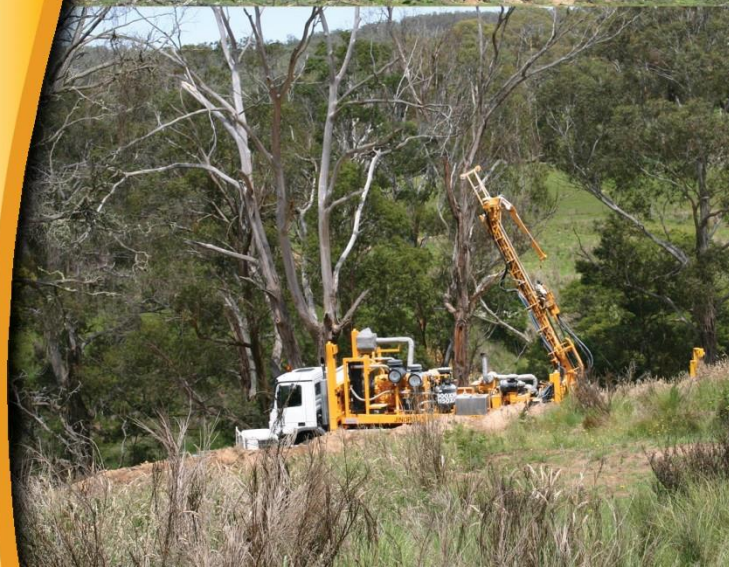
aurelia METALS Ltd.

Modification Report

for the

Dargues Gold Mine



Modification 5

MP10_0054

August 2022

Modification Report

for the

Dargues Gold Mine

Modification 5
MP10_0054

Prepared for:

Big Island Mining Pty Ltd
ABN: 12 112 787 470
920 Majors Creek Road
MAJORS CREEK NSW 2622

Telephone: 1800 732 002
Email: office@aureliametals.com.au

Prepared by:

R.W. Corkery & Co. Pty. Limited
Geological & Environmental Consultants
ABN: 31 002 033 712

Telephone: (02) 9985 8511
Email: admin@rwcorkery.com

Brooklyn Office:
Level 1, 12 Dangar Road
PO Box 239
BROOKLYN NSW 2083

Orange Office:
62 Hill Street
ORANGE NSW 2800

Brisbane Office:
Level 54, 111 Eagle Street
BRISBANE QLD 4000

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EXECUTIVE SUMMARY

This *Modification Report* has been prepared by R.W. Corkery & Co. Pty. Limited on behalf of Big Island Mining Pty Ltd (the Applicant) to support an application to modify Project Approval MP10_0054 for the Dargues Gold Mine (the Proposed Modification).

The Proposed Modification seeks consent for the following.

- Construction and use of a Water Storage Dam with a capacity of approximately 180ML for the storage of supernatant water from the Tailings Storage Facility (TSF), water pumped from underground workings, and excess raw water from on- and off-site sources.
- A 60 000tpa increase in the approved processing rate from 355 000tpa to 415 000tpa.
- Emergency trucking of water to the Project Site, including up to 10 laden water trucks per day (20 water truck movements per day).
- Administrative amendments to MP10_0054 to reflect minor changes in the Project Site layout since the commencement of mining operations and to permit replacement of the High Volume Air Sampler unit with a depositional dust gauge.

The Proposed Modification is required to:

- ensure that excess water, including supernatant water from the TSF, generated at the Mine can be safely and effectively managed;
- maximise the efficient use of TSF for tailings residue storage by providing an alternative storage area for supernatant water;
- enable additional storage of water for use in processing operations during periods of reduced rainfall or drought;
- permit the efficient use of existing processing plant infrastructure to reflect increased efficiencies in ore processing as a result of ongoing refinements and improvements to the Project's mining and processing operations;
- provide for operational security where inadequate water resources are available as a result of severe and/or prolonged drought or lower than anticipated groundwater inflow rates; and
- adjust the air quality monitoring requirements as discussed with the EPA and DPE road traffic noise criteria relevant to the Project, and the Project Site layout as constructed are reflected within MP10_0054 to ensure ongoing compliance with MP10_0054.

This application is being made under Section 4.55(2) of the *Environmental Planning and Assessment Act 1979*. The Proposed Modification complies with all preconditions for granting approval, including being substantially the same as the development as originally approved under MP10_0054.

Assessments undertaken for Proposed Modification determined the following.

- Biodiversity – direct impacts on biodiversity values resulting from the Proposed Modification would be the clearing of 2.82 ha of native vegetation (PCT 1100 in low condition). However, the Biodiversity Study Area does not include any habitat for species with a high biodiversity risk weighting or threatened ecological communities. It is considered that the total impact of the Proposed Modification to biodiversity would be relatively minor and that no biodiversity offsetting requirements would be generated.
- Heritage – placement of the proposed water pipelines at surface would result in minimal impacts to Aboriginal heritage items and values, however, construction of the proposed Water Storage Dam would result in direct impacts to any surface or subsurface archaeological materials within the dam footprint. It is noted that the social and cultural values of DGM PAD 22-1 have already been significantly impacted by the historic displacement of local Aboriginal people from the area, along with the area surrounding DGM PAD 22-1 being cleared and developed. As a result, it is considered that impacts to historic and heritage values would be minimal, and the proposed activities would not result in any net increase to loss of cultural heritage significance.
- Transportation – the Proposed Modification would not change the maximum number of movements generated during any one hour, nor the number of laden heavy vehicle movements generated over the life of the Project. For the purpose of water transportation, a maximum of 20 heavy vehicle movements would be generated per day, when required.
- Noise – the Proposed Modification would not result in exceedances of the relevant noise criteria at surrounding receivers and, as a result, the Proposed Modification is unlikely to increase noise-related impacts in the vicinity of the Project Site.
- Air Quality – the Proposed Modification would result in minor increases in particulate matter concentrations, with rare exceedances of relevant criteria attributed to high background concentrations. The Proposed Modification would not significantly impact greenhouse gas emissions generated by the approved Project.
- Surface Water – it is considered that no significant additional impacts to surface water would occur as a result of the Proposed Modification given the proposed management and mitigation measures and the continued implementation of existing controls and management measures. The proposed Water Storage Dam would not be permitted to discharge at any time and has been designed to ensure that no water would flow into the Sydney drinking catchment in the event of uncontrolled discharge or dam failure. Therefore, it is considered that the Proposed Modification would result in no impacts to the Sydney drinking water catchment.

- Groundwater – the Proposed Modification would not involve disturbance of groundwater resources and therefore potential impacts to those resources would be negligible.
- Visual amenity – considering the locations of disturbance areas associated with the Proposed Modification and the visual setting of the Project Site, additional visual amenity impacts associated with the Proposed Modification would be negligible.

All other environmental aspects are unlikely to be affected by the Proposed Modification.

The Applicant contends that the Proposed Modification would be in the public interest as it would allow the Applicant to operate the Project in a safe, efficient and economically viable manner, allowing for continued employment opportunities and economic contributions without significant additional environmental impacts.

1. Introduction

1.1 Scope

This *Modification Report* has been prepared by R.W. Corkery & Co. Pty Limited (RWC) on behalf of Big Island Mining Pty Ltd (the Applicant) to support an application to modify Project Approval MP10_0054 (the Proposed Modification, Modification 5 or MOD 5).

The Dargues Gold Mine (the Project, the Mine) was initially proposed in December 2009. Project Approval PA10_0054 was granted by the Land and Environment Court on 7 February 2012, with subsequent modifications granted on:

- 12 July 2012 (MOD 1) to permit the use of back fill;
- 24 October 2013 (MOD 2) to regularise the approved Project Site layout following minor changes during the detailed design phase of the Project;
- 10 August 2016 (MOD 3) to allow the construction and use of the Eastern Waste Rock Emplacement, construction and use of the Spring Creek Crossing, and to accommodate an extension to the Project life; and
- 23 May 2019 (MOD 4) to permit relocation of the approved heavy vehicle crossing (Spring Creek Crossing), reinstatement of an alternate internal access road, and administrative modifications to reflect changes in land ownership within the Project Site.

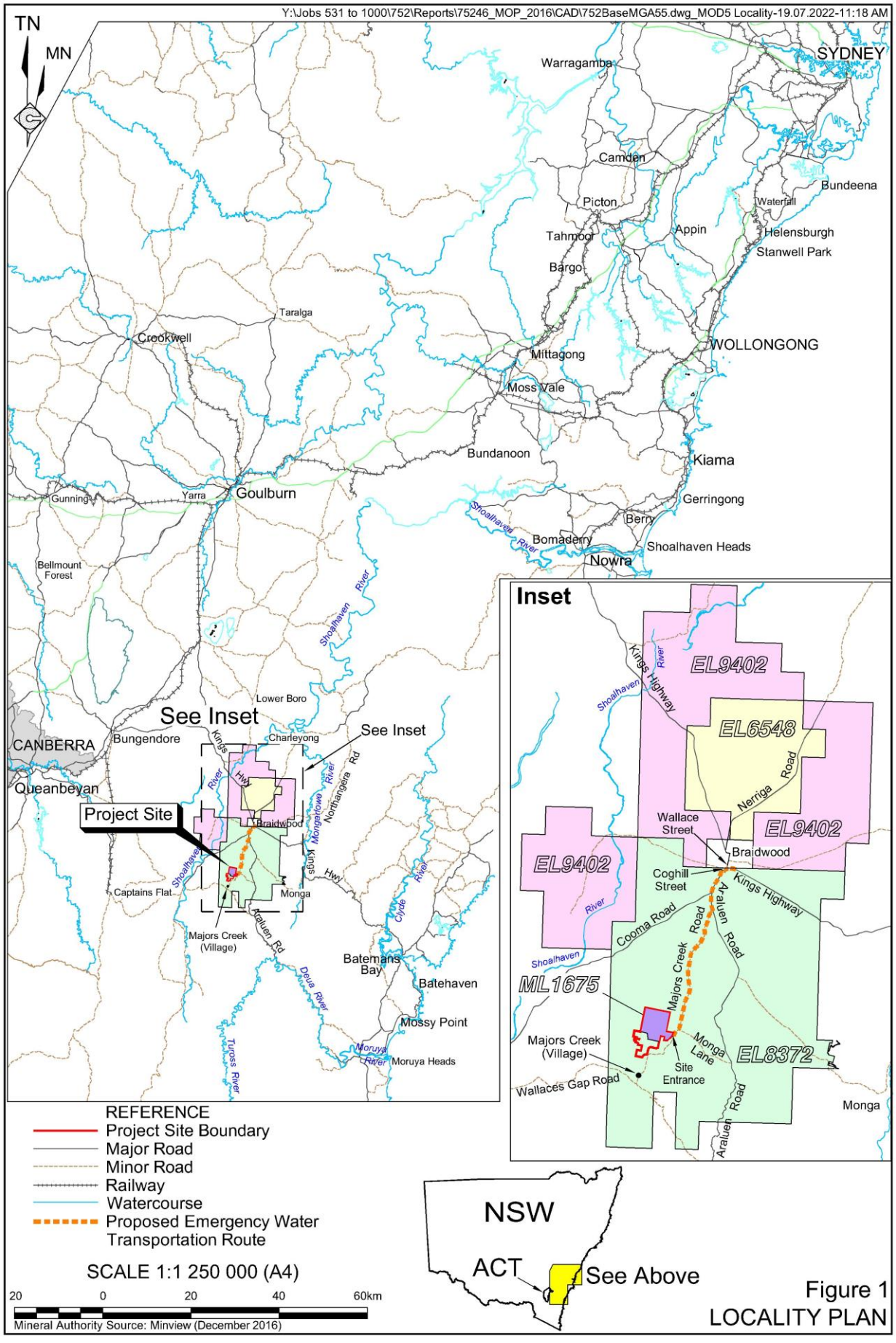
The current version of the modified project approval for the Project is hereafter referred to as MP10_0054.

Figure 1 presents the location of the Project Site approximately 60km southeast of Canberra, approximately 13km south of Braidwood, and immediately to the north of the village of Majors Creek.

Construction of the Project commenced on 11 February 2013 and the Project was placed into care and maintenance in December 2013. Construction of surface infrastructure for the Project commenced on 27 March 2017, with underground mining commencing in May 2018 and construction of the process plant commencing in January 2019. Processing of ore at the process plant commenced in May 2020.

The Applicant has identified a number of adjustments to the approved Project Site layout and operations which are required in order to minimise risks to the environment and maximise the efficiency of mining, processing and transportation operations on site. The Proposed Modification to MP10_0054 seeks consent for the following.

- Construction and use of a Water Storage Dam with a capacity of approximately 180ML for the storage of supernatant water from the Tailings Storage Facility (TSF), water pumped from underground workings, and excess raw water from on- and off-site sources.


Y:\Jobs 531 to 1000\752\Reports\75246_MOP_2016\CAD\752BaseMGA55.dwg_MOD5 Locality-19.07.2022-11:18 AM
TN
MN
SYDNEY
Warragamba
Camden
Picton
Tahmoor
Bargo
Appin
Bundeena
Waterfall
Helensburgh
Stanwell Park
WOLLONGONG
Mittagong
Moss Vale
Bundanoon
Kiama
Gerringong
Berry
Bomaderry
Nowra
Shoalhaven Heads
Taralga
Crookwell
Gunning
Yarra
Goulburn
Bellmount Forest
Lower Boro
See Inset
CANBERRA
Bungendore
Charleyong
Queanbeyan
Project Site
Braidwood
Captains Flat
Monga
Majors Creek (Village)
Araluen Rd
Batemans Bay
Batehaven
Mossy Point
Moruya Heads
Inset
EL9402
EL6548
EL9402
EL9402
ML1675
EL8372
Kings Highway
Nerriga Road
Wallace Street
Coghill Street
Araluen Road
Cooma Road
Majors Creek Road
Monga Lane
Site Entrance
Wallaces Gap Road
Monga
REFERENCE
Project Site Boundary
Major Road
Minor Road
Railway
Watercourse
Proposed Emergency Water Transportation Route
SCALE 1:1 250 000 (A4)
20 0 20 40 60km
Mineral Authority Source: Minview (December 2016)
NSW
ACT
See Above
Figure 1
LOCALITY PLAN

- A 60 000tpa increase in the approved processing rate from 355 000tpa to 415 000tpa.
- Emergency trucking of water to the Project Site, including up to 10 laden water trucks per day (20 water truck movements per day).
- Administrative amendments to MP10_0054 to reflect minor changes in the Project Site layout since the commencement of mining operations and to permit replacement of the High Volume Air Sampler unit with a depositional dust gauge.

The objectives of the Proposed Modification are to:

- reduce, to the maximum extent practicable, the overall environmental impact the Project and to minimise risks posed to the environment by the Project;
- ensure that the Project is operated in an economical and sustainable manner; and
- minimise, to the maximum extent practicable, potential impacts on the local community and other stakeholders.

The information contained in this document relates only to those components of the Project that would be the subject of the Proposed Modification. Aspects of the Project that would not be modified would continue to be undertaken in accordance with the following.

- Modified project approval MP10_0054 (consolidated version following MOD 4) and its associated conditions, statement of commitments and plans.
- *Environmental Assessment* dated September 2010 (RWC, 2010a).
- *Response to Submissions* dated December 2010, including associated documentation and correspondence (RWC, 2010b).
- *Environmental Assessment – Modification 1* dated April 2012 (RWC, 2012a).
- *Response to Submissions* dated June 2012 (RWC, 2012b).
- *Environmental Assessment – Modification 2* dated July 2013 (RWC, 2013a).
- *Response to Submissions* dated September 2013 (RWC, 2013b).
- *Environmental Assessment – Modification 3* dated July 2015 (RWC, 2015a).
- *Response to Submissions* dated November 2015 (RWC, 2015b).
- *Statement of Environmental Effects – Modification 4* dated November 2018 (RWC, 2018)
- *Response to Submissions* dated January 2019 (RWC, 2019)
- Other licences and approvals held by the Applicant for the Project.

As a result, this document should be read in conjunction with the above. Section 1.4 presents an overview of those activities which would be amended as a result of the Proposed Modification.

The application to modify MP10_0054 is made under Section 4.56(1) of the *Environmental Planning & Assessment Act 1979 (EP&A Act)*. This *Modification Report* has been prepared to support that application and is generally consistent with the *State Significant Development*

Guidelines (version dated December 2021) (SSD Guidelines) (DPIE, 2021a) and specifically Appendix E to the SSD Guidelines: *State Significant Development – Preparing a Modification Report.*

No formal assessment requirements were issued by the Department of Planning and Environment (DPE) in response to the Briefing Paper submitted on 28 October 2021 which outlined the Proposed Modification. Details of consultation undertaken with government agencies and the community as part of the Proposed Modification are provided in Section 6.

1.2 The Applicant

The Applicant, Big Island Mining Pty Ltd, is a privately-owned company whose ultimate parent company is Aurelia Metals Limited (Aurelia). Aurelia is an Australian Securities Exchange listed exploration and mining company which also owns the Peak Gold Mine, located south of Cobar, NSW, and the Hera Mine, located south of Nymagee, NSW.

Notwithstanding the purchase of Big Island Mining Pty Ltd by Aurelia in 2020, the entities that control the Project remain unchanged from previous applications.

The Applicant is committed to continuing the development and operation of the Project in a manner that achieves environmentally responsible outcomes and benefits the local community and broader region. The Applicant recognises that the Proposed Modification should not be achieved to the detriment of the local community or the environment. Rather, the Applicant believes that the Proposed Modification would further minimise the potential for adverse Project-related environmental impacts while providing the maximum economic and other benefits for all stakeholders, including its employees and contractors, the surrounding community, State and Commonwealth governments, Queanbeyan–Palerang Regional Council and the Applicant's shareholders.

1.3 Background

1.3.1 Introduction

The Applicant and its associated predecessors have controlled exploration licences over the Project Site since 2002. At that time, an exploration program was commenced to identify additional hard rock gold resources associated with the historic Jembaicumbene, Majors Creek (also known as Elrington) and Araluen alluvial goldfields. Through this exploration program the Dargues Reef Gold Deposit was defined and subsequently determined to be economically recoverable following a Definitive Feasibility Study in 2010.

This subsection provides an overview of the approvals, licences, mineral authorities and permits held by the Applicant, a brief overview of mineral exploration activities undertaken, and an overview of the resources and reserves within the Project Site. This subsection also provides a brief overview of the approved activities, status of Project operations and environmental performance to date.

1.3.2 Existing Approvals, Licences, Mineral Authorities and Permits

Table 1 presents the development consents, licences and approvals held by the Applicant in relation to the Dargues Gold Mine.

Table 1
Dargues Gold Mine – Existing Consents, Licences and Approvals

Page 1 of 2

Issuing / Responsible Authority	Approval Number	Date of Issue	Expiry	Comments
Project Approval – NSW EP&A Act				
Department of Planning and Industry (under delegation)	PA10_0054 (NSW)	07/02/2012	13/08/2018	Original project approval as prescribed by the Land and Environment Court
Department of Planning and Environment (under delegation)	MP10_0054 MOD 1	12/07/2012	13/08/2018	Modification of the Project Approval to allow the use of Back Fill
Department of Planning and Environment (under delegation)	MP10_0054 MOD 2	24/10/2013	13/08/2018	Modification to regularise changes to the site layout.
Department of Planning and Environment (under delegation)	MP10_0054 MOD 3	10/08/2016	30/06/2025	Modification to allow the construction and use of the Eastern Waste Rock Emplacement, Spring Creek Crossing, and an extension of Project life.
Department of Planning and Environment (under delegation)	MP10_0054 MOD 4	23/05/2019	30/06/2025	Modification of Spring Creek Crossing and other minor administrative amendments.
Controlled Action Approval – Commonwealth EPBC Act				
Commonwealth Minister for the Environment	EPBC 2010/5770	27/09/2011	31/08/2025	Variation to extend this approval to 31 August 2025 was granted 8 October 2020.
Commonwealth Minister for the Environment	EPBC 2015/7539	February 2017	31/08/2025	Modification of the Project Approval to extend the end date of mining operations and for additional infrastructure.
Environment Protection Licence				
EPA	EPL20095	18/05/2012	-	Last varied in August 2021. Current variation pending following submission on 7 April 2022.
Mineral Authorities				
Minister for Resources and Energy	ML1675	13/04/2012	12/04/2024	-
	EL6548	5/04/2006	5/04/2023	-
	EL8372	21/05/2015	20/05/2027	-
	EL9402	10/05/2022	10/05/2028	-

Table 1 (Cont'd)
Dargues Gold Mine – Existing Consents, Licences and Approvals

Issuing / Responsible Authority	Approval Number	Date of Issue	Expiry	Comments
Water Licences				
Natural Resources Access Regulator	WAL39281	29/03/2017	-	Extraction of up to 320ML/y of groundwater from the Dargues Gold Mine.
	WAL39282	19/10/2017	-	Extraction of up to 39ML/y of groundwater from the Snobs workings.
	WAL39287	29/03/2017	-	Extraction of up to 16ML/y of groundwater from the Steward and Merton's workings.
	WAL39292	29/03/2017	-	Extraction of up to 24ML/y of groundwater from the United Miners workings.
Other Approvals, Licences and Permits				
Explosives Storage License	XSTR200092	16/07/2018	23/04/2023	License holder is authorised to process and store the following Class of Explosives 1.1.B, 1.1.D and 1.4B.
Radiation License	5089849	27/06/2019	27/06/2023	Covers seven (7) sealed source fixed radiation gauges located within the Processing Plant.
Wastewater Treatment Plant	LGA.2018.255	6/02/2019	6/02/2024	Operation of a Fuji Clean integrated multistage wastewater treatment plant.
Dams Safety NSW	Design conforms to the Committee's requirements.	3/02/2012 and 9/12/2016	-	Resources Regulator High Risk Activity Notification SHRA0001650

Source: Big Island Mining Pty Ltd

1.3.3 Exploration Operations

Gold was first discovered at Majors Creek on 5 October 1851, with several significant alluvial goldfields being established in the following years. The majority of gold extracted within the vicinity of the Project Site was won by alluvial mining in the mid to late 1800s. The mineral authorities held by the Applicant encompass the Majors Creek (Elrington) Goldfield, the Jembaicumbene alluvial Goldfield and a small section of the Araluen Goldfield. Past historic production comprises approximately 1.25 million ounces sourced from alluvial (98%) and lode gold (2%) workings. The area surrounding the Project Site represents the richest alluvial goldfield in NSW.

The Dargues Gold Deposit has been evaluated and drill tested by several mining companies. To date, in excess of 60 000m of reverse circulation and diamond drilling has been completed, with the majority targeting along-strike and down-dip extensions of the known mineralised gold lodes that make up the Dargues Gold Deposit.

The Applicant has identified a range of associated prospects in the vicinity of the Dargues Gold Deposit, including Chinaman's, Ruby Lode, Copper Ridge, Excalibur and the Carmine Prospects. These and other mineralised zones are the focus of current and future mineral exploration activities, however, do not form a component of the Mine or the Proposed Modification. Should mineralisation with the potential to be economically extracted be identified, a further modification to MP10_0054 and/or a new development consent would be sought.

1.3.4 Identified Resources and Reserves

Gold mineralisation within the Dargues Gold Deposit occurs as several discrete gold lodes positioned within zones of structural weakness and intense alteration within the host Braidwood Granodiorite. The Dargues Gold Deposit had a JORC-compliant mineral resource of 2.1Mt @ 5.1g/t gold at 30 June 2021. The ore reserve, namely that component of the mineral resource that can be mined using current mining techniques, is 1.3Mt @ 4.9g/t Au as of 30 June 2021.

1.3.5 Approved Activities

The approved Project is fully described in RWC (2010a), RWC (2012a), RWC (2013a), RWC (2015a) and RWC (2018). However, for completeness, the approved activities include the following key components (**Figure 2**).

- Extraction of waste rock and ore material from the Dargues Gold Deposit using underground sublevel open stope mining methods with a suitable crown pillar, and internal pillars and sills to prevent surface subsidence and ensure geotechnical stability of the approved mine.
- Filling of voids created during underground mining using a combination of back fill (a mixture of tailings and cement) and waste rock.
- Construction and use of surface infrastructure required for the underground mine, including a box cut, portal and decline, magazines, fuel store, ventilation rises, back fill hole(s) and power and water supply.
- Construction and use of a processing plant and office area which includes an integrated run-of-mine (ROM) pad/temporary waste rock emplacement, crushing and grinding, gravity separation and flotation circuits, Applicant and mining contractor site offices, workshop, laydown area, ablution facilities, stores, car parking, and associated infrastructure.
- Construction and use of a Tailings Storage Facility (TSF).
- Construction and use of a Water Storage system, including construction and use of eight harvestable rights dams and an associated water reticulation system to enable the harvesting and supply of water for environmental flows.
  - It is noted that water harvesting operations are consistent with the Applicant's rights under Section 53 of the *Water Storage Act 2000*.

- Construction and use of a site access road and intersection to allow site access from Majors Creek Road.
- Construction of a heavy vehicle crossing of Spring Creek to permit direct access between the process plant and the TSF.
- Construction and use of the Eastern Waste Rock Emplacement for the storage of waste rock.
- Processing of up to 355 000 tonnes of ore per calendar year.
- Transportation of product (i.e. gold bearing concentrate) from the Project Site through Braidwood via public roads surrounding the Project Site using covered semi-trailers.

1.3.6 Sensitive Receivers

Figure 3 shows land ownership and surrounding residences in the vicinity of the Project Site. Individual receiver IDs presented in RWC (2010a) have been retained to permit comparison of potential environmental impacts at individual sensitive receiver locations.

1.4 Need for the Modification

1.4.1 Introduction

Following the granting of MP10_0054 (MOD 4) on 23 May 2019 and the commencement of ore processing operations in May 2020, the Applicant has continued to review and refine site practices, management strategies and production targets based on experience with on-site ore processing and tailings management activities. Additionally, experiences during extended drought conditions at the Project Site in 2019 and 2020 have informed the need to clarify the permissibility of emergency transportation of water to site to support the continuation of operations.

Consequently, the Applicant has identified a number of adjustments to the approved Project Site layout and conditions of MP10_0054 which are required to minimise potential environment risks associated with the Project, maximise the efficiency of mining activities and tailings residue management, clarify permissible transportation operations, and regularise the development consent to account for minor changes to the Project Site. The activities included in the Proposed Modification are shown on **Figure 4**, outlined below, and described in greater detail in Section 4.

1.4.2 Construction and use of Water Storage Dam

The Applicant is seeking permission for construction and use of a turkey nest-style Water Storage Dam (WSD) with no natural catchment and a capacity of approximately 180ML. The proposed WSD would be used for the receipt and storage of supernatant water from the TSF, water pumped from underground workings, and raw water from other on-site and off-site sources.

Y:\Jobs 531 to 1000\752\Reports\75247_SoEE_2018\CAD\752BaseMGA55.dwg_5 Constructed PS Layout-20.01.2020-9:20 AM

TN
MN

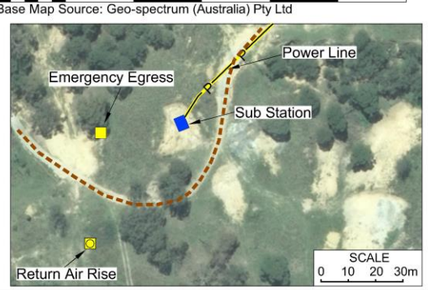
Magazine
Temporary Construction Material Stockpile & Laydown Area
See Detail Right
See Detail Left
Spring Creek Crossing
Spring Creek
Eastern Waste Rock Emplacement
SWP1
SB2
SB1
Tailings Storage Facility
Tailings Storage Facility Access Road
Soil Stockpile
Site Access Road
See Detail Below Left
Existing Site Access Track (Emergency Access only once Site Access Road finalised)
Majors Creek Road

Office and Core Processing Area
Offices
Core Shed
Soil Stockpile
Store Shed
Heavy Vehicle Workshop
Mine Infrastructure Area
Concentrate Storage Shed
Processing Plant Area
PWP01
RWP01
ROM Pad
Box Cut
Road subject to change depending on Waste Rock Balance
SCCSB1
SCCSB2
SCCSB3
SCCSB4
WRESB1

SCALE 1:9 000 (A3)

100 0 100 200 300 400 500 m

Base Map Source: Geo-spectrum (Australia) Pty Ltd



SCALE 1:4 500

50 0 50 100 150 200 m

REFERENCE

- Project Site Boundary
- Contour (m AHD)(Interval = 5m)
- Contour (m AHD)(Interval = 10m)
- Spot height (m AHD)
- Watercourse / Drainage Line
- Existing Dam/Water Storage
- Mine Infrastructure Area
- Office and Core Processing Area
- Processing Plant Area
- Box Cut
- ROM Pad
- Waste Rock Emplacement
- Long Term Sediment Basin
- Raw Water/Process Water Pond
- Harvestable Rights Dam (Indicative Location)
- Soil Stockpile (Indicative Location)
- Clean Water Diversion Structure (Indicative Location)
- Dirty Water Diversion Structure (Indicative Location)
- Transmission Line (Above ground)
- Telstra Fibre Optic Cable
- Road (Sealed/Unsealed)
- Track (Unsealed)

Figure 2
APPROVED PROJECT SITE LAYOUT

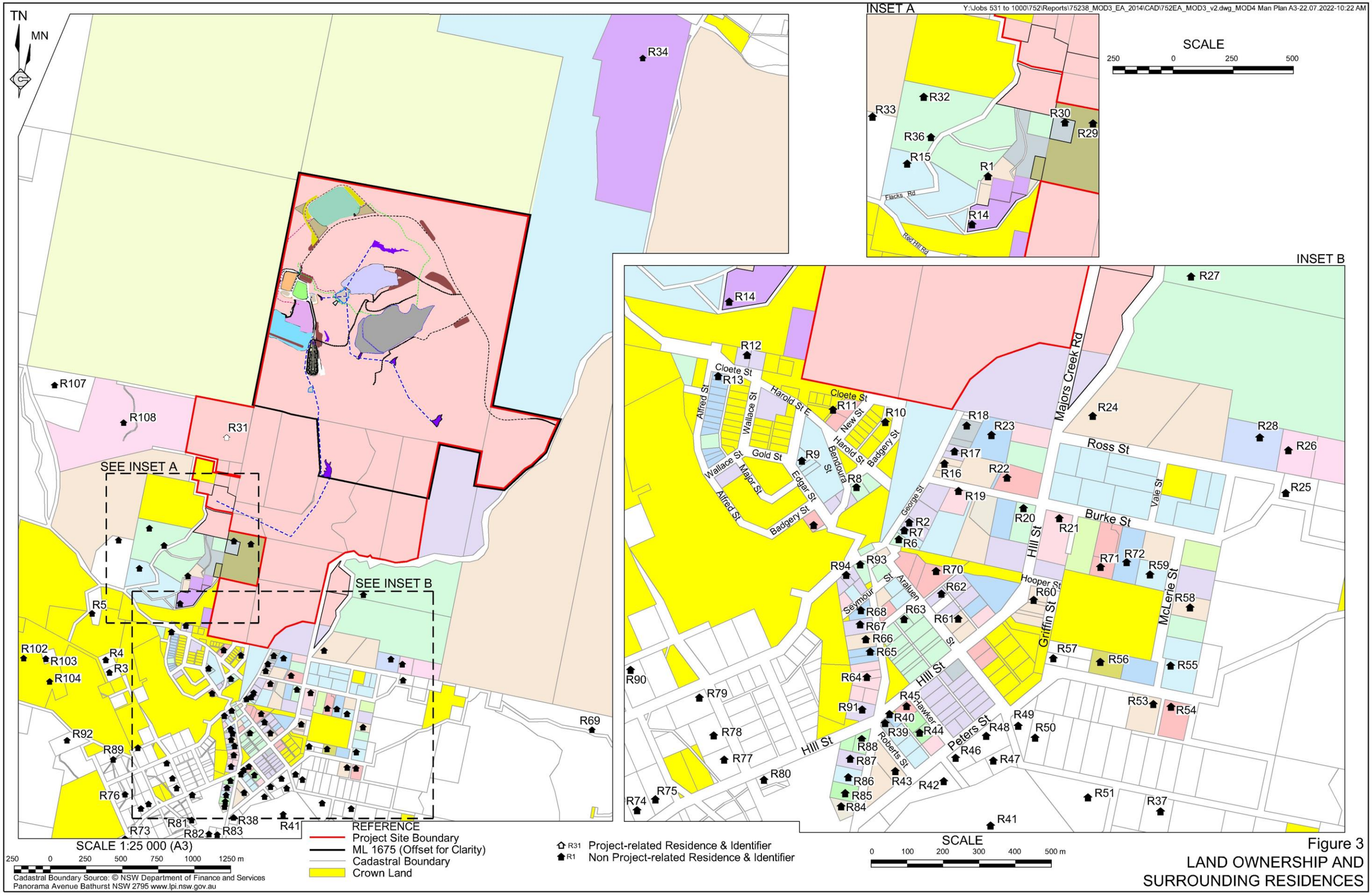


Figure 3
LAND OWNERSHIP AND SURROUNDING RESIDENCES

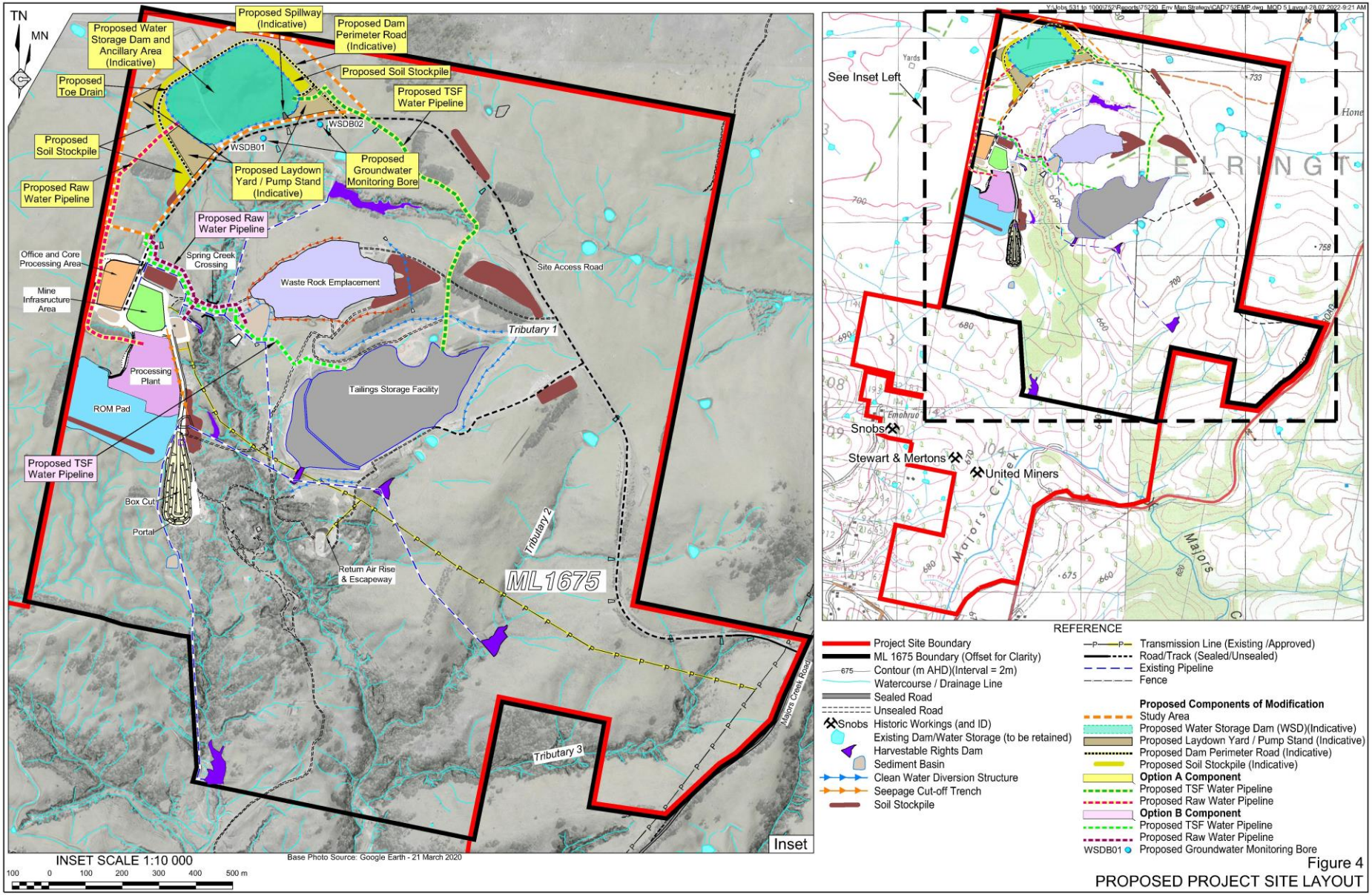


Figure 4
PROPOSED PROJECT SITE LAYOUT

Additional on-site water storage, and the capacity to store supernatant water from the TSF in particular, is required to:

- ensure that excess water, including supernatant water from the TSF, generated at the Mine can be safely and effectively managed;
- maximise the efficient use of TSF for tailings residue storage by providing an alternative storage area for supernatant water; and
- enable additional storage of water for use in processing operations during periods of reduced rainfall or drought.

The current detailed design report prepared for the proposed WSD indicates that the WSD is not likely to be a declared dam under the *Dams Safety Act 2015* based on low consequence category assessment. Final classification of the proposed WSD would be made following referral to Dams Safety NSW.

Ancillary infrastructure including a perimeter access road, pipelines to various water storages within the Project Site, a pump stand / laydown area, and surface water diversion bunds would also be constructed adjacent to and/or in the vicinity of the proposed WSD (**Figure 4**).

Impacts associated with construction of the proposed WSD are addressed in Section 7.

1.4.3 Increased Rate of Processing

The Applicant is seeking permission to increase the approved processing rate under Condition 6(a) of Schedule 2 of MP10_0054 MOD 4 by 60 000tpa from 355 000tpa to 415 000tpa (i.e. an increase of approximately 17%). This increase is required to permit the efficient use of the existing processing plant and would reflect increased efficiencies in ore processing as a result of ongoing refinements and improvements to the Project's mining and processing operations.

The proposed processing rate increase would not require any changes to the existing processing plan or the approved TSF and would not increase the total amount of ore processed over the life of the Project (1.6Mt). Mining operations at the Project are approved until 30 June 2025 under Condition 2(5) of MP10_0054 MOD 4 and the proposed processing rate increase would not change the life of the Project.

Potential traffic and transportation-related impacts associated with the proposed increase in processing rate are addressed in Section 7.4.

1.4.4 Emergency Transportation of Water

The Applicant is seeking permission for emergency trucking of water to the Project Site from off-site sources via the Kings Highway, Wallace Street and Coghill Street, Araluen Road and Majors Creek Road. It is anticipated that the proposed water truck movements would comply with existing transportation limits under Condition 3(41) of MP10_0054, including:

- a maximum of four laden concentrate truck movements per hour (combined total for emergency water trucks and ore concentrate trucks);

- compliance with approved laden concentrate truck despatch times (i.e. between 7:00am and 10:00pm, Monday to Saturday, and between 8:00am and 10:00pm on Sundays and Public Holidays); and
- compliance with prohibited heavy vehicle movement periods associated with local school bus operation times (i.e. no heavy vehicle movements to/from the Project Site between 7:00am and 8:30am and between 3:00pm and 5:00pm on school days).

The three primary water sources for the Project include groundwater from dewatering of the active underground workings, groundwater from historic underground workings, and surface water collected from harvestable rights dams and roofed infrastructure. Emergency trucking of water to the Project Site has been identified as a requirement to provide for operational security where inadequate water resources are available as a result of severe and/or prolonged drought or lower than anticipated groundwater inflow rates.

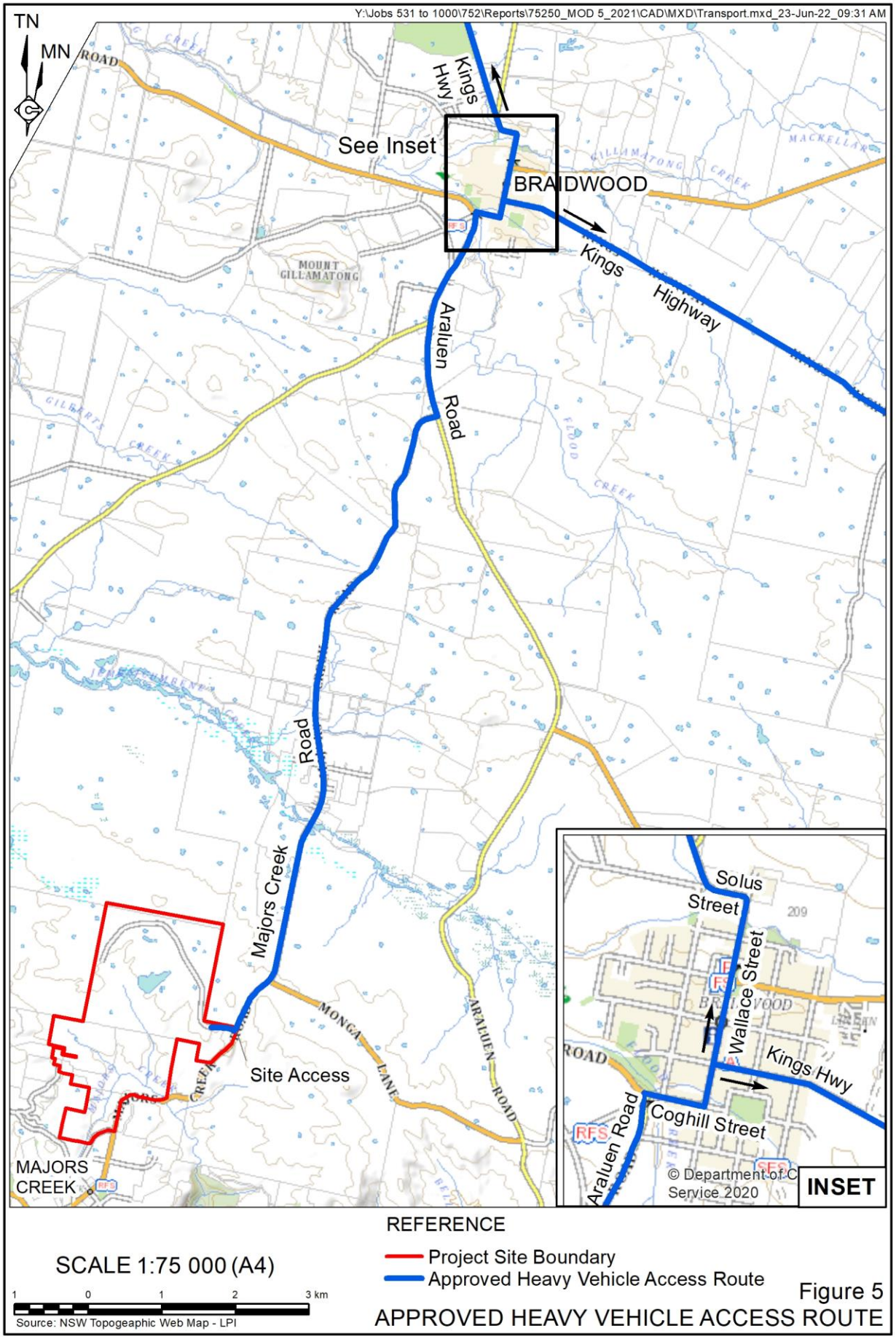
Emergency trucking of water to the Project Site would only be undertaken where operational water requirements cannot be met by on-site water storages and groundwater inflows into underground workings. Water would be sourced from an appropriately licenced source under a commercial arrangement and would be trucked to site via the approved transportation route for the Project (**Figure 5**).

Emergency trucking of water to the Project Site would be limited to a maximum of 10 laden water trucks per day (i.e. 20 water truck movements per day). Potential traffic and transportation-related impacts associated with the proposed emergency transportation of water are addressed in Section 7.8.

1.4.5 Administrative Amendments

The Applicant is seeking the following additional administrative amendments to MP10_0054 as part of the Proposed Modification.

- Amendment to Condition 17(e) of Schedule 3 of MP10_0054 to remove the requirement for high volume samplers to be included in the air quality monitoring program for the Project.
  - Approval to decommission the existing high volume air sampler at the Project Site has been confirmed by both the EPA and DPE (see Section 4.5.1).
  - An application to vary EPL20095 has been submitted and is currently pending.
- Amendment to Condition 2 of Schedule 3 to update the daytime traffic noise impact assessment criterion from 55dB(A) ($LA_{eq\ (1\ hour)}$) to 60dB(A) ($LA_{eq\ (1\ hour)}$) and the evening traffic noise impact assessment criterion from 50dB(A) ($LA_{eq\ (1\ hour)}$) to 55dB(A) ($LA_{eq\ (1\ hour)}$).
  - This update would ensure that the traffic noise impact assessment criteria are consistent with the relevant values for ‘principal haulage routes’ as outlined in Section 2.2.2 of the *NSW Road Noise Policy* (DECCW, 2011).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Service 2020
REFERENCE
Project Site Boundary
Approved Heavy Vehicle Access Route
SCALE 1:75 000 (A4)
1 0 1 2 3 km
Source: NSW Topogeaphic Web Map - LPI
Figure 5
APPROVED HEAVY VEHICLE ACCESS ROUTE

- Updated Project Site layout figures to replace the outdated versions currently included as the first two figures in Appendix 2 of MP10_0054. The updated figures include:
  - the Water Storage Dam and associated pipeline routes which form part of the Proposed Modification;
  - the layout of the TSF as outlined in the *Final Design Report* for the TSF (Knight Piesold, 2011); and
  - infrastructure as constructed at the Project Site.

It is noted that the updates to the Project Site Layout would also be incorporated into figures included in EPBC Act Approvals 2021/5570 and 2015/7539 through separate applications to vary those approvals.

2. Alternatives Considered

2.1 Introduction

In preparing the Proposed Modification, the Applicant considered a range of alternatives. This section presents an overview of the alternatives considered and rejected during the planning phase of the Proposed Modification.

2.2 Not Proceeding with Construction and Use of the Water Storage Dam

The consequences of not proceeding with the construction and use of the proposed WSD relate principally to the reduced safety and lost operational efficiencies that are expected to be generated by the operation of the proposed WSD.

Potential storage capacity exceedances or uncontrolled discharges of supernatant water from the TSF represent a significant risk. Additionally, such discharges would represent non-compliances with conditions of MP10_0054 (Condition 21, Schedule 3) and EPL 20095 (Condition L1.1). Without additional on-site water storage, particularly with respect to supernatant water from the TSF, the Project would be unable to safely and effectively manage any excess water that may be generated during successive extreme rainfall events.

As the construction and use of the proposed WSD is primarily a solution to operational issues regarding tailings and excess water management, the alternative of not proceeding with this proposed activity was rejected.

2.3 No Increase in Processing Rate

The proposed increase in processing rate would allow for the efficient use of existing processing plant and would reflect increased efficiencies in ore processing as a result of ongoing refinements and improvements to the Project's mining and processing operations.

Forgoing an increase in the approved processing rate would result in reduced capability for the Applicant to manage its operations in the most cost effective and efficient manner possible. As the proposed increase in processing rate is a matter of operational efficiencies, the alternative of not proceeding with this proposed activity was rejected.

2.4 No Emergency Transportation of Water

Experiences with extended drought conditions at the Project Site during 2019 and 2020 have informed the need to clarify the permissibility of emergency transportation of water to site to support the continuation of operations. Without sufficient water resources, operations at the Project Site would not be able to continue, therefore potentially resulting in:

- uncertainty for the Applicant's employees and a potential reduction in the total number of positions or hours available at the Project; and

- potential adverse social and economic impacts for contractors, suppliers, and those businesses and individuals that rely upon the flow on effects from the Applicants' overall operations.

As emergency transportation of water is an operational necessity, and as several other measures aimed at improving water use efficiency and increasing water storage volumes have already been implemented at the Project Site (see Section 4.4), the alternative of not proceeding with this proposed activity was rejected.

2.5 No Administrative Amendments

The proposed administrative amendments represent updates to the development consent which are required to reflect revised air quality monitoring requirements as discussed with the EPA and DPE (**Appendix 3**), road traffic noise criteria relevant to the Project, and the Project Site layout as constructed. As the proposed amendments are required to ensure ongoing compliance with MP10_0054, the alternative of not proceeding with the proposed administrative amendments was rejected.

3. Strategic Context

3.1 Strategic Plans

3.1.1 Queanbeyan-Palerang Regional Council Local Strategic Planning Statement

The *Queanbeyan-Palerang Regional Council Local Strategic Planning Statement* (QPRC, 2020) lists a range of planning priorities for the Local Government Area (LGA), several of which are relevant to the Proposed Modification.

Planning Priority 5 is to "…*consider the environmental impacts of future development*." Specific outcomes under Planning Priority 5 include minimising the impacts of development upon the natural environment. The activities included in the Proposed Modification have been designed in such a manner to ensure environmental impacts are minimised. Identification and assessment of these potential impacts along with proposed ameliorative and mitigation measures are detailed in Section 6.

Planning Priority 6 is to ensure *"the land, vegetation and waterways of the region are managed in an integrated manner for long-term community and environmental health.*" Specific outcomes under Planning Priority 6 include protecting and enhancing biodiversity values, and sustainable management of both surface and groundwater resources. The proposed WSD would allow for sustainable and efficient management of water resources within the Project Site.

Planning Priority 7 is to "…*actively promote and implement sound resource conservation and good environmental practice*." Specific outcomes under Planning Priority 7 include ensuring that extractive industries are protected from land-use conflict, and ensuring they are undertaken in a sustainable manner. The Project has been located to avoid land use conflicts and limit possible environmental impacts for the local community.

3.1.2 South East and Tablelands Regional Plan 2036

The *South East and Tablelands Regional Plan 2036* ties regional planning for the South East and Tableland Region with its proximity to Canberra, and specifically to the concept of a borderless region. This is underpinned by the *ACT-NSW Memorandum of Understanding (MoU) on Regional Collaboration* that was signed in 2018 and which has a priority to take a regional approach to infrastructure, transport and economic development. A number of Directions under *South East and Tablelands Regional Plan 2036* are relevant to the Proposed Modification.

Direction 13 is to "*manage the ongoing use of mineral resources*". The activities included in the Proposed Modification have been designed to ensure that the Project will continue to be operated in an economical and sustainable manner in accordance with this Direction.

Direction 18 is to "*secure water sources*". As stated in Section 1.4.2, construction and operation of the proposed WSD will allow for sustainable and efficient management of water resources within the Project Site.

3.2 Community Views

Section 6.2 provides an overview of the community engagement that has been undertaken by the Applicant in relation to the Proposed Modification and associated activities.

3.3 Economic and Social Trends

The Project currently directly employs approximately 60 full time employees, the majority of whom reside within and contribute to the economic development of the Queanbeyan–Palerang LGA. It is estimated that the Project injects approximately $3 million to $7 million per year into the local and regional economy, excluding employee and contractor wages and salaries, a significant proportion of which is spent within the local and regional economy. This expenditure has and will continue to generate additional economic activity and flow on effects for the local and regional community, providing further employment opportunities.

Anecdotally, the Applicant understands that despite the end of the drought, challenging agricultural conditions of past years are continuing to have a significant impact on rural communities surrounding the Project Site, including reduced employment, consumption, and economic activity. The Proposed Modification would ensure that the Applicant is able to continue to employ local workers and contribute to a diverse local economy for many years. Should the Applicant cease to continue operation of the Project, substantial economic and social advantages would be lost.

3.4 Environmental Trends

The Applicant notes that the recent end of the drought has resulted in substantial improvement in the health of the surrounding environment and increased availability of water stored in existing on site storages.

The Proposed Modification would increase available water storage at the Project Site, thereby increasing water security for the Project during any future drought periods. Additionally, as the proposed WSD would be capable of storing contaminated supernatant water from the TSF, the Proposed Modification would minimise risk to the environment and downstream water users during high rainfall periods by allowing the Applicant to more effectively manage freeboard and reduce the potential for discharge from the TSF.

3.5 Strategic Support for the Project

Considering the above, the Applicant contends that there is strong strategic support for the activities included in the Proposed Modification.

4. Description of the Modification

4.1 Overview of the Proposed Modification

Table 2 presents a comparison of the approved Project and the Proposed Modification. **Appendix 1** presents an updated project description for the Project which incorporates the changes outlined under the Proposed Modification. **Appendix 2** provides an updated table of mitigation measures for the Project under the Proposed Modification.

Table 2
Comparison of the Approved Project and the Proposed Modification

Component	Currently Approved (MP10_0054 MOD 4)	Proposed Modification
Water Storage Dam	No current approval.	Construction and use of a turkey's nest style Water Storage Dam with no natural catchment and a capacity of approximately 180ML.
Processing Rate	Processing up to 355 000tpa	Processing up to 415 000tpa.
Emergency Transportation of Water	A maximum of 4 concentrate trucks exiting the site per hour.	A maximum of 4 laden concentrate or water trucks entering or exiting the site per hour.
Administrative Amendments	Air quality monitoring program including a combination of high volume air samplers and dust deposition gauges.	Air quality monitoring program including dust deposition gauges.
	Daytime traffic noise impact assessment criterion of 55dB(A) ($LA_{eq\ (1\ hour)}$).	Daytime traffic noise impact assessment criterion of 60dB(A) ($LA_{eq\ (1\ hour)}$).
	Project Site layout as shown in Appendix 2 of MP10_0054 and EPBC Act Approvals 2010/5770 and 2015/7539.	Project Site layout as shown on **Figure 4**.

4.2 Water Storage Dam

4.2.1 Introduction

The following sub-section fully describes the proposed WSD, including the proposed design parameters, construction logistics and the proposed monitoring and mitigation measures to be implemented.

4.2.2 Design of Water Storage Dam

The proposed WSD would be a turkey nest-style dam with no natural catchment and a capacity of approximately 180ML. Ancillary infrastructure including a perimeter access road, pipelines to various water storages within the Project Site, a pump stand / laydown area and surface water diversion bunds would also be constructed adjacent to the proposed WSD as shown on **Figure 4**.

As the WSD is expected to receive and store supernatant water from the TSF, the dam would be constructed in accordance with the NSW Environment Protection Authority's *Tailings Dam Policy* and would therefore achieve a maximum liner permeability of 1 x 10^{-9}m/s over 1m or equivalent. Based on its capacity, location, and low consequence category assessment in the current detailed design report, it is unlikely that the proposed WSD would be a declared dam under the *Dams Safety Act 2015*.

The salient features and storage characteristics of the proposed WSD would be approximately as described in **Table 3**.

Table 3
Water Storage Dam Salient Features and Storage Characteristics

Parameter	Value
Embankment type	Turkeys Nest / Paddock
Total length of embankment	820m
Batter slopes	1V:2.5H Upstream, 1V:3H Downstream
Crest width	6m
Maximum embankment height	6.6m at RL 717.4m AHD
Maximum excavation depth (below existing ground level)	3m
Volume at Maximum Operating Level (MOL)	181.8ML at RL 716.7m AHD
Minimum freeboard to embankment crest at RL 717.4m AHD	0.7m
Qualitative Consequence Category Assessment (High Level)	'High C' for a Sunny Day Failure[1]
Note 1: Based on Site Selection Options Study dated 24 September 2021. More recent information suggests that the Proposed WSD would not be a declared dam under the *Dams Safety Act 2015*. Final classification would be made following referral to Dams Safety NSW.	
Source: GHD Pty Ltd (2021)	

4.2.3 Design of the Raw Water Pipeline and TSF Water Pipeline

Figure 4 shows two options for the pipeline routes which would connect the proposed WSD to the TSF and existing raw water pipeline network at the Project Site.

The Option A pipeline routes show:

- the raw water pipeline route connecting the Study Area to the existing raw water pipeline network and raw water storages, crossing the Site Access Road and crossing Spring Creek via Spring Creek Crossing; and
- the TSF water pipeline connecting the Study Area to the TSF, crossing the Site Access Road and crossing Spring Creek via the Spring Creek Crossing.

Under Option A, the location of the WSD is assumed to be anywhere within the Study Area and the pipelines would be extended from the Study Area boundary to the WSD footprint upon construction.

The Option B pipeline routes show:

- the raw water pipeline extending from the western boundary of the indicative WSD footprint to the Processing Plant, generally following the western boundary of the Project Site; and

- the TSF water pipeline extending from the eastern boundary of the indicative WSD footprint to the northern boundary of the TSF, crossing the Site Access Road.

Where pipelines would be required to cross existing roads or trafficked areas under either option, the pipelines would cross beneath the surface to avoid damage from vehicles.

Potential impacts associated with both options have been assessed in this report, however, only one route is likely to be constructed once final design work for the WSD has been completed. The final TSF water and raw water pipeline routes would pipeline routes would follow areas assessed as part of the Option A routes, Option B routes, and/or areas of existing disturbance within the Project Site.

4.2.4 WSD Construction Operations

The proposed WSD would be constructed using the cut and fill method, with embankment construction materials sourced from the WSD footprint. **Table 4** presents approximate material volumes required for the construction of the proposed WSD. It is anticipated that any surplus material removed from the WSD footprint would be transported to the approved Waste Rock Emplacement

Table 4
Water Storage Dam Volumetric Estimate

Cut Volume	Fill Volume	Surplus Volume	Liner Area	Vertical Sand Filter Drain
75 100m^3	68 400m^3	6 700m^3	21 350m^2	950m^3
Source: GHD Pty Ltd (2021)				

Construction would be undertaken in accordance with the currently approved hours of operation identified in Condition 3(3) of MP10_0054, the relevant conditions and timeframes of which are presented in **Table 5**.

Table 5
Proposed Hours of Dam Construction Operations

Activity	Operating Hours
Vegetation clearing, topsoil stripping and rehabilitation	7:00am to 6:00pm, Monday to Saturday 8:00am to 6:00pm, Sundays and public holidays
Remainder of construction operations	24 hours per day, 7 days a week

4.2.5 Pipeline Construction Operations

Pipelines installed along either the Option A or Option B pipeline routes would primarily be installed on the existing surface with minimal disruption to vegetation. Where necessary, under boring would be employed to install pipelines beneath existing roads or trafficked areas to ensure that pipelines cannot be damaged by vehicles.

4.2.6 Operation of Water Storage Dam

The proposed WSD will be used for receipt and storage of supernatant water from the TSF, water pumped from underground workings, and raw water from other on-site sources such as the harvestable rights dams via the use of various pipelines. The level of the WSD would be monitored regularly to ensure that the maximum operating level and minimum freeboard to the embankment crest are maintained at all times (see Section 4.2.2).

Water collected by and stored in the WSD would primarily be pumped to the Processing Plant for use in processing operations. Any other usage of water stored in the proposed WSD would be in accordance with the approved *Water Management Plan* for the Project.

4.2.7 Monitoring and Mitigation Measures

Two additional groundwater monitoring bores would be installed in the vicinity of the WSD to permit monitoring of potential impacts on local groundwater levels and quality. These additional groundwater monitoring bores would be incorporated into the existing groundwater monitoring program at the Project Site and would be monitored in accordance with the methodology outlined in the *Water Management Plan* for the Project. The Proposed locations of the additional groundwater monitoring bores are shown on **Figure 4** and listed in **Table 6**.

Table 6
Proposed Location of Additional Monitoring Bore

Bore ID	Coordinates	
	Easting	Northing
WSDB01	748975	6063992
WSDB02	749129	6064030

4.2.8 Rehabilitation

Section 2.14 of RWC (2010a) provides an overview of the approved Project Site rehabilitation and decommissioning activities. In addition, rehabilitation activities for the Project Site are outlined in the Applicant's *Mining Operations Plan* (MOP) and *Rehabilitation Management Plan* (RMP) (draft at time of writing). The current MOP was approved by the Resources Regulator on 24 May 2017 and provides a detailed description of the anticipated rehabilitation objectives, indicators and criteria for each of the rehabilitation domains within ML 1675.

Should the Proposed Modification be approved, the Applicant would amend the RMP to include any specific rehabilitation activities relating to the WSD and associated infrastructure. Rehabilitation of the proposed WSD and associated infrastructure would likely involve the following.

- Removal of all infrastructure not required for the final land use, including the liner and walls of the WSD.
- Completion of a contamination assessment and any follow up actions, if necessary.

- Ripping of compacted surfaces and profiling of the surface to achieve a final ground surface similar to the existing surface.
- Revegetation to establish a landform suitable for the final land use.

These rehabilitation activities would be consistent with the currently approved rehabilitation methods for similar infrastructure within the Project Site. Subject to future approval if required, the WSD may be retained to support the final land use.

4.3 Increase in Processing rate

Condition 2(6) of MP10_0054 identifies the operating conditions for the Project related to processing. Condition 2(6)(a) identifies the following limit on processing.

> "*The Applicant shall not:*
>
> *a) process more than 355 000 tonnes of ore at the site in a calendar year"*

The Applicant proposes to increase the processing rate for the Project by 60 000tpa from 355 000tpa to 415 000tpa, an increase of approximately 17%. The need for this component of the Proposed Modification is outlined in Section 1.4.3.

No changes to equipment, infrastructure, operating hours or transportation routes at the Project Site would be required to accommodate the proposed increase in ore throughout. Whilst the proposed processing rate increase would generate additional concentrate, it is not anticipated that the Proposed Modification would result in transportation rates above those already approved under MP10_0054.

The Applicant proposes to amend Condition 2(6)(a) of MP10_0054 MOD 4 as follows.

> *The Applicant shall not:*
>
> *a) process more than 415 000 tonnes of ore at the site in a calendar year"*

Condition 41 of Schedule 3 of MP10_0054 currently limits Project-related transportation to a maximum of four concentrate trucks exiting the Project Site per hour, with transportation limited to between 7:00am to 10:00pm, Monday to Saturday, and between 8:00am to 10:00pm, Sundays and Public Holidays. Additionally, heavy vehicle movements to or from the Project Site are prohibited between 7:00am and 8:30am and between 3:00pm and 5:00pm on school days.

Table 7 identifies the traffic levels which were assessed in the original traffic impact assessment during the site establishment (completed) and operational phases of the Project. As identified in **Table 7**, approved traffic levels for the Project include an average of 20 heavy vehicle movements per day along Majors Creek Road north of the Site Entrance.

The proposed processing rate increase would not result in the generation of heavy vehicle movements which would exceed the approved maximum hourly or average daily vehicle movements for the Project. As such, the Proposed Modification would not change the number of laden heavy vehicle movements generated over the life of the Project. No road or intersection upgrades are considered to be required as a result of the Proposed Modification (see Section 7.4).

Table 7
Approved Transportation Levels

Transportation Rate	Daily Traffic Movements (Average)		
	Light Vehicles	Heavy Vehicles	Total Vehicles
Site Establishment			
Majors Creek Road – North of Site Entrance	24	6	30
Majors Creek Road – South of Site Entrance	6	0	6
Total	30	6	36
Project Operation			
Majors Creek Road – North of Site Entrance	20	20[1, 2]	40
Majors Creek Road – South of Site Entrance	6	0	6
Total	26	20	46
Note 1: Including 4 bus movements. Note 2: An additional 2 vehicle movements would be required for a 6 month period during Year 3 of the Project.			
Source: RWC (2012a)			

4.4 Emergency Trucking of Water

Conditions 41(a) to 41(c) of Schedule 3 of MP10_0054 MOD 4 identify the following operating conditions for the Project related to transportation.

> *"The Applicant shall ensure that:*
>
> *a) a maximum of 4 concentrate trucks exit the site per hour;*
>
> *b) the dispatch of concentrate from the site is limited to between the hours of 7am to 10pm Monday to Saturday and 8am – 10pm Sundays and Public Holidays;*
>
> *c) all heavy vehicle movements to or from the site are prohibited between the hours of 7am – 8.30am and 3pm – 5pm on school days;"*

The Applicant is seeking development consent for emergency trucking of water to the Project Site from off-site sources via the approved heavy vehicle access route as shown on **Figure 5**. Emergency trucking of water to the Project Site would be limited to a maximum of 10 laden water trucks per day (i.e. 20 water truck movements per day).

The Proposed Modification seeks to explicitly include vehicles required for the emergency trucking of water under the approved transportation rates for concentrate trucks without capturing other laden vehicles which are currently not limited by MP10_0054 MOD 4 (e.g. irregular product deliveries, mobile equipment). The Applicant is therefore seeking to amend Conditions 41(a) and 41(b) of Schedule 3 of MP10_0054 MOD 4 to specify the following.

> *"The Applicant shall ensure that:*
>
> *a) a combined maximum of 4 laden concentrate trucks and/or water trucks enter or exit the site per hour;*
>
> *b) the dispatch of concentrate and/or water trucks from the site is limited to between the hours of 7am to 10pm Monday to Saturday and 8am – 10pm Sundays and Public Holidays;*

No change to part (c) of Condition 41 would be required.

Emergency trucking of water to the Project Site would only be undertaken where operational water requirements cannot be met by on-site water storages and extraction of groundwater from underground workings. As the availability of suitable water would be variable and uncertain under such conditions, it is not possible to specify a specific source from which water would be sought. However, all emergency water would be sourced from an appropriately licenced source under a commercial arrangement and transported to the Project Site via the approved heavy vehicle access route.

As identified above in the proposed amendments to Condition 41 of MP10_0054, vehicles involved in the proposed emergency trucking of water would be limited by the approved transport rates for the Project. As such, it is not anticipated that emergency trucking of water would result in a net increase in traffic levels above the approved limits.

4.5 Administrative Amendments

Administrative amendments to MP10_0054 included as part of the Proposed Modification include the following.

4.5.1 Removal of High Volume Air Sampler

The air quality monitoring system for the Project consists of five depositional dust gauges for the measurement of deposited dust and a single High Volume Air Sampler (HVAS) (EPA monitoring point 77) for the measurement of PM_{10}. Following a review of air quality monitoring data collected by the HVAS unit since monitoring commenced in 2019, it was determined that the PM_{10} levels at the Project Site have generally remained well below the relevant assessment criteria.

It is proposed that the HVAS unit would be replaced with another operating depositional dust gauge and incorporated into the current air quality monitoring program for the Project Site. This proposed administrative amendment is consistent with recommendations supported by EPA and DPE via correspondence dated 23 February 2022 and 17 March 2022 respectively (**Appendix 3**).

Condition 17(e) of Schedule 3 of MP10_0054 states that the *Air Quality and Greenhouse Gas Management Plan* must:

> *"include an air quality monitoring program, that uses a combination of high-volume samplers and dust deposition gauges to evaluate the performance of the project, and includes a protocol for determining exceedances with the relevant conditions of this approval"*

The Applicant proposes to modify Condition 17(e) as follows.

> *"include an air quality monitoring program, that uses ~~a combination of high-volume samplers and~~ dust deposition gauges to evaluate the performance of the project, and includes a protocol for determining exceedances with the relevant conditions of this approval"*

It is noted that the Applicant would lodge a variation to EPL 20095 to reflect this change to the air quality monitoring program in accordance with government agency recommendations should approval for the Proposed Modification be granted.

4.5.2 Amendment to Traffic Impact Assessment Criteria

Condition 2 of Schedule 3 identifies the traffic noise criteria for the Project as presented in **Table 8**.

Table 8
Approved Road Traffic Noise Criteria

Road	Day $LA_{eq(1\ hour)}$	Evening $LA_{eq(1\ hour)}$
Majors Creek Road, Araluen Road, Captains Flat Road, Coghill Street and Wallace Street	55	50

The Applicant is seeking to modify Condition 2 of Schedule 3 to update the noise traffic criteria for the Project in accordance with Section 2.2.2 of the *NSW Road Noise Policy* (DECCW, 2011). As identified in the *NSW Road Noise Policy*, noise criteria for identified principal haulage routes should match those for arterial/sub-arterial roads as these routes carry a different level of traffic and mix of vehicle types compared to local roads.

The proposed update to traffic noise criteria for the Project would ensure that the traffic noise impact assessment criteria are consistent with the relevant value for 'principal haulage routes'. **Table 9** presents the proposed modification to Table 2 under Condition 2 of Schedule 3 of MP10_0054.

Table 9
Proposed Road Traffic Noise Criteria

Road	Day $LA_{eq(15\ hour)}$	Evening $LA_{eq(9\ hour)}$
Majors Creek Road, Araluen Road, Captains Flat Road, Coghill Street and Wallace Street	60	55

4.5.3 Project Site Layout Amendments

Figures included as Appendix 2 of MP10_0054 identify the approved site layout for the Project following changes made under MOD 3. In the event that the Proposed Modification is granted, the Applicant proposed to replace the first two figures in Appendix 2 of MP10_0054 with **Figure 4**. This updated Project Site layout would include the WSD and associated infrastructure which form part of the Proposed Modification and would also reflect approved infrastructure as constructed at the Project Site.

One key update to the Project Site layout shown on **Figure 4** is to correct the footprint and embankment height shown for the TSF. Whilst the height which on the approved site layout (**Figure 2**) was consistent with the indicative design characteristics as outlined in RWC (2010a), the figure was not subsequently updated to reflect final design characteristics as outlined in the *Tailings Storage Final Design Report* prepared by Knight Peisold Consulting (Knight Peisold, 2011) and submitted as Appendix 1 of RWC (2015b). The correct final embankment height as shown on **Figure 4** is 712m AHD (approximately 28m above the natural surface).

Construction of the final TSF in accordance with the final design report and the requirements of NSW Dams Safety, rather than strictly in accordance with the indicative design characteristics presented in RWC (2010a), was identified in the following.

- RWC (2010a) – Section 2.7.2.2:
  - *"The facility would comprise a single cell with a decant tower and would be constructed in accordance with the requirements of the NSW Dams Safety Committee."*

- RWC (2013a) (MOD 2) – Section 2.6:
  - *"The Proponent notes that detailed designs for the approved Tailings Storage Facility are currently being prepared and assessed by the Dam Safety Committee and that minor adjustments to the presented layout may be required."*

- RWC (2015b) (MOD 3 Response to Submissions) – Section 2.3.2:
  - *"Construction of a Tailings Storage Facility with the following design parameters (Section 2.7.2.2 of RWC (2010a)). Appendix 1 presents the Final Design Report prepared for the Project by Knight Piésold in November 2011, referred to hereafter as Knight Piésold (2011). That report will be reviewed to ensure that the design of the facility is consistent with any guidelines or standards that may have been adjusted since the design was completed.*

    Maximum area of disturbance - approximately 9.3ha.

    Maximum area within the upslope diversion structure – approximately 12ha.

    Maximum embankment height – approximately 28m above the natural surface.

    Slope of outer face of the embankment – 1:3.5 V:H.

    Storage capacity – 0.89Mt of tailings.

    Up slope clean surface water diversion channel capable of diverting a maximum probable flood around the facility (Condition 3(25A) of MP10_0054)."

The *Tailings Storage Facility Final Design Report* was submitted to DPE as Appendix 1 to RWC (2015b). Satisfaction with the final design report was confirmed by Dams Safety NSW (then the NSW Dams Safety Committee) on 3 February 2021 and satisfaction with the latest version of the final design report (November 2016) was confirmed on 9 December 2016 (**Appendix 3**).

It is noted that the updates to the Project Site layout would also be incorporated into figures included in EPBC Act Approvals 2021/5570 and 2015/7539 through a separate application to vary those approvals.

5. Statutory Context

5.1 Power to Grant Approval

The application to modify MP10_0054 MOD 4 would be made under Section 4.56 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and would be assessed by the Department of Planning and Environment (DPE).

The Mine was transitioned from a Part 3A Project to a State Significant Development by an order published in the NSW Government Gazette on 23 November 2018. In accordance with Clause 3BA(6) of Schedule 2 of the *Environmental Planning and Assessment (Savings, Transitional and Other Provisions) Regulation 2017*, the relevant reference point for comparison is the last modification granted under Section 75W of Part 3A of the *Environmental Planning and Assessment Act 1979*. In this case, MOD 3 granted on 10 August 2016 is the development to which the test for 'substantially the same' will be applied.

5.2 Consent Authority

In accordance with Section 2.7A(1) of the *State Environmental Planning Policy (Planning Systems) 2021*, if any of the following criteria are exceeded, the consent authority is the Independent Planning Commission.

- Queanbeyan–Palerang Regional Council provides a submission objecting to the application.
- Objections are received from 50 persons or more.
- The Applicant has disclosed a reportable political donation under Section 10.4 of the EP&A Act.

Should none of the above criteria be exceeded, the Minister for Planning and Public Spaces is the consent authority. The Applicant understands that in these circumstances, the Minister has delegated their powers to determine the application to a senior officer of the Department of Planning and Environment.

5.3 Permissibility

The Project Site occurs within the Queanbeyan–Palerang LGA. The entire Project Site is within 'Zone RU1 – Primary Production' under the *Palerang Local Environment Plan 2014* (Palerang LEP).

Underground mining is not identified as permissible with consent within Zone RU1, however, Clause 2.9(1)(b) of *State Environmental Planning Policy (Resources and Energy) 2021* (Resources and Energy SEPP) identifies that mining is permissible, with consent, on any land where agriculture is permissible. As agriculture is permissible in Zone RU1 under the Palerang LEP, underground mining is also permissible, with consent.

5.4 Other Approvals

Table 10 presents the existing approvals (excluding MP10_0054) held for the Project and identifies where modifications to those approvals would be required or where new approvals would be necessary.

Table 10
Existing Approvals and Need for Modification

Approval	Modification / New Approval Required?	Justification / Comment
EPBC 2010/5770	Modification	Variation to amend the area defined as the "Project Site Layout".
EPBC 2015/7539	Modification	Variation to amend the area defined as the "Project Site Layout".
EPL20095	Modification	Modification required to: • include additional groundwater monitoring bore in the vicinity of the proposed WSD; and • replace HVAS with a depositional dust gauge.
ML1675 EL6548 EL8372 EL9402	No	No changes to the approved mining activities.
WAL39281 WAL39282 WAL39287 WAL39292	No	• Based on its design, the proposed Water Storage Dam would not be included under Harvestable Rights. • Under Section 4.41 of the EP&A Act, a water use approval under Section 89, a Water Storage work under Section 90 or an activity approval under Section 91 of the *Water Storage Act 2000* is not required.
XSTR200092	No	No changes to approved explosives storage conditions.
5089849	No	No changes to sealed source radiation gauges.
LGA.2018.255	No	No changes to wastewater treatment.

5.5 Pre-Conditions to Granting Approval

An overview of relevant pre-conditions to the consent authority exercising its power to grant approval is provided in Table A4.1 of **Appendix 4**.

5.6 Mandatory Matters for Consideration

An overview of the relevant mandatory matters for consideration by the consent authority in determining the application to modify the development consent is provided in Table A4.2 of **Appendix 4**.

6. Engagement

6.1 Government Agency Consultation

The Applicant consulted with Department of Planning and Environment (DPE) during preparation of this Modification Report. In particular, a Briefing Paper outlining the Proposed Modification was provided on 28 October 2021 via the Planning Portal with a request for a Scoping Meeting. This was followed by a videoconference with the Department in October 2021 during which the Applicant provided the Department with a briefing on the proposed activities and a range of matters to be addressed in the Modification Report were discussed.

The Briefing Paper was also provided to DPE Water, Dams Safety NSW, DPI Fisheries and Water NSW on 18 May 2022, requesting feedback and/or assessment requirements in relation to the proposed WSD. The following feedback was received.

- DPE Water and DPI Fisheries replied on 19 May 2022 and 25 May 2022, noting that they would provide comments once the Modification Report was formally referred to them by DPE.
- Water NSW responded on 30 May 2022, noting that as a portion of the proposed WSD would be located within the Sydney Drinking Water Catchment, consideration of Chapter 8 of the *State Environmental Planning Policy (Biodiversity and Conservation) 2021* would be required.

In addition to the above, representatives of the Applicant met with representatives of Queanbeyan Palerang Shire Council on 25 November 2021 and with representatives of Eurobodalla Shire Council on 13 January 2022 to provide an overview of the Proposed Modification. No specific concerns relating to the Proposed Modification were recorded during those meetings.

6.2 Community Consultation

The Applicant has engaged in extensive community consultation in relation to the approved activities undertaken at the Project Site as well as Proposed Modification. Consultation has included the following.

- Community newsletters.
- Community Consultative Committee Meetings[1] held on 21 June 2021, 18 October 2021, 13 December 2021, 28 March 2022 and 8 June 2022.
  - Provided updates regarding the proposed design characteristics of the WSD and location options being considered within the Project Site.
  - Provided updates on the status of the *Modification Report* and associated specialist assessments.

[1] CCC meeting minutes are available at https://www.aureliametals.com/projects/dargues/ccc-minutes.

  - Provided updates on the status of consultation with Queanbeyan Palerang Regional Council, Eurobodalla Shire Council and DPE.
  - Discussed plans to hold community consultation forums to consult with the broader community regarding the Proposed Modification.
  - Community member requested that the impact of the proposed emergency trucking of water be considered.
- Community consultation forums held at the Majors Creek Recreation Reserve Hall on 15 December 2021, 19 December 2021 and 14 June 2022.
  - Discussions between representatives of the Applicant and community members covered a range of matters including the purpose and status of the Proposed Modification and the performance of the Project generally.
  - Community members expressed concerns regarding potential impacts associated with the proposed emergency trucking of water to the Project Site.
  - Community members expressed concerns regarding potential noise impacts associated with the proposed increase to the approved processing rate.
  - During the June 2022 forum, representatives of the Applicant provided a PowerPoint presentation which included an overview of the Proposed Modification as well as a summary of the outcomes of specialist assessments completed to assess potential environmental impacts associated with the Proposed Modification.
- Ad-hoc community engagement with community members.

7. Assessment of Impacts

7.1 Introduction

This section describes the specific environmental features of the Mine Site and its surrounds that may be affected by the Proposed Modification. Information on existing conditions, proposed safeguards and controls, and potential impacts the Proposed Modification may have following the implementation of these measures is presented for all relevant issues.

7.2 Biodiversity

7.2.1 Introduction

A Biodiversity Development Assessment Report (BDAR) has been prepared by WSP Australia Pty Ltd (WSP) to assess the potential impact of the Proposed Modification to terrestrial biodiversity. This report, hereafter referred to as WSP (2022), is summarised in the following subsections and presented as **Appendix 5**.

The following subsection provides an overview of the existing environment with respect to biodiversity at the Project Site. Potential impacts from the Proposed Modification are presented, and management and mitigation measures are proposed to reduce or prevent these impacts. This is followed by discussion of any residual impacts relating to the Proposed Modification.

7.2.2 Local Setting and Environmental Performance

7.2.2.1 Regional Setting and Database Search Results

The Project Site occurs in the South East Corner Bioregion, within the South East Coastal Ranges subregion and within the Braidwood Granites Mitchell Landscape, comprising rounded and undulating hills on Silurian-Devonian granite and granodiorite.

The Study Area (**Figure 6**), which includes all areas of potential disturbance associated with the Proposed Modification, does not contain any mapped rivers, streams or wetlands. There is limited habitat connectivity within the Study Area due to clearing for agricultural use within and surrounding the Project Site. The closest wooded (native vegetation) area occurs along Spring Creek, which does not intersect the Study Area. There were no other areas of other geological significance or soil hazards identified or known within the Study Area.

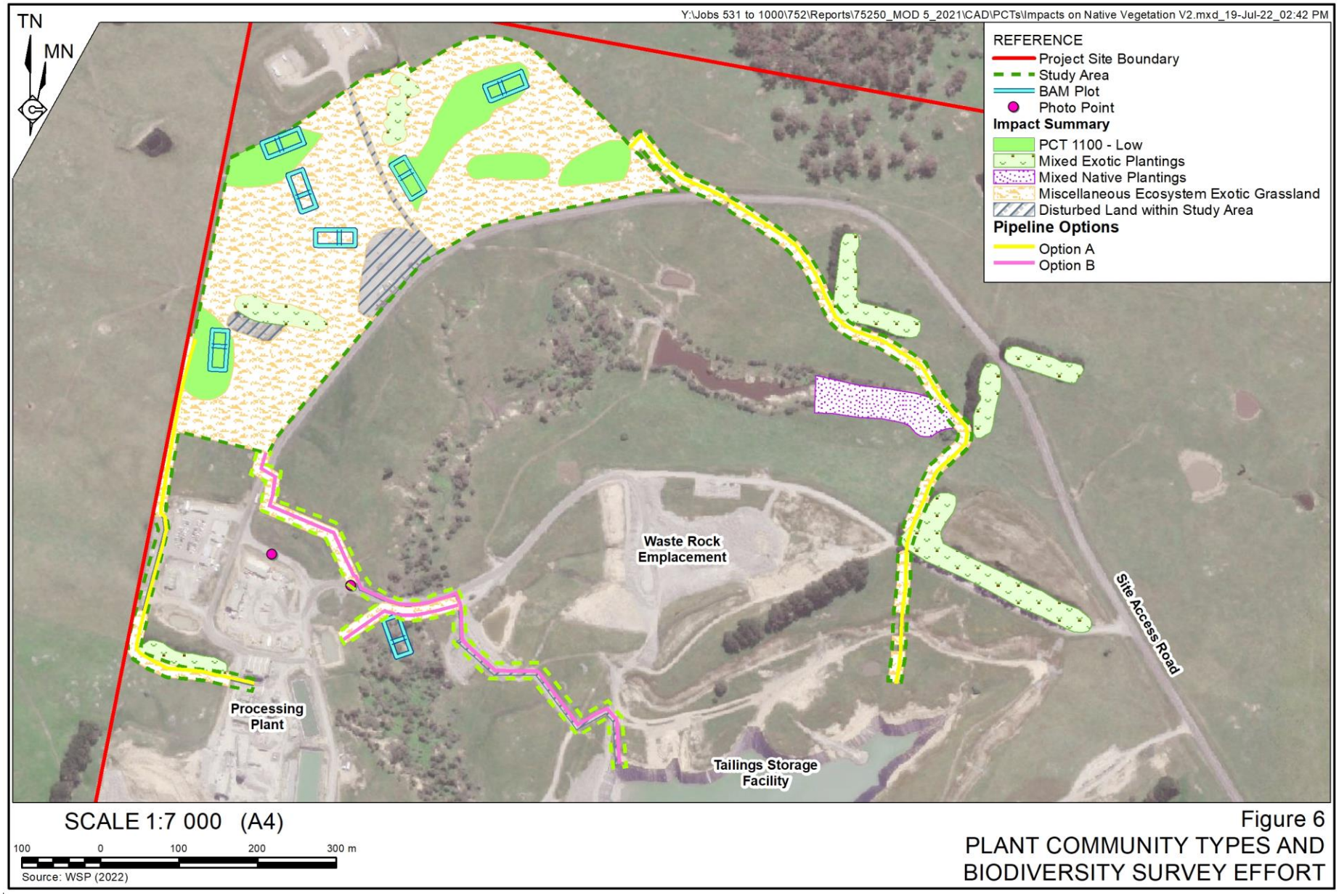


Figure 6
PLANT COMMUNITY TYPES AND BIODIVERSITY SURVEY EFFORT

7.2.2.2 Desktop Assessments

WSP assessed two possible areas for the location of the proposed water management dam, access road, pump stand, laydown area, pipelines and surface water diversion bunds. The combined area of these two options comprises approximately 15.17ha (**Figure 6**). A 1 500m buffer zone was applied to the Study Area, creating an assessment area for native vegetation covering approximately 1 076ha, and hereafter referred to as the "Broader Study Area". Native vegetation cover within the Broader Study Area was mapped as approximately 10.7 per cent, with the majority represented by woodland and open forest. Native non-woody vegetation was unable to be mapped as the available State Vegetation Type Map (SVTM) mapped all non-wooded areas were as cleared land and native grasslands could not be discerned on aerial photography.

Under the BAM, threatened species are assessed as either ecosystem credit species, species credit species or a combination of the two (referred to as dual credit species). Initial desktop assessment to determine ecosystem (predicted) and species (candidate) credit species involved entering the identified vegetation types and zones into BAM-C. This allowed predicted and candidate species reports to be generated for the associated Plant Community Types (PCTs) within the Broader Study Area.

Likelihood of occurrence assessments were undertaken for all threatened species, populations and migratory species identified through database searches. These assessments were conducted for both BC Act and EPBC Act listed species. These assessments enabled justification for any identification of species inclusions for both ecosystem and species credit species. They also enabled identification of species considered Matters of National Environmental Significance (MNES) under the EPBC Act.

7.2.3 Field Survey Methodology

WSP (2022) sampled a total of seven vegetation integrity plots over three field survey sessions: 6 December 2021 (5 plots), 31 January 2022 (one plot) and April 2022 (one plot) (**Figure 6**). Field traverses, focusing on suitable habitat for target species, occurred on foot in a combination of parallel traverses and meanders across all vegetation types.

Fauna habitat assessments were undertaken to assess the likelihood of threatened candidate species identified in the desktop review as potentially occurring within the Study Area. One targeted survey for *Leucochrysum albicans subsp. Tricolor*, identified in the BAM-C as having moderate to greater likelihood of occurring in the Study Area, was undertaken using vegetation integrity plots and field traverses on 6 December 2021 and 31 January 2022.

Opportunistic sightings of flora and fauna were also recorded during the field surveys.

Table 11 presents the number of vegetation integrity plots for each PCT and vegetation zone or other map unit. At each vegetation integrity plot survey location dedicated 20-minute searches were conducted for *Leucochrysum albicans subsp. Tricolor*. During field surveys, data on dominant canopy species, native species richness, vegetation structure and condition was collected to validate and refine the native vegetation layer to determine associated PCT. The vegetation was first assessed to a PCT level, and then aligned to a vegetation zone (native vegetation with the same PCT and broad condition state).

The following PCTs were considered as candidates for the native vegetation in the Study Area.

- PCT 1100 Ribbon Gum - Snow Gum grassy forest on damp flats in the eastern South Eastern Highlands Bioregion
- PCT 1110 River Tussock - Tall Sedge - Kangaroo Grass moist grasslands of the South Eastern Highlands Bioregion
- PCT 1288 Wallaby Grass - Kangaroo Grass - Rush - Blown Grass Wet Tussock Grassland Moist Grasslands of the South Eastern Highlands Bioregion

Table 11
Vegetation Zones or Other Map Units and Vegetation Integrity Plots

BAM-C Vegetation Zone	Vegetation Zone Name (BAM-C) or Other Map Units	Study Area (ha)	Plots Required (BAM)	Plots Sampled
1	PCT 1100 (low)	2.82	1	4
N/A	No PCT - Miscellaneous ecosystem – exotic grassland	10.73	-	2
N/A	No PCT – Disturbed land (non-vegetation)	1.07	-	-
N/A	No PCT – Mixed exotic plantings	0.54	-	-
Source: WSP (2022) – after Table 4.2				

7.2.4 Desktop Assessment and Field Survey Results

7.2.4.1 Plant Community Types

Grassland vegetation within the Study Area was found to be dominated by exotic species, with a low cover (<10%) of native species recorded (WSP, 2022). WSP concluded that the grassland vegetation is likely to have been derived from a woodland or forest parent vegetation type, based on wooded remnants observed on nearby land, occurring in a similar habitat, landscape position, slope and elevation (WSP, 2022). PCT selection was therefore reliant on available vegetation mapping in nearby land with similar habitat (WSP, 2022).

Based on this assessment, native vegetation recorded within the Study Area has been assigned to PCT 1100 Ribbon Gum - Snow Gum grassy forest on damp flats, eastern South Eastern Highlands Bioregion (PCT 1100 Ribbon Gum). Areas mapped as PCT 1100 (low) had a relatively higher representation of native species cover (about 30%). In comparison, other cleared grassland areas mapped as ‘miscellaneous ecosystems – exotic grassland’ could not be attributed to a PCT due to the high proportion of exotic species cover (over 90%) and very low proportion of native perennial species cover (less than 10%).

A broad condition state infers that the vegetation has a similar tree cover, shrub cover, ground cover, weediness or combinations of these attributes which determine vegetation condition. Broad condition state is used for stratifying areas of the same PCT into a vegetation zone for determining the vegetation integrity score. The broad condition state for PCT 1100 Ribbon Gum in the Study Area is low as it has been modified due to land management practices over previous decades.

Three vegetation integrity plots were used to calculate the vegetation integrity score for BAM-C calculations, presented in **Table 12**. **Figure 6** details the occurrence of PCT 1100 Ribbon Gum within the Study Area.

Table 12
Summary of Native Vegetation Type, Zone and Integrity

BAM-C#	Vegetation Type	Vegetation Class	Vegetation Zone	Pct % Cleared	Tec1*	Patch Size Class (ha)	Composition Condition Score	Structure Condition Score	Function Condition Score	Vegetation Integrity Score	Subject Lan Extent (ha)
NSW Vegetation Formation: Grassy Woodlands											
1	PCT 1100 Ribbon Gum	Tableland Clay Grassy Woodlands	1	83	-	2.82	11.9	2.2	0	0.4	2.82
										Total extent of native vegetation	**2.82**
* Does not meet the final determination criteria for any threatened ecological communities listed under the BC Act or EPBC Act (see Section 4.7).											
Source: WSP (2022) – modified after Table 4.4											

7.2.4.2 Priority Weeds and Weeds of National Significance

The following three exotic flora species recorded within the Study Area during field surveys are listed under the NSW Biosecurity Act 2015 (BA Act) as Weeds of National Significance (WONS) (WSP, 2022) (**Table 13**). All three weeds are identified as high threat weeds (HTW) under the BAM. A full inventory of weed species recorded within each vegetation integrity plot is presented in Appendix A of **Appendix 5**.

Table 13
High Threat Weeds (HTW) And Weeds of National Significance (WONS) Recorded Within the Study Area

Common Name	Scientific Name	WONS*	HTW**
Blackberry	*Rubus fruticosus* species aggregate	Yes – General Biosecurity duty (prevent, eliminate or minimise).	Yes
Hawthorn	*Crataegus monogyna*	Yes – General Biosecurity duty (prevent, eliminate or minimise).	Yes
Scotch broom	*Cytisus scoparius* subsp. *scoparius*	Yes – General Biosecurity duty (prevent, eliminate or minimise).	Yes
Paspalum	*Paspalum dilatatum*	No	Yes
* WONS – Weed of National Significance under the *NSW Biosecurity Act 2015* ** HTW – High Threat Weed listed under BAM 2020			
Source: WSP (2022) – modified after Table 4.7			

7.2.4.3 Threatened Ecological Communities

Vegetation in the Study Area was assessed to determine whether it met the definition of a Threatened Ecological Community (TEC) under the BC Act. Four TECs were considered most likely to be candidates based on vegetation type, habitat and location. PCT 1100 was linked to the following three TECs.

- Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions EEC (BC Act).
- Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion CEEC (BC Act).
- Werriwa Tablelands Cool Temperate Grassy Woodland CEEC (BC Act).

Natural Temperate Grassland of the South Eastern Highlands, which is listed as critically endangered under the EPBC Act, was also considered as a candidate.

Assessment by WSP (2022) determined that PCT 1100 does not meet the definition of any listed TECs due to the very low proportion of species characteristic of PCT 1100 being recorded within the Study Area.

No candidate TECs listed under the EPBC Act were considered by WSP (2022) to have a moderate or greater potential to occur in the Study Area based on the vegetation and habitat present.

7.2.4.4 Threatened Species

7.2.4.4.1 *Threatened Flora*

A search of the relevant protected matters databases identified that a total of 22 EPBC Act listed threatened flora species have been recorded within a 10km radius of the Study Area. WSP (2022) assessed these threatened flora species for their likelihood of occurrence within the Study Area based on their habitat and distribution (see Appendix B of WSP (2022)). Based on that assessment, WSP (2022) determined that no threatened flora species have a moderate or better likelihood of occurring within the Study Area and therefore no threatened flora would be affected by the Proposed Modification.

7.2.4.4.2 *Threatened Fauna*

A search of the relevant protected matters databases identified that a total of 34 EPBC Act listed threatened fauna species have been recorded within a 10km radius of the Study Area. WSP (2022) assessed these threatened flora species for their likelihood of occurrence within the Study Area based on previous occurrence records and availability of potential habitat (see Appendix B of WSP (2022)). Based on that assessment, WSP (2022) determined that no threatened fauna species have a moderate or better likelihood of occurring within the Study Area and therefore no threatened fauna would be affected by the Proposed Modification.

7.2.4.4.3 *Credit Species*

Flora – Species Credit Species

A total of seven threatened flora species were identified by BAM-C as candidate threatened flora species (species credit species) within the Study Area. One species, Hoary sunray (*Leucochrysum albicans* subsp. *tricolor*), was retained as a candidate species credit species as it was assessed as having the potential to occur in the subject land based on the presence of suitable habitat (WSP, 2022). All other candidate threatened flora species were excluded as species credit species in BAM-C based on the high level of degradation of habitat and the lack of suitable habitat in the Study Area.

No additional flora species were included as candidate threatened flora species with a moderate likelihood of occurrence in the Study Area based on as the presence of potential suitable habitat (WSP, 2022).

No threatened flora species were recorded by WSP (2022) in the Study Area during the field survey. Consequently, *Leucochrysum albicans* subsp. *tricolor* was removed from BAM-C as a candidate threatened flora species.

Fauna - Ecosystem Credit Species

A total of 23 threatened fauna species were identified by BAM-C as predicted or ecosystem credit species within the Study Area (WSP, 2022). Of these species, 22 were retained as candidate species and one species, Glossy black-cockatoo (*Calyptorhynchus lathami*), was excluded due to the absence of required habitat within the Study Area.

With the exception of the gang-gang cockatoo (*Callocephalon fimbriatum*), no threatened fauna species (ecosystem species) were recorded in the Study Area during the field survey. The gang-gang cockatoo was recorded flying over the area during the field survey on 31 January 2022, however, no individuals of that species were observed foraging within the Study Area.

Fauna - Species Credit Species

A total of 16 candidate threatened fauna species were identified by BAM-C as potential candidate threatened fauna species (species credit species) (WSP, 2022). All 16 species were excluded by WSP (2022) as candidate species based on the lack of suitable habitat or on the high level of degradation of habitat in the subject land.

No threatened fauna species (species credit species) were recorded in the Study Area during the field survey.

7.2.4.4.4 *Other Protected Entities*

Migratory species are considered MNES and are protected under the EPBC Act. A total of twelve EPBC Act listed migratory species are predicted to occur within the locality of the Study Area, however, no migratory species are considered to have a moderate or better likelihood of occurrence within the Study Area (WSP, 2022). Therefore, it is not likely that the Proposed Modification would significantly affect migratory species and thus this group has not been considered further (WSP, 2022).

No EPBC Act listed critical habitat has been recorded or is considered likely to occur within the Study Area (WSP, 2022).

No World Heritage Properties, nor nationally significant wetlands, are located within or near to the Study Area and therefore are not likely to be impacted by the Proposed Modification (WSP, 2022).

7.2.5 Management and Mitigation Measures

The Applicant would implement the following management and mitigation measures to avoid and minimise impacts to biodiversity as a result of the Proposed Modification.

- Prepare and implement a *Construction Environmental Management Plan* which covers disturbance associated with the Proposed Modification.
- Update the existing *Environmental Management Strategy* for the Project to include any changes to existing environmental management measures required as a result of the Proposed Modification.
- Update the existing *Biodiversity Management Plan* for the Project to include any changes to existing biodiversity management measures required as a result of the Proposed Modification.
- Clearly delineate the assessed Study Area and communicate to personnel involved in construction that clearing of vegetation outside of this area is not permitted.
- Provide construction personnel with a map of the Study Area detailing sensitive biodiversity areas, clearing boundaries, and any biodiversity exclusion zones, and provide briefings to communicate the significance of these features prior to commencement of clearing works.
- Locate areas of disturbance within areas of limited biodiversity value (e.g. exotic dominated grassland, disturbed areas, existing tracks) preferentially during the detailed design of the WSD and during construction.
- Use existing tracks, roads, and cleared areas, where possible, to avoid unnecessary disturbance.
- Engage a suitably qualified ecologist to complete pre-clearing surveys of potential habitat prior to vegetation clearing works.
  - Clearing protocols, including pre-clearing surveys, daily surveys and staged clearing, would be implemented under the supervision of a trained ecologist or licensed wildlife handler during clearing events, where required.
  - Biodiversity exclusion zones (temporary fencing) for retained vegetation would be clearly identified by a suitably qualified ecologist prior to the commencement of construction.
- Implement a threatened species unexpected finds protocol if threatened flora and fauna species, not assessed in the biodiversity assessment, are identified in the disturbance area.

- Relocate habitat features (e.g. surface rock, fallen timber) from the development footprint to adjacent retained vegetation, where practicable.
- Implement hygiene protocols to prevent the introduction and/or spread of weeds or pathogens.
- Ensure that rehabilitation and/or ongoing maintenance of retained native vegetation and habitat on, or adjacent to, disturbance areas is undertaken as soon as possible.

7.2.6 Assessment of Impacts

7.2.6.1 Native Vegetation

The results of field surveys and vegetation mapping were used to inform the design of the WSD and ancillary infrastructure during preliminary planning stages. As a result, areas of disturbance associated with the Proposed Modification including the two pipeline route options have been located in areas of existing disturbance or non-native vegetation where practicable. Only 15.5 per cent of the Study Area consists of native vegetation in low condition (VI score of 0.4). The remainder of the Study Area consists of disturbed land and exotic vegetation that does not contain any native PCTs.

Management and mitigation measures have been developed to address the direct and indirect impacts of the Proposed Modification (refer Section 7.2.5).

7.2.6.2 Direct Impacts Unable to be Avoided

Direct impacts on biodiversity values resulting from the Proposed Modification would include disturbance of up to 2.82 ha of native vegetation (PCT 1100 in low condition) as well as disturbance of additional areas not classified as a PCT (**Figure 6**).

As the Study Area does not include any TECs listed under the EPBC Act or any habitat for species with a high biodiversity risk weighting, the Proposed Modification would not impact any threatened species or TECs (WSP, 2022).

Injury and mortality of fauna could occur during construction activities and during operation. All roads have potential to result in the mortality of native animals. However, as the Proposed Modification would not result in an increase in traffic levels compared to those already approved for the Project, it is unlikely that the Proposed Modification would contribute significantly to vehicle strike to native fauna and the consequences of impacts to species are likely to be negligible (WSP, 2022).

7.2.6.3 Indirect Impacts Unable to be Avoided

Indirect impacts have been considered in terms of the nature, extent and duration of impacts on native vegetation, threatened ecological communities and threatened species habitats likely to be affected. WSP (2022) assessed the potential impacts of the Proposed Modification on indirect impacts including inadvertent impacts to adjacent vegetation or habitat, habitat

connectivity and fragmentation, edge effects, transportation of weeds and pathogens, loss of breeding habitat, increase in predatory species populations, and impacts associated with light, noise and dust. WSP (2022) concluded that indirect impacts on biodiversity resulting from the Proposed Modification are likely to be low to negligible and that the Proposed Modification would be unlikely to have an indirect impact on any threatened entities.

7.2.6.4 Cumulative Impacts

Cumulative impacts can be defined as the successive, incremental, and combined effect of multiple impacts, which may in themselves be minor but could become significant when considered together.

The most significant cumulative impact associated with the Proposed Modification would be the continued loss of biodiversity in the region. The Proposed Modification has the potential to contribute to the cumulative loss of habitat and would likely place further pressure on local threatened flora and fauna species and ecological communities.

The direct impacts on PCTs and threatened species habitat are the most likely contribution to cumulative impacts. The Proposed Modification further increases the disturbance footprint of the Project and would result in the removal of a relatively small area (2.82 ha) of native vegetation in low condition (PCT 1100 low). Although this would contribute to cumulative impacts in the area, the total impact of the Proposed Modification would be relatively minor (WSP, 2022).

7.2.6.5 Key Threatening Processes

Any process that threatens, or may threaten, the survival, abundance or evolutionary development of a native species or ecological community is considered a Key Threatening Process (KTP). KTPs listed in Schedule 4 of the BC Act and Section 183 of the EPBC Act were individually assessed against the Proposed Modification to determine their relevance.

A total of six KTPs listed under the BC Act and three listed under the EPBC Act were considered relevant to the Proposed Modification. These are presented in **Table 14**. Mitigation measures have been developed to minimise these KTPs (refer Section 7.2.5).

Table 14
Key Threatening Processes Relevant to the Proposed Modification

Page 1 of 2

Key Threatening Process	Relevant Legislation	Relevance to the Proposed Modification
Clearing of native vegetation/land clearance	BC Act/ EPBC Act	The Proposed Modification would involve the clearing of a very small amount of native groundcover in an exotic-dominant grassland. Impacts to native vegetation from the Proposed Modification would be negligible.
Infection of native plants by *Phytophthora cinnamomi*	BC Act/ EPBC Act	*Phytophthora cinnamomi* is known to occur in the South Eastern Highlands bioregion. The construction and operation of the Proposed Modification may increase the risk of introducing or spreading *Phytophthora cinnamomi* as it would require the movement of soil, water and plant material.

Table 14 (Cont'd)
Key Threatening Processes Relevant to the Proposed Modification

Key Threatening Process	Relevant Legislation	Relevance to the Proposed Modification
Introduction and establishment of Exotic Rust Fungi of the order *Pucciniales* pathogenic on plants of the family Myrtaceae	BC Act	Exotic Rust Fungi is known to occur in the South Eastern Highlands bioregion. The construction and operation of the Proposed Modification may increase the risk of introducing or spreading Exotic rust fungi through the movement of soil and water as well as the presence and movement of equipment.
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	EPBC Act	Chytridiomycosis is currently predicted within South Eastern Highlands bioregion. The construction and operation of the Proposed Modification may increase the risk of introducing and/or spreading this pathogen as it would require the movement of soil, water and plant material.
Invasion of native plant communities by exotic perennial grasses	BC Act	The invasion and establishment of exotic perennial grasses is a potential indirect impact of the construction and operation phases of the Proposed Modification. The spread and establishment exotic perennial grasses (i.e. *Paspalum dilatatum**) may be facilitated through the movement of soils and machinery. Mitigation measures are recommended to effectively manage these KTPs.
Bushrock removal	BC Act	Bushrock removal is likely to occur in the Study Area, as small areas of surface rock occur within the proposed WSD footprint.
Source: WSP (2022) – modified after Table 9.3		

7.2.6.6 Biodiversity Offsetting Impacts

As no candidate threatened flora or fauna species were recorded during field surveys and none have been assumed to be present, the Proposed Modification would not generate any species credit requirements (WSP, 2022).

An offset is required for any impacts on PCTs that are associated with a vegetation zone that has a vegetation integrity score of:

- ≥15, where the PCT is representative of an Endangered Ecological Community (EEC) or a Critically Endangered Ecological Community (CEEC).
- ≥17, where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or represents a vulnerable ecological community.
- ≥20, where the PCT does not represent a TEC and is not associated with threatened species habitat.

The required ecosystem and species credit obligations associated with the Proposed Modification are presented in **Table 15**.

Due to the low vegetation integrity score of PCT 1100 (low) in the Study Area, no biodiversity offset ecosystem credit requirements would be generated by the Proposed Modification.

Table 15
Impacts Requiring Biodiversity Offset

BAM-C# and Vegetation Type	Vegetation Zone	TEC*	SAII^	Species Sensitivity to Gain Class	Vegetation Integrity Score	Offset Required
1 – PCT 1100	Low	No	No	High Sensitivity to Potential Gain	0.4	No
*Threatened Ecological Community ^Serious and Irreversible Impacts						
Source: WSP (2022) – after Table 11.1						

7.3 Heritage

7.3.1 Introduction

An Aboriginal and Historic Heritage Assessment Report was prepared by Lantern Heritage Pty Ltd (Lantern). The assessment, referred to hereafter as Lantern (2022), is presented as **Appendix 6**. The heritage Study Area comprised the Study Area and proposed pipeline routes (Option A and Option B) shown on **Figure 7**. This subsection presents an overview of the results of that assessment.

Lantern (2022) was prepared in accordance with the *Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW, 2010a) and the *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH, 2011).

7.3.2 Aboriginal Community Consultation

Aboriginal community consultation was undertaken in accordance with *Aboriginal Cultural Heritage Consultation Requirements for Applicants* (DECCW, 2010b). Appendix 2 of Lantern (2022) includes a full description of the consultation undertaken; however, the following provides an overview of that program.

- Stage 1 – Identification of Aboriginal parties.

  Lantern sent a letter to the Registered Aboriginal Parties (RAPs) identified in RWC (2010a) and the *Aboriginal Heritage Management Plan* for the Mine for the Mine on 25 January 2022 requesting those Aboriginal groups or persons with cultural knowledge to register their interest in the Proposed Modification. The following registered their interest and are referred to hereafter as RAPs.

  – Yurwang Gundana Consultancy Heritage Services
  – Buru Ngunawal Aboriginal Corporation
  – Ngunnawal Heritage Aboriginal Corporation

- Stage 2/3 – information about the Proposed Modification and invitations to participate in field surveys.

An outline of the Proposed Modification as included in the original letters sent to the RAPs on 25 January 2021. Invitations to participate in the two rounds of heritage field surveys for the Proposed Modifications were issued to the RAPs on 22 February 2022 and 22 March 2022.

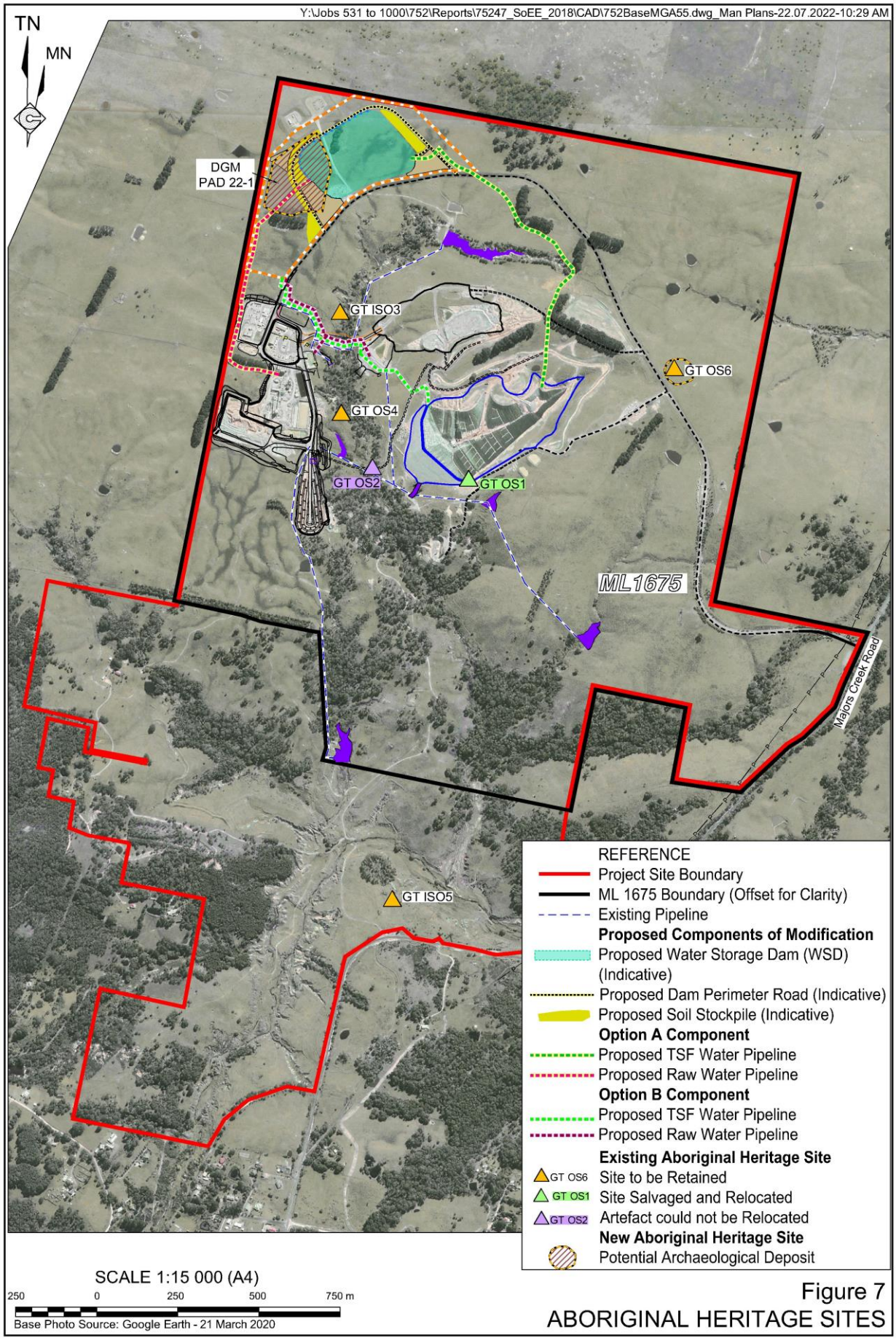


Figure 7
ABORIGINAL HERITAGE SITES

- Stage 4 – comments on the draft Aboriginal and Historic Heritage Assessment Report.

  A draft of Lantern (2022) was provided to all RAPs on 7 June 2020, with responses requested by 6 July 2022. By 21 July 2022, only one comment had been received from Mundawari Heritage Consultants (formerly Ngunnawal Heritage Aboriginal Corporation) noting that they supported the recommendations outlined in Lantern (2022), in particular the recommendation for test excavation. No other comments were received from RAPs.

The following RAPs participated in the fieldwork.

- Mogo Local Aboriginal Land Council (LALC)

7.3.3 Local Setting and Environmental Performance

The following subsection provides an overview of the local setting, specifically in relation to Aboriginal and historical heritage.

- Hydrology – Drainage within the heritage study area is dominated by a number of unnamed tributaries which feed into Spring Creek, which merges with Majors Creek in the southern section of the Mine Site. These watercourses would have provided a range of food resources for people of the Walbunja and Wandanndian communities.
- Geology – Landforms within the heritage study area are characterised by rounding and undulating to moderately steep hills formed on Silurian-Devonian granite and granodiorite. Rocky outcrops within the landscape may have acted as sources of stone procurement for tool manufacture.
- Soils – The soils that characterise the majority of the heritage study area are comprised of mottled red and yellow texture-contrast soils, with shallow red earths along ridges and yellow texture contrast soils on slopes.
- Vegetation – Mature, native species which would have been present within the heritage study area in antiquity would have provided seasonal resources for Aboriginal people in the past. Given the near total absence of mature native vegetation within the heritage study area resulting from significant disturbance resulting from current and 19th century mining activities, culturally modified trees (scarred or carved) are unlikely to be present.
- Climate – The climate would not have been an impediment to year-round occupation.
- Land use – High levels of ground surface disturbance exist throughout the heritage study area, with little undisturbed land considered to remain. Activities such as vegetation clearance, cultivation and grazing would have displaced Aboriginal objects and are likely to have reduced the potential for subsurface archaeological material. However, disturbance at a given location does not necessarily mean that there would be no cultural material present, as often a disturbed context would reveal objects which may have previously been at a subsurface level. As noted above, initial vegetation clearing would also have removed culturally modified trees.

7.3.4 Management and Mitigation Measures

All heritage related management and mitigation measures identified in RWC (2010a) and the approved *Aboriginal Heritage Management Plan* for the Mine would continue to be implemented. In addition, the Applicant would implement the following recommendations as outlined in Lantern (2022).

- Undertake a program of test excavation to determine the nature and extent of archaeological deposits within DGM PAD 22-1 prior to ground surface disturbance.

The Applicant notes that, should the Proposed Modification be approved, the *Aboriginal Heritage Management Plan* for the Mine required under *Schedule 5, Condition 4(d)* of MP10_0054 would need to be reviewed and, if necessary, revised. The recommendation for a program of test excavation and any findings would also be incorporated into the revised *Aboriginal Heritage Management Plan* as required.

7.3.5 Assessment of Impacts

7.3.5.1 Introduction

Lantern (2022) undertook an assessment of both Aboriginal and historic heritage within the heritage study area. The following subsections provide a summary of the survey methodology and results.

7.3.5.2 Aboriginal Heritage

Desktop Database Search

A desktop search was conducted to identify any potential previously recorded Aboriginal heritage within or in the vicinity of the heritage study area. The results of this search are summarised as follows.

The search of the Aboriginal Heritage Information Management System (AHIMS) database on 2 December 2021 returned nine records for Aboriginal heritage sites within an area of latitude -35.58 to -35.52 and longitude 149.69 to 149.82 centred over the heritage study area. Seven of these identified sites are within the Mine Site, however, none are located within the heritage study area.

Searches of the Australian Heritage Database and the NSW State Heritage Inventory were also undertaken on 2 December 2021. Results showed that no Aboriginal places are listed on either heritage register within or adjacent to the heritage study area.

As shown in **Table 16**, artefact scatters are the dominant recorded site type in the local area. Other site types include two isolated artefacts, one isolated artefact site and potential archaeological deposit (PAD) and one reburial site. The reburial site contains repatriated artefacts which were salvaged from the surface of GT 0S1 on 9 June 2017 to avoid impacts associated with activities approved under Modification 3 to MP10_0054 (see Section 3.4.1 of the approved *Aboriginal Heritage Management Plan* for the Mine).

Table 16
AHIMS Database Results

Site Type	Total
Artefact scatter	5
Isolated artefact	2
Reburial site	1
Isolated artefact and PAD	1
Source: Lantern (2022) – after Table 3	

Predictive Model

Based on knowledge of the environmental contexts of the heritage study area and a desktop review of the known local and regional archaeological records, the following presents the predictions made concerning the probability of those site types being recorded within the heritage study area.

- Isolated Artefacts – Noting that three isolated artefacts have been recorded Mine Site, and that isolated finds can occur anywhere, particularly within disturbed contexts, it is predicted that this site type could be recorded within the heritage study area.
- Stone Artefact Scatters – Characterised by a concentration of stone flakes, stone artefact scatters generally occur in association with resources such as major water sources. As the study area is in the vicinity of five permanent water sources, stone artefact scatters are likely to occur within the heritage study area.
- PAD – Comprising of buried archaeological materials, or soils and sediment thought to contain buried archaeological materials, PADs can occur in areas of sedimentary aggradation within depositional environments. As PADs are likely to be observed in areas of active erosion, this site type is likely to occur within the heritage study area, particularly in associated with gentle slopes overlooking water courses.
- Aboriginal Scar Trees – This site type may occur within areas where old-growth, mature vegetation persists. As the heritage study is located within predominately disturbed land, it is considered unlikely that this site type would be recorded.
- Heaths / Ovens – This site type is considered possible in areas where A-Horizon soils are relatively undisturbed. However, given the high levels of disturbance across the heritage study area, and that no sites of this type have been recorded within or in the vicinity of the study area, the likelihood of identifying this site type is significantly reduced.
- Ceremonial Places – This site type does not necessarily follow landform predictability and are, overall, a rare site type with a low likelihood of being present and remaining extant. It is noted that no ceremonial places have been recorded within or in the vicinity of the study area, however a stone arrangement has been recorded north of Braidwood at a distance of more than 12km from the Mine Site.

- Grinding Grooves / Quarries – These site types are usually found in conjunction and are likely occur in areas of rocky outcrops. It is considered that there is a moderate likelihood for these site types to be recorded.
- Burials - Potential burials are more likely to be found on elevated sandy contexts or in association with rivers and major creeks. While these landscape features exist within the heritage study area, acidic soils such as those overlying granites are not conducive to bone preservation. Therefore, burials are unlikely to occur.
- Shell Middens – This site type is characterised by evidence of collected, eaten and discarded shellfish. Middens may also contain other materials such as stone artefacts, faunal remains or charcoal from cooking. This site type is unlikely to occur in upland areas, particularly those with acidic soils.

Field Survey Results

Field survey of the heritage study area was conducted over two days on 9 March 2022 and 31 March 2022. The first day of survey covered the initial Proposed Dam and ancillary infrastructure disturbance footprint, while the second day of survey covered the final disturbance footprint design. The initial survey was attended by two archaeologists from Lantern Heritage and one Aboriginal Officer from Mogo LALC, while the second survey was attended by one archaeologist from Lantern Heritage and one Aboriginal Officer from LALC.

One site characterised as a potential archaeological deposit (DGM PAD 22-1) was identified during the field surveys (**Figure 7**). The site measures approximately 265m (north-south) by 180m (east-west) and is located on a gently inclined landform in close proximity to a permanent water source. Various micro-topographic elevated raises located adjacent to minor drainage lines representing the areas of highest archaeological potential within the site. No Aboriginal objects were directly observed at the site due to poor visibility as a result of waterlogged soils and thick grasses.

It is noted that a number of AHIMS sites are recorded in the vicinity of DGM PAD 22-1 along the banks of Spring Creek, which likely eroded out of surrounding soil deposits. Given the range of historical impacts from 19th century gold mining along Spring Creek, it is possible that these artefacts were originally situated within or in the vicinity of DGM PAD 22-1 before being distributed downslope via a combination of human and natural forces.

Considering the above, DGM PAD 22-1 is assumed to have moderate potential for subsurface archaeological material.

Due to the proposed disturbance footprint of approximately 10ha, poor surface visibility and lack of subsurface archaeological investigations in the immediate area, Lantern (2022) recommends undertaking test excavation within the site to determine the nature and extent of archaeological deposits within DGM PAD 22-1 prior to any ground disturbing activities.

Statement of Significance

The statement of significance for DGM PAD 22-1 presented as **Table 17** was compiled based on Aboriginal consultation, along with the research and accompanying archaeological analysis presented in Appendix 2 of Lantern (2022).

Table 17
Statement of Significance for DGM PAD 22-1

Site	Statement of Significance
DGM PAD 22-1	The site is part of a broader complex of sites and associated cultural landscape that is assessed to be of moderate Aboriginal cultural value. It has low significance in terms of social / cultural values. It has moderate significance in terms of aesthetic values relating to its position within the broader landscape. It also has moderate scientific value as a site that can contribute to an understanding of Aboriginal occupation of the Southern Highlands which little is yet known.
Source: Lantern (2022) – after Table 6	

Impact Assessment

It is considered that the surface disturbance associated with construction of the Proposed WSD and ancillary infrastructure would result in a range of impacts across an area of approximately 10ha. An overview of these impacts and their extent is provided as **Table 18**.

Table 18
Assessment of Archaeological Impacts

Action/Works	Impact Type	Comments
Site preparation earthworks	Direct	Extensive earthworks will occur to surface and subsurface deposits within the area of the proposed WSD.
	Indirect	Transport and stockpiling of materials may result in indirect impacts.
Placement of Water Pipeline	Direct	Placement of water pipeline across the ground surface may result in direct impacts.
	Indirect	Transport and placement of water pipeline may result in indirect impacts.
Underground pipeline trench	Direct	Excavation of underbore for water pipeline will result in ground disturbance.
	Indirect	Installation of underground services will result in chang4es to subsurface drainage which may result in indirect impacts to subsurface deposits.
Source: Lantern (2022) – after Table 8		

Lantern (2022) notes that the placement of the proposed water pipelines at surface would result in minimal impacts to Aboriginal heritage items and values, however, construction of the proposed WSD would result in direct impacts to any surface or subsurface archaeological materials within the dam footprint. While there would be an increase in direct harm to the archaeological deposits within this area, the extent of the archaeological deposits is currently unknown. Notwithstanding, these impacts would result in the loss of scientific / research potential of these deposits.

It is noted that the social and cultural values of DGM PAD 22-1 have already been significantly impacted by the historic displacement of local Aboriginal people from the area, along with the area surrounding DGM PAD 22-1 being cleared and developed. As a result, it is considered that impacts to historic and heritage values would be minimal, and the proposed activities would not result in any net increase to loss of cultural heritage significance.

7.3.5.3 Historical Heritage

Desktop Database Search

A search of the Australian Heritage Database and the NSW State Heritage Inventory was undertaken on 2 December 2021 in conjunction with desktop searches for items or places of Aboriginal Heritage. Results showed that no historic items or places are listed on either heritage register within or adjacent to the heritage study area.

Field Survey Results

No structures, relics or potential sites of historical significance were identified within the heritage study area during field surveys.

7.3.5.4 Conclusion

Activities associated with the Proposed Modification would result in direct harm to DGM PAD 22-1. As noted by Lantern (2022), this site is considered to be of low social and cultural value. However, the scientific significance of the site is unknown and test excavations prior to surface disturbance works are required to determine the type, extent and nature of the subsurface archaeological deposit.

Notwithstanding, all RAPs agreed that the Proposed Modification would have limited impacts and would not result in a loss of cultural heritage significance.

7.4 Transportation

7.4.1 Introduction

A Traffic Impact Assessment was undertaken by The Transport Planning Partnership (TTPP) to assess the potential impact of the Proposed Modification on local traffic and the road network. This report, hereafter referred to as TTPP (2022), is summarised in the following subsections and presented as **Appendix 7**.

The following subsection provides an overview of the existing environment with respect to transportation surrounding the Project Site. Potential impacts from the Proposed Modification are presented, and management and mitigation measures are proposed to reduce or prevent these impacts. This is followed by discussion of any residual impacts relating to the Proposed Modification.

7.4.2 Local Setting and Existing Traffic Environment

Heavy vehicles access and exit the Project Site via the approved heavy vehicle access route (**Figure 5**) which includes the following public roads.

- Majors Creek Road
- Araluen Road
- Captains Flat Road

- Coghill Street
- Wallace Street
- Solus Street
- Kings Highway

Condition 41(a) of MP10_0054 permits the despatch of four concentrate trucks per hour, equivalent to a limit of eight concentrate truck movements per hour (i.e. four unladen inbound and four laden outbound). Assuming that the transportation of concentrate was undertaken at the approved maximum hourly rate continuously throughout the hours permitted, the Mine could generate a maximum of 120 concentrate truck trips per day (60 unladen inbound and 60 laden outbound) Monday to Saturday during school holidays. This maximum transportation rate would be reduced to 92 concentrate truck movements per day (46 unladen inbound and 46 laden outbound) on school days, and 112 truck trips (56 unladen inbound and 56 laden outbound) on Sundays.

Condition 41 of MP10_0054 does not limit the number of vehicle movements permitted for trucks other than concentrate trucks (e.g. rigid and articulated heavy vehicles required for irregular product deliveries and mobile equipment transportation).

Table 19 presents a summary of the traffic-related impacts associated with the approved Project and the Proposed Modification.

Table 19
Summary of Approved and Modification Traffic Generation Implications

Component	Approved	Modification
Ore Processing over Life of Mine	1.6Mt	
Life of the Project	To 30 June 2025	
Maximum Annual Ore Processing	355 000tpa	415 000tpa
Water Transportation	-	Maximum 10 loads per day (20 movements per day) when required
Maximum Laden Truck Movements	4 per hour concentrates despatch	4 per hour concentrates despatch and water importation
Maximum Daily Laden Truck Movements	120 Monday to Saturday 112 Sundays and public holidays 92 school days	120 Monday to Saturday 112 Sundays and public holidays 92 school days
Transportation Hours	7:00am to 10:00pm Monday to Saturday 8:00am to 10:00pm Sundays and public holidays	
Heavy Vehicle Movements Prohibited Hours	7:00am to 8:30am and 3:00pm to 5:00pm on school days	
Source: TTPP (2022) – After Table 2.1		

7.4.2.1 Road Standards – Level of Service

Level of Service (LOS) is used as a performance standard for roads and intersections and is a qualitative assessment of the operational conditions within a traffic stream as perceived by drivers or passengers. LOS is described in terms of factors such as speed, travel time, comfort, convenience, traffic interruptions, freedom to manoeuvre and safety. There are six Levels of Service for roads, ranging from A (i.e. free flow) to F (i.e. forced or breakdown flow). The desirable LOS for rural roads is C or above.

Austroads (2020a) refers to the Highway Capacity Manual (HCM), which defines three classes of road:

- Class I – roads on which motorists expect to travel at relatively high speeds, mostly serving long-distance movements or connecting links between facilities that serve long-distance movements;
- Class II – roads on which motorists do not necessarily expect to travel at high speeds, acting as access routes to Class I facilities, scenic routes or pass through rugged terrain; and
- Class III – roads that serve developed areas, and may be portions of Class I or Class II highways that pass through small towns or developed areas.

Majors Creek Road is considered a Class II road. On Class II roads, LOS is defined only in terms of Percent Time Spent Following (PTSF). PTSF is a measure of the level of opportunities a motorist has to overtake, and is estimated from the demand traffic volumes, the directional distribution of that traffic, and the percentage of no-passing zones. Existing Road Conditions. LOS criteria for Class II roads is presented in **Table 20**.

Table 20
LOS Criteria for Class II Two-Lane Two-Way Roads

Level of Service	Percent Time Spent Following
A	≤ 40
B	> 40 – 55
C	> 55 – 70
D	> 70 – 85
E	≥ 85
F	Forced or breakdown flow.
Source: TTPP (2022) – After Table 4.5	

7.4.2.2 Existing Road Conditions

The local road network used by Project related vehicles is presented on **Figure 5** and is detailed as follows.

Majors Creek Road

- Majors Creek Road is a two lane, sealed rural road that connects the village of Majors Creek to Araluen Road (a distance of approximately 11.85km).

- Majors Creek Road typically has a sealed pavement generally 5.8m wide with gravel shoulder on both sides of between 1.0m and 1.5m. The Applicant has previously funded road upgrades to provide line markings and pavement widening in accordance with the minimum width requirement of the Road Design Guide for annual average daily traffic (AADT) flows of 150 to 500 vehicles.
- Majors Creek Road currently operates with a LOS A.

Araluen Road

- Araluen Road is a two lane, sealed rural road. The distance between Majors Creek Road and Captains Flat Road is approximately 1km.
- Araluen Road is 6.2m wide with a sealed pavement and gravel shoulders of between 1.5m and 2.0m. Araluen Road is considered to meet the minimum pavement width requirement of the Road Design Guide for the AADT flows of 500 to 2000 vehicles, namely 2 x 3m or 3.5m lane width. The Applicant has previously funded upgrades to the shoulder arrangement of Araluen Road to meet Road Design recommendations.
- Araluen Road currently operates with a LOS A.

Captains Flat Road

- Captains Flat Road is a two lane, sealed rural road. The distance between Araluen Road and Coghill Street is approximately 2km.
- Captains Flat Road maintains a 7.0m wide sealed pavement with gravel shoulders of variable widths. Captains Flat Road is considered to meet the minimum pavement width requirement of the Road Design Guide for the AADT flows of 500 to 2000 vehicles, namely 2 x 3m or 3.5m lane width. The Applicant has previously funded upgrades to the shoulder arrangement of Captains Flat Road to meet Road Design recommendations.
- Captains Flat Road currently operates with a LOS A.

Coghill Street / Wallace Street

- Coghill and Wallace Streets are town roads within the Braidwood township with 50km/hr speed limits. Both streets form part of a regional road that connects to the Kings Highway at Lascelles Street and form part of the school bus route to Captains Flat Road, Araluen Road and Majors Creek Road.
- Coghill Street between Bombay Street and Wallace Street provides a sealed road pavement for two lanes of traffic and wide shoulders. Both roads provide the pavement width and wide shoulders nominated as standard for rural town roads.
- Both Coghill and Wallace Streets operate with a LOS A.

Kings Highway

- Kings Highway is typically a two lane, sealed State road, that connects Batemans Bay and Queanbeyan via Braidwood and Bungendore.
- Kings Highway typically has wide sealed shoulders, centre linemarking, edgelines and raised reflective pavement markers. Within Braidwood, the highway is also known as Lascelles Street and Wallace Street. In the vicinity of Braidwood, Kings Highway has a posted speed limit of 80 kilometres per hour (km/h), reducing to 50 km/h within Braidwood. A 40 km/h school zone speed limit applies between McKellar Street and Wilson Street.

7.4.2.3 Operational Intersections

As all Project-generated heavy vehicles would use the existing intersection of Majors Creek Road with the Site Access Road, its geometry has been reviewed. Austroads (2020b) sets out warrants for greenfields rural intersection treatments, which focus on safety performance outcomes and are based on the peak hourly number of turning and through vehicle movements at the intersection (TTPP, 2022).

7.4.2.4 Traffic Volume and Composition

Table 21 presents traffic survey data provided by Queanbeyan-Palerang Regional Council to TTPP from surveys conducted between April 2020 and June 2020 on Majors Creek Road (west of Araluen Road and at between Jembaicumbene Creek bridge and Morgans Road). The data suggest that Majors Creek Road carries in the order of 40 to 50 vehicles per hour during weekday peak hours, with articulated vehicles representing 2 to 3 percent of total traffic.

Table 21
Traffic Volume Data April 2020 – June 2020

Survey Location	Composition	Average Vehicle Movements (two way)			
		Daily	Weekday	Weekday AM Peak Hour	Weekday PM Peak Hour
Majors Creek Road west of Araluen Road	87.8% light	565	532	42	48
	10.1% rigid				
	2.1% articulated				
Majors Creek Road south of Morgans Road	83.9% light	491	519	40	45
	13.2% rigid				
	2.9% articulated				
Source: Queanbeyan-Palerang Regional Council (2022)					

TTPP conducted additional traffic surveys for one week from Wednesday 3 February 2022 to Tuesday 8 February 2022 inclusive on the Site Access Road and Majors Creek Road north of Monga Lane. Automatic tube counters were used to quantify existing traffic conditions in the vicinity of the Project and assess the contributions of the Project to existing traffic. Recorded traffic volumes and compositions are presented in **Table 22** and **Table 23**.

Table 22
Two Way Daily Traffic Volumes - February 2022

Road	Vehicle Movements per Day						
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Site Access Road	207	228	274	248	198	125	112
Majors Creek Road	652	592	716	762	675	433	425
Source: TTPP (2022) – After Table 3.4							

Table 23
Average Daily Traffic Composition February 2022

Road and Location	Light Vehicles (%)	Rigid Heavy Vehicles (%)	Articulated Heavy Vehicles (%)
Site Access Road	81.7	13.2	5.1
Majors Creek Road north of Site Access Road	83.9	13.9	2.2
Source: TTPP (2022) – After Table 3.5			

The data presented in **Table 22** demonstrates that traffic conditions on both the Site Access Road and Majors Creek Road during February 2022 were notably different between weekdays and weekend days (TTPP, 2022). The majority of the rigid vehicles on both surveyed roads were two-axle trucks/buses, which includes longer wheelbase utilities and 4WDs that are often used in mining and rural settings (TTPP, 2022). Although identified as heavy vehicles by the Austroads Classification System, many of these vehicles have a Gross Vehicle Mass of below 4.5 tonnes, and so are generally considered as light vehicles (TTPP, 2022).

Throughout the surveyed week, the morning peak hour for traffic on the Site Access Road consistently occurred between 6:00am and 7:00am, and the evening peak hour occurred between 6:00pm and 7:00pm every day except Tuesday, when it occurred between 5:00pm and 6:00pm (TTPP, 2022). **Table 24** presents the two-way peak hourly traffic volume recorded each day on the Site Access Road.

Table 24
Two-Way Site Access Road Peak Hour Traffic 2022

Day	AM Peak Hour* (vehicle movements per hour)				PM Peak Hour** (vehicle movements per hour)			
	Light	Rigid	Articulate	Total	Light	Rigid	Articulate	Total
Monday	44	6	0	50	33	4	0	37
Tuesday	58	2	0	60	42	3	2	47
Wednesday	51	8	1	60	36	4	0	40
Thursday	47	8	0	55	35	5	0	40
Friday	48	2	0	50	27	3	0	30
Saturday	30	2	0	32	29	1	0	30
Sunday	29	2	0	31	37	1	0	38
Average Day	44	4	0	48	34	3	0	37
Average Weekday	50	5	0	55	35	4	0	39
*AM Peak Hour occurred 6:00am to 7:00pm everyday **PM Peak Hour occurred 5:00pm to 6:00pm or 6:00pm to 7:00pm								
Source: TTPP (2022) – After Table 3.8								

Mine-generated traffic varies throughout the day due to the arrivals and departures of the workforce, and the permitted hours for concentrates transport and heavy vehicle movements. For the purposes of the traffic impact assessment, TTPP (2022) considered the following four periods with respect to Mine-generated traffic.

- AM peak hour – 6:00am to 7:00am
- Daytime hours – between 7:00am and 5:00pm
- PM peak hours – occurs between 5:00pm and 7:00pm
- Night time hours – between 7:00pm and 10:00pm

Table 25 presents the peak hourly two-way traffic volumes recorded on the Site Access Road during each of the above periods over the average weekday. TTPP (2022) used the average weekday as the basis for assessment as traffic generation during weekend days is significantly lower than weekdays.

Table 25
Average Weekday Surveyed Mine-Generated Hourly Traffic 2022

Assessment Period	Vehicle Movements per Hour							
	Light		Rigid		Articulated		Total	
	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
AM Peak Hour[1]	41	9	4	1	0	0	45	10
Daytime[2]	10	1	1	1	0	0	12	2
PM Peak Hour[3]	11	24	1	3	0	0	12	27
Night Time[4]	1	4	1	0	1	0	2	4
Note 1: AM peak hour – 6:00am to 7:00am Note 2: Daytime hours – between 7:00am and 5:00pm Note 3: PM peak hours – occurs between 5:00pm and 7:00pm Note 4: Night time hours – between 7:00pm and 10:00pm								
Source: TTPP (2022) - After Table 3.9								

Comparison between the surveyed traffic volumes on the Site Access Road and those on Majors Creek Road north of the Project Site suggest that while the majority of Mine-generated traffic approaches and departs to and from the north, small numbers of non-articulated vehicles approach and depart to and from the south. All articulated vehicles on the Site Access Road are also recorded on Majors Creek Road to the north of the Project Site, consistent with the use of the approved route to/from the north only by trucks carrying concentrate (TTPP, 2022).

Articulated vehicles are used for the transport of ore concentrates from the Project Site. As shown in **Table 26**, the Project currently generates an average of ten articulated vehicle movements per day (five inbound and five outbound). Over the surveyed week, a total of 35 articulated vehicles were recorded departing the Project Site, with a maximum of two articulated vehicle departures during any one hour. This is consistent with the consent which allows a maximum of four departures by concentrates trucks per hour (TTPP, 2022). The number of articulated vehicle arrivals, which is not constrained by consent conditions, varied between zero and three arrivals during any one hour over the surveyed week (TTPP, 2022).

Table 26
Surveyed Site Access Road Daily Two-Way Traffic 2022 (vehicles per day)

Day	Vehicle Movements per Day			
	Light	**Rigid**	**Articulated**	**Total**
Monday	173	24	10	207
Tuesday	189	23	16	228
Wednesday	208	53	13	274
Thursday	184	43	21	248
Friday	170	18	10	198
Saturday	106	18	1	125
Sunday	107	5	0	112
Average Day	**162**	**26**	**10**	**199**
Average Weekday	**185**	**32**	**14**	**231**
Source: TTPP (2022) – After Table 3.6				

7.4.2.5 Background Traffic Growth

A future horizon of 2025 was adopted, being the final year of the approved life of the Project. TTPP (2022) assumed an average traffic growth rate of 2.0% per annum on the approved transportation route between 2022 and 2025 to estimate future background traffic growth. It is noted that this growth rate was also applied to existing Project-related traffic as surveyed in 2022 and therefore conservatively assumes that Project-related traffic would also increase at the same rate as background traffic, resulting in an overestimate of future traffic (TTPP, 2022).

7.4.2.6 Baseline Future Traffic Conditions Under Existing Approval

Without the proposed modification, the volume of traffic generated by the Mine would continue at its existing levels, noting that the surveys recorded articulated vehicle volumes being below those permitted for the transport of concentrates under Condition 41 of MP10_0054.

Table 27 compares the surveyed hourly traffic volumes with those that could be expected with the maximum permitted number of articulated vehicle movements per hour for concentrates transportation. The baseline traffic forecasts for 2022 to 2025 at maximum concentrate transportation levels (at the approved 355 000tpa processing rate) assume that the following vehicle movements coincide with the busiest hour of each assessment period.

- Surveyed peak hourly light and rigid heavy vehicle movements.
- Up to four laden articulated vehicles exiting and four unladen articulated vehicles entering the Project Site (i.e. concentrate transport vehicles).
- Up to one articulated vehicle associated with general deliveries entering and existing the Project Site in one hour.

TTPP (2022) note that maximum number of concentrate truck departures cannot coincide with the morning peak hour for Mine-generated traffic as the morning peak hour consistently occurs earlier than the arrival or departure of heavy vehicles and concentrate trucks is permitted.

Table 27
Surveyed and Future Mine-Generated Peak Hour Traffic

Assessment Period	Vehicle Movements per Hour							
	Light		Rigid		Articulated		Total	
	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
Surveyed 2022								
AM Peak Hour[1]	41	9	4	1	0	0	45	10
Daytime[2]	10	1	1	1	0	0	12	2
PM Peak Hour[3]	11	24	1	3	0	0	12	27
Night Time[4]	1	4	1	0	1	0	2	4
Baseline 2022 to 2025 at Maximum Hourly Concentrates Transportation (355 000tpa)								
AM Peak Hour[1]	41	9	4	1	0	0	45	10
Daytime[2]	10	1	1	1	4	4	16	6
PM Peak Hour[3]	11	24	1	3	4	4	16	31
Night Time[4]	1	4	1	0	4	4	6	8
Note 1: AM peak hour – 6:00am to 7:00am Note 2: Daytime hours – between 7:00am and 5:00pm Note 3: PM peak hours – occurs between 5:00pm and 7:00pm Note 4: Night time hours – between 7:00pm and 10:00pm								
Source: TTPP (2022) – After Tables 3.9 and 4.1								

Table 28 presents the average weekday traffic expected to be generated by the Project:

- based on 2022 traffic survey data recorded by TTPP;
- at the approved maximum ore processing rate (355 000tpa) on an average day; and
- for a 'maximum' weekday which assumes the continuous loading and departure of concentrate trucks within an hour throughout the permitted concentrate transportation hours on a school holiday weekday.

TTPP (2022) note that the 'maximum' weekday scenario represents the theoretical maximum daily concentrate truck movement generation and is considered to overestimate the number of concentrate vehicle movements that would realistically occur on any one day. Based on **Table 28**, TTPP (2022) concluded that the surveyed vehicle movements in 2022 were generally consistent with average daily concentrate transportation movements expected under the existing approved conditions.

Table 28
Baseline Daily Mine-Generated Traffic

Traffic Levels	Vehicle Movements per Day				
	Light Vehicles	Rigid Vehicles	Articulated Vehicles (Concentrate Transportation)	Articulated Vehicles (Other)	Total Vehicles
Surveyed 2022 Traffic Data	185	32	8	6	231
Baseline 2022 to 2025 Traffic (355 000tpa)	185	32	7	6	230
Maximum Concentrate Transportation[1]	185	32	120	6	343
Note 1: assumes the continuous loading and departure of concentrate trucks within an hour throughout the permitted concentrate transportation hours on a school holiday weekday.					
Source: TTPP (2022) – After Table 4.2					

7.4.2.7 Road Safety

TTPP (2022) obtained information from Transport for NSW (TfNSW) pertaining to road crashes on roads forming part of the approved heavy vehicle access route between January 2016 and December 2020. During this period, a total of 17 road crashes were recorded on roads which form part of the approved heavy vehicle access route, 11 of which occurred in 50km/h speed limit areas. No crashes were recorded on or near the intersection of Majors Creek Road and the Site Access Road, with the majority of crashes recorded on Kings Highway and on dry, sealed roads. No fatalities were recorded.

7.4.3 Management and Mitigation Measures

No additional transport or road safety related management and mitigation measures would be required as a result of the Proposed Modification (TTPP, 2022). The Applicant would continue to implement all management and mitigation measures identified in RWC (2010a) and the approved *Traffic Management Plan – Revision 5* (TMP) for the Project.

7.4.4 Assessment of Impacts

7.4.4.1 Future Traffic Volumes

The impact of the Proposed Modification on the peak hourly traffic volumes during each of the four assessment periods is summarised in **Table 29**. The predicted traffic volumes for each assessment period assume that the maximum permitted concentrates and water transportation may coincide with the busiest hour during each of those periods, with the exception of the AM peak hour, which occurs earlier than the approved hours for concentrates and water transportation (TTPP, 2022).

As demonstrated by **Table 29**, the maximum number of articulated vehicle movements with the Proposed Modification would be the same as those expected under the existing approved transportation conditions for the Project (TTPP, 2022). Given that the Proposed Modification would not increase movements of other vehicle types associated with the Project, the Proposed Modification would therefore have no impact on the future peak hourly movements generated by the Project (TTPP, 2022).

Table 30 summarises the impact of the Proposed Modification on daily traffic volumes on the Site Access Road and Majors Creek Road compared with baseline conditions.

Table 29
Impact of Proposed Modification on Peak Hourly Traffic Volumes 2025

Assessment Period*	Vehicle Movements per Hour									
	Light		Rigid		Articulated (Concentrate and Water)		Articulated (Other)		Total	
	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
Site Access Road - Baseline at Maximum Ore Processing Rate 355 000tpa										
AM Peak Hour[1]	41	9	4	1	0	0	1	1	46	11
Daytime[2]	10	1	1	1	4	4	1	1	17	7
PM Peak Hour[3]	11	24	1	3	4	4	1	1	17	32
Night Time[4]	1	4	1	0	4	4	1	1	6	9
Site Access Road - Baseline at Maximum Ore Processing Rate 415 000tpa										
AM Peak Hour[1]	37	23	3	7	0	0	1	1	46	11
Daytime[2]	18	25	3	7	4	5	1	1	17	7
PM Peak Hour[3]	35	22	1	7	5	4	1	1	17	32
Night Time[4]	10	6	1	2	4	4	1	1	6	9
Majors Creek Road - Baseline at Maximum Ore Processing Rate 355 000tpa										
AM Peak Hour[1]	37	23	3	7	0	0	1	1	41	31
Daytime[2]	18	25	3	7	4	5	1	2	26	38
PM Peak Hour[3]	35	22	1	7	5	4	2	1	42	34
Night Time[4]	10	6	1	2	4	4	2	1	17	13
Majors Creek Road - Baseline at Maximum Ore Processing Rate 415 000tpa										
AM Peak Hour[1]	37	23	3	7	0	0	1	1	41	31
Daytime[2]	18	25	3	7	4	5	1	2	26	38
PM Peak Hour[3]	35	22	1	7	5	4	2	1	42	34
Night Time[4]	10	6	1	2	4	4	2	1	17	13

Note 1: AM peak hour – 6:00am to 7:00am
Note 2: Daytime hours – between 7:00am and 5:00pm
Note 3: PM peak hours – occurs between 5:00pm and 7:00pm
Note 4: Night time hours – between 7:00pm and 10:00pm

Source: TTPP (2022) – After Table 5.3

Table 30
Impact of Proposed Modification on Daily Traffic Volumes 2025 (vehicles per day)

Assessment Period	Vehicle Movements per Day				
	Light	Rigid	Articulated (Concentrate and Water)	Articulated (Other)	Total
Site Access Road - Baseline at Maximum Ore Processing Rate 355 000tpa					
Average Weekday[1]	185	32	7	6	230
Maximum Weekday[2]	185	32	120	6	343
Site Access Road – Proposed Modification at Maximum Ore Processing Rate 415 000tpa					
Average Weekday[1]	185	32	9	6	232
Average Weekday with Maximum Daily Water Transportation[3]	185	32	29	6	252
Maximum Weekday[2]	185	32	120	6	343
Majors Creek Road - Baseline at Maximum Ore Processing Rate 355 000tpa					
Average Weekday[1]	541	105	7	11	720
Maximum Weekday[2]	597	105	120	11	833
Majors Creek Road – Proposed Modification at Maximum Ore Processing Rate 415 000tpa					
Average Weekday[1]	541	105	9	11	722
Average Weekday with Maximum Daily Water Transportation[3]	597	105	29	11	742
Maximum Weekday[2]	597	105	120	11	833

Note 1: Average daily concentrate at maximum annual ore processing rate and maximum daily water transportation.

Note 2: School holiday weekday with maximum hourly concentrate and water truck movements throughout approved transportation hours.

Note 3: Includes 10 laden articulated water trucks (20 movements) per day.

Source: TTPP (2022) – After Table 5.4

7.4.4.2 Midblock Level of Service

TTPP (2022) stipulates that formal analysis of the impact of the Proposed Modification on the midblock level of service is not warranted as the Proposed Modification would not alter the maximum number of vehicle movements generated by the Project in any one hour. **Table 31** presents the average weekday midblock LOS on Majors Creek Road north of Project Site. The results indicate that the LOS experienced by drivers during peak hours on Majors Creek Road would not be impacted by the Proposed Modification (TTPP, 2022). The LOS on Majors Creek Road would remain good (LOS A), with drivers experiencing minimal delays due to interactions with other traffic (TTPP, 2022).

Table 31
Average Weekday Midblock Level of Service – Majors Creek Road North of Mine 2022

	Baseline 2025 at Maximum Concentrate Transportation				Proposed Modification 2025 at Maximum Concentrate and Water Transportation			
	Inbound		Outbound		Inbound		Outbound	
Time Period*	PTSF[5]	LOS[6]	PTSF	LOS	PTSF	LOS	PTSF	LOS
AM Peak Hour[1]	34.1	A	26.2	A	34.1	A	26.2	A
Daytime[2]	23.2	A	36.1	A	23.2	A	36.1	A
PM Peak Hour[3]	33.2	A	26.8	A	33.2	A	26.8	A
Night Time[4]	32.1	A	22.4	A	32.1	A	22.4	A
Note 1: AM peak hour – 6:00am to 7:00am Note 2: Daytime hours – between 7:00am and 5:00pm Note 3: PM peak hours – occurs between 5:00pm and 7:00pm Note 4: Night time hours – between 7:00pm and 10:00pm Note 5: PTSF = percent time spent following Note 6: Level of Service								
Source: TTPP (2022) – After Table 5.5								

7.4.4.3 Intersections

As the Proposed Modification would not alter the maximum number of vehicle movements generated by the Project in any one hour, it would have no impact on peak hour conditions at any intersections along the transportation route (TTPP, 2022). The future peak hourly volumes are expected to remain well below the threshold volumes for analysis, and as such, there is no capacity concern regarding the operation of the Project access intersection. Similarly, the background traffic volumes on the other roads in the region and along the approved transportation route are sufficiently low that no issues are envisaged with intersection capacity or vehicle delays, and the Proposed Modification would have no impact on the hourly traffic volumes at those intersections (TTPP, 2022).

Considering the peak hourly volumes during the four assessment periods under investigation, and the likely distribution of traffic suggested by the traffic survey results, the existing and forecast peak hourly traffic volumes with the Proposed Modification warrant the minimum preferred treatments at Majors Creek Road at the Site Access Road (TTPP, 2022). Similarly, the minimum preferred treatment is warranted at the intersection of Araluen Road and Majors Creek Road, which the Project contributes to with regards to demand on the turning movements.

The general minimum preferred treatment at rural road intersections are Basic Auxiliary Left (BAL) and Basic Auxiliary Right (BAR) treatments. The existing layout of the Majors Creek Road and Araluen Road intersection meets or exceeds the minimum treatments warranted via the provision of auxiliary right turn (AUR) and basic left turn treatment (BAL) in Majors Creek Road (TTPP, 2022). As required by MP10_0054, the Site Access Road and Majors Creek Road intersection was constructed in accordance with the relevant standards and to the satisfaction of Queanbeyan-Palerang Regional Council (TTPP, 2022).

As the Proposed Modification would not change the maximum number of vehicles turning at any intersection during any one hour compared with the approved conditions, no alterations to the intersection layout are warranted on the basis of either the Austroads guidelines or changed traffic demands (TTPP, 2022).

7.4.4.4 Road Safety

A review of the road crash history of the approved transportation route did not highlight any clustering of crashes that might suggest an inherent concern with the design of the road at that location with regard to road safety that could be exacerbated by the Project (TTPP, 2022).

7.4.4.5 Conclusions

No changes to the operational workforce at the Project Site are proposed, therefore it would not result in any change to the existing light vehicle and workforce bus movement generation (TTPP, 2022). Similarly, no changes to the total amount of ore to be processed are proposed, however the maximum annual processing rate is proposed to be increased from 355 000tpa to 415 000tpa. Therefore, the total number of truck movements generated by the transportation of concentrates over the life of the Project would not increase, but the demand for concentrates transport in any one year may increase (TTPP, 2022). As the total would be unaltered, any increase in transportation one year would be offset by a decrease another year (TTPP, 2022).

A maximum of 10 loads of water transported per day would be generated by the Proposed Modification. This would only occur when required, noting that it is expected that the number of water loads required on any one day would vary, with water transportation taking place on a campaign basis and occurring over distinct, short periods, rather than being an ongoing day-to-day activity.

It is proposed that the existing limit of four laden concentrate truck departures per hour permitted by Condition 41(a) would be modified to permit up to four laden trucks to be despatched from or received at the Project Site per hour. The laden trucks would be inclusive of both concentrate truck departures and emergency water truck arrivals when required. Each despatch of a concentrates transport truck would be matched by the arrival of an empty truck, and each arrival of a laden water truck at the Project Site would be matched by the departure of an empty truck. With four laden truck arrivals or departures permitted in one hour, the transportation limit would therefore remain at eight truck movements per hour, being four inbound and four outbound movements. The Proposed Modification would therefore not alter the maximum number of heavy vehicle movements generated by the Project in any one hour compared with the existing approved conditions (TTPP, 2022). The existing limits on transportation hours would apply to both concentrate trucks and emergency water trucks.

TTPP (2022) concluded that the Proposed Modification would not change the maximum number of vehicle movements generated during any one hour, nor the number of laden heavy vehicle movements generated over the life of the Project. A maximum of 20 heavy vehicle movements would be generated per day, when required, for the purpose of water transportation, and no road or intersection upgrades are considered to be required as a result of the Proposed Modification (TTPP, 2022).

Contributions for road infrastructure upgrades, as required by Condition 11 of MP10_0054, are made under a Planning Agreement with Queanbeyan-Palerang Regional Council. As the total number of vehicle movements generated over the life of the Project would not be altered by the Proposed Modification, nor the maximum number of heavy vehicle movements permitted during any one hour, no amendments to the Planning Agreement are considered to be required (TTPP, 2022).

7.5 Noise

7.5.1 Introduction

A Noise Assessment for the Proposed Modification was undertaken by Muller Acoustic Consulting Pty Ltd (MAC). The resulting report is presented as **Appendix 8** and is hereafter referred to as MAC (2022). The following subsections provide a summary of the NIA and describe the operational safeguards and management measures to be implemented.

7.5.2 Local Setting, Environmental Performance and Assessment Criteria

7.5.2.1 Sensitive Receivers

Figure 3 shows the locations of all non-Project related sensitive receivers in the vicinity of the Project Site.

7.5.2.2 Background Noise Levels and Meteorological Conditions

In accordance with Section 2.3 of the *Noise Policy for Industry* (NPI) (EPA, 2017b), MAC (2022) adopted the minimum assumed Rating Background Noise Levels (**Table 32**).

Table 32
Adopted Rating Background Noise Levels

Period[1]	Adopted Rating Background Noise Levels (dB LA_{90})
Day	35
Evening	30
Night	30
Note 1: Day: period from 7:00am – 6:00pm, Monday to Saturday, or 8:00am – 6:00pm on Sundays and public holidays Evening: period from 6:00pm – 10:00pm Night: all other periods	
Source: MAC (2022) – modified after Table 4	

As a detailed analysis of the significance of noise enhancing conditions in the vicinity of the Project Site has not been undertaken. As a result, the default noise enhancing identified in Fact Sheet D of the NPI (EPA, 2017b) were adopted by MAC (2022) (**Table 33**).

Table 33
Modelled Meteorological Parameters

Assessment Condition[1]	Temperature (˚C)	Wind Speed[2] / Direction	Relative Humidity (%)	Stability Class
Day	20	3m/s all directions	50	D
Evening	10	3m/s all directions	50	D
Night	10	2m/s all directions	50	F
Note 1: Day: period from 7:00am – 6:00pm, Monday to Saturday, or 8:00am – 6:00pm on Sundays and public holidays. Evening: period from 6:00pm – 10:00pm. Night: all other periods. Note 2: Implemented using CONCAWE meteorological corrections.				
Source: MAC (2022) – modified after Table 13				

7.5.2.3 Assessment Criteria

7.5.2.3.1 Operational Noise Criteria

Table 34 presents the Project Intrusiveness Noise Level criteria adopted by MAC (2022) for the Noise Assessment based on the Rating Background Noise Levels plus 5dBA. These criteria only apply to residential receivers.

Table 34
Project Intrusiveness Noise Level Criteria

Receiver Type	Period[1]	Adopted Rating Background Noise Levels (dB LA_{90})	Project Intrusiveness Noise Level (dB $LA_{eq(15\ min)}$)
Rural Residential	Day	35	40
	Evening	30	35
	Night	30	35
Note 1: Day: period from 7:00am – 6:00pm, Monday to Saturday, or 8:00am – 6:00pm on Sundays and public holidays. Evening: period from 6:00pm – 10:00pm. Night: all other periods.			
Source: MAC (2022) – modified after Table 5			

Table 35 presents the Project Amenity Noise Level criteria adopted by MAC (2022) for the Noise Assessment for residential and other receiver types.

Table 36 presents the Project Noise Trigger Level criteria adopted by MAC (2022) for the Noise Assessment. The Project Noise Trigger Level represent the lower of either the Project Intrusiveness Noise Level or the Project Amenity Noise Level.

Table 37 presents the maximum noise trigger level criteria adopted by MAC (2022) for the Noise Assessment. These trigger levels are applied to residential receivers for transient noise events that have the potential to disturb sleep and are based on the maximum value of the night time Rating Background Noise Levels and trigger levels in accordance with Section 2.5 of the NPI.

Table 35
Project Amenity Noise Level Criteria

Receiver Type	Noise Amenity Area	Assessment Period[1]	NPI Recommended Amenity Noise Level (dB $LA_{eq(period)}$)	Amenity Noise Level (dB $LA_{eq(period)}$)[2]	Project Amenity Noise Level (dB $LA_{eq(15\ min)}$)[3]
Residential	Rural	Day	50	50	53
		Evening	45	45	48
		Night	40	40	43
Note 1: Day: period from 7:00am – 6:00pm, Monday to Saturday, or 8:00am – 6:00pm on Sundays and public holidays Evening: period from 6:00pm – 10:00pm Night: all other periods Note 2: PANL is equal to the Amenity Noise Level minus 5dB as there is no other industry in the area. Note 3: Includes a +3dB adjustment to the amenity period level to convert to a 15-minute assessment period in accordance with Section 2.2 of the NPI.					
Source: MAC (2022) – modified after Table 6					

Table 36
Project Noise Trigger Levels

Receiver Type	Noise Amenity Area	Assessment Period[1]	PINL (dB $LA_{eq(15\ min)}$)	PANL (dB $LA_{eq(15\ min)}$)	PNTL (dB $LA_{eq(15\ min)}$)
Residential	Rural	Day	40	53	40
		Evening	35	48	35
		Night	35	43	35
Note 1: Day: period from 7:00am – 6:00pm, Monday to Saturday, or 8:00am – 6:00pm on Sundays and public holidays Evening: period from 6:00pm – 10:00pm Night: all other periods					
Source: MAC (2022) – modified after Table 7					

Table 37
Maximum Noise Trigger Levels[1]

Residential Receivers	
52dB LAmax or RBL + 15dB	
Trigger	52
RBL 30 + 15dB	45
Highest	**52**
Note 1: Apply during night periods, including 10:00pm – 7:00am, Monday to Saturday and 10:00pm – 8:00am, Sundays and public holidays.	
Source: MAC (2022) – modified after Table 8	

7.5.2.3.2 *Road Traffic Noise Criteria*

Table 38 presents the relevant road traffic noise criteria adopted by MAC (2022) in accordance with the *NSW Road Noise Policy Criteria* (DECCW, 2011).

Table 38
Road Traffic Noise Assessment Criteria

Road Category	Assessment Criteria	
	Day (7:00am – 10:00pm)	**Night (10:00pm – 7:00am)**
Freeways / arterial / sub-arterial	60dB $LA_{eq(15hr)}$	55dB $LA_{eq(9hr)}$
Local	55dB $LA_{eq\ (1hr)}$	50dB $LA_{eq(1hr)}$
Source: MAC (2022) – modified after Table 9		

7.5.3 Assessment Methodology

MAC (2022) developed a computer model, including a three-dimensional digital terrain map, using DGMR (iNoise, Version 2022.Rev1) noise modelling software to quantify Project noise emissions at sensitive receivers in the vicinity of the Project Site. The scenario modelled conservatively assume the maximum number of plant and equipment operating simultaneously at their typical noise emission level and are therefore considered to represent the worst-case scenario.

MAC (2022) assessed noise impacts under a single operational scenario (**Figure 8**) which represent worst-case noise emissions at the Project Site. This scenario includes concurrent processing and extraction operations, product transportation and haulage, an increased processing rate and construction activities associated with the WSD. It is noted that plant undertaking construction activities in the operational scenario have been located closer to sensitive receivers to assess worst-case noise emissions.

Assumed sound power levels for construction and operational noise sources are listed in Table 10 of MAC (2022).

7.5.4 Management and Mitigation Measures

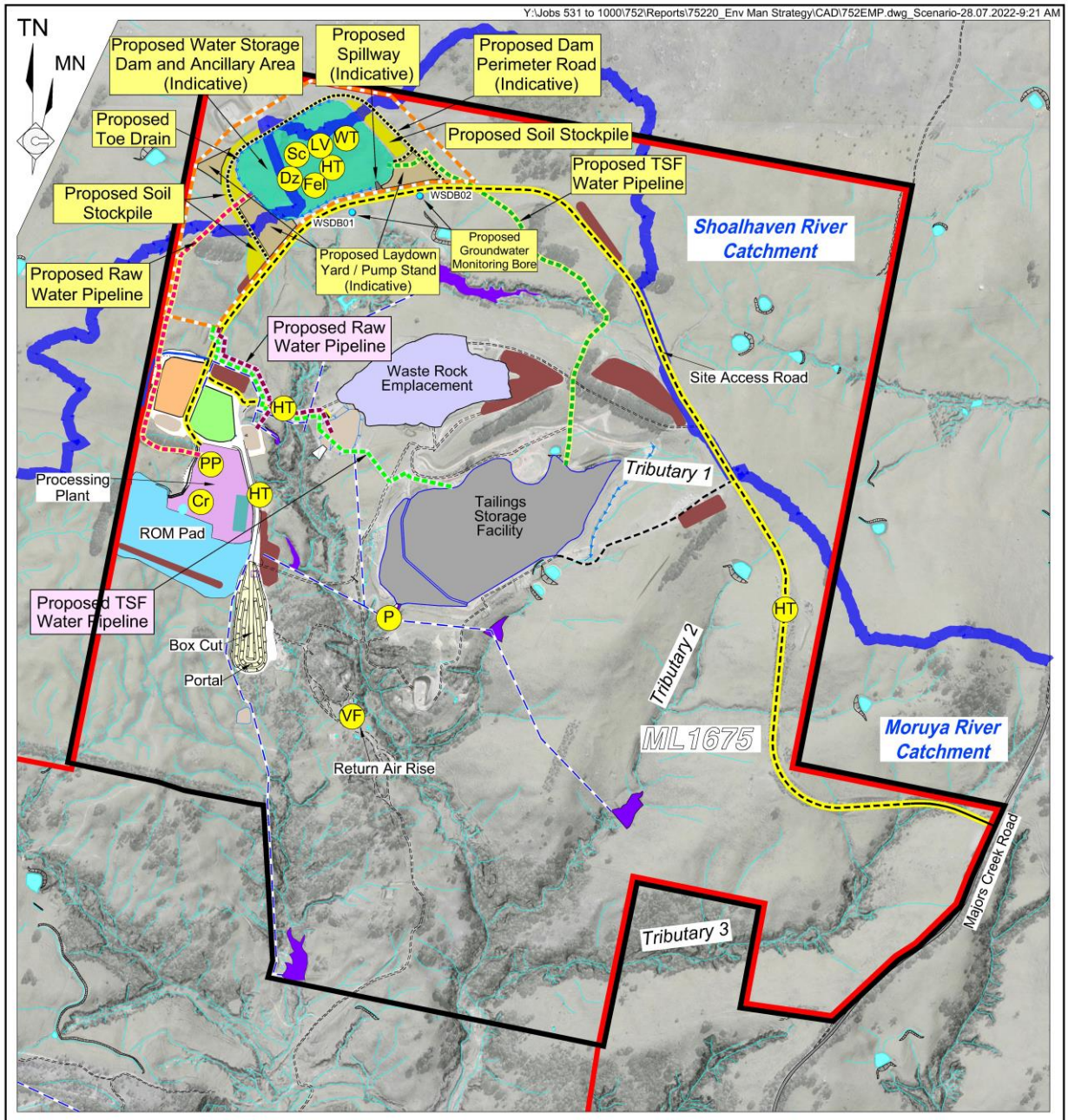
All management and mitigation measures identified in RWC (2010a) and the approved *Noise Management Plan for the Dargues Reef Gold Project – Revision 6* would continue to be implemented. No additional noise management or mitigation measures are proposed, nor are any required.

7.5.5 Assessment of Impacts

7.5.5.1 Operational Noise Assessment

MAC (2022) concludes that predicted operational noise levels are expected to satisfy the relevant Project Noise Trigger Levels (see **Table 36**) at all assessed sensitive receivers under noise enhancing meteorological conditions for the operational noise scenario. Predicted noise emissions are shown as noise contours for the operational noise scenario on **Figures 9** to **12**.

MAC (2022) notes that predicted noise contours presented in **Figures 9** to **12**would not exceed the Voluntary Land Acquisition and Mitigation Policy (VLAMP) criteria of 40dB $LA_{eq\ (15min)}$ daytime or 35dB $LA_{eq\ (15min)}$ night-time at any of the assessed sensitive receiver locations. Furthermore, the VLAMP criteria applicable to privately owned vacant lands (50dB $L_{Aeq\ (period)}$ daytime and 40dB $LA_{eq\ (period)\ night\text{-}time}$) would not be exceeded.



REFERENCE

- Project Site Boundary
- ML 1675 Boundary (Offset for Clarity)
- 675 Contour (m AHD)(Interval = 2m)
- Watercourse / Drainage Line
- Sealed Road
- Unsealed Road
- Existing Dam/Water Storage (to be retained)
- Harvestable Rights Dam
- Road/Track (Sealed/Unsealed)
- Fence
- Existing Pipeline
- Catchment Boundary

Proposed Components of Modification

- Study Area
- Proposed Water Storage Dam (WSD) (Indicative) and Ancillary Disturbance Area
- Proposed Laydown Yard / Pump Stand (Indicative)
- Proposed Dam Perimeter Road (Indicative)
- Proposed Soil Stockpile (Indicative)

Option A Component

- Proposed TSF Water Pipeline
- Proposed Raw Water Pipeline

Option B Component

- Proposed TSF Water Pipeline
- Proposed Raw Water Pipeline
- WSDB01 Proposed Groundwater Monitoring Bore

Noise Source:

- Cr Crusher
- Dz Dozer
- Fel Front-end Loader
- HT Haul Truck
- LV Light Vehicle
- PP Processing Plant
- P Pump
- S Scraper
- VF Vent Fan
- WT Water Truck
- Line Source Route

SCALE 1:15 000 (A4)

250 0 250 500 750 m

Base Photo Source: Google Earth - 21 March 2020

Figure 8
DAM CONSTRUCTION SCENARIO
AND INCREASED PROCESSING RATE

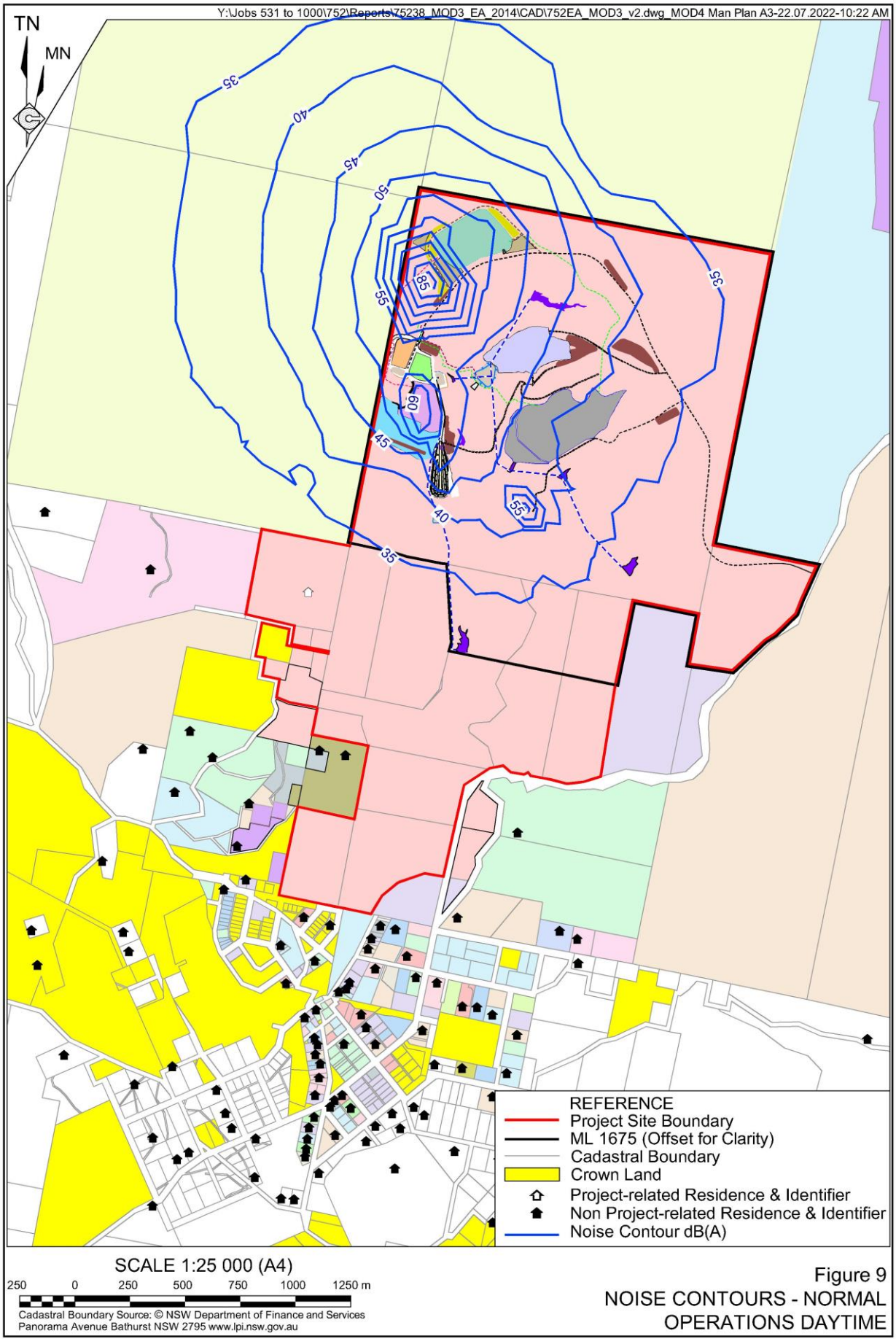


Figure 9
NOISE CONTOURS - NORMAL OPERATIONS DAYTIME

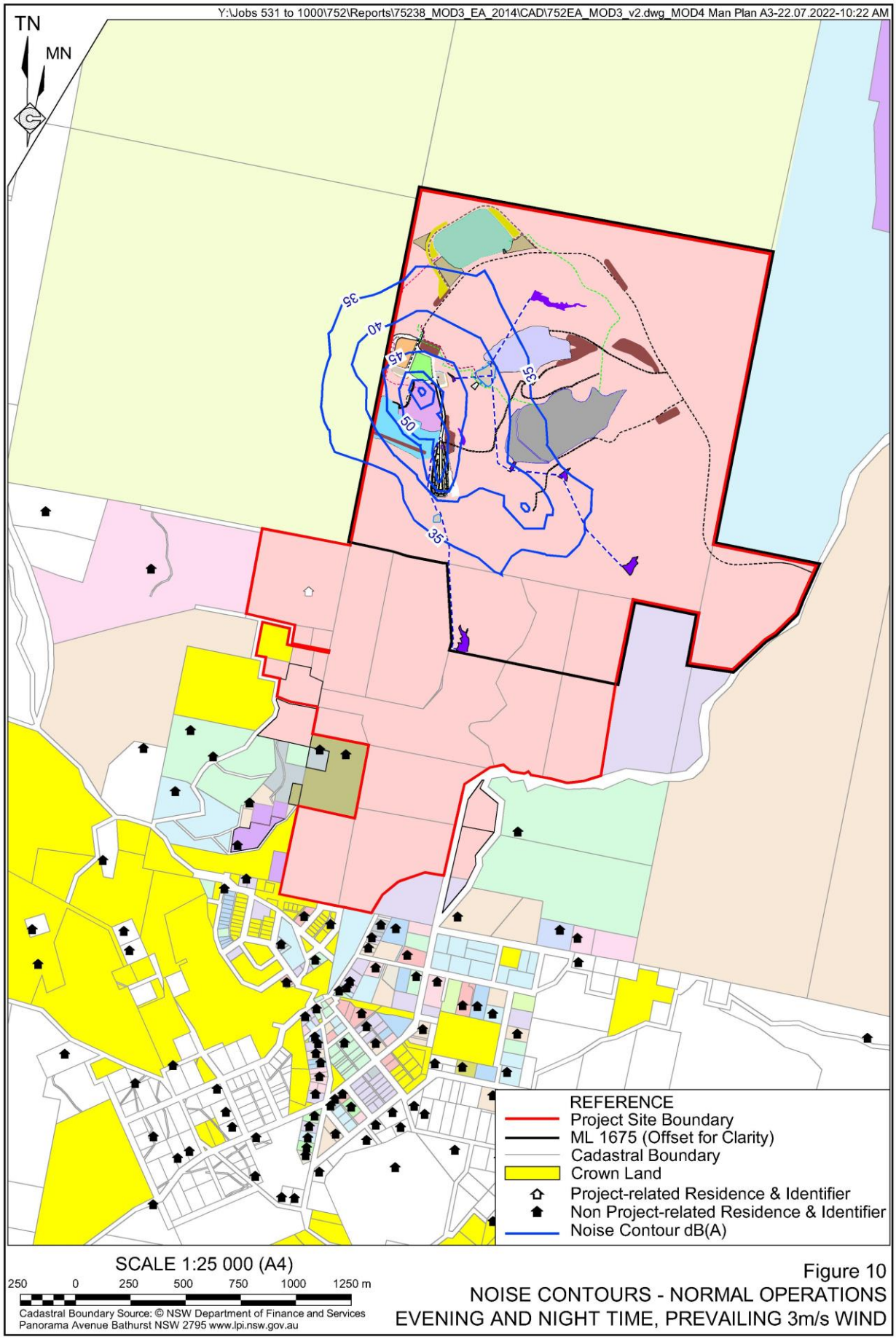


Figure 10
NOISE CONTOURS - NORMAL OPERATIONS
EVENING AND NIGHT TIME, PREVAILING 3m/s WIND

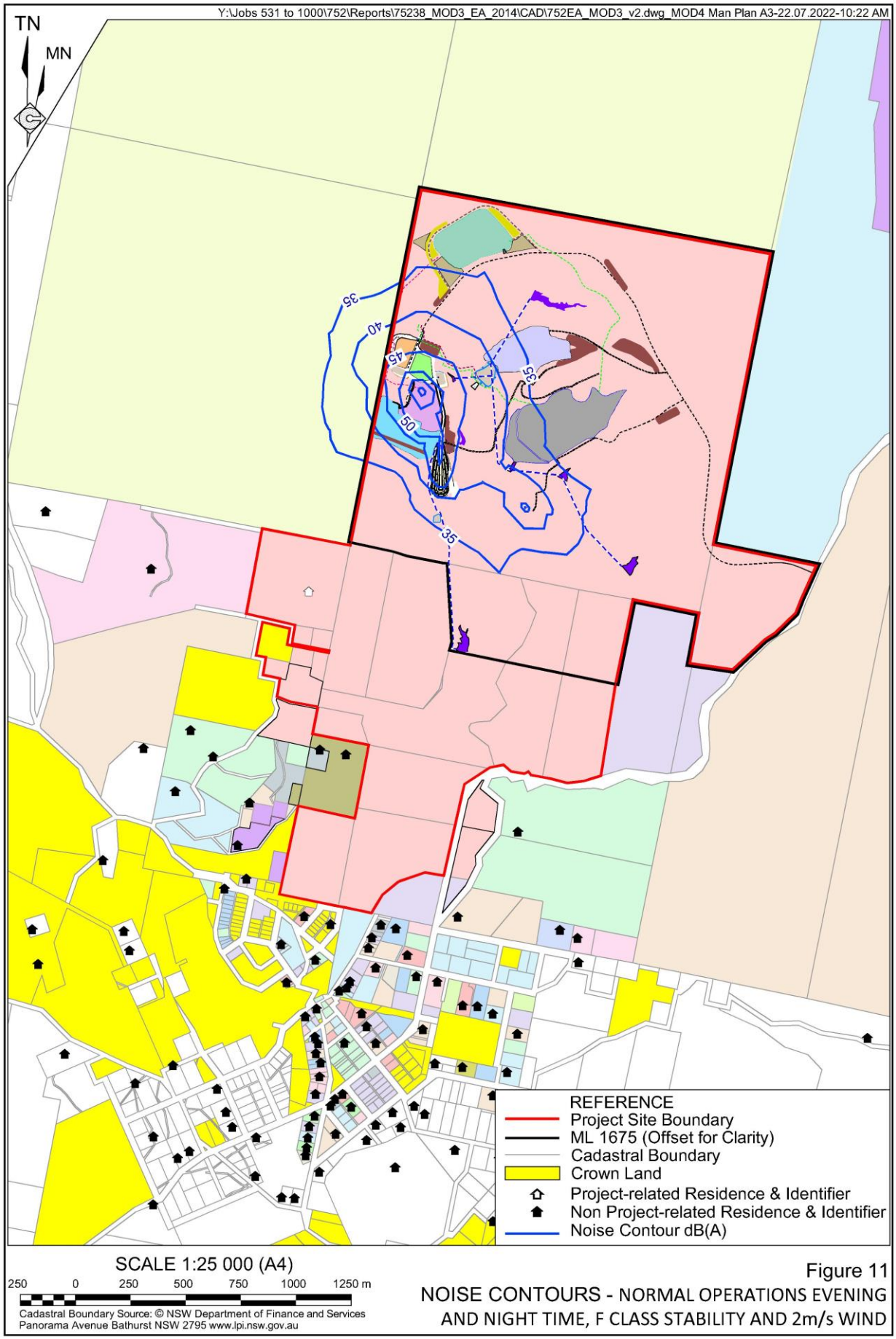


Figure 11
NOISE CONTOURS - NORMAL OPERATIONS EVENING AND NIGHT TIME, F CLASS STABILITY AND 2m/s WIND

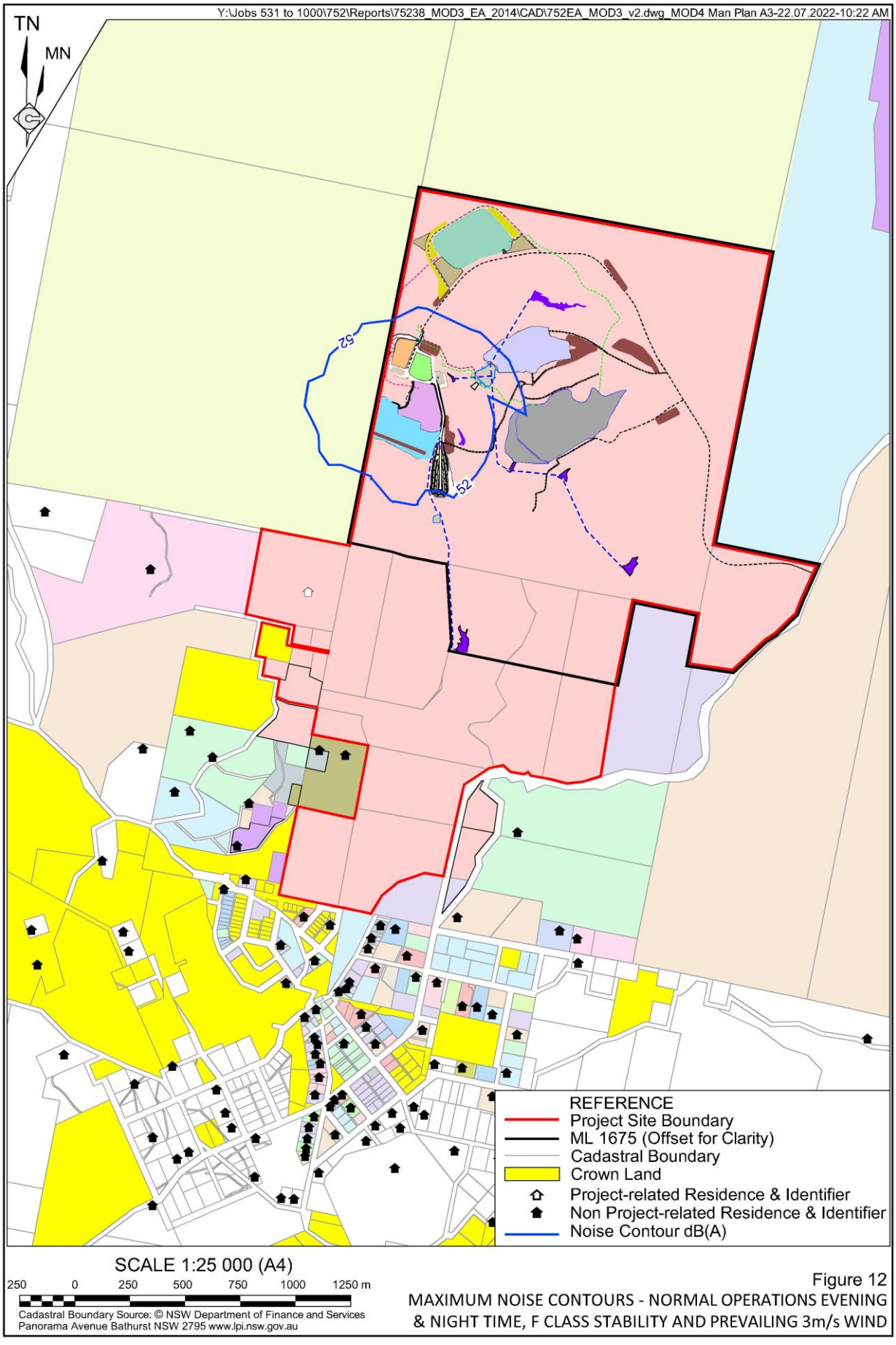


Figure 12
MAXIMUM NOISE CONTOURS - NORMAL OPERATIONS EVENING & NIGHT TIME, F CLASS STABILITY AND PREVAILING 3m/s WIND

7.5.5.2 Road Traffic Noise Assessment

Considering that the Proposed Modification would not change the maximum number of movements generated during any one hour, nor the number of laden heavy vehicle movements generated over the life of the Project, MAC (2022) concludes that the Proposed Modification would not result in any changes to road traffic noise levels in the vicinity of the Mine Site.

7.6 Air Quality

7.6.1 Introduction

Northstar Air Quality Pty Ltd (Northstar) prepared an Air Quality Impact Assessment for the Proposed Modification. The resulting report, referred to hereafter as Northstar (2022), is presented as **Appendix 9**. The following sub-sections draw on information presented in that report and describes the existing air quality environment, predicted changes to that environment as a result of the Proposed Modification, the proposed management and mitigation measures and an assessment of air quality-related impacts.

7.6.2 Local Setting and Environmental Performance

7.6.2.1 Meteorological Data

For air quality modelling purposes, Northstar (2022) relied on meteorological data sourced from the Bureau of Meteorology (BoM) Automatic Weather Station (AWS) (Station No. 069132) located at Braidwood Racecourse, approximately 13.5km north of the Project Site. Meteorological data is also collected by the Applicant at an on-site weather station (see **Figure 13**), however, as data at the Braidwood Racecourse AWS is fully validated by an independent source, this station was selected as the primary source of data for the Air Quality Impact Assessment to avoid any perceived bias.

Data from the year 2017 was selected to provide an approximation of representative conditions surrounding the Project Site based on an examination of the meteorology and background air quality conditions for the period 2016 to 2020.

7.6.2.2 Background Air Quality

It is noted that the Applicant operates a High-Volume Air Sampler (HVAS) for the measurement of PM_{10} on a 1-in-6 day cycle, located approximately 1.3km southwest of the underground portal (see **Figure 13**). Northstar (2022) notes that while the measurements provided by the on-site HVAS effectively demonstrate the impact of the Project Site and all other sources of particulate emissions on the air quality environment within a particular area, these measurements are not appropriate for use within an air quality impact assessment as they do not provide a continuous daily measurement which can be used to determine the cumulative impacts of the Proposed Modification in accordance with *Approved Methods for the Sampling and Analysis of Air Pollutants in NSW* (EPA, 2017a).

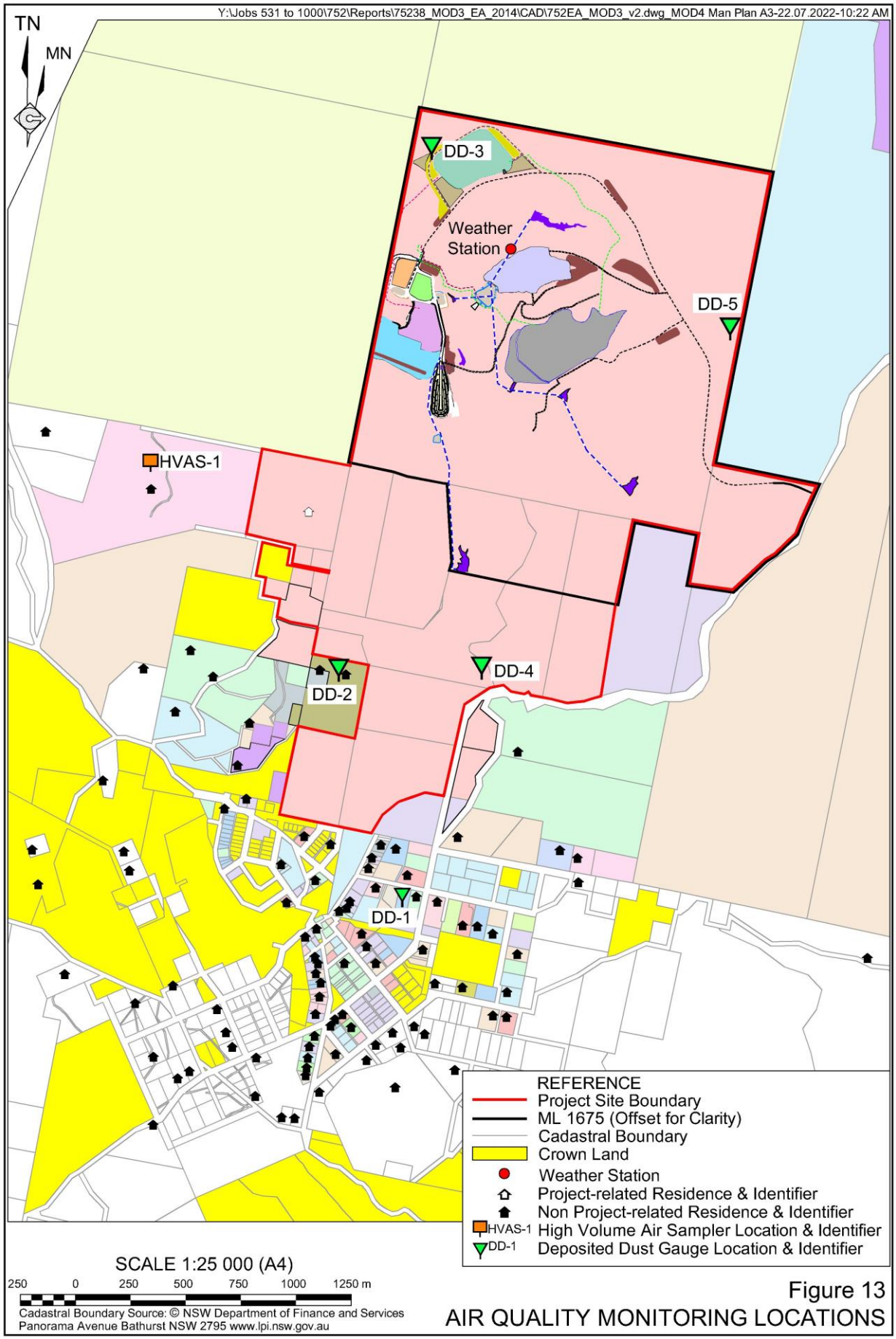


Figure 13
AIR QUALITY MONITORING LOCATIONS

The closest Air Quality Monitoring Stations (AQMS) to the Mine Site are located within the ACT and operated by the ACT government. However, Northstar (2022) notes that these stations are located in highly urbanised areas and are therefore not considered representative of the air quality surrounding the Mine Site, which is likely to be impacted by sources such as agricultural activities and wood fired heaters in contrast to road traffic and other urban-related emissions sources. As a result, Northstar (2022) undertook a review of annual and daily maximum PM_{10} concentrations at various NSW DPE operated AQMS located within regional centres along with the on-site HVAS, presented as Appendix B to Northstar (2022).

In summary, concentrations of PM_{10} measured at the Wagga Wagga North AQMS were consistently greater than all other stations included in the analysis. As a result, data from the Wagga Wagga North AQMS were adopted by Northstar (2022) to conservatively represent air quality in the vicinity of the Project Site. It is noted that while this air quality monitoring station is situated at a greater distance to the Mine Site when compared to the ACT operated air quality monitoring stations, it is located in an area considered to be more representative of the existing environment as it relates to air quality in the vicinity of the Project Site.

A summary of the background air quality concentrations adopted by Northstar (2022) are provided in **Table 39**.

Table 39
Summary of Background Air Quality

Pollutant	Averaging Period	Measured Value	Comments
TSP	Annual µg/m^3	48.2	Estimated on a TSP:PM_{10} ratio of 2.3404:1
PM_{10}	24-hour µg/m^3	Daily Varying	The 24-hour maximum PM_{10} in 2017 at Wagga Wagga North was measured to be 171.6 µg/m^3
	Annual µg/m^3	20.6	
$PM_{2.5}$	24-hour µg/m^3	Daily Varying	The 24-hour maximum $PM_{2.5}$ in 2014 at Wagga Wagga North was measured to be 32.5 µg/m^3
	Annual µg/m^3	8.1	
Deposited Dust	Annual g/m^2/month	2.1	Maximum annual average measured at an deposited dust gauge
Source: Northstar (2022) – Modified after Table 4			

7.6.3 Potential Sources of Air Pollutants

The following activities associated with the Proposed Modification were considered by Northstar (2022) as potential sources of air pollutants.

- Vegetation clearing and soil stripping.
- Movement of material around the WSD to create embankments.
- Loading of haul trucks, transport, unloading, and storage of surplus materials from the WSD footprint, additional ore material, and concentrate.
- Processing of additional ore material.
- Loading product trucks with additional concentrate and haulage offsite.
- Wind erosion of disturbed areas.

Northstar (2022) notes that no significant additional emissions associated with the proposed emergency transportation of water are anticipated, given that the inclusion of water trucks would not result in an increase to approved laden truck movements.

7.6.4 Assessment Methodology and Criteria

7.6.4.1 Assessment Methodology

Using the site-specific meteorological file generated, air dispersion modelling was used to simulate the dispersion of particulate matter associated with the sources outlined in Section 7.6.3. A range of emissions controls, including the use of a water truck to dampen roads during dry conditions, were included in the modelling assessment. Modelling was performed using the NSW EPA approved CALPUFF atmospheric dispersion model in 3-dimensional (3-D) mode.

An assessment of the impacts of activities at the Mine Site was undertaken to characterise the likely day-to-day operation of the Proposed Modification. This assessment relied upon average operational characteristics to assess the Project against longer term (annual average) and shorter-term (24-hour) criteria for particulate matter.

One scenario was selected for dispersion modelling (construction of the WSD coincidental with increased processing activities) and is presented on **Figure 8**. Northstar (2022) notes that the peak activity rates are likely to be similar to average activity rates, and therefore, comparison of potential impacts against short term air quality criteria is also considered appropriate.

As the background data for 24-hour $PM_{2.5}$ and PM_{10} used for the assessment includes periods when the standard assessment criteria are either considered high or exceeded (i.e. background PM_{10} levels are at approximately 82.4% of the criteria, and the criteria for $PM_{2.5}$ is exceeded within any assumed background level, regardless of the operation of the Project), Northstar (2022) assessed particulate matter using the Level 2 Contemporaneous Assessment Method provided in the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA, 2017a).

7.6.4.2 Assessment Criteria

Table 40 presents the air quality criteria listed in the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (EPA, 2017a) which were adopted by Northstar (2022).

It is noted that *Condition 3(14)* of MP10_0054 defines the annual average PM_{10} criteria applicable to the Project Site as 30µg/m^3 and does not include any $PM_{2.5}$ criterion, however, the more stringent criteria presented in **Table 40** was adopted by Northstar (2022) in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (EPA, 2017a).

Table 40
Air Quality Assessment Criteria

Pollutant	Averaging Period	Criterion (µg/m^3)		Comments
PM_{10}	24 hours	50		Numerically equivalent to the AAQ NEPM*1 standards and goals
	Annual	25		
$PM_{2.5}$	24 hours	25		
	1 year	8		
TSP	Annual	90		N/A
Deposited dust	1 year	(g/m^2/month)		Defined by AS 3580.10.1
		2*2	4*3	
Note 1: National Environment Protection (Ambient Air Quality) Measure Note 2: Maximum total increase in deposited dust level Note 3: Maximum total deposited dust level				
Source: Northstar (2022) – modified after Table 2				

7.6.5 Management and Mitigation Measures

Based on the results of dispersion modelling presented in Section 7.6.6, the Proposed Modification is not anticipated to result in any additional exceedances of the relevant air quality criterion at any sensitive receptor location.

As a result, all management and mitigation measures identified in RWC (2010a) and the approved *Air Quality and Greenhouse Gas Management Plan for the Dargues Reef Gold Mine – Revision 5* would continue to be implemented, and no further management and mitigation measures are required.

7.6.6 Assessment of Impacts

Predicted annual average particulate matter emissions for the assessment scenario are presented in **Table 40**. In summary, results indicate that predicted incremental concentrations of particulate matter at non-Project related residential receiver locations are as follows.

- 0.2% of the annual average TSP criterion.
- <0.1% of the annual average PM_{10} criterion.
- <0.1% of the annual average $PM_{2.5}$ criterion.
- <5.0% of the annual average deposited dust criterion.

Similarly, the assessment results indicate that the addition of incremental impacts to background concentrations results in the following cumulative impacts, as a maximum.

- 53.8% of the annual average TSP criterion.
- 82.8% of the annual average PM_{10} criterion.
- 102.0% of the annual average $PM_{2.5}$ criterion.
- 53.8% of the annual average deposited dust criterion.

Table 41 identifies that the annual average $PM_{2.5}$ criteria is predicted to be exceeded at all receiver locations, however, Northstar (2022) notes that these exceedances are a result of background $PM_{2.5}$ concentrations exceeding the relevant criteria without the addition of any incremental impact.

The predicted maximum 24-hour average PM_{10} and $PM_{2.5}$ concentrations are presented in detail in Section 6.3 of Northstar (2022). In summary, cumulative impacts as predicted would result in 5 days that exceed the 24-hour $PM_{2.5}$ criterion and 10 days that exceed the PM_{10} criterion. As above, Northstar (2022) notes that these exceedances are a result of background concentrations which exceed the relevant criteria.

Considering the above, Northstar (2022) notes that changes to particulate matter and deposited dust concentrations directly attributable to the Proposed Modification are negligible.

Table 41
Predicted Annual Average Particulate Matter and Deposited Dust Concentrations

Receiver ID[1]	Annual Average Concentration (µg/m^3)															
	TSP				PM_{10}				$PM_{2.5}$				Deposited Dust			
	WMD Construction	Increased Processing	Background	Cumulative Impact	WMD Construction	Increased Processing	Background	Cumulative Impact	WMD Construction	Increased Processing	Background	Cumulative Impact	WMD Construction	Increased Processing	Background	Cumulative Impact
Criterion	**90**				**25**				**8**				**2**		**-**	**4**
R1	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R2	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R3	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R4	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R5	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R6	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R7	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R8	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R9	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R10	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R11	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R12	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R13	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R14	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R15	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R16	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R17	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R18	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R19	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R20	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R21	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R22	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R23	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R24	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R25	0.1	<0.1	48.2	48.4	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R26	0.1	<0.1	48.2	48.4	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R27	0.2	<0.1	48.2	48.4	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R28	0.1	<0.1	48.2	48.4	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R29	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R30	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R31	0.1	<0.1	48.2	48.4	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R32	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R33	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R34	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R35	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R36	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R37	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R38	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2

Table 41 (Cont'd)
Predicted Annual Average Particulate Matter and Deposited Dust Concentrations

Receiver ID[1]	Annual Average Concentration (µg/m^3)															
	TSP				PM_{10}				$PM_{2.5}$				Deposited Dust			
	WMD Construction	Increased Processing	Background	Cumulative Impact	WMD Construction	Increased Processing	Background	Cumulative Impact	WMD Construction	Increased Processing	Background	Cumulative Impact	WMD Construction	Increased Processing	Background	Cumulative Impact
Criterion	**90**				**25**				**8**				**2**		**-**	**4**
R39	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R40	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R41	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R42	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R43	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R44	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R45	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R46	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R47	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R48	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R49	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R50	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R51	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R52	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R53	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R54	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R55	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R56	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R57	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R58	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R59	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R60	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R61	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R62	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R63	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R64	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R65	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R66	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R67	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R68	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R69	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R70	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R71	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R72	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R73	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R74	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R75	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R76	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R77	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2

Table 41 (Cont'd)
Predicted Annual Average Particulate Matter and Deposited Dust Concentrations

Receiver ID[1]	Annual Average Concentration (µg/m^3)															
	TSP				PM_{10}				$PM_{2.5}$				Deposited Dust			
	WMD Construction	Increased Processing	Background	Cumulative Impact	WMD Construction	Increased Processing	Background	Cumulative Impact	WMD Construction	Increased Processing	Background	Cumulative Impact	WMD Construction	Increased Processing	Background	Cumulative Impact
Criterion	**90**				**25**				**8**				**2**		**-**	**4**
R78	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R79	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R80	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R81	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R82	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R83	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R84	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R85	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R86	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R87	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R88	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R89	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R90	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R91	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R92	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R93	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R94	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R95	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R96	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R97	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R98	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R99	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R100	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R101	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R102	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R103	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R104	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R105	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R106	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2
R107	<0.1	<0.1	48.2	48.3	<0.1	<0.1	20.6	20.7	<0.1	<0.1	**8.1**	**8.2**	<0.1	<0.1	2.1	2.2

Note 1: Sensitive receiver locations shown on **Figure 3**

Note 2: Bold text – exceedance of relevant criterion

Source: Northstar (2022) – modified after Tables 6 and 7

7.7 Surface Water

7.7.1 Introduction

The following subsection provides an overview of the existing environment with respect to surface water at the Project Site. Potential impacts from the proposed modification are presented, and management and mitigation measures are proposed to reduce or prevent these impacts. This is followed by discussion of any residual impacts relating to the proposed modification.

7.7.2 Local Setting and Environmental Performance

The Project Site lies on the boundary of Shoalhaven and Moruya Catchments (**Figure 14** and **Figure 15**).

The Shoalhaven Catchment forms part of the Sydney Drinking Water Catchment, with the upper Shoalhaven Catchment covering an area of approximately 9 460km^2. Surface waters within the catchment flow to the Shoalhaven River which flows in a northerly direction before turning east and flowing to the Pacific Ocean east of Nowra. Within the small section of the Project Site located inside the Shoalhaven Catchment, drainage lines are typically poorly defined and ephemeral.

The Moruya Catchment covers an area of approximately 1 490km^2. Surface waters in the vicinity of the Project Site flow initially to Majors Creek, before flowing to Araluen Creek and the Deua River. The Deua River merges with the Moruya River and flows to the Pacific Ocean at Moruya.

Drainage within the northern section of the Project Site is dominated by Spring Creek and a number of unnamed tributaries. Spring Creek merges with Majors Creek in the southern section of the Project Site. Spring Creek and its tributaries have been extensively disturbed by historic mining activities as well as more recent agricultural land uses.

Drainage immediately to the west of the Project Site is dominated by Shingle House Creek and its tributary, North Creek.

Drainage within the southern section of the Project Site is dominated by Majors Creek which, within the Project Site, flows from west to east. This creek has also been extensively disturbed by historic mining-related activities, with the alluvial sediments subjected to sluicing and dredging. In addition, a non-Aboriginal Heritage Assessment (ASR, 2010 – see Section 6.7.3) noted that at least two stamp batteries and a chlorination plant were established within the creek as part of historic mining activities in the area.

Monitoring of surface water quality and flow rates has continued to be undertaken at 19 locations within and surrounding the Project Site. These locations are presented on **Figures 14** and **15**. To the 2020-2021 reporting period, surface water monitoring results have remained consistent with historical monitoring. Changes in water quality have primarily been driven by rainfall, surface water runoff and seasonal influences. No significant trends or changes in water quality have been detected as a result of operations at the Project Site.

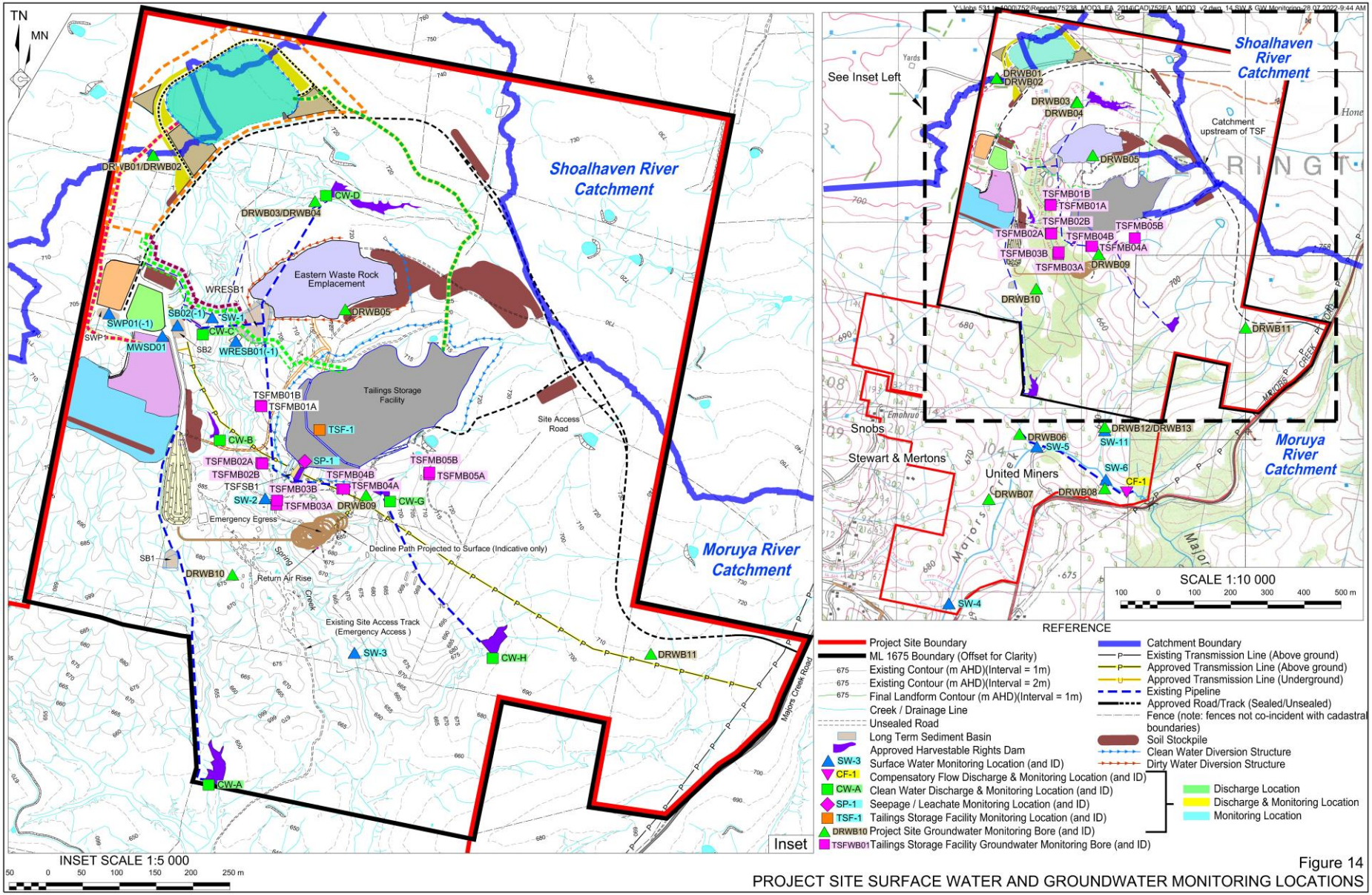


Figure 14
PROJECT SITE SURFACE WATER AND GROUNDWATER MONITORING LOCATIONS

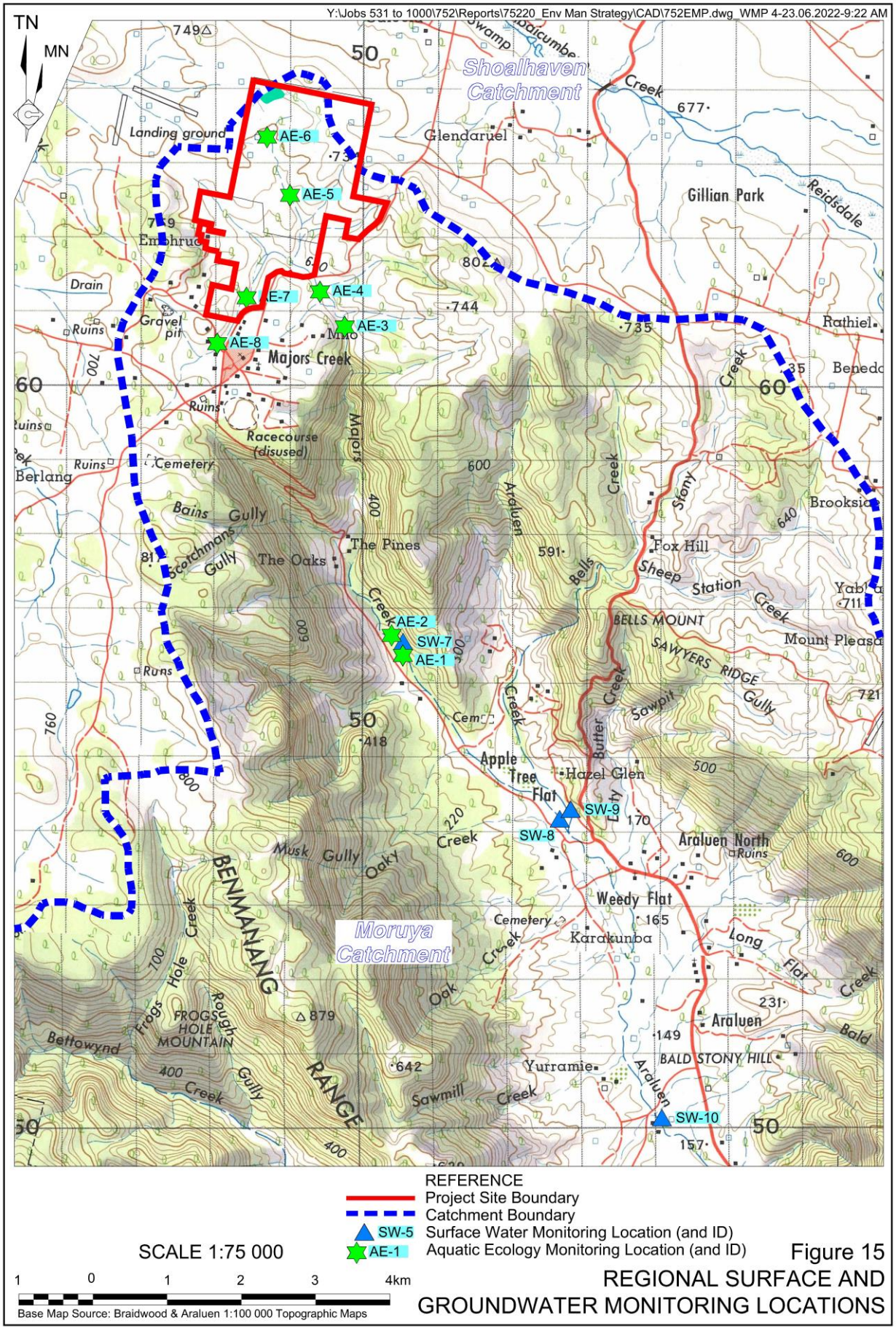


Figure 15
REGIONAL SURFACE AND GROUNDWATER MONITORING LOCATIONS

7.7.3 Management and Mitigation Measures

Commitments made previously regarding the management of surface water within the Project Site and described within RWC (2010a), RWC (2012a), RWC (2013a), RWC (2015a) and RWC (2018) would remain. The current water management system would continue to be implemented, with the inclusion of the proposed WSD as detailed in Section 4.2. Existing water management has proved to be effective at separating and managing clean, dirty and potentially contaminated water.

The purpose of the proposed WSD is to provide additional capacity for the Applicant to manage water at the Project Site, thereby reducing risks associated with uncontrolled discharge from the TSF and other on site water storages.

The Applicant would implement the following management and mitigation measures to avoid and minimise potential impacts to surface water as a result of the Proposed Modification.

- Ensure that the WSD spillway (see **Figure 4**) and any other surface water diversion structures are constructed to ensure that any potential discharge from the WSD is directed away from the Shoalhaven Catchment and into the Moruya Catchment.
- Update the *Water Management Plan*, including the Project water balance, to include any changes to water management practices required as a result of the Proposed Modification.
- Update the *Erosion and Sediment Control Plan* to incorporate any additional management measures required during the construction and operation of the proposed WSD and water pipelines.

7.7.4 Assessment of Impacts

Construction and use of the proposed WSD would assist with management of water resources within the Project Site. It is considered that no significant additional impacts to surface water would occur as a result of the Proposed Modification given the continued implementation of existing controls and management measures.

The proposed WSD would not be permitted to discharge at any time and the WSD spillway has been located to ensure that any uncontrolled discharge would not flow into the Shoalhaven Catchment and therefore the Sydney Drinking Water Catchment. Additionally, the WSD has been designed so that no water would flow into the Shoalhaven Catchment in the event of dam failure. Therefore, it is considered that the Proposed Modification would not result in impacts to the Sydney drinking water catchment.

Furthermore, should approval for the Proposed Modification be granted, updates to the *Water Management Plan* and *Erosion and Sediment Control Plan* would ensure all runoff and water resources within the Project Site will be appropriately managed.

7.8 Groundwater

7.8.1 Introduction

The following subsection provides an overview of the existing environment with respect to groundwater at the Project Site. Potential impacts from the proposed modification are presented, and management and mitigation measures are proposed to reduce or prevent these impacts. This is followed by discussion of any residual impacts relating to the proposed modification.

7.8.2 Local Setting and Environmental Performance

Three principal classes of aquifers exist within and surrounding the Project Site, detailed as follows.

- Fracture-controlled, granodiorite-hosted aquifer

  This aquifer occurs across the entire Project Site and surrounding catchments. The Project Site is underlain by the Braidwood granodiorite which is cut by a number of fracture systems. As a result, the aquifer may be categorised a hydraulically "tight" massive granodiorite with little or no primary permeability and localised fracture or fault systems which may be open and transmit groundwater flow.

- A regolith aquifer, namely a shallow, weathered aquifer overlying the granodiorite.

  This aquifer occurs across the majority of the Project Site and surrounding catchments and is hosted by weathered granodiorite material. Weathering typically occurs to a depth of approximately 15m.

- A shallow alluvial aquifer associated with the Majors Creek alluvial deposits.

  This aquifer comprises sand and clay with boulders adjacent to and within Majors Creek. The alluvial material has been extensively disturbed during historic alluvial gold mining operations, resulting in piles of alluvial material in sections of the creek and exposed bedrock in other sections.

Monitoring of groundwater quality and levels has been and would continue to be undertaken at 29 locations within and surrounding the Project Site. These locations are presented on **Figures 14** and **15**. To the 2020-2021 monitoring period, groundwater quality has remained consistent with historical sampling. Groundwater levels at bores within and surrounding the Project Site remained stable, with the exception of the following.

- DRWB10 is hydraulically connected to historic workings within the underground mine which have been dewatered to reduce the risk of inundation and inrush (**Figure 14**).
- DRWB09 is a production bore and is subject to occasional pumping (**Figure 14**).
- The majority of standing water levels recorded in monitoring bores have returned to within pre-operative levels, with the alluvial aquifer bores remaining stable.

It is noted that all groundwater quality measurements indicate that groundwater quality has remained consistent with historical sampling results, with any readings outside of the trigger levels identified in the existing *Water Management Plan* directly attributable to seasonal variation, flow conditions or sampling error.

7.8.3 Management and Mitigation Measures

Commitments made previously regarding the management of surface water within the Project Site and described within RWC (2010a), RWC (2012a), RWC (2013a), RWC (2015a) and RWC (2018) would remain. In addition, the following management and mitigation measures would be implemented.

- Construction of two additional groundwater monitoring bores located southwest of the proposed WSD (see Section 4.2.6 and **Figure 4**).
- Incorporation of the additional groundwater monitoring bores into the existing *Water Management Plan* to monitor for potential impacts to the local groundwater system.

7.8.4 Assessment of Impacts

The Proposed Modification would not involve disturbance of groundwater resources and therefore potential impacts to those resources would be negligible.

Notwithstanding, an update to the existing *Water Management Plan* would be completed to incorporate the additional monitoring bore and to monitor for potential impacts to the local groundwater system as a result of the proposed WSD.

7.9 Visual Amenity

7.9.1 Introduction

The following subsection provides an overview of the existing environment with respect to visual amenity surrounding the Project Site. Potential impacts from the proposed modification are presented, and management and mitigation measures are proposed to reduce or prevent these impacts. This is followed by discussion of any residual impacts relating to the proposed modification.

7.9.2 Local Setting and Environmental Performance

The existing visual amenity surrounding the Project Site is typical of rural areas in the southern tablelands, with the outlook from most rural residences and other vantage points including land used for agriculture, nature conservation, transportation, or other infrastructure. Outlooks from residences within the village of Majors Creek include views of surrounding buildings, Majors Creek, established trees and smaller vegetation.

Visual amenity impacts of the existing approved operations are limited to obstructed views of the ROM pad, located approximately 550m south of the proposed WSD, from residences to the southeast, south and southwest of the Project Site, and obstructed views of the TSF from motorists using Majors Creek Road.

The rural landscape surrounding the Project Site ranges from variably rolling to steeply incised. Vegetation varies from pasture to areas of remnant vegetation and regrowth, both native (wattles) and woody weeds (broom and blackberry) and wind breaks. As a result, elevated areas of land to the south the Project Site may have obstructed views of the Project Site depending on the density of obscuring vegetation. Areas of lower elevation to the south of the Project Site, particularly those areas with surrounding vegetation, have very limited views of the Project Site or views of the southern section of the Project Site only.

7.9.3 Assessment of Impacts

As identified in **Figure 4**, the proposed WSD would be located within the north-western extent of the Project Site, an area that is not visible from private residences or Majors Creek Road.

Given that the location of the disturbance areas associated with the Proposed Modification are located approximately 550m north of the ROM pad, and the visual setting of the Project Site, the additional visual amenity impacts would be negligible.

7.10 Environmental Aspects which would be Unaffected

The Applicant considers that the remaining environmental impacts associated with the ongoing operations under MP10_0054, as modified, would remain generally consistent with existing approved operations.

Table 42 presents an overview of the environmental issues that the Applicant contends there would be no significant additional impacts and justifies the contention for each.

Table 42
Environmental Aspects which would be unaffected by the Proposed Modification

Issue	Nature of Additional Impact and Justification
Blasting and Vibration	Nil. The Proposed Modification would not result in changes to blasting practices or controls.
Bushfire	Nil. The Proposed Modification would not result in increased risk of bushfire.
Soils, Land Capability or Agricultural Lands	Nil. The Proposed Modification would not result in additional impacts to important agricultural lands.
Social and Economic	The socio-economic impacts of the Proposed Modification would be improved operational efficiencies and therefore Project robustness, minimising the potential for disruptions during downturns in the commodity cycle and maximising benefits for the community and surrounding businesses.

8. Justification of Modified Project

8.1 Ecologically Sustainable Development

8.1.1 Introduction

Throughout the design of the Dargues Gold Mine in its original application for Development Consent, as well as the Proposed Modification, the Applicant has endeavoured to address each of the sustainable development principles. The following subsections draw together the features of the Proposed Modification that reflect the four principles of sustainable development, namely:

- the precautionary principle;
- the principle of social equity;
- the principle of the conservation of biodiversity and ecological integrity; and
- the principle for the improved valuation and pricing of environmental resources.

8.1.2 The Precautionary Principle

The Precautionary Principle identifies that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

Throughout the development of the Proposed Modification, the Applicant, RWC and the specialist consultant team have adopted an anticipatory approach to impacts by undertaking an analysis of the risks posed by the Proposed Modification. Examples of matters relating to the precautionary principle that were considered during the various stages of the Proposed Modification are listed below.

- The design of the Proposed Modification was prepared in accordance with the relevant guidelines.
- Recognised experts in the fields of biodiversity, heritage, noise, air quality and traffic were engaged by the Applicant to ensure that potential adverse impacts were well understood and, therefore, were capable of being mitigated to the greatest extent practicable.

As a result, the precautionary principle has been considered during all stages of the design and assessment of the Proposed Modification. The approach adopted provides a high degree of certainty that the Proposed Modification would not result in any major unforeseen impacts.

8.1.3 Social Equity

Social equity embraces value concepts of justice and fairness so that the basic needs of all sectors of society are met and there is a fair distribution of costs and benefits to the community. Social equity includes both inter-generational (between generations) and intra-generational (within generations) equity considerations.

The Project, as approved, and the Applicant, would ensure intra-generational equity through:

- its commitment to provide employment and training opportunities for members of the community surrounding the Project Site; and
- support for the community though increased economic activity, infrastructure improvements (e.g. continued contributions towards the maintenance of Majors Creek Road and upgrades to the Braidwood Recreation Ground) and formal and informal support via its Voluntary Planning Agreement (VPA) and other mechanisms.

Similarly, the Project, as approved, and the Applicant, would ensure inter-generational equity through the establishment of a final landform that would be stable, non-polluting, self-sustaining and suitable for a final land use of nature conservation and agriculture. In addition, the Applicant notes that ongoing weed management and habitat conservation works are already providing long-term benefits.

The Proposed Modification would ensure that the Project is as robust as possible, and that resources would continue to be available to ensure that these benefits would continue.

Finally, the Applicant acknowledges that the principle of social equity also includes aspects of ensuring that those with an interest in the Project are adequately consulted and informed about all aspects of the Project. The Applicant will continue to maintain an open line of communication with the community surrounding the Project Site to provide accurate, factually correct information in a timely manner and to respond to reasonable community concerns.

8.1.4 Conservation of Biological Diversity and Ecological Integrity

The protection of biodiversity and maintenance of ecological processes and systems are central goals of sustainability. It is important that developments do not threaten the integrity of the ecological system as a whole or the conservation of threatened species in the short- or long-term.

Additional disturbance associated with the Proposed Modification would be limited to areas of disturbed land, exotic vegetation that does not equate to a native PCT and approximately 2.82 ha of native vegetation in low condition. As a result, the Proposed Modification would minimise the potential impacts on threatened flora and fauna (and native vegetation and fauna habitats generally) to the greatest extent practicable.

8.1.5 Improved Valuation and Pricing of Environmental Resources

The issues that form the basis of this principle relate to the acceptance that all resources are appropriately valued, cost-effective environmental stewardship is adopted, and the adoption of user pays prices based upon the full life cycle of the costs.

In line with these objectives, the Applicant's principal objective of the Proposed Modification is the design and operation of the Project in a manner that minimises impacts on the environment and surrounding residents, as well as researching, planning, and designing of the environmental safeguards and mitigation measures to prevent irreversible damage to environmental resources. In doing so, the Applicant has and would continue to invest considerable resources in the management and mitigation of environmental risks. In addition, the Applicant contends that the Project, as modified, would be sufficiently robust to ensure that sufficient resources are available to undertake all environmental-related tasks and meet any commitments made to the local community.

8.2 Strategic Considerations

The Proposed Modification is consistent with the Goals of the *Queanbeyan-Palerang Regional Council Local Strategic Planning Statement* and the *South East and Tablelands Regional Plan 2036* in that it would allow for:

- protection and enhancement of biodiversity values;
- consideration of the environmental impacts of future development;
- avoidance of land use conflicts;
- sustainable management of mineral resources; and
- securing of water sources.

8.3 Statutory Considerations

The Proposed Modification is made under Section 4.56 of the EP&A Act and the Minister for Planning, or their delegate, or the Independent Planning Commission, is the consent authority. Sections 5.5 and 5.6 identify the preconditions to granting approval and the matters that must be considered by the Consent Authority prior to doing so. In summary, however, the Proposed Modification meets all preconditions to granting of development consent and this application addresses all matters to be considered by the Consent Authority.

8.4 Community Considerations

The Proposed Modification would not adversely impact on the community. Indeed, the Proposed Modification would provide for the ongoing operation of the Project at the current scale of operations, with potential adverse community impacts being avoided. In addition, as identified in Sections 3.2 and 6, the community have been provided with information and opportunity to communicate concerns in relation to the Project, the Proposed Modification and associated activities and no concerns or issues have been raised.

8.5 Biophysical Considerations

The following presents an overview of the range of additional residual impacts on the biophysical environment should the Proposed Modification proceed.

- Biodiversity – direct impacts on biodiversity values resulting from the Proposed Modification would be the clearing of 2.82 ha of native vegetation (PCT 1100 in low condition). However, the Biodiversity Study Area does not include any habitat for species with a high biodiversity risk weighting or TECs. Only 19.4 per cent of the Study Area contains a PCT. It is considered that the total impact of the Proposed Modification to biodiversity would be relatively minor and that no biodiversity offsetting requirements would be generated.
- Heritage – placement of the proposed water pipelines at surface would result in minimal impacts to Aboriginal heritage items and values, however, construction of the proposed WSD would result in direct impacts to any surface or subsurface archaeological materials within the dam footprint. It is noted that the social and cultural values of DGM PAD 22-1 have already been significantly impacted by the historic displacement of local Aboriginal people from the area, along with the area surrounding DGM PAD 22-1 being cleared and developed. As a result, it is considered that impacts to historic and heritage values would be minimal, and the proposed activities would not result in any net increase to loss of cultural heritage significance.
- Surface Water – construction and use of the proposed WSD would assist with management of water resources within the Project Site. It is considered that no significant additional impacts to surface water would occur as a result of the Proposed Modification given the proposed management and mitigation measures and the continued implementation of existing controls and management measures. The proposed WSD would not be permitted to discharge at any time and has been designed to ensure that no water would flow into the Sydney drinking catchment in the event of uncontrolled discharge or dam failure. Therefore, it is considered that the Proposed Modification would result in no impacts to the Sydney Drinking Water Catchment.
- Groundwater – the Proposed Modification would not involve disturbance of groundwater resources and therefore potential impacts to those resources would be negligible.
- Noise – the Proposed Modification would not result in any exceedances of the relevant noise criteria. Consequently, the Proposed Modification is unlikely to increase noise-related impacts surrounding the Project Site.
- Air Quality – the Proposed Modification would result in negligible increases in particulate matter concentrations, with rare exceedances of relevant criteria attributed to high background concentrations. The Proposed Modification would not significantly impact greenhouse gas emissions generated by the approved Project.

- Transportation – the Proposed Modification would not change the maximum number of movements generated during any one hour, nor the number of laden heavy vehicle movements generated over the life of the Project. A maximum of 20 heavy vehicle movements would be generated per day, when required, for the purpose of water transportation.
- Visual Amenity – given that the location of the disturbance areas associated with the Proposed Modification are located approximately 550m north of the ROM pad, and the visual setting of the Project Site, the additional visual amenity impacts would be negligible.

All other environmental aspects are unlikely to be affected by the Proposed Modification.

8.6 Socio-Economic Considerations

The Proposed Modification would result in:

- continued employment of local residents at existing employment levels;
- continued expenditure by Mine personnel in commercial facilities of Majors Creek, Braidwood and other towns;
- continued contribution to the local and surrounding economies through payments for goods and services and contributions via taxes, royalties, rates and the VPA; and
- the continued provision of indirect flow-on benefits associated with the afore-mentioned employment and economic contributions.

Based on the above, and the fact that the Proposed Modification would be undertaken without affecting the amenity of surrounding residents, it would have a positive influence on the socio-economic conditions of the town of Majors Creek and surrounding region. As a result, it is considered that on balance the Proposed Modification would provide for a net socio-economic benefit.

8.7 The Public Interest

In concluding this document, the Applicant contends that the Proposed Modification would be in the public interest for the following reasons. Each of the benefits identified represent those which are provided by the Project currently and which would be threatened should the Proposed Modification not be approved.

- Direct full-time employment for approximately 120 to 140 full-time equivalent positions during the operational phase of the Project.
- Contribution of $3 million to $7 million per year to the local and regional economy through wages and purchases of local goods and services.
- Support of local community services and projects.

- Approximately $10 million to $31 million per year to the State and national economy through purchases of goods and services within NSW and Australia.
- Approximately $1 million to $8 million per year to the local, State and national governments through the payment of rates, taxes and royalties.

9. References

Austroads (2020a). *Guide to Traffic Management Part 3: Traffic Studies and Analysis Methods*

Austroads (2020b). *Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings Management.*

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