sunrise
energy metals

Sunrise Project

Project Execution Plan Modification

Modification Report

Main Report and Appendices

EXECUTIVE SUMMARY

ES.1 INTRODUCTION

The Sunrise Project (the Project) is a nickel, cobalt and scandium open cut mining project situated near the village of Fifield, approximately 350 kilometres west-northwest of Sydney, in New South Wales (NSW).

SRL Ops Pty Ltd owns the rights to develop the Project. SRL Ops Pty Ltd is a wholly owned subsidiary of Sunrise Energy Metals Limited (SEM)[1].

Development Consent (DA 374-11-00) for the Project was issued under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) in 2001. Six modifications to Development Consent (DA 374-11-00) have since been granted under the EP&A Act.

The Project includes the establishment and operation of the following:

- mine and processing facility;
- limestone quarry;
- rail siding;
- borefield, surface water extraction infrastructure and water pipeline;
- gas pipeline;
- accommodation camp; and
- associated transport activities and transport infrastructure (e.g. the Fifield Bypass, road and intersection upgrades).

This Modification Report is a Statement of Environmental Effects that has been prepared by SEM to support a request to modify Development Consent (DA 374-11-00) under section 4.55(2) of the EP&A Act.

ES.2 OVERVIEW OF THE MODIFICATION

SEM has continued to review and optimise the Project design, construction and operation as part of preparations for Project execution. The outcomes of this review are outlined in the Project Execution Plan.

The Project Execution Plan identified a number of changes to the approved mine and processing facility, accommodation camp, rail siding and road transport activities.

The Project Execution Plan Modification (the Modification) includes these Project Execution Plan changes to allow for the optimisation of the construction and operation of the Project.

Table ES.1 provides a comparative summary of the existing/approved and modified Project.

In accordance with clause 3BA(6) of Schedule 2 of the *Environmental Planning and Assessment (Savings, Transitional and Other Provisions) Regulation 2017*, the consent authority is required to satisfy itself that any consent as modified would result in the Project remaining substantially the same development as was last modified under section 75W of the EP&A Act (i.e. Modification 4, which is the existing/approved Project), inclusive of consideration of the changes arising from previously approved modifications.

Based on a review of the proposed changes, SEM considers that the modified Project would be substantially the same as the existing/approved Project.

ES.3 STAKEHOLDER ENGAGEMENT OVERVIEW

SEM has consulted with a number of stakeholders during the development of the Modification, including:

- NSW Department of Planning, Industry and Environment;
- other relevant NSW Government agencies;
- Lachlan Shire Council, Parkes Shire Council and Forbes Shire Council;
- relevant infrastructure owners and service providers;
- Community Consultative Committee; and
- the local community.

The outcomes of engagement with these stakeholders have informed the development of the scope of the Modification and SEM's preparation of the Modification Report.

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[1] SEM was previously Clean TeQ Holdings Limited (Clean TeQ).

Table ES.1
Comparison of the Existing/Approved and Modified Project

Project Component	Existing/Approved	Modified
Mining Tenements	• Mining Lease 1770 and Mining Lease 1769.	• No change.
Project Life	• Construction phase – two years. • Operational phase – 21 years from the commencement of mining.	• Increased construction phase duration from two to three years. • No change to the operational phase.
Hours of Operation	• 24 hours per day, seven days per week.	• No change.
Mining Method	• Conventional open cut mining methods.	• No change to mining method. • Increased mining rate during initial years.
Open Cut Pit Extents	• Progressive development of two main open cut pits and multiple small-scale scandium open cut pits.	• No change to open cut pit extents. • Minor changes to the mining sequence.
Waste Rock Management	• Waste rock deposited in small-scale scandium open cut voids and in waste rock emplacements.	• No change to waste rock management. • Minor changes to the waste rock emplacement sequence.
Processing Facility Area	• Key components include processing plant, sulphuric acid plant, limestone slurry plant, process reagent storages, power plant, workshops, warehouses, offices, fuel storages, water treatment plants, run-of-mine pad, laydown areas and vehicle access points.	• No change to key components. • Revised processing facility area layout (including revised processing plant layout and two additional vehicle site access points).
Processing Plant	• Metals extracted from the ore using an acid leach circuit and a resin-in-pulp circuit/metals recovery. • Autoclave feed rate of up to 2.5 million tonnes of ore (dry weight) in any calendar year.	• No change.
Processing Plant Reagents	• Up to 1,050,000 tonnes per annum (tpa) of sulphuric acid produced in the sulphuric acid plant.	• No change to sulphuric acid plant process or production rate. • Reduced sulphuric acid plant stack height from 80 metres (m) to 40 m.
	• Up to 990,000 tpa of limestone delivered to the mine and processing facility via road from either – the limestone quarry (up to 790,000 tpa); and/or – third-party suppliers (up to 560,000 tpa).	• No change.
	• Other processing plant reagents delivered to the mine and processing facility via road and rail.	• Revisions to processing plant reagent types, rates and storage volumes.
Products	• Up to 40,000 tpa of nickel and cobalt metal equivalents, as sulphate precipitate products. • Up to 100,000 tpa of ammonium sulphate. • Up to 180 tpa of scandium oxide.	• No change.
Tailings Management	• Tailings deposited in the tailings storage facility.	• No change to tailings management. • Revised tailings storage facility cell construction sequence. • Addition of a decant transfer pond.
Water Supply	• Development of borefield, surface water extraction infrastructure and water pipeline to the mine and processing facility.	• No change.

Table ES.1 (Continued)
Comparison of the Existing/Approved and Modified Project

Project Component	Existing/Approved	Modified
Water Management	• Overall objective is to control runoff from the construction and operational areas while diverting up-catchment water around these areas.	• No change to the overall water management objective. • Relocated and resized evaporation pond. • Changes to the water management system to reflect the modified mine and processing facility layout.
Power Supply	• Co-generation power plant (40 megawatts). • Diesel-powered backup generator.	• No change to co-generation power plant. • Increased number of diesel-powered backup generators (and associated stacks) from one to four.
Exploration Activities	• No exploration activities.	• Addition of exploration activities within the approved surface development area inside Mining Lease 1770.
Accommodation Camp	• Development of an accommodation camp on the Sunrise property. • Approximate capacity of 1,300 personnel during the construction phase. • Reduced capacity of 300 personnel during the operations phase.	• Increased construction phase capacity from 1,300 to 1,900 personnel. • Increased size of the treated wastewater irrigation area. • Option for an alternative alignment of the last section of the accommodation camp water pipeline along the accommodation camp services corridor rather than along the access road corridor. • Option to transfer treated wastewater to the mine and processing facility via a water pipeline. • No change to the operational phase capacity.
Rail Siding	• Development of a rail siding on the Bogan Gate Tottenham Railway.	• Rail siding relocated approximately 500 m south of the approved location on the Bogan Gate Tottenham Railway. • Addition of an ammonium sulphate storage and distribution facility. • Addition of a 22 kilovolt electricity transmission line (subject to separate approval). • No other changes to rail siding operations.
Gas Pipeline	• Development of a gas pipeline from the Moomba Sydney Pipeline to the mine and processing facility.	• No change.
Material Transport	• Transport of reagents and products via a combination of road and rail.	• Changes to construction phase vehicle movements associated with the increased construction phase accommodation camp capacity and changes to heavy vehicle delivery requirements. • Changes to operational phase heavy vehicle movements associated with revisions to processing plant reagent types, rates and storage volumes. • Changes to operational phase heavy vehicle movements to and from the rail siding associated with the transport of metal and ammonium sulphate products.
Road and Intersection Upgrades	• Road and intersection upgrades in accordance with the Development Consent (DA 374-11-00) and Voluntary Planning Agreement.	• Two additional mine and processing facility vehicle access point intersections on Wilmatha Road. • Extension to the Scotson Lane road upgrade. • No change to other road and intersection upgrades.
Workforce	• Peak of approximately 1,000 personnel during construction phase. • Approximately 335 personnel during operation phase.	• Increased peak construction phase workforce from approximately 1,000 to 1,900 personnel. • Increased operational phase workforce from approximately 335 to 340 personnel.

ES.4 ASSESSMENT OF POTENTIAL ENVIRONMENTAL IMPACTS

SEM has undertaken a review of the potential environmental impacts of the Modification to identify key potential environmental aspects requiring assessment. The key potential environmental aspects identified and environmental review outcomes are summarised in Table ES.2.

ES.5 EVALUATION OF MERITS

Approval of the Modification is considered to be justified given:

- The Modification would allow for the optimisation of the construction and operation of the approved Project.
- The Modification would increase the peak construction phase workforce from approximately 1,000 personnel to approximately 1,900 personnel and the duration of the construction phase would increase from two to three years providing additional employment opportunities and economic benefits.
- The Modification would include the development of NSW mineral resources in a manner that minimises environmental impacts through the implementation of the Environmental Management Strategy and other measures.

In weighing up the main environmental impacts (costs and benefits) associated with the proposal as assessed and described in this Modification Report, the Modification is, on balance, considered to be in the public interest of the State of NSW.

Table ES.2
Key Outcomes of Environmental Review of the Modified Project

Environmental Aspect	Summary of Key Environmental Review Conclusions
Air Quality	• Compliance with the relevant air quality criteria is predicted at privately-owned sensitive receivers surrounding the modified mine and processing facility and rail siding.
Noise	• Two "moderate" exceedances and five "negligible" exceedances are predicted at privately-owned sensitive receivers in the vicinity of the mine and processing facility with the implementation of reasonable and feasible mitigation measures. • The privately owned dwellings with a "moderate" exceedance would be afforded noise mitigation measures upon request rights in accordance with the Voluntary Land Acquisition and Mitigation Policy. • Compliance with the relevant noise criteria is predicted at the modified rail siding.
Surface Water	• The water balance modelling demonstrates that the modified site water management system has sufficient capacity and flexibility to accommodate a wide range of climate scenarios. • No overflows are predicted from the tailings storage facility, decant transfer pond, evaporation pond, mine water dams or processing plant runoff dams over the Project life. • The predicted average and maximum annual off-site water requirements for the Project would not significantly change. • Potential surface water impacts associated with the Modification are not considered to be significant.
Groundwater	• No significant change to approved groundwater impacts are predicted as a result of the Modification. • The Modification would have "minimal impact" as defined in the Aquifer Interference Policy.
Hazard and Risks	• The Preliminary Hazard Analysis concluded that the modified Project would comply with all relevant risk criteria (including societal risk, area cumulative risk, propagation risk, transport risk and environmental risk).

Table ES.2 (Continued)
Key Outcomes of Environmental Review of the Modified Project

Environmental Aspect	Summary of Key Environmental Review Conclusions
Road Transport	• Construction phase daily traffic movements would significantly reduce. • Operational phase daily traffic movements would not significantly change. • Construction and operational phase truck traffic in Trundle main street would reduce. • The road and intersection upgrades required by Development Consent (DA 374-11-00) and the Voluntary Planning Agreement are appropriate for the modified Project with the addition of the extension of the approved Scotson Lane upgrade to the modified rail siding access and two additional vehicle site access points. • No significant impacts to road performance, capacity, efficiency or safety are expected as a result of the traffic associated with the Modification.
Biodiversity	• No increase to impacts on vegetation abundance, vegetation integrity, habitat suitability, threatened species abundance, habitat connectivity, threatened species movement, flight path integrity or hydrological processes that are known to sustain a threatened species or ecological community. • As there would be no increase in impacts on biodiversity values, a Biodiversity Development Assessment Report is not required.
Aboriginal Cultural Heritage	• No additional Aboriginal cultural heritage sites would be impacted by the Modification.
Historic Heritage	• No additional historic heritage sites would be impacted by the Modification.
Visual	• The Modification is not expected to significantly change the visual impacts associated with the mine and processing facility, accommodation camp and rail siding.
Social	• All identified social impacts associated with the Modification are evaluated as low significance, with the exception of two positive impacts rated as medium significance.
Economic Effects	• The Modification would provide additional employment opportunities during the construction phase of the Project that would result in increased economic benefits (e.g. increased wages, business turnover) in the NSW economy.
Greenhouse Gas Emissions	• The total greenhouse gases directly generated as a result of the modified Project (Scope 1 emissions) would be less than those generated by the approved Project.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF TABLES (Continued)

LIST OF FIGURES

LIST OF ATTACHMENTS

LIST OF APPENDICES

1 INTRODUCTION

The Sunrise Project (the Project) is a nickel, cobalt and scandium open cut mining project situated near the village of Fifield, approximately 350 kilometres (km) west-northwest of Sydney, in New South Wales (NSW) (Figure 1).

SRL Ops Pty Ltd owns the rights to develop the Project. SRL Ops Pty Ltd is a wholly owned subsidiary of Sunrise Energy Metals Limited (SEM)[2].

Development Consent (DA 374-11-00) for the Project was issued under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) in 2001. Six modifications to Development Consent (DA 374-11-00) have since been granted under the EP&A Act. Development Consent (DA 374-11-00) is provided in Attachment 1.

This Modification Report is a Statement of Environmental Effects that has been prepared by SEM to support a request to modify Development Consent (DA 374-11-00) under section 4.55(2) of the EP&A Act.

1.1 DESCRIPTION OF THE EXISTING/APPROVED PROJECT

1.1.1 Project Overview

The Project includes the establishment and operation of the following:

- mine and processing facility;
- limestone quarry;
- rail siding;
- borefield, surface water extraction infrastructure and water pipeline;
- gas pipeline;
- accommodation camp; and
- associated transport activities and transport infrastructure (e.g. the Fifield Bypass, road and intersection upgrades).

The Project is currently approved to:

- undertake mining operations for 21 years from the day upon which mining operations start;
- operate a maximum autoclave feed rate of 2.5 million tonnes (Mt) of ore (dry weight) in any calendar year;
- transport in any one calendar year no more than 40,000 tonnes (t) of nickel and cobalt metal equivalents, 180 t of scandium oxide and 100,000 t of ammonium sulphate;
- extract up to 790,000 t of limestone from the limestone quarry in any one calendar year; and
- operate related supporting infrastructure.

Construction of the Project commenced in 2006, which included components of the borefield, however construction of other Project components is yet to commence.

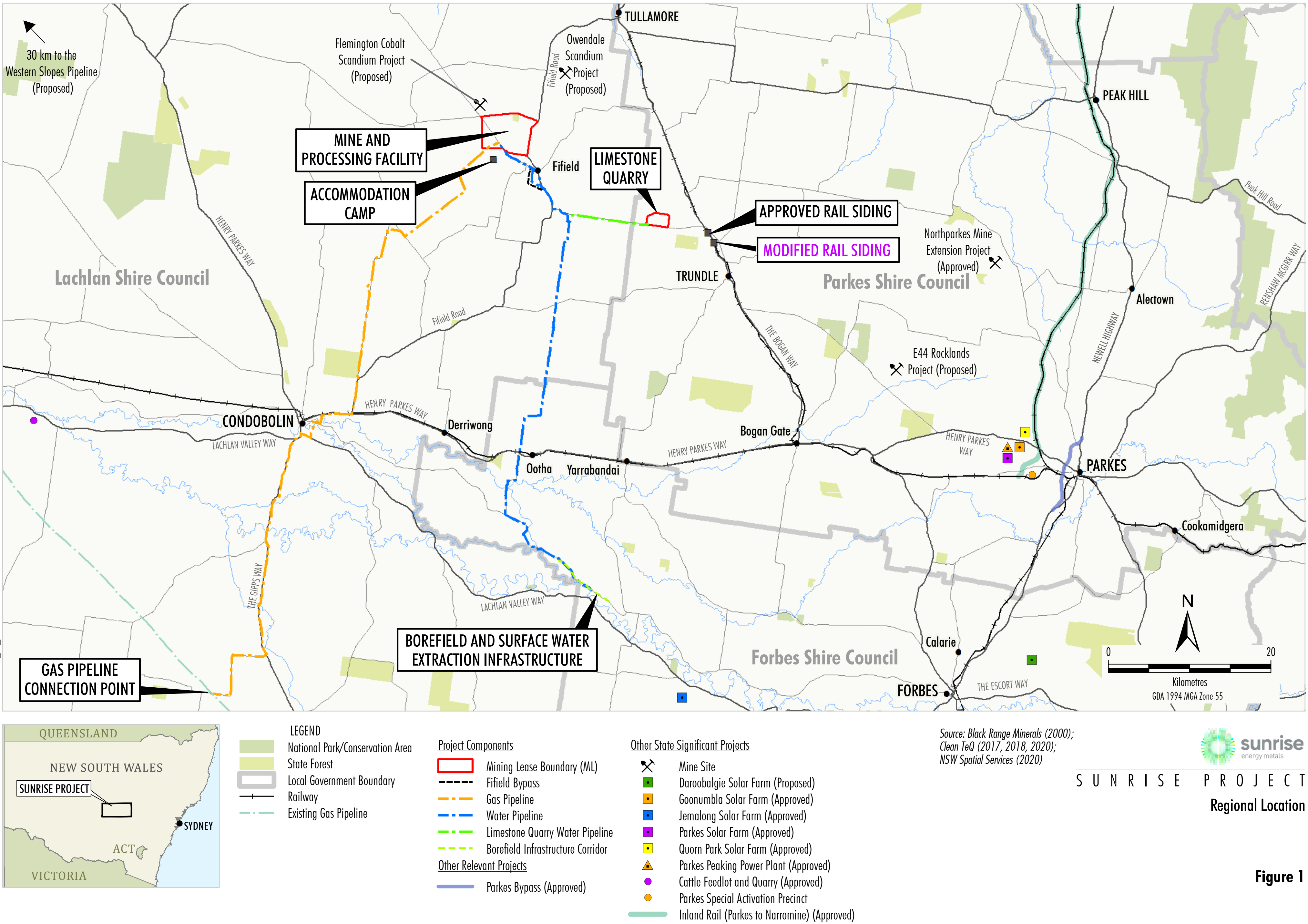
1.1.2 Environment Monitoring and Management

An Environmental Management Strategy (Clean TeQ, 2019a) has been developed and approved for the Project to minimise environmental impacts by providing the strategic context for environmental management across the Projects various components.

The following environmental management and monitoring plans and strategies have been developed in consultation with relevant agencies as part of the Environmental Management Strategy:

- Water Management Plan, including:
  - Water Balance;
  - Surface Water Management Plan; and
  - Groundwater Management Plan.
- Noise Management Plan;
- Air Quality Management Plan;
- Blast Management Plan;
- Heritage Management Plan;
- Rehabilitation Management Plan;
- Biodiversity Management Plan and Revegetation Strategy;
- Traffic Management Plan; and
- Road Upgrade and Maintenance Strategy.

[2] SEM was previously Clean TeQ Holdings Limited (Clean TeQ).



30 km to the Western Slopes Pipeline (Proposed)
Flemington Cobalt Scandium Project (Proposed)
Owendale Scandium Project (Proposed)
Fifield Road
TULLAMORE
MINE AND PROCESSING FACILITY
ACCOMMODATION CAMP
Fifield
LIMESTONE QUARRY
APPROVED RAIL SIDING
MODIFIED RAIL SIDING
PEAK HILL
Peak Hill Road
Northparkes Mine Extension Project (Approved)
TRUNDLE
Lachlan Shire Council
Parkes Shire Council
HENRY PARKES WAY
Fifield Road
Alectown
NEWELL HIGHWAY
REINSHAW MCGIRR WAY
THE BOGAN WAY
E44 Rocklands Project (Proposed)
CONDOBOLIN
LACHLAN VALLEY WAY
HENRY PARKES WAY
Derriwong
Ootha
Yarrabandai
Bogan Gate
HENRY PARKES WAY
HENRY PARKES WAY
PARKES
Cookamidgera
THE GIPPS WAY
LACHLAN VALLEY WAY
BOREFIELD AND SURFACE WATER EXTRACTION INFRASTRUCTURE
Calarie
Forbes Shire Council
FORBES
THE ESCORT WAY
N
0
20
Kilometres
GDA 1994 MGA Zone 55
GAS PIPELINE CONNECTION POINT
CTL-20-08 MOD 7_MT_202B
QUEENSLAND
NEW SOUTH WALES
SUNRISE PROJECT
SYDNEY
ACT
VICTORIA
LEGEND
National Park/Conservation Area
State Forest
Local Government Boundary
Railway
Existing Gas Pipeline
Project Components
Mining Lease Boundary (ML)
Fifield Bypass
Gas Pipeline
Water Pipeline
Limestone Quarry Water Pipeline
Borefield Infrastructure Corridor
Other Relevant Projects
Parkes Bypass (Approved)
Other State Significant Projects
Mine Site
Daroobalgie Solar Farm (Proposed)
Goonumbla Solar Farm (Approved)
Jemalong Solar Farm (Approved)
Parkes Solar Farm (Approved)
Quorn Park Solar Farm (Approved)
Parkes Peaking Power Plant (Approved)
Cattle Feedlot and Quarry (Approved)
Parkes Special Activation Precinct
Inland Rail (Parkes to Narromine) (Approved)
Source: Black Range Minerals (2000); Clean TeQ (2017, 2018, 2020); NSW Spatial Services (2020)
sunrise energy metals
SUNRISE PROJECT
Regional Location

Figure 1

In addition, the following hazard studies will be prepared for the Project in accordance with Development Consent (DA 374-11-00):

- Fire Safety Study;
- Final Hazard Analysis;
- Construction Safety Study;
- Hazard and Operability Study;
- Transport of Hazardous Materials Study;
- Emergency Plan; and
- Safety Management System.

A further detailed description of the Project environmental management and monitoring plans and hazard studies listed above is provided in Section 6.

SEM maintains and operates an environmental monitoring network for the Project, including meteorological, dust, particulate matter, surface water and groundwater monitoring.

An overview of environmental management actions and environmental monitoring results, including a review of SEM's performance against the requirements of the environmental management and monitoring plans, is presented each year in an Annual Review. The Annual Review is provided to government agencies and made publicly available on SEM's website.

1.1.3 Community Engagement

SEM is committed to engaging with communities to understand their priorities, provide information about the Project, and seek opportunities to create shared value. To do so, SEM operates under a community engagement policy which defines guiding principles for interactions with the community (Clean TeQ, 2019b).

A Community Consultative Committee (CCC) has been established for the Project. The purpose of the CCC is to provide a forum for open discussion between SEM representatives, the community, the relevant councils and other stakeholders on issues directly relating to the Project activities, environmental performance and community relations, and to keep the community informed on these matters. The independently chaired CCC meets biannually and the meeting presentation and minutes are publicly available on the SEM website.

In addition, SEM has offices located in Parkes and Condobolin which are regularly open to members of the community to discuss the Project with SEM employees.

In addition, SEM operates a toll-free community complaints line to allow community members to easily raise issues regarding SEM's activities.

A Voluntary Planning Agreement (VPA) was executed with Lachlan Shire Council (LSC), Parkes Shire Council (PSC) and Forbes Shire Council (FSC) in December 2018. The first payments of $200,000 to LSC, $100,000 to PSC and $100,000 to FSC were made in January 2019.

In 2019 SEM provided financial and/or non-financial support to local agricultural shows, primary and secondary schools (in Trundle, Condobolin, Parkes and Forbes), and the Trundle Bush Tucker Day (Clean TeQ, 2020a). SEM intends to continue its support of local agricultural shows and events as they recommence after the COVID-19 pandemic.

During 2020, SEM donated 100 megalitres (ML) of its surface water allocation to the LSC to assist filling Gum Bend Lake to allow for the continuation of recreational activities over the 2020/2021 summer.

1.2 MODIFICATION OVERVIEW

SEM has continued to review and optimise the Project design, construction and operation as part of preparations for Project execution. The outcomes of this review are outlined in the Project Execution Plan (Clean TeQ, 2020b).

The Project Execution Plan identified a number of changes to the approved mine and processing facility, accommodation camp, rail siding and road transport activities.

The Project Execution Plan Modification (the Modification) includes these Project Execution Plan changes to allow for the optimisation of the construction and operation of the Project.

Table 1 provides a comparative summary of the existing/approved and modified Project. Based on a review of the proposed changes, SEM considers that the modified Project would be substantially the same as the existing/approved Project.

A detailed description of the Modification is provided in Section 3.

Table 1
Comparison of the Existing/Approved and Modified Project

Project Component	Existing/Approved	Modified
Mining Tenements	• Mining Lease (ML) 1770 and ML 1769.	• No change.
Project Life	• Construction phase – two years. • Operational phase – 21 years from the commencement of mining.	• Increased construction phase duration from two to three years. • No change to the operational phase.
Hours of Operation	• 24 hours per day, seven days per week.	• No change.
Mining Method	• Conventional open cut mining methods.	• No change to mining method. • Increased mining rate during initial years.
Open Cut Pit Extents	• Progressive development of two main open cut pits and multiple small-scale scandium open cut pits.	• No change to open cut pit extents. • Minor changes to the mining sequence.
Waste Rock Management	• Waste rock deposited in small-scale scandium open cut voids and in waste rock emplacements.	• No change to waste rock management. • Minor changes to the waste rock emplacement sequence.
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Processing Plant	• Metals extracted from the ore using an acid leach circuit and a resin-in-pulp circuit/metals recovery. • Autoclave feed rate of up to 2.5 Mt of ore (dry weight) in any calendar year.	• No change.
Processing Plant Reagents	• Up to 1,050,000 tonnes per annum (tpa) of sulphuric acid produced in the sulphuric acid plant.	• No change to sulphuric acid plant process or production rate. • Reduced sulphuric acid plant stack height from 80 metres (m) to 40 m.
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Comparison of the Existing/Approved and Modified Project

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Power Supply	• Co-generation power plant (40 megawatts [MW]). • Diesel-powered backup generator.	• No change to co-generation power plant. • Increased number of diesel-powered backup generators (and associated stacks) from one to four.
Exploration Activities	• No exploration activities.	• Addition of exploration activities within the approved surface development area inside ML 1770.
Accommodation Camp	• Development of an accommodation camp on the Sunrise property. • Approximate capacity of 1,300 personnel during the construction phase. • Reduced capacity of 300 personnel during the operations phase.	• Increased construction phase capacity from 1,300 to 1,900 personnel. • Increased size of the treated wastewater irrigation area. • Option for an alternative alignment of the last section of the accommodation camp water pipeline along the accommodation camp services corridor rather than along the access road corridor. • Option to transfer treated wastewater to the mine and processing facility via a water pipeline. • No change to the operational phase capacity.
Rail Siding	• Development of a rail siding on the Bogan Gate Tottenham Railway.	• Rail siding relocated approximately 500 m south of the approved location on the Bogan Gate Tottenham Railway. • Addition of an ammonium sulphate storage and distribution facility. • Addition of a 22 kilovolt (kV) electricity transmission line (ETL) (subject to separate approval). • No other changes to rail siding operations.
Gas Pipeline	• Development of a gas pipeline from the Moomba Sydney Pipeline to the mine and processing facility.	• No change.
Material Transport	• Transport of reagents and products via a combination of road and rail.	• Changes to construction phase vehicle movements associated with the increased construction phase accommodation camp capacity and changes to heavy vehicle delivery requirements. • Changes to operational phase heavy vehicle movements associated with revisions to processing plant reagent types, rates and storage volumes. • Changes to operational phase heavy vehicle movements to and from the rail siding associated with the transport of metal and ammonium sulphate products.
Road and Intersection Upgrades	• Road and intersection upgrades in accordance with the Development Consent (DA 374-11-00) and Voluntary Planning Agreement.	• Two additional mine and processing facility vehicle access point intersections on Wilmatha Road. • Extension to the Scotson Lane road upgrade. • No change to other road and intersection upgrades.
Workforce	• Peak of approximately 1,000 personnel during construction phase. • Approximately 335 personnel during operation phase.	• Increased peak construction phase workforce from approximately 1,000 to 1,900 personnel. • Increased operational phase workforce from approximately 335 to 340 personnel.

1.3 STRUCTURE OF THE DOCUMENT

This Modification Report, prepared in consideration of the exhibition draft *Preparing a Modification Report State Significant Development Guide* (NSW Department of Planning, Industry and Environment [DPIE], 2020a), is structured as follows:

Section 1	Provides an overview of the existing/approved Project and the background to the Modification.
Section 2	Provides an overview of the strategic context for the modified Project.
Section 3	Provides a description of the Modification.
Section 4	Describes the statutory context of the Modification.
Section 5	Provides a summary of the engagement undertaken for the Modification and key issues raised.
Section 6	Provides a review of the existing/approved environmental management at the Project and an environmental assessment of the Modification.
Section 7	Evaluates the merits of the modified Project, and provides justification for approval of the Modification.
Section 8	Lists the references cited in Sections 1 to 7.

Attachments 1 and 2 and Appendices A to J provide supporting information as follows:

Attachment 1	Development Consent (DA 374-11-00)
Attachment 2	Proposed Amendments to Appendix 1 of Development Consent (DA 374-11-00)
Appendix A	Air Quality Assessment
Appendix B	Noise Assessment
Appendix C	Surface Water Assessment
Appendix D	Road Transport Assessment
Appendix E	Preliminary Hazard Analysis
Appendix F	Biodiversity Review
Appendix G	Aboriginal Cultural Heritage Assessment
Appendix H	Land Contamination Assessment
Appendix I	Social Impact Review
Appendix J	Environmental Review of Rail Siding Electricity Transmission Line

2 STRATEGIC CONTEXT

This section outlines the strategic context for the Modification. The strategic need and potential benefits of the Modification are also described in this section.

2.1 REGIONAL CONTEXT

The Project is located in the Lachlan, Parkes and Forbes local government areas (LGAs) (Figure 1), which form part of the Central West and Orana region of NSW. The wider Central West and Orana region also comprises the LGAs of Bathurst Region, Blayney, Cabonne, Cowra, Lithgow, Oberon, Orange, Weddin, Bogan, Coonamble, Dubbo Region, Gilgandra, Narromine, Mid-Western Region, Warren and Warrumbungle (NSW Government, 2017).

The Central West and Orana region has a diverse and productive economy that leverages its connections to Sydney, Newcastle, Canberra, Melbourne and Brisbane to access domestic and international markets (NSW Government, 2017).

The Central West and Orana region's gross regional product represents approximately 12 percent (%) of NSW's gross regional product. The "mining" and the "agriculture, forestry and fishing" sectors are the two largest contributors to the region's gross regional product ($2.5 billion and $1.3 billion, respectively) (NSW Government, 2017).

Productive and diversified agribusiness, manufacturing, mineral and renewable energy resources provide local employment opportunities in the Central West and Orana region. The "agriculture, forestry and fishing" and "mining" sectors provide approximately 11% and 5% of employment opportunities in the region, respectively (NSW Government, 2017).

The Lachlan Shire is located in the south-west of the Central West and Orana region. Condobolin is the local service centre and main residential area for the Lachlan Shire and provides a hub for agricultural activity, grain storage and transportation links for Lake Cargelligo, Tottenham, Tullibigeal, Burcher, Derriwong, Fifield and Albert (NSW Government, 2017).

The Parkes Shire has a diverse economy underpinned by agriculture and mining and supported by a robust transport and logistics industry. The Parkes Shire includes the strategic centre of Parkes and smaller towns of Peak Hill, Bogan Gate, Trundle and Tullamore (NSW Government, 2017).

Parkes sits at the intersection of the Newell Highway and the rail corridor that links Melbourne, Brisbane, Sydney and Perth, as well as Adelaide and Darwin (NSW Government, 2017). The NSW Government has established the Parkes Special Activation Precinct under the *State Environmental Planning Policy (Activation Precincts) 2020* to take advantage of this access to existing national transport corridors and provide opportunities for new industries to co-locate in Parkes to drive economic activity (NSW Government, 2020).

The Forbes Shire is located in the south of the Central West and Orana region. The economy is underpinned by irrigated and dryland agriculture, particularly grains and livestock, as well as wholesale trade, health care and manufacturing (NSW Government, 2017).

2.2 PROJECT CONTEXT

The Modification would involve changes to the approved mine and processing facility, accommodation camp, rail siding and road transport activities (Section 3).

The mine and processing facility and accommodation camp are located approximately 40 km north-east of Condobolin and approximately 80 km north-west of Parkes. Fifield is the closest community to these Project components and is located approximately 2 km to the south-east (Figure 1).

Existing land uses in the vicinity of the mine and processing facility and accommodation camp are characterised by a combination of agricultural enterprises (grazing and dryland cropping), carbon offset properties and forestry operations (Fifield State Forest).

The rail siding is located approximately 50 km north-west of Parkes. Trundle is the closest community to the rail siding and is located approximately 4 km to the south-southeast (Figure 1).

Existing land uses in the vicinity of the rail siding are characterised by a combination of agricultural enterprises (grazing and dryland cropping), roads and the Bogan Gate Tottenham Railway. The Bogan Gate Tottenham Railway is infrequently used for grain transport and provides access to the Port of Newcastle, Port Botany and Port Kembla.

Relevant land ownership information for land parcels and the location of rural dwellings within the immediate vicinity of the mine and processing facility, accommodation camp and rail siding is provided in Section 6.2.

A detailed description of the regional road network is provided in Section 6.6.

2.3 POTENTIAL CUMULATIVE INTERACTIONS WITH OTHER STATE SIGNIFICANT PROJECTS

This section describes the potential interaction between the modified Project and other State significant projects in the region that may be of potential relevance to the environmental assessment of the Modification.

Key proposed or approved projects that may potentially interact with, or have potential cumulative impacts with, the modified Project are listed in Table 2 and shown on Figure 1.

Table 2 also classifies each of the State significant projects as "relevant" or "potentially relevant" in accordance with the draft *Assessing Cumulative Impacts Guide Guidance for State Significant Projects* (DPIE, 2020b).

Cumulative impacts with the modified Project and the "relevant" State significant projects have been considered in this Modification Report (Section 6) in accordance with the draft *Assessing Cumulative Impacts Guide Guidance for State Significant Projects* (DPIE, 2020b).

The NSW Government has established the Parkes Special Activation Precinct under the *State Environmental Planning Policy (Activation Precincts) 2020*. The Parkes Special Activation Precinct is a 3,600 hectare (ha) industrial park located approximately 3 km west of Parkes (Figure 1) (NSW Government, 2020).

Construction of Stage 1 infrastructure for the industrial park (i.e. road and electricity distribution infrastructure) is expected to commence in June 2021 (Regional Growth NSW, 2021).

The Parkes Solar Farm, Goonumbla Solar Farm and Parkes Peaking Power Plant (Table 2) are located in the Parkes Special Activation Precinct. Any future developments associated with the Parkes Special Activation Precinct may also potentially interact with, or have potential cumulative impacts with, the modified Project. These potential interactions or cumulative impacts would be assessed as part of separate development applications for these future developments.

2.4 RELEVANT STRATEGIC PLANNING DOCUMENTS

2.4.1 Central West and Orana Regional Plan 2036

The *Central West and Orana Regional Plan 2036* (NSW Government, 2017) (the Regional Plan) applies to the Central West and Orana region which includes the Lachlan, Parkes and Forbes LGAs where the Project is located (Section 2.1). The Regional Plan outlines the land use planning priorities for the region over 20 years to 2036.

The Regional Plan recognises the significance of mineral resource development and includes the growth of mineral resource development in the overall vision for the region. The modified Project would provide continued growth of mineral resource development in the region.

The Regional Plan has four goals for the region:

- *The most diverse regional economy in NSW*
- *A stronger, healthier environment and diverse heritage*
- *Quality freight, transport and infrastructure networks*
- *Dynamic, vibrant and healthy communities*

The Modification is generally consistent with the goals of the Regional Plan as:

- The modified Project would benefit the regional economy through the creation of employment opportunities and regional expenditure, including the addition of an ammonium sulphate storage and distribution facility that would facilitate the supply of ammonium sulphate (a fertiliser) to agricultural operations in the region.
- The modified Project incorporates a range of strategies to manage and minimise impacts on the environment and heritage (Sections 1.1.2 and 6 and Appendices A to J).

Table 2
Summary of Key Proposed or Approved State Significant Projects in the Project Region

Project	Overview	Status	Cumulative Impact Assessment[1]
Lachlan Shire Local Government Area			
Cattle Feedlot and Quarry (Department of Infrastructure, Planning and Natural Resources, 2005)	• 50,000 head cattle feedlot and quarry (providing material to the feedlot for construction and maintenance), located approximately 30 km west of Condobolin. • The construction workforce is approximately 85 personnel in the first year of construction and 53 personnel over the following three years of construction. • The operational workforce is approximately 50 personnel.	• Approved (2005) – Not constructed	• Relevant Project – Required to be Considered
Flemington Cobalt Scandium Mine (Australian Mines Limited, 2017)	• A proposed nickel, cobalt and scandium open cut mine located to the immediate north-west of the Project. • The proposed construction workforce is approximately 120 to 150 personnel for approximately 12 to 18 months. • The proposed operational workforce is approximately 75 personnel for 18 years.	• Environmental Assessment Requirements (EARs) Issued (2018)	• Potentially Relevant Project – Not Required to be Considered
Owendale Scandium Mine (R.W. Corkery & Co. Pty Limited, 2018)	• A proposed nickel, cobalt and scandium open cut mine (immediately north-east of the Project), processing site (located approximately 5 km west of Condobolin) and associated infrastructure. • The proposed construction period is approximately two years (no workforce estimate provided). • The proposed operational workforce is approximately 121 personnel for 28 years of mining operations.	• EARs Issued (2018)	• Potentially Relevant Project – Not Required to be Considered
Western Slopes Pipeline (APA Group, 2017)	• A proposed high pressure gas pipeline approximately 450 km in length to connect the Narrabri Gas Project to the NSW gas transmission network, with the alignment located north and west of the Project. • The proposed construction workforce is between 250 and 350 personnel for approximately eight to 10 months. • The proposed operational workforce is four to five personnel for approximately 40 years.	• EARs Issued (2019)	• Potentially Relevant Project – Not Required to be Considered
Parkes Shire Local Government Area			
Northparkes Mine Extension Project (CMOC Mining Services Pty Ltd, 2018)	• A copper-gold mine located approximately 27 km north-west of Parkes. • Operational workforce of approximately 700 personnel until end of the mine life in 2032.	• Approved (2014) – Operational	• Relevant Project – Required to be Considered
Inland Rail Parkes to Narromine (Australian Rail Track Corporation [ARTC], 2021)	• An upgrade of the existing rail line between Parkes and Narromine as part of the Inland Rail Project (including 98.4 km of upgraded track and 5.4 km of new track).	• Approved (2018) – Operational	• Relevant Project – Required to be Considered
Parkes Solar Farm (Neoen Renewing Energy, 2016)	• A 65 MW photovoltaic solar farm located approximately 10 km west of Parkes. • The operational workforce on-site is approximately one for the expected 25 to 30 year operational life.	• Approved (2016) – Operational	• Relevant Project – Required to be Considered

Table 2 (Continued)
Summary of Key Proposed or Approved State Significant Projects in the Project Region

Project	Overview	Status	Cumulative Impact Assessment[1]
Goonumbla Solar Farm (Geolyse, 2016)	• A 70 MW photovoltaic solar farm located approximately 10 km west of Parkes and immediately north of the Parkes Solar Farm. • There are no operational employees stationed on-site at the solar farm.	• Approved (2016) – Operational	• Relevant Project – Required to be Considered
Quorn Park Solar Farm (Premise Australia Pty Limited, 2019)	• An 80 MW photovoltaic solar farm located approximately 10 km north-west of Parkes. • The peak construction workforce is 100 personnel for approximately nine months. • The operational workforce is two to three personnel for the expected 30 year operational life.	• Approved (2020) – Not constructed	• Relevant Project – Required to be Considered
Parkes Peaking Power Plant (NSW Department of Planning [DoP], 2008)	• A gas turbine peaking power plant with a nominal output between 120 MW to 150 MW, located approximately 10 km west of Parkes. • The construction workforce is approximately 44 personnel for six to eight months. • The operational workforce is approximately four personnel.	• Approved (2008) – Not constructed	• Relevant Project – Required to be Considered
Parkes Bypass[2] (Transport for NSW [TfNSW], 2019 and 2021)	• A 10.5 km Newell Highway bypass approximately 2 km west of Parkes. • The main construction workforce is up to approximately 400 personnel for approximately three years.	• Approved (2019) – Under construction	• Relevant Project – Required to be Considered
E44 Rocklands Project (MineSoils, 2021)	• A proposed open cut mine to supplement existing underground operations at Northparkes Mine, approximately 50 km south-east of the Sunrise Mine.	• Site Verification Certificate Application submitted (2020)	• Potentially Relevant Project – Not Required to be Considered
Forbes Shire Local Government Area			
Jemalong Solar Farm (NGH Environmental Pty Ltd, 2017)	• A 50 MW photovoltaic solar farm undergoing construction, approximately 36 km west of Forbes. • The construction workforce is approximately 100 direct jobs and 100 indirect jobs over a construction period of approximately 12 months. • The operational workforce is three to four personnel for approximately 30 years.	• Approved (2018) – Under construction	• Relevant Project – Required to be Considered
Daroobalgie Solar Farm (Pacific Hydro, 2019)	• A 100 MW photovoltaic solar farm located approximately 11 km north-east of Forbes. • A proposed peak construction workforce of approximately 160 personnel for approximately 12 to 18 months. • A proposed operational workforce of approximately four to six personnel for the expected operational life of approximately 25 years.	• EARs Issued (2019)	• Potentially Relevant Project – Not Required to be Considered

1 In accordance with the draft *Assessing Cumulative Impacts Guide Guidance for State Significant Projects* (DPIE, 2020b).

2 Approved under Part 5 of the EP&A Act.

- The modified Project includes consideration of potential impacts on transport infrastructure (Section 6.6 and Appendix D).
- The modified Project would include road and intersection upgrades and ongoing maintenance contributions that would improve the quality of transport infrastructure (Sections 3.5.3 and 6.6 and Appendix D).
- SEM would continue to make community contributions supporting positive social outcomes, social infrastructure investments and/or community resilience improvements that would promote community growth and development (Sections 1.1.3 and 6.13 and Appendix I).

2.4.2 Lachlan Shire Council Community Strategic Plan 2017/18 – 2026/27

The *Community Strategic Plan 2017/18 – 2026/27* (the Lachlan CSP) (LSC, 2017) is LSC's strategic plan for the Lachlan Shire to 2027.

The Lachlan CSP includes visions for seven key themes:

- Community Services – *That everyone in Lachlan Shire receives the services that they need to enjoy a rich and diverse lifestyle*.
- Tourism & Economic Development – *That Lachlan Shire is a place people want to be and that people who want to work have a job*.
- Transport – *To have a world class transport network that enables everyone in the community to be where they want to be when they want*.
- Governance & Financial Control – *A responsive and sustainable Council with community focus and a can-do attitude*.
- People and Environment – *Lachlan Shire is clean and green and a safe place to live*.
- Recreation – *Foster the need of our citizens recreational and cultural pursuits.*
- Service Infrastructure – *Provide world class water and sewerage systems in every town in the shire*.

The Modification is generally consistent with the key themes included in the Lachlan CSP as:

- SEM would continue to make community contributions supporting positive social outcomes, social infrastructure investments and/or community resilience improvements that would promote community growth and development (Sections 1.1.3 and Section 6.13 and Appendix I).
- The modified Project would benefit the Lachlan Shire economy by continuing to diversify the economy and through the creation of training and employment opportunities and regional expenditure.
- The modified Project includes consideration of potential impacts on transport infrastructure (Section 6.6 and Appendix D).
- The modified Project would include road and intersection upgrades that would improve the quality of transport infrastructure in the Lachlan Shire (Sections 3.5.3 and 6.6 and Appendix D).
- SEM would make contributions to ongoing road maintenance in the Lachlan Shire in accordance with the terms of the VPA to assist in maintaining the road network.
- The modified Project incorporates a range of strategies to manage and minimise impacts on the environment and heritage (Sections 1.1.2 and 6 and Appendices A to J).
- The modified Project would incorporate Project-specific water supply and sewerage infrastructure and therefore would not impact LSC water and sewerage infrastructure.

2.4.3 Parkes Shire 2030+ Community Strategic Plan

PSC's strategic plan for the Parkes Shire is outlined in the *Parkes Shire 2030+ Community Strategic Plan* (the Parkes CSP) (PSC, 2021).

The Parkes CSP includes eight future directions for the Parkes Shire:

- *Develop education and lifelong learning opportunities*.
- *Improve health and well being*.
- *Promote, support and grow our communities*.

- *Grow and diversify the economic base*.
- *Develop Parkes as a national logistics hub*.
- *Enhance recreation and culture*.
- *Care for the natural and built environment in a changing climate*.
- *Maintain and improve the Shire's assets and infrastructure*.

The Modification is generally consistent with the strategic directions included in the Parkes CSP as:

- SEM would continue to make community contributions supporting positive social outcomes, social infrastructure investments and/or community resilience improvements that would promote community growth and development (Sections 1.1.3 and Section 6.13 and Appendix I).
- The modified Project would benefit the Parkes Shire economy by continuing to diversify the economy and through the creation of training and employment opportunities and regional expenditure.
- The modified Project would support the development of the Parkes national logistics hub through the use of transport infrastructure associated with the Parkes national logistics hub (e.g. rail transport).
- The modified Project includes consideration of potential impacts on transport infrastructure (Section 6.6 and Appendix D).
- The modified Project would include road and intersection upgrades that would improve the quality of transport infrastructure in the Parkes Shire (Sections 3.5.3 and 6.6 and Appendix D).
- SEM would make contributions to ongoing road maintenance in the Parkes Shire in accordance with the terms of the VPA to assist in maintaining the road network.
- The modified Project incorporates a range of strategies to manage and minimise impacts on the environment and heritage (Sections 1.1.2 and 6 and Appendices A to J).

2.4.4 Forbes Community Strategic Plan 2018-2028

The *Forbes Community Strategic Plan 2018–2028* (the Forbes CSP) (FSC, 2017) sets out the FSC's vision, long term goals and community priorities for the future of Forbes Shire.

The Forbes CSP includes goals for six future directions for the Forbes Shire:

- Community and Culture – *Our communities are healthy, vibrant and connected, sustained by our diversity, our inclusiveness and the strong community spirit that binds us*.
- Local Economy – *Our local economy is strong, innovative and sustainable, providing diverse local employment opportunities and ease of access to goods and services*.
- Natural Environment – *The good health of our natural environment and biodiversity is valued, protected and enhanced*.
- Rural and Urban Land Use – *Our rural and urban land uses are carefully planned and managed to acknowledge the importance of local agriculture and accommodate growth, diversity and amenity in our town and villages*.
- Infrastructure and Services – *Our Shire is supported by high quality, reliable infrastructure and services that meet the needs of our communities and connects us locally, regionally and nationally*.
- Government and Representation – *We are supported by strong and ethical civic leadership at all levels and activities of government within the Shire are conducted in an open, transparent and inclusive manner*.

The Modification is generally consistent with the strategic directions included in the Forbes CSP as:

- SEM would continue to make community contributions supporting positive social outcomes, social infrastructure investments and/or community resilience improvements that would promote community growth and development (Sections 1.1.3 and Section 6.13 and Appendix I).
- The modified Project would benefit the Forbes Shire economy by continuing to diversify the economy and through the creation of training and employment opportunities and regional expenditure.
- The modified Project incorporates a range of strategies to manage and minimise impacts on the environment (Sections 1.1.2 and 6 and Appendices A to J).
- The modified Project incorporates a range of strategies to manage and minimise impacts on the surrounding land users (Section 6 and Appendices A to J).

- The modified Project includes consideration of potential impacts on transport infrastructure (Section 6.6 and Appendix D).
- SEM would make contributions to ongoing road maintenance in the Forbes Shire in accordance with the terms of the VPA to assist in maintaining the road network.

2.4.5 Parkes Special Activation Precinct Master Plan

The NSW Government has established the Parkes Special Activation Precinct under the *State Environmental Planning Policy (Activation Precincts) 2020*.

The *Parkes Special Activation Precinct Master Plan* (the Master Plan) (NSW Government, 2020) is a statutory planning document under *State Environmental Planning Policy (Activation Precincts) 2020* and describes the vision and principles for the Parkes Special Activation Precinct, provides detailed land use provisions by sub-precinct and provides performance criteria for environmental considerations.

The Master Plan includes the following overall vision for the Parkes Special Activation Precinct:

> *Stimulating economic development and employment, the Parkes Special Activation Precinct will be a hub of sustainability and enterprise that will enhance the local and regional community. Located at the epicentre of transport and logistics, Parkes will be a true inland port to national and global markets.*

Although the Master Plan does not apply to the modified Project as the modified Project is not located in the Parkes Special Activation Precinct, the Modification is generally consistent with the vision included in the Master Plan as:

- The modified Project would support economic development and provide employment opportunities in the region.
- The modified Project incorporates a range of strategies to manage and minimise impacts on the environment and heritage (Sections 1.1.2 and 6 and Appendices A to J).
- The modified Project would utilise transport infrastructure associated with the Parkes Special Activation Precinct (e.g. rail transport).

2.4.6 Other Relevant NSW Assessment Policies

A range of NSW environmental assessment policies for various potential environmental aspects pertain to assessment and to the application of the Modification assessment findings (e.g. the *Voluntary Land Acquisition and Mitigation Policy* [VLAMP] [NSW Government, 2018]).

Where relevant to the Modification, the requirements of these policies and the assessed outcomes relative to these policies are presented in Section 6 and/or the associated specialist Appendices A to J.

2.5 STRATEGIC NEED AND POTENTIAL BENEFITS OF THE MODIFICATION

Once operating, the Project will be a leading global supplier of nickel and cobalt sulphates to the lithium-ion battery industry. It will also produce low-cost scandium for use in lightweight aluminium alloys for key transportation markets (Clean TeQ, 2020b).

Demand for lithium-ion batteries is expected to increase at approximately 28% per annum between 2020 to 2030. The increased demand for lithium-ion batteries is forecast to increase demand for nickel and cobalt by 36% and 19% per annum respectively (compound annual growth rate) over the same period (SEM, 2021).

The Modification includes a number of changes to the approved Project to optimise the construction and operation of the Project.

Production from the modified Project would contribute to Commonwealth Government tax revenue as well as NSW Government royalty and tax revenues.

The modified Project would provide employment for up to approximately 1,900 personnel during the three year construction phase and up to approximately 340 personnel during the 21 year operations phase.

The Project would also support regional businesses over the modified Project life.

Environmental mitigation measures (including performance monitoring) would be implemented at the modified Project to minimise potential impacts on the environment and community (Section 6).

A detailed evaluation of the Modification is provided in Section 7.

3 DESCRIPTION OF THE MODIFICATION

A description of the Modification is provided in this section, including a comparison of the modified Project with the approved Project. As only minor changes are proposed to the approved Project as part of the Modification (Table 1), this section focuses on the components of the Project that would change as a result of the Modification.

3.1 OVERVIEW

The Modification would include the following changes to the approved Project:

Mine and Processing Facility

- addition of a temporary construction laydown area inside the approved tailings storage facility surface development area;
- optimised production schedule resulting in an increased mining rate during the initial years of mining and associated changes to mining and waste rock emplacement sequencing;
- revised processing facility area layout, including a revised processing plant layout and two additional vehicle site access points;
- reduced sulphuric acid plant stack height from 80 m to 40 m;
- revisions to processing plant reagent types, rates and storage volumes;
- revised tailings storage facility cell construction sequence and the addition of a decant transfer pond;
- relocated and resized evaporation pond;
- changes to the water management system to reflect the modified mine and processing facility layout;
- increased number of diesel-powered backup generators (and associated stacks) from one to four;
- addition of exploration activities within the approved surface development area inside ML 1770;
- increased duration of the construction phase from two years to three years;
- increased peak construction phase workforce from approximately 1,000 to approximately 1,900 personnel;

Rail Siding

- revised rail siding location and layout;
- addition of an ammonium sulphate storage and distribution facility to the rail siding;
- extension of the Scotson Lane road upgrade;
- addition of a 22 kV ETL (subject to separate approval) to the rail siding power supply;
- increased peak operational phase workforce from approximately five to approximately 10 personnel;

Accommodation Camp

- increased construction phase capacity from 1,300 to 1,900 personnel;
- increased size of the treated wastewater irrigation area;
- option for an alternative alignment of the last section of the accommodation camp water pipeline along the accommodation camp services corridor, rather than along the access road corridor;
- option to transfer treated wastewater to the mine and processing facility for reuse via a water pipeline located inside the approved services corridor;

Road Transport Activities

- changes to construction phase vehicle movements associated with the increased construction phase accommodation camp capacity and changes to heavy vehicle delivery requirements;
- changes to operational phase heavy vehicle movements associated with revisions to processing plant reagent types, rates and storage volumes; and
- changes to operational phase heavy vehicle movements to and from the rail siding associated with the transport of metal and ammonium sulphate products.

The Modification would not change the following approved components of the Project:

- other mine and processing facility components (e.g. surface development area, mining method, processing method and rate, tailings management and water management concepts);
- other accommodation camp components (e.g. surface development area; operational phase capacity);

- other transport activities and transport infrastructure (e.g. the Fifield Bypass);
- limestone quarry;
- borefield, surface water extraction infrastructure and water pipeline; and/or
- gas pipeline.

The sub-sections below provide a detailed description of the Project components relevant to the Modification.

3.2 MINE AND PROCESSING FACILITY

3.2.1 General Arrangement

The general arrangement of the approved mine and processing facility includes the following main components:

- open cut pits (including small-scale scandium rich open cut pits);
- waste rock emplacements;
- ore stockpiles;
- processing facility area, including:
  - ROM pad;
  - processing plant;
  - sulphuric acid plant;
  - limestone slurry plant;
  - reagent storage areas;
  - fuel storage areas;
  - gas-fired power plant, diesel generators and associated power distribution infrastructure;
  - vehicle site access points;
  - offices, workshops, warehouse, laboratory and amenities buildings and car parking facilities;
  - communications infrastructure;
  - raw water dam;
  - potable water treatment plant;
  - wastewater (including sewage) treatment plant;
  - water management infrastructure;
  - laydown areas; and
  - concrete batch plant (construction phase only).
- tailings storage facility;
- evaporation pond;
- water storage dam;
- sediment dams, mine water dams, diversion dams, diversions, pumps, pipelines and other water management structures and equipment;
- gravel and clay borrow pits (within the open cut pits, waste rock emplacement and tailings storage facility surface development area);
- laydown areas;
- explosives magazine;
- power distribution infrastructure;
- internal roads and haul roads;
- topsoil stockpiles; and
- other associated minor infrastructure, plant, equipment and activities.

The approved mine and processing facility general arrangement is provided on Figure 2.

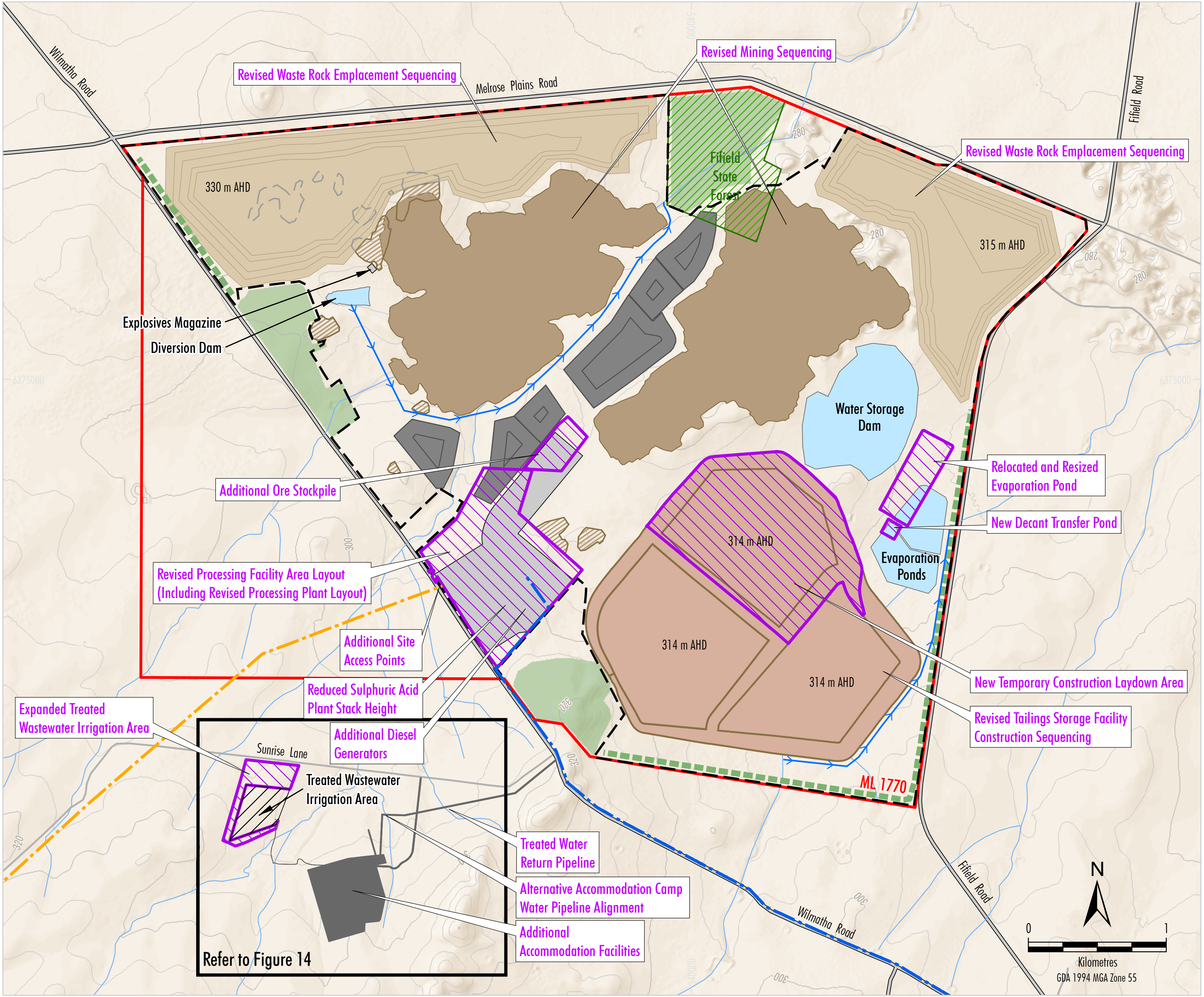
The Modification would include the following changes to the approved mine and processing facility general arrangement (Figure 2):

- addition of a temporary construction laydown area inside the tailings storage facility surface development area (Section 3.2.2);
- changes to mining and waste rock emplacement sequencing (Section 3.2.3);
- revised processing facility area layout (Section 3.2.4);
- revised tailings storage facility cell construction sequence and addition of a decant transfer pond (Section 3.2.5);
- relocated and resized evaporation pond (Section 3.2.6); and
- changes to the water management system to reflect the modified layout (Section 3.2.6).

The Modification would <u>not</u> change the final extents and designs of the approved open cut pits or waste rock emplacements (Figure 2).

In addition, the Modification would <u>not</u> change the approved mine and processing facility surface development area (Figure 2).

Progressive general arrangements of the modified mine and processing facility are provided on Figures 3 to 9.



LEGEND

State Forest

Approved Project

Mining Lease Boundary (ML)

Approved Surface Development Area

Processing Facility

Tailings Storage Facility

Open Cut Pit (Scandium Oxide)

Backfilled Open Cut Pit (Scandium Oxide)

Open Cut Pit

Waste Rock Emplacement

Ore Stockpile

Accommodation Camp

Water Storage

Diversion Structure

Vegetation Screening

Existing Open Woodland to be Maintained

Gas Pipeline

Water Pipeline

Modified Project

Modified Layout

Source: Black Range Minerals (2000); Clean TeQ (2017, 2018, 2020); NSW Spatial Services (2020)

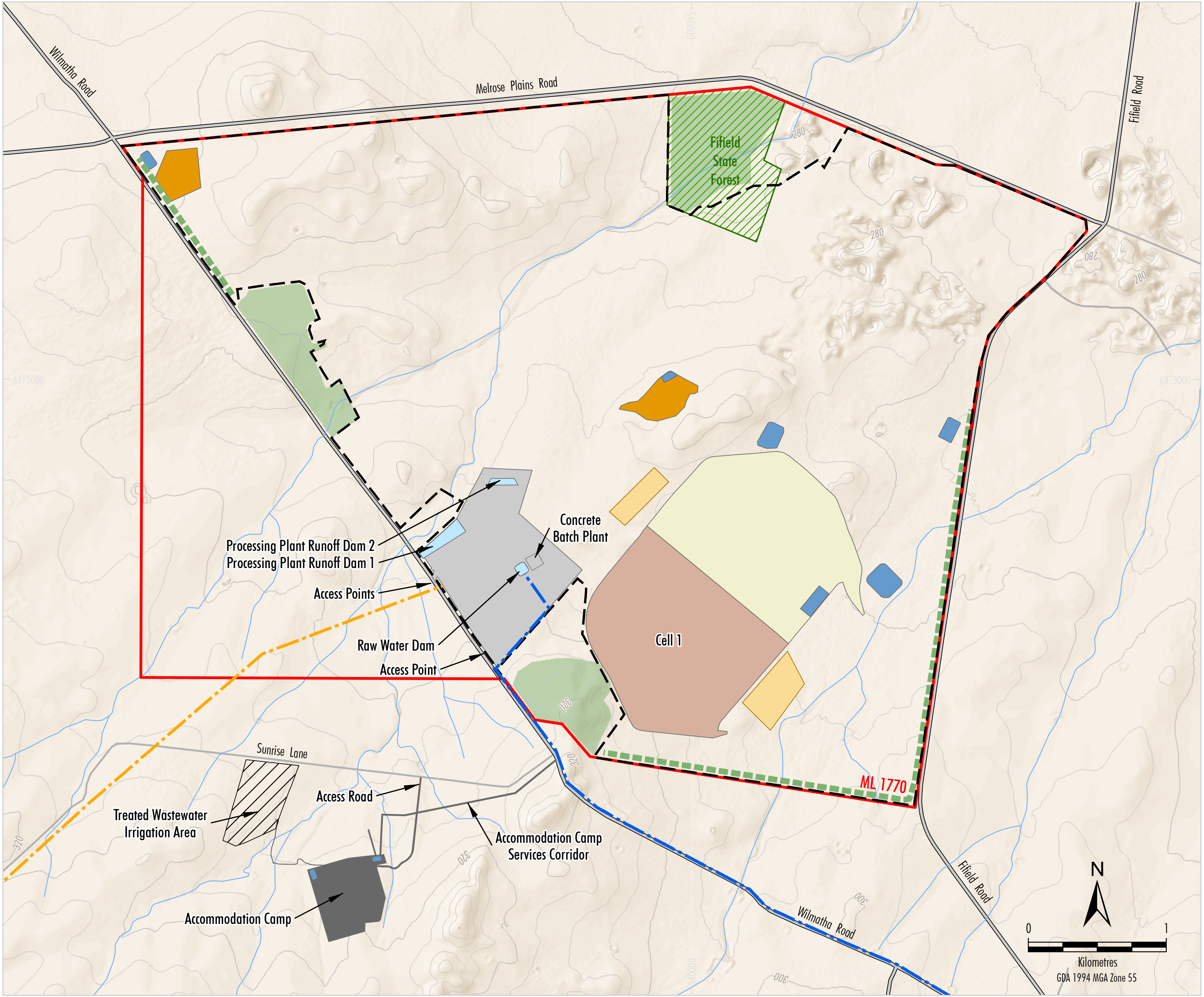
sunrise energy metals

S U N R I S E P R O J E C T

Approved and Modified Mine and Processing Facility Conceptual General Arrangement

Figure 2

CTL-20-08 MOD 7_MT_204D



LEGEND
- State Forest
- Mining Lease Boundary (ML)
- Approved Surface Development Area
- Processing Facility
- Tailings Storage Facility
- Topsoil Stockpile
- Accommodation Camp
- Water Storage
- Sediment Dam
- Laydown Area
- Borrow Pit
- Vegetation Screening
- Existing Open Woodland to be Maintained
- Gas Pipeline
- Water Pipeline

Source: Black Range Minerals (2000); Clean TeQ (2017, 2018, 2020); NSW Spatial Services (2020)

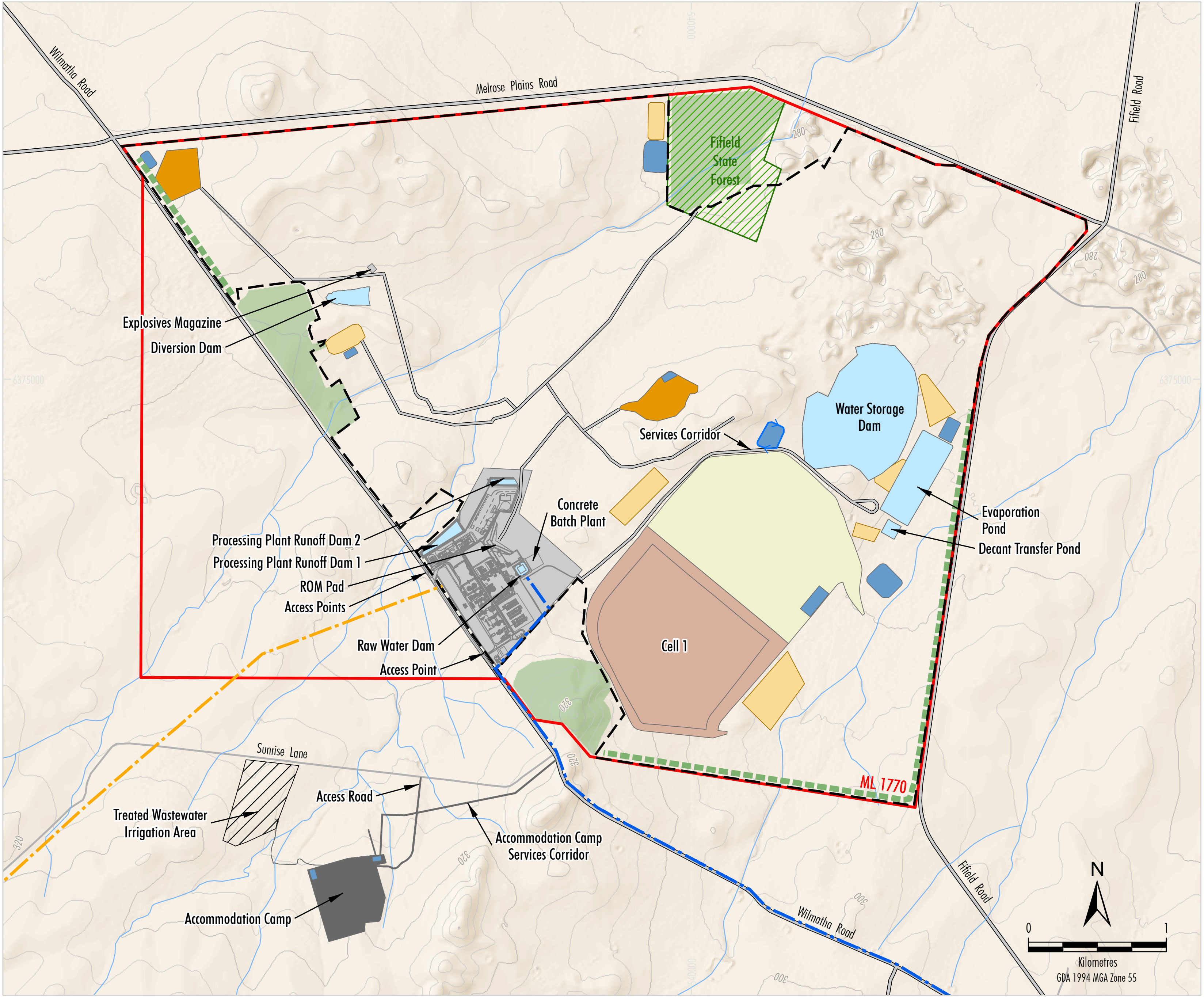
sunrise energy metals

SUNRISE PROJECT

Modified Mine and Processing Facility
Conceptual General Arrangement
Construction Year 1

Figure 3

CTL-20-08 MOD 7_MT_209A



LEGEND

- State Forest
- Mining Lease Boundary (ML)
- Approved Surface Development Area
- Processing Facility
- Tailings Storage Facility
- Topsoil Stockpile
- Accommodation Camp
- Water Storage
- Sediment Dam
- Laydown Area
- Borrow Pit
- Diversion Structure
- Vegetation Screening
- Existing Open Woodland to be Maintained
- Gas Pipeline
- Water Pipeline

Source: Black Range Minerals (2000); Clean TeQ (2017, 2018, 2020); NSW Spatial Services (2020)

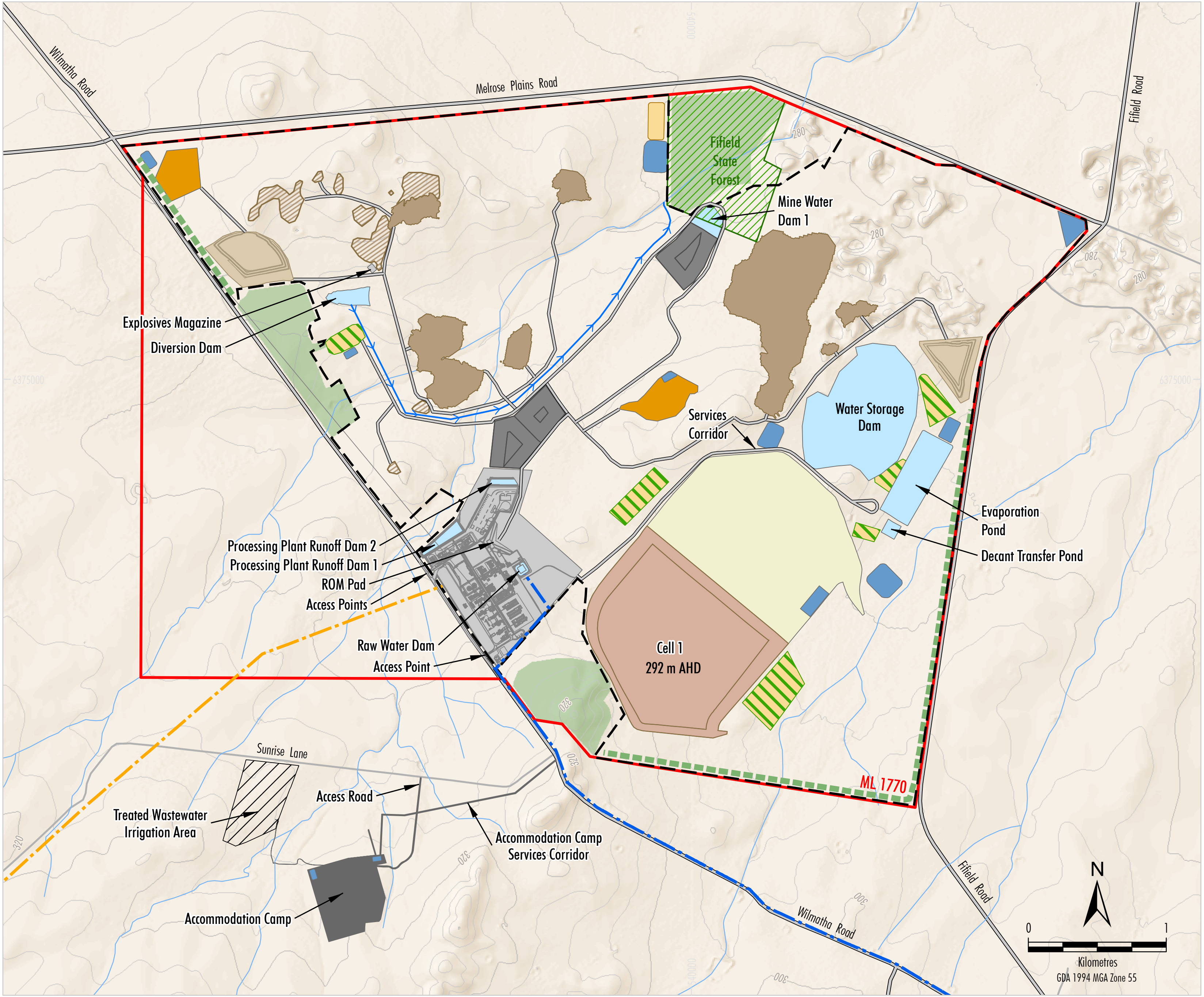
sunrise energy metals

S U N R I S E   P R O J E C T

Modified Mine and Processing Facility
Conceptual General Arrangement
Construction Year 2

Figure 4

CTL-20-08 MOD 7_MT_210A

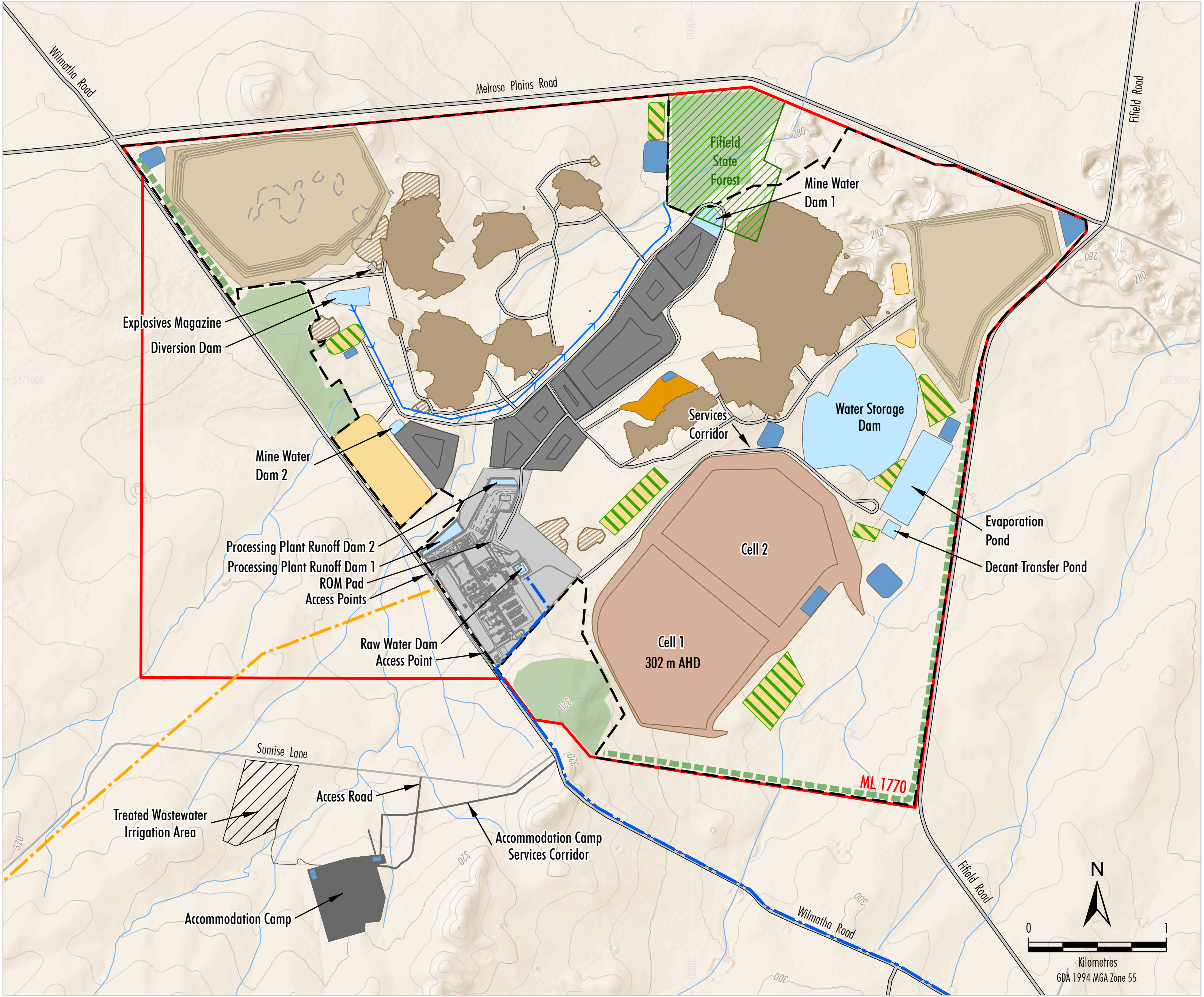


SUNRISE PROJECT

Modified Mine and Processing Facility
Conceptual General Arrangement
Operational Year 1

Figure 5

CTL-20-08 MOD 7_MT_201C



LEGEND
- State Forest
- Mining Lease Boundary (ML)
- Approved Surface Development Area
- Processing Facility
- Tailings Storage Facility
- Open Cut Pit (Scandium Oxide)
- Backfilled Open Cut Pit (Scandium Oxide)
- Open Cut Pit
- Waste Rock Emplacement
- Ore Stockpile
- Topsoil Stockpile
- Accommodation Camp
- Water Storage
- Sediment Dam
- Borrow Pit
- Initial Rehabilitation
- Diversion Structure
- Vegetation Screening
- Existing Open Woodland to be Maintained
- Gas Pipeline
- Water Pipeline

Source: Black Range Minerals (2000); Clean TeQ (2021); NSW Spatial Services (2020, 2021)

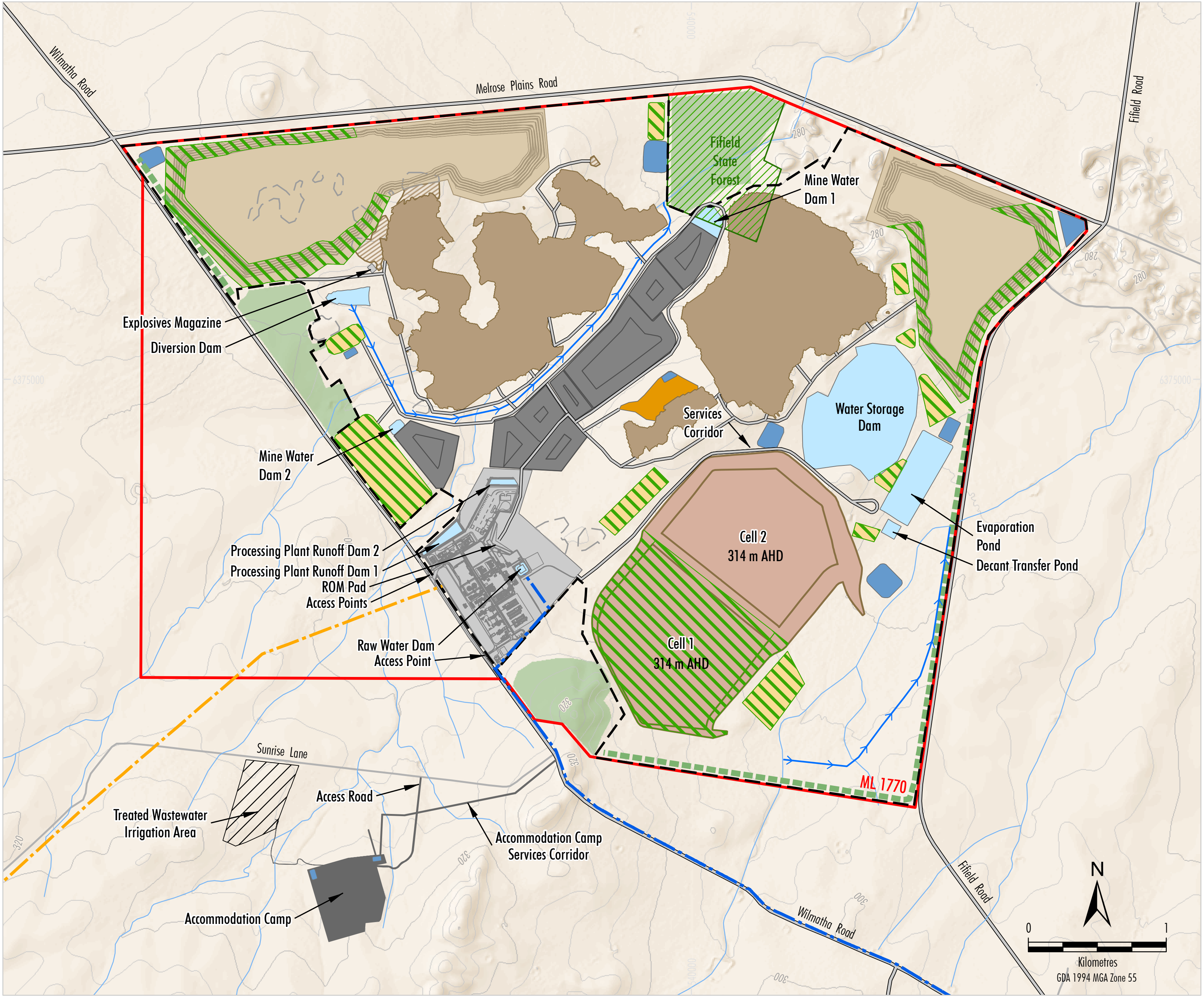
sunrise energy metals

S U N R I S E   P R O J E C T

Modified Mine and Processing Facility Conceptual General Arrangement Operational Year 5

Figure 6

CTL-20-08 MOD 7_MT_206D



LEGEND
- State Forest
- Mining Lease Boundary (ML)
- Approved Surface Development Area
- Processing Facility
- Tailings Storage Facility
- Open Cut Pit (Scandium Oxide)
- Backfilled Open Cut Pit (Scandium Oxide)
- Open Cut Pit
- Waste Rock Emplacement
- Ore Stockpile
- Topsoil Stockpile
- Accommodation Camp
- Water Storage
- Sediment Dam
- Borrow Pit
- Initial Rehabilitation
- Diversion Structure
- Vegetation Screening
- Existing Open Woodland to be Maintained
- Gas Pipeline
- Water Pipeline

Source: Black Range Minerals (2000); Clean TeQ (2021); NSW Spatial Services (2020, 2021)

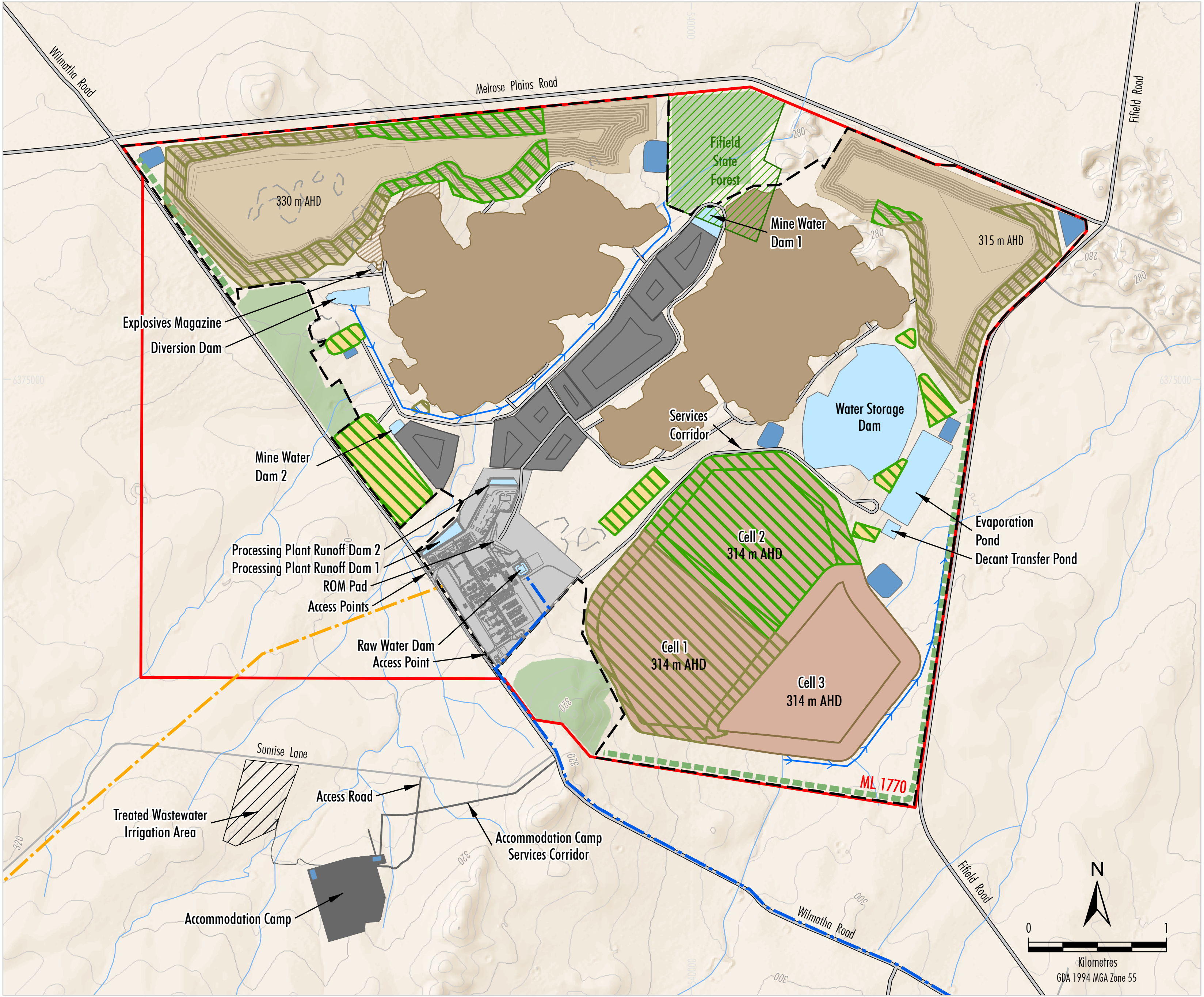
sunrise energy metals

SUNRISE PROJECT

Modified Mine and Processing Facility
Conceptual General Arrangement
Operational Year 10

Figure 7

CTL-20-08 MOD 7_MT_211C



LEGEND
State Forest
Mining Lease Boundary (ML)
Approved Surface Development Area
Processing Facility
Tailings Storage Facility
Open Cut Pit (Scandium Oxide)
Backfilled Open Cut Pit (Scandium Oxide)
Open Cut Pit
Waste Rock Emplacement
Ore Stockpile
Topsoil Stockpile
Accommodation Camp
Water Storage
Sediment Dam
Initial Rehabilitation
Advanced Rehabilitation
Diversion Structure
Vegetation Screening
Existing Open Woodland to be Maintained
Gas Pipeline
Water Pipeline

Source: Black Range Minerals (2000); Clean TeQ (2021); NSW Spatial Services (2020, 2021)

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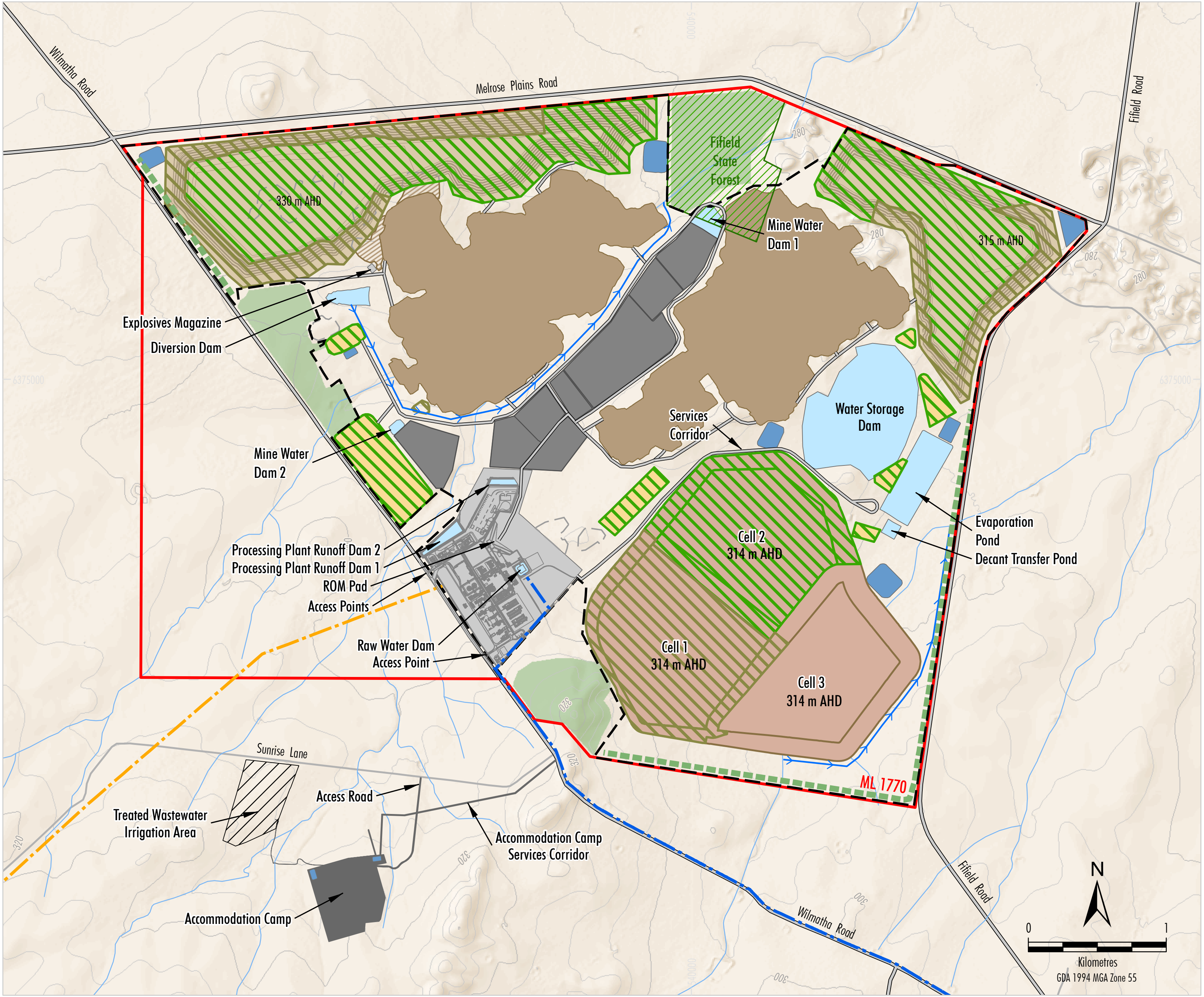
S U N R I S E   P R O J E C T

Modified Mine and Processing Facility
Conceptual General Arrangement
Operational Year 17

Figure 8

CTL-20-08 MOD 7_MT_217A



Source: Black Range Minerals (2000); Clean TeQ (2021); NSW Spatial Services (2020, 2021)

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SUNRISE PROJECT

Modified Mine and Processing Facility
Conceptual General Arrangement
Operational Year 21

Figure 9

CTL-20-08 MOD 7_MT_221B

3.2.2 Construction

The approved construction phase includes development of the following key mine and processing facility components over an approximate two year period:

- processing facility;
- tailings storage facility;
- water storage dam;
- evaporation pond; and
- water management infrastructure.

The approved construction phase workforce is up to approximately 1,000 personnel during the peak construction phase.

The Modification would include an increase in the peak construction phase workforce from approximately 1,000 personnel to approximately 1,900 personnel. A detailed review of the Project construction phase manning conducted as part of the Project Execution Plan concluded that the workforce would peak at approximately 1,900 personnel for approximately two months.

The duration of the construction phase would increase from two to three years as part of the Modification. The commissioning phase component of the construction phase is expected to be longer than originally contemplated based on the time required to commission other similar processing plants.

The Modification would also include the addition of a temporary construction laydown area inside the tailings storage facility surface development area (Figure 2). The additional temporary construction laydown area outside of the processing facility area would improve the constructability of the processing facility.

There would be no significant change to the key construction activities as a result of the Modification.

Details of construction phase heavy vehicle requirements for the Modification are provided in Section 3.5.

3.2.3 Mining Operations

Conventional open cut mining methods are approved to develop the two main open cut pits and multiple small-scale scandium open cut pits. Ore will be loaded directly to haul trucks for transfer to the ROM pad or ore stockpiles.

Waste rock material is approved to be emplaced in either one of the two waste rock emplacements, or used to backfill the small-scale scandium open cut pits located outside the approved open cut pit areas (Figure 2).

The waste rock emplacements are approved to be constructed up to approximately 20 m and 30 m high (corresponding to the heights of approximately 315 metres Australian Height Datum (m AHD) and 330 m AHD for the eastern and western waste rock emplacements, respectively [Figure 9]). The overall batter slopes of the waste rock emplacements will be 1 vertical (V):4 horizontal (H) with reverse graded berms at approximately 10 m intervals. Intermediate batter slopes will be constructed to 1V:3H grades.

Excavators, haul trucks, dozers, drills, graders and front end loaders will be used during mining operations. Mining operations will be conducted 24 hours per day, seven days per week.

The Project Execution Plan included a review of mining operations to optimise production and the financial performance of the Project. The optimised mining operations include an increased mining rate during the initial years of mining operations and associated changes to mining and waste rock emplacement sequencing.

The Modification would include the optimised mining operations. The revised mining and waste rock emplacement sequencing is shown on Figures 5 to 9.

The modified mining rate would require changes to the size of the approved mine fleet. A list of the approved and modified major mobile equipment for the Project is provided in the Noise Assessment (Appendix B).

The Modification would not change the approved mining method, final design and extents of the open cut pits and waste rock emplacements. The approved mine and processing facility life (i.e. 21 years), operating hours and workforce (i.e. 300 personnel) would not change as a result of the Modification.

3.2.4 Processing Facility Area

Processing Facility Area Layout

The approved processing facility area layout is shown on Figure 2.

The Modification includes a revised processing facility area layout (Figure 2) that was optimised as part of the Project Execution Plan.

As part of the processing facility layout optimisation, two additional vehicle site access points have been included to improve site access safety by separating light vehicle and heavy vehicle streams (Figure 2).

Processing Plant

The approved processing plant includes the following key processing stages:

- **Ore preparation circuit** – removal of oversize material and production of an ore slurry suitable for acid leaching;
- **Acid leach circuit** – leaching of nickel, cobalt and scandium from the ore slurry by application of sulphuric acid under high pressure and temperature in an autoclave to produce an autoclave slurry containing acid, scandium and soluble nickel and cobalt sulphates;
- **Resin in Pulp (RIP) circuit** – a two stage process that first separates scandium and then nickel and cobalt from residue solids (tailings) contained in the autoclave slurry using ion exchange resin;
- **Tailings neutralisation and thickening circuit** – neutralisation of residue solids slurry (tailings) with a limestone slurry prior to thickening and transfer to the tailings storage facility; and
- **Metals recovery circuit** – recovery of:
  - scandium oxide from the loaded resin by desorption with sodium carbonate followed by precipitation and calcination; and
  - nickel and cobalt sulphates from the loaded resin by desorption with sulphuric acid followed by solvent extraction and precipitation.

The processing plant is approved to operate with an autoclave feed rate of up to 2.5 Mt of ore (dry weight) in any calendar year.

The Modification would include revisions to processing plant reagent types, rates and storage quantities based on revised process modelling conducted as part of the Project Execution Plan.

A summary of the approved and modified processing plant reagents is provided in Table 3.

The Modification would not change the approved processing stages, processing rate, or product quantities.

Table 3
Summary of Approved and Modified Peak Processing Plant Process Reagents

Project Components	Approved	Modified
Sulphur	350,000 tpa	No Change
Limestone	990,000 tpa	No Change
Flocculant	820 tpa	No Change
Caustic Soda	330 tpa	1,300 tpa
Soda Ash	7,500 tpa	1,500 tpa
Ammonia	26,000 tpa	No Change
Hydrochloric Acid	17,000 tpa	2,500 tpa
Quicklime	40,000 tpa	65,000 tpa
Sodium metabisulphite	5,600 tpa	7,000 tpa
Resin, cRIP	720 tpa	780 tpa
Diluent	190,000 Lpa	350,000 Lpa
Extractant	75,000 Lpa	109,000 Lpa
Hydrated Lime	1,500 tpa	600 tpa
Hydrogen Peroxide	70 tpa	1,000 tpa
Minor reagents (mill balls, coagulant, oxalic acid, hydrogen peroxide, resin [Sc cLX])	Used in ore preparation, thickening and tailings neutralisation, sulphuric acid plant and wastewater treatment plant.	No Change

Sulphuric Acid Plant

The sulphuric acid plant is approved to produce approximately 1,050,000 tpa of sulphuric acid for use in the acid leach circuit in the processing plant.

The Modification would include a reduction in the height of the sulphuric acid plant stack from 80 m to 40 m.

Consideration of the potential air quality impact of the reduced sulphuric acid plant stack is provided in Section 6.2.

No changes to other aspects of the approved sulphuric acid plant are proposed as part of the Modification.

3.2.5 Tailings Storage Facility

Construction Sequence

The approved tailings storage facility consists of three cells (Figure 2). Each cell would be progressively developed using downstream lifts prior to the construction of the next cell. The approved cell construction sequence is for the northern cell (Tailings Storage Facility [TSF] Cell 2) to be constructed first, followed by the south-western cell (TSF Cell 1) and then the south-eastern cell (TSF Cell 3).

The Modification would include a revised tailings storage facility cell construction sequence to improve the constructability of the tailings storage facility and to reduce initial construction costs.

The modified cell construction sequence would be TSF Cell 1 constructed first, followed by TSF Cell 2 and then TSF Cell 3 (Figures 5 to 9).

The Modification would not change the approved tailings storage facility design. The tailings storage facility would be designed and constructed consistent with the requirements outlined in Condition 29, Schedule 3 of Development Consent (DA 374-11-00).

The design of the tailings storage facility would take into consideration the relevant geotechnical conditions at the site.

Decant Water Management

Tailings are approved to be pumped from the processing plant to the tailings storage facility to be deposited. A decant pond will form in the operational tailings storage facility cell.

Supernatant water (including incident rainfall) in the decant pond is approved to be decanted from the tailings storage facility to the water storage dam for reuse in the processing plant (Section 3.2.6).

In accordance with Condition 29, Schedule 3 of Development Consent (DA 374-11-00), the tailings storage facility (including decant pond) will be operated to capture and convey the volume of runoff generated from a 1 in 100 year average recurrence interval (ARI) rain event of 72 hours duration. The decant system will be designed to remove stored water so that the tailings storage facility will have a capacity to capture and convey a separate 1 in 100 year ARI rain event of 72 hours duration rain event within seven days of the event occurring.

The Modification would include the addition of a decant transfer pond (Figure 2). The decant transfer pond would be used to manage stored water volumes in the tailings storage facility and the water storage dam.

Supernatant water (including incident rainfall) would initially be decanted from the tailings storage facility to the decant transfer pond. The tailings storage facility seepage collection sumps would also be dewatered to the decant transfer pond. The water in the decant transfer pond would then be pumped to the water storage dam for re-use in the processing plant (Section 3.2.6).

Consistent with the approved tailings storage facility, the decant transfer pond would be designed to:

- include floor and side walls with a minimum of:
  - a 900 millimetre (mm) clay liner with a permeability of no more than 1×10^{-9} metres per second (m/s); or
  - a synthetic (plastic) liner of 1.5 mm minimum thickness with a permeability of no more than 1×10^{-14} m/s (or equivalent).
- maintain a freeboard storage in excess of that required to store the volume of runoff generated from a 1 in 100 year ARI rain event of 72 hours duration.

No other changes to the approved tailings storage facility decant water management operations are proposed as part of the Modification.

3.2.6 Water Management

Water Management System

Water management at the approved mine and processing facility will be conducted in accordance with the water management performance measures outlined in Condition 29, Schedule 3 of Development Consent (DA 374-11-00).

Consistent with these performance measures, the key objectives of the approved water management system are to control runoff from construction and operational areas, while diverting up-catchment water around these areas, and to minimise the use of clean water on-site.

The water management system will be progressively developed during the construction and operation of the mine as diversion and containment requirements change.

The Modification would not change the approved water management performance measures or objectives of the water management system.

The Modification would however include the following changes to the approved water management system:

- revised tailings storage facility cell construction sequence and the addition of a decant transfer pond (Section 3.2.5);
- relocated and resized evaporation pond; and
- changes to the water management system to reflect the modified mine and processing facility layout.

The approved and modified conceptual water management schematic is shown on Figure 10.

A detailed description of the operation of the approved and modified water management system is provided in the Surface Water Assessment (Appendix C).

Water Storages

The approved water management system consists of the following key water storages:

- tailings storage facility;
- evaporation pond;
- water storage dam;
- raw water dam;
- mine water dams/processing plant runoff dams; and
- sediment dams.

The Modification would not change the design and/or the operation of the water storage dam or the raw water dam.

A description of the changes to the other water storages proposed in the Modification is provided below.

Tailings Storage Facility

The Modification would include a revised tailings storage facility cell construction sequence.

In addition, the Modification would include the addition of a decant transfer pond (Figures 2 and 10).

Additional detail on these proposed changes is provided in Section 3.2.5.

Evaporation Pond

The evaporation pond is approved to contain and evaporate a processing plant liquid waste stream containing high concentrations of chloride to prevent the build-up of chloride in the water management system and process water.

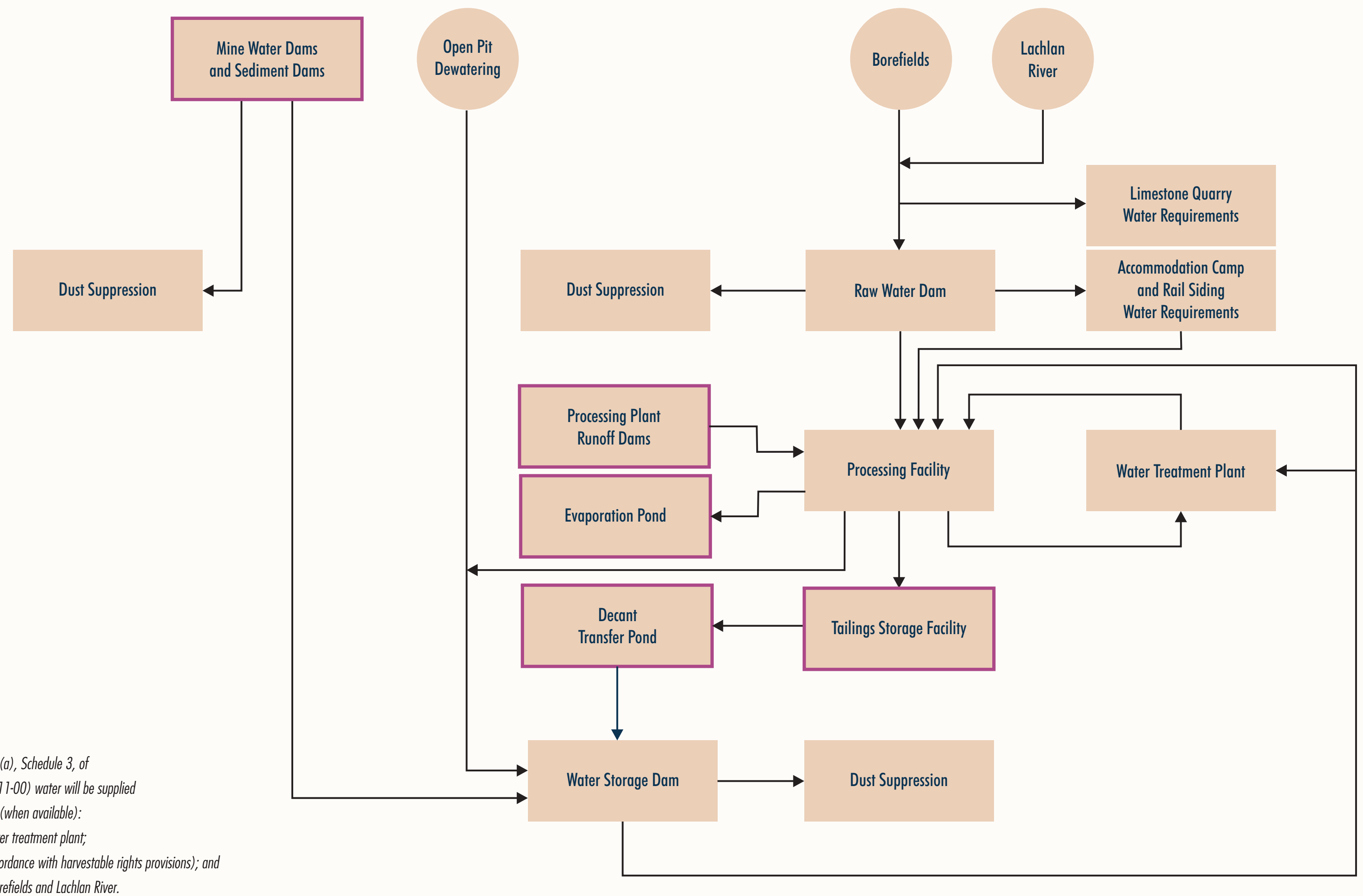
The Modification would include the relocation and resizing of the evaporation pond approximately 400 m to the north of its approved location (Figure 2) to avoid the predicted flood extent of the unnamed watercourse prior to its diversion in Year 11 (Figure 7).

The design and operation of the modified evaporation pond would be consistent with the relevant water management performance measures outlined in Condition 29, Schedule 3 of Development Consent (DA 374-11-00), including that the floor and side walls would have a minimum of a 900 mm clay or modified soil liner with a permeability of no more than 1×10^{-9} m/s, or a synthetic (plastic) liner of 1.5 mm minimum thickness with a permeability of no more than 1×10^{-14} m/s (or equivalent).

The Modification would not change the operation of the evaporation pond.

Mine Water/Processing Plant Runoff Dams and Sediment Dams

Mine water dams/processing plant runoff dams and sediment dams are approved to capture runoff from construction and operational areas.



Note:
In accordance with Condition 30(a), Schedule 3, of Development Consent (DA 374-11-00) water will be supplied in the following order of priority (when available):
1. *recycled water from the water treatment plant;*
2. *other on-site sources (in accordance with harvestable rights provisions); and*
3. *water extracted from the borefields and Lachlan River.*

CTL-20-08 MOD 7_MT_002B

LEGEND
Approved Component
Modified Component
Flow Path

Source: Clean TeQ (2020)

S U N R I S E P R O J E C T

Modified Conceptual Water Management Schematic

Figure 10

The Modification would include minor changes to the progressive development and location of the mine water dams/processing plant runoff dams and sediment dams to reflect the modified layout (Figure 3 to 9).

The design and operation of the modified mine water dams/processing plant runoff dams and sediment dams would be conducted consistent with the relevant water management performance measures outlined in Condition 29, Schedule 3 of Development Consent (DA 374-11-00).

Clean Water Diversions

Two permanent clean water diversions (i.e. the southern and northern diversions) are approved at the mine and processing facility (Figure 2).

The mine and processing facility layout changes proposed as part of the Modification, particularly the relocation of the evaporation pond, would delay the requirement for the construction of the southern diversion from Year 1 to approximately Year 11 (Figure 7).

The design and operation of the southern diversion would be conducted consistent with the relevant water management performance measures outlined in Condition 29, Schedule 3 of Development Consent (DA 374-11-00).

The Modification would not change the approved northern diversion.

Water Supply

Water is approved to be supplied to the mine and processing facility from a number of, and varying, sources during the life of the Project, including the following in order of priority (when available) (Figure 10):

- recycled water from the processing facility and tailings storage facility;
- mine dewatering (in-pit and advance);
- internal runoff collection at the mine site (including harvestable rights); and
- off-site supply (i.e. borefield and surface water extraction from the Lachlan River).

SEM will source water from the borefield and surface water from the Lachlan River in accordance with relevant *Water Management Act 2000* approvals to meet the off-site water demand.

The Modification would not change the approved water supply sources.

Water Consumption

The main water requirements at the Project are associated with the processing facility once commissioned and operating. Other water demand requirements include water for construction activities (e.g. moisture for soil compaction control), dust suppression, cooling water and other potable and non-potable uses.

The water requirements will fluctuate with climatic conditions, ore processing rates and as the extent of the mining operation changes over time.

The predicted average and maximum annual off-site water requirements for the approved Project operational phase are approximately 2,800 megalitres per year (ML/year) and 4,080 ML/year, respectively (Hydro Engineering and Consulting Pty Ltd [HEC], 2019).

The Modification would not significantly change the predicted average and maximum annual off-site water requirements for the approved Project (Appendix C).

Simulated Performance of the Site Water Management System

A water balance model (using the GoldSim® simulation package) has been prepared by HEC (2021), to simulate the performance of the site water management system over the life of the modified Project.

The water balance modelling demonstrates that the proposed site water management system has sufficient capacity and flexibility to accommodate a wide range of climate scenarios (Appendix C).

No overflows were predicted from the tailings storage facility, decant transfer pond, evaporation pond, mine water dams or processing plant runoff dams over the Project life (Appendix C).

3.2.7 Power Supply

Power for the mine and processing facility is approved to be provided by the power plant and a diesel-powered backup generator. The steam for the power plant is approved to be generated through heat recovery from the sulphuric acid plant or steam generated by gas. Steam generation would also be supported by an auxiliary diesel boiler.

No change to the approved power plant is proposed as part of the Modification. As per the approved Project, if the heat recovery from the sulphuric acid plant supported by the auxiliary diesel boiler is able to meet the power requirements of the mine and processing facility, there would be no need for the external gas supply, and therefore the gas pipeline would not be constructed.

The Modification would however increase the number of backup diesel-powered generators (and associated stacks) from one to four.

SEM is separately considering importing electricity to the mine and processing facility via an electricity transmission line to supplement on-site generation. This electricity transmission line would be subject to separate environmental assessment and approval and does not form part of the Modification.

3.2.8 Road and Intersection Upgrades

The approved mine and processing facility has one vehicle site access point on Wilmatha Road.

As part of the processing facility layout optimisation, two additional vehicle site access points have been included to improve site access safety by separating light vehicle and heavy vehicle streams (Figure 2).

One vehicle site access point would provide access to the processing facility offices and car parking area and would be for light vehicles and buses.

The other two vehicle site access points would form an access loop to the processing facility area (predominantly for heavy vehicles) with dedicated entry and exit points.

The modified Wilmatha Road and vehicle site access point intersections would be undertaken in consultation with the LSC.

3.2.9 Exploration Activities

The Modification would include the addition of exploration activities within the approved surface development area inside ML 1770.

These exploration activities, within and external to the open cut footprint, would be used to investigate aspects such as geological and geotechnical features and waste rock characteristics as input into detailed mine planning and feasibility studies.

Details of the exploration activities would be included in the relevant Mining Operations Plan.

3.2.10 Rehabilitation Strategy

Rehabilitation Objectives

The approved rehabilitation objectives for the Project are outlined in Condition 55, Schedule 3 of the Development Consent (DA 374-11-00). The Modification would not change the approved rehabilitation objectives.

Progressive Rehabilitation

Consistent with Condition 56, Schedule 3 of Development Consent (DA 374-11-00), SEM would rehabilitate the modified mine and processing facility site progressively, that is, as soon as is practicable following disturbance, to the satisfaction of the Secretary of DPIE.

The modified progressive rehabilitation of the mine and processing facility is shown on Figures 5 to 9, and Figure 11 illustrates the conceptual rehabilitated final landform.

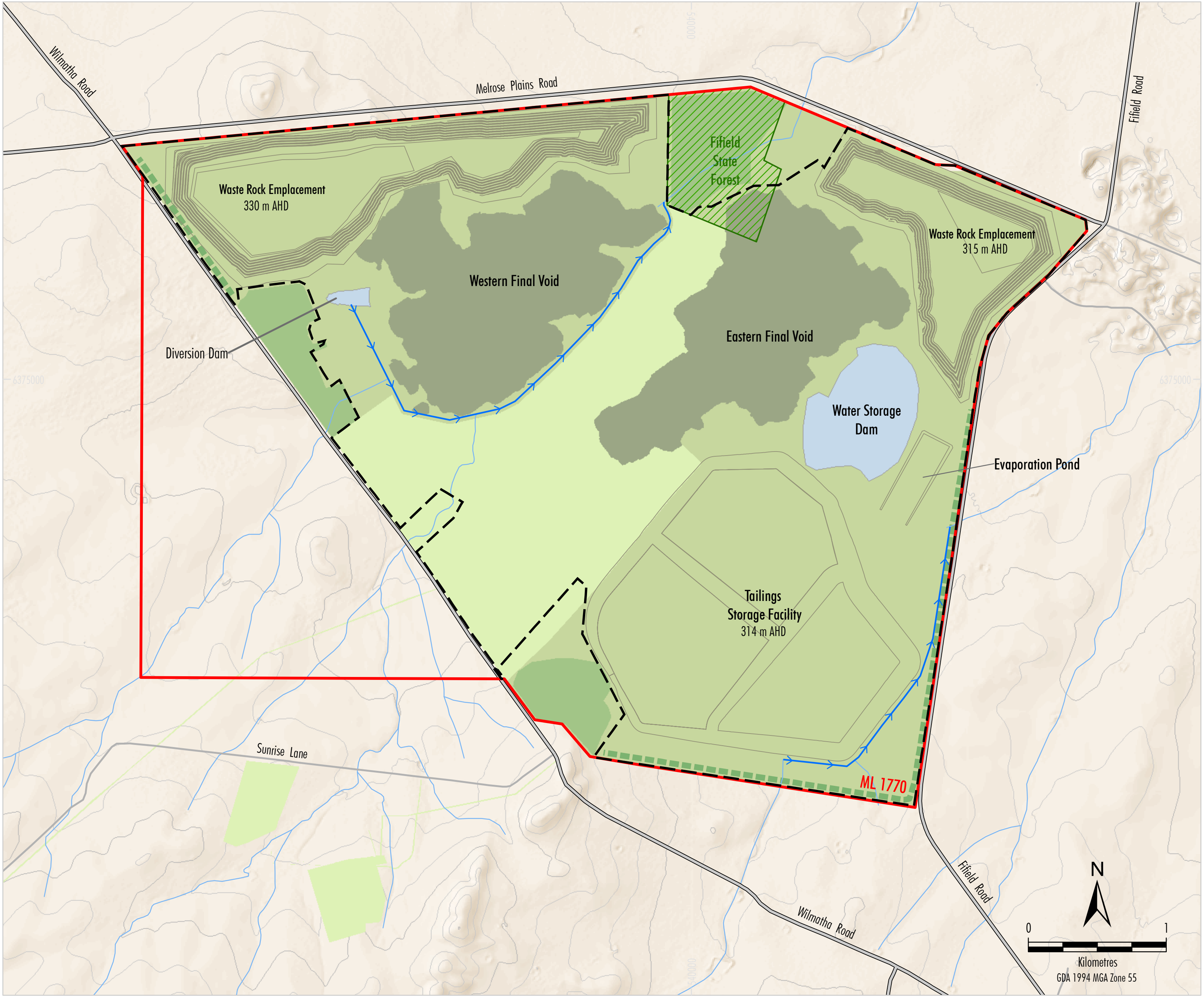
Final Landform

Key features of the approved final landform include:

- two final voids;
- western waste rock emplacement to a maximum final elevation of approximately 330 m AHD;
- eastern waste rock emplacement to a maximum final elevation of approximately 315 m AHD;
- tailings storage facility with a final elevation of approximately 314 m AHD;
- evaporation pond;
- water storage dam; and
- surface water diversions.

The Modification would not change the key features of the approved final landform with the exception of the location of the rehabilitated evaporation pond and addition of the decant transfer pond.

The approved rehabilitation strategy for the evaporation pond (i.e. embankment breached and profiled to be a free-draining landform with runoff reporting to the natural environment) would be unchanged.



LEGEND

State Forest

Mining Lease Boundary (ML)

Approved Surface Development Area

Final Land Use

Nature Conservation (Endemic Woodland)

Agriculture (Pasture for Grazing)

Final Void

Water Management Area

Diversion Structure

Vegetation Screening

Existing Open Woodland to be Maintained

Source: Black Range Minerals (2000); Clean TeQ (2021); NSW Spatial Services (2020, 2021)

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S U N R I S E   P R O J E C T

Modified Final Landform and Land Uses

Figure 11

CTL-20-08 MOD 7_MT_213B

The conceptual rehabilitation strategy for the decant transfer pond would be as follows:

- The embankments would be removed and the area profiled to be a free-draining landform with runoff reporting to the natural environment.
- If there are any contaminated soils associated with the decant transfer pond area, these would be identified and remediated in accordance with the requirements of the NSW *Contaminated Land Management Act 1997*.
- A layer of soil (depending on the outcomes of trials) would be placed on the reprofiled landform prior to revegetation.
- Following rehabilitation, endemic woodland land use would occur on the rehabilitated decant transfer pond.

Figure 11 illustrates the conceptual rehabilitated final landform for the modified mine and processing facility.

Post-mining Land Uses

The approved post-mining land use at the mine and processing facility and accommodation camp is a combination of agriculture (pasture for grazing) and endemic woodland areas.

The Modification would not change the approved post-mining land uses.

Figure 11 illustrates the conceptual post-mining land uses for the modified mine and processing facility.

3.3 RAIL SIDING

3.3.1 Location

The approved rail siding is located on the Bogan Gate Tottenham Railway approximately 25 km south-east of the mine and processing facility (Figures 1 and 12).

The Modification would include the relocation of the rail siding approximately 500 m south of the approved location (Figure 12) to allow for the development of the ammonium sulphate storage and distribution facility (Section 3.3.2) and to improve operability of the rail siding.

In addition, the relocation of the rail siding would minimise rail and road traffic interactions at the rail level crossing on Scotson Lane in the vicinity of the approved rail siding (Figure 12).

3.3.2 Ammonium Sulphate Storage and Distribution Facility

Ammonium sulphate produced at the mine and processing facility is approved to be transported by road to the rail siding for transport by rail at a rate of up to 100,000 tpa.

The Modification would include the addition of an ammonium sulphate storage and distribution facility at the rail siding (Figure 13) to facilitate the supply of ammonium sulphate (a fertiliser) to agricultural operations in the region by road, in addition to distribution by rail.

The ammonium sulphate storage and distribution facility would be a predominantly enclosed shed that would allow for the covered loading/unloading and storage of the ammonium sulphate.

The ammonium sulphate would be unloaded from the haulage vehicles (typically B-double trucks) directly onto stockpiles within the ammonium sulphate storage and distribution facility, which would have capacity to store approximately 30,000 t of ammonium sulphate.

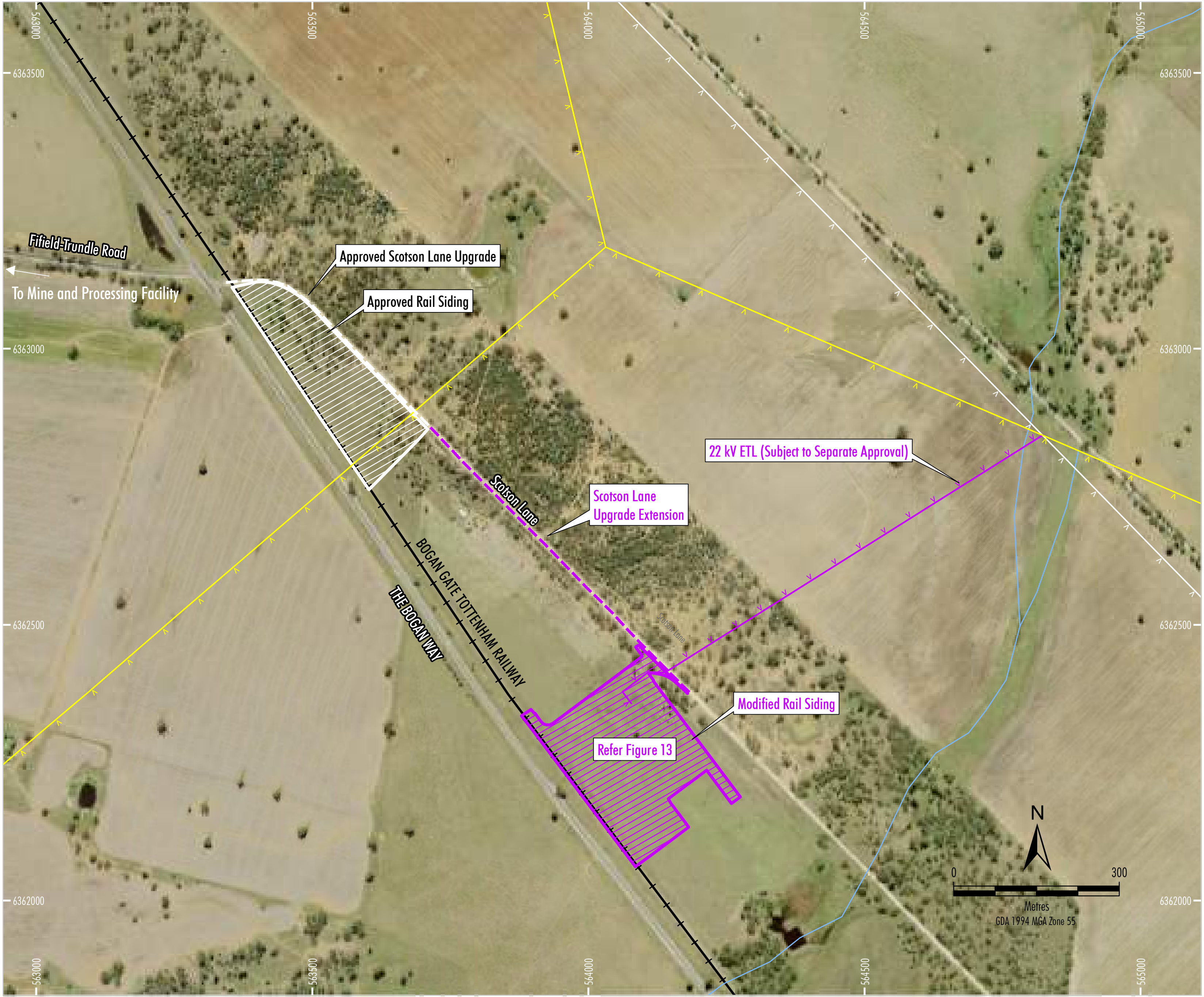
A front end loader would be used to reclaim ammonium sulphate from the stockpiles and load directly into haulage vehicles for transport by road to agricultural operations in the region or into containers for transport by rail.

3.3.3 General Arrangement

The general arrangement of the modified rail siding would include the following main components:

- loading siding[3];
- site access point and internal roads;
- truck parking/loading/unloading hardstand areas and weighbridge;
- container storage hardstand areas;
- ammonium sulphate storage and distribution facility (Section 3.3.2);
- site offices, ablution facilities, sewage system and car parking;

[3] The loading siding may not be required depending on other rail operations on the Bogan Gate Tottenham Railway.



Source: Black Range Minerals (2000); Clean Teq (2020, 2021); NSW Spatial Services (2020, 2021).

Orthophoto: © NSW Department of Finance, Services & Innovation (2021)

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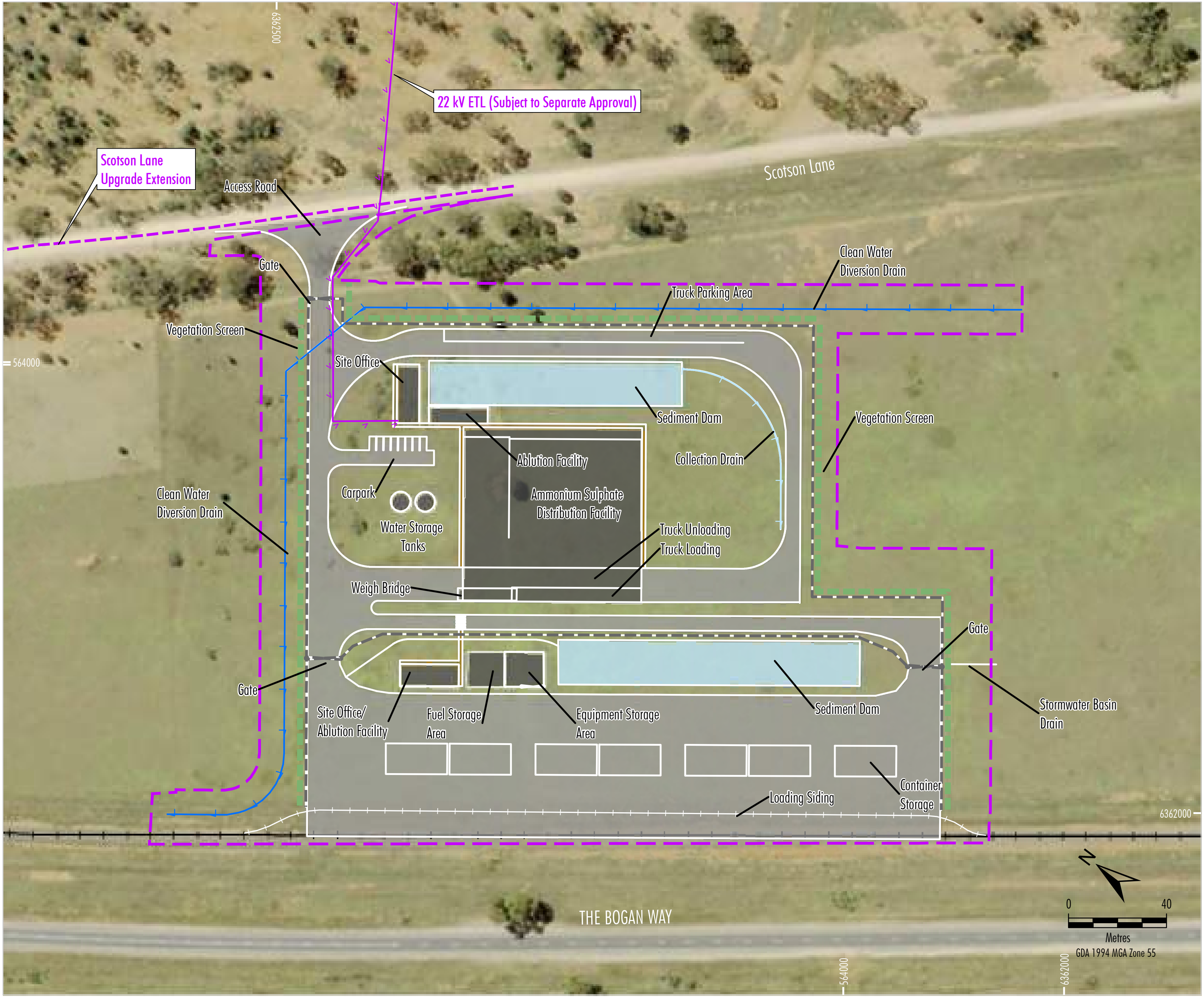
Approved and Modified Rail Siding Location

Figure 12

CTL-20-08 MOD 7_MT_205D



LEGEND
Railway
Modified Project
Surface Development Area
Scotson Lane Upgrade Extension
22 kV Electricity Transmission Line (Subject to Separate Approval)

Source: Black Range Minerals (2000); NSW Spatial Services (2020); Clean Teq (2017, 2018, 2020).
Orthophoto: © NSW Department of Finance, Services & Innovation (2020)

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S U N R I S E   P R O J E C T

Modified Rail Siding General Arrangement

Figure 13

CTL-20-08 MOD 7_MT_212C

- equipment and fuel storage areas;
- water storage tanks;
- lighting and telecommunications infrastructure;
- sediment dams, clean water diversions, runoff collection drains and other water management equipment and structures;
- landscaping (including vegetation screens) and perimeter security fencing; and
- other associated minor infrastructure, plant, equipment and activities.

The general arrangement of the modified rail siding is provided on Figure 13.

The Bogan Gate Tottenham Railway is infrequently used for grain transport. Depending on future rail operations on the Bogan Gate Tottenham Railway, the Project trains may therefore be able to be loaded/unloaded on the main line. If this is the case, the loading siding would not be constructed and train loading/unloading would occur on the main line. The requirement for the loading siding would be determined in consultation with John Holland (or the relevant rail network operator at the time).

The design and construction of the loading siding would be undertaken in accordance with the requirements of John Holland (or the relevant rail network operator at the time).

3.3.4 Construction

Construction of the modified rail siding would be undertaken during the Project construction phase and would take approximately seven months.

Consistent with Condition 1, Schedule 3 of Development Consent (DA 374-11-00), construction of the modified rail siding would be undertaken between 7:00 am and 6:00 pm, seven days per week.

A list of the approved and modified construction mobile equipment for the rail siding is provided in the Noise Assessment (Appendix B).

3.3.5 Operations

Sulphur, minor quantities of other consumables and empty containers for product transport are approved to be received by rail at the rail siding.

The incoming containers are approved to be unloaded by reachstacker/forklift and either loaded on to haulage vehicles for transport to the mine and processing facility or temporarily stored on the container storage hardstand areas prior to loading on to haulage vehicles.

The reachstacker/forklift will then load the train with containers containing metal sulphate and ammonium sulphate products, and empty sulphur containers.

The Modification would not change the approved rail loading/unloading operations with the exception of the potential for loading/unloading on the main line (Section 3.3.3).

An average of three trains per week (six train movements per week), with a maximum of two trains per day, is approved at the rail siding.

Although the Modification would not change the frequency of train movements, the length of the trains would increase from approximately 44 wagons to 77 wagons[4]. The additional wagons are required as a detailed review of the Project rail transport requirements conducted as part of the Project Execution Plan, determined that the metal sulphate and ammonium sulphate products could not be backloaded in containers transporting sulphur as the products may become contaminated. Additional wagons would therefore be required to transport the additional containers.

Consistent with Condition 1, Schedule 3 of Development Consent (DA 374-11-00), operations at the modified rail siding would be undertaken 24 hours per day, seven days per week.

3.3.6 Water Management

During construction of the rail siding, erosion and sedimentation controls would be designed, installed and maintained in accordance with the relevant requirements of *Managing Urban Stormwater: Soils and Construction* including Volume 1 (Landcom, 2004), Volume 2A – Installation of Services (Department of Environment and Climate Change [DECC], 2008a) and Volume 2C – Unsealed Roads (DECC 2008b).

[4] The modified train length would be approximately 1,050 m.

Sediment dams would be constructed within the footprint of the rail siding to collect rainfall runoff from hardstand and infrastructure areas during operations. The sediment dams would be designed, constructed and operated in accordance with the relevant requirements of *Managing Urban Stormwater: Soils and Construction* – Volume 1 (Landcom, 2004).

Waters collected in the sediment dams would be utilised at the rail siding, allowed to evaporate or released from site following treatment for any pollution.

3.3.7 Supporting Infrastructure

Water Supply

Water for use at the modified rail siding would be sourced from either the rail siding sediment dams (Section 3.3.6) or from the mine and processing facility.

Water sourced from the mine and processing facility would be transported to the rail siding by truck and stored in the water storage tanks (Figure 13).

Power Supply

The approved power supply for the rail siding is from an existing ETL that passes through the approved rail siding site (Figure 12).

As the existing ETL does not have sufficient capacity for the modified rail siding, a new 22 kV ETL (subject to separate approval) would be required to provide power to the modified rail siding (Figures 12 and 13).

Waste Management

The Modification would not significantly change the approved waste generation and management at the rail siding.

All waste generated at the modified rail siding would be disposed of at an appropriately licensed landfill consistent with Condition 54, Schedule 3 of Development Consent (DA 374-11-00).

The sewage system would be designed and constructed in accordance with PSC requirements. Waste from the sewage system would be periodically collected for disposal by a licensed contractor. Dependent upon the design, treated effluent from the sewage system would either be reused at the rail siding or released underground into an absorption field located inside the modified rail siding surface development area (e.g. along the vegetation screen).

3.3.8 Road and Intersection Upgrades

The Modification would include an approximate 675 m extension of the approved Scotson Lane road upgrade (Figure 12).

Consistent with the approved road and intersection upgrades between the rail siding and the mine and processing facility, Scotson Lane, between The Bogan Way and the modified rail siding access road, would be upgraded to include an 8 m sealed pavement and 1 m gravel shoulders.

In addition, the intersection of Scotson Lane and the modified rail siding access road would be located approximately 475 m to the south-east of the approved location (Figures 12 and 13).

The Scotson Lane road upgrade would be undertaken in consultation with the PSC.

3.3.9 Workforce

The approved rail siding construction and operational workforce is approximately 15 and five personnel, respectively.

The Modification would increase the rail siding construction and operational workforces to approximately 20 and 10 personnel, respectively.

3.3.10 Rehabilitation Strategy

Consistent with Condition 55, Schedule 3 of the Development Consent (DA 374-11-00), the modified rail siding would be rehabilitated to the satisfaction of the Secretary of the DPIE.

The following decommissioning and final land use options exist for the modified rail siding:

- decommission the rail siding infrastructure and rehabilitate the area to its former land use (i.e. agriculture); or
- transfer ownership of the rail siding to landholders with the rail siding remaining in working condition.

The decommissioning and land use options for the modified rail siding would be determined in consultation with landowners and PSC and be subject to the agreement of the Secretary of the DPIE.

The approved rehabilitation objectives for the Project are outlined in Condition 55, Schedule 3 of the Development Consent (DA 374-11-00) and the Modification would not change the approved rehabilitation objectives.

3.4 ACCOMMODATION CAMP

3.4.1 Capacity

The Modification would include an increase in the peak construction workforce from approximately 1,000 personnel to approximately 1,900 personnel (Section 3.2.2).

The capacity of the accommodation camp during the construction phase would increase from approximately 1,300 personnel to 1,900 personnel to accommodate the modified construction workforce.

Consistent with the approved accommodation camp, at the completion of the construction phase, the capacity of the modified accommodation camp would be reduced to approximately 300 personnel during the operations phase.

This reduced capacity accommodation camp would be maintained for the short-term use of temporary contractors and visitors during the operations phase (e.g. short-term contractors present during scheduled processing plant maintenance shutdowns). No permanent employees or contractors would reside in the modified accommodation camp on a full-time basis during operations.

3.4.2 General Arrangement

The approved accommodation camp general arrangement is shown on Figure 14 and would include the following main components:

- accommodation camp, including:
  - accommodation facilities;
  - administration offices and first aid facility;
  - recreational and mess areas;
  - fire-fighting infrastructure (e.g. fire water tank and reticulation system);
  - internal access roads and car parking areas; and
  - communications infrastructure.
- sewage pump station, irrigation water pipeline and irrigation area;
- utilities area, including:
  - water supply infrastructure (e.g. water treatment plant, storage tanks, distribution system);
  - water management infrastructure, including collection drains and sediment dams;
  - sewage collection system, treatment plant and storage tanks; and
  - power supply infrastructure (e.g. diesel generators, substation).
- accommodation camp ETL (between the mine site and the accommodation camp);
- accommodation camp water pipeline (between the mine site and the accommodation camp);
- site access road from Sunrise Lane; and
- construction (laydown) areas.

The Modification would include the following changes to the approved accommodation camp general arrangement (Figure 14):

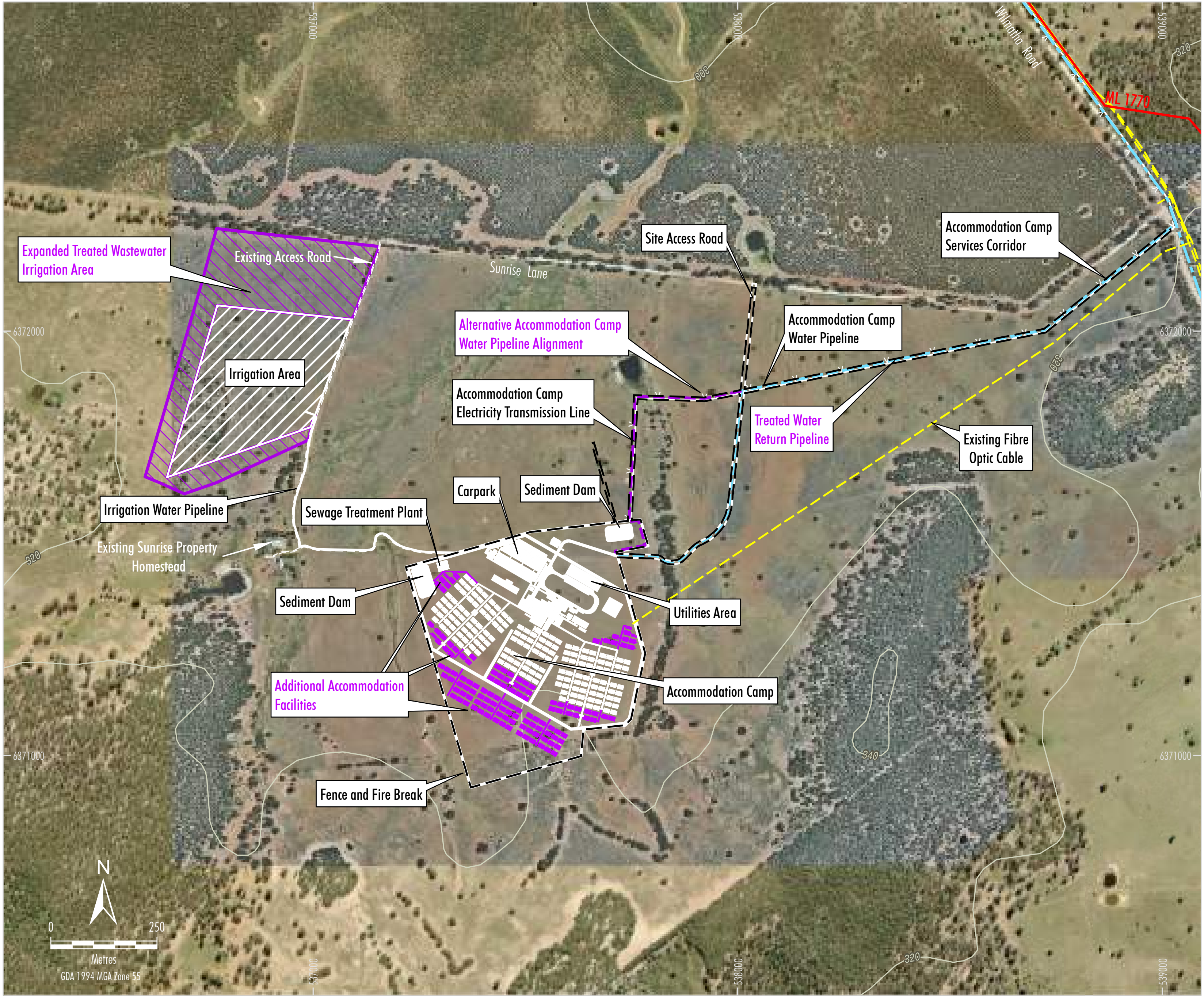
- additional accommodation facilities (i.e. conventional demountable components);
- increased size of the treated wastewater irrigation area;
- option for an alternative alignment of the last section of the accommodation camp water pipeline along the accommodation camp services corridor rather than along the access road corridor (subject to detailed design outcomes); and
- a new water pipeline located inside the approved accommodation camp services corridor to transfer treated wastewater to the mine and processing facility.

The Modification would not change other components of the approved accommodation camp general arrangement.

In addition, the Modification would not change the approved accommodation camp surface development area (Figure 14).

The general arrangement of the modified accommodation camp is provided on Figure 14.

In accordance with Condition 47, Schedule 3 of Development Consent (DA 374-11-00), SEM would prepare the final layout of the modified accommodation camp in consultation with the LSC and to the satisfaction of the Secretary of the DPIE.



LEGEND
Telstra Fibre Optic Cable
Approved Project
Mining Lease Boundary (ML)
Approved Surface Development Area
Accommodation Camp Component
Water Pipeline
Electricity Transmission Line
Modified Project
Accommodation Camp Component
Alternative Water Pipeline Alignment

Source: Black Range Minerals (2000); Clean TeQ (2021); NSW Spatial Services (2020, 2021) Orthophoto: Clean TeQ (Oct 2018); Esri, DigitalGlobe (2017)

Note: The approved accommodation camp layout shown has been prepared in consultation with the LSC and approved by the Secretary of the DPIE on 3 June 2019.

sunrise energy metals

SUNRISE PROJECT

Approved and Modified Accommodation Camp Conceptual General Arrangement

Figure 14

CTL-20-08 MOD 7_MT_207D

3.4.3 Wastewater Management

Sewage generated at the accommodation camp is approved to be treated by a packaged sewage treatment plant in the utilities area. The treated wastewater produced from the sewage treatment plant will be pumped to the irrigation area via the irrigation water pipeline (Figure 14).

The Modification would include an increase in the size of the treated wastewater irrigation area due to the increased wastewater volume associated with the increased construction phase accommodation camp capacity.

Consistent with Condition 29, Schedule 3 of Development Consent (DA 374-11-00), irrigation of the treated wastewater at the modified accommodation camp would be undertaken in accordance with the *Environmental Guidelines Use of Effluent by Irrigation* (Department of Environment and Conservation [DEC], 2004).

The Modification would also include the construction of a new water pipeline located inside the approved services corridor to provide the option to transfer treated wastewater from the accommodation camp to the mine and processing facility for reuse.

3.4.4 Waste Management

The amount of waste generated at the accommodation camp would increase as a result of the increased accommodation camp capacity proposed as part of the Modification (Section 3.4.1).

Consistent with Condition 54, Schedule 3 of Development Consent (DA 374-11-00), SEM would implement the following waste management measures at the modified Project (including the accommodation camp):

- implement all reasonable and feasible measures to minimise the waste generated by the development (e.g. maximise recycling of key waste streams);
- classify all waste in accordance with the *Waste Classification Guidelines* (Environment Protection Authority [EPA], 2014);
- store and handle all waste generated on site in accordance with its waste classification;
- ensure that waste is disposed of at appropriately licensed waste facilities; and
- manage on-site sewage treatment and disposal in accordance with the requirements of the EPA and LSC.

SEM would consult with relevant councils in the region to determine suitable appropriately licensed waste facilities for the disposal of waste generated at the modified Project.

3.5 ROAD TRANSPORT

3.5.1 Construction Phase

Heavy vehicles are approved to deliver construction equipment, construction materials, processing plant components, and construction consumables to the Project. A peak of 160 heavy vehicle movements per day is expected over the approved construction period.

A detailed review of the Project road transport requirements was conducted as part of the Project Execution Plan. The review identified that changes to the construction phase heavy vehicle delivery requirements would be required for the modified Project.

The increased construction phase workforce (Section 3.2.2) would also result in increased road traffic movements.

Further detail on the approved and modified construction phase road transport requirements of the Project is provided in Section 6.6 and the Road Transport Assessment (Appendix D).

3.5.2 Operations Phase

Metal sulphate and ammonium sulphate products are approved to be transported from the mine and processing facility to the rail siding by road. These products were to be backloaded in trucks transporting sulphur from the rail siding to the mine and processing facility.

The detailed review of the Project road transport requirements conducted as part of the Project Execution Plan, determined that the metal sulphate and ammonium sulphate products could not be backloaded in trucks transporting sulphur as the products may become contaminated. Separate truck movements would therefore be required to transport these products.

In addition, revisions to processing plant reagent types, rates and storage volumes would be required as part of the Modification (Section 3.2.4). These revisions to processing plant reagent types, rates and storage volumes would result in minor changes to road transport requirements.

Further detail on the approved and modified operational phase road transport requirements of the Project is provided in Section 6.6 and the Road Transport Assessment (Appendix D).

3.5.3 Road and Intersection Upgrades and Maintenance

Road and intersection upgrades and maintenance will be undertaken in accordance with Conditions 43 and 44, Schedule 3 of Development Consent (DA 374-11-00) and the VPA.

Details of the approved road and intersection upgrades and maintenance are outlined in the Road Upgrade and Maintenance Strategy (Clean TeQ, 2019c).

The Modification would include two additional vehicle site access points from Wilmatha Road to the mine and processing facility (Section 3.2.8).

The Modification would also include an extension of the Scotson Lane road upgrade to reflect the modified rail siding location (Section 3.3.8).

The Modification would not change other road and intersection upgrades and maintenance requirements for the Project.

3.6 HAZARD STUDIES

A range of environmental management and monitoring plans, strategies and hazard studies are required to be prepared for the Project in accordance with Development Consent (DA 374-11-00) (Section 1.1.2).

Condition 12, Schedule 2 of Development Consent (DA 374-11-00) allows for the progressive development and staging of the environmental management and monitoring plans and strategies.

SEM proposes to modify Condition 12, Schedule 2 of Development Consent (DA 374-11-00) so that the hazard studies can be progressively developed and staged consistent with the environmental management and monitoring plans and strategies. This would allow SEM to prepare hazard studies that reflect the development that is planned to be carried out at the Project at the time of preparation of the hazard studies.

The following modifications (underlined) to Condition 12, Schedule 2 of Development Consent (DA 374-11-00) is proposed:

UPDATING & STAGING OF <u>HAZARD STUDIES,</u> STRATEGIES, PLANS OR PROGRAMS

12. *With the approval of the Secretary, the Applicant may submit any <u>hazard study,</u> strategy, plan or program required by this consent on a progressive basis.*

    To ensure these <u>hazard studies,</u> strategies, plans or programs are updated on a regular basis, the Applicant may at any time submit revised <u>hazard studies,</u> strategies, plans or programs to the Secretary for approval.

    With the agreement of the Secretary, the Applicant may prepare any revised <u>hazard study,</u> strategy, plan or program without undertaking consultation with all the parties referred to under the relevant condition of this consent.

    Notes:

    - *While any <u>hazard study,</u> strategy, plan or program may be submitted on a progressive basis, the Applicant must ensure that all development being carried out on site is covered by suitable <u>hazard studies,</u> strategies, plans or programs at all times.*
    - *If the submission of any <u>hazard study,</u> strategy, plan or program is to be staged, then the relevant <u>hazard study,</u> strategy, plan or program must clearly describe the specific stage to which the <u>hazard study,</u> strategy, plan or program applies, the relationship of this stage to any future stages, and the trigger for updating the <u>hazard study,</u> strategy, plan or program.*

4 STATUTORY CONTEXT

This section outlines the statutory requirements relevant to the assessment of the Modification.

4.1 ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

The EP&A Act and *Environmental Planning and Assessment Regulation 2000* set the framework for planning and environmental assessment in NSW.

4.1.1 Applicability of S4.55(2) of the Environmental Planning and Assessment Act 1979

The Project was approved under Part 4 of the EP&A Act in 2001 (Development Consent [DA 374-11-00]) (Attachment 1).

Section 4.55(2) of the EP&A Act relevantly provides:

> **4.55 Modifications of consents-generally**
>
> …
>
> *(2) Other modifications*
>
> *A consent authority may, on application being made by the applicant or any other person entitled to act on a consent granted by the consent authority and subject to and in accordance with the regulations, modify the consent if:*
>
> *(a) it is satisfied that the development to which the consent as modified relates is substantially the same development as the development for which consent was originally granted and before that consent as originally granted was modified (if at all), and*

Clause 3BA(6) of Schedule 2 of the *Environmental Planning and Assessment (Savings, Transitional and Other Provisions) Regulation 2017* relevantly provides:

> ***3BA Winding-up of transitional Part 3A modification provisions on cut-off date of 1 March 2018 and other provisions relating to modifications***
>
> …
>
> *(6) In the application of section 4.55 (1A) or (2) or 4.56 (1) of the Act to the following development, the consent authority need only be satisfied that the development to which the consent as modified relates is substantially the same development as the development authorised by the consent (as last modified under section 75W):*
>
> *(a) development that was previously a transitional Part 3A project and whose approval was modified under section 75W,*
>
> …

The consent authority is, therefore, required to satisfy itself that any consent as modified would result in the Project remaining substantially the same development as was last modified under section 75W of the EP&A Act (i.e. Modification 4), inclusive of consideration of the changes arising from previously approved modifications.

The Project would demonstrably remain a large nickel, cobalt and scandium mine that incorporates the following key elements approved under Development Consent (DA 374-11-00) (Table 1):

- mine and processing facility;
- limestone quarry;
- rail siding;
- borefield, surface water extraction infrastructure and water pipeline;
- gas pipeline;
- accommodation camp; and
- associated transport activities and transport infrastructure (e.g. the Fifield Bypass, road and intersection upgrades).

The consent authority can therefore be satisfied that the Project, incorporating the Modification, would remain "substantially the same".

This Modification Report is a Statement of Environmental Effects that has been prepared in support of the application to modify Development Consent (DA 374-11-00).

4.1.2 EP&A Act Objects

Section 1.3 of the EP&A Act describes the objects of the EP&A Act as follows:

> *(a) to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources,*
>
> *(b) to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment,*
>
> *(c) to promote the orderly and economic use and development of land,*

> *(d) to promote the delivery and maintenance of affordable housing,*
>
> *(e) to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats,*
>
> *(f) to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage),*
>
> *(g) to promote good design and amenity of the built environment,*
>
> *(h) to promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants,*
>
> *(i) to promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State,*
>
> *(j) to provide increased opportunity for community participation in environmental planning and assessment.*

The Modification is considered to be generally consistent with the objects of the EP&A Act, as the modified Project:

- incorporates:
  - development of NSW mineral resources in a manner that minimises environmental impacts through the implementation of the Environmental Management Strategy (Section 1.1.2) and other measures (Section 6);
  - measures to minimise potential biodiversity impacts (including native plants and animals, threatened species, and their habitats) (Section 6.8);
  - measures to minimise the potential Aboriginal and historic heritage impacts of the Modification (Sections 6.9 and 6.10 and Appendix G);
  - measures to minimise potential amenity impacts associated with air quality and noise impacts on surrounding land uses (Sections 6.2 and 6.3, respectively);
  - a Preliminary Hazard Analysis (PHA) to assess the potential hazards associated with the modified Project (Section 6.7 and Appendix E); and
  - employment and other socio-economic benefits to the community (Sections 6.13 and 6.14);
- involves the orderly and economic use of land;
- would support the provision of community services and facilities through contributions to Commonwealth Government tax revenue as well as NSW Government royalty and tax revenues and voluntary contributions to community initiatives;
- is an application under section 4.55(2) of the EP&A Act that would be determined by the NSW Government however, consultation with the LSC, PSC and FSC and a range of stakeholders has been undertaken (Section 5); and
- involves public involvement and participation through SEM's consultation activities (Section 5), which would be ongoing following the public exhibition of this Modification Report and the DPIE's assessment of the Modification in accordance with the requirements of the EP&A Act.

4.1.3 Evaluation under Section 4.15(1) of the Environmental Planning and Assessment Act 1979

In evaluating the Modification, under section 4.15(1) of the EP&A Act, the consent authority is required to take into consideration a range of matters as they are of relevance to the subject of the application, including:

> *(a) the provisions of:*
>
> > *(i) any environmental planning instrument, and*
> >
> > *(ii) any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Planning Secretary has notified the consent authority that the making of the proposed instrument has been deferred indefinitely or has not been approved), and*
> >
> > *(iii) any development control plan, and*
> >
> > *(iiia) any planning agreement that has been entered into under section 7.4, or any draft planning agreement that a developer has offered to enter into under section 7.4, and*
> >
> > *(iv) the regulations (to the extent that they prescribe matters for the purposes of this paragraph),*
> >
> > *…*
>
> *that apply to the land to which the development application relates,*
>
> *(b) the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality,*

> *(c) the suitability of the site for the development,*
>
> *…*
>
> *(e) the public interest.*

While this is a requirement of the consent authority, this Modification Report has been prepared to generally address the requirements of section 4.15(1) of the EP&A Act to assist the consent authority, as follows:

- Consideration of the requirements of relevant environmental planning instruments is provided in Sections 4.2 and 2.4.1.
- SEM entered into a VPA with the LSC, PSC and FSC in December 2018.
- This Modification Report has been prepared in consideration of the prescribed matters in the *Environmental Planning and Assessment Regulation 2000*.
- The predicted impacts of the Modification, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality are provided in Section 6 and Appendices A to J.
- The suitability of the proposed site for the Modification is considered in Section 7.
- Consideration of whether, on evaluation, the Project is considered to be in the public interest is provided in Section 7.

4.2 NSW ENVIRONMENTAL PLANNING INSTRUMENTS

NSW environmental planning policies and local environmental plans that may be relevant to the Modification are discussed below.

4.2.1 State Environmental Planning Policies

State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007

The *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries)* (Mining SEPP) regularises the various environmental planning instruments that previously controlled mining activities and aims to provide for the proper management of and development of mineral resources.

Clause 5(3) of the Mining SEPP gives it primacy where there is an inconsistency between the provisions of the Mining SEPP and the provisions of any other environmental planning instruments (except the *State Environmental Planning Policy [State Significant Precincts] 2005* and *State Environmental Planning Policy [Coastal Management] 2018*).

Part 2 – Permissible Development

Clause 7

Clause 7(1) of the Mining SEPP states that development for any of the following purposes may be carried out only with development consent:

> *(b) mining carried out:*
>
> *(i) on land where development for the purposes of agriculture or industry may be carried out (with or without development consent), or*
>
> *(ii) on land that is, immediately before the commencement of this clause, the subject of a mining lease under the Mining Act 1992 or a mining licence under the Offshore Minerals Act 1999,*
>
> …

Further discussion of the permissibility of mining in accordance with the Mining SEPP is provided in the sub-sections below.

Part 3 – Clauses 12AB to 17

Part 3 of the Mining SEPP outlines the matters to be considered when determining development applications. Relevant clauses are discussed below.

Clause 12AB

Clause 12AB of the Mining SEPP identifies non-discretionary development standards for the purposes of subsection 4.15(2) of the EP&A Act in relation to the carrying out of development for the purposes of mining.

Table 4 provides details of the non-discretionary development standards listed in clause 12AB of the Mining SEPP and a summary of the environmental assessments carried out for the Modification.

Where a project does not comply with the non-discretionary development standards in clause 12AB of the Mining SEPP, this does not prevent the consent authority from granting consent even though any such standard is not complied with.

Table 4
Clause 12AB Non-discretionary Development Standards for Mining

Subclause of Clause 12AB	Compliance of the Modified Project
(3) Cumulative noise level *The development does not result in a cumulative amenity noise level greater than the recommended amenity noise levels, as determined in accordance with Table 2.2 of the Noise Policy for Industry, for residences that are private dwellings.*	The amenity noise levels of the modified Project would comply with the recommended amenity noise levels outlined in Table 2.2 of the *Noise Policy for Industry* (NPfI) (EPA, 2017a) at all privately-owned sensitive receivers (Section 6.3 and Appendix B) with the exception of two privately-owned sensitive receivers (Currajong Park 1 and Currajong Park 2).
(4) Cumulative air quality level *The development does not result in a cumulative annual average level greater than 25 µg/m^3 of PM_{10} or 8 µg/m^3 of $PM_{2.5}$ for private dwellings.*	The Modification would not result in a cumulative annual average level greater than 25 micrograms per cubic metre (µg/m^3) of PM_{10} or 8 µg/m^3 of $PM_{2.5}$ at any privately-owned dwellings when considered with existing background sources (Section 6.2.3 and Appendix A).
(5) Airblast overpressure *Airblast overpressure caused by the development does not exceed:* *(a) 120 dB (Lin Peak) at any time, and* *(b) 115 dB (Lin Peak) for more than 5% of the total number of blasts over any period of 12 months,* *measured at any private dwelling or sensitive receiver.*	The Modification would not change approved blasting practices.
(6) Ground vibration *Ground vibration caused by the development does not exceed:* *(a) 10 mm/sec (peak particle velocity) at any time, and* *(b) 5 mm/sec (peak particle velocity) for more than 5% of the total number of blasts over any period of 12 months,* *measured at any private dwelling or sensitive receiver.*	The Modification would not change approved blasting practices.
(7) Aquifer interference *Any interference with an aquifer caused by the development does not exceed the respective water table, water pressure and water quality requirements specified for item 1 in columns 2, 3 and 4 of Table 1 of the Aquifer Interference Policy for each relevant water source listed in column 1 of that Table.*	The Modification would meet the relevant minimal impact considerations as defined by the *Aquifer Interference Policy* (AIP) (NSW Government, 2012) (Section 6.5.2).

Clause 12

Clause 12 of the Mining SEPP requires that, before determining an application for consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must:

(a) consider:

(i) the existing uses and approved uses of land in the vicinity of the development, and

(ii) whether or not the development is likely to have a significant impact on the uses that, in the opinion of the consent authority having regard to land use trends, are likely to be the preferred uses of land in the vicinity of the development, and

(iii) any ways in which the development may be incompatible with any of those existing, approved or likely preferred uses, and

(b) evaluate and compare the respective public benefits of the development and the land uses referred to in paragraph (a) (i) and (ii), and

(c) evaluate any measures proposed by the applicant to avoid or minimise any incompatibility, as referred to in paragraph (a) (iii).

Existing land uses in the vicinity of the mine and processing facility and accommodation camp are characterised by a combination of agricultural enterprises (gazing and dryland cropping), carbon offset properties and forestry operations (Fifield State Forest).

Existing land uses in the vicinity of the rail siding are characterised by a combination of agricultural enterprises (grazing and dryland cropping), roads and the Bogan Gate Tottenham Railway.
The Modification components are considered to be compatible with existing and future land uses in the vicinity of the modified Project.

SEM would implement a range of measures to avoid or minimise incompatibility of the modified Project with existing and future land uses in the area (e.g. vegetation screens at the modified rail siding). This would be achieved through the implementation of the existing/approved Environmental Management Strategy (Section 1.1.2).

Clause 12A

Clause 12A(2) requires that, before determining an application for consent for State Significant Development for the purposes of mining, the consent authority must consider any applicable provisions of a voluntary land acquisition and mitigation policy and, in particular:

a) *any applicable provisions of the policy for the mitigation or avoidance of noise or particulate matter impacts outside the land on which the development is to be carried out, and*

b) *any applicable provisions of the policy relating to the developer making an offer to acquire land affected by those impacts.*

The applicable provisions of the VLAMP (NSW Government, 2018) are addressed in Sections 6.2 and 6.3 and Appendices A and B.

Clause 13

Clause 13(2) of the Mining SEPP requires that, before determining any application for consent for development in the vicinity of an existing mine, petroleum production facility or extractive industry (clause 13[1]), to which this clause applies, the consent authority must:

(a) consider:

(i) the existing uses and approved uses of land in the vicinity of the development, and

(ii) whether or not the development is likely to have a significant impact on current or future extraction or recovery of minerals, petroleum or extractive materials (including by limiting access to, or impeding assessment of, those resources), and

(iii) any ways in which the development may be incompatible with any of those existing or approved uses or that current or future extraction or recovery, and

(b) evaluate and compare the respective public benefits of the development and the uses, extraction and recovery referred to in paragraph (a) (i) and (ii), and

(c) evaluate any measures proposed by the applicant to avoid or minimise any incompatibility, as referred to in paragraph (a) (iii).

The approved mine and processing facility is located within an existing mining tenement under the *NSW Mining Act 1992* (ML 1770).

There would be no direct interaction between the modified Project and other existing or proposed mining operations. A summary of the Project key interactions with surrounding State significant projects is provided in Section 2.3 and, where relevant, potential cumulative environmental impacts are described in Section 6.

The modified Project does not overlap with any other mineral or petroleum tenements or other extractive industry, except for the accommodation camp which is located on SEM-owned land. Exploration Licence (EL) 8935 and EL 8478 overlap the accommodation camp area and are held by Rimfire Pacific Mining N.L. and Australian Mines Limited, respectively.

Neither Rimfire Pacific Mining N.L. or Australian Mines Limited have an application for a project on the accommodation camp area.

SEM has consulted with Rimfire Pacific Mining N.L. and Australian Mines Limited regarding the Modification and will continue to consult with Rimfire Pacific Mining N.L. and Australian Mines Limited regarding potential interactions with the modified Project.

Therefore, the Modification would not have a significant impact of current or reasonably foreseeable extraction or recovery of minerals, petroleum or extractive materials.

Clause 14

Clause 14(1) of the Mining SEPP requires that, before granting consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must consider whether or not the approval should be issued subject to conditions aimed at ensuring the development is undertaken in an environmentally responsible manner, including conditions to ensure the following:

(a) that impacts on significant water resources, including surface and groundwater resources, are avoided, or are minimised to the greatest extent practicable,

(b) that impacts on threatened species and biodiversity, are avoided, or are minimised to the greatest extent practicable,

(c) that greenhouse gas emissions are minimised to the greatest extent practicable.

In addition, clause 14(2) requires that, without limiting clause 14(1), in determining a development application for development for the purposes of mining, petroleum production or extractive industry, the consent authority must consider an assessment of the greenhouse gas emissions (including downstream emissions) of the development, and must do so having regard to any applicable state or national policies, programs or guidelines concerning greenhouse gas emissions.

The potential impacts of the Modification on surface water and groundwater resources are discussed in Sections 6.4 and 6.5, respectively, including measures to minimise potential impacts.

The potential biodiversity impacts as a result of the Modification are described in Section 6.8.

An assessment of the potential greenhouse gas emissions due to the Modification is provided in Section 6.15.

Clause 15

Clause 15 of the Mining SEPP requires that:

> *(1) Before granting consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must consider the efficiency or otherwise of the development in terms of resource recovery.*
>
> *(2) Before granting consent for the development, the consent authority must consider whether or not the consent should be issued subject to conditions aimed at optimising the efficiency of resource recovery and the reuse or recycling of material.*
>
> *(3) The consent authority may refuse to grant consent to development if it is not satisfied that the development will be carried out in such a way as to optimise the efficiency of recovery of minerals, petroleum or extractive materials and to minimise the creation of waste in association with the extraction, recovery or processing of minerals, petroleum or extractive materials.*

The Modification would promote the economic recovery of nickel, cobalt and scandium resources at the Project (i.e. through the optimised production schedule and revised mine site layout). As such, the Modification aims to achieve efficient resource recovery.

Clause 16

Clause 16(1) of the Mining SEPP requires that, before granting consent for development for the purposes of mining or extractive industry that involves the transport of materials, the consent authority must consider whether or not the consent should be issued subject to conditions that do any one or more of the following:

> *(a) require that some or all of the transport of materials in connection with the development is not to be by public road,*
>
> *(b) limit or preclude truck movements, in connection with the development, that occur on roads in residential areas or on roads near to schools,*
>
> *(c) require the preparation and implementation, in relation to the development, of a code of conduct relating to the transport of materials on public roads.*

Metal sulphate and ammonium sulphate products generated at the modified Project would be transported by road to the rail siding.

The Modification would also include the addition of an ammonium sulphate storage and distribution facility at the rail siding to facilitate the supply of ammonium sulphate to agricultural operations in the region by road, in addition to distribution by rail.

The potential impacts of the Modification on the surrounding road transport network are discussed in Section 6.6. No significant impacts on the performance capacity, efficiency and safety of the road network are expected to arise as a result of the Modification (Appendix D).

SEM has consulted with TfNSW, LSC, PSC and FSC regarding the Modification (Section 5).

Clause 17

Clause 17 of the Mining SEPP requires that before granting consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must consider whether or not the approval should be issued subject to conditions aimed at ensuring the rehabilitation of land that will be affected by the development. In particular, the consent authority must consider whether conditions of the consent should:

> *(a) require the preparation of a plan that identifies the proposed end use and landform of the land once rehabilitated, or*
>
> *(b) require waste generated by the development or the rehabilitation to be dealt with appropriately, or*

(c) require any soil contaminated as a result of the development to be remediated in accordance with relevant guidelines (including guidelines under clause 3 of Schedule 6 to the Act and the Contaminated Land Management Act 1997), or

(d) require steps to be taken to ensure that the state of the land, while being rehabilitated and at the completion of the rehabilitation, does not jeopardize public safety.

The rehabilitation of the modified Project would generally be consistent with the approved rehabilitation objectives outlined in Condition 55, Schedule 3 of the Development Consent (DA 374-11-00) (Section 3.2.10).

Consistent with Condition 56, Schedule 3 of Development Consent (DA 374-11-00), SEM would rehabilitate the modified mine and processing facility site progressively, that is, as soon as is practicable following disturbance, to the satisfaction of the Secretary of DPIE (Section 3.2.10).

The Mining Operations Plan (which would describe how rehabilitation at the Project would be undertaken) would be prepared under the conditions of ML 1770.

State Environmental Planning Policy No. 33 (Hazardous and Offensive Development)

Clause 12 of SEPP 33 requires a PHA to be prepared for developments for the purposes of potentially hazardous industries.

The PHA must be prepared in accordance with the current circulars or guidelines published by the DPIE and submitted with the development application.

Clause 13 of SEPP 33 requires the consent authority to consider the following when determining an application to carry out development for the purposes of a potentially hazardous or potentially offensive industry:

(a) current circulars or guidelines published by the Department of Planning relating to hazardous or offensive development, and

(b) whether any public authority should be consulted concerning any environmental and land use safety requirements with which the development should comply, and

(c) in the case of development for the purpose of a potentially hazardous industry—a preliminary hazard analysis prepared by or on behalf of the applicant, and

(d) any feasible alternatives to the carrying out of the development and the reasons for choosing the development the subject of the application (including any feasible alternatives for the location of the development and the reasons for choosing the location the subject of the application), and

(e) any likely future use of the land surrounding the development.

A PHA has been conducted for the modified Project in accordance with SEPP 33 (Appendix E).

This PHA was conducted to evaluate the hazards associated with the modified Project in accordance with the general principles of risk evaluation and assessment outlined in the NSW Department of Planning (DoP) (2011a) (now DPIE) *Hazardous Industry Planning Advisory Paper No 6 – Hazard Analysis*.

The PHA also addressed the requirements of the *Hazardous and Offensive Development Application Guidelines: Applying SEPP 33* (DoP, 2011b), and *Hazard Industry Planning Advisory Paper No.4 – Risk Criteria for Land Use Safety Planning* (DoP, 2011c).

In regard to clause 13(b), consultation has been undertaken with public authorities during the preparation of this Modification Report as described in Section 5.

In regard to clause 13(e), the land surrounding the Project is generally zoned as RU1 (Primary Production) under the *Lachlan Local Environment Plan 2013* (Lachlan LEP), *Parkes Local Environment Plan 2012* (Parkes LEP) or *Forbes Local Environment Plan 2013* (Forbes LEP) (Section 4.2.2) and the Project is generally compatible with the uses that are permissible on adjoining lands.

Consideration of the potential impacts of the Project on agricultural land uses and amenity are assessed in Sections 6.2, 6.3, 6.11 and 6.12.

***State Environmental Planning Policy No. 55* (*Remediation of Land*)**

The *State Environmental Planning Policy No. 55* (*Remediation of Land)* (SEPP 55) aims to provide a State-wide planning approach to the remediation of contaminated land. Under SEPP 55, planning authorities are required to consider the potential for contamination to adversely affect the suitability of the site for its proposed use.

A consent authority must consider the following under clause 7(1):

> (a) *it has considered whether the land is contaminated, and*
>
> (b) *if the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for the purpose for which the development is proposed to be carried out, and*
>
> (c) *if the land requires remediation to be made suitable for the purpose for which the development is proposed to be carried out, it is satisfied that the land will be remediated before the land is used for that purpose.*

Clause 7(2) provides that before a consent authority determines an application for development consent, a "preliminary investigation" is required where:

- the application for consent is to carry out development that would involve a "change of use"; and
- that "change of use" applies to certain land specified in clause 7(4).

The certain land specified in clause 7(4) on which the "change of use" must relate is either:

- land that is an "investigation area" – defined in SEPP 55 as land declared to be an investigation area by a declaration in force under Division 2 of Part 3 of the *Contaminated Land Management Act 1997*; or
- land on which development for a purpose referred to in Table A5-1 to the contaminated land planning guidelines (being *Managing Land Contamination – Planning Guidelines SEPP 55 – Remediation of Land* [NSW Department of Urban Affairs and Planning and EPA, 1998]) is being, or is known to have been carried out.

The component of the modified Project located within the boundary of Development Consent (DA 374-11-00) does not involve a "change of use" because the modified Project would involve the continued development of a nickel, cobalt and scandium mine and associated activities within this area.

Ground Doctor (Appendix H) completed a Land Contamination Assessment of the modified rail siding area (located outside the boundary of the Development Consent [DA 374-11-00]), including a Stage 1 (or Preliminary Investigation) in accordance with the *Guidelines for Consultants Reporting on Contaminated Sites* (Office of Environment and Heritage [OEH], 2011).

On the basis of the Stage 1 (or Preliminary Investigation) Land Contamination Assessment, the modified rail siding area is suitable for the land use proposed by the Modification (Section 6.11 and Appendix H).

State Environmental Planning Policy (Koala Habitat Protection) 2021

Clause 3 outlines the aims of the *State Environmental Planning Policy (Koala Habitat Protection) 2021* (Koala Habitat Protection SEPP):

> *This Policy aims to encourage the conservation and management of areas of natural vegetation that provide habitat for koalas to support a permanent free-living population over their present range and reverse the current trend of koala population decline.*

Part 2 of the Koala Habitat Protection SEPP requires the councils in certain LGAs (including the Parkes and Forbes LGAs) to consider certain development controls for koala habitats and regulates a councils determination of development applications.

For example, clause 11(5) of the Koala Habitat Protection SEPP (which relates to certain land without an approved koala management plan) states:

> (5) *However, despite subclauses (3) and (4), the council may grant development consent if the applicant provides to the council—*
>
> (a) *information, prepared by a suitably qualified and experienced person in accordance with the Guideline, the council is satisfied demonstrates that the land subject of the development application—*
>
> (i) *does not include any trees belonging to the koala use tree species listed in Schedule 2 for the relevant koala management area, or*
>
> (ii) *is not core koala habitat,*

Since the Modification is an application to modify Development Consent (DA 374-11-00) under section 4.55(2) of the EP&A Act, the LSC and PSC will not be the consent authorities. Notwithstanding that Part 2 of the Koala Habitat Protection SEPP does not apply in circumstances where the consent authority is not the Council.

An assessment of Koala habitat for the purpose of the Koala Habitat Protection SEPP has been undertaken and concluded that the Modification would not impact core Koala habitat as the modified rail siding does not represent core Koala habitat (Section 6.8 and Appendix F).

State Environmental Planning Policy (Infrastructure) 2007

The *State Environmental Planning Policy (Infrastructure) 2007* (Infrastructure SEPP) applies to the whole of NSW and includes provisions for consultation with relevant public authorities about certain development during the development assessment process.

<u>Electricity Transmission and Distribution Networks</u>

Subdivision 2 of Division 5 of Part 3 of the Infrastructure SEPP relates to developments that are likely to affect an electricity transmission or distribution network.

Clause 45 of the Infrastructure SEPP relevantly provides:

> *(1) This clause applies to a development application (or an application for modification of a consent) for development comprising or involving any of the following:*
>
> > *(a) the penetration of ground within 2m of an underground electricity power line or an electricity distribution pole or within 10m of any part of an electricity tower,*
> >
> > *(b) development carried out:*
> >
> > > *(i) within or immediately adjacent to an easement for electricity purposes (whether or not the electricity infrastructure exists), or*
> > >
> > > *(ii) immediately adjacent to an electricity substation, or*
> > >
> > > *(iii) within 5m of an exposed overhead electricity power line,*
> >
> > *…*
>
> *(2) Before determining a development application (or an application for modification of a consent) for development to which this clause applies the consent authority must:*
>
> > *(a) give written notice to the electricity supply authority for the area in which the development is to be carried out, inviting comments about potential safety risks, and*
> >
> > *(b) take into consideration any response to the notice that is received within 21 days after the notice is given.*

The approved power supply for the rail siding is from an existing ETL that passes through the approved rail siding site (Figure 12).

As the existing ETL does not have sufficient capacity for the modified rail siding, a new 22 kV ETL (subject to separate approval) would be required to provide power to the modified rail siding (Section 3.3.7).

Consultation would be conducted with Essential Energy (the relevant electricity supply authority) regarding the modified Project. Further consultation with Essential Energy would be conducted during the Project operations (e.g. preparation of management plans).

<u>Rail Corridor</u>

Subdivision 2 of Division 15 of Part 3 of the Infrastructure SEPP relates to development in or adjacent to rail corridors.

Clause 86 of the Infrastructure SEPP relevantly provides:

> *(1) This clause applies to development (other than development to which clause 88 applies) that involves the penetration of ground to a depth of at least 2m below ground level (existing) on land:*
>
> > *(a) within or above a rail corridor, or*
> >
> > *(b) within 25m (measured horizontally) of a rail corridor, or*
> >
> > *(b1) within 25m (measured horizontally) of the ground directly below a rail corridor, or*
> >
> > *(c) within 25m (measured horizontally) of the ground directly above an underground rail corridor.*
>
> *(2) Before determining a development application for development to which this clause applies, the consent authority must:*
>
> > *(a) within 7 days after the application is made, give written notice of the application to the rail authority for the rail corridor, and*
> >
> > *(b) take into consideration:*
> >
> > > *(i) any response to the notice that is received within 21 days after the notice is given, and*
> > >
> > > *(ii) any guidelines issued by the Secretary for the purposes of this clause and published in the Gazette.*
>
> *(3) Subject to subclause (5), the consent authority must not grant consent to development to which this clause applies without the concurrence of the rail authority for the rail corridor to which the development application relates.*
>
> *…*

(5) The consent authority may grant consent to development to which this clause applies without the concurrence of the rail authority concerned if—

(a) the rail corridor is owned by or vested in ARTC or is the subject of an ARTC arrangement, or

(b) in any other case, 21 days have passed since the consent authority gave notice under subclause (2)(a) and the rail authority has not granted or refused to grant concurrence.

The Bogan Gate Tottenham Railway is located within the modified Project Development Application area. Consistent with the approved Project, the modified Project would involve the construction and operation of components of the rail siding within and adjacent to the rail easement of the Bogan Gate Tottenham Railway. The design and construction of the loading siding would be undertaken in accordance with the requirements of John Holland (or the relevant rail network operator at the time).

SEM has consulted with John Holland (the relevant rail authority) in relation to the Modification (Section 5).

4.2.2 Local Environmental Plans

The Project is located within the Lachlan, Parkes and Forbes LGAs, which are covered by the Lachlan LEP, Parkes LEP and Forbes LEP, respectively.

The modified rail siding is within the Parkes LGA and, therefore, the Parkes LEP is relevant to the Modification.

As the Modification would not change the location of Project components located in the Lachlan and Forbes LGAs, the Lachlan and Forbes LEPs have not been considered further in this section.

Permissibility

As the Modification would not change the limestone quarry (within the Parkes LGA), this component has not been considered further in this section.

The modified rail siding site is within Zone RU1 (Primary Production) within the Parkes LGA.

Under the Parkes LEP, freight transport facilities are listed as permissible activity with consent on lands zones RU1 (primary production).

Therefore, the modified rail siding is permissible under the Parkes LEP.

Zone Objectives

Clause 2.3(2), Section 2 of the Parkes LEP provides:

The consent authority must have regard to the objectives for development in a zone when determining a development application in respect of land within the zone.

The modified rail siding is located within Zone RU1 (Primary Production) within the Parkes LGA. The objectives of Zone RU1 (Primary Production) include:

- *To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.*
- *To encourage diversity in primary industry enterprises and systems appropriate for the area.*
- *To minimise the fragmentation and alienation of resource lands.*
- *To minimise conflict between land uses within this zone and land uses within adjoining zones.*
- *To encourage eco-tourism enterprises that minimise any adverse effect on primary industry production.*
- *To permit non-agricultural uses that support the primary production purposes of the zone.*
- *To permit small scale rural tourism uses associated with primary production and environmental conservation with minimal impact on primary production and the scenic amenity of the area.*
- *To encourage the provision of tourist accommodation in association with agricultural activities.*
- *To provide opportunities for employment-generating development that adds value to local agricultural production and integrates with tourism.*

The modified Project is not inconsistent with the objectives of Zone RU1 (Primary Production) of the Parkes LEP, as:

- The modified Project would include development of NSW mineral resources in a manner that minimises environmental impacts through the implementation of the Environmental Management Strategy (Section 1.1.2) and other measures (Section 6).
- The modified Project would not result in the fragmentation or alienation of natural resource lands and would optimise the recovery of mineral resources.

- The modified Project site is considered suitable, and incorporates measures to allow for compatibility with existing land uses.
- The modified Project would provide employment and other socio-economic benefits to the community (Sections 6.13 and 6.14).
- The modified Project would include the re-establishment of agricultural land and endemic woodland areas post-mining (including in the Fifield State Forest) (Section 3.2.10).
- The modified Project would be conducted in accordance with the existing Compensation Agreement with Forestry Corporation of NSW.
- The Modification is not expected to significantly change the approved impacts on the Fifield State Forest.

4.3 OTHER STATE LEGISLATION

In addition to the EP&A Act, the following NSW Acts may be applicable to the modified Project:

- *Biosecurity Act 2015;*
- *Biodiversity Conservation Act 2016* (BC Act);
- *Contaminated Land Management Act 1997*;
- *Crown Land Management Act 2016*;
- *Dams Safety Act 2015*;
- *Dangerous Goods (Road and Rail Transport) Act 2008*;
- *Fisheries Management Act 1994*;
- *Heritage Act 1977*;
- *Local Land Services Act 2013*;
- *Mining Act 1992*;
- *National Parks and Wildlife Act 1974* (NPW Act);
- *Protection of the Environment Operations Act 1997* (PoEO Act);
- *Radiation Control Act 1990*;
- *Roads Act 1993*;
- *Threatened Species Conservation Act 1995;*
- *Water Management Act 2000*;
- *Work Health and Safety Act 2011*; and
- *Work Health and Safety (Mines) Act 2013.*

Relevant licences or approvals required under these Acts would continue to be obtained for the modified Project.

Additional detail on the likely requirements under some of the key Acts is provided in the sub-sections below.

Mining Act 1992

Under the *Mining Act 1992*, environmental protection and rehabilitation are regulated by conditions of mining leases, including requirements for the submission of a Mining Operations Plan prior to the commencement of operations, and subsequent Annual Reviews.

Mining operations at the modified mine and processing facility would be wholly within the boundary of ML 1770. Therefore, there is no need for the amendment or variation of existing authorities or the issue of new authorities under the *Mining Act 1992*. The Mining Operations Plan (incorporating the modified mine and processing facility) would be prepared under the conditions of ML 1770.

The Modification would not change operations at the limestone quarry (ML 1769).

The objects of the *Mining Act 1992* are to encourage and facilitate the discovery and development of mineral resources in NSW, having regard to the need to encourage ecologically sustainable development.

The Modification is considered to be generally consistent with the objects of the *Mining Act 1992*, as the modified Project:

- incorporates the development of NSW mineral resources in a manner that minimises environmental impacts through the implementation of the Environmental Management Strategy (Section 1.1.2) and other measures (Section 6); and
- promotes the economic recovery of nickel, cobalt and scandium resources at the Project (i.e. through the optimised production schedule and revised mine site layout).

National Parks and Wildlife Act 1974

The NPW Act contains provisions for the protection and management of national parks, historic sites, nature reserves and Aboriginal heritage in NSW.

SEM holds Aboriginal Heritage Impact Permit C0003049 and Aboriginal Heritage Impact Permit C0003887 issued under the NPW Act for the Project.

An Aboriginal Cultural Heritage Assessment (ACHA) for the Modification has been undertaken in consultation with the Registered Aboriginal Parties (RAPs) (Appendix G).

SEM would consult with Heritage NSW regarding the need to seek a new area based Aboriginal Heritage Impact Permit for the modified rail siding.

Protection of the Environment Operations Act 1997

The PoEO Act is the primary NSW legislation that regulates pollution control and licensing. One key feature of the Act is the statutory requirement to apply for and obtain an Environment Protection Licence (EPL) in circumstances where a scheduled activity or activities are being carried out (those activities being defined in Schedule 1 of the PoEO Act).

The approved Project is currently licensed under EPL 21146 to conduct “concrete works”, “crushing, grinding or separating” and “extractive activities” as defined in Schedule 1 of the PoEO Act.

SEM would review EPL 21146 in consultation with the EPA, and if necessary, apply to vary EPL 21146 under the PoEO Act to incorporate the Modification.

Water Management Act 2000

The *Water Management Act 2000* contains provisions for the licensing, allocation, capture and use of water resources. Under the *Water Management Act 2000*, water sharing plans are being introduced (and many have commenced) for water sources. Water sharing plans establish rules for sharing water between different users and between the various environmental sources (namely rivers or aquifers).

The Project is located within the *Water Sharing Plan for the Macquarie Bogan Unregulated Rivers Water Sources 2012*, *Water Sharing Plan for the NSW Murray-Darling Basin Fractured Rock Groundwater Sources 2020, Water Sharing Plan for the Lachlan Unregulated River Water Sources 2012, Water Sharing Plan for the Lachlan Regulated River Water Source 2016* and *Water Sharing Plan for the Lachlan Alluvial Groundwater Sources 2020* (Appendix C).

SEM currently holds the following water supply works approvals for the Project:

- Water Supply Works Approval 70CA614098 for the Project borefield and linking pipeline.
- Water Supply Works Approval 70WA617095 for the surface water extraction infrastructure and water pipeline.

In addition, SEM currently holds the following water access licences (WALs) for the Project:

- WAL 32068 in the Upper Lachlan Alluvial Groundwater Source (Upper Lachlan Alluvial Zone 5 Management Zone) for 3,154 share components under the *Water Sharing Plan for the Lachlan Alluvial Groundwater Sources 2020*.
- WAL 39837 in the Upper Lachlan Alluvial Groundwater Source (Upper Lachlan Alluvial Zone 5 Management Zone) for 766 share components under the *Water Sharing Plan for the Lachlan Alluvial Groundwater Sources 2020*.
- WAL 28681 in the Lachlan Fold Belt Murray-Darling Basin (MDB) Groundwater Source (Lachlan Fold Belt MDB [Other] Management Zone), for 243 share components under the *Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2020*.
- WAL 6679 in the Lachlan Regulated River Water Source, for 123 share components (General Security) under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*.
- WAL 1798 in the Lachlan Regulated River Water Source, for 300 share components (General Security) under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*.
- WAL 42370 in the Lachlan Regulated River Water Source, for 0 share components (High Security) under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*.

Consistent with Condition 20, Schedule 3 of Development Consent (DA 374 11 00), SEM would obtain necessary water licences for the modified Project.

Biodiversity Conservation Act 2016

The BC Act sets the legislative framework for biodiversity conservation in NSW.

Section 6.8 considers the potential biodiversity impacts associated with the Modification.

As described in Section 6.8, with reference to clause 30A, sections 1(a) and 2(c) of the *Biodiversity Conservation (Savings and Transitional) Regulation 2017*, the Modification would not increase impacts on biodiversity values and therefore, it is considered that a Biodiversity Development Assessment Report (BDAR) is not required.

Forestry Act 2012

The *Forestry Act 2012* provides for the dedication, management and use of State Forests and other Crown-timber land for forestry and other purposes.

The approved and modified mine and processing facility would involve activities within Fifield State Forest, which are dedicated as State Forest pursuant to the *Forestry Act 2012*.

Section 35 of the *Forestry Act 2012* provides that the exercise of any right under the *Mining Act 1992* on land within a State Forest is subject to conditions and restrictions relating to forestry as may be prescribed by the relevant regulations. For the portion of the Project within the Fifield State Forest, SEM holds ML 1770.

SEM has entered into a Compensation Agreement with Forestry Corporation of NSW for access into the Fifield State Forest. SEM has consulted with the Forestry Corporation of NSW regarding the Modification (Section 5).

The modified Project would be conducted in accordance with the existing Compensation Agreement with Forestry Corporation of NSW.

Crown Land Management Act 2016

The *Crown Land Management Act 2016* provides for the management of Crown land in NSW.

SEM has entered into a Compensation Agreement with DPIE – Crown Lands for the Crown land area at the mine and processing facility.

SEM holds a Crown Lands Licence (Licence number 603648) for the Crown land area at the accommodation camp.

For all relevant Crown land directly affected by the modified Project, SEM would enter into necessary leases or licences under the *Crown Lands Act 1989* and/or reach agreements under section 265 of the *Mining Act 1992* to allow Project activities to occur.

The Modification would not require additional areas of Crown Land relative to the approved Project. SEM has consulted with the DPIE – Crown Lands regarding the Modification (Section 5).

SEM has consulted with the DPIE – Crown Lands regarding the Modification (Section 5).

Local Land Services Act 2013

The *Local Land Services Act 2013* established the Local Land Services which provides for management and delivery of local land services in the social, economic and environmental interests of NSW.

As part of this role, the Local Land Services manages Travelling Stock Reserves in NSW. SEM has entered into a Compensation Agreement with Local Land Services for the Travelling Stock Reserve in the mine and processing facility area.

Roads Act 1993

Works or structures that disturb the surface of a public road, or connect a road to a classified road, require consent under section 138 of the *Roads Act 1993*. The road upgrades associated with the Modification would disturb the surface of any public roads or connections to classified roads. Consent under section 138 of the *Roads Act 1993* is therefore required for the Modification.

Consents under section 138 of the *Roads Act 1993* would be obtained where required, in consultation with the relevant roads authority/authorities.

Dams Safety Act 2015

The *Dams Safety Act 2015* regulates the safety of dams. The *Dams Safety Regulation 2019* sets out operational details and safety standards that declared dam owners must comply with to satisfy the provisions of the *Dams Safety Act 2015*.

The *Dams Safety Act 2015* is administered by Dams Safety NSW.

The tailings storage facility and water storage dam are classified as a "declared dam" under the *Dams Safety Act 2015.* These dams will be managed in accordance with the requirements of the *Dams Safety Act 2015.*

SEM has consulted with Dams Safety NSW regarding the Modification (Section 5).

SEM would comply with the *Dams Safety Act 2015*, where relevant.

4.4 COMMONWEALTH LEGISLATION

Environment Protection and Biodiversity Act 1999

The objective of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is to provide for the protection of those aspects of the environment that are of national environmental significance.

Matters of national environmental significance include:

- world heritage properties;
- wetlands listed under the Ramsar Convention;
- listed threatened species and ecological communities;
- listed migratory species protected under international agreements;
- nuclear actions;
- the Commonwealth marine environment;
- national heritage places; and
- water resources, in relation to coal seam gas development and large coal mining developments.

Proposals that are likely to have a significant impact on a matter of environmental significance are defined as a controlled action under the EPBC Act.

A proposal that is, or may be, a controlled action is required to be referred to the Commonwealth Department of Agriculture, Water and Environment (DAWE) to determine whether or not the action is a controlled action.

The Project was referred in 2001, and was determined as "not a controlled action" (EPBC 2001/133).

It is concluded that the Modification would not have a significant impact on Matters of National Environmental Significance for the following reasons:

- The Modification would not have a significant impact on listed threatened species and ecological communities and/or migratory species and would result in a reduction to the clearance of *the Poplar Box Grassy Woodland on Alluvial Plains* endangered ecological community (Poplar Box EEC) (Section 6.8 and Appendix F).
- The Modification would not have a significant impact on wetlands of international importance.
- The Modification would not have a significant impact on world heritage properties or national heritage places.
- The Modification would not impact the Great Barrier Reef Marine Park and/or Commonwealth marine areas.
- The Modification is not a nuclear action.
- The Modification is not a coal mining or coal seam gas project that could have an impact on a water resource.

It is considered that there is no need to refer the Modification to the Commonwealth Minister for the Environment.

National Greenhouse and Energy Reporting Act 2007

The *National Greenhouse and Energy Reporting Act 2007* (NGER Act) introduced a single national reporting framework for the reporting and dissemination of companies' greenhouse gas emissions and energy use. The NGER Act makes registration and reporting mandatory for companies whose energy production, energy use or greenhouse gas emissions meet specified thresholds.

Section 3 of the NGER Act defines the objects of the Act:

> *(1) The first object of this Act is to introduce a single national reporting framework for the reporting and dissemination of information related to greenhouse gas emissions, greenhouse gas projects, energy consumption and energy production of corporations to:*
>
> > *(b) inform government policy formulation and the Australian public; and*
> >
> > *(c) meet Australia's international reporting obligations; and*
> >
> > *(d) assist Commonwealth, State and Territory government programs and activities; and*
> >
> > *(e) avoid the duplication of similar reporting requirements in the States and Territories.*
>
> *(2) The second object of this Act is to ensure that net covered emissions of greenhouse gases from the operation of a designated large facility do not exceed the baseline applicable to the facility.*

The Project is anticipated to trigger the current NGER Act reporting threshold during the Project life, based on the Scope 1 and 2 greenhouse gas emission estimates provided in Appendix A. Accordingly, SEM would report relevant energy use and greenhouse gas emissions associated with its activities.

4.5 DEVELOPMENT APPLICATION AREA

Appendix 1 of Development Consent (DA 374-11-00) describes the Development Application area for the approved Project.

The proposed changes to Appendix 1 of Development Consent (DA 374-11-00) are provided in Attachment 2 and are described in this section.

4.5.1 Rail Siding

Appendix 1 of Development Consent (DA 374-11-00) lists Part Lot 39 DP 752117 for the approved rail siding.

The modified rail siding is located on Lot 1 DP 630504 (Figure 15). It is proposed that Part Lot 39 DP 752117 be replaced by Lot 1 DP 630504 in Appendix 1 of Development Consent (DA 374-11-00) (Attachment 2).

4.5.2 Administrative Amendments

Various other administrative changes to the Appendix 1 of Development Consent (DA 374-11-00) are proposed to (Attachment 2):

- reflect refined property boundary surveys;
- update lots as a result of recent property subdivisions;
- remove lots that are no longer part of the Project; and
- include lots along the approved water and gas pipeline that were not previously included.

4.6 MODIFIED PROJECT COMPLIANCE WITH STATUTORY REQUIREMENTS

The Draft *State Significant Development Guide – Preparing a Modification Report* (DPIE, 2020a) requires that "The applicant must also include a detailed statutory compliance table for the modified project as an appendix to the Modification Report, which identifies all the relevant statutory requirements for the modified project and indicates where they have been addressed in the Modification Report".

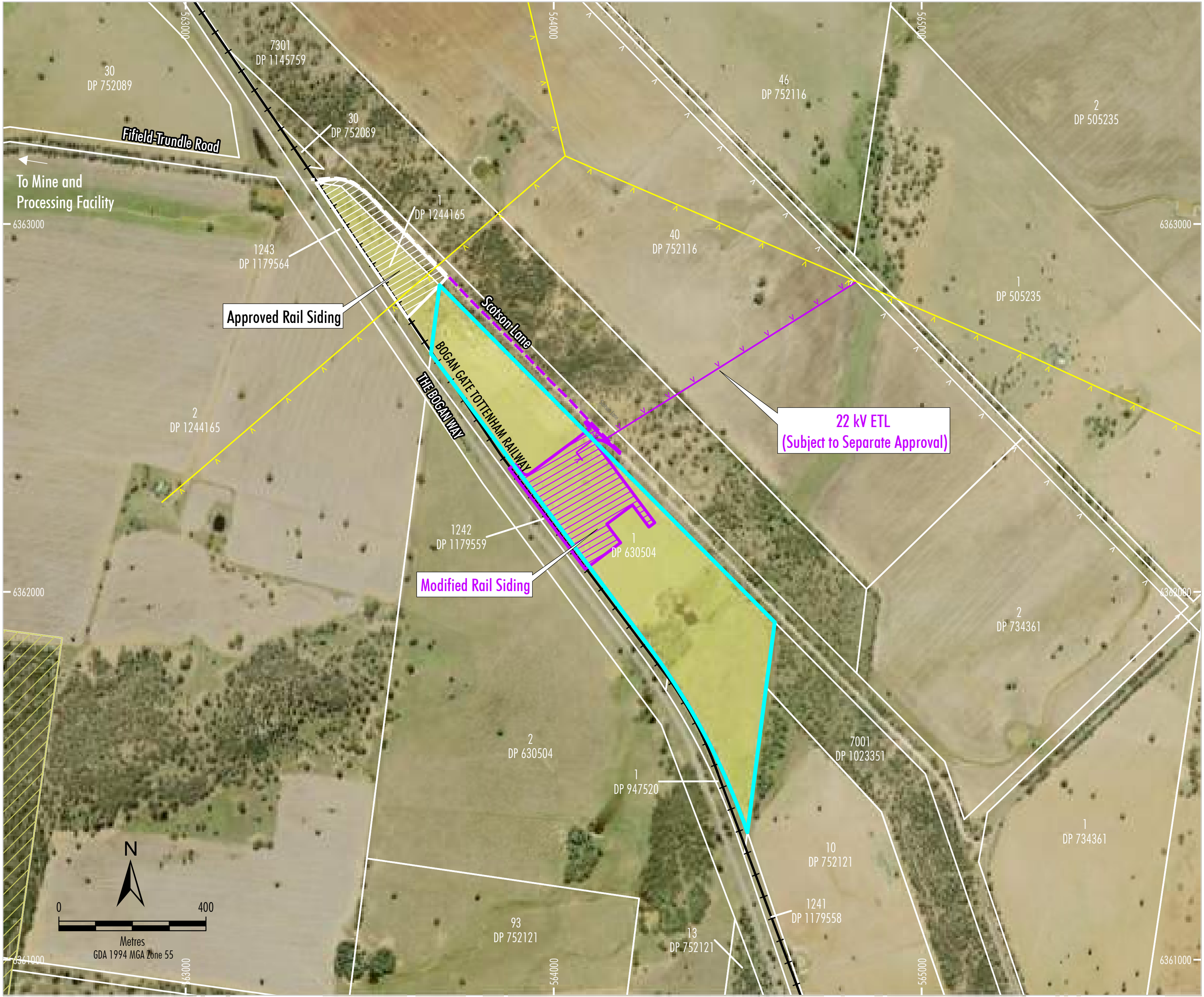
A summary of the modified Project's compliance with relevant statutory requirements is provided in Table 5.

Table 5
Statutory Compliance for the Project

Relevant Statute	Section Addressed	Project Compliance
Commonwealth Legislation		
Environment Protection and Biodiversity Conservation Act 1999	Section 4.5.1	✓
National Greenhouse and Energy Reporting Act 2007	Section 4.3	✓
NSW Legislation		
Environmental Planning and Assessment Act 1979	Section 4.1	✓
Mining Act 1992	Section 4.3	✓
Protection of the Environment Operations Act 1997	Section 4.3	✓
Water Management Act 2000	Sections 4.3, 6.4 and 6.5 and Appendix C	✓
Dams Safety Act 2015	Section 4.3	✓
Biodiversity Conservation Act 2016	Sections 4.3 and 6.8 and Appendix F	✓
Forestry Act 2012	Section 4.3	✓
Roads Act 1993	Section 4.3	✓
Other legislation	Section 4.3	✓

Table 5 (Continued)
Statutory Compliance for the Project

Relevant Statute	Section Addressed	Project Compliance
NSW Planning Policies		
State Environmental Planning Policy (State and Regional Development) 2011	Section 2.4.1	✓
State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007	Section 4.2.1	✓
State Environmental Planning Policy No. 33 – Hazardous and Offensive Development	Section 4.2.1	✓
State Environmental Planning Policy (Koala Habitat Protection) 2019	Section 4.2.1	✓
State Environmental Planning Policy No.55 – Remediation of Land	Section 4.2.1 and Appendix G	✓
State Environmental Planning Policy (Infrastructure) 2007	Section 4.2.1	✓
Lachlan Local Environmental Plan 2013	Section 4.2.2	✓
Parkes Local Environmental Plan 2012	Section 4.2.2	✓
Forbes Local Environmental Plan 2013	Section 4.2.2	✓



LEGEND

Railway

Existing 11 kV Electricity Transmission Line

Existing 22 kV Electricity Transmission Line

Approved Project

Surface Development Area

Scotson Lane Upgrade

Modified Project

Surface Development Area

Scotson Lane Upgrade Extension

22 kV Electricity Transmission Line (Subject to Separate Approval)

Lot to be Added to Appendix 1 of Development Consent (DA 374-11-00)

Land Tenure

Sunrise Energy Metals Pty Ltd

Other

Source: Black Range Minerals (2000); NSW Spatial Services (2020); Clean Teq (2017, 2018, 2020, 2021).
Orthophoto: © NSW Department of Finance, Services & Innovation (2020)

sunrise energy metals

SUNRISE PROJECT MODIFICATION

Lot to be Added to Development Consent (DA 374-11-00)

Figure 15

CTL-20-08 MOD 7_MT_220A

5 ENGAGEMENT

This section provides an overview of the engagement undertaken during the preparation of this Modification Report, the key issues raised during this engagement, and any changes to the approved Project engagement that would be required as a result of the Modification.

5.1 ENGAGEMENT APPROACH

The engagement undertaken during preparation of this Modification Report is in accordance with SEM's Scoping Letter for the Modification and has been undertaken with consideration of the requirements of *Undertaking Engagement Guide Guidance for State Significant Projects* (DPIE, 2020c).

Key objectives of the engagement undertaken for the Modification are to:

- engage with key government and public stakeholders about the Modification;
- seek input from key stakeholders on elements of the Modification; and
- continue the ongoing dialogue between SEM and key stakeholders regarding the development of the Project.

It is anticipated that consultation will continue during the public exhibition of this Modification Report and the assessment of the Modification by the NSW Government.

5.2 MODIFICATION REPORT ENGAGEMENT

5.2.1 NSW Government Agencies

Department of Planning, Industry and Environment

SEM held a videoconference with DPIE on 18 November 2020 to provide an overview of the Modification.

Following the videoconference, SEM provided a Scoping Letter to the DPIE that provided an overview of the Modification, the proposed approval pathway, and the proposed scope of the environmental assessment and engagement based on the outcomes of the videoconference.

The DPIE subsequently wrote to SEM on 8 December 2020, confirming the proposed approval pathway and that it was generally satisfied with the proposed environmental assessment and engagement scope outlined in SEM's Scoping Letter. The DPIE letter also requested that the Modification Report include consideration of relevant statutory requirements associated with the Modification as well as a revised evaluation of the modified Project. These additional aspects have been considered in Sections 4 and 7 of this Modification Report.

SEM held a videoconference with representatives of the DPIE on 28 June 2021 to provide an update on the Modification and to discuss the findings of the environmental assessment and engagement outcomes.

Environment Protection Authority

SEM provided a briefing package to the EPA on 24 March 2021 that provided an overview of the Modification, outlined the approach to assessing potential noise, air quality and water resources impacts associated with the Modification, and described the proposed waste management measures for the modified Project.

The EPA did not request any additional information regarding the Modification.

Natural Resources Access Regulator

SEM provided a briefing package to the Natural Resources Access Regulator (NRAR) on 16 April 2021 that provided an overview of the Modification, outlined the approach to assessing potential water resource impacts associated with the Modification and offered further information if requested.

The NRAR did not request any additional information regarding the Modification.

Transport for NSW

SEM met with TfNSW on 7 June 2021 to provide an overview of the Modification and discuss the findings of the Road Transport Assessment for the Modification.

TfNSW raised no significant concerns with the Modification or the Road Transport Assessment.

Biodiversity, Conservation and Science Directorate

SEM provided a briefing package to the Biodiversity, Conservation and Science Directorate [BCS] on 29 March 2021 that provided an overview of the Modification and the proposed approach to assessing potential biodiversity impacts associated with the modified rail siding.

BCS subsequently wrote to SEM on 6 April 2021 confirming that no BDAR is required for the Modification (Sections 4.3 and 6.8).

Heritage NSW

SEM provided a briefing package to Heritage NSW on 17 February 2021 that provided an overview of the Modification and presented the proposed approach to preparing the ACHA for the modified rail siding.

Heritage NSW raised no significant issues with the proposed approach to the ACHA.

Mining, Exploration and Geoscience

SEM provided a briefing package to the Mining, Exploration and Geoscience (MEG) Group (within the Department of Regional NSW) on 28 May 2021 to provide an overview of the Modification, describe the relevant resource and tenements and offer further information if requested.

MEG requested additional information on 28 June 2021. SEM has included some of the requested information in this Modification Report and will separately provide the remaining information to MEG.

Resources Regulator

SEM provided a briefing package to the Resources Regulator on 18 May 2021 that provided an overview of the Modification, described the modified rehabilitation strategy and offered further information if requested.

The Resources Regulator did not request any additional information regarding the Modification.

Dams Safety NSW

SEM provided a briefing package and held a teleconference with Dams Safety NSW on 11 June 2021 that provided an overview of the Modification, including a description of the revised tailings storage facility cell construction sequence and decant water management.

SEM also outlined that the tailings storage facility and water storage dam would be managed in accordance with the requirements of the *Dams Safety Act 2015.*

Dams Safety NSW did not request any additional information regarding the Modification.

Department of Planning, Industry and Environment – Crown Lands

SEM provided a briefing package to the DPIE – Crown Lands on 26 May 2021 to provide an overview of the Modification and offer further information if requested.

The DPIE – Crown Lands subsequently indicated that it had no objections to the Modification. No further information on the Modification was requested.

Forestry Corporation of NSW

SEM provided a briefing package to the Forestry Corporation of NSW on 1 June 2021 that provided an overview of the Modification, an overview of potential interactions with the Fifield State Forest and offered further information if requested.

The Forestry Corporation of NSW requested they be provided an opportunity to review the Modification Report during the public exhibition phase.

5.2.2 Local Councils

The Project is located within the Lachlan, Parkes and Forbes LGAs (Figure 1).

SEM held meetings with the LSC, PSC and FSC on 10 December 2020, 30 November 2020 and 19 January 2021, respectively to provide an overview of the Modification and to outline the approach to assessing potential road transport and community infrastructure impacts associated with the Modification.

SEM held additional meetings with the LSC, PSC and FSC on 6 May 2021, 23 April 2021 and 27 April 2021, respectively, to provide an update on the Modification.

SEM held further meetings with the LSC, PSC and FSC on 24 May 2021, 11 June 2021 and 8 June 2021 respectively to provide an update on the Modification and to discuss the findings of the Road Transport Assessment and Social Impact Review for the Modification.

No significant issues with the Modification were raised by the LSC, PSC or FSC during the meetings. The PSC did however request that the use of Middle Trundle Road by Project truck traffic be minimised. SEM subsequently significantly reduced the amount of Project truck movements on Middle Trundle Road.

In addition, Square Peg Social Performance (SPSP) undertook consultation activities in support of the Social Impact Review for the Modification (Appendix I). Further detail on the Social Impact Review consultation activities is provided in Appendix I.

SEM will continue to consult with the LSC, PSC and FSC throughout the Modification assessment process to respond to any issues or concerns raised.

5.2.3 Infrastructure Owners and Service Providers

John Holland

John Holland is the operator of the Bogan Gate Tottenham Railway.

SEM provided a briefing package to John Holland on 31 May 2021 that provided an overview of the Modification including the modified rail siding and the associated implications for the Bogan Gate Tottenham Railway. John Holland provided in-principle support for the Modification.

Essential Energy

Essential Energy is the electricity supply authority for the existing 22 kV electricity transmission line in the vicinity of the modified rail siding. As described in Section 3.3.7, a new 22 kV ETL (subject to separate approval) would be required to provide power to the modified rail siding (Figures 12 and 13).

SEM provided a briefing package to Essential Energy on 28 May 2021 that provided an overview of the Modification including the modified rail siding power supply. Essential Energy did not raise any concerns with the Modification and provided in-principle support for the proposed approval pathway for the new 22 kV ETL.

5.2.4 Community Engagement

Community Consultation Committee

A CCC has been established for the Project (Section 1.1.3).

Updates on the status of the Modification have been provided at the November 2020 and April 2021 CCC meetings. SEM will provide an overview of the environmental assessment findings at the next CCC meeting scheduled for late July 2021.

Fifield and Trundle Communities

SEM representatives met with business and community members in Trundle and Fifield on 15 and 16 June 2021, respectively, to provide a briefing on the Modification and for the local community to ask SEM any specific queries or issues of concern relating to the Modification.

Aboriginal Stakeholders

Aboriginal stakeholders were consulted throughout the preparation of the ACHA for the Modification (Appendix G). Consultation was conducted with reference to the Heritage NSW policy *Aboriginal cultural heritage consultation requirements for proponents 2010* (Department of Environment, Climate Change and Water [DECCW], 2010a).

Further detail on consultation with Aboriginal stakeholders for the Modification is provided in Section 6.9 and Appendix G.

Neighbouring Landholders

SEM consults with neighbouring landholders as part of its ongoing community engagement.

SEM met with landholders neighbouring the mine and processing facility and rail siding to provide an overview of the Modification and the outcomes of key assessments on 16 June 2021.

SEM will continue to consult with neighbouring landholders during the exhibition period of this Modification Report.

Community Newsletter

SEM will distribute a community newsletter providing information on the Project and the Modification in July 2021.

Neighbouring Tenement Holders

Australian Mines Limited is the proponent of the Flemington Cobalt Scandium Mine, a proposed nickel, cobalt and scandium open cut mine located to the immediate north-west of the mine and processing facility within EL 8478. EL 8478 also overlays the approved accommodation camp site.

Rimfire Pacific Mining N.L. is the holder of EL 8935 which also overlays the approved accommodation camp site.

SEM provided a briefing letter on the Modification to Australian Mines Limited and Rimfire Pacific Mining N.L. on 28 May 2021.

SEM will continue to consult with Australian Mines Limited and Rimfire Pacific Mining N.L. regarding potential interactions with the modified Project.

5.3 CONSIDERATION OF APPROVED CONSULTATION REQUIREMENTS

SEM has conducted a review of the consultation requirements in Development Consent (DA 374-11-00) and considers that no changes to the approved consultation requirements are required as a result of the Modification.

6 ASSESSMENT OF IMPACTS

6.1 IDENTIFICATION OF KEY ISSUES

The Modification would include changes to the approved mine and processing facility, accommodation camp, rail siding and road transport activities (Section 3).

SEM has undertaken a review of the potential environmental impacts of the Modification to identify the key potential environmental aspects requiring assessment.

The key potential environmental impacts associated with the modified mine and processing facility and accommodation camp would be related to the modified construction and operational activities. As the approved surface development area would not change, there would be no changes to surface development related impacts (e.g. biodiversity, Aboriginal cultural heritage) at the mine site and processing facility and accommodation camp as a result of the Modification.

The key potential environmental impacts associated with the modified rail siding would be related to the modified surface development area and potential amenity impacts associated with the construction and operation of the modified rail siding.

The changes to road transport activities would change the approved potential impacts on the road transport network.

As no changes to the other approved Project components are proposed as part of the Modification, no changes to the related environmental impacts are expected and therefore have not been considered further in this Modification Report.

The key environmental potential environmental impacts associated with the Modification are addressed in Sections 6.2 to 6.14 and in Appendices A to I.

In additional to the above, a new 22 kV ETL (subject to separate approval) would be required to provide power to the modified rail siding (Section 3.3.7). Although the potential environmental impacts would be assessed as part of the separate approval, an environmental review of the potential impacts of the new 22 kV ETL is provided in Appendix J.

6.2 AIR QUALITY

The potential air quality impacts associated with the Modification would be related to proposed changes to the mine and processing facility and the modified rail siding (Section 6.1).

An Air Quality Assessment for the Modification was undertaken by Jacobs (2021) and is presented as Appendix A. The assessment was conducted in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (Approved Methods) (EPA, 2017b).

Potential greenhouse gas emissions associated with the Modification are discussed in Section 6.15.

6.2.1 Background

Sensitive Receivers

Mine and Processing Facility

Nearby sensitive receivers to the mine and processing facility predominantly include residential receivers.

The residential receivers are generally located in all directions in the vicinity of the mine and processing facility (i.e. to the north, south, east and west) (Figure 16).

The closest privately-owned sensitive receiver (Currajong Park 2) is located approximately 1.2 km north of the ML 1770 boundary (Figure 16).

Fifield is the closest community to the mine and processing facility and is located approximately 2 km to the south-east of the Project (Figure 16). Fifield includes residential and community receivers.

Existing land uses in the vicinity of the mine and processing facility are characterised by a combination of agricultural enterprises (grazing and dryland cropping), carbon offset properties and forestry operations (Fifield State Forest) (Section 2.2).

Rail Siding

The modified rail siding is located approximately 50 km north-west of Parkes. Trundle is the closest community to the rail siding and is located approximately 4 km to the south-southeast (Figure 1).

The two closest privately-owned sensitive receivers are located approximately 1 km west (Glen Rock) and 1.2 km east (Ballenrae West) of the modified rail siding.

Existing land uses in the vicinity of the rail siding are characterised by a combination of agricultural enterprises (grazing and dryland cropping), roads and the Bogan Gate Tottenham Railway.

Concentrations of Particulate Matter

Operations and construction activities at the modified mine and processing facility and rail siding have the potential to generate particulate matter emissions in the form of:

- total suspended particulate matter (TSP);
- particulate matter with an aerodynamic diameter less than or equal to 10 micrometres (PM_{10}) (a subset of TSP); and
- particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometres ($PM_{2.5}$) (a subset of TSP and PM_{10}).

Relevant health-based air quality impact assessment criteria for TSP, PM_{10} and $PM_{2.5}$ are specified in Development Consent (DA 374-11-00) and by the EPA in the Approved Methods (EPA, 2017b), and are provided in Table 6.

Dust Deposition

Particulate matter has the potential to cause nuisance (amenity) effects when it is deposited on surfaces.

The amenity criteria for the maximum increase in dust deposition, as specified in Development Consent (DA 374-11-00) and in the Approved Methods (EPA, 2017b) are provided in Table 7.

Concentrations of Gaseous Pollutants

The modified processing facility would generate emissions of gaseous pollutants associated with the processing of ore and power generation.

The impact assessment criteria for the gaseous pollutants that may be emitted by the processing facility, as specified by the EPA in the Approved Methods (EPA, 2017b), are provided in Table 8.

Existing Air Quality

Particulate Matter and Dust Deposition

Jacobs (2021) reviewed background level concentrations of PM_{10}, $PM_{2.5}$ and dust deposition recorded at the various SEM air quality monitors as well as NSW Government operated monitors in the region. A detailed discussion of the background dust levels is provided in Appendix A, and a summary is provided below.

Background concentrations of PM_{10} and $PM_{2.5}$ have been monitored by SEM at two locations (PM2 and PM4) since November 2019 in the vicinity of the mine and processing facility (Figure 16).

TSP is not monitored in the vicinity of the Project. Jacobs (2021) assumed that average PM_{10} concentrations are 40% of TSP concentrations (NSW Minerals Council, 2000; Jacobs, 2018).

A summary of the measured background levels is provided in Table 9. The measured background levels were below the relevant PM_{10}, $PM_{2.5}$ and TSP criteria when extraordinary events (e.g. dust storms and regional bushfire activity) were excluded. However, levels were generally higher in 2019 and early 2020 due to drought conditions and associated extraordinary events (Appendix A).

Monitoring of background dust deposition is undertaken by SEM at four locations (DG1 to DG4) in the vicinity of the mine and processing facility (Figure 16). A summary of the existing dust deposition data is provided in Table 10.

Background dust deposition levels were below the relevant dust deposition criteria (4 g/m^2/month) based on all available data (Appendix A).

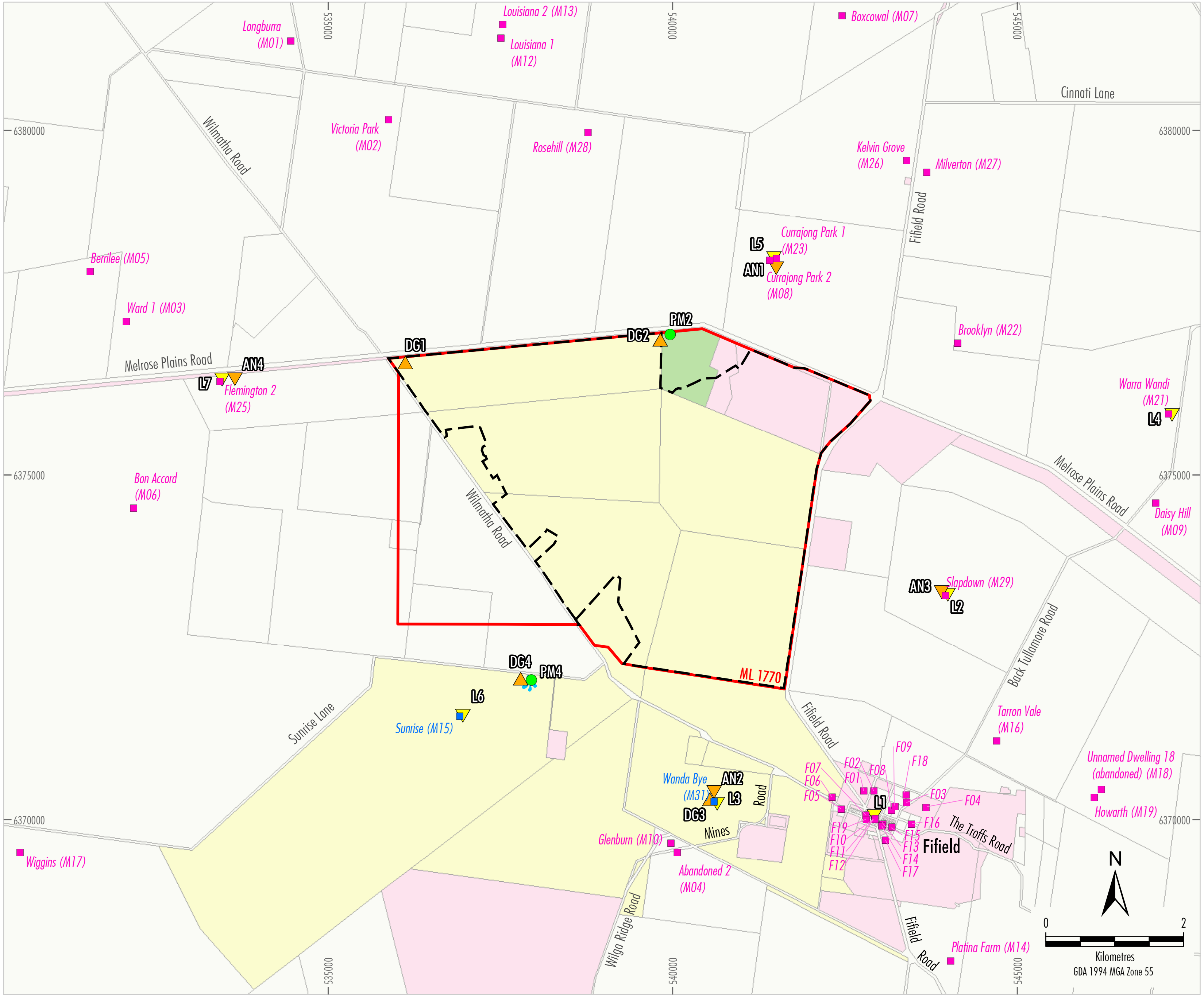
Gaseous pollutants

Concentrations of gaseous pollutants in the vicinity of the Project were assessed to be negligible as the Project is well removed from regional centres, industry and other major developments (Appendix A).

Previous Assessments

Mine and Processing Facility

An Air Quality Assessment was undertaken for Modification 4 of the Project (Ramboll Environ, 2017).



Source: Black Range Minerals (2000); Clean TeQ (2017, 2018); NSW Department of Industry (2017); NSW Land & Property Information (2017)

sunrise energy metals

S U N R I S E   P R O J E C T

Sensitive Receiver and Amenity Monitoring Locations – Mine and Processing Facility

Figure 16

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Table 6
Air Quality Criteria for Particulate Matter Concentrations

Pollutant	Averaging Time	Impact Assessment Criteria[1, 2]
Particulate matter (PM_{10})	24-hour	50 µg/m^3
	Annual	25 µg/m^3
Particulate matter ($PM_{2.5}$)	24-hour	25 µg/m^3
	Annual	8 µg/m^3
Particulate matter (TSP)	Annual	90 µg/m^3

After: Development Consent (DA 374-11-00) and Approved Methods (EPA, 2017b).

1 Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources).
2 Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents and any other activity agreed by the Secretary.

Table 7
Air Quality Criteria for Dust Deposition

Averaging Time	Maximum Increase in Deposited Dust Level	Maximum Total Deposited Dust Level
Annual	2 g/m^2/month	4 g/m^2/month

After: Development Consent (DA 374-11-00) and Approved Methods (EPA, 2017b).

Table 8
Air Quality Criteria for Gaseous Pollutants

Pollutant	Averaging time	Criterion	Application[1]
Nitrogen dioxide (NO_2)	1-hour	246 µg/m^3	100th percentile, cumulative
	Annual	62 µg/m^3	100th percentile, cumulative
Carbon monoxide (CO)	15-minute	100,000 µg/m^3	100th percentile, cumulative
	1-hour	30,000 µg/m^3	100th percentile, cumulative
	8-hour	10,000 µg/m^3	100th percentile, cumulative
Sulphur dioxide (SO_2)	10-minute	712 µg/m^3	100th percentile, cumulative
	1-hour	570 µg/m^3	100th percentile, cumulative
	24-hour	228 µg/m^3	100th percentile, cumulative
	Annual	60 µg/m^3	100th percentile, cumulative
Sulphuric acid (H_2SO_4)	1-hour	18 µg/m^3	99.9th percentile, incremental
Benzene	1-hour	29 µg/m^3	99.9th percentile, incremental
1,3-butadiene	1-hour	40 µg/m^3	99.9th percentile, incremental

1 The 100th percentile application criteria stipulates a “maximum allowable” criteria (i.e. the criterion must be complied with all the time). The 99.9th percentile application criteria allows for up to nine hours of exceedance per year (i.e. 0.01% of one year). Criteria for air quality indicators with a 99.9th percentile is applied beyond the development boundary.

Table 9
Measured and Estimated Annual Average TSP, PM_{10} and $PM_{2.5}$ at the Project

Year	PM_{10} (µg/m^3)		$PM_{2.5}$ (µg/m^3)		TSP[1] (µg/m^3)	
	PM2	PM4	PM2	PM4	PM2	PM4
2020	11.4	14.4	3.8	4.5	46	64
Criteria	**25**		**8**		**90**	

After: Jacobs (2021).

1 Estimated based on PM_{10} being 40% of TSP levels (Jacobs, 2021).

Table 10
Measured Annual Average Deposited Dust at the Project ($g/m^2/month$)

Year	DG1	DG2	DG3	DG4
2019	3.4	2.8	2.5	3.0
2020	3.1	2.6	2.3	3.2
Criteria	**4.0**			

After: Jacobs (2021).

This assessment demonstrated that no exceedances of the EPA impact assessment criteria were anticipated for particulate matter and dust deposition at the mine and processing facility (Ramboll Environ, 2017).

In addition, the predicted concentrations of gaseous pollutants were predicted to be well below the EPA impact assessment criteria beyond the mine and processing facility boundary and/or at privately-owned sensitive receivers (Ramboll Environ, 2017).

Rail Siding

The most recent air quality assessment of the approved rail siding was undertaken as part of the Syerston Project Environmental Impact Statement (EIS) (Black Range Minerals, 2000).

The assessment concluded that the approved rail siding was not considered to include significant dust generating activities (Black Range Minerals, 2000).

Air Quality Management Plan

The approved Air Quality Management Plan (Clean TeQ, 2019d) describes the air quality monitoring program and air quality management strategies for the approved Project.

Locations of the current air quality monitoring locations are shown on Figure 16. The monitoring program consists of a combination of dust deposition gauges, two continuous PM_{10} and $PM_{2.5}$ monitors and an automatic weather station.

Consistent with the approved Air Quality Management Plan (Clean TeQ, 2019d), no air quality or meteorological monitors operate in the vicinity of the modified rail siding.

6.2.2 Impact Assessment Review

Jacobs (2021) assessed the potential impacts of a peak construction phase and various operational phases of modified mine and processing facility (i.e. particulate matter generated by mobile equipment, exposed areas and gaseous pollutants released from dedicated stacks).

Jacobs (2021) also assessed indicative construction and operational scenarios of the modified rail siding (i.e. particulate matter generated by mobile equipment, exposed areas and other sources).

Dispersion Modelling Methodology

The CALPUFF modelling system was used by Jacobs (2021) to assess potential air quality impacts (from gaseous pollutants and particulate matter) associated with the modified Project.

CALPUFF is a multi-layer, non-steady-state puff dispersion model that is approved by the EPA (EPA, 2017b).

Further description of the dispersion modelling is provided in Appendix A.

Assessment of Meteorological Conditions

The dispersion modelling completed for the Modification is based on data from the site meteorological station “AWS” located near the proposed accommodation camp (Figure 16).

Meteorological monitoring at the AWS has been undertaken since November 2018.

Following a review of the data, the 2020 calendar year was selected as the representative year, and was used for the modelling (Appendix A).

Jacobs (2021) adopted the meteorological conditions from the mine and processing facility AWS for the modified rail siding.

Details of the analysis of meteorological conditions modelled is provided in Appendix A.

Air Quality Modelling Scenarios

Mine and Processing Facility

Four scenarios representative of the modified mine and processing facility were assessed for potential particulate matter impacts (Appendix A):

- Construction Year 2 – representative of the peak construction phase;
- Year 1 – representative of maximum ore and waste extraction, with mining in the eastern and western open cut pits, and TSF Cell 1 in operation;
- Year 10 – representative of continued mining across both eastern and western open cut pits, and TSF Cell 2 in operation; and
- Year 17 – representative of the final years of mining, with the maximum extent of the open cut pits, maximum heights and extent of the waste rock emplacements, and TSF Cell 3 in operation.

A single modelling scenario representing expected peak emissions was used to assess emissions of gaseous pollutants (Appendix A).

Rail Siding

Two scenarios representative of the modified rail siding were assessed for potential particulate matter impacts (Appendix A):

- Construction – representative of the peak construction phase; and
- Operational – representative of typical operations at the rail siding.

The scenarios for the mine and processing facility and modified rail siding were selected in consideration of maximum potential dust emissions (e.g. to account for the maximum material movements and proximity to privately-owned sensitive receivers) to evaluate the potential impacts at the nearest privately-owned sensitive receivers throughout the life of the modified Project.

Emission Inventories

Mine and Processing Facility

Particulate matter emission inventories were prepared for the four scenarios assessed in consideration of the indicative construction and mining activities for each year, including ore extraction, blasting, waste rock removal rates, haul distances and routes, active stockpile and pit areas and mobile equipment operating hours.

The major sources of dust emissions are predicted to be associated with the following activities (Appendix A):

- hauling of waste rock and ore in trucks on unpaved roads (including diesel particulate emissions);
- wind erosion of exposed areas and stockpiles;
- dozer operations; and
- handling and loading/unloading of waste rock and ore.

Consistent with the Approved Methods (EPA, 2017b), emission factors developed by the United States Environmental Protection Agency (US EPA) have been used to estimate the particulate matter emissions generated by the modified Project (Appendix A).

A full description of the dispersion model methodology and emission inventories is provided in Appendix A.

Estimated emissions of gaseous pollutants from the processing facility used in the modelling were estimated by SEM based on the current design of the processing facility, and take into account the use of emission control equipment incorporated into the processing operations. The modified stack design parameters, including the reduced acid plant stack height (Section 3.2.4), were also considered.

The assumed stack design and emissions are detailed in Appendix A.

Rail Siding

Particulate matter emission inventories were prepared for the rail siding scenarios which were assessed in consideration of the typical activities during the construction and operational phases.

The major sources of dust emissions are predicted to be associated with the following activities (Appendix A):

- wind erosion of exposed areas (construction and operational phases) and soil stockpiles;
- wind erosion from soil stockpiles (construction phase); and
- handling of ammonium sulphate (operational phase).

Consistent with the Approved Methods (EPA, 2017b), emission factors developed by the US EPA have been used to estimate the particulate matter emissions generated by the modified Project (Appendix A).

Mitigation Measures

Best practice dust mitigation measures to be implemented for the modified mining operations were developed with reference to the recommendations of the *NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining* (Katestone Environmental, 2011) (Appendix A). While this study was focussed on coal mines, the emissions generating sources considered in the study, and a number of the associated mitigation measures, are considered relevant to the Project mining activities.

Dust mitigation measures that would be implemented for the modified Project would include (Clean TeQ, 2019d):

- use of water carts/trucks to control emissions from haul roads;
- roads constructed in a proper manner and consideration given to using material with low silt/fines content;
- restricting speed on haul roads;
- progressive rehabilitation of disturbed areas;
- minimising pre-strip areas;
- minimisation of drop heights for handling of waste rock and ore;
- direct placement of waste rock and ore where possible; and
- delay of blasts during unfavourable weather conditions.

The processing facility has been designed to minimise potential impacts of gaseous pollutants through the use of emission control equipment incorporated into the processing operations, and design of the stacks.

Compliance with Impact Assessment Criteria

Mine and Processing Facility

Particulate Matter

No exceedances of the Development Consent (DA 374-11-00) or Approved Methods criteria were predicted at any privately-owned sensitive receivers in all scenarios for:

- annual average dust deposition levels (both incremental and cumulative);
- cumulative annual average TSP concentrations;
- cumulative annual average and 24-hour PM_{10} concentrations; or
- cumulative annual average and 24-hour $PM_{2.5}$ concentrations.

Figure 17 shows the 24-hour maximum PM_{10} concentrations for Construction Year 2 and Operational Years 1, 10 and 17 for the modified Project only (i.e. excluding background sources). Additional air quality contour plots for other particulate matter parameters from the modified mine and processing facility are provided in Appendix A.

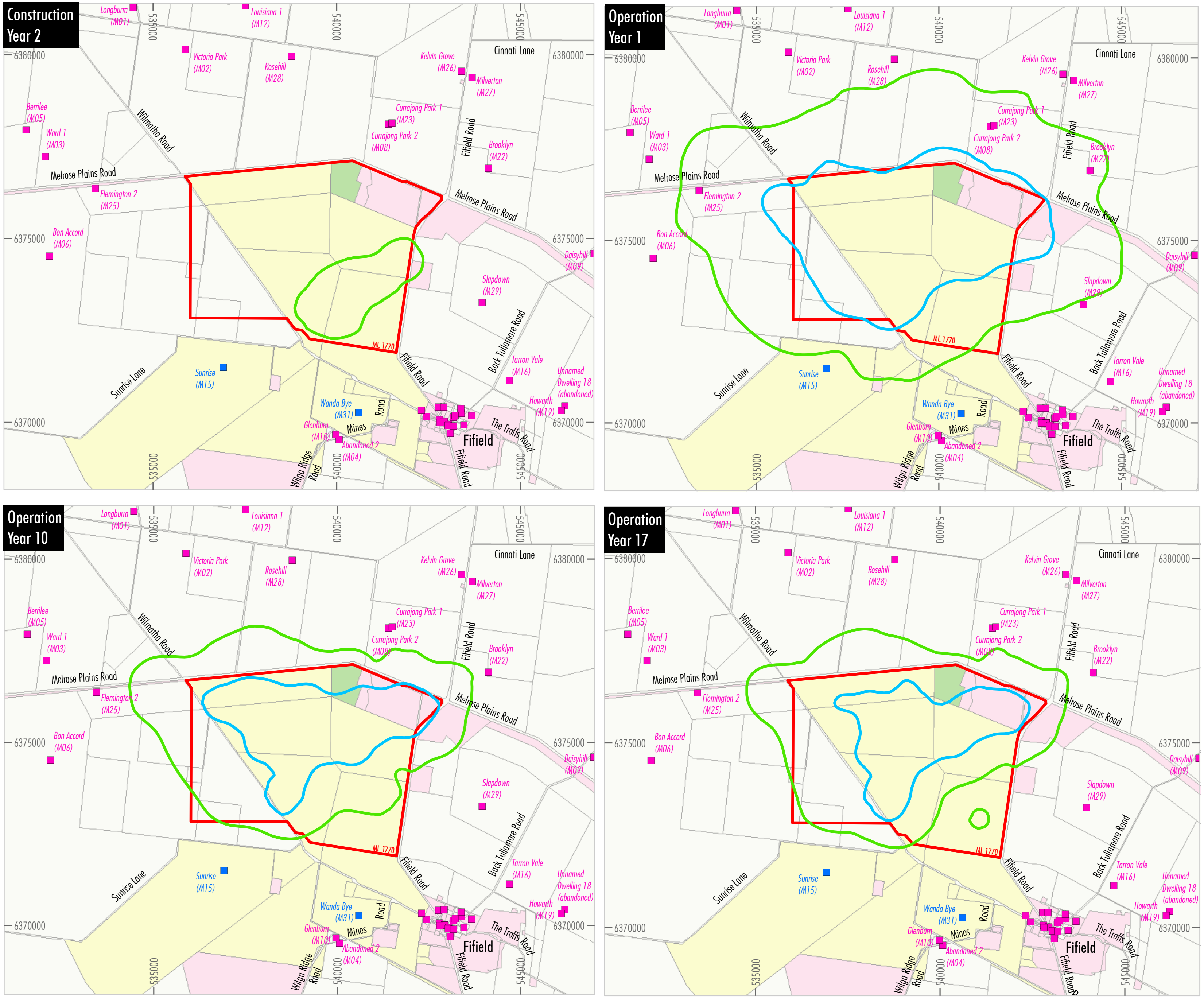
Gaseous Pollutants

Jacobs (2021) considered the potential gaseous emissions from the following at the mine and processing facility:

- the processing facility;
- blasting; and
- diesel exhaust from mobile equipment.

No exceedances of the criteria for gaseous pollutants described in the Approved Methods were predicted at any privately-owned sensitive receivers, in Years 1, 10 and 17.

For all gaseous pollutants, the predicted concentrations were well below the relevant criteria at all privately-owned receivers (Appendix A).



LEGEND
Mining Lease Boundary (ML)
Sunrise Energy Metals Owned Land
Crown Land
Fifield State Forest
Private Landholder
Mine-owned Dwelling
Private Dwelling
20 $\mu g/m^3$ Contour
50 $\mu g/m^3$ Contour

Note: Fifield receiver labels are shown on Figure 16.

Criteria = 50 $\mu g/m^3$

N
0 4
Kilometres
GDA 1994 MGA Zone 55

Source: Black Range Minerals (2000); CleanTeQ (2017, 2019); Jacobs (2021); NSW Department of Industry (2017); NSW Land & Property Information (2017)

sunrise energy metals

SUNRISE PROJECT

Modified Project Only Maximum 24 Hour PM_{10} Air Quality Contours – Mine and Processing Facility

Figure 17

CTL-20-08 MOD 7_MT_225A

Air quality contours for gaseous pollutant emissions from the processing facility are provided in Appendix A.

Blasting

Jacobs (2021) considered the potential post-blast fume emissions from the modified Project (as Nitrogen Dioxide [NO_2]).

The post-blast fume emissions were well below the relevant NO_2 criteria (246 µg/m^3) at all nearby privately-owned sensitive receivers.

Additional air quality contours for blasting emissions are provided in Appendix A.

Diesel Exhaust

Jacobs (2021) considered the potential diesel exhaust emissions (as NO_2) from mobile equipment.

The modified Project would comply with the relevant 1-hour average and annual average criteria at all nearby privately-owned sensitive receivers (Appendix A).

Additional air quality contours for diesel exhaust emissions are provided in Appendix A.

Cumulative NO_2 Emissions

Cumulative impacts of these modified Project components would comply with the relevant 1-hour average criteria at all sensitive privately-owned sensitive receivers (Appendix A).

Rail Siding

No exceedances of the Development Consent (DA 374-11-00) or Approved Methods criteria were predicted at any privately-owned sensitive receivers in all scenarios for:

- annual average dust deposition levels (both incremental and cumulative);
- cumulative annual average TSP concentrations;
- cumulative annual average and 24-hour PM_{10} concentrations; or
- cumulative annual average and 24-hour $PM_{2.5}$ concentrations.

Figure 18 shows 24-hour maximum PM_{10} concentrations for the construction and operational scenarios for the modified rail siding only (i.e. excluding background sources). Additional air quality contour plots are provided in Appendix A.

Vacant Land Assessment

Jacobs (2021) has conducted a vacant land assessment in accordance with the VLAMP (NSW Government, 2018) and concluded that no privately-owned sensitive receivers are likely to exceed the criteria based on potential impacts on vacant land (Appendix A).

Cumulative Impacts

The potential cumulative air quality impacts of the modified Project with “relevant” projects as defined in the draft *Assessing Cumulative Impacts Guide Guidance for State Significant Projects* (DPIE, 2020b) (Section 2.3) were considered by Jacobs (Appendix A).

Jacobs concluded that none of the “relevant” projects would potentially interact with, or have potential cumulative air quality impacts with, the modified Project given the distance between the modified Project and the other “relevant” projects (Appendix A).

6.2.3 Mitigation Measures, Management and Monitoring

Air Quality Management Plan

Prior to the operations phase of the modified Project, the existing Air Quality Management Plan (Clean TeQ, 2019d) would be updated, where necessary, to incorporate the Modification.

In addition, Jacobs (2021) reviewed the existing air quality monitoring network at the Project and concluded that no changes are required for the modified Project.

6.3 NOISE

The potential noise impacts associated with the Modification would be related to proposed changes to the mine and processing facility and modified rail siding (Section 6.1).

A Noise Assessment for the Modification was undertaken by Renzo Tonin & Associates (Renzo Tonin) and is presented in Appendix B. The assessment was conducted in accordance with:

- NPfI (EPA, 2017a);
- VLAMP (NSW Government, 2018);
- *Interim Construction Noise Guideline* (ICNG) (DECC, 2009); and
- *Road Noise Policy* (DECCW, 2011).

LEGEND

- Railway
- Mining Lease Boundary (ML)
- Sunrise Energy Metals Owned Land
- Crown Land
- Private Landholder
- Mine-owned Dwelling
- Private Dwelling
- 20 $\mu g/m^3$ Contour
- 50 $\mu g/m^3$ Contour

Modified Project

- Modified Rail Siding Surface Development Area

Criteria = 50 $\mu g/m^3$

Source: Black Range Minerals (2000); NSW Spatial Services (2020); Clean Teq (2017, 2018, 2020); Jacobs (2021).

sunrise energy metals

S U N R I S E P R O J E C T

Modified Project Only Maximum 24 Hour PM_{10} Air Quality Contours – Rail Siding

Figure 18

CTL-20-08 MOD 7_MT_227A

As the Modification would not change the approved blasting or rail transportation activities at the Project, potential blasting and rail transportation impacts have not been considered in this section.

6.3.1 Background

Sensitive Receivers

Refer to Section 6.2.1 for a description of sensitive receivers in the vicinity of the mine and processing facility and rail siding.

Background Noise Levels

The Rating Background Level is the background noise level determined without the subject premises in operation, in accordance with the NPfI.

Renzo Tonin (2017) conducted background noise surveys for the Project. These surveys concluded that for all seven monitoring locations, all noise levels were approximately 30 A-weighted decibels (dBA) or below, with the exception of one monitoring location which was affected by insect noise.

Review of the background noise levels measured by Renzo Tonin (2017) indicated the Rating Background Levels would be 30 dBA during all periods, for all sensitive receivers. Therefore the minimum Rating Background Levels applicable under the NPfI were adopted for the Modification (Appendix B).

Construction Noise Criteria

The ICNG provides construction noise management levels based on the time of day in which construction activities occur, with the "noise affected" construction noise management level being the Rating Background Level plus 10 dBA during recommended standard construction hours and the Rating Background Level plus 5 dBA outside of recommended standard construction hours. The ICNG recommended standard construction hours are Monday to Friday 7 am to 6 pm and Saturday 8 am to 1 pm (Appendix B).

Consistent with Condition 1, Schedule 3 of Development Consent (DA 374-11-00), construction of the modified mine and processing facility would be undertaken 24 hours per day, seven days per week and construction of the modified rail siding would be undertaken between 7.00 am to 6.00 pm, seven days per week.

Modified construction activities would therefore be undertaken both within and outside of the ICNG recommended standard construction hours.

The construction noise management levels for the modified Project are shown in Table 11.

The ICNG also sets out recommended acceptable noise levels for other noise-sensitive non-residential receivers (Appendix B).

Operational Noise Criteria

The NPfI recommends two noise assessment criteria, "intrusiveness" and "amenity", both of which are relevant for the assessment of noise from the modified Project (Appendix B). Cumulative noise impacts are assessed against the amenity criteria, while the Project-only noise impacts are assessed against the intrusiveness criteria.

The intrusiveness criteria are based on an energy average noise level over a 15-minute period. In accordance with the NPfI, intrusiveness criteria require the L_{Aeq} noise level from the source being assessed to not exceed the Rating Background Level by more than 5 dBA (when measured over a 15-minute period).

Amenity criteria are based on the setting of the area (e.g. rural, suburban, urban, industrial, etc.) (EPA, 2017a). Amenity criteria are based on the energy average noise level over the entire day, evening or night period rather than a 15-minute interval. Notwithstanding, under the NPfI, the Project amenity noise levels used for assessment purposes are converted to an equivalent energy average noise level over a 15-minute period.

Table 11
Construction Noise Management Levels at Residential Receivers

<table>
<tr><th rowspan="3">Sensitive Receiver Location</th><th colspan="3">L_{A90} Rating Background Level</th><th colspan="4">Noise Management Level $L_{Aeq,15min}$</th></tr>
<tr><th rowspan="2">Day</th><th rowspan="2">Evening</th><th rowspan="2">Night</th><th>Recommended Standard Hours</th><th colspan="3">Outside Recommended Standard Hours</th></tr>
<tr><th>Day</th><th>Day</th><th>Evening</th><th>Night</th></tr>
<tr><td>All residential receivers</td><td>35</td><td>30</td><td>30</td><td>45</td><td>40</td><td>35</td><td>35</td></tr>
</table>

Source: Appendix B.

The NPfI prescribes how to establish Project-specific $L_{Aeq(15\ minute)}$ intrusive criteria and amenity criteria. The NPfI Project-specific intrusive and amenity assessment criteria for the modified Project are presented in Table 12.

As the Project-specific intrusive criteria are the most stringent (i.e. less than the Project amenity criteria), Appendix B assesses Project-only noise levels against the Project intrusive criteria (i.e. these are the Project Noise Trigger Levels in accordance with the NPfI) (Table 12).

Cumulative noise levels inclusive of other industrial noise sources are assessed against the recommended amenity noise criteria level for rural areas, as adjusted to a 15-minute assessment period (Table 12).

The criteria adopted for other receiver types (e.g. hotels, fire stations, churches and town halls) are provided in Appendix B.

Noise Management and Noise Affectation Zones

In those cases where the Project Noise Trigger Levels are exceeded, it does not automatically follow that all people exposed to the noise would find the noise noticeable or unacceptable.

Table 13 presents the methodology used for assessing operational noise against the NPfI Project-specific noise assessment criteria.

For the purposes of assessing potential noise impacts consistent with the VLAMP, exceedances can be separated into a Noise Management Zone (i.e. negligible, marginal or moderate impacts of 1 to 5 dBA above the criteria) and a Noise Affectation Zone (i.e. greater than 5 dBA above the criteria, with impacts considered to be moderate or significant) (Table 14).

The adopted treatments for the Project for predicted noise exceedances are outlined in Table 14. These treatments are generally consistent with Table 4.2 of the NPfI and Table 1 of the VLAMP.

Development Consent (DA 374-11-00) Criteria

Development Consent (DA 374-11-00) prescribes noise criteria for the mine and processing facility and rail siding (Table 15).

Predicted noise levels for the Modification have been assessed against both these Development Consent (DA 374-11-00) criteria and the revised criteria derived under the NPfI.

Previous Assessments

Mine and Processing Facility

A Noise and Blasting Assessment was undertaken for Modification 4 (Renzo Tonin, 2017). The assessment concluded that:

- Noise levels from the construction of the mine and processing facility would comply with the ICNG criteria within and outside of the recommended standard construction hours.
- Noise levels from the operation of the mine and processing facility would exceed the relevant noise criteria at seven privately-owned sensitive receivers. All seven privately-owned sensitive receivers were predicted to experience “negligible” exceedances of the relevant criteria.

Rail Siding

Richard Heggie Associates (2000) assessed the potential noise impacts associated with the construction of the rail siding.

The assessment concluded that noise levels associated with the construction of the rail siding would comply with the relevant criteria.

Noise Management Plan

The approved Noise Management Plan (Clean TeQ, 2020c) describes the noise monitoring program and noise management strategies for the approved Project.

Locations of the current noise monitoring locations in the vicinity of the mine and processing facility are shown on Figure 16.

Consistent with the approved Noise Management Plan (Clean TeQ, 2020c), no noise monitors operate in the vicinity of the modified rail siding.

6.3.2 Impact Assessment Review

Construction Noise

An assessment of the predicted noise level during the expected peak construction phase at the mine and processing facility and an indicative maximum case modified rail siding construction scenario has been undertaken and is presented in Appendix B and a summary is provided below.

Table 12
NPfI Project-specific Intrusive and Amenity Assessment Criteria for Operational Noise (dBA)

Sensitive Receiver	Intrusive $L_{Aeq(15\ minute)}$[1]			Amenity $L_{Aeq(15\ minute)}$[1]		
	Day	Evening	Night	Day	Evening	Night
All residential receivers	40 dBA	35 dBA	35 dBA	48 dBA	43 dBA	38 dBA

Source: After Appendix B.

1 Daytime = 7.00 am to 6.00 pm; Evening = 6.00 pm to 10.00 pm; Night–time = 10.00 pm to 7.00 am.

Table 13
Significance of Residual Noise Impacts and Potential Treatments

Residual Noise Exceeds NPfI Criteria By	Total Cumulative Industrial Noise Level	Significance of Residual Impact	Example of Potential Treatment
0 to 2 dBA	Not applicable	Negligible	The exceedance would not be discernible by the average listener and therefore would not warrant receiver-based treatment or controls.
3 to 5 dBA	< recommended amenity noise level or > recommended amenity noise level, but the increase in total cumulative industrial noise level resulting from the development is less than or equal to 1 dB	Marginal	Provide mechanical ventilation/comfort condition systems to enable windows to be closed without compromising internal air quality/amenity.
3 to 5 dBA	> recommended amenity noise level and the increase in total cumulative industrial noise level resulting from the development is more than 1 dB	Moderate	As for "marginal", but also upgraded façade elements, such as windows, doors or roof insulation, to further increase the ability of the building façade to reduce noise levels.
>5 dBA	=< recommended amenity noise level	Moderate	
>5 dBA	> recommended amenity noise level	Significant	May include suitable commercial agreement where considered feasible and reasonable.

Source: NSW Government (2018).

Table 14
Noise Impact Assessment Methodology

Noise Management Zone		Noise Affectation Zone
1-2 dB Above Project Noise Trigger Levels	3-5 dB Above Project Noise Trigger Levels	> 5 dB Project Noise Trigger Levels
• No treatment/controls required	• Voluntary mitigation rights applicable. • Architectural treatment required if requested (including ventilation and upgraded façade elements).	• Voluntary mitigation rights applicable. • Architectural treatment required if requested (including ventilation and upgraded façade elements). • Voluntary land acquisition rights applicable.

Source: After Appendix B.

Table 15
Development Consent (DA 374-11-00) Operational Noise Criteria for the Mine and Processing Facility and Rail Siding

Sensitive Receiver	Day	Evening	Night	
	$L_{Aeq,15min}$ (dBA)	$L_{Aeq,15min}$ (dBA)	$L_{Aeq,15min}$ (dBA)	$L_{A1,1 min}$ (dBA)
Mine and Processing Facility				
Currajong Park (M08 and M23)	37	37	37	45
Abandoned 2 (M04) Glenburn (M10) Rosehill (M28) Slapdown (M29)	35	36	36	45
Brooklyn (M22)	36	35	35	45
Wanda Bye	35	35	37	45
All other privately-owned residence	35	35	35	45
Rail Siding				
Glen Rock (Q06) Ballanrae (Q08) Spring Park (Q09)	37	35	35	45
All other privately-owned residence	35	35	35	45

Note: Wanda Bye is now mine-owned.

The Environmental Noise Model was used by Renzo Tonin (Appendix B) to simulate the modified mine and processing facility and rail siding construction components using noise source information (i.e. mobile/stationary plant and equipment sound power levels and locations) and predict corresponding potential noise levels at relevant receiver locations.

The Environmental Noise Model is compatible with the NPfI and has previously been accepted by the EPA and DPIE for use in environmental noise assessments (Appendix B).

The sources of noise included in the modelled scenarios are outlined in Appendix B.

The predicted construction noise levels at all privately-owned sensitive receivers would comply with the construction noise management levels (Table 11) within and outside of recommended hours for all time periods (Figures 19, 20 and 21) (Appendix B).

Operational Noise

An assessment of the maximum case operational noise impacts of the modified mine and processing facility and modified rail siding has been undertaken (Appendix B) and a summary is provided below.

Mine and Processing Facility

<u>Modelling Methodology</u>

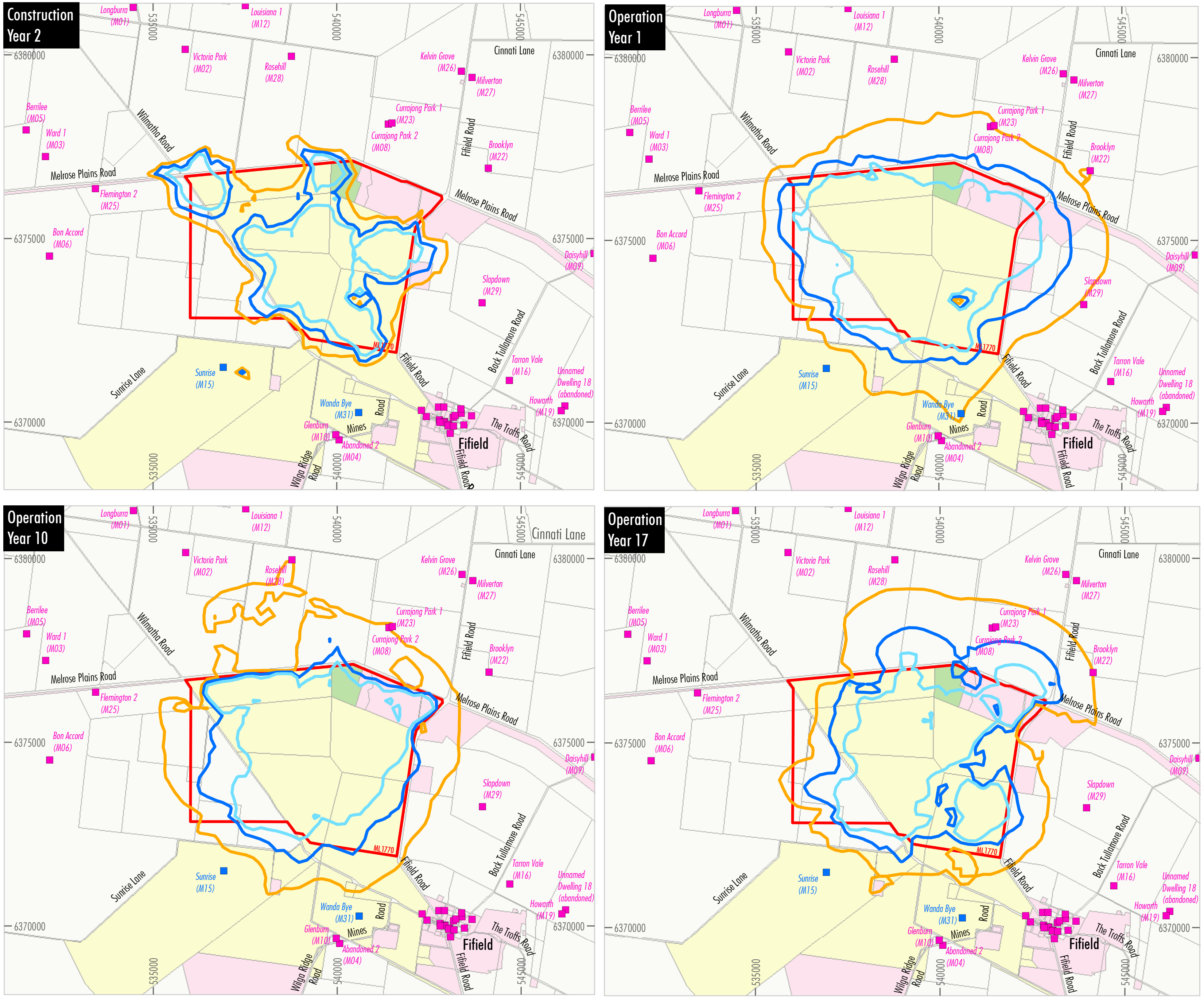
The Environmental Noise Model was used by Renzo Tonin (Appendix B) to simulate the modified operational mine and processing facility using noise source information (i.e. mobile/stationary plant and equipment sound power levels and locations) and predict corresponding potential noise levels at relevant receiver locations.

The sources of noise included in the modelled scenarios are outlined in Appendix B. Consistent with the NPfI, the noise model also considered meteorological effects, topographical features, distance from source to receiver and noise attenuation.

The locations of all modelled receivers in the vicinity of the mine and processing facility are provided in Appendix B and shown in Figure 16.

<u>Assessment of Meteorological Conditions</u>

The NPfI generally directs the use of two approaches for the assessment of noise impacts through the use of default meteorological parameters or site-specific parameters.



LEGEND

- Mining Lease Boundary (ML)
- Sunrise Energy Metals Owned Land
- Crown Land
- Fifield State Forest
- Private Landholder
- Mine-owned Dwelling
- Private Dwelling
- 35 dBA Noise Contour
- 40 dBA Noise Contour
- 45 dBA Noise Contour

Note: Fifield receiver labels are shown on Figure 16.

Criteria:
Construction (during recommended standard hours): 45 dBA
Construction (outside recommended standard hours): 40 dBA
Operation: 40 dBA

N

0 4
Kilometres
GDA 1994 MGA Zone 55

Source: Black Range Minerals (2000); CleanTeQ (2017, 2019); Renzo Tonin (2021); NSW Department of Industry (2017); NSW Land & Property Information (2017)

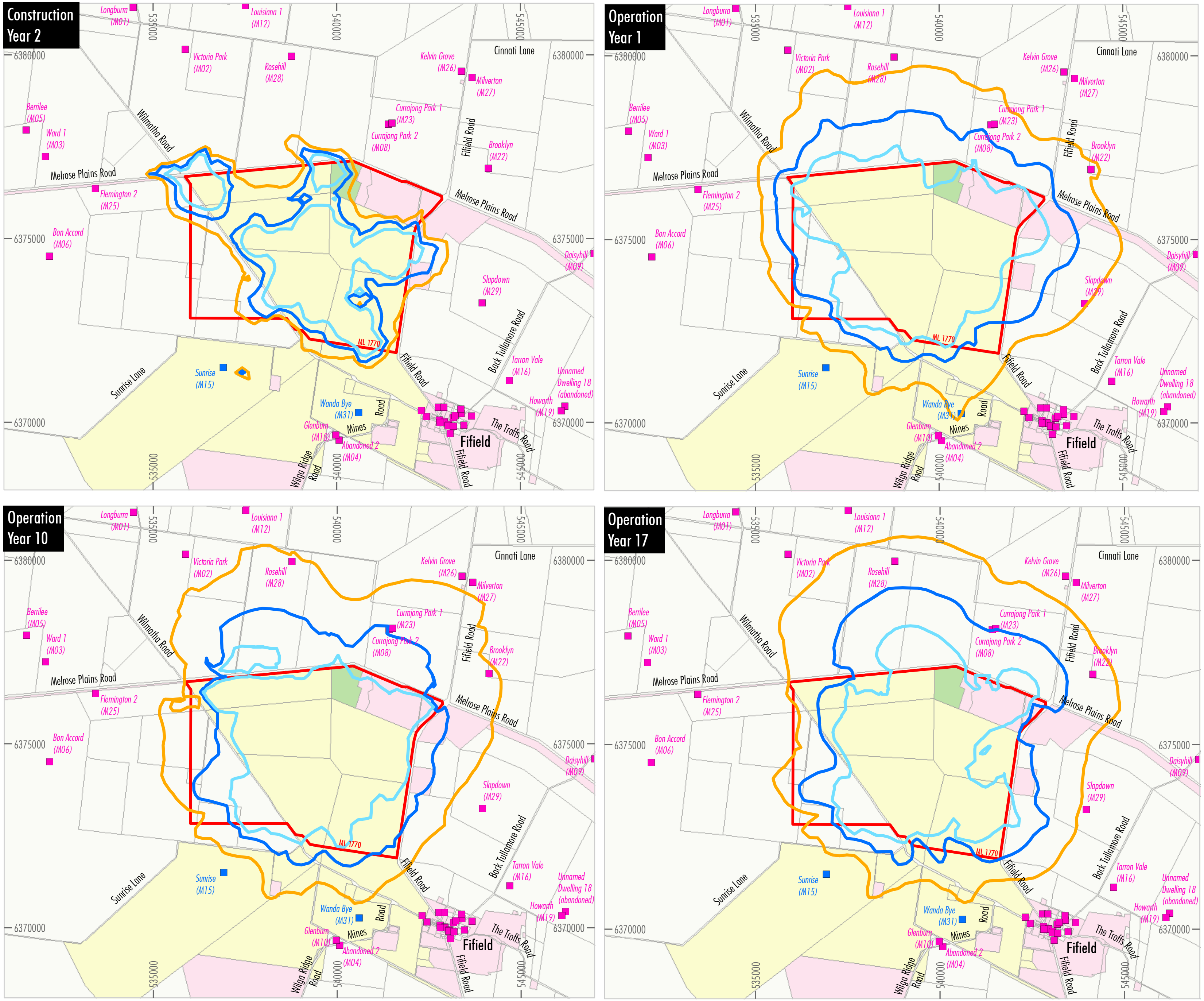
sunrise energy metals

SUNRISE PROJECT

Maximum Day Construction and Operation Noise Contours $L_{Aeq\,(15\,minute)}$ dBA – Mine and Processing Facility

Figure 19

CTL-20-08 MOD 7_MT_230A



LEGEND
- Mining Lease Boundary (ML)
- Sunrise Energy Metals Owned Land
- Crown Land
- Fifield State Forest
- Private Landholder
- Mine-owned Dwelling
- Private Dwelling
- 35 dBA Noise Contour*
- 40 dBA Noise Contour*
- 45 dBA Noise Contour*

*Note: * Contours shown are the maximum case for all modelled standard meteorological conditions and relevant noise enhancing winds (e.g. S, SW, SSW, WSW).*

Note: Fifield receiver labels are shown on Figure 16.

Criteria = 35 dBA

N

0 4
Kilometres
GDA 1994 MGA Zone 55

Source: Black Range Minerals (2000); Clean TeQ (2017, 2019); Renzo Tonin (2021); NSW Department of Industry (2017); NSW Land & Property Information (2017)

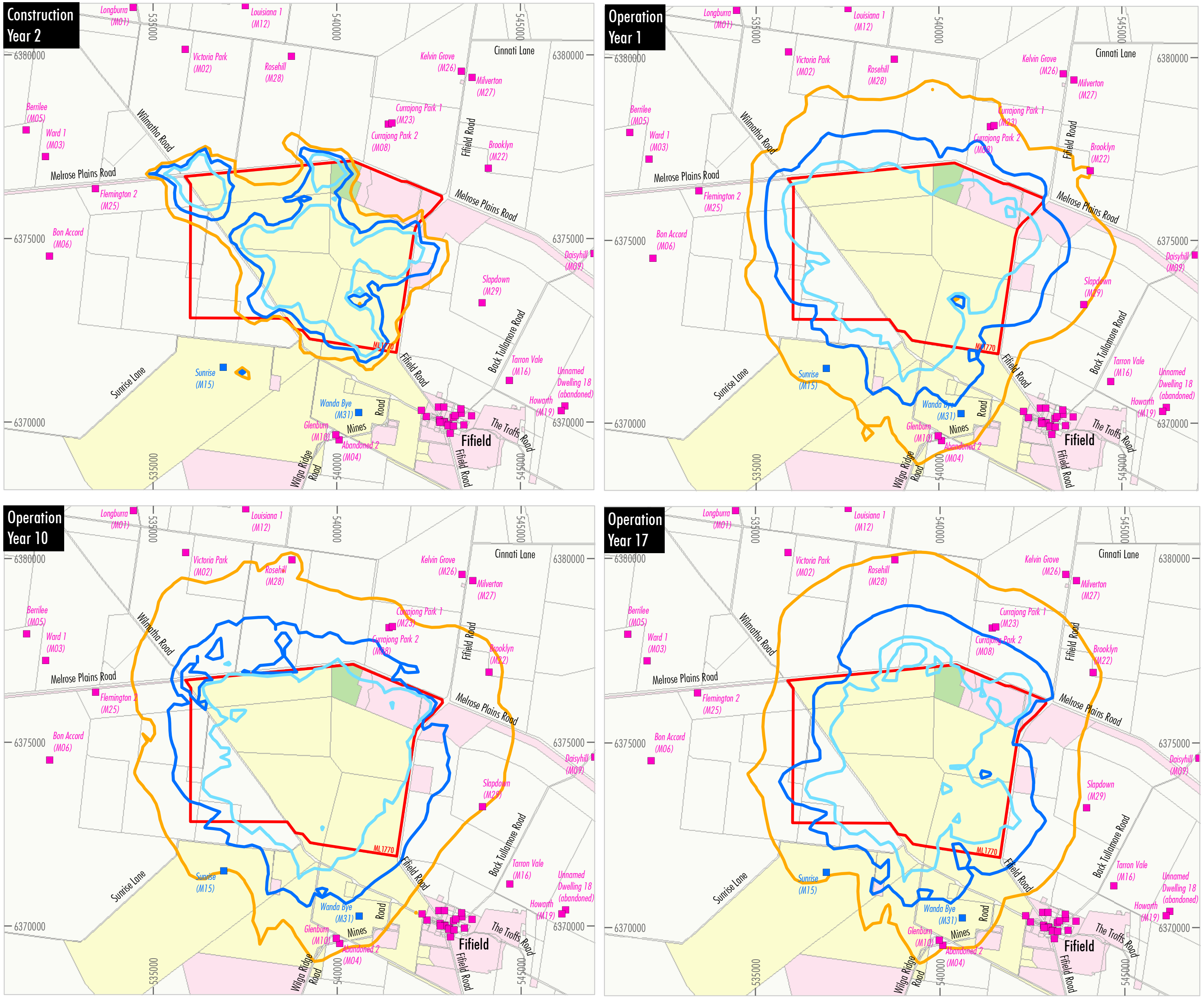
sunrise energy metals

S U N R I S E   P R O J E C T

Maximum Evening Construction and Operation Noise Contours $L_{Aeq\,(15\,minute)}$ dBA – Mine and Processing Facility

Figure 20

CTL-20-08 MOD 7_MT_231A



LEGEND

- Mining Lease Boundary (ML)
- Sunrise Energy Metals Owned Land
- Crown Land
- Fifield State Forest
- Private Landholder
- Mine-owned Dwelling
- Private Dwelling
- 35 dBA Noise Contour
- 40 dBA Noise Contour
- 45 dBA Noise Contour

Note: Fifield receiver labels are shown on Figure 16.

Criteria = 35 dB(A)

N

0 4

Kilometres

GDA 1994 MGA Zone 55

Source: Black Range Minerals (2000); CleanTeQ (2017, 2019); Renzo Tonin (2021); NSW Department of Industry (2017); NSW Land & Property Information (2017)

sunrise energy metals

SUNRISE PROJECT

Maximum Night Construction and Operation Noise Contours $L_{Aeq\,(15\,minute)}$ dBA – Mine and Processing Facility

Figure 21

CTL-20-08 MOD 7_MT_229A

The noise modelling completed for the Modification by Renzo Tonin (Appendix B) has adopted the more detailed approach, using site-specific meteorological data obtained from the on-site meteorological station (Figure 16) to determine the appropriate noise-enhancing meteorological conditions in accordance with Fact Sheet D of the NPfI. This approach provides a more accurate prediction of noise increases due to meteorological factors.

Based on the site-specific meteorological data, temperature inversions were found to be a feature of the site in the night time (Appendix B).

In addition, some noise-enhancing winds (south, south-southwest, south-west, west-southwest) were found to be a feature of the site during the evening and were, therefore, also modelled (Appendix B).

Further details on the analysis and meteorological conditions modelled are provided in Appendix B.

<u>Noise Modelling Scenarios</u>

Three scenarios of the modified mine and processing facility were assessed for potential noise impacts. These scenarios were selected to evaluate potential impacts at the nearest privately-owned receivers over the life of the modified Project (Appendix B):

- Year 1 – year of peak material movement and operation of maximum operational fleet.
- Year 10 – reduced operational fleet with the north-western waste emplacement at an indicative height of approximately 323 m AHD and the north-eastern waste emplacement at an indicative height of approximately 298 m AHD.
- Year 17 – reduced operational fleet with the north-western waste emplacement at a maximum height of approximately 330 m AHD and the north-eastern waste emplacement at a maximum height of approximately 315 m AHD.

<u>Assessment of Feasible and Reasonable Noise Mitigation Measures</u>

Renzo Tonin (Appendix B) conducted an assessment of feasible and reasonable noise mitigation measures for the mine and processing facility. This involved an iterative process.

The following iterative steps were undertaken to determine noise mitigation measures that were incorporated to reduce potential noise emissions from the mine and processing facility (Appendix B):

- Preliminary noise modelling of scenarios representative of the maximum noise emissions from the mine and processing facility to identify potential for noise exceedances.
- Evaluation of various combinations of noise management and mitigation measures to assess their relative effectiveness.
- Review of the effectiveness of these measures and assessment of their feasibility.
- Adoption of mitigation measures to minimise noise emissions associated with the mine and processing facility. As a result of the preliminary modelling, modifications to the mine and processing facility were undertaken in order to improve acoustic performance.

The preliminary noise modelling indicated that in the absence of additional noise mitigation measures, intrusive noise levels at privately-owned dwellings could, with adverse meteorological conditions, range up to 7 dBA above the Project Noise Trigger Levels.

Without additional noise mitigation measures, five privately-owned sensitive receivers (M08 [Currajong Park 2], M22 [Brooklyn], M23 [Currajong Park 1], M28 [Rosehill] and M29 [Slapdown]) were predicted to experience moderate or significant exceedances of the Project Noise Trigger Levels (i.e. greater than 3 dBA above the Project Noise Trigger Levels) and other privately owned sensitive receivers were predicted to experience negligible exceedances.

To provide a noise reduction of up to 2 dBA, the following additional mitigation measures during the evening would be required:

- Cease operations on the north-eastern waste emplacement and ceased operation of an excavator in the eastern open cut pit during predominant south-southwest, south-west and west-southwest wind conditions in the evening period in Year 10.
- Cease haulage on the north-western waste emplacement during predominant south wind conditions in the evening period in Year 10.
- Cease haulage on the north-eastern waste emplacement during south-southwest and south-west wind conditions in the evening period in Year 17.

Operational Noise Level Predictions

Table 16 presents a summary of predicted exceedances of noise criteria due to the operational noise from the mine and processing facility (incorporating the additional mitigation measures), based on maximum noise predictions for all time periods and meteorological conditions.

Indicative noise contours of modelled day, evening and night maximum noise predictions for Years 1, 10 and 17 are shown on Figures 19, 20 and 21, respectively.

In summary, the operational noise assessment indicated the following under adverse meteorological conditions (Appendix B):

- During the day, no exceedances of the Project Noise Trigger Levels at any privately-owned sensitive receiver are predicted.
- During the evening, exceedances of the Project Noise Trigger Levels of 0 to 2 dBA (i.e. negligible exceedance) are predicted at privately-owned sensitive receivers M22, M28 and M29 and exceedances of 3 to 5 dBA are predicted at privately-owned sensitive receivers M08 and M23, resulting in moderate exceedances.
- During the night-time period, exceedances of the Project Noise Trigger Levels of 0 to 2 dBA (i.e. negligible exceedance) are predicted at privately-owned sensitive receivers M04, M10, M22, M28 and M29, an exceedance of 3 to 5 dBA is predicted at privately-owned sensitive receivers M08 and M23, resulting in moderate exceedances.

The impact of a potential exceedance of 1 to 2 dBA above the Project Noise Trigger Level is negligible and not discernible by the average listener based on the characterisation of noise impacts outlined in Table 13.

Two privately-owned receivers (M08 and M23) are predicted to experience moderate exceedances (i.e. 3 to 5 dBA above the Project Noise Trigger Levels) in the night-time and evening periods. The exceedance is classified as moderate in accordance with the VLAMP as the predicted increase in noise levels associated with the Modification is greater than 1 dBA at these privately-owned sensitive receivers (Appendix B).

The amenity noise level of the modified Project would comply with the recommended amenity noise levels outlined in Table 2.2 of the NPfI (EPA, 2017a) at all privately-owned sensitive receivers with the exception of two privately-owned sensitive receivers (Currajong Park 1 and Currajong Park 2) (Appendix B).

Negotiated Agreements

Given the considerable operating costs associated with significantly modifying mining operations during adverse meteorological conditions (i.e. implementing the additional mitigation measures), SEM will seek to enter into negotiated agreements with the owners of the five privately-owned receivers that were predicted to experience moderate or significant exceedances based on the preliminary modelling (i.e. without the additional mitigation measures) in accordance with the VLAMP (NSW Government, 2018).

In accordance with Condition 7, Schedule 3 of Development Consent (DA 374-11-00), if negotiated agreements were to be put in place with the owners of the five privately-owned sensitive receivers, or these sensitive receivers were to become mine-owned, significant modifications to mining operations would not be considered reasonable, and modifications to mining operations would be less significant, with a noise reduction of less than 2 dBA (e.g. ceasing operation of a small number of noisy equipment such as drills, moving such equipment to more sheltered areas, or avoiding the use of intermittently operating auxiliary equipment).

However, if negotiated agreements with the owners of the five privately-owned sensitive receivers are not achieved, or are only achieved for a subset of the five privately-owned sensitive receivers, SEM would implement the additional mitigation measures as required to reduce noise levels by up to 2 dBA.

Sleep Disturbance

Renzo Tonin (Appendix B) conducted an assessment of potential sleep disturbance impacts. The maximum noise level criteria (L_{AFmax}) of 52 dBA have been adopted in accordance with the NPfI.

All privately-owned sensitive receivers are predicted to comply with the sleep disturbance criteria (Appendix B).

Table 16
Summary of Potential Operational Noise Exceedances at Privately-owned Receivers under Adverse Meteorological Conditions

Period	Noise Management Zone				Noise Affectation Zone
	Negligible	Marginal	Moderate		Significant
	0-2 dBA above Project Noise Trigger Level	3-5 dBA above Project Noise Trigger Level AND ≤ Amenity Noise Trigger Level	3-5 dBA above Project Noise Trigger Level AND > Amenity Noise Trigger Level	>5 dBA above Project Noise Trigger Level AND ≤ Amenity Noise Trigger Level	>5 dBA above Project Noise Trigger Level AND > Amenity Noise Trigger Level
Day	-	-	-	-	-
Evening	M22 (Brooklyn), M28 (Rosehill) and M29 (Slapdown)	-	M08 (Currajong Park 2) and M23 (Currajong Park 1)	-	-
Night	M04 (Abandoned 2), M10 (Glenburn), M22 (Brooklyn), M28 (Rosehill) and M29 (Slapdown)	-	M08 (Currajong Park 2) and M23 (Currajong Park 1)	-	-

Assessment of Privately-owned Land

No privately-owned sensitive receiver in the vicinity of the mine and processing facility is predicted to experience exceedances of the relevant VLAMP noise criteria on greater than 25% of land (Appendix B).

Rail Siding

Modelling Methodology

The same modelling methodology as the mine and processing facility was adopted for the rail siding.

The locations of all modelled sensitive receivers in the vicinity of the modified rail siding are provided in Appendix B and shown on Figure 18.

Assessment of Meteorological Conditions

The same meteorological conditions as the mine and processing facility (i.e. temperature inversions at night and noise enhancing winds during the evening, as well as standard conditions) have been adopted at the modified rail siding. The adoption of the mine and processing facility meteorological conditions is consistent with the NPfI (Appendix B).

Further details on the analysis and meteorological conditions modelled are provided in Appendix B.

Noise Modelling Scenario

An indicative scenario has been prepared to assess the potential noise impacts of the modified rail siding.

Operational Noise Level Predictions

Based on the indicative operational scenario of the modified rail siding, all privately-owned sensitive receivers would comply with the relevant noise criteria (Appendix B). Indicative noise contours for the modified rail siding are provided in Figure 22.

Sleep Disturbance

Renzo Tonin (Appendix B) conducted an assessment of potential sleep disturbance impacts. The maximum noise level criteria (L_{AFmax}) of 52 dBA have been adopted in accordance with the NPfI.

All privately-owned sensitive receivers are predicted to comply with the sleep disturbance criteria (Appendix B).

Assessment of Privately-owned Land

No privately-owned sensitive receiver in the vicinity of the modified rail siding is predicted to experience exceedances of the relevant VLAMP noise criteria on greater than 25% of land (Appendix B).

Comparison Against Development Consent Criteria

A comparison of the modified Project's operational noise levels and the Development Consent (DA 374-11-00) at the relevant sensitive receivers is provided in Appendix B.

LEGEND
Railway
Sunrise Energy Metals Owned Land
Crown Land
Private Landholder
Mine-owned Dwelling
Private Dwelling
35 dBA Noise Contour*
40 dBA Noise Contour*
45 dBA Noise Contour*

Modified Project

Modified Rail Siding Surface Development Area

*Note: * Contours shown are the maximum case for all modelled standard meteorological conditions and relevant noise enhancing winds (e.g. S, SW, SSW, WSW).*

Criteria:
Day = 40 dBA
Evening = 35 dBA
Night = 35 dBA

Source: Black Range Minerals (2000); NSW Spatial Services (2020); Clean Teq (2017, 2018, 2020); Renzo Tonin (2021).

N
0 1
Kilometres
GDA 1994 MGA Zone 55

sunrise energy metals

S U N R I S E   P R O J E C T

Maximum Operation Noise Contours $L_{Aeq\ (15\ minute)}$ dBA – Rail Siding

Figure 22

CTL-20-08 MOD 7_MT_232A

Cumulative Impacts

The potential cumulative noise impacts of the modified Project with “relevant” projects as defined in the draft *Assessing Cumulative Impacts Guide Guidance for State Significant Projects* (DPIE, 2020b) (Section 2.3) were considered by Renzo Tonin (Appendix B).

Renzo Tonin concluded that none of the “relevant” projects would potentially interact with, or have potential cumulative noise impacts with, the modified Project given the distance between the modified Project and the other “relevant” projects (Appendix B).

6.3.3 Mitigation Measures, Management and Monitoring

Noise mitigation and management measures for the Project are described in the Noise Management Plan (Clean TeQ, 2020c) and would continue to be implemented for the modified Project. This plan would be reviewed and updated, where necessary, to incorporate the Modification.

In addition to the existing management measures outlined in the Noise Management Plan (Clean TeQ, 2020c), the following additional feasible mitigation measures were identified and would be undertaken for the modified Project:

- Cease operations on the north-eastern waste emplacement and ceased operation of an excavator in the eastern pit during predominant south-southwest, south-west and west-southwest wind conditions in the evening period in Year 10.
- Cease haulage on the north-western waste emplacement during predominant south wind conditions in the evening period in Year 10.
- Cease haulage on the north-eastern waste emplacement during south-southwest and south-west wind conditions in the evening period in Year 17.

In addition, the potential treatment for the two privately-owned sensitive receivers predicted to experience ”moderate” exceedances would include mechanical ventilation/comfort condition systems to enable windows to be closed without compromising internal air quality/amenity and also upgraded façade elements such as windows, doors or roof insulation, to further increase the ability of the building façade to noise levels, if requested by the landholder.

6.4 SURFACE WATER

The potential surface water impacts associated with the Modification would be related to the modified mine and processing facility, accommodation camp, and rail siding (Section 6.1).

A Surface Water Assessment has been undertaken for the Modification by HEC and is provided as Appendix C.

6.4.1 Background

Mine and Processing Facility and Accommodation Camp

Hydrological Setting

The mine and processing facility and accommodation camp are located in the upper headwaters of Bullock Creek, a tributary of the Bogan River, within the Macquarie-Bogan catchment (Figure 23). The mine and processing facility is approximately 55 km to the south-south-west of the Bogan River. The Bogan River travels in a north-north-westerly direction towards Bourke and ultimately discharges to the Darling River (Appendix C).

Three drainage lines traverse the mine and processing facility generally in a north-easterly direction (Figure 23).

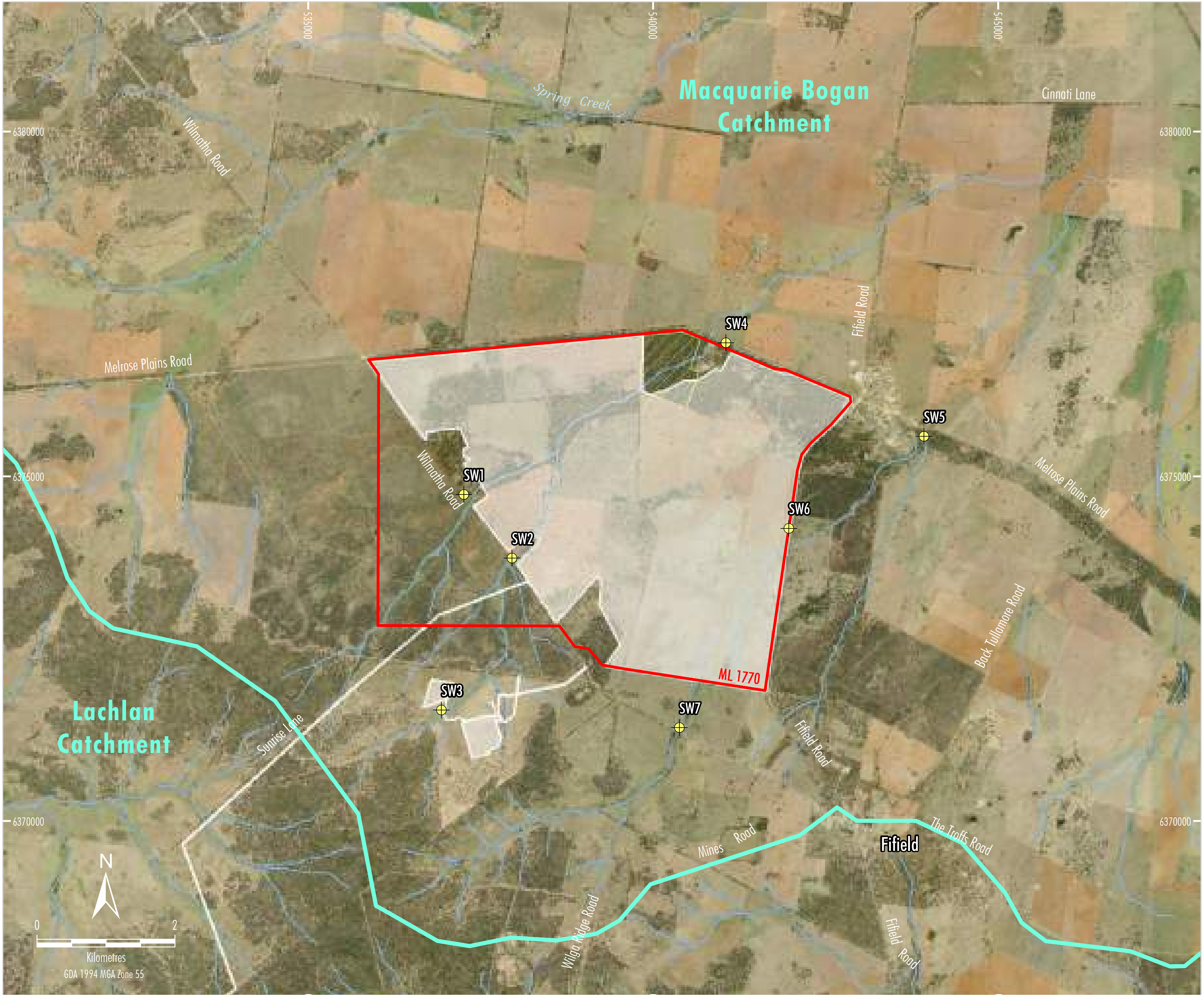
The two northernmost drainage lines converge approximately 1.5 km downstream of where they cross Wilmatha Road (Figure 23), forming the ‘northern drainage line’.

The southernmost drainage line enters the mine and processing facility on its southern edge, approximately 750 m downstream of Wilmatha Road (Figure 23).

The accommodation camp area drains into the southern leg of the northern drainage line that enters the mine and processing facility (Figure 23).

The drainage lines that traverse the mine and processing facility and accommodation camp are shallow broad vegetated ephemeral channels which flow north-east towards Bullock Creek (Appendix C).

The northern and southern drainage lines have a catchment area of approximately 2,700 ha and 1,950 ha respectively, and lose definition approximately 5 km downstream from ML 1770 (Appendix C). The drainage lines in the vicinity of the mine and processing facility are not suitable for flow monitoring. In addition, there are no gauging stations maintained on Bullock Creek (Appendix C).



LEGEND
State Forest
Mining Lease Boundary (ML)
Surface Development Area
Surface Water Quality Monitoring Location
Drainage Feature
Surface Water Catchment Boundary

Source: Black Range Minerals (2000); Clean TeQ (2017, 2018, 2020); NSW Spatial Services (2020)

sunrise energy metals

S U N R I S E P R O J E C T

Local Hydrology and Surface Water Quality Monitoring Sites - Mine and Processing Facility

Figure 23

CTL-20-08 MOD 7_MT_222A

Surface Water Quality

Surface water quality monitoring is undertaken in the vicinity of the mine and processing facility and accommodation camp in accordance with the approved Surface Water Management Plan (Clean TeQ, 2019e). Due to the ephemeral nature of the drainage lines, surface water sampling is undertaken only following rainfall events (and when water is flowing) for the following parameters: pH; electrical conductivity (EC); suspended solids; anions; cations; and select total and dissolved metals.

Baseline surface water quality monitoring has been undertaken at sites SW1 to SW7 (Figure 23) in the vicinity of the mine and processing facility since October 2018.

A detailed summary of the monitoring results from sites SW1 to SW7 is provided in Appendix C.

Surface Water Users

Given the ephemeral nature of the drainage lines in the vicinity of the mine and processing facility and accommodation camp, there are no known surface water users immediately upstream or downstream with an access licence (Appendix C).

Surface water runoff is collected in water storages by land users surrounding the mine and processing facility under their harvestable right entitlement under the *Water Management Act 2000*.

Flooding

The local group of west and north-west flowing rivers (Bogan, Macquarie, Castlereagh, Namoi and Barwon Rivers) drain an extensive floodplain north of the mine and processing facility at low gradients (less than 1 in 5,000) historically producing large areas of inundation in wet years. The mine and processing facility is located some 30 m to 70 m above the estimated upper extent of this floodplain (Golder Associates [Golder], 2000b).

Flood events in the vicinity of the mine and processing facility and accommodation camp are relatively minor and short in duration as the mine and processing facility and accommodation camp are located in the headwaters of the catchment (Clean TeQ, 2019e).

Surface Water Licensing

The mine and processing facility and accommodation camp are located within the mapped extent of the Upper Bogan River Water Source under the *Water Sharing Plan for the Macquarie Bogan Unregulated Rivers Water Sources 2012*.

SEM does not currently hold any WALs under the *Water Sharing Plan for the Macquarie Bogan Unregulated Rivers Water Sources 2012*.

Rail Siding

Hydrological Setting

The modified rail siding would be located in the catchment of the Yarrabandai Creek. Yarrabandai Creek travels south-west through the township of Trundle and connects with the Bumbuggan Creek, a tributary of the Lachlan River, approximately 40 km directly south-west of Trundle (Appendix C).

The modified rail siding site is not traversed by any drainage lines. The closest drainage line is located approximately 220 m south-east of the modified rail siding (Figure 12) (Appendix C).

Surface Water Users

Given the ephemeral nature of the drainage lines in the vicinity of the modified rail siding, there are no known surface water users immediately upstream or downstream with an access licence.

Surface water flows are collected in dams by surrounding land users under their harvestable rights under the *Water Management Act 2000*.

Flooding

The modified rail siding is located approximately 220 m north-west of the closest defined drainage line, and approximately 5.5 km from Yarrabandai Creek. Given their ephemeral nature, flood events in the vicinity of the modified rail siding are expected to be relatively minor and short in duration.

Surface Water Licensing

The modified rail siding is located within the mapped extent of the Gunningbland and Yarrabandai Water Source under the *Water Sharing Plan for the Lachlan Unregulated River Water Sources 2012.*

SEM does not currently hold any WALs under the *Water Sharing Plan for the Lachlan Unregulated River Water Sources 2012*.

SEM may however rely on its "harvestable right" entitlement for the water storages at the modified rail siding under the *Water Management Act 2000*.

Water Management

Water management at the Project is approved to be conducted in accordance with the water management performance measures outlined in Condition 29, Schedule 3 of Development Consent (DA 374-11-00).

A Surface Water Management Plan (Clean TeQ, 2019e) has been developed for the Project in accordance with Condition 30(b), Schedule 3 of Development Consent (DA 374-11-00) and includes:

- water management performance measures and performance indicators, including trigger levels;
- a description of the Project water management system;
- a surface water monitoring program; and
- a contingency plan to manage any unpredicted impacts and their consequences

HEC (2019) developed a water balance model (using the GoldSim® simulation package) for the Project, which is summarised in the approved Water Balance (Clean TeQ, 2019f) prepared in accordance with Condition 30(a), Schedule 3 of Development Consent (DA 374-11-00). This water balance model has been updated to incorporate the Modification (Section 6.4.2 and Appendix C).

A detailed description of the approved water management system is provided Appendix C.

Project Water Supply – Surface Water

The Project water supply includes surface water extraction from the Lachlan River (Section 3.2.6).

SEM currently holds the following WALs for the surface water extraction infrastructure (Section 4.3):

- WAL 6679 in the Lachlan Regulated River Water Source, for 123 share components (General Security) under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*.
- WAL 1798 in the Lachlan Regulated River Water Source, for 300 share components (General Security) under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*.
- WAL 42370 in the Lachlan Regulated River Water Source, for 0 share components (High Security) under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*.

6.4.2 Impact Assessment Review

The key potential surface water impacts associated with the Modification would be (Appendix C):

- potential impacts on surface water catchments and drainage associated with the modified mine and processing facility (including the expanded treated wastewater irrigation area), and the modified rail siding;
- potential impacts on downstream surface water associated with the modified mine and processing facility water management system, expanded treated wastewater irrigation area, and the modified rail siding, including potential impacts to downstream water quality; and
- surface water licencing requirements for the modified mine and processing facility and modified rail siding.

Water Management System

The water management systems for the modified mine and processing facility and rail siding are described in Sections 3.2.6 and 3.3.6, and have been designed to comply with the water management performance measures outlined in Condition 29, Schedule 3 of Development Consent (DA 374-11-00).

A detailed description of the operation of the modified water management system is provided in Appendix C.

Simulated Performance of the Modified Project Water Management System

HEC (2021) has revised the existing Project water balance model (based on the GoldSim® simulation package) to predict changes in the water balance over the mine life and assesses variation in the water balance associated with the Modification (Appendix C).

The water balance modelling demonstrates that the modified site water management system has sufficient capacity and flexibility to accommodate a wide range of climate scenarios (Appendix C).

No overflows were predicted from the tailings storage facility, decant transfer pond, evaporation pond, mine water dams or processing plant runoff dams over the Project life (Appendix C).

Although the Modification would not change the approved final voids, HEC (2021) has simulated the long-term behaviour of the final voids. The simulated water level in the eastern and western final void reaches a maximum of approximately 258 m AHD and 263.5 m AHD, respectively. This is approximately 16.0 m and 14.5 m below the spill level (i.e. the final void waterbodies would be contained under all climate scenarios) (Appendix C).

Surface Water Flow Regime

As the Modification would not increase the extent of the approved surface development area at the mine and processing facility and accommodation camp, no significant change to the approved flow impacts in the drainage lines in the vicinity of the mine and processing facility and accommodation camp would be expected (Appendix C).

The modified mine and processing facility and accommodation camp would not result in a significant reduction in the total catchment area of Bullock Creek (up to approximately 3.3% at Tullamore) which is not considered significant given the discontinued nature of watercourses within the catchment (Appendix C).

The catchment area of the Bogan River would not be significantly reduced due to the mine and processing facility and accommodation camp (approximately up to 0.3% at Dandaloo) and the change to flows in the Bogan River would be indiscernible (Appendix C).

Post-closure, the modified mine and processing facility and accommodation camp is estimated to result in a 1.2% and 0.1% reduction in catchment area of Bullock Creek (at Tullamore) and the Bogan River (at Dandaloo), respectively.

The catchment area of the drainage line to the south-east of the modified rail siding would reduce by approximately 0.1% (at the modified rail siding) and therefore there would be a very small and indiscernible impact to flow in the drainage line (Appendix C).

Surface Water Quality

The Modification would not change the approved water management performance measures or objectives of the water management system (i.e. control runoff from construction and operational areas, while diverting up-catchment water around these areas, and to minimise the use of clean water on-site) (Section 3.2.6). Furthermore, no overflows were predicted from the tailings storage facility, decant transfer pond, evaporation pond, mine water dams or processing plant runoff dams over the Project life or from the final voids (Appendix C).

Based on the above, HEC (2021) concluded there would be a low risk of adverse water quality impacts in the vicinity of the mine and processing facility as a result of the Modification.

As the expanded treated wastewater irrigation area at the accommodation camp would be designed, operated and maintained in accordance with *Environmental Guidelines: Use of Effluent by Irrigation* (DEC, 2004), it is expected that there would be a low risk of adverse water quality impacts associated with the modified treated wastewater irrigation area (Appendix C).

There would be a low risk of adverse water quality impacts in the vicinity of the rail siding as a result of the Modification (Appendix C).

Flooding Impacts

No significant changes to the approved potential localised flooding impacts at the mine and processing facility and accommodation camp are expected as a result of the Modification as the approved water management performance measures would be unchanged (Appendix C).

The mine and processing facility and accommodation camp are unlikely to be affected by regional flooding impacts as they are located approximately 7.5 km from Bullock Creek (Appendix C).

The Modification is not expected to result in significant flooding impacts at the rail siding (Appendix C).

Lachlan River Surface Water Extraction

The Modification would not significantly change the predicted average and maximum annual off-site water requirements for the Project (Appendix C).

SEM currently holds groundwater and surface water entitlements greater than the predicted average annual off-site water demand during the operations phase based on the results of the water balance (Appendix C).

Consistent with the approved Project, additional surface water entitlements would be required for the predicted maximum operational phase annual off-site water demand of the modified Project (Appendix C).

SEM currently holds WAL 42370 in the Lachlan Regulated River Water Source, for 0 share components (High Security) under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*. SEM will use WAL 42370 for trading of water on the open market under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016* to obtain additional water entitlements (if required).

Cumulative Impacts

The potential cumulative surface water impacts of the modified Project with "relevant" projects as defined in the draft *Assessing Cumulative Impacts Guide Guidance for State Significant Projects* (DPIE, 2020b) (Section 2.3) were considered by HEC (Appendix C).

HEC concluded that none of the "relevant" projects would potentially interact with, or have potential cumulative surface water impacts with, the modified Project given the distance between the modified Project and the other "relevant" projects (Appendix C).

6.4.3 Mitigation Measures, Management and Monitoring

SEM has reviewed the water management performance measures included in Condition 29, Schedule 3 of Development Consent (DA 374-11-00) in the context of the Modification and concluded that no changes are required for the modified Project.

The approved Surface Water Management Plan, and Water Balance (Clean TeQ, 2019e; 2019f) would be reviewed, and updated where necessary, to include the Modification (subject to any modified Development Consent conditions).

Consistent with Condition 26, Schedule 3 of Development Consent (DA 374-11-00), SEM would obtain sufficient water entitlements for the modified Project, and if necessary, adjust the scale of the modified Project to match its available water supply.

6.5 GROUNDWATER

The potential groundwater impacts associated with the Modification would be related to the modified construction and operational activities at the mine and processing facility (Section 6.1).

6.5.1 Background

Local Geology

Previous hydrogeological investigations for the Project have encountered the following geological formations within the mine and processing facility and immediate surrounds (Golder, 2017):

- Laterite;
- Ultrabasic intrusive rocks (pyroxenite, gabbro, diorite); and
- residual soils/alluvial (including unsaturated palaeochannel deposits).

Residual soil/alluvial covers up to 2 m of low-lying areas of the mine and processing facility site. An unsaturated palaeochannel exists through the mine and processing facility in a north-easterly direction. The palaeochannel is up to 1,500 m wide and 35 m deep and comprises silts, clays, gravels, quartz and rock fragments (Golder, 2017).

The residual soil/alluvium is generally underlain by highly and slightly weathered ultrabasic intrusive rocks including pyroxenite, gabbro and diorite. The average thickness of the highly and slightly weathered rock stratum are reported as 11 m and 13 m, respectively (Golder, 2017).

The mine and processing facility site is formed predominantly of an oblate Dunite core intrusion approximately 2 km north-south by 3 km east-west which is surrounded by ultramafic and mafic rocks (gabbro, diorite and olivine pyroxenite) and Laterite. The deposit targeted for mining contains resource grade nickel and cobalt mineralisation within the Laterite profile overlying the Dunite core intrusion (Golder, 2017).

The Girilambone Group forms the basement rock beneath the three geological formations. The bedrock is mostly dominated by fine quartz sandstone, siltstones and shale, mostly metamorphosed to quartzite, phyllite and schist (Golder, 2017).

The occurrence of groundwater within the bedrock (slightly weathered and fresh rock) is expected to be limited to secondary permeability such as joints, fault/shear zones or other geological discontinuities in the rock mass (Coffey, 2018).

Groundwater Levels

A number of groundwater monitoring sites have been established at the mine and processing facility and surrounds and are shown on Figure 24. Generally, groundwater levels are 30 m to 60 m below ground level and follow the surface topography, being highest in the western area of the mine and processing facility (Golder, 2017).

Groundwater enters the mine and processing facility from the west and flows either south-east towards the paleochannel or north-east following the lowering topography. A groundwater divide is interpreted to exist beneath the topographical ridge in the (centre) eastern area of the site (Golder, 2017).

Groundwater Yield

Groundwater at the mine and processing facility and surrounds is typically low yielding as indicated by hydraulic testing. The hydraulic conductivities are generally very low and the potential yield of the fractured rock aquifer is expected to be low (in the order of 0.1 litres per second or less) (Golder, 2017).

Groundwater Use

A bore census was undertaken in the vicinity of the mine and processing facility by Environment & Natural Resource Solutions (2019) which found the groundwater use at the mine and processing facility and surrounds is limited. The locations of bores inspected during the bore census are included on Figure 24.

The closest privately-owned bore (GW057335) is located approximately 1.8 km to the west of ML 1770 (Figure 24).

Groundwater Quality

Based on the groundwater quality monitoring between June 2018 and September 2020, groundwater salinity across the mine site and surrounds varies from fresh (170 mg/L total dissolved solids [TDS]) to saline (10,300 mg/L TDS). Fresh groundwater has been encountered in the north-west area of the site (GAM 1), brackish in and near the palaeochannel, and saline in the south-east area of the site (GAM 11) (Figure 24) (Ground Doctor, 2020a, 2020b). These results are similar to groundwater quality monitoring reported in Coffey (2018) and Golder (2000b).

The groundwater is generally neutral to slightly alkaline and the metal concentrations are generally below the Australian and New Zealand Environment and Conservation Council & Agriculture and Resource Management Council of Australia and New Zealand (2000) livestock trigger values. Where available, metals concentrations show similar values between 1999, 2018, and 2020 (Coffey, 2018; Ground Doctor, 2020a, 2020b).

Groundwater Dependent Ecosystems

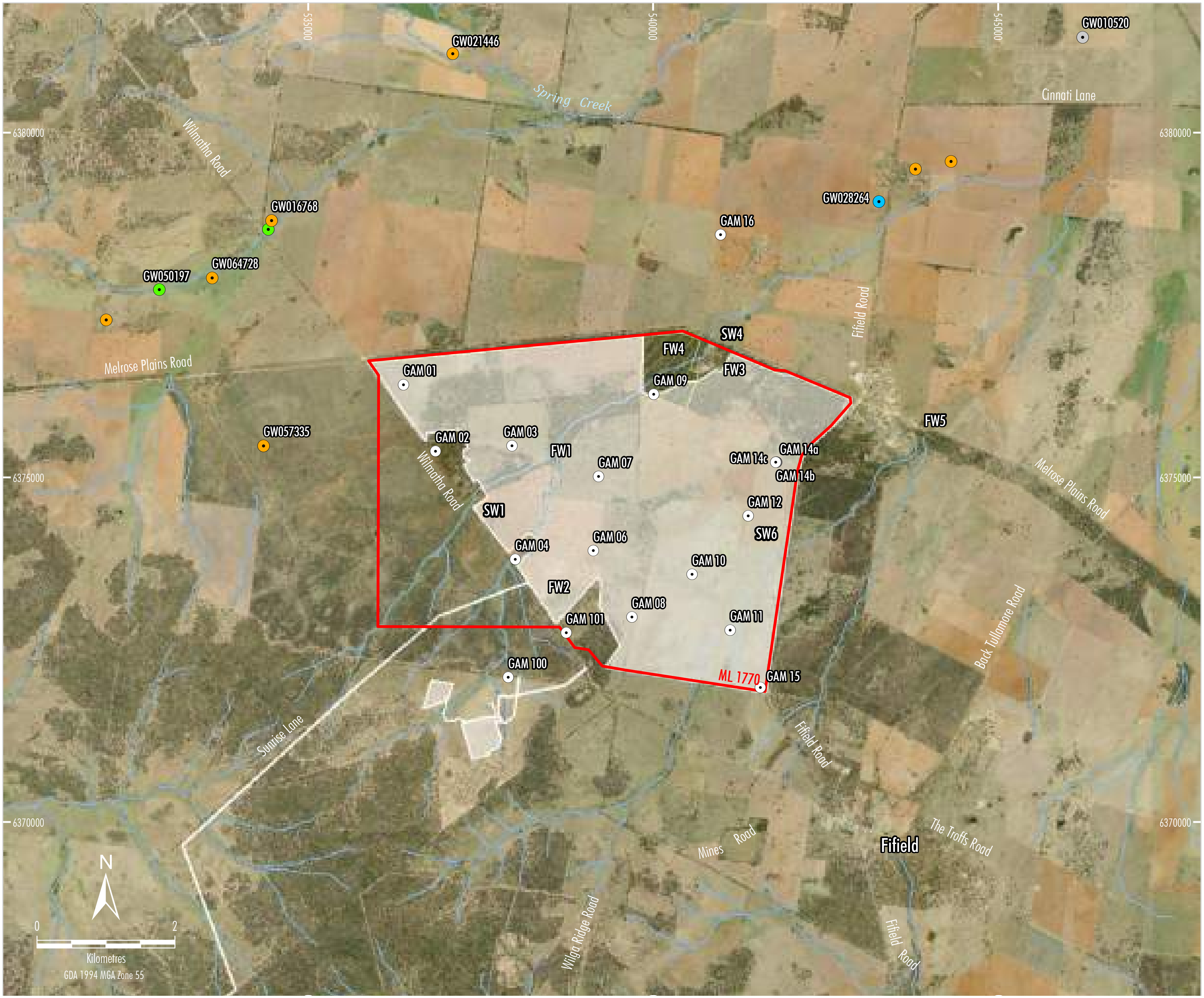
The Groundwater Dependent Ecosystems Atlas (Bureau of Meteorology, 2015) identifies no aquatic groundwater dependent ecosystems at the mine and processing facility and a low potential for terrestrial groundwater dependent ecosystems in the vicinity of the mine and processing facility (Golder, 2017).

Previous Assessments

A number of groundwater studies have been conducted for the Project to date (Golder 2000a, 2000b and 2017; Coffey, 2018).

The key potential groundwater impacts at the mine and processing facility will be associated with the excavation of the open cut pits and potential seepage from the tailings storage facility. A summary of the predicted potential groundwater impacts is provided below:

- **Groundwater Drawdown** – the excavation of the open cut pits has the potential to intercept groundwater in the deepest area of the open cut pits resulting in a predicted maximum 1 m drawdown extent within ML 1770 (Golder, 2017).
- **Groundwater Inflows** – the excavation of the open cut pits has the potential to intercept groundwater in the deepest area of the open cut pits resulting in predicted groundwater inflows of up to approximately 0.0023 L/s reducing to be generally less than 0.002 L/s post-mining (Golder, 2017).
- **Seepage** – seepage from the tailings storage facility is not anticipated to migrate significantly beyond the tailings storage facility footprint during the Project life and thereafter the open cuts would act as a sink that would collect seepage from the tailings storage facility in the longer term (Coffey, 2018).



Source: Black Range Minerals (2000); Clean TeQ (2017, 2018, 2020); NSW Spatial Services (2020)

S U N R I S E   P R O J E C T

Groundwater Monitoring Network and Groundwater Users - Mine and Processing Facility

Figure 24

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- **Groundwater Users** – given that no significant groundwater drawdown or seepage impacts are predicted, and the closest privately-owned bore (GW057335) is located approximately 1.8 km to the west of ML 1770 (Figure 24), no significant impacts are predicted to groundwater users (Golder, 2017 and Coffey, 2018).
- **Groundwater Dependent Ecosystems** – the mine and processing facility is unlikely to impact terrestrial groundwater dependent ecosystems (Coffey, 2018).
- **Aquifer Interference Policy** – the mine and processing facility will meet the relevant minimal impact considerations outlined in the AIP (NSW Government, 2012) (Golder, 2017 and Coffey, 2018).

Groundwater Management Plan

In accordance with Condition 30(c), Schedule 3 of Development Consent (DA 374-11-00), a Groundwater Management Plan (Clean TeQ, 2019g) has been developed for the Project and includes:

- performance measures and performance indicators, including trigger levels;
- a description of groundwater management measures;
- a contingency plan to manage any unpredicted impacts and their consequences; and
- a groundwater monitoring program.

Groundwater Licensing

Groundwater extracted by mine dewatering (in-pit and advance) from the open cut pit (and immediate surrounds) is located in the Lachlan Fold Belt MDB Groundwater Source administered by the *Water Sharing Plan for the NSW Murray-Darling Basin Fractured Rock Groundwater Sources 2020* under the *Water Management Act 2000*.

SEM currently holds 243 share components (currently equivalent to 243 ML/year) in the corresponding Lachlan Fold Belt MDB Groundwater Source.

6.5.2 Impact Assessment Review

The potential groundwater impacts associated with the Modification would be associated with the revised mining sequence (Section 3.2.3) and revised tailings storage facility cell construction sequence and the addition of a decant transfer pond (Section 3.2.5).

Potential impacts associated with these proposed changes are discussed in more detail below.

Groundwater Drawdown and Inflows

The revised mining sequence would not significantly change the predicted drawdown and groundwater inflows as the approved final open cut design and extents (including depth) would remain unchanged (Section 3.2.3).

The predicted maximum 1 m drawdown extent would therefore remain within ML 1770 and the predicted groundwater inflows would remain less than 1 ML/year for the modified mine and processing facility.

Seepage

The modified tailings storage facility cell construction sequence would not significantly change the potential seepage impacts as the approved tailings storage facility design and the seepage management requirements outlined in Condition 29, Schedule 3 of Development Consent (DA 374-11-00) would remain unchanged (Section 3.2.5).

Potential seepage impacts of the decant transfer pond would be minor as the water level (head) would not be significant (approximately 1 m) and the floor and side walls of the decant transfer pond would be constructed with a minimum of:

- a 900 mm clay liner with a permeability of no more than 1×10^{-9} m/s; or
- a synthetic (plastic) liner of 1.5 mm minimum thickness with a permeability of no more than 1×10^{-14} m/s (or equivalent).

In addition, the decant transfer pond would be decommissioned at the end of the Project (Section 3.2.10), and therefore there would be no long-term potential seepage impacts associated with the decant transfer pond.

Given the above, seepage from the modified tailings storage facility is not anticipated to migrate significantly beyond the tailings storage facility footprint during the modified Project life and thereafter the open cuts would act as a sink that would collect seepage from the tailings storage facility in the longer term.

Groundwater Users

The Modification is not expected to have significant impacts on groundwater users as the predicted groundwater drawdown or seepage impacts are not expected to significantly change.

Groundwater Dependent Ecosystems

The Modification is not expected to have significant impacts on groundwater dependent ecosystems as the predicted groundwater drawdown or seepage impacts are not expected to significantly change.

Consideration of the Aquifer Interference Policy

The AIP (NSW Government, 2012) applies State-wide and details water licence and impact assessment requirements. The stated purpose of the AIP (NSW Government, 2012) is to ensure equitable water sharing between various water users and proper licensing of water taken by aquifer interference activities, such that the take is accounted for in the water budget and water sharing arrangements.

As described in Section 6.5.1, the approved mine and processing facility meets the relevant minimal impact considerations outlined in the AIP (NSW Government, 2012) (Golder, 2017 and Coffey, 2018).

Water Source

The AIP (NSW Government, 2012) requires all water taken by aquifer interference activities to be accounted for within the extraction limits set by the relevant Water Sharing Plan. The Water Sharing Plan relevant to the mine and processing facility is the *Water Sharing Plan for the NSW Murray-Darling Basin Fractured Rock Groundwater Sources 2020*.

Modelling of Potential Impacts

The potential groundwater impacts of the Modification have been reviewed above, which included a review of the existing groundwater model for the mine and processing facility (Coffey, 2018).

Licensing Requirements

SEM currently holds 243 share components (currently equivalent to 243 ML/year) in the Lachlan Fold Belt MDB Groundwater Source administered by the *Water Sharing Plan for the NSW Murray-Darling Basin Fractured Rock Groundwater Sources 2020*.

The Modification would not change the predicted groundwater inflows during the Project life and post-mining (i.e. less than 1 ML/year) and, therefore, the existing volumetric licence allocations held by SEM are considered to be adequate.

Minimal Impact Considerations

Department of Primary Industries – Water mapping of highly productive groundwater indicates that no highly productive groundwater is present at the mine and processing facility. The fractured rock aquifers associated with the mine site are considered to be less productive as testing of groundwater and monitoring bores indicate the yield is less than 5 L/s (Coffey, 2018).

Therefore, the following AIP (NSW Government, 2012) minimal impact considerations apply for groundwater quality at the mine site:

1. *Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40 m from the activity.*
2. *If condition 1 is not met then appropriate studies will need to demonstrate to the Minister's satisfaction that the change in groundwater quality will not prevent the long-term viability of the dependent ecosystem, significant site or affected water supply works.*

As the Modification would not significantly change the approved groundwater drawdown and seepage impacts, the modified mine and processing facility would not lower the beneficial use category of the groundwater source beyond 40 m of the activity, and therefore the modified mine and processing facility meet the relevant minimal impact considerations outlined in the AIP (NSW Government, 2012).

Cumulative Impacts

No potential cumulative groundwater impacts with "relevant" projects as defined in the draft *Assessing Cumulative Impacts Guide Guidance for State Significant Projects* (DPIE, 2020b) (Section 2.3) are expected given the distance between the mine and processing facility and the other "relevant" projects.

6.5.3 Mitigation Measures, Management and Monitoring

The approved Groundwater Management Plan (Clean TeQ, 2019g) would be updated to include the Modification (subject to any modified Development Consent conditions).

In addition, SEM would maintain relevant water licences under the *Water Management Act 2000* for the modified Project in accordance with Condition 26, Schedule 3 of Development Consent (DA 374-11-00).

6.6 ROAD TRANSPORT

The potential road transport impacts associated with the Modification would be related to modified construction phase and operational phase road transport activities.

A Road Transport Assessment for the Modification was undertaken by The Transport Planning Partnership (TTPP) and is presented as Appendix D.

The assessment was prepared generally in accordance with the *Guide to Traffic Generating Developments* (NSW Roads and Traffic Authority [RTA], 2002) and relevant Austroads guides and TfNSW supplements to the Austroads guides.

6.6.1 Background

Relevant Roads

The following key roads are of relevance to the Project (Figure 25):

- Henry Parkes Way – extends between Orange and Condobolin through Parkes.
- The Bogan Way – extends generally north from Forbes to Tullamore. The Bogan Way joins the Henry Parkes Way between Gunningbland to Bogan Gate.
- Fifield Road – extends generally north-east between Henry Parkes Way east of Condobolin to Tullamore.
- The McGrane Way – extends north-east from north of Tullamore to Narromine. The McGrane Way intersects The Bogan Way near Tullamore.
- Fifield-Trundle Road/Platina Road – provides an east-west link between The Bogan Way near Trundle to Fifield Road south of Fifield.
- Wilmatha Road – extends north-west from Fifield and past the mine and processing facility.
- Sunrise Lane – provides access to the accommodation camp access road and rural properties to the west of Wilmatha Road.
- Scotson Lane – links The Bogan Way near Fifield-Trundle Road and Numulla Road and provides access to the rail siding.
- Middle Trundle Road – links Henry Parkes Way approximately halfway between Parkes and Bogan Gate to The Bogan Way south of Trundle.

Existing Traffic Volumes

Traffic survey data in the Project area are summarised in Table 17 and traffic survey locations shown on Figure 25.

Traffic volumes are generally low and the proportion of heavy vehicles varies from low (7%) to relatively high (51%).

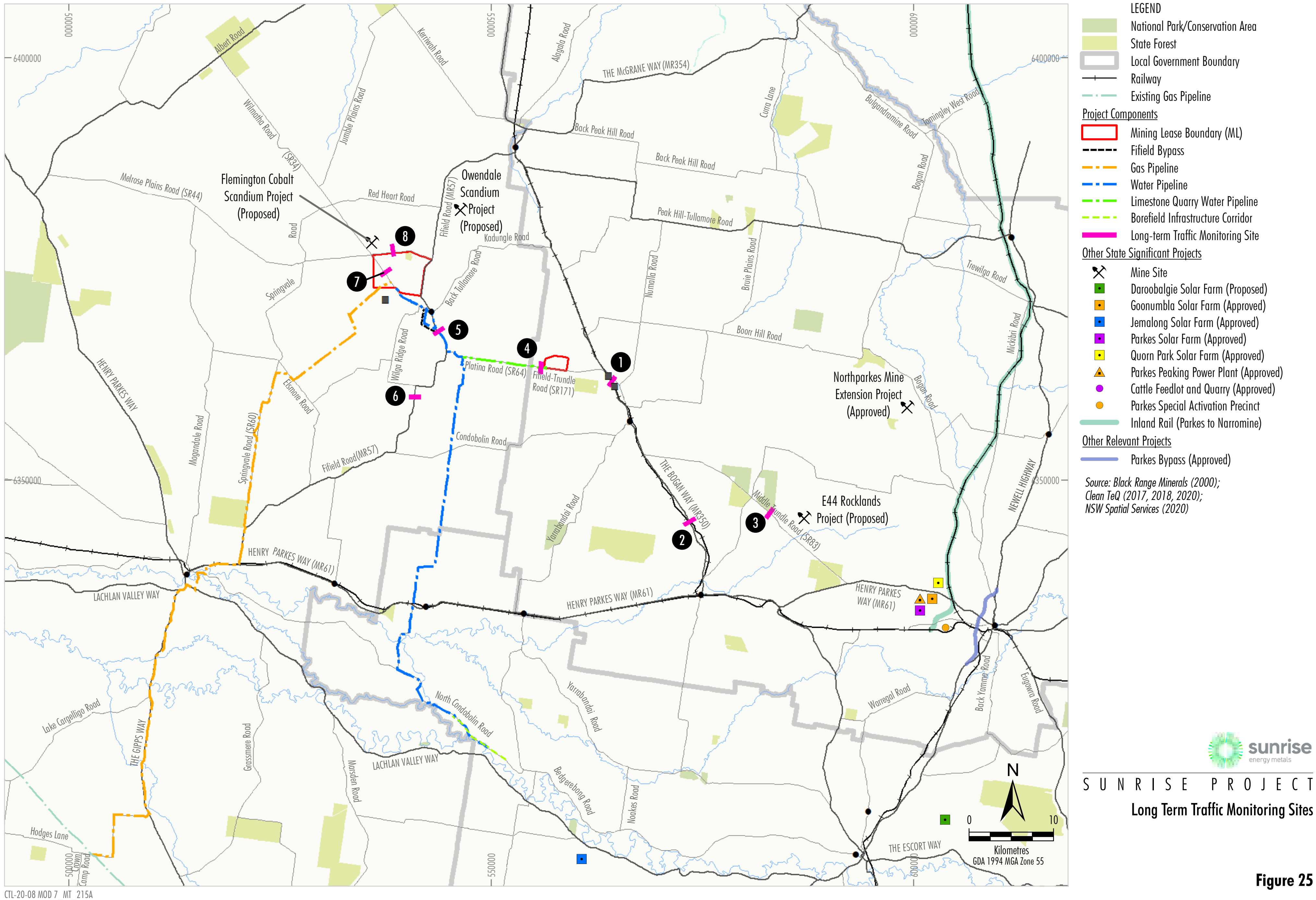
Further details on the road survey data are provided in Appendix D.

Table 17
Surveyed Annual Average Daily Traffic Volumes

Site[1]	Location	2017			2018		
		Light	Heavy	Total	Light	Heavy	Total
1	The Bogan Way between Trundle and Fifield-Trundle Road	329	76	405	332	51	383
2	The Bogan Way between Bogan Gate and Middle Trundle Road	291	86	377	285	43	328
3	Middle Trundle Road between The Bogan Way and Henry Parkes Way	170	30	200	243	19	262
4	Platina Road/Fifield-Trundle Road between The Bogan Way and Fifield Road	66	15	81	61	6	67
5	Fifield Road between Slee Street and Platina Road	200	95	295	187	148	335
6	Fifield Road between Platina Road and Springvale Road	139	99	238	147	150	297
7	Wilmatha Road north of Sunrise Lane	14	4	18	15	5	20
8	Melrose Plains Road between Fifield Road and Wilmatha Road	9	4	13	7	2	9

Source: Appendix D.

1 Refer to Figure 25.



LEGEND
National Park/Conservation Area
State Forest
Local Government Boundary
Railway
Existing Gas Pipeline
Project Components
Mining Lease Boundary (ML)
Fifield Bypass
Gas Pipeline
Water Pipeline
Limestone Quarry Water Pipeline
Borefield Infrastructure Corridor
Long-term Traffic Monitoring Site
Other State Significant Projects
Mine Site
Daroobalgie Solar Farm (Proposed)
Goonumbla Solar Farm (Approved)
Jemalong Solar Farm (Approved)
Parkes Solar Farm (Approved)
Quorn Park Solar Farm (Approved)
Parkes Peaking Power Plant (Approved)
Cattle Feedlot and Quarry (Approved)
Parkes Special Activation Precinct
Inland Rail (Parkes to Narromine)
Other Relevant Projects
Parkes Bypass (Approved)
Source: Black Range Minerals (2000); Clean TeQ (2017, 2018, 2020); NSW Spatial Services (2020)
Flemington Cobalt Scandium Project (Proposed)
Owendale Scandium Project (Proposed)
Northparkes Mine Extension Project (Approved)
E44 Rocklands Project (Proposed)
1
2
3
4
5
6
7
8
HENRY PARKES WAY (MR61)
LACHLAN VALLEY WAY
THE GIPPS WAY
THE BOGAN WAY (MR350)
THE McGRANE WAY (MR354)
NEWELL HIGHWAY
THE ESCORT WAY
HENRY PARKES WAY
Platina Road (SR64)
Fifield-Trundle Road (SR171)
Fifield Road (MR57)
Condobolin Road
Kadungle Road
Back Peak Hill Road
Peak Hill-Tullamore Road
Boorr Hill Road
Middle Trundle Road (SR83)
North Condobolin Road
Melrose Plains Road (SR44)
Springvale Road (SR60)
Red Heart Road
Albert Road
Wilmatha Road
Jumble Plains Road
Keriwah Road
Alagala Road
Curra Lane
Bulgandramine Road
Tomingley West Road
Bogan Road
Trewilga Road
Mickibri Road
Numalla Road
Bruie Plains Road
Back Tullamore Road
Wilga Ridge Road
Elsmore Road
Mogandale Road
Yarrabandai Road
Bedgerebong Road
Nookes Road
Marsden Road
Grassmere Road
Lake Cargelligo Road
Hodges Lane
Crown Camp Road
Warregal Road
Back Yamma Road
Eugowra Road
6400000
6350000
500000
550000
600000
N
0
10
Kilometres
GDA 1994 MGA Zone 55
sunrise energy metals
SUNRISE PROJECT
Long Term Traffic Monitoring Sites
Figure 25
CTL-20-08 MOD 7_MT_215A

Road Safety

A review of TfNSW accident data in the vicinity of the Project for the five year period from 1 July 2015 to 30 June 2020 was undertaken by TTPP (Appendix D).

Overall, the review of the TfNSW accident data identified no inherent concerns with the safety of the key routes used by Project traffic (Appendix D).

Road and Intersection Upgrades and Maintenance

Road and intersection upgrades and maintenance will be undertaken for the Project in accordance with Conditions 43 and 44, Schedule 3 of Development Consent (DA 374-11-00) and the VPA (Section 3.5.3).

Details of the approved road and intersection upgrades and maintenance are outlined in the Road Upgrade and Maintenance Strategy (Clean TeQ, 2019c).

Traffic Management Plan

In accordance with Condition 45, Schedule 3 of Development Consent (DA 374-11-00), a Traffic Management Plan (Clean TeQ, 2019h) has been developed for the Project and includes:

- details of all transport routes and traffic types to be used for development-related traffic;
- a program to monitor and report on the amount of metal sulphate precipitate, scandium oxide and ammonium sulphate transported from the mine;
- a program to monitor and report on the amount of limestone transported from the limestone quarry and third party suppliers;
- measures that would be implemented to:
  - minimise traffic safety issues and disruption to local users of the transport route/s during construction and decommissioning of the development;
  - operate shuttle bus services to transport employees to and from Parkes, Forbes and Condobolin; and
  - operate high capacity trucks to transport limestone and other materials and products to and from the mine and processing facility.
- a Road Transport Protocol for all drivers transporting materials to and from the site with measures to:
  - ensure drivers adhere to the designated transport routes and prioritise the use of national, state and regional roads over local roads;
  - verify that these heavy vehicles are completely covered whilst in transit;
  - co-ordinate the staggering of heavy vehicle departures to minimise impacts on the road network, where practicable;
  - minimise disruption to school bus timetables and rail services;
  - ensure travelling stock access and right of way to the adjacent travelling stock route;
  - maintain radio communications between all school buses and heavy vehicle operators operating on the transport route between the rail siding and mine and processing facility, limestone quarry or third party limestone quarries and the mine and processing facility;
  - manage worker fatigue during trips to and from the site;
  - manage appropriate driver behaviour including adherence to speed limits, safe overtaking and maintaining appropriate distances between vehicles (i.e. a Driver Code of Conduct);
  - inform drivers of relevant drug and alcohol policies;
  - regularly inspect vehicles maintenance and safety records;
  - implement contingency procedures when the transport route is disrupted;
  - respond to emergencies;
  - transport processing reagents safely;
  - minimise disruption to community events and festivals, in consultation with event organisers;
  - implement reasonable and feasible measures to minimise amenity impacts to local communities, including minimising night time truck movements and compression braking in urban areas as far as practicable; and
  - ensure compliance with and enforcement of the protocol.

6.6.2 Impact Assessment Review

Potential impacts of the Modification on road traffic movements, key intersection performance and road safety are assessed in Appendix D and are summarised below.

The key potential road transport impacts of the Modification would be associated with (Appendix D):

- changes to vehicle movements associated with the increased construction phase workforce and accommodation camp capacity;
- changes to construction phase heavy vehicle movements;
- increased construction phase duration from two to three years;
- changes to operational phase heavy vehicle movements associated with revisions to processing plant reagent types, rates and storage volumes;
- increased operational phase heavy vehicle movements between the mine and processing facility and the rail siding associated with the transport of metal sulphate and ammonium sulphate products which would no longer be backloaded;
- additional operational phase heavy vehicle movements to and from the rail siding associated with the distribution of ammonium sulphate from the rail siding;
- revised rail siding location; and
- two new mine and processing facility vehicle site access points on Wilmatha Road.

Modified Project Traffic Generation

The following maximum case traffic scenarios were investigated to determine the potential impact of the modified Project on the local road network, having regard to the modified Project traffic volumes and other traffic volumes throughout the life of the Project:

- peak construction activity – including construction of the mine and processing facility, rail siding and road upgrades and is expected to occur in the second year of construction (nominally in 2023); and
- peak operational activity – including peak production and changes in non-Project traffic over a further 10 year period (nominally 2033).

Table 18 summarises the approved and modified Project forecast daily vehicle movements (traffic in both directions) for the mine and processing facility and rail siding for both the construction and operational phases. Traffic associated with other Project components would remain generally unchanged.

The Modification would result in a significant decrease in Project-related daily vehicle movements during the construction phase principally due to the introduction of shuttle buses to transport the Project construction workforce between surrounding towns and the mine and processing facility and rail siding (Table 18 and Appendix D).

The Modification would not significantly change the Project-related daily vehicle movements during the operations phase with the exception of increases in the vicinity of the modified rail siding associated with the transport of ammonium sulphate (a fertiliser) to agricultural operations in the region by road (Section 3.3.2) (Appendix D).

Table 18
Approved and Modified Mine and Processing Facility, Accommodation Camp and Rail Siding Daily Traffic Generation

Project Component	Approved Project	Modified Project
Construction Phase (Peak)		
Mine and Processing Facility/Accommodation Camp[1]	470	308
Rail Siding	130	24
Operational Phase (Peak)		
Mine and Processing Facility	304	270
Rail Siding	54	84

Source: After Appendix D.

1 Excludes movements between the mine and processing facility and accommodation camp.

The Modification would result in the following changes to Project-related daily vehicle movements in Trundle:

- Construction Phase – 124 fewer light vehicle trips per day, 14 additional bus trips per day, and 12 fewer heavy vehicle trips per day.
- Operational Phase – 22 additional light vehicle trips per day, four additional bus trips per day and two fewer heavy vehicle trips per day.

Cumulative Future Traffic Volumes

Tables 19 and 20 present the total predicted future traffic volumes on key roads (Figure 25), incorporating modified Project traffic and estimated background traffic growth, for the construction and operational scenarios, respectively. These predictions are made away from intersections (i.e. midblock).

The Austroads (2020) *Guide to Traffic Management Part 3: Traffic Studies and Analysis* provides guidelines for the capacity and performance of two lane, two-way rural roads. Austroads (2020) define Levels of Service as a qualitative measure describing the operational conditions within a traffic stream (in terms of speed, travel time, freedom to manoeuvre, traffic interruptions, comfort, convenience and safety) as perceived by drivers and/or passengers.

Level of Service A provides the best traffic conditions, with no restrictions on desired travel speed or overtaking. Levels of Service B to D describe progressively worse traffic conditions, with Level of Service E for traffic conditions that are at or close to capacity, with virtually no freedom to select desired speeds or manoeuvre in the traffic stream.

The Modification would not change the existing Level of Service on key roads surrounding the modified Project (i.e. Level of Service A) (Appendix D).

The potential cumulative road transport impacts associated with the other "relevant" projects as defined in the draft *Assessing Cumulative Impacts Guide Guidance for State Significant Projects* (DPIE, 2020b) (Section 2.3) have also been considered by TTPP (Appendix D).

Further consideration of the potential cumulative impacts associated with the "relevant" project listed above is provided in Appendix D.

Intersection Performance

TTPP (2021) considered that formal peak hour intersection analysis for key intersections was not warranted given the low predicted traffic volumes. No capacity concerns regarding the operation of key intersections are expected for the modified Project (Appendix D).

Rail Level Crossings

There are two railway lines that operate in the vicinity of the Project: the Orange Broken Hill Railway and the Bogan Gate Tottenham Railway (Figure 1). Rail level crossings on key Project routes are located on Henry Parkes Way, The Bogan Way, Fifield Road and Scotson Lane.

As the Modification would not significantly increase Project-related vehicles at these level crossings or change the approved Project rail movements, the Modification is not expected to have a perceptible impact on the operation of these level crossings (Appendix D).

Road Safety Review

The review of the road crash history of the routes that would be used by the modified Project traffic does not highlight any specific concerns regarding the safety of those routes or any specific location with a poor crash history.

The modified Project would not result in significant impacts on the safety of the road network with implementation of the proposed mitigation measures (Section 6.6.3) (Appendix D).

6.6.3 Mitigation Measures, Management and Monitoring

Road and Intersection Upgrades and Maintenance

The Modification would include the following additional road and intersection upgrades:

- two additional vehicle site access points from Wilmatha Road to the mine and processing facility (Section 3.2.8); and
- an extension of the Scotson Lane road upgrade to reflect the modified rail siding location (Section 3.3.8).

Table 19
Predicted Cumulative Traffic Volumes – Construction Phase

Site	Location	Approved Project				Modified Project			
		Light Vehicles	Buses	Heavy Vehicles	Total	Light Vehicles	Buses	Heavy Vehicles	Total
1	The Bogan Way between Trundle and Fifield-Trundle Road	669	10	163	842	545	24	139	708
2	The Bogan Way between Bogan Gate and Middle Trundle Road	393	6	49	448	385	10	119	514
3	Middle Trundle Road between The Bogan Way and Henry Parkes Way	534	6	126	666	426	16	32	474
4	Platina Road/Fifield-Trundle Road between Fifield Road and Road Upgrades	363	4	110	477	199	22	96	317
4	Platina Road/Fifield-Trundle Road between Road Upgrades and The Bogan Way	339	4	110	453	199	22	94	315
5	Fifield Road between Slee Street and Platina Road	613	26	317	956	431	48	305	784
6	Fifield Road between Platina Road and Springvale Road	341	24	217	582	267	28	231	526
7	Wilmatha Road between Sunrise Lane and Project access	815	0	96	911	99	72	110	281
7	Wilmatha Road between Fifield Road and Sunrise Lane	371	4	126	501	199	26	114	339
8	Melrose Plains Road between Fifield Road and Wilmatha Road	13	0	4	17	13	0	4	17

Source: After Appendix D.

[1] Refer to Figure 25.

Table 20
Predicted Cumulative Traffic Volumes – Operational Phase

Site	Location	Approved Project				Modified Project			
		Light Vehicles	Buses	Heavy Vehicles	Total	Light Vehicles	Buses	Heavy Vehicles	Total
1	The Bogan Way between Trundle and Fifield-Trundle Road	591	14	143	748	613	18	141	772
2	The Bogan Way between Bogan Gate and Middle Trundle Road	451	6	123	580	463	10	121	594
3	Middle Trundle Road between The Bogan Way and Henry Parkes Way	436	10	36	482	474	10	36	520
4	Platina Road/Fifield-Trundle Road between Fifield Road and Road Upgrades	168	6	173	347	170	10	175	355
4	Platina Road/Fifield-Trundle Road between Road Upgrades and The Bogan Way	168	6	133	307	186	10	139	335
5	Fifield Road between Slee Street and Platina Road	424	42	447	913	404	46	443	893
6	Fifield Road between Platina Road and Springvale Road	284	38	286	608	302	38	284	624
7	Wilmatha Road between Fifield Road and Project Access	144	12	185	341	110	16	181	307
8	Melrose Plains Road between Fifield Road and Wilmatha Road	13	0	4	17	13	0	4	17

Source: After Appendix D.

[1] Refer to Figure 25.

These additional road and intersection upgrades would be conducted in consultation with the LSC and PSC.

SEM will continue to make road maintenance contributions in accordance with Development Consent (DA 374-11-00) and the VPA.

Road Upgrades and Maintenance Strategy and Traffic Management Plan

The approved Road Upgrades and Maintenance Strategy (Clean TeQ, 2019c) and Traffic Management Plan (Clean TeQ, 2019h) would be updated to incorporate the Modification.

6.7 HAZARD AND RISKS

The potential hazards associated with the Modification would be related to the modified mine and processing facility and rail siding (Section 6.1).

A PHA has been prepared for the Modification by Pinnacle Risk Management and is provided as Appendix E.

6.7.1 Background

Previous Assessments

A PHA was prepared for the original Project EIS by SHE Pacific (2000) in accordance with the general principles of risk evaluation and assessment provided in *Hazardous Industry Planning Advisory Paper No 4 – Risk Criteria for Land Use Safety Planning* and *Hazardous Industry Planning Advisory Paper No 6 – Guidelines for Hazard Analysis* (NSW Department of Urban Affairs and Planning, 1992a; 1992b).

SHE Pacific (2000) assessed the following aspects of the mine and processing facility:

- gaseous releases including sulphur dioxide;
- fires including torch (ignition of pressurised flammable liquid), flash (ignition of flammable gas and air),
- pool (ignition of a pool of flammable liquid) and warehouse (dangerous goods stores) fires; and;
- explosions.

SHE Pacific (2000) concluded that most incidences related to the mine and processing facility would have negligible impacts as a result of the distance between the processing facility, the site boundary and the nearest occupied residence (SHE Pacific, 2000).

More recently, a PHA was prepared for the Project Modification 4 by Pinnacle Risk Management (2017) in accordance with the *Hazardous Industry Planning Advisory Paper No 6 – Hazard Analysis* (DoP, 2011a).

Pinnacle Risk Management (2017) considered the main additional potential risk events associated with the changes to the mine and processing facility approved by Modification 4, which comprised:

- decomposition of the ammonium nitrate emulsion (explosives) to be used for blasting at the mine and processing facility;
- large loss of containment of ammonia (e.g. tank or transfer pipe/hose failure); and
- irregular release of sulphur dioxide or sulphur trioxide (e.g. equipment failure)

Pinnacle Risk Management (2017) found that the distances from the processing facility to the site boundary and nearest residences were generally found to control the significance of the incidents and their potential hazardous impacts, consistent with the findings of SHE Pacific (2000).

Societal risk, area cumulative risk, propagation risk, transport risk and environmental risk were also concluded to be acceptable by Pinnacle Risk Management (2017).

Management Regime

In accordance with Conditions 52 and 53, Schedule 3 of Development Consent (DA 374-11-00), SEM will prepare a range of pre-construction and pre-commissioning hazard studies for the processing facility and gas pipeline, including a Final Hazard Analysis, Construction Safety Study, Hazard and Operability Study, Transport of Hazardous Materials Study, Emergency Plan and a Safety Management System.

6.7.2 Impact Assessment Review

The PHA for the Modification used a risk-based assessment for credible events that have the potential for off-site impacts. The methodology for the hazard analysis and risk assessment included (Appendix E):

- review of the relevant Modification components to identify credible, potential hazardous events, their causes and consequences;
- estimate of the consequences of the potential hazardous events that could have off-site impacts;
- analysis of the risk of propagation within the modified mine and processing facility and rail siding; and
- assessment of the risk levels to check if they are within the criteria stipulated in *Hazardous and Offensive Development Application Guidelines, Applying SEPP 33* (DoP, 2011b).

The main potential risk events associated with the modified Project would include (Appendix E):

- natural gas due to failure of the natural gas supply pipeline with subsequent ignition. This can occur anywhere along the pipeline;
- incident involving the explosives storages where the explosives detonate; and
- sulphur oxides and ammonia due to a large release and dispersion downwind.

Pinnacle Risk Management (Appendix E) found that the modified mine and processing facility and rail siding show compliance with all DoP (2011b) risk criteria.

Societal risk, area cumulative risk, propagation risk, transport risk and environmental risk are also concluded to be acceptable (Appendix E).

The primary reason for the low risk levels from the modified mine and processing facility is the separation distances between the potentially hazardous materials and equipment to the nearest private residences and also the site boundaries (Appendix E).

For the modified rail siding, the primary reasons for the low risk levels are the low risk nature of the materials stored and the separation distances to the nearest private residences (Appendix E).

6.7.3 Mitigation Measures, Management and Monitoring

The PHA for the Modification (Appendix E) concluded that the recommended mitigation measures specific to lowering the risk of off-site impacts associated with potential releases of ammonia identified by Pinnacle Risk Management (2017) remain valid for the modified mine and processing facility.

No specific mitigation measures were identified in the PHA for the modified rail siding (Appendix E).

The hazard related mitigation measures for the modified Project would be considered as part of the hazard studies to be prepared in accordance with Conditions 52 and 53, Schedule 3 of Development Consent (DA 374-11-00).

6.8 BIODIVERSITY

The potential biodiversity impacts of the Modification would be associated with the modified rail siding (Section 6.1).

A Biodiversity Review has been prepared for the modified rail siding by Biodiversity Australia in accordance with the requirements of clause 30A(2)(c) of the *Biodiversity Conservation (Savings and Transitional) Regulation 2017* and is provided as Appendix F.

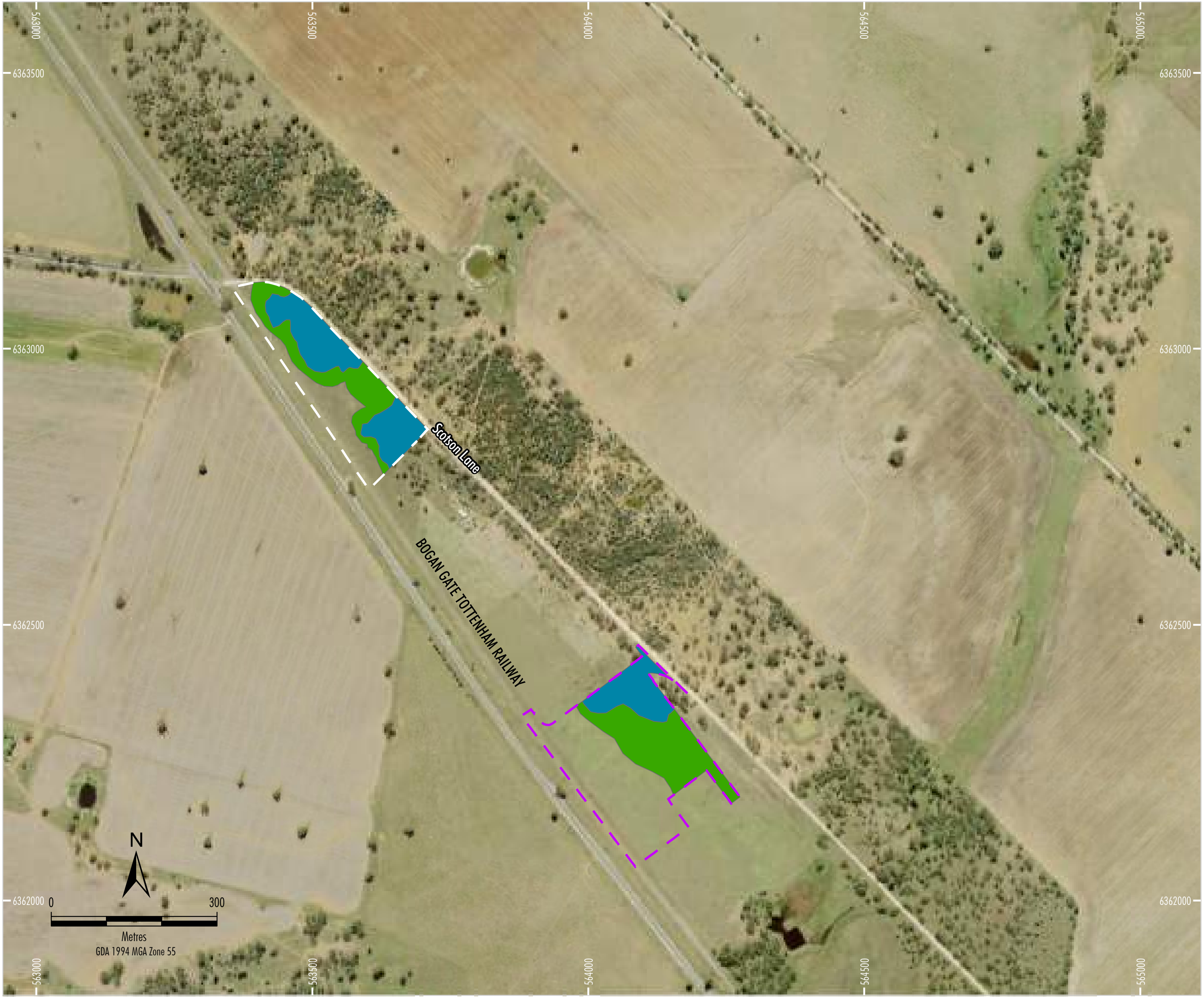
6.8.1 Background

Survey Results

Ecological surveys of the approved and modified rail siding surface development areas were carried out from 30 October to 2 November 2020 by Biodiversity Australia (Appendix F).

The surveys involved vegetation assessments in accordance with the *Biodiversity Assessment Method* (BAM) (DPIE, 2020d), threatened flora traverses in accordance with the *Surveying threatened plants and their habitats* (DPIE, 2020e), habitat assessments and mapping of Plant Community Types (PCTs) (Appendix F).

The PCTs identified in the approved and modified rail siding surface development areas are listed in Table 21 and shown on Figure 26. The remainder of the approved and modified rail siding surface development areas comprised previously cleared exotic grassland (Appendix F).



LEGEND

Modified Rail Siding Surface Development Area

Approved Rail Siding Surface Development Area

Vegetation Communities

Poplar Box Grassy Woodland (Good) (PCT 244)*

Derived Native Grassland (PCT 244)

*Note: * Endangered Ecological Community listed under the EPBC Act.*

Source: Black Range Minerals (2000); NSW Spatial Services (2020); Clean Teq (2021); Biodiversity Australia (2021).
Orthophoto: © NSW Spatial Services (2020)

sunrise energy metals

SUNRISE PROJECT

Approved and Modified Rail Siding Plant Community Type Mapping

Figure 26

CTL-20-08 MOD 7_MT_214A

Table 21
Approved and Modified Rail Sidings – Plant Community Types

Vegetation Zone	PCT	PCT Name	Condition	Clearance (ha)		Modification
				Approved Rail Siding Surface Development Area	Modified Rail Siding Surface Development Area	
1	244	Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of Central NSW	Woodland (Good)*	1.95	1.02	0.93 ha less clearance
2	244	Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of Central NSW	DNG	1.38	1.97	0.59 ha greater clearance
			Total	**3.33**	**2.99**	**0.34 ha less clearance**

* *Poplar Box Grassy Woodland on Alluvial Plains* listed under the EPBC Act.

The woodland form of PCT 244 (Vegetation Zone 1) is equivalent to Poplar Box EEC listed under the EPBC Act. The Derived Native Grassland (DNG) form of PCT 244 (Vegetation Zone 2) is not considered Poplar Box EEC because it does not meet the Key Diagnostic Characteristics outlined within the EBPC Conservation Advice (DAWE, 2020). The Modification would result in 0.93 ha less clearance of Poplar Box EEC (Table 21).

No threatened flora species listed under the BC Act or EPBC Act were recorded within the approved or modified rail siding surface development areas (Appendix F).

Field surveys recorded two threatened fauna species, namely the Grey-crowned Babbler (*Pomatostomus temporalis*) (vulnerable under the BC Act), and Major Mitchell's Cockatoo (*Lophochroa leadbeateri*) (vulnerable under the BC Act) (Appendix F).

The Grey-crowned Babbler was only heard calling from adjacent habitats, however would be likely to use the habitats within the approved and modified rail siding surface development areas for foraging. The Major Mitchell's Cockatoo was observed flying overhead in the modified rail siding site. No breeding sites were located during the surveys (Appendix F).

Management and Monitoring Regime

In accordance with Condition 35, Schedule 3 of Development Consent (DA 374-11-00), a Biodiversity Management Plan and Revegetation Strategy (Clean TeQ, 2019i) has been prepared for the approved Project, and includes:

- a Vegetation Clearance Protocol;
- threatened species management measures;
- tailings storage facility management;
- weed control and monitoring measures;
- feral animal control and monitoring measures;
- controlling erosion measures;
- bushfire management measures;
- road management measures;
- revegetation area monitoring and management areas; and
- a staff and contractor education program.

6.8.2 Impact Assessment Review

The potential biodiversity impacts of the Modification would be associated with the revised rail siding location and layout.

In general, the vegetation condition and habitat values identified within the approved and modified rail siding surface development areas are considered similar, based on species diversity, structural diversity and non-endemic species invasion (Appendix F).

Table 22 provides an assessment of the impacts of the Modification on biodiversity values. In summary, the Modification would not increase impacts on vegetation abundance, vegetation integrity, habitat suitability, threatened species abundance, habitat connectivity, threatened species movement, flight path integrity or hydrological processes that are known to sustain a threatened species or ecological community.

As the Modification would not increase impacts on biodiversity values, it is considered that a BDAR is not required (Appendix F).

Cumulative Impacts

Given that the Modification would not result in an increased impact on biodiversity values, it is considered that the Modification would not increase cumulative biodiversity impacts in the region.

6.8.3 Mitigation Measures, Management and Monitoring

Given that the Modification would not result in an increased impact on biodiversity values, there would be no change to the approved mitigation, management and monitoring measures for the Project.

Notwithstanding, the Biodiversity Management Plan and Revegetation Strategy (Clean TeQ, 2019i) would be reviewed and, if necessary, revised by SEM to include the Modification (subject to any modified Development Consent conditions).

Table 22
Impacts of the Modification on Biodiversity Values

Biodiversity Value	Meaning	Relevant (✓ or NA)*	Explanation
Vegetation abundance *1.4(b) BC Regulation*	*Occurrence and abundance of vegetation at a particular site*	✓	**The Modification would not result in an increased impact on vegetation abundance.** The Modification would result in 0.34 ha less clearance of native vegetation overall and a 0.93 ha reduction in the clearance of PCT 244 woodland (equivalent to Poplar Box EEC) (Table 21).
Vegetation integrity *1.5(2)(a) BC Act*	*Degree to which the composition, structure and function of vegetation at a particular site and the surrounding landscape has been altered from a near natural state*	✓	**The Modification would not result in an increased impact on vegetation integrity.** In general, the vegetation condition and habitat values identified within the approved and modified rail siding surface development areas are considered similar, based on species diversity, structural diversity and non-endemic species invasion. The approved rail siding surface development area contains a greater area of extant woodland than the modified rail siding surface development area (Table 21).
Habitat suitability *1.5(2)(b) BC Act*	*Degree to which the habitat needs of threatened species are present at a particular site*	✓	**The Modification would not result in an increased impact on habitat suitability.** The habitat present in the approved and modified rail siding surface development areas provide marginal habitat for threatened fauna (e.g. Grey-crowned Babbler) due to the past disturbance and lack of suitable tree hollows. No threatened flora species were recorded at either the approved or modified rail siding. The Modification has been designed to avoid impacts on habitat by predominantly locating the modified rail siding components in previously cleared exotic grassland and DNG rather than woodland. The Modification would not impact rocks, karst, caves, crevices, cliffs, human made structures or non-native vegetation known to be associated with any threatened species. The Modification is unlikely to cause a greater impact on any adjacent habitat due to noise, dust or light spill during construction or operation.

Table 22 (Continued)
Impacts of the Modification on Biodiversity Values

Biodiversity Value	Meaning	Relevant (✓ or NA)*	Explanation
Threatened species abundance *1.4(a) BC Regulation*	*Occurrence and abundance of threatened species or threatened ecological communities, or their habitat, at a particular site*	✓	**The Modification would not impact the occurrence and abundance of threatened species, or their habitat, in the locality.** The Modification would result in 0.34 ha less clearance of native vegetation overall and a 0.93 ha reduction in the clearance of PCT 244 woodland (Table 21). No threatened flora species were recorded in either site. The habitat in the approved and modified rail siding sites provide marginal habitat for threatened fauna.
Habitat connectivity *1.4(c) BC Regulation*	*Degree to which a particular site connects different areas of habitat of threatened species to facilitate the movement of those species across their range*	✓	**The Modification would not result in an increased impact on habitat connectivity**. The woodland that would be cleared in the modified rail siding surface development area is on the edge of a larger patch of woodland and therefore does not provide a connection between two woodland habitats.
Threatened species movement *1.4(d) BC Regulation*	*Degree to which a particular site contributes to the movement of threatened species to maintain their lifecycle*	N/A	**The Modification is not likely to impact a well-defined movement pattern for any particular species, given the majority of clearance would be of previously cleared exotic grassland and DNG.** As described above, the woodland that would be cleared in the modified rail siding surface development area is on the edge of a larger patch of woodland and therefore does not provide a connection between two woodland habitats.
Flight path integrity *1.4(e) BC Regulation*	*Degree to which the flight paths of protected animals over a particular site are free from interference*	N/A	**The Modification would not interfere with any flight paths of protected animals.**
Water sustainability *1.4(f) BC Regulation*	*Degree to which water quality, water bodies and hydrological processes sustain threatened species and threatened ecological communities at a particular site*	N/A	**The Modification would not impact water quality, water bodies or hydrological processes that are known to sustain a threatened species or threatened ecological community.**

Source: Appendix F.

* *A biodiversity value is not relevant to a proposed development if the value is not present on the development site and there is no potential for direct or indirect impacts on the biodiversity value if it occurs off-site* (Department of Planning & Environment, 2018).

6.9 ABORIGINAL CULTURAL HERITAGE

The potential Aboriginal cultural heritage impacts of the Modification would be associated with the modified rail siding (Section 6.1).

An ACHA has been prepared for the modified rail siding by Landskape Natural and Cultural Heritage Management (Landskape) (2021) and is presented in Appendix G.

6.9.1 Background

Aboriginal Cultural Heritage Assessment

The ACHA has been undertaken in consideration of relevant requirements of various advisory documents and guidelines, including but not limited to:

- *Aboriginal cultural heritage consultation requirements for proponents 2010* (the Consultation Guidelines) (DECCW, 2010a);
- *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW, 2010b); and
- *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH, 2011).

The ACHA (Appendix G) incorporates relevant information from previous assessments (including for the Project), the results of the field survey and associated consultation with the Aboriginal community, including:

- results from extensive fieldwork and archaeological and cultural investigations previously undertaken at the Project and surrounds;
- search results from the Heritage NSW Aboriginal Heritage Information Management System (AHIMS) database;
- results from extensive consultation with the Aboriginal community regarding archaeological and cultural heritage values; and
- a detailed description of the methods implemented and the results of the archaeological and cultural field survey conducted by archaeologists and representatives of the Aboriginal community for the Modification on 23 February 2021.

The key steps involved in the preparation of the ACHA and associated consultation are described below.

Aboriginal History

Aboriginal people of the Wiradjuri language group were traditionally affiliated with the region encompassing the Macquarie, Lachlan and Murrumbidgee Rivers. The Wiradjuri appear to have had a semi-sedentary lifestyle, being hunter-fisher-gatherers, and were often situated on a particular waterway or drainage catchment area where resources were plentiful (Appendix G).

Aboriginal settlement patterns of the south-west slopes are possibly reflected in the distribution of modified trees. Aboriginal people seem to have spent most of their time situated within close proximity to reliable water sources. Areas that people occupied were also influenced by available food sources, including waterbirds, kangaroos, wallabies, and various plant foods (Appendix G).

Previous Archaeological Investigations

Several Aboriginal heritage surveys and assessments have been undertaken in proximity to the modified rail siding area, including studies by Appleton (2000 and 2005) and Landskape (2017a, 2017b and 2018) for the Project and subsequent modifications. Also relevant is a more recent study by OzArk Environment and Heritage (2020) *draft Aboriginal Cultural Heritage Study of the Lachlan Shire*, prepared for the LSC.

A detailed description of the investigations and surveys undertaken in proximity to the modified rail siding area and surrounds is provided in Appendix G.

Previously Recorded Aboriginal Cultural Heritage Sites

There are no previously recorded Aboriginal cultural heritage sites within or immediately adjacent to the modified rail siding area (Appendix G). The closest previously recorded Aboriginal cultural heritage sites are two isolated finds of stone artefacts (AHIMS site numbers 35-5-0170 and 35-5-0171), located north of Platina Road approximately 5 km west of the modified rail siding area (Landskape, 2017b).

Community Consultation

The ACHA for the Modification included consultation with 10 RAPs, consistent with the Consultation Guidelines (DECCW, 2010a) and the *NSW National Parks and Wildlife Regulation 2009*.

Consultation with the RAPs regarding the approved Project and the Modification has been extensive and involved various methods including on-site meetings, written and verbal correspondence, archaeological survey attendance and on-site inspections.

Table 23 summaries the main stages of the Aboriginal cultural heritage consultation process undertaken for the Modification. A detailed account of the consultation process (including consultation records and a detailed consultation log) is provided in Appendix G.

Survey Design and Methodology

The archaeological field survey for the Modification was undertaken on 23 February 2021 by suitably qualified archaeologists Dr Matt Cupper and Dr Tim Stone, with the assistance of Aboriginal community representatives.

The area investigated included the modified rail siding area and immediate surrounds. The field investigation involved inspection on foot, and the field teams examined the ground surface for any archaeological traces such as stone artefacts, hearths, hearthstones, shells, bones and mounds. All mature trees in the area of proposed disturbance were inspected for scarring or carving by Aboriginal people. Particular attention was paid to areas with high ground surface visibility such as along stock and vehicle tracks and in scalds, gullies and other eroded areas.

Archaeological Findings

No Aboriginal cultural heritage sites were identified during the field survey, despite the intensive nature of the survey. This result was attributed to the landscape setting of the modified rail siding area, situated in the hinterland plain away from water sources, as well as past disturbance by agriculture which is likely to have removed any pre-existing Aboriginal cultural heritage sites (Appendix G).

A more detailed discussion of the survey results is provided in Appendix G.

Archaeological and Cultural Heritage Values

During the archaeological survey the attending RAPs did not identify any specific locations within the modified rail siding area or wider surrounds as being of high or specific cultural significance.
It is noted, however, that all land has cultural significance for individual Aboriginal people and for the Aboriginal community collectively and disturbance of land is often contrary to principle Aboriginal beliefs regarding the land and its cultural significance and values.

Table 23
Summary of Aboriginal Heritage Consultation Undertaken for the Modification

Date	Consultation Conducted
Notification of Project and Registrations	
19 and 20 January 2021	Letters were sent out to the existing 10 RAPs for the Project to advise them of the Modification and notify them that they have been automatically registered as RAPs for the Modification.
9 February 2021	The list of RAPs for the Modification, along with the written notifications, were provided to the Condobolin Local Aboriginal Land Council and the West Wyalong Local Aboriginal Land Council.
17 February 2021	The list of RAPs for the Modification, along with the written notifications, were provided to Heritage NSW.
Proposed Methodology Review and Information Session	
22 and 23 January 2021	The Proposed Methodology for undertaking the ACHA was distributed to the RAPs for review and comment. An invitation to an information session for the Proposed Methodology and a field survey of the ACHA Study Area (Appendix G) was also extended in this correspondence.
23 February 2021	Information session held for the Modification ACHA and Proposed Methodology.
Field Surveys	
23 February 2021	An Aboriginal cultural heritage survey was conducted by archaeologists from Landskape accompanied by representatives of the RAPs. The cultural significance of the modified rail siding area was discussed with attending representatives.
Draft ACHA Review	
19 March 2021	A copy of the draft ACHA was provided to all RAPs for their review and comment. The draft ACHA included survey results, archaeological and cultural significance assessment (based on feedback received during consultation and fieldwork), potential impacts and proposed mitigation and management measures. No comments specific to the draft ACHA content were provided by the RAPs.

Source: Appendix G

Management and Monitoring Regime

In accordance with Condition 40, Schedule 3 of Development Consent (DA 374-11-00), a Heritage Management Plan (Clean TeQ, 2019j) has been prepared for the Project, and includes:

- a protocol for the management of recorded and previously unrecorded Aboriginal heritage sites;
- a protocol for ongoing involvement of the Aboriginal community;
- a management and monitoring program for Aboriginal cultural heritage sites; and
- an Aboriginal cultural heritage awareness training program.

6.9.2 Impact Assessment Review

Potential Direct and Indirect Impacts

No Aboriginal cultural heritage sites were identified in the archaeological field surveys and, therefore, no known Aboriginal cultural heritage sites, items or values would be impacted due to the Modification.

Although the modified rail siding area and surrounds was sufficiently surveyed, there remains a very low potential for additional Aboriginal cultural heritage sites to be located within this area (e.g. sites that may have been obscured by grass or soil at the time of survey). Such previously unidentified features, should they occur, would most likely be isolated finds or low-density concentrations of stone artefacts (Appendix G).

The shallow soils of the modified rail siding area, coupled with past disturbance from pastoralism, agriculture, and track and fence construction, means that significant in situ subsurface cultural deposits are highly improbable (Appendix G).

Potential Cumulative Impacts

Given that no Aboriginal cultural heritage places or objects have been identified in the modified rail siding area and surrounds, coupled with the very low potential to occur, it is considered that the Modification would not increase cumulative impacts to Aboriginal cultural heritage in the region (Appendix G).

6.9.3 Mitigation Measures, Management and Monitoring

Given that the Modification would not result in an increased impact on Aboriginal cultural heritage, there would be no change to the approved mitigation, management and monitoring measures for the Project.

Notwithstanding, the Heritage Management Plan (Clean TeQ, 2019j) would be reviewed and, if necessary, revised by SEM to include the Modification (subject to any modified Development Consent conditions).

6.10 HISTORIC HERITAGE

The potential historic heritage impacts of the Modification would be associated with the modified rail siding (Section 6.1).

6.10.1 Background

Recorded Historic Heritage Sites

There are no previously recorded historic heritage sites at the modified rail siding.

In addition, no items of State or local heritage significance are listed as occurring in the modified rail siding surface development area in the Parkes LEP or the Heritage NSW (2021) *State Heritage Inventory*.

Field Survey and Results

A field survey of the modified rail siding area and surrounds was undertaken by suitably qualified archaeologist Dr Matt Cupper (Landskape, 2021) on 23 February 2021.

No historic heritage sites were identified in the field surveys and it is considered unlikely that any historical cultural heritage places or objects would occur (Appendix G).

Management and Monitoring Regime

In accordance with Condition 40, Schedule 3 of Development Consent (DA 374-11-00), a Heritage Management Plan (Clean TeQ, 2019j) has been prepared for the Project, and includes:

- a protocol for the management of recorded and previously unrecorded historic heritage sites;
- a monitoring program for historic heritage sites; and

- a protocol for the establishment and maintenance of a historic heritage site database.

6.10.2 Impact Assessment Review

The Modification would not result in additional potential historic heritage impacts as no historic heritage sites are located within the modified rail siding area (Appendix G).

6.10.3 Mitigation Measures, Management and Monitoring

Given that the Modification would not result in an increased impact on historic heritage, there would be no change to the approved mitigation, management and monitoring measures for the Project.

Notwithstanding, the Heritage Management Plan (Clean TeQ, 2019j) would be reviewed and, if necessary, revised by SEM to include the Modification (subject to any modified Development Consent conditions).

6.11 LAND AND AGRICULTURAL RESOURCES

The potential land and agricultural resource impacts of the Modification would be associated with the modified rail siding (Section 6.1).

6.11.1 Background

Landform

The landform at the modified rail siding has limited relief, and has a gentle gradient (approximately 1 to 2%) from north-west to south-east. Elevation at the modified rail siding area ranges from approximately 264 m AHD in the north-west to approximately 259 m AHD in the south-east (Appendix H).

Land Use and Soil Capability

Existing land uses in the vicinity of the modified rail siding are characterised by a combination of agricultural enterprises (grazing and dryland cropping), roads and the Bogan Gate Tottenham Railway.

The Land and Soil Capability classification system is used to give an indication of the land management practices that can be applied to a parcel of agricultural land. Agricultural land is classified by evaluating biophysical features of the land and soil including landform position, slope gradient, drainage, climate, soil type and soil characteristics to derive detailed rating tables for a range of land and soil hazards (OEH, 2012).

The approved and modified rail siding surface development areas are identified as having Land and Soil Capability Class of 4 ("moderate capability land"). This Land and Soil Capability Class is defined as (OEH, 2012):

> *Class 4 land has moderate to high limitations for high-impact land uses. Will restrict land management options for regular high-impact land uses such as cropping, high-intensity grazing and horticulture. These limitations can only be managed by specialised management practices with a high level of knowledge, expertise, inputs, investment and technology.*

Land Contamination

A Land Contamination Assessment was undertaken for the modified rail siding by Ground Doctor Pty Ltd (Ground Doctor) in the form of a Stage 1 (or Preliminary Investigation) Land Contamination Assessment, and is provided as Appendix H.

The Land Contamination Assessment was prepared in accordance with clause 7 of SEPP 55, *Managing Land Contamination Planning Guidelines SEPP 55 – Remediation of Land* (Department of Urban Affairs and Planning and EPA, 1998) and *Consultants reporting on contaminated land – Contaminated Land Guidelines* (EPA, 2020).

On the basis of the Stage 1 (or Preliminary Investigation) Land Contamination Assessment result, the modified rail siding surface development area is suitable for the proposed commercial/industrial development (i.e. the modified rail siding) (Appendix H).

Management and Monitoring Regime

In accordance with Condition 35, Schedule 3 of Development Consent (DA 374-11-00), a Biodiversity Management Plan and Revegetation Strategy (Clean TeQ, 2019i) has been prepared for the Project, and includes:

- a Vegetation Clearance Protocol;
- threatened species management measures;

- tailings storage facility management;
- weed control and monitoring measures;
- feral animal control and monitoring measures;
- controlling erosion measures;
- bushfire management measures;
- road management measures;
- revegetation area monitoring and management areas; and
- a staff and contractor education program.

In accordance with Condition 57, Schedule 3 of Development Consent (DA 374-11-00), a Rehabilitation Management Plan (Clean TeQ, 2019k) has been prepared for the Project, and includes:

- rehabilitation objectives and principles;
- a rehabilitation implementation strategy;
- performance measures and completion criteria;
- a rehabilitation monitoring program; and
- rehabilitation contingency measures and remedial action.

Further, and in accordance with Condition 30(b), Schedule 3 of Development Consent (DA 374-11-00), the Surface Water Management Plan (Clean TeQ, 2019e) developed for the Project includes a range of erosion and sediment control measures (e.g. sediment dams would be designed, constructed and operated in accordance with the relevant requirements of *Managing Urban Stormwater: Soils and Construction* – Volume 1 [Landcom, 2004]).

6.11.2 Impact Assessment Review

The potential land resource impacts of the Modification would be associated with the construction and operation of the modified rail siding. The Modification would result in a net increase in surface development area associated with the relocation of the rail siding of approximately 2.1 ha.

Landform

The modified rail siding would primarily comprise hardstand and water management infrastructure areas, as well as a number of buildings (e.g. the ammonium sulphate storage and distribution facility) and other infrastructure.

Given the above, the modified rail siding would not have a significant impact on the existing landform.

Land Use and Soil Capability

The approved and modified rail siding surface development areas are identified as being comprised entirely of Land and Soil Capability Class 4 (Section 6.11.1).

Given that the Modification would only result in a minor increase in the amount of potential agricultural land that would be disturbed by the rail siding (i.e. approximately 2.1 ha), no significant change to the approved land use and capability impacts of the rail siding is expected as part of the Modification.

In addition, the approved final decommissioning land use options for the approved rail siding (i.e. agriculture) (Section 3.3.10) would not change for the modified rail siding.

Land Contamination

Potential land contamination risks associated with the modified rail siding would primarily be related to contamination from spillage of metal sulphate and ammonium sulphate products, fuels, sulphur and other chemicals.

Soils and Erosion

Potential impacts of the Modification on soils would relate primarily to:

- disturbance of in situ soil resources within the modified rail siding surface development area; and
- increased erosion and sediment movement due to exposure of soils during construction.

During construction of the modified rail siding, erosion and sedimentation controls would be designed, installed and maintained in accordance with the relevant requirements of *Managing Urban Stormwater: Soils and Construction* including Volume 1 (Landcom, 2004), Volume 2A – Installation of Services (DECC, 2008a) and Volume 2C – Unsealed Roads (DECC 2008b).

Sediment dams would be constructed within the footprint of the rail siding to collect rainfall runoff from hardstand and infrastructure areas during operations. The sediment dams would be designed, constructed and operated in accordance with the relevant requirements of *Managing Urban Stormwater: Soils and Construction* – Volume 1 (Landcom, 2004).

Through the implementation of the erosion and sediment control measures above, the modified rail siding is not expected to result in any significant soil erosion impacts.

6.11.3 Mitigation Measures, Management and Monitoring

The approved Biodiversity Management Plan and Revegetation Strategy (Clean TeQ, 2019i), Rehabilitation Management Plan (Clean TeQ, 2019k) and Surface Water Management Plan (Clean TeQ, 2019e) would be updated to include the Modification (subject to any modified Development Consent conditions).

General measures to reduce the potential for contamination of land would include the following:

- Storage of ammonium sulphate on impermeable surfaces inside a predominantly enclosed ammonium sulphate storage and distribution facility.
- Metal sulphate products and sulphur prill will be stored in sealed shipping containers and would be stored on impermeable surfaces.
- Contractors transporting dangerous goods loads would be appropriately licensed in accordance with the provisions of the *Australian Code for the Transport of Dangerous Goods by Road and Rail* (National Transport Commission, 2007).
- On-site consumable storage areas would be designed with appropriate bunding and would be operated, where applicable, in compliance with the requirements of *Australian Standard (AS) 1940-2017: The Storage and Handling of Flammable and Combustible Liquids*.
- Fuel storage areas would be regularly inspected and maintained. In addition, during construction and operations, diesel and chemicals would be managed to minimise the risk of spills which could cause soil contamination.
- Sediment dams would be constructed within the footprint of the rail siding to collect rainfall runoff from hardstand and infrastructure areas during operations. The sediment dams would be designed, constructed and operated in accordance with the relevant requirements of *Managing Urban Stormwater: Soils and Construction* – Volume 1 (Landcom, 2004).

6.12 VISUAL AMENITY

The potential visual impacts of the Modification would be associated with the modified mine and processing facility and accommodation camp, and modified rail siding (Section 6.1).

6.12.1 Background

Visual Character

Mine and Processing Facility and Accommodation Camp

The mine and processing facility and accommodation camp and the surrounding environment is characterised by a combination of agricultural enterprises (grazing and dryland cropping), carbon offset properties and forestry operations (Fifield State Forest). Previous mining areas exist to the south-east and north-east, and within the north-eastern portion of ML 1770 (Black Range Minerals, 2000).

The Fifield community is located approximately 4.5 km to the south-east. The closest privately-owned sensitive receivers to the mine and processing facility include ‘Currajong Park’, ‘Slapdown’ and ‘Brooklyn’ (Figure 16).

Views of the mine and processing facility from the surrounding region will be limited due to the lack of public vantage points, the relatively flat topography and shielding roadside vegetation (Black Range Minerals, 2000).

The southern portion of the mine and processing facility will be visible from Fifield Road and from Wilmatha Road. The northern view from Melrose Plains Road will be limited due to vegetation along the northern boundary of the site (Black Range Minerals, 2000).

The accommodation camp will be visible from Sunrise Lane.

Rail Siding

The approved and modified rail siding sites and the surrounding environment is characterised by a combination of agricultural enterprises (grazing and dryland cropping).

The modified rail siding is located between Scotson Lane (with an adjacent band of remnant vegetation to the east associated with a travelling stock reserve), and the Bogan Gate Tottenham Railway to the west. The modified rail siding area has limited relief and views are available from Scotson Lane, The Bogan Way and the Tottenham to Bogan Gate Railway.

The closest privately-owned sensitive receiver to the approved and modified rail siding is 'Glen Rock' (Figure 18). The 'Glen Rock' residence is located approximately 1 km south-west and 1.1 km west from the approved and modified rail siding, respectively.

Previous Assessment

Resource Strategies (2000) conducted a Visual Impacts Assessment for the mine and processing facility and rail siding for the Syerston Project EIS, and a summary of these findings are provided below.

Mine and Processing Facility

Resource Strategies (2000) found that the limited population residing in the vicinity of the mine and processing facility minimises the potential for visual impacts, and that views of the mine and processing facility would be limited by the vegetation screens, existing vegetation (e.g. roadside vegetation) and the absence of elevated public viewpoints surrounding the mine and processing facility.

With regard to night-lighting, Resource Strategies (2000) found the main regional impact of light emissions is that a glow would be seen in the night sky above the mine and processing facility from the surrounding region and residences. Fixed (buildings and stacks) and mobile lights, such as those used on the waste emplacements, would be visible from some roads and on occasions at some of the surrounding properties.

Accommodation Camp

The potential visual impacts of the approved accommodation camp were concluded to be low (Clean TeQ, 2018).

In addition, any potential impacts associated with night lighting will be insignificant compared to the mine and processing facility (Clean TeQ, 2018).

Rail Siding

Resource Strategies (2000) found that views of the approved rail siding will be obscured in part by vegetation on adjacent properties, however views of the approved rail siding would be available at close proximity due to the lack of screening vegetation between The Bogan Way and the Tottenham to Bogan Gate Railway, and the approved rail siding.

Resource Strategies (2000) also found that views from the "Glen Rock" homestead will be available, however, the level of visual impact will be minimal due to the proposed lowset rail siding infrastructure.

With regard to the potential night lighting of the approved rail siding, Resource Strategies (2000) concluded that lighting at the approved rail siding would be restricted due to low levels of night activities and is considered to be of minor impact.

Mitigation Measures

In accordance with Condition 48, Schedule 3 of Development Consent (DA 374-11-00), SEM will implement the following visual mitigation measures at the Project:

- implement all reasonable and feasible measures to minimise the visual and off-site lighting impacts;
- ensure that all external lighting complies with *Australian Standard AS4282 (INT) 1995 - Control of Obtrusive Effects of Outdoor Lighting* (or its latest version);
- take all practical measures to shield views of the Project from users of public roads and privately-owned residences; and
- ensure the visual appearance of all ancillary infrastructure (including paint colours, specifications and screening) blends in as far as possible with the surrounding landscape; and
- establish and maintain vegetation screens (Figure 2) at the mine and processing facility for the life of the Project (unless otherwise agreed by the Secretary).

The approved rail siding includes vegetation screens along the boundaries of the approved rail siding (Black Range Minerals, 2000).

6.12.2 Impact Assessment Review

Mine and Processing Facility

The key potential visual impacts of the modified mine and processing facility would be associated with:

- changes to waste rock emplacement sequencing;
- revised tailings storage facility cell construction sequence and the addition of a decant transfer pond;
- the relocated evaporation pond; and
- a reduced sulphuric acid plant stack height from 80 m to 40 m.

The Modification would not change the approved final design and extents of the waste rock emplacements (i.e. approximately 20 m and 30 m high for the eastern and western waste rock emplacements, respectively [Figure 9]).

In addition, the Modification would not change the approved tailings storage facility design or location (Section 3.2.5).

Given the above, although there may be changes to the timing of the approved visual impacts, the Modification would not significantly change the approved visual impacts associated with the waste rock emplacements and tailings storage facility post-mining.

The relocated evaporation pond would be visible from Fifield Road consistent with the approved evaporation pond. The level of visual modification associated with the relocated evaporation pond in the context of the approved mine and processing facility would not be significant.

The reduced sulphuric acid plant stack height (i.e. from 80 m to 40 m) would result in a reduction to the potential visual amenity impacts for the sensitive receivers in the vicinity of the mine and processing facility.

The scale and intensity of night-lighting for the modified mine and processing facility would be of a similar intensity when compared to the approved night-lighting at the mine and processing facility.

Accommodation Camp

Potential visual impacts associated with the modified accommodation camp would primarily be related to the additional accommodation facilities (i.e. conventional demountable components) (Figure 14). The additional accommodation facilities would be visible from Sunrise Lane consistent with the approved accommodation camp.

The level of visual modification associated with the modified accommodation camp in the context of the approved accommodation camp would not be significant. Given this, the Modification would not significantly change the approved level of visual impact associated with the accommodation camp.

The scale and intensity of night-lighting for the modified accommodation camp would be of a similar intensity when compared to the approved night-lighting at the accommodation camp.

Rail Siding

The potential visual impacts of the modified rail siding would primarily be associated with the revised location and layout and the addition of an ammonium sulphate storage and distribution facility (approximately 500 m south of the approved location).

The modified rail siding would be visible from The Bogan Way, Scotson Lane and potentially from nearby residences.

As The Bogan Way and Scotson Lane users would be exposed to the views of the modified rail siding for a relatively short period of time and the number of users is limited, the visual sensitivity of users on these roads would be low. Consistent with the approved rail siding mitigation measures, vegetation screens would be included along the boundaries of the modified rail siding (Figure 13) to minimise views for vehicles approaching from both ways on The Bogan Way and Scotson Lane.

The ammonium sulphate storage and distribution facility would be a predominantly enclosed shed that would be designed to blend in as far as possible with the surrounding landscape consistent with Condition 48, Schedule 3 of Development Consent (DA 374-11-00).

Consistent with Condition 48, Schedule 3 of Development Consent (DA 374-11-00), night lighting at the modified rail siding would comply with *Australian Standard AS4282 (INT) 1995 - Control of Obtrusive Effects of Outdoor Lighting* (or its latest version).

In consideration of the above, the Modification is not expected to significantly change the approved visual impacts of the rail siding.

6.12.3 Mitigation Measures, Management and Monitoring

SEM would implement the visual mitigation measures consistent with Condition 48, Schedule 3 of Development Consent (DA 374 11-00) for the modified mine and processing facility and accommodation camp, and modified rail siding.

In addition, vegetation screens would be included along the boundaries of the modified rail siding (Figure 13) to minimise views from The Bogan Way and Scotson Lane.

6.13 SOCIAL

A Social Impact Review for the Modification was undertaken by SPSP and is presented as Appendix I.

The Social Impact Review considers the principles in the draft *Social Impact Assessment Guideline State significant projects* (DPIE, 2020f) and the *Technical Supplement to support the Social Impact Assessment Guideline for State significant projects* (DPIE, 2020g).

6.13.1 Background

Social Locality

The Social Impact Review defines the Project's "Social Locality" as the LGAs in direct proximity to, and with the potential to be impacted by the Project – namely the LSC, FSC and PSC (Appendix I).

Previous Assessment

A Community Infrastructure Assessment (Martin and Associates, 2000) was completed as part of the *Syerston* (now Sunrise) *Nickel Cobalt Project Environmental Impact Statement* (Black Range Minerals, 2000).

The Social Impact Review drew on aspects of the Modification to review and update the social impacts identified in the Community Infrastructure Assessment (Martin and Associates, 2000).

Consultation

Consultation undertaken by SPSP for the Social Impact Review included meetings with representatives of the LSC, FSC and PSC. SPSP sought feedback from the three Councils on the potential social impacts they anticipated from the Modification.

In addition, information was gathered as to the Councils preferences for impact mitigation and benefit enhancement measures and community priorities and concerns.

Key concerns raised regarding the potential impacts and benefits of the modified Project identified during consultation are discussed in Section 6.13.2.

Social Baseline

A description of the social baseline is provided in Appendix I, with respect to:

- population trends;
- income;
- employment;
- housing;
- health; and
- education and other services and facilities.

Existing Management Measures

The existing social management measures committed to by SEM for the approved Project include:

- preferentially sourcing suppliers from the Social Locality where they are cost and quality competitive;
- deploying a community information and engagement program, and a complaints and grievance process, so that potentially affected communities are aware of impacts and have opportunities to raise concerns with SEM;
- operating in accordance with an approved Traffic Management Plan (Clean TeQ, 2019h) and undertaking road and intersection upgrades and maintenance (in accordance with Development Consent [DA 374-11-00] and the VPA) to address the safety, road performance and quality aspects of the traffic changes;

- operating in accordance with an approved Air Quality Management Plan (Clean TeQ, 2019d) and Noise Management Plan (Clean TeQ, 2020c) (in accordance with Development Consent [DA 374-11-00]) to minimise potential amenity impacts associated with the approved Project;
- providing operational workforce bus transport from towns in the Social Locality to minimise workforce-related road traffic;
- operating high-capacity trucks to transport limestone and other materials and products to and from the mine and processing facility, to minimise heavy vehicle traffic volumes; and
- continuing to make community contributions in accordance with the VPA (Section 1.1.3), to support positive social outcomes, social infrastructure investments and/or community resilience improvements.

6.13.2 Impact Assessment Review

SPSP (2021) has assessed potential negative and positive social impacts in the Social Locality for the construction and operational phases of the modified Project.

Construction Phase

Employment and Business Opportunities

The Modification would include an increase in the peak construction phase workforce from approximately 1,000 personnel to approximately 1,900 personnel, peaking for approximately two months (Figure 27). The average construction phase workforce would increase from approximately 611 personnel to 784 personnel (Appendix I).

The duration of the construction phase would also increase from two to three years as part of the Modification.

A monthly breakdown of the indicative modified construction workforce numbers, as well as indicative construction timing for each construction activity, is provided on Figure 27.

Due to the highly specialised, skilled nature of the construction workforce, it is expected that the majority of roles would be filled by non-local workers and the remaining roles would be filled by local residents already residing in the region. Over the construction phase, an average of approximately 78 local residents are expected to find employment at the modified Project. During peak construction, up to 190 local residents are expected to find employment at the modified Project (Appendix I).

Consultation with the LSC, PSC and FSC identified anticipation for local employment and business opportunities as a key expectation within the community. Local employment for the modified Project is likely to be experienced positively by the local community, including jobseekers and businesses.

This positive impact is expected to last the duration of the construction phase, albeit at varying intensities (Appendix I).

Pressure on Local Housing Markets Prior to Accommodation Camp Commissioning

The Modification would increase the duration of the initial construction phase where the accommodation camp would not be available (as it is being constructed) from approximately three months to six months. During this initial construction phase, the construction workforce size would average 211 personnel and peak at approximately 300 personnel (Figure 27) (Appendix I).

Demand for single accommodation during this six month initial construction phase is expected to be up to 270 units. It is likely that the short-term accommodation and rental markets in the Social Locality would be able to cater for the additional non-local workforce during the initial construction phase. Notwithstanding, the increased demand may contribute to localised and short-term rent increases, depending on where the demand eventuates and whether other projects in the region contribute to cumulative pressures (Appendix I).

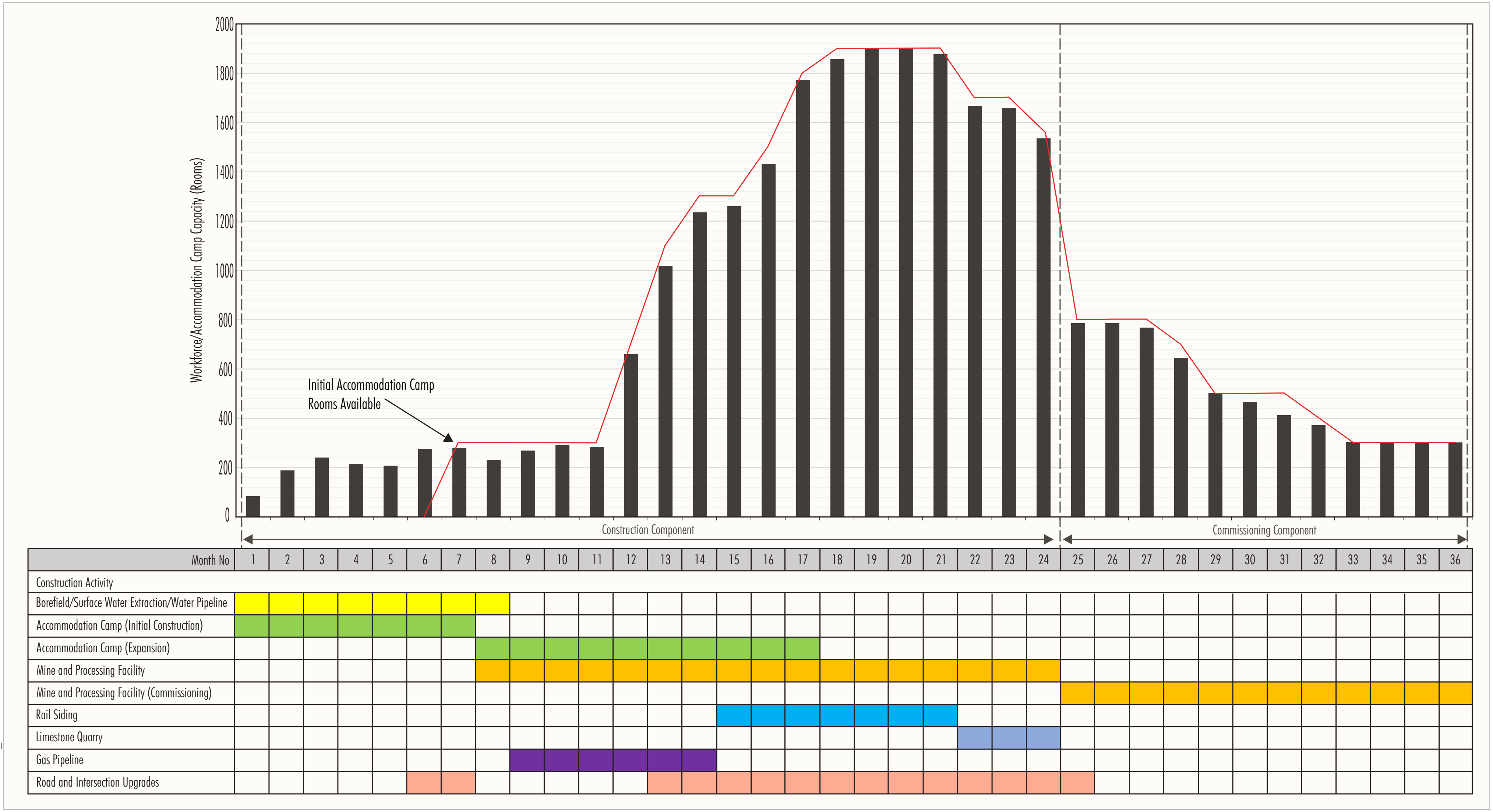
Pressure on Local Housing Markets After Accommodation Camp Commissioning

Once the accommodation camp is operational, the majority of non-local personnel would reside in the accommodation camp and the remaining personnel would be local residents already residing in the region. The Modification is therefore not expected to impact the local housing market for the remainder of the construction phase (Appendix I).

Notwithstanding, it is possible that the Modification would give rise to some additional indirect or induced demand for housing, however this is likely to be small (Appendix I).

Demand for Health, Schooling and Other Services

Consultation with LSC, PSC and FSC revealed some concern about the potential for impacts to existing services and facilities including health and social facilities (Appendix I).



CTL-20-08 MOD 7 _003C

LEGEND

Accommodation Camp Capacity

Indicative Project Construction Workforce

Source: Clean TeQ (2021)

S U N R I S E   P R O J E C T

Indicative Modified Construction Workforce and Construction Timing

Figure 27

The Community Infrastructure Assessment (Martin & Associates Pty Ltd, 2000) considered that existing services and facilities, including health services and schools would be able to mostly absorb additional demand induced by the construction workforce and accompanying families. SPSP (2021) concluded that the additional student demand brought about by the incremental change in the construction workforce for the Modification is expected to be negligible (Appendix I).

As the majority of the modified construction workforce is expected to reside in the accommodation camp, with the remaining personnel being local residents already residing in the region, there is expected to be negligible demand for schooling and other services (Appendix I).

Road Traffic Related Impacts

Consultation with LSC, PSC and FSC and an analysis of submissions on previous modifications suggest traffic related impacts are of concern to the community, particularly in Trundle.

The Modification would change traffic volumes stemming from the increased construction workforce requirements and to deliver construction equipment, materials, components and consumables. Workforce traffic which is likely to predominantly comprise buses, would mostly originate from Parkes (including the Parkes airport), Condobolin and Forbes.

Construction phase daily traffic movements would significantly reduce, principally due to the introduction of shuttle buses to transport the Project construction workforce between surrounding towns and the mine and processing facility (Appendix D).

The potential changes to traffic movements were considered to have a low impact on people's way of life and health and wellbeing (Appendix I).

Operational Phase

Potential social impacts associated with the operational phase of the modified Project would be associated with:

- the increase in the workforce from approximately 335 personnel to approximately 340 personnel (the rail siding workforce would increase from five to 10 personnel);
- changes to amenity impacts at the mine and processing facility and rail siding; and
- changes to Project traffic movements.

SPSP (2021) concluded that the relatively minor change in the operational workforce (approximately 1%) would not significantly change the approved employment and business opportunities; pressure on local housing markets; and the demand for schooling and other services and facilities.

The Modification would not significantly change the Project-related daily vehicle movements during the operations phase with the exception of increases in the vicinity of the modified rail siding (Appendix D).

The potential changes to amenity impacts and traffic movements were considered to have a low impact on people's way of life and health and wellbeing (Appendix I).

Cumulative Impacts

The potential cumulative social impacts of the modified Project with "relevant" projects as defined in the draft *Assessing Cumulative Impacts Guide Guidance for State Significant Projects* (DPIE, 2020b) (Section 2.3) were considered by SPSP (Appendix I).

SPSP found that the risk of cumulative social impacts of the Modification, in conjunction with other "relevant" projects, is considered manageable, due to the small scale of the other projects and their distance from the Project (Appendix I).

6.13.3 Mitigation Measures, Management and Monitoring

The existing social impact mitigation measures committed to by SEM (Section 6.13.1) are generally considered to be sufficient to address the potential social impacts associated with the Modification, with the following additions (SPSP, 2021):

- increasing the size of the construction workforce accommodation camp to accommodate all non-residential construction workers;
- mitigation upon request rights for one property in accordance with the VLAMP (NSW Government, 2018) to reduce noise levels at the residence (e.g. mechanical ventilation, upgraded façade elements or roof insulation); and
- providing construction workforce transport (i.e. buses) from towns in the Social Locality to minimise workforce-related road traffic.

6.14 ECONOMIC EFFECTS

6.14.1 Background

The approved Project will provide employment opportunities for up to 1,000 personnel during the two year construction phase and 300 personnel during the 21 year operational phase.

SEM will use local suppliers preferentially where local suppliers can be cost and quality competitive with other potential suppliers.

SEM will pay substantial taxes to the Commonwealth Government, royalties and other taxes to the NSW Government, as well as annual community contributions to the LSC, PSC and FSC in accordance with the VPA (Section 1.1.3).

In addition to these benefits, the Project will give rise to incremental flow-on impacts on the NSW economy associated with additional disposable income and direct benefits to businesses and their employees associated with additional operating expenditures.

6.14.2 Impact Assessment Review

The Modification would include an increase in the peak construction phase workforce from approximately 1,000 personnel to approximately 1,900 personnel. In addition, the duration of the construction phase would increase from two to three years as part of the Modification (Section 3.2.3).

The Modification would therefore provide additional employment and business opportunities during the construction phase of the Project that would result in increased economic benefits (e.g. increased wages, business turnover) in the NSW economy.

The significant approved employment and business opportunities during the operations phase of the Project would be unchanged by the Modification.

6.14.3 Mitigation Measures, Management and Monitoring

Given that the Modification would result in positive economic impacts, no specific management measures are proposed as part of the Modification.

6.15 GREENHOUSE GAS EMISSIONS

An assessment of the potential greenhouse gas emissions of the modified Project has been prepared by Jacobs (2021) and is included in Appendix A.

6.15.1 Quantitative Assessment of Potential Greenhouse Gas Emissions

Greenhouse Gas Protocol

The Greenhouse Gas Protocol (GHG Protocol) contains methodologies for assessing and calculating greenhouse gas emissions (World Business Council for Sustainable Development [WBCSD] and World Resources Institute [WRI], 2015). The GHG Protocol provides standards and guidance for companies and other types of organisations preparing a greenhouse gas emissions inventory. It covers the accounting and reporting of the six greenhouse gases covered by the Kyoto Protocol.

Under the GHG Protocol the establishment of operational boundaries involves identifying emissions associated with an entity's operations, categorising them as direct or indirect emissions, and identifying the scope of accounting and reporting for indirect emissions.

Three “Scopes” of emissions (Scope 1, Scope 2 and Scope 3) are defined for greenhouse gas accounting and reporting purposes. Scopes 1 and 2 have been carefully defined to ensure that two or more entities would not account for emissions in the same Scope.

Scope 1: Direct Greenhouse Gas Emissions

Direct greenhouse gas emissions (Scope 1) are defined as those emissions that occur from sources that are owned or controlled by the entity (WBCSD and WRI, 2015). Scope 1 emissions are those emissions that are principally the result of the following types of activities undertaken by an entity and include:

- Generation of electricity, heat or steam – these emissions result from combustion of fuels in stationary sources (e.g. boilers, furnaces and turbines).
- Physical or chemical processing – most of these emissions result from manufacture or processing of chemicals and materials (e.g. the manufacture of cement, aluminium, adipic acid and ammonia, or waste processing).

- Transportation of materials, products, waste, and employees – these emissions result from the combustion of fuels in entity owned/controlled mobile combustion sources (e.g. trucks, trains, ships, aeroplanes, buses and cars).
- Fugitive emissions – these emissions result from intentional or unintentional releases (e.g. equipment leaks from joints, seals, packing, and gaskets; methane emissions from coal mines and venting; hydrofluorocarbons emissions during the use of refrigeration and air conditioning equipment; and methane leakages from gas transport) (WBCSD and WRI, 2015).

Scope 2: Electricity Indirect Greenhouse Gas Emissions

Scope 2 emissions are a category of indirect emissions that accounts for greenhouse gas emissions from the generation of purchased electricity consumed by an entity.

Purchased electricity is defined as electricity that is purchased or otherwise brought into the organisational boundary of the entity (WBCSD and WRI, 2015). Scope 2 emissions physically occur at the facility where electricity is generated (WBCSD and WRI, 2015). Entities report the emissions from the generation of purchased electricity that is consumed in its owned or controlled equipment or operations as Scope 2.

Scope 3: Other Indirect Greenhouse Gas Emissions

Under the GHG Protocol, Scope 3 is an optional reporting category that allows for the treatment of all other indirect emissions.

Scope 3 emissions are defined as those emissions that are a consequence of the activities of an entity, but which arise from sources not owned or controlled by that entity. Examples of Scope 3 activities provided in the GHG Protocol are extraction and production of purchased materials, transportation of purchased fuels, and use of sold products and services (WBCSD and WRI, 2015).

The GHG Protocol notes that reporting Scope 3 emissions can result in double counting of emissions (e.g. when compiling national inventories) and can also make comparisons between organisations and/or projects difficult because reporting is voluntary.

Greenhouse Gas Estimation Methodology

Direct and indirect greenhouse gas emissions of the modified Project have been estimated by Jacobs (Appendix A) using emission factors from a range of sources including:

- *National Greenhouse Accounts Factors* (NGAF) (Department of Industry, Science, Energy and Resources [DISER], 2020);
- *National Greenhouse Gas Inventory – Paris Agreement Inventory* (DISER, 2021);
- *Freighting goods / freight train* (Department for Environment, Food and Rural Affairs, 2019); and
- estimates from Ramboll Environ (2017).

The NGAF (DISER, 2020) provide greenhouse gas emission factors for carbon dioxide (CO_2), methane and nitrous oxide.

Emission factors are standardised for each of these greenhouse gases by being expressed as a carbon dioxide equivalent (CO_2-e) based on their Global Warming Potential. This is determined by the differing periods that greenhouse gases remain in the atmosphere and their relative effectiveness in absorbing outgoing infrared radiation (DISER, 2020).

Modified Project Greenhouse Gas Emissions

Key potential direct and indirect greenhouse gas emission sources of the modified mine and processing facility (including key transport activities) have been considered in the greenhouse gas emission estimates and their respective scopes include (Appendix A):

- combustion of diesel fuel usage from mobile mining equipment (Scopes 1 and 3);
- combustion of diesel fuel usage from the processing facility (Scope 1);
- emissions from the use of explosives (Scope 1); and
- emissions associated with the transport of product (Scope 3).

As no electricity would be imported to the mine and processing facility from off-site, there would be no Scope 2 emissions.

Power for the mine and processing facility would be provided by a power plant and a diesel-powered backup generator. The steam for the power plant is approved to be generated through heat recovery from the sulphuric acid plant or steam generated by gas. Steam generation would also be supported by auxiliary diesel boilers.

As per the approved Project, if the heat recovery from the sulphuric acid plant supported by the auxiliary diesel boiler is able to meet the power requirements of the mine and processing facility, there would be no need for the external gas supply.

As no electricity would be imported to the mine and processing facility from off-site, there would be no Scope 2 emissions.

It has conservatively been assumed that auxiliary diesel boiler and diesel generators (rather than gas) will be required to power the mine and processing facility as this would represent the maximum case scenario (Appendix A).

The modified mine and processing facility would result in the following greenhouse gas emissions over the life of the Project (Appendix A):

- Scope 1 emissions – 6.68 Mt of CO_2-e.
- Scope 2 emissions – 0 Mt CO_2-e.
- Scope 3 emissions – 0.09 Mt CO_2-e.

The greenhouse gas emissions from the modified rail siding would not significantly change relative to the approved rail siding.

6.15.2 Mitigation Measures, Management and Monitoring

The modified Project would use various mitigation measures to minimise the overall generation of greenhouse gas emissions to the greatest extent practicable.

The mitigation measures to reduce the level of future greenhouse gas emissions from the Project include (Clean TeQ, 2019d):

- minimising the re-handling of material;
- maintaining the mobile fleet in good operating order; and
- optimising the design of roads to minimise the distance travelled between working areas.

Greenhouse gas emissions from the Project would be tracked and reported each year in the Annual Review, prepared in accordance with Condition 5, Schedule 5 of Development Consent (DA 374-11-00), and through the National Greenhouse and Energy Reporting Scheme, if the relevant reporting thresholds are met.

7 EVALUATION OF MERITS

SEM has continued to review and optimise the Project design, construction and operation as part of preparations for Project execution. The outcomes of this review are outlined in the Project Execution Plan (Clean TeQ, 2020b).

The Project Execution Plan (Clean TeQ, 2020b) identified a number of changes to the approved mine and processing facility, accommodation camp, rail siding and road transport activities.

SEM proposes to modify Development Consent (DA 374-11-00) to incorporate these Project Execution Plan changes to allow for the optimisation of the construction and operation of the Project.

7.1 STAKEHOLDER ENGAGEMENT OVERVIEW

SEM has consulted with a number of stakeholders during the development of the Modification, including:

- DPIE;
- other relevant NSW Government agencies;
- LSC, PSC and FSC;
- relevant infrastructure owners and service providers;
- neighbouring tenement holders;
- Aboriginal stakeholders;
- CCC; and
- the local community.

The outcomes of engagement with these stakeholders have informed the development of the scope of the Modification and SEM's preparation of the Modification Report.

7.2 SUITABILITY OF THE SITE

The Modification would involve changes to the approved mine and processing facility, accommodation camp, rail siding and road transport activities (Section 3).

The Modification would allow for the efficient and economic recovery of the approved mineral resources within ML 1770.

Existing land uses in the vicinity of the mine and processing facility and accommodation camp are characterised by a combination of agricultural enterprises (grazing and dryland cropping), carbon offset properties and forestry operations (Fifield State Forest).

Existing land uses in the vicinity of the modified rail siding are characterised by a combination of agricultural enterprises (grazing and dryland cropping), roads and the Bogan Gate Tottenham Railway. The Bogan Gate Tottenham Railway provides access to the Port of Newcastle, Port Botany and Port Kembla.

SEM owns or holds relevant access agreements to the mine and processing facility, accommodation camp and modified rail siding sites.

The Modification components are considered to be compatible with existing and future land uses in the vicinity of the Project.

SEM would implement a range of measures to avoid or minimise incompatibility of the modified Project with existing and future land uses in the area. This would be achieved through the implementation of the existing Environmental Management Strategy (Clean TeQ, 2019a), with updates to the relevant environmental management plans listed in Section 1.1.2.

Further, the rehabilitation strategy for the modified Project would include post-mining land uses that would be consistent with surrounding existing land uses (i.e. a combination of agriculture [pasture for grazing] and endemic woodland areas) (Section 3.2.10).

7.3 CONSOLIDATED SUMMARY OF IMPACTS

SEM will operate in accordance with its approved environmental management plans and environmental monitoring programs (Section 1.1.2).

SEM has undertaken a review of the potential environmental impacts of the Modification to identify key potential environmental aspects requiring assessment. The key environmental aspects identified are summarised in Table 24.

Table 24
Key Outcomes of Environmental Review of the Modified Project

Environmental Aspect	Summary of Key Environmental Review Conclusions
Air Quality	• Compliance with the relevant air quality criteria is predicted at privately-owned sensitive receivers surrounding the modified mine and processing facility and rail siding.
Noise	• Two "moderate" exceedances and five "negligible" exceedances are predicted at privately-owned sensitive receivers in the vicinity of the mine and processing facility with the implementation of reasonable and feasible mitigation measures. • The privately owned dwellings with a "moderate" exceedance would be afforded noise mitigation measures upon request rights in accordance with the VLAMP. • Compliance with the relevant noise criteria is predicted at the modified rail siding.
Surface Water	• The water balance modelling demonstrates that the modified site water management system has sufficient capacity and flexibility to accommodate a wide range of climate scenarios. • No overflows are predicted from the tailings storage facility, decant transfer pond, evaporation pond, mine water dams or processing plant runoff dams over the Project life. • The predicted average and maximum annual off-site water requirements for the Project would not significantly change. • Potential surface water impacts associated with the Modification are not considered to be significant.
Groundwater	• No significant change to approved groundwater impacts are predicted as a result of the Modification. • The Modification would have "minimal impact" as defined in the AIP.
Hazard and Risks	• The PHA concluded that the modified Project would comply with all relevant risk criteria (including societal risk, area cumulative risk, propagation risk, transport risk and environmental risk).
Road Transport	• Construction phase daily traffic movements would significantly reduce. • Operational phase daily traffic movements would not significantly change. • Construction and operational phase truck traffic in Trundle main street would reduce. • The road and intersection upgrades required by Development Consent (DA 374-11-00) and the VPA are appropriate for the modified Project with the addition of the extension of the approved Scotson Lane upgrade to the modified rail siding access and two additional vehicle site access points. • No significant impacts to road performance, capacity, efficiency or safety are expected as a result of the traffic associated with the Modification.
Biodiversity	• No increase to impacts on vegetation abundance, vegetation integrity, habitat suitability, threatened species abundance, habitat connectivity, threatened species movement, flight path integrity or hydrological processes that are known to sustain a threatened species or ecological community. • As there would be no increase in impacts on biodiversity values, a BDAR is not required.
Aboriginal Cultural Heritage	• No additional Aboriginal cultural heritage sites would be impacted by the Modification.
Historic Heritage	• No additional historic heritage sites would be impacted by the Modification.
Visual	• The Modification is not expected to significantly change the visual impacts associated with the mine and processing facility, accommodation camp and rail siding.
Social	• All identified social impacts associated with the Modification are evaluated as low significance, with the exception of two positive impacts rated as medium significance.
Economic Effects	• The Modification would provide additional employment opportunities during the construction phase of the Project that would result in increased economic benefits (e.g. increased wages, business turnover) in the NSW economy.
Greenhouse Gas Emissions	• The total greenhouse gases directly generated as a result of the modified Project (Scope 1 emissions) would be less than the approved Project.

7.4 JUSTIFICATION OF IMPACTS

Approval of the Modification is considered to be justified given:

- The Modification would allow for the optimisation of the construction and operation of the approved Project.
- The Modification would increase the peak construction phase workforce from approximately 1,000 personnel to approximately 1,900 personnel and the duration of the construction phase would increase from two to three years providing additional employment opportunities and economic benefits.
- The Modification would include the development of NSW mineral resources in a manner that minimises environmental impacts through the implementation of the Environmental Management Strategy (Section 1.1.2) and other measures (Section 6).

7.5 CONCLUSION

The modified Project would be substantially the same as the existing/approved Project.

In weighing up the main environmental impacts (costs and benefits) associated with the proposal as assessed and described in this Modification Report, the Modification is, on balance, considered to be in the public interest of the State of NSW.

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sunrise
energy metals

Sunrise Project

Project Execution Plan Modification

Attachment 1

Development Consent
(DA 374-11-00)

ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

INTEGRATED STATE SIGNIFICANT DEVELOPMENT

DETERMINATION OF DEVELOPMENT APPLICATION PURSUANT TO SECTIONS 76(A)9 & 80

I, the Minister for Urban Affairs and Planning, pursuant to Sections 76(A)9 & 80 of the Environmental Planning and Assessment Act, 1979 determine the development application ("the application") referred to in Schedule 1 by granting consent to the application subject to the conditions set out in Schedules 2 to 5.

The reasons for the imposition of the conditions are to:

(i) minimise the adverse impact the development may cause through water, noise and air pollution, and disturbance to archaeological sites, flora and fauna and the visual environment;

(ii) provide for environmental monitoring and reporting; and

(iii) set requirements for development infrastructure provision.

Andrew Refshauge MP

Minister for Urban Affairs and Planning,

SYDNEY, 2001 FILE NO.S98/01078

Red type represents December 2017 modification – MOD 5
Green type represents May 2018 modification – MOD 6
Blue type represents September 2018 modification – MOD 4

SCHEDULE 1

Applicant:	Clean TeQ Sunrise Pty Ltd
Consent Authority:	The Minister for Urban Affairs and Planning
Land:	See Appendix 1
Development:	Sunrise Mine Project

TABLE OF CONTENTS

DEFINITIONS

Accommodation Camp	Accommodation camp located on the land listed in Appendix 1 and shown in Appendix 2
Applicant	Clean TeQ Sunrise Pty Ltd, or any other person/s who rely on this consent to carry out the development that is subject to this consent
ARI	Average Recurrence Interval
BCA	Building Code of Australia
Borefields	The Borefields located on the land listed in Appendix 1 and shown in Appendix 2
CCC	Community Consultative Committee
Clean water	Water not in contact with mine water
Construction	All site activities associated with the development, including clearing, trenching, earthworks, road works, development of borrow pits and tailings dams; or the location of earthmoving plant or buildings (portable or fixed) onto the site
Conditions of this consent	Conditions contained in Schedules 2 to 5 inclusive
Councils	Lachlan Shire Council, Parkes Shire Council, Forbes Shire Council
Day	The period from 7.00 am to 6.00 pm on Monday to Saturday, and 8.00 am to 6.00 pm on Sundays and Public Holidays
Department	Department of Planning & Environment
Development	The development as described in the EIS and comprising the: • mine including mine processing facility; • mining operations; • limestone quarry including limestone processing facility; • quarrying operations; • rail siding; • borefields; • water pipeline; • gas pipeline; and • accommodation camp
DoI Lands & Water	The Department of Industry – Lands and Water
DPI	Department of Primary Industries
DSC	Dams Safety Committee
EIS	• Environmental Impact Statement prepared by Resource Strategies Pty Ltd dated October 2000 and supplemented by letters dated 3 December 2000 and 12 January 2001. • Statement of Environmental Effects prepared by Resource Strategies Pty Ltd dated May 2005. • Letter prepared by Ivanplats Syerston Pty Ltd dated 22 December 2005. • Environmental Assessment titled "Syerston Project Scandium Oxide Modification Environmental Assessment" dated May 2016 and Response to Submissions. • Letter prepared by Clean TeQ Holdings Limited dated 13 October 2017, and response to submissions dated 16 November 2017. • Environmental Assessment dated January 2018 and Response to Submissions dated 23 February 2018. • Letter prepared by Clean TeQ Holdings Limited dated 16 May 2018. • Environmental Assessment titled "Syerston Project Modification 4 Environmental Assessment" dated November 2017 and Response to Submissions dated February 2018. • Letter prepared by Clean TeQ Holdings Limited dated 29 June 2018.
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000*
EPA	Environment Protection Authority
EPL	Environment Protection Licence issued under the POEO Act
Evening	The period from 6.00 pm to 10.00 pm
Feasible	Feasible relates to engineering considerations and what is practical to build or to implement
Gas pipeline	The gas pipeline located on the land listed in Appendix 1 and shown in Appendix 2
Ha	Hectare
Heritage item	An item as defined under the *Heritage Act 1977* and/or an Aboriginal object

	or Aboriginal place as defined under the *National Parks and Wildlife Act 1974*
Incident	A set of circumstances that: a) causes or threatens to cause material harm to the environment; and/or b) breaches or exceeds the limits or performance measures/criteria in this consent
LAeq	Equivalent continuous sound pressure level with "A" weighted scale
Land	In general, the definition of land is consistent with the definition in the EP&A Act. However, in relation to acquisition it means the whole of a lot, or contiguous lots owned by the same landowner, in a current plan registered at the Land Titles Office at the date of this consent
Limestone processing facility	Infrastructure and plant associated with crushing operations for the preparation of limestone at the limestone quarry, exclusive of all quarrying activities
Limestone product	Limestone produced at the limestone quarry
Limestone quarry	Limestone quarry including the limestone processing facility, located on the land listed in Appendix 1 and shown in Appendix 2
Limestone quarry water	Water that accumulates within active quarrying and infrastructure areas
Material harm to the environment	Actual or potential harm to the health or safety of human beings or to ecosystems that is not trivial
Mine	The mine including the mine processing facility, located on the land listed in Appendix 1 and shown in Appendix 2
Mine processing facility	Infrastructure and plant associated with the processing of ore at the Mine, including: • processing plant; • electricity and steam co-generation plant; • the industrial gas plants; • sulphur storage; • sulphuric acid plant; • ~~hydrogen sulphide flare;~~ • scandium oxide plant; and • water treatment plant.
Mine water	Water that accumulates within active mining and infrastructure areas
Mining operations	Includes the removal of overburden and extraction, processing, handling, storage and transportation of ore
Minor	Not very large, important or serious
Mitigation	Activities associated with reducing the impacts of the development prior to or during those impacts occurring
Night	The period from 10pm each night to 7.00 am on Mondays to Saturdays and to 8.00 am on Sundays and Public Holidays
NP&W Act	*National Parks & Wildlife Act 1974*
OEH	Office of Environment and Heritage
POEO Act	*Protection of the Environment Operations Act 1997*
Power generation facilities	On-site electricity and steam co-generation plant and standby diesel generators
Preliminary Works	Site establishment and earthworks associated with the mine processing facility and gas pipeline including: • clearing and grubbing; • topsoil removal; • slope protection; • installation of drainage, culverts, and storm water retention; • establishment of temporary roads, power, water and fuelling facilities; and • construction of fencing and gates, laydown areas, subsurface utilities and contractor hardstands.
Privately-owned land	Land that is not owned or leased by a public agency, or a mining company (or its subsidiary)
Public infrastructure	Infrastructure that provides services to the general public, such as roads, railways, water supply, drainage, sewerage, gas supply, electricity, telephone, telecommunications, etc
Quarrying operations	The extraction, processing, stockpiling and transportation of limestone product and the associated removal of vegetation, topsoil and overburden
Rail siding	The rail siding located on the land listed in Appendix 1 and shown in Appendix 2
Reasonable	Reasonable relates to the application of judgement in arriving at a decision, taking into account: mitigation benefits, cost of mitigation versus benefits

	provided, community views and the nature and extent of potential improvements
Rehabilitation	The restoration of land disturbed by the development to a good condition to ensure it is safe, stable and non-polluting
RFS	Rural Fire Service
RMS	Roads and Maritime Services
Secretary	The Secretary of the Department, or nominee and/or delegate
Site	The land listed in Appendix 1
Transport route	Routes SR171, SR64, MR57 and SR34 between the rail siding and the mine, as shown in Appendix 2
TSP	Total Suspended Particulate
VPA	Voluntary Planning Agreement
Water pipeline	The water pipeline located on the land listed in Appendix 1 and shown in Appendix 2

SCHEDULE 2

ADMINISTRATIVE CONDITIONS

OBLIGATION TO MINIMISE HARM TO THE ENVIRONMENT

1. In addition to meeting the specific performance measures and criteria established under this consent, the Applicant must implement all reasonable and feasible measures to prevent and/or minimise any harm to the environment that may result from the construction, operation, or rehabilitation of the development.

TERMS OF CONSENT

2. The Applicant must carry out the development:
   (a) generally in accordance with the EIS; and
   (b) in accordance with the conditions of this consent.

   Note: The general layout of the development is shown in the figures in Appendix 2.

3. If there is any inconsistency between the documents referred to in condition 2 above, the most recent document must prevail to the extent of the inconsistency.

4. The Applicant must comply with any reasonable requirements of the Secretary arising from the Department's assessment of:
   (a) any strategies, plans, programs, reviews, audits, reports or correspondence that are submitted in accordance with this consent (including any stages of these documents);
   (b) any reports, reviews or audits commissioned by the Department regarding compliance with this consent; and
   (c) the implementation of any actions or measures contained in these documents.

LIMITS ON MINING OPERATIONS

Mining Operations

5. The Applicant may carry out mining operations at the mine for 21 years from the day upon which mining operations start.

Ore Processing

6. In any calendar year, the Applicant must not exceed an autoclave feed rate of 2.5 million tonnes of ore at the mine.

Off-site Product Transport

7. In any calendar year, the Applicant must not transport more than 180 tonnes of scandium oxide and 40,000 tonnes of nickel and cobalt metal equivalents (as sulphate precipitate products) and 100,000 tonnes of ammonium sulphate from the mine.

LIMITS ON QUARRYING OPERATIONS

Extraction

8. In any calendar year, the Applicant must not extract more than 790,000 tonnes of limestone from the limestone quarry.

Restriction on Use of Extracted Limestone

9. Limestone extracted from the limestone quarry may only be sent to the mine for use in mining operations, and may not be sold or used for any other purpose.

NOTIFICATION OF DEPARTMENT

10. The Applicant must notify the Department and the relevant Councils in writing of the day upon which the:
    (a) development of the mine starts;
    (b) commissioning of the mine processing facility starts;
    (c) development of the limestone quarry starts;
    (d) development of the gas pipeline starts;
    (e) commissioning of the gas pipeline starts;
    (f) commissioning of the borefields starts;

(g) development of the water pipeline starts;
(h) commissioning of the water pipeline starts;
(i) development of the rail siding starts;
(j) rail siding operations start;
(k) road or intersection upgrades start;
(l) road or intersection upgrades are completed; and
(m) development of the accommodation camp starts;
(n) commissioning of the accommodation camp starts; and
(o) accommodation camp capacity is reduced.

11. If the carrying out of the development is to be staged, then the Applicant must notify the Department and relevant Councils in writing prior to the commencement of the relevant stage, and clearly identify the development that would be carried out in the relevant stage.

UPDATING & STAGING OF STRATEGIES, PLANS OR PROGRAMS

12. With the approval of the Secretary, the Applicant may submit any strategy, plan or program required by this consent on a progressive basis.

    To ensure these strategies, plans or programs are updated on a regular basis, the Applicant may at any time submit revised strategies, plans or programs to the Secretary for approval.

    With the agreement of the Secretary, the Applicant may prepare any revised strategy, plan or program without undertaking consultation with all the parties referred to under the relevant condition of this consent.

    Notes:
    - *While any strategy, plan or program may be submitted on a progressive basis, the Applicant must ensure that all development being carried out on site is covered by suitable strategies, plans or programs at all times.*
    - *If the submission of any strategy, plan or program is to be staged, then the relevant strategy, plan or program must clearly describe the specific stage to which the strategy, plan or program applies, the relationship of this stage to any future stages, and the trigger for updating the strategy, plan or program.*

STRUCTURAL ADEQUACY

Building and Structures

13. The Applicant must ensure that all new buildings and structures, and any alterations or additions to existing buildings and structures, are constructed in accordance with the relevant requirements of the BCA.

    Notes:
    - *Under Part 6 of the EP&A Act, the Applicant is required to obtain construction and occupation certificates for the proposed building works.*
    - *Part 8 of the EP&A Regulation sets out the requirements for the certification of the development.*

Pipeline Construction and Operation

14. The Applicant must design and construct the gas pipeline in accordance with the relevant Australian Standards, in particular *AS2885 Pipelines – Gas and Liquid Petroleum*, or its latest version.

    Note: All utility crossings of Henry Parkes Way require concurrence from RMS in accordance with Section 138(2) of the Roads Act 1993*.*

DEMOLITION

15. The Applicant must ensure that all demolition work is carried out in accordance with *Australian Standard AS 2601-2001: The Demolition of Structures*, or its latest version.

OPERATION OF PLANT AND EQUIPMENT

16. The Applicant must ensure that all plant and equipment used on site, or in connection with the development, is:
    (a) maintained in a proper and efficient condition; and
    (b) operated in a proper and efficient manner.

PLANNING AGREEMENTS

17. Prior to carrying out any development under this consent after 6 May 2017, unless otherwise agreed by the Secretary, the Applicant must enter into a VPA with each of the relevant Councils, consistent with the offers summarised in Appendix 3. The VPA must include the provision of funding for:
    (a) the road upgrades required for the development;

(b) ongoing road maintenance for the development; and
(c) community enhancement initiatives in the locality.

SCHEDULE 3

ENVIRONMENTAL PERFORMANCE CONDITIONS

NOISE

Hours of Construction/Operation

1. The Applicant must comply with the restrictions in Table 1, unless otherwise agreed by the Secretary.

Table 1: Restriction on Hours of Construction/Operation

Activity	Operating Hours
• Construction of the: - gas pipeline; - water pipeline and borefields; - rail siding; - accommodation camp; and - road upgrades • Construction materials haulage along the transport route	• 7 am to 6 pm, Monday to Sunday
• All quarrying operations (excluding truck loading on the limestone quarry site)	• 7 am to 5 pm, Monday to Sunday

Note: All other operations are permitted 24 hours per day, seven days per week.

Construction Noise

2. The Applicant must minimise the noise generated during construction of the development in accordance with the best practice requirements outlined in the *Interim Construction Noise Guideline (DECC, 2009),* or its latest version.

Operational Noise Criteria - Mine

3. The Applicant must ensure that the noise generated by development at the mine does not exceed the criteria in Table 2.

Table 2: Noise Criteria (dB(A)) – Mine

Location and Receiver ID	Day	Evening	Night	
	$L_{Aeq\ (15\ minute)}$	$L_{Aeq\ (15\ minute)}$	$L_{Aeq\ (15\ minute)}$	$L_{A1\ (1\ minute)}$
Currajong Park (M08 and M23)	37	37	37	45
Abandoned (M04) Glenburn (M10) Rosehill (M28) Slapdown (M29)	35	36	36	45
Brooklyn (M22)	36	35	35	45
Wanda Bye	35	37	37	45
All other privately-owned residences	35	35	35	45

Note: To identify the residences referred to in Table 2, see Appendix 4.

Noise Acquisition Criteria – Mine

3A. If the noise generated by the development at the mine causes sustained exceedances of the criteria in Table 2A at any residence on privately-owned land, then upon receiving a written request for acquisition from the landowner, the Applicant must acquire the land in accordance with the procedures in conditions 3-4 of Schedule 4.

Table 2A: Noise Acquisition Criteria (dB(A)) – Mine

Location	Day	Evening	Night
	$L_{Aeq\ (15\ minute)}$	$L_{Aeq\ (15\ minute)}$	$L_{Aeq\ (15\ minute)}$
All privately-owned residences	40	40	40

Note: To identify the residences referred to in Table 2A, see Appendix 4.

Operational Noise Criteria – Limestone Quarry

4. The Applicant must ensure that the noise generated by development at the limestone quarry does not exceed the criteria in Table 3.

Table 3: Noise Criteria (dB(A)) – Limestone Quarry

Location	Day	Evening	Night	
	$L_{Aeq\ (15\ minute)}$	$L_{Aeq\ (15\ minute)}$	$L_{Aeq\ (15\ minute)}$	$L_{A1\ (1\ minute)}$
Moorelands	42	35	35	45
Lesbina Eastbourne	38	35	35	45
Gillenbine	37	35	35	45
All other privately-owned residences	35	35	35	45

Note: To identify the residences referred to in Table 3, see Appendix 4.

Operational Noise Criteria – Rail Siding

5. The Applicant must ensure that the noise emissions from the development at the rail siding do not exceed the noise limits in Table 4.

Table 4: Noise Criteria (dB(A)) – Rail Siding

Location	Day	Evening	Night	
	$L_{Aeq\ (15\ minute)}$	$L_{Aeq\ (15\ minute)}$	$L_{Aeq\ (15\ minute)}$	$L_{A1\ (1\ minute)}$
Glen Rock Ballanrae Spring Park	37	35	35	45
All other privately-owned residences	35	35	35	45

Note: To identify the residences referred to in Table 4, see Appendix 4.

Noise Management Requirements

6. Noise generated by the development is to be measured in accordance with the relevant requirements of the *NSW Industrial Noise Policy* (EPA, 1999), or its latest version. Appendix 4 sets out the meteorological conditions under which the criteria in conditions 3 – 5 above apply, and the requirements for evaluating compliance with these criteria.

Noise Agreements

7. However, the noise criteria in conditions 3 – 5 above do not apply if the Applicant has an agreement with the owner/s or leaseholders of the residence to generate higher noise levels, and the Applicant has advised the Department in writing of the terms of this agreement.

Operating Conditions

8. The Applicant must:
   (a) minimise the noise impacts of the development during meteorological conditions under which the noise limits in this consent do not apply; and
   (b) undertake regular attended monitoring of the noise of the development, to ensure compliance with the relevant conditions of this consent.

Noise Management Plan

9. Prior to carrying out any development under this consent after 6 May 2017, the Applicant must prepare a Noise Management Plan for the development to the satisfaction of the Secretary. This plan must:
   (a) be prepared in consultation with the EPA;
   (b) include management of construction, traffic and operational noise;
   (c) describe the measures that would be implemented to ensure compliance with the noise criteria and operating conditions of this consent, including measures to reduce noise emissions from the mine during night time operations under adverse meteorological conditions;
   (d) include a noise monitoring program for evaluating and reporting on:
      - compliance against the noise criteria in this consent;
      - compliance against the noise operating conditions; and
   (e) defines what constitutes a noise incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any noise incidents.

10. The Applicant must implement the approved Noise Management Plan for the development.

BLASTING

11. Deleted.

Blasting Criteria

12. The Applicant must ensure that blasting at the mine or limestone quarry does not cause exceedances of the criteria in Table 5.

Table 5: Blasting Criteria (dB(A))

Location	Airblast overpressure (db(lin peak))	Ground vibration (mm/s)	Allowable exceedance
Residence on privately-owned land	120	10	0%
	115	5	5% of total blasts over any 12 month period

13. However, these criteria do not apply if the Applicant has a written agreement with the relevant landowner, and has advised the Department in writing of the terms of this agreement.

Blasting Hours

14. The Applicant may only carry out blasting at the mine or limestone quarry between 9:00am and 5:00pm Monday to Saturday, inclusive. No blasting is allowed on Sundays, public holidays or at any other time without the written approval of the Secretary.

    This condition does not apply to blasts required to ensure the safety of the mine, its workers or the general public.

Operating Conditions

15. The Applicant must:
    (a) implement best management practice to:
    - protect the safety of people and livestock in the surrounding area;
    - protect public or private infrastructure/ property in the surrounding area from damage from blasting operations; and
    - minimise the dust and fume emissions from any blasting; and

    (b) monitor and report on compliance with the relevant blasting conditions in this consent,

    to the satisfaction of the Secretary.

Blast Management Plan

16. Prior to carrying out any blasting at the mine or limestone quarry, the Applicant must prepare a Blast Management Plan for the development to the satisfaction of the Secretary. This plan must:
    (a) describe the measures that would be implemented to ensure compliance with the blasting criteria and operating conditions of this consent;
    (b) propose and justify any alternative ground vibration limits for any public infrastructure in the vicinity of the site (if relevant); and
    (c) include a monitoring program for evaluating and reporting on compliance with the blasting criteria and operating conditions.

17. The Applicant must implement the approved Blast Management Plan for the development.

AIR QUALITY

Odour

18. The Applicant must ensure that no offensive odours are emitted from the development, as defined under the POEO Act.

Air Quality – Mine

19. The Applicant must ensure that gaseous emissions from the development at the mine comply with the requirements of any EPL or the relevant requirements of the *Protection of the Environment Operations (Clean Air) Regulation 2010* and the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (2016)* (or its latest version).

20. On submission of an application for an Environment Protection Licence, the Applicant must provide an air quality impact assessment to ensure the impacts of the proposal are appropriately assessed and demonstrate compliance with the relevant requirements of the *Protection of the Environment Operations (Clean Air) Regulation 2010*~~, to the satisfaction of the EPA~~.

Air Quality Criteria - Development

21. The Applicant must ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate matter emissions generated by the development do not cause exceedances of the criteria listed in Tables 6, 7 and 8 at any residence on privately owned land.

Table 6: Long term impact assessment criteria for particulate matter

Pollutant	Averaging period	d Criterion
TSP matter	Annual	a 90 µg/m³
Particulate matter < 10 µm (PM10)	Annual	a 25 µg/m³
Particulate matter < 2.5 µm (PM2.5)	Annual	a 8 µg/m³

Table 7: Short term impact assessment criterion for particulate matter

Pollutant	Averaging period	d Criterion
Particulate matter < 10 µm (PM10)	24 hour	a 50 µg/m³
Particulate matter < 2.5 µm (PM2.5)	24 hour	a 25 µg/m³

Table 8: Long term impact assessment criteria for deposited dust

Pollutant	Averaging period	Maximum increase in deposited dust level	Maximum total deposited dust level
c Deposited dust	Annual	b 2 g/m²/month	a 4 g/m²/month

Notes to Tables 6-8:

a. *Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources).*
b. *Incremental impact (i.e. incremental increase in concentrations due to the development on its own).*
c. *Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method.*
d. *Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents or any other activity agreed by the Secretary.*

Operating Conditions

22. The Applicant must:
    (a) minimise:
    - dust emissions from the development;
    - the surface disturbance of the development, including implementing interim rehabilitation strategies to stabilise areas prone to dust generation that cannot be permanently rehabilitated;
    - the greenhouse gas emissions of the development;

    (b) carry out any monitoring required by the EPA, and publish the results of this monitoring on its website.

Air Quality Management Plan

23. Prior to carrying out any development under this consent after 6 May 2017, unless otherwise agreed by the Secretary, the Applicant must prepare an Air Quality Management Plan for the development to the satisfaction of the Secretary. This plan must:
    (a) be prepared in consultation with the EPA;
    (b) outline the procedure for notifying property owners and occupiers likely to be affected by dust from the operations;
    (c) describe the measures that would be implemented to ensure compliance with the relevant air quality criteria and operating conditions of this consent;
    (d) include an air quality monitoring program that:
    - includes real-time monitoring;
    - supports proactive and reactive air quality management strategies;
    - includes monitoring of the sulphuric acid plant stack emissions, including continuous monitoring of in-stack pollutant concentrations;
    - includes key performance indicators;
    - evaluates and reports on:
      - baseline monitoring;
      - compliance against the air quality operating conditions;
      - compliance against the air quality criteria in this consent;
      - the effectiveness of the air quality management system; and
    - considers what real-time and/or regular reporting on air quality monitoring data would be useful to provide regularly on the Applicant's website;

(e) defines what constitutes an air quality incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any air quality incidents.

24. The Applicant must implement the approved Air Quality Management Plan for the development.

Air Quality Verification

24A. The Applicant must provide an Air Quality Verification Report to the satisfaction of the EPA, that confirms all sulphuric acid plant and power generation facility stack emission discharges will comply with the prescribed concentrations contained in the *Protection of the Environment Operations (Clean Air) Regulation 2010* and best practice emission concentrations.

Meteorological Monitoring

25. Prior to carrying out any development under this consent after 6 May 2017, the Applicant must ensure that there is a suitable meteorological station operating in the vicinity of the mine site that complies with the requirements in the *Approved Methods for Sampling of Air Pollutants in New South Wales* guideline. Once established, this meteorological station must operate for the remainder of the life of the development.

WATER

Water Supply

26. The Applicant must ensure that it has sufficient water for all stages of the development, and if necessary, adjust the scale of development on site to match its available water supply.

Note: Under the Water Act 1912 *and/or the* Water Management Act 2000*, the Applicant is required to obtain the necessary water licences for the development.*

Water Pollution

27. Unless an EPL authorises otherwise, the Applicant must comply with Section 120 of the POEO Act.

Compensatory Water Supply

28. The Applicant must provide a compensatory water supply to anyone whose basic landholder water rights (as defined in the *Water Management Act 2000*) are adversely and directly impacted as a result of the development. This supply must be provided in consultation with DoI Lands & Water, and to the satisfaction of the Secretary.

The compensatory water supply measures must provide an alternative long-term supply of water that is equivalent to the loss attributable to the development. Equivalent water supply must be provided (at least on an interim basis) as soon as possible after the loss is identified, unless otherwise agreed with the landowner.

If the Applicant and the landowner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Secretary for resolution.

If the Applicant is unable to provide an alternative long-term supply of water, then the Applicant must provide alternative compensation to the satisfaction of the Secretary.

Water Management Performance Measures

29. The Applicant must ensure the development on site complies with the performance measures in Table 9, to the satisfaction of the Secretary.

Table 9: Water Management Performance Measures

Feature	*Performance Measure*
Water management – General	• Maintain separation between clean and mine water management systems • Minimise the use of clean water on site
Construction and operation of infrastructure	• Design, install and maintain erosion and sediment controls generally in accordance with the series *Managing Urban Stormwater: Soils and Construction including Volume 1, Volume 2A – Installation of Services and Volume 2C – Unsealed Roads* • Design, install and maintain infrastructure within 40 m of watercourses generally in accordance with the *Guidelines for Controlled Activities on Waterfront Land (DPI 2012)*, or its latest version • Design, install and maintain any creek crossings generally in accordance

Feature	Performance Measure
	with the *Policy and Guidelines for Fish Habitat Conservation and Management (DPI, 2013)* and *Why Do Fish Need To Cross The Road? Fish Passage Requirements for Waterway Crossings (NSW Fisheries 2003)*, or their latest versions
Clean water diversion infrastructure	• Maximise the diversion of clean water around disturbed areas on site • Design, construct and maintain the clean water diversions to capture and convey the 100 year, peak flow rainfall event
Sediment dams (mine and limestone quarry)	• Design, install and/or maintain the dams generally in accordance with the series *Managing Urban Stormwater: Soils and Construction – Volume 1 and Volume 2E Mines and Quarries*
Mine and limestone quarry water storages	• Design, install and/or maintain mine and limestone water storage infrastructure to ensure no discharge of mine or limestone quarry water off-site (except in accordance with an EPL) • On-site storages (including mine infrastructure dams, groundwater storage and treatment dams) are suitably designed, installed and/or maintained to minimise permeability • Ensure that the floor and side walls of the Tailings Storage Facility, Evaporation Basin and Surge Dam are designed with a minimum of a 900 mm clay or modified soil liner with a permeability of no more than 1 x 10^{-9} m/s, or a synthetic (plastic) liner of 1.5 mm minimum thickness with a permeability of no more than 1 x 10^{-14} m/s (or equivalent) • Design, install and maintain a seepage interception system in the Tailings Storage Facility embankments in accordance with DSC guidelines • Design, install and maintain the water storages to capture and convey the 100 year, 72-hour ARI rainfall event • Design, install and/or maintain the facilities to meet the requirements of the DSC • The design of the Tailings Storage Facility should conform to: - DSC3A – Consequence Categories for Dams (DSC); and - DSC3F – Tailings Dams (DSC)
Chemical and hydrocarbon storage	• Chemical and hydrocarbon products to be stored in bunded areas in accordance with the relevant Australian Standards
Irrigation Area	• Manage the irrigation area in accordance with the EPA's *Environmental Guidelines: Use of Effluent by Irrigation*

Water Management Plan

30. Prior to carrying out any development after 6 May 2017, the Applicant must prepare a Water Management Plan for the development in consultation with DoI Lands & Water and the EPA, and to the satisfaction of the Secretary. This plan must include:

(a) a Water Balance that:
- includes details of:
  - sources and security of water supply, including contingency planning for future reporting periods;
  - water use and management on site;
  - measures to prioritise the use of water in the following order:
    - o recycled water from the water treatment plant;
    - o other on-site sources (in accordance with harvestable rights provisions); and
    - o water extracted from the borefields and Lachlan River;
  - reporting procedures, including the preparation of a site water balance for each calendar year; and
- describes the reasonable and feasible measures that would be implemented to minimise clean water use on site and maximise the reuse of recovered tailings water at the facility;

(b) a Surface Water Management Plan, that includes:
- baseline data on water flows and quality in the watercourses that could be affected by the development (if available);
- a detailed description of the water management system on-site, including the:
  - clean water diversion systems;
  - erosion and sediment controls; and
  - water storages; and
  - irrigation area;
- objectives and performance criteria, including trigger levels for investigating any potential or actual adverse impacts associated with the development, including the:
  - surface water flows and quality;
  - downstream flooding;

- a program to monitor and report on:
  - the effectiveness of the water management system and tailings storage facility; and
  - surface water flows and water quality;
  - the performance measures listed in Table 9;
  - impacts on water users;
  - downstream flooding;
- a plan to respond to any exceedances of the trigger levels and/or performance criteria, and minimise and/or offset any adverse surface water impacts of the development;

(c) a Groundwater Management Plan, that includes:
- baseline data on groundwater levels, yield and quality in the region and privately-owned groundwater bores that could be affected by the development in the vicinity of the borefields;
- groundwater assessment criteria, including trigger levels for investigating any potentially adverse groundwater impacts associated with the development in the vicinity of the borefields;
- a program to monitor and report on:
  - groundwater inflows into the open cut pits, if relevant;
  - the seepage/leachate from the tailings storage facility and evaporation ponds; and
  - the impacts of the development on:
    - o groundwater supply of any potentially affected landholders, particularly around the borefields;
    - o regional and local aquifers; and
    - o post-mining groundwater recovery;
- a plan to respond to any exceedances of the groundwater assessment criteria, and mitigate any adverse impacts of the development;

31. The Applicant must implement the approved Water Management Plan for the development.

BIODIVERSITY

Revegetation

32. For every 1 ha of native woodland vegetation cleared for the mine or limestone quarry, a minimum of 2 ha must be revegetated as native woodland.

Revegetation Strategy

33. Prior to carrying out any development under this consent after 6 May 2017, the Applicant must prepare a Revegetation Strategy for the development, in consultation with OEH, to the satisfaction of the Secretary. This strategy must:
(a) include updated estimates of the likely clearing of native vegetation required over the life of the development;
(b) identify areas on or off site that will be available for revegetation over the life of the development;
(c) propose a strategy for progressive rehabilitation and revegetation for the development and which reflects the requirements of condition 32 (for the mine and limestone quarry); and
(d) include a program to monitor and review the effectiveness of the strategy over the life of the development.

34. The Applicant must implement the approved Revegetation Strategy for the development.

Biodiversity Management Plan

35. Prior to carrying out any development under this consent after 6 May 2017, the Applicant must prepare a Biodiversity Management Plan for the development in consultation with OEH, and to the satisfaction of the Secretary. This plan must:
(a) describe the short, medium, and long term measures that would be implemented to:
- manage and enhance the quality of remnant vegetation and fauna habitat on site, with specific emphasis on the preservation of remnant Box woodland; and
- ensure that the Revegetation Strategy is effectively implemented over the life of the development;

(b) include detailed performance and completion criteria for evaluating the performance of the revegetation area identified in the approved Revegetation Strategy, and triggering remedial action (if necessary);
(c) include a detailed description of the measures that would be implemented for:
- protecting vegetation and fauna habitat outside the approved disturbance area on-site;
- enhancing the quality of existing vegetation and fauna habitat in the revegetation area identified in the approved Revegetation Strategy;
- minimising, clearing and avoiding unnecessary disturbance within the approved development footprint;
- recording the details of any vegetation clearing that is undertaken for the development;
- progressively rehabilitating and revegetating the site, particularly in temporary disturbance areas;
- maximising the salvage of resources within the approved disturbance area - including vegetative

- and soil resources – for beneficial reuse in the rehabilitation of the site;
- collecting and propagating seed;
- identifying and managing significant impacts on any threatened fauna species not identified in the EIS, (particularly the Yellow-bellied Sheathtail Bat, Little Pied Bat, Greater Long eared bat, Barking Owl, Pied Honey eater, Major Mitchell's Cockatoo and Superb Parrot);
- minimising the impacts on threatened fauna on site, including pre-clearance surveys (with an emphasis on tree hollows, stags and roosting bats);
- seasonally adjusting activities to minimise disturbance of potential breeding activities;
- minimising potential exposure to tailings;
- implementing a fauna rescue strategy (including provision of artificial roosts);
- controlling weeds and feral pests;
- managing bushfire risk;
- controlling erosion;

(d) include a seasonally-based program to monitor and report on the effectiveness of these measures;
(e) identify the potential risks to the successful implementation of the Biodiversity Management Plan, and include a description of the contingency measures that would be implemented to mitigate against these risks; and
(f) include details of who would be responsible for monitoring, reviewing, and implementing the plan.

36. The Applicant must implement the approved Biodiversity Management Plan for the development.

HERITAGE

Protection of Heritage Sites

37. Unless otherwise authorised under the NP&W Act, the Applicant must ensure that the development does not cause any direct or indirect impact on any Aboriginal heritage items located outside the approved disturbance area of the development.

38. Prior to any disturbance of the artefacts identified as Syerston 1 in the EIS, the Condobolin Local Aboriginal Council or the Wiradjuri Branch of the NSW Aboriginal Land Council must be invited to collect the artefacts.

39. The pastoral out station on the western boundary of the mine site (illustrated in Figure 5 in Appendix M of the EIS) should be retained if practical and feasible.

Heritage Management Plan

40. Prior to carrying out any development under this consent after 6 May 2017, the Applicant must prepare a Heritage Management Plan for the development to the satisfaction of the Secretary. This plan must:
(a) be prepared by a suitably qualified and experienced person(s) whose appointment has been endorsed by the Secretary;
(b) be prepared in consultation with OEH and the Condobolin Local Aboriginal Land Council, Wiradjuri Branch of the NSW Aboriginal Land Council (in relation to the management of Aboriginal heritage values);
(c) include a description of the measures that would be implemented for:
    - managing the discovery of any human remains or previously unidentified heritage objects on site; and
    - ensuring workers on-site receive suitable heritage inductions prior to carrying out works on the site, and that suitable records are kept of these inductions;
(d) include a description of the measures that would be implemented for:
    - protecting, monitoring and/ or managing Aboriginal heritage items on site, paying particular attention to the following sites as identified in the EIS:
        - Syerston 2 – open scatter and possible knapping floor;
        - Syerston 3 – isolated flake of brown/red vitreous volcanic material; and
        - Scarred tree beside the Fifield to Wilmatha Road;
    - implementing archaeological investigations and/ or salvage measures for Aboriginal heritage items on site;
    - maintaining and managing reasonable access for Aboriginal stakeholders to heritage items on site;
    - on-going consultation with the Aboriginal stakeholders in the conservation and management of Aboriginal cultural heritage on site; and
    - protecting Aboriginal sites and items outside the development disturbance area from the development; and
(e) include the following for the management of non-Aboriginal heritage:
    - a description of the measures that would be implemented for:
        - protecting, monitoring and/or managing heritage objects on site (particularly the pastoral out station referred to in condition 39 of this consent);
        - recording, prior to disturbance, any heritage areas or structures that will be impacted by the development, and making these records publicly available;

- managing the discovery of any previously unidentified heritage objects on site; and
- implementing archaeological investigations and/ or salvage measures for heritage items on site;

41. The Applicant must implement the approved Heritage Management Plan for the development.

TRANSPORT

42. Deleted.

Road Upgrade and Maintenance Strategy

43. Prior to carrying out any development under this consent after 6 May 2017, the Applicant must prepare a Road Upgrade and Maintenance Strategy for the development, in consultation with RMS and Council, and to the satisfaction of the Secretary. This strategy must:
    (a) identify the road and intersection upgrades required for the project, including all those outlined in Appendix 5; ~~and~~
    (b) include a program that details:
    - the scheduling of road upgrades required to be implemented in accordance with Appendix 5; and
    - the maintenance of the relevant sections of the road network following the upgrades; and

    (c) be consistent with the terms of the VPA outlined in Appendix 3.

44. The Applicant must implement the approved Road Upgrade and Maintenance Strategy for the development.

Traffic Management Plan

45. Prior to carrying out any development under this consent after 6 May 2017, the Applicant must prepare a Traffic Management Plan for the development in consultation with the relevant road authority, and to the satisfaction of the Secretary. This plan must include:
    (a) details of all transport routes and traffic types to be used for development-related traffic;
    (b) a program to monitor and report on the amount of metal sulphate precipitate, scandium oxide and ammonium sulphate transported from the mine;
    (c) a program to monitor and report on the amount of limestone transported from the limestone quarry and third party suppliers;
    (d) the measures that would be implemented to:
    - minimise traffic safety issues and disruption to local users of the transport route/s during construction and decommissioning of the development, including:
        - temporary traffic controls, including detours and signage;
        - notifying the local community about development-related traffic impacts; and
        - a traffic management system for managing over-dimensional vehicles;
    - operate shuttle bus services to transport employees to and from Parkes, Forbes and Condobolin to the mine; and
    - operate high capacity trucks to transport limestone and other materials and products to and from the mine;

    (e) a Road Transport Protocol for all drivers transporting materials to and from the site with measures to:
    - ensure drivers adhere to the designated transport routes, and prioritise use of national, state and regional roads over local roads;
    - verify that these heavy vehicles are completely covered whilst in transit;
    - co-ordinate the staggering of heavy vehicle departures to minimise impacts on the road network, where practicable;
    - minimise disruption to school bus timetables and rail services;
    - ensure travelling stock access and right of way to the adjacent travelling stock route;
    - maintain radio communications between all school buses and heavy vehicle operators operating on the transport route between the rail siding, limestone quarry or third party limestone quarries and the mine;
    - manage worker fatigue during trips to and from the site;
    - manage appropriate driver behaviour including adherence to speed limits, safe overtaking and maintaining appropriate distances between vehicles (i.e. a Driver Code of Conduct);
    - inform drivers of relevant drug and alcohol policies;
    - regularly inspect vehicles maintenance and safety records;
    - implement contingency procedures when the transport route is disrupted (e.g. flood events and other emergencies);
    - respond to emergencies;
    - transport processing reagents safely;
    - minimise disruption to community events and festivals, in consultation with event organisers;
    - implement reasonable and feasible measures to minimise amenity impacts to local communities, including minimising night time truck movements and compression braking in urban areas as far as practicable; and

- ensure compliance with and enforcement of the protocol.

46. The Applicant must implement the approved Traffic Management Plan for the development.

ACCOMMODATION CAMP

47. Prior to carrying out any development at the accommodation camp, unless otherwise agreed by the Secretary, the Applicant must prepare a final layout for the accommodation camp in consultation with Lachlan Shire Council, and to the satisfaction of the Secretary.

47A. Prior to reducing the capacity of the accommodation camp, unless otherwise agreed by the Secretary, the Applicant must prepare a reduced capacity accommodation camp layout in consultation with Lachlan Shire Council, and to the satisfaction of the Secretary.

VISUAL

Operating Conditions

48. The Applicant must:
   (a) implement all reasonable and feasible measures to minimise the visual and off-site lighting impacts of the development;
   (b) ensure that all external lighting associated with the development complies with *Australian Standard AS4282 (INT) 1995 - Control of Obtrusive Effects of Outdoor Lighting*, or its latest version;
   (c) take all practical measures to shield views of the development from users of public roads and privately-owned residences; and
   (d) ensure the visual appearance of all ancillary infrastructure (including paint colours, specifications and screening) blends in as far as possible with the surrounding landscape; and
   (e) establish the vegetation screens (shown in Figure 2 in Appendix 2) within 3 years of the commencement of any development on the mine site (unless otherwise agreed by the Secretary), and maintain these screens throughout the life of the development;

   to the satisfaction of the Secretary.

BUSHFIRE MANAGEMENT

49. The Applicant must:
   (a) ensure that the development:
      - provides for asset protection in accordance with the RFS's *Planning for Bushfire Protection 2006* (or equivalent); and
      - is suitably equipped to respond to any fires on site;
   (b) develop procedures to manage potential fires on site an in the vicinity of the site, in consultation with the RFS; and
   (c) assist the RFS and emergency services as much as possible if there is a fire in the vicinity of the site.

DANGEROUS GOODS

50. The Applicant must ensure that the storage, handling, use and transport of dangerous goods is done in accordance with:
   (a) the relevant Australian Standards, particularly AS1940 and AS1596;
   (b) the *Australian Code for the Transport of Dangerous Goods by Road and Rail*;
   (c) *Hazardous Industry Planning Advisory Paper No 11 'Route Selection'*; and
   (d) *Managing Risk of Hazardous Chemicals in the Workplace Code of Practice* (SafeWork NSW).

51. Bulk storage of hydrogen sulphide (H_2S) and sulphur dioxide (SO_2) is not permitted at the mine, other than to ensure process continuity in the event of a process upset, start-up or shut-down.

HAZARDS AND RISK

Pre-Construction Hazard Studies

52. Prior to commencement of construction of the mine processing facility and gas pipeline (except for preliminary works), the Applicant must prepare and submit for approval a:
   (a) Fire Safety Study for the mine processing facility and gas pipeline, covering all relevant aspects of the Department's publication *Hazardous Industry Planning Advisory paper No. 2, 'Fire Safety Study'* and the *New South Wales Government's Best Practice Guidelines for Contaminated Water Retention and Treatment Systems*.

(b) Final Hazard Analysis for the mine processing facility and gas pipeline, prepared by a suitably qualified and experienced person(s) approved by the Secretary, consistent with the Department's publication *Hazardous Industry Planning Advisory Paper No. 6 , 'Guidelines for Hazard Analysis'*. The Final Hazard Analysis must report on the implementation of the recommendation made by the Preliminary Hazard Assessment, within the EIS.

(c) Construction Safety Study for the mine processing facility and gas pipeline, prepared in accordance with *Hazardous Industry Planning Advisory Paper No. 7, 'Construction Safety Study Guidelines'*.

(d) Hazard and Operability Study for the mine processing facility and gas pipeline, to be conducted by a suitably qualified and experienced team and chaired by a suitably qualified and independent, whose appointments have been endorsed by the Secretary. The study shall be consistent with the Department's *Hazardous Industry Planning Advisory Paper No. 8, 'HAZOP Guidelines'*. The final report for the study must be accompanied by a program for the implementation of all recommendations made within the report. If the Applicant intends to defer the implementation of a recommendation, reasons must be documented

52A. Construction of the mine processing facility and gas pipeline must not commence until approval of the Pre-Construction Hazard Studies has been given by the Secretary.

Pre-Commissioning Hazard Studies

53. Prior to commissioning of the mine processing facility and gas pipeline, the Applicant must prepare and submit for approval:

(a) Transport of Hazardous Materials Study for the development, covering the transport of hazardous materials including details of routes to be used for the movement of vehicles carrying hazardous materials to or from the development. The Study must be carried out in accordance with the Department's publication *Hazardous Industry Planning Advisory Paper No. 11, 'Route Selection'*. Suitable routes identified in the Study must be used except where departures are necessary for local deliveries or emergencies.

(b) Emergency Plan for the development, prepared by suitably qualified person(s) approved by the Secretary. The Plan must be developed in consultation with the State Emergency Services, RFS, Fire & Rescue NSW and Lachlan Shire Council, and include detailed procedures for the development and include consideration of the safety of all people outside the development who may be at risk from the development. The Plan must be prepared in a manner that is consistent with the:

- Department's publication *Hazardous Industry Planning Advisory Paper No. 1, 'Industry Emergency Planning Guidelines'*, including the matters in Appendix 6 – Major Hazard Facilities;
- *Code of Practice for Emergency Planning at Mines* (NSW Resources Regulator); and
- *Work Health and Safety (Mines and Petroleum Sites) Act 2013* and Regulations;

(c) Safety Management System for the development, prepared in accordance with the Department's publication Hazardous Industry Planning Advisory Paper No. 9, 'Safety Management'. The System must cover all operations on-site and associated transport activities involving hazardous materials, and include hazardous chemicals as a Principal Mining Hazard. All safety-related procedures, responsibilities and policies, along with details of mechanisms for ensuring adherence to procedures, must be clearly specified in the System. Records must be kept on-site and must be available for inspection by the Secretary upon request.

53A. Commissioning of the mine processing facility and gas pipeline must not commence until approval of the Pre-Commissioning Hazard Studies has been given by the Secretary.

WASTE

54. The Applicant must:

(a) implement all reasonable and feasible measures to minimise the waste generated by the development;
(b) classify all waste in accordance with the EPA's *Waste Classification Guidelines 2014 (*or its latest version);
(c) store and handle all waste generated on site in accordance with its classification;
(d) not receive or dispose of any waste on site;
(e) ensure that waste is disposed of at appropriately licensed waste facilities; and
(f) manage on-site sewage treatment and disposal in accordance with the requirements of the relevant Councils and EPA.

REHABILITATION

Rehabilitation Objectives

55. The Applicant must rehabilitate the site to the satisfaction of the Secretary. This rehabilitation must be generally consistent with the proposed rehabilitation strategy described in the EIS, and comply with the objectives in Table 10.

Table 10: Rehabilitation Objectives

Feature	***Objective***
Site (as a whole)	• Safe, stable & non-polluting • Materials (including topsoils, substrates and seeds of the disturbed areas) are recovered, appropriately managed and used effectively as resources in the rehabilitation of the site • Final landforms to: - restore native vegetation communities and ecosystem function (in the applicable domains); - sustain the intended land use for the post-mining domains; - minimise visual impacts - be generally in keeping with the natural terrain features of the area; - incorporate micro-relief • incorporate drainage lines consistent with topography and natural drainage where reasonable and feasible
Final voids	• Minimise: - the size and depth of the final void/s - the drainage catchment of the final voids - risk of flood interaction for all flood events up to and including a 1 in 100 year or 1% annual exceedance probability storm event
Surface infrastructure	• To be decommissioned and removed, unless agreed otherwise by the Secretary
Agriculture	• Agriculture (pasture for grazing) land use areas are established and self-sustaining within a reasonable timeframe
Community	• Ensure public safety • Minimise the adverse socio-economic effects of mine closure

Progressive Rehabilitation

56. The Applicant must rehabilitate the site progressively, that is, as soon as is practicable following disturbance, to the satisfaction of the Secretary Industry.

Rehabilitation Management Plan

57. Prior to carrying out any development under this consent after 6 May 2017, the Applicant must prepare a Rehabilitation Management Plan for the development to the satisfaction of the Secretary. This plan must:
    (a) be prepared in consultation with the Department, OEH, DPI and relevant Councils;
    (b) be prepared in accordance with relevant guidelines and consistent with the rehabilitation objectives in the EIS and in Table 10;
    (c) include detailed performance and completion criteria for evaluating the performance of the rehabilitation of the site, and triggering remedial action (if necessary);
    (d) describe the measures that would be implemented to ensure compliance with the relevant conditions of this consent, and address all aspects of rehabilitation including timeframes for achieving specified rehabilitation objectives;
    (e) review the final land use options, including the use of void water at the mine and limestone quarry;
    (f) include a mine closure strategy that details measures to minimise the long term impacts associated with mine closure, including final landform and the final voids, final land use and socio-economic issues;
    (g) include interim rehabilitation where necessary to minimise the area exposed for dust generation;
    (h) include a strategy for the preparation of the site for habitat rehabilitation as part of the revegetation program, including the exclusion of stock feeding on bushland reconstruction areas;
    (i) include a program to monitor, independently audit and report on the effectiveness of the measures, and progress against the detailed performance and completion criteria; and
    (j) build to the maximum extent practicable on the other management plans required under this consent.

58. The Applicant must implement the approved Rehabilitation Management Plan for the development.

SCHEDULE 4

ADDITIONAL PROCEDURES

NOTIFICATION OF LANDOWNERS/ TENANTS

1. As soon as practicable after obtaining monitoring results showing an exceedance of any relevant criteria in Schedule 3, the Applicant must notify affected landowners in writing of the exceedance, and provide regular monitoring results to each affected landowner until the development is again complying with the relevant criteria.

INDEPENDENT REVIEW

2. If an owner of privately-owned land considers the development to be exceeding the relevant criteria in schedule 3, then he/she may ask the Secretary in writing for an independent review of the impacts of the development on his/her land.

   If the Secretary is satisfied that an independent review is warranted, then within 2 months of the Secretary's decision the Applicant must:
   (a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Secretary, to:
      - consult with the landowner to determine his/her concerns;
      - conduct monitoring to determine whether the development is complying with the relevant criteria in schedule 3; and
      - if the development is not complying with these criteria, then identify the measures that could be implemented to ensure compliance with the relevant criteria; and

   (b) give the Secretary and landowner a copy of the independent review.

   Note: Where the independent review finds that the development is not complying with applicable criteria, the Department may take enforcement action under the EP&A Act to ensure compliance with the consent.

LAND ACQUISITION

3. Within 3 months of receiving a written request from a landowner with acquisition rights, the Applicant must make a binding written offer to the landowner based on:
   (a) the current market value of the landowner's interest in the land at the date of this written request, as if the land was unaffected by the development, having regard to the:
      - existing and permissible use of the land, in accordance with the applicable planning instruments at the date of the written request; and
      - presence of improvements on the land and/or any approved building or structure which has been physically commenced at the date of the landowner's written request, and is due to be completed subsequent to that date;

   (b) the reasonable costs associated with:
      - relocating within the Lachlan Shire Council Council, Forbes Shire Council or Parkes Shire Council local government areas, or to any other local government area determined by the Secretary; and
      - obtaining legal advice and expert advice for determining the acquisition price of the land, and the terms upon which it is to be acquired; and

   (c) reasonable compensation for any disturbance caused by the land acquisition process.

   However, if at the end of this period, the Applicant and landowner cannot agree on the acquisition price of the land and/or the terms upon which the land is to be acquired, then either party may refer the matter to the Secretary for resolution.

   Upon receiving such a request, the Secretary will request the President of the NSW Division of the Australian Property Institute to appoint a qualified independent valuer to:
   - consider submissions from both parties;
   - determine a fair and reasonable acquisition price for the land and/or the terms upon which the land is to be acquired, having regard to the matters referred to in paragraphs (a)-(c) above;
   - prepare a detailed report setting out the reasons for any determination; and
   - provide a copy of the report to both parties.

   Within 14 days of receiving the independent valuer's report, the Applicant must make a binding written offer to the landowner to purchase the land at a price not less than the independent valuer's determination.

   However, if either party disputes the independent valuer's determination, then within 14 days of receiving the independent valuer's report, they may refer the matter to the Secretary for review. Any request for a review must be accompanied by a detailed report setting out the reasons why the party disputes the independent valuer's determination.

Following consultation with the independent valuer and both parties, the Secretary will determine a fair and reasonable acquisition price for the land, having regard to the matters referred to in paragraphs (a)-(c) above, the independent valuer's report, the detailed report of the party that disputes the independent valuer's determination and any other relevant submissions.

Within 14 days of this determination, the Applicant must make a binding written offer to the landowner to purchase the land at a price not less than the Secretary's determination.

If the landowner refuses to accept the Applicant's binding written offer under this condition within 6 months of the offer being made, unless the Secretary determines otherwise, then the Applicant's obligations to acquire the land shall cease.

4. The Applicant must pay all reasonable costs associated with the land acquisition process described in condition 4 above, including the costs associated with obtaining Council approval for any plan of subdivision (where permissible), and registration of this plan at the Office of the Registrar-General.

SCHEDULE 5

ENVIRONMENTAL MANAGEMENT, REPORTING AND AUDITING

ENVIRONMENTAL MANAGEMENT

Environmental Management Strategy

1. Prior to carrying out any development under this consent after 6 May 2017, the Applicant must prepare an Environmental Management Strategy for the development in consultation with the relevant authorities and the CCC and to the satisfaction of the Secretary. This strategy must:
   (a) provide the strategic framework for environmental management of the development;
   (b) identify the statutory approvals that apply to the development;
   (c) describe the role, responsibility, authority and accountability of all key personnel involved in the environmental management of the development;
   (d) include overall ecological and community objectives for the development, and a strategy for the restoration and management of the areas affected by operations, including elements such as creek lines and drainage channels, within the context of those objectives;
   (e) identify cumulative environmental impacts and procedures for dealing with these at each stage of the development;
   (f) describe the procedures that would be implemented to:
      - keep the local community and relevant agencies informed about the operation and environmental performance of the development;
      - receive, handle, respond to, and record complaints;
      - resolve any disputes that may arise;
      - respond to any non-compliance; and
      - respond to emergencies; and
   (g) include:
      - copies of any strategies, plans and programs approved under the conditions of this consent; and
      - a clear plan depicting all the monitoring to be carried out in relation to the development.

2. Following approval, the Applicant must carry out the development in accordance with this strategy.

Adaptive Management

3. The Applicant must assess and manage development-related risks to ensure that there are no exceedances of the criteria and/or performance measures in Schedule 3. Any exceedance of these criteria and/or performance measures constitutes a breach of this consent and may be subject to penalty or offence provisions under the EP&A Act or EP&A Regulation.

   Where any exceedance of these criteria and/or performance measures has occurred, the Applicant must, at the earliest opportunity:
   (a) take all reasonable and feasible steps to ensure that the exceedance ceases and does not recur;
   (b) consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action; and
   (c) implement remediation measures as directed by the Secretary
   to the satisfaction of the Secretary.

Management Plan Requirements

4. The Applicant must ensure that the management plans required under this consent are prepared in accordance with any relevant guidelines, are consistent with other plans prepared for other stakeholders, and include:
   (a) detailed baseline data;
   (b) a description of:
      - the relevant statutory requirements (including any relevant approval, licence or lease conditions);
      - any relevant limits or performance measures/criteria;
      - the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;
   (c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;
   (d) a program to monitor and report on the:
      - impacts and environmental performance of the development;
      - effectiveness of any management measures (see c above);
   (e) a contingency plan to manage any unpredicted impacts and their consequences;

(f) a program to investigate and implement ways to improve the environmental performance of the development over time;
(g) a protocol for managing and reporting any:
- incidents;
- complaints;
- non-compliances with statutory requirements; and
- exceedances of the impact assessment criteria and/or performance criteria; and

(h) a protocol for periodic review of the plan.

Note: The Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans.

Annual Review

5. By the end of March each year, the Applicant must review the environmental performance of the development for the previous calendar year to the satisfaction of the Secretary. This review must:
(a) describe the development (including any rehabilitation) that was carried out in the past calendar year, and the development that is proposed to be carried out over the current calendar year;
(b) include a comprehensive review of the monitoring results and complaints records of the development over the past year, which includes a comparison of these results against the:
- relevant statutory requirements, limits or performance measures/criteria;
- monitoring results of previous years; and
- relevant predictions in the EIS;

(c) identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;
(d) identify any trends in the monitoring data over the life of the development;
(e) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and
(f) describe what measures will be implemented over the next year to improve the environmental performance of the development.

Revision of Strategies, Plans and Programs

6. Within 3 months of the submission of:
(a) annual review under condition 5 above;
(b) incident report under condition 8 below;
(c) audit under condition 10 below; or
(d) any modification to the conditions of this consent (unless the conditions require otherwise),

the Applicant must review and, if necessary, revise the strategies, plans, and programs required under this consent to the satisfaction of the Secretary.

Where this review leads to revisions in any such document, then within 4 weeks of the review the revised document must be submitted to the Secretary for approval.

Note: This is to ensure the strategies, plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the development.

Community Consultative Committee

7. The Applicant must establish and operate a CCC for the development to the satisfaction of the Secretary, in accordance with the *Community Consultative Committee Guidelines for State Significant Project (2016)*, or its latest version. The Applicant must ensure at least one CCC meeting is held prior to any development at the mine, unless the Secretary agrees otherwise.

Notes:
- *The CCC is an advisory committee. The Department and other relevant agencies are responsible for ensuring that the Applicant complies with this consent.*
- *In accordance with the guideline, the Committee should be comprised of an independent chair and appropriate representation from the Applicant, Councils, and the local community.*

REPORTING

Incident Reporting

8. The Applicant must immediately notify the Secretary and any other relevant agencies including the relevant Council of any incident that has caused, or threatens to cause, material harm to the environment. For any other incident associated with the development, the Applicant must notify the Secretary and any other relevant agencies including the relevant Council as soon as practicable after the Applicant becomes aware of the incident. Within 7 days of the date of the incident, the Applicant must provide the Secretary and any relevant agencies with a detailed report on the incident, and such further reports as may be requested.

Regular Reporting

9. The Applicant must provide regular reporting on the environmental performance of the development on its website, in accordance with the reporting arrangements in any plans or programs approved under the conditions of this consent.

AUDITING

10. Within 1 year of the commencement of the development after 6 May 2017, and every 3 years thereafter, unless the Secretary directs otherwise, the Applicant must commission and pay the full cost of an Independent Environmental Audit of the development. This audit must:
    (a) be conducted by a suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Secretary;
    (b) include consultation with the relevant agencies;
    (c) assess the environmental performance of the development and assess whether it is complying with the requirements in this consent, and any other relevant approvals, EPL/s; and/or mining lease/s;
    (d) include a comprehensive Hazard Audit of the development in accordance with the Department's publication *Hazardous Industry Planning Advisory paper No. 5 - Hazard Audit Guidelines*, including a review of the Site Safety Management System and all entries made in the incident register since the previous Audit.
    (e) review the adequacy of any approved strategy, plan or program required under the abovementioned approvals; and
    (f) recommend measures or actions to improve the environmental performance of the development, and/or any strategy, plan or program required under these approvals.

    Note: This audit team must be led by a suitably qualified auditor, and include experts in water resources, noise, air quality, ecology, and any other fields specified by the Secretary.

11. Within 3 months of commissioning this audit, or as otherwise agreed by the Secretary, the Applicant must submit a copy of the audit report to the Secretary, together with its response to any recommendations contained in the audit report.

ACCESS TO INFORMATION

12. The Applicant must:
    (a) make the following information publicly available on its website as relevant to the stage of the development:
    - the EIS;
    - current statutory approvals for the development;
    - approved strategies, plans or programs required under the conditions of this consent;
    - a comprehensive summary of the monitoring results of the development, which have been reported in accordance with the various plans and programs approved under the conditions of this consent;
    - a complaints register, which is to be updated on a monthly basis;
    - any independent environmental audit, and the Applicant's response to the recommendations in any audit; and
    - any other matter required by the Secretary; and

    (b) keep this information up to date,

    to the satisfaction of the Secretary.

APPENDIX 1

SCHEDULE OF LAND

Site	***Land Description***
Mine	Lots 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11 DP 754021 Lot 7001 DP 1028245 Lots 7301 and 7302 DP 1148734 Lot 7303 DP 1148889 Lot 1 DP 652705
Fifield Bypass Road	Lots 8 and 28 DP 752111 Crown Road
Limestone quarry	Lots 11, 12 and 24 DP 752089 Lot 352 DP 629402 Lot 281 DP 610057
Rail siding	Part Lot 39 DP 752117
Gas pipeline	Lots 10 and 17 DP 752086 Lots 4, 5, 27 and 28 DP 752087 Lots 1 and 2 DP 580284
Borefields/water pipeline	Lot 1 and 6 DP 598735 Lots 24 and 103 DP 752106 Lot 29 DP 752077
Accommodation camp	Lot 17 DP 752086

And all Crown road reserves, crown land, road reserves, main roads, rail corridors, and travelling stock routes within the development application area, as modified.

APPENDIX 2

DEVELOPMENT LAYOUT PLANS

Figure 1: Development Components

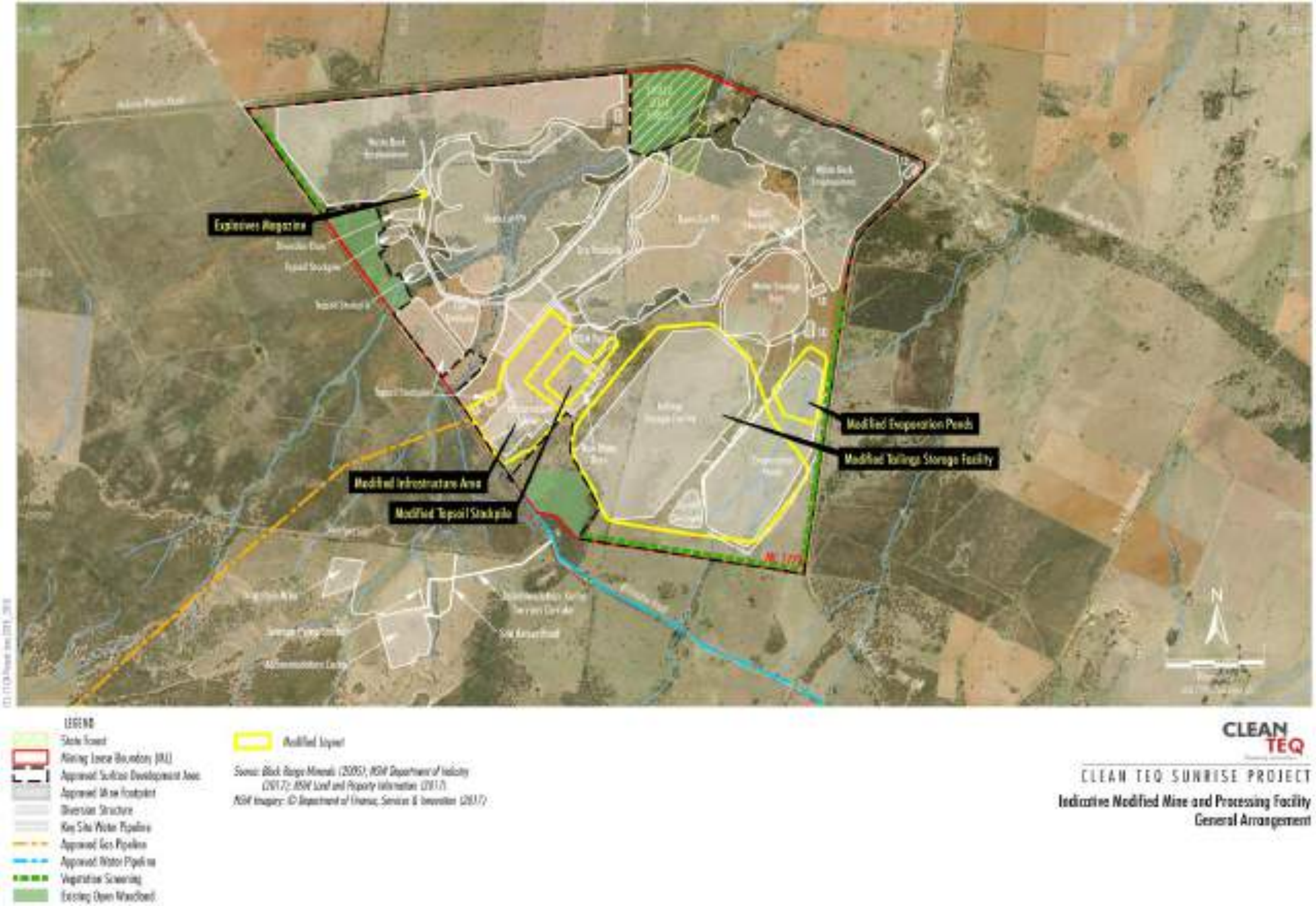

***Figure 2**: Mine and Processing Facility – General Layout*

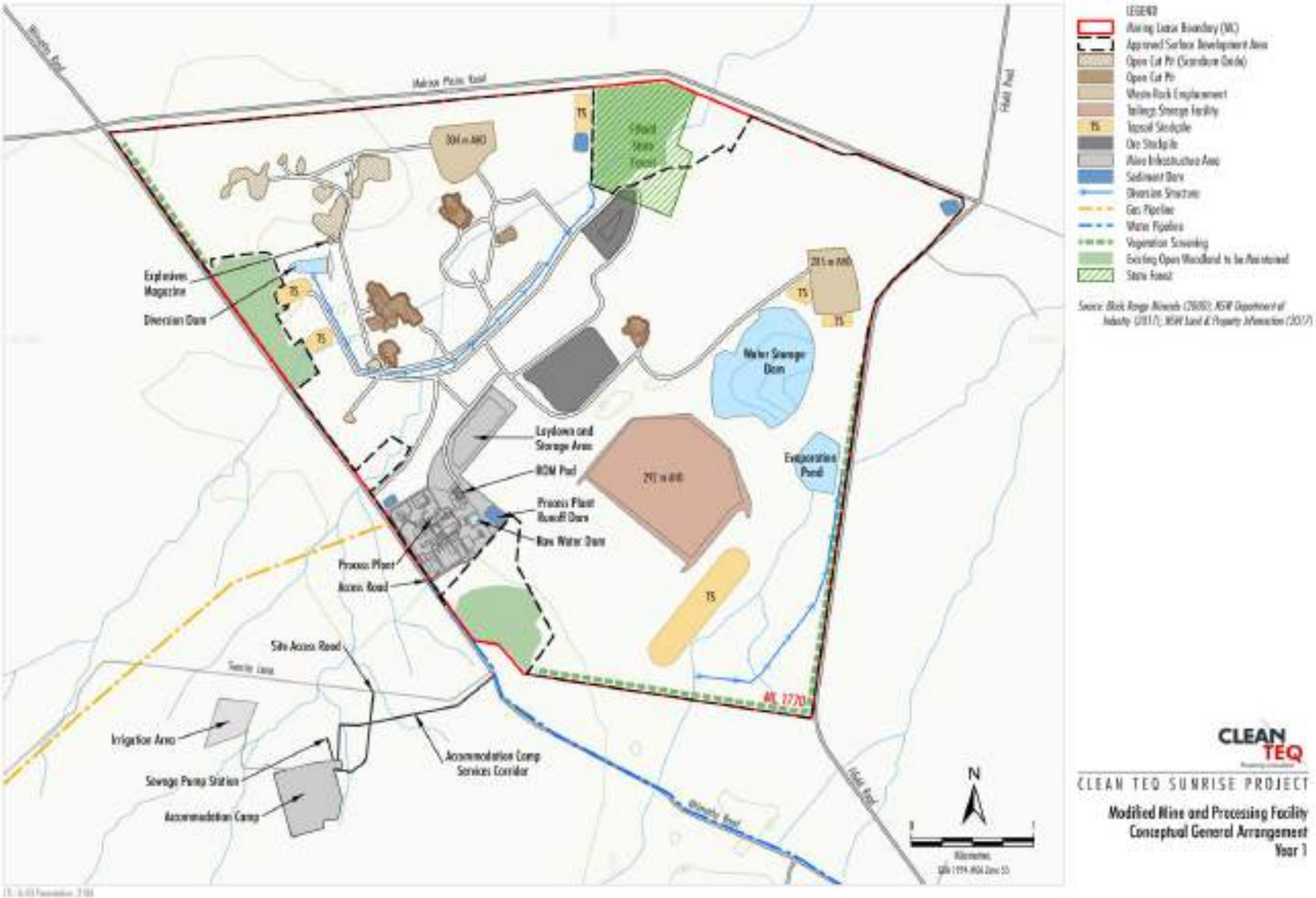

***Figure 3**: Mine and Processing Facility – Year 1*

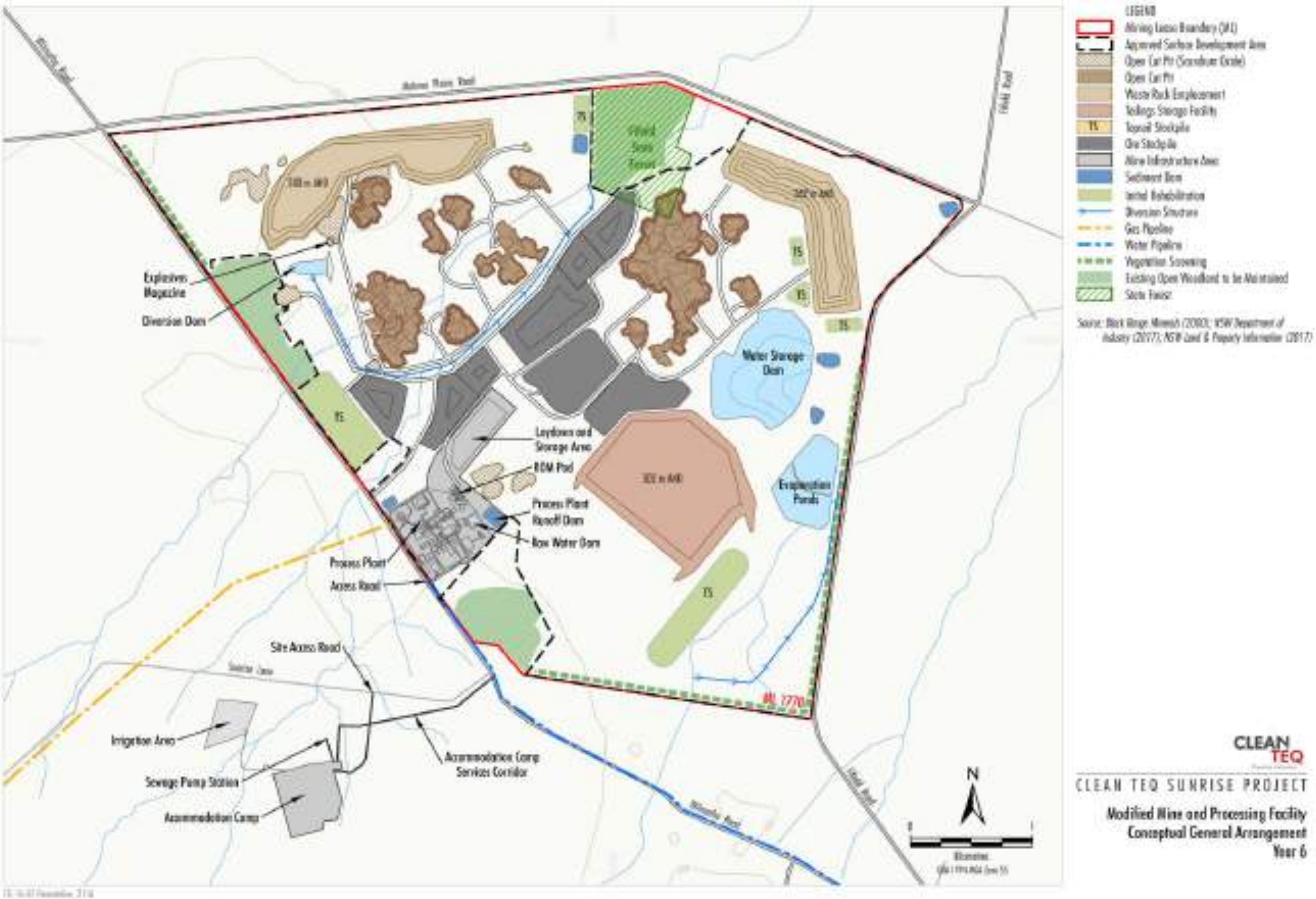

Figure 4: *Mine and Processing Facility – Year 6*

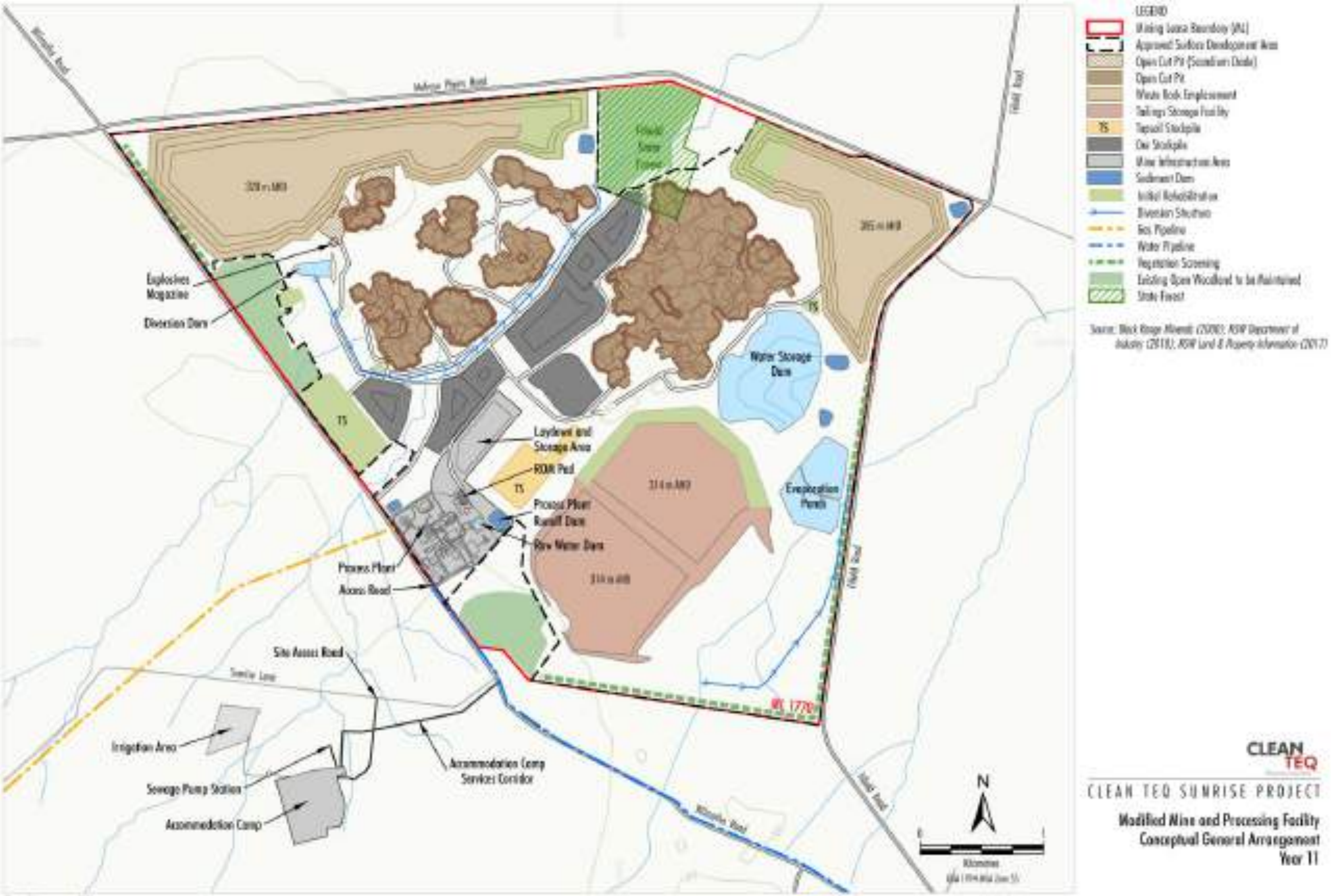

Figure 5: Mine and Processing Facility – Year 11

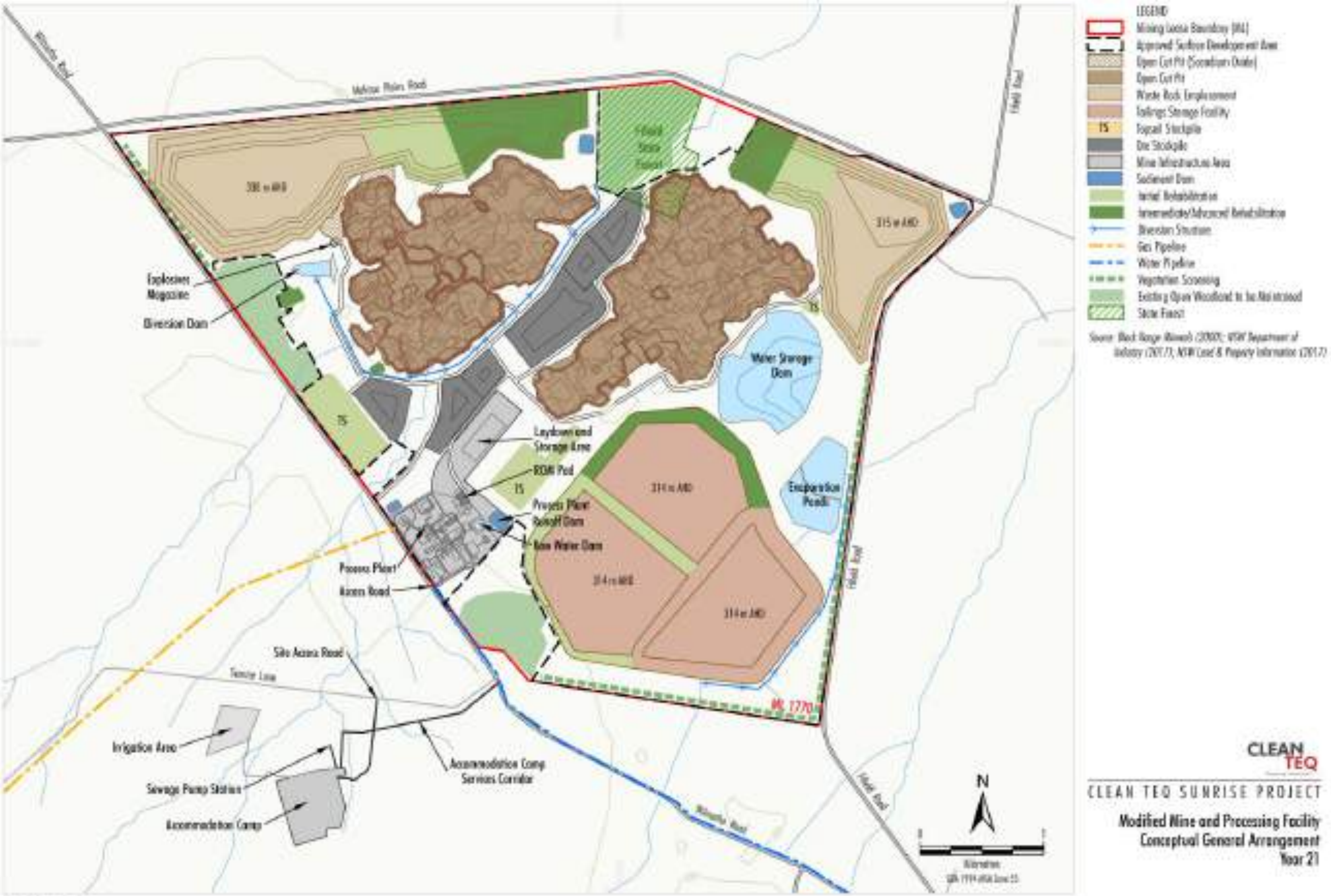

Figure 6: *Mine and Processing Facility – Year 21*

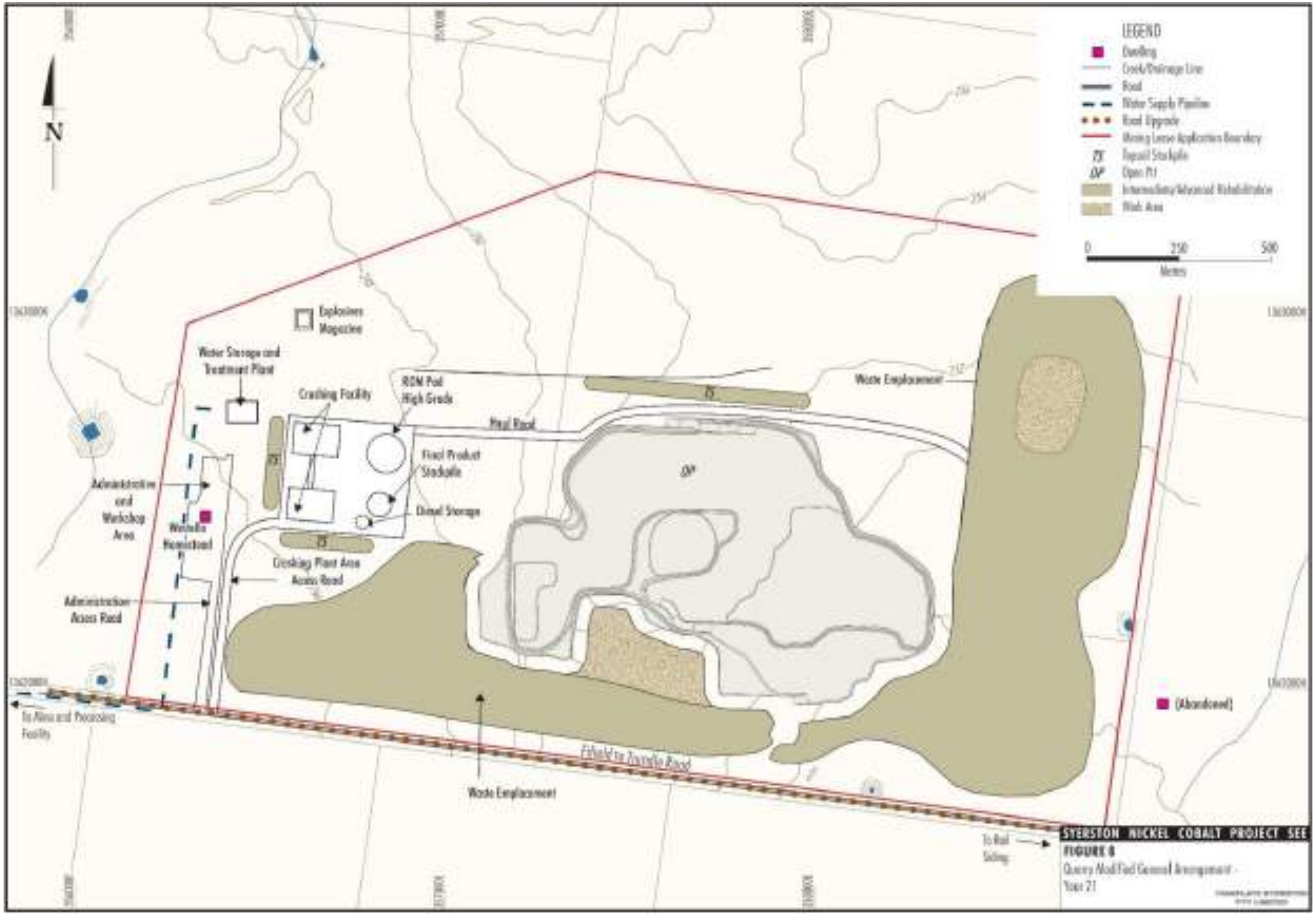

Figure 7: Limestone Quarry Layout

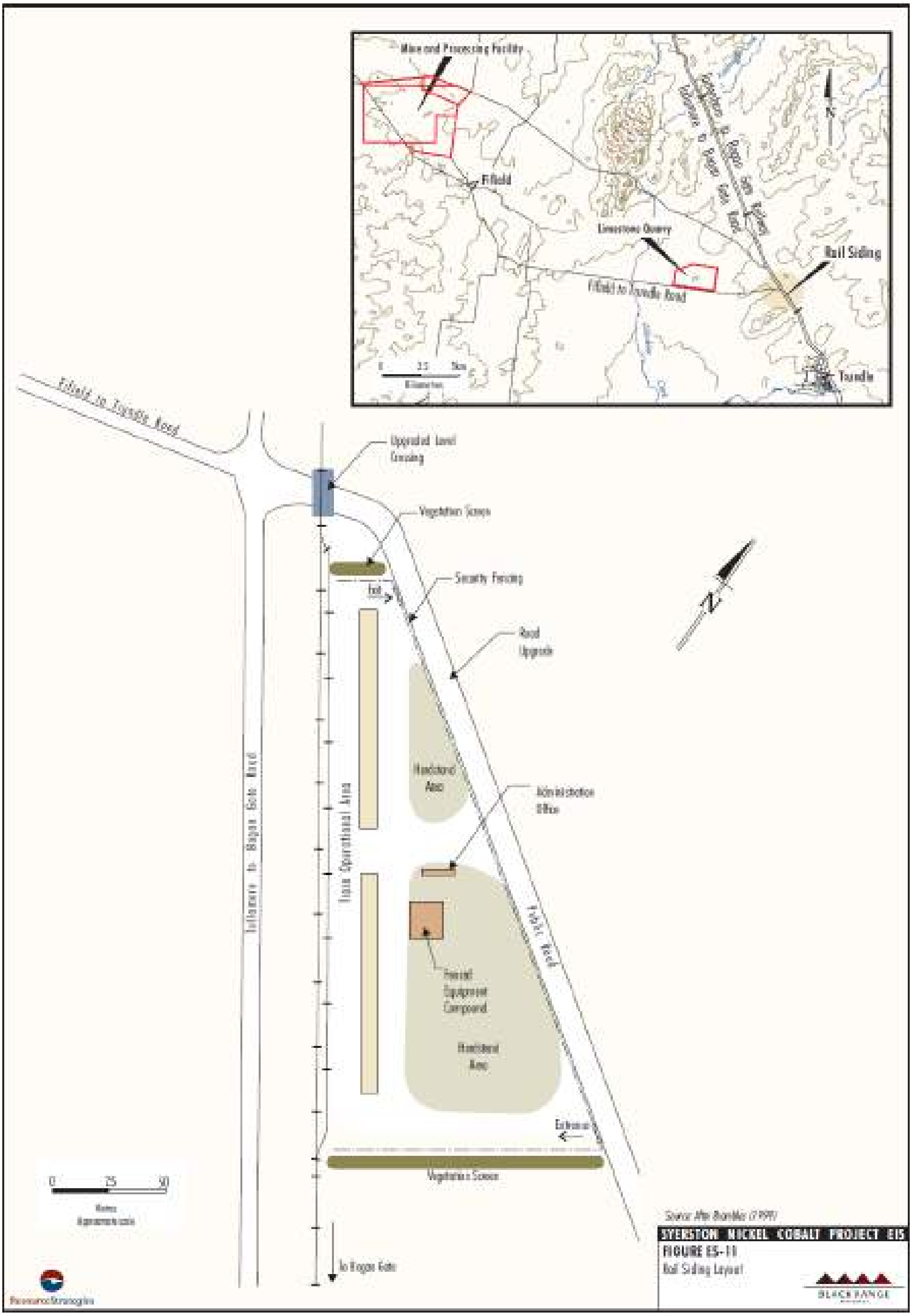

Figure 8: Rail Siding Layout

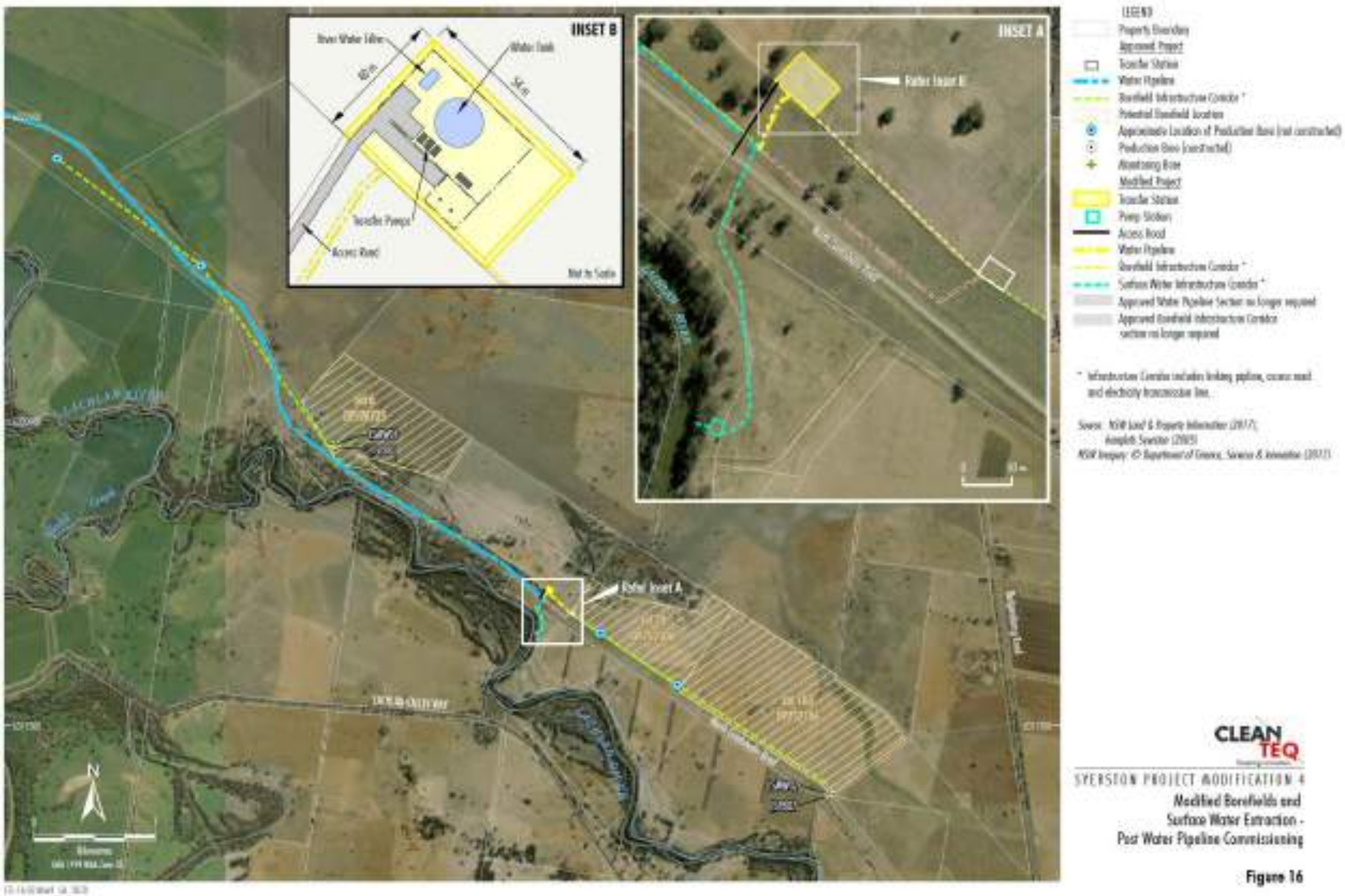

Figure 9: Borefields Layout

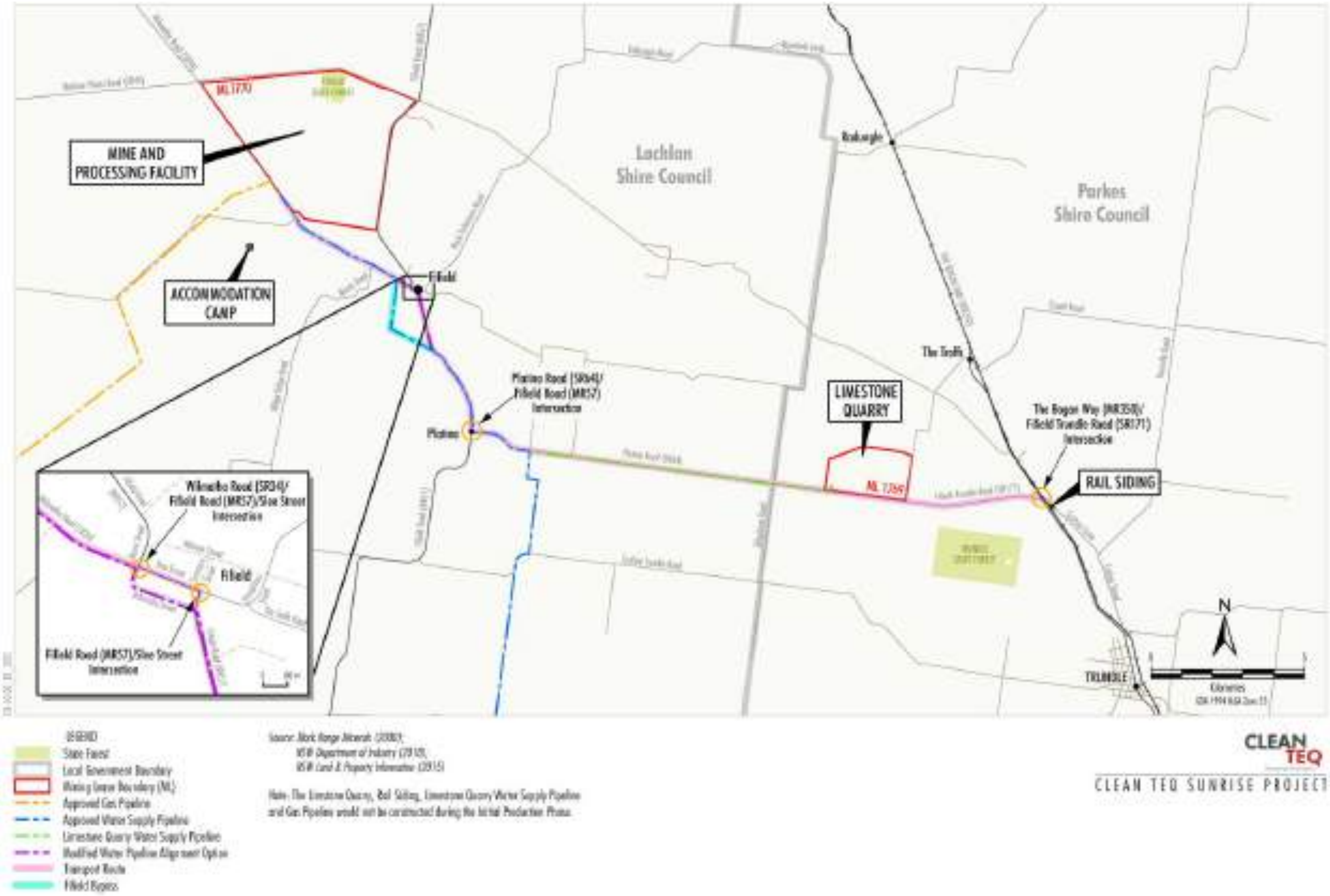

Figure 10: Transport Route

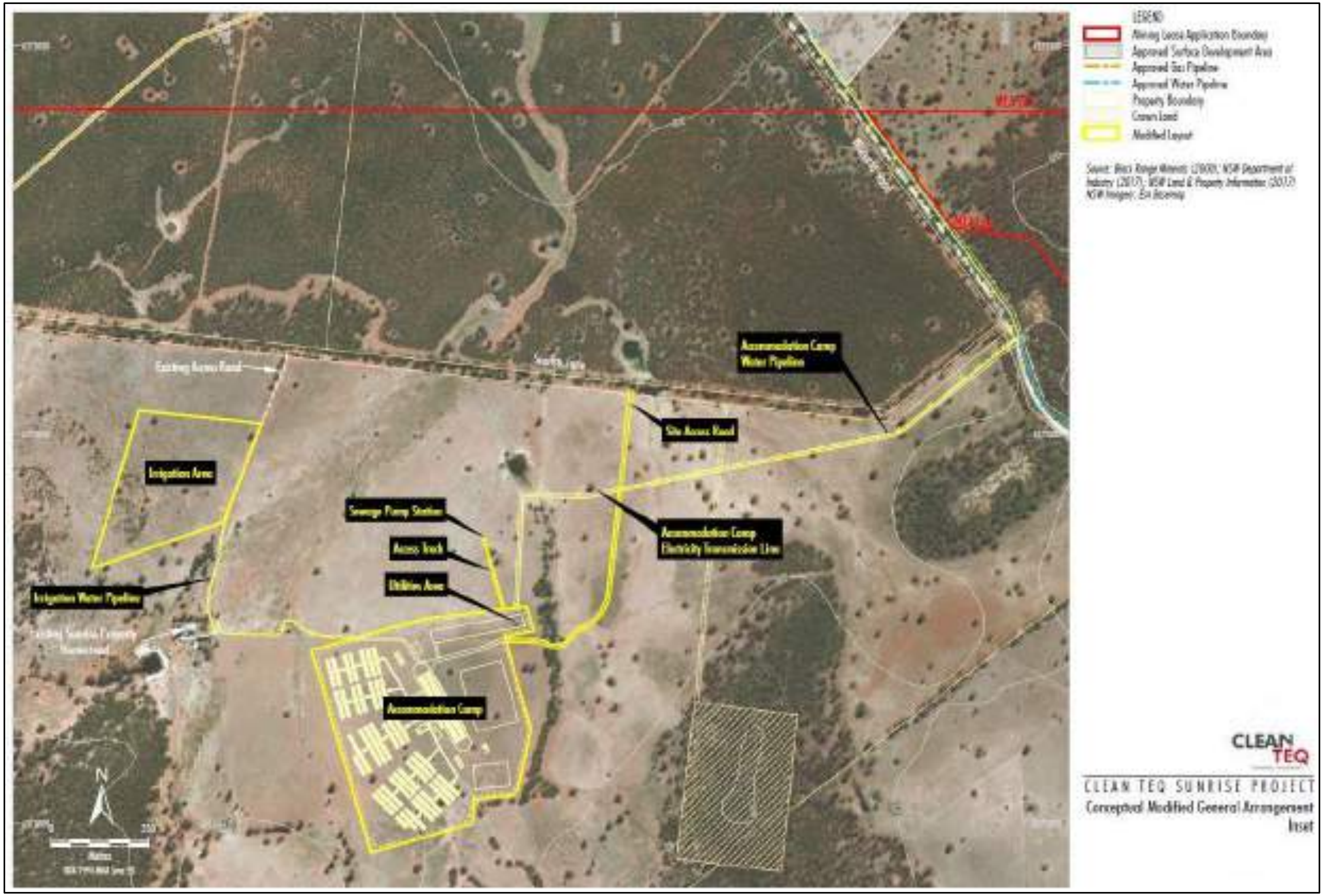

Figure 11: Accommodation Camp Layout

APPENDIX 3

TERMS OF VOLUNTARY PLANNING AGREEMENTS

Community Enhancement Contribution

- Clean TeQ shall pay an annual total payment of $400,000 plus CPI to Forbes Shire Council (FSC), Parkes Shire Council (PSC) and Lachlan Shire Council (LSC).
- The total payment shall be allocated 50% to Lachlan Shire Council, with 25% each to Parkes Shire Council and Forbes Shire Council, unless otherwise determined jointly by FSC, LSC and PSC.
- The first payment of $400,000 shall be payable within 21 days of signing of this Agreement and then paid on the same date each year until Mining Operations cease.

If the Final Investment Decision is not reached within 12 months of the initial payment, no further annual Community Enhancement Contributions will be made until the Final Investment Decision is reached. Once the Final Investment Decision is reached payments will resume within 21 days of the Final Investment Decision and continue annually.

Road Maintenance Contribution

- Clean TeQ shall pay an annual **Road Maintenance Contribution** totalling $340,000 plus CPI as follows:
  - (i) Lachlan Shire Council: $168,000
  - (ii) Parkes Shire Council: $152,000
  - (iii) Forbes Shire Council: $20,000
- The first annual contribution shall be paid within 21 days of the Final Investment Decision and then paid on the same date each year until Mining Operations cease.
- If the Final Investment Decision is not reached within 12 months of the initial payment, no further Road Maintenance Contributions shall be made until the Final Investment Decision is reached. Once the Final Investment Decision is reached, payments shall resume within 21 days of the Final Investment Decision payable annually on the same date.
- The Road Maintenance Contributions are to be used to maintain the following roads:

Parkes Shire Council

- o Middle Trundle Road [SR83] (between Henry Parkes Way [MR61] and The Bogan Way [MR350]);
- o The Bogan Way [MR350] (between Henry Parkes Way [MR61] and Fifield Trundle Road [SR171]);
- o Fifield Trundle Road [SR171] (between The Bogan Way [MR350] and the Parkes Shire boundary);
- o Fifield Road [MR 57] (between the Parkes Shire Boundary and The Bogan Way [MR350]);
- o The Bogan Way [MR350] (between Fifield Road [MR57] and The McGrane Way [MR354]); and
- o The McGrane Way [MR354] (between The Bogan Way [MR350] and the Parkes Shire Boundary).
- o Scotson Lane between the rail siding access road and The Bogan Way [MR350].

Lachlan Shire Council

- Fifield Road [MR57] (between Henry Parkes Way [MR61] and Slee St [in Fifield Village] and between Slee St [in Fifield Village] and Red Heart Road [SR41]);
- Platina Road [SR64] (between the Lachlan Shire Boundary and Fifield Road [MR57]);
- Slee St [in Fifield Village] (between Fifield Road [MR57] and Wilmatha Road [SR34]);
- Wilmatha Road [SR34] (between Slee St [in Fifield Village] and Mine Access Road);and
- Fifield Road [MR57] (between Red Heart Road [SR41] and the Lachlan Shire Boundary).

Forbes Shire Council

- North Condobolin Road (between the bore fields and Ootha-Mulguthrie Road);
- Ootha-Mulguthrie Road (between North Condobolin Road and Henry Parkes Way [MR61]);
- Ootha- Ringwood Road (between Henry Parkes Way [MR61] and Burkes Road);
- Burkes Road (between Ootha- Ringwood Road and Ootha North Road); and
- Ootha North Road (between Burkes Road and the Forbes Shire Boundary).

- Clean TeQ shall maintain Sunrise Lane (between the accommodation camp site access road and Wilmatha Road [SR34]), to the satisfaction of LSC, during the construction and operation phase of the mine and processing facility.

Project Facilitation Contribution

Clean TeQ shall pay LSC, PSC and FSC each an annual Project Facilitation Contribution of $30,000 within 21 days of the Final Investment Decision and then on the same date each year thereafter. The payments are to be made during the period between Final Investment Decision and two years to the day after the commencement of construction.

Consumer Price Index

- The Community Enhancement Contribution, the Road Maintenance Contribution and the Project Facilitation Contribution are all subject to CPI. The three different contributions shall be indexed according to the CPI at the time of payments after the initial payment.

Major Repair Contributions

- Clean TeQ shall pay Major Repair Contributions on the Transport Route to address exceptional failure of or damage to roads where government grants do not cover the full cost of repairs.
- The Major Repair Contribution shall be undertaken on an as needs basis during the life of the mine, but limited to a maximum 5 km of construction in any year, unless mutually agreed between Clean TeQ and the relevant council(s).
- Clean TeQ shall pay the Major Repair Contribution to the Council(s) within 30 Business Days of the date of the letter notifying the relevant Council of acceptance of the Cost Report.These contributions are to be mutually agreed by the Parties and do not substitute for the nominated Road Maintenance Contributions.

Road and Intersection Upgrades

Clean TeQ shall pay for and be responsible for the following Road and Intersection Upgrades. Such upgrades shall commence promptly following the Final Investment Decision, or earlier at the sole discretion of Clean TeQ:

Road Upgrades

Prior to the commissioning of the Accommodation Camp, Clean TeQ shall pay for and require the completion of the upgrade of Sunrise Lane (between the Accommodation Camp access road and Wilmatha Road [SR34]) to the following:

- all weather unsealed surface for an operating speed standard of 80 km/h; and
- carriageway width of 9 m (equivalent to two 3.5 m lanes and two 1.0 m wide shoulders).

Construction of the Road and Intersection Upgrades are to commence promptly following the Final Investment Decision and be completed prior to the Commissioning of the Development.

Prior to the Commissioning of the Development (meaning the date on which the testing of the Mine Processing Facility to verify that it functions according to its design objectives and specifications is completed), Clean TeQ shall pay for and be responsible for the delivery of the following upgrades:

- road pavement (8.0 m sealed pavement and 1.0 m gravel shoulders); and
- all private access roads (3.5 m sealed private access road approach and 3.0 m gravel shoulders along road 30 m either side of all private access roads).

to the following roads:

- Platina Road [SR64] (between the Lachlan Shire boundary and Fifield Road [MR57]);
- Fifield Road [MR57] (between Platina Road [SR64] and Slee St [in Fifield Village]);
- Wilmatha Road [SR34] (between Slee St [in Fifield Village] and the mine and processing facility access road); and
- Fifield Trundle Road [SR171] (between The Bogan Way [MR350] and the Parkes Shire boundary).

Clean TeQ shall prepare a road construction programme detailing the work specifications, timing and scheduling of road upgrades required. The programme shall be prepared by the Clean TeQ in consultation with the relevant Councils. The road upgrades shall be undertaken in accordance with the road construction programme unless otherwise agreed the relevant Councils.

Intersection Upgrades

Prior to the Commissioning of the Development (as defined in the VPA), Clean TeQ shall pay for the following intersection upgrades:

- Platina Road [SR64] /Fifield Road [MR57];
- Fifield Road [MR57] /Slee Street [in Fifield Village];
- Slee Street [in Fifield Village]/Wilmatha Road [SR34]/Fifield Road;
- The Bogan Way [MR350] /Fifield Trundle Road [SR171] and Scotson Lane;
- Henry Parkes Way [MR61] and Middle Trundle Road [SR83];
- Henry Parkes Way [MR61] and The Bogan Way [MR350]; and
- Sunrise Lane/Wilmatha Road [SR34] - remove the transition between the gravel and dirt surfaces while Wilmatha Road remains unsealed, and then seal a minimum of 30 m of Sunrise Lane on the approach to the intersection once Wilmatha Road is sealed.

Clean TeQ shall prepare a road construction programme detailing the work specifications, timing and scheduling of intersection upgrades required. The programme shall be prepared by the Clean TeQ in consultation with the relevant Councils The road upgrades shall be undertaken in accordance with the road construction programme unless otherwise agreed the relevant Councils.

Road Safety Audits

Prior to Commissioning of the Development, Clean TeQ shall pay for and deliver a road safety audit to determine road upgrade requirements on the following roads (including intersections and rail crossings):

- Henry Parkes Way [MR61] (between Jones Lane [eastern outskirts of Condobolin] and Fifield Road [MR57]);
- Fifield Road [MR57] (between Henry Parkes Way [MR61] and Slee St [in Fifield Village] and between Slee St [in Fifield Village] and Red Heart Road [SR41]);
- Platina Road [SR64] (between the Lachlan Shire Boundary and Fifield Road [MR57]);
- Slee St [in Fifield Village] (between Fifield Road [MR57] and Wilmatha Road [SR34]);
- Wilmatha Road [SR34] (between Slee St [in Fifield Village] and Mine Access Road); and
- Fifield Road [MR57] (between Red Heart Road [SR41] and the Lachlan Shire Boundary);
- Henry Parkes Way [MR61] (between Westlime Road [western outskirts of Parkes] and The Bogan Way [MR350]);
- Middle Trundle Road [SR83] (between Henry Parkes Way [MR61] and The Bogan Way [MR350]);
- The Bogan Way [MR350] (between Henry Parkes Way [MR61] and Fifield Trundle Road [SR171]);
- Fifield Road [MR 57] (between the Parkes Shire Boundary and The Bogan Way [MR350]);
- The Bogan Way [MR350] (between Fifield Road [MR57] and The McGrane Way [MR354]);
- Fifield Trundle Road [SR171] (between The Bogan Way [MR350] and the Parkes Shire boundary); and
- The McGrane Way [MR354] (between The Bogan Way [MR350] and the Parkes Shire Boundary).

Prior to the Commissioning of the Development, Clean TeQ shall reach an agreement with the relevant Councils on funding and the timing of works as to any additional, specific road safety matters relevant to the Project as deemed necessary by the road safety audit.

APPENDIX 4

NOISE COMPLIANCE ASSESSMENT

Applicable Meteorological Conditions

13. The noise criteria in conditions 3-5 of Schedule 3 apply under all meteorological conditions except the following:
    (a) wind speeds greater than 3 m/s at 10 metres above ground level; or
    (b) stability category F temperature inversion conditions and wind speeds greater than 2 m/s at 10 m above ground level; or
    (c) Pascall stability classes G temperature inversion conditions

Determination of Meteorological Conditions

14. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station on or in the vicinity of the Mine.

Compliance Monitoring

15. Unless directed otherwise by the Secretary, attended monitoring is to be used to evaluate compliance with the relevant conditions of consent.

    Note: The Noise Management Plan (see condition 7 of Schedule 3) is required to include a noise monitoring program for the development, which will include details of the frequency of monitoring. The Secretary may direct that the frequency of monitoring increase or decrease at any time during the life of the development.

16. Unless otherwise agreed with the Secretary, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the NSW Industrial Noise Policy (as amended or replaced from time to time), in particular the requirements relating to:
    (a) monitoring locations for the collection of representative noise data;
    (b) meteorological conditions during which collection of noise data is not appropriate;
    (c) equipment used to collect noise date, and conformity with Australian Standards relevant to such equipment; and
    (d) modifications to noise data collected including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration.

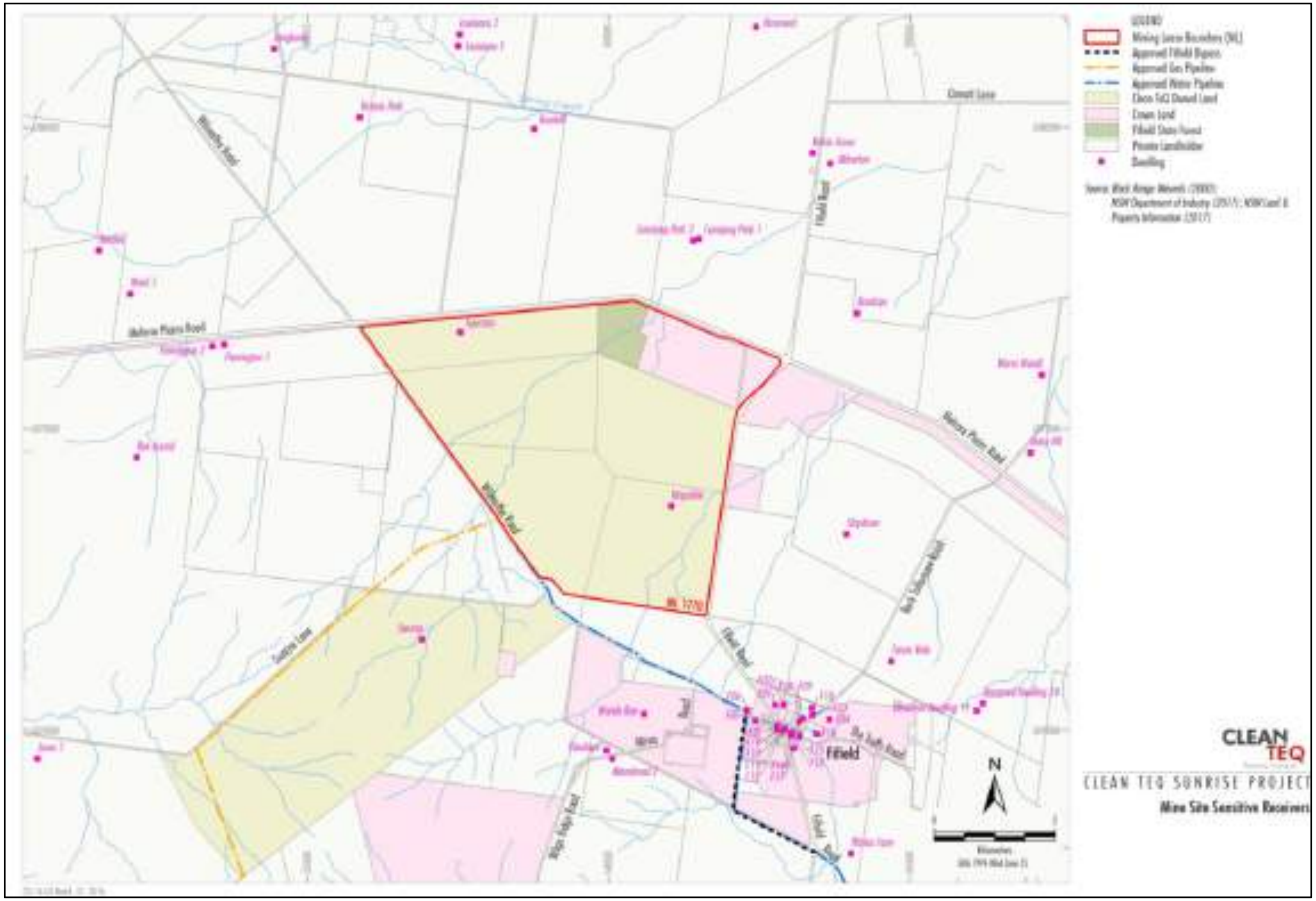

Figure 8: Residences surrounding the mine

Figure 9: Residences surrounding the quarry

APPENDIX 5

ROAD AND INTERSECTION UPGRADES

1. Road upgrades – prior to commissioning of the mine processing facility	(a) Platina Road [SR64] (between the Lachlan Shire boundary and Fifield Road [MR57]); (b) Fifield Road [MR57] (between Platina Road [SR64] and Slee St [in Fifield Village]); (c) Wilmatha Road [SR34] (between Slee St [in Fifield Village] and the mine; and (d) Fifield Trundle Road [SR171] (between The Bogan Way [MR350] and the Parkes Shire boundary)
2. Intersection upgrades – prior to commissioning of the mine processing facility	(a) Platina Road [SR64] / Fifield Road [MR57]; (b) Fifield Road [MR57] / Slee Street [In Fifield Village]; (c) Slee Street [In Fifield Village] / Wilmatha Road [SR34] / Fifield Road; (d) The Bogan Way [MR350] /Fifield Trundle Road [SR171]; (e) Henry Parkes Way and Middle Trundle Road (including a Channelised Right Short [CHR(s)] turn lane in Henry Parkes Way); (f) Henry Parkes Way and The Bogan Way; and (g) Sunrise Lane and Wilmatha Road [SR34].
3. Further road and intersection upgrades – prior to the development of the limestone quarry or rail siding, or transport of limestone from third party suppliers	(a) Henry Parkes Way [SR61] (between Jones Lane and Fifield Road [MR57]); (b) Fifield Road [MR57] (between Henry Parkes Way [MR61] and Slee St [In Fifield Village] and between Slee St [in Fifield Village] and Red Heart Road [SR41]; (c) Platina Road [SR64] (between Lachlan Shire boundary and Fifield Road [MR57] ; (d) Slee St [in Fifield Village] (between Fifield Road [MR57] and Wilmatha Road [SR34]; (e) Wilmatha Road [SR34] (between Slee St [in Fifield Village] and Melrose Plains Road [SR44]); (f) Springvale Road [SR60] (between Fifield Road [MR57] and Melrose Plains Road [SR44]); (g) Henry Parkes Way [MR61] (between Westlime Road [western outskirts of Parkes] and The Bogan Way [MR350]) ; (h) Middle Trundle Road [SR83] (between Henry Parkes Way [MR61] and The Bogan Way [MR350]); (i) The Bogan Way [MR350] (between Henry Parkes Way [MR61] and Fifield Trundle Road [SR171]); (j) Fifield Trundle Road [SR171] (between The Bogan Way [MR350] and the Parkes Shire boundary); and (k) Melrose Plains Road [SR44) (between Springvale Road [SR60] and 4.65 km after the Melrose Plains Road [SR44] / Back Tullamore Road [SR1151] intersection); and (l) Forbes Street improvement works, in accordance with the Pedestrian Access Review (GTA Consultants, 2018).
4. Road upgrades – prior to commissioning of the accommodation camp	(a) Sunrise Lane, between the accommodation camp and Wilmatha Road [SR34].
5. Intersection upgrades – prior to commissioning of the accommodation camp	(a) Accommodation camp access road and Sunrise Lane.

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Project Execution Plan Modification

Attachment 2

Proposed Amendments to Appendix 1 of Development Consent (DA 374-11-00)

Table A2-1
Updated Appendix 1 of Development Application (374-11-00)

Site	Land Description
Mine	• *Lots 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11 DP 754021* • *Lot 7001 DP 1028245* • *Lots 7301 and 7302 DP 1148734* • *Lot 7303 DP 1148889* • *Lot 1 DP 652705*
Fifield Bypass Road	• ***~~Lots 8 and~~ Lot*** *28 DP 752111* • ***Lot 1 DP 1250340*** • *Crown Road*
Limestone Quarry	• *Lots 11, 12 and 24 DP 752089* • ***~~Lot 352 DP 629402~~*** • *Lot 281 DP 610057*
Rail Siding	• ***~~Part Lot 39 DP 752117~~*** • ***Lot 1 DP 630504***
Gas Pipeline	• *Lots 10 and 17 DP 752086* • *Lots 4, 5, 27 and 28 DP 752087* • *Lots 1 and 2 DP 580284* • ***Lots 4 and 5 DP 754021***
Borefields/ ***surface water extraction infrastructure****/ water pipeline*	• ***~~Lots 1 and~~ Lot*** *6 DP 598735* • *Lots 24 and 103 DP 752106* • *Lot****s 1 and*** *29 DP 752077* • ***Part Lot 1 DP 1144211*** • ***Lot 1 DP 1250340*** • ***Lot 28 DP 752111*** • ***Crown Road*** • ***Lot 8 DP 754021*** • ***Lot 24 DP 752089***
Accommodation Camp	• *Lot 17 DP 752086*

And all Crown Road Reserves, crown land, road reserves, main roads, rail corridors, and travelling stock routes with the development application area, as modified.

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Project Execution Plan Modification

Appendix A

Air Quality Assessment

Sunrise Project - Project Execution Plan Modification

Air Quality Assessment

Final | Revision 1

30 June 2021

Sunrise Energy Metals Limited

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Sunrise Project - Project Execution Plan Modification

Project No:	IS366000
Document Title:	Air Quality Assessment
Document No.:	Final
Revision:	Revision 1
Document Status:	-
Date:	30 June 2021
Client Name:	Sunrise Energy Metals Limited
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Project Manager:	Shane Lakmaker
Author:	Shane Lakmaker
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Document history and status

Revision	Date	Description	Author	Reviewed	Approved
D1R1	27/02/21	Draft report	S Lakmaker	M Pickett	P Horn
D2R0	8/06/21	Draft report	S Lakmaker	Res Strat	P Horn
D3R0	25/06/21	Draft report	S Lakmaker	Res Strat / SEM	P Horn
Final r1	30/06/21	Final	S Lakmaker	Res Strat / SEM	P Horn

Contents

Figures

Tables

Acronyms and definitions

Abbreviation	Definition
BoM	Bureau of Meteorology
CALMET	Meteorological model for the CALPUFF air dispersion model
CALPUFF	Computer-based air dispersion model
CO	Carbon monoxide
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DPIE	NSW Department of Planning, Industry and Environment
EPA	NSW Environment Protection Authority
EPL	Environment Protection Licence
GHG	Greenhouse Gas
Jacobs	Jacobs Group (Australia) Pty Limited
Mtpa	Million tonnes per annum
NGER	National Greenhouse Gas and Energy Reporting
NEPM	National Environment Protection Measure
NEPC	National Environment Protection Council of Australia
NO_2	Nitrogen dioxide
NPI	National Pollutant Inventory
OEH	Office of Environment and Heritage, now part of the Department of Planning, Industry and Environment as Environment, Energy and Science
$PM_{2.5}$	Particulate matter with equivalent aerodynamic diameters less than 2.5 microns
PM_{10}	Particulate matter with equivalent aerodynamic diameters less than 10 microns
POEO Act	*Protection of the Environment Operations (POEO) Act 1997*
SEM	Sunrise Energy Metals Limited
SO_2	Sulphur dioxide
H_2SO_4	Sulphuric acid
TAPM	The Air Pollution Model – a meteorological and air dispersion model developed by CSIRO
TSP	Total suspended particulate matter

Executive Summary

The Sunrise Project (the Project) is a nickel, cobalt and scandium open cut mining project situated near the village of Fifield, approximately 350 kilometres (km) west-northwest of Sydney, in New South Wales (NSW).

Development Consent (DA 374-11-00) for the Project was issued under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) in 2001.

The Project Execution Plan Modification (the Modification) includes the implementation of Project changes identified in the Project Execution Plan to optimise the construction and operation of the Project.

This Air Quality Assessment has been prepared to support an application by Sunrise Energy Metals Pty Ltd (SEM) to modify Development Consent (DA 374-11-00) for the Project, which would be sought under section 4.55(2) of the EP&A Act.

The air quality assessment involved identifying the key potential air quality impacts, characterising the existing environment, quantifying emissions to air and modelling the potential impact of the modified Project on local air quality. Greenhouse gas emissions were estimated in accordance with recognised methodologies.

The key potential air quality impacts were identified as construction and operational dust, processing facility emissions, post-blast fume, and diesel exhaust. These potential air quality impacts, plus greenhouse gas emissions, were the focus of the assessment.

The most commonly associated emission to air from open cut mining is dust. Key classifications of particulate matter include:

- Total suspended particulates (TSP).
- Particulate matter with equivalent aerodynamic diameter of 10 microns or less (PM_{10}).
- Particulate matter with equivalent aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$).
- Deposited dust.

A review of the local meteorological and ambient air quality conditions was undertaken. The review considered data collected from existing meteorological and air quality monitors at the mine and processing facility. Approximately two years of meteorological data and one year of air quality data was available from the monitors at the mine and processing facility. One of the objectives for reviewing the data was to develop an understanding of existing air quality impacts as well as the meteorological conditions which typically influence the local air quality conditions. The following conclusions of the background air quality and meteorological data were made:

- Winds are predominantly from the southwest to west, and northeast to east with some variations by season and from year-to-year.
- Air quality conditions were adversely influenced by drought between 2017 to 2019 and into early 2020. The drought led to an increase in the frequency of dust storms and bushfires which, in turn, affected air quality during this period. These conditions were not unique to the Central West region of NSW.
- In the absence of Project activities (having not yet commenced), the measured 24-hour average PM_{10} and $PM_{2.5}$ concentrations exceeded the NSW Environment Protection Authority (EPA) criteria on multiple occasions in 2020, due to the extraordinary events (e.g. bushfires, dust storms etc.).
- Annual average PM_{10} and $PM_{2.5}$ concentrations did not exceed the EPA criteria after the records of extraordinary events were taken into consideration (i.e. excluded).
- Estimated TSP concentrations and measured deposited dust levels did not exceed the EPA criteria in 2020.

The key outcomes of the modelling and subsequent assessment are:

- Construction and operational dust emissions (i.e. particulate matter in the form of TSP, PM_{10}, $PM_{2.5}$ and deposited dust) due to operations at the mine and processing facility are not expected to cause adverse air quality impacts at the nearest private sensitive receptors. Modelling led to the following specific outcomes for the modified Project:
  - Maximum 24-hour average PM_{10} project only and cumulative concentrations would comply with air quality criteria (50 micrograms per cubic metre [$\mu g/m^3$]) at all private sensitive receptors.
  - Annual average PM_{10} project only and cumulative concentrations would comply with air quality criteria (25 $\mu g/m^3$) at all private sensitive receptors.
  - Maximum 24-hour average $PM_{2.5}$ project only and cumulative concentrations would comply with air quality criteria (25 $\mu g/m^3$) at all private sensitive receptors.
  - Annual average $PM_{2.5}$ project only and cumulative concentrations would comply with air quality criteria (8 $\mu g/m^3$) at all private sensitive receptors.
  - Annual average TSP project only and cumulative concentrations would comply with air quality criteria (90 $\mu g/m^3$) at all private sensitive receptors.
  - Annual average project only and cumulative deposited dust levels would comply with air quality criteria (2 g/m^2/month and 4 g/m^2/month respectively) at all private sensitive receptors.
  - Dust concentrations and deposition levels would comply with the Voluntary Land Acquisition and Mitigation Policy (VLAMP) (NSW Government, 2018) criteria at all private sensitive receptors and vacant land.
- Construction and operational dust emissions due to the modified rail siding are not expected to cause adverse air quality impacts at the nearest private sensitive receptors. That is, based on modelling, dust concentration (PM_{10}, $PM_{2.5}$ and TSP) and dust deposition levels would comply with EPA and VLAMP criteria at all private sensitive receptors.
- Processing facility emissions are not expected to cause adverse air quality impacts at the nearest private receptors, based on modelling (using conservative assumptions) which showed compliance with air quality criteria.
- Operational post-blast fume emissions (as NO_2) are not expected to result in any adverse air quality impacts, based on modelling which showed compliance with air quality criteria.
- Operational diesel exhaust emissions associated with off-road vehicles and equipment are not expected to result in any adverse air quality impacts, based on modelling which showed compliance with air quality criteria.
- The estimated annual average Scope 1 and 2 greenhouse gas emissions from the modified Project represent approximately 0.05% of Australia's 2019 emissions.
- SEM would implement air quality and greenhouse gas emission management measures to minimise the potential impacts of the modified Project.
- No changes would be required to the existing air quality monitoring network.

Given the above, the modified Project is not expected to cause adverse impacts on the local air quality environment near the mine and processing facility or rail siding. Notwithstanding, the existing Air Quality Management Plan (Clean TeQ, 2019a) would be reviewed and updated, where necessary, to incorporate the Modification.

Important note about your report

The sole purpose of this report and the associated services performed by Jacobs is to quantify the potential air quality impacts of a modification to the approved Sunrise Project in accordance with the scope of services set out in the contract between Jacobs and the Client. That scope of services, as described in this report, was developed with the Client.

In preparing this report, Jacobs has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, Jacobs has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

Jacobs derived the data in this report from information sourced from the Client (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. Jacobs has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by Jacobs for use of any part of this report in any other context.

This report has been prepared on behalf of, and for the exclusive use of, Jacobs's Client, and is subject to, and issued in accordance with, the provisions of the contract between Jacobs and the Client. Jacobs accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party.

1. Introduction

1.1 Background

The Sunrise Project (the Project) is a nickel, cobalt and scandium open cut mining project situated near the village of Fifield, approximately 350 kilometres (km) west-northwest of Sydney, in New South Wales (NSW) (Figure 1.1).

Development Consent (DA 374-11-00) for the Project was issued under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) in 2001.

The Project includes the establishment and operation of the following:

- mine and processing facility;
- limestone quarry;
- rail siding;
- borefield, surface water extraction infrastructure and water pipeline;
- gas pipeline;
- accommodation camp; and
- associated transport activities and transport infrastructure (e.g. the Fifield Bypass, road and intersection upgrades).

Construction of the Project commenced in 2006, which included components of the borefield, however construction of other Project components is yet to commence.

The Project Execution Plan Modification (the Modification) includes the implementation of Project changes identified in the Project Execution Plan (Clean TeQ, 2020) to optimise the construction and operation of the Project.

This Air Quality Assessment has been prepared to support an application by Sunrise Energy Metals Pty Ltd (SEM)[1] to modify Development Consent (DA 374-11-00) for the Project, which would be sought under section 4.55(2) of the EP&A Act.

1.2 Overview of the Modification

SEM has continued to review and optimise the Project design as part of preparations for the Project execution. The outcomes of this review are outlined in the Project Execution Plan (Clean TeQ, 2020).

The Project Execution Plan identified a number of changes to the approved mine and processing facility, accommodation camp, rail siding and road transport activities.

The Modification includes these Project Execution Plan changes to allow for the optimisation of the construction and operation of the modified Project. The Modification would include (Figure 1.2 and Figure 1.3):

Mine and Processing Facility

- addition of a temporary construction laydown area inside the approved tailings storage facility surface development area;
- optimised production schedule resulting in an increased mining rate during the initial years of mining and associated changes to mining and waste rock emplacement sequencing;

[1] [1] SEM was previously Clean TeQ Holdings Limited (Clean TeQ).

- revised processing facility area layout, including a revised processing plant layout and two additional vehicle site access points;
- reduced sulphuric acid plant stack height from 80 metres (m) to 40 m;
- revisions to processing plant reagent types, rates and storage volumes;
- revised tailings storage facility cell construction sequence and the addition of a decant transfer pond;
- relocated and resized evaporation pond;
- changes to the water management system to reflect the modified mine and processing facility layout;
- increased number of diesel-powered backup generators (and associated stacks) from one to four;
- addition of exploration activities within the approved surface development area inside Mining Lease (ML) 1770;
- increased duration of the construction phase from two years to three years;
- increased peak construction phase workforce from approximately 1,000 to approximately 1,900 personnel;

Rail Siding

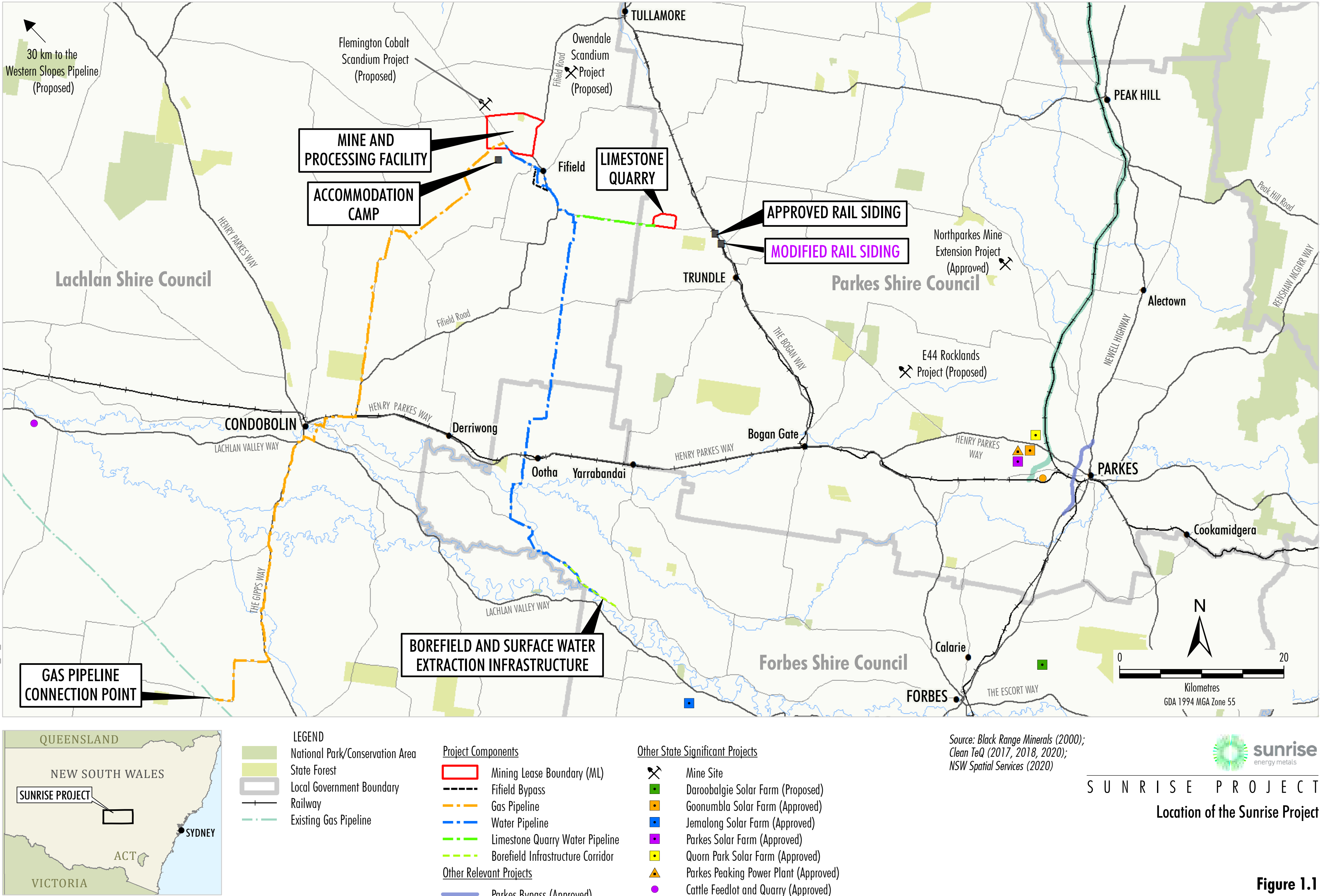
- revised rail siding location and layout;
- addition of an ammonium sulphate storage and distribution facility to the rail siding;
- extension of the Scotson Lane road upgrade;
- addition of a 22 kilovolt (kV) electricity transmission line (ETL) (subject to separate approval) to the rail siding power supply;
- increased peak operational phase workforce from approximately five to approximately 10 personnel;

Accommodation Camp

- increased construction phase capacity from 1,300 to 1,900 personnel;
- increased size of the treated wastewater irrigation area;
- option for an alternative alignment of the last section of the accommodation camp water pipeline along the accommodation camp services corridor, rather than along the access road corridor; and
- option to transfer treated wastewater to the mine and processing facility for reuse via a water pipeline located inside the approved services corridor;

Road Transport Activities

- changes to construction phase vehicle movements associated with the increased construction phase accommodation camp capacity and changes to heavy vehicle delivery requirements;
- changes to operational phase heavy vehicle movements associated with revisions to processing plant reagent types, rates and storage volumes; and
- changes to operational phase heavy vehicle movements to and from the rail siding associated with the transport of metal sulphate and ammonium sulphate products.



LEGEND

National Park/Conservation Area
State Forest
Local Government Boundary
Railway
Existing Gas Pipeline

Project Components

Mining Lease Boundary (ML)
Fifield Bypass
Gas Pipeline
Water Pipeline
Limestone Quarry Water Pipeline
Borefield Infrastructure Corridor

Other Relevant Projects

Parkes Bypass (Approved)

Other State Significant Projects

Mine Site
Daroobalgie Solar Farm (Proposed)
Goonumbla Solar Farm (Approved)
Jemalong Solar Farm (Approved)
Parkes Solar Farm (Approved)
Quorn Park Solar Farm (Approved)
Parkes Peaking Power Plant (Approved)
Cattle Feedlot and Quarry (Approved)
Parkes Special Activation Precinct
Inland Rail (Parkes to Narromine) (Approved)

Source: Black Range Minerals (2000); Clean TeQ (2017, 2018, 2020); NSW Spatial Services (2020)

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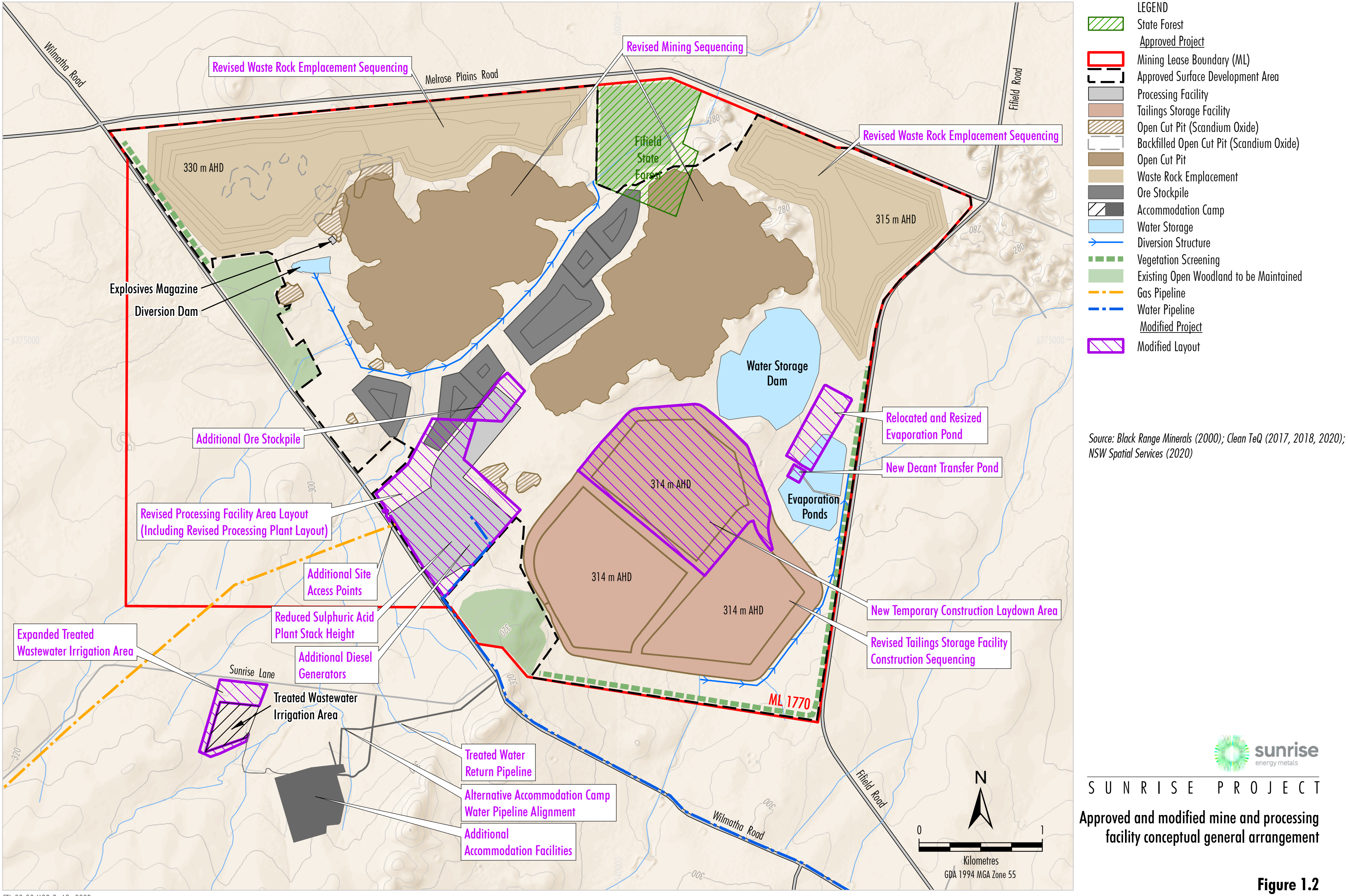
SUNRISE PROJECT

Location of the Sunrise Project

Figure 1.1



SUNRISE PROJECT

Approved and modified mine and processing facility conceptual general arrangement

Figure 1.2

CTL-20-08 MOD 7_AQ_202B

Source: Black Range Minerals (2000);
Clean Teq (2020, 2021); NSW Spatial Services (2020, 2021).

Orthophoto: © NSW Department of Finance, Services & Innovation (2021)

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S U N R I S E   P R O J E C T

Approved and modified rail siding location

Figure 1.3

CTL-20-08 MOD 7_AQ_203B

The Modification would not change the following approved components of the Project:

- other mine and processing facility components (e.g. surface development area, mining method, processing method and rate, tailings management and water management concepts);
- other accommodation camp components (e.g. surface development area; operational phase capacity);
- other transport activities and transport infrastructure (e.g. the Fifield Bypass);
- limestone quarry;
- borefield, surface water extraction infrastructure and water pipeline; and/or
- gas pipeline.

1.3 Report Structure

The report is structured as follows:

- Section 1 – Introduces the Air Quality Assessment and provides a summary of the Modification.
- Section 2 – Identifies the key potential air quality and greenhouse gas impacts to be addressed.
- Section 3 – Outlines the key relevant legislative and policy assessment requirements for air quality and greenhouse gas.
- Section 4 – Discusses key features of the existing environment including surrounding land uses, sensitive receptors, and local meteorological and air quality conditions.
- Section 5 – Provides an overview of the methods used to assess the potential for air quality and greenhouse gas impacts.
- Section 6 – Provides an assessment of the potential construction and operational air quality impacts including potential cumulative impacts.
- Section 7 – Provides an assessment of the potential greenhouse gas emissions.
- Section 8 – Outlines the measures to mitigate or otherwise effectively manage and monitor potential impacts.
- Section 9 – Provides the conclusions of the assessment.

2. Potential Impacts

Potential air quality impacts can arise when emissions from an industry or activity lead to a deterioration in the ambient air quality. Potential air quality impacts have been identified from a review of the Modification and associated activities. This identification process has considered the types of emissions to air and proximity of these emission sources to sensitive receptors.

Emissions to air associated with the Modification could occur from a variety of activities including material handling, material transport, blasting, processing, power generation, and wind erosion from exposed areas at the mine and processing facility and the rail siding. These emissions have the potential to be generated during both the construction and operational phases.

Emissions to air from the modified mining operations would include dust, also referred to as particulate matter. Key classifications of particulate matter include:

- Total suspended particulates (TSP).
- Particulate matter with equivalent aerodynamic diameter of 10 microns or less (PM_{10}).
- Particulate matter with equivalent aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$).
- Deposited dust.

Plant and equipment engine exhausts associated with the modified mining operations also have the potential to generate emissions that include carbon monoxide (CO), oxides of nitrogen (NO_x) and particulate matter, and to a lesser extent sulphur dioxide (SO_2).

The Modification would not change the approved blasting activities on ML 1770. Blasting does have the potential to generate nitric oxide (NO) emissions which, in turn, can oxidise to the more harmful nitrogen dioxide (NO_2).

The processing facility includes a sulphuric acid plant which has the potential to generate emissions of SO_2, NO_x and sulphuric acid mist (H_2SO_4).

Power generation for the modified mine and processing facility would be provided by an on-site gas fired power plant and heat recovery steam generation units. Steam required for process use will be generated from steam produced from the heat recovery steam generation units and/or an auxiliary diesel boiler. Emergency power requirements will be provided by four diesel-powered backup generators.

There is however potential for the sulphuric acid plant to produce sufficient steam to power the co-generation plant and meet the power requirements of the mine and processing facility. If this was to occur, there will be no need for the external gas supply to generate steam and therefore the gas pipeline would not be constructed. When the sulphuric acid plant is not operating (e.g. planned maintenance), the auxiliary diesel boiler would be required to generate process steam and diesel generators will be required to provide emergency power for essential lighting and process loads.

No change to the approved power supply is proposed as part of the Modification with the exception of an increase in the number of backup diesel-powered generators (and associated stacks) from one to four.

For the purposes of this assessment, it has conservatively been assumed that the auxiliary diesel boiler and diesel generators would be operated 24 hours per day, every day of the year as this would represent the maximum case scenario.

Emissions from these diesel-powered power generation activities would potentially include SO_2, CO, NO_x, $PM_{2.5}$ and volatile organic compounds (VOCs) such as benzene and 1,3-butadiene.

The key potential impacts for the Modification would therefore include:

- Construction and operational dust (i.e. particulate matter in the form of TSP, PM_{10}, $PM_{2.5}$ and deposited dust).
- Processing facility emissions (H_2SO_4, SO_2, CO, NO_2, $PM_{2.5}$ and VOCs [e.g. benzene and 1,3-butadiene]).
- Post-blast fumes (NO_2).
- Diesel exhaust (PM_{10}, $PM_{2.5}$ and NO_2).

In addition, the modified Project would generate greenhouse gas emissions (e.g. carbon dioxide [CO_2]). An assessment of the potential greenhouse gas emissions is included in this assessment.

These potential air quality and greenhouse gas impacts are the focus of this assessment.

3. Policy Setting

3.1 Air Quality Criteria

Air quality is typically quantified by the concentrations of substances in the ambient air. Air pollution occurs when the concentration (or some other measure of intensity) of one or more substances known to cause health, nuisance and/or environmental effects exceeds a certain level. With regard to human health and nuisance effects, the substances most relevant to the Modification have been identified (Section 2), as dust in various forms, NO_2, H_2SO_4, SO_2, CO, and VOCs.

The NSW Environment Protection Authority (EPA) has developed assessment criteria for a range of air quality indicators including those mentioned above. These criteria are outlined in the "Approved Methods for the Modelling and Assessment of Air Pollutants in NSW" (EPA, 2016), hereafter referred to as the Approved Methods. Most of the EPA criteria referred to in this report have been drawn from national standards for air quality set by the National Environmental Protection Council of Australia (NEPC) as part of the National Environment Protection Measures (NEPMs) (NEPC, 1998). To measure compliance with ambient air quality criteria, the NSW Department of Planning, Industry and Environment (DPIE) has established a network of monitoring stations across NSW and up-to-date records are published on the DPIE website.

The Modification has been assessed in terms of its ability to comply with the air quality criteria set by the EPA as part of the Approved Methods. These criteria (as well as those from Development Consent [DA 374-11-00]) are outlined in Table 3.1 and apply to sensitive receptors, where the Approved Methods defines a sensitive receptor as *"a location where people are likely to work or reside; this may include a dwelling, school, hospital, office or public recreational area"*. This definition has also been interpreted as places of near-continuous occupation.

Table 3.1 EPA air quality assessment criteria and Development Consent (DA 374-11-00) criteria

Air quality indicator	Averaging time	Criterion	Application[1]	Development Consent (DA 374-11-00)
Particulate matter (PM_{10})	24-hour	50 µg/m³	100th percentile, cumulative	50 µg/m³
	Annual	25 µg/m³	100th percentile, cumulative	25 µg/m³
Particulate matter ($PM_{2.5}$)	24-hour	25 µg/m³	100th percentile, cumulative	25 µg/m³
	Annual	8 µg/m³	100th percentile, cumulative	8 µg/m³
Particulate matter (TSP)	Annual	90 µg/m³	100th percentile, cumulative	90 µg/m³
Deposited dust	Annual (maximum increase)	2 g/m²/month	100th percentile, cumulative	2 g/m²/month
	Annual (maximum total)	4 g/m²/month	100th percentile, cumulative	4 g/m²/month
Nitrogen dioxide (NO_2)	1-hour	246 µg/m³	100th percentile, cumulative	Nil
	Annual	62 µg/m³	100th percentile, cumulative	Nil
Carbon monoxide (CO)	15-minute	100 mg/m³	100th percentile, cumulative	Nil
	1-hour	30 mg/m³	100th percentile, cumulative	Nil
	8-hour	10 mg/m³	100th percentile, cumulative	Nil
Sulphur dioxide (SO_2)	10-minute	712 µg/m³	100th percentile, cumulative	Nil
	1-hour	570 µg/m³	100th percentile, cumulative	Nil
	24-hour	228 µg/m³	100th percentile, cumulative	Nil
	Annual	60 µg/m³	100th percentile, cumulative	Nil
Sulphuric acid (H_2SO_4)	1-hour	18 µg/m³	99.9th percentile, incremental	Nil
Benzene	1-hour	29 µg/m³	99.9th percentile, incremental	Nil
1,3-butadiene	1-hour	40 µg/m³	99.9th percentile, incremental	Nil

1 *The 100th percentile application criteria stipulates a 'maximum allowable' criteria (i.e. the criterion must be complied with all the time). The 99.9th percentile application criteria allows for up to 9 hours of exceedance per year (i.e. 0.01% of one year). Criteria for air quality indicators with a 99.9th percentile is applied beyond the development boundary.*

The EPA criteria for all listed indicators in Table 3.1 (except H_2SO_4, benzene and 1,3-butadiene) relate to the total concentration of pollutants in the air (that is, cumulative) and not just the contribution from project-specific sources. Therefore, some consideration of background levels is required when using these criteria to assess the potential impacts of the Modification. Section 4 provides further discussion of background levels.

The modified Project is assessed against the current criteria detailed in the Approved Methods as these criteria would be applied by the consent authority (DPIE) in accordance with the provisions of Clause 12AB of the S*tate Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (Mining SEPP) (2018 amendment).

The *NSW Voluntary Land Acquisition and Mitigation Policy* (NSW Government, 2018) (VLAMP) includes the NSW Government's policy for voluntary mitigation and land acquisition to address dust (particulate matter) impacts from state significant mining, petroleum and extractive industry developments. The VLAMP brings the air quality criteria in line with the NEPM standards and EPA criteria.

From the VLAMP, voluntary mitigation rights may apply where, even with best practice management, the development contributes to exceedances of the criteria in Table 3.2 at any residence or workplace on privately owned land.

Table 3.2 VLAMP mitigation criteria for particulate matter

Air quality indicator	Averaging time	Mitigation criterion	Impact type
Particulate matter (PM_{10})	24-hour	50 µg/m³ **	Human health
	Annual	25 µg/m³ *	Human health
Particulate matter ($PM_{2.5}$)	24-hour	25 µg/m³ **	Human health
	Annual	8 µg/m³ *	Human health
Particulate matter (TSP)	Annual	90 µg/m³ *	Amenity
Deposited dust	Annual (maximum increase)	2 g/m²/month **	Amenity
	Annual (maximum total)	4 g/m²/month *	Amenity

Source: NSW Government (2018).
** Cumulative impact (i.e. increase in concentrations due to the development plus background concentrations due to all other sources).*
*** Incremental impact (i.e. increase in concentrations due to the development alone), with zero allowable exceedances of the criteria over the life of the development.*

Voluntary acquisition rights may apply where, even with best practice management, the development contributes to exceedances of the criteria in Table 3.3 at any residence or workplace on privately owned land, or on more than 25% of any privately owned land where there is an existing dwelling or where a dwelling could be built under existing planning controls.

The difference between the voluntary mitigation and voluntary acquisition criteria is that acquisition criteria permits up to five exceedances of the relevant criteria over the life of the Project, whereas the mitigation criteria does not allow any exceedances of the relevant criteria.

The particulate matter levels for comparison with the criteria in Table 3.2 and Table 3.3 must be calculated in accordance with the Approved Methods.

Table 3.3 VLAMP acquisition criteria for particulate matter

Air quality indicator	Averaging time	Acquisition criterion	Impact type
Particulate matter (PM_{10})	24-hour	50 µg/m^3 **	Human health
	Annual	25 µg/m^3 *	Human health
Particulate matter ($PM_{2.5}$)	24-hour	25 µg/m^3 **	Human health
	Annual	8 µg/m^3 *	Human health
Particulate matter (TSP)	Annual	90 µg/m^3 *	Amenity
Deposited dust	Annual (maximum increase)	2 g/m^2/month **	Amenity
	Annual (maximum total)	4 g/m^2/month *	Amenity

Source: NSW Government (2018).
** Cumulative impact (i.e. increase in concentrations due to the development plus background concentrations due to all other sources).*
*** Incremental impact (i.e. increase in concentrations due to the development alone), with up to five allowable exceedances of the criteria over the life of the development.*

3.2 Greenhouse Gas

3.2.1 Overview

Greenhouse gas (GHG) is a collective term for a range of gases that are known to absorb radiation in the atmosphere, where they contribute to the greenhouse effect (global warming). GHGs include:

- CO_2; by far the most abundant GHG, primarily released during fuel combustion.
- Methane (CH_4); generated from the anaerobic decomposition of carbon-based material (including enteric fermentation and waste disposal in landfills).
- Nitrous oxide (N_2O); generated from industrial activity, fertiliser use and production.
- Hydrofluorocarbons (HFCs); commonly used as refrigerant gases in cooling systems.
- Perfluorocarbons (PFCs); used in a range of applications including solvents, medical treatments and insulators.
- Sulphur hexafluoride (SF_6); used as a cover gas in magnesium smelting and as an insulator in heavy duty switch gear.

It is common practice to aggregate the emissions of these gases to the equivalent emission of CO_2. This provides a simple figure for comparison of emissions against targets. Aggregation is based on the potential of each gas to contribute to global warming relative to CO_2 and is known as the global warming potential (GWP). The resulting number is expressed as carbon dioxide equivalents (or CO_2-e) and the National Greenhouse Accounts (NGA) factors describe the methods for estimating greenhouse gas emissions.

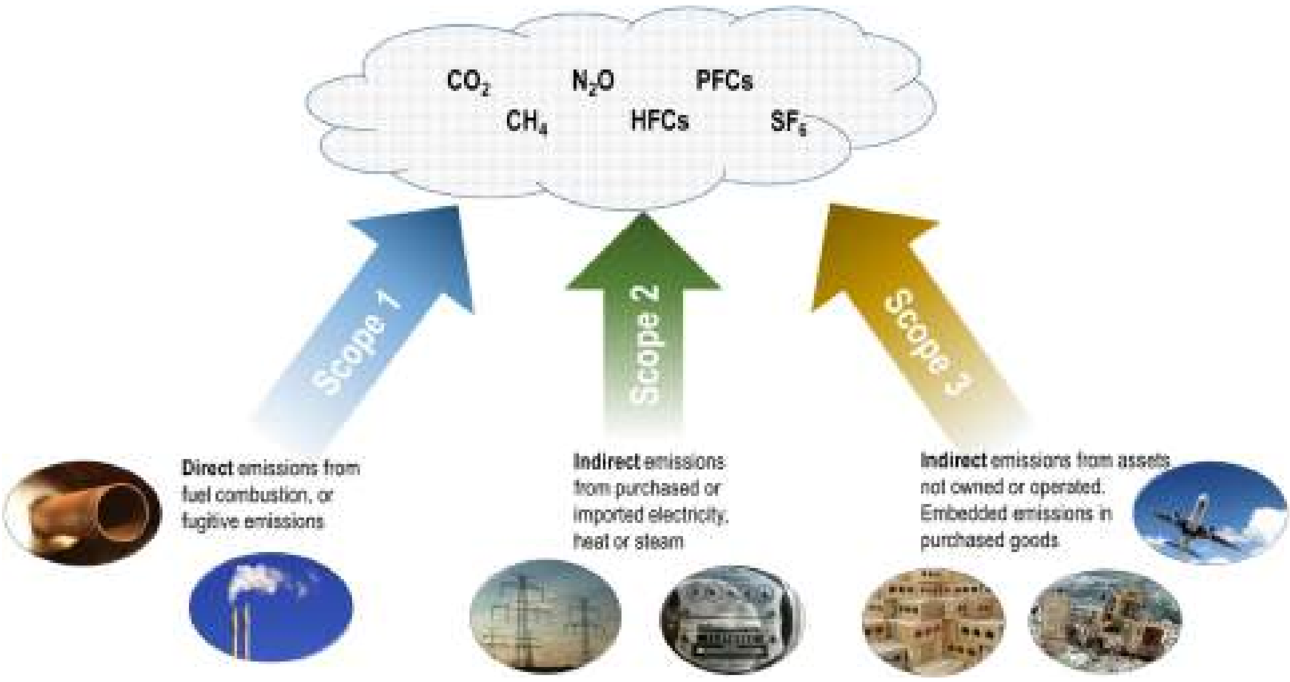
GHG emissions that form an inventory can be split into three categories known as ‘Scopes’. Scopes 1, 2 and 3 are defined by the Greenhouse Gas Protocol (GHG Protocol)[2] (World Business Council for Sustainable Development [WBCSD] and World Resources Institute [WRI], 2020) and can be summarised as follows (refer to Figure 3.1):

- Scope 1 – Direct emissions from sources that are owned or operated by the organisation (examples include combustion of diesel in company owned vehicles or used in on-site generators).
- Scope 2 – Indirect emissions associated with the import of energy from another source (examples include importation of electricity or heat).

[2] The GHG Protocol is a collaboration between the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD). The GHG Protocol provides guidance on the calculation and reporting of carbon footprints.

- Scope 3 – Other indirect emissions (other than Scope 2 energy imports) which are a direct result of the operations of the organisation but from sources not owned or operated by them (examples include business travel (by air or rail) and product usage).

The purpose of differentiating between the scopes of emissions is to avoid the potential for double counting, where two or more organisations assume responsibility for the same emissions.



Adapted from – World Business Council for Sustainable Development – Greenhouse Gas Protocol

Figure 3.1 Sources of greenhouse gases

3.2.2 Federal Greenhouse Gas Policy

Paris Climate Conference COP21

During the 21st yearly session of the Conference of Parties (COP21) held in Paris in 2015 an agreement was reached 'to achieve a balance between anthropogenic (human induced) emissions by sources and removals by sinks of greenhouse in the second half of this century'.

Following COP21, international agreements were made to:

- Keep global warming well below 2.0 degrees Celsius, with an aspirational goal of 1.5 degrees Celsius (based on pre-industrial levels).
- From 2018, countries are to submit revised emission reduction targets every five years, with the first being effective from 2020, and goals set to 2050.
- Define a pathway to improve transparency and disclosure of emissions.
- Make provisions for financing the commitments beyond 2020.

In response to this challenge Australia has committed to reducing emissions to 26-28% of 2005 levels by 2030 (Commonwealth of Australia, 2015).

National Greenhouse and Energy Reporting Act 2007

The Federal Government uses the National Greenhouse Gas and Energy Reporting (NGER) legislation for the measurement, reporting and verification of GHG emissions in Australia. This legislation is used for a range of purposes, including international GHG reporting. Corporations which meet the thresholds for reporting under NGER must register and report their GHG emissions.

Under the *National Greenhouse and Energy Reporting Act 2007* (NGER Act), constitutional corporations in Australia which exceed thresholds for GHG emissions or energy production or consumption are required to measure and report data to the Clean Energy Regulator on an annual basis. The *National Greenhouse and Energy Reporting (Measurement) Determination 2008* identifies a number of methodologies to account for GHGs from specific sources relevant to the Project. This includes emissions of GHGs from direct fuel combustion (fuels for transport energy purposes), emissions associated with consumption of power from direct combustion of fuel (e.g. diesel generators used during construction), and from consumption of electricity from the grid. SEM will report its emissions under the NGER Act if trigger levels are reached.

Emissions Reduction Fund (ERF)

Previous legislation passed by the Australian Government to reduce carbon emissions was the *Clean Energy Act 2011*. This legislation established an Emissions Trading Scheme (ETS), also referred to as a carbon price. Under this ETS, approximately 370 companies were required to purchase a permit for every tonne of carbon equivalent they emit.

The *Clean Energy Legislation (Carbon Tax Repeal) Act 2014* repealed the *Clean Energy Act 2011*. This abolished the carbon pricing mechanism from 1 July 2014, and replaced it with the Australian Government's Direct Action Plan, which aims to focus on sourcing low cost emission reductions. The Direct Action Plan includes an ERF; legislation to implement the ERF came into effect on 13 December 2014, and is now considered to be the centrepiece of the Australian Government's policy suite to reduce emissions.

Emissions reduction and sequestration methodologies are available under the ERF which could provide the opportunity to earn carbon credits as a result of emissions reduction activities.

3.2.3 State Greenhouse Gas Policy

NSW Climate Change Policy Framework

In response to national GHG reduction commitments, the NSW government has developed the NSW Climate Change Policy Framework (NSW Government, 2016) which sets the objective of achieving net-zero emissions by 2050. It intends to achieve this through a combination of policy development, leading by example and advocacy.

3.2.4 Existing Approvals

As required under Development Consent (DA 374-11-00), SEM is required to “minimise the greenhouse gas emissions of the development”. SEM has a number of processes by which GHG emissions from Project operations will be mitigated. These processes are included in the Air Quality Management Plan (Clean TeQ, 2019a). This plan sets out a range of measures for the management and mitigation of GHGs and opportunities for energy savings.

Section 8 provides further details on these measures.

4. Existing Environment

This section provides a description of the environmental characteristics in the area, including a review of the local meteorological and ambient air quality conditions. The review considers data collected from existing meteorological and air quality monitors at the mine and processing facility (Figure 4.1). One of the objectives for reviewing these data was to develop an understanding of the existing air quality as well as the meteorological conditions which typically influence the local air quality conditions.

4.1 Meteorology

Meteorological conditions are important for determining the transport of emissions, and the potential influences on air quality. In addition, meteorological data are often used with concurrent air quality data to determine potential contributions from sources of interest. This section provides an analysis of meteorological data collected at the Project and identifies the datasets that may be representative of the long term, local conditions.

The EPA prescribes the minimum requirements for meteorological data that are to be used for air quality assessments. These requirements are outlined in the Approved Methods and include minimum data capture rates, siting and operation, and data preparation. Two types of meteorological stations are described by the EPA:

- “Site specific”; and
- “Site representative”.

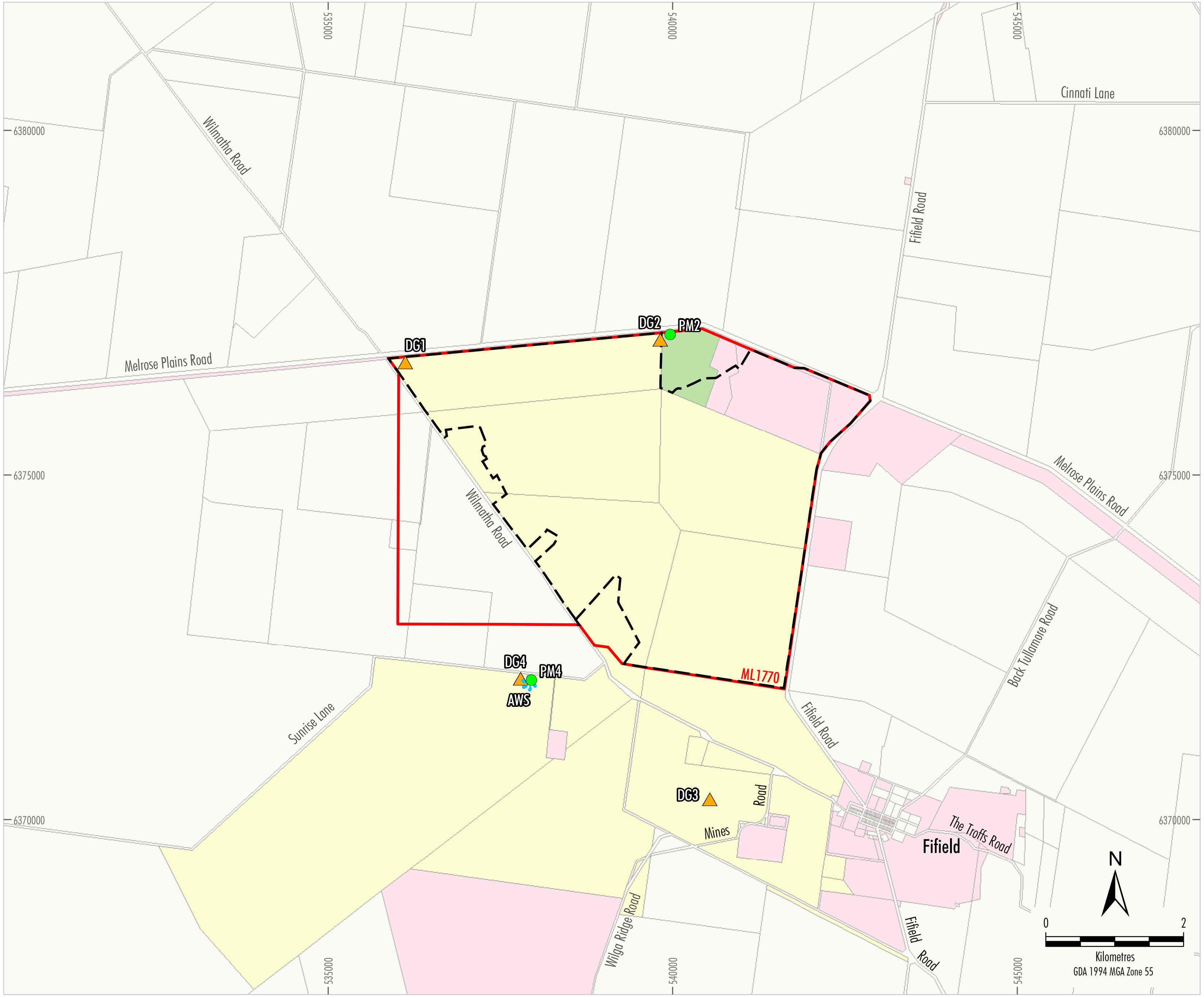
Data from site-specific meteorological stations are preferred for air quality assessments however site representative data are also acceptable provided that analysis indicates that the data adequately describes the expected meteorological conditions at the site of interest.

SEM has been conducting meteorological monitoring at the Automatic Weather Station (“AWS”) at the accommodation camp site since November 2018 (Figure 4.1) and in accordance with Schedule 3, Condition 23 of Development Consent (DA 374-11-00). The AWS would be classified as “site-specific” by the Approved Methods based on its proximity to the mine and processing facility. This means that modelling is to be conducted using a dataset that is a minimum of one year duration and at least 90% complete.

Two years of data from the AWS were available and these data have been analysed in order to characterise the local conditions and to identify representative datasets. The analysis involved comparing statistics from the data collected for each calendar year to determine a year-long dataset that most closely reflects the longer term, local conditions. Wind data have primarily been used for this purpose although rainfall data have also been considered.

Wind-roses have been prepared from the 2019 and 2020 data collected at the AWS. The wind-roses (Figure 4.2 and Figure 4.3) show the frequency of wind speeds and wind directions based on hourly records for each year and by season. The circular format of the wind rose shows the direction from which the wind blew and the length of each "spoke" around the circle shows how often the wind blew from that direction. The different colours of each spoke provide details on the speed of the wind from each direction.

The most common winds in 2019 (Figure 4.2) were from the southwest and north-northeast. This pattern of winds was evident in summer and autumn while fewer north-northeast winds were observed in winter and spring. In 2020 (Figure 4.3) there was a shift in conditions where the most common winds were from the west and east. The most noticeable shift, compared to 2019, was in winter and spring when west-northwest (winter) and east (autumn) winds were observed.



Source: Black Range Minerals (2000); NSW Department of Industry (2017); NSW Land & Property Information (2017)

sunrise energy metals

SUNRISE PROJECT

Location of air quality and meteorological monitoring sites

Figure 4.1

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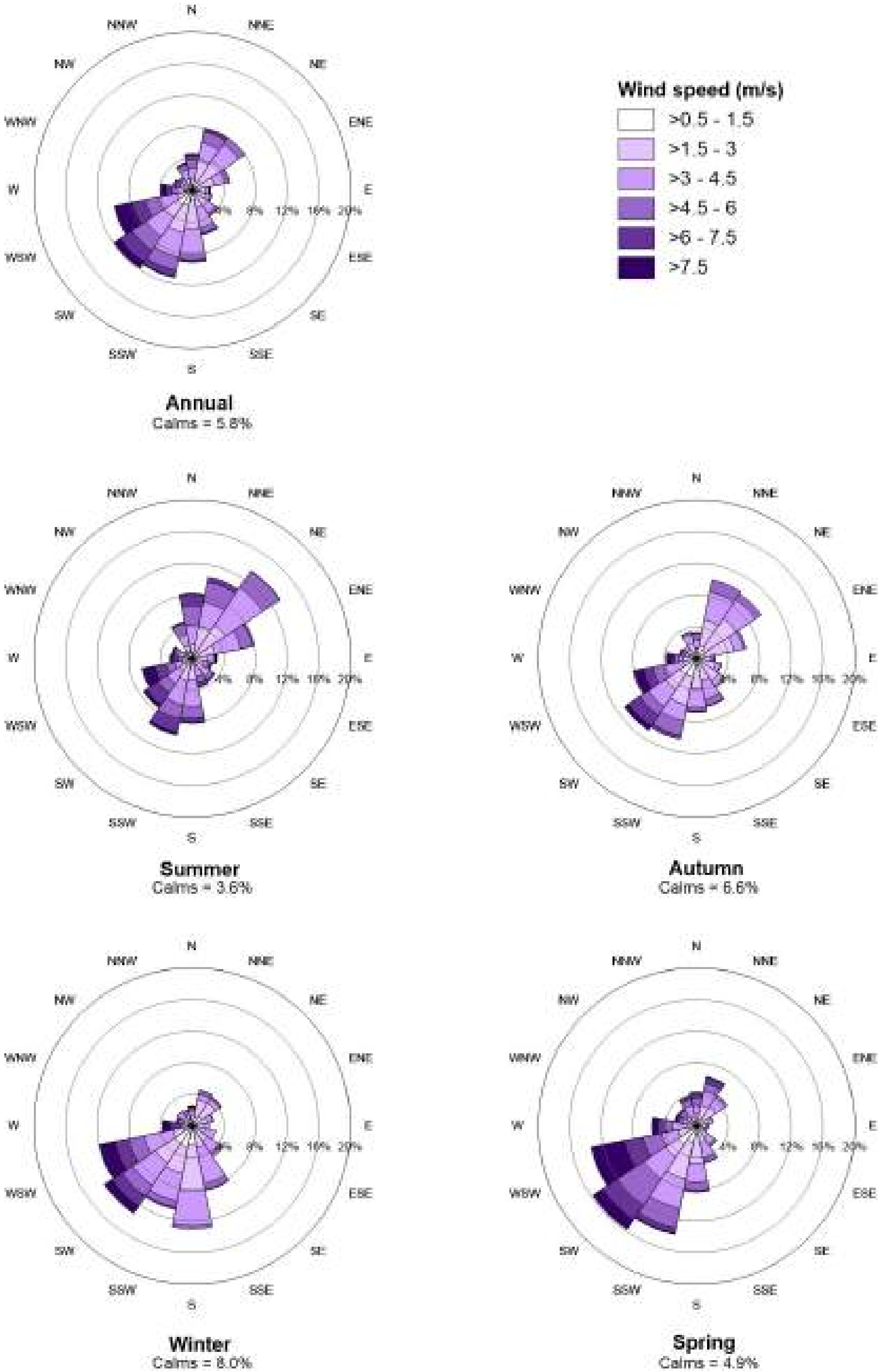


Figure 4.2 Annual and seasonal wind-roses for data collected at AWS in 2019

Figure 4.3 Annual and seasonal wind-roses for data collected at AWS in 2020

Figure 4.4 shows the wind speed and rainfall data from the AWS.

These data show that wind speeds were slightly higher towards the end of 2019 with maximum wind speeds reaching around 12 metres per second.

Rainfall in 2019 was 26 percent lower than the long term average (recorded by the Bureau of Meteorology [BoM] at the Trundle [Murrumbogie] station number 50028), an outcome of the drought which affected many parts of NSW and lasted from 2017 to 2019. Rainfall recorded at the AWS in 2020 was 790 mm, 66 percent higher than the long term average of 476 mm at Trundle.

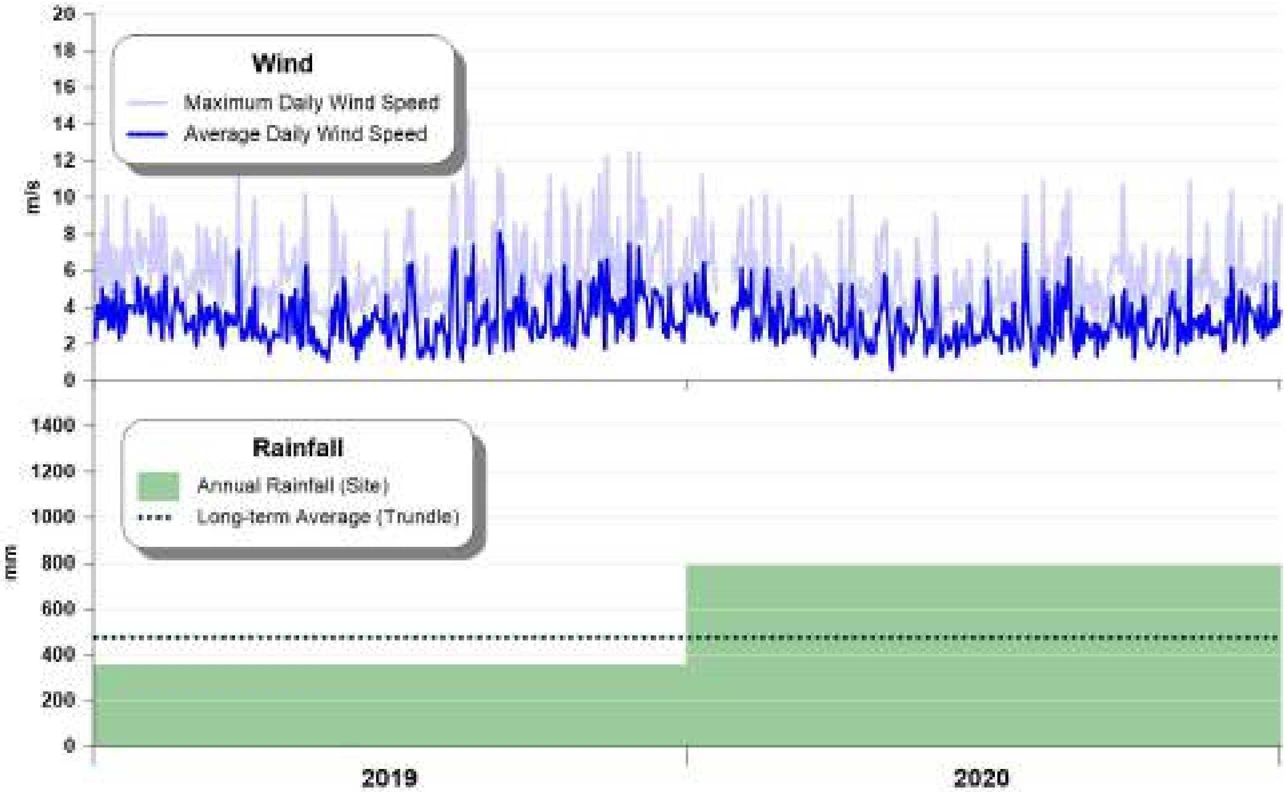


Figure 4.4 Wind speed and rainfall data collected at the AWS during 2019 and 2020

Table 4.1 provides annual wind statistics from the 2019 and 2020 datasets. Data capture exceeded the EPA's minimum requirement (90%) and the mean wind speeds in 2019 and 2020 were within five percent of the average across both years.

Table 4.1 Statistics from meteorological data collected in 2019 and 2020

Year	2019	2020
Percentage complete (%)	100	97
Mean wind speed (m/s)	3.4	3.1
Percentage of calms (<= 0.5 m/s)	5.8	5.3
Percentage of wind speeds >6 m/s	11.6	6.3

The data from 2020 have been used to inform the air quality impacts of the Modification. This selection was based on:

- Meeting the EPA's requirements for site-specific data.
- High data capture rate, meeting the EPA's requirement for a minimum 90% complete dataset.
- The availability of concurrent ambient air quality data.
- A year that was not adversely influenced by bushfire activity or extreme conditions (Section 4.2.1).

Methods used for incorporating the 2020 data into modelling for the Modification are discussed in detail in Section 5.

4.2 Air Quality

This section examines the historical air quality conditions around the Project and establishes the appropriate background levels to be considered for assessment of the Modification.

It should be noted that air quality monitoring data represent the contributions from all sources that have at some stage been upwind of each monitor. In the case of particulate matter (as PM_{10}) for example, a measurement may contain contributions from many sources such as from mining activities, construction works, bushfires and 'burning off', agricultural activities, industry, vehicles, roads, wind-blown dust from nearby and remote areas, fragments of pollens, moulds, and so on.

4.2.1 Extraordinary Events

Air quality in many parts of NSW, including the Central West, was adversely influenced by drought conditions between 2017 to 2019 and into 2020. A deterioration in air quality conditions in recent years was not unique to the Central West region and extraordinary events, beyond normal conditions, have been identified as part of annual reviews of monitoring data.

The DPIE's "Annual Air Quality Statement 2018" concluded that particle levels increased across NSW in 2018 due to dust from the widespread, intense drought and smoke from bushfires and hazard reduction burning (Office of Environment and Heritage [OEH], 2019). Subsequently the "Annual Air Quality Statement 2019" (DPIE, 2020a) and "Annual Air Quality Statement 2020" (DPIE, 2021) concluded that air quality in NSW was greatly affected by the continuing intense drought conditions and unprecedented extensive bushfires during 2019 and into early 2020. In addition, the continued "intense drought has led to an increase in widespread dust events throughout the year [2019]" (DPIE, 2020a). In addition, the NSW Government released an "Air quality special statement spring-summer 2019-20" which indicated that the percentage of hours affected by smoke in the spring-summer 2019-20 period at the closest BoM station to the Project (Condobolin) was 18% (DPIE, 2020b).

The influence of drought conditions on air quality is evident in the DPIE's monitoring data. Figure 4.5 shows the annual average PM_{10} concentrations from data collected at various rural and urban air quality monitoring sites since 2010. These data show an increase in PM_{10} concentrations at all rural and urban locations from 2017 onwards, reflecting the onset of drought conditions, and increased bushfire activity in 2019. The bushfires intensified in late 2019 and continued into early 2020. The annual average PM_{10} concentrations then decreased with the onset of rain in early 2020.

Between 2010 and 2020 all monitoring locations identified in Figure 4.5 recorded at least one year with one or more days when the 24-hour average PM_{10} concentration exceeded 50 µg/m^3. In 2019, there were no fewer than 17 days (Wollongong being the minimum) when the 24-hour average PM_{10} concentration exceeded 50 µg/m^3.

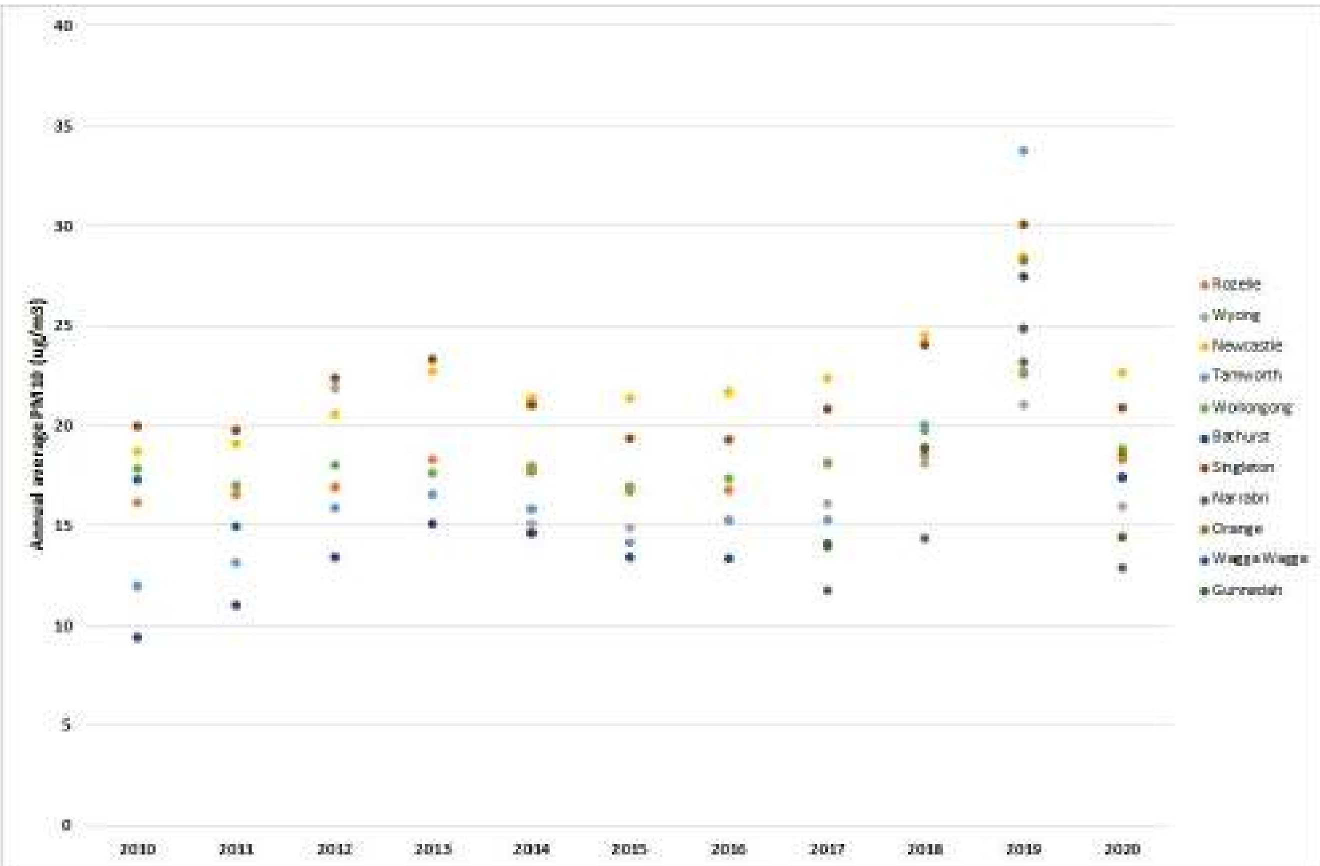


Figure 4.5 Annual average PM_{10} concentrations at various NSW air quality monitoring sites

The use of years with elevated air quality levels, largely driven by extraordinary events or extreme climatic conditions (or both) are avoided in modelling studies primarily because they do not address the definition of representative. In addition, extraordinary events cannot be reliably simulated in air dispersion models as it is not possible to identify all probable factors that led to these events, for example, the factors that influence the time, location and intensity of bushfires. This context has been considered in the analysis below.

4.2.2 Particulate Matter (as PM_{10})

Concentrations of PM_{10} are monitored by SEM at two locations referred to as PM2 and PM4 in the vicinity of the mine and processing facility (Figure 4.1). The monitoring commenced in November 2019 and includes the measurement of PM_{10} as 5-minute averages. These records have been processed into 24-hour averages for comparison with the EPA criteria.

Figure 4.6 shows the measured 24-hour average PM_{10} concentrations from data collected at PM2 and PM4 in 2020. The measurements in January 2020 highlighted the effects of the drought and bushfires on air quality as the 24-hour average PM_{10} concentrations exceeded the EPA (2016) criteria (50 µg/m^3) on most days in the month. Rainfall in late January and into February coincided with a decrease in the number of days exceeding 50 µg/m^3. Increases in PM_{10} concentrations from 2017 to 2019, and into early 2020, were not unique to the Central West region of NSW (Figure 4.5).

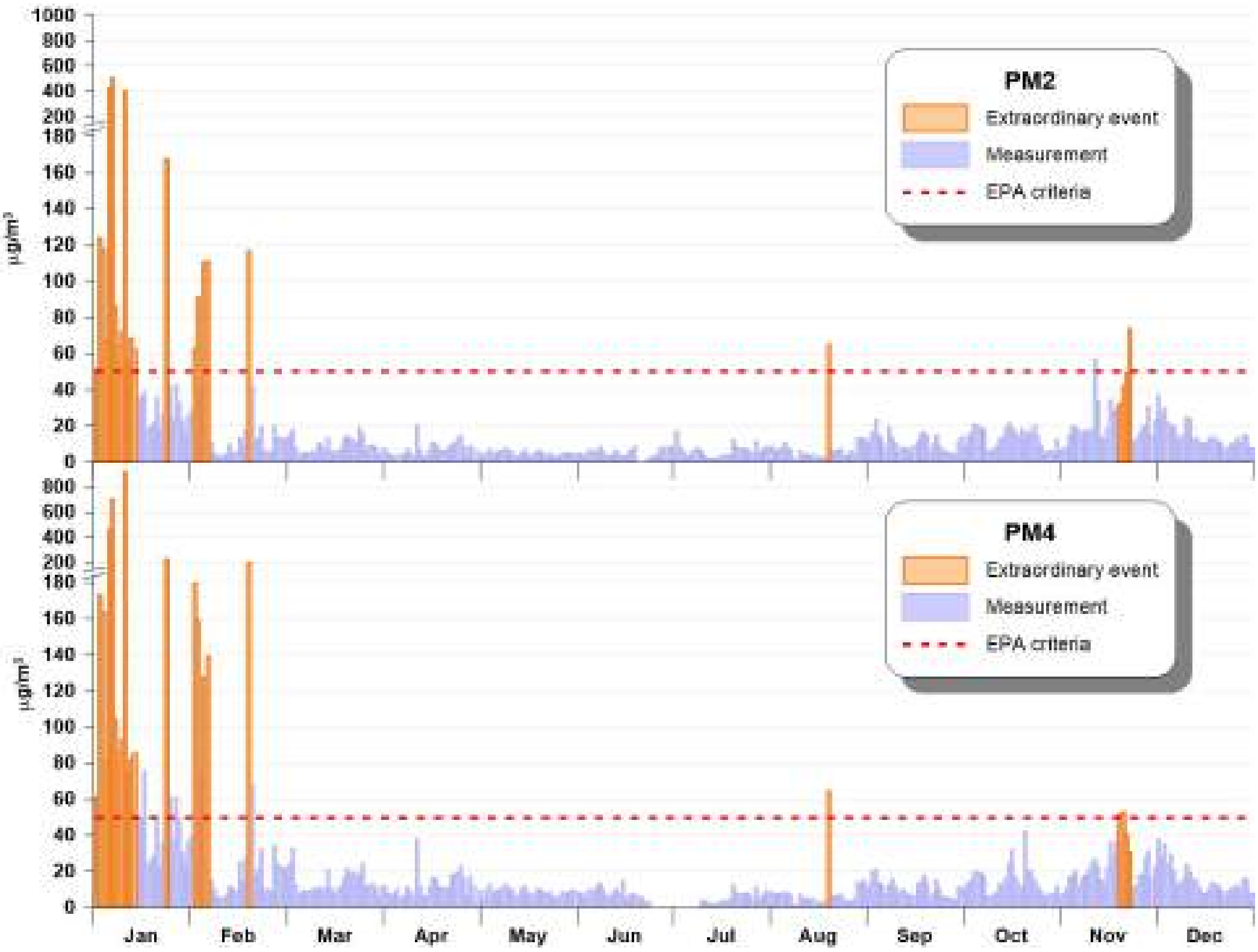


Figure 4.6 Measured 24-hour average PM_{10} concentrations in 2020

Table 4.2 provides a summary of the available PM_{10} data. As noted above, the drought conditions and bushfire activity had adversely affected air quality in early 2020, with many days of PM_{10} concentrations exceeding the 50 µg/m^3 criterion. An estimate of the annual average PM_{10} was conducted excluding extraordinary events. This was done by removing measurements from days where the PM_{10} concentrations exceeded 50 µg/m^3 concurrently at both monitors; an approach that assumes the two monitors (which are five kilometres apart) would not record elevated levels concurrently unless there was a regional influence. As expected, and based on outcomes from other regional NSW air quality monitoring locations, the estimated annual average PM_{10} concentrations (excluding extraordinary events) did not exceed the 25 µg/m^3 criterion.

Table 4.2 Summary of measured PM_{10} concentrations in 2020

Statistic	Monitor PM2	Monitor PM4	EPA criterion
Including extraordinary events			
Maximum 24-hour average in µg/m^3	512	919	50
Number of days above 50 µg/m^3	22	28	-
Annual average in µg/m^3	18.6	25.5	25
Excluding extraordinary events			
Annual average in µg/m^3	11.0	14.0	25

4.2.3 Particulate Matter (as $PM_{2.5}$)

Concentrations of $PM_{2.5}$ are monitored by SEM at PM2 and PM4 in the vicinity of the mine and processing facility (Figure 4.1). The monitoring commenced in November 2019 and included the measurement of $PM_{2.5}$ as 5 minute averages. These records have been processed into 24-hour averages for comparison with the EPA criteria.

Figure 4.7 shows the measured 24-hour average $PM_{2.5}$ concentrations from data collected at PM2 and PM4 in 2020. As for PM_{10}, the measurements highlighted the effects of the drought and bushfire activity with 24-hour average $PM_{2.5}$ concentrations exceeding the criterion (25 µg/m^3) early in 2020 until rainfall in late January and early February led to a corresponding reduction in measured levels.

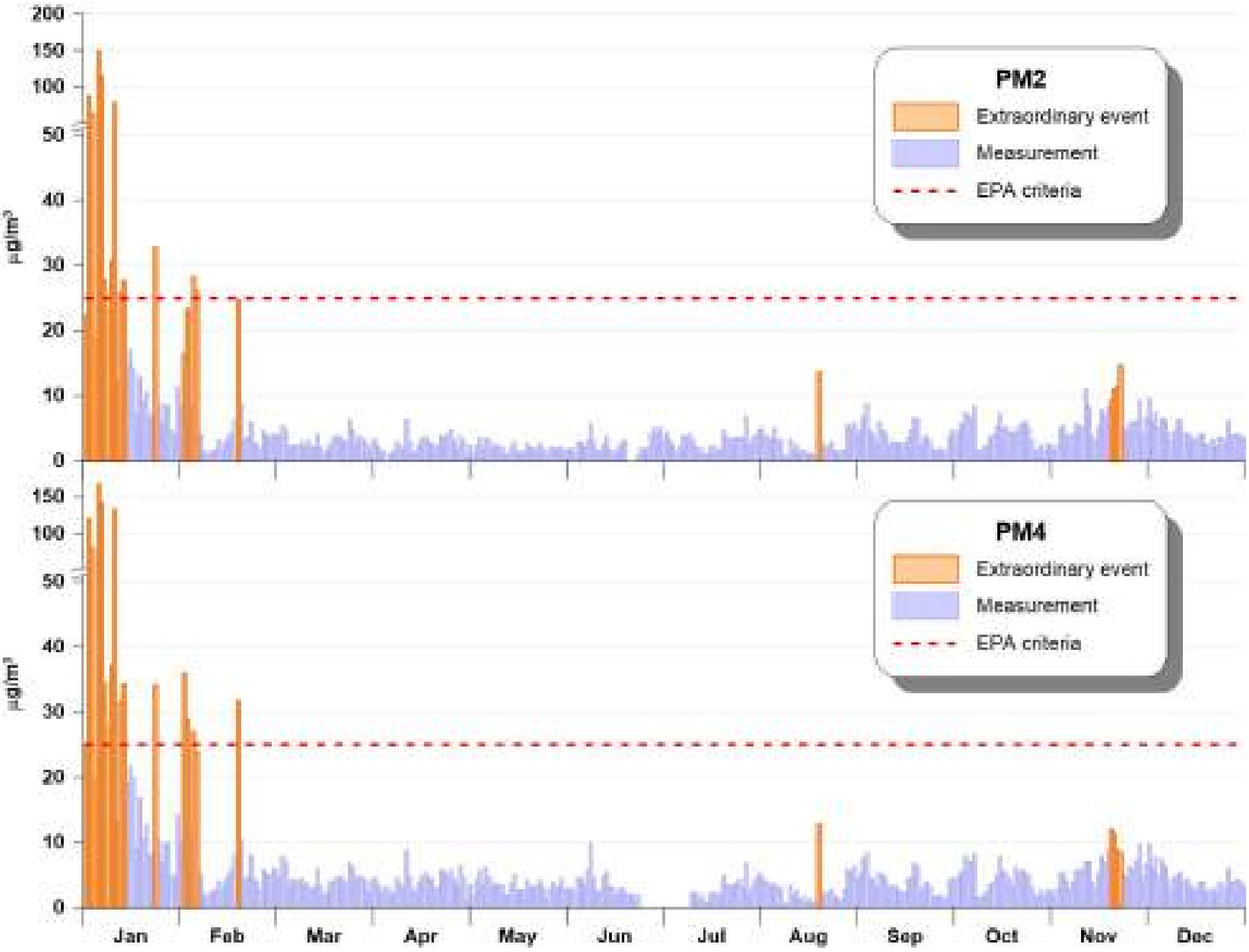


Figure 4.7 Measured 24-hour average $PM_{2.5}$ concentrations in 2020

Table 4.3 provides a summary of the available $PM_{2.5}$ data. The $PM_{2.5}$ concentrations exceeded 25 µg/m^3 criterion on 12 (PM2) to 15 days (PM4), primarily influenced by the drought conditions that persisted into early 2020. Annual average $PM_{2.5}$ concentrations did not exceed the 25 µg/m^3 criterion either with or without records of extraordinary events.

Table 4.3 Summary of measured $PM_{2.5}$ concentrations in 2020

Statistic	Monitor PM2	Monitor PM4	EPA criterion
Including extraordinary events			
Maximum 24-hour average in µg/m³	149	168	25
Number of days above 25 µg/m³	12	15	-
Annual average in µg/m³	6.0	7.3	8
Excluding extraordinary events			
Annual average in µg/m³	3.8	4.5	8

4.2.4 Particulate Matter (as TSP)

TSP is not monitored in the vicinity of the Project. The NSW Minerals Council (2000) estimated that, for rural environments in NSW, the average PM_{10} concentrations are typically 40% of the TSP concentrations. In addition, more recent studies (e.g. Jacobs, 2018) examined PM_{10} and TSP data and showed that average PM_{10} concentrations are close to 40% of the TSP concentrations in rural environments of NSW. For this assessment it has been conservatively assumed that the measured PM_{10} concentrations (including extraordinary events) would be 40% of the TSP concentrations, an assumption that yields estimated annual average TSP concentrations of between 46 µg/m³ (PM2) and 64 µg/m³ (PM4).

Table 4.4 shows the estimated annual average TSP concentrations from each PM_{10} monitoring site for data collected in 2020. These estimates do not highlight any exceedances of EPA criteria with respect to TSP.

Table 4.4 Summary of estimated TSP concentrations in 2020

Statistic	Monitor PM2	Monitor PM4	EPA criterion
Annual average in µg/m³	46	64	90

4.2.5 Deposited Dust

Air quality criteria for deposited dust are set to protect against nuisance amenity impacts. Monitoring of deposited dust relates to the collection of particles that settle from the ambient air, and includes TSP, PM_{10} and $PM_{2.5}$. Insoluble and soluble matter are separated by filtration and the mass of dried insoluble solids is determined gravimetrically. The exposure period is 30 ±2 days and one result (of insoluble solids) is obtained every month.

Monitoring of deposition dust is carried out by SEM at four locations (DG1-DG4) in the vicinity of the mine and processing facility (Figure 4.1) and Table 4.5 shows the annual average deposited dust levels for data collected in 2019 and 2020. Recorded deposited dust levels from all sources have not exceeded the 4 g/m²/month criterion including extraordinary events.

Table 4.5 Summary of measured deposited dust

Year	DG1	DG2	DG3	DG4	EPA criterion
Annual average in g/m²/month					
2019	3.4	2.8	2.5	3.0	4
2020	3.1	2.6	2.3	3.2	4

4.2.6 Other Air Quality Indicators

The Project is well removed from regional population centres, towns, main roads, industry and other major developments. The absence of industry and human activity means that concentrations of air quality indicators, other than dust emissions associated with activity in the region (e.g. agriculture and vehicles on unsealed roads), would be negligible and likely to approach baseline levels, that is, near the lowest concentrations that would be measured in NSW. In the context of the potential, modified Project emissions, this outcome applies to NO_2, SO_2, and CO.

4.3 Potential Cumulative Interactions with Other Projects

Other key proposed or approved projects that may potentially interact with, or have potential cumulative impacts with, the modified Project include (Figure 1.1):

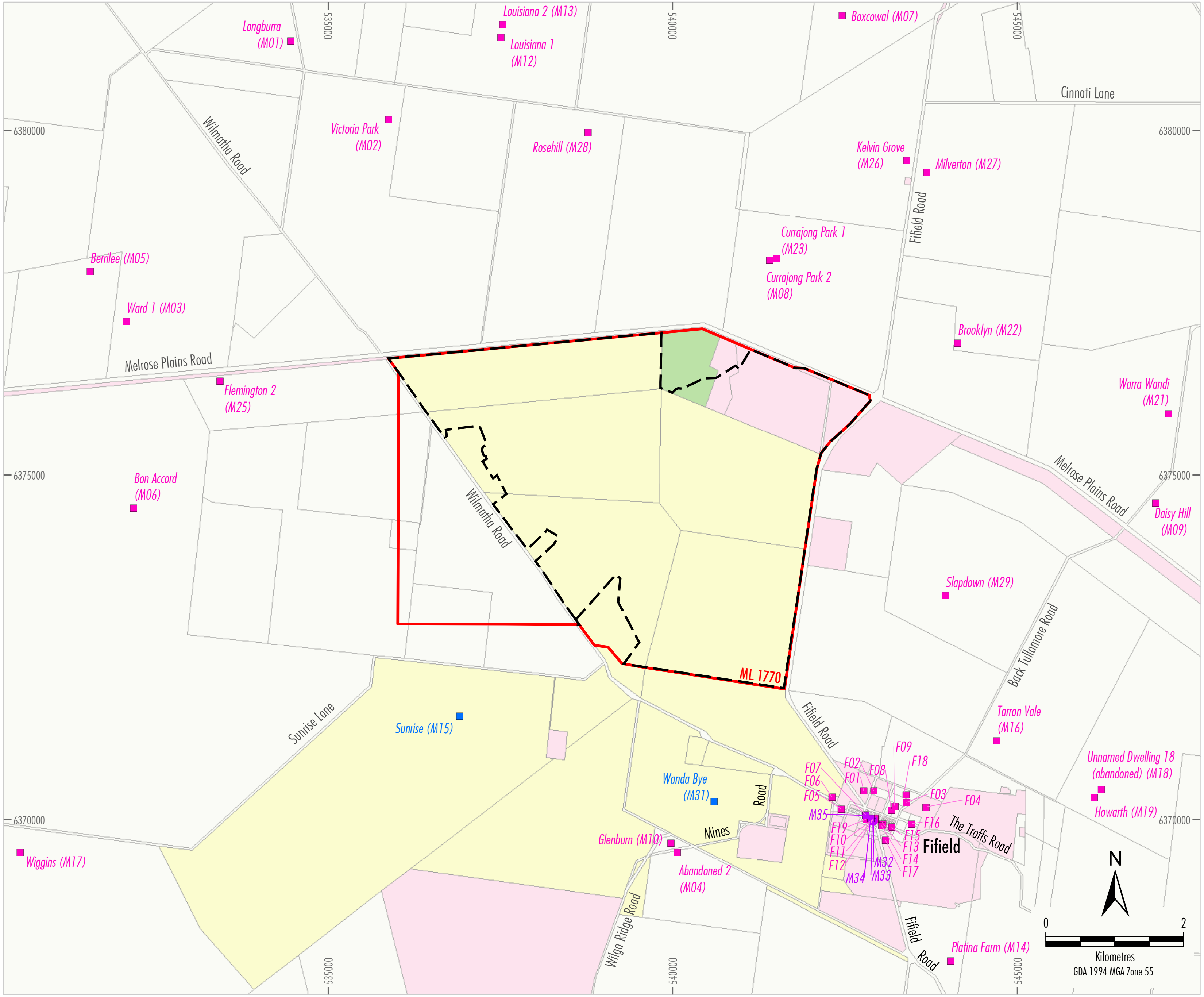
- Parkes Special Activation Precinct.
- Cattle Feedlot and Quarry.
- Flemington Cobalt Scandium Mine.
- Owendale Scandium Mine.
- Western Slopes Pipeline.
- Northparkes Mine Extension Project.
- Inland Rail Parkes to Narromine.
- Parkes Solar Farm.
- Goonumbla Solar Farm.
- Quorn Park Solar Farm.
- Parkes Peaking Power Plant.
- Parkes Bypass.
- E44 Rocklands Project.
- Jemalong Solar Farm.
- Daroobalgie Solar Farm.

Of these key proposed or approved projects, only the proposed Flemington Cobalt Scandium Mine and Owendale Scandium Mine may potentially interact with, or have potential cumulative air quality impacts with, the modified Project as they are located immediately north-west and north-east of the mine and processing facility, respectively. The Environmental Assessment Requirements for these projects were issued in 2018. In accordance with the draft *Assessing Cumulative Impacts Guide Guidance for State Significant Projects* (DPIE, 2020c) guideline, these projects are 'potentially relevant projects', and are therefore not required to be considered. It is expected that any potential cumulative interactions between these projects and the modified Project would be considered in the air quality assessments for these projects.

Potential cumulative interactions with other key proposed or approved projects would not be expected as they are located a considerable distance away from approved and modified Project activities (Figure 1.1).

4.4 Sensitive Receptors

The locations of the sensitive receptors assessed in this report are shown on Figure 4.8 (mine and processing facility) and Figure 4.9 (rail siding).



LEGEND
- Mining Lease Boundary (ML)
- Approved Surface Development Area
- Sunrise Energy Metals Owned Land
- Crown Land
- Fifield State Forest
- Private Landholder
- Mine-owned Dwelling
- Private Dwelling
- Community Receiver

Source: Black Range Minerals (2000); Clean TeQ (2017, 2018); NSW Department of Industry (2017); NSW Land & Property Information (2017)

SUNRISE PROJECT

Location of sensitive receptors near the mine processing facility

Figure 4.8

CTL-20-08 MOD 7_AQ_205B

Source: Black Range Minerals (2000); NSW Spatial Services (2020); Clean Teq (2017, 2018, 2020).
Orthophoto: © NSW Department of Finance, Services & Innovation (2020)

SUNRISE PROJECT

Location of sensitive receptors near the rail siding

Figure 4.9

CTL-20-08 MOD 7_AQ_206B

4.5 Summary of Existing Environment

The review of the existing environment led to the following observations:

- Winds are predominantly from the southwest to west, and northeast to east with some variations by season and from year-to-year.
- Air quality conditions were adversely influenced by drought between 2017 to 2019 and into early 2020. The drought led to an increase in the frequency of dust storms and bushfires which, in turn, affected air quality. These conditions were not unique to the Central West region of NSW (Figure 4.5).
- Measured 24-hour average PM_{10} and $PM_{2.5}$ concentrations exceeded the EPA criteria on multiple occasions in 2020, due to the extraordinary events in January associated with drought conditions and bushfires. Annual average PM_{10} and $PM_{2.5}$ concentrations did not exceed the EPA criteria after the records of extraordinary events were taken into consideration (i.e. excluded).
- Estimated annual average TSP concentrations and measured annual average deposited dust levels did not exceed the EPA criteria in 2020 after the records of extraordinary events were taken into consideration (i.e. excluded).

One of the objectives for reviewing the air quality monitoring data was to determine appropriate background levels to be added to the modified Project's contributions for the assessment of potential cumulative impacts. Table 4.6 shows the assumed background levels that apply at sensitive receptors based on the review of available monitoring data from 2020 (Section 4.2). These levels are considered to be representative of the local air environment, since they are derived from local measurements, and have been added to the modified Project's contributions to determine the potential cumulative impacts. In situations where background levels are elevated the proponent must "*demonstrate that no additional exceedances of the impact assessment criteria will occur as a result of the proposed activity and that best management practices will be implemented to minimise emissions of air pollutants as far as is practical*" (EPA, 2016).

Table 4.6 Assumed background levels that apply at sensitive receptors

Air quality indicator	Averaging time	Assumed background level that applies at sensitive receptors	Notes
Particulate matter (PM_{10})	24-hour	Variable by day	Average of the measured 24-hour average PM_{10} concentrations from PM2 and PM4 in 2020, excluding extraordinary events. A total of 5 days exceeded 50 µg/m^3 in this dataset.
	Annual	12.3 µg/m^3	Average of the measured annual average PM_{10} concentrations from PM2 and PM4 in 2020, excluding extraordinary events.
Particulate matter ($PM_{2.5}$)	24-hour	Variable by day	Average of the measured 24-hour average $PM_{2.5}$ concentrations from PM2 and PM4 in 2020, excluding extraordinary events.
	Annual	4.0 µg/m^3	Average of the measured annual average $PM_{2.5}$ concentrations from PM2 and PM4 in 2020, excluding extraordinary events.
Particulate matter (TSP)	Annual	55 µg/m^3	Estimated annual average TSP concentration in 2020, calculated by conservatively assuming the measured PM_{10} concentrations (including extraordinary events) is 40% of the TSP (from both PM2 and PM4).
Deposited dust	Annual	3.2 g/m^2/month	Highest annual average deposited dust level from all four gauges (DG1-DG4) in 2020.
Nitrogen dioxide (NO_2)	All	0 µg/m^3	No significant sources near the Project.
Carbon monoxide (CO)	All	0 µg/m^3	No significant sources near the Project.
Sulphur dioxide (SO_2)	All	0 µg/m^3	No significant sources near the Project.
Sulphuric acid (H_2SO_4)	1-hour	0 µg/m^3	No significant sources near the Project.

5. Assessment Methodology

This assessment has followed the procedures outlined in the Approved Methods (EPA, 2016). The Approved Methods include guidelines for the preparation of meteorological data, reporting requirements and air quality assessment criteria to assess the significance of potential impacts.

Specific methodologies for each of the identified potential impacts (Section 2) are described below.

5.1 Construction and Operational Dust (Mining Operations)

Construction and operational dust impacts from the mining operations have been quantified by modelling. The choice of model has considered the expected transport distances for the emissions, as well as the potential for temporally and spatially varying flow fields due to influences of the local terrain, land use, and potential for stagnation conditions characterised by calm or very low wind speeds with variable wind directions. The CALPUFF model has been selected. This model is specifically listed in the Approved Methods and has been used to predict ground-level particulate matter concentrations and deposited dust levels due to the modified Project. Concentrations and deposition levels have been simulated for every hour of the representative year and results at local communities and sensitive receptors have then been compared to the relevant air quality assessment criteria.

Figure 5.1 shows an overview of the model inputs. Appendix A provides details of all model settings.

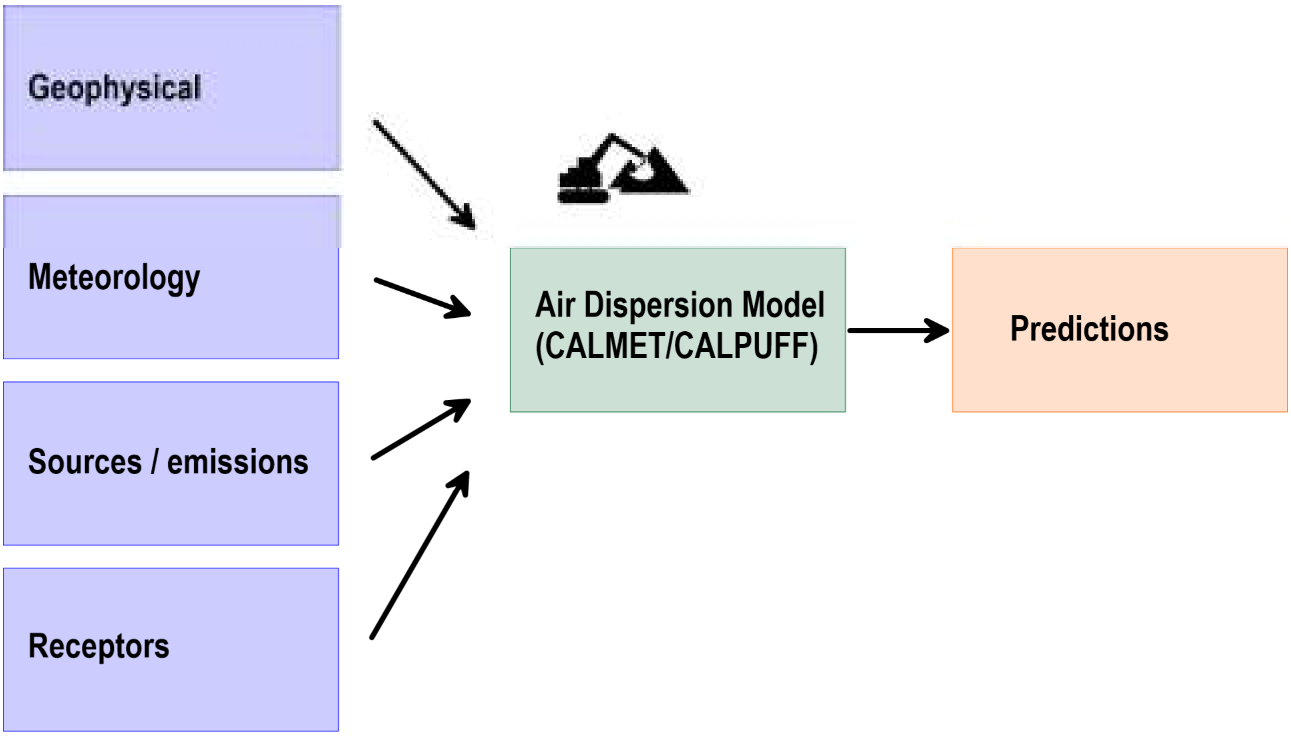


Figure 5.1 Overview of model inputs

The most commonly associated emission to air from open cut mining is dust (particulate matter). A dispersion model commonly required to simulate the dispersion of these emissions. Total dust emissions have been estimated for selected operational scenarios using the mining production schedule, equipment listing and mine plans combined with emission factors from:

- Emission Estimation Technique Manual for Mining (National Pollution Inventory [NPI], 2012); and
- AP 42 (US EPA, 1985 and updates).

The modified Project mining production schedule has been used to identify a range of future operational years to be assessed. There are no specific guidelines or procedures which define an adequate level of information to demonstrate that selected scenarios are representative of worst-case impacts. The worst-case for one location may be different to the worst-case for another location so it is important to consider scenarios of mining at various locations and intensities as well as potential for cumulative effects with other existing or approved operations.

Four future construction and operational scenarios have been selected:

- Construction Year 2; and
- Operations in Years 1, 10 and 17.

These years address the maximum material handling quantities, maximum haul distances, and varying proximities to sensitive receptors.

Table 5.1 summarises the modelled annual TSP, PM_{10} and $PM_{2.5}$ emissions, for each modelled year respectively, due to the modified mining operations. It should be noted that the main intent of the inventories was to capture the most significant emission sources that may affect off-site air quality. Not every source will be captured. However, the contribution of emissions from sources not identified will be captured in the air quality monitoring data and these data have been added to the predicted modified Project contributions. Full details on the emission calculations, including assumptions, emission controls and allocation of emissions to modelled locations are provided in Appendix B.

Table 5.1 Modelled construction and mining operational dust emissions

Air quality indicator	Annual emissions (kg/y)			
	Construction Year 2	Operations Year 1	Operations Year 10	Operations Year 17
Particulate matter (TSP)	329,371	2,005,859	1,674,884	1,650,221
Particulate matter (PM_{10})	124,169	663,351	647,687	663,104
Particulate matter ($PM_{2.5}$)	25,723	113,361	112,547	106,363

Mining operations were represented by a series of volume sources located according to the location of activities for each modelled scenario. Emissions from the dust generating activities were assigned to one or more of the source locations (refer to Appendix B for details of the allocations).

Dust emissions for all modelled mine-related sources have been considered to fit in one of three categories, as follows:

- Wind insensitive sources, where emissions are relatively insensitive to wind speed (for example, dozers).
- Wind sensitive sources, where emissions vary with the hourly wind speed, raised to the power of 1.3, a generic relationship published by the US EPA (1987). This relationship has been applied to sources such as loading and unloading of waste and ore to/from trucks and results in increased emissions with increased wind speed.
- Wind sensitive sources, where emissions also vary with the hourly wind speed, but raised to the power of 3, a generic relationship published by Skidmore (1998). This relationship has been applied to sources including wind erosion from stockpiles, overburden dumps or active pits, and results in increased emissions with increased wind speed.

Emissions from each volume source were developed on an hourly time step, taking into account the level of activity at that location and, in some cases, the hourly wind speed. This approach ensured that light winds corresponded with lower dust generation and higher winds, with higher dust generation.

Blasting activities and associated emissions were assumed to take place only during daylight hours (9 am to 5 pm for the purposes of the modelling) consistent with the hours specified in Condition 14, Schedule 3 of Development Consent (DA 374-11-00). All other activities have been modelled for 24 hours per day.

Pit retention (that is, retention of dust particles within the open pits) has not been included in the model simulations. This is a conservative approach as the coarser dust can remain trapped in the pits, particularly in light winds. Typically, five per cent of the PM_{10} emissions are trapped in the pit.

Finally, the model results at identified sensitive receptors were then compared with the EPA air quality criteria, previously discussed in Section 3.1. Contour plots have also been created to show the spatial distribution of model predictions. Section 6.1 provides the assessment of construction and operational dust for mining operations.

5.2 Construction and Operational Dust (Rail Siding)

Construction and operational dust impacts from the modified rail siding have been quantified by modelling. The modelling methodology was identical to the methodology for mining operations (Section 5.1) except for the location and extent of the model boundaries. Given that the topography of the region is relatively flat, the comprehensive meteorological data from the mine site have been extrapolated to the location of the modified rail siding site. Full details of the model setup are provided in Appendix A.

Table 5.2 summarises the modelled annual TSP, PM_{10} and $PM_{2.5}$ emissions due to construction and operation of the modified rail siding facility. Details on the emission calculations, including assumptions, emission controls and allocation of emissions to modelled locations are provided in Appendix B.

Table 5.2 Modelled rail siding construction and operational dust emissions

Air quality indicator	Annual emissions (kg/y)	
	Construction	Operation
Particulate matter (TSP)	56,508	1,271
Particulate matter (PM_{10})	15,303	625
Particulate matter ($PM_{2.5}$)	5,608	94

Construction and operational activities were represented by a series of volume sources located according to the layout of the modified rail siding. The model results at identified sensitive receptors were then compared with the EPA air quality criteria, previously discussed in Section 3.1. Contour plots have also been created to show the spatial distribution of model predictions. Section 6.2 provides the assessment of construction and operational dust for the modified rail siding.

5.3 Processing Facility

The processing facility includes a sulphuric acid plant which would generate emissions of H_2SO_4, SO_2 and NO_x.

As noted in Section 2, for the purposes of this assessment, it has conservatively been assumed that auxiliary diesel boiler and diesel generators will be required to power the mine and processing facility as this would represent the maximum case scenario. In addition, it has been conservatively assumed that the diesel-powered backup generators would operate 24 hours per day, 365 days per year. This approach is consistent with that adopted in the Air Quality Assessment for the approved Project (Ramboll Environ, 2017). Emissions from these diesel-powered power generation activities would mainly include SO_2, CO, NO_x, $PM_{2.5}$ and VOCs such as benzene (7.9% of total VOCs) and 1,3-butadiene (7% of total VOCs).

Potential impacts due to emissions from these sources have been quantified by modelling.

Table 5.3 shows the source and emission data as used by the dispersion model, based on information supplied by SEM. Mass emission rates of each pollutant were calculated to reflect in-stack concentrations at the limits for scheduled premises under the *Protection of the Environment Operations (Clean Air) Regulation 2010*. It was assumed that emissions would be released continuously from all sources for 24 hours per day, every day of the year. These are conservative assumptions that would over-state potential impacts.

Table 5.3 Modelled processing facility emissions

Source	Sulphuric acid plant stack	Diesel power plant (boiler)	Diesel fired auxiliary power generator 1	Diesel fired auxiliary power generator 2	Diesel fired auxiliary power generator 3	Diesel fired auxiliary power generator 4
Modelled Easting (m)	538400	538490	538482	538482	538482	538482
Modelled Northing (m)	6373390	6373410	6373451	6373451	6373451	6373451
Height (m)	40	30	10	10	10	10
Base elevation (m)	298	299	299	299	299	299
Stack tip diameter (m)	1.80	0.9	0.9	0.9	0.9	0.9
Exhaust temperature (C)	75	180	300	300	300	300
Exhaust velocity (m/s)	26.6	22.7	18.5	18.5	18.5	18.5
Mass emission rates (g/s)						
CO	0	1.1	0.7	0.7	0.7	0.7
H_2SO_4	5.3	0	0	0	0	0
NO_x	18.6	4.4	2.8	2.8	2.8	2.8
PM	0	0.4	0.3	0.3	0.3	0.3
SO_2	53.1	0.01	0.01	0.01	0.01	0.01
VOCs	0	0.3	0.2	0.2	0.2	0.2
In-stack concentrations (mg/Nm^3)						
CO	0	125	125	125	125	125
H_2SO_4	100	0	0	0	0	0
NO_x	350	500	500	500	500	500
PM	0	50	50	50	50	50
SO_2	1000	1.1	1.8	1.8	1.8	1.8
VOCs	0	40	40	40	40	40
Clean Air Regulation limits (mg/Nm^3)						
CO	-	125	125	125	125	125
H_2SO_4	100	-	-	-	-	-
NO_x	350	500	500	500	500	500
PM	50	50	50	50	50	50
SO_2	1000	-	-	-	-	-
VOCs	-	40	40	40	40	40

The model results were then compared with the EPA air quality criteria (Section 3). Contour plots have also been created to show the spatial distribution of model predictions. Section 6.3 provides the assessment of the processing facility emissions and potential impacts.

5.4 Post-Blast Fume

Blasting is approved to be undertaken on ML 1770. The Modification would not change the approved blasting activities.

Blasting activities have the potential to result in fume and particulate matter emissions. Particulate matter emissions from blasting are produced from the modelling discussed in Section 5.1. Post-blast fume has also been quantified by modelling.

Post-blast fume can be produced in non-ideal explosive conditions of the ammonium nitrate/fuel oil (ANFO) and is visible as an orange/brown plume. The fumes are comprised of NO_x which includes NO and NO_2. Various studies that review NO_x monitoring data (see for example Jacobs, 2019) indicate that the percentage of NO_2 in the NO_x is typically inversely proportional to the total NO_x concentration. When NO_x concentrations are high, the percentage of NO_2 in the NO_x is typically of the order of 20%.

The methodology for the operational post-blast fume modelling is outlined below:

- Blast modelled as single volume sources in locations indicative of the centre of the east pit. The blasts are conservatively assumed to be on the surface rather than in-pit.
- Release heights of 20 m, effective plume heights of 40 m, initial horizontal spread (sigma y) of 25 m and initial vertical spread (sigma z) of 10 m. These are conservative estimates based on the data presented by Attalla *et al*. (2008). No plume rise due to buoyancy was modelled, which is again a conservative assumption.
- Blasting emissions are conservatively simulated for every hour between 9 am and 5 pm to assess potential blasting impacts at all hours of permitted blast times (and meteorological conditions). It should be noted that blasting would not be carried out every hour between 9 am and 5 pm.
- Blasting could be on any day of the week; a conservative assumption as, in accordance with Development Consent (DA 374-11-00), blasting cannot occur on Sundays or public holidays unless written approval is obtained from the administering authority.
- NO_x emissions are based on data presented in the Queensland *Guidance Note for the Management of oxides of nitrogen in open cut blasting* (DEEDI, 2011). It was conservatively assumed that the initial NO_2 concentration in the plume would be 17 ppm (34.9 mg/m^3) based on the Rating 3 Fume Category in the Queensland Guidance Note.
- The initial NO_2 concentration in the plume was converted to a total NO_x emission rate based on a detailed measurement program of NO_x in blast plumes in the Hunter Valley made by Attalla *et al*. (2008) which found that the NO:NO_2 ratio was typically 27:1, giving a NO_x:NO_2 ratio of approximately 18.6 g NO_x/g NO_2.
- Calculated emission of 390 g/s of NO_x per blast and an emission release time of 5 minutes.
- 30% of the NO_x is NO_2 at the points of maximum 1-hour average concentrations and at sensitive receptors. This is a conservative assumption; as noted above, when hourly NO_x concentrations are high, the percentage of NO_2 in the NO_x is typically of the order of 20%. The annual average fraction of NO_2 in the NO_x is typically higher than the maximum hourly fraction of NO_2 in the NO_x due to more time available for oxidation.

Model results for post-blast fume have been compared to the applicable EPA air quality criterion for NO_2; that is 246 µg/m^3 as a 1-hour average and taking background levels into account. Section 6.4 provides the assessment of operational post-blast fume.

5.5 Diesel Exhaust

Emissions from diesel exhausts associated with off-road vehicles and equipment at mine sites are often deemed a lower air quality impact risk than dust emissions from material handling activities. This is because of the relatively few emission sources involved, for example when compared to a busy motorway, and the large distances between the sources and sensitive receptors. Nevertheless, a review of the potential impacts has been carried out, including modelling to quantify potential impacts.

The most significant emissions from diesel exhausts are products of combustion including CO, NO_x, PM_{10} and $PM_{2.5}$. It is the NO_x, or more specifically NO_2, and PM_{10} (including $PM_{2.5}$) which have been assessed. DPIE monitoring data have shown that CO concentrations have not exceeded relevant air quality criteria at rural or urban monitoring stations in NSW, indicating that this indicator represents a much lower air quality risk.

The modelling for operational dust (Section 5.1) has considered emission factors that represent the contribution from both wheel generated particulates and the exhaust particulates. These emission factors, including with control factors, are based on measured emissions which included diesel particulates in the form of both PM_{10} and $PM_{2.5}$. The emission factors are also likely to include more diesel exhaust particulate than from a modern truck as the factors were developed on the basis of emissions from trucks measured in the 1980s (that is, older trucks). Todoroski Air Sciences (TAS) has also reported (TAS, 2016) that several studies, reported to the EPA, confirmed that a control factor of 85% can be maintained, representing all components of the truck haulage emission. This information indicates that the potential PM_{10} and $PM_{2.5}$ emissions generated by diesel exhaust are captured in the modelling for operational dust (Section 6.1).

Table 5.4 and Table 5.5 provides the explicit estimates of PM_{10} and $PM_{2.5}$ emissions due to the diesel boiler and equipment exhausts, respectively. Emission factors for “Industrial off-road vehicles and equipment” from the EPA’s Air Emissions Inventory for 2008 (EPA, 2012) were used for the calculations and it has been assumed that there will be no reduction to emissions in the future; a conservative approach. These factors relate to diesel exhaust and evaporative emissions.

Table 5.4 Calculated PM_{10} emissions from diesel engines

Parameter	Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17
Annual estimated fuel usage (kL/y) (source: SEM)	1,059	10,425	5,041	5,624
PM_{10} diesel exhaust emission factor (kg/kL)	2.84			
PM_{10} diesel exhaust emissions - all equipment (kg/y)	3,009	29,607	14,318	15,971

Table 5.5 Calculated $PM_{2.5}$ emissions from diesel engines

Parameter	Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17
Annual estimated fuel usage (kL/y) (source: SEM)	1,059	10,425	5,041	5,624
$PM_{2.5}$ diesel exhaust emission factor (kg/kL)	2.75			
$PM_{2.5}$ diesel exhaust emissions – all equipment (kg/y)	2,918	28,719	13,888	15,492

Emissions of NO_x from diesel exhausts have been estimated using fuel consumption data, provided by SEM, and an emission factor from the EPA’s Air Emissions Inventory for 2008 (EPA, 2012). Table 5.6 shows the calculations. Again, it has been assumed that there would be no reduction to emissions in the future; a conservative approach.

The NO_x emission estimates for Operations Year 1 from Table 5.6 have been explicitly modelled to provide an indication of the off-site NO_2 concentrations due to diesel exhaust emissions. Section 6.5 provides the assessment of operational diesel exhaust.

Table 5.6 Modelled NO_x emissions from diesel engines

Parameter	Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17
Estimated fuel usage (kL) (source: SEM)	1,059	10,425	5,041	5,624
NO_x diesel exhaust emission factor (kg/kL)	40.77			
NO_x diesel exhaust emissions – all equipment (kg/y)	43,190	425,029	205,540	229,277

5.6 Greenhouse Gas Emissions

The GHG inventory has been calculated in accordance with the principles of the GHG Protocol (WBCSD and WRI, 2020). The initial action for a GHG inventory is to determine the sources of GHG emissions, assess their likely significance and set a boundary for the assessment. Creating an inventory of the likely GHG emissions associated with the modified Project has the benefit of determining the scale of the emissions and providing a baseline from which to develop and deliver GHG reduction options.

The results of this assessment are presented in terms of the previously mentioned 'Scopes' to help understand the direct and indirect impacts of the modified Project. The GHG Protocol (and similar reporting schemes) dictates that reporting Scope 1 and 2 sources is mandatory, whilst reporting Scope 3 sources is optional. Reporting *significant* Scope 3 sources is recommended. Scope 3 emissions are a consequence of the activities of the company, but occur from sources not owned or controlled by the company. Some examples of Scope 3 activities include the extraction and production of purchased materials, transportation of purchased fuels, and use of sold products and services. The inventory for this assessment includes all significant sources of GHGs (Scopes 1, 2 and 3) associated with the modified Project.

Future projections of production, fuel usage and site activities were used to determine the GHG emissions from the modified Project. Table 5.7 shows the key emission sources that have been considered in this assessment, their respective scope and the relevant estimation methodologies.

Section 7 provides the assessment of GHG emissions.

Table 5.7 Greenhouse gas emission sources and estimation methodologies

Activity	Description	Scope(s)	Emission estimation methodology
Diesel usage (mining)	Combustion of diesel fuel from mobile mining equipment.	1, 3	Emission factors from NGA Factors (DISER, 2020).
Diesel usage (limestone)	Combustion of diesel fuel from vehicles transporting limestone from the quarry.	1, 3	Emission estimates from Sunrise (formerly Syerston) Project Modification 4 Air Quality and Greenhouse Gas Assessment (Ramboll Environ, 2017).
Diesel usage (sulphur)	Combustion of diesel fuel from vehicles transporting sulphur from rail siding.	1, 3	Emission estimates from Ramboll Environ (2017).
Diesel usage (power generation)	Combustion of diesel fuel from stationary power generation units.	1, 3	Emission estimates from Ramboll Environ (2017).
Processing facility	Emissions from PAL vent scrubber stack, partial neutralisation vent scrubber stack and RIP vent scrubber stack	1	Emission estimates from Ramboll Environ (2017).
Blasting	Detonation of explosives used for blasting.	1	Emission factors from NGA Factors (DCC, 2008).
Transport (rail)	Transport of product by rail to port.	3	Emission factors from the Department for Environment, Food and Rural Affairs (DEFRA) (2019), based on "Freighting goods / freight train". 500 km assumed distance to port.

6. Air Quality Assessment

This section provides an assessment of the identified key potential air quality impacts at the modified mine and processing facility and rail siding (Section 2).

6.1 Construction and Operational Dust (Mining Operations)

Model results for construction and operational dust near the mine site have been assessed for each of the key particulate matter classifications, as outlined below. Tabulated model results are provided in Appendix C.

6.1.1 Particulate Matter (as PM_{10})

Figure 6.1 shows the modelled maximum project only 24-hour average PM_{10} concentrations due to the modified Project for each construction and operational scenario. The EPA does not prescribe a project only criteria for 24-hour average PM_{10}, but the VLAMP refers to 50 $\mu g/m^3$ for the purposes of determining land acquisition and mitigation. The modelling shows that the 50 $\mu g/m^3$ criterion would not be exceeded at any private sensitive receptor for project only contributions.

Compliance with the EPA's 24-hour average PM_{10} criterion of 50 $\mu g/m^3$ has also been assessed. This criterion relates to the total concentration in the air (that is, cumulative) and not just the contribution from the modified Project. As noted in Section 4.2 most locations in NSW have historically recorded one or more days each year when the 24-hour average PM_{10} concentration exceeded 50 $\mu g/m^3$. The model has therefore been configured to show the number of days each year above 50 $\mu g/m^3$, and an assessment made of whether the modified Project would cause additional exceedances.

Figure 6.2 shows the modelled number of days above 50 $\mu g/m^3$ due to the modified Project and other sources of PM_{10} (i.e. cumulative). These results show that, for a representative year, the nearest private sensitive receptors are not expected to experience any additional days when PM_{10} concentrations exceed 50 $\mu g/m^3$ due to the modified Project. These results are within the range of historically measured days when PM_{10} concentrations at rural monitors operated by the DPIE have exceeded 50 $\mu g/m^3$, excluding extraordinary years such as those years with increased occurrence of dust storms and bushfires. The site specific monitoring carried out by SEM (Section 4.2) showed that there were between 22 and 28 days in 2020 when PM_{10} concentrations exceeded 50 $\mu g/m^3$. Excluding extraordinary events, the typical number of days per year above 50 $\mu g/m^3$ has been estimated at five (Table 4.6).

Additional investigation of the potential for the modified Project to cause an exceedance has been carried out. This involved examining contemporaneous background and modified Project contributions for each day in the modelling year, referred to as a "Level 2" assessment by the Approved Methods. Figure 6.3 shows a time series of 24-hour average PM_{10} concentrations at the nearest private sensitive receptor, M08 (Currajong Park 2). At M08 (Figure 6.3) the results indicate that there were no additional exceedance days as a result of the modified Project.

Figure 6.4 shows the modelled annual average project only PM_{10} concentrations due to the modified Project. There are no applicable project only criteria but it can be seen from these results that the contribution of the modified Project to annual average PM_{10} concentrations at the nearest private sensitive receptors would be no more than 6 $\mu g/m^3$ per year.

Figure 6.5 shows the modelled annual average PM_{10} concentrations due to the modified Project and other sources of PM_{10} (i.e. cumulative). These results indicate compliance with the EPA's assessment criterion for annual average PM_{10} (25 $\mu g/m^3$) at all private sensitive receptors.

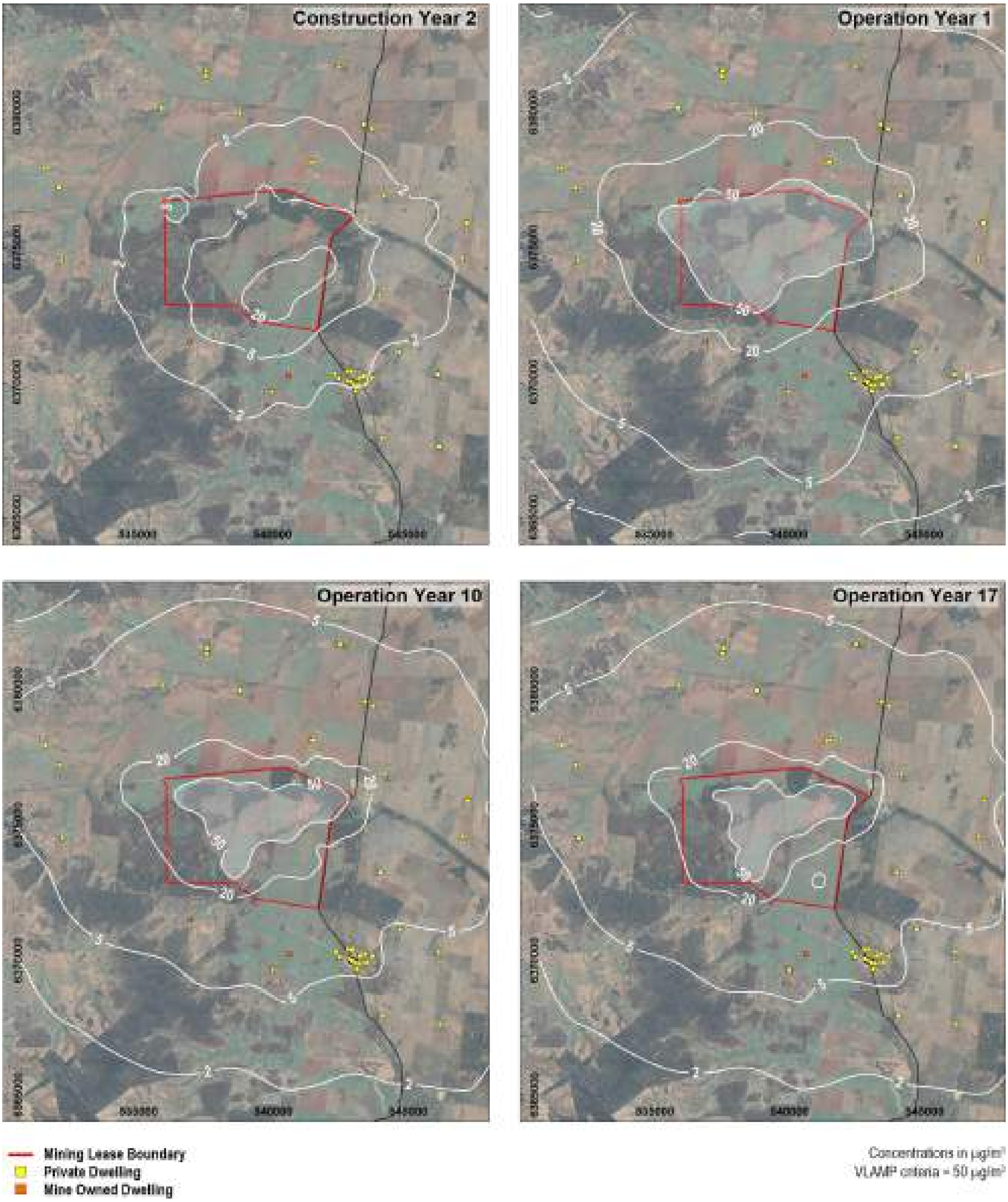


Figure 6.1 Modelled maximum 24-hour average PM_{10} due to the modified Project

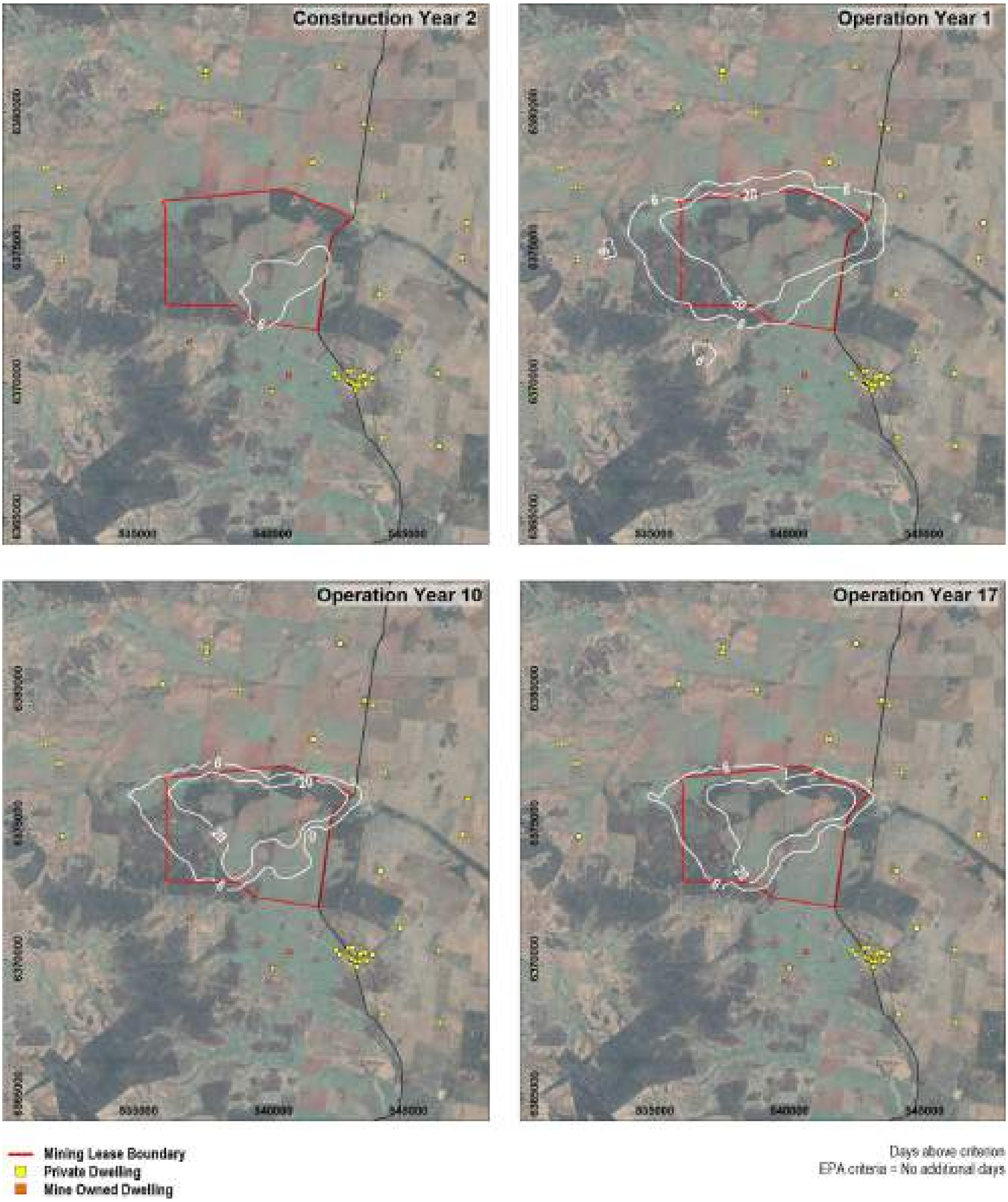


Figure 6.2 Modelled number of days above 50 µg/m^3 PM_{10} due to the modified Project and other sources

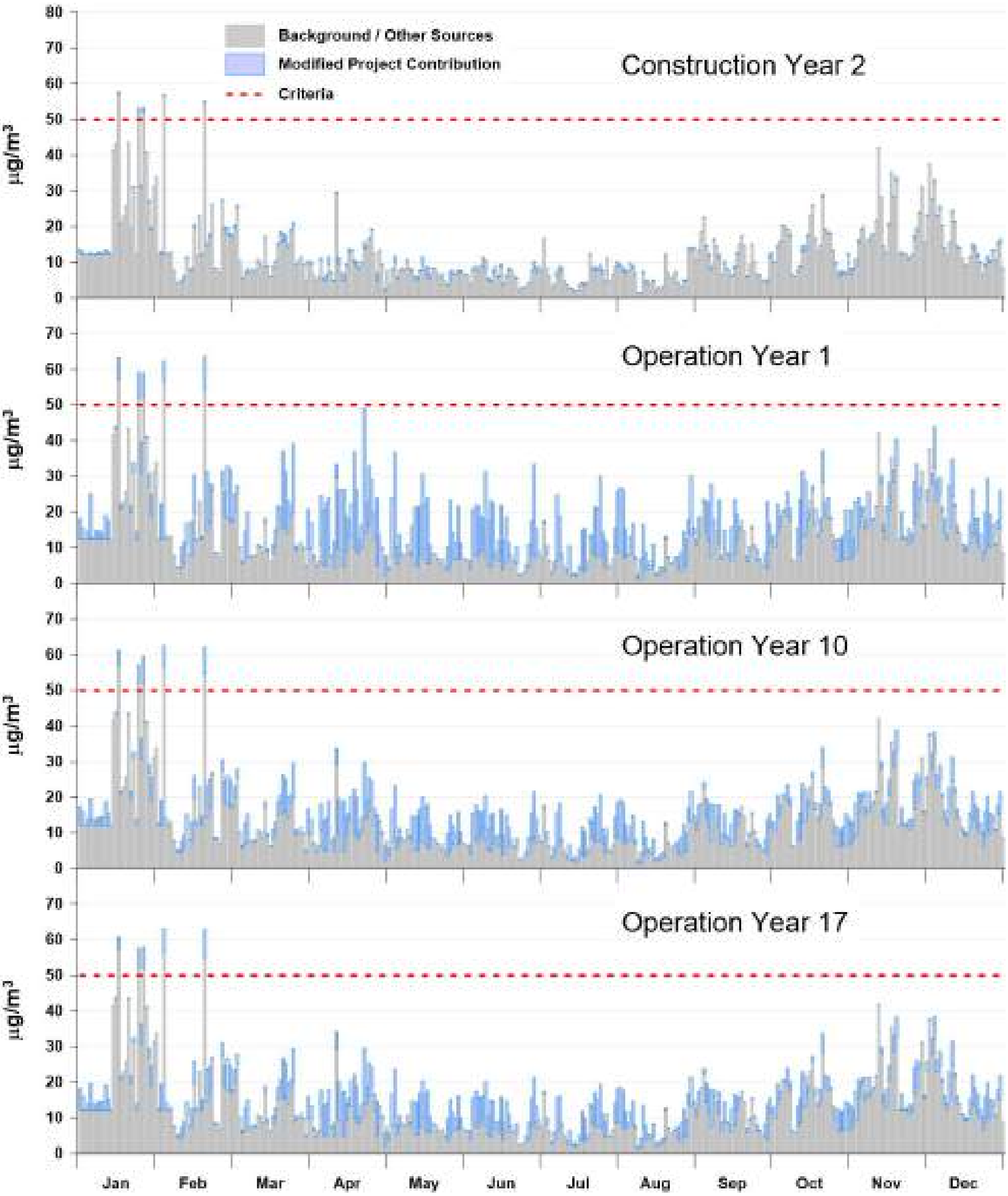


Figure 6.3 Time series of 24-hour average PM_{10} of the modified Project and other sources at M08

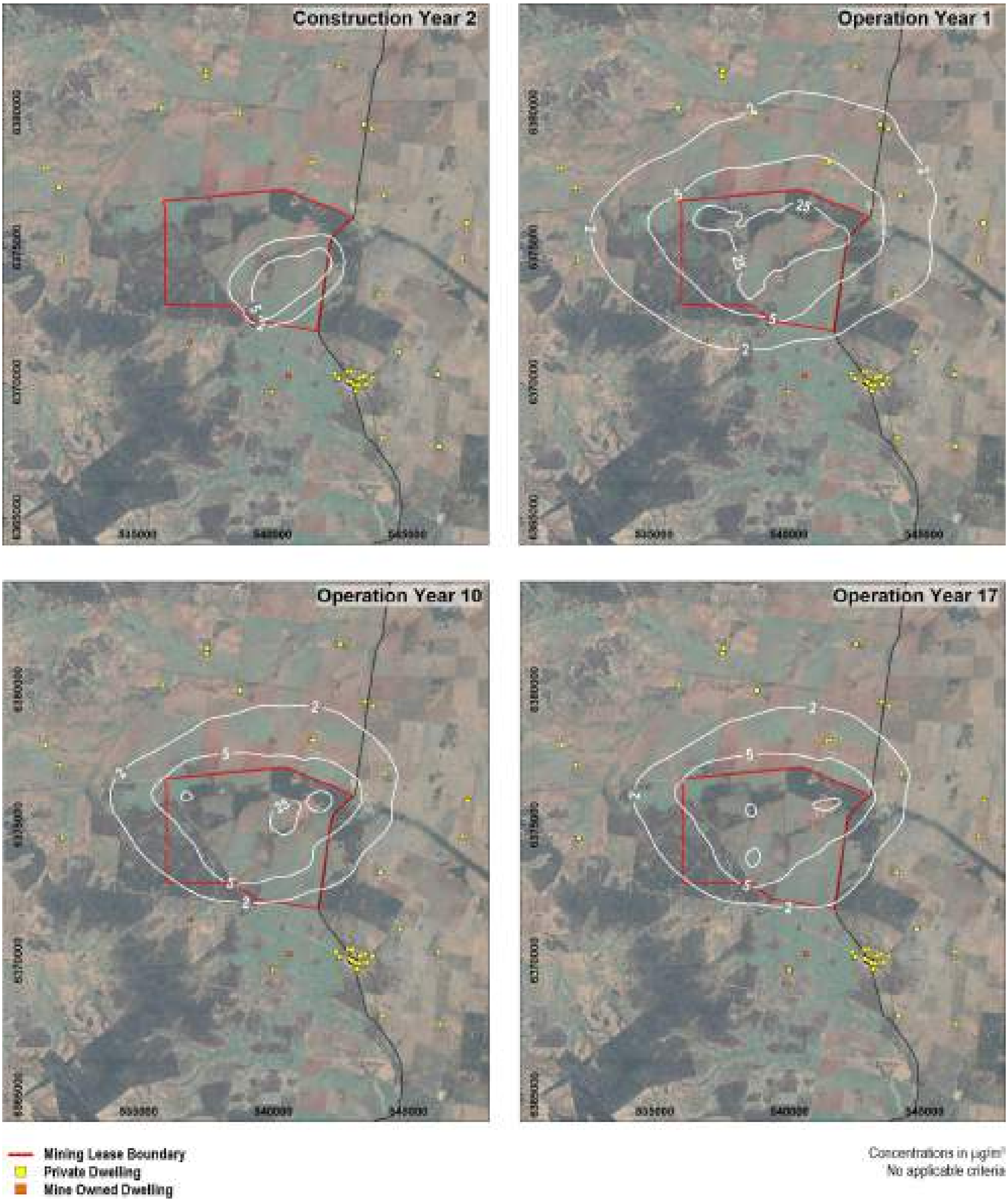


Figure 6.4 Modelled annual average PM_{10} due to the modified Project

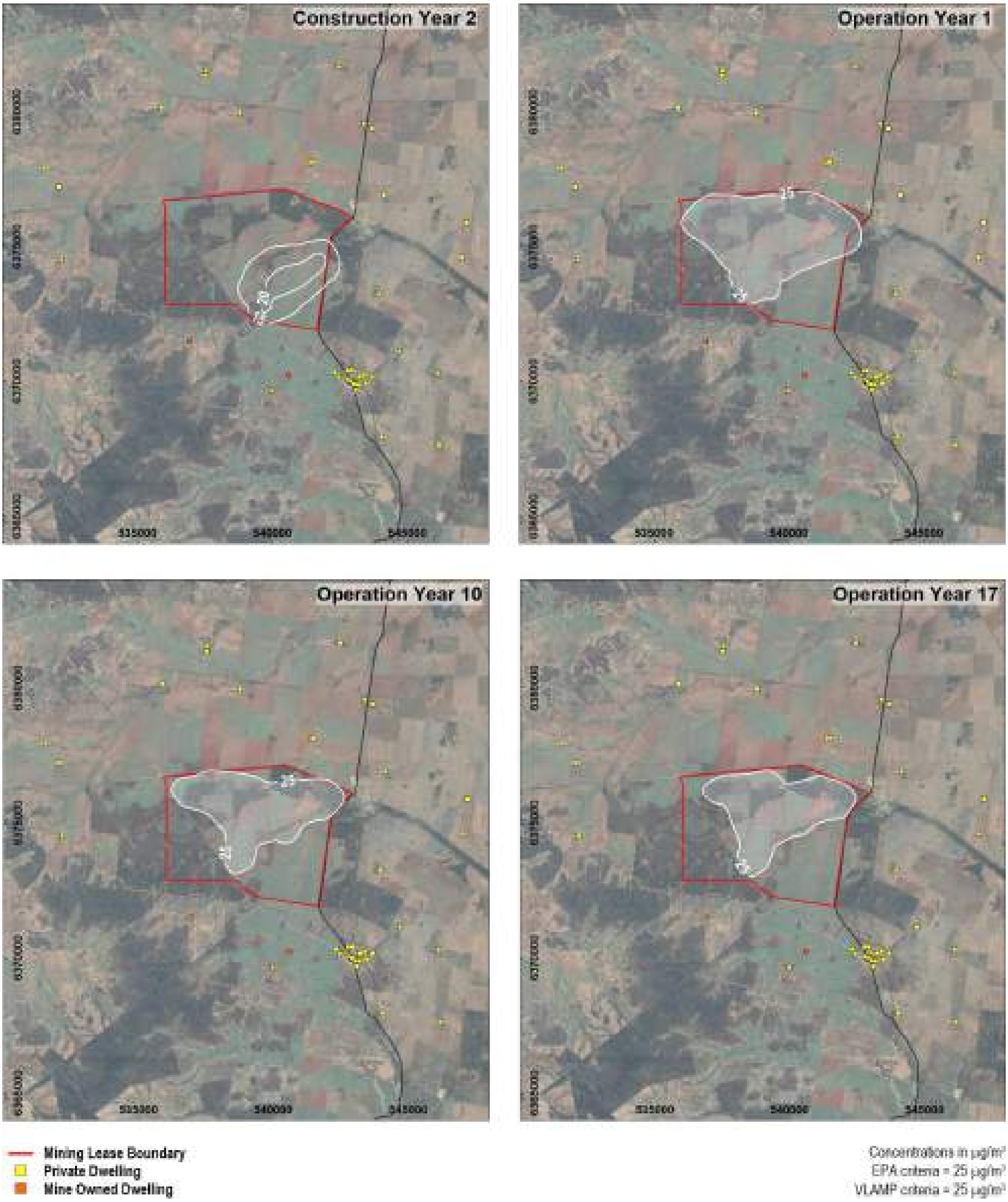


Figure 6.5 Modelled annual average PM_{10} due to the modified Project and other sources

6.1.2 Particulate Matter (as $PM_{2.5}$)

Figure 6.6 shows the modelled maximum 24-hour average $PM_{2.5}$ concentrations due to the modified Project for each assessment scenario. The EPA does not prescribe a project only criteria for 24-hour average $PM_{2.5}$, however the VLAMP (NSW Government, 2018) refers to 25 µg/m^3 for the purposes of determining land acquisition and mitigation. The modelling shows that the 25 µg/m^3 criterion would not be exceeded at any private sensitive receptor.

Compliance with the EPA's cumulative 24-hour average $PM_{2.5}$ criterion of 25 µg/m^3 has also been assessed. Figure 6.7 shows the modelled maximum 24-hour average $PM_{2.5}$ concentrations due to the modified Project and other sources of $PM_{2.5}$. These results indicate compliance with the EPA's assessment criterion for cumulative 24-hour average $PM_{2.5}$ (25 µg/m^3) at all private sensitive receptors.

Figure 6.8 shows the modelled annual average project only $PM_{2.5}$ concentrations due to the modified Project. There are no applicable project only criteria but it can be seen from these results that the contribution of the modified Project to annual average $PM_{2.5}$ concentrations at the nearest private sensitive receptors would be in the order of 1 to 2 µg/m^3.

Figure 6.9 shows the modelled annual average cumulative $PM_{2.5}$ concentrations due to the modified Project and other sources of $PM_{2.5}$. These results indicate compliance with the EPA's assessment criterion for cumulative annual average $PM_{2.5}$ (8 µg/m^3) at all private sensitive receptors.

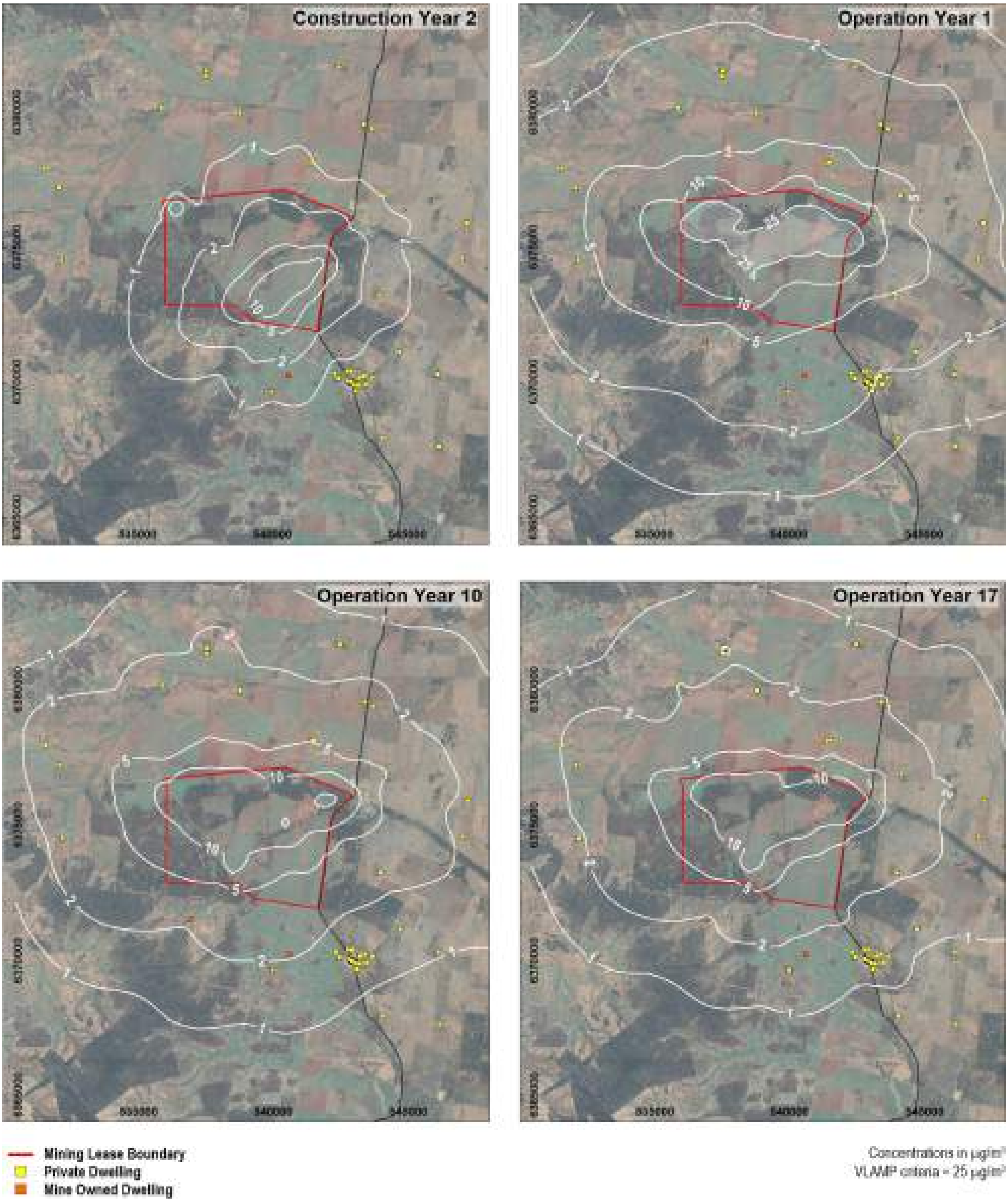


Figure 6.6 Modelled maximum 24-hour average $PM_{2.5}$ due to the modified Project

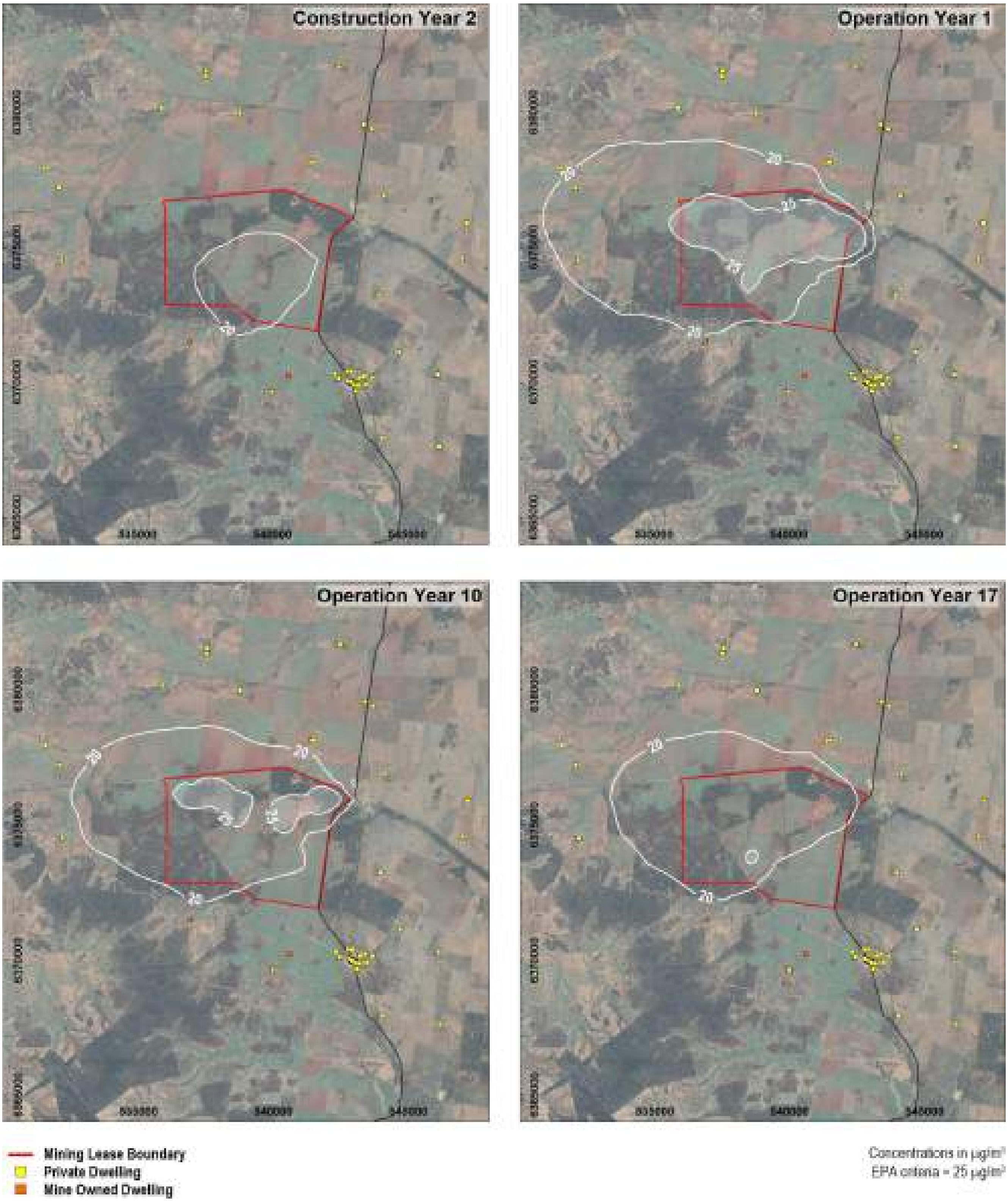


Figure 6.7 Modelled maximum 24-hour average $PM_{2.5}$ due to the modified Project and other sources

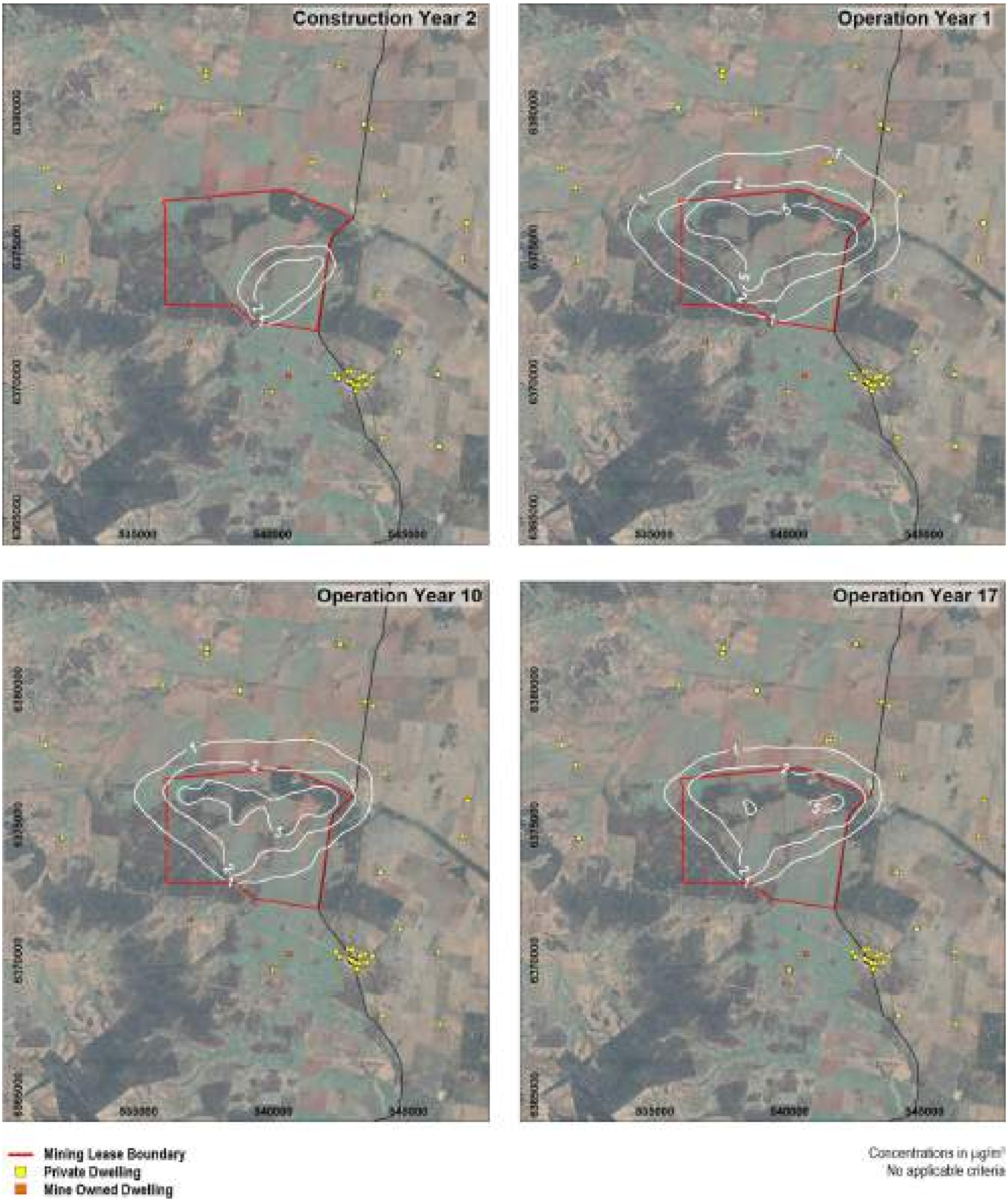


Figure 6.8 Modelled annual average $PM_{2.5}$ due to the modified Project

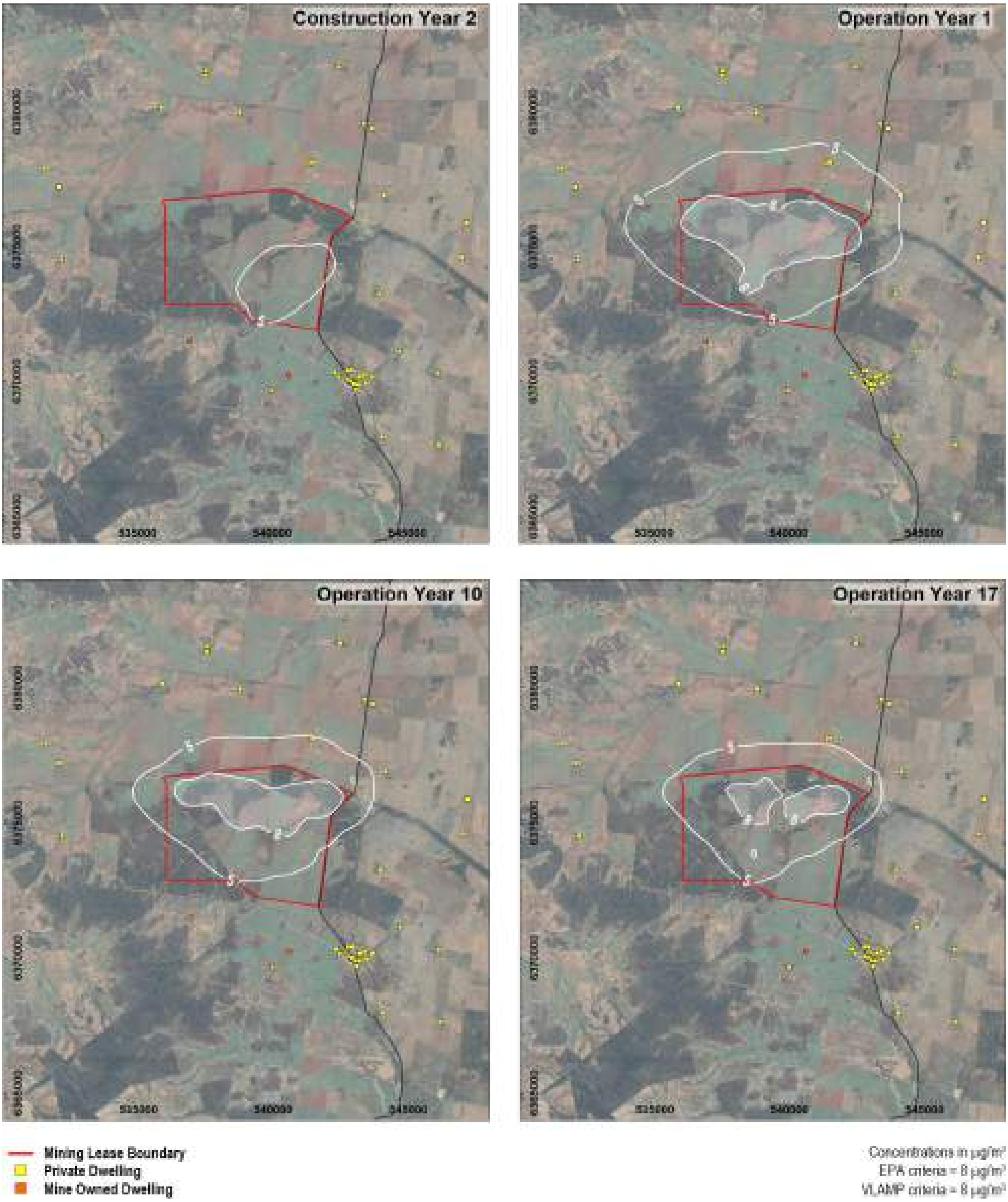


Figure 6.9 Modelled annual average $PM_{2.5}$ due to the modified Project and other sources

6.1.3 Particulate Matter (as TSP)

Figure 6.10 shows the modelled annual average project only TSP concentrations due to the modified Project. There are no applicable project only criteria but it can be seen from these results that the contribution of the modified Project to annual average TSP concentrations at the nearest private sensitive receptors would be in the order of less than 5 µg/m^3.

Figure 6.11 shows the modelled annual average TSP concentrations due to the modified Project and other background sources of TSP (i.e. cumulative). These results indicate compliance with the EPA's assessment criterion for annual average TSP (90 µg/m^3) at all private sensitive receptors. Consequently, the modified Project is not anticipated to cause adverse air quality impacts in terms of TSP concentrations.

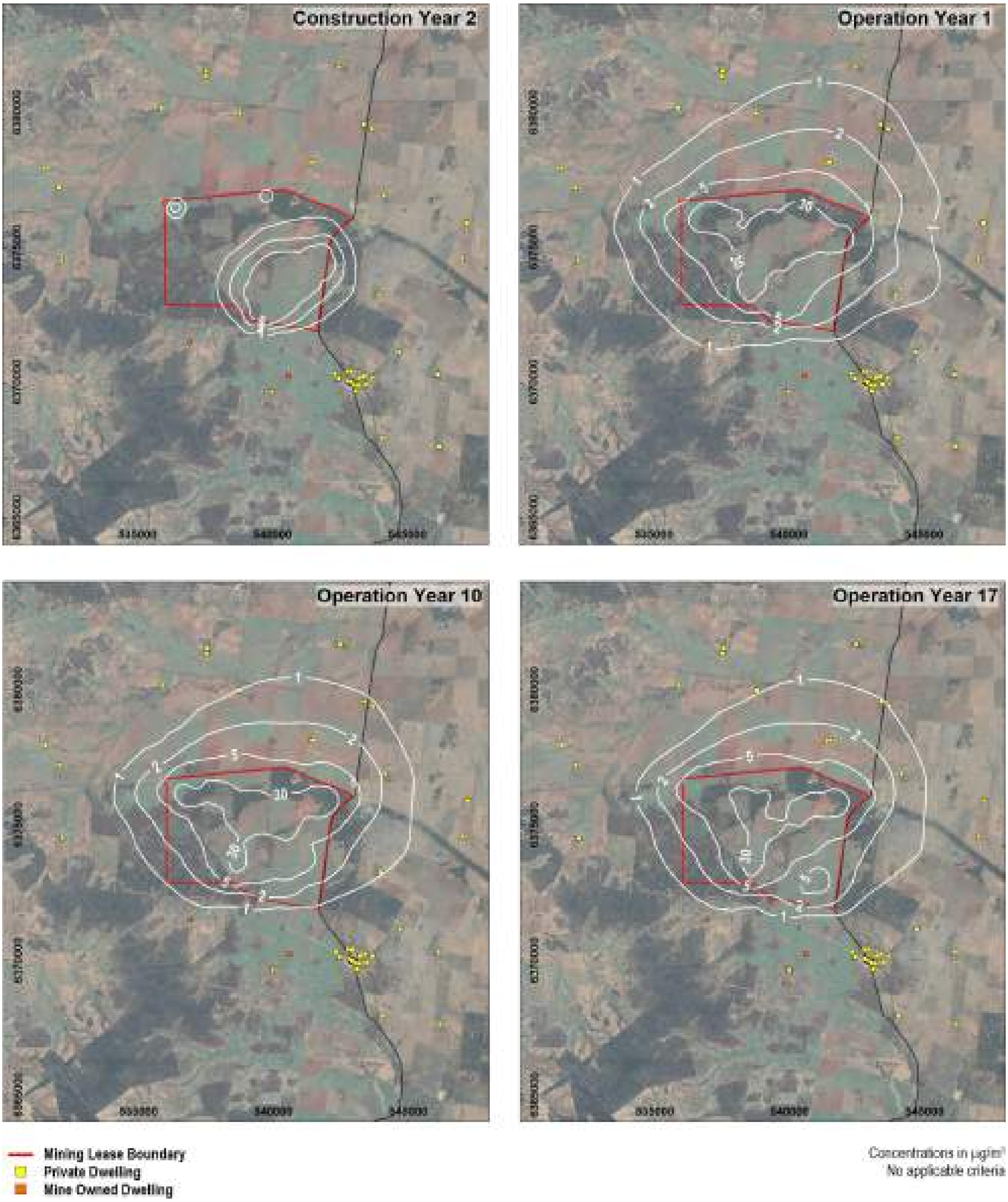


Figure 6.10 Modelled annual average TSP due to the modified Project

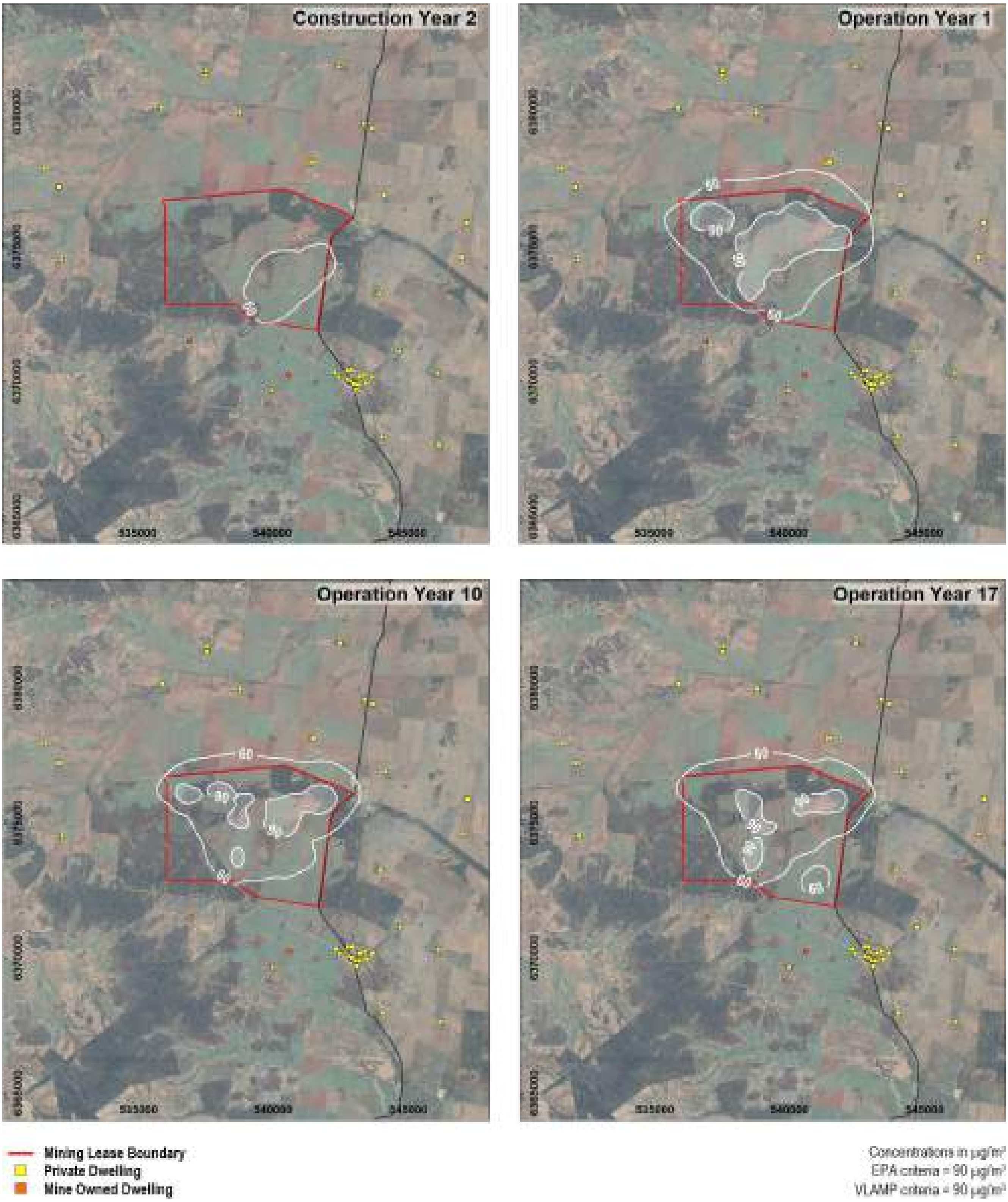


Figure 6.11 Modelled annual average TSP due to the modified Project and other sources

6.1.4 Deposited Dust

Figure 6.12 shows the modelled annual average project only deposited dust levels due to the modified Project. These results show that the EPA's assessment criterion for deposited dust due to project only contributions of the modified Project (2 $g/m^2/month$) would not be exceeded at private sensitive receptors.

Figure 6.13 shows the modelled annual average deposited dust levels due to the modified Project and other sources of deposited dust. These results indicate compliance with the EPA's assessment criterion for total deposited dust (4 $g/m^2/month$) at all private sensitive receptors. Consequently, the modified Project is not anticipated to cause adverse air quality impacts in terms of deposited dust levels.

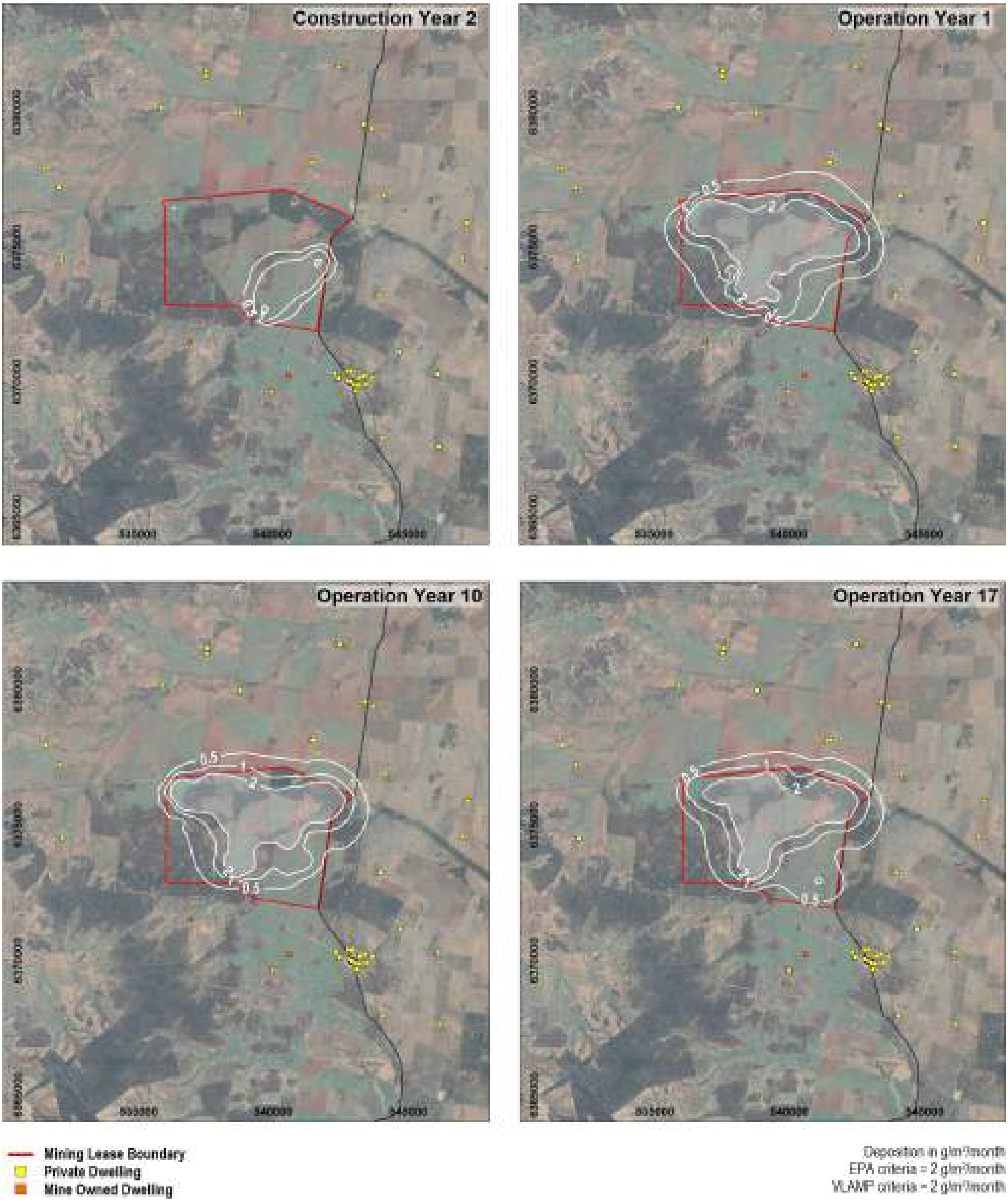


Figure 6.12 Modelled annual average deposited dust due to the modified Project

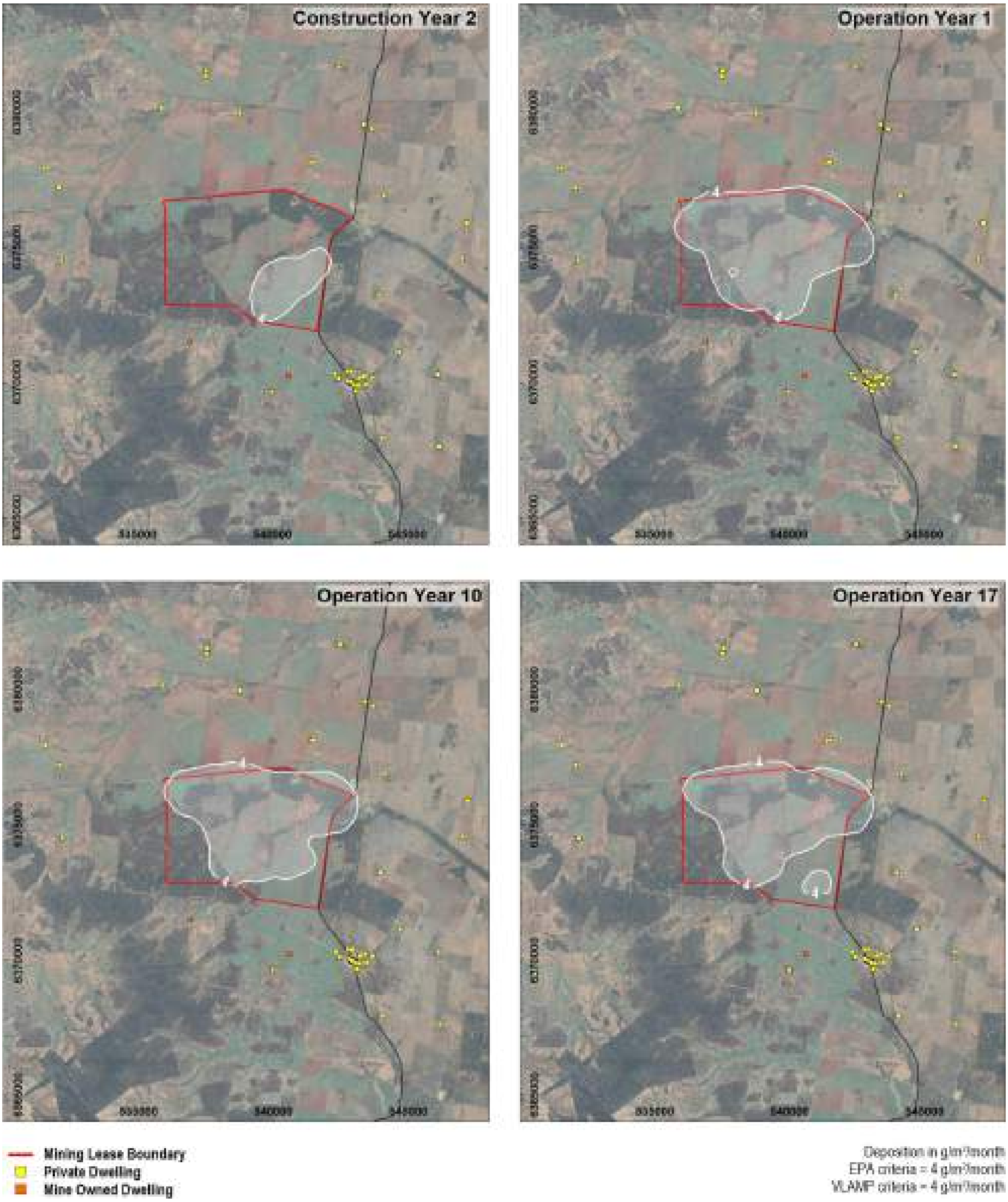


Figure 6.13 Modelled annual average deposited dust due to the modified Project and other sources

6.2 Construction and Operational Dust (Rail Siding)

Model results for construction and operational dust near the rail siding are provided in Appendix D and have been assessed for each of the key particulate matter classifications, as outlined below.

6.2.1 Particulate Matter (as PM_{10})

The modelling for the construction and operation of the rail siding (Appendix D) does not highlight a significant air quality risk in terms of PM_{10}. Contributions of the modified Project are well below EPA criteria at sensitive receptors.

6.2.2 Particulate Matter (as $PM_{2.5}$)

The modelling for the construction and operation of the rail siding (Appendix D) does not highlight a significant air quality risk in terms of $PM_{2.5}$. Contributions of the modified Project are well below EPA criteria at sensitive receptors.

6.2.3 Particulate Matter (as TSP)

The modelling for the construction and operation of the rail siding (Appendix D) does not highlight a significant air quality risk in terms of TSP. Contributions of the modified Project are well below EPA criteria at sensitive receptors.

6.2.4 Deposited Dust

The modelling for the construction and operation of the rail siding (Appendix D) does not highlight a significant air quality risk in terms of deposited dust. Contributions of the modified Project are well below EPA criteria at sensitive receptors.

6.2.5 Other Potential Impacts

An ammonium sulphate storage and distribution facility is proposed for the modified railing siding. Potential odour impacts from the ammonium sulphate storage facility would be minimal as ammonium sulphate is an inorganic salt, an odourless substance, and not recognised as a source of odorous emissions.

6.3 Processing Facility

Emissions that were modelled from the processing facility included H_2SO_4, SO_2, CO, NO_x, $PM_{2.5}$ and VOCs such as benzene and 1,3-butadiene. Modelling of these emissions has been carried out based on the methodology described in Section 5.2 with results provided as contour plots in Appendix E.

Inspection of the results from Appendix E led to the following observations:

- Maximum 1-hour average CO concentrations do not exceed the EPA criterion (30 mg/m^3) at the nearest sensitive receptors.
- Maximum 8-hour average CO concentrations do not exceed the EPA criterion (10 mg/m^3) at the nearest sensitive receptors.
- H_2SO_4 concentrations do not exceed the EPA criterion (18 µg/m^3) at the nearest sensitive receptors.
- Maximum 1-hour average NO_2 concentrations do not exceed the EPA criterion (246 µg/m^3) at the nearest sensitive receptors.
- Annual average NO_2 concentrations do not exceed the EPA criterion (62 µg/m^3) at the nearest sensitive receptors.

- Maximum 24-hour average PM_{10} concentrations do not exceed the EPA criterion (50 µg/m^3) at the nearest sensitive receptors as a result of operations of the processing facility in isolation. The maximum contributions of PM_{10} emissions from the processing facility do not introduce adverse cumulative effects with dust from mining operations at the nearest sensitive receptors (less than 1 µg/m^3) (Section 6.1).
- Annual average PM_{10} concentrations do not exceed the EPA criterion (25 µg/m^3) at the nearest sensitive receptors as a result of operations of the processing facility in isolation. The maximum contributions of PM_{10} emissions from the processing facility do not introduce adverse cumulative effects with dust from mining operations at the nearest sensitive receptors (less than 0.1 µg/m^3) (Section 6.1).
- Maximum 1-hour average SO_2 concentrations do not exceed the EPA criterion (570 µg/m^3) at the nearest sensitive receptors.
- Maximum 24-hour average SO_2 concentrations do not exceed the EPA criterion (228 µg/m^3) at the nearest sensitive receptors.
- Annual average SO_2 concentrations do not exceed the EPA criterion (60 µg/m^3) at the nearest sensitive receptors.
- Benzene concentrations do not exceed the EPA criterion (29 µg/m^3) beyond the mining lease boundary for 99.9% of the time (i.e. 99.9th percentile).
- 1-3 butadiene concentrations do not exceed the EPA criterion (40 µg/m^3) beyond the mining lease boundary for 99.9% of the time (i.e. 99.9th percentile).

The results from the processing facility modelling were based on conservative assumptions including continuous release of maximum emissions from all sources. That is, in-stack concentrations were modelled at the limits for scheduled premises under the *Protection of the Environment Operations (Clean Air) Regulation 2010*. Actual emissions are expected to be less than what was modelled. Compliance with the EPA criteria demonstrates that the facility will not lead to adverse air quality impacts.

6.4 Post-Blast Fume

Figure 6.14 shows the modelled maximum 1-hour average NO_2 concentrations due to post-blast fume, based on the methodology outlined in Section 5.4. These results show that, under worst-case meteorological conditions with a rated 3 fume, and conservatively assuming blasting every day between 9 am and 5 pm, the maximum 1-hour average NO_2 concentrations would not exceed EPA's criterion of 246 µg/m^3 at any sensitive receptor location. It should be noted that blasting is expected to occur infrequently and only at depth in the pits towards the end of the mine life (i.e. in Operational Years 16 to 19).

While worst-case assumptions have been made with respect to time-of-day, fume rating and background levels, the modelling has been based on a blast positioned broadly in the middle of the east pit. It is acknowledged that moving the assumed blast location, for example further to the west, would lead to a corresponding shift in the contours, potentially changing the modelled extent of impacts. However, this potential would be managed through the design process for each individual blast which would be designed to comply with relevant criteria. The potential for post-blast fume impacts would be identified prior to all blasts, taking into account the specific parameters of each blast, to avoid worst-case conditions and to minimise fume emissions from blasting, in accordance with contemporary conditions of approval. SEM has developed a pre-blasting procedure which covers fume management (Clean TeQ, 2019b). The Blast Management Plan (Clean TeQ, 2019b) would be implemented during operations, including key fume management actions, such as defining the potential risk zone based upon weather patterns and obtaining internal permission to fire based on an assessment of real-time weather conditions.

Based on the dispersion modelling, with predominantly worst-case assumptions, and proposed implementation of site-specific pre-blast procedures, it has therefore been concluded that the modified Project would not lead to adverse air quality impacts with respect to post-blast fumes.

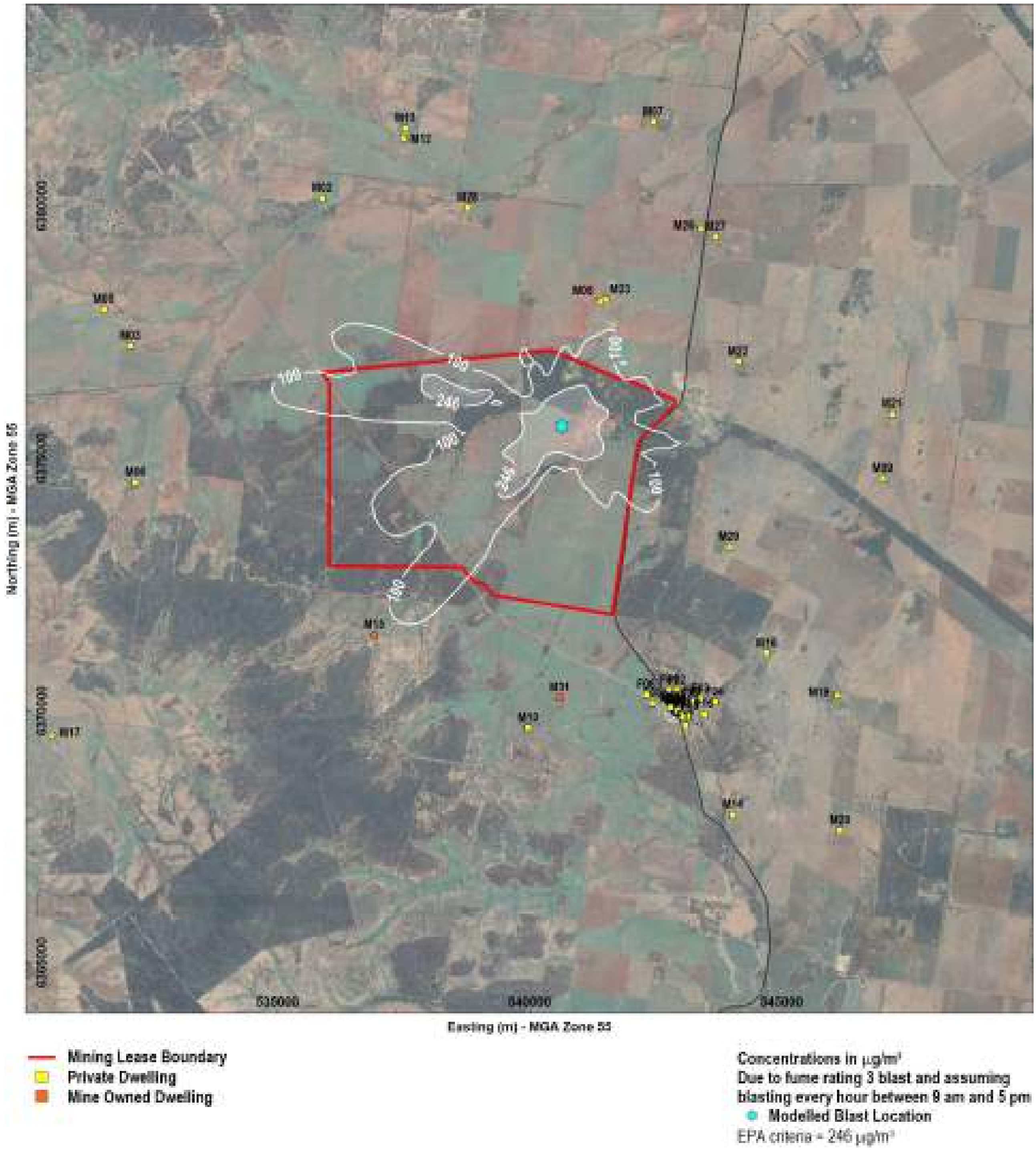


Figure 6.14 Modelled maximum 1-hour average NO_2 due to blasting

6.5 Diesel Exhaust

Figure 6.15 shows the modelled maximum 1-hour average NO_2 concentrations due to diesel exhaust emissions from the operations in Year 1, based on the methodology outlined in Section 5.5. For these hourly average results it has been assumed that 30% of the NO_x is NO_2 at the locations of maximum ground-level concentrations. The results show compliance with the EPA's 246 µg/m^3 criterion at all sensitive receptors. In addition, from inspection of the results in Section 6.3 and Section 6.4, potential cumulative NO_2 concentrations with the processing facility, diesel exhaust, and blasting emissions would also comply with the EPA's criteria (246 µg/m^3) at all sensitive receptors.

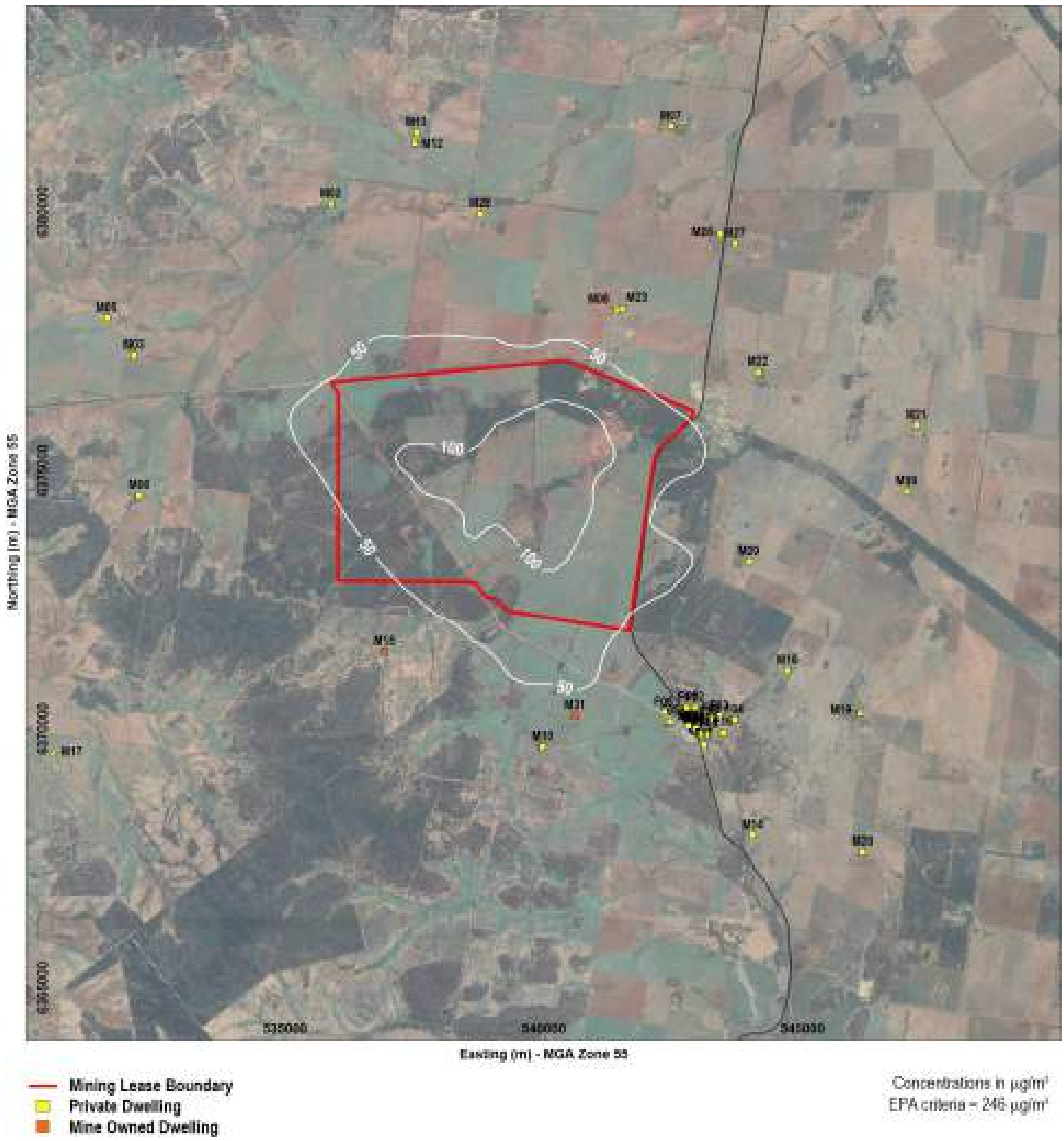


Figure 6.15 Modelled maximum 1-hour average NO_2 due to diesel exhausts

Figure 6.16 shows the modelled annual average NO_2 concentrations. For these annual average results, a conservative assumption of 100% of the NO_x is NO_2 has been applied[3]. The results show compliance with the EPA's 62 µg/m^3 criterion at all sensitive receptors. It has therefore been concluded that the modified Project would not lead to adverse air quality impacts with respect to NO_2 emissions from diesel exhaust.

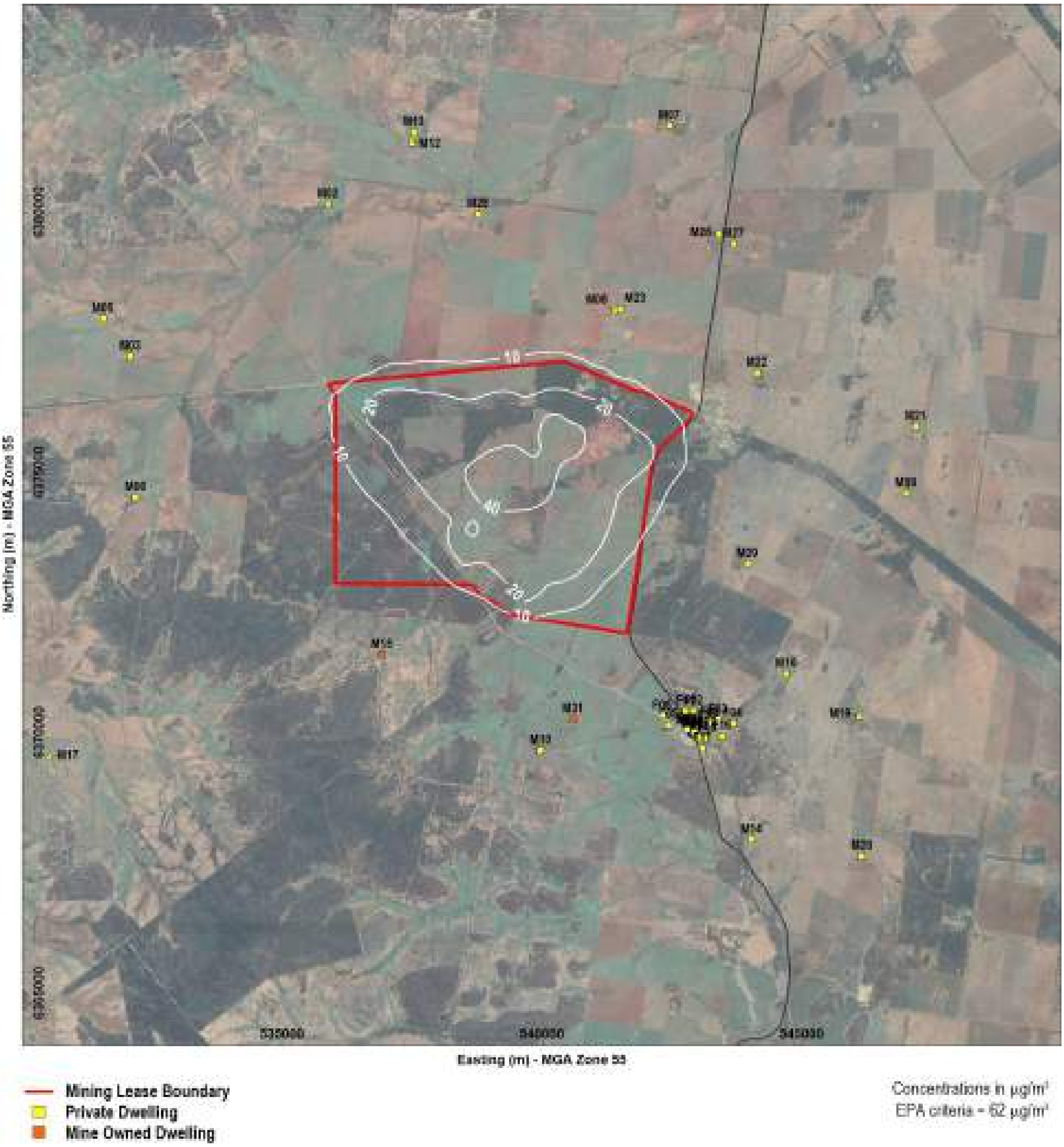


Figure 6.16 Modelled annual average NO_2 due to diesel exhausts

[3] 30% of the NO_x is assumed to be NO_2 at the points of maximum 1-hour average concentrations. The annual average fraction of NO_2 in the NO_x is typically higher than the maximum hourly fraction of NO_2 in the NO_x due to more time available for oxidation. 100% of the NO_x is NO_2 has been assumed to apply for annual average concentrations.

7. Greenhouse Gas Assessment

7.1 Emissions

Table 7.1 shows the estimated emissions of GHGs due to all identified GHG-generating activities for each mining year. Section 5.6 describes the greenhouse gas emission sources, their respective ‘Scope’ and the GHG emission estimation methodology. Scopes 1, 2 and 3 are defined by the GHG Protocol and can be summarised as follows (Figure 3.1):

- Scope 1 – Direct emissions from sources that are owned or operated by the organisation (examples include combustion of diesel in company owned vehicles or used in on-site generators).
- Scope 2 – Indirect emissions associated with the import of energy from another source (examples include importation of electricity or heat).
- Scope 3 – Other indirect emissions (other than Scope 2 energy imports) which are a direct result of the operations of the organisation but from sources not owned or operated by them (examples include business travel (by air or rail) and product usage).

Over the lifetime of the modified Project (i.e. 3 year construction and 21 year operational period) the Scope 1 and 2 emissions are estimated to average 0.28 Mt CO_2-e per year. Appendix F provides more detailed breakdowns of the estimated emissions for each activity by mining year.

Table 7.1 Summary of estimated greenhouse gas emissions

Mining year	Emissions (t CO_2-e)[1]		
	Scope 1	Scope 2	Scope 3
Construction Year 1	2,883	-	147
Construction Year 2	2,883	-	147
Construction Year 3	91,642	-	501
Operation Year 1	327,433	-	5,932
Operation Year 2	313,295	-	5,210
Operation Year 3	312,779	-	5,184
Operation Year 4	317,813	-	5,441
Operation Year 5	310,726	-	5,079
Operation Year 6	317,780	-	5,439
Operation Year 7	312,383	-	5,163
Operation Year 8	314,692	-	5,281
Operation Year 9	312,783	-	5,184
Operation Year 10	318,576	-	5,480
Operation Year 11	310,602	-	5,073
Operation Year 12	316,792	-	5,389
Operation Year 13	317,019	-	5,400
Operation Year 14	313,821	-	5,237
Operation Year 15	317,774	-	5,439
Operation Year 16	314,900	-	5,265
Operation Year 17	317,875	-	5,422
Operation Year 18	304,568	-	741
Operation Year 19	303,742	-	698

Mining year	Emissions (t CO_2-e)[1]		
	Scope 1	Scope 2	Scope 3
Operation Year 20	303,319	-	698
Operation Year 21	303,319	-	698
Average	278,308	-	3,927
Total	6,679,398	-	94,246

1 *Values may not sum exactly due to rounding.*

Figure 7.1 shows the estimated GHG emissions by scope and by activity. These estimates show that the processing facility (i.e. acid plant) would be the most significant direct (Scope 1) source of GHG emissions.

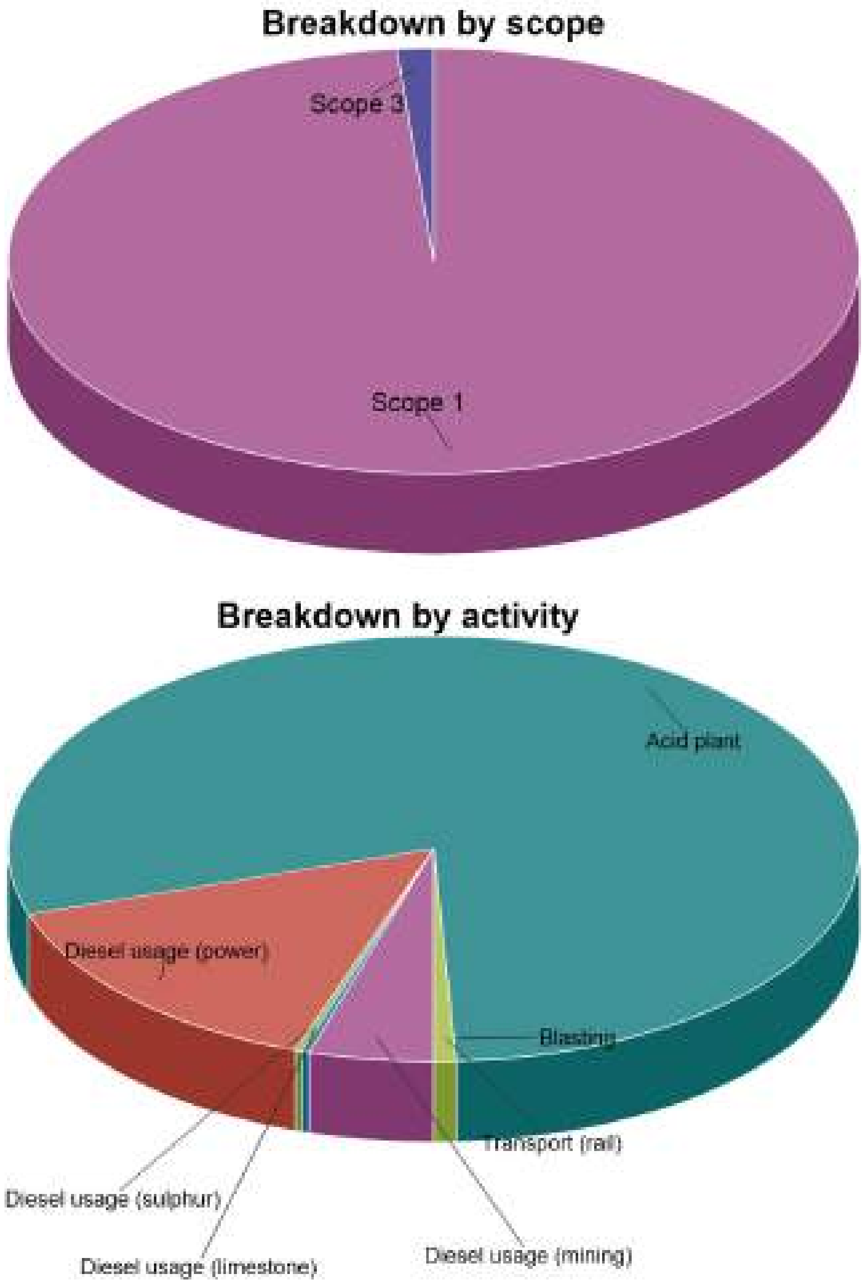


Figure 7.1 Summary of greenhouse gas emissions by scope and activity

7.2 Impact and Context

The Commonwealth Department of Industry, Science, Energy and Resources (DISER) (2021) provides a National Greenhouse Gas Inventory, where statistics on emissions per annum are stored, and detailed analysis of sources can be determined. To develop the context for this assessment, the impacts of the emissions projected in this assessment have been compared with the latest emissions officially recorded on the National Greenhouse Gas Inventory. The latest available data through the inventory is from 2019.

Table 7.2 presents these national and state figures in context with the projected emissions from the modified Project. The estimated annual average Scope 1 and 2 emissions from the modified Project (0.28 Mt CO_2-e) represent approximately 0.05% of Australia's 2019 emissions (DISER, 2021).

Table 7.2 Greenhouse gas emissions in the State and National context

Parameter	Value
National and State statistics	
2019 Total Australia GHG emissions (Mt CO_2-e)	529.3
2019 Total NSW GHG emissions (Mt CO_2-e)	136.6
Modified Project statistics	
Average projected GHG emissions per year (Mt CO_2-e)	0.28
Proportion of 2019 total Australia GHG emissions	0.05%
Proportion of 2019 total NSW GHG emissions	0.20%

In addition, the Sunrise (formerly Syerston) Modification 4 Air Quality and Greenhouse Gas Assessment (Ramboll Environ, 2017) estimated that annual Scope 1 emissions from the approved Project would be 0.32 Mt CO_2-e. The Scope 1 GHG emissions of the modified Project are estimated to be 0.28 Mt CO_2-e (Table 7.1) which is less than the approved Project emissions.

Section 8 outlines the monitoring and management measures for the modified Project including those relevant to the minimisation of GHG emissions.

8. Monitoring and Management

Monitoring and management is discussed below in the context of the potential air quality and GHG impacts for the modified Project.

8.1 Particulate Matter

Table 8.1 summarises the emission management measures from the Air Quality Management Plan (Clean TeQ, 2019a). These emissions management measures would continue to be adopted for the modified Project.

Table 8.1 Particulate matter emission management measures

Activity	Emission management measures	Assumed emission control (%) (NPI, 2012, Donelly et al, 2011)
General	Site inductions will include air quality requirements to ensure employee and contractor awareness of potential dust impacts, especially with respect to the nearest sensitive receptors	-
Disturbed areas	Only the minimum area necessary for construction activities will be disturbed. Cleared areas will be watered, as required. Where any exposed areas, stockpiles, etc. are predicted to be inactive for one month or more, a cover crop will be established, if practicable.	30 (primary rehabilitation)
Material stockpiling and handling	Long-term stockpiles will be revegetated as soon as practicable following completion. Water carts will be used on stockpile areas to minimise dust generation as necessary. Material handling and stripping/ripping will be avoided or postponed if excessive dust lift-off occurs. Material with low moisture content will be sprayed with water prior to and/or during handling if necessary to control visible dust. The drop height will be minimised when loading or unloading material as far as practicable. Spillage from loading/unloading will be minimised and cleaned up as soon as practicable.	70 (water sprays for unloading to hopper) 30 (primary rehabilitation)
Roads	Roads will be constructed in a proper manner and consideration will be given to constructing all major haul roads using material with low silt/fines content. Speed limits will be imposed on all roads. Water carts will be utilised as necessary to minimise excessive visible dust. Road vehicles will remain on formed roads and tracks where practicable.	85 (haul roads)

In addition to the measures listed above, both proactive and reactive dust control strategies informed by air quality and meteorological monitoring systems would be implemented. Reactive air quality management would assess the need to modify site activities in response to the following triggers:

- visual conditions, such as excessive visible dust;
- meteorological conditions, such as dry, strong wind conditions; and
- ambient air quality conditions (that is, elevated short-term PM_{10} concentrations).

Proactive air quality management would involve the planning of activities to minimise potential air quality impacts in advance of potentially adverse conditions.

Prior to the operations phase of the modified Project, the existing Air Quality Management Plan (Clean TeQ, 2019a) would be reviewed and updated, where necessary. The Air Quality Management Plan (Clean TeQ, 2019a) and Blast Management Plan (Clean TeQ, 2019b) would be revised to detail the implementation of monitoring and management controls to manage air quality impacts associated with the operations phase of the modified Project to maintain compliance with air quality criterion as required.

No changes would be required to the existing air quality monitoring network based on the expected impacts of the modified Project.

Environment Protection Licence (EPL 21146) would be reviewed and updated, where necessary, under the *Protection of the Environment (Operations) Act 1997* (POEO Act). Relevant to air quality, the EPL includes requirements to minimise emissions and to monitor air quality. Also relevant is the *Protection of the Environment Operations (Clean Air) Regulation 2010* which prescribes requirements for motor vehicle emissions and industrial emissions (such as VOCs). Motor vehicle emissions would be addressed by regular maintenance of all vehicles associated with the Project.

8.2 Greenhouse Gas Emissions

Mitigation of GHG emissions is inherent in the development of the mine plan. For example, reducing fuel usage by mobile plant and equipment is an objective of mine planning and good practice. Hence, savings of GHG emissions are attributable to appropriate mine planning. Mitigation measures to reduce the level of future GHG emissions include (Clean TeQ, 2019a):

- minimising the re-handling of material;
- maintaining the mobile fleet in good operating order; and
- optimising the design of roads to minimise the distance travelled between working areas.

9. Conclusions

This report has provided an assessment of the potential air quality and GHG impacts of a modification to Development Consent (DA 374-11-00). In summary, the air quality assessment involved identifying the key potential air quality impacts, characterising the existing environment, quantifying emissions to air and modelling the potential impacts of the modified Project on local air quality. GHG emissions were estimated in accordance with recognised methodologies.

The key potential air quality impacts were identified as construction and operational dust, processing facility emissions, post-blast fume, and diesel exhaust. These potential air quality impacts, plus GHG emissions, were the focus of the assessment.

A review of the local meteorological and ambient air quality conditions was undertaken. The review considered data collected from existing meteorological and air quality monitors at the mine and processing facility. Approximately two years of meteorological data and one year of air quality data was available from the monitors at the mine and processing facility. One of the objectives for reviewing the data was to develop an understanding of existing air quality impacts as well as the meteorological conditions which typically influence the local air quality conditions. The following conclusions of the background air quality and meteorological data were made:

- Winds are predominantly from the southwest to west, and northeast to east with some variations by season and from year-to-year.
- Air quality conditions were adversely influenced by drought between 2017 to 2019 and into early 2020. The drought led to an increase in the frequency of dust storms and bushfires which, in turn, affected air quality during this period. These conditions were not unique to the Central West region of NSW and it was noted that most locations in NSW have historically recorded one or more days each year when the 24-hour average PM_{10} concentration exceeded EPA criteria.
- In the absence of Project activities (having not yet commenced), the measured background levels of 24-hour average PM_{10} and $PM_{2.5}$ concentrations exceeded the EPA criteria on multiple occasions in 2020, due to the extraordinary events (e.g. bushfires, dust storms etc.).
- Annual average PM_{10} and $PM_{2.5}$ concentrations did not exceed the EPA criteria after the records of extraordinary events were taken into consideration (i.e. excluded).
- Estimated TSP concentrations and measured deposited dust levels did not exceed the EPA criteria in 2020.

The key outcomes of the modelling and subsequent assessment are:

- Construction and operational dust emissions (i.e. particulate matter in the form of TSP, PM_{10}, $PM_{2.5}$ and deposited dust) due to operations at the mine and processing facility are not expected to cause adverse air quality impacts at the nearest private sensitive receptors. Modelling led to the following specific outcomes for the modified Project:
  - Maximum 24-hour average PM_{10} project only and cumulative concentrations would comply with air quality criteria (50 $\mu g/m^3$) at all private sensitive receptors.
  - Annual average PM_{10} project only and cumulative concentrations would comply with air quality criteria (25 $\mu g/m^3$) at all private sensitive receptors.
  - Maximum 24-hour average $PM_{2.5}$ project only and cumulative concentrations would comply with air quality criteria (25 $\mu g/m^3$) at all private sensitive receptors.
  - Annual average $PM_{2.5}$ project only and cumulative concentrations would comply with air quality criteria (8 $\mu g/m^3$) at all private sensitive receptors.
  - Annual average TSP project only and cumulative concentrations would comply with air quality criteria (90 $\mu g/m^3$) at all private sensitive receptors.
  - Annual average project only and cumulative deposited dust levels would comply with air quality criteria (2 g/m^2/month and 4 g/m^2/month respectively) at all private sensitive receptors.

  - Dust concentrations and deposition levels would comply with the VLAMP (NSW Government, 2018) criteria at all private sensitive receptors and vacant land.

- Construction and operational dust emissions due to the modified rail siding are not expected to cause adverse air quality impacts at the nearest private sensitive receptors. That is, based on modelling, dust concentration (PM_{10}, $PM_{2.5}$ and TSP) and dust deposition levels would comply with EPA and VLAMP criteria at all private sensitive receptors.
- Processing facility emissions are not expected to cause adverse air quality impacts at the nearest private receptors, based on modelling (using conservative assumptions) which showed compliance with air quality criteria.
- Operational post-blast fume emissions (as NO_2) are not expected to result in any adverse air quality impacts, based on modelling which showed compliance with air quality criteria.
- Operational diesel exhaust emissions associated with off-road vehicles and equipment are not expected to result in any adverse air quality impacts, based on modelling which showed compliance with air quality criteria.
- The estimated annual average Scope 1 and 2 greenhouse gas emissions from the modified Project represent approximately 0.05% of Australia's 2019 emissions.
- SEM would implement air quality and greenhouse gas emission management measures to minimise the potential impacts of the modified Project.
- No changes would be required to the existing air quality monitoring network.

Given the above, the modified Project is not expected to cause adverse impacts on the local air quality environment near the mine and processing facility or rail siding. Notwithstanding, the existing Air Quality Management Plan would be reviewed and updated, where necessary, to incorporate the Modification.

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Appendix A. Model settings and setup

Geophysical

Figure A1 shows the model grid, land-use and terrain information, as used by CALMET. Changes from grassland to barren land (i.e. mining areas) will have very little influence on the modelling results.

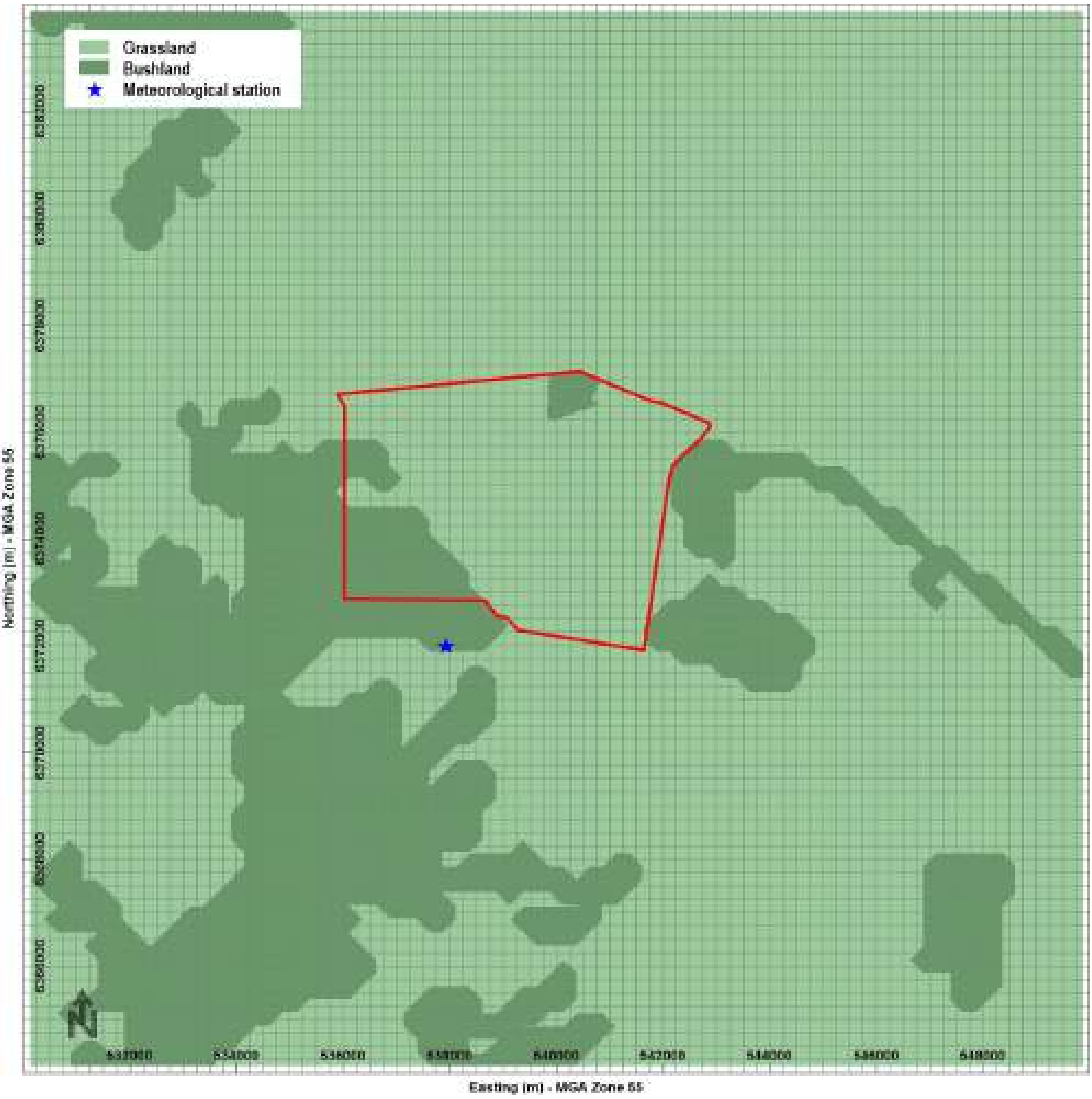

Figure A1 Model domain, grid, land use and terrain information

Meteorology

The CALPUFF model, through the CALMET meteorological pre-processor, simulates complex meteorological patterns that exist in a particular region. The necessary upper air data for CALMET were generated by the CSIRO's prognostic model, TAPM, and the required surface observation data were sourced from the site weather station. CALMET was used to produce a year-long, three-dimensional output of meteorological conditions for input to the CALPUFF air dispersion model. The meteorological modelling followed the guidance of TRC (2011) and adopted the "observations" mode.

Table A1 Model settings and inputs for TAPM

Parameter	Value(s) for mine site	Value(s) for rail siding
Model version	4.0.5	4.0.5
Number of grids (spacing)	4 (30 km, 10 km, 3 km, 1 km)	4 (30 km, 10 km, 3 km, 1 km)
Number of grid points	35 x 35 x 25	35 x 35 x 25
Year(s) of analysis	2020	2020
Centre of analysis	32°45' S, 147°25' E	32°45' S, 147°25' E
Terrain data source	30 m Shuttle Research Topography Mission (SRTM)	30 m Shuttle Research Topography Mission (SRTM)
Land use data source	Default	Default
Meteorological data assimilation	Project meteorological station. Radius of influence = 10 km. Number of vertical levels for assimilation = 4	Project meteorological station. Radius of influence = 10 km. Number of vertical levels for assimilation = 4

Table A2 Model settings and inputs for CALMET

Parameter	Value(s) for mine site	Value(s) for rail siding
Model version	6.334	6.334
Terrain data source(s)	30 m SRTM and Project DEM.	30 m SRTM.
Land use data source(s)	Digitised from aerial imagery	Digitised from aerial imagery
Meteorological grid domain	20 km x 20 km	10 km x 10 km
Meteorological grid resolution	0.25 km	0.2 km
Meteorological grid dimensions	80 x 80 x 9 grid points	50 x 50 x 9 grid points
Meteorological grid origin	530000 mE, 6364000 mN. MGA Zone 55	560000 mE, 6358000 mN MGA Zone 55
Surface meteorological stations	AWS: wind speed, wind direction, temperature and humidity TAPM (at location of AWS): ceiling height, cloud cover, temperature, relative humidity and air pressure	AWS: wind speed, wind direction, temperature and humidity TAPM (at location of AWS): ceiling height, cloud cover, temperature, relative humidity and air pressure
Upper air meteorological stations	Upper air data file for the location of the AWS, derived by TAPM. Biased towards surface observations (-1, -0.8, -0.6, -0.4, -0.2, 0, 0, 0, 0)	Upper air data file for the location of the AWS, derived by TAPM. Biased towards surface observations (-1, -0.8, -0.6, -0.4, -0.2, 0, 0, 0, 0)
Simulation length	8784 hours (1 Jan 2020 to 31 Dec 2020)	8784 hours (1 Jan 2020 to 31 Dec 2020)
R1, R2	0.5, 1	0.5, 1
RMAX1, RMAX2	5, 20	5, 20
TERRAD	5	5

Table A3 Model settings and inputs for CALPUFF

Parameter	Value(s) for mine site	Value(s) for rail siding
Model version	6.42	6.42
Computational grid domain	80 x 80	50 x 50
Chemical transformation	None	None
Dry deposition	Yes	Yes
Wind speed profile	ISC rural	ISC rural
Puff element	Puff	Puff
Dispersion option	Turbulence from micrometeorology	Turbulence from micrometeorology
Time step	3600 seconds (1 hour)	3600 seconds (1 hour)
Terrain adjustment	Partial plume path	Partial plume path
Number of volume sources	See below. Height = 5 m, SY = 20 m, SZ = 10 m.	See below. Height = 5 m, SY = 20 m, SZ = 10 m.
Receptors	562 discrete receptors. See below.	Gridding receptors at 200 m resolution.

Sources (mine site)

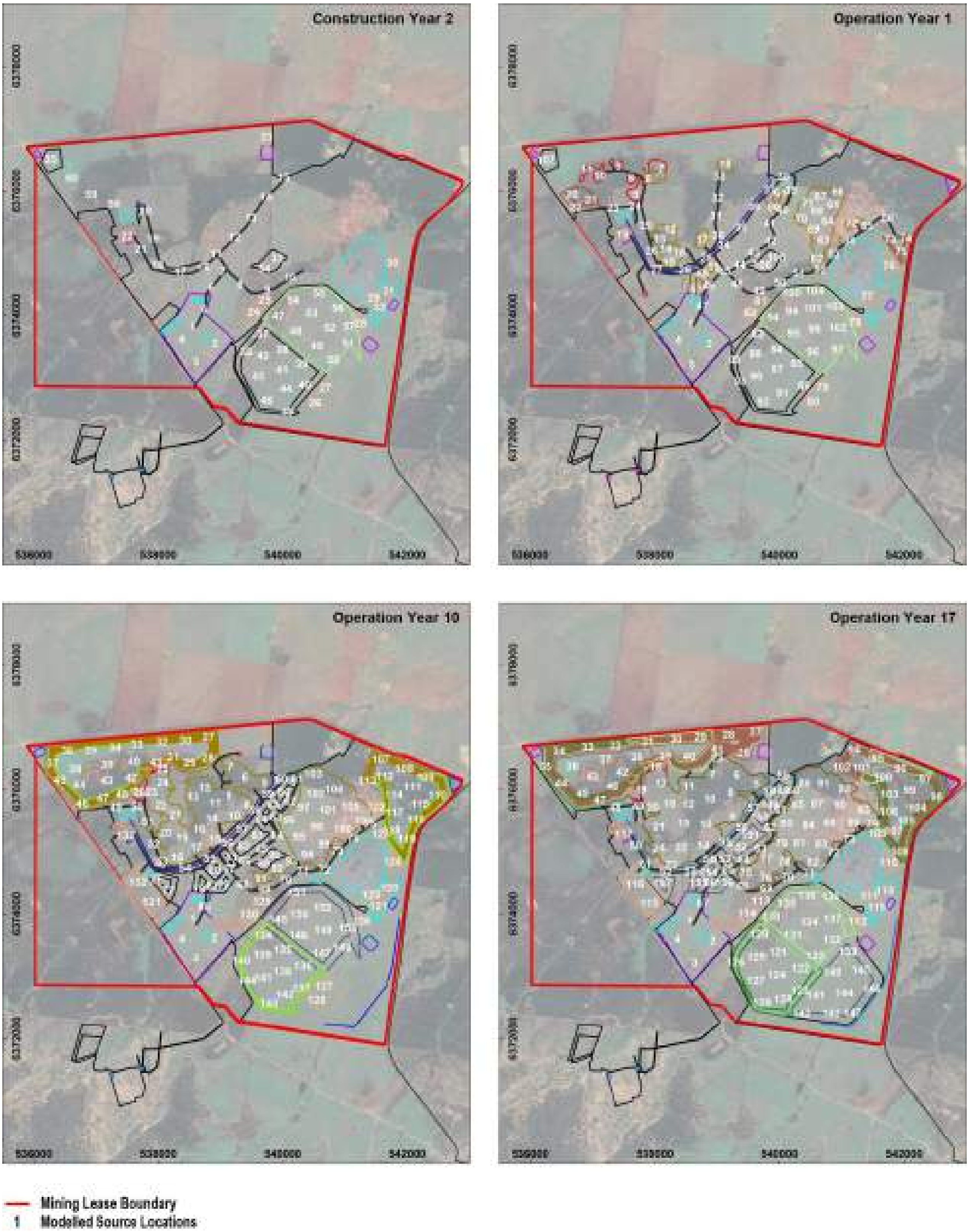

Figure A2 Location of modelled sources of construction and operational dust emissions at mine site

Sources (rail siding)

Figure A3 Location of modelled sources of construction and operational dust emissions at the modified rail siding

Receptors

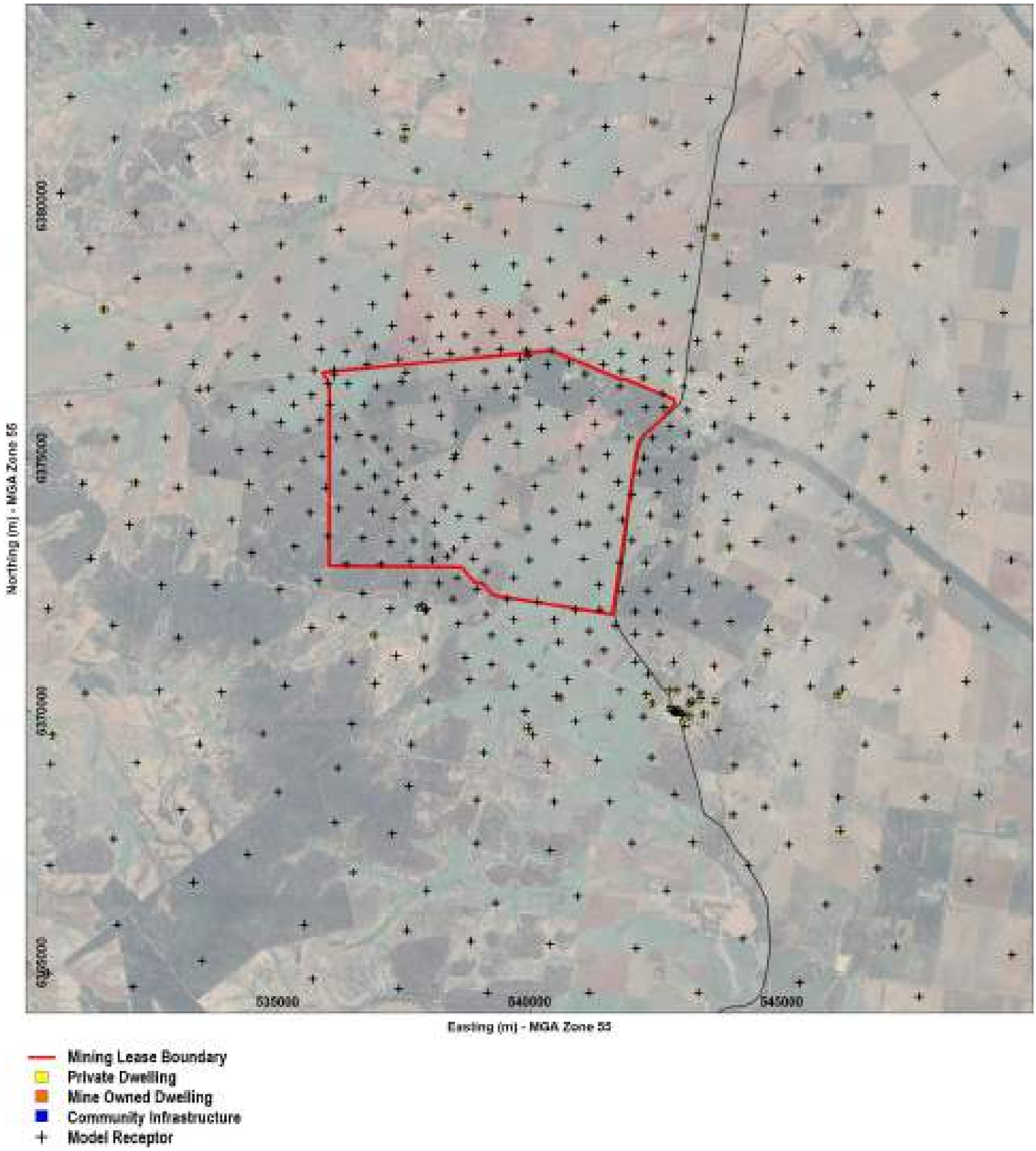

Figure A4 Location of model receptors for mine site

Appendix B. Emission calculations

Emission factors

Activity	Emission factor			Units	Source
	TSP	PM_{10}	$PM_{2.5}$		
Drilling	$E_{TSP} = 0.59$	$E_{PM10} = 0.52 \times E_{TSP}$	$E_{PM2.5} = 0.03 \times E_{TSP}$	kg/hole	US EPA / NPI
Blasting	$E_{TSP} = 0.00022 \times A^{1.5}$	$E_{PM10} = 0.52 \times E_{TSP}$	$E_{PM2.5} = 0.03 \times E_{TSP}$	kg/blast	US EPA / NPI
Loading / dumping waste / ore	$E_{TSP} = 0.74 \times 0.0016 \times ((U/2.2)^{1.3}/(M/2)^{1.4})$	$E_{PM10} = 0.35 \times 0.0016 \times ((U/2.2)^{1.3}/(M/2)^{1.4})$	$E_{PM2.5} = 0.053 \times 0.0016 \times ((U/2.2)^{1.3}/(M/2)^{1.4})$	kg/t	US EPA / NPI
Hauling on unsealed roads	$E_{TSP} = 4$	$E_{PM10} = 0.3 \times E_{TSP}$	$E_{PM2.5} = 0.03 \times E_{TSP}$	kg/VKT	SPCC
Dozers working	$E_{TSP} = 2.6 \times (S^{1.2}/M^{1.3})$	$E_{PM10} = 0.3375 \times (S^{1.5}/M^{1.4})$	$E_{PM2.5} = 0.105 \times E_{TSP}$	kg/hour	US EPA / NPI
Miscellaneous transfers	$E_{TSP} = 0.74 \times 0.0016 \times ((U/2.2)^{1.3}/(M/2)^{1.4})$	$E_{PM10} = 0.35 \times 0.0016 \times ((U/2.2)^{1.3}/(M/2)^{1.4})$	$E_{PM2.5} = 0.053 \times 0.0016 \times ((U/2.2)^{1.3}/(M/2)^{1.4})$	kg/t	US EPA / NPI
Wind erosion from exposed areas	$E_{TSP} = 0.1$	$E_{PM10} = 0.5 \times E_{TSP}$	$E_{PM2.5} = 0.075 \times E_{TSP}$	kg/ha/h	US EPA
Grading roads	$E_{TSP} = 0.0034 \times s^{2.5}$	$E_{PM10} = 0.00336 \times s^{2}$	$E_{PM2.5} = 0.0001054 \times s^{2.5}$	kg/VKT	US EPA / NPI

A = blast area (m^2)
U = wind speed (m/s)
M = moisture content (%)
S = silt content (%)
s = speed (km/h)

Emission inventory

Sunrise MOD 7 - Construction Year 2	Annual emissions (kg/y)						TSP		PM10		PM2.5		Variables							
Activity	TSP	PM10	PM2.5	Control (%)	Intensity	Units	Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2)^1.3	Moisture (%)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)
East pit - drilling	0	0	0	0	0	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-
East pit - blasting	0	0	0	0	0	blasts/y	66.4	kg/blast	34.5	kg/blast	2.0	kg/blast	4500	-	-	-	-	-	-	-
East pit - excavators loading waste to trucks	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - hauling waste from pit to dump	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	-	4	98	0	-	-
East pit - unloading waste to dump	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - dozers shaping dump	0	0	0	0	0	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
East pit - dozers working in pit	0	0	0	0	0	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
East pit - loading ore to trucks	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - hauling ore to low grade stockpile	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	-	4	98	0	-	-
East pit - hauling ore to high grade stockpile	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	-	4	98	0	-	-
East pit - unloading ore to low grade stockpile	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - unloading ore to high grade stockpile	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - drilling	0	0	0	0	0	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-
West pit - blasting	0	0	0	0	0	blasts/y	66.4	kg/blast	34.5	kg/blast	2.0	kg/blast	4500	-	-	-	-	-	-	-
West pit - excavators loading waste to trucks	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - hauling waste from pit to dump	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	-	4	98	0	-	-
West pit - unloading waste to dump	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - dozers shaping dump	0	0	0	0	0	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
West pit - dozers working in pit	0	0	0	0	0	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
West pit - loading ore to trucks	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - hauling ore to low grade stockpile	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	-	4	98	0	-	-
West pit - hauling ore to high grade stockpile	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	-	4	98	0	-	-
West pit - unloading ore to low grade stockpile	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - unloading ore to high grade stockpile	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - excavators loading to trucks	4932	2333	353	0	2500000	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - hauling for pond construction 1	13857	4095	416	85	833333	t/y	0.11086	kg/t	0.03276	kg/t	0.003	kg/t	-	-	-	4	98	2.8	-	-
Evaporation ponds - hauling for pond construction 2	13857	4095	416	85	833333	t/y	0.11086	kg/t	0.03276	kg/t	0.003	kg/t	-	-	-	4	98	2.8	-	-
Evaporation ponds - hauling to TSF	16827	4972	505	85	833333	t/y	0.13461	kg/t	0.03978	kg/t	0.004	kg/t	-	-	-	4	98	3.4	-	-
Evaporation ponds - unloading to pond walls 1	1644	778	118	0	833333	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - unloading to pond walls 2	1644	778	118	0	833333	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-

Sunrise MOD 7 - Construction Year 2	Annual emissions (kg/y)						TSP		PM10		PM2.5		Variables							
Activity	TSP	PM10	PM2.5	Control (%)	Intensity	Units	Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2)^1.3	Moisture (%)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)
Evaporation ponds - unloading to TSF	1644	778	118	0	833333	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - dozers shaping ponds	117281	28552	12315	0	7008	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
Processing - loading low grade ore to trucks	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - loading high grade ore to trucks	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - hauling low grade ore to ROM	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	-	4	98	0	-	-
Processing - hauling high grade ore to ROM	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	-	4	98	0	-	-
Processing - unloading ore to ROM	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - loading ore to hopper	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - sizing of ore	0	0	0	0	0	t/y	0.01250	kg/t	0.00430	kg/t	0.0003	kg/t	-	-	-	-	-	-	-	-
Processing - hauling limestone to site	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	-	4	50	0	-	-
Processing - unloading limestone to ROM	0	0	0	0	0	t/y	0.00521	kg/t	0.00246	kg/t	0.0004	kg/t	-	1.67	1	-	-	-	-	-
Processing - loading limestone to hopper	0	0	0	0	0	t/y	0.00521	kg/t	0.00246	kg/t	0.0004	kg/t	-	1.67	1	-	-	-	-	-
Processing - hauling elemental sulphur to site	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	-	4	50	0	-	-
Processing - unloading elemental sulpur to hopper	0	0	0	70	0	t/y	0.01374	kg/t	0.00650	kg/t	0.0010	kg/t	-	1.67	0.5	-	-	-	-	-
Processing - transfer elemental sulphur to plant / stockpile	0	0	0	0	0	t/y	0.01374	kg/t	0.00650	kg/t	0.0010	kg/t	-	1.67	0.5	-	-	-	-	-
Processing - loading product to trucks	0	0	0	0	0	t/y	0.00055	kg/t	0.00026	kg/t	0.0000	kg/t	-	1.67	5	-	-	-	-	-
Processing - hauling product from site	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	-	4	50	0	-	-
Rejects - loading rejects to trucks	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Rejects - hauling rejects to dump	0	0	0	85	0	t/y	0.00000	kg/t	0	kg/t	0.000	kg/t	-	-	-	4	98	0	-	-
Rejects - unloading rejects to dump	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Wind erosion from active and inactive pits	0	0	0	0	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from borrow pits	17170	8585	1288	0	20	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from initial rehabilitation	0	0	0	30	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from ore stockpiles	0	0	0	0	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from ROM pad	876	438	66	0	1	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from TSF	101704	50852	7628	10	129	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from topsoil stockpiles	30397	15199	2280	0	35	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from limestone stockpiles	263	131	20	0	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from product stockpiles	88	44	7	0	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Grading roads	7189	2542	79	50	23360	km/y	0.61547	kg/VKT	0.2176	kg/VKT	0.007	kg/VKT	-	-	-	-	-	-	-	8
Total	329371	124169	25723																	

Sunrise MOD 7 - Operation Year 1	Annual emissions (kg/y)						TSP		PM10		PM2.5		Variables							
Activity	TSP	PM10	PM2.5	Control (%)	Intensity	Units	Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2)^1.3	Moisture (%)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)
East pit - drilling	5443	2830	163	0	9225	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-
East pit - blasting	4084	2124	123	0	62	blasts/y	66.4	kg/blast	34.5	kg/blast	2.0	kg/blast	4500	-	-	-	-	-	-	-
East pit - excavators loading waste to trucks	9299	4398	666	0	4713742	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - hauling waste from pit to dump	156766	46326	4703	85	4713742	t/y	0.22171	kg/t	0.06552	kg/t	0.007	kg/t	-	-	-	4	98	5.6	-	-
East pit - unloading waste to dump	9299	4398	666	0	4713742	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - dozers shaping dump	117281	28552	12315	0	7008	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
East pit - dozers working in pit	117281	28552	12315	0	7008	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
East pit - loading ore to trucks	8456	3999	606	0	4286351	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - hauling ore to low grade stockpile	0	0	0	85	0	t/y	0.22963	kg/t	0.06786	kg/t	0.007	kg/t	-	-	-	4	98	6	-	-
East pit - hauling ore to high grade stockpile	218919	64692	6568	85	4286351	t/y	0.34049	kg/t	0.10062	kg/t	0.010	kg/t	-	-	-	4	98	8.6	-	-
East pit - unloading ore to low grade stockpile	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - unloading ore to high grade stockpile	8456	3999	606	0	4286351	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - drilling	5443	2830	163	0	9225	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-
West pit - blasting	4084	2124	123	0	62	blasts/y	66.4	kg/blast	34.5	kg/blast	2.0	kg/blast	4500	-	-	-	-	-	-	-
West pit - excavators loading waste to trucks	9299	4398	666	0	4713742	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - hauling waste from pit to dump	179161	52943	5375	85	4713742	t/y	0.25339	kg/t	0.07488	kg/t	0.008	kg/t	-	-	-	4	98	6.4	-	-
West pit - unloading waste to dump	9299	4398	666	0	4713742	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - dozers shaping dump	117281	28552	12315	0	7008	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
West pit - dozers working in pit	117281	28552	12315	0	7008	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
West pit - loading ore to trucks	8456	3999	606	0	4286351	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - hauling ore to low grade stockpile	0	0	0	85	0	t/y	0.06335	kg/t	0.01872	kg/t	0.002	kg/t	-	-	-	4	98	1.6	-	-
West pit - hauling ore to high grade stockpile	86549	25576	2596	85	4286351	t/y	0.13461	kg/t	0.03978	kg/t	0.004	kg/t	-	-	-	4	98	3.4	-	-
West pit - unloading ore to low grade stockpile	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - unloading ore to high grade stockpile	8456	3999	606	0	4286351	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - excavators loading to trucks	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - hauling for pond construction 1	0	0	0	85	0	t/y	0.07918	kg/t	0.0234	kg/t	0.002	kg/t	-	-	-	4	98	2	-	-
Evaporation ponds - hauling for pond construction 2	0	0	0	85	0	t/y	0.48302	kg/t	0.14274	kg/t	0.014	kg/t	-	-	-	4	98	12.2	-	-
Evaporation ponds - hauling to TSF	0	0	0	85	0	t/y	0.13461	kg/t	0.03978	kg/t	0.004	kg/t	-	-	-	4	98	3.4	-	-
Evaporation ponds - unloading to pond walls 1	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - unloading to pond walls 2	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - unloading to TSF	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - dozers shaping ponds	0	0	0	0	0	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-

Sunrise MOD 7 - Operation Year 1	Annual emissions (kg/y)						TSP		PM10		PM2.5		Variables							
Activity	TSP	PM10	PM2.5	Control (%)	Intensity	Units	Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2)^1.3	Moisture (%)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)
Processing - loading low grade ore to trucks	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - loading high grade ore to trucks	16911	7999	1211	0	8572702	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - hauling low grade ore to ROM	0	0	0	85	0	t/y	0.08710	kg/t	0.02574	kg/t	0.003	kg/t	-	-	-	4	98	2	-	-
Processing - hauling high grade ore to ROM	295286	87259	8859	85	8572702	t/y	0.22963	kg/t	0.06786	kg/t	0.007	kg/t	-	-	-	4	98	6	-	-
Processing - unloading ore to ROM	16911	7999	1211	0	8572702	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - loading ore to hopper	16911	7999	1211	0	8572702	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - sizing of ore	107159	36863	2572	0	8572702	t/y	0.01250	kg/t	0.00430	kg/t	0.0003	kg/t	-	-	-	-	-	-	-	-
Processing - hauling limestone to site	16296	4816	489	85	700000	t/y	0.15520	kg/t	0.04586	kg/t	0.005	kg/t	-	-	-	4	50	2	-	-
Processing - unloading limestone to ROM	3644	1724	261	0	700000	t/y	0.00521	kg/t	0.00246	kg/t	0.0004	kg/t	-	1.67	1	-	-	-	-	-
Processing - loading limestone to hopper	3644	1724	261	0	700000	t/y	0.00521	kg/t	0.00246	kg/t	0.0004	kg/t	-	1.67	1	-	-	-	-	-
Processing - hauling elemental sulphur to site	4074	1204	122	85	350000	t/y	0.07760	kg/t	0.02293	kg/t	0.002	kg/t	-	-	-	4	50	1	-	-
Processing - unloading elemental sulpur to hopper	1443	682	103	70	350000	t/y	0.01374	kg/t	0.00650	kg/t	0.0010	kg/t	-	1.67	0.5	-	-	-	-	-
Processing - transfer elemental sulphur to plant / stockpile	4809	2274	344	0	350000	t/y	0.01374	kg/t	0.00650	kg/t	0.0010	kg/t	-	1.67	0.5	-	-	-	-	-
Processing - loading product to trucks	131	62	9	0	240180	t/y	0.00055	kg/t	0.00026	kg/t	0.0000	kg/t	-	1.67	5	-	-	-	-	-
Processing - hauling product from site	2796	826	84	85	240180	t/y	0.07760	kg/t	0.02293	kg/t	0.002	kg/t	-	-	-	4	50	1	-	-
Rejects - loading rejects to trucks	101	48	7	0	51000	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Rejects - hauling rejects to dump	2423	716	73	85	51000	t/y	0.31673	kg/t	0.0936	kg/t	0.010	kg/t	-	-	-	4	98	8	-	-
Rejects - unloading rejects to dump	101	48	7	0	51000	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Wind erosion from active and inactive pits	99952	49976	7496	0	114	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from borrow pits	25492	12746	1912	0	29	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from initial rehabilitation	12019	6009	901	30	20	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from ore stockpiles	25141	12571	1886	0	29	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from ROM pad	876	438	66	0	1	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from TSF	101704	50852	7628	10	129	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from topsoil stockpiles	30397	15199	2280	0	35	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from limestone stockpiles	263	131	20	0	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from product stockpiles	88	44	7	0	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Grading roads	16699	5904	183	50	54264	km/y	0.61547	kg/VKT	0.2176	kg/VKT	0.007	kg/VKT	-	-	-	-	-	-	-	8
Total	2005859	663351	113361																	

Sunrise MOD 7 - Operation Year 10	Annual emissions (kg/y)						TSP		PM10		PM2.5		Variables							
Activity	TSP	PM10	PM2.5	Control (%)	Intensity	Units	Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2)^1.3	Moisture (%)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)
East pit - drilling	5443	2830	163	0	9225	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-
East pit - blasting	4084	2124	123	0	62	blasts/y	66.4	kg/blast	34.5	kg/blast	2.0	kg/blast	4500	-	-	-	-	-	-	-
East pit - excavators loading waste to trucks	7860	3718	563	0	3984510	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - hauling waste from pit to dump	127781	37760	3833	85	3984510	t/y	0.21380	kg/t	0.06318	kg/t	0.006	kg/t	-	-	-	4	98	5.4	-	-
East pit - unloading waste to dump	7860	3718	563	0	3984510	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - dozers shaping dump	87961	21414	9236	0	5256	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
East pit - dozers working in pit	87961	21414	9236	0	5256	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
East pit - loading ore to trucks	2990	1414	214	0	1515578	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - hauling ore to low grade stockpile	47524	14044	1426	85	1212462	t/y	0.26131	kg/t	0.07722	kg/t	0.008	kg/t	-	-	-	4	98	7	-	-
East pit - hauling ore to high grade stockpile	16201	4788	486	85	303116	t/y	0.35633	kg/t	0.1053	kg/t	0.011	kg/t	-	-	-	4	98	9	-	-
East pit - unloading ore to low grade stockpile	2392	1131	171	0	1212462	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - unloading ore to high grade stockpile	598	283	43	0	303116	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - drilling	5443	2830	163	0	9225	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-
West pit - blasting	4084	2124	123	0	62	blasts/y	66.4	kg/blast	34.5	kg/blast	2.0	kg/blast	4500	-	-	-	-	-	-	-
West pit - excavators loading waste to trucks	7860	3718	563	0	3984510	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - hauling waste from pit to dump	127781	37760	3833	85	3984510	t/y	0.21380	kg/t	0.06318	kg/t	0.006	kg/t	-	-	-	4	98	5.4	-	-
West pit - unloading waste to dump	7860	3718	563	0	3984510	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - dozers shaping dump	87961	21414	9236	0	5256	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
West pit - dozers working in pit	87961	21414	9236	0	5256	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
West pit - loading ore to trucks	2990	1414	214	0	1515578	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - hauling ore to low grade stockpile	24482	7235	734	85	1212462	t/y	0.13461	kg/t	0.03978	kg/t	0.004	kg/t	-	-	-	4	98	3.4	-	-
West pit - hauling ore to high grade stockpile	10081	2979	302	85	303116	t/y	0.22171	kg/t	0.06552	kg/t	0.007	kg/t	-	-	-	4	98	5.6	-	-
West pit - unloading ore to low grade stockpile	2392	1131	171	0	1212462	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - unloading ore to high grade stockpile	598	283	43	0	303116	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - excavators loading to trucks	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - hauling for pond construction 1	0	0	0	85	0	t/y	0.07918	kg/t	0.0234	kg/t	0.002	kg/t	-	-	-	4	98	2	-	-
Evaporation ponds - hauling for pond construction 2	0	0	0	85	0	t/y	0.48302	kg/t	0.14274	kg/t	0.014	kg/t	-	-	-	4	98	12.2	-	-
Evaporation ponds - hauling to TSF	0	0	0	85	0	t/y	0.13461	kg/t	0.03978	kg/t	0.004	kg/t	-	-	-	4	98	3.4	-	-
Evaporation ponds - unloading to pond walls 1	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - unloading to pond walls 2	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - unloading to TSF	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - dozers shaping ponds	0	0	0	0	0	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-

Sunrise MOD 7 - Operation Year 10	Annual emissions (kg/y)						TSP		PM10		PM2.5		Variables							
Activity	TSP	PM10	PM2.5	Control (%)	Intensity	Units	Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2)^1.3	Moisture (%)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)
Processing - loading low grade ore to trucks	4784	2263	343	0	2424925	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - loading high grade ore to trucks	1196	566	86	0	606231	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - hauling low grade ore to ROM	31682	9362	950	85	2424925	t/y	0.08710	kg/t	0.02574	kg/t	0.003	kg/t	-	-	-	4	98	2	-	-
Processing - hauling high grade ore to ROM	20882	6171	626	85	606231	t/y	0.22963	kg/t	0.06786	kg/t	0.007	kg/t	-	-	-	4	98	6	-	-
Processing - unloading ore to ROM	5980	2828	428	0	3031156	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - loading ore to hopper	5980	2828	428	0	3031156	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - sizing of ore	37889	13034	909	0	3031156	t/y	0.01250	kg/t	0.00430	kg/t	0.0003	kg/t	-	-	-	-	-	-	-	-
Processing - hauling limestone to site	16296	4816	489	85	700000	t/y	0.15520	kg/t	0.04586	kg/t	0.005	kg/t	-	-	-	4	50	2	-	-
Processing - unloading limestone to ROM	3644	1724	261	0	700000	t/y	0.00521	kg/t	0.00246	kg/t	0.0004	kg/t	-	1.67	1	-	-	-	-	-
Processing - loading limestone to hopper	3644	1724	261	0	700000	t/y	0.00521	kg/t	0.00246	kg/t	0.0004	kg/t	-	1.67	1	-	-	-	-	-
Processing - hauling elemental sulphur to site	4074	1204	122	85	350000	t/y	0.07760	kg/t	0.02293	kg/t	0.002	kg/t	-	-	-	4	50	1	-	-
Processing - unloading elemental sulpur to hopper	1443	682	103	70	350000	t/y	0.01374	kg/t	0.00650	kg/t	0.0010	kg/t	-	1.67	0.5	-	-	-	-	-
Processing - transfer elemental sulphur to plant / stockpile	4809	2274	344	0	350000	t/y	0.01374	kg/t	0.00650	kg/t	0.0010	kg/t	-	1.67	0.5	-	-	-	-	-
Processing - loading product to trucks	131	62	9	0	240180	t/y	0.00055	kg/t	0.00026	kg/t	0.0000	kg/t	-	1.67	5	-	-	-	-	-
Processing - hauling product from site	2796	826	84	85	240180	t/y	0.07760	kg/t	0.02293	kg/t	0.002	kg/t	-	-	-	4	50	1	-	-
Rejects - loading rejects to trucks	493	233	35	0	250000	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Rejects - hauling rejects to dump	11878	3510	356	85	250000	t/y	0.31673	kg/t	0.0936	kg/t	0.010	kg/t	-	-	-	4	98	8	-	-
Rejects - unloading rejects to dump	493	233	35	0	250000	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Wind erosion from active and inactive pits	278568	139284	20893	0	318	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from borrow pits	227147	113573	17036	0	259	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from initial rehabilitation	49240	24620	3693	30	80	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from ore stockpiles	84359	42179	6327	0	96	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from ROM pad	876	438	66	0	1	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from TSF	96973	48487	7273	10	123	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from topsoil stockpiles	0	0	0	0	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from limestone stockpiles	263	131	20	0	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from product stockpiles	88	44	7	0	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Grading roads	11133	3936	122	50	36176	km/y	0.61547	kg/VKT	0.2176	kg/VKT	0.007	kg/VKT	-	-	-	-	-	-	-	8
Total	1674884	647687	112547																	

Sunrise MOD 7 - Operation Year 17	Annual emissions (kg/y)						TSP		PM10		PM2.5		Variables							
Activity	TSP	PM10	PM2.5	Control (%)	Intensity	Units	Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2)^1.3	Moisture (%)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)
East pit - drilling	5443	2830	163	0	9225	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-
East pit - blasting	4084	2124	123	0	62	blasts/y	66.4	kg/blast	34.5	kg/blast	2.0	kg/blast	4500	-	-	-	-	-	-	-
East pit - excavators loading waste to trucks	6325	2991	453	0	3206220	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - hauling waste from pit to dump	102822	30385	3085	85	3206220	t/y	0.21380	kg/t	0.06318	kg/t	0.006	kg/t	-	-	-	4	98	5.4	-	-
East pit - unloading waste to dump	6325	2991	453	0	3206220	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - dozers shaping dump	58641	14276	6157	0	3504	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
East pit - dozers working in pit	58641	14276	6157	0	3504	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
East pit - loading ore to trucks	4525	2140	324	0	2293731	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - hauling ore to low grade stockpile	89905	26568	2697	85	2293731	t/y	0.26131	kg/t	0.07722	kg/t	0.008	kg/t	-	-	-	4	98	7	-	-
East pit - hauling ore to high grade stockpile	0	0	0	85	0	t/y	0.35633	kg/t	0.1053	kg/t	0.011	kg/t	-	-	-	4	98	9	-	-
East pit - unloading ore to low grade stockpile	4525	2140	324	0	2293731	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
East pit - unloading ore to high grade stockpile	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - drilling	5443	2830	163	0	9225	holes/y	0.59	kg/hole	0.31	kg/hole	0.018	kg/hole	-	-	-	-	-	-	-	-
West pit - blasting	4084	2124	123	0	62	blasts/y	66.4	kg/blast	34.5	kg/blast	2.0	kg/blast	4500	-	-	-	-	-	-	-
West pit - excavators loading waste to trucks	6325	2991	453	0	3206220	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - hauling waste from pit to dump	102822	30385	3085	85	3206220	t/y	0.21380	kg/t	0.06318	kg/t	0.006	kg/t	-	-	-	4	98	5.4	-	-
West pit - unloading waste to dump	6325	2991	453	0	3206220	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - dozers shaping dump	58641	14276	6157	0	3504	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
West pit - dozers working in pit	58641	14276	6157	0	3504	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-
West pit - loading ore to trucks	4525	2140	324	0	2293731	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - hauling ore to low grade stockpile	46315	13686	1389	85	2293731	t/y	0.13461	kg/t	0.03978	kg/t	0.004	kg/t	-	-	-	4	98	3.4	-	-
West pit - hauling ore to high grade stockpile	0	0	0	85	0	t/y	0.22171	kg/t	0.06552	kg/t	0.007	kg/t	-	-	-	4	98	5.6	-	-
West pit - unloading ore to low grade stockpile	4525	2140	324	0	2293731	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
West pit - unloading ore to high grade stockpile	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - excavators loading to trucks	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - hauling for pond construction 1	0	0	0	85	0	t/y	0.07918	kg/t	0.0234	kg/t	0.002	kg/t	-	-	-	4	98	2	-	-
Evaporation ponds - hauling for pond construction 2	0	0	0	85	0	t/y	0.48302	kg/t	0.14274	kg/t	0.014	kg/t	-	-	-	4	98	12.2	-	-
Evaporation ponds - hauling to TSF	0	0	0	85	0	t/y	0.13461	kg/t	0.03978	kg/t	0.004	kg/t	-	-	-	4	98	3.4	-	-
Evaporation ponds - unloading to pond walls 1	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - unloading to pond walls 2	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - unloading to TSF	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Evaporation ponds - dozers shaping ponds	0	0	0	0	0	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	-	2	-	-	-	10	-

Sunrise MOD 7 - Operation Year 17	Annual emissions (kg/y)						TSP		PM10		PM2.5		Variables							
Activity	TSP	PM10	PM2.5	Control (%)	Intensity	Units	Factor	Units	Factor	Units	Factor	Units	Area (m2)	(ws/2.2)^1.3	Moisture (%)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)
Processing - loading low grade ore to trucks	9050	4280	648	0	4587462	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - loading high grade ore to trucks	0	0	0	0	0	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - hauling low grade ore to ROM	59937	17712	1798	85	4587462	t/y	0.08710	kg/t	0.02574	kg/t	0.003	kg/t	-	-	-	4	98	2	-	-
Processing - hauling high grade ore to ROM	0	0	0	85	0	t/y	0.22963	kg/t	0.06786	kg/t	0.007	kg/t	-	-	-	4	98	6	-	-
Processing - unloading ore to ROM	9050	4280	648	0	4587462	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - loading ore to hopper	9050	4280	648	0	4587462	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Processing - sizing of ore	57343	19726	1376	0	4587462	t/y	0.01250	kg/t	0.00430	kg/t	0.0003	kg/t	-	-	-	-	-	-	-	-
Processing - hauling limestone to site	16296	4816	489	85	700000	t/y	0.15520	kg/t	0.04586	kg/t	0.005	kg/t	-	-	-	4	50	2	-	-
Processing - unloading limestone to ROM	3644	1724	261	0	700000	t/y	0.00521	kg/t	0.00246	kg/t	0.0004	kg/t	-	1.67	1	-	-	-	-	-
Processing - loading limestone to hopper	3644	1724	261	0	700000	t/y	0.00521	kg/t	0.00246	kg/t	0.0004	kg/t	-	1.67	1	-	-	-	-	-
Processing - hauling elemental sulphur to site	4074	1204	122	85	350000	t/y	0.07760	kg/t	0.02293	kg/t	0.002	kg/t	-	-	-	4	50	1	-	-
Processing - unloading elemental sulpur to hopper	1443	682	103	70	350000	t/y	0.01374	kg/t	0.00650	kg/t	0.0010	kg/t	-	1.67	0.5	-	-	-	-	-
Processing - transfer elemental sulphur to plant / stockpile	4809	2274	344	0	350000	t/y	0.01374	kg/t	0.00650	kg/t	0.0010	kg/t	-	1.67	0.5	-	-	-	-	-
Processing - loading product to trucks	131	62	9	0	240180	t/y	0.00055	kg/t	0.00026	kg/t	0.0000	kg/t	-	1.67	5	-	-	-	-	-
Processing - hauling product from site	2796	826	84	85	240180	t/y	0.07760	kg/t	0.02293	kg/t	0.002	kg/t	-	-	-	4	50	1	-	-
Rejects - loading rejects to trucks	493	233	35	0	250000	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Rejects - hauling rejects to dump	11878	3510	356	85	250000	t/y	0.31673	kg/t	0.0936	kg/t	0.010	kg/t	-	-	-	4	98	8	-	-
Rejects - unloading rejects to dump	493	233	35	0	250000	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	-	1.67	2	-	-	-	-	-
Wind erosion from active and inactive pits	361613	180806	27121	0	413	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from borrow pits	248740	124370	18656	0	284	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from initial rehabilitation	13644	6822	1023	30	22	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from ore stockpiles	84359	42179	6327	0	96	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from ROM pad	876	438	66	0	1	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from TSF	96500	48250	7238	10	122	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from topsoil stockpiles	0	0	0	0	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from limestone stockpiles	263	131	20	0	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Wind erosion from product stockpiles	88	44	7	0	0	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-	-
Grading roads	11133	3936	122	50	36176	km/y	0.61547	kg/VKT	0.2176	kg/VKT	0.007	kg/VKT	-	-	-	-	-	-	-	8
Total	1650221	663104	106363																	

Emission calculations

Sunrise MOD 7 - Rail Siding (Construction)

	Annual emissions (kg/y)						TSP		PM10		PM2.5		Variables						
Activity	TSP	PM10	PM2.5	Control (%)	Intensity	Units	Factor	Units	Factor	Units	Factor	Units		Moisture (%)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)
Stripping topsoil by scraper	744	187	37	50	51300	t/y	0.029	kg/t	0.0073	kg/t	0.001	kg/t	-	-	-	-	-	-	-
Dozers working	48867	11897	5131	0	2920	h/y	16.7	kg/h	4.1	kg/h	1.757	kg/h	-	2	-	-	-	10	-
Excavator working	202	96	14	0	102600	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	1.67	2	-	-	-	-	-
Loading spoil to truck(s)	202	96	14	0	102600	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	1.67	2	-	-	-	-	-
Hauling spoil over unsealed surfaces	398	118	12	75	102600	t/y	0.01552	kg/t	0.00459	kg/t	0.000	kg/t	-	-	4	50	0.2	-	-
Unloading spoil from truck(s)	202	96	14	0	102600	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	1.67	2	-	-	-	-	-
Wind erosion from exposed areas	4993	2497	374	0	6	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-
Grading roads	899	318	10	50	2920	km/y	0.61547	kg/VKT	0.2176	kg/VKT	0.007	kg/VKT	-	-	-	-	-	-	8
Total	56508	15303	5608																

Emission calculations

Sunrise MOD 7 - Rail Siding (Operation)

	Annual emissions (kg/y)						TSP		PM10		PM2.5		Variables						
Activity	TSP	PM10	PM2.5	Control (%)	Intensity	Units	Factor	Units	Factor	Units	Factor	Units	$(ws/2.2)^{1.3}$	Moisture (%)	kg/VKT	t/truck	km/trip	Silt (%)	Speed (km/h)
Hauling ammonium sulphate to rail siding	0	0	0	100	100000	t/y	0.05432	kg/t	0.01605	kg/t	0.002	kg/t	-	-	4	50	0.7	-	-
Unloading ammonium sulphate to stockpiles	197	93	14	0	100000	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	1.67	2	-	-	-	-	-
Loading ammonium sulphate to trucks (or trains)	197	93	14	0	100000	t/y	0.00197	kg/t	0.00093	kg/t	0.0001	kg/t	1.67	2	-	-	-	-	-
Hauling ammonium sulphate off-site	0	0	0	100	100000	t/y	0.05432	kg/t	0.01605	kg/t	0.002	kg/t	-	-	4	50	0.7	-	-
Wind erosion from exposed areas	876	438	66	0	1	ha	876.0	kg/ha/y	438.0	kg/ha/y	65.7	kg/ha/y	-	-	-	-	-	-	-
Total	1271	625	94																

Source allocations
Construction Year 2

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 --------------------------------      13-May-2021 16:28
  DUST EMISSION CALCULATIONS XL1
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 Number of dust sources : 60
 Number of activities   : 60

  -----ACTIVITY SUMMARY-----
 ACTIVITY NAME : East pit - drilling
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - blasting
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0

 ACTIVITY NAME : East pit - excavators loading waste to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - hauling waste from pit to dump
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - unloading waste to dump
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - dozers shaping dump
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - dozers working in pit
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - loading ore to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - hauling ore to low grade stockpile
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - hauling ore to high grade stockpile
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - unloading ore to low grade stockpile
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - unloading ore to high grade stockpile
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - drilling
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - blasting
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0

 ACTIVITY NAME : West pit - excavators loading waste to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - hauling waste from pit to dump
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - unloading waste to dump
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - dozers shaping dump
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - dozers working in pit
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - loading ore to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - hauling ore to low grade stockpile
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - hauling ore to high grade stockpile
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - unloading ore to low grade stockpile
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - unloading ore to high grade stockpile
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Evaporation ponds - excavators loading to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 4932 kg/y TSP  2333 kg/y PM10  353 kg/y PM2.5
 FROM SOURCES  : 2
31 32
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Evaporation ponds - hauling for pond construction
1
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 13857 kg/y TSP  4095 kg/y PM10  416 kg/y PM2.5
 FROM SOURCES  : 2
```

31 32
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - hauling for pond construction
2
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 13857 kg/y TSP 4095 kg/y PM10 416 kg/y PM2.5
FROM SOURCES : 2
31 32
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - hauling to TSF
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 16827 kg/y TSP 4972 kg/y PM10 505 kg/y PM2.5
FROM SOURCES : 25
28 31 32 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54
55 56 57
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - unloading to pond walls 1
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 1644 kg/y TSP 778 kg/y PM10 118 kg/y PM2.5
FROM SOURCES : 2
31 32
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - unloading to pond walls 2
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 1644 kg/y TSP 778 kg/y PM10 118 kg/y PM2.5
FROM SOURCES : 2
31 32
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - unloading to TSF
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 1644 kg/y TSP 778 kg/y PM10 118 kg/y PM2.5
FROM SOURCES : 22
36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - dozers shaping ponds
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 117281 kg/y TSP 28552 kg/y PM10 12315 kg/y PM2.5
FROM SOURCES : 24
31 32 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55
56 57
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading low grade ore to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading high grade ore to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling low grade ore to ROM
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling high grade ore to ROM
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - unloading ore to ROM
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading ore to hopper
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - sizing of ore
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling limestone to site
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - unloading limestone to ROM
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading limestone to hopper
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling elemental sulphur to site
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - unloading elemental sulpur to hopper
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - transfer elemental sulphur to plant / stockpile
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading product to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling product from site
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Rejects - loading rejects to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Rejects - hauling rejects to dump
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Rejects - unloading rejects to dump
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from active and inactive pits
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from borrow pits
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 17170 kg/y TSP 8585 kg/y PM10 1288 kg/y PM2.5
FROM SOURCES : 3
33 34 35
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from initial rehabilitation
ACTIVITY TYPE : Wind erosion

DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from ore stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from ROM pad
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 876 kg/y TSP 438 kg/y PM10 66 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from TSF
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 101704 kg/y TSP 50852 kg/y PM10 7628 kg/y PM2.5
FROM SOURCES : 22
36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from topsoil stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 30397 kg/y TSP 15199 kg/y PM10 2280 kg/y PM2.5
FROM SOURCES : 8
23 24 25 26 27 28 29 30
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from limestone stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 263 kg/y TSP 131 kg/y PM10 20 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from product stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 88 kg/y TSP 44 kg/y PM10 7 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Grading roads
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 7189 kg/y TSP 2542 kg/y PM10 79 kg/y PM2.5
FROM SOURCES : 56
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
51 52 53 54 55 56 57 58 59 60
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

Pit retention sources:

Operation Year 1

--------------------------------   13-May-2021 16:38
DUST EMISSION CALCULATIONS XL1

Number of dust sources : 107
Number of activities   : 60

-----ACTIVITY SUMMARY-----
ACTIVITY NAME : East pit - drilling
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 5443 kg/y TSP 2830 kg/y PM10 163 kg/y PM2.5
FROM SOURCES : 11
62 63 64 65 66 67 68 69 70 71 72
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : East pit - blasting
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 4084 kg/y TSP 2124 kg/y PM10 123 kg/y PM2.5
FROM SOURCES : 11
62 63 64 65 66 67 68 69 70 71 72
HOURS OF DAY :
0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0

ACTIVITY NAME : East pit - excavators loading waste to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 9299 kg/y TSP 4398 kg/y PM10 666 kg/y PM2.5
FROM SOURCES : 11
62 63 64 65 66 67 68 69 70 71 72
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : East pit - hauling waste from pit to dump
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 156766 kg/y TSP 46326 kg/y PM10 4703 kg/y PM2.5
FROM SOURCES : 19
52 53 54 55 56 62 63 64 65 66 67 68 69 70 71 72 73 74 75
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : East pit - unloading waste to dump
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 9299 kg/y TSP 4398 kg/y PM10 666 kg/y PM2.5
FROM SOURCES : 3
73 74 75
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : East pit - dozers shaping dump
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 117281 kg/y TSP 28552 kg/y PM10 12315 kg/y PM2.5
FROM SOURCES : 3
73 74 75
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : East pit - dozers working in pit
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 117281 kg/y TSP 28552 kg/y PM10 12315 kg/y PM2.5
FROM SOURCES : 11
62 63 64 65 66 67 68 69 70 71 72
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : East pit - loading ore to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 8456 kg/y TSP 3999 kg/y PM10 606 kg/y PM2.5
FROM SOURCES : 11
62 63 64 65 66 67 68 69 70 71 72
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : East pit - hauling ore to low grade stockpile
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 21
45 46 48 49 50 51 52 57 58 59 62 63 64 65 66 67 68 69 70 71 72
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : East pit - hauling ore to high grade stockpile
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 218919 kg/y TSP 64692 kg/y PM10 6568 kg/y PM2.5
FROM SOURCES : 25
39 40 41 42 43 44 45 48 49 50 51 52 60 61 62 63 64 65 66 67 68 69
70 71 72
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : East pit - unloading ore to low grade stockpile
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 3
57 58 59
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : East pit - unloading ore to high grade stockpile
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 8456 kg/y TSP 3999 kg/y PM10 606 kg/y PM2.5
FROM SOURCES : 2
60 61
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : West pit - drilling
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 5443 kg/y TSP 2830 kg/y PM10 163 kg/y PM2.5
FROM SOURCES : 14
5 6 7 8 9 10 11 12 13 14 15 16 17 18
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : West pit - blasting
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 4084 kg/y TSP 2124 kg/y PM10 123 kg/y PM2.5
FROM SOURCES : 14
5 6 7 8 9 10 11 12 13 14 15 16 17 18
HOURS OF DAY :
0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0

ACTIVITY NAME : West pit - excavators loading waste to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 9299 kg/y TSP 4398 kg/y PM10 666 kg/y PM2.5
FROM SOURCES : 14
5 6 7 8 9 10 11 12 13 14 15 16 17 18
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : West pit - hauling waste from pit to dump
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 179161 kg/y TSP 52943 kg/y PM10 5375 kg/y PM2.5
FROM SOURCES : 28
5 6 7 8 9 10 11 12 13 14 15 16 17 18 20 21 22 23 24 25 26 27 28 29
30 31 32 33
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : West pit - unloading waste to dump
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 9299 kg/y TSP 4398 kg/y PM10 666 kg/y PM2.5
FROM SOURCES : 3
20 21 22
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : West pit - dozers shaping dump

ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 117281 kg/y TSP 28552 kg/y PM10 12315 kg/y PM2.5
FROM SOURCES : 3
20 21 22
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : West pit - dozers working in pit
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 117281 kg/y TSP 28552 kg/y PM10 12315 kg/y PM2.5
FROM SOURCES : 14
5 6 7 8 9 10 11 12 13 14 15 16 17 18
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : West pit - loading ore to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 8456 kg/y TSP 3999 kg/y PM10 606 kg/y PM2.5
FROM SOURCES : 14
5 6 7 8 9 10 11 12 13 14 15 16 17 18
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : West pit - hauling ore to low grade stockpile
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 27
5 6 7 8 9 10 11 12 13 14 15 16 17 18 24 25 26 27 28 29 30 31 32 33
57 58 59
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : West pit - hauling ore to high grade stockpile
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 86549 kg/y TSP 25576 kg/y PM10 2596 kg/y PM2.5
FROM SOURCES : 17
24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 60 61
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : West pit - unloading ore to low grade stockpile
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 3
57 58 59
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : West pit - unloading ore to high grade stockpile
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 8456 kg/y TSP 3999 kg/y PM10 606 kg/y PM2.5
FROM SOURCES : 2
60 61
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - excavators loading to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - hauling to east dump
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - hauling to west dump
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - hauling to TSF
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - unloading to east dump
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - unloading to west dump
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - unloading to TSF
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - dozers shaping ponds
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading low grade ore to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading high grade ore to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 16911 kg/y TSP 7999 kg/y PM10 1211 kg/y PM2.5
FROM SOURCES : 2
60 61
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling low grade ore to ROM
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling high grade ore to ROM
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 295286 kg/y TSP 87259 kg/y PM10 8859 kg/y PM2.5
FROM SOURCES : 11
39 40 41 42 43 44 45 46 47 60 61
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - unloading ore to ROM
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 16911 kg/y TSP 7999 kg/y PM10 1211 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading ore to hopper
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 16911 kg/y TSP 7999 kg/y PM10 1211 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - sizing of ore
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 107159 kg/y TSP 36863 kg/y PM10 2572 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling limestone to site
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 16296 kg/y TSP 4816 kg/y PM10 489 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - unloading limestone to ROM
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 3644 kg/y TSP 1724 kg/y PM10 261 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading limestone to hopper
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 3644 kg/y TSP 1724 kg/y PM10 261 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling elemental sulphur to site
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 4074 kg/y TSP 1204 kg/y PM10 122 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - unloading elemental sulpur to hopper
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 1443 kg/y TSP 682 kg/y PM10 103 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - transfer elemental sulphur to plant / stockpile

ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 4809 kg/y TSP 2274 kg/y PM10 344 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading product to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 131 kg/y TSP 62 kg/y PM10 9 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling product from site
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 2796 kg/y TSP 826 kg/y PM10 84 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Rejects - loading rejects to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 101 kg/y TSP 48 kg/y PM10 7 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Rejects - hauling rejects to dump
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 2423 kg/y TSP 716 kg/y PM10 73 kg/y PM2.5
FROM SOURCES : 17
1 2 3 4 20 21 22 23 24 25 26 27 28 29 45 46 47
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Rejects - unloading rejects to dump
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 101 kg/y TSP 48 kg/y PM10 7 kg/y PM2.5
FROM SOURCES : 3
20 21 22
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from active and inactive pits
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 99952 kg/y TSP 49976 kg/y PM10 7496 kg/y PM2.5
FROM SOURCES : 25
5 6 7 8 9 10 11 12 13 14 15 16 17 18 62 63 64 65 66 67 68 69 70 71
72
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from active and shaped dumps
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 25492 kg/y TSP 12746 kg/y PM10 1912 kg/y PM2.5
FROM SOURCES : 6
20 21 22 73 74 75
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from initial rehabilitation
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 12019 kg/y TSP 6009 kg/y PM10 901 kg/y PM2.5
FROM SOURCES : 8
19 76 77 78 79 80 81 82
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from ore stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 25141 kg/y TSP 12571 kg/y PM10 1886 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from ROM pad
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 876 kg/y TSP 438 kg/y PM10 66 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from TSF
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 101704 kg/y TSP 50852 kg/y PM10 7628 kg/y PM2.5
FROM SOURCES : 11
83 84 85 86 87 88 89 90 91 92 93
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from topsoil stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 30397 kg/y TSP 15199 kg/y PM10 2280 kg/y PM2.5
FROM SOURCES : 7
76 77 78 79 80 81 82
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from limestone stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 263 kg/y TSP 131 kg/y PM10 20 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from product stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 88 kg/y TSP 44 kg/y PM10 7 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Grading roads
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 16699 kg/y TSP 5904 kg/y PM10 183 kg/y PM2.5
FROM SOURCES : 107
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69
70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91
92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

Pit retention sources:

Operation Year 10

--------------------------------   13-May-2021 16:31
DUST EMISSION CALCULATIONS XL1

Number of dust sources : 153
Number of activities   : 60

-----ACTIVITY SUMMARY-----
ACTIVITY NAME : East pit - drilling
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 5443 kg/y TSP 2830 kg/y PM10 163 kg/y PM2.5
FROM SOURCES : 16
91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : East pit - blasting
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 4084 kg/y TSP 2124 kg/y PM10 123 kg/y PM2.5
FROM SOURCES : 16
91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106
HOURS OF DAY :
0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0

ACTIVITY NAME : East pit - excavators loading waste to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 7860 kg/y TSP 3718 kg/y PM10 563 kg/y PM2.5
FROM SOURCES : 16
91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : East pit - hauling waste from pit to dump
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 127781 kg/y TSP 37760 kg/y PM10 3833 kg/y PM2.5
FROM SOURCES : 34
71 72 73 74 75 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105
106 107 108 109 110 111 112 113 114 115 116 117 118 119
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : East pit - unloading waste to dump
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 7860 kg/y TSP 3718 kg/y PM10 563 kg/y PM2.5
FROM SOURCES : 13
107 108 109 110 111 112 113 114 115 116 117 118 119
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : East pit - dozers shaping dump
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 87961 kg/y TSP 21414 kg/y PM10 9236 kg/y PM2.5
FROM SOURCES : 13
107 108 109 110 111 112 113 114 115 116 117 118 119
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : East pit - dozers working in pit
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 87961 kg/y TSP 21414 kg/y PM10 9236 kg/y PM2.5
FROM SOURCES : 16
91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : East pit - loading ore to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 2990 kg/y TSP 1414 kg/y PM10 214 kg/y PM2.5
FROM SOURCES : 16
91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : East pit - hauling ore to low grade stockpile
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 47524 kg/y TSP 14044 kg/y PM10 1426 kg/y PM2.5
FROM SOURCES : 26

67 68 69 70 71 78 79 80 81 82 91 92 93 94 95 96 97 98 99 100 101
102 103 104 105 106
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : East pit - hauling ore to high grade stockpile
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 16201 kg/y TSP 4788 kg/y PM10 486 kg/y PM2.5
FROM SOURCES : 31
61 62 63 64 65 66 67 68 69 70 71 83 84 85 86 91 92 93 94 95 96 97
98 99 100 101 102 103 104 105 106
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : East pit - unloading ore to low grade stockpile
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 2392 kg/y TSP 1131 kg/y PM10 171 kg/y PM2.5
FROM SOURCES : 5
78 79 80 81 82
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : East pit - unloading ore to high grade stockpile
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 598 kg/y TSP 283 kg/y PM10 43 kg/y PM2.5
FROM SOURCES : 4
83 84 85 86
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : West pit - drilling
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 5443 kg/y TSP 2830 kg/y PM10 163 kg/y PM2.5
FROM SOURCES : 22
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : West pit - blasting
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 4084 kg/y TSP 2124 kg/y PM10 123 kg/y PM2.5
FROM SOURCES : 22
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
HOURS OF DAY :
0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0

ACTIVITY NAME : West pit - excavators loading waste to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 7860 kg/y TSP 3718 kg/y PM10 563 kg/y PM2.5
FROM SOURCES : 22
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : West pit - hauling waste from pit to dump
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 127781 kg/y TSP 37760 kg/y PM10 3833 kg/y PM2.5
FROM SOURCES : 51
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
51 52 53 54 55
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : West pit - unloading waste to dump
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 7860 kg/y TSP 3718 kg/y PM10 563 kg/y PM2.5
FROM SOURCES : 22
27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : West pit - dozers shaping dump
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 87961 kg/y TSP 21414 kg/y PM10 9236 kg/y PM2.5
FROM SOURCES : 22
27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : West pit - dozers working in pit
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 87961 kg/y TSP 21414 kg/y PM10 9236 kg/y PM2.5
FROM SOURCES : 22
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : West pit - loading ore to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 2990 kg/y TSP 1414 kg/y PM10 214 kg/y PM2.5
FROM SOURCES : 22
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : West pit - hauling ore to low grade stockpile
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 24482 kg/y TSP 7235 kg/y PM10 734 kg/y PM2.5
FROM SOURCES : 31
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 54 55
56 57 78 79 80 81 82
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : West pit - hauling ore to high grade stockpile
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 10081 kg/y TSP 2979 kg/y PM10 302 kg/y PM2.5
FROM SOURCES : 30
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 57 58
59 60 83 84 85 86
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : West pit - unloading ore to low grade stockpile
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 2392 kg/y TSP 1131 kg/y PM10 171 kg/y PM2.5
FROM SOURCES : 5
78 79 80 81 82
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : West pit - unloading ore to high grade stockpile
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 598 kg/y TSP 283 kg/y PM10 43 kg/y PM2.5
FROM SOURCES : 4
83 84 85 86
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - excavators loading to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - hauling to east dump
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - hauling to west dump
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - hauling to TSF
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - unloading to east dump
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - unloading to west dump
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - unloading to TSF
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - dozers shaping ponds
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading low grade ore to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 4784 kg/y TSP 2263 kg/y PM10 343 kg/y PM2.5
FROM SOURCES : 5
78 79 80 81 82
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading high grade ore to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 1196 kg/y TSP 566 kg/y PM10 86 kg/y PM2.5
FROM SOURCES : 4
83 84 85 86
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling low grade ore to ROM
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 31682 kg/y TSP 9362 kg/y PM10 950 kg/y PM2.5
FROM SOURCES : 15
1 2 3 4 64 65 66 67 78 79 80 81 82 87 88
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling high grade ore to ROM
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 20882 kg/y TSP 6171 kg/y PM10 626 kg/y PM2.5
FROM SOURCES : 16
1 2 3 4 62 63 64 65 66 67 83 84 85 86 87 88
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - unloading ore to ROM
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 5980 kg/y TSP 2828 kg/y PM10 428 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading ore to hopper
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 5980 kg/y TSP 2828 kg/y PM10 428 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - sizing of ore
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 37889 kg/y TSP 13034 kg/y PM10 909 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling limestone to site
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 16296 kg/y TSP 4816 kg/y PM10 489 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - unloading limestone to ROM
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 3644 kg/y TSP 1724 kg/y PM10 261 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading limestone to hopper
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 3644 kg/y TSP 1724 kg/y PM10 261 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling elemental sulphur to site
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 4074 kg/y TSP 1204 kg/y PM10 122 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - unloading elemental sulpur to hopper
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 1443 kg/y TSP 682 kg/y PM10 103 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - transfer elemental sulphur to plant / stockpile
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 4809 kg/y TSP 2274 kg/y PM10 344 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading product to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 131 kg/y TSP 62 kg/y PM10 9 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling product from site
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 2796 kg/y TSP 826 kg/y PM10 84 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Rejects - loading rejects to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 493 kg/y TSP 233 kg/y PM10 35 kg/y PM2.5
FROM SOURCES : 6
1 2 3 4 87 88
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Rejects - hauling rejects to dump
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 11878 kg/y TSP 3510 kg/y PM10 356 kg/y PM2.5
FROM SOURCES : 18
38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Rejects - unloading rejects to dump
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 493 kg/y TSP 233 kg/y PM10 35 kg/y PM2.5
FROM SOURCES : 11
38 39 40 41 42 43 44 45 46 47 48
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from active and inactive pits
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 278568 kg/y TSP 139284 kg/y PM10 20893 kg/y PM2.5
FROM SOURCES : 38
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from active and shaped dumps
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 227147 kg/y TSP 113573 kg/y PM10 17036 kg/y PM2.5
FROM SOURCES : 35
27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 107 108 109 110 111 112 113 114 115 116 117 118 119
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from initial rehabilitation
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 49240 kg/y TSP 24620 kg/y PM10 3693 kg/y PM2.5
FROM SOURCES : 21
124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from ore stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 84359 kg/y TSP 42179 kg/y PM10 6327 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from ROM pad
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 876 kg/y TSP 438 kg/y PM10 66 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from TSF
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 96973 kg/y TSP 48487 kg/y PM10 7273 kg/y PM2.5
FROM SOURCES : 9
145 146 147 148 149 150 151 152 153
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from topsoil stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from limestone stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 263 kg/y TSP 131 kg/y PM10 20 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from product stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 88 kg/y TSP 44 kg/y PM10 7 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Grading roads
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 11133 kg/y TSP 3936 kg/y PM10 122 kg/y PM2.5
FROM SOURCES : 153
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

Pit retention sources:

Operation Year 17

```
 --------------------------------      13-May-2021 16:23
  DUST EMISSION CALCULATIONS XL1
 --------------------------------

 Number of dust sources : 157
 Number of activities   : 60

  -----ACTIVITY SUMMARY-----
 ACTIVITY NAME : East pit - drilling
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 5443 kg/y TSP  2830 kg/y PM10  163 kg/y PM2.5
 FROM SOURCES  : 19
75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - blasting
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 4084 kg/y TSP  2124 kg/y PM10  123 kg/y PM2.5
 FROM SOURCES  : 19
75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93
 HOURS OF DAY  :
0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0

 ACTIVITY NAME : East pit - excavators loading waste to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 6325 kg/y TSP  2991 kg/y PM10  453 kg/y PM2.5
 FROM SOURCES  : 19
75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - hauling waste from pit to dump
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 102822 kg/y TSP  30385 kg/y PM10  3085 kg/y PM2.5
 FROM SOURCES  : 35
75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96
97 98 99 100 101 102 103 104 105 106 107 108 109
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - unloading waste to dump
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 6325 kg/y TSP  2991 kg/y PM10  453 kg/y PM2.5
 FROM SOURCES  : 16
94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - dozers shaping dump
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 58641 kg/y TSP  14276 kg/y PM10  6157 kg/y PM2.5
 FROM SOURCES  : 16
94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - dozers working in pit
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 58641 kg/y TSP  14276 kg/y PM10  6157 kg/y PM2.5
 FROM SOURCES  : 19
75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - loading ore to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 4525 kg/y TSP  2140 kg/y PM10  324 kg/y PM2.5
 FROM SOURCES  : 19
75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - hauling ore to low grade stockpile
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 89905 kg/y TSP  26568 kg/y PM10  2697 kg/y PM2.5
 FROM SOURCES  : 24
75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 152 153
154 155 156
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - hauling ore to high grade stockpile
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 23
75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 148 149
150 151
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - unloading ore to low grade stockpile
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 4525 kg/y TSP  2140 kg/y PM10  324 kg/y PM2.5
 FROM SOURCES  : 5
152 153 154 155 156
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : East pit - unloading ore to high grade stockpile
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 4
148 149 150 151
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - drilling
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 5443 kg/y TSP  2830 kg/y PM10  163 kg/y PM2.5
 FROM SOURCES  : 20
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - blasting
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 4084 kg/y TSP  2124 kg/y PM10  123 kg/y PM2.5
 FROM SOURCES  : 20
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
 HOURS OF DAY  :
0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0

 ACTIVITY NAME : West pit - excavators loading waste to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 6325 kg/y TSP  2991 kg/y PM10  453 kg/y PM2.5
 FROM SOURCES  : 20
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - hauling waste from pit to dump
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 102822 kg/y TSP  30385 kg/y PM10  3085 kg/y PM2.5
 FROM SOURCES  : 43
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - unloading waste to dump
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 6325 kg/y TSP  2991 kg/y PM10  453 kg/y PM2.5
 FROM SOURCES  : 23
25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
47
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - dozers shaping dump
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 58641 kg/y TSP  14276 kg/y PM10  6157 kg/y PM2.5
 FROM SOURCES  : 23
25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46
47
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - dozers working in pit
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 58641 kg/y TSP  14276 kg/y PM10  6157 kg/y PM2.5
 FROM SOURCES  : 20
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - loading ore to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 4525 kg/y TSP  2140 kg/y PM10  324 kg/y PM2.5
 FROM SOURCES  : 20
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - hauling ore to low grade stockpile
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 46315 kg/y TSP  13686 kg/y PM10  1389 kg/y PM2.5
 FROM SOURCES  : 25
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 152 153 154
155 156
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - hauling ore to high grade stockpile
 ACTIVITY TYPE : Wind insensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 24
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 148 149 150
151
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - unloading ore to low grade stockpile
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 4525 kg/y TSP  2140 kg/y PM10  324 kg/y PM2.5
 FROM SOURCES  : 5
152 153 154 155 156
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : West pit - unloading ore to high grade stockpile
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 4
148 149 150 151
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 ACTIVITY NAME : Evaporation ponds - excavators loading to trucks
 ACTIVITY TYPE : Wind sensitive
 DUST EMISSION : 0 kg/y TSP  0 kg/y PM10  0 kg/y PM2.5
 FROM SOURCES  : 1
1
 HOURS OF DAY  :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
```

ACTIVITY NAME : Evaporation ponds - hauling to east dump
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - hauling to west dump
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - hauling to TSF
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - unloading to east dump
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - unloading to west dump
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - unloading to TSF
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Evaporation ponds - dozers shaping ponds
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading low grade ore to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 9050 kg/y TSP 4280 kg/y PM10 648 kg/y PM2.5
FROM SOURCES : 5
152 153 154 155 156
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading high grade ore to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 4
148 149 150 151
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling low grade ore to ROM
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 59937 kg/y TSP 17712 kg/y PM10 1798 kg/y PM2.5
FROM SOURCES : 14
1 2 3 4 63 64 65 66 67 152 153 154 155 156
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling high grade ore to ROM
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 16
1 2 3 4 60 61 62 63 64 65 66 67 148 149 150 151
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - unloading ore to ROM
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 9050 kg/y TSP 4280 kg/y PM10 648 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading ore to hopper
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 9050 kg/y TSP 4280 kg/y PM10 648 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - sizing of ore
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 57343 kg/y TSP 19726 kg/y PM10 1376 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling limestone to site
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 16296 kg/y TSP 4816 kg/y PM10 489 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - unloading limestone to ROM
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 3644 kg/y TSP 1724 kg/y PM10 261 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading limestone to hopper
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 3644 kg/y TSP 1724 kg/y PM10 261 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling elemental sulphur to site
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 4074 kg/y TSP 1204 kg/y PM10 122 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - unloading elemental sulpur to hopper
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 1443 kg/y TSP 682 kg/y PM10 103 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - transfer elemental sulphur to plant / stockpile
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 4809 kg/y TSP 2274 kg/y PM10 344 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - loading product to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 131 kg/y TSP 62 kg/y PM10 9 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Processing - hauling product from site
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 2796 kg/y TSP 826 kg/y PM10 84 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Rejects - loading rejects to trucks
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 493 kg/y TSP 233 kg/y PM10 35 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Rejects - hauling rejects to dump
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 11878 kg/y TSP 3510 kg/y PM10 356 kg/y PM2.5
FROM SOURCES : 20
1 2 3 4 42 43 44 45 46 47 48 49 50 51 52 53 54 65 66 67
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Rejects - unloading rejects to dump
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 493 kg/y TSP 233 kg/y PM10 35 kg/y PM2.5
FROM SOURCES : 4
42 43 44 45
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from active and inactive pits
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 361613 kg/y TSP 180806 kg/y PM10 27121 kg/y PM2.5
FROM SOURCES : 40
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from active and shaped dumps
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 248740 kg/y TSP 124370 kg/y PM10 18656 kg/y PM2.5
FROM SOURCES : 38

26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from initial rehabilitation
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 13644 kg/y TSP 6822 kg/y PM10 1023 kg/y PM2.5
FROM SOURCES : 27
110 111 112 113 114 115 116 117 120 121 122 123 124 125 126 127 128
129 130 131 132 133 134 135 136 137 138
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from ore stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 84359 kg/y TSP 42179 kg/y PM10 6327 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from ROM pad
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 876 kg/y TSP 438 kg/y PM10 66 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from TSF
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 96500 kg/y TSP 48250 kg/y PM10 7238 kg/y PM2.5
FROM SOURCES : 9
139 140 141 142 143 144 145 146 147
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from topsoil stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 1
1
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from limestone stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 263 kg/y TSP 131 kg/y PM10 20 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from product stockpiles
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 88 kg/y TSP 44 kg/y PM10 7 kg/y PM2.5
FROM SOURCES : 4
1 2 3 4
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Grading roads
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 11133 kg/y TSP 3936 kg/y PM10 122 kg/y PM2.5
FROM SOURCES : 157
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69
70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91
92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110
111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127
128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144
145 146 147 148 149 150 151 152 153 154 155 156 157
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

Pit retention sources:

Rail siding construction

-------------------------------- 03-May-2021 10:57
DUST EMISSION CALCULATIONS XL1

-----ACTIVITY SUMMARY-----
ACTIVITY NAME : Stripping topsoil by scraper
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 744 kg/y TSP 187 kg/y PM10 37 kg/y PM2.5
FROM SOURCES : 14
13 14 15 16 17 18 19 20 21 22 23 24 25 26
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Dozers working
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 48867 kg/y TSP 11897 kg/y PM10 5131 kg/y PM2.5
FROM SOURCES : 14
13 14 15 16 17 18 19 20 21 22 23 24 25 26
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Excavator working
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 202 kg/y TSP 96 kg/y PM10 14 kg/y PM2.5
FROM SOURCES : 14
13 14 15 16 17 18 19 20 21 22 23 24 25 26
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Loading spoil to truck(s)
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 202 kg/y TSP 96 kg/y PM10 14 kg/y PM2.5
FROM SOURCES : 14
13 14 15 16 17 18 19 20 21 22 23 24 25 26
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Hauling spoil over unsealed surfaces
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 398 kg/y TSP 118 kg/y PM10 12 kg/y PM2.5
FROM SOURCES : 14
13 14 15 16 17 18 19 20 21 22 23 24 25 26
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Unloading spoil from truck(s)
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 202 kg/y TSP 96 kg/y PM10 14 kg/y PM2.5
FROM SOURCES : 14
13 14 15 16 17 18 19 20 21 22 23 24 25 26
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from exposed areas
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 4993 kg/y TSP 2497 kg/y PM10 374 kg/y PM2.5
FROM SOURCES : 14
13 14 15 16 17 18 19 20 21 22 23 24 25 26
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Grading roads
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 899 kg/y TSP 318 kg/y PM10 10 kg/y PM2.5
FROM SOURCES : 14
13 14 15 16 17 18 19 20 21 22 23 24 25 26
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

Pit retention sources:

Rail siding operation

-------------------------------- 30-Apr-2021 16:22
DUST EMISSION CALCULATIONS XL1

-----ACTIVITY SUMMARY-----
ACTIVITY NAME : Hauling ammonium sulphate to rail siding
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 22
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Unloading ammonium sulphate to stockpiles
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 197 kg/y TSP 93 kg/y PM10 14 kg/y PM2.5
FROM SOURCES : 2
16 17
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Loading ammonium sulphate to trucks (or trains)
ACTIVITY TYPE : Wind sensitive
DUST EMISSION : 197 kg/y TSP 93 kg/y PM10 14 kg/y PM2.5
FROM SOURCES : 6
16 17 23 24 25 26
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Hauling ammonium sulphate off-site
ACTIVITY TYPE : Wind insensitive
DUST EMISSION : 0 kg/y TSP 0 kg/y PM10 0 kg/y PM2.5
FROM SOURCES : 22
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

ACTIVITY NAME : Wind erosion from exposed areas
ACTIVITY TYPE : Wind erosion
DUST EMISSION : 876 kg/y TSP 438 kg/y PM10 66 kg/y PM2.5
FROM SOURCES : 4
15 16 17 18
HOURS OF DAY :
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

Pit retention sources:

Appendix C. Tabulated model results

Tabulated Model Results (Mine Site)

ID	Status	Project				Cumulative				Criteria
		Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17	Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17	
Maximum 24-hour average PM_{10} ($\mu g/m^3$)										
M03	Private	1	17	11	9	57	59	58	58	50
M06	Private	1	14	8	7	57	59	59	59	50
M07	Private	1	10	6	6	57	59	59	59	50
M08	Private	3	35	16	16	58	64	62	63	50
M09	Private	2	11	6	6	57	57	57	57	50
M10	Private	2	11	6	6	58	59	58	58	50
M12	Private	1	14	9	8	57	63	59	58	50
M13	Private	1	14	9	8	57	63	59	59	50
M14	Private	1	4	3	3	57	57	57	57	50
M15	Mine-owned	4	15	8	8	58	61	60	60	50
M16	Private	2	8	5	5	57	57	57	57	50
M17	Private	0	3	2	2	57	58	58	58	50
M19	Private	1	5	4	4	57	57	57	57	50
M20	Private	1	3	3	3	57	57	57	57	50
M21	Private	1	11	7	6	57	57	57	57	50
M22	Private	3	27	19	16	58	58	59	59	50
M23	Private	3	33	15	15	58	63	62	63	50
M26	Private	2	15	9	9	57	62	61	62	50
M27	Private	2	14	9	8	57	62	62	62	50
M28	Private	2	17	9	9	57	66	60	60	50
M29	Private	5	19	11	10	57	58	57	57	50
M31	Mine-owned	3	12	6	6	58	58	58	58	50
M32	Community	2	6	6	6	57	57	57	57	50
M33	Community	2	6	6	6	57	57	57	57	50
M34	Community	2	6	6	6	57	57	57	57	50
M35	Community	2	6	6	6	57	57	57	57	50
F01	Private	2	7	7	7	57	58	57	57	50
F02	Private	2	7	6	7	57	58	57	57	50
F03	Private	2	6	6	7	57	57	57	57	50
F04	Private	2	6	6	6	57	57	57	57	50
F05	Private	2	7	6	6	57	58	57	57	50
F06	Private	2	8	6	7	57	58	58	58	50
F07	Private	2	7	6	7	57	57	57	57	50
F08	Private	2	6	6	7	57	57	57	57	50
F09	Private	2	6	6	7	57	57	57	57	50
F10	Private	2	6	6	6	57	57	57	57	50
F11	Private	2	6	6	6	57	57	57	57	50
F12	Private	2	6	6	6	57	57	57	57	50
F13	Private	2	6	6	6	57	57	57	57	50
F14	Private	2	6	6	6	57	57	57	57	50
F15	Private	2	6	6	6	57	57	57	57	50
F16	Private	2	6	6	6	57	57	57	57	50
F17	Private	2	6	5	6	57	57	57	57	50
Number of days above 50 $\mu g/m^3$ PM_{10} (days)										
M03	Private	0	0	0	0	5	5	5	5	-
M06	Private	0	0	0	0	5	5	5	5	-
M07	Private	0	0	0	0	5	5	5	5	-
M08	Private	0	0	0	0	5	5	5	5	-
M09	Private	0	0	0	0	5	5	5	5	-
M10	Private	0	0	0	0	5	5	5	5	-

ID	Status	Project				Cumulative				Criteria
		Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17	Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17	
M12	Private	0	0	0	0	5	5	5	5	-
M13	Private	0	0	0	0	5	5	5	5	-
M14	Private	0	0	0	0	5	5	5	5	-
M15	Mine-owned	0	0	0	0	5	6	5	5	-
M16	Private	0	0	0	0	5	5	5	5	-
M17	Private	0	0	0	0	5	5	5	5	-
M19	Private	0	0	0	0	5	5	5	5	-
M20	Private	0	0	0	0	5	5	5	5	-
M21	Private	0	0	0	0	5	5	5	5	-
M22	Private	0	0	0	0	5	5	5	5	-
M23	Private	0	0	0	0	5	5	5	5	-
M26	Private	0	0	0	0	5	5	5	5	-
M27	Private	0	0	0	0	5	5	5	5	-
M28	Private	0	0	0	0	5	5	5	5	-
M29	Private	0	0	0	0	5	5	5	5	-
M31	Mine-owned	0	0	0	0	5	5	5	5	-
M32	Community	0	0	0	0	5	5	5	5	-
M33	Community	0	0	0	0	5	5	5	5	-
M34	Community	0	0	0	0	5	5	5	5	-
M35	Community	0	0	0	0	5	5	5	5	-
F01	Private	0	0	0	0	5	5	5	5	-
F02	Private	0	0	0	0	5	5	5	5	-
F03	Private	0	0	0	0	5	5	5	5	-
F04	Private	0	0	0	0	5	5	5	5	-
F05	Private	0	0	0	0	5	5	5	5	-
F06	Private	0	0	0	0	5	5	5	5	-
F07	Private	0	0	0	0	5	5	5	5	-
F08	Private	0	0	0	0	5	5	5	5	-
F09	Private	0	0	0	0	5	5	5	5	-
F10	Private	0	0	0	0	5	5	5	5	-
F11	Private	0	0	0	0	5	5	5	5	-
F12	Private	0	0	0	0	5	5	5	5	-
F13	Private	0	0	0	0	5	5	5	5	-
F14	Private	0	0	0	0	5	5	5	5	-
F15	Private	0	0	0	0	5	5	5	5	-
F16	Private	0	0	0	0	5	5	5	5	-
F17	Private	0	0	0	0	5	5	5	5	-
Annual average PM_{10} (μg/m^3)										
M03	Private	0.1	1.4	1.0	0.9	12	14	13	13	25
M06	Private	0.1	1.6	1.0	0.9	12	14	13	13	25
M07	Private	0.1	1.5	1.0	1.0	12	14	13	13	25
M08	Private	0.4	5.5	3.7	3.6	13	18	16	16	25
M09	Private	0.2	1.1	0.8	0.8	12	13	13	13	25
M10	Private	0.2	0.9	0.5	0.6	12	13	13	13	25
M12	Private	0.1	1.3	0.9	0.9	12	14	13	13	25
M13	Private	0.1	1.4	0.9	0.9	12	14	13	13	25
M14	Private	0.1	0.3	0.2	0.2	12	13	12	12	25
M15	Mine-owned	0.4	2.1	1.2	1.3	13	14	13	14	25
M16	Private	0.2	0.9	0.6	0.6	12	13	13	13	25
M17	Private	0.0	0.3	0.2	0.2	12	13	13	13	25
M19	Private	0.1	0.6	0.4	0.4	12	13	13	13	25
M20	Private	0.1	0.3	0.2	0.2	12	13	12	12	25

ID	Status	Project				Cumulative				Criteria
		Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17	Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17	
M21	Private	0.2	1.1	0.8	0.8	12	13	13	13	25
M22	Private	0.4	3.7	2.7	2.4	13	16	15	15	25
M23	Private	0.4	5.2	3.5	3.4	13	17	16	16	25
M26	Private	0.2	2.3	1.6	1.5	13	15	14	14	25
M27	Private	0.2	2.2	1.6	1.5	13	15	14	14	25
M28	Private	0.2	2.1	1.5	1.4	12	14	14	14	25
M29	Private	0.6	2.2	1.5	1.4	13	15	14	14	25
M31	Mine-owned	0.3	1.1	0.6	0.6	13	13	13	13	25
M32	Community	0.2	0.7	0.5	0.5	12	13	13	13	25
M33	Community	0.2	0.7	0.5	0.5	12	13	13	13	25
M34	Community	0.2	0.8	0.5	0.5	12	13	13	13	25
M35	Community	0.2	0.8	0.5	0.5	12	13	13	13	25
F01	Private	0.2	0.9	0.6	0.6	12	13	13	13	25
F02	Private	0.2	0.9	0.6	0.6	12	13	13	13	25
F03	Private	0.2	0.8	0.5	0.5	12	13	13	13	25
F04	Private	0.2	0.8	0.5	0.5	12	13	13	13	25
F05	Private	0.2	0.8	0.5	0.5	12	13	13	13	25
F06	Private	0.2	0.9	0.6	0.6	12	13	13	13	25
F07	Private	0.2	0.8	0.5	0.5	12	13	13	13	25
F08	Private	0.2	0.8	0.5	0.5	12	13	13	13	25
F09	Private	0.2	0.8	0.5	0.5	12	13	13	13	25
F10	Private	0.2	0.8	0.5	0.5	12	13	13	13	25
F11	Private	0.2	0.7	0.5	0.5	12	13	13	13	25
F12	Private	0.2	0.7	0.5	0.5	12	13	13	13	25
F13	Private	0.2	0.7	0.4	0.5	12	13	13	13	25
F14	Private	0.2	0.7	0.4	0.4	12	13	13	13	25
F15	Private	0.1	0.7	0.4	0.4	12	13	13	13	25
F16	Private	0.1	0.7	0.4	0.4	12	13	13	13	25
F17	Private	0.1	0.7	0.4	0.4	12	13	13	13	25
Maximum 24-hour average $PM_{2.5}$ (µg/m^3)										
M03	Private	0.4	4.6	3.1	2.4	19	20	20	20	25
M06	Private	0.5	3.9	2.4	1.8	19	20	20	20	25
M07	Private	0.4	2.2	1.6	1.3	19	19	19	19	25
M08	Private	1.1	6.5	5.0	3.9	19	20	20	20	25
M09	Private	0.6	2.5	1.7	1.4	19	19	19	19	25
M10	Private	1.1	2.9	1.9	1.6	19	19	19	19	25
M12	Private	0.5	3.1	2.4	2.0	19	20	19	19	25
M13	Private	0.5	3.2	2.5	2.1	19	20	19	19	25
M14	Private	0.3	1.1	0.7	0.7	19	19	19	19	25
M15	Mine-owned	2.0	3.5	2.1	1.9	20	20	20	20	25
M16	Private	0.7	2.3	1.5	1.2	19	19	19	19	25
M17	Private	0.2	1.0	0.7	0.5	19	19	19	19	25
M19	Private	0.5	1.6	1.1	0.9	19	19	19	19	25
M20	Private	0.3	0.8	0.7	0.7	19	19	19	19	25
M21	Private	0.5	2.5	1.8	1.4	19	19	19	19	25
M22	Private	1.0	7.0	5.4	3.9	19	19	19	19	25
M23	Private	1.0	6.3	4.7	3.6	19	20	20	20	25
M26	Private	0.6	3.7	2.7	2.2	19	19	19	19	25
M27	Private	0.6	3.4	2.6	2.0	19	19	19	19	25
M28	Private	0.7	3.6	2.4	2.1	19	20	19	19	25
M29	Private	1.5	4.8	2.7	2.2	19	19	19	19	25
M31	Mine-owned	1.7	3.2	2.1	1.7	19	19	19	19	25

ID	Status	Project				Cumulative				Criteria
		Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17	Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17	
M32	Community	0.6	2.2	1.3	1.3	19	19	19	19	25
M33	Community	0.6	2.2	1.3	1.2	19	19	19	19	25
M34	Community	0.6	2.2	1.3	1.3	19	19	19	19	25
M35	Community	0.7	2.3	1.4	1.3	19	19	19	19	25
F01	Private	0.8	2.5	1.5	1.4	19	19	19	19	25
F02	Private	0.8	2.3	1.4	1.4	19	19	19	19	25
F03	Private	0.7	1.9	1.3	1.3	19	19	19	19	25
F04	Private	0.7	1.8	1.2	1.2	19	19	19	19	25
F05	Private	0.8	2.6	1.5	1.2	19	19	19	19	25
F06	Private	0.9	2.7	1.6	1.3	19	19	19	19	25
F07	Private	0.7	2.3	1.4	1.3	19	19	19	19	25
F08	Private	0.7	2.1	1.2	1.3	19	19	19	19	25
F09	Private	0.7	2.0	1.3	1.3	19	19	19	19	25
F10	Private	0.7	2.2	1.3	1.3	19	19	19	19	25
F11	Private	0.6	2.2	1.3	1.3	19	19	19	19	25
F12	Private	0.6	2.2	1.3	1.3	19	19	19	19	25
F13	Private	0.6	2.1	1.3	1.2	19	19	19	19	25
F14	Private	0.6	2.1	1.3	1.2	19	19	19	19	25
F15	Private	0.6	2.0	1.2	1.2	19	19	19	19	25
F16	Private	0.6	1.8	1.2	1.2	19	19	19	19	25
F17	Private	0.6	2.0	1.2	1.1	19	19	19	19	25
Number of days above 25 µg/m^3 $PM_{2.5}$ (days)										
M03	Private	0	0	0	0	0	0	0	0	-
M06	Private	0	0	0	0	0	0	0	0	-
M07	Private	0	0	0	0	0	0	0	0	-
M08	Private	0	0	0	0	0	0	0	0	-
M09	Private	0	0	0	0	0	0	0	0	-
M10	Private	0	0	0	0	0	0	0	0	-
M12	Private	0	0	0	0	0	0	0	0	-
M13	Private	0	0	0	0	0	0	0	0	-
M14	Private	0	0	0	0	0	0	0	0	-
M15	Mine-owned	0	0	0	0	0	0	0	0	-
M16	Private	0	0	0	0	0	0	0	0	-
M17	Private	0	0	0	0	0	0	0	0	-
M19	Private	0	0	0	0	0	0	0	0	-
M20	Private	0	0	0	0	0	0	0	0	-
M21	Private	0	0	0	0	0	0	0	0	-
M22	Private	0	0	0	0	0	0	0	0	-
M23	Private	0	0	0	0	0	0	0	0	-
M26	Private	0	0	0	0	0	0	0	0	-
M27	Private	0	0	0	0	0	0	0	0	-
M28	Private	0	0	0	0	0	0	0	0	-
M29	Private	0	0	0	0	0	0	0	0	-
M31	Mine-owned	0	0	0	0	0	0	0	0	-
M32	Community	0	0	0	0	0	0	0	0	-
M33	Community	0	0	0	0	0	0	0	0	-
M34	Community	0	0	0	0	0	0	0	0	-
M35	Community	0	0	0	0	0	0	0	0	-
F01	Private	0	0	0	0	0	0	0	0	-
F02	Private	0	0	0	0	0	0	0	0	-
F03	Private	0	0	0	0	0	0	0	0	-
F04	Private	0	0	0	0	0	0	0	0	-

ID	Status	Project				Cumulative				Criteria
		Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17	Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17	
F05	Private	0	0	0	0	0	0	0	0	-
F06	Private	0	0	0	0	0	0	0	0	-
F07	Private	0	0	0	0	0	0	0	0	-
F08	Private	0	0	0	0	0	0	0	0	-
F09	Private	0	0	0	0	0	0	0	0	-
F10	Private	0	0	0	0	0	0	0	0	-
F11	Private	0	0	0	0	0	0	0	0	-
F12	Private	0	0	0	0	0	0	0	0	-
F13	Private	0	0	0	0	0	0	0	0	-
F14	Private	0	0	0	0	0	0	0	0	-
F15	Private	0	0	0	0	0	0	0	0	-
F16	Private	0	0	0	0	0	0	0	0	-
F17	Private	0	0	0	0	0	0	0	0	-
Annual average $PM_{2.5}$ ($\mu g/m^3$)										
M03	Private	0.0	0.4	0.3	0.2	4.1	4.5	4.4	4.3	8
M06	Private	0.1	0.5	0.3	0.2	4.1	4.5	4.3	4.3	8
M07	Private	0.1	0.4	0.3	0.2	4.1	4.4	4.3	4.3	8
M08	Private	0.2	1.3	1.0	0.9	4.2	5.4	5.1	4.9	8
M09	Private	0.1	0.3	0.2	0.2	4.1	4.4	4.3	4.2	8
M10	Private	0.1	0.3	0.2	0.1	4.1	4.3	4.2	4.2	8
M12	Private	0.0	0.4	0.3	0.2	4.1	4.4	4.3	4.3	8
M13	Private	0.0	0.4	0.3	0.2	4.1	4.4	4.3	4.3	8
M14	Private	0.0	0.1	0.1	0.1	4.1	4.1	4.1	4.1	8
M15	Mine-owned	0.2	0.5	0.3	0.3	4.2	4.5	4.4	4.3	8
M16	Private	0.1	0.3	0.2	0.2	4.1	4.3	4.2	4.2	8
M17	Private	0.0	0.1	0.1	0.1	4.1	4.1	4.1	4.1	8
M19	Private	0.1	0.2	0.1	0.1	4.1	4.2	4.2	4.1	8
M20	Private	0.0	0.1	0.1	0.1	4.1	4.1	4.1	4.1	8
M21	Private	0.1	0.3	0.2	0.2	4.1	4.4	4.3	4.2	8
M22	Private	0.1	1.0	0.8	0.6	4.2	5.0	4.8	4.7	8
M23	Private	0.1	1.2	1.0	0.8	4.2	5.3	5.0	4.9	8
M26	Private	0.1	0.6	0.5	0.4	4.1	4.6	4.5	4.4	8
M27	Private	0.1	0.6	0.5	0.4	4.1	4.6	4.5	4.4	8
M28	Private	0.1	0.5	0.4	0.4	4.1	4.6	4.5	4.4	8
M29	Private	0.2	0.6	0.4	0.3	4.3	4.6	4.4	4.4	8
M31	Mine-owned	0.1	0.3	0.2	0.2	4.2	4.3	4.2	4.2	8
M32	Community	0.1	0.2	0.1	0.1	4.1	4.3	4.2	4.2	8
M33	Community	0.1	0.2	0.1	0.1	4.1	4.3	4.2	4.2	8
M34	Community	0.1	0.2	0.1	0.1	4.1	4.3	4.2	4.2	8
M35	Community	0.1	0.2	0.1	0.1	4.1	4.3	4.2	4.2	8
F01	Private	0.1	0.3	0.2	0.1	4.1	4.3	4.2	4.2	8
F02	Private	0.1	0.3	0.2	0.1	4.1	4.3	4.2	4.2	8
F03	Private	0.1	0.2	0.1	0.1	4.1	4.3	4.2	4.2	8
F04	Private	0.1	0.2	0.1	0.1	4.1	4.3	4.2	4.2	8
F05	Private	0.1	0.2	0.2	0.1	4.1	4.3	4.2	4.2	8
F06	Private	0.1	0.3	0.2	0.1	4.1	4.3	4.2	4.2	8
F07	Private	0.1	0.2	0.2	0.1	4.1	4.3	4.2	4.2	8
F08	Private	0.1	0.2	0.1	0.1	4.1	4.3	4.2	4.2	8
F09	Private	0.1	0.2	0.1	0.1	4.1	4.3	4.2	4.2	8
F10	Private	0.1	0.2	0.1	0.1	4.1	4.3	4.2	4.2	8
F11	Private	0.1	0.2	0.1	0.1	4.1	4.3	4.2	4.2	8
F12	Private	0.1	0.2	0.1	0.1	4.1	4.3	4.2	4.2	8

ID	Status	Project				Cumulative				Criteria
		Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17	Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17	
F13	Private	0.1	0.2	0.1	0.1	4.1	4.3	4.2	4.2	8
F14	Private	0.1	0.2	0.1	0.1	4.1	4.3	4.2	4.2	8
F15	Private	0.1	0.2	0.1	0.1	4.1	4.2	4.2	4.2	8
F16	Private	0.1	0.2	0.1	0.1	4.1	4.2	4.2	4.2	8
F17	Private	0.1	0.2	0.1	0.1	4.1	4.2	4.2	4.2	8
Annual average TSP (μg/m³)										
M03	Private	0.0	0.4	0.3	0.3	55	55	55	55	90
M06	Private	0.0	0.5	0.3	0.3	55	56	55	55	90
M07	Private	0.1	0.8	0.6	0.6	55	56	56	56	90
M08	Private	0.3	3.9	2.9	2.9	55	59	58	58	90
M09	Private	0.1	0.6	0.5	0.5	55	56	56	55	90
M10	Private	0.1	0.3	0.2	0.2	55	55	55	55	90
M12	Private	0.0	0.6	0.5	0.4	55	56	55	55	90
M13	Private	0.0	0.6	0.5	0.4	55	56	55	55	90
M14	Private	0.0	0.1	0.1	0.1	55	55	55	55	90
M15	Mine-owned	0.2	1.1	0.7	0.8	55	56	56	56	90
M16	Private	0.1	0.4	0.3	0.4	55	55	55	55	90
M17	Private	0.0	0.1	0.1	0.1	55	55	55	55	90
M19	Private	0.1	0.3	0.2	0.2	55	55	55	55	90
M20	Private	0.0	0.1	0.1	0.1	55	55	55	55	90
M21	Private	0.1	0.5	0.5	0.5	55	56	55	55	90
M22	Private	0.2	2.0	1.8	1.6	55	57	57	57	90
M23	Private	0.3	3.7	2.8	2.8	55	59	58	58	90
M26	Private	0.2	1.3	1.1	1.0	55	56	56	56	90
M27	Private	0.2	1.3	1.1	1.0	55	56	56	56	90
M28	Private	0.1	1.2	1.0	0.9	55	56	56	56	90
M29	Private	0.5	1.3	1.1	1.0	55	56	56	56	90
M31	Mine-owned	0.1	0.4	0.3	0.3	55	55	55	55	90
M32	Community	0.1	0.3	0.2	0.3	55	55	55	55	90
M33	Community	0.1	0.3	0.2	0.3	55	55	55	55	90
M34	Community	0.1	0.3	0.2	0.3	55	55	55	55	90
M35	Community	0.1	0.3	0.2	0.3	55	55	55	55	90
F01	Private	0.1	0.4	0.3	0.3	55	55	55	55	90
F02	Private	0.1	0.4	0.3	0.3	55	55	55	55	90
F03	Private	0.1	0.4	0.3	0.3	55	55	55	55	90
F04	Private	0.1	0.3	0.3	0.3	55	55	55	55	90
F05	Private	0.1	0.3	0.3	0.3	55	55	55	55	90
F06	Private	0.1	0.4	0.3	0.3	55	55	55	55	90
F07	Private	0.1	0.3	0.3	0.3	55	55	55	55	90
F08	Private	0.1	0.3	0.3	0.3	55	55	55	55	90
F09	Private	0.1	0.3	0.3	0.3	55	55	55	55	90
F10	Private	0.1	0.3	0.2	0.3	55	55	55	55	90
F11	Private	0.1	0.3	0.2	0.3	55	55	55	55	90
F12	Private	0.1	0.3	0.2	0.3	55	55	55	55	90
F13	Private	0.1	0.3	0.2	0.3	55	55	55	55	90
F14	Private	0.1	0.3	0.2	0.2	55	55	55	55	90
F15	Private	0.1	0.3	0.2	0.2	55	55	55	55	90
F16	Private	0.1	0.3	0.2	0.3	55	55	55	55	90
F17	Private	0.1	0.3	0.2	0.2	55	55	55	55	90
Annual average deposited dust (g/m²/month)										
M03	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
M06	Private	0.0	0.1	0.0	0.0	3.2	3.3	3.2	3.2	4

ID	Status	Project				Cumulative				Criteria
		Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17	Construction Year 2	Operation Year 1	Operation Year 10	Operation Year 17	
M07	Private	0.0	0.1	0.1	0.1	3.2	3.3	3.3	3.3	4
M08	Private	0.0	0.4	0.3	0.3	3.2	3.6	3.5	3.5	4
M09	Private	0.0	0.1	0.1	0.1	3.2	3.3	3.3	3.3	4
M10	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
M12	Private	0.0	0.1	0.1	0.1	3.2	3.3	3.3	3.3	4
M13	Private	0.0	0.1	0.1	0.0	3.2	3.3	3.3	3.2	4
M14	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
M15	Mine-owned	0.0	0.2	0.1	0.1	3.2	3.4	3.3	3.3	4
M16	Private	0.0	0.1	0.1	0.1	3.2	3.3	3.3	3.3	4
M17	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
M19	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
M20	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
M21	Private	0.0	0.1	0.1	0.1	3.2	3.3	3.3	3.3	4
M22	Private	0.0	0.2	0.2	0.2	3.2	3.4	3.4	3.4	4
M23	Private	0.0	0.4	0.3	0.3	3.2	3.6	3.5	3.5	4
M26	Private	0.0	0.1	0.1	0.1	3.2	3.3	3.3	3.3	4
M27	Private	0.0	0.1	0.1	0.1	3.2	3.3	3.3	3.3	4
M28	Private	0.0	0.1	0.1	0.1	3.2	3.3	3.3	3.3	4
M29	Private	0.1	0.2	0.2	0.2	3.3	3.4	3.4	3.4	4
M31	Mine-owned	0.0	0.1	0.0	0.0	3.2	3.3	3.2	3.2	4
M32	Community	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
M33	Community	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
M34	Community	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
M35	Community	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
F01	Private	0.0	0.1	0.1	0.1	3.2	3.3	3.3	3.3	4
F02	Private	0.0	0.1	0.1	0.1	3.2	3.3	3.3	3.3	4
F03	Private	0.0	0.1	0.0	0.1	3.2	3.3	3.2	3.3	4
F04	Private	0.0	0.1	0.0	0.1	3.2	3.3	3.2	3.3	4
F05	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
F06	Private	0.0	0.1	0.0	0.1	3.2	3.3	3.2	3.3	4
F07	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
F08	Private	0.0	0.1	0.0	0.0	3.2	3.3	3.2	3.2	4
F09	Private	0.0	0.1	0.0	0.1	3.2	3.3	3.2	3.3	4
F10	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
F11	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
F12	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
F13	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
F14	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
F15	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
F16	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4
F17	Private	0.0	0.0	0.0	0.0	3.2	3.2	3.2	3.2	4

Tabulated Model Results (Rail Siding)

ID	Status	Project		Cumulative		Criteria
		Construction	Operation	Construction	Operation	
Maximum 24-hour average PM_{10} (µg/m³)						
Q06	Private	10	0	58	57	50
Q22	Mine owned	13	0	60	57	50
Q08	Private	7	0	58	57	50
Q09	Private	4	0	58	57	50
Q19	Private	4	0	58	57	50
Number of days above 50 µg/m³ PM_{10} (days)						
Q06	Private	0	0	5	5	-
Q22	Mine owned	0	0	5	5	-
Q08	Private	0	0	5	5	-
Q09	Private	0	0	5	5	-
Q19	Private	0	0	5	5	-
Annual average PM_{10} (µg/m³)						
Q06	Private	1.2	0.0	14	12	25
Q22	Mine owned	1.8	0.0	14	12	25
Q08	Private	0.9	0.0	13	12	25
Q09	Private	0.3	0.0	13	12	25
Q19	Private	0.3	0.0	13	12	25
Maximum 24-hour average $PM_{2.5}$ (µg/m³)						
Q06	Private	4.4	0.0	20	19	25
Q22	Mine owned	6.1	0.0	22	19	25
Q08	Private	3.4	0.0	19	19	25
Q09	Private	2.0	0.0	20	19	25
Q19	Private	2.0	0.0	20	19	25
Number of days above 25 µg/m³ $PM_{2.5}$ (days)						
Q06	Private	0	0	0	0	-
Q22	Mine owned	0	0	0	0	-
Q08	Private	0	0	0	0	-
Q09	Private	0	0	0	0	-
Q19	Private	0	0	0	0	-
Annual average $PM_{2.5}$ (µg/m³)						
Q06	Private	0.6	0.0	4.6	4.0	8
Q22	Mine owned	0.9	0.0	4.9	4.0	8
Q08	Private	0.5	0.0	4.5	4.0	8
Q09	Private	0.2	0.0	4.2	4.0	8
Q19	Private	0.2	0.0	4.2	4.0	8
Annual average TSP (µg/m³)						
Q06	Private	1.5	0.0	57	55	90
Q22	Mine owned	3.2	0.0	58	55	90
Q08	Private	1.0	0.0	56	55	90
Q09	Private	0.2	0.0	55	55	90
Q19	Private	0.2	0.0	55	55	90
Annual average deposited dust (g/m²/month)						
Q06	Private	0.1	0.0	3.3	3.2	4
Q22	Mine owned	0.3	0.0	3.5	3.2	4
Q08	Private	0.1	0.0	3.3	3.2	4
Q09	Private	0.0	0.0	3.2	3.2	4
Q19	Private	0.0	0.0	3.2	3.2	4

Appendix D. Modelling for the rail siding

Figure D1 Modelled dust concentrations and deposition levels due to construction of the rail siding

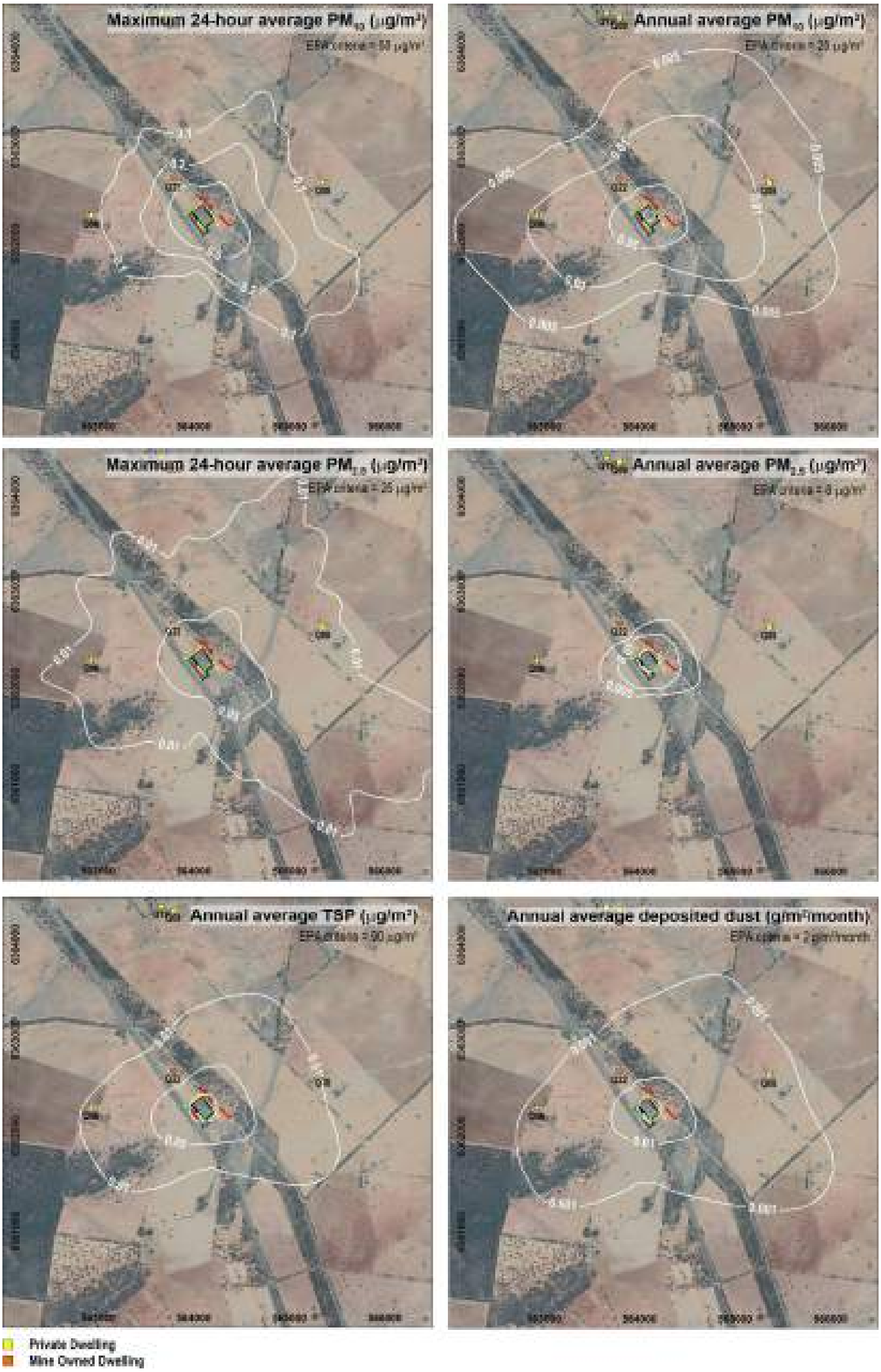

Figure D2 Modelled dust concentrations and deposition levels due to operation of the rail siding

Appendix E. Modelling for the processing facility

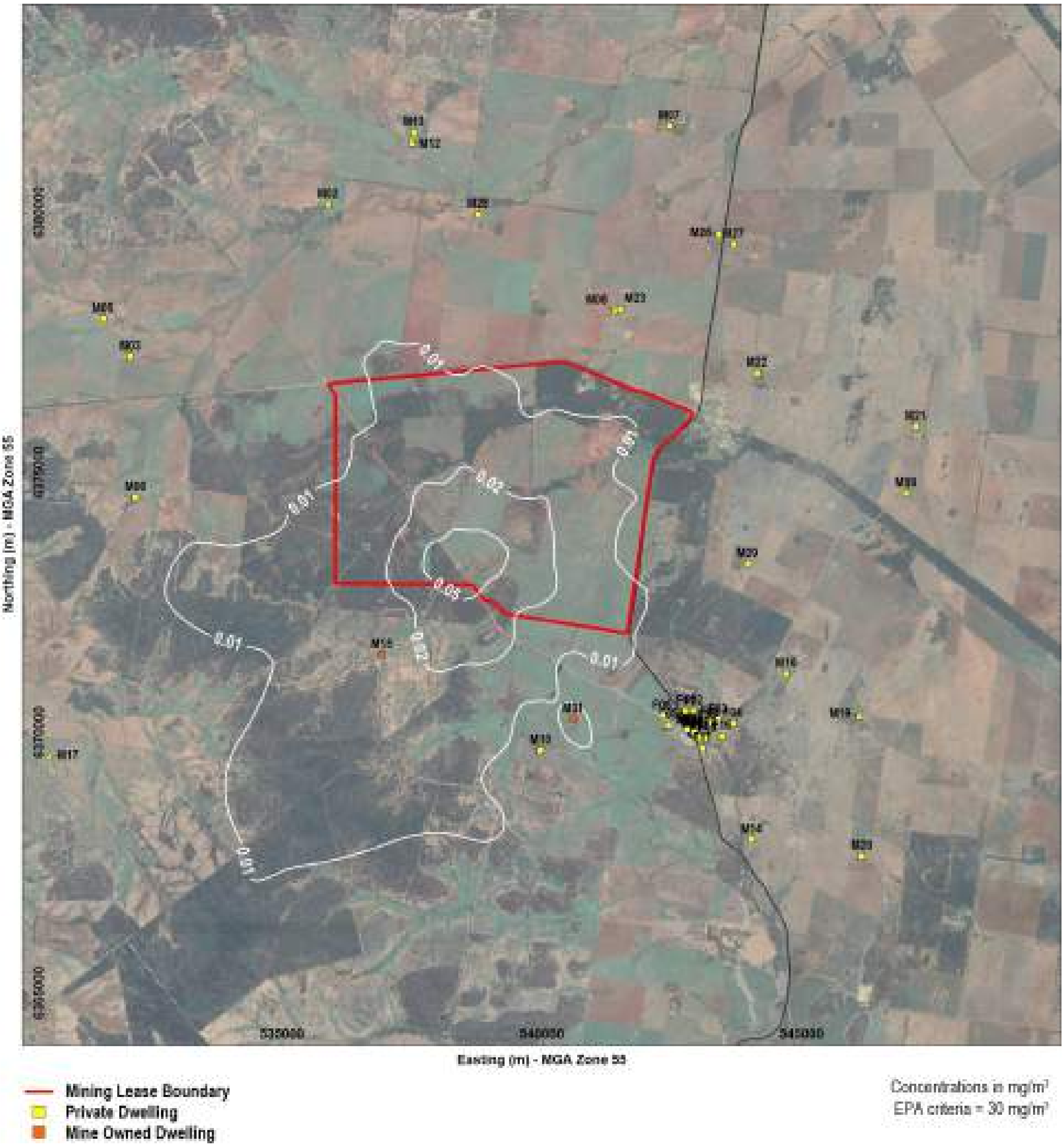

Figure E1 Modelled maximum 1-hour average CO due to the processing facility

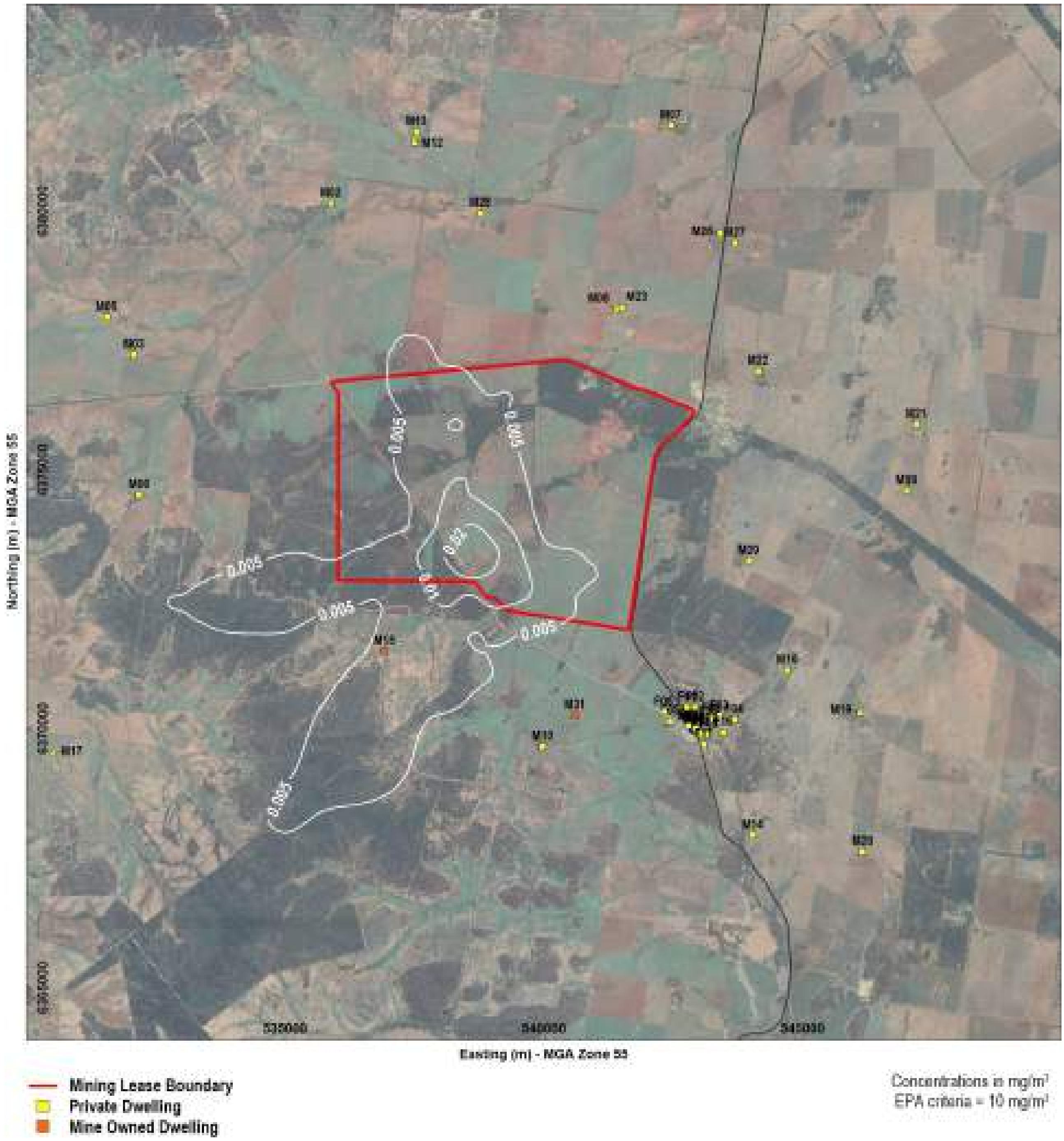

Figure E2 Modelled maximum 8-hour average CO due to the processing facility

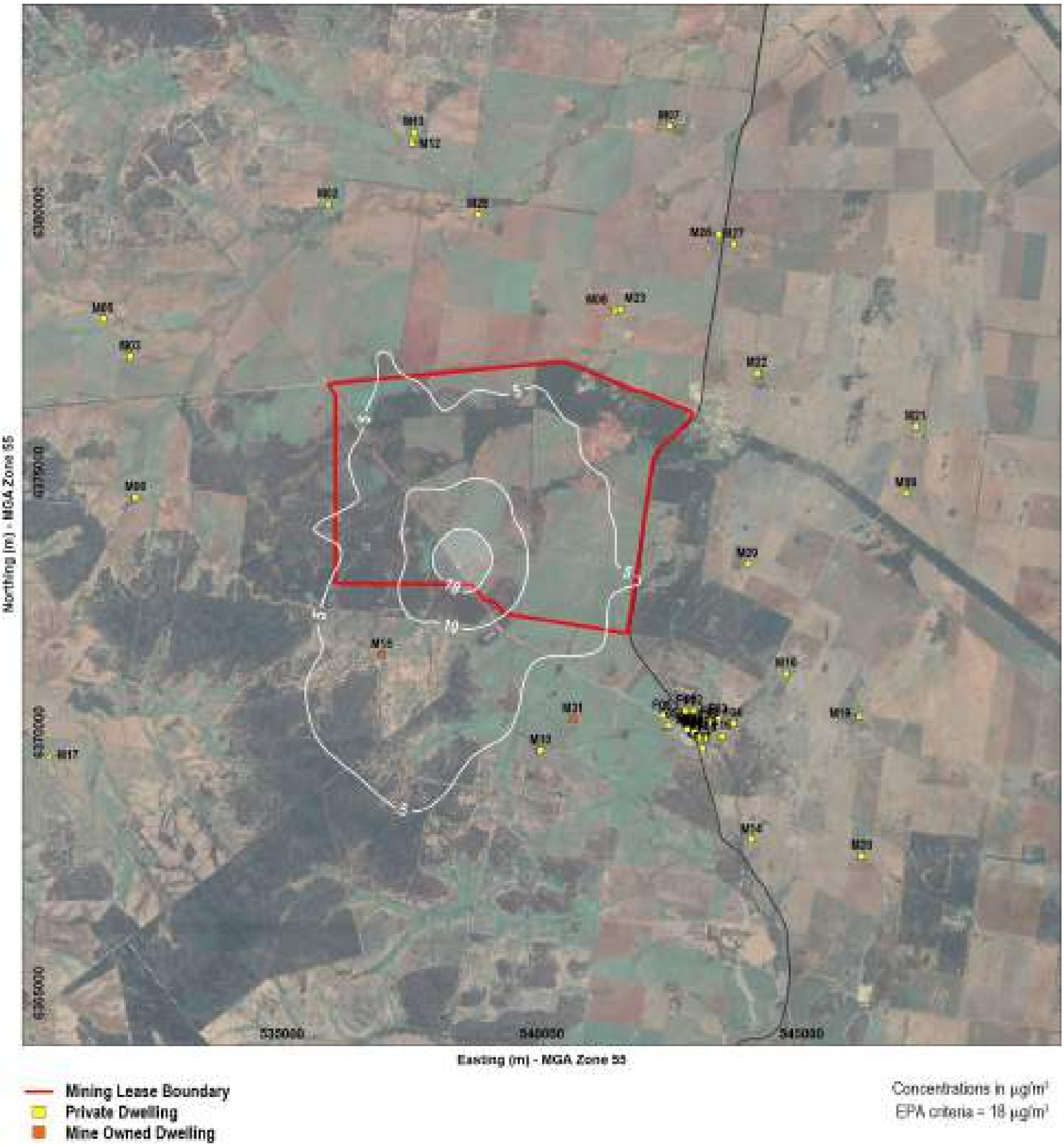

Figure E3 Modelled 99.9th percentile H_2SO_4 due to the processing facility

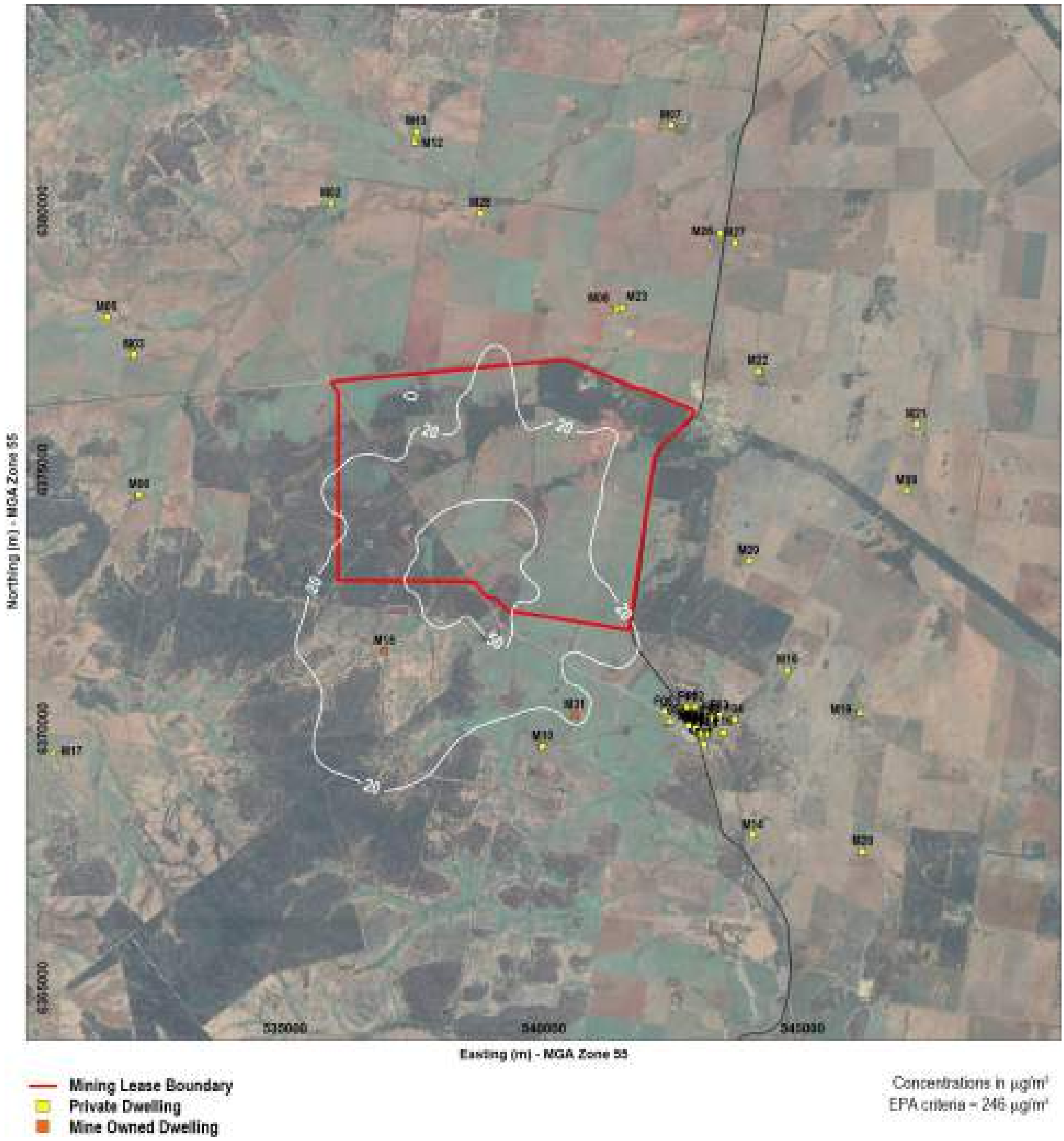

Figure E4 Modelled maximum 1-hour average NO_2 due to the processing facility

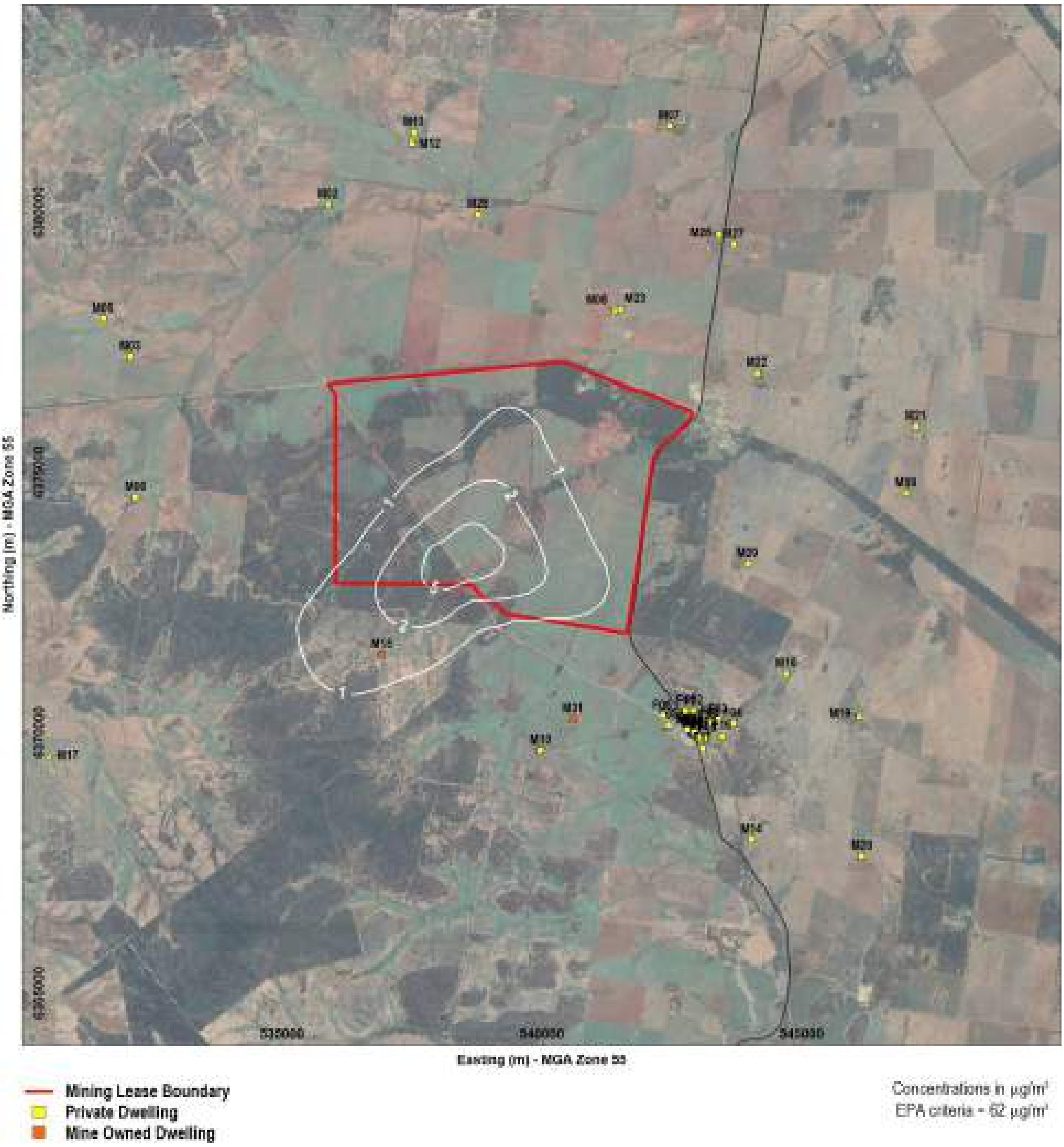

Figure E5 Modelled annual average NO_2 due to the processing facility

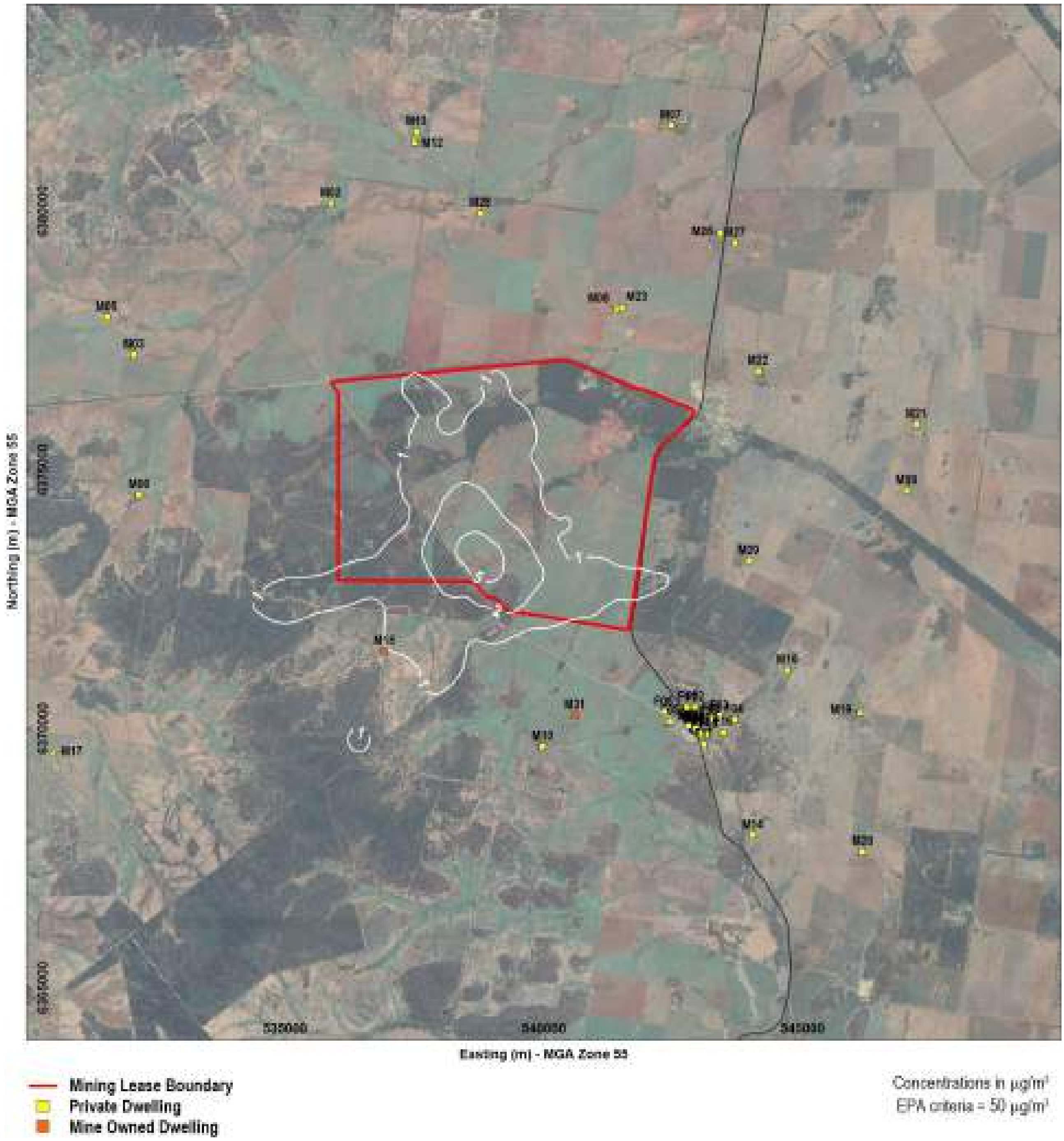

Figure E6 Modelled maximum 24-hour average PM_{10} due to the processing facility

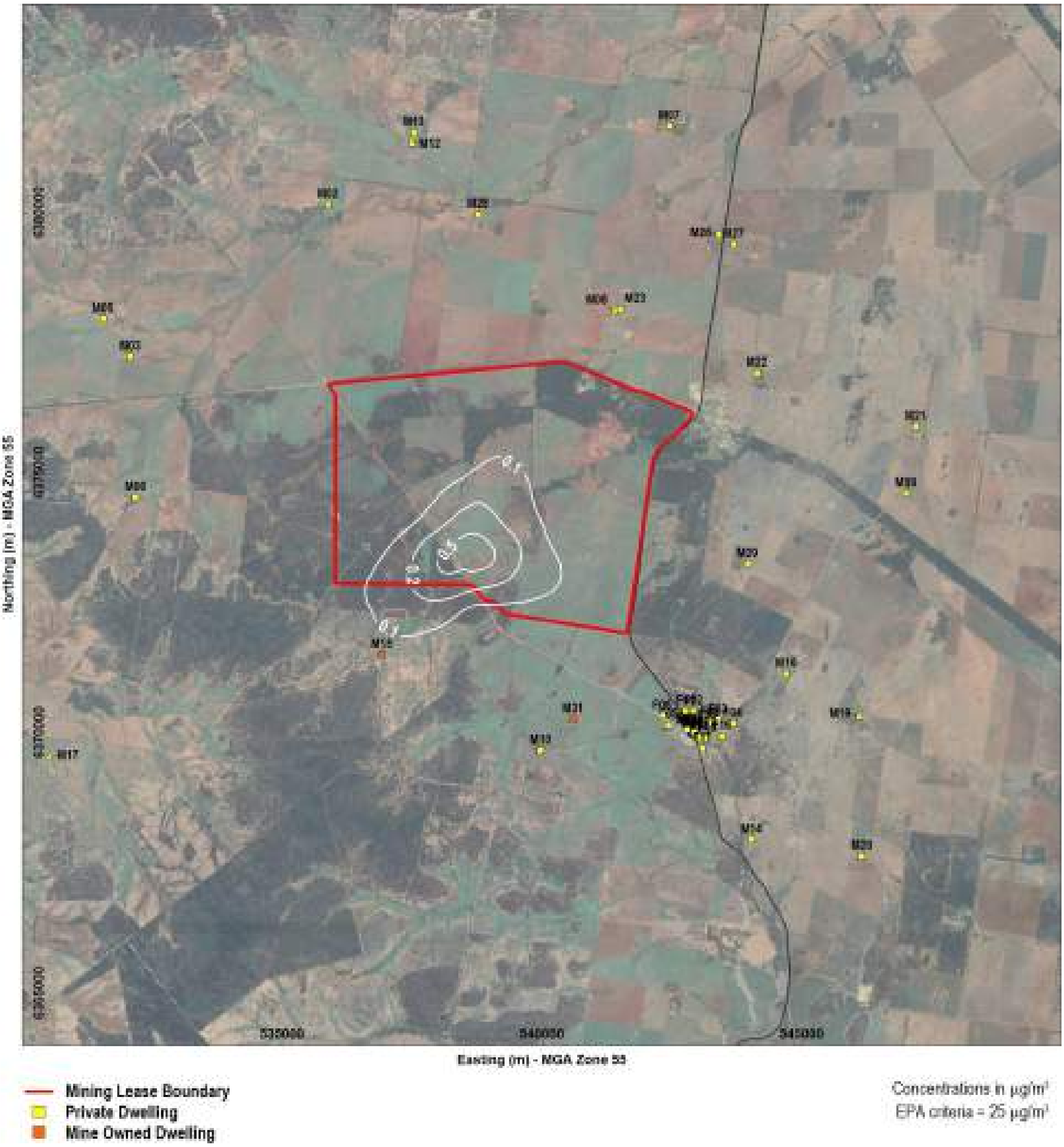

Figure E7 Modelled annual average PM_{10} due to the processing facility

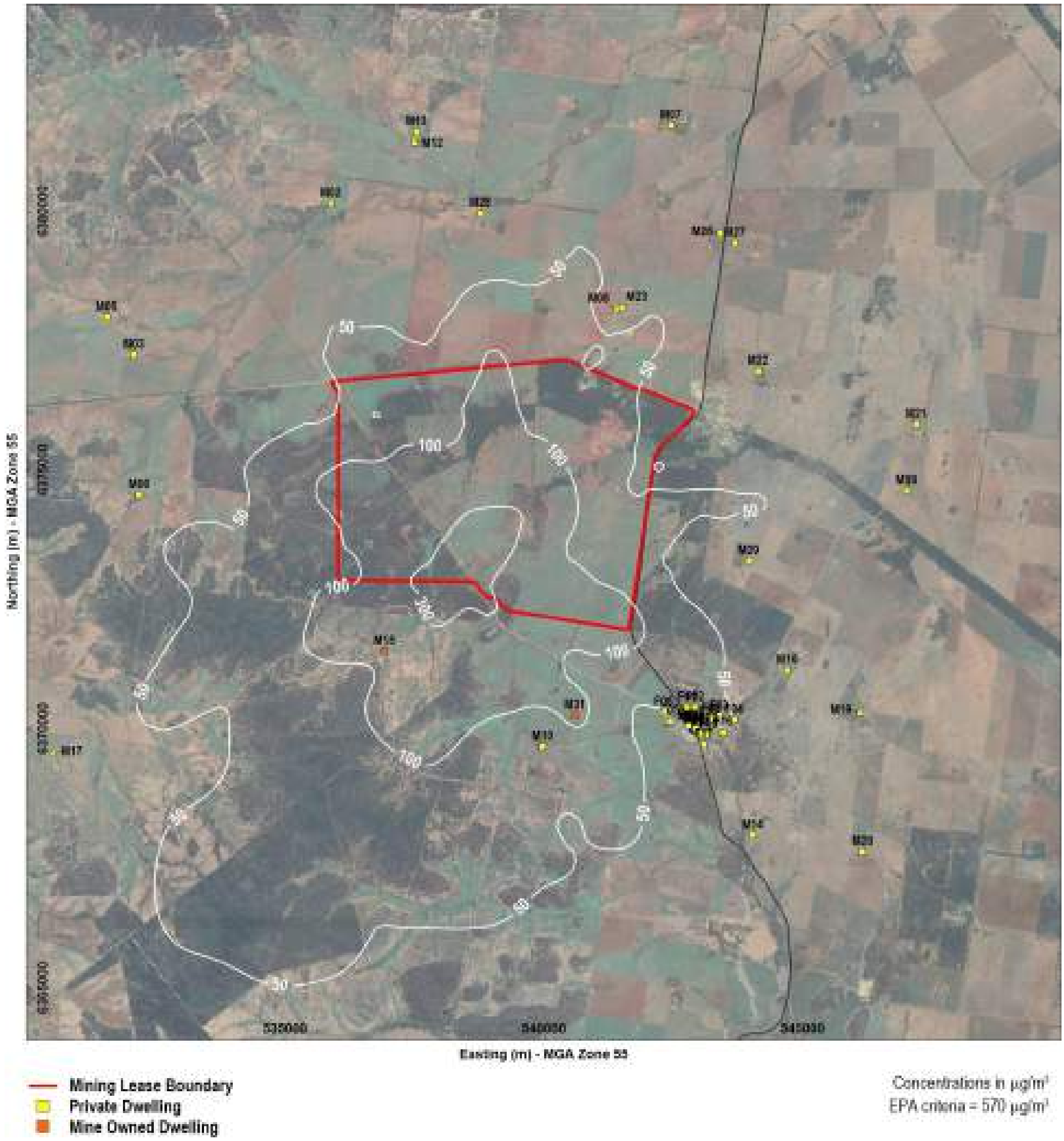

Figure E8 Modelled maximum 1-hour average SO_2 due to the processing facility

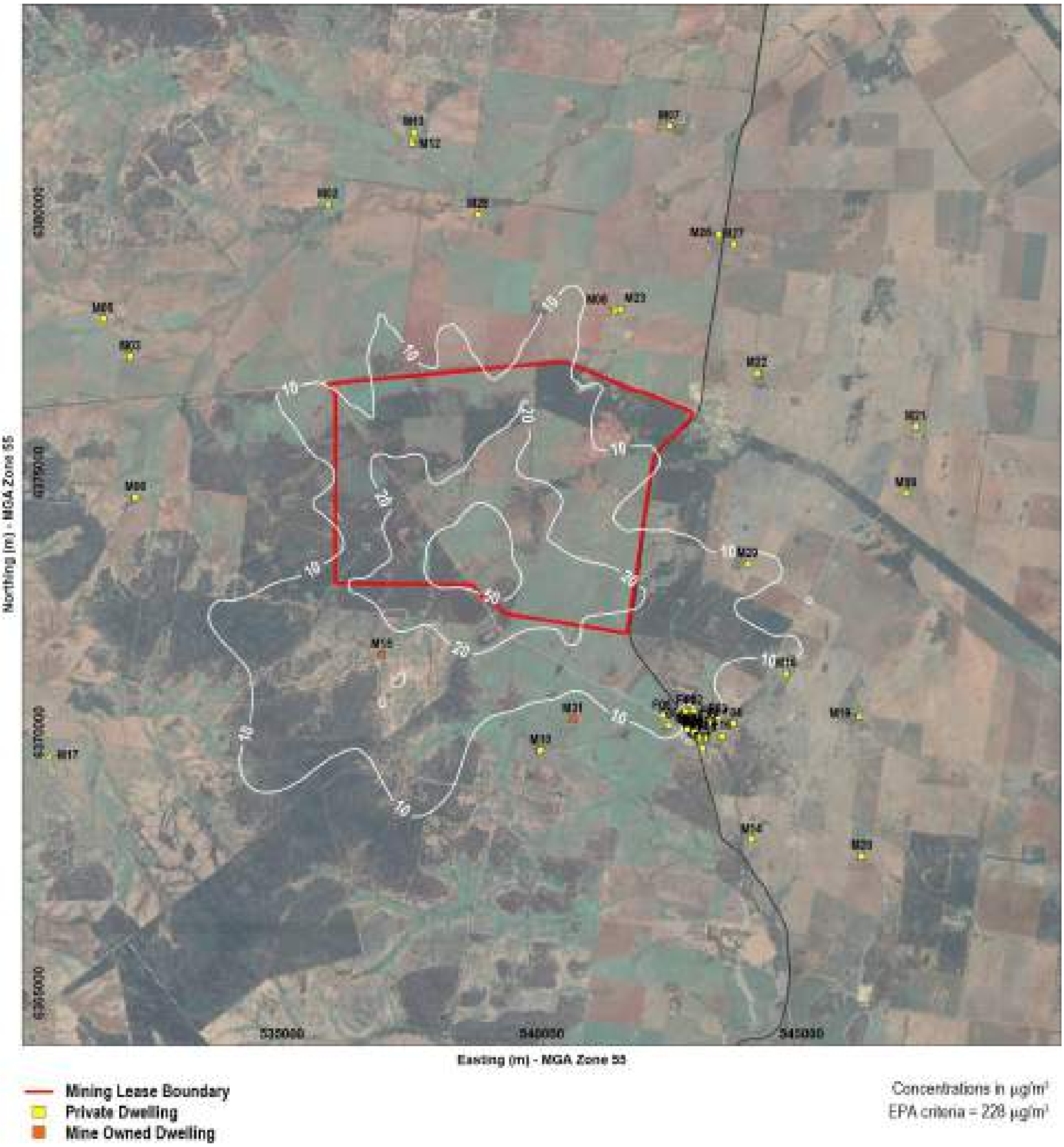

Figure E9 Modelled maximum 24-hour average SO_2 due to the processing facility

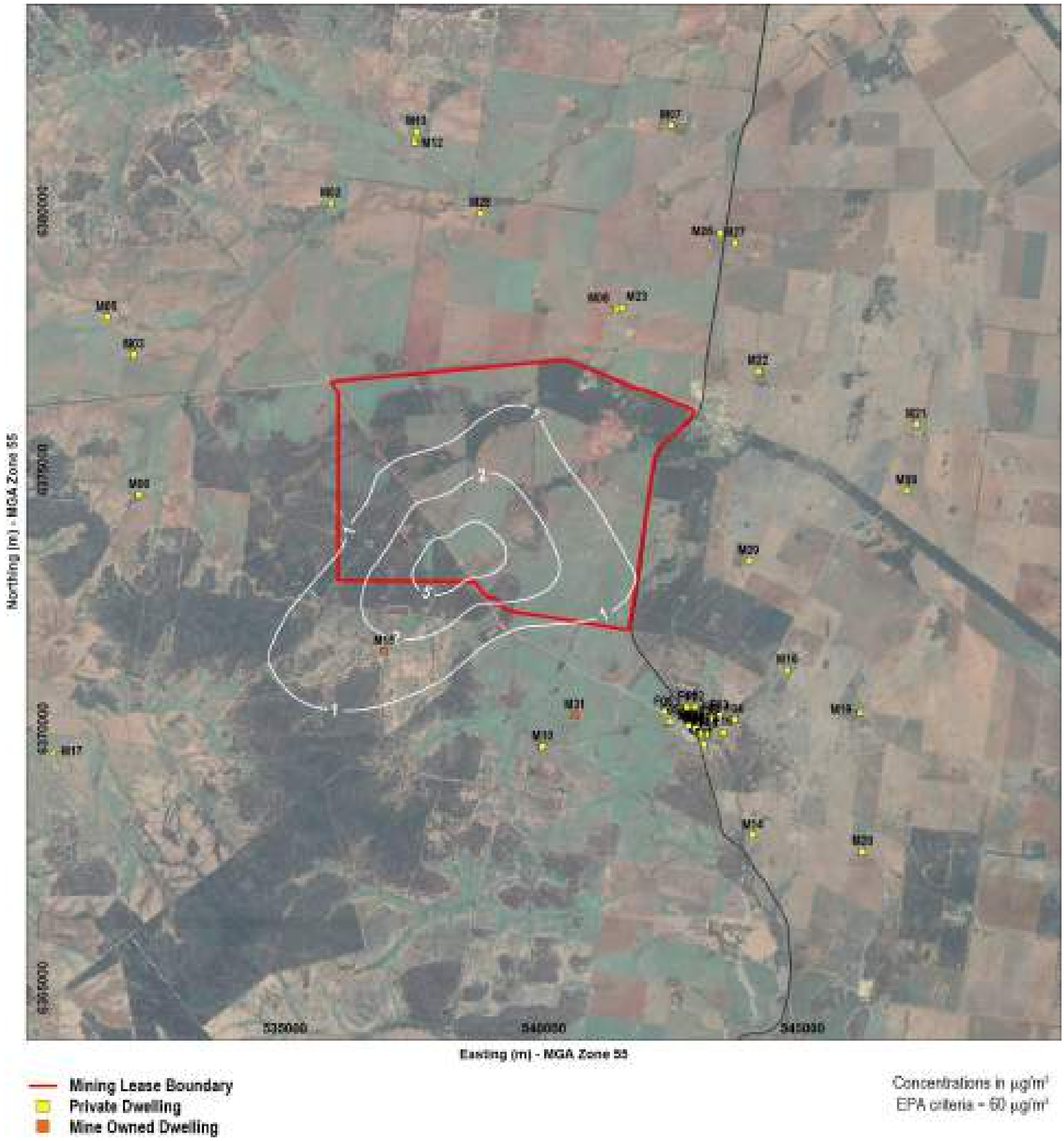

Figure E10 Modelled annual average SO_2 due to the processing facility

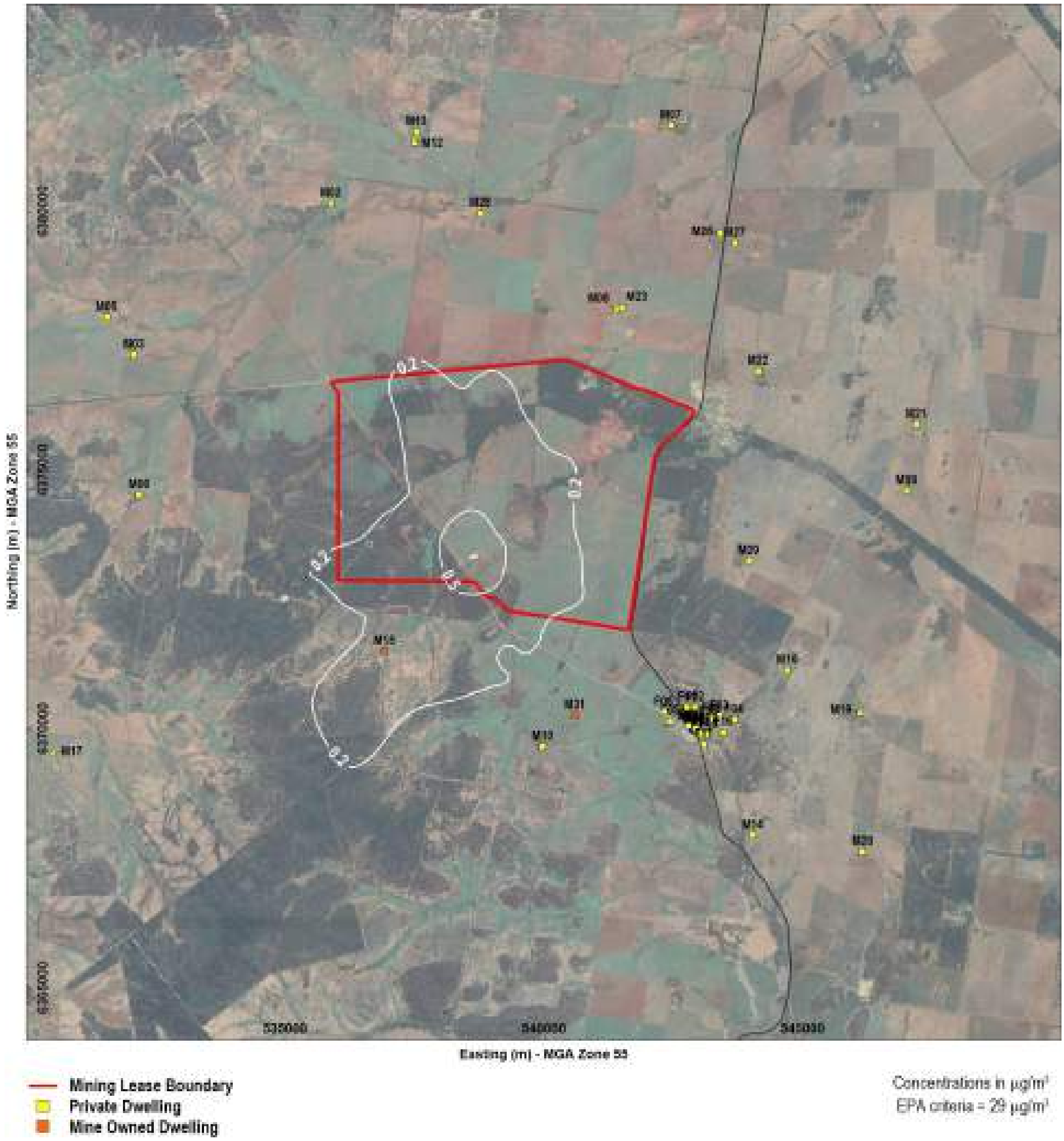

Figure E11 Modelled 99.9th percentile benzene due to the processing facility

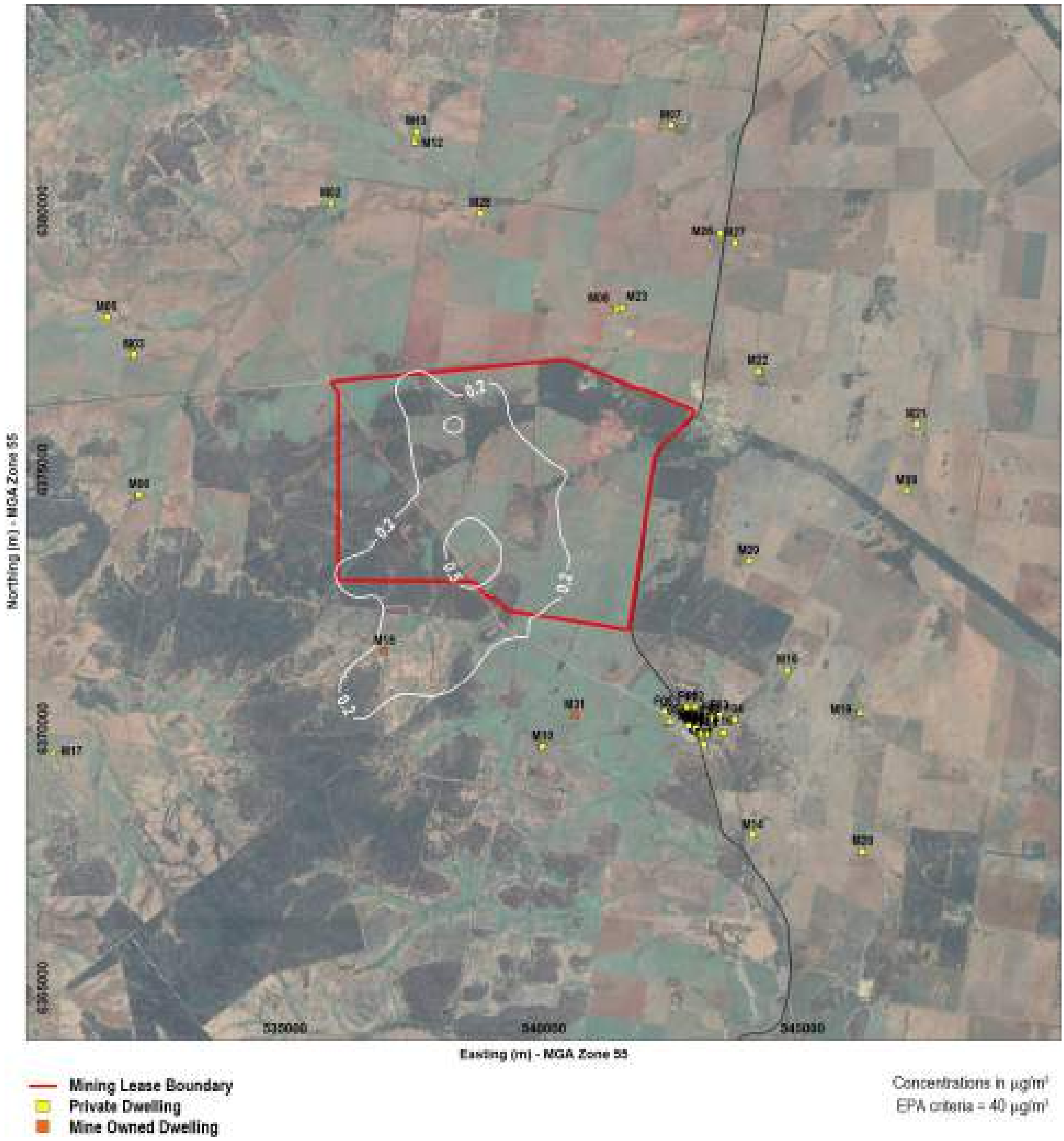

Figure E12 Modelled 99.9th percentile 1-3 butadiene due to the processing facility

Appendix F. Greenhouse gas emissions by activity

Diesel usage (mining)

Source of usage: Clean TeQ

		Emission factor (kg CO2-e/kL)			Emissions (t CO2-e/year)			
Year	Usage (kL)	Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	Total
Construction Year 1	1,059	2721.3	0	138.96	2,883	-	147	3,030
Construction Year 2	1,059	2721.3	0	138.96	2,883	-	147	3,030
Construction Year 3	1,875	2721.3	0	138.96	5,103	-	261	5,364
Operation Year 1	10,425	2721.3	0	138.96	28,370	-	1,449	29,818
Operation Year 2	5,230	2721.3	0	138.96	14,232	-	727	14,959
Operation Year 3	5,040	2721.3	0	138.96	13,715	-	700	14,416
Operation Year 4	6,890	2721.3	0	138.96	18,749	-	957	19,707
Operation Year 5	4,286	2721.3	0	138.96	11,663	-	596	12,259
Operation Year 6	6,878	2721.3	0	138.96	18,717	-	956	19,673
Operation Year 7	4,895	2721.3	0	138.96	13,320	-	680	14,000
Operation Year 8	5,743	2721.3	0	138.96	15,628	-	798	16,427
Operation Year 9	5,041	2721.3	0	138.96	13,719	-	701	14,420
Operation Year 10	7,170	2721.3	0	138.96	19,513	-	996	20,509
Operation Year 11	4,240	2721.3	0	138.96	11,539	-	589	12,128
Operation Year 12	6,515	2721.3	0	138.96	17,728	-	905	18,634
Operation Year 13	6,598	2721.3	0	138.96	17,956	-	917	18,873
Operation Year 14	5,423	2721.3	0	138.96	14,758	-	754	15,512
Operation Year 15	6,876	2721.3	0	138.96	18,711	-	955	19,666
Operation Year 16	5,624	2721.3	0	138.96	15,304	-	781	16,085
Operation Year 17	6,753	2721.3	0	138.96	18,377	-	938	19,316
Operation Year 18	1,875	2721.3	0	138.96	5,103	-	261	5,364
Operation Year 19	1,564	2721.3	0	138.96	4,255	-	217	4,473
Operation Year 20	1,564	2721.3	0	138.96	4,255	-	217	4,473
Operation Year 21	1,564	2721.3	0	138.96	4,255	-	217	4,473
							Average	13,609
							Total	326,607

Diesel usage (limestone delivery from quarry)

Source of usage: Ramboll, 2017

		Emission factor (kg CO2-e/kL)			Emissions (t CO2-e/year)			
Year	Usage (kL)	Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	Total
Construction Year 1	-	2721.3	0	138.96	-	-	-	-
Construction Year 2	-	2721.3	0	138.96	-	-	-	-
Construction Year 3	180	2721.3	0	138.96	490	-	25	515
Operation Year 1	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 2	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 3	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 4	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 5	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 6	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 7	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 8	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 9	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 10	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 11	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 12	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 13	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 14	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 15	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 16	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 17	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 18	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 19	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 20	360	2721.3	0	138.96	980	-	50	1,030
Operation Year 21	360	2721.3	0	138.96	980	-	50	1,030
							Average	1,006
							Total	22,138

Diesel usage (sulphur delivery from rail siding)									
Source of usage: Ramboll, 2017									
		Emission factor (kg CO2-e/kL)			Emissions (t CO2-e/year)				
Year	Usage (kL)	Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	Total	
Construction Year 1	-	2721.3	0	138.96	-	-	-	-	
Construction Year 2	-	2721.3	0	138.96	-	-	-	-	
Construction Year 3	100	2721.3	0	138.96	271	-	14	285	
Operation Year 1	199	2721.3	0	138.96	542	-	28	569	
Operation Year 2	199	2721.3	0	138.96	542	-	28	569	
Operation Year 3	199	2721.3	0	138.96	542	-	28	569	
Operation Year 4	199	2721.3	0	138.96	542	-	28	569	
Operation Year 5	199	2721.3	0	138.96	542	-	28	569	
Operation Year 6	199	2721.3	0	138.96	542	-	28	569	
Operation Year 7	199	2721.3	0	138.96	542	-	28	569	
Operation Year 8	199	2721.3	0	138.96	542	-	28	569	
Operation Year 9	199	2721.3	0	138.96	542	-	28	569	
Operation Year 10	199	2721.3	0	138.96	542	-	28	569	
Operation Year 11	199	2721.3	0	138.96	542	-	28	569	
Operation Year 12	199	2721.3	0	138.96	542	-	28	569	
Operation Year 13	199	2721.3	0	138.96	542	-	28	569	
Operation Year 14	199	2721.3	0	138.96	542	-	28	569	
Operation Year 15	199	2721.3	0	138.96	542	-	28	569	
Operation Year 16	199	2721.3	0	138.96	542	-	28	569	
Operation Year 17	199	2721.3	0	138.96	542	-	28	569	
Operation Year 18	199	2721.3	0	138.96	542	-	28	569	
Operation Year 19	199	2721.3	0	138.96	542	-	28	569	
Operation Year 20	199	2721.3	0	138.96	542	-	28	569	
Operation Year 21	199	2721.3	0	138.96	542	-	28	569	
							Average	556	
							Total	12,236	

Diesel usage (power generation)								
Source of usage: Ramboll, 2017								
		Emission factor (scaling)			Emissions (t CO2-e/year)			
Year	t CO2-e	Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	Total
Construction Year 1	-	1	0	0.009	-	-	-	-
Construction Year 2	-	1	0	0.009	-	-	-	-
Construction Year 3	22,785	1	0	0.009	22,785	-	202	22,987
Operation Year 1	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 2	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 3	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 4	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 5	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 6	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 7	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 8	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 9	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 10	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 11	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 12	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 13	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 14	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 15	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 16	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 17	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 18	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 19	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 20	45,570	1	0	0.009	45,570	-	403	45,973
Operation Year 21	45,570	1	0	0.009	45,570	-	403	45,973
							Average	44,928
							Total	988,420

Acid plant

Includes PAL vent scrubber stack, partial neutralisation vent scrubber stack, RIP vent scrubber stack (Ramboll, 2017)

		Emission factor (scaling)			Emissions (t CO2-e/year)			
Year	t CO2-e	Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	Total
Construction Year 1	-	1	0	0	-	-	-	-
Construction Year 2	-	1	0	0	-	-	-	-
Construction Year 3	62,993	1	0	0	62,993	-	-	62,993
Operation Year 1	251,972	1	0	0	251,972	-	-	251,972
Operation Year 2	251,972	1	0	0	251,972	-	-	251,972
Operation Year 3	251,972	1	0	0	251,972	-	-	251,972
Operation Year 4	251,972	1	0	0	251,972	-	-	251,972
Operation Year 5	251,972	1	0	0	251,972	-	-	251,972
Operation Year 6	251,972	1	0	0	251,972	-	-	251,972
Operation Year 7	251,972	1	0	0	251,972	-	-	251,972
Operation Year 8	251,972	1	0	0	251,972	-	-	251,972
Operation Year 9	251,972	1	0	0	251,972	-	-	251,972
Operation Year 10	251,972	1	0	0	251,972	-	-	251,972
Operation Year 11	251,972	1	0	0	251,972	-	-	251,972
Operation Year 12	251,972	1	0	0	251,972	-	-	251,972
Operation Year 13	251,972	1	0	0	251,972	-	-	251,972
Operation Year 14	251,972	1	0	0	251,972	-	-	251,972
Operation Year 15	251,972	1	0	0	251,972	-	-	251,972
Operation Year 16	251,972	1	0	0	251,972	-	-	251,972
Operation Year 17	251,972	1	0	0	251,972	-	-	251,972
Operation Year 18	251,972	1	0	0	251,972	-	-	251,972
Operation Year 19	251,972	1	0	0	251,972	-	-	251,972
Operation Year 20	251,972	1	0	0	251,972	-	-	251,972
Operation Year 21	251,972	1	0	0	251,972	-	-	251,972
							Average	243,382
							Total	5,354,405

Blasting emissions

		Emission factor (t CO2-e/t Explosives)			Emissions (t CO2-e/year)			
Year	Explosives (t)	Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	Total
Construction Year 1	-	0.17	0	0	-	-	-	-
Construction Year 2	-	0.17	0	0	-	-	-	-
Construction Year 3	-	0.17	0	0	-	-	-	-
Operation Year 1	-	0.17	0	0	-	-	-	-
Operation Year 2	-	0.17	0	0	-	-	-	-
Operation Year 3	-	0.17	0	0	-	-	-	-
Operation Year 4	-	0.17	0	0	-	-	-	-
Operation Year 5	-	0.17	0	0	-	-	-	-
Operation Year 6	-	0.17	0	0	-	-	-	-
Operation Year 7	-	0.17	0	0	-	-	-	-
Operation Year 8	-	0.17	0	0	-	-	-	-
Operation Year 9	-	0.17	0	0	-	-	-	-
Operation Year 10	-	0.17	0	0	-	-	-	-
Operation Year 11	-	0.17	0	0	-	-	-	-
Operation Year 12	-	0.17	0	0	-	-	-	-
Operation Year 13	-	0.17	0	0	-	-	-	-
Operation Year 14	-	0.17	0	0	-	-	-	-
Operation Year 15	-	0.17	0	0	-	-	-	-
Operation Year 16	3,134	0.17	0	0	533	-	-	533
Operation Year 17	2,554	0.17	0	0	434	-	-	434
Operation Year 18	2,361	0.17	0	0	401	-	-	401
Operation Year 19	2,491	0.17	0	0	423	-	-	423
Operation Year 20	-	0.17	0	0	-	-	-	-
Operation Year 21	-	0.17	0	0	-	-	-	-
							Average	448
							Total	1,792

Transport of Product (Rail)								
Factor	kg CO2-e/t.km	0.03333	DEFRA 2019 - Freighting goods - Freight train					
Distance	km	500	Assumed distance to port					
		Emission factor (kg CO2-e/t)			Emissions (t CO2-e/year)			
Year	Product (t)	Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3	Total
Construction Year 1	0	0	0	16.67	-	-	-	-
Construction Year 2	0	0	0	16.67	-	-	-	-
Construction Year 3	0	0	0	16.67	-	-	-	-
Operation Year 1	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 2	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 3	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 4	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 5	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 6	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 7	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 8	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 9	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 10	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 11	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 12	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 13	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 14	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 15	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 16	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 17	240,180	0	0	16.67	-	-	4,003	4,003
Operation Year 18	0	0	0	16.67	-	-	-	-
Operation Year 19	0	0	0	16.67	-	-	-	-
Operation Year 20	0	0	0	16.67	-	-	-	-
Operation Year 21	0	0	0	16.67	-	-	-	-
							Average	4,003
							Total	68,044

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Sunrise Project

Project Execution Plan Modification

Appendix B

Noise Assessment

Acoustics
Vibration
Structural Dynamics

SUNRISE PROJECT - PROJECT EXECUTION PLAN MODIFICATION

Noise Assessment

30 June 2021

Sunrise Energy Metals Limited

TJ345-12F02 Report (r3).docx

Document details

Detail	Reference
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Attention:	Ms Bronwyn Flynn

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Contents

List of tables

List of figures

1 Introduction

The Sunrise Project (the Project) is a nickel, cobalt and scandium open cut mining project situated near the village of Fifield, approximately 350 kilometres (km) west-northwest of Sydney, in New South Wales (NSW) (Figure 1).

Development Consent (DA 374-11-00) for the Project was issued under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) in 2001.

The Project Execution Plan identified a number of changes to the approved mine and processing facility, accommodation camp, rail siding and road transport activities.

The Project Execution Plan Modification (the Modification) includes these Project Execution Plan changes to allow for the optimisation of the construction and operation of the Project.

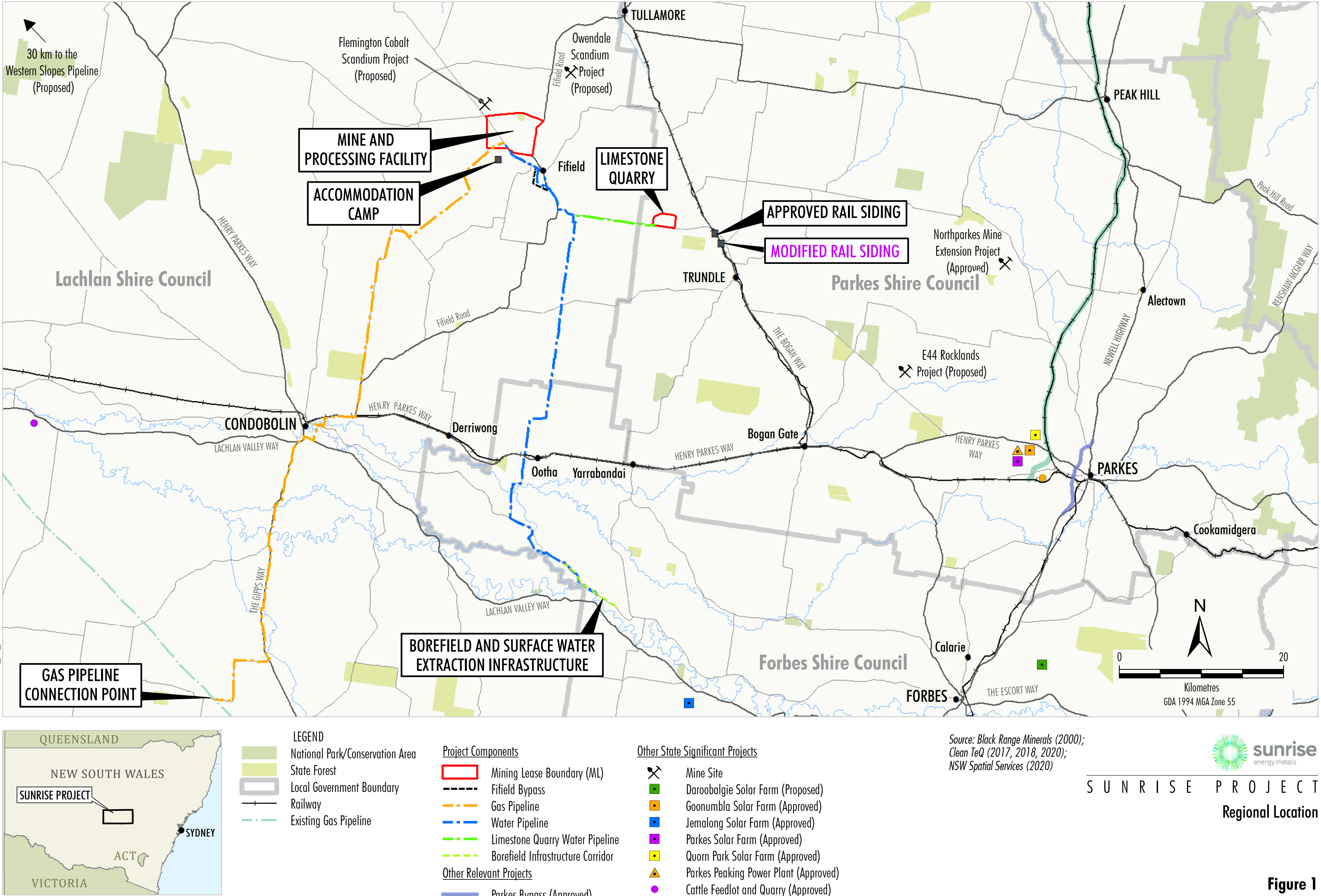
This Noise Assessment has been prepared to support an application by Sunrise Energy Metals Limited (SEM)[1] to modify Development Consent (DA 374-11-00) for the Project, which would be sought under section 4.55(2) of the EP&A Act.

Noise impacts associated with the Modification are assessed in accordance with a number of policies, guidelines and standards, including:

- NSW *Interim Construction Noise Guideline* (ICNG) (Department of the Environment and Climate Change [DECC], 2009);
- NSW *Noise Policy for Industry* (NPfI) (Environment Protection Authority [EPA], 2017);
- *Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Developments* (NSW Government, 2018); and
- NSW *Road Noise Policy* (RNP) (Department of Environment, Climate Change and Water [DECCW], 2011).

The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard/New Zealand Standard ISO 9001. Appendix A contains a glossary of acoustic terms used in this report.

[1] SEM was previously Clean TeQ Holdings Limited (Clean TeQ).



LEGEND
- National Park/Conservation Area
- State Forest
- Local Government Boundary
- Railway
- Existing Gas Pipeline

Project Components
- Mining Lease Boundary (ML)
- Fifield Bypass
- Gas Pipeline
- Water Pipeline
- Limestone Quarry Water Pipeline
- Borefield Infrastructure Corridor

Other Relevant Projects
- Parkes Bypass (Approved)

Other State Significant Projects
- Mine Site
- Daroobalgie Solar Farm (Proposed)
- Goonumbla Solar Farm (Approved)
- Jemalong Solar Farm (Approved)
- Parkes Solar Farm (Approved)
- Quorn Park Solar Farm (Approved)
- Parkes Peaking Power Plant (Approved)
- Cattle Feedlot and Quarry (Approved)
- Parkes Special Activation Precinct
- Inland Rail (Parkes to Narromine) (Approved)

Source: Black Range Minerals (2000); Clean TeQ (2017, 2018, 2020); NSW Spatial Services (2020)

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SUNRISE PROJECT
Regional Location

Figure 1

2 Project Overview

The Project is a nickel, cobalt and scandium open cut mining project situated near the village of Fifield, approximately 350 km west-northwest of Sydney, in NSW (Figure 1).

The Project includes the establishment and operation of the following:

- mine and processing facility;
- limestone quarry;
- rail siding;
- borefield, surface water extraction infrastructure and water pipeline;
- gas pipeline;
- accommodation camp; and
- associated transport activities and transport infrastructure (e.g. the Fifield Bypass, road and intersection upgrades).

Construction of the Project commenced in 2006, which included components of the borefield, however construction of other Project components is yet to commence.

2.1 Overview of the Modification

SEM has continued to review and optimise the Project design, construction and operation as part of preparations for Project execution. The outcomes of this review are outlined in the Project Execution Plan (Clean TeQ, 2020a).

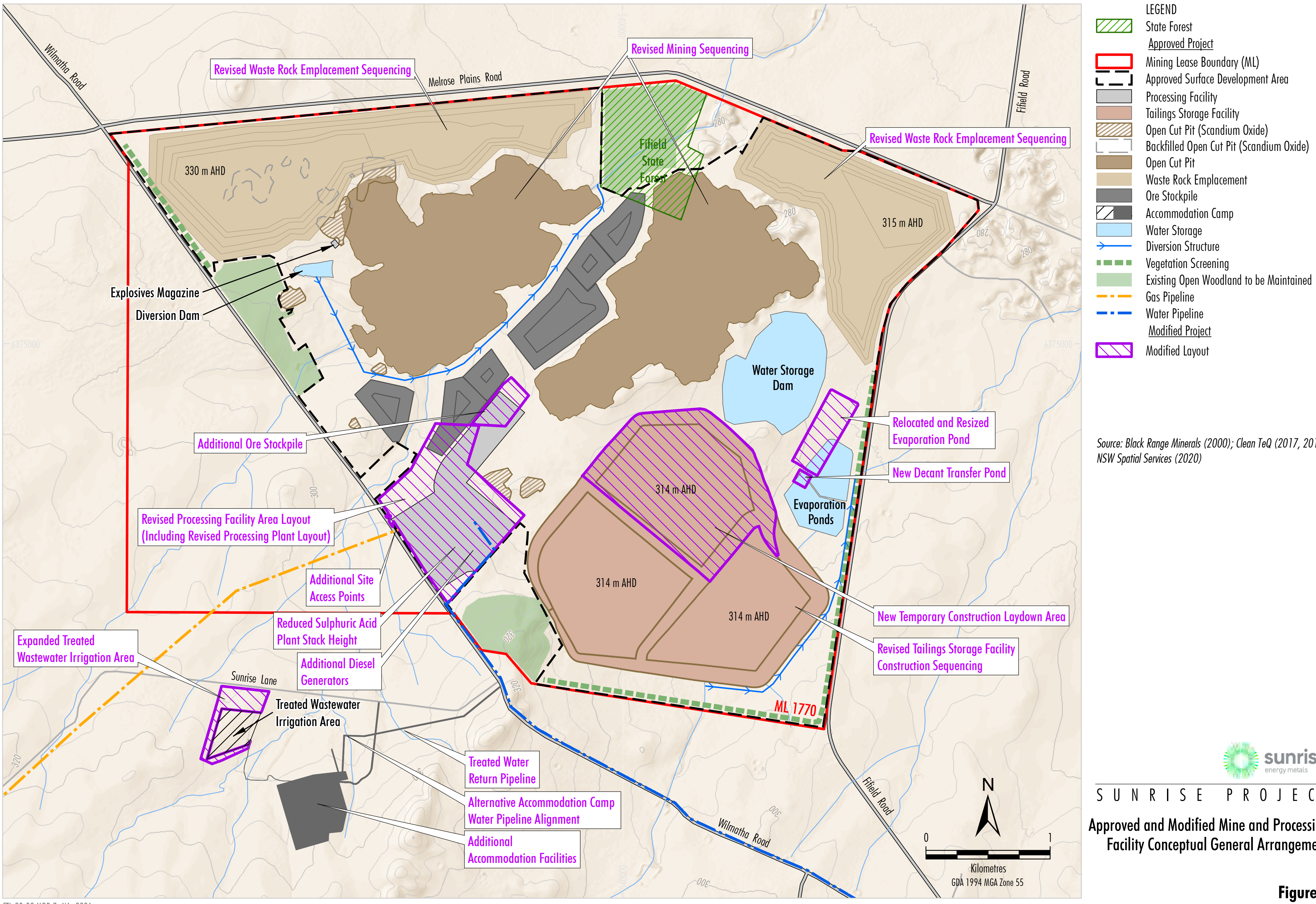
The Project Execution Plan identified a number of changes to the approved mine and processing facility, accommodation camp, rail siding and road transport activities.

The Modification includes these Project Execution Plan changes to allow for the optimisation of the construction and operation of the Project.

The Modification would include the following changes to the approved Project (Figure 2 and Figure 3):

Mine and Processing Facility

- addition of a temporary construction laydown area inside the approved tailings storage facility surface development area;
- optimised production schedule resulting in an increased mining rate during the initial years of mining and associated changes to mining and waste rock emplacement sequencing;



Source: Black Range Minerals (2000); Clean TeQ (2017, 2018, 2020); NSW Spatial Services (2020)

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SUNRISE PROJECT

Approved and Modified Mine and Processing Facility Conceptual General Arrangement

Figure 2

CTL-20-08 MOD 7_NA_223A

LEGEND
Railway
Existing 11 kV Electricity Transmission Line
Existing 22 kV Electricity Transmission Line
Drainage Feature

Approved Project
Surface Development Area
Scotson Lane Upgrade

Modified Project
Surface Development Area
Scotson Lane Upgrade Extension
22 kV Electricity Transmission Line
(Subject to Separate Approval)

Source: Black Range Minerals (2000);
Clean Teq (2020, 2021); NSW Spatial Services (2020, 2021).

Orthophoto: © NSW Department of Finance, Services & Innovation (2021)

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S U N R I S E   P R O J E C T

Approved and Modified
Rail Siding

Figure 3

CTL-20-08 MOD 7_NA_224A

- revised processing facility area layout, including a revised processing plant layout and two additional vehicle site access points;
- reduced sulphuric acid plant stack height from 80 m to 40 m;
- revisions to processing plant reagent types, rates and storage volumes;
- revised tailings storage facility cell construction sequence and the addition of a decant transfer pond;
- relocated and resized evaporation pond;
- changes to the water management system to reflect the modified mine and processing facility layout;
- increased number of diesel-powered backup generators (and associated stacks) from one to four;
- addition of exploration activities within the approved surface development area inside Mining Lease (ML) 1770;
- increased duration of the construction phase from two years to three years;
- increased peak construction phase workforce from approximately 1,000 to approximately 1,900 personnel;

Rail Siding

- revised rail siding location and layout;
- addition of an ammonium sulphate storage and distribution facility to the rail siding;
- extension of the Scotson Lane road upgrade;
- addition of a 22 kV electricity transmission line (ETL) (subject to separate approval) to the rail siding power supply;
- increased peak operational phase workforce from approximately five to approximately 10 personnel;

Accommodation Camp

- increased construction phase capacity from 1,300 to 1,900 personnel;
- increased size of the treated wastewater irrigation area;

- option for an alternative alignment of the last section of the accommodation camp water pipeline along the accommodation camp services corridor, rather than along the access road corridor;
- option to transfer treated wastewater to the mine and processing facility for reuse via a water pipeline located inside the approved services corridor;

Road Transport Activities

- changes to construction phase vehicle movements associated with the increased construction phase accommodation camp capacity and changes to heavy vehicle delivery requirements;
- changes to operational phase heavy vehicle movements associated with revisions to processing plant reagent types, rates and storage volumes; and
- changes to operational phase heavy vehicle movements to and from the rail siding associated with the transport of metal sulphate and ammonium sulphate products.

The Modification would not change the following approved components of the Project:

- other mine and processing facility components (e.g. surface development area, mining method, processing method and rate, tailings management and water management concepts);
- other accommodation camp components (e.g. surface development area; operational phase capacity);
- other transport activities and transport infrastructure (e.g. the Fifield Bypass);
- limestone quarry;
- borefield, surface water extraction infrastructure and water pipeline; and/or
- gas pipeline.

The issues addressed in this assessment include noise emissions from:

- modified mine and processing facility and rail siding construction activities;
- modified mine and processing facility and rail siding operational activities; and
- road traffic associated with the modified mine and processing facility and rail siding.

The Modification would not change the approved blasting practices at the Project. Therefore, potential blasting impacts have not been considered further in this assessment.

3 Noise Sensitive Receivers

Land use in the local area in the vicinity of the mine and processing facility is predominately agricultural operations (rural). The majority of properties surrounding the mine and processing facility are privately owned and the remainder are either community properties or mine owned. Fifield (a small community) is located approximately 2 km south-east of the mine and processing facility.

Land use in the local area in the vicinity of the modified rail siding is predominately agriculture operations (rural) The majority of properties surrounding the modified rail siding are privately owned. Trundle is the closest community to the modified rail siding and is located approximately 4 km to the south-southeast.

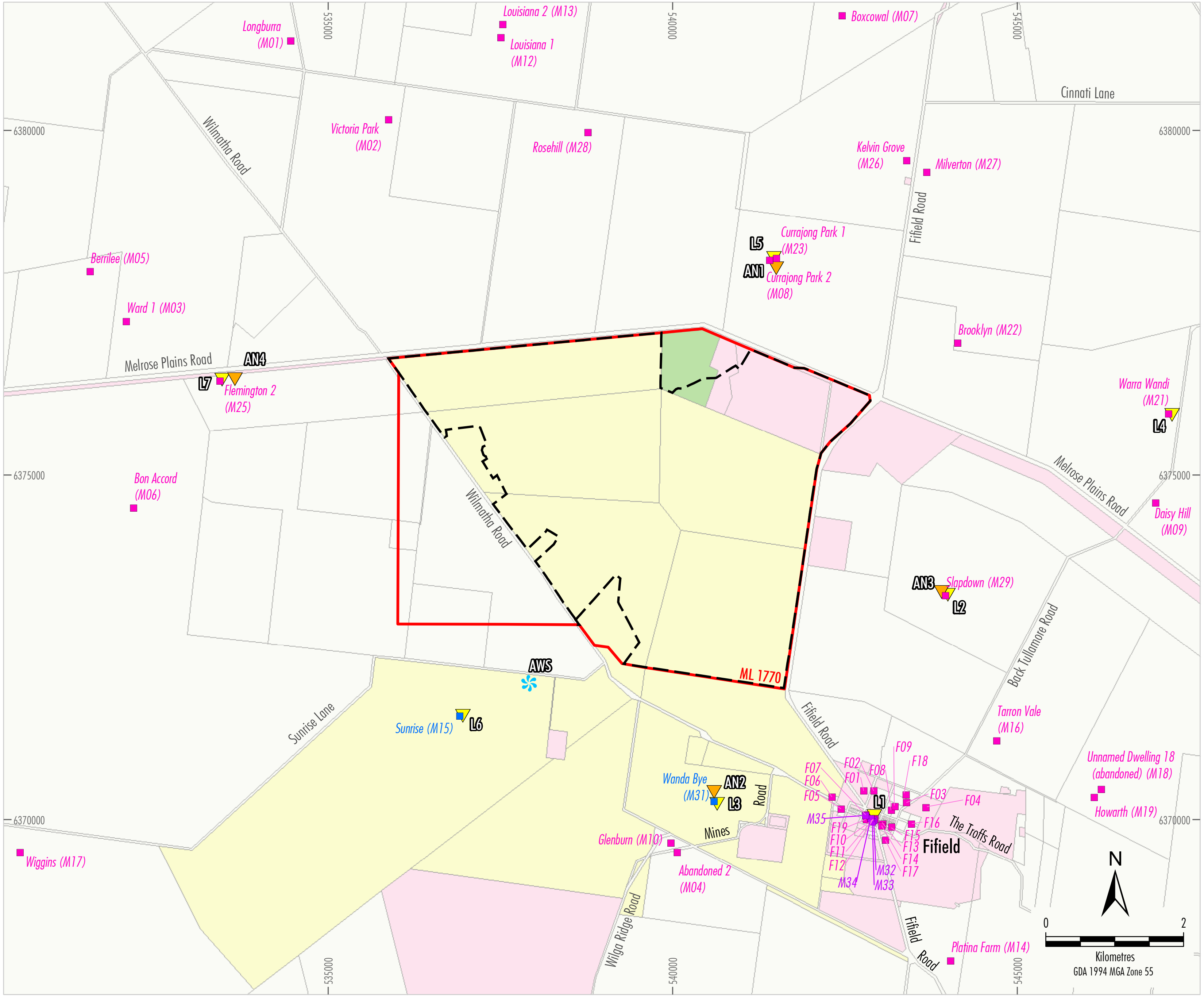
The noise sensitive receiver locations considered in this assessment are listed in Table 3.1 and shown on Figure 4 and Figure 5.

Table 3.1 – Receiver Locations and Ownership Details

ID	Description	Easting	Northing	Ownership
Mine and Processing Facility				
M01	Longburra	534460	6381299	Private
M02	Victoria Park	535880	6380159	Private
M03	Ward 1	532074	6377231	Private
M04	Abandoned 2	540068	6369522	Private
M05	Berrilee	531549	6377952	Private
M06	Bon Accord	532179	6374519	Private
M07	Boxcowal	542455	6381666	Private
M08	Currajong Park 2	541407	6378116	Private
M09	Daisy Hill	547007	6374597	Private
M10	Glenburn	539974	6369660	Private
M12	Louisiana 1	537510	6381346	Private
M13	Louisiana 2	537536	6381538	Private
M14	Platina Farm	544033	6367948	Private
M15	Sunrise	536914	6371503	Mine-owned
M16	Tarron Vale	544700	6371139	Private
M17	Wiggins	530531	6369523	Private
M18	Unnamed Dwelling 18 (abandoned)	546216	6370438	Private
M19	Howarth	546115	6370320	Private
M21	Warra Wandi	547194	6375889	Private
M22	Brooklyn	544134	6376913	Private
M23	Currajong Park 1	541505	6378145	Private
M25	Flemington 2	533432	6376363	Private
M26	Kelvin Grove	543396	6379565	Private

ID	Description	Easting	Northing	Ownership
M27	Milverton	543687	6379393	Private
M28	Rosehill	538772	6379967	Private
M29	Slapdown	543958	6373248	Private
M31	Wanda Bye	540599	6370264	Mine-owned
M32	Fifield Town Hall	542918	6369990	Community
M33	Fifield Fire Station	542895	6369968	Community
M34	Fifield Hotel	542872	6370013	Community
M35	St Dympna's Catholic Church	542799	6370059	Community
F01	Fifield Residences	542770	6370414	Private
F02		542918	6370415	Private
F03		543390	6370245	Private
F04		543672	6370175	Private
F05		542443	6370155	Private
F06		542310	6370326	Private
F07		542800	6370068	Private
F08		543170	6370138	Private
F09		543224	6370187	Private
F10		542932	6370017	Private
F11		542932	6370001	Private
F12		542932	6370001	Private
F13		543045	6369937	Private
F14		543033	6369911	Private
F15		543178	6369894	Private
F16		543463	6369933	Private
F17		543086	6369700	Private
F18		543384	6370362	Private
F19		542808	6369999	Private
Rail Siding				
Q04	Rockleigh (abandoned)	559019	6363455	Private
Q05	Reas Falls	559754	6362715	Private
Q06	Glen Rock	562921	6362293	Private
Q08	Ballenrae West	565349	6362639	Private
Q09	Spring Park	563786	6364360	Private
Q11	The Troffs (abandoned)	559015	6364760	Private
Q17	Boree	563434	6366319	Private
Q18	Boree 2	563816	6366037	Private
Q19	Spring Park 2	563653	6364404	Private
Q20	Ballanrae North	566899	6364681	Private
Q22	Q22	563784.8	6362678	Mine-owned

ID	Description	Easting	Northing	Ownership
Q23	Charlton's	565794	6359093	Private
Q24	Corinya Park	566349	6359048	Private
Q25	Three Trees	560627	6367710	Private
Q26	Rowlands	565465	6359685	Private



LEGEND
- Mining Lease Boundary (ML)
- Approved Surface Development Area
- Sunrise Energy Metals Owned Land
- Crown Land
- Fifield State Forest
- Private Landholder
- Mine-owned Dwelling
- Private Dwelling
- Community Receiver
- Meteorological Station
- Modification 4 Background Monitor (2016)
- Project Noise Monitor

Source: Black Range Minerals (2000); Clean TeQ (2017, 2018); NSW Department of Industry (2017); NSW Land & Property Information (2017)

sunrise energy metals

S U N R I S E   P R O J E C T

Sensitive Receiver and Noise Monitoring Locations – Mine and Processing Facility

Figure 4

CTL-20-08 MOD 7_NA_225A

LEGEND

Railway

Mining Lease Boundary (ML)

Sunrise Energy Metals Owned Land

Crown Land

Private Landholder

Mine-owned Dwelling

Private Dwelling

Modified Project

Modified Rail Siding Surface Development Area

Source: Black Range Minerals (2000); NSW Spatial Services (2020); Clean Teq (2017, 2018, 2020).
Orthophoto: © NSW Department of Finance, Services & Innovation (2020)

sunrise energy metals

S U N R I S E   P R O J E C T

Sensitive Receiver Locations - Rail Siding

Figure 5

CTL-20-08 MOD 7_NA_226A

4 Review of Existing Noise Criteria and Management Measures

A summary of the existing Development Consent (DA 374-11-00) noise criteria and existing management measures are provided below.

4.1 Existing Noise Criteria

4.1.1 Construction

Condition 1, Schedule 3 of Development Consent (DA 374-11-00) outlines the construction hours for the Project. This includes construction hours of 7:00 am to 6:00 pm on Monday to Sunday at the rail siding, and 24 hours per day, seven days per week at the mine and processing facility.

In addition, Condition 2, Schedule 3 of Development Consent (DA 374-11-00) requires SEM to minimise noise generated during construction of the development in accordance with the best practice requirements outlined in the ICNG.

4.1.2 Operational

The existing Development Consent (DA 374-11-00) noise criteria for the mine and processing facility is provided in Table 4.1.

Table 4.1 – Development Consent (DA 374-11-00) Noise Criteria for the Mine and Processing Facility

Location and Receiver ID	Day	Evening	Night	
	$L_{Aeq,15min}$	$L_{Aeq,15min}$	$L_{Aeq,15min}$	$L_{A1,1\ min}$
Currajong Park (M08 and M23)	37	37	37	45
Abandoned 2 (M04)	35	36	36	45
Glenburn (M10)				
Rosehill (M28)				
Slapdown (M29)				
Brooklyn (M22)	36	35	35	45
All other privately-owned residence	35	35	35	45

Notes: Wanda Bye is now mine owned and therefore has been removed from the relevant noise criteria above.

$L_{aeq\ (15\ minute)}$ if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the $L_{Aeq,15min}$ descriptor).

The existing Development Consent (DA 374-11-00) noise criteria for the rail siding is provided in Table 4.2.

Table 4.2 – Development Consent (DA 374-11-00) Noise Criteria for the Rail Siding

Location	Day	Evening	Night	
	$L_{Aeq,15min}$	$L_{Aeq,15min}$	$L_{Aeq,15min}$	$L_{A1,1min}$
Glen Rock	37	35	35	45
Ballanrae				
Spring Park				
All other privately-owned residence	35	35	35	45

Development Consent (DA 374-11-00) stipulates noise criteria for the limestone quarry. Given the Modification would not change any Project components at the limestone quarry, the relevant Development Consent (DA 374-11-00) criteria has not been reproduced and noise from the limestone quarry is not considered further.

Condition 7, Schedule 3 of Development Consent (DA 374-11-00) also outlines that the noise criteria outlined in Table 4.1 and Table 4.2 do not apply if a noise agreement with the owner/s or leaseholders of the residence has been reached with SEM.

4.2 Existing Management Measures

The Project operates in accordance with various environmental management plans including the Noise Management Plan (Clean TeQ, 2020b). The Noise Management Plan outlines various noise management measures at the Project including the noise monitoring program, performance indicators, and noise management measures, including:

- temporary cessation of work within an area, or from a particularly noisy piece of equipment, will be considered when adverse conditions are present;
- all plant and machinery used on-site will be maintained regularly to minimise noise generation;
- all plant and machinery used on-site will be operated in a proper and efficient manner (e.g. at correct speed) to minimise noise generation;
- lesser noise generating construction activities (e.g. welding and electrical works) will be conducted during the evening/night-time period;
- regular communication and updates will be provided to local residents on the status and nature of site construction activities; and
- in the event of a complaint from a local resident, SEM will implement the complaints response process.

5 Existing Acoustic Environment

Background noise varies over the course of any 24 hour period, typically from a minimum at 3:00 am in the morning to a maximum during morning and afternoon traffic peak hours. Therefore, the NPfI requires that the level of background and ambient noise be assessed separately for the daytime, evening and night-time periods. The NPfI defines these periods as follows:

- **Day**: 7:00 am to 6:00 pm, Monday to Saturday and 8:00 am to 6:00 pm Sundays and Public Holidays.
- **Evening:** 6:00 pm to 10:00 pm, Monday to Sunday and Public Holidays.
- **Night:** 10:00 pm to 7:00 am, Monday to Saturday and 10:00 pm to 8:00 am Sundays and Public Holidays.

The identified receivers in the vicinity of the mine and processing facility and rail siding are all classified as rural under the NPfI (EPA, 2017). Based on Table 2.1 of the NPfI, for a conservative assessment the minimum assumed Rating Background Levels (RBLs) are adopted for all receiver locations. Therefore, the applicable RBLs used for this assessment are presented in Table 5.1 below.

Table 5.1 – Applicable Rating Background Levels for Mine and Processing Facility and Modified Rail Siding

Time of Day	Minimum RBLs, dB(A)[1]	Applicable RBL, dB(A)
Day	35	**35**
Evening	30	**30**
Night	30	**30**

Notes: 1. In accordance with Table 2.1 of the NPfI (EPA, 2017).

Noise monitoring in the vicinity of the mine and processing facility was conducted as part of the Syerston Project[2] - Modification 4 Noise and Blasting Assessment (Renzo Tonin & Associates, 2017) in 2016 at seven (7) locations. The recorded RBLs for all seven (7) monitoring locations were approximately 30 dB(A) or below (with the exception of one monitoring location which was affected by insect noise) which is consistent with background noise levels expected for the areas (Renzo Tonin & Associates, 2017). These levels are also consistent with the RBLs adopted for this assessment (Table 5.1).

Noise monitoring has not been undertaken in the vicinity of the modified rail siding. Notwithstanding, background noise levels in the vicinity of the modified rail siding are expected to be similar to the levels at the mine and processing facility. This assessment conservatively assumes the minimum RBLs for the modified rail siding (Table 5.1).

[2] In November 2017 the Syerston Project changed name to the Clean TeQ Sunrise Project (now the Sunrise Project).

5.1 Potential Cumulative Interactions with Other Projects

Other key proposed or approved projects that may potentially interact with, or have potential cumulative impacts with, the modified Project include (Figure 1):

- Parkes Special Activation Precinct.
- Cattle Feedlot and Quarry.
- Flemington Cobalt Scandium Mine.
- Owendale Scandium Mine.
- Western Slopes Pipeline.
- Northparkes Mine Extension Project.
- Inland Rail Parkes to Narromine.
- Parkes Solar Farm.
- Goonumbla Solar Farm.
- Quorn Park Solar Farm.
- Parkes Peaking Power Plant.
- Parkes Bypass.
- E44 Rocklands Project.
- Jemalong Solar Farm.
- Daroobalgie Solar Farm.

Of these key proposed or approved projects, only the proposed Flemington Cobalt Scandium Mine and Owendale Scandium Mine may potentially interact with, or have potential cumulative noise impacts with, the modified Project as they are located immediately north-west and north-east of the mine and processing facility, respectively. The Environmental Assessment Requirements for these projects were issued in 2018. In accordance with the draft *Assessing Cumulative Impacts Guide Guidance for State Significant Projects* (Department of Planning, Industry and Environment, 2020) guideline, these projects are 'potentially relevant projects', and are therefore not required to be considered. It is expected that any potential cumulative interactions between these projects and the modified Project would be considered in the noise assessments for these projects.

Potential cumulative interactions with other key proposed or approved projects would not be expected as they are located a considerable distance away from approved and modified Project activities (Figure 1).

6 Meteorology

Certain meteorological conditions may increase noise levels by focusing sound-wave propagation paths at a single point. Such refraction of sound waves occur during temperature inversions (atmospheric conditions where temperatures increase with height above ground level) and where there is a wind gradient (that is, wind velocities increasing with height) with wind direction from the source to the receiver.

Temperature inversions occurring within the lowest 50 m to 100 m of atmosphere can affect noise levels measured on the ground. Temperature inversions are most commonly caused by radiative cooling of the ground at night, leading to the cooling of the air in contact with the ground. This is especially prevalent on cloudless nights with little wind. Air that is somewhat removed from contact with the ground will not cool as much, resulting in warmer air aloft than nearer the ground.

Similarly, when significant wind exists, the conditions can significantly affect noise levels at receptor points downwind of a noise source. This would depend, however, on the particular direction and the velocity of the wind at that time. It should also be noted that although wind can increase noise emission levels as perceived from a downstream assessment point, background noise also tends to increase as a result of increased wind activity. This often causes masking of potential increases in intrusive noise.

The NPfI (EPA, 2017) recommends that project noise criteria are to apply under weather conditions characteristic of an area. These conditions may include calm, wind and temperature inversions. In this regard, the increase in noise that results from atmospheric temperature inversions and wind effects may need to be assessed. The noise levels predicted under characteristic meteorological conditions for each receiver are then compared with the criteria to establish whether the meteorological effect will cause a significant impact.

The NPfI (EPA, 2017) permits two approaches for assessing these effects – use of default parameters and use of site-specific parameters:

- When using default parameters, general meteorological values are used to predict noise levels, foregoing detailed analyses of site-specific meteorological data. This approach assumes that meteorological effects are conservative, in that it is likely to predict the upper range of increases in noise levels. Actual noise levels may be less than predicted.

- The use of site-specific parameters is a more detailed approach, which involves analysing site meteorological data to determine whether inversion and/or wind effects are significant features warranting assessment. Where assessment is warranted, default parameters are available for use in predicting noise or, where preferred, measured values may be used instead. The use of site-specific parameters provides a more accurate prediction of noise increases due to meteorological factors.

SEM collects meteorological data in the vicinity of the mine and processing facility in accordance with Condition 25, Schedule 3 of Development Consent (DA 374-11-00) (Figure 4). In accordance with the NPfI, data collected from weather-monitoring stations are considered relevant for a radius of 30 kilometres from the station, provided the surrounding area is in the same topographical basin as the station. Therefore, the meteorological data collected in the vicinity of the mine and processing facility are also relevant for the rail siding.

For this assessment, the more detailed approach using site-specific meteorological parameters was conducted. Weather data was provided by Jacobs Group (Australia) (Jacobs) (2021) taken from the air quality assessment's (Jacobs, 2021) CALMET model for the years 2019 and 2020 which was based on data from the Project's automated weather station located on-site (Figure 4).

6.1 Temperature Inversions

Assessment of impacts from temperature inversions is confined to the winter night-time period, as this is the time likely to have temperature inversions and produce the greatest impact on amenity of nearby residences. As the Project operates at night-time, there is potential for noise impact due to inversions and further consideration of these effects is required.

Following the NPfI procedure, the likelihood of temperature inversion occurrence was determined based on Pasquill-Gifford stability classes for the winter night-time periods in the weather data. A summary of the likelihood of temperature inversions for the night-time is presented in Table 6.1 below.

Table 6.1 – Winter Night-time Temperature Inversion (TI) Likelihood, %

Season	Pasquill-Gifford Stability Class							TI Likelihood (F+G)
	A	B	C	D	E	F	G	
Winter	0.0	0.0	0.0	5.6	17.4	77.0	-	77.0

The results above indicate that the F class temperature inversions are above the 30% occurrence threshold nominated in the NPfI for the night-time period, and therefore, the adverse temperature inversion conditions need to be considered in the assessment for the night-time period.

6.2 Wind Effects

The NPfI specifies a procedure for assessing the significance of wind effects, and a default wind speed to be used in the assessment (3 metres per second [m/s]) where these effects are found to be significant. The procedure requires that wind effects be assessed where wind is a feature of the area. The assessment considers each of the four seasons and assessment periods (day, evening, and night) individually.

Wind is considered to be a feature where source-to-receiver wind speeds (at 10 m height) of 0.5 to 3 m/s occur for 30% of the time or more in any assessment period (day, evening and night) in any season. Winds with velocities less than 0.5 m/s (calm conditions) and greater than 3 m/s (at 10 m height), are not included in the calculations of wind occurrence.

Analysis of the wind data was undertaken using the EPA's Noise Enhancement Wind Analysis program to determine if wind is a 'feature' of the area as defined by the NPfI. The program determines whether there are prevailing source-to-receiver wind conditions. The results of the analysis are presented in Table 6.2 below.

Table 6.2 – Percentage of Wind Records (0.5 to 3 m/s) from the mine and processing facility to Receiver, %

Direction	Summer			Autumn			Winter			Spring		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
N	7.7	12.6	15.4	14.2	7.5	13.9	8.3	5.6	6.0	6.4	5.6	6.7
NNE	8.2	15.7	22.9	16.2	12.1	21.1	8.5	6.3	8.0	6.9	8.0	8.1
NE	7.7	17.1	21.8	14.9	13.9	23.1	11.4	9.0	10.2	9.9	11.0	16.1
ENE	8.5	15.6	23.4	13.5	15.9	25.2	13.2	11.4	14.4	10.8	16.6	22.0
E	6.8	12.3	20.5	11.8	17.1	21.6	11.9	10.9	14.4	10.6	19.4	20.5
ESE	6.8	10.2	13.5	9.4	15.2	16.2	12.3	11.7	13.1	10.5	21.0	20.6
SE	5.3	10.2	13.5	10.5	16.8	14.7	13.1	13.7	15.3	9.1	19.4	18.1
SSE	3.9	7.5	9.6	7.6	12.8	10.5	7.9	8.6	9.3	5.7	11.8	10.1
S	5.3	19.9	15.1	10.4	**30.3**	23.7	14.0	25.8	21.1	7.3	26.0	22.8
SSW	4.7	19.2	15.7	10.1	**30.7**	26.5	15.5	**33.7**	26.8	8.2	26.9	26.6
SW	5.0	21.0	14.7	8.2	28.4	25.1	13.6	**35.9**	26.5	7.9	29.1	24.8
WSW	5.6	15.2	10.8	7.2	23.9	18.5	11.7	**31.8**	24.5	7.2	24.6	20.6
W	5.1	8.0	7.0	7.1	10.9	11.5	11.7	25.1	22.1	6.8	17.6	15.2
WNW	5.2	6.6	4.5	7.6	7.2	6.9	8.6	15.8	15.9	6.2	12.9	9.3
NW	5.6	4.7	5.1	8.6	5.8	6.2	7.3	8.6	10.8	5.5	8.9	8.0
NNW	5.5	7.6	6.8	10.8	5.8	7.3	8.7	7.2	6.9	5.6	5.5	4.9

Notes: **Bold** denotes greater than 30% occurrence of wind scenario.

The results above indicate that there are greater than 30% occurrence of winds between 0.5 m/s and 3 m/s (source-to-receiver component) for certain directions. Therefore, there are prevailing wind (i.e. adverse) conditions in accordance with the NPfI, and south, south-southwest, south-west and west-southwest wind effects during the evening are considered in this assessment.

In accordance with the NPfI, further analyses were undertaken to determine the significance of winds between 0.5 m/s and 2 m/s (source-to-receiver component) during temperature inversion events on winter nights, and no significance was found.

6.3 Summary of Meteorological Assessment Conditions

Based on the findings in Section 6.1 (temperature inversions will need to be considered in the assessment for the night-time period) and Section 6.2 (wind effects are considered in this assessment for the directions south, south-southwest, south-west and west-southwest for the evening period).

Table 6.3 presents a summary of the meteorological conditions considered for the operational noise computer modelling for the mine and processing facility and rail siding. The assessable meteorological conditions have been prepared in accordance with the NPfI.

Table 6.3 – Summary of Meteorological Assessment Conditions

Period	Meteorological Condition Type	Windspeed (Default)	Wind Direction	Inversion
Day	Standard Conditions	0.5 m/s	Source-receiver	-
Evening	Standard Conditions	0.5 m/s	Source-receiver	-
	Adverse Conditions	3 m/s	South	-
		3 m/s	South-southwest	-
		3 m/s	South-west	-
		3 m/s	West-southwest	-
Night	Standard Conditions	0.5 m/s	Source-receiver	-
	Adverse Conditions	-	-	4°C / 100 m

7 Criteria

7.1 Construction Noise

The key components of the ICNG (DECC, 2009) that are incorporated into this assessment include:

- Use of L_{Aeq} as the descriptor for measuring and assessing construction noise.
- Application of reasonable and feasible noise mitigation measures.

NSW noise policies, including the NPfI, RNP and Rail Infrastructure Noise Guideline (RING) (EPA, 2013) have moved to the primary use of L_{Aeq} over any other descriptor. As an energy average, L_{Aeq} provides ease of use when measuring or calculating noise levels since a full statistical analysis is not required as when using, for example, the L_{A10} descriptor.

As stated in the ICNG, a noise mitigation measure is feasible if it is capable of being put into practice and is practical to build given the project constraints. Selecting reasonable mitigation measures from those that are feasible involves making a judgement to determine whether the overall noise benefit outweighs the overall social, economic and environmental effects.

The ICNG provides two methods for the assessment of construction noise, being either a quantitative or a qualitative assessment. A quantitative assessment is recommended for major construction projects of significant duration, and involves the measurement and prediction of noise levels, and assessment against set criteria. A qualitative assessment is recommended for small projects with a duration of less than three weeks and focuses on minimising noise disturbance through the implementation of reasonable and feasible work practices, and community notification.

Given the scale and the (three year) duration of the construction works proposed for the modified Project, a quantitative assessment has been undertaken, consistent with the ICNG.

Table 7.1, reproduced from the ICNG, sets out the Noise Management Levels (NMLs) and how they are to be applied for residential receivers. The Noise Management Levels outline the criteria used in the construction noise assessment (Section 8).

Table 7.1 – Noise Management Levels at Residential Receivers

<table>
<tr><th>Time of Day</th><th>Management Level $L_{Aeq,15min}$</th><th>How to Apply</th></tr>
<tr><td rowspan="2">Recommended standard hours:
Monday to Friday
7 am to 6 pm
Saturday 8 am to 1 pm
No work on Sundays or public holidays</td><td>Noise affected
RBL + 10 dB(A)</td><td>The noise affected level represents the point above which there may be some community reaction to noise.
Where the predicted or measured $L_{Aeq,15min}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level.
The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.</td></tr>
<tr><td>Highly noise affected
75 dB(A)</td><td>The highly noise affected level represents the point above which there may be strong community reaction to noise.
Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account:
• times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences
• if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.</td></tr>
<tr><td>Outside recommended standard hours</td><td>Noise affected
RBL + 5 dB(A)</td><td>A strong justification would typically be required for works outside the recommended standard hours.
The proponent should apply all feasible and reasonable work practices to meet the noise affected level.
Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community.
For guidance on negotiating agreements see section 7.2.2 of the ICNG.</td></tr>
</table>

Based on the above ICNG requirements, Table 7.2 presents the construction NMLs established for the nearest noise sensitive residential receivers based upon the RBLs nominated in Section 5.

Consistent with Development Consent (DA 374-11-00), construction activities at the modified mine and processing facility would be conducted 24 hours per day, seven days per week and construction activities at the modified rail siding would be conducted between 7:00 am to 6:00 pm, Monday to Sunday.

Table 7.2 – Construction Noise Management Levels at Residential Receivers

Receiver Location	L_{A90} RBL[1,2]			NML $L_{Aeq,15min}$			
				Recommended Standard Hours	Outside Recommended Standard Hours		
	Day	Evening	Night	Day	Day	Evening	Night
All residential receivers	35	30	30	45	40	35	35

Notes: 1. RBLs have adopted the minimum background noise levels nominated in the NPfI as surrounding receivers are rural and previous long term background noise levels were recorded at below the minimum background noise levels (Section 5).

2. the A-weighted sound pressure level that is exceeded for 90% of the 15-minute measurement period.

The construction activities would therefore be conducted both within and outside of the recommended standard construction hours.

The Fifield Hotel (Receiver M34) is assumed to have a permanent caretaker's residence on the property and is considered to be a residential receiver.

Table 7.3 sets out the applicable parts of the ICNG NMLs (measured either internal or external of the premises) for other noise sensitive receiver locations. As identified for residential receivers, a 'highly affected' noise objective of $L_{Aeq,15min}$ 75 dB(A) is also adopted for all noise sensitive receivers, with exceedances addressed as described in Table 7.1.

Table 7.3 – Noise Management Levels at Other Noise Sensitive Land Uses

Land Use	Where Objective Applies	Management Level $L_{Aeq,15min}$
Places of worship	Internal noise level	45 dB(A)
Community centres	Depends on the intended use of the centre.	Refer to the 'maximum' internal levels in AS2107 for specific uses.
Commercial premises	External noise level	70 dB(A)

It is noted that as a general rule, building structures would typically provide a minimum of 10 dB(A) reduction from external noise levels to internal noise levels, with windows opened sufficiently for fresh air ventilation. Therefore, the equivalent external noise management levels for the Fifield Town Hall (Receiver M32) and St Dympna's Catholic Church (Receiver M35) are **55 dB(A)**.

The Fifield Fire Station (Receiver M33) is considered to be a commercial premise.

7.2 Operational Noise

Operational noise from the Project is assessed in accordance with the NPfI. The NPfI is used as a guide by the EPA for setting statutory limits in licences for scheduled noise sources.

The NPfI has two components:

- Controlling intrusive noise impacts in the short term for residences.
- Maintaining noise level amenity for particular land uses for residences and other land uses.

7.2.1 Intrusive Noise Impacts

According to the NPfI, the intrusiveness of a noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the $L_{Aeq,15min}$ descriptor) does not exceed the background noise level measured in the absence of the source by more than 5 dB(A). The intrusiveness criterion is only applicable to residential type receivers and is summarised as follows:

- **$L_{Aeq,15min}$ Intrusiveness noise level = RBL plus 5dB(A)**

Table 7.4 presents the adopted RBLs and the Project intrusiveness noise criteria established for the nearest noise sensitive residential receivers adopting the minimum background noise levels based upon the noise monitoring outlined in Section 5.

Table 7.4 – Project Intrusiveness Criteria

Receiver Location	L_{A90} RBL[1]			$L_{Aeq,15min}$ Intrusiveness Criteria		
	Day	Evening	Night	Day	Evening	Night
All residential receivers	35	30	30	40	35	35

Notes: 1. RBLs have adopted the minimum background noise levels nominated in the NPfI as surrounding receivers are rural and previous long term background noise levels were recorded at below the minimum background noise levels.

7.2.2 Amenity Noise Levels

The amenity noise levels are determined in accordance with Chapter 2.4 of the NPfI. The NPfI recommends base acceptable noise levels for various receivers, including residential, commercial, industrial receivers and sensitive receivers such as schools, hospitals, churches and parks.

To limit continued increases in noise levels, the maximum ambient noise level within an area from industrial noise sources should not normally exceed the acceptable noise levels specified in Table 2.2 of the NPfI, the applicable parts of which are reproduced in Table 7.5 below.

Table 7.5 – Amenity Noise Levels – Recommended L_{Aeq} Noise Levels from Industrial Sources

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended $L_{Aeq,period}$ Amenity Noise Level
Residence	Rural	Day	50
		Evening	45
		Night	40
	Suburban	Day	55
		Evening	45
		Night	40
Hotels, motels, caretakers' quarters, holiday accommodation, permanent resident caravan parks	See column 4	See column 4	5 dB(A) above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day
Place of worship – internal	All	When in use	40
Commercial premises	All	When in use	65

Notes: 2. Daytime: 7:00 am - 6:00 pm; Evening: 6:00 pm - 10;00 pm; Night-time: 10:00 pm - 7:00 am.

3. On Sundays and Public Holidays, Daytime: 8:00 am - 6:00 pm; Evening: 6:00 pm - 10:00 pm; Night-time: 10:00 pm - 8:00 am.

4. The L_{Aeq} index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

It is noted that as a general rule, building structures would typically provide a minimum of 10 dB(A) reduction from external noise levels to internal noise levels, with windows opened sufficiently for fresh air ventilation. Therefore, the equivalent external management levels for the town hall and place of worship are **45 dB(A)** and **50 dB(A)**, respectively.

The recommended amenity noise levels represent the objective for total industrial noise at a receiver location, whereas the Project amenity noise level represents the objective for noise from a single industrial development at a receiver location.

To ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, a project amenity noise level applies for each new source of industrial noise as follows:

- **Project amenity noise level for industrial developments = recommended amenity noise level (Table 7.5) minus 5 dB(A)**

The relevant recommended amenity noise levels as well as Project amenity noise levels are summarised below in Table 7.6.

Table 7.6 – Recommended and Project Amenity Noise Levels, dB(A)

Type of receiver	Land Use	Recommended $L_{Aeq,period}$ Amenity Noise Level			Project $L_{Aeq,period}$ Amenity Noise Level		
		Day	Evening	Night	Day	Evening	Night
Residence	Rural residential	50	45	40	45	40	35
Hotel	Caretakers' quarters (rural)	55	50	45	50	45	40
Any	Place of worship	External 50 dB(A) when in use			External 45 dB(A) when in use		
Any	Commercial premises	65 dB(A) when in use			60 dB(A) when in use		

7.2.3 Project Noise Trigger Levels

In accordance with the NPfI, noise impact should be assessed in terms of both intrusiveness and amenity. The NPfI describes the 'Project noise trigger levels' (PNTL) (also referred to as Project Specific Noise Level [PSNL]) as being the lower (i.e. more stringent) of the Project intrusiveness noise level and Project amenity noise levels. The NPfI also stipulates that Project trigger noise levels should be expressed as $L_{Aeq,15min}$ levels as follows:

- **$L_{Aeq,15min}$ = $L_{Aeq,period}$ plus 3 dB**

Based on the background and ambient noise monitoring carried out at the nearest affected receiver locations, the PNTL are outlined in Table 7.7 below.

Table 7.7 – Project Noise Trigger Levels

Locality	Land Use	Intrusiveness, $L_{Aeq,15min}$, dB(A)			Amenity, $L_{Aeq,15min}$, dB(A)		
		Day	Evening	Night	Day	Evening	Night
Privately Owned Land	Rural residential	**40**	**35**	**35**	48	43	38
Hotel	Caretakers' quarters (rural)	N/A	N/A	N/A	**53**	**48**	**43**
Any	Fifield Town Hall	N/A	N/A	N/A	**External 43 dB(A) when in use**		
Any	St Dympna's Catholic Church	N/A	N/A	N/A	**External 48 dB(A) when in use**		
Any	Fifield Fire Station	N/A	N/A	N/A	**63 dB(A) when in use**		

Notes: **Bold** text denotes the lower of the Project intrusiveness noise levels and Project amenity noise levels (i.e. Project Specific Trigger Levels).

It is noted the PNTLs are consistent with the noise criteria presented in Development Consent (DA 374-11-00), with the exception of Currajong Park, Abandoned 2, Glenburn, Rosehill, Slapdown and Brooklyn residences (Section 4).

7.2.4 Voluntary Land Acquisition and Mitigation Policy

The NSW Government's *Voluntary Land Acquisition and Mitigation Policy: For State Significant Mining, Petroleum and Extractive Industry Developments* (NSW Government, 2018) (VLAMP) refers to the criteria in the NPfI.

The NPfI considers the assessment of intrusiveness and amenity noise levels and states that the intrusiveness and amenity noise levels have been selected to protect at least 90% of the population living in the vicinity of industrial noise sources from the adverse effects of noise for at least 90% of the time. Provided the intrusiveness and amenity noise levels in the policies are achieved, then it is unlikely that most people would consider the resultant noise levels excessive.

In the cases where the PNTL or cannot be achieved, then it does not automatically follow that those people affected by the noise would find the noise unacceptable. In subjective terms, exceedances of the PNTLs are described in the VLAMP and reproduced in Table 7.8 below.

Table 7.8 – Characterisation of Noise Impacts & Potential Treatments

If the Predicted Noise Level minus the PNTL[1] is:	And the Total Cumulative Industrial Noise Level is:	Characterisation of Impacts:	Potential Treatment:
All time periods 0-2 dB(A)	Not applicable	Impacts are considered to be **negligible**	The exceedances would not be discernible by the average listener and therefore would not warrant receiver based treatments or controls
All time periods 3-5 dB(A)	• ← recommended amenity noise level in Table 2.2 of the NPfI; or • > recommended amenity noise level in Table 2.2 of the NPfI, but the increase in total cumulative industrial noise level resulting from the development is ← 1 dB	Impacts are considered to be **marginal**	Provide mechanical ventilation/comfort condition systems to enable windows to be closed without compromising internal air quality/amenity.
All time periods 3-5 dB(A)	> recommended amenity noise level in Table 2.2 of the NPfI, and the increase in total cumulative industrial noise level resulting from the development is > 1dB	Impacts are considered to be **moderate**	As for marginal impacts but also upgraded façade elements such as windows, doors or roof insulation, to further increase the ability of the building façade to noise levels.
Day and evening >5 dB(A)	← recommended amenity noise levels in Table 2.2 of the NPfI	Impacts are considered to be **moderate**	As for marginal impacts but also upgraded façade elements such as windows, doors or roof insulation, to further increase the ability of the building façade to noise levels.
Day and evening >5 dB(A)	> recommended amenity noise levels in Table 2.2 of the NPfI	Impacts are considered to be **significant**	Provide mitigation as for moderate impacts and see voluntary land acquisition provisions below.
Night >5 dB(A)	Not applicable	Impacts are considered to be **significant**	Provide mitigation as for moderate impacts and see voluntary land acquisition provisions below.

Notes: 1. also referred to as the PSNL.

Furthermore, the policy also presents information regarding the requirements for voluntary mitigation and voluntary acquisition. A consent authority can apply voluntary mitigation and voluntary land acquisition rights to reduce:

- *operational noise impacts of a development on privately owned land; and*
- *rail noise impacts of a development on privately owned land near a non-network rail line (private rail line), on or exclusively servicing an industrial site (see Appendix 3 of the RING);*

But not:

- *construction noise impacts, as these impacts are shorter term and can be controlled;*
- *noise impacts on the public road or rail network; or*

- *modifications of existing developments with legacy noise issues, where the modification would have beneficial or negligible noise impacts*[3].

Voluntary Mitigation Rights

A consent authority should only apply voluntary mitigation rights where, even with the implementation of best practice management at the mine and processing facility:

- *the noise generated by the development would meet the requirements in Table 1 (see following page)* (sic)*, such that the impacts would be characterised as marginal, moderate or significant, at any residence on privately owned land; or*
- *the development would increase the total industrial noise level at any residence on privately owned land by more than 1 dB(A) and noise levels at the residence are already above the recommended amenity noise levels in Table 2.2 of the Noise Policy for Industry; or*
- *the development includes a private rail line and the use of that private rail line would cause exceedances of the recommended acceptable levels in Table 6 of Appendix 3 of the RING by greater than or equal to 3 dB(A) at any residence on privately owned land*

All noise levels must be calculated in accordance with the NPfI or RING (as applicable).

The selection of mitigation measures in cases when the PNTLs are not, or cannot be, achieved, should be guided by the potential treatments identified in Table 7.8.

Voluntary Land Acquisition Rights

A consent authority should only apply voluntary land acquisition rights where, even with the implementation of best practice management:

- *the noise generated by the development would be characterised as significant, according to Table 1 (see following page)* (sic)*, at any residence on privately owned land; or*
- *the noise generated by the development would contribute to exceedances of the acceptable noise levels plus 5 dB in Table 2.2 of the NPfI on more than 25% of any privately owned land where there is an existing dwelling or where a dwelling could be built under existing planning controls*[4]*; or*
- *the development includes a private rail line and the use of that private rail line would cause exceedances of the recommended maximum criteria in Table 6 of Appendix 3 of the RING at any residence on privately owned land.*

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[3] Noise issues for existing premises may be addressed through site-specific pollution reduction programs under the *Protection of the Environment Operations Act 1997.*

[4] Voluntary land acquisition rights should not be applied to address noise levels on vacant land other than land specifically meeting these criteria.

All noise levels must be calculated in accordance with the NPfI or RING (as applicable).

7.2.5 Cumulative Noise Levels

For cumulative noise levels, the NPfI amenity criteria is applicable as it is intended to control the total noise level at a receiver location from all industrial or mining developments (Table 3.1). Cumulative noise levels are therefore assessed against the recommended amenity level nominated in Table 7.5.

It is noted there are no other industrial noise sources in the vicinity of the mine and processing facility and modified rail siding that would contribute to cumulative noise levels.

7.2.6 Sleep Disturbance

The potential for sleep disturbance from maximum noise level events from the modified Project during the night time period needs to be considered. Section 2.5 of the NPfI provides sleep disturbance trigger levels and the relevant trigger levels are summarised below:

- *$L_{Aeq,15min}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or*
- *L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater*

For the RBLs in Table 7.4, the relevant trigger levels for the Project are summarised in Table 7.9 below.

Table 7.9 – Sleep Disturbance Trigger Levels

Receiver	Sleep Disturbance Trigger Levels, 10:00 pm - 7:00 am	
	$L_{Aeq,15min}$	L_{AFmax}
All residential	40 dB(A)	52 dB(A)

7.3 Road Traffic Noise

Noise impact from the potential changes in traffic on the surrounding road network due to construction and operational activities is assessed against the RNP (DECCW, 2011). The RNP sets out criteria to be applied to particular types of road and land uses. These noise criteria are to be applied when assessing noise impact and determining mitigation measures for sensitive receivers that are potentially affected by road traffic noise associated with the construction and operation of the modified Project, with the aim of preserving the amenity appropriate to the land use.

Table 7.10 sets out the assessment criteria for residences, to be applied to particular types of projects, road category and land use. These criteria are for assessment against façade corrected noise levels when measured in front of a building façade. The surrounding road network potentially impacted by the modified Project traffic consists of roads classified as sub-arterial roads.

In Table 7.10 below and in accordance with the RNP, freeways, arterial roads and sub-arterial roads are grouped together and attract the same criteria.

Table 7.10 – Road Traffic Noise Assessment Criteria for Residential Land Uses

Road Category	Type of Project/Land Use	Assessment Criteria, dB(A)	
		Day 7:00 am – 10:00 pm	Night 10:00 pm – 7:00 am
Freeway/arterial/sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq,15hour}$ 60 (external)	$L_{Aeq,9hour}$ 55 (external)

Where existing traffic noise levels are above the noise assessment criteria, the primary objective is to reduce these through feasible and reasonable measures to meet the assessment criteria.

As described in the RNP, in assessing feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.

For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'.

The traffic noise impact from the 'land use development with potential to generate additional traffic on existing road' would need to also comply with the 'Relative Increase Criteria' as discussed in Section 2.4 of the RNP. The relative increase criteria are to be applied to the external areas of existing residential and sensitive land uses impacted upon by traffic noise.

The relative increase criteria as set out in the RNP applicable to the modified Project are reproduced in Table 7.11 below.

Table 7.11 – Relative Increase Criteria

Type of Development	Total Traffic Noise Level Increase, dB(A)
Land use development with the potential to generate additional traffic on existing road	Existing traffic $L_{Aeq,period}$ + 12 dB (external)

8 Construction Noise Assessment

8.1 Construction Noise Modelling Scenario

The construction noise modelling scenario for the mine and processing facility is based on the peak construction phase which is expected to occur in Construction Year 2 of the modified Project. The construction noise modelling scenario for the rail siding is considered indicative of the 7 month rail siding construction phase.

Consistent with Development Consent (DA 374-11-00), construction activities at the mine and processing facility would be conducted 24 hours per day, seven days per week and the construction activities at the rail siding would be conducted between 7:00 am to 6:00 pm, Monday to Sunday (Section 7.1).

8.2 Construction Noise Sources

The Sound Power Levels (SWLs) of plant likely to be used during the construction activities have been determined based on manufacturer's specifications, or other available information including Renzo Tonin & Associates' database of noise levels and previous studies.

Modifying factor adjustments, as per Fact Sheet C of the NPfI, has been considered for all proposed plant and equipment. Based on Renzo Tonin & Associates' experience, noise from all proposed plant and equipment, individually and in combination were determined not to exhibit tonal, low-frequency, impulsive, and/or intermittent characteristics. Therefore, no modifying factors corrections are required.

A summary of plant and equipment included in the noise modelling for the construction scenarios and relevant SWLs is provided in Table 8.1.

Table 8.1 – Indicative Construction Plant, Equipment Fleet List and SWLs – Mine and Processing Facility and Rail Siding

Plant Item	Specification	SWLs, dB(A) re. 1pW (per Item)	Number of Items
Mine and Processing Facility			
Excavator	EX1200	115	2
FEL	966	112	3
Franna Crane	-	110	1
Haul Truck	740	110	12
Scraper	-	110	3
Dozer	D10	109	1
Grader	16M	108	2
Roller	825H	107	2
Service Truck	-	105	1
Water Cart	777F	105	2

Plant Item	Specification	SWLs, dB(A) re. 1pW (per Item)	Number of Items
Light Vehicle	-	88	20
Rail Siding			
FEL	998	115	1
Scraper	-	110	1
Dozer	-	109	1
Excavator	-	107	1
Roller	-	107	1
Concrete Truck	-	106	1
Grader	-	106	1
Truck	-	105	2
Light Vehicle	-	88	2

8.3 Noise Modelling Methodology

Noise emissions from the various plant and equipment listed in Table 8.1 were calculated to the nearest and potentially most affected residential receiver locations identified in Table 3.1. The noise modelling methodology has been undertaken in accordance with the ICNG. Noise emissions were determined by modelling the noise sources, receiver locations, topographical features of the intervening area and recommended noise control treatments, using the Environmental Noise Model (ENM) computer program. ENM is an industry accepted noise modelling program which calculates the contribution of each noise source at each specified receptor point and allows for the prediction of the total noise from a site. ENM is endorsed by the EPA and its environmental noise predictions have been verified on many occasions using noise monitoring measurements in the field.

Noise levels were calculated at the nearest affected residential locations considering the maximum case scenario of all plant operating simultaneously.

8.4 Predicted Construction Noise Levels

Table 8.2 below presents predicted construction noise levels at the nearest potentially affected receivers to the mine and processing facility and modified rail siding. Construction noise contours are presented in Appendix B. With regard to noise contours, the calculation involves numerical interpolation from a series of calculations to specific points within a regular spaced grid, 1.5 m above ground level. The noise contours are estimates of the predicted noise levels, and the contour values may differ slightly from equivalent calculations at individual residences.

Table 8.2 – Predicted Construction Noise Levels at Nearest Potentially Affected Receivers ($L_{Aeq,15min}$)

ID	Description	Construction Noise Management Level, dB(A)				Predicted Construction Noise Levels for Year 2, dB(A)		
		Recommended Standard Hours	Outside Recommended Standard Hours			Day	Evening	Night
		Day	Day	Evening	Night			
Mine and Processing Facility								
Privately-owned Receivers								
M01	Longburra	45	40	35	35	<20	<20	<20
M02	Victoria Park	45	40	35	35	<20	<20	<20
M03	Ward 1	45	40	35	35	<20	<20	<20
M04	Abandoned 2	45	40	35	35	20	21	22
M05	Berrilee	45	40	35	35	<20	<20	<20
M06	Bon Accord	45	40	35	35	<20	<20	<20
M07	Boxcowal	45	40	35	35	<20	<20	<20
M08	Currajong Park 2	45	40	35	35	23	23	24
M09	Daisy Hill	45	40	35	35	<20	<20	<20
M10	Q22	45	40	35	35	20	21	22
M12	Louisiana 1	45	40	35	35	<20	<20	<20
M13	Louisiana 2	45	40	35	35	<20	<20	<20
M14	Platina Farm	45	40	35	35	<20	<20	<20
M16	Tarron Vale	45	40	35	35	<20	<20	<20
M17	Wiggins	45	40	35	35	<20	<20	<20
M18	Unnamed Dwelling 18 (abandoned)	45	40	35	35	<20	<20	<20
M19	Howarth	45	40	35	35	<20	<20	<20
M21	Warra Wandi	45	40	35	35	<20	<20	<20
M22	Brooklyn	45	40	35	35	20	20	21
M23	Currajong Park 1	45	40	35	35	22	23	23
M25	Flemington 2	45	40	35	35	<20	<20	<20
M26	Kelvin Grove	45	40	35	35	<20	<20	<20
M27	Milverton	45	40	35	35	<20	<20	<20
M28	Rosehill	45	40	35	35	<20	<20	<20
M29	Slapdown	45	40	35	35	22	23	24
M34	Fifield Hotel	45	40	35	35	<20	<20	<20
F01	Fifield Residences	45	40	35	35	<20	<20	<20
F02		45	40	35	35	<20	<20	<20
F03		45	40	35	35	<20	<20	<20
F04		45	40	35	35	<20	<20	<20
F05		45	40	35	35	<20	<20	<20
F06		45	40	35	35	<20	<20	<20
F07		45	40	35	35	<20	<20	<20
F08		45	40	35	35	<20	<20	<20
F09		45	40	35	35	<20	<20	<20
F10		45	40	35	35	<20	<20	<20

ID	Description	Construction Noise Management Level, dB(A)				Predicted Construction Noise Levels for Year 2, dB(A)		
		Recommended Standard Hours	Outside Recommended Standard Hours			Day	Evening	Night
		Day	Day	Evening	Night			
F11		45	40	35	35	<20	<20	<20
F11		45	40	35	35	<20	<20	<20
F13		45	40	35	35	<20	<20	<20
F14		45	40	35	35	<20	<20	<20
F15		45	40	35	35	<20	<20	<20
F16		45	40	35	35	<20	<20	<20
F17		45	40	35	35	<20	<20	<20
F18		45	40	35	35	<20	<20	<20
F19		45	40	35	35	<20	<20	<20
Community Building								
M32	Fifield Town Hall	55[1]				<20	<20	<20
M33	Fifield Fire Station	70[1]				<20	<20	<20
M35	St Dympna's Catholic Church	55[1]				<20	<20	<20
Mine-owned Receivers								
M15	Sunrise	45	40	35	35	<20	<20	<20
M31	Wanda Bye	45	40	35	35	<20	<20	<20
Rail Siding								
Privately-owned Receivers								
Q04	Rockleigh (abandoned)	45	40	35	35	<20	-	-
Q05	Reas Falls	45	40	35	35	<20	-	-
Q06	Glen Rock	45	40	35	35	31	-	-
Q08	Ballenrae West	45	40	35	35	37	-	-
Q09	Spring Park	45	40	35	35	24	-	-
Q11	The Troffs (abandoned)	45	40	35	35	<20	-	-
Q17	Boree	45	40	35	35	<20	-	-
Q18	Boree 2	45	40	35	35	<20	-	-
Q19	Spring Park 2	45	40	35	35	24	-	-
Q20	Ballanrae North	45	40	35	35	<20	-	-
Q23	Charlton's	45	40	35	35	<20	-	-
Q24	Corinya Park	45	40	35	35	<20	-	-
Q25	Three Trees	45	40	35	35	<20	-	-
Q26	Rowlands	45	40	35	35	24	-	-
Mine-owned Receivers								
Q22	Q22	45	40	35	35	52	-	-

Notes 1. When in use

The predicted construction noise levels at all privately-owned receivers and community buildings were found to comply with the construction NMLs for all relevant time periods (Table 8.2). This outcome is consistent with the approved Project (Renzo Tonin & Associates, 2017).

9 Operational Noise Assessment

9.1 Operational Noise Modelling Scenarios

The scenarios selected for mine and processing facility operational noise modelling for the Modification were:

- Year 1 – the year of commencement of maximum operational fleet.
- Year 10 – reduced operational fleet with the north-western waste emplacement at an indicative height of approximately 323 m Australian Height Datum (AHD) and the north-eastern waste emplacement at an indicative height of approximately 298 m AHD.
- Year 17 – reduced operational fleet with the north-western waste emplacement at maximum height of approximately 330 m AHD and the north-eastern waste emplacement at maximum height of approximately 315 m AHD.

An indicative modified rail siding operational scenario has also been prepared.

Consistent with Development Consent (DA 374-11-00) operations at the mine and processing facility and rail siding would be undertaken 24 hours per day, seven days per week.

9.2 Operational Noise Sources

The SWLs of plant likely to be used during the operation of the modified Project have been determined based on manufacturer's specifications, or other available information including Renzo Tonin & Associates' database of noise levels and previous studies.

Modifying factor adjustments, as per Fact Sheet C of the NPfI, have been considered for all proposed plant and equipment. Based on Renzo Tonin & Associates' experience, noise from all proposed plant and equipment, individually and in combination were determined not to exhibit tonal, low-frequency, impulsive, and/or intermittent characteristics. Therefore, no modifying factors corrections are required.

A summary of plant and equipment included in the noise modelling for the operational scenarios and relevant SWLs is provided in Table 9.1. SEM would have a daytime and evening/night-time fleet with reduced ore and waste haul trucks required during the evening and night (Table 9.1).

9.3 Noise Modelling Methodology

Noise emissions from the various plant and equipment listed in Table 9.1 were calculated to the nearest and potentially most affected residential receiver locations. Noise emissions were determined by modelling the noise sources, receiver locations, topographical features of the intervening area and recommended noise control treatments, using the ENM program.

Table 9.1 – Indicative Operational Plant and Equipment List and SWLs

Plant Item	Specification	$L_{Aeq,15min}$ SWL dB(A) re. 1 pico Watt (pW) (per Item)	Number of Equipment			Period of Use
			Year 1	Year 10	Year 17	
Mine Site						
Process Plant	-	124	1	1	1	Day, Evening, Night
Excavator (Ore)	EX1200	115	3	2	2	Day, Evening, Night
Excavator (Waste)	EX2500	115	1	1	1	Day, Evening, Night
FEL	992K	115	1	1	1	Day, Evening, Night
Haul Truck (Waste)	777D	115	14 (7)	9 (6)	6 (3)	Day (Evening, Night)
Drill Rig	M6290	111	2	2	1	Day, Evening, Night
Compactor	CP64	110	1	1	1	Day, Evening, Night
Franna Crane	-	110	1	1	1	Day, Evening, Night
Haul Truck (Ore) / Moxy	740	110	7 (5)	6 (3)	6 (6)	Day (Evening, Night)
Integrated Tool Carrier	980H	110	1	1	1	Day, Evening, Night
Dozer	D10	109	4	3	2	Day, Evening, Night
Grader	16M	108	4	2	2	Day, Evening, Night
Roller	825H	107	1	1	1	Day, Evening, Night
Heavy Vehicle	-	105	2	2	2	Day, Evening, Night
Service Truck	-	105	4	2	2	Day, Evening, Night
Water Cart	777F	105	4	2	2	Day, Evening, Night
Forklift	MHT-X	103	1	1	1	Day, Evening, Night
Elevated Work Platform	-	98	1	1	1	Day, Evening, Night
Light Vehicle	-	88	14	8	6	Day, Evening, Night
Rail Siding						
FEL	998	115	1	1	1	Day, Evening, Night
Locomotive	-	110	2	2	2	Day, Evening, Night
Reach Stacker	-	106	4 (2)	4 (2)	4 (2)	Day (Evening, Night)
Truck	-	105	4	4	4	Day, Evening, Night
Forklift	-	103	1	1	1	Day, Evening, Night
Light Vehicle	-	88	3	3	3	Day, Evening, Night

Noise levels were calculated at the nearest affected residential locations considering the maximum case scenario of all plant operating simultaneously. As a further exercise, the noise levels resulting from adverse meteorological conditions, potentially increasing noise emissions at the nearest residences, were computed using the ENM program. These occurrences are expected to be infrequent based on typical weather patterns for the study area and present extreme cases.

Where feasible and reasonable, mitigation measures have been introduced into the proposal to reduce potential noise emissions from the modified Project. The iterative steps undertaken are described below:

1. Preliminary noise modelling of scenarios representative of the maximum noise emissions from the modified Project to identify the potential for noise exceedances (Section 9.4).

2. Evaluation of various combinations of noise management and mitigation measures to assess their relative effectiveness.

3. Review of the effectiveness of these measures and assessment of their feasibility by SEM.

4. Adoption of management and mitigation measures to appreciably reduce noise emissions associated with the modified Project (Section 9.5).

9.4 Preliminary Noise Modelling, Evaluation and Review of Management and Mitigation Measures

As described in Section 9.3, preliminary noise modelling of the modified Project was undertaken which indicated that, in the absence of additional noise mitigation measures, intrusive noise levels at privately-owned dwellings could, with adverse meteorological conditions (i.e. Category F temperature inversion conditions at night, or predominate winds in the evening), range up to 7 dB(A) above the PNTLs.

Five privately-owned receivers (M08 [Currajong Park 2], M22 [Brooklyn], M23 [Currajong Park 1], M28 [Rosehill] and M29 [Slapdown]) were predicted to experience moderate and significant exceedances of the PNTLs (i.e. greater than 3 dB[A] above the PNTLs).

Modelling and evaluation of a range of potential noise mitigation benefits, capital and operating costs of mitigation and impacts on related modified Project metrics was undertaken. From this it was identified by SEM that an appreciable noise reduction of up to 2 dB(A) could be reasonably achieved albeit at significant operating cost to SEM, by modifying mining operations during the evening period during various wind enhancing conditions. The following reasonable and feasible mitigation measures were identified and adopted in the noise modelling for the Modification (Section 9.5):

<u>Year 10</u>

- Ceased operations on the north-eastern waste emplacement and ceased operation of an excavator in the eastern pit during south-southwest, south-west and west-southwest wind conditions in the evening period.
- Ceased haulage on the north-western waste emplacement during south wind condition in the evening period.

Year 17

- Ceased haulage on the north-eastern waste emplacement during south-southwest and south-west wind conditions in the evening period.

The resulting achievable maximum intrusive noise levels of up to 40 dB(A) would result in a "moderate" exceedance of the PNTL of 35 dB(A) at two receivers. In accordance with the VLAMP (NSW Government, 2018) these receivers would be afforded noise mitigation measures upon request rights.

Given the considerable operating costs associated with significantly modifying mining operations during adverse meteorological conditions, SEM will seek to enter into negotiated agreements with the owners of the two receivers with predicted moderate exceedances in accordance with the VLAMP (NSW Government, 2018).

In accordance with Condition 7, Schedule 3 of Development Consent (DA 374-11-00) (Section 4.1.2), if negotiated agreements were to be put in place with the owners of the five receivers, or these receivers were to become mine-owned, significant modifications to mining operations would not be considered reasonable, and modifications to mining operations would be less significant, with a noise reduction of less than 2 dB(A) (e.g. ceasing operation of a small number of noisy equipment such as drills, moving such equipment to more sheltered areas, or avoiding the use of intermittently operating auxiliary equipment).

However, if negotiated agreements with the owners of the five receivers are not achieved or are only achieved for a subset of the five receivers, SEM would significantly modify mining operations during the predominant south, south-southwest, south-west and west-southwest wind conditions in the evening period as required to reduce noise levels by up to 2 dB(A).

9.5 Predicted Operational Noise Levels

Table 9.2, Table 9.3 and Table 9.4 below present predicted operational noise levels for Year 1, Year 10 and Year 17, at the nearest potentially affected receivers, respectively.

The results presented in Table 9.2, Table 9.3 and Table 9.4 assume that the reasonable and feasible mitigation measures described in Section 9.4 are implemented and negotiated agreements are not achieved with the owners of the receivers that are exceeded.

Table 9.2 – Year 1 Predicted Operational Noise Levels at Nearest Potentially Affected Receivers ($L_{Aeq,15min}$)

ID	Description	PNTL, dB(A)			Predicted Operational Noise Levels, dB(A)							
					Day	Evening					Night	
		Day	Evening	Night	Standard Conditions	Standard Conditions	S Wind	SSW Wind	SW Wind	WSW Wind	Standard Conditions	F Class Inversion
Mine and Processing Facility												
Privately-owned Receivers												
M01	Longburra	*40*	*35*	*35*	25	24	27	26	23	<20	25	27
M02	Victoria Park	*40*	*35*	*35*	27	26	32	31	29	22	28	32
M03	Ward 1	*40*	*35*	*35*	23	23	24	<20	<20	<20	24	28
M04	Abandoned 2	*40*	*35*	*35*	33	32	19	20	21	23	34	**36**
M05	Berrilee	*40*	*35*	*35*	22	21	22	<20	<20	<20	22	25
M06	Bon Accord	*40*	*35*	*35*	22	21	18	<20	<20	<20	22	24
M07	Boxcowal	*40*	*35*	*35*	24	22	25	26	26	25	23	25
M08	Currajong Park 2	*40*	*35*	*35*	**37**	34	**39**	**40**	**39**	**38**	35	**38**
M09	Daisy Hill	*40*	*35*	*35*	27	25	22	26	27	28	26	28
M10	Glenburn	*40*	*35*	*35*	33	33	20	20	21	23	35	**37**
M12	Louisiana 1	*40*	*35*	*35*	27	25	31	30	29	26	27	29
M13	Louisiana 2	*40*	*35*	*35*	28	25	31	30	29	26	26	29
M14	Platina Farm	*40*	*35*	*35*	21	20	<20	<20	<20	22	21	25
M16	Tarron Vale	*40*	*35*	*35*	27	25	<20	20	25	27	26	27
M17	Wiggins	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	16	18
M18	Unnamed Dwelling 18 (abandoned)	*40*	*35*	*35*	21	20	<20	<20	20	21	20	22
M19	Howarth	*40*	*35*	*35*	22	20	<20	<20	20	21	21	22
M21	Warra Wandi	*40*	*35*	*35*	25	23	22	24	25	26	24	25
M22	Brooklyn	*40*	*35*	*35*	35	32	34	**36**	**37**	**37**	33	35
M23	Currajong Park 1	*40*	*35*	*35*	**36**	32	**37**	**38**	**38**	**37**	33	**37**
M25	Flemington 2	*40*	*35*	*35*	25	24	25	20	<20	<20	25	27
M26	Kelvin Grove	*40*	*35*	*35*	27	25	28	29	29	29	26	29
M27	Milverton	*40*	*35*	*35*	27	24	27	27	28	27	25	27
M28	Rosehill	*40*	*35*	*35*	28	26	33	32	31	28	28	30
M29	Slapdown	*40*	*35*	*35*	35	33	28	33	35	**37**	34	**36**
M34	Fifield Hotel	*40*	*35*	*35*	26	24	<20	<20	21	26	25	29
F01	Fifield Residences	*40*	*35*	*35*	28	26	<20	<20	23	27	27	29
F02		*40*	*35*	*35*	28	26	<20	<20	23	27	27	30

ID	Description	PNTL, dB(A)			Predicted Operational Noise Levels, dB(A)							
					Day	Evening					Night	
		Day	Evening	Night	Standard Conditions	Standard Conditions	S Wind	SSW Wind	SW Wind	WSW Wind	Standard Conditions	F Class Inversion
F03		*40*	*35*	*35*	24	22	<20	<20	19	22	23	25
F04		*40*	*35*	*35*	26	24	<20	<20	23	25	25	28
F05		*40*	*35*	*35*	30	29	<20	20	27	31	31	33
F06		*40*	*35*	*35*	30	30	20	21	28	31	32	34
F07		*40*	*35*	*35*	26	24	<20	<20	21	25	25	28
F08		*40*	*35*	*35*	26	24	<20	<20	21	25	25	28
F09		*40*	*35*	*35*	24	21	<20	<20	<20	22	22	26
F10		*40*	*35*	*35*	27	26	<20	<20	23	27	27	29
F11		*40*	*35*	*35*	27	25	<20	<20	23	26	27	29
F11		*40*	*35*	*35*	27	25	<20	<20	23	26	27	29
F13		*40*	*35*	*35*	26	25	<20	<20	23	26	26	28
F14		*40*	*35*	*35*	26	25	<20	<20	22	25	26	28
F15		*40*	*35*	*35*	23	20	<20	<20	<20	21	22	25
F16		*40*	*35*	*35*	23	20	<20	<20	<20	21	21	24
F17		*40*	*35*	*35*	25	23	<20	<20	20	26	24	29
F18		*40*	*35*	*35*	26	24	<20	<20	22	26	25	28
F19		*40*	*35*	*35*	26	24	<20	<20	<20	25	25	28
Community Building												
M32	Fifield Town Hall	*43 when in use*			26	25	<20	<20	23	26	26	29
M33	Fifield Fire Station	*63 when in use*			25	23	<20	<20	20	25	25	29
M35	St Dympna's Catholic Church	*48 when in use*			26	24	<20	<20	20	25	25	28
Mine-owned Receivers												
M15	Sunrise	*40*	*35*	*35*	32	31	25	24	24	25	32	35
M31	Wanda Bye	*40*	*35*	*35*	36	36	23	24	25	35	37	39
Rail Siding												
Privately-owned Receivers												
Q04	Rockleigh (abandoned)	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
Q05	Reas Falls	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
Q06	Glen Rock	*40*	*35*	*35*	27	28	25	21	20	<20	28	33
Q08	Ballenrae West	*40*	*35*	*35*	30	31	32	33	35	35	32	33
Q09	Spring Park	*40*	*35*	*35*	<20	<20	28	28	26	22	20	26
Q11	The Troffs (abandoned)	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20

ID	Description	PNTL, dB(A)			Predicted Operational Noise Levels, dB(A)							
					Day	Evening					Night	
		Day	Evening	Night	Standard Conditions	Standard Conditions	S Wind	SSW Wind	SW Wind	WSW Wind	Standard Conditions	F Class Inversion
Q17	Boree	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
Q18	Boree 2	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
Q19	Spring Park 2	*40*	*35*	*35*	25	25	34	34	32	28	26	32
Q20	Ballanrae North	*40*	*35*	*35*	<20	<20	<20	20	20	20	<20	<20
Q23	Charlton's	*40*	*35*	*35*	<20	20	<20	<20	<20	<20	21	25
Q24	Corinya Park	*40*	*35*	*35*	<20	<20	<20	<20	<20	23	<20	26
Q25	Three Trees	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
Q26	Rowlands	*40*	*35*	*35*	23	25	<20	<20	<20	24	26	28
Mine-owned Receivers												
Q22	Q22	*40*	*35*	*35*	45	45	49	48	46	42	45	48

Notes: 1. Green denotes a **negligible** exceedance of 0-2 dB(A) above the PNTL.
2. Blue denotes a **moderate** exceedance of 3-5 dB(A) above the PNTL.
3. Red denotes a **significant** exceedance of >5 dB(A) above the PNTL.

Table 9.3 – Year 10 Predicted Operational Noise Levels at Nearest Potentially Affected Receivers ($L_{Aeq,15min}$)

ID	Description	PNTL, dB(A)			Predicted Operational Noise Levels, dB(A)							
					Day	Evening					Night	
		Day	Evening	Night	Standard Conditions	Standard Conditions	S Wind	SSW Wind	SW Wind	WSW Wind	Standard Conditions	F Class Inversion
Mine and Processing Facility												
Privately-owned Receivers												
M01	Longburra	*40*	*35*	*35*	28	27	29	29	26	<20	27	30
M02	Victoria Park	*40*	*35*	*35*	31	30	33	33	31	25	31	33
M03	Ward 1	*40*	*35*	*35*	26	25	24	20	<20	<20	26	29
M04	Abandoned 2	*40*	*35*	*35*	31	32	20	20	21	22	33	35
M05	Berrilee	*40*	*35*	*35*	25	24	25	<20	<20	<20	25	28
M06	Bon Accord	*40*	*35*	*35*	23	22	<20	<20	<20	<20	24	26
M07	Boxcowal	*40*	*35*	*35*	25	23	28	26	26	25	24	28
M08	Currajong Park 2	*40*	*35*	*35*	35	33	**40**	**37**	**37**	**36**	34	**38**
M09	Daisy Hill	*40*	*35*	*35*	25	22	<20	23	25	26	23	29
M10	Glenburn	*40*	*35*	*35*	32	33	20	20	21	22	34	**36**
M12	Louisiana 1	*40*	*35*	*35*	30	29	33	33	32	29	30	32
M13	Louisiana 2	*40*	*35*	*35*	30	28	32	32	31	28	29	32

ID	Description	PNTL, dB(A)			Predicted Operational Noise Levels, dB(A)							
					Day	Evening					Night	
		Day	Evening	Night	Standard Conditions	Standard Conditions	S Wind	SSW Wind	SW Wind	WSW Wind	Standard Conditions	F Class Inversion
M14	Platina Farm	*40*	*35*	*35*	<20	<20	<20	<20	<20	21	<20	24
M16	Tarron Vale	*40*	*35*	*35*	25	25	<20	<20	23	26	25	29
M17	Wiggins	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
M18	Unnamed Dwelling 18 (abandoned)	*40*	*35*	*35*	20	<20	<20	<20	<20	<20	20	23
M19	Howarth	*40*	*35*	*35*	21	21	<20	<20	<20	21	21	24
M21	Warra Wandi	*40*	*35*	*35*	25	23	21	25	26	26	24	29
M22	Brooklyn	*40*	*35*	*35*	33	32	34	35	**36**	**37**	33	**37**
M23	Currajong Park 1	*40*	*35*	*35*	35	33	**39**	**37**	**37**	**36**	34	**37**
M25	Flemington 2	*40*	*35*	*35*	28	28	22	21	<20	<20	29	32
M26	Kelvin Grove	*40*	*35*	*35*	29	26	34	29	29	29	27	31
M27	Milverton	*40*	*35*	*35*	29	27	34	30	30	29	28	31
M28	Rosehill	*40*	*35*	*35*	35	33	**37**	**36**	35	32	34	**36**
M29	Slapdown	*40*	*35*	*35*	29	29	21	26	30	32	30	35
M34	Fifield Hotel	*40*	*35*	*35*	25	25	<20	<20	21	27	27	31
F01	Fifield Residences	*40*	*35*	*35*	27	27	<20	<20	22	27	28	31
F02		*40*	*35*	*35*	27	26	<20	<20	21	26	28	30
F03		*40*	*35*	*35*	24	24	<20	<20	<20	24	25	28
F04		*40*	*35*	*35*	27	28	<20	20	26	29	29	31
F05		*40*	*35*	*35*	30	31	<20	20	28	31	32	34
F06		*40*	*35*	*35*	31	31	20	21	29	32	33	35
F07		*40*	*35*	*35*	26	26	<20	<20	22	27	27	31
F08		*40*	*35*	*35*	26	26	<20	<20	20	25	27	29
F09		*40*	*35*	*35*	25	25	<20	<20	<20	24	26	28
F10		*40*	*35*	*35*	27	27	<20	<20	25	28	29	31
F11		*40*	*35*	*35*	26	26	<20	<20	22	26	27	30
F11		*40*	*35*	*35*	26	26	<20	<20	22	26	27	30
F13		*40*	*35*	*35*	26	26	<20	<20	23	27	28	30
F14		*40*	*35*	*35*	25	25	<20	<20	21	25	27	29
F15		*40*	*35*	*35*	23	23	<20	<20	<20	24	24	27
F16		*40*	*35*	*35*	24	24	<20	<20	<20	23	25	27
F17		*40*	*35*	*35*	23	23	<20	<20	20	27	25	30
F18		*40*	*35*	*35*	25	25	<20	<20	21	25	26	29

ID	Description	PNTL, dB(A)			Predicted Operational Noise Levels, dB(A)							
					Day	Evening					Night	
		Day	Evening	Night	Standard Conditions	Standard Conditions	S Wind	SSW Wind	SW Wind	WSW Wind	Standard Conditions	F Class Inversion
F19		*40*	*35*	*35*	25	25	<20	<20	21	25	26	29
Community Building												
M32	Fifield Town Hall	*43 when in use*			25	26	<20	<20	23	26	27	30
M33	Fifield Fire Station	*63 when in use*			25	25	<20	<20	20	26	26	30
M35	St Dympna's Catholic Church	*48 when in use*			25	26	<20	<20	21	26	27	30
Mine-owned Receivers												
M15	Sunrise	*40*	*35*	*35*	32	32	25	25	25	25	33	35
M31	Wanda Bye	*40*	*35*	*35*	34	35	22	22	23	34	36	39
Rail Siding												
Privately-owned Receivers												
Q04	Rockleigh (abandoned)	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
Q05	Reas Falls	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
Q06	Glen Rock	*40*	*35*	*35*	27	28	25	21	20	<20	28	33
Q08	Ballenrae West	*40*	*35*	*35*	30	31	32	33	35	35	32	33
Q09	Spring Park	*40*	*35*	*35*	<20	<20	28	28	26	22	20	26
Q11	The Troffs (abandoned)	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
Q17	Boree	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
Q18	Boree 2	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
Q19	Spring Park 2	*40*	*35*	*35*	25	25	34	34	32	28	26	32
Q20	Ballanrae North	*40*	*35*	*35*	<20	<20	<20	20	20	20	<20	<20
Q23	Charlton's	*40*	*35*	*35*	<20	20	<20	<20	<20	<20	21	25
Q24	Corinya Park	*40*	*35*	*35*	<20	<20	<20	<20	<20	23	<20	26
Q25	Three Trees	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
Q26	Rowlands	*40*	*35*	*35*	23	25	<20	<20	<20	24	26	28
Mine-owned Receivers												
Q22	Q22	*40*	*35*	*35*	45	45	49	48	46	42	45	48

Notes:
1. Green denotes a **negligible** exceedance of 0-2 dB(A) above the PNTL.
2. Blue denotes a **moderate** exceedance of 3-5 dB(A) above the PNTL.
3. Red denotes a **significant** exceedance of >5 dB(A) above the PNTL.

Table 9.4 – Year 17 Predicted Operational Noise Levels at Nearest Potentially Affected Receivers ($L_{Aeq,15min}$)

ID	Description	PNTL, dB(A)			Predicted Operational Noise Levels, dB(A)							
					Day	Evening					Night	
		Day	Evening	Night	Standard Conditions	Standard Conditions	S Wind	SSW Wind	SW Wind	WSW Wind	Standard Conditions	F Class Inversion
Mine and Processing Facility												
Privately-owned Receivers												
M01	Longburra	*40*	*35*	*35*	26	26	29	28	25	<20	26	29
M02	Victoria Park	*40*	*35*	*35*	29	29	33	32	29	20	29	32
M03	Ward 1	*40*	*35*	*35*	23	23	24	<20	<20	<20	24	28
M04	Abandoned 2	*40*	*35*	*35*	30	31	<20	<20	<20	21	32	35
M05	Berrilee	*40*	*35*	*35*	22	21	24	<20	<20	<20	22	26
M06	Bon Accord	*40*	*35*	*35*	20	20	<20	<20	<20	<20	21	23
M07	Boxcowal	*40*	*35*	*35*	28	27	30	30	30	30	28	30
M08	Currajong Park 2	*40*	*35*	*35*	38	**36**	**40**	**40**	**40**	**40**	**37**	**40**
M09	Daisy Hill	*40*	*35*	*35*	26	24	22	25	28	29	25	28
M10	Glenburn	*40*	*35*	*35*	31	32	<20	<20	<20	20	33	**36**
M12	Louisiana 1	*40*	*35*	*35*	29	28	33	32	31	28	29	32
M13	Louisiana 2	*40*	*35*	*35*	28	28	32	32	31	27	28	32
M14	Platina Farm	*40*	*35*	*35*	<20	<20	<20	<20	<20	21	20	24
M16	Tarron Vale	*40*	*35*	*35*	28	27	<20	20	26	29	28	30
M17	Wiggins	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
M18	Unnamed Dwelling 18 (abandoned)	*40*	*35*	*35*	23	22	<20	<20	22	23	22	24
M19	Howarth	*40*	*35*	*35*	22	20	<20	<20	20	22	20	23
M21	Warra Wandi	*40*	*35*	*35*	25	24	23	27	28	29	25	28
M22	Brooklyn	*40*	*35*	*35*	35	32	33	**36**	**37**	**37**	32	**36**
M23	Currajong Park 1	*40*	*35*	*35*	38	**36**	**40**	**40**	**40**	**40**	**37**	**39**
M25	Flemington 2	*40*	*35*	*35*	23	23	23	<20	<20	<20	24	29
M26	Kelvin Grove	*40*	*35*	*35*	30	28	32	32	32	32	28	31
M27	Milverton	*40*	*35*	*35*	31	29	32	33	33	33	29	32
M28	Rosehill	*40*	*35*	*35*	32	33	**37**	**37**	**36**	34	33	**36**
M29	Slapdown	*40*	*35*	*35*	33	31	23	31	33	34	32	34
M34	Fifield Hotel	*40*	*35*	*35*	24	24	<20	<20	<20	26	25	29
F01	Fifield Residences	*40*	*35*	*35*	30	30	20	21	28	32	32	34
F02		*40*	*35*	*35*	29	29	20	20	28	31	31	33

ID	Description	PNTL, dB(A)			Predicted Operational Noise Levels, dB(A)							
		Day	Evening	Night	Day	Evening					Night	
					Standard Conditions	Standard Conditions	S Wind	SSW Wind	SW Wind	WSW Wind	Standard Conditions	F Class Inversion
F03		40	35	35	26	24	<20	<20	<20	26	25	28
F04		40	35	35	28	27	<20	<20	26	29	28	31
F05		40	35	35	28	29	<20	<20	26	29	30	33
F06		40	35	35	29	29	<20	20	26	29	31	33
F07		40	35	35	24	25	<20	<20	20	25	26	30
F08		40	35	35	28	28	<20	<20	26	29	29	32
F09		40	35	35	25	24	<20	<20	20	25	25	30
F10		40	35	35	26	26	<20	<20	23	27	28	30
F11		40	35	35	26	26	<20	<20	23	27	27	30
F11		40	35	35	26	26	<20	<20	23	27	27	30
F13		40	35	35	26	26	<20	<20	23	27	27	30
F14		40	35	35	26	26	<20	<20	24	27	28	31
F15		40	35	35	23	23	<20	<20	20	24	24	26
F16		40	35	35	23	21	<20	<20	<20	24	22	26
F17		40	35	35	22	22	<20	<20	<20	25	23	28
F18		40	35	35	26	25	<20	<20	20	27	26	29
F19		40	35	35	24	24	<20	<20	<20	25	25	29
Community Building												
M32	Fifield Town Hall	43 when in use			26	26	<20	<20	23	27	27	30
M33	Fifield Fire Station	63 when in use			24	24	<20	<20	<20	25	25	29
M35	St Dympna's Catholic Church	48 when in use			24	25	<20	<20	20	25	26	29
Mine-owned Receivers												
M15	Sunrise	40	35	35	30	31	25	25	24	25	32	35
M31	Wanda Bye	40	35	35	34	35	21	21	22	34	36	38
Rail Siding												
Privately-owned Receivers												
Q04	Rockleigh (abandoned)	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20
Q05	Reas Falls	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20
Q06	Glen Rock	40	35	35	27	28	25	21	20	<20	28	33
Q08	Ballenrae West	40	35	35	30	31	32	33	35	35	32	33
Q09	Spring Park	40	35	35	<20	<20	28	28	26	22	20	26
Q11	The Troffs (abandoned)	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20

ID	Description	PNTL, dB(A)			Predicted Operational Noise Levels, dB(A)							
					Day	Evening					Night	
		Day	Evening	Night	Standard Conditions	Standard Conditions	S Wind	SSW Wind	SW Wind	WSW Wind	Standard Conditions	F Class Inversion
Q17	Boree	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
Q18	Boree 2	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
Q19	Spring Park 2	*40*	*35*	*35*	25	25	34	34	32	28	26	32
Q20	Ballanrae North	*40*	*35*	*35*	<20	<20	<20	20	20	20	<20	<20
Q23	Charlton's	*40*	*35*	*35*	<20	20	<20	<20	<20	<20	21	25
Q24	Corinya Park	*40*	*35*	*35*	<20	<20	<20	<20	<20	23	<20	26
Q25	Three Trees	*40*	*35*	*35*	<20	<20	<20	<20	<20	<20	<20	<20
Q26	Rowlands	*40*	*35*	*35*	23	25	<20	<20	<20	24	26	28
Mine-owned Receivers												
Q22	Q22	*40*	*35*	*35*	45	45	49	48	46	42	45	48

Notes:
1. Green denotes a **negligible** exceedance of 0-2 dB(A) above the PNTL.
2. Blue denotes a **moderate** exceedance of 3-5 dB(A) above the PNTL.
3. Red denotes a **significant** exceedance of >5 dB(A) above the PNTL.

A number of residential receivers were found to exceed the PNTL with the assumed mitigation measures in place, as shown in Table 9.2, Table 9.3 and Table 9.4. All community / commercial receivers were found to comply with the PNTL. A summary of the privately-owned receivers with PNTL exceedances during the operational phase are presented in Table 9.5.

Table 9.5 – Summary of Privately-owned Dwellings with PNTL Exceedances

Zone[1]	Exceedance Level	Maximum Predicted Noise Level		
		Year 1	Year 10	Year 17
Noise Management Zone	Negligible 0-2 dB(A) above PNTL	M04 [Abandoned 2], M10 [Glenburn], M22 [Brooklyn], M29 [Slapdown]	M10 [Glenburn], M22 [Brooklyn], M28 [Rosehill]	M10 [Glenburn], M22 [Brooklyn], M28 [Rosehill]
	Moderate 3-5 dB(A) above PNTL	M08 [Currajong Park 2], M23 [Currajong Park 1]	M08 [Currajong Park 2], M23 [Currajong Park 1]	M08 [Currajong Park 2], M23 [Currajong Park 1]
Noise Affectation Zone	Significant >5 dB(A) above PNTL	-	-	-

Notes: 1. Source: After VLAMP.

With the implementation of the assumed mitigation measures, receivers M04 [Abandoned 2], M10 [Glenburn], M22 [Brooklyn], M28 [Rosehill] and M29 [Slapdown] are predicted to experience negligible exceedances above the PNTL. As described in the NPfI and VLAMP, "negligible" exceedances would not be discernible to the average listener. Receivers M08 [Currajong Park 2] and M23 [Currajong Park 1] are predicted to experience moderate exceedances above the PNTL with the assumed mitigated measures implemented. In accordance with the VLAMP, potential treatment to receivers M08 and M23 include providing mechanical ventilation/comfort condition systems to enable windows to be closed without compromising internal air quality/amenity, also upgraded façade elements such as windows, doors or roof insulation, to further increase the ability of the building façade to reduce noise levels, if requested by the landholder.

With the exception of Currajong Park 1 and 2 (which is now in the moderate exceedance level), all other receivers would remain within the predicted exceedance levels of the approved Project (i.e. negligible exceedance) (Renzo Tonin & Associates, 2017). A comparison of the maximum modified Project's operational noise levels and the Development Consent (DA 374-11-00) is provided in Table 9.6.

Table 9.6 – Comparison of modified Project Operational Noise Levels and Development Consent (DA 374-11-00) Criteria ($L_{Aeq,15min}$)

Location and Receiver ID	Development Consent (DA 374-11-00) Criteria, dB(A)			Modified Project Maximum Predicted Operational Noise Levels, dB(A)		
	Day	Evening	Night	Day	Evening	Night
Mine and Processing Facility						
Currajong Park 2 (M08)	37	37	37	38	40	40
Currajong Park 1 (M23)	37	37	37	38	40	39
Abandoned 2 (M04)				33	32	36
Glenburn (M10)	35	36	36	33	33	37
Rosehill (M28)				35	37	36
Slapdown (M29)				35	37	36
Brooklyn (M22)	36	35	35	35	37	37
All other privately-owned residence	35	35	35	N/A	N/A	N/A
Rail Siding						
Glen Rock (Q06)				27	28	33
Ballanrae (Q08)	37	35	35	30	35	33
Spring Park (Q09)				<20	28	26
All other privately-owned residence	35	35	35	N/A	N/A	N/A

In addition, with the exception of Currajong Park 1 and 2, all other receivers would comply with the amenity noise criteria (Section 7.2.3), which would exceed the relevant criteria by up to 2 dBA in the night.

Mitigated operational noise contours, which incorporate the mitigation measures described above, are presented in Appendix B.

With regards to noise contours, the calculation involves numerical interpolation from a series of calculations to specific points within a regular spaced grid, 1.5 m above ground level. It is noted that the noise contours are estimates of the predicted noise levels, and the contour values may differ slightly from equivalent calculations at individual residences.

As per the VLAMP, review of the operational noise contours in Appendix B found no property experiences exceedance of the acceptable noise levels plus 5 dB in Table 2.2 of the NPfI (i.e. Night = 40 + 5 = 45 dB[A] for rural residential receivers) on more than 25% of the property's land (i.e. any land where there is an existing dwelling or where a dwelling could be built under existing planning controls).

9.6 Sleep Disturbance

The potential for sleep disturbance from the modified Project's night-time operations has been based on the noise modelling methodology described in Sections 9.3 and 9.4. From Section 9.5, no privately-owned receiver location was predicted to experience noise levels greater than $L_{Aeq,15min}$ 40 dB(A) and therefore comply with the $L_{Aeq,15min}$ sleep disturbance trigger level. The $L_{Aeq,15min}$ sleep disturbance trigger level is not considered further from herein.

The proposed operational plant and equipment and their corresponding typical L_{Amax} SWLs used for the prediction of L_{Amax} sleep disturbance are presented in Table 9.7.

Table 9.7 – Sleep Disturbance Sound Power Levels (L_{Amax})

Plant Item	Specification	L_{Amax} SWL dB(A) re. 1pW (per Item)	Number of Equipment		
			Year 1	Year 10	Year 17
Mine and Processing Facility					
Process Plant	-	124	1	1	1
Excavator (Ore)	EX1200	119	3	2	2
Excavator (Waste)	EX2500	119	1	1	1
FEL	992K	120	1	1	1
Haul Truck (Waste)	777D	120	7	6	3
Drill Rig	M6290	114	2	2	1
Compactor	CP64	110	1	1	1
Franna Crane	-	110	1	1	1
Haul Truck (Ore) / Moxy	740	117	5	3	6
Integrated Tool Carrier	980H	116	1	1	1
Dozer	D10	116	4	3	2
Grader	16M	115	4	2	2
Roller	825H	110	1	1	1
Heavy Vehicle	-	116	2	2	2
Service Truck	-	116	4	2	2
Water Cart	777F	116	4	2	2
Rail Siding					
FEL	998	115	1	1	1
Locomotive	-	120	2	2	2
Reach Stacker	-	116	2	2	2
Truck	-	116	4	4	4

Based on the SWLs presented above, Table 9.8 presents the predicted night time L_{Amax} noise levels at the nearest affected residential receivers. The maximum noise level predictions take into account the meteorological assessment conditions nominated in Section 6 for the night time period and presented values are the highest L_{Amax} noise levels predicted over all meteorological conditions.

Table 9.8 – Predicted Sleep Disturbance Noise Levels at Nearest Affected Residential Receivers (L_{Amax})

ID	Description	L_{Amax}, Sleep Disturbance Trigger Level (10:00 pm - 7:00 am)	Predicted Sleep Disturbance Level L_{Amax}		
			Year 1	Year 10	Year 17
Mine and Processing Facility					
Privately-owned Receivers					
M01	Longburra	*52*	32	35	34
M02	Victoria Park	*52*	37	38	37
M03	Ward 1	*52*	32	34	33
M04	Abandoned 2	*52*	39	39	38
M05	Berrilee	*52*	30	33	31
M06	Bon Accord	*52*	29	31	28
M07	Boxcowal	*52*	31	32	35
M08	Currajong Park 2	*52*	44	43	45
M09	Daisy Hill	*52*	33	35	33
M10	Glenburn	*52*	40	39	39
M12	Louisiana 1	*52*	34	37	37
M13	Louisiana 2	*52*	34	37	36
M14	Platina Farm	*52*	29	27	28
M16	Tarron Vale	*52*	33	34	34
M17	Wiggins	*52*	23	24	22
M18	Unnamed Dwelling 18 (abandoned)	*52*	27	28	29
M19	Howarth	*52*	28	29	29
M21	Warra Wandi	*52*	31	35	33
M22	Brooklyn	*52*	41	42	41
M23	Currajong Park 1	*52*	42	43	45
M25	Flemington 2	*52*	32	37	33
M26	Kelvin Grove	*52*	34	36	37
M27	Milverton	*52*	33	37	38
M28	Rosehill	*52*	35	41	41
M29	Slapdown	*52*	41	40	39
F01	Fifield Residences	*52*	35	36	38
F02		*52*	35	35	37
F03		*52*	31	33	33
F04		*52*	33	34	35
F05		*52*	37	37	37
F06		*52*	37	38	37
F07		*52*	33	34	34
F08		*52*	33	34	36
F09		*52*	32	33	35
F10		*52*	34	35	34
F11		*52*	33	34	34
F11		*52*	33	34	34

ID	Description	L_{Amax}, Sleep Disturbance Trigger Level (10:00 pm - 7:00 am)	Predicted Sleep Disturbance Level L_{Amax}		
			Year 1	Year 10	Year 17
F13		*52*	33	34	35
F14		*52*	32	33	35
F15		*52*	30	31	30
F16		*52*	30	32	31
F17		*52*	32	33	32
F18		*52*	33	33	34
F19		*52*	33	33	33
Mine-owned Receivers					
M15	Sunrise	*52*	40	39	40
M31	Wanda Bye	*52*	42	41	41
Rail Siding					
Privately-owned Receivers					
Q04	Rockleigh (abandoned)	*52*	26	26	26
Q05	Reas Falls	*52*	27	27	27
Q06	Glen Rock	*52*	46	46	46
Q08	Ballenrae West	*52*	47	47	47
Q09	Spring Park	*52*	39	39	39
Q11	The Troffs (abandoned)	*52*	24	24	24
Q17	Boree	*52*	29	29	29
Q18	Boree 2	*52*	29	29	29
Q19	Spring Park 2	*52*	43	43	43
Q20	Ballanrae North	*52*	31	31	31
Q23	Charlton's	*52*	37	37	37
Q24	Corinya Park	*52*	38	38	38
Q25	Three Trees	*52*	22	22	22
Q26	Rowlands	*52*	40	40	40
Mine-owned Receivers					
Q22	Q22	*52*	61	61	61

From Table 9.8, predicted sleep disturbance noise levels for all privately owned receivers were found to comply with the sleep disturbance trigger level for all operational years.

10 Road Traffic Noise Assessment

A Road Transport Assessment for the Modification was prepared by The Transport Planning Partnership (TTPP) (2021). The modified Project operational traffic would be consistent through the life of the modified Project and the year 2033 was selected as a future assessment scenario by TTPP (2021).

The Road Transport Assessment (TTPP, 2021) identified six road locations for forecasting future traffic volumes to determine the impact on the traffic volumes carried by the surrounding road network for the year 2033. Table 10.1 presents the future day (7:00 am to 10:00 pm) and night (10:00 pm to 7:00 am) total traffic for the modified Project compared to the approved Project on the six surrounding roads, including a breakdown of light and heavy vehicles.

Table 10.1 – Traffic Volumes

Road	Total traffic (vehicles per day)					
	Day (7:00 am – 10:00 pm)			Night (10:00 pm - 7:00 am)		
	Light	Heavy	Total	Light	Heavy	Total
Year 2033 with Modification						
1. The Bogan Way north of Trundle	552	139	691	61	20	81
2. Fifield Road north of Platina Road	356	394	750	48	95	143
3. Fifield-Trundle Road west of The Bogan Way	147	108	255	39	41	80
4. Platina Road east of Fifield Road	139	140	279	31	45	76
5. Wilmatha Road west of Slee Street	73	147	220	37	50	87
6. Slee Street in Fifield	356	394	750	48	95	143
Year 2033 with Approved Project						
1. The Bogan Way north of Trundle	541	140	681	50	17	67
2. Fifield Road north of Platina Road	366	397	763	58	92	150
3. Fifield-Trundle Road west of The Bogan Way	138	104	242	30	35	65
4. Platina Road east of Fifield Road	138	140	278	30	39	69
5. Wilmatha Road west of Slee Street	90	150	240	54	47	101
6. Slee Street in Fifield	366	397	763	58	92	150

Based on the traffic volumes in Table 10.1, and the nearest distance from each of the six roads to residential receivers, the traffic noise levels at the worst affected receiver locations are predicted for the year 2033 and compared in Table 10.2. If the predicted traffic noise levels at the closest residential receiver meets the proposed criteria then the criteria would be met at all other residential receivers along the same road.

Table 10.2 – Predicted Day ($L_{Aeq,15hour}$) and Night ($L_{Aeq,9hour}$) Traffic Noise Levels

Road	Distance to nearest receiver (m)	Day $L_{Aeq,15hour}$ (dB[A]) (7:00 am – 10:00 pm)			Night $L_{Aeq,9hour}$ (dB[A]) (10:00 pm - 7:00 am)		
		Modific -ation Traffic	Approved Traffic	Differ -ence	Modific -ation Traffic	Approved Traffic	Differ -ence
1. The Bogan Way north of Trundle	22	56	56	-0.1	49	49	0.8
2. Fifield Road north of Platina Road	35	56	56	0.0	52	52	0.1
3. Fifield-Trundle Road west of The Bogan Way	200	41	41	0.2	39	38	0.7
4. Platina Road east of Fifield Road	52	51	51	0.0	48	48	0.6
5. Wilmatha Road west of Slee Street	16	53	53	-0.1	51	51	0.1
6. Slee Street in Fifield	11	59	59	0.0	55	55	0.1

From Table 10.2, the daytime $L_{Aeq,15hour}$ traffic noise levels predicted for receivers along all six roads are within the RNP $L_{Aeq,15hour}$ noise criterion of 60 dB(A) for year 2033. Furthermore, the receivers along all six roads would not experience an increase of more than 2 dB(A) compared to existing traffic noise levels, without the Project.

The night time $L_{Aeq,9hour}$ traffic noise levels predicted for receivers along all six roads are within the RNP $L_{Aeq,9hour}$ noise criterion of 55 dB(A) for year 2033. Furthermore, the receivers along all six roads would not experience an increase of more than 2 dB(A) compared to existing traffic noise levels, without the modified Project.

From Table 10.2, the noise level change between the approved Project and the Modification scenarios are less than 2 dB at receivers close to the roads and it would be expected that receivers well removed from the roads would also experience a less than 2 dB increase. The Modification therefore complies with the relative increase criteria.

11 Conclusion

11.1 General

- SEM has undertaken a Project Execution Plan to identify opportunities to improve the overall efficiency of the of the Project and the Modification involves the implementation of these opportunities.
- For day, evening and night periods the minimum RBLs as nominated in the NPfI have been adopted to allow for a conservative assessment.
- An analysis of noise enhancement from adverse meteorological conditions has been conducted in accordance with the NPfI based upon the CALMET model outputs provided by the air quality consultant (Jacobs). Based on site-specific meteorological data, both wind enhancement and temperature inversions were found to be a feature of the area and were included in the operational noise modelling. Noise modelling for the operational phase was undertaken under a varied set of adverse meteorological conditions.

11.2 Project Construction Noise

- Project construction activities at the mine and processing facility would occur 24 hours per day, seven days per week.
- Construction activities at the rail siding would occur 7:00 am to 6:00 pm, Monday to Sunday.
- The mine and processing facility construction scenario was assessed for the peak construction phase which is expected to occur in Construction Year 2 of the Project.
- The modified rail siding construction scenario is considered indicative of the 7 month rail siding construction phase.
- All surrounding receivers were found to comply with the ICNG noise management levels.

11.3 Project Operational Noise

- Operational scenarios were considered for Year 1, Year 10 and Year 17 at the mine and processing facility coinciding with the commencement of utilisation of the maximum operational fleet and subsequent significant stages of development of the north-eastern and north-western emplacements.
- An operation scenario was also developed for the modified rail siding.
- Following the implementation of feasible and reasonable mitigation measures, five (5) privately owned receivers are predicted to experience negligible (i.e. 1 to 2 dB[A]) exceedances of the PNTL and two (2) privately owned receivers are predicted to experience moderate (i.e. 3 to 5 dB[A]) exceedances of the PNTL.

- All privately-owned receivers are predicted to experience operational noise levels below the PNTL at the modified rail siding.
- In accordance with the NSW Government's *Voluntary Land Acquisition and Mitigation Policy – SSD Mining* (NSW Government, 2018), negligible exceedances would not be discernible by the average listener and would not warrant receiver based treatments or controls. The potential treatment for moderate exceedances would be to provide mechanical ventilation / comfort condition systems to enable windows to be close without comprising internal air quality / amenity and also upgraded façade elements such as windows, doors or roof insulation, to further increase the ability of the building façade to noise levels, if requested by the landholder.
- All privately-owned receivers are predicted to experience night-time L_{Amax} noise levels below the sleep disturbance trigger level.

11.4 Project Road Traffic Noise

- Road traffic noise was assessed for the year 2033 for six major roads of the surrounding road network, as determined by the Road Transport Assessment for the modified Project (TTPP, 2021).
- Predicted road traffic noise at sensitive receiver locations for all day and night periods were found to comply with the relevant RNP criteria and requirements.

References

1. Clean TeQ (2020a) *Project Execution Plan*.
2. Clean TeQ (2020b) *Clean TeQ Sunrise Project Noise Management Plan.*
3. Department of Environment and Climate Change (2009) *NSW Interim Construction Noise Guideline.*
4. Department of Environment, Climate Change and Water (2011) *NSW Road Noise Policy.*
5. Department of Planning, Industry and Environment (2020) *Assessing Cumulative Impacts Guide - Guidance for State Significant Projects.*
6. Environment Protection Authority (2013) *Rail Infrastructure Noise Guideline*.
7. Environment Protection Authority (2017) *NSW Noise Policy for Industry*.
8. Jacobs Group (Australia) (2021) *Sunrise Project - Project Execution Plan Modification Air Quality and Greenhouse Gas Assessment*
9. New South Wales Government (2018) *Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Developments.*
10. Renzo Tonin & Associates (2017) *Syerston Project – Modification 4 Noise and Blasting Assessment.*
11. The Transport Planning Partnership (2021) *Sunrise Project Project Execution Plan Road Transport Assessment.*

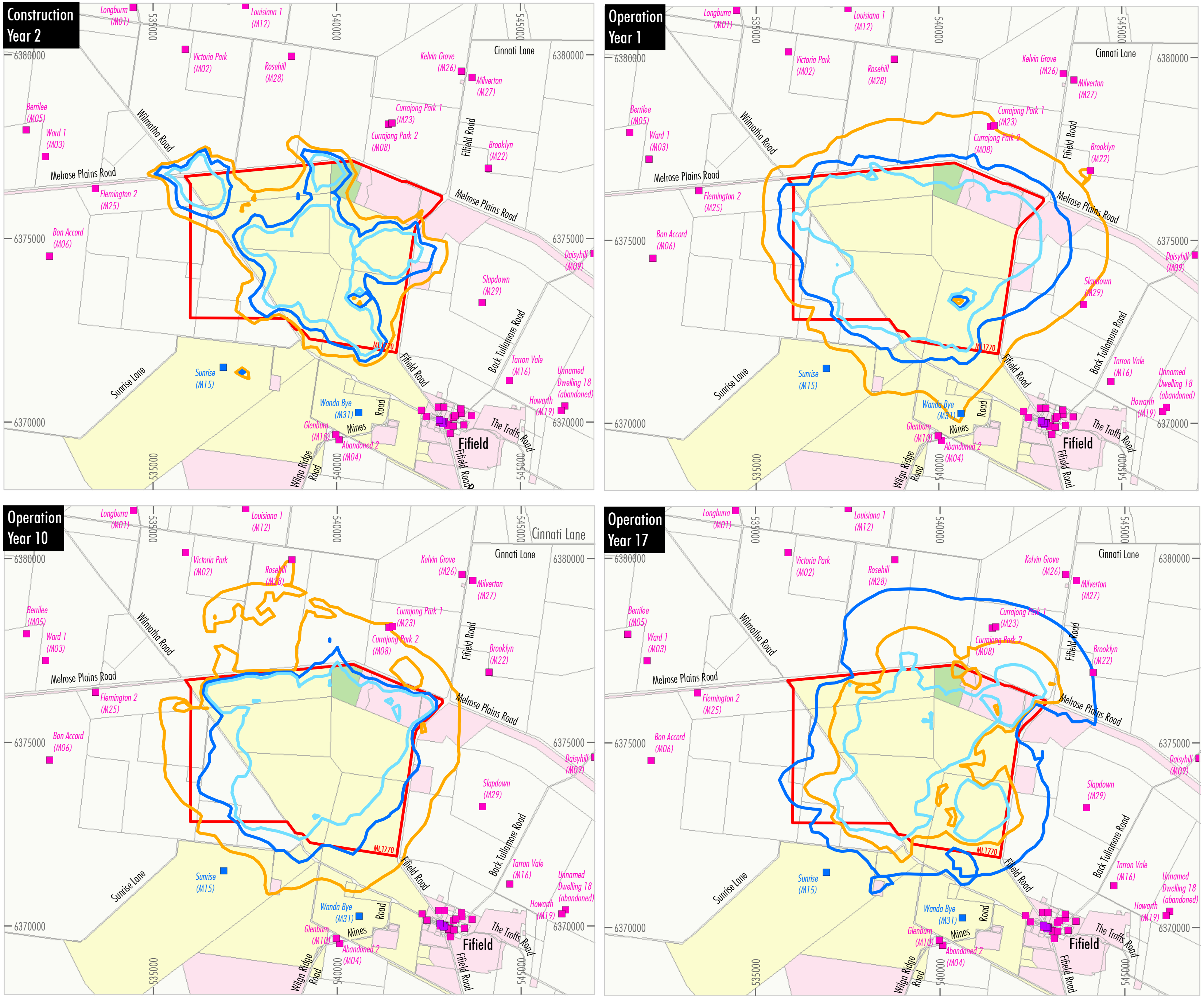
APPENDIX A Glossary of Terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Assessment period	The period in a day over which assessments are made.
Assessment point	A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L_{90} noise level (see below).
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of every day sounds: 0 dB The faintest sound we can hear 30 dB A quiet library or in a quiet location in the country 45 dB Typical office space. Ambience in the city at night 60 dB CBD mall at lunch time 70 dB The sound of a car passing on the street 80 dB Loud music played at home 90 dB The sound of a truck passing on the street 100 dB The sound of a rock band 110 dB Operating a chainsaw or jackhammer 120 dB Deafening
dB(A)	A-weighted decibels. The A-weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L_{Max}	The maximum sound pressure level measured over a given period.
L_{Min}	The minimum sound pressure level measured over a given period.
L_1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.

L_{10}	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L_{90}	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L_{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.

APPENDIX B Construction and Operational Noise Contours



LEGEND

- Mining Lease Boundary (ML)
- Sunrise Energy Metals Owned Land
- Crown Land
- Fifield State Forest
- Private Landholder
- Mine-owned Dwelling
- Private Dwelling
- Community Receiver
- 35 dB(A) Noise Contour
- 40 dB(A) Noise Contour
- 45 dB(A) Noise Contour

Note: Fifield receiver labels are shown on Figure 4.

Criteria:
Construction (during recommended standard hours): 45 dB(A)
Construction (outside recommended standard hours): 40 dB(A)
Operation: 40 dB(A)

N

0 4
Kilometres
GDA 1994 MGA Zone 55

Source: Black Range Minerals (2000); CleanTeQ (2017, 2019); Renzo Tonin (2021); NSW Department of Industry (2017); NSW Land & Property Information (2017)

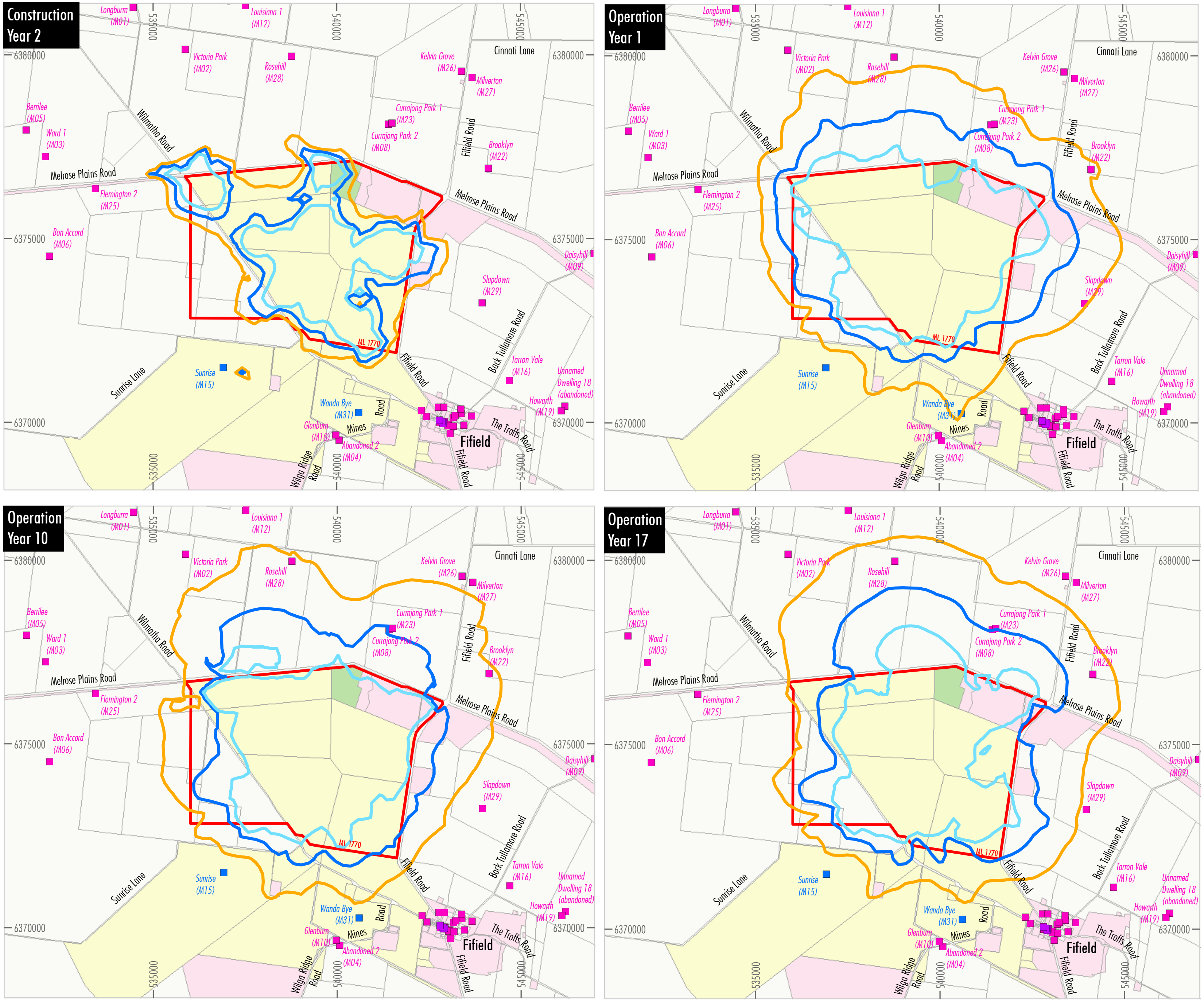
sunrise energy metals

S U N R I S E   P R O J E C T

Maximum Day Construction and Operation Noise Contours $L_{Aeq\,(15\ minute)}$ dB(A) – Mine and Processing Facility

Figure B-1

CTL-20-08 MOD 7_NA_228A



LEGEND

- Mining Lease Boundary (ML)
- Sunrise Energy Metals Owned Land
- Crown Land
- Fifield State Forest
- Private Landholder
- Mine-owned Dwelling
- Private Dwelling
- Community Receiver
- 35 dB(A) Noise Contour*
- 40 dB(A) Noise Contour*
- 45 dB(A) Noise Contour*

*Note: * Contours shown are the maximum case for all modelled standard meteorological conditions and relevant noise enhancing winds (e.g. S, SW, SSW, WSW).*

Note: Fifield receiver labels are shown on Figure 4.

Criteria = 35 dB(A)

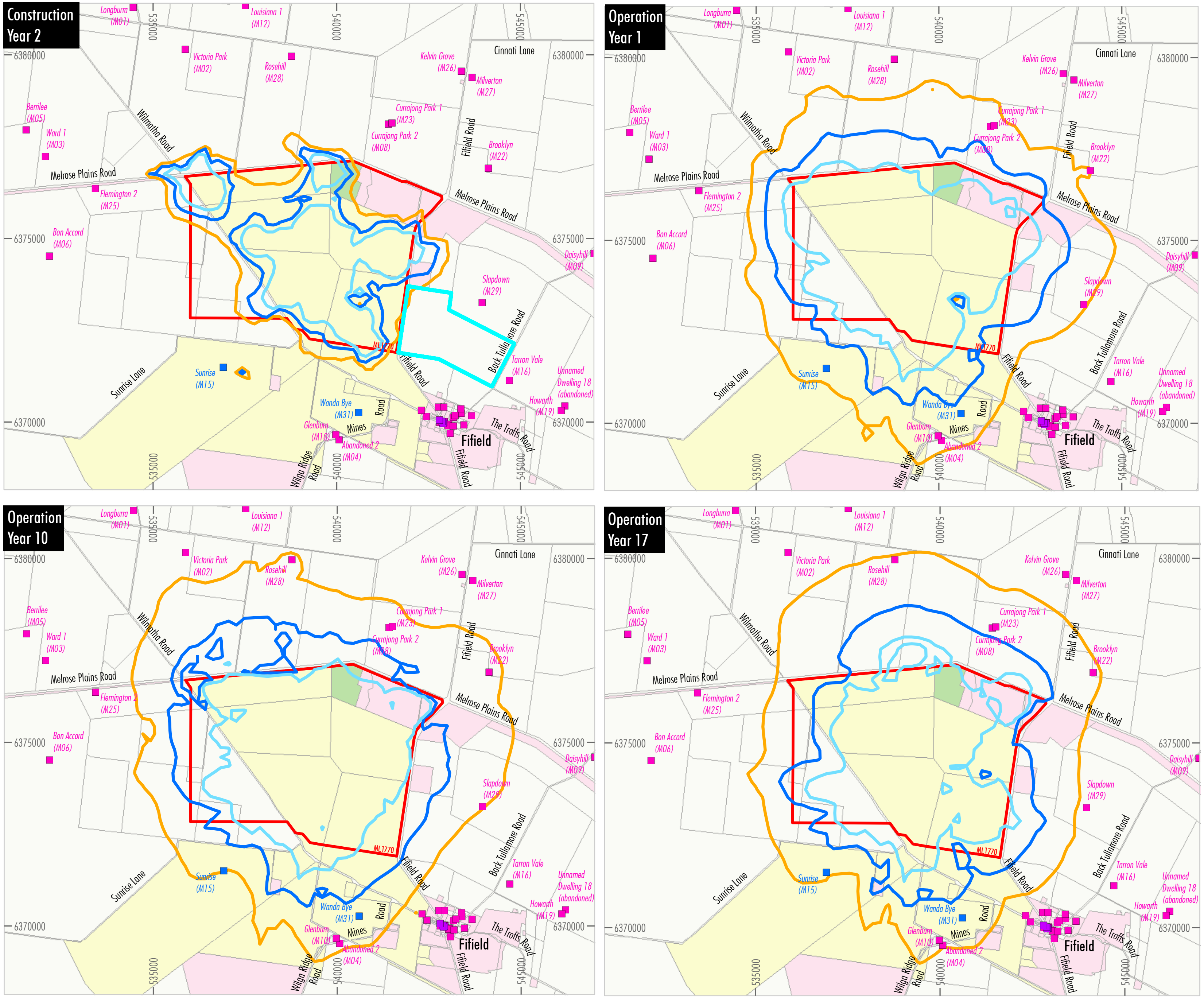
Source: Black Range Minerals (2000); Clean TeQ (2017, 2019); Renzo Tonin (2021); NSW Department of Industry (2017); NSW Land & Property Information (2017)

sunrise energy metals

S U N R I S E   P R O J E C T

Maximum Evening Construction and Operation Noise Contours $L_{Aeq\ (15\ minute)}$ dB(A) – Mine and Processing Facility

Figure B-2



LEGEND

- Mining Lease Boundary (ML)
- Sunrise Energy Metals Owned Land
- Crown Land
- Fifield State Forest
- Private Landholder
- Mine-owned Dwelling
- Private Dwelling
- Community Receiver
- 35 dB(A) Noise Contour
- 40 dB(A) Noise Contour
- 45 dB(A) Noise Contour

Note: Fifield receiver labels are shown on Figure 4.

Criteria = 35 dB(A)

N

0 4

Kilometres

GDA 1994 MGA Zone 55

Source: Black Range Minerals (2000); CleanTeQ (2017, 2019); Renzo Tonin (2021); NSW Department of Industry (2017); NSW Land & Property Information (2017)

sunrise energy metals

SUNRISE PROJECT

Maximum Night Construction and Operation Noise Contours $L_{Aeq\,(15\,minute)}$ dB(A) – Mine and Processing Facility

Figure B-3

CTL-20-08 MOD 7_NA_229A

LEGEND
Railway
Sunrise Energy Metals Owned Land
Crown Land
Private Landholder
Mine-owned Dwelling
Private Dwelling
35 dB(A) Noise Contour
40 dB(A) Noise Contour
45 dB(A) Noise Contour

Modified Project

Modified Rail Siding Surface Development Area

Criteria:
Day (Outside of Recommended Hours) = 40 dB(A)
Day (During Recommended Hours) = 45 dB(A)
Evening = 35 dB(A)
Night = 40 dB(A)

Source: Black Range Minerals (2000);
NSW Spatial Services (2020);
Clean Teq (2017, 2018, 2020); Renzo Tonin (2021).

N
0 1
Kilometres
GDA 1994 MGA Zone 55

sunrise energy metals

SUNRISE PROJECT

Maximum Construction Noise Contours $L_{Aeq\ (15\ minute)}$ dB(A) – Rail Siding

Figure B-4

CTL-20-08 MOD 7_NA_231A

sunrise energy metals

S U N R I S E   P R O J E C T

Maximum Operation
Noise Contours $L_{Aeq\,(15\,minute)}$ dB(A)
– Rail Siding

Figure B-5

CTL-20-08 MOD 7_NA_230A

sunrise
energy metals

w w w . s u n r i s e e m . c o m

sunrise
energy metals

Sunrise Project

Project Execution Plan Modification

Appendix C

Surface Water Assessment

HYDRO ENGINEERING & CONSULTING PTY LTD

REPORT

Sunrise Project

Project Execution Plan

Modification

Surface Water Assessment

Prepared for: Sunrise Energy Metals Limited

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Revision	Description	Author	Reviewer	Approved	Date
f	Final	CAW	TSM/RS	TSM	28/6/2021
g	Final Rev 1	CAW	TSM/Client	TSM	29/6/2021
h	Final Rev 2	CAW	TSM/Client	TSM	30/6/2021

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

1.1 BACKGROUND

The Sunrise Project (the Project) is a nickel, cobalt and scandium open cut mining project situated near the village of Fifield, approximately 350 kilometres (km) west-northwest of Sydney, in New South Wales (NSW) (Figure 1). Construction of the Project commenced in 2006, which included components of the borefield, however construction of other Project components is yet to commence.

SRL Ops Pty Ltd owns the rights to develop the Project. SRL Ops Pty Ltd is a wholly owned subsidiary of Sunrise Energy Metals Limited (SEM)[1].

Development Consent (DA 374-11-00) for the Project was issued under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) in 2001. Six modifications to Development Consent (DA 374-11-00) have since been granted under the EP&A Act.

The Project Execution Plan (Clean TeQ, 2020) identified a number of changes to the approved mine and processing facility, accommodation camp, rail siding and road transport activities. The Project Execution Plan Modification (the Modification) includes these Project Execution Plan changes to allow for the optimisation of the construction and operation of the Project.

Hydro Engineering & Consulting Pty Ltd (HEC) was engaged by SEM to conduct an assessment of the relevant surface water aspects of the modified Project. The results of this assessment are documented in this Surface Water Assessment, which has been prepared to support an application by SEM to modify Development Consent (DA 374-11-00) for the Project.

1.1 MODIFICATION DESCRIPTION

The Modification would include the following changes to the approved Project, as illustrated in Figure 2 and Figure 3:

<u>Mine and Processing Facility</u>

- addition of a temporary construction laydown area inside the approved tailings storage facility surface development area;
- optimised production schedule resulting in an increased mining rate during the initial years of mining and associated changes to mining and waste rock emplacement sequencing;
- revised processing facility area layout, including a revised processing plant layout and two additional vehicle site access points;
- reduced sulphuric acid plant stack height from 80 metres (m) to 40 m;
- revisions to processing plant reagent types, rates and storage volumes;
- revised tailings storage facility (TSF) cell construction sequence and the addition of a decant transfer pond (DTP);
- relocated and resized evaporation pond (EP);
- changes to the water management system to reflect the modified mine and processing facility layout;
- increased number of diesel-powered backup generators (and associated stacks) from one to four;

[1] SEM was previously Clean TeQ Holdings Limited (Clean TeQ).

- addition of exploration activities within the approved surface development area inside Mining Lease (ML) 1770;
- increased peak construction phase workforce from approximately 1,000 to approximately 1,900 personnel;

Rail Siding

- revised rail siding location and layout;
- addition of an ammonium sulphate storage and distribution facility to the rail siding;
- extension of the Scotson Lane upgrade;
- addition of a 22 kV electricity transmission line (ETL) (subject to separate approval) to the rail siding power supply;
- increased peak operational phase workforce from approximately five to approximately 10 personnel;

Accommodation Camp

- increased construction phase capacity from 1,300 to 1,900 personnel;
- increased size of the treated wastewater irrigation area;
- option for an alternative alignment of the last section of the accommodation camp water pipeline along the accommodation camp services corridor, rather than along the access road corridor; and
- option to transfer treated wastewater to the mine and processing facility for reuse via a water pipeline located inside the approved services corridor.

Road Transport Activities

- changes to construction phase vehicle movements associated with the increased construction phase accommodation camp capacity and changes to heavy vehicle delivery requirements;
- changes to operational phase heavy vehicle movements associated with revisions to processing plant reagent types, rates and storage volumes; and
- changes to operational phase heavy vehicle movements to and from the rail siding associated with the transport of metal sulphate and ammonium sulphate products.

The Modification would not change the following approved components of the Project:

- other mine and processing facility components (e.g. surface development area, mining method, processing method and rate, tailings management and water management concepts);
- other accommodation camp components (e.g. surface development area; operational phase capacity);
- other transport activities and transport infrastructure (e.g. the Fifield Bypass);
- limestone quarry;
- borefield, surface water extraction infrastructure and water pipeline; and/or
- gas pipeline.

1.2 STUDY REQUIREMENTS AND SCOPE

The scope of works for this Surface Water Assessment comprises:

- update of the existing Project site water balance to reflect the modified Project, and subsequent water balance modelling to indicate whether the Modification would result in any changes to the Project water demand or water management system;
- assessment of potential impacts of the Modification on surface water catchments and drainage and downstream water quality impacts;
- consideration of potential surface water license requirements for the modified Project; and
- review of the approved surface water management measures and monitoring program and, if necessary, recommendation of extensions or improvements.

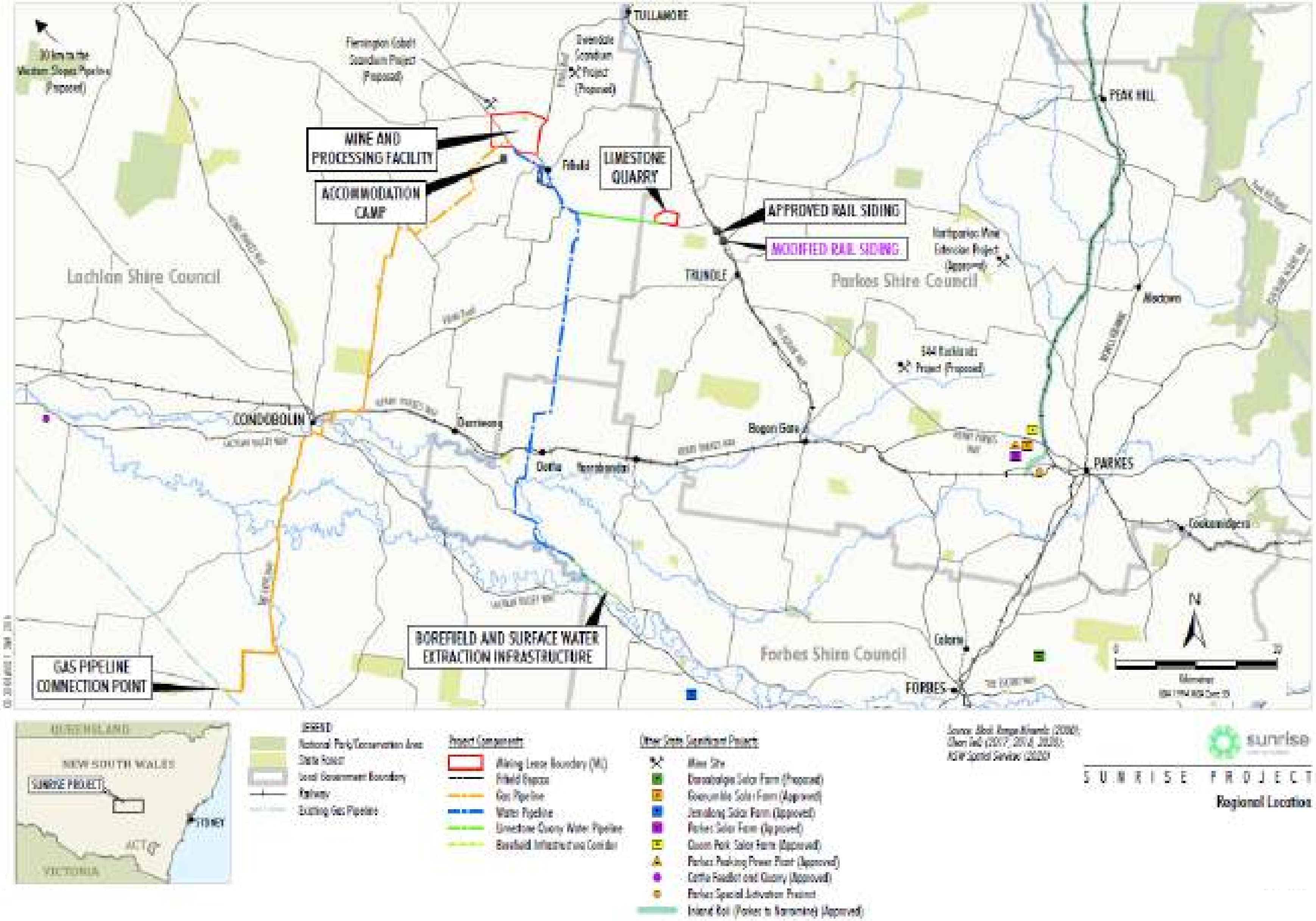


Figure 1 Regional Location

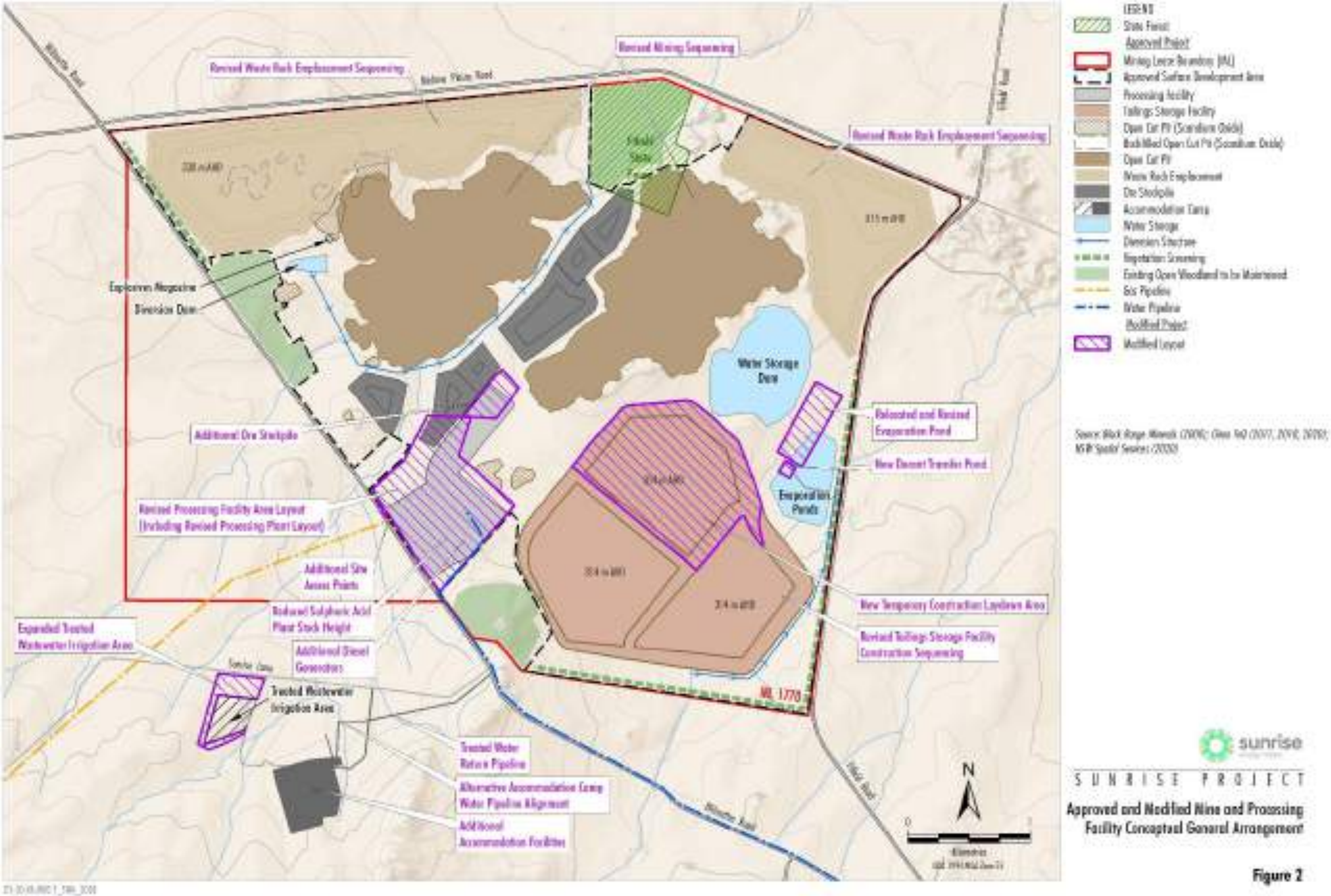


Figure 2 Mine and Processing Facility Conceptual General Arrangement

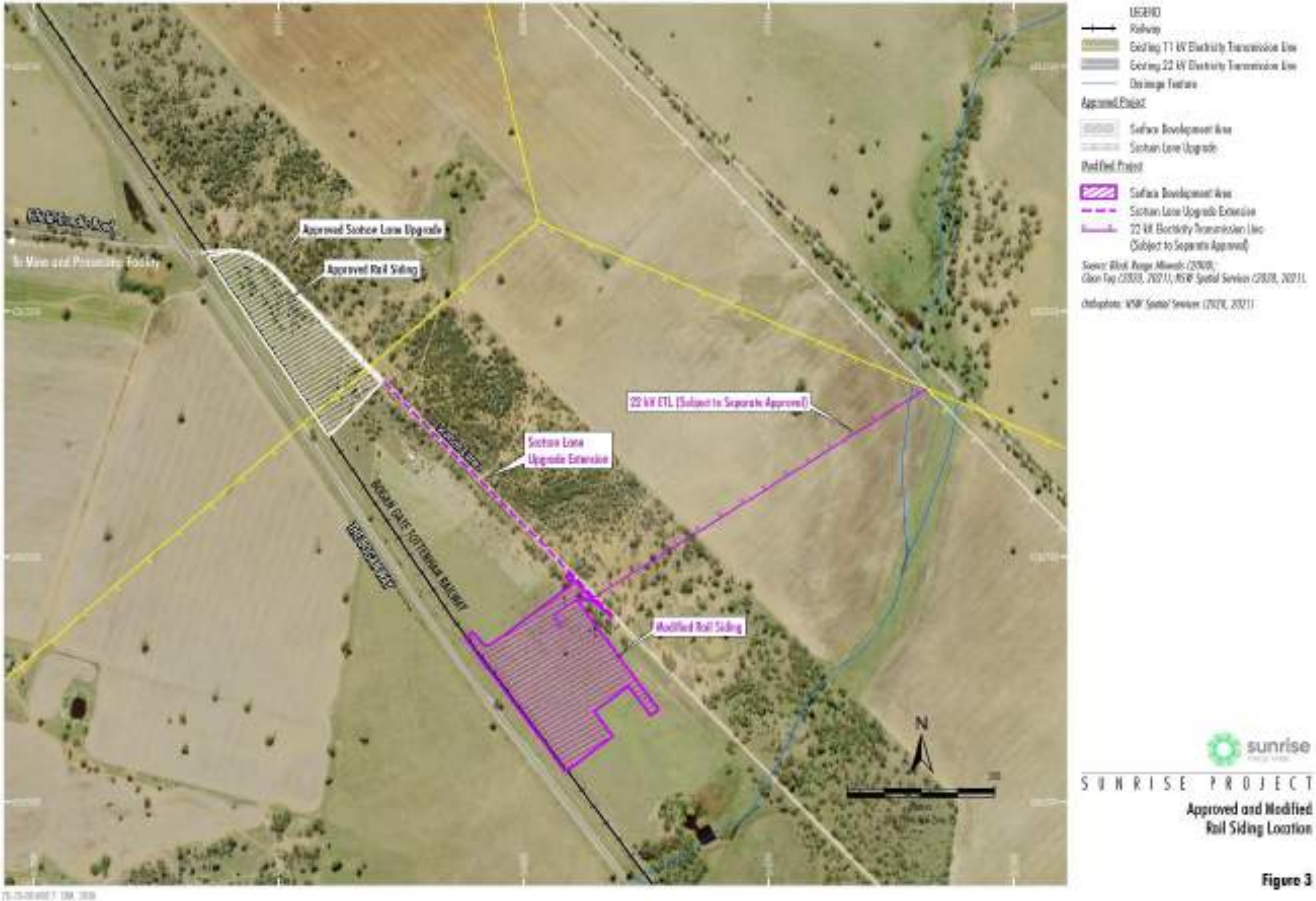


Figure 3 Approved and Modified Rail Siding Location

2.0 OVERVIEW OF RELEVANT STATUTORY REQUIREMENTS

SEM's statutory obligations relevant to water management for the Project are contained in:

- the conditions of Development Consent (DA 374-11-00);
- Environment Protection Licence (EPL) 21146 issued under the *Protection of the Environment Operations Act 1997* (POEO Act);
- water supply works, water use approvals and water access licences (WALs) issued under the *Water Management Act 2000*; and
- other relevant legislation, policies and guidelines.

The obligations relevant to this Surface Water Assessment are described below.

2.1 DEVELOPMENT CONSENT (DA 374-11-00)

Condition 29, Schedule 3 of Development Consent (DA 374-11-00) includes a range of water management performance measures to be implemented for the Project. These performance measures are reproduced in Table 1 below.

Table 1 Project Water Management Performance Measures

Feature	Performance Measure
Water management – General	• *Maintain separation between clean and mine water management systems* • *Minimise the use of clean water on site*
Construction and operation of infrastructure	• *Design, install and maintain erosion and sediment controls generally in accordance with the series Managing Urban Stormwater: Soils and Construction including Volume 1, Volume 2A – Installation of Services and Volume 2C – Unsealed Roads* • *Design, install and maintain infrastructure within 40 m of watercourses generally in accordance with the Guidelines for Controlled Activities on Waterfront Land (DPI, 2012), or its latest version* • *Design, install and maintain any creek crossings generally in accordance with the Policy and Guidelines for Fish Habitat Conservation and Management (DPI, 2013) and Why Do Fish Need To Cross The Road? Fish Passage Requirements for Waterway Crossings (NSW Fisheries, 2003), or their latest versions*
Clean water diversion infrastructure	• *Maximise the diversion of clean water around disturbed areas on site* • *Design, construct and maintain the clean water diversions to capture and convey the 100 year, peak flow rainfall event*
Sediment dams (mine and limestone quarry)	• *Design, install and/or maintain the dams generally in accordance with the series Managing Urban Stormwater: Soils and Construction – Volume 1 and Volume 2E Mines and Quarries*
Mine and limestone quarry water storages	• *Design, install and/or maintain mine and limestone water storage infrastructure to ensure no discharge of mine or limestone quarry water off-site (except in accordance with an EPL)* • *On-site storages (including mine infrastructure dams, groundwater storage and treatment dams) are suitably designed, installed and/or maintained to minimise permeability* • *Ensure that the floor and side walls of the Tailings Storage Facility, Evaporation Basin and Surge Dam are designed with a minimum of a 900 mm clay or modified soil liner with a permeability of no more than* 1×10^{-9} *m/s, or a synthetic (plastic) liner of 1.5 mm minimum thickness with a permeability of no more than* 1×10^{-14} *m/s (or equivalent)* • *Design, install and maintain a seepage interception system in the Tailings Storage Facility embankments in accordance with DSC guidelines*

Table 1 (Cont.) Project Water Management Performance Measures

Feature	Performance Measure
Mine and limestone quarry water storages	• *Design, install and maintain the water storages to capture and convey the 100 year ARI, 72-hour rainfall event* • *Design, install and/or maintain the facilities to meet the requirements of the DSC* • *The design of the Tailings Storage Facility should conform to: DSC3A – Consequence Categories for Dams (DSC); and DSC3F – Tailings Dams (DSC)*
Chemical and hydrocarbon storage	*Chemical and hydrocarbon products to be stored in bunded areas in accordance with the relevant Australian Standards*
Irrigation Area	*Manage the irrigation area in accordance with the EPA's Environmental Guidelines: Use of Effluent by Irrigation*

Condition 30, Schedule 3 of Development Consent (DA 374-11-00) requires that a Water Management Plan be developed for the Project, comprised of the following component plans:

- Water Balance;
- Surface Water Management Plan; and
- Groundwater Management Plan.

Condition 30, Schedule 3 of Development Consent (DA 374-11-00) also prescribes the requirements of the Water Management Plan, Water Balance, Surface Water Management Plan and Groundwater Management Plan. The approved Water Management Plan and its component plans are available on the SEM website.

Conditions 26 and 27, Schedule 3 of Development Consent (DA 374-11-00) are also relevant to this Surface Water Assessment:

Water Supply

26. The Applicant must ensure that it has sufficient water for all stages of the development, and if necessary, adjust the scale of development on site to match its available water supply. Note: Under the Water Act 1912 and/or the Water Management Act 2000, the Applicant is required to obtain the necessary water licences for the development.

Water Pollution

27. Unless an EPL authorises otherwise, the Applicant must comply with Section 120 of the POEO Act.

The modified Project has been considered against the requirements of Development Consent (DA 374-11-00) in Section 7.

2.2 ENVIRONMENT PROTECTION LICENCE 21146

SEM holds EPL 21146 for the Project, issued by the Environment Protection Authority (EPA) under the POEO Act. EPL 21146 includes surface water quality limits for receiving waters at the mine and processing facility (SW4 and SW6 in Figure 7 in Section 3.3.1) and for waters discharged from the sediment dams (refer Figure 9 to Figure 15 in Section 4.3for proposed sediment dam locations).

Table 2 lists the EPL 21146 surface water quality limits for receiving waters at the mine and processing facility and sediment dam discharges.

Table 2 EPL 21146 Surface Water Quality Limits

Parameter	Units	Limit
Receiving Waters		
Electrical Conductivity	µS/cm	2,200
pH	pH units	6.5 – 8.5
Total Suspended Solids	mg/L	50
Iron	mg/L	3.7
Nickel	mg/L	0.008
Sediment Dam Discharges[1]		
Electrical Conductivity	µS/cm	2,200
pH	pH units	6.5 – 8.5
Total Suspended Solids	mg/L	50[2]
Turbidity	Nephelometric Turbidity Units (NTU)	50

µS/cm = micro Siemens per centimetre; mg/L = milligrams per litre.

[1] Limits do not apply when the discharge occurs solely as a result of rainfall measured at the site which exceeds a total of 50.7 mm of rainfall over any consecutive 5 day period (Condition L2.5 of EPL 21146).

[2] Limit is not deemed to be exceeded where the turbidity limit is not exceeded at the time of discharge and the EPA is advised of any total suspended solids exceedances within 3 working days of the completion of the total suspended solids testing (Condition L2.6 of EPL 21146).

The modified Project has been considered against the requirements of EPL 21146 in Section 7.0.

2.3 WATER MANAGEMENT ACT 2000

The *Water Management Act 2000* incorporates the provisions of various prior Acts relating to the management of surface and groundwater in NSW and provides a single statute for regulation of water access, use and works (e.g. pumps or bores) that affect the licensing of surface water and alluvial and non-alluvial (i.e. fractured rock and porous rock) groundwater in the vicinity of the Project.

As water sharing plans have commenced under the *Water Management Act 2000* for all surface and groundwater systems within which the Project lies, the *Water Management Act 2000* is relevant to water licensing considerations for the Project. The following water sharing plans have commenced under the *Water Management Act 2000* for all groundwater and surface water systems within which the Project lies, including:

<u>Mine and Processing Facility and Accommodation Camp</u>

- *Water Sharing Plan for the Macquarie Bogan Unregulated Rivers Water Sources 2012*; and
- *Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2020.*

<u>Rail Siding</u>

- *Water Sharing Plan for the Lachlan Unregulated River Water Sources 2012.*

<u>External Water Sources</u>

- *Water Sharing Plan for the Lachlan Regulated River Water Source 2016;* and
- *Water Sharing Plan for the Lachlan Alluvial Groundwater Sources 2020.*

Further to the above, the following water supply works, water use approvals and WALs issued under the *Water Management Act 2000* are relevant to water management for the Project:

- Water Supply Works Approval (WSWA) 70CA614098 for the Project borefield and linking pipeline.
- Water Supply Works Approval (WSWA) 70WA617095 for the surface water extraction infrastructure and water pipeline.
- WAL 32068 in the Upper Lachlan Alluvial Groundwater Source (Upper Lachlan Alluvial Zone 5 Management Zone) for 3,154 share components under the *Water Sharing Plan for the Lachlan Alluvial Groundwater Sources 2020*.
- WAL 39837 in the Upper Lachlan Alluvial Groundwater Source (Upper Lachlan Alluvial Zone 5 Management Zone) for 766 share components under the *Water Sharing Plan for the Lachlan Alluvial Groundwater Sources 2020*.
- WAL 28681 in the Lachlan Fold Belt Murray-Darling Basin (MDB) Groundwater Source (Lachlan Fold Belt MDB [Other] Management Zone), for 243 share components under the *Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2020*.
- WAL 6679 in the Lachlan Regulated River Water Source, for 123 share components (General Security) under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*.
- WAL 1798 in the Lachlan Regulated River Water Source, for 300 share components (General Security) under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*.
- WAL 42370 in the Lachlan Regulated River Water Source, for zero share components (High Security) under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*.

Consideration of the modified Project against the water sharing plans, and the relevant water use approvals and WALs above, is provided in Section 5.4 and Section 7.0.

2.4 OTHER LEGISLATION, POLICIES AND GUIDANCE

There are various NSW Acts, water policy and guideline documentation regulated by DPIE – Water and the EPA relevant to this Surface Water Assessment. A summary is provided in the following sub sections.

2.4.1 National Water Quality Management Strategy

The National Water Quality Management Strategy is a joint national approach to improving water quality in Australian and New Zealand waterways. The Australian New Zealand Water Quality Guidelines (ANZG, 2018) have been developed to progressively supersede the ANZECC & ARMCANZ (2000) Guidelines, with revisions provided for aquatic ecosystem default guideline values. Where updated default guideline values are yet to be published under the ANZG 2018 Guidelines, adoption of the ANZECC & ARMCANZ (2000) Guideline default values is recommended.

The modified Project has been considered against the ANZECC & ARMCANZ (2000) and ANZG 2018 Guidelines in Section 7.0.

2.4.2 NSW Water Quality and River Flow Objectives

The NSW Water Quality and River Flow Objectives (Office of Environment and Heritage [OEH], 2006) have been developed to guide plans and actions to achieve healthy waterways in NSW, including the Macquarie-Bogan River catchment. Each objective is based on providing the right water quality for the environment and the different beneficial uses of the water. They are based on measurable environmental values (EVs), which are those values or uses of water that the community believes are important for a healthy ecosystem for public benefit, welfare, safety or health. The water quality trigger values are based on ANZECC & ARMCANZ (2000), which is being progressively superseded by the ANZG 2018 Guidelines and tailored for application to rivers in the Murray-Darling Basin.

The modified Project has been considered against the NSW Water Quality and River Flow Objectives guidelines in Section 7.0.

3.0 BASELINE SURFACE WATER RESOURCES

3.1 CATCHMENTS AND SURFACE WATER RESOURCES

3.1.1 Mine and Processing Facility and Accommodation Camp

The mine and processing facility and accommodation camp are located in the upper headwaters of Bullock Creek, a tributary of the Bogan River, within the Macquarie-Bogan catchment. The mine and processing facility is located approximately 55 km to the south-south-west of the Bogan River (Figure 4). The Bogan River travels in a north-north-westerly direction towards Bourke and ultimately discharges to the Darling River.

The three drainage lines that traverse the mine and processing facility are shallow broad vegetated ephemeral channels (Golder Associates [Golder], 2017) which flow north-east towards Bullock Creek. These drainage lines lose definition approximately 5 km north-east of ML 1770 (refer Figure 4 for locations). The accommodation camp and irrigation area are located in the headwaters of the central drainage line. The northern and central drainage lines converge approximately 1.5 km downstream of where they enter ML 1770. The drainage lines have a catchment area of approximately 2,800 ha (northern and central) and 1,840 ha (southern) to the downstream boundary of ML 1770.

The drainage lines in the vicinity of the mine and processing facility are not suitable for flow monitoring due to their shallow broad nature. In addition, there are no gauging stations maintained on Bullock Creek.

Numerous farm dams are located along the ephemeral drainage lines and watercourses in the catchment area of Bullock Creek. North of the township of Tullamore, Bullock Creek flows at a relatively low gradient (approximately 0.1%) along a defined floodplain (Black Range Minerals, 2000).

3.1.2 Rail Siding

The rail siding would be relocated approximately 500 m to the south of the approved location as part of the Modification (Figure 3). The modified rail siding is not traversed by any defined natural drainage lines. The closest defined drainage line is located approximately 220 m south-east of the modified rail siding (Figure 3). The modified rail siding would be located in the catchment of the Yarrabandai Creek (Figure 4). Yarrabandai Creek travels south-west through the township of Trundle and connects with the Bumbuggan Creek, a tributary of the Lachlan River, approximately 40 km directly south-west of Trundle.

3.2 RAINFALL AND EVAPORATION

The long term average monthly rainfall recorded at the regional Bureau of Meteorology (BoM) stations located in Trundle and Tullamore are summarised in Table 3 in comparison with Scientific Information for Land Owners (SILO) Point Data[2] average monthly rainfall. The locations of the stations and SILO data point are shown in Figure 5.

[2] The SILO Point Data is a system which provides synthetic daily climate data sets for a specified point by interpolation between surrounding point records held by BoM, https://www.longpaddock.qld.gov.au/silo/point-data/.

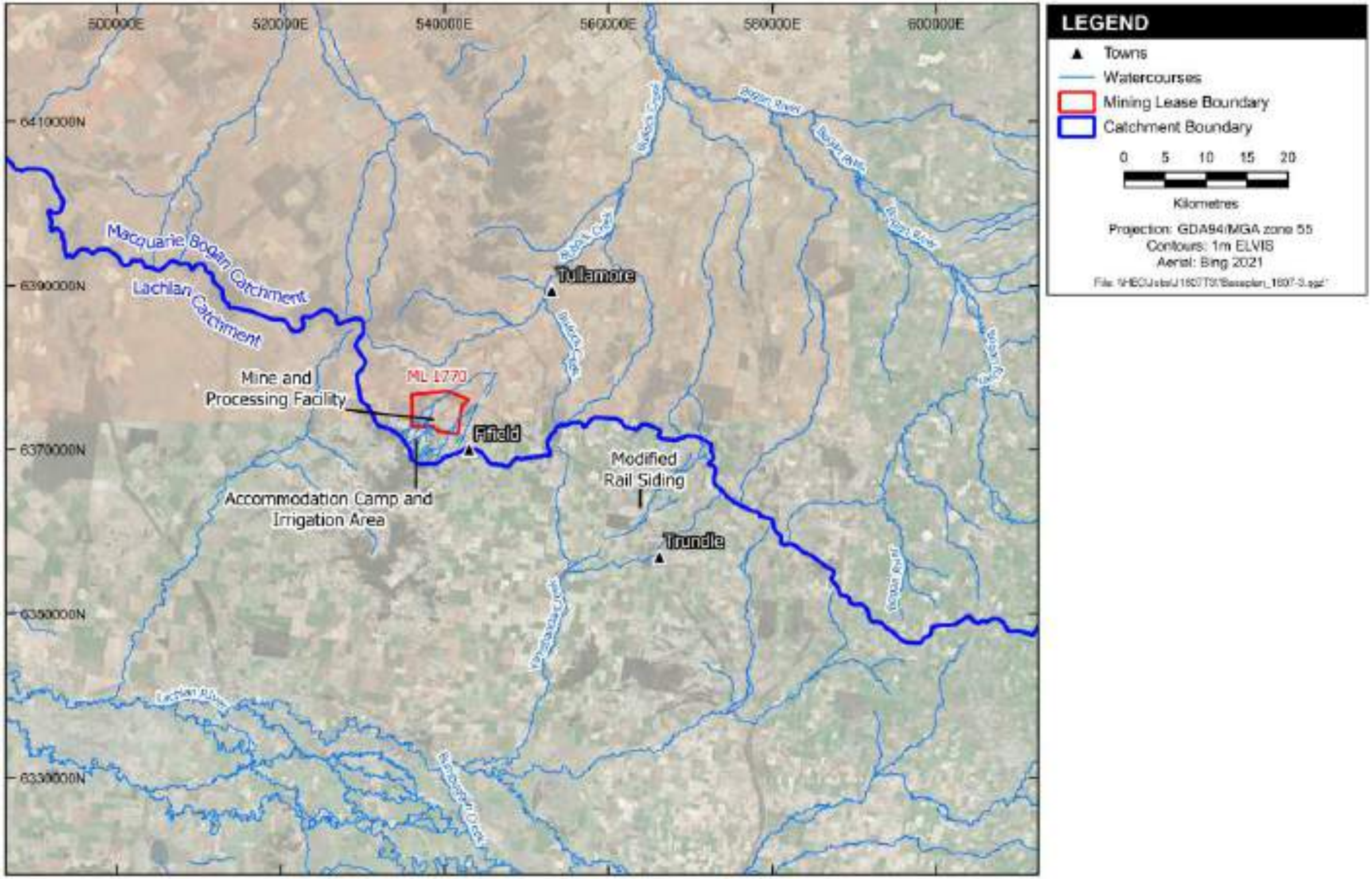


Figure 4 Regional Surface Water Systems

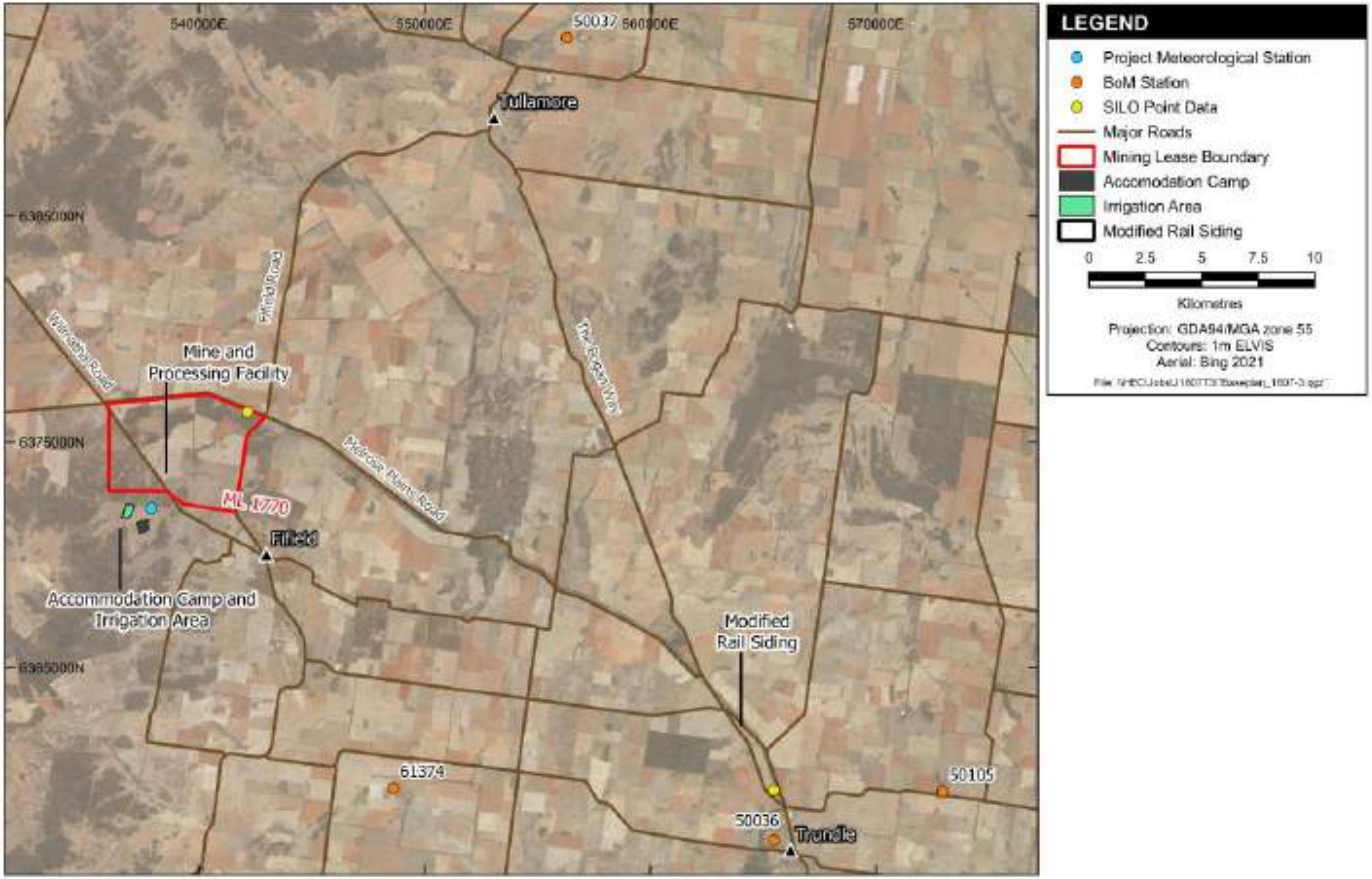


Figure 5 Regional Rainfall and Weather Stations

Table 3 Summary of Average Regional Rainfall and Evaporation

BoM Station Number	50036	50105	61374	50037	SILO Point Data			
BoM Station Name	**Trundle (Long St)**	**Trundle (Huntingdale)**	**Trundle (Murrumbogie)**	**Tullamore (Kitchener St)**	**Mine and Processing Facility**		**Rail Siding**	
Latitude	-32.92	-32.9	-32.9	-32.6	-32.75		-32.9	
Longitude	147.7	147.78	147.52	147.6	147.45		147.7	
Data Period	1883 – May 2021	1968 – Jul 2016	1883 – Jul 2019	1914 – Apr 2021	Jan 1889 – May 2021			
Month	**Rainfall (mm)**				**Rainfall (mm)**	**Evaporation (mm)**	**Rainfall (mm)**	**Evaporation (mm)**
January	47.1	53.0	49.7	51.6	48.9	283.6	45.3	277.2
February	45.0	51.9	44.3	47.7	42.9	227.3	44.2	221.8
March	42.0	40.0	41.9	42.4	42.6	192.9	43.6	188.0
April	39.1	35.9	34.7	36.4	36.3	119.9	37.7	117.2
May	38.6	41.5	37.9	37.6	36.8	70.8	38.3	69.8
June	39.5	37.3	39.1	38.7	39.6	45.5	39.8	45.1
July	37.2	40.2	35.6	34.8	36.2	49.8	38.2	49.3
August	37.2	36.1	35.9	37.0	35.6	75.4	37.5	73.6
September	33.6	35.7	32.8	31.9	32.3	114.5	34.1	110.9
October	42.6	46.3	42.4	43.3	41.6	173.7	44.2	168.7
November	45.4	48.2	41.5	43.8	42.0	223.1	47.8	216.7
December	45.4	48.8	43.9	45.6	42.3	279.9	45.4	273.0
Annual	**493**	**515**	**480**	**491**	**477**	**1856**	**496**	**1812**

As indicated in Table 3, the climatic conditions of the mine and processing facility area are dry (semi-arid), with annual pan evaporation exceeding rainfall by a factor of four. Average rainfall depths are relatively consistent throughout the year with maximum monthly rainfall occurring in January and minimum monthly rainfall occurring in September.

SEM also operate a Project meteorological station adjacent to the accommodation camp (refer Figure 5 for location) with data recorded since mid-November 2018. Figure 6 presents the total monthly rainfall recorded at the Project meteorological station.

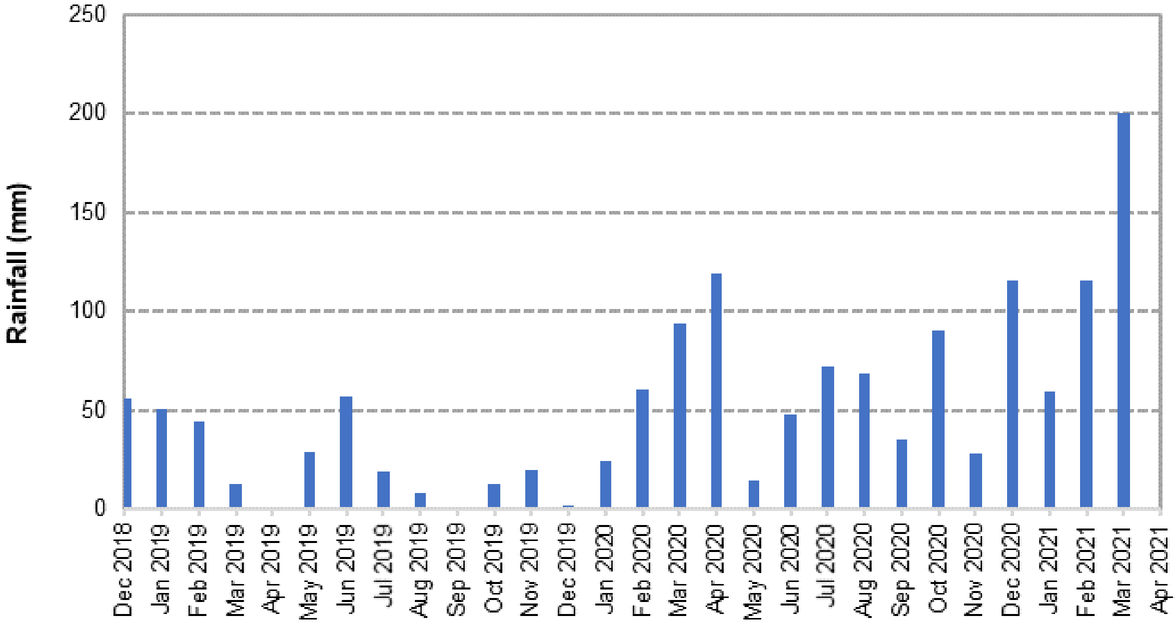


Figure 6 Project Meteorological Station Monthly Rainfall

The data in Figure 6 shows that 200 mm of rainfall was recorded at the Project meteorological station in March 2021 while no rainfall was recorded in April 2021. The total rainfall recorded at the Project meteorological station during 2019 was 258 mm, while the total rainfall recorded during 2020 was 770 mm.

3.3 SURFACE WATER QUALITY

3.3.1 Surface Water Monitoring Program

Surface water quality monitoring has been undertaken intermittently in the vicinity of the mine and processing facility since 1997. The locations of the surface water quality monitoring sites are shown in Figure 7.

Baseline surface water quality monitoring was undertaken at sites FW1 to FW5 between 1997 and 2000 and in August 2017. A summary of the baseline surface water quality monitoring results from sites FW1 to FW5 is presented in the approved Surface Water Management Plan (Clean TeQ, 2019).

SEM commenced baseline surface water quality monitoring at sites SW1 to SW7 in the vicinity of the mine and processing facility in October 2018 in accordance with the approved Surface Water Management Plan (Clean TeQ, 2019). Due to the ephemeral nature of the drainage lines (Section 3.1.1), surface water sampling is only undertaken following rainfall events that result in flow in the drainage lines. Surface water quality monitoring has been undertaken for pH, electrical conductivity, total suspended solids, anions, cations and select total and dissolved metals. A summary of surface water quality monitoring sites SW1 to SW7 is presented in Table 4.

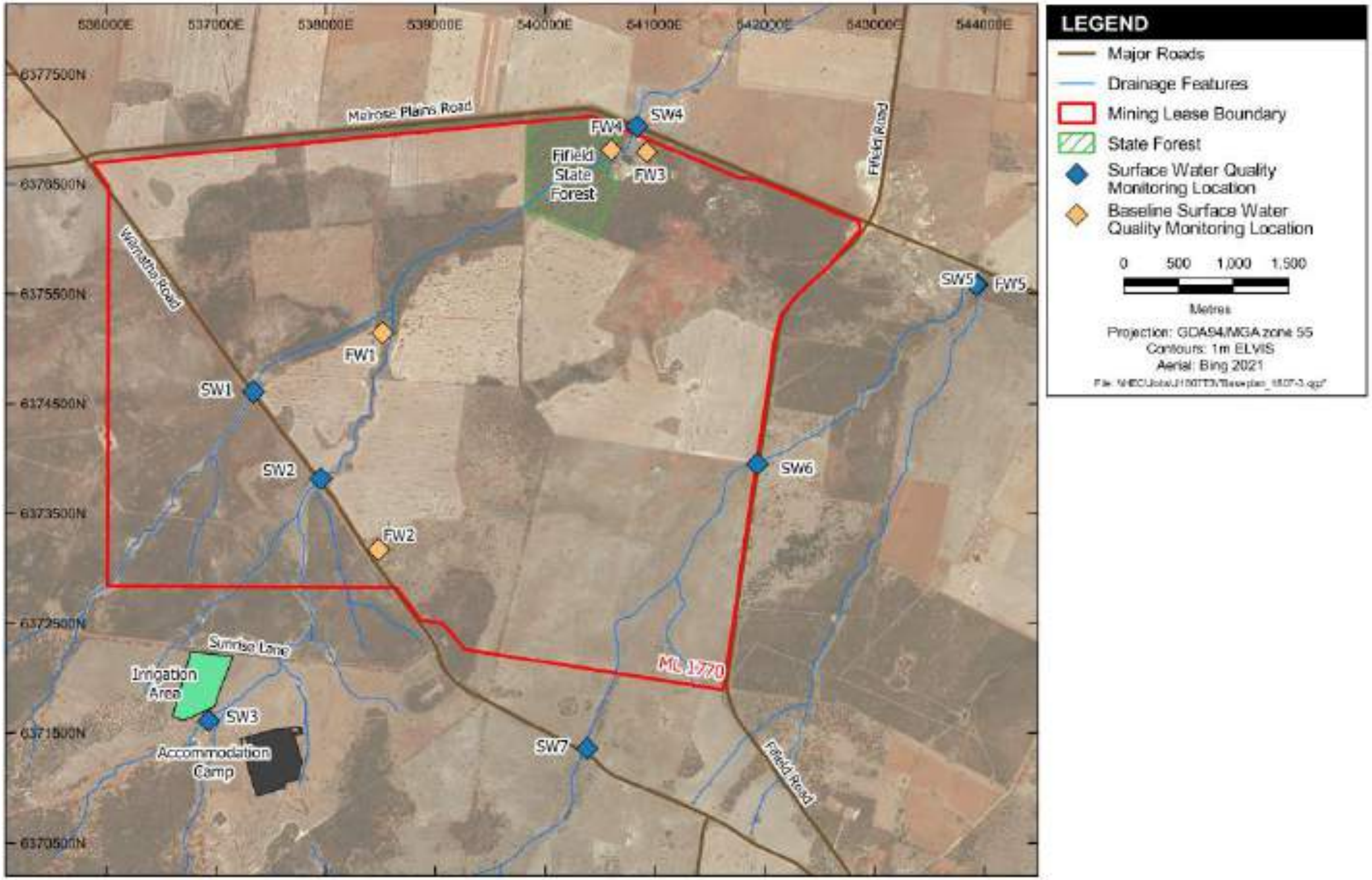


Figure 7 Surface Water Monitoring Locations

Table 4 Surface Water Monitoring Program

Site	Drainage Line & Location	Purpose	Period of Record Presented
SW1	Ephemeral drainage line - western boundary of mine and processing facility	Baseline monitoring / reference site for characterisation of water quality upstream of mine and processing facility	Oct 2018 – Jan 2021 (intermittent)
SW2	Ephemeral drainage line - western boundary of mine and processing facility	Baseline monitoring / assessment of potential downstream water quality influences associated with the accommodation camp and treated wastewater irrigation area	Oct 2018 – Jan 2021 (intermittent)
SW3	Headwaters of ephemeral drainage line - adjacent to accommodation camp and treated wastewater irrigation area	Baseline monitoring / assessment of potential water quality influences associated with the treated wastewater irrigation area and accommodation camp	Oct 2018 – Jan 2021 (intermittent)
SW4	Ephemeral drainage line - downstream of mine and processing facility	Baseline monitoring / assessment of potential downstream water quality influences associated with the mine and processing facility	Oct 2018 – Jan 2021 (intermittent)
SW5	Ephemeral drainage line - downstream of mine and processing facility	Baseline monitoring / assessment of potential downstream water quality influences associated with mine and processing facility	Oct 2018 – Jan 2021 (intermittent)
SW6	Ephemeral drainage line - eastern boundary of mine and processing facility	Baseline monitoring / assessment of potential downstream water quality influences associated with mine and processing facility	Nov 2018 – Jan 2021 (intermittent)
SW7	Ephemeral drainage line - upstream of mine and processing facility	Baseline monitoring / reference site for characterisation of water quality upstream of mine and processing facility	Jan 2020 – Aug 2020 (intermittent)

3.3.2 Water Quality Trigger Values

Site Specific Trigger Values

As described in the approved Surface Water Management Plan (Clean TeQ, 2019), the baseline monitoring results from sites FW1 to FW5 indicate that the water quality conditions of the ephemeral drainage lines in the vicinity of the mine and processing facility exceeded the ANZECC & ARMCANZ (2000) 'default guideline trigger values' for a number of physicochemical constituents. During the construction and operational phases of the Project, the trigger values in EPL 21146 will be used as an indicator of potential impacts to surface water quality with investigations initiated where trigger values are exceeded in accordance with the approved Surface Water Management Plan (Clean TeQ, 2019).

Notwithstanding the above, as additional baseline water quality data is collected at sites SW1 to SW7, the data should be reviewed against the ANZG 2018 Guideline default guideline trigger values, and site-specific trigger values should be developed where constituents naturally exceed the ANZG 2018 Guideline default guideline trigger values. Derivation of the site-specific trigger values should be undertaken in accordance with the ANZG 2018 Guideline.

Default Guideline Trigger Values

In NSW, the level of protection applied to most waterways is that for 'slightly to moderately disturbed' ecosystems, for which the ANZG 2018 Guideline recommends adoption of the default guideline values for aquatic ecosystems at the 95% species protection level. The ANZG 2018 Guideline default guideline trigger values listed in Table 5 have been used as a basis for interpretation of the water quality data in Section 3.3.3, in addition to the EPL 21146 trigger values and the ANZECC & ARMCANZ (2000) default guideline trigger value for turbidity.

As the mine and processing facility is located in an agricultural area, default guideline trigger values for primary industries (short term irrigation and livestock drinking) from ANZECC & ARMCANZ (2000) have also been considered in the assessment of baseline water quality data. Where default guideline trigger values were available from multiple sources, excepting EPL 21146, the lower value default guideline trigger value has been adopted.

Table 5 Water Quality Default Guideline Trigger Values

Parameter (mg/L unless otherwise specified)	EPL 21146 (Monitoring Sites SW4 and SW6)	Aquatic Ecosystems (Upland Rivers in NSW)‡	Aquatic Ecosystems (95% Level of Species Protection)†	Primary Industries (Short Term Irrigation and Livestock Drinking)^
pH (pH units)	6.5 – 8.5	-	-	-
Electrical Conductivity (µS/cm)	2,200	-	-	-
Total Dissolved Solids	-	-	-	2,000
Total Suspended Solids	50	-		
Turbidity (NTU)	-	50	-	-
Sulphate as Turbidimetric SO_4	-	-	-	1,000
Calcium	-	-	-	1,000
Sodium	-	-	-	460*
Chloride	-	-	-	700*
Aluminium (pH > 6.5)	-	-	0.055	-
Arsenic - As III	-	-	0.024	-
Cadmium	-	-	0.0002	-
Chromium	-	-	0.001	-
Cobalt	-	-	0.0014	-
Copper	-	-	0.0014	-
Iron	3.7	-	-	-
Lead	-	-	0.0034	-
Manganese	-	-	1.9	-
Nickel	0.008	-	-	-
Zinc	-	-	0.008	-

NTU = Nephelometric Turbidity Units

Note that default guideline trigger values were not tabulated for all sources, only for the source which corresponded with the lowest default guideline trigger value or EPL 21146 trigger value.

† ANZG (2018) – default guideline trigger values were derived for total metals, however, the default guideline trigger value should also be compared with the dissolved metal concentration as this represents the bioavailable fraction.

‡ ANZECC & ARMCANZ (2000) for Upland Rivers – ANZECC & ARMCANZ (2000) define upland streams as those above 150 m elevation, however, for the NSW Murray-Darling Basin, 250 m may be a more scientifically appropriate altitudinal trigger to distinguish between lowland and upland rivers (OEH, 2006). The minimum elevation of the Project area is 273 m AHD.

^ ANZECC & ARMCANZ (2000) for primary industries (short term irrigation and livestock drinking).

* Default guideline trigger value for tolerant crops.

3.3.3 Baseline Water Quality Assessment

Summary statistics of the baseline water quality monitoring data recorded in the vicinity of the mine and processing facility are presented in Table 6 to Table 9 below. The percentage of samples which exceeded the surface water quality trigger value are also presented (% exceedances).

With regard to the interpretation of the water quality monitoring results below, it should be noted that EPL 21146 includes surface water quality limits for sites SW4 and SW6 only, which are located downstream of the mine and processing facility (Figure 7).

The pH records presented in Table 6 to Table 9 indicate that the water quality of the ephemeral drainage lines ranges from slightly acidic to slightly alkaline, with relatively consistent pH values recorded at both upstream and downstream monitoring sites. Minimum values of pH 6.3 have been recorded at monitoring sites SW3 (upstream of the mine and processing facility) and SW6, which is less than the EPL 21146 lower water quality limit for pH. As such, there is potential that the current EPL 21146 lower water quality limit for pH will be exceeded at times during the mine and processing facility construction and operational phases, due to the lower pH levels which naturally occur in the ephemeral drainage lines in the vicinity of ML 1770, rather than operations at the mine and processing facility.

Electrical conductivity values below the EPL 21146 limit of 2,200 µS/cm have been recorded at all sites, with a maximum of 459 µS/cm recorded at monitoring site SW2 which is located at the upstream boundary of ML 1770. Variable total suspended solids have been recorded in the ephemeral watercourses with 12 to 760 mg/L recorded at upstream monitoring site SW2, less than 5 to 21 mg/L recorded at the central monitoring site SW6 and between less than 5 and 290 mg/L recorded at the downstream monitoring site SW4. Total suspended solids concentrations above the current EPL 21146 water quality limit of 50 mg/L were recorded at monitoring sites SW1 to SW5 while turbidity levels above the EPL 21146 water quality limit of 50 NTU were recorded frequently at all monitoring sites. Consequently, there is potential that the current EPL 21146 water quality limits for total suspended solids and turbidity will be frequently exceeded during the mine and processing facility construction and operational phases, due to the higher levels of these constituents which naturally occur in the ephemeral drainage lines in the vicinity of ML 1770.

No exceedances of the default guideline trigger value for arsenic, cadmium or manganese were recorded during the baseline monitoring period at any monitoring site.

Dissolved and total aluminium concentrations exceeded the default guideline trigger value of 0.055 mg/L at all sites and for all samples collected during the baseline monitoring period. A minimum of 0.08 mg/L total aluminium was recorded at monitoring site SW5 and a maximum of 13 mg/L recorded at monitoring site SW2. Total copper concentrations exceeded the default guideline trigger value of 0.0014 mg/L for all samples collected during the baseline monitoring period at all sites except for SW5 for which 86% of samples exceeded the default guideline trigger value. Dissolved copper concentrations frequently exceeded the default guideline trigger value at all sites.

Total zinc concentrations frequently exceeded the default guideline trigger value of 0.008 mg/L at all monitoring sites during the baseline monitoring period. The dissolved zinc concentrations exceeded the default guideline trigger value at monitoring sites SW1 (11% of samples), SW2 (8% of samples) and SW6 (17% of samples).

Total cobalt concentrations exceeded the default guideline trigger value of 0.0014 mg/L at all monitoring sites except SW7 during the baseline monitoring period. The dissolved cobalt concentrations exceeded the default guideline trigger value at monitoring sites SW1 (33% of samples) and SW6 (33% of samples).

Total iron concentrations exceeded the EPL 21146 water quality limit of 3.7 mg/L for 33%, 42%, 17% and 14% of samples recorded at upstream monitoring sites SW1, SW2, SW3 and SW5 respectively. At monitoring sites SW4 and SW6, total iron concentrations exceeded the EPL 21146 water quality limit for 25% and 17% of samples respectively. The water quality limit for iron was not exceeded at any site based on the recorded dissolved iron concentrations.

Total nickel concentrations exceeded the EPL 21146 water quality limit of 0.008 mg/L for 33% and 25% of samples recorded at upstream monitoring sites SW1 and SW2 respectively. At monitoring sites SW4 and SW6, total nickel concentrations exceeded the EPL 21146 water quality limit for 13% and 17% of samples respectively. The water quality limit for nickel was not exceeded at any site based on the recorded dissolved nickel concentrations.

As the default guideline trigger values (Table 5) and EPL 21146 water quality limits (Table 2) have been frequently exceeded for a number of constituents at all or a majority of monitoring sites during the baseline monitoring period, it is recommended that the existing EPL 21146 water quality limits are reviewed for all constituents and revised accordingly. It is recommended that additional baseline monitoring data is collected to inform the development of the site-specific trigger values in accordance with the ANZG 2018 Guideline.

Table 6 Surface Water Quality Data – SW1 and SW7

Parameter (mg/L unless otherwise stated)	Trigger Value	SW1					SW7				
		No. of Samples	Min	Median	Max	% Exceedances	No. of Samples	Min	Median	Max	% Exceedances
Field pH	6.5 - 8.5°	7	6.5	7.2	7.9	0%	2	7.3	-	7.3	0%
Lab pH		9	6.1	6.6	7.8	22%	2	6.9	-	7.3	0%
Field EC (µS/cm)	2200°	3	66	82	210	0%	2	158	-	192	0%
Lab EC (µS/cm)		9	23	39	97	0%	2	79	-	84	0%
Total Dissolved Solids	2000^	9	14	52	96	0%	2	70	-	98	0%
Total Suspended Solids	50°	9	11	64	300	56%	2	<5	-	46	0%
Turbidity (NTU)	50‡	6	23.7	84.8	713	83%	2	25.2	-	119	50%
Sulphate as Turbidimetric SO_4	1000^	9	<1	<1	4.9	0%	2	<1	-	<1	0%
Total Alkalinity as $CaCO_3$	-	9	<1	<1	56	-	2	27	-	53	-
Calcium	1000^	9	0.9	1.6	7.2	0%	2	5.9	-	6.3	0%
Magnesium	-	9	0.9	1.7	2.2	-	2	2.8	-	3.4	-
Potassium	-	9	2.9	5.9	15	-	2	10	-	12	-
Sodium	460^	9	0.9	2.5	5.8	0%	2	4.4	-	5.7	0%
Chloride	700^	9	1.4	6.3	31	0%	2	4.6	-	5.1	0%
Dissolved Aluminium	0.055†	9	0.07	0.36	1	100%	2	0.95	-	0.96	100%
Dissolved Arsenic	0.024†	9	<0.001	<0.001	0.002	0%	2	<0.001	-	<0.001	0%
Dissolved Cadmium	0.0002†	9	<0.0001	<0.0001	<0.0001	0%	2	<0.0001	-	<0.0001	0%
Dissolved Chromium	0.001†	9	<0.001	<0.001	0.008	22%	2	0.002	-	0.002	100%

° EPL 21146; † ANZG (2018) default guideline trigger value for aquatic ecosystems (95% level of species protection for slightly to moderately disturbed ecosystems); ‡ ANZECC (2000) default guideline trigger value for upland rivers in NSW; ^ ANZECC (2000) default guideline trigger value for primary industries.

Table 6 (Cont.) Surface Water Quality Data – SW1 and SW7

Parameter (mg/L unless otherwise stated)	Trigger Value	SW1					SW7				
		No. of Samples	Min	Median	Max	% Exceedances	No. of Samples	Min	Median	Max	% Exceedances
Dissolved Cobalt	0.0014†	9	<0.001	<0.001	0.006	33%	2	<0.001	-	<0.001	0%
Dissolved Copper	0.0014†	8	<0.001	0.0025	0.005	88%	2	0.004	-	0.004	100%
Dissolved Iron	3.7°	9	0.12	0.5	1	0%	2	0.88	-	1.6	0%
Dissolved Lead	0.0034†	8	<0.001	<0.001	0.002	0%	2	<0.001	-	<0.001	0%
Dissolved Manganese	1.9†	8	<0.001	0.03	0.12	0%	2	0.006	-	0.012	0%
Dissolved Nickel	0.008°	9	<0.001	<0.001	0.003	0%	2	0.003	-	0.003	0%
Dissolved Zinc	0.008†	9	<0.005	<0.005	0.012	11%	2	<0.005	-	<0.005	0%
Total Aluminium	0.055†	9	0.54	1.4	11	100%	2	0.94	-	1.6	100%
Total Arsenic	0.024†	9	<0.001	0.001	0.007	0%	2	<0.001	-	0.002	0%
Total Cadmium	0.0002†	9	<0.0001	<0.0001	<0.0001	0%	2	<0.0001	-	<0.0001	0%
Total Chromium	0.001†	9	<0.001	0.008	0.11	89%	2	0.003	-	0.006	100%
Total Cobalt	0.0014†	9	<0.001	0.002	0.018	67%	2	<0.001	-	0.001	0%
Total Copper	0.0014†	8	0.002	0.0075	0.032	100%	2	0.006	-	0.007	100%
Total Iron	3.7°	9	0.83	1.8	26	33%	2	2.5	-	2.9	0%
Total Lead	0.0034†	9	<0.001	<0.001	0.025	33%	2	<0.001	-	0.003	0%
Total Manganese	1.9†	8	0.011	0.1255	0.3	0%	2	0.013	-	0.028	0%
Total Nickel	0.008°	9	<0.001	0.003	0.03	33%	2	0.004	-	0.004	0%
Total Zinc	0.008†	9	0.006	0.015	0.07	67%	2	0.007	-	0.009	50%

° EPL 21146; † ANZG (2018) default guideline trigger value for aquatic ecosystems (95% level of species protection for slightly to moderately disturbed ecosystems); ‡ ANZECC (2000) default guideline trigger value for upland rivers in NSW; ^ ANZECC (2000) default guideline trigger value for primary industries.

Table 7 Surface Water Quality Data – SW2 and SW3

Parameter (mg/L unless otherwise stated)	Trigger Value	SW2					SW3				
		No. of Samples	Min	Median	Max	% Exceedances	No. of Samples	Min	Median	Max	% Exceedances
Field pH	6.5 - 8.5°	10	6.5	7.3	8.1	0%	10	6.3	7.3	7.5	10%
Lab pH		12	6.5	6.7	7.4	0%	12	6.2	6.6	7	25%
Field EC (µS/cm)	2200°	6	45	131	459	0%	6	49	88	395	0%
Lab EC (µS/cm)		12	20	60	120	0%	12	21	42	84	0%
Total Dissolved Solids	2000^	12	14	89	160	0%	12	11	59	110	0%
Total Suspended Solids	50°	12	14	43	760	33%	12	21	35.5	580	33%
Turbidity (NTU)	50‡	9	64.9	97.1	561	100%	11	35.1	81.2	531	82%
Sulphate as Turbidimetric SO_4	1000^	12	<1	<1	21	0%	12	<1	<1	16	0%
Total Alkalinity as $CaCO_3$	-	12	<1	11	49	-	12	<1	<1	31	-
Calcium	1000^	12	0.5	2.2	6.6	0%	12	0.6	1.25	2	0%
Magnesium	-	12	0.7	1.6	2.8	-	12	0.6	1.25	1.9	-
Potassium	-	12	3.5	6.05	19	-	12	3.5	4.15	8.7	-
Sodium	460^	12	1.3	5.75	12	0%	12	<1	5.35	16	0%
Chloride	700^	12	1.2	7.8	53	0%	12	<1	8.85	29	0%
Dissolved Aluminium	0.055†	12	0.06	0.555	2.9	100%	12	0.1	0.33	2.5	100%
Dissolved Arsenic	0.024†	12	<0.001	<0.001	0.002	0%	12	<0.001	<0.001	0.003	0%
Dissolved Cadmium	0.0002†	12	<0.0001	<0.0001	<0.0001	0%	12	<0.0001	<0.0001	<0.0001	0%
Dissolved Chromium	0.001†	12	<0.001	<0.001	0.003	17%	12	<0.001	<0.001	0.002	17%

° EPL 21146; † ANZG (2018) default guideline trigger value for aquatic ecosystems (95% level of species protection for slightly to moderately disturbed ecosystems); ‡ ANZECC (2000) default guideline trigger value for upland rivers in NSW; ^ ANZECC (2000) default guideline trigger value for primary industries.

Table 7 (Cont.) Surface Water Quality Data – SW2 and SW3

Parameter (mg/L unless otherwise stated)	Trigger Value	SW2					SW3				
		No. of Samples	Min	Median	Max	% Exceedances	No. of Samples	Min	Median	Max	% Exceedances
Dissolved Cobalt	0.0014†	12	<0.001	<0.001	<0.001	0%	12	<0.001	<0.001	<0.001	0%
Dissolved Copper	0.0014†	11	<0.001	0.002	0.003	64%	11	<0.001	<0.001	0.004	36%
Dissolved Iron	3.7°	12	0.12	0.45	1.4	0%	12	0.15	0.36	1.3	0%
Dissolved Lead	0.0034†	11	<0.001	<0.001	0.002	0%	11	<0.001	<0.001	<0.001	0%
Dissolved Manganese	1.9†	11	<0.001	0.007	0.19	0%	11	<0.001	<0.001	0.039	0%
Dissolved Nickel	0.008°	12	<0.001	0.0015	0.002	0%	12	<0.001	<0.001	0.002	0%
Dissolved Zinc	0.008†	12	<0.005	<0.005	0.009	8%	12	<0.005	<0.005	0.008	0%
Total Aluminium	0.055†	12	0.63	2.6	13	100%	12	0.38	1.7	5.5	100%
Total Arsenic	0.024†	12	<0.001	0.002	0.007	0%	12	<0.001	0.002	0.004	0%
Total Cadmium	0.0002†	12	<0.0001	<0.0001	<0.0001	0%	12	<0.0001	<0.0001	<0.0001	0%
Total Chromium	0.001†	12	0.002	0.004	0.031	100%	12	<0.001	0.0025	0.033	83%
Total Cobalt	0.0014†	12	<0.001	0.001	0.025	33%	12	<0.001	<0.001	0.003	17%
Total Copper	0.0014†	11	0.002	0.004	0.041	100%	11	0.002	0.002	0.006	100%
Total Iron	3.7°	12	0.77	3.35	28	42%	12	1.1	2.45	6.8	17%
Total Lead	0.0034†	12	<0.001	0.0015	0.025	25%	12	<0.001	<0.001	0.005	17%
Total Manganese	1.9†	11	0.007	0.024	0.34	0%	11	0.013	0.032	0.12	0%
Total Nickel	0.008°	12	<0.001	0.003	0.035	25%	12	<0.001	0.002	0.005	0%
Total Zinc	0.008†	12	0.006	0.009	0.14	50%	12	<0.005	0.008	0.028	33%

° EPL 21146; † ANZG (2018) default guideline trigger value for aquatic ecosystems (95% level of species protection for slightly to moderately disturbed ecosystems); ‡ ANZECC (2000) default guideline trigger value for upland rivers in NSW; ^ ANZECC (2000) default guideline trigger value for primary industries.

Table 8 Surface Water Quality Data – SW4 and SW6

Parameter (mg/L unless otherwise stated)	Trigger Value	SW4					SW6				
		No. of Samples	Min	Median	Max	% Exceedances	No. of Samples	Min	Median	Max	% Exceedances
Field pH	6.5 - 8.5°	6	7.0	7.3	7.8	0%	5	6.3	7.1	7.5	20%
Lab pH		8	6.4	7	7.2	13%	6	6.6	7	7.2	0%
Field EC (µS/cm)	2200°	3	105	129	132	0%	3	100	171	186	0%
Lab EC (µS/cm)		8	26	66.5	110	0%	6	33	66	98	0%
Total Dissolved Solids	2000^	8	13	41.5	110	0%	6	<10	92.5	150	0%
Total Suspended Solids	50°	8	<5	21	290	25%	6	<5	14	21	0%
Turbidity (NTU)	50‡	7	9.8	59.6	743	57%	5	17.8	45.1	79.7	40%
Sulphate as Turbidimetric SO_4	1000^	8	<1	<1	7.8	0%	6	<1	<1	7.1	0%
Total Alkalinity as $CaCO_3$	-	8	<1	25	56	-	6	<1	13.5	51	-
Calcium	1000^	8	2.2	4.25	8.7	0%	6	1.2	3.2	6.3	0%
Magnesium	-	8	1.2	2.85	4	-	6	0.9	2	3.9	-
Potassium	-	8	2.7	7.55	17	-	6	6.1	10	20	-
Sodium	460^	8	<1	4.5	6.8	0%	6	1.3	3.1	5.9	0%
Chloride	700^	8	<1	4.95	29	0%	6	1.5	4.3	16	0%
Dissolved Aluminium	0.055†	8	0.09	0.355	1.9	100%	6	<0.01	0.29	0.85	83%
Dissolved Arsenic	0.024†	8	<0.001	<0.001	0.002	0%	6	<0.001	<0.001	0.002	0%
Dissolved Cadmium	0.0002†	8	<0.0001	<0.0001	<0.0001	0%	6	<0.0001	<0.0001	<0.0001	0%
Dissolved Chromium	0.001†	8	<0.001	<0.001	0.003	38%	6	<0.001	<0.001	0.002	33%

° EPL 21146; † ANZG (2018) default guideline trigger value for aquatic ecosystems (95% level of species protection for slightly to moderately disturbed ecosystems); ‡ ANZECC (2000) default guideline trigger value for upland rivers in NSW; ^ ANZECC (2000) default guideline trigger value for primary industries.

Table 8 (Cont.) Surface Water Quality Data – SW4 and SW6

Parameter (mg/L unless otherwise stated)	Trigger Value	SW4					SW6				
		No. of Samples	Min	Median	Max	% Exceedances	No. of Samples	Min	Median	Max	% Exceedances
Dissolved Cobalt	0.0014†	8	<0.001	<0.001	<0.001	0%	6	<0.001	<0.001	0.002	33%
Dissolved Copper	0.0014†	7	<0.001	0.002	0.004	71%	6	<0.001	0.003	0.007	67%
Dissolved Iron	3.7°	8	0.12	0.29	1.1	0%	6	0.07	0.34	0.58	0%
Dissolved Lead	0.0034†	7	<0.001	<0.001	<0.001	0%	5	<0.001	<0.001	<0.001	0%
Dissolved Manganese	1.9†	7	<0.001	0.008	0.058	0%	5	<0.001	0.006	0.074	0%
Dissolved Nickel	0.008°	8	<0.001	0.002	0.003	0%	6	<0.001	0.002	0.005	0%
Dissolved Zinc	0.008†	8	<0.005	<0.005	0.008	0%	6	<0.005	<0.005	0.01	17%
Total Aluminium	0.055†	8	0.33	1.3	7.1	100%	6	0.35	0.675	2.1	100%
Total Arsenic	0.024†	8	<0.001	<0.001	0.003	0%	6	<0.001	<0.001	<0.001	0%
Total Cadmium	0.0002†	8	<0.0001	<0.0001	<0.0001	0%	6	<0.0001	<0.0001	<0.0001	0%
Total Chromium	0.001†	8	<0.001	0.0035	0.052	88%	6	<0.001	0.002	0.01	67%
Total Cobalt	0.0014†	8	<0.001	<0.001	0.005	25%	6	<0.001	<0.001	0.003	33%
Total Copper	0.0014†	7	0.002	0.004	0.016	100%	6	0.002	0.0045	0.013	100%
Total Iron	3.7°	8	0.53	1.7	12	25%	6	0.51	1.07	4	17%
Total Lead	0.0034†	8	<0.001	<0.001	0.01	25%	6	<0.001	<0.001	<0.001	0%
Total Manganese	1.9†	7	0.021	0.026	0.19	0%	5	0.013	0.034	0.094	0%
Total Nickel	0.008°	8	0.003	0.004	0.009	13%	6	<0.001	0.003	0.009	17%
Total Zinc	0.008†	8	<0.005	0.0075	0.037	25%	6	<0.005	0.007	0.016	33%

° EPL 21146; † ANZG (2018) default guideline trigger value for aquatic ecosystems (95% level of species protection for slightly to moderately disturbed ecosystems); ‡ ANZECC (2000) default guideline trigger value for upland rivers in NSW; ^ ANZECC (2000) default guideline trigger value for primary industries.

Table 9 Surface Water Quality Data – SW5

Parameter (mg/L unless otherwise stated)	Trigger Value	SW5				
		No. of Samples	Min	Median	Max	% Exceedances
Field pH	6.5 - 8.5°	6	7.1	7.7	8.3	0%
Lab pH		7	6.8	7	7.8	0%
Field EC (µS/cm)	2200°	3	73	80	94	0%
Lab EC (µS/cm)		7	56	67	140	0%
Total Dissolved Solids	2000^	7	56	60	91	0%
Total Suspended Solids	50°	7	8.2	22	71	14%
Turbidity (NTU)	50‡	6	10.2	27.6	99.2	17%
Sulphate as Turbidimetric SO_4	1000^	7	<1	<1	11	0%
Total Alkalinity as $CaCO_3$	-	7	23	37	71	-
Calcium	1000^	7	1.9	3.4	3.9	0%
Magnesium	-	7	2.1	3.2	9.2	-
Potassium	-	7	4.7	6.5	11	-
Sodium	460^	7	4.4	5.6	7.6	0%
Chloride	700^	7	1.5	3.4	13	0%
Dissolved Aluminium	0.055†	7	<0.01	0.23	1.2	86%
Dissolved Arsenic	0.024†	7	<0.001	<0.001	0.002	0%
Dissolved Cadmium	0.0002†	7	<0.0001	<0.0001	<0.0001	0%
Dissolved Chromium	0.001†	7	<0.001	<0.001	0.002	14%
Dissolved Cobalt	0.0014†	7	<0.001	<0.001	<0.001	0%
Dissolved Copper	0.0014†	7	<0.001	0.003	0.004	86%
Dissolved Iron	3.7°	7	<0.05	0.49	2.1	0%
Dissolved Lead	0.0034†	6	<0.001	<0.001	<0.001	0%
Dissolved Manganese	1.9†	6	<0.001	0.004	0.04	0%
Dissolved Nickel	0.008°	7	<0.001	0.002	0.002	0%
Dissolved Zinc	0.008†	7	<0.005	<0.005	0.006	0%
Total Aluminium	0.055†	7	0.08	0.82	1.3	100%
Total Arsenic	0.024†	7	<0.001	<0.001	<0.001	0%
Total Cadmium	0.0002†	7	<0.0001	<0.0001	<0.0001	0%
Total Chromium	0.001†	7	<0.001	0.002	0.003	57%
Total Cobalt	0.0014†	7	<0.001	<0.001	0.002	14%
Total Copper	0.0014†	7	<0.001	0.004	0.005	86%
Total Iron	3.7°	7	0.28	2.1	5.2	14%
Total Lead	0.0034†	7	<0.001	<0.001	<0.001	0%
Total Manganese	1.9†	6	0.017	0.0325	0.077	0%
Total Nickel	0.008°	7	0.002	0.002	0.003	0%
Total Zinc	0.008†	7	<0.005	<0.005	0.009	29%

° EPL 21146; † ANZG (2018) default guideline trigger value for aquatic ecosystems (95% level of species protection for slightly to moderately disturbed ecosystems); ‡ ANZECC (2000) default guideline trigger value for upland rivers in NSW; ^ ANZECC (2000) default guideline trigger value for primary industries.

4.0 WATER MANAGEMENT SYSTEM

4.1 OVERVIEW

Consistent with the general water management performance measures for the Project (Section 2.1), the key objectives of the water management system are to manage runoff from the construction and operational areas, while diverting up-catchment undisturbed water around these areas and to reduce to a practical minimum the use of water on-site.

The water management system will include both permanent features that will continue to operate post-closure (e.g. diversion drains) and temporary structures during mining operations (e.g. sediment dams).

An internal drainage system will be constructed to collect and contain runoff generated within the construction and operational areas. Sediment control structures such as sediment dams and sediment fences will be employed where necessary within and downstream of disturbance areas. Mine affected water dams will be constructed to contain water runoff generated from the processing plant and ore stockpile areas.

4.2 APPROVED WATER MANAGEMENT SYSTEM – MINE AND PROCESSING FACILITY AND ACCOMMODATION CAMP

As detailed in the approved Surface Water Management Plan (Clean TeQ, 2019), the following water management structures/facilities are approved for the mine and processing facility:

- TSF;
- EP;
- water storage dam (WSD);
- processing plant runoff dam (PPRD);
- raw water dam (RWD);
- mine water dams (MWD);
- sediment dams (SD);
- diversion dam, northern and southern diversion drains, sediment water collection drains and mine water collection drains;
- Wastewater Treatment Plant (WWTP) and treated wastewater irrigation area.

Water supply for mine and processing facility is approved to be supplied from the following sources:

- internal runoff collection at the mine and processing facility;
- mine dewatering from the open cut pits;
- offsite borefield; and
- surface water extraction from the Lachlan River.

Water will be supplied to the accommodation camp from the RWD via the accommodation camp water pipeline.

Consistent with the relevant water management performance measures (Section 2.1), the approved TSF, EP, WSD, PPRD, RWD and MWD at the mine and processing facility will be:

- designed, installed and/or maintained to ensure no discharge of mine affected water off-site (except in accordance with an EPL);
- designed, installed and/or maintained to minimise permeability; and

- if applicable, designed, installed and/or maintained to meet the requirements of Dams Safety NSW (previously the Dams Safety Committee [DSC]).

In addition:

- the floor and side walls of the TSF, EP and WSD will be designed with a minimum of a 900 mm clay or modified soil liner with a permeability of no more than 1 x 10^{-9} m/s, or a synthetic (plastic) liner of 1.5 mm minimum thickness with a permeability of no more than 1 x 10^{-14} m/s (or equivalent);
- the seepage interception system for the TSF embankments will be designed, installed and maintained in accordance with DSC guidelines; and

The design of the TSF will conform to:

- *DSC3A – Consequence Categories for Dams* (DSC); and
- *DSC3F – Tailings Dams* (DSC).

Consistent with the relevant water management performance measures (Section 2.1), the approved sediment dams at the mine and processing facility and accommodation camp will be designed, installed and/or maintained generally in accordance with the series *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004) and *Managing Urban Stormwater Soils and Construction – Volume 2E – Mines and Quarries* (Department of Environment and Climate Change [DECC], 2008a).

A description of the approved water management system is provided below.

4.2.1 Tailings Storage Facility

The TSF is approved to store tailings from the processing plant with three cells approved to be constructed and filled sequentially over the life of the Project. The approved cell construction sequence is for the northern cell (TSF Cell 2) to be constructed first, followed by the south western cell (TSF Cell 1) and then the south eastern cell (TSF Cell 3). Each cell would be progressively developed using downstream lifts prior to the construction of the next cell. The TSF will be constructed with a fully encompassing raised perimeter embankment to restrict capture of external runoff. Seepage collection/interception drains will be located in the TSF embankment to intercept horizontal seepage through the embankment. Seepage collected in the interception drains, along with runoff from the TSF embankment, will be transferred via an embankment toe seepage collection drain to a seepage collection sump located at the north-eastern corner of the TSF. Any accumulation of seepage in the collection sump will be transferred back to the TSF. The accumulated decant water is approved to be piped/pumped to the WSD for reuse in the processing plant.

4.2.2 Evaporation Pond

The EP is approved to contain and evaporate a processing plant liquid waste stream containing high concentrations of chloride to prevent the build-up of chloride in the process water.

The EP will not be used to harvest runoff from land as it will be used to contain mine water or effluent in accordance with best management practice (Section 7.4). The approved EP has a maximum capacity of approximately 281 million litres (ML).

4.2.3 Water Storage Dam

Decant water from the TSF will be piped/pumped to the WSD for reuse in the processing plant.

The WSD will not be used to harvest runoff from land as it will be used to contain mine water or effluent in accordance with best management practice (Section 7.4). The approved WSD has a maximum capacity of approximately 1,230 ML.

4.2.4 Processing Plant Runoff Dam

The approved PPRD will capture runoff from the processing facility area.

Water collected from disturbance areas within the processing plant footprint will be temporarily contained in the PPRD and then reused in the mine site water system. The approved PPRD has a maximum operating capacity of approximately 34 ML.

4.2.5 Raw Water Dam

The approved RWD will be used as buffer storage for water supplied to the site from the external sources (e.g. borefield and Lachlan River). As illustrated in Figure 8, water will be supplied from the RWD to the processing plant and accommodation camp. Additional water supply requirements for dust suppression will also be supplied from the RWD. The approved RWD has a maximum operating capacity of approximately 15 ML.

4.2.6 Sediment Dams

Construction of sediment dams at the mine and processing facility and the accommodation camp area has been approved to enable capture and treatment of runoff from disturbed areas. The majority of the mine and processing facility sediment dams will be equipped with a pump to transfer water to the WSD for supply to the processing plant (refer Figure 8). Where impracticable to transfer water from a sediment dam to the WSD (i.e. where the distance is excessive), the sediment dam will be emptied via mobile pump and used locally for dust suppression purposes.

Sediment dams SD11a and SD11b, located at the accommodation camp, will be managed independently of the mine and processing facility water management system. Controlled release from SD11a and SD11b will be undertaken in order to reinstate the settling zone capacity following rainfall events.

In accordance with the water management performance measures (Section 2.1), the conceptual design of the approved sediment dams was undertaken in accordance with the Landcom (2004) and DECC (2008a) guidelines as follows (HEC, 2019):

- Type F sediment retention basin;
- Sediment dams to be in place for more than three years unless otherwise stated;
- A sensitive receiving environment and therefore capacity to be adequate to capture runoff from a 95th percentile 5-day duration rainfall event of 50.7 mm or 85th percentile 5-day duration rainfall event of 28.4 mm dependent on duration of disturbance (Dubbo 5-day rainfall depth in Table 6.3a of Landcom, 2004 – Dubbo was selected as the closest location to the Project based on the three Central Tablelands and Central Western Slopes locations presented in Table 6.3a of Landcom, 2004);
- A volumetric runoff coefficient of 0.74 assuming soil hydrologic group D – Table F2 of Landcom (2004);
- Allowance for sediment storage zone capacity equal to 50% of the above calculated settling zone capacity; and
- Pump rate required to reinstate settling zone capacity within 5 days.

A summary of the conceptual design characteristics of the approved sediment dams is provided in Table 10.

Table 10 Conceptual Design Characteristics – Approved Sediment Dams

Sediment Dam	Years Required^	Estimated Maximum Catchment Area (ha)	Settling Zone Volume (ML)	Sediment Zone Volume (ML)	Minimum Required Volume (ML)	Required Pump Rate (L/s)
SD1**	OY1 - OY21	129	48.4	24.2	72.6	120
SD2**	OY1 - OY21	172	64.5	32.2	96.7	150
SD3a**	CY1 - OY6	2	0.6	0.3	0.9	10
SD3b**	OY6 - OY21	88	33.2	16.6	49.7	80
SD4**	CY1 - OY11	210	78.6	39.3	117.9	190
SD5**	OY1 - OY6	23	8.5	4.3	12.8	20
SD6**	OY1 - OY6	11	3.9	2.0	5.9	10
SD8*	CY1 - OY1	71	15.0	7.5	22.5	40
SD11a**	CY1 - OY21	12	4.4	2.2	6.6	20
SD11b**	CY1 - OY21	8	3.1	1.5	4.6	10
SD12*	CY2	15	3.1	1.6	4.7	10

* Assumed to be in place for 6 – 12 months and conceptually designed to capture runoff from an 85th percentile 5-day duration rainfall event of 28.4 mm.

** Assumed to be in place for greater than 3 years and conceptually designed to capture runoff from a 95th percentile 5-day duration rainfall event of 50.7 mm.

^ CY = construction year; OY = operational year

4.2.7 Mine Water Dams

Water collected from the disturbance footprint of the processing facility and ore stockpile areas will be temporarily contained in the approved MWDs. The approved MWDs were conceptually sized based on a 1% AEP, 72-hour rainfall depth for the mine and processing facility of 196 mm (BoM, 2021) and a nominal runoff coefficient of 50%. A summary of the conceptual design characteristics of the approved MWDs is provided in Table 11.

Table 11 Conceptual Sizing – Approved Mine Water Dams

Dam	Years Required^	Estimated Maximum Catchment Area (ha)	Minimum Required Storage Capacity (ML)
MWD1	OY1 – OY21	117	116
MWD2	OY6 – OY21	18	19
MWD3	OY6 – OY21	93	92
MWD4	CY1 – OY21	91	91
MWD5	CY1 – OY21	31	32

^ CY = construction year; OY = operational year

4.2.8 Diversion and Collection Drains

The northern and southern diversion drains and a diversion dam (associated with the northern diversion drain) are approved to divert up-catchment runoff from undisturbed areas offsite, while collection drains are approved to collect and convey disturbed area and mine affected runoff to the PPRD and MWDs.

The diversion dam and northern diversion drain will be operational in the north-western portion of ML 1770 from CY2, as shown in Figure 10, to collect and convey runoff from the external catchment area and undisturbed areas of ML1770. The runoff will be diverted via the northern diversion drain and discharged at the mine and processing facility area boundary to a third order stream which passes through Fifield State Forest.

The southern diversion drain will be constructed along the south-eastern boundary of the mine and processing facility area to collect and convey runoff from the external catchment area and undisturbed areas along the eastern boundary of ML 1770 to discharge offsite to a third order stream. The southern diversion drain was approved to be operational from OY1.

Collection drains will be constructed to collect and convey disturbed area runoff to the sediment dams and mine affected runoff to MWDs and PPRD. Most channels and drains (with the exception of the PPRDs and MWDs) would be grass-lined with minor sections requiring rip-rap protection to protect against erosion. Grass-lined drains should be inspected at regular intervals and rip-rap should be placed where necessary to enhance erosion resistance in areas with poor grass cover (USDA & NRCS, 1984).

Consistent with the relevant water management performance measures (Section 2.1) and best management practices, the diversion and collection drains will be designed, installed and maintained as follows:

- diversion drains and diversion dam: designed to capture and convey the 1% AEP, peak flow in accordance with Development Consent (DA 374-11-00);
- collection drains (less than 3 years duration): sized based on DECC (2008a) to capture and convey the 20% AEP, peak flow; and
- collection drains (greater than 3 years duration): sized based on DECC (2008a) to capture and convey the 5% AEP, peak flow.

4.2.9 Wastewater Treatment Plant and Treated Wastewater Irrigation Area

Wastewater generated at the accommodation camp is approved to be collected and treated at an on-site WWTP. The WWTP will comprise anaerobic and aerobic treatment and final disinfection of treated effluent. The WWTP will be installed and operated in accordance with Lachlan Shire Council requirements.

Treated wastewater is approved to be transferred to the irrigation area via an irrigation water pipeline. The approved treated wastewater irrigation area will be approximately 10.5 ha in size, divided into discrete irrigation zones.

Consistent with relevant water management performance measures (Section 2.1), the treated wastewater irrigation area will be managed in accordance with the *Environmental Guidelines: Use of Effluent by Irrigation* (OEH, 2006) and the irrigation rate would be controlled so as not to:

- cause irrigation water runoff from the treated wastewater irrigation area; or
- exceed the capacity of the soil in the treated wastewater irrigation area to effectively absorb the applied nutrient and hydraulic loads.

4.2.10 Water Supply

The approved external water supply sources for the mine and processing facility and accommodation camp comprise offsite supply from the borefield and the Lachlan River.

Borefield

The approved borefield will extract groundwater from within Zone 5 of the Upper Lachlan Alluvial Groundwater Source which is administered by the *Water Sharing Plan for the Lachlan Alluvial Groundwater Sources 2020* under the *Water Management Act 2000*.

SEM holds WAL 32068 in the Upper Lachlan Alluvial Groundwater Source (Upper Lachlan Alluvial Zone 5 Management Zone) for 3,154 share components. The borefield will be operated in accordance with the conditions of WAL 32068.

SEM holds WSWA 70CA614098 for the approved borefield and linking pipeline.

Lachlan River

SEM holds WAL 6679 and WAL 1798 in the Lachlan Regulated River Water Source, for 123 and 300 General Security share components respectively, under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*. In addition, SEM holds WAL 42370 (zero High Security share components) in the Lachlan River Regulated River Source, for subsequent trading of water on the open market under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016.*

SEM holds WSWA 70WA617095 for the surface water extraction infrastructure and water pipeline.

4.3 MODIFIED WATER MANAGEMENT SYSTEM – MINE AND PROCESSING FACILITY AND ACCOMMODATION CAMP

The approved water management structures/facilities described above are generally proposed to be retained for the modified Project, with changes to the location, number and sizing of some water management structures/facilities proposed. In addition, the construction of a Decant Transfer Pond (DTP) is proposed as part of the Modification.

Consistent with the approved water management system (Section 4.2), the modified water management system will be progressively developed during the construction and operational phases as diversion and collection requirements change. Figure 8 presents a schematic representation of the modified water management system. Figure 9 to Figure 15 show the water management system for each stage of the modified Project. Note that the water management system for the accommodation camp would remain the same over the modified Project life (i.e. Construction Year 1 to Operational Year 21) as currently approved, with the exception of a treated water return pipeline from the WWTP to the process water tank at the mine and processing facility to enable treated water to be used in the processing plant (Section 4.3.10).

As illustrated in Figure 9 to Figure 15, the water management system has been assessed for stages (at different points in time) representative of the Project development:

- Construction Year 1 (CY1) – initial construction activities including construction of the PPRDs, RWD, WSD, TSF (Cell 1), EP, DTP, required sediment dams and the treated wastewater irrigation area;
- Construction Year 2 (CY2) – construction activities including construction of the diversion dam, northern diversion drain and required sediment dams (Stage 1);
- Operational Year 1 (OY1) – initial operations, with preferential mining of high grade ore deposits and one TSF cell (Cell 1) in operation;
- Operational Year 5 (OY5) – mining across both eastern and western open cut pits with one TSF cell (Cell 1) in operation and Cell 2 under construction;
- Operational Year 10 (OY10) – continued mining across both eastern and western open cut pits with one TSF cell (Cell 2) in operation and initial rehabilitation of Cell 1 commenced;
- Operational Year 17 (OY17) - final year of mining across both eastern and western open cut pits, waste rock emplacements at maximum extent, one TSF cell (Cell 3) in operation, initial rehabilitation of Cell 2 commenced and advanced rehabilitation of Cell 1 commenced; and
- Operational Year 21 (OY21) – no mining occurring and on-going processing of stockpiled ore, with maximum extents of the open cut pits and waste rock emplacements and one TSF cell (Cell 3) in operation.

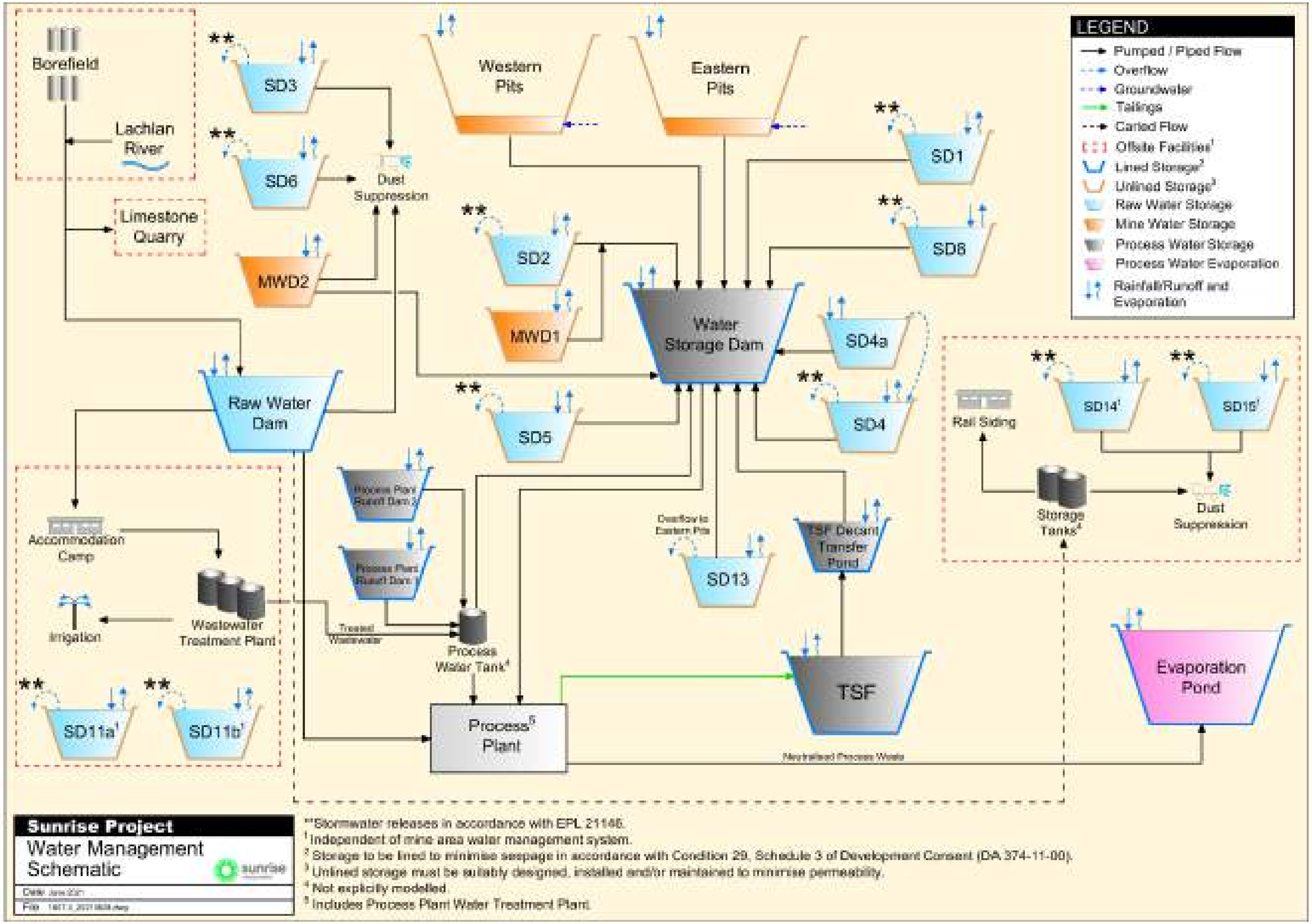


Figure 8 Modified Water Management System Schematic

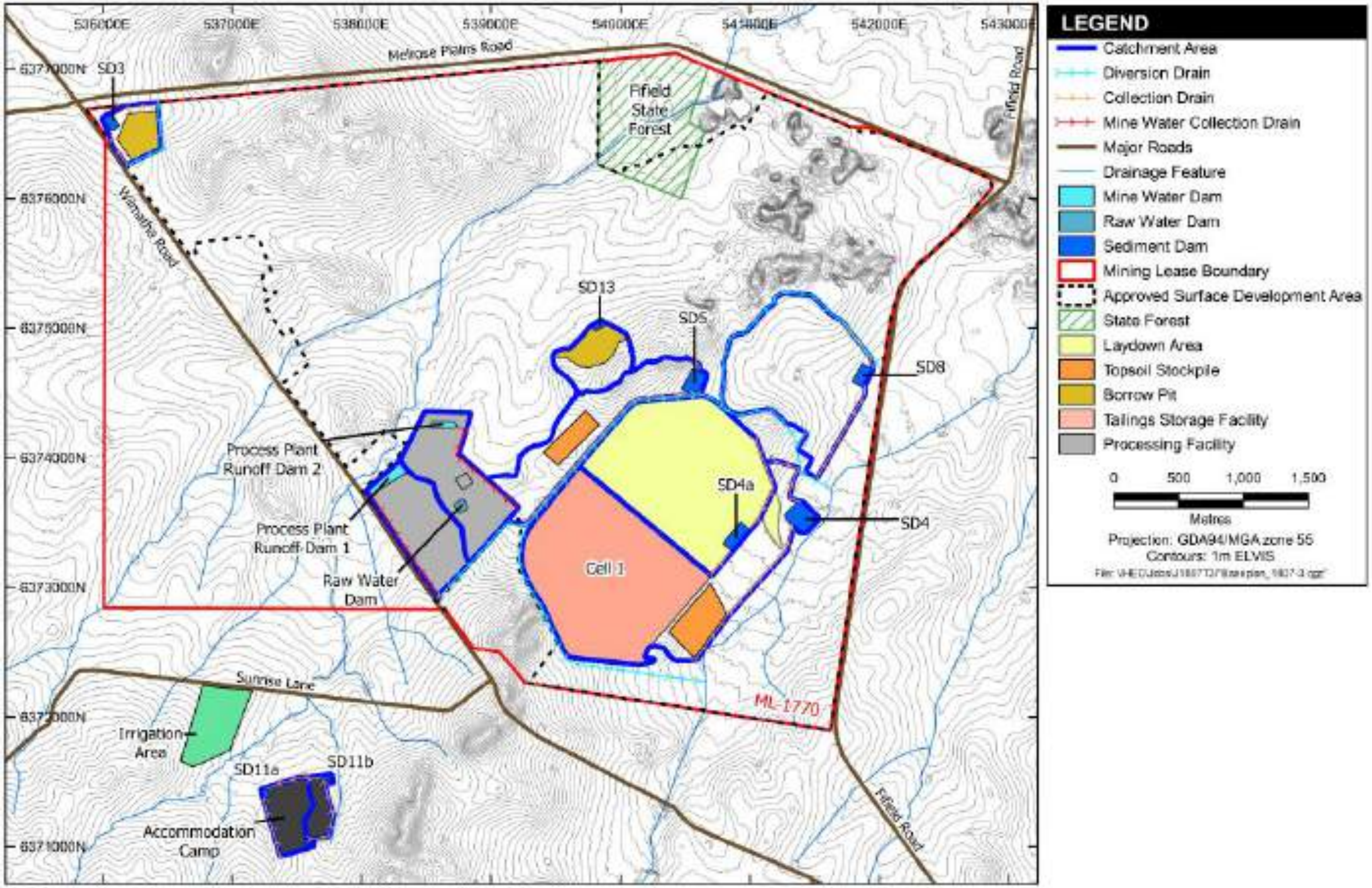


Figure 9 Construction Year 1 Water Management Plan

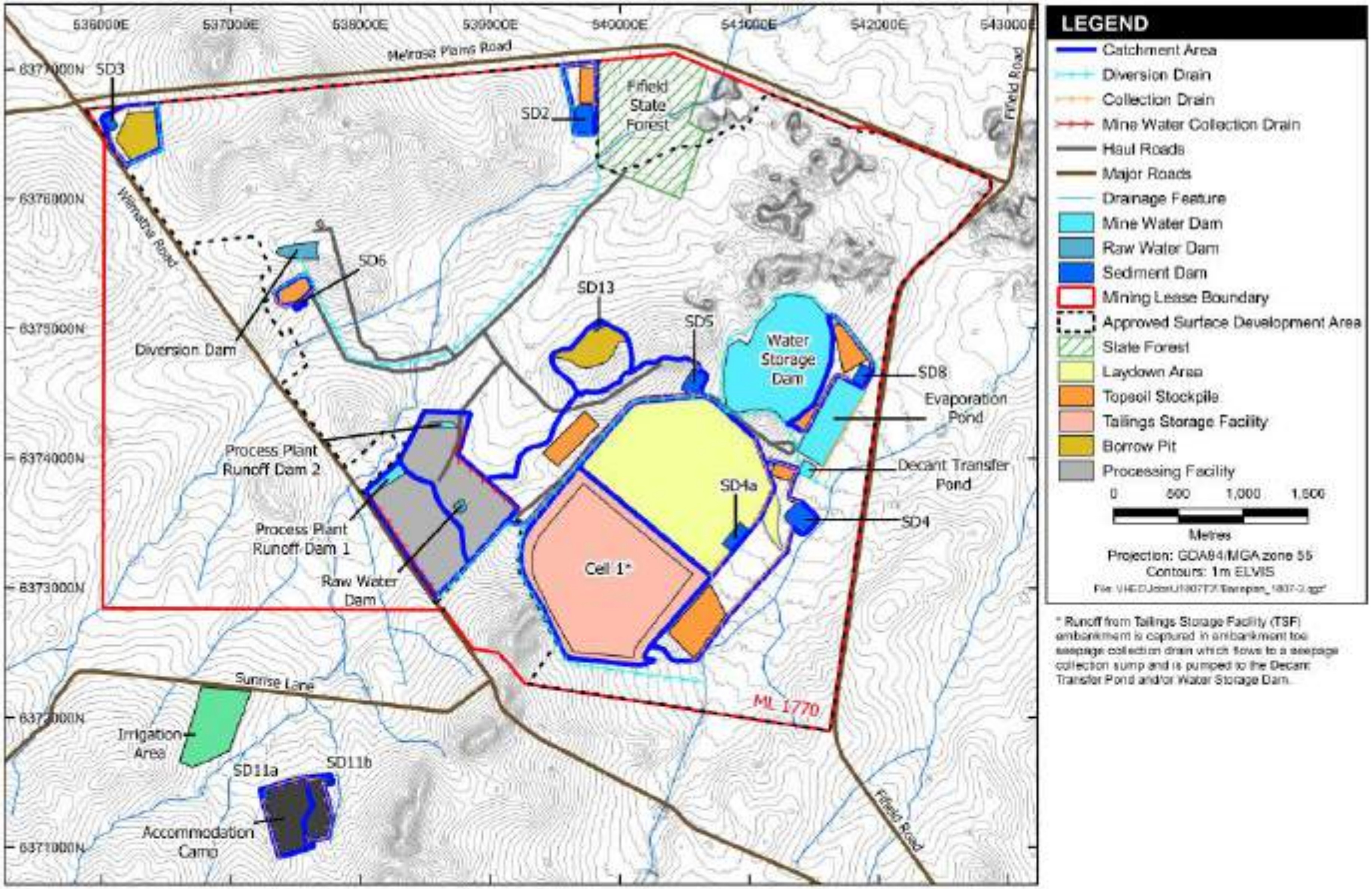
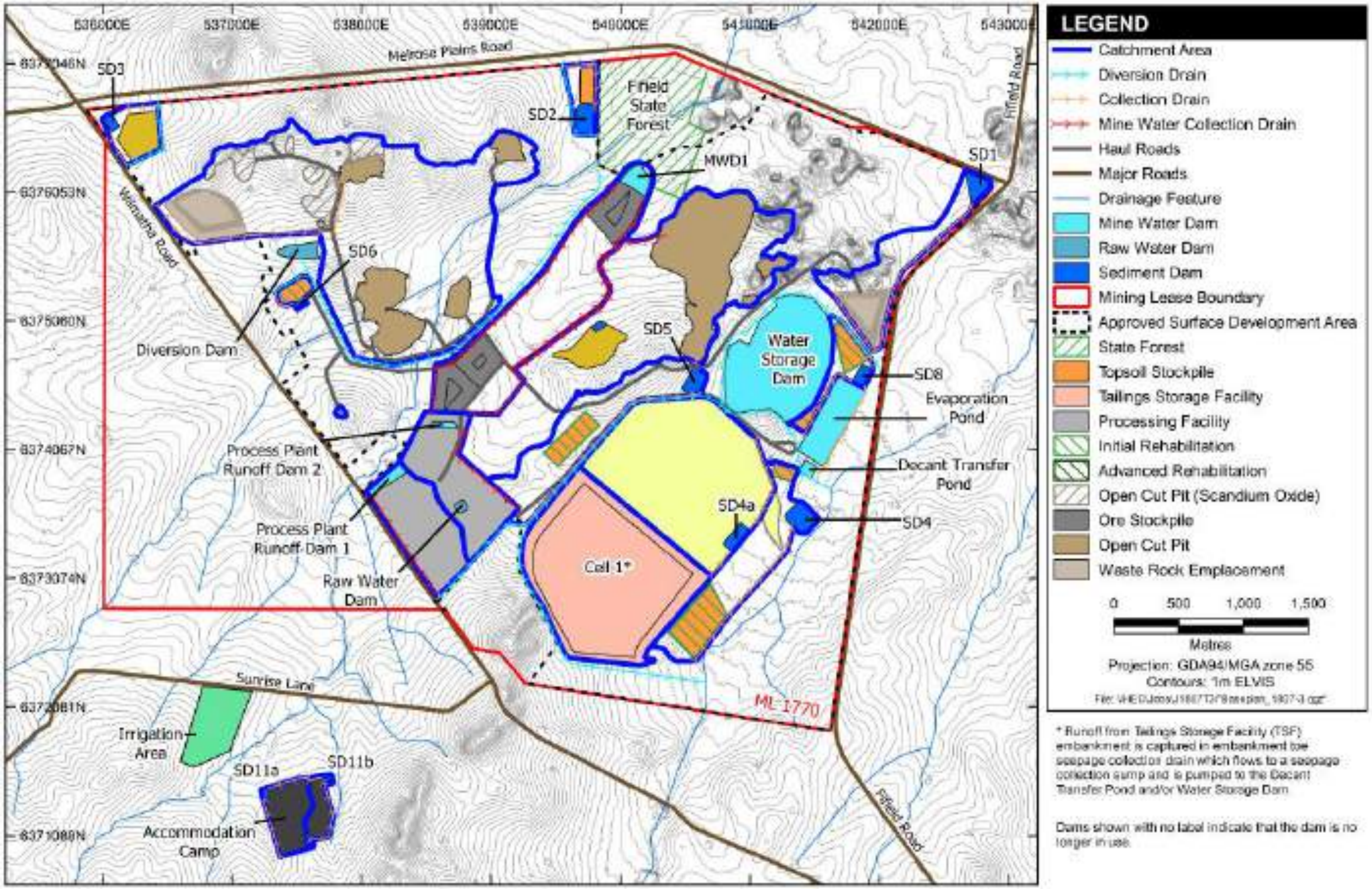


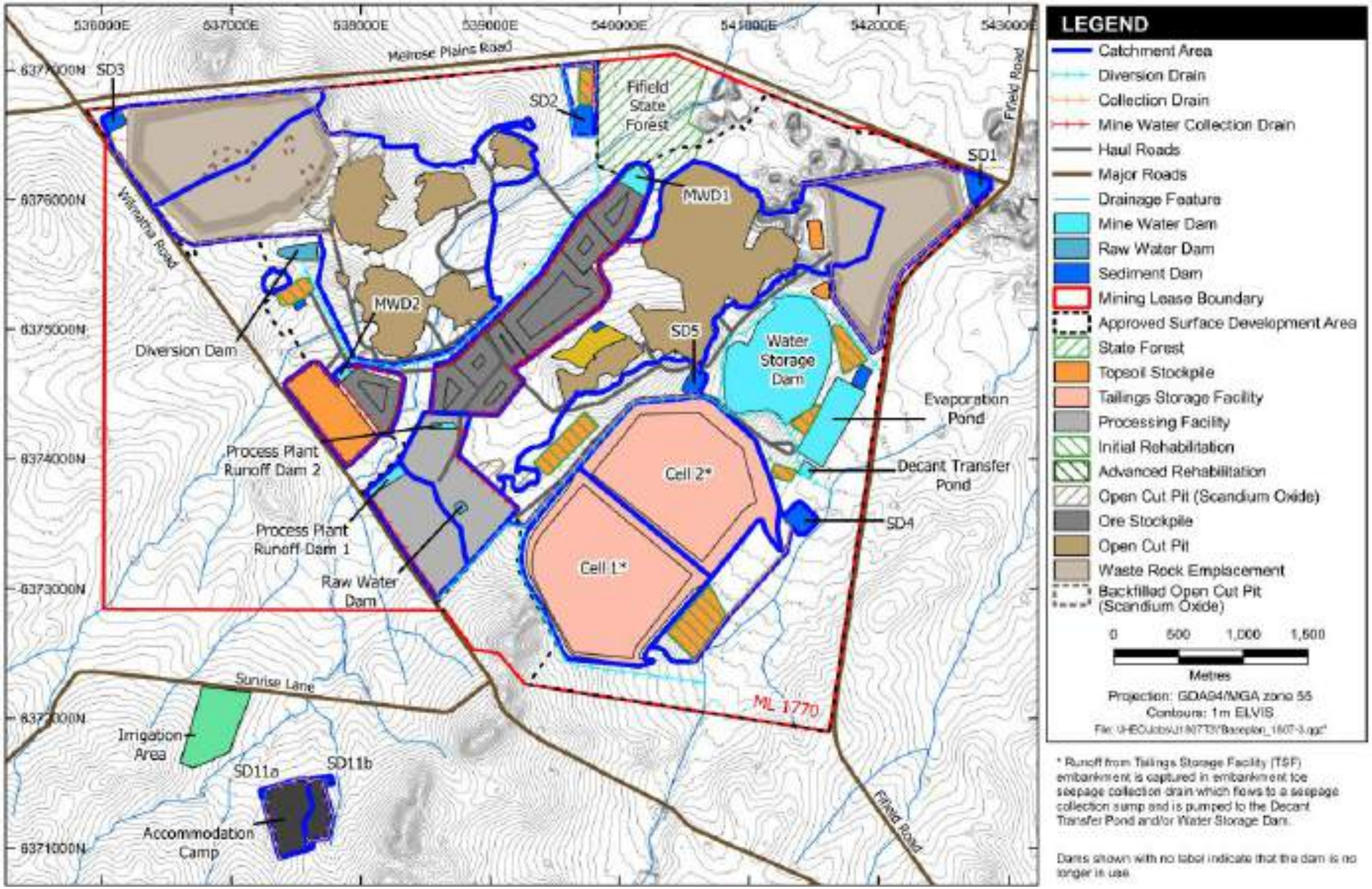
Figure 10 Construction Year 2 Water Management Plan



* Runoff from Tailings Storage Facility (TSF) embankment is captured in embankment toe seepage collection drain which flows to a seepage collection sump and is pumped to the Decant Transfer Pond and/or Water Storage Dam

Dams shown with no label indicate that the dam is no longer in use.

Figure 11 Operational Year 1 Water Management Plan



* Runoff from Tailings Storage Facility (TSF) embankment is captured in embankment toe seepage collection drain which flows to a seepage collection sump and is pumped to the Decant Transfer Pond and/or Water Storage Dam.

Dams shown with no label indicate that the dam is no longer in use.

Figure 12 Operational Year 5 Water Management Plan

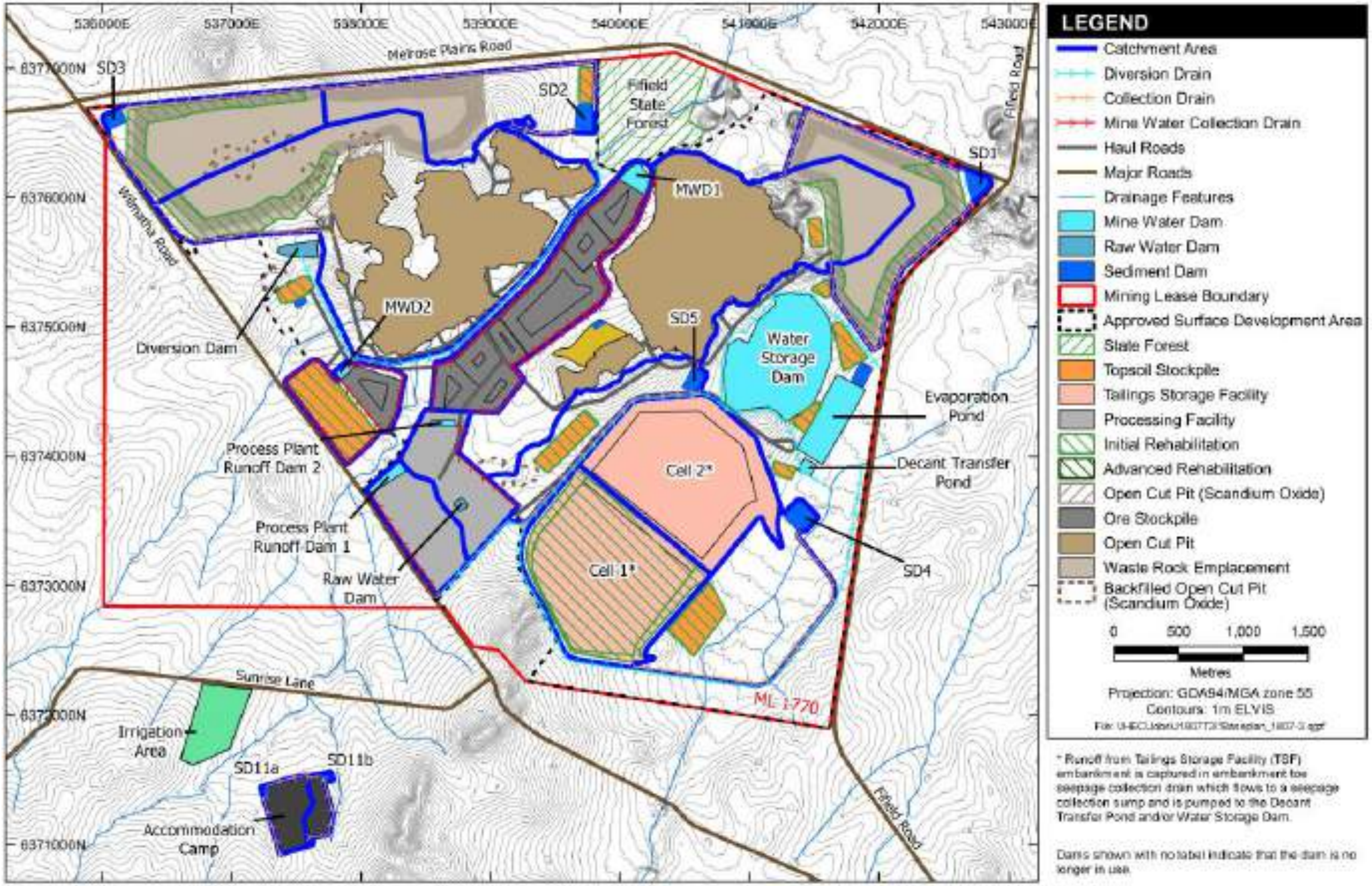


Figure 13 Operational Year 10 Water Management Plan

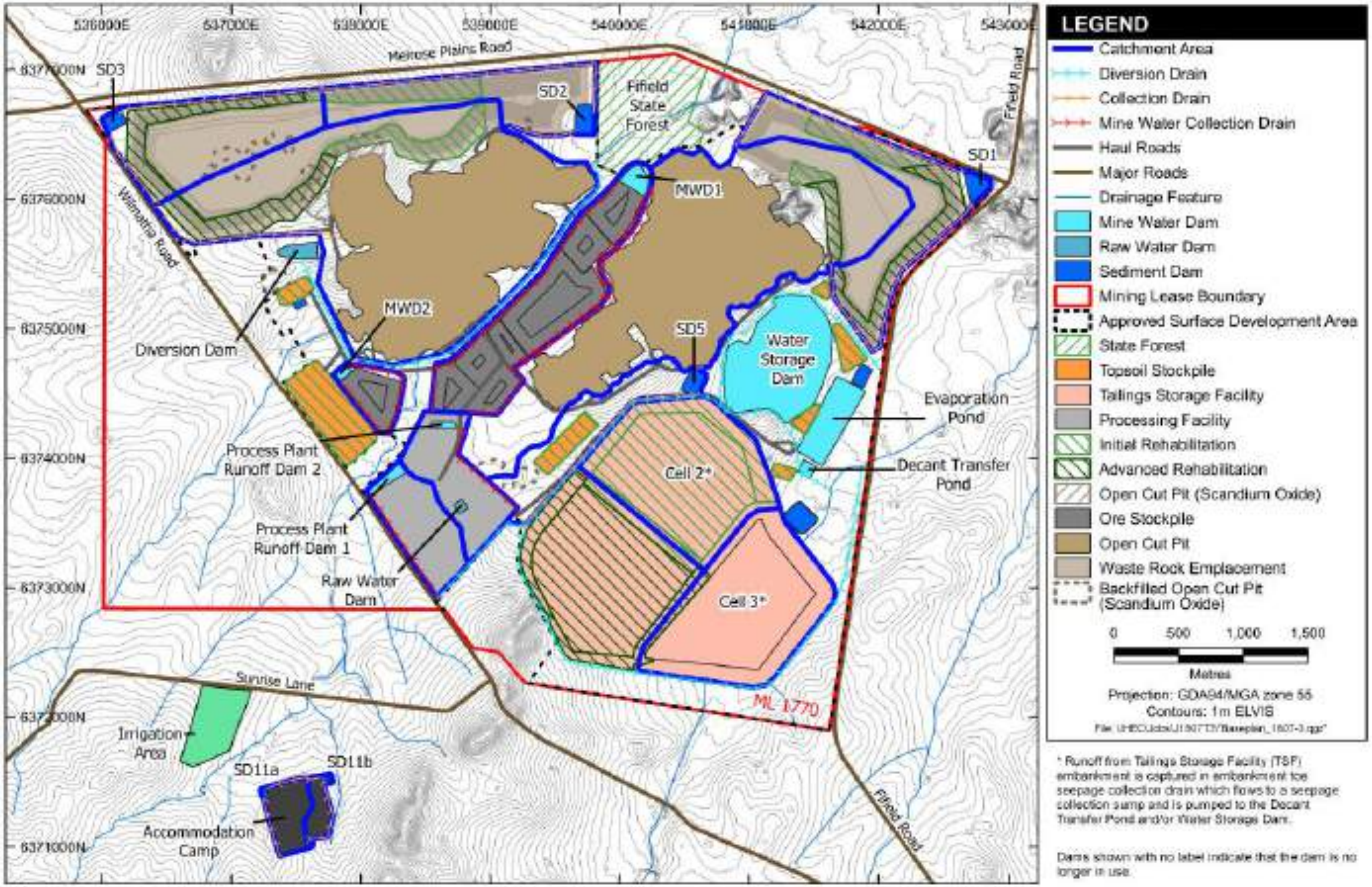


Figure 14 Operational Year 17 Water Management Plan

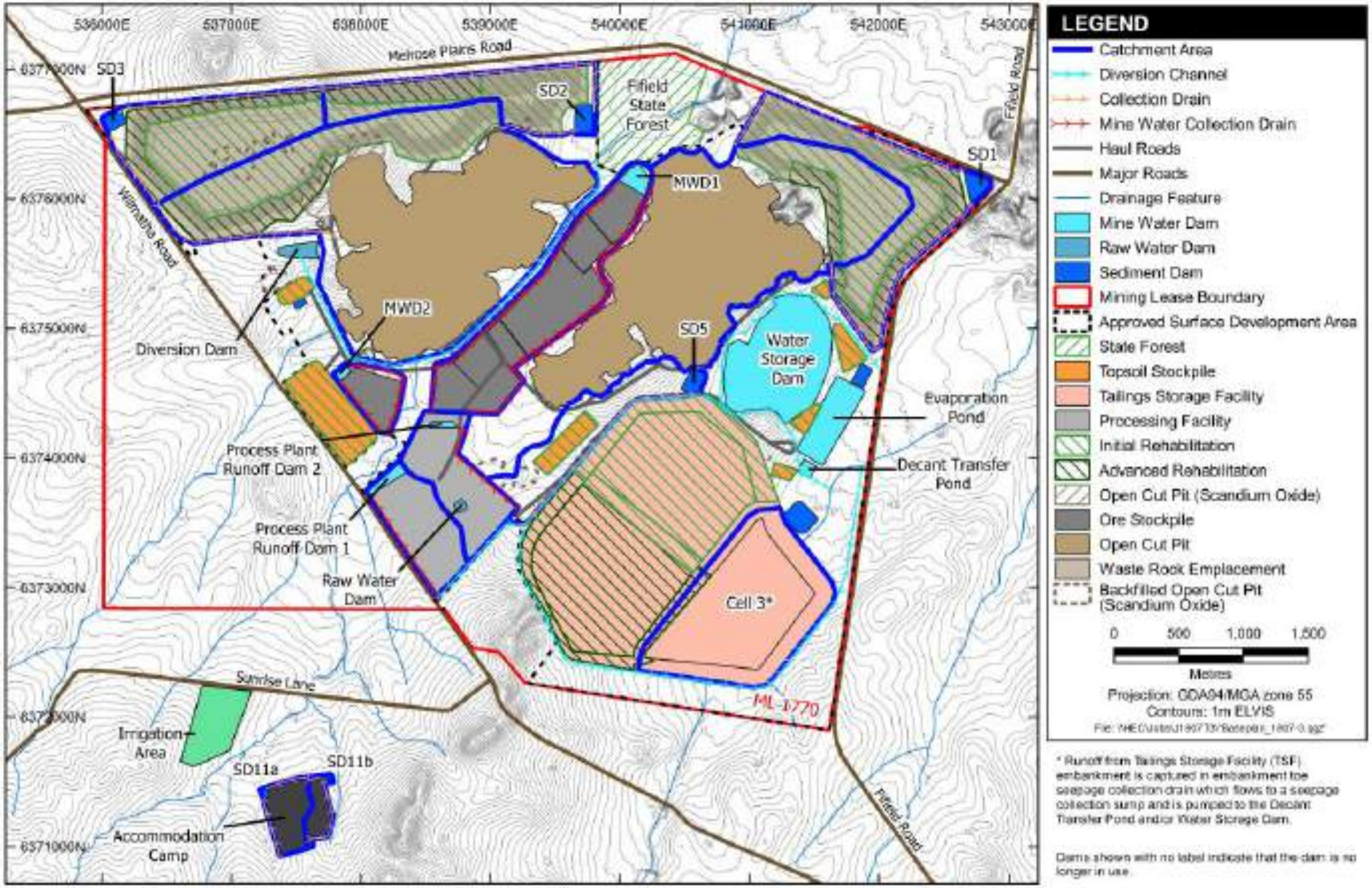


Figure 15 Operational Year 21 Water Management Plan

4.3.1 Tailings Storage Facility

The Modification would include a revised TSF construction sequence with TSF Cell 1 constructed first, followed by TSF Cell 2 and then TSF Cell 3 (Figures 11 to 15). As part of the Modification, TSF decant water would first be transferred to the DTP prior to transfer to the WSD, as illustrated in Figure 8.

Any seepage and embankment runoff would also first be pumped to the DTP and then to the WSD for reuse in the processing plant.

The TSF decant pipe and decant pump pond have been sized to transfer a 1% AEP, 72-hour rainfall event to the DTP and WSD within 7 days (Golder, 2020).

4.3.2 Decant Transfer Pond

The Modification would include the addition of a DTP (Figure 10). The DTP would be used to manage stored water volumes in the TSF and WSD.

Supernatant water (including incident rainfall) would initially be decanted from the TSF to the DTP. The TSF seepage collection sumps would also be dewatered to the DTP. The water in the DTP would then be pumped to the WSD for reuse in the processing plant.

The DTP would be constructed to accommodate a 1% AEP, 72-hour rainfall design event in excess of the operational capacity consistent with the water management performance measures (Section 2.1) (Golder, 2020). The operational capacity of the DTP would be approximately 7 ML (1.1 m depth), with a maximum capacity of approximately 22 ML (3 m depth).

In addition, the DTP would be designed and constructed consistent with the requirements of Development Consent (DA 374-11-00):

- designed, installed and maintained to ensure no discharge of mine affected water off-site (except in accordance with an EPL);
- designed, installed and maintained to minimise permeability; and
- designed, installed and maintained to meet the requirements of Dams Safety NSW (if required under the provisions of the *Dams Safety Act 1978*).

4.3.3 Evaporation Pond

The Modification would include the relocation and resizing of the EP approximately 400 m to the north of its approved location (Figure 2) to avoid the predicted flood extent of the southern drainage line (Figures 9 to 15) prior to its diversion in Year 11 (Golder, 2018).

The Modification would increase the capacity of the EP from approximately 281 ML to 340 ML at full development in order to accommodate an increased inflow rate of high chloride process water (Golder, 2020). The inflow rate of high chloride process water has increased from 2.5 m^3/hr adopted for the definitive feasibility study to 9.9 m^3/hr adopted for the detailed design study (Golder, 2020).

Consistent with the approved EP, the modified EP would be designed and constructed in accordance with the requirements of Development Consent (DA 374-11-00) (Section 4.2.2).

4.3.4 Water Storage Dam

No changes to the WSD are proposed as part of the Modification.

4.3.5 Processing Plant Runoff Dams

The Modification would include the construction of two PPRDs to reflect the revised processing facility area layout. The two PPRDs would replace the approved PPRD, MWD4 and MWD5 in that they would capture runoff from the processing facility area.

The PPRDs have been conceptually sized based on the results of the site water balance to avoid overflow from these storages (refer Section 5.3.4).

As illustrated in Figure 8, the PPRDs will be equipped with a pump to transfer water to the Process Water Tank (PWT). The PWT will supply water to the processing plant, based on the processing plant demand requirements, with excess water pumped to the WSD for temporary storage. The PWT will have a maximum capacity of 2,500 m^3.

4.3.6 Raw Water Dam

The Modification would increase the capacity of the RWD from approximately 15 ML to approximately 38 ML. Consistent with the approved RWD, the modified RWD would be designed in accordance with the relevant requirements of Development Consent (DA 374-11-00) (Section 4.2.5).

4.3.7 Sediment Dams

To accommodate the revised mine and processing facility area layout for the Modification, some changes to the location, number and sizing of the approved sediment dams would be required. Consistent with the approved sediment dams (refer Section 4.2.6), the conceptual design of the modified sediment dams has been undertaken in accordance with Landcom (2004) and DECC (2008a) (refer Section 4.2.6).

The modified sediment dam minimum pump rates, as listed in Table 12, have been specified based on the requirement that the sediment dams can be emptied within 5 days of filling, as per Landcom (2004). Water in excess of the sediment dam storage capacity would overflow to the receiving environment in accordance with Landcom (2004) and the requirements of EPL 21146.

Controlled release from SD11a and SD11b will be undertaken in order to reinstate the settling zone capacity following rainfall events. The catchment area of SD11a and SD11b is proposed to increase slightly from that approved (refer Section 4.2.6) due to the proposed additional accommodation facilities (Clean TeQ, 2020).

A summary of the conceptual design characteristics of the modified sediment dams is provided in Table 12.

Table 12 Conceptual Design Characteristics – Modified Sediment Dams

Sediment Dam	Years Required^	Estimated Maximum Catchment Area (ha)	Settling Zone Volume (ML)	Sediment Zone Volume (ML)	Minimum Required Volume (ML)	Minimum Required Pump Rate (L/s)
SD1	CY3 - OY21	93	34.9	17.4	52.3	90
SD2	CY2 - OY21	93	34.7	17.4	52.1	90
SD3	CY1 – OY1	15	2.4	1.2	3.6	10
	OY1 - OY21	88	33.2	16.6	49.7	80
SD4a	CY1 – OY5	125	46.9	23.4	70.3	110
SD4	CY1 – OY15	187	70.0	35.0	105.0	170
SD5	CY1 – OY21	57	21.5	10.7	32.2	50
SD6	CY2 – OY5	5	0.7	0.4	1.1	10
SD8	CY1 – OY5	95	15.1	7.6	22.7	40
SD11a	CY1 – OY21	17	6.2	3.1	9.3	10
SD11b	CY1 – OY21	8	3.1	1.6	4.7	10
SD13	CY1 – OY1	23	3.6	1.8	5.4	10

^ CY = construction year; OY = operational year

4.3.8 Mine Water Dams

To accommodate the revised mine and processing facility area layout for the Modification, some changes to the location, number and sizing of the approved MWDs would be required.

The MWDs have been conceptually sized based on the results of the site water balance to avoid overflow from these storages (refer Section 5.3.4).

As illustrated in Figure 8, water will be pumped from MWD1 and MWD2 to the WSD and from MWD2 for dust suppression purposes.

4.3.9 Diversion and Collection Drains

The mine and processing facility layout changes proposed as part of the Modification, particularly the relocation of the evaporation pond, would delay the requirement for the construction of the southern diversion from OY1 to approximately OY11 (Figure 13). The Modification would also result in minor changes to the layout and construction timing of the collection drains at the mine and processing facility.

The Modification would not change the approved northern diversion drain.

The Modification would not change the key objectives of the water management system, i.e. to manage runoff from the construction and operational areas, while diverting up-catchment undisturbed area water around these areas and to reduce to a practical minimum the use of water on-site.

4.3.10 Wastewater Treatment Plant and Treated Wastewater Irrigation Area

Wastewater generated at the accommodation camp is approved to be collected and treated at an on-site WWTP, as detailed in Section 4.2.9. An increased construction phase capacity of the accommodation camp from approximately 1,300 to approximately 1,900 personnel is proposed as part of the Modification. In order to manage the additional rate of treated wastewater from the WWTP due to the proposed increase in construction phase accommodation camp personnel, the treated wastewater irrigation area is proposed to be increased from approximately 10.5 ha to approximately 21 ha.

The Modification would also include the construction of a return pipeline from the WWTP to the process water tank at the mine and processing facility to enable the option of treated wastewater to be reused in the processing plant.

Consistent with relevant performance measures (Section 2.1), the expanded treated wastewater irrigation area would be designed and managed in accordance with the *Environmental Guidelines: Use of Effluent by Irrigation* (Department of Environment and Conservation [DEC], 2004), as summarised in Section 4.2.9.

4.4 MODIFIED WATER MANAGEMENT SYSTEM - RAIL SIDING

As described in Section 3.1.2, the rail siding would be relocated approximately 500 m to the south of the approved location as part of the Modification (Figure 3). During construction of the modified rail siding, erosion and sediment controls would be designed, installed and maintained in accordance with the relevant requirements of Landcom (2004), *Volume 2A – Installation of services* (DECC, 2008b) and *Volume 2C – Unsealed Roads* (DECC, 2008c). As shown in Figure 16, a diversion drain will be constructed along the northern and eastern boundaries of the modified rail siding to divert undisturbed area water runoff from the upstream catchment area around the modified rail siding. The diversion drain will discharge to an existing overland flow path downstream of the modified rail siding.

The total catchment area of the modified rail siding is approximately 4.7 ha.

Sediment dams SD14 and SD15 would be constructed at the modified rail siding to collect any sediment laden rainfall runoff from the modified rail siding area. Collection drains would be constructed along the southern boundary of the rail siding to capture and convey runoff to the sediment dams. The sediment dams would be designed, constructed and operated in accordance with the relevant requirements of Landcom (2004) and DECC (2008a). Water stored in the sediment dams would be utilised at the rail siding or released from site. Controlled release from SD14 and SD15 will be undertaken in order to reinstate the settling zone capacity following rainfall events, in accordance with Landcom (2004). If required, additional water will be supplied from the RWD at the mine and processing facility to meet dust suppression demands. Water sourced from the mine and processing facility would be transported to the modified rail siding by truck and stored in water storage tanks (refer Figure 8). Water in excess of the sediment dam storage capacity will overflow to the receiving environment in accordance with Landcom (2004).

A summary of the conceptual design characteristics of the proposed rail siding sediment dams is provided in Table 13.

Table 13 Conceptual Design Characteristics – Modified Rail Siding Sediment Dams

Sediment Dam*	Years Required^	Estimated Maximum Catchment Area (ha)	Settling Zone Volume (ML)	Sediment Zone Volume (ML)	Minimum Required Volume (ML)	Required Pump Rate (L/s)
SD14	CY1 - OY21	2	0.9	0.4	1.3	10
SD15	CY1 - OY21	2	0.9	0.4	1.3	10

* Assumed to be in place for greater than 3 years and conceptually designed to capture runoff from a 95th percentile 5-day duration rainfall event of 50.7 mm

^ CY = construction year; OY = operational year

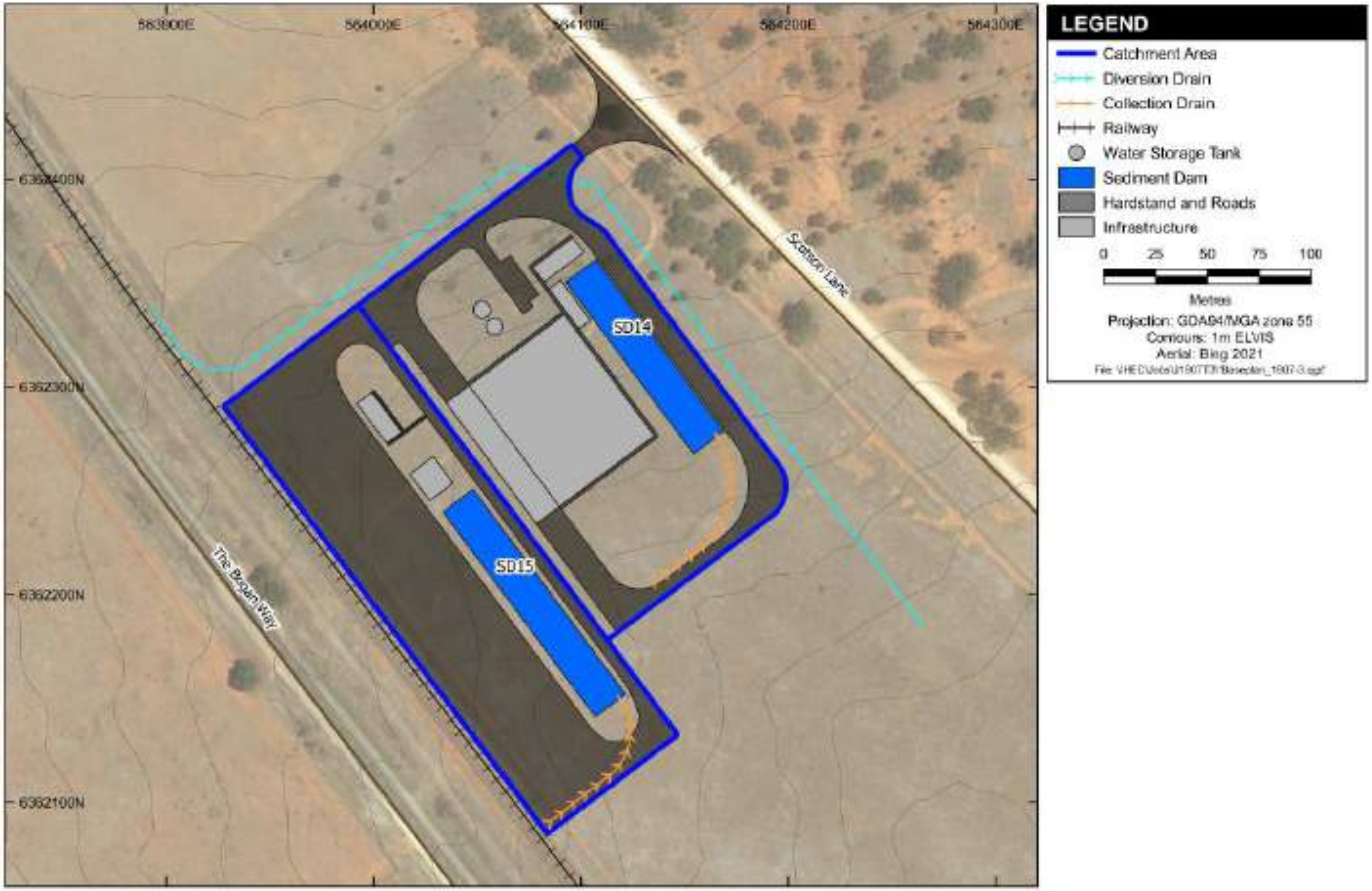


Figure 16 Rail Siding Water Management Plan

4.5 PROPOSED FINAL LANDFORM WATER MANAGEMENT SYSTEM

Key features of the approved mine and processing facility final landform include two final voids, two waste rock emplacements, TSF, EP, WSD and the northern and southern diversion drains.

The Modification would not change the key features of the approved final landform with the exception of the location of the rehabilitated EP and DTP.

Figure 17 illustrates the conceptual rehabilitated final landform and post-mining land uses of the modified mine, processing facility and accommodation camp. Permanent diversion drains would be constructed around the final voids to convey runoff from upstream areas away from the final void and divert runoff to existing surface water drainages to reduce the final void catchment areas. The permanent diversion drains will be designed to convey runoff from the 1% AEP peak rainfall event (refer Section 4.2.8). The final landform catchment area directed to the final voids is estimated at 600 ha. The final void catchment areas have been reduced where practicable in accordance with Condition 55, Schedule 3 of Development Consent (DA 374-11-00).

The long term drainage strategy for the EP (i.e. embankment breached and profiled to be a free-draining landform with runoff reporting to the natural environment) would be unchanged.

The conceptual rehabilitation strategy for the DTP would be as follows:

- The embankments would be removed and profiled to provide a free-draining landform with runoff reporting to the natural environment.
- If there are any contaminated soils associated within the DTP area, these would be identified and remediated in accordance with the requirements of the NSW *Contaminated Land Management Act 1997*.
- A layer of soil (depending on the outcomes of trials) would be placed on the reprofiled landform prior to revegetation.
- Following rehabilitation, the rehabilitated DTP would comprise endemic woodland.

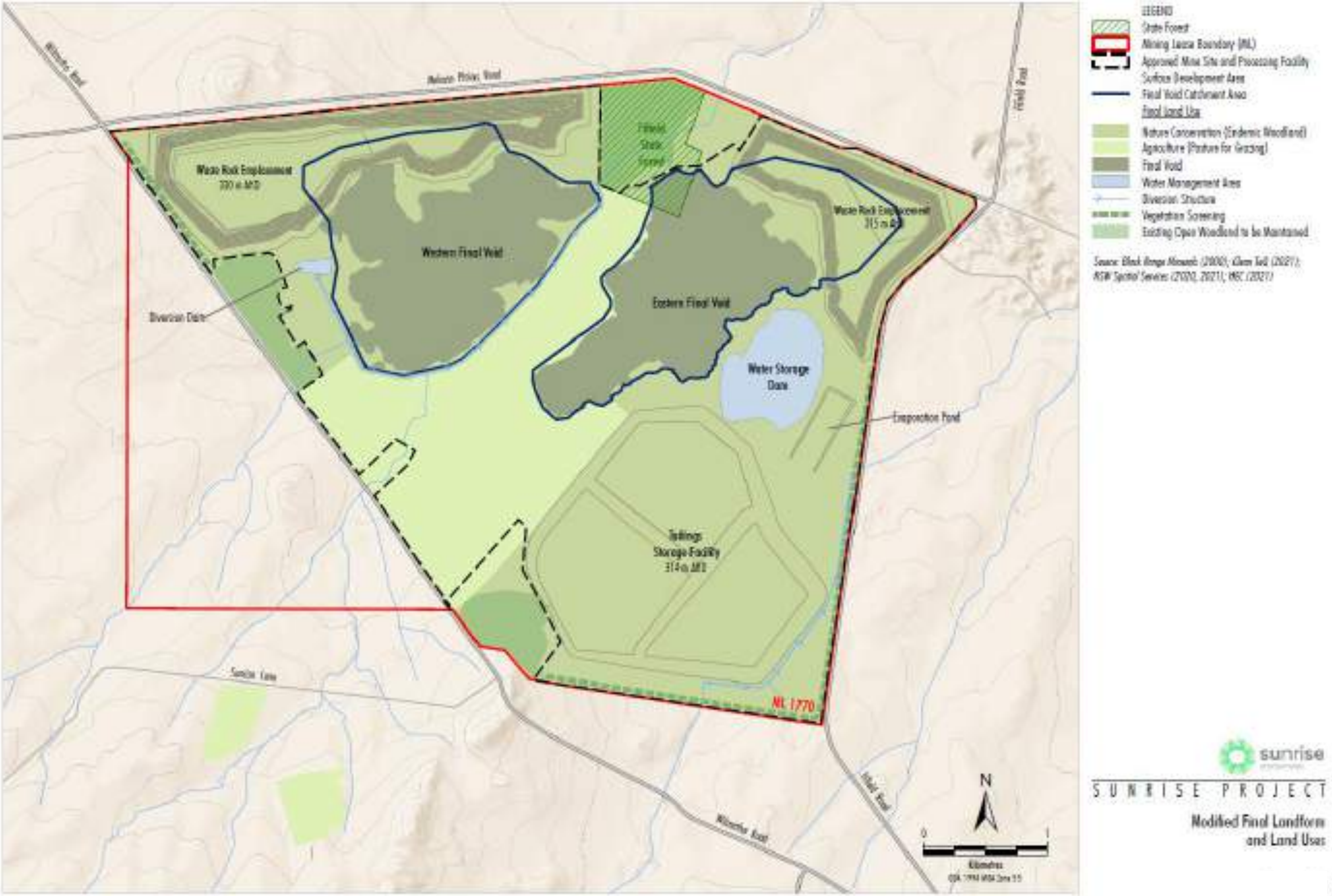


Figure 17 Final Landform Water Management Plan

5.0 SITE WATER BALANCE MODEL

5.1 MODEL DESCRIPTION

The approved water balance for the Project is described in the approved Water Management Plan (Clean TeQ, 2019).

The water balance model has been revised to reflect the modified Project and to assess whether the Modification would result in any changes to the Project water demand or site water management system. The water balance model is described below and the results of the water balance modelling undertaken for the Modification are summarised in Section 5.3.

The Project water balance model has been updated to simulate the storages and linkages shown in the modified water management schematic in Figure 8. The approved and modified water balance models were developed using the GoldSim® simulation package. The model simulates the behaviour of water held in and pumped between all simulated water storages. For each storage, the model simulates:

Change in Storage = Inflow – Outflow

Where:

Inflow includes rainfall runoff, groundwater inflow (for the open cut pits), tailings supernatant water[3] (for the tailings storage), water sourced from offsite and all pumped inflows from other storages.

Outflow includes evaporation, overflow and all pumped outflows to other storages or to a demand sink (e.g. the processing plant).

The model operates on an 8-hourly time step and is simulated for a 24 year period equivalent to the 3 year construction phase and 21 year operational phase for the modified Project. The model simulates 132, 24 year "realizations", derived using a climatic data set from 1889 to 2020[4]. The first realization uses climatic data from 1889-1912, the second 1890-1913, the third 1891-1914, and so on. This method effectively includes all historical climatic events in the water balance model, including high, low and median rainfall periods.

5.2 MODEL ASSUMPTIONS AND DATA

A summary of key model assumptions and underpinning data are provided in the sub-sections that follow.

5.2.1 Rainfall and Evaporation

A data set comprising 132 years of rainfall and pan evaporation data (1889 - 2020 inclusive) was obtained for the mine and processing facility area and for the rail siding area from SILO Point Data. A summary of the rainfall and pan evaporation data for each location is provided in Table 3 and Section 3.2.

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[3] Tailings supernatant water is water liberated from tailings slurry as it settles within the TSF. This water reports to the tailings surface and is available for reclaim pumping to the DTP.

[4] Additional climate data after 2020 was generated by "wrapping" data from the beginning of the climate data set to after 2020. In this way, data from the beginning and end of the data set was used in the same number of realizations as all other data.

5.2.2 Rainfall Runoff Simulation and Catchment Areas

For water surface areas, rainfall was modelled to add directly to the storage volume with no losses. Rainfall runoff in the water balance model is simulated using the Australian Water Balance Model (AWBM) (Boughton, 2004). The AWBM is a nationally-recognised catchment-scale water balance model that estimates catchment yield (flow) from rainfall and evaporation.

The AWBM simulation of flow from six different sub-catchment types was undertaken, namely: undisturbed (natural) areas, hardstand (for example, roads and infrastructure areas), open cut pit/pre-strip areas, active waste rock emplacement, rehabilitated waste rock emplacement and tailings. The AWBM parameters were specified on the basis of experience with similar projects. Catchment evaporation pan factors were set to 1 for tailings and hardstand areas and 0.85 for all other sub-catchment types. The tailings sub-catchment was split into two classifications; wet beach (20% of the area) and dry beach (80% of the area) to allow for the different runoff characteristics expected.

Each modelled storage catchment area was divided into sub-catchment areas corresponding with the above specified sub-catchment types. Catchment areas for the modified Project (e.g. open cut pits, processing facility, ore stockpiles areas, water storages) were calculated for CY1, CY2, OY1, OY5, OY10, OY17 and OY21 on the basis of the stage plans (refer Figure 9 to Figure 15). The catchment area is calculated in the model by linearly interpolating between the values derived from the stage plans. The total catchment area, including the accommodation camp and rail siding, will increase from approximately 640 hectares (ha) in CY1 to 1,680 ha in OY10 as mining progresses. From OY10 to OY21, the total catchment area is proposed to reduce to approximately 1,420 ha as areas are rehabilitated and runoff from these areas is directed offsite.

5.2.3 Groundwater Inflow

Groundwater inflow rates to the open cut pits were estimated by Golder (2017) using a two-dimensional (2D) fine element groundwater model. Two cases were simulated: 1. base case – simulated using calibrated hydraulic conductivities; and 2. sensitivity case – simulated with increased hydraulic conductivity (half an order of magnitude). Forecast open cut pit groundwater inflow rates are presented in Table 14 for the base case and sensitivity case (Golder, 2017).

Table 14 Open Cut Pit Groundwater Inflow Rates

Operational Year	Base Case Inflow Rate (ML/year)	Sensitivity Case Inflow Rate (ML/year)
1	0.071	0.153
2	0.058	0.113
3	0.052	0.098
4 - 21	0.046	0.084

As the forecast open cut pit groundwater inflow rates are negligible and do not vary greatly between the base case and sensitivity case, only the base case groundwater inflow rates have been adopted in the site water balance modelling.

The model simulates an equal distribution of groundwater inflow, based on the rates specified in Table 14, to the eastern and western pits. Groundwater and rainfall runoff are then simulated pumped from the open cut pits to the WSD for use in the processing plant.

5.2.4 Evaporation from Storage Surfaces

Level-volume-area relationships for each modelled storage were obtained or estimated from the following sources:

- WSD, EP and DTP – Golder (2020).
- RWD – Drawing No. 2020-SPT-1100-41DK-0001 (SEM, 2020).
- Sediment dams and MWDs - estimated to achieve the required storage capacity with consideration to surface area constraints as assessed from contour plans provided by SEM.
- Open cut pits – estimated based on the maximum surface area extent and depth, as indicated by SEM.

The water surface area of each storage (calculated on each day from the modelled volume and volume-area relationships) was multiplied by daily pan evaporation obtained from SILO Point Data and by a pan factor[5] to calculate an evaporation volume. Monthly pan factors for Cobar (approximately 200 km north-west of the site) obtained from McMahon et al. (2013) were used, as listed in Table 15. The monthly pan factors were selected for Cobar as this is the closest location to the mine and processing facility with similar geographic characteristics (i.e. elevation and proximity to the coast) presented in McMahon et al. (2013).

Table 15 Adopted Monthly Pan Evaporation Factors

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pan Factor	0.736	0.727	0.725	0.765	0.802	0.863	0.882	0.873	0.843	0.815	0.768	0.732

5.2.5 Construction Demand

Water supply during the construction phase (CY1 to CY3) will be required for infrastructure construction, dust suppression and the accommodation camp.

The water demand for construction purposes was modelled as 900 ML/year as specified by SEM.

Dust suppression for the modified mine and processing facility and rail siding roads during the construction phase was modelled as summarised in Section 5.2.7.

Daily raw water demand requirements modelled for the accommodation camp for the construction phase (CY1 to CY3), as provided by SEM, are illustrated in Figure 18.

All wastewater from the accommodation camp (including from the reverse osmosis plant) will be treated in the WWTP. The treated wastewater generated from the WWTP was modelled as 80% of the raw water supply rate. Treated wastewater was simulated as supplied in entirety to the treated wastewater irrigation area in CY1 and CY2. In CY3, 95% of the treated wastewater was simulated as transferred to the mine and processing facility, and 5% to the treated wastewater irrigation area, as advised by SEM.

[5] A pan factor is a multiplier (usually less than one) used to convert monitored pan evaporation data to estimates of open water evaporation.

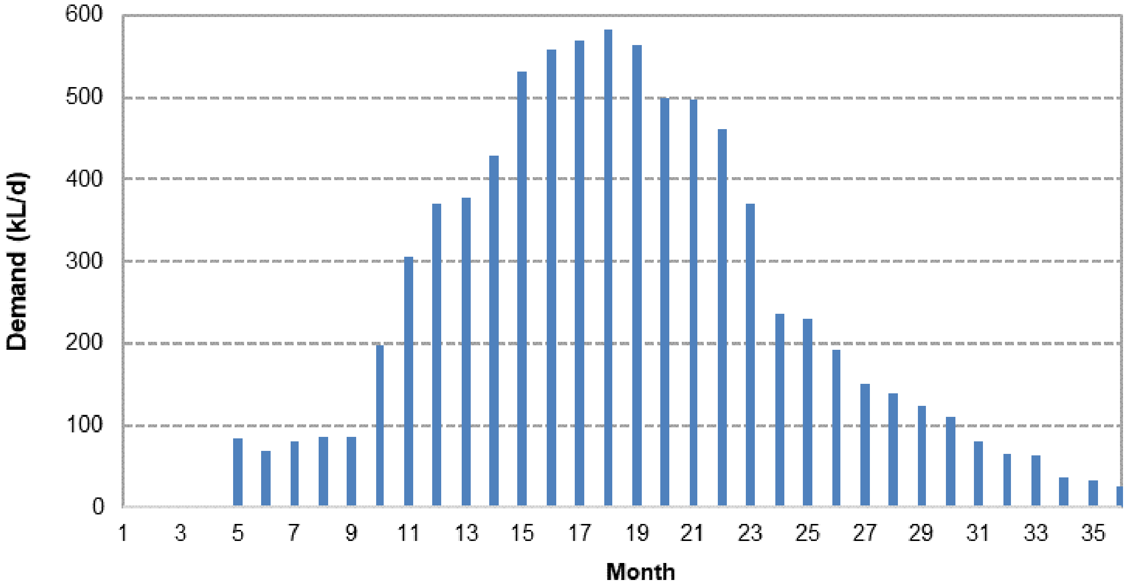

Figure 18 Accommodation Camp Raw Water Demand During Construction

5.2.6 Processing Plant Demand and Tailings Disposal

The ore and tailings properties provided by SEM for estimation of processing plant water make-up demand and tailings supernatant rate[6] were as follows:

- Ore moisture content: 10% free moisture
- Tailings slurry solids concentration: 48%
- Initial tailings settled dry density: 0.75 t/m^3
- Tailings particle density: 3.3 g/cm^3

Table 16 presents the process ore feed rate, autoclave feed rate and tailings output rate, as provided by SEM. Limestone will be added to the tailings to neutralise sulphuric acid, approved at up to 990,000 tonnes/year, prior to transfer to the TSF. The addition of limestone to the tailings will result in a greater tailings output rate than that of the process ore feed rate. The water makeup demand and tailings supernatant rate estimated based on these rates and the above specified parameters are also presented for each year of the modified Project life.

Table 16 Mined Ore Tonnes, Processing Plant Water Make-Up Rate and Tailings Supernatant Rate

Year	Process Ore Feed Rate (tonnes/year)	Autoclave Feed Rate (tonnes/year)	Tailings Output (tonnes/year)	Water Makeup Demand (ML/d)	Tailings Supernatant Rate (ML/d)
CY3	681,231	630,769	820,000	2.3	0.12
OY1	830,769	769,231	1,000,000	2.7	0.15
OY2 – OY20	2,700,000	2,500,000	3,250,000	8.9	0.47
OY21	1,700,000	1,574,074	2,046,296	5.6	0.30

Additional processing plant input and loss rates at full production (OY2 – OY20) are listed in Table 17. The input and loss rates for other operational years were scaled based on the annual mined ore rate.

[6] Tailings supernatant is water liberated from tailings slurry as it settles within the TSF. This water reports to the tailings surface and is available for reclaim pumping to the DTP.

Table 17 Processing Plant Water Supply and Loss Rates at Full Production

Water Stream		Rate (ML/d)
Input	Reagents	0.07
Loss	Ore reject entrainment	0.03
	Evaporation from process	0.67
	Process plant water treatment plant effluent	0.21
	Product entrainment	0.14

5.2.7 Dust Suppression Demand

Dust suppression demand for the mine and processing facility and rail siding roads was calculated as the difference between daily pan evaporation and rainfall multiplied by the respective area, up to a maximum rate of 4 L/m^2/d. The road areas were estimated based on the stage plans for CY1 to OY21 (Figures 9 to 15).

5.2.8 Tailings Storage

The TSF will comprise three cells which will be constructed and filled sequentially over the life of the Project. The modified cell construction sequence would be TSF Cell 1 constructed first, followed by TSF Cell 2 and then TSF Cell 3 (Figures 9 to 15). The simulated timing of the construction and operation of each cell is presented in Table 18.

Table 18 Modified TSF Cell Staging

Year	Cell Construction Occurring	Cell Receiving Tailings
CY1	Cell 1	
CY2		
CY3		Cell 1
OY1		Cell 1
OY2		Cell 1
OY3		Cell 1
OY4	Cell 2	Cell 1
OY5		Cell 1
OY6		Cell 1 / Cell 2
OY7		Cell 1 / Cell 2
OY8		Cell 1 / Cell 2
OY9		Cell 1 / Cell 2
OY10		Cell 2
OY11		Cell 2
OY12		Cell 2
OY13	Cell 3	Cell 2
OY14		Cell 2
OY15		Cell 2 / Cell 3
OY16 - 21		Cell 3

The decant pond was assumed to be located near the eastern internal corner of each cell with a beach slope of 1%. The volume-area relationship for the maximum decant pond simulated for each active TSF cell is presented in Table 19.

Table 19 TSF Cell Decant Pond Storage Characteristics

Cell	Maximum Depth (m)	Maximum Storage Volume (ML)	Maximum Surface Area (ha)
1	4.4	889	59.7
2	4.4	889	59.7
3	3.5	624	38.5

Table 19 shows the maximum storage volume and surface area of each TSF cell decant pond simulated in the model. However, water would be transferred from the internal decant ponds within each cell to the DTP and then to the WSD for reuse in processing. Therefore, the actual stored water volume of the TSF cell decant ponds would be significantly less than the maximum allowable storage volume for the majority of the time (refer Section 5.3.5).

For the purposes of modelling, it was assumed that each filled TSF cell would be rehabilitated over a subsequent four-year period. For the first year of rehabilitation, the TSF cell under rehabilitation was modelled with AWBM parameters representative of a TSF cell, with rainfall runoff reporting to the decant pond. For the second and third year of rehabilitation, the TSF cell being rehabilitated was modelled with AWBM parameters representative of a waste rock emplacement, with rainfall runoff reporting to the decant pond. For the fourth year, the TSF cell being rehabilitated was modelled with AWBM parameters representative of a rehabilitated surface, with rainfall runoff reporting to the decant pond. Following completion of the four-year rehabilitation period, the rainfall runoff from the rehabilitated TSF cell was not included in the water balance as it was assumed to discharge offsite.

5.2.9 Evaporation Pond

The high chloride waste stream approved to be transferred to the EP was simulated at the following rates, as advised by SEM:

- OY1 – 0.1 ML/d
- OY2 – 0.18 ML/d
- OY3 to OY21 - 0.2 ML/d

5.2.10 Water Supply Priority

Consistent with the approved Project water management system, the modified water management system has been designed to utilise onsite water supply as a priority over external supply. The simulated priority of water supply to the processing plant was as follows:

Priority 1 – PPRDs supply to the processing plant via the PWT.

Priority 2 – WSD supply to the processing plant.

Priority 3 – RWD (i.e. offsite supply from the Project borefield/Lachlan River) supply to the processing plant.

5.2.11 Pumping Rates and Triggers

Simulated pumped transfer rates between storages and the triggers which dictate whether pumping occurs are summarised in Table 20. The simulated pump rates for the sediment dams were specified in accordance with the design criteria (refer Section 4.3.7) or as advised by SEM. Pump rates for the mine water storages and the triggers which dictate pumping were set based on iterative simulations to ensure no modelled occurrences of overflow from these storages.

Table 20 Modelled Pump Rates and Triggers

Source	Destination	Max Pump Rate (L/s)	Trigger
SD1	WSD	120	If >2 ML and WSD<369 ML, pump out; if <=1 ML or WSD>=369 ML, turn off
SD2		150	
SD3	Mine area dust suppression	80	If >1 ML, pump out at lesser of demand and pump rate; if <=0.5 ML, turn off
SD4	WSD	170	If >2 ML and WSD<369 ML, pump out; if <1= ML or WSD>=369 ML, turn off
SD4a		150	
SD5		50	
SD6	Mine area dust suppression	10	If >0.2 ML, pump out at lesser of demand and pump rate; if <=0.1 ML, turn off
SD8	WSD	40	If >2 ML and WSD<369 ML, pump out; if <=1 ML or WSD>=369 ML, turn off
SD13		10	If >1 ML and WSD<369 ML, pump out; if <=0.5 ML or WSD>=369 ML, turn off
SD14	Rail siding dust suppression	20†	If >0.2 ML, pump out at lesser of demand and pump rate; if <=0.1 ML, turn off
SD15			
MWD1	WSD	120	If >3 ML and WSD<1,107 ML, pump out; if <=2 ML or WSD>=1,107 ML, turn off
MWD2	Mine area dust suppression	No pump rate set - water transferred for dust suppression usage based on demand	
	WSD	100	If >2 ML and WSD<1,230 ML, pump out; if <=1 ML or WSD>=1,230 ML, turn off
PPRD1	Process plant (via PWT^)	50	If >2 ML, pump out at lesser of demand and pump rate; if <=1 ML, turn off
	WSD (via PWT^)	100	If >2 ML and WSD<1,230 ML, pump out; if <=1 ML or WSD>=1,230 ML, turn off
PPRD2	Process plant (via PWs)	50	If >2 ML, pump out at lesser of demand and pump rate; if <=1 ML, turn off
	WSD (via PWT^)	130	If >2 ML and WSD<1,230 ML, pump out; if <=1 ML or WSD>=1,230 ML, turn off
WSD	Process plant	150	If >7.5 ML, pump out at lesser of demand and pump rate; if <=5 ML, turn off
TSF Cell 1	DTP	150	If >2 ML and DTP<6.9 ML and WSD<861ML, pump out; if <=1 ML or DTP>=6.9 ML or WSD>=861 ML, turn off
TSF Cell 2			
TSF Cell 3			
DTP	WSD	150	If >2 ML and WSD<1,230 ML, pump out; if <=1 ML or WSD>=1,230 ML, turn off
RWD	Project demands	No pump rate set - water transferred for processing plant and dust suppression usage based on demand	
Western Pits	WSD	150	If >10 ML and WSD<861 ML, pump out; if <=5 ML or WSD>=861 ML, turn off
Eastern Pits		150	

† A combined pump rate of 20 L/s from SD14 and SD15 was found to be adequate to meet dust suppression demands at the rail siding where sufficient water supply was available from SD14 and SD15. At times when insufficient water supply is available, water would be trucked from the mine and processing facility RWD (refer Section 4.4).

^ The PWT was not explicitly modelled.

5.3 SITE WATER BALANCE MODEL RESULTS

5.3.1 Probabilistic Results

Probabilistic outputs for key model results are presented in the following sections. The probability outputs are presented for the 5th to 95th percentile predicted volumes, with a 90% chance that the predicted volumes will fall in between the 5th/95th percentile results. It is important to note that none of these outputs represents a single climatic realization – these probabilities are compiled from all 132 realizations simulated – e.g. the median volume does not represent model forecast volume for median climatic conditions.

5.3.2 Overall Site Water Balance

Table 21 summarises the average annual water balance for the modified Project life based on the average water balance results (averaged over the 24 year simulation period).

Table 21 Modified Project Summary Water Balance

Average Inflows (ML/year)	
Rainfall runoff	2,033
Groundwater	0.04
Offsite supply	1,985
Reagents	22
Water in ore	227
Accommodation camp WWTP treated water to mine and processing facility	7.9
TOTAL	**4,275**
Average Outflows (ML/year)	
Evaporation	539
Dust suppression	314
Sediment dam overflow	130
Process loss	326
Water entrained in tailings	2,817
Construction use	113
Accommodation camp WWTP treated wastewater to irrigation area	0.42
Accommodation camp treatment process waste	2.1
TOTAL	**4,241**
Stored Water Inventory (ML/year)	
Increase in stored water inventory	34

Table 21 illustrates that rainfall runoff contributes the majority of system inflows over the modified Project life while water entrained in tailings dominates system outflows.

The average water balance results presented in Table 21 indicate an average annual increase in stored water inventory of 34 ML. The increase in stored water inventory relates predominately to the high chloride waste stream stored in the EP which is not able to be reused (up to 75 ML per year). The increase in simulated stored water inventory is also due to ‘rules’ that are simulated in the model for each site water storage regarding operating volumes i.e. to ensure site water demands are met and to reduce the potential for overflow from mine water storages.

An average volumetric runoff coefficient of 0.27 was calculated for the site based on the AWBM rainfall runoff predictions for the 24 year simulation period and 132 realizations – that is, 27% of site rainfall becomes runoff on average.

5.3.3 Predicted Total Stored Water Inventory

The predicted total stored water inventory over the modified Project life is shown in Figure 19 as probability plots. Note that the total stored water inventory and total storage capacity includes the water management storages only and does not include water stored temporarily in the eastern and western pits or the TSF cell internal decant ponds. The model simulation commences in July and hence each year is from 1 July to 30 June.

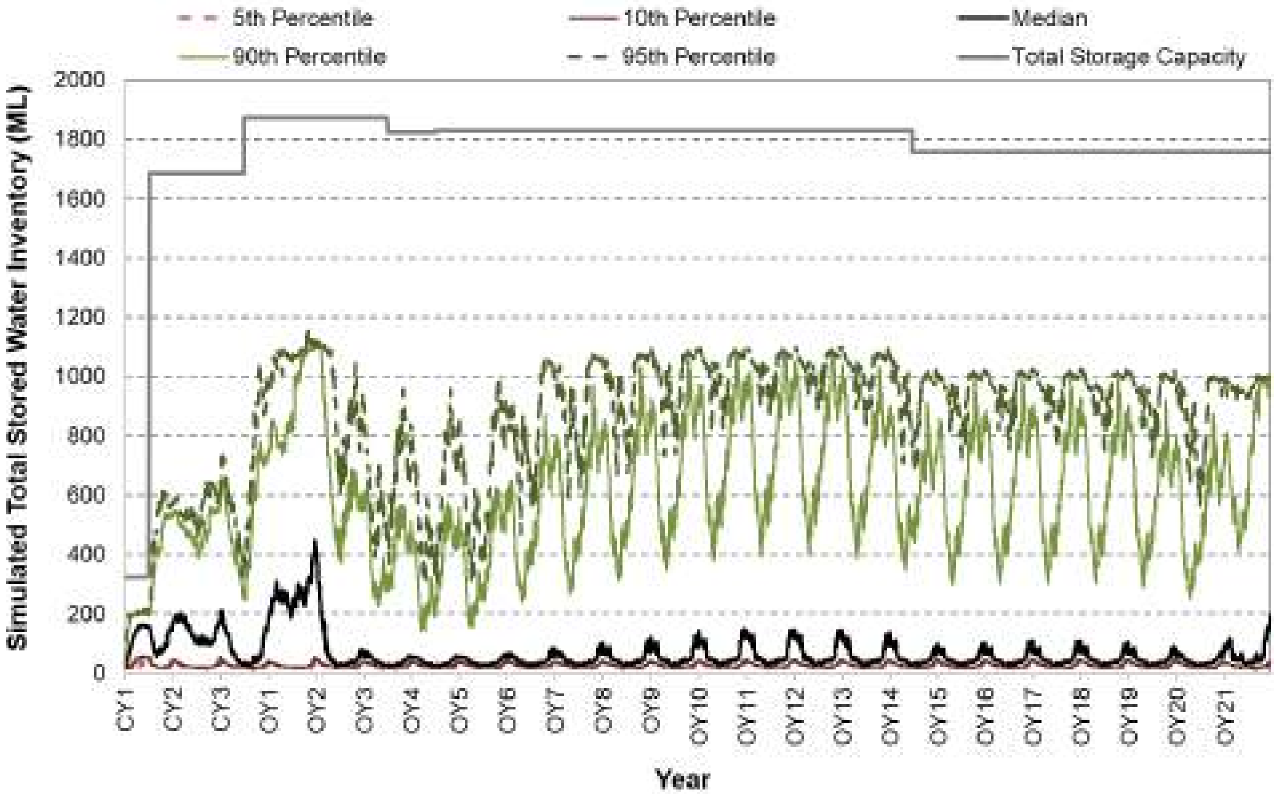

Figure 19 Simulated Total Water Inventory

Figure 19 illustrates that the forecast 95th percentile inventory peaks at approximately 1,160 ML at the end of OY1 in comparison with a maximum available storage capacity of 1,871 ML. The increase in stored water volume between CY3 and end of OY1 occurs due to an increase in catchment area, and therefore increase in rainfall runoff volumes, during the ramp up period prior to full production.

The median modelled stored water volume peaks at approximately 450 ML at the end of OY1. Following commencement of full production in OY2, the median total stored water volume is predicted to decrease and would not exceed approximately 145 ML during the remainder of the modified Project life.

Although on-site storage capacity exceeds the 95th percentile modelled inventory, the stored water volumes are not equally distributed between storages and hence overflows are predicted from sediments dams (but not mine water storages) during the modified Project life (refer Section 5.3.6).

5.3.4 Predicted MWD and PPRD Storage Requirements

The required capacity of the MWDs and PPRDs to achieve no overflows over the modified Project life was assessed based on the site water balance results for the full 24 year, 132 realization simulation and adoption of the operational characteristics summarised in Table 20. Table 22 presents the predicted minimum capacity requirements of the MWDs and PPRDs to achieve no overflows.

Table 22 Predicted Capacity Requirements – Modified MWDs and PPRDs

Dam	Years Required^	Estimated Maximum Catchment Area (ha)	Minimum Required Storage Capacity (ML)
MWD1	OY1 - OY21	103	113
MWD2	OY5 - OY21	45	19
PPRD1	CY1 - OY21	40	48
PPRD2	CY1 - OY21	45	61

^ CY = construction year; OY = operational year

5.3.5 Predicted TSF Cell Stored Water Volume

Decant water from the TSF cell internal decant ponds to the DTP and then to the WSD, may be restricted at times dependent on the available storage capacity of the WSD. Table 23 presents the model predictions of the maximum stored water volume in each TSF cell based on the 5th percentile, median and 95th percentile model results. The 95th percentile stored water volumes are compiled from all 132 realizations and are those which would be expected to be exceeded 5% of the time and the 5th percentile values are those which would be expected to be exceeded 95% of the time.

Table 23 Predicted Maximum Stored Water Volume in TSF Cells

TSF Cell	Predicted Maximum Stored Water Volume (ML)		
	5th Percentile	Median	95th Percentile
Cell 1	9	35	182
Cell 2	8	34	177
Cell 3	8	32	169

It should be noted that the stored water volumes in the TSF cells will be intermittent and temporary following significant rainfall only, with water transferred to the DTP and then to the WSD when sufficient storage capacity is available in the WSD.

5.3.6 Predicted Dam Overflow

No overflow was predicted from the WSD, MWDs, PPRDs, RWD, EP, TSF or DTP based on all results for the 24 year, 132 realization simulation.

Predicted average annual overflow volumes, for the 5th percentile, median and 95th percentile, are presented in Figure 20 for the mine and processing facility sediment dams and Figure 21 for the rail siding and accommodation camp sediment dams.

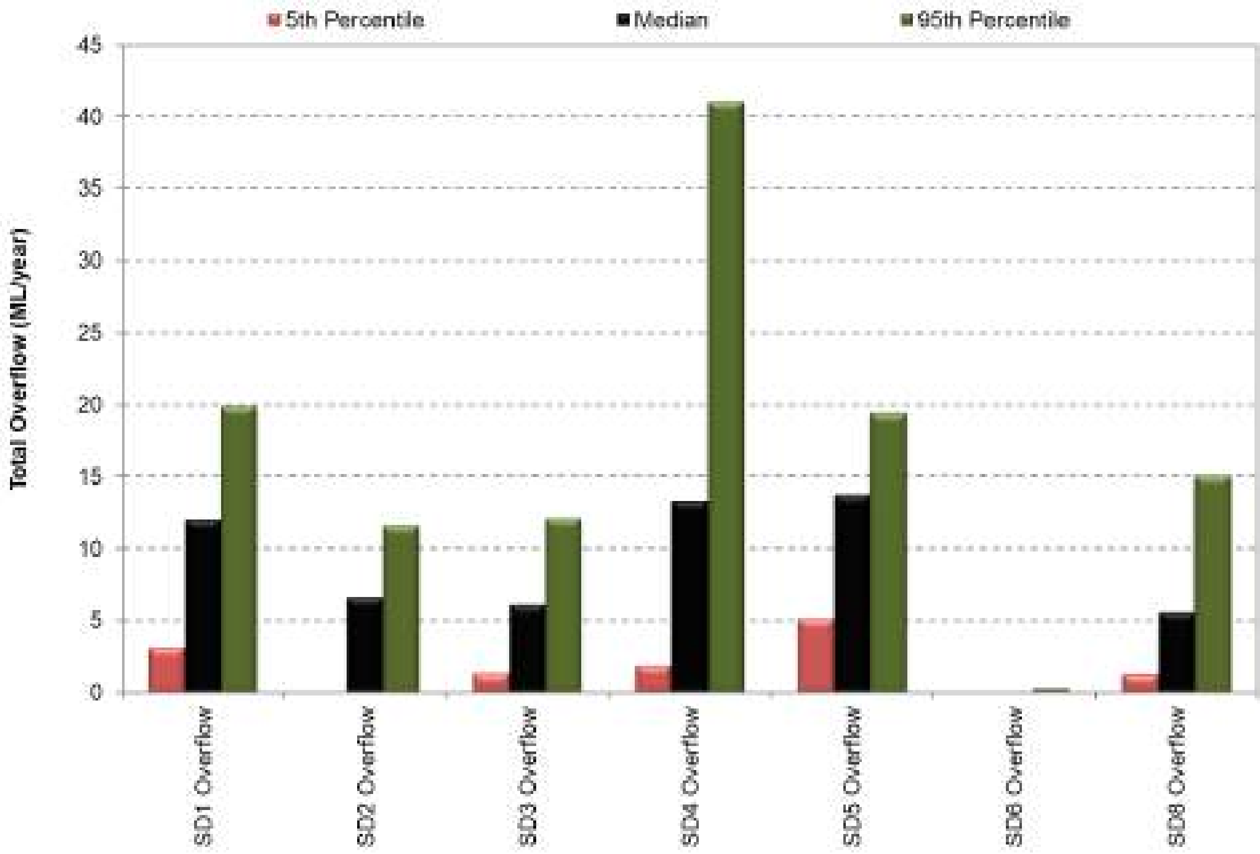

Figure 20 Predicted Average Annual Overflow from Mine and Processing Facility Sediment Dams

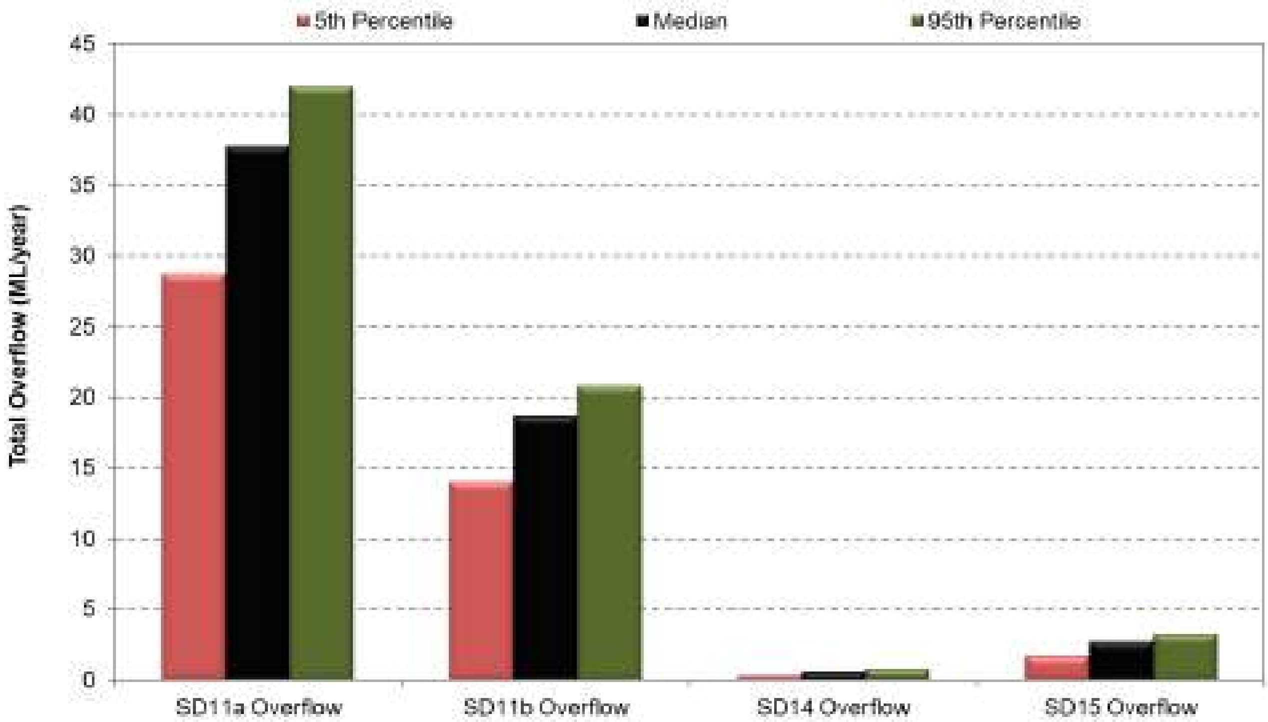

Figure 21 Predicted Average Annual Overflow from Accommodation Camp and Rail Siding Sediment Dams

Figure 20 illustrates variable overflow volumes from the mine and processing facility sediment dams. For the larger catchment area sediment dams (SD3 and SD4), an average annual overflow volume of 1 ML to 12 ML and 2 ML to 41 ML respectively was predicted based on the 5th percentile and 95th percentile model results.

Figure 21 illustrates that the average annual overflow from the accommodation camp sediment dams (SD11a and SD11b) is predicted at 28 ML to 42 ML and 14 ML to 21 ML respectively, based on the 5th percentile and 95th percentile model results. The accommodation camp sediment dams will be managed independently of the mine and processing facility, with controlled release from SD11a and SD11b undertaken in order to reinstate the settling zone capacity following rainfall events (Section 4.3.7). Controlled release from the accommodation camp sediment dams has not been simulated in the water balance model and, as such, the volumes presented in Figure 21 are a conservative estimate of average annual overflow.

For the rail siding sediment dams (SD14 and SD15), an average annual overflow volume of 0.4 ML to 0.8 ML and 1.7 ML to 3.3 ML respectively was predicted based on the 5th percentile and 95th percentile model results. Supply from the rail siding sediment dams for dust suppression purposes has been simulated in the water balance model, however, controlled release from the sediment dams has not been simulated and, as such, predicted overflow from SD14 and SD15 is a conservative estimate.

5.3.7 Potential Mining Disruption

The risk of mining disruption has been assessed by comparing the number of days per year that more than 200 ML is held in a given open cut pit (an arbitrary volume chosen to represent conditions which *could* lead to mining disruption). Table 24 presents the model predictions where the 95th percentile values are the number of days per year which would be expected to be exceeded in 5% of years and the median values are those which would be expected to be exceeded in 50% of years.

Table 24 Predicted Annual Number of Days in Excess of 200 ML Stored in Pit

Open Cut Pits	Number of Days Annually		
	5th Percentile	Median	95th Percentile
Western Pits	0	10	23
Eastern Pits	0	6	17

The results in Table 24 indicate a low risk of impact to mining operations associated with excess stored water in the open cut pits.

5.4 EXTERNAL SUPPLY REQUIREMENTS

Figure 22 presents the total annual maximum and average offsite supply predicted over the life of the Project based on the 24 year, 132 realization simulation.

Figure 22 illustrates that the maximum annual off-site water demand during the construction phase is predicted at 1,960 ML in CY3. SEM currently holds groundwater and surface water entitlements necessary to supply the predicted maximum annual offsite water demand during the construction phase (refer Section 4.2.10).

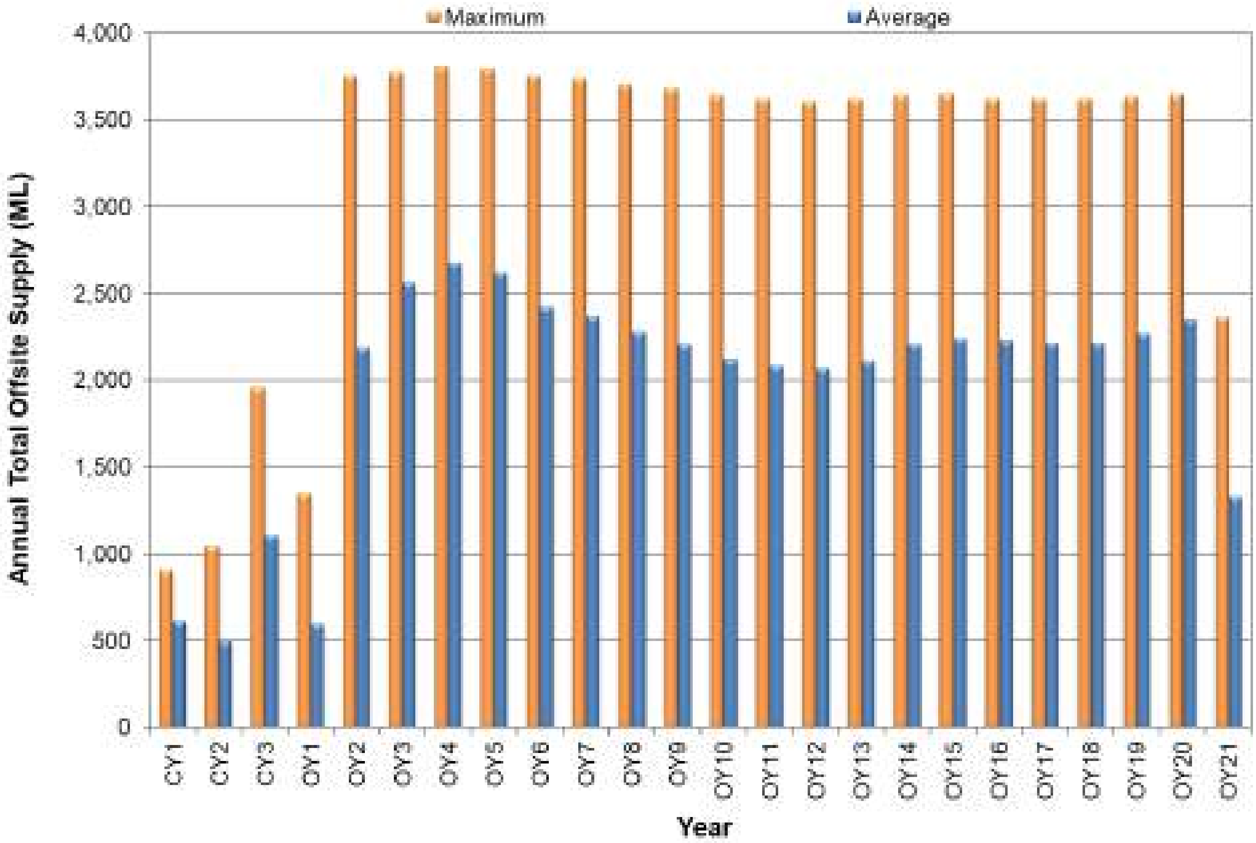

Figure 22 Simulated Annual Offsite Supply Volume

The annual offsite supply requirement is greatest in OY4, with a maximum supply requirement of 3,804 ML and an average supply requirement of 2,670 ML predicted in this year. Over the full operational phase (OY1 to OY21), the average annual offsite supply requirement is in the order of 2,160 ML. As noted in Section 4.2.10, SEM currently holds 3,154 share components from groundwater sources and 423 share components from surface water entitlements, which is greater than the predicted average annual offsite water demand during the operational phase although less than the predicted maximum annual offsite water demand during the operational phase.

SEM currently holds WAL 42370 in the Lachlan Regulated River Water Source, for zero share components (High Security) under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*. The Lachlan Regulated River Water Source has a history of available water determinations (AWDs) orders and water trading. While the water market is variable (availability subject to rainfall), it is mature (administered since 2004) and has significant available shares for trading. If required to meet the predicted maximum annual external water demand during the operational phase, SEM could purchase volumetric allocations under WAL 42370 on the open market in accordance with Condition 26, Schedule 3 of Development Consent (DA 374-11-00), and if necessary, adjust the scale of the Project to match its available water supply.

6.0 FINAL VOID WATER BALANCE MODELLING

6.1 MODEL DESCRIPTION

A daily timestep, final void water balance model has been developed using the GoldSim® simulation package. The model simulates the volume of the final void water bodies by simulating the inflows, outflows and resultant volume of water and salt mass:

Change in Storage = Inflow – Outflow

Where:

Inflow includes direct rainfall, runoff and groundwater inflow.

Outflow includes evaporation.

6.2 KEY DATA AND ASSUMPTIONS

The model simulates inflow from rainfall runoff within the final void catchment areas (Figure 17), direct rainfall on the surface area of the final voids, groundwater inflow from bedrock as well as outflow due to evaporation on a daily basis for each final void. Key model input data include the following:

- Eastern final void: a catchment area of 291 ha comprising 93 ha of rehabilitated waste rock emplacement and disturbed area sub-catchment and 198 ha of remnant open cut pit sub-catchment.
- Western final void: a catchment area of 313 ha comprising 104 ha of rehabilitated waste rock emplacement and disturbed area sub-catchment and 209 ha of remnant open cut pit sub-catchment.
- A 132-year rainfall data set (1889 to 2020) obtained from SILO Point Data and a 132-year evaporation data set for the same period (refer Section 5.2.1). The data set was repeated several times over to generate an extended period of climate data for final void simulation – to ensure equilibrium water levels were reached during the simulation period.
- A constant pan factor of 0.8 was assumed for calculation of evaporation from the final void until the water level reached 10 m below the spill point (if this occurs) at which point monthly pan factors taken from McMahon et al. (2013) were used – refer Section 5.2.1. The lower pan factor used for lower final void levels reflects lower evaporation likely at depth as a result of shading effects.
- Surface rainfall runoff was estimated using the AWBM applied to the final void sub-catchments, in a manner similar to the operational water balance model (refer Section 5.2.2). Direct rainfall was simulated on the contained water surface.
- Long term groundwater inflow rates of 0.002 L/s to each final void (Golder, 2017).

As described in Section 4.5, the catchment area directed to the final voids has been reduced where practicable in accordance with Condition 55, Schedule 3 of Development Consent (DA 374-11-00).

6.3 SIMULATED FUTURE PERFORMANCE

The model-predicted water level for the eastern and western final voids is shown in Figure 23 in comparison with the final void spill levels of 274 m AHD and 278 m AHD respectively.

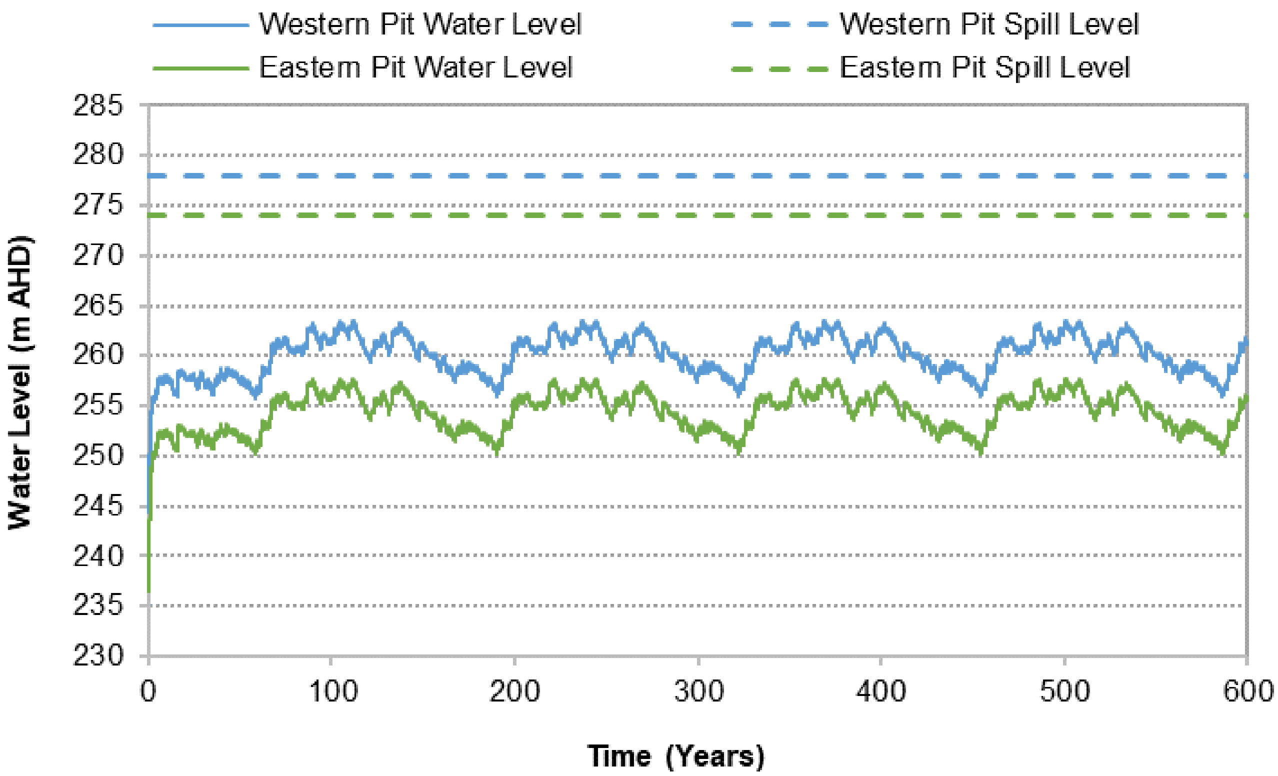

Figure 23 Predicted Final Void Water Level

The model predictions indicate that the eastern and western final void would reach a peak equilibrium level of 258 m AHD and 263.5 m AHD respectively – approximately 16 m and 14.5 m below the spill level respectively (i.e. the final voids are not predicted to overflow). The water level is predicted to rise rapidly in the first 13 years when the water surface area is smaller and therefore evaporation rates are lower. After approximately 13 years, the water level is predicted to rise at a lower rate and reach equilibrium over a period of approximately 250 years.

Given that the only outflow from the final void would be to evaporation, salinity is predicted to increase trending to hyper-salinity in the very long term. Water quality in the final void at any given point in time would vary with depth as a result of mixing and stratification processes that would occur as a result of temperature and salinity differentials.

6.4 IMPLICATIONS OF CLIMATE CHANGE ON FINAL VOID WATER BALANCE

Assessments of likely future concurrent rainfall and evapotranspiration changes for the mine and processing facility area have been undertaken using the online Climate Futures Tool (CSIRO and BoM, 2015a). The assessment was undertaken for the year 2090 (approximately 45 years post-mine closure). Climate variable inputs for the 'best case', 'maximum consensus' case and 'worst case' as defined by CSIRO and BoM (2015b) for the RCP4.5 climate change scenarios are provided in Table 25.

The majority of climate models predict a decrease in rainfall and an increase in evapotranspiration. This would result in a lower void water level than predicted in Section 6.3. The 'worst case' climate model predicts an increase in annual rainfall of 3.8%, however, this is offset by an increase in evapotranspiration of 5.5%.

Table 25 RCP4.5 Scenario Climate Variable Inputs

Scenario	Climate Model	Annual Change	
		Rainfall	Evapotranspiration
Best Case (largest reduction in rainfall)	GFDL-CM3	-24.2%	9%
Maximum Consensus (highest agreement between different climate models)	CanESM2	-4%	11.5%
Worst Case (largest increase in rainfall)	CESM1-BGC	3.8%	5.5%

The potential effects of climate change as reported by CSIRO and BoM (2015a) are not expected to alter the prediction that water in the final voids would be contained. Accordingly, application of the RCP8.5 emissions scenario, which typically predicts even lower rainfall and higher evapotranspiration conditions than the RCP4.5 scenario, is not predicted to alter the prediction that water in the final voids would be contained. The net impacts of all scenarios would result in negligible change to final void equilibrium levels.

7.0 POTENTIAL SURFACE WATER IMPACTS

The potential impacts of the modified Project on local and regional surface water resources and water licensing requirements comprise:

- impacts on surface water catchments and drainage associated with the mine and processing facility, modified rail siding and expanded treated wastewater irrigation area;
- downstream surface water impacts associated with the modified mine and processing facility water management system, expanded treated wastewater irrigation area and modified rail siding, including potential impacts to downstream water quality; and
- surface water licencing requirements for the modified mine and processing facility and rail siding.

The potential cumulative impacts from surrounding operations have also been considered for the modified mine and processing facility.

7.1 CATCHMENT YIELD AND FLOW IMPACTS

7.1.1 Mine and Processing Facility and Accommodation Camp

As the Modification would not increase the extent of the approved surface development area at the mine and processing facility and accommodation camp, no significant change to the approved flow impacts in the drainage lines in the vicinity of the mine and processing facility and accommodation camp would be expected.

Given the above, the Modification is expected to result in negligible change to the approved flow impacts in Bullock Creek and the Bogan River.

Notwithstanding the above, a description of the catchment yield and flow impacts for the mine and processing facility has been provided below for completeness.

Table 26 presents the total area captured over the life of the mine and processing facility from the Bullock Creek at Tullamore and Bogan River at Dandaloo catchments.

Table 26 Total Area Excised from Surface Water Catchments

Year	Excised Area (km^2)	Bullock Ck at Tullamore*	Bogan River at Dandaloo (GS 421083)^
		Percentage of Catchment Area	Percentage of Catchment Area
CY1	6.4	1.3%	0.1%
CY2	8.6	1.7%	0.2%
OY1	12.7	2.5%	0.2%
OY5	14.3	2.8%	0.3%
OY10	16.8	3.3%	0.3%
OY17	15.5	3.0%	0.3%
OY21	14.3	2.8%	0.3%
Final Landform	6.0	1.2%	0.1%

* Approximate total catchment area of 518 km^2

^ Total catchment area of 5,440 km^2 as stated at: https://realtimedata.waternsw.com.au/

The maximum area excised by the mine and processing facility and accommodation camp from the Bullock Creek and Bogan River catchment is estimated at 16.8 km^2 in OY10, equating to 3.3% of the total catchment area of Bullock Creek at Tullamore and 0.3% of the total catchment area of the Bogan River at Dandaloo. A reduction in 3.3% of the total catchment area of Bullock Creek at Tullamore is not considered significant given the discontinued nature of watercourses within the catchment. Post-closure, the mine and processing facility is estimated to result in a 1.2% and 0.1% reduction in catchment area of Bullock Creek at Tullamore and the Bogan River at Dandaloo respectively.

With a mean annual flow volume of 63,504 ML in the Bogan River at Dandaloo (WaterNSW gauging station [GS] 421083), the maximum reduction in mean annual flow due to the Project is estimated at 167 ML (0.3%). This represents a very small and indiscernible impact to flow in the Bogan River at Dandaloo.

7.1.2 Rail Siding

The drainage line to the south-east of the modified rail siding (Figure 3) has a catchment area of approximately 51.6 km^2 upstream of the modified rail siding. The maximum area excised by the modified rail siding would be approximately 0.05 km^2, equating to 0.1% of the drainage lines catchment area. This would represent a very small and indiscernible impact to flow in this drainage line.

7.2 DRAINAGE AND FLOODING IMPACTS

7.2.1 Mine and Processing Facility and Accommodation Camp

Regional Scale

As noted in Section 3.1.1, the mine and processing facility and accommodation camp are located in the upper headwaters of the Bullock Creek catchment. The Bullock Creek floodplain is prominent to the north of Tullamore while, to the south of Tullamore, Bullock Creek flows through steeper terrain. At its closest point, Bullock Creek is 7.5 km from the mine and processing facility. As such, it is unlikely that the mine and processing facility and accommodation camp will be affected by regional flooding impacts.

Given the above, the Modification is not expected to significantly change approved flooding impacts due to the mine and processing facility.

Local Scale

As described in Section 4.3.9, the diversion and collection drains, sediment dams and water storages at the mine and processing facility and accommodation camp will be designed, installed and maintained in accordance with the water management performance measures described in Condition 29, Schedule 3 of Development Consent (DA 374-11-00).

As the Modification would not change the Development Consent (DA 374-11-00) requirements for the diversion and collection drains and diversion dam, and that no overflow was predicted from the WSD, MWDs, PPRDs, RWD, EP, TSF or DTP based on all results for the 24 year, 132 realization simulations (Section 5.3.6), no significant changes to the approved potential localised drainage and flooding impacts is expected for the modified Project.

Notwithstanding the above, it is recognised that potential localised drainage and flooding impacts may occur in the vicinity of the mine and processing facility area. It is therefore recommended that further assessment (i.e. hydrologic and hydraulic modelling) be undertaken for the mine and processing facility during the detailed design stage to assess the potential localised flooding impacts and develop mitigation and management measures.

7.2.2 Rail Siding

The Modification is not expected to result in significant flooding impacts at the modified rail siding.

7.3 WATER QUALITY IMPACTS

7.3.1 Mine and Processing Facility and Accommodation Camp

The Modification would not change the approved water management performance measures or objectives of the water management system (i.e. control runoff from construction and operational areas, while diverting up-catchment water around these areas, and to minimise the use of undisturbed area water on-site).

Further, the water management system would be designed such that overflow from the sediment dams occurs in accordance with the Development Consent (DA 374-11-00) and EPL 21146. Detailed design of the sediment dams would be undertaken and appropriate sediment and erosion control would be implemented during construction and operations. Sediment and erosion control is likely to incorporate level spreaders or similar (refer Landcom [2004]) with appropriate armouring (e.g. rockfill) to mitigate the risk of erosion caused by overflow. Details would be included in the Surface Water Management Plan (Clean TeQ, 2019) and the sediment dams would be operated in accordance with EPL 21146.

A geochemical investigation conducted for the Environmental Impact Statement (Black Range Minerals, 2000) identified that materials excavated by the mining operations would be highly weathered and would be non-acid forming. As such, the risk of developing acid drainage at the Project was deemed to be very low to nil. The waste rock samples were found to be naturally alkaline and slightly to moderately saline. Chromium, iron and nickel were expected to be significantly enriched in the waste rock relative to average crustal abundances. However, as runoff from the waste rock emplacement areas is expected to maintain a near neutral pH in the long term, the risk of increased solubility of these elements is expected to be low. As described in Section 8.0, water quality monitoring of discharge from the sediment dams would be undertaken and assessed against the requirements of EPL 21146, as well as background and baseline water quality.

As stated in Section 5.3.6, no overflow was predicted from the WSD, MWDs, PPRDs, RWD, EP, TSF or DTP based on all water balance results for the 24 year, 132 realization simulation.

Based on the above, it is expected that there will be a low risk of adverse water quality impacts on the adjacent surface water systems due to the Modification during construction and operations.

The final void water balance modelling (Section 6.0) has indicated that the water level of the final voids should stabilise well below spill level under both natural conditions and with consideration to potential climate change effects. As such, there is a negligible risk of overflow from the final voids and therefore negligible risk to the water quality of adjacent watercourses in the long term.

7.3.2 Rail Siding

The rail siding water management system would be designed such that overflow occurs from active sediment control structures following settlement. Detailed design of the sediment dams would be undertaken and appropriate sediment and erosion control would be implemented during construction and operations. Sediment and erosion control is likely to incorporate level spreaders or similar (refer Landcom [2004]) with appropriate armouring (e.g. rockfill) to mitigate the risk of erosion caused by overflow. Details would be included in the Surface Water Management Plan (Clean TeQ, 2019).

As presented in Section 5.3.6, low overflow volumes are likely to occur from the rail siding sediment dams with a predicted average annual overflow volume of 0.4 ML to 0.8 ML and 1.7 ML to 3.3 ML from SD14 and SD15 respectively based on the 5th percentile and 95th percentile water balance model results.

It is recommended that overflow from the sediment dams is directed to a gross pollutant trap (GPT) prior to discharge offsite. A specifically designed GPT (e.g. triple interceptor) would aid in providing treatment for overflow (e.g. hydrocarbons, oils and gross pollutants from the rail siding roads and hardstand areas) prior to offsite release (Johnstaff, 2020).

Based on the above, it is expected that there will be a low risk of adverse water quality impacts on the adjacent surface water systems due to the Modification rail siding.

7.3.3 Treated Wastewater Irrigation Area

Consistent with the relevant performance measure (Section 2.1), the accommodation camp treated wastewater irrigation area will be managed in accordance with the *Environmental Guidelines: Use of Effluent by Irrigation* (DEC, 2004) with the irrigation controlled so as not to:

- cause irrigation water runoff from the treated wastewater irrigation area; or
- exceed the capacity of the soil in the treated wastewater irrigation area to effectively adsorb the nutrient and hydraulic loads.

The accommodation camp WWTP is proposed to treat wastewater to Class B/Class C standards. The recommended water quality specifications for Class B and Class C recycled water are presented in Table 27.

Table 27 Water Quality Specifications for Class B and Class C Recycled Water

Constituent	Class B (Median Value)	Class C (Median Value)
E. coli (cfu/100 mL)	< 100	< 1,000
Biological Oxygen Demand (mg/L)	20	20
Suspended Solids (mg/L)	30	30
Total Dissolved Solids (mg/L)	1,000 / 1,600	1,000 / 1,600
pH	6.8 - 5	6.8 - 5

* Source: Truewater Australia (2018)

Based on the expected total dissolved solids concentration of the recycled water, the recycled water will be of medium strength as defined in DEC (2004). For medium strength effluents, runoff diversion and collection management are required to divert external runoff away from the treated wastewater irrigation area (DEC, 2004). As such, it is recommended that a diversion drain is constructed along the western boundary of the treated wastewater irrigation area and a diversion bund is constructed along the southern boundary to divert external runoff further downstream where the topography is naturally sloped away from the treated wastewater irrigation area.

In accordance with DEC (2004), a tailwater collection system may be required to manage runoff from the treated wastewater irrigation area. Catch drains that direct runoff to a collection pond and a system to return the collected runoff to the effluent storage facility and/or the irrigation supply system is recommended in accordance with DEC (2004). Additionally, a water balance assessment of the proposed irrigation system should be undertaken prior to operation to assess the volume of recycled water that could be sustainably used on average each year, in accordance with DEC (2004).

DEC (2004) recommend a separation distance of 50 m from the treated wastewater irrigation area to natural waterbodies. Based on the modified treated wastewater irrigation area, the minimum distance of the irrigation area to the closest defined drainage line is estimated to be 68 m.

With the treated wastewater irrigation area designed, operated and maintained in accordance with the DEC (2004) guidelines, it is expected that there will be a low risk of adverse water quality impacts on the adjacent surface water systems due to the modified treated wastewater irrigation area.

7.4 WATER LICENCING REQUIREMENTS

7.4.1 Mine and Processing Facility and Accommodation Camp Water Licencing Requirements

<u>Water Sharing Plan for the Macquarie Bogan Unregulated Rivers Water Sources 2012</u>

The mine and processing facility and accommodation camp are located within the mapped extent of the Upper Bogan River Water Source under the *Water Sharing Plan for the Macquarie Bogan Unregulated Rivers Water Sources 2012*. The key objectives of the modified water management system are to manage runoff from construction and operational areas, while diverting up catchment water around these areas and to minimise the use of undisturbed area water on-site.

Licensing considerations for the water storages at the modified mine and processing facility and accommodation camp are summarised in Table 28.

The modified water storages are solely for the capture, containment and recirculation of mine affected water consistent with best management practice to prevent the contamination of a water source. These types of dams are “excluded works” under the Water Management (General) Regulation 2018 and, given that they are located on minor streams, are exempt from the requirement for water supply works approvals and WALs. Specifically, Item 12 of Schedule 4 of the Water Management (General) Regulation 2018 provides WAL exemptions in relation to water take from or by means of an ‘excluded work’ as defined in Schedule 1:

> *Dams solely for the capture, containment and recirculation of drainage and/or effluent, consistent with best management practice or required by a public authority (other than Landcom or the Superannuation Administration Corporation or any of their subsidiaries) to prevent the contamination of a water source, that are located on a minor stream.*

Therefore, the water captured in these water storages would not be subject to licencing under the *Water Sharing Plan for the Macquarie Bogan Unregulated Rivers Water Sources 2012*.

Notwithstanding the above, where appropriate, SEM may rely on its harvestable right entitlement for the water storages at the modified mine and processing facility and accommodation camp. Under the *Water Management Act 2000*, landholders in rural areas are permitted to collect a proportion of the rainfall runoff on their property and store it in one or more dams up to a certain size on minor streams. A dam can capture up to 10% of the average regional rainfall runoff for their landholding without requiring a licence. The landholding owned by SEM (located in the *Water Sharing Plan for the Macquarie Bogan Unregulated Rivers Water Sources 2012*) which is attributable to the mine and processing facility provides a maximum harvestable right capacity (i.e. maximum dam capacity) of 205 ML (Clean TeQ, 2019).

Table 28 Summary of Water Licensing Requirements for the Project Water Storages

<table>
<tr><th>Water Storage</th><th>Water Type Stored</th><th>Purpose</th><th>Water Licensing Requirement</th></tr>
<tr><td>SD1</td><td rowspan="11">Disturbed area runoff</td><td rowspan="19">Capture, containment and recirculation of drainage and/or effluent consistent with best management practice</td><td rowspan="19">Nil - Excluded Work</td></tr>
<tr><td>SD2</td></tr>
<tr><td>SD3</td></tr>
<tr><td>SD4</td></tr>
<tr><td>SD4a</td></tr>
<tr><td>SD5</td></tr>
<tr><td>SD6</td></tr>
<tr><td>SD8</td></tr>
<tr><td>SD11a</td></tr>
<tr><td>SD11b</td></tr>
<tr><td>SD13</td></tr>
<tr><td>MWD1</td><td rowspan="8">Mine water</td></tr>
<tr><td>MWD2</td></tr>
<tr><td>PPRD1</td></tr>
<tr><td>PPRD2</td></tr>
<tr><td>TSF</td></tr>
<tr><td>DTP</td></tr>
<tr><td>WSD</td></tr>
<tr><td>EP</td></tr>
<tr><td>RWD</td><td>Raw water</td><td>Turkeys nest dam to hold raw water from external water supply</td><td>Nil – Turkeys nest dam</td></tr>
</table>

Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2020

The mine and processing facility and accommodation camp are located within the mapped extent of the Lachlan Fold Belt MDB Groundwater Source under the *Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2020*. SEM holds WAL 28681 under this water sharing plan for 243 share components. The existing volumetric licence allocations held by SEM are greater than the predicted groundwater inflows during the Project life and post-mining (i.e. less than 1 ML/year) (Golder, 2017) and therefore no additional licences are expected to be required.

7.4.2 Rail Siding Water Licencing Requirements

Water Sharing Plan for the Lachlan Unregulated River Water Sources 2012

The modified rail siding is located within the mapped extent of the Gunningbland and Yarrabandai Water Source under the *Water Sharing Plan for the Lachlan Unregulated River Water Sources 2012*.

Sediment dams SD14 and SD15 at the modified rail siding would be solely for the capture, containment and recirculation of drainage consistent with best management practice to prevent the contamination of a water source and are therefore exempt from the requirement for water supply works approvals or WAL under the *Water Sharing Plan for the Lachlan Unregulated River Water Sources 2012*.

Notwithstanding the above, where appropriate, SEM may rely on its harvestable right entitlement for the water storages at the modified rail siding (subject to incorporation in the Water Management Plan). The landholding owned by SEM which is attributable to the modified rail siding provides a maximum harvestable right capacity (i.e. maximum dam capacity) of 0.26 ML.

7.4.3 External Water Licencing Requirements

A description of SEMs water supply works, water use approvals and WALs issued under the *Water Management Act 2000* is provided in Section 2.3.

SEM currently holds a combined total of 3,577 share components for the Project borefield and surface water extraction infrastructure, which is greater than the predicted average annual offsite water demand during the operational phase (2,160 ML), although less than the predicted maximum annual offsite water demand during the operational phase (3,804 ML) (Section 5.4).

SEM currently holds WAL 42370 in the Lachlan Regulated River Water Source, for zero share components (High Security) under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*. The Lachlan Regulated River Water Source has a history of available water determinations (AWDs) orders and water trading. While the water market is variable (availability subject to rainfall), it is mature (administered since 2004) and has significant available shares for trading. If required to meet the predicted maximum annual external water demand during the operational phase, SEM could purchase volumetric allocations under WAL 42370 on the open market.

7.5 CUMULATIVE IMPACTS

Other key proposed or approved projects that may potentially interact with, or have potential cumulative impacts with, the modified Project include:

- Parkes Special Activation Precinct
- Cattle Feedlot and Quarry
- Flemington Cobalt Scandium Mine
- Owendale Scandium Mine
- Western Slopes Pipeline
- Northparkes Mine Extension Project
- Inland Rail Parkes to Narromine
- Parkes Solar Farm
- Goonumbla Solar Farm
- Quorn Park Solar Farm
- Parkes Peaking Power Plant
- Parkes Bypass
- E44 Rocklands Project
- Jemalong Solar Farm
- Daroobalgie Solar Farm

Of these key proposed or approved projects, only the proposed Flemington Cobalt Scandium Mine and Owendale Scandium Mine may potentially interact with, or have potential cumulative surface water impacts with, the modified Project as they are located immediately north-west and north east of the mine and processing facility, respectively. The Environmental Assessment Requirements for these projects were issued in 2018. In accordance with the draft *Assessing Cumulative Impacts Guide - Guidance for State Significant Projects* (Department of Planning, Industry and Environment, 2020) guideline, these projects are 'potentially relevant projects', and are therefore not required to be considered. It is expected that any potential cumulative interactions between these projects and the modified Project would be considered and assessed in the surface water assessments for these projects.

8.0 RECOMMENDATIONS FOR MONITORING, MITIGATION AND MANAGEMENT

Surface water monitoring for the Project will be undertaken in accordance with EPL 21146 and the approved Surface Water Management Plan (Clean TeQ, 2019). Existing and recommended surface water monitoring for the modified Project are summarised in Table 29.

Table 29 Existing and Recommended Surface Water Monitoring

Type of Monitoring	Monitoring Sites/ Locations	Parameters	Frequency	Recommendation
Baseline surface water quality	SW1 to SW7	pH, electrical conductivity, total suspended solids, anions, cations and select total and dissolved metals (including chromium, iron and nickel)	Event based and weekly thereafter (if flowing)	Collection of additional baseline monitoring data to inform the development of site-specific trigger values
Wet weather and controlled release water quality	SD1, SD2, SD3, SD4, SD5, SD6, SD8, SD11a, SD11b	pH, electrical conductivity, total suspended solids, turbidity, select total and dissolved metals (including chromium, iron and nickel)	Event based	Commence once dams commissioned
	SD14, SD15	Oil and grease, pH and total suspended solids	Event based	Commence once dams commissioned
Reference and impact site surface water quality	SW1 to SW7	pH, electrical conductivity, total suspended solids, anions, cations, select total and dissolved metals (including chromium, iron and nickel)	Event based and weekly thereafter (if flowing)	Implement during construction and operational phase Additional monitoring in the vicinity of the treated wastewater irrigation area is recommended (refer Section 8.2)
			Event based and monthly thereafter (if flowing)	Continue during post-mining phase
Surface water quality	TSF, EP, WSD, open cut pits	pH, electrical conductivity, total suspended solids, anions, cations and select total and dissolved metals (including chromium, iron and nickel)	Quarterly	Implement at commencement of operational phase
Climate	Sunrise Weather Station	Rainfall	Continuous	Continue

Table 29 (Cont.) Existing and Recommended Surface Water Monitoring

Type of Monitoring	Monitoring Sites/ Locations	Parameters	Frequency	Recommendation
Water level	All water management system storages	Stored water level	At least once per month	Implement at commencement of operational phase
Water volume monitoring	Treated wastewater Irrigation area	Application rates, times, duration and areas	Continuous	Implement at commencement of operation of the accommodation camp
Visual monitoring	Treated wastewater Irrigation area	Runoff, waterlogging and erosion	Weekly	Implement at commencement of operation of the accommodation camp
Erosion and sediment control	Erosion and sediment control structures	Integrity/function, silt build up	Monthly and within five days of 50.7 mm of rainfall occurring over any consecutive five day period	Commence once installed
Structural integrity, erosion and sediment control	Diversion and collection drains			
Pipeline leakage, integrity and erosion and sediment control	Treated water pipeline and water supply pipeline	Pipeline leakage monitoring (e.g. differential flow monitoring) (water supply pipeline only)	Regular	Commence once pipeline installed
Site water demands	Truckfill (dust suppression)	Water usage rates	Daily truck count	Implement at commencement of operational phase
	Process plant		Logged continuously via flow meter, recorded monthly	
Site water supply	Borefield and Lachlan River water extraction	Water supply rates	Logged continuously via flow meter, recorded monthly	
Mine pit inflows	Open cut pits	Dewatering rates	Logged continuously via flow meter, recorded monthly	

8.1 BASELINE MONITORING

As stated in Section 3.3.2, the default guideline trigger values and EPL 21146 water quality limits have been frequently exceeded for a number of constituents at all or a majority of monitoring sites during the baseline monitoring period. As such, it is recommended that site-specific trigger values are developed for all constituents in accordance with the ANZG 2018 Guideline and the EPL 21146 water quality limits revised accordingly. The EPL 21146 water quality limits for the sediment dams should also be reassessed as the water quality of the sediment dams will reflect the baseline water quality of the region.

It is recommended that additional baseline monitoring data is collected to inform the development of the site-specific trigger values in accordance with ANZG (2018). ANZG (2018) recommend that data should be collected over 2 years of monthly sampling in order to derive site-specific trigger values. Where flow does not occur monthly in the monitored watercourses, it is recommended that the duration of baseline monitoring is extended to collect a minimum of 24 samples.

8.2 OPERATIONAL MONITORING AND MANAGEMENT

Surface water monitoring for the construction and operational phase of the Modification should be undertaken in accordance with EPL 21146 and the approved Water Management Plan (Clean TeQ, 2019), as summarised in Table 29.

It is recommended that the existing water quality monitoring site, SW3, is moved further upstream to provide a reference site for the drainage line that flows adjacent to the treated wastewater irrigation area and accommodation camp.

To enable calibration and update of the site water balance model, it is recommended that monitoring of the water level of site water storages and water usage/extraction rates is undertaken during the operational phase (refer Table 29).

Local erosion and sediment control is recommended to be implemented during the construction and operational phases. Monitoring of the integrity/function and silt accumulation of the sediment controls is recommended to be undertaken monthly and within five days of 50.7 mm of rainfall occurring over any consecutive five day period.

Pipeline leakage monitoring (e.g. differential flow monitoring installed at either end of the pipeline) should be installed as part of the construction of the water supply pipeline.

8.3 POST-MINING MONITORING AND MANAGEMENT

Water quality monitoring should continue for two years following cessation of operations with monitoring data reviewed at annual intervals (as part of the Annual Review process) over this period. Reviews should involve assessment against long term performance objectives that are derived from baseline conditions or a justifiable departure from these, with due allowance for climatic variations. If objectives are not substantially met within the two-year period, management measures should be revised and the monitoring period extended.

8.4 POTENTIAL CONTINGENCY MEASURES

In accordance with the approved Surface Water Management Plan (Clean TeQ, 2019), potential contingency measures in the event of unforeseen impacts or impacts in excess of those predicted would include:

- The conduct of additional monitoring (e.g. increase in monitoring frequency or additional sampling locations) to confirm impacts and inform the proposed contingency measures.
- Implementation of adaptive management strategies and refinements to the water management system design such as additional sedimentation dams, increases to pumping capacity, installation of new structures as required to address the identified issue.

Annual forecast water balance modelling is recommended to be undertaken to inform near term water supply reliability for the Modification as it progresses. Such forecasts will allow SEM to plan for contingency measures such as implementation of water reduction measures (including reduced production) should water shortfalls be predicted.

8.5 REVIEW AND REPORTING

In accordance with Development Consent (DA 374-11-00), SEM will review the environmental performance of the Project by the end of March each year for the previous calendar year). The Annual Review will be made publicly available on the SEM website.

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Sunrise Project

Project Execution Plan Modification

Appendiix D

Road Transport Assessment

Sunrise Project
Project Execution Plan Modification
Road Transport Assessment

Prepared for:

Sunrise Energy Metals Limited

29 June 2021

The Transport Planning Partnership

E: info@ttpp.net.au

Sunrise Project
Project Execution Plan Modification
Road Transport Assessment

Client: Sunrise Energy Metals Limited

Version: Final

Date: 29 June 2021

TTPP Reference: 20485

Quality Record

Version	Date	Prepared by	Approved by	Signature
Final	29/06/2021	PJD	PJD	

Table of Contents

Tables

Figures

Appendices

References

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1 Introduction

The Sunrise Project (the Project) is a nickel, cobalt and scandium open cut mining project situated near the village of Fifield, approximately 350 kilometres (km) west-northwest of Sydney, in New South Wales (NSW) (Figure 1.1).

SRL Ops Pty Ltd owns the rights to develop the Project. SRL Ops Pty Ltd is a wholly owned subsidiary of Sunrise Energy Metals Limited[1] (SEM).

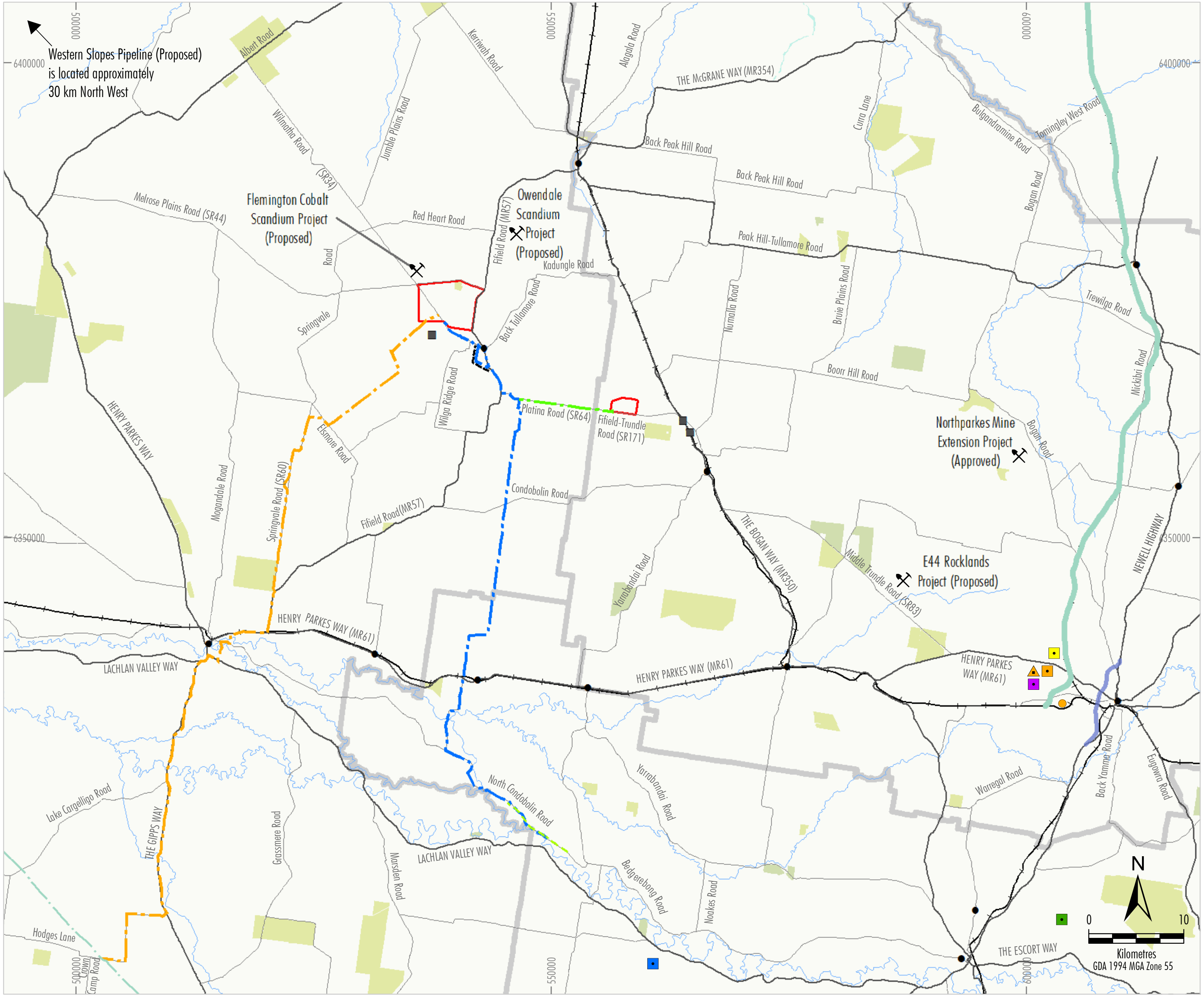
Development Consent (DA 374-11-00) for the Project was issued under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) in 2001. Construction of the Project commenced in 2006, which included components of the borefield, however construction of other Project components is yet to commence.

The Project Execution Plan Modification (the Modification) includes the implementation of Project changes identified in the Project Execution Plan to optimise the construction and operation of the Project.

This Road Transport Assessment has been prepared to accompany an application by SEM to modify Development Consent (DA 374-11-00) for the Project, which would be sought under section 4.55(2) of the EP&A Act.

This Road Transport Assessment has been prepared generally in accordance with the *Guide to Traffic Generating Developments* (Roads and Traffic Authority, 2002), relevant Austroads guides and Transport for New South Wales' (TfNSW) supplements to the Austroads guides.

[1] Sunrise Energy Metals Limited was previously Clean TeQ Holdings Limited (Clean TeQ).



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LEGEND

- National Park/Conservation Area
- State Forest
- Local Government Boundary
- Railway
- Existing Gas Pipeline

Project Components

- Mining Lease Boundary (ML)
- Fifield Bypass
- Gas Pipeline
- Water Pipeline
- Limestone Quarry Water Pipeline
- Borefield Infrastructure Corridor

Other State Significant Projects

- Mine Site
- Daroobalgie Solar Farm (Proposed)
- Goonumbla Solar Farm (Approved)
- Jemalong Solar Farm (Approved)
- Parkes Solar Farm (Approved)
- Quorn Park Solar Farm (Approved)
- Parkes Peaking Power Plant (Approved)
- Cattle Feedlot and Quarry (Approved)
- Parkes Special Activation Precinct
- Inland Rail (Parkes to Narromine) (Approved)

Other Relevant Projects

- Parkes Bypass (Approved)

Source: Black Range Minerals (2000); Clean TeQ (2017, 2018, 2020); NSW Spatial Services (2020, 2021)

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SUNRISE PROJECT

Regional Location

Figure 1.1

2 Approved Project and Modification Overview

2.1 Approved Project

The approved Project includes the establishment and operation of the following (Figure 1.1):

- a mine and processing facility;
- a limestone quarry;
- a rail siding;
- borefield, surface water extraction infrastructure and water pipeline;
- a gas pipeline;
- an accommodation camp; and
- associated transport activities and transport infrastructure (e.g. the Fifield Bypass, road and intersection upgrades).

The Project is currently approved to:

- undertake mining operations for 21 years from the day upon which mining operations start;
- operate a maximum autoclave feed rate of 2.5 million tonnes (Mt) of ore in any calendar year;
- transport in any one calendar year no more than 40,000 tonnes (t) of nickel and cobalt metal equivalents (as sulphate precipitate products), 180 t of scandium oxide and 100,000 t of ammonium sulphate;
- extract up to 790,000 t of limestone from the limestone quarry in any one calendar year; and
- operate related supporting infrastructure.

A detailed description of the approved road traffic trip generation is provided in Section 4. The approved transport route for the Project is between the mine and processing facility and the rail siding, utilising Fifield-Trundle Road, Platina Road, Fifield Road and Wilmatha Road.

A Voluntary Planning Agreement has been executed with Lachlan Shire Council, Parkes Shire Council and Forbes Shire Council, with a number of road and intersection upgrades to be undertaken as part of the Project in accordance with the Voluntary Planning Agreement and Development Consent (DA 374-11-00) (Section 4.1).

2.2 The Modification

SEM has continued to review and optimise the Project design as part of preparations for the Project execution. The outcomes of this review are outlined in the Project Execution Plan (Clean TeQ, 2020).

The Project Execution Plan identified a number of changes to the approved mine and processing facility, accommodation camp, rail siding and road transport activities. The Modification includes these Project Execution Plan changes to allow for the optimisation of the construction and operation of the Project. The Modification would include:

Mine and Processing Facility

- addition of a temporary construction laydown area inside the approved tailings storage facility surface development area;
- optimised production schedule resulting in an increased mining rate during the initial years of mining and associated changes to mining and waste rock emplacement sequencing;
- revised processing facility area layout, including a revised processing plant layout and two additional vehicle site access points;
- reduced sulphuric acid plant stack height from 80 metres [m] to 40 m;
- revisions to processing plant reagent types, rates and storage volumes;
- revised tailings storage facility cell construction sequence and the addition of a decant transfer pond;
- relocated and resized evaporation pond;
- changes to the water management system to reflect the modified mine and processing facility layout;
- increased number of diesel-powered backup generators (and associated stacks) from one to four;
- addition of exploration activities within Mining Lease (ML) 1770;
- increased construction phase duration from two to three years;
- increased peak construction phase workforce from approximately 1,000 to approximately 1,900 personnel;

Rail Siding

- revised rail siding location and layout;
- addition of an ammonium sulphate storage and distribution facility to the rail siding;
- extension of the Scotson Lane road upgrade;
- addition of a 22 kilovolt (kV) electricity transmission line (ETL) (subject to separate approval) to the rail siding power supply;

- increased peak operational phase workforce from approximately five to approximately 10 personnel;

Accommodation Camp

- increased construction phase capacity from 1,300 to 1,900 personnel;
- increased size of the treated wastewater irrigation area;
- option for an alternative alignment of the last section of the accommodation camp water pipeline along the accommodation camp services corridor rather than along the access road corridor; and
- option to transfer treated wastewater to the mine and processing facility for reuse via a water pipeline located inside the approved services corridor;

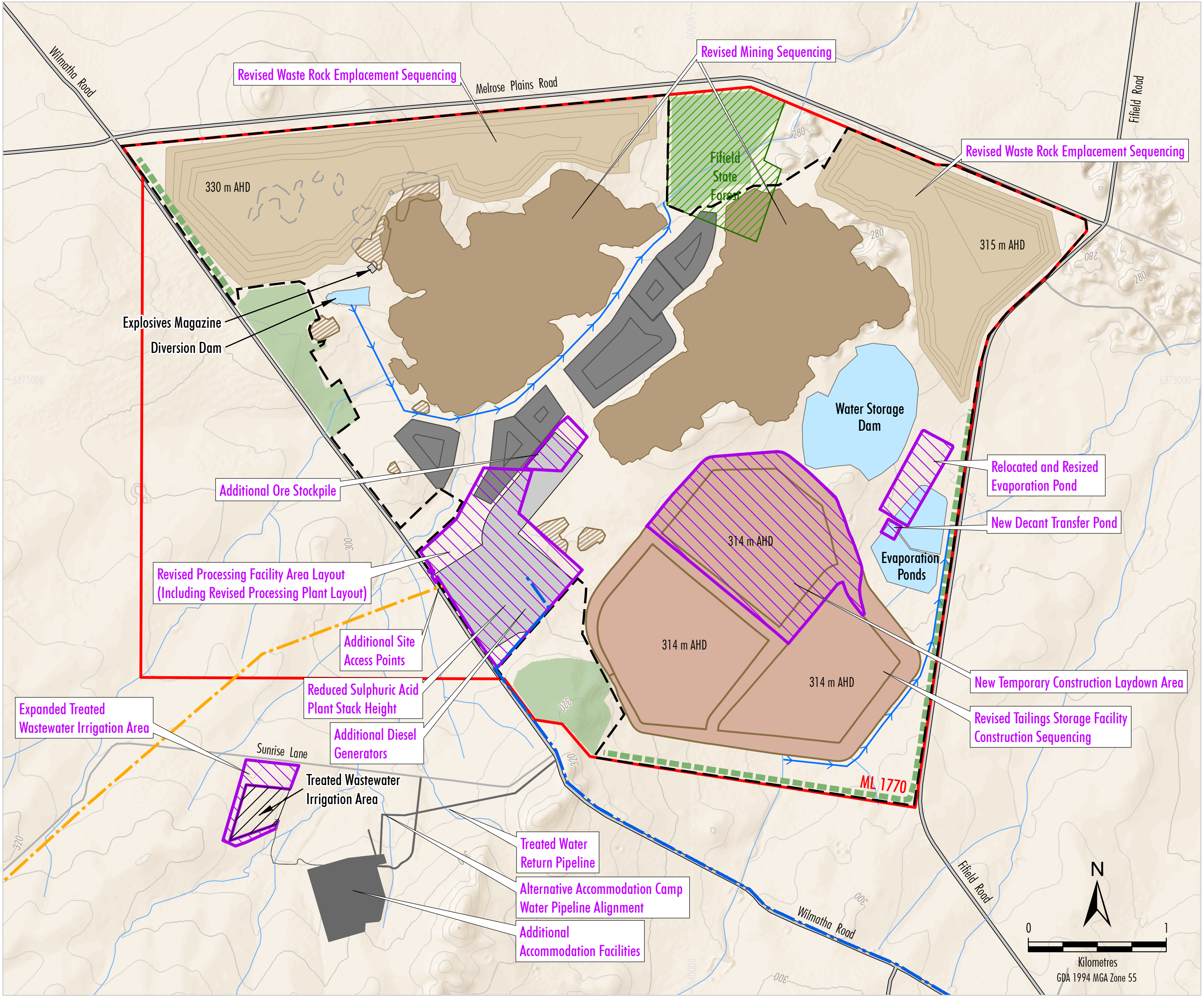
Road Transport Activities

- changes to construction phase vehicle movements associated with the increased construction phase accommodation camp capacity and changes to heavy vehicle delivery requirements;
- changes to operational phase heavy vehicle movements associated with revisions to processing plant reagent types, rates and storage volumes; and
- changes to operational phase heavy vehicle movements to and from the rail siding associated with the transport of metal and ammonium sulphate products.

The Modification would not change the following approved components of the Project:

- other mine and processing facility components (e.g. surface development area, mining method, processing method and rate, tailings management and water management concepts);
- other accommodation camp components (e.g. surface development area; operational phase capacity);
- other transport activities and transport infrastructure (e.g. the Fifield Bypass);
- limestone quarry;
- borefield, surface water extraction infrastructure and water pipeline; and/or
- gas pipeline.

The modified mine and processing facility and the rail siding general arrangements are shown on Figure 2.1 and Figure 2.2. The modified construction schedule and associated workforce schedule is shown on Figure 2.3.



LEGEND
State Forest
Approved Project
Mining Lease Boundary (ML)
Approved Surface Development Area
Processing Facility
Tailings Storage Facility
Open Cut Pit (Scandium Oxide)
Backfilled Open Cut Pit (Scandium Oxide)
Open Cut Pit
Waste Rock Emplacement
Ore Stockpile
Accommodation Camp
Water Storage
Diversion Structure
Vegetation Screening
Existing Open Woodland to be Maintained
Gas Pipeline
Water Pipeline
Modified Project
Modified Layout

Source: Black Range Minerals (2000); Clean TeQ (2017, 2018, 2020); NSW Spatial Services (2020)

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S U N R I S E   P R O J E C T

Approved and Modified Mine and Processing Facility Conceptual General Arrangement

Figure 2.1

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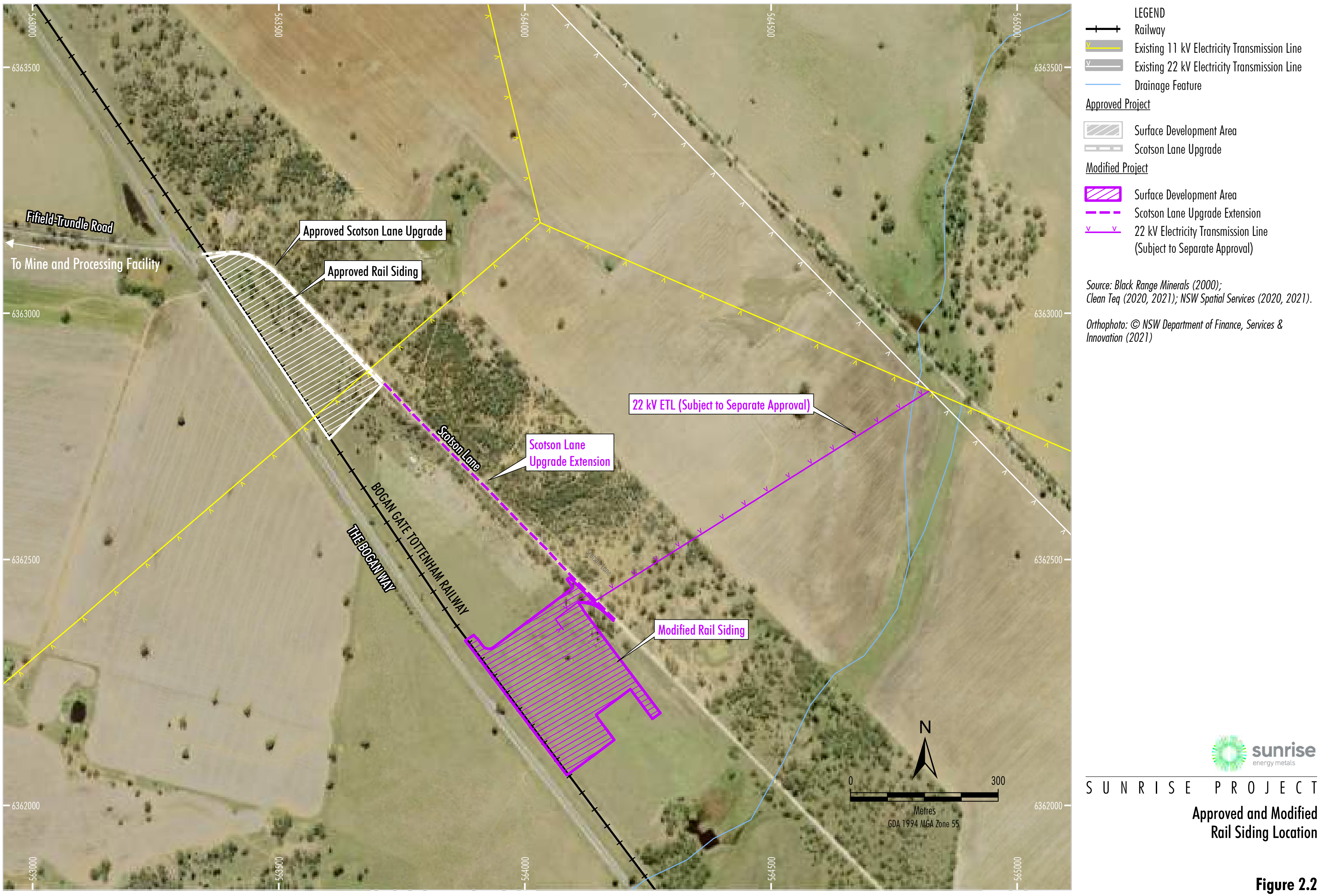

Figure 2.2

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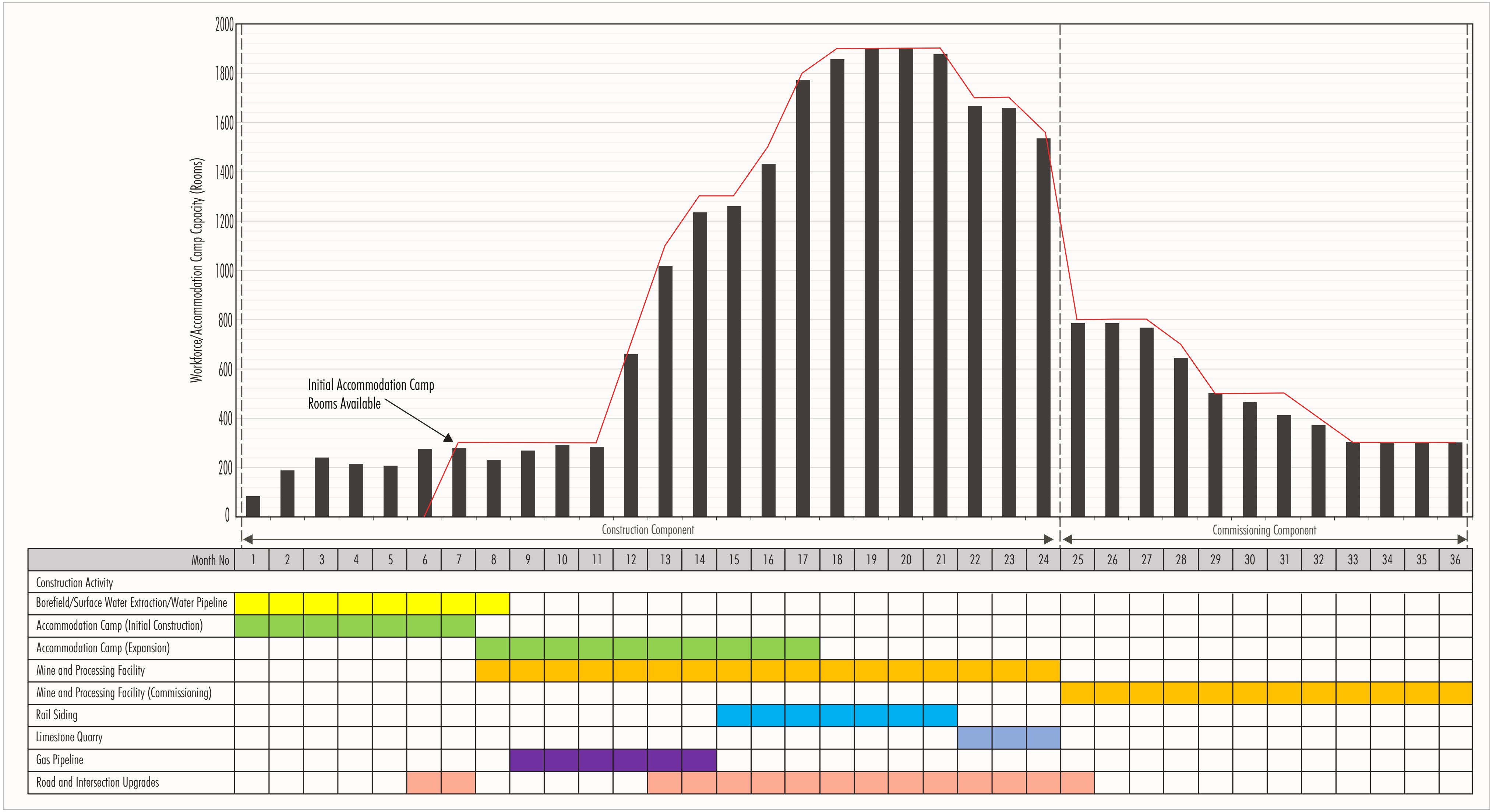


Source: Clean TeQ (2021)

LEGEND

Accommodation Camp Capacity

Indicative Project Construction Workforce

S U N R I S E   P R O J E C T

Indicative Modified Construction Workforce and Construction Timing

Figure 2.3

Road Transport Implications

The following components of the Modification would result in changes to the approved impacts on the road network:

- increased construction phase duration from two to three years;
- changes to construction phase vehicle movements associated with the increased construction phase accommodation camp capacity and changes to heavy vehicle delivery requirements;
- changes to operational phase heavy vehicle movements associated with revisions to processing plant reagent types, rates and storage volumes; and
- changes to operational phase heavy vehicle movements to and from the rail siding associated with the transport of metal and ammonium sulphate products.
- revised rail siding location and layout; and
- two additional mine and processing facility vehicle site access points on Wilmatha Road.

This assessment considers the implications of the Modification for the following scenarios:

- peak construction activity, which would occur in the second year of construction, nominally in 2023 (Figure 2.3); and
- peak production activity, with unrelated background changes in traffic over a further 10 year period, nominally 2033.

3 Road Transport Environment

3.1 Road Network

The road system in the region is presented in Figure 1.1 and briefly described below. It is noted that the approved Project includes a range of road and intersection upgrades to the road network and these are described in Section 4.1.

Henry Parkes Way (MR61E) forms part of Main Road 61 East, which provides an east-west link between Orange and Condoblin, and connects Parkes and Condobolin through Bogan Gate and Ootha. Henry Parkes Way typically has a single travel lane in each direction with gravel or grassed shoulders, and a speed limit of 100 kilometres per hour (km/h). Through Bogan Gate, the speed limit is reduced to 50 km/h. It has centre and edge line marking and guidance posts. It is crossed by the Bogan Gate Tottenham Railway at a passive level crossing at Bogan Gate. It is crossed by the Orange Broken Hill Railway at an active level crossing approximately 5 km west of Parkes, at which the speed limit on Henry Parkes Way is reduced to 80 km/h. As a Regional Road, TfNSW provides financial assistance to the relevant local councils for its management.

The Bogan Way (MR350) is a Regional Road and forms part of Main Road 350, which extends from the Newell Highway at Forbes to Henry Parkes Way near Bogan Gate then via Trundle and Kadungle to the Peak Hill-Tullamore Road (MR348) near Tullamore, then continues to Nyngan. The Bogan Way has a two lane sealed carriageway, with centre line marking and guidance posts. The road shoulder is unpaved and varies in width from 0 to 2 metres (m), with no edge line marking. The speed limit is generally 100 km/h, with 80 km/h signposted through Gunningbland between Forbes and Henry Parkes Way, and 50 km/h through Trundle, in Bogan Gate and in Forbes. There is a 40 km/h school speed zone at the southern end of Trundle. The Bogan Way is crossed by the Bogan Gate Tottenham Railway at three passive control level crossings between Trundle and Bogan Gate. As a Regional Road, TfNSW provides financial assistance to the relevant Councils for its management.

Middle Trundle Road (SR83) runs northwest from Henry Parkes Way approximately midway between Parkes and Bogan Gate to The Bogan Way approximately 4 km south of Trundle. It is also known as Shire Road 83. The route between Parkes and Trundle along Middle Trundle Road is some 10 km shorter than the alternative route via Bogan Gate. The intersections at each end of Middle Trundle Road are basic rural road T-intersections, without auxiliary lane treatments or channelisation. The intersection of Middle Trundle Road with The Bogan Way was constructed in 2013 and has some turning path deficiences relating to B-doubles and B-triples, but is deemed suitable due to low volumes (Crossroads Civil Design, 2014). Sealing of Middle Trundle Road along its entire length was completed in early 2019 under the NSW Government's Drought Reflief Heavy Vehicle Access Program. The Parkes Shire Council is responsible for the management of Middle Trundle Road.

The McGrane Way (MR354) is a Regional road which extends from the Nyngan-Condobolin Road (MR57) at Tullamore to the Tomingley-Narromine Road (MR89) at Narromine. It is typically a sealed road with a speed limit of 100 km/h, a single travel lane in each direction and centre and edge line marking. As a Regional Road, TfNSW provides financial assistance to the Parkes Shire Council and Narromine Shire Council for its management.

Fifield Road (MR57N) is a Regional Road also known as Main Road 57 North, which runs northwards from Henry Parkes Way approximately 6 km east of Condobolin, through Fifield to Tullamore. In Fifield, it is known as **Slee Street** and Burra Street. It is crossed by the Orange Broken Hill Railway just to the north of its intersection with Henry Parkes Way at an active level crossing, and by the Bogan Gate Tottenham Railway at a passive level crossing at Tullamore. It is a two lane sealed road with centre line marking. The speed limit on Fifield Road is typically 100 km/h, and reduced to 50 km/h at Fifield. This portion of MR57N is a Regional Road, thus TfNSW provides financial assistance to the Lachlan Shire Council for its management.

Fifield-Trundle Road (SR171) and **Platina Road (SR64)** are also known as Shire Road 171 and Shire Road 64 respectively. These roads provide a link between The Bogan Way approximately 6 km north of Trundle and Fifeld Road approximately 5 km south of Fifield. The section of road in the Parkes Shire is known as Fifield-Trundle Road and the section of road in the Lachlan Shire is known as Platina Road. Fifield-Trundle Road typically has a 6.5 m wide formation with 6.0 m wide seal. Platina Road typically has a sealed surface approximately 4 m wide, with 1 m gravel shoulders. There is limited line marking. The intersections at the ends of Fifield-Trundle Road and Platina Road are basic rural T-intersections, without auxiliary lane treatments or channelisation. The Parkes Shire Council and Lachlan Shire Council are responsible for the management of Fifield-Trundle Road and Platina Road, respectively.

Wilmatha Road (SR34), also known as Shire Road 34, runs northwest from Fifield past the mine and processing facility site, and crosses Melrose Plains Road at the northwestern boundary of the mine and processing facility. It has an unsealed surface approximately 8 to 12 m wide and a speed limit of 100 km/h. The Lachlan Shire Council is responsible for the management of Wilmatha Road.

Sunrise Lane is a local unsealed road extending west from Wilmatha Road approximately 4 km from Fifield. It provides access to a limited number of rural properties along its length but does not provide through access to any other roads.

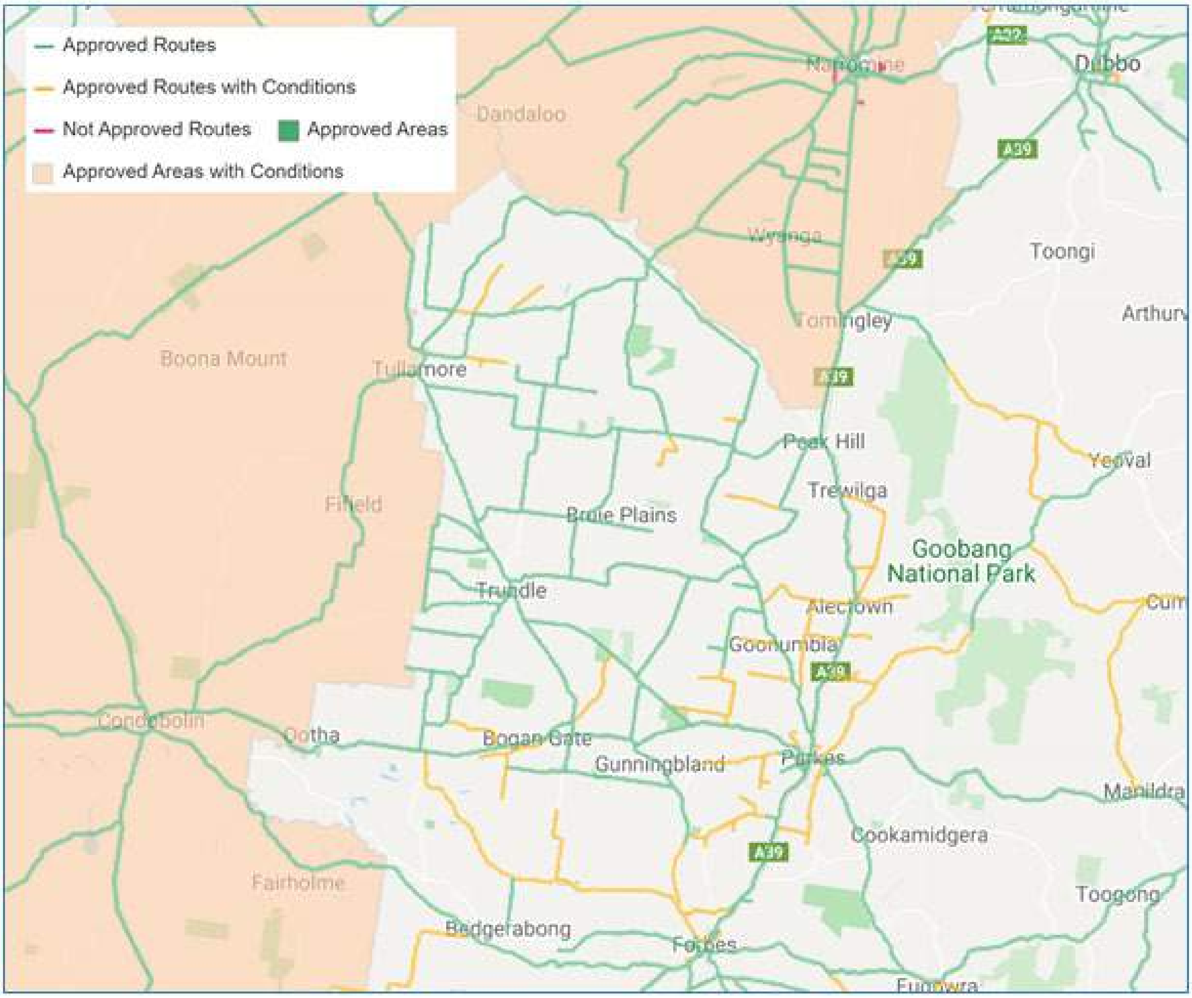
Scotson Lane is a local unsealed road extending between The Bogan Way near Fifield-Trundle Road and Numalla Road, crossing the Bogan Gate Tottenham Railway at a passive level crossing. Its intersection with The Bogan Way is slightly offset to the south from the intersection of Fifield-Trundel Road with The Bogan Way. The Parkes Shire Council is responsible for the management of Scotson Lane.

3.2 Heavy Vehicle Routes

The general approved routes for B-double network access in the region are presented in Figure 3.1. Lachlan and Narromine Shires are approved areas for B-doubles, with travel restrictions as follows within the Lachlan Shire:

- no travel permitted if there is water over the road;
- no travel if the road is closed and no travel on unsealed roads if restricted to light vehicles up to 3 t due to rain or if other temporary restrictions apply;
- maximum 80 km/h speed on all unsealed roads and sealed roads where the seal is so narrow as to require travelling on the unsealed shoulder to pass another vehicle.

Figure 3.1: Approved 25/27m B-Double Network Access

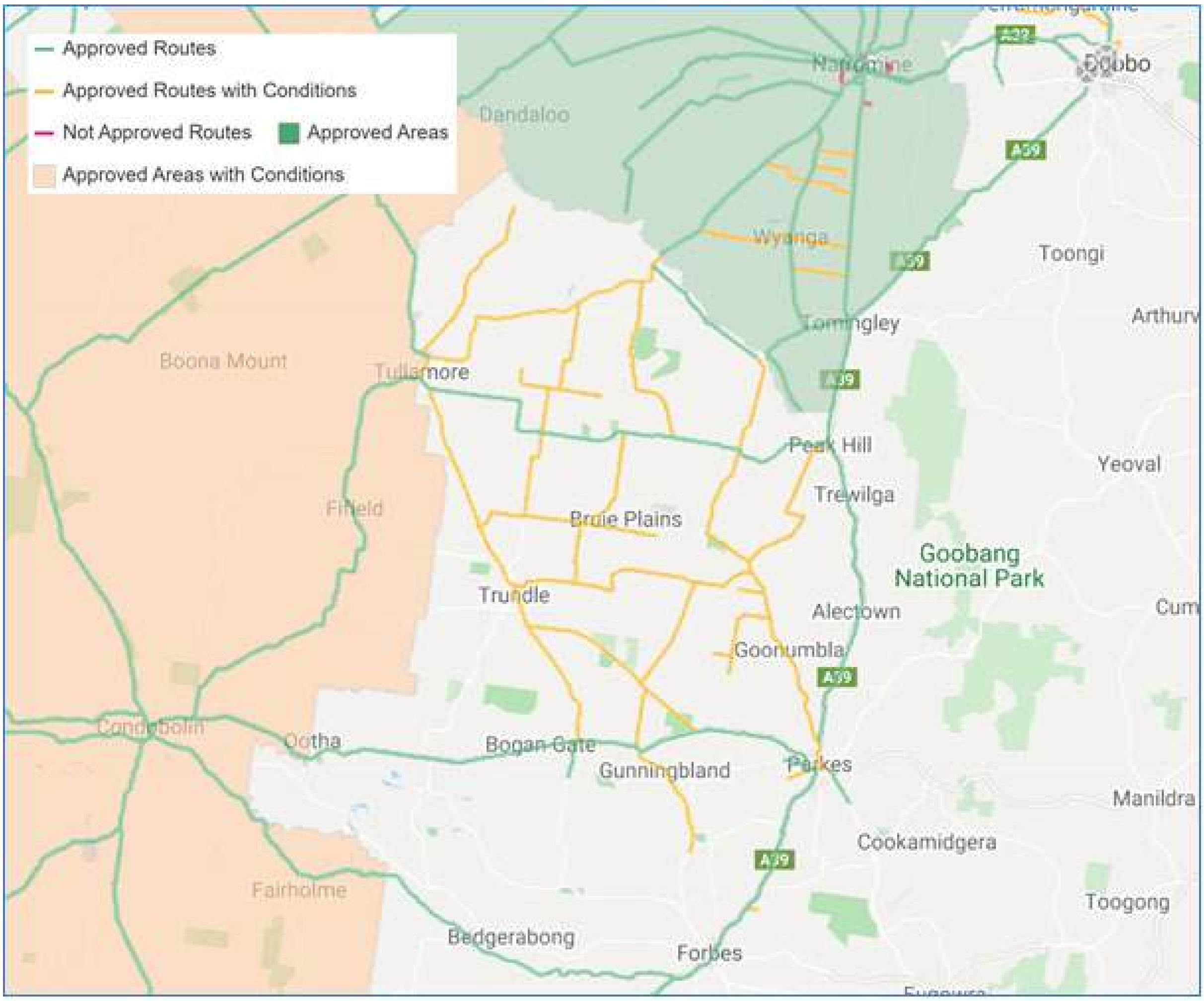


The approved routes for modular B-triple road train network access in the region are presented in Figure 3.2. Lachlan Shire is an approved area for road train access, with travel restriction as follows:

- no travel permitted if there is water over the road;
- no travel if the road is closed and no travel on unsealed roads if restricted to light vehicles up to 3 t due to rain or if other temporary restrictions apply;
- maximum 80 km/h speed on all unsealed roads and sealed roads where the seal is so narrow as to require travelling on the unsealed shoulder to pass another vehicle.

The Bogan Way between Henry Parkes Way and Peak Hill Tullamore Road (south of Tullamore) is an approved route for modular B-triple road trains, subject to a speed limit of 80 km/h. Middle Trundle Road is an approved route for modular B-triple road trains, subject to a speed limit of 80 km/h, with no access permitted between sunset and sunrise, nor between 7:30 am and 9:00 am and between 3:00 pm and 4:30 pm on school days.

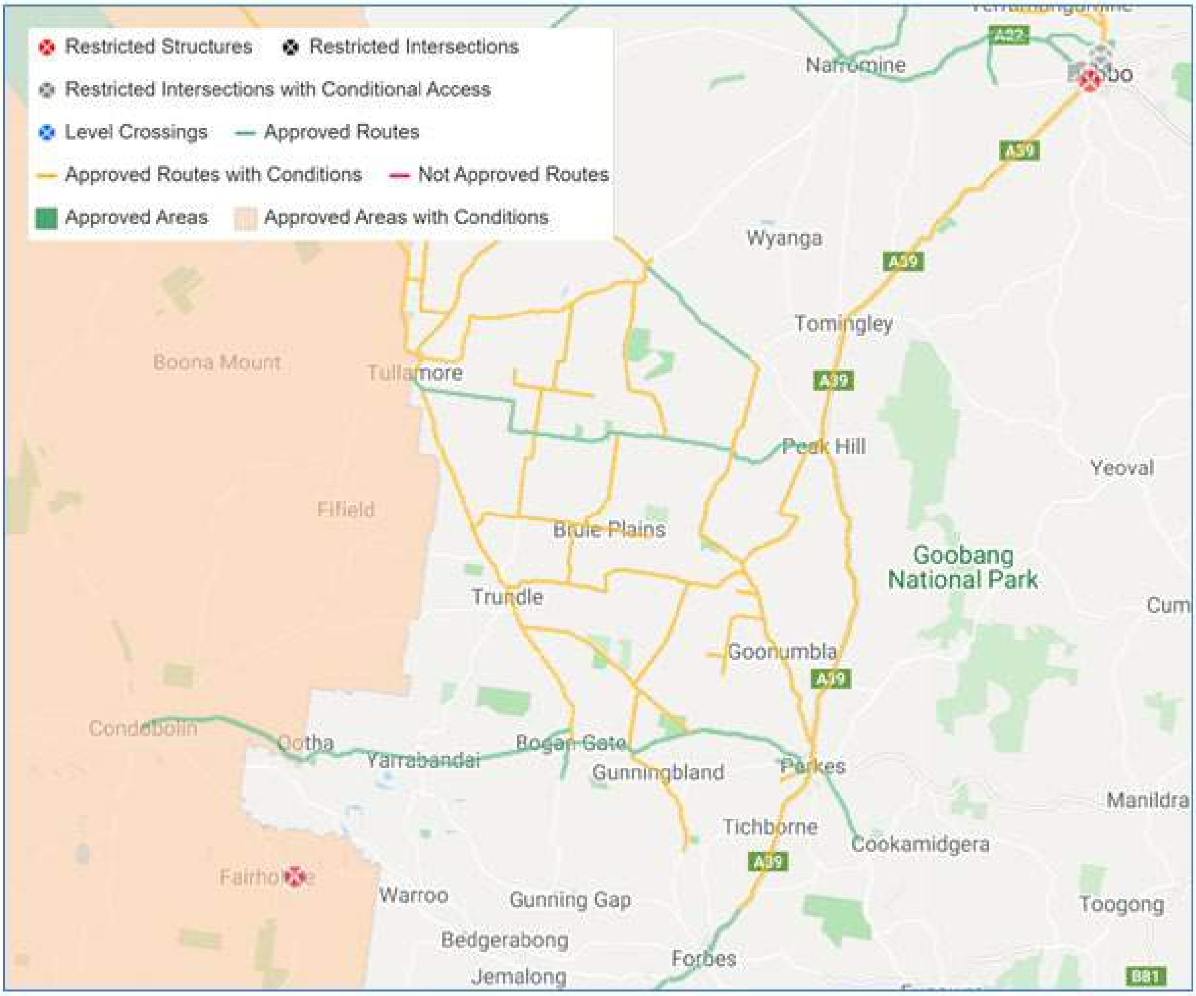
Figure 3.2: Approved Modular B-Triple Network Access



The approved routes for AB-triple road train network access in the region are presented in Figure 3.3. Lachlan Shire is an approved area for AB-triple road train access, with travel restriction as follows:

- no travel permitted if there is water over the road;
- no travel if the road is closed and no travel on unsealed roads if restricted to light vehicles up to 3 t due to rain or if other temporary restrictions apply;
- maximum 80 km/h speed on all unsealed roads and sealed roads where the seal is so narrow as to require travelling on the unsealed shoulder to pass another vehicle.

Figure 3.3: Approved AB-Triple Network Access



Notwithstanding the above, in January 2018, SEM obtained Heavy Vehicle Authorisation Permit 119039 to operate higher capacity vehicles (AB-triples) between the mine and processing facility and Parkes via Wilmatha Road, Slee Street, Fifield Road, Platina Road, Fifield-Trundle Road, The Bogan Way (including Forbes Street, Trundle and Edols Street, Bogan Gate), Henry Parkes Way and roads in Parkes (Brolgan Road and Westlime Road).

3.3 Traffic Volumes

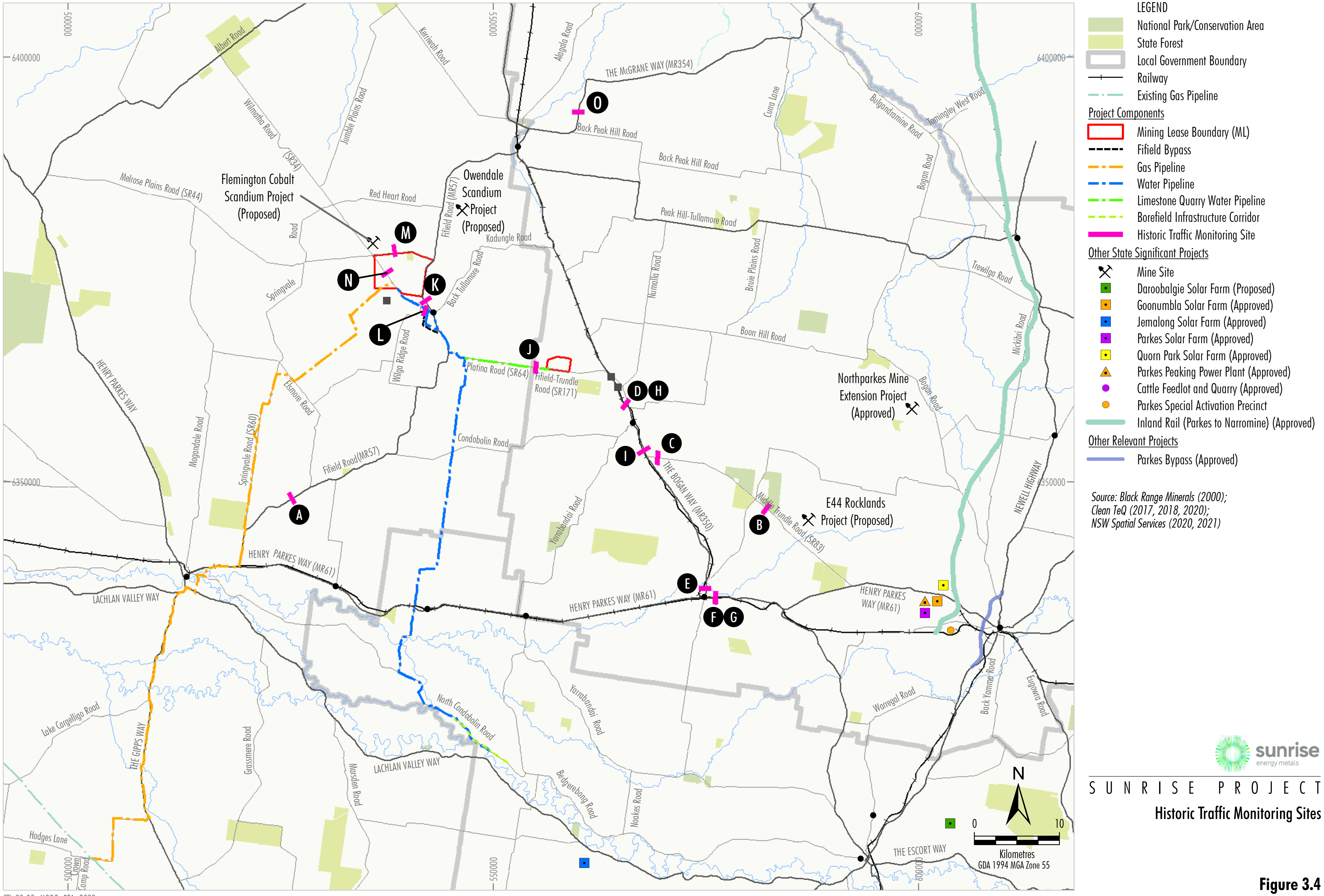
3.3.1 Historic Surveys

Historic traffic survey data has been collated for roads in the region. This includes data collected by Lachlan Shire Council and Parkes Shire Council during 2014 and 2015, and data collected for SEM during November 2016 (GTA Consultants, 2017). The results of those surveys are summarised in Table 3.1 for the average daily vehicles and their classification as surveyed.

Table 3.1: Surveyed Daily Traffic Volumes and Classifications 2014 to 2016 (vehicles per day)

Site[A]	Road and Location	Survey Date	Light Vehicles	Heavy Vehicles	Total Vehicles
		Council Surveys 2014			
A	Fifield Road north of Raynella Road	February to April 2014	143	91	234
B	Middle Trundle Road 13km northwest of Henry Parkes Way	September 2014	85	8	93
C	Middle Trundle Road 500m east of The Bogan Way	October 2014	91	7	98
D	The Bogan Way north of Trundle town	October 2014	321	158	479
E	The Bogan Way north of Henry Parkes Way	November 2014	373	94	467
F	Henry Parkes Way east of Bogan Gate town	November 2014	815	209	1024
G	Henry Parkes Way east of East Street, Bogan Gate	December 2014	789	197	986
H	The Bogan Way south of Numulla Road (north of Trundle)	December 2014	425	81	506
		Council Surveys 2015			
I	The Bogan Way 180m north of Middle Trundle Road	August 2015	322	54	376
J	Fifield-Trundle Road at Parkes Shire boundary	September to November 2015	62	23	85
		Sunrise Energy Metals Surveys 2016			
K	Fifield Road between Tullamore and Fifield	November 2016	130	55	185
L	Slee Street in Fifield	November 2016	176	70	246
M	Melrose Plains Road east of Wilmatha Road	November 2016	7	6	13
N	Wilmatha Road south of Melrose Plains Road	November 2016	13	8	21
O	The McGrane Way north of Back Peak Hill Road (north-east of Tullamore)	November 2016	94	30	124

[A] *Refer to Figure 3.4*



SUNRISE PROJECT
Historic Traffic Monitoring Sites

Figure 3.4

CTL-20-08_MOD7_RTA_202B

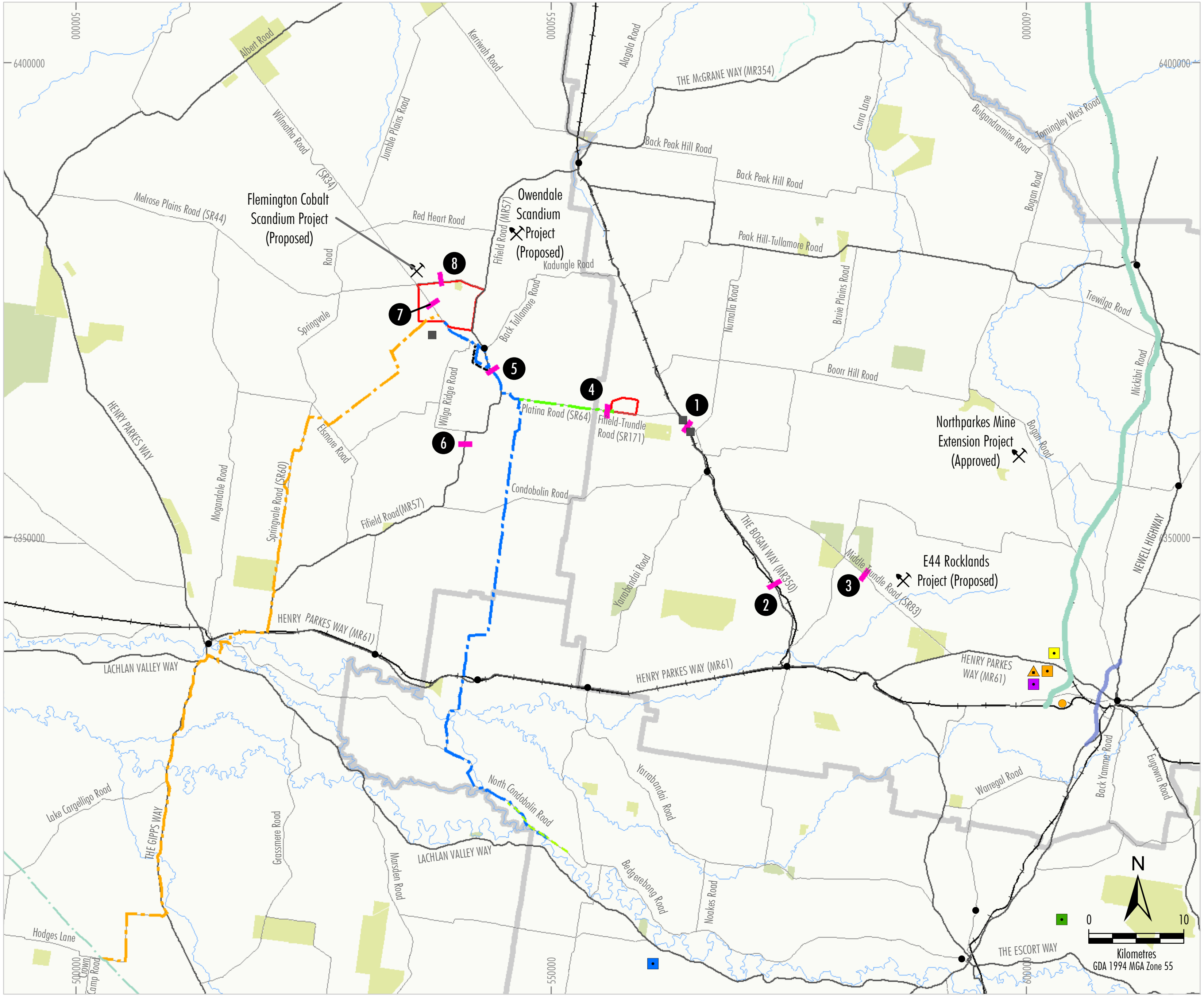
3.3.2 Long Term Traffic Monitoring Program

SEM commissioned a program of traffic surveys that collected traffic volume and classification data on a continuous basis throughout the 2017 and 2018 calendar years at the following eight locations (shown in Figure 3.5):

1. The Bogan Way between Trundle and Fifield-Trundle Road;
2. The Bogan Way between Bogan Gate and Middle Trundle Road;
3. Middle Trundle Road between The Bogan Way and Henry Parkes Way;
4. Platina Road/Fifield-Trundle Road between The Bogan Way and Fifield Road
5. Fifield Road between Slee Street and Platina Road;
6. Fifield Road between Platina Road and Springvale Road;
7. Wilmatha Road north of Sunrise Lane; and
8. Melrose Plains Road between Fifield Road and Wilmatha Road.

The surveyed traffic volumes collected during the traffic monitoring program are presented in GTA Consultants (2018b) and The Transport Planning Partnership (TTPP) (2019), noting that some data periods were impacted by roadworks and damaged tubes. Notably, during the monitoring program, the bridge on The Bogan Way north of Bogan Gate was closed for over five months between 11 October 2017 and 23 March 2018. A diversion was in place, which increased travel distance by some 4 km. The closure of The Bogan Way north of Bogan Gate appears to have influenced local traffic conditions, with a decrease in the use of The Bogan Way north of Bogan Gate, and an increase in the use of Middle Trundle Road.

Table 3.2 presents the annual average daily traffic at the surveyed locations, excluding data identified as being impacted by roadworks or other issues.



LEGEND

- National Park/Conservation Area
- State Forest
- Local Government Boundary
- Railway
- Existing Gas Pipeline

Project Components

- Mining Lease Boundary (ML)
- Fifield Bypass
- Gas Pipeline
- Water Pipeline
- Limestone Quarry Water Pipeline
- Borefield Infrastructure Corridor
- Long-term Traffic Monitoring Site

Other State Significant Projects

- Mine Site
- Daroobalgie Solar Farm (Proposed)
- Goonumbla Solar Farm (Approved)
- Jemalong Solar Farm (Approved)
- Parkes Solar Farm (Approved)
- Quorn Park Solar Farm (Approved)
- Parkes Peaking Power Plant (Approved)
- Cattle Feedlot and Quarry (Approved)
- Parkes Special Activation Precinct
- Inland Rail (Parkes to Narromine) (Approved)

Other Relevant Projects

- Parkes Bypass (Approved)

Source: Black Range Minerals (2000); Clean TeQ (2017, 2018, 2020); NSW Spatial Services (2020, 2021)

sunrise energy metals

SUNRISE PROJECT

Long Term Traffic Monitoring Sites

CTL-20-08_MOD7_RTA_205A

Figure 3.5

Table 3.2: Annual Average Daily Traffic in 2017 and 2018 (vehicles per day)

Site^A	Location	2017			2018		
		Light	Heavy	Total	Light	Heavy	Total
1	The Bogan Way between Trundle and Fifield-Trundle Road	329	76	405	332	51	383
2	The Bogan Way between Bogan Gate and Middle Trundle Road	291	86	377	285	43	328
3	Middle Trundle Road between The Bogan Way and Henry Parkes Way	170	30	200	243	19	262
4	Platina Road/Fifield-Trundle Road between The Bogan Way and Fifield Road	66	15	81	61	6	67
5	Fifield Road between Slee Street and Platina Road	200	95	295	187	148	335
6	Fifield Road between Platina Road and Springvale Road	139	99	238	147	150	297
7	Wilmatha Road north of Sunrise Lane	14	4	18	15	5	20
8	Melrose Plains Road between Fifield Road and Wilmatha Road	9	4	13	7	2	9

^A *Refer to Figure 3.5*

As a robust approach to this assessment, the surveyed 85th percentile daily volumes for 2018 have been adopted as being the background volumes experienced on the road network in 2018, rather than the surveyed average volumes. On 85 percent (%) of days in 2018, the daily traffic volume was at or below the 85th percentile level presented in Table 3.3. Adopting this higher demand (rather than average volumes) takes into consideration the variation in demand over the year due to seasonal factors such as harvest activity, but excludes the very busiest days such as during the ABBA Festival held annually in Trundle.

Table 3.3: 85th Percentile Daily Traffic in 2018 (vehicles per day)

Site^A	Location	Light Vehicles	Heavy Vehicles	Total Vehicles
1	The Bogan Way between Trundle and Fifield-Trundle Road	388	60	448
2	The Bogan Way between Bogan Gate and Middle Trundle Road	332	50	382
3	Middle Trundle Road between The Bogan Way and Henry Parkes Way	299	24	323
4	Platina Road/Fifield-Trundle Road between The Bogan Way and Fifield Road	73	7	80
5	Fifield Road between Slee Street and Platina Road	247	196	443
6	Fifield Road between Platina Road and Springvale Road	195	199	394
7	Wilmatha Road north of Sunrise Lane	21	7	28
8	Melrose Plains Road between Fifield Road and Wilmatha Road	12	4	16

^A *Refer to Figure 3.5. Note 85th percentile demand excludes those periods of data impacted by roadworks.*

3.4 Background Traffic Growth

The results in Table 3.2 indicate that average traffic volumes on the surveyed roads fluctuated, with some increasing and some decreasing from 2017 to 2018. Significant growth in average daily traffic from 2017 to 2018 was recorded on both Middle Trundle Road and Fifield Road. On Fifield Road, the increase is primarily the result of an increase in heavy vehicles, while on Middle Trundle Road, the increase is primarily the result of an increase in light vehicles. Moderate decreases in average daily traffic were recorded on The Bogan Way, primarily related to an observed decrease in the number of heavy vehicles.

The driving factor behind those observed changes are not known, and may be related to any number of things such as impacts of a specific development, or changes to road management or network conditions (e.g. the progressive sealing of Middle Trundle Road that was completed in early 2019) which have resulted in routes being more or less attractive to certain drivers.

In consideration of the observed fluctuations and seasonal variations in traffic, for the purpose of this assessment, the background traffic (unrelated to the Project or Modification) has been estimated on the basis of the surveyed 2018 daily 85th percentile demands (Table 3.3). An annual growth rate of 2% per annum has been adopted, consistent with GTA Consultants (2017). A higher growth rate of 3% per annum has been adopted for heavy vehicles only on Fifield Road to reflect the higher growth in heavy vehicles observed on that route. The forecast background traffic volumes for the two assessment scenarios (Section 2.2) are provided in Table 3.4.

Table 3.4: Background and Forecast 85th Percentile Daily Traffic (vehicles per day)

Site[A]	Location	2018		2023		2033	
		Light	Heavy	Light	Heavy	Light	Heavy
1	The Bogan Way between Trundle and Fifield-Trundle Road	388	60	427	67	521	81
2	The Bogan Way between Bogan Gate and Middle Trundle Road	332	50	367	55	447	67
3	Middle Trundle Road between The Bogan Way and Henry Parkes Way	299	24	330	26	402	32
4	Platina Road/Fifield-Trundle Road between The Bogan Way and Fifield Road	73	7	81	8	98	9
5	Fifield Road between Slee Street and Platina Road	247	196	273	227	332	305
6	Fifield Road between Platina Road and Springvale Road	195	199	215	231	262	310
7	Wilmatha Road north of Sunrise Lane	21	7	23	8	28	9
8	Melrose Plains Road between Fifield Road and Wilmatha Road	12	4	13	4	16	5

[A] *Refer to Figure 3.5*

Review of the 2018 survey data indicates that the busiest hour occurred at different times of the day at the different survey locations, typically between 9:00 am and 4:00 pm. During the busiest hour at the surveyed locations (excluding Wilmatha Road and Melrose Plains Road), the number of vehicles was typically 9-11% of the daily total traffic. During the hours when Project-generated traffic is expected to peak, the number of vehicles at the surveyed locations was up to 5% of the daily total traffic. As a robust assessment, this study has estimated the peak hourly baseline traffic for the 85th percentile day, assuming that 10% of the daily traffic (85th percentile day) occurs during the Project's peak hours. The resulting peak hourly traffic is presented in Table 3.5.

Table 3.5: Baseline 85th Percentile Day Peak Hourly Traffic (vehicles per hour)

Site[A]	Location	2018		2023		2033	
		Light	Heavy	Light	Heavy	Light	Heavy
1	The Bogan Way between Trundle and Fifield-Trundle Road	39	6	43	7	52	8
2	The Bogan Way between Bogan Gate and Middle Trundle Road	33	5	36	6	44	7
3	Middle Trundle Road between The Bogan Way and Henry Parkes Way	30	2	33	2	40	3
4	Platina Road/Fifield-Trundle Road between The Bogan Way and Fifield Road	7	1	8	1	9	1
5	Fifield Road between Slee Street and Platina Road	25	19	28	22	34	30
6	Fifield Road between Platina Road and Springvale Road	19	20	21	23	26	31
7	Wilmatha Road north of Sunrise Lane	2	1	2	1	3	1
8	Melrose Plains Road between Fifield Road and Wilmatha Road	2	0	2	0	3	0

[A] *Refer to Figure 3.5*

3.5 State Significant Projects

Other state significant projects in the region may impact on traffic conditions on those roads serving the Project. Key proposed or approved projects that may potentially interact with, or have potential cumulative impacts with, the modified Project are listed in Table 3.6 and shown on Figure 1.1. Table 3.6 also classifies each of the projects as being relevant (required to be considered in this assessment) or potentially relevant (not required to considered in this assessment) in accordance with the draft *Assessing Cumulative Impacts Guide Guidance for State Significant Projects* (NSW Government, 2020).

Relevant cumulative impacts with the modified Project and the relevant State significant projects have been considered in this Road Transport Assessment in accordance with the draft *Assessing Cumulative Impacts Guide Guidance for State Significant Projects* (NSW Government, 2020).

Table 3.6: Summary of Key Proposed or Approved State Significant Development and Infrastructure Projects in the Region

Project	Overview	Status	Cumulative Impact Assessment[A]
Lachlan Shire Local Government Area			
Cattle Feedlot and Quarry (Department of Infrastructure, Planning and Natural Resources, 2005)	50,000 head cattle feedlot and quarry (providing material to the feedlot for construction and maintenance), located approximately 30 km west of Condobolin. The construction workforce is approximately 85 personnel in the first year of construction and 53 personnel over the following three years of construction. The operational workforce is approximately 50 personnel.	Approved 2005, not constructed	Relevant – required to be considered
Flemington Cobalt Scandium Mine (Australian Mines Limited, 2017)	A proposed nickel, cobalt and scandium open cut mine located to the immediate north-west of the Project. The proposed construction workforce is approximately 150 to 120 personnel for approximately 12 to 18 months. The proposed operational workforce is approximately 75 personnel for 18 years.	Environmental Assessment Requirements (EARs) Issued 2018	Potentially Relevant – not required to be considered
Owendale Scandium Mine (R.W. Corkery & Co. Pty. Limited, 2018)	A proposed nickel, cobalt and scandium open cut mine (immediately north-east of the Project), processing site (located approximately 5 km west of Condobolin) and associated infrastructure. The proposed construction period is approximately two years (no workforce estimate provided). The proposed operational workforce is approximately 121 personnel for 28 years of mining operations.	EARs Issued 2018	Potentially Relevant – not required to be considered
Western Slopes Pipeline (APA, 2017)	A proposed high pressure gas pipeline approximately 450 km in length to connect the Narrabri Gas Project to the NSW gas transmission network, with the alignment located north and west of the Project. The proposed construction workforce is between 250 and 350 personnel for approximately 8 to 10 months. The proposed operational workforce is 4 to 5 personnel until the end of the pipeline's useful life (estimated to be approximately 40 years).	EARs Issued 2019	Potentially Relevant – not required to be considered
Parkes Shire Local Government Area			
Northparkes Mine Extension Project (CMOC Mining Services Pty Ltd, 2018)	A copper-gold mine located approximately 27 km north-west of Parkes. Operational workforce of approximately 700 personnel until end of the mine life in 2032.	Approved 2014 – Operational	Relevant – required to be considered
Inland Rail Parkes to Narromine (ARTC, 2021)	An upgrade of the existing rail line between Parkes and Narromine as part of the Inland Rail Project (including 98.4 km of upgraded track and 5.4 km of new track).	Approved 2018 – Operational	Relevant – required to be considered
Parkes Solar Farm (Neoen Renewing Energy, 2016)	A 65 Megawatt (MW) photovoltaic solar farm located approximately 10 km west of Parkes. The operational workforce on-site is approximately one for the expected 25 to 30 year operational life.	Approved 2016 – Operational	Relevant – required to be considered

Project	Overview	Status	Cumulative Impact Assessment[A]
Goonumbla Solar Farm (Geolyse, 2016)	A 70 MW photovoltaic solar farm located approximately 10 km west of Parkes and immediately north of the Parkes Solar Farm. There are no operational employees stationed on-site at the solar farm.	Approved 2016 – operational	Relevant – required to be considered
Quorn Park Solar Farm (Premise, 2019)	An 80 MW photovoltaic solar farm located approximately 10 km north-west of Parkes. The peak construction workforce is 100 personnel for approximately nine months. The operational workforce is 2 to 3 personnel for the expected 30 year operational life.	Approved 2020 – not constructed	Relevant – required to be considered
Parkes Peaking Power Plant (NSW Department of Planning, 2008)	A gas turbine peaking power plant with a nominal output between 120 MW to 150 MW, located approximately 10 km west of Parkes. The construction workforce is approximately 44 personnel for six to eight months. The operational workforce is approximately four personnel.	Approved 2008 – not constructed	Relevant – required to be considered
Parkes Bypass[B] (RMS, 2019 and TfNSW, 2021)	A 10.5 km Newell Highway bypass approximately 2 km west of Parkes. The main construction workforce is up to approximately 400 personnel for approximately three years.	Approved (2019) – under construction	Relevant – required to be considered
E44 Rocklands Project (MineSoils, 2021)	A proposed open cut mine to supplement existing underground operations at Northparkes Mine, approximately 50 km south-east of the Sunrise Mine.	Site Verification Certificate Application submitted 2020	Potentially Relevant – not required to be considered
Forbes Shire Local Government Area			
Jemalong Solar Farm (NGH Environmental Pty Ltd, 2017)	A 50 MW photovoltaic solar farm undergoing construction, approximately 36 km west of Forbes. The construction workforce is approximately 100 direct jobs and 100 indirect jobs over a construction period of approximately 12 months. The operational workforce is three to four personnel for approximately 30 years.	Approved 2018 – under construction	Relevant – required to be considered
Daroobalgie Solar Farm (Pacific Hydro, 2019)	A 100 MW photovoltaic solar farm located approximately 11 km north-east of Forbes. A proposed peak construction workforce of approximately 160 personnel for approximately 12 to 18 months. A proposed operational workforce of approximately four to six personnel for the expected operational life of approximately 25 years.	EARs Issued 2019	Potentially Relevant – not required to be considered

[A] *In accordance with the draft Assessing Cumulative Impacts Guide Guidance for State Significant Projects (NSW Government, 2020).*
[B] *Approved under Part 5 of the EP&A Act.*

The NSW Government has established the Parkes Special Activation Precinct under the *State Environmental Planning Policy (Activation Precincts) 2020*. The Parkes Special Activation Precinct is a 3,600 hectare (ha) industrial park located approximately 3 km west of Parkes (Figure 1.1). Construction of Stage 1 infrastructure for the industrial park (i.e. road and electricity distribution infrastructure) is expected to commence in June 2021 (Regional Growth NSW, 2021).

The Parkes Solar Farm, Goonumbla Solar Farm and Parkes Peaking Power Plant (Table 3.6) are located in the Parkes Special Activation Precinct. Any future developments associated the Parkes Special Activation Precinct may also potentially interact with, or have potential cumulative impacts with, the modified Project. These potential interactions or cumulative impacts would be assessed as part of separate development applications for these future developments.

The relevant projects to be considered in this assessment (Table 3.6) are each discussed below with respect to their potential for interaction with Project-generated traffic (described in Section 5).

Cattle Feedlot and Quarry

The approved Cattle Feedlot and Quarry was proposed by Rockdale Beef Pty Ltd includes a 50,000 head cattle feedlot and quarry approximately 30 km west of Condobolin (Figure 1.1).

The Cattle Feedlot and Quarry was approved by the NSW Minister for Infrastructure and Planning in April 2005 and construction was yet to commence at the time of writing this document.

In its assessment report for the Cattle Feedlot and Quarry, the Department of Infrastructure, Planning and Natural Resources (2005) indicates that the proponent, Rockdale Beef Pty Ltd (Rockdale) has estimated that during the early stages of construction, the construction workforce is expected to generate approximately 106 two-way traffic movements per day, with an additional four two-way trips for deliveries of aggregate, sand and cement. Once operational, the Cattle Feedlot and Quarry is expected to generate an average of 190 light vehicle trips and 224 heavy vehicle trips per day.

A minimum of 60 % of the generated traffic is expected to be sourced from Condobolin. A minimum 10 % of the daily traffic travelling towards Condobolin would then travel south to the abattoir at Yanco. The proposed transport route from the Cattle Feedlot and Quarry site to the abattoir at Yanco includes Kiacatoo Road south to Lachlan Valley Way, east along Lachlan Valley Way to Condobolin, south along Main Road 57 to West Wyalong, then Newell Highway to Narrandera then Yanco.

A Transport Code of Conduct for the management of traffic associated with construction and operation of the Cattle Feedlot and Quarry is required to be prepared and implemented. In addition, contributions to maintenance and upgrading of roads along the transport route are also required for the Cattle Feedlot and Quarry.

As traffic generated by the Cattle Feedlot and Quarry would generally occur west and south of Condobolin, the potential for interaction with Project-generated traffic would be very minimal should the Cattle Feedlot and Quarry be constructed during the life of the Project.

Northparkes Mine

The approved Northparkes Mine is a copper-gold mine located approximately 27 km northwest of Parkes via the Newell Highway and Bogan Road (Figure 1.1). It has been operating since 1993, and mining operations are approved until 2032.

Modification 4 to Project Approval PA 11_0060 (the most recent approval) was approved in September 2018, which included additional ore processing infrastructure. The Modification did not involve any changes to operating hours, the number of employees, or the processing rate, and so would not result in any impacts to road traffic aspects of the Northparkes Mine (Umwelt, 2018). No changes to future traffic conditions as a result of activity at Northparkes Mine are therefore anticipated.

The ongoing contribution of the Northparkes Mine on traffic conditions in the vicinity of the Project would be negligible, noting that less than 5 % of the workforce is assumed to travel to and from Trundle and Bogan Gate (Transport & Urban Planning, 2013). As the latest Modification would not impact its traffic generation, the traffic survey data (Section 0) is expected to have fully captured the existing and ongoing future contribution of the Northparkes Mine to traffic conditions and therefore have been considered in this assessment.

Inland Rail Parkes to Narromine

Inland Rail is a 1,700 km freight rail line that will connect Melbourne and Brisbane via regional Victoria, NSW and Queensland proposed by the Australian Rail Track Corporation Ltd. It comprises 13 different projects, the first of which is the Parkes to Narromine Section.

The Parkes to Narromine Section of the Inland Rail was commissioned in late September 2020, and is now operational. The Parkes to Narromine Section involved the upgrade of 98.4 km of existing rail track between Parkes and south of Narromine, including a full rebuild of the rail tracks, rail formation and supporting structures. A new 5.3 km length of new rail track, known as the North West Connection, was constructed west of Parkes, which provides a new corridor between the Orange Broken Hill Railway and the Parkes Narromine Railway.

GHD (2017) assessed the traffic and transport aspects of the Parkes to Narromine Section. That assessment found that once operational, minimal traffic generation is expected. The key traffic impacts relate to increased train activity at level crossings, although faster train speeds will be permitted, which will slightly decrease delays associated with individual trains. Traffic activity at most levels crossings in the study area was found to be low, and the number of vehicles likely to be delayed by train activity is not substantial. It also found that there is capacity at each level crossing for delayed traffic to queue clear of adjacent intersections.

With respect to potential interactions with traffic generated by the Project, the Parkes to Narromine Section of the Inland Rail crosses Henry Parkes Way approximately 6 km west of Parkes at an actively controlled level crossing with flashing lights and boom barriers, at which the speed limit on Henry Parkes Way has recently been reduced to 80 km/h.

Project-generated traffic travelling to or from Parkes would pass through that level crossing on Henry Parkes Way, with those drivers experiencing delays at the level crossing as described above. The delays due to trains at that level crossing and the Project's contribution to the road traffic at the level crossing are considered sufficiently small that no further assessment of this interaction between the Project and Parkes to Narromine Section rail traffic is warranted.

Parkes Solar Farm

The approved Parkes Solar Farm involves the development of a 65 million watt (MW) photovoltaic solar farm and associated infrastructure approximately 10 km west of Parkes (Neoen Renewing Energy, 2016) (Figure 1.1). Operations at the Parkes Solar Farm commenced in April 2018.

The number of ongoing operational workers is very low and would generate negligible traffic over the operational life of the Parkes Solar Farm. This assessment therefore does not include any forecasts for traffic to and from the Parkes Solar Farm, as background traffic growth considerations would adequately address the potential traffic generation of the Parkes Solar Farm.

Goonumbla Solar Farm

The approved Goonumbla Solar Farm involves the development of a 70 MW photovoltaic solar farm and associated infrastructure and is located on the southern side of Henry Parkes Way approximately 10 km west of Parkes and immediately to the north of the Parkes Solar Farm (Figure 1.1).

The traffic implications of construction and operation of the Goonumbla Solar Farm were assessed by Geolyse (2016), which found that while construction activity would generate moderate traffic volumes over a short period, once commissioned and operational, it would generate negligible traffic, with no permanent employees to be stationed on-site.

FRV Services Australia is the developer of the Goonumbla Solar Farm, and its website indicates that the Goonumbla Solar Farm has been constructed and was expected to become operational in 2020. There would be no overlap between Project traffic and the construction traffic associated with the Goonumbla Solar Farm. The volume of traffic generated by the Goonumbla Solar Farm when operational would be well within the day-to-day variations in traffic and so has not been considered further in this assessment.

Quorn Park Solar Farm

Quorn Park Solar Farm was approved on 16 July 2020, and involves the development of an 80 MW solar farm approximately 10 km west of Parkes (Figure 1.1), with vehicular access proposed from Back Trundle Road via McGrath Lane and Henry Parkes Way. It is understood that construction of the Quorn Park Solar Farm has not yet commenced.

A number of road upgrades are required for the Quorn Park Solar Farm, including upgrading of the intersections of McGrath Lane with Henry Parkes Way and with Back Trundle Road, and upgrading of McGrath Lane and part of Back Trundle Road. A Traffic Management Plan is required to be developed and implemented, including measures to minimise traffic impacts during construction.

As construction of the Quorn Park Solar Farm has not commenced, there is the potential for the Quorn Park Solar Farm construction to coincide with the construction phase of the Project. Once operational, Geolyse (2018) indicates that the Quorn Park Solar Farm is expected to generate up to four vehicle trips per day, and the Development Consent SSD 9097 limits traffic generation to no more than four heavy vehicle movements[2] per day (eight trips) during operations. The operational phase traffic generation of the Quorn Park Solar Farm traffic would be sufficiently low that no further consideration of the cumulative implications is considered to be warranted.

Premise Australia (2019) and Geolyse (2018) indicate that during its nine month construction period, imported components will be transported by road from Newcastle, Botany Bay and/or Port Kembla. The haulage routes used from those ports to the Quorn Park Solar Farm would all be via Newell Highway to Parkes then Henry Parkes Way, McGrath Lane and Back Trundle Road. Construction workers for the Quorn Park Solar Farm are expected to travel to and from surrounding regional centres, with the majority travelling to and from Parkes via Henry Parkes Way, McGrath Lane and Back Trundle Road.

[2] Development Consent SSD 9097 defines a vehicle movement as one vehicle entering and leaving the site (i.e., equivalent to two vehicle trips used elsewhere in this report).

Development Consent SSD 9097 limits traffic generation during construction to not more than 63 heavy vehicle movements (126 trips) and three over-dimensional heavy vehicle movements (six trips) per day. It may not generate more than 30 vehicle movements an hour (60 trips) at the intersection of Henry Parkes Way and McGrath Lane. Geolyse (2018) indicates that a peak of approximately 30 vehicles per hour will occur at the beginning and end of the work day as crews arrive/leave the site. Site construction hours would be standard construction hours of Monday to Friday 7:00 am to 6:00 pm, and 8:00 am to 1:00 pm on Saturdays. The weekday peaks for traffic generated by the workforce are therefore likely to occur approximately 6:30 am to 7:30 am, and 5:30 pm to 6:30 pm.

Should the construction of the Quorn Park Solar Farm coincide with the Project, there is therefore some potential for Project-generated traffic to interact with up to 30 vehicle trips per hour on Henry Parkes Way between McGrath Lane and Parkes. This assumes that the peak hours for the Quorn Park Solar Farm construction traffic and that of the Project also coincide.

Parkes Peaking Power Plant

The approved Parkes Peaking Power Plant will include construction and operation of three 40 MW gas fired turbines to generate 120 MW; construction and operation of an underground natural gas pipeline connecting to the Central West Pipeline at Parkes; and associated electricity transmission infrastructure.

Although approval was granted for the Parkes Peaking Power Plant on 18 July 2008, the project has not been constructed. As construction of the Parkes Peak Power Plant has not commenced, there is the potential for the Parkes Peaking Power Plant construction to coincide with the construction phase of the Project.

The Parkes Peaking Power Plant will be located approximately 500 m south of Condobolin Road (Henry Parkes Way) approximately 10 km west of Parkes (Figure 1.1). Vehicular access will be via Pat Meredith Drive, an upgrade of a dirt track between the sealed TransGrid access road to the proposed site access. Approval is subject to measures to manage the impacts of construction of the pipeline on roads, including development of a Gas Pipeline Construction Environmental Management Plan.

URS (2007) indicates that construction is expected to occur over six to eight months. During the peak, construction activity is expected to generate 70 light vehicles and eight heavy vehicles per day. Typically construction activity is expected to generate an average of 22 light vehicles and five heavy vehicles per day. A total of 12 deliveries using over-dimension and over-mass vehicles would occur over the construction phase to transport gas turbine, generator and transformer units. Gas pipeline construction is estimated to generate a small amount of vehicular traffic over several weeks.

The construction traffic is expected to peak between 6:00 am and 6:30 am, and between 4:30 pm and 5:00 pm when construction workers arrive and leave the site. URS (2007) does not provide information on the suggested distribution of traffic on the public road network, however it would generally be expected that the majority of traffic would be travelling to and from Parkes, resulting in the traffic occurring on Henry Parkes Way between Pat Meredith Drive and Parkes.

During the operational phase, the traffic generation of the Parkes Peaking Power Plant is expected to be negligible, and would be sufficiently low that no further consideration of the cumulative implications is considered to be warranted.

Newell Highway Upgrade, Parkes Bypass

The Parkes Bypass is a 10.5 km Newell Highway upgrade/bypass on the western outskirts of Parkes to reduce travel time, improve freight productivity and efficiency, improve pedestrian access through Parkes, and provide access to the Parkes Special Activation Precinct. The upgrade involves relocating the Newell Highway between Maguire Road to the north and Barkers Road to the south. The Parkes Bypass is expected to remove up to 1,200 heavy vehicles per day from local streets in the Parkes town centre.

Early construction works commenced in September 2020, with the main construction works expected to occur from the end of 2021 to 2024 (TfNSW, 2020a). There is therefore the potential for construction of the Parkes Bypass to coincide with the construction phase of the Project.

The Parkes Bypass will involve construction of a new roundabout on Henry Parkes Way at the location of the current intersection with Westlime Road west of Parkes, which will be designed for Performance Based Standard 3a vehicles up to 36.5 m in length. A new T-intersection will be constructed on Henry Parkes Way with the Hartigan Avenue Extension, to the west of the new roundabout, at which Henry Parkes Way will be the priority road. Construction work will occur in stages to reduce impacts on operational traffic on the Newell Highway and surrounding local roads. Traffic management and access controls will be implemented under a construction traffic management plan.

The Review of Environmental Factors (REF) (RMS, 2020) and addendum (TfNSW, 2021) indicate that construction would be largely carried out in accordance with standard construction working hours, i.e., from 7:00 am to 6:00 pm Monday to Friday, 8:00 am to 1:00 pm Saturdays, and no work on Sundays or public holidays. The main site compound will be located towards the central portion of the Parkes Bypass footprint. Additional secondary site compounds are proposed, and remain generally in the central portion of the footprint, with one located immediately to the north of Henry Parkes Way.

The construction impacts are identified as being minor, with an average of about 200 vehicles per day, and up to 440 vehicles per day including both light and heavy vehicles. The additional traffic would primarily affect roads such as the Newell Highway, Hartigan Avenue, Westlime Road, Brolgan Road, London Road, Condobolin Road (Henry Parkes Way) and Bogan Road. Excluding the workforce traffic, construction traffic would be spread throughout the day and would enter and leave the site via designated routes, with no more than about 10 to 20 vehicles arriving and leaving per hour on average. The construction workforce would arrive and leave site at the start and end of each work day, resulting in an average of 100 light vehicles and up to 300 light vehicles traveling on local roads during those times.

The REF (RMS, 2020) and addendum (TfNSW, 2021) do not provide details of the distribution of the workforce and delivery trips on the road network beyond the roads identified above as being impacted, nor does it provide details regarding the construction site access locations and designated access routes. Quantitative forecasts of the traffic implications of the Parkes Bypass construction activity cannot be developed, however it is considered reasonable to assume that the majority of construction traffic would be travelling to and from Parkes, and that at any one time, construction traffic will be travelling to and from multiple construction compound sites in the local region. The forecast numbers of construction vehicles would therefore be spread across a number of routes in the region, with peaks in additional traffic occurring during the peaks associated with movement of the workforce each day.

Jemalong Solar Farm

The approved Jemalong Solar Farm involves the development of a 50 MW photovoltaic solar farm and associated infrastructure and is located approximately 36 km west of Forbes (Figure 1.1). It is understood that the Jemalong Solar Farm is currently under construction.

NGH Environmental (2017) found that the potential traffic impacts of the Jemalong Solar Farm will be greatest during its construction and decommissioning stages, with three to 12 cars per day expected during normal operations, and an average of under four heavy vehicle movements and 17 light vehicle movements per day during the peak construction stage.

Vehicles accessing the Jemalong Solar Farm are restricted to travel via Lachlan Valley Way, Wilbertroy Lane, Naroo Lane and the approved site access point. Approval of the Jemalong Solar Farm is subject to requirements to upgrade the intersection of Lachlan Valley Way and Wilbertroy Lane, and upgrade Wilbertroy Lane and Naroo Lane between Lachlan Valley Way and the site access point. A Traffic Management Plan has also been developed and approved (Genex Power, 2020), and includes details of measures to be implemented to minimise traffic safety issues and disruption to other road users during construction, upgrading or decommissioning works, as well as a driver's code of conduct.

As the Jemalong Solar Farm is currently under construction, its construction traffic generation is not expected to coincide with that of the Project. The operational traffic generation of the Jemalong Solar Farm is expected to be sufficiently low that further assessment of its potential interaction with Project-generated traffic is not considered to be warranted.

3.6 Road Safety History

Validated crash data was obtained from TfNSW for the most recent five-year period available, being from 1 July 2015 to 30 June 2020. The data also included preliminary data (which is subject to change) for the period from 1 July 2020 to 7 March 2021. The records include those crashes which conform to the national guidelines for reporting and classifying road vehicle crashes based on the following criteria:

- the crash was reported to the police;
- the crash occurred on a road open to the public;
- the crash involved at least one moving vehicle; and
- the crash involved at least one person being killed or injured or at least one motor vehicle being towed away.

Crash data were reviewed for primary access routes for the Project and relevant to the Modification, including:

- Henry Parkes Way – Fifield Road to Bathurst Street at Condobolin, and Bogan Gate to Westlime Road at Parkes;
- The Bogan Way – Forbes to Henry Parkes Way, and Henry Parkes Way to The McGrane Way;
- Middle Trundle Road;
- Fifield-Trundle Road;
- Platina Road;
- Fifield Road – Henry Parkes Way to Tullamore;
- The McGrane Way – The Bogan Way to Derribong Avenue (MR89) at Narromine;
- Scotson Lane – The Bogan Way to the modified rail siding access location;
- Wilmatha Road – Fifield Road to modified mine and processing facility access locations; and
- Sunrise Lane – Wilmatha Road to accommodation camp access location.

Over the investigation period, no crashes were reported on:

- Fifield-Trundle Road;
- Platina Road;

- Scotson Lane – The Bogan Way to rail siding access location;
- Wilmatha Road – Fifield Road to mine and processing facility access location; and
- Sunrise Lane – Wilmatha Road to accommodation camp access location.

Over the investigation period and routes reviewed, a total of 55 crashes occurred on the remaining routes, resulting in four fatalities, 16 people being seriously injured and 26 people being moderately injured. Table 3.7 demonstrates that over all the roads investigated, the most common types of crashes involved single vehicles leaving the carriageway, known as run-off-road (ROR) crashes (including all "off-path" crashes in Table 3.7), which made up approximately 67% of the total reported crashes on the routes. This is consistent with the TfNSW Centre for Road Safety (2021) crash and casualty statistics, which indicate that over the period 2015 to 2019 inclusive, two-thirds of all crashes in country areas with a speed limit of 100 km/h or more were off path or out of control vehicle crashes. The Australian Road Research Board (ARRB, 2011) states that known causes of ROR crashes include:

- driver behaviours such as speed, inattention, avoidance manoeuvres, errant vehicles;
- driver impairment including fatigue, alcohol, drugs, mood state;
- road conditions such as horizontal alignment, shoulder deficiencies, slippery surface, poor delineation, damaged surfaces;
- vehicle failure; and
- environmental conditions such as rain, fog, snow, livestock or native fauna.

Table 3.7: Crash Types on Project Access Routes (1 July 2015 to 7 March 2021)

Route	Pedestrian	Adjacent Approaches	Opposing Directions	Same Direction	U-turn/Parking	Overtaking	On-Path	Off-Path on Straight	Off-Path on Curve	Miscellaneous	Total
Fifield Road	-	1	1	-	-	-	1	1	-	-	4
Henry Parkes Way	1	1	-	1	1	-	1	7	3	-	15
Middle Trundle Road	-	-	-	-	-	-	1	1	1	-	3
The Bogan Way	-	2	-	2	-	1	1	13	4	-	23
The McGrane Way	-	-	-	-	-	1	1	3	4	1	10
Total	**1**	**4**	**1**	**3**	**1**	**2**	**5**	**25**	**12**	**1**	**55**

A detailed review of the crashes on each route is provided in the following sections, and summary tables of crash characteristics on each route are presented in Appendix A.

Fifield Road: Henry Parkes Way to Tullamore

Four crashes were reported on Fifield Road:

- a motorcycle struck a kangaroo in daylight during fine weather on a dry road surface;
- cross-traffic crash between a light truck in Fifield Road and a light truck in Carlisle Road in daylight during fine weather on a dry road surface. Speeding was nominated as a contributing factor;
- southbound car lost control and struck a tree/bush in daylight during fine weather on a dry road surface. Fatigue was nominated as a contributing factor; and
- southbound B-double on the wrong side of the road on a bend struck a northbound light truck utility head on in darkness, during fine weather and on a dry road surface.

Henry Parkes Way: Condobolin to Fifield Road

Five crashes were reported on that part of Henry Parkes Way between Bathurst Street, Condobolin and Fifield Road. Key features of those five crashes were:

- four of the crashes occurred in the lower speed limit zone in Condobolin (including Denison Street), with speeding nominated as a contributing factor in one of those crashes;
- one rear-end crash occurred between two westbound vehicles in the 100 km/h speed limit zone east of Condobolin;
- one crash involved the sudden illness of the driver; and
- one crash involved a pedestrian in darkness, during rain.

Henry Parkes Way: Bogan Gate to Westlime Road, Parkes

Key features of the ten crashes reported on Henry Parkes Way between Bogan Gate and Parkes were:

- one single-vehicle fatal crash involved loss of control of a car on a straight section of road in daylight, during overcast weather and on a dry road surface. Speeding was nominated as a contributing factor;
- two single-vehicle crashes involved a heavy vehicle (both B-doubles);
- one crash involved a vehicle striking a kangaroo and one involved a driver swerving to avoid an animal;
- one crash involved a distracted driver; and
- fatigue was nominated as a contributing factor in two crashes.

Middle Trundle Road: The Bogan Way to Henry Parkes Way

Three crashes were reported on Middle Trundle Road:

- an eastbound station wagon lost control and struck a tree/bush in daylight during fine weather on a dry road surface;
- a westbound car lost control and struck a drain/culvert in daylight during fine weather on a dry road surface. Speeding was nominated as a contributing factor; and
- an eastbound car struck a kangaroo in daylight during fine weather on a dry road surface.

The Bogan Way: Henry Parkes Way to Forbes

Nine crashes were reported on that part of The Bogan Way between Henry Parkes Way and Forbes. Key features of those nine crashes were:

- one single-vehicle fatal crash that occurred on a bend in the road in darkness on a dry road surface during fine weather, for which speeding was nominated as a contributing factor;
- four of the crashes occurred at intersections in the 50 km/h speed limit zone in Forbes; and
- of the five crashes which occurred in the 80 km/h or 100 km/h speed limit zones along the route, speeding was nominated as a contributing factor in three crashes, and fatigue was nominated as a contributing factor in two crashes.

The Bogan Way: Bogan Gate to The McGrane Way

Key features of those 14 crashes that occurred on The Bogan Way between Bogan Gate and The McGrane Way near Tullamore were:

- one single-vehicle fatal crash that occurred on a straight section of the road in darkness on a dry road surface during fine weather;
- two crashes involved a B-double, one of which involved the vehicle braking hard on a wet road, and the other involved a tyre failure/fault;
- one crash involved a vehicle striking straying stock, and one involved a driver swerving to avoid an animal;
- one crash occurred in the lower speed limit zone in Trundle (Forbes Street), involving the sudden illness of a driver, whose vehicle struck parked cars. Speeding was nominated as a contributing factor;
- two crashes involved asleep or drowsy drivers; and
- three crashes involved distracted drivers (including one fatal crash).

The McGrane Way – The Bogan Way to Narromine

Key features of the ten crashes that were reported on The McGrane Way between Tullamore and Narromine were:

- one fatal crash that occurred at the railway level crossing south of Narromine, in which a B-double stuck a train in daylight during fine weather on a dry road surface. Speeding was nominated as a contributing factor;
- six crashes involved a heavy vehicle (road train, B-double or semitrailer);
- one crash involved a vehicle striking an animal in darkness on a wet road surface, and one involved a B-double driver swerving to avoid an animal; and
- one crash occurred at an intersection in the 50 km/h speed limit zone in Narromine.

Overall, the crash history data do not highlight any specific location on the routes associated with the Project that has a notably poor crash history that may suggest an inherent concern with the road layout at that location.

3.7 Trundle Main Street

A review of the pedestrian environment along Forbes Street (The Bogan Way) through Trundle was undertaken with regard to the existing and forecast traffic conditions expected to occur with the approved Project (GTA Consultants, 2018a). The review included consultation with a range of stakeholders and local community representatives, and with consideration of the TfNSW and Austroads guidelines and Australian standards relating to pedestrians and pedestrian facilities.

That review concluded the existing pedestrian and vehicular environment in Forbes Street is generally satisfactory and no immediate upgrades would be required to meet current standards. With the Project traffic, no significant deterioration in the safety of that environment is anticipated that would require immediate upgrading to meet current standards. Some measures were identified to mitigate the existing issues identified, including:

- a modified kerb extension treatment near 61/63 Forbes Street;
- a modified kerb extension treatment between Croft Street and East Street;
- threshold treatments at the northern and southern entries to Trundle;
- speed reduction warning signs on the northern and southern approaches to Trundle; and
- audit of heavy vehicles and consultation with the Trundle community within 12 months of commencement of operations at the Project.

Parkes Shire Council has developed the Trundle Main Street Plan (King and Campbell, in association with Myrtle Studio, 2021), which addresses Forbes Street between the Trundle Services and Citizens Club (north of Hutton Street) to the north and Croft Street (north of Trundle Central School) to the south.

The Trundle Main Street Plan has been developed in consultation with the local community and incorporates key features recommended in the GTA Consultants (2018a) study, such as the kerb extension treatment near 61/63 Forbes Street (amended in the Plan to include a wide central refuge) and entry signage, which would appropriately be located as part of the threshold treatments and speed reduction signs.

Parkes Shire Council secured a $945,400 grant from the NSW Government through the Your High Street program to assist in implementing components of the Trundle Main Street Plan (including improvements to pedestrian access and safety).

In consultation with Parkes Shire Council and TfNSW, SEM proposes to implement any outstanding Forbes Street improvement works outlined in GTA Consultants (2018a) (Section 4.1).

4 Approved Project

4.1 Road and Intersection Upgrades

Road and intersection upgrades will be undertaken in accordance with Development Consent (DA 374-11-00) and the Voluntary Planning Agreement. A summary of these road and intersection upgrades as outlined in the Road Upgrade and Maintenance Strategy (Clean TeQ, 2019a) is provided below.

Prior to commissioning of the accommodation camp, Sunrise Lane will be upgraded between the accommodation camp vehicle access point and Wilmatha Road to the following:

- all weather unsealed surface for an operating speed standard of 80 km/h; and
- carriageway width of 9 m (equivalent to two 3.5 m lanes and two 1.0 m wide shoulders).

Prior to commissioning of the mine and processing facility (as defined in the Voluntary Planning Agreement), SEM will pay to complete the following upgrades:

- road pavement (8.0 m sealed pavement and 1.0 m gravel shoulders); and
- all private access roads (3.5 m sealed private access road approach and 3.0 m gravel shoulders along road 30 m either side of all private access roads)

to the following roads:

- Platina Road (between the Lachlan Shire boundary and Fifield Road);
- Fifield Road (between Platina Road and Slee St [in Fifield Village]);
- Wilmatha Road (between Slee St [in Fifield Village] and the mine and processing facility vehicle access point); and
- Fifield Trundle Road (between The Bogan Way and the Parkes Shire boundary).

Prior to the commissioning of the mine and processing facility (as defined in the Voluntary Planning Agreement), SEM will pay for the following intersection upgrades:

- Platina Road/Fifield Road – upgrade to Austroads standards;
- Fifield Road/Slee Street (in Fifield Village) – signage and line marking to Austroads standards, for the transport route upgrade;
- Slee Street (in Fifield Village)/Wilmatha Road/Fifield Road – signage and line marking to Austroads standards for the transport route upgrade;
- Henry Parkes Way and Middle Trundle Road – a Channelised Right Short (CHR) turn lane, constructed in accordance with Austroads guidelines for basic rural intersection treatments;

- Henry Parkes Way and The Bogan Way – signage and line marking to Austroads standards;
- Sunrise Lane/Wilmatha Road – remove the transition between the gravel and dirt surfaces while Wilmatha Road remains unsealed, then seal a minimum of 30 m of Sunrise Lane on the approach to the intersection once Wilmatha Road is sealed;
- Fifield-Trundle Road and Limestone Quarry access – basic rural intersection treatment; and
- Wilmatha Road and the mine and processing facility vehicle site access point – basic rural intersection treatment with priority between the mine and processing facility access and Wilmatha Road south.

Prior to the commissioning of the rail siding, SEM will pay for the following intersection and road upgrades:

- The Bogan Way/Fifield Trundle Road and Scotson Lane – right-left staggered T-intersections with signage and line marking to Austroads standards; and
- upgrade of Scotson Lane between The Bogan Way and the approved rail siding access.

Based on the outcomes of the Pedestrian Access Review (GTA Consultants, 2018a), in consultation with the Parkes Shire Council and TfNSW, SEM proposes to implement the outstanding recommendations including the following pedestrian access upgrades in Trundle.

- a modified kerb extension treatment near 61/63 Forbes Street;
- a modified kerb extension treatment between Croft Street and East Street;
- threshold treatments at the northern and southern entries to Trundle; and
- speed reduction warning signs on the northern and southern approaches to Trundle.

Prior to the commissioning of the mine and processing facility (as defined in the Voluntary Planning Agreement), SEM will reach an agreement with the Lachlan Shire Council, Parkes Shire Council and Forbes Shire Council on funding and the timing of works as to any additional, specific road safety matters relevant to the Project as deemed necessary by the road safety audits conducted in accordance with the Voluntary Planning Agreement.

4.2 Road Maintenance Contributions

SEM will make road maintenance contributions in accordance with Development Consent (DA 374-11-00) and the Voluntary Planning Agreement. Maintenance of Project related roads described in the Voluntary Planning Agreement will be completed by the relevant Council.

SEM will however maintain Sunrise Lane (between the accommodation camp site access road and Wilmatha Road), to the satisfaction of Lachlan Shire Council, during the construction and operational phases of the Project.

In addition, the Voluntary Planning Agreement allows for the payment of Major Repair Contributions on the Project transport routes on an as-needs basis during the life of the Project but limited to a maximum of 5 km of construction in any year, unless mutually agreed between SEM and the Councils. These contributions are to address exceptional failure of or damage to roads where NSW and Commonwealth Government grants do not cover the full cost of repairs. The Major Repair Contributions do not substitute for the Road Maintenance Contributions.

4.3 Construction Phase Project Traffic

The approved Project construction phase traffic was quantified by MWT (2000) as summarised in Table 4.1.

Table 4.1: Peak Project Construction Phase Daily Traffic Generation (vehicle trips per day)

	Light Vehicles	Heavy Vehicles	Total
Workforce	212	34 (including 4 bus trips)	246
Major Equipment and Supplies	-	24	24
Other Traffic	200	100	300
Total (rounding)	**420**	**160**	**580**

Source: MWT (2000), assumes 1,000 person accommodation camp is located at the mine and processing facility site.

In addition to the above, MWT (2000) found that off-site construction activities would result in a net increase of about 30 vehicle trips per day to and from either the limestone quarry or rail siding development site.

The relocation of the accommodation camp from the mine and processing facility to the "Sunrise" property off Sunrise Lane was considered in the Road Transport Assessment conducted for the Modification 4 Environmental Assessment (GTA Consultants, 2017). At that time, SEM was considering the use of shuttle buses to transport the construction workforce between the mine and processing facility site and the accommodation camp or local towns, however the Project was assessed by GTA Consultants (2017) on the assumption that no shuttle buses would be used to transport the construction workforce.

TTPP has developed indicative daily and peak hourly forecasts based on the peak construction traffic generation described in MWT (2000) and GTA Consultants (2017) with the likely distribution of that traffic on the surrounding road network consistent with expected sources and routes. The additional 30 off-site trips per day are assumed to occur to and from the rail siding. The resulting traffic generated during the peak construction phase of the Project as approved is presented in Table 4.2.

It is noted that MWT (2000) did not explicitly include road traffic movements associated with the road upgrades in the assessment of the approved Project impacts.

Table 4.2: Approved Project Peak Construction Phase Traffic on Road Network

Road and Location	Daily (vehicles per day)				Peak Hour (vehicles per hour)			
	Light Vehicles	Buses	Heavy Vehicles	Total Vehicles	Light Vehicles	Buses	Heavy Vehicles	Total Vehicles
Fifield Road Fifield to Tullamore	8	0	6	14	2	0	2	4
Fifield Road Fifield to Platina Road	340	4	112	456	92	2	14	108
Fifield Road Platina Road to Henry Parkes Way	126	0	10	136	52	0	2	54
Fifield-Trundle Road Platina Road to Limestone Quarry	282	4	102	388	84	2	12	98
Fifield-Trundle Road Limestone Quarry to The Bogan Way	258	4	102	364	89	2	12	103
Henry Parkes Way Condobolin to Fifield Road	126	0	10	136	52	0	2	54
Henry Parkes Way Bogan Gate to Gunningbland	24	0	0	24	13	0	0	13
Henry Parkes Way Middle Trundle Road to Parkes	204	4	102	310	77	2	12	91
Middle Trundle Road	204	4	102	310	77	2	12	91
Platina Road	282	4	102	388	84	2	12	98
Scotson Lane The Bogan Way to Rail Siding	98	0	32	130	36	0	4	40
Sunrise Lane Wilmatha Road to Camp Access	580	4	30	614	262	2	4	268
The Bogan Way Fifield-Trundle Road to Trundle	242	4	102	348	94	2	12	108
The Bogan Way Trundle to Middle Trundle Road	230	4	102	336	90	2	12	104
The Bogan Way Middle Trundle Road to Bogan Gate	26	0	0	26	13	0	0	13
The Bogan Way Gunningbland to Forbes	24	0	0	24	10	0	0	10
The McGrane Way Tullamore to Narromine	0	0	6	6	0	0	2	2
Wilmatha Road Fifield Road to Sunrise Lane	348	4	118	470	94	2	16	112
Wilmatha Road Sunrise Lane to Mine and mine and processing facility access	792	0	88	880	344	0	12	356

4.4 Operational Phase Project Traffic

The Road Transport Assessment conducted for the Modification 4 Environmental Assessment (GTA Consultants, 2017) quantified the traffic generation of the Project during its peak operational phase. Those forecasts assumed that all employee travel will be via private vehicles, and that the largest vehicles used for transporting product or materials will be B-doubles.

As part of the Responses to Submissions component of Modification 4, GTA Consultants (2018a) considered the potential impact the use of shuttle buses for operational employee transport, and higher capacity vehicles for the transport of limestone would have on the number of Project-generated vehicle trips on Forbes Street, Trundle (refer to Section 3.7). Applying those same assumptions, TTPP has estimated the number and distribution of the daily and peak hourly Project-generated traffic for the approved Project based on the trip sources and travel routes described in GTA Consultants (2017). The resulting approved Project-generated trips on the road network are summarised in Table 4.3.

It is noted that GTA Consultants (2017) did not explicitly include road traffic movements associated with the limestone quarry and rail siding workforce in the assessment of the impacts of the approved Project, as that assessment assumed the total workforce travelled to and from the mine and processing facility each day.

Table 4.3: Approved Project Operational Phase Traffic on Road Network

Road and Location	Daily (vehicles per day)				Peak Hour (vehicles per hour)			
	Light Vehicles	Buses	Heavy Vehicles	Total Vehicles	Light Vehicles	Buses	Heavy Vehicles	Total Vehicles
Fifield Road Fifield to Tullamore	24	0	4	28	12	0	2	14
Fifield Road Fifield to Platina Road	92	12	172	276	38	6	24	68
Fifield Road Platina Road to Henry Parkes Way	22	6	8	36	11	3	4	18
Fifield-Trundle Road Platina Road to Limestone Quarry	70	6	164	240	27	3	20	50
Fifield-Trundle Road Limestone Quarry to The Bogan Way	70	6	124	200	27	3	16	46
Henry Parkes Way Condobolin to Fifield Road	14	6	8	28	7	3	4	14
Henry Parkes Way Fifield Road to Ootha	8	0	0	8	4	0	0	4
Henry Parkes Way Bogan Gate to Middle Trundle Road	0	0	62	62	0	0	6	6
Henry Parkes Way Middle Trundle Road to Parkes	34	6	70	110	9	3	10	22
Middle Trundle Road	34	6	8	48	9	3	4	16
Platina Road	70	6	164	240	27	3	20	50
Scotson Lane The Bogan Way to Rail Siding	0	0	54	54	0	0	6	6
The Bogan Way Fifield-Trundle Road to Trundle	70	6	70	146	27	3	10	40
The Bogan Way Trundle to Middle Trundle Road	38	6	70	114	11	3	10	24
The Bogan Way Middle Trundle Road to Bogan Gate	4	0	62	66	2	0	6	8
The McGrane Way Tullamore to Narromine	0	0	4	4	0	0	2	2
Wilmatha Road Fifield Road to Mine and processing facility access	116	12	176	304	50	6	26	82

Note: assumes shuttle buses operate to/from Parkes and Condobolin and AB-triples are used for limestone transport.
[A] Assumes 560,000 tpa limestone sourced from local quarries and 430,000 tpa limestone sourced from the limestone quarry on Fifield-Trundle Road.

5 Modified Project

5.1 Construction Phase Traffic Generation

5.1.1 Assessment Scenario

Figure 2.3 shows the modified construction schedule and associated workforce schedule. The level and nature of construction activity would vary throughout the construction phase of the modified Project, which would occur over approximately three years. For the purpose of this assessment, a scenario has been adopted which reflects the period during which the construction workforce and heavy vehicle movements would be at its peak and therefore result in the peak construction phase road transport impacts.

The peak workforce and heavy vehicle movements would occur in the middle of Year 2 of the construction period, at which time, the construction activity would be occurring at the mine and processing facility, rail siding and on the road and intersection upgrades (Figure 2.3). Construction of the other Project components (accommodation camp, borefield, surface water extraction infrastructure and water pipeline, gas pipeline, limestone quarry) would occur outside of the peak construction period (Figure 2.3). The Modification would not change the approved construction traffic associated with these other Project components.

The adopted assessment scenario with regard to the characteristics of the peak workforce is summarised in Table 5.1, which assumes that approximately 90% of the construction workforce would reside in the accommodation camp.

Table 5.1: Peak Construction Workforce Travel Characteristics on Typical Day

	Accommodation Camp Residents	Local Region Residents	Total Workers
Not Working	190	N/A	190
Rail Siding Construction Site	18	2	20
Road Upgrades	6	14	20
Mine and processing facility Construction Site	1,496	174	1,670
Total	**1,710**	**190**	**1,900**

Consistent with the approved Project, construction activity associated with the external infrastructure (borefield, surface water extraction infrastructure and water pipeline, gas pipeline, rail siding, accommodation camp and road upgrades) would occur only between 7:00 am and 6:00 pm. Similarly, haulage of construction materials along the transport route (between the rail siding and mine and processing facility) would be limited to these hours. All other construction activities would occur 24 hours per day, seven days per week, including construction activity at the mine and processing facility and limestone quarry.

5.1.2 Mine and Processing Facility Construction Traffic

For the adopted peak scenario, approximately 1,670 personnel would work at the mine and processing facility on any day, of which approximately 90% would reside in the accommodation camp, and the remainder would reside in the surrounding towns (Table 5.1). For the purpose of this assessment, it is assumed that of those workers residing in the local area, half would reside in Parkes, one-third would reside in Condobolin, one-tenth would reside in Forbes and the remainder in regional locations including Trundle, Tullamore, Ootha and Bogan Gate. This distribution is consistent with that adopted for the Project operational workforce (Section 5.2.1).

The resulting distribution of the construction workforce residing in the local area and travelling to the various work sites each day is summarised in Table 5.2. Of the total workers at the mine and processing facility, approximately 70% would work during the day shift, and 30% would work during the night shift.

Table 5.2: Daily Mine and Processing Facility Construction Workforce Distribution

Residential Location	Workers	Day Shift	Night Shift
Accommodation Camp	1,496	1,047	449
Parkes	87	61	26
Condobolin	58	41	17
Forbes	17	12	5
Other Local	12	9	3
Total	**1,670**	**1,170**	**500**

SEM would operate shuttle buses for the local resident construction workers to and from Parkes, Condobolin and Forbes, which are expected to carry the majority (93%) of the workers who reside in those towns, and the remainder of workers would travel in light vehicles, with an average car occupancy of 1.4 people per vehicle. These services would typically use large coaches, with an average seating capacity of 50 people. Where demand is lower, such as between Forbes and the mine and processing facility, smaller buses with a seating capacity of 22 people would be used. The buses to and from Parkes would stop in Trundle to pick up and set down workers, and those to and from Forbes would stop in Bogan Gate to pick up and set down workers.

Shuttle buses would also operate for workers travelling between the accommodation camp and mine and processing facility, which would transport approximately 95% of those workers. This service would use large coaches, with an average seating capacity of 50 people. The remaining workers would travel in light vehicles, with an average car occupancy of three people per vehicle.

Table 5.3 summarises the number of vehicles expected to be used for the transport of the mine and processing facility construction workforce.

Table 5.3: Daily Mine and Processing Facility Peak Construction Workforce Travel Vehicles

Residential Location	Day Shift		Night Shift	
	Buses	Cars	Buses	Cars
Accommodation Camp	20	18	9	8
Parkes	2	3	1	1
Condobolin	1	2	1	1
Forbes	1	1	1	0
Other Local	0	3	0	1
Total	**24**	**27**	**12**	**11**

Table 5.4 summarises the number and distribution of vehicle trips generated by the mine and processing facility construction workforce travelling to and from the site during the morning and afternoon peak hours. This assumes all shift change traffic occurs within one hour in the morning and the evening, and that to the extent possible, a bus arriving with workers would also depart with workers.

Table 5.4: Peak Hour Mine and Processing Facility Peak Construction Workforce Trip Generation (vehicle trips per hour)

	AM Peak Hour				PM Peak Hour			
	Inbound		Outbound		Inbound		Outbound	
	Bus	Car	Bus	Car	Bus	Car	Bus	Car
Accommodation Camp	20	18	9	8	9	8	20	18
Parkes	2	3	1	1	1	1	2	3
Condobolin	1	2	1	1	1	1	1	2
Forbes	1	1	1	0	1	0	1	1
Other Local	0	3	0	1	0	1	0	3
Total	**24**	**27**	**12**	**11**	**12**	**11**	**24**	**27**

Note: a trip is a one way movement, a vehicle arriving and departing the site generates two trips.

The transport of the mine and processing facility construction workforce to and from the site would generate 72 bus trips per day and 76 private car trips per day. Of these, 58 bus trips per day and 52 private car trips per day (74% of the total workforce-generated trips) would occur only on Wilmatha Road and Sunrise Lane between the mine and processing facility site and the accommodation camp. Half of the employee trips would occur during the morning peak shift changeover and half during the evening shift changeover.

Construction activity at the mine and processing facility would also require deliveries of equipment and consumables. This traffic would occur mainly between 7:00 am and 6:00 pm, generating an average of 45 heavy vehicle deliveries or visits per day. Each delivery vehicle would generate one trip when arriving and one when departing the mine and processing facility. The resulting daily and peak hourly vehicle trip generation is summarised in Table 5.5.

Table 5.5: Mine and Processing Facility Construction Heavy Vehicle Delivery Trips

Origin or Destination	Daily (vehicle trips per day)	Peak Hour (vehicle trips per hour)
Parkes	66	6
Condobolin	20	2
Dubbo	4	2
Total	**90**	**10**

5.1.3 Rail Siding Construction Traffic

Construction activity at the rail siding would require a daily workforce of up to 20 people, the majority of whom would reside in the accommodation camp. A shuttle bus would operate between the accommodation camp and the rail siding, utilising a minibus (approximately 20 to 22 person capacity) at the start and end of the day shift. The bus is assumed to return to the accommodation camp during the day.

Assuming approximately 10% of the rail siding workforce would not reside at the accommodation camp, some additional private vehicles trips can be expected to be generated between the rail siding and the local towns. For the purpose of this assessment, it is assumed that these workers would reside in Parkes or Condobolin, and would each drive a light vehicle.

Construction activity at the rail siding would require a peak of eight heavy vehicle deliveries per day, generating 16 vehicle trips per day. During the peak construction period, six of the deliveries would be concrete trucks travelling from the mine and processing facility site, and two of the deliveries would be sourced from Parkes.

Table 5.6 summarises the daily and peak hourly vehicles trips generated by the construction activity at the rail siding.

Table 5.6: Rail Siding Construction Trip Generation

	Daily (vehicle trips per day)			Peak Hour (vehicle trips per hour)		
	Light Vehicles	Bus	Heavy Vehicles	Light Vehicles	Bus	Heavy Vehicles
Mine and Processing Facility	-	-	12	-	-	2
Accommodation Camp	-	4	-	-	2	-
Parkes	2	-	4	1	-	-
Condobolin	2	-	-	1	-	-
Total	**4**	**4**	**16**	**2**	**2**	**2**

5.1.4 Road Upgrades Construction Traffic

Construction activity for the road upgrades would require a daily workforce of up to 20 people, of which approximately 70% would reside in the local area and 30% in the accommodation camp. Workers would travel to the road upgrades construction site in light vehicles. For the purpose of this assessment, it has been assumed that car pooling would occur for these workforce trips, with an average occupancy of three people per vehicle.

Construction activity at the road upgrades would require a peak of five heavy vehicle deliveries per day, which would be primarily sourced from Condobolin and Parkes, generating 10 vehicle trips per day. Table 5.7 summarises the daily and peak hourly vehicle trips generated by the construction activity at the road upgrades.

Table 5.7: Road Upgrades Construction Trip Generation

	Daily (vehicle trips per day)			Peak Hour (vehicle trips per hour)		
	Light Vehicles	Heavy Vehicles	Total Vehicles	Light Vehicles	Heavy Vehicles	Total Vehicles
Accommodation Camp	4	-	4	2	-	2
Parkes	6	4	10	3	2	5
Condobolin	4	6	10	2	2	4
Forbes	2	-	2	1	-	1
Total	**16**	**10**	**26**	**8**	**4**	**12**

5.1.5 Accommodation Camp Traffic

In addition to the trips generated transporting workers between the accommodation camp and Project construction sites as described above, the accommodation camp would also be expected to generate additional vehicle trips on the road network as indicated by MWT (2000):

- recreational trips by camp residents when not working;
- travel by camp residents to and from Parkes Airport;
- delivery trips for accommodation camp-related consumables and supplies; and
- miscellaneous visitors.

Camp Resident Recreational Travel

On any one day, up to 190 of the accommodation camp residents would not be working (Table 5.1) and may choose to travel to any of the local towns for recreational purposes. As the main towns of Parkes, Condobolin and Forbes would be serviced by SEM's shuttle bus services, it is anticipated that approximately 10% of the recreational person-trips would also use the buses, which would pick up and set down at the accommodation camp as well as the mine and processing facility. These recreational trips by bus would therefore not generate any additional trips on the road network above those accounted for in travel by employees who do not reside in the accommodation camp. The remaining recreational travel would be by light vehicle, with a high level of car pooling. Consistent with MWT (2000), this assessment assumes an average car occupancy of three people per vehicle.

The recreational trips are likely to occur throughout the day and not necessarily during the same peak hours associated with the movement of workers to and from the accommodation camp. For the purpose of this assessment, it has been assumed that approximately 10% of the recreational trips would occur during those peak hours, with the trips being outbound from the accommodation camp during the morning, and inbound during the evening.

Airport-Camp Bus Travel

Some workers who reside in the accommodation camp during their work periods may choose to fly to and from their usual place of residence at the end or start of their rostered work period. The nearest airport with regular services is at Parkes, and it is expected that buses would be scheduled between the accommodation camp and Parkes Airport to align with scheduled flights.

MWT (2000) found that buses to and from Parkes Airport would generate a peak of four bus trips per day for peak occupation of the camp of approximately 1,000 people. With the increase in the accommodation camp capacity to 1,900 people, it is expected that the demand for bus trips to and from the airport would also increase, and an allowance of up to eight bus trips per day has been assumed at peak occupation of the accommodation camp.

Camp Deliveries

Deliveries of food and consumables for the accommodation camp are anticipated to generate two heavy vehicle deliveries per day when the camp is fully occupied. Such deliveries are likely to be sourced from Parkes and would occur during the day rather than during the peaks when the workforce is travelling.

Camp Visitors

Miscellaneous visitors to the accommodation camp may include design, regulatory or general visitors. At its peak occupancy, up to 15 visitors per day may be expected, primarily drawn from Parkes and Dubbo. Visitor trips would be made in light vehicles, with most occurring during the day rather than during the peaks when the workforce is travelling.

Total Accommodation Camp Trips

Table 5.8 summarises the daily and peak hourly trips expected to be generated by the accommodation camp at its peak occupancy, excluding those trips generated between the accommodation camp and the construction sites (refer to Sections 5.1.2 to 5.1.4).

Table 5.8: Total Accommodation Camp Trip Generation

Destination	Daily (vehicle trips per day)				Peak Hour (vehicle trips per hour)			
	Recreational Light Vehicles	Airport Buses	Deliveries Heavy Vehicles	Visitors Light Vehicles	Recreational Light Vehicles	Airport Buses	Deliveries Heavy Vehicles	Visitors Light Vehicles
Parkes	58	8	4	22	6	2	-	2
Condobolin	38	-	-	-	4	-	-	-
Forbes	12	-	-	-	2	-	-	-
Other	8	-	-	-	1	-	-	-
Dubbo	-	-	-	8	-	-	-	-
Total	**116**	**8**	**4**	**30**	**13**	**2**	**-**	**2**

Excludes trips generated between the accommodation camp and construction worksites.

5.2 Operational Phase Traffic Generation

5.2.1 Employees – Mine and Processing Facility

Consistent with the approved Project, a workforce of approximately 300 employees would be required at the mine and processing facility. Approximately 80% of the workforce (i.e. 240 employees) would be present on site each day, with 180 employees on day shift and 60 employees on night shift. It is anticipated that half the employees would reside in Parkes, one third would reside in Condobolin, one tenth would reside in Forbes and the remainder in regional locations including Trundle, Tullamore, Ootha and Bogan Gate. The resulting distribution of the operational workforce travelling to the mine and processing facility each day is summarised in Table 5.9.

Table 5.9: Daily Mine and Processing Facility Employee Distribution

Location	Percent of Employees (%)	Employees Present at Mine per Day		
		Day Shift	Night Shift	Total
Parkes	50	90	30	120
Condobolin	33	60	20	80
Forbes	10	18	6	24
Other	7	12	4	16
Total	**100**	**180**	**60**	**240**

SEM has determined that it would operate shuttle buses to and from Parkes, Condobolin and Forbes to the mine and processing facility. The buses to and from Forbes would stop in Bogan Gate to pick up and set down employees, and the buses to and from Parkes would stop in Trundle to pick up and set down employees. The shuttle buses are anticipated to transport approximately 90% of the workforce who reside in those towns, while the remaining 10% would travel by private car. TTPP's experience with employee transport to and from regional mining projects is that some level of car pooling occurs, however for the purpose of this assessment and considering the small proportion of employees travelling from any one residential location to the mine by private vehicle, it has been assumed that all employees travelling by private vehicle to the mine and processing facility would travel alone. On this basis, Table 5.10 summarises the number of vehicles required to transport the mine and processing facility operational workforce each day.

Table 5.10: Daily Mine and Processing Facility Employee Travel Vehicles

Location	Day Shift		Night Shift	
	Buses	Cars	Buses	Cars
Parkes	2	9	1	3
Condobolin	2	6	1	2
Forbes	1	2	1	1
Other Local	0	5	0	1
Total	**5**	**22**	**3**	**7**

Note: Bus capacity up to 50 people, car occupancy one person per car.

The transport of the operational workforce to and from the mine and processing facility would generate 16 bus trips per day and 58 private car trips per day. Half of the employee trips would occur during the morning peak shift changeover and half during the evening shift changeover.

Table 5.11 summarises the peak hourly number and distribution of vehicle trips generated by the operational workforce travelling to and from the mine and processing facility each day. This assumes all shift change traffic occurs within one hour in the morning and the evening, and that to the extent possible, a bus arriving with workers would also depart with workers.

Table 5.11: Peak Hour Mine and Processing Facility Employee Trip Generation (vehicle trips per hour)

Location	AM Peak Hour				PM Peak Hour			
	Inbound		Outbound		Inbound		Outbound	
	Bus	Car	Bus	Car	Bus	Car	Bus	Car
Parkes	2	9	1	3	1	3	2	9
Condobolin	2	6	1	2	1	2	2	6
Forbes	1	2	1	1	1	1	1	2
Other Local	0	5	0	1	0	1	0	5
Total	**5**	**22**	**3**	**7**	**3**	**7**	**5**	**22**

Note: a trip is a one way movement, a vehicle arriving and departing the site generates two trips. Buses stopping in Bogan Gate and Trundle are not considered separately.

5.2.2 Employees – Rail Siding

In addition to the operational workforce at the mine and processing facility, 10 personnel would be employed at the rail siding. These workers would work two 12-hour day shifts (six personnel during the day shift and four personnel during the night shift). For the purpose of this assessment, it has been assumed that the residential distribution of those workers would be similar to that of the mine and processing facility workforce, and that they would all travel by private vehicle with some car pooling, although it is possible that some would use the shuttle buses if shift times align appropriately with those at the mine and processing facility, such that buses to and from Forbes and Parkes could pick up and set down employees at the rail siding. The resulting travel characteristics of the rail siding workforce are summarised in Table 5.12.

Table 5.12: Rail Siding Employee Travel

Location	Employees		Cars		Peak Hour Vehicle Trips			
					AM Peak		PM Peak Outbound	
	Day	Night	Day	Night	Inbound	Outbound	Inbound	Outbound
Parkes	3	2	2	1	2	1	1	2
Condobolin	2	1	1	1	1	1	1	1
Forbes	1	1	1	1	1	1	1	1
Total	**6**	**4**	**4**	**3**	**4**	**3**	**3**	**4**

Based on Table 5.12, the transport of the workforce between the rail siding and local towns would generate up to 14 private car trips per day.

5.2.3 Employees – Limestone Quarry

In addition to the operational workforce at the mine and processing facility, 30 personnel would be employed at the limestone quarry. These workers would work a 12-hour day shift. For the purpose of this assessment, it has been assumed that the residential distribution of those workers would be similar to that of the mine and processing facility workforce, and that they would all travel by private vehicle with some car pooling, although it is possible that some would use the shuttle buses if shift times align appropriately with those at the mine and processing facility, such that buses to and from Forbes and Parkes could pick up and set down employees at the limestone quarry. Excluding use of buses, the estimated travel characteristics of the limestone quarry workforce are summarised in Table 5.13.

Table 5.13: Limestone Quarry Employee Travel

Location	Employees	Cars	Peak Hour Vehicle Trips	
			AM Peak Inbound	PM Peak Outbound
Parkes	15	11	11	11
Condobolin	10	8	8	8
Forbes	3	3	3	3
Other	2	2	2	2
Total	**30**	**24**	**24**	**24**

Based on Table 5.13, the transport of the workforce between the limestone quarry and local towns would generate up to 48 private car trips per day.

5.2.4 Materials and Product

Raw materials would be transported to the Project using a range of vehicle types, including rigid trucks, B-doubles, road tankers, and AB-triple road trains. The typical types of trucks expected to be used and the source for each material or product are summarised in Table 5.14, noting that actual vehicle types used may vary.

Table 5.14: Materials and Product Transport Vehicle Types

Indicative Vehicle Type	Rail Siding	Parkes Newcastle via Parkes Sydney	Quarries	Newcastle via Dubbo
Road tanker (powder)	-	Hydrated lime Sodium Metabisulphite Flocculants	-	-
Road tanker (liquid)	-	Hydrogen peroxide Hydrochloric acid Soda ash Diluent Caustic soda	-	-
Road tanker dual trailer	-	Diesel	-	-
B-double	Sulphur Nickel sulphate Cobalt sulphate Scandium oxide	-	Limestone[A]	-
B-double road tanker	-	Quicklime	-	Ammonia
AB-triple	-	-	Limestone[A]	-
26m short Road Train	Ammonium sulphate[B]	-	-	-
Flatbed/Rigid truck	-	Resin Extractant General loads	-	-

[A] *Approximately 75% of limestone would be transported in AB-triple road trains, and 25% in B-doubles.*
[B] *Ammonium sulphate would be transported to the rail siding, then distributed by both road and rail from the rail siding.*

Table 5.15 summarises the modified Project's average daily deliveries associated with the transport of materials and products, based on the demand for each material, and the anticipated vehicle types and their payloads. The forecasts assume that transport occurs seven days per week and 52 weeks per year. With regard to the transport of limestone, it is anticipated that approximately 75% of the limestone would be transported to the mine and processing facility in AB-triples with a 72.5 t payload, and 25% by B-doubles with a 48 t payload. The overall average load per delivery would therefore be approximately 64.3 t.

Table 5.15: Raw Materials and Product Delivery Summary

Product	Annual Demand (tpa)	Average Payload (t)	Annual Loads	Origin Average Daily Loads			
				Rail Siding	Parkes Newcastle Sydney	Limestone Quarries	Newcastle via Dubbo
Ammonia	24,978	35.0	714	-	-	-	2.0
Hydrochloric Acid	690	20.0	35	-	0.1	-	-
Soda Ash	1,291	20.0	38	-	0.2	-	-
Quicklime	46,424	35.0	1,326	-	3.6	-	-
Hydrated Lime	458	24.0	19	-	0.1	-	-
Sodium Metabisulphite	1,291	19.0	68	-	0.2	-	-
Flocculants	470	20.0	24	-	0.1	-	-
Diluent	254	25.0	10	-	0.0	-	-
Diesel	9,869	50.0	197	-	0.5	-	-
Limestone	990,000	64.3	15,397	-	-	42.3	-
Sulphur	286,226	49.7	5,760	15.8	-	-	-
Caustic Soda	1,033	20.0	52	-	0.1	-	0.1
Nickel and Cobalt Sulphates	150,000	40.0	3,750	10.3	-	-	-
Ammonium Sulphate	100,000	50.0	2,000	5.5	-	-	-
Scandium Oxide	180	40.0	5	0.0	-	-	-
General Loads	1,040	20.0	52	-	0.1	-	0.1
Hydrogen Peroxide	657	20.0	33	-	0.1	-	0.1
Resin	497	20.0	25	-	0.1	-	0.1
Extractant	75	20.0	4	-	0.0	-	0.0
Average Daily Total Loads (rounded)				**32**	**6**	**42**	**2**
Average Daily Trips				**64**	**12**	**84**	**4**

A Ammonium sulphate would be transported to the rail siding, then distributed by both road and rail from the rail siding.

The transport of raw materials and product associated with the modified Project would generate an average of approximately 82 deliveries per day, or 164 vehicle trips per day to and from the mine and processing facility.

Ammonium sulphate would be transported to the rail siding for distribution. The location of the end market for ammonium sulphate is not yet confirmed, and for the purpose of this assessment it has been estimated that approximately half would be transported by rail from the rail siding, and half transported by road by customers in the local region. The road transport of ammonium sulphate by customers is assumed to occur towards both Parkes and Condobolin, and would generate an average of an additional six vehicle trips per day between the rail siding and Parkes or Condobolin above those trips presented in Table 5.15.

The total of 990,000 tpa of limestone required for the Project would be sourced from a combination of the limestone quarry and other local quarries. Up to 790,000 tpa of limestone may be sourced from the limestone quarry, in which case, the balance of 200,000 tpa would be procured from local quarries. Alternatively, up to 560,000 tpa of limestone may be procured from local quarries, in which case, the balance of 430,000 tpa would be sourced from the limestone quarry.

As the other local limestone supplier has not yet been confirmed, for the purposes of this assessment, it is assumed that third-party limestone deliveries would originate from the Parkes area. These delivery trips would follow a similar route to those vehicles approaching from Parkes, with all limestone transport vehicles travelling via Bogan Gate rather than Middle Trundle Road. Limestone sourced from the limestone quarry would be transported on the transport route between the limestone quarry and the mine and processing facility.

To account for the variations which may occur in the routes used for limestone deliveries, this assessment of the contribution of the modified Project traffic on the wider road network assumes that each part of the transport route carries the maximum amount of limestone permitted, i.e., 560,000 tpa of limestone is transported on that part of the transport route between the limestone quarry and Parkes, and 990,000 limestone is transported on that part of the transport route between the mine and processing facility and the limestone quarry. This represents the conditions under which the transport of limestone would have its greatest impact on each part of the road network.

5.2.5 Other Traffic

Consistent with the approved Project, other traffic visiting the modified Project during its operational phases would include deliveries of daily consumables, locally sourced spare parts and equipment, maintenance contractors, mine and processing facility staff visiting off-site facilities, regulatory inspectors and general visitors. This traffic would occur mainly between 7:00 am and 6:00 pm, generating an average of 16 deliveries or visits per day (GTA Consultants, 2017) as summarised in Table 5.16.

Table 5.16: Other Visitor Traffic Generation

Origin or Destination	Daily (vehicles per day)		AM Peak Hour (vehicles per hour)		PM Peak Hour (vehicles per hour)	
	Light Vehicles	Heavy Vehicles	Light Vehicles	Heavy Vehicles	Light Vehicles	Heavy Vehicles
Parkes	20	4	2	2	2	2
Condobolin	4	4	2	2	2	2
Total	**24**	**8**	**4**	**4**	**4**	**4**

5.2.6 Total Operational Phase Generation

Table 5.17 summarises the daily vehicle trips forecast to be generated by the peak operational phase of the modified Project.

Table 5.17: Daily Modified Project Trips – Operational Phase (vehicle trips per day)

Origin or Destination	Employees		Materials and Product	Other		Total		
	Light Vehicles	Buses	Heavy Vehicles	Light Vehicles	Heavy Vehicles	Light Vehicles	Buses	Heavy Vehicles
Parkes Newcastle Sydney	24 (6) [22]	6	12	20	4	44 (6) [22]	6	14
Condobolin	16 (4) [16]	6	-	4	4	20 (4) [16]	6	4
Forbes	6 (4) [6]	4	-	-	-	6 (4) [6]	4	-
Other Local	12 [4]	-	-	-	-	16 [4]	-	-
Rail Siding	-	-	64	-	-	-	-	64
Limestone Quarries	-	-	84	-	-	-	-	84
Newcastle via Dubbo	-	-	4	-	-	-	-	6
Total	**58 (14) [48]**	**16**	**164**	**24**	**8**	**82 (14) [48]**	**16**	**172**

10 = trips to and from the mine and processing facility,
(10) = rail siding employee trips, not to or from the mine and processing facility.
[10] = limestone quarry employee trips, not to or from the mine and processing facility.

Table 5.17 demonstrates that the peak operational phase of the modified Project can be expected to generate 82 light vehicle trips per day, 16 bus trips per day, and 172 heavy vehicle trips per day to and from the mine and processing facility. Up to 14 additional light vehicle trips per day would be generated between the rail siding and local towns, and 48 additional light vehicle trips per day between the limestone quarry and local towns.

Table 5.18 summarises the peak hourly vehicle trips forecast to be generated by the peak operational phase of the modified Project.

Table 5.18: Peak Hourly Trips – Operational Phase (vehicle trips per hour)

Origin or Destination	Employees		Materials and Product	Other		Total		
	Light Vehicles	Buses	Heavy Vehicles	Light Vehicles	Heavy Vehicles	Light Vehicles	Buses	Heavy Vehicles
Parkes Newcastle Sydney	12 (3) [11]	3	2	2	2	14 (3) [11]	3	4
Condobolin	8 (2) [8]	3	-	2	2	10 (2) [8]	3	2
Forbes	3 (2) [3]	2	-	-	-	3 (2) [3]	2	-
Other	6 [2]	-	-	-	-	6 [2]	-	-
Rail Siding	-	-	6	-	-	-	-	6
Limestone Quarries	-	-	8	-	-	-	-	8
Newcastle via Dubbo	-	-	2	-	-	-	-	2
Total	**29 (7) [24]**	**8**	**18**	**4**	**4**	**33 (7) [24]**	**8**	**22**

10 = trips to and from the mine and processing facility,
(10) = rail siding employee trips, not to or from the mine and processing facility.
[10] = limestone quarry employee trips, not to or from the mine and processing facility.

Table 5.18 demonstrates that during the peaks associated with the movement of the workforce to and from the mine and processing facility, the peak operational phase of the modified Project can be expected to generate 33 light vehicle trips per hour, eight bus trips per hour, and 22 heavy vehicle trips per hour to and from the mine and processing facility. Up to seven additional light vehicle trips per hour would be generated between the rail siding and local towns, and 24 additional light vehicle trips per hour between the limestone quarry and local towns.

5.3 Travel Routes

The routes used by vehicles travelling to and from the mine and processing facility would vary according to the origin/destination as follows, using the approved transport route to the extent possible:

- rail siding – on the approved transport route including Scotson Lane, Fifield-Trundle Road, Platina Road, Fifield Road, Slee Street, Wilmatha Road, and the mine and processing facility access;
- limestone quarry – on the approved transport route including limestone quarry access, Fifield-Trundle Road, Platina Road, Fifield Road, Slee Street, Wilmatha Road, and the mine and processing facility access;
- Parkes/Newcastle/Sydney (heavy vehicles) – Henry Parkes Way, The Bogan Way, Fifield-Trundle Road, Platina Road, Fifield Road, Slee Street, Wilmatha Road, and the mine and processing facility access;
- Parkes/Newcastle/Sydney (light vehicles, buses and some small regular deliveries) – Henry Parkes Way, Middle Trundle Road, The Bogan Way, Fifield-Trundle Road, Platina Road, Fifield Road, Slee Street, Wilmatha Road, and the mine and processing facility access;
- Newcastle via Dubbo (ammonia only) – Mitchell Highway, The McGrane Way, The Bogan Way, Fifield Road, Burra Street, Wilmatha Road, and the mine and processing facility access;
- Condobolin and local sources – Henry Parkes Way, Fifield Road, Slee Street, Wilmatha Road, and the mine and processing facility access;
- Trundle and Bogan Gate – The Bogan Way, Fifield-Trundle Road, Platina Road, Fifield Road, Slee Street, Wilmatha Road, and the mine and processing facility access; and
- Tullamore – Fifield Road, Burra Street, Wilmatha Road, and the mine and processing facility access.

Based on consultation with the Parkes Shire Council, SEM proposes to direct the majority of construction phase truck movements from Parkes along Henry Parkes Way and The Bogan Way rather than using Middle Trundle Road as per the approved Project.

Routes between the local towns and the rail siding would be consistent with those above:

- Parkes (light vehicles) – Henry Parkes Way, Middle Trundle Road, The Bogan Way, and Scotson Lane;
- Parkes (heavy vehicles) – Henry Parkes Way, The Bogan Way, and Scotson Lane; and
- Condobolin – Henry Parkes Way, Fifield Road, Platina Road, Fifield-Trundle Road, and Scotson Lane.

The location of the road upgrade works would change as the works progress, and for the purpose of this assessment, the road upgrade works have been assumed to occur along Fifield-Trundle Road in the vicinity of the Limestone Quarry. Routes between the local towns and the limestone quarry and the nominal road upgrades site would be generally consistent with those above:

- Parkes (light vehicles) – Henry Parkes Way, Middle Trundle Road, The Bogan Way, and Fifield-Trundle Road;
- Parkes (heavy vehicles) – Henry Parkes Way, The Bogan Way, and Fifield-Trundle Road;
- Condobolin – Henry Parkes Way, Fifield Road, Platina Road and Fifield-Trundle Road;
- Forbes – The Bogan Way, Henry Parkes Way, The Bogan Way, and Fifield-Trundle Road;
- Trundle – The Bogan Way and Fifield-Trundle Road; and
- Tullamore – The Bogan Way and Fifield-Trundle Road.

5.4 Construction Phase Traffic Distribution

The resulting contribution of the peak construction activity for the modified Project on the roads serving the Project are summarised in Table 5.19 for daily and peak hourly conditions.

Table 5.19: Modified Project Peak Construction Traffic on Road Network

	Daily (vehicles per day)				Peak Hour (vehicles per hour)			
	Light Vehicles	Buses	Heavy Vehicles	Total Vehicles	Light Vehicles	Buses	Heavy Vehicles	Total Vehicles
Fifield Road Fifield to Tullamore	18	0	6	24	3	0	2	5
Fifield Road Fifield to Platina Road	158	26	100	284	25	13	12	50
Fifield Road Platina Road to Henry Parkes Way	52	4	24	80	11	2	4	17
Fifield-Trundle Road Platina Road to Limestone Quarry	118	22	88	228	20	11	12	43
Fifield-Trundle Road Limestone Quarry to The Bogan Way	118	22	86	226	20	11	10	41
Henry Parkes Way Condobolin to Fifield Road	50	4	24	78	10	2	4	16
Henry Parkes Way Fifield Road to Ootha	2	0	0	2	1	0	0	1
Henry Parkes Way Bogan Gate to Gunningbland	16	4	70	90	4	2	6	12
Henry Parkes Way Middle Trundle Road to Parkes	96	14	78	188	16	5	8	29
Middle Trundle Road	96	14	8	118	16	5	2	23
Platina Road	118	22	88	228	20	11	12	43
Scotson Lane The Bogan Way to Rail Siding	4	4	16	24	2	4	2	8
Sunrise Lane Wilmatha Road to Camp Access	204	70	4	278	42	35	0	77
The Bogan Way Fifield-Trundle Road to Trundle	118	18	78	214	20	7	8	35
The Bogan Way Trundle to Middle Trundle Road	114	18	78	210	20	7	8	35
The Bogan Way Middle Trundle Road to Bogan Gate	18	4	70	92	4	2	6	12
The Bogan Way Henry Parkes Way to Forbes	16	4	0	20	3	2	0	5
The McGrane Way Tullamore to Narromine	8	0	6	14	0	0	2	2
Wilmatha Road Fifield Road to Sunrise Lane	176	26	106	308	28	13	14	55
Wilmatha Road Sunrise Lane to mine and processing facility	76	72	102	250	38	36	14	88

5.5 Operational Phase Traffic Distribution

The resulting contribution of the operational phase activity for the modified Project on the roads serving the Project are summarised in Table 5.20 for daily and peak hourly conditions.

Table 5.20: Modified Project Operational Phase Traffic on Road Network

	Daily (vehicles per day)				Peak Hour (vehicles per hour)			
	Light Vehicles	Buses	Heavy Vehicles	Total Vehicles	Light Vehicles	Buses	Heavy Vehicles	Total Vehicles
Fifield Road Fifield to Tullamore	10	0	4	14	5	0	2	7
Fifield Road Fifield to Platina Road	72	16	168	256	28	8	22	58
Fifield Road Platina Road to Henry Parkes Way	40	6	6	52	20	3	2	25
Fifield-Trundle Road Platina Road to Limestone Quarry	72	10	166	248	28	5	20	53
Fifield-Trundle Road Limestone Quarry to The Bogan Way	88	10	130	228	36	5	16	57
Henry Parkes Way Condobolin to Fifield Road	40	6	6	52	20	3	2	25
Henry Parkes Way Fifield Road to Ootha	0	0	0	0	0	0	0	0
Henry Parkes Way Bogan Gate to Gunningbland	16	4	60	80	8	2	6	16
Henry Parkes Way Gunningbland to Middle Trundle Road	0	0	60	60	0	0	6	6
Henry Parkes Way Middle Trundle Road to Parkes	72	6	68	146	28	3	10	41
Middle Trundle Road	72	6	8	86	28	3	4	35
Platina Road	72	10	166	248	28	5	20	53
Scotson Lane The Bogan Way to Rail Siding access	14	0	70	84	7	0	6	13
The Bogan Way Fifield-Trundle Road to Trundle	92	10	68	170	38	5	10	53
The Bogan Way Trundle to Middle Trundle Road	88	10	68	166	36	5	10	51
The Bogan Way Middle Trundle Road to Bogan Gate	16	4	60	80	8	2	6	16
The Bogan Way Henry Parkes Way to Forbes	16	4	0	20	8	2	0	10
The McGrane Way Tullamore to Narromine	2	0	4	6	1	0	2	3
Wilmatha Road Fifield Road to mine and processing facility	82	16	172	270	33	8	24	65

6 Impacts of the Modification

6.1 Impacts on Construction Phase Traffic

Table 6.1 and Table 6.2 compare the daily and peak hourly Project-generated traffic during the peak construction phase as approved and with the Modification. This comparison demonstrates that considering the daily trips generated during the peak construction phase, the Modification would be expected to result in a significant decrease in the number of light vehicle trips generated, an increase in the number of bus trips generated and generally a decrease in the number of heavy vehicle trips generated.

Comparing the approved and modified Project traffic expected at key locations on the road network, Table 6.1 indicates that compared with the approved Project, during the peak construction phase, the modified Project would result in:

- Fifield (Fifield Road/Slee Street) – 182 fewer light vehicle trips per day, 22 additional bus trips per day, and 12 fewer other heavy vehicle trips per day; and
- Trundle (The Bogan Way/Forbes Street) – 124 fewer light vehicle trips per day, 14 additional bus trips per day, and 24 fewer other heavy vehicle trips per day.

Comparing the approved and modified Project traffic expected at key locations on the road network, Table 6.2 indicates that compared with the approved Project, during the peak construction phase, the modified Project would result in the following changes to peak hour movements:

- Fifield (Fifield Road/Slee Street) – 67 fewer light vehicle trips per peak hour, 11 additional bus trips per peak hour, and two fewer other heavy vehicle trips per peak hour; and
- Trundle (The Bogan Way/Forbes Street) – 74 fewer light vehicle trips per peak hour, five additional bus trips per peak hour, and four fewer other heavy vehicle trips per peak hour.

Table 6.1: Approved and Modified Project Peak Construction Daily Traffic (vehicles per day)

	Approved Project				Modified Project			
	Light Vehicles	Buses	Heavy Vehicles	Total Vehicles	Light Vehicles	Buses	Heavy Vehicles	Total Vehicles
Fifield Road Fifield to Tullamore	8	0	6	14	18	0	6	24
Fifield Road Fifield to Platina Road	340	4	112	456	158	26	100	284
Fifield Road Platina Road to Henry Parkes Way	126	0	10	136	52	4	24	80
Fifield-Trundle Road Platina Road to Limestone Quarry	282	4	102	388	118	22	88	228
Fifield-Trundle Road Limestone Quarry to The Bogan Way	258	4	102	364	118	22	86	226
Henry Parkes Way Condobolin to Fifield Road	126	0	10	136	50	4	24	78
Henry Parkes Way Fifield Road to Ootha	0	0	0	0	2	0	0	2
Henry Parkes Way Bogan Gate to Gunningbland	24	0	0	24	16	4	70	90
Henry Parkes Way Middle Trundle Road to Parkes	204	4	102	310	96	14	78	188
Middle Trundle Road	204	4	102	310	96	14	8	118
Platina Road	282	4	102	388	118	22	88	228
Scotson Lane The Bogan Way to Rail Siding	98	0	32	130	4	4	16	24
Sunrise Lane Wilmatha Road to Camp Access	580	4	30	614	204	70	4	278
The Bogan Way Fifield-Trundle Road to Trundle	242	4	102	348	118	18	78	214
The Bogan Way Trundle to Middle Trundle Road	230	4	102	336	114	18	78	210
The Bogan Way Middle Trundle Road to Bogan Gate	26	0	0	26	18	4	70	92
The Bogan Way Gunningbland to Forbes	24	0	0	24	16	4	0	20
The McGrane Way Tullamore to Narromine	0	0	6	6	8	0	6	14
Wilmatha Road Fifield Road to Sunrise Lane	348	4	118	470	176	26	106	308
Wilmatha Road Sunrise Lane to mine and processing facility access	792	0	88	880	76	72	102	250

Table 6.2: Approved and Modified Project Construction Peak Hour Traffic (vehicles per hour)

	Approved Project				Modified Project			
	Light Vehicles	Buses	Heavy Vehicles	Total Vehicles	Light Vehicles	Buses	Heavy Vehicles	Total Vehicles
Fifield Road Fifield to Tullamore	2	0	2	4	3	0	2	5
Fifield Road Fifield to Platina Road	92	2	14	108	25	13	12	50
Fifield Road Platina Road to Henry Parkes Way	52	0	2	54	11	2	4	17
Fifield-Trundle Road Platina Road to Limestone Quarry	84	2	12	98	20	11	12	43
Fifield-Trundle Road Limestone Quarry to The Bogan Way	89	2	12	103	20	11	10	41
Henry Parkes Way Condobolin to Fifield Road	52	0	2	54	10	2	4	16
Henry Parkes Way Fifield Road to Ootha	0	0	0	0	1	0	0	1
Henry Parkes Way Bogan Gate to Gunningbland	13	0	0	13	4	2	6	12
Henry Parkes Way Middle Trundle Road to Parkes	77	2	12	91	16	5	8	29
Middle Trundle Road	77	2	12	91	16	5	2	23
Platina Road	84	2	12	98	20	11	12	43
Scotson Lane The Bogan Way to Rail Siding	36	0	4	40	2	4	2	8
Sunrise Lane Wilmatha Road to Camp Access	262	2	4	268	42	35	0	77
The Bogan Way Fifield-Trundle Road to Trundle	94	2	12	108	20	7	8	35
The Bogan Way Trundle to Middle Trundle Road	90	2	12	104	20	7	8	35
The Bogan Way Middle Trundle Road to Bogan Gate	13	0	0	13	4	2	6	12
The Bogan Way Gunningbland to Forbes	10	0	0	10	3	2	0	5
The McGrane Way Tullamore to Narromine	0	0	2	2	0	0	2	2
Wilmatha Road Fifield Road to Sunrise Lane	94	2	16	112	28	13	14	55
Wilmatha Road Sunrise Lane to mine and processing facility access	344	0	12	356	38	36	14	88

6.2 Impacts on Operational Phase Traffic

Table 6.4 and Table 6.5 compare the daily and peak-hourly Project-traffic generated during the operational phase as approved and with the Modification. These forecasts for both the approved and modified Project assume that the maximum amount of limestone is sourced from local quarries, i.e., representing conditions when the maximum number of truck movements would occur through Trundle. Should the maximum amount of limestone be sourced from the limestone quarry instead, the number of trucks travelling through Trundle would be reduced as shown in Table 6.3.

Table 6.3: Effect of Limestone Source on Modified Project Traffic on Forbes Street, Trundle

	Maximum Limestone Transported from Local Quarries		Maximum Limestone Transported from Limestone Quarry	
	Daily (vehicles per day)	Peak Hour (vehicles per hour)	Daily (vehicles per day)	Peak Hour (vehicles per hour)
Light Vehicles	92	38	92	38
Buses	10	5	10	5
Heavy Vehicles	68	10	38	6
Total Vehicles	**170**	**53**	**140**	**49**

Comparing the approved and modified daily Project traffic expected at key locations on the road network, the forecasts (Table 6.4) indicate that compared with the approved Project, during the operational phase, the modified Project would result in:

- Fifield (Fifield Road/Slee Street) – 20 fewer light vehicle trips per day, four additional bus trips per day and four fewer other heavy vehicle trips per day.
- Trundle (The Bogan Way/Forbes Street) – 22 additional light vehicle trips per day, four additional bus trips per day and two fewer heavy vehicle trips per day.

Comparing the approved and modified peak hourly Project traffic expected at key locations on the road network, the forecasts (Table 6.5) indicate that compared with the approved Project, during the operational phase, the modified Project would result in the following changes to peak hour movements:

- Fifield (Fifield Road/Slee Street) – 10 fewer light vehicle trips per peak hour, two additional bus trips per peak hour and two fewer other heavy vehicle trips per peak hour.
- Trundle (The Bogan Way/Forbes Street) – 11 additional light vehicle trips per peak hour, two additional bus trips per peak hour, and no change to other heavy vehicle trips.

Table 6.4: Approved and Modified Project Operational Daily Traffic (vehicles per day)

	Approved Project				Modified Project			
	Light Vehicles	Buses	Heavy Vehicles	Total Vehicles	Light Vehicles	Buses	Heavy Vehicles	Total Vehicles
Fifield Road Fifield to Tullamore	24	0	4	28	10	0	4	14
Fifield Road Fifield to Platina Road	92	12	172	276	72	16	168	256
Fifield Road Platina Road to Henry Parkes Way	22	6	8	36	40	6	6	52
Fifield-Trundle Road Platina Road to Limestone Quarry	70	6	164	240	72	10	166	248
Fifield-Trundle Road Limestone Quarry to The Bogan Way	70	6	124	200	88	10	130	228
Henry Parkes Way Condobolin to Fifield Road	14	6	8	28	40	6	6	52
Henry Parkes Way Fifield Road to Ootha	8	0	0	8	0	0	0	0
Henry Parkes Way Bogan Gate to Gunningbland	0	0	62	62	16	4	60	80
Henry Parkes Way Gunningbland to Middle Trundle Road	0	0	62	62	0	0	60	60
Henry Parkes Way Middle Trundle Road to Parkes	34	6	70	110	72	6	68	146
Middle Trundle Road	34	6	8	48	72	6	8	86
Platina Road	70	6	164	240	72	10	166	248
Scotson Lane The Bogan Way to Rail Siding	0	0	54	54	14	0	70	84
The Bogan Way Fifield-Trundle Road to Trundle	70	6	70	146	92	10	68	170
The Bogan Way Trundle to Middle Trundle Road	38	6	70	114	88	10	68	166
The Bogan Way Middle Trundle Road to Bogan Gate	4	0	62	66	16	4	60	80
The Bogan Way Henry Parkes Way to Forbes	0	0	0	0	16	4	0	20
The McGrane Way Tullamore to Narromine	0	0	4	4	2	0	4	6
Wilmatha Road Fifield Road to mine and processing facility access	116	12	176	304	82	16	172	270

Table 6.5: Approved and Modified Project Operational Peak Hour Traffic (vehicles per hour)

	Approved Project				Modified Project			
	Light Vehicles	Buses	Heavy Vehicles	Total Vehicles	Light Vehicles	Buses	Heavy Vehicles	Total Vehicles
Fifield Road Fifield to Tullamore	12	0	2	14	5	0	2	7
Fifield Road Fifield to Platina Road	38	6	24	68	28	8	22	58
Fifield Road Platina Road to Henry Parkes Way	11	3	4	18	20	3	2	25
Fifield-Trundle Road Platina Road to Limestone Quarry	27	3	20	50	28	5	20	53
Fifield-Trundle Road Limestone Quarry to The Bogan Way	27	3	16	46	36	5	16	57
Henry Parkes Way Condobolin to Fifield Road	7	3	4	14	20	3	2	25
Henry Parkes Way Fifield Road to Ootha	4	0	0	4	0	0	0	0
Henry Parkes Way Bogan Gate to Gunningbland	0	0	6	6	8	2	6	16
Henry Parkes Way Gunningbland to Middle Trundle Road	16	4	60	80	0	0	6	6
Henry Parkes Way Middle Trundle Road to Parkes	9	3	10	22	28	3	10	41
Middle Trundle Road	9	3	4	16	28	3	4	35
Platina Road	27	3	20	50	28	5	20	53
Scotson Lane The Bogan Way to Rail Siding	0	0	6	6	7	0	6	13
The Bogan Way Fifield-Trundle Road to Trundle/	27	3	10	40	38	5	10	53
The Bogan Way Trundle to Middle Trundle Road	11	3	10	24	36	5	10	51
The Bogan Way Middle Trundle Road to Bogan Gate	2	0	6	8	8	2	6	16
The Bogan Way Henry Parkes Way to Forbes	0	0	0	0	8	2	0	10
The McGrane Way Tullamore to Narromine	0	0	2	2	1	0	2	3
Wilmatha Road Fifield Road to mine and processing facility access	50	6	26	82	33	8	24	65

6.3 Future Traffic Volumes – Peak Construction

Based on the baseline daily and peak hour traffic volumes with background growth (Section 3.4), future traffic volumes at the surveyed locations have been forecast during the peak construction phase in 2023. The resulting daily volumes are summarised in Table 6.6 and peak hourly volumes in Table 6.7, noting that the peak hour results assume that the Project peak coincides with background peak. As that is unlikely, the peak hourly forecasts are considered to overestimate future conditions.

Table 6.6: Total Daily Traffic 2023 (vehicles per day)

Site[A]	Location	Approved Project				Modified Project			
		Light Vehicles	Buses[B]	Heavy Vehicles	Total	Light Vehicles	Buses[B]	Heavy Vehicles	Total
1	The Bogan Way between Trundle and Fifield-Trundle Road	669	10	163	842	545	24	139	708
2	The Bogan Way between Bogan Gate and Middle Trundle Road	393	6	49	448	385	10	119	514
3	Middle Trundle Road between The Bogan Way and Henry Parkes Way	534	6	126	666	426	16	32	474
4	Platina Road/Fifield-Trundle Road between Fifield Road and Road Upgrades	363	4	110	477	199	22	96	317
4	Platina Road/Fifield-Trundle Road between Road Upgrades and The Bogan Way	339	4	110	453	199	22	94	315
5	Fifield Road between Slee Street and Platina Road	613	26	317	956	431	48	305	784
6	Fifield Road between Platina Road and Springvale Road	341	24	217	582	267	28	231	526
7	Wilmatha Road between Sunrise Lane and Project access	815	0	96	911	99	72	110	281
7	Wilmatha Road between Fifield Road and Sunrise Lane	371	4	126	501	199	26	114	339
8	Melrose Plains Road between Fifield Road and Wilmatha Road	13	0	4	17	13	0	4	17

[A] *Refer to Figure 3.5*
[B] *Includes allowance for non-Project buses in surveyed background heavy vehicles.*

Table 6.7: Total Peak Hour Traffic 2023 (vehicles per hour)

Site[A]	Location	Approved Project				Modified Project			
		Light Vehicles	Buses[B]	Heavy Vehicles	Total	Light Vehicles	Buses[B]	Heavy Vehicles	Total
1	The Bogan Way between Trundle and Fifield-Trundle Road	137	2	19	158	63	7	15	85
2	The Bogan Way between Bogan Gate and Middle Trundle Road	49	0	6	55	40	2	12	54
3	Middle Trundle Road between The Bogan Way and Henry Parkes Way	110	2	14	126	49	5	4	58
4	Platina Road/Fifield-Trundle Road between Fifield Road and Road Upgrades	92	2	13	107	28	11	13	52
4	Platina Road/Fifield-Trundle Road between Road Upgrades and The Bogan Way	97	2	13	112	28	11	11	50
5	Fifield Road between Slee Street and Platina Road	120	4	34	158	53	15	32	100
6	Fifield Road between Platina Road and Springvale Road	73	2	23	98	32	4	25	61
7	Wilmatha Road between Sunrise Lane and Project access	346	0	13	359	40	36	15	91
7	Wilmatha Road between Fifield Road and Sunrise Lane	96	2	17	115	30	13	15	58
8	Melrose Plains Road between Fifield Road and Wilmatha Road	2	0	0	2	2	0	0	2

[A] *Refer to Figure 3.5*
[B] *Includes allowance for non-Project buses in surveyed background heavy vehicles.*

6.4 Future Traffic Volumes – Operational

Based on the baseline daily and peak hour traffic volumes with background growth (Section 3.4), future traffic volumes at the surveyed locations have been forecast during operational conditions in 2033. The resulting daily volumes are summarised in Table 6.8 and peak hourly volumes in Table 6.9, noting that the peak hour results assume that the Project peak coincides with background peak. As that is unlikely, the peak hourly forecasts are considered to overestimate future conditions.

Table 6.8: Total Daily Traffic 2033 (vehicles per day)

Site[A]	Location	Approved Project				Modified Project			
		Light Vehicles	Buses[B]	Heavy Vehicles	Total	Light Vehicles	Buses[B]	Heavy Vehicles	Total
1	The Bogan Way between Trundle and Fifield-Trundle Road	591	14	143	748	613	18	141	772
2	The Bogan Way between Bogan Gate and Middle Trundle Road	451	6	123	580	463	10	121	594
3	Middle Trundle Road between The Bogan Way and Henry Parkes Way	436	10	36	482	474	10	36	520
4	Platina Road/Fifield-Trundle Road between Fifield Road and Road Upgrades	168	6	173	347	170	10	175	355
4	Platina Road/Fifield-Trundle Road between Road Upgrades and The Bogan Way	168	6	133	307	186	10	139	335
5	Fifield Road between Slee Street and Platina Road	424	42	447	913	404	46	443	893
6	Fifield Road between Platina Road and Springvale Road	284	38	286	608	302	38	284	624
7	Wilmatha Road between Fifield Road and Project access	144	12	185	341	110	16	181	307
8	Melrose Plains Road between Fifield Road and Wilmatha Road	13	0	4	17	13	0	4	17

[A] *Refer to Figure 3.5*
[B] *Includes allowance for non-Project buses in surveyed background heavy vehicles.*

Table 6.9: Total Peak Hour Traffic 2033 (vehicles per hour)

Site[A]	Location	Approved Project				Modified Project			
		Light Vehicles	Buses[B]	Heavy Vehicles	Total	Light Vehicles	Buses[B]	Heavy Vehicles	Total
1	The Bogan Way between Trundle and Fifield-Trundle Road	63	4	17	84	88	6	17	111
2	The Bogan Way between Bogan Gate and Middle Trundle Road	44	0	7	51	52	2	7	61
3	Middle Trundle Road between The Bogan Way and Henry Parkes Way	49	3	7	59	68	3	7	78
4	Platina Road/Fifield-Trundle Road between Fifield Road and Road Upgrades	36	3	21	60	37	5	21	63
4	Platina Road/Fifield-Trundle Road between Road Upgrades and The Bogan Way	36	3	17	56	45	5	17	67
5	Fifield Road between Slee Street and Platina Road	72	9	51	132	62	11	49	122
6	Fifield Road between Platina Road and Springvale Road	37	6	32	75	46	6	30	82
7	Wilmatha Road between Fifield Road and Project access	53	6	27	86	36	8	25	69
8	Melrose Plains Road between Fifield Road and Wilmatha Road	2	0	0	2	2	0	0	2

[A] *Refer to Figure 3.5*

6.5 Intersection Performance

At unsignalised intersections with minor roads, where there are relatively low volumes of through and turning vehicles, capacity considerations are usually not significant, and detailed analysis of capacity is not warranted. As a guide, at volumes below the following combinations of maximum hourly volumes at a cross intersection with a two lane two way road, capacity analysis is not warranted:

- major road 400 vehicles per hour, minor road 250 vehicles per hour;
- major road 500 vehicles per hour, minor road 200 vehicles per hour; and
- major road 650 vehicles per hour, minor road 100 vehicles per hour.

The majority of intersections that would be used by traffic generated by the modified Project are T-intersections and so have fewer potentially conflicting movements than a cross intersection. Comparison between these threshold volumes and the peak hourly volumes on the key roads (Table 6.7 and Table 6.9) indicates that the forecast traffic volumes on all roads are well below the threshold volumes above, and as such, there is no capacity concerns regarding the operation of the intersections.

6.6 Road Operational Performance

The capacity of a road is the number of vehicles that can be accommodated on the road infrastructure before it fails to function as it was intended. Austroads (2020a) defines capacity as the maximum sustainable hourly rate at which vehicles can reasonably be expected to traverse a point or uniform section of a lane or roadway during a given time period under the prevailing roadway, traffic and control conditions. The capacity of a single traffic lane is affected by factors such as the pavement width and restricted lateral clearances, the presence of heavy vehicles and grades.

Austroads (2020a) provides guidelines for the assessment of the capacity and performance of two-lane, two-way rural roads that, in turn, refer to the *Highway Capacity Manual* (HCM) (Transportation Research Board, 2016). Level of Service (LoS) represents road users' perceptions of the quality of service provided by a road link, and describes operational conditions in terms of factors such as speed and travel time, freedom to manoeuvre, traffic interruptions, comfort, convenience and safety. Levels of Service are designated A through F, with LoS A providing the best traffic conditions, with no restriction on desired travel speed or overtaking. LoS B to D describes progressively worse traffic conditions. LoS E occurs when traffic conditions are at or close to capacity, and there is virtually no freedom to select desired speeds or to manoeuvre in the traffic stream. The service flow rate for LoS E is taken as the capacity of a lane or roadway. In rural situations, LoS C is generally considered to be acceptable. At LoS C, most vehicles are travelling in platoons, and travel speeds are curtailed. At LoS D, platooning increases significantly, and the demand for passing is high, but the capacity to do so is low.

The LoS experienced by drivers on two-way rural roads is dependent on the drivers' expectations regarding the road, and three classes of road are defined in the HCM. Class I roads are those on which motorists expect to travel at relatively high speeds, and most often serve long-distance trips or provide connecting links between facilities that serve long-distance trips. Class II roads are those on which motorists do not necessarily expect to travel at high speeds, and may function as access routes to Class I facilities, serve as scenic or recreational routes or pass through rugged terrain. Class III roads serve moderately developed areas, and may be portions of a Class I or Class II highway that pass through small towns or developed recreational areas, where local traffic mixes with through traffic, and the density of unsignalised roadside access points increases.

On Class I roads, LoS is defined in terms of Percent Time Spent Following (PTSF) and Average Travel Speed (ATS), with the worst of these criteria being adopted as the LoS. On Class II roads, LoS is defined only in terms of PTSF. The PTSF is a measure of the level of opportunities to overtake, and is estimated from the demand traffic volumes, the directional distribution of that traffic, and the percentage of no-passing zones. On Class III roads, LoS is defined in terms of Percent of Free-Flow Speed (PFFS), which is the ratio of ATS to the free-flow speed, representing the ability of vehicles to travel at or near the posted speed limit. The LoS criteria for two-lane roads are as shown in Table 6.10.

Table 6.10: Level of Service Criteria for Two-Lane, Two-Way Roads

Level of Service	Class I		Class II	Class III
	Average Travel Speed (km/h)	PTSF (percent)	PTSF (percent)	PFFS (percent)
A	> 90	≤ 35	≤ 40	> 91.7
B	> 80 – 90	> 35 – 50	> 40 – 55	> 83.3 – 91.7
C	> 70 – 80	> 50 – 65	> 55 – 70	> 75.0 – 83.3
D	> 60 – 70	> 65 – 80	> 70 – 85	> 66.7 – 75.0
E	≤ 60	≥ 80	≥ 85	≤ 66.7

Source: Austroads (2020a).

For the purpose of this review, the surveyed access routes have been considered as Class II routes, and based on the forecast traffic and assuming background traffic is typically 60% in the peak direction and 40% in the contrapeak direction. As a robust assessment, a higher than standard adjustment factor has been applied to all heavy vehicles in the traffic stream, to account for the use of larger heavy vehicles. The PTSF and resulting LoS at key locations have been determined and are summarised in Table 6.11 for the peak direction of travel, noting the PTSF in the contrapeak direction is lower than in the peak direction. The upgrades to the transport route are assumed to occur after the peak construction period.

Table 6.11: Project Peak Hour Midblock Levels of Service in Peak Direction

Site[A]	Location	Construction Phase (2023)		Operations Phase (2033)	
		PTSF	LoS	PTSF	LoS
1	The Bogan Way between Trundle and Fifield-Trundle Road	29.3	A	34.4	A
2	The Bogan Way between Bogan Gate and Middle Trundle Road	24.8	A	27.2	A
3	Middle Trundle Road between The Bogan Way and Henry Parkes Way	26.3	A	29.4	A
4	Platina Road/Fifield-Trundle Road between Fifield Road and Road Upgrades	32.5	A	24.3	A
4	Fifield-Trundle Road between Road Upgrades and The Bogan Way	24.6	A	30.2	A
5	Fifield Road between Slee Street and Platina Road	31.6	A	37.7	A
6	Fifield Road between Platina Road and Springvale Road	27.4	A	31.2	A
7	Wilmatha Road between Sunrise Lane and Project access	34.7	A	29.1	A
7	Wilmatha Road between Fifield Road and Sunrise Lane	24.8	A	29.1	A
8	Melrose Plains Road between Fifield Road and Wilmatha Road	14.8	A	14.8	A

[A] *Refer to Figure 3.5*

Table 6.11 demonstrates that the midblock LoS would be good at the key locations with the modified Project traffic during both the peak construction phase and longer term operational phase. Drivers would experience negligible restriction on their desired travel speed or overtaking.

As discussed (Section 3.5), there is potential for the Project construction traffic to coincide with traffic associated with construction of:

- the Quorn Park Solar Farm, generating up to 186 vehicle trips per day (30 vehicle trips during peak hours) on Henry Parkes Way between McGrath Lane and Parkes; and
- the Parkes Peaking Power Plant, generating up to 70 light and eight heavy vehicle trips per day on Henry Parkes Way between Pat Meredith Drive and Parkes during the peak construction period.

During construction, the modified Project would generate up to 188 vehicles per day and 29 vehicles per hour on that part of Henry Parkes Way on which the above projects may also generate traffic (Table 5.19).

Geolyse (2018) indicates that during 2017, Henry Parkes Way west of Moulden Street (approximately 2 km west of the Parkes CBD) carried approximately 1,400 vehicles per day, 137 vehicles per hour during the morning peak hour, and 156 vehicles per hour during the evening peak hour (all two way traffic). Assuming the same background growth rate described in Section 3.4, this could be expected to grow to approximately 1,577 vehicles per day and 176 vehicles per hour by 2023.

In the unlikely event that the peak construction activity of the Project coincided with that of the Quorn Park Solar Farm and Parkes Peaking Power Plant, the cumulative impact on Henry Parkes Way between Pat Meredith Drive and Parkes would be in the order of 452 vehicles per day. In the very unlikely event that not only do the peak construction phases coincide, but the peak hourly traffic generation of the three peak construction activities also coincide, the cumulative impact on Henry Parkes Way between Pat Meredith Drive and Parkes would be in the order of up to 94 vehicles per hour. On this basis, Henry Parkes Way would carry in the order of up to 270 vehicles per hour during the evening peak hour in 2023.

As noted, detailed forecasts of traffic associated with construction of the Parkes Bypass are not available, however if the above activities also coincided with construction of the Parkes Bypass, it could be expected that additional traffic may also occur on Henry Parkes Way between Parkes and the western extent of the Parkes Bypass works, near the Hartigan Avenue Extension. If the average 100 construction vehicles per day associated with the Parkes Bypass workforce all used Henry Parkes Way to and from Parkes during the same hour as the other construction traffic above, Henry Parkes Way would carry in the order of 370 vehicles per hour between the Hartigan Avenue Extension and Parkes. This remains well below the capacity of the road, and no potential issues regarding road performance are raised, noting that a traffic management plan will be implemented for the Parkes Bypass construction activities to minimise impacts to other traffic.

Considering the short term nature of each of the construction phases, and that each project would be subject to a Traffic Management Plan or a Construction Environmental Management Plan, the potential cumulative impacts should construction of the three projects coincide do not raise any concerns with regard to the operation of the road network.

6.7 Railway Level Crossings

There are two railway lines that operate in the vicinity of the Project, the Orange Broken Hill Railway operated by the Australian Rail Track Corporation (ARTC) and the Bogan Gate Tottenham Railway operated by John Holland Group Pty Ltd (John Holland).

There are railway level crossings at the following locations that will be used by Project-related vehicles:

- Henry Parkes Way approximately 5 km west of Parkes on the Orange Broken Hill Railway (active level crossing);

- Fifield Road just to the north of its intersection with Henry Parkes Way on the Orange Broken Hill Railway (active level crossing);
- Henry Parkes Way in Bogan Gate on the Bogan Gate Tottenham Railway (Give Way signs on the approach from both directions);
- The Bogan Way in three locations between Bogan Gate and Trundle on the Bogan Gate Tottenham Railway (Give Way signs on the approach from both directions);
- The Bogan Way south of Henry Parkes Way at Gunningbland on the Orange Broken Hill Railway (active level crossing);
- Fifield Road in Tullamore on the Bogan Gate Tottenham Railway (Give Way signs on the approach from both directions); and
- Scotson Lane near The Bogan Way on the Bogan Gate Tottenham Railway (Give Way signs on the approach from both directions).

The Modification would not significantly increase Project-related vehicles at these level crossings (Sections 6.1 and 6.2).

In addition, the Modification would not change the rail movements associated with the approved rail siding (i.e. an average of three trains per week, with a maximum of two trains per day).

Given the above, the Modification is therefore not expected to have a perceptible impact on the operation of these level crossings.

6.8 School Buses

A range of school bus services operate in the vicinity of the Project (Clean TeQ, 2019b).

SEM has developed a Traffic Management Plan (Clean TeQ, 2019b) for the Project in accordance with Condition 45, Schedule 3 of Development Consent (DA 374-11-00) that includes measures to minimise disruption to school bus services including radio communication between heavy vehicle and school bus operators.

It is recommended that the Traffic Management Plan be updated to incorporate the Modification.

6.9 Transport of Hazardous Goods

Prior to commissioning of the mine and processing facility a Transport of Hazardous Materials Study will be prepared in accordance with Condition 53(a), Schedule 3 of Development Consent (DA 374-11-00). The study will cover the transport of hazardous materials, including details of the routes to be used.

In addition, a Safety Management System will be prepared for the Project by SEM in accordance with Condition 53(c), Schedule 3 of Development Consent (DA 374-11-00). The Safety Management System will cover Project transport activities involving hazardous materials and include safety-related procedures, responsibilities and policies, along with details of mechanisms for ensuring adherence to procedures.

6.10 Oversize Vehicles

A number of oversize vehicle movements may be generated on an occasional basis during the life of the modified Project. The proposed movement for any oversize vehicles would be negotiated with TfNSW and relevant local councils on a case-by-case basis.

All oversize loads would be transported with the relevant permits and load declarations obtained in accordance with *Additional Access Conditions Oversize and overmass heavy vehicles and loads* (TfNSW, 2020b), and any other licences and escorts as required by regulatory authorities.

6.11 Road Safety Impacts

The review of the road crash history of the routes that would be used by the modified Project traffic (Section 0) does not highlight any specific concerns regarding the safety of those routes or any specific location with a poor crash history.

Consistent with the Voluntary Planning Agreement for the approved Project, Road Safety Audits will be conducted on key Project routes.

The road and intersection upgrades for the approved Project will be designed and constructed in accordance with Austroads requirements to provide a safe road environment for all road users. Those upgrades would be revised as required for the modified Project, discussed in Section 7.

7 Mitigation Measures

A number of mitigation measures will be undertaken for the approved Project. The suitability of each of those measures to the forecast conditions with the modified Project have been reviewed to determine if any changes would be appropriate, and the findings are discussed in this section. Any relevant changes to the road or intersection upgrades noted in this section would be incorporated into a revision to the Road Upgrade and Maintenance Strategy (Clean TeQ, 2019a).

7.1 Road and Intersection Upgrades

7.1.1 Sunrise Lane Upgrade

For the approved Project, prior to commissioning of the accommodation camp, Sunrise Lane will be upgraded between the accommodation camp access road and Wilmatha Road to the following:

- all weather unsealed surface for an operating speed standard of 80 km/h; and
- carriageway width of 9 m (equivalent to two 3.5 m lanes and two 1.0 m wide shoulders).

This upgrade standard is consistent with a Class 4A unsealed road standard (ARRB, 2009), which is the highest road standard in the unsealed roads hierarchy. Class 4A unsealed roads carry an average of more than 150 vehicles per day, including large vehicles. Table 6.1 indicates that the approved Project would generate 614 vehicles per day on Sunrise Lane, while the modified Project would generate 278 vehicles per day on Sunrise Lane. The nominated upgrade for the approved Project is appropriate for the modified Project.

7.1.2 Transport Route Upgrade

For the approved Project, prior to commissioning of the mine and processing facility (as defined in the Voluntary Planning Agreement), a number of roads will be upgraded to the following standard:

- road pavement (8.0 m sealed pavement and 1.0 m gravel shoulders); and
- all private access roads (3.5 m sealed private access road approach and 3.0 m gravel shoulders along the road 30 m either side of all private access roads)

The roads to be upgraded include:

- Platina Road (between the Lachlan Shire boundary and Fifield Road);
- Fifield Road (between Platina Road and Slee St [in Fifield Village]);

- Wilmatha Road (between Slee St [in Fifield Village] and the mine and processing facility access); and
- Fifield Trundle Road (between The Bogan Way and the Parkes Shire boundary).

The upgraded general road standard allows for 3.5 m wide travel lanes, with a sealed shoulder 0.5 m wide and a gravel shoulder 1.0 m wide on each side of the road. This is consistent with the Austroads (2016) desirable carriageway widths for rural roads carrying more than 3,000 vehicles per day, and exceeds the minimum requirements for a designated heavy vehicle route.

Table 6.8 indicates that with both the approved and modified Project and with unrelated background changes in traffic conditions, traffic volumes on these roads would be at their greatest on Fifield Road between Slee Street and Platina Road. With the approved Project and background traffic changes, in 2033 this road is forecast to carry 913 vehicles per day, and the modified Project would carry 893 vehicles per day. Table 6.4 indicates that the modified Project would generate fewer bus and heavy vehicle movements per day on this part of the road than the approved Project.

The widened shoulders adjacent to private access roads will provide for school buses to stop clear of the travel lanes to allow children to board and disembark school buses when required. No change to this requirement is warranted by the modified Project.

The upgrade to the transport route nominated to be completed for the approved Project is therefore also considered to be appropriate for the modified Project.

7.1.3 Platina Road and Fifield Road Intersection Upgrade

For the approved Project, prior to commissioning of the mine and processing facility (as defined in the Voluntary Planning Agreement), the intersection of Platina Road and Fifield Road will be upgraded to Austroads standards.

For the modified Project, application of the Austroads (2020b) warrants for the major road treatments at rural road intersections indicates that the intersection would require the minimum Basic Left-Turn (BAL) and Basic Right-Turn (BAR) treatments. The rural BAL treatment on the major road has a widened shoulder, which assists turning vehicles to move further off the through carriageway, making it easier for through vehicles to pass. The rural BAR treatment features a widened shoulder on the major road that allows through vehicles, having slowed, to pass to the left of turning vehicles. The BAL treatment on the minor road allows turning movements to occur from a single lane, with a shoulder that is too narrow to be used by left-turning vehicles, so as to prevent vehicles from standing two abreast at the holding line. These design features are preferred to safely manage the movement of vehicles in the high-speed rural environment.

It is noted that GTA Consultants (2017) found that the highest demands may warrant consideration of altering the priority at that intersection, such that the southern approach of Fifield Road becomes the minor leg of the intersection. That assessment did not however allow for use of shuttle buses to transport the workforce. The modified Project would reduce the Project-generated traffic at the intersection to below that described in GTA Consultants (2017), and the distribution of vehicle movements would not warrant altering the priority at the intersection.

With the modified Project, it would be appropriate to upgrade the intersection to BAL and BAR standards, in accordance with Austroads guidelines, allowing for the swept paths of the Project-generated heavy vehicles, and upgrades to signage and linemarking as required to meet Austroads guidelines.

7.1.4 Fifield Road and Slee Street Intersection Upgrade

For the approved Project, prior to commissioning of the mine and processing facility (as defined in the Voluntary Planning Agreement), the intersection of Fifield Road and Slee Street (at the eastern end of Fifield Village) will be upgraded to Austroads standards for the transport route. This would generally be expected to require consideration of the swept paths of heavy vehicles turning between Slee Street and Fifield Road as part of the upgrade of the transport route described in Section 0.

The approved Project intersection upgrade is appropriate for the modified Project.

7.1.5 Slee Street, Wilmatha Road and Fifield Road Intersection Upgrade

For the approved Project, prior to commissioning of the mine and processing facility (as defined in the Voluntary Planning Agreement), the intersection of Slee Street, Wilmatha Road and Fifield Road (at the western end of Fifield Village) will be upgraded to Austroads standards as part of the upgrade of the transport route (Section 0). This is expected to include installation of advance warning signs on Slee Street, Fifield Road and Wilmatha Road approaches and appropriate signage and linemarking at the intersection to clarify priority.

The modified Project would contribute slightly lower volumes of traffic through this intersection compared with the approved Project, with most of the Project-generated traffic continuing to be moving between Wilmatha Road and Slee Street. The upgrades for the approved Project would remain appropriate for the modified Project.

7.1.6 Henry Parkes Way and Middle Trundle Road

With the approved Project, prior to commissioning of the mine and processing facility (as defined in the Voluntary Planning Agreement), the intersection of Henry Parkes Way and Middle Trundle Road will be upgraded, with a Channelised Right Short (CHR(S)) turn lane to be constructed in accordance with Austroads guidelines for basic rural intersection treatments.

Channelised treatments separate conflicting vehicle paths by raised or painted medians and/or islands, and often use auxiliary lanes in conjunction with channelisation. The CHR(S) treatment on the major road provides a continuous lane for through vehicles only, and a short auxiliary turn lane for right-turning vehicles only.

Application of the Austroads (2020b) warrants for the major road treatments at rural road intersections indicates that with the modified Project, the CHR(S) treatment would be appropriate for the intersection. No change to the upgrade for the approved Project would be required for the modified Project.

7.1.7 Henry Parkes Way and The Bogan Way Intersection Upgrade

For the approved Project, prior to commissioning of the mine and processing facility (as defined in the Voluntary Planning Agreement), signage and linemarking at the intersection of Henry Parkes Way and The Bogan Way at Bogan Gate will be upgraded in accordance with Austroads guidelines. The existing intersection has wide sealed and unsealed shoulders on Henry Parkes Way which allow for vehicles to pass a vehicle which has slowed to turn into The Bogan Way.

Project-generated traffic at that intersection will primarily consist of trucks transporting limestone between local quarries and the mine and processing facility, and buses and cars transporting workers between Forbes and the mine and processing facility. The upgrades to signage and linemarking to meet Austroads guidelines is appropriate for the modified Project.

7.1.8 Sunrise Lane and Wilmatha Road Intersection Upgrade

For the approved Project, the transition between the gravel and dirt surfaces will be removed while Wilmatha Road remains unsealed, then a minimum of 30 m of Sunrise Lane will be sealed on the approach to the intersection once Wilmatha Road is sealed prior to commissioning of the mine and processing facility (Section 7.1.2). This upgrade is appropriate for the modified Project traffic demands.

7.1.9 Fifield-Trundle Road and Limestone Quarry Access Intersection

For the approved Project, prior to commissioning of the mine and processing facility (as defined in the Voluntary Planning Agreement), the intersection of Fifield-Trundle Road and the Limestone Quarry Access will be constructed with a basic rural intersection treatment.

For both the approved and modified Project, the limestone would be sourced from a combination of the limestone quarry and other local quarries. The distribution of Project-generated traffic at this intersection will therefore change according to where limestone is being sourced. Trucks transporting limestone from local quarries near Parkes would travel along Fifield-Trundle Road through the intersection. Trucks transporting limestone from the limestone quarry would turn left into and right out of the limestone quarry access. The warranted major road treatment for both options has therefore been considered.

Application of the Austroads (2020b) warrants for the major road treatments at rural road intersections indicates that for the modified Project with the maximum of 560,000 tpa being sourced from local limestone quarries, and the balance of 430,000 tpa being sourced from the limestone quarry, the BAL and BAR treatments in Fifield-Trundle Road would be appropriate.

Application of the Austroads (2020b) warrants for the major road treatments at rural road intersections indicates that for the modified Project with the maximum of 790,000 tpa being sourced from the limestone quarry, and the balance of 200,000 tpa being sourced from the local quarries, the BAL and BAR treatments in Fifield-Trundle Road would be appropriate.

No change to this intersection upgrade for the approved Project would be required for the modified Project. As for the approved Project, the modified Project upgrade would take into account the swept paths of the heavy vehicles turning into and out of the limestone quarry in accordance with Austroads guidelines.

7.1.10 Wilmatha Road and Mine and Processing Facility Access Intersection

For the approved Project, prior to commissioning of the mine and processing facility (as defined in the Voluntary Planning Agreement), the intersection of Wilmatha Road with the access for the mine and processing facility will be constructed with a basic rural intersection treatment, with priority being between the mine and processing facility access and Wilmatha Road south.

The modified Project proposes that separate accesses be provided to separate the heavy vehicle movements from those of the light vehicles. A combined entry and exit access would be used by light vehicles and the shuttle buses transporting the workforce. Separate entry and exit accesses would be provided for the heavy vehicles transporting materials to and from the mine and processing facility. The general plant layout indicates that the heavy vehicle entry would be located approximately 50 m south of the light vehicle entry/exit, with heavy vehicles turning right from Wilmatha Road into the entry. The entry access would be angled at approximately 45 degrees to Wilmatha Road with sufficient width for five heavy vehicles to wait abreast before entering the weighbridge. The heavy vehicle exit would be located approximately 650 m south of the heavy vehicle entry, and would be aligned at 90 degrees to Wilmatha Road.

The combined entry/exit access would carry 82 light vehicles and 16 shuttle bus movements per day, with half being inbound and half outbound. The heavy vehicle entry access would carry 86 inbound heavy vehicles per day, and the heavy vehicle exit would carry 86 outbound heavy vehicles per day. Through traffic along Wilmatha Road unrelated to the modified Project is expected to remain low at approximately 37 vehicle trips per day (Table 3.4).

It is recommended that the intersection of Wilmatha Road with the heavy vehicle entry access be constructed with priority being for the movements between Wilmatha Road (south) and the heavy vehicle entry road. This would give priority to the laden trucks entering the mine and processing facility, so they would not need or slow or stop and restart just prior to entering the site if there is a southbound vehicle on Wilmatha Road. To achieve this, it is recommended that at the intersection, Wilmatha Road be aligned as a modified T-intersection such that southbound vehicles on Wilmatha Road perform a right turn (only) at the intersection, giving way to any heavy vehicle entering the mine site. Northbound vehicles along Wilmatha Road would perform a left turn at the intersection, however this may appropriately be designed as a through movement lane.

Similarly, it is recommended that the intersection of Wilmatha Road with the combined entry/exit access for light vehicles and shuttle buses be constructed with priority being for the movements between Wilmatha Road (south) and the mine and processing facility access. As for the heavy vehicle entry intersection, a modified T-intersection is recommended, which clearly defines the priority, with southbound vehicles along Wilmatha Road performing a right turn movement at the intersection and northbound vehicles along Wilmatha Road performing a left turn.

The heavy vehicle exit road intersection with Wilmatha Road would be appropriately constructed as a standard T-intersection, with the exit roadway being at 90 degrees to Wilmatha Road. The intersection design would take into consideration the swept path requirements of the exiting heavy vehicles turning from the exit onto Wilmatha Road.

Notwithstanding the above, it is noted that there are alternative intersection layouts that could be adopted. SEM would finalise the design of these intersections in consultation with the Lachlan Shire Council.

7.1.11 The Bogan Way, Fifield-Trundle Road and Scotson Lane Intersection

For the approved Project, prior to the commissioning of the rail siding, the intersection of The Bogan Way, Fifield-Trundle Road and Scotson Lane will be upgraded to a right-left staggered T-intersection layout with signage and line marking to Austroads standards.

The modified Project would generate a demand for 70 vehicles per day travelling between Scotson Lane and Fifield-Trundle Road compared with 54 vehicles per day for the approved Project. As intersection capacity is not a concern (Section 6.5), the right-left stagger intersection is suitable, noting that the stagger distance needs to be small enough to enable an efficient crossing manoeuvre across The Bogan Way, yet great enough to eliminate the possibility of high speed manoeuvres from the minor roads.

No change to the upgrade for the approved Project would be required for the modified Project. As for the approved Project, the upgrade would take into account the swept paths of the heavy vehicles turning between The Bogan Way and Fifield-Trundle Road, and between Scotson Lane and Fifield-Trundle Road in accordance with Austroads guidelines. Signage and linemarking will be in accordance with Austroads guidelines.

7.1.12 Scotson Lane Upgrade

Consistent with the upgrading of the transport route described in Section 7.1.2, it is appropriate to upgrade Scotson Lane between The Bogan Way and the modified rail siding access. The recommended upgraded general road standard allows for 3.5 m wide travel lanes, with a sealed shoulder 0.5 m wide and a gravel shoulder 1.0 m wide on each side of the road. This is consistent with the upgrade of the transport route (Section 7.1.2) and satisfies the Austroads (2016) requirements for a designated heavy vehicle route.

7.2 Road Maintenance Contributions

SEM will make road maintenance contributions in accordance with Development Consent (DA 374-11-00) and the Voluntary Planning Agreement.

SEM will also maintain Sunrise Lane (between the accommodation camp site access road and Wilmatha Road), to the satisfaction of Lachlan Shire Council, during the construction and operational phase of the Project.

No change to the above would be required by the modified Project.

7.3 Trundle Main Street

The review of the pedestrian environment along Forbes Street (The Bogan Way) through Trundle was undertaken with regard to the forecast conditions with the approved Project (GTA Consultants, 2018a). The recommendations from that study have been considered in the development of the Trundle Main Street Plan (King and Campbell, 2021).

For guidance, Table 7.1 compares the forecast Project-generated traffic on Forbes Street for the approved and modified Project for both the construction and ongoing operational stages. It should be noted that peak hours for Project-generated traffic (for both the approved and modified Project) would occur at the shift changeover times, so would occur earlier in the morning and later in the evening than the peaks associated with school and general local traffic in Trundle.

Table 7.1: Project-Generated Traffic on Forbes Street, Trundle

	Approved Project		Modified Project	
	Daily (vehicles per day)	Peak Hour (vehicles per hour)	Daily (vehicles per day)	Peak Hour (vehicles per hour)
Peak Construction Stage				
Light Vehicles	242	94	118	20
Buses	4	2	18	7
Heavy Vehicles	102	12	78	8
Total Vehicles	348	108	214	35
Operational Stage				
Light Vehicles	70	27	92	38
Buses	6	3	10	5
Heavy Vehicles	70	10	68	10
Total Vehicles	146	40	170	53

The change in traffic expected to use Forbes Street for the modified Project compared with the approved Project does not raise any issues with the recommendations of the Pedestrian Access Review (GTA Consultants, 2018a) or the development of the Trundle Main Street Plan (King and Campbell, 2021). In consultation with the Parkes Shire Council and TfNSW, SEM will implement any outstanding Forbes Street improvement works outlined in GTA Consultants (2018a) (Section 4.1).

7.4 Traffic Management Plan

In accordance with Condition 45, Schedule 3 of Development Consent (DA 374-11-00), a Traffic Management Plan has been developed for the approved Project and includes (Clean TeQ, 2019b):

- details of all transport routes and traffic types to be used for development-related traffic;
- a program to monitor and report on the amount of metal sulphate precipitate, scandium oxide and ammonium sulphate transported from the mine;
- a program to monitor and report on the amount of limestone transported from the limestone quarry and third party suppliers;
- the measures that would be implemented to:
  - minimise traffic safety issues and disruption to local users of the transport route/s during construction and decommissioning of the development, including:
    - temporary traffic controls, including detours and signage;
    - notifying the local community about development-related traffic impacts; and
    - a traffic management system for managing over-dimensional vehicles; and
  - operate shuttle bus services to transport employees to and from Parkes, Forbes and Condobolin;
  - operate high capacity trucks to transport limestone and other materials and products to and from the mine and processing facility;
- a Road Transport Protocol for all drivers transporting materials to and from the site with measures to:
  - ensure drivers adhere to the designated transport routes and prioritise the use of national, state and regional roads over local roads;
  - verify that these heavy vehicles are completely covered whilst in transit;
  - co-ordinate the staggering of heavy vehicle departures to minimise impacts on the road network, where practicable;
  - minimise disruption to school bus timetables and rail services;
  - ensure travelling stock access and right of way to the adjacent travelling stock route;
  - maintain radio communications between all school buses and heavy vehicle operators operating on the transport route between the rail siding and mine and processing facility, limestone quarry or third party limestone quarries and the mine and processing facility;

- manage worker fatigue during trips to and from the site;
- manage appropriate driver behaviour including adherence to speed limits, safe overtaking and maintaining appropriate distances between vehicles (i.e. a Driver Code of Conduct);
- inform drivers of relevant drug and alcohol policies;
- regularly inspect vehicles maintenance and safety records;
- implement contingency procedures when the transport route is disrupted;
- respond to emergencies;
- transport processing reagents safely;
- minimise disruption to community events and festivals, in consultation with event organisers;
- implement reasonable and feasible measures to minimise amenity impacts to local communities, including minimising night time truck movements and compression braking in urban areas as far as practicable; and
- ensure compliance with and enforcement of the protocol.

It is recommended that the Traffic Management Plan be updated to incorporate the Modification.

7.5 Road Upgrade and Maintenance Strategy

In accordance with Condition 43, Schedule 3 of Development Consent (DA 374-11-00), a Road Upgrade and Maintenance Strategy has been developed for the approved Project (Clean TeQ, 2019a) (Sections 4.1 and 4.2).

It is recommended that the Road Upgrade and Maintenance Strategy be updated to incorporate the Modification (Sections 7.1 and 7.2).

8 Conclusions

This study has found that the modified Project would have acceptable impacts on the operation of the road system. Implementation of the various mitigation measures for the approved Project, with some refinements for the modified Project, would result in no significant impacts to road performance, capacity, efficiency or safety arising as a result of the traffic associated with the modified Project.

The road and intersection upgrades required by Development Consent (DA 374-11-00) and the Voluntary Planning Agreement (including the Trundle main street pedestrian access upgrades) are appropriate for the modified Project noting that the approved Scotson Lane upgrade would be extended to the modififed rail siding access.

SEM will reach an agreement with the Lachlan Shire Council, Parkes Shire Council and Forbes Shire Council on funding and the timing of works as to any additional, specific road safety matters relevant to the Project as deemed necessary by the road safety audits conducted in accordance with the Voluntary Planning Agreement.

The road maintenance contributions required by Development Consent (DA 374-11-00) and the Voluntary Planning Agreement are also considered appropriate for the modified Project.

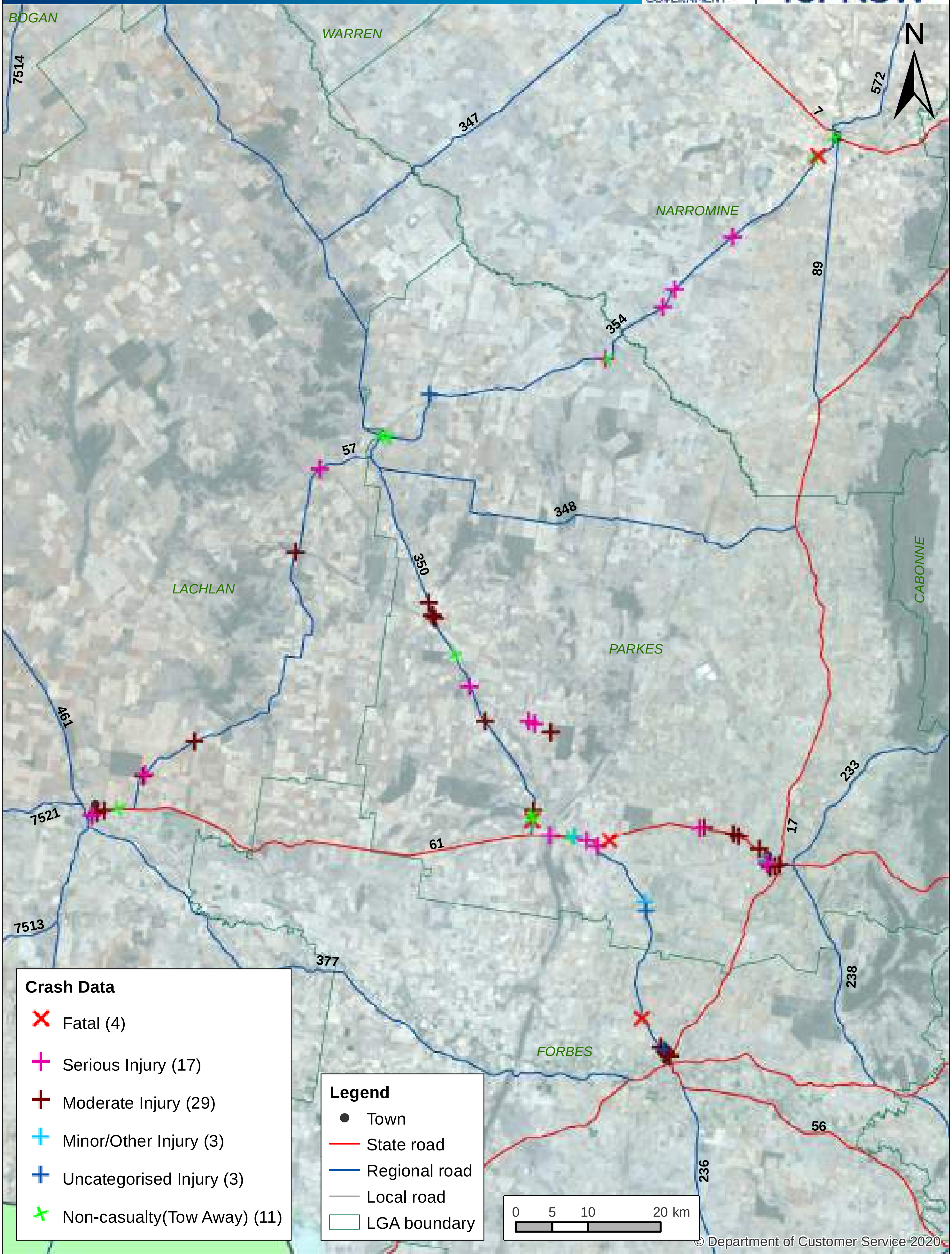
It is recommended that the Traffic Management Plan and the Road Upgrade and Maintenance Strategy be updated to incorporate the Modification.

Appendix A

Road Crash History Summary

Title

All crashes 01.07.2014 to 31.07.2020p



Detailed Crash Report

Crash No.	Data Source	Date	Day of Week	Time	Distance	ID Feature	Loc Type	Alignment	Weather	Surface Condition	Speed Limit	No. of Tus	Tu Type/Obj	Age/Sex	Street Travelling	Speed Travelling	Manoeuvre	Degree of Crash-Detailed	Killed	Seriously Inj.	Moderately Inj.	Minor/Other Inj.	Uncateg'd Inj.	Factors S F
West Region																								
Forbes LGA																								
Forbes																								
Bogan Gate Rd																								
1224203	P	22/01/2020	Wed	15:00	80 m E	CHURCHILL ST	2WY	STR	Fine	Dry	80	1	4WD	M64	W in BOGAN GATE RD	60	Proceeding in lane	MC	0	0	2	0	0	F
E73629938							RUM:	71	Off rd left => obj				Drain/culvert											
Dowling St																								
1221511	P	31/10/2019	Thu	20:50	at	JOHNSON ST	XJN	STR	Fine	Dry	50	1	UTE	M44	E in JOHNSON ST	50	Proceeding in lane	MC	0	0	1	0	0	F
E72867438							RUM:	73	Off rd rght => obj				Signpost											
Johnson St																								
1224742	S	11/12/2019	Wed	07:50	at	BARTON ST	XJN	STR	Fine	Dry	50	2	4WD	M87	W in BARTON ST	Unk	Proceeding in lane	MC	0	0	1	0	0	
E611752191							RUM:	10	Cross traffic				4WD	F36	S in JOHNSON ST	Unk	Proceeding in lane							
1177114	S	25/07/2018	Wed	20:45	at	BLACK ST	TJN	STR	Fine	Dry	50	2	TKU	M22	W in JOHNSON ST	Unk	Proceeding in lane	MC	0	0	2	0	0	
E70106780							RUM:	32	Right rear				CAR	F73	W in JOHNSON ST	0	Wait turn right							
1249384	P	23/09/2020	Wed	16:00	at	FARNELL ST	XJN	STR	Fine	Dry	50	2	CAR	F34	E in FARNELL ST	10	Proceeding in lane	UC	0	0	0	0	1	
E75812432							RUM:	10	Cross traffic				M/C	M58	S in JOHNSON ST	50	Proceeding in lane							
1117279	S	07/09/2016	Wed	12:20	at	FARRAND ST	XJN	STR	Fine	Dry	50	2	CAR	M29	W in JOHNSON ST	Unk	Proceeding in lane	NC	0	0	0	0	0	
E60923560							RUM:	32	Right rear				CAR	F54	W in JOHNSON ST	Unk	Turning right							
Newell Hwy																								
1095740	P	28/02/2016	Sun	20:30	at	DOWLING ST	TJN	CRV	Fine	Dry	50	3	TRK	M25	S in NEWELL HWY	25	Proceeding in lane	MC	0	0	4	0	0	
E60334732							RUM:	30	Rear end				VAN	F20	S in NEWELL HWY	0	Stationary							
													BDBL	U U	S in NEWELL HWY	0	Stationary							
1114936	P	10/09/2016	Sat	20:25	at	DOWLING ST	TJN	STR	Fine	Dry	50	2	CAR	M25	S in NEWELL HWY	10	Turning right	MC	0	0	1	0	0	
E62644862							RUM:	21	Right through				CAR	F25	N in NEWELL HWY	10	Proceeding in lane							
1156469	P	17/11/2017	Fri	20:44	at	SHERRIFF ST	TJN	STR	Raining	Wet	50	2	CAR	M21	S in NEWELL HWY	10	Turning right	MC	0	0	1	0	0	
E68986367							RUM:	21	Right through				CAR	F71	N in NEWELL HWY	15	Proceeding in lane							
1184902	P	24/10/2018	Wed	11:05	at	SHERRIFF ST	TJN	STR	Fine	Dry	50	2	TKU	F21	S in NEWELL HWY	20	Turning right	MC	0	0	1	0	0	
E68594170							RUM:	21	Right through				TKU	M67	N in NEWELL HWY	20	Proceeding in lane							
The Bogan Way																								
1161876	P	18/02/2018	Sun	04:20	300 m S	YARRABANDAI RD	2WY	CRV	Fine	Dry	100	1	UTE	M19	N in THE BOGAN WAY	180	Proceeding in lane	FC	1	0	0	0	0	S
E67704241							RUM:	83	Off rt/rt bnd=>obj				Fence											
Lachlan LGA																								
Condobolin																								
Denison St																								

Crash No.	Data Source	Date	Day of Week	Time	Distance	ID Feature	Loc Type	Alignment	Weather	Surface Condition	Speed Limit	No. of Tus	Tu Type/Obj	Age/Sex	Street Travelling	Speed Travelling	Manoeuvre	Degree of Crash-Detailed	Killed	Seriously Inj.	Moderately Inj.	Minor/Other Inj.	Uncateg'd Inj.	Factors S	Factors F
1187119	P	12/10/2018	Fri	19:12	at	BP SERVICE STATION ENT	2WY	CRV	Raining	Wet	50	2	WAG	M54	E in DENISON ST	15	Forward from drive	SC	0	1	0	0	0		
E69356972							RUM:	47	Emerging from drive				LOR	M23	N in DENISON ST	40	Proceeding in lane								
1120380	P	17/11/2016	Thu	06:45	at	MOLONG ST	XJN	STR	Fine	Dry	50	2	TRK	M19	E in MOLONG ST	900	Proceeding in lane	MC	0	0	2	0	0	S	
E65224884							RUM:	10	Cross traffic				4WD	M56	N in DENISON ST	50	Proceeding in lane								
1172430	P	04/05/2018	Fri	07:50	30 m S	MOLONG ST	2WY	STR	Fine	Wet	50	2	TKU	M42	E in DENISON ST	5	Reverse from drive	SC	0	1	0	0	0		
E66821009							RUM:	0	Ped nearside				PED	M55	W in DENISON ST		Walk across carriageway								
Fifield Rd																									
1158302	P	29/10/2017	Sun	12:00	at	CARLISLE RD	XJN	STR	Fine	Dry	100	2	TRK	M76	S in CARLISLE RD	60	Proceeding in lane	MC	0	0	2	0	0	S	
E66143664							RUM:	10	Cross traffic				TRK	F25	W in FIFIELD RD	95	Proceeding in lane								
1197107	P	15/03/2019	Fri	12:50	850 m N	SPRINGVALE RD	2WY	STR	Fine	Dry	100	1	CAR	M23	S in FIFIELD RD	100	Proceeding in lane	SC	0	1	0	0	0		F
E70343345							RUM:	71	Off rd left => obj				Tree/bush												
1207370	P	04/07/2019	Thu	21:00	20 km S	TRUNDLE RD	2WY	CRV	Fine	Dry	100	2	BDBL	U U	S in FIFIELD RD	Unk	Incorrect side	MC	0	0	1	0	0		
E70733009							RUM:	20	Head on				TKU	F39	N in FIFIELD RD	80	Proceeding in lane								
Henry Parkes Way																									
1170704	P	23/03/2018	Fri	15:00	300 m E	AERODROME RD	2WY	STR	Fine	Dry	100	2	CAR	U U	W in HENRY PARKES WAY	Unk	Proceeding in lane	NC	0	0	0	0	0		
E67392248							RUM:	30	Rear end				TKU	M51	W in HENRY PARKES WAY	90	Proceeding in lane								
1163842	P	18/01/2018	Thu	16:45	at	NUMBER 42 HN	2WY	STR	Fine	Dry	60	1	SEM	M70	E in HENRY PARKES WAY	40	Proceeding in lane	MC	0	0	1	0	0		
E66495845							RUM:	73	Off rd rght => obj				Tree/bush												
Jones Lane																									
1151947	P	01/09/2017	Fri	15:15	30 m S	MAITLAND ST	2WY	STR	Fine	Dry	50	2	SEM	M49	S in JONES LANE	30	Proceeding in lane	MC	0	0	1	0	0		
E65688266							RUM:	92	Struck train				TRN	M50	W in JONES LANE		Other manoeuvre								
Fifield																									
Fifield Rd																									
1156166	P	12/08/2017	Sat	10:30	20 km W	TULLAMORE TN	2WY	STR	Fine	Dry	100	1	M/C	M20	E in FIFIELD RD	90	Proceeding in lane	MC	0	0	1	0	0		
E65489966							RUM:	67	Struck animal				Kangaroo												
Tullamore																									
The Bogan Way																									
1086519	P	19/10/2015	Mon	15:40	7.6 km W	CARDIGAN ST	2WY	STR	Fine	Dry	100	1	BDBL	M58	W in THE BOGAN WAY	80	Proceeding in lane	SC	0	1	0	0	0		
E58675370							RUM:	71	Off rd left => obj				Tree/bush												

Narromine LGA

Narromine

Dandaloo St

Detailed Crash Report

Crash No.	Data Source	Date	Day of Week	Time	Distance	ID Feature	Loc Type	Alignment	Weather	Surface Condition	Speed Limit	No. of Tus	Tu Type/Obj	Age/Sex	Street Travelling	Speed Travelling	Manoeuvre	Degree of Crash-Detailed	Killed	Seriously Inj.	Moderately Inj.	Minor/Other Inj.	Uncateg'd Inj.	Factors S	Factors F
1178261	S	13/08/2018	Mon	13:15	at	DERRIBONG AVE	XJN	STR	Fine	Dry	50	1	RDTR	M27	N in DERRIBONG AVE	Unk	Turning right	NC	0	0	0	0	0	S	
E68853733							RUM:	88	Out of cont on bend																
The Mcgrane Way																									
1217023	P	26/10/2019	Sat	10:16	10 m S	BELMONT RD	TJN	STR	Fine	Dry	110	1	BDBL	M64	N in THE MCGRANE WAY	80	Proceeding in lane	SC	0	1	0	0	0		
E73020162							RUM:	70	Off road to left																
1206929	P	27/05/2019	Mon	17:15	30 km S	NARROMINE TN	2WY	STR	Fine	Dry	110	1	UTE	M19	S in THE MCGRANE WAY	100	Proceeding in lane	SC	0	1	0	0	0		F
E71485264							RUM:	71	Off rd left => obj				Tree/bush												
1187465	P	20/11/2018	Tue	16:10	33 km S	NARROMINE TN	2WY	CRV	Overcast	Dry	100	1	BDBL	M53	S in THE MCGRANE WAY	75	Proceeding in lane	SC	0	1	0	0	0	S	
E135629402							RUM:	88	Out of cont on bend																
1079894	P	23/09/2015	Wed	17:15	at	RAILWAY LX	2WY	CRV	Fine	Dry	100	2	BDBL	M46	E in THE MCGRANE WAY	100	Proceeding in lane	FC	1	0	1	0	0	S	
E58966145							RUM:	92	Struck train				TRN	M36	S in THE MCGRANE WAY		Other manoeuvre								
1155037	S	16/11/2017	Thu	22:00	100 m S	WILSONS LANE	2WY	STR	Overcast	Wet	100	1	TRK	M43	S in THE MCGRANE WAY	Unk	Proceeding in lane	NC	0	0	0	0	0		
E65875813							RUM:	67	Struck animal				Straying stock												
Parkes LGA																									
Bogan Gate																									
Henry Parkes Way																									
1116776	S	27/09/2016	Tue	15:15	5 km E	BOGAN GATE TN	2WY	STR	Fine	Dry	100	1	BDBL	F34	E in HENRY PARKES WAY	Unk	Proceeding in lane	NC	0	0	0	0	0		
E62019337							RUM:	72	Off road to right																
1076103	S	12/08/2015	Wed	14:15	1 km W	PARKES TN	2WY	STR	Raining	Wet	100	1	CAR	M33	E in HENRY PARKES WAY	Unk	Proceeding in lane	OC	0	0	0	1	0		
E58902561							RUM:	71	Off rd left => obj				Tree/bush												
1164775	P	03/02/2018	Sat	05:30	40 m W	RAWSON RD	2WY	CRV	Fine	Dry	100	1	CAR	M42	E in HENRY PARKES WAY	100	Proceeding in lane	SC	0	1	0	0	0	S	
E66618640							RUM:	80	Off left/right bend																
Middle Trundle Rd																									
1198780	P	22/01/2019	Tue	06:00	10 km E	THE BOGAN WAY	2WY	STR	Fine	Dry	100	1	CAR	F20	E in MIDDLE TRUNDLE RD	100	Proceeding in lane	MC	0	0	1	0	0		
E72514084							RUM:	67	Struck animal				Kangaroo												
The Bogan Way																									
1115044	P	09/09/2016	Fri	21:00	2 km N	BLACK RANGE RD	2WY	STR	Raining	Wet	100	1	TRK	M48	S in THE BOGAN WAY	Unk	Proceeding in lane	NC	0	0	0	0	0		F
E62824267							RUM:	73	Off rd rght => obj				Tree/bush												
1123954	P	12/01/2017	Thu	21:50	1 km N	RAWSON RD	2WY	STR	Fine	Dry	100	1	TRK	M29	N in THE BOGAN WAY	Unk	Proceeding in lane	FC	1	1	0	0	0		
E63253440							RUM:	74	On road-out of cont.																
1119023	S	30/10/2016	Sun	17:00	3 km N	STATION ST	2WY	STR	Overcast	Dry	100	1	UTE	M26	S in THE BOGAN WAY	Unk	Proceeding in lane	NC	0	0	0	0	0		
E62495923							RUM:	72	Off road to right																
1146049	P	06/08/2017	Sun	15:15	55 km S	TULLAMORE TN	2WY	STR	Unk	Dry	100	1	4WD	M80	N in THE BOGAN WAY	100	Proceeding in lane	MC	0	0	1	0	0		F
E65372176							RUM:	72	Off road to right																

Detailed Crash Report

Crash No.	Data Source	Date	Day of Week	Time	Distance	ID Feature	Loc Type	Alignment	Weather	Surface Condition	Speed Limit	No. of Tus	Tu Type/Obj	Age/Sex	Street Travelling	Speed Travelling	Manoeuvre	Degree of Crash-Detailed	Killed	Seriously Inj.	Moderately Inj.	Minor/Other Inj.	Uncateg'd Inj.	Factors S	Factors F
Gunningbland																									
Henry Parkes Way																									
1138991	P	20/04/2017	Thu	20:40	1.8 km W	BOGAN GATE RD	2WY	CRV	Fine	Dry	100	1	UTE	M52	W in HENRY PARKES WAY	100	Proceeding in lane	SC	0	1	0	0	0	S	
E63127260							RUM:	83	Off rt/rt bnd=>obj				Tree/bush												
1190741	P	23/01/2019	Wed	19:00	1.6 km W	LYNTON LANE	2WY	STR	Overcast	Dry	100	1	CAR	F47	W in HENRY PARKES WAY	100	Proceeding in lane	FC	1	0	0	0	0	S	
E136839102							RUM:	71	Off rd left => obj				Drain/culvert												
The Bogan Way																									
1209830	P	10/08/2019	Sat	15:30	140 m S	HENRY PARKES WAY	2WY	CRV	Raining	Wet	100	1	M/C	M53	N in THE BOGAN WAY	60	Proceeding in lane	SC	0	1	0	0	0	S	
E72380115							RUM:	85	Off rt/lft bnd=>obj				Tree/bush												
Nelungaloo																									
The Bogan Way																									
1246379	P	06/10/2020	Tue	14:30	20 km N	FORBES TN	2WY	STR	Fine	Dry	100	1	4WD	F66	N in THE BOGAN WAY	90	Proceeding in lane	UC	0	0	0	0	1		F
E75770012							RUM:	71	Off rd left => obj				Tree/bush												
1147091	P	23/08/2017	Wed	08:00	100 m S	NELUNGALOO RD	2WY	STR	Fine	Dry	80	1	4WD	M39	S in THE BOGAN WAY	90	Pull out opposite	OC	0	0	0	1	0	S	
E65343407							RUM:	51	Out of control otake																
Parkes																									
Hartigan Ave																									
1112804	P	18/08/2016	Thu	16:15	at	BEST ST	TJN	STR	Fine	Dry	50	2	CAR	F69	W in HARTIGAN AVE	20	Turning right	MC	0	0	1	0	0		
E61119120							RUM:	13	Right near				CAR	F32	S in BEST ST	0	Stationary								
1224069	P	11/01/2020	Sat	08:00	at	BILLY MAC PL	TJN	CRV	Fine	Dry	50	1	ATKR	M29	N in HARTIGAN AVE	Unk	Proceeding in lane	OC	0	0	0	1	0	S	
E286840996							RUM:	81	Off left/rt bnd=>obj				Embankment												
1235094	P	03/06/2020	Wed	19:19	100 m S	BILLY MAC PL	2WY	CRV	Fine	Dry	50	1	TKU	M26	S in HARTIGAN AVE	100	Proceeding in lane	SC	0	1	0	0	0	S	
E73554160							RUM:	84	Off right/left bend																
1169177	S	27/04/2018	Fri	17:22	at	LONDON RD	TJN	CRV	Fine	Dry	50	2	WAG	M32	N in LONDON RD	Unk	Proceeding in lane	MC	0	0	1	0	0		
E238954098							RUM:	30	Rear end				4WD	M60	N in LONDON RD	0	Stationary								
1220316	P	22/10/2019	Tue	16:00	500 m W	LONDON RD	2WY	STR	Fine	Dry	50	1	CAR	F19	W in HARTIGAN AVE	Unk	Proceeding in lane	SC	0	1	0	0	0		
E72835472							RUM:	71	Off rd left => obj				Tree/bush												
Henry Parkes Way																									
1233695	P	29/04/2020	Wed	10:00	2.1 km W	MCGRATH LANE	2WY	CRV	Raining	Wet	100	1	WAG	M74	W in HENRY PARKES WAY	80	Proceeding in lane	SC	0	1	0	0	0	S	
E73521309							RUM:	80	Off left/right bend																
1185444	P	28/10/2018	Sun	04:00	100 m W	MILLERS LOOKOUT RD	2WY	STR	Fine	Dry	100	1	4WD	M19	E in HENRY PARKES WAY	100	Proceeding in lane	MC	0	0	1	0	0		F
E69667728							RUM:	74	On road-out of cont.																
1155716	P	10/10/2017	Tue	23:45	1 km W	MOULDEN ST	2WY	STR	Fine	Dry	100	1	BDBL	M40	W in HENRY PARKES WAY	95	Proceeding in lane	MC	0	0	1	0	0		
E65364644							RUM:	70	Off road to left																

Detailed Crash Report

Crash No.	Data Source	Date	Day of Week	Time	Distance	ID Feature	Loc Type	Alignment	Weather	Surface Condition	Speed Limit	No. of Tus	Tu Type/Obj	Age/Sex	Street Travelling	Speed Travelling	Manoeuvre	Degree of Crash-Detailed	Killed	Seriously Inj.	Moderately Inj.	Minor/Other Inj.	Uncateg'd Inj.	Factors S	Factors F
1205117	P	30/04/2019	Tue	18:00	10 km W	PARKES TN	2WY	CRV	Fine	Dry	100	1	4WD	F22	E in HENRY PARKES WAY	100	Proceeding in lane	MC	0	0	1	0	0		
E71677557							RUM:	67	Struck animal				Kangaroo												
1197860	P	08/02/2019	Fri	19:30	Unk Unk	UNKNOWN UK	2WY	STR	Overcast	Dry	100	1	CAR	F25	E in HENRY PARKES WAY	100	Proceeding in lane	MC	0	0	1	0	0		F
E72066187							RUM:	74	On road-out of cont.																
Newell Hwy																									
1145981	P	09/08/2017	Wed	20:20	at	HARTIGAN AVE	XJN	CRV	Fine	Dry	50	2	CAR	F68	E in HARTIGAN AVE	15	Turning right	MC	0	0	1	0	0		
E284360594							RUM:	21	Right through				MSC	M22	W in HARTIGAN AVE	30	Proceeding in lane								
Westlime Rd																									
1200450	S	22/02/2019	Fri	10:05	at	BROLGAN RD	XJN	STR	Fine	Dry	50	2	TKU	F60	E in BROLGAN RD	Unk	Proceeding in lane	MC	0	0	1	0	0		
E427090892							RUM:	10	Cross traffic				TKU	M28	S in WESTLIME RD	Unk	Proceeding in lane								
Trundle																									
Forbes St																									
1125630	P	15/12/2016	Thu	15:00	20 m N	PARKES ST	2WY	STR	Fine	Dry	50	4	CAR	F85	S in FORBES ST	75	Proceeding in lane	SC	0	1	1	2	0	S	
E63669879							RUM:	71	Off rd left => obj				CAR	M69	W in FORBES ST	0	Parked								
													TRK		W in FORBES ST	0	Stationary								
													4WD		W in FORBES ST	0	Parked								
Middle Trundle Rd																									
1193288	P	28/10/2018	Sun	11:50	1.05 km E	DOREENS LANE	2WY	CRV	Fine	Dry	100	1	CAR	F69	W in MIDDLE TRUNDLE RD	Unk	Proceeding in lane	SC	0	1	0	0	0	S	
E70016665							RUM:	87	Off lft/lft bnd=>obj				Drain/culvert												
1165332	P	02/03/2018	Fri	14:21	2 km E	DOREENS LANE	2WY	STR	Fine	Dry	100	1	WAG	F48	E in MIDDLE TRUNDLE RD	80	Proceeding in lane	SC	0	1	0	0	0		
E67387421							RUM:	71	Off rd left => obj				Tree/bush												
The Bogan Way																									
1211481	P	05/08/2019	Mon	19:00	2 km N	CAPELL RD	2WY	STR	Fine	Dry	100	1	TKU	M33	S in THE BOGAN WAY	80	Proceeding in lane	MC	0	0	1	0	0		F
E71385805							RUM:	73	Off rd rght => obj				Drain/culvert												
1108031	P	28/05/2016	Sat	11:14	1 km S	MIDDLETRUNDLE RD	2WY	STR	Overcast	Wet	100	1	4WD	F21	S in THE BOGAN WAY	90	Proceeding in lane	MC	0	0	1	0	0		
E60895037							RUM:	73	Off rd rght => obj				Tree/bush												
1165166	P	26/02/2018	Mon	11:05	3.2 km N	NUMULLA RD	2WY	CRV	Fine	Dry	100	1	LOR	M28	S in THE BOGAN WAY	100	Proceeding in lane	NC	0	0	0	0	0		
E1020791390							RUM:	80	Off left/right bend																
1204127	P	11/04/2019	Thu	09:30	1 km S	ROCKLEA RD	2WY	CRV	Fine	Dry	100	1	CAR	F32	N in THE BOGAN WAY	100	Proceeding in lane	MC	0	0	1	0	0	S	
E137087601							RUM:	85	Off rt/lft bnd=>obj				Tree/bush												
1111718	P	18/07/2016	Mon	18:36	9 km N	TRUNDLE TN	2WY	STR	Fine	Dry	100	1	TRK	M20	S in THE BOGAN WAY	80	Proceeding in lane	MC	0	0	1	0	0		
E61672913							RUM:	67	Struck animal				Straying stock												
1186045	P	26/09/2018	Wed	07:00	10 km N	TRUNDLE TN	2WY	STR	Fine	Dry	100	1	CAR	F32	N in THE BOGAN WAY	Unk	Proceeding in lane	MC	0	0	1	0	0		
E133389301							RUM:	73	Off rd rght => obj				Drain/culvert												

Detailed Crash Report

Crash No.	Data Source	Date	Day of Week	Time	Distance	ID Feature	Loc Type	Alignment	Weather	Surface Condition	Speed Limit	No. of Tus	Tu Type/Obj	Age/Sex	Street Travelling	Speed Travelling	Manoeuvre	Degree of Crash-Detailed	Killed	Seriously Inj.	Moderately Inj.	Minor/Other Inj.	Uncateg'd Inj.	Factors S F
Tullamore																								
The Bogan Way																								
1074654	P	15/07/2015	Wed	06:00	at	THE MCGRANE WAY	TJN	STR	Overcast	Wet	100	1	BDBL	M39	N in THE BOGAN WAY	90	Proceeding in lane	NC	0	0	0	0	0	
E58390647							RUM: 75		Off end of road				Signpost											
The Mcgrane Way																								
1160139	S	07/01/2018	Sun	21:53	3 km W	BULGANDRAMINE RD	2WY	STR	Overcast	Wet	100	1	BDBL	M49	E in THE MCGRANE WAY	Unk	Proceeding in lane	NC	0	0	0	0	0	
E66272304							RUM: 70		Off road to left															
1212366	P	08/09/2019	Sun	02:15	1 km E	CARDIGAN ST	2WY	STR	Fine	Dry	100	2	CAR	M57	E in THE MCGRANE WAY	Unk	Pull out opposite	NC	0	0	0	0	0	
E73261368							RUM: 53		Overtake turning				4WD	M70	E in THE MCGRANE WAY	5	Turning right							
1219021	P	31/10/2019	Thu	08:50	250 m E	CURRA LANE	2WY	CRV	Fine	Dry	100	1	SEM	M59	E in THE MCGRANE WAY	Unk	Proceeding in lane	SC	0	1	0	0	0	S F
E72290024							RUM: 80		Off left/right bend															
1252533	P	01/11/2020	Sun	13:30	150 m S	NEW PARK LANE	2WY	CRV	Fine	Dry	100	1	SEM	M30	S in THE MCGRANE WAY	60	Proceeding in lane	UC	0	0	0	0	1	S
E76433832							RUM: 87		Off lft/lft bnd=>obj				Signpost											

Report Totals: Crashes: 67 Fatal Crashes(FC): 4 Serious Injury Crashes(SC): 17 Moderate Injury Crashes(MC): 29 Minor/Other Injury Crashes(OC): 3 Uncategorised Injury Crashes(UC): 3 Non-Casualty Crashes(NC): 11

Killed(K): 4 Seriously Injured(S): 18 Moderately Injured(M): 38 Minor/Other Injured(O): 5 Uncategorised Injured(U): 3

Crashid dataset Fifield Area Crashes 01.07.2015 to 07.03.2021p

Note: *Data for the 9 month period prior to the generated date of this report are incomplete and are subject to change.*

Crash self reporting, including self reported injuries began Oct 2014. Trends from 2014 are expected to vary from previous yrs. More unknowns are expected in self reported data. Reporting yrs 1996-2004 & 2020 Q3 onwards contain uncategorised inj crashes.

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sunrise
energy metals

w w w . s u n r i s e e m . c o m

sunrise
energy metals

Sunrise Project

Project Execution Plan Modification

Appendix E

Preliminary Hazard Analysis

Pinnacle
Risk Management Pty Ltd

PRELIMINARY HAZARD ANALYSIS
FOR THE SUNRISE PROJECT
PROJECT EXECUTION PLAN MODIFICATION,
FIFIELD, NSW

Prepared by: Dean Shewring

29 June 2021

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Sunrise Project PEP Modification -
Preliminary Hazard Analysis

Disclaimer

This report was prepared by Pinnacle Risk Management Pty Limited (Pinnacle Risk Management) as an account of work for Sunrise Energy Metals Limited (SEM). The material in it reflects Pinnacle Risk Management's best judgement in the light of the information available to it at the time of preparation. However, as Pinnacle Risk Management cannot control the conditions under which this report may be used, Pinnacle Risk Management will not be responsible for damages of any nature resulting from use of or reliance upon this report. Pinnacle Risk Management's responsibility for advice given is subject to the terms of engagement with SEM.

Rev	Date	Description	Reviewed By
A	1/06/2021	Draft for Comment	SEM
B	26/6/21	Draft Comments Included	SEM
C	29/6/21	Final Issue	SEM

Contents

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

The Sunrise Project (the Project) is a nickel, cobalt and scandium open cut mining project situated near the village of Fifield, approximately 350 kilometres (km) west-northwest of Sydney, in New South Wales.

Development Consent (DA 374-11-00) for the Project was issued under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) in 2001.

SRL Ops Pty Ltd owns the rights to develop the Project. SRL Ops Pty Ltd is a wholly owned subsidiary of Sunrise Energy Metals Limited (SEM)[1].

SEM has continued to review and optimise the Project design, construction and operations as part of preparations for Project execution. The outcomes of this review are outlined in the Project Execution Plan.

The Project Execution Plan Modification (the Modification) includes the implementation of Project changes identified in the Project Execution Plan to optimise the construction and operation of the Project. The Project Execution Plan identified a number of changes to the approved mine and processing facility, accommodation camp, rail siding and road transport activities.

Pinnacle Risk Management Pty Ltd has been engaged by SEM to conduct a Preliminary Hazard Analysis (PHA) for the modified Project. Relevant to this PHA, the Modification would include the following changes to the mine and processing facility:

- Revised processing facility area layout including a revised processing plant layout;
- Revised processing plant reagent types, rates and storage volumes (including increased ammonia storage vessels capacity); and
- Reduced sulphuric acid plant stack height from 80 m to 40 m.

The Modification would include a revised rail siding location and layout, and the addition of an ammonium sulphate storage and distribution facility to the rail siding.

This PHA has been prepared to support an application by SEM to modify Development Consent (DA 374-11-00) for the Project, which would be sought under section 4.55(2) of the EP&A Act.

The risks associated with the modified mine and processing facility, and rail siding have been assessed and compared against the NSW Department of Planning (now the NSW Department of Planning, Industry and Environment) risk criteria.

The results are summarised in Table 1 and show compliance with all risk criteria.

[1] SEM was previously Clean TeQ Holdings Limited (Clean TeQ).

Table 1 - HIPAP 4 Risk Compliance

Description	Risk Criteria	Risk Acceptable?	Comments
Fatality risk to sensitive users, including hospitals, schools, aged care	0.5×10^{-6} per year	Y	The facility is to be located in a rural area with no nearby sensitive landusers. Based on the analysis in this PHA, there are no credible fires, explosions or toxic gas releases that can cause fatality to sensitive land users. The estimated maximum individual fatality risk at the site boundary is 1×10^{-6}/yr
Fatality risk to residential and hotels	1×10^{-6} per year	Y	As the estimated maximum individual fatality risk at the site boundary is 1×10^{-6}/yr then this criterion is satisfied
Fatality risk to commercial areas, including offices, retail centres, warehouses	5×10^{-6} per year	Y	As the estimated maximum individual fatality risk at the site boundary is 1×10^{-6}/yr then this criterion is satisfied
Fatality risk to sporting complexes and active open spaces	10×10^{-6} per year	Y	As the estimated maximum individual fatality risk at the site boundary is 1×10^{-6}/yr then this criterion is satisfied
Fatality risk to be contained within the boundary of an industrial site	50×10^{-6} per year	Y	As the estimated maximum individual fatality risk at the site boundary is 1×10^{-6}/yr then this criterion is satisfied
Injury risk – incident heat flux radiation at residential areas should not exceed 4.7 kW/m^2 at frequencies of more than 50 chances in a million per year or incident explosion overpressure at residential areas should not exceed 7 kPa at frequencies of more than 50 chances in a million per year	50×10^{-6} per year	Y	Based on the analysis in this PHA, there are no credible fires or explosions that can cause injury at the closest privately owned residence

Description	Risk Criteria	Risk Acceptable?	Comments
Toxic exposure – Toxic concentrations in residential areas which would be seriously injurious to sensitive members of the community following a relatively short period of exposure	10×10^{-6} per year	Y	The likelihood of causing injury at the closest privately owned residence is approximately 1×10^{-6}/yr, therefore, this criterion is satisfied
Toxic exposure – Toxic concentrations in residential areas which should cause irritation to eyes or throat, coughing or other acute physiological responses in sensitive members of the community	50×10^{-6} per year	Y	The likelihood of causing irritation at the closest privately owned residence is approximately 4×10^{-6}/yr, therefore, this criterion is satisfied
Propagation due to Fire and Explosion – exceed radiant heat levels of 23 kW/m^2 or explosion overpressures of 14 kPa in adjacent industrial facilities	50×10^{-6} per year	Y	The facility has no adjacent industrial facilities, therefore, this criterion is satisfied

Societal risk, area cumulative risk, propagation risk, transport risk and environmental risk are also concluded to be acceptable.

The primary reason for the low risk levels from the modified mine and processing facility and rail siding is the separation distances between the potentially hazardous materials and equipment and the nearest private place of residences and also the site boundaries.

The highest contributors to off-site risk are releases of ammonia, in particular, from transfer operations to the storage vessels, and sulphur dioxide releases from catastrophic equipment failure. It is expected that the design review process followed by the Hazard and Operability (HAZOP) study would help mitigate the risk of releases to acceptable levels. This would include designing to Australian Standard AS2022 for the ammonia storage and handling systems. The following recommendations were made in the approved 2017 PHA and are still valid for the modified design. These recommendations are made to lower the risk associated with releases of ammonia.

1. Ensure that the final design includes means to automatically isolate the ammonia road tanker and storage vessels should a release during a transfer occur (vapour and liquid lines). Actuation should be local as well as remote;

2. Provide closed circuit television (CCTV) coverage of the ammonia transfer area to the plant's control room;

3. Provide means to isolate the ammonia flow to the plant should a release occur. This should be at each storage vessel;

4. Provide means to suppress an ammonia vapour plume. A plume could occur due to a release from the transfer system, the storage vessels or the plant supply lines. Options include spray deluge for the transfers bay and fire water monitors in the transfer and storage area. The latter can be operated remotely (preferable) or manually (may require the use of a full protective suit with self-contained breathing air). Monitors can be fixed or portable;

5. Provide means for road tanker driveaway protection. This could include interlocks on the vehicles brakes or self-sealing devices in the transfer lines;

6. Include the transfer hoses and couplings (dry-break preferred) in the preventative maintenance system. The transfer hoses would need to be regularly inspected, tested and replaced as per the manufacturer's recommendations;

7. Provide means for preventing stress corrosion cracking in the ammonia storage vessels and include the vessels in the preventative maintenance system for routine inspections;

8. Provide wind socks at appropriate locations to allow people to decide the best means of escape from an ammonia plume;

9. Provide alternate emergency assembly areas given that an ammonia plume can travel in any direction;

10. Provide means for protection for the ammonia road tanker driver should a release occur, e.g. safehouse;

11. Apply good practice for building design, e.g. design buildings as safehouses should relevant guidelines recommend this. For example, design buildings as per the recommendations in the Chemical Industries Association guideline, “Guidance for the Location and Design of Occupied Buildings on Chemical Manufacturing Sites”;

12. Provide overfill protection on the ammonia storage vessels. This system should be reviewed via a Safety Integrity Level (SIL) analysis; and

13. Provide means to prevent the vapour compressor from overpressuring the vapour return line and/or the road tanker.

GLOSSARY

Al	Aluminium
ANE	Ammonium Nitrate Emulsion
AS	Australian Standard
CCPS	Centre for Chemical Process Safety
CCTV	Closed Circuit Television
cLX	Continuous Resin-In-Column
cRIP	Continuous Resin–in-Pulp
CSX	Cobalt Solvent Extraction
DG	Dangerous Good
DoP	NSW Department of Planning (now the Department of Planning, Industry and Environment)
DPIE	Department of Planning, Industry and Environment
EP&A	Environmental Planning and Assessment (Act)
ERPG	Emergency Response Planning Guidelines
EIV	Emergency Isolation Valve
EN	Eluate Neutralisation
FEL	Front-End Loader
HAZOP	Hazard and Operability Study
HIPAP	Hazardous Industry Planning Advisory Paper
HP	High Pressure
HPAL	High Pressure Acid Leach
HSE	Health and Safety Executive (UK)
IBC	Intermediate Bulk Container
IDLH	Immediately Dangerous to Life and Health
ISX	Impurity Solvent Extraction
LGA	Local Government Area
LP	Low Pressure

Ni	Nickel
NSW	New South Wales
NSX	Nickel Solvent Extraction
PAL	Pressure Acid Leach
PHA	Preliminary Hazard Analysis
PN	Partial Neutralisation
QRA	Quantitative Risk Analysis
ROM	Run of Mine
Sc	Scandium
SEM	Sunrise Energy Metals Limited
SEP	Surface Emissive Power
SEPP	State Environmental Planning Policy
SFARP	So Far As Reasonably Practicable
Si	Silica
SIL	Safety Integrity Level
SMBS	Sodium Metabisulphate
SLOT	Specified Level of Toxicity
SSAN	Security Sensitive Ammonium Nitrate
STEL	Short Term Exposure Limit
SX	Solvent Extraction
TLV	Threshold Limit Value
TN	Tailings Neutralisation
TNT	Trinitrotoluene
TWA	Time Weighted Average

REPORT

1 INTRODUCTION

1.1 BACKGROUND

The Sunrise Project (the Project) is a nickel, cobalt and scandium open cut mining project situated near the village of Fifield, approximately 350 kilometres (km) west-northwest of Sydney, in New South Wales (NSW) (Figure 1).

Development Consent (DA 374-11-00) for the Project was issued under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) in 2001.

The Project includes the establishment and operation of the following:

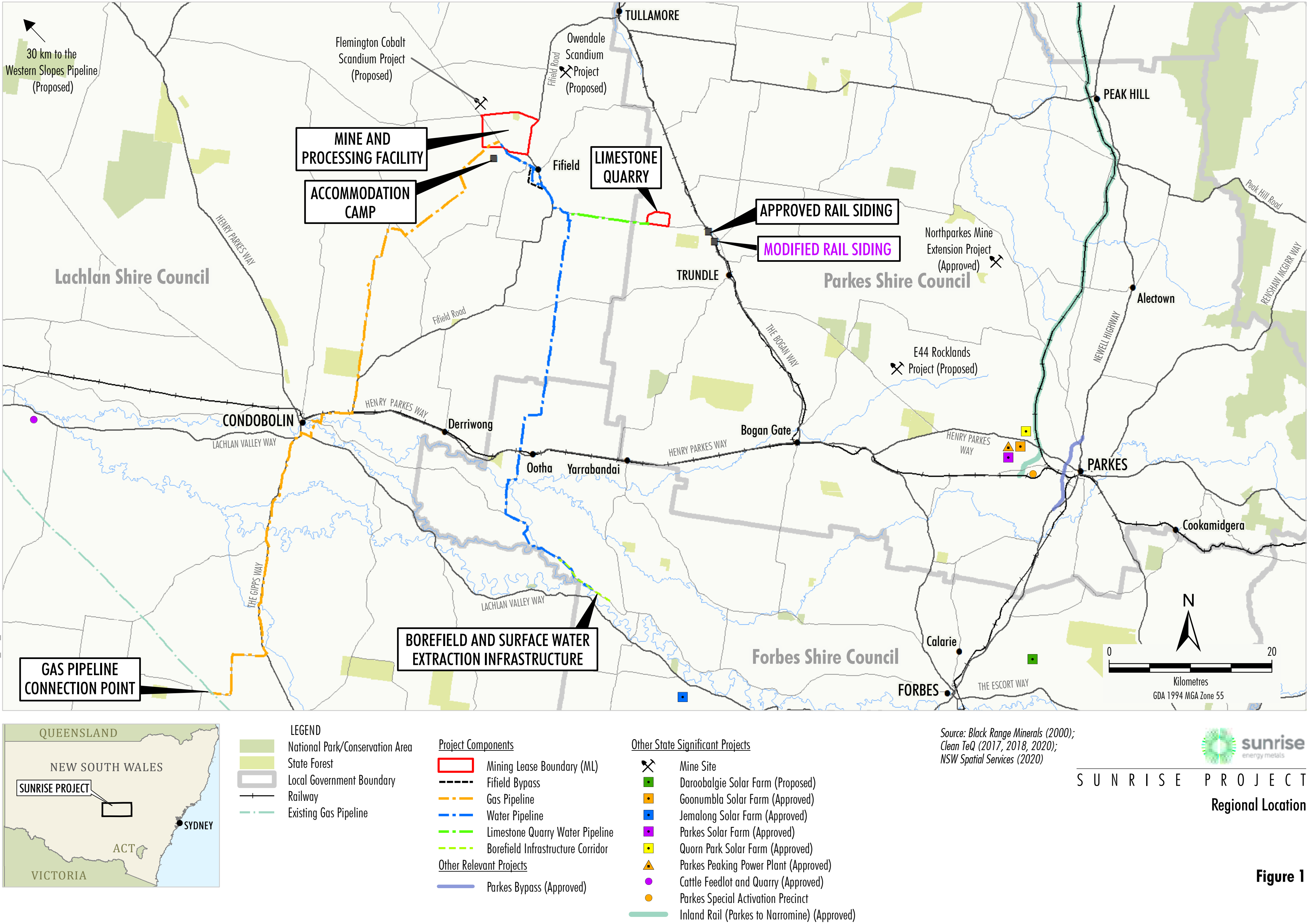
- Mine and processing facility;
- Limestone quarry;
- Rail siding;
- Borefield, surface water extraction infrastructure and water pipeline;
- Gas pipeline; and
- Associated transport activities and transport infrastructure (e.g. the Fifield Bypass, road and intersection upgrades).

SRL Ops Pty Ltd owns the rights to develop the Project. SRL Ops Pty Ltd is a wholly owned subsidiary of Sunrise Energy Metals Limited (SEM)[2].

SEM has continued to review and optimise the Project design, construction and operations as part of preparations for Project execution. The outcomes of this review are outlined in the Project Execution Plan.

The Project Execution Plan Modification (the Modification) includes the implementation of Project changes identified in the Project Execution Plan to optimise the construction and operation of the Project. The Project Execution Plan identified a number of changes to the approved mine and processing facility, accommodation camp, rail siding and road transport activities.

[2] SEM was previously Clean TeQ Holdings Limited (Clean TeQ).



Source: Black Range Minerals (2000); Clean TeQ (2017, 2018, 2020); NSW Spatial Services (2020)

SUNRISE PROJECT

Regional Location

Figure 1

Pinnacle Risk Management Pty Ltd (Pinnacle) has been engaged by SEM to conduct a Preliminary Hazard Analysis (PHA) for the modified mine and processing facility. The original PHA for the Project was completed in 2000 (Ref 1), while the currently approved PHA for the Project was completed in 2017 for Modification 4 (Ref 2).

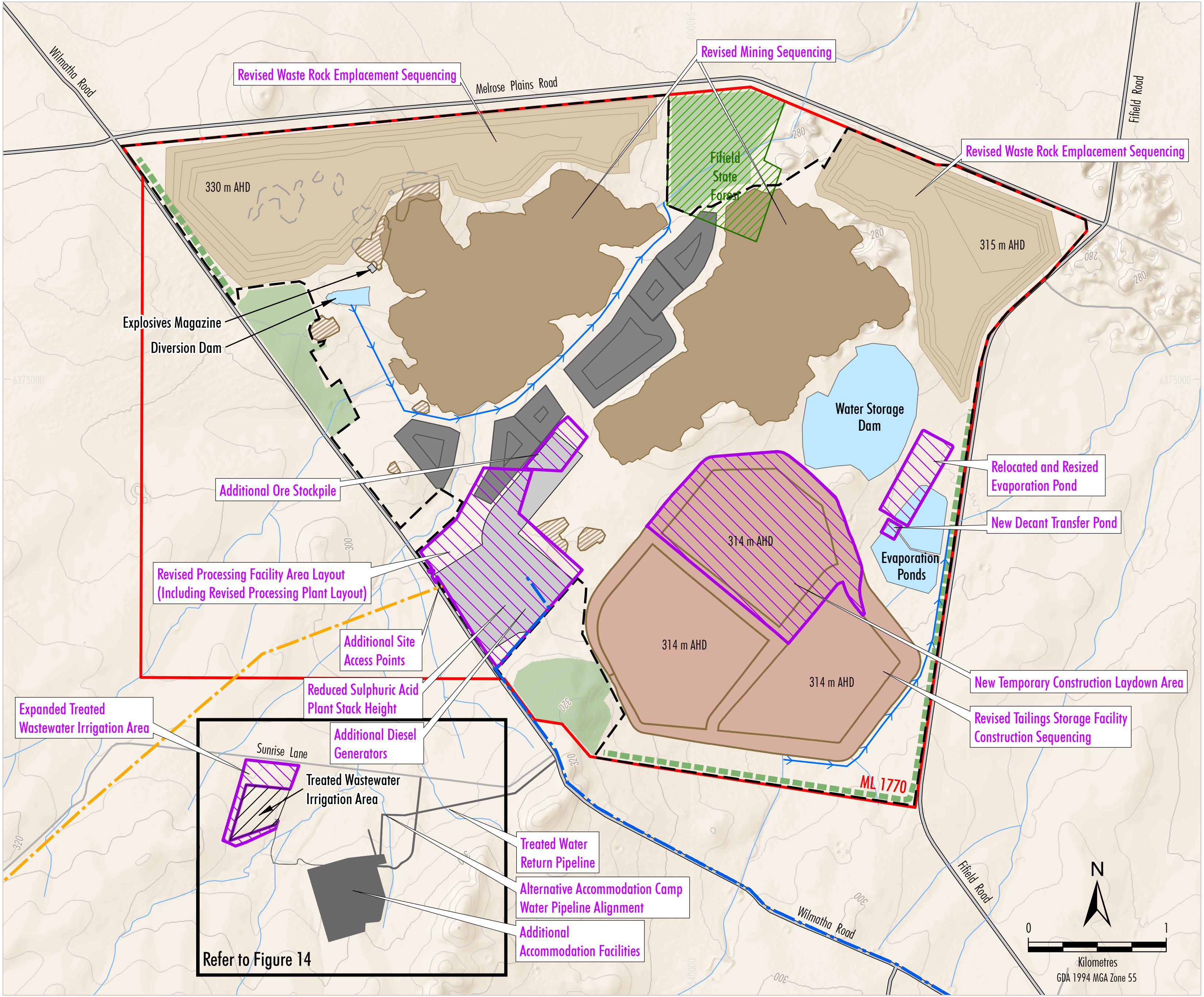
The Modification would include the following changes to the mine and processing facility (Figure 2):

- Revised processing facility area layout including a revised processing plant layout;
- Revised processing plant reagent types, rates and storage volumes (including increased ammonia storage vessels capacity);
- Reduced sulphuric acid plant stack height from 80 metres (m) to 40 m; and
- Increased number of diesel-powered backup generators (and associated stacks) from one to four.

Also, the Modification would include a revised rail siding location and layout, and the addition of an ammonium sulphate storage and distribution facility to the rail siding (Figure 3 and Figure 4).

This PHA has been prepared to support an application by SEM to modify Development Consent (DA 374-11-00) for the Project, which would be sought under section 4.55(2) of the EP&A Act.

This PHA has been prepared in accordance with the guidelines published by the NSW Department of Planning (DoP) (now the NSW Department of Planning, Industry and Environment [DPIE]) *Hazardous Industry Planning Advisory Paper (HIPAP) No 6* (Ref 3).



Source: Black Range Minerals (2000); Clean TeQ (2017, 2018, 2020); NSW Spatial Services (2020)

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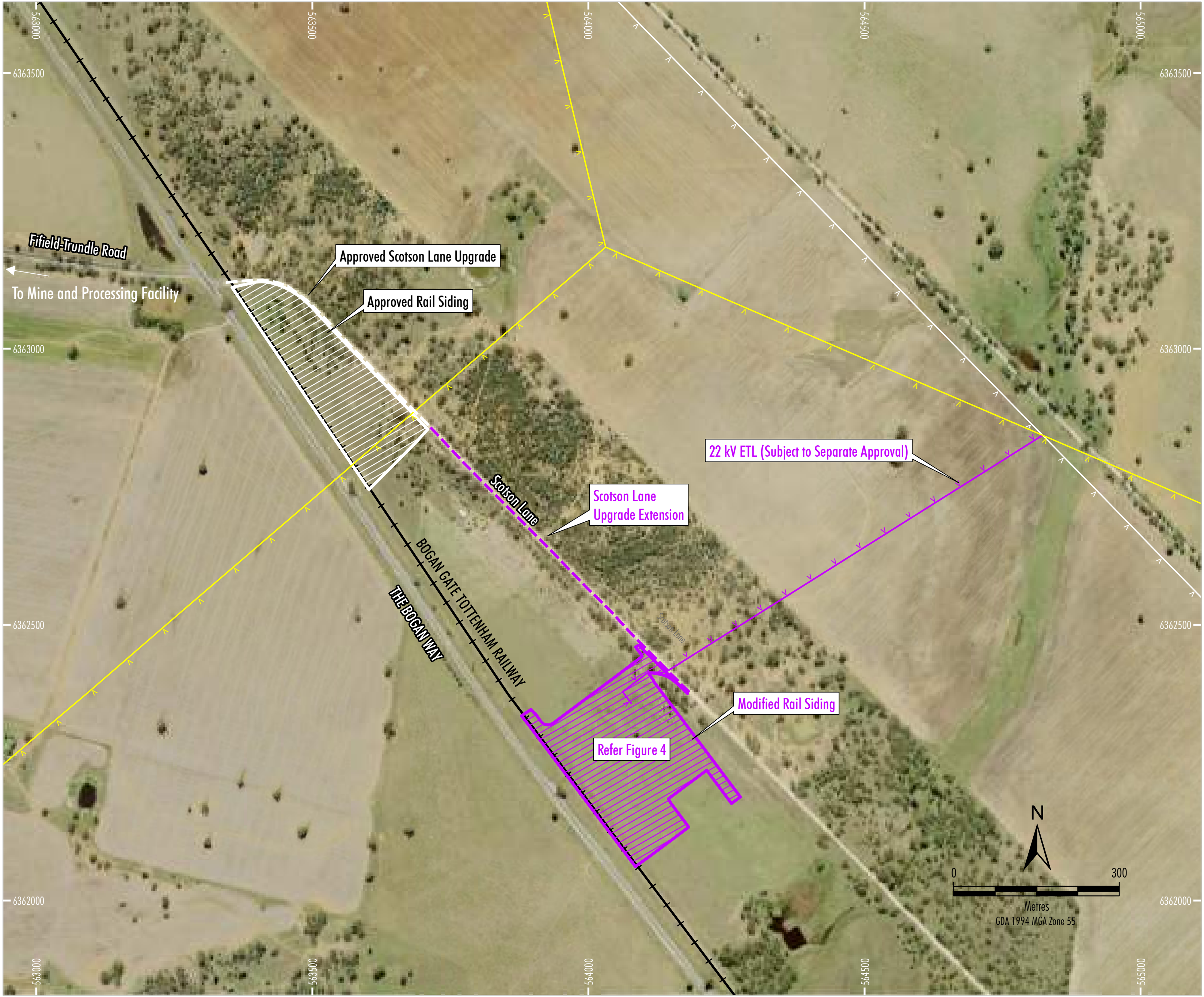
SUNRISE PROJECT

Approved and Modified Mine and Processing Facility Conceptual General Arrangement

Figure 2

CTL-20-08 MOD 7_PHA_202B



LEGEND

Railway

Existing 11 kV Electricity Transmission Line

Existing 22 kV Electricity Transmission Line

Approved Project

Surface Development Area

Scotson Lane Upgrade

Modified Project

Surface Development Area

Scotson Lane Upgrade Extension

22 kV Electricity Transmission Line (Subject to Separate Approval)

Source: Black Range Minerals (2000); Clean Teq (2020, 2021); NSW Spatial Services (2020, 2021).

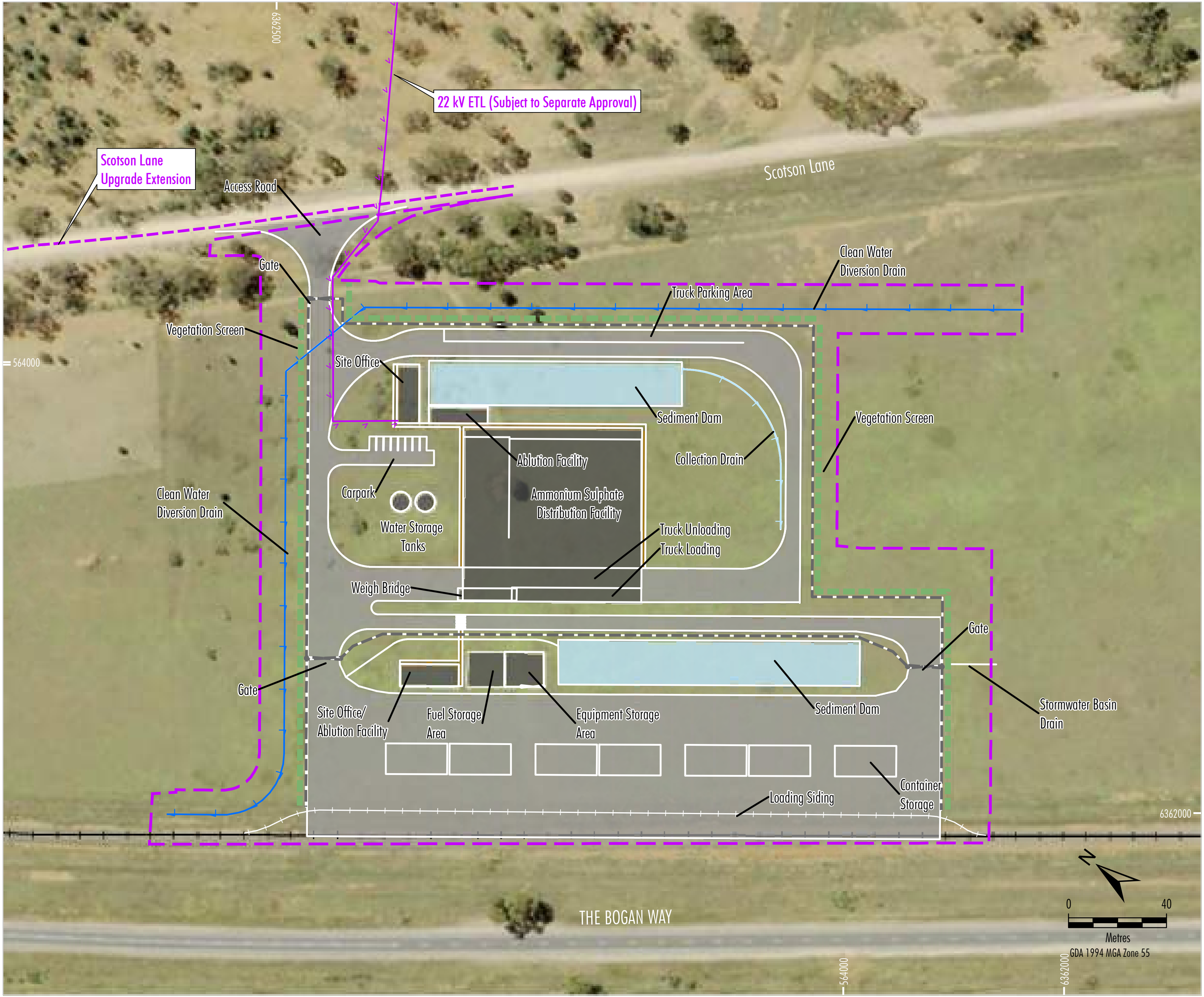
Orthophoto: © NSW Department of Finance, Services & Innovation (2021)

SUNRISE PROJECT

Approved and Modified Rail Siding Location

Figure 3

CTL-20-08 MOD 7_PHA_203A



LEGEND

Railway

Modified Project

Surface Development Area

Scotson Lane Upgrade Extension

22 kV Electricity Transmission Line (Subject to Separate Approval)

Source: Black Range Minerals (2000); NSW Spatial Services (2020); Clean Teq (2017, 2018, 2020).
Orthophoto: © NSW Department of Finance, Services & Innovation (2020)

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S U N R I S E P R O J E C T

Modified Rail Siding General Arrangement

Figure 4

CTL-20-08 MOD 7_PHA_204A

1.2 OBJECTIVES

The main aims of this PHA study are to:

- Identify the credible, potential hazardous events associated with the Modification (including the modified mine and processing facility and modified rail siding);
- Evaluate the level of risk associated with the identified potential hazardous events to surrounding land users and compare the calculated risk levels with the risk criteria published by the DoP in HIPAP No 4 (Ref 4);
- Review the adequacy of the proposed safeguards to prevent and mitigate the potential hazardous events; and
- Where necessary, submit recommendations to SEM to ensure that the modified Project is operated and maintained at acceptable levels of process safety and effective safety management systems are used.

1.3 SCOPE

This PHA assesses the credible, potential hazardous events and corresponding risks associated with the modified mine and processing facility and modified rail siding, with the potential for off-site impacts only.

Given the significant separation distances between the potentially hazardous materials and equipment at the modified mine and processing facility and rail siding to adjacent land users then only the events that have the potential for off-site impacts are analysed in detail in this PHA. This approach is consistent with the methodology used in the original and approved PHAs (Refs 1 and 2).

The transport of more hazardous materials, e.g. ammonia, are included in this PHA.

Given the Modification does not involve any changes to the limestone quarry, borefield, surface water extraction infrastructure and water pipeline, or the gas pipeline that are relevant to this PHA, the risks associated with these components of the Project have not been reassessed.

1.4 METHODOLOGY

In accordance with the approach recommended by the DoP in HIPAP No 6 (Ref 3), the underlying methodology of the PHA is risk-based, that is, the risk of a particular potentially hazardous event is assessed as the outcome of its consequences and likelihood.

The PHA has been conducted as follows:

- Initially, the relevant components of the revised processing facility area and rail siding were reviewed to identify credible, potential hazardous events, their causes and consequences. Proposed safeguards were also included in this review;
- As the potential hazardous events are located at a significant distance from other sensitive land users, the consequences of the potential hazardous events that could have off-site impact were estimated;
- Included in the analysis is the risk of propagation within the mine and processing facility and modified rail siding; and
- If adverse off-site impacts could occur, assess the risk levels to check if they are within the criteria in HIPAP No 4 (Ref 4).

1.5 RISK CRITERIA

The assessment of risks to both the public as well as to operating personnel from a potentially hazardous development requires the application of the basic steps outlined in Section 1.4. As per the NSW State Environmental Planning Policy (SEPP) 33 (Ref 5) and HIPAP No 6 (Ref 3), the chosen analysis technique should be commensurate with the nature of the risks involved.

The typical risk analysis methodology attempts to take account of all credible hazardous situations that may arise from the operation of processing plants etc. Specific incidents, identified by a variety of techniques, are assessed in terms of consequences and likelihood.

Having assembled data on the credible incidents, risk analysis requires the following general approach for individual incidents (which are then summated for all potential recognised incidents to get cumulative risk):

Risk = Likelihood x Consequence

For quantitative risk analysis (QRA) and hazard analysis, the consequences of an incident are calculated using standard correlations and probit-type methods which assess the effect of fire radiation, explosion overpressure and toxicity to an individual, depending on the type of hazard.

In this PHA, however, the approach adopted to assess the risk of the identified hazardous events is scenario based risk assessment. The reason for this approach is the limited hazardous events with the potential for off-site harm, i.e. there are generous separation distances involved to sensitive receptors.

Therefore, appropriate analysis of credible scenarios is performed in this PHA. Typically, the consequences of the potential events with off-site impact are assessed first. For the events which do not contribute to off-site risk (as determined by the risk criteria in HIPAP No 4 (Ref 4), no further risk analysis is warranted. When the consequence of an event does have the potential to impact people off-site, the likelihood and hence risk is then analysed as required.

The DoP risk criteria applying to developments are summarised in Table 2 below (from Ref 4).

Table 2 – Risk Criteria, New Plants

Description	Risk Criteria
Fatality risk to sensitive users, including hospitals, schools, aged care	0.5×10^{-6} per year
Fatality risk to residential and hotels	1×10^{-6} per year
Fatality risk to commercial areas, including offices, retail centres, warehouses	5×10^{-6} per year
Fatality risk to sporting complexes and active open spaces	10×10^{-6} per year
Fatality risk to be contained within the boundary of an industrial site	50×10^{-6} per year
Injury risk – incident heat flux radiation at residential areas should not exceed 4.7 kW/m^2 at frequencies of more than 50chances in a million per year or incident explosion overpressure at residential areas should not exceed 7 kPa at frequencies of more than 50chances in a million per year	50×10^{-6} per year
Toxic exposure - Toxic concentrations in residential areas which would be seriously injurious to sensitive members of the community following a relatively short period of exposure	10×10^{-6} per year
Toxic exposure - Toxic concentrations in residential areas which should cause irritation to eyes or throat, coughing or other acute physiological responses in sensitive members of the community	50×10^{-6} per year
Propagation due to Fire and Explosion – exceed radiant heat levels of 23 kW/m^2 or explosion overpressures of 14 kPa in adjacent industrial facilities	50×10^{-6} per year

2 PROJECT DESCRIPTION

The Project includes the establishment and operation of the following:

- Mine and processing facility;
- Limestone quarry;
- Rail siding;
- Borefield, surface water extraction infrastructure and water pipeline;
- Gas pipeline; and
- Associated transport activities and transport infrastructure (e.g. the Fifield Bypass, road and intersection upgrades).

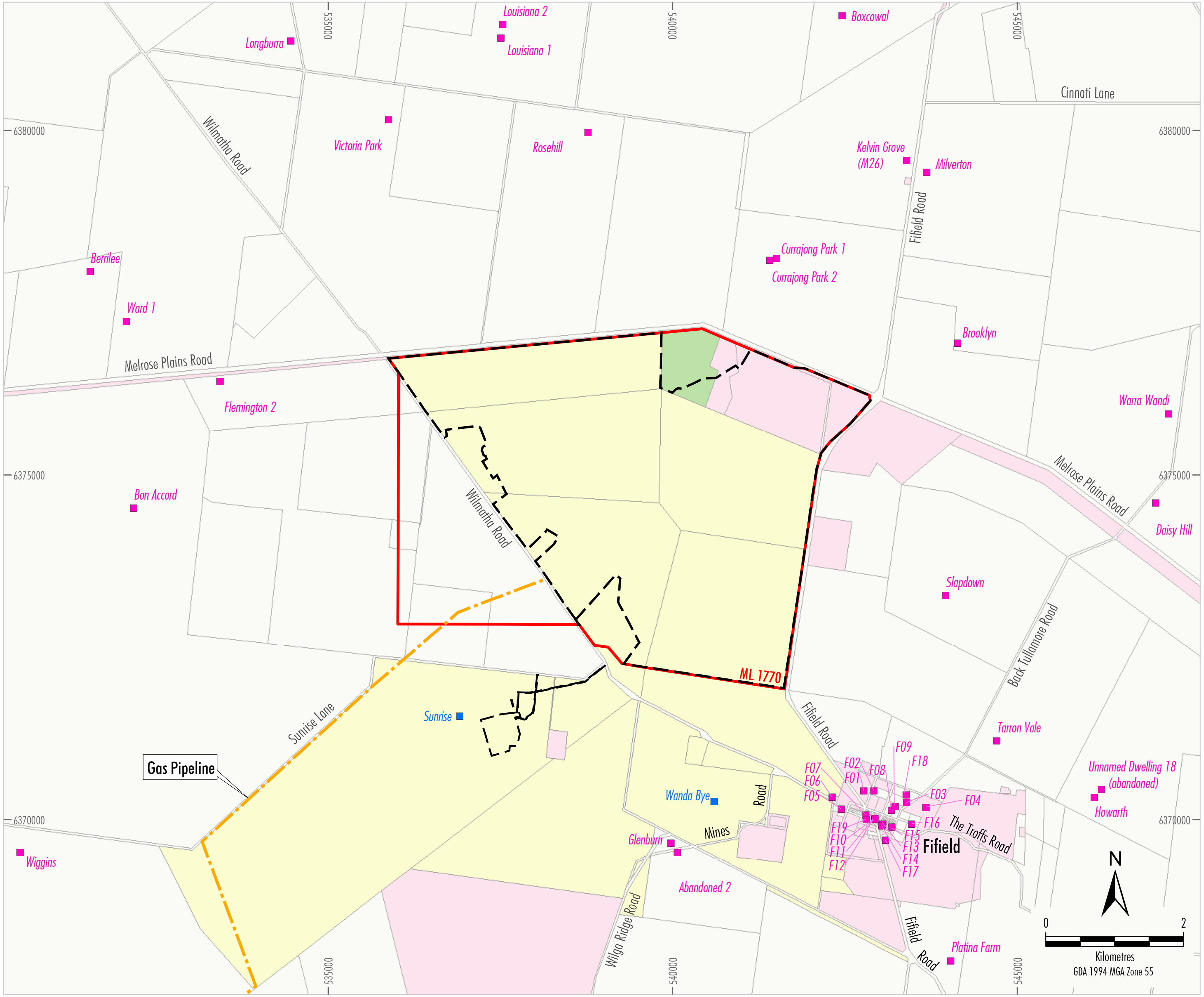
Land use surrounding the modified mine and processing facility, as well as the modified rail siding, is largely agricultural and is dominated by sheep farming and cropping.

The mine and processing facility is located approximately 4.5 km north-west of the village of Fifield in the Lachlan Shire Local Government Area (LGA) in the Central Western Region of NSW (Figure 1). The modified rail siding is located on the Bogan Gate Tottenham Railway approximately 25 km south-east of the mine and processing facility in the Parkes Shire LGA (Figure 1).

Both the mine and processing facility and modified rail siding are accessible by road. There are no ecologically sensitive areas (e.g. National Parks or wetlands) in the immediate vicinity of the mine and processing facility or modified rail siding.

Locations of the nearest dwellings from the processing facility are (Figure 5):

- ‘Sunrise’ approximately 2.6 km south-west (SEM owned);
- ‘Wanda Bye’ approximately 2.6 km south (SEM owned);
- ‘Slapdown’ approximately 4.6 km east;
- ‘Currajong Park 1 and 2’ approximately 5.8 km north-east; and
- ‘Flemington’ approximately 6.8 km north-west.



LEGEND
- Mining Lease Boundary (ML)
- Approved Surface Development Area
- Gas Pipeline
- Sunrise Energy Metals Owned Land
- Crown Land
- Fifield State Forest
- Private Landholder
- Mine-owned Dwelling
- Private Dwelling

Source: Black Range Minerals (2000); NSW Department of Industry (2017); NSW Land & Property Information (2017)

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SUNRISE PROJECT

Mine and Processing Facility Land Ownership

Figure 5

CTL-20-08 MOD 7_PHA_205B

The distance of impact to residential areas is taken as 4.6 km, i.e to the 'Slapdown' dwelling, as this is the closest privately-owned dwelling to the processing facility, and the percentage of the wind direction from the west is relatively higher than some other directions.

Locations of the nearest dwellings from the modified rail siding are (Figure 6):

- An SEM-owned property approximately 350 m north-west;
- 'Glen Rock' approximately 1.1 km west; and
- 'Ballenrae West' approximately 1.3 km east.

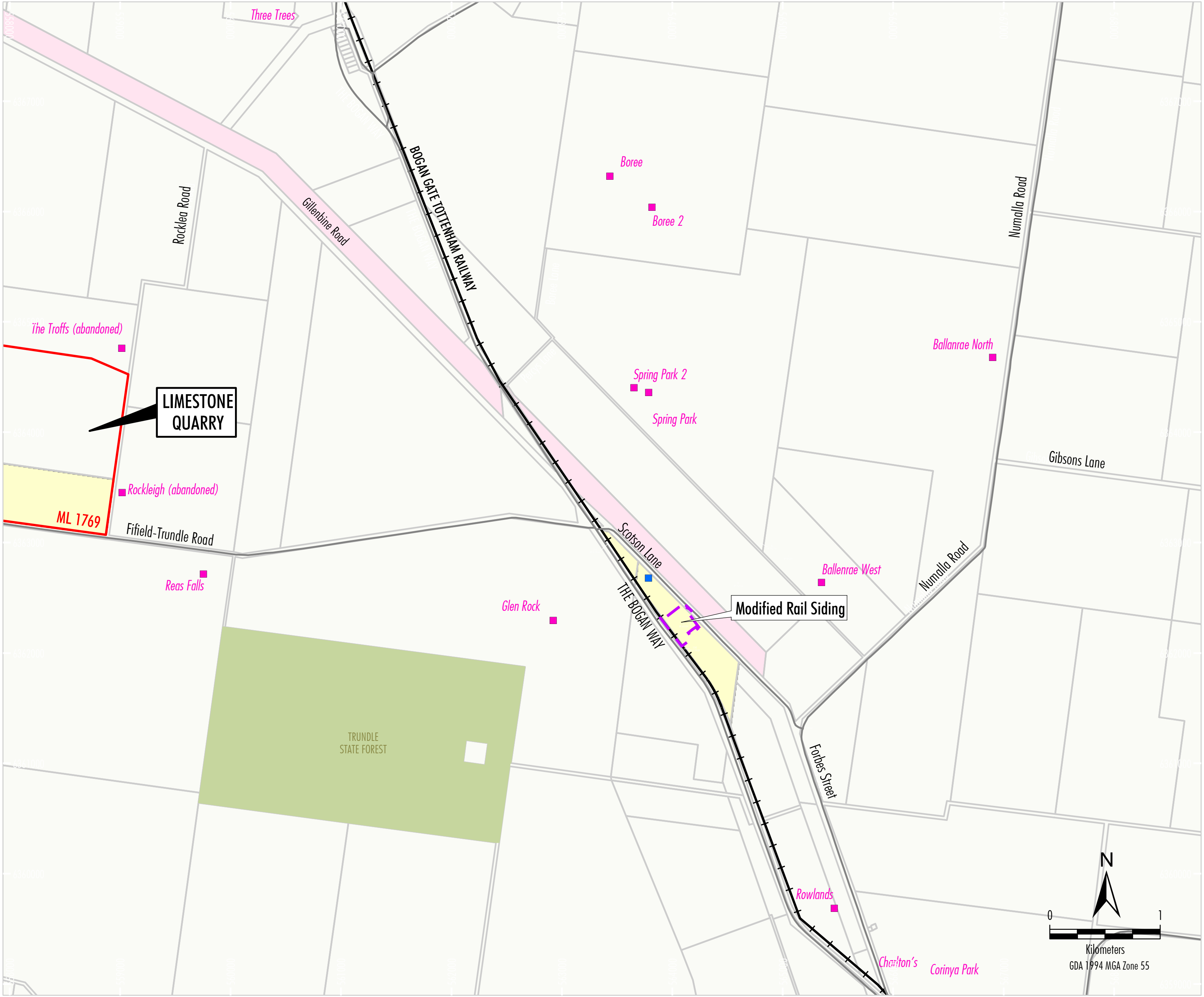
The distance of impact to residential areas is taken as 1.1 km, i.e to the 'Glen Rock' dwelling, as this is the closest privately-owned dwelling to the modified rail siding.

Security of the mine and processing facility and modified rail siding would be achieved by a number of means. This includes security fencing, site personnel and where necessary security patrols by an external security company (including weekends and night patrols). Both the modified mine and processing facility and modified rail siding would operate 24 hours per day, 7 days per week.

At the modified mine and processing facility, there would be approximately 180 people on site during day shifts and 60 people on site during night shifts. At the modified rail siding, there would be approximately 6 people on site during day shift and 4 people on site during night shifts.

There are no natural hazards for either the mine and processing facility or modified rail siding that are considered high risk.

A detailed layout drawing showing the proposed location of the mine and processing facility components is provided on Figure 7.



LEGEND

- Railway
- Mining Lease Boundary (ML)
- Sunrise Energy Metals Owned Land
- Crown Land
- Private Landholder
- Mine-owned Dwelling
- Private Dwelling

Modified Project

- Surface Development Area

Source: Black Range Minerals (2000); NSW Spatial Services (2020); Clean Teq (2017, 2018, 2020).
Orthophoto: © NSW Department of Finance, Services & Innovation (2020)

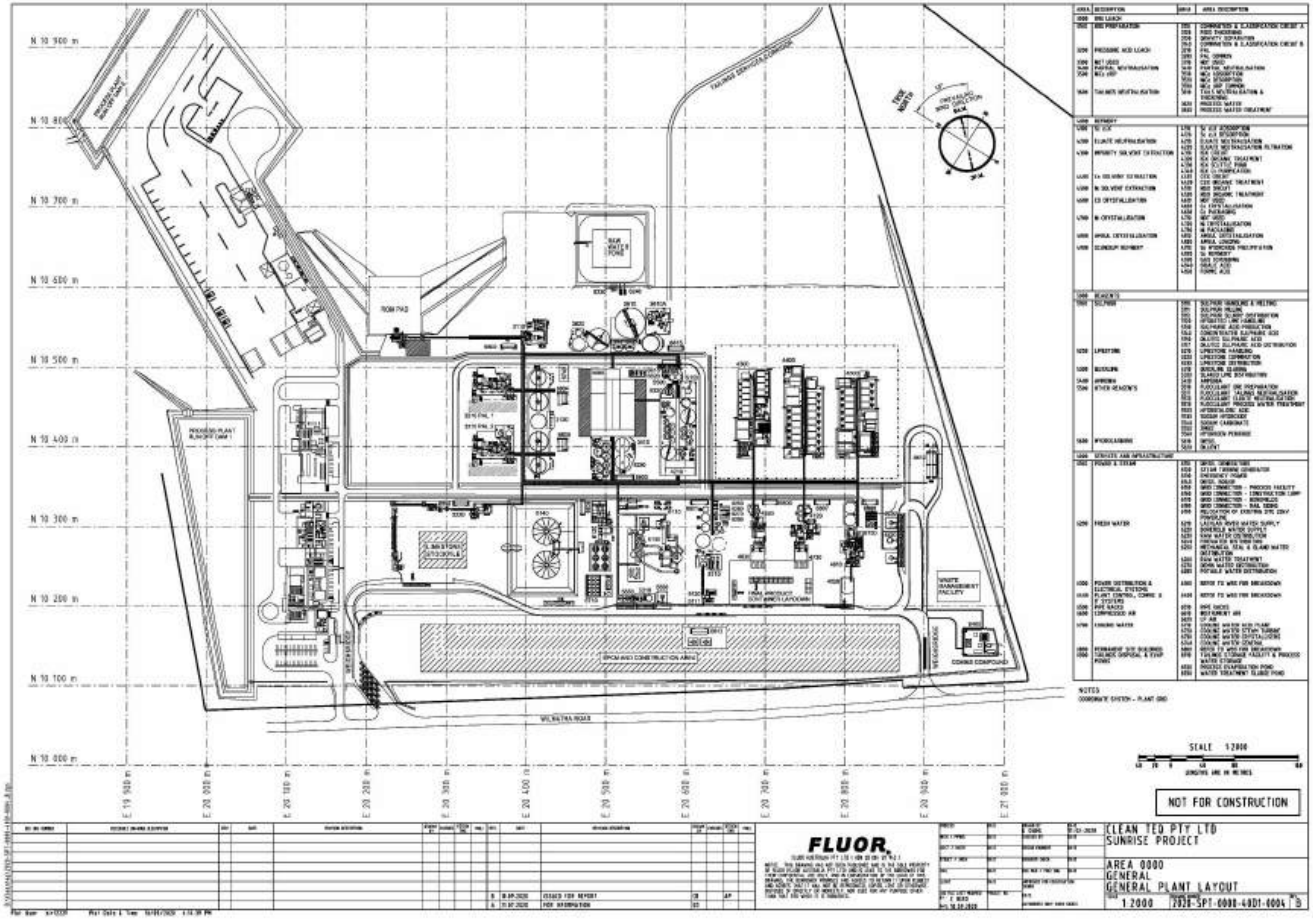
SUNRISE PROJECT

Rail Siding Land Ownership

Figure 6

CTL-20-08 MOD 7_PHA_206B

Figure 7 - Mine and Processing Facility Components



3 PROCESS DESCRIPTION

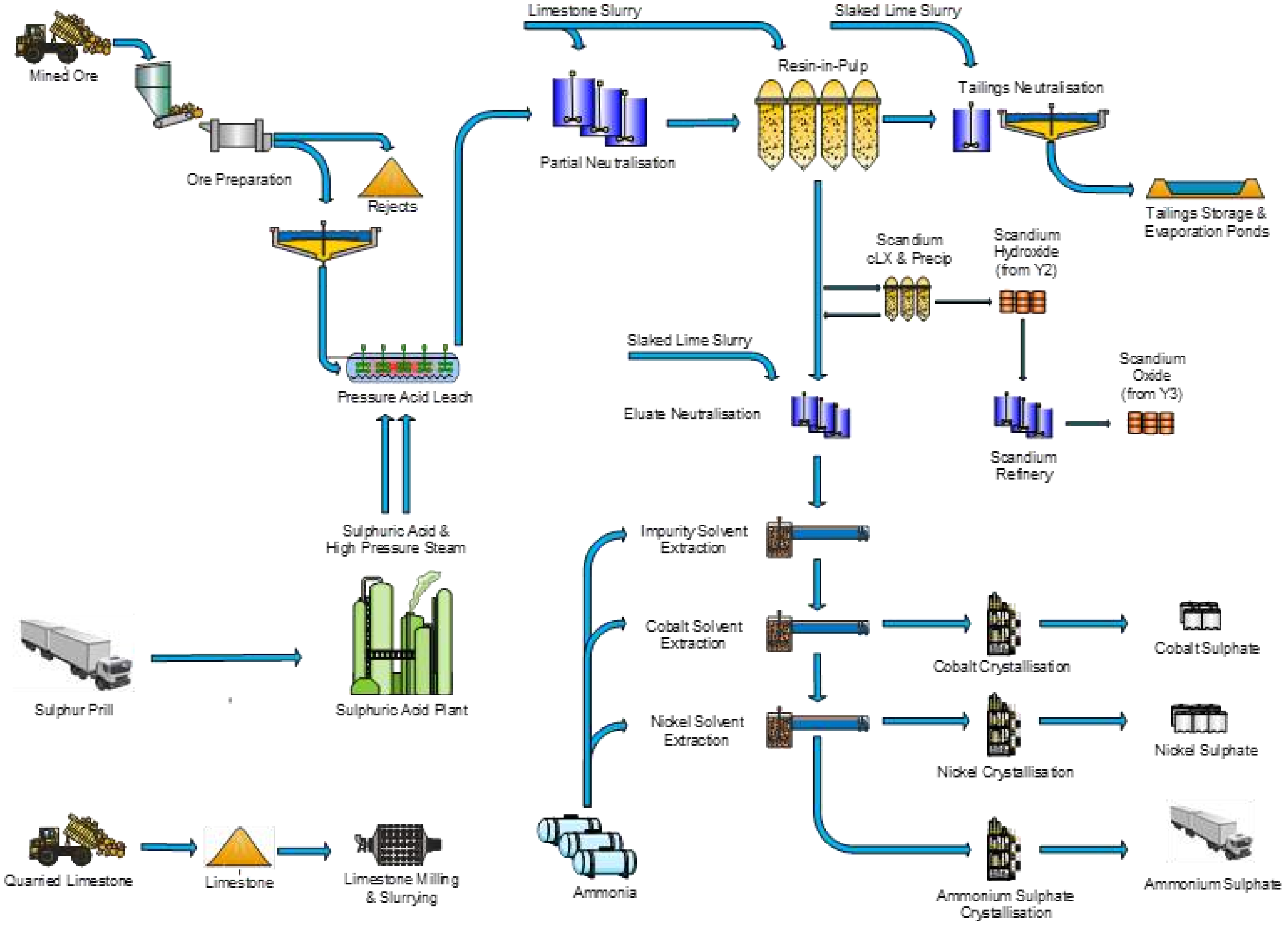
3.1 OVERALL PROCESS DESCRIPTION

The following process description is from the Sunrise Project Execution Plan Phase Report (Ref 6). It is an update of that presented in the previous PHA (Ref 2). Further details can be obtained in Ref 6. A process schematic flow sheet is shown in Figure 8.

The processing plant comprises four main areas and numerous sub-areas as listed below.

- Area 3000 Ore Leach
    - Sub-area 3100 Ore Preparation
    - Sub-area 3200 Pressure Acid Leach
    - Sub-area 3400 Partial Neutralisation (PN)
    - Sub-area 3500 NiCo cRIP (Nickel Cobalt Continuous Resin in Pulp)
    - Sub-area 3600 Tailings Neutralisation (TN)
- Area 4000 Refinery
    - Sub-area 4100 Sc cLX (Scandium Continuous Liquid Ion Exchange)
    - Sub-area 4200 Eluate Neutralisation (EN)
    - Sub-area 4300 Impurity Solvent Extraction (ISX)
    - Sub-area 4400 Co Solvent Extraction (CSX)
    - Sub-area 4500 Ni Solvent Extraction (NSX)
    - Sub-area 4600 Co Crystallisation
    - Sub-area 4700 Ni Crystallisation
    - Sub-area 4800 Amsul (ammonium sulphate) Crystallisation
    - Sub-area 4900 Scandium Refinery

Figure 8 – Schematic Process Flow Sheet



- Area 5000 Reagents
  - Sub-area 5100 Sulphur
  - Sub-area 5200 Limestone
  - Sub-area 5300 Quicklime
  - Sub-area 5400 Ammonia
  - Sub-area 5500 Other Reagents
  - Sub-area 5600 Hydrocarbons
- Area 6000 Services and Infrastructure
  - Sub-area 6100 Power and Steam
  - Sub-area 6200 Fresh Water
  - Sub-area 6600 Air Supply
  - Sub-area 6700 Cooling Water
  - Sub-area 6900 Tailings Disposal and Evaporation Ponds

The processing plant has a nameplate capacity of 2.5 Mtpa of solids fed to the leach autoclaves. The processing facility is designed to produce a maximum of 30 ktpa of contained nickel (Ni) and cobalt (Co) in the form of battery grade nickel sulphate hexahydrate and cobalt sulphate heptahydrate. The scandium recovery circuit is designed to produce a scandium hydroxide product at a rate of 30 tpa of contained scandium oxide equivalent. A scandium refinery to produce 20 tpa of high purity scandium oxide from a portion of this scandium hydroxide will be operated from Year 3 onwards. Ammonium sulphate, commonly used as an agricultural fertilizer, is produced as a by-product of the refining process at a rate of approximately 70 ktpa. Notwithstanding the above, is noted that the Project is approved to produce 40 tpa of nickel and cobalt metal sulphates, 100 ktpa of ammonium sulphate and 180 tpa of scandium oxide.

Ore is mined from the open pits and hauled to the adjacent processing plant. Ore is primarily directly tipped into the Run-of-Mine (ROM) bin, however can be deposited to a ROM stockpile if direct tipping is not available. The ROM stockpile is serviced by a front-end-loader (FEL) and used to supplement direct tipped ore if there is an interruption such as poor weather or mechanical issues.

The ore preparation circuit is designed to process high grade, low silica goethite ore (Silica:Aluminium [Si:Al] < 2.65) for the first 4 years of operation using a combination of crushing and closed circuit ball milling (wet screen classification) to achieve the desired particle size distribution without appreciable mass rejection.

Feed blends rich in silica (silicified goethite, Si:Al > 2.65) are amenable to beneficiation by rejecting a competent, coarse grained barren component. A second ore preparation circuit will be constructed in year 4 to process this ore using a combination of crushing, open circuit wet scrubbing and size classification using vibrating wet screens to selectively reject coarse, low grade components of the ore and advance a beneficiated slurry to the existing ball mill circuit.

The classified slurry is then dewatered in paste thickeners before entering the 18-hour pressure acid leach (PAL) feed surge tanks. The ore preparation circuit is operated at elevated temperature by recirculating a stream of water that is heated in the downstream leach circuits using low pressure (LP) flash steam. This configuration reduces the quantity of high pressure (HP) steam required for autoclave temperature control. The ore preparation circuit is designed with redundancy, surge and catchup capacity to allow for regular planned maintenance to be performed without compromising downstream production.

The two parallel, identical PAL trains lie at the core of the processing facility and represent the asset which has the highest impact on the plant availability. Upstream of PAL the plant has been designed to ensure that slurry is always available for leaching when the autoclaves are in operation. Similarly, the downstream circuits have been designed to ensure leached slurry can always be received for processing when the autoclaves are in operation.

Preheated slurry from the ore preparation circuit is pumped through two direct contact steam heaters, using steam recovered from the flash circuit as the heating medium, before entering the six-compartment, mechanically agitated horizontal autoclave. Leaching of the slurry is undertaken at high temperature (250°C) to reduce iron and aluminium solubility, thereby reducing leach acid consumption which is the primary contributor to reagent operating costs. Leached slurry is discharged through a three-stage flash pressure reduction system and pumped to the partial neutralisation circuit. LP steam recovered from the final flash vessel is used to heat water for use in Ore preparation as previously described.

The partial neutralisation (PN) circuit is the physical and chemical link between the upstream leach circuit and the downstream continuous resin-in-pulp (cRIP) circuit. In cRIP, soluble nickel and cobalt are extracted from the slurry using an ion exchange resin. When nickel and cobalt are extracted, any soluble iron, aluminium and chromium present will also be extracted to a large extent and this impurity transfer incurs significant operating cost and also occupies production capacity otherwise reserved for nickel and cobalt. Fortunately, iron, aluminium and chromium can be selectively precipitated from the slurry by raising the slurry pH. This must be performed carefully (to avoid precipitating a significant quantity of nickel and cobalt which will occur if pH is raised too high) and quickly (to avoid adsorption of nickel and cobalt on the precipitated solids which increases with ageing time). The PN circuit is designed to address these challenges.

The PN circuit consists of two co-current stages of neutralisation separated by a surge tank. Each stage comprises several mechanically agitated tanks configured in series. Limestone slurry is added to the tanks for the purpose of acid neutralisation (pH control). The first PN stage is designed to achieve addition of ~80% of total limestone demand, which is consumed quickly and without the need for particularly close control of the final pH.

A six-hour PN surge tank separates the two PN stages and is the major slurry surge point between the leach circuit and the resin-in-pulp (cRIP) circuit used for primary recovery of nickel-cobalt-scandium from the leached slurry. This permits the downstream circuits (PN stage 2, cRIP) to be controlled at a slower rate of change relative to the leach circuit. This mode of operation is conducive to achieving high recoveries as a result of tight control of the PN stage 2 pH (low Ni-Co precipitation losses) as well as steady cRIP operation (high soluble Ni-Co recovery).

The second stage of PN receives the remaining ~20% of limestone to reduce remaining iron, aluminium and chromium to optimum levels for the downstream cRIP circuit.

The cRIP circuit adsorbs the value metals from the advancing slurry using ion exchange. cRIP is divided into two parallel trains, each with an adsorption and desorption circuit. The resin adsorbs the value metals (Nickel, Cobalt, Scandium) from the slurry preferentially over the majority of the impurities (Manganese, Magnesium), discharging the spent pulp from the circuit to the tailings neutralisation circuit for disposal. The loaded resin is washed to remove entrained pulp before being contacted with dilute sulphuric acid (eluant) to desorb (elute) all loaded metals, thereby creating a relatively concentrated stream of nickel and cobalt containing minor impurities (eluate). Eluate is stored in a 12-hour surge tank providing the primary process break between the upstream large-volume slurry processing areas and the downstream low-volume liquor processing areas. Eluted resin is recirculated to adsorption.

Spent pulp, and other waste streams from the processing plant, are neutralised using slaked lime in the tailings neutralisation circuit before being thickened in the tailings thickener to reduce the contained water content to only that required for pumping/transfer purposes. Densified slurry from the tailings neutralisation area is pumped to the tailings storage facility for final deposition.

Process water, the combination of tailings thickener overflow and water recovered from the tailings dam, is entirely re-used within the process. Some are used directly for the preparation of limestone slurry and for treatment in the process water treatment plant (if required) to remove magnesium, manganese and sulphate to levels suitable for re-use in the Ore Prep (and downstream PAL) circuit. Ore Prep make-up water is supplemented by raw water imported from offsite. The balance is further clarified to remove suspended solids with the resulting *clean* process water used in the cRIP circuit for washing of loaded resin.

Eluate produced within the cRIP area is a relatively concentrated stream of liquor containing nickel, cobalt and scandium (as value metals), together with small but significant levels of iron, aluminium, chromium, copper, zinc, manganese, magnesium and calcium. These elements are sequentially separated in a series of unit operations that together encompass the Refinery section of Sunrise.

The first refining unit operation is for recovery of scandium. This is an optional process in that selective scandium removal is not required to facilitate nickel-cobalt production. Consequently, scandium is recovered from only a portion of the eluate (20%), with the balance of the eluate proceeding directly to the downstream eluate neutralisation area. Scandium recovery will commence only at the start of Year 2.

Scandium is recovered from the eluate using an ion exchange process. Scandium is adsorbed onto a scandium-selective resin, which is then washed and eluted using sodium carbonate; eluted resin is returned to adsorption. The scandium-rich eluate is heated to selectively precipitate contained iron, then sodium hydroxide is added to precipitate a scandium hydroxide product which is washed, partially dewatered and stored in Intermediate Bulk Containers (IBCs) for further processing. Refining of the scandium hydroxide to a higher purity (for example, scandium oxide) will take place from Year 3 onwards.

All eluate, whether treated for scandium or not, is processed through the eluate neutralisation (EN) circuit. Here a two-stage counter-current precipitation process is used to selectively remove iron, aluminium and chromium impurities while retaining nickel and cobalt in the liquor phase for downstream recovery. Slaked lime slurry is used as the precipitation agent. Precipitated impurities are dewatered and washed then recycled to the upstream partial neutralisation circuit for recovery of any co-precipitated and/or soluble nickel-cobalt. The two-stage configuration avoids recirculating a high proportion of nickel-cobalt across the cRIP circuit, thereby conserving operating costs.

Each EN stage comprises several mechanically agitated tanks configured in series followed by a thickener to effect solid-liquid separation. Slaked lime slurry is added to the tanks for the purpose of acid neutralisation (pH control). The EN stage 1 precipitate (comprising gypsum, iron- and aluminium-hydroxides) is thickened, then dewatered and washed in a pressure filter, then re-pulped and returned to the upstream PN circuit. The EN stage 2 precipitate (comprising gypsum, iron- and aluminium-hydroxides, together with nickel- and cobalt hydroxides) is thickened and recycled to the first EN stage 1 reactor for nickel-cobalt redissolution.

The liquor discharged from the EN stage 2 thickener is clarified in a polishing filter before entering a 12-hour surge tank which, together with the eluate surge tank, provides surge volume ahead of the three sequential solvent extraction (SX) circuits. This ensures, as far as practicable, SX operation with low rates of change in feed flow and composition which is conducive to achieving the high metal separation extents demanded by the nickel and cobalt product purity specifications, as well as low levels of internal metal recirculation within the SX areas which drive operating costs.

Each SX circuit uses a specific organic solvent to selectively extract certain metals, leaving others behind in the liquor phase for further processing. The organic extractant type and the metals targeted for extraction in each SX circuit are:

1. Impurity SX (ISX): Phosphoric acid (e.g. Di-(2-ethylhexyl) phosphoric acid); zinc, calcium, copper, manganese

2. Cobalt SX (CSX): Phosphonic acid (e.g. Cyanex 272); cobalt (plus remaining zinc, copper, manganese)

3. Nickel SX (NSX): Carboxylic acid (e.g. Versatic 10); nickel.

All SX circuits use mixer-settlers for aqueous-organic contacting in a counter-current configuration. Gaseous anhydrous ammonia is used for pH control in the extraction stages and dilute sulphuric acid used for scrubbing and stripping solutions. All aqueous exit streams are treated for organic removal to both minimise the cost associated with organic reagent make-up and also to prevent cross-contamination of extractants between adjacent circuits.

ISX produces a strip product liquor that is neutralised with lime slurry and discharged into an evaporation pond.

CSX strip product liquor, rich in cobalt, is returned to the cobalt purification section of the ISX circuit for final scavenging of impurities. This purified strip product is advanced to the cobalt crystallisation circuit.

NSX strip product liquor, rich in nickel, is advanced directly to the nickel crystallisation circuit.

Cobalt and nickel crystallisation and packaging circuits have a similar design configuration. Crystalliser feed liquor is collected from upstream in three twelve-hour surge tanks before being pumped into the crystallisers. In addition to providing surge capacity, the three feed tanks enable blending and, if necessary, quarantining of feed solutions. The dry crystalliser products are conveyed to the eight-hour silo's in the respective packaging plant. The product crystals are withdrawn from the silo's and packaged into sealed 1m^3 bulk bags and loaded into shipping containers for dispatch to customers. Process condensate from the crystallisers is used for strip and scrub liquor make-up in the respective SX circuits. Residual mother liquor is purged to the feed tanks of the respective solvent extraction circuits to provide an outlet for chloride. The crystallisers are designed to run on a continuous basis while the packaging plants are designed to run for 12 hours per day.

NSX raffinate is advanced to a single twenty-four-hour amsul crystalliser feed tank which provides a surge point between the solvent extraction and amsul crystalliser circuits. The amsul crystalliser recovers high quality water from the NSX raffinate for re-use as cRIP eluant make-up) while providing an outlet for the ammonium sulphate produced during SX extraction. The ammonium sulphate crystals, which require a crystalliser specifically designed to meet the large crystal size demanded by the amsul market, are transported from the crystalliser circuit to the storage and distribution shed. . Amsul is reclaimed in bulk from the sheds stockpiles and transported by truck to the storage and distribution facility at the rail siding for sale to local markets.

All rainfall collected within the designated perimeter of the processing plant is considered potentially contaminated and therefore fully contained and returned directly to the processing plant. Within bunded areas, rainfall is collected and returned to the process via drains and sump pumps. Water collected outside of the bunded areas, such as rainfall on roads, is contained within the processing plant drainage system and directed to one of two lined processing plant runoff dams via a series of spoon drains and culverts. Each of the two processing plant runoff dams have a duty and standby set of pumps, and appropriate instrumentation for automatic operation, to pump the water from the dams directly to the process water tank for use in the processing plant.

3.2 RAIL SIDING

The Modification would include the following changes to the approved rail siding (Figure 3 and Figure 4):

- Revised rail siding location and layout;
- Addition of an ammonium sulphate storage and distribution facility to the rail siding;
- Extension of the Scotson Lane upgrade; and
- Addition of a 22 kV electrical transmission line (subject to separate approval) to the rail siding power supply.

Consistent with the approved rail siding, the modified rail siding will serve as a loading and unloading point for the consumables transported by rail and as the export point for the nickel, cobalt, scandium and ammonium sulphate product. As described above, the modified rail siding would also include the addition of an ammonium sulphate storage and distribution facility which would facilitate the supply of ammonium sulphate (a fertiliser) to agricultural operations in the region.

Activities at the rail siding would include train loading and unloading (by forklift), container stacking, and truck loading and unloading. The modified rail siding would consist of the following main components:

- Loading siding[3];
- Site access point and internal roads;
- Truck parking, loading and unloading hardstand areas and weighbridge;
- Container storage hardstand areas;
- Ammonium sulphate storage and distribution facility;

[3] The loading siding may not be required depending on other rail operations on the Tottenham to Bogan Gate Railway.

- Site offices, ablution facilities, sewage system and car parking;
- Equipment and fuel storage areas;
- Water storage tanks;
- Lighting and telecommunications infrastructure;
- Sediment dams, clean water diversions, runoff collection drains and other water management equipment and structures;
- Landscaping (including vegetation screen) and perimeter security fencing; and
- Other associated minor infrastructure, plant, equipment and activities.

The Bogan Gate Tottenham Railway is infrequently used for grain transport. Depending on future rail operations on the Bogan Gate Tottenham Railway, the Project trains may therefore be able to be loaded/unloaded on the main line. If this is the case, the loading siding would not be constructed and train loading/unloading would occur on the main line. The requirement for the loading siding would be determined in consultation with John Holland (or the relevant rail network operator at the time).

The modified rail siding perimeter would be fenced. Trucks would run from the siding to the mine and processing facility on a campaign basis when trains arrive.

3.3 TRANSPORT

The various aspects of transport associated with the Project are:

- Rail transportation of bulk materials to, and from, the modified rail siding using containers;
- Road transport of limestone from the limestone quarry or third party suppliers to the mine and processing facility;
- Road transport of bulk materials, chemicals, reagents and goods to the mine and processing facility;
- On-site transport and storage requirements; and
- Export of product from site.

The rail system would be used primarily for the receival of sulphur and export of product, plus receival of other reagents and supplies.

The bulk chemicals likely to be transported to the mine and processing facility by road tankers are diluent, diesel, caustic soda, liquid nitrogen, quicklime, anhydrous ammonia, hydrogen peroxide, hydrated lime, sulphuric acid (for startup), hydrochloric acid, ammonium nitrate and flocculant. Waste oil from the effluent separator would be transported from the mine and processing facility by road tanker. The majority of the packaged chemicals (e.g. acids, bases and reagents in bulkiboxes, and chemicals and catalysts supplied in drums, bulkabags or cylinders) are to be transported by road.

The mine and processing facility is accessible by the existing local road network. The local road network would be upgraded in accordance with the conditions of Development Consent DA 374-11-00 and Voluntary Planning Agreement with the Lachlan Shire Council, Parkes Shire Council and Forbes Shire Council. Nickel, cobalt and scandium product would be exported from the site in containers via road to the rail siding and via rail transport to a suitable port (e.g. Port Botany or Newcastle). Bulk ammonium sulphate by-product would be transported by road to the ammonium sulphate storage and distribution facility located near the rail siding area for storage and distribution to users.

The sulphur transport capacity would be a 350,000 tonne per annum operation involving bulk transport by ship to Newcastle and then by rail and road to the site.

Up to a total of 990,000 tonnes of limestone would be transported by road to the mine and processing facility, with up to 790,000 tonnes from the limestone quarry and up to 560,000 tonnes from a third party supplier.

The above process description is very similar to that presented in the previous, approved PHA (Ref 2). With regards to major hazards, the events with the potential for adverse off-site impacts from the mine site are the same as previously analysed, i.e. releases of sulphur dioxide (from the sulphuric acid plant) and ammonia, failures associated with the natural gas pipeline and an incident involving explosives (including the ammonium nitrate emulsion). The other potential hazardous events, e.g. fires (such as pool fires in the solvent extraction areas), dust explosions (e.g. sulphur or ammonium sulphate) and corrosive liquids releases, do not pose credible off-site impacts given the separation distances between the potentially hazardous materials and equipment and the nearest private place of residences and also the site boundaries. For example, the closest plant equipment to the nearest site boundary around the processing plant is approximately 110 m away.

4 HAZARD IDENTIFICATION

4.1 HAZARDOUS MATERIALS

The hazardous materials involved with the Modification are shown in Table 3. Given the large separation distances from the location of these materials to the nearest place of residence to the modified processing facility (4.6 km to the nearest privately owned property) then the materials with the potential for off-site impact are:

- Natural gas due to failure of the natural gas supply pipeline with subsequent ignition. This can occur anywhere along the pipeline;
- Incident involving the explosives storages where the explosives detonate; and
- Ammonia and sulphur oxides due to a large release and dispersion downwind.

The potential for offsite impact at the rail siding is negligible given the materials.

4.1.1 Natural Gas

Natural gas is a Class 2.1 Dangerous Good (DG) (flammable gas). It is a colourless hydrocarbon fluid mainly composed of the following hydrocarbons:

- Methane (typically 88.5% or higher);
- Ethane (typically 8%);
- Propane (typically 0.2%);
- Carbon dioxide (typically 2%); and
- Nitrogen (typically 1.3%).

For a typical natural gas, the TLV (threshold limit value) is approximately 1,000 parts per million (ppm) and the STEL (short term exposure limit) is 30,000 ppm (i.e. approaching 5 vol% which is the lower explosive limit).

The hydrocarbons are not considered to represent a significant environmental threat. Their hazard potential derives solely from the fact that they are flammable materials. To enable ready leak detection, natural gas is normally odorised with mercaptans (sulphur containing hydrocarbons).

The flammability range is typically 5% to 15% by volume in air. The vapours are lighter than air and will normally disperse safely if not confined and/or ignited. Natural gas ignition can lead to jet fires, flash fires or vapour cloud explosions.

Products of combustion include carbon monoxide and carbon dioxide.

Table 3 - Hazardous Materials Summary

Material	Plant Area	Description	Typical Annual Consumption	Storage Amount
Processing Plant Raw Materials				
Sulphur Prills	5110	Prilled solids. Transported in closed containers by rail and road. Full container storage provided on site with primary site sulphur storage as molten sulphur.	286,226 t	300 t
Sulphuric Acid (98.5%)	5140	Product of the sulphuric acid plant; stored in two tanks prior to use in various process areas (predominantly area 3200).	N/A	45,000 t
Hydrated Lime ($Ca(OH)_2$)	5120	Powder. Transported to site in road tankers and stored in a closed silo.	458 t	50 t
Quicklime (CaO)	5310	Powder. Transported to site in road tankers and stored in a closed silo.	46,424 t	403 t
Anhydrous Ammonia	5410	Liquid. Transported to site in pressurised road tankers and stored in bullets.	24,978 t	415 t
Flocculant (Ore Preparation)	5510	Powder. Transported to site in road tankers and stored in closed silos.	470 t	60 t
Flocculant (Eluate Neutralisation)	5510	Powder. Transported to site in road tankers and stored in closed silos.		
Flocculant (Tailings)	5510	Powder. Transported to site in road tankers and stored in closed silos.		
Flocculant (Process Water Treatment)	5510	Powder. Transported to site in road tankers and stored in closed silos.		
Hydrochloric Acid (32%)	5520	Liquid. Transported to site in road tankers and stored in a tank.	690 t	233 t (203 $m^{3)}$

Material	Plant Area	Description	Typical Annual Consumption	Storage Amount
Diluent -Shell Shellsol D70 or equivalent	5620	Liquid. Transported to site in road tankers and stored in a tank.	254 t (317 m^3)	48 t (60 m^3)
Sodium Metabisulphate (SMBS)	5550	Powder. Transported to site in road tankers and stored in a closed silo.	1,291 t	371 t
Resin	3500/4100	Resin delivered in 1 te bulkabags	497 t	100 t
Extractant, ISX	4310	Liquid. Transported to site in IBC's which are stored in the warehouse until use.	75 t (82 m^3)	15 t (16 m^3)
Extractant, CSX	4410	Liquid. Transported to site in IBC's which are stored in the warehouse until use.		
Extractant, NSX	4510	Liquid. Transported to site in IBC's which are stored in the warehouse until use.		
Caustic (NaOH)	5530	Liquid. Transported to site in road tankers and stored in a tank.	1,033 t	119 t (78 m^3)
Soda Ash (Na_2CO_3)	5540	Powder. Transported to site in road tankers and stored in a closed silo.	1,291 t	17 t
Hydrogen Peroxide (70%)	5560	Liquid. Transported to site in road tankers and stored in a tank.	657 t	83 t (64 m^3)
Diesel Fuel (All Users)	5610	Liquid. Transported to site in road tankers and stored in a tank.	9,869 m^3	1,000 m^3 (1,000 kL)
Mine				
Mining Explosives	Explosive's magazine	Solid AN precursor transported to site by road and stored prior to mixing as emulsion	-	Stored in secure magazine at site

Material	Plant Area	Description	Typical Annual Consumption	Storage Amount
'In-Process' Fluids				Estimates Only
Molten Sulphur	5130	Sulphur is melted and filtered. Clean molten sulphur is stored in two tanks prior to use in the sulphuric acid plant.	N/A	10,000 t
Sulphur Dioxide and Sulphur Trioxide (SO_2/SO_3)	5130	SO_2 and SO_3 are intermediates in the production of sulphuric acid. SO_2 is produced by burning sulphur and is catalytically converted to SO_3. SO_3 is absorbed in weak acid to produce stronger acid. Low level SO_2/SO_3 atmospheric emissions (<250 ppm) leave the acid plant stack.	-	No storage, however, large volumes exist within the acid plant
Slaked Lime Slurry	5320	Quicklime is slaked and the slurry product is stored in two tanks prior to use in Areas 3600 and 4200.	N/A	150 t (384 m^3 slurry)
HPAL Process Slurry	3200	Acidic process slurry (40 g/L free acid) at high temperature (250°C) and pressure.	-	2 x 718 m^3 autoclaves plus other piping, heaters and flash vessels
Partial Neutralisation Slurry	3410	Partially neutralised slurry (pH<4) at atmospheric temperature and pressure.	-	6 x 0.5 ML tanks
Tailings Slurry	3600	Neutralised process slurry (pH ~6) at atmospheric temperature and pressure.	-	Multiple large process tanks
cRIP Slurry	3500	Partially neutralised slurry (pH <4) at atmospheric temperature and pressure.	-	Estimate ~20 ML of process tankage
cRIP Eluate	4100	Partially neutralised pregnant liquor (pH ~2) at atmospheric temperature and pressure.	-	Multiple large process tanks
Neutralised Eluate	4200	Neutralised pregnant liquor (pH ~6) at atmospheric temperature and pressure.	-	Multiple large process tanks

Material	Plant Area	Description	Typical Annual Consumption	Storage Amount
Various Solvent Extraction Process Fluids	4300-4900	SX organic phases (combustible). SX aqueous phases (acidic).	-	Multiple large process tanks
Rail Siding				
Sulphur Prills	7170	Prilled solids. Transported in closed containers by rail and stored temporarily prior to road transport to plant. Full container storage provided at rail siding.	286,226 t	2400 (up to 120 full containers) t
Ammonium Sulphate	7170	Inorganic and odourless sulphate salt. Transported by truck from the processing facility to the rail siding and stockpiled in an enclosed shed.	-	30,000 t

4.1.2 Explosives (Ammonium Nitrate Emulsion)

Ammonium nitrate emulsion (ANE) is a Dangerous Good (DG) 5.1, Packing Group II, liquid (a creamy emulsion that supports combustion of other materials). A typical composition for ANE is:

- Ammonium nitrate > 60%;
- Fuels (diesel) < 10%;
- Mineral oil, hydrocarbon solvent, petroleum < 10%;
- Water 5 to 30%; and
- Non-hazardous materials < 30%.

ANE will support combustion of other materials and increase the intensity of a fire. It will decompose on heating emitting irritating white fumes (ammonium nitrate). Brown fumes indicate the presence of toxic oxides of nitrogen, e.g. nitrogen dioxide.

A major fire may involve a risk of explosion, in particular, if the ANE is confined and contaminated. An adjacent detonation may also involve the risk of explosion (i.e. sympathetic detonation). Heating can cause expansion or decomposition of the material which can lead to the containers exploding.

When molten, ANE may decompose violently due to shock or pressure.

ANE is insoluble in water, however, open fires can be fought by applying water spray.

This material is classified as Security Sensitive Ammonium Nitrate (SSAN). Within Australia, all persons who have unsupervised access to Security Sensitive Ammonium Nitrate require security clearances. The issuing of security clearances is controlled and issued through the local Government authorities. The checks include a criminal history check and a politically motivated violence check.

4.1.3 Ammonia

Anhydrous ammonia is toxic and flammable (DG Class 2.3 toxic gas). It is a gas at normal temperature and pressure but may be liquefied under moderate pressure (630 kPag at 15^{o}C) or at temperatures below -33^{o}C at atmospheric pressure.

At low concentrations in air, ammonia vapour irritates the eyes, nose and throat. Ammonia is very soluble in water, therefore as it enters the body, it is readily absorbed. Irritation is immediate and local to the point of entry. Inhalation of high concentrations produces a sensation of suffocation and quickly causes burning of the respiratory tract and may result in death.

Anhydrous liquid ammonia causes severe burns on contact with the skin and if swallowed, it will cause very severe corrosion in the mouth, throat and stomach. Severe eye damage may result from direct contact with the liquid or exposure to high gas concentrations. Long term disability is mainly due to corneal and respiratory injuries.

The exposure limits for ammonia are summarised in Table 4.

Table 4 - Ammonia Exposure Limits

Material	Odour Threshold	Exposure Limit (ppm)		IDLH (ppm)	Injury mechanism
		TWA	STEL		
Ammonia	5 to 53 ppm	25	35	300	Irritant

Note: IDLH is Immediately Dangerous to Life and Health

Ammonia is flammable in air in a concentration range of 16 - 25% by volume but it does not readily ignite (the minimum ignition energy is 100 mJ, compared with 0.29 mJ for methane). Ignition is therefore difficult and the probability of an explosion in the open air is low. The auto-ignition temperature of ammonia is 651^{o}C (relatively high compared to hydrocarbon materials).

Ammonia decomposes into flammable hydrogen gas at approximately 450^{o}C.

Given the difficulty of ignition, the relatively narrow flammability range and typical operating conditions, ammonia storage and distribution installations are not generally regarded as significant fire or unconfined explosion hazards.

Water spray can be used to absorb vapour releases but should not be sprayed on pools of liquid ammonia as this will cause the liquid to rapidly vaporise (ammonia dissolves exothermically in water). If water is used for vapour absorption, a minimum of 100 volumes of water must be available for each volume of ammonia.

The transport of liquefied ammonia in a tank or bulk container made of quenched and tempered steel is prohibited unless the liquefied ammonia contains not less than 0.2wt% water. Stress corrosion cracking can occur due to the presence of stress and oxygen (even at low ppm), if water is not present for these materials of construction.

4.1.4 Sulphur Oxides

Sulphur dioxide and sulphur trioxide would be produced within the sulphuric acid plant at the mine and processing facility. In the sulphuric acid plant, sulphur dioxide is formed by the combustion of sulphur in a burner. The sulphur dioxide is catalytically converted to sulphur trioxide in a fixed bed reactor. The sulphur trioxide is absorbed in weak acid to produce sulphuric acid.

Both gases are toxic but non-combustible.

Sulphur dioxide is a colourless gas with a characteristic pungent and suffocating odour. The TWA (Time Weighted Average – concentration) is 2 ppm and the STEL is 5 ppm. Repeated exposure to the gas (>10 ppm) may cause lung effects including constriction and inflammation of the lungs and reduced lung function. The IDLH (immediately dangerous to life and health) is 100 ppm. Sulphur dioxide is an air contaminant and a constituent of smog. As the gas is heavier than air, it can accumulate in low points such as sumps and pits. In the presence of moisture, sulphur dioxide will form sulphurous acid (H_2SO_3) which is corrosive.

Sulphur trioxide, if released, will react with water in the atmosphere and form a white visible cloud. The mist is likely to contain submicron droplets which remain airborne until they absorb additional water and rain out or are deposited onto surfaces. With regard to the effects of the acid mist formed, a LC_{50} (lethal concentration for 50% mortality) of 60 mg/m^3 for a 60 minute exposure is typical of most reported data.

4.2 Potential Hazardous Incidents Review

In accordance with the requirements of HIPAP No 6, (Ref 3), it is necessary to identify hazardous events associated with the facility's operations. As recommended in HIPAP No 6, the PHA focuses on "atypical and abnormal events and conditions. It is not intended to apply to continuous or normal operating emissions to air or water".

In keeping with the principles of risk assessments, credible hazardous events with ***the potential for off-site effects*** have been identified. That is, local events with limited impact or "slips, trips and falls" type events are not included nor are non-credible situations such as an aircraft crash occurring at the same time as an earthquake.

Given that the nearest place of residence is approximately 4.6 km away and the mine and processing facility boundary is at least 150 m from the hazardous materials, only a limited number of potential hazardous events can have off-site impact. This was the basis for the original approved PHA in 2000 (Ref 1) and the revised PHA in 2017 (Ref 2). As examples, large pool fires in the solvent extraction area have the following distances to various levels of radiant heat.

Table 5 - Pool Fire Scenarios

Pool Fire Scenario	SEP (kW/m^2)	Distance to Specified Radiant Heat Level (m)		
		23 kW/m^2	12.6 kW/m^2	4.7 kW/m^2
10 m diameter pool fire	56	4	9	19
50 m diameter pool fire	20		3	36

"SEP" is the surface emissive power (i.e. the radiant heat level of the flames).

From Table 5, there will be no adverse radiant heat impact from pool fires at the site's boundary. Therefore, these events do not contribute to the off-site risk criteria shown in Table 2 and can be ignored in this analysis (consistent with the methodology in the approved PHAs from 2000 and 2017, Refs 1 and 2, respectively).

Similarly for jet fires, Ref 1 included various jet fire scenarios with estimated flame lengths up to 30 m. As with pool fires, no adverse off-site impact is expected given the separation distance to the site's boundary.

The potential for offsite impact at the rail siding is negligible given the materials.

In preparation for the PHA conducted in 2000, a one day hazardous event identification exercise was conducted. It is from this study, the subsequent assessments conducted in 2017 and the assessment for this report that the potential hazardous events for off-site impact have been determined.

These potential hazardous events are summarised in the following Hazard Identification Word Diagram (Table 6). This diagram presents the causes and consequences of the events, together with major preventative and protective features that are to be included as part of the design.

Table 6 - Hazard Identification Word Diagram

Event Number	Hazardous Event	Causes	Consequences	Proposed Safeguards - Prevention Detection Mitigation
1	Loss of containment from the natural gas pipeline	External interference, e.g. pipe damaged by excavation activities. Corrosion. Exceeding the maximum allowable operating pressure. Weld failure. Ground movement or ground erosion by water	Potential for failure of the natural gas line and a jet fire, flash fire and/or explosion (if the gas is confined) if ignited. This can cause injury to people, and damage to property and the environment	Pipeline designed to AS2885 including signage along the pipeline route. This includes aspects associated with pipeline such as design and construction, welding, operation and maintenance, and field pressure testing. The pipeline would be buried deep to lower the risk of third party damage and recorded for Dial-Before-You-Dig purposes. Pressure monitoring for leak detection
2	Decomposition of the Ammonium Nitrate Emulsion (ANE)	ANE subjected to heat, confinement and impurities. Sympathetic detonation	Potential for the ANE to explode. This can cause injury to people, and damage to property and the environment	ANE would be delivered and stored in precursor form and only mixed at point of use. All explosives handling will be compliant to the relevant Australian Standards and by trained personnel

Event Number	Hazardous Event	Causes	Consequences	Proposed Safeguards - Prevention Detection Mitigation
3	Large loss of containment of ammonia. The ammonia tanks are larger than the previously approved tanks, therefore, ammonia releases are re-assessed in this PHA	Ammonia tank failure, e.g. due to stress corrosion cracking. Catastrophic failure of a large pipe or transfer hose conveying liquid ammonia	Release of ammonia which is both a toxic and flammable hazard. The ammonia would disperse downwind with the potential to impact people. At high concentrations, ammonia can also cause corrosive impact to vegetation	Tanks designed to AS2022. See the recommendations in this PHA for further safeguarding
4	Release of sulphur dioxide or sulphur trioxide. There are changes to the approved sulphuric acid plant, i.e. site location and stack height, therefore, sulphur oxides releases are re-assessed in this PHA	Fugitive emissions from vessel holding hot molten sulphur. Leak or rupture at acid plant due to mechanical failure or impact, e.g. suction seals, valves, blower, piping, vessel or heat exchanger, transport or cranage accident. Loss of absorption in acid plant absorption tower, e.g. loss of reflux liquid	Release of sulphur dioxide or sulphur trioxide at ground level or through the stack. Toxic gases are dispersed downwind. Acute effects only (no long term effects). Corrosion of nearby structures	Regular maintenance. Computer control and monitoring of the acid plant. Stack emissions monitoring. Operator training and surveillance. Automatic shutdown of plant on upset conditions. Sulphur dioxide monitors located throughout the plant. Mechanical protection of the plant from vehicles, e.g. bollards, walls. Appropriate materials of construction. Visual indication of release (visible white plume for a sulphur trioxide release)

5 HAZARDOUS EVENTS ASSESSMENT

5.1 NATURAL GAS SUPPLY PIPELINE FAILURE

The natural gas pipeline was assessed in the 2000 PHA (Ref 1) and subsequently approved. The following pipeline assessment has not been changed as part of this PHA; it is included for completeness only.

Natural gas would be supplied to the site from a lateral of the Moomba to Sydney gas pipeline. The majority of the pipeline run would be within the road reserve. It would be laid underground and setback a minimum safety distance from all residences in accordance with Australian Standard AS2885 (Pipelines – Gas and Liquid Petroleum).

The pipe route has been selected to avoid sensitive areas, thereby taking public safety into consideration. This includes routing the pipe around the outskirts of Condobolin.

The major hazards associated with the pipe are loss of containment from leaks (e.g. due to mechanical damage) leading to fires (jet and flash) and explosions.

To reduce the likelihood of these events from occurring, the pipe is to be laid in accordance with the relevant standards and codes (e.g. AS2885). Measures recommended in this standard to reduce the likelihood of loss of containment include burial to avoid damage from hostile events (e.g. sabotage), corrosion protection features (e.g. corrosion allowance on wall thickness, approved material of construction and cathodic protection), flow monitoring (by computer controls) and fracture control plans (including means of isolation), signage, deep burial and large wall thickness to protect against common digging activities (e.g. ploughing, digging and fence post drilling), and minimisation of joints (and hence potential leak points and hazardous areas for electrical equipment selection).

Given that the natural gas pipe is to be run to avoid sensitive areas and would be installed with mitigation features as detailed in such standards as AS2885, acceptable levels of risk result would be attained.

Data for pipeline failure is available from a number of sources but one of the most recent, comparable data sets is from the United Kingdom's Health and Safety Executive (HSE) (Ref 7).

The HSE have researched pipeline releases in the United Kingdom over a 45 year period and determined a current failure rate of approximately 2.8×10^{-5}/year.km. This is for small, medium and large releases. Note the HSE data assumes the pipelines are in use 100% of the time.

The probability of ignition of flammable gas releases is dependent on the size of the release but is reported (Cox, Lees and Ang, Ref 8) as being from 1 to 30% depending on the size of the leak. As a conservative assumption, a 30% probability of ignition is taken for a leak of natural gas.

Therefore, the likelihood of a release and ignition is:

$$L = 2.8x10^{-5}/yr.km \times 0.3 = 8.4x10^{-6}/yr.km \text{ or } 8.4x10^{-9}/yr.m$$

The results from ignition include a jet fire, a flash fire and/or an explosion if the natural gas is confined.

The above low likelihood for a release and ignition supports the anecdotal evidence in Australia that gas and liquid lines built to the Australian Standards, e.g. AS2885, have a low failure rate. The low likelihood of releases and ignition plus construction to recognised codes confirms that the SFARP (So Far As Reasonably Practicable) principle is met.

5.2 EXPLOSIVES

Explosives at the limestone quarry were assessed and approved in the 2000 PHA (Ref 1). The following explosives assessment has not been changed as part of this PHA; it is included for completeness only.

> *Explosives will be used at the limestone quarry. The use of explosives shall be as per standard mining and regulatory practice, e.g. detonators stored separately to explosive charges, purpose built storage facilities, static protection facilities and strict procedural control enacted by well trained personnel. Historically, these practices have proven to be adequate in avoiding unplanned explosions with off-site impacts. As such, the risk of a spurious explosion involving the explosives stored on the limestone quarry site is deemed to be acceptable. This judgement is based on the assumption that the quarry site will have a quality safety management system in place and in use for the life of the facility.*

Explosives at the mine and processing facility were assessed and approved in the 2017 PHA (Ref 2). Similarly to the limestone explosives, they will be stored and used as per the requirements of the Australian Standards. The following explosives assessment has not been changed as part of this PHA; it is included for completeness only.

> *If explosives are to be used at the mine and processing facility, initial information provides the following:*
>
> *Type: Ammonium nitrate emulsion (ANE)*
>
> *Quantity: Approximately 25 tes*
>
> *Whilst storage and use as per the Australian Standards provides risk assurance for explosives, there are ways for it to decompose, e.g. impurities and heat whilst confined.*

The trinitrotoluene (TNT) equivalence for ANE is approximately 0.8. For 25 tes ANE, the equivalent mass of TNT is 20 te. Using the TNT explosion model, the distances to selected explosion overpressures are shown in Table 7.

Given the distance to the nearest site boundary from the explosive storage area is approximately 920 m then the criteria shown in Table 2 are satisfied.

Table 7 - Explosive Overpressures

Explosion Scenario	Distance to Specified Overpressure Level, m		
	21 kPa	14 kPa	7 kPa
25 te ANE	206	265	410

For information, the consequences of various levels of overpressure generated from explosions are shown in Table 8 (Ref 4).

Table 8 - Effects of Explosion Overpressures

Overpressure kPa	Effect
3.5	90% glass breakage No fatality and very low probability of injury
7	Damage to internal partitions and joinery but can be repaired Probability of injury is 10%. No fatality
14	Houses uninhabitable and badly cracked
21	Reinforced structures distort Storage tanks fail 20% chance of fatality to a person in a building
35	Houses uninhabitable Trucks and plant items overturned Threshold of eardrum damage 50% chance of fatality for a person in a building and 15% chance of fatality for a person in the open
70	Threshold of lung damage 100% chance of fatality for a person in a building or in the open Complete demolition of houses

5.3 TOXIC GAS RELEASES

As identified in Section 4, large releases of sulphur oxides and ammonia have the potential to impact people off-site. The 2000 PHA (Ref 1) assessed releases of sulphur oxides and hydrogen sulphide. The latter is no longer part of the processing plant's design and hence is not included in this report.

The 2000 PHA toxic gas modelling basis is included in Appendix A for information. This methodology is still relevant and is used in this revised PHA.

The DoP risk criteria of importance for this rural site are:

- Irritation, injury and fatality risk at a place of residence. The nearest place of residence is the 'Slapdown' house located 4.6 km from the processing plant. Note that HIPAP No 4 defines the one in a million criterion assuming that residents would be at their place of residence (taken to be the house) and exposed to the risk 24 hours a day and continuously day after day for the whole year; and

- Fatality risk to be contained within the boundary of an industrial site, i.e. no more than $50x10^{-6}$/yr.

As the processing areas where the hazardous materials are stored and handled are a significant distance from the site's boundary and the nearest place of residence, e.g. the ammonia storage is 262 m from the nearest site boundary, then only the releases that have the potential to cause irritation, injury and/or fatality at these locations are assessed (consistent with the 2000 PHA approach).

Meteorological Data

The meteorological data used in this PHA comprises an updated set of five dominant weather/wind combinations (Pasquill stability category / wind speed) for the area and has been used as the basis for all dispersion calculations. This is based on 2016 data with hourly measurements for 365 days.

The probability of the relevant combined weather/wind category and wind direction (data is split into 8 directions) is used in the calculation of toxic impact at the nearest place of residence ('Slapdown') and the nearest site boundary.

The meteorological data used for this risk assessment, sourced from the Condobolin Bureau of Meteorology weather station, is shown in Table 9.

Slapdown is chosen preferentially to Fifield given the low probabilities of wind from the north-west that could cause a plume to travel towards Fifield, i.e. the risk of potential plumes is higher for westerly winds that blow towards Slapdown.

Table 9 - Stability Class / Wind Speed

Wind Direction	Stability Class / Wind Speed (m/s) Percentages:					
	D5.9	D2.4	E5.8	E2	F2	
N	4.5	3.1	2.4	2.9	5.0	
NE	2.7	2.4	2.5	2.7	2.9	
E	1.9	3.4	1.2	3.9	2.3	
SE	1.3	3.0	0.4	2.0	1.0	
S	1.6	3.2	0.8	1.8	1.0	
SW	5.5	3.9	2.8	3.1	2.7	
W	4.4	3.5	1.7	3.3	2.6	
NW	1.5	1.8	0.5	1.5	1.4	
Totals:	23.4	24.2	12.4	21.3	18.7	100

5.3.1 Sulphur Oxides Releases

Releases of sulphur oxides were assessed in the 2000 PHA (Ref 1). The following is an update of this work.

Sulphuric acid would be produced in a double adsorption style, sulphur burning acid plant. After the burner, the sulphur dioxide is reacted over a fixed bed catalyst system to form sulphur trioxide. The sulphur trioxide is absorbed in acid to form the required 98 wt% sulphuric acid. Overhead gases from the absorber are vented to atmosphere.

These types of plants run at low pressure (typically 24 kPag after the burner) and hence there exists a low driving force for releases. Gas stream temperatures of 80ºC or higher are normal.

Sulphur trioxide is present in the process from the reactor to the absorption tower. Any releases from these areas (including failure of absorption reflux flow) would immediately form white clouds as the sulphur trioxide readily forms sulphuric acid when combined with atmospheric moisture. The sulphuric acid mist generated becomes a dense cloud which partly rains out on to the ground and other surfaces.

This strong affinity of sulphur trioxide with water makes accurate modelling of sulphur trioxide clouds difficult, particularly over large distances such as that to the nearest place of residence. The approach taken in this analysis is to model releases of sulphur dioxide to determine the significant effects, if any, at the nearest place of residence and site boundary. Depending on these results, off-site effects of sulphur trioxide releases can be surmised. Whilst sulphur dioxide also reacts with atmospheric moisture, the reaction is not as fast as that of sulphur trioxide and is not taken into account in the modelling of releases.

The composition of the sulphur dioxide stream varies from plant to plant (e.g. depending on the sulphur sources), and, of course, within each plant. In this study, a composition of 18vol% sulphur dioxide in air is used (typical maximum value).

Release scenarios were only performed for the cases where the plant was kept operating. Once the plant is stopped, the low pressure in the equipment minimises the flowrate of further releases.

Release conditions are summarised as follows:

Plant rate (gas stream after burner)	65 kg/s
Sulphur dioxide rate	25 kg/s
Pressure	24 kPag
Temperature (approximate)	80^{o}C
Release height (approximate pipe rack level)	10 m

Given this temperature, the density of the sulphur dioxide stream when it is released to atmospheric pressure was calculated to be 1.22 kg/m^3. As this is approximately the same as air at 15^{o}C (1.23 kg/m^3), the plume is treated as having neutral buoyancy and it is modelled by using the Gaussian neutral gas dispersion correlations. The simulations involving large releases are based on a release duration of one minute (at full plant rate). Large releases would become known (visual, noise and smell as well as process monitoring alarms and trips) soon after the catastrophic failure, hence it is realistic to assume shutdown within one minute. For the smaller releases (from 50 mm holes or smaller), release durations of 15 minutes are modelled (to determine the worst case effect distances). This time allows for operator intervention to manually control and/or stop the leak.

Toxic Impact of Sulphur Dioxide

The toxicity effects of sulphur dioxide are summarised in Table 10.

Table 10 - Effects of Sulphur Dioxide

Exposure Level (ppm)	Duration (minutes)	Effects
0.3 3 25	60	ERPG 1 ERPG 2 ERPG 3

The three ERPG (emergency response planning guidelines) tiers are defined as follows:

- **ERPG-3** is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects.
- **ERPG-2** is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action.
- **ERPG-1** is the maximum airborne concentration below which nearly all individuals could be exposed for up to 1 hour without experiencing more than mild, transient adverse health effects or without perceiving a clearly defined objectionable odour.

Given the above definitions, ERPG 1 (0.3 ppm) and 2 (3 ppm) are taken as the limits for irritation and injury, respectively.

One level of fatal toxicity used by the United Kingdom HSE (Health and Safety Executive) in relation to the provision of land use planning advice is termed the Specified Level of Toxicity (SLOT). The HSE has defined the SLOT as:

- Severe distress to almost everyone in the area;
- Substantial fraction of exposed population requiring medical attention;
- Some people seriously injured, requiring prolonged treatment; and
- Highly susceptible people possibly being killed.

The SLOT value for sulphur dioxide is 4.655×10^6 ppm^2.min. Hence, for a 1 minute exposure, the required average concentration is 2,160 ppm, or for a 15 minute exposure, the required average concentration is 560 ppm. The SLOT values are used to determine if fatality at the nearest place of residence and site boundary from a release is possible.

Sulphur Dioxide Release Cases Modelled

The following scenarios involving sulphur dioxide releases were modelled for the five dominant stability classes and wind speeds in Table 9. Concentrations at the nearest place of residence and site boundary are calculated.

1. Catastrophic vessel failures or full pipe fractures. The release rate is modelled as full plant rate for one minute.
2. Piping and vessels failures corresponding to the various hole sizes discussed in Appendix A (15 minutes duration).

The results for Scenario 1 above are shown in Table 11. Whilst there is a plantation across the road from the releases, the modelling is performed based on parkland and bushes given the land use beyond the plantation.

The distances used in the modelling have been measured from the sulphuric acid plant to the nearest residential dwelling (i.e. Slapdown) and the nearest property boundary.

Table 11 – Sulphur Dioxide Release Modelling – Catastrophic Failures

Stability Class / Wind Speed	Concentration (ppm) at Nearest Residence (4.6 km)	Concentration (ppm) at Nearest Boundary (150` m)
D5.9	3	2,500
D2.4	3	6,100
E5.8	8	3,200
E2	8	9,200
F2	24	5,100

Given the results in Table 11, irritation and injury (but not fatality) are possible at the nearest place of residence and also fatality at the nearest site's boundary due to catastrophic equipment failures. The corresponding risks are analysed in Section 6 of this PHA.

The results for Scenario 2 above are shown in Table 12.

Table 12 – Sulphur Dioxide Hole Release Modelling

Stability Class / Wind Speed	50 mm Hole (0.2 kg/s)	
	Concentration (ppm) at Nearest Residence (4.6 km)	Concentration (ppm) at Nearest Boundary (150 m)
D5.9	0.1	20
D2.4	0.2	50
E5.8	0.2	25
E2	0.6	74
F2	2	39

The flowrates from 25 mm diameter or smaller holes are too low to impact people at the locations of interest.

Given the results in Table 12 then irritation (but not injury or fatality) is possible at the nearest place of residence due to releases through a 50 mm hole (for the E2 and F2 conditions). The corresponding risks are analysed in Section 6 of this PHA.

The concentrations at the nearest site boundary are not expected to cause fatality.

From the 2000 PHA (Ref 1), with regard to sulphur trioxide releases, it was discussed previously that sulphur trioxide reacts readily with atmospheric moisture to form sulphuric acid which, being a dense mist, rains out significantly on to the ground and nearby structures. Given the predicted low sulphur dioxide levels from releases from 50 mm holes (or less) would only just cause impact at the nearest place of residence, it can be surmised that sulphur trioxide releases from these size holes are unlikely to have any significant off-site impacts. However, for a worst case release at full plant rates involving the sulphur trioxide steam, off-site effects can certainly be expected at the nearest site boundary and are conservatively modelled as sulphur dioxide releases.

5.3.2 Ammonia Releases

Releases of ammonia were not assessed in the 2000 PHA (Ref 1) as ammonia storage and handling was not part of the original design.

Anhydrous ammonia is to be delivered by road tanker and would be transferred to the two anhydrous ammonia storage bullets (208 te capacity each).

Vapour from the bullets passes through the Compressor Knockout Vessels, the Ammonia Unloading Compressors and then back into the ammonia road tanker, i.e. so that liquid ammonia can be transferred into the bullets.

The liquid discharge from the bullets passes through a vaporiser before being distributed to the process at a rate of approximately 1 kg/s (corresponds to approximately 25,000 te/year).

Losses of containment of ammonia can therefore be from:

- Road tanker transfers;
- The storage bullets; and
- Piping including the vaporiser.

It is estimated that an average three ammonia deliveries per day would take place.

Ammonia is normally a heavy gas when modelled due to cooling when flashed (with the formation of mist) and also absorption of water from the atmosphere. Therefore, it is modelled with the heavy gas model (SLAB) within Effects.

Toxic Impact of Ammonia

The toxicity effects of ammonia are summarised in Table 13.

Table 13 - Effects of Ammonia

Exposure Level (ppm)	Duration (minutes)	Effects
25	60	ERPG 1
150		ERPG 2
1,500		ERPG 3

The above exposure limits are quite conservative given the following information from the Australian Standard (AS2022) for ammonia (Ref 9):

Up to 100 ppm – no adverse effect for the average worker with no deliberate exposure for long periods permitted.

400 ppm – immediate nose and throat irritation with no serious effect after 30 minutes to one hour.

700 ppm – immediate eye irritation with no serious effect after 30 minutes to one hour.

1,700 ppm – convulsive coughing, severe eye, nose, and throat irritation; could be fatal after 30 minutes.

2,000-5,000 ppm – convulsive coughing, severe eye, nose, and throat irritation; could be fatal after 15 minutes.

Over 5,000 ppm – respiratory spasm, rapid asphyxia and fatal within minutes.

To be consistent with the sulphur oxides modelling, ERPG 1 (25 ppm) and 2 (150 ppm) are taken as the limits for irritation and injury.

The SLOT value for ammonia is 3.78×10^8 ppm^2.min. Hence, for a 1 minute exposure, the required average concentration is 19,440 ppm, or for a 15 minute exposure, the required average concentration is 5,020 ppm. The SLOT values are used to determine if fatality at the nearest place of residence and site boundary from a release is possible.

Ammonia Release Cases Modelled

The following scenarios involving ammonia releases were modelled for the five dominant stability classes and wind speeds in Table 9. Concentrations at the nearest place of residence (i.e. Slapdown) and the site boundary are calculated. The location at the site boundary is the nearest point to the sulphuric acid plant (i.e. the Wilmatha Road boundary) so that cumulative risk can be estimated at this location. The modelling was also performed at the nearest site boundary to the ammonia storage area. The risk results were identical.

1. Catastrophic storage bullet failures. The release quantity is taken as 208 te per bullet, i.e. worst case as the bullets are assumed to be full.

2. Liquid releases from piping, transfer hose and vessel failures corresponding to the various hole sizes discussed in Appendix A (15 minutes duration).

3. Vapour releases from piping, transfer hose and vessel failures corresponding to the various hole sizes discussed in Appendix A (15 minutes duration).

Scenario 1 – Catastrophic Bullet Failure:

The results for Scenario 1 above are shown in Table 14. The modelling is performed based on regular large obstacles as the ammonia plume travels first through the plant and then through the plantation across the road.

Table 14 – Ammonia Release Modelling – Catastrophic Failures

Stability Class / Wind Speed	Concentration (ppm) at Nearest Residence (4.6 km)	Concentration (ppm) at the Boundary (425 m)
D5.9	1,600	79,000
D2.4	1.3	49,000
E5.8	2,600	90,000
E2	-	52,000
F2	-	65,000

Note: The distances used in the modelling have been measured from the ammonia storage and handling area to the nearest residential dwelling (i.e. Slapdown) and the nearest property boundary opposite the sulphuric acid plant (to estimate the maximum cumulative risk).

For the E2 and F2 conditions, the vapour would layer and be largely held by the plant structures and surrounding plantation without dispersing as far as the other weather / wind combinations. This has been observed with historical releases of liquid ammonia.

Given the results in Table 14 then irritation and injury (but not fatality) are possible at the nearest place of residence due to catastrophic storage bullet failures. Also, the concentrations predicted at the nearest site boundary are sufficiently high to cause fatality.

The corresponding risks are analysed in Section 6 of this PHA.

It is noted that historical releases of ammonia (including the 7,000 te release in Lithuania in 1989) have not resulted in fatalities beyond 200 m. Hence, the modelling results are very conservative.

Scenario 2 – Liquid Releases:

The results for Scenario 2 are shown in Table 15 and Table 16.

Table 15 – Ammonia (Liquid) 50 mm Hole Release Modelling

Stability Class (Wind Speed [m/s])	50 mm Hole (rate = 36 kg/s)	
	Concentration (ppm) at Nearest Residence (4.6 km)	Concentration (ppm) at the Boundary (425 m)
D5.9	110	3,500
D2.4	23	4,900
E5.8	200	5,600
E2	-	7,000
F2	-	12,000

This rate, i.e. 36 kg/s, is equivalent to 130 te/hr. Whilst this would exceed the transfer rate into the bullets, the results would be indicative for liquid releases from the transfer hose or bullets.

Table 16 – Ammonia (Liquid) 25 mm Hole Release Modelling

Stability Class / Wind Speed	25 mm Hole (rate = 9.3 kg/s)	
	Concentration (ppm) at Nearest Residence (4.6 km)	Concentration (ppm) at the Boundary (425 m)
D5.9	29	980
D2.4	16	2,000
E5.8	52	1,870
E2	-	2,300
F2	-	5,860

As above, for the E2 and F2 conditions, the vapour would layer and be largely held by the plant structures and surrounding plantation without dispersing as far as the other weather / wind combinations. This has been observed with historical releases of liquid ammonia.

Given the results shown in Table 15 and Table 16 then irritation and injury (but not fatality) are possible at the nearest place of residence due to liquid ammonia releases. There is a risk of fatality at the site boundary for some weather / wind combinations.

The corresponding risks are analysed in Section 6 of this PHA.

Scenario 3 – Vapour Releases:

The design plant vapour ammonia rate is up to 1 kg/s. This rate is modelled to determine the potential consequential impacts. This rate is also indicative of the vapour flow to the road tankers when performing transfers.

The results for Scenario 3 are shown in Table 17.

Table 17 – Ammonia Vapour Release Modelling

Stability Class / Wind Speed	Rate = 1 kg/s	
	Concentration (ppm) at Nearest Residence (4.6 km)	Concentration (ppm) at the Boundary (425 m)
D5.9	2	90
D2.4	4	220
E5.8	4	190
E2	11	560
F2	36	1,450

The plant design ammonia vapour rate does not result in concentrations at the boundary sufficient to result in fatality. Irritation impact at the nearest place of residence is possible for F2 condition only.

The corresponding risks are analysed in Section 6 of this PHA.

5.4 Transport Incidents

5.4.1 Road

Road transport was assessed in the 2017 PHA (Ref 2). The following is an update of this assessment.

Chemicals transported by road would, where relevant, be transported in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (Ref 10).

The expected frequency and quantity of deliveries of the main Dangerous Goods to the site is given in Table 18.

Hazardous materials that are less frequently delivered include flocculant, diluent, hydrochloric acid, extractant, hydrogen peroxide and explosives (typically one or less deliveries per week).

Table 18 – Bulk Chemicals Road Transport Frequencies

Material Transported	Nominal Site Delivery Frequency	Nominal Annual Consumption
Ammonia	2.3 B Doubles (35 t each) per day	24,978 t
Caustic	5 road tankers (20 t each) per month	1,033 t
Diluent	1 road tanker (25 t each) per month	254 t
Hydrochloric Acid	3 road tankers (20 t each) per month	690 t
Hydrogen Peroxide	3 road tankers (20 t each) per month	657 t

Materials such as limestone, hydrated lime, soda ash, diesel, SMBS, the nickel, cobalt and scandium products, ammonium sulphate and quicklime are not classified as dangerous goods for transport by road and rail and therefore are relatively safe to transport in bulk form (subject to road and rail usage regulations). Shellsol and diesel are both combustible liquids. The transport of these types of materials in approved road tankers throughout Australia is commonplace and of low risk.

The packaged chemicals delivered by road transport in IBCs (intermediate bulk containers), drums, bulk bags or cylinders, again, would be transported in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail. The main usage of these chemicals is for dosing systems, shutdown replacements and topping up storages. The small packaged volumes with low usage rates pose minimal transport risks due to loss of containment. Mitigation of risks is also provided by the proposed use of approved transport companies through their safety management systems and emergency response plans.

Hydrochloric acid is a corrosive liquid. Hydrogen peroxide is an oxidising material and also a corrosive fluid. If these materials are involved in a traffic accident, the primary risk to people, the environment and property is the corrosive nature of the fluids (including vapours). It is possible for fires to result from hydrogen peroxide releases as it will oxidise combustible material (mostly due to the water evaporating which allows the hydrogen peroxide to dry / concentrate with subsequent ignition).

From a review of incidents involving ammonium nitrate, the outcomes of a truck accident whilst carrying ammonium nitrate are as follows:

1. Release of the solid ammonium nitrate without harmful effect (it is a commonly used fertiliser). In this case, the ammonium nitrate will be swept-up and recovered;

2. Release of the solid ammonium nitrate and combustion of other materials (it is an oxidising agent). It is possible for the ammonium nitrate to be involved in a fire without a subsequent explosion, however, toxic gases will be emitted;

3. Release of the solid ammonium nitrate to waterways thereby increasing the water's nitrogen content and hence environmental impact; and

4. Heating whilst confined (with or without contamination) with a subsequent explosion.

The main road transport hazard is ammonia. If a road tanker carrying ammonia is involved in an accident and the vessel integrity is lost then there is the potential for serious injury and fatality for people involved in the accident or those nearby.

Causes for road tanker accidents are summarised in Table 19 (Ref 11).

Table 19 – Causes for Road Tanker Accidents

Human Error	Equipment Failures	System or Procedural Failures	External Events
• driver impairment, e.g. alcohol or drugs • speeding • driver overtired • driver exceeding safe working hours • en-route inspection • contamination • overfilling • other vehicle's driver • taking tight turns/ramps too quickly (overturns) • unsecured loads	• non-dedicated trailer • rail road crossing guard failure • leaking valve • leaking fitting • brake failure • relief device failure • tyre failure • soft shoulder • overpressure • material defect • steering failure • sloshing • high centre of gravity • corrosion • bad weld • excessive grade • poor intersection design • road chamber/width • suspension system • tyre fire caused by friction, brakes overheating or exploding tyres give sparks due to metal in the rubber) • fuel tank fire (diesel)	• driver incentives to work longer hours • driver training • carrier selection • container specification • route selection • emergency response training • speed enforcement • driver rest periods • maintenance • inspection • time of the day restrictions	• vandalism/sabotage • rain • fog/visibility • wind • flood/washout • fire at rest area/parking areas • earthquake • existing accident • animals on road

A detailed analysis of heavy vehicle risks in NSW was performed for the Cowal Gold Project (Ref 12). This study found the following typical heavy vehicle accident rates for similar road routes:

> 0.016 - 2.96 Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel

This data compares well with reported data, e.g. the Centre for Chemical Process Safety (CCPS) guidelines (Ref 11) quote a figure of approximately 2 accidents/year (for all causes) per 10^6 miles, i.e. 1.2×10^{-6} accidents per kilometre per year.

In the event of an accident involving a heavy vehicle, the carried goods may or may not be released. The probability of release is dependent on factors such as speed, shipping conditions (i.e. pressurised versus non-pressurised), inadequate load securing, and strength and integrity of the container.

Various studies of release probabilities from heavy vehicles involved in an accident have been undertaken. The Guidelines for Chemical Transportation Risk Analysis (CCPS, 1995, Ref 11) indicates that the release probability for various road types is between 5 and 10% (i.e. approximately one heavy vehicle accident in every 10 to 20 would result in a release of the material). The probability of fatality then has to be taken into account but this would depend on factors such as the leak size, i.e. the probability of fatality could be any value from 0 to 1.

Given the history of road tanker transport in NSW, compliance with the Australian Dangerous Goods Code (an indicator of achieving SFARP (so far as reasonably practicable)) and the above representative data then the risk of an accident involving a vehicle transporting a hazardous material such as ammonia to the site resulting in a release of material is therefore relatively low.

5.4.2 Rail

The following is an updated rail assessment from the 2017 PHA (Ref 2).

For this development, rail transport primarily concerns the movement of sulphur from the stockpile in Newcastle, NSW, to the modified rail siding. The proposed number of return train trips per week is approximately three. To avoid congestion in the Sydney rail network as well as steep grades in the crossing of the Blue Mountains (i.e. minimise the likelihood of an accident), it is proposed that trains to and from the site use a route via Muswellbrook, Ulan, Dubbo, Narromine and Parkes to Bogan Gate.

The significant hazards are the potential for the sulphur to catch alight and emit toxic fumes (e.g. sulphur dioxide). The sulphur could catch alight due to ignition whilst in transit (e.g. arson, lightning strike or static) or due to an accident involving the train.

Radiant heat effects due to burning sulphur are localised only. Any loss of containment during transport would be responded to as per the proposed emergency response plans for the site to avoid contamination of waterways etc.

Sulphur is classified as a flammable solid (4.1), Packing Group III (minor danger only). It is routinely transported in bulk around the world. Separation from non-compatible materials and elimination of ignition sources are the major measures taken to avoid incident.

Protection features for the bulk transport of sulphur by rail to the proposed siding include minimal dust in the bulk sulphur (prilled form), proposed water sprays at all transfer points, local fire brigades (for water application), electrics (such as motors) rated for the hazardous area zones, separation from non-compatible materials and static protection. Small fires can be smothered with sand or even with additional sulphur. The sulphur remains within the shipping containers until it is discharged into a hopper at the site.

Given the proposed protective features associated with the rail transport of sulphur, the low likelihood of ignition of sulphur within the containers and the accepted risk of transport of bulk sulphur by road or rail throughout Australia and the world, the overall risk of an incident involving sulphur with significant consequences during rail transport is considered low. No further analysis (i.e. quantification of risks) of the transport of bulk sulphur to this site is deemed necessary.

The product metals are likely to be transported from the site by road. The nickel and cobalt sulphates and scandium oxide products would be stored and transported in bulkabags in containers, not as a bulk product.

The product metals would also be transported from the modified rail siding by rail (the bulkabags would be within containers).

The Modification would allow ammonium sulphate to also be transported from the modified rail siding by truck. Ammonium sulphate will be transported in bulk via rail or trucks.

An average of three trains per week (six train movements per week), with a maximum of two trains per day, is approved at the rail siding.

5.5 NATURAL AND OTHER EXTERNAL HAZARDOUS EVENTS

The site has been assessed with regard to exposure to the following external hazards:

Subsidence	Landslide
Burst dam	Earthquake
Storm and high winds	Rising water courses
Flood	Storm water runoff
Lightning	Forest fire
Vermin/insect infestation	Security

Given the current proposed location of the project components, there are no obvious significant hazards amongst this list that could result in on-site events leading to serious off-site impacts.

6 RISK ANALYSIS

6.1 HIPAP 4 RISK CRITERIA

As discussed and analysed in Section 5.3, the DoP risk criteria of importance for this rural site are:

- Irritation, injury and fatality risk at a place of residence; and
- Fatality risk to be contained within the boundary of an industrial site, i.e. no more than $50x10^{-6}$/yr.

Given there are a minimal number of materials and events that can cause off-site impact, the updated analysis in this PHA was done on the same basis as the previous PHAs (Refs 1 and 2). That is, model the sulphur dioxide and ammonia release cases for the five dominant stability class / wind directions to determine which events can contribute to off-site risk. The results are shown in Section 5.3.

These results are then analysed using event likelihoods (United Kingdom HSE 2012 data used, Ref 14), probits, the probability of use (e.g. transfer hoses) and the probability that the stability class / wind direction exists. The analysis is shown in Appendix B along with further explanation of the assumptions and data sources. The total estimated risks at the nearest place of residence and the site boundary are compared to the HIPAP 4 risk criteria (Ref 4) in Table 20.

Table 20 – Comparison to HIPAP 4 Risk Criteria

Risk Type	HIPAP No 4 Criteria	Estimated Risk or Likelihood	Comments
Irritation	$50x10^{-6}$/yr	$4x10^{-6}$/yr	Compliant
Injury	$10x10^{-6}$/yr	$1x10^{-6}$/yr	Compliant
Fatality	$50x10^{-6}$/yr	$1x10^{-6}$/yr	Compliant

The assessment was done on a conservative use of stability class / wind direction data. The above estimated risk values are likely to be conservatively high.

Given the separation distance between the processing plant and both the nearest place of residence and site boundary then all other risk criteria are satisfied.

6.2 CUMULATIVE AND PROPAGATION RISK

Given the rural location, the generous separation distances and that significant consequential impacts largely remain on-site then it is reasonable to conclude that the modified development does not make a significant contribution to the existing cumulative risk in the area.

There is the potential for on-site propagation events, e.g. a diluent fire causing another loss of containment. However, as shown in this report, the separation distances mitigate the impacts from the potential hazardous events, either occurring in isolation or due to propagation from other events, and that the off-site risk is acceptable.

6.3 SOCIETAL RISK

Societal risk results are usually presented as F-N curves which show the frequency of events (F) resulting in N or more fatalities. To determine societal risk, it is necessary to quantify the population within each zone of risk surrounding a facility. By combining the results for different risk levels, a societal risk curve can be produced.

Societal risk is normally calculated where the 1 per million per year (pmpy) contour (or calculated risk level) approaches closely to residential areas or sensitive land uses or when events with very large consequence distances are being assessed. Hence, the potential exists for multiple fatalities as a result of a single accident.

In this study, there is a risk of fatality at the nearest site boundary, however, the surrounding area is rural with the nearest place of residence being 4.6 km from the processing plant. At this location, there is no estimated risk of fatality. Therefore, societal risk at residential and other types of land users is acceptable.

6.4 RISK TO THE BIOPHYSICAL ENVIRONMENT

The main concern for risk to the biophysical environment is generally with effects on whole systems or populations. Whereas any adverse effect on the environment is obviously undesirable, to have an incident with such consequences requires exposure of a sensitive area to either large effect, short term releases or smaller effect, long term releases. For this site, the latter includes seepage from the tailings storage facility and continuous gas emissions, e.g. from the stacks. These events are assessed separately within the Environmental Assessment for the Modification and are not included here.

Given the limited number of events (large effect, short term releases) that can occur at this site with off-site impacts and the rural nature of the surrounding area, the risk to people and other biological groups (animals and plants) is low. This has been shown by analysis summary in Section 6.1.

In summary, whilst off-site effects can be expected if a major release were to occur, there are no identified whole systems or populations which are at unacceptable levels of risk due to the potentially hazardous events reviewed in this PHA.

For completeness, risks to the biophysical environment due to significant loss of containment events are summarised below.

6.4.1 Escape of Materials to Atmosphere

The potential events that could lead to the escape of significant quantities of harmful materials to the atmosphere (and the effects / mitigation features available) are summarised as follows:

1. Dust release from stockpiles (water sprays and dust suppressant to be used);

2. Ammonia releases (analysis as per Section 5.3.2 of this PHA). See the recommendations in this study;

3. Products of combustion from fires (hydrocarbon fires typically generate carbon dioxide, soot and water which readily disperse due to buoyancy of the plume);

4. Sulphur oxide releases (including sulphuric acid mist) from the sulphuric acid plant (generally, containment is within process piping and equipment and startup emissions etc are dispersed via the plant stack – 40 m high) or from sulphur fires (sulphur fires are slow burning, easy to detect and typically smothered to extinguish); and

5. Loss of containment of process gases, e.g. hydrogen and natural gas (if released, these types of gases readily disperse due to their low molecular weights).

6.4.2 Escape of Materials to Soil or Waterways

The potential events that could lead to the escape of significant quantities of harmful materials to the soil or waterways (and the effects / mitigation features available) are summarised as follows:

1. Loss of containment of acidic liquids or other hazardous liquid within the process or storage areas (all areas bunded to contain spills, disposal of spills on an as needs basis);

2. Loss of containment of hazardous liquids outside of bunded areas (site stormwater and effluent systems route all flow to the treatment plant area, thereby minimising the chance of harmful soil or waterways effects);

3. Rupture of the tailings pipe (high integrity pipe design, instrumentation and visual inspection to be used to monitor flow problems); and

4. Loss of containment from the tailings storage facility, water storage dam or evaporation pond (conformance to dam safety regulations including routine monitoring of dam's structural condition).

7 CONCLUSION AND RECOMMENDATIONS

The risks associated with the modified mine and processing facility, and rail siding have been assessed and compared against the NSW Department of Planning (now the NSW Department of Planning, Industry and Environment) risk criteria.

The results are summarised in Table 21 and show compliance with all risk criteria.

Societal risk, area cumulative risk, propagation risk, transport risk and environmental risk are also concluded to be acceptable.

The primary reason for the low risk levels from the modified mine and processing facility and rail siding is the separation distances between the potentially hazardous materials and equipment and the nearest private place of residences and also the site boundaries.

The highest contributors to off-site risk are releases of ammonia, in particular, from transfer operations to the storage vessels, and sulphur dioxide releases from catastrophic equipment failure. It is expected that the design review process followed by the Hazard and Operability (HAZOP) study would help mitigate the risk of releases to acceptable levels. This would include designing to Australian Standard AS2022 for the ammonia storage and handling systems. The following recommendations were made in the approved 2017 PHA and are still valid for the modified design. These recommendations are made to lower the risk associated with releases of ammonia.

1. Ensure that the final design includes means to automatically isolate the ammonia road tanker and storage vessels should a release during a transfer occur (vapour and liquid lines). Actuation should be local as well as remote;

2. Provide closed circuit television (CCTV) coverage of the ammonia transfer area to the plant's control room;

3. Provide means to isolate the ammonia flow to the plant should a release occur. This should be at each storage vessel;

4. Provide means to suppress an ammonia vapour plume. A plume could occur due to a release from the transfer system, the storage vessels or the plant supply lines. Options include spray deluge for the transfers bay and fire water monitors in the transfer and storage area. The latter can be operated remotely (preferable) or manually (may require the use of a full protective suit with self-contained breathing air). Monitors can be fixed or portable;

5. Provide means for road tanker driveaway protection. This could include interlocks on the vehicles brakes or self-sealing devices in the transfer lines;

6. Include the transfer hoses and couplings (dry-break preferred) in the preventative maintenance system. The transfer hoses would need to be regularly inspected, tested and replaced as per the manufacturer's recommendations;

7. Provide means for preventing stress corrosion cracking in the ammonia storage vessels and include the vessels in the preventative maintenance system for routine inspections;

8. Provide wind socks at appropriate locations to allow people to decide the best means of escape from an ammonia plume;

9. Provide alternate emergency assembly areas given that an ammonia plume can travel in any direction;

10. Provide means for protection for the ammonia road tanker driver should a release occur, e.g. safehouse;

11. Apply good practice for building design, e.g. design buildings as safehouses should relevant guidelines recommend this. For example, design buildings as per the recommendations in the Chemical Industries Association guideline, "Guidance for the Location and Design of Occupied Buildings on Chemical Manufacturing Sites";

12. Provide overfill protection on the ammonia storage vessels. This system should be reviewed via a Safety Integrity Level (SIL) analysis; and

13. Provide means to prevent the vapour compressor from overpressuring the vapour return line and/or the road tanker.

Table 21 - HIPAP 4 Risk Compliance

Description	Risk Criteria	Risk Acceptable?	Comments
Fatality risk to sensitive users, including hospitals, schools, aged care	0.5×10^{-6} per year	Y	The facility is to be located in a rural area with no nearby sensitive landusers. Based on the analysis in this PHA, there are no credible fires, explosions or toxic gas releases that can cause fatality to sensitive land users. The estimated maximum individual fatality risk at the site boundary is $1x10^{-6}$/yr
Fatality risk to residential and hotels	1×10^{-6} per year	Y	As the estimated maximum individual fatality risk at the site boundary is $1x10^{-6}$/yr then this criterion is satisfied
Fatality risk to commercial areas, including offices, retail centres, warehouses	5×10^{-6} per year	Y	As the estimated maximum individual fatality risk at the site boundary is $1x10^{-6}$/yr then this criterion is satisfied
Fatality risk to sporting complexes and active open spaces	10×10^{-6} per year	Y	As the estimated maximum individual fatality risk at the site boundary is $1x10^{-6}$/yr then this criterion is satisfied
Fatality risk to be contained within the boundary of an industrial site	50×10^{-6} per year	Y	As the estimated maximum individual fatality risk at the site boundary is $1x10^{-6}$/yr then this criterion is satisfied
Injury risk – incident heat flux radiation at residential areas should not exceed 4.7 kW/m^2 at frequencies of more than 50 chances in a million per year or incident explosion overpressure at residential areas should not exceed 7 kPa at frequencies of more than 50 chances in a million per year	50×10^{-6} per year	Y	Based on the analysis in this PHA, there are no credible fires or explosions that can cause injury at the closest privately owned residence

Description	Risk Criteria	Risk Acceptable?	Comments
Toxic exposure – Toxic concentrations in residential areas which would be seriously injurious to sensitive members of the community following a relatively short period of exposure	10×10^{-6} per year	Y	The likelihood of causing injury at the closest privately owned residence is approximately 1×10^{-6}/yr, therefore, this criterion is satisfied
Toxic exposure – Toxic concentrations in residential areas which should cause irritation to eyes or throat, coughing or other acute physiological responses in sensitive members of the community	50×10^{-6} per year	Y	The likelihood of causing irritation at the closest privately owned residence is approximately 4×10^{-6}/yr, therefore, this criterion is satisfied
Propagation due to Fire and Explosion – exceed radiant heat levels of 23 kW/m^2 or explosion overpressures of 14 kPa in adjacent industrial facilities	50×10^{-6} per year	Y	The facility has no adjacent industrial facilities, therefore, this criterion is satisfied

8 APPENDIX A - 2000 PHA TOXIC GAS MODELLING BASIS

Appendix A - 2000 PHA Toxic Gas Modelling Basis

Given these large distances to the nearest place of residence, the assessment approach taken in this PHA is to analyse all incidents that may have an effect (e.g. irritation, injury and/or fatality) at this location as well as at the site's nearest boundary (for fatality risk). This approach is taken as the majority of identified incidents have no effect over such a large distance, e.g. a diluent pool fire would have no thermal effects at distances of approximately 150 metres and hence rigorous analysis is unnecessary. This approach would allow detailed assessment of, and hence draw attention to, the significant hazardous events. This approach would also aid in the determination of plant design requirements to mitigate the risks from these significant hazardous incidents as well as influence the plant's safety management systems and emergency response plans.

The consequence calculations in this PHA were carried out using commercially available risk assessment software, TNO's Effects (Ref 13). The consequence models used within Effects are well known and are fully documented in the TNO Yellow Book (Ref 13).

Essentially, for each scenario defined by the analyst (e.g. those events considered significant and likely to have an impact at the nearest place of residence and boundary), an appropriate release rate is calculated by using established equations within Effects. Data pertinent to the release conditions, including the initial state of the material, is included in the calculations.

Once the release conditions and rate have been determined, the likely outcomes (e.g. toxic gas release) are modelled. The results from these simulations (e.g. plume concentrations from toxic gas releases) are used to determine the effect on people, property and/or the environment.

The scenarios identified in Section 4 are the basis of the risk assessment. The significant events that involve fires, explosions and toxic gas releases are analysed further in this PHA. The basis for each analysis is given in the corresponding section to define the conditions of release for each event. This also includes assumptions made for each scenario.

Release Sources

For gas or liquid release scenarios, piping failures have been analysed using four failure cases. These are full pipe fracture, 50 mm, 13 mm, and 3 mm holes. Gasket failure is likely to result in a gap equivalent to the area between two flange bolts and is included in the analysis where relevant. This is considered equivalent to a 13 mm diameter hole size. Vessel failures have been analysed as catastrophic rupture and leaks of 50 mm, 25 mm, 13 mm and 6 mm. These generic failure cases are comparable to those used in a number of published risk assessment studies and described in Lees (Refs 14 and 15).

Release Rates

Release rates were calculated for each release scenario using standard equations based on hole size, pressure, temperature and material state (i.e. gas or liquid). Where the calculated release rate was greater than the maximum possible process rate (for example, if the flow was limited by the sulphur burning rate), the release rate was specified as equal to the limiting production rate. The maximum release inventory was also limited to the contents of the plant equipment plus the amount lost over the duration of the leak (variable depending on the leak rate).

Release Duration

The assumed time taken to stop and control a release is based on a credible estimate of a release scenario rather than always taking a worst case approach (in accordance with quantitative risk analysis principles).

For any scenarios where automatic shutdown of the plant occurs on detection of the hazardous event, a release duration of 1 minute has been chosen. This is consistent with the reported methodologies in Lees (Ref 15) and the approach taken within the Orica ISORIS risk assessment package (Ref 16). Also, if any worst case events occur (e.g. catastrophic rupture within the sulphuric acid plant where large visible clouds may occur, e.g. for sulphur trioxide, along with numerous alarms and trips) which are immediately obvious to the operators (24 hour manning), a release duration of one minute has been chosen.

For smaller leak scenarios which rely on manual response to stop and control the release (i.e. where operator intervention is required to stop the leak, usually by shutting down production or closing valves), release duration of between 6 and 30 minutes can be expected. The duration depends on the means to alert the operators of the release (e.g. process alarms) as well as the closeness of the release to the operators (i.e. smell, sight and/or noise may indicate a release if the operator is nearby). In this assessment, release duration for small leaks is assessed individually as described in the appropriate section.

Given that the plants are to be designed to the latest design standards which would include comprehensive monitoring via programmable electronic systems, it can be expected that sufficient alarms and trips would exist to warn the operators of significant abnormal plant behaviour. This expectation can be verified in the Final Hazard Analysis and HAZOP studies if the project goes ahead. As such, the nominated release durations are judged to be achievable.

As a further means to mitigate the release duration (and hence release quantity), it is proposed to install emergency isolation valves (EIVs) on the inlets and outlets of all equipment processing the more hazardous materials (e.g. the ammonia storage vessels). Once a plant trip is initiated, these EIVs would shut, thereby boxing in sections of pipework and equipment. Hence, the amount released and the release duration are minimised.

For the sulphuric acid plant, shutting the plant down quickly stops releases as these plants run at low pressure (typically up to 24 kPag). Hence, there is little driving force for losses once the plant is stopped.

For any processing plant, once the plant is stopped, the maximum amount released (and hence maximum duration) is limited by depressurising to atmospheric pressure if a pipe or vessel failure has occurred.

9 APPENDIX B - RISK ANALYSIS

Appendix B - Risk Analysis

The risk analysis performed for this PHA is shown Table 22.

The notes associated with the calculations and shown in the table are:

Note 1. Liquid ammonia lines estimated to be approximately 50 m, i.e. from road tankers to bullets and to the vaporiser.

Note 2. Includes the ammonia vapour supply line as well as the vapour line back to the road tankers.

Note 3. United Kingdom HSE data used for all likelihoods.

This failure rate includes catastrophic failures as well as 50 mm holes.

Note 4. Same basis as the 2000 PHA (Ref 1.

Note 5. Transfer failure rate is (United Kingdom HSE data):

0.2×10^{-6}/operation x 3 transfers per day x 340 days per year = 2×10^{-4}/yr

Note: Allowance for shutdowns and other periods taken to be 25 days.

Note 6. Holes can occur in the pipework and vessels.

Note 7. Holes and failures can occur in the pipework and vessels plus transfer hose failures.

Note 8. Probits for sulphur dioxide and ammonia (from Ref 17):

$$Y = a + b\ln(tC^n)$$

where

- Y = probit value
- C = concentration of the toxic gas in ppm
- t = duration of exposure in minutes
- tC^n is referred to as the *Toxic Load*
- a, b, n are constants (unique for each gas)

Chemical	a	b	n
Ammonia	-9.82	0.71	2.0
Sulphur dioxide	-23.70	1.14	3.7

Note 9. The widths of the plumes are estimated to relatively narrow at the nearest place of residence. This results in a narrow angle for the plume (i.e. in the 'Y' direction) and hence the wind direction that can cause impact. The angle of the plume is increased to 5^o to allow for modelling inaccuracies. The probability that the wind is blowing towards the nearest residence is then taken to be (5/45) times the values for wind blowing from the west. Outside of this arc, the plume is not expected at the place of residence.

Table 22 – Risk Analysis

Scenario	Stability Class Wind Speed	Pipe Length, m	Pipe Failure Likelihood, times/yr.m	Probability of System in Use	Vessels Failure Likelihood, times/yr	Number of Vessels	Transfer Hose Failure Likelihood, times/yr	Event Likelihood, times/yr	Probit Value	Probability of Fatality	Probability of Wind Direction from the Northeast	Probability of Wind Direction from the West	Contribution to the Following Risks:		
													Irritation	Injury	Fatality
						Note 4:			Note 8:		Note 9:	Note 9:			
Sulphur Dioxide - Catastrophic Failures	D5.9				4.00E-06	8		3.20E-05	9	1	0.003	0.005	1.60E-07	1.60E-07	9.60E-08
	D2.4				4.00E-06	8		3.20E-05	13	1	0.003	0.004	1.28E-07	1.28E-07	9.60E-08
	E5.8				4.00E-06	8		3.20E-05	10	1	0.003	0.002	6.40E-08	6.40E-08	9.60E-08
	E2				4.00E-06	8		3.20E-05	15	1	0.003	0.004	1.28E-07	1.28E-07	9.60E-08
	F2				4.00E-06	8		3.20E-05	12	1	0.003	0.003	9.60E-08	9.60E-08	9.60E-08
		Note 4:	Note 3:					Note 6:							
Sulphur Dioxide - 50 mm Holes	E2	500	1.40E-07		5.00E-06	8		1.10E-04				0.004	4.40E-07		
	F2	500	1.40E-07		5.00E-06	8		1.10E-04				0.003	3.30E-07		
Ammonia - Catastrophic Failures	D5.9				4.00E-06	2		8.00E-06	6	0.85	0.003	0.005	4.00E-08	4.00E-08	2.04E-08
	D2.4				4.00E-06	2		8.00E-06	6	0.85	0.003				2.04E-08
	E5.8				4.00E-06	2		8.00E-06	6	0.85	0.003	0.002	1.60E-08	1.60E-08	2.04E-08
	E2				4.00E-06	2		8.00E-06	6	0.85	0.003				2.04E-08
	F2				4.00E-06	2		8.00E-06	6	0.85	0.003				2.04E-08
		Note 1:					Note 5:	Note 7:							
Ammonia (liquid) - 50 mm Holes	D5.9	50	5.00E-07	0.08	5.00E-06	2	2.00E-04	2.12E-04	2	0.01	0.003	0.005	1.06E-06		6.36E-09
	D2.4	50	5.00E-07	0.08	5.00E-06	2	2.00E-04	2.12E-04	2	0.01	0.003	0.004			6.36E-09
	E5.8	50	5.00E-07	0.08	5.00E-06	2	2.00E-04	2.12E-04	2	0.01	0.003	0.002	4.24E-07	4.24E-07	6.36E-09
	E2	50	5.00E-07	0.08	5.00E-06	2	2.00E-04	2.12E-04	3	0.025	0.003	0.004			1.59E-08
	F2	50	5.00E-07	0.08	5.00E-06	2	2.00E-04	2.12E-04	4	0.15	0.003	0.003			9.54E-08
		Note 1:													
Ammonia (liquid) - 25 mm Holes	D5.9	50	5.00E-07	0.08	5.00E-06	2		1.21E-05	0		0.003	0.005	6.04E-08		
	E5.8	50	5.00E-07	0.08	5.00E-06	2		1.21E-05	1		0.003	0.002	2.42E-08		
	F2	50	5.00E-07	0.08	5.00E-06	2		1.21E-05	2	0.01	0.003	0.003			3.63E-10
		Note 2:	Note 3:				Note 5:								
Ammonia Vapour Releases	F2	150	6.00E-07		5.00E-06	2	2.00E-04	3.00E-04				0.003	9.00E-07		
TOTALS:													3.87E-06	1.06E-06	7.13E-07

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Sunrise Project

Project Execution Plan Modification

Appendix F

Biodiversity Review

Biodiversity AUSTRALIA

SUSTAINABLE PARTNERSHIPS
DEDICATED TO ACHIEVING
ECOLOGICAL AND ECONOMICAL BALANCE

LEADING THE WAY
IN ENVIRONMENTAL
MANAGEMENT

SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION - RAIL SIDING BIODIVERSITY REVIEW

TRUNDLE, NSW

JUNE 2021

Contents

List of Tables

List of Figures

List of Photos

List of Appendices

Document Control Page

Version Control

Version	Purpose	Author	Reviewed / approved by	Date
Rev 1.0	Draft Report	Will Steggall	Will Steggall	03/12/2020
Rev 2.0	Final Report	Daniel Joyce	Leonie Stevenson	25/02/2021
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Rev 4.0	Final Report	Daniel Joyce	Simone Ludlow	12/05/2021
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Executive Summary

Sunrise Energy Metals Limited (SEM) is the proponent of the approved Sunrise Project (the Project) situated near the village of Fifield, approximately 350 kilometres west-northwest of Sydney in New South Wales (NSW). The Project is a nickel, cobalt and scandium open cut mining and processing project. Development Consent (DA 374-11-00) for the Project was issued under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* in 2001.

The Project Execution Plan Modification (the Modification) includes the implementation of Project changes identified in the Project Execution Plan to optimise the construction and operation of the Project.

Biodiversity Australia Pty Ltd has been engaged by SEM to conduct ecological field surveys and assess biodiversity values at the approved Project rail siding site and the proposed relocated rail siding site (part of the Modification) for the Project near Trundle, NSW. This report provides the results of the surveys at the proposed and approved rail siding sites. Surveys were carried out by two ecologists from 30th October to 2nd November 2020.

The study areas were characterised by a mix of cleared agricultural land, derived native grassland, and patches of woodland. Woodland areas occurred in the eastern portion of each study area. The vegetation surveys identified one Plant Community Type (PCT) within the study areas in woodland and derived native grassland forms, namely PCT 244. The woodland is equivalent to the *Poplar Box Grassy Woodland on Alluvial Plains* endangered ecological community listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Bird surveys identified 25 avian species in the study areas. Two threatened bird species were recorded, namely the Grey-crowned Babbler (*Pomatostomus temporalis*) and Major Mitchell's Cockatoo (*Lophochroa leadbeateri*) (flying overhead). These are highly mobile species and would not be significantly impacted by the Modification.

In general, the vegetation condition and habitat values identified within the approved and proposed rail siding site are considered similar, based on species diversity, structural diversity and non-endemic species invasion.

In conclusion, the Modification:

- would not increase impacts on biodiversity values as defined by the NSW *Biodiversity Conservation Act 2016* as there would be a reduction in native vegetation/habitat clearance, and therefore, if the Department of Planning, Industry and Environment is satisfied, a Biodiversity Development Assessment Report is not required;
- would not impact core Koala habitat under *State Environmental Planning Policy (Koala Habitat Protection) 2021* as the proposed rail siding site does not represent core Koala habitat;

- would not significantly affect threatened species, populations or ecological communities listed under the NSW *Fisheries Management Act 1994*, or their habitats as no waterbodies are present in the proposed rail siding site; and
- would not significantly impact threatened species, threatened ecological communities or migratory species listed under the EPBC Act (and would result in a reduction to the clearance of the *Poplar Box Grassy Woodland on Alluvial Plains* endangered ecological community).

1. Introduction

1.1 Background

The Sunrise Project (the Project) is a nickel, cobalt and scandium open cut mining and processing project situated near the village of Fifield, approximately 350 kilometres (km) west-northwest of Sydney, in New South Wales (NSW) (Figure 1).

SRL Ops Pty Ltd owns the rights to develop the Project. SRL Ops Pty Ltd is a wholly owned subsidiary of Sunrise Energy Metals Limited (SEM)[1].

Development Consent (DA 374-11-00) for the Project was issued under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) in 2001.

SEM has continued to review and optimise the Project design, construction and operation as part of preparations for Project execution. The outcomes of this review are outlined in the Project Execution Plan (Clean TeQ Sunrise Pty Ltd 2020).

The Project Execution Plan identified a number of changes to the approved mine and processing facility, accommodation camp, rail siding and road transport activities.

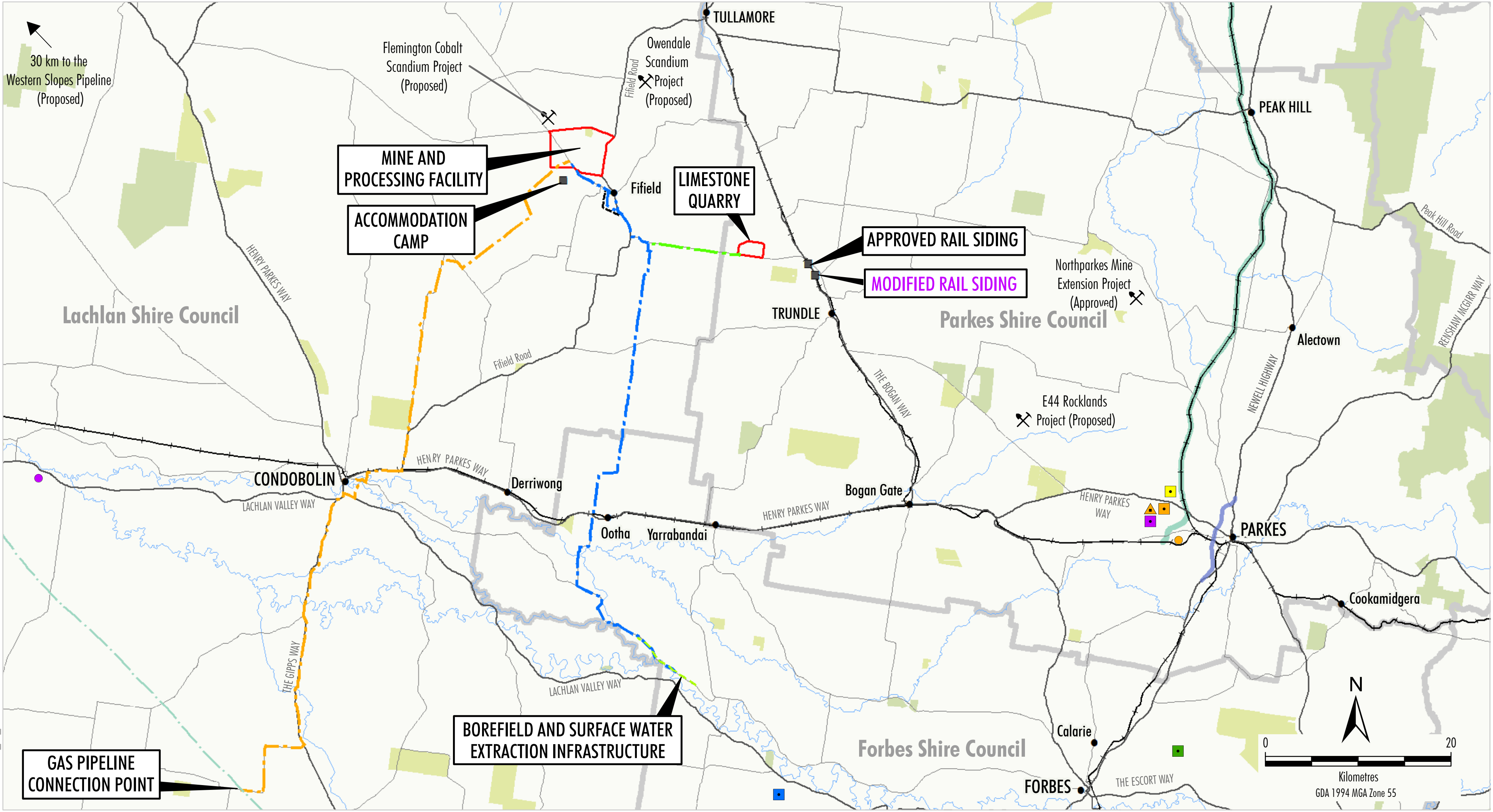
The Project Execution Plan Modification (the Modification) includes these Project Execution Plan changes to allow for the optimisation of the construction and operation of the Project.

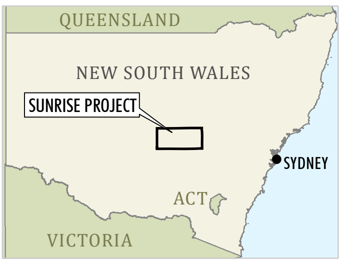
The Modification would include the following changes to the rail siding:

- revised rail siding location and layout;
- addition of an ammonium sulphate storage and distribution facility to the rail siding;
- extension of the Scotson Lane road upgrade;
- addition of a 22 kilovolt electricity transmission line (subject to separate approval) to the rail siding power supply; and
- increased peak operational phase workforce from approximately five to approximately 10 personnel

Changes associated with the rail siding would require an additional surface development area. SEM would relinquish (forgo clearance in) the approved rail siding surface development area as part of the Modification. The other changes included in the Modification would not require additional surface development areas and therefore have not been considered further in this Biodiversity Review.

[1] SEM was previously Clean TeQ Holdings Limited.





LEGEND

- National Park/Conservation Area
- State Forest
- Local Government Boundary
- Railway
- Existing Gas Pipeline

Project Components

- Mining Lease Boundary (ML)
- Fifield Bypass
- Gas Pipeline
- Water Pipeline
- Limestone Quarry Water Pipeline
- Borefield Infrastructure Corridor

Other Relevant Projects

- Parkes Bypass (Approved)

Other State Significant Projects

- Mine Site
- Daroobalgie Solar Farm (Proposed)
- Goonumbla Solar Farm (Approved)
- Jemalong Solar Farm (Approved)
- Parkes Solar Farm (Approved)
- Quorn Park Solar Farm (Approved)
- Parkes Peaking Power Plant (Approved)
- Cattle Feedlot and Quarry (Approved)
- Parkes Special Activation Precinct
- Inland Rail (Parkes to Narromine) (Approved)

Source: Black Range Minerals (2000); Clean TeQ (2017, 2018, 2020); NSW Spatial Services (2020)

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Regional Location

Figure 1

Biodiversity Australia Pty Ltd has been engaged by SEM to conduct ecological field surveys and assess biodiversity values at the approved rail siding site and a proposed rail siding site for the Project near Trundle, NSW (Figure 2). This Biodiversity Review provides the results of these surveys and has been prepared to support an application by SEM to modify Development Consent (DA 374-11-00) for the Project, which would be sought under section 4.55(2) of the EP&A Act.

1.2 Location of the Study Areas

The study areas for this assessment are shown on Figure 3 and comprises the following:

- Study Area 1 – the approved rail siding site which is approximately 7.1 hectares (ha) in area and is accessed from Scotson Lane; and
- Study Area 2 – the proposed rail siding site which is approximately 9.2 ha in area and is located 500 metres south of the approved site on Scotson Lane.

1.3 Scope of Works

Detailed field surveys were undertaken from 30th October to 2nd November 2020. This scope of works for the rail siding study areas covered vegetation surveys as per the *Biodiversity Assessment Method* (BAM) (Department of Planning, Industry and Environment [DPIE] 2020a), threatened flora searches as per the *Surveying Threatened Plants and their Habitats: NSW Survey Guide for the Biodiversity Assessment Method* (DPIE 2020b), habitat assessments and mapping of Plant Community Types (PCTs).

LEGEND
Railway
Existing 11 kV Electricity Transmission Line
Existing 22 kV Electricity Transmission Line
Drainage Feature

Approved Project
Surface Development Area
Scotson Lane Upgrade

Modified Project
Surface Development Area
Scotson Lane Upgrade Extension
22 kV Electricity Transmission Line (Subject to Separate Approval)

Source: Black Range Minerals (2000); Clean Teq (2020, 2021); NSW Spatial Services (2020, 2021).

Orthophoto: © NSW Department of Finance, Services & Innovation (2021)

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Approved and Modified Rail Siding Location

Figure 2

CTL-20-08 MOD 7_BA_202B

LEGEND
Railway
Study Area

Source: Black Range Minerals (2000); Clean Teq (2020, 2021); NSW Spatial Services (2020, 2021).

Orthophoto: © NSW Department of Finance, Services & Innovation (2021)

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S U N R I S E   P R O J E C T

Approved and Modified Rail Siding Study Areas

Figure 3

CTL-20-08 MOD 7_BA_203A

2. Methods

2.1 Desktop Study and Literature Review

A review of government databases and Geographic Information System (GIS) layers relevant to the study areas was initially undertaken. Database searches included:

- Department of Agriculture, Water and the Environment (DAWE) *EPBC Act Protected Matters Search Tool* (DAWE 2020a);
- DPIE *BioNet Atlas* (DPIE 2020c) records within 5 kilometres of the study areas;
- DPIE *Threatened Biodiversity Data Collection* (DPIE 2020d); and
- NSW *State Vegetation Type Map* (Lachlan/Riverina region) (Office of Environment and Heritage [OEH] 2016).

The *Syerston Nickel-Cobalt Project Flora Report* (Bower and Kenna 2000) describes the vegetation that occurred at the approved rail siding site in 1999, but this report does not include any vegetation mapping for the site.

2.2 Vegetation Mapping

Vegetation mapping was undertaken using data collected in the field and checked against existing PCT mapping for the region (OEH 2016) and aerial imagery.

Mapping was undertaken in QGIS 3.10 on desktop and in the field using a GIS capable tablet. As per the BAM (DPIE 2020a) methodology, vegetation zones were assigned to each community based on PCT and condition (e.g. woodland and derived native grassland [DNG]).

2.3 Field Surveys

2.3.1 Vegetation Surveys

Surveys were carried out by two ecologists from 30th October to 2nd November 2020. The following survey methods were undertaken to address current standards:

- Survey of vegetation communities (vegetation plots and transects as per the BAM [DPIE 2020a]);
- Review of vegetation against listings of Threatened Ecological Communities;
- Targeted searches for threatened plants within the study areas; and
- Collation of a site flora species list.

A total of four vegetation integrity plots as per the BAM (DPIE 2020a) were undertaken in each of the study areas. The location of these is shown in Figure 4 (Study Area 1: A1-A4; Study Area 2: P1-P4). Rapid data points were also undertaken across the study areas to assist with vegetation mapping. A total of six rapid data points were undertaken in the study areas (Figure 4).

CTL-20-08 MOD 7_BA_204A

LEGEND
Modified Rail Siding Surface Development Area
Approved Rail Siding Surface Development Area
Study Area
Rapid Data Point (Approved Rail Siding)
Rapid Data Point (Modified Rail Siding)
BAM Plot Location (Approved Rail Siding)
BAM Plot Location (Modified Rail Siding)
Hollow-bearing Tree (Approved Rail Siding)
Hollow-bearing Tree (Modified Rail Siding)
Threatened Flora Transect

Source: Black Range Minerals (2000); NSW Spatial Services (2020); Clean Teq (2021); Biodiversity Australia (2021).
Orthophoto: © NSW Spatial Services (2020)

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Survey Sites

Figure 4

Targeted surveys for the following potentially occurring threatened flora species were undertaken in suitable habitat in the study areas:

- Pine Donkey Orchid (*Diuris tricolor*).
- A Spear grass (*Austrostipa wakoolica*).
- Silky Swainson-pea (*Swainsona sericea*).

Surveys were undertaken by Will Steggall (Assessor Number BAAS17107) with expertise and experience undertaking threatened plant surveys in accordance with the *Surveying Threatened Plants and their Habitats: NSW Survey Guide for the Biodiversity Assessment Method* (DPIE 2020b).

The field survey was undertaken in accordance with the above guideline (DPIE 2020b) using parallel transverses within each study area. Additionally, the survey was continued between the beginning and end of each parallel transect. Opportunistic searches for threatened plants were also undertaken during vegetation plot surveys. The location of threatened flora survey transects is shown in Figure 4.

2.3.2 Fauna Surveys

2.3.2.1 Habitat Evaluation

Habitat evaluation was used to assess the suitability of habitats in the study areas for potentially occurring fauna species by two ecologists from 30th October to 2nd November 2020. Habitats in the study areas were defined and assessed according to parameters such as:

- Structural and floristic characteristics of the vegetation e.g. understorey type and development, crown depth, groundcover density, etc.
- Degree and extent of disturbance e.g. fire, logging, weed invasion, modification to structure and diversity, etc.
- Presence of water in any form e.g. rivers, dams, creeks, drainage lines, soaks.
- Size and abundance of hollows and fallen timber.
- Availability of shelter e.g. rocks, logs, hollows, undergrowth.
- Wildlife corridors, refuges and proximate habitat types.
- Presence of mistletoe, nectar, gum, seed, sap, etc. sources.
- Any other specific habitat features listed in the *Threatened Biodiversity Data Collection* (DPIE 2020d) relevant to the target species.

In addition to the above, large hollow-bearing trees in the study areas were identified and GPS located (Figure 4).

2.3.2.2 Diurnal Bird Survey

Bird surveys involved passive surveys (e.g. listening for bird calls) and active observation/binocular searches. Point counts were undertaken for half an hour with two observers; and birds were also surveyed while walking around the study areas. Two dedicated bird surveys were undertaken across the study areas.

2.4 Data Entry and Credit Calculations

Flora data collected in the field was entered into the BAM Calculator (BAM-C) by Hanna Reid (Assessor Number BAAS18114). This was used to generate a vegetation integrity score for each vegetation zone. Output reports from the credit calculator are provided in Appendices E and F, respectively, for the proposed and approved rail siding sites.

3. Results

3.1 Flora and Vegetation

The field surveys recorded 62 flora species (50 native and 12 exotic) at the approved rail siding site (Study Area 1) and 55 flora species (44 native and 11 exotic) at the proposed rail siding site (Study Area 2). The full flora list for each study area is provided in Appendix A.

The *Syerston Nickel-Cobalt Project Flora Report* (Bower and Kenna 2000) describes the vegetation that occurred at the approved rail siding site in 1999 as follows:

> *The proposed rail siding at the eastern end of Route 64 has lost nearly all its former native tree cover and is now a native grassland with a wide diversity of native grasses and herbs. The adjoining roadside trees and few remaining paddock trees suggest the area was predominantly a grassy, open Poplar Box (Eucalyptus populnea) woodland.*

Consistent with those past observations, a single PCT was identified at each study area (PCT 244 - Poplar Box Grassy Woodland), in woodland and DNG forms (Photos 1 to 3). The PCT mapping is provided in Figure 5.

3.1.1 Plant Community Types

The details of PCTs recorded within the surface development areas of the approved and proposed rail siding (Figure 5) are provided in Table 1.

Table 1: Native Vegetation at the Approved and Proposed Rail Siding Sites

Vegetation Zone	PCT	PCT Name	Condition	Clearance (ha)		Modification
				Approved Rail Siding Surface Development Area within Study Area 1	Proposed Rail Siding Surface Development Area within Study Area 2	
1	244	Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of Central NSW	Woodland (Good)*	1.95	1.02	0.93 ha less clearance
2	244	Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of Central NSW	DNG	1.38	1.97	0.59 ha greater clearance
			Total	**3.33**	**2.99**	**0.34 ha less clearance**

* *Poplar Box Grassy Woodland on Alluvial Plains* listed under the EPBC Act.

The remainder of the study areas shown on Figure 5 are comprised of cleared land. In these areas, trees have been cleared and the groundcover is dominated by non-native plant species (Photo 4).

LEGEND
Modified Rail Siding Surface Development Area
Approved Rail Siding Surface Development Area
Study Area
Vegetation Communities
Poplar Box Grassy Woodland (Good) (PCT 244)*
Derived Native Grassland (PCT 244)

*Note: * Endangered Ecological Community listed under the EPBC Act.*

Source: Black Range Minerals (2000); NSW Spatial Services (2020); Clean Teq (2021); Biodiversity Australia (2021).
Orthophoto: © NSW Spatial Services (2020)

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Plant Community Type Mapping

Figure 5

CTL-20-08 MOD 7_BA_205B

Photo 1: PCT 244 Woodland at the Approved Rail Siding Site BAM Plot 2

Photo 2: PCT 244 Woodland at the Proposed Rail Siding Site BAM Plot 1

Photo 3: PCT 244 DNG at the Approved Rail Siding BAM Plot 3

Photo 4: Cleared Land with Paterson's Curse (Echium plantagineum) at the Proposed Rail Siding Site BAM Plot 3

3.1.2 Vegetation Condition

As shown in Table 1, the approved rail siding site (Study Area 1) contains a greater area of extant woodland than the proposed rail siding site (Study Area 2). The approved rail siding site (Study Area 1) was predominantly cleared during the biodiversity surveys conducted for the Project Environmental Impact Statement (after Bower and Kenna 2000), and the proposed rail siding site (Study Area 2) is likely to have been cleared for a similar period of time.

Flora data collected in the field was entered into the BAM-C to generate a Vegetation Integrity (VI) score for each vegetation zone. Table 2 provides a comparison of the VI scores for the approved (Study Area 1) and proposed rail siding (Study Area 2) sites.

Table 2: Vegetation Integrity of the Native Vegetation at the Approved and Proposed Rail Siding Sites

Vegetation Zone	PCT	PCT Name	Condition	VI Score	
				Approved Rail Siding Site (Study Area 1)	Proposed Rail Siding Site (Study Area 2)
1	244	Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of Central NSW	Woodland (Good)*	70.4	78.0
2	244	Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of Central NSW	DNG	38.9	40.3

* *Poplar Box Grassy Woodland on Alluvial Plains* listed under the EPBC Act

Output reports from the credit calculator are provided in Appendices E and F, respectively, for the proposed and approved rail siding sites.

In general, the vegetation condition and habitat values identified within the approved and proposed rail siding sites are considered similar, based on species diversity, structural diversity and non-endemic species invasion.

The apparent differences in the calculated VI scores between the approved and proposed rail siding sites is likely natural variation and not an actual measure that the vegetation is in better condition in the approved rail siding site. The reasons for this are:

- the quantities of vegetation clearance are so small such that the BAM (DPIE 2020a) only requires minimal plots to be sampled; and
- the vegetation is subject to the same agricultural practises and thus has been subject to the same disturbances such as grazing, introduction of non-native vegetation and clearing.

3.1.3 Threatened Ecological Communities

The woodland form of PCT 244 (Vegetation Zone 1) is equivalent to the *Poplar Box Grassy Woodland on Alluvial Plains* endangered ecological community (Poplar Box EEC) listed under the EPBC Act. The DNG form of PCT 244 (Vegetation Zone 2) is not considered Poplar Box EEC because it does not meet the Key Diagnostic Characteristics outlined within the EBPC Conservation Advice (DAWE 2020b).

The Conservation Advice outlines the following Key Diagnostic Characteristics for identification of Poplar Box EEC.

Location and Physical Environment:

- Occurs on soils associated with ancient and recent depositional alluvial plains with clay, clay-loam, loam and sandy loam, non-sodic soils.

Structure:

- A grassy woodland to grassy open woodland with a tree crown cover of 10% or more at patch scale.
- A canopy (tree) layer, capable of reaching 10 m or more in height and dominated by *Eucalyptus populnea* (poplar box) or co-dominated with *E. populnea* hybrids.
- Mid layer (1-10 m) crown cover of shrubs to small trees of 20% or less.
- A ground layer (<1 m) mostly dominated across a patch by native grasses, other herbs and occasionally chenopods, ranging from sparse to thick (in response to canopy development, soil moisture, disturbance and/or management history).

Thresholds for assessing quality of Poplar Box EEC are presented in Table 3 of the EPBC Conservation Advice (DAWE 2020b). Based on this, table data from across the two study areas was assessed, as well as taking into account the presence of the Poplar Box EEC community connected immediately to the north-east of the study areas (which is a continuous patch with a size of greater than five hectares).

The Poplar Box EEC in the approved rail siding site (Study Area 1) is considered *Class A3 Category. A Large Patch with low perennial weeds and a diverse native understory*. Based on the thresholds of;

- ≥ 10 trees per ha with ≥ 30 cm diameter at breast height (dbh) (and/or with hollows); and
- smaller trees, saplings or seedlings suggestive of periodic recruitment; and
- ≥ 20 native plant spp. per ha in ground layer.

The Poplar Box EEC in the proposed rail siding site (Study Area 2) is considered *Class B Moderate Quality. A large patch with moderate quality native understorey*, based on;

- ≥ 50% of perennial vegetation cover in ground layer is native; and
- ≥ 20 perennial native plant species per ha in ground layer; or
- ≥ 10 trees per ha with ≥ 30 cm dbh (or hollows).

The Modification would result in 0.93 ha less clearance of Poplar Box EEC (Table 1).

3.1.4 Threatened Plants

No threatened plants were recorded in the study areas.

3.2 Fauna Species and Habitats

The fauna surveys recorded 25 fauna species which were all avian species. The full fauna list is provided in Appendix B.

3.2.1 Hollow-bearing Trees

Field surveys identified and mapped six hollow-bearing trees within the approved rail siding site (Study Area 1) (HBT 1-6) and two within the proposed rail siding site (Study Area 2) (HBT 1-2). Only larger hollow-bearing trees with multiple hollows or single large hollows were recorded. The location of hollow-bearing trees is shown in Figure 4. Photo 5 shows an example of a hollow-bearing tree in the approved rail siding site (Study Area 1). Hollow-bearing tree data is provided in Appendix C.

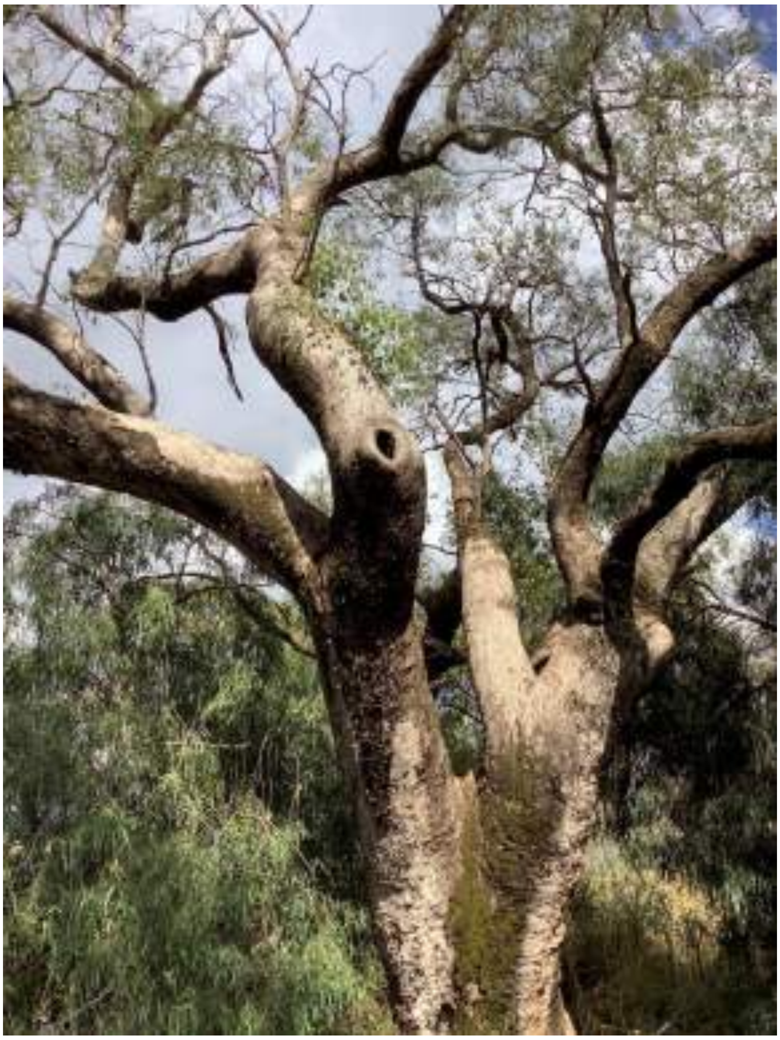
3.2.2 Threatened Fauna

Field surveys recorded two threatened bird species comprising the following:

- Grey-crowned Babbler (*Pomatostomus temporalis*) - Vulnerable under the BC Act.
- Major Mitchell's Cockatoo (*Lophochroa leadbeateri)* - Vulnerable under the BC Act.

The Grey-crowned Babbler was only heard calling from adjacent habitats, however would be likely to use the habitats within the study areas for foraging. The Major Mitchell's Cockatoo was observed flying overhead in the proposed rail siding site and no breeding sites were found.

Photo 5: Example of Large Hollow-bearing Tree in Approved Rail Siding Site (HBT 3)



4. Impact Assessment

Table 3 provides an assessment of the impacts of the Modification on biodiversity values. The Modification would not increase impacts on biodiversity values as defined by the BC Act, as there would be a reduction in native vegetation/habitat clearance, and therefore a Biodiversity Development Assessment Report is not required.

Table 3: Evaluation of Impacts on Biodiversity Values

Biodiversity Value	Meaning	Relevant (✓ or N/A)*	Explanation
Vegetation abundance – 1.4(b) BC Regulation	Occurrence and abundance of vegetation at a particular site	✓	The Modification would not result in an increased impact on vegetation abundance. As shown in Table 1, the Modification would result in 0.34 ha less clearance of native vegetation overall and a 0.93 ha reduction in the clearance of PCT 244 woodland.
Vegetation integrity 1.5(2)(a) BC Act	Degree to which the composition, structure and function of vegetation at a particular site and the surrounding landscape has been altered from a near natural state	✓	The Modification would not result in an increased impact on vegetation integrity. Vegetation integrity scores are presented in Table 2. In general, the vegetation condition and habitat values identified within the approved and proposed rail siding site are considered similar, based on species diversity, structural diversity and non-endemic species invasion. As shown in Table 1, the approved rail siding site (Study Area 1) contains a greater area of extant woodland than the proposed rail siding site (Study Area 2).
Habitat suitability 1.5(2)(b) BC Act	Degree to which the habitat needs of threatened species are present at a particular site	✓	The Modification would not result in an increased impact on habitat suitability. The habitat present in the approved and proposed rail siding sites provide marginal habitat for threatened fauna (e.g. Grey-crowned Babbler) due to the past disturbance and lack of suitable tree hollows. No threatened flora species were recorded in either site. The Modification has been designed to avoid impacts on habitat by predominantly locating the supporting infrastructure in previously cleared exotic grassland and DNG (rather than woodland). The Modification would not impact rocks, karst, caves, crevices, cliffs, human made structures or non-native vegetation known to be associated with any threatened species. The Modification is unlikely to cause a greater impact on any adjacent habitat due to noise, dust or light spill during construction or operation.

Biodiversity Value	Meaning	Relevant (✓ or N/A)*	Explanation
Threatened species abundance 1.4(a) BC Regulation	Occurrence and abundance of threatened species or threatened ecological communities, or their habitat, at a particular site	✓	The Modification would not impact the occurrence and abundance of threatened species, or their habitat, in the locality. As shown in Table 1, the Modification would result in 0.34 ha less clearance of native vegetation overall and a 0.93 ha reduction in the clearance of PCT244 woodland. No threatened flora species were recorded in either site. The habitat in the approved and proposed rail siding sites provide marginal habitat for threatened fauna.
Habitat connectivity 1.4(c) BC Regulation	Degree to which a particular site connects different areas of habitat of threatened species to facilitate the movement of those species across their range	✓	The Modification would not result in an increased impact on habitat connectivity. The woodland to be cleared is on the edge of a larger patch of woodland and therefore does not provide a connection between two woodland habitats.
Threatened species movement 1.4(d) BC Regulation	Degree to which a particular site contributes to the movement of threatened species to maintain their lifecycle	N/A	The Modification is not likely to impact a well-defined movement pattern for any particular species, given the majority of clearance would be of previously cleared exotic grassland and DNG. As described above, the woodland to be cleared is on the edge of a larger patch of woodland and therefore does not provide a connection between two woodland habitats.
Flight path integrity 1.4(e) BC Regulation	Degree to which the flight paths of protected animals over a particular site are free from interference	N/A	The Modification would not interfere with any flight paths of protected animals.
Water sustainability 1.4(f) BC Regulation	Degree to which water quality, water bodies and hydrological processes sustain threatened species and threatened ecological communities at a particular site	N/A	The Modification would not impact water quality, water bodies or hydrological processes that are known to sustain a threatened species or threatened ecological community.

* A biodiversity value is not relevant to a proposed development if the value is not present on the development site and there is no potential for direct or indirect impacts on the biodiversity value if it occurs off-site (Department of Planning and Environment 2018).

Overall, the proposed rail siding site is located in an area of lower quality habitat compared to the approved rail siding site due to a lesser area of extant woodland than the approved rail siding site.

State Environmental Planning Policy (Koala Habitat Protection) 2021

The proposed rail siding site is located in the Parkes Local Government Area which is listed in Schedule 1 of the *State Environmental Planning Policy (Koala Habitat Protection) 2021* (Koala SEPP 2021).

Poplar Box (*E. populnea*) is a recognised Koala use tree species listed in Schedule 2 of the Koala SEPP 2021, however no core Koala habitat is present as there is no evidence of a resident population or records of Koalas at the site. Further, the Koala SEPP 2021 does not apply to Part 4 development applications which are determined by a consent authority other than a local council.

NSW *Fisheries Management Act, 1994*

The Modification would not significantly affect threatened species, populations or ecological communities listed under the NSW *Fisheries Management Act, 1994*, or their habitats. No waterbodies are present in the proposed rail siding site (Study Area 2).

Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999*

The Modification would not significantly impact threatened species, threatened ecological communities or migratory species listed under the EPBC Act.

As described in Section 3.1.3, the woodland form of PCT 244 in the approved (Study Area 1) and proposed (Study Area 2) rail siding sites is equivalent to Poplar Box EEC listed under the EPBC Act. The Modification would result in 0.93 ha less clearance of Poplar Box EEC (Table 1).

No threatened species or migratory species listed under the EPBC Act are known to occur in the proposed rail siding site (Study Area 2).

5. Conclusion

This report has provided the results of the surveys at the proposed (Study Area 2) and approved (Study Area 1) rail siding sites. Surveys were carried out by two ecologists from 30th October to 2nd November 2020.

The study areas were characterised by a mix of cleared agricultural land, DNG and patches of woodland. Woodland areas occurred in the eastern portion of each study area. The vegetation surveys identified one PCT within the study areas in woodland and DNG forms, namely PCT 244. The woodland in each study area is equivalent to the Poplar Box EEC listed under the EPBC Act.

Bird surveys identified 25 avian species in the study areas. Two threatened bird species were recorded, namely the Grey-crowned Babbler (*Pomatostomus temporalis*) and Major Mitchell's Cockatoo (*Lophochroa leadbeateri*) (flying overhead). These are highly mobile species and would not be significantly impacted by the Modification.

In general, the vegetation condition and habitat values identified within the approved and proposed rail siding site are considered similar, based on species diversity, structural diversity and non-endemic species invasion.

In conclusion, the Modification:

- would not increase impacts on biodiversity values as defined by the BC Act as there would be a reduction in native vegetation/habitat clearance, and therefore, if DPIE is satisfied, a Biodiversity Development Assessment Report is not required;
- would not impact core Koala habitat under the Koala SEPP 2021 as the proposed rail siding site (Study Area 2) does not represent core Koala habitat;
- would not significantly affect threatened species, populations or ecological communities listed under the NSW *Fisheries Management Act, 1994*, or their habitats as no waterbodies are present in the proposed rail siding site (Study Area 2); and
- would not significantly impact threatened species, threatened ecological communities or migratory species listed under the EPBC Act (and would result in a reduction to the clearance of the Poplar Box EEC).

6. References

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APPENDIX A: FLORA SPECIES LIST

Table A1: Flora list – Proposed Rail Siding Site (Study Area 2)

Common Name	Scientific Name	Plot P1 % cover	Plot P2 % cover	Plot P3 % cover	Plot P4 % cover
Canopy Trees					
White Cypress	*Callitris glaucophylla*	2			
Poplar Box	*Eucalyptus populnea*	30			
Small Trees/Shrubs					
False Sandalwood	*Eremophila mitchellii*	0.5			
Wilga	Geijera parviflora	5			
Western Boobialla	*Myoporum montanum*	2			
Spiny Saltbush	*Rhagodia spinescens*	0.1			
-	*Senna artemisioides* subsp. *zygophylla*	0.2			
Ferns					
-	*Cheilanthes sieberi*	0.2	3	1	0.7
Grasses					
Bunch Wiregrass	*Aristida behriana*	2	0.6		
Jericho Wiregrass	*Aristida jerichoensis*		0.5		
Tall Speargrass	*Austrostipa bigeniculata*	10			1
Speargrass	*Austrostipa scabra*	10	1	1	5
Bearded Oats	*Avena barbata*	0.2	1	0.5	
Curly Windmill Grass	*Enteropogon acicularis*	10	40	20	15
-	*Juncus sp.*	0.1			
Perennial Ryegrass	*Lolium perenne*	30		5	1
Hairy Panic	*Panicum effusum*	0.2			
Two-colour Panic	*Panicum simile*	1.5	0.5	1	
Wallaby Grass	*Rytidosperma fulvum*	5			1
Wallaby Grass	*Rytidosperma sp.*	3	0.3	2	20
Squirrel Tail Fescue	*Vulpia bromoides*		5		
Groundcovers					
Purple Burr-daisy	*Calotis cuneifolia*	1	0.5	0.2	5
Yellow Burr-daisy	*Calotis lappulacea*	5	2	2	2
Saffron Thistle	*Carthamus lanatus*	0.2		0.3	0.3
-	*Convolvulus recurvatus*	0.5	1	1	2
Blueberry Lily	*Dianella revoluta*	0.7			
Kidney Weed	*Dichondra repens*		0.8	0.5	1
Patterson's Curse	*Echium plantagineum*	0.2	15	60	
Fishweed	*Einadia trigonos*			0.1	1
Winter Apple	*Eremophila debilis*	0.2			
Blue Storksbill	*Erodium crinitum*			5	
-	*Euchiton sphaericus*		0.2		
Spotted Spurge	*Euphorbia maculata*	0.1			
-	*Goodenia pinnatifida*	0.1			
Burr Medic*	*Medicago polymorpha**		3	15	5
Red-flowered Mallow*	*Modiola caroliniana**			0.1	

Common Name	Scientific Name	Plot P1 % cover	Plot P2 % cover	Plot P3 % cover	Plot P4 % cover
-	*Oxalis perennans*	0.1			
-	*Plantago debilis*	0.2			
Cockspur Flower	*Plectranthus parviflorus*			0.1	0.5
Common White Sunray	*Rhodanthe floribunda*	0.1			
Grey Copperburr	*Sclerolaena diacantha*	0.1	0.1		
Corrugated Sida	*Sida corrugata*	0.2	0.5	0.8	2
Quena	*Solanum esuriale*		0.1		
Common Sowthistle	*Sonchus oleraceus*	0.1			
Haresfoot Clover	*Trifolium arvense*	1	30	10	10
Fuzzweed	*Vittadinia cuneata*	5	1	5	1
Dissected New Holland Daisy	*Vittadinia dissecta*	0.2			
Wooly New Holland Daisy	*Vittadinia gracilis*		0.3	1	0.2
Tufted Bluebell	*Wahlenbergia communis*	0.2	0.7	0.3	
Sprawling Bluebell	*Wahlenbergia gracilis*		0.5		
Golden Everlasting	*Xerochrysum bracteatum*	0.3	0.3		
-	*Asperula* sp.	0.7			
-	*Dodonaea viscosa* subsp. *spatulata*	0.1			
Ruby Saltbush	*Enchylaena tomentosa*	0.1			
-	*Glycine tabacina*	0.1			
Key: Denotes exotic species (*).					

Table A2: Flora list –Approved Rail Siding Site (Study Area 1)

Common Name	Scientific Name	Plot A1 % cover	Plot A2 % cover	Plot A3 % cover	Plot A4 % cover
Canopy Trees					
White Cypress	*Callitris glaucophylla*	0.2	1		
Poplar Box	*Eucalyptus populnea*	15	10		
Shrubs/small trees					
Western Silver Wattle	*Acacia decora*	7	10		0.2
-	*Dodonaea viscosa* subsp. *spatulata*		0.5		
Ruby Saltbush	*Enchylaena tomentosa*		0.5		
False Sandalwood	*Eremophila mitchellii*	0.5			
Wilga	*Geijera parviflora*	1	1		
Western Boobialla	*Myoporum montanum*	0.1	0.1		
Ferns					
-	*Cheilanthes sieberi*		1	5	1
Grasses					
Bunch Wiregrass	*Aristida behriana*	0.5	2		
Tall Speargrass	*Austrostipa bigeniculata*	0.5	10	25	15
Foxtail Speargrass	*Austrostipa densiflora*		30		
Speargrass	*Austrostipa scabra*		25	15	5
Bearded Oats	*Avena barbata*	0.2		0.2	0.5
Prairie Grass	*Bromus catharticus*	0.5			
Windmill Grass	*Chloris truncata*		5		
Curly Windmill Grass	*Enteropogon acicularis*	1	5	5	15
Weeping Grass	*Microlaena stipoides*	0.5			
Perennial Ryegrass	*Lolium perenne*	70	0.5		0.2
Hairy Panic	*Panicum effusum*		0.1		
Two-colour Panic	*Panicum simile*	0.5			
Wallaby Grass	*Rhytidosperma fulvum*			1	
Wallaby Grass	*Rhytidosperma* sp.			2	2
Groundcovers					
Creeping Saltbush	*Atriplex semibaccata*			0.2	
Purple Burr-daisy	*Calotis cuneifolia*	1	0.5		
Yellow Burr-daisy	*Calotis lappulacea*		2	2	2
Saffron Thistle	*Carthamus lanatus*	0.5		0.5	0.5
Maltese Cockspur	*Centaurea melitensis*	0.1			
-	*Convolvulus recurvatus*	0.3	0.5	2	
Blueberry Lily	*Dianella revoluta*	0.5	0.1		0.1
Kidney Weed	*Dichondra repens*	0.5		0.5	1
Paterson's Curse	*Echium plantagineum*	15	0.5	30	60
Climbing Saltbush	*Einadia nutans*		0.3		
Fishweed	*Einadia trigonos*		0.5	1	
Winter Apple	*Eremophila debilis*	0.1	0.1		
Blue Storksbill	*Erodium crinitum*		0.5	10	3
-	*Euchiton sphaericus*	0.1		0.5	

Common Name	Scientific Name	Plot A1 % cover	Plot A2 % cover	Plot A3 % cover	Plot A4 % cover
Mat Spurge	*Euphorbia dallachyana*		0.3		
Spotted Spurge	*Euphorbia maculata*			0.5	
Prickly Lettuce	*Lactuca serriola*				0.1
Slender Wire Lily	*Laxmannia gracilis*		0.5		
Burr Medic*	*Medicago polymorpha**	1		2	1
-	*Plantago debilis*	0.2			
Common White Sunray	*Rhodanthe floribunda*		10		
Small White Sunray	*Rhodanthe corymbiflora*		10		
Swamp Dock	*Rumex brownii*	0.2			
Grey Copperburr	*Sclerolaena diacantha*		1	0.1	
Corrugated Sida	*Sida corrugata*		0.5	0.5	1
Quena	*Solanum esuriale*		0.2		
Common Sowthistle	*Sonchus oleraceus*	0.1			
Haresfoot Clover	*Trifolium arvense*	0.5	0.5	1	2
Fuzzweed	*Vittadinia cuneata*	0.5	1	10	5
Dissected New Holland Daisy	*Vittadinia dissecta*		1	1	
Tufted Bluebell	*Wahlenbergia communis*		0.8	0.1	
Golden Everlasting	*Xerochrysum bracteatum*	1	0.5	0.5	1
Sedges, Rushes, Aquatics					
-	*Carex inversa*	0.5			
Wattle Mat-rush	*Lomandra filiformis*	0.2			
Vines and Scramblers					
Blushing Bindweed	*Convolvulus erubescens*				2
-	*Glycine tabacina*	0.5			

Key: * Denotes exotic species.

APPENDIX B: FAUNA SPECIES LIST

Table B1: Fauna species list

Common Name	Scientific Name	Detection Method	Approved Rail	Proposed Rail
Aves				
Quail (Unidentified)		Vis	X	
Buff-rumped Thornbill	*Acanthiza reguloides*	Vis	X	
Red Wattlebird	*Anthochaera carunculata*	HC		X
Grey Shrike-thrush	*Colluricincla harmonica*	HC	X	
White-winged Chough	*Corcorax melanorhamphos*	Vis	X	
Australian Raven	*Corvus coronoides*	HC	X	X
Pied Butcherbird	*Cracticus nigrogularis*	HC	X	
Australian Magpie	*Cracticus tibicen*	Vis	X	X
Galah	*Eolophus roseicapilla*	Vis	X	X
Brown Gerygone	*Gerygone mouki*	HC	X	
White-throated Gerygone	*Gerygone olivacea*	HC	X	X
Magpie Lark	*Grallina cyanoleuca*	HC		X
Major Mitchell's Cockatoo	***Lophochroa leadbeateri***	**Vis**		X
Rufous Songlark	*Megalurus mattewsi*	HC	X	
Brown Songlark	*Megalurus cruralis*	HC		X
Cockatiel	*Nymphicus hollandicus*	Vis		X
Rufous Whistler	*Pachycephala rufiventris*	Vis	X	
Striated Pardalote	*Pardalotus striatus*	HC	X	X
Grey-crowned Babbler	***Pomatostomus temporalis***	HC	X	
Red-rumped Parrot	*Psephotus haematonotus*	Vis	X	
Willie Wagtail	*Rhipidura leucophrys*	Vis	X	
Weebill	*Smicrornis brevirostris*	HC		X
Apostlebrid	*Struthidea cinerea*	Vis	X	
Double-barred Finch	*Taeniopygia bichenovii*	Vis	X	
Key: Species listed as threatened under the BC Act and/or EPBC Act (bold), Introduced species (*) Observation Key: PIR Camera (Cam), Elliot Traps (Elliot), Heard Calling (HC), Hair Tube (HT), Nest/Bower (NE), Scats (Scat), Scratchings (SC), Visual Observation (Vis).				

APPENDIX C: HOLLOW-BEARING TREE DATA

Table C1: Hollow-bearing tree data

Name	Species	Height	DBH	Small Hollows	Medium Hollows	Large Hollows	Comments	Latitude	Longitude
Proposed Rail Siding									
HBT 1	Grey box	13	110			1	Trunk chimney, low value	-32.8746	147.6856
HBT 2	Grey box	18	80,75	3				-32.8743	147.6851
Approved Rail Siding									
HBT 1	Poplar box	17	100	2	3			-32.8689	147.6787
HBT 2	Poplar box	15	80		3			-32.8689	147.6789
HBT 3	Poplar box	13	150	4	3	3	Very large old tree many hollows	-32.8687	147.6786
HBT 4	Poplar box	15	90			1	Trunk chimney	-32.8686	147.6785
HBT 5	Poplar box	17	100	2	2			-32.8707	147.6808
HBT 6	Poplar box	18	130	6	3			-32.8703	147.6804

APPENDIX D: VEGETATION INTEGRITY DATA

Table D1: Vegetation Integrity Data

plot	pct	area	patchsize	Condition Class	zone	easting	northing	bearing	compTree	compShrub	compGrass	compForbs	compFerns	compOther	strucTree	strucShrub	strucGrass	strucForbs	strucFerns	strucOther	funLargeTrees	funHollowtrees	funLitterCover	funLenFallenLogs	funTreeStem5to9	funTreeStem10to19	funTreeStem20to29	funTreeStem30to49	funTreeStem50to79	funTreeRegen	funHighThreatExotic
P1	244	1.02	125	Woodland	55	564039.3	6362310.7	325	2	8	9	13	1	2	32	8.2	41.8	13.3	0.2	0.6	4	1	50	1	0	0	0	0	0	1	0.2
P2	244	1.02	125	Woodland	55	564041.4	6362384.7	318	0	1	6	12	1	1	0	7	42.9	7	3	1	0	0	24	0	0	0	0	0	0	1	15
P3	244	1.97	125	DNG	55	564160.4	6362369	87	0	0	4	11	1	1	0	0	24	15.3	1	1	0	0	25	0	0	0	0	0	0	1	60
A1	244	1.95	125	Woodland	55	563524	6362937	15	2	5	8	10	0	2	15.2	8.7	4.7	4.6	0	0.8	3	3	2	0	1	1	1	0	0	1	15
A2	244	1.95	125	Woodland	55	563502	6363036	265	2	7	7	17	1	1	11	13.2	77.1	29.7	1	0.5	0	0	3.2	0	1	1	1	0	0	1	0.5
A3	244	1.38	125	DNG	55	563679	6362837	315	0	0	5	13	1	1	0	0	48	56.9	5	2	0	0	20	0	0	0	0	0	0	1	30

APPENDIX E: BAM CALCULATOR REPORTS – PROPOSED RAIL SIDING SITE

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id

00024431/BAAS17107/21/00024432

Proposal Name

Sth West Lindfield Prelim

BAM data last updated *

22/02/2021

Assessor Name

Will Steggall

Assessor Number

BAAS17107

BAM Data version *

37

Proponent Name(s)

Report Created

11/03/2021

BAM Case Status

Open

Assessment Revision

0

Assessment Type

Part 4 Developments (Small Area)

Date Finalised

To be finalised

BOS entry trigger

BOS Threshold: Biodiversity Values Map

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Nil

Additional Information for Approval

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

BAM Biodiversity Credit Report (Variations)

Name
Amaurornis moluccana / Pale-vented Bush-hen
Petaurus australis / Yellow-bellied Glider

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
690-Blackbutt - Tallowwood dry grassy open forest of the central parts NSW North Coast Bioregion	Not a TEC	0.2	5	0	5.00

690-Blackbutt - Tallowwood dry grassy open forest of the central parts NSW North Coast Bioregion

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Northern Hinterland Wet Sclerophyll Forests This includes PCT's: 690, 1281, 1558, 1845, 1846, 1847, 1914	Northern Hinterland Wet Sclerophyll Forests >=50% and <70%	690_Moderate	Yes	5	Macleay Hastings,Carrai Plateau, Coffs Coast and Escarpment, Comboyne Plateau, Karuah Manning, Macleay Gorges, Mummel Escarpment and Upper Manning. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Variation options

Formation	Trading group	Zone	HBT	Credits	IBRA region
Wet Sclerophyll Forests (Grassy sub-formation)	Tier 3 or higher threat status	690_Moderate	Yes (including artificial)	5	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Variations)

Species Credit Summary

No Species Credit Data

Credit Retirement Options

Like-for-like options

BAM Credit Summary Report

Proposal Details

Assessment Id
00023200/BAAS17107/20/00023201

Proposal Name
Clean TeQ Proposed Rail siding

BAM data last updated *
22/02/2021

Assessor Name
Will Steggall

Report Created
11/03/2021

BAM Data version *
37

Assessor Number
BAAS17107

BAM Case Status
Open

Date Finalised
To be finalised

Assessment Revision
1

Assessment Type
Part 4 Developments (General)

BOS entry trigger
BOS Threshold: Area clearing threshold

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	BC Act Listing status	EPBC Act listing status	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).											
1	244_Good	Not a TEC	78	78.0	1			High Sensitivity to Potential Gain	2.00		40
2	244_Poor	Not a TEC	40.3	40.3	2			High Sensitivity to Potential Gain	2.00		40
										Subtotal	**80**
										Total	**80**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Species credits

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00023200/BAAS17107/20/00023201	Clean TeQ Proposed Rail siding	22/02/2021

Assessor Name	Report Created	BAM Data version *
Will Steggall	11/03/2021	37

Assessor Number	Assessment Type	BAM Case Status
BAAS17107	Part 4 Developments (General)	Open

Assessment Revision	BOS entry trigger	Date Finalised
1	BOS Threshold: Area clearing threshold	To be finalised

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Diamond Firetail	Stagonopleura guttata	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Dusky Woodswallow	Artamus cyanopterus cyanopterus	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Grey Falcon	Falco hypoleucos	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Grey-crowned Babbler (eastern subspecies)	Pomatostomus temporalis temporalis	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Grey-headed Flying-fox	Pteropus poliocephalus	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).

Koala	Phascolarctos cinereus	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Major Mitchell's Cockatoo	Lophochroa leadbeateri	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Scarlet Robin	Petroica boodang	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Speckled Warbler	Chthonicola sagittata	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Superb Parrot	Polytelis swainsonii	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
White-bellied Sea-Eagle	Haliaeetus leucogaster	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Common Name	Scientific Name	Plant Community Type(s)
Glossy Black-Cockatoo	Calyptorhynchus lathami	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C
Glossy Black-Cockatoo	Calyptorhynchus lathami	Refer to BAR

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id

00023200/BAAS17107/20/00023201

Assessor Name

Will Steggall

Proponent Names

Assessment Revision

1

BOS entry trigger

BOS Threshold: Area clearing threshold

Proposal Name

Clean TeQ Proposed Rail siding

Assessor Number

BAAS17107

Report Created

11/03/2021

Assessment Type

Part 4 Developments (General)

BAM data last updated *

22/02/2021

BAM Data version *

37

BAM Case Status

Open

Date Finalised

To be finalised

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Nil

Additional Information for Approval

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Calyptorhynchus lathami / Glossy Black-Cockatoo

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).	Not a TEC	3.0	40	40	80

244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).	Like-for-like credit retirement options					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Floodplain Transition Woodlands This includes PCT's: 56, 74, 76, 80, 81, 82, 237, 244, 248, 251, 628	Floodplain Transition Woodlands >=70% and <90%	244_Good	Yes	40	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Floodplain Transition Woodlands This includes PCT's: 56, 74, 76, 80, 81, 82, 237, 244, 248, 251, 628	Floodplain Transition Woodlands >=70% and <90%	244_Poor	No	40	Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

No Species Credit Data

Like-for-like credit retirement options

Credit Retirement Options

BAM Vegetation Zones Report

Proposal Details

Assessment Id	Assessment name	BAM data last updated *
00023200/BAAS17107/20/00023201	Clean TeQ Proposed Rail siding	22/02/2021
Assessor Name	**Report Created**	**BAM Data version ***
Will Steggall	11/03/2021	37
Assessor Number	**Assessment Type**	**BAM Case Status**
BAAS17107	Part 4 Developments (General)	Open
Assessment Revision	**Date Finalised**	**BOS entry trigger**
1	To be finalised	BOS Threshold: Area clearing threshold

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Vegetation Zones

#	Name	PCT	Condition	Area	Minimum number of plots	Management zones

1	244_Good	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).	Good	1.02	1	
2	244_Poor	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).	Poor	1.97	1	

BAM Candidate Species Report

Proposal Details

Assessment Id 00023200/BAAS17107/20/00023201	Proposal Name Clean TeQ Proposed Rail siding	BAM data last updated * 22/02/2021
Assessor Name Will Steggall	Report Created 11/03/2021	BAM Data version * 37
Assessor Number BAAS17107	Assessment Type Part 4 Developments (General)	BAM Case Status Open
Assessment Revision 1	Date Finalised To be finalised	BOS entry trigger BOS Threshold: Area clearing threshold

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

List of Species Requiring Survey

Name	Presence	Survey Months
Austrostipa metatoris A spear-grass	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Austrostipa wakoolica A spear-grass	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Burhinus grallarius Bush Stone-curlew	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?

Cercartetus nanus Eastern Pygmy-possum	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Eleocharis obicis Spike-Rush	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Hieraaetus morphnoides Little Eagle	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Lepidium monoplocoides Winged Peppercress	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Lophochroa leadbeateri Major Mitchell's Cockatoo	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Lophoictinia isura Square-tailed Kite	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?

Phascolarctos cinereus Koala	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Polytelis swainsonii Superb Parrot	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Pteropus poliocephalus Grey-headed Flying-fox	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Swainsona murrayana Slender Darling Pea	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Swainsona sericea Silky Swainson-pea	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Glossy Black-Cockatoo	Calyptorhynchus lathami	Refer to BAR
White-bellied Sea-Eagle	Haliaeetus leucogaster	Habitat constraints

APPENDIX F: BAM CALCULATOR REPORTS – APPROVED RAIL SIDING SITE

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id

00023213/BAAS17107/20/00023214

Proposal Name

Clean TeQ Approved Rail siding

BAM data last updated *

22/02/2021

Assessor Name

Will Steggall

Assessor Number

BAAS17107

BAM Data version *

37

Proponent Names

Report Created

11/03/2021

BAM Case Status

Open

Assessment Revision

1

Assessment Type

Part 4 Developments (General)

Date Finalised

To be finalised

BOS entry trigger

BOS Threshold: Area clearing threshold

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Nil

Additional Information for Approval

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).	Not a TEC	3.3	69	27	96

BAM Biodiversity Credit Report (Like for like)

<table>
<tr><td rowspan="3">244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).</td><td colspan="6">Like-for-like credit retirement options</td></tr>
<tr><td>Class</td><td>Trading group</td><td>Zone</td><td>HBT</td><td>Credits</td><td>IBRA region</td></tr>
<tr><td>Floodplain Transition Woodlands
This includes PCT's:
56, 74, 76, 80, 81, 82, 237, 244, 248, 251, 628</td><td>Floodplain Transition Woodlands >=70% and <90%</td><td>244_Good</td><td>Yes</td><td>69</td><td>Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee.
or
Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.</td></tr>
<tr><td></td><td>Floodplain Transition Woodlands
This includes PCT's:
56, 74, 76, 80, 81, 82, 237, 244, 248, 251, 628</td><td>Floodplain Transition Woodlands >=70% and <90%</td><td>244_Moderate</td><td>No</td><td>27</td><td>Lower Slopes, Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee.
or
Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.</td></tr>
</table>

Species Credit Summary

No Species Credit Data

Like-for-like credit retirement options

Credit Retirement Options

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00023200/BAAS17107/20/00023201	Clean TeQ Proposed Rail siding	22/02/2021
Assessor Name	Assessor Number	BAM Data version *
Will Steggall	BAAS17107	37
Proponent Name(s)	Report Created	BAM Case Status
	11/03/2021	Open
Assessment Revision	Assessment Type	Date Finalised
1	Part 4 Developments (General)	To be finalised
BOS entry trigger	* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.	
BOS Threshold: Area clearing threshold		

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Nil

Additional Information for Approval

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

BAM Biodiversity Credit Report (Variations)

Name
Calyptorhynchus lathami / Glossy Black-Cockatoo

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).	Not a TEC	3.0	40	40	80.00

244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Floodplain Transition Woodlands This includes PCT's: 56, 74, 76, 80, 81, 82, 237, 244, 248, 251, 628	Floodplain Transition Woodlands >=70% and <90%	244_Good	Yes	40	Lower Slopes,Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Floodplain Transition Woodlands This includes PCT's: 56, 74, 76, 80, 81, 82, 237, 244, 248, 251, 628	Floodplain Transition Woodlands >=70% and <90%	244_Poor	No	40	Lower Slopes,Bogan-Macquarie, Inland Slopes, Lachlan Plains, Murray Fans, Murrumbidgee and Nymagee. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Variation options

Formation	Trading group	Zone	HBT	Credits	IBRA region

	Grassy Woodlands	Tier 2 or higher threat status	244_Good	Yes (including artificial)	40	IBRA Region: NSW South Western Slopes, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Grassy Woodlands	Tier 2 or higher threat status	244_Poor	No	40	IBRA Region: NSW South Western Slopes, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

No Species Credit Data

Credit Retirement Options

Like-for-like options

BAM Candidate Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00023213/BAAS17107/20/00023214	Clean TeQ Approved Rail siding	22/02/2021
Assessor Name	**Report Created**	**BAM Data version ***
Will Steggall	11/03/2021	37
Assessor Number	**Assessment Type**	**BAM Case Status**
BAAS17107	Part 4 Developments (General)	Open
Assessment Revision	**Date Finalised**	**BOS entry trigger**
1	To be finalised	BOS Threshold: Area clearing threshold

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

List of Species Requiring Survey

Name	Presence	Survey Months
Austrostipa metatoris A spear-grass	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Austrostipa wakoolica A spear-grass	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Burhinus grallarius Bush Stone-curlew	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?

Calyptorhynchus lathami Glossy Black-Cockatoo	No (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☑ Survey month outside the specified months?
Cercartetus nanus Eastern Pygmy-possum	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Eleocharis obicis Spike-Rush	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Haliaeetus leucogaster White-bellied Sea-Eagle	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Hieraaetus morphnoides Little Eagle	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☑ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Lepidium monoplocoides Winged Peppercress	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?

Lophochroa leadbeateri Major Mitchell's Cockatoo	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug **☐ Sep** **☐ Oct** **☑ Nov** **☐ Dec** ☐ Survey month outside the specified months?
Lophoictinia isura Square-tailed Kite	No (surveyed)	**☐ Jan** ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug **☐ Sep** **☐ Oct** **☑ Nov** **☐ Dec** ☐ Survey month outside the specified months?
Ninox connivens Barking Owl	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr **☐ May** **☐ Jun** **☐ Jul** **☐ Aug** **☐ Sep** **☐ Oct** **☑ Nov** **☐ Dec** ☐ Survey month outside the specified months?
Phascolarctos cinereus Koala	No (surveyed)	**☐ Jan** **☐ Feb** **☐ Mar** **☐ Apr** **☐ May** **☐ Jun** **☐ Jul** **☐ Aug** **☐ Sep** **☐ Oct** **☑ Nov** **☐ Dec** ☐ Survey month outside the specified months?
Polytelis swainsonii Superb Parrot	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug **☐ Sep** **☐ Oct** **☑ Nov** ☐ Dec ☐ Survey month outside the specified months?
Swainsona murrayana Slender Darling Pea	No (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug **☑ Sep** ☐ Oct ☐ Nov ☐ Dec ☑ Survey month outside the specified months?

Swainsona sericea Silky Swainson-pea	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Tyto novaehollandiae Masked Owl	No (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☑ Survey month outside the specified months?

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Glossy Black-Cockatoo, Riverina population	Calyptorhynchus lathami - endangered population	Refer to BAR
Grey-headed Flying-fox	Pteropus poliocephalus	Habitat constraints

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00023213/BAAS17107/20/00023214	Clean TeQ Approved Rail siding	22/02/2021
Assessor Name	**Report Created**	**BAM Data version ***
Will Steggall	11/03/2021	37
Assessor Number	**BAM Case Status**	**Date Finalised**
BAAS17107	Open	To be finalised
Assessment Revision	**Assessment Type**	**BOS entry trigger**
1	Part 4 Developments (General)	BOS Threshold: Area clearing threshold

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	BC Act Listing status	EPBC Act listing status	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).											
1	244_Good	Not a TEC	70.4	70.4	2			High Sensitivity to Potential Gain	2.00		69
2	244_Moderate	Not a TEC	38.9	38.9	1.4			High Sensitivity to Potential Gain	2.00		27
										Subtotal	**96**
										Total	**96**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Species credits

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00023213/BAAS17107/20/00023214	Clean TeQ Approved Rail siding	22/02/2021

Assessor Name	Report Created	BAM Data version *
Will Steggall	11/03/2021	37

Assessor Number	Assessment Type	BAM Case Status
BAAS17107	Part 4 Developments (General)	Open

Assessment Revision	BOS entry trigger	Date Finalised
1	BOS Threshold: Area clearing threshold	To be finalised

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Barking Owl	Ninox connivens	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Corben's Long-eared Bat	Nyctophilus corbeni	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Diamond Firetail	Stagonopleura guttata	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Dusky Woodswallow	Artamus cyanopterus cyanopterus	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Glossy Black-Cockatoo	Calyptorhynchus lathami	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).

Grey Falcon	Falco hypoleucos	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Grey-crowned Babbler (eastern subspecies)	Pomatostomus temporalis temporalis	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Grey-headed Flying-fox	Pteropus poliocephalus	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Koala	Phascolarctos cinereus	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Little Eagle	Hieraaetus morphnoides	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Little Pied Bat	Chalinolobus picatus	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Major Mitchell's Cockatoo	Lophochroa leadbeateri	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Masked Owl	Tyto novaehollandiae	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Painted Honeyeater	Grantiella picta	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Pied Honeyeater	Certhionyx variegatus	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Scarlet Robin	Petroica boodang	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Speckled Warbler	Chthonicola sagittata	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).

Spotted Harrier	Circus assimilis	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Square-tailed Kite	Lophoictinia isura	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Stripe-faced Dunnart	Sminthopsis macroura	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Superb Parrot	Polytelis swainsonii	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Turquoise Parrot	Neophema pulchella	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Varied Sittella	Daphoenositta chrysoptera	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
White-bellied Sea-Eagle	Haliaeetus leucogaster	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C

BAM Vegetation Zones Report

Proposal Details

Assessment Id	Assessment name	BAM data last updated *
00023213/BAAS17107/20/00023214	Clean TeQ Approved Rail siding	22/02/2021
Assessor Name	Report Created	BAM Data version *
Will Steggall	11/03/2021	37
Assessor Number	Assessment Type	BAM Case Status
BAAS17107	Part 4 Developments (General)	Open
Assessment Revision	Date Finalised	BOS entry trigger
1	To be finalised	BOS Threshold: Area clearing threshold

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Vegetation Zones

#	Name	PCT	Condition	Area	Minimum number of plots	Management zones

1	244_Good	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).	Good	1.95	1	
2	244_Moderate	244-Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt).	Moderate	1.38	1	

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sunrise
energy metals

Sunrise Project

Project Execution Plan Modification

Appendix G

Aboriginal Cultural Heritage Assessment

Sunrise Project –

Project Execution Plan Modification

Aboriginal Cultural Heritage Assessment

Report to Sunrise Energy Metals Limited
29 June 2021

Landskape

a division of ML Cupper Pty Ltd
ABN 48 107 932 918

PO Box 1068 Carlton 3053

e-mail: landskape@telstra.com

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Sunrise Energy Metals Limited

Sunrise Project –

Project Execution Plan Modification

Aboriginal Cultural Heritage Assessment

Local Government Area: Parkes

Nearest Town: Trundle

Landskape

Natural and Cultural Heritage Management

a division of M.L. Cupper Pty Ltd

ABN: 48 107 932 918

Author: Dr Matt Cupper
Date: 29 June 2021

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TABLE OF CONTENTS

Figures

Tables

Appendices

EXECUTIVE SUMMARY

The Sunrise Project (the Project) is a nickel, cobalt and scandium open cut mining project situated near the village of Fifield, approximately 350 kilometres (km) west-northwest of Sydney, in New South Wales (NSW).

SRL Ops Pty Ltd owns the rights to develop the Project. SRL Ops Pty Ltd is a wholly owned subsidiary of Sunrise Energy Metals Limited (SEM)[1].

The Project includes the establishment and operation of the nickel, cobalt, scandium mine and processing facility, limestone quarry, rail siding, borefield, surface water extraction infrastructure and water pipeline, gas pipeline, accommodation camp and associated transport activities and transport infrastructure (e.g. the Fifield Bypass and road and intersection upgrades). Open cut mining and processing of ore to produce up to 180 tonnes per annum (tpa) of scandium oxide and 40,000 tpa of nickel and cobalt metal equivalents (as sulphate precipitate products) are approved at the mine and processing facility. Construction of the Project commenced in 2006 with the construction of components of the borefields, however the Project operations are yet to commence.

An Environmental Impact Statement (EIS) was prepared in late 2000 by then-proponent Black Range Minerals to apply for Development Consent for the Project. The existing environment, potential environmental impacts, mitigation measures and environmental management, rehabilitation and monitoring strategies associated with the Project are documented in the EIS. An archaeological investigation (Appleton, 2000) was prepared as part of the EIS. The Project was granted Development Consent (DA 374-11-00) in May 2001, with six modifications approved since that time.

A Heritage Management Plan (HMP) was prepared for the Project in accordance with Condition 40, Schedule 3 of Development Consent (DA 374-11-00). The HMP was prepared and reviewed by Dr Matt Cupper of Landskape Natural and Cultural Heritage Management (Landskape), with the latest revision approved by the Department of Planning, Industry and Environment in 2019.

SEM has continued to review and optimise the Project design as part of preparations for the Project execution. The outcomes of this review are outlined in the Project Execution Plan (Clean TeQ, 2020).

The Project Execution Plan identified a number of changes to the approved mine and processing facility, accommodation camp, rail siding and road transport activities. The Project Execution Plan Modification (the Modification) includes these Project Execution Plan changes to allow for the optimisation of the construction and operation of the Project. To this end, SEM commissioned Landskape to undertake an Aboriginal Cultural Heritage Assessment (ACHA) of the Modification. This would support an application by SEM to modify Development Consent (DA 374-11-00) for the Project, which would be sought under section 4.55(2) of the EP&A Act.

Changes associated with the rail siding would require an additional surface development area and, therefore, the revised rail siding location is the subject of this ACHA. A larger area, including the revised rail siding location and surrounds, was surveyed in the field (the Study Area), The other changes included in the Modification would not require additional surface development areas and therefore have not been considered further in this ACHA.

[1] SEM was previously Clean TeQ Holdings Limited (Clean TeQ).

This report presents an assessment of the Aboriginal cultural heritage related issues for the Modification in accordance with the relevant requirements of the various advisory documents and guidelines.

No Aboriginal cultural heritage sites have previously been recorded in or immediately adjacent to the Study Area. The present survey did not encounter any Aboriginal cultural heritage sites in the Study Area.

Based on the results of this cultural heritage investigation and consultation with representatives of the Registered Aboriginal Parties (RAPs) the following is recommended:

- The Modification is unlikely to harm Aboriginal cultural heritage.

- In the unlikely event that human skeletal remains are encountered during the course of activities associated with the Modification, all work in that area must cease. Remains must not be handled or otherwise disturbed except to prevent further disturbance. SEM should notify the Police or the State Coroner's Office (tel: 02 9552 4066) immediately. If there is reason to suspect that the skeletal remains are more than 100 years old and of Aboriginal origin, SEM should contact the Environmental Line (tel: 131 555) for advice. In the unlikely event that an Aboriginal burial is encountered, strategies for its management would need to be developed with the involvement of the local Aboriginal community.

- SEM should apply for an Aboriginal Heritage Impact Permit under section 90 of the *National Parks and Wildlife Act, 1974* (and/or a variation application to the existing approved AHIP #C0003049).

- SEM should update the Project HMP, which outlines the management and mitigation measures for Aboriginal cultural heritage, in consultation with the Aboriginal community and Heritage NSW and should incorporate the Modification and the recommendations of this assessment. The HMP should continue to remain active for the life of the Modification and define the tasks, scope and conduct of all Aboriginal cultural heritage management activities.

- SEM should continue to provide training to all on-site personnel regarding the HMP strategies relevant to their employment tasks.

- SEM should continue to involve the RAPs and any other relevant Aboriginal community groups or members in matters pertaining to the Modification.

1 INTRODUCTION

The Sunrise Project (the Project) is a nickel, cobalt and scandium open cut mining project situated near the village of Fifield, approximately 350 kilometres (km) west-northwest of Sydney, in New South Wales (NSW) (Figure 1). SRL Ops Pty Ltd owns the rights to develop the Project. SRL Ops Pty Ltd is a wholly owned subsidiary of Sunrise Energy Metals Limited (SEM)[2].

Development Consent (DA 374-11-00) for the Project was issued under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) in 2001. Six modifications to Development Consent (DA 374-11-00) have since been granted under the EP&A Act.

The Project Execution Plan Modification (the Modification) includes the implementation of Project changes identified in the Project Execution Plan to optimise the construction and operation of the Project.

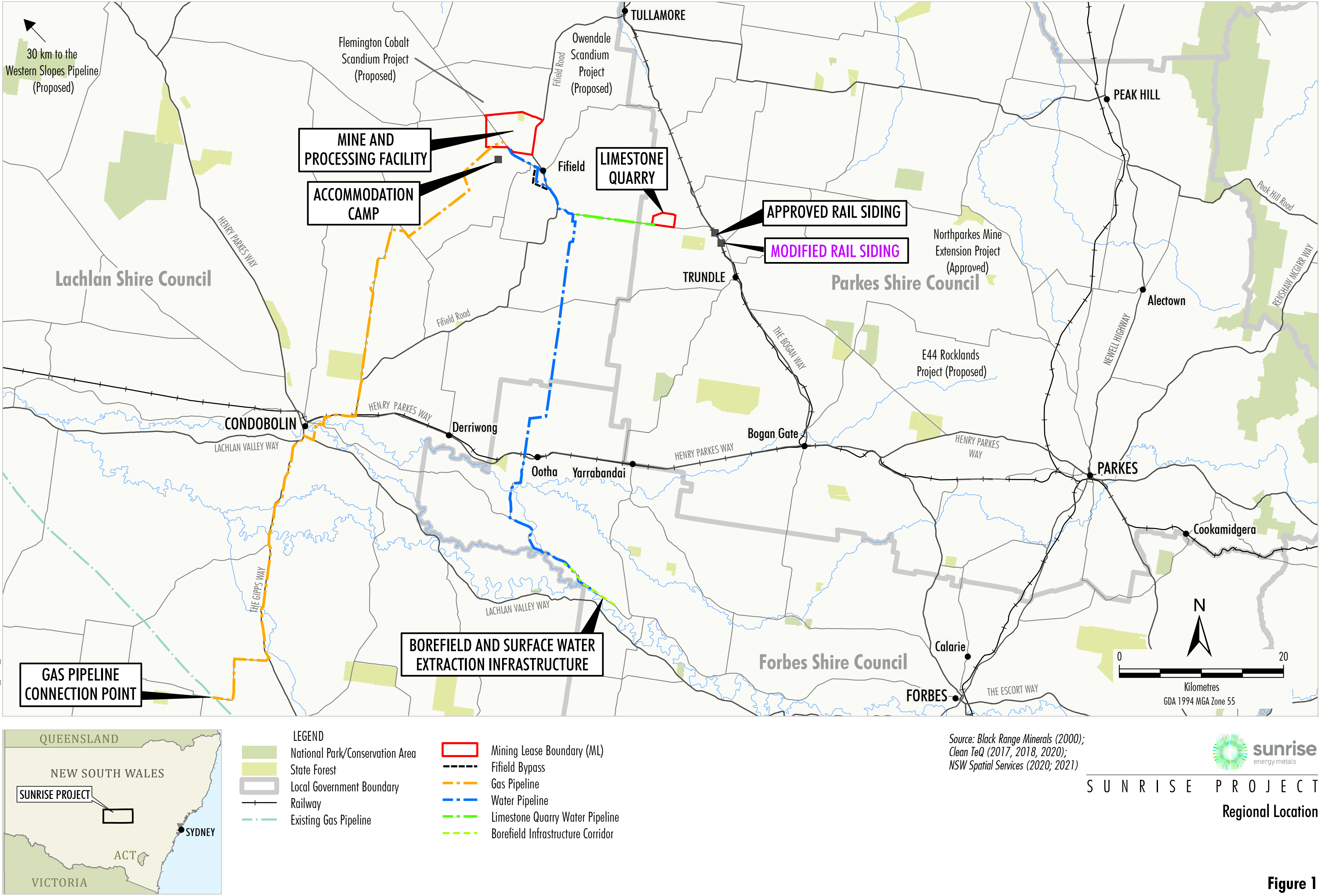
This Aboriginal Cultural Heritage Assessment (ACHA) has been prepared to support an application by SEM to modify Development Consent (DA 374-11-00) for the Project, which would be sought under section 4.55(2) of the EP&A Act.

This report presents an assessment of the potential Aboriginal cultural heritage related issues for the Modification in accordance with the relevant requirements of the various advisory documents and guidelines. These guidelines and documents include (but are not limited to):

- *Aboriginal cultural heritage consultation requirements for proponents 2010* (Part 6 *National Parks and Wildlife Act, 1974* [NP&W Act]) (Consultation Guidelines) (NSW Department of Environment, Climate Change and Water [DECCW], 2010a).
- *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW, 2010b).
- *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (NSW Office of Environment and Heritage [OEH], 2011).
- *The Burra Charter: The Australia ICOMOS Charter for the Conservation of Places of Cultural Significance* (Australia International Council on Monuments and Sites, 2013).
- *Aboriginal Cultural Heritage: Standards and Guidelines Kit* (NSW National Parks and Wildlife Service, 1997).
- *Ask First: A Guide to Respecting Indigenous Heritage Places and Values* (Australian Heritage Commission, 2002).
- *NSW Minerals Industry Due Diligence Code of Practice for the Protection of Aboriginal Objects* (NSW Minerals Council, 2010).
- *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW, 2010c).
- *Engage Early – Guidance for proponents on best practice Indigenous engagement for environmental assessments under the Environment and Protection and Biodiversity Conservation Act 1999 (EPBC Act)* (Commonwealth Department of the Environment, 2016).

This ACHA would be used to support an application for an Aboriginal Heritage Impact Permit (AHIP) under section 90 of the NP&W Act (and/or a variation application to the existing approved AHIP #C0003049).

[2] SEM was previously Clean TeQ Holdings Limited (Clean TeQ).



LEGEND

- National Park/Conservation Area
- State Forest
- Local Government Boundary
- Railway
- Existing Gas Pipeline
- Mining Lease Boundary (ML)
- Fifield Bypass
- Gas Pipeline
- Water Pipeline
- Limestone Quarry Water Pipeline
- Borefield Infrastructure Corridor

Source: Black Range Minerals (2000); Clean TeQ (2017, 2018, 2020); NSW Spatial Services (2020; 2021)

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SUNRISE PROJECT

Regional Location

Figure 1

1.1 OBJECTIVES OF STUDY

The specific objectives of the ACHA were to:

- consult the local Aboriginal community to identify any concerns they may have (consultation with the Aboriginal community followed the requirements of the Consultation Guidelines [DECCW, 2010a]);
- conduct a desktop assessment (including heritage register searches) to delineate areas of known and predicted Aboriginal cultural heritage within the Study Area;
- undertake a stratified archaeological survey of known and predicted Aboriginal cultural heritage identified in the desktop assessment with representatives of the local Aboriginal community;
- record any Aboriginal cultural heritage sites within the Study Area and assess their significance;
- identify the nature and extent of approved impacts of the Modification on Aboriginal cultural heritage; and
- develop measures in consultation with the Aboriginal community to avoid or mitigate potential impacts of the Modification on Aboriginal cultural heritage places and objects.

Preparation of this report involved collation of relevant archival, archaeological, historical and environmental information and the use of aerial photographs and topographic and geomorphic maps to identify areas likely to contain Aboriginal cultural heritage sites.

1.2 STRUCTURE OF THIS REPORT

This ACHA has been prepared in consideration of the requirements of the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW, 2010b) and as such includes the following specific information:

Section 1: Outlines the Modification and the objectives and structure of this report.

Section 2: Lists the investigators and contributors involved with this report.

Section 3: Provides a summary description of the existing Project and the Modification being considered in this ACHA.

Section 4: Details the consultation and partnership with the Aboriginal community.

Section 5: Outlines the landscape context and includes descriptions of land use history, geology and vegetation within the Study Area.

Section 6: Provides background information and a description of previous archaeological works, including relevant ethno-history and the regional archaeological context for the Study Area.

Section 7: Describes the current predictive model for the Study Area including archaeological survey and data collection, information regarding the method of the survey and a description of the areas surveyed. The results of the survey area are presented in this section. Also provides a consideration of cultural values/significance.

Section 8: Assesses the impact of the Modification on Aboriginal cultural heritage.

Section 9: Describes the management, mitigation measures and recommendations.

Section 10: Provides a summary of the recommendations.

Section 11: Lists the references cited in this report.

Appendix 1: Provides a glossary of commonly used terms in this report.

Appendix 2: Provides a log of consultation carried out for the Modification relevant to Aboriginal cultural heritage.

Appendix 3: Provides a summary of correspondence to Aboriginal community stakeholders.

Appendix 4: Provides a summary of correspondence from Aboriginal community stakeholders.

Appendix 5: Provides the Aboriginal Heritage Information Management System (AHIMS) Register search results.

Appendix 6: Provides relevant cadastre information.

2 INVESTIGATORS AND CONTRIBUTORS

Landskape was commissioned by SEM to complete the ACHA for the Modification and to prepare this report.

Dr Matt Cupper and Dr Tim Stone, qualified archaeologists and geoscientists with extensive experience as cultural heritage advisors, were Landskape's project archaeologists for the Modification.

The field investigation for the Modification was completed on 23 February 2021 by project archaeologists Dr Matt Cupper and Dr Tim Stone, with the assistance of the following Aboriginal community representatives: Eugene Coe (Wiradjuri Condobolin Corporation) and Isabel Goolagong (Condobolin Local Aboriginal Land Council).

Community consultation pursuant to the Consultation Guidelines (DECCW, 2010a) was managed by SEM.

3 DESCRIPTION OF THE MODIFICATION

3.1 THE APPROVED PROJECT

Development Consent (DA 374-11-00) for the Project was issued under Part 4 of the EP&A Act in 2001. The Development Consent (DA 374-11-00) has been modified on six occasions since it was issued.

3.2 THE MODIFICATION

SEM has continued to review and optimise the Project design, construction and operation as part of preparations for Project Execution. The outcomes of this review are outlined in the Project Execution Plan (Clean TeQ Sunrise Pty Ltd, 2020).

The Project Execution Plan identified a number of changes to the approved mine and processing facility, accommodation camp, rail siding and road transport activities. The Modification includes these Project Execution Plan changes to allow for the optimisation of the construction and operation of the Project.

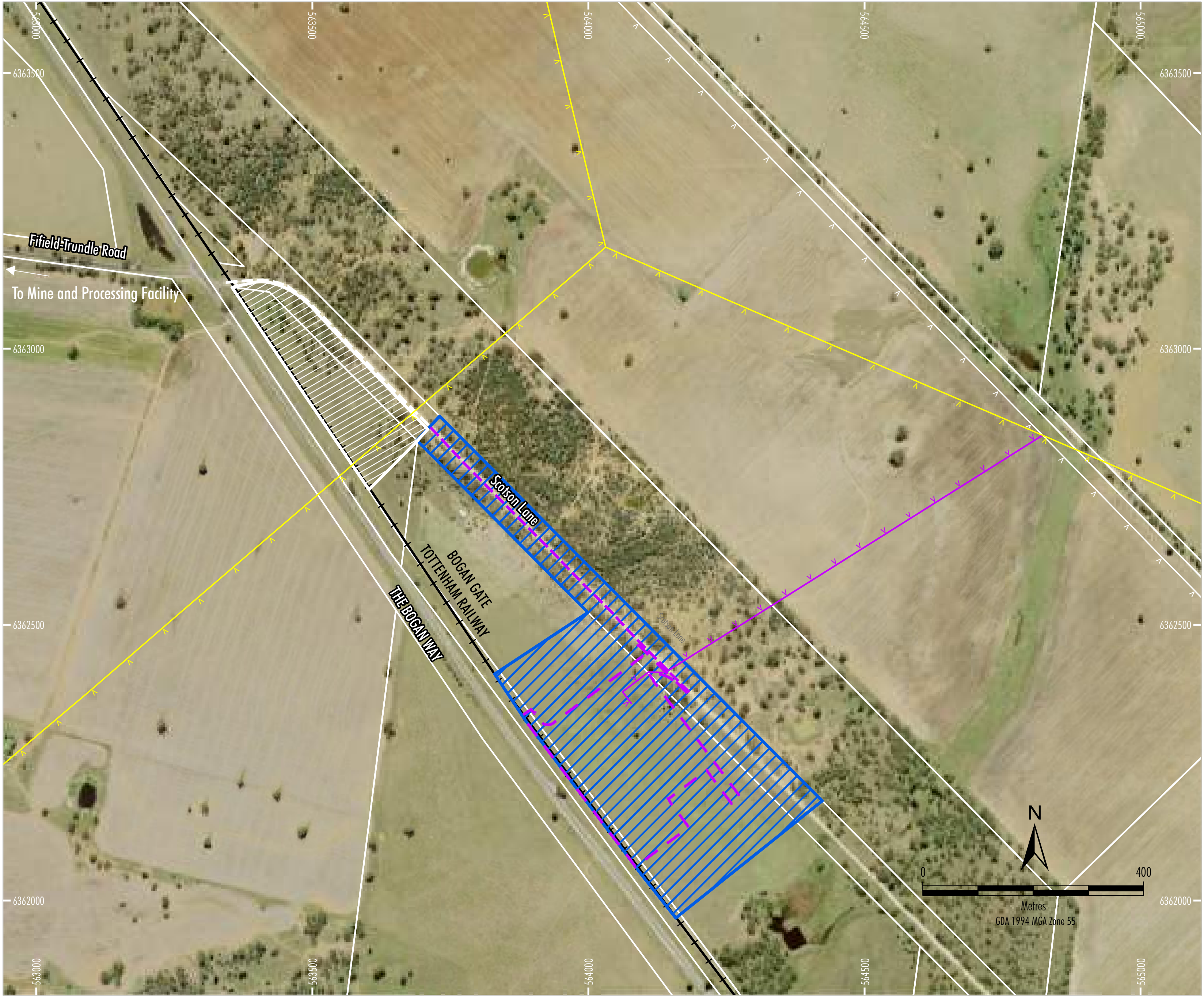
Changes associated with the rail siding would require an additional surface development area. The other changes included in the Modification would not require additional surface development areas and therefore have not been considered further in this ACHA.

The Modification would include the following changes to the rail siding:

- revised rail siding location and layout (**Figure 2**);
- addition of an ammonium sulphate storage and distribution facility to the rail siding;
- addition of a 22 kV Electricity Transmission Line (which would be subject to a separate approval) to the rail siding power supply;
- extension of the Scotson Lane road upgrade; and
- increased peak operational phase workforce from approximately five to approximately 10 personnel.

The revised rail siding location shown on **Figure 2** is the subject of this ACHA. A larger area, including the revised rail siding location and surrounds, was surveyed in the field (the Study Area, as shown on Figure 2).

Cadastre information relevant to the Study Area is presented in **Appendix 6.**



LEGEND

Railway

Existing 11 kV Electricity Transmission Line

Existing 22 kV Electricity Transmission Line

Approved Project

Rail Siding Surface Development Area

Scotson Lane Upgrade

Modified Project

Surface Development Area

Scotson Lane Upgrade Extension

22 kV Electricity Transmission Line (Subject to Separate Approval)

Study Area

Source: Black Range Minerals (2000); NSW Spatial Services (2020); Clean Teq (2017, 2018, 2020).
Orthophoto: NSW Spatial Services (2020, 2021).

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SUNRISE PROJECT

ACHA Study Area and Approved and Modified Rail Siding Location

Figure 2

CTL-20-08_ACHA_202C

4 ABORIGINAL COMMUNITY CONSULTATION

4.1 INTRODUCTION

Consultation with the Aboriginal community for the Modification was undertaken in accordance with the Consultation Guidelines (DECCW, 2010a), and the NSW *National Parks and Wildlife Regulation, 2009* (NP&W Regulation).

Accordingly, this assessment has involved the appropriate representatives of the local Aboriginal community and considered their cultural values and concerns. The following sections describe consultation undertaken with the Aboriginal community and demonstrate that the input of the involved Aboriginal community representatives has been considered.

The Consultation Guidelines (DECCW, 2010a) outline a four stage consultation process that includes detailed guidance as to the aim of each consultation stage and what actions are necessary for it to be successfully completed. These four stages include the following:

- Stage 1 – Notification of Modification proposal and registration of interest.
- Stage 2 – Presentation of information about the proposed Modification.
- Stage 3 – Gathering information about the cultural significance.
- Stage 4 – Review of draft ACHA report.

It is noted that community consultation was undertaken previously as part of the archaeological investigation prepared to support the original EIS for the Project (Appleton, 2000) and as part of the Modification to the borefield (Modification 2) (Appleton, 2005). Notwithstanding, this consultation was undertaken prior to the implementation of relevant guidelines and regulations, and hence, SEM commissioned Landskape to prepare a contemporary assessment including consultation with the local Aboriginal community in accordance with the Consultation Guidelines (DECCW, 2010a) and the NP&W Regulation. An ACHA was therefore prepared by Landskape in 2017 for the Project. Subsequently, ACHAs were also prepared in 2017 by Landskape for Modification 4 (i.e. surface water extraction infrastructure and modified water pipeline alignment) and Modification 6 (i.e. accommodation camp relocation).

4.2 REGISTERED ABORIGINAL PARTIES

In accordance with Sections 4.1 and 4.2 of the Consultation Guidelines (DECCW, 2010a), a total of 10 RAPs have previously registered an interest in the Project[3], including:

- Wiradjuri Condobolin Corporation.
- Murie Elders Group.
- Binjang Wellington Wiradjuri Aboriginal Heritage Survey.
- West Wyalong LALC.
- Condobolin LALC.
- Louise Davis.
- Peter Peckham.

[3] The Forbes Aboriginal & Community Working Party were originally registered as stakeholders for the consultation process, however at a later date they advised SEM that they did not wish to be included in the Aboriginal consultation process going forward, and hence have not been described further in this report.

- Sandra Peckham.
- Isabel Goolagong.
- Wiradjuri Cultural and Environmental Rangers.

A consultation log detailing all Aboriginal community consultation undertaken for the Modification is provided in **Appendix 2**. A copy of relevant written correspondence sent to and received from the RAPs is provided in **Appendices 3** and **4** respectively.

4.3 PROPOSED METHODOLOGY

Information regarding the Modification was provided in writing to all RAPs on 19 and 20 January 2021. A copy of the Proposed Methodology was provided for review and comment on 22 and 23 January 2021 (**Appendix 3**).

A minimum of 28 days was allowed for the RAPs to provide input in regards to the following aspects:

- The nature of the Proposed Methodology.
- Any Aboriginal objects or places of cultural value within the Study Area, or issues of cultural significance.
- Any restrictions or protocols considered necessary in relation to any information of sensitivity that may be provided.
- Any other factors considered to be relevant to the ACHA.

SEM representatives invited the RAPs to a discussion forum in Trundle on 23 February 2021 to update them on the Project, the Modification and the ACHA. Present were Bronwyn Flynn, Michael Wood and Mick Hanlon (SEM), Dr Matt Cupper and Dr Tim Stone (Landskape) and RAP representative Eugene Coe (Wiradjuri Condobolin Corporation).

4.4 COMMENTS ON PROPOSED METHODOLOGY

At the close of the Proposed Methodology review period, no comments or feedback on the Proposed Methodology was received by SEM.

A consultation log detailing all Aboriginal community consultation undertaken for the Modification is provided in **Appendix 2**. A copy of relevant written correspondence sent to and received from the RAPs is provided in **Appendices 3** and **4** respectively.

4.5 ABORIGINAL CULTURAL HERITAGE FIELD SURVEYS

The field investigation for the Modification was completed on 23 February 2021 by project archaeologists Dr Matt Cupper and Dr Tim Stone, with the assistance of the following Aboriginal community representatives: Eugene Coe (Wiradjuri Condobolin Corporation) and Isabel Goolagong (Condobolin Local Aboriginal Land Council).

During the field surveys, attending RAPs were invited to provide any cultural information or values associated with the Study Area. For example, the archaeologists encouraged participants to provide input on bush food resources, fauna and cultural associations/knowledge of the Study Area.

4.6 REVIEW OF DRAFT ACHA REPORT

A draft of this report has been provided to all RAPs for their review and comment in accordance with Sections 4.3 and 4.4 of the Consultation Guidelines (DECCW, 2010a). No comments specific to the draft ACHA content were provided. Other correspondence from RAPs is recorded in the consultation log in **Appendix 2**.

5 LANDSCAPE CONTEXT

5.1 CONTEXT OF MODIFIED RAIL SIDING AREA

The Study Area is located on the western extent of the southwest slopes region of central western NSW. It occupies undulating plains abutting footslopes of the Lachlan Fold Belt to the north of the Lachlan riverine tract. The climate is semi-arid, receiving approximately 420 millimetres of rainfall per annum (Bureau of Meteorology, 2021).

Geologically, the Study Area comprises heavily lateritised sedimentary and volcanic deposits of Ordovician to Devonian age. These have weathered to lateritic clay loams and occasional gravels. Most of the Study Area has been previously cleared for cereal cropping or pastoralism with remnant, isolated paddock trees (see **Figures 3 to 6**). Remnant woodland vegetation persists along the verge of Scotson Lane.

Figure 3. Cleared paddock in the Study Area.

Figure 4. Cleared paddock in the Study Area.

Figure 5. Cleared paddock in the Study Area.

Figure 6. Cleared fenceline in the Study Area.

6 ABORIGINAL CULTURAL HERITAGE CONTEXT

6.1 ETHNO-HISTORICAL CONTEXT

Aboriginal people of the Wiradjuri language group occupied the southwest slopes of central western NSW at the time of first contact with Europeans (Sturt, 1833; Hovell and Hume, 1837; Mitchell, 1839; Tindale, 1974). The Wiradjuri were traditionally associated with the region encompassing the Macquarie, Lachlan and Murrumbidgee Rivers.

There may have been around 60 different dialects of Wiradjuri, whose speakers shared similar material culture and social organisation (Howitt, 1904; White, 1986). Perhaps the greatest regional variation was between speakers of the northern dialect (*Wirraaydhuurray*) and those of the south (speakers of the *Wirraayjuurray* dialect) (White, 1986). For example, the practice of carving zigzag motifs into tree trunks appears to have been particular to the Wiradjuri of the Macquarie and Lachlan River valleys, but is absent from the Murrumbidgee (Etheridge, 1918; Bell, 1982). Such carved trees are thought to have perhaps marked ceremonial areas and burial grounds. The *Burbung* ceremony was another of the Wiradjuri customs and traditions (Howitt, 1904). This ceremony was associated with male initiation and involved the preparation of special earth mounds and usually the application of red ochre.

The Wiradjuri were hunter-fisher-gatherers and appear to have had a semi-sedentary lifestyle. They caught fish including eels, freshwater crayfish, yabbies, tortoises and freshwater mussels in the Lachlan, Macquarie and Murrumbidgee Rivers and other streams and wetlands in the region (Howitt, 1904). Watercraft were manufactured from large slabs of bark cut from River Red Gum trees. Fish were caught using fishing lines and nets made from reed fibre.

Nets were used to catch waterbirds, whose eggs were also collected. Some of the other animals that the Wiradjuri hunted include kangaroos, wallabies, emus, possums, echidnas, lizards, snakes and frogs (Howitt, 1904). In summer, some Wiradjuri journeyed southeast to the high plains of the Great Dividing Range, where bogong moths were collected in large quantities (Flood, 1980). Plant foods included Native Millet, Panic Grass, Pigface fruits, Wild Cherries, Kangaroo Apple, tubers, yams, roots and other grass grains (Howitt, 1904; Gott, 1983).

Aspects of the initial interaction between Europeans and the Wiradjuri led to violent conflict. Aboriginal people were shot, poisoned and displaced from their land by pastoral settlers and, in retaliation, cattle, sheep, stockmen and shepherds were speared (Pearson, 1984).

Explorer and Surveyor-General of NSW Lieutenant John Joseph William Molesworth Oxley had led an expedition down the Lachlan River in 1817 (Johnson, 2001). At Goobothery upstream of Condobolin, he exhumed the burial mound of a Wiradjuri leader that had been marked by two carved trees. Oxley's party was eventually forced to divert north by the Great Cumbungi Swamp in the lower reaches of the Lachlan (Johnson, 2001). He struck the Macquarie River and encountered favourable land for pasture, further surveying the region the following year and opening up the southwest slopes to pastoral settlement (Pearson, 1984). Over the next few years pastoral runs were taken up along the Macquarie in the Wellington area approximately 140 km northeast of the Study Area.

Expanding European settlement led to conflict with the Wiradjuri. Intense fighting occurred between 1822 and 1824 in what were termed the Bathurst Wars (Pearson, 1984). In 1824, Governor Brisbane instituted a period of martial law over the region between Bathurst and Wellington. There was considerable resistance by local Aboriginal people led by Windradyne, a senior Wiradjuri guerrilla leader, but by the end of the year the violence had been quashed. Martial law was repealed on 11 December 1824, and on 28 December 1824 Windradyne travelled to Parramatta, where he was pardoned by Governor Brisbane (Pearson, 1984).

The first pastoral runs were taken up on the Lachlan in the 1830s and within a decade of the first contact with Europeans many of the Wiradjuri were living adjacent to pastoral homesteads, often working as shepherds or engaged in other labouring activities (Günther, 1837-1842). Those Aboriginal people who resided on pastoral holdings in central western NSW continued to live a semi-traditional existence into the second half of the nineteenth century (Pearson, 1984). This included collecting plant and animal foods to supplement station rations. Historical sources record a rapid decline in Wiradjuri numbers, caused by dispossession of land and the consequent destruction of habitat and social networks (Günther, 1837-1842; Pearson, 1984). Diseases including smallpox and malnutrition also took their toll (Günther, 1837-1842; Pearson, 1984). Traditional social networks collapsed. Other social structures, such as marriage laws, were also abandoned.

Grants of land were set aside for church and government Aboriginal reserves from the 1830s. One of the earliest was Wellington Mission operated by the Church Missionary Society for Africa and the Far East between 1832 and 1844 on the Macquarie River at Wellington (Günther, 1837-1842). One of the ministers, Reverend Watson, had a policy of removing Aboriginal children from their families, which led to bitter confrontations between Watson and other missionaries. The Church Missionary Society dismissed Watson in 1839 (Pearson, 1984). Watson and his wife left the mission along with a small group of Wiradjuri People and established a private mission, known as Apsley Mission, just outside the boundary of the Wellington Mission. Approximately eight years after establishing Apsley Mission, Watson, his wife Ann and their small Aboriginal community of about thirty people moved to a new site on the bank of the Macquarie River, known as the Blake's Fall Mission (Pearson, 1984).

An Aboriginal Reserve (reserve number R32512) was gazetted for Aboriginal people on the south bank of the Lachlan River at Condobolin on 13 April 1901 (Department of Lands, 1900). Known as the Condobolin Mission, and later the Willow Bend Mission, the reserve was originally run by the Aborigines Protection Board (later Aborigines Welfare Board). Aboriginal people also resided at a self-managed “fringe camp” at the Murie Reserve, approximately 4 km south of Condobolin, between approximately 1900 and 1970.

Many of the contemporary Aboriginal people of central western NSW live in regional centres such as Condobolin, and the region has a population of around 13,600 Aboriginal people, or some 6 % of the total population (Australian Bureau of Statistics, 2016).

6.2 PREHISTORIC CONTEXT

Accounts of Aboriginal land use of central western NSW during the nineteenth century provide an insight into possible settlement patterns in the prehistoric period. Pearson (1984) concluded that, prior to European settlement, large localised clans of Aboriginal people inhabited the southwest slopes encompassing the Study Area.

During normal conditions, clans divided into bands of up to 20 people, who may have used a territory with a radius of 20 km to 30 km. These bands coalesced relatively quickly into groups of 80 to 150 people to take advantage of a guaranteed or desirable resource, such as seasonal food resources (Pearson, 1984).

The material record of this occupation is preserved in the archaeological sites of central western NSW, most of which probably date to the period since the last Ice Age (after around 18,000 years ago). All that remains at many of these sites are flakes of stone debris from the making and resharpening of stone tools. These were made both at Aboriginal open and closed habitation areas (campsites and rockshelters) or special activity areas such as axe grinding groove sites.

As well as being the sites of manufacture and maintenance of stone implements, habitation areas usually contain evidence of domestic and other activities such as cooking and food preparation. Campfires or oven hearths are common, marked by charcoal and heat retaining stones or hearthstones. Organic remains consist of marsupial, rodent, bird, lizard, snake and fish bones, eggshell and freshwater mussel shell. Modified trees show where bark may have been removed by Aboriginal people to manufacture canoes, shelters and dishes, or carved to mark burial grounds and ceremonial sites.

6.3 TYPES OF ABORIGINAL CULTURAL HERITAGE SITES IN THE REGION

Based on the results and analytical conclusions of previous archaeological surveys in similar landscape contexts on the southwest slopes of central western NSW, it is possible to predict the types and topographic contexts of Aboriginal cultural heritage sites in the Study Area. The occurrence and survival of archaeological sites is, however, dependent on many factors including micro-topography and the degree of land surface disturbance.

The types of Aboriginal cultural heritage sites previously recorded on the southwest slopes of central western NSW are described in Sections 6.3.1-6.3.11.

6.3.1 Stone Artefact Scatters

Scatters of stone artefacts exposed at the ground surface are one of the most commonly occurring types of archaeological site in the region. The remains of fire hearths may also be associated with the artefacts. In rare instances, sites that were used over a long period of time may accumulate sediments and become stratified. That is, there may be several layers of occupation buried one on top of another.

Stone artefact scatters are almost invariably located near permanent or semi-permanent water sources. Local topography is also important in that open campsites tend to occur on level, well drained ground elevated above the local water source. In central western NSW they are commonly located on river terraces and along creek-lines and also around the margins of lakes and swamps.

6.3.2 Modified Trees

Slabs of bark were cut from trees by Aboriginal people and used for a variety of purposes including roofing shelters and constructing canoes, shields and containers. Scars also resulted from the cutting of toeholds for climbing trees to obtain honey or to capture animals such as possums. Some trees were carved, whereby Aboriginal people cut designs through the bark onto the wood beneath. Ethno-historic records indicate that some carved trees were associated with burials whilst others may have been sacred or totemic sites.

In central western NSW, River Red Gums and Box are the most commonly modified species. Carvings are often on Box or Cypress Pine. The classification of modified trees as natural, European or Aboriginal is often problematic. However, if the scar is associated with Aboriginal activity the tree must now be more than approximately 150 years old (Long, 2005).

6.3.3 Hearths

Hearths consist of lumps of burnt clay or stone cobble hearthstones. Sometimes ash and charcoal are preserved. Other materials found in hearths include animal bone, freshwater mussel shell, emu eggshell and stone artefacts. Hearths probably represent the remains of cooking ovens, similar to those described in ethnographic accounts by Major Thomas Mitchell (Mitchell, 1839). These were lined with baked clay nodules and stone cobbles, possibly to retain heat. Hearths may be isolated or occur in clusters and may be associated with open campsites or middens. They are sometimes located on floodplain terraces of central western NSW.

6.3.4 Stone Quarries

These are locations where Aboriginal people obtained raw material for their stone tools or ochre for their art and decoration. Materials commonly used for making flaked stone tools include chert, silcrete, quartz and quartzite. These materials were obtained from exposed sedimentary formations or picked up as loose rock on the surface. Stone quarries may also be associated with volcanic rock outcrops, which provided the raw material for ground stone tools such as stone axes. Gobondery Mountains to the northeast of Fifield has one such axe quarry (Beuzeville, 1917).

6.3.5 Stone Arrangements, Ceremonial Rings and Ceremony and Dreaming Sites

Stone arrangements range from cairns or piles of rock to more elaborate arrangements such as stone circles or standing slabs of rock held upright by stones around the base. Beuzeville (1917) describes concentric stone circles measuring 4 metres (m) to 5 m in diameter near The Troffs, east of Fifield. Some stone arrangements were used in ceremonial activities whilst others may represent sacred or totemic sites. Other features associated with the spiritual aspects of Aboriginal life are those now called ‘ceremony and dreaming’ sites. These can be either stone arrangements or natural features such as rock outcrops, waterholes or mountains, which may be associated with initiation ceremonies or the activities of ancestral creators.

6.3.6 Water Holes

These result from Aboriginal people modifying rock outcrops to collect or trap surface or groundwater. Water holes may be in the beds of creeks or hill slopes where sheets of rock may have been hollowed out to pool water. In most instances, soft stone such as limestone or sandstone outcrops provided the most suitable surface for excavating water holes. A notable example in the Fifield area was a stone trough cut by Aboriginal people at a spring, which gave its name to the locality “The Troffs” (Beuzeville, 1917; this site has subsequently been destroyed by railway construction).

6.3.7 Freshwater Shell Middens

Shell middens are deposits of shell and other food remains accumulated by Aboriginal people as food refuse. In inland NSW these middens typically comprise shells of the freshwater lacustrine mussel (*Velesunio ambiguous*) or the freshwater riverine mussel (*Alathyria jacksoni*). Freshwater middens are most frequently found as thin layers or small patches of shell and often contain stone or bone artefacts and evidence of cooking. Such sites are relatively common along the watercourses of central western NSW and their associated wetlands.

6.3.8 Earth Mounds

Earth mounds may have been used by Aboriginal people as cooking ovens or as campsites. Originally they appear to have ranged from 3 m to 35 m in diameter and from 0.5 m to 2 m in height. Today, however, they may be difficult to recognise because of the effects of ploughing, grazing and burrowing rabbits. Earth oven material, stone artefacts, food refuse and the remains of hut foundations have been exposed in excavated earth mounds.

6.3.9 Rockshelter Sites

Caves or shelters in cliff lines and beneath boulder overhangs were often used by Aboriginal people as campsites. Because of the confined area in these shelters and because of repeated Aboriginal occupation of such sites, the occupation deposits that they contain are often richer than open campsites and are usually stratified. Rockshelters will only be found where suitable geological formations are present. They may occur as sandstone overhangs, shelters beneath granite tors or as limestone caves.

6.3.10 Rock Art Sites

Rock art consists of paintings, drawings and/or engravings on rock surfaces. In most instances in the wider region, rock art is related to the distribution of rockshelters but it may also be found on freestanding rocks.

6.3.11 Burials

Aboriginal burial grounds may consist of a single interment or a suite of burials. In the drier parts of the Murray-Darling Basin, skeletal material is regularly found eroding from sand deposits (Bonhomme, 1990; Hope, 1993). In the higher southwest slopes burial sites are rarely found because conditions for the preservation of bone are poor. Knowledge of Aboriginal burial grounds is best sought from local Aboriginal communities.

6.4 PREVIOUS ABORIGINAL CULTURAL HERITAGE INVESTIGATIONS

An understanding of the past Aboriginal occupation of central western NSW has begun to emerge from a number of studies including some undertaken within and in proximity to the Study Area. However, there have been few systematic regional investigations, with most undertaken in discrete areas including management studies of conservation reserves in the region and for mining and infrastructure developments. These include surveys of the Cowal Gold Operations near West Wyalong (south of the Study Area) (Paton, 1989; Cane, 1995, 1996, 1997; Huys and Johnston, 1995; Nicholson, 1997; Stone, 2002; Pardoe, 2009, 2011, 2013) and the Project (Appleton, 2000; Landskape, 2017a; 2017b, 2018). Also relevant is Flood's (1980) broad-scale study of the uplands further east, which identified general features of the regional archaeological record of the southwest slopes of central western NSW, and OzArk Environment and Heritage's (2020) draft Aboriginal Cultural Heritage Study of the Lachlan Shire prepared for the Lachlan Shire Council.

Surface scatters of flaked stone artefacts are the most common site type in central western NSW. These stone assemblages are dominated by flakes and flaked pieces mostly struck from quartz, and less commonly, silcrete, chert and quartzite. Few formalised tool types have been recorded, but include ground-edged axes and grinding dishes. Eucalypt trees modified by Aboriginal people are also well represented along creeklines of central western NSW and are particularly abundant on the adjacent plains. Other site types on the plains include earthen features such as hearths and mounds. Rockshelters, rock art sites, axe-head grinding grooves, waterholes, stone sources and stone arrangements also occur in the foothills of the southwest slope.

Aboriginal occupation of central western NSW is known to date from at least 29,000 to 34,000 years ago. The oldest ages have been obtained from the Pleistocene (Ice Age) sites of Cuddie Springs and Tambar Springs at the downstream end of the Macquarie River catchment some 300 km north of the Study Area (e.g. Field and Dodson, 1999). Closer to the Study Area, a burial of a very tall and robust Aboriginal male, Kiacatoo Man, from Kiacatoo some 30 km downstream on the Lachlan River from Condobolin, has been dated to 17,000 years ago (Kemp *et al.*, 2014).

The Lachlan River was a particular focus of past Aboriginal occupation. Trees carved by Aboriginal people are a prominent site type along the river. Carved trees had designs cut into their trunks, commonly a type of zigzag motif, and marked ceremonial areas and burial grounds (Etheridge, 1918; Bell, 1982). This practice appears to have been peculiar to the central part of western NSW. Bell (1982) located a total of 205 carved trees in this region. Most were concentrated along the Bogan and Macquarie Rivers and the middle reaches of the Lachlan River.

The distribution of modified trees probably reflects wider Aboriginal settlement patterns of the southwest slopes. People seem to have spent much of their time near the more reliable water sources. Paton and Hughes (1984), who examined areas near Condobolin, recorded that stone artefact densities drop from one artefact per square metre (m^2) close to the Lachlan River, to as little as one artefact per 400 m^2 away from the river. These stone artefact assemblages are dominated by quartz (77 %) with the remainder comprising chert.

Similar stone artefact scatters close to water sources in the Lachlan River valley have been described by Silcox (1986) at West Wyalong and Paton (1989), Cane (1995, 1996, 1997), Huys and Johnston (1995), Nicholson (1997), Stone (2002) and Pardoe (2009, 2011, 2013) at Lake Cowal. These studies found that quartz, silcrete and chert were prevalent in lithic assemblages, the latter often used to manufacture backed blades. Other formal artefact types such as modified flakes, scrapers, adze slugs and seed grinding implements were less abundant.

Rock art sites tend to occur in the bedrock ranges of the southwest slopes, mainly to the northeast of the Study Area. Paintings include both figurative and non-figurative motifs. Lines, dots, tracks, hand stencils and depictions of humans, emus and kangaroos are represented (Gunn, 1983; Martin, 1991).

Flood's (1980) investigation of the higher uplands of central western NSW to the east of the Study Area provides insights into possible regional patterns of past Aboriginal land use. Flood (1980) found that lowland sites often either comprised large base camps, open occupation areas covering two or three square kilometres found on sand dunes and near lakes and rivers, or smaller camps distributed along river banks in a lineal pattern.

Flood (1980) noted typical landscape settings of Aboriginal campsites. All sites are within 1 km and most within 100 m of a river, creek, lake or spring. However, no sites are located right at the water's edge. All sites are located on well-drained ground with a reasonably good view of the approaches. When sites occur on the side of a mountain range or valley their aspect is usually east or north thus obtaining shelter from the prevailing westerly winds (Flood, 1980).

6.5 PREVIOUSLY RECORDED ABORIGINAL CULTURAL HERITAGE IN THE STUDY AREA

The most recent archaeological investigations pertinent to the Study Area are Appleton’s (2000, 2005) and Landskape’s (2017a, 2017b, 2018) previous assessments undertaken for the Project (and subsequent modifications).

There are no previously recorded Aboriginal cultural heritage sites within or immediately adjacent to the Study Area (AHIMS search number 574354; accessed 8 March 2021) (**Appendix 5**). The closest previously recorded Aboriginal cultural heritage sites are two isolated finds of stone artefacts (AHIMS site numbers 35-5-0170 and 35-5-0171) north of Platina Road approximately 5 km west of the Study Area (Landskape, 2017b).

7 CULTURAL HERITAGE FIELD INVESTIGATION

In accordance with the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in New South Wales* (OEH, 2011) and the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW, 2010b), an archaeological design and survey methodology was prepared as a key component of the cultural heritage field assessment. Details of the archaeological design and survey methodology are presented in the following sections.

7.1 CULTURAL HERITAGE SITE PREDICTIVE MODEL

Previous archaeological studies indicate that the most frequently recorded Aboriginal cultural heritage places in central western NSW are open occupation areas represented by scatters of stone artefacts and culturally modified trees (Heritage NSW AHIMS site database). Burials, earthen features including mounds and hearths and stone features including stone quarries, ceremonial rings, water holes, rockshelters and rock art sites are also represented in the archaeological record.

The potential for encountering Aboriginal cultural heritage in the Study Area is mitigated to a large extent by the high degree of previous disturbance. For example, the extent of tree clearance from past agricultural land use reduces the probability of encountering modified and carved trees. Similarly, modification of the original land surface during past agricultural land use and grading tracks and fencelines could have destroyed earthen features such as mounds and stone features such as arrangements and ceremonial rings, had they previously existed in this area. Stone artefacts, alternatively, are more likely to survive in the cultivated soil.

Based on past observations of archaeological site types and their distribution and landscape setting, the following predictive model of Aboriginal cultural heritage site locations for the activity can be proposed:

- **Trees scarred or carved by Aboriginal people** may occur wherever mature Eucalypt trees grow. However, given the extent of vegetation clearance in the Study Area, the probability of encountering culturally modified trees is not particularly high.
- **Stone artefact scatters** and **isolated finds** of stone artefacts are possible at the Study Area. They are typically found within 200 m of water sources and are also possible around natural depressions such as ephemeral swamps. There is a low likelihood of occurrence in the Study Area given the absence of water sources and natural depressions.
- **Burial sites** are possible, particularly in sandy deposits elevated above waterways. However, there is a low likelihood of occurrence within the Study Area, particularly given the absence of sandy deposits.
- **Freshwater shell middens** will not occur, given the absence of permanent sources of water.
- **Earthen features** including **mounds**, **ovens** and **hearths, stone arrangements** and **ceremonial rings** are normally restricted to level ground, the former usually adjacent to water sources (which are absent from the Study Area). They are also unlikely to occur due to previous land disturbance such as earthworks associated with grading tracks and fence lines and ploughed cultivation during agricultural cropping, which is likely to have destroyed earthen and stone features, had these site types originally occurred in the Study Area.
- **Rockshelters, grinding grooves, water holes, stone quarries** and **rock art sites** are not likely to occur, given the absence of suitable rock outcrops in the Study Area.

While predictive studies such as this can be expected to identify areas in which sites associated with subsistence activities may be present (notably open habitation areas) other sites may fall outside such a predictive framework. For example, places associated with spiritual aspects of traditional Aboriginal society such as ceremony and dreaming sites are often located at topographically distinct or unique features, which cannot be identified from an examination of maps or other records. For this reason, it was essential that local Aboriginal communities be consulted so that sites of significance to them can be identified.

7.2 FIELD METHODOLOGY

7.2.1 Logistics

The field investigation for the Modification was completed on 23 February 2021 by project archaeologists Dr Matt Cupper and Dr Tim Stone, with the assistance of the following Aboriginal community representatives: Eugene Coe (Wiradjuri Condobolin Corporation) and Isabel Goolagong (Condobolin Local Aboriginal Land Council).

7.2.2 Survey Methods

The Study Area was inspected on foot by the project archaeologists and Aboriginal community representatives (**Figures 7** and **8**). The field teams examined the ground surface for any archaeological traces such as stone artefacts, hearths, hearthstones, shells, bones and mounds. All mature trees in the areas of proposed disturbance were inspected for scarring or carving by Aboriginal people.

Particular attention was paid to areas with high ground surface visibility such as along stock and vehicle tracks and in scalds, gullies and other eroded areas.

The team members walked abreast across the Study Area in a series of closely spaced transects. These were evenly distributed over the Study Area and approximately 2 m apart. Due to the general openness of the landscape, it was usually possible to identify likely site locations from at least 2 m and deviate from the transects to make closer inspections.

The entire Study Area was treated as a single survey unit given its small size and homogeneous landform.

Figure 7. Survey team members inspecting the Study Area.

Figure 8. Survey team members inspecting the Study Area.

7.2.3 Access to Survey Areas and Weather Conditions

Access was available to all of the Study Area and weather conditions were good during the survey.

7.3 SURVEY COVERAGE DATA

7.3.1 Conditions of Visibility

Conditions of ground surface visibility affect how many sites are located. Visibility may also skew the results of a survey. If, for example, conditions of ground surface visibility vary dramatically between different environments, then this would be reflected in the numbers of sites reported for each area. The area with the best visibility may be reported as having the most sites (because they are visible on the ground) while another area with less visibility but perhaps more sites would be reported as having very little occupation. It is important therefore to consider the nature of ground surface visibility as part of any archaeological investigation.

Conditions of ground surface visibility were typically 50% or higher across the Study Area (**Table 1**, **Figures 9** and **10**). Grass and herbaceous plant growth was low, with extensive areas of the ground surface exposed by erosion from scalding and stock and vehicular traffic.

Figure 9. Excellent visibility conditions within the Study Area.

Figure 10. Excellent visibility conditions within the Study Area.

7.3.2 Coverage Analysis

Coverage analysis is a useful measurement to allow cultural resource managers to assess surveys from adjacent areas and it also allows some meaningful calculation of the actual sample size surveyed. The 'actual' or 'effective' area surveyed by a study depends on the conditions of ground surface visibility. Conditions of surface visibility are affected by vegetation cover, geomorphic processes such as sedimentation and erosion rates, and the abundance of natural rock that may obscure the remains of cultural activities.

Approximately 25% of the surface of the Study Area was inspected on foot (**Tables 1** and **2**). This is a relatively high coverage and was a result of the generally intensive nature of the survey and the typically excellent conditions of surface visibility.

Table 1. Effective Survey Coverage of the Study Area.

Survey Unit	Landform	Survey Unit Area (m^2)	Visibility (%)	Exposure (%)	Effective Cover (m^2)	Effective Cover (%)	No. of Sites
1	Sandplain	**190,645**	50	50	47,661	25	-
Total		**190,645**			**47,661**	**25**	**-**

m^2 – square metres.

Table 2. Landform Summary of Sampled Areas of the Study Area.

Landform	Landform Area (m^2)	Area Effectively Covered (m^2)	Landform Effectively Surveyed (%)	No. of Sites
Sandplain	190,645	47,661	25	-
Total	**190,645**	**47,661**	**25**	**-**

7.4 SURVEY RESULTS AND DISCUSSION

No Aboriginal cultural heritage places were located in the Study Area, despite the intensive nature of the survey. This negative result is attributable to the landscape setting of the Study Area, located in the hinterland plain away from water sources, which is unlikely to contain Aboriginal cultural heritage. Past disturbance by agriculture is also likely to have removed Aboriginal cultural heritage places, had they previously occurred.

Modified trees were not identified because most River Red Gum and Box, the most commonly modified types of tree, have been previously cleared. Quarry sites are also definitely not represented as rock outcrop is lacking. Landforms such as lunettes or source-bordering sand dunes that might contain sensitive sub-surface archaeological material such as burials do not occur in the Study Area. The sediments of the Study Area had been well enough exposed by pastoral and agricultural activities, vehicular traffic and wind and water erosion to determine that no archaeological material was present on the surface nor is likely to be buried beneath the soil.

No non-Aboriginal (i.e. historical) cultural heritage sites were recorded in the Study Area and it is unlikely that any historical cultural heritage places or objects would occur in the Study Area.

7.5 IDENTIFIED ABORIGINAL CULTURAL VALUES

As described in earlier sections, this assessment has been prepared in accordance with the Consultation Guidelines (DECCW, 2010a) and the NP&W Regulation.

The cultural values assessment undertaken to date has been based on the following:

- Review of background resources including previous archaeological investigations for the surrounding region and the approved Project (Appleton, 2000, 2005; Landskape, 2017a, 2017b, 2018).
- Historical research.
- Discussions with RAPs during field survey.
- Discussions with RAPs during community information session.
- Requests for comments during the review period for the Proposed Methodology.
- Specific meetings with RAPs upon request.

These points of consultation provided the opportunity for the Aboriginal community to have direct input into the management of Aboriginal cultural heritage values (both tangible and intangible) in the Study Area.

All land has cultural significance for individual Aboriginal people and for the Aboriginal community collectively. Development upon, or disturbance of, land is often contrary to principal Aboriginal beliefs regarding land, its values and its inherent cultural significance.

During the archaeological surveys the attending RAPs did not identify any specific locations within the Study Area or wider surrounds as being of high or specific cultural significance.

8 POTENTIAL IMPACTS OF THE MODIFICATION ON ABORIGINAL CULTURAL HERITAGE

In accordance with the *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH, 2011), the principles of ecologically sustainable development were considered in assessing the likely harm of the Modification to Aboriginal cultural heritage sites.

No Aboriginal cultural heritage places or objects were identified in the Study Area, so no known Aboriginal cultural heritage sites, items or values would be potentially impacted by the proposed works. The potential for previously unidentified Aboriginal cultural heritage to occur in the Study Area is, however, considered in Section 8.1.

8.1 POTENTIAL FOR PREVIOUSLY UNIDENTIFIED ABORIGINAL CULTURAL HERITAGE TO OCCUR IN THE STUDY AREA

Although the Study Area was sufficiently surveyed, there remains a very low potential for Aboriginal cultural heritage sites to be located within this area (e.g. sites that may have been obscured by grass or soil at the time of survey). Such previously unidentified features, should they occur, would probably be isolated finds or low-density concentrations of stone artefacts (based on the predictive model outlined in Section 7.1 and informed by the results of the current survey, summarised in Section 7.5).

The shallow soils of the Study Area, coupled with past disturbance from pastoralism, agriculture, and track and fence construction, means that significant *in situ* subsurface cultural deposits are highly improbable.

The Study Area does not contain culturally sensitive landforms such as lunettes or source-bordering sand dunes where subsurface Aboriginal cultural deposits (e.g. burials) have been recorded previously.

A strategy for managing any newly identified Aboriginal objects during the life of the Modification is outlined in Section 9.

8.2 POTENTIAL CUMULATIVE IMPACTS

Given that no Aboriginal cultural heritage places or objects have been identified in the Study Area, coupled with the very low potential for such heritage to occur, the Modification would not increase cumulative impacts to Aboriginal cultural heritage in the region.

8.3 FLEXIBILITY OF THE MODIFICATION DESIGN

Given that no Aboriginal cultural heritage places or objects have been identified in the Study Area, the proposed rail siding design does not need to be modified to avoid Aboriginal cultural heritage sites.

9 MANAGEMENT STRATEGIES FOR CULTURAL HERITAGE

This section presents proposed strategies for the management of Aboriginal cultural heritage values within the Study Area that may be subject to direct impacts by the construction of the rail siding. These recommendations have been developed in consideration of the management measures outlined in the Project Heritage Management Plan (HMP), prepared in accordance with Condition 40, Schedule 3 of Development Consent (DA 374-11-00).

9.1 GENERAL RECOMMENDATIONS

9.1.1 Heritage Management Plan

The HMP, which outlines the management and mitigation measures for Aboriginal and historical cultural heritage, has been previously prepared for the Project in consultation with the RAPs and Heritage NSW. SEM should review and, if necessary, revise the HMP for the Project to reflect the results and recommendations of this assessment. The HMP should continue to remain active during the course of activities associated with construction of the modified rail siding and define the tasks, scope and conduct of all Aboriginal cultural heritage management activities.

9.1.2 Role of the Local Aboriginal Community

SEM is committed to involving the local Aboriginal community as an integral participant in the management of Aboriginal cultural heritage values in the Study Area. The strategies outlined in this report have incorporated the views of community representatives and the HMP would be revised following receipt of the modified Development Consent in consultation with the local Aboriginal community.

9.1.3 Site Management and Cultural Awareness Training

The effective application of the HMP and its strategies is dependent on an appreciation of its content and function by on-site staff and employees.

It is proposed to provide training to all on-site personnel regarding the HMP strategies relevant to their employment tasks.

10 SUMMARY RECOMMENDATIONS

Based on the results of this cultural heritage investigation and consultation with representatives of the RAPs the following is recommended:

- The Modification is unlikely to harm Aboriginal cultural heritage.
- In the unlikely event that human skeletal remains are encountered during the course of activities associated with the Modification, all work in that area must cease. Remains must not be handled or otherwise disturbed except to prevent further disturbance. SEM should notify the Police or the State Coroner's Office (tel: 02 9552 4066) immediately. If there is reason to suspect that the skeletal remains are more than 100 years old and of Aboriginal origin, SEM should contact the Environmental Line (tel: 131 555) for advice. In the unlikely event that an Aboriginal burial is encountered, strategies for its management would need to be developed with the involvement of the local Aboriginal community.
- SEM should apply for an Aboriginal Heritage Impact Permit under section 90 of the NP&W Act (and/or a variation application to the existing approved AHIP #C0003049).
- SEM should update the Project HMP, which outlines the management and mitigation measures for Aboriginal cultural heritage, in consultation with the Aboriginal community and Heritage NSW to incorporate the Modification and the recommendations of this assessment. The HMP should continue to remain active for the life of the Modification and define the tasks, scope and conduct of all Aboriginal cultural heritage management activities.
- SEM should continue to provide training to all on-site personnel regarding the HMP strategies relevant to their employment tasks.
- SEM should continue to involve the RAPs and any other relevant Aboriginal community groups or members in matters pertaining to the Modification.

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APPENDIX 1

GLOSSARY

GLOSSARY

Archaeological site - A place with evidence of past human activity. This evidence may include Aboriginal and/or historic artefacts, features, structures or organic traces.

Artefact scatter - A surface scatter of Aboriginal or historic cultural material. Scatters of stone artefacts are a common archaeological site type. These scatters may also contain charcoal, discarded animal bones, shell and ochre.

Assemblage - A collection of artefacts from a single archaeological site.

Burial site - A place with a concentration of human remains. Ochre, stone tools, charcoal and grave goods may be associated with burials. Most burial sites are found in sand dunes but dead trees, caves and rock shelters were also used.

Ceremonial ring - Place that may be associated with initiation ceremonies, meetings or sacred rituals. Stone arrangements may be present, including cairns, stone circles or standing slabs of rock.

Chert - A fine-grained opaline rock ranging in colour from white to black, but most often grey, brown, grayish brown and light green to rusty red.

Cultural material - Any material remains or objects resulting from human activity.

Flake - A piece of stone detached from a core that typically displays a striking platform, bulb of percussion and flake scars on the ventral surface.

Flaked piece - Small fragments of stone resulting from the manufacture of stone tools. A striking platform or bulb of percussion may not be evident.

Ground surface visibility - The amount of bare ground exposed, usually expressed as a percentage.

Hearth - The remains of a campfire containing charcoal, discoloured soil, and possibly, hearthstones, heat retainers or the remains of animals or shellfish cooked and consumed at the campsite.

Hearthstone – Stone cobble placed in a campfire to retain heat for cooking.

Heat retainer - Nodule of baked clay, thought to have been placed in campfires to retain heat for cooking.

in situ - An artefact or other feature that has not been disturbed from its original position.

Mound - Raised areas of earth ranging from 3 m to 35 m in diameter and from 0.5 m to 2 m in height. Earth oven material, stone artefacts, food refuse and the remains of hut foundations have been recovered from excavated earth mounds in the central and western parts of Victoria.

Ochre - Soft varieties of the iron oxides goethite, limonite or haematite usually coloured red or yellow and used as pigment for painting.

Quarry - An outcrop of stone or ochre where Aboriginal people have extracted the raw material for use or trade. Stone quarries are identifiable by a dense scatter of broken stone and flakes or consist of pits or hollows where material has been dug out of the ground.

Quartz – A silica mineral resistant to weathering because of its hardness. It is commonplace in the landscape as a consequence.

Quartzite - A metamorphic rock formed by the re-crystallization of quartz.

Modified tree - A tree with a scar on its trunk caused by bark removal.

Shell midden - A surface scatter or heap of discarded shell often with charcoal, animal bones and stone artefacts. Middens may be found near coastlines, rivers, creeks, swamps and ancient lakes.

Silcrete - A hard, fine-grained rock composed of silica cement.

Stone feature - Cairns, rock wells, grinding groves, stone structures, fish traps and stone arrangements are examples of stone features.

Survey - An inspection of land either by foot or vehicle for the purpose of identifying archaeological sites.

Transect - A predetermined area or a path that directs the course of a survey.

APPENDIX 2

CONSULTATION LOG

DATE	ORGANISATION CONTACTED	HOW CONTACTED	CONTACTED BY	NATURE OF CONSULTATION
19/01/2021 and 20/01/2021	Registered Aboriginal Parties (RAPs)	Email	Clean TeQ Sunrise Pty Ltd	Letters sent out to the existing 10 RAPs for the Clean TeQ Sunrise Project to advise them of the Modification and notify them that they have been automatically registered as RAPs for the Modification. Requested updated contact details and to confirm receipt of the email.
20/01/2021	Clean TeQ Sunrise Pty Ltd	Email	Louise Davis	Provided confirmation of receipt of the letter and noted they would be available when a date is decided for the field survey.
22/01/2021 and 23/01/2021	RAPs	Email	Clean TeQ Sunrise Pty Ltd	Copy of Proposed Methodology distributed for review and comment. Feedback on the Proposed Methodology was requested by 22 February 2021. An invitation to an information session for the Proposed Methodology and a field survey of the ACHA Study Area was also extended in this correspondence. Requested confirmation of receipt of the email.
25/01/2021	Clean TeQ Sunrise Pty Ltd	Email	Louise Davis	Confirmed receipt of the Proposed Methodology.
25/01/2021	Clean TeQ Sunrise Pty Ltd	Email	Peter White	Provided updated contact details.
28/01/2021	Clean TeQ Sunrise Pty Ltd	Email	Tim Gumbleton (CLALC)	Advised that the contact for Condobolin Local Aboriginal Land Council (CLALC) (Dave Carter) no longer works for CLALC and requested that he be changed to the contact.
02/02/2021	Clean TeQ Sunrise Pty Ltd	Phone call	Peter Peckham	Advised he would be available for the field work on 23 February 2021. Will talk to Sandra Peckham (his sister and another RAP for the Project) and get back to Clean TeQ with required information and insurances.
9/02/2021	CLALC and West Wyalong Local Aboriginal Land Council (WWLALC)	Email	Clean TeQ Sunrise Pty Ltd	Provided a copy of the list of RAPs for the Modification, along with a copy of the written notifications (in accordance with the consultation guideline).
9/02/2021	Wiradjuri Condobolin Corporation (WCC)	Phone	Clean TeQ Sunrise Pty Ltd	Left a voicemail asking for Ally (WCC representative) to return call regarding upcoming ACHA field work.
9/02/2021	Murie Elders Group	Phone	Clean TeQ Sunrise Pty Ltd	Attempted to call regarding upcoming ACHA field work – phone not connected.
9/02/2021	WWLALC	Phone	Clean TeQ Sunrise Pty Ltd	Left a voicemail asking for Leeanne (WWLALC representative) to return call regarding upcoming ACHA field work.

DATE	ORGANISATION CONTACTED	HOW CONTACTED	CONTACTED BY	NATURE OF CONSULTATION
9/02/2021	CLALC (Tim Gumbleton)	Phone	Clean TeQ Sunrise Pty Ltd	Advised he sent the Proposed Methodology email to four members of the advisory committee, asking if anyone could attend. Tim asked to have the email resent to him and he'll ensure insurances are provided for someone to attend.
9/02/2021	CLALC (Tim Gumbleton)	Email	Clean TeQ Sunrise Pty Ltd	Resent email providing Proposed Methodology, as requested.
9/02/2021	Louise Davis	Phone	Clean TeQ Sunrise Pty Ltd	Left a voicemail asking for Louise to return call regarding upcoming ACHA field work.
9/02/2021	Peter Peckham	Phone	Clean TeQ Sunrise Pty Ltd	Spoke to Peter who advised he is not available on the date of field work. Also advised that his sister and RAP Sandra Peckham does not have current insurances to undertake the work.
10/02/2021	WCC (Ally Coe)	Email	Clean TeQ Sunrise Pty Ltd	Resent email providing Proposed Methodology with a reminder regarding field work.
10/02/2021	Murie Elders Group (Rebecca Shepherd)	Email	Clean TeQ Sunrise Pty Ltd	Resent email providing Proposed Methodology with a reminder regarding field work.
10/02/2021	Binjang Wellington Wiradjuri Aboriginal Heritage Survey (Jamie Gray)	Email	Clean TeQ Sunrise Pty Ltd	Resent email providing Proposed Methodology with a reminder regarding field work.
10/02/2021	WWLALC (Leeanne Hampton)	Email	Clean TeQ Sunrise Pty Ltd	Resent email providing Proposed Methodology with a reminder regarding field work.
10/02/2021	Louise Davis	Email	Clean TeQ Sunrise Pty Ltd	Resent email providing Proposed Methodology with a reminder regarding field work.
10/02/2021	Isabel Goolagong	Phone	Clean TeQ Sunrise Pty Ltd	Spoke to Isabel who advised that she hadn't seen the email providing the Proposed Methodology. Isabel confirmed the correct email address was on file and also provided a second mobile number for herself. The Proposed Methodology was subsequently resent to Isabel. She advised she will be able to attend the field work and is on the CLALC advisory committee, so would confirm if she can represent CLALC and use their insurances.
10/02/2021	Wiradjuri Cultural and Environmental Rangers/Wiradjuri Ranger Landcare (Peter White)	Phone	Clean TeQ Sunrise Pty Ltd	Advised his wife, Liz Doyle, intends to attend the field work and he will provide the required insurance paperwork.

DATE	ORGANISATION CONTACTED	HOW CONTACTED	CONTACTED BY	NATURE OF CONSULTATION
10/02/2021	Clean TeQ Sunrise Pty Ltd	Email	WWLALC (Linton Howarth)	Responded to the email reminder from Clean TeQ Sunrise Pty Ltd, advising that a representative of WWLALC, Louise Davis, will attend the field work and provided her contact details. Linton also advised that WWLALC had no issues with the Proposed Methodology.
10/02/2021	Clean TeQ Sunrise Pty Ltd	Phone	Louise Davis	Confirmed she will attend the field work on behalf of WWLALC.
11/02/2021	Clean TeQ Sunrise Pty Ltd	Email	WWLALC	Provided copies of iCare Workers Compensation Insurances and Elders Insurance Statutory Liability.
11/02/2021	Clean TeQ Sunrise Pty Ltd	Email	Linton Howarth (WWLALC)	Advised that Leeanne Hampton no longer works for WWLALC. Contact for WWLALC was subsequently updated to Linton Howarth.
17/02/2021	Heritage NSW	Email	Clean TeQ Sunrise Pty Ltd	Provided a copy of the list of RAPs for the Modification, along with a copy of the written notifications (in accordance with the consultation guideline).
18/02/2021	WWLALC	Email	Clean TeQ Sunrise Pty Ltd	Advised WWLALC that the statutory liability provided is different to the required public liability. Requested current public liability.
18/02/2021	CLALC	Email	Clean TeQ Sunrise Pty Ltd	Followed up regarding required work cover and public liability insurance for participation in field surveys.
18/02/2021	Peter White	Email	Clean TeQ Sunrise Pty Ltd	Followed up regarding required work cover and public liability insurance for participation in field surveys.
19/02/2021	WCC (Ally Coe)	Phone	Clean TeQ Sunrise Pty Ltd	Indicated WCC would like to send a representative (Eugene Coe) to the field surveys. Advised they will provide appropriate insurances.
22/02/2021	Clean TeQ Sunrise Pty Ltd	Email	WCC	Provided copies of insurances.
23/02/2021	The only RAP in attendance was Eugene Coe (WCC)	Presentation	Dr Matt Cupper and Clean TeQ Sunrise Pty Ltd	Information session held for the Modification ACHA and Proposed Methodology.
23/02/2021	The only RAPs in attendance were Eugene Coe (WCC) and Isabel Goolagong (CLALC)	Field survey	Dr Matt Cupper and Clean TeQ Sunrise Pty Ltd	Field survey of the ACHA Study Area undertaken.
19/03/2021	RAPs	Email	Clean TeQ Sunrise Pty Ltd	Emailed draft ACHA and cover letter to RAPs, including request to confirm receipt of email. Cover letter included closing date for feedback from RAPs.
19/03/2021	Clean TeQ Sunrise Pty Ltd	Email	Peter Peckham	Confirmed receipt of the draft ACHA.

DATE	ORGANISATION CONTACTED	HOW CONTACTED	CONTACTED BY	NATURE OF CONSULTATION
22/03/2021	Clean TeQ Sunrise Pty Ltd	Email	Isabel Goolagong (CLALC)	Confirmed receipt of the draft ACHA and queried whether there is native title over the Sunrise Mine.
24/03/2021	Isabel Goolagong (CLALC)	Email	Clean TeQ Sunrise Pty Ltd	Responded to Isabel's email advising that prior to the Mining Lease Application (ML 1770) being determined, Clean TeQ did not identify any native title party during the application process.
25/03/2021	Clean TeQ Sunrise Pty Ltd	Email	Peter White	Requested a hard copy of the draft ACHA be posted to him.
30/03/2021	Peter White	Email	Clean TeQ Sunrise Pty Ltd	Advised that a hard copy has been posted to his address.

APPENDIX 3

CORRESPONDENCE TO ABORIGINAL COMMUNITY STAKEHOLDERS

STEP 1 CORRESPONDENCE

19 January 2021

Wiradjuri Condobolin Corporation
PO Box 194
Condobolin NSW 2877

Attention: Ally Coe

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT

Dear Ally,

Clean TeQ Sunrise Pty Ltd (Clean TeQ) owns the rights to develop the approved, but yet to be constructed, Clean TeQ Sunrise Project (the Project). The Project is a nickel cobalt scandium open cut mining project situated approximately 350 kilometres west-northwest of Sydney, in New South Wales (NSW).

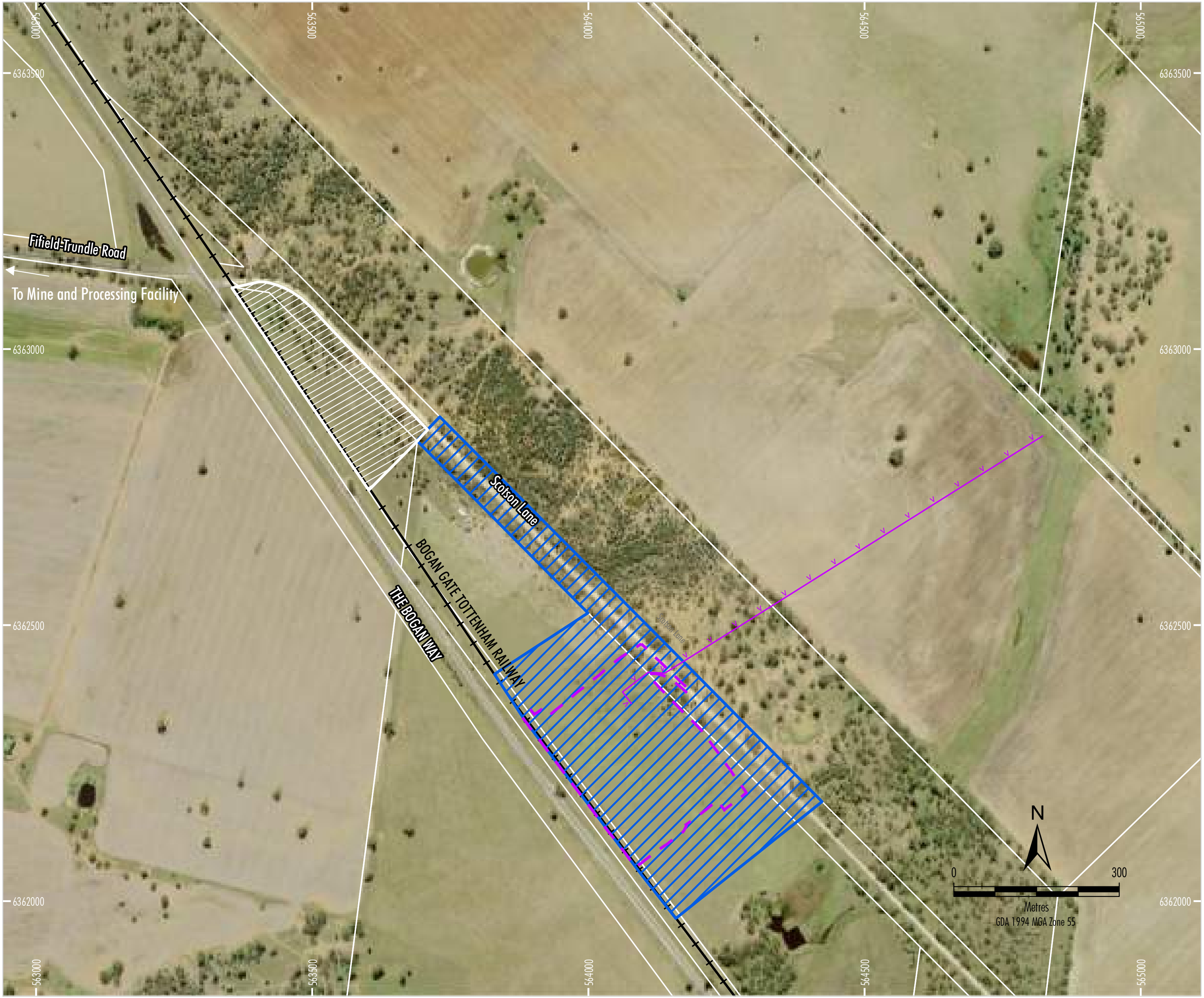
Development Consent (DA 374-11-00) for the Project was issued under Part 4 of the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act) in 2001. Six modifications to Development Consent (DA 374-11-00) have since been granted under the EP&A Act. Clean TeQ proposes an additional modification to Development Consent (DA 374-11-00) under section 4.55(2) of the EP&A Act.

Clean TeQ has continued to review and optimise the Project design as part of preparations for the Project execution. This review has identified a number of changes to the mine site, accommodation camp, rail siding and road transport activities to optimise the construction and operation of the Project (the Modification).

The Modification would change the approved surface development area as a result of proposed revisions to the location and layout of the Project rail siding.

As part of the Modification application, Clean TeQ will be preparing an Aboriginal Cultural Heritage Assessment for the modified rail siding, to identify ways to avoid or minimise potential harm to Aboriginal objects. The subject area of the Aboriginal Cultural Heritage Assessment is depicted as the "ACHA Subject Area" on Figure 1.

Community consultation is an important part of this process. In accordance with the requirements as set out in the *Aboriginal cultural heritage consultation requirements for proponents 2010* (NSW Department of Environment, Climate Change and Water, 2010) (Consultation Guidelines), Clean TeQ is required to conduct a community consultation process with relevant Aboriginal people to assist in the preparation of the Aboriginal Cultural Heritage Assessment. This includes writing to the existing Registered Aboriginal Parties for the Project to notify them of the Modification.



LEGEND
- ACHA Subject Area
- Railway
- Approved Rail Siding Surface Development Area
- Modified Rail Siding Surface Development Area
- Proposed 22 kV Electricity Transmission Line (Subject to Separate Approval)

Source: Black Range Minerals (2000); NSW Spatial Services (2020); Clean Teq (2017, 2018, 2020).
Orthophoto: © NSW Department of Finance, Services & Innovation (2020)

CLEAN TEQ SUNRISE PROJECT

ACHA Subject Area and Approved and Modified Rail Siding Location

Figure 1

CTL-20-08_BS_ACHA_201C Date: 19/01/2021

Due to your previous involvement with Aboriginal cultural heritage matters at the Project, you have been automatically registered for the consultation process associated with the Modification. You do NOT need to contact Clean TeQ to re-register for the Modification.

However, Clean TeQ would appreciate if you could please provide updated contact details for the Modification. Could you please complete the attached form and return to Clean TeQ via the contact details provided below.

Clean TeQ advises that the details of Registered Aboriginal Parties for the Modification will be forwarded to Heritage NSW within the Department of Premier and Cabinet, the Condobolin Local Aboriginal Land Council (LALC), the Peak Hill LALC and West Wyalong LALC in accordance with Section 4.1.5 of the Consultation Guidelines, unless you specify that you do not want your details released.

Should you have any queries regarding your registration, require any further clarification, or wish to discuss the Modification further please do not hesitate to contact Clean TeQ via the following contact details:

Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

Yours Sincerely
CLEAN TEQ HOLDINGS LIMITED

Bronwyn Flynn
Environment, Approvals & Community Lead

CLEAN TEQ SUNRISE PROJECT EXECUTION PLAN MODIFICATION UPDATED CONTACT DETAILS

Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

Name	
Registered Aboriginal Party (if different from above)	
Address	
Postal Address (if different from above)	
Telephone Number	
Email Address	

Signed: ____

Date: ____

19 January 2021

Condobolin Local Aboriginal Land Council
PO Box 377
Condobolin NSW 2877

Attention: Dave Carter

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT

Dear Dave,

Clean TeQ Sunrise Pty Ltd (Clean TeQ) owns the rights to develop the approved, but yet to be constructed, Clean TeQ Sunrise Project (the Project). The Project is a nickel cobalt scandium open cut mining project situated approximately 350 kilometres west-northwest of Sydney, in New South Wales (NSW).

Development Consent (DA 374-11-00) for the Project was issued under Part 4 of the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act) in 2001. Six modifications to Development Consent (DA 374-11-00) have since been granted under the EP&A Act. Clean TeQ proposes an additional modification to Development Consent (DA 374-11-00) under section 4.55(2) of the EP&A Act.

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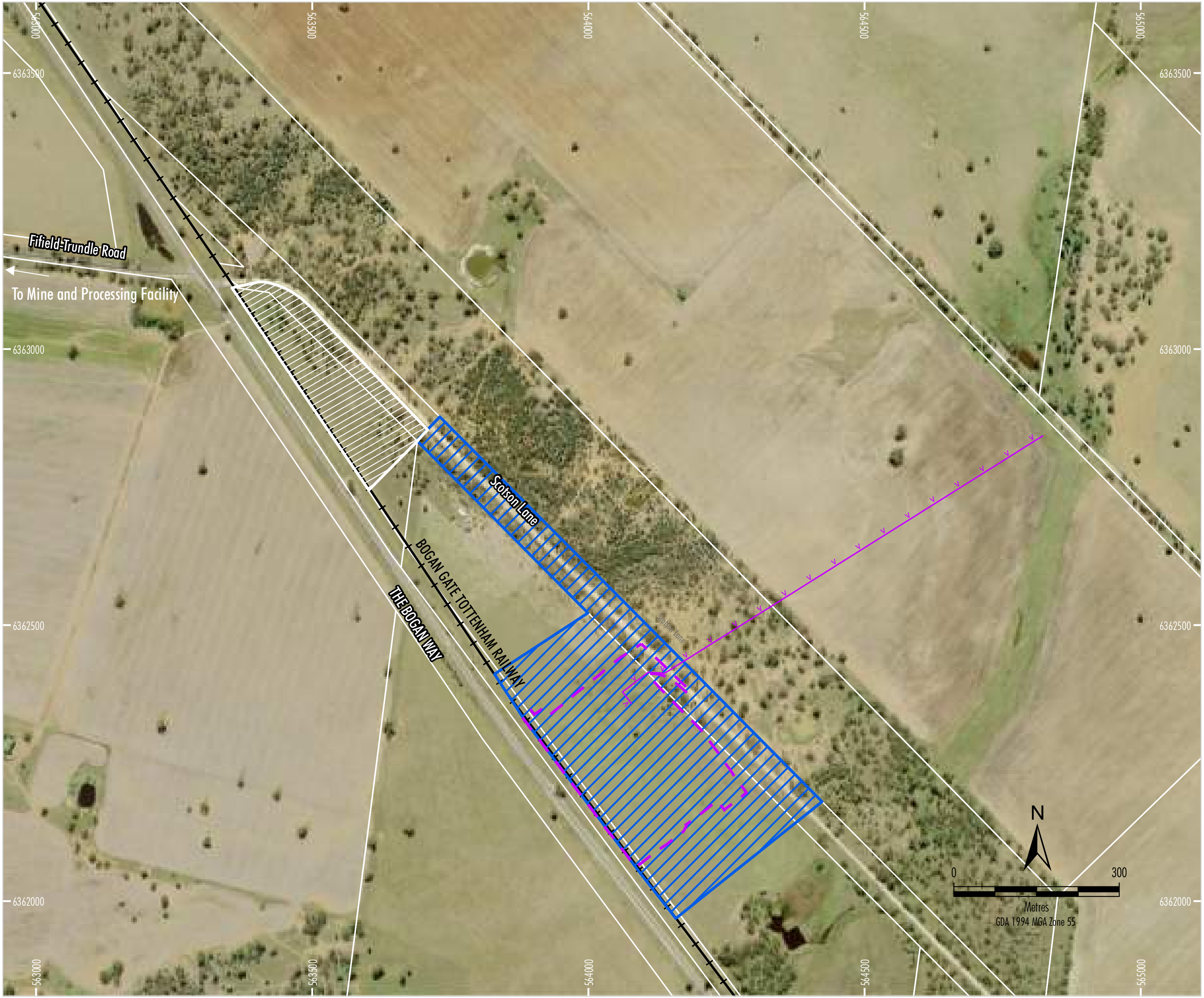

LEGEND
- ACHA Subject Area
- Railway
- Approved Rail Siding Surface Development Area
- Modified Rail Siding Surface Development Area
- Proposed 22 kV Electricity Transmission Line (Subject to Separate Approval)

Source: Black Range Minerals (2000); NSW Spatial Services (2020); Clean Teq (2017, 2018, 2020).
Orthophoto: © NSW Department of Finance, Services & Innovation (2020)

CLEAN TEQ SUNRISE PROJECT

ACHA Subject Area and Approved and Modified Rail Siding Location

Figure 1

CTL-20-08_BS_ACHA_201C Date: 19/01/2021

Due to your previous involvement with Aboriginal cultural heritage matters at the Project, you have been automatically registered for the consultation process associated with the Modification. You do NOT need to contact Clean TeQ to re-register for the Modification.

However, Clean TeQ would appreciate if you could please provide updated contact details for the Modification. Could you please complete the attached form and return to Clean TeQ via the contact details provided below.

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Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

Yours Sincerely
CLEAN TEQ HOLDINGS LIMITED

Bronwyn Flynn
Environment, Approvals & Community Lead

CLEAN TEQ SUNRISE PROJECT EXECUTION PLAN MODIFICATION UPDATED CONTACT DETAILS

Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

Name	
Registered Aboriginal Party (if different from above)	
Address	
Postal Address (if different from above)	
Telephone Number	
Email Address	

Signed: ____

Date: ____

19 January 2021

Cottage 1, 1 Condobolin Road
Bogan Gate NSW 2876

Attention: Isabel Goolagong

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT

Dear Isabel,

Clean TeQ Sunrise Pty Ltd (Clean TeQ) owns the rights to develop the approved, but yet to be constructed, Clean TeQ Sunrise Project (the Project). The Project is a nickel cobalt scandium open cut mining project situated approximately 350 kilometres west-northwest of Sydney, in New South Wales (NSW).

Development Consent (DA 374-11-00) for the Project was issued under Part 4 of the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act) in 2001. Six modifications to Development Consent (DA 374-11-00) have since been granted under the EP&A Act. Clean TeQ proposes an additional modification to Development Consent (DA 374-11-00) under section 4.55(2) of the EP&A Act.

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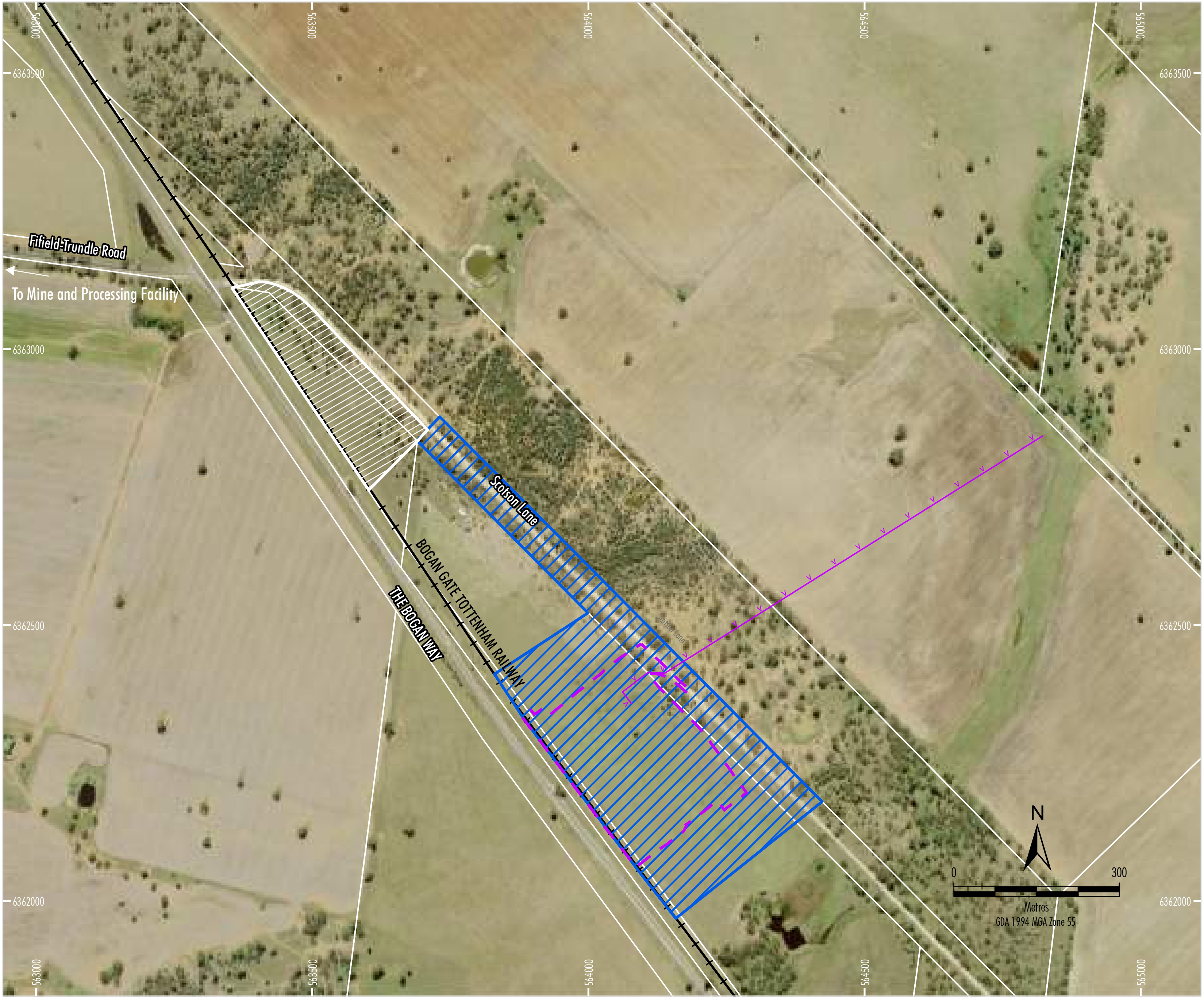
As part of the Modification application, Clean TeQ will be preparing an Aboriginal Cultural Heritage Assessment for the modified rail siding, to identify ways to avoid or minimise potential harm to Aboriginal objects. The subject area of the Aboriginal Cultural Heritage Assessment is depicted as the “ACHA Subject Area” on Figure 1.

Community consultation is an important part of this process. In accordance with the requirements as set out in the *Aboriginal cultural heritage consultation requirements for proponents 2010* (NSW Department of Environment, Climate Change and Water, 2010) (Consultation Guidelines), Clean TeQ is required to conduct a community consultation process with relevant Aboriginal people to assist in the preparation of the Aboriginal Cultural Heritage Assessment. This includes writing to the existing Registered Aboriginal Parties for the Project to notify them of the Modification.



LEGEND
- ACHA Subject Area
- Railway
- Approved Rail Siding Surface Development Area
- Modified Rail Siding Surface Development Area
- Proposed 22 kV Electricity Transmission Line (Subject to Separate Approval)

Source: Black Range Minerals (2000); NSW Spatial Services (2020); Clean Teq (2017, 2018, 2020).
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CLEAN TEQ SUNRISE PROJECT

ACHA Subject Area and Approved and Modified Rail Siding Location

Figure 1

CTL-20-08_BS_ACHA_201C Date: 19/01/2021

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Should you have any queries regarding your registration, require any further clarification, or wish to discuss the Modification further please do not hesitate to contact Clean TeQ via the following contact details:

Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

Yours Sincerely
CLEAN TEQ HOLDINGS LIMITED

Bronwyn Flynn
Environment, Approvals & Community Lead

CLEAN TEQ SUNRISE PROJECT EXECUTION PLAN MODIFICATION UPDATED CONTACT DETAILS

Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

Name	
Registered Aboriginal Party (if different from above)	
Address	
Postal Address (if different from above)	
Telephone Number	
Email Address	

Signed: ____

Date: ____

19 January 2021

Binjang Wellington Wiradjuri Aboriginal Heritage Survey
260 Myall Street
Dubbo NSW 2830

Attention: Jamie Gray

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT

Dear Jamie,

Clean TeQ Sunrise Pty Ltd (Clean TeQ) owns the rights to develop the approved, but yet to be constructed, Clean TeQ Sunrise Project (the Project). The Project is a nickel cobalt scandium open cut mining project situated approximately 350 kilometres west-northwest of Sydney, in New South Wales (NSW).

Development Consent (DA 374-11-00) for the Project was issued under Part 4 of the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act) in 2001. Six modifications to Development Consent (DA 374-11-00) have since been granted under the EP&A Act. Clean TeQ proposes an additional modification to Development Consent (DA 374-11-00) under section 4.55(2) of the EP&A Act.

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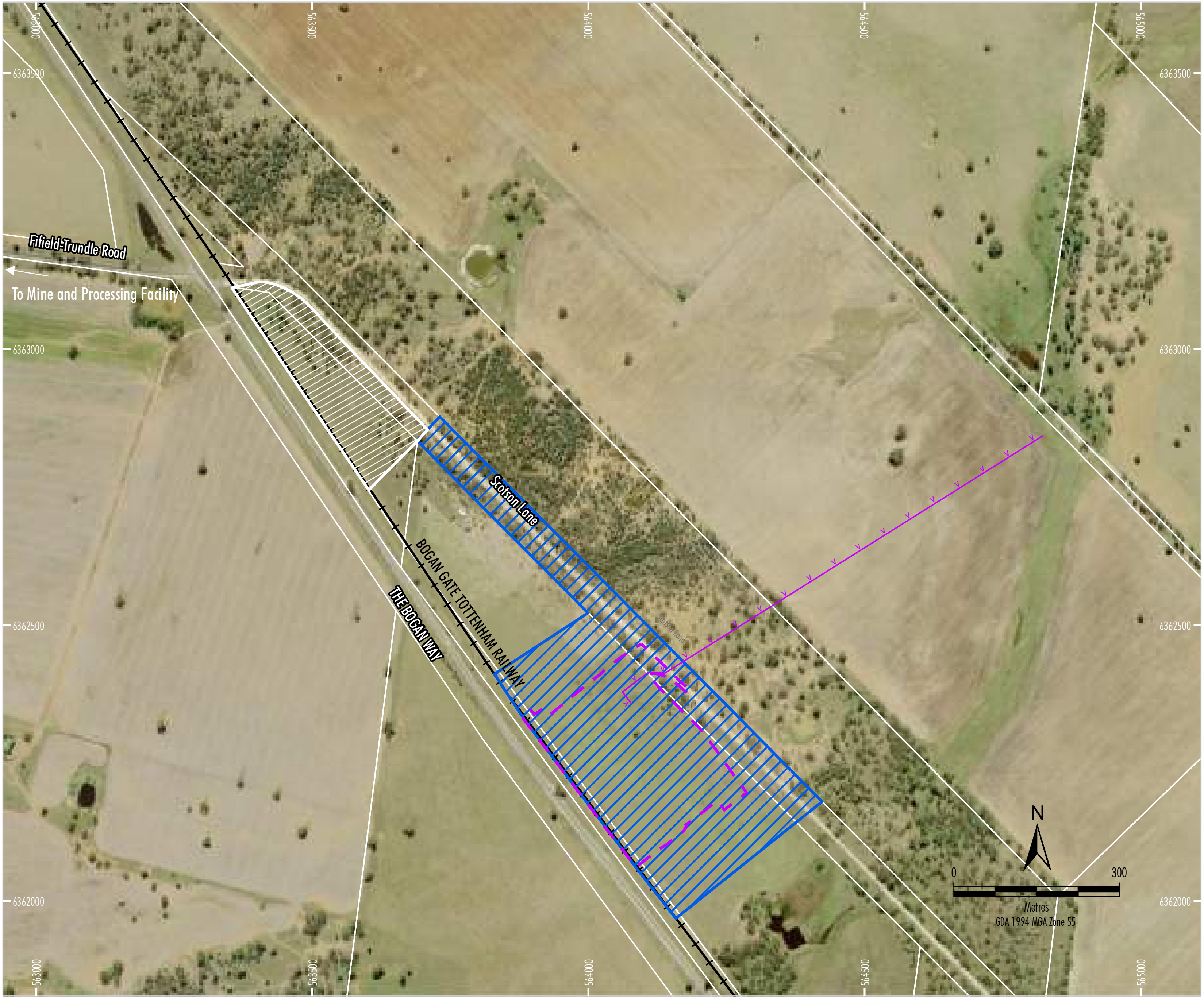
As part of the Modification application, Clean TeQ will be preparing an Aboriginal Cultural Heritage Assessment for the modified rail siding, to identify ways to avoid or minimise potential harm to Aboriginal objects. The subject area of the Aboriginal Cultural Heritage Assessment is depicted as the "ACHA Subject Area" on Figure 1.

Community consultation is an important part of this process. In accordance with the requirements as set out in the *Aboriginal cultural heritage consultation requirements for proponents 2010* (NSW Department of Environment, Climate Change and Water, 2010) (Consultation Guidelines), Clean TeQ is required to conduct a community consultation process with relevant Aboriginal people to assist in the preparation of the Aboriginal Cultural Heritage Assessment. This includes writing to the existing Registered Aboriginal Parties for the Project to notify them of the Modification.



LEGEND
ACHA Subject Area
Railway
Approved Rail Siding Surface Development Area
Modified Rail Siding Surface Development Area
Proposed 22 kV Electricity Transmission Line (Subject to Separate Approval)

Source: Black Range Minerals (2000); NSW Spatial Services (2020); Clean Teq (2017, 2018, 2020).
Orthophoto: © NSW Department of Finance, Services & Innovation (2020)

CLEAN TEQ SUNRISE PROJECT

ACHA Subject Area and Approved and Modified Rail Siding Location

Figure 1

CTL-20-08_BS_ACHA_201C Date: 19/01/2021

Due to your previous involvement with Aboriginal cultural heritage matters at the Project, you have been automatically registered for the consultation process associated with the Modification. You do NOT need to contact Clean TeQ to re-register for the Modification.

However, Clean TeQ would appreciate if you could please provide updated contact details for the Modification. Could you please complete the attached form and return to Clean TeQ via the contact details provided below.

Clean TeQ advises that the details of Registered Aboriginal Parties for the Modification will be forwarded to Heritage NSW within the Department of Premier and Cabinet, the Condobolin Local Aboriginal Land Council (LALC), the Peak Hill LALC and West Wyalong LALC in accordance with Section 4.1.5 of the Consultation Guidelines, unless you specify that you do not want your details released.

Should you have any queries regarding your registration, require any further clarification, or wish to discuss the Modification further please do not hesitate to contact Clean TeQ via the following contact details:

Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

Yours Sincerely
CLEAN TEQ HOLDINGS LIMITED

Bronwyn Flynn
Environment, Approvals & Community Lead

CLEAN TEQ SUNRISE

CLEAN TEQ SUNRISE PROJECT EXECUTION PLAN MODIFICATION UPDATED CONTACT DETAILS

Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

Name	
Registered Aboriginal Party (if different from above)	
Address	
Postal Address (if different from above)	
Telephone Number	
Email Address	

Signed: ______________________________

Date: ______________________________

19 January 2021

West Wyalong Local Aboriginal Land Council
PO Box 332
West Wyalong NSW 2671

Attention: Leeanne Hampton

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT

Dear Leeanne,

Clean TeQ Sunrise Pty Ltd (Clean TeQ) owns the rights to develop the approved, but yet to be constructed, Clean TeQ Sunrise Project (the Project). The Project is a nickel cobalt scandium open cut mining project situated approximately 350 kilometres west-northwest of Sydney, in New South Wales (NSW).

Development Consent (DA 374-11-00) for the Project was issued under Part 4 of the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act) in 2001. Six modifications to Development Consent (DA 374-11-00) have since been granted under the EP&A Act. Clean TeQ proposes an additional modification to Development Consent (DA 374-11-00) under section 4.55(2) of the EP&A Act.

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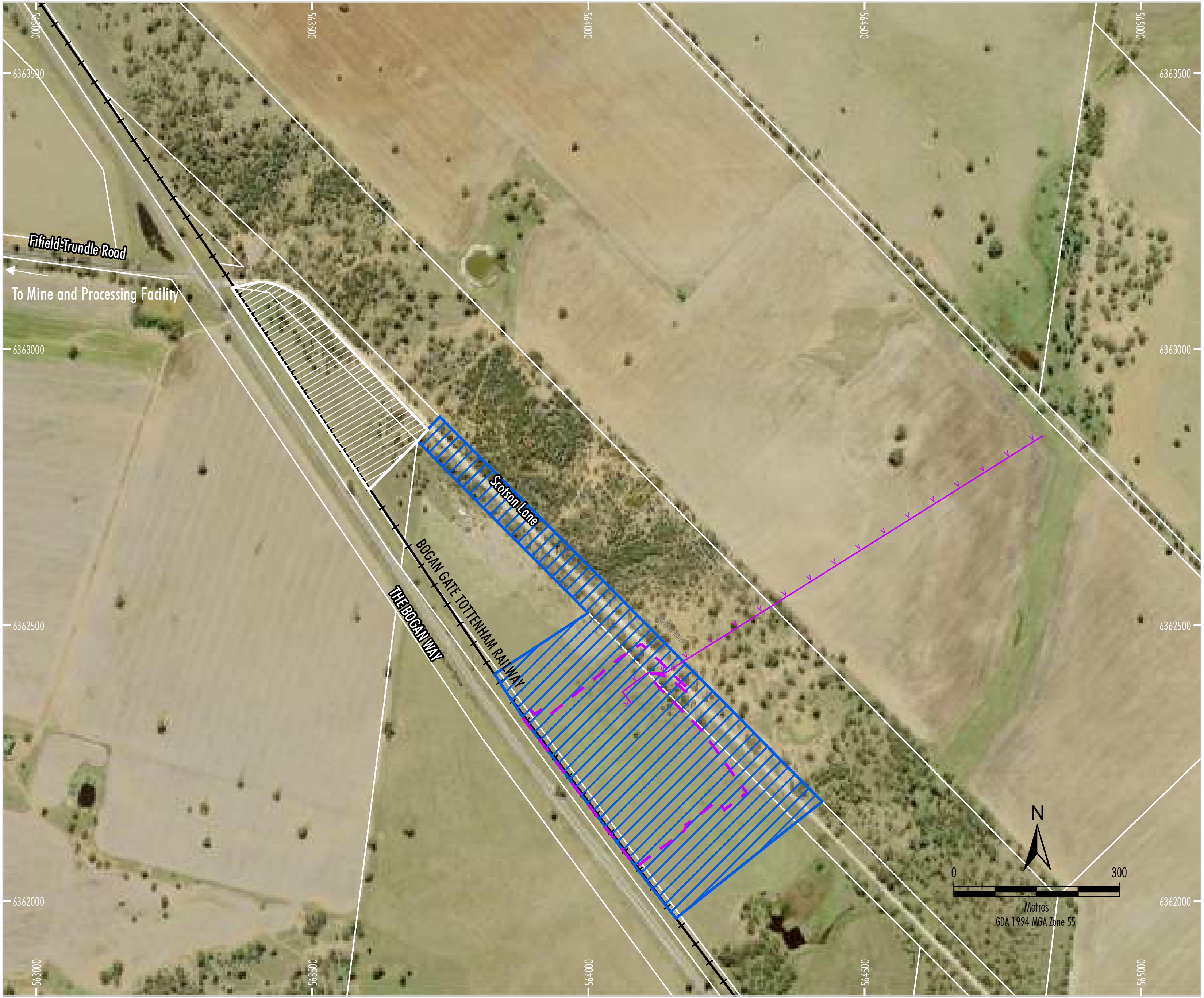
The Modification would change the approved surface development area as a result of proposed revisions to the location and layout of the Project rail siding.

As part of the Modification application, Clean TeQ will be preparing an Aboriginal Cultural Heritage Assessment for the modified rail siding, to identify ways to avoid or minimise potential harm to Aboriginal objects. The subject area of the Aboriginal Cultural Heritage Assessment is depicted as the "ACHA Subject Area" on Figure 1.

Community consultation is an important part of this process. In accordance with the requirements as set out in the *Aboriginal cultural heritage consultation requirements for proponents 2010* (NSW Department of Environment, Climate Change and Water, 2010) (Consultation Guidelines), Clean TeQ is required to conduct a community consultation process with relevant Aboriginal people to assist in the preparation of the Aboriginal Cultural Heritage Assessment. This includes writing to the existing Registered Aboriginal Parties for the Project to notify them of the Modification.



LEGEND
- ACHA Subject Area
- Railway
- Approved Rail Siding Surface Development Area
- Modified Rail Siding Surface Development Area
- Proposed 22 kV Electricity Transmission Line (Subject to Separate Approval)

Source: Black Range Minerals (2000); NSW Spatial Services (2020); Clean Teq (2017, 2018, 2020).
Orthophoto: © NSW Department of Finance, Services & Innovation (2020)

SUNRISE

CLEAN TEQ SUNRISE PROJECT

ACHA Subject Area and Approved and Modified Rail Siding Location

Figure 1

CTL-20-08_BS_ACHA_201C Date: 19/01/2021

Due to your previous involvement with Aboriginal cultural heritage matters at the Project, you have been automatically registered for the consultation process associated with the Modification. You do NOT need to contact Clean TeQ to re-register for the Modification.

However, Clean TeQ would appreciate if you could please provide updated contact details for the Modification. Could you please complete the attached form and return to Clean TeQ via the contact details provided below.

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Should you have any queries regarding your registration, require any further clarification, or wish to discuss the Modification further please do not hesitate to contact Clean TeQ via the following contact details:

Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

Yours Sincerely
CLEAN TEQ HOLDINGS LIMITED

Bronwyn Flynn
Environment, Approvals & Community Lead

CLEAN TEQ SUNRISE PROJECT EXECUTION PLAN MODIFICATION UPDATED CONTACT DETAILS

Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

Name	
Registered Aboriginal Party (if different from above)	
Address	
Postal Address (if different from above)	
Telephone Number	
Email Address	

Signed: ____

Date: ____

19 January 2021

53 McDonnell Street
Condobolin NSW 2877

Attention: Louise Davis

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT

Dear Louise,

Clean TeQ Sunrise Pty Ltd (Clean TeQ) owns the rights to develop the approved, but yet to be constructed, Clean TeQ Sunrise Project (the Project). The Project is a nickel cobalt scandium open cut mining project situated approximately 350 kilometres west-northwest of Sydney, in New South Wales (NSW).

Development Consent (DA 374-11-00) for the Project was issued under Part 4 of the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act) in 2001. Six modifications to Development Consent (DA 374-11-00) have since been granted under the EP&A Act. Clean TeQ proposes an additional modification to Development Consent (DA 374-11-00) under section 4.55(2) of the EP&A Act.

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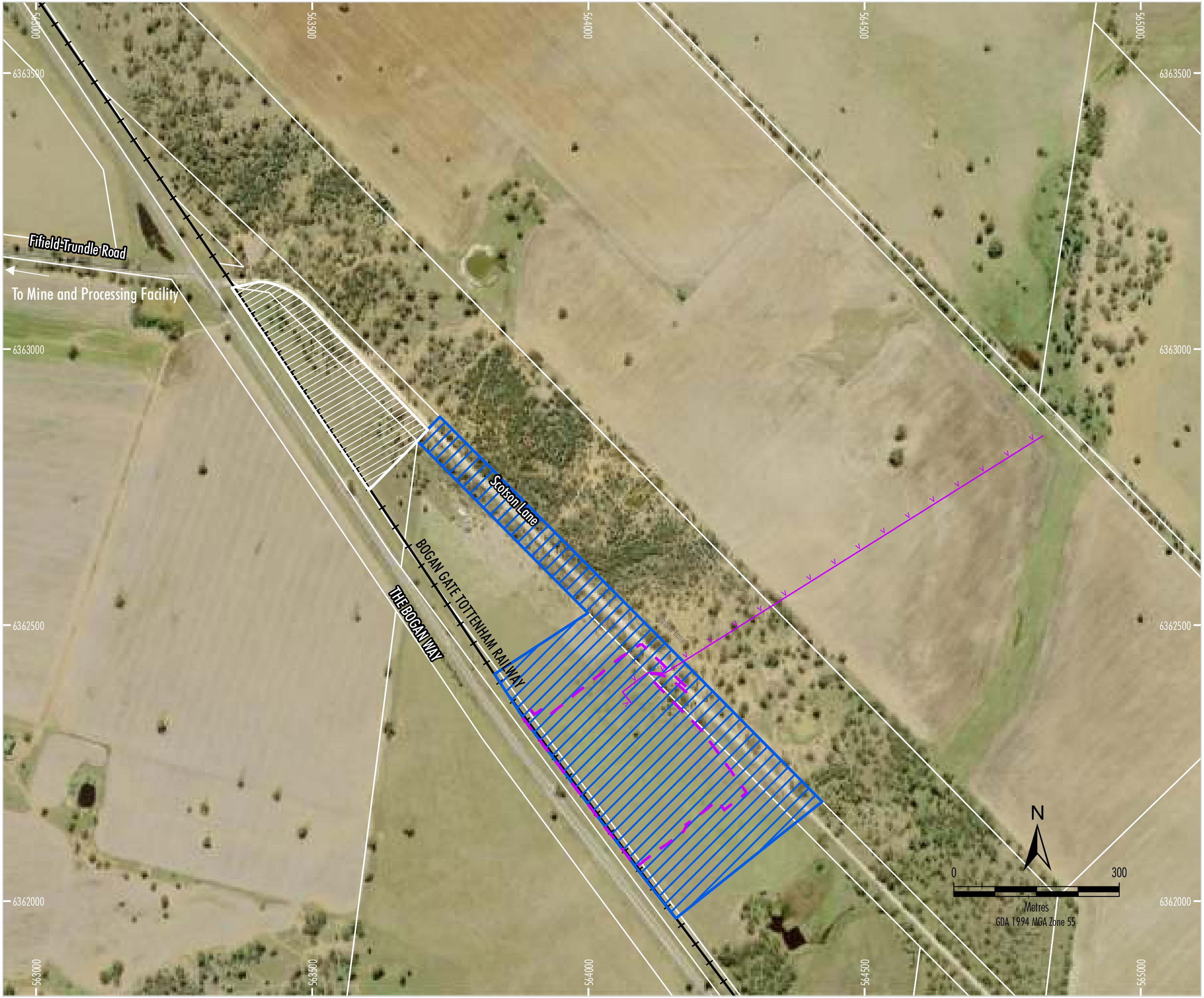

LEGEND
ACHA Subject Area
Railway
Approved Rail Siding Surface Development Area
Modified Rail Siding Surface Development Area
Proposed 22 kV Electricity Transmission Line (Subject to Separate Approval)

Source: Black Range Minerals (2000); NSW Spatial Services (2020); Clean Teq (2017, 2018, 2020).
Orthophoto: © NSW Department of Finance, Services & Innovation (2020)

CLEAN TEQ SUNRISE PROJECT

ACHA Subject Area and Approved and Modified Rail Siding Location

Figure 1

CTL-20-08_BS_ACHA_201C Date: 19/01/2021

Due to your previous involvement with Aboriginal cultural heritage matters at the Project, you have been automatically registered for the consultation process associated with the Modification. You do NOT need to contact Clean TeQ to re-register for the Modification.

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Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

Yours Sincerely
CLEAN TEQ HOLDINGS LIMITED

Bronwyn Flynn
Environment, Approvals & Community Lead

CLEAN TEQ SUNRISE PROJECT EXECUTION PLAN MODIFICATION UPDATED CONTACT DETAILS

Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

Name	
Registered Aboriginal Party (if different from above)	
Address	
Postal Address (if different from above)	
Telephone Number	
Email Address	

Signed: ____

Date: ____

19 January 2021

27 Jennings Street
Geurie NSW 2818

Attention: Peter Peckham

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT

Dear Peter,

Clean TeQ Sunrise Pty Ltd (Clean TeQ) owns the rights to develop the approved, but yet to be constructed, Clean TeQ Sunrise Project (the Project). The Project is a nickel cobalt scandium open cut mining project situated approximately 350 kilometres west-northwest of Sydney, in New South Wales (NSW).

Development Consent (DA 374-11-00) for the Project was issued under Part 4 of the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act) in 2001. Six modifications to Development Consent (DA 374-11-00) have since been granted under the EP&A Act. Clean TeQ proposes an additional modification to Development Consent (DA 374-11-00) under section 4.55(2) of the EP&A Act.

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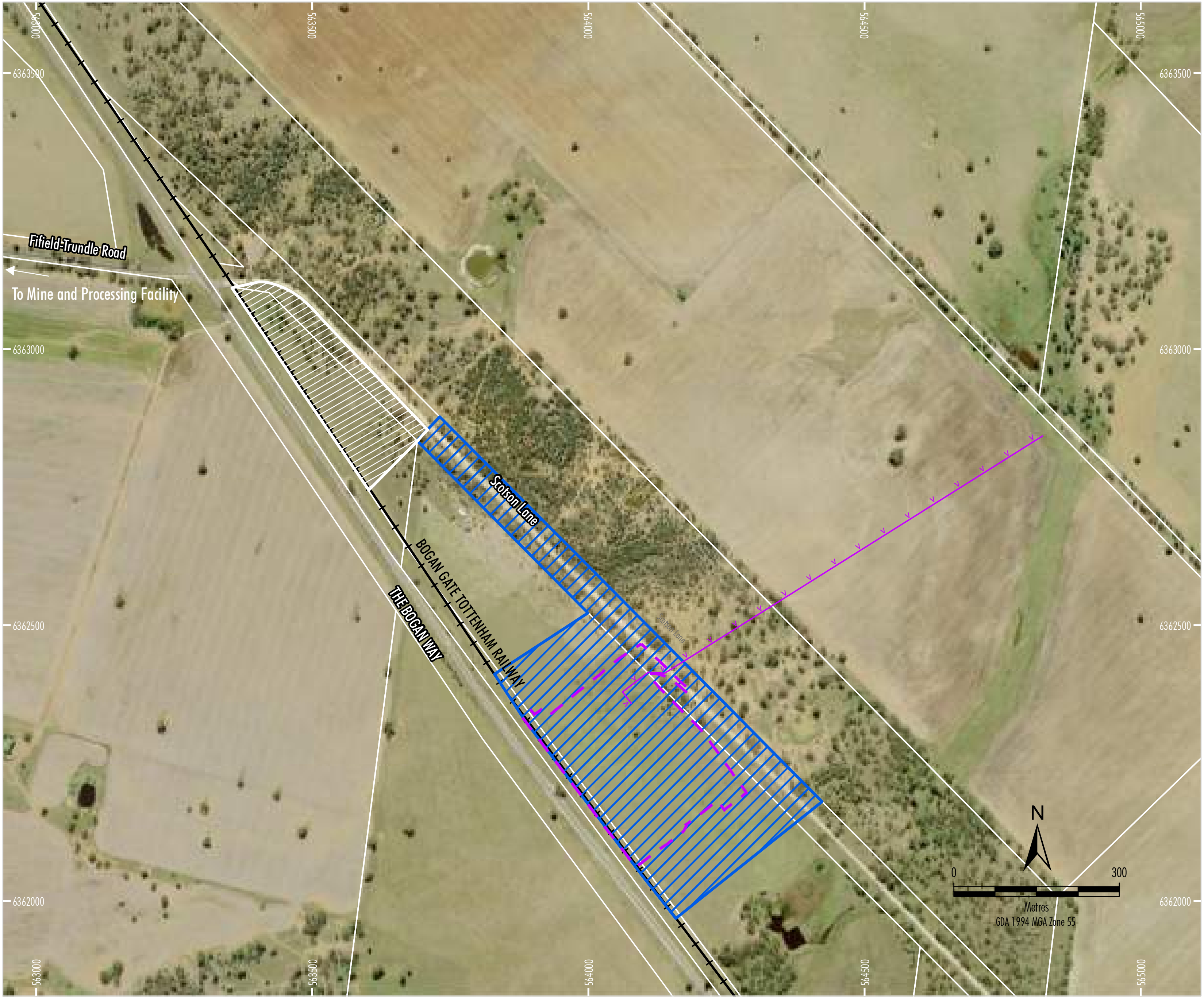

LEGEND
ACHA Subject Area
Railway
Approved Rail Siding Surface Development Area
Modified Rail Siding Surface Development Area
Proposed 22 kV Electricity Transmission Line (Subject to Separate Approval)

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Orthophoto: © NSW Department of Finance, Services & Innovation (2020)

CLEAN TEQ SUNRISE PROJECT

ACHA Subject Area and Approved and Modified Rail Siding Location

Figure 1

CTL-20-08_BS_ACHA_201C Date: 19/01/2021

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Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

Yours Sincerely
CLEAN TEQ HOLDINGS LIMITED

Bronwyn Flynn
Environment, Approvals & Community Lead

CLEAN TEQ SUNRISE PROJECT EXECUTION PLAN MODIFICATION UPDATED CONTACT DETAILS

Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

Name	
Registered Aboriginal Party (if different from above)	
Address	
Postal Address (if different from above)	
Telephone Number	
Email Address	

Signed: ____

Date: ____

19 January 2021

Wiradjuri Country Farm
Gunningbland NSW 2876

Attention: Peter White

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT

Dear Peter,

Clean TeQ Sunrise Pty Ltd (Clean TeQ) owns the rights to develop the approved, but yet to be constructed, Clean TeQ Sunrise Project (the Project). The Project is a nickel cobalt scandium open cut mining project situated approximately 350 kilometres west-northwest of Sydney, in New South Wales (NSW).

Development Consent (DA 374-11-00) for the Project was issued under Part 4 of the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act) in 2001. Six modifications to Development Consent (DA 374-11-00) have since been granted under the EP&A Act. Clean TeQ proposes an additional modification to Development Consent (DA 374-11-00) under section 4.55(2) of the EP&A Act.

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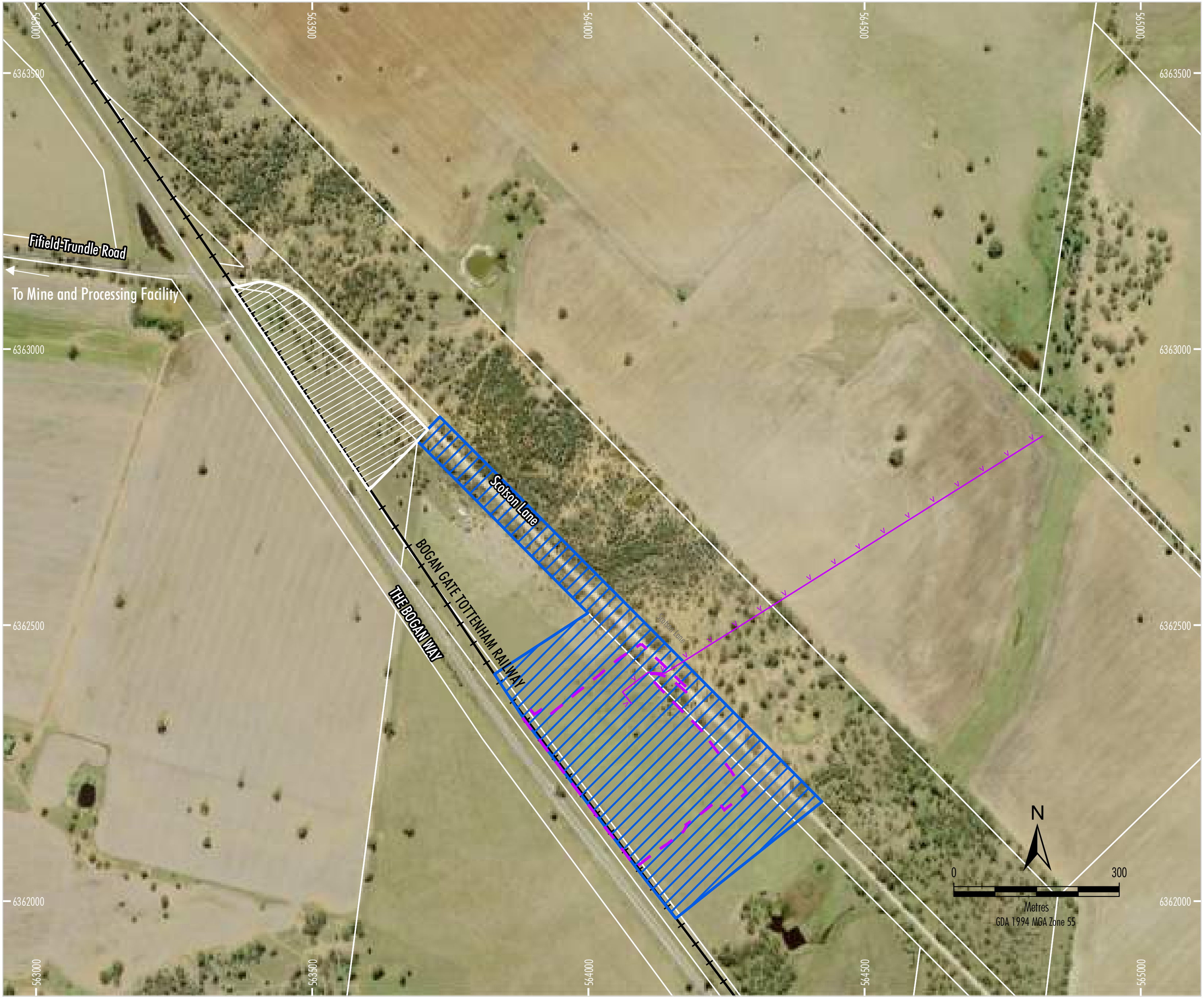

LEGEND

- ACHA Subject Area
- Railway
- Approved Rail Siding Surface Development Area
- Modified Rail Siding Surface Development Area
- Proposed 22 kV Electricity Transmission Line (Subject to Separate Approval)

Source: Black Range Minerals (2000); NSW Spatial Services (2020); Clean Teq (2017, 2018, 2020).
Orthophoto: © NSW Department of Finance, Services & Innovation (2020)

CLEAN TEQ SUNRISE PROJECT

ACHA Subject Area and Approved and Modified Rail Siding Location

Figure 1

CTL-20-08_BS_ACHA_201C Date: 19/01/2021

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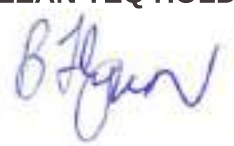
Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

Yours Sincerely
CLEAN TEQ HOLDINGS LIMITED



Bronwyn Flynn
Environment, Approvals & Community Lead

CLEAN TEQ SUNRISE PROJECT EXECUTION PLAN MODIFICATION UPDATED CONTACT DETAILS

Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

Name	
Registered Aboriginal Party (if different from above)	
Address	
Postal Address (if different from above)	
Telephone Number	
Email Address	

Signed: ____

Date: ____

19 January 2021

Murie Elders Group
18 William Street
Condobolin NSW 2877

Attention: Rebecca Shepherd

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT

Dear Rebecca,

Clean TeQ Sunrise Pty Ltd (Clean TeQ) owns the rights to develop the approved, but yet to be constructed, Clean TeQ Sunrise Project (the Project). The Project is a nickel cobalt scandium open cut mining project situated approximately 350 kilometres west-northwest of Sydney, in New South Wales (NSW).

Development Consent (DA 374-11-00) for the Project was issued under Part 4 of the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act) in 2001. Six modifications to Development Consent (DA 374-11-00) have since been granted under the EP&A Act. Clean TeQ proposes an additional modification to Development Consent (DA 374-11-00) under section 4.55(2) of the EP&A Act.

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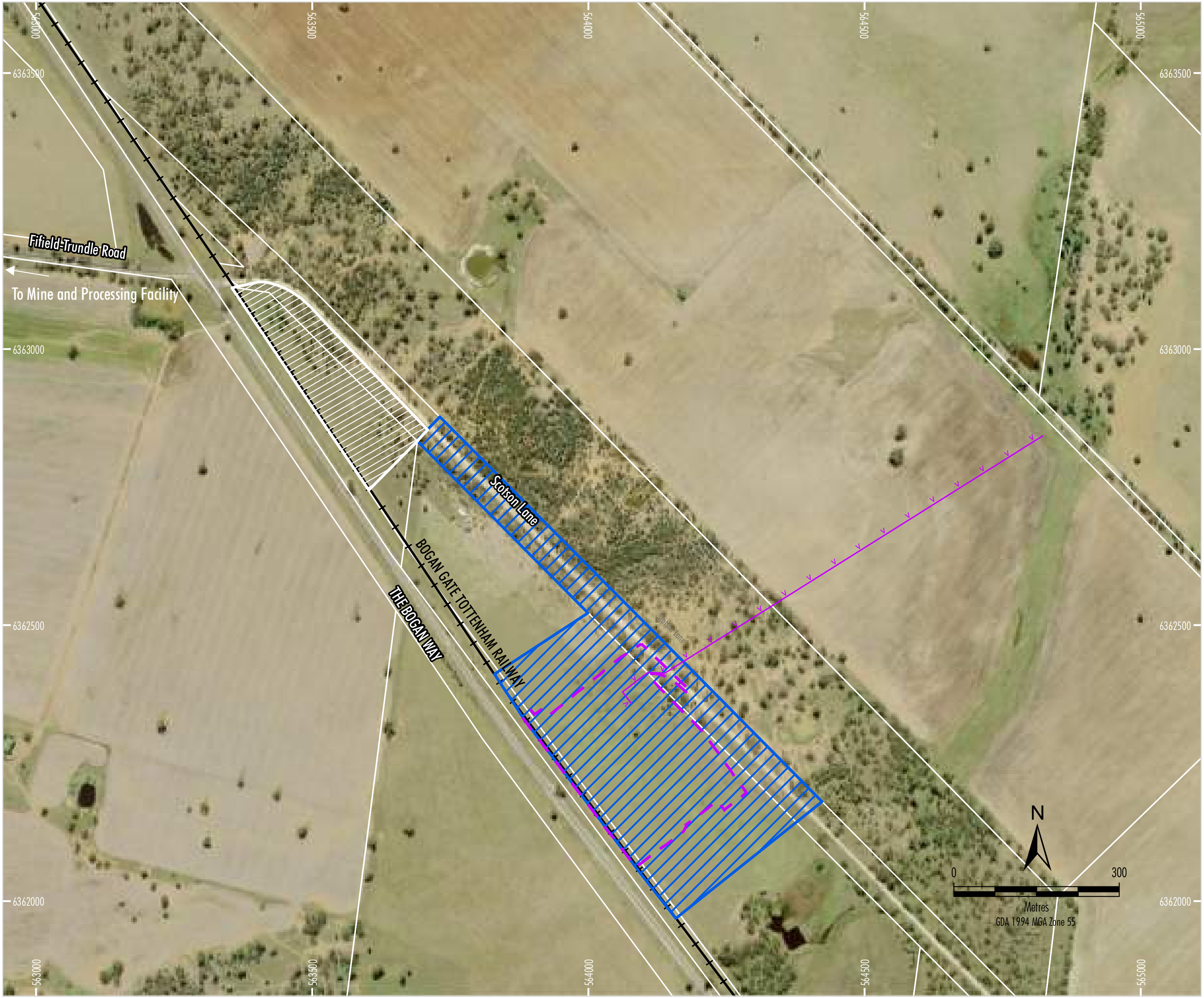

LEGEND

- ACHA Subject Area
- Railway
- Approved Rail Siding Surface Development Area
- Modified Rail Siding Surface Development Area
- Proposed 22 kV Electricity Transmission Line (Subject to Separate Approval)

Source: Black Range Minerals (2000); NSW Spatial Services (2020); Clean Teq (2017, 2018, 2020).
Orthophoto: © NSW Department of Finance, Services & Innovation (2020)

CLEAN TEQ SUNRISE PROJECT

ACHA Subject Area and Approved and Modified Rail Siding Location

Figure 1

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Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

Yours Sincerely
CLEAN TEQ HOLDINGS LIMITED

Bronwyn Flynn
Environment, Approvals & Community Lead

CLEAN TEQ SUNRISE PROJECT EXECUTION PLAN MODIFICATION UPDATED CONTACT DETAILS

Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

Name	
Registered Aboriginal Party (if different from above)	
Address	
Postal Address (if different from above)	
Telephone Number	
Email Address	

Signed: ____

Date: ____

19 January 2021

106 Derribong Road
Dandaloo via Trangie NSW 2823

Attention: Sandra Peckham

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT

Dear Sandra,

Clean TeQ Sunrise Pty Ltd (Clean TeQ) owns the rights to develop the approved, but yet to be constructed, Clean TeQ Sunrise Project (the Project). The Project is a nickel cobalt scandium open cut mining project situated approximately 350 kilometres west-northwest of Sydney, in New South Wales (NSW).

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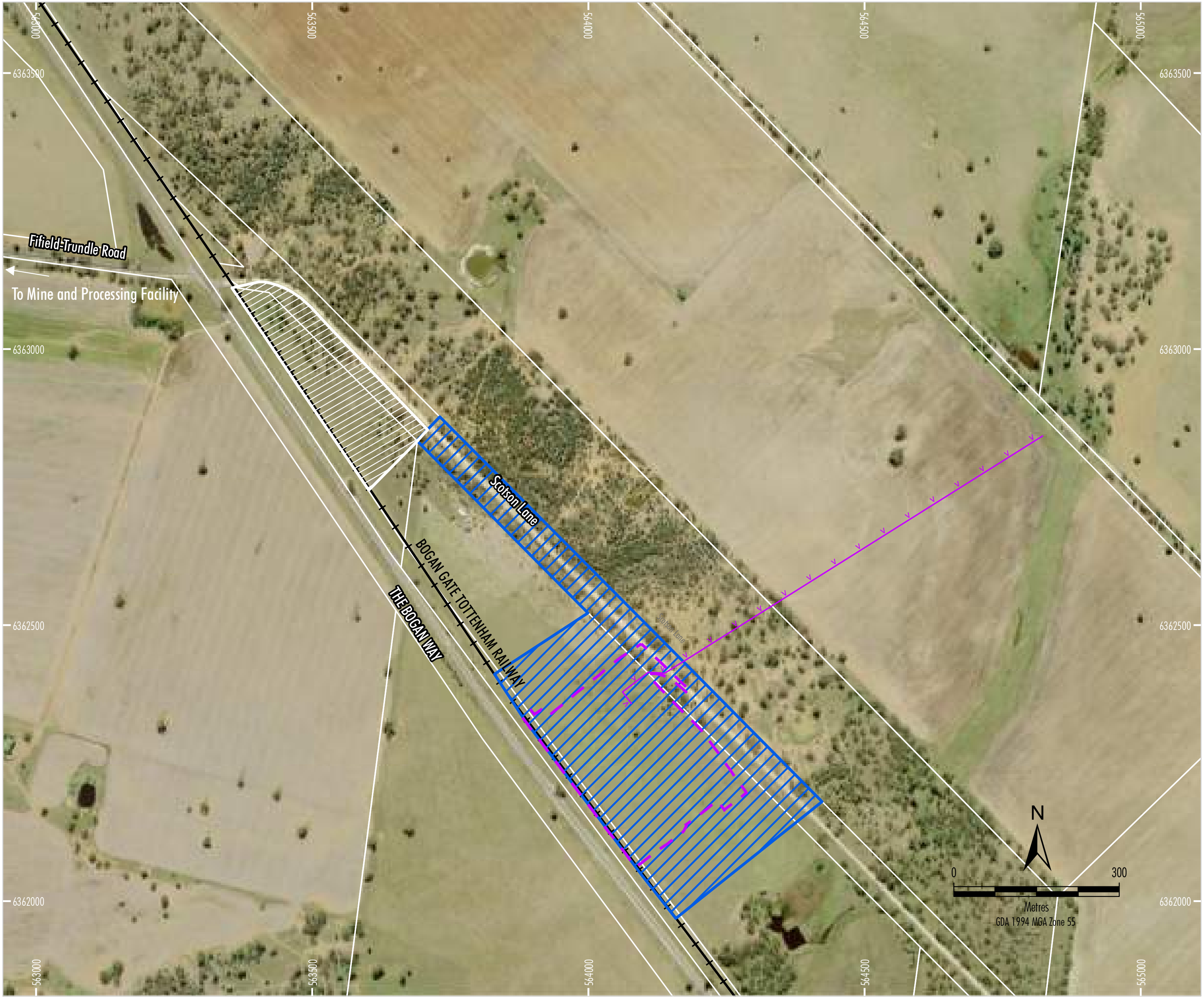

LEGEND
- ACHA Subject Area
- Railway
- Approved Rail Siding Surface Development Area
- Modified Rail Siding Surface Development Area
- Proposed 22 kV Electricity Transmission Line (Subject to Separate Approval)

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Orthophoto: © NSW Department of Finance, Services & Innovation (2020)

CLEAN TEQ SUNRISE PROJECT

ACHA Subject Area and Approved and Modified Rail Siding Location

Figure 1

CTL-20-08_BS_ACHA_201C Date: 19/01/2021

Due to your previous involvement with Aboriginal cultural heritage matters at the Project, you have been automatically registered for the consultation process associated with the Modification. You do NOT need to contact Clean TeQ to re-register for the Modification.

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Should you have any queries regarding your registration, require any further clarification, or wish to discuss the Modification further please do not hesitate to contact Clean TeQ via the following contact details:

Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

Yours Sincerely
CLEAN TEQ HOLDINGS LIMITED

Bronwyn Flynn
Environment, Approvals & Community Lead

CLEAN TEQ SUNRISE PROJECT EXECUTION PLAN MODIFICATION UPDATED CONTACT DETAILS

Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

Name	
Registered Aboriginal Party (if different from above)	
Address	
Postal Address (if different from above)	
Telephone Number	
Email Address	

Signed: ____

Date: ____

STEP 2 CORRESPONDENCE

9 February 2021

Condobolin Local Aboriginal Land Council
PO Box 114
CONDOBOLIN NSW 2877

Attention: Tim Gumbleton

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT

Dear Tim,

In accordance with the policy titled *Aboriginal cultural heritage consultation requirements for proponents 2010* (NSW Department of Environment, Climate Change and Water [DECCW], 2010), this letter advises of the Aboriginal stakeholders to be involved in the community consultation process for the Project Execution Plan Modification:

- Wiradjuri Condobolin Corporation.
- Murie Elders Group.
- Binjang Wellington Wiradjuri Aboriginal Heritage Survey.
- West Wyalong Local Aboriginal Land Council.
- Condobolin Local Aboriginal Land Council.
- Louise Davis.
- Peter Peckham.
- Sandra Peckham.
- Isabel Goolagong.
- Wiradjuri Cultural and Environmental Rangers.

These parties are the existing Registered Aboriginal Parties for the Clean TeQ Sunrise Project.

In accordance with Section 4.1.6 of the *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW, 2010), copies of the notification letters sent to the Registered Aboriginal Parties are provided in Enclosure A.

Should you require any further information, please feel free to call or email the undersigned on 0429 066 086 and bflynn@cleanteq.com.

Yours Sincerely

CLEAN TEQ HOLDINGS LIMITED

Bronwyn Flynn
Environment, Approvals & Community Lead

12 February 2021

Heritage NSW
PO Box 2111
DUBBO NSW 2830

Attention: Phil Purcell – Archaeologist

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT

Dear Phil,

In accordance with the policy titled *Aboriginal cultural heritage consultation requirements for proponents 2010* (NSW Department of Environment, Climate Change and Water [DECCW], 2010), this letter advises of the Aboriginal stakeholders to be involved in the community consultation process for the Project Execution Plan Modification:

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Should you require any further information, please feel free to call or email the undersigned on 0429 066 086 and bflynn@cleanteq.com.

Yours Sincerely

CLEAN TEQ HOLDINGS LIMITED

Bronwyn Flynn
Environment, Approvals & Community Lead

9 February 2021

West Wyalong Local Aboriginal Land Council
PO Box 332
West Wyalong NSW 2671

Attention: Leeanne Hampton

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT

Dear Leeanne,

In accordance with the policy titled *Aboriginal cultural heritage consultation requirements for proponents 2010* (NSW Department of Environment, Climate Change and Water [DECCW], 2010), this letter advises of the Aboriginal stakeholders to be involved in the community consultation process for the Project Execution Plan Modification:

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Yours Sincerely

CLEAN TEQ HOLDINGS LIMITED

Bronwyn Flynn
Environment, Approvals & Community Lead

PROPOSED METHODOLOGY AND CORRESPONDENCE

CLEAN TEQ SUNRISE PROJECT
PROJECT EXECUTION PLAN MODIFICATION

PROPOSED METHODOLOGY
FOR THE
ABORIGINAL CULTURAL HERITAGE ASSESSMENT

January 2021
Project No. CTL-20-08
Document No. 01073226

1 INTRODUCTION

The Clean TeQ Sunrise Project (the Project) is a nickel, cobalt and scandium open cut mining project situated near the village of Fifield, approximately 350 kilometres (km) west-northwest of Sydney, in New South Wales (NSW) (Figure 1).

Clean TeQ Sunrise Pty Ltd owns the rights to develop the Project. Clean TeQ Sunrise Pty Ltd is a wholly owned subsidiary of Clean TeQ Holdings Limited (Clean TeQ).

Development Consent (DA 374-11-00) for the Project was issued under Part 4 of NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) in 2001. Six modifications to Development Consent (DA 374-11-00) have since been granted under the EP&A Act.

Clean TeQ proposes an additional modification to Development Consent (DA 374-11-00) under section 4.55(2) of the EP&A Act.

1.1 Approved Project

The approved Project includes the establishment and operation of the following:

- mine and processing facility;
- limestone quarry;
- rail siding;
- borefields, surface water extraction infrastructure and water pipeline;
- gas pipeline;
- accommodation camp; and
- associated transport activities and transport infrastructure (e.g. the Fifield Bypass, road and construction upgrades).

The approved Project is presented on Figure 1.

1.2 Project Execution Plan Modification

Clean TeQ has continued to review and optimise the Project design as part of preparations for the Project execution.

The Project Execution Plan identified a number of changes to the approved mine and processing facility, accommodation camp, rail siding and road transport activities.

The Project Execution Plan Modification (the Modification) includes these Project Execution Plan changes to allow for the optimisation of the construction and operation of the Project.

The Modification would change the approved surface development area as a result of proposed revisions to the location and layout of the Project rail siding. The revised location of the rail siding is the Subject Area of the Aboriginal Cultural Heritage Assessment (ACHA) (Figure 2).

Clean TeQ is seeking to engage with the Aboriginal community as part of preparation of an ACHA for the Modification. Consultation with Aboriginal people and communities will be guided by Heritage NSW's guideline *Aboriginal cultural heritage consultation requirements for proponents 2010* (NSW Department of Environment, Climate Change and Water [DECCW], 2010).

1.3 Structure of this Document

Section 2 of this document describes the previous archaeological investigations undertaken for the approved Project that are relevant to the Modification, while Section 3 outlines the Proposed Methodology for the cultural and archaeological assessment of Aboriginal objects, places and/or Aboriginal cultural heritage values within the ACHA Subject Area.

Section 4 outlines the sensitive cultural information management protocol and Section 5 provides further information on the preparation of the ACHA report. Relevant personnel and critical timeframes for the assessment are outlined in Sections 6 and 7, respectively.

2 PREVIOUS ARCHAEOLOGICAL INVESTIGATIONS

A number of archaeological surveys and assessments have been conducted for the approved Project. Of relevance to the ACHA Subject Area and surrounds are the studies prepared by Archaeological Surveys and Reports (2000) and Landskape Natural and Cultural Heritage Management (Landskape) (2017; 2019).

The location of the Approved Rail Siding Surface Development Area is shown on Figure 2. An archaeological investigation was completed by Archeological Surveys and Reports (2000) of the mine site and at the locations of associated ancillary infrastructure. The investigation identified 14 Aboriginal heritage sites, none of which were located in the Approved Rail Siding Surface Development Area.

An ACHA was later completed by Landskape (2017) to support an application for an Aboriginal Heritage Impact Permit (AHIP) under section 90 of the *National Parks and Wildlife Act, 1974* (NP&W Act) for all components of the approved Project. 13 Aboriginal cultural heritage sites were newly identified in the approved project components, none of which were located in the Approved Rail Siding Surface Development Area.

Landskape (2019) completed an Aboriginal Cultural Heritage Due Diligence Assessment for a portion of the Scotson Lane road reserve (adjacent to the Approved Rail Siding Surface Development Area), which concluded that no Aboriginal objects or landscape features were identified.

3 PROPOSED ASSESSMENT METHODOLOGY

The Proposed Methodology for the cultural and archaeological assessment for the ACHA is as follows:

- Conduct a desktop assessment to delineate areas of known and predicted Aboriginal objects, places and/or Aboriginal cultural heritage values, including a detailed review of the previous assessments and investigations.
- Identify the Aboriginal cultural heritage values associated with the ACHA Subject Area through consultation with Aboriginal people with cultural knowledge or responsibilities for Country in which the ACHA Subject Area occurs, utilising written and oral research and field investigation.

- The conduct of a cultural and archaeological assessment with representatives of the local Aboriginal community, to identify Aboriginal objects, places and/or Aboriginal cultural heritage values within the ACHA Subject Area. The field investigation would be carried out by the project archaeologist with the assistance of Aboriginal representatives.
- Record/document any Aboriginal objects, places and/or Aboriginal cultural heritage values within the ACHA Subject Area and assess their significance in consultation with representatives of the Registered Aboriginal Parties (RAPs).
- In consultation with the RAPs, develop recommended management and mitigation measures for Aboriginal objects, places and/or Aboriginal cultural heritage values.
- Provide a consideration of the potential impacts of the Modification on Aboriginal objects, places and/or Aboriginal cultural heritage values within the ACHA Subject Area.
- Describe and justify the outcomes and alternatives.
- Document the Aboriginal cultural heritage impact assessment and the recommendations to minimise potential impacts on Aboriginal cultural heritage.
- Provide a copy of the draft ACHA to the RAPs for their review and feedback.
- Document any feedback received as part of the cultural assessment from RAPs for presentation in the final ACHA report (subject to the sensitivity of the information provided).
- As part of the process, Clean TeQ would seek an AHIP (or a variation to an existing AHIP) under section 90 of the NP&W Act.

In accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW, 2010) Clean TeQ requests that RAPs provide, where relevant during the conduct of the ACHA, cultural information regarding:

- whether there are any Aboriginal sites/objects of cultural value to Aboriginal people in the ACHA Subject Area or surrounds; and
- whether there are any places of cultural value to Aboriginal people in the ACHA Subject Area or surrounds.

This may include places of social, spiritual and cultural value, historic places with cultural significance, and potential places/areas of historic, social, spiritual and/or cultural significance.

4 SENSITIVE CULTURAL INFORMATION – MANAGEMENT PROTOCOL

In the event that a RAP has sensitive or restricted public access information, it is proposed that Clean TeQ would manage this information (if provided by the Aboriginal community) in accordance with a sensitive cultural information management protocol.

It is anticipated that the protocol would include making note of and managing the material in accordance with the following key limitations/requirements as advised by the relevant RAP at the time of the information being provided:

- any restrictions on access to the material;
- any restrictions on communication of the material;
- any restrictions on the location/storage of the material;
- any cultural recommendations on handling the material;

- any contextual information;
- any names and contact details of persons authorised by the relevant Aboriginal party to make decisions concerning the Aboriginal material and the degree of authorisation;
- any details of any consent given in accordance with customary law;
- the level of confidentiality to be accorded to the material; and
- any access and use by the RAP, of the cultural information in the material.

All RAPs should be aware of the mandatory requirement that all feedback provided must be documented in the final ACHA (DECCW, 2010), including copies of any submissions received and the proponents response to the issues raised.

5 ABORIGINAL CULTURAL HERITAGE ASSESSMENT

Following consultation on the Proposed Methodology of the cultural and archaeological assessment, and undertaking any required field components, a draft ACHA report will be prepared. The draft ACHA will be provided to all RAPs for their review and comment, and will include:

- details of the Aboriginal objects, places and/or Aboriginal cultural heritage values within the ACHA Subject Area and how they may be impacted by the Modification;
- details of the consultation undertaken and how comments received at various times were considered; and
- management and mitigation recommendations drawing on information provided by RAPs and the results of the cultural and archaeological assessments.

6 PERSONNEL

Project Archaeologist: Dr Matt Cupper would be the project archaeologist. Dr Matt Cupper has a wide range of experience in cultural and natural heritage management and an academic background in archaeology, geology and botany, including a PhD in the palaeoecology and early Aboriginal occupation of the Darling River. His particular area of expertise is the interaction of Aboriginal people and arid ecosystems in the interior of Australia. As a consultant archaeologist he has been engaged in many management and research-oriented studies of the Murray Darling Basin for industry and government. These have included investigation of the cultural heritage of the dunefields of western NSW for petroleum and mineral sands developments, and archaeological surveys of water supply and irrigation infrastructure along the Lachlan, Murray and Darling Rivers. Dr Matt Cupper has undertaken Aboriginal cultural heritage works for the Project since 2017.

Aboriginal Field Representatives: It is anticipated that Aboriginal field representatives would be engaged by Clean TeQ for the duration of the cultural heritage field survey (the number may be subject to change based on the extent of the area requiring survey or due to workplace health and safety constraints). Aboriginal field representatives (including community leaders and Elders attending community consultation meetings) would invoice and, where appropriate, negotiate with Clean TeQ directly in relation to engagement for the field surveys. Aboriginal field personnel may be engaged on a rotational basis (e.g. a different team of representatives each day) as required.

7 CRITICAL TIMEFRAMES

Critical timeframes for the ACHA are outlined below:

1. Collation of culturally significant information – ongoing throughout process until the end of the draft ACHA review period.
2. Provision of comments on the Proposed Methodology to Clean TeQ – 22 February 2021.
3. Information session and field survey – 23 February 2021 (noting that survey dates will be confirmed with RAPs selected to participate in the field surveys as required).
4. Provision of a draft ACHA (including proposed management and mitigation measures) to RAPs for review and comment – anticipated to occur March 2021 (following field survey).
5. Provision of comments from RAPs on draft ACHA to Clean TeQ – anticipated to occur April 2021.
6. Finalisation of the ACHA in consideration of comments received – April 2021.
7. As part of the process, Clean TeQ would seek an AHIP (or a variation to an existing AHIP) under section 90 of the NP&W Act. This would occur following finalisation of the ACHA.

8 REFERENCES

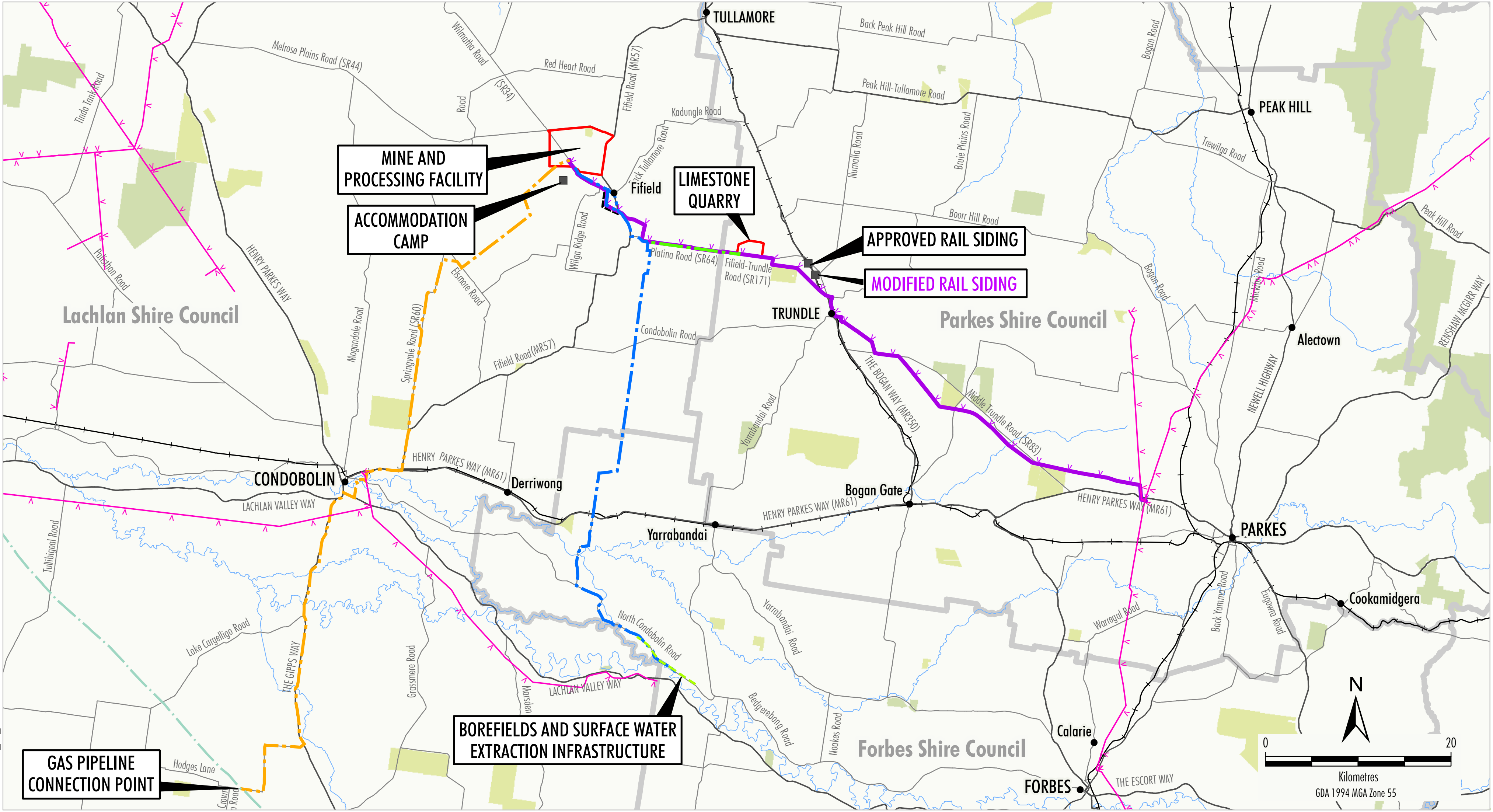
Archaeological Surveys and Reports (2000) *The report of the archaeological investigation of the Mine Site and sites of Associated Ancillary Infrastructure for the Syerston Nickel-Cobalt Project.* Report prepared for Black Range Minerals Ltd.

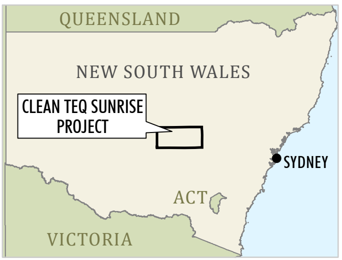
Department of Environment, Climate Change and Water (2010) *Aboriginal cultural heritage consultation requirements for proponents 2010*.

Landskape Natural and Cultural Heritage Management (2017) *Syerston Project Aboriginal Cultural Heritage Assessment.* Report to Clean TeQ Limited.

Landskape Natural and Cultural Heritage Management (2019) *Aboriginal Cultural Heritage Due Diligence Assessment: Clean TeQ Sunrise Project Rail Siding.* Report to Clean TeQ Limited.

FIGURES





LEGEND

- National Park/Conservation Area
- State Forest
- Local Government Boundary
- Railway
- Existing Gas Pipeline
- Existing Regional High Voltage Electricity Transmission Line
- Mining Lease Boundary (ML)
- Fifield Bypass
- Gas Pipeline
- Water Pipeline
- Limestone Quarry Water Pipeline
- Borefield Infrastructure Corridor
- Proposed 132 kV Electricity Transmission Line (Subject to Separate Approval)

Source: Black Range Minerals (2000); Clean TeQ (2017, 2018, 2020); NSW Spatial Services (2020)

CLEAN TEQ SUNRISE PROJECT

Regional Location

Figure 1

LEGEND
ACHA Subject Area
Railway
Approved Rail Siding Surface Development Area

Source: Black Range Minerals (2000); NSW Spatial Services (2020); Clean Teq (2017, 2018, 2020).
Orthophoto: © NSW Department of Finance, Services & Innovation (2020)

CLEAN TEQ SUNRISE PROJECT

ACHA Subject Area

Figure 2

CTL-20-08_MOD7_ACHA_PM_201A Date: 20/01/2021

22 January 2021

Wiradjuri Condobolin Corporation
PO Box 194
Condobolin NSW 2877

Attention: Ally Coe

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT PROPOSED METHODOLOGY, INFORMATION SESSION AND FIELD SURVEY

Dear Ally,

As described in correspondence from Clean TeQ Sunrise Pty Ltd (Clean TeQ) dated 19 January 2021, due to your previous involvement in Aboriginal cultural heritage related matters at the Clean TeQ Sunrise Project (the Project), you have been automatically registered for the Aboriginal consultation process associated with the Project Execution Plan Modification (the Modification).

This letter provides information on the following:

- Proposed methodology for review and comment.
- Information session regarding the Project.
- Fieldwork selection criteria.
- Ongoing consultation.

Proposed Methodology

Please find enclosed for your review a copy of the Proposed Methodology for the Aboriginal Cultural Heritage Assessment (ACHA) for the Modification (Enclosure A).

In accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (NSW Department of Environment, Climate Change and Water, 2010), we have provided the Proposed Methodology for your review and feedback. Your feedback may include the identification of issues or areas of cultural significance that may be used to affect, inform or refine the Proposed Methodology.

If you wish to provide input on the following, please provide feedback to Clean TeQ (via the contact details provided at the end of this letter) by **Monday 22 February 2021**:

- The nature of the Proposed Methodology.
- Any Aboriginal objects or places of cultural value within the ACHA Subject Area, or issues of cultural significance, that you are aware of.
- Any restrictions or protocols you may consider necessary in relation to any information of sensitivity that you may provide.
- Any other factors you consider to be relevant to the heritage assessment.

All comments received will be taken into consideration as the Methodology is finalised.

Information Session

All Registered Aboriginal Parties (RAPs) are invited to attend an information session with the consulting archaeologist and Clean TeQ representatives to discuss the Modification and the Proposed Methodology. The information session will be held on Tuesday 23 February 2021 at the Trundle Golf Club (Gatenby Street, Trundle NSW 2875), and will commence at 9:00 am and conclude at approximately 10:00 am. Note that the proposed field survey (described below) will be held following the information session.

At the information session, Clean TeQ will provide a presentation on the nature and scale of the Modification, an overview of the impact assessment process and will discuss the roles, functions and responsibilities of participants and protocols for the management of any sensitive cultural heritage information.

The information session will also provide RAPs with an opportunity to raise any cultural issues or comments/perspectives regarding the Modification or the Proposed Methodology. Note that issues can also be raised at any point during the consultation process.

Light refreshments and drinks will be provided at the information session and bottled water will be available during field surveys following the information session.

Please note that Clean TeQ will not be paying for attendance at the information session.

Can you please indicate whether you are interested in attending the information session by **9 February 2021** via the contact details provided at the end of this letter.

Field Survey

As part of the ACHA for the Modification, Clean TeQ will be facilitating a field survey of the ACHA Subject Area, to allow representatives of the RAPs to inspect the area and any Aboriginal heritage sites which may be located within or in immediate proximity to the area.

Clean TeQ is pleased to advise that the Wiradjuri Condobolin Corporation has been allocated one (1) survey position for an estimated half day of survey work on Tuesday 23 February 2021. The field survey is expected to take place from 10:30 am (i.e. following the information session).

Please provide Clean TeQ with a name and contact phone number of the survey representative attending the survey, via the contact details provided at the end of this letter.

Personal Protection Equipment (PPE)

In accordance with Clean TeQ's Work Health and Safety Requirements, the following PPE will be required for participation in the field surveys and will not be provided by Clean TeQ:

- High visibility long sleeve shirt (or vest) and long pants.
- Steel capped boots.
- Sun hat.

PPE is to be worn by the survey representative at all times while on site and during the surveys.

Insurance Requirements

Clean TeQ requires copies of valid and current insurances including public liability and workers compensation prior to participation in the field surveys. Could you please provide this information by **Tuesday 9 February 2021** via the contact details provided at the end of this letter.

Additional Survey Requirements

Representatives who wish to be involved in the field survey will be required to be 'fit for duty', being physically fit, in good health and capable of working all day in various terrains and temperatures. In some circumstances, Clean TeQ may require a medical certificate stating that the individual is fit for work.

All individuals participating in the field survey may be required to pass a random drug and alcohol test at some time during the field surveys. The drug and alcohol test may include mouth swabs and urine samples. Please note that if an individual fails to provide a sample, or if they provide a positive test, they will not be eligible for further field surveys.

Please do not attend the information session or field surveys if you are feeling unwell. Due to restrictions in NSW associated with the Coronavirus (COVID-19), Clean TeQ will be undertaking temperature testing upon arrival at the information session. In addition, you will be required to scan a QR code and sign-in upon arrival. Please maintain a distance of at least 1.5 metres from others throughout the day.

Payment and Billing Details

There will be paid participation for those representatives participating in the field survey.
Clean TeQ will pay each field representative at a half day rate of $400 (ex. GST) or a full day rate of $700 (ex. GST). In the event of cancellation of fieldwork (i.e. due to bad weather) Clean TeQ will pay a half day rate if less than 24 hours notice is provided.

Clean TeQ will not be paying for any additional travel, accommodation or logistical expenses.

All invoices for the survey representatives attending the survey are to be addressed to Clean TeQ Sunrise Pty Ltd and provided via the contact details below upon completion of surveys. The invoices should detail the hours worked.

To indicate your attendance at the information session and field surveys, provide relevant insurances or to discuss any queries you many have, please do not hesitate to contact Clean TeQ via the following contact details:

Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

Yours Sincerely
CLEAN TEQ HOLDINGS LIMITED

Bronwyn Flynn
Environment, Approvals & Community Lead

22 January 2021

Condobolin Local Aboriginal Land Council
PO Box 377
Condobolin NSW 2877

Attention: Dave Carter

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT PROPOSED METHODOLOGY, INFORMATION SESSION AND FIELD SURVEY

Dear Dave,

As described in correspondence from Clean TeQ Sunrise Pty Ltd (Clean TeQ) dated 19 January 2021, due to your previous involvement in Aboriginal cultural heritage related matters at the Clean TeQ Sunrise Project (the Project), you have been automatically registered for the Aboriginal consultation process associated with the Project Execution Plan Modification (the Modification).

This letter provides information on the following:

- Proposed methodology for review and comment.
- Information session regarding the Project.
- Fieldwork selection criteria.
- Ongoing consultation.

Proposed Methodology

Please find enclosed for your review a copy of the Proposed Methodology for the Aboriginal Cultural Heritage Assessment (ACHA) for the Modification (Enclosure A).

In accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (NSW Department of Environment, Climate Change and Water, 2010), we have provided the Proposed Methodology for your review and feedback. Your feedback may include the identification of issues or areas of cultural significance that may be used to affect, inform or refine the Proposed Methodology.

If you wish to provide input on the following, please provide feedback to Clean TeQ (via the contact details provided at the end of this letter) by **Monday 22 February 2021**:

- The nature of the Proposed Methodology.
- Any Aboriginal objects or places of cultural value within the ACHA Subject Area, or issues of cultural significance, that you are aware of.
- Any restrictions or protocols you may consider necessary in relation to any information of sensitivity that you may provide.
- Any other factors you consider to be relevant to the heritage assessment.

All comments received will be taken into consideration as the Methodology is finalised.

Information Session

All Registered Aboriginal Parties (RAPs) are invited to attend an information session with the consulting archaeologist and Clean TeQ representatives to discuss the Modification and the Proposed Methodology. The information session will be held on Tuesday 23 February 2021 at the Trundle Golf Club (Gatenby Street, Trundle NSW 2875), and will commence at 9:00 am and conclude at approximately 10:00 am. Note that the proposed field survey (described below) will be held following the information session.

At the information session, Clean TeQ will provide a presentation on the nature and scale of the Modification, an overview of the impact assessment process and will discuss the roles, functions and responsibilities of participants and protocols for the management of any sensitive cultural heritage information.

The information session will also provide RAPs with an opportunity to raise any cultural issues or comments/perspectives regarding the Modification or the Proposed Methodology. Note that issues can also be raised at any point during the consultation process.

Light refreshments and drinks will be provided at the information session and bottled water will be available during field surveys following the information session.

Please note that Clean TeQ will not be paying for attendance at the information session.

Can you please indicate whether you are interested in attending the information session by **9 February 2021** via the contact details provided at the end of this letter.

Field Survey

As part of the ACHA for the Modification, Clean TeQ will be facilitating a field survey of the ACHA Subject Area, to allow representatives of the RAPs to inspect the area and any Aboriginal heritage sites which may be located within or in immediate proximity to the area.

Clean TeQ is pleased to advise that the Condobolin Local Aboriginal Land Council has been allocated one (1) survey position for an estimated half day of survey work on Tuesday 23 February 2021. The field survey is expected to take place from 10:30 am (i.e. following the information session).

Please provide Clean TeQ with a name and contact phone number of the survey representative attending the survey, via the contact details provided at the end of this letter.

Personal Protection Equipment (PPE)

In accordance with Clean TeQ's Work Health and Safety Requirements, the following PPE will be required for participation in the field surveys and will not be provided by Clean TeQ:

- High visibility long sleeve shirt (or vest) and long pants.
- Steel capped boots.
- Sun hat.

PPE is to be worn by the survey representative at all times while on site and during the surveys.

Insurance Requirements

Clean TeQ requires copies of valid and current insurances including public liability and workers compensation prior to participation in the field surveys. Could you please provide this information by **Tuesday 9 February 2021** via the contact details provided at the end of this letter.

Additional Survey Requirements

Representatives who wish to be involved in the field survey will be required to be 'fit for duty', being physically fit, in good health and capable of working all day in various terrains and temperatures. In some circumstances, Clean TeQ may require a medical certificate stating that the individual is fit for work.

All individuals participating in the field survey may be required to pass a random drug and alcohol test at some time during the field surveys. The drug and alcohol test may include mouth swabs and urine samples. Please note that if an individual fails to provide a sample, or if they provide a positive test, they will not be eligible for further field surveys.

Please do not attend the information session or field surveys if you are feeling unwell. Due to restrictions in NSW associated with the Coronavirus (COVID-19), Clean TeQ will be undertaking temperature testing upon arrival at the information session. In addition, you will be required to scan a QR code and sign-in upon arrival. Please maintain a distance of at least 1.5 metres from others throughout the day.

Payment and Billing Details

There will be paid participation for those representatives participating in the field survey.
Clean TeQ will pay each field representative at a half day rate of $400 (ex. GST) or a full day rate of $700 (ex. GST). In the event of cancellation of fieldwork (i.e. due to bad weather) Clean TeQ will pay a half day rate if less than 24 hours notice is provided.

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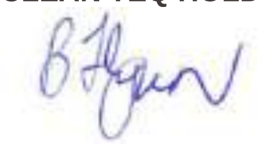
To indicate your attendance at the information session and field surveys, provide relevant insurances or to discuss any queries you many have, please do not hesitate to contact Clean TeQ via the following contact details:

Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

Yours Sincerely
CLEAN TEQ HOLDINGS LIMITED



Bronwyn Flynn
Environment, Approvals & Community Lead

22 January 2021

Cottage 1, 1 Condobolin Road
Bogan Gate NSW 2876

Attention: Isabel Goolagong

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT PROPOSED METHODOLOGY, INFORMATION SESSION AND FIELD SURVEY

Dear Isabel,

As described in correspondence from Clean TeQ Sunrise Pty Ltd (Clean TeQ) dated 19 January 2021, due to your previous involvement in Aboriginal cultural heritage related matters at the Clean TeQ Sunrise Project (the Project), you have been automatically registered for the Aboriginal consultation process associated with the Project Execution Plan Modification (the Modification).

This letter provides information on the following:

- Proposed methodology for review and comment.
- Information session regarding the Project.
- Fieldwork selection criteria.
- Ongoing consultation.

Proposed Methodology

Please find enclosed for your review a copy of the Proposed Methodology for the Aboriginal Cultural Heritage Assessment (ACHA) for the Modification (Enclosure A).

In accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (NSW Department of Environment, Climate Change and Water, 2010), we have provided the Proposed Methodology for your review and feedback. Your feedback may include the identification of issues or areas of cultural significance that may be used to affect, inform or refine the Proposed Methodology.

If you wish to provide input on the following, please provide feedback to Clean TeQ (via the contact details provided at the end of this letter) by **Monday 22 February 2021**:

- The nature of the Proposed Methodology.
- Any Aboriginal objects or places of cultural value within the ACHA Subject Area, or issues of cultural significance, that you are aware of.
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Information Session

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At the information session, Clean TeQ will provide a presentation on the nature and scale of the Modification, an overview of the impact assessment process and will discuss the roles, functions and responsibilities of participants and protocols for the management of any sensitive cultural heritage information.

The information session will also provide RAPs with an opportunity to raise any cultural issues or comments/perspectives regarding the Modification or the Proposed Methodology. Note that issues can also be raised at any point during the consultation process.

Light refreshments and drinks will be provided at the information session and bottled water will be available during field surveys following the information session.

Please note that Clean TeQ will not be paying for attendance at the information session.

Can you please indicate whether you are interested in attending the information session by **9 February 2021** via the contact details provided at the end of this letter.

Field Survey

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Clean TeQ is pleased to advise that you have been allocated one (1) survey position for an estimated half day of survey work on Tuesday 23 February 2021. The field survey is expected to take place from 10:30 am (i.e. following the information session).

Please provide Clean TeQ with a name and contact phone number of the survey representative attending the survey, via the contact details provided at the end of this letter.

Personal Protection Equipment (PPE)

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- Sun hat.

PPE is to be worn by the survey representative at all times while on site and during the surveys.

Insurance Requirements

Clean TeQ requires copies of valid and current insurances including public liability and workers compensation prior to participation in the field surveys. Could you please provide this information by **Tuesday 9 February 2021** via the contact details provided at the end of this letter.

Additional Survey Requirements

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Please do not attend the information session or field surveys if you are feeling unwell. Due to restrictions in NSW associated with the Coronavirus (COVID-19), Clean TeQ will be undertaking temperature testing upon arrival at the information session. In addition, you will be required to scan a QR code and sign-in upon arrival. Please maintain a distance of at least 1.5 metres from others throughout the day.

Payment and Billing Details

There will be paid participation for those representatives participating in the field survey.
Clean TeQ will pay each field representative at a half day rate of $400 (ex. GST) or a full day rate of $700 (ex. GST). In the event of cancellation of fieldwork (i.e. due to bad weather) Clean TeQ will pay a half day rate if less than 24 hours notice is provided.

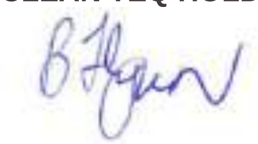
Clean TeQ will not be paying for any additional travel, accommodation or logistical expenses.

All invoices for the survey representatives attending the survey are to be addressed to Clean TeQ Sunrise Pty Ltd and provided via the contact details below upon completion of surveys. The invoices should detail the hours worked.

To indicate your attendance at the information session and field surveys, provide relevant insurances or to discuss any queries you many have, please do not hesitate to contact Clean TeQ via the following contact details:

Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

Yours Sincerely
CLEAN TEQ HOLDINGS LIMITED



Bronwyn Flynn
Environment, Approvals & Community Lead

22 January 2021

Binjang Wellington Wiradjuri Aboriginal Heritage Survey
260 Myall Street
Dubbo NSW 2830

Attention: Jamie Gray

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT PROPOSED METHODOLOGY, INFORMATION SESSION AND FIELD SURVEY

Dear Jamie,

As described in correspondence from Clean TeQ Sunrise Pty Ltd (Clean TeQ) dated 19 January 2021, due to your previous involvement in Aboriginal cultural heritage related matters at the Clean TeQ Sunrise Project (the Project), you have been automatically registered for the Aboriginal consultation process associated with the Project Execution Plan Modification (the Modification).

This letter provides information on the following:

- Proposed methodology for review and comment.
- Information session regarding the Project.
- Fieldwork selection criteria.
- Ongoing consultation.

Proposed Methodology

Please find enclosed for your review a copy of the Proposed Methodology for the Aboriginal Cultural Heritage Assessment (ACHA) for the Modification (Enclosure A).

In accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (NSW Department of Environment, Climate Change and Water, 2010), we have provided the Proposed Methodology for your review and feedback. Your feedback may include the identification of issues or areas of cultural significance that may be used to affect, inform or refine the Proposed Methodology.

If you wish to provide input on the following, please provide feedback to Clean TeQ (via the contact details provided at the end of this letter) by **Monday 22 February 2021**:

- The nature of the Proposed Methodology.
- Any Aboriginal objects or places of cultural value within the ACHA Subject Area, or issues of cultural significance, that you are aware of.
- Any restrictions or protocols you may consider necessary in relation to any information of sensitivity that you may provide.
- Any other factors you consider to be relevant to the heritage assessment.

All comments received will be taken into consideration as the Methodology is finalised.

Information Session

All Registered Aboriginal Parties (RAPs) are invited to attend an information session with the consulting archaeologist and Clean TeQ representatives to discuss the Modification and the Proposed Methodology. The information session will be held on Tuesday 23 February 2021 at the Trundle Golf Club (Gatenby Street, Trundle NSW 2875), and will commence at 9:00 am and conclude at approximately 10:00 am. Note that the proposed field survey (described below) will be held following the information session.

At the information session, Clean TeQ will provide a presentation on the nature and scale of the Modification, an overview of the impact assessment process and will discuss the roles, functions and responsibilities of participants and protocols for the management of any sensitive cultural heritage information.

The information session will also provide RAPs with an opportunity to raise any cultural issues or comments/perspectives regarding the Modification or the Proposed Methodology. Note that issues can also be raised at any point during the consultation process.

Light refreshments and drinks will be provided at the information session and bottled water will be available during field surveys following the information session.

Please note that Clean TeQ will not be paying for attendance at the information session.

Can you please indicate whether you are interested in attending the information session by **9 February 2021** via the contact details provided at the end of this letter.

Field Survey

As part of the ACHA for the Modification, Clean TeQ will be facilitating a field survey of the ACHA Subject Area, to allow representatives of the RAPs to inspect the area and any Aboriginal heritage sites which may be located within or in immediate proximity to the area.

Clean TeQ is pleased to advise that the Binjang Wellington Wiradjuri Aboriginal Heritage Survey has been allocated one (1) survey position for an estimated half day of survey work on Tuesday 23 February 2021. The field survey is expected to take place from 10:30 am (i.e. following the information session).

Please provide Clean TeQ with a name and contact phone number of the survey representative attending the survey, via the contact details provided at the end of this letter.

Personal Protection Equipment (PPE)

In accordance with Clean TeQ's Work Health and Safety Requirements, the following PPE will be required for participation in the field surveys and will not be provided by Clean TeQ:

- High visibility long sleeve shirt (or vest) and long pants.
- Steel capped boots.
- Sun hat.

PPE is to be worn by the survey representative at all times while on site and during the surveys.

Insurance Requirements

Clean TeQ requires copies of valid and current insurances including public liability and workers compensation prior to participation in the field surveys. Could you please provide this information by **Tuesday 9 February 2021** via the contact details provided at the end of this letter.

Additional Survey Requirements

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Please do not attend the information session or field surveys if you are feeling unwell. Due to restrictions in NSW associated with the Coronavirus (COVID-19), Clean TeQ will be undertaking temperature testing upon arrival at the information session. In addition, you will be required to scan a QR code and sign-in upon arrival. Please maintain a distance of at least 1.5 metres from others throughout the day.

Payment and Billing Details

There will be paid participation for those representatives participating in the field survey.
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Clean TeQ will not be paying for any additional travel, accommodation or logistical expenses.

All invoices for the survey representatives attending the survey are to be addressed to Clean TeQ Sunrise Pty Ltd and provided via the contact details below upon completion of surveys. The invoices should detail the hours worked.

To indicate your attendance at the information session and field surveys, provide relevant insurances or to discuss any queries you many have, please do not hesitate to contact Clean TeQ via the following contact details:

Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

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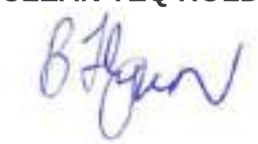

Bronwyn Flynn
Environment, Approvals & Community Lead

CLEAN TEQ SUNRISE

22 January 2021

West Wyalong Local Aboriginal Land Council
PO Box 332
West Wyalong NSW 2671

Attention: Leeanne Hampton

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT PROPOSED METHODOLOGY, INFORMATION SESSION AND FIELD SURVEY

Dear Leeanne,

As described in correspondence from Clean TeQ Sunrise Pty Ltd (Clean TeQ) dated 19 January 2021, due to your previous involvement in Aboriginal cultural heritage related matters at the Clean TeQ Sunrise Project (the Project), you have been automatically registered for the Aboriginal consultation process associated with the Project Execution Plan Modification (the Modification).

This letter provides information on the following:

- Proposed methodology for review and comment.
- Information session regarding the Project.
- Fieldwork selection criteria.
- Ongoing consultation.

Proposed Methodology

Please find enclosed for your review a copy of the Proposed Methodology for the Aboriginal Cultural Heritage Assessment (ACHA) for the Modification (Enclosure A).

In accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (NSW Department of Environment, Climate Change and Water, 2010), we have provided the Proposed Methodology for your review and feedback. Your feedback may include the identification of issues or areas of cultural significance that may be used to affect, inform or refine the Proposed Methodology.

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The information session will also provide RAPs with an opportunity to raise any cultural issues or comments/perspectives regarding the Modification or the Proposed Methodology. Note that issues can also be raised at any point during the consultation process.

Light refreshments and drinks will be provided at the information session and bottled water will be available during field surveys following the information session.

Please note that Clean TeQ will not be paying for attendance at the information session.

Can you please indicate whether you are interested in attending the information session by **9 February 2021** via the contact details provided at the end of this letter.

Field Survey

As part of the ACHA for the Modification, Clean TeQ will be facilitating a field survey of the ACHA Subject Area, to allow representatives of the RAPs to inspect the area and any Aboriginal heritage sites which may be located within or in immediate proximity to the area.

Clean TeQ is pleased to advise that the West Wyalong Local Aboriginal Land Council has been allocated one (1) survey position for an estimated half day of survey work on Tuesday 23 February 2021. The field survey is expected to take place from 10:30 am (i.e. following the information session).

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Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

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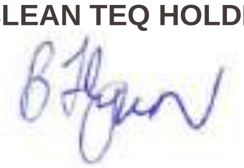
CLEAN TEQ HOLDINGS LIMITED



Bronwyn Flynn
Environment, Approvals & Community Lead

22 January 2021

53 McDonnell Street
Condobolin NSW 2877

Attention: Louise Davis

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT PROPOSED METHODOLOGY, INFORMATION SESSION AND FIELD SURVEY

Dear Louise,

As described in correspondence from Clean TeQ Sunrise Pty Ltd (Clean TeQ) dated 19 January 2021, due to your previous involvement in Aboriginal cultural heritage related matters at the Clean TeQ Sunrise Project (the Project), you have been automatically registered for the Aboriginal consultation process associated with the Project Execution Plan Modification (the Modification).

This letter provides information on the following:

- Proposed methodology for review and comment.
- Information session regarding the Project.
- Fieldwork selection criteria.
- Ongoing consultation.

Proposed Methodology

Please find enclosed for your review a copy of the Proposed Methodology for the Aboriginal Cultural Heritage Assessment (ACHA) for the Modification (Enclosure A).

In accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (NSW Department of Environment, Climate Change and Water, 2010), we have provided the Proposed Methodology for your review and feedback. Your feedback may include the identification of issues or areas of cultural significance that may be used to affect, inform or refine the Proposed Methodology.

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Information Session

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Light refreshments and drinks will be provided at the information session and bottled water will be available during field surveys following the information session.

Please note that Clean TeQ will not be paying for attendance at the information session.

Can you please indicate whether you are interested in attending the information session by **9 February 2021** via the contact details provided at the end of this letter.

Field Survey

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Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
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Yours Sincerely
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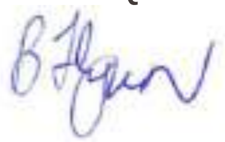

Bronwyn Flynn
Environment, Approvals & Community Lead

22 January 2021

27 Jennings Street
Geurie NSW 2818

Attention: Peter Peckham

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT PROPOSED METHODOLOGY, INFORMATION SESSION AND FIELD SURVEY

Dear Peter,

As described in correspondence from Clean TeQ Sunrise Pty Ltd (Clean TeQ) dated 19 January 2021, due to your previous involvement in Aboriginal cultural heritage related matters at the Clean TeQ Sunrise Project (the Project), you have been automatically registered for the Aboriginal consultation process associated with the Project Execution Plan Modification (the Modification).

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Yours Sincerely
CLEAN TEQ HOLDINGS LIMITED

Bronwyn Flynn
Environment, Approvals & Community Lead

22 January 2021

Wiradjuri Country Farm
Gunningbland NSW 2876

Attention: Peter White

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT PROPOSED METHODOLOGY, INFORMATION SESSION AND FIELD SURVEY

Dear Peter,

As described in correspondence from Clean TeQ Sunrise Pty Ltd (Clean TeQ) dated 19 January 2021, due to your previous involvement in Aboriginal cultural heritage related matters at the Clean TeQ Sunrise Project (the Project), you have been automatically registered for the Aboriginal consultation process associated with the Project Execution Plan Modification (the Modification).

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Payment and Billing Details

There will be paid participation for those representatives participating in the field survey.
Clean TeQ will pay each field representative at a half day rate of $400 (ex. GST) or a full day rate of $700 (ex. GST). In the event of cancellation of fieldwork (i.e. due to bad weather) Clean TeQ will pay a half day rate if less than 24 hours notice is provided.

Clean TeQ will not be paying for any additional travel, accommodation or logistical expenses.

All invoices for the survey representatives attending the survey are to be addressed to Clean TeQ Sunrise Pty Ltd and provided via the contact details below upon completion of surveys. The invoices should detail the hours worked.

To indicate your attendance at the information session and field surveys, provide relevant insurances or to discuss any queries you many have, please do not hesitate to contact Clean TeQ via the following contact details:

Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

Yours Sincerely
CLEAN TEQ HOLDINGS LIMITED

Bronwyn Flynn
Environment, Approvals & Community Lead

22 January 2021

Murie Elders Group
18 William Street
Condobolin NSW 2877

Attention: Rebecca Shepherd

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT PROPOSED METHODOLOGY, INFORMATION SESSION AND FIELD SURVEY

Dear Rebecca,

As described in correspondence from Clean TeQ Sunrise Pty Ltd (Clean TeQ) dated 19 January 2021, due to your previous involvement in Aboriginal cultural heritage related matters at the Clean TeQ Sunrise Project (the Project), you have been automatically registered for the Aboriginal consultation process associated with the Project Execution Plan Modification (the Modification).

This letter provides information on the following:

- Proposed methodology for review and comment.
- Information session regarding the Project.
- Fieldwork selection criteria.
- Ongoing consultation.

Proposed Methodology

Please find enclosed for your review a copy of the Proposed Methodology for the Aboriginal Cultural Heritage Assessment (ACHA) for the Modification (Enclosure A).

In accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (NSW Department of Environment, Climate Change and Water, 2010), we have provided the Proposed Methodology for your review and feedback. Your feedback may include the identification of issues or areas of cultural significance that may be used to affect, inform or refine the Proposed Methodology.

If you wish to provide input on the following, please provide feedback to Clean TeQ (via the contact details provided at the end of this letter) by **Monday 22 February 2021**:

- The nature of the Proposed Methodology.
- Any Aboriginal objects or places of cultural value within the ACHA Subject Area, or issues of cultural significance, that you are aware of.
- Any restrictions or protocols you may consider necessary in relation to any information of sensitivity that you may provide.
- Any other factors you consider to be relevant to the heritage assessment.

All comments received will be taken into consideration as the Methodology is finalised.

Information Session

All Registered Aboriginal Parties (RAPs) are invited to attend an information session with the consulting archaeologist and Clean TeQ representatives to discuss the Modification and the Proposed Methodology. The information session will be held on Tuesday 23 February 2021 at the Trundle Golf Club (Gatenby Street, Trundle NSW 2875), and will commence at 9:00 am and conclude at approximately 10:00 am. Note that the proposed field survey (described below) will be held following the information session.

At the information session, Clean TeQ will provide a presentation on the nature and scale of the Modification, an overview of the impact assessment process and will discuss the roles, functions and responsibilities of participants and protocols for the management of any sensitive cultural heritage information.

The information session will also provide RAPs with an opportunity to raise any cultural issues or comments/perspectives regarding the Modification or the Proposed Methodology. Note that issues can also be raised at any point during the consultation process.

Light refreshments and drinks will be provided at the information session and bottled water will be available during field surveys following the information session.

Please note that Clean TeQ will not be paying for attendance at the information session.

Can you please indicate whether you are interested in attending the information session by **9 February 2021** via the contact details provided at the end of this letter.

Field Survey

As part of the ACHA for the Modification, Clean TeQ will be facilitating a field survey of the ACHA Subject Area, to allow representatives of the RAPs to inspect the area and any Aboriginal heritage sites which may be located within or in immediate proximity to the area.

Clean TeQ is pleased to advise that the Murie Elders Group has been allocated one (1) survey position for an estimated half day of survey work on Tuesday 23 February 2021. The field survey is expected to take place from 10:30 am (i.e. following the information session).

Please provide Clean TeQ with a name and contact phone number of the survey representative attending the survey, via the contact details provided at the end of this letter.

Personal Protection Equipment (PPE)

In accordance with Clean TeQ's Work Health and Safety Requirements, the following PPE will be required for participation in the field surveys and will not be provided by Clean TeQ:

- High visibility long sleeve shirt (or vest) and long pants.
- Steel capped boots.
- Sun hat.

PPE is to be worn by the survey representative at all times while on site and during the surveys.

Insurance Requirements

Clean TeQ requires copies of valid and current insurances including public liability and workers compensation prior to participation in the field surveys. Could you please provide this information by **Tuesday 9 February 2021** via the contact details provided at the end of this letter.

Additional Survey Requirements

Representatives who wish to be involved in the field survey will be required to be 'fit for duty', being physically fit, in good health and capable of working all day in various terrains and temperatures. In some circumstances, Clean TeQ may require a medical certificate stating that the individual is fit for work.

All individuals participating in the field survey may be required to pass a random drug and alcohol test at some time during the field surveys. The drug and alcohol test may include mouth swabs and urine samples. Please note that if an individual fails to provide a sample, or if they provide a positive test, they will not be eligible for further field surveys.

Please do not attend the information session or field surveys if you are feeling unwell. Due to restrictions in NSW associated with the Coronavirus (COVID-19), Clean TeQ will be undertaking temperature testing upon arrival at the information session. In addition, you will be required to scan a QR code and sign-in upon arrival. Please maintain a distance of at least 1.5 metres from others throughout the day.

Payment and Billing Details

There will be paid participation for those representatives participating in the field survey.
Clean TeQ will pay each field representative at a half day rate of $400 (ex. GST) or a full day rate of $700 (ex. GST). In the event of cancellation of fieldwork (i.e. due to bad weather) Clean TeQ will pay a half day rate if less than 24 hours notice is provided.

Clean TeQ will not be paying for any additional travel, accommodation or logistical expenses.

All invoices for the survey representatives attending the survey are to be addressed to Clean TeQ Sunrise Pty Ltd and provided via the contact details below upon completion of surveys. The invoices should detail the hours worked.

To indicate your attendance at the information session and field surveys, provide relevant insurances or to discuss any queries you many have, please do not hesitate to contact Clean TeQ via the following contact details:

Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

Yours Sincerely
CLEAN TEQ HOLDINGS LIMITED

Bronwyn Flynn
Environment, Approvals & Community Lead

22 January 2021

106 Derribong Road
Dandaloo via Trangie NSW 2823

Attention: Sandra Peckham

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT PROPOSED METHODOLOGY, INFORMATION SESSION AND FIELD SURVEY

Dear Sandra,

As described in correspondence from Clean TeQ Sunrise Pty Ltd (Clean TeQ) dated 19 January 2021, due to your previous involvement in Aboriginal cultural heritage related matters at the Clean TeQ Sunrise Project (the Project), you have been automatically registered for the Aboriginal consultation process associated with the Project Execution Plan Modification (the Modification).

This letter provides information on the following:

- Proposed methodology for review and comment.
- Information session regarding the Project.
- Fieldwork selection criteria.
- Ongoing consultation.

Proposed Methodology

Please find enclosed for your review a copy of the Proposed Methodology for the Aboriginal Cultural Heritage Assessment (ACHA) for the Modification (Enclosure A).

In accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (NSW Department of Environment, Climate Change and Water, 2010), we have provided the Proposed Methodology for your review and feedback. Your feedback may include the identification of issues or areas of cultural significance that may be used to affect, inform or refine the Proposed Methodology.

If you wish to provide input on the following, please provide feedback to Clean TeQ (via the contact details provided at the end of this letter) by **Monday 22 February 2021**:

- The nature of the Proposed Methodology.
- Any Aboriginal objects or places of cultural value within the ACHA Subject Area, or issues of cultural significance, that you are aware of.
- Any restrictions or protocols you may consider necessary in relation to any information of sensitivity that you may provide.
- Any other factors you consider to be relevant to the heritage assessment.

All comments received will be taken into consideration as the Methodology is finalised.

Information Session

All Registered Aboriginal Parties (RAPs) are invited to attend an information session with the consulting archaeologist and Clean TeQ representatives to discuss the Modification and the Proposed Methodology. The information session will be held on Tuesday 23 February 2021 at the Trundle Golf Club (Gatenby Street, Trundle NSW 2875), and will commence at 9:00 am and conclude at approximately 10:00 am. Note that the proposed field survey (described below) will be held following the information session.

At the information session, Clean TeQ will provide a presentation on the nature and scale of the Modification, an overview of the impact assessment process and will discuss the roles, functions and responsibilities of participants and protocols for the management of any sensitive cultural heritage information.

The information session will also provide RAPs with an opportunity to raise any cultural issues or comments/perspectives regarding the Modification or the Proposed Methodology. Note that issues can also be raised at any point during the consultation process.

Light refreshments and drinks will be provided at the information session and bottled water will be available during field surveys following the information session.

Please note that Clean TeQ will not be paying for attendance at the information session.

Can you please indicate whether you are interested in attending the information session by **9 February 2021** via the contact details provided at the end of this letter.

Field Survey

As part of the ACHA for the Modification, Clean TeQ will be facilitating a field survey of the ACHA Subject Area, to allow representatives of the RAPs to inspect the area and any Aboriginal heritage sites which may be located within or in immediate proximity to the area.

Clean TeQ is pleased to advise that you have been allocated one (1) survey position for an estimated half day of survey work on Tuesday 23 February 2021. The field survey is expected to take place from 10:30 am (i.e. following the information session).

Please provide Clean TeQ with a name and contact phone number of the survey representative attending the survey, via the contact details provided at the end of this letter.

Personal Protection Equipment (PPE)

In accordance with Clean TeQ's Work Health and Safety Requirements, the following PPE will be required for participation in the field surveys and will not be provided by Clean TeQ:

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Insurance Requirements

Clean TeQ requires copies of valid and current insurances including public liability and workers compensation prior to participation in the field surveys. Could you please provide this information by **Tuesday 9 February 2021** via the contact details provided at the end of this letter.

Additional Survey Requirements

Representatives who wish to be involved in the field survey will be required to be 'fit for duty', being physically fit, in good health and capable of working all day in various terrains and temperatures. In some circumstances, Clean TeQ may require a medical certificate stating that the individual is fit for work.

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Please do not attend the information session or field surveys if you are feeling unwell. Due to restrictions in NSW associated with the Coronavirus (COVID-19), Clean TeQ will be undertaking temperature testing upon arrival at the information session. In addition, you will be required to scan a QR code and sign-in upon arrival. Please maintain a distance of at least 1.5 metres from others throughout the day.

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Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

Yours Sincerely
CLEAN TEQ HOLDINGS LIMITED

Bronwyn Flynn
Environment, Approvals & Community Lead

DRAFT ACHA LETTERS

19 March 2021

Wiradjuri Condobolin Corporation
Ally Coe
PO Box 194
CONDOBOLIN NSW 2877

Attention: Ally Coe

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT DRAFT REPORT

Dear Ally,

Please find enclosed for your review, a copy of the draft Aboriginal Cultural Heritage Assessment (ACHA) for the Clean TeQ Sunrise Project – Project Execution Plan Modification.

Review of Draft ACHA

In accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (Department of Environment, Climate Change and Water, 2010), we have provided the draft ACHA for your review and feedback. Your feedback may include the identification of issues or areas of cultural significance that may be used to affect, inform or refine the draft ACHA.

Please provide comments to Clean TeQ Sunrise Pty Ltd (Clean TeQ) (via the contact details provided at the end of this letter) if you wish to provide input on the following:

- Identification of issues.
- Any Aboriginal objects or places of cultural value within the Study Area, or issues of cultural significance, that you are aware of.
- Any restrictions or protocols you may consider necessary in relation to any information of sensitivity that you may provide.
- Any other factors you consider to be relevant to the heritage assessment.

All comments received will be taken into consideration as the ACHA is finalised.

Should you wish to provide feedback on the draft ACHA please advise Clean TeQ via the following contact details by **5.00pm on Monday 19 April 2021**:

Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

In addition, if you would like a hard copy of the draft ACHA posted to you, please request this via the contact details above.

Yours Sincerely

CLEAN TEQ HOLDINGS LIMITED

Bronwyn Flynn
Environment, Approvals & Community Lead

19 March 2021

Isabel Goolagong
Cottage 1, 1 Condobolin Road
BOGAN GATE NSW 2876

Attention: Isabel Goolagong

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT DRAFT REPORT

Dear Isabel,

Please find enclosed for your review, a copy of the draft Aboriginal Cultural Heritage Assessment (ACHA) for the Clean TeQ Sunrise Project – Project Execution Plan Modification.

Review of Draft ACHA

In accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (Department of Environment, Climate Change and Water, 2010), we have provided the draft ACHA for your review and feedback. Your feedback may include the identification of issues or areas of cultural significance that may be used to affect, inform or refine the draft ACHA.

Please provide comments to Clean TeQ Sunrise Pty Ltd (Clean TeQ) (via the contact details provided at the end of this letter) if you wish to provide input on the following:

- Identification of issues.
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- Any other factors you consider to be relevant to the heritage assessment.

All comments received will be taken into consideration as the ACHA is finalised.

Should you wish to provide feedback on the draft ACHA please advise Clean TeQ via the following contact details by **5.00pm on Monday 19 April 2021**:

Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

In addition, if you would like a hard copy of the draft ACHA posted to you, please request this via the contact details above.

Yours Sincerely

CLEAN TEQ HOLDINGS LIMITED

Bronwyn Flynn
Environment, Approvals & Community Lead

19 March 2021

Binjang Wellington Wiradjuri Aboriginal Heritage Survey
Jamie Gray
260 Myall Street
DUBBO NSW 2830

Attention: Jamie Gray

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT DRAFT REPORT

Dear Jamie,

Please find enclosed for your review, a copy of the draft Aboriginal Cultural Heritage Assessment (ACHA) for the Clean TeQ Sunrise Project – Project Execution Plan Modification.

Review of Draft ACHA

In accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (Department of Environment, Climate Change and Water, 2010), we have provided the draft ACHA for your review and feedback. Your feedback may include the identification of issues or areas of cultural significance that may be used to affect, inform or refine the draft ACHA.

Please provide comments to Clean TeQ Sunrise Pty Ltd (Clean TeQ) (via the contact details provided at the end of this letter) if you wish to provide input on the following:

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All comments received will be taken into consideration as the ACHA is finalised.

Should you wish to provide feedback on the draft ACHA please advise Clean TeQ via the following contact details by **5.00pm on Monday 19 April 2021**:

Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

In addition, if you would like a hard copy of the draft ACHA posted to you, please request this via the contact details above.

Yours Sincerely

CLEAN TEQ HOLDINGS LIMITED

Bronwyn Flynn
Environment, Approvals & Community Lead

19 March 2021

West Wyalong Local Aboriginal Land Council
Linton Howarth
PO Box 332
WEST WYALONG NSW 2671

Attention: Linton Howarth

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT DRAFT REPORT

Dear Linton,

Please find enclosed for your review, a copy of the draft Aboriginal Cultural Heritage Assessment (ACHA) for the Clean TeQ Sunrise Project – Project Execution Plan Modification.

Review of Draft ACHA

In accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (Department of Environment, Climate Change and Water, 2010), we have provided the draft ACHA for your review and feedback. Your feedback may include the identification of issues or areas of cultural significance that may be used to affect, inform or refine the draft ACHA.

Please provide comments to Clean TeQ Sunrise Pty Ltd (Clean TeQ) (via the contact details provided at the end of this letter) if you wish to provide input on the following:

- Identification of issues.
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All comments received will be taken into consideration as the ACHA is finalised.

Should you wish to provide feedback on the draft ACHA please advise Clean TeQ via the following contact details by **5.00pm on Monday 19 April 2021**:

Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

In addition, if you would like a hard copy of the draft ACHA posted to you, please request this via the contact details above.

Yours Sincerely

CLEAN TEQ HOLDINGS LIMITED

Bronwyn Flynn
Environment, Approvals & Community Lead

19 March 2021

Louise Davis
53 McDonnell Street
CONDOBOLIN NSW 2877

Attention: Louise Davis

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT DRAFT REPORT

Dear Louise,

Please find enclosed for your review, a copy of the draft Aboriginal Cultural Heritage Assessment (ACHA) for the Clean TeQ Sunrise Project – Project Execution Plan Modification.

Review of Draft ACHA

In accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (Department of Environment, Climate Change and Water, 2010), we have provided the draft ACHA for your review and feedback. Your feedback may include the identification of issues or areas of cultural significance that may be used to affect, inform or refine the draft ACHA.

Please provide comments to Clean TeQ Sunrise Pty Ltd (Clean TeQ) (via the contact details provided at the end of this letter) if you wish to provide input on the following:

- Identification of issues.
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- Any other factors you consider to be relevant to the heritage assessment.

All comments received will be taken into consideration as the ACHA is finalised.

Should you wish to provide feedback on the draft ACHA please advise Clean TeQ via the following contact details by **5.00pm on Monday 19 April 2021**:

Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

In addition, if you would like a hard copy of the draft ACHA posted to you, please request this via the contact details above.

Yours Sincerely

CLEAN TEQ HOLDINGS LIMITED

Bronwyn Flynn
Environment, Approvals & Community Lead

19 March 2021

Peter Peckham
27 Jennings Street
GEURIE NSW 2818

Attention: Peter Peckham

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT DRAFT REPORT

Dear Peter,

Please find enclosed for your review, a copy of the draft Aboriginal Cultural Heritage Assessment (ACHA) for the Clean TeQ Sunrise Project – Project Execution Plan Modification.

Review of Draft ACHA

In accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (Department of Environment, Climate Change and Water, 2010), we have provided the draft ACHA for your review and feedback. Your feedback may include the identification of issues or areas of cultural significance that may be used to affect, inform or refine the draft ACHA.

Please provide comments to Clean TeQ Sunrise Pty Ltd (Clean TeQ) (via the contact details provided at the end of this letter) if you wish to provide input on the following:

- Identification of issues.
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- Any restrictions or protocols you may consider necessary in relation to any information of sensitivity that you may provide.
- Any other factors you consider to be relevant to the heritage assessment.

All comments received will be taken into consideration as the ACHA is finalised.

Should you wish to provide feedback on the draft ACHA please advise Clean TeQ via the following contact details by **5.00pm on Monday 19 April 2021**:

Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

In addition, if you would like a hard copy of the draft ACHA posted to you, please request this via the contact details above.

Yours Sincerely

CLEAN TEQ HOLDINGS LIMITED

Bronwyn Flynn
Environment, Approvals & Community Lead

19 March 2021

Wiradjuri Cultural and Environmental Rangers/Wiradjuri Ranger Landcare
Peter White
Wiradjuri Country Farm
Lot 156 Bogan Way GUNNINGBLAND NSW 2876

Attention: Peter White

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT DRAFT REPORT

Dear Peter,

Please find enclosed for your review, a copy of the draft Aboriginal Cultural Heritage Assessment (ACHA) for the Clean TeQ Sunrise Project – Project Execution Plan Modification.

Review of Draft ACHA

In accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (Department of Environment, Climate Change and Water, 2010), we have provided the draft ACHA for your review and feedback. Your feedback may include the identification of issues or areas of cultural significance that may be used to affect, inform or refine the draft ACHA.

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All comments received will be taken into consideration as the ACHA is finalised.

Should you wish to provide feedback on the draft ACHA please advise Clean TeQ via the following contact details by **5.00pm on Monday 19 April 2021**:

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In addition, if you would like a hard copy of the draft ACHA posted to you, please request this via the contact details above.

Yours Sincerely

CLEAN TEQ HOLDINGS LIMITED

Bronwyn Flynn
Environment, Approvals & Community Lead

19 March 2021

Murie Elders Group
Rebecca Shepherd
18 William Street
CONDOBOLIN NSW 2877

Attention: Rebecca Shepherd

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT DRAFT REPORT

Dear Rebecca,

Please find enclosed for your review, a copy of the draft Aboriginal Cultural Heritage Assessment (ACHA) for the Clean TeQ Sunrise Project – Project Execution Plan Modification.

Review of Draft ACHA

In accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (Department of Environment, Climate Change and Water, 2010), we have provided the draft ACHA for your review and feedback. Your feedback may include the identification of issues or areas of cultural significance that may be used to affect, inform or refine the draft ACHA.

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In addition, if you would like a hard copy of the draft ACHA posted to you, please request this via the contact details above.

Yours Sincerely

CLEAN TEQ HOLDINGS LIMITED

Bronwyn Flynn
Environment, Approvals & Community Lead

19 March 2021

Sandra Peckham
106 Derribong Road
DANDALOO via TRANGIE NSW 2823

Attention: Sandra Peckham

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT DRAFT REPORT

Dear Sandra,

Please find enclosed for your review, a copy of the draft Aboriginal Cultural Heritage Assessment (ACHA) for the Clean TeQ Sunrise Project – Project Execution Plan Modification.

Review of Draft ACHA

In accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (Department of Environment, Climate Change and Water, 2010), we have provided the draft ACHA for your review and feedback. Your feedback may include the identification of issues or areas of cultural significance that may be used to affect, inform or refine the draft ACHA.

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PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

In addition, if you would like a hard copy of the draft ACHA posted to you, please request this via the contact details above.

Yours Sincerely

CLEAN TEQ HOLDINGS LIMITED

Bronwyn Flynn
Environment, Approvals & Community Lead

19 March 2021

Condobolin Local Aboriginal Land Council
Tim Gumbleton
55 Berry Street
WAGGA WAGGA NSW 2650

Attention: Tim Gumbleton

RE: CLEAN TEQ SUNRISE PROJECT – PROJECT EXECUTION PLAN MODIFICATION ABORIGINAL CULTURAL HERITAGE ASSESSMENT DRAFT REPORT

Dear Tim,

Please find enclosed for your review, a copy of the draft Aboriginal Cultural Heritage Assessment (ACHA) for the Clean TeQ Sunrise Project – Project Execution Plan Modification.

Review of Draft ACHA

In accordance with the *Aboriginal cultural heritage consultation requirements for proponents 2010* (Department of Environment, Climate Change and Water, 2010), we have provided the draft ACHA for your review and feedback. Your feedback may include the identification of issues or areas of cultural significance that may be used to affect, inform or refine the draft ACHA.

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- Any Aboriginal objects or places of cultural value within the Study Area, or issues of cultural significance, that you are aware of.
- Any restrictions or protocols you may consider necessary in relation to any information of sensitivity that you may provide.
- Any other factors you consider to be relevant to the heritage assessment.

All comments received will be taken into consideration as the ACHA is finalised.

Should you wish to provide feedback on the draft ACHA please advise Clean TeQ via the following contact details by **5.00pm on Monday 19 April 2021**:

Bronwyn Flynn
Environment, Approvals and Community Lead
Clean TeQ Sunrise Pty Ltd
0429 066 086
PO Box 92 Parkes NSW 2870
bflynn@cleanteq.com

In addition, if you would like a hard copy of the draft ACHA posted to you, please request this via the contact details above.

Yours Sincerely

CLEAN TEQ HOLDINGS LIMITED

Bronwyn Flynn
Environment, Approvals & Community Lead

APPENDIX 4

CORRESPONDENCE FROM ABORIGINAL COMMUNITY STAKEHOLDERS

STEP 1 CORRESPONDENCE

From: Louise Davis <louise.davis28@hotmail.com>
Sent: Wednesday, 20 January 2021 4:50 PM
To: Bronwyn Flynn <bflynn@cleanteq.com>
Subject: Re: Clean TeQ - Project Execution Plan Modification Aboriginal Cultural Heritage Assessment

Hi Bronwyn,
I have received your email and I will be available when you decide on a date for the site work to commence.
Regards,
Louise Davis

Sent from the Check for Hotmail app

From:	Peter White
To:	Bronwyn Flynn
Subject:	Aboriginal cultural Heritage Assessment
Date:	Monday, 25 January 2021 7:05:52 AM
Attachments:	ATT00001.txt

Both of these are the same organisation, Wiradjuri Landcare holds or insurance and is due to be renewed early February when it will be sent to use. The same committee runs both.

From: Tim Gumbleton <Tim.Gumbleton@rsm.com.au>
Sent: Thursday, 28 January 2021 4:07 PM
To: Ben Stockdale <BStockdale@cleanteq.com>
Cc: Bronwyn Flynn <bflynn@cleanteq.com>
Subject: RE: Clean TeQ - Project Execution Plan Modification Aboriginal Cultural Heritage Assessment [RSM-CLIENT.FID36391394]

Hi Ben,

Thanks for letting me know.

David Carter has no authority in respect of the LALC whatsoever and ceased employment some time ago.

My role is to undertake both management and governance ie I am simultaneously the CEO and the board.

Can you please arrange for the LALC's details to be updated to ensure that no correspondence is issued to Mr Carter.

In terms of the next steps, we are intending to conduct the board election now on 15 February. Do you have any availability around that time to work through the next steps?

Kind regards, Tim

Tim Gumbleton FCA
Principal I Restructuring & Recovery – Regional NSW & Victoria

RSM Australia Pty Ltd
Mobile Corporate Advisory and Formal/Informal Insolvency Services
M: +61 (0) 418 919 882
E: Tim.Gumbleton@rsm.com.au | **W:** www.rsm.com.au

PROPOSED METHODOLOGY

From: Louise Davis <louise.davis28@hotmail.com>
Sent: Monday, 25 January 2021 11:39 AM
To: Bronwyn Flynn <bflynn@cleanteq.com>
Subject: Re: Clean TeQ - Project Execution Plan Modification Aboriginal Cultural Heritage Assessment - Proposed Methodology

Hi Bronwyn,
Yes I received the letter
Kind Regards,
Louise

Sent from the Check for Hotmail app

From: ww.lalc@bigpond.com <ww.lalc@bigpond.com>
Sent: Wednesday, 10 February 2021 1:11 PM
To: Bronwyn Flynn <bflynn@cleanteq.com>
Subject: RE: Clean TeQ - Project Execution Plan Modification Aboriginal Cultural Heritage Assessment - Proposed Methodology

Dear Bronwyn,
I apologise for the delay in responding to your previous email.
We do intend to send a representative to this assessment. Her name is Louise Davis. Phone number: 0458663428. I have forwarded this email to her.
WWLALC has no issues or information in line with the Proposed Methodology.
Thank you for the reminder and we will endeavour to be more prompt with our responses.
Regards,

linton
Linton Howarth
Chief Executive Officer
West Wyalong Local Aboriginal Land Council
(02)69723493, Mob. 0418723498
Yindyamarra

From: ww.lalc@bigpond.com <ww.lalc@bigpond.com>
Sent: Thursday, 11 February 2021 2:51 PM
To: Bronwyn Flynn <bflynn@cleanteq.com>
Subject: RE: Clean TeQ Sunrise - Project Execution Plan Modification Aboriginal Cultural Heritage Assessment - Notification of RAP Involvement

Dear Bron,
Thanks for the correspondence regarding Aboriginal Stakeholders.
Just to note Leeanne Hampton is no longer employed by West Wyalong Local Aboriginal Land Council.
Regards,

linton
Linton Howarth
Chief Executive Officer
West Wyalong Local Aboriginal Land Council
(02)69723493, Mob. 0418723498
Yindyamarra

DRAFT ACHA LETTERS

From:	Bronwyn Flynn
To:	isabel.goolagong
Subject:	RE: Clean TeQ Sunrise Project Execution Plan Modification - Draft Aboriginal Cultural Heritage Assessment
Attachments:	image001.png

Hi Isabel

Thanks for your response. If you have any comments or queries, just send them through to me and I'll take a look. It's a pretty long document though (as they usually are)!!

On your question regarding the Native Title, the company went through a process quite a few years ago when the mining lease application was processed to confirm there was no Native Title interest in any of the land that is the subject of Mining Lease 1770. I wasn't with the company then, so I have limited knowledge myself on this one.

Please let me know if you have any other questions and I'll do my best to answer them.
Kind Regards
Bron

From: isabel.goolagong <isabel.goolagong@gmail.com>
Sent: Monday, 22 March 2021 11:23 AM
To: Bronwyn Flynn <bflynn@cleanteq.com>
Subject: RE: Clean TeQ Sunrise Project Execution Plan Modification - Draft Aboriginal Cultural Heritage Assessment

Hi Bronwyn,

I have received the report and will review asap.

Can you please tell me if there has been a native title put over the mine?

Regards

Isabel

Sent from my Galaxy

From: Bronwyn Flynn
To: Peter White
Subject: RE: Aboriginal cultural heritage assessment draft report

Hi Peter

No problems at all, we have one on its way to you.

Kind Regards
Bron

From: Peter White <Peter.WHITE@justice.nsw.gov.au>
Sent: Thursday, 25 March 2021 7:47 AM
To: Bronwyn Flynn <bflynn@sunriseem.com>
Subject: Aboriginal cultural heritage assessment draft report

Good morning Bronwyn I hope this finds you well.

I would like a hard copy of this please to be sent to
Wiradjuri country farm Lot 156 Bogan Way Gunningbland NSW

Peter White
Wiradjuri Cultural and Environmental Rangers
0477639640

APPENDIX 5

AHIMS REGISTER SEARCH

Note: This appendix contains culturally sensitive material and is available upon request and subject to approval by the NSW Office of Environment and Heritage.

AHIMS Web Services (AWS)
Search Result

Purchase Order/Reference : Trundle

Client Service ID : 574354

LandSkape - Natural & Cultural Heritage Management

Date: 08 March 2021

P O Box 246
Merbein Victoria 3505

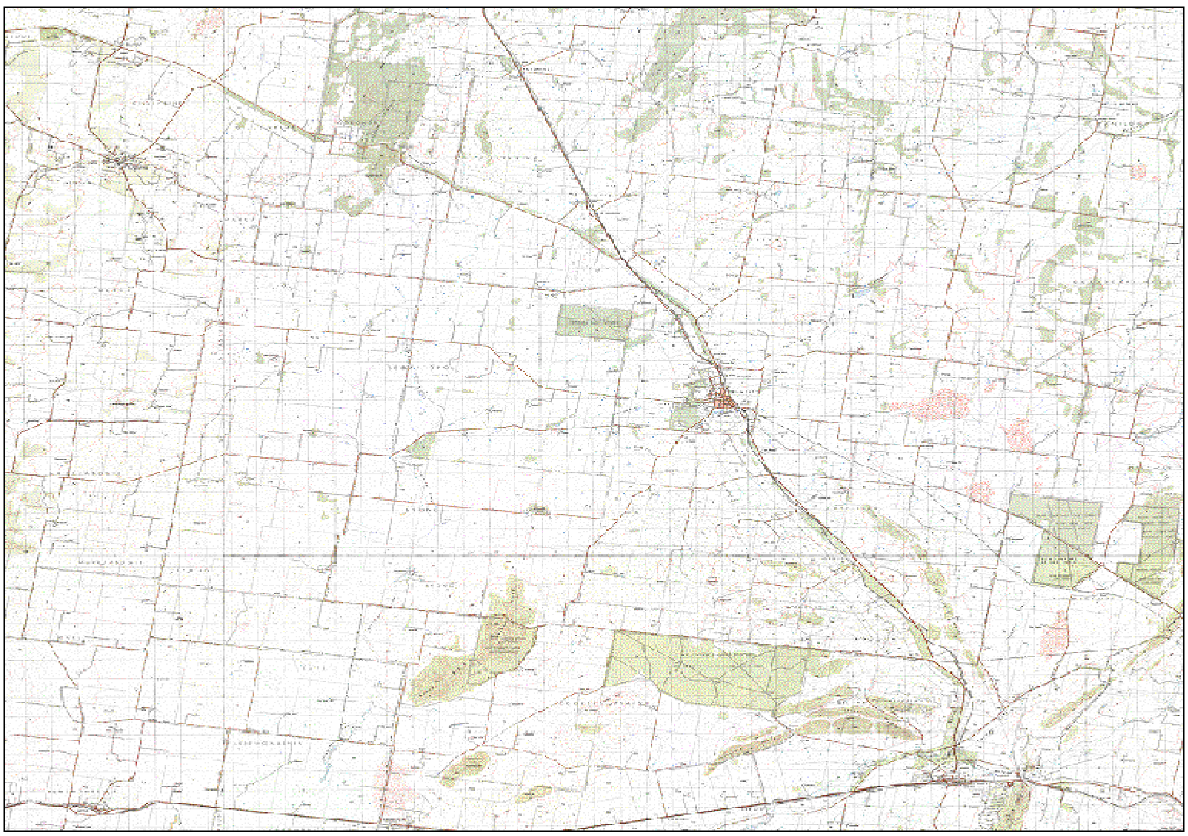
Attention: Matt Cupper

Email: landskape@telstra.com

Dear Sir or Madam:

AHIMS Web Service search for the following area at Datum :GDA, Zone : 55, Eastings : 540000 - 582300, Northings : 6335000 - 6377000 with a Buffer of 1000 meters, conducted by Matt Cupper on 08 March 2021.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

113	**Aboriginal sites are recorded in or near the above location.**
0	**Aboriginal places have been declared in or near the above location. ***

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
35-5-0139	OSA	AGD	55	550970	6371110	Open site	Valid	Artefact : -		
	Contact	Recorders	Craig Wall					Permits		
35-4-0020	CF-ST3	AGD	55	544317	6364125	Open site	Valid	Modified Tree (Carved or Scarred) : 1		100577
	Contact T Russell	Recorders	OzArk Environmental and Heritage Management					Permits		
35-4-0021	CF-ST4	AGD	55	544268	6364143	Open site	Valid	Modified Tree (Carved or Scarred) : 1		100577
	Contact T Russell	Recorders	OzArk Environmental and Heritage Management					Permits		
43-2-0051	Bogan Gate Lagoon	AGD	55	573530	6337713	Open site	Valid	Artefact : -, Hearth : -		
	Contact T Russell	Recorders	Mr.Russell Hill					Permits		
43-2-0052	Bogan Gate Lagoon 2	AGD	55	573536	6337694	Open site	Valid	Artefact : -		
	Contact T Russell	Recorders	Mr.Russell Hill					Permits		
43-2-0053	Bogan Gate Lagoon 3	AGD	55	573514	6337653	Open site	Valid	Artefact : -		
	Contact T Russell	Recorders	Mr.Russell Hill					Permits		
43-2-0054	Bogan Gate Lagoon 4	AGD	55	573538	6337712	Open site	Valid	Artefact : -		
	Contact T Russell	Recorders	Mr.Russell Hill					Permits		
43-2-0060	Restriction applied. Please contact ahims@environment.nsw.gov.au.					Open site	Valid			
	Contact	Recorders	Archaeological Risk Assessment Services (ARAS),Mr.Giles (dup ID#12832) Hamm					Permits		
43-2-0061	Restriction applied. Please contact ahims@environment.nsw.gov.au.					Open site	Valid			
	Contact Dareton Aboriginal Land Coun	Recorders	Archaeological Risk Assessment Services (ARAS),Mr.Giles (dup ID#12832) Hamm					Permits		
35-5-0150	Restriction applied. Please contact ahims@environment.nsw.gov.au.					Open site	Valid			
	Contact Mr.William Bates	Recorders	Archaeological Risk Assessment Services (ARAS),Mr.Giles (dup ID#12832) Hamm					Permits		
35-5-0177	Trundle CR-ST1	GDA	55	564942	6357441	Open site	Valid	Modified Tree (Carved or Scarred) : -		104311
	Contact	Recorders	OzArk Environmental and Heritage Management,Doctor.Alyce Cameron					Permits		
43-2-0011	Yarrabandai;	AGD	55	550102	6336009	Open site	Valid	Modified Tree (Carved or Scarred) : -	Carved Tree	65
	Contact	Recorders	Unknown Author					Permits		
43-2-0012	Black Range;Bogan;	AGD	55	557000	6345000	Closed site	Valid	Art (Pigment or Engraved) : -	Shelter with Art	
	Contact	Recorders	Lindsay Coe					Permits		

Report generated by AHIMS Web Service on 17/03/2021 for Matt Cupper for the following area at Datum :GDA, Zone : 55, Eastings : 540000 - 582300, Northings : 6335000 - 6377000 with a Buffer of 1000 meters. Additional Info : identify previously recorded Aboriginal cultural heritage sites in study area. Number of Aboriginal sites and Aboriginal objects found is 113

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
35-5-0152	Bogan Gate 2	GDA	55	564695	6359961	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	**Recorders**	Mr.Larry Towney,Central Tablelands Local Land Services - Orange					**Permits**		
43-2-0072	Bogan Gate 3	GDA	55	574963	6338485	Open site	Valid	Modified Tree (Carved or Scarred) : -, Water Hole : -		
	Contact	**Recorders**	Mr.Larry Towney,Central Tablelands Local Land Services - Orange					**Permits**		
43-2-0083	Bogan Gate Dam 1	GDA	55	574961	6338498	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	**Recorders**	Mr.Mark Saddler					**Permits**		
43-2-0084	Bogan Gate Dam 2	GDA	55	574966	6338505	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	**Recorders**	Mr.Mark Saddler					**Permits**		
43-2-0085	Bogan Gate Dam 3	GDA	55	574933	6338513	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	**Recorders**	Mr.Mark Saddler					**Permits**		
43-2-0086	Bogan Gate Dam 4	GDA	55	574947	6338544	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	**Recorders**	Mr.Mark Saddler					**Permits**		
43-2-0087	Bogan Gate Dam 5	GDA	55	574954	6338577	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Mr.Mark Saddler					**Permits**		
43-2-0088	Bogan Gate Dam 6	GDA	55	574956	6338573	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	**Recorders**	Mr.Mark Saddler					**Permits**		
43-2-0089	Bogan Gate Dam 7	GDA	55	574993	6338535	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	**Recorders**	Mr.Mark Saddler					**Permits**		
35-5-0172	Gillenbine Creek OS - 1	GDA	55	553608	6370744	Open site	Valid	Artefact : 200		
	Contact	**Recorders**	OzArk Environmental and Heritage Management,Mr.Ben Churcher					**Permits**		
35-5-0173	Gobondry Mountains IF - 1	GDA	55	552916	6370711	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	OzArk Environmental and Heritage Management,Mr.Ben Churcher					**Permits**		
35-5-0174	Gobondry Mountains IF - 2	GDA	55	552735	6370754	Open site	Valid	Artefact : 1		

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
	Contact	Recorders	OzArk Environmental and Heritage Management,Mr.Ben Churcher					Permits		
35-5-0175	Gobondry Mountains OS - 1	GDA	55	552484	6370692	Open site	Valid	Artefact : 3		
	Contact	Recorders	OzArk Environmental and Heritage Management,Mr.Ben Churcher					Permits		
35-5-0176	Gobondry Mountains OS -2	GDA	55	551798	6371276	Open site	Valid	Artefact : 30		
	Contact	Recorders	OzArk Environmental and Heritage Management,Mr.Ben Churcher					Permits		
35-3-0114	Trundle Road	AGD	55	568000	6368500	Open site	Valid	Modified Tree (Carved or Scarred) : 1	Scarred Tree	
	Contact	Recorders	Warren Bluff					Permits		
35-3-0110	Trundle Road;	AGD	55	581900	6377500	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	
	Contact	Recorders	Warren Bluff					Permits		
35-3-0111	Trundle Road;	AGD	55	577500	6367900	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	
	Contact	Recorders	Warren Bluff					Permits		
35-3-0112	Trundle Road;	AGD	55	572500	6368000	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	
	Contact	Recorders	Warren Bluff					Permits		
35-3-0113	Trundle Road;	AGD	55	578900	6368500	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	
	Contact	Recorders	Warren Bluff					Permits		
35-4-0015	SYERSTON 1	AGD	55	539570	6375950	Open site	Valid	Artefact : -		97529
	Contact	Recorders	Mr.John Appleton					Permits	4165	
35-5-0151	Gobondery Springs	GDA	55	551980	6371292	Open site	Valid	Aboriginal Ceremony and Dreaming : -, Water Hole : -		
	Contact	Recorders	Mr.Larry Towney,Central Tablelands Local Land Services - Orange					Permits		
36-4-0132	Kingsdale Artefact 2	GDA	55	541605	6373200	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Doctor.Matt Cupper,Doctor.Matt Cupper,LandSkape - Natural & Cultural Heritage M					Permits	4165	
35-5-0170	The Troffs Isolated Artefact 2	GDA	55	558576	6363906	Open site	Valid	Artefact : -		
	Contact	Recorders	Doctor.Matt Cupper,LandSkape - Natural & Cultural Heritage Management					Permits	4165	
35-5-0171	The Troffs Isolated Artefact 1	GDA	55	558586	6364019	Open site	Valid	Artefact : -		
	Contact	Recorders	Doctor.Matt Cupper,LandSkape - Natural & Cultural Heritage Management					Permits	4165	
35-4-0024	Kingsdale Artefact 1	GDA	55	541601	6373077	Open site	Destroyed	Artefact : -		

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
	Contact	Recorders	Doctor.Matt Cupper,Doctor.Matt Cupper,LandSkape - Natural & Cultural Heritage M					Permits	4165	
35-4-0029	Fifield Scarred Tree 1	GDA	55	539945	6371468	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Doctor.Matt Cupper,LandSkape - Natural & Cultural Heritage Management					Permits	4165	
35-4-0031	Kingsdale Isolated Artefact 1	GDA	55	541176	6372773	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Doctor.Matt Cupper,Doctor.Matt Cupper,LandSkape - Natural & Cultural Heritage M					Permits	4165	
35-4-0032	Kingsdale Isolated Artefact 2	GDA	55	540981	6373561	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Doctor.Matt Cupper,Doctor.Matt Cupper,LandSkape - Natural & Cultural Heritage M					Permits	4165	
35-5-0153	Gillenbine scar tree #1	GDA	55	552188	6370681	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Ms.Jodielyn Edge,Doctor.Sarah Martin					Permits		
35-5-0154	Gillenbine scar tree #2	GDA	55	552239	6370650	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Ms.Jodielyn Edge,Doctor.Sarah Martin					Permits		
35-5-0155	Gillenbine scar tree #3	GDA	55	552235	6370637	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Ms.Jodielyn Edge,Doctor.Sarah Martin					Permits		
35-5-0156	Gillenbine scar tree #4	GDA	55	552179	6370614	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Ms.Jodielyn Edge,Doctor.Sarah Martin					Permits		
35-5-0157	Gillenbine scar tree #5	GDA	55	552161	6370622	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Ms.Jodielyn Edge,Doctor.Sarah Martin					Permits		
35-5-0158	Gillenbine scar tree #6	GDA	55	552166	6370632	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Ms.Jodielyn Edge,Doctor.Sarah Martin					Permits		
35-5-0159	Gillenbine scar tree #7	GDA	55	552196	6370715	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Doctor.Sarah Martin					Permits		
35-5-0160	Trundle Land Care 10	GDA	55	565169	6356519	Open site	Valid	Modified Tree (Carved or Scarred) : -		

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
	Contact	Recorders	Mr.Mark Saddler					Permits		
35-5-0161	Trundle Land Care 8	GDA	55	565065	6356148	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Mr.Mark Saddler					Permits		
35-5-0162	Trundle Land Care 7	GDA	55	564875	6356117	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Mr.Mark Saddler					Permits		
35-5-0163	Trundle Land Care 6	GDA	55	564875	6356113	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Mr.Mark Saddler					Permits		
35-5-0164	Trundle Land Care 5	GDA	55	564812	6356135	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Mr.Mark Saddler					Permits		
35-5-0165	Trundle Land Care 4	GDA	55	564764	6356349	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Mr.Mark Saddler					Permits		
35-5-0166	Trundle Land Care 3	GDA	55	565080	6356188	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Mr.Mark Saddler					Permits		
35-5-0167	Trundle Land Care 2	GDA	55	565081	6356188	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Mr.Mark Saddler					Permits		
35-5-0168	Trundle Land Care 1	GDA	55	565142	6356220	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Mr.Mark Saddler					Permits		
35-5-0169	Trundle Land Care 9	GDA	55	565053	6356126	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Mr.Mark Saddler					Permits		
43-2-0207	SWWNR - West Cookeys Plains Artefact 3	GDA	55	558054	6342685	Open site	Valid	Artefact : -		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
43-2-0208	SWWNR - West Cookeys Plains Artefact 4	GDA	55	558034	6342824	Open site	Valid	Artefact : -		104334

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
43-2-0209	SWWNR - West Cookeys Plains Artefact 5	GDA	55	558034	6342826	Open site	Valid	Artefact : -		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
35-5-0178	SWWNR - Blow Clear West Scarred Tree 5	GDA	55	578121	6351771	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
35-5-0179	SWWNR - Blow Clear West Scarred Tree 6	GDA	55	577349	6351817	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
35-5-0180	SWWNR - Blow Clear West Scarred Tree 7	GDA	55	577325	6351691	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
35-5-0181	SWWNR - Blow Clear West Scarred Tree 8	GDA	55	577429	6350914	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
35-5-0182	SWWNR - Blow Clear West Scarred Tree 9	GDA	55	577716	6350955	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
35-5-0183	SWWNR - Blow Clear West Scarred Tree 10	GDA	55	577847	6351145	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
35-5-0184	SWWNR - Blow Clear West Scarred Tree 11	GDA	55	577788	6351115	Open site	Valid	Modified Tree (Carved or Scarred) : -		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
35-5-0185	SWWNR - Blow Clear West Scarred Tree 12	GDA	55	577861	6351325	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
35-5-0196	SWWNR - Blow Clear West Scarred Tree 23	GDA	55	577933	6350918	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
35-5-0197	SWWNR - Blow Clear West Scarred Tree 24	GDA	55	577905	6351015	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
35-5-0198	SWWNR - Blow Clear West Scarred Tree 25	GDA	55	577933	6351079	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
35-5-0199	SWWNR - Blow Clear West Scarred Tree 26	GDA	55	577855	6351328	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
35-5-0200	SWWNR - Blow Clear West Scarred Tree 27	GDA	55	577610	6351856	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
35-5-0201	SWWNR - Blow Clear West Scarred Tree 28	GDA	55	577427	6351880	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
35-5-0202	SWWNR - Blow Clear West Scarred Tree 29	GDA	55	578176	6351766	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
35-5-0203	SWWNR - Bow Clear West Scarred Tree 30	GDA	55	578298	6351744	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
35-5-0204	SWWNR - Bow Clear West Scarred Tree 31	GDA	55	578355	6351760	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
35-5-0205	SWWNR - Blow Clear West Scarred Tree 32	GDA	55	578711	6350650	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
35-5-0206	SWWNR - Blow Clear West Scarred Tree 33	GDA	55	578681	6350576	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
35-5-0207	SWWNR - Blow Clear West Scarred Tree 34	GDA	55	578241	6350304	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	**Recorders**	Condobolin Local Aboriginal Land Council					**Permits**		
35-5-0208	SWWNR - Blow Clear West Scarred Tree 35	GDA	55	578056	6350451	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	**Recorders**	Condobolin Local Aboriginal Land Council					**Permits**		
43-2-0205	SWWNR - West Cookeys Plains Artefact	GDA	55	556829	6345241	Open site	Valid	Artefact : -		104334
	Contact	**Recorders**	Condobolin Local Aboriginal Land Council					**Permits**		
43-2-0206	SWWNR - West Cookeys Plains Artefact 2	GDA	55	558041	6342692	Open site	Valid	Artefact : -		104334
	Contact	**Recorders**	Condobolin Local Aboriginal Land Council					**Permits**		
35-5-0186	SWWNR - Blow Clear West Scarred Tree 13	GDA	55	577754	6350746	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	**Recorders**	Condobolin Local Aboriginal Land Council					**Permits**		
35-5-0187	SWWNR - Blow Clear West Scarred Tree 14	GDA	55	577482	6350911	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	**Recorders**	Condobolin Local Aboriginal Land Council					**Permits**		
35-5-0188	SWWNR - Blow Clear West Scarred Tree 15	GDA	55	577482	6350851	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	**Recorders**	Condobolin Local Aboriginal Land Council					**Permits**		
35-5-0189	SWWNR - Blow Clear West Scarred Tree 16	GDA	55	577506	6350867	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	**Recorders**	Condobolin Local Aboriginal Land Council					**Permits**		
35-5-0190	SWWNR - Blow Clear West Scarred Tree 17	GDA	55	577674	6350757	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	**Recorders**	Condobolin Local Aboriginal Land Council					**Permits**		
35-5-0191	SWWNR - Blow Clear West Scarred Tree 18	GDA	55	577745	6350708	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	**Recorders**	Condobolin Local Aboriginal Land Council					**Permits**		
35-5-0192	SWWNR - Blow Clear West Scarred Tree 19	GDA	55	577764	6350700	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	**Recorders**	Condobolin Local Aboriginal Land Council					**Permits**		

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
35-5-0193	SWWNR - Blow Clear West Scarred Tree 20	GDA	55	577951	6350536	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
35-5-0194	SWWNR - Blow Clear West Scarred Tree 21	GDA	55	578012	6350686	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
35-5-0195	SWWNR - Blow Clear West Scarred Tree 22	GDA	55	577998	6350776	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
43-2-0210	SWWNR - West Cookeys Plains Artefact 6	GDA	55	557948	6342588	Open site	Valid	Artefact : -		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
43-2-0211	SWWNR - West Cookeys Plains Artefact 7	GDA	55	558054	6342688	Open site	Valid	Artefact : -		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
43-2-0212	SWWNR - West Cookeys Plains Artefact 8	GDA	55	556856	6343243	Open site	Valid	Artefact : -		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
43-2-0213	SWWNR - West Cookeys Plains Scarred Tree	GDA	55	557160	6345446	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
43-2-0214	SWWNR - West Cookeys Plains Scarred Tree 2	GDA	55	557103	6345492	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
43-2-0215	SWWNR - West Cookeys Plains Scarred Tree 3	GDA	55	557147	6345502	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
43-2-0216	SWWNR - West Cookeys Plains Scarred Tree 4	GDA	55	558562	6343901	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
43-2-0217	SWWNR - West Cookeys Plains Scarred Tree 5	GDA	55	558575	6343889	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : Trundle

Client Service ID : 574354

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
43-2-0218	SWWNR - West Cookeys Plains Scarred Tree 6	GDA	55	558583	6343714	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
43-2-0219	SWWNR - West Cookeys Plains Scarred Tree 7	GDA	55	558712	6343778	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
43-2-0220	SWWNR - West Cookeys Plains Scarred Tree 8	GDA	55	558693	6344159	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
43-2-0221	SWWNR - West Cookeys Plains Scarred Tree 9	GDA	55	558621	6344082	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
43-2-0222	SWWNR - West Cookeys Plains Scarred Tree 10	GDA	55	558600	6344047	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
43-2-0223	SWWNR - West Cookeys Plains Scarred Tree 11	GDA	55	558559	6344043	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
43-2-0224	SWWNR - West Cookeys Plains Scarred Tree 12	GDA	55	558598	6343592	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
43-2-0225	SWWNR - West Cookeys Plains Scarred Tree 13	GDA	55	556829	6345241	Open site	Valid	Modified Tree (Carved or Scarred) : 1		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		
35-5-0209	St Pats School Tree	GDA	55	565915	6357198	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Mr.Mark Saddler					Permits		
43-2-0199	SWWNR - Blow Clear West Scarred Tree	GDA	55	582910	6346120	Open site	Valid	Hearth : -		104334
	Contact	Recorders	Condobolin Local Aboriginal Land Council					Permits		

Report generated by AHIMS Web Service on 17/03/2021 for Matt Cupper for the following area at Datum :GDA, Zone : 55, Eastings : 540000 - 582300, Northings : 6335000 - 6377000 with a Buffer of 1000 meters. Additional Info : identify previously recorded Aboriginal cultural heritage sites in study area. Number of Aboriginal sites and Aboriginal objects found is 113

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
43-2-0202	SWWNR - Blow Clear West Scarred Tree 4	GDA	55	581920	6346962	Open site	Valid	Modified Tree (Carved or Scarred) : -		104334
	Contact	**Recorders**	Condobolin Local Aboriginal Land Council					**Permits**		

APPENDIX 6

CADASTRE INFORMATION

LEGEND

Railway

Existing 11 kV Electricity Transmission Line

Existing 22 kV Electricity Transmission Line

Approved Project

Surface Development Area

Scotson Lane Upgrade

Modified Project

Surface Development Area

Scotson Lane Upgrade Extension

22 kV Electricity Transmission Line (Subject to Separate Approval)

Land Tenure

Sunrise Energy Metals Owned Land

Other

Source: Black Range Minerals (2000); NSW Spatial Services (2020); Clean Teq (2017, 2018, 2020).
Orthophoto: © NSW Department of Finance, Services & Innovation (2020)

sunrise energy metals

S U N R I S E P R O J E C T

Cadastral Information

Figure A6-1

CTL-20-08_ACHA_203A

sunrise
energy metals

w w w . s u n r i s e e m . c o m

Sunrise Project

Project Execution Plan Modification

Appendix H

Land Contamination Assessment

Ground Doctor Pty Ltd

Stage 1 Land Contamination Assessment
Sunrise Project Modified Rail Siding

~

Part of 193 Scotson Lane
Trundle, NSW

~

On Behalf Of:
SRL Ops Pty Ltd

17 May 2021

2021-GD006-RP1-FINAL

DOCUMENT CONTROLS

Project Details	
Project Number:	2021-GD006-RP1
Project /Document Title:	Stage 1 Land Contamination Assessment Sunrise Project Modified Rail Siding Part of 193 Scotson Lane, Trundle, NSW

Report Details	
Prepared For:	SRL Ops Pty Ltd ABN: 21 008 755 155 Level 6 350 Collins Street Melbourne VIC 3000 Attention: Ms Bronwyn Flynn Ph: 0429 066 086 bflynn@sunriseem.com
Prepared By:	Ground Doctor Pty Ltd ABN: 32 160 178 656 PO Box 6278 22 Tamworth Street Dubbo NSW 2830 Ph: 0407 875 302 admin@grounddoc.com.au
Approved By:	Mr James Morrow Environmental Engineer Certified Environmental Practitioner No.: 1194 Site Contamination Specialist No.: SC41087
Review Date:	25 June 2021
File Name:	2021-GD006-RP1-FINAL
Report Status:	FINAL
Reports Issued:	Electronic PDF – Draft Report – 16 March 2021 Electronic PDF – Draft Report 2 – 6 May 2021 Electronic PDF – Draft Report 3 – 7 May 2021 Electronic PDF – Final Report – 17 May 2021 Electronic PDF – Final Report – 25 June 2021

TABLE OF CONTENTS

LIST OF ANNEXURES

1 Introduction

The Sunrise Project (the Project) is a nickel, cobalt and scandium open cut mining project situated near the village of Fifield, approximately 350 kilometres west-northwest of Sydney, in New South Wales (NSW). SRL Ops Pty Ltd owns the rights to develop the Project. SRL Ops Pty Ltd is a wholly owned subsidiary of Sunrise Energy Metals Limited (SEM)[11].

Development Consent (DA 374 11 00) for the Project was issued under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) in 2001. Six modifications to Development Consent (DA 374 11 00) have since been granted under the EP&A Act.

SEM has continued to review and optimise the Project design, construction and operation as part of preparations for the Project execution. The outcomes of this review are outlined in the Project Execution Plan (Clean TeQ, 2020).

The Project Execution Plan Modification (the Modification) includes the implementation of Project changes identified in the Project Execution Plan to optimise the construction and operation of the Project. The Project Execution Plan identified a number of changes to the approved mine and processing facility, accommodation camp, rail siding and road transport activities. The Modification would include the following changes to the rail siding:

- revised rail siding location and layout;
- addition of an ammonium sulphate storage and distribution facility to the rail siding;
- extension of the Scotson Lane road upgrade;
- addition of a 22 kV ETL (subject to separate approval) to the rail siding power supply; and
- increased peak operational phase workforce from approximately five to approximately 10 personnel.

Ground Doctor was commissioned by SEM to conduct a Stage 1 Preliminary Investigation of the Modified Rail Siding Site (part of Lot 1 of DP 630504), Scotson Lane, Trundle, NSW (the Study Area). The Study Area is shown on *Figure 1*.

This Stage 1 Preliminary Investigation has been prepared in accordance with clause 7 of the NSW *State Environmental Planning Policy No 55 – Remediation of Land* (SEPP 55), *Managing Land Contamination Planning Guidelines SEPP 55 – Remediation of Land* (Department of Urban Affairs and Planning and Environment Protection Authority, 1998) and the NSW Environment Protection Authority (EPA) (2020a) *Consultants reporting on contaminated land – Contaminated Land Guidelines.*

1.1 Statutory Considerations

The SEPP 55 applies to the whole of NSW and is concerned with the remediation of contaminated land. It sets out matters relating to contaminated land that a consent authority must consider in determining an application for development consent.

[1] SEM was previously Clean TeQ Holdings Limited (Clean TeQ).

Clause 7(1) of SEPP 55 provides that a consent authority must not consent to the carrying out of any development on land unless:

(a) it has considered whether the land is contaminated, and

(b) if the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for the purpose for which the development is proposed to be carried out, and

(c) if the land requires remediation to be made suitable for the purpose for which the development is proposed to be carried out, it is satisfied that the land will be remediated before the land is used for that purpose.

Clause 7 of SEPP 55 further provides:

(2) Before determining an application for consent to carry out development that would involve a change of use on any of the land specified in subclause (4), the consent authority must consider a report specifying the findings of a preliminary investigation of the land concerned carried out in accordance with the contaminated land planning guidelines.

(3) The applicant for development consent must carry out the investigation required by subclause (2) and must provide a report on it to the consent authority. The consent authority may require the applicant to carry out, and provide a report on, a detailed investigation (as referred to in the contaminated land planning guidelines) if it considers that the findings of the preliminary investigation warrant such an investigation.

(4) The land concerned is—

(a) land that is within an investigation area,

(b) land on which development for a purpose referred to in Table 1 to the contaminated land planning guidelines is being, or is known to have been, carried out…

As set out above, clause 7(2) provides that, before a consent authority determines an application for development consent, a "preliminary investigation" is required where:

- the application for consent to carry out development that would involve a "change of use"; and
- that "change of use" is relevant to certain land specified in clause 7(4).

1.2 Stage 1 Preliminary Investigation Objectives

The objective of this Stage 1 Preliminary Investigation is to address the matters referred to in clause 7 of SEPP 55, in particular:

- whether the land within the Study Area is contaminated;
- if the land within the Study Area is contaminated, whether the land is suitable in its contaminated state (or will be suitable, after remediation) for the modified rail siding; and
- if the land within the Study Area requires remediation to be made suitable for the purpose for which the modified rail siding is proposed to be carried out, whether the land will be remediated before the land is used for that purpose.

The objectives of the Stage 1 Preliminary Investigation undertaken for the Study Area were to:

- identify past and present land uses within the Study Area and within adjoining land;
- identify potential sources of land contamination associated with past or present use of the Study Area and adjoining land, and identify the associated potential contaminants of concern;

- assess the setting, and subsurface conditions at the Study Area and the surrounding environment to identify potential human health and environmental receptors;

- collect preliminary data to assess the potential for significant contamination to exist within the Study Area; and

- use the previously mentioned information to assess the suitability of the Study Area for the proposed commercial/industrial development.

1.3 Scope of Work

To achieve the objectives outlined above, Ground Doctor completed the following work:

- Conducted an inspection of the Study Area to establish current conditions, surrounding land uses and potential human and environmental receptors located within or close to the Study Area.

- Reviewed and presented aerial photography of the Study Area dated 1958, 1966, 1974, 1983, 1992, 1996, 2001, 2004 and 2019 (*Annexure B*).

- Reviewed available Parkes Shire Council records related to the assessment area.

- Interviewed former landholders to obtain information related to previous uses with particular focus on the use of the Study Area.

- Obtained land titles records for the Study Area spanning the period 1915 to 2021, which outlined historical property transactions and property ownership records (*Annexure C*).

- Conducted a search of NSW EPA database for notices pertaining to the Study Area under the *Contaminated Land Management Act 1997*.

- Conducted a search of the NSW EPA public register of licences, applications and notices made under the *Protection of the Environment Operations Act 1997* (POEO Act), or records of NSW EPA regulated activities that do not require a license, related to the Study Area.

- Conducted a search of the WaterNSW registered groundwater works database to identify groundwater works located within 1 km of the Study Area.

- Conducted a search of the NSW SafeWork dangerous goods licensing database for records of dangerous goods storage within the Study Area (*Annexure D*).

- Obtained and reviewed the Section 10.7 (2) and (5) Planning Certificate for the Study Area to identify any issues relating to potential land contamination (*Annexure F*).

- Reviewed available soil and geology maps to assess subsurface conditions within the Study Area.

- Identified relevant human health and environmental risk pathways based on the proposed future use of the Study Area and identified potential contaminants of concern.

- Used all of the reviewed data to prepare a sampling and analytical plan for a preliminary surface soil assessment.

- Collected near surface soil samples at seven locations within the Study Area to assess identified potential sources of contamination within the Study Area (*Figure 2 of Annexure A)*.

- Sub-contracted an analytical laboratory to analyse the seven near surface soil samples for the identified contaminants of concern.

- Developed a CSM using the site history, the site setting, preliminary soil data and the proposed future land use. The CSM was used to assess the suitability of the assessment area for the proposed Modified Rail Siding.

- Used the information obtained from the works listed above to make conclusions regarding the suitability of the Study Area for the proposed commercial / industrial use.

- Prepared this report outlining the findings of the Stage 1 Preliminary Investigation.

1.4 The Modified Rail Siding

The general arrangement of the modified rail siding would include the following main components (*Figure 3* of *Annexure A)*:

- rail spur2;
- site access point and internal roads;
- truck parking/loading/unloading hardstand areas;
- container storage hardstand areas;
- ammonium sulphate storage and distribution facility;
- site offices, ablution facilities, sewage system and car parking;
- equipment storage area;
- weighbridge;
- fuel storage area;
- water storage tanks;
- telecommunications;
- sediment dams, clean water diversions, runoff collection drains and other water management equipment and structures;
- landscaping and perimeter fencing; and
- other associated minor infrastructure, plant, equipment and activities.

The proposed use would be regarded as commercial / industrial in the context of this Stage 1 Preliminary Investigation.

[2] The rail spur may not be required depending on other rail operations on the Tottenham to Bogan Gate Railway.

2 Study Area Description

2.1 The Study Area

The Study Area is located within part of 193 Scotson Lane, Trundle, NSW. The Study Area occupies part of Lot 1 DP 630504 (*Figure 4 of Annexure A)*. The extent of the Study Area is shown relative to surrounding features in *Figure 1* of *Annexure A*.

The Study Area has an area of approximately 8.3 hectares (ha).

The *Parkes Local Environment Plan 2012* (Parkes LEP) indicates that the Study Area is zoned "RU1-Primary Production".

The Study Area details are summarised in *Table 1*.

Table 1: Summary of Study Area Details

	Description
Street Address:	Part of "Moomalong" 193 Scotson Lane, Trundle, NSW, 2875
Lot and DP Number:	Part of Lot 1 DP 630504
Area	8.3 ha
Local Government Area:	Parkes Shire Council
Zoning	RU1 – Primary Production
Geographical Coordinates (MGA94 Zone 55):	East 564110 North 6362250 (Approximate Study Area Centre)

The modified rail siding extends into the adjacent Bogan Gate to Tottenham Railway corridor to allow movement of trains into the rail siding. Ground Doctor did not assess parts of the modified rail siding within the railway corridor as the rail siding would not change use of the corridor. Similarly, a small part of the modified rail siding extends into the Scotson Lane road reserve. Development in this area is largely restricted to vehicle access, which would not represent a change of use.

2.2 Study Area Layout and Features

A Study Area inspection was conducted by Mr James Morrow of Ground Doctor on 25 February 2021. Photographs of the Study Area taken during the Study Area Inspection are presented as *Annexure E*.

The Study Area was predominantly cleared open space that appeared to have been for livestock grazing and growing of fodder crops. Some shrubs and small trees were present in the northern parts of the Study Area. Ground Doctor did not identify any evidence of existing or previous infrastructure with the exception of post and wire paddock fencing.

2.3 Adjoining Land-use

At the time of the Study Area inspection, land uses adjoining the Study Area were as follows.

- The Study Area (8.3 ha) is part of a larger property ("Moomalong" approx. 34.5 ha). The house and outbuildings of the property are situated approximately 350 m north-west of the Study Area. The remainder of the Moomalong Property to the north-west and south-east of the Study Area is predominantly cleared open space that has been used for cropping and/or grazing of livestock.

- Scotson Lane is located on the north-east side of the Study Area. Land to the east of the road contains a travelling stock reserve (TSR) that is wooded with native vegetation. Agricultural land situated east of the TSR is used for cropping and/or grazing of livestock.

- The Bogan Gate to Tottenham Railway is located adjacent to the south western boundary of the Study Area. The railway consists of a single track that is surrounded by vacant open space. The Bogan Way is located to the south-west of the Bogan Gate to Tottenham Railway. Land to the south-west of The Bogan Way is used for cropping and/or grazing of livestock.

2.4 Topography and Hydrology

A digital elevation model (DEM) based on Lidar survey data collected on a 2 m grid was used to plot elevation contours of the Study Area and surrounds (Figure 1). DEM data was obtained from the Australia and New Zealand Intergovernmental Committee on Survey and Mapping "ELVIS" website (https://elevation.fsdf.org.au/, 2 March 2021).

The surface contours for the Study Area and surrounds are presented as *Figure 1* of *Annexure A*.

The Study Area has a gentle gradient (approximately 1-2%) from north-west to south-east. The Study Area elevation ranges from approximately 264 m Australian Height Datum (AHD) along the north-west boundary to approximately 259 m AHD at the south-east boundary.

There was no evidence of major earthworks within the Study Area.

The Study Area generally drains to a small dam located approximately 220 m south-east of the Study Area situated on an unnamed drainage line within the Moomalong Property. The unnamed drainage lines catchment originates approx. 8 km to the north west of the Study Area and drains in a south westerly direction toward Yarrabandai Creek (approximately 12 km south west of the Study Area). Yarrabandai Creek flows in a south westerly direction into the Goobang Creek and Lachlan River.

2.5 Geology

The Geological Survey of NSW (1997) "*Narromine" 1:250,000 Geological Series Sheet SI55-3*" indicates that the Study Area is situated on "*Edols Conglomerate*", which is described as "*mass flow polymictic conglomerate and massive to planar bedded medium grained sandstone*". The geology sheet indicates that the Edols Conglomerate is obscured by residual soils.

2.6 Soil Landscape

Ground Doctor reviewed online soil mapping (NSW Government eSpade, 15 March 2021) for information on soil types within the Study Area. There was no soil landscape mapping available for the Study Area.

'Great soil groups' mapping (NSW Government eSpade, 15 March 2021) indicated the Study Area is within an area of "Earthy Sands", which are described as "a mainly sandy soil with an earthy fabric and little texture differentiation from topsoil to subsoil". Soil and land capability mapping indicates the Study Area is of 'moderate to severe limitations' (Class 4) (NSW Government eSpade, 15 March 2021).

Acid Sulphate Soil Risk Mapping (NSW Government eSpade. 15 March 2021) indicates the Study Area is situated in an area with low probability of containing acid sulphate soils.

2.7 Hydrogeology

Ground Doctor conducted a search of the WaterNSW registered groundwater works database (https://realtimedata.waternsw.com.au/water.stm, 15 March 2021) for registered groundwater works located within 1 km of the Study Area. No registered groundwater works were identified within 1 km of the Study Area.

The nearest registered groundwater work GW027932, is located approximately 1.1 km south of the Study Area (Figure 1). The work summary form for GW027932 indicates that the groundwater work is a bore registered for stock watering. The bore is recorded as being 61 m deep and intersected groundwater in shale at a depth of approximately 55 m below ground level. The recorded standing water level was 24.4 m below ground level.

The relative absence of groundwater bores in the vicinity of the Study Area, combined with a low yield (0.24L/second for GW027932) suggests that water quality and yields are likely to be marginal and only suitable for stock watering.

2.8 Sensitive Environments

The nearest identified sensitive environment to the modified rail siding is a small dam and unnamed drainage line located approximately 220 m to the south-east of the Study Area.

The nearest residence is located approximately 350 m north-west of the Study Area and is SEM owned.

The nearest registered groundwater work (GW027932) was located approximately 1.1 km to the south of the Study Area. No other registered groundwater works were located within 2 km of the Study Area.

3 Study Area History and Relevant Information

3.1 *Aerial Photography Review*

Ground Doctor reviewed aerial photographs of the Study Area dated 1958, 1966, 1974, 1983, 1992, 1996, 2001, 2004 and 2019. The photographs reviewed are presented as *Annexure B.*

3.1.1 The Study Area

The aerial photograph record over the Study Area commences in 1958. The 1958 photograph the Study Area depicts a lot which is partially cleared open space and partially wooded. Vegetation which appears to be woody scrub is present north-west to south-east across the centre of the Study Area which may be associated with a potential minor drainage line. The Study Area appears to be used for livestock grazing.

The Study Area appears mostly unchanged in the 1966 aerial photograph. The open areas around the remaining vegetation appears to be used for fodder cropping.

In the 1974 aerial photograph the Study Area has been cleared of all remaining woody vegetation, and the abovementioned potential minor drainage line (1958) appears to be no longer present. The Study Area appeared to be used for cropping. The Study Area is cleared open space in the 1983, 1992 and 1996 aerial photos.

In the 2001, 2004 and 2019 aerial photographs, the Study Area remains cleared open space with the exception of gradual re-establishment of some woody scrub and small trees in the northern corner of the Study Area. In the 2019 aerial photograph, the southern portion of the Study Area appears to be used for fodder cropping whilst the northern portion appears to be used for livestock grazing only. The gradual reestablishment of woody scrub in the northern portion of the Study Area suggests that only the southern portion was cropped in later years.

There is no infrastructure visible within the Study Area in any of the aerial photographs with the exception of post and wire paddock fencing.

3.1.2 Adjacent Land Use

The Bogan Gate to Tottenham Railway is present at the south western boundary in all photographs reviewed. The Bogan Way is not present in the 1958 aerial photograph. The Bogan Way is first visible in the 1974 aerial photograph and is present in all subsequent aerial photographs.

A road is visible along the north eastern boundary in all historic aerial photographs in the present day location of Scotson Lane. Scotson Lane is believed to have been the main road between Trundle and Tullamore, prior to the construction of The Bogan Way sometime preceding to the 1974 aerial photograph.

The travelling stock reserve is visible on the north east side of Scotson Lane in all aerial photographs.

All other surrounding land appears to be used for livestock grazing and/or fodder cropping in all aerial photographs. There is no major infrastructure present in adjacent land with the exception of the Bogan Gate to Tottenham Railway.

3.2 *Council Records*

Ground Doctor spoke to Ms Alana Ryan of Parkes Shire Council on Friday 12 February 2021 to request a search of available property files for address associated with the Study Area (Section 2.1).

Alana Ryan searched the Council property file record database during the phone call and indicated that there were no records for the address associated with the Study Area within Council records, which dated back to 1974.

3.3 Land Title Records

A search of land titles records was undertaken by Advanced Legal Searchers on behalf of Ground Doctor. The search retrieved property records dating back to 1915. Results of the search are presented as *Annexure C*.

Land now described as Lot 1 DP 630504 was originally comprised of two larger parcels of land which spanned from Scotson Lane in the north east, up to 1 km south-west of the Bogan Gate to Tottenham Railway. One of the original parcels of land was wholly outside the Study Area. In 1983, parts of the two parcels of land north east of the Bogan Gate to Tottenham Railway were amalgamated into Lot 1 DP 630504. At the same time land on the south eastern side of the Bogan Gate to Tottenham Railway was given a new title.

The history of property ownership of land within the Study Area, as recorded in the land title search results (*Annexure C*), is summarised in *Table 2*.

Table 2: Summary of Study Area Historical Ownership

Period	Study Area Owner / Lease Details
Lot 1 DP 630504	
2018 – to date	SRL Ops Pty Ltd *(ACN 008 755 155)*
2007 – 2018	Colin Rupert Grinter Valda Ruth Grinter
1996 – 2007	Graeme Anders Stephensen
1990 – 1996	Leslie Beaumont Miell, motor mechanic Elizabeth Adriana Miell, his wife
1988 – 1990	William Edward Ford
Lot 1 DP 630504 – CTVol 15024 Fol 217	
1983 – 1988	William Edward Ford
1979 – 1983	Terrence John Green, farmer
Portion 94 Parish Trundle – Area 231 Acres 3 Roods 30 Perches – CTVol 8047 Fol 20	
1979 – 1979	Terrence John Green, farmer
1977 – 1979	James Frederick Fitzsimmons, farmer Dorothy Fitzsimmons, his wife
1967 – 1977	Jeffery Bertram Frogley, farmer
1967 – 1967	Percival Oscar Fleming, farmer
1960 – 1967	Rural Bank of New South Wales, grantee *(Percival Oscar Fleming, farmer, mortgagor)*
Portion 94 Parish Trundle – Area 231 Acres 3 Roods 30 Perches	
Prior – 1960	Crown Land
(1927 – 1960)	*(Conditional Purchase 1927/7 Parkes)*

The land was owned by SEM at the time of Assessment.

Land within the Study Area was Crown Land until 1960 but had a conditional purchase over it suggesting it was most likely occupied prior to 1960.

Recorded occupations of previous owners of the Study Area included farmer, and motor mechanic. Aerial photographs of the Study Area taken in the period 1990-1996 (when the Study Area was owned by a "motor mechanic") show no evidence to suggest the Study Area or the immediate surrounds were used to maintain or store motor vehicles.

3.4 Interview with Former Land Owner

Ground Doctor conducted an informal interview by telephone with the former owner, Ms Ruth Grinter, on 25 February 2021.

Ruth Grinter indicated that her and her husband Colin Grinter had used the property to graze a small number of livestock which included up to 20 cows, 60 sheep or 60 goats at any one time. There was no formal livestock pest treatment area. Livestock were penned and treated for pests in a small laneway (paddock) adjacent to Scotson Lane in an area located to the north-west of the Study Area.

Ruth Grinter indicated that the previous owners had used to property to keep horses.

Ruth Grinter indicated the original "Trundle Hotel" had been located approximately 70 m south-east of the Study Area. The Hotel had fronted what is now Scotson Lane, which was previously the main road between Trundle and Tullamore. Land title records presented in *Annexure C* include information for land previously occupied by the hotel. The land title records indicate that land to the south-east of the Study Area was owned by a "hotel keeper" until 1915. The hotel was later moved into the modern Trundle township.

Ruth Grinter also indicated that part of the property had been used as a market garden in the late 1800's. It was believed that market gardeners grew produce along the drainage line approximately 200 m south of the Study Area.

3.5 SafeWork NSW Dangerous Goods License Search

Ground Doctor conducted a search of the SafeWork NSW dangerous goods licencing records pertaining to the Study Area. A copy of the search result is presented as *Annexure D.*

SafeWork NSW indicated that they did not hold any records for the Study Area.

3.6 NSW EPA Notified Contaminated Sites

Ground Doctor conducted a search of the NSW EPA list of sites notified under Section 60 of the *Contaminated Land Management Act 1997* (CLM Act) (NSW EPA, 2020b). The search was conducted on 15 March 2021. There were no notifications listed for the Study Area or for Trundle.

Ground Doctor conducted a search of the NSW EPA list of sites for which orders or notices have been made under the provisions of the CLM Act (NSW EPA, 2020c). The search was conducted on 15 March 2021. There were no records identified for the Study Area or for Trundle.

3.7 Protection of the Environment Operations Act 1997 Registers

The NSW EPA maintains a list of activities which are licensed under the POEO Act (NSW EPA, 2020d). There were no licensed activities within the Study Area or for Trundle.

3.8 Naturally Occurring Asbestos

The Study Area is not situated within an area that is mapped as being a naturally occurring asbestos risk area (NSW Resources and Geoscience, 2019).

3.9 Section 10.7 Planning Certificate

Ground Doctor obtained a copy of the Section 10.7 Planning Certificate for the Study Area from Parkes Council. The Planning Certificate is presented as *Annexure F*.

The Section 10.7 (2) Planning Certificate dated 11 March 2021 states that the Study Area is not on the Parkes Council register of contaminated sites.

The Section 10.7 (5) Planning Certificate dated 11 March 2021 (*Annexure F*) states that, pursuant to section 59(2) of the CLM Act, the Study Area is:

- Not within land declared to be significantly contaminated land under Part 3 of that Act;
- Not subject to a Management Order in the meaning of that Act;
- Not the subject of an approved Voluntary Management Proposal of the EPA's agreement under section 17 of that Act;
- Not subject to an ongoing Maintenance Order under Part 3 of that Act;
- Not the subject of a Site Area Audit Statement within the meaning of Part 4 of that Act.

4 Preliminary Sampling and Analytical Plan

The Data Quality Objectives (DQO) process was used to develop a preliminary sampling and analytical plan.

4.1 State the Problem

4.1.1 Potential Areas of Environmental Concern

Ground Doctor assessed potential areas of environmental concern within the Study Area based on the information presented in *Sections 2 and 3.* Potential areas of environmental concern are summarised in *Table 3*.

Table 3: Summary of Potential Areas of Environmental Concern

Potential Area of Environmental Concern	Summary of Issue	Potential Contaminants of Concern
Former Agricultural Use	Study Area historical information indicates that land within and adjacent to the Study Area was likely used for livestock grazing and growing of fodder crops. Market gardening activities may also have occurred; however, these would have pre-dated modern agricultural chemical use. Pesticides, herbicides and/or fertilisers are likely to have been applied to the Study Area during previous agricultural use. Soil most likely to have been impacted by this activity is near surface soil, as chemical is typically applied at the ground surface. The potential sources of impact are diffuse. If significant contamination existed, it would be expected to be distributed uniformly across areas where chemical had been applied.	Organochlorine pesticides (OCPs), organophosphorus pesticides (OPPs) and metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc).
Railway Activity	The Bogan Gate to Tottenham Railway is located to the south-west immediately adjacent the south western margin of the Study Area. Railway activities with most potential to contaminate land typically occur within yards and maintenance areas, or in areas with sidings where trains may have been loaded and unloaded. The railway adjacent to the Study Area consisted of a single track. There was no evidence of previous siding or yards. Potential sources in this setting include movement of material from the railway into the Study Area (e.g. shedding of train brake material which may contain asbestos, application of herbicides to control vegetation along the corridor, disposal of products of combustion from steam locomotives and spill of hydrocarbon fuels). The identified railway was considered to pose low risk of potential contamination.	Total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylenes (BTEX), polycyclic aromatic hydrocarbons (PAHs), OCPs, OPPs, metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc), phenoxy acid herbicides and asbestos.

4.1.2 Consideration of Exposure Pathways

The identified potential areas of environmental concern have low potential to have resulted in significant land contamination.

The identified potential contaminants of concern include non-volatile and volatile chemicals. Relevant exposure pathways for the identified contaminants of concern would be:

- direct contact with soil;
- inhalation of dust generated from exposed soil at the surface; and

- vapour inhalation.

Potential environmental exposure pathways relevant to the assessment are:

- Ecological impacts to flora and fauna in undeveloped open areas of the Study Area.

4.1.3 Nature of the Identified Potential Sources

The identified potential sources of contamination were above ground sources most likely to have impacted near surface soil (if impacts had occurred). Specific point sources of contamination were not identified within the Study Area. The identified potential sources of concern were diffuse and would be expected to have resulted in uniform impacts across the Study Area adjacent to the rail corridor (if impacts had occurred).

4.2 Identify the Decision

The primary objective of this assessment was to assess the suitability of the Study Area for the proposed commercial / industrial use (i.e. the modified rail siding).

4.3 Identify Inputs to the Decision

A desktop assessment of the Study Area history was used to identify past land uses that had potential to result in land contamination within the assessment area (i.e. the Study Area). The findings of the desktop assessment are summarised in *Section 4.1.1*.

A total of seven preliminary soil surface samples were collected at selected locations within the Study Area (*Figure 2 of Annexure A*).

The need for a more detailed Stage 2 assessment was to be evaluated based on the results of preliminary soil sampling and analysis. If significant impacts were not observed in near surface soil within the Study Area then it was unlikely that significant contamination existed in those areas.

4.4 Define the Assessment Area Boundary

The assessment area boundary (i.e. the Study Area) is marked on *Figure 2* of *Annexure A*.

Characterisation of potential soil impacts by sampling and analysis was limited to the assessment area.

4.5 Decision Rule – How to Assess Risk

Ground Doctor used field observations to identify potential aesthetic impacts such as discolouration and odour.

Soil analytical data was assessed against Soil Investigation Levels (SILs) published in the National Environment Protection Council (NEPC) (1999) *National Environment Protection (Assessment of Contamination) Measure* (NEPM) (amended April 2013).

The SILs comprise a range of thresholds for assessment of risks to human health and the environment. The adopted SILs are discussed in the following sections and summarised in *Table 4*.

4.5.1 Health Screening Levels

The NEPM (2013) health screening levels (HSLs) for petroleum hydrocarbons were used to assess soil analytical results. Ground Doctor adopted the "HSL D" sub-category, which is applicable to commercial or industrial land use. The HSLs are used to assess potential vapour intrusion risks associated with subsurface contaminants. That is, to assess whether hydrocarbon vapour from soil contamination has the potential to migrate into an overlying building or into a nearby building at an unacceptable concentration.

4.5.2 Health Investigation Levels

Ground Doctor adopted Health Investigation Levels (HILs) outlined in the NEPM (2013) for assessment of potential human health impacts in soil. Ground Doctor adopted the "HIL D" sub-category, which is applicable to commercial or industrial land use. The adopted screening thresholds are summarised in *Table 4*.

Where no HIL was published for analytes of concern, Ground Doctor used detection of any such compound as preliminary screening criteria.

4.5.3 Ecological Screening Levels

The Ecological Screening Levels (ESLs) are designed to assess potential impacts of petroleum hydrocarbons in soil to flora and fauna. The ESLs apply to soil encountered within the upper 2 m of the subsurface only and are not applicable for areas of the Study Area that would be paved or covered by buildings.

4.5.4 Ecological Investigation Levels

Ground Doctor adopted Ecological Investigation Levels (EILs) outlined in the NEPM (2013) for assessment of potential ecological impacts in soil. Ground Doctor adopted the published EILs for "commercial / industrial" land use as preliminary screening thresholds. The adopted screening thresholds are summarised in *Table 4*.

4.5.5 Management Limits

Results exceeding Management Limits should trigger consideration of other potential risks to human health. These may include, potential for groundwater contamination, potential for free phase light non-aqueous phase liquid (LNAPL) to be present, potential for vapour to impact underground services or infrastructure and potential for land users, public or maintenance workers to come into direct contact with soil.

Ground Doctor adopted Management Limits for commercial or industrial land use.

4.5.6 Asbestos

Ground Doctor adopted detection of asbestos as a preliminary screening threshold.

Table 4: Adopted NEPM (2013) Soil Investigation Levels

Analyte	NEPM SILs			
	HSL D Sand - 0-<1m	EIL / ESL - Comm/Ind (Fine Grain)	Management Limits - Comm / Ind (Fine Grain)	HIL D
TRH and BTEXN				
TRH C6 - C10	-	215	800	na
TRH C6 - C10 less BTEX	260	-	-	na
TRH >C10-C16	-	170	1000	na
TRH >C10 - C16 less Naph	NL	-	-	na
TRH >C16-C34	NL	2500	5000	na
TRH >C34-C40	NL	6600	10000	na
Benzene	3	95	-	na
Toluene	NL	135	-	na
Ethylbenzene	NL	185	-	na
naphthalene	NL	370	-	na
Total +ve Xylenes	230	95	-	na
PAHs				
Naphthalene	NL	370	na	-
Benzo(a)pyrene	na	0.7	na	-
Total +vePAH's	na	na	na	4000
Benzo(a)pyrene TEQ	na	na	na	40
OCPs				
HCB	na	na	na	80
Heptachlor	na	na	na	50
Aldrin	na	na	na	45a
gamma-Chlordane	na	na	na	530b
alpha-chlordane	na	na	na	530b
Endosulfan I	na	na	na	2000d
DDE	na	na	na	3600c
Dieldrin	na	na	na	45a
Endrin	na	na	na	100
Endosulfan II	na	na	na	2000d
DDD	na	na	na	3600c
DDT	na	640	na	3600c
Methoxychlor	na	na	na	2500
Total +ve DDT+DDD+DDE	na	na	na	3600
OPPs				
Chlorpyriphos	na	na	na	2000
Phenoxy Acid Herbicides				
2,4,5-T	na	na	na	5000
2,4-D	na	na	na	9000
MCPA	na	na	na	5000
MCPB	na	na	na	5000
Mecoprop	na	na	na	5000
Picloram	na	na	na	35000
Metals				
Arsenic	na	160	na	3000
Cadmium	na	-	na	900
Total Chromium	na	310*	na	3600
Copper	na	85*	na	240000
Lead	na	1800	na	1500
Mercury	na	na	na	730
Nickel	na	55*	na	6000
Zinc	na	110*	na	400000

All thresholds expressed as mg/kg.
na – not applicable.
NL - non-limiting. The compound(s) do not pose an unacceptable vapour risk, even when NAPL is present.
a – threshold applies to the sum of aldrin and dieldrin.
b – threshold applies to the sum of alpha and gamma chlordane.
c – threshold applies to the sum of DDE, DDD and DDT
d – threshold applies to the sum of endosulfan 1 and 2.
*- EIL is the most conservative "Added Contaminant Limit", not total concentration

4.5.7 Soil Decision Rule

The adopted assessment criteria were not intended to be Study Area suitability criteria. The assessment criteria were intended to provide some preliminary limits which prompt further consideration of Study Area specific conditions, or more detailed assessment, if exceeded.

4.6 Specify Limits on Decision Errors

Ground Doctor collected and analysed a field duplicate sample for quality assurance and quality control (QAQC) purposes. Ground Doctor adopted the following criteria with which to assess the results of duplicate sampling:

- Calculated relative percentage difference (RPD) values should be less than 50% where the reported concentrations of analytes are greater than 10 times the estimated quantification limit (EQL);

- Calculated RPD values should be less than 75% where the reported concentrations of analytes are greater than 5 times the EQL but less than 10 times the EQL; and

- Calculated RPD values should be less than 100% where the reported concentrations of analytes are less than 5 times the EQL.

4.7 Optimise the Design for Collecting Data

Soil sampling locations are shown in *Figure 2* of *Annexure A.*

Soil samples (SS01-SS04) were collected from the upper 0.2 m of soil adjacent to the Bogan Gate to Tottenham Railway corridor. Soil samples collected adjacent to the railway corridor were analysed for TRH, BTEX, PAHs, OCPs, OPPs, phenoxy acid herbicides, metals and asbestos.

Soil samples SS05-SS07 were collected from the upper 0.2 m across the remainder of the Study Area where livestock grazing and cropping had occurred. Soil samples collected from these locations were analysed for OCPs, OPPs and heavy metals.

Soil sampling locations were selected using an informal systematic pattern to achieve an even coverage along the adjacent railway boundary and within former livestock grazing and cropping areas.

4.7.1 Quality Assurance and Quality Control

A field duplicate sample (“DUPA0”) was collected at “SS01” to assess the repeatability of the adopted soil sampling and analytical procedures.

4.7.2 Sampling Methodology

Soil samples were collected by hand from near surface soils. A hand tool was used to break up near surface soil. Care was used to ensure the sampled soil had not come into direct contact with the hand tool.

The sampler wore clean disposable nitrile gloves at each sampling location. Samples were placed directly into new laboratory supplied 125 millilitre glass jars that were labelled with appropriate sample identification, the project identification and sampling date.

Additional samples were placed into plastic snap lock bags to allow field screening with a photo ionisation detector (PID) to assess the presence of volatile organic compounds (VOCs).

Soil samples were placed on ice inside an esky immediately after collection.

4.7.3 Soil Sample Analysis

Sample analysis was sub-contracted to Eurofins (Sydney). The soil samples were sent to Eurofins by express overnight courier. Eurofins has National Association of Testing Authorities (NATA) accreditation for the proposed analysis and used analytical methods which comply with the NEPM (2013) guidelines.

5 Preliminary Soil Assessment Results

5.1 Field Observations

Ground Doctor did not identify any areas of surface staining or signs of distressed vegetation within the Study Area during the site inspection.

Ground Doctor did not identify any potential asbestos containing material within the Study Area during the site inspection.

The near surface soil samples were comprised of silty sandy clay that was brown, dry and had low plasticity.

Soil samples were free of discolouration and unnatural odour. Field screening of soils with a PID indicated that sample headspace for all samples contained VOC concentrations less than 0.5 parts per million (ppm).

5.2 Analytical Results

Soil analytical results are summarised and compared to the adopted SILs in *Table G1* of *Annexure G*.

The laboratory Certificate of Analysis for preliminary soil samples is presented as *Annexure H*.

The reported concentrations of TRH, BTEX, PAHs, OCPs, OPPs, phenoxy acid herbicides were less than the laboratory limit of reporting (LOR) and the adopted SILs.

Reported concentrations of metals in soil did not exceed the adopted SILs and appeared indicative of background concentrations.

Asbestos was not detected in any soil sample.

6 Quality Assurance and Quality Control

Multiple sources of information were used to establish the Study Area history. Sources were cross checked and where overlap occurred, were found to be consistent.

Surface soil was sampled in a systematic manner across the Study Area. The sampling density was low but considered appropriate for assessing the identified potential sources of environmental concern, which were diffuse.

The sampler wore clean disposable nitrile gloves when collecting each sample to minimise cross contamination. Where a hand tool was used to break soil for sampling, care was taken to collect soil that had not come into direct contact with the hand tool.

Ground Doctor labelled samples appropriately and placed samples on ice in an esky immediately after collection. Samples remained on ice until they were sent to the analytical laboratory. Samples were sent by overnight courier service to minimise transit time and ensure samples remained on ice whilst in transit.

A field duplicate sample was analysed to assess the repeatability of the sampling and analytical procedure. Analytical results for the duplicate and primary sample are presented in *Table G2* of *Annexure G*. Reported concentrations of all analytes except metals were below the LOR, so an RPD could not be calculated. For metals, the RPDs ranged from 0-12%. Duplicate sample results indicated that field procedures and laboratory analysis could achieve repeatable results.

Eurofins performed a number of quality assurance checks as part of the analytical procedures. These include, adding and recovering surrogate compounds to each sample, spiking some samples to measure recovery, analysing blank samples to check for false positives and analysis of laboratory duplicate samples. Ground Doctor reviewed lab QAQC data and found that all results were within the laboratory performance criteria.

The level of data QAQC was considered appropriate given the objective of the assessment. Results for QAQC parameters indicate that data was of acceptable quality to assess potential risks to human health and the environment associated with the Study Area. The data could be relied upon to make the conclusions outlined in *Section 7*.

7 Conclusions

The Study Area history and setting were assessed using a range of data sources. The identified potential areas of concern were:

- Livestock grazing and cropping across the Study Area.
- Railway activity along the south western boundary of the Study Area.

The potential for these activities to have caused (unacceptable) land contamination was considered low.

Preliminary soil sampling and analysis was undertaken in the Study Area to quantify potential contamination associated with the potential areas of concern. Results of soil sample analysis indicated there was no significant (unacceptable) impacts to soil within the Study Area, and therefore the likelihood (unacceptable) contamination occurring within the Study Area is low.

The results of the investigation indicate that the Study Area is suitable for the proposed commercial / industrial development in its current state.

8 Limitations of this Report

The findings of this report are based on the Scope of Work outlined in *Section 1.3* and detailed in later sections of this report. Ground Doctor performed the services in a manner consistent with the normal level of care and expertise exercised by members of the environmental consulting profession. No warranties, express or implied are made.

The results of this assessment are based upon the information documented and presented in this report. All conclusions and recommendations regarding the Study Area are the professional opinions of Ground Doctor personnel involved with the project, subject to the qualifications made above. While normal assessments of data reliability have been made, Ground Doctor assumes no responsibility or liability for errors in any data obtained from regulatory agencies, statements from sources outside of Ground Doctor, or developments resulting from situations outside the scope of this project.

Ground Doctor assessed soil within the Study Area for potential contaminants of concern related to previous use of the Study Area. The absence of the compounds of concern in soil samples cannot be interpreted as a guarantee that such materials, or other potentially toxic or hazardous compounds, do not exist at the Study Area in soil or other media.

The results of this preliminary investigation are based on the Study Area conditions identified at the time of the investigation. Ground Doctor will not be liable to revise the report to account for any changes in Study Area characteristics, regulatory requirements, guidelines or the availability of additional information, subsequent to the issue date of this report. Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigations.

Statements in this report regarding the suitability of the Study Area for commercial / industrial use are made on the basis of risks posed by land contamination (if any), not on any other basis.

This report, including the data, findings and conclusions contained within it remains the intellectual property Ground Doctor Pty Ltd. A licence to use the report for the specific purpose identified is granted to SEM subject to full payment of the agreed project fees. Ground Doctor Pty Ltd accepts no liability for use or interpretation by any person or body other than SEM. This report should not be reproduced without prior approval by SEM. The report should not be amended in any way without prior approval by Ground Doctor Pty Ltd. The report should not be relied upon by other parties, who should make their own enquires.

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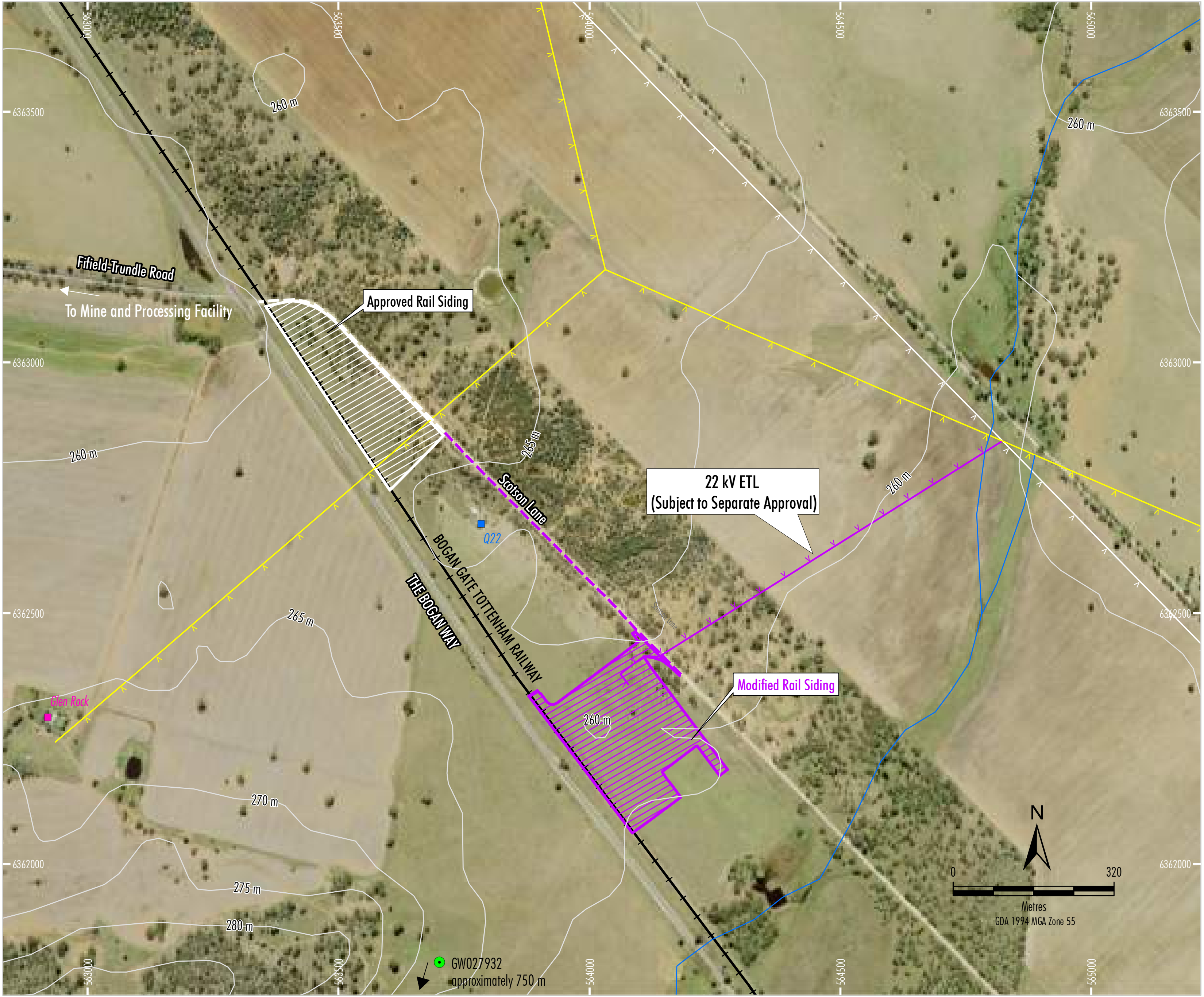
Annexure A

Figures



LEGEND

- Mine-owned Dwelling
- Private Dwelling
- Registered Groundwater Bore
- Watercourse
- Surface Contour (m AHD)
- Railway
- Existing 11 kV Electricity Transmission Line
- Existing 22 kV Electricity Transmission Line

Approved Project

- Surface Development Area
- Scotson Lane Upgrade

Modified Project

- Surface Development Area
- Scotson Lane Upgrade Extension
- 22 kV Electricity Transmission Line (Subject to Separate Approval)

Source: Black Range Minerals (2000); Clean Teq (2020, 2021); NSW Spatial Services (2020, 2021).

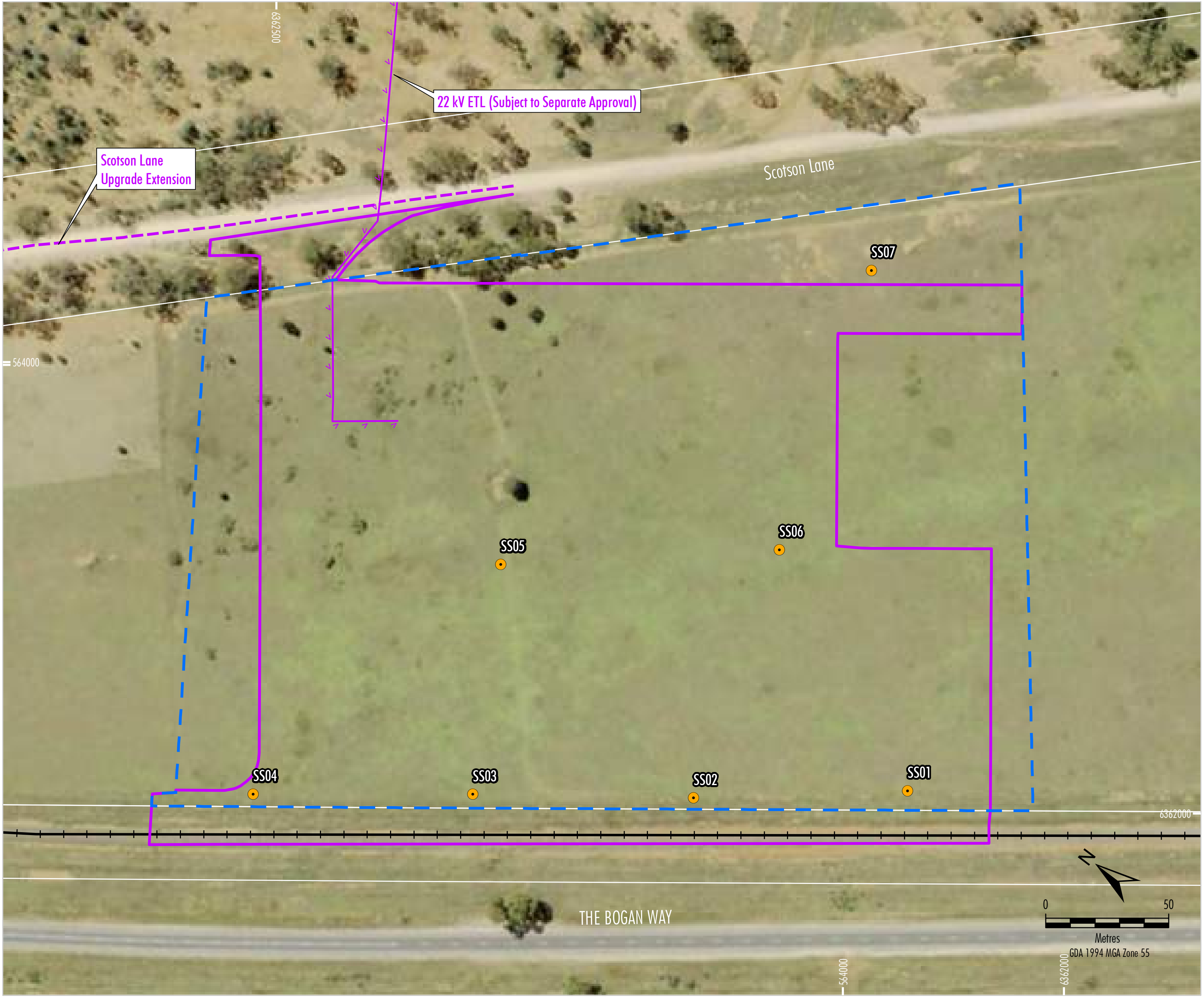
Orthophoto: © NSW Department of Finance, Services & Innovation (2021)

S U N R I S E   P R O J E C T

Approved and Modified Rail Siding Location

Figure 1

CTL-20-08 MOD 7_LCA_Rail_202A



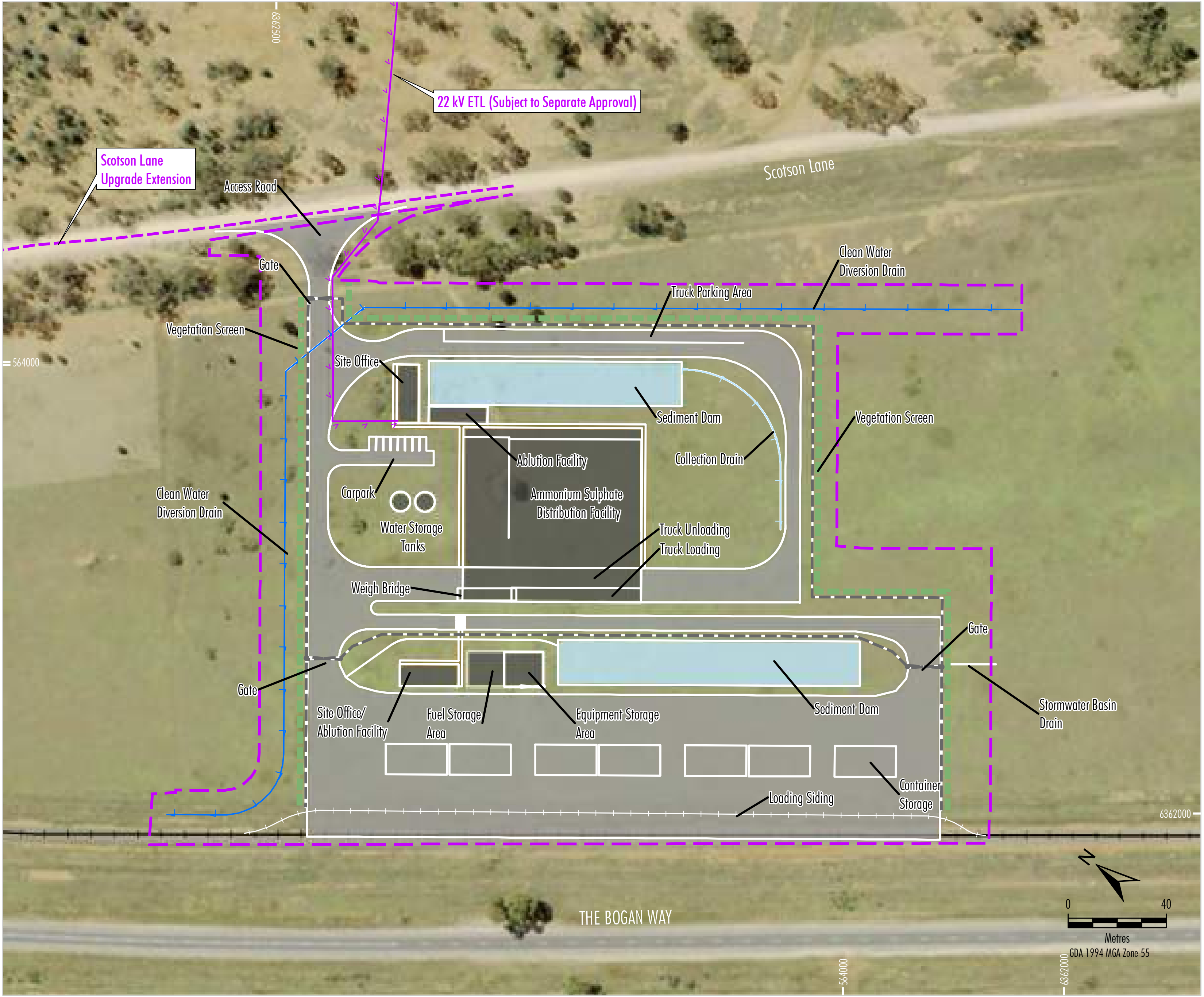
LEGEND
Railway
Cadastral Boundary
Modified Project
Surface Development Area
22 kV Electricity Transmission Line
(Subject to Separate Approval)
Study Area
Soil Sampling Location

Source: Black Range Minerals (2000); NSW Spatial Services (2020 - 2021); ELVIS (2021); Clean Teq (2021); Ground Doctor (2021).
Orthophoto: © NSW Spatial Services (2021)

SUNRISE PROJECT
Modified Rail Siding
Study Area and Soil Sampling Locations

Figure 2

CTL-20-08 MOD 7_LCA_Rail_203B



Source: Black Range Minerals (2000); NSW Spatial Services (2020); Clean Teq (2021).
Orthophoto: © NSW Department of Finance, Services & Innovation (2020)

S U N R I S E P R O J E C T

Modified Rail Siding General Arrangement

Figure 3

CTL-20-08 MOD 7_LCA_Rail_205A

LEGEND

- Railway
- Existing 11 kV Electricity Transmission Line
- Existing 22 kV Electricity Transmission Line

Approved Project

- Surface Development Area
- Scotson Lane Upgrade
- Scotson Lane Upgrade Extension

Modified Project

- Surface Development Area
- 22 kV Electricity Transmission Line (Subject to Separate Approval)

Land Tenure

- Sunrise Energy Metals Limited
- Other

Source: Black Range Minerals (2000); NSW Spatial Services (2020); Clean Teq (2017, 2018, 2020, 2021).
Orthophoto: © NSW Department of Finance, Services & Innovation (2020)

S U N R I S E   P R O J E C T

Cadastral Information

Figure 4

CTL-20-08 MOD 7_LCA_Rail_204A

Annexure B

Aerial Photographs

LOTSEARCH

LOTSEARCH AERIALS

Date: 25 Feb 2021

Reference: LS017956 EA

Address: The Bogan Way, Trundle, NSW 2875

Aerial Imagery 2019

The Bogan Way, Trundle, NSW 2875

Scale: 0 50 100 150 200 Meters

Data Sources Aerial Imagery: © Aerometrex Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

Date: 23 February 2021

Aerial Imagery 2004

The Bogan Way, Trundle, NSW 2875

Scale: 0 50 100 150 200 Meters	Data Source Aerial Imagery: © NSW Department of Customer Service	Coordinate System: GDA 1994 MGA Zone 56	Date: 24 February 2021

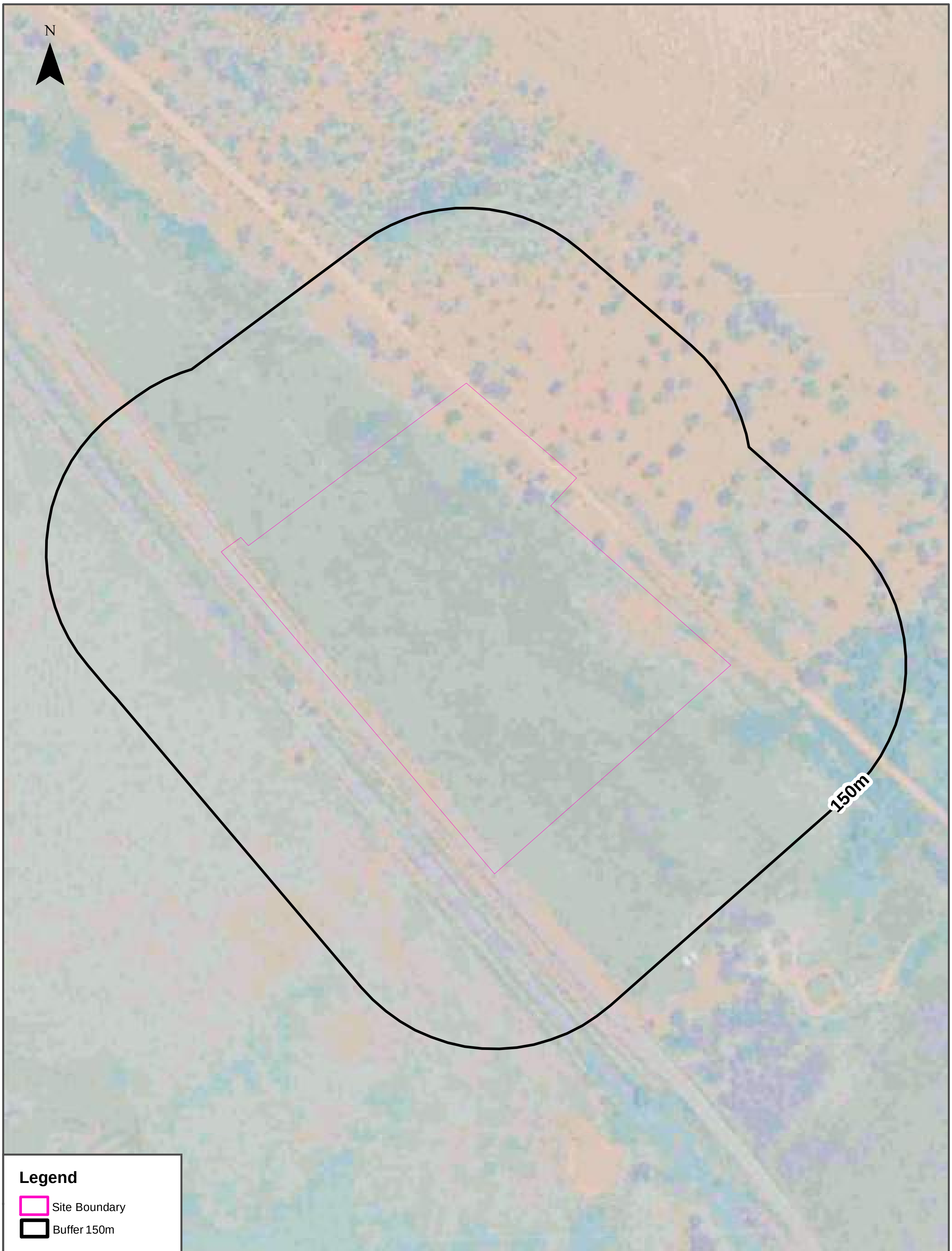
Aerial Imagery 2001

The Bogan Way, Trundle, NSW 2875

Scale: 0 50 100 150 200 Meters	Data Source Aerial Imagery: © NSW Department of Customer Service	Coordinate System: GDA 1994 MGA Zone 56	Date: 24 February 2021

Aerial Imagery 1996

The Bogan Way, Trundle, NSW 2875



Legend

Site Boundary

Buffer 150m

Scale: 0 50 100 150 200 Meters	Data Source Aerial Imagery: © NSW Department of Customer Service	Coordinate System: GDA 1994 MGA Zone 56	Date: 24 February 2021

Aerial Imagery 1992

The Bogan Way, Trundle, NSW 2875

Scale: 0 50 100 150 200 Meters	Data Source Aerial Imagery: © NSW Department of Customer Service	Coordinate System: GDA 1994 MGA Zone 56	Date: 24 February 2021

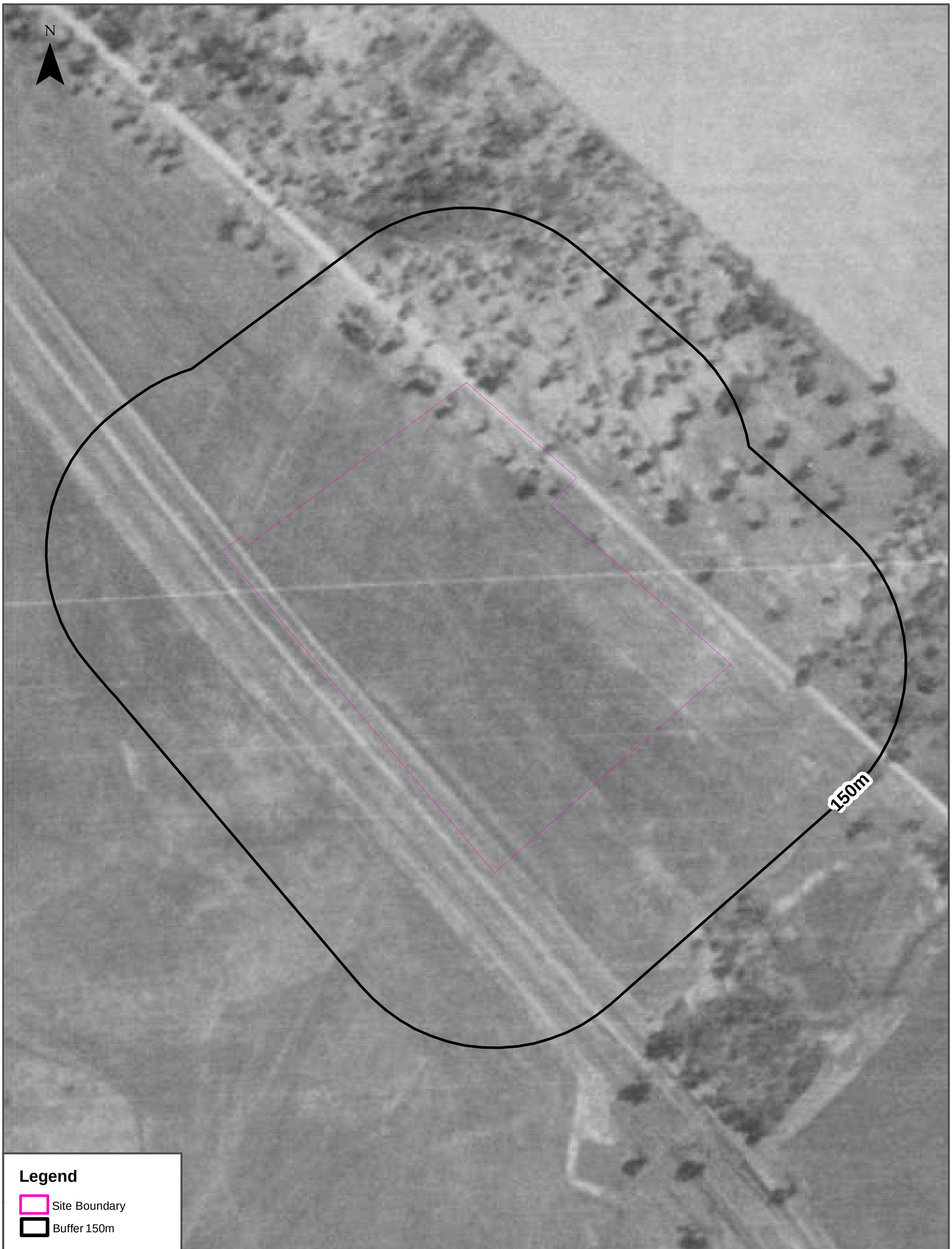
Aerial Imagery 1983

The Bogan Way, Trundle, NSW 2875

Scale: 0 50 100 150 200 Meters	Data Source Aerial Imagery: © NSW Department of Customer Service	Coordinate System: GDA 1994 MGA Zone 56	Date: 24 February 2021

Aerial Imagery 1974

The Bogan Way, Trundle, NSW 2875



Scale: 0 50 100 150 200 Meters

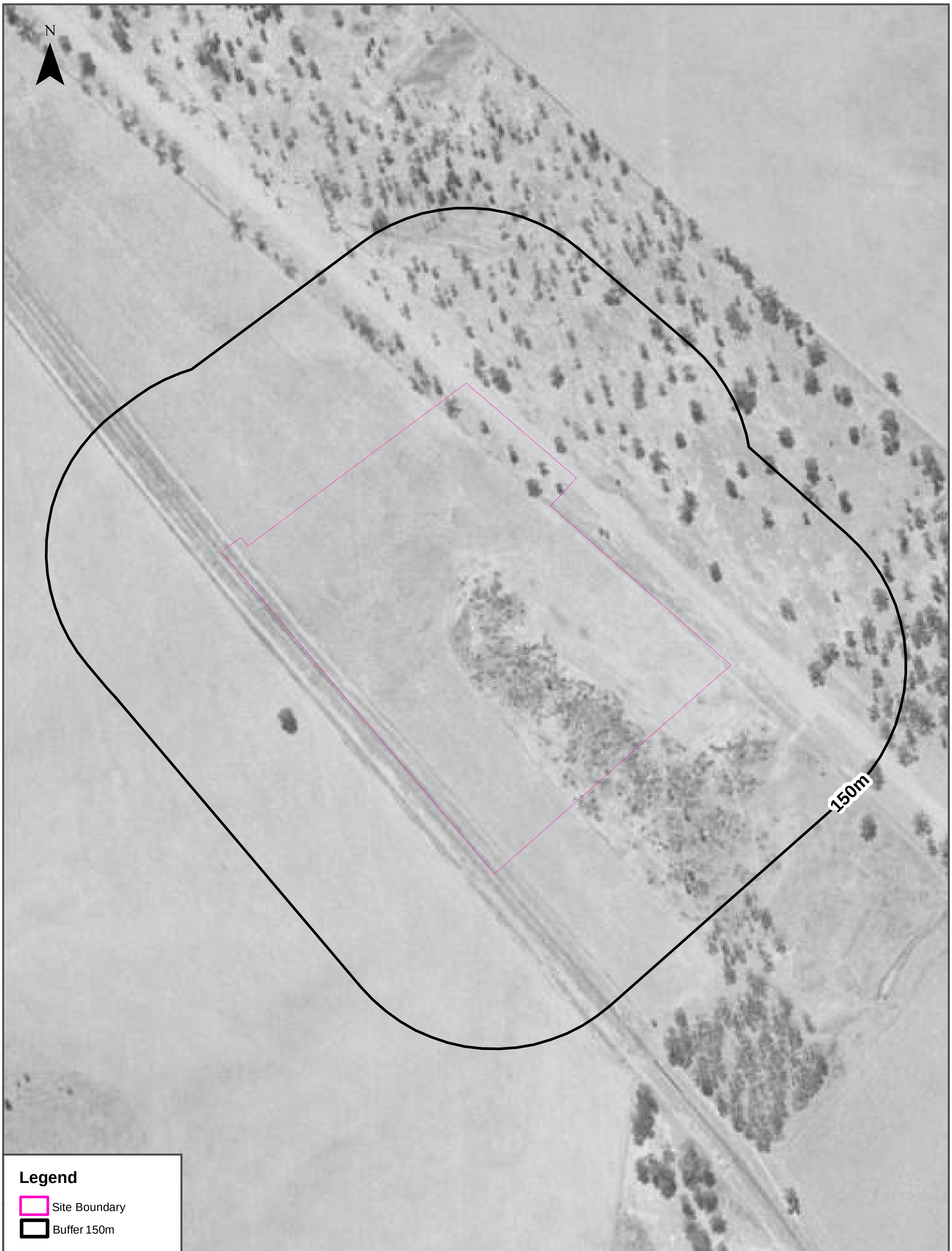
Data Source Aerial Imagery:
© NSW Department of Customer Service

Coordinate System:
GDA 1994 MGA Zone 56

Date: 24 February 2021

Aerial Imagery 1966

The Bogan Way, Trundle, NSW 2875



Legend

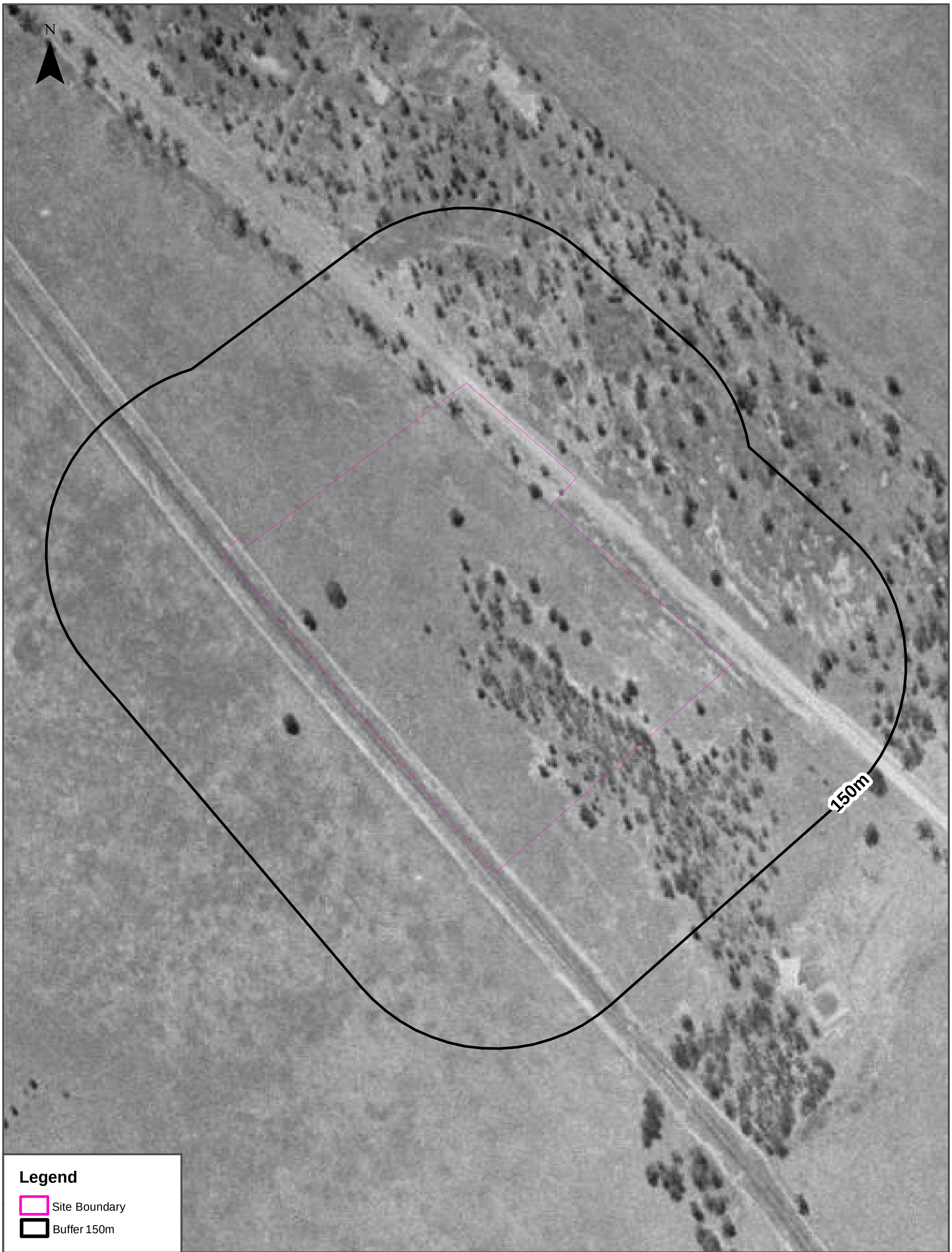
Site Boundary

Buffer 150m

Scale: 0 50 100 150 200 Meters	Data Source Aerial Imagery: © NSW Department of Customer Service	Coordinate System: GDA 1994 MGA Zone 56	Date: 24 February 2021

Aerial Imagery 1958

The Bogan Way, Trundle, NSW 2875



Scale:
0 50 100 150 200
Meters

Data Source Aerial Imagery: ©2021 Geoscience Australia

Coordinate System:
GDA 1994 MGA Zone 56

Date: 23 February 2021

USE OF REPORT - APPLICABLE TERMS

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   (h) the Report does not include any information relating to the actual state or condition of the Property;
   (i) the Report should not be used or taken to indicate or exclude actual fitness or unfitness of Land or Property for any particular purpose
   (j) the Report should not be relied upon for determining saleability or value or making any other decisions in relation to the Property and in particular should not be taken to be a rating or assessment of the desirability or market value of the property or its features; and
   (k) the End User should undertake its own inspections of the Land or Property to satisfy itself that there are no defects or failures
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(b) waives any right it may have to claim against Third Party Content Supplier in connection with the Report, or the negotiation of, entry into, performance of, or termination of these Terms; and

(c) releases each Third Party Content Supplier from any claim it may have otherwise had in connection with the Report, or the negotiation of, entry into, performance of, or termination of these Terms.

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    (a) any indirect, incidental, consequential, special or exemplary damages arising out of or in relation to the Report or these Terms; or

    (b) any loss of profit, loss of revenue, loss of interest, loss of data, loss of goodwill or loss of business opportunities, business interruption arising directly or indirectly out of or in relation to the Report or these Terms,

    irrespective of how that liability arises including in contract or tort, liability under indemnity or for any other common law, equitable or statutory cause of action or otherwise.
12. These Terms are subject to New South Wales law.

Annexure C

Land Titles Search Results

ADVANCE LEGAL SEARCHERS PTY LTD
(ACN 147 943 842)
ABN 82 147 943 842

18/36 Osborne Road,
Manly NSW 2095

Telephone: +612 9977 6713
Mobile: 0412 169 809
Email: search@alsearchers.com.au

15th February, 2021

GROUND DOCTOR PTY LTD
22 Tamworth Street,
PO Box 6278
DUBBO. NSW 2830

Attention: James Morrow,

RE: **The Bogan Way,**
Trundle

Current Search

Folio Identifier 1/630504 (title attached)
DP 630504 (plan attached)
Dated 13th February, 2021
Registered Proprietor:
CLEAN TEQ SUNRISE PTY LTD

Title Tree
Lot 1 DP 630504

Folio Identifier 1/630504

Certificate of Title Volume 15024 Folio 217

(a)	**(b)**
CTVol 2525 Folio 48	CTVol 13814 Folio 212
****	CTVol 8047 Folio 20
	Crown Land
	****

Summary of proprietor(s)
Lot 1 DP 630504

Year	Proprietor(s)
	(Lot 1 DP 630504)
2018 – todate	Clean Teq Sunrise Pty Ltd *(ACN 008 755 155)*
2007 – 2018	Colin Rupert Grinter Valda Ruth Grinter
1996 – 2007	Graeme Anders Stephensen
1990 – 1996	Leslie Beaumont Miell, motor mechanic Elizabeth Adriana Miell, his wife
1988 – 1990	William Edward Ford
	(Lot 1 DP 630504 – CTVol 15024 Fol 217)
1983 – 1988	William Edward Ford
1983 – 1983	Terrence John Green, farmer

See Notes (a) & (b)

Note (a)

	(Portions 7 & 8 Parish Trundle – Area 76 Acres 0 Roods 12 ½ Perches – CTVol 2525 Fol 48)
1979 – 1983	Terrence John Green, farmer
1977 – 1979	James Frederick Fitzsimmons, farmer Dorothy Fitzsimmons, his wife
1967 – 1977	Jeffery Bertram Frogley, farmer
1949 – 1967	Percival Oscar Fleming, farmer
1939 – 1949	Joseph William Simpson, farmer
1926 – 1939	Terrence Edward Kitamura, student
1915 – 1926	Alfred Oscar Hollibone, farmer and grazier
1914 – 1915	Oswald Ernest Ingram, hotel keeper

****

Note (b)

	(Portion 94 Parish Trundle – CTVol 13814 Fol 212)
1979 – 1983	Terrence John Green, farmer
	(Portion 94 Parish Trundle – Area 231 Acres 3 Roods 30 Perches – CTVol 8047 Fol 20)
1979 – 1979	Terrence John Green, farmer
1977 – 1979	James Frederick Fitzsimmons, farmer Dorothy Fitzsimmons, his wife
1967 – 1977	Jeffery Bertram Frogley, farmer
1967 – 1967	Percival Oscar Fleming, farmer
1960 – 1967	Rural Bank of New South Wales, grantee *(Percival Oscar Fleming, farmer, mortgagor)*
	(Portion 94 Parish Trundle – Area 231 Acres 3 Roods 30 Perches)
Prior – 1960	Crown Land
(1927 – 1960)	*(Conditional Purchase 1927/7 Parkes)*

****

Cadastral Records Enquiry Report : Lot 1 DP 630504

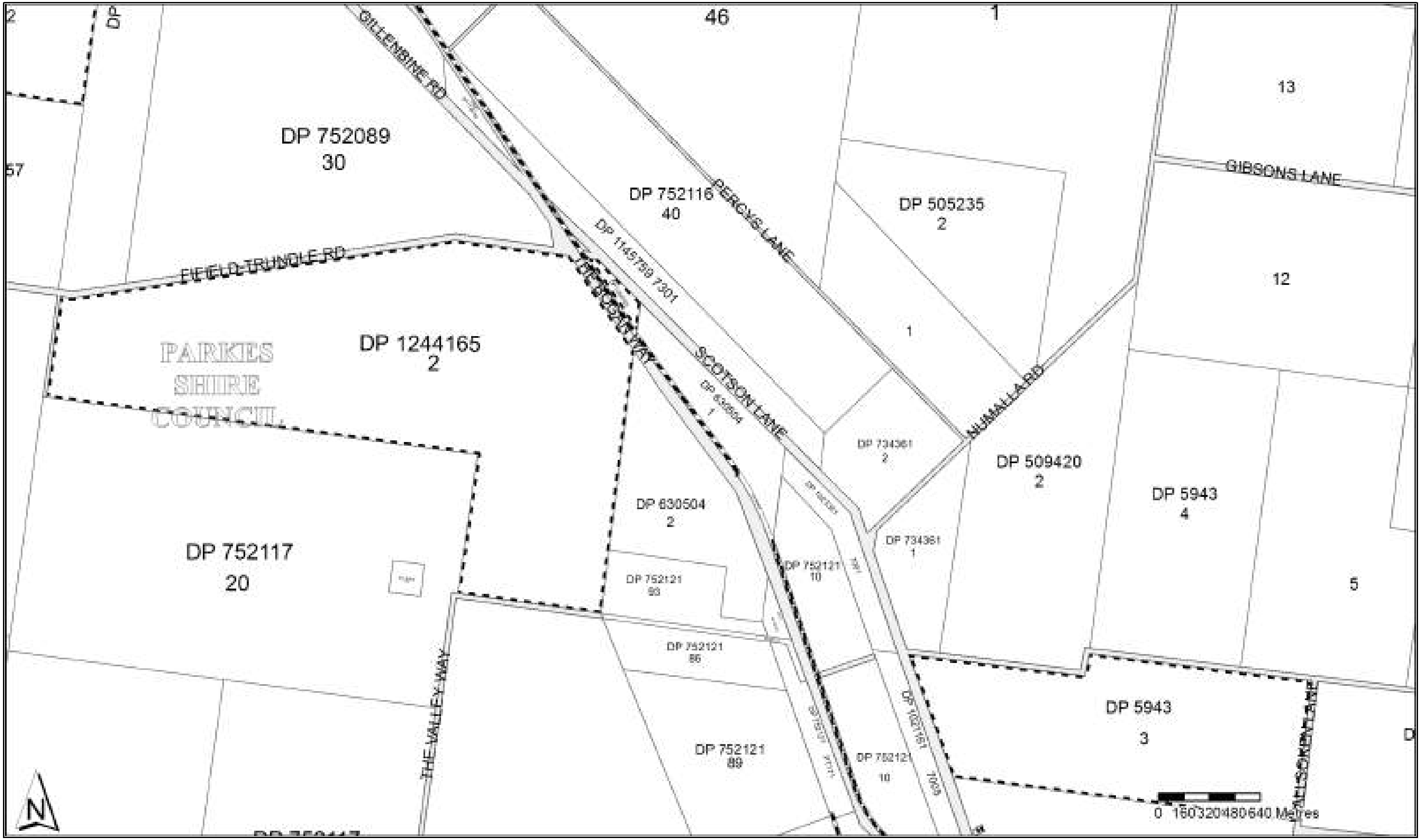
Ref : NOUSER

Locality : TRUNDLE

Parish : TRUNDLE

LGA : PARKES

County : CUNNINGHAM



This information is provided as a searching aid only.Whilst every endeavour is made to ensure that current map, plan and titling information is accurately reflected, the Registrar General cannot guarantee the information provided. For ALL ACTIVITY PRIOR TO SEPTEMBER 2002 you must refer to the RGs Charting and Reference Maps

	Status	Surv/Comp	Purpose
DP5943 Lot(s): 3			
DP1145374	REGISTERED	SURVEY	SURVEY INFORMATION ONLY
DP867279 Lot(s): 20			
DP1051493	REGISTERED	SURVEY	SURVEY INFORMATION ONLY
DP1179558 Lot(s): 1241			
CA163950 - LOT 1241 DP1179558			
DP1179559 Lot(s): 1242			
CA163951 - LOT 1242 DP1179559			
DP1179564 Lot(s): 1243			
CA163957 - LOT 1243 DP1179564			
DP1194143 Lot(s): 1			
NSW GAZ. CLOSED ROAD LOT 1 DP1194143	15-08-2014		Folio : 2892
DP1244165 Lot(s): 1, 2			
DP752117	HISTORICAL	COMPILATION	CROWN ADMIN NO.
DP1244882 Lot(s): 2			
PLAN OF MINERALS ONLY DP1244882	REGISTERED	COMPILATION	DEPARTMENTAL

Plan	Surv/Comp	Purpose
DP5943	SURVEY	UNRESEARCHED
DP124573	COMPILATION	DEPARTMENTAL
DP505235	SURVEY	SUBDIVISION
DP509420	COMPILATION	DEPARTMENTAL
DP514454	SURVEY	RESUMPTION OR ACQUISITION
DP610057	SURVEY	SUBDIVISION
DP630504	COMPILATION	SUBDIVISION
DP653100	COMPILATION	DEPARTMENTAL
DP667633	COMPILATION	DEPARTMENTAL
DP721713	COMPILATION	DEPARTMENTAL
DP734361	COMPILATION	SUBDIVISION
DP752089	COMPILATION	CROWN ADMIN NO.
DP752116	COMPILATION	CROWN ADMIN NO.
DP752117	COMPILATION	CROWN ADMIN NO.
DP752121	COMPILATION	CROWN ADMIN NO.
DP867279	SURVEY	RESUMPTION OR ACQUISITION
DP947520	COMPILATION	UNRESEARCHED
DP1021161	COMPILATION	DEPARTMENTAL
DP1023351	COMPILATION	DEPARTMENTAL
DP1023352	COMPILATION	DEPARTMENTAL
DP1074944	COMPILATION	DEPARTMENTAL
DP1145759	COMPILATION	CROWN LAND CONVERSION
DP1179558	COMPILATION	LIMITED FOLIO CREATION
DP1179559	COMPILATION	LIMITED FOLIO CREATION
DP1179564	COMPILATION	LIMITED FOLIO CREATION
DP1194143	COMPILATION	CROWN ROAD ENCLOSURE
DP1244165	COMPILATION	SUBDIVISION

[redacted]FICATE OF TITLE
[redacted]AL PROPERTY ACT, 1900

NEW SOUTH WALES

Vol. 13814 Fol. 212
CANCELLED

Prior Title (Crown Grant)
Vol. 8047 Fol. 20

CANCELLED

EDITION ISSUED
16 3 1979

(Page 1) Vol. 13814 Fol. 212

I certify that the person described in the First Schedule is the registered proprietor of the undermentioned estate in the land within described subject nevertheless to such exceptions encumbrances and interests as are shown in the Second Schedule.

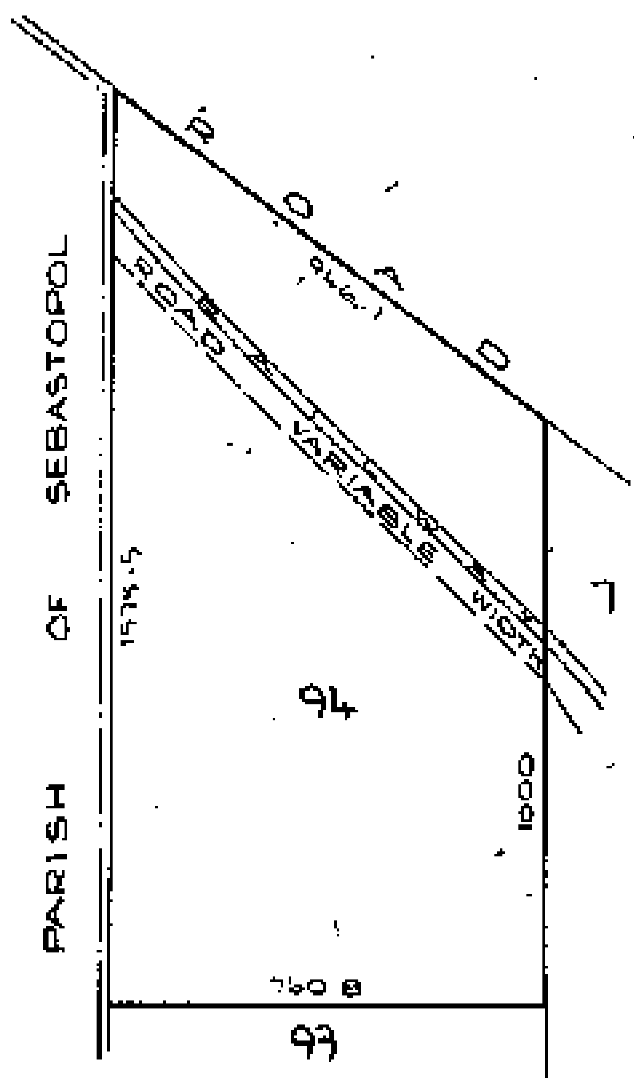
Registrar General.

PERSONS ARE CAUTIONED AGAINST ALTERING OR ADDING TO THIS CERTIFICATE OR ANY NOTIFICATION HEREON

WARNING: THIS DOCUMENT MUST NOT BE REMOVED FROM THE REGISTRAR GENERAL'S OFFICE.

PLAN SHOWING LOCATION OF LAND

LENGTHS ARE IN METRES



AREA : 89·01 ha
THIS AREA DOES NOT INCLUDE THE AREA OF THE RAILWAY AND THE ROAD.
REDUCTION RATIO 1:12500

R13468 M.X.

ESTATE AND LAND REFERRED TO

Estate in Fee Simple in Portion 94 in the Shire of Goobang Parish of Trundle and County of Cunningham. EXCEPTING THEREOUT the railway and the road shown in the plan hereon and the minerals reserved by the Crown Grant.

FIRST SCHEDULE

TERRENCE JOHN GREEN of Parkes, Farmer.

SECOND SCHEDULE

1. Reservations and conditions, if any, contained in the Crown Grant above referred to.
2. R13468 Mortgage to The Commercial Banking Company of Sydney Limited.

NOTE: ENTRIES RULED THROUGH AND AUTHENTICATED BY THE SEAL OF THE REGISTRAR GENERAL ARE CANCELLED

Vol. 13814 Fol. 212

9081whlpte
C.T. 2710.91
T397128 M
W630504 R.
18-3-91

FIRST SCHEDULE (continued)

REGISTERED PROPRIETOR	INSTRUMENT NATURE	INSTRUMENT NUMBER	REGISTERED	Signature of Registrar General

SECOND SCHEDULE (continued)

INSTRUMENT NATURE	INSTRUMENT NUMBER	PARTICULARS	REGISTERED	Signature of Registrar General	CANCELLATION
3681466		Leased by Rural Bank of New South Wales Registered 15-10-1981			
T397128		Mortgage to Rural Assistance Board. Registered 15-2-1983.			

This deed is cancelled as to whole

New Certificates of Title have issued on 5-4-1983

for lots in Deposited Plan No. 630504 as follows:-

Lots 1-2 Vol. 15024 Fol 217-218 respectively

REGISTRAR GENERAL

NOTE: ENTRIES RULED THROUGH AND AUTHENTICATED BY THE SEAL OF THE REGISTRAR GENERAL ARE CANCELLED

15024217

[redacted]FICATE OF TITLE

NEW SOUTH WALES [redacted]L PROPERTY ACT, 1900

First Titles: Vol. 1373 Fol. 186
Vol. 1380 Fol. 28
Vol. 8047 Fol. 20

Prior Titles: Vol. 2525 Fol. 48
Vol. 13814 Fol. 212

Vol. 15024 Fol. 217

CANCELLED
ISSUED 4 1983

SEE AUTO FOLIO

I certify that the person named in the First Schedule is the registered proprietor of an estate in fee simple (or such other estate or interest as is set out below) in the land described subject to the recordings appearing in the Second Schedule and to the provisions of the Real Property Act, 1900.

Registrar General.

15024 217

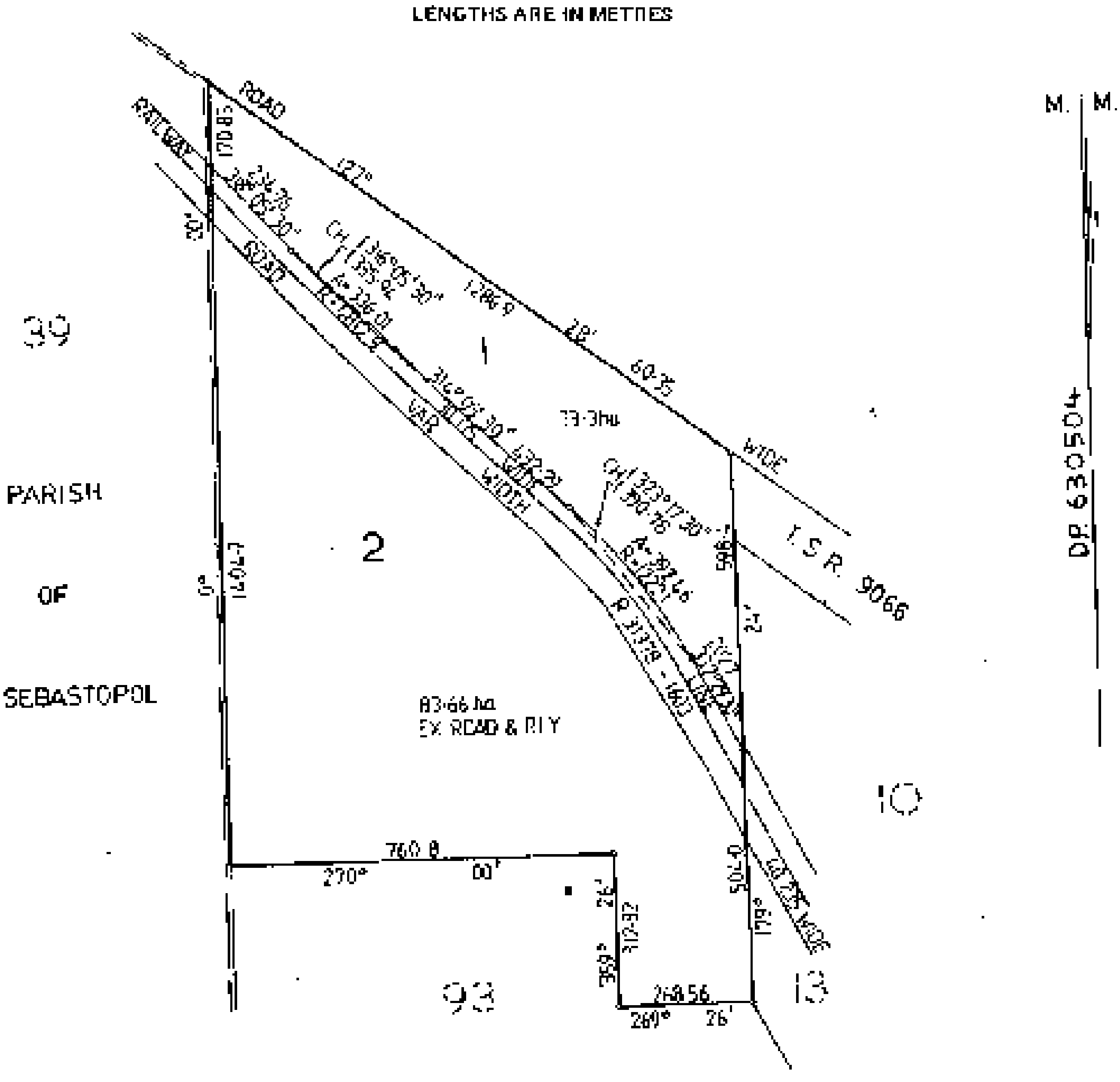
(Page 1) Vol. .... Fol. ....

PERSONS ARE CAUTIONED AGAINST ALTERING OR ADDING TO THIS CERTIFICATE OR ANY NOTIFICATION HEREON

NOTE: ENTRIES RULED THROUGH AND AUTHENTICATED BY THE SEAL OF THE REGISTRAR GENERAL ARE CANCELLED

PLAN SHOWING LOCATION OF LAND

LENGTHS ARE IN METRES



LAND REFERRED TO

Lot 1 in Deposited Plan 630504 at Trundle in the Shire of Parkes Parish of Trundle and County of Cunningham.

FIRST SCHEDULE

~~TERRENCE JOHN GREEN~~

SECOND SCHEDULE

GRM

1. Land excludes minerals and is subject to reservations and conditions in favour of the Crown - See Crown Grant.
~~2. R13460 Mortgage to The National Commercial Banking Corporation of Australia Limited.~~ T560905
~~3. S681468 Caveat by State Bank of New South Wales.~~ Withdrawn T560904
~~4. T397120 Mortgage to Rural Assistance Board.~~ T560906

RG 2/54

Vol 15024 Fol 217

D. West, Government Printer

FIRST SCHEDULE (continued)

REGISTERED PROPRIETOR | Registrar General

William Edward Ford by Transfer T560907. Registered 6-6-1983.

CANCELLED

SEE AUTO FOLIO

SECOND SCHEDULE (continued)

PARTICULARS	Registrar General	CANCELLATION
~~T600705 Mortgage to Westpac Banking Corporation. Registered 23-6-1983~~		W250094
MS W272373 Mortgage to State Bank of New South Wales. Registered 21-4-1986		

NOTATIONS AND UNREGISTERED DEALINGS

T560904 M R
-5 M R
-6 M
-7 M R
T688705 M R
WA550940 DM
W272373 R

NOTE- ENTRIES RULED THROUGH AND AUTHENTICATED BY THE SEAL OF THE REGISTRAR GENERAL ARE CANCELLED

Form: 01T
Release 3.1
www.lands.nsw.gov.au

TRANSFER

New South Wales
Real Property Act 1900

AD400060Y

PRIVACY NOTE: Section 31B of the Real Property Act 1900 (RP Act) authorises t[he] ... by this form for the establishment and maintenance of the Real Propert[y] ... the Register is made available to any person for search upon payment of a fee, if any.

STAMP DUTY	Office of State Revenue use only 1 NEW SOUTH WALES DUTY 31-08-2007 0004530413-001 SECTION 18(2) DUTY $ **************2.00
(A) **TORRENS TITLE**	1/630504
(B) **LODGED BY**	Document Collection Box: 4624 Name, Address or DX and Telephone: UNIVERSAL TITLE SEARCHERS LLPN: 123374C Reference: 2438453 CODES: T TW (Sheriff)
(C) **TRANSFEROR**	Graeme Anders Stephensen
(D) **CONSIDERATION**	The transferor acknowledges receipt of the consideration of $ 60,000.00 and as regards
(E) **ESTATE**	the land specified above transfers to the transferee an estate in fee simple
(F) **SHARE TRANSFERRED**	
(G)	Encumbrances (if applicable):
(H) **TRANSFEREE**	Colin Rupert Grinter and Valda Ruth Grinter
(I)	**TENANCY:** Joint Tenants

DATE 28 - 8 - 2007

(J) I certify that the person(s) signing opposite, with whom I am personally acquainted or as to whose identity I am otherwise satisfied, signed this instrument in my presence.

Signature of witness: X

Name of witness: Susan Mary Stephensen
Address of witness: 19 Baker St Forbes NSW 2871

Certified correct for the purposes of the Real Property Act 1900 by the transferor.

Signature of transferor: X GAS

Certified correct for the purposes of the Real Property Act 1900 by the person whose signature appears below.

Signature:

Signatory's name: Philip ~~G~~ Gilderdale
Signatory's capacity: transferee's solicitor

System Document Identification

Form Number: 01T-e
Template Number: T_nsw16
ELN Document ID: 8295538
ELN NOS ID: 8295540

TRANSFER

New South Wales
Real Property Act 1900

Land Registry Document Identification

AN832489

Stamp Duty: 9475350-001

PRIVACY NOTE: Section 31B of the Real Property Act 1900 (RP Act) authorises the Registrar General to collect the information required by this form for the establishment and maintenance of the Real Property Act Register. Section 96B RP Act requires that the Register is made available to any person for search upon payment of a fee, if any.

LODGED BY:

Responsible Subscriber: MCCULLOUGH ROBERTSON LAWYERS ABN 42721345951
Address: L11, 66 Eagle ST
Brisbane 4000
Telephone:
PEXA Subscriber Number: 6159
Customer Account Number: 501092W
Document Collection Box: 1W
Client Reference: 165250-18

LAND TITLE REFERENCE

1/630504

TRANSFEROR

COLIN RUPERT GRINTER

VALDA RUTH GRINTER

TRANSFEREE

CLEAN TEQ SUNRISE PTY LTD ACN 008755155
Registered company

Tenancy: Sole Proprietor

CONSIDERATION

The transferor acknowledges receipt of the consideration of $450,000.00

ESTATE TRANSFERRED

FEE SIMPLE

The Transferor transfers to the Transferee the Estate specified in this Instrument and acknowledges receipt of any Consideration shown.

SIGNING FOR TRANSFEROR

I certify that:

1. The Certifier has taken reasonable steps to ensure that this Registry Instrument or Document is correct and compliant with relevant legislation and any Prescribed Requirement.
2. The Certifier has retained the evidence supporting this Registry Instrument or Document.
3. The Certifier holds a properly completed Client Authorisation for the Conveyancing Transaction including this Registry Instrument or Document.
4. The Certifier has taken reasonable steps to verify the identity of the transferor.

Party Represented by Subscriber:

COLIN RUPERT GRINTER
VALDA RUTH GRINTER

Signed By: Dennis McGroder
Signer Capacity: Practitioner Certifier
PEXA Signer Number: 62395
Digital Signing Certificate Number: 35505

Signed for Subscriber: HUGHES & CO. LAWYERS & CONVEYANCING PTY LTD ABN 95169302710

HUGHES & CO. LAWYERS & CONVEYANCING

Subscriber Capacity: Representative Subscriber
PEXA Subscriber Number: 2144 **Customer Account Number:** 500456
Date: 02/11/2018

SIGNING FOR TRANSFEREE

I certify that:

1. The Certifier has taken reasonable steps to ensure that this Registry Instrument or Document is correct and compliant with relevant legislation and any Prescribed Requirement.
2. The Certifier has retained the evidence supporting this Registry Instrument or Document.
3. The Certifier holds a properly completed Client Authorisation for the Conveyancing Transaction including this Registry Instrument or Document.
4. The Certifier has taken reasonable steps to verify the identity of the transferee.

Party Represented by Subscriber:

CLEAN TEQ SUNRISE PTY LTD

Signed By: Eva Vicic **Signer Capacity:** Practitioner Certifier
PEXA Signer Number: 41169 **Digital Signing Certificate Number:** 22558

Signed for Subscriber: PARTNERS OF MCCULLOUGH ROBERTSON ABN 42721345951

MCCULLOUGH ROBERTSON LAWYERS

Subscriber Capacity: Representative Subscriber
PEXA Subscriber Number: 6159 **Customer Account Number:** 501092
Date: 02/11/2018

Req:D342460 /Doc:DL Y839340 /Rev 17 Aug 2010 /NSW LRS /Pgs:ALL /Prt:12 Feb 2021 13:03 /Seq:1 of 1
. Office of the Registrar General /Src:GLOBALX /Ref:advlegs

OFFICE USE ONLY

RP 13 STAMP DUTY

[redacted]

Y839340

TRANSFER

REAL PROPERTY ACT, 1900

T 3 2 2 X $ 44 R 2/2

	Torrens Title Reference	If Part Only, Delete Whole and Give Details	Location
DESCRIPTION OF LAND Note (a)	Identifier 1/630504	WHOLE	Parish of Trundle County of Cunningham

TRANSFEROR Note (b)

WILLIAM EDWARD FORD

ESTATE Note (c)

(the abovenamed TRANSFEROR) hereby acknowledges receipt of the consideration of $21,500.00 and transfers an estate in fee simple in the land above described to the TRANSFEREE

TRANSFEREE Note (d)

LESLIE BEAUMONT MIELL of "Pilgrim Hill", Cowra Road, Forbes, Motor Mechanic and ELIZABETH ADRIANA MIELL of the same address, his wife

OFFICE USE ONLY

TENANCY Note (e)

as joint tenants/~~tenants in common~~

PRIOR ENCUMBRANCES Note (f)

subject to the following PRIOR ENCUMBRANCES 1 ...... 2 ...... 3 ......

DATE

We hereby certify this dealing to be correct for the purposes of the Real Property Act, 1900.

EXECUTION Note (g)

Signed in my presence by the transferor who is personally known to me

Signature of Witness

BRIAN LESLIE SEFONTE

Name of Witness (BLOCK LETTERS)

20 GOBONDERRY ST TRUNDLE. LINEMAN

Address and occupation of Witness

W.E. Ford

Signature of Transferor

Signed in my presence by the transferee who is personally known to me

Note (g)

Signature of Witness

Name of Witness (BLOCK LETTERS)

Address and occupation of Witness

L.R. Whiteley

Signature of Transferee

Solicitor for the Transferees

TO BE COMPLETED BY LODGING PARTY Notes (h) and (i)

LODGED BY

REED HANIGAN & TURNER
LAW STATIONERS
60-72 ELIZABETH ST SYDNEY 2000
DX 457 SYDNEY, PH., 232 1466
390

Ref

Delivery Box Number

LOCATION OF DOCUMENTS		
CT	OTHER	
		Herewith
		In L.T.O. with
		Produced by

OFFICE USE ONLY

Checked	Passed
Signed	Extra Fee

REGISTERED 12 FEB 1990

Secondary Directions	
Delivery Directions	CT 390

PLAN FORM 1

WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION

*OFFICE USE ONLY

DP 630504

Council Clerk's Certificate

I hereby certify that –

(a) the requirements of the Local Government Act, 1919 (other than the requirements for the registration of plans), and

*(b) the requirements of section 34B of the †Metropolitan Water, Sewerage, and Drainage Act, 1924, as amended. †Hunter District Water, Sewerage, and Drainage Act, 1938, as amended

have been complied with by the applicant in relation to the proposed Subdivision (Insert "new road", "subdivision" or "consolidated lot") set out herein.

Subdivision No. 20/82

Date 19.8.82

(Signature) ......

Council Clerk

*This part of certificate to be deleted where the application is only for a consolidated lot or the opening of a new road or where the land to be subdivided is wholly outside the area of operations of the Metropolitan Water Sewerage and Drainage Board and the Hunter District Water Board.
†Delete if inapplicable

Surveyor's Certificate

I, RICHARD NORTON ARNDELL
of PO BOX 12 PARKES
a surveyor registered under the Surveyors Act, 1929, as amended, hereby certify that ~~the survey represented in this~~ plan IS COMPILED FROM C137-1347, C1355-1947 & Ms 705Fs is accurate and has been made *(1) by me (2) under my immediate supervision in accordance with the Survey Practice Regulations, 1933, and was completed on † 21ST JULY 1982

Signature ......

Surveyor registered under Surveyors Act, 1929, as amended
Datum Line of Azimuth.
*Strike out either (1) or (2). †Insert date of survey.

PLAN OF SUBDIVISION OF PORTIONS 7, 8 & 94

Mun./Shire ~~City~~ : PARKES

Locality: TRUNDLE

Parish: TRUNDLE

County: CUNNINGHAM

Reduction Ratio 1: 12500

Lengths are in metres

Registered: 18-3-1983

C.A. Nº 29/82 OF 19-8-1982

Title System: TORRENS

Purpose: SUBDIVISION

Ref. Map: PARISH

Last Plan:

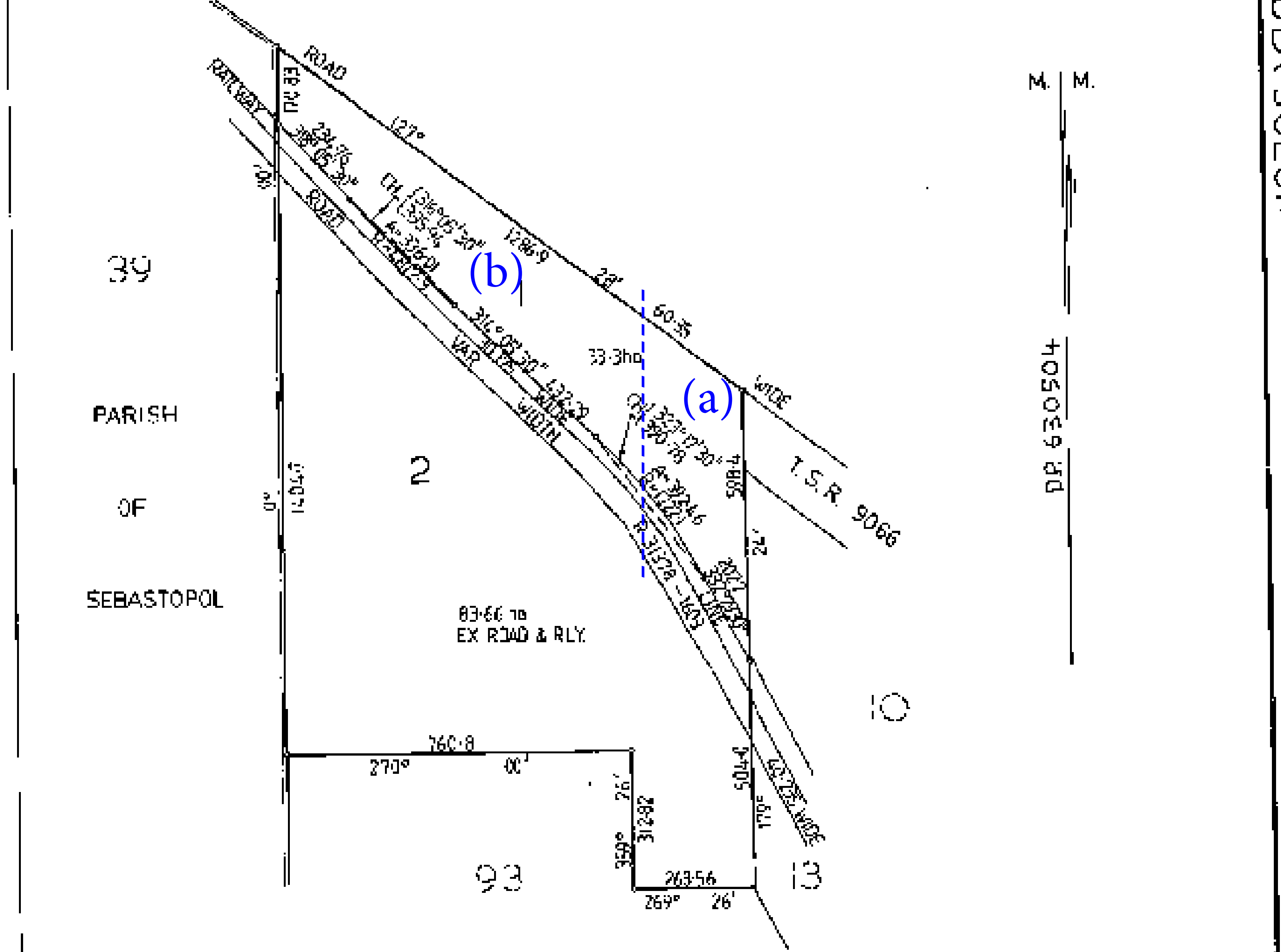
Signatures, seals and statements of intention to dedicate public roads or to create public reserves, drainage reserves, easements or restrictions as to user.

MORTGAGEE UNDER MORTGAGE Q184148
SIGNED AT SYDNEY THIS 25th DAY OF October 1982 FOR THE COMMERCIAL BANKING COMPANY OF SYDNEY LIMITED BY ITS DULY APPOINTED ATTORNEY UNDER POWER OF ATTORNEY NO. 9 ... 367 WHO DECLARES THAT HE HAS NOT RECEIVED NOTICE OF THE REVOCATION OF HIS POWER.

WITNESS

KEITH LLOYD DAWSON, Member

JAMES GARRETT, Member



M.P.D.

SURVEYOR'S REFERENCE 5217

Plan Drawing only to appear in this space

N O O 2 A I B

DP 630504

I, Bruce Richard Davies, Under Secretary for Lands and Registrar General for New South Wales, certify that this negative is a photograph made as a permanent record of a document in my custody this day.

23rd March, 1983

NEW SOUTH WALES LAND REGISTRY SERVICES - HISTORICAL SEARCH

SEARCH DATE

12/2/2021 5:55PM

FOLIO: 1/630504

First Title(s): SEE PRIOR TITLE(S)
Prior Title(s): VOL 15024 FOL 217

Recorded	Number	Type of Instrument	C.T. Issue
28/3/1988		TITLE AUTOMATION PROJECT	LOT RECORDED FOLIO NOT CREATED
21/9/1988		CONVERTED TO COMPUTER FOLIO	FOLIO CREATED CT NOT ISSUED
12/2/1990	Y839339	DISCHARGE OF MORTGAGE	
12/2/1990	Y839340	TRANSFER	EDITION 1
8/3/1996	2002216	TRANSFER	EDITION 2
6/9/2007	AD400060	TRANSFER	
6/9/2007	AD400061	MORTGAGE	EDITION 3
28/6/2011	AG330155	TRANSMISSION APPLICATION	
28/6/2011	AG330308	DISCHARGE OF MORTGAGE	EDITION 4
2/11/2018	AN832489	TRANSFER	EDITION 5

*** END OF SEARCH ***

NEW SOUTH WALES LAND REGISTRY SERVICES - TITLE SEARCH

FOLIO: 1/630504

SEARCH DATE	TIME	EDITION NO	DATE
12/2/2021	5:56 PM	5	2/11/2018

LAND

LOT 1 IN DEPOSITED PLAN 630504
AT TRUNDLE
LOCAL GOVERNMENT AREA PARKES
PARISH OF TRUNDLE COUNTY OF CUNNINGHAM
TITLE DIAGRAM DP630504

FIRST SCHEDULE

CLEAN TEQ SUNRISE PTY LTD (T AN832489)

SECOND SCHEDULE (1 NOTIFICATION)

1 LAND EXCLUDES MINERALS AND IS SUBJECT TO RESERVATIONS AND CONDITIONS IN FAVOUR OF THE CROWN - SEE CROWN GRANT(S)

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

advlegs PRINTED ON 12/2/2021

Annexure D

NSW SafeWork
Dangerous Goods Search Results

Locked Bag 2906, Lisarow NSW 2252
Customer Experience 13 10 50
ABN 81 913 830 179 | www.safework.nsw.gov.au

Our Ref: D21/026055

22 February 2021

Mr James Morrow
Ground Doctor Pty Ltd
James.morrow@grounddoc.com.au

Dear Mr Morrow

RE SITE: Lot 1 DP 630504 The Bogan Way Trundle NSW 2875

I refer to your site search request received by SafeWork NSW on 12 February 2021 requesting information on Storage of Hazardous Chemicals for the above site.

A search of the records held by SafeWork NSW has not located any records pertaining to the above-mentioned premises.

For further information or if you have any questions, please call us on 13 10 50 or email licensing@safework.nsw.gov.au

Yours sincerely

Gabriela Draper

Licensing Representative
Licensing and Funds, Better Regulation
SafeWork NSW

Annexure E

Study Area Inspection Photographs

Oblique aerial view looking south east across the Study Area.

Oblique aerial view looking north east across the Study Area.

Oblique aerial view looking north west across the Study Area.

Oblique aerial view looking west across the Study Area.

Annexure F

Section 10.7 Planning Certificates

PLANNING CERTIFICATE UNDER SECTION 10.7
ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979
Information provided pursuant to Section 10.7(2) of the Act

Applicant Details:	Ground Doctor Pty Ltd PO Box 6278 DUBBO NSW 2830

Your Reference:	Trundle Siding
Certificate No:	PC2021/0134
Date:	11 March 2021
Property Number:	704700
Subject Land:	Lot 1 DP 630504
Property Address:	'Moomalong' 193 Scotson Lane, Trundle
Owners:	Clean Teq Sunrise Pty Ltd
Location Map:	As shown on the map below and edged in red

Note *This drawing is provided by Parkes Shire Council to its clients and correspondents for their information on an as is basis. It represents a depiction of the land details as currently held and should not be relied upon as a definitive or complete statement of the title details.*

1. Names of relevant planning instruments and DCPs (1) The name of each environmental planning instrument that applies to the carrying out of development on the land.	Parkes Local Environmental Plan 2012 State Environmental Planning Policies: • State Environmental Planning Policy (Activation Precincts) 2020. • State Environmental Planning Policy (Affordable Rental Housing) 2009. • State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004. • State Environmental Planning Policy (Concurrences and Consents) 2018. • State Environmental Planning Policy (Educational Establishments and Child Care Facilities) 2017. • State Environmental Planning Policy (Exempt and Complying Development Codes) 2008. • State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004. • State Environmental Planning Policy (Infrastructure) 2007. • State Environmental Planning Policy (Koala Habitat Protection) 2019. • State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007. • State Environmental Planning Policy 21 – Caravan Parks. • State Environmental Planning Policy 33 – Hazardous and Offensive Development. • State Environmental Planning Policy 36 – Manufactured Home Estates. • State Environmental Planning Policy 50 – Canal Estate Development. • State Environmental Planning Policy 55 – Remediation of Land. • State Environmental Planning Policy 64 –Advertising and Signage. • State Environmental Planning Policy 65 - Design Quality of Residential Flat Development. • State Environmental Planning Policy 70 - Affordable Housing (Revised Schemes). • State Environmental Planning Policy (Primary Production and Rural Developments) 2019. • State Environmental Planning Policy (State and Regional Development) 2011. • State Environmental Planning Policy (State Significant Precincts) 2005. • State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017. • State Environmental Planning Policy (State and Regional Development) 2011.
(2) The name of each proposed environmental planning instrument that will apply to the carrying out of development on the land and that is or has been the subject of community consultation or on public exhibition under the Act (unless the Planning Secretary has notified the council that the making of the proposed instrument has been deferred indefinitely or has not been approved).	Nil.

	(3) The name of each development control plan that applies to the carrying out of development on the land	Parkes Shire Development Control Plan 2013.
	(4) In this clause, proposed environmental planning instrument includes a planning proposal for a LEP or a draft environmental planning instrument	Not Applicable.
2.	**Zoning and land use under relevant LEPs** For each environmental planning instrument or proposed instrument referred to in clause 1 (other than a SEPP or proposed SEPP) that includes the land in any zone (however described): (a) the identity of the zone, whether by reference to a name (such as "Residential Zone" or "Heritage Area") or by reference to a number (such as "Zone No 2(a)")	RU1 Primary Production
	(b) the purposes for which the instrument provides that development may be carried out within the zone without the need for development consent,	Refer to Schedule A
	(c) the purposes for which the instrument provides that development may not be carried out within the zone except with development consent,	Refer to Schedule A
	(d) the purposes for which the instrument provides that development is prohibited within the zone,	Refer to Schedule A
	(e) whether any development standards applying to the land fix minimum land dimensions for the erection of a dwelling house on the land and, if so, the minimum land dimensions so fixed,	There are minimum development standards applying to the land that fix the minimum land dimensions for the erection of a dwelling house on the land. The minimum land dimension is 400 hectares.
	(f) whether the land includes or comprises critical habitat,	Not to Council's knowledge, however, persons with an interest in the land may examine the 'Register of Critical Habitat' which is kept by the Director-General of National Parks and Wildlife Service.
	(g) whether the land is in a conservation area (however described),	No.
	(h) whether an item of environmental heritage (however described) is situated on the land.	No.
2A.	**Zoning and land use under State Environmental Planning Policy (Sydney Region Growth Centres) 2006** To the extent that the land is within any zone (however described) under: (a) Part 3 of the *State Environmental Planning Policy (Sydney Region Growth Centres) 2006* (***the 2006 SEPP***), or	Not Applicable.

(b) a Precinct Plan (within the meaning of the 2006 SEPP), or (c) a proposed Precinct Plan that is or has been the subject of community consultation or on public exhibition under the Act the particulars referred to in clause 2 (a)–(h) in relation to that land (with a reference to “the instrument” in any of those paragraphs being read as a reference to Part 3 of the 2006 SEPP, or the Precinct Plan or proposed Precinct Plan, as the case requires).	
3. Complying Development (1) The extent to which the land is land on which complying development may be carried out under each of the codes for complying development because of the provisions of clauses 1.17A (1) (c) to (e), (2), (3) and (4), 1.18 (1) (c3) and 1.19 of State Environmental Planning Policy (Exempt and Complying Development Codes) 2008. (2) The extent to which complying development may not be carried out on that land because of the provisions of clauses 1.17A (1) (c) to (e), (2), (3) and (4), 1.18 (1) (c3) and 1.19 of that Policy and the reasons why it may not be carried out under those clauses. (3) If the council does not have sufficient information to ascertain the extent to which complying development may or may not be carried out on the land, a statement that a restriction applies to the land, but it may not apply to all of the land, and that council does not have sufficient information to ascertain the extent to which complying development may or may not be carried out on the land.	**Housing Code** Complying Development under the Housing Code may not be carried out on the land. **Rural Housing Code** Complying Development under the Rural Housing Code may be carried out on the land. **Low Rise Medium Density Housing Code** Complying Development under the Low Rise Medium Density Housing Code may not be carried out on the land. **Greenfield Housing Code** Complying Development under the Greenfield Housing Code may not be carried out on the land. **Inland Code** Complying Development under the Inland Code may be carried out on the land. **Housing Alterations Code** Complying Development under the Housing Alterations Code may be carried out on the land. **General Development Code** Complying Development under the General Development Code may be carried out on the land. **Commercial and Industrial Alterations Code** Complying Development under the Commercial and Industrial Alterations Code may be carried out on the land. **Commercial and Industrial (New Buildings and Additions) Code** Complying Development under the Commercial and Industrial Code (New Buildings and Additions) may not be carried out on the land. **Container Recycling Facilities Code** Complying Development under the Container Recycling Facilities Code may not be carried out on the land. **Subdivisions Code** Complying Development under the Subdivision Code may be carried out on the land. **Demolition Code** Complying Development under the Demolition Housing Code may be carried out on the land.

		Fire Safety Code Complying Development under the Fire Safety Code may be carried out on the land.
4B.	**Annual charges under Local Government Act 1993 for coastal protection services that relate to existing coastal protection works** In relation to a coastal council—whether the owner (or any previous owner) of the land has consented in writing to the land being subject to annual charges under section 496B of the *Local Government Act 1993* for coastal protection services that relate to existing coastal protection works (within the meaning of section 553B of that Act). **Note.** Existing coastal protection works" are works to reduce the impact of coastal hazards on land (such as seawalls, revetments, groynes and beach nourishment) that existed before the commencement of section 553B of the *Local Government Act 1993*.	Not Applicable.
5.	**Mine subsidence** Whether or not the land is proclaimed to be a mine subsidence district within the meaning of the *Coal Mine Subsidence Compensation Act 2017.*	The land is not proclaimed to be a mine subsidence district within the meaning of the *Coal Mine Subsidence Compensation Act 2017.*
6.	**Road widening and road realignment** Whether or not the land is affected by any road widening or road realignment under: (a) Division 2 of Part 3 of the Roads Act 1993, or (b) any environmental planning instrument, or (c) any resolution of the council.	No.
7.	**Council and other public authority policies on hazard risk restrictions** Whether or not the land is affected by a policy: (a) adopted by the council, or (b) adopted by any other public authority and notified to the council for the express purpose of its adoption by that authority being referred to in planning certificates issued by the council, that restricts the development of the land because of the likelihood of land slip, bushfire, tidal inundation, subsidence, acid sulphate soils or any other risk (other than flooding).	Part of the subject land is identified on the Parkes Local Environmental Plan 2012 Terrestrial Biodiversity Maps and therefore Clause 6.2 Terrestrial Biodiversity of the Parkes Local Environmental Plan 2012 must be considered before determining a development application for development on the land.
7A.	**Flood related development controls information** (1) Whether or not development on that land or part of the land for the purposes of dwelling houses, dual occupancies, multi dwelling housing or residential flat buildings (not including development for the purposes of group homes or seniors housing) is subject to flood related development controls.	No.

	(2) Whether or not development on that land or part of the land for any other purpose is subject to flood related development controls. (3) Words and expressions in this clause have the same meanings as in the instrument set out in the Schedule to the *Instrument*.	
8.	**Land reserved for acquisition** Whether or not any environmental planning instrument or proposed environmental planning instrument, referred to in clause 1 makes provision in relation to the acquisition of the land by a public authority, as referred to in section 3.15 of the Act.	No.
9.	**Contributions Plan** The name of each contributions plan applying to the land.	Parkes Shire Section 94 Contributions Plan 2016. Parkes Shire Section 94A Contributions Plan 2016.
9A.	**Biodiversity certified land** If the land is biodiversity certified land (under Part 8 of the Biodiversity Conservation Act 2016), a statement to that effect. Note: Biodiversity certified land includes land certified under Part 7AA of the Threatened Species Conservation Act 1995 that is taken to be certified under Part 8 of the Biodiversity Conservation Act 2016.	No.
10.	**Biodiversity stewardship sites** If the land is a biodiversity stewardship site under a biodiversity stewardship agreement under Part 5 of the Biodiversity Conservation Act 2016, a statement to that effect (but only if the council has been notified of the existence of the agreement by the Chief Executive of the Office of Environment and Heritage). Note: Biodiversity stewardship agreements include biobanking agreements under Part 7A of the Threatened Species Conservation Act 1995 that are taken to be biodiversity stewardship agreements under Part 5 of the Biodiversity Conservation Act 2016.	No.
10A.	**Native vegetation clearing set asides** If the land contains a set aside area under section 60ZC of the Local Land Services Act 2013, a statement to that effect (but only if the council has been notified of the existence of the set aside area by Local Land Services or it is registered in the public register under that section).	Council is not aware of any native vegetation clearing set asides in respect of the subject land.

11.	**Bush fire prone land** If any of the land is bush fire prone land (as defined in the Act), a statement that all or, as the case may be, some of the land is bush fire prone land. If none of the land is bush fire prone land, a statement to that effect.	No.
12.	**Property vegetation plans** If the land is land to which a property vegetation plan approved under Part 4 of the Native Vegetation Act 2003 (and that continues in force) applies, a statement to that effect (but only if the council has been notified of the existence of the plan by the person or body that approved the plan under that Act).	No.
13.	**Orders under Trees (Disputes Between Neighbours) Act 2006** Whether an order has been made under the *Trees (Disputes Between Neighbours) Act 2006* to carry out work in relation to a tree on the land (but only if the council has been notified of the order).	No.
14.	**Directions under Part 3A** If there is a direction by the Minister in force under section 75P (2) (c1) of the Act that a provision of an environmental planning instrument prohibiting or restricting the carrying out of a project or a stage of a project on the land under Part 4 of the Act does not have effect, a statement to that effect identifying the provision that does not have effect.	No.
15.	**Site compatibility certificates and conditions for seniors housing** If the land is land to which *State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004* applies: (a) a statement of whether there is a current site compatibility certificate (seniors housing), of which the council is aware, in respect of proposed development on the land and, if there is a certificate, the statement is to include: (i) the period for which the certificate is current, and (ii) that a copy may be obtained from the head office of the Department, and (b) a statement setting out any terms of a kind referred to in clause 18 (2) of that Policy that have been imposed as a condition of consent to a development application granted after 11 October 2007 in respect of the land.	Council is not aware of a current site compatibility certificate (seniors housing) in respect of the subject land.

16. Site compatibility certificates for infrastructure A statement of whether there is a valid site compatibility certificate (infrastructure), or site compatibility certificate (schools or TAFE establishments), of which the council is aware, in respect of proposed development on the land and, if there is a certificate, the statement is to include: (a) the period for which the certificate is valid, and (b) that a copy may be obtained from the head office of the Department.	Council is not aware of any valid site compatibility certificate (infrastructure) in respect of the subject land.
17. Site compatibility certificates and conditions for affordable rental housing (1) A statement of whether there is a current site compatibility certificate (affordable rental housing), of which the council is aware, in respect of proposed development on the land and, if there is a certificate, the statement is to include: (a) the period for which the certificate is current, and (b) that a copy may be obtained from the head office of the Department. (2) A statement setting out any terms of a kind referred to in clause 17 (1) or 37 (1) of *State Environmental Planning Policy (Affordable Rental Housing) 2009* that have been imposed as a condition of consent to a development application in respect of the land.	Council is not aware of any valid site compatibility certificate (affordable rental housing) in respect of the subject land.
18. Paper Subdivision Information (1) The name of any development plan adopted by a relevant authority that applies to the land or that is proposed to be subject to a consent ballot. (2) The date of any subdivision order that applies to the land. (3) Words and expressions used in this clause have the same meaning as they have in Part 16C of this Regulation.	Not Applicable
19. Site Verification Certificates A statement of whether there is a current site verification certificate, of which the council is aware, in respect of the land and, if there is a certificate, the statement is to include: (a) the matter certified by the certificate, and **Note.** A site verification certificate sets out the Director-General's opinion as to whether the land concerned is or is not biophysical strategic agricultural land or critical industry cluster land—see Division 3 of Part 4AA of *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007*.	Council is not aware of any current site verification certificates in respect of the land.

	(b) the date on which the certificate ceases to be current (if any), and (c) that a copy may be obtained from the head office of the Department of Planning and Infrastructure.	
20.	**Loose-fill asbestos insulation** If the land includes any residential premises (within the meaning of Division 1A of Part 8 of the Home Building Act 1989) that are listed on the register that is required to be maintained under that Division, a statement to that effect.	No.
21.	**Affected building notices and building product rectification orders** (1) A statement of whether there is any affected building notice of which the Council is aware that is in force in respect of the land. (2) A statement of: (a) whether there is any building product rectification order of which the council is aware that is in force in respect of the land and has not been fully complied with, and (b) whether any notice of intention to make a building product rectification order of which the council is aware has been given in respect of the land is outstanding. (3) In this clause: ***affected building notice*** has the same meaning as in Part 4 of the *Building Products (Safety) Act 2017*. ***building product rectification order*** has the same meaning as in the *Building Products (Safety) Act 2017*.	No.
22.	**State Environmental Planning Policy (Western Sydney Aerotropolis) 2020** For land to which *State Environmental Planning Policy (Western Sydney Aerotropolis) 2020* applies, whether the land is: (a) in an ANEF or ANEC contour of 20 or greater as referred to in clause 19 of that Policy, or (b) shown on the *Lighting Intensity* and *Wind Shear Map* under that Policy, or (c) shown on the *Obstacle Limitation Surface Map* under that Policy, or (d) in the "public safety area" on the *Public Safety Area Map* under that Policy, or (e) in the "3 kilometre wildlife buffer zone" or the "13 kilometre wildlife buffer zone" on the *Wildlife Buffer Zone Map* under that Policy.	No.
	Note. The following matters are prescribed by section 59 (2) of the *Contaminated Land Management Act 1997* as additional matters to be specified in a planning certificate: (a) that the land to which the certificate relates is significantly contaminated land within the meaning of that Act—if the land (or part of the land) is significantly contaminated land at the date when the certificate is issued,	Nil.

(b) that the land to which the certificate relates is subject to a management order within the meaning of that Act—if it is subject to such an order at the date when the certificate is issued,

(c) that the land to which the certificate relates is the subject of an approved voluntary management proposal within the meaning of that Act—if it is the subject of such an approved proposal at the date when the certificate is issued,

(d) that the land to which the certificate relates is subject to an ongoing maintenance order within the meaning of that Act—if it is subject to such an order at the date when the certificate is issued,

(e) that the land to which the certificate relates is the subject of a site audit statement within the meaning of that Act—if a copy of such a statement has been provided at any time to the local authority issuing the certificate.

Disclaimer
This certificate contains information provided to Parkes Shire Council by other authorities and is as current as the latest information available to Council at the time of production of this document. The information is provided in good faith and the Council shall not incur any liability in respect of any such advice. It is strongly recommended that you contact the relevant authorities to confirm the accuracy of the information

Brent Tucker
ACTING MANAGER PLANNING SERVICES

SCHEDULE A

Zone RU1 Primary Production

1 Objectives of Zone

The objectives of this zone are:

- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.
- To encourage diversity in primary industry enterprises and systems appropriate for the area.
- To minimise the fragmentation and alienation of resource lands.
- To minimise conflict between land uses within this zone and land uses within adjoining zones.
- To encourage eco-tourism enterprises that minimise any adverse effect on primary industry production.
- To permit non-agricultural uses that support the primary production purposes of the zone.
- To permit small scale rural tourism uses associated with primary production and environmental conservation with minimal impact on primary production and the scenic amenity of the area.
- To encourage the provision of tourist accommodation in association with agricultural activities.
- To provide opportunities for employment-generating development that adds value to local agricultural production and integrates with tourism.

2 Permitted without consent

Environmental protection works; Extensive agriculture; Forestry; Home occupations; Intensive plant agriculture.

3 Permitted with consent

Air transport facilities; Airstrips; Animal boarding or training establishments; Aquaculture; Bed and breakfast accommodation; Boat launching ramps; Boat sheds; Building identification signs; Business identification signs; Camping grounds; Caravan parks; Cellar door premises; Cemeteries; Community facilities; Correctional centres; Crematoria; Depots; Dual occupancies (attached); Dwelling houses; Eco-tourist facilities; Educational establishments; Environmental facilities; Extractive industries; Farm buildings; Farm stay accommodation; Flood mitigation works; Freight transport facilities; Helipads; Highway service centres; Home industries; Home occupations (sex services); Industrial training facilities; Information and education facilities; Intensive livestock agriculture; Jetties; Landscaping material supplies; Open cut mining; Plant nurseries; Recreation areas; Recreation facilities (major); Recreation facilities (outdoor); Roads; Roadside stalls; Rural industries; Rural supplies; Rural workers' dwellings; Secondary dwellings; Timber yards; Veterinary hospitals; Water recreation structures.

4 Prohibited

Any development not specified in item 2 or 3.

PLANNING CERTIFICATE UNDER SECTION 14
ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

Information provided pursuant to Section 10.7(5) of the Act

Applicant Details: Ground Doctor Pty Ltd
PO Box 6278
DUBBO NSW 2830

Your Reference:	Trundle Siding
Certificate No:	PC2021/0134
Date:	11 March 2021
Property Number:	704700
Subject Land:	Lot 1 DP 630504
Property Address:	'Moomalong' 193 Scotson Lane, Trundle
Owners:	Clean Teq Sunrise Pty Ltd
Location Map:	As shown on the map below and edged in red

Note *This drawing is provided by Parkes Shire Council to its clients and correspondents for their information on an as is basis. It represents a depiction of the land details as currently held and should not be relied upon as a definitive or complete statement of the title details.*

1.	**Development Consent** Whether any development consent (including complying development certificate) with respect to the land has been granted within the previous two years.	No
2.	**Resolution to prepare Draft Local Environmental Plan** Whether the land is affected by any resolution of the Council to seek amendment to any environmental planning instrument or draft environmental planning instrument applying to the land.	No
3.	**Tree Preservation Order** Whether the land is affected by a Tree Preservation Order.	No
4.	**Residential District Proclamation** Whether the land is affected by a Residential District Proclamation.	No
5.	**Contaminated Site Register** Whether the land is listed in Council's Contaminated Sites Register.	No
6.	**Dwelling Potential on Land Zoned RU1 Primary Production** Whether Development Consent can be granted for the erection of a dwelling on the land.	The land is zoned RU1 Primary Production under Parkes Local Environmental Plan 2012 ("PLEP 2012"). Pursuant to clause 4.2A(1) of PLEP 2012, development consent for erection of a dwelling house on land zoned RU1 Primary Production can be granted in the following circumstances: a) The land is a lot that is at least the 400 hectare minimum lot size development standard as shown on the PLEP 2012 Lot Size Map; or b) The land is a lot created under an Environmental Planning Instrument (defined below) before the PLEP 2012 commenced and on which the erection of a dwelling house was permissible before that commencement; or c) The land is a lot resulting from a subdivision for which development consent was granted before the PLEP 2012 commenced and on which the erection of a dwelling house would have been permissible if the plan of subdivision had been registered before that commencement; or d) The land is an Existing Holding (defined below); or e) The land would have been a lot or Holding referred to in (a), (b), (c) or (d) above had it not been affected by: a minor realignment of its boundaries that did not create an additional lot, or a subdivision creating or widening a public road or public reserve or another public purpose.

A dwelling house can be erected on the land under the circumstances above for the following reasons:

a) Council's records indicate that Lot 1 DP 630504 was held in the same ownership on 14 December 1990 and formed an existing holding (defined below). Clause 4.2A(2)(d) can be used to permit the erection of a dwelling house on the land. Should a dwelling be located upon Lot 1 DP 630504 the holding is exhausted.

Environmental Planning Instrument means an environmental planning instrument (including a SEPP or LEP but not including a DCP) made, or taken to have been made, under Part 3 and in force.

Existing Holding means land that:

(a) was a holding on 14 December 1990, and
(b) is a holding at the time the application for development consent referred to in subclause (2) is lodged,

whether or not there has been a change in the ownership of the holding since 14 December 1990, and includes any other land adjoining that land acquired by the owner since 14 December 1990.

Holding means all adjoining land, even if separated by a road or railway, held by the same person or persons.

7. Building Certificate

A Building Information Certificate issued under Section 6.22-6.26 of the Environmental Planning and Assessment Act, 1979 is required should it be necessary to ascertain whether or not a development complies with Council's requirements. A separate application and fee is required.

8. Other Certificates

The following certificates area also available from Council:

a) Section 603 – Local Government Act 1993 – “Rates Certificate” which details any monies payable to Council (eg. outstanding rates, charges for works undertaken by Council). A separate application and fee is required.
b) Section 735A – Local Government Act 1993 – “Outstanding Notices Certificate (LGA)” which details any outstanding notices issued under the Local Government Act. A separate application and fee is required.
c) Clause 41 of Schedule 5 – Environmental Planning and Assessment Act, 1979 – “Outstanding Notices Certificate (EP&A Act 1979)” which details any outstanding notices of proposed orders or outstanding orders issued under the Environmental Planning and Assessment Act, 1979. A separate application and fee is required.

d) Combined Section 735A and Clause 41 of Schedule 5 of EP&A Act 1979. A separate application and fee is required. e) Section 6.22-6.23 – Environmental Planning and Assessment Act, 1979 – “Building Information Certificate” which details whether a building complies with Council approvals and the Building Code of Australia. A separate application and fee is required.	

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Brent Tucker
ACTING MANAGER PLANNING SERVICES

Annexure G

Soil Analytical Results Summary Tables

Table G1
Summary of Soil Analytical Results and Comparison to Preliminary Assessment Crietria (mg/kg)

Sample ID	SS01	SS02	SS03	SS04	SS05	SS06	SS07	NEPM (2013) SILs			
Date	25-Feb-21	25-Feb-21	25-Feb-21	25-Feb-21	25-Feb-21	25-Feb-21	25-Feb-21	HSL D	EIL / ESL D	Manage Limit	HIL D
Total Recoverable Hydrocarbons - 2013 NEPM Fractions											
Naphthalene	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	NL	370	na	
TRH C6-C10	< 20	< 20	< 20	< 20	-	-	-	-	215	800	
TRH C6-C10 less BTEX (F1)	< 20	< 20	< 20	< 20	-	-	-	260	-	-	
TRH >C10-C16	< 50	< 50	< 50	< 50	-	-	-	-	170	1000	na
TRH >C10-C16 less Naphthalene (F2)	< 50	< 50	< 50	< 50	-	-	-	NL	-	-	na
TRH >C10-C40 (total)*	< 100	< 100	< 100	< 100	-	-	-	na	na	na	na
TRH >C16-C34	< 100	< 100	< 100	< 100	-	-	-	NL	2500	5000	na
TRH >C34-C40	< 100	< 100	< 100	< 100	-	-	-	NL	6600	10000	na
BTEX											
Benzene	< 0.1	< 0.1	< 0.1	< 0.1	-	-	-	3	95	-	-
Ethylbenzene	< 0.1	< 0.1	< 0.1	< 0.1	-	-	-	NL	185	-	-
m&p-Xylenes	< 0.2	< 0.2	< 0.2	< 0.2	-	-	-	-	-	-	-
o-Xylene	< 0.1	< 0.1	< 0.1	< 0.1	-	-	-	-	-	-	-
Toluene	< 0.1	< 0.1	< 0.1	< 0.1	-	-	-	NL	135	-	-
Xylenes - Total*	< 0.3	< 0.3	< 0.3	< 0.3	-	-	-	230	95	-	-
Polycyclic Aromatic Hydrocarbons											
Acenaphthene	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	na	na	na	-
Acenaphthylene	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	na	na	na	-
Anthracene	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	na	na	na	-
Benz(a)anthracene	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	na	na	na	-
Benzo(a)pyrene	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	na	0.7	na	-
Benzo(a)pyrene TEQ (lower bound) *	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	na	na	na	40
Benzo(b&j)fluoranthene	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	na	na	na	-
Benzo(g.h.i)perylene	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	na	na	na	-
Benzo(k)fluoranthene	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	na	na	na	-
Chrysene	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	na	na	na	-
Dibenz(a.h)anthracene	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	na	na	na	-
Fluoranthene	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	na	na	na	-
Fluorene	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	na	na	na	-
Indeno(1.2.3-cd)pyrene	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	na	na	na	-
Naphthalene	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	na	370	na	-
Phenanthrene	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	na	na	na	-
Pyrene	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	na	na	na	-
Total PAH*	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	na	na	na	4000
Heavy Metals											
Arsenic	16	21	17	25	17	18	28	na	160	na	3000
Cadmium	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	na	-	na	900
Chromium	39	46	46	62	37	40	41	na	310*	na	3600
Copper	17	18	18	17	22	16	28	na	85*	na	240000
Lead	16	21	21	19	32	27	22	na	1800	na	1500
Mercury	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	na	na	na	730
Nickel	18	21	19	23	22	17	37	na	55*	na	6000
Zinc	48	62	58	68	37	46	110	na	110*	na	400000
Organochlorine Pesticides											
4.4'-DDD	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	na	na	na	-
4.4'-DDE	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	na	na	na	-
4.4'-DDT	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	na	640	na	-
a-BHC	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	na	na	na	-
Aldrin	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	na	na	na	-
Aldrin and Dieldrin (Total)*	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	na	na	na	45
b-BHC	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	na	na	na	-
Chlordanes - Total	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	na	na	na	530
d-BHC	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	na	na	na	-
DDT + DDE + DDD (Total)*	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	na	na	na	3600
Dieldrin	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	na	na	na	-
Endosulfan I	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	na	na	na	2000
Endosulfan II	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	na	na	na	2000
Endosulfan sulphate	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	na	na	na	-
Endrin	< 0.05	< 0.1	< 0.1	< 0.1	< 0.05	< 0.05	< 0.05	na	na	na	100
Endrin aldehyde	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	na	na	na	-
Endrin ketone	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	na	na	na	-
g-BHC (Lindane)	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	na	na	na	-
Heptachlor	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	na	na	na	50
Heptachlor epoxide	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	na	na	na	-
Hexachlorobenzene	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	na	na	na	80
Methoxychlor	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	na	na	na	2500
Toxaphene	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	na	na	na	160
Organophosphorus Pesticides											
Azinphos-methyl	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	na	na	na	-
Bolstar	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	na	na	na	-
Chlorfenvinphos	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	na	na	na	-
Chlorpyrifos	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	na	na	na	2000
Chlorpyrifos-methyl	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	na	na	na	-
Coumaphos	< 2	< 2	< 2	< 2	< 2	< 2	< 2	na	na	na	-
Demeton-O	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	na	na	na	-
Demeton-S	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	na	na	na	-
Diazinon	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	na	na	na	-
Dichlorvos	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	na	na	na	-
Dimethoate	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	na	na	na	-
Disulfoton	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	na	na	na	-
EPN	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	na	na	na	-
Ethion	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	na	na	na	-
Ethoprop	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	na	na	na	-
Ethyl parathion	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	na	na	na	-
Fenitrothion	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	na	na	na	-
Fensulfothion	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	na	na	na	-
Fenthion	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	na	na	na	-
Malathion	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	na	na	na	-
Merphos	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	na	na	na	-
Methyl parathion	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	na	na	na	-
Mevinphos	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	na	na	na	-
Monocrotophos	< 2	< 2	< 2	< 2	< 2	< 2	< 2	na	na	na	-
Naled	< 0.2	< 0.5	< 0.5	< 0.5	< 0.2	< 0.2	< 0.2	na	na	na	-
Omethoate	< 2	< 2	< 2	< 2	< 2	< 2	< 2	na	na	na	-
Phorate	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	na	na	na	-
Pirimiphos-methyl	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	na	na	na	-
Pyrazophos	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	na	na	na	-
Ronnel	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	na	na	na	-
Terbufos	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	na	na	na	-
Tetrachlorvinphos	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	na	na	na	-
Tokuthion	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	na	na	na	-
Trichloronate	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	na	na	na	-
Acid Herbicides											
2.4.5-T	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	na	na	na	5000
2.4.5-TP	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	na	na	na	-
2.4-D	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	na	na	na	9000
2.4-DB	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	na	na	na	-
Actril (Ioxynil)	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	na	na	na	-
Dicamba	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	na	na	na	-
Dichlorprop	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	na	na	na	-
Dinitro-o-cresol	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	na	na	na	-
Dinoseb	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	na	na	na	-
MCPA	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	na	na	na	5000
MCPB	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	na	na	na	5000
Mecoprop	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	na	na	na	5000
Asbestos	Non-detect	Non-detect	Non-detect	Non-detect	Non-detect	Non-detect	Non-detect	Detection			

Table G2
Relative Percentage Difference For Duplicate and Primary Soil Samples

Sample ID	SS01	DUPA	RPD
Date	25-Feb-21	25-Feb-21	%
Heavy Metals			
Arsenic	16	17	**6**
Cadmium	< 0.4	< 0.4	**-**
Chromium	39	41	**5**
Copper	17	18	**6**
Lead	16	18	**12**
Mercury	< 0.1	< 0.1	**-**
Nickel	18	18	**0**
Zinc	48	48	**0**

Annexure H

Laboratory Certificate of Analysis

Sample Receipt Advice

Company name:	Clean TeQ Sunrise Pty Ltd
Contact name:	James Morrow
Project name:	TRUNDLE RAIL SLIDING
Project ID:	2021-GD006
Turnaround time:	5 Day
Date/Time received	Feb 26, 2021 8:40 AM
Eurofins reference	776840

Sample Information

- ✓ A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- ✓ All samples have been received as described on the above COC.
- ✓ COC has been completed correctly.
- ✓ Attempt to chill was evident.
- ✓ Appropriately preserved sample containers have been used.
- ✓ All samples were received in good condition.
- ✓ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
- ✓ Appropriate sample containers have been used.
- ✓ Sample containers for volatile analysis received with zero headspace.
- ✗ Split sample sent to requested external lab.
- ✗ Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Michael Morrison on phone : 03 8564 5933 or by email: MichaelMorrison@eurofins.com

Results will be delivered electronically via email to James Morrow - james.morrow@grounddoc.com.au.

Note: A copy of these results will also be delivered to the general Clean TeQ Sunrise Pty Ltd email address.

eurofins | Environment Testing

Certificate of Analysis

Clean TeQ Sunrise Pty Ltd
Level 6, 350 Collins Street
Melbourne
VIC 3000

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Attention:	**James Morrow**
Report	**776840-S**
Project name	TRUNDLE RAIL SLIDING
Project ID	2021-GD006
Received Date	Feb 26, 2021

Client Sample ID			**SS01**	**SS02**	**SS03**	**SS04**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**S21-Fe53787**	**S21-Fe53788**	**S21-Fe53789**	**S21-Fe53790**
Date Sampled			**Feb 25, 2021**	**Feb 25, 2021**	**Feb 25, 2021**	**Feb 25, 2021**
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	< 50	< 50	< 50	< 50
TRH C29-C36	50	mg/kg	< 50	< 50	< 50	< 50
TRH C10-C36 (Total)	50	mg/kg	< 50	< 50	< 50	< 50
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total*	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	82	84	82	81
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	< 20	< 20	< 20	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C10-C40 (total)*	100	mg/kg	< 100	< 100	< 100	< 100
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5

Client Sample ID			SS01	SS02	SS03	SS04
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S21-Fe53787	S21-Fe53788	S21-Fe53789	S21-Fe53790
Date Sampled			Feb 25, 2021	Feb 25, 2021	Feb 25, 2021	Feb 25, 2021
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	106	109	110	107
p-Terphenyl-d14 (surr.)	1	%	118	INT	131	101
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4.4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDT	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
a-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Aldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
b-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
d-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin	0.05	mg/kg	< 0.05	< 0.1	< 0.1	< 0.1
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
g-BHC (Lindane)	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Methoxychlor	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Toxaphene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dibutylchlorendate (surr.)	1	%	114	140	110	144
Tetrachloro-m-xylene (surr.)	1	%	94	131	99	95
Organophosphorus Pesticides						
Azinphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Bolstar	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorfenvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Coumaphos	2	mg/kg	< 2	< 2	< 2	< 2
Demeton-S	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Demeton-O	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Diazinon	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dichlorvos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2

Client Sample ID			SS01	SS02	SS03	SS04
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S21-Fe53787	S21-Fe53788	S21-Fe53789	S21-Fe53790
Date Sampled			Feb 25, 2021	Feb 25, 2021	Feb 25, 2021	Feb 25, 2021
Test/Reference	LOR	Unit				
Organophosphorus Pesticides						
Dimethoate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Disulfoton	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
EPN	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethoprop	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenitrothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fensulfothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Malathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Merphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Methyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Mevinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Monocrotophos	2	mg/kg	< 2	< 2	< 2	< 2
Naled	0.2	mg/kg	< 0.2	< 0.5	< 0.5	< 0.5
Omethoate	2	mg/kg	< 2	< 2	< 2	< 2
Phorate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pirimiphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pyrazophos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ronnel	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Terbufos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tetrachlorvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tokuthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Trichloronate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Triphenylphosphate (surr.)	1	%	120	INT	146	149
Acid Herbicides						
2.4-D	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2.4-DB	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2.4.5-T	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2.4.5-TP	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Actril (Ioxynil)	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dicamba	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dichlorprop	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dinitro-o-cresol	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dinoseb	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
MCPA	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
MCPB	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Mecoprop	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Warfarin (surr.)	1	%	79	82	80	82
Ammonia (as N)	5	mg/kg	< 5	< 5	< 5	< 5
Sulphate (as SO4)	10	mg/kg	13	< 10	41	63
Sulphur	5	mg/kg	85	95	57	66
% Moisture	1	%	5.3	2.9	6.0	6.3
Heavy Metals						
Arsenic	2	mg/kg	16	21	17	25
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	39	46	46	62
Copper	5	mg/kg	17	18	18	17

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Client Sample ID			SS01	SS02	SS03	SS04
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S21-Fe53787	S21-Fe53788	S21-Fe53789	S21-Fe53790
Date Sampled			Feb 25, 2021	Feb 25, 2021	Feb 25, 2021	Feb 25, 2021
Test/Reference	LOR	Unit				
Heavy Metals						
Lead	5	mg/kg	16	21	21	19
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	5	mg/kg	18	21	19	23
Zinc	5	mg/kg	48	62	58	68

Client Sample ID			SS05	SS06	SS07	DUPA
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S21-Fe53791	S21-Fe53792	S21-Fe53793	S21-Fe53794
Date Sampled			Feb 25, 2021	Feb 25, 2021	Feb 25, 2021	Feb 25, 2021
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	-	-	-	< 20
TRH C10-C14	20	mg/kg	-	-	-	< 20
TRH C15-C28	50	mg/kg	-	-	-	< 50
TRH C29-C36	50	mg/kg	-	-	-	< 50
TRH C10-C36 (Total)	50	mg/kg	-	-	-	< 50
BTEX						
Benzene	0.1	mg/kg	-	-	-	< 0.1
Toluene	0.1	mg/kg	-	-	-	< 0.1
Ethylbenzene	0.1	mg/kg	-	-	-	< 0.1
m&p-Xylenes	0.2	mg/kg	-	-	-	< 0.2
o-Xylene	0.1	mg/kg	-	-	-	< 0.1
Xylenes - Total*	0.3	mg/kg	-	-	-	< 0.3
4-Bromofluorobenzene (surr.)	1	%	-	-	-	82
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene[N02]	0.5	mg/kg	-	-	-	< 0.5
TRH C6-C10	20	mg/kg	-	-	-	< 20
TRH C6-C10 less BTEX (F1)[N04]	20	mg/kg	-	-	-	< 20
TRH >C10-C16	50	mg/kg	-	-	-	< 50
TRH >C10-C16 less Naphthalene (F2)[N01]	50	mg/kg	-	-	-	< 50
TRH >C16-C34	100	mg/kg	-	-	-	< 100
TRH >C34-C40	100	mg/kg	-	-	-	< 100
TRH >C10-C40 (total)*	100	mg/kg	-	-	-	< 100
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	-	-	-	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	-	-	-	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	-	-	-	1.2
Acenaphthene	0.5	mg/kg	-	-	-	< 0.5
Acenaphthylene	0.5	mg/kg	-	-	-	< 0.5
Anthracene	0.5	mg/kg	-	-	-	< 0.5
Benz(a)anthracene	0.5	mg/kg	-	-	-	< 0.5
Benzo(a)pyrene	0.5	mg/kg	-	-	-	< 0.5
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	-	-	-	< 0.5
Benzo(g.h.i)perylene	0.5	mg/kg	-	-	-	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	-	-	-	< 0.5
Chrysene	0.5	mg/kg	-	-	-	< 0.5
Dibenz(a.h)anthracene	0.5	mg/kg	-	-	-	< 0.5
Fluoranthene	0.5	mg/kg	-	-	-	< 0.5

Client Sample ID			SS05	SS06	SS07	DUPA
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S21-Fe53791	S21-Fe53792	S21-Fe53793	S21-Fe53794
Date Sampled			Feb 25, 2021	Feb 25, 2021	Feb 25, 2021	Feb 25, 2021
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Fluorene	0.5	mg/kg	-	-	-	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	-	-	-	< 0.5
Naphthalene	0.5	mg/kg	-	-	-	< 0.5
Phenanthrene	0.5	mg/kg	-	-	-	< 0.5
Pyrene	0.5	mg/kg	-	-	-	< 0.5
Total PAH*	0.5	mg/kg	-	-	-	< 0.5
2-Fluorobiphenyl (surr.)	1	%	-	-	-	104
p-Terphenyl-d14 (surr.)	1	%	-	-	-	117
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4.4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDT	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
a-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Aldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
b-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
d-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
g-BHC (Lindane)	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Methoxychlor	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Toxaphene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dibutylchlorendate (surr.)	1	%	104	116	111	102
Tetrachloro-m-xylene (surr.)	1	%	97	87	97	88
Organophosphorus Pesticides						
Azinphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Bolstar	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorfenvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Coumaphos	2	mg/kg	< 2	< 2	< 2	< 2
Demeton-S	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Demeton-O	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Diazinon	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dichlorvos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dimethoate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Disulfoton	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2

Client Sample ID			SS05	SS06	SS07	DUPA
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S21-Fe53791	S21-Fe53792	S21-Fe53793	S21-Fe53794
Date Sampled			Feb 25, 2021	Feb 25, 2021	Feb 25, 2021	Feb 25, 2021
Test/Reference	LOR	Unit				
Organophosphorus Pesticides						
EPN	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethoprop	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenitrothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fensulfothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Malathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Merphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Methyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Mevinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Monocrotophos	2	mg/kg	< 2	< 2	< 2	< 2
Naled	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Omethoate	2	mg/kg	< 2	< 2	< 2	< 2
Phorate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pirimiphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pyrazophos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ronnel	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Terbufos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tetrachlorvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tokuthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Trichloronate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Triphenylphosphate (surr.)	1	%	121	116	129	112
Acid Herbicides						
2.4-D	0.5	mg/kg	-	-	-	< 0.5
2.4-DB	0.5	mg/kg	-	-	-	< 0.5
2.4.5-T	0.5	mg/kg	-	-	-	< 0.5
2.4.5-TP	0.5	mg/kg	-	-	-	< 0.5
Actril (Ioxynil)	0.5	mg/kg	-	-	-	< 0.5
Dicamba	0.5	mg/kg	-	-	-	< 0.5
Dichlorprop	0.5	mg/kg	-	-	-	< 0.5
Dinitro-o-cresol	0.5	mg/kg	-	-	-	< 0.5
Dinoseb	0.5	mg/kg	-	-	-	< 0.5
MCPA	0.5	mg/kg	-	-	-	< 0.5
MCPB	0.5	mg/kg	-	-	-	< 0.5
Mecoprop	0.5	mg/kg	-	-	-	< 0.5
Warfarin (surr.)	1	%	-	-	-	82
Ammonia (as N)	5	mg/kg	< 5	< 5	< 5	< 5
Sulphate (as SO4)	10	mg/kg	21	57	110	13
Sulphur	5	mg/kg	63	75	93	94
% Moisture	1	%	5.4	9.4	16	20
Heavy Metals						
Arsenic	2	mg/kg	17	18	28	17
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	37	40	41	41
Copper	5	mg/kg	22	16	28	18
Lead	5	mg/kg	32	27	22	18
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1

Client Sample ID			SS05	SS06	SS07	DUPA
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S21-Fe53791	S21-Fe53792	S21-Fe53793	S21-Fe53794
Date Sampled			Feb 25, 2021	Feb 25, 2021	Feb 25, 2021	Feb 25, 2021
Test/Reference	LOR	Unit				
Heavy Metals						
Nickel	5	mg/kg	22	17	37	18
Zinc	5	mg/kg	37	46	110	48

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Sydney	Mar 02, 2021	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
BTEX	Sydney	Mar 02, 2021	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Mar 02, 2021	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Sydney	Mar 02, 2021	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Polycyclic Aromatic Hydrocarbons	Sydney	Mar 02, 2021	14 Days
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water			
Organochlorine Pesticides	Sydney	Mar 02, 2021	14 Days
- Method: LTM-ORG-2220 OCP & PCB in Soil and Water			
Organophosphorus Pesticides	Sydney	Mar 02, 2021	14 Days
- Method: LTM-ORG-2200 Organophosphorus Pesticides by GC-MS			
Metals M8	Sydney	Mar 02, 2021	180 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Acid Herbicides	Melbourne	Mar 04, 2021	14 Days
- Method: LTM-ORG-2180 Phenoxy Acid Herbicides			
Ammonia (as N)	Sydney	Mar 02, 2021	28 Days
- Method: LTM-INO-4200 Ammonia by Discrete Analyser			
Sulphate (as SO4)	Sydney	Mar 02, 2021	28 Days
- Method: E045 Anions by Ion Chromatography			
Sulphur	Melbourne	Mar 04, 2021	7 Days
- Method: LTM-MET-3010 Alkali Metals Sulfur Silicon and Phosphorus by ICP-AES			
% Moisture	Sydney	Feb 26, 2021	14 Days
- Method: LTM-GEN-7080 Moisture			

Company Name: Clean TeQ Sunrise Pty Ltd
Address: Level 6, 350 Collins Street
Melbourne
VIC 3000

Project Name: TRUNDLE RAIL SLIDING
Project ID: 2021-GD006

Order No.: 14542
Report #: 776840
Phone: 03 9797 6777
Fax: 9706 8344

Received: Feb 26, 2021 8:40 AM
Due: Mar 4, 2021
Priority: 5 Day
Contact Name: James Morrow

Eurofins Analytical Services Manager : Michael Morrison

Sample Detail						Ammonia (as N)	Asbestos - AS4964	Sulphate (as SO4)	Sulphur	Acid Herbicides	Metals M8	Suite B14: OCP/OPP	Moisture Set	Eurofins Suite B10
Melbourne Laboratory - NATA Site # 1254 & 14271									X	X				
Sydney Laboratory - NATA Site # 18217						X	X	X			X	X	X	X
Brisbane Laboratory - NATA Site # 20794														
Perth Laboratory - NATA Site # 23736														
Mayfield Laboratory														
External Laboratory														
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**									
1	SS01	Feb 25, 2021		Soil	S21-Fe53787	X	X	X	X	X			X	X
2	SS02	Feb 25, 2021		Soil	S21-Fe53788	X	X	X	X	X			X	X
3	SS03	Feb 25, 2021		Soil	S21-Fe53789	X	X	X	X	X			X	X
4	SS04	Feb 25, 2021		Soil	S21-Fe53790	X	X	X	X	X			X	X
5	SS05	Feb 25, 2021		Soil	S21-Fe53791	X		X	X		X	X	X	
6	SS06	Feb 25, 2021		Soil	S21-Fe53792	X		X	X		X	X	X	
7	SS07	Feb 25, 2021		Soil	S21-Fe53793	X		X	X		X	X	X	
8	DUPA	Feb 25, 2021		Soil	S21-Fe53794	X	X	X	X	X			X	X
Test Counts						8	5	8	8	5	3	3	8	5

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Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**ug/L:** micrograms per litre
ppm: Parts per million	**ppb:** Parts per billion	**%:** Percentage
org/100mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100mL:** Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Environment Testing

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/kg	< 20			20	Pass	
TRH C10-C14	mg/kg	< 20			20	Pass	
TRH C15-C28	mg/kg	< 50			50	Pass	
TRH C29-C36	mg/kg	< 50			50	Pass	
Method Blank							
BTEX							
Benzene	mg/kg	< 0.1			0.1	Pass	
Toluene	mg/kg	< 0.1			0.1	Pass	
Ethylbenzene	mg/kg	< 0.1			0.1	Pass	
m&p-Xylenes	mg/kg	< 0.2			0.2	Pass	
o-Xylene	mg/kg	< 0.1			0.1	Pass	
Xylenes - Total*	mg/kg	< 0.3			0.3	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/kg	< 0.5			0.5	Pass	
TRH C6-C10	mg/kg	< 20			20	Pass	
TRH >C10-C16	mg/kg	< 50			50	Pass	
TRH >C16-C34	mg/kg	< 100			100	Pass	
TRH >C34-C40	mg/kg	< 100			100	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/kg	< 0.5			0.5	Pass	
Acenaphthylene	mg/kg	< 0.5			0.5	Pass	
Anthracene	mg/kg	< 0.5			0.5	Pass	
Benz(a)anthracene	mg/kg	< 0.5			0.5	Pass	
Benzo(a)pyrene	mg/kg	< 0.5			0.5	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Benzo(g.h.i)perylene	mg/kg	< 0.5			0.5	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Chrysene	mg/kg	< 0.5			0.5	Pass	
Dibenz(a.h)anthracene	mg/kg	< 0.5			0.5	Pass	
Fluoranthene	mg/kg	< 0.5			0.5	Pass	
Fluorene	mg/kg	< 0.5			0.5	Pass	
Indeno(1.2.3-cd)pyrene	mg/kg	< 0.5			0.5	Pass	
Naphthalene	mg/kg	< 0.5			0.5	Pass	
Phenanthrene	mg/kg	< 0.5			0.5	Pass	
Pyrene	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Organochlorine Pesticides							
Chlordanes - Total	mg/kg	< 0.1			0.1	Pass	
4.4'-DDD	mg/kg	< 0.05			0.05	Pass	
4.4'-DDE	mg/kg	< 0.05			0.05	Pass	
4.4'-DDT	mg/kg	< 0.05			0.05	Pass	
a-BHC	mg/kg	< 0.05			0.05	Pass	
Aldrin	mg/kg	< 0.05			0.05	Pass	
b-BHC	mg/kg	< 0.05			0.05	Pass	
d-BHC	mg/kg	< 0.05			0.05	Pass	
Dieldrin	mg/kg	< 0.05			0.05	Pass	
Endosulfan I	mg/kg	< 0.05			0.05	Pass	
Endosulfan II	mg/kg	< 0.05			0.05	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Endosulfan sulphate	mg/kg	< 0.05			0.05	Pass	
Endrin	mg/kg	< 0.05			0.05	Pass	
Endrin aldehyde	mg/kg	< 0.05			0.05	Pass	
Endrin ketone	mg/kg	< 0.05			0.05	Pass	
g-BHC (Lindane)	mg/kg	< 0.05			0.05	Pass	
Heptachlor	mg/kg	< 0.05			0.05	Pass	
Heptachlor epoxide	mg/kg	< 0.05			0.05	Pass	
Hexachlorobenzene	mg/kg	< 0.05			0.05	Pass	
Methoxychlor	mg/kg	< 0.2			0.2	Pass	
Toxaphene	mg/kg	< 0.1			0.1	Pass	
Method Blank							
Organophosphorus Pesticides							
Azinphos-methyl	mg/kg	< 0.2			0.2	Pass	
Bolstar	mg/kg	< 0.2			0.2	Pass	
Chlorfenvinphos	mg/kg	< 0.2			0.2	Pass	
Chlorpyrifos	mg/kg	< 0.2			0.2	Pass	
Chlorpyrifos-methyl	mg/kg	< 0.2			0.2	Pass	
Coumaphos	mg/kg	< 2			2	Pass	
Demeton-S	mg/kg	< 0.2			0.2	Pass	
Demeton-O	mg/kg	< 0.2			0.2	Pass	
Diazinon	mg/kg	< 0.2			0.2	Pass	
Dichlorvos	mg/kg	< 0.2			0.2	Pass	
Dimethoate	mg/kg	< 0.2			0.2	Pass	
Disulfoton	mg/kg	< 0.2			0.2	Pass	
EPN	mg/kg	< 0.2			0.2	Pass	
Ethion	mg/kg	< 0.2			0.2	Pass	
Ethoprop	mg/kg	< 0.2			0.2	Pass	
Ethyl parathion	mg/kg	< 0.2			0.2	Pass	
Fenitrothion	mg/kg	< 0.2			0.2	Pass	
Fensulfothion	mg/kg	< 0.2			0.2	Pass	
Fenthion	mg/kg	< 0.2			0.2	Pass	
Malathion	mg/kg	< 0.2			0.2	Pass	
Merphos	mg/kg	< 0.2			0.2	Pass	
Methyl parathion	mg/kg	< 0.2			0.2	Pass	
Mevinphos	mg/kg	< 0.2			0.2	Pass	
Monocrotophos	mg/kg	< 2			2	Pass	
Naled	mg/kg	< 0.2			0.2	Pass	
Omethoate	mg/kg	< 2			2	Pass	
Phorate	mg/kg	< 0.2			0.2	Pass	
Pirimiphos-methyl	mg/kg	< 0.2			0.2	Pass	
Pyrazophos	mg/kg	< 0.2			0.2	Pass	
Ronnel	mg/kg	< 0.2			0.2	Pass	
Terbufos	mg/kg	< 0.2			0.2	Pass	
Tetrachlorvinphos	mg/kg	< 0.2			0.2	Pass	
Tokuthion	mg/kg	< 0.2			0.2	Pass	
Trichloronate	mg/kg	< 0.2			0.2	Pass	
Method Blank							
Acid Herbicides							
2.4-D	mg/kg	< 0.5			0.5	Pass	
2.4-DB	mg/kg	< 0.5			0.5	Pass	
2.4.5-T	mg/kg	< 0.5			0.5	Pass	
2.4.5-TP	mg/kg	< 0.5			0.5	Pass	
Actril (Ioxynil)	mg/kg	< 0.5			0.5	Pass	
Dicamba	mg/kg	< 0.5			0.5	Pass	

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Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Dichlorprop	mg/kg	< 0.5			0.5	Pass	
Dinitro-o-cresol	mg/kg	< 0.5			0.5	Pass	
Dinoseb	mg/kg	< 0.5			0.5	Pass	
MCPA	mg/kg	< 0.5			0.5	Pass	
MCPB	mg/kg	< 0.5			0.5	Pass	
Mecoprop	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Ammonia (as N)	mg/kg	< 5			5	Pass	
Sulphate (as SO4)	mg/kg	< 10			10	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/kg	< 2			2	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Lead	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 5			5	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	85			70-130	Pass	
TRH C10-C14	%	75			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	90			70-130	Pass	
Toluene	%	92			70-130	Pass	
Ethylbenzene	%	93			70-130	Pass	
m&p-Xylenes	%	94			70-130	Pass	
o-Xylene	%	96			70-130	Pass	
Xylenes - Total*	%	94			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	86			70-130	Pass	
TRH C6-C10	%	83			70-130	Pass	
TRH >C10-C16	%	75			70-130	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	81			70-130	Pass	
Acenaphthylene	%	90			70-130	Pass	
Anthracene	%	86			70-130	Pass	
Benz(a)anthracene	%	91			70-130	Pass	
Benzo(a)pyrene	%	93			70-130	Pass	
Benzo(b&j)fluoranthene	%	92			70-130	Pass	
Benzo(g.h.i)perylene	%	83			70-130	Pass	
Benzo(k)fluoranthene	%	86			70-130	Pass	
Chrysene	%	87			70-130	Pass	
Dibenz(a.h)anthracene	%	89			70-130	Pass	
Fluoranthene	%	83			70-130	Pass	
Fluorene	%	85			70-130	Pass	
Indeno(1.2.3-cd)pyrene	%	88			70-130	Pass	
Naphthalene	%	81			70-130	Pass	
Phenanthrene	%	79			70-130	Pass	
Pyrene	%	84			70-130	Pass	

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Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery							
Organochlorine Pesticides							
Chlordanes - Total	%	94			70-130	Pass	
4.4'-DDD	%	73			70-130	Pass	
4.4'-DDE	%	101			70-130	Pass	
4.4'-DDT	%	93			70-130	Pass	
a-BHC	%	91			70-130	Pass	
Aldrin	%	100			70-130	Pass	
b-BHC	%	95			70-130	Pass	
d-BHC	%	89			70-130	Pass	
Dieldrin	%	77			70-130	Pass	
Endosulfan I	%	92			70-130	Pass	
Endosulfan II	%	86			70-130	Pass	
Endosulfan sulphate	%	99			70-130	Pass	
Endrin	%	110			70-130	Pass	
Endrin aldehyde	%	76			70-130	Pass	
Endrin ketone	%	83			70-130	Pass	
g-BHC (Lindane)	%	96			70-130	Pass	
Heptachlor	%	93			70-130	Pass	
Heptachlor epoxide	%	95			70-130	Pass	
Hexachlorobenzene	%	99			70-130	Pass	
Methoxychlor	%	104			70-130	Pass	
LCS - % Recovery							
Organophosphorus Pesticides							
Diazinon	%	97			70-130	Pass	
Dimethoate	%	121			70-130	Pass	
Ethion	%	130			70-130	Pass	
Mevinphos	%	86			70-130	Pass	
LCS - % Recovery							
Acid Herbicides							
2.4-D	%	105			70-130	Pass	
2.4-DB	%	91			70-130	Pass	
2.4.5-T	%	109			70-130	Pass	
2.4.5-TP	%	110			70-130	Pass	
Actril (Ioxynil)	%	97			70-130	Pass	
Dicamba	%	104			70-130	Pass	
Dichlorprop	%	102			70-130	Pass	
Dinitro-o-cresol	%	108			70-130	Pass	
Dinoseb	%	110			70-130	Pass	
MCPA	%	90			70-130	Pass	
MCPB	%	90			70-130	Pass	
Mecoprop	%	94			70-130	Pass	
LCS - % Recovery							
Sulphate (as SO4)	%	82			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic	%	108			80-120	Pass	
Cadmium	%	110			80-120	Pass	
Chromium	%	116			80-120	Pass	
Copper	%	118			80-120	Pass	
Lead	%	119			80-120	Pass	
Mercury	%	117			80-120	Pass	
Nickel	%	117			80-120	Pass	
Zinc	%	108			80-120	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	S21-Fe51090	NCP	%	83			70-130	Pass	
TRH C10-C14	S21-Ma06214	NCP	%	77			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S21-Fe51090	NCP	%	81			70-130	Pass	
Toluene	S21-Fe51090	NCP	%	71			70-130	Pass	
Ethylbenzene	S21-Fe51090	NCP	%	84			70-130	Pass	
m&p-Xylenes	S21-Fe51090	NCP	%	93			70-130	Pass	
o-Xylene	S21-Fe51090	NCP	%	118			70-130	Pass	
Xylenes - Total*	S21-Fe51090	NCP	%	102			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	S21-Fe51090	NCP	%	104			70-130	Pass	
TRH C6-C10	S21-Fe51090	NCP	%	86			70-130	Pass	
TRH >C10-C16	S21-Ma06214	NCP	%	76			70-130	Pass	
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	S21-Fe51198	NCP	%	95			70-130	Pass	
Acenaphthylene	S21-Fe51198	NCP	%	109			70-130	Pass	
Anthracene	S21-Fe51198	NCP	%	100			70-130	Pass	
Benz(a)anthracene	S21-Fe51198	NCP	%	108			70-130	Pass	
Benzo(a)pyrene	S21-Fe51198	NCP	%	112			70-130	Pass	
Benzo(b&j)fluoranthene	S21-Fe51198	NCP	%	112			70-130	Pass	
Benzo(g.h.i)perylene	S21-Fe51198	NCP	%	111			70-130	Pass	
Benzo(k)fluoranthene	S21-Fe51198	NCP	%	101			70-130	Pass	
Chrysene	S21-Fe51198	NCP	%	95			70-130	Pass	
Dibenz(a.h)anthracene	S21-Fe51198	NCP	%	107			70-130	Pass	
Fluoranthene	S21-Fe51198	NCP	%	98			70-130	Pass	
Fluorene	S21-Fe51198	NCP	%	105			70-130	Pass	
Indeno(1.2.3-cd)pyrene	S21-Fe51198	NCP	%	104			70-130	Pass	
Naphthalene	S21-Fe51198	NCP	%	94			70-130	Pass	
Phenanthrene	S21-Fe51198	NCP	%	91			70-130	Pass	
Pyrene	S21-Fe51198	NCP	%	100			70-130	Pass	
Spike - % Recovery									
Organochlorine Pesticides				Result 1					
Chlordanes - Total	S21-Ma01534	NCP	%	75			70-130	Pass	
4.4'-DDD	S21-Ma01534	NCP	%	90			70-130	Pass	
4.4'-DDE	S21-Ma01534	NCP	%	92			70-130	Pass	
a-BHC	S21-Ma01534	NCP	%	84			70-130	Pass	
Aldrin	S21-Ma01534	NCP	%	88			70-130	Pass	
b-BHC	S21-Ma01534	NCP	%	89			70-130	Pass	
d-BHC	S21-Ma01534	NCP	%	87			70-130	Pass	
Dieldrin	S21-Ma01534	NCP	%	79			70-130	Pass	
Endosulfan I	S21-Ma01534	NCP	%	88			70-130	Pass	
Endosulfan II	S21-Ma01534	NCP	%	88			70-130	Pass	
Endosulfan sulphate	S21-Ma01534	NCP	%	94			70-130	Pass	
Endrin	S21-Ma01534	NCP	%	115			70-130	Pass	
Endrin ketone	S21-Ma01534	NCP	%	80			70-130	Pass	
g-BHC (Lindane)	S21-Ma01534	NCP	%	84			70-130	Pass	
Heptachlor	S21-Ma01534	NCP	%	80			70-130	Pass	
Heptachlor epoxide	S21-Ma01534	NCP	%	92			70-130	Pass	
Hexachlorobenzene	S21-Ma01534	NCP	%	83			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Methoxychlor	S21-Ma01534	NCP	%	89			70-130	Pass	
Spike - % Recovery									
Organochlorine Pesticides				Result 1					
4.4'-DDT	S21-Fe53806	NCP	%	85			70-130	Pass	
Endrin aldehyde	S21-Fe53806	NCP	%	106			70-130	Pass	
Spike - % Recovery									
Organophosphorus Pesticides				Result 1					
Diazinon	S21-Fe53806	NCP	%	114			70-130	Pass	
Dimethoate	S21-Fe51090	NCP	%	121			70-130	Pass	
Ethion	S21-Fe48824	NCP	%	91			70-130	Pass	
Fenitrothion	S21-Fe53806	NCP	%	84			70-130	Pass	
Methyl parathion	S21-Fe53806	NCP	%	85			70-130	Pass	
Mevinphos	S21-Fe53806	NCP	%	105			70-130	Pass	
Spike - % Recovery									
				Result 1					
Ammonia (as N)	S21-Fe53788	CP	%	87			70-130	Pass	
Spike - % Recovery									
				Result 1					
Sulphate (as SO4)	S21-Fe53790	CP	%	91			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	S21-Fe53791	CP	%	125			75-125	Pass	
Cadmium	S21-Fe53791	CP	%	120			75-125	Pass	
Chromium	S21-Fe53791	CP	%	117			75-125	Pass	
Copper	S21-Fe53791	CP	%	102			75-125	Pass	
Lead	S21-Fe53791	CP	%	84			75-125	Pass	
Mercury	S21-Fe53791	CP	%	109			75-125	Pass	
Nickel	S21-Fe53791	CP	%	105			75-125	Pass	
Zinc	S21-Fe53791	CP	%	116			75-125	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	S21-Fe53787	CP	mg/kg	< 20	< 20	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	S21-Fe53787	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Toluene	S21-Fe53787	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Ethylbenzene	S21-Fe53787	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
m&p-Xylenes	S21-Fe53787	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
o-Xylene	S21-Fe53787	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Xylenes - Total*	S21-Fe53787	CP	mg/kg	< 0.3	< 0.3	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	S21-Fe53787	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
TRH C6-C10	S21-Fe53787	CP	mg/kg	< 20	< 20	<1	30%	Pass	
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	S21-Ma03176	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acenaphthylene	S21-Ma03176	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Anthracene	S21-Ma03176	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benz(a)anthracene	S21-Ma03176	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(a)pyrene	S21-Ma03176	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(b&j)fluoranthene	S21-Ma03176	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(g.h.i)perylene	S21-Ma03176	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	

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Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Benzo(k)fluoranthene	S21-Ma03176	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chrysene	S21-Ma03176	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibenz(a.h)anthracene	S21-Ma03176	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluoranthene	S21-Ma03176	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluorene	S21-Ma03176	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	S21-Ma03176	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Naphthalene	S21-Ma03176	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Phenanthrene	S21-Ma03176	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pyrene	S21-Ma03176	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
Organochlorine Pesticides				Result 1	Result 2	RPD			
Chlordanes - Total	S21-Ma03176	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
4.4'-DDD	S21-Ma03176	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DDE	S21-Ma03176	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4.4'-DDT	S21-Ma03176	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
a-BHC	S21-Ma03176	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Aldrin	S21-Ma03176	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
b-BHC	S21-Ma03176	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
d-BHC	S21-Ma03176	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Dieldrin	S21-Ma03176	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan I	S21-Ma03176	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan II	S21-Ma03176	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan sulphate	S21-Ma03176	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin	S21-Ma03176	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin aldehyde	S21-Ma03176	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin ketone	S21-Ma03176	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
g-BHC (Lindane)	S21-Ma03176	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor	S21-Ma03176	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor epoxide	S21-Ma03176	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Hexachlorobenzene	S21-Ma03176	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Methoxychlor	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Duplicate									
Organophosphorus Pesticides				Result 1	Result 2	RPD			
Azinphos-methyl	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Bolstar	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Chlorfenvinphos	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Chlorpyrifos	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Chlorpyrifos-methyl	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Coumaphos	S21-Ma03176	NCP	mg/kg	< 2	< 2	<1	30%	Pass	
Demeton-S	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Demeton-O	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Diazinon	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Dichlorvos	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Dimethoate	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Disulfoton	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
EPN	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Ethion	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Ethoprop	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Ethyl parathion	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Fenitrothion	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Fensulfothion	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Fenthion	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Malathion	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Merphos	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	

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Duplicate									
Organophosphorus Pesticides				Result 1	Result 2	RPD			
Methyl parathion	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Mevinphos	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Monocrotophos	S21-Ma03176	NCP	mg/kg	< 2	< 2	<1	30%	Pass	
Naled	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Omethoate	S21-Ma03176	NCP	mg/kg	< 2	< 2	<1	30%	Pass	
Phorate	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Pirimiphos-methyl	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Pyrazophos	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Ronnel	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Terbufos	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Tetrachlorvinphos	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Tokuthion	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Trichloronate	S21-Ma03176	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Duplicate									
Acid Herbicides				Result 1	Result 2	RPD			
2.4-D	M21-Fe54613	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2.4-DB	M21-Fe54613	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2.4.5-T	M21-Fe54613	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
2.4.5-TP	M21-Fe54613	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Actril (Ioxynil)	M21-Fe54613	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dicamba	M21-Fe54613	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dichlorprop	M21-Fe54613	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dinitro-o-cresol	M21-Fe54613	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dinoseb	M21-Fe54613	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
MCPA	M21-Fe54613	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
MCPB	M21-Fe54613	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Mecoprop	M21-Fe54613	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Sulphur	S21-Fe53787	CP	mg/kg	85	77	10	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C10-C14	S21-Fe53789	CP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C15-C28	S21-Fe53789	CP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH C29-C36	S21-Fe53789	CP	mg/kg	< 50	< 50	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
TRH >C10-C16	S21-Fe53789	CP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH >C16-C34	S21-Fe53789	CP	mg/kg	< 100	< 100	<1	30%	Pass	
TRH >C34-C40	S21-Fe53789	CP	mg/kg	< 100	< 100	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	S21-Fe53790	CP	mg/kg	25	25	<1	30%	Pass	
Cadmium	S21-Fe53790	CP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	S21-Fe53790	CP	mg/kg	62	52	16	30%	Pass	
Copper	S21-Fe53790	CP	mg/kg	17	18	4.0	30%	Pass	
Lead	S21-Fe53790	CP	mg/kg	19	20	3.0	30%	Pass	
Mercury	S21-Fe53790	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Nickel	S21-Fe53790	CP	mg/kg	23	20	14	30%	Pass	
Zinc	S21-Fe53790	CP	mg/kg	68	75	11	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S21-Fe53792	CP	%	9.4	8.4	11	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs

Authorised by:

Adrian Tabacchiera	Analytical Services Manager
Andrew Sullivan	Senior Analyst-Organic (NSW)
Charl Du Preez	Senior Analyst-Inorganic (NSW)
Emily Rosenberg	Senior Analyst-Metal (VIC)
John Nguyen	Senior Analyst-Metal (NSW)
Joseph Edouard	Senior Analyst-Organic (VIC)

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

Certificate of Analysis

Environment Testing

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025–Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Clean TeQ Sunrise Pty Ltd
Level 6, 350 Collins Street
Melbourne
VIC 3000

Attention:	James Morrow
Report	776840-AID
Project Name	TRUNDLE RAIL SLIDING
Project ID	2021-GD006
Received Date	Feb 26, 2021
Date Reported	Mar 07, 2021

Methodology:

Asbestos Fibre Identification	Conducted in accordance with the Australian Standard AS 4964 – 2004: Method for the Qualitative Identification of Asbestos in Bulk Samples and in-house Method LTM-ASB-8020 by polarised light microscopy (PLM) and dispersion staining (DS) techniques. *NOTE: Positive Trace Analysis results indicate the sample contains detectable respirable fibres.*
Unknown Mineral Fibres	Mineral fibres of unknown type, as determined by PLM with DS, may require another analytical technique, such as Electron Microscopy, to confirm unequivocal identity. *NOTE: While Actinolite, Anthophyllite and Tremolite asbestos may be detected by PLM with DS, due to variability in the optical properties of these materials, AS4964 requires that these are reported as UMF unless confirmed by an independent technique.*
Subsampling Soil Samples	The whole sample submitted is first dried and then passed through a 10mm sieve followed by a 2mm sieve. All fibrous matter greater than 10mm, greater than 2mm as well as the material passing through the 2mm sieve are retained and analysed for the presence of asbestos. If the sub 2mm fraction is greater than approximately 30 to 60g then a sub-sampling routine based on ISO 3082:2009(E) is employed. *NOTE: Depending on the nature and size of the soil sample, the sub-2 mm residue material may need to be sub-sampled for trace analysis, in accordance with AS 4964-2004.*
Bonded asbestos-containing material (ACM)	The material is first examined and any fibres isolated for identification by PLM and DS. Where required, interfering matrices may be removed by disintegration using a range of heat, chemical or physical treatments, possibly in combination.The resultant material is then further examined in accordance with AS 4964 - 2004. *NOTE: Even after disintegration it may be difficult to detect the presence of asbestos in some asbestos-containing bulk materials using PLM and DS. This is due to the low grade or small length or diameter of the asbestos fibres present in the material, or to the fact that very fine fibres have been distributed intimately throughout the materials. Vinyl/asbestos floor tiles, some asbestos-containing sealants and mastics, asbestos-containing epoxy resins and some ore samples are examples of these types of material, which are difficult to analyse.*
Limit of Reporting	The performance limitation of the AS 4964 (2004) method for non-homogeneous samples is around 0.1 g/kg (equivalent to 0.01% (w/w)). Where no asbestos is found by PLM and DS, including Trace Analysis, this is considered to be at the nominal reporting limit of 0.01% (w/w). The NEPM screening level of 0.001% (w/w) is intended as an on-site determination, not a laboratory Limit of Reporting (LOR), per se. Examination of a large sample size (e.g. 500 mL) may improve the likelihood of detecting asbestos, particularly AF, to aid assessment against the NEPM criteria. Gravimetric determinations to this level of accuracy are outside of AS 4964 and hence NATA Accreditation does not cover the performance of this service (non-NATA results shown with an asterisk). *NOTE: NATA News March 2014, p.7, states in relation to AS 4964: "This is a qualitative method with a nominal reporting limit of 0.01 % " and that currently in Australia "there is no validated method available for the quantification of asbestos".This report is consistent with the analytical procedures and reporting recommendations in the NEPM and the WA DoH.*

Project Name TRUNDLE RAIL SLIDING
Project ID 2021-GD006
Date Sampled Feb 25, 2021
Report 776840-AID

Client Sample ID	Eurofins Sample No.	Date Sampled	Sample Description	Result
SS01	21-Fe53787	Feb 25, 2021	Approximate Sample 75g Sample consisted of: Brown fine-grained clayey soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
SS02	21-Fe53788	Feb 25, 2021	Approximate Sample 73g Sample consisted of: Brown fine-grained clayey soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
SS03	21-Fe53789	Feb 25, 2021	Approximate Sample 86g Sample consisted of: Brown fine-grained clayey soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
SS04	21-Fe53790	Feb 25, 2021	Approximate Sample 55g Sample consisted of: Brown fine-grained clayey soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.
DUPA	21-Fe53794	Feb 25, 2021	Approximate Sample 95g Sample consisted of: Brown fine-grained clayey soil and rocks	No asbestos detected at the reporting limit of 0.01% w/w. Organic fibre detected. No trace asbestos detected.

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Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Asbestos - LTM-ASB-8020	Sydney	Feb 26, 2021	Indefinite

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Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Company Name:	Clean TeQ Sunrise Pty Ltd	**Order No.:**	14542	**Received:**	Feb 26, 2021 8:40 AM
Address:	Level 6, 350 Collins Street	**Report #:**	776840	**Due:**	Mar 4, 2021
	Melbourne	**Phone:**	03 9797 6777	**Priority:**	5 Day
	VIC 3000	**Fax:**	9706 8344	**Contact Name:**	James Morrow
Project Name:	TRUNDLE RAIL SLIDING				
Project ID:	2021-GD006				

Eurofins Analytical Services Manager : Michael Morrison

Sample Detail						Ammonia (as N)	Asbestos - AS4964	Sulphate (as SO4)	Sulphur	Acid Herbicides	Metals M8	Suite B14: OCP/OPP	Moisture Set	Eurofins Suite B10
Melbourne Laboratory - NATA Site # 1254 & 14271									X	X				
Sydney Laboratory - NATA Site # 18217						X	X	X			X	X	X	X
Brisbane Laboratory - NATA Site # 20794														
Perth Laboratory - NATA Site # 23736														
Mayfield Laboratory														
External Laboratory														
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**									
1	SS01	Feb 25, 2021		Soil	S21-Fe53787	X	X	X	X	X			X	X
2	SS02	Feb 25, 2021		Soil	S21-Fe53788	X	X	X	X	X			X	X
3	SS03	Feb 25, 2021		Soil	S21-Fe53789	X	X	X	X	X			X	X
4	SS04	Feb 25, 2021		Soil	S21-Fe53790	X	X	X	X	X			X	X
5	SS05	Feb 25, 2021		Soil	S21-Fe53791	X		X	X		X	X	X	
6	SS06	Feb 25, 2021		Soil	S21-Fe53792	X		X	X		X	X	X	
7	SS07	Feb 25, 2021		Soil	S21-Fe53793	X		X	X		X	X	X	
8	DUPA	Feb 25, 2021		Soil	S21-Fe53794	X	X	X	X	X			X	X
Test Counts						8	5	8	8	5	3	3	8	5

Internal Quality Control Review and Glossary

General

1. QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Samples were analysed on an 'as received' basis.
4. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
5. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Advice.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

Units

% w/w: weight for weight basis	grams per kilogram
Filter loading:	fibres/100 graticule areas
Reported Concentration:	fibres/mL
Flowrate:	L/min

Terms

Dry	Sample is dried by heating prior to analysis
LOR	Limit of Reporting
COC	Chain of Custody
SRA	Sample Receipt Advice
ISO	International Standards Organisation
AS	Australian Standards
WA DOH	Reference document for the NEPM. Government of Western Australia, Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia (2009), including supporting document Recommended Procedures for Laboratory Analysis of Asbestos in Soil (2011)
NEPM	National Environment Protection (Assessment of Site Contamination) Measure, 2013 (as amended)
ACM	Asbestos Containing Materials. Asbestos contained within a non-asbestos matrix, typically presented in bonded and/or sound condition. For the purposes of the NEPM, ACM is generally restricted to those materials that do not pass a 7mm x 7mm sieve.
AF	Asbestos Fines. Asbestos containing materials, including friable, weathered and bonded materials, able to pass a 7mm x 7mm sieve. Considered under the NEPM as equivalent to “non-bonded / friable”.
FA	Fibrous Asbestos. Asbestos containing materials in a friable and/or severely weathered condition. For the purposes of the NEPM, FA is generally restricted to those materials that do not pass a 7mm x 7mm sieve.
Friable	Asbestos-containing materials of any size that may be broken or crumbled by hand pressure. For the purposes of the NEPM, this includes both AF and FA. It is outside of the laboratory’s remit to assess degree of friability.
Trace Analysis	Analytical procedure used to detect the presence of respirable fibres in the matrix.

Comments

The samples received were not collected in an approved asbestos bag and was therefore sub-sampled from the 250mL glass jar. Valid sub-sampling procedures were applied so as to ensure that the sub-samples to be analysed accurately represented the samples received.

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N/A	Not applicable

Asbestos Counter/Identifier:

Chamath JHM Annakkage Senior Analyst-Asbestos (NSW)

Authorised by:

Sayeed Abu Senior Analyst-Asbestos (NSW)

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

eurofins Environment Testing

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Company Name:	Clean TeQ Sunrise Pty Ltd	**Order No.:**	14542	**Received:**	Feb 26, 2021 8:40 AM
Address:	Level 6, 350 Collins Street	**Report #:**	776840	**Due:**	Mar 4, 2021
	Melbourne	**Phone:**	03 9797 6777	**Priority:**	5 Day
	VIC 3000	**Fax:**	9706 8344	**Contact Name:**	James Morrow
Project Name:	TRUNDLE RAIL SLIDING				
Project ID:	2021-GD006				

Eurofins Analytical Services Manager : Michael Morrison

Sample Detail						Ammonia (as N)	Asbestos - AS4964	Sulphate (as SO4)	Sulphur	Acid Herbicides	Metals M8	Suite B14: OCP/OPP	Moisture Set	Eurofins Suite B10
Melbourne Laboratory - NATA Site # 1254 & 14271									X	X				
Sydney Laboratory - NATA Site # 18217						X	X	X			X	X	X	X
Brisbane Laboratory - NATA Site # 20794														
Perth Laboratory - NATA Site # 23736														
Mayfield Laboratory														
External Laboratory														
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**									
1	SS01	Feb 25, 2021		Soil	S21-Fe53787	X	X	X	X	X			X	X
2	SS02	Feb 25, 2021		Soil	S21-Fe53788	X	X	X	X	X			X	X
3	SS03	Feb 25, 2021		Soil	S21-Fe53789	X	X	X	X	X			X	X
4	SS04	Feb 25, 2021		Soil	S21-Fe53790	X	X	X	X	X			X	X
5	SS05	Feb 25, 2021		Soil	S21-Fe53791	X		X	X		X	X	X	
6	SS06	Feb 25, 2021		Soil	S21-Fe53792	X		X	X		X	X	X	
7	SS07	Feb 25, 2021		Soil	S21-Fe53793	X		X	X		X	X	X	
8	DUPA	Feb 25, 2021		Soil	S21-Fe53794	X	X	X	X	X			X	X
Test Counts						8	5	8	8	5	3	3	8	5

CHAIN OF CUSTODY RECORD

Eurofins | mgt ABN 50 005 085 521

☒ Sydney Laboratory ☐ Brisbane Laboratory ☐ Perth Laboratory ☐ Melbourne Laboratory

Company	Ground Doctor Pty Ltd (on behalf of CleanTeQ)	Project Nr	2021-00006	Project Manager	Bromwyn Ryan	Sampler(s)	James Morrow
Address	PO Box 6278 Dubbo NSW	Project Name	Trundle Rail Siding	EDD Format (ESdat, EQuIS etc)	NA	Handed over by	James Morrow
Contact Name	James Morrow					Email for Invoice	accounts.[illegible]@cleanteq.com
Phone Nr	407876360					Email for Results	james.morrow@groundoctor.com.au; [illegible]@cleanteq.com
Special Directions							
Purchase Order	14542						
Quote ID Nr	180820CTDW						

No	WWTP Ref	Client Sample ID	Sampled Date/Time dd/mm/yy hh:mm	Matrix Solid (S) Water (W)	OCP / OPPs / Heavy Metals	TRH / BTEX / PAHs / OCPs / OPPs / Heavy Metals / Asbestos	Ammonia / Sulphate / Total Sulphur	Jar (Glass or HDPE)	Sample Comments / Dangerous Goods Hazard Warning
1		SS01	25/02/21 00:00	S		☒	☒	1	
2		SS02	25/02/21 00:00	S		☒	☒	1	
3		SS03	25/02/21 00:00	S		☒	☒	1	
4		SS04	25/02/21 00:00	S		☒	☒	1	
5		SS05	25/02/21 00:00	S	☒		☒	1	
6		SS06	25/02/21 00:00	S	☒		☒	1	
7		SS07	25/02/21 00:00	S	☒		☒	1	
8		DUPA	25/02/21 00:00	S		☒	☒	1	
				Total Counts					

Containers: 500mL Plastic, 250mL Plastic, 125mL Plastic, 200mL Amber Glass, 40mL vial, 100mL PFAS Bottle, Jar (Glass or HDPE), Asbestos (bagged)

Required Turnaround Time: ☐ Overnight (reporting by 9am) ☐ Same day ☐ 1 day ☐ 2 days ☐ 3 days ☐ 5 days (Standard) ☐ Other ( )

Method of Shipment	☒ Courier (# 3007dn) ☐ Hand Delivered ☐ Postal	Name	James Morrow	Signature	JRM	Date	25/02/2021	Time	1430
Eurofins | mgt Laboratory Use Only	Received By: HA	SYD | BNE | MEL | PER | ADL | NTL | DRW	Signature		Date 26/2/21	Time	8:40AM	Temperature	3.5°C
	Received By	SYD | BNE | MEL | PER | ADL | NTL | DRW	Signature		Date	Time		Report No	776840

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w w w . s u n r i s e e m . c o m

Sunrise Project

Project Execution Plan Modification

Appendix I

Social Impact Review

SOCIAL IMPACT REVIEW

For the Sunrise Project

Project Execution Plan Modification

Provided for

SUNRISE ENERGY METALS LIMITED

Authors

DANIEL HOLM

MOLLY WAGNER

S P S P SQUARE PEG SOCIAL PERFORMANCE

EXECUTIVE SUMMARY

The Sunrise Project (the Project) is a nickel, cobalt and scandium open cut mining project situated near the village of Fifield, approximately 350 kilometres west-northwest of Sydney, in New South Wales (NSW).

SRL Ops Pty Ltd owns the rights to develop the Project. SRL Ops Pty Ltd is a wholly owned subsidiary of Sunrise Energy Metals Limited (SEM)[1].

This Social Impact Review considers and assesses the likely social impacts of the Project Execution Plan Modification (the Modification), which involves changes to the approved mine and processing facility, accommodation camp, rail siding and road transport activities. This review has considered the social impacts that are directly attributable to the Modification.

Broadly following the NSW Department of Planning, Industry and Environment's (DPIE's) draft *Social Impact Assessment* (SIA) *Guideline State significant projects* (DPIE, 2020a) and the *Technical Supplement to support the Social Impact Assessment Guideline for State-significant projects* (DPIE, 2020b) (the SIA Guidelines), this Social Impact Review is based on a desktop review of social and demographic data supplemented with consultation with the Lachlan Shire, Forbes Shire and Parkes Shire Councils – to review and update the social impacts identified for the approved Project that may occur as a result of the Modification. The general scope for the Social Impact Review was communicated to the DPIE in the Modification Scoping Meeting and Scoping Letter and was subsequently endorsed by the DPIE in December 2020.

Identified potential social impacts include:

- additional employment and business opportunities associated with the increased construction workforce;
- additional pressures on local housing markets from the increased construction workforce during the initial construction phase;
- additional demand for community facilities from the increased construction workforce during the construction phase;
- impacts to people's way of life and sense of safety from changes to traffic volumes during the construction and operational phases; and
- amenity impacts from changes to the mine and processing facility and rail siding layout and activities.

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1 SEM was previously Clean TeQ Holdings Limited (Clean TeQ).

Utilising the social impact significance matrix in the SIA Guidelines, all identified social impacts associated with the Modification were rated as low significance, with the exception of the following two positive impacts rated as medium significance:

- additional employment opportunities for local residents as well as local businesses who can supply to the Project, arising from the increased construction workforce; and
- additional pressures on local housing markets arising from the increased construction workforce (prior to construction of the accommodation camp) which benefits landlords and short-term accommodation providers.

The existing social impact mitigation measures committed to by SEM include the following:

- preferentially sourcing suppliers from the Social Locality where they are cost and quality competitive;
- providing operational workforce bus transport from towns in the Social Locality to minimise workforce-related road traffic;
- operating high-capacity trucks to transport limestone and other materials and products to and from the mine and processing facility, to minimise heavy vehicle traffic volumes;
- deploying a community information and engagement program, and a complaints and grievance process, to ensure potentially affected communities are aware of impacts and have opportunities to raise concerns with the proponent;
- operating in accordance with an approved Traffic Management Plan and undertaking road and intersection upgrades and maintenance (in accordance with Development Consent [DA 374-11-00] and the Voluntary Planning Agreement [VPA]) to address the safety, road performance and quality aspects of the traffic changes;
- operating in accordance with an approved Air Quality Management Plan and Noise Management Plan (in accordance with Development Consent [DA 374-11-00]) to minimise potential amenity impacts associated with the approved Project; and
- continuing to make community contributions in accordance with the VPA, to support positive social outcomes, social infrastructure investments and/or community resilience improvements.

The existing social impact mitigation measures committed to by SEM are generally considered to be sufficient to address the potential social impacts associated with the Modification, with the following additions:

- increasing the size of the construction workforce accommodation camp to accommodate all non-residential construction workers;
- mitigation upon request rights for one property in accordance with the Voluntary Land Acquisition and Mitigation Policy (NSW Government, 2018) to reduce noise levels at the residence (e.g. mechanical ventilation, upgraded façade elements or roof insulation); and
- providing construction workforce transport from towns in the Social Locality to minimise workforce-related road traffic.

The risk of cumulative social impacts of the Modification, in conjunction with other projects, is considered manageable, due to the small scale of the other projects and their distance from the Project.

In summary, the potential social impacts associated with this Modification are all assessed to be relatively contained and readily manageable.

GLOSSARY AND ABBREVIATIONS

Term	Meaning
ABS	Australian Bureau of Statistics
DPIE	NSW Department of Planning, Industry and Environment
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
ETL	Electricity Transmission Line
FSC	Forbes Shire Council
LGA	Local Government Area
LSC	Lachlan Shire Council
m	Metres
ML	Mining Lease
NSW	New South Wales
PSC	Parkes Shire Council
SA2	Statistical Area Level 2
SA4	Statistical Area Level 4
SEIFA	Socio-Economic Indexes for Areas
SEM	Sunrise Energy Metals Limited
SIA	Social Impact Assessment
The Project	Sunrise Project
The Modification	The Modification described in Section 2
The SIA Guidelines	The draft *Social Impact Assessment Guideline State significant projects* (Department of Planning, Industry and Environment 2020a) and the *Technical Supplement to support the Social Impact Assessment Guideline for State-significant projects* (Department of Planning, Industry and Environment, 2020b)
VLAMP	*Voluntary Land Acquisition and Mitigation Policy* (NSW Government, 2018)
VPA	Voluntary Planning Agreement

TABLE OF CONTENTS

1. INTRODUCTION

1.1 Background

The Sunrise Project (the Project) is a nickel, cobalt and scandium open cut mining project situated near the village of Fifield, approximately 350 kilometres (km) west-northwest of Sydney, in New South Wales (NSW) (Figure 1).

SRL Ops Pty Ltd owns the rights to develop the Project. SRL Ops Pty Ltd is a wholly owned subsidiary of Sunrise Energy Metals Limited (SEM)[2].

Development Consent (DA 374-11-00) for the Project was issued under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) in 2001. Six modifications to the Development Consent (DA 374-11-00) have since been granted under the EP&A Act.

SEM has continued to review and optimise the Project design, construction and operation as part of preparations for Project execution. The outcomes of this review are outlined in the Project Execution Plan (Clean TeQ, 2020).

The Project Execution Plan identified a number of changes to the approved mine and processing facility, accommodation camp, rail siding and road transport activities. The Project Execution Plan Modification (the Modification) includes these Project Execution Plan changes to allow for the optimisation of the construction and operation of the Project. Details of the Modification are provided in Section 2.

Square Peg Social Performance was engaged to carry out a Social Impact Review for the Modification. This document presents the outcomes of the review, including updated social and demographic data for the communities near the Project, and an assessment of potential social impacts from the Modification.

1.2 Method

This Social Impact Review is based on a desktop review of social and demographic data supplemented with consultation with the Lachlan Shire Council (LSC), Forbes Shire Council (FSC) and Parkes Shire Council (PSC) (the Councils). These Local Government Areas (LGAs) constitute the Project's 'Social Locality'.

The general scope for the Social Impact Review was communicated to the NSW Department of Planning, Industry and Environment (DPIE) in the Modification Scoping Meeting and Scoping Letter and was subsequently endorsed by the DPIE in December 2020. Data for this Social Impact Review was collected over a period between January and March 2021. Table 1 summarises the data sources that have been used for this review.

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2 SEM was previously Clean TeQ Holdings Limited (Clean TeQ).

FIGURE 1 REGIONAL LOCATION

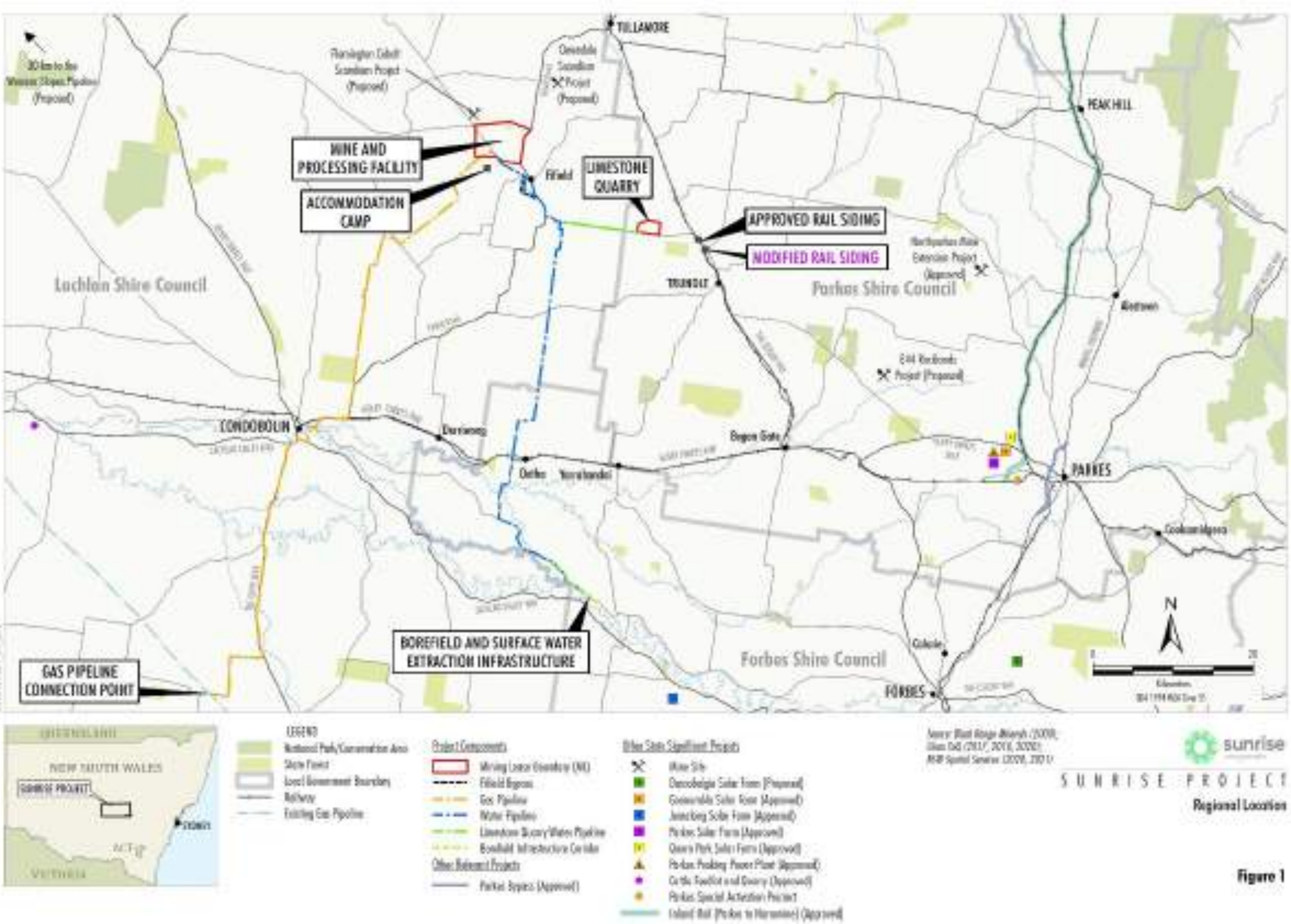

TABLE 1 SUMMARY OF DATA SOURCES

Primary Data	Quantitative Social and Demographic Data	Qualitative Community Data
• Consultation with representatives of the LSC, FSC and PSC.	• Australian Bureau of Statistics (ABS) Census Community, Time Series, and Indigenous Profiles from the 2016 Census. • The ABS Tourist accommodation survey and Personal income in Australia publications. • NSW government data including from DPIE, Department of Education and Department of Community and Justice. • School annual reports from Catholic Education Wilcannia – Forbes and one Independent school	• Community strategic plans for the Lachlan, Forbes and Parkes Shires. • Websites for the LSC, FSC and PSC.

In terms of process, as a first step a community profile was created by collecting up to date data regarding the Social Locality, primarily from the ABS, NSW Government departments, local Council community plans and websites. Indicators were selected to provide an update to the original Community Infrastructure Assessment (Martin & Associates Pty Ltd, 2000)[3] and some additional indicators were included to paint a more comprehensive picture of the Social Locality. Where available, the same data for NSW as a whole was presented as a comparison.

Secondly, consultation was undertaken with the Councils located in the Social Locality. The purpose of the consultation was to seek feedback on the potential social impacts they anticipated from the Modification. In addition, information was gathered as to their preferences for impact mitigation and benefit enhancement measures and community priorities and concerns. Consultation was held remotely via the Microsoft Teams videoconference platform. The Council representatives were presented with a description of the Modification prior to the meeting, and care was taken to ensure participants were informed of the purpose of the meeting and granted their consent to participate in it. Summary findings from the consultation are contained in APPENDIX A.

Thirdly, drawing on details of the Modification, the updated community profile and feedback from the Councils, the impacts identified in the Community Infrastructure Assessment (Martin & Associates Pty Ltd, 2000) were reviewed and updated. In identifying and assessing impacts, aspects of the draft *Social Impact Assessment* (SIA) *Guideline State significant projects* (DPIE, 2020a) and the *Technical Supplement to support the Social Impact Assessment Guideline for State-significant projects* (DPIE, 2020b) (the SIA Guidelines) were used. The process followed for the assessment broadly included:

1) listing all aspects of the Modification;
2) considering whether each aspect may give rise to a potential social impact, using:
    a) the social impact categories provided in the SIA Guidelines; and

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3 The Community Infrastructure Assessment (Martin & Associates Pty Ltd, 2000) was completed as part of the *Syerston Nickel Cobalt Project Environmental Impact Statement* (EIS) (Black Range Minerals, 2000).

    b) the original assessment in the Community Infrastructure Assessment.
3) identifying potentially affected stakeholder groups for each identified potential social impact;
4) analysing the potential impact of the incremental change associated with the Modification and likely community experience thereof;
5) evaluating the significance of each social impact using the likelihood and magnitude matrix provided in the SIA Guidelines; and
6) considering whether the impacts from the Project in conjunction with impacts from nearby projects may give rise to cumulative impacts. This assessment followed a three-step process, aligned with the draft *Assessing Cumulative Impacts Guide Guidance for State Significant Projects* (NSW Government, 2020):
    a) identifying relevant projects to be included in the assessment;
    b) considering the likelihood of cumulative social impacts arising for each relevant project (taking into account whether the projects would give rise to social impacts of a similar nature, whether the same or similar geographies or stakeholders would be impacted, and whether projects were likely to occur concurrently); and
    c) for those projects where there was a reasonable likelihood of cumulative social impacts, qualitatively assessing the significance of the impact based on publicly available information.

1.3 Assumptions and Limitations

It is important to note that the identification and evaluation of social impacts is not a mechanical or 'scientific' process. It does not provide exact predictions, but rather draws on primary and secondary data as well as the professional judgement of the authors to reason around how impacts may be experienced by various stakeholders. As social impacts are primarily about people's experience of a potential change, there is always an element of uncertainty associated with impact evaluations.

Additionally, as this is a Social Impact Review of potential social impacts that are directly attributable to the Modification, identified potential social impacts are considered in relation to the approved social impacts described in the Community Infrastructure Assessment (Martin & Associates Pty Ltd, 2000). This review has not considered the veracity of the assumptions or conclusions from the Community Infrastructure Assessment, but has taken the approved social impacts as a starting point to understand the incremental change that may be brought about by the Modification. This review has only considered social impacts that are directly attributable to the Modification.

2. OVERVIEW OF THE APPROVED PROJECT AND MODIFICATION

2.1 Approved Project Overview

The Project is a nickel, cobalt and scandium open cut mining project which includes the establishment and operation of a mine and processing plant; limestone quarry; rail siding; gas pipeline; borefield, surface water extraction infrastructure and water pipeline; accommodation camp and associated transport activities and transport infrastructure (Figure 1).

The Project infrastructure will be located in three Local Government Areas (LGAs); Lachlan, Forbes and Parkes Shires (Figure 1). The majority of the Project will be located in the Lachlan Shire, including the mine and processing facility, accommodation camp, gas pipeline, and a component of the water pipeline. The limestone quarry and the rail siding will be located in the Parkes Shire. The surface water extraction infrastructure, borefield and a section of the water pipeline will be located in Forbes Shire. Road and intersection upgrades and maintenance will be conducted in the Lachlan and Parkes Shire LGAs.

Construction of the Project commenced in 2006, which included components of the borefield, however construction of other Project components is yet to commence.

The approved construction phase workforce is up to approximately 1,000 personnel during the peak construction phase. Approximately 335 personnel would be required during the operational phase:

- Mine and processing facility – 300 personnel;
- Limestone quarry – 30 personnel; and
- Rail siding – 5 personnel.

2.1.1 Potential Social Impacts of the Approved Project

The Community Infrastructure Assessment (Martin & Associates Pty Ltd, 2000) identified and described social impacts that may arise from the original Project proposed in the EIS. Table 2 below summarises the social impacts described in the Community Infrastructure Assessment.

The Community Infrastructure Assessment (Martin & Associates Pty Ltd, 2000) assumed a peak operational workforce of approximately 371 full time jobs in year four of the Project. The operational workforce was subsequently reduced to 335 in Modification 1 and therefore the approved operational phase social impacts would be slightly less than described in Table 2.

TABLE 2 IDENTIFIED SOCIAL IMPACTS ASSESSED IN THE COMMUNITY INFRASTRUCTURE ASSESSMENT

Impact	Detail
Employment opportunities	A peak construction workforce of 962 persons, with an average of 611 persons over a 24 month construction period. Assumed that 21% of roles would be filled by local residents.
	An operational workforce of approximately 371 full-time jobs peaking in year four of the Project[4]. Assumed 73% of the workforce would be non-local and 27% local.
Housing and accommodation requirements	A peak of 180 workers required during the initial three months of construction prior to the accommodation camp being operational, leading to a total additional direct and indirect demand for 135 single accommodation and 30 family accommodation units.
	Average workforce of 611 during the remainder of the construction phase leading to a direct and indirect additional demand for 127 family accommodation units. All single accommodation demand catered for by the accommodation camp.
	Operational workforce of 371 assumed to consist of 100 local residents and 271 non-local, leading to a total direct and indirect additional accommodation requirement of 322 family accommodation units and 137 single accommodation units.
School facilities and services	Insignificant additional demand for schooling during construction. An additional 215 children expected during operations phase, spread between Parkes and Condobolin.
Health and community services and facilities	No significant impact expected on hospital or acute health services from the Project, although some expected increased demand on community health services during construction phase.

Source: Martin & Associates Pty Ltd, 2000

2.2 Proposed Modification

SEM has continued to review and optimise the Project design, construction and operation as part of preparations for Project execution. The outcomes of this review are outlined in the Project Execution Plan (Clean TeQ, 2020).

The Project Execution Plan identified a number of changes to the approved mine and processing facility, accommodation camp, rail siding and road transport activities (Figures 2 and 3). Specific details of the Modification are provided below.

Mine and Processing Facility

- addition of a temporary construction laydown area inside the approved tailings storage facility surface development area;
- optimised production schedule resulting in an increased mining rate during the initial years of mining and associated changes to mining and waste rock emplacement sequencing;

4 Operational workforce size was reduced to 335 in Modification 1.

- revised processing facility area layout, including a revised processing plant layout and two additional vehicle site access points;
- reduced sulphuric acid plant stack height from 80 metres [m] to 40 m;
- revisions to processing plant reagent types, rates and storage volumes;
- revised tailings storage facility cell construction sequence and the addition of a decant transfer pond;
- relocated and resized evaporation pond;
- changes to the water management system to reflect the modified mine and processing facility layout;
- increased number of diesel-powered backup generators (and associated stacks) from one to four;
- addition of exploration activities within the approved surface development area inside Mining Lease (ML) 1770;
- increased duration of the construction phase from two years to three years; and
- increased peak construction phase workforce from approximately 1,000 to approximately 1,900 personnel;

Rail Siding

- revised rail siding location and layout;
- addition of an ammonium sulphate storage and distribution facility to the rail siding;
- extension of the Scotson Lane road upgrade;
- addition of a 22 kV Electricity Transmission Line (ETL) (subject to separate approval) to the rail siding power supply; and
- increased peak operational phase workforce from approximately five to approximately 10 personnel;

Accommodation Camp

- increased construction phase capacity from 1,300 to 1,900 personnel;
- increased size of the treated wastewater irrigation area;
- option for an alternative alignment of the last section of the accommodation camp water pipeline along the accommodation camp services corridor rather than along the access road corridor; and
- option to transfer treated wastewater to the mine and processing facility for reuse via a water pipeline located inside the approved services corridor;

Road Transport Activities

- changes to construction phase vehicle movements associated with the increased construction phase accommodation camp capacity and changes to heavy vehicle delivery requirements;
- changes to operational phase heavy vehicle movements associated with revisions to processing plant reagent types, rates and storage volumes; and
- changes to operational phase heavy vehicle movements to and from the rail siding associated with the transport of metal and ammonium sulphate products.

The Modification would not change the following approved components of the Project:

- other mine and processing facility components (e.g. surface development area, mining method, processing method and rate, tailings management and water management concepts);
- other accommodation camp components (e.g. surface development area; operational phase capacity);
- other transport activities and transport infrastructure (e.g. the Fifield Bypass);
- limestone quarry;
- borefield, surface water extraction infrastructure and water pipeline; and/or
- gas pipeline.

FIGURE 2 APPROVED AND MODIFIED MINE AND PROCESSING FACILITY CONCEPTUAL GENERAL ARRANGEMENT

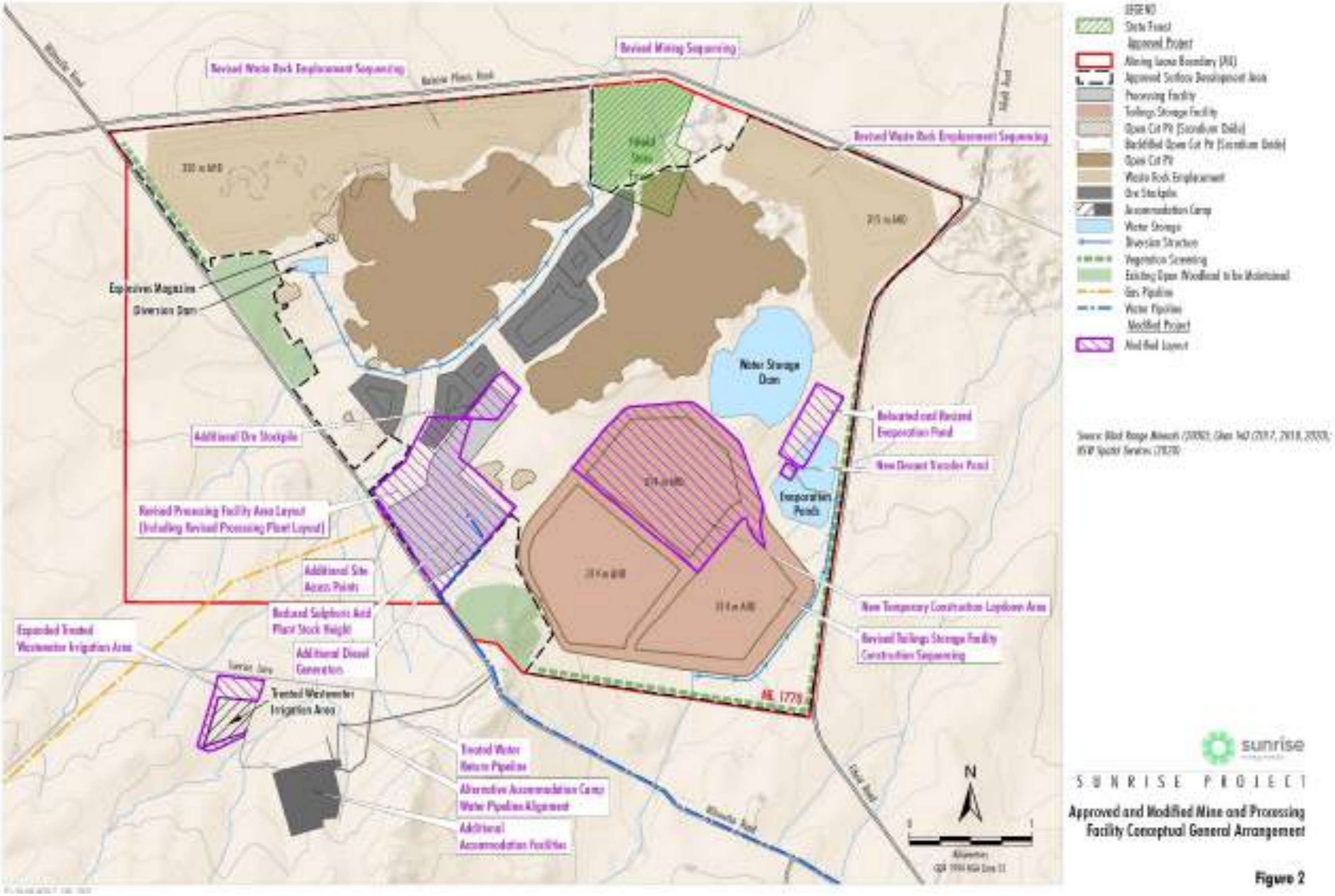
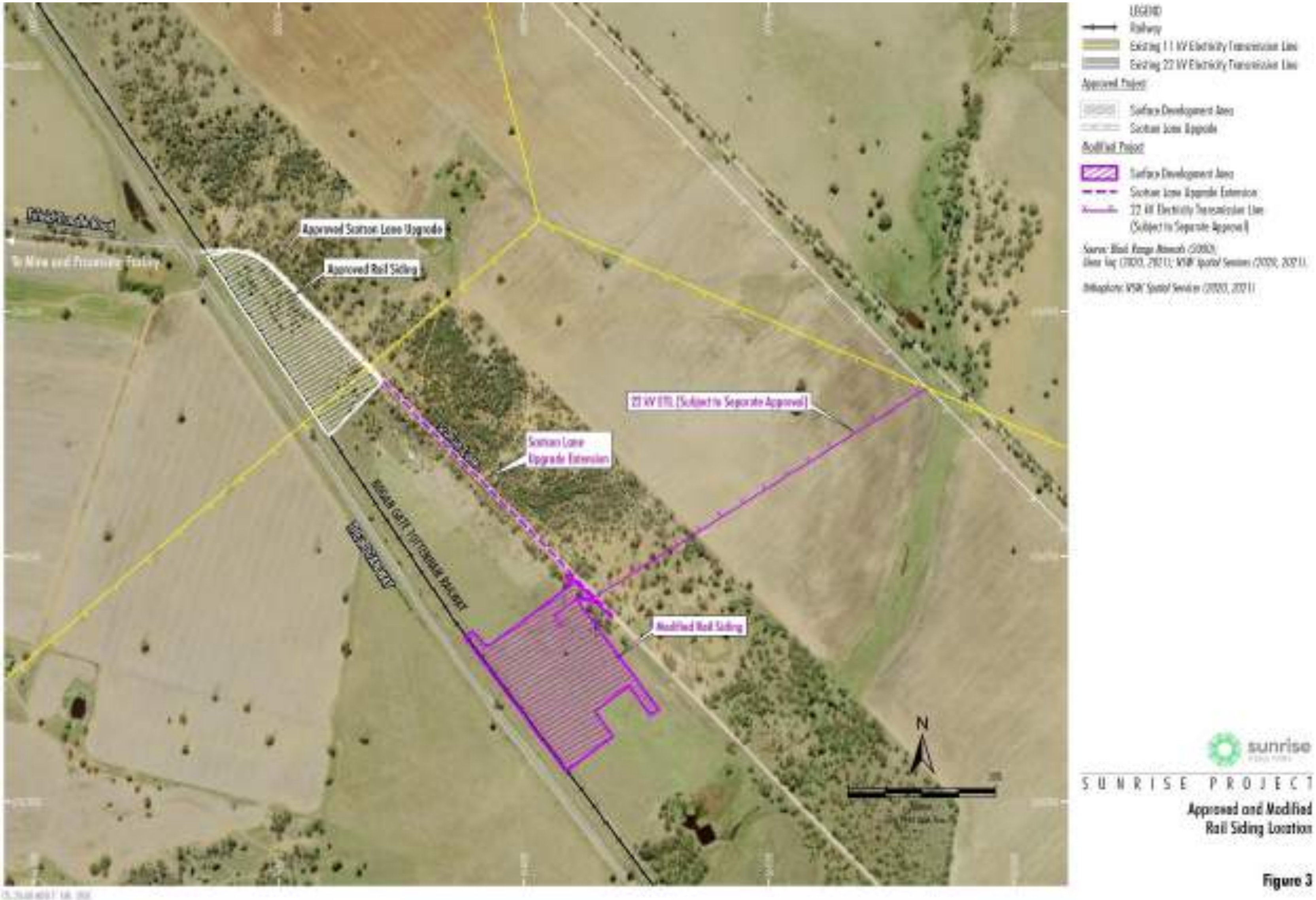


Figure 3 approved and modified Rail Siding Location



3. SOCIAL BASELINE

3.1 Overview of the Social Locality

As described in previous sections, the Project is located within three LGAs - Lachlan, Parkes and Forbes Shire LGAs. The three LGAs comprise the north-western portion of the Central West region in NSW and are located on Wiradjuri country. The Project is located predominately in rural communities, across primarily agricultural land, with the larger towns of Parkes, Forbes and Condobolin within commuting distance of the Project.

3.1.1 Lachlan Shire

Lachlan Shire is located in the Central West region of NSW, approximately 200 km west of Orange and 400 km west of Sydney. The Lachlan Shire encompasses an area of 14,965 km^2. Condobolin is the largest town in the Lachlan Shire, followed by Lake Cargelligo, Tottenham and the villages of Tullibigeal, Burcher, Derriwong, Albert, Fifield and Murrin Bridge. The Lachlan River, major roads such as Lachlan Valley Way and The Gipps Way and Broken Hill Railway Line pass through the Lachlan Shire (LSC, 2017).

The farming sector accounts for one quarter of the Lachlan Shire's employment. The rich agricultural district has made the Lachlan Shire one of the largest grain producers in the Central West. The LSC has invested in industrial estates to grow the region's light manufacturing sector. The LSC also manages NSW largest road network of any LGA, maintaining 3,918 km of roads (LSC, 2017).

The LSC has released the *Community Strategic Plan 2017/18 – 2020/27* highlighting the region's strategic goals over the ten-year period, in response to three key challenges – growth of population; maintaining a skilled workforce; and advocating and lobbying on behalf of the community (LSC, 2017). As a result, nine actions have been prioritised by the LSC:

1) *make the Shire attractive so we attract business and jobs;*
2) *grow tourism – identify the type of tourist to be attracted, and give an increased focus to an Indigenous theme;*
3) *attract industry to the Shire;*
4) *make the Shire attractive so we attract the right skilled labour;*
5) *train our own residents, particularly our youth;*
6) *address the housing shortage;*
7) *develop community advocates;*
8) *make the Shire attractive to support the advocacy; and*
9) *support decentralisation to bring government offices and facilities to the Shire.*

3.1.2 Forbes Shire

Forbes Shire is located in the Central West region of NSW, approximately 300 km west of Sydney. The Forbes Shire encompasses an area of 4,718 km^2 and includes the town of Forbes and the villages of Bedgerebong, Garema, Wirrinya, Corinella and Ootha. The Lachlan River (including Lake Forbes) is central to the identity of the Forbes Shire and runs directly through the middle of Forbes.

Positioned on the Newell Highway, halfway between Brisbane and Melbourne, almost 80% of Australia's population can be reached within 12 hours driving time from Forbes. Forbes is located four hours from Sydney via road (FSC, 2018). The Forbes Shire LGA is a regional community whose main source of employment is the agricultural, forestry and fishing sector (FSC, 2018).

The *Forbes Community Strategic Plan 2018-2028* (FSC, 2018) roadmaps a 10-year plan. As part of this plan, the Council has identified six key directions for the region:

1) *community and culture;*
2) *local economy;*
3) *natural environment;*
4) *rural and urban land use;*
5) *infrastructure and services; and*
6) *government and representation.*

3.1.3 Parkes Shire

Parkes Shire is located in the Central West region of NSW, approximately 300 km west of Sydney. Parkes Shire encompasses an area of 5,919 km^2, with its major town being Parkes. Parkes Shire also includes the towns of Peak Hill, Alectown, Bogan Gate, Trundle and Tullamore. Situated along the Newell Highway and the Orange to Broken Hill Railway, Australia's major inland touring route, Parkes provides an intersection for essential road and rail corridors (PSC, 2021).

The Parkes Shire was once an agricultural hub, which has evolved to encompass a diversified economy with strong industries in mining, health care and social assistance, education and training, retail trade and accommodation, and food service. The community is serviced by a regional airport with several return flights daily between Parkes and Sydney and is also accessed by daily coach and rail services to and from Sydney (PSC, 2021a). The *Parkes Shire 2030+ Strategic Community Plan* (PSC, n.d.) addresses overall community goals up to 2030 with eight strategic goals:

1) *develop education and lifelong learning opportunities;*
2) *improve health and well-being;*
3) *promote, support and grow our communities;*
4) *grow and diversify the economic base;*
5) *develop Parkes as a national logistics hub;*
6) *enhance recreation and culture;*
7) *care for the natural and built environment in a changing climate; and*
8) *maintain and improve the Shire's assets and infrastructure.*

3.2 Population

3.2.1 Population Trends

At the time of the 2016 census the three Shires in the Social Locality had a total population of approximately 30,000 people. Approximately half of these (14,608) resided in Parkes Shire, just over 30% in Forbes Shire (9,587), and the remainder (6,194) in Lachlan Shire. Overall, the population has remained relatively steady between 2001 and 2016, with a slight population increase in Parkes Shire, and a slight decrease in Forbes and Lachlan Shires. In total, the Social Locality population decreased by 3% between 2001 and 2016, compared to a growth of 18.5% for NSW as a whole. Table 3 below outlines population trends for the three Shires in the Social Locality and compares these with NSW.

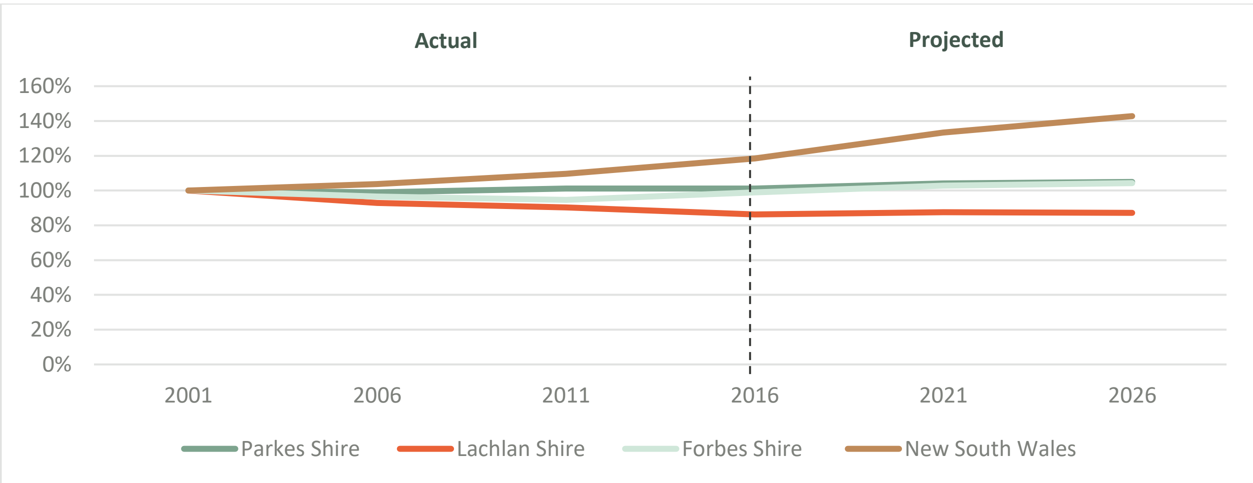
Table 3 Population Trends

	2001	2006	2011	2016	Change Between 2001 – 2016 (%)
Parkes Shire	14,433	14,284	14,592	14,608	1%
Lachlan Shire	7,180	6,672	6,477	6,194	-14%
Forbes Shire	9,691	9,361	9,169	9,587	-1%
Total Social Locality	*31,304*	*30,317*	*30,238*	*30,389*	-3%
NSW	6,311,168	6,549,174	6,917,656	7,480,228	19%

Source: ABS Census Data 2016, Time Series Profile.

Figure 4 visualises indexed population trends and projections to show the proportional evolution of the population size in the Social Locality between 2001 and 2026. Notably, the population in NSW is projected to increase by 40% compared to the 2001 population by 2026, whereas the three Shires in the Social Locality are projected to grow modestly or experience a small decline.

Figure 4 Evolution of Population (Actual and projected, indexed: 2001=100)



Source: Based on ABS Census Data 2016, Time Series Profile and DPIE Population Projections.

There is general similarity between the three Shires in the Social Locality with regards to median age, household size, number of persons per bedroom and the males to female ratio (Table 4). Compared to that of the NSW average, the Social Locality has slightly higher median ages, smaller household sizes, and fewer people per bedroom. The male to female ratio is relatively similar.

TABLE 4 COMPARATIVE POPULATION AND HOUSEHOLD INDICATORS

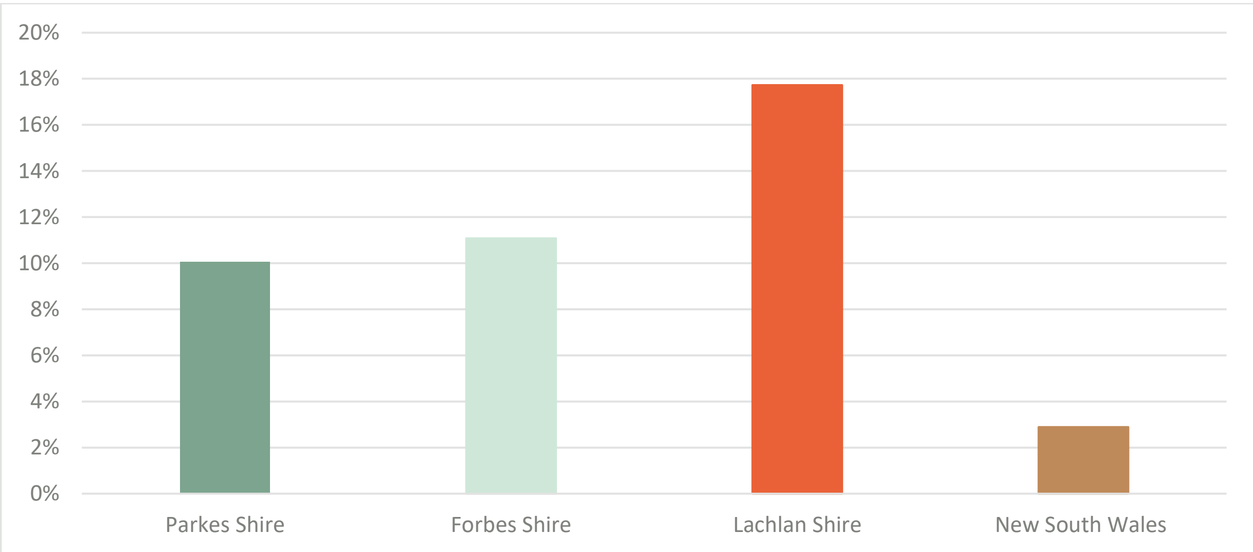
	Parkes Shire	Lachlan Shire	Forbes Shire	NSW
Median age	41	40	42	38
Average household size	2.4	2.4	2.4	2.6
Average number of persons per bedroom	0.8	0.8	0.8	0.9
No of males per female	0.969	1.000	1.005	0.971

Source: ABS Census Data 2016, General Community Profile

3.2.2 Indigenous Population and Cultural Diversity

Figure 5 below shows the proportion of Indigenous people in each of the three Shires in the Social Locality, compared to NSW. The proportion of Indigenous people in the Social Locality is well above that of NSW, with approximately 18% of the population in Lachlan Shire, 11% in Forbes Shire, and 10% in Parkes Shire identifying as Aboriginal and/or Torres Strait Islander in the 2016 Census. This is to be compared with 3% for NSW.

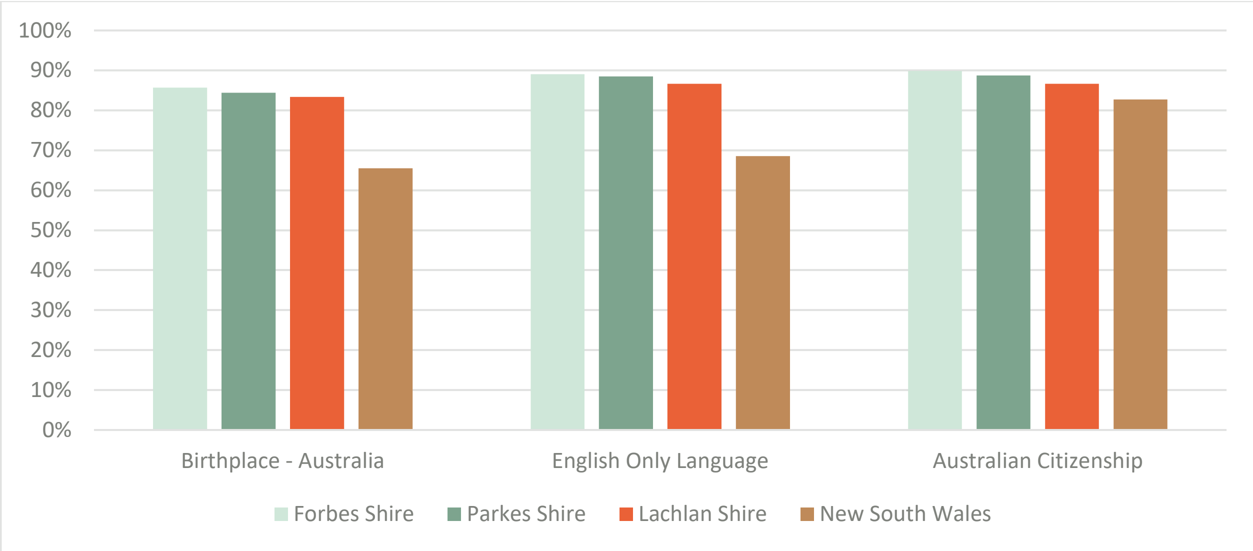
FIGURE 5 INDIGENOUS POPULATION



Source: ABS Census Data 2016, General Community Profile

The population in the Social Locality appears to be slightly more culturally homogenous than NSW. Figure 6 shows that, compared to NSW, Parkes, Forbes and Lachlan Shires all have a higher proportion of the population whose birthplace is Australia, who only speak English at home and who have Australian citizenship.

FIGURE 6 CULTURAL DIVERSITY



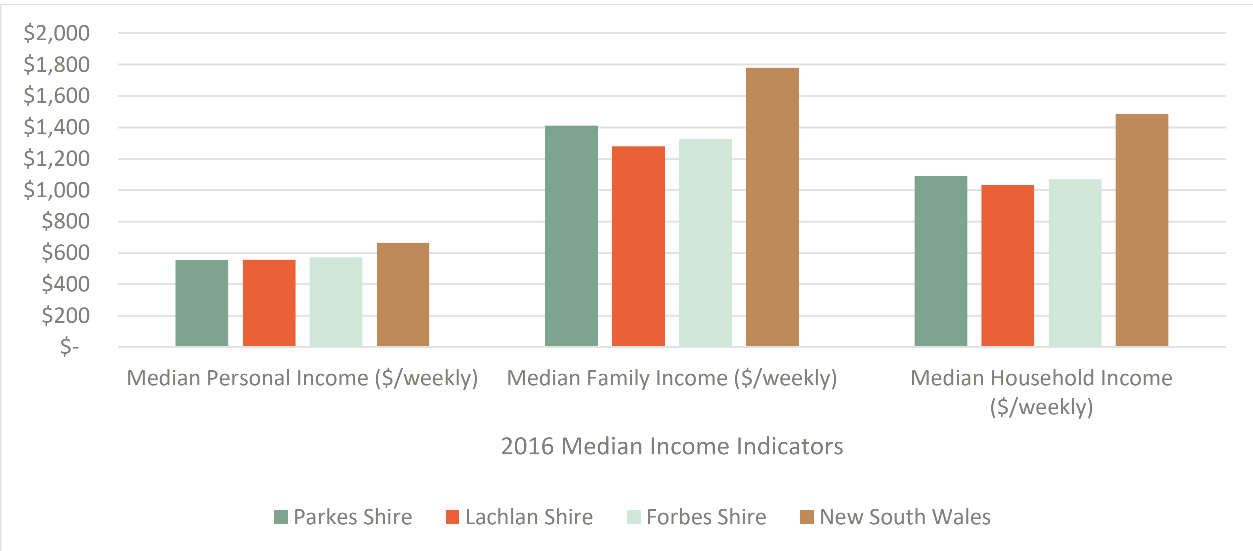
Source: ABS Census Data 2016, General Community Profile

3.3 Economic Indicators

3.3.1 Income

With regards to incomes, Figure 7 below shows the three Shires have lower median personal, family and household incomes compared to NSW. Among the Shires the differences are small, with Parkes Shire recording the highest median and family weekly incomes ($1,412 and $1,088 respectively) and Forbes Shire the highest median personal weekly income at $571 at the time of the 2016 Census.

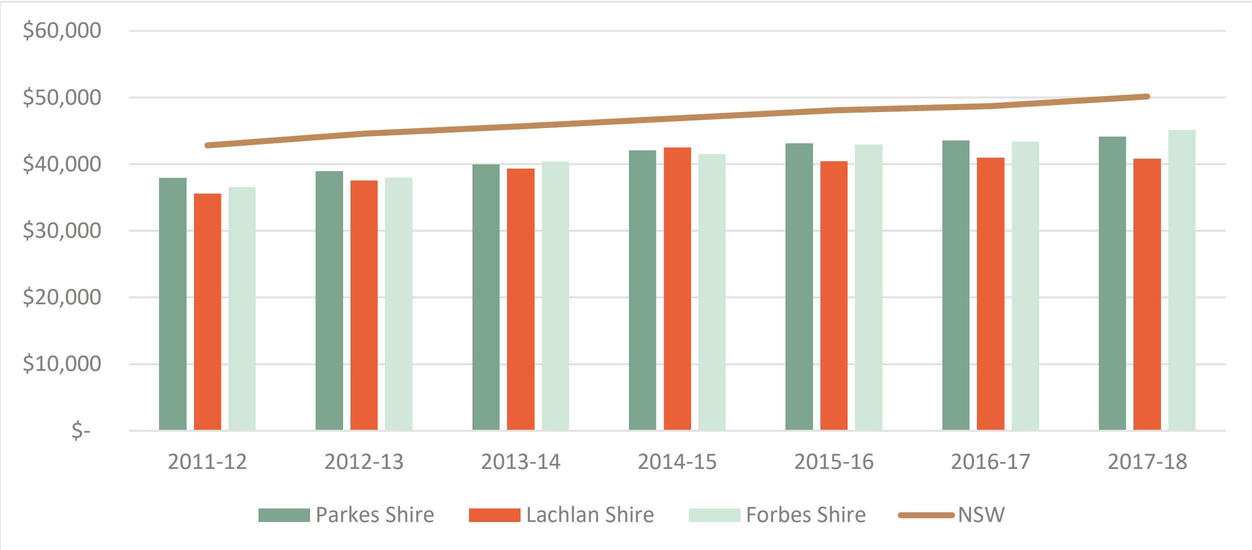
FIGURE 7 COMPARATIVE INCOME INDICATORS



Source: ABS Census Data 2016, General Community Profile

Figure 8 below shows the median personal annual income across the three Shires in the Social Locality compared to that of NSW between the 2011/2012 and 2017/2018 financial years. Incomes in the Social Locality are consistently somewhat lower than the NSW median, albeit growing on a similar trajectory. The exception is Lachlan Shire, where the median income fell between the 2014/15 and 2015/16 financial years and has remained relatively stable since.

FIGURE 8 MEDIAN PERSONAL ANNUAL INCOME TRENDS



Source: ABS 2020, Personal Income in Australia, Table 1, Total Income

3.3.2 Labour Market

At the time of the 2016 Census, labour force participation rates across Lachlan, Forbes and Parkes Shires were around 55%, compared with 59.2% in NSW. Compared to the NSW average of 6.3%, unemployment rates varied, with Forbes Shire below the NSW average at 5.4% and Lachlan and Parkes Shires above at 6.8% and 7.5% respectively. Unemployment among the Indigenous population also varied, with 24.4% and 20.9% of the Indigenous population in Lachlan and Parkes Shire respectively being unemployed, significantly higher than the NSW average of 15.3% and that of Forbes at 13.5%. Table 5 and Table 6 show labour market data for the Shires and the Indigenous population specifically.

TABLE 5 LABOUR FORCE

	Parkes Shire	Forbes Shire	Lachlan Shire	NSW
Total labour force	6,307	4,169	2,644	3,605,881
Unemployment rate	7.5%	5.4%	6.8%	6.3%
Labour force participation rate	54.1%	54.6%	54.6%	59.2%

Source: ABS Census Data 2016, General Community Profile

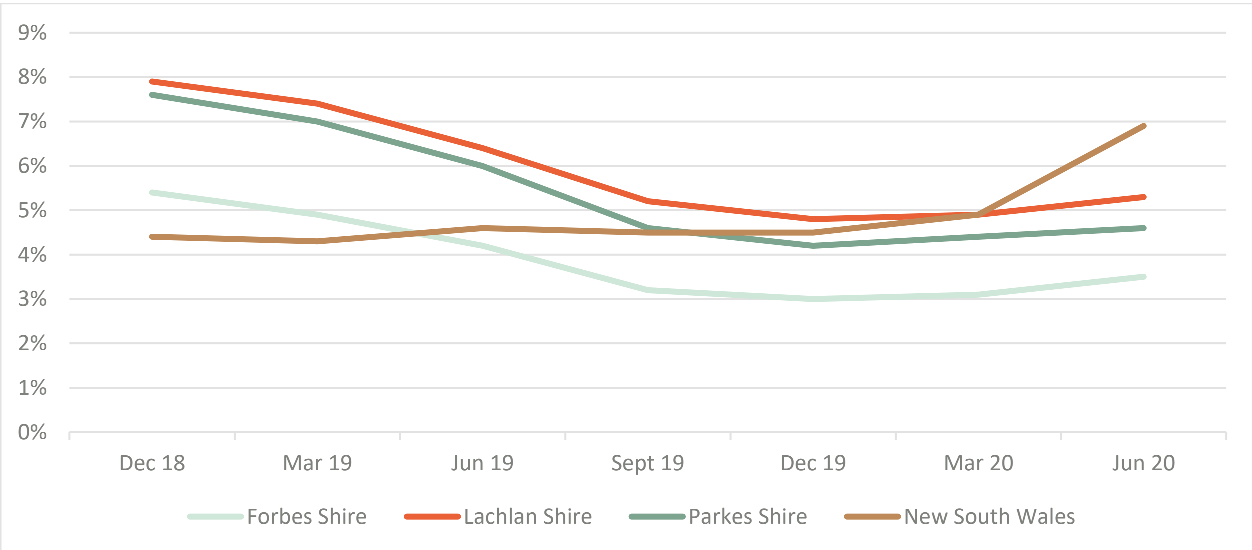
TABLE 6 INDIGENOUS LABOUR FORCE

	Parkes Shire	Forbes Shire	Lachlan Shire	NSW
Total labour force	487	394	352	77,143
Unemployment rate	20.9%	13.5%	24.4%	15.3%
Labour force participation rate	51.4%	55%	50.2%	54.4%

Source: ABS Census Data 2016, Aboriginal and Torres Strait Islander Peoples Profile

Current unemployment estimates show that Parkes and Lachlan Shires have similar unemployment rates (Figure 9). Noticeably, and similar to the 2016 Census figures, Forbes Shire has a lower unemployment rate. The unemployment rates in the Social Locality have followed a similar trajectory over the last two years, beginning with a general downward trend, followed by a stabilisation in the second half of 2019, and a slight increase in early 2020 as the effects of COVID-19 were beginning to be felt. By contrast, the NSW unemployment rates have remained relatively stable throughout most of this period, but with a more dramatic increase from the March quarter 2020. Unemployment estimates for the three Shires were 3.5% for Forbes Shire, 4.6% for Parkes Shire and 5.3% for Lachlan Shire in the June quarter 2020, to be contrasted with 6.9% for NSW as a whole[5].

FIGURE 9 UNEMPLOYMENT RATE TRENDS



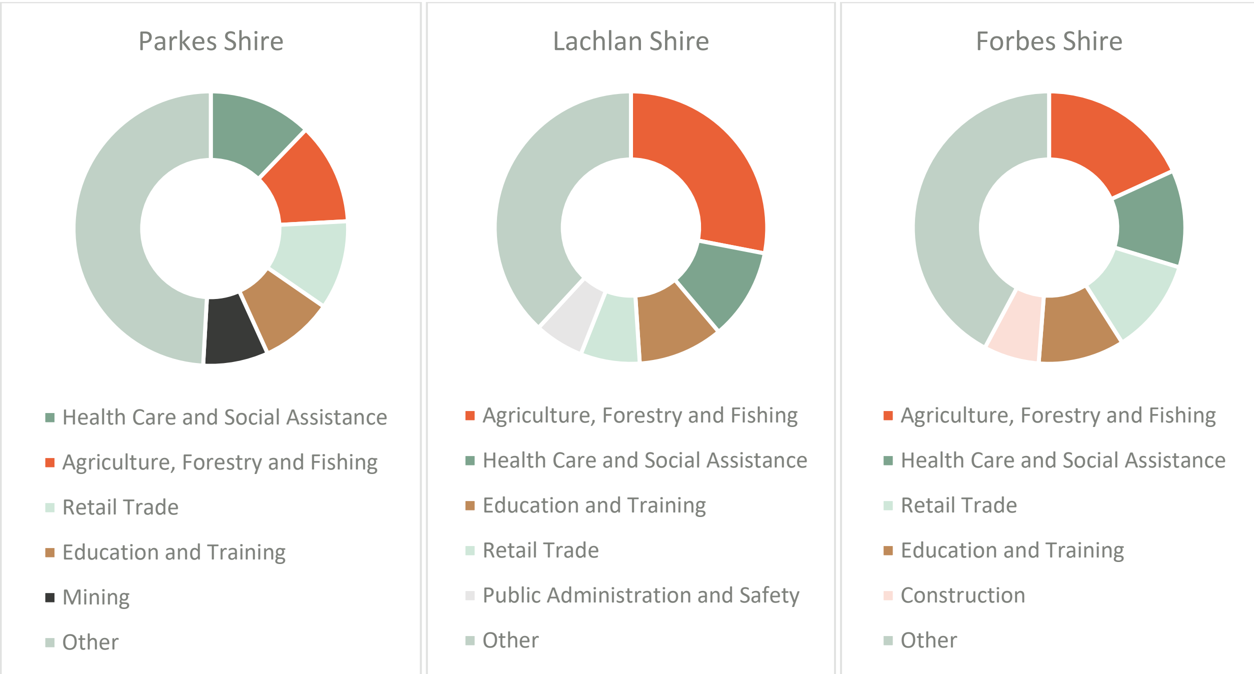
Source: Small Area Labour Markets, LGA Data Tables and SA4 Time Series Profile, June Quarter 2020

5 The Labour Market Information Portal notes however that unemployment figures for the June quarter 2020 should be interpreted with caution due to uncertainty and volatility associated with COVID-19.

3.3.3 Industries of Employment

The industries which have the most employees are similar across each Shire. Agriculture, forestry, and fishing is a key employment sector across all three Shires, being the largest sector in Lachlan Shire (28%) and Forbes Shire (18%), and the second largest in Parkes Shire (12%), where health care and social assistance is the largest. Mining features as the fifth largest industry of employment in Parkes (Figure 10).

FIGURE 10 TOP FIVE INDUSTRIES OF EMPLOYMENT



Source: ABS Census Data 2016, General Community Profile

3.4 Housing

3.4.1 Dwellings

Overall, Parkes Shire has more dwellings than Forbes and Lachlan Shires; however, this is proportional to their overall population. Forbes has the highest percentage of occupied private dwellings, with the Lachlan Shire having a greater percentage of unoccupied private dwellings, although proportionally the differences are small (Table 7)[6].

[6] This may mean there is room for population growth within the existing housing stock. As the condition of the unoccupied private dwellings is not known, it is difficult to draw a conclusion to that effect with any degree of certainty.

TABLE 7 DWELLING STRUCTURE

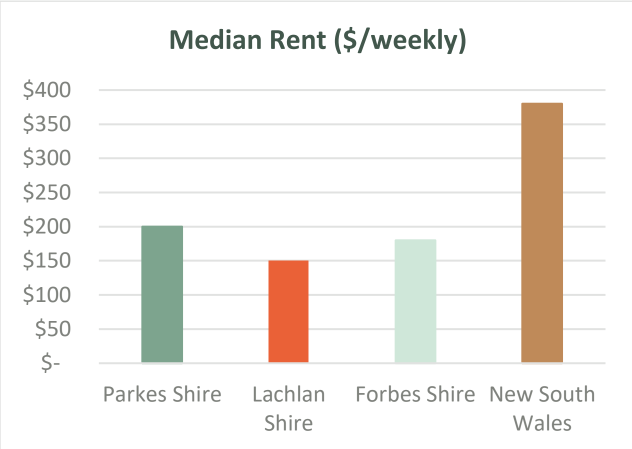
	Parkes Shire		Lachlan Shire		Forbes Shire	
	Number	*%*	*Number*	*%*	*Number*	*%*
Total occupied private dwellings	5,294	85.54%	2,206	84.36%	3,496	86.73%
Total unoccupied private dwellings	895	14.46%	409	15.64%	532	13.20%

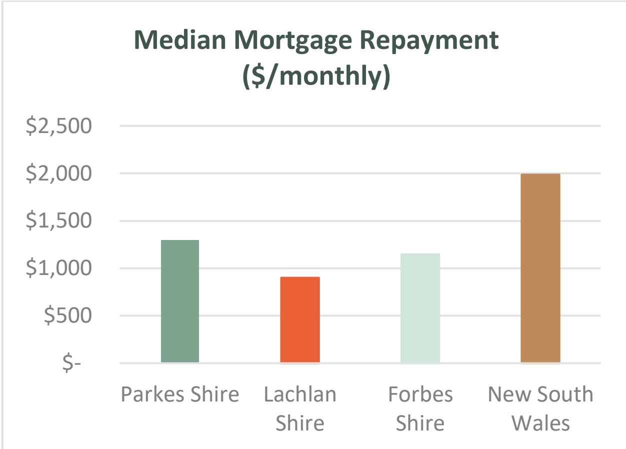
Source: ABS Census Data 2016, General Community Profile

3.4.2 Housing Cost and Ownership

Housing costs in the Social Locality, including houses and units, were significantly lower than the NSW medians at the time of the 2016 Census. Figure 11 highlights how the Social Locality's median mortgage repayments and rents are significantly below the State's median, with housing costs in the Lachlan Shire less than half of the NSW medians.

FIGURE 11 MEDIAN HOUSING COSTS



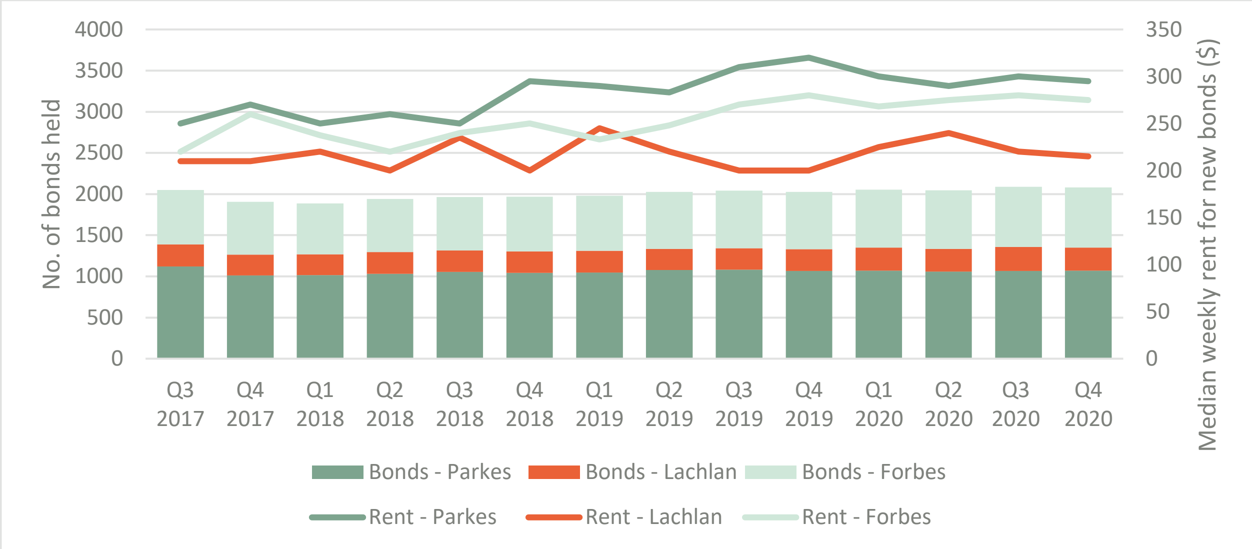


Source: ABS Census Data 2016, General Community Profile

More recent rental costs are provided in Figure 12, which shows the median rent for new bonds lodged by quarter in the Social Locality, as well as the total number of bonds held. The latter provides an indication of the evolution of the size of the rental market, although the total number of rental properties available is likely to be larger[7]. At the end of 2020 there were a total of 2,081 bonds held across the three Shires, and the median rents for new leases ranged between $215 and $295 per week. The total number of bonds have remained relatively stable over the last three years, but rents have experienced a general upward trend except in Lachlan Shire where the trend, albeit some fluctuations, is relatively stable. The increase in rental costs in Parkes between quarter two and four of 2019 is potentially associated with increased housing demand from construction of the Inland Rail Project.

[7] This is because the total rental market also includes properties that are rented privately and properties that are available but currently not rented.

Figure 12 Median Rent and Rental Bonds



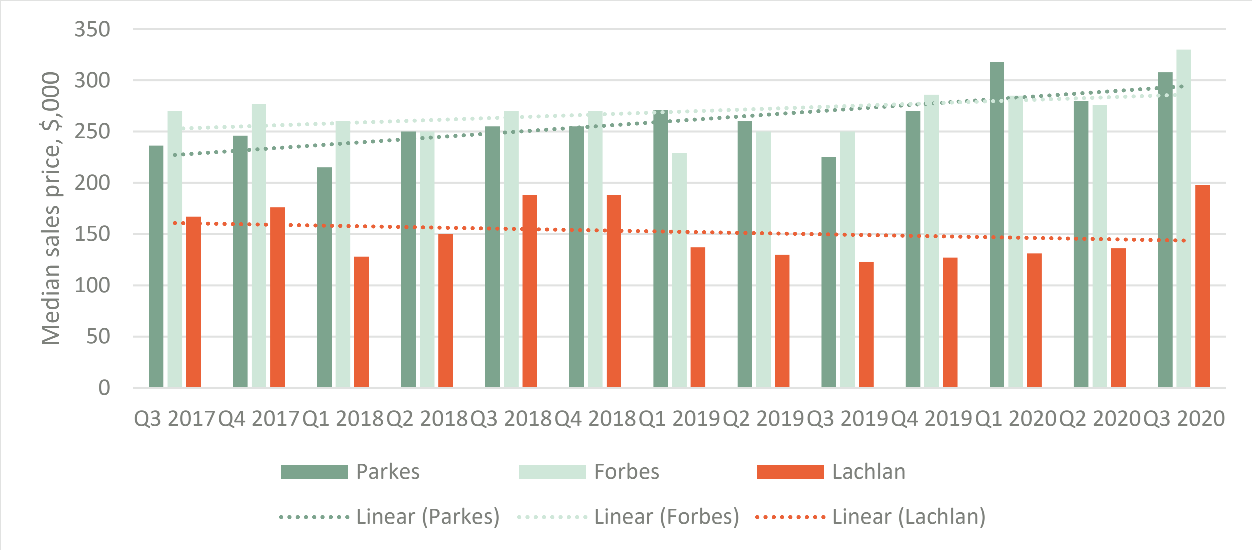
Source: Department of Communities and Justice, 2020

A search of National Shelter's 2020 rental affordability index revealed that rents for an average Australian rental household were considered affordable for postcode 2870, which approximates Parkes, and very affordable for postcodes 2871 (Forbes) and 2877 (Condobolin) (SGS Economics and Planning, 2020).

Figure 13 below shows recent median sales prices for dwellings in the three Shires, as well as linear trend lines. In the September quarter of 2020 the median sales price was $330,000 in Forbes, $308,000 in Parkes and $198,000 in Lachlan Shire. Over the period from Q3 2017 to Q3 2020 dwelling prices have trended slightly upwards in Forbes and Parkes, and marginally downwards in Lachlan Shire.

Figure 14 shows the rates of home ownership and renters within the Social Locality compared to NSW. Overall, housing ownership rates are higher in the Forbes, Parkes and Lachlan Shires compared to NSW with more homes owned outright, and fewer owned with a mortgage. Within the Social Locality the Lachlan Shire has a lower number of owners with a mortgage compared to that of Parkes and Forbes.

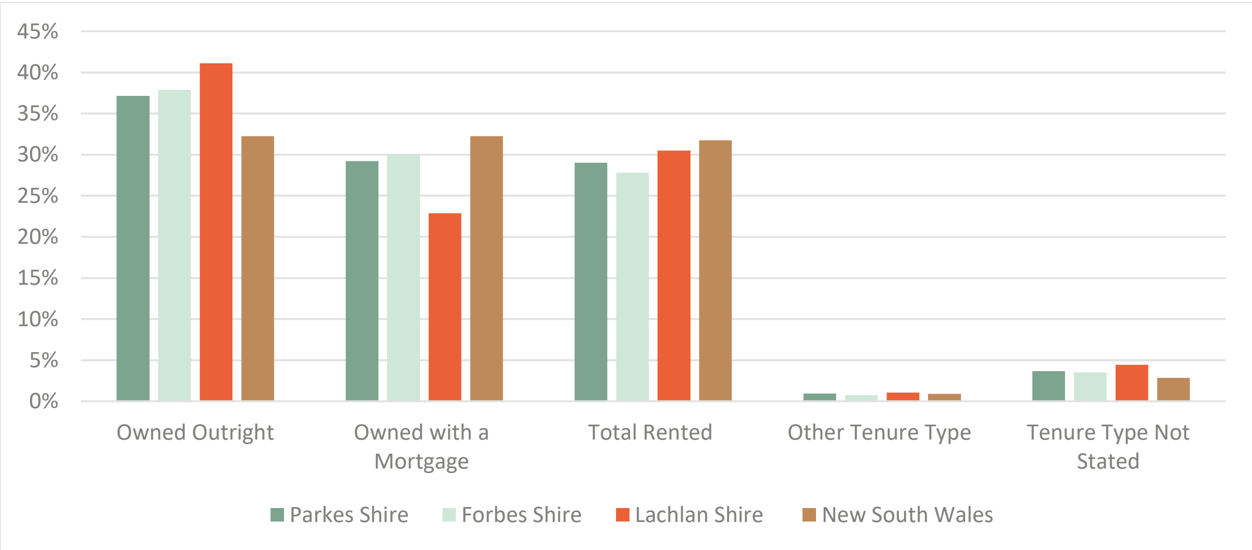
Figure 13 Median Sales Prices



Source: Department of Communities and Justice, 2020

Note: no values were reported for Q4 2019 and Q1 2020 for Lachlan Shire, most likely because there were fewer than ten sales in those periods. The figures provided here are the mid points between the two immediate periods before and after so as not to skew the trend line.

Figure 14 Home Ownership



Source: ABS Census Data 2016, General Community Profile

3.4.3 Short Term Accommodation

Short term accommodation available in the Social Locality in 2016 is shown in Table 8 below[8]. In total, there were 18 short term accommodation facilities in the area, 10 in Parkes, six in Forbes and two in the Condobolin Statistical Area Level 2 (SA2), with 293 and 156 rooms available in Parkes and Forbes respectively. Compared to figures presented in the Community Infrastructure Assessment (Martin & Associates Pty Ltd, 2000) which reported a total of 26 establishments across the Social Locality (Martin & Associates Pty Ltd, 2000), it would appear the number of establishments has reduced[9].

TABLE 8 SHORT TERM ACCOMMODATION (HOTELS, MOTELS AND SERVICED APARTMENTS) IN SOCIAL LOCALITY, JUNE QUARTER 2016

	Parkes SA2	Forbes SA2	Condobolin SA2
Establishments	10	6	2
Rooms	293	156	-
Bed spaces	793	442	-
Room nights occupied	13,459	7,447	-
Room nights available	26,663	14,196	-
Room occupancy rate %	51%	53%	-
Guest nights occupied	19,256	12,842	-
Guest nights available	72,163	40,222	-
Bed occupancy rate %	27%	32%	-

Source: ABS 2016, Tourist Accommodation 2015-16.

3.5 Community Infrastructure

The following review of community facilities in the Social Locality is based on a desktop search for facilities within the respective Shire.

3.5.1 Education Facilities

PSC manages the Central West Family Day Care which services Parkes, Forbes, Condobolin and surrounding districts. Within Parkes there are three pre-schools/long day care services, a Family Day Care Scheme, four primary schools (three public and one Catholic), one high school and a Christian school for Kindergarten to Year 12. Whilst Parkes does not have a university, it does offer tertiary education through the Parkes TAFE College, which forms part of the TAFE Western NSW Institute (PSC, 2016).

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8 This data is based on the latest available ABS tourist accommodation survey. The survey reports data on an SA2 level. The Parkes, Forbes and Condobolin SA2's roughly covers a similar area as the Social Locality, with the exception of Parkes SA2 which approximates the town of Parkes. Other than the number of establishments, data is not available for Condobolin SA2.

9 Note however that the areas provided here are SA2's and the data in the Community Infrastructure Assessment is presented at LGA level, hence the figures may not be entirely comparable.

Forbes has five childcare and preschool centres, three primary schools (two public and one Catholic) and two high schools (one public and one Catholic). There is a TAFE campus in Forbes, providing a range of courses (FSC, n.d).

There are approximately 12 schools and child care centres in the Lachlan Shire, including in Condobolin, Tullibigeal, and Lake Cargelligo. The Lachlan Shire does not have a university or other form of tertiary education.

The Community Infrastructure Assessment identified a total of 14 schools in the Social Locality, with an enrolment of 4,769 students in 1996 (Martin & Associates Pty Ltd, 2000). A total of 18 schools have been identified in the Social Locality at the locations reported in the Community Infrastructure Assessment, with a total of 4,763 enrolments in 2019. Table 9 below outlines these schools.

TABLE 9 SCHOOLS AND ENROLMENTS IN THE SOCIAL LOCALITY

Location	School	Years	Enrolment 1996	Enrolment 2019
Parkes	Parkes High School	7-12	782	610
	Parkes Public School	K-6	425	426
	Middleton Public School	K-6	285	210
	Parkes East Public School	K-6	410	344
	Parkes Christian School	K-12	140	217
	Holy Family Parish Primary School	K-6	270	223
Bogan Gate	Bogan Gate Public School	K-6	29	8
Trundle	Trundle Central School	K-12	150	107
	St Patrick's Parish Primary School	K-6	59	28
Tullamore	Tullamore Central School	K-12	145	67
Forbes	Forbes Public School	K-6	-	280
	Forbes North Public School	K-6	-	268
	Forbes High School	7-12	-	340
	Red Bend Catholic College	7-12	719	715
	St Laurence's Parish Primary School	K-6	-	320
Condobolin	Condobolin Public School	K-6	703	295
	Condobolin High School	7-12	499	210
	St Joseph's Parish Primary School	K-6	153	95
Total			**4,769**	**4,763**

Source: NSW Department of Education, 2020, Catholic Education Wilcannia-Forbes, 2020, Parkes Christian School, 2020.

Notes: some of the schools are named marginally differently in the Community Infrastructure Assessment, with the public schools named primary schools, the Parkes Christian School being named Parkes Central West Christian School. Further, other than Red Bend Catholic College no schools were identified in Forbes in the Community Infrastructure Assessment. The 1996 enrolment figures for the Condobolin Public school were reported to include all of Lachlan Shire. Finally, there are additional schools located in the LGA's in the Social Locality. This list solely includes schools at the locations in the Community Infrastructure Assessment.

3.5.2 Social and Community Facilities

PSC offers residents and visitors free access to an array of library services, facilities, and programs through four locations – a central library in Parkes with branches in Peak Hill, Trundle and Tullamore. Twenty-seven parks and the Parkes Aquatic Centre also service the Parkes community, with PSC also operating pools in Peak Hill, Trundle and Tullamore (PSC, 2016). The Henry Parkes Centre located on the northern side of Parkes also incorporates the Parkes Visitor Information and four museums (PSC, 2021b).

Forbes has one central library which is a part of the Central West Libraries Network. The Wiradjuri Dreaming Centre is also located in Forbes. There are 14 parks within Forbes, providing free access to playgrounds, BBQ facilities and toilets. Forbes hosts a Conservatorium of Music providing residents access to music education and performances (FSC, n.d). Other community facilities include public pools, a museum and a ski dam (FSC, 2021).

The Lachlan Shire has two pools, one at Lake Cargelligo and the other in Condobolin. Recreation water sports are encouraged through access to the three lakes or rivers located in the Lachlan Shire – Gum Bend Lake, Lachlan River and Lake Cargelligo. Lachlan Shire has a strong historical presence with seven museums (LSC, n.d).

3.5.3 Health and Aged Care

Parkes has recently developed a 28-bed hospital, providing access to the region in the service areas of an emergency department, medical imaging, ambulatory care, inpatient units, and birthing suites (JBA Urban Planning Consultants Pty Ltd, 2014). The Peak Hill Multipurpose Service is also new and provides the community four acute beds and 10 high care residential aged care beds, emergency, allied health, oral health and community health services. Parkes has the primary hospital facilities in the Social Locality (PSC, 2016).

Four public and private health care services are located in the Forbes Shire. The main hospital precinct is a combination of two medical centres, with 18 consultation rooms and two treatment rooms, amongst a range of other services. Home and aged care services in Forbes are provided through the local Home and Community Care Program and the local Jemalong Residential Village. The Village is a 91-place individual room facility incorporating 30 dementia beds (FSC, n.d).

Lachlan Shire offers a district hospital, medical centre and Aboriginal health service in Condobolin. In the smaller towns and villages in the Lachlan Shire, there is a family medical practice and district hospital in Lake Cargelligo and a medical centre and multi-purpose health service in Tottenham (LSC, n.d).

3.6 Summary of Social Baseline

In summary, key points that emerge from this social baseline are:

- The population in the Social Locality is – on average – slightly older and more culturally homogenous than that of NSW, with slightly higher median ages, higher proportions of people born in Australia and who speak English only at home. The population is relatively stable with a minor decrease in population size between 2001 and 2016.
- A high proportion, ranging from 10% to 18% of the population of the Social Locality are Aboriginal and/or Torres Strait Islander peoples compared to NSW (3%).
- Agriculture plays a large part of the economy in the region, being the largest or second largest industry of employment in the Social Locality.
- Unemployment levels vary across the Social Locality, with Lachlan and Parkes Shires above the NSW average and Forbes Shire below at the time of the 2016 Census. Unemployment levels have since dropped to 3.1% in the Forbes Shire, 4.4% in the Parkes Shire and 4.9% in the Lachlan Shire in the March quarter of 2020, prior to COVID-19 affecting the labour market. Indigenous unemployment in the Social Locality was high at the time of the 2016 Census, at over 20% in Lachlan and Parkes Shires and 13.5% in Forbes Shire.
- Housing costs are relatively low in the Social Locality compared to NSW and are therefore more likely to be affordable relative to other parts of NSW. Home ownership levels are higher, particularly in Lachlan Shire. Rents have been generally trending upwards in Parkes and Forbes Shires, and remained relatively stable in Lachlan Shire over the last three years.
- Income levels are relatively low in the Social Locality compared to NSW.
- There are a range of social and community facilities across the Social Locality, including libraries, parks and health care facilities. Parkes, as the largest city in the area hosts a larger number of facilities.
- A total of 18 primary and secondary schools have been identified in key locations in the Social Locality, with a total enrolment of more than 4,700 students.

4. SOCIAL IMPACTS OF THE MODIFICATION

This chapter identifies and evaluates the potential social impacts that may arise from the Modification. The impact identification and evaluation process involved the following steps.

Step One: Identify Aspects of the Modification Likely to Give Rise to Social Impacts
Initially, all the aspects of the Modification were listed and assessed as to whether they may give rise to a social impact in any of the categories identified in the SIA Guidelines. This was further correlated with the potential impacts described in the Community Infrastructure Assessment (Martin & Associates Pty Ltd, 2000). For each aspect and attendant potential social impact, potentially affected stakeholder groups were identified. The key aspects of the Modification identified that may give rise to potential social impacts are further described in Section 4.1. Appendix B contains the full list of aspects of the Modification and potential social impacts.

Step Two: Analyse Likely Impacts
Each of the potential social impacts were then analysed to identify the nature and extent of the change brought about by the Modification. Where possible the change was quantified using the assumptions in the Community Infrastructure Assessment and contemporary Project information associated with the Modification. Importantly, this quantification is not an exact prediction, but rather a means of reasoning about the likely scale of the change.

Step Three: Evaluate Social Impacts
Potential impacts were then evaluated using the significance matrix and associated definitions and guidance provided in the SIA Guidelines (see Appendix C). This evaluation drew on the nature and extent of the change considered in relation to the existing social environment, feedback from the consultation process, as well as a review of submissions to previous modifications for the Project. At this stage it was also considered whether the relevant potential impact was addressed in other specialist studies supporting the Modification and these were referenced. For potential impacts with a medium or high significance, mitigation measures were then considered and a residual assessment carried out.

Step Four: Conduct Cumulative Impact Assessment
Finally, a cumulative impact assessment was carried out considering whether the identified potential social impacts may coincide with impacts from other nearby projects.

4.1 Consideration of Key Aspects of the Modification

This section discusses the key aspects of the Modification that may give rise to potential social impacts. A list of all aspects of the Modification and an assessment of their potential to generate social impacts is provided in Appendix B.

4.1.1 Construction Phase

Construction Phase Workforce

The Modification would include an increase in the peak construction phase workforce from approximately 1,000 personnel to approximately 1,900 personnel. A detailed review of the Project construction phase manning conducted as part of the Project Execution Plan (Clean TeQ, 2020) concluded that the workforce would peak at approximately 1,900 personnel for approximately two months (Figure 15).

The duration of the construction phase would increase from two to three years as part of the Modification. The commissioning phase component of the construction phase is expected to be longer than originally contemplated based on the time required to commission similar processing plants. A monthly breakdown of the indicative modified construction workforce numbers, as well as indicative construction timing for each construction activity, is provided in Figure 15.

Accommodation Camp

The Modification would include an increase in the capacity of the accommodation camp during the construction phase, from approximately 1,300 personnel to 1,900 personnel, to accommodate the modified construction workforce. The capacity of the accommodation camp would be progressively expanded during the construction phase as the construction workforce increases to its peak (Figure 15).

The Modification would increase the period for construction of the accommodation camp, until first rooms become available, from approximately three months to six months. During this initial construction phase, the construction workforce size would average 211 personnel, peaking at close to 300 personnel (Figure 15).

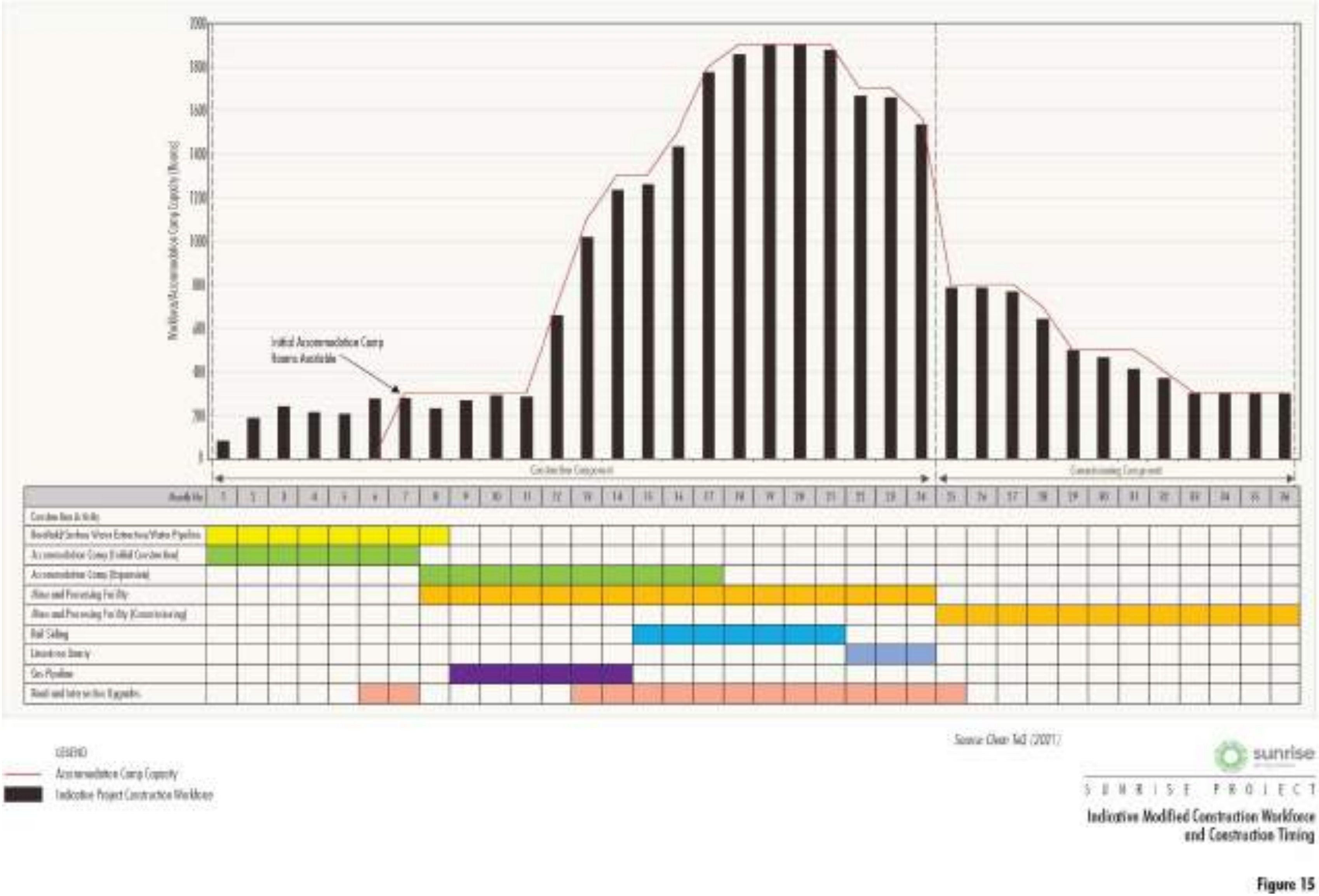
The residential distribution of the construction workforce during construction of the accommodation camp is expected to be 50% in Parkes, 33% in Condobolin, 10% in Forbes and 7% in other surrounding areas.

Due to the highly specialised, skilled nature of the construction workforce, it is expected that 90% of roles would be filled by non-local workers and the remaining 10% filled by local residents already residing in the region. As such, following first availability of rooms at the accommodation camp (i.e. month seven), approximately 90% of the construction workforce are expected to reside in the accommodation camp, and the remaining 10% in surrounding areas (local residents already residing in the region). The distribution of this 10% is expected to reflect the distribution of the workforce during construction of the accommodation camp.

Construction Phase Project Traffic

Heavy vehicles are approved to deliver construction equipment, construction materials, processing plant components, and construction consumables to the Project. A peak of 160 heavy vehicle movements per day is expected over the approved Project construction period.

FIGURE 15 INDICATIVE MODIFIED CONSTRUCTION WORKFORCE AND CONSTRUCTION TIMING



A detailed review of the Project road transport requirements was conducted as part of the Project Execution Plan, which identified that changes to heavy vehicle movements would be required for the modified Project. The Road Transport Assessment for the Modification (The Transport Planning Partnership [TTPP], 2021) concludes there would generally be decreases in truck movements across the road network during the construction phase.

In addition, as part of the Modification, SEM would operate shuttle buses between towns in the Social Locality (Parkes, Condobolin, Forbes) and the mine and processing facility, which would reduce the number of light vehicle movements associated with the modified Project during construction. Shuttle buses would also be operated between the accommodation camp and the mine and processing facility during the construction phase.

The Road Transport Assessment for the Modification (TTPP, 2021) also concludes that the modified Project would have acceptable impacts on the operation of the road system during the construction phase. It further concludes that implementation of the various mitigation measures for the approved Project, with some refinements for the modified Project, would result in no significant impacts to road performance, capacity, efficiency or safety arising as a result of the traffic associated with the modified Project.

Road and intersection upgrades and maintenance would be undertaken in accordance with Development Consent (DA 374-11-00) and the Voluntary Planning Agreement (VPA). A summary of these road and intersection upgrades and maintenance is outlined in the Road Upgrade and Maintenance Strategy (Clean TeQ, 2019). In addition, the approved Scotson Lane road upgrade would be extended to the modified rail siding access.

Furthermore, in accordance with the Development Consent (DA 374-11-00), a Traffic Management Plan has been developed for the approved Project. This would be updated to incorporate the Modification, consistent with the requirements for the approved Project, including:

- details of all transport routes and traffic types to be used for development-related traffic;
- a program to monitor and report on the amount of metal sulphate precipitate and scandium oxide transported from the mine;
- a program to monitor and report on the amount of limestone transported from the limestone quarry;
- the measures that would be implemented to minimise traffic safety issues and disruption to local users of the transport route/s during construction and decommissioning of the development, including:
    - temporary traffic controls, including detours and signage;
    - notifying the local community about development-related traffic impacts; and
    - a traffic management system for managing over-dimensional vehicles; and
- a Road Transport Protocol for all drivers transporting materials to and from the site with measures to:
    - ensure drivers adhere to the designated transport routes;
    - verify that these heavy vehicles are completely covered whilst in transit;

- co-ordinate the staggering of heavy vehicle departures to minimise impacts on the road network, where practicable;
- minimise disruption to school bus timetables and rail services;
- ensure travelling stock access and right of way to the adjacent travelling stock route;
- maintain radio communications between all school buses and heavy vehicle operators operating on the transport route between the rail siding and mine;
- manage worker fatigue during trips to and from the site;
- manage appropriate driver behaviour via a Driver Code of Conduct including:
  - obey all the laws and regulations that apply to vehicles on public and private roads;
  - respect the rights of others, including drivers and pedestrians, to use and share the road space;
  - maintain a safe following distance between vehicles;
  - ensure the Project-related vehicle is clean and in good mechanical condition to reduce environmental impacts;
  - do not travel in convoys unless under approved escorts;
  - follow the designated access routes for the Project;
  - abide by all NSW/interstate road rules and vehicle regulations;
  - ensure a high level of courtesy; and
  - turn off flashing/rotating beacons when on public roads.
- inform drivers of relevant drug and alcohol policies;
- regularly inspect vehicles maintenance and safety records;
- implement contingency procedures when the transport route is disrupted;
- respond to emergencies;
- transport processing reagents safely; and
- ensure compliance with and enforcement of the protocol.

Community Contributions

SEM is committed to engaging with communities to understand their priorities, provide information about the Project, and seek opportunities to create shared value.

In December 2018, SEM entered into a VPA with LSC, PSC and FSC. The first community contribution payment of $200,000 to LSC, $100,000 to PSC and $100,000 to FSC was made in January 2019. These community contributions have been used to fund various community initiatives (e.g. development of Trundle Main Street Masterplan and the Forbes Recreation and Open Space Strategy).

In 2019, SEM provided financial and/or non-financial support to local agricultural shows, primary and secondary schools (in Trundle, Condobolin, Parkes and Forbes), and the Trundle Bush Tucker Day (Clean TeQ, 2020). SEM intends to continue its support of local agricultural shows and events as they recommence after the COVID-19 pandemic.

During 2020, SEM donated 100 mega litres of its surface water allocation to the LSC to assist filling Gum Bend Lake to allow for the continuation of recreational activities over the 2020/2021 summer.

SEM would continue to make community contributions supporting positive social outcomes, social infrastructure investments and/or community resilience improvements as part of the modified Project.

4.1.2 Operational Phase

Operational Phase Workforce

The Modification would increase the operational phase workforce from approximately 335 personnel to approximately 340 personnel as the rail siding workforce would increase from five to 10. Given this relatively minor change (approximately 1%), no significant changes to approved social impacts associated with the operational workforce are anticipated.

Operational-related Traffic

Products and ammonium sulphate are approved to be transported from the mine and processing facility to the rail siding by road. These products were to be backloaded in trucks transporting sulphur from the rail siding to the mine and processing facility. However, a detailed review of the Project road transport requirements conducted as part of the Project Execution Plan (Clean TeQ, 2020), determined the metal products and ammonium sulphate could not be backloaded in trucks transporting sulphur as the products may become contaminated. Separate truck movements would therefore be required to transport these products.

In addition, revisions to processing plant input types, quantities and storage would be required as part of the Modification. These revisions to processing plant inputs and quantities would result in changes to road transport requirements.

The Road Transport Assessment for the Modification (TTPP, 2021) concludes that there would generally be decreases in truck movements across the road network during the operational phase.

SEM would continue to operate shuttle buses between Parkes, Condobolin and Forbes and the mine and processing facility consistent with the approved Project, which would reduce the number of light vehicle movements associated with the Project during operations.

Management measures in the existing Traffic Management Plan for the approved Project, which would be updated to incorporate the Modification, are described in Section 4.1.1.

Changes to Mine and Processing Facility

Section 2.2 lists changes proposed to the approved mine and processing facility as part of the Modification. Of these, the following changes have the potential to change the amenity of the mine and processing facility:

- addition of a temporary construction laydown area inside the approved tailings storage facility footprint;
- optimised production schedule resulting in an increased mining rate during the initial years of mining and associated changes to mining and waste rock emplacement sequencing;
- revised processing facility area layout, including a revised processing plant layout and two additional site vehicle access points;
- reduced sulphuric acid plant stack height from 80 m to 40 m;

- revised tailings storage facility cell construction sequence and the addition of a decant transfer pond;
- relocated and resized evaporation pond; and
- changes to the water management system to reflect the modified mine and processing facility layout.

In accordance with the Development Consent (DA 374-11-00), an Air Quality Management Plan and Noise Management Plan have been developed for the approved Project. These management plans include a range of measures to minmise potential amentity impacts associated with the approved Project. Management measures in the existing Air Quality Management Plan and Noise Management Plan for the approved Project would be updated to incorporate the Modification.

Relocation of Rail Siding

The approved rail siding is located on the Tottenham Bogan Gate Railway approximately 25 km south-east of the mine and processing facility (Figures 1 and 3).

The Modification would include the relocation of the rail siding approximately 500 m south of the approved location (Figure 3) to allow for the development of the ammonium sulphate storage and distribution facility and to improve operability of the rail siding.

The existing Air Quality Management Plan and Noise Management Plan for the approved Project would be updated to incorporate the Modification (including the modified rail siding).

Community Contributions

As described in Section 4.1.1, in accordance with the VPA, SEM would continue to make community contributions supporting positive social outcomes, social infrastructure investments and/or community resilience improvements as part of the modified Project.

4.2 Description of Potential Social Impacts During the Construction Phase

4.2.1 Additional Employment and Business Opportunities Arising from the Construction Workforce Improving People’s Livelihoods

As noted above, the Community Infrastructure Assessment (Martin & Associates Pty Ltd, 2000) forecast a construction workforce peak of 962 persons, with an average of 611 workers over a 24-month construction phase (Table 10). The assessment also assumed that approximately 21% of the workforce could potentially be filled by residents in the Social Locality of Lachlan, Forbes and Parkes Shires, equating to an average of 128 local workers.

The Modification involves a larger peak workforce of approximately 1,900 persons and an extended construction period of 36 months in total, with the average workforce being 784. As described in Section 4.1.1, it is expected that 10% of roles in the construction workforce would be filled by local residents already residing in the region. As such, on average approximately 78 local residents can be expected to find employment in the construction workforce, with a peak of 190 local residents.

This impact is likely to be experienced positively by the local community, including jobseekers and businesses. Anticipation for local employment was mentioned as a key expectation by all the Councils consulted for the Modification. A review of submissions on previous modifications also suggested there is a concern that the Project would not provide meaningful local employment opportunities, and as such provide only limited benefit to the local communities. It is however also worth noting that unemployment rates in the Social Locality are generally low, meaning that there is a risk, albeit low, of unsustainable competition for labour potentially affecting local businesses negatively.

TABLE 10 INCREMENTAL CHANGE IN EMPLOYMENT

	Community Infrastructure Assessment	Modification
Average Total Construction Workforce	611 workers over 24 months.	784 workers over 36 36 months.
Average Local Construction Workforce	Assumed 21% local workforce, equals 128 persons for 24 months.	Assumed 10% local workforce, 78 workers for 36 months.

This impact is expected to last the duration of the construction phase, albeit at varying intensities. Operational employment levels, where the opportunities for local participation are likely to be greater, remain unchanged by the Modification.

4.2.2 Additional Pressure on Local Housing Markets from the Construction Workforce Prior to the Accommodation Camp being Constructed

The increased construction workforce size and the longer construction period may lead to additional demand for temporary housing and accommodation, particularly prior to the accommodation camp being constructed (Table 11). The Community Infrastructure Assessment anticipated that the accommodation camp would be constructed in three months, and a peak workforce of 180 persons would be required during this period (Martin & Associates Pty Ltd, 2000). Taking into account indirect or induced additional employment, certain assumptions around family sizes and proportions of local and non-local workforces, it was anticipated that an additional 30 units of accommodation for families and 135 for singles would be required during the initial three-month phase.

The assessment considered that most of these would be required in Condobolin, followed by Trundle/Tullamore and Parkes, and concluded that there was adequate accommodation available to accommodate this increase (Martin & Associates Pty Ltd, 2000).

TABLE 11 INCREMENTAL INCREASE IN HOUSING DEMAND – INITIAL PHASE

	Community Infrastructure Assessment	Modification
Demand for Family Accommodation Units	30 units during initial three-month phase.	No demand expected.
Demand for Single Accommodation Units	135 units during initial three-month phase.	270 units (90% of peak construction workforce) during initial six-month phase.

The Modification would see six months of the accommodation camp construction before first rooms are available. The workforce would average 211 personnel and would peak at close to 300 personnel at that time, an increased peak of 54% on the Community Infrastructure Assessment (Martin & Associates Pty Ltd, 2000). It is expected that 90% of the construction workforce during this time would move to the region as singles, with few – if any – bringing family members (due to the temporary nature of the construction workforce). The remaining 10% are expected to be local residents already residing in the region. Therefore, no demand for family dwellings is expected, while demand for single accommodation is expected to be 270 units for six months.

As noted in Section 3.4.3, there were a total of 293 short term accommodation rooms in Parkes Shire and 156 in Forbes in 2016.[10] Further, Section 3.4 noted that a total of 2,081 rental unit bonds were held in the Social Locality in the December quarter 2020, and that the total rental market is likely to be larger than this. Assuming that approximately half of the additional dwelling demand would access the rental market and the other half use short-term accommodation, this would represent an additional demand of 6.5% of total existing rental bonds and 30% of short-term accommodation. The incremental demand created by the Modification (total of 135 units of accommodation during the initial six-month phase), would hence represent half of this: 3.2% of the total bonds and 15% of the short-term accommodation units. This would constitute a short-term impact during the initial six-month phase, and would also be to some extent offset by the reduced anticipated demand for family accommodation.

It thus seems likely that the short-term accommodation and rental markets would be able to cater for the additional non-local workforce during the initial six-month phase until first rooms are available at the accommodation camp. Nevertheless, the Project induced increased demand may contribute to localised and short-term rent increases depending on where the demand eventuates and whether other projects contribute to cumulative pressures (discussed further in Section 4.6). In the consultation with Councils, housing and accommodation emerged as a key point with respondents both expressing an expectation that Project workforces should locate in their Shires and a slight concern about the flow on effects of too rapid or too large influxes. The key opportunities for Project employees to relocate to the Social Locality are likely to be associated with the operational workforce (only a minor change is proposed to the operational workforce for the Modification [Section 4.1.2]).

4.2.3 Additional Pressure on Local Housing Markets from the Construction Workforce during the Remainder of the Construction Phase

The Community Infrastructure Assessment considered the potential direct and indirect/induced housing demand from an average construction workforce of 611 persons (Martin & Associates Pty Ltd, 2000). Similar to above and utilising assumptions about family sizes and non-local vs local workforces, it was anticipated the Project would lead to demand for 127 family dwellings during the remainder of the construction phase. All demand for single accommodation units, a total of 435, would be absorbed by the accommodation camp (Table 12).

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[10] More current LGA level tourism accommodation data for the LGA's is not available, and the ABS tourist accommodation data from 2015/16 does not report data for Lachlan Shire.

As described in Section 4.1.1, it is expected that approximately 90% of the modified construction workforce would reside in the accommodation camp and, therefore, most of the additional demand for housing and accommodation would not be required to be met by the local housing or short-term accommodation markets. It is anticipated that the remaining 10% of the construction workforce would be local residents already residing in the region.

The average construction workforce for the Modification is 784; 28% greater than for the approved Project. As 90% of the construction workforce is expected to reside in the accommodation camp, with the remaining 10% including local residents already residing in the region, the Modification is not expected to impact the local housing market for the remainder of the construction phase. It is nevertheless possible that the Modification would give rise to some additional indirect or induced demand for housing, however this is likely to be small.

TABLE 12 INCREMENTAL CHANGE IN HOUSING DEMAND – REMAINDER OF CONSTRUCTION PHASE

	Community Infrastructure Assessment	Modification
Demand for Family Accommodation Units	127 units during remainder of construction phase.	No or negligible demand.
Demand for Single Accommodation Units	All demand absorbed by accommodation camp during remainder of construction phase.	90% of demand absorbed by accommodation camp, remaining 10% already residing in local area during remainder of construction phase.

4.2.4 Additional Demand for Schooling and Other Services and Facilities from Increased Construction Workforce and Accompanying Families

The Community Infrastructure Assessment (Martin & Associates Pty Ltd, 2000) considered that existing services and facilities, including health services and schools would be able to mostly absorb additional demand induced by the construction workforce and accompanying families. It was predicted the construction workforce would bring 68 in-migrating children, which would be readily catered for by schools in the region. Likewise, the assessment considered it likely the hospitals in the region could absorb additional demand, and noted that community health services may experience some increased demand.

As noted above, 90% of the modified construction workforce is expected to reside in the accommodation camp, with the remaining 10% including local residents already residing in the region. The additional student demand brought about by the incremental change in the construction workforce in the Modification is therefore expected to be negligible.

The Community Infrastructure Assessment (Martin & Associates Pty Ltd, 2000) anticipated the construction workforce would not lead to any noticeable impact on Condobolin Hospital, but that nearby community health centres may experience some additional demand during the construction phase.

It is difficult to quantify the demand for health services from the non-resident construction workforce, as it is likely they would access most non-acute health care at their home location. In addition, SEM would provide first aid facilities at the mine and processing facility that would minimise demand for acute health care from existing health services. Nevertheless, consultation with Councils revealed some concern about the potential for impacts to existing services and facilities including health and social facilities.

4.2.5 Changed Construction Traffic Impacts Peoples' Way of Life and Sense of Safety

The Modification would change light and heavy vehicle traffic volumes stemming from the increased construction workforce requirements and to deliver construction equipment, materials, components and consumables. Workforce traffic which is likely to predominantly comprise buses, would mostly originate from Parkes (including the Parkes airport), Condobolin and Forbes.

As described in Section 4.1.1, the Road Transport Assessment for the Modification (TTPP, 2021) concludes an expected decrease in truck movements and total vehicle movements on most routes across the road network during the construction phase.

Consultation with Councils and an analysis of submissions on previous modifications suggest traffic related impacts are of concern to the community, particularly in Trundle. As such, the overall incremental reduction in construction traffic movements from the Modification is likely to be experienced as a positive impact by the community. Notwithstanding this, there will be minor increases in truck movements and total vehicle movements along some routes, particularly between Condobolin and the mine and processing facility. Residents near these routes are therefore likely to experience this impact negatively. It should however be noted that the temporal extent of this impact (both positive and negative) is limited – during the construction phase only, and the increases in traffic movements between Condobolin and the mine and processing facility represent a very small number of vehicle movements in comparison to the total traffic volume along these roads.

The findings of the Road Transport Assessment for the Modification (TTPP, 2021) are summarised in Section 4.1.

4.3 Description of Potential Social Impacts During the Operational Phase

4.3.1 Changed Operational Traffic Impacts Peoples' Way of Life and Sense of Safety

The Modification involves changes to truck and total vehicle movements across the road network during the operational phase. There would be a reduction in truck movements along some key routes, particularly along the Bogan Way through Trundle, and no significant change to truck traffic between the rail siding and mine and processing facility. Total vehicle movement along other routes may increase somewhat, as detailed in the Road Transport Assessment for the Modification (TTPP, 2021). Overall, the incremental change in truck and total vehicle movement stemming from the Modification is likely to be small and contained, impacting some residents marginally negatively and others marginally positively, depending on their location. On the other hand, the impacts – both positive and negative – are of a relatively long duration; the entirety of the operational phase.

In addition, the Road Transport Assessment for the Modification (TTPP, 2021) concludes the modified Project would have acceptable impacts on the operation of the road system. It further concludes that implementation of the various mitigation measures for the approved Project, with some refinements for the modified Project, would result in no significant impacts to road performance, capacity, efficiency or safety arising as a result of the traffic associated with the modified Project.

4.3.2 Changed Operational Workforce

The Modification would increase the operational phase workforce from approximately 335 personnel to approximately 340 personnel as the rail siding workforce would increase from five to 10. Given this relatively minor change (approximately 1%), no significant changes to the approved social impacts associated with the following are anticipated:

- employment and business opportunities;
- pressure on local housing markets; and
- demand for schooling and other services and facilities.

4.3.3 Amenity Impacts from Mine and Processing Facility

The Modification proposes some changes to the general arrangement of the mine and processing facility (Section 4.1.2). Although these revisions are likely to constitute a minor impact, nearby residents may nevertheless experience amenity impacts from it.

Air Quality

The Air Quality and Greenhouse Gas Assessment (Jacobs [Australia] Pty Ltd, 2021) prepared for the Modification considered potential air quality impacts in detail and a summary of the results is provided below.

The Air Quality and Greenhouse Gas Assessment (Jacobs, 2021) considered the potential air quality impacts of an indicative construction scenario and three indicative ‘maximum case’ operational scenarios of the modified Project at the mine and processing facility.

Jacobs (2021) concluded that there would be no exceedances of the relevant air quality criteria at any nearby residences for the modified Project. As such, the modified Project is anticipated to have minimal impact on the local air quality environment (Jacobs, 2021).

Jacobs (2021) also assessed the potential air quality impacts of the gaseous pollutants generated at the processing facility, and various other activities at the mine and processing facility. It was concluded that no exceedances of the relevant criteria for the modified Project is anticipated (Jacobs, 2021).

The existing Air Quality Management Plan for the approved Project would be updated to incorporate the Modification.

Noise

The Noise and Blasting Assessment (Renzo Tonin, 2021) prepared for the Modification also considered potential noise impacts in detail and a summary of the results is provided below.

The Noise and Blasting Assessment (Renzo Tonin, 2021) considered the potential noise impacts of an indicative construction scenario and three indicative operational scenarios of the modified Project at the mine and processing facility.

Renzo Tonin (2021) concluded that elevated noise levels are anticipated at several sensitive receivers in the vicinity of the mine and processing facility for the modified Project. Incorporating reasonable and feasible noise mitigation measures, a 'moderate' exceedance of the relevant noise criteria is predicted at one property. In accordance with the *Voluntary Land Acquisition and Mitigation Policy* (VLAMP) (NSW Government, 2018), this property would be afforded mitigation measures upon request rights to reduce noise levels at the residence (e.g. mechanical ventilation, upgraded façade elements or roof insulation).

Several other receivers in the vicinity of the mine and processing facility are predicted to experience a 'negligible' exceedance of the relevant noise criteria (Renzo Tonin, 2021). The VLAMP states the following regarding negligible exceedances of the relevant noise criteria (NSW Government, 2018):

> *The exceedances would not be discernible by the average listener and therefore would not warrant receiver based treatment or controls*

The existing Noise Management Plan for the approved Project would be updated to incorporate the Modification.

Visual

There would be no significant changes to potential visual impacts associated with the modified mine and processing facility relative to the approved mine and processing facility, with the exception of the reduced sulphuric acid plant stack height from 80 m to 40 m. This is expected to result in a reduction in the overall visual impact of the mine and processing facility.

4.3.4 Amenity Impacts from Rail Siding

The Modification proposes changes to the location of, and addition of certain activities at, the approved rail siding (Section 4.1.2). Although these changes are likely to constitute a minor impact, nearby residents may nevertheless experience amenity impacts from it. The Air Quality and Greenhouse Gas Assessment (Jacobs, 2021) and Noise and Blasting Assessment (Renzo Tonin, 2021) prepared for the Modification consider this potential impact in detail and a summary of the results is provided below.

Air Quality

The Air Quality and Greenhouse Gas Assessment (Jacobs, 2021) considered the potential air quality impacts of indicative construction and operational scenarios of the relocated rail siding. Jacobs (2021) concluded that there would be no exceedances of the relevant air quality criteria at any nearby residence of the modified rail siding. Given the above, there would be no significant changes to air quality impacts associated with the modified rail siding.

Noise

The Noise and Blasting Assessment (Renzo Tonin, 2021) considered the potential noise impacts of indicative construction and operational scenarios of the relocated rail siding. Renzo Tonin (2021) concluded that there would be no exceedances of the relevant noise quality criteria at any nearby residence of the modified rail siding. Given the above, there would be no significant changes to noise impacts associated with the modified rail siding.

Visual

Consideration of the potential visual impacts associated with the modified rail siding is provided in the Modification Report. There would be no significant changes to visual impacts associated with the modified rail siding.

4.3.5 Road Noise

Renzo Tonin (2021) conducted an assessment of the potential road noise impacts of the Modification, in accordance with the NSW *Road Noise Policy* (RNP) (Department of Environment, Climate Change and Water, 2011). Traffic movements associated with the modified Project are expected to comply with the relevant road noise criteria outlined in the RNP and therefore there would be no significant change to the approved road noise impacts.

4.4 Summary of Assessment

Table 13 describes the social impacts and potentially affected stakeholders and provides a significance evaluation for each impact. The social impact significance matrix, which informs the significance ratings in Table 13 is provided in Table 15 (Appendix C) and draws from the SIA Guidelines (DPIE, 2020a).

TABLE 13 IMPACT EVALUATION

Impact	Phase	Potentially affected stakeholders	Impact category	Positive/ negative	Likelihood	Magnitude	Significance
Additional employment and business opportunities arising from increased construction workforce	Construction	Local residents / jobseekers and local businesses who can supply to the Project	Livelihoods	Positive	Possible	Minor	Medium
		Local businesses experiencing competition for labour	Livelihoods	Negative	Unlikely	Minor	Low
Additional pressures on local housing markets from increased construction workforce (prior to construction of the accommodation camp) impacts renters and landlords	Construction	Landlords and short-term accommodation providers	Livelihoods	Positive	Possible	Minor	Medium
		Renters, particularly those on lower incomes	Livelihoods	Negative	Unlikely	Minor	Low
Additional demand for schooling and other services and facilities from increased construction workforce and accompanying families	Construction	Service providers	Accessibility	Negative/ positive	Very unlikely	Minor	Low
Changes to construction traffic impacts people's way of life and sense of safety	Construction	Residents and road users along Project routes experiencing a decrease in traffic	Way of life Health and Wellbeing	Positive	Likely	Minimal	Low
		Residents and road users along Project routes experiencing an increase in traffic	Way of life Health and wellbeing	Negative	Likely	Minimal	Low
Changes to operational traffic impacts people's way of life and sense of safety	Operations	Residents and road users along Project routes experiencing a decrease in traffic, particularly of heavy vehicles	Way of life Health and wellbeing	Positive	Likely	Minimal	Low
		Residents and road users along Project routes experiencing an increase in traffic	Way of life Health and wellbeing	Negative	Likely	Minimal	Low
Air quality impacts from mine and processing facility	Operations	Nearby residents	Surroundings	Negative	Possible	Minimal	Low
Noise impacts from mine and processing facility	Operations	Nearby residents	Surroundings	Negative	Possible	Minimal	Low
Visual impacts from reduced sulphuric acid plant stack height	Operations	Nearby residents	Surroundings	Positive	Possible	Minimal	Low

4.5 Mitigation Measures and Residual Impacts

As Table 13 above shows, a total of seven negative impacts were identified, all with a low significance. It should also be noted that the magnitude for each of these were assessed as either minor or minimal. The existing mitigation measures committed to by SEM include the following:

- preferentially sourcing suppliers from the Social Locality where they are cost and quality competitive;
- providing operational workforce bus transport from towns in the Social Locality to minimise workforce-related road traffic;
- operating high-capacity trucks to transport limestone and other materials and products to and from the mine and processing facility, to minimise heavy vehicle traffic volumes;
- deploying a community information and engagement program, and a complaints and grievance process, to ensure potentially affected communities are aware of impacts and have opportunities to raise concerns with SEM;
- operating in accordance with an approved Traffic Management Plan and undertaking road and intersection upgrades and maintenance (in accordance with Development Consent [DA 374-11-00] and the VPA) to address the safety, road performance and quality aspects of the traffic changes; and
- operating in accordance with an approved Air Quality Management Plan and Noise Management Plan (in accordance with Development Consent [DA 374-11-00]) to minimise potential amenity impacts associated with the approved Project; and
- continuing to make community contributions in accordance with the VPA, to support positive social outcomes, social infrastructure investments and/or community resilience improvements.

The existing social impact mitigation measures committed to by SEM are generally considered to be sufficient to address the potential social impacts associated with the Modification, with the following additions:

- increasing the size of the construction workforce accommodation camp to accommodate all non-residential construction workers;
- mitigation upon request rights for one property in accordance with the VLAMP (NSW Government, 2018) to reduce noise levels at the residence (e.g. mechanical ventilation, upgraded façade elements or roof insulation); and
- providing construction workforce transport from towns in the Social Locality to minimise workforce-related road traffic.

4.6 Cumulative Social Impacts

The Modification may give rise to cumulative social impacts in conjunction with other relevant projects in the Social Locality. To assess potential cumulative social impacts that may arise from the Modification in conjunction with other projects, the three-step process described in the methodology section (Section 1.2) was followed.

Key proposed or approved projects that may potentially interact with, or have potential cumulative impacts with, the modified Project are listed in Table 14 and are shown on Figure 1.

Table 14 also classifies each of the projects as 'relevant' or 'potentially relevant' in accordance with the draft *Assessing Cumulative Impacts Guide Guidance for State Significant Projects* (DPIE, 2020c).

Cumulative impacts with the modified Project and the relevant projects have been considered in Table 14 in accordance with the draft *Assessing Cumulative Impacts Guide Guidance for State Significant Projects* (DPIE, 2020c). Further, key uncertainties associated with the assessment are noted.

In summary, of the nine relevant projects required to be considered, most were deemed unlikely or very unlikely to contribute to cumulative social impacts in a material way. For those that were deemed 'possible' to contribute to cumulative impacts, there are significant uncertainties with regards to the project components that would cause these impacts (e.g. timing, workforce sourcing, accommodation or traffic solutions).

Further, most of the relevant projects are relatively contained (in extent of impact area) and with small proposed workforces and short construction timeframes. As such it seems unlikely that they would, in conjunction with the identified social impacts of the Modification, contribute to significant cumulative social impacts. The main exception to this is the Parkes Bypass Project, which with a peak workforce of approximately 400 personnel and an anticipated three-year construction phase (early works commenced in late 2020 with completion in late 2024 [Department of Infrastructure, Transport, Regional Development and Communications, 2021]) may – if the construction phases coincide – contribute to cumulative pressures on labour demand and housing and accommodation sectors in Parkes Shire. It should however be noted that the main driver for potential cumulative impacts is the approved Project, and not the Modification per se. SEM has committed to ongoing engagement with local councils, including PSC, which would enable planning for managing these impacts, should the construction phases occur concurrently.

Nevertheless, should all of the relevant projects with a possibility to contribute to cumulative social impacts be constructed concurrently, all seek to source their workforce from the Social Locality, and none develop purpose-built workforce accommodation, it is possible that this will lead to noticeable competition for local labour and pressures on housing markets, as well as noticeable increases in traffic. This is however considered highly unlikely. Further, as the modified Project is the only one which is known to have proposed a workforce accommodation facility, it is likely to be a minor contributor to housing related impacts, as well as having the capacity to source additional workers from outside the Social Locality should competition for local labour be unsustainable.

TABLE 14 CUMULATIVE SOCIAL IMPACT ASSESSMENT

Project	Overview	Status	Cumulative Impact Assessment[1]	Consideration of potential for cumulative social impacts		
				Likelihood	Rationale and nature of potential impacts	Key uncertainties
Lachlan Shire Council						
Cattle Feedlot and Quarry (Department of Infrastructure, Planning and Natural Resources, 2005)	50,000 head cattle feedlot and quarry (providing material to the feedlot for construction and maintenance), located approximately 30 km west of Condobolin. The construction workforce is approximately 85 personnel in the first year of construction and 53 personnel over the following three years of construction. The operational workforce is approximately 50 personnel.	Approved (2005) – Not constructed	Relevant Project – Required to be Considered	Unlikely	The location approximately 80 km from the Project means no cumulative amenity impacts are anticipated. There is a possibility for cumulative social impacts related to employment and housing depending on construction timing and proposed workforce solutions. These are however considered negligible considering the small construction and operational workforce. Proposed traffic routes do not intersect with the Project's traffic routes.	Timing, workforce sourcing and accommodation solutions are unknown.
Flemington Cobalt Scandium Mine (Australian Mines Limited, 2017)	A proposed nickel, cobalt and scandium open cut mine located to the immediate north-west of the Project. The proposed construction workforce is approximately 120 to 150 personnel for approximately 12 to 18 months. The proposed operational workforce is approximately 75 personnel for 18 years.	Environmental Assessment Requirements (EARs) Issued (2018)	Potentially Relevant Project – Not Required to be Considered	–	–	–
Owendale Scandium Mine (R.W. Corkery & Co. Pty. Limited, 2018)	A proposed nickel, cobalt and scandium open cut mine (immediately north-east of the Project), processing site (located approximately 5 km west of Condobolin) and associated infrastructure. The proposed construction period is approximately two years (no workforce estimate provided). The proposed operational workforce is approximately 121 personnel for 28 years of mining operations.	EARs Issued (2018)	Potentially Relevant Project – Not Required to be Considered	–	–	–

Project	Overview	Status	Cumulative Impact Assessment[1]	Consideration of potential for cumulative social impacts		
				Likelihood	Rationale and nature of potential impacts	Key uncertainties
Western Slopes Pipeline (APA, 2017)	A proposed high pressure gas pipeline approximately 450 km in length to connect the Narrabri Gas Project to the NSW gas transmission network, with the alignment located north and west of the Project. The proposed construction workforce is between 250 and 350 personnel for approximately eight to 10 months. The proposed operational workforce is four to five personnel until the end of the pipeline's useful life (estimated to be approximately 40 years).	EARs Issued (2019)	Potentially Relevant Project – Not Required to be Considered	–	–	–
Parkes Shire Council						
Northparkes Mine Extension Project (CMOC Mining Services Pty Ltd, 2018)	A copper-gold mine located approximately 27 km north-west of Parkes via the Newell Highway and Bogan Road. Operational workforce of approximately 700 personnel until end of the mine life in 2032.	Approved (2014) – Operational	Relevant Project – Required to be Considered	Unlikely	Relative proximity to Project means there is a possibility for cumulative social impacts related to traffic, workforce and housing. However, as the project is already operational and represents a continuation of mine operations those change processes are unlikely to be experienced cumulatively.	N/A
Inland Rail Parkes to Narromine (ARTC, 2021)	An upgrade of the existing rail line between Parkes and Narromine as part of the Inland Rail Project, including 98.4 km of upgraded track and 5.4 km of new track.	Approved (2018) – Operational	Relevant Project – Required to be Considered	Very unlikely	Already constructed project with minimal ongoing workforce and traffic impacts means cumulative impacts related to these are very unlikely. Project is located at a significant distance from the mine and processing facility and rail siding and as such will not contribute to amenity related cumulative impacts.	N/A

Project	Overview	Status	Cumulative Impact Assessment[1]	Consideration of potential for cumulative social impacts		
				Likelihood	Rationale and nature of potential impacts	Key uncertainties
Parkes Solar Farm (Neoen Renewing Energy, 2016)	A 65 Megawatt (MW) photovoltaic solar farm located approximately 10 km west-northwest of Parkes. The operational workforce on-site is approximately one person for the expected 25 to 30-year operational life.	Approved (2016) – Operational	Relevant Project – Required to be Considered	Very unlikely	Project is located approximately 60 to 70 km from mine and processing facility and rail siding and as such unlikely to cause amenity related cumulative impacts. Ongoing workforce and traffic impact is minimal and as such unlikely to cause housing, employment or traffic related cumulative impacts.	N/A
Goonumbla Solar Farm (Geolyse, 2016)	A 70 MW photovoltaic solar farm located approximately 10 km west of Parkes and immediately north of the Parkes Solar Farm. There are no operational employees stationed on-site at the solar farm.	Approved (2016) – Operational	Relevant Project – Required to be Considered	Very unlikely	Project is located approximately 60 to 70 km from mine and processing facility and rail siding and as such very unlikely to cause amenity related cumulative impacts. Ongoing workforce and traffic impact is minimal and as such unlikely to cause housing, employment or traffic related cumulative impacts.	N/A
Quorn Park Solar Farm (Premise, 2019)	An 80 MW photovoltaic solar farm located approximately 10 km north-west of Parkes. The peak constructed workforce is 100 personnel for approximately nine months. The operational workforce is two to three personnel for the expected 30 year operational life.	Approved (2020) – Not constructed	Relevant Project – Required to be Considered	Possible	Project is located approximately 60 to 70 km from mine and processing facility and rail siding and as such very unlikely to cause amenity related cumulative impacts. Should construction of the two projects occur concurrently there is a possibility of cumulative social impacts related to traffic (for a short section of Henry Parkes Way), employment and housing. It is likely the project will involve sourcing workforce locally. No accommodation camp appears to be proposed. There are no anticipated cumulative impacts associated with operations.	Timing is unknown.

Project	Overview	Status	Cumulative Impact Assessment[1]	Consideration of potential for cumulative social impacts		
				Likelihood	Rationale and nature of potential impacts	Key uncertainties
Parkes Peaking Power Plant (NSW Department of Planning, 2008)	A gas turbine peaking power plant with a nominal output between 120 MW to 150 MW, located approximately 10 km west of Parkes. The construction workforce is approximately 44 personnel for six to eight months. The operational workforce is approximately four personnel.	Approved (2008) – Not constructed	Relevant Project – Required to be Considered	Possible	Project is located approximately 60 to 70 km from the mine and processing facility and rail siding and as such very unlikely to cause amenity related cumulative impacts. Should construction of the two projects occur concurrently, there is a possibility of cumulative social impacts related to traffic, employment and housing	Timing, workforce sourcing, accommodation and traffic solutions are unknown.
Parkes Bypass[2] (Transport for NSW [TfNSW], 2019 and 2021)	A 10.5 km Newell Highway bypass approximately 2 km west of Parkes. The main construction workforce is up to approximately 400 personnel for approximately three years.	Approved (2019) – Under construction	Relevant Project – Required to be Considered	Possible	Project is located approximately 80 km from the mine and processing facility and rail siding and as such is very unlikely to cause amenity-related cumulative impacts. Should construction of the two projects occur concurrently there is a possibility of cumulative social impacts related to employment and housing.	Workforce sourcing and accommodation solutions are unknown.
Rocklands Project (MineSoils, 2021)	A proposed open cut mine to supplement existing underground operations at Northparkes Operation, approximately 50 km east of the Sunrise Mine.	Submitted Site Verification Certificate Application (2020)	Potentially Relevant Project – Not Required to be Considered	–	–	–
Forbes Shire Council						
Jemalong Solar Farm (NGH Environmental Pty Ltd, 2017)	A 50 MW photovoltaic solar farm undergoing construction, approximately 36 km west of Forbes. The construction workforce is approximately 100 direct jobs and 100 indirect jobs over a construction period of approximately 12 months. The operational workforce is three to four personnel for approximately 30 years.	Approved (2018) – Under construction	Relevant Project – Required to be Considered	Very unlikely	Construction most likely completed prior to Project commencement. Project is located more than 80 km from mine and processing facility and rail siding and as such will not give rise to cumulative amenity impacts. Minimal operational workforce means cumulative traffic, employment and housing related impacts are very unlikely.	N/A

Project	Overview	Status	Cumulative Impact Assessment[1]	Consideration of potential for cumulative social impacts		
				Likelihood	Rationale and nature of potential impacts	Key uncertainties
Daroobalgie Solar Farm (Pacific Hydro, 2019)	A 100 MW photovoltaic solar farm located approximately 11 km north-east of Forbes. A proposed peak construction workforce of approximately 160 personnel for approximately 12 to 18 months. A proposed operational workforce of approximately four to six personnel for the expected operational life of approximately 25 years.	EARs Issued (2019)	Potentially Relevant Project – Not Required to be Considered	–	–	–

1 Source: SEM (2021).

2 Approved under Part 5 of the EP&A Act.

In addition, the NSW Government has established the Parkes Special Activation Precinct under the *State Environmental Planning Policy (Activation Precincts) 2020*. The Parkes Special Activation Precinct is a 3,600 hectare industrial park located approximately 3 km west of Parkes (Figure 1). Construction of Stage 1 infrastructure for the industrial park (i.e. road and electricity distribution infrastructure) is expected to commence in June 2021 (Regional Growth NSW, 2021).

The Parkes Solar Farm, Goonumbla Solar Farm and Parkes Peaking Power Plant (Table 16) are located in the Parkes Special Activation Precinct. Any future developments associated the Parkes Special Activation Precinct may also potentially interact with, or have potential cumulative impacts with, the modified Project. These potential interactions or cumulative impacts would be assessed as part of separate development applications for these future developments.

5. CONCLUSION

This Social Impact Review has considered and evaluated the likely social impacts that may arise from the Modification, in isolation or in conjunction with relevant nearby projects. Overall, all identified social impacts associated with the Modification are evaluated as low significance, with the exception of the following two positive impacts rated as medium significance:

- additional employment opportunities for local residents as well as local businesses who can supply to the Project, arising from the increased construction workforce; and
- additional pressures on local housing markets arising from the increased construction workforce (prior to construction of the accommodation camp) benefits landlords and short-term accommodation providers.

The existing social impact mitigation measures committed to by SEM include the following:

- preferentially sourcing suppliers from the Social Locality where they are cost and quality competitive;
- providing workforce bus transport from towns in the Social Locality to minimise workforce-related road traffic;
- operating high-capacity trucks to transport limestone and other materials and products to and from the mine and processing facility, to minimise heavy vehicle traffic;
- deploying a community information and engagement program, and a complaints and grievance process, to ensure potentially affected communities are aware of impacts and have opportunities to raise concerns with SEM;
- operating in accordance with an approved Traffic Management Plan and undertaking road and intersection upgrades and maintenance (in accordance with Development Consent [DA 374-11-00] and the VPA) to address the safety, road performance and quality aspects of the traffic changes; and
- operating in accordance with an approved Air Quality Management Plan and Noise Management Plan (in accordance with Development Consent [DA 374-11-00]) to minimise potential amenity impacts associated with the approved Project; and

- continuing to make community contributions in accordance with the VPA, to support positive social outcomes, social infrastructure investments and/or community resilience improvements.

The existing social impact mitigation measures committed to by SEM are generally considered to be sufficient to address the potential social impacts associated with the Modification, with the following additions:

- increasing the size of the construction workforce accommodation camp to accommodate all non-residential construction workers;
- mitigation upon request rights for one property in accordance with the VLAMP (NSW Government, 2018) to reduce noise levels at the residence (e.g. mechanical ventilation, upgraded façade elements or roof insulation); and
- providing construction workforce transport from towns in the Social Locality to minimise workforce-related road traffic.

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APPENDIX A Consultation summary

This section summarises the key themes from the consultation meetings with the three Councils; Lachlan Shire Council, Parkes Shire Council and Forbes Shire Council.

A meeting with representatives of the Lachlan Shire Council took place on 3 March 2021, the Forbes Shire Council on 15 March 2021 and the Parkes Shire Council on 3 March 2021 and 19 May 2021.

In general, officers from all three Councils noted that communities looked forward to opportunities for local employment and business participation. They also noted that they would like to see relocating workers settle in their Shires, thus increasing patronage for local community organisations and services. The various strategic plans, liveability initiatives and community plans the Councils have developed to increase the attractiveness of their areas were discussed.

In this context, some also expressed concerns that if growth is too rapid or too large, this could put unsustainable pressures on the local communities, housing markets and facilities.

Another general comment was that the Modification itself was unlikely to cause major change in many respects. The exception was that the community of Trundle had previously expressed concerns around traffic impacts and that this was an important issue for SEM to manage. In relation to traffic and other matters, the importance of working around and minimising impacts to existing industries was also noted. In particular during harvest season, traffic relating to agriculture is increasing and it was suggested the Project should take this into account.

Another important theme was the importance of community engagement and communication. The Councils suggested that keeping communities informed of change, both positive and negative, would lead to greater acceptance and support. The Council representatives also expressed a wish to see more details around the Modification, particularly around traffic impacts. Council representatives also raised some very specific questions relating to their Shires, such as where to locate pick up points for the workforce transport to avoid overcrowded car parks.

Council representatives also raised a number of issues that were unrelated to the Modification (but related to the Project), for instance noting that water was a sensitive topic in some areas, and that the construction of the approved borefield and pipeline could be perceived negatively by some community members.

APPENDIX B Aspects of the Modification and Attendant Social Impacts

Aspect	Approved project	Change	Potential Impact	Stakeholder
Mining Method	Conventional open cut mining methods	Increased mining production rate during initial years	Potential for amenity impacts for nearby residents (noise, air quality, visual)	Residents nearby the mine and processing facility
Open Cut Pit Extents	Progressive development of two main open cut pits and multiple small-scale scandium open cut pits	Minor changes to the mining sequence	Potential for amenity impacts for nearby residents (noise, air quality, visual)	Residents nearby the mine and processing facility
Waste Rock Management	Waste rock deposited in open cut voids and in waste rock emplacements	Minor changes to the waste rock emplacement sequence	Potential for amenity impacts for nearby residents (noise, air quality, visual)	Residents nearby the mine and processing facility
Mine Infrastructure Area	Key components include process plant, sulphuric acid plant, limestone slurry plant, process input storages, power plant, workshops, warehouses, offices, fuel storages, water treatment plants, run-of-mine pad, laydown areas and access roads	Revised process plant layout Two additional site access points	Potential for amenity impacts for nearby residents (noise, air quality, visual) No expected material social impact other than improved road safety from additional access points	Residents nearby the mine and processing facility
Sulphuric Acid Plant Stack	Stack height would be 40 m.	Reduced sulphuric acid plant stack height from 80 m to 40 m.	Potential for amenity impacts for nearby residents (air quality, visual)	Residents nearby the mine and processing facility
Process Plant Inputs	Other process plant inputs delivered to the mine and processing facility via road and rail	Revisions to process plant input types, rates and storage volumes	No expected material social impact	N/A
Tailings Management	Tailings deposited in the tailings storage facility	Revised tailings storage facility cell construction sequence	No expected material social impact	N/A
Site Water Management	Overall objective is to control runoff from the construction and operational areas while diverting upstream water around these areas	Relocated evaporation pond and addition of a separate decant transfer pond. Other changes to the site water management system to reflect modified layout	No expected material social impact	N/A
Power Supply	Co-generation power plant (40 megawatts) and diesel-powered generator (backup)	Increased diesel-powered generator (backup) capacity	No expected material social impact	N/A
Exploration Activities		Addition of exploration activities within ML 1770	No expected material social impact	N/A

Aspect	Approved project	Change	Potential Impact	Stakeholder
Accommodation Camp	Development of an accommodation camp on the Sunrise property.	Increased construction phase capacity from 1,300 to 1,900 personnel	Potential for changed workforce traffic from larger workforce (discussed below)	Residents living nearby camp and along access routes
			Additional opportunities for local workforce and supplier participation (discussed below)	Local jobseekers and businesses
	Approximate capacity of 1,300 personnel during the construction phase.	Increased construction phase capacity from 1,300 to 1,900 personnel	No expected material social impact	N/A
Rail Siding	Development of a rail siding on the Tottenham to Bogan Gate Railway	Relocated rail siding and the addition of an ammonium sulphate storage and distribution facility to the rail siding	Potential for amenity impacts for nearby residents (noise, visual, air quality)	Residents nearby rail siding
	Rail siding operational workforce of five personnel	Rail siding operational workforce of ten personnel	No expected material social impact	
	Power from existing ETL that passes through the approved rail siding site.	A new 22 kV ETL (subject to separate approval) to provide power to the modified rail siding	No expected material social impact	
Material Transport	Transport of inputs and products via a combination of road and rail	Changed construction phase heavy vehicle movements	Potential impacts on people's way of life and sense of safety	Residents near transport route Other road users
		Changed operational phase heavy vehicle movements to and from the rail siding associated with the transport of product and ammonium sulphate	Potential impacts on people's way of life and sense of safety	Residents near transport route Other road users
		Changed operational phase heavy vehicle movements associated with revisions to processing plant inputs and storage volumes.	Potential impacts on people's way of life and sense of safety	Residents near transport route Other road users
Employees	Peak of approximately 1,000 personnel during construction phase	Increase to the peak construction phase workforce to approximately 1,900 personnel	Potential for increased local employment and contracting opportunities (noted in Community Infrastructure Assessment)	Local jobseekers and businesses
			Potential for additional housing demand (noted in Community Infrastructure Assessment)	Landlords, renters
			Potential for increased demand for social services and facilities including health, education and community facilities (noted in Community Infrastructure Assessment)	Service providers

APPENDIX C Impact Evaluation Tools

The following tables and figures are drawn from the SIA Guidelines and technical supplement (DPIE, 2020).

TABLE 15 SOCIAL IMPACT SIGNIFICANCE MATRIX

		Magnitude Level				
		1. Minimal	2. Minor	3. Moderate	4. Major	5. Transformational
Likelihood Level	A. Almost certain	Medium	Medium	High	Very High	Very High
	B. Likely	Low	Medium	High	High	Very High
	C. Possible	Low	Medium	Medium	High	High
	D. Unlikely	Low	Low	Medium	Medium	High
	E. Very Unlikely	Low	Low	Low	Medium	Medium

TABLE 16 DEFINING LIKELIHOOD LEVELS OF SOCIAL IMPACT

Likelihood Level	Meaning
Almost certain	definite or almost definitely expected (e.g. has happened on similar projects)
Likely	high probability
Possible	medium probability
Unlikely	low probability
Very unlikely	improbable or remote probability

TABLE 17 CHARACTERISTICS OF SOCIAL IMPACT MAGNITUDE

Characteristic		Details needed to enable assessment
Magnitude	Extent	Who specifically is expected to be affected (directly, indirectly and/or cumulatively), including any potentially vulnerable people? Which location(s) and people are affected? (e.g. near neighbours, local, regional).
	Duration	When is the social impact expected to occur? Will it be time-limited (e.g. over particular project phases) or permanent?
	Severity or scale	What is the likely scale or degree of change? (e.g. mild, moderate, severe)
	Sensitivity or importance	How sensitive/vulnerable (or how adaptable/resilient) are affected people to the impact, or (for positive impacts) how important is it to them? This might depend on the value they attach to the matter; whether it is rare/unique or replaceable; the extent to which it is tied to their identity; and their capacity to cope with or adapt to change.
	Level of concern/ interest	How concerned/interested are people? Sometimes, concerns may be disproportionate to findings from technical assessments of likelihood, duration and/ or severity. Concern itself can lead to negative impacts, while interest can lead to expectations of positive impacts.

TABLE 18 DEFINING MAGNITUDE LEVELS FOR SOCIAL IMPACTS

Magnitude Level	Meaning and Examples
Transformational	Substantial change experienced in community wellbeing, livelihood, amenity, infrastructure, services, health and/or heritage values; permanent displacement or addition of at least 20% of a community.
Major	Substantial deterioration/improvement to something that people value highly, either lasting for an indefinite time, or affecting many people in a widespread area.
Moderate	Noticeable deterioration/improvement to something that people value highly, either lasting for an extensive time or affecting a group of people.
Minor	Mild deterioration/improvement, for a reasonably short time, for a small number of people who are generally adaptable and not vulnerable.
Minimal	No noticeable change experienced by people in the locality.

TABLE 19 SOCIAL IMPACT CATEGORIES

Impact Category	Description
way of life	including how people live, how they get around, how they work, how they play, and how they interact each day
Community	including composition, cohesion, character, how the community functions and people's sense of place
accessibility	including how people access and use infrastructure, services and facilities, whether provided by a public, private or not-for-profit organisation
Culture	both Aboriginal and non-Aboriginal, including shared beliefs, customs, values and stories, and connections to Country, land, waterways, places and buildings
health and wellbeing	including physical and mental health especially for people vulnerable to social exclusion or substantial change, psychological stress resulting from financial or other pressures, and changes to public health overall
Surroundings	including ecosystem services such as shade, pollution control, and erosion control, public safety and security, access to and use of the natural and built environment, and aesthetic value and amenity
Livelihoods	including people's capacity to sustain themselves through employment or business, whether they experience personal breach or disadvantage, and the distributive equity of impacts and benefits
decision-making systems	particularly whether people experience procedural fairness, can make informed decisions, can meaningfully influence decisions, and can access complaint, remedy and grievance mechanisms

DOCUMENT PROPERTIES

Version	Purpose	Issued	Contributors	Approver
1.0	Final Report	29 June 2021	Molly Wagner Daniel Holm	Daniel Holm

sunrise
energy metals

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sunrise
energy metals

Sunrise Project

Project Execution Plan Modification

Appendix J

Environmental Review of Rail Siding Electricity Transmission Line

SUNRISE PROJECT

PROJECT EXECUTION PLAN MODIFICATION

ENVIRONMENTAL REVIEW OF
RAIL SIDING ELECTRICITY TRANSMISSION LINE

JUNE 2021
Project No. CTL-20-08
Document No. 01081085-004

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF PLATES

1 INTRODUCTION

1.1 OVERVIEW OF THE SUNRISE PROJECT

The Sunrise Project (the Project) is a nickel, cobalt and scandium open cut mining project situated near the village of Fifield, approximately 350 kilometres (km) west-northwest of Sydney, in New South Wales (NSW) (Figure 1).

SRL Ops Pty Ltd owns the rights to develop the Project. SRL Ops Pty Ltd is a wholly owned subsidiary of Sunrise Energy Metals Limited (SEM)[1].

Development Consent (DA 374-11-00) for the Project was issued under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) in 2001. Six modifications to Development Consent (DA 374-11-00) have since been granted under the EP&A Act.

The Project includes the establishment and operation of the following:

- mine and processing facility;
- limestone quarry;
- rail siding;
- borefield, surface water extraction infrastructure and water pipeline;
- gas pipeline;
- accommodation camp; and
- associated transport activities and transport infrastructure (e.g. the Fifield Bypass, road and intersection upgrades).

Construction of the Project commenced in 2006, which included components of the borefield, however construction of other Project components is yet to commence.

1.2 OVERVIEW OF THE MODIFICATION AND THE ELECTRICITY TRANSMISSION LINE

SEM has continued to review and optimise the Project design as part of preparations for the Project execution. The outcomes of this review are outlined in the Project Execution Plan (Clean TeQ, 2020).

The Project Execution Plan identified a number of changes to the approved mine and processing facility, accommodation camp, rail siding and road transport activities.

The Project Execution Plan Modification (the Modification) includes these Project Execution Plan changes to allow for the optimisation of the construction and operation of the Project.

Of relevance to this environmental review, the Modification would include the relocation of the rail siding approximately 500 metres (m) south of the approved location (Figure 2).

A new 22 kilovolt (kV) electricity transmission line (ETL) would be required to provide power to the modified rail siding. The ETL would be subject to separate assessment under Part 5 of the EP&A Act and any relevant notification requirements (e.g. under clause 42 of the *State Environmental Planning Policy (Infrastructure) 2007*).

The currently proposed alignment of the ETL and the associated corridor is shown on Figure 3, and would be approximately 1,000 m long and 20 m wide. The Study Area referred to in this environmental review comprises a 20 m corridor along the ETL alignment, however excludes the portion of the ETL located within the modified rail siding surface development area (Figure 3)

The proposed ETL alignment considered in this environmental review would be refined, if required, through consultation with Essential Energy (or the relevant electricity supply authority) and relevant landholders during assessment under Part 5 of the EP&A Act.

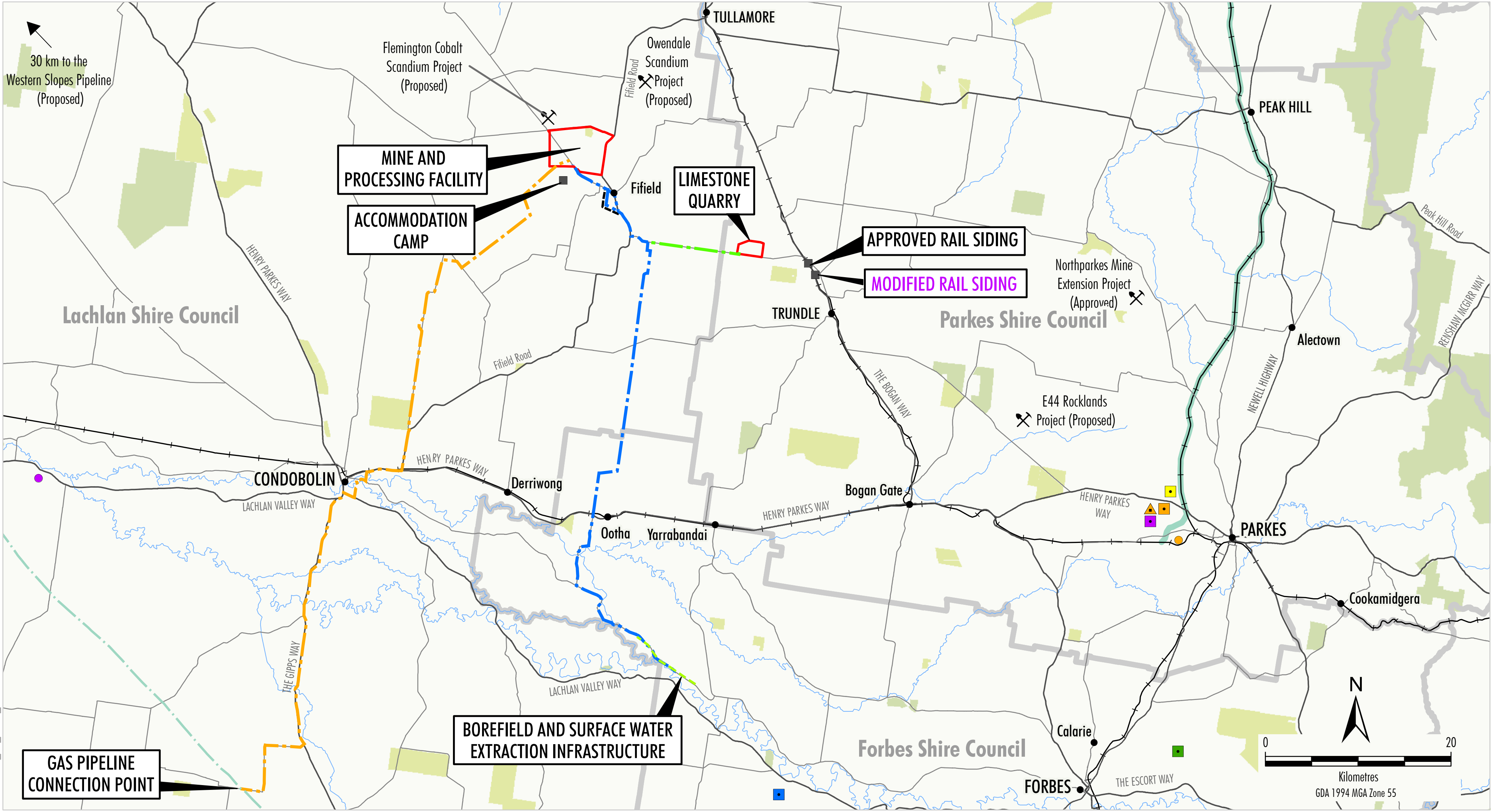
1.3 PURPOSE OF THIS DOCUMENT

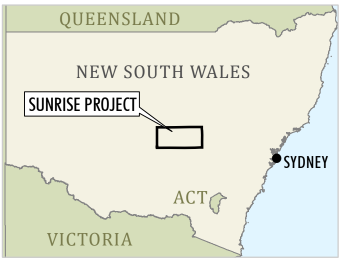
This document has been prepared by SEM and presents the outcomes of an environmental review of the construction and operation of the ETL. Specifically, it identifies:

- the key environmental and land use constraints within the Study Area; and
- the potential environmental and approval issues associated with the ETL.

The purpose of this document is to assist the consent authority to consider the likely impacts of the ETL. If the Modification to Development Consent (DA 374-11-00) is approved, the potential environmental impacts of the ETL would be examined to meet the requirements of Part 5 of the EP&A Act.

[1] SEM was previously Clean TeQ Holdings Limited (Clean TeQ).





LEGEND

National Park/Conservation Area
State Forest
Local Government Boundary
Railway
Existing Gas Pipeline

Project Components

Mining Lease Boundary (ML)
Fifield Bypass
Gas Pipeline
Water Pipeline
Limestone Quarry Water Pipeline
Borefield Infrastructure Corridor

Other State Significant Projects

Mine Site
Daroobalgie Solar Farm (Proposed)
Goonumbla Solar Farm (Approved)
Jemalong Solar Farm (Approved)
Parkes Solar Farm (Approved)
Quorn Park Solar Farm (Approved)
Parkes Peaking Power Plant (Approved)
Cattle Feedlot and Quarry (Approved)
Parkes Special Activation Precinct
Inland Rail (Parkes to Narromine) (Approved)

Source: Black Range Minerals (2000); Clean TeQ (2017, 2018, 2020); NSW Spatial Services (2020)

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S U N R I S E   P R O J E C T

Regional Location

Figure 1

LEGEND

Railway

Existing 11 kV Electricity Transmission Line

Existing 22 kV Electricity Transmission Line

Drainage Feature

Approved Project

Surface Development Area

Scotson Lane Upgrade

Modified Project

Surface Development Area

Scotson Lane Upgrade Extension

22 kV Electricity Transmission Line (Subject to Separate Approval)

Source: Black Range Minerals (2000); Clean Teq (2020, 2021); NSW Spatial Services (2020, 2021).

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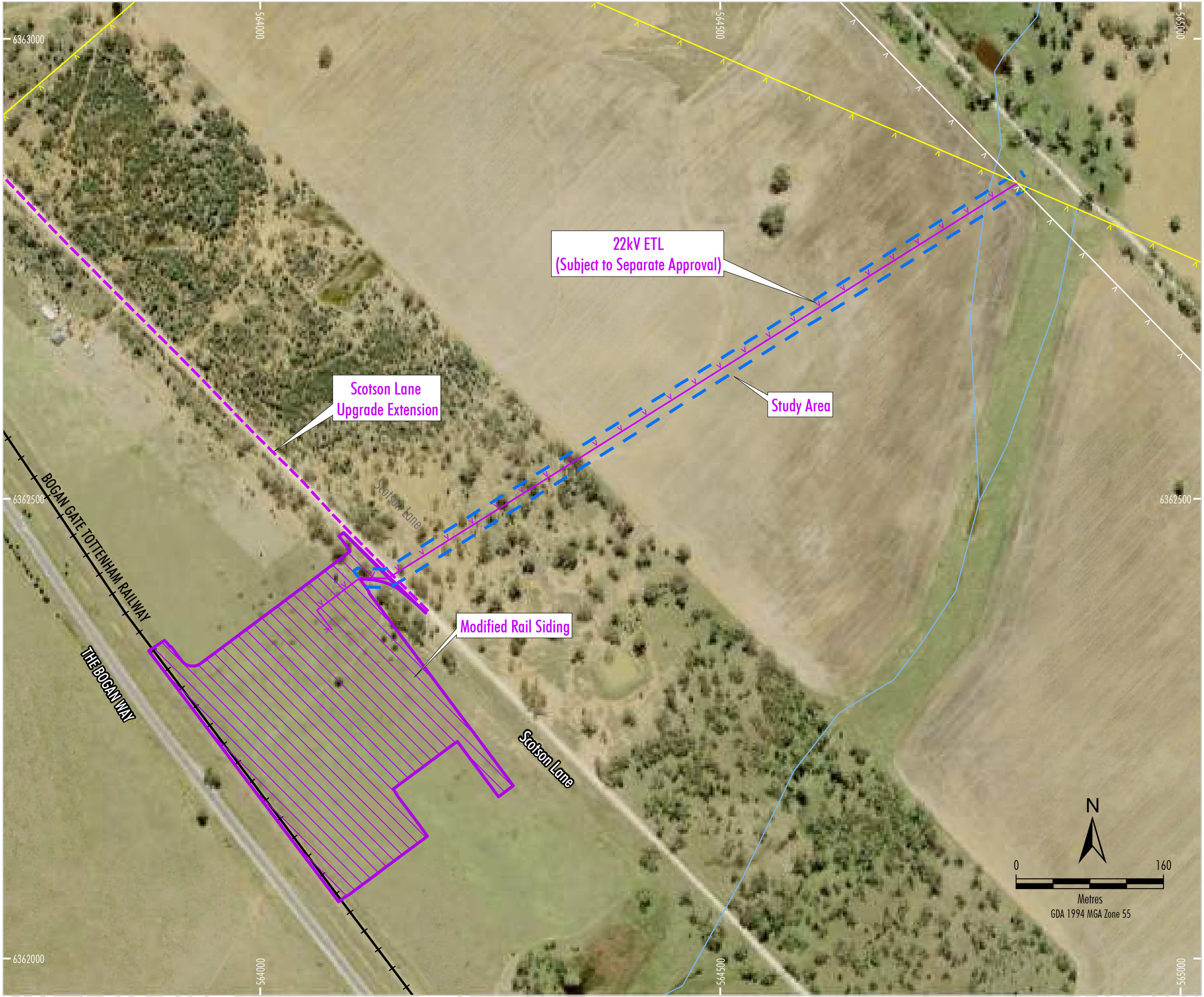
Approved and Modified Rail Siding Location

Figure 2

CTL-20-08 Rail_ETL_EnvRev_202B



LEGEND

Railway

Drainage Feature

Existing 11 kV Electricity Transmission Line

Existing 22 kV Electricity Transmission Line

Modified Project

Surface Development Area

Scotson Lane Upgrade Extension

22 kV Electricity Transmission Line (Subject to Separate Approval)

Study Area

Source: Black Range Minerals (2000); Clean Teq (2020, 2021); NSW Spatial Services (2020, 2021).

Orthophoto: © NSW Department of Finance, Services & Innovation (2021)

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Indicative Study Area

Figure 3

CTL-20-08 Rail_ETL_EnvRev_203A

2 DESCRIPTION OF THE ELECTRICITY TRANSMISSION LINE

2.1 PROPOSED ALIGNMENT

The proposed ETL alignment considered in this environmental review has been determined in consideration of minimising potential environmental impacts. Land ownership within and surrounding the Study Area is shown on Figure 4.

The proposed ETL alignment considered in this environmental review would be refined through consultation with Essential Energy and the relevant landholders during the assessment process under Part 5 of the EP&A Act (Section 1.2).

2.2 PROPOSED DESIGN

Ownership of the ETL would likely be transferred to Essential Energy on completion of construction. Hence, design and construction of the ETL would be in accordance with relevant Essential Energy construction and design standards.

The ETL would consist of three conductor wires which would transfer electricity at 22 kV (Plate 1).

Plate 1 Example of a Typical 22 kV Rural Electricity Transmission Line with Three Conductor Wires

The wires would be attached to approximately 10 m high poles. Each pole would be spaced at a distance ranging from approximately 50 m to 150 m.

2.3 PROPOSED CONSTRUCTION METHODS

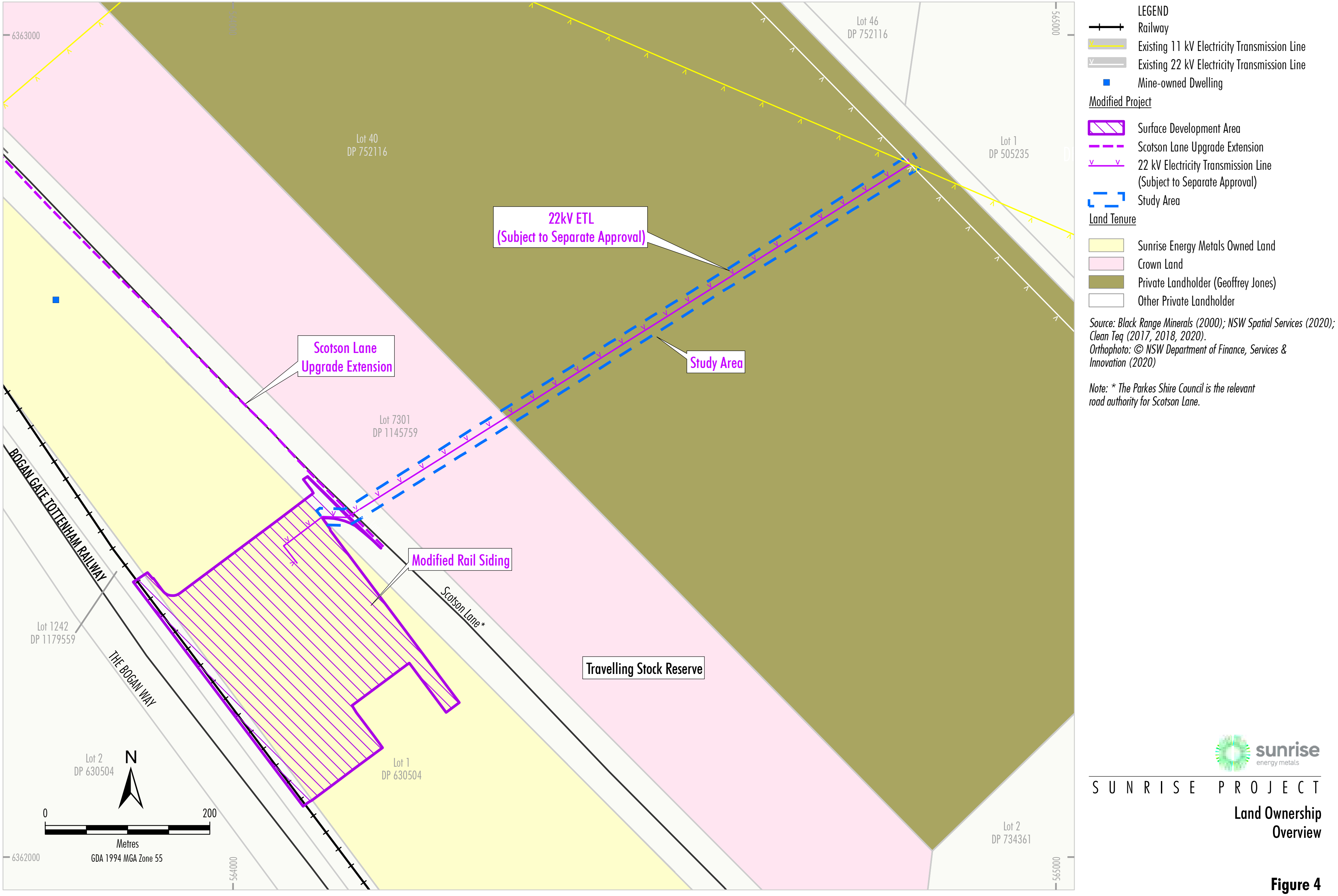
The anticipated sequence of works during construction of the ETL would include:

- installing pre-construction mitigation measures, such as erosion, sediment and water quality controls, and fencing sensitive areas;
- locating and relocating utilities, services and signage (if required);
- clearing vegetation along the easement;
- erecting poles;
- stringing conductor wires;
- testing and commissioning;
- rehabilitating topsoil and revegetation; and
- restoring the ETL corridor (e.g. general clean up and temporary environmental controls).

During construction, a site compound would be used containing basic amenities, plant and material storage areas. The site compound is expected to be located within the surface development area of the modified rail siding (Figure 2).

Construction works that would generate audible noise at any sensitive receiver would be undertaken between 7.00 am and 6.00 pm Monday to Friday and 8.00 am and 1.00 pm on Saturday. Audible works outside these hours may be undertaken where the following requirements are met:

- the works are emergency works, unplanned or unavoidable and the affected residents have been notified as far as reasonably practicable; or
- the works fall into one of the following categories and the affected residents are provided with a notification letter at least five days prior to the works:
  - the delivery of oversized plant or structures that cannot be undertaken during standard hours;
  - maintenance and repair of essential public infrastructure that is unable to occur during standard hours;
  - it is a requirement of a regulatory authority; and/or
  - where there is a demonstrated and justified need to operate outside the recommended standard operating hours.



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Land Ownership Overview

Figure 4

CTL-20-08 Rail_ETL_EnvRev_204A

2.4 PROPOSED ACCESS

During operation, access to the ETL corridor would be provided by Scotson Lane (Figure 2).

2.5 OPERATION AND MAINTENANCE REQUIREMENTS

Once the ETL is constructed, periodic maintenance would be required consisting of attendance on-site by small work groups utilising light vehicles and small to medium plant. Likely maintenance and operation activities associated with the ETL would include but not be limited to:

- vegetation trimming to maintain electrical safety clearances and an asset protection zone;
- unplanned fault and breakdown repairs;
- insulator and conductor repair;
- pole maintenance and replacement where pole integrity is reduced; and
- staff attendance for routine inspection, operation, audit and maintenance activities.

3 ENVIRONMENTAL REVIEW

A desktop assessment of the Study Area has been conducted to review the potential environmental impacts associated with the ETL as outlined in the sections below.

3.1 LAND USE

The Study Area is located within the Parkes Local Government Area (LGA) on land zoned RU1 – Primary Production under the *Parkes Local Environmental Plan 2012* (Parkes LEP).

The ETL would be consistent with the objectives and land use zoning of the Parkes LEP. However, it is proposed that the ETL would be authorised pursuant to the *State Environmental Planning Policy (Infrastructure) 2007*.

Current land uses in the Study Area include livestock grazing and cropping within Lot 40, DP 752116, a road reserve (Scotson Lane), and a travelling stock reserve (Crown land) (Figure 4). A portion of the Study Area would also be located within the modified rail siding surface development area (Lot 1, DP 630504)

Consultation with Essential Energy and relevant landholders would inform the final ETL alignment and design, and would seek to mitigate potential impacts on existing land users.

The ETL would not form a physical barrier as people, animals and machinery would continue to be able to move along and across the proposed route.

3.2 NOISE AND VIBRATION

The normal noise and vibration environment near the Study Area is primarily influenced by traffic flows on The Bogan Way and infrequent train movements on the Bogan Gate Tottenham Railway.

The closest residential receiver to the Study Area is SEM owned and is located approximately 350 m to the northwest (Figure 4). The closest private residential receiver to the Study Area is located approximately 1.1 km to the west.

Impacts to the noise and vibration environment are likely to be associated with construction, rather than operation, of the ETL.

Construction activities would be temporary and transitory, would occur during standard hours (Section 2.3) and would comply with Essential Energy's management principles for construction noise and vibration.

3.3 AIR QUALITY

Direct potential impacts to local air quality would be limited to dust and emissions from vehicles, plant and equipment generated during the construction phase, and to a lesser extent, during ETL maintenance activities. Given the nature of the works, it is unlikely that there would be an odour impact.

Construction activities would be temporary and transitory and would comply with Essential Energy's management principles for construction air quality.

3.4 HYDROLOGY

The Study Area is within the catchment of an unnamed drainage line located to the south-east of the Study Area (Figure 3) which flows to Yarrabandai Creek approximately 12 km to the south-west.

Potential surface water impacts would be minimised by the use of erosion and sediment control measures during construction of the ETL.

3.5 SOILS

Elevations within the Study Area range from approximately 260 m Australian Height Datum (AHD) to approximately 265 m AHD.

A review of the Department of Planning, Industry and Environment (DPIE) (2021a) eSPADE database found that there is no soil landscape mapping available for the Study Area. The *Australian Soil Classification Soil Type Map of NSW* (DPIE, 2021b) indicates the Study Area is mapped as 'Chromosols'.

The Study Area is outside the extent of mapped potential acid sulfate soils (DPIE, 2021a).

Erosion and sediment control measures would be implemented in accordance with *Managing Urban Stormwater Soils and Construction* (the Blue Book) (Landcom, 2004) to mitigate potential impacts on soils.

3.6 CONTAMINATION

The Study Area is not listed on the contaminated land register maintained by the NSW Environmental Protection Authority (EPA) (EPA, 2021).

Current land uses in the Study Area includes livestock grazing, cropping, existing electrical infrastructure and road reserve.

The Land Contamination Assessment prepared for the modified rail siding (Ground Doctor, 2021) found that the potential for historical land uses at the modified rail siding (livestock grazing and cropping) to have caused significant land contamination is considered low.

Given the proximity of the Study Area to the modified rail siding, and the similar historical land uses, it is considered that the chance of significant land contamination occurring in the Study Area is low.

Notwithstanding the above, further consideration of the potential for existing contamination within the Study Area would be completed as part of the assessment process under Part 5 of the EP&A Act.

Mitigation measures would be implemented to minimise the potential for contamination to occur, and to manage any unexpected contamination identified during construction.

3.7 FLORA AND FAUNA

The majority of the Study Area is characterised by areas of cleared land and road reserves, except for the portion located within the travelling stock reserve.

The NSW State Vegetation Type Mapping (DPIE, 2015) indicates that the portion of the Study Area located within the travelling stock reserve is comprised of Plant Community Type 244 (Poplar Box grassy woodland on alluvial clay-loam soils) (Figure 5).

A review of ecological database records was undertaken for the Study Area, including a review of threatened flora and fauna records from the following sources:

- *Birdlife Australia Atlas Database* (Birdlife Australia, 2021);
- *BioNet Atlas* (DPIE, 2021b);
- *Protected Matters Search Tool* (Commonwealth Department of Agriculture, Water and the Environment, 2021); and
- *Atlas of Living Australia Atlas* (Atlas of Living Australia, 2021).

Based on the information currently available, it is expected that the ETL would not significantly affect threatened species or ecological communities, or their habitats with the implementation of appropriate avoidance and mitigation measures.

Notwithstanding the above, a more detailed assessment of the ETL under Part 5 of the EP&A Act would comply with the relevant requirements of the NSW *Biodiversity Conservation Act 2016* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Vegetation clearance during construction and easement maintenance would occur in accordance with Essential Energy requirements.

3.8 BUSHFIRE

Land within the Study Area is not mapped as bush fire prone land (NSW Rural Fire Service, 2021).

Notwithstanding, the ETL would be designed and constructed to comply with Essential Energy's guidelines to minimise the risk of causing a bush fire and vegetation safety clearances.

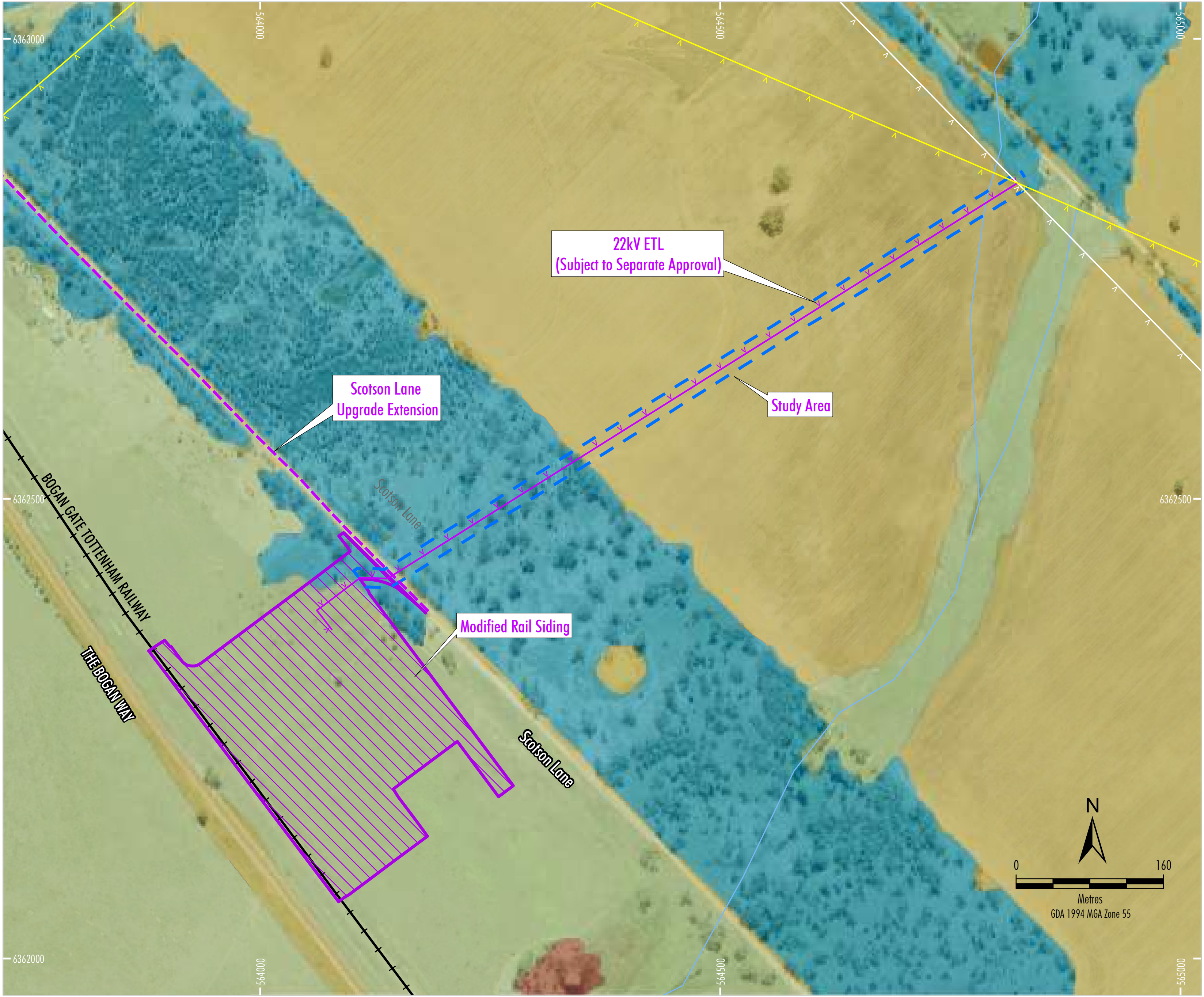
3.9 ABORIGINAL CULTURAL HERITAGE

The Study Area is located in an area administered by the Condobolin Local Aboriginal Land Council.

A desktop assessment of the NSW Biodiversity and Conservation Division's (BCD) Aboriginal Heritage Information Management System was conducted for the Study Area. This search found there are no previously recorded Aboriginal cultural heritage sites within or immediately adjacent to the Study Area (BCD, 2021).

Given the above, it is expected that the ETL would not significantly impact Aboriginal cultural heritage with the implementation of appropriate avoidance and mitigation measures.

The ETL would comply with the requirements of the NSW *National Parks and Wildlife Act 1974*.



LEGEND
Railway
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Existing 11 kV Electricity Transmission Line
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Modified Project
Surface Development Area
Scotson Lane Upgrade Extension
22 kV Electricity Transmission Line
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Study Area

Vegetation Communities
Derived Native Grassland (PCT 250)
Poplar Box Grassy Woodland (PCT 244)
Grey Box Grassy Woodland (PCT 76)
Non-remnant Vegetation

Source: Black Range Minerals (2000); Clean Teq (2020, 2021); NSW Spatial Services (2020, 2021).

Orthophoto: © NSW Department of Finance, Services & Innovation (2021)

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NSW Government Vegetation Mapping within the Study Area

Figure 5

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3.10 HISTORIC HERITAGE

A desktop assessment was conducted using the NSW State Heritage Inventory (Heritage NSW, 2021) and the Parkes LEP. This assessment concluded there are no State or Local Heritage listed items in the Study Area.

As the Study Area is located away from existing buildings, it is not expected that historic heritage would be found or impacted during construction.

3.11 VISUAL AND LANDSCAPE CHARACTER

The ETL would be located in an area with existing electrical infrastructure.

Visual modifications as a result of the ETL would include:

- vegetation clearing, minimised through the use of existing cleared land;
- vertical poles (approximately 10 m high);
- horizontal cables between poles;
- earthmoving equipment and elevated work platforms during short term construction activities.

ETL's are a common visual component in the broader local landscape, with existing power lines adjacent the Study Area and visible from The Bogan Way.

The vertical poles would provide the most significant contrast with the existing setting. The greatest visual effect from power poles and wires is when viewed against the skyline, where their outline becomes clearly delineated. As the topography is generally flat, the power line would primarily be viewed against a landscape background and, therefore, would have only a low-level contrast.

3.12 TRAFFIC AND ACCESS

The ETL would cross Scotson Lane. Scotson Lane is an unsealed local road that provides a link between Numalla Road and The Bogan Way.

The Parkes Shire Council is the relevant roads authority for Scotson Lane. The ETL would be designed in accordance with the Parkes Shire Council and Essential Energy design standards, including minimum clearances of public roads.

A traffic control plan would be prepared for construction activities in accordance with Australian Standard 1742.3 *Manual of uniform traffic control devices – Traffic control for works on roads*.

During operation, the ETL would only be visited by vehicles on an intermittent basis for general maintenance purposes.

3.13 SOCIAL AND ECONOMIC

Construction projects such as the ETL create opportunities for suppliers, contractors and consultants which creates flow on benefits for local communities.

Short-term impacts on the community during the construction phase of the ETL may include increased traffic intensity and noise.

However due to the small scale of the ETL, it is considered that the local socio-economic impacts of the ETL construction would be minimal.

The ETL would allow for the operation of the modified rail siding, which would have an operational workforce of approximately 10 personnel, and allow for the distribution of products from the mine and processing facility.

3.14 ELECTRIC AND MAGNETIC FIELD CONSIDERATIONS

Electric and magnetic fields (EMF) are part of the natural environment and are present in the atmosphere, with static magnetic fields created by the Earth's core. EMF is also produced wherever electricity or electrical equipment is in use. ETL's, electrical wiring, household appliances and electrical equipment all produce EMF.

Detailed consideration of EMF impacts would occur as part of an assessment under Part 5 of the EP&A Act, although it is noted that the closest private residential receiver is approximately 1.1 km from the Study Area. On this basis, EMF impacts of the ETL are not expected to be significant.

It is anticipated that Essential Energy would implement measures to reduce magnetic field exposure, including where relevant:

- using a compact phase configuration (e.g. ABC, delta construction); and
- balancing loads across phases.

4 CONCLUSION

The final alignment of the ETL would require further consultation with relevant stakeholders, analysis of design constraints, impact assessment and review of opportunities to reduce potential impacts during assessment under Part 5 of the EP&A Act.

However, based on the above environmental review, it is considered that the likely impacts of the ETL would not be significant and are acceptable.

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