HUNTER VALLEY OPERATIONS

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# HUNTER VALLEY OPERATIONS CONTINUATION PROJECT

## ENVIRONMENTAL IMPACT STATEMENT

DECEMBER 2022



# HVO Continuation Project

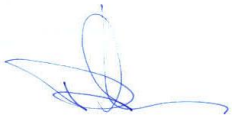
## Environmental Impact Statement

HV Operations Pty Ltd

H190408 RP1

December 2022

Approved by



**Duncan Peake**
**Director**
19 December 2022

Ground floor 20 Chandos Street
St Leonards NSW 2065
PO Box 21
St Leonards NSW 1590

This report has been prepared in accordance with the brief provided by HV Operations Pty Ltd and has relied upon the information collected at the time and under the conditions specified in the report. All findings, conclusions or recommendations contained in the report are based on the aforementioned circumstances. The report is for the use of HV Operations Pty Ltd and no responsibility will be taken for its use by other parties. HV Operations Pty Ltd may, at its discretion, use the report to inform regulators and the public.

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# EIS declaration

*For submission of an environmental impact statement (EIS) under Part 4, Division 4.1 of the NSW Environmental Planning and Assessment Act 1979.*

**Details of persons by whom this EIS was prepared**


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| **Project details** | |
|---|---|
| Project name | Hunter Valley Operations (HVO) Continuation Project |
| Application number | HVO North Open Cut Coal Continuation Project: SSD-11826681<br>HVO South Open Cut Coal Continuation Project: SSD-11826621 |
| Address of the land in respect of which the development application is made | Refer to the schedule of lands in Appendix A |
| **Applicant details** | |
| **Applicant name** | HV Operations Pty Ltd |
| **Applicant address** | PO Box 315 Singleton NSW 2330 |

**Declaration by registered environmental assessment practitioner**

**The undersigned declares that this EIS:**

- has been prepared in accordance with Part 8 of the Environmental Planning and Assessment Regulation 2021;
- contains all available information relevant to the environmental assessment of the development, activity or infrastructure to which the EIS relates;
- does not contain information that is false or misleading;
- addresses the Planning Secretary's environmental assessment requirements (SEARs) for the project;
- identifies and addresses the relevant statutory requirements for the project, including any relevant matters for consideration in environmental planning instruments;
- has been prepared having regard to the Department's State Significant Development Guidelines – Preparing an Environmental Impact Statement;
- contains a simple and easy to understand summary of the project as a whole, having regard to the economic, environmental and social impacts of the project and the principles of ecologically sustainable development;
- contains a consolidated description of the project in a single chapter of the EIS;
- contains an accurate summary of the findings of any community engagement; and
- contains an accurate summary of the detailed technical assessment of the impacts of the project as a whole.

| | |
|---|---|
| Name: Nicole Armit | Name: Duncan Peake |
| Registation number: R80025 | Registation number: R80016 |
| Organisation registered with: EIANZ | Organisation registered with: EIANZ |
| Signature  |  |
| Date 19 December 2022 | 19 December 2022 |

# Executive Summary

## ES1 Background

Hunter Valley Operations (HVO) is an established multi-pit open cut coal mining complex, comprising two mine sites separated by the Hunter River, HVO North and HVO South. HVO is approximately 24 kilometres (km) north-west of Singleton in the Hunter Valley of New South Wales (NSW) (refer to Figure ES1 and Figure ES2). While the two mine sites are approved under separate development consents, they operate as one complex with fully integrated environmental management systems. The HVO Complex is illustrated at a local scale in Figure ES3. HVO is owned by subsidiary companies of Yancoal and Glencore, as participants in the unincorporated HVO Joint Venture (JV). HV Operations Pty Ltd is the appointed manager of the JV.

HVO North operates under Development Consent DA 450-10-2003, which was granted in 2004 and allows extraction of up to 22 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal until 12 June 2025. HVO North comprises the approved mining areas of West Pit, Mitchell Pit, Carrington Pit and North Pit as shown in Figure ES3, as well as the Hunter Valley (HV) and Howick Coal Preparation Plants (CPP) and the Howick and HVO North mine infrastructure area (MIA). The Newdell Load Point (LP) and Hunter Valley (HVLP) train loading facilities are also at HVO North.

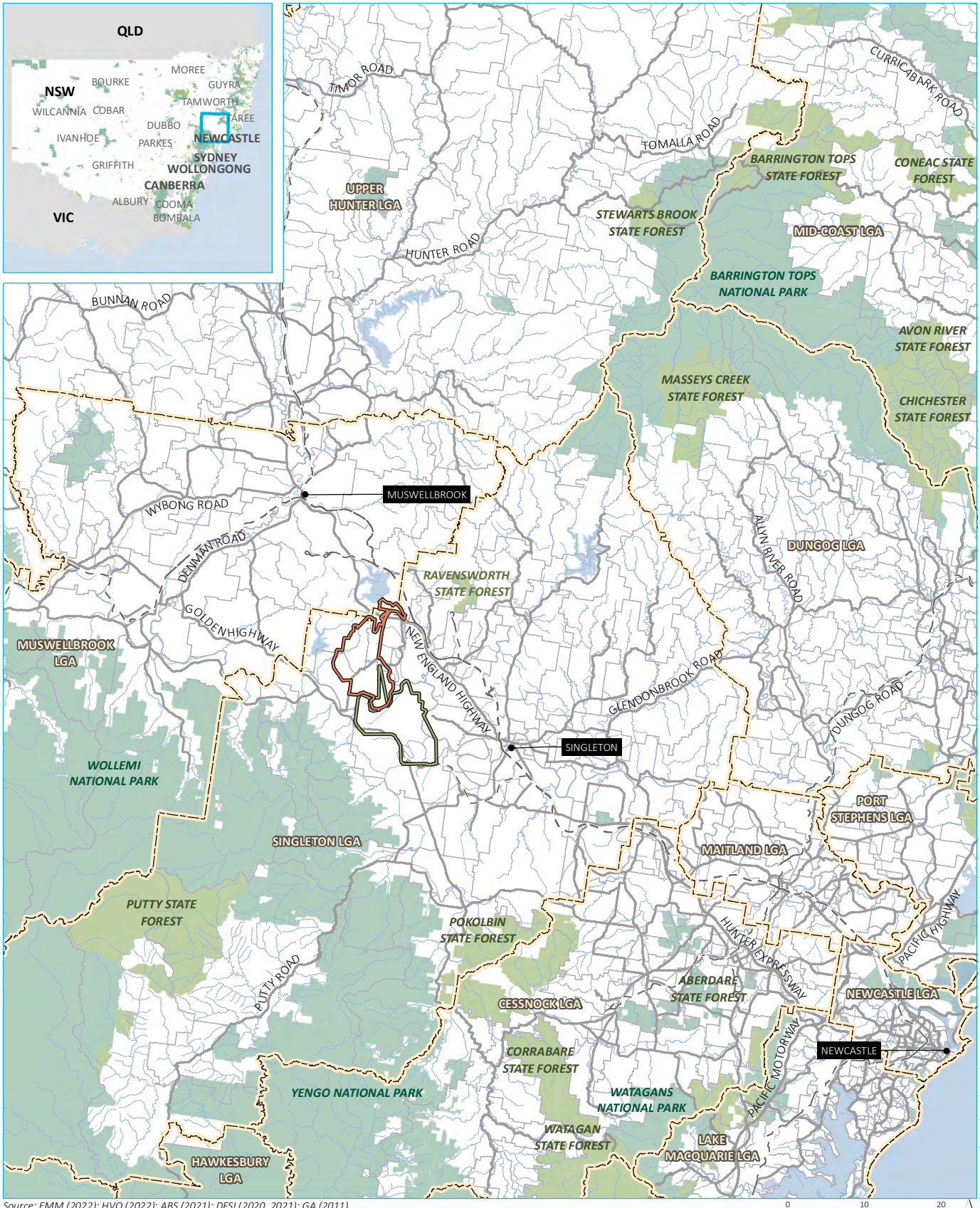
HVO South operates under Project Approval (PA) 06_0261, which was granted in 2009 and comprises the approved mining areas of Riverview Pit, Cheshunt Pit, Riverview South East Extension and South Lemington Pits 1 and 2, as well as the MIA, and the Lemington CPP (LCPP) and rail loop (approved but not constructed) as shown in Figure ES3. PA 06_0261 allows extraction of up to 20 Mtpa of ROM coal until 24 March 2030.

## ES2 Project overview

HV Operations Pty Ltd is seeking approval for the HVO Continuation Project (the Project) from the NSW Minister for Planning, or delegate, under the provisions of Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act), and from the Federal Minister for the Environment under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Broadly, the Project involves the continuation of the life of HVO North and HVO South, from the current approved mining completion dates of 2025 and 2030 respectively, to the end of 2050 at HVO North and the end of 2045 at HVO South. The continuation of mining across the HVO Complex will optimise resource recovery from the existing operation, predominantly by extracting coal from deeper seams at HVO North by mining through previously mined areas and within the extent of existing mining tenements. At HVO South, an extension to the life of the mine is proposed to facilitate improved mine sequencing outcomes. The primary components of the Project at HVO North and HVO South are shown in Figure ES4.

To enable the Project to proceed, two new State Significant Development (SSD) consents are required; one for HVO North and one for HVO South. The Project seeks to maintain separate development consents for HVO North and South, as is currently the case. This Environmental Impact Statement (EIS) has been prepared to assess the social, environmental and economic impacts of the Project and will accompany the development applications under Part 4, Division 4.1 of the EP&A Act.




Source: EMM (2022); HVO (2022); ABS (2021); DFSI (2020, 2021); GA (2011)

0 10 20 km

GDA2020 MGA Zone 56

N

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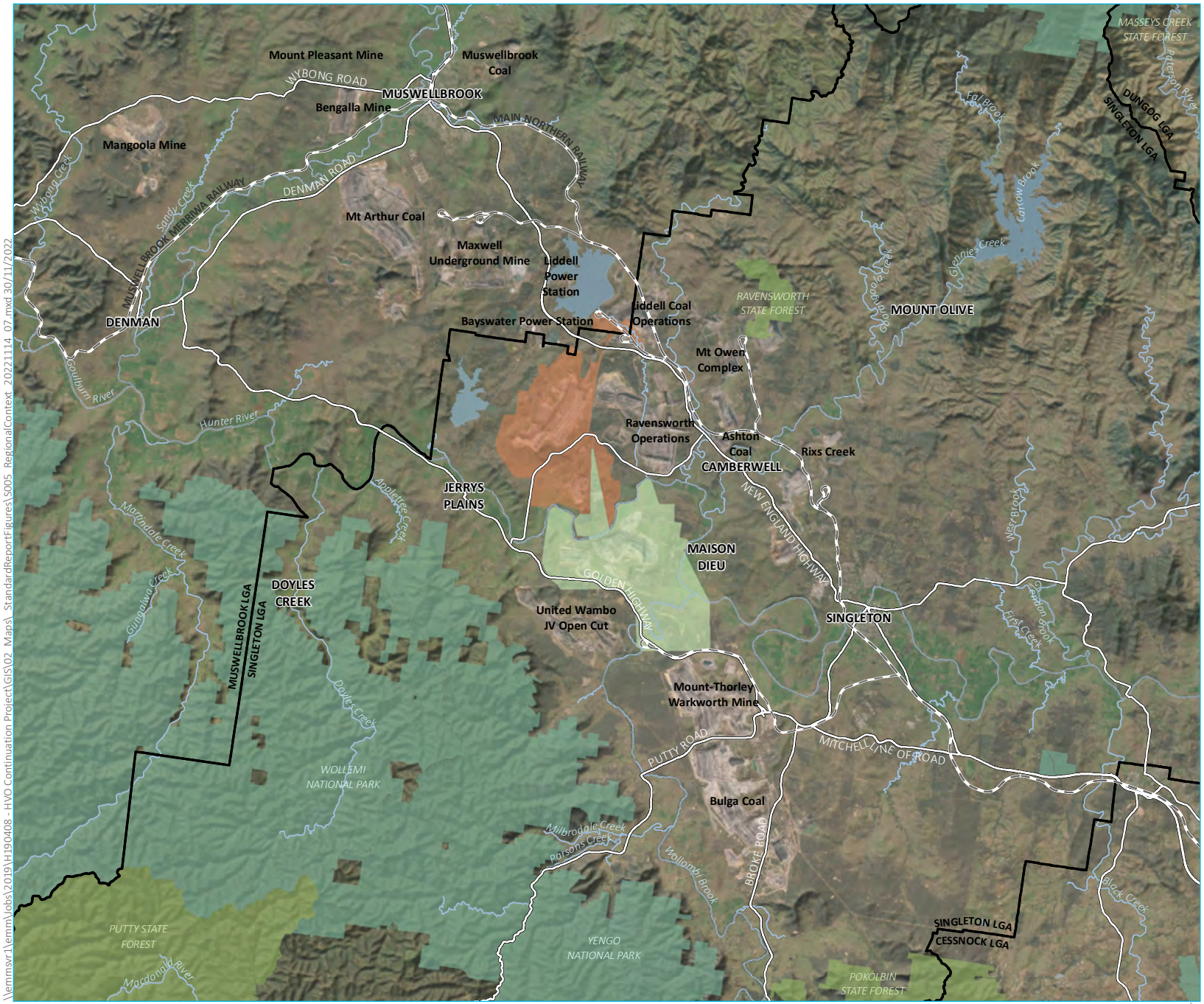
## KEY

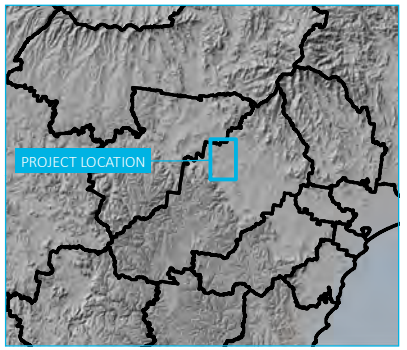
- Existing HVO North development consent boundary (DA 450-10-2003)
- Existing HVO South project approval boundary (PA 06_0261)
- Rail line
- Major road
- Named watercourse
- Named waterbody
- Suburb boundary
- Local government area
- NPWS reserve
- State forest

Locality plan

HVO Continuation Project
Envieonmental Impact Statement
Figure ES1

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KEY

- Existing HVO North development consent boundary (DA 450-10-2003)
- Existing HVO South project approval boundary (PA 06_0261)

Existing environment

- Main road
- Rail line
- Named watercourse
- Named waterbody
- NPWS reserve
- State forest
- Local government area

Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011); ASGC (2006)

0 10 20 km

GDA2020 MGA Zone 56

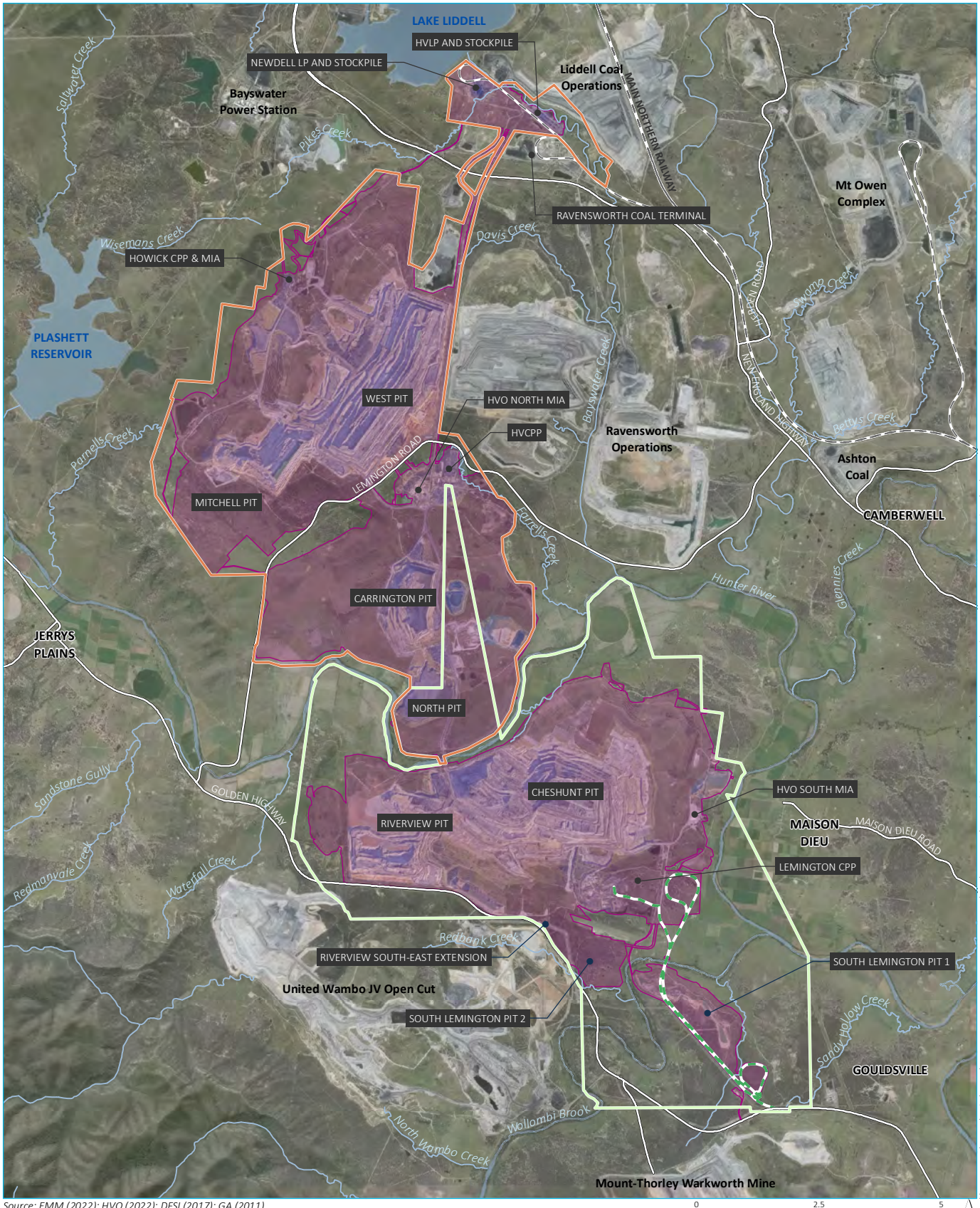
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\\emmsvr1\emm\Jobs\2019\H190408 - HVO Continuation Project\GIS\02 Maps_StandardReportFigures\S005 RegionalContext 20221114 07.mxd 30/11/2022

# Regional context

HVO Continuation Project
Environmental Impact Statement
Figure ES2

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*Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011)*

0 2.5 5 km

GDA2020 MGA Zone 56

N

## KEY

- Existing HVO North development consent boundary (DA 450-10-2003)
- Existing HVO South project approval boundary (PA 06_0261)
- Existing and approved disturbance area
- South Lemington Rail Loop and haul route (approved, not yet constructed)

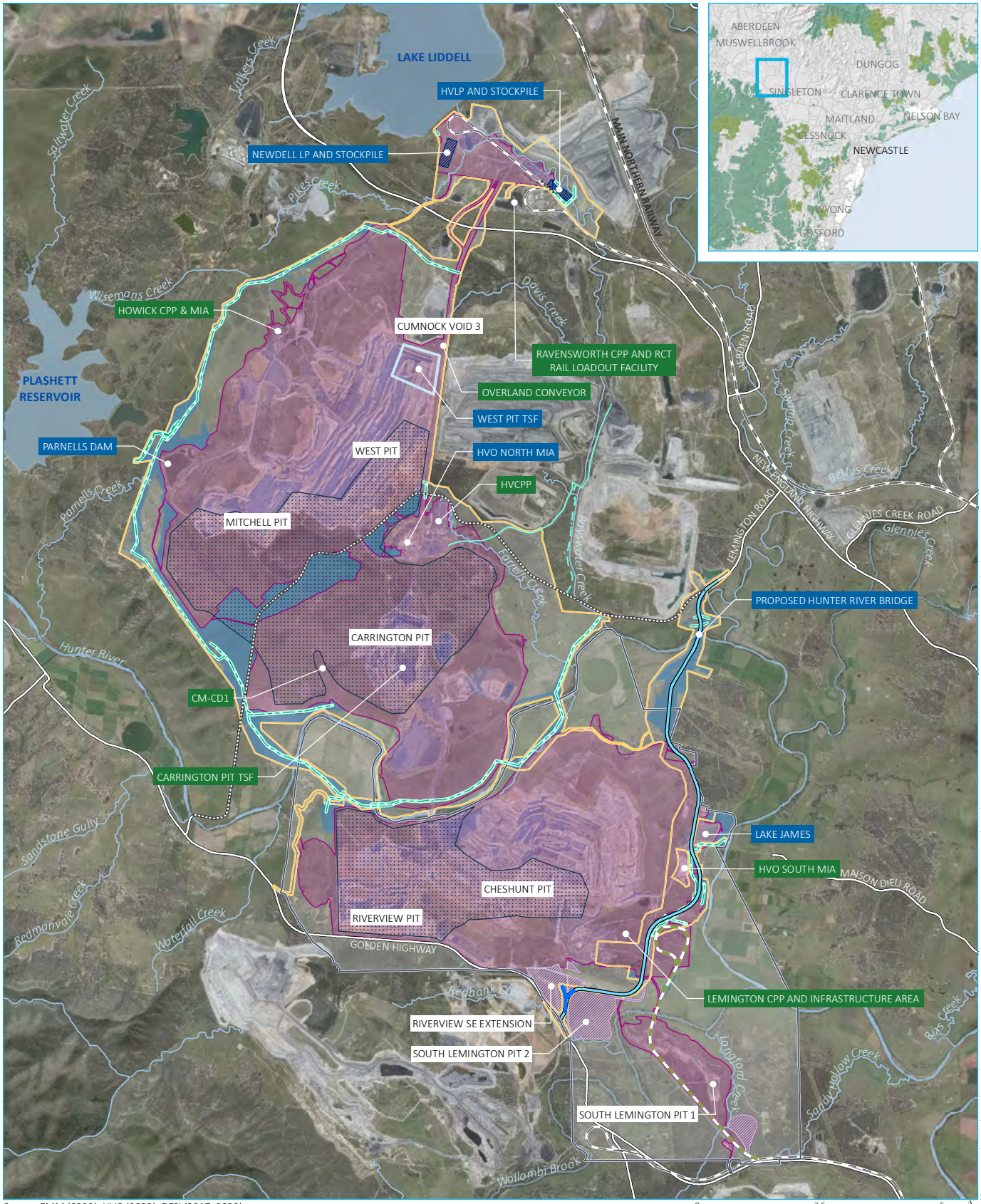
Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

# Local context

HVO Continuation Project
Environmental Impact Statement
Figure ES3

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Source: EMM (2022); HVO (2022); DFSI (2017, 2020)

0 2.5 5 km

GDA2020 MGA Zone 56

N

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## KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Existing and approved disturbance area
- Previously approved area not retained
- Project related item
- Existing item

Existing HVO elements to be maintained

- South Lemington Rail Loop (approved, not yet constructed)

Proposed HVO Continuation Project elements

- Lemington Road realignment
- Indicative location of public road closure
- Haul route to Ravensworth Operations
- Transmission line relocation
- Alternative Golden Highway intersection
- Proposed mining area
- Product stockpile
- Additional disturbance area
- West Pit TSF

Existing environment

- Rail line
- Major road
- Ravensworth Operations access road
- Named watercourse
- Named waterbody
- NPWS reserve (refer to inset)
- State forest (refer to inset)

# Proposed conceptual layout

HVO Continuation Project
Environmental Impact Statement
Figure ES4

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## ES2.1 HVO North

The key changes proposed by the Project to the approved HVO North operations include:

- an extension to the life of the mine until the end of 2050;
- extraction of coal to the base of the Barrett seam across the HVO North mining area. Existing operations are approved to extract coal to the base of the Barrett seam in the West Pit; however, are only approved to the base of the shallower Bayswater seam in the Carrington Pit;
- extraction of an additional approximate 400 Mt of ROM coal through the extraction of coal from deeper seams and a small increase in the mining extent (between the existing West and Mitchell Pits and Carrington Pit);
- infrastructure upgrades, as listed below:
    - realignment of Lemington Road and construction of a new bridge over the Hunter River. While the proposed realigned road corridor is partly within the HVO South development consent boundary, the realignment is required to enable the progression of mining from the West and Mitchell Pits into the Carrington Pit at HVO North. The works associated with the road realignment therefore form part of the HVO North Project;
    - HVO North site access road relocation off the existing Lemington Road;
    - an increase in the capacity of Parnells Dam (Dam 9W) from approximately 1 gigalitre (GL) to approximately 4 GL;
    - realignment of transmission and telecommunication lines that are currently within the proposed mining area;
    - mine infrastructure area (MIA) upgrade;
    - construction of the North Void flood protection levee;
    - ancillary activities as required to facilitate operations;
    - access roads to facilitate service provider access;
    - use of demountable/temporary buildings in Project compounds as required; and
    - upgrade of the existing Newdell LP train loading facility and construction of a new product stockpile; or an extension of the HVLP product coal stockpile. While approval for both options is sought, only one will be constructed;
- coal haulage from the HVCPP to the Ravensworth ROM pad, via internal haul roads;
- revision and implementation of the tailings strategy;
- amendments to the approved final landform; and
- changes to the development consent boundary to incorporate the changes listed above.

Other than as set out above, all activities that are currently approved under the existing HVO North approval are intended to continue. Key aspects and outcomes of the approved development at HVO North that will remain the same under the Project include the following:

- the maximum allowable annual coal extraction and processing rate;
- annual operational workforce numbers and associated traffic generation;
- approved heights of overburden emplacement areas;
- receipt of ROM coal from HVO South via internal haul roads for processing at all CPP facilities approved for HVO North;
- continued avoidance of the Aboriginal heritage site known as Carrington Mine – Colluvial Deposit 1 (CM-CD1); and
- the ridge between Jerrys Plains and HVO North will remain, continuing to provide an effective amenity barrier.

## ES2.2 HVO South

The key changes proposed by the Project to the existing approved operations at HVO South include:

- an extension of the life of the mine until the end of 2045;
- a reduction in the approved maximum ROM coal extraction rate from 20 Mtpa to 18 Mtpa;
- changes to the approved mine sequencing (although noting that mining within the two primary open cut pits, Riverview and Cheshunt, will remain generally within the same footprint as approved);
- removal of coal extraction from the mine plan in the Riverview South East Extension, South Lemington Pit 1 and South Lemington Pit 2 mining areas;
- infrastructure upgrades and changes to that currently approved, as listed below:
    - removal of the LCPP short rail loop option and the associated road or conveyor haulage options;
    - removal of the approved conveyor from HVO South to the HVCPP at HVO North (the conveyor has not been constructed);
    - removal of the need to relocate Comleroi Road (due to the removal of coal extraction from the Riverview South East Extension);
    - construction of the Cheshunt and Riverview Pit flood protection levees;
    - realignment of transmission lines;
    - enlargement of Lake James (Dam 15S) from approximately 0.7 GL to approximately 2 GL;
    - additional tailings pipelines and pumps;
    - ancillary activities as required to facilitate operations;
    - access roads to facilitate service provider access; and

- use of demountable/temporary buildings in Project compounds as required;

- revision and implementation of the tailings strategy; and
- amendments to the final landform due to rescheduling and or infrastructure relocations.

Other than as set out above, all activities that are currently approved under the existing HVO South approval are intended to continue. Key aspects of the approved development at HVO South that will remain the same under the Project include the following:

- the coal seams to be extracted (ie no increase in the depth of mining);
- the extent of approved mining areas within the Riverview and Cheshunt Pits;
- approved heights of overburden emplacement areas;
- construction of the LCPP and associated rail loop (long rail loop option only);
- transfer of coal from HVO South to HVO North for processing; and
- annual operational workforce numbers and associated traffic generation.

## ES3 Need for the Project

Operations first commenced at HVO over 70 years ago, in 1949. Since its inception HVO has been, and continues to be, an important contributor to the Hunter Valley and NSW economy, producing high quality thermal and semi-soft coking coal suitable for use in international and domestic markets. Significant coal resources remain across the HVO Complex beyond what is currently approved for extraction.

Consideration of the Project's need in the context of international and domestic coal markets are discussed further below.

### ES3.1 International market needs

The latest World Energy Outlook (WEO 2022), published by the International Energy Agency (IEA) in October 2022, describes how the world is in the midst of the first truly global energy crisis, due to a combination of the effects of the Covid-19 pandemic, and Russia's invasion of Ukraine, with impacts that will be felt for years to come. The crisis has resulted in a current boost to demand for oil and coal as consumers look to secure alternatives to high priced gas.

While coal demand is predicted to continue to decline in advanced economies by the WEO (2022), overall coal consumption in developing and emerging market economies is expected to continue a more sustained rise in a few fast growing countries and regions, notably India and Southeast Asia, a current key market for HVO. Assets in developing countries such as South-east Asia are on average 10 to 15 years old, with new plant continuing to be constructed.

Current national and NSW policy recognises the ongoing demand for coal, particularly in the Asian export market and its importance to the NSW and Australian economy (IPC 2022a, and IPC 2022b). The current strategic direction relating to coal seeks to continue exploration, extraction and export (IPC 2022a, and IPC 2022b).

In NSW, the State government's *Strategic Statement on Coal Exploration and Mining in NSW* (strategic statement) recognises that mining will continue to be an important part of the State economy into the future. The strategic statement notes that coal remains a critical energy source globally, supplying over a third of all electricity, and predicts the global demand for thermal coal will remain strong to 2050.

Coal remains a key energy source for developing countries because it provides a reliable source of grid-based energy, and because of established investment in coal generation capacity.

In relation to coking coal, of which the product mix from HVO comprises approximately 12% in the form of semi-soft coal, Wood MacKenzie (2021) reports that demand is forecast to continue to rise, albeit at a modest rate of on average 1.4% over the next 20 years.

## ES3.2 Domestic context

The strategic statement indicates the balanced approach the NSW Government will take in relation to the future of coal mining in the State by setting a clear and consistent policy framework that supports investment certainty, so that the NSW coal sector can satisfy long-term global demand for coal, while giving NSW coal-reliant communities time to adapt to a low carbon future. The Project is consistent with the objectives and direction of the strategic statement supporting responsible coal mining in areas deemed suitable for mining, reducing impacts and supporting the diversification of the regional Hunter economy.

The Commonwealth Government's *Climate Change Act 2022* (Climate Change Act) commenced on 14 September 2022, which enshrines Australia's commitments under the Paris Agreement to reduce Australia's national GHG emissions. The life of the Project (2045 at HVO South and 2050 at HVO North) is consistent with the assumptions which underpin the Commonwealth Government's commitment to net zero emissions by 2050.

HVO is a designated large facility under the *National Greenhouse and Energy Reporting Act 2007* and is, therefore, subject to carbon regulation and pricing, which is in the process of being strengthened with respect to the safeguard mechanism amendments that form part of the overarching updated national emission reduction targets.

In NSW, around 70% of electricity is derived from coal (DCCEEW 2022). NSW's energy mix contains the largest share of coal compared with other states and territories, due to the high percentage of electricity generation from coal in the State.

## ES3.3 Project objectives and benefits

The primary objective of the Project is to efficiently and economically recover an additional approximate 400 Mt of ROM coal resources over approximately 25 years, which are within existing mining tenements and predominantly within existing and approved disturbance areas across the HVO Complex while maximising the utilisation of existing infrastructure. Extensive investigations have been undertaken into a long-term plan for the complex beyond the approved mine life to achieve increased recovery of the remaining coal resources while balancing social, environmental, and economic outcomes.

The Project will:

- enable the continuation of a brownfield mining complex in a long-established coal mining and power generation precinct;
- maximise resource recovery by mining the deeper Barrett seam in HVO North, within existing mining tenements and minimising further disturbance;
- provide ongoing employment opportunities for the existing approximate 1,500 full time equivalent (FTE) workforce well beyond the life of the current planning approvals under which the complex currently operates, which will become increasingly important as the local and regional Hunter Valley economy continues to diversify beyond coal;
- provide improvements in terms of reliability and accessibility of Lemington Road through periods of heavy rainfall through the realignment of the road, which will include the construction of a new bridge over the Hunter River;

- provide the opportunity to contemporise the HVO final landform by incorporating natural landform design principles. Areas disturbed by mining activities as a result of the Project will reflect a landform that is sympathetic to the surrounding landscape;
- reduce the maximum annual ROM coal extraction rate at HVO South, from 20 Mtpa to 18 Mtpa. The maximum annual ROM coal extraction rate at HVO North will remain the same at 22 Mtpa;
- reduce the area at HVO South approved for coal extraction, which in turn will reduce the impact of the Project on the Central Hunter Grey Box – Ironbark endangered ecological community (EEC) compared to that approved at HVO South, namely in South Lemington Pit 1, South Lemington Pit 2 and the Riverview South East Extension; and
- continue the ongoing contribution to the local, regional, and State economies from a well-established mining operation.

Further, the Project will contribute to meeting the ongoing demand for high quality thermal and semi-soft coal throughout a period in which there is expected to be a gradual decline of coal mining in the Hunter region, giving local communities time to adapt. The current geopolitical landscape and emerging energy crisis has led to governments placing a heightened priority on energy security, which is contributing to the continued demand for coal.

## ES4 Environmental, social and economic implications

Applications for SSD under Part 4, Division 4.1 of the EP&A Act must be accompanied by an EIS prepared in accordance with the Secretary's environmental assessment requirements (SEARs). Accordingly, this EIS has been prepared by EMM Consulting Pty Limited (EMM) on behalf of HV Operations Pty Ltd to support SSD applications relating to HVO North (SSD 11826681) and HVO South (SSD 11826621). It has been prepared to address the SEARs issued for the Project in accordance with the *State Significant Development Guidelines* (NSW Government 2021).

This EIS is supported by input from technical specialists and detailed technical assessments to address the matters identified in the Project's SEARs as requiring assessment. A summary of the key outcomes of these assessments and the key management measures proposed for the Project is provided in Table ES1.

## Table ES1 Summary of key assessment outcomes and proposed measures

| Technical matter | Key assessment outcomes and proposed measures |
|---|---|
| Air quality | Compliance with cumulative annual average $PM_{10}$ and $PM_{2.5}$ air quality criteria is expected to be achieved at sensitive receptors that are not already subject to existing acquisition rights from HVO or other surrounding mines, apart from one receptor (308). It is anticipated this receptor will therefore be entitled to voluntary acquisition rights, as outlined in the *Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Developments* (VLAMP). Notably, the contribution of the Project to annual average PM concentrations at the nearest local communities is predicted to be low, and in the order of 5 µg/m$^3$ or less for $PM_{10}$ (against criterion of 25 µg/m$^3$), and 1 to 2 µg/m$^3$ for $PM_{2.5}$ (against a criterion of 8 µg/m$^3$).<br>In addition, in accordance with the VLAMP, it is anticipated that another receptor (121), as well as 308 will be entitled to voluntary acquisition rights as the Project may contribute to an exceedance of the annual average $PM_{10}$ and $PM_{2.5}$ criteria on more than 25% of the privately owned land associated with these existing dwellings.<br>Cumulative 24-hour $PM_{10}$ and $PM_{2.5}$ concentrations may continue to exceed air quality criteria from time-to-time; however, these events are predicted to be within the range of historically measured days above the criteria, excluding extraordinary events.<br>Predicted TSP and deposited dust concentrations comply with the relevant air quality criteria.<br>HVO will continue to implement best practice air quality management measures including proactive management of operations to minimise impacts in adverse conditions.<br>HVO currently operates a near neighbour amenity resource program, which is a voluntary commitment to offer water tank cleaning or supply of water filters to neighbours that request such a service. HVO proposes to replace this program with a more structured program whereby private residences within 4 km of the proposed mining area will be eligible for tank inspections, cleaning and installation of first flush filter systems for residential water tanks and domestic taps. |
| Greenhouse gas | The estimated annual average Scope 1 and 2 emissions from the Project (1.26 Mt $CO_2$-e) represent approximately 0.25% of Australia's 2020 emissions and 0.0025% of global emissions. The HVO thermal product is high quality, high energy bituminous coal suitable for high efficiency power generation. Should this high-quality coal not be available for export, markets will turn to alternative sources which may include lower quality sub-bituminous and even lignite (brown coal) from Indonesia or lignite quality brown coal from India.<br>Measures to minimise or mitigate Scope 1 and Scope 2 greenhouse gas (GHG) emissions have been considered throughout the development and assessment of the Project. HVO will continue to manage its contribution to Australian GHG emissions inventories through reporting under the *National Greenhouse and Energy Reporting Act 2007* (NGER Act), as well as other government initiatives implemented to manage emissions at a national level. As a designated large facility under the NGER Act, the Safeguard Mechanism applies to HVO, and therefore ongoing operations at HVO will be subject to the emissions reduction requirements that are contained within it.<br>HVO is committed to the ongoing consideration of reasonable and economically feasible technologies as they become available and will review technologies throughout the life of the mine to improve efficiencies and reduce emissions. |

## Table ES1 Summary of key assessment outcomes and proposed measures

| Technical matter | Key assessment outcomes and proposed measures |
|---|---|
| Noise | Development of the Project design has been an iterative one undertaken in conjunction with the noise assessment, in which all reasonable and feasible mitigation measures have been considered in accordance with the NSW Government's *Noise Policy for Industry* (NPfI) to minimise noise impacts on sensitive receptors. These measures include progressive attenuation of the mining fleet, haul route selection to minimise exposure of significant noise generating mobile fleet, construction of a roadside bund on the exposed side of the haul road from the Mitchell Pit towards the Howick CPP, and equipment shutdowns during enhancing meteorological conditions. With all of these measures considered, achievable noise levels have been developed for HVO in accordance with the NPfI, which are proposed as the noise criteria for the Project.<br><br>The assessment found that six sensitive receptors on the outskirts of Jerrys Plains not currently entitled to voluntary mitigation rights, are anticipated to be entitled to these rights due to predicted exceedances of the Project Noise Trigger Levels (PNTLs), which have been established in accordance with the NPfI. It is anticipated that these sensitive receptors will be subject to voluntary mitigation in the form of acoustic treatments to reduce noise inside the residence as outlined in the VLAMP. While a marginal noise impact is predicted at these receptors due to the Project, it is noted that the PNTLs for these sensitive receptors in the evening and night-time periods are lower than the current EPL limit that applies (ie noise management group 6), and the recommended noise criteria is consistent with the current EPL (ie HVO will need to comply with the same noise levels at these receptors as it does now).<br><br>A further 13 sensitive receptors that currently hold noise mitigation rights in accordance with the HVO South Project Approval are anticipated to have these rights extended based on predicted marginal residual noise impacts as a result of the Project.<br><br>In addition, seven sensitive receptors that already have mitigation rights in accordance with the HVO South Project Approval are not predicted to experience noise levels such that they would be entitled to voluntary mitigation rights for the Project; however, HVO proposes to retain voluntary noise mitigation rights for these sensitive receptors despite predictions being lower than applicable criteria.<br><br>Construction noise predictions are below the 'noise affected level' for all other sensitive receptors around HVO. Some sensitive receptors in Maison Dieu may experience noise levels that are higher than the 'noise affected' management level, but well below the 'highly noise affected' management level, as specified in the *Interim Construction Noise Guideline* (EPA 2009).<br><br>No significant road traffic noise impacts during operation or construction are predicted under the Project. |

## Table ES1 Summary of key assessment outcomes and proposed measures

| Technical matter | Key assessment outcomes and proposed measures |
|---|---|
| Blasting | Blasting impacts were assessed at blast sensitive locations in proximity to the Project such as private residences at Maison Dieu and Jerrys Plains, heritage items, infrastructure (public roads and bridges, high voltage transmission lines and electrical substations) and livestock and the equine industry in Jerrys Plains. The assessment found that exposure to vibration and airblast overpressure can be effectively managed via the application of blast management measures such as reduced charge masses.<br>Further, there will be no impacts to declared dams, adjacent mines or the Hunter Valley Gliding Club from vibration or airblast overpressure, with predicted levels below the relevant criteria.<br>Best practice blast management protocols will continue to be implemented at HVO. In addition to these measures:<br>• three additional blast monitors will be installed at different stages of the Project at a location representative of private residence 317 or 311 in Jerrys Plains, the Great Lodge (heritage site), and at Oaklands Homestead (heritage site);<br>• one additional portable monitor will be positioned at a location representative of the closest heritage site to the active blasting area out of the Carrington Homestead (heritage site) and Wandewoi Homestead (heritage site);<br>• additional controls will be used to manage overpressure levels below the applicable criteria at residential receptors;<br>• when blasting within 1,500 m of the heritage site Great Lodge, Carrington Homestead and Wandewoi Homestead, blast design measures will be carried out to meet ground vibration criteria; and<br>• increased ground vibration control measures will be required to manage vibration levels below applicable limits for some public infrastructure. |

## Table ES1 Summary of key assessment outcomes and proposed measures

| Technical matter | Key assessment outcomes and proposed measures |
|---|---|
| Water resources | The Project will result in minimal to no changes to the annual flow and average duration of dry periods for Hunter River and most of its tributaries. The duration of dry days in Wollombi Brook is predicted to be less for the Project than currently occurs as a result of the approved operations.<br>The water quality of the Hunter River is expected to remain within the existing range observed in the Hunter River with no significant adverse impacts due to the Project.<br>The proposed realignment and new Hunter River bridge crossing of Lemington Road will significantly improve the flood immunity of this road as it crosses the Hunter River. Flood modelling indicates potential impacts to third-party properties will be minor. Relative to baseline conditions these changes result in negligible changes to flood affected areas and will not have an impact on the use of the land.<br>The proposed change to mining at HVO South will result in less groundwater drawdown in the Wollombi Brook alluvium in comparison to the approved operations, through the removal of mining in the South Lemington Pit 1 and 2 area from the mine plan.<br>At HVO North, as mining will mainly be progressing deeper through previously disturbed or currently approved mining areas, the incremental effects of the Project on groundwater are expected to be minor (between 0.2 and 0.5 m). The alluvium along the main channel of the Hunter River is largely buffered from drawdown by low permeability groundwater barriers installed along sections of the aquifer. To limit seepage potential between emplaced spoil and alluvial sediments, a low permeability barrier wall (LPBW) will be constructed in the Carrington West Wing area on the alluvial benches of the highwall following mining in that area and prior to backfilling. The barrier wall will be keyed into the Permian bedrock and will be designed to meet the current development consent requirement of a permeability of $1 \times 10^{-8}$ metres per second.<br>Modelling indicates there are no known privately owned water supply bores situated within the zone where drawdown is predicted to exceed the *Aquifer Interference Policy* (NOW 2012) threshold for minimal impact of 2 m.<br>The final voids are anticipated to remain long-term sinks (ie no discharge) with sufficient freeboard maintained under all modelled scenarios. This prediction is to be expected as the water levels within the final voids are well below groundwater levels within the rock mass surrounding the final voids.<br>HVO holds considerable water entitlement in the relevant surface water and groundwater sources in the Project area, which is sufficient to account for the predicted takes during mining. HVO will continue to manage water in accordance with the objectives of the water management plan and relevant licence requirements. |

## Table ES1 Summary of key assessment outcomes and proposed measures

| Technical matter | Key assessment outcomes and proposed measures |
|---|---|
| Biodiversity | Removal from the Project of some previously approved but not yet disturbed mining areas will result in the avoidance of approximately 87 ha of Central Hunter Grey Box – Ironbark Woodland EEC and smaller areas of other high value vegetation.<br>Avoidance and minimisation strategies for the Project included refinement and location selection of the Lemington Road realignment to avoid larger areas of Warkworth Sands Woodland EEC and Central Hunter Grey Box – Ironbark Woodland EEC, careful consideration of the proposed transmission easement alignment to avoid high value vegetation where possible, and habitat retention following decommissioning of existing transmission lines.<br>After accounting for the implementation of avoidance and minimisation strategies, the Project will remove 397 ha of native vegetation (as defined by the *Biodiversity Assessment Method* (DPIE 2020)), of which 188.8 ha meets the offsetting threshold under the Biodiversity Offset Scheme (BOS). Of this, 97.4 ha conforms to Threatened Ecological Communities (TECs) under the *Biodiversity Conservation Act 2016 (*BC Act) (92.9 ha in HVO North and 4.5 ha in HVO South).<br>An assessment was undertaken to identify the biodiversity credits required to offset the impacts of the Project. HVO is committed to delivering a biodiversity offset strategy in accordance with the BC Act that appropriately compensates for the unavoidable loss of biodiversity values and residual impacts of the Project. To account for the Project's impacts to Warkworth Sands Woodland EEC, an offset site referred to as the South Lemington Offset, has been identified near South Lemington Pit 1 at HVO South. This site, along with proposed restoration measures is anticipated to provide for the entire Warkworth Sands Woodland ecosystem credit requirements for the Project. HVO proposes to stage the retirement of credits as clearing of the additional disturbance area occurs. |
| Aquatic ecology | No impacts are predicted on the aquatic ecology of the Hunter River, particularly as flow is managed through regulated releases from Glenbawn Dam. The predicted minor changes in streamflow and duration of dry days due to the Project in its tributaries is expected to have a negligible to minor impact on aquatic ecology.<br>As described above under water resources, the incremental effects of the Project on groundwater are expected to be minor. In addition, the alluvial aquifer will continue to be recharged from regulated flows in the Hunter River, and therefore impacts to this aquifer ecosystem, and endangered river red gum populations that occur along the river are likely to be minor or negligible. The river red gum population opportunistically uses shallow groundwater and will continue to have access to this shallow alluvial groundwater. No significant impact on groundwater dependent ecosystems (GDEs) or aquatic ecology is predicted.<br>Peak cumulative drawdown of up to 5 m is predicted in the Wollombi Brook alluvium near South Lemington Pit 1 and above the Lemington underground. This will have a minor impact on GDEs though it will not prevent the long-term viability of the ecosystems.<br>In addition, the Project is predicted to have a negligible impact on Hunter River flow and flooding regime post-mining. Therefore, river red gum communities will have the continued ability to rely on flooding for germination.<br>Stygofauna were recorded during sampling, mostly from within the paleochannel aquifer north of the Hunter River and west of the existing mine. This area is already approved for excavation as part of the Carrington West Wing at HVO North. The assessment found that the regional impact on stygofauna is likely to be minor as all taxa collected from the paleochannel were also collected at other locations along the Hunter River and within the Hunter Valley. |

## Table ES1 Summary of key assessment outcomes and proposed measures

| Technical matter | Key assessment outcomes and proposed measures |
|---|---|
| Aboriginal cultural heritage | A comprehensive Aboriginal Cultural Heritage Assessment (ACHA) process was completed for the Project in consultation with the 33 Registered Aboriginal Parties (RAPs).<br>The Project has been designed to continue avoidance of a significant Aboriginal heritage site, CM-CD1, at HVO North.<br>304 extant Aboriginal sites were identified within the Project disturbance area. Of these, 145 (138 at HVO North and 7 at HVO South) are in the additional disturbance area associated with the Project or approved disturbance areas associated with another mine that overlaps the Project, and 159 (96 at HVO North and 63 at HVO South) are in the existing and approved disturbance area.<br>Of the sites identified in the Project disturbance area, 84 (28%) will be avoided, 198 (65%) will be collected via surface collection, 19 (6%) will involve surface collection and salvage excavation, one (<1%) will be salvaged via salvage excavation only, and the scarred portions of two scarred trees (<1%) will be salvaged and relocated.<br>The majority (84%) of the extant sites identified were found to be of low scientific significance. Three sites of high significance were identified at HVO North, one of which will continue to be avoided (CM-CD1) and two (scarred trees) will be salvaged.<br>Cultural values mapping of the Project area, which was undertaken by Dr Philip Clarke with involvement from RAPs, did not identify any Aboriginal cultural values or places, or any sites beyond archaeological sites already identified by the ACHA, within the Project area.<br>The existing Aboriginal Cultural Heritage Management Plans will be revised and consolidated in consultation with the RAPs and Heritage NSW, to guide the mitigation and management of sites in the Project area and to avoid inadvertent impacts.<br>HVO has also committed to meaningful social mitigation of Aboriginal cultural heritage impacts of the Project through a number of initiatives identified in consultation with RAPs, including job readiness programs, assistance relating to tendering for work at HVO by Aboriginal suppliers, and a commitment of $1,000,000 over the first 10 years of the Project for funding programs that align with Closing the Gap initiatives. The Social Impact Management Plan proposed to be developed for the Project will further develop these initiatives and outline the proposed implementation plan. |
| Historic heritage | At HVO North:<br>• One unlisted item assessed as having local contributory significance, remnant stockyards, will be directly impacted by the Project at HVO North. Mitigation measures comprising archival recording are proposed for this item. No other historic heritage item will be directly impacted by the Project.<br>• The State listed Chain of Ponds Inn is within the HVO North existing and proposed development consent boundary. However, this item is outside of the Project disturbance area and is more than 5 km from the proposed mining area. Therefore, Project related impacts are not predicted to occur to the Chain of Ponds Inn.<br>At HVO South:<br>• No historic heritage items will be directly impacted by the Project.<br>• The Great Lodge, an ungazetted item but assessed as potentially State significant, has been identified within the HVO South proposed development consent boundary; however, it is outside of the Project disturbance area. No direct impacts will therefore occur because of the Project, and the blasting assessment found that potential impacts to the Great Lodge can be managed effectively via appropriate blast design. Given the nature of the item's condition, monitoring and further assessment to determine significance will be undertaken. |

## Table ES1 Summary of key assessment outcomes and proposed measures

| Technical matter | Key assessment outcomes and proposed measures |
|---|---|
| Soil and land resources | Soil resources have been assessed for suitability in post mining landforms for intended land uses.<br>A potential soil deficiency of approximately 454,630 m³ has been identified, compared to what is required to meet the final land use objectives, or 6% of the soil bank. Additional alternate growth medium enhancement strategies, specialised management of salvaged soils and ongoing assessment of soil resources prior to stripping will be employed to manage this deficit. |
| Agriculture | The Project disturbance area primarily consist of existing mining areas, existing rehabilitation areas and low intensity grazing land.<br>The Project is not predicted to result in significant adverse impacts on surrounding private agricultural land and mining operations are expected to successfully continue to coexist with the surrounding agricultural land uses.<br>Once the Project area is rehabilitated (ie to the final landform), overall the Project will deliver a net increase of approximately 138 ha of land use for agriculture, compared to the currently approved final landform for the complex. |
| Traffic and transport | During continued operations, the impact of Project on the local road network is anticipated to be minor. No changes to the existing approved workforce are proposed and therefore the Project will not change traffic movements associated with the operation.<br>The Project will require the realignment of a portion of Lemington Road. The realigned Lemington Road will deliver an improved travel experience for users in terms of reliability, safety and average speed, and replacement of the existing single-lane low level bridge crossing over the Hunter River (Moses Crossing) with a new bridge. The new bridge across the Hunter River will substantially improve the flood resilience of the road, providing a significantly more reliable access between the New England Highway and Golden Highway, thereby improving access for the community.<br>In terms of changes to travel time due to the Lemington Road realignment, it was found that:<br>• trips to/from the west of the Lemington Road/Golden Highway intersection will increase between 1.40 minutes and 2.30 minutes indicating minor impact to travel time, affecting approximately 5% of the trips currently recorded on Lemington Road; and<br>• trips to/from the east of the Lemington Road/Golden Highway intersection will decrease by approximately 9–10 minutes, which is an improvement in travel time. |
| Visual amenity | Visual impacts associated with HVO's existing mining operations have previously been assessed and approved and are considered as part of the existing environment. While it is acknowledged that there are privately-owned receptors and road corridors that are already subject to a high visual impact from HVO's existing mining operations and other surrounding mining operations, the level of visual impact on these properties will not materially change when compared with the currently approved operations. |
| Rehabilitation and closure | The Project will provide the opportunity to contemporise the HVO final landform by incorporating natural landform design principles. Areas disturbed by mining activities as a result of the Project will reflect a landform that is safe and stable and sympathetic to the surrounding landscape.<br>The proportion of land rehabilitated to native ecosystem will be greater than previously proposed due to the adoption of revised geomorphic landform designs for the overburden emplacements. The percentage of native vegetation to be established for the Project is approximately 39% while approximately 56% will be returned to grazing land. The remainder of rehabilitated land use is represented by pit lakes or water storages in support of final land uses.<br>Final rehabilitation and project closure requirements will be formulated in consultation with key government agencies and other relevant stakeholders during the detailed closure planning phase. |

## Table ES1 Summary of key assessment outcomes and proposed measures

| Technical matter | Key assessment outcomes and proposed measures |
|---|---|
| Hazards, public safety and health | A hazard identification and consequence analysis was undertaken for the Project based on the hazardous materials and quantities stored on site at HVO. The consequence analysis identified that there will be no incidents which would result in offsite impacts; hence, the potential for fatality or injury or environmental impact to occur will be negligible.<br>Based on the information reviewed, contamination identified during previous investigations does not appear to present an unacceptable risk to off-site human and ecological receptors. Areas investigated are considered suitable for continued commercial/industrial (coal mining) land use.<br>Potential risks to human health resulting from the Project have been assessed against accepted safety or health-based assessment criteria established by the NSW Government. Risks to human health are determined to be low and no further detailed health risk assessment was determined to be required. |
| Social | Impacts and benefits associated with the Project are likely to be experienced most acutely by those people who live nearby; however, they also extend throughout the broader region. Accordingly, the Social Impact Assessment (SIA) has examined a local study area along with a regional study area set within a broader social area of reference. The local study area includes the communities which directly surround HVO, being Jerrys Plains, Maison Dieu, Long Point, Gouldsville and Camberwell, along with the two key nearby townships of Singleton and Muswellbrook.<br>Economic activity in the region is dominated by mining, which is the leading industry sector with respect to employment share in the local area, followed by retail trade, health care and social assistance.<br>The SIA identified the potential impacts and benefits of the Project via a range of tools and data sources, in accordance with the *Social Impact Assessment Guideline for State Significant Projects* (DPE 2021c). This included data collected as part of the social baseline analysis, the outcomes of specialists technical reports prepared for the EIS, and the outcomes of engagement.<br>No mitigated social impacts rated as a high risk have been identified for the Project, with all potential impacts ranked as medium or low. The key social impacts identified relate to the continued generation of dust and noise associated with ongoing operations, traffic congestion during construction activities, and issues relating to pest and land management. A number of social benefits have also been identified with a very high or high benefit rating, including the realignment of Lemington Road and the improved, safer road conditions and accessibility this will deliver to the community, ongoing employment and stability of the local population, continued royalty payments to the State government, ongoing provision of community grants, improved rehabilitation outcomes, continuation of procurement opportunities for local businesses, and the benefit of allowing more time for transition planning in the Hunter Valley through the ongoing provision of jobs and flow on benefits.<br>Key mitigation measures to mitigate the potential social impacts include the implementation of a tank inspection and cleaning program, for which all private residences within 4 km of the proposed mining area will be eligible. This program will include the installation of first flush filter systems for residential water tanks and domestic taps. Several Aboriginal social mitigation measures have also been identified in consultation with RAPs relating to a number of Closing the Gap themes. HVO will develop a funding framework to enable funding of programs and projects that align with Closing the Gap initiatives, to the value of $1,000,000 over the first 10 years of the Project.<br>These mitigation measures, including the funding framework described, will be detailed in a SIMP, which will be developed for the Project. |
| Economics | The cost benefit analysis found the Project is expected to generate significant net benefits and is also expected to generate increased economic activity and employment within the NSW community. The estimated net benefit of the Project to NSW is $4,848.5 million in NPV terms. At a local scale, the Project is expected to deliver a net benefit to the Lower Hunter (SA3) region of $1,739.0 million.<br>Given the significant net benefits of the Project, the Project is desirable and justified from an economic efficiency perspective. |

## ES5 Engagement

HVO has a long history of active engagement with the local community. Engagement specific to the Project has been undertaken over several years and involved a range of mechanisms to consult with neighbouring property owners, the local community, Federal, State and local government agencies, service providers, local community groups, Aboriginal groups and the HVO Community Consultative Committee (CCC) members. Engagement tools included a number of community (drop in) information sessions, regular distribution of newsletters to the local community with Project updates, establishment and regular updates of a Project website, surveys and individual stakeholder briefings.

Feedback from stakeholders and the broader community has been varied and includes both positive and negative views on a range of topics. Community views can be grouped into themes, as shown in Figure ES5.




**Figure ES5 Engagement outcome themes**

Technical studies prepared to inform this EIS considered stakeholder views with examples where changes to the Project have occurred due to feedback. These include revisions of mine plans to avoid and minimise impacts, particularly with respect to noise, biodiversity and Aboriginal cultural heritage, and the design of Lemington Road.

Engagement with key stakeholders will continue through EIS exhibition, determination of the Project, approved operations and, if the Project is approved, proposed operations.

## ES6 Key conclusions

The development of the Project design for which approval is sought has been an iterative one developed over a number of years. Detailed concept and pre-feasibility studies considering both mining options and infrastructure arrangements were carried out, and each of these studies evaluated potential environmental and social impacts to inform the Project design as results from studies became available. The Project has, therefore, been developed to avoid and minimise impacts where reasonable and feasible to do so.

Numerous technical investigations have been carried out to support this EIS. These assessments identified residual impacts of the Project and appropriate mitigation measures to address these impacts. The Project's design and proposed management measures are based on a comprehensive understanding of the environmental conditions in and around the Project area, gained over a very long history of mining at HVO.

The Project will contribute to meeting the ongoing demand for high quality thermal and semi-soft coal throughout a period in which there is expected to be a gradual decline of coal mining in the Hunter region, giving local communities time to adapt.

The Project represents a brownfield mining proposal that aligns with the strategic direction and policy objectives at a local, state and national level. It will provide ongoing employment opportunities for up to 1,500 workers and will deliver significant economic benefits to the State and local region.

For these reasons stated above, the Project is justified and represents a net benefit to the local region and to NSW.

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# Part A
## The Project

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# 1 Introduction

## 1.1 Background

Hunter Valley Operations (HVO) is a well established multi-pit open cut coal mining complex, comprising two mine sites separated by the Hunter River, HVO North and HVO South. HVO is approximately 24 kilometres (km) north-west of Singleton in the Hunter Valley of New South Wales (NSW) (refer to Figure 1.1 and Figure 1.2). While the two mine sites are approved under separate development consents, they operate as one complex with fully integrated environmental management systems. The HVO Complex is illustrated at a local scale in Figure 1.3.

Operations first commenced at HVO over 70 years ago, in 1949. Since its inception HVO has been, and continues to be, an important contributor to the Hunter Valley and NSW economy, producing high quality thermal and semi-soft coking coal suitable for use in international and domestic markets.

HVO North operates under Development Consent DA 450-10-2003 issued by the then NSW Minister for Infrastructure and Planning in 2004, which allows extraction of up to 22 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal until 12 June 2025. HVO North comprises the approved mining areas of West Pit, Mitchell Pit, Carrington Pit and North Pit as shown in Figure 1.3, as well as the Hunter Valley (HV) and Howick Coal Preparation Plants (CPP) and the Howick and HVO North mine infrastructure area (MIA). The Newdell Load Point (LP) and Hunter Valley (HVLP) train loading facilities are also at HVO North, as shown in Figure 1.3.

HVO South operates under Project Approval (PA) 06_0261 issued by the then NSW Minister for Planning in 2009 and comprises the approved mining areas of Riverview Pit, Cheshunt Pit, Riverview South East Extension and South Lemington Pits 1 and 2, as well as the MIA, and the Lemington CPP (LCPP) and rail loop (approved but not constructed) as shown in Figure 1.3. PA 06_0261 allows extraction of up to 20 Mtpa of ROM coal until 24 March 2030.

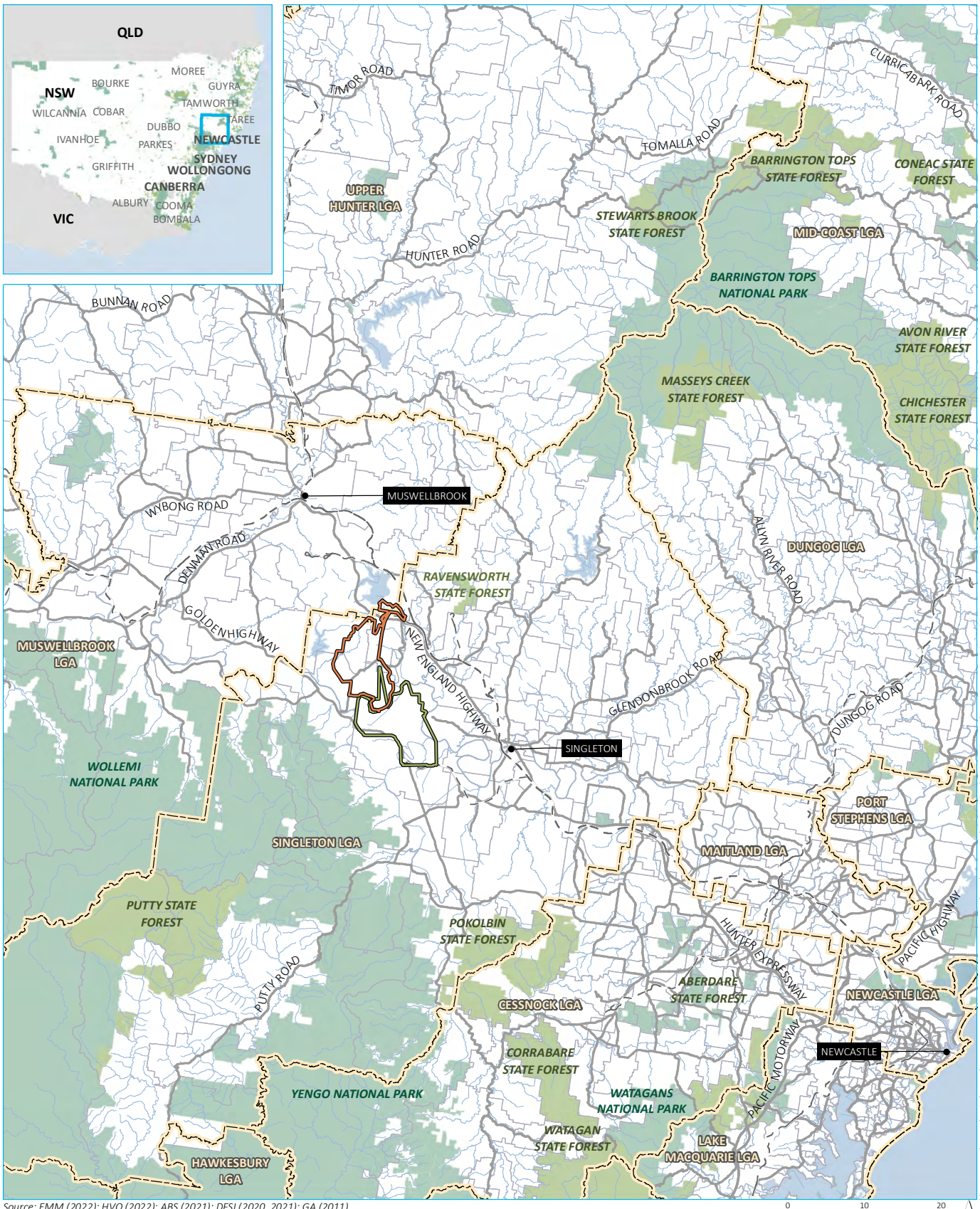
HVO is owned by subsidiary companies of Yancoal and Glencore, as participants in the unincorporated HVO Joint Venture (JV). HV Operations Pty Ltd is the appointed manager of the JV.

## 1.2 Project overview

Significant coal resources remain across the HVO Complex beyond what is currently approved for extraction. Extensive investigations have been undertaken into a long-term plan for the complex beyond the approved mine life to achieve increased recovery of the remaining coal resources while balancing social, environmental, and economic outcomes. Based on the results of these investigations, HV Operations Pty Ltd is seeking approval for the HVO Continuation Project (the Project) from the NSW Minister for Planning, or delegate, under the provisions of Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act), and approval from the Federal Minister for the Environment under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Broadly, the Project involves the continuation of the life of HVO North and HVO South, from the current approved mining completion dates of 2025 and 2030 respectively, to the end of 2050 at HVO North and the end of 2045 at HVO South. The continuation of mining across the HVO Complex will optimise resource recovery from the existing operation, predominantly by extracting coal from deeper seams at HVO North by mining through previously mined areas and within the extent of existing mining tenements.

At HVO South, an extension to the life of the mine is proposed to facilitate improved mine sequencing outcomes. The Project proposes a reduced mining footprint compared to what is currently approved for extraction, with the previously approved coal extraction in the Riverview South East Extension area and South Lemington Pits 1 and 2 (refer to Figure 1.3) proposed to be removed from the mine plan (and future approvals) for the Project. However, some rehabilitation works will be required to be undertaken in the South Lemington Pit 1 area, as part of the mine closure process.




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*Source: EMM (2022); HVO (2022); ABS (2021); DFSI (2020, 2021); GA (2011)*

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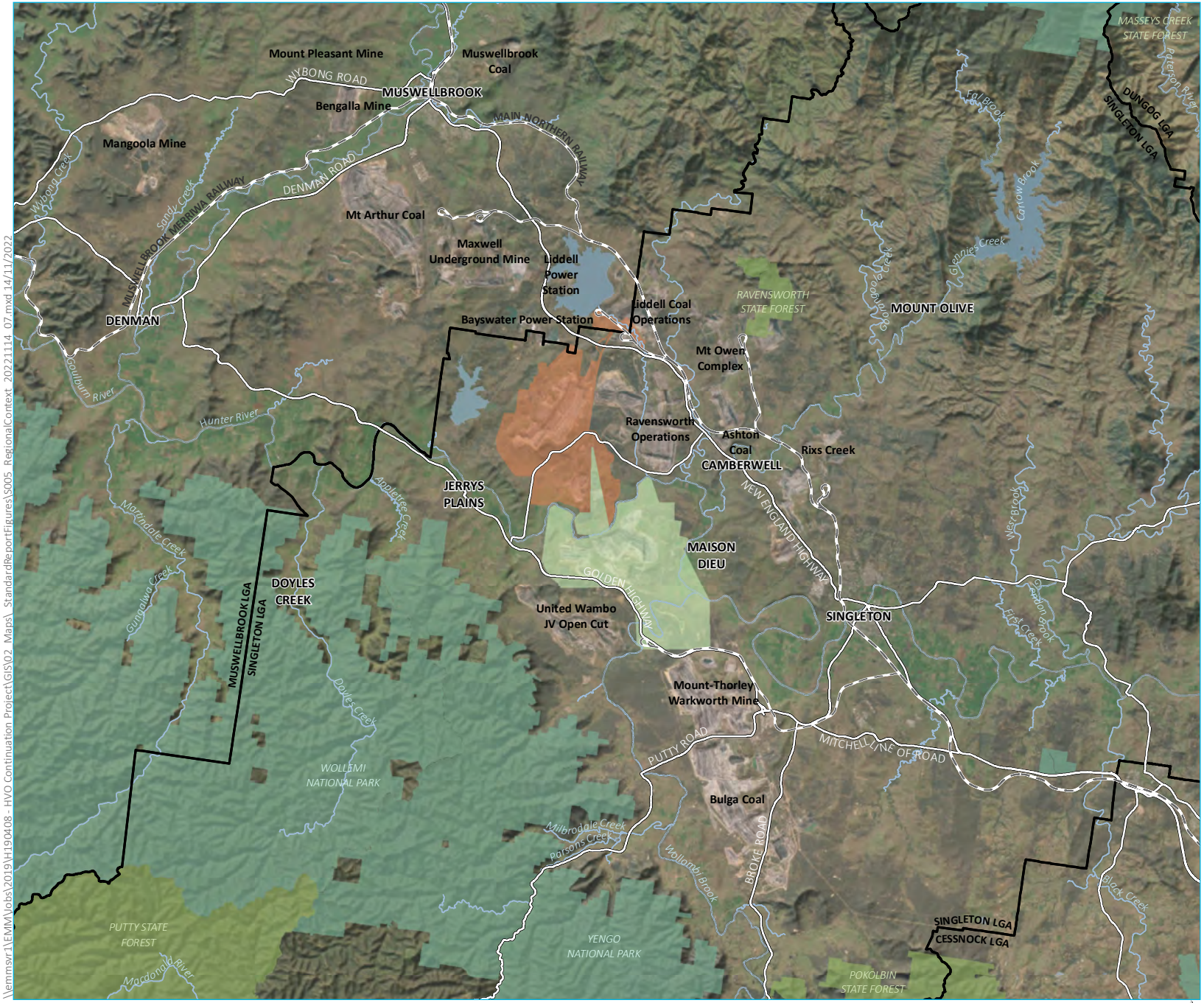
KEY

- Existing HVO North development consent boundary (DA 450-10-2003)
- Existing HVO South project approval boundary (PA 06_0261)
- Rail line
- Major road
- Named watercourse
- Named waterbody
- Suburb boundary
- Local government area
- NPWS reserve
- State forest

Locality plan

HVO Continuation Project
Environmental Impact Statement
Figure 1.1

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KEY

- Existing HVO North development consent boundary (DA 450-10-2003)
- Existing HVO South project approval boundary (PA 06_0261)

Existing environment

- Main road
- Rail line
- Named watercourse
- Named waterbody
- NPWS reserve
- State forest
- Local government area

Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011); ASGC (2006)

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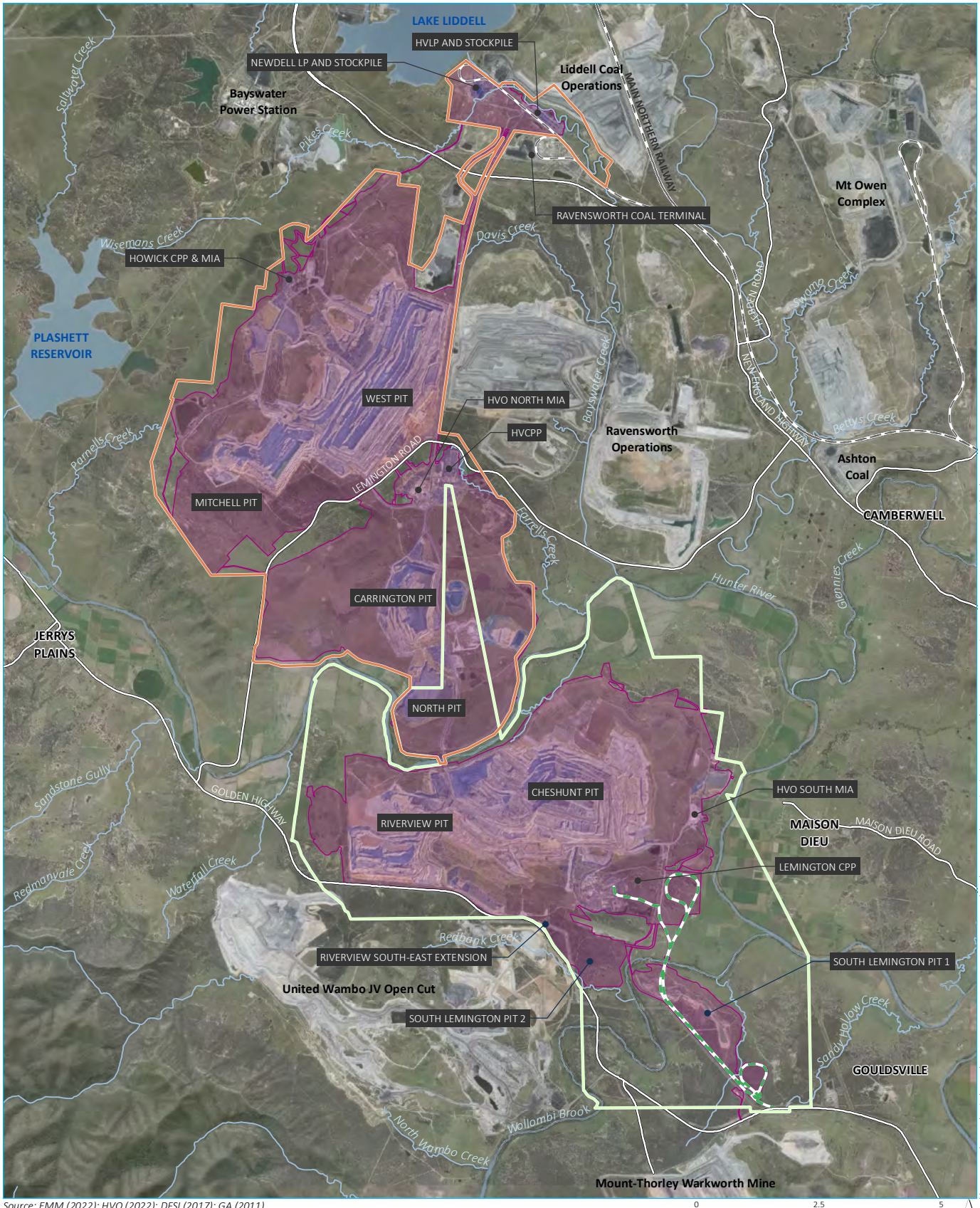
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# Regional context

HVO Continuation Project
Environmental Impact Statement
Figure 1.2

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Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011)

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## KEY

- Existing HVO North development consent boundary (DA 450-10-2003)
- Existing HVO South project approval boundary (PA 06_0261)
- Existing and approved disturbance area
- South Lemington Rail Loop and haul route (approved, not yet constructed)

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

# Local context

HVO Continuation Project
Environmental Impact Statement
Figure 1.3

EMM creating opportunities

Of the two approved rail loop options associated with the LCPP, the shorter rail loop is not included in the Project and will be relinquished. This reduction in disturbance, in addition to the removal of coal extraction in the Riverview South East Extension area and South Lemington Pits 1 and 2 from the proposed mine plan, avoids the disturbance of some areas of Central Hunter Grey Box – Ironbark Woodland and Hunter Lowland Redgum Forest, which are both listed as endangered ecological communities (EEC) under the NSW *Biodiversity Conservation Act 2016* (BC Act).

A number of infrastructure upgrades and changes will also be required to facilitate the Project (and are included as part of it), including realignment of part of Lemington Road, relocation of transmission and telecommunication lines, an upgrade of the Newdell LP including construction of a new product coal stockpile and train loading bin, an upgrade of the HVLP product coal stockpile including an extension to the existing coal stockpile, and improvements to Lake James (Dam 15S) and Parnells Dam (Dam 9W). In relation to the proposed improvements at the Newdell LP and HVLP, while the Project seeks approval for both, only one option will be developed.

The primary objective of the Project is to efficiently and economically recover an additional approximate 400 Mt of ROM coal reserves over approximately 25 years, which are within existing mining tenements and predominantly within existing and approved disturbance areas across the HVO Complex, using existing infrastructure. The Project will:

- enable the continuation of a brownfield mining complex in a long-established coal mining and power generation precinct;
- maximise resource recovery by mining to the deeper Barrett seam in HVO North, within existing mining tenements, using mostly existing or already approved infrastructure and minimising further disturbance;
- provide ongoing employment opportunities for the existing approximate 1,500 full time equivalent (FTE) workforce well beyond the life of the current planning approvals under which the complex operates, which will become increasingly important as the local and regional Hunter Valley economy continues to diversify beyond coal;
- provide improvements in terms of reliability and accessibility of Lemington Road in heavy rainfall through the realignment of the road, which will include the construction of a new bridge over the Hunter River;
- provide the opportunity to contemporise the HVO final landform by incorporating natural landform design principles. Areas disturbed by mining activities as a result of the Project will reflect a landform that is sympathetic to the surrounding landscape;
- reduce the maximum annual ROM coal extraction rate at HVO South, from up to 20 Mtpa to up to 18 Mtpa. The maximum annual ROM coal extraction rate at HVO North will remain the same at up to 22 Mtpa;
- reduce the area at HVO South approved for coal extraction, which in turn will reduce the impact of the Project on the Central Hunter Grey Box – Ironbark Woodland EEC and Hunter Lowland Redgum Forest EEC compared to that currently approved at HVO South, namely in South Lemington Pit 1, South Lemington Pit 2 and the Riverview South East Extension; and
- continue the ongoing contribution to the local, regional, and State economies from a well-established mining operation.

To enable the Project to proceed, two new State significant development (SSD) consents are required; one for HVO North and one for HVO South, under Part 4, Division 4.1 of the EP&A Act. The Project seeks to maintain separate development consents for HVO North and South, as is currently the case. The approval pathway is discussed further in Chapter 5.

A full project description is provided in Chapter 4. The primary components of the Project at HVO North and HVO South are outlined below.

### 1.2.1 HVO North

The key changes proposed by the Project to the approved HVO North operations include:

- an extension to the life of the mine until the end of 2050;
- extraction of coal to the base of the Barrett seam across the HVO North mining area. Existing operations are approved to extract coal to the base of the Barrett seam in the West Pit and Mitchell Pit; however, are only approved to the base of the shallower Bayswater seam in the Carrington Pit;
- extraction of an additional approximate 400 Mt of ROM coal through the extraction of coal from deeper seams and a small increase in the mining extent (between the existing West and Mitchell Pits and Carrington Pit);
- infrastructure upgrades, as listed below:
    - realignment of Lemington Road and construction of a new bridge over the Hunter River. While the proposed realigned road corridor is partly within the HVO South development consent boundary, the realignment is required to enable the progression of mining from the West and Mitchell Pits into the Carrington Pit at HVO North. The works associated with the road realignment therefore form part of the HVO North Project;
    - HVO North site access road relocation off the existing Lemington Road;
    - an increase in the capacity of Parnells Dam (Dam 9W) from approximately 1 gigalitre (GL) to approximately 4 GL;
    - realignment of transmission and telecommunication lines that are currently within the proposed mining area;
    - mine infrastructure area (MIA) upgrade;
    - ancillary activities as required to facilitate operations;
    - access roads to facilitate service provider access;
    - use of demountable/temporary buildings in Project compounds as required; and
    - upgrade of the existing Newdell LP train loading facility and construction of a new product stockpile; or an extension of the HVLP product coal stockpile, including the closure of a section of Liddell Station Road. While approval for both options is sought, only one will be constructed;
- coal haulage from the HVCPP to the Ravensworth ROM pad, via internal haul roads;
- revision and implementation of the tailings strategy;
- amendments to the approved final landform; and
- changes to the development consent boundary to incorporate the changes listed above.

Other than as set out above, all activities that are currently approved under the existing HVO North approval are intended to continue. Key aspects and outcomes of the approved development at HVO North that will remain the same under the Project include the following:

- the maximum allowable annual coal extraction and processing rate;
- annual operational workforce numbers and associated traffic generation;
- approved heights of overburden emplacement areas;
- receipt of ROM coal from HVO South via internal haul roads for processing at all CPP facilities approved for HVO North;
- continued avoidance of the Aboriginal heritage site known as Carrington Mine – Colluvial Deposit 1 (CM-CD1); and
- the ridge between Jerrys Plains and HVO North will remain, continuing to provide an effective amenity barrier.

### 1.2.2 HVO South

The key changes proposed by the Project to the existing approved operations at HVO South include:

- an extension of the life of the mine until the end of 2045;
- a reduction in the approved maximum ROM coal extraction rate from 20 Mtpa to 18 Mtpa;
- changes to the approved mine sequencing (although noting that mining within the two primary open cut pits, Riverview and Cheshunt, will remain generally within the same footprint as approved);
- removal of coal extraction from the mine plan in the Riverview South East Extension, South Lemington Pit 1 and South Lemington Pit 2 mining areas;
- infrastructure upgrades and changes to that currently approved, as listed below:
    - removal of the LCPP short rail loop option;
    - removal of the approved conveyor from HVO South to the HVCPP at HVO North (the conveyor has not been constructed);
    - removal of the need to relocate Comleroi Road (due to the removal of coal extraction from the Riverview South East Extension);
    - construction of the Cheshunt and Riverview Pit flood protection levees;
    - realignment of transmission lines;
    - enlargement of Lake James (Dam 15S) from approximately 0.7 GL to approximately 2 GL;
    - additional tailings pipelines and pumps;
    - ancillary activities as required to facilitate operations;
    - access roads to facilitate service provider access; and

- use of demountable/temporary buildings in Project compounds as required;

- revision and implementation of the tailings strategy; and
- amendments to the final landform due to rescheduling and or infrastructure relocations.

Other than as set out above, all activities that are currently approved under the existing HVO South approval are intended to continue. Key aspects of the approved development at HVO South that will remain the same under the Project include the following:

- the coal seams to be extracted (ie no increase in the depth of mining);
- the extent of approved mining areas within the Riverview and Cheshunt Pits;
- approved heights of overburden emplacement areas;
- construction of the LCPP and associated rail loop (long rail loop option only);
- transfer of coal from HVO South to HVO North for processing; and
- annual operational workforce numbers and associated traffic generation.

## 1.3 The applicant

As described above, HVO is owned by subsidiary companies of Yancoal and Glencore, as participants in the unincorporated HVO JV. HV Operations Pty Ltd is the appointed manager of the JV in which:

- 51% interest is held by Coal Allied Operations Pty Ltd (a wholly owned subsidiary of Yancoal); and
- 49% interest is held by Anotero Pty Ltd (a wholly owned subsidiary of Glencore).

HV Operations Pty Ltd is the proponent of the Project, as detailed in Table 1.1.

**Table 1.1 Proponent details**

| Requirement | Detail |
|---|---|
| Proponent | HV Operations Pty Ltd |
| Postal address | PO Box 315 Singleton NSW 2330 |
| ABN | 76 606 478 399 |
| Nominated contact | Jason Martin – Approvals Manager |
| Contact details | 1800 888 733 |

## 1.4 Purpose of this document

The Project is SSD pursuant to Schedule 1 of the *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP). Accordingly, approval is required under Part 4, Division 4.1 of the EP&A Act for the Project.

Applications for SSD under Part 4, Division 4.1 of the EP&A Act must be accompanied by an environmental impact statement (EIS) prepared in accordance with the Secretary's environmental assessment requirements (SEARs). Accordingly, this EIS has been prepared by EMM Consulting Pty Limited (EMM) on behalf of HV Operations Pty Ltd to support SSD applications relating to HVO North (SSD 11826681) and HVO South (SSD 11826621). It has been prepared to address the SEARs issued for the Project on 11 March 2021, and in accordance with the *State Significant Development Guidelines* (NSW Government 2021d) as required by Part 8, Division 2, clause 173(3) of the NSW Environmental Planning and Assessment Regulation 2021 (EP&A Regulation). The schedule of lands to which this EIS applies is provided in Appendix A. The SEARs, and where they have been addressed in the EIS, are provided in Appendix B.

The primary objective of this EIS is to inform the local community, government agencies and other stakeholders about the Project and the measures that will be implemented to minimise, mitigate, manage and monitor potential impacts, together with a description of the residual social, economic and environmental impacts.

## 1.5 EIS structure and study team

This EIS is structured as follows:

- **Part A – The Project (Chapters 1–4)**: introduces the applicant and existing mining operations at HVO, describes the strategic policy context and need for the Project, and provides a detailed project description. Part A also describes the avoidance and minimisation of impact processes and outcomes as well as alternatives considered for the Project.
- **Part B – Statutory context (Chapter 5):** outlines the statutory context relevant to the Project.
- **Part C – Engagement and identification of environmental and community issues (Chapter 6):** describes the stakeholder engagement that was undertaken for the Project, discusses the issues raised throughout this engagement, and how the issues identified have been addressed in the EIS.
- **Part D – Impact assessment (Chapter 7–27):** assesses the potential environmental and social impacts of the Project and describes the proposed management and mitigation measures to address these impacts. Chapter 27 provides a summary of all proposed management, mitigation, and monitoring measures.
- **Part E – Justification and conclusion (Chapters 28)**: provides a detailed Project justification, including consideration of the Project against the principles of ecologically sustainable development (ESD), and presents the conclusions of the EIS.
- **Part F – Study team and abbreviations:** includes a list of the study team members and defines the acronyms and terms used throughout.

The EIS is supported by input from technical specialists and detailed technical assessments, which are included in the appendices to this main report.

## 1.6 Terminology

The below key terms are used throughout this EIS to describe existing operations and the Project.

## Table 1.2 Key Project terms

| Term | Definition |
|---|---|
| HVO Complex | Comprises both HVO North and HVO South operations. |
| The Project | The Project in its entirety as described in Chapter 4; encompassing the continuation of the life of the complex, ie both HVO North and HVO South, within their respective proposed development consent boundaries, as illustrated in Figure 4.1. |
| Project area | The area that is the subject of the two development applications, ie the proposed development consent boundary for HVO North and the proposed development consent boundary for HVO South. |
| Existing and approved disturbance | Areas that are disturbed, previously disturbed and/or approved under the NSW EP&A Act to be disturbed under the current development consents that apply to the HVO Complex. |
| Approved mining area | The areas within the existing and approved disturbance area that have been previously assessed and approved under the NSW EP&A Act for mining operations. |
| Additional disturbance area | The areas that will be disturbed by the Project that are outside of the existing and approved disturbance area for the HVO Complex and other neighbouring mines (Ravensworth Operations, United Wambo and Liddell Coal Operations (LCO)). |
| Previously approved areas not retained | Areas that are disturbed and/or approved to be disturbed under the current development consents that apply to the HVO Complex, that will no longer be disturbed by the Project, such as the LCPP short rail loop, the Riverview South East Extension and South Lemington Pit 2 mining areas, and the approved temporary crossing across the Hunter River between HVO North and South. |
| Project disturbance area | This area is a combination of the existing and approved disturbance area, and the additional disturbance area associated with the Project, minus the areas not being retained by the Project. If the Project is approved, this will become the 'approved disturbance area' under the new SSD development consents. |
| Proposed mining area – HVO North | Areas where coal extraction will take place for the Project and includes:<br>• areas already disturbed by mining at HVO North (eg West Pit, Wilton Pit, Mitchell Pit and Carrington Pit) that will be re-disturbed to facilitate coal extraction of the deeper Barrett seam;<br>• areas not previously approved for mining (eg the area between the Mitchell Pit and Carrington Pit); and<br>• areas approved but not yet disturbed (eg the Carrington West Wing area). |
| Proposed mining area – HVO South | Comprises the Riverview Pit and Cheshunt Pit, where coal extraction will continue under the Project, down to the Bayswater seam.<br>The HVO South proposed mining area does not include the previously approved South Lemington Pit 1, South Lemington Pit 2, or the Riverview South East Extension, as coal extraction is not proposed in these areas as part of the Project. However, rehabilitation activities will be required in some of these areas, as indicatively shown on the staged mine plans (Figure 4.5 to Figure 4.9), and form part of the Project. |

**Table 1.2 Key Project terms**

| Term | Definition |
|---|---|
| Transmission line corridors | Two categories of transmission line corridors have been defined for the purpose of quantifying the extent of disturbance for the Project:<br>• realigned transmission lines (ie new transmission line easements) – the extent of disturbance will be limited to transmission line pole pads and an access road for maintenance along the alignment, as well as vegetation management to maintain safe transmission line clearance; and<br>• existing transmission line easements to be decommissioned – disturbance will be confined to existing access tracks and cleared areas required for removal of poles and associated infrastructure. |
| Realigned Lemington Road corridor | The corridor extends from the existing Comleroi Road intersection with the Golden Highway at the southern end of the new alignment, along the Comleroi Road alignment around the south-eastern side of HVO South, and then extends in a northerly direction to join the existing Lemington Road approximately 2.3 km south of the existing New England Highway/Lemington Road intersection (refer to Figure 4.12). The corridor also allows for two options with respect to the connection to the Golden Highway; one assuming that the Golden Highway is realigned by United Wambo as approved under SSD 7142, and a second option that aligns with the current alignment of the Golden Highway.<br>The proposed realigned corridor forms part of the HVO North development application. |
| Mining operations | Includes the removal and placement of overburden, the extraction, processing, handling, storage and transportation of coal, and the emplacement of rejects and tailings. |

# 2 Strategic context

## 2.1 Strategic justification for the project

### 2.1.1 Overview

The Project involves the continuation of an existing mine in an area that is an established coal mining and power generation precinct, providing employment and other socio-economic contributions to the local and regional community. The strategic planning framework for the area is well established, and mining projects are permissible with development consent on the land within the site.

Current national and NSW policy recognises the ongoing demand for coal, particularly in the Asian export market (which is the current key market for HVO) and its importance to the NSW and Australian economy (IPC 2022a, and IPC 2022b). The current strategic direction relating to coal seeks to continue exploration, extraction and export (IPC 2022a, and IPC 2022b). In NSW, the state government's *Strategic Statement on Coal Exploration and Mining in NSW* (NSW Government 2020a, strategic statement) recognises that mining will continue to be an important part of the State economy into the future. The Project represents a brownfield mining proposal that aligns with this strategic direction and policy objectives at a local, state and national level, as discussed in this chapter. This includes relevant climate change policy and regulation. HVO is a designated large facility under the *National Greenhouse and Energy Reporting Act 2007* (NGER Act) and is therefore subject to carbon regulation and pricing, which is in the process of being strengthened with respect to the safeguard mechanism amendments that form part of the overarching updated national emission reduction targets.

Further, the Project will contribute to meeting the ongoing demand for high quality thermal and semi-soft coal throughout a period in which there is expected to be a gradual decline of coal mining in the Hunter region, giving local communities time to adapt. The current geopolitical landscape (discussed in Section 2.1.3) and emerging energy crisis has led to governments placing a heightened priority on energy security, which is contributing to the continued demand for coal.

### 2.1.2 NSW strategic statement on coal exploration and mining in NSW

The NSW Government's strategic statement was released in 2020 and describes its position on the use of coal to 2050, and the approach to a global transition to a low carbon future. The strategic statement outlines how important the coal mining industry is for the economy of NSW, particularly the regional and local economies where mining occurs. The strategic statement notes that the coal mining industry is a significant source of employment, directly and indirectly employing over 110,000 people, and underpins prosperity in many local economies. It is the state's largest export commodity and is a major source of revenue, which the NSW Government uses to help fund essential services and infrastructure such as schools, hospitals, and transport. Royalties from coal brought in around $1.5 billion for the NSW Government in FY 2019–20, with these funds used for public services and infrastructure. The NSW Budget Statement 2022–23 notes that under projected conditions, NSW and other states will face a growing shortfall in revenues and will come to rely more on fiscal transfers from the Commonwealth, thus emphasising the important contribution the coal sector makes to the NSW budget.

The strategic statement notes that over the coming decades, the coal mining industry will be directly affected by the global transition to different forms of energy generation. However, it is noted that this transition will occur over an extended period of time. During the transition, the NSW Government commits to continue to support the local economy and the responsible development of the state's abundant, high quality coal resources for the benefit of the state. The strategic statement makes it clear that the NSW Government seeks to recognise existing industry investment by continuing to consider responsible applications to extend the life of current coal mines, such as the HVO Complex.

In NSW, around 70% of electricity is derived from coal (DCCEEW 2022a). NSW's energy mix contains the largest share of coal compared with other states and territories, due to the high percentage of electricity generation from coal in the state. Some 85% of the coal mined in the state is exported, mainly to Asia, where it is mostly used to generate electricity. NSW is an important coal producer; however, its exports of coal represent only around 3% of total global coal consumption (NSW Government 2020a).

The strategic statement indicates the balanced approach the NSW Government will take in relation to the future of coal mining in the state by setting a clear and consistent policy framework that supports investment certainty, so that the NSW coal sector can satisfy long-term global demand for coal, while giving NSW coal-reliant communities time to adapt to a low carbon future. It describes four areas for action within the NSW coal sector, which are listed in Table 2.1. The Project is consistent with these areas for action, as described in the table.

**Table 2.1 NSW Strategic statement on coal and Project alignment**

| Areas for action | HVO context |
|---|---|
| 1. Improving certainty about where coal mining should occur. | HVO is within an area well known for its coal resources and that is identified in the accompanying map to the strategic statement as an area where coal mining occurs. The Project comprises the continuation of mining at HVO within existing mining tenements and adjacent to other active mining operations. |
| 2. Supporting responsible coal production in areas deemed suitable for mining. | The Project primarily seeks to extend the life of an existing coal mining complex.<br>HVO has been operating for over 70 years and is surrounded by other coal mining operations and major power generation infrastructure, including Ravensworth Operations, Ashton, United Wambo, Liddell Coal Operations, Wambo Underground Mine, Mount Thorley and Warkworth mines, Bayswater power station and Liddell power station. The Project will use predominantly existing infrastructure to optimise the extraction of a high-quality coal resource from within existing tenements where coal mining activities currently occur.<br>The Project involves the extraction of deeper coal seams, which can be extracted without significantly increasing the existing and approved disturbance area of HVO. It has been designed to consider the benefits and consequences for other land uses, including surrounding agricultural land-uses, rural residential land holdings and the towns of Singleton and Muswellbrook. |

**Table 2.1 NSW Strategic statement on coal and Project alignment**

| Areas for action | HVO context |
|---|---|
| 3. Reduce the impact of coal mining.<br>To do so, the NSW Government will work to:<br>a) strengthen regulatory requirements for mine rehabilitation and closure planning;<br>b) support the improved management of air and water impacts from coal mining;<br>c) facilitate beneficial uses of coal mining land once mining has ended;<br>d) continue to ensure mining-affected communities receive an appropriate share of the benefits of mining;<br>e) address the impacts of mining in the Greater Sydney Water Catchment, responding to the Independent Expert Panel report;<br>f) reduce the greenhouse gas emissions directly associated with coal mining in NSW (fugitive emissions); and<br>g) monitor security of supply for domestic coal users during the transition to low carbon energy sources, including domestic users of coking coal. | a) The Project provides the opportunity to contemporise the HVO final landform by incorporating natural landform design principles. Areas disturbed by mining activities as a result of the Project will reflect a landform that is sympathetic to the surrounding landscape.<br>b) The Project does not propose an increase in the annual ROM coal extraction rate across the complex. At HVO South, a reduction is proposed, from up to 20 Mtpa to 18 Mtpa, and at HVO North the approved annual ROM coal extraction rate will stay the same at up to 22 Mtpa. The ridgeline which provides an amenity barrier between the HVO Complex and Jerrys Plains will remain, and no increase in the approved overburden emplacement heights is proposed. The site employs real time air quality monitoring and response systems to enable effective dust minimisation practices to be implemented. The Project will not impact on any privately owned bores, and no additional surface water or groundwater licences are required.<br>c) Consistent with existing operations, which has returned areas to native woodlands and pastures to be grazed, progressive rehabilitation of mined areas will continue throughout the mine life, establishing a mixture of native vegetation and open grassland areas, and with a pit lake associated with the two remaining final voids. A conceptual final landform has been designed for the Project that incorporates natural design principles. While a mixture of native vegetation and open grassland areas is proposed to be established, the conceptual rehabilitation strategy has been developed so as not to preclude other potential beneficial uses, as discussed further in Chapter 21.<br>d) The Project will enable the continuation of the significant flow-on benefits that HVO provides. HVO currently spends approximately $500 million on goods and services across 740 suppliers annually, leading to around 4,450 flow-on jobs. The economic assessment of the Project (EY 2022, refer to Appendix W), found that the local benefits of the Project will be significant, comprising approximately $760 million to local suppliers, $955 million to local workers, and payment of council rates to Singleton Council of $37 million.<br>e) The Project is not within the Greater Sydney Water Catchment.<br>f) The Project has been designed to minimise GHG emissions and makes commitments to further reduce the predicted GHG over the life of the mine, as discussed in Section 2.2.<br>g) Product coal from HVO may be transported by rail or conveyor for domestic use at the adjacent Bayswater and Liddell power stations. |
| 4. Supporting diversification of coal-reliant regional economies to assist with the phase-out of thermal coal mining. | The Project is ideally positioned to provide ongoing export earnings for the state, and to continue to provide employment and economic support to the regional Hunter community. This will assist in reducing the scale of social impacts that are likely to arise from a decline in coal mining in the Hunter Valley. Consistent with the strategic statement, the Project will support the local community while the local economy diversifies away from its reliance on coal mining, and while the global economy transitions to an increased reliance on low carbon energy, by providing ongoing direct and indirect employment and state revenue. |

### 2.1.3 Coal demand and energy security

The NSW Government's strategic statement notes that coal remains a critical energy source globally, supplying over a third of all electricity, and predicts the global demand for thermal coal will remain strong to 2050. The long term global demand outlook for seaborne thermal coal, as reported in the strategic statement, is shown in Figure 2.1.

At a state level, some 85% of the coal mined in NSW is exported, mainly to Asian markets, where it is mostly used to generate electricity. The long-term seaborne thermal coal demand outlook for NSW's major exporter partners is illustrated in Figure 2.2, which again demonstrates demand until 2050.

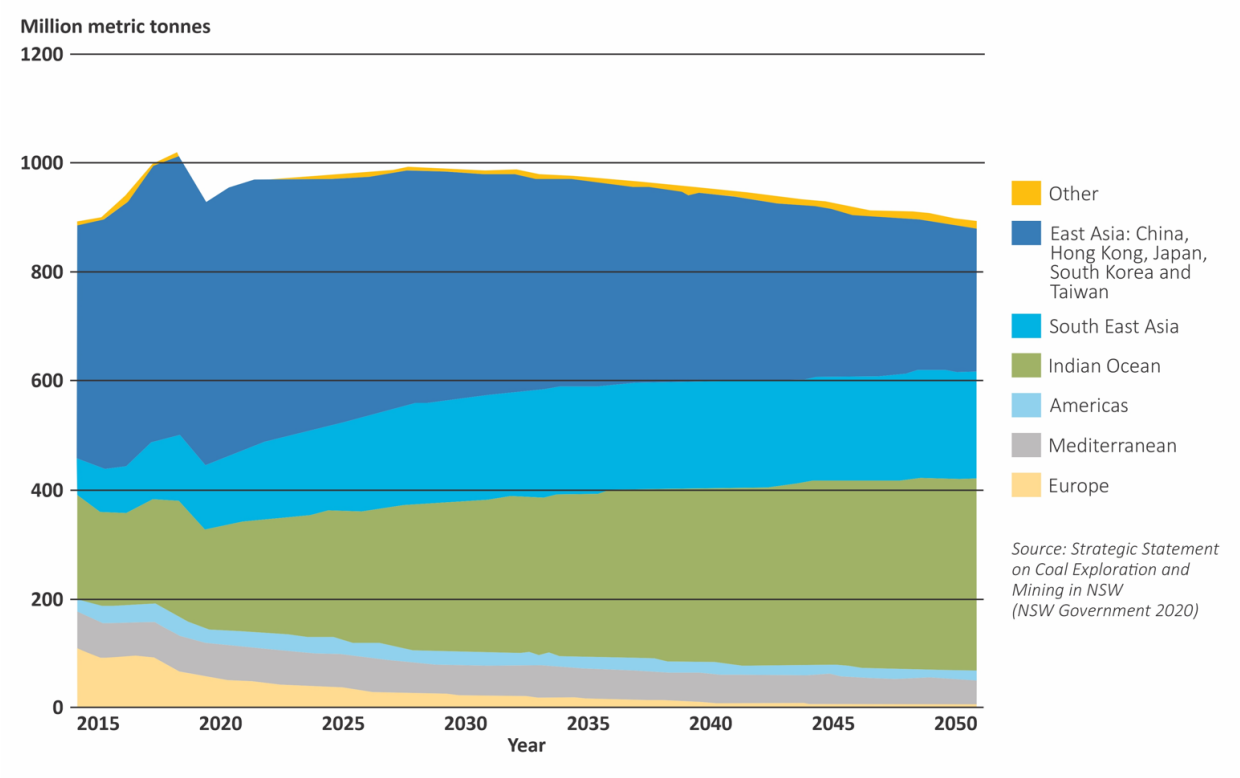



**Figure 2.1** **Long term global thermal coal demand outlook for seaborne thermal coal**

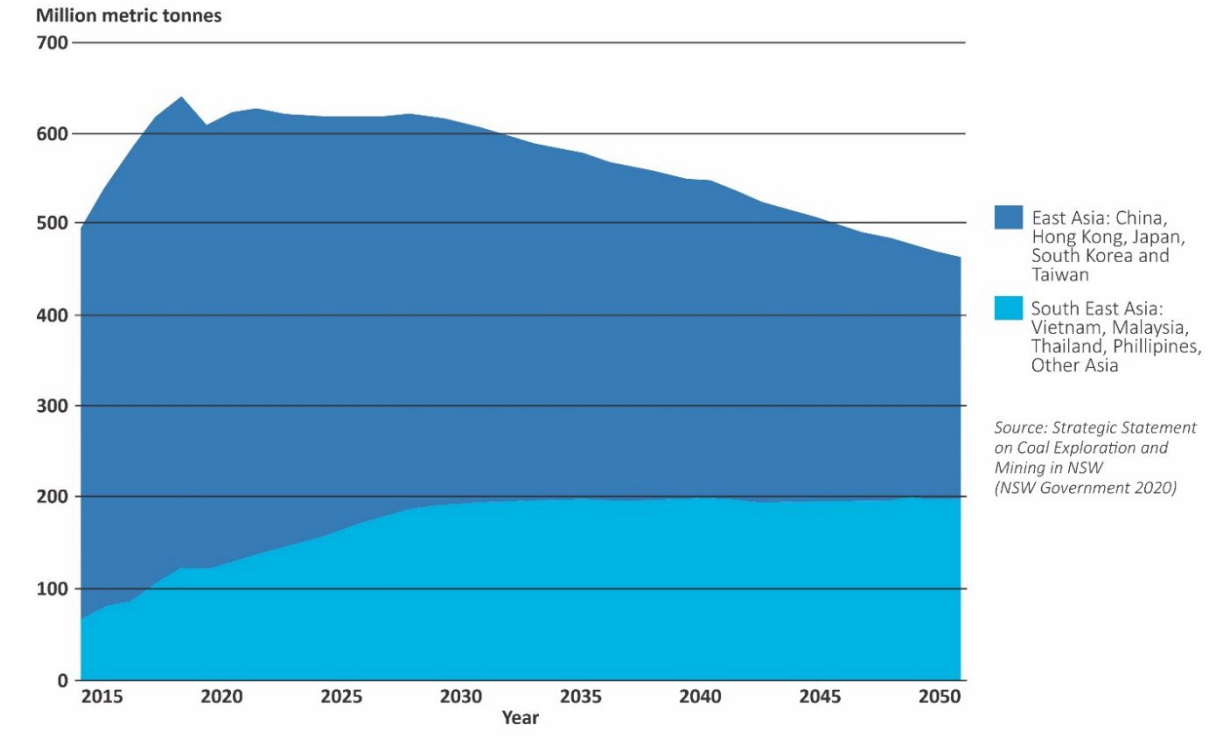



**Figure 2.2** **Long term seaborne thermal coal demand outlook for NSW's major export partners**

The *Resources and Energy Quarterly* (REQ) (Commonwealth Office of the Chief Economist (OCE)) provides forecasts of energy export prices and quantities, noting that Australia has the world's fourth largest resource of black thermal coal (which produces less emissions than brown coal) and is the world's second largest thermal coal exporter. The key export markets for Australian thermal coal are in the Asian region.

The REQ (September 2022) notes investment in new coal capacity continues to decline. In this regard, Yancoal and Glencore are well placed to provide longer term certainty for Australia's coal mining and export future through meeting ongoing global demand when global investment in new coal mining projects decreases, by having a diverse range of established mining operations producing high quality thermal coal, and through their extensive experience in operating in the international coal market which has a long history of variable export prices compared to many other commodities.

The status of the world's energy market has changed dramatically over the last few years due to a combination of the effects including the COVID-19 pandemic, and Russia's invasion of Ukraine. The latest World Energy Outlook (WEO 2022), published by the International Energy Agency (IEA) in October 2022, describes how the world is in the midst of the first truly global energy crisis, with impacts that will be felt for years to come.

The crisis has resulted in a current boost to demand for oil and coal as consumers look to secure alternatives to high priced gas. Several European Union member states and the UK have made preparations to increase coal-fired power generation in response to the reduced supply of natural gas from Russia, with actions including re-commissioning mothballed coal facilities and generation plant, postponing the closure of coal generators, and seeking supplies of coal to diversify and secure their energy supplies for 2022 and the near-term. Announcements from Germany, Austria, France and the Netherlands suggest that over 10 GW of coal-fired power generation capacity has been placed on standby in Europe for the 2022–23 European winter (REQ September 2022).

The WEO (2022) has considered how the world will respond to the energy crisis, using a number of scenarios. Each scenario is based on ways policy makers might respond to the crisis. The Stated Policies Scenario (STEPS) explores how the energy system will evolve if current policy settings are retained, including the latest policy measures adopted by governments around the world, but does not assume that aspirational or economy-wide targets are met unless they are backed up with detail on how they are to be achieved. Under the Announced Pledges Scenario (APS), governments get the benefit of the doubt. In this scenario, their targets are achieved on time and in full. The final scenario modelled by the IEA considers net zero by 2050 (NZE).

In each of the IEA's modelled scenarios, the share of fossil fuels in the global energy mix is predicted to reduce in the period to 2050, although the rate of reduction differs for each of the three scenarios. From 80% today, which is a level that has been constant for decades, the proportion of fossil fuels in the global energy mix under the STEPS is predicted to be around 75% in 2030 and just above 60% by mid-century. In the APS, a drive to meet climate pledges is modelled by the IEA to see demand for all fossil fuels enter into decline by 2030. The NZE scenario maps out a more rapid transformation which is consistent with a path to net zero $CO_2$ emissions from energy and industrial processes by 2050. However, under both the APS and the NZE scenarios, fossil fuels still comprise a share of overall energy demand in 2050.

Specifically for coal, the IEA predicts that future demand will range under the various scenarios modelled. Global coal demand is predicted to range from 5,149 Mt (STEPS) to 3,024 Mt (NZE scenario) in 2030, to within the range of 3,828 Mt (STEPS) to 539 Mt (NZE) in 2050. In all scenarios, the supply of coal from HVO will continue to represent a relatively low percentage of overall demand at around 0.4% by 2030 under the STEPS (or 0.8% under NZE), and less than 0.1% by 2050 under the STEPS (or 0.6% under NZE), assuming a reduced production from HVO as the mine winds down to closure in 2050.

The IEA (2022) notes that while there are many uncertainties in the 2022 WEO, an important constant across all scenarios is the rising share of electricity in global final energy consumption. This is associated with a huge overall predicted increase in global electricity demand over the coming decades. By mid-century, electricity demand is predicted to be 75% higher than today in the STEPS, 120% higher in APS and 150% in the NZE Scenario. The IEA also notes that clean energy will be central to the shift to net zero.

In advanced economies, coal demand is predicted to continue to decline over time in all scenarios. However, in developing and emerging market economies, overall coal consumption shows a more sustained rise in a few fast growing countries and regions, notably India and Southeast Asia, which is a market for HVO.

The WEO (2021) noted that while European and North American coal-fired power generating assets are on average around 40 years old and approaching the end of their design life, assets in developing countries such as south-east Asia are on average 10 to 15 years old, with new plants continuing to be constructed, and those developing countries cannot afford to decommission these assets as they haven't generated sufficient financial returns to repay the investment loans that established them.

The IEA also notes that technologies needed to equip coal power plants with carbon capture technologies, or to co-fire ammonia and hydrogen in high shares in coal-fired power plants are important technologies because they can provide a low emissions source of generation and flexibility, and because they help extend the use of existing assets. In July 2022, IEA CEO Dr Birol said that despite criticism of carbon capture and storage the technology would be vital to reach net zero emission goals given the continued reliance on fossil fuels for 80% of global energy over the last 30 years (AFR 2022).

The solution to reducing reliance on Russian gas and oil supplies, while at the same time trending to low carbon energy alternatives, requires time for low carbon energy sources to be procured and commissioned. This must occur at the same time as rebuilding the supporting electricity distribution grid systems that must be redesigned to service the de-centralised layout of renewable energy sources, in addition to investing in the required energy storage systems also required to support renewable generation methods. Ensuring a just transition to an increased reliance on low carbon energy is a shared responsibility between government, industry, and the community. As noted above, the Project will support the local community while the local economy diversifies away from its reliance on mining.

Coal remains a key energy source for developing countries because it provides a reliable source of grid-based energy, and because of established investment in coal generation capacity. There is a strong emphasis on its use in Asia, reflective of the large volume of thermal coal imported by Asian countries, and increasingly, this is based on the introduction of high efficiency low emissions (HELE) coal power systems, for which there continues to be significant ongoing deployment (Michener undated).

In relation to coking coal, of which the product mix from HVO comprises approximately 12% in the form of semi-soft coal, Wood MacKenzie (2021) reports that demand is forecast to continue to rise, albeit at a modest rate of on average 1.4% over the next 20 years. Demand for seaborne steelmaking coal is forecast to reach 390 Mt in 2040, up from 293 Mt in 2020.

The need for coal from the Project is driven by global energy demand, largely from developing Asian countries, and the lack of investment in new sources of supply of coal. Figure 2.6 in Section 2.5 demonstrates the anticipated decline of coal production at a local level in the Hunter Valley. It is also noted that the Scope 3 emissions which result from the combustion of the coal fall under the regulations of the respective markets HVO sells to, most of which have articulated climate and energy policy and/or regulation.

It is clear that there is a short-term challenge of resolving the energy crisis as well as the longer term challenge of an orderly transition to a low emission future. This transition is not linear or uniform across geographies and time and coal continues to have a role in meeting global energy needs.

## 2.2 Greenhouse gas emissions

Relevant strategic planning documents that establish the Australian and NSW Government's positions on greenhouse gas (GHG) emissions and climate change are discussed below.

### 2.2.1 Commonwealth Government Net Zero 2050

The Commonwealth Government's *Climate Change Act 2022* (Climate Change Act) commenced on 14 September 2022, which enshrines Australia's commitments under the Paris Agreement to reduce Australia's national GHG emissions to:

- a 43% below 2005 levels by 2030; and
- net zero by 2050.

The life of the Project (2045 at HVO South and 2050 at HVO North) is consistent with the assumptions which underpin the Commonwealth Government's commitment to net zero emissions by 2050.

One of the Federal Government's key policy measures designed to achieve the 43% emissions reduction target are the proposed amendments to the safeguard mechanism. The safeguard mechanism is a component of the Emissions Reduction Fund; the Australian Government's central climate change policy tool administered by the Clean Energy Regulator. The aim of the safeguard mechanism is to ensure emissions reductions purchased through the Emissions Reduction Fund are not displaced by significant increase in emissions elsewhere in the economy.

The safeguard mechanism applies to 215 designated large facilities (facilities that emit more than 100,000 t $CO_{2e}$ Scope 1 emissions per year) and requires that the net covered emissions of GHG from the operation of a designated large facility do not exceed the baseline applicable to the facility.

HVO is a designated large facility as defined by the NGER Act. The safeguard mechanism therefore applies to HVO, and HVO will be subject to the emissions reduction requirements contained within it.

### 2.2.2 NSW Climate Change Policy Framework

The NSW Government released the *NSW Climate Change Policy Framework* (CCPF) in 2016, with an objective of achieving net zero emissions by 2050. However, the CCPF does not set emission reduction targets for individual sectors, or developments. This has been acknowledged by the Independent Planning Commission (IPC) in the statement of reasons for decision on several projects, including the Mangoola Coal Continued Operations Project (IPC 2021a), the Dendrobium Extension Project (IPC 2021b) and the Vickery Extension Project (IPC 2020). As the IPC has acknowledged, the CCPF guides NSW Government policy and programs with respect to climate change, with a key policy being the NSW Net Zero Plan, as described below.

### 2.2.3 NSW Net Zero Plan Stage 1: 2020-2030

The NSW Government released its *Net Zero Plan Stage 1: 2020-2030* (NSW Government 2020b, Net Zero Plan) in March 2020, which laid the foundation for achieving net zero emissions in the state by 2050. The objective of the Net Zero Plan is to achieve a 35% reduction in GHG emissions in NSW by 2030 compared to 2005 levels. Notably there are no commitments made for the coal mining industry and GHG emissions in the Net Zero Plan that could be imposed on the Project.

HVO is actively engaged in minimising greenhouse gas emissions associated with their coal operations and supporting the NSW Government objectives of net-zero emissions by 2050. In addition, HVO is governed by a range of climate change commitments made by Yancoal and Glencore, as the JV partners of HVO, including:

- Yancoal:
    - supporting innovation and investment in carbon capture, utilisation and storage through various industry and policy initiatives, to work towards the commitments outlined in the Paris Agreement;

- taking a constructive role in public policy development and participation in relevant industry associations, guided by recognition of the aims of the Paris Agreement; and
- supporting research into technologies that will reduce GHG emissions from the downstream consumption of products (Scope 3).

- Glencore:
  - announcing a 1.5°C pathway aligned target of a 50% reduction of total emissions (Scope 1, 2 and 3) by 2035 on 2019 levels, consistent with the midpoint of the Intergovernmental Panel on Climate Change's 1.5°C scenarios and the 1.5°C pathways set out by the International Energy Agency; and
  - setting an ambition to achieve, with a supportive policy environment, net zero total emissions by 2050. This will be done by managing the carbon footprint of Glencore's operations and contributing to global decarbonisation.

Further discussion on the policies of Yancoal and Glencore in relation to GHG emissions is provided in Section 2.2.4 and Section 2.2.5, respectively.

As diesel fuel consumption represents almost half of estimated direct GHG emissions, measures to minimise GHG emissions at HVO are generally focused on the efficient use of diesel, by:

- optimising the design of haul roads to minimise the distance travelled;
- using a fleet management system where required to optimise the efficient use of machinery;
- minimising the re-handling of material (ie coal, overburden and topsoil);
- maintaining the mobile fleet in good operating order; and
- explore options for fuel switching, as well as alternate electricity sources and battery storage.

As part of the Project, HVO will review and update existing direct (Scope 1) greenhouse gas minimisation measures at HVO, including consideration of the fuel efficiency in mobile fleet items where technology has developed and is economically and commercially ready for deployment at industrial scale. The HVO Air Quality and Greenhouse Gas Management Plan will be updated to incorporate the Project, subject to conditions of any development consent for the Project. In addition, HVO will investigate whether it is reasonable and feasible to also reduce Scope 2 GHG emissions associated with on-site electricity use (eg evaluation of sourcing site electricity from renewable sources).

The Net Zero Plan also acknowledges that actions on climate change should not undermine businesses, and the jobs and the communities they support. HVO is a significant employer in the Hunter Valley, with a workforce of approximately 1,500 FTE. Therefore, the flow-on economic and social benefits to the local community are also significant. The social impact assessment (refer to Chapter 23 and Appendix V and the economic assessment (refer to Chapter 24 and Appendix W) clearly demonstrate the benefits to the community and discuss the commitments above and how these can be integrated into the Project to address emissions.

### 2.2.4 Yancoal policy

As described in Chapter 1, HVO is owned by subsidiary companies of Yancoal and Glencore.

Yancoal recognises that the transition to a lower carbon economy is a significant global challenge, and that the Australian coal mining industry has a key role to play in this energy transition by continuing to supply high-quality coal, which has a lower emissions profile than that of other exporting countries, to ensure universal access to affordable, reliable, and modern energy. Yancoal also recognises that energy production associated with the consumption of traditional fossil fuel energy sources contributes to global warming through the release of GHG emissions, and it therefore has an important role to proactively manage the direct (Scope 1) and indirect (Scope 2) emissions and energy intensity of its operations, and to support research into technologies that will reduce GHG emissions from the downstream consumption of its products (Scope 3) (Yancoal 2021).

In this regard, in its 2021 environmental, social and governance (ESG) report, Yancoal committed to the following:

- Continue to calculate, track and report Scope 1 and Scope 2 emissions through the Australian Government's NGER legislation.
- Identify and manage climate-related risks and opportunities, recognising that they may impact its people, infrastructure and value chains, and customers and markets.
- Monitor relevant policy, market, technology and financial signals and signposts to inform how Yancoal's investment and development priorities should adapt to transitions in the global energy mix.
- Provide annual disclosures in line with the Taskforce for Climate-Related Financial Disclosures recommendations in Yancoal's annual ESG Report.
- Strongly support innovation and investment in Carbon Capture, Utilisation and Storage (CCUS) through various industry and policy initiatives, to work towards the commitments outlined in the Paris Agreement.
- Take a constructive role in public policy development and participation in relevant industry associations, guided by Yancoal's recognition of the aims of the Paris Agreement.

### 2.2.5 Glencore policy

Glencore has developed a robust climate change strategy for its global operations which includes company-wide emission reduction targets and a commitment to a responsible managed decline of its global coal business over time.

Glencore has carefully considered its position regarding the future of its coal mining operations and how it intends to support the global transition to a low-carbon future.

Glencore makes a material contribution to the Australian economy and in the communities where it operates. In 2021, Glencore's coal business in Australia directly contributed approximately $9 billion to the economy and employed around 9,900 people. This also extends to the 4,850 suppliers who continue to work alongside Glencore so that its operations are safe, sustainable and successful. Further to this direct contribution, the indirect contributions of Glencore's coal operations include 53,750 flow on jobs and $19 billion in total economic activity.

In addition to making consistent contributions to local, regional, state and national economies, Glencore acknowledges that the future success of Australia's mining industry is increasingly focussed on the ability to operate in line with community and investor expectations on ESG performance.

Glencore recognises that it has a role to play in supporting the transition to a low carbon future and aligning with the Paris Agreement goal of limiting global temperature rises to 1.5 degrees. Glencore has an ambition to be a net zero total emissions company by 2050. This means it is not only reducing the direct emissions from its own operations (Scope 1 and Scope 2 emissions), but also those created from the use of its products (Scope 3).

Glencore is committed to the following:

- 15% reduction in total emissions by 2026;
- 50% reduction in total emissions by 2035; and
- an ambition to achieve net zero total emissions by 2050.

In 2019, Glencore announced that it would cap its global coal production. Glencore further expanded its commitment in 2020 by announcing it would adopt a responsibly managed decline of its global coal portfolio. Glencore believes that by managing the depletion of its coal portfolio and responsibly realising the remaining value in these assets it can make a meaningful contribution to global climate change goals.

Glencore has factored the continued development of its coal project pipeline, including HVO, into its emission reduction targets outlined above. Glencore will continue to identify, assess and develop coal projects against investment criteria consistent with meeting its climate change goals. As coal assets in Colombia and South Africa come to the end of their economic life, the Australian coal business will continue to supply the high quality coal required to meet ongoing global steel production and energy demand.

Under all credible scenarios, fossil fuels (oil, gas and coal) will continue to be an important part of the global energy mix for decades, but its share of the global energy mix will decline. As long as there is demand for coal then Glencore will continue to operate its mines until they reach the end of their economic lives. Selling coal mines does not remove their associated emissions, and Glencore believes a managed decline is a more responsible approach, which it has already begun to implement.

Over the next five years, Glencore will close and begin to rehabilitate a number of coal operations that come to the end of their economic life, including the Liddell Coal Operations and Integra underground mine in NSW, and the Newlands coal operations in Queensland. The closure of the Baal Bone coal operation will be completed in 2022 and the West Wallsend coal operation closure will be finalised in 2023 with demolition of all facilities now completed and capping of tailings dam underway.

## 2.3 Land use planning

The Project is predominantly in the Singleton LGA, with a small portion of the Project area (less than 4%) in the Muswellbrook LGA. Relevant strategic land use planning instruments that establish the state, regional or local land use planning contexts for the Project are outlined below.

### 2.3.1 Hunter Regional Plan

#### i Hunter Regional Plan 2036

The *Hunter Regional Plan 2036* (HRP) (DPE 2016a) focuses on the economic growth and prosperity of the Hunter region. The HRP sets out four goals for the Hunter Region, with the aim of creating:

- the leading regional economy in Australia;
- a biodiversity-rich natural environment;
- thriving communities; and
- greater housing choice and jobs.

The HRP recognises coal mining will remain a significant growth opportunity for the Hunter region for some time. The HRP aims to strengthen the region's economic resilience and protect its well-established employment and economic bases by building on its existing strengths to promote greater market and industry diversification. The intent of the HRP is to plan for greater land use compatibility, protect and connect areas of natural values, and to sustain water quality and security.

The HRP outlines 'directions' to achieve the four goals identified above. The Project aligns to a number of these directions, as summarised in Table 2.2.

**Table 2.2 Directions of the Hunter Regional Plan 2036**

| Direction | Alignment of the Project |
|---|---|
| **Direction 5** – Transform the productivity of the Upper Hunter.<br>The HRP notes that the Upper Hunter is undergoing a transition with major transformation occurring in power generation and changes in the mining sector. Identifying the land and infrastructure requirements that can support the future development of the region's coal and alternative energy resources will enable the Upper Hunter to respond to new and emerging opportunities. | The Project will enable the further development of a high-quality coal resource from an existing mining operation, while also contributing to the upgrade of coal loading infrastructure in the region; specifically, the Newdell LP and the HVLP.<br>The Project will also improve the accessibility and reliability of Lemington Road, an important access point between the Golden and New England highways. The proposed Lemington Road realignment includes a new bridge over the Hunter River.<br>The existing Moses Crossing low level bridge is often closed during heavy rain and has been underwater for a combined total of more than seven months since 2010. The proposed new bridge would have kept Lemington Road clear of flooding over the same time period, including during the recent extreme rainfall events. |
| **Direction 11** – Manage the ongoing use of natural resources.<br>This direction is aimed at the management and ongoing use of natural resources to achieve balanced outcomes. The direction states that "the combination of undeveloped coal resources in the Hunter and Newcastle coalfields and the export capability of the Port of Newcastle provide significant opportunities for growth". | The Project will enable the extraction of undeveloped coal resources (an additional approximate 400 Mt of ROM coal not previously approved for extraction at HVO) from an existing mining complex. The coal will be extracted predominantly from within existing and approved disturbance areas and mainly using existing infrastructure. |
| **Direction 13** – Plan for greater land use compatibility.<br>This direction is focused on managing future land use planning and compatibility; in particular, "identify and protect important agricultural land, including intensive agricultural clusters". | The Project is a brownfield development, optimising coal extraction within existing tenements, thereby continuing an existing land use. The Project will not introduce new impacts on critical agricultural clusters, as discussed in Chapter 18. Due to a change in government policy relating to the management of noise impacts since noise emissions from HVO were last assessed for a development application, one landholder in the mapped equine Critical Industry Cluster (CIC), which is approximately 2.6 km from the nearest point of the Project area, will be entitled to voluntary mitigation rights under the NSW Government's *Voluntary Land Acquisition and Mitigation Policy* (2018). Further discussion is provided in Chapter 18. |
| **Direction 14** – Protect and connect natural areas.<br>This direction is aimed at identifying and protecting new and existing natural areas, through a holistic management approach across both public and private lands to ensure habitat connectivity. | As noted above, the Project is a brownfield development within an existing mining complex.<br>Avoidance of native vegetation, and in particular listed threatened ecological communities and species, was a key consideration in the evolution of the Project design, as described in Section 2.7 and Appendix D.<br>Re-establishing and maintaining habitat connectivity was also a key consideration in the development of the rehabilitation strategy for the Project (refer to Chapter 21), which includes native vegetation corridors across the final landform. |

**Table 2.2 Directions of the Hunter Regional Plan 2036**

| Direction | Alignment of the Project |
|---|---|
| **Direction 15** – Sustain water quality and security.<br>This direction states that monitoring and management of existing land uses, and in the future those associated with growth, will be integral in the protection of the region's quality and security of water supplies. Water sharing plans form the basis of water allocation across the Hunter, and changes in water demand may result in the potential relocation of water over time. | A comprehensive surface water assessment has been undertaken for the Project (refer to Appendix J), which included an assessment of potential water quality impacts. As described in Chapter 12, the Project is not anticipated to adversely impact water quality of surrounding water resources.<br>The Project will not require any additional water licences. |

The Project's economic benefit through the ongoing development and export of coal resources, and the utilisation of existing infrastructure aligns with HRP directions 5 and 11. The land proposed to be mined for the Project and the required infrastructure has been owned by mining companies for the strategic purpose of future development of coal resources for many years. Consideration of potential environmental impacts is a requirement of direction 14, and the Project's potential environmental impacts have been assessed in detail in this EIS. Direction 15 identifies the importance of monitoring and management of existing land uses. The management and effective mitigation measures of the Project's potential environmental impacts are discussed in this EIS.

The Project aligns with the HRP's aim of providing ongoing opportunities for Hunter communities to thrive, through the continuing employment of approximately 1,500 FTEs in the region. The Project's significant ongoing contribution to the regional economy will assist in the development of the HRP's goal of the Hunter becoming the leading regional economy.

The HRP acknowledges that the coal industry has driven significant investment in the transport and energy infrastructure sectors in the Hunter Valley, and that these improvements will continue to underpin the growth and diversification of the Hunter's economy and employment base as the region diversifies away from a key dependency on coal mining.

### ii Draft Hunter Regional Plan 2041

A review of the HRP was undertaken by DPE in 2021, and the *Draft Hunter Regional Plan 2041* (draft HRP 2041) was published in December 2021. The draft HRP 2041 has not been finalised, and at the time of reporting the plan was open to further consultation and feedback and may be revised. Importantly, the draft HRP 2041 notes that mining, energy and industrial sectors all make the Hunter an economic powerhouse and will remain important contributors into the future. The draft HRP 2041 also notes that mining is a significant source of direct and indirect jobs and underpins the Hunter Valley's prosperity. Coal is the state's largest export commodity, and is a major source of revenue, which the NSW Government uses to help fund essential services and infrastructure such as schools, hospitals, roads and transport.

The draft HRP 2041 recognises that the world has begun the transition to other forms of energy, and the NSW Government will work to support coal-dependent communities to diversify for the future with good employment opportunities. In this regard, the ongoing operations proposed at HVO by the Project, along with the direct and indirect employment and economic benefits resulting from the Project, will enable and support the transition to sustainable energy forms over time, with reduced impacts to the local population and economy, and with reduced support required from the NSW Government compared what would occur with a faster decline in the mining sector.

The draft HRP 2041 contains eight objectives for the Hunter. The first objective of diversifying the Hunter's mining, energy and industrial capacity relates closely to the Project, and notes that opportunities for the future alternate use of mine land and associated infrastructure such as power transmission lines, rail lines and water storages will play a key role in the transition of the local economy as existing mines cease operations. The draft HRP 2041 contains a discussion on strategic land use opportunities in Strategy 1.1 and 1.2. These strategies encourage early consideration of alternative land uses during the design stage of new or expanded mines. In this regard, a discussion of how the Project could facilitate alternate land uses that may arise at the completion of the Project is provided in the Rehabilitation and Closure Strategy in Chapter 21.

### 2.3.2 Upper Hunter Strategic Regional Land Use Plan

The *Upper Hunter Strategic Regional Land Use Plan* (Upper Hunter SRLUP, DPI 2012b) provides a framework for supporting growth, protecting the environment and managing competing land uses from 2012 to 2032.

The objective of the Upper Hunter SRLUP is to balance the economic growth in regional NSW with the protection of the most valuable agricultural land and sustainable management of natural resources. The strategic framework outlines key initiatives to minimise land use conflicts arising from coal mining activities and the coal seam gas industry.

The importance of strategic land use planning on the protection of biodiversity across various land use types is also recognised in the Upper Hunter SRLUP. The strategic plan identifies the potential for post-mining rehabilitation to contribute to biodiversity conservation in the longer term and that the landscape value can be maximised through the location and design of rehabilitated sites. The Upper Hunter SRLUP states that effective planning is required to design a post-mining landscape that will allow a number of different land uses including conservation.

The Upper Hunter SRLUP aims to guide management of competing land-uses by identifying where high value agricultural land and critical industry clusters are located, with processes to verify if strategic agricultural land would be affected. In this regard, clause 30 of the EP&A Regulation outlines special provisions for development applications relating to mining development on strategic agricultural land. If a project involves a mining development within the meaning of Part 2.4 of the *State Environmental Planning Policy (Resources and Energy 2021*), clause 30 of the EP&A Regulation requires that the development application be accompanied by either a Gateway Certificate, where the development occurs on land which meets the definition of Biophysical Strategic Agricultural Land (BSAL); or a Site Verification Certificate (SVC) that certifies that the land on which the proposed development is to be carried out is not BSAL.

The Project involves the extraction of coal from deeper seams (ie down to the Barrett seam) in areas that have predominantly been previously mined. Despite these areas being mined, the deeper seams are covered by an exploration licence (EL) only, as existing mining leases (MLs) do not extend to the depth of the Barrett seam across the entire proposed mining area. Therefore, existing EL's will be converted to ML to enable extraction to depth in some areas.

There are some small areas of mining and infrastructure establishment that will require new mining leases where the required SVC's have been issued and BSAL has been determined to not exist. Further details are provided in Chapter 5.

### 2.3.3 Singleton Local Strategic Planning Statement 2041

The *Singleton Local Strategic Planning Statement 2041* (Singleton Council 2020) (SLSPS) provides clear land-use planning direction for the Singleton LGA to 2041. The SLSPS is identified as a 20-year blueprint for land use and development, outlining the Singleton LGA's planning priorities. The SLSPS's strategic vision is for Singleton to be internationally recognised as a mining centre of excellence, and its transition to a more diversified and innovative economy. Underpinning this vision is the SLSPS's focus on:

> Diverse post-mining development outcomes, protection and enhancement of agricultural productivity, growth of professional support services, and the efficient and effective re-use of rehabilitated mining land.

The SLSPS identifies a need for the mineral resource industry to be productive, accountable, and considerate of surrounding land uses as a planning priority. The SLSPS notes that the Singleton LGA's economic growth and stability will be significantly linked to the ongoing prosperity and stability of the mining industry over the next few decades. The SLSPS recognises coal mining as a significant land use and economic driver of the Singleton LGA for the foreseeable future.

The Project is aligned with the SLSPS as it aims to support continual economic development in the Singleton LGA. The Project is mainly surrounded by other mining operations, mining and energy related infrastructure, HVO owned buffer land which continues to be used for agricultural purposes where possible, and other agricultural land. Potential impacts from the Project will be managed and mitigated to minimise effects on surrounding land uses as far as practicable.

### 2.3.4 Muswellbrook Local Strategic Planning Statement

The *Muswellbrook Shire Council Community Strategic Plan* (Muswellbrook Shire Council 2017) prioritises improved community and environmental outcomes. The Project is aligned with the number 1 goal identified in this plan, which is to support job growth within the shire.

The Project meets the aims and objectives of the plan as it is located predominately within the existing approved disturbance areas and has been designed to minimise and mitigate impacts on surrounding land uses and the environment.

### 2.3.5 Singleton Local Environmental Plan 2013

The *Singleton Local Environmental Plan 2013* (Singleton LEP) presents local environmental planning provisions for land within the Singleton LGA, and outlines permissibility of various lands uses within individual land use zones.

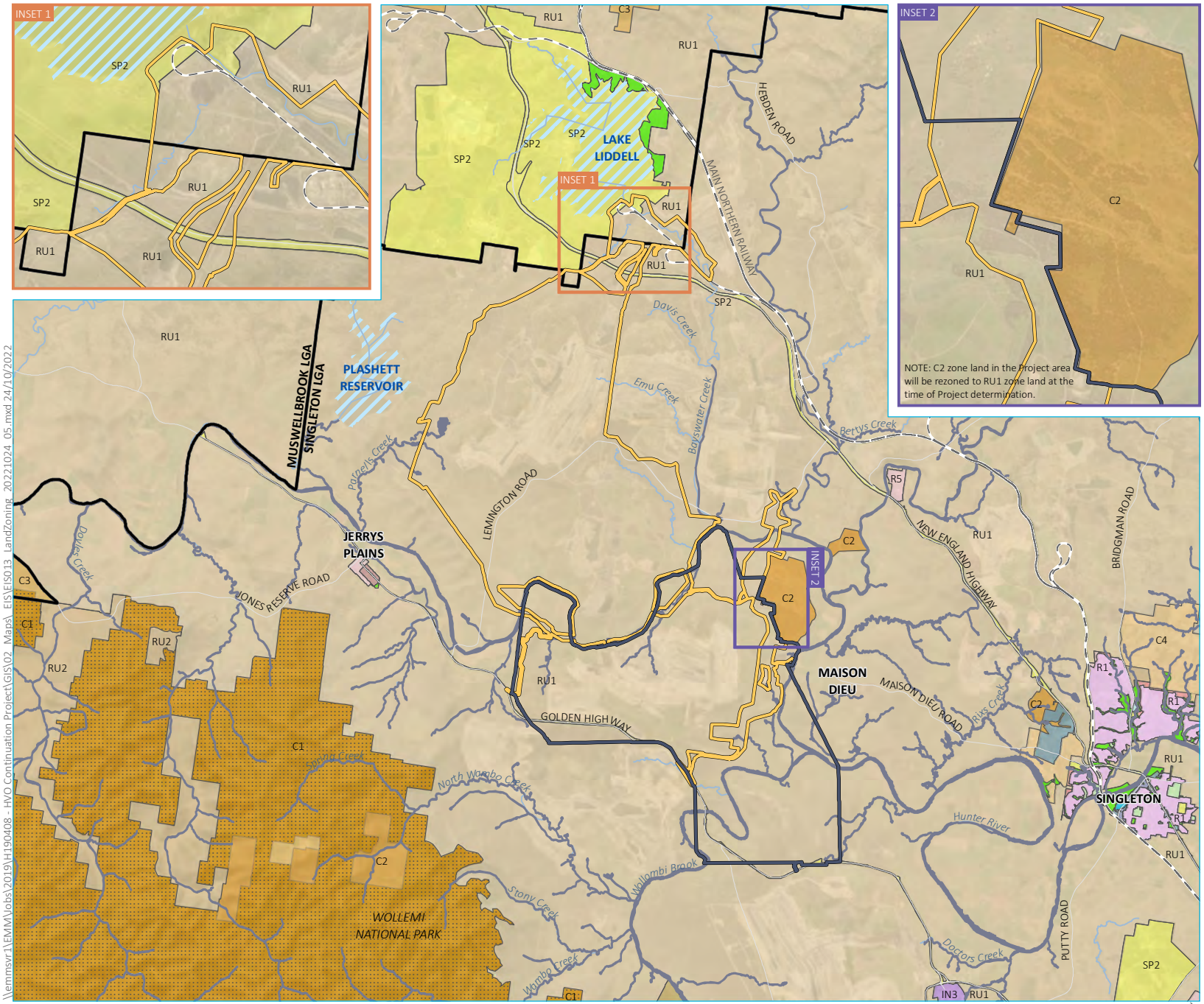
The majority of the Project area (approximately 96%) is contained within the Singleton LGA, and except for a small section along the realigned Lemington Road corridor, the Project area is largely on land zoned RU1 – Primary Production with a small area within land zoned SP2 Infrastructure. Open cut mining is permissible with development consent in the RU1 zone, and no mining is proposed in the SP2 zone as part of the Project. The objectives of the RU1 zone, and how the Project meets these objectives, is outlined in Table 2.3.

A small section of the realigned Lemington Road corridor in the proposed HVO North development consent boundary is in an area currently zoned C2 – Environmental Conservation under the Singleton LEP. Roads are permitted with consent in the C2 zone. However, it is noted that this area is subject to subdivision between HVO and Warkworth Mine in accordance with the consent SSD 6464 (as modified). This will result in the C2 zone land having been rezoned to RU1 zone land by the time of determination of the Project. There will therefore be no C2 zone land in the Project area.

The land zoning for the Project area is shown in Figure 2.3.

### Table 2.3 Objectives of the Singleton LEP

| Objective | How the Project meets the objective |
|---|---|
| **RU1 – Primary Production** | |
| To encourage sustainable primary industry production by maintaining and enhancing the natural resource base. | The Project involves the continuation of an existing open cut mining operation, predominantly within existing disturbance areas. No BSAL has been identified in new areas proposed to be disturbed by the Project. The final land use proposed post-mining will include pasture areas suitable for an agricultural use (grazing). |
| To encourage diversity in primary industry enterprises and systems appropriate for the area. | As above, the Project comprises the continuation of an existing mining operation, and therefore will not affect the diversity of primary industry in the region. |
| To minimise the fragmentation and alienation of resource lands. | The Project will increase the recovery of a natural resource (high-quality coal) predominantly from within existing mining tenements. The proposed continuation of mining involves mining through an area not previously mined which is currently dissected by Lemington Road. Further, there is no BSAL in new areas proposed to be mined. The Project will therefore not fragment or alienate resource lands. |
| To minimise conflict between land uses within this zone and land uses within adjoining zones. | HVO is within a well-established mining and power generation region, with the general area surrounding the HVO Complex comprised of various open cut and underground coal mining operations. HVO has been operating for over 70 years and has been successfully co-existing with surrounding land uses for a long period of time. Other land uses in the area include agriculture, and as demonstrated by the Agricultural Impact Statement prepared for the Project (refer to Chapter 18), the Project will not adversely affect neighbouring agricultural land use. |




KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Riparian land

Land zoning

- B1 Neighbourhood Centre
- B3 Commercial Core
- B4 Mixed Use
- B5 Business Development
- B6 Enterprise Corridor
- C1 National Parks and Nature Reserves
- C2 Environmental
- C3 Environmental Management
- C4 Environmental Living
- IN3 Heavy Industrial
- R1 General Residential
- R2 Low Density Residential
- R5 Large Lot Residential
- RE1 Public
- RE2 Private
- RU1 Primary
- RU2 Rural Landscape
- RU4 Primary Production Small Lots
- RU5 Village
- SP2 Infrastructure

Existing environment

- Rail line
- Main
- Named watercourse
- Named waterbody
- NPWS reserve
- State forest
- Local government area

Source: EMM (2022); HVO (2022); DFSI (2017); DPIE (2021)

0 5 10 km

GDA2020 MGA Zone 56

N

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# Land zoning

HVO Continuation Project
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Figure 2.3

EMM creating opportunities

### 2.3.6 Muswellbrook Local Environmental Plan 2009

The *Muswellbrook Local Environmental Plan 2009* (Muswellbrook LEP) presents local environmental planning provisions for land within the Muswellbrook Shire LGA, and outlines permissibility of various lands uses within individual land use zones.

A small portion (up to 4%) of the Project area is contained within the Muswellbrook LGA, primarily on land zoned RU1 – Primary Production under the Muswellbrook LEP, and a small section zoned SP2 – Infrastructure, as shown in Figure 2.3. Minor works related to transmission lines are proposed within the SP2 zone as part of the Project. Works within the RU1 zone will be limited to upgrades of coal handling facilities and transmission line infrastructure (ie the upgrade of the Newdell LP train loading facility, or the extension of the HVLP product stockpile and the construction of a new 66 kV Ausgrid transmission line). The proposed works will occur within an area that is not currently used for primary production and already contains coal handling and loading infrastructure, or, in case of the HVLP extension, in an area that that has been verified as non-BSAL and an SVC (No. 41389276) has been issued accordingly.

The Project is permissible with development consent in the RU1 zone within the Muswellbrook LGA.

## 2.4 Key features of the site and surrounds

### 2.4.1 Overview

HVO is within a well-established coal mining and power generation region in the Hunter Valley and is one of the oldest mines in the Hunter Valley. The coal industry in Singleton can be traced back to the 1850's in Rix's Creek and Glendon. A substantial mine was developed by James Singleton at Rix's Creek and by the late 1800's there were about 16 coal mines in the Singleton area (*The History of Singleton*, Singleton Historic Society and Museum). Existing land uses surrounding HVO are shown in Figure 1.2 and include mining operations and mine-owned buffer land, power generation industries, agricultural land, transport infrastructure, rural residential areas and conservation areas.

### 2.4.2 Land ownership and sensitive receptors

Most of the land within the existing and proposed development consent boundaries for HVO North and HVO South is owned by HVO or associated entities, as shown in Figure 2.4. Properties not owned by HVO generally relate to road and utility infrastructure providers, ie Singleton Council, Muswellbrook Council, AGL, Ausgrid, Telstra and Transport for NSW, as well as some Crown land (discussed further in Chapter 5) and land owned by other mining operations, some of which are Yancoal and Glencore owned including Ravensworth Operations, Ashton, United Wambo and Liddell Coal Operations. Land south of the LCPP area is owned and used by the Hunter Valley Gliding Club (HVGC). An existing agreement is in place for approved impacts on the HVGC. A schedule of lands is provided in Appendix A.

At HVO South a small number of private landholdings are to the east and south within the existing and proposed development consent boundaries, in Maison Dieu and Warkworth respectively. No private landholdings are within the existing and proposed development consent boundaries at HVO North.

The sensitive receptor assessment locations (including privately owned and mine owned) used in the relevant technical studies for the Project are shown in Figure 2.4. It is noted that receptor numbers were not historically aligned between HVO North and HVO South. As part of this EIS, receptors have been re-numbered so that there is one receptor list for the complex, which is provided in Appendix C.

In relation to HVO North, four properties are listed as entitled to voluntary acquisition upon request under Condition 1 Schedule 3 of DA 450-10-2003. However, all the listed properties are now mine owned, having been acquired by either the HVO JV or Ravensworth Operations. No properties are identified as being entitled to the implementation of mitigation measures upon request under the current HVO North development consent.

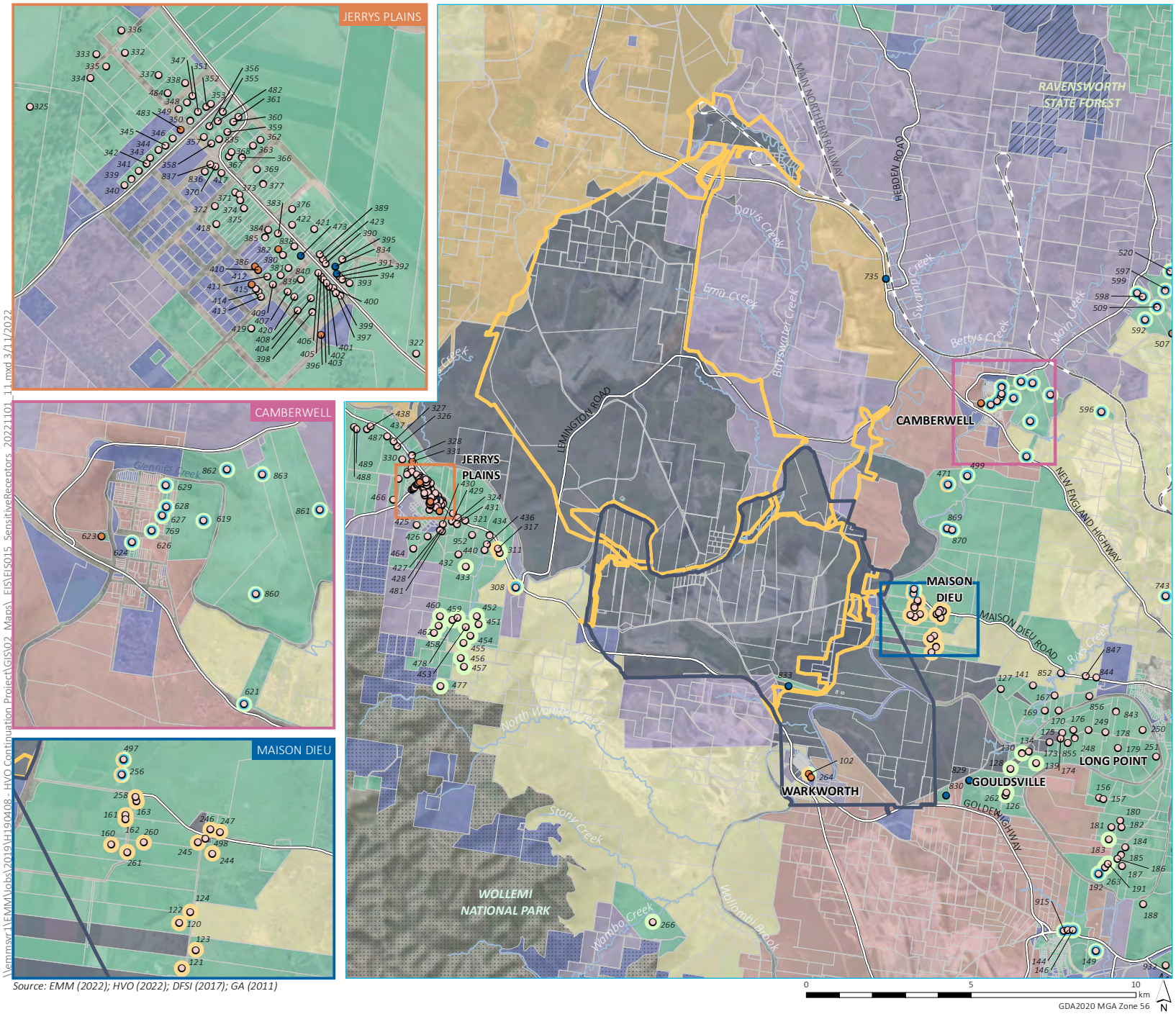
At HVO South, Condition 1 Schedule 3 of PA 06_0261 lists five properties that are entitled to acquisition upon request; however, all the listed properties are now mine owned, having been acquired by either the HVO JV or other mining operations. A number of privately owned properties are entitled to mitigation upon request under the HVO South Project Approval (outlined in Table 2, 4 and 14 of PA 06_0261), and are listed in Table 2.4. It is noted that the numbers previously assigned to residential dwellings (ie receptors) around HVO, as documented in PA 06_0261, have been reviewed for the Project to provide a consistent receptor list between HVO North and HVO South.

Numerous properties in the vicinity of HVO are also entitled to voluntary acquisition or mitigation upon request under the development consents for surrounding mining operations. These residences are also identified in Figure 2.4.

**Table 2.4 Privately owned receptors entitled to mitigation upon request under existing HVO development consents**

| Receptor number (Project) | *Previous receptor number HVO North* | *Previous receptor number HVO South* | Associated with | Due to noise or air quality |
|---|---|---|---|---|
| 120 | *120* | *120* | HVO South | Noise and air quality |
| 121 | *34* | *121* | HVO South | Noise and air quality |
| 122 | *56* | *122* | HVO South | Noise and air quality |
| 123 | *50* | *123* | HVO South | Noise and air quality |
| 160 | *5* | *160* | HVO South | Noise |
| 161 | *61* | *161* | HVO South | Noise |
| 162 | *162* | *162* | HVO South | Noise |
| 163 | *163* | *163* | HVO South | Noise |
| 244 | *244* | *244* | HVO South | Noise |
| 245 | *245* | *245* | HVO South | Noise |
| 246 | *246* | *246* | HVO South | Noise |
| 247 | *247* | *247* | HVO South | Noise |
| 256 | *47* | *256* | HVO South | Noise |
| 258 | *258* | *258* | HVO South | Noise |
| 260 | *260* | *260* | HVO South | Noise |
| 261 | *261* | *261* | HVO South | Noise |
| 308 | *31* | *308* | HVO South | Noise |
| 311 | *3* | *311* | HVO South | Noise |
| 317 | *76* | *317* | HVO South | Noise |
| 471 | *NA* | *471* | HVO South | Air quality |
| 497 | *NA* | *NA*[1] | HVO South | Noise |

1 - Receptor 497 not previously allocated a receptor number under PA06_0261. However, is located within 1 km of Shearers Lane and as such afforded mitigation rights as per Schedule 3, Condition 2 of PA06_0261.




Land holder and land ownership

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Figure 2.4

Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011)

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### 2.4.3 Land use context

#### i Mining operations

The general area surrounding the HVO Complex is comprised of a number of operating and former open-cut and underground coal mining operations. Existing open cut pits, mine-related infrastructure and rehabilitated former mining areas are to the north, south-east and south-west of the HVO Complex. Surrounding operating mines include Glencore's Liddell Coal Operations, Ravensworth Operations and the Mount Owen Complex, as well as United-Wambo (a Glencore and Peabody JV), Peabody's Wambo Underground Mine and Yancoal's Mount Thorley and Warkworth mines, also referred to as MTW, and Ashton.

These mines are supported by an extensive network of access roads, rail lines and rail loops, coal preparation plants, water management infrastructure and tailings dams.

#### ii Power generation and transmission infrastructure

AGL's Bayswater and Liddell power stations are north-west of HVO (refer to Figure 1.2), and collectively provide around 30% of NSW electricity. These power stations are serviced by extensive network of water supply pumping stations, pipelines, water storage dams, fly ash disposal dams, power transmission lines and a coal train unloader. Liddell Power Station is due to be closed in 2023.

An extensive network of high voltage transmission lines (500 kV and 330 kV lines) runs through the area surrounding the HVO Complex forming a major part of the NSW electricity supply grid.

#### iii Agriculture

Generally, land owned by HVO not utilised for mining activities is made available for agricultural purposes. This is undertaken via land licence agreements with agricultural enterprises. Agricultural activities undertaken on HVO-owned land include low intensity grazing on mine buffer land with cropping activities carried out on alluvial lands proximate to the Hunter River, as well as a dairy in Maison Dieu. Grazing is also undertaken on some rehabilitated areas under land licence agreements.

Beef cattle grazing occurs throughout the Upper Hunter region and is the most frequent agricultural land use. Dairying and equine grazing along with cropping such as lucerne growing enterprises are concentrated in areas that feature alluvial soils suitable for highly productive pastures and reliable access to water.

#### iv Biophysical strategic agricultural land and critical industry clusters

There is an area of regionally mapped BSAL, as defined within the *Upper Hunter Strategic Regional Land Use Plan 2012* (UHSRLUP 2012b), associated with the Hunter River alluvial flats which divide HVO North and HVO South (refer to Figure 18.2). The regionally mapped BSAL is partially on previously disturbed land from historical mining activities. No Project related activities are proposed on this land.

As described above in Section 2.3.2, an assessment of areas over which new MLs will be required for the Project has been conducted in accordance with the *Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land* (NSW Government 2013), to confirm if any BSAL is present in these areas. The assessment confirmed that no BSAL is present, and SVCs were accordingly issued by the Secretary (SVC-12575722 and SVC-41389276).

A mapped equine CIC is approximately 2.6 km from the nearest point of the Project area boundary. Notably, the Project is not within this CIC; at HVO North mining will continue progressing to the south-east away from the CIC. No changes are proposed to the annual coal extraction rate at HVO North, and a reduction is proposed to the annual coal extraction rate at HVO South. The Project is therefore not anticipated to result in impacts to the CIC, as discussed further in Chapter 18.

#### v Crown land

There are a number of areas of Crown land within the Project area, including near the HVLP, adjacent to Lake James and the realigned Lemington Road, Hunter River, Bayswater Creek and Wollombi Brook (refer to Figure 2.4). A detailed discussion on Crown land, including native title status and access arrangements, is provided in Chapter 5.

#### vi National estate and conservation areas

The Wollemi National Park is approximately 5 km south-west of the HVO Complex, covering an area of over 500,000 ha. The Wollemi National Park is one of the eight protected areas that forms part of the UNESCO World Heritage–listed Greater Blue Mountains Area, and is part of the Great Dividing Range.

Yengo National Park is around 20 km south of the HVO Complex and covers over 150,000 ha. It is also part of the World Heritage Area.

The Ravensworth State Forest is around 12 km north-east of HVO. The Putty State Forest is on the southern side of the Wollemi National Park and is around 40 km south-west of the complex. The Project will not affect the operations of any state forest.

#### vii Recreation

There are limited recreational land uses undertaken on land surrounding the Project area.

Land south of the LCPP is owned and operated by the HVGC (shown in Figure 1.3). The Singleton Clay Target Club use land owned by HVO JV. There is also a pony club and tennis courts in Jerrys Plains. The Singleton motorcross track is within the HVO North development consent boundary, adjacent to the northern boundary of the Project area and the neighbouring Liddell Coal Operations.

### 2.4.4 Built features

#### i Residential

HVO is approximately 24 km west of Singleton, which is the largest town in the upper Hunter Valley. Singleton has a population of over 16,000 people and supports a range of local industries.

Private residences near the HVO Complex are predominantly at Maison Dieu to the east, Long Point and Gouldsville to the south-east, Camberwell to the north-east and Jerrys Plains to the west (refer to Figure 2.4). These are rural residences and predominantly on large lots.

Maison Dieu is around 2 km east of the HVO South MIA and has a population of around 175 people (ABS 2021). Long Point (64 people; ABS 2021) and Gouldsville (24 people; ABS 2021) are approximately 7–8 km south-east of the HVO South MIA and the predominantly mine-owned Warkworth (42 people; ABS 2021) is south of HVO South. Camberwell (102 people; ABS 2021) is around 7 km north-east of the HVO South MIA, and Jerrys Plains (447 people; ABS 2021) is approximately 8 km west of the HVO North MIA.

#### ii Roads

The HVO Complex lies between the Golden Highway and the New England Highway. These form part of the NSW state classified road network and are key transport routes from Newcastle to Dubbo (Golden Highway) and Newcastle to Brisbane (New England Highway).

The key local roads in the vicinity of HVO include Liddell Station Road, Pikes Gully Road, Old New England Highway, Comleroi Road and Lemington Road. Under the proposal, Lemington Road will be realigned to allow the progression of the open-cut mining operations at HVO North.

#### iii Rail

The Main Northern Railway, which runs from Sydney to Armidale via Maitland, is to the northeast of the HVO Complex. The HVO, Ravensworth Operations and Liddell Coal Operations rail loading facilities are in the north of the HVO Complex. The South Lemington Rail Loop approved by the existing HVO South Project Approval is yet to be constructed.

#### iv Defence

The Singleton Military Area is approximately 12 km south-east of the Project. The base is home to the Lone Pine Barracks, Australian Army School of Infantry, Special Forces Training Centre, Defence Support Group Singleton and other regular support services. The Royal Australian Infantry Corps Museum is also located within the barracks.

### 2.4.5 Natural features

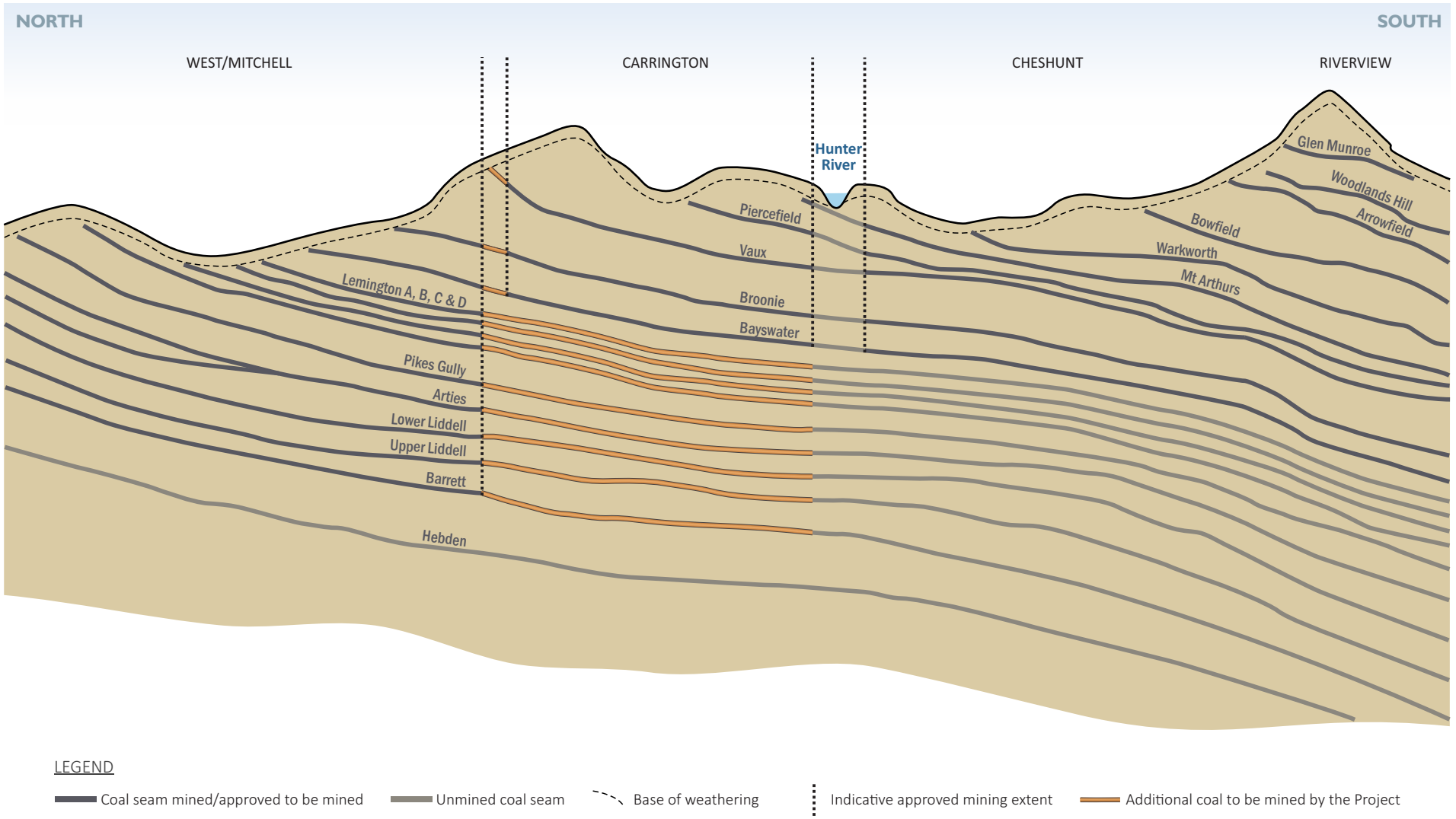
#### i Resource definition

HVO is in the Hunter Coalfield in the northern part of the Sydney basin which contains numerous important coal producing intervals in the Permian stratigraphy. The coal seams at HVO are contained within the lower Jerrys Plains and Vane Subgroups of the Whittingham Coal Measures. The Jerrys Plains Subgroup contains 15 coal seams, with the Whybrow seam at the top in the Mt Leonard Formation and the Bayswater seam at the base in the Burnamwood Formation. The Vane Subgroup contains 6 coal seams, with the Lemington seam at the top and Hebden seam at the base.

The seams mined at HVO include the Glen Munro, Woodlands Hill, Arrowfield, Bowfield, Mt Arthur, Piercefield, Vaux, Broonie, Bayswater, Lemington, Pikes Gully, Arties, Liddell and Barrett. The coal seams currently mined at HVO, compared to the proposed mining stratigraphy, are illustrated in Figure 2.5. No changes are proposed to the seams mined at HVO South.

Given the long history of mining at HVO, there is a good understanding of the geology, geotechnical and coal quality characteristics of most seams that occur across the Complex. The HVO coal resource has been extensively explored, with exploration commencing in the 1940's by the Joint Coal Board and the Bureau of Mineral Resources.

Since this time, a robust geological model has been developed and continually improved to further define the resource. The Project, as informed by the improved geological model, proposes to extract an additional approximate 400 Mt of ROM coal from HVO from the additional mining areas in HVO North and from the deeper Barrett seam. A total of approximately 737 Mt is proposed to be extracted over the Project life from the Complex, of which approximately 349 Mt is currently approved to be extracted under current HVO North and South consents.




Stratigraphy

HVO Continuation Project

Environmental Impact Statement

Figure 2.5

### ii Watercourses

The Hunter River and Wollombi Brook are the main watercourses near and within the Project area. The Hunter River is a regulated river influenced by Glenbawn Dam and divides the HVO North and HVO South operations. It is fed by Parnells Creek, Farrells Creek, Bayswater Creek, Bowmans Creek, Glennies Creek and several unnamed tributaries immediately upstream and downstream of HVO.

HVO has been operating for a long time in proximity to both the Hunter River and Wollombi Brook, and these mining activities have been the subject of numerous detailed water resource and flood studies, which has enabled HVO to develop a thorough understanding of the environment in which it operates and effective measures to manage the impacts of its operation. The detailed assessment of potential impacts to these natural features, completed as part of this EIS, and the potential impact and mitigation measures are described in Part D of this EIS.

### iii Topography

At a regional scale, the terrain is characterised by a steep and incised Wandewoi Range to the west of HVO, declining generally towards the low-lying floodplains of the Hunter River and Wollombi Brook. Topography to the north consists of low rolling hills. The main topographic highpoint within the region is located south-west of the Project area within the Wollemi National Park. Mining in the region, including at HVO, occurs adjacent to the Hunter River floodplains where the topography grades into flat alluvial lands. The ground levels in the Hunter River and Wollombi Brook alluvial lands vary from 50 to 70 mAHD.

## 2.5 Cumulative impacts with other development

The cumulative impacts of the Project with other mining development in the area has been assessed for the Project in accordance with the *Cumulative Impact Assessment Guidelines for State Significant Projects* (DPIE 2021a) and the *Social Impact Assessment Guideline for State Significant mining, petroleum production and extractive industry development* (DPIE 2021c).

Given that the Project will be undertaken within existing tenements and does not seek to increase the intensity of production, the cumulative impacts are unlikely to be substantially different to that already experienced for the Upper Hunter Valley.

Nonetheless, the cumulative impacts of the Project with other mining developments nearby are considered in each of the various environmental and social impact assessments undertaken for the Project (in Chapters 7–25), with a comprehensive summary provided in Chapter 26.

## 2.6 Agreements with other parties

HVO will progress discussions with a number of parties for the purpose of entering into agreements relating to the Project. The proposed agreements and status are described below.

- Voluntary Planning Agreement (VPA) – HVO will discuss a VPA accounting for the changes arising from the Project with Singleton Council.

- Agreement with the HVGC – Schedule 3, condition 47 of the existing HVO South Project Approval requires that HVO maintains an agreement with the HVGC to address potential impacts of the mine on the use and operation of the HVGC's facilities. Further, condition 49 requires the development of an amenity management plan for HVGC's facilities within HVO. This agreement is in place, as well as the amenity management plan, which will both be updated to reflect the Project.

- Mitigation agreements with neighbouring landholders with respect to noise and air quality impacts – 21 receptors currently have voluntary mitigation rights relating to noise and/or air quality under the existing Project Approval for HVO South (as listed in Table 2.4). These existing agreements, and how the Project will affect them, is described below:
  - Noise:
    - 20 of the 21 receptors with existing voluntary mitigation rights have mitigation rights due to noise.
    - The noise levels at 13 of these receptors (in Maison Dieu) due to the Project are predicted to continue to comprise a 'marginal' impact, in accordance with the VLAMP. These receptors will therefore continue to be entitled to voluntary mitigation rights under the development consent for the Project, if approved. HVO has informed these landholders of the extension of these rights under the Project, through the provision of letters to each landholder, and meetings with landholders who took up the offer of a meeting.
    - The predicted noise levels associated with the Project at the remaining seven receptors are lower than the threshold triggering these mitigation rights; however, HVO commits to extending these rights, as a condition of the development consent, should the Project be approved. HVO has met with these landholders to explain that their existing rights will be extended, the provision of letters to each landholder, and meetings with landholders who took up the offer of a meeting.
    - The predicted noise levels from the Project at 15 new receptors (equivalent to 11 landholders) in Jerrys Plains are predicted to marginally exceed the relevant noise criteria (as discussed further in Chapter 9). Of these, six are considered isolated residences in accordance with the *Noise Policy for Industry* (EPA 2017) and will therefore also be entitled to voluntary mitigation rights in accordance with the VLAMP. HVO has explained the new entitlement to voluntary mitigation rights should the Project proceed through the provision of letters to each landholder, and meetings with landholders who took up the offer of a meeting.
  - Air quality:
    - Five of the 21 receptors with existing voluntary mitigation rights under the HVO South Project Approval have mitigation rights due to air quality emissions.
    - An exceedance of the annual $PM_{10}$ and $PM_{2.5}$ criteria is predicted to occur at one receptor, R308, in one year (Year 11) of the Project.
    - The annual $PM_{10}$ and $PM_{2.5}$ levels are predicted to exceed the relevant criteria across more than 25% of the contiguous landholdings associated with two receptors, R121 and R308, and therefore these landholders will be entitled to voluntary acquisition rights due to the Project. R121 currently has voluntary mitigation rights due to noise and air quality under the HVO South Project Approval, and R308 currently has voluntary mitigation rights due to noise under the HVO South Project Approval, and noise acquisition rights under the United Wambo development consent.

A summary of receptors with current mitigation rights, and receptors with changed rights due to the Project (highlighted in bold), is provided in Table 2.5.

**Table 2.5 Privately owned receptors entitled to mitigation/acquisition due to the Project**

| Receptor | Existing rights (HVO) | Due to | Existing rights (other mines) | Project |
|---|---|---|---|---|
| 120 | Mitigation | Noise and air quality | No | Continue mitigation |
| **121** | Mitigation | Noise and air quality | No | Acquisition (air quality)<br>Continue mitigation (noise) |
| 122 | Mitigation | Noise and air quality | No | Continue mitigation |
| 123 | Mitigation | Noise and air quality | No | Continue mitigation |
| 160 | Mitigation | Noise | No | Continue mitigation |
| 161 | Mitigation | Noise | No | Continue mitigation |
| 162 | Mitigation | Noise | No | Continue mitigation |
| 163 | Mitigation | Noise | No | Continue mitigation |
| 244 | Mitigation | Noise | No | Continue mitigation |
| 245 | Mitigation | Noise | No | Continue mitigation |
| 246 | Mitigation | Noise | No | Continue mitigation |
| 247 | Mitigation | Noise | No | Continue mitigation |
| 256 | Mitigation | Noise | Yes – Ravensworth Operations | Continue mitigation |
| 258 | Mitigation | Noise | No | Continue mitigation |
| 260 | Mitigation | Noise | No | Continue mitigation |
| 261 | Mitigation | Noise | No | Continue mitigation |
| **308** | Mitigation | Noise | Yes – United Wambo | Acquisition (air quality)<br>Continue mitigation (noise) |
| 311 | Mitigation | Noise | Yes – United Wambo | Continue mitigation |
| 317 | Mitigation | Noise | Yes –- United Wambo | Continue mitigation |
| **326** | No | N/A | No | Mitigation (noise) |
| **327** | No | N/A | No | Mitigation (noise) |
| **328** | No | N/A | No | Mitigation (noise) |
| **330** | No | N/A | No | Mitigation (noise) |
| **437** | No | N/A | No | Mitigation (noise) |
| **487** | No | N/A | No | Mitigation (noise) |
| 471 | Mitigation | Air quality | Yes – Ravensworth Operations, Ashton | Continue mitigation |
| 497 | Mitigation | Noise | Yes – Ravensworth Operations | Continue mitigation |

Further discussion on impacts to sensitive receptors is provided in Chapter 8 (air quality) and Chapter 10 (noise).

## 2.7 Feasible alternatives to the Project

To meet Project objectives, detailed concept and pre-feasibility studies considering mining options and infrastructure arrangements were carried out. Each of these studies evaluated potential environmental and social impacts to inform the Project design, as described in Chapter 4, being the preferred Project.

The following sections summarise the mining options and infrastructure arrangements considered that were ultimately found either not to be feasible, or desirable, or able to form part of, the preferred Project design which best met Project objectives. A detailed Mine Planning Options Report (MPOR, HVO 2022a) and Infrastructure Options and Avoidance Report (IOAR, HVO 2022b), available in Appendix D, provide further details regarding options considered and discussed below.

### 2.7.1 Alternative mine options considered but not selected

The preferred Project mine design was chosen as it provides the best balance between optimal resource recovery and financial return, and reducing environmental and social impacts, through the implementation of appropriate mitigation measures. The preferred Project mine design has been continually optimised as further information has been made available via exploration drilling and the completion of environmental and infrastructure studies.

Alternative options considered during the development of the preferred Project mine design included the following (noting that the Project is 'Option 1' in the MPOR, hence the alternatives start at number 2 in the below list):

- Alternative option 2 – No Project – mining ends at the complex as per the HVO North consent (June 2025).
- Alternative option 3 – Maximise resource recovery – mining in several additional locations around and in addition to the preferred mine design localities.
- Alternative option 4 – No final void remaining at the end of the preferred mine design.
- Alternative option 5 – Impacting the CM-CD1 Aboriginal cultural heritage site.
- Alternative option 6 – Excluding existing Lemington Road from the mining footprint.
- Alternative option 7 – Underground extraction of target seams.

Further mine plan options that were not considered reasonable and feasible during early stages of the mine planning phase were only developed to a qualitative and/or concept quantitative level and are outlined in the MPOR.

#### i Alternative option 2 – No Project – mining ends as per HVO North consent (June 2025)

Not proceeding with the Project would mean the cessation of mining at the HVO Complex in mid-2025. Currently, the HVO South Project Approval allows for mining to continue to 2030; however, as HVO South coal is currently processed through HVO North-based CPP facilities, this option would likely mean that no further coal extraction at HVO South would occur as the CPP facilities cease approval for use when the HVO North consent lapses in 2025. This option would therefore forego the approved ROM coal remaining to be extracted at HVO South, as well as the additional approximate 400 Mt of ROM coal to be extracted by the Project. It would also mean cessation of employment and the associated flow-on benefits to the approximate 1,500 FTE HVO workforce.

There is allowance in the current HVO South Project Approval for the construction of the Lemington CPP facility; however, this option considered that construction of this facility would not be feasible to complete prior to mid-2025 to allow continuous operations at HVO South once HVO North stops operating, or for it to operate long enough to be economically feasible considering the current HVO South approval lapses in 2030.

The current schedule for this option assumes mining progresses as per current operations, with a short ramp down prior to the end of mining by June 2025 and aligns to the economic base case considered in the economic assessment of the Project (EY 2022). It also assumes that the rehabilitation of South Lemington Pit 1 would occur prior to cessation of mining at HVO South to backfill that current void. For the reasons mentioned above, this option was not considered reasonable or feasible and did not meet Project objectives.

### ii Alternative option 3 – Maximise resource recovery – mining in several additional locations

Coal resources extend throughout the area around the HVO Complex, adjacent to and underlying existing operations and infrastructure, and waterways such as the Hunter River and Wollombi Brook. Various resource recovery options, in addition to the preferred Project mine design, were reviewed as part of the process of determining the maximum resource recovery achievable while maintaining a reasonable and feasible mine plan. A total of 6 alternative mining locations were considered and are documented in the MPOR.

These options were considered not reasonable and feasible and did not meet Project objectives as outlined in the MPOR, with key considerations summarised below:

- proximity and exposure of the additional mining locations to community receptors, notably the Jerrys Plains locality, and the potential resultant community health and amenity impacts;
- proximity to nearby equine critical industry cluster;
- proximity to the natural features including the Hunter River and Wollombi Brook;
- proximity and potential impacts to high value ecological communities;
- interactions with existing infrastructure and required space for infrastructure to support further mining activities;
- geotechnical consideration of challenging mining conditions and existing mining infrastructure; and
- alignment with stakeholder feedback obtained during the engagement activities during the preparation of this EIS.

### iii Alternative option 4 – No final void remaining at end of preferred mine plan

The Project includes two final voids at the cessation of mining, one at HVO North and one at HVO South. However, a no-void option was considered in acknowledgement of stakeholder expectations and government direction including the *Improving Mine Rehabilitation in NSW Discussion Paper* (DPE 2017).

This option considers that the mining voids are progressively backfilled and rehabilitated as soon as practicable as mining progresses, noting that at the cessation of coal extraction the final voids are fully backfilled and rehabilitated. The MPOR provides a detailed analysis of a no final void option, with key considerations summarised below:

HVO North:

- Requires the rehandling of approximately 730 Mbcm of material mined from existing rehabilitated areas to fill the proposed void at the end of coal extraction to approximately 75 mAHD (to achieve a free-draining surface).
- Results in the disturbance of approximately 1,100 ha of rehabilitated land established during operations.

- An approximate 21 year extension of site works would be required post-mining, including prolongation of potential air quality and noise impacts for nearby receptors, and delay in mine site rehabilitation outcomes with no economic return.
- Remaining remnants of highwalls may be required to be shaped to meet visual amenity and geotechnical stability objectives.

HVO South:

- Requires rehandling of approximately 610 Mbcm of material mined from existing rehabilitated areas to fill the proposed void at the end of coal extraction to approximately 70 m AHD (to achieve a free-draining surface).
- Results in the disturbance of approximately 850 ha of rehabilitated land established during operations.
- An approximate 18 year extension of site works would be required post-mining, including prolongation of potential air quality and noise impacts for nearby receptors, and delay in mine site rehabilitation outcomes.
- Remaining remnants of highwalls may be required to be shaped to meet visual amenity and geotechnical stability objectives.

This option was not considered reasonable and feasible and did not best meet Project objectives due to the ongoing noise and dust generation, potential significant removal of established rehabilitation, delays in establishing the final landform and associated land use, and associated costs that significantly affects the Project's viability.

#### iv Alternative option 5 – Mining the area including CM-CD1 heritage site

A previously identified Aboriginal heritage site, known as Carrington Mine Colluvial Deposit Area 1 (CM-CD1, AHIMS #37-2-1877), is present at HVO North (see Figure 4.1). CM-CD1 is a north-south linear landform feature immediately west of the Carrington Mine, north of the Hunter River, and south of the current Lemington Road alignment. Despite being identified in environmental and planning documents for nearly 20 years as possibly high significance due to being potentially of Pleistocene antiquity, little investigation has occurred to CM-CD1 beyond its initial discovery in the late 1990s (CQCHM 2009). Rather, it has been protected from disturbance by being excluded from mining activities occurring in the vicinity since that time.

As part of the Aboriginal and cultural heritage assessment completed for the Project, (refer to Chapter 15) investigations of CM-CD1 were completed to determine the archaeological content and age of the deposit. Optically-Stimulated Luminescence (OSL) dating confirmed the 'Older Stratum' of CM-CD1 is of significant age relating to the early Holocene and late Pleistocene periods (10,000–12,000 years ago). As such, this is one of the few deposits in the Hunter Valley of this age, and the site is considered of high scientific (archaeological) and cultural significance (EMM 2022a, refer to Appendix N).

The area including CM-CD1 was included in an original mine plan considered for the Project, but once the Aboriginal cultural heritage assessment was undertaken and the significance of the area was fully understood, the decision was made to avoid direct impacts to this area. HVO has committed to not disturbing this site as part of the Project.

### v Alternative option 6 – Excluding Lemington Road from the mining footprint

No disturbance to the existing Lemington Road alignment was considered as an alternative option, with the existing Lemington Road alignment to remain in place and mining occurring on either side. This option would require an additional crossing of Lemington Road to allow for material to be transported from the southern void to the northern emplacement areas, to reduce coal sterilisation and minimise final voids, leaving only one void to the south-east of the proposed mining area. This option incorporates most of the same constraints as the preferred Project mine plan, with the addition of excluding the existing Lemington Road alignment constraint.

The IOR provides a detailed analysis of excluding Lemington Road from the proposed mining area at HVO North, with key considerations summarised below:

- approximately 65 Mt of ROM coal would be sterilised with dumping adjacent to both sides of the road to topography and above and the loss of 26 Mt ROM over the life of the mine;
- operational constraints as a result of bridges over Lemington Road to transport material to the north side of the road;
- potential increased amenity impacts due to the crossing of Lemington Road at or above topography by haul trucks to backfill the northern void;
- ongoing impacts to road users due to proximity to mining activities, namely as a result of road closures in response to blasting;
- change to the final landform to accommodate not mining through the road; and
- increased complexity of surface water management systems required in the area.

No disturbance of the existing Lemington Road alignment was not considered reasonable and feasible and did not best meet Project objectives due to the above considerations. Furthermore, the proposed Lemington Road realignment benefits to the community from the upgrade of the road, such as improved flood immunity, as per the preferred Project option, would not be realised.

### vi Alternative option 7 – Underground extraction of target seams

As an alternative to the open cut mining method, the extraction of resources in the Project area using underground mining methods was considered. The benefit of this option is that it would reduce the impact on the surface; however, underground mining is not considered economically viable for resource extraction in the area for the following reasons:

- Coal quality, seam proximity and seam thickness are all significant constraints on minable coal tonnage utilising underground mining methods. Considering a minable ROM coal thickness of greater than 2 m, and sufficient separation in depth between mined seams to maintain geotechnical stability of potential target and coal quality, only a few seams display potential for underground mining. Initial reviews indicate that this would lead to a significant reduction in resource recovery with less than 15% of the minable tonnage identified in the preferred Project mine plan being potentially recoverable.
- The presence of regional geological features such as the faulting to the west of HVO North associated with the Muswellbrook anticline, the Hunter Valley Dyke and the Hunter Valley Fault Zone which transects HVO North to the south, and Lemington dyke and numerous faults that influence HVO South would also constrain underground mining.

- There is a high capital cost associated with the establishment of an underground mine and the coal tonnes available for recovery within the resource area are insufficient to ensure the economic viability of the operation.
- Whilst mining does not occur from the surface there are still potential surface subsidence impacts that could influence existing drainage lines and shallow alluvial aquifers. Additionally, subsidence could impose additional stresses on surface infrastructure such as Lemington Road.
- There would be reduced employment opportunities associated with this option, including reduced length of employment due to limited suitable mining reserves. Changes to mining processes would mean either hiring a new workforce or retraining the existing workforce with a new set of skills required for an underground mining operation.
- Multiple final voids would still remain at cessation of mining following the transition from open cut to underground mining.

For the above financial and technical reasons, underground mining extraction across the resource area was not considered reasonable and feasible and did not best meet Project objectives.

### 2.7.2 Alternative infrastructure options considered but not selected

Infrastructure requirements for the Project were evaluated against the objectives of achieving maximum efficiency, and using existing and approved infrastructure where possible (including integrating the coal handling and preparation capacity at nearby Ravensworth Operations facilities) to minimise the need for the construction of new facilities.

New infrastructure proposed for the Project, described in Chapter 4, was designed in consideration of avoiding key site constraints such as cultural heritage and biodiversity constraints, to achieve minimal impacts where reasonable and feasible.

Key alternative infrastructure options considered during the development of the Project are summarised below and discussed in further detail within the IOR:

HVO North:

- Realignment path of Lemington Road.
- Product coal stockpile and train loading facility upgrades.
- Improvements to the HVO North MIA.

HVO South:

- Lemington CPP and associated rail loop.

Further infrastructure options that were not considered reasonable and feasible and did not meet Project objectives during early stages of project planning were developed to a qualitative and/or concept quantitative level only and are outlined in the IOR.

### i HVO North

#### a Realignment path of Lemington Road

The existing Lemington Road passes between the West/Mitchell Pits and the Carrington area at HVO North. As this area is proposed to be mined, the Project seeks to realign part of Lemington Road to the east of the HVO Complex, linking the existing Comleroi Road in the south with the existing Lemington Road in the north approximately 2.3 km south of the New England Highway, as shown in Figure 4.12.

The Lemington Road realignment presents an opportunity to improve the accessibility and reliability of the road as the primary access point joining the Golden Highway and New England Highway between Singleton and Muswellbrook. The realigned road includes the construction of a new bridge over the Hunter River (refer to Figure 4.12), which will be constructed to meet the requirements of a 1 in 10 ARI flood protection design. This design will provide improved accessibility and safety outcomes in comparison to the existing Moses Crossing, which is a low-level bridge across the Hunter River at the southern end of the existing Lemington Road.

Alternative routes considered for the Lemington Road realignment, and justification of the preferred path, are documented in the IOR and summarised below:

- Alternative Option 1 – Lemington Road realignment south of HVO North:
    - This realignment option would involve the realignment of Lemington Road south of HVO North but north of the Hunter River. It would not require the construction of new intersections with the New England Highway or Golden Highway nor a bridge over the Hunter River; however, safe separation between the public traffic, mining operations and the Hunter River would be difficult to implement. Mining would be highly visible from the relocated section of Lemington Road. In addition, this alignment is also partly located over an area of rehabilitated mine overburden, which could present challenging geotechnical conditions and associated potential construction difficulties. As such this option was not considered reasonable and feasible and did not best meet Project objectives.
- Alternative Option 2 – Pikes Gully Road Extension:
    - This realignment option involves upgrade and extension of the existing Pikes Gully Road along the western side of the HVO Complex and construction of a new Hunter River crossing and Golden Highway intersection in the vicinity of Jerrys Plains. Currently, the land which would be relied upon to facilitate this option between the Hunter River and the Golden Highway intersection is privately owned. This option would rely upon the purchase of private land, and the location of an intersection with the Golden Highway would increase traffic movements in the vicinity of Jerrys Plains Village and the surrounding equine industry.
    - In addition, given the large proportion of the road users who access Lemington Road from the east, this alignment would not be seen as desirable due to the increase in travel times. It would also result in an increase in through traffic in Jerrys Plains. As such, this option was not considered reasonable and feasible and did not best meet Project objectives.

- Alternative Option 3 – Close Lemington Road:
    - Approximately 8% of road users rely on Lemington Road to travel between the New England and Golden Highways as a through road (WSP 2022), providing a thoroughfare for the community of Jerry Plains to access the north of Singleton. HVO considered that the closure of Lemington Road was not preferred given the use of the road by users as a connection between the two Highways. Notwithstanding this, as identified in Chapter 19, Lemington Road is subject to significant closure periods due to the flooding of Moses Crossing and at the time of preparation of this EIS, had been closed for more than three consecutive months.

The preferred Lemington Road realignment proposed by the Project, and discussed in Chapter 4, provides the following benefits when compared to alternative options considered:

- The existing New England Highway intersections are not required to be upgraded, reducing impact to local road users along key regional NSW highways.
- There will be minimal interaction with the proposed or potential future mining operations.
- It provides significant flood immunity compared to the existing Moses Crossing over the Hunter River crossing.
- There will be minimal travel time impacts between the Golden Highway and the New England Highway for local residents of Jerrys Plains.
- There will be a reduced visual exposure to the proposed mine workings along the realigned road when compared to the existing Lemington Road alignment and alternative options considered.

### b Avoidance measures adopted for Lemington Road

The proposed realignment of Lemington Road has been carefully considered to avoid areas of environmental sensitivity, including the presence of Warkworth Sands Woodland (listed under the BC Act) and Central Hunter Grey Box-Ironbark Woodland (also BC Act listed). In addition, the alignment has been developed in consideration of identified Aboriginal cultural heritage items. Avoidance measures are documented in the IOR with key items summarised below:

- Consideration of biodiversity matters:
    - The proposed realignment of Lemington Road crosses an area identified as Warkworth Sands Woodland, as shown in Figure 13.2 and further discussed in the IOR. Direct impacts to Warkworth Sands Woodland have been avoided as much as is reasonable and feasible due to the location of the existing mining operations and established biodiversity offsets areas in proximity of the proposed alignment. HVO has conducted further assessment of the alignment within the area of Warkworth Sands Woodland to reduce the overall disturbance required whilst meeting relevant road design parameters. This has resulted in the avoidance of approximately 7 ha of Warkworth Sands Woodland EEC by the proposed alignment. These avoidance measures will increase road construction cost but minimise impacts to Warkworth Sands Woodland as much as possible.

- Consideration of Aboriginal cultural heritage matters:
    - Two scar trees of potential Aboriginal cultural heritage origin, identified as TR212-ST1 and TR216-ST1 are located within the Lemington Road alignment (as shown in Figure 15.7). Further engineering consideration of TR212-ST1 and TR216-ST1 was undertaken in an attempt to identify reasonable and feasible measure to avoid the items. Due to an extremely constrained alignment as a result primarily of local topography and the established biodiversity offset area in proximity of the items, avoidance is not achievable. A 330 kV transmission line in proximity to the road alignment and the requirement to provide access to a residence further restricted potential avoidance options.
    - As a result of the identified constraints, impacts to TR212-ST1 and TR216-ST1 are proposed. As discussed in Chapter 14, measures are proposed to mitigate the proposed impacts in consultation with Registered Aboriginal Parties (RAPs). Further discussion on TR212-ST1 and TR216-ST1 is provided in Chapter 15.

### c Product stockpile and train loading facility upgrades

Rather than progressing the design of new coal handling and processing facilities for the Project, the primary objective of the CPP design process was to utilise existing facilities where possible, and to re-evaluate the implementation of facilities already approved but not yet constructed. This approach to maximise the efficiency of the existing facilities was driven by the objectives of achieving maximum operational efficiencies and reduced capital and operating costs.

The Project, as described in Chapter 4, seeks to increase the stockpile capacity of the HVLP and Newdell LP and stockpile, and upgrade the existing train loading infrastructure at Newdell (noting that while approval is sought for upgrades to both the HVLP and Newdell LP, only one will be constructed). This option has been selected as it is the most cost effective option that minimises disturbance and interaction with existing infrastructure. It can also readily receive product coal from both the HVCPP and Howick CPP.

Alternatives considered are summarised below and discussed in detail in the IOR.

Additional stockpile capacity at Hunter Valley or Howick CPP:

- Both the HVCPP and Howick CPP have product stockpiles albeit of limited capacity. An option considered was increasing the size of either or both of these two facilities. This option is not considered reasonable or feasible for the following reasons:
    - The product stockpile should ideally be situated close to the train load out facility to maximise blending opportunities and minimise operational delay impacts from long overland conveyors during actual train loading operations.
    - Upgrading the HVCPP and Howick CPP would incur significant capital costs in comparison to proposed improvements to the HVLP and Newdell LP options.

### d Improvements to the HVO North MIA

The existing HVO North MIA within the HVO North Project area will be upgraded to include a new workshop suitable for ultra-class haul trucks and incorporate modern maintenance facilities. The upgrade will also include administration offices, bath house extension and carparking to more appropriately manage and modernise the existing facilities. It will also assist in the transition in workforce away from the Howick MIA facility as mining in HVO North progresses further south-east.

The option to upgrade the HVO North MIA was identified as the most appropriate location for the following reasons:

- it is already the principal HVO facility and works are achievable without additional disturbance;
- the HVO North MIA and HVCPP combined are centrally located without near neighbours and close to mining operations, minimising potential impact to sensitive receivers; and
- as mining progress further south upgrading and or refurbishment of the Howick MIA represents an impractical long term solution.

### ii HVO South

#### a Lemington CPP and associated rail loop

HVO South has approval to construct and operate the LCPP and to construct a rail loop off the Wambo rail spur, as shown in Figure 3.4. The construction of this infrastructure has not been required to date.

Construction of the LCPP, and the trucking of ROM coal from the Riverview and Cheshunt Pits for processing there, was approved in an earlier development application for HVO South (PA 06_0261) and remains approved under the current consolidated Project Approval.

The opportunity to construct the LCPP and rail loop is critical for the continued operations of HVO South. The Project proposes to construct the LCPP in around Year 11–15 when production exceeds the capacity of the HVO North clearance infrastructure and approved processing limits. Moreover, the Lemington facility is critical if, should operational or commercial arrangement require it, the HVO South operation is required to operate independently.

In reviewing the approved LCPP and associated rail loop in consideration of the Project, the following constraints were identified should it be moved outside the existing approved location, which are further described within the IOR:

- impacts to identified items of biodiversity value;
- potential amenity impacts, namely to residences of Maison Dieu;
- proximity to the Hunter River and Wollombi Brook and associated flood immunity considerations;
- proximity to mining operations; and
- there are very few alternate locations for the Lemington CPP.

As with the location of the LCPP, the location of the connecting product coal clearance infrastructure is similarly constrained. There is no available corridor for a rail, or even conveyor, to link the Lemington CPP with the HVO rail facilities at the HVLP and Newdell LP. The currently approved options were therefore the most reasonable available alternatives.

It was also identified that the short rail loop option, with a rail balloon loop adjacent to the Wambo rail spur near the Golden Highway, required substantial impact to woodland which contains approximately 25 ha of the Central Hunter Grey Box – Ironbark Woodland EEC. Moreover, neither a conveyor, or a truck haul option, was particularly feasible due to the constraints of the area, the crossing of South Lemington Pit 1 and the adjacent Wollombi Brook. It was therefore decided that the approved long rail option, which is currently approved under PA 06_0261, is the preferred product coal clearance option for the LCPP.

## 2.8 Geotechnical assessment of the mine design

As part of the mine design process, the proposed designs undergo a geotechnical assessment to assess slope stability at both an overall slope and individual batter/inter-ramp scale. Additionally, in the input to the SEARs for the Project, the Department of Regional NSW – Mining, Exploration and Geoscience (MEG) requested a geotechnical assessment to support the mine design and method selected. A geotechnical assessment was undertaken by Encompass Mining to address this requirement and this section describes the outcomes.

Further to the below discussion, it is noted that neither the slope design or geotechnical models are static and as additional data becomes available ongoing updates and development of the geotechnical model will occur and designs refined throughout the ongoing operation of HVO.

### 2.8.1 HVO North

Wall design geometries and slope stability analysis and designs of pit walls/overburden emplacements:

- A slope stability assessment for the HVO North pit design was undertaken considering wall design geometries, in-pit dump profiles and final void long-term stability. Various failure mechanisms were considered within the assessment, and the outcomes support the mine design and mining methodology in that all slopes assessed in the design achieved an acceptable factor of safety (FoS) and indicate safe and stable slopes during mining (considering both overall slope, and individual batter/inter-ramp scale failure), and long-term safe and stable slopes within the final void.

Structural trends, stress magnitude and orientation, jointing and cleating:

- The orientation and position of the principal geological structure - including jointing, bedding and discontinuities - relative to the proposed pit walls is a primary consideration in the overall geotechnical assessment of slope stability and design parameters. Key structural orientations and conditions data identified within the HVO North region were incorporated into the geotechnical model utilised in the assessment. Strength parameters adopted for the assessment were derived from results of HVO North geotechnical investigation programs.

Explanation of the current understanding of the paleochannel and the expected impact on operations and planning, as well as the design and risk reduction measures to protect the Hunter River and Wollombi Brook:

- Hydrogeological condition parameters were derived from site observations, river levels, groundwater monitoring data and engineering judgement. The influence of elevated phreatic surfaces associated with the Hunter River and the North Void TSF on highwall stability in the south-east corner has been considered in the mine design and assessment, however the presence of the paleochannel within the HVO North mining area is not anticipated to have a notable additional impact. A LPBW has previously been installed on the eastern arm of the paleochannel in accordance with the requirements of the HVO North development consent DA 450-10-2003. When mining progresses through the western arm of the paleochannel as proposed by the Project, another LPBW will be installed on the alluvial benches post mining and prior to backfill, to limit seepage between emplaced spoil and alluvial sediments.

Long term stability of final voids:

- The majority of the HVO North pit shell will be progressively backfilled with overburden as the mining operation advances, with ongoing shaping and rehabilitation of the spoil. The conceptual final landform includes one final void in the south-eastern extent of the pit shell, and stability modelling indicates that the slope profiles, including the west spoil slopes, are suitable for long term stability. Results also indicate that although there is a reduction in FoS for the final slope when considering the long-term effects of water storage, the flat grade of the slope ensures the maintenance of long-term stability. Additional investigation into the Hunter Valley Fault Zone (HVFZ), considering interaction between the end-wall and the HVFZ structure, is recommended prior to operations commencing in this area to refine modelling of the structure and end-wall design.

### 2.8.2 HVO South

Wall design geometries and slope stability analysis and designs of pit walls/overburden emplacements:

- Slope stability assessment for the HVO South pit design was undertaken considering wall design geometries, in-pit dump profiles and final void long-term stability. Various failure mechanisms were considered within the assessment and the outcomes support the mine design and mining methodology in that all slopes assessed achieved an acceptable FoS and indicate safe and stable slopes during mining (considering both over all slope and individual batter/inter-ramp scale failure), and long-term safe and stable slopes within the final void.

Structural trends, stress magnitude and orientation, jointing and cleating:

- The orientation and position of the principal geological structures – including jointing, bedding, and discontinuities - relative to the proposed pit walls is a primary consideration in the overall geotechnical assessment of slope stability and design parameters. Key structural orientations and conditions data identified within the HVO South regions were incorporated into the geotechnical model utilised in the assessment. Strength parameters adopted for the assessment were derived from results of HVO South geotechnical investigation programs, and the hydrogeological condition parameters were derived from site observations, river levels, groundwater monitoring data and engineering judgement.

Explanation of the design and risk reduction measures to protect the Hunter River and Wollombi Brook:

- The mine design at HVO South considers the proximity of the Hunter River; the phreatic surface in the geotechnical model includes considerations of the impact of the rivers and a higher FoS is set as the assessment criterion for walls adjacent to the Hunter River.

Long term stability of final voids:

- The majority of the HVO South pit shell will be progressively backfilled with overburden as the mining operation advances, with ongoing shaping and rehabilitation of the spoil. The conceptual final landform includes one final void in the south-eastern extent of the pit shell. Stability modelling indicates the slope profiles are suitable for long term stability. Results also indicate that although there is a reduction in the FoS for the final low-wall slopes when considering the long-term effects of water storage, the flat grade of the slope ensures the maintenance of long-term stability.

# 3 Overview of existing operations

## 3.1 Existing approvals and development history

### 3.1.1 NSW planning approvals

Since the beginning of operations in 1949, the development of HVO has occurred through a series of expansions and acquisitions that, at one point, resulted in the operation managing 18 separate development approvals for activities north of the Hunter River, and 25 separate development approvals for activities at HVO South.

HVO North now operates under DA 450-10-2003, which was granted on 12 June 2004 by the then NSW Minister for Infrastructure, Planning and Natural Resources under Part 4 of the EP&A Act. The 2004 approval consolidated the 18 historical approvals for activities at HVO North, authorising the continuation of all aspects of HVO North as it currently operated at the time and extending and altering certain aspects as described in the EIS that accompanied the consolidation application. DA 450-10-2003 allows the extraction of up to 22 Mtpa of ROM coal until 12 June 2025.

DA 450-10-2003 has since been modified on seven occasions, the most recent being Modification (Mod) 7 in July 2017, which was an administrative modification to update the Schedule of Lands to which the development consent applies. The last substantial modification was Mod 3 (described in Table 3.1), which allowed for the extension of the Carrington Pit to the west, modification of the development consent boundary and the realignment and increase in size of the Carrington Pit final void.

The Project Approval under which HVO South operates, PA 06_0261, was granted on 24 March 2009 by the then NSW Minister for Planning. This approval, amongst other things, consolidated 25 separate consents and 10 project modifications that applied to HVO South with a single Project Approval. As was the case with the HVO North consent consolidation in 2004, the 2009 approval at HVO South also authorised continuation of all operational activities and aspects that were in place at the time under historical approvals.

PA 06_0261 has been modified on seven occasions, the most recent being Mod 7 which was approved on 27 May 2022 and involved augmenting the existing approved water management infrastructure to enable the transfer and storage of water into the existing Lemington Underground Mine void for later extraction and reuse at MTW and HVO. HVO has also recently submitted an application seeking a further minor modification (Mod 8) to increase the storage capacity for raw materials used in the manufacturing of ammonium nitrate emulsion. At the time of submission of this EIS, Mod 8 is yet to be determined. The last substantial modification was Mod 5 (described in Table 3.1) which, amongst other things, enabled an increase in the maximum ROM production rate from 16 Mtpa to 20 Mtpa at HVO South, and coal extraction to the base of the deeper Bayswater seam in the Riverview Pit.

A summary of the current approvals and development consents held by HVO is provided in Table 3.1, including the history of modifications of these approvals. Commonwealth approvals under the EPBC Act relevant to the HVO Complex are discussed in Section 3.1.4.

## Table 3.1 HVO planning approval history

| Approval number | Issue date | Summary of approved activity |
|---|---|---|
| **HVO North** | | |
| DA 450-10-2003 | 12 June 2004 | Consolidation of 18 existing development approvals applying to HVO North, into a single consent, fully integrating West Pit into existing operations.<br>Continuation of all aspects of HVO north of the Hunter River as it operated at the time under historical approvals.<br>Extension of open cut mining in West Pit to the east.<br>Production rate of 12 Mtpa ROM coal from West Pit, 10 Mtpa ROM coal from Carrington Pit.<br>Coal haulage of 16 Mtpa from HVO South to the HVCPP.<br>Total processing capacity of 20 Mtpa at HVCPP, 6 Mtpa at Howick CPP and 4.5 Mtpa at Newdell CPP (subsequently demolished as approved under this development consent).<br>Movement of coal and rejects between areas of HVO, including between HVO South and HVO North.<br>Temporary crossings of the Hunter River for heavy equipment too heavy for the existing bridge.<br>Mining operations permitted until 12 June 2025.<br>Operations 24 hours a day, 7 days a week. |
| DA 450-10-2003 Modification 1 | 16 August 2005 | Upgrade of HVLP to increase the loading rate from 4,000 tonnes per hour (tph) to an average rate of approximately 5,100 tph with a peak load of up to 7,200 tph. |
| DA 450-10-2003 Modification 2 | 25 June 2006 | Extension of open cut mining to the south and east of Carrington Pit to access approximately 19 Mt of ROM coal.<br>Construction of up to three levees and potential construction of groundwater barrier walls. Diversion of an existing drainage channel.<br>Construction of a service corridor and modification of the development consent boundary. |
| DA 450-10-2003 Modification 3 | 19 March 2013 | Extension of the Carrington Pit to the west (in an area known as the Carrington West Wing) to allow an additional 17 Mt of ROM coal to be extracted over a period of six years.<br>Development of an out-of-pit overburden emplacement area to the north of the extension area.<br>Construction of flood levees, a groundwater barrier wall, a temporary watercourse diversion and a service corridor to the south of the extension area.<br>Rehabilitation of the site.<br>Modification of the development consent boundary to include the extension area.<br>Realignment and increase in the size of the approved Carrington Pit final void to 100 ha. |
| DA 450-10-2003 Modification 4 | 16 January 2014 | Installation of overland pipelines to transport fine reject slurry.<br>Construction and operation of a new fine reject emplacement area.<br>Modification to the development consent boundary to encompass Cumnock Void 3, located to the north-east of West Pit. |
| DA 450-10-2003 Modification 5 | 9 December 2016 | Upgrade of a sediment dam and relocation of a powerline corridor at the HVLP.<br>Approval for communication towers to be constructed anywhere within the HVO North Mining complex. |
| DA 450-10-2003 Modification 6 | 25 January 2017 | Emplacement of fine rejects in Carrington Pit. |
| DA 450-10-2003 Modification 7 | 28 July 2017 | Administrative modification to include mining lease application areas within the development consent boundary. |

## Table 3.1 HVO planning approval history

| Approval number | Issue date | Summary of approved activity |
|---|---|---|
| 884/2004 | 2 February 2005<br>(Singleton Council) | Construction and use of an access road to the former Energy Australia (now Ausgrid) substation. |
| **HVO South** | | |
| PA 06_0261 | 24 March 2009 | Consolidation of 25 separate consents and 10 associated modifications that applied to HVO South.<br>Continuation of all aspects of HVO South as it operated at the time under historical approvals.<br>Extraction of up to 16 Mtpa of ROM coal, using opencut and highwall/auger mining methods.<br>Transportation of coal by truck to the LCPP or any existing CPP at HVO North, and continuation of the approval to construct a coal conveyor to HVO North.<br>Processing capacity of 16 Mtpa at LCPP.<br>Transport of ROM coal from all HVO South pits for processing at any HVO CPP.<br>Emplacement of coal reject within HVO North and HVO South overburden emplacements, and storage of tailings in existing and additional facilities at HVO South.<br>Construction of either of two options for the rail line, rail loop and coal loading facilities (adjacent to the CPP or South Lemington Pit 1).<br>Transportation of overburden and product coal between HVO South and HVO North in either direction.<br>Mining operations permitted until 24 March 2030.<br>Operations 24 hours a day, 7 days a week. |
| Modification 1 | 17 December 2009 | Amendment of the HVO South Project Approval boundary to incorporate Lake James and associated infrastructure.<br>Increased storage capacity (730 ML) and maximum discharge rate (200 ML/day) of Lake James, which forms part of HVO's water management system. |
| Modification 2 | 3 February 2012 | Reallocation of 140 ha of remnant woodland vegetation and native enhancement areas with the Archerfield Biodiversity Enhancement Area to an alternative site within the Goulburn River Biodiversity Area (part of the offset package for the Warkworth Continuation Project, previously known as the Warkworth Extension Project). |
| Modification 3 | 31 October 2012 | Inclusion of reference to (and biodiversity conservation measures for) the Goulburn River biodiversity offset area, and to amend the Statement of Commitments to remove the suggestion that HVO South has ongoing obligations in relation to the Archerfield Biodiversity Enhancement Area. |
| Modification 4 | 31 October 2012 | Clarification that HVO would not undertake mining-related activities in the biodiversity offset areas established for the Warkworth Extension Project that lie within the area subject to the HVO South Project approval.<br>Relinquishment of a yet to be constructed western heavy equipment access route, with respect to Warkworth Mine's former Habitat Management Area. |
| Modification 5 | 28 February 2018 | The progression of mining from the Cheshunt Pit into Riverview Pit to mine to the base of the deeper Bayswater seam and in South Lemington Pit 2 to mine to the base of the Vaux seam below the Bowfield seam; amendment to the overburden emplacement strategy, an increased rate of extraction to 20 Mtpa of ROM coal and an update to the Statement of Commitments within the Project Approval to remove inconsistencies with approved management plans. |
| Modification 6 | 26 November 2021 | Construction and operation of a modular ammonium nitrate emulsion manufacturing plant within the existing approved HVO South mine disturbance area. |

**Table 3.1 HVO planning approval history**

| Approval number | Issue date | Summary of approved activity |
|---|---|---|
| Modification 7 | 27 May 2022 | Augmenting the existing approved water management infrastructure to enable the transfer and storage of water into the existing Lemington Underground Mine void for later extraction and reuse at MTW and HVO.<br>Construction of bores and associated infrastructure (eg pumps and power supply) at three transfer sites and adjacent to the existing Lemington underground (LUG) bore, and the use of these bores to transfer water from HVO into and out of the former Lemington Underground Mine void, and development of supporting infrastructure (including pipelines and powerlines). |
| Modification 8 | Pending | The modification is seeking to allow increased storage capacity for raw materials used in the manufacturing of ammonium nitrate emulsion. |

### 3.1.2 Environment protection licence

HVO operates under one EPL, EPL 640, which applies across the HVO Complex and is detailed in Table 3.2.

**Table 3.2 HVO licensed activities**

| Licence number | Dated | Licensee detail | Scheduled activity and scale |
|---|---|---|---|
| EPL 640 | 4 March 2022 | Licensee: HV Operations Pty Ltd<br>Premises: Hunter Valley Operations | Coal works >5 Mtpa handling capacity.<br>Crushing, grinding or separating >2 Mtpa processing capacity.<br>Dangerous goods production >25 ktpa production capacity.<br>Extractive activities 50–100 ktpa extracted or processed.<br>Mining for coal >5 Mtpa production capacity. |

### 3.1.3 Mining tenements

There are 53 tenements held across the HVO Complex including 1 sublease area (shown in Figure 3.1). Appendix E provides a list of tenements, their purpose, depth and restrictions, as well as where there are gaps in the tenements and therefore areas where new mining leases (MLs) are required for the Project. As discussed in Chapter 5, Site Verification Certificates (SVC-12575722 and SVC-41389276) have been issued over the areas in which new MLs are required for the Project.

### 3.1.4 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

There is one existing EPBC Act approval at HVO. In 2016, a referral (EPBC 2016/7640) was submitted to allow for the continuation of coal mining operations in areas within the HVO Complex that were previously approved under the NSW EP&A Act after the commencement of the EPBC Act. This referral covered discrete areas across both HVO North and HVO South and related to the presence of the critically endangered ecological community (CEEC) Central Hunter Valley Eucalypt Forest Woodland, which was listed as a CEEC by the Federal Government in 2015. The action was declared a controlled action and was approved by the Minister on 10 October 2016.

A second referral (EPBC 2016/7641) was also submitted relating to the extension of open cut coal mining operations at HVO South and the proposed deeper mining in the Bayswater Seam within the Riverview Pit area. This action was considered not likely to significantly impact on a water resource and was determined as not a controlled action by the Minister on 20 March 2018.

In addition to these referrals, large portions of HVO (North and South) benefit from 'grandfathering' provisions under Section 43A of the EPBC Act. These rights are afforded to HVO because of approvals and licences issued under the EP&A Act and the POEO Act, respectively, that were in place as at the commencement of the EPBC Act in July 2000 and the commencement of the 'water trigger' under the EPBC Act in 2013.

## 3.2 HVO Complex operations

### 3.2.1 Overview

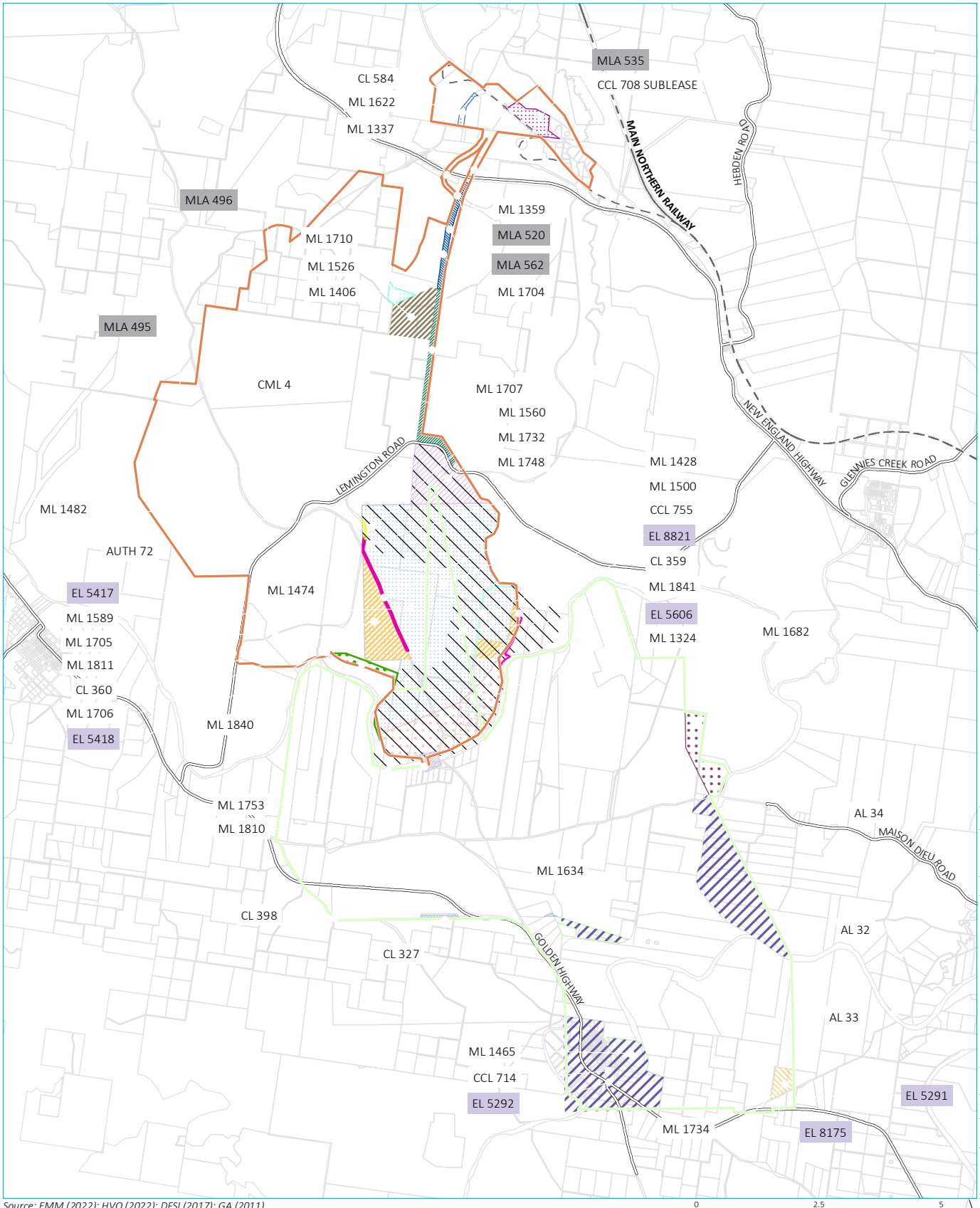
Mining at HVO involves the following general sequence:

- vegetation stripping and topsoil removal;
- open cut mining to remove the overburden and interburden and coal;
- emplacement of overburden and interburden;
- coal processing and transportation of coal to the train load out facilities; and
- overburden shaping and rehabilitation.

The general mining sequence at HVO is illustrated in Figure 3.2. Land preparation ahead of mining involves the construction of appropriate erosion and sediment control structures, clearing of vegetation, and the stripping and direct placing on rehabilitation of topsoil or stockpiling of topsoil for rehabilitation of the site. Mining is currently carried out by dragline, shovels and excavators, supported by loaders, dozers, graders, drill rigs, water trucks, other ancillary equipment and a fleet of haul trucks. Overburden and interburden is either free dug or drilled and blasted and removed using a dragline or a combination of shovel/excavator/front end loaders/dozers and placed in trucks for haulage to out of pit emplacements or to backfill areas in the pit.

Mining is currently undertaken in four main areas:

- HVO North:
  - West Pit – progressing in an easterly direction towards Lemington Road; and
  - Mitchell Pit – progressing in a southerly and easterly direction, also towards Lemington Road.
- HVO South:
  - Cheshunt Pit – progressing in a westerly and southerly direction; and
  - Riverview Pit – progressing south towards the Golden Highway.




*Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011)*

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## KEY

- Existing HVO North development consent boundary (DA 450-10-2003)
- Existing HVO South project approval boundary (PA 06_0261)

Existing environment

- Rail line
- Major road
- Cadastral boundary

Mining authority

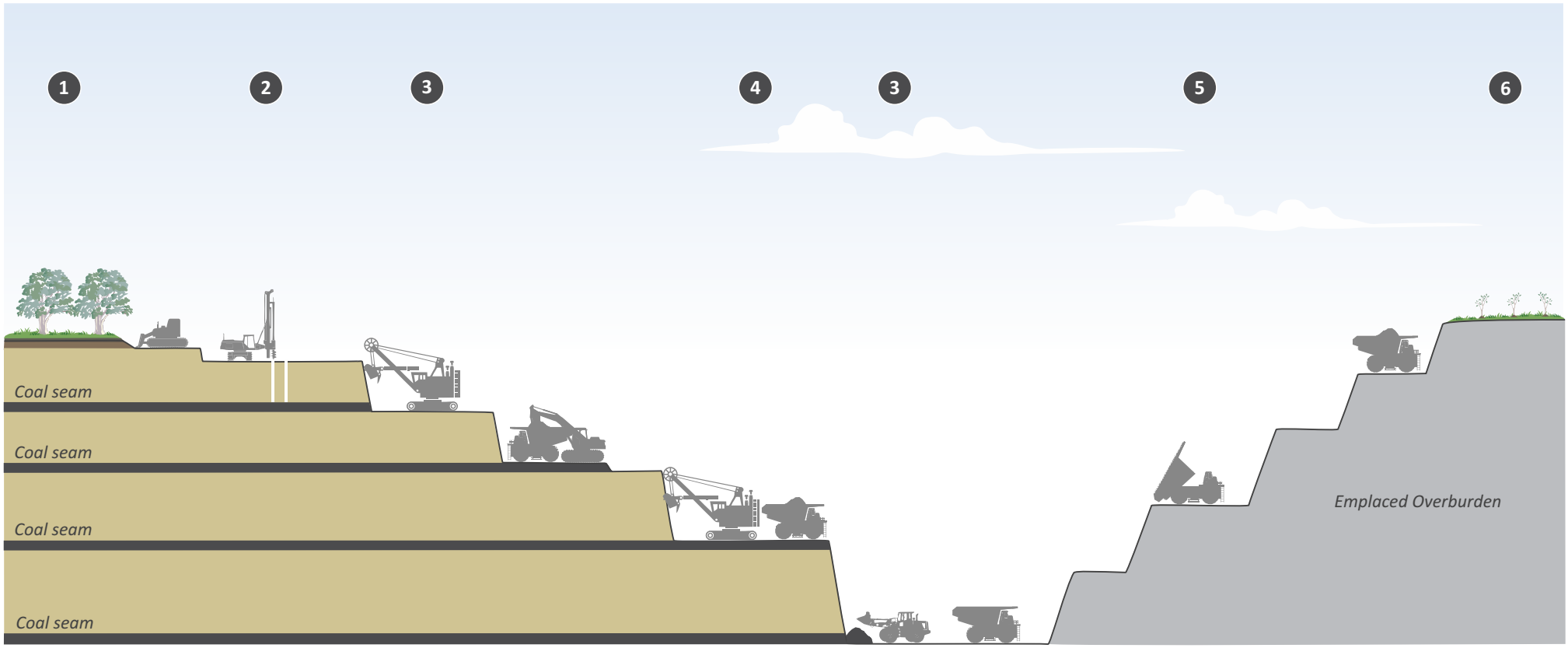
- AL 32
- AL 33
- AL 34

- Auth 72
- CCL 708 Sublease
- CCL 714
- CCL 755
- CL 327
- CL 359
- CL 360
- CL 398
- CL 584
- CML 4
- EL 5291
- EL 5292
- EL 5417
- EL 5418
- EL 5606
- EL 8175
- EL 8821
- ML 1324
- ML 1337
- ML 1359
- ML 1406
- ML 1428
- ML 1465
- ML 1474
- ML 1482
- ML 1500
- ML 1526
- ML 1560
- ML 1589
- ML 1622
- ML 1634
- ML 1682
- ML 1704
- ML 1705
- ML 1706
- ML 1707
- ML 1710
- ML 1732
- ML 1734
- ML 1748
- ML 1753
- ML 1810
- ML 1811
- ML 1840
- ML 1841
- MLA 495
- MLA 496
- MLA 520
- MLA 535
- MLA 562

# HVO JV mining authorities

HVO Continuation Project
Environmental Impact Statement
Figure 3.1

[redacted]




1. Vegetation clearing and topsoil removal and salvage.
2. Overburden drilling and blasting, including highwall pre-split and throw blasting.
3. Coal extracted with truck and loader or excavator. It is generally free-dug or ripped with dozers but sometimes drilled and blasted.
4. Overburden removal using shovel or excavator and trucks and dragline.
5. Overburden placed into completed mine areas by trucks.
6. Shaping, topsoiling and revegation.

**NOT TO SCALE**
*This diagram is a conceptual representation only*

EMM
creating opportunities

Conceptual mining method
HVO Continuation Project
Environmental Impact Statement
Figure 3.2

### i HVO North summary

The existing HVO North development consent boundary, shown in Figure 3.3, comprises the approved mining areas of West Pit, Mitchell Pit and Carrington Pit. In addition, the HVO North development consent boundary contains associated mining infrastructure, notably access tracks, administration buildings, water storage infrastructure, pipelines, workshops, transmission lines, CPPs and associated coal handling infrastructure, including conveyors, load points, stacker and rail loop. The existing and approved disturbance area at HVO North, being the area in which operations are currently approved to be undertaken within the development consent boundary, is shown in Figure 3.3.

HVO North can extract up to 22 Mtpa of ROM coal until 12 June 2025, comprised of the following:

- 12 Mtpa from West Pit/Mitchell Pit; and
- 10 Mtpa from Carrington Pit.

Mining currently occurs down to the base of the Barrett seam in the West Pit and Mitchell Pit. Mining in the Carrington area previously occurred down to the Bayswater seam. Mining in this area ceased in 2018 to prepare for the commencement of in-pit tailings emplacement, as approved by Mod 6, which started in the Carrington Pit in 2019. HVO also has approval to extract approximately 17 Mt of ROM coal in the Carrington West Wing area, as approved by Mod 3. Coal extraction in this area has not yet commenced. The North Pit mining area located south of the Carrington Pit was previously operated as an open-cut truck and shovel operation, which commenced in 1979. Coal extraction has ceased in the North Pit, which is now a TSF and is in the process of decommissioning.

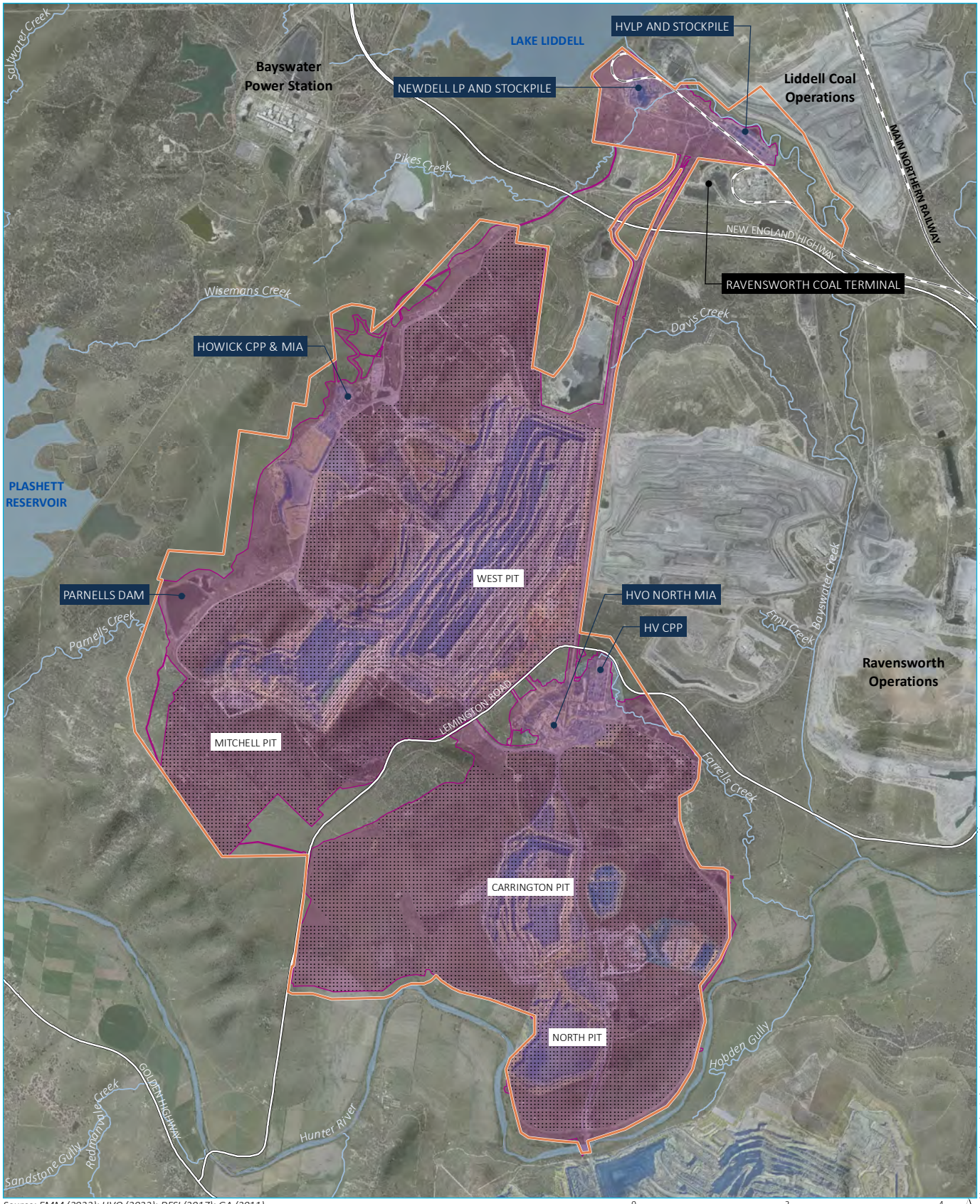
The primary mining method at HVO North is truck and shovel, although the use of a dragline is also approved. Blasting is allowed 7.00 am to 6.00 pm Monday to Saturday inclusive (except public holidays) up to a maximum of 3 blasts per day and 12 blasts per week.

### ii HVO South summary

The existing HVO South open cut mining operation comprises the approved mining areas of Cheshunt Pit, Riverview Pit, South Lemington Pit 1, South Lemington Pit 2, and the Riverview South East Extension (also referred to as the Glider Pit). HVO South can extract up to 20 Mtpa of ROM coal until 24 March 2030. The existing HVO South development consent boundary is illustrated in Figure 3.4. In addition to the noted mining areas, the HVO South development consent boundary contains associated mining infrastructure, notably access tracks, water storage infrastructure, pipelines, administration buildings, workshops and transmission lines. The existing and approved disturbance area of HVO South, being the area in which activities are currently approved to be undertaken within the development consent boundary, is shown in Figure 3.4.

Mining currently occurs in the Riverview Pit and Cheshunt Pit down to the base of the Bayswater Seam. The main sections of Cheshunt Pit have progressed to the south-west towards Riverview Pit. Strips within Cheshunt Pit have already reached the approved Bayswater seam, with other parts yet to reach this seam as per the currently approved mine plan.

Coal extraction is also approved to the base of the Bowfield and Vaux seams in South Lemington Pit 1 and Pit 2, respectively. Limited mining activities have previously been undertaken in the South Lemington Pit 1 (ceasing in 2001) and the Riverview South East Extension area (also referred to as the Glider Pit); however the South Lemington Pit 2 area remains undisturbed by mining. The previously mined void in South Lemington Pit 1 is currently used for temporary storage of mine water from HVO and the nearby MTW operation.




*Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011)*

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KEY

- Existing HVO North development consent boundary (DA 450-10-2003)
- Existing and approved disturbance area
- Approved mining area

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

HVO North existing consent boundary and existing and approved disturbance area

HVO Continuation Project
Environmental Impact Statement
Figure 3.3

EMM creating opportunities

Mining is primarily undertaken at HVO South by dragline, truck and shovel; however, highwall mining, including continuous highwall mining and auger mining, is also approved in the Riverview Pit, Cheshunt Pit, and South Lemington Pit 2 as shown in Figure 3.4. Highwall and auger mining activities are approved within the Bowfield, Broonie and Bayswater Seams. It is noted that highwall and auger mining was previously approved within the South Lemington Pit 1 area however, this approval was relinquished under Modification 4.

Blasting at HVO South is allowed 7.00 am to 6.00 pm Monday to Saturday inclusive (except public holidays) to a maximum of 3 blasts per day and 15 blasts per week.

### 3.2.2 Coal handling and processing

Coal extracted across the HVO Complex is transported via internal haul roads to one of two CPPs; the HVCPP or the Howick CPP, where it is crushed to size and either processed to remove impurities or bypassed where coal quality is appropriate. Processing produces saleable coal, along with coarse and fine reject materials. Coarse rejects are disposed of in pit, and fine rejects are placed in a TSF. Each CPP site has storage facilities for raw (unprocessed/ROM) coal and processed (saleable/product) coal.

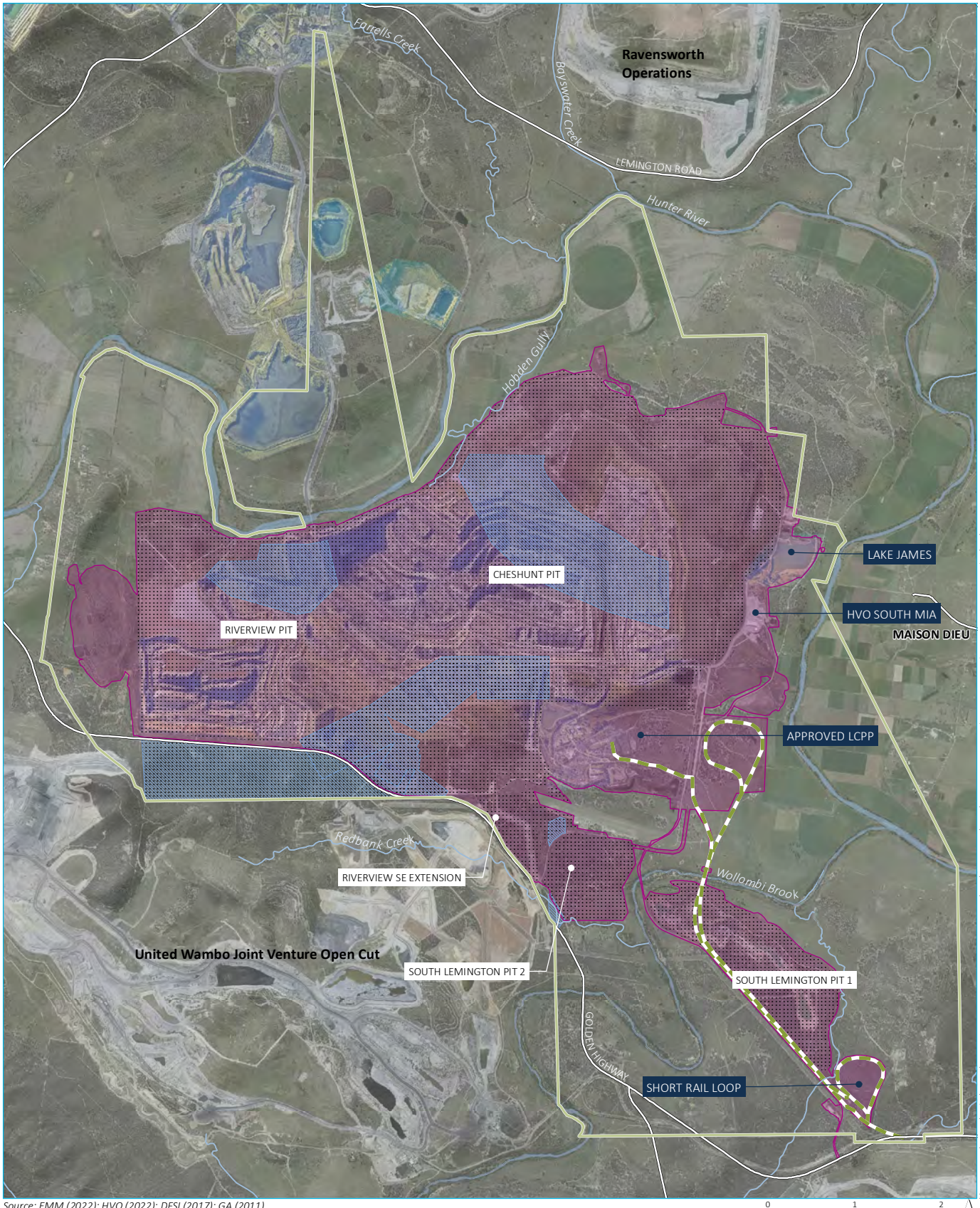
The HVCPP may process up to a total of 20 Mtpa of ROM coal from the HVO Complex, of which only 16 Mtpa may be received from HVO South. The Howick CPP may process up to 6 Mtpa of ROM coal. Both HVCPP and Howick CPP utilise available processing technologies to process ROM coal.

The HVO South approval authorises the use of the HVCPP and Howick CPP, and the HVLP and Newdell LP for coal extracted from HVO South. Two CPP's were constructed in the Lemington area as part of the initial development of the Lemington mine in 1971. Lemington No 1 CPP was closed and decommissioned in 1987 and demolished by 1998; however, Lemington No 2 CPP operated until 2003, when it was placed under care and maintenance and demolished in 2011.

HVO South has approval to construct and operate the LCPP and to construct a rail loop off the Wambo rail spur, as shown in Figure 3.4. The construction of this infrastructure has not been required to date.

Construction of the LCPP, and the trucking of ROM coal from the Riverview and Cheshunt Pits for processing there, was approved in an earlier development application for HVO South (PA 06_0261) and remains approved under the current consolidated project approval.

A coal flow diagram for the HVO Complex is provided in Figure 3.5.




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*Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011)*

0 1 2 km

GDA2020 MGA Zone 56

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KEY

- Existing HVO South project approval boundary (PA 06_0261)
- Existing and approved disturbance area
- Approved highwall mining area
- Approved mining area
- South Lemington Rail Loop and haul route (approved, not yet constructed)

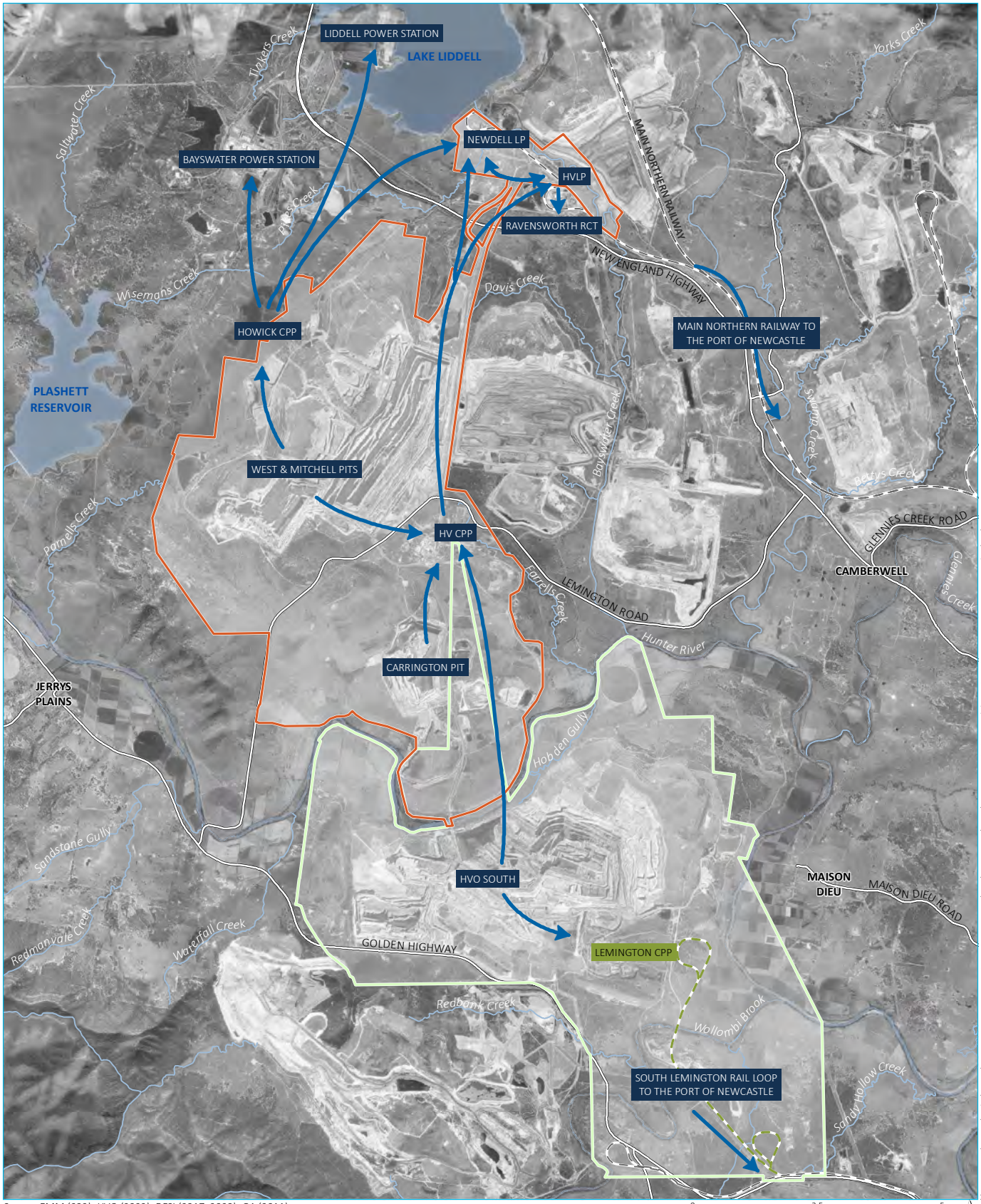
Existing environment

- Major road
- Named watercourse
- Named waterbody

HVO South existing consent boundary and existing and approved disturbance area

HVO Continuation Project
Environmental Impact Statement
Figure 3.4

EMM creating opportunities




Source: EMM (202); HVO (2022); DFSI (2017, 2020); GA (2011)

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## KEY

- Existing HVO North development consent boundary (DA 450-10-2003)
- Existing HVO South project approval boundary (PA 06_0261)
- Coal flow direction
- South Lemington Rail Loop (approved, not yet constructed)

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

# HVO Complex existing coal flow diagram

HVO Continuation Project
Environmental Impact Statement
Figure 3.5

EMM creating opportunities

### 3.2.3 Product transport

Product coal is transported to one of the three loading points on the northern side of the New England Highway (refer to Figure 3.5). Coal from the HVCPP is predominantly transported to the HVLP or Newdell LP by overland conveyor or via truck to the Ravensworth Coal Terminal (RCT), whereas product coal from the Howick CPP is trucked to the Newdell LP. In the event of an emergency or issue with the overland conveyor, coal can be transported via truck between noted CPPs, LPs and the RCT. After the coal has reached either the HVLP, RCT or the Newdell LP, it is transported to the Port of Newcastle by rail.

Product coal may also be transported directly from the Howick CPP via conveyor to the AGL Bayswater and Liddell power stations.

### 3.2.4 Waste rock management

#### i Overburden

Overburden is approved to be disposed of within all pits and out-of-pit emplacement areas across the HVO Complex. The overburden or interburden is either free dug or drilled and blasted, before being removed using a combination of dragline, shovel, excavator, front end loaders and dozers and placed in trucks for haulage to out of pit emplacement or refill areas in the pit. As part of the integrated operation between HVO North and HVO South, mining waste can be transported to any pit across the complex for emplacement to achieve the approved final landform. All mining waste emplacements are reshaped as required to construct the final landform.

#### ii Coarse rejects

Coarse rejects from both CPPs are disposed of in pit across the complex. The coarse reject material is transported by truck and buried below the final surface level in overburden emplacements as part of the final landform design. This material has similar properties to overburden in contact with coal seams and is generally saline and alkaline.

#### iii Fine rejects

Fine rejects (tailings) have been emplaced in various approved TSFs across the complex. Currently, tailings are emplaced within approved TSFs in Carrington Pit as well as Cumnock Void 3 under agreement with Ravensworth Operations to utilise the void capacity. Tailings from the Howick CPP are currently pumped via a pipeline to Cumnock Void 3, while tailings from the HVCPP are pumped via a pipeline to the Carrington Pit TSF. Figure 3.6 shows the TSFs across the complex.

Intermittent deposition of tailings occurs in Dam 6W TSF and Central TSF as part of ongoing management towards decommissioning. The South East TSF is currently in the capping phase. Prior to TSFs reaching capacity a detailed closure plan is developed for the individual facility to determine effective closure requirements including capping depth.

### 3.2.5 Water management

The HVO Complex currently operates under an integrated water management system across HVO North and South, in accordance with the HVO Water Management Plan. The integrated mine water management system also facilitates approved water transfers with other mining operations (MTW (via the South Lemington Pit 1 Void), Wambo, LCO (via LPs), and Ravensworth Operations (via the Cumnock Void 3 tailings decant return)). Water to support operations is also sourced from the Hunter River under relevant Water Access Licences (WALs).

Water is managed according to type whether it be mine water, sediment water or clean water. The objectives of the water management system are to minimise raw water usage (including minimising extraction from the Hunter River), impacts to the environment and neighbours, and to provide adequate water to facilitate the processing of coal and dust suppression to ensure interference to mining production is minimised.

Key water management components at the HVO Complex include water storages, licensed discharge points (LDPs), Hunter River pumping stations, groundwater bores for extraction, flood protection levees, clean water diversions, and low permeability barrier walls (LPBW), which have been constructed in the eastern arm of the paleochannel and in the Alluvial Lands. Construction of another LPBW is also approved in the Carrington West Wing area in the western arm of the paleochannel; however, this barrier wall has not been constructed due to the Carrington West Wing pit not being mined to date. The diversion of the Unnamed Tributary to the west of Carrington West Wing is also approved; however, similarly to the LPBW, this has not yet been diverted due to mining operations not commencing in the Carrington West Wing.

Key existing water management components are identified in Figure 3.6. Further discussion on the proposed water management infrastructure for the Project is provided in Chapter 4.

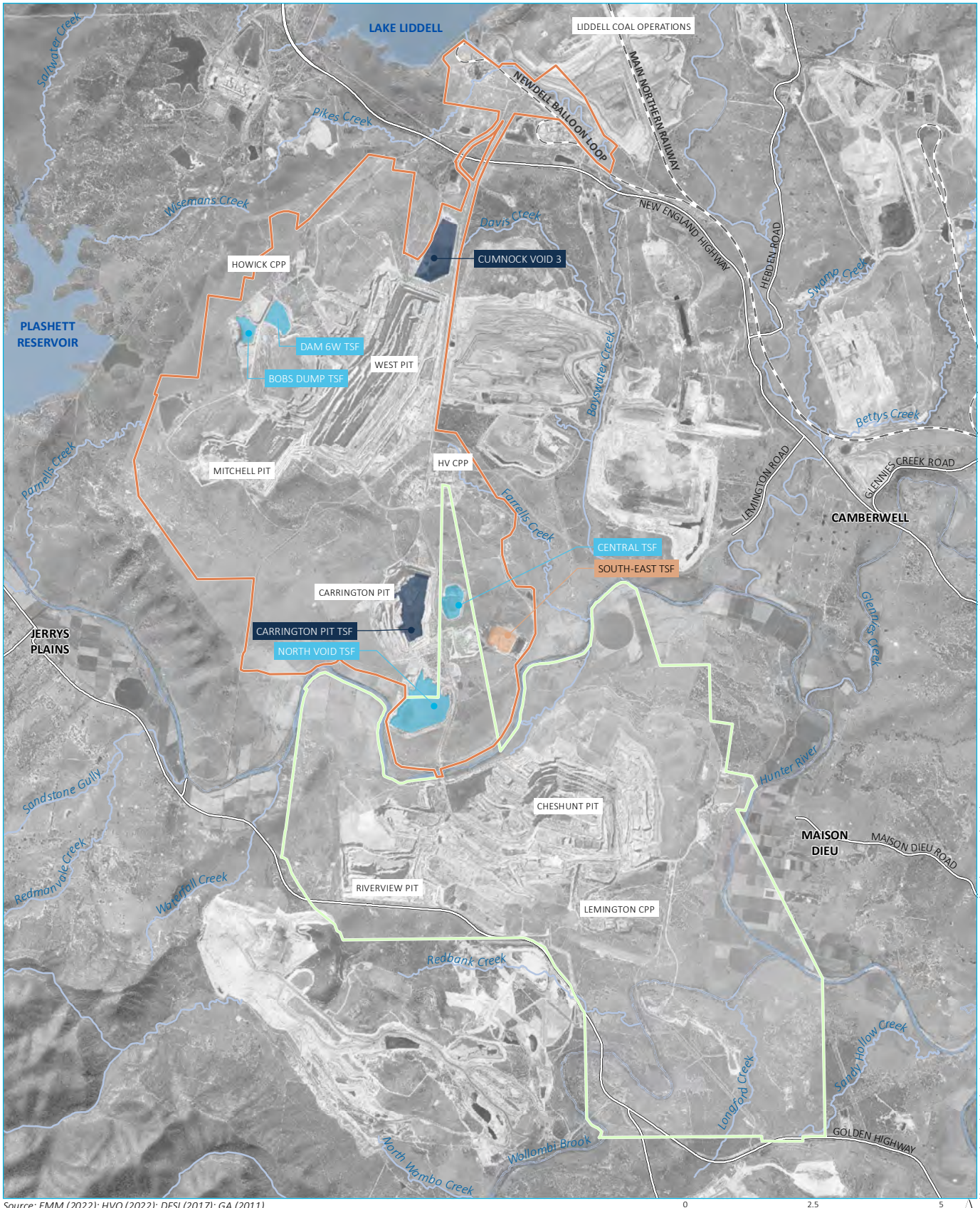
Water from the HVO Complex is discharged in accordance with Hunter River Salinity Trading Scheme (HRSTS) via four licensed discharge points as shown in Figure 3.7. Excess mine water can be released into the Hunter River via LDPs at mine constructed dams, being Dam 9W (Parnells Dam) and Dam 11N at HVO North, and Dam 15S (Lake James) at HVO South, as well as at the alluvial lands discharge point at HVO North. Discharges are only allowed during high and flood flow periods in the Hunter River as determined by Water NSW and DPE Water, and in accordance with EPL640.

### 3.2.6 Other infrastructure

Other infrastructure necessary to support the mining operation at the HVO Complex includes, but is not limited to, workshops, vehicle washing facilities, bulk oil and fuel storages, explosive magazines, ammonium nitrate storage and ammonium nitrate emulsion manufacturing, explosives storage, water and tailings management infrastructure, storage hoppers and crushers, coal stockpiles, erection pads, bathhouse, general stores, administration offices, and other minor facilities and incidental activities.

### 3.2.7 Workforce and operating hours

The HVO Complex has approximately 1,500 FTE workers and is a continuous operation, with approval to operate 24 hours per day, seven days per week.




*Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011)*

0 2.5 5 km

GDA2020 MGA Zone 56

N

## KEY

- Existing HVO North development consent boundary (DA 450-10-2003)
- Existing HVO South project approval boundary (PA 06_0261)
- Intermittent tailings deposition as part of decommissionings
- Active tailings storage facility
- Inactive tailings storage facility (capping in progress)

Existing environment

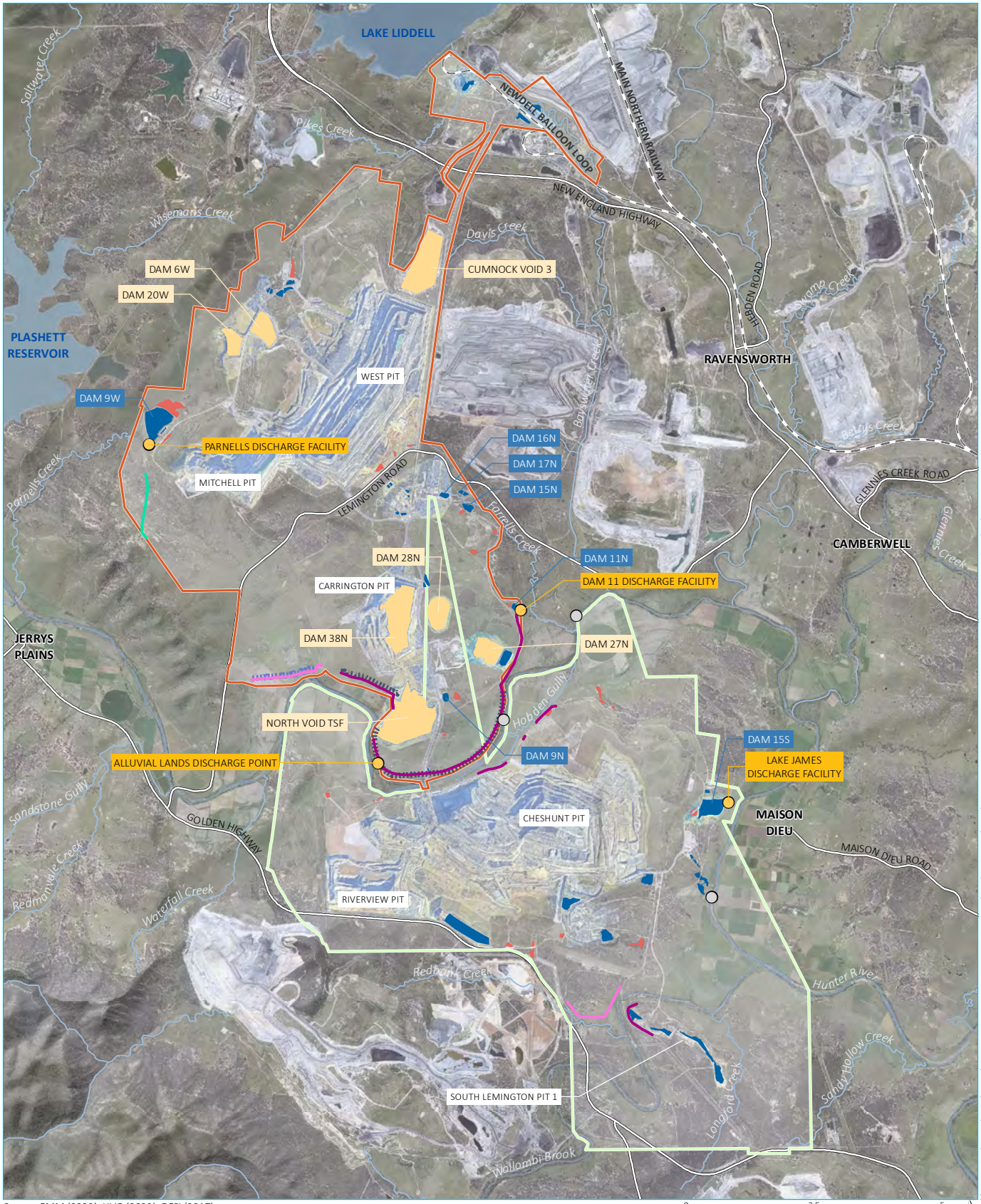
- Rail line
- Major road
- Named watercourse
- Named waterbody

# Existing tailings storage facilities

HVO Continuation Project
Environmental Impact Statement
Figure 3.6

EMM creating opportunities

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Source: EMM (2022); HVO (2022); DFSI (2017)

0 2.5 5 km

GDA2020 MGA Zone 56

N

\\emmsvr1\emm\Jobs\2019\H190408 - HVO Continuation Project\GIS\02_Maps_EIS\EIS020_ExistingWaterManagement_20221128_13.mxd 28/11/2022

## KEY

- Existing HVO North development consent boundary (DA 450-10-2003)
- Existing HVO South project approval boundary (PA 06_0261)
- Approved, not yet constructed clean water diversion
- Levee
- Approved, not yet constructed levee
- Low permeability barrier wall
- Approved, not yet constructed barrier wall
- Hunter River pump station
- HRSTS discharge facility
- Sediment dam
- Mine water storage
- Tailings dam

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

# Existing and approved key water management components

HVO Continuation Project
Environmental Impact Statement
Figure 3.7

EMM creating opportunities

### 3.2.8 Rehabilitation and final void

Disturbed areas are progressively rehabilitated across the HVO Complex, with the establishment of a mixture of woodland, grassland and grazing areas as approved in the post mining landform (refer to Figure 3.8). In accordance with existing approval requirements and the current Rehabilitation Management Plan (RMP), approximately 70% of post mining rehabilitated areas at HVO North are proposed to meet a final land use of grazing, in which native or introduced pasture species will be relied upon to support future economic activities including agricultural enterprises. Native and introduced pasture species will provide some biodiversity values for native fauna species that are able to persist in grazed areas. The remaining approximate 30% will be rehabilitated to woodland communities. This includes overstorey strata to provide habitat and encourage native fauna populations and threatened species that are known to occur, or traverse, in and around HVO. Specifically within the Carrington West Wing area, as approved under Modification 3, 65 ha of Class II rural land capability land and 65 ha of Class III land is to be reinstated, with the Carrington West Wing void to be backfilled and returned to native pasture. In addition, Central Hunter Grey Box Ironbark Woodland is to be established across 4 ha in the Carrington West Wing final landform. Further, an area of at least 0.14 ha of riparian vegetation adjacent to Bayswater Creek must be revegetated to represent the Swamp Oak Floodplain Forest community.

In relation to water management infrastructure, the approved final landform at HVO North includes the reinstatement of the Unnamed Tributary to its original position in the Carrington West Wing area following its diversion to allow mining there (noting this tributary has not yet been diverted). Whilst flood protection levees are removed or incorporated into the final landform, excluding the Alluvial Lands Levee which is approved to remain post mining.

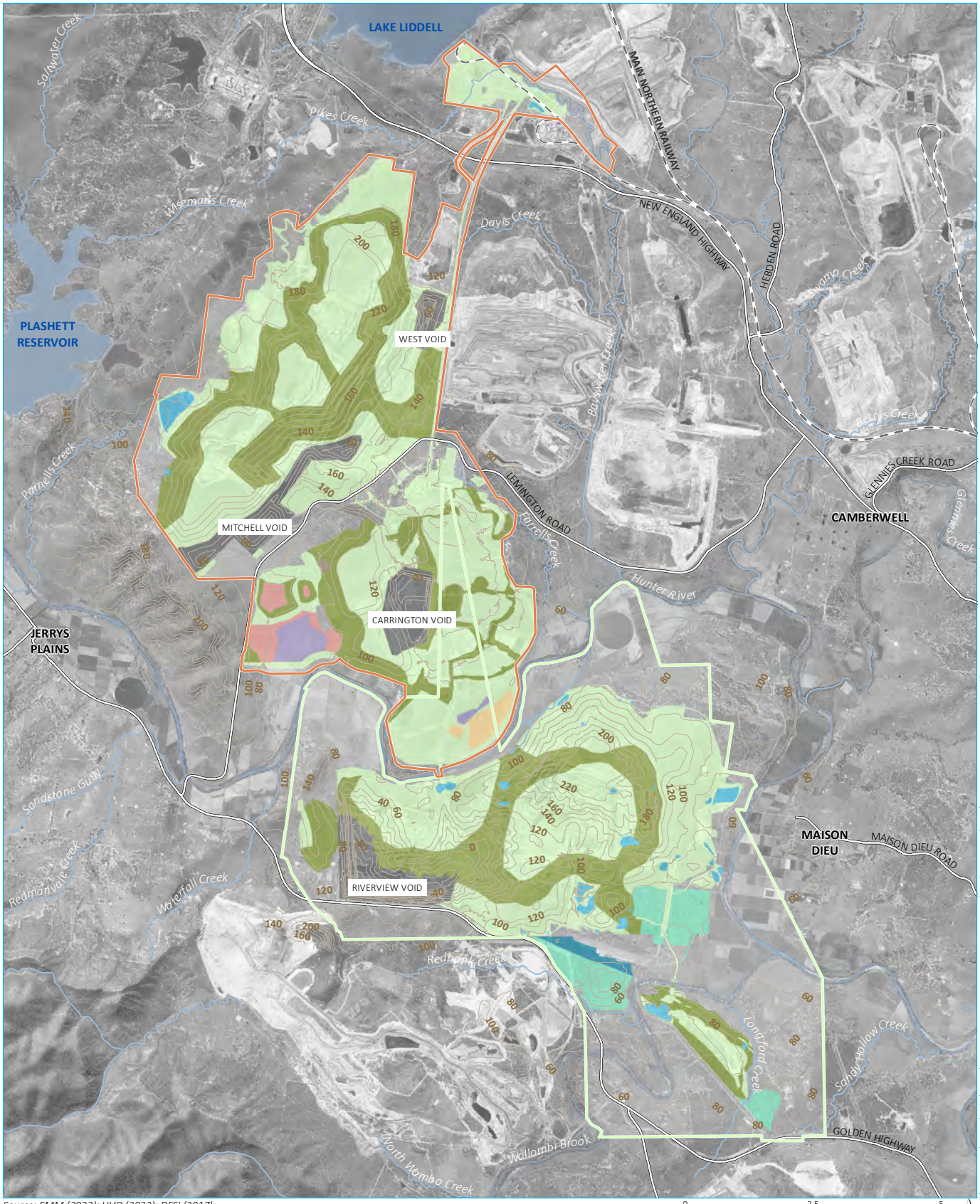
At HVO South, 60%–70% of rehabilitation is proposed to achieve a final land use of grazing, with native or introduced pasture. The remaining 30%–40% will be rehabilitated to a woodland community. One final void is approved to remain in the Riverview Pit with an equilibrium water level of approximately 30 mAHD, estimated to be reached after 300 years. The current approved final landform includes backfilling the other approved mining areas with overburden, ie South Lemington Pit 1, South Lemington Pit 2 and the Riverview South East Extension Area, so that only one void remains. South Lemington Pit 1 and South Lemington Pit 2 are to be rehabilitated to final land use outcomes of grazing or woodland. It is also noted that an area of South Lemington Pit 2 is identified as a wildlife corridor (see Figure 3.8), which is representative of a woodland domain; however, is consistent with terminology under PA 06_0261 as South Lemington Pit 2 is not identified within the RMP.

The Riverview South East Extension Area as approved does not have a designated final land use nor is it identified within the RMP. The mining area is also not all owned by HVO and is within the United Wambo approved Project area (SSD-7142). As such, the approved final land use identified under SSD-7142 for the Riverview South East Extension Area has been relied upon to inform Figure 3.8.

Four voids are currently approved to remain across the entire complex; three at HVO North and one at HVO South as follows:

- HVO North:
  - Carrington Pit (evaporative sink);
  - West Pit; and
  - Mitchell Pit.
- HVO South:
  - Riverview Pit.

Chapter 21 provides further discussion on the existing final landform and the interactions with that proposed by the Project.




*Source: EMM (2022); HVO (2022); DFSI (2017)*

0 2.5 5 km

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N

## KEY

- Existing HVO North development consent boundary (DA 450-10-2003)
- Existing HVO South project approval boundary (PA 06_0261)
- Approved 20 m contour

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

Final land use domain

- Native Ecosystem | Native Woodland
- Native Ecosystem | Central Hunter Grey Box Ironbark Woodland
- Native Ecosystem | Swamp Oak Floodplain Forest
- Agricultural - Grazing | Pasture
- Agricultural - Grazing | Class 1 Agricultural Land
- Agricultural - Grazing | Class 2 Agricultural Land
- Agricultural - Grazing | Class 3 Agricultural Land
- Water Management Areas
- Final Void

Approved mining areas not contained in RMP PA 06_0261

- Grassland
- Wildlife corridor

# Approved conceptual final rehabilitation and post mining land use plan

HVO Continuation Project
Environmental Impact Statement
Figure 3.8

EMM creating opportunities

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## 3.3 Environmental management

The HVO Complex is managed under an Environmental Management System (EMS) to facilitate compliance with environmental standards and legislative requirements. The HVO EMS has been developed generally in accordance with ISO 14001. The EMS forms a framework for managing all environmental and community aspects, impacts and performance of the mining operations.

The objectives of the EMS are to:

- Provide an overarching framework for the environmental management and monitoring of activities undertaken at HVO North and HVO South, which incorporates the principles of continuous improvement.
- Maintain compliance with:
  - HVO South Project Approval 06-0261;
  - HVO North Development Consent 450-10-2003; and
  - other approvals (eg EPL 640, MLs, water licences and management plans).

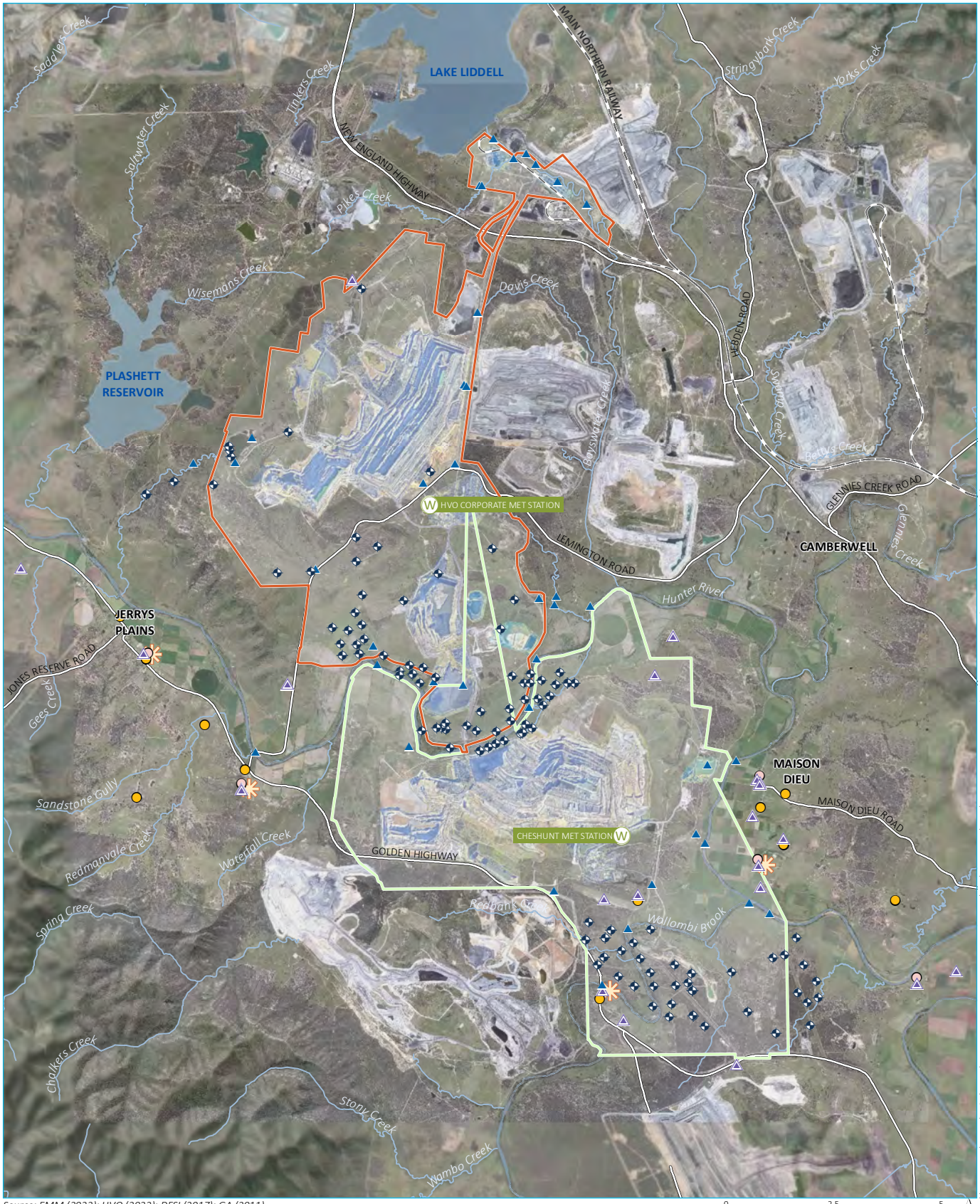
The EMS sets out the procedures for periodic review and, where necessary, revision of the document so that it is maintained to reflect current mining operations to the satisfaction of the Secretary of DPE.

The EMS relies upon an environmental policy, risk register, objectives and targets, a series of management plans, a monitoring program and environmental standards and procedures. The effectiveness of the system has been demonstrated through audits, which have resulted in environmental improvement across the complex. The EMS is subject to an independent compliance audit every three years, undertaken by a suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Secretary. The audits assess the environmental performance of the operation and determine the complex's compliance with the requirements of the project approval, development consent, EPL, mining leases and any other relevant approvals.

As per existing policies and procedures, an extensive air quality, noise, vibration and surface and groundwater monitoring network supports environmental management at HVO, as shown in Figure 3.9, which is current as of October 2022. Two real-time meteorological stations have been installed and are referred to as the HVO Corporate and the Cheshunt meteorological stations.

An annual review is produced each calendar year in accordance with the existing project approval and development consent conditions. The annual review documents the operations environmental performance with respect to the relevant monitoring requirements and is made available to the community via the HVO website.

HVO has an established Community Consultive Committee (CCC) comprised of community representatives. The CCC meet and are engaged to discuss HVO's mining operations and environmental performance. Community and stakeholder engagement completed as part of this EIS is outlined in Chapter 6 and as part of the social impact assessment in Chapter 23.




Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011)

0 2.5 5 km

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KEY

- Existing HVO North development consent boundary (DA 450-10-2003)
- Existing HVO South project approval boundary (PA 06_0261)

- Air quality monitoring location
- Weather monitoring location
- Surface water monitoring location
- Groundwater monitoring location
- Noise monitoring location - real time
- Noise monitoring location - attended
- Blast monitoring location

NOTE: Overlapping symbols have a slight offset applied

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

# HVO Complex - environmental monitoring network

HVO Continuation Project
Environmental Impact Statement
Figure 3.9

EMM creating opportunities

# 4 Project description

## 4.1 Introduction

The Project proposes to extend the life of HVO primarily through the extraction of coal from deeper seams within existing tenements. It seeks to continue mining operations at the HVO Complex to 2050, that being for approximately a further 25 years at HVO North and 15 years at HVO South beyond the approved mining completion dates of 2025 and 2030, respectively. Other than as described in this EIS, all activities that are currently approved under the existing HVO North and HVO South approvals are intended to continue as part of the Project.

The key Project elements are shown conceptually in Figure 4.1 (HVO Complex), Figure 4.2 (HVO North) and Figure 4.3 (HVO South), and are described in further detail for HVO North and HVO South in Section 4.4 and Section 4.5 respectively.

## 4.2 Project area

The Project area comprises the proposed development consent boundary for HVO North and the proposed development consent boundary for HVO South, as shown in Figure 4.4. The schedule of lands for HVO North and HVO South is provided in Appendix A and includes all land with the boundaries shown in Figure 4.4.

The Project area for HVO North and HVO South is described further below.

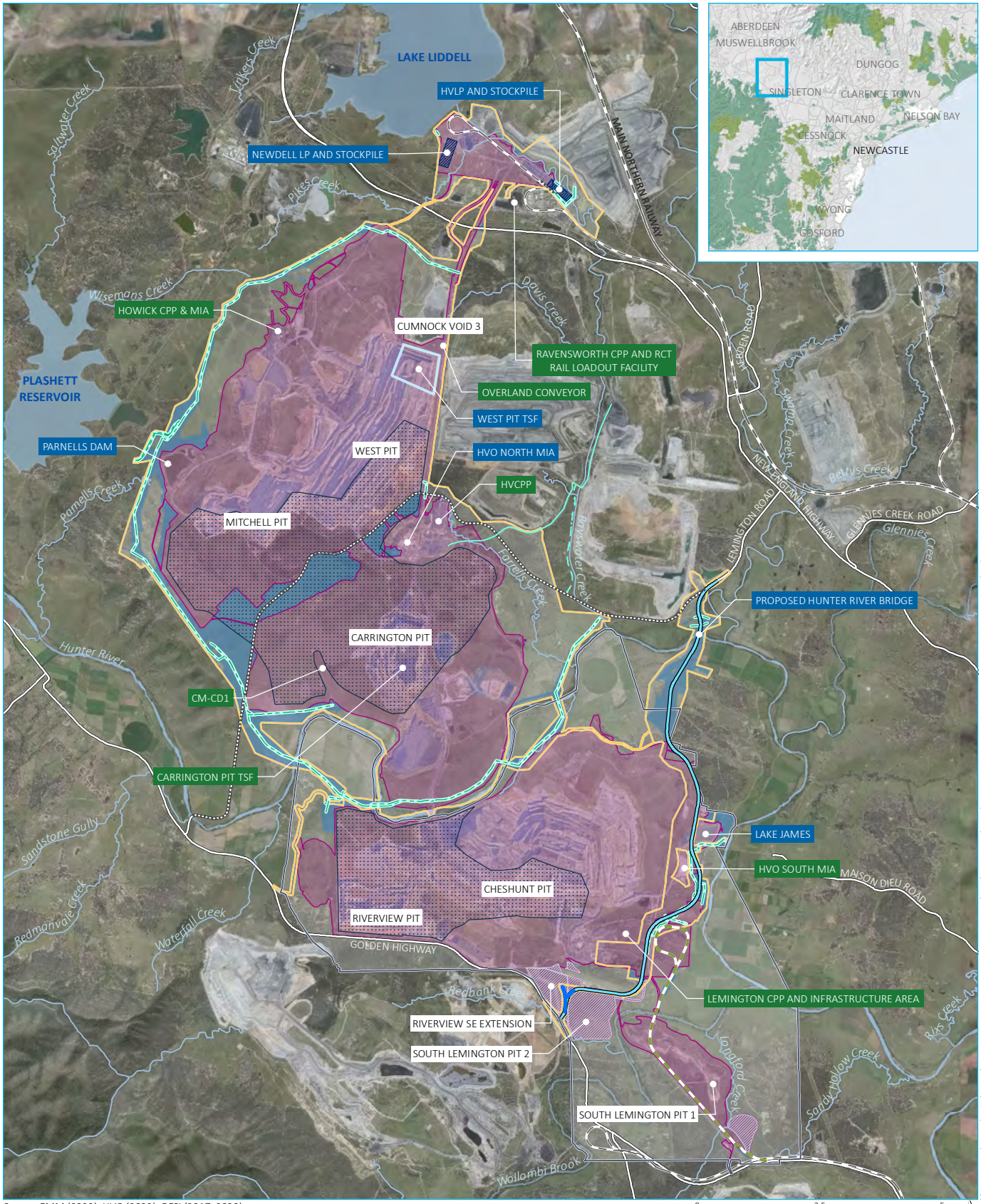
### 4.2.1 HVO North

The proposed development consent boundary for HVO North is similar to the currently approved boundary, with changes proposed primarily to accommodate infrastructure relocation and upgrades, and a small change in the west to accommodate the additional mining area between the Mitchell and Carrington Pits. The key changes proposed to the existing development consent boundary at HVO North are summarised below:

- **Proposed mining area** – the progression of mining from the Mitchell Pit through to the Carrington Pit, through an area previously not approved for mining, necessitates a small increase in the HVO North development consent boundary in the vicinity of Lemington Road.

- **Lemington Road realignment** – the development consent boundary is proposed to be expanded to include the realigned Lemington Road corridor. While part of this corridor is within the existing and proposed HVO South development consent boundary, given that the realignment is required due to the progression of mining at HVO North, the works associated with the road realignment form part of the HVO North development application.

- **Transmission and telecommunication line relocations** – sections of Ausgrid's transmission lines will be realigned as part of the Project, as well as AGL transmission lines. Sections of Telstra telecommunication lines will also be realigned, and access points to realigned infrastructure will be relocated to avoid interaction with mining activities, where possible. As a result of consultation with the infrastructure owners, these transmission lines are included as part of the Project and therefore sit within the Project area. Most of this infrastructure will need to be relocated at the same time as the construction of the Lemington Road realignment.




*Source: EMM (2022); HVO (2022); DFSI (2017, 2020)*

0 2.5 5 km

GDA2020 MGA Zone 56

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## KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Existing and approved disturbance area
- Previously approved area not retained
- Project related item
- Existing item

Existing HVO elements to be maintained

- South Lemington Rail Loop (approved, not yet constructed)

Proposed HVO Continuation Project elements

- Lemington Road realignment
- Indicative location of public road closure
- Haul route to Ravensworth Operations
- Transmission line relocation
- Alternative Golden Highway intersection
- Proposed mining area
- Product stockpile
- Additional disturbance area
- West Pit TSF

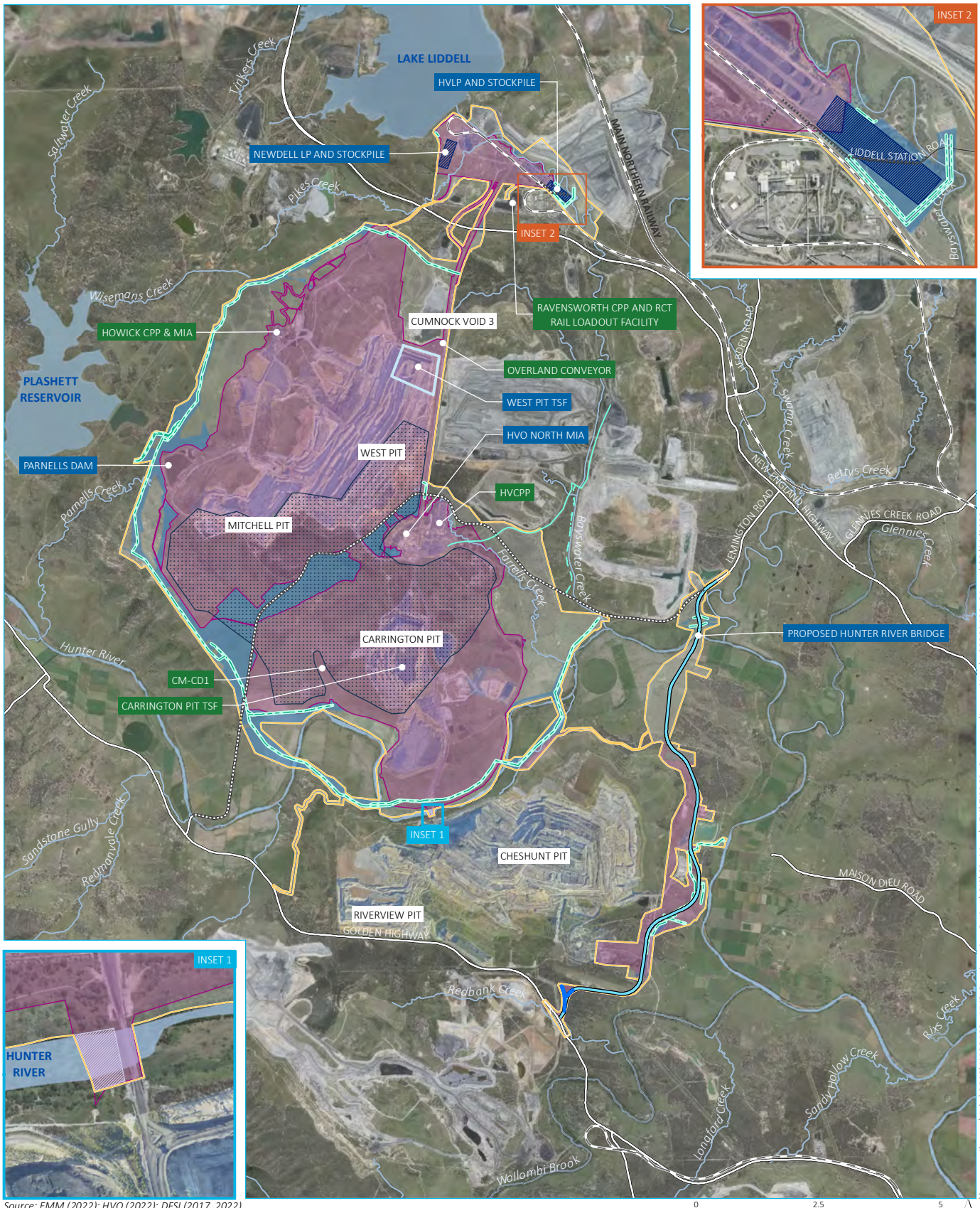
Existing environment

- Rail line
- Major road
- Ravensworth Operations access road
- Named watercourse
- Named waterbody
- NPWS reserve (refer to inset)
- State forest (refer to inset)

# Proposed conceptual layout

HVO Continuation Project
Environmental Impact Statement
Figure 4.1

EMM creating opportunities




Source: EMM (2022); HVO (2022); DFSI (2017, 2022)

0 2.5 5 km

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## KEY

- Existing and approved disturbance area
- HVO North proposed development consent boundary
- Previously approved area not retained
- Project related item
- Existing item

Proposed HVO Continuation Project elements

- Lemington Road realignment
- Indicative location of public road closure
- Haul route to Ravensworth Operations
- Transmission line relocation
- Alternative Golden Highway intersection
- Proposed mining area
- Product stockpile
- Additional disturbance area
- West Pit TSF

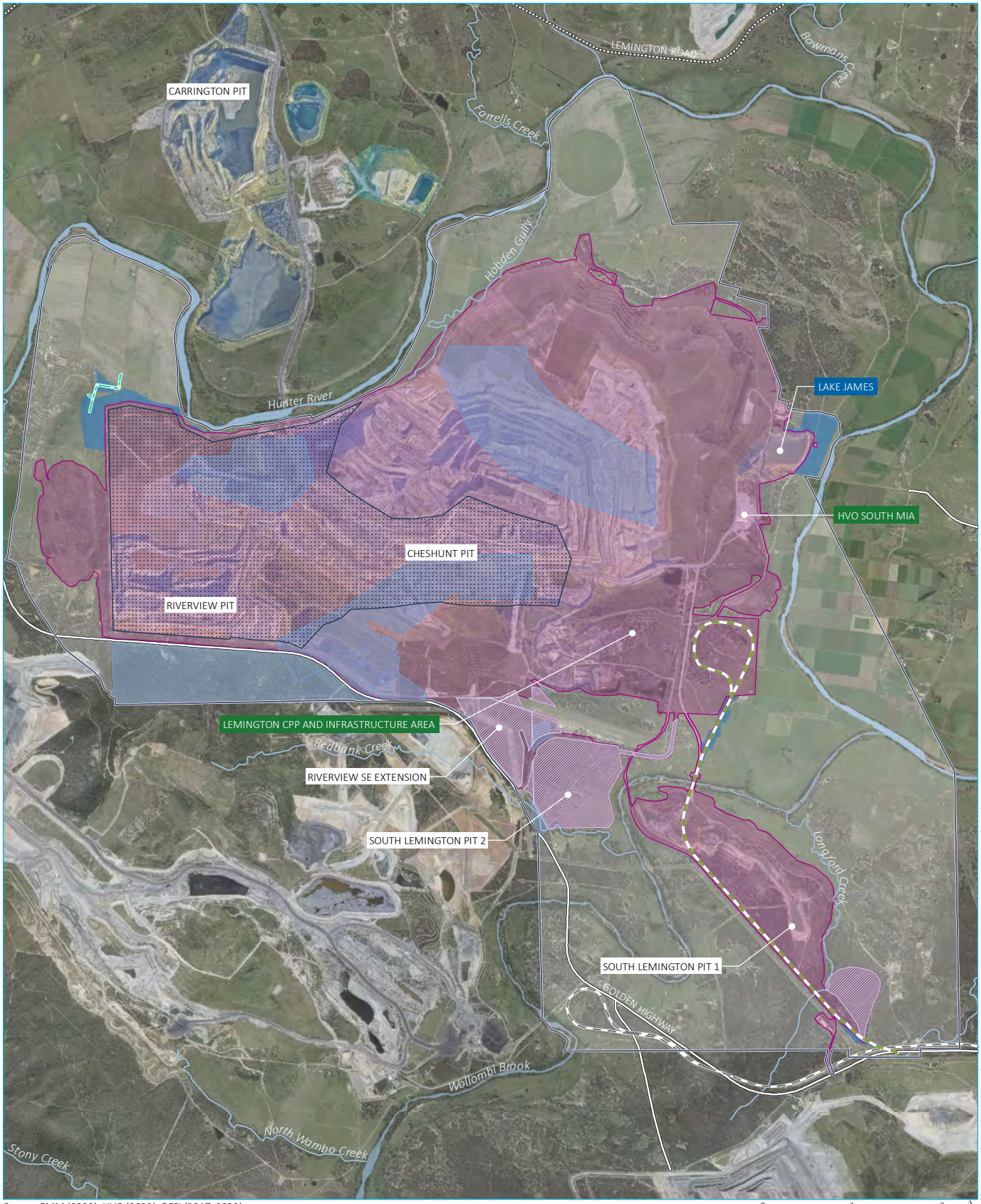
Existing environment

- Rail line
- Major road
- Ravensworth Operations access road
- Named watercourse
- Named waterbody

# Project conceptual layout - HVO North

HVO Continuation Project
Environmental Impact Statement
Figure 4.2

EMM creating opportunities




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*Source: EMM (2022); HVO (2022); DFSI (2017, 2022)*

0 1 2 km

GDA2020 MGA Zone 56

N

## KEY

- HVO South proposed development consent boundary
- Existing and approved disturbance area
- Previously approved area not retained
- Approved highwall mining area
- Project related item
- Existing item

Proposed HVO Continuation Project elements

- Indicative location of public road closure
- Transmission line relocation
- Proposed mining area
- Additional disturbance area

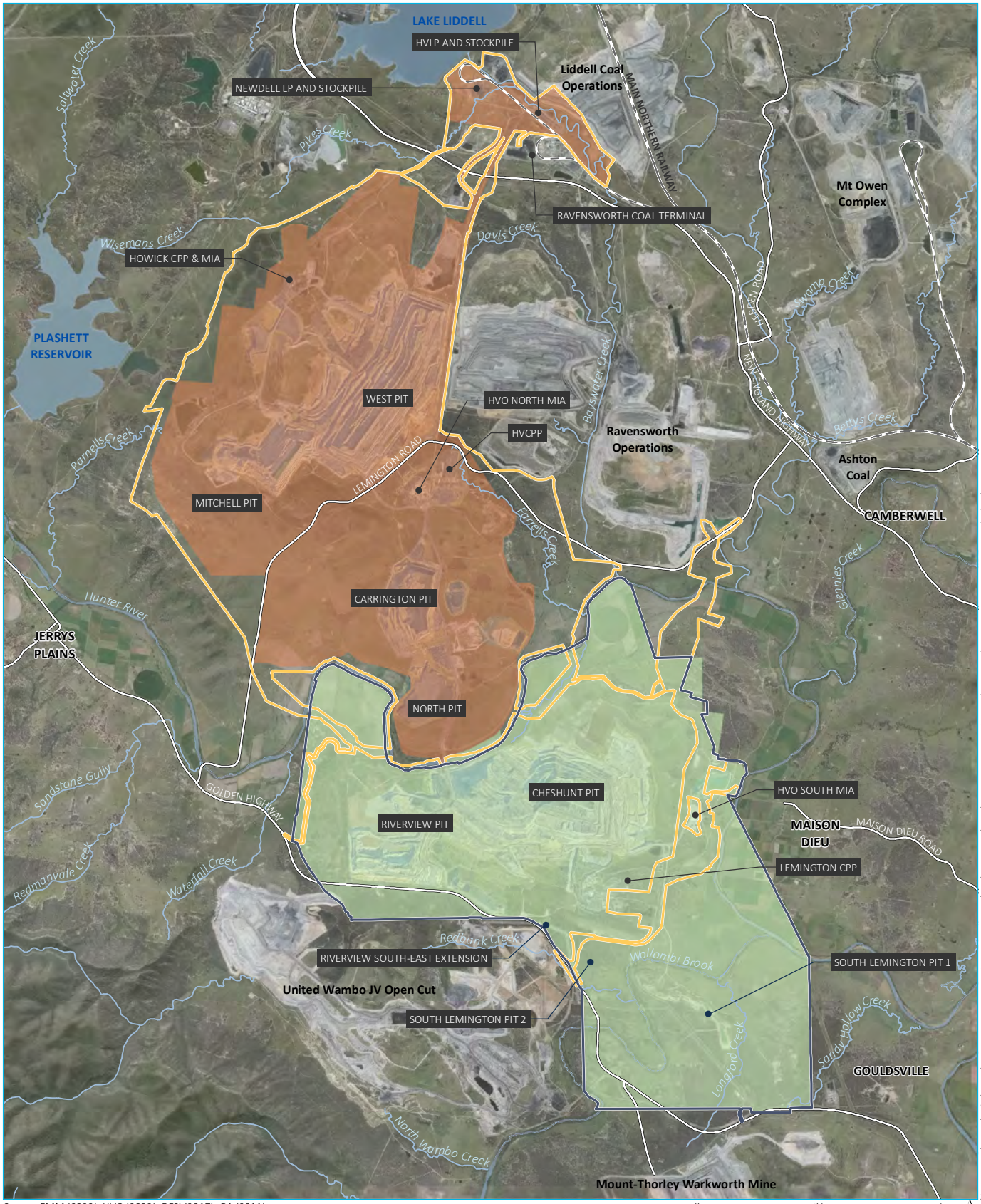
Existing HVO elements to be maintained

- South Lemington Rail Loop (approved, not yet constructed)
- Major road
- Named watercourse
- Named waterbody

# Project conceptual layout - HVO South

HVO Continuation Project
Environmental Impact Statement
Figure 4.3

EMM creating opportunities




*Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011)*

0 2.5 5 km

GDA2020 MGA Zone 56

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## KEY

- Existing HVO North development consent boundary (DA 450-10-2003)
- Existing HVO South project approval boundary (PA 06_0261)
- HVO North proposed development consent boundary
- HVO South proposed development consent boundary

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

# Existing and proposed development consent boundaries

HVO Continuation Project
Environmental Impact Statement
Figure 4.4

EMM creating opportunities

### 4.2.2 HVO South

At HVO South, while the development consent boundary will remain largely the same as the existing Project Approval boundary, the area in which coal extraction will take place for the Project will be reduced, as coal extraction in the South Lemington Pits 1 and 2 and the Riverview South East Extension is no longer proposed. Rehabilitation activities will be required in these areas and form part of the Project, as illustrated in the staged mine plans (refer to Figure 4.5 to Figure 4.9 in Section 4.3).

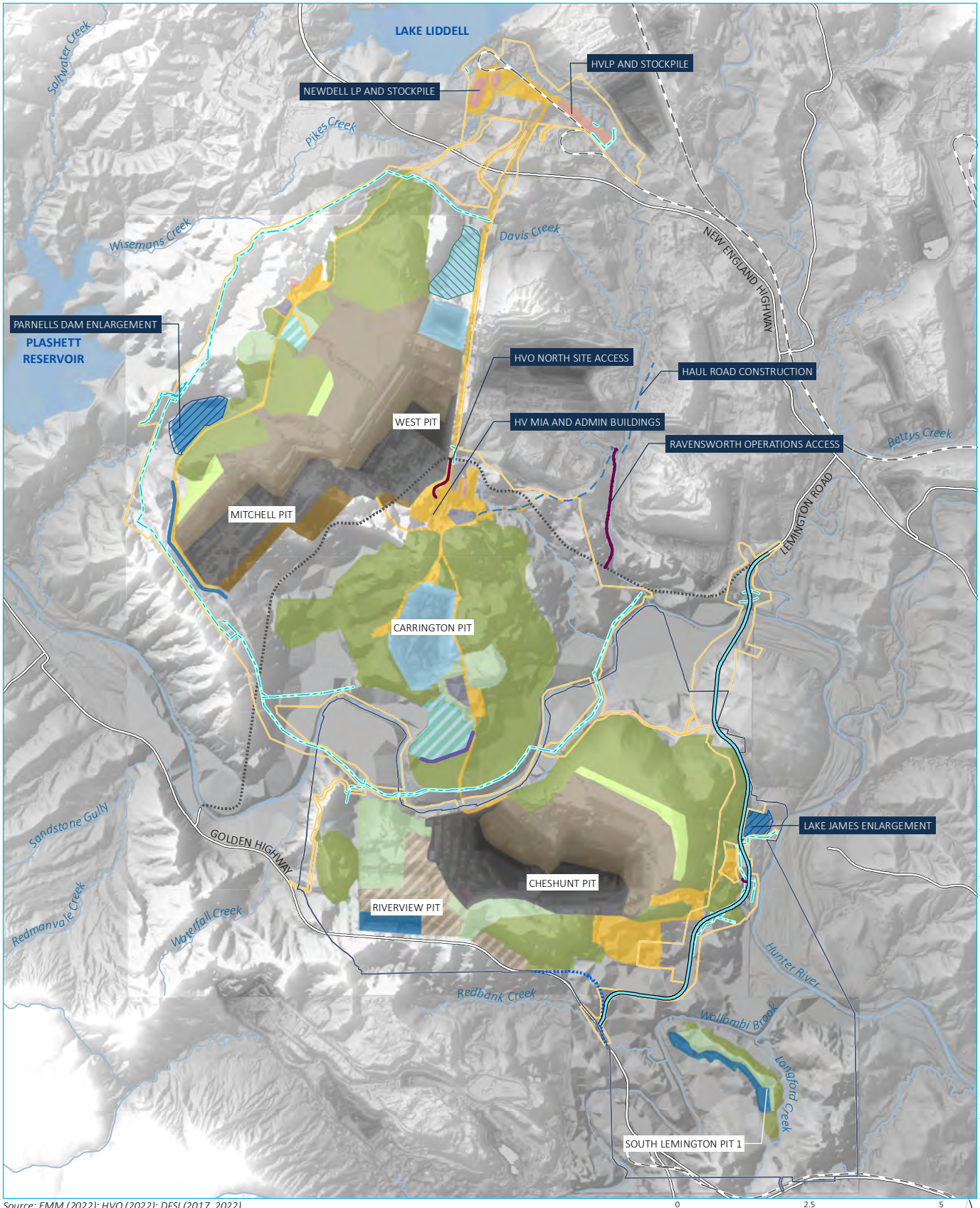
The proposed changes to the development consent boundary at HVO South primarily relate to alignment with cadastral boundaries and the removal from the Project of:

- the approved but not yet constructed conveyor from HVO South to the HVO North mine infrastructure area (MIA); and
- the exclusion of the Warkworth Northern Biodiversity Area offset.

## 4.3 Conceptual Project stages and schedule

Conceptual staged mine plans for the life of the Project are provided for indicative years 3, 7, 11, 18 and 22 in Figure 4.5 to Figure 4.9. For the purposes of relevant technical assessments, Year 1 is assumed to be 2023, pending the timeframe for approval of the Project. Year 1, or commencement of the Project, will start when any of the construction activities related to the establishment of the required mine support infrastructure commence, as described in Section 4.4.5 and Section 4.5.5. For HVO North, this is anticipated to be any works associated with the realignment of Lemington Road and transmission and communication assets. For HVO South, initial activities will include enlargement works of Lake James.

The conceptual mine years presented in Figure 4.5 to Figure 4.9 were chosen as they are considered representative of key mining stages for the Project and to capture the most conservative scenarios (such as maximum material movement and closest proximity of activity) for assessment in terms of potential impacts to neighbouring properties with respect to air quality, noise and visual amenity. The conceptual stage plans illustrate the different activities being undertaken during that indicative year, including coal extraction, overburden and tailings emplacement, infrastructure construction and rehabilitation. It should be noted that these conceptual mine stages are indicative only and may be subject to change (due to aspects such as mining rate, market conditions, geology and impacts of weather) within defined production limits identified.




\\emmsvr1\EMM\Jobs\2019\H190408 - HVO Continuation Project\GIS\02_Maps_EIS\EIS001_2025StagePlan_20220921_08.mxd 27/09/2022

*Source: EMM (2022); HVO (2022); DFSI (2017, 2022)*

KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Lemington Road realignment
- Mine access road
- Proposed haul route to Ravensworth Operations
- Indicative location of public road closure
- Alternative Golden Highway alignment
- Proposed transmission line relocation

Water infrastructure

- Levee
- Diversion drain
- Dam enlargement
- Cumnock Void 3 (managed by Ravensworth Operations)

Year 3 indicative mine plan

- Active emplacement area
- Inactive emplacement area
- Active mining area
- Active tailings emplacement
- Inactive tailings emplacement/capping in progress
- Infrastructure/access
- Preparation area
- Product coal stockpile
- ROM coal stockpile
- Rehabilitation
- Shaping for final landform
- Temporary stabilisation
- Water storage

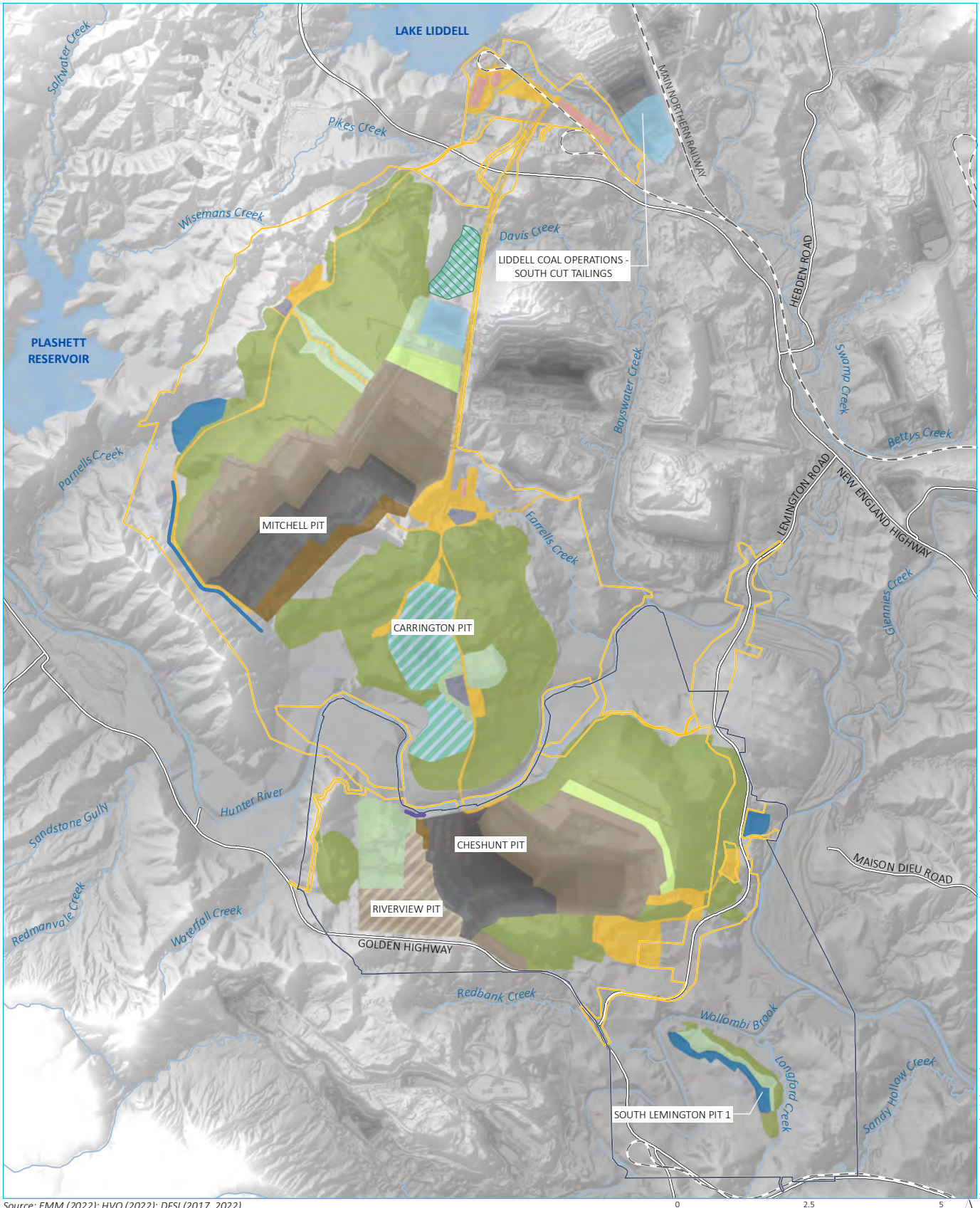
Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

# Conceptual mine plan - year 3

HVO Continuation Project
Environmental Impact Statement
Figure 4.5

EMM creating opportunities




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*Source: EMM (2022); HVO (2022); DFSI (2017, 2022)*

## KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary

Water infrastructure

- Levee
- Diversion drain
- Cumnock Void 3 (managed by Ravensworth Operations)

Year 7 indicative mine plan

- Active emplacement area
- Inactive emplacement area
- Active mining area
- Active tailings emplacement
- Inactive tailings emplacement/capping in progress
- Infrastructure/access
- Preparation area
- Product coal stockpile
- ROM coal stockpile
- Rehabilitation
- Shaping for final landform
- Temporary stabilisation
- Water storage

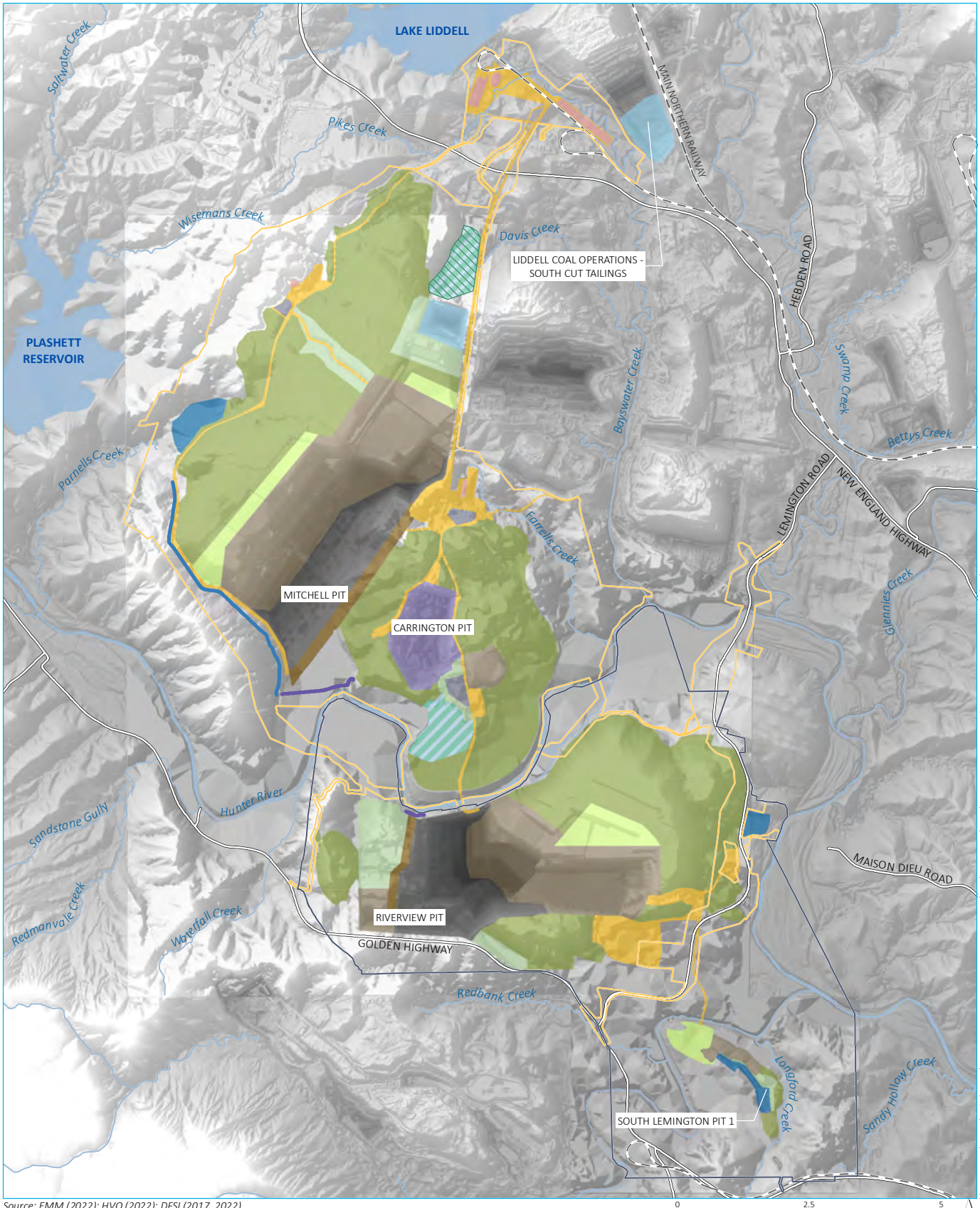
Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

# Conceptual mine plan - year 7

HVO Continuation Project
Environmental Impact Statement
Figure 4.6

EMM creating opportunities




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*Source: EMM (2022); HVO (2022); DFSI (2017, 2022)*

0 2.5 5 km

GDA2020 MGA Zone 56

N

## KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary

Water infrastructure

- Levee
- Diversion drain
- Cumnock Void 3 (managed by Ravensworth Operations)

Year 11 indicative mine plan

- Active emplacement area
- Active mining area
- Active tailings emplacement
- Inactive tailings emplacement/capping in progress
- Carrington Pit tailings recovery
- Infrastructure/access
- Preparation area
- Product coal stockpile
- ROM coal stockpile
- Rehabilitation
- Shaping for final landform
- Temporary stabilisation
- Water storage

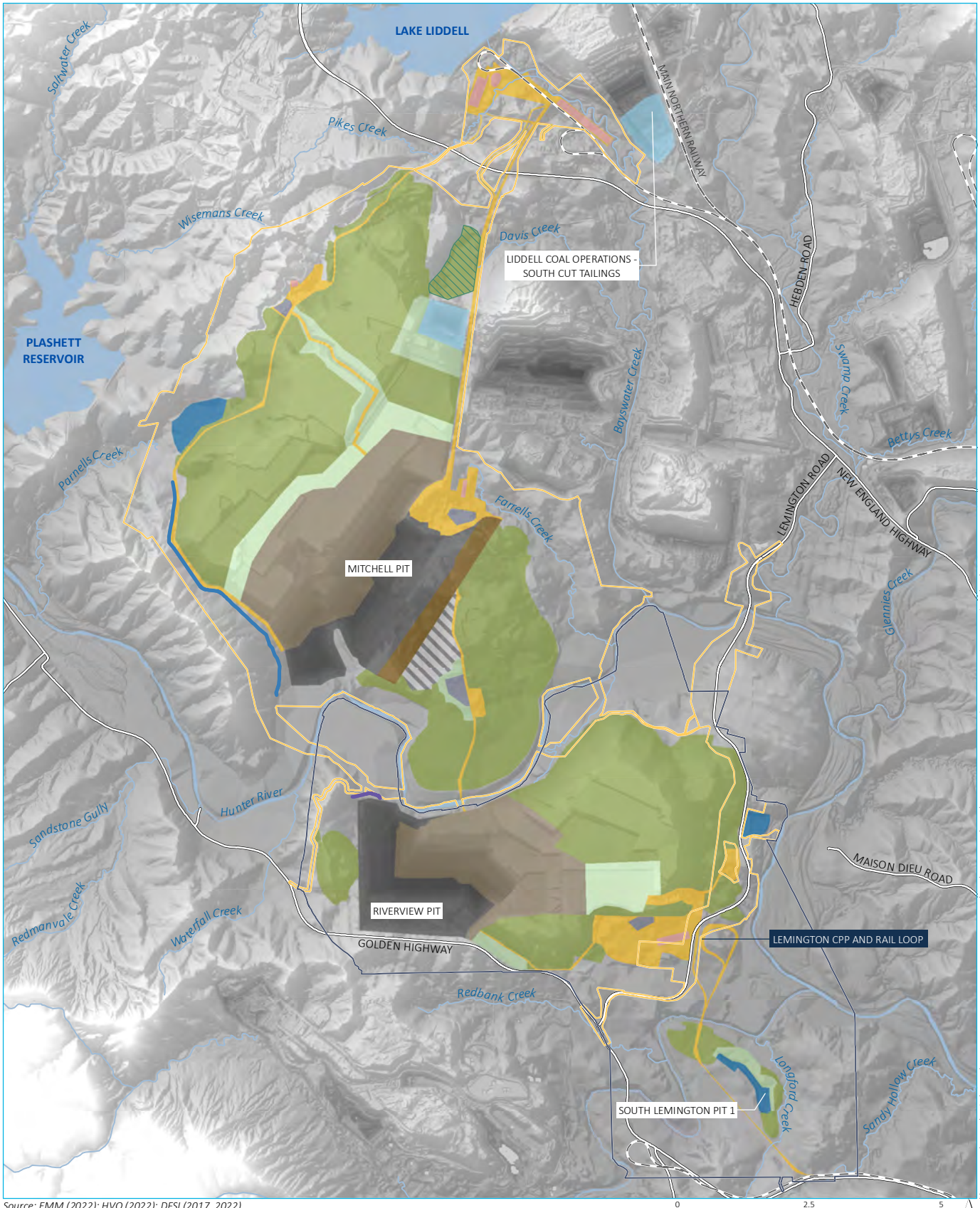
Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

# Conceptual mine plan - year 11

HVO Continuation Project
Environmental Impact Statement
Figure 4.7

EMM creating opportunities




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*Source: EMM (2022); HVO (2022); DFSI (2017, 2022)*

0 2.5 5 km

GDA2020 MGA Zone 56

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## KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary

Water infrastructure

- Levee
- Diversion drain
- Cumnock Void 3 (managed by Ravensworth Operations)

Year 18 indicative mine plan

- Active emplacement area
- Active mining area
- Inactive mining area
- Active tailings emplacement
- Infrastructure/access
- Preparation area
- Product coal stockpile
- ROM coal stockpile
- Rehabilitation
- Shaping for final landform
- Temporary stabilisation
- Water storage

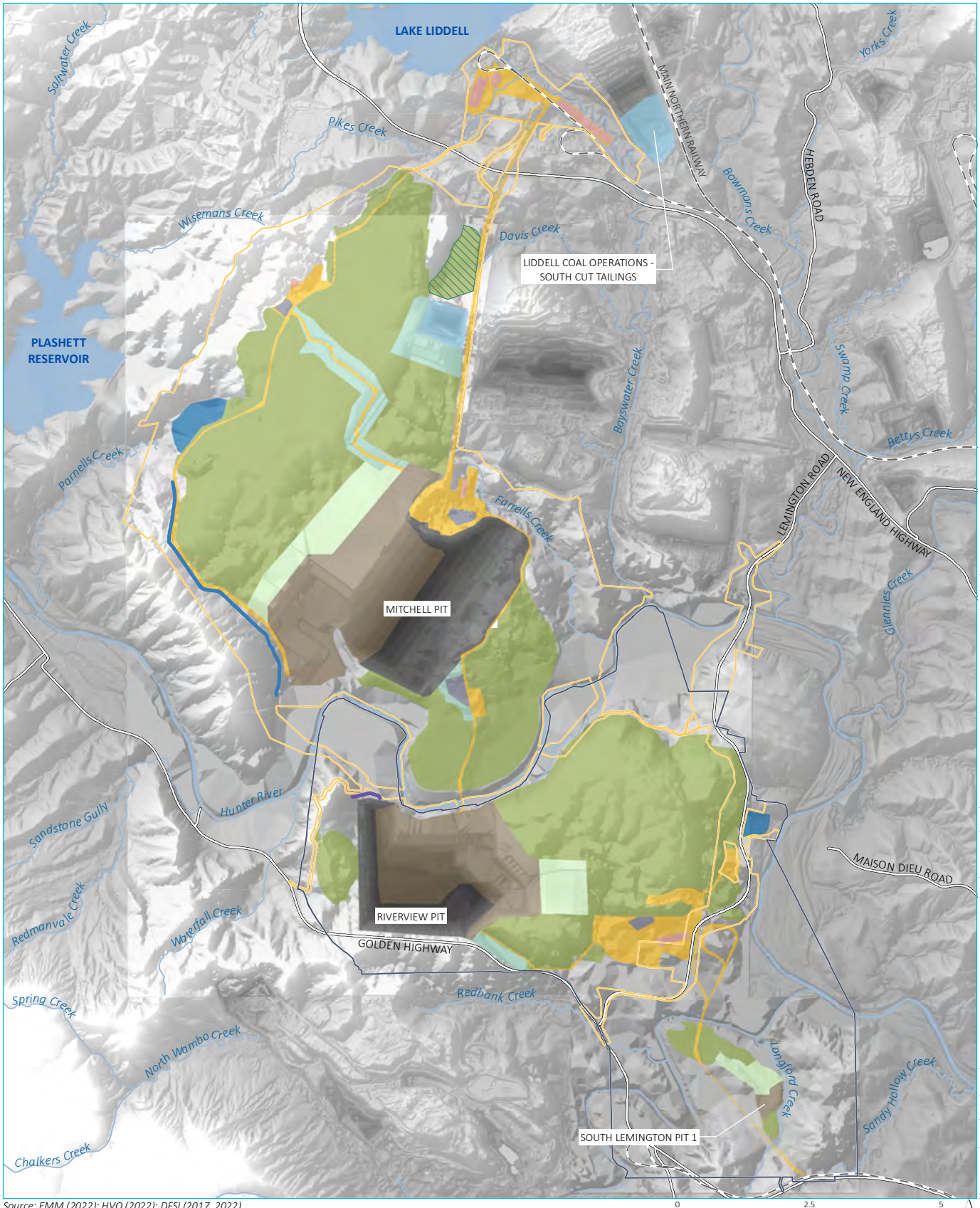
Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

# Conceptual mine plan - year 18

HVO Continuation Project
Environmental Impact Statement
Figure 4.8

EMM creating opportunities




*Source: EMM (2022); HVO (2022); DFSI (2017, 2022)*

0 2.5 5 km

GDA2020 MGA Zone 56

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## KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Cumnock Void 3 (managed by Ravensworth Operations)

Water infrastructure

- Levee
- Diversion drain

Year 22 indicative mine plan

- Active emplacement area
- Active mining area
- Active tailings emplacement
- Infrastructure/access
- Product coal stockpile
- ROM coal stockpile
- Rehabilitation
- Shaping for final landform
- Temporary stabilisation
- Water storage

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

# Conceptual mine plan - year 22

HVO Continuation Project
Environmental Impact Statement
Figure 4.9

EMM creating opportunities

## 4.4 HVO North Continuation Project

### 4.4.1 Summary of key elements

The key Project elements at HVO North for which approval is sought include those activities required to carry out open cut coal mining and processing, and are summarised in Table 4.1 and are discussed in more detail in the sections below. Other than as set out in the table as a summary of the Project, all activities that are currently approved under the existing HVO North approval are intended to continue.

**Table 4.1 HVO North - key Project elements**

| Project element | Existing approved operations | Summary of the changes proposed by the Project |
|---|---|---|
| Project area | • Development consent boundary as shown in Figure 4.4. | • Increase in the development consent boundary to accommodate an extension to the approved mining area, as well as the areas covered by proposed infrastructure to support the Project (including the Lemington Road and transmission and telecommunication line realignments). |
| Mining method | • Open cut mining operation, primarily using truck and shovel. The use of a dragline is also approved.<br>• Blasting – 7.00 am to 6.00 pm Monday to Saturday inclusive (except public holidays) up to a maximum of 3 blasts per day and 12 blasts per week. | • No change. |
| Resource recovery | • Coal extraction to the base of the Barrett seam in West Pit and Mitchell Pit.<br>• Coal extraction to the base of Bayswater seam in the Carrington area.<br>• Approval to extract up to 498 Mt of ROM coal, comprising 22 Mtpa over 21 years, plus 19 Mt in Carrington Pit (Mod 2) and 17 Mt in Carrington West Wing (Mod 3). | Progression of mining generally as illustrated in the indicative staged mine plans in Figure 4.5 to Figure 4.9. Extraction of the coal resource will comprise:<br>• extension of open cut mining from the approved West Pit and Mitchell Pit areas, through Lemington Road into the Carrington Pit area;<br>• mining to the base of the Barrett seam in the Carrington Pit area; and<br>• a reduction in the proposed mining area within the Carrington West Wing area, compared to the approved mining area, as per the indicative staged mine plans.<br>The extension of the mining area and the extraction of deeper coal resources in the Carrington Pit area will result in the extraction of approximately an additional 400 Mt of ROM coal over that currently approved for extraction. |

**Table 4.1 HVO North - key Project elements**

| Project element | Existing approved operations | Summary of the changes proposed by the Project |
|---|---|---|
| Disturbance area | • Avoidance of heritage site CM-CD1. Mining operations and associated activities are not permitted within 20 m of CM-CD1.<br>• Existing and approved disturbance of approximately 4,965 ha. | • An assessed additional disturbance area of approximately 926 ha to that currently approved, noting that avoidance of CM-CD1 will be maintained. The area directly disturbed will likely be less, subject to detailed infrastructure design and construction. |
| Annual production | • Up to 22 Mtpa of ROM coal, comprising:<br>– 12 Mtpa from West Pit; and<br>– 10 Mtpa from Carrington Pit. | • The Project seeks to remove the currently approved separation of extraction limits between West Pit and Carrington Pit, due to the resource being mined in a continuous sequence. |
| Mine life | • Operations are approved until 12 June 2025. | • Mining operations at HVO North until the end of 2050. |
| Beneficiation | • ROM coal may be transported via internal haul roads to either HVCPP or Howick CPP for processing.<br>• HVCPP is approved to process up to 20 Mtpa ROM coal (not receiving more than 16 Mtpa ROM from HVO South).<br>• Howick CPP is approved to wash up to 6 Mtpa ROM coal.<br>• Both HV and Howick CPP can use flotation to process ROM coal. | • Use of temporary coal stockpiles assembled in new mining areas, within the Project disturbance area prior to processing or transport.<br>• Construction of a haul road (refer to Figure 4.1) to enable ROM coal to be transported to the neighbouring Ravensworth Operations ROM pad via haul truck until the end of Ravensworth Operations approved mine life. |
| Management of mining waste – overburden emplacement | • Ability to dispose of overburden within all pits and out-of-pit emplacement areas across HVO.<br>• Maximum overburden emplacement area height of approximately 240 m AHD. | • No change. Overburden will continue to be emplaced across HVO within the Project disturbance area. However, the sequence of overburden emplacement has been revised to reflect the extended mine life and additional mining areas (ie between Mitchell/West Pit and the Carrington area). |
| Management of mining waste – coarse reject | • Ability to emplace coarse rejects within overburden emplacement areas across HVO. | • No change. |

**Table 4.1 HVO North - key Project elements**

| Project element | Existing approved operations | Summary of the changes proposed by the Project |
|---|---|---|
| Management of mining waste – tailings | • Emplacement of tailings within approved TSFs at HVO and Ravensworth Operations, including Carrington Pit TSF at HVO North, and the Cumnock Void 3 TSF at Ravensworth Operations. Intermittent deposition of tailings occurs in Dam 6W TSF, Bobs Dump TSF and Central TSF as part of ongoing management towards decommissioning.<br>• Capping and rehabilitation of TSFs following completion of emplacement activities. | • The Project includes options for:<br>– additional tailings pipelines and pumps;<br>– removal, relocation and/or reprocessing of tailings from historic TSFs as required, including the Carrington TSF;<br>– emplacement of tailings within the northern extent of West Pit, as shown in Figure 4.11; and<br>– emplacement of tailings at approved tailings facilities at LCO.<br>• Over the life of HVO, the tailings and reject management strategy will continue to be refined to meet operational needs. This may also include trial or testing facilities in the Project approved disturbance area to inform the strategy. |

**Table 4.1 HVO North - key Project elements**

| Project element | Existing approved operations | Summary of the changes proposed by the Project |
|---|---|---|
| General infrastructure | • HV MIA and Howick MIA.<br>• Maintenance and ancillary infrastructure required to facilitate operations. | • Realignment of a section of Lemington Road from Comleroi Road in the south to the existing Lemington Road in the north, joining the existing road alignment approximately 2.3 km south of the existing New England Highway/Lemington Road intersection. The corridor also allows for two options with respect to the connection to the Golden Highway; one assuming that the Golden Highway is realigned by United Wambo SSD 7142 as approved, and a second option that aligns with the current alignment of the Golden Highway.<br>• HVO South access road relocation to join the realigned Lemington Road and HVO North access road to be realigned from the existing Lemington Road shown in Figure 4.12. It is noted that other existing access points to both infrastructure and mining areas are to be maintained as approved.<br>• Closure of a small section of Liddell Station Road to accommodate the HVLP product stockpile extension (if constructed), which is not currently accessible to the public.<br>• Realignment of sections of Ausgrid's transmission lines, and AGL transmission lines, as shown in Figure 4.13.<br>• Realignment of internal transmission lines to support mining activities.<br>• Realignment of Telstra telecommunication lines.<br>• HVO North MIA upgrade.<br>• Maintenance and ancillary activities as required to facilitate operations, including the replacement of plant and equipment where required.<br>• Access roads to facilitate service provider access.<br>• Use of demountable/temporary buildings and other ancillary temporary facilities to enable construction activities and mining operations as required.<br>• Access road establishment to an existing mine-owned property east of realigned Lemington Road as shown in Figure 4.12.<br>• Maintenance and ancillary infrastructure required to support construction activities and mining operations within the Project disturbance area, including communication towers, installation and maintenance of water supply works and works on waterfront land, construction and use of buildings for construction or mining operations, installation of environmental monitoring equipment including piezometers, and explosives storage and transport. |

**Table 4.1 HVO North - key Project elements**

| Project element | Existing approved operations | Summary of the changes proposed by the Project |
|---|---|---|
| Temporary Hunter River crossings | • Construction of temporary crossings of the Hunter River to allow the relocation of mining equipment that is too heavy for the existing bridge. | • Approval for the temporary crossing of the Hunter River for heavy equipment will not be retained. |
| Product transport | • Transport of product coal from HVCPP by overland conveyor and or truck to HVLP or Newdell LP.<br>• Transport of product coal from Howick CPP by overland conveyor to power stations or by truck to HVLP or Newdell LP.<br>• Intermittent haulage of coal between HVCPP, HVLP, Newdell LP and RCT.<br>• In the event of an emergency or issue with coal conveyance infrastructure, coal can be transported via truck between noted CPPs, LPs and the RCT. | • Upgrade of product coal infrastructure as follows:<br>– new Newdell product stockpile and upgrade of the existing Newdell train loading facility. These works will include an upgrade of the existing stockpile plus new train loading bin, conveyors and support infrastructure such as access roads, power and communication services; or<br>– an extension of the product coal stockpile footprint at the HVLP as shown in Figure 4.2, to increase the total stockpile capacity of the load point. The extension will require the relocation of Ausgrid transmission lines and communication infrastructure in this area and the closure of a portion of Liddell Station Road.<br>• As described above under 'beneficiation', the Project includes the construction of a haul road to enable ROM coal to be transported to the neighbouring Ravensworth Operations ROM pad via haul truck for processing, from where product coal is then transferred to RCT for transport to market. |

**Table 4.1 HVO North - key Project elements**

| Project element | Existing approved operations | Summary of the changes proposed by the Project |
|---|---|---|
| Water management | • Integrated water management with HVO South.<br>• Water supply works including pumps, bores, diversions and dams.<br>• Water discharges in accordance with Hunter River Salinity Trading Scheme (HRSTS).<br>• Transfer of water between HVO South, LCO and Ravensworth Operations.<br>• Existing and approved flood protection levees as shown in Figure 3.7, including the Alluvial Lands, Carrington, Carrington West Wing and North Pit levees.<br>• Construction of groundwater low permeability barrier walls (LPBW) as follows:<br>– LPBW across the eastern arm of the Hunter River paleochannel within 2 years of mining in the Carrington Pit Southern Extension (*constructed*).<br>– Carrington West Wing LPBW prior to undertaking mining within 100 m of the western arm of the Hunter River paleochannel, with an applicable permeability of 1 x $10^{-8}$ m/s (*not yet constructed*).<br>• Diversion of the Unnamed Tributary to the west of Carrington West Wing. | • Continuation of the ability to transfer water to and from other mining operations where permitted.<br>• Improved flood protection levee for North Pit (up to 1,000 year Average Recurrence Interval (ARI)).<br>• Improved flood protection for Carrington West Wing levee (up to 1,000 year ARI).<br>• Additional mine/dirty water containment dams as required, as mining progresses.<br>• Clean water diversion as required, as mining progresses, including an extension of the Mitchell clean water diversion.<br>• Parnells Dam enlargement from approximately 1 GL to approximately 4 GL, new spillway, and refurbishment of existing HRSTS discharge facility (no change to EPL/HRSTS approval).<br>• Emplacement of clayey material to form a LPBW on benches that intercept the eastern arm of the Hunter River paleochannel to limit inflows from the alluvium to the pit, as well as limiting potential for seepage from the backfilled pit into the alluvium. The LPBW design was considered as part of the project design, and an alternative suitable approach has been identified to meet the same objectives.<br>• Revised water management system and revised conceptual final landform, as shown in Figure 4.14 and Figure 4.15 respectively. |
| Rehabilitation | • Progressive rehabilitation, with the establishment of a mixture of pasture and native habitat areas.<br>• Removal of levees and reinstatement of the Unnamed Tributary in the Carrington West Wing area to its original position. | • Incorporation of natural landform design elements to areas of new rehabilitation under the Project, as outlined in the rehabilitation strategy (refer to Chapter 21).<br>• Progressive rehabilitation, with the post mining land use to comprise a mixture of grazing and native habitat areas.<br>• The Alluvial Lands flood levee will be left in place in the final landform. The Carrington and North Void TSF levees will be incorporated into the rehabilitated overburden dump/tailings capping respectively, and so will not be retained as levees. The Carrington West Wing levee will be partially removed and incorporated into the final landform. |

**Table 4.1 HVO North - key Project elements**

| Project element | Existing approved operations | Summary of the changes proposed by the Project |
|---|---|---|
| Final void | • Approved final void in Carrington Pit (evaporative sink).<br>• Approved final void in West Pit.<br>• Approved final void in Mitchell Pit.<br>• Carrington West Wing void to be backfilled and returned to pasture. | • One final void at HVO North, representing a reduction in the number of voids that will remain post mining compared to existing approved operations (ie from three to one). |
| Operational workforce | • Approximately 1,500 FTE workers (HVO Complex). | • No change. |
| Construction workforce | N/A | Construction activities associated with the Project will create approximately 600 temporary employment opportunities over an approximate five year period. These construction activities are anticipated to include:<br>• Lemington Road realignment and associated works;<br>• transmission line and telecommunications decommissioning and realignment;<br>• upgrades to MIAs and relevant access roads;<br>• construction of the coal haulage route to Ravensworth Operations;<br>• upgrade of the existing Newdell LP train loading facility and construction of a new product coal stockpile or extension of the HVLP product stockpile;<br>• Parnells Dam capacity increase, and other water management system works such as levee construction; and<br>• clean water diversion drains.<br>Construction activities will generally be undertaken within standard construction hours (Monday to Friday 7.00 am to 6.00 pm, Saturday 8.00 am to 1.00 pm, and no work on Sundays or public holidays). However, some out of hours work may be required from time to time. |
| Hours of operation | • Continuous operations, 24 hours per day, seven days per week. | • No change. Continuous operations, 24 hours per day, seven days per week. |

### 4.4.2 Mining

#### i Mining methods and equipment

No changes are proposed to current mining methods and equipment type at HVO North as described in Section 3.2. Truck and shovel will remain the primary mining method supported by ancillary equipment, with the option of also using a dragline from time to time. Retaining approval for the use of the dragline will maintain flexibility as required for extraction and rehabilitation activities to occur in an efficient manner.

The typical mining fleet that will continue to be used for operations at HVO North includes:

- excavators;
- shovels;
- haul trucks;
- dozers;
- loaders;
- drills;
- water carts; and
- graders.

Fleet numbers and types may vary from time to time throughout the life of the Project. Factors such as technological advances in mining equipment and varying geotechnical properties of the material being mined may require alterations to the composition of the fleet. Where this occurs, noise and dust generating activities will be considered and measures put in place to maintain compliance with conditions of approval and licences.

Ancillary equipment to support mining operations will continue to be relied upon as required, which may include but is not limited to scrapers, backhoes, service trucks, articulated trucks, mobile cranes, rollers, mulchers, front end loaders, generators, crushers, screening/batching plant, water pumps, lighting plants and light vehicles.

#### ii Extraction rate and mine life

The Project seeks to maintain the approved annual extraction rate of 22 Mtpa at HVO North, while extending the life of mining operations, from 2025 to the end of 2050. The Project seeks to remove the current separate annual extraction limits for different mining areas (ie 12 Mt in West/Mitchell Pit and 10 Mt in Carrington Pit).

Upon commencement of the Project, mining will continue in HVO North, generally in accordance with the indicative staged mine plans presented in Figure 4.5 to Figure 4.9. Mining will continue in the West and Mitchell Pit areas, progressing in a southerly direction towards the Carrington area, mining through the section currently separating these two areas including Lemington Road. Coal resources in the Carrington area will be extracted down to, and inclusive of, the Barrett seam, with the completion of mining occurring before reaching the North Void TSF, as shown in Figure 4.2.

Mining through Lemington Road will result in additional land being mined that was not previously approved to be mined.

Year 1, or commencement of the Project, is anticipated to be in approximately mid-2023 subject to timing of approval. In addition to continuation of existing mining activities at HVO North, in Year 1 the construction of the infrastructure upgrades at HVO North will commence. Those works must occur prior to mining activities progressing through the existing Lemington Road and the transmission lines in the area; ie the relocation of Lemington Road and transmission and telecommunication lines within the HVO North proposed mining area.

Progressive rehabilitation activities will be carried out as mining progresses; however, final rehabilitation activities will be completed following the cessation of mining operations at the end of 2050.

It is also noted that ongoing exploration drilling within tenement areas will occur throughout the mine life, to obtain further information regarding resources to be mined, as well as geological and geotechnical information relevant to the mining and construction activities that will be undertaken. Drilling may also be undertaken as required for gas and hydrogeological monitoring and investigations. Exploration drilling cuttings and drilling fluids as part of any exploration drilling program associated with a HVO mining tenement may be disposed of within approved tailings facilities.

### 4.4.3 Coal handling, processing and transport

ROM coal from HVO North will continue to be predominantly processed at the HV and Howick CPPs. ROM coal and product coal flow paths and volumes will generally remain as per the coal flow diagram presented in Chapter 3 (refer to Figure 3.5), with one addition aimed at increasing flexibility in coal processing with the neighbouring Ravensworth Operations. The Project seeks to construct a haul road from the HVCPP to the Ravensworth ROM pad, as shown in Figure 4.2, to enable the transport of ROM coal from HVO North to Ravensworth Operations for processing in the Ravensworth CPP and railed through the RCT.

Following processing, product coal will continue to be predominantly transported via rail from the HVLP and Newdell LP facilities to the Port of Newcastle. Where commercial opportunities exist, coal may be transported by rail or conveyor for domestic use. Product coal is also currently hauled from Howick CPP to Newdell LP which is proposed to continue. As is also currently approved, coal may be intermittently hauled from the HVCPP to the HVLP and between HVLP, Newdell LP and RCT.

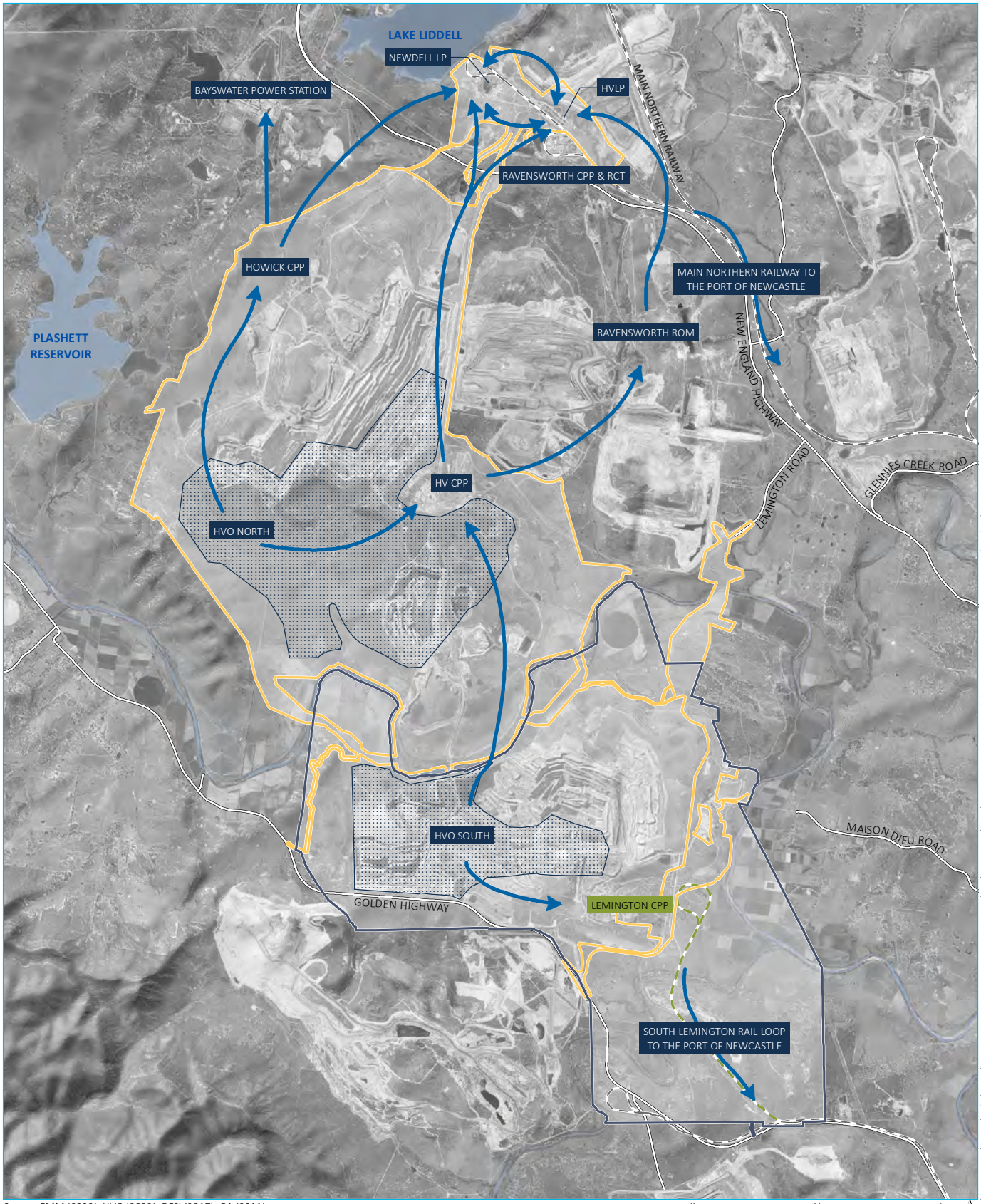
Coal handling infrastructure improvements proposed by the Project include an extension of the HVLP product coal stockpile, or the construction of a new product stockpile and train loading facilities at the Newdell LP.

The construction of a new product stockpile and train loading facilities at Newdell will require the demolition of parts of the existing Newdell LP facility. The new facility will involve the construction of a new product coal stockpile and train loading bin and an upgrade of elements of the existing stockpile.

If the HVLP upgrade is proceeded with, the HVLP product stockpile will be extended as shown in Figure 4.2. The extension will involve the removal of vegetation and topsoil from the extended footprint, establishment of a hard stand base and necessary infrastructure such as conveyors, stackers and reclaimers. The extension will also require the closure of a portion of Liddell Station Road. This portion of road is not currently publicly accessible. In addition, the construction of the HVLP stockpile extension requires the realignment of existing transmission lines as shown in Figure 4.2. Communication lines which interact with the HVLP extension are also required to be realigned.

Upgrades to either the HVLP or the Newdell LP will improve coal handling efficiency across the HVO Complex. A coal flow diagram is presented in Figure 4.10, illustrating the proposed movement, handling and transportation of coal across HVO Complex.

From time to time additional coal stockpiles may be developed in pit and at the surface facilities to manage market conditions.




*Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011)*

0 2.5 5 km

GDA2020 MGA Zone 56

N

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KEY

- Coal flow direction
- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Proposed mining area
- South Lemington Rail Loop

Existing environment

- Rail line
- Major road
- Named waterbody

Coal flow diagram

HVO Continuation Project
Environmental Impact Statement
Figure 4.10

EMM creating opportunities

### 4.4.4 Tailings and reject management

#### i Overview

Coarse reject, together with overburden, is currently emplaced within active overburden emplacement areas. Tailings is pumped from CPPs to tailings storage facilities across HVO via a network of pipelines. This approach will generally continue for the Project.

The key aspects of the tailings and reject management strategy throughout the life of the Project at HVO North are as follows:

- continuation of the disposal of coarse reject material with overburden across the HVO Complex; and
- disposal of tailings as follows:
  - emplacement of tailings in a TSF to be established in the northern extent of West Pit, as shown in Figure 4.11;
  - continuation of tailings emplacement in the Carrington Pit TSF and Cumnock Void 3 TSF during the early stages of the Project; and
  - emplacement of tailings in the South Cut void of LCO.

The Project also involves the recovery of tailings from some existing TSFs in areas that will be mined through as part of the Project. Tailings emplaced in the Carrington Pit TSF will be relocated and/or reprocessed to enable the extraction of coal remaining in this area.

Other historic tailings facilities that are proposed to be mined through, such as the Central TSF, will be assessed prior to mining. If recovery via routine mining methods is not possible then an approach similar to the Carrington Pit TSF recovery will be implemented. In addition, decommissioning and rehabilitation of TSFs no longer being used will continue. This may include intermittent deposition of tailings in these TSFs as part of ongoing management towards decommissioning.

Figure 4.11 illustrates the key components of the tailings and reject management strategy for the Project, including the proposed conceptual location of the pipeline to transfer tailings from HVO to LCO's South Cut, the proposed TSF within the northern extent of West Pit, existing TSFs that will remain, and those in which tailings are proposed to be recovered to facilitate the progression of mining.

Over the life of HVO, the tailings and reject management strategy will continue to be refined to meet operational needs. This may also include trial or testing facilities in the Project disturbance area to inform the strategy.

#### ii West Pit TSF

As noted above, the Project proposes the establishment of an additional in-pit TSF in the northern extent of West Pit, where tailings will be emplaced until full. A feasibility study of the establishment of the West Pit TSF was undertaken, which included consolidation modelling.

The West Pit TSF will be bounded on two sides by the highwall and end wall which are expected to be practically impermeable. The western and southern walls will comprise overburden emplacements. Tailings will be deposited into West Pit in a manner that meets the following objectives:

- promotes efficient water recovery from the decant;
- recovers as much water as possible for reuse; and
- provides a seal to the mine spoil to reduce the amount of seepage from the tailings to the spoil.

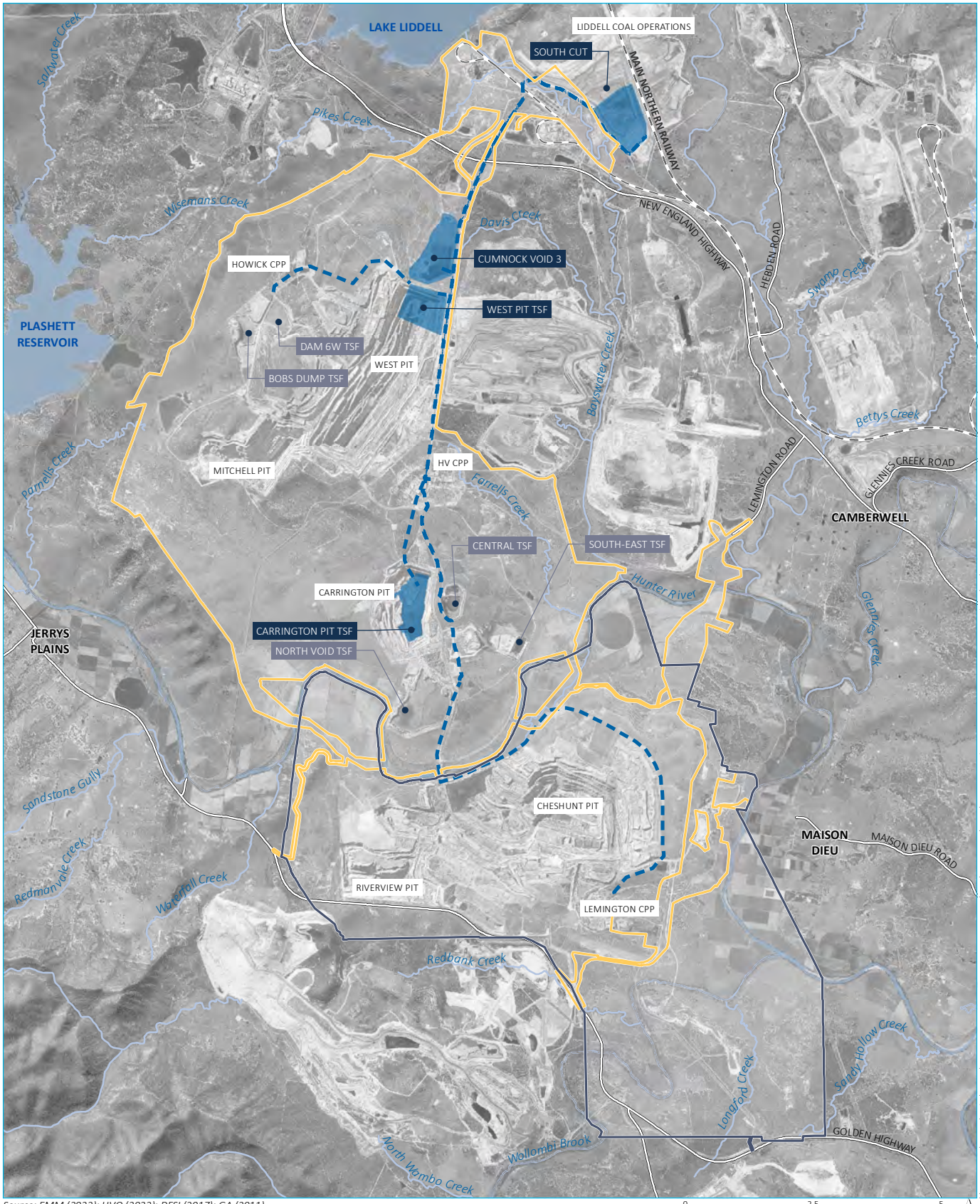
The TSF in West Pit is anticipated to be relied upon for the life of the Project. The proposed capping and rehabilitation of the West Pit TSF (and other TSF's to be utilised by the Project) is described in Chapter 21 (rehabilitation and closure).

### iii Liddell Coal Operation's South Cut void

Disposal of additional tailings from the Project is proposed in the neighbouring LCO South Cut void, immediately north of the New England Highway and HVO North. The commercial arrangements between HVO and LCO for this activity will be the subject of an agreement between the two mines. A current application to modify the LCO development consent (DA 305-11-01 MOD 8) seeks to allow the receipt of tailings at LCO from nearby mining operations and for the South Cut void to operate as a multi-user tailings facility. The emplacement of HVO tailings in the South Cut void will have a number of benefits, including the beneficial use of an existing open cut void by effectively utilising the storage capacity of this void, and avoiding the establishment of an additional TSF at HVO. A further benefit of utilising LCO's South Cut void is that it reduces the number of voids in the local area. This proposed modification is currently in progress within the NSW planning system.

The indicative pipeline route to LCO is shown in Figure 4.11.

LCO's South Cut void is bounded on three side by highwalls and on the western face by dumped mine spoil. HVO will utilise the LCO void for tailings storage as approved by the LCO consent conditions.




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*Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011)*

0 2.5 5 km

GDA2020 MGA Zone 56

N

KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Proposed tailings storage facility
- Conceptual tailings pipeline

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

Tailings storage facilities

HVO Continuation Project
Environmental Impact Statement
Figure 4.11

EMM creating opportunities

### 4.4.5 Mine support infrastructure

#### i Summary of construction activities

A summary of the construction activities required to support the Project are listed below, generally in the order of construction (noting some will occur concurrently) and are described in more detail in the following sub-sections.

- Lemington Road realignment – Realignment of a section of Lemington Road, construction of a new bridge over the Hunter River, and closure of a portion of the existing road (refer to Figure 4.2 and Figure 4.12).
- Site access – Construction of a new site access road to the HVO North MIA from the road that is currently Lemington Road (Figure 4.1).
- Electricity and telecommunications – Decommissioning and realignment of transmission and telecommunications lines (Figure 4.1 and Figure 4.10).
- MIA upgrades – HVO MIA upgrade (Figure 4.1).
- Newdell LP and HVLP – Upgrade of the Newdell LP and train loading facility and construction of a new product stockpile at the facility, or an extension to the HVLP product coal stockpile (Figure 4.1).
- Water management – Water management system upgrades (Figure 4.1 and Figure 4.14), including flood protection levees and enlargement of Parnells Dam and Lake James.
- Ravensworth Operations haul road – Haul road crossing to Ravensworth Operations including an overpass over the mine access road that is currently Lemington Road.
- Material recovery – Recovery of suitable materials from operational areas, such as gravel, and transported via HVO internal haul roads and public roads to support construction activities as required.
- Waste disposal – Disposal or re-use of inert construction waste, such as concrete, bitumen and fill. Disposal at an appropriate depth within emplacement areas across the HVO complex and Ravensworth Operations. Construction waste will be transported via HVO internal haul roads and public roads. Re-use on internal roads or hardstand areas.

Construction activities will also require the establishment and use of a range of temporary facilities to support construction, such as demountable buildings, car parking and laydown areas.

Further to the above, other upgrades and installation of infrastructure may be required from time to time, such as, but not limited to, upgrades to CPPs and associated infrastructure, site services (including electricity distribution), and the water management system. All works will be undertaken within the Project disturbance area.

Construction activities will generally be undertaken within standard construction hours (Monday to Friday 7.00 am to 6.00 pm, Saturday 8.00 am to 1.00 pm and no work on Sundays or public holidays). However, some out of hours work may be required from time to time. As described in the noise assessment for the Project (EMM 2022c), if this occurs, activities will be managed such that operational noise criteria are met.

The construction program proposed for the Project is scheduled to extend up to five years, and subject to approval it is expected to commence from Year 1 of the Project, which in this EIS is anticipated to be approximately mid-2023 subject to timing of approval.

The peak construction activities are anticipated to occur in approximately Year 2 where several works will overlap. This period also represents the peak number of construction workers required on-site.

### ii Lemington Road realignment

The current Lemington Road alignment passes between the West/Mitchell Pits and the Carrington area at HVO North. As this area is proposed to be mined, the Project seeks to realign part of Lemington Road to the east of the HVO Complex, linking the existing Comleroi Road in the south with the existing Lemington Road in the north approximately 2.3 km south of the New England Highway, as shown in Figure 4.12.

The Lemington Road realignment presents an opportunity to improve the accessibility and reliability of the road as the primary access point joining the Golden Highway and New England Highway between Singleton and Muswellbrook. The realigned road includes the construction of a new bridge over the Hunter River (refer to Figure 4.12), which will be constructed to meet the requirements of a 1 in 10 ARI flood protection design. This design will provide improved accessibility and safety outcomes in comparison to the existing Moses Crossing, which is a low-level bridge across the Hunter River at the southern end of the existing Lemington Road. River level data indicates Moses Crossing has been underwater for a total of more than seven months since 2010; however, the proposed new bridge would have been accessible throughout the same period, including during the recent extreme rainfall events.

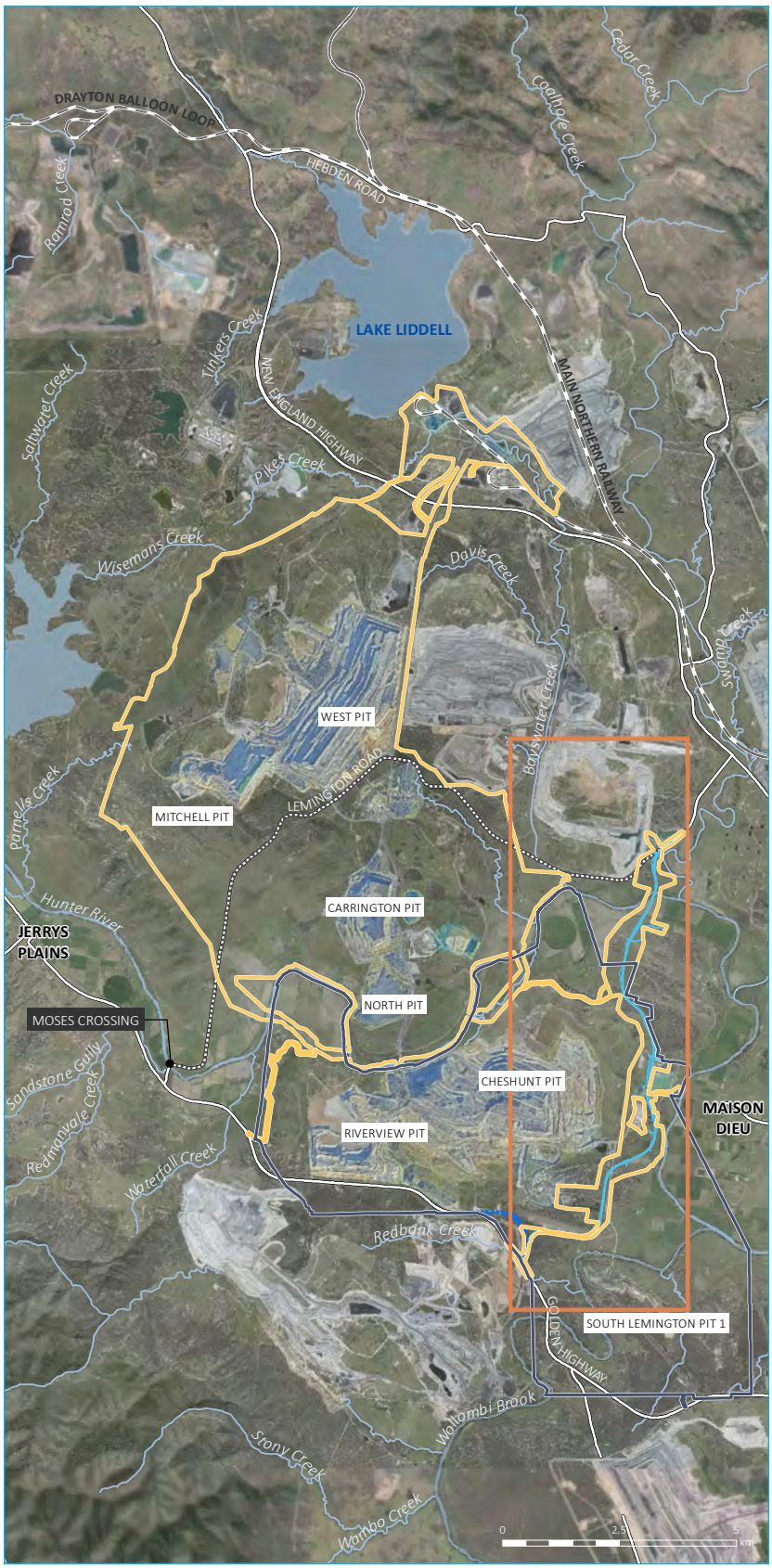
The existing Lemington Road will be kept open and serviceable until the new alignment is completed. Disruption to traffic using the existing road will be minimal and associated with the tie-in works north of the Hunter River and haulage of material over Lemington Road to Ravensworth Operations. Disruption will be scheduled to minimise travel time impacts during the morning and afternoon peak periods. The existing Comleroi Road will be upgraded and widened to the same standard as the rest of Lemington Road. There will be some temporary disruption to Comleroi Road traffic during construction to allow for these works.

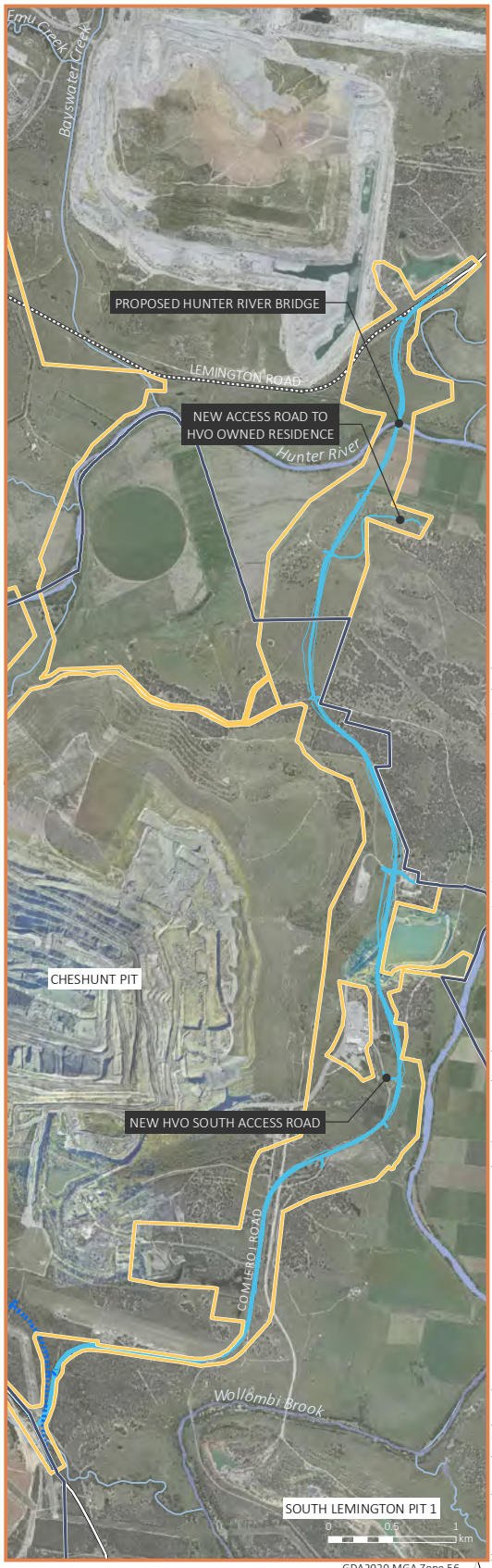
Access to HVO South MIA facilities will be maintained with a new intersection from the proposed Lemington Road. Access to an existing mine-owned property east of the proposed realignment will be provided. The existing Lemington Road from the new tie-in point through to the Ravensworth Operations mine access intersection and the HVO North MIA will be maintained as a private mine access road to the two operations. The intersection with the Golden Highway, including Moses Crossing, will be maintained as service providers require access via the river crossing to their respective assets in the area.

The proposed changes to Lemington Road and the local road network are not anticipated to require changes to the existing New England Highway intersection. The realignment will provide the opportunity to upgrade the intersection at Comleroi Road with the Golden Highway. The intersection design will cater for either the current Golden Highway alignment or the realignment as approved under the United Wambo JV project as necessary.

All works undertaken to either upgrade or construct roads, including the construction of the bridge over the Hunter River, will be undertaken in accordance with contemporary Australian road design standards. The disturbance associated with the road construction includes allowances for associated construction activities required for the development of the new road and areas subject to upgrades, including but not limited to, stockpiles, erosion and sediment control, access tracks, laydown areas, administration facilities, general amenities, temporary construction river crossings, temporary river flow diversions and equipment and workforce parking. Where possible these have been located within the existing and approved disturbance area.

The proposed new alignment of Lemington Road has been carefully considered to avoid areas of environmental sensitivity, including the presence of Warkworth Sands Woodland and Central Hunter Grey Box-Ironbark Woodland (both listed under the BC Act), and to minimise the potential for changes to travel time to local road users. Alternative routes considered for the Lemington Road realignment, and justification of the preferred path, are documented in Appendix D.




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*Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011)*

GDA2020 MGA Zone 56

N

KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Proposed Lemington Road realignment
- Indicative location of public road closure
- Alternate Golden Highway alignment (as per United Wambo Joint Venture - SSD 7142)

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

# Lemington Road realignment

HVO Continuation Project
Environmental Impact Statement
Figure 4.12

EMM creating opportunities

South Lemington Pit 1 and the adjacent borrow pit will require backfilling and rehabilitation in two stages throughout the Project. To facilitate this some mining equipment may need to be traversed across the proposed Lemington Road to access this work area. When access is required, appropriate traffic controls will be implemented in consultation with Singleton Council.

### iii Site access

The progression of mining at HVO North will mine through the existing access road to the HVO North MIA from what is currently Lemington Road. The access road will be moved east of the current location in proximity to the existing HVO North overland conveyor. The access road will be a sealed road suitable for light and heavy vehicle movements, as per the existing access road. As shown in the indicative Project stage plans (Figure 4.5 to Figure 4.9) the access road is required to be relocated early in the Project to avoid interaction with planned mining activities in the West Pit area.

Ravensworth Operations is currently undertaking works to relocate their mine access road in line with their development consent. Both the current access road and the future access road for Ravensworth Operations are private roads, accessed from what is currently Lemington Road but will become a private access road under the Project. Existing access arrangements to HVO mining infrastructure will be maintained, which includes occasional temporary access via existing minor entrances.

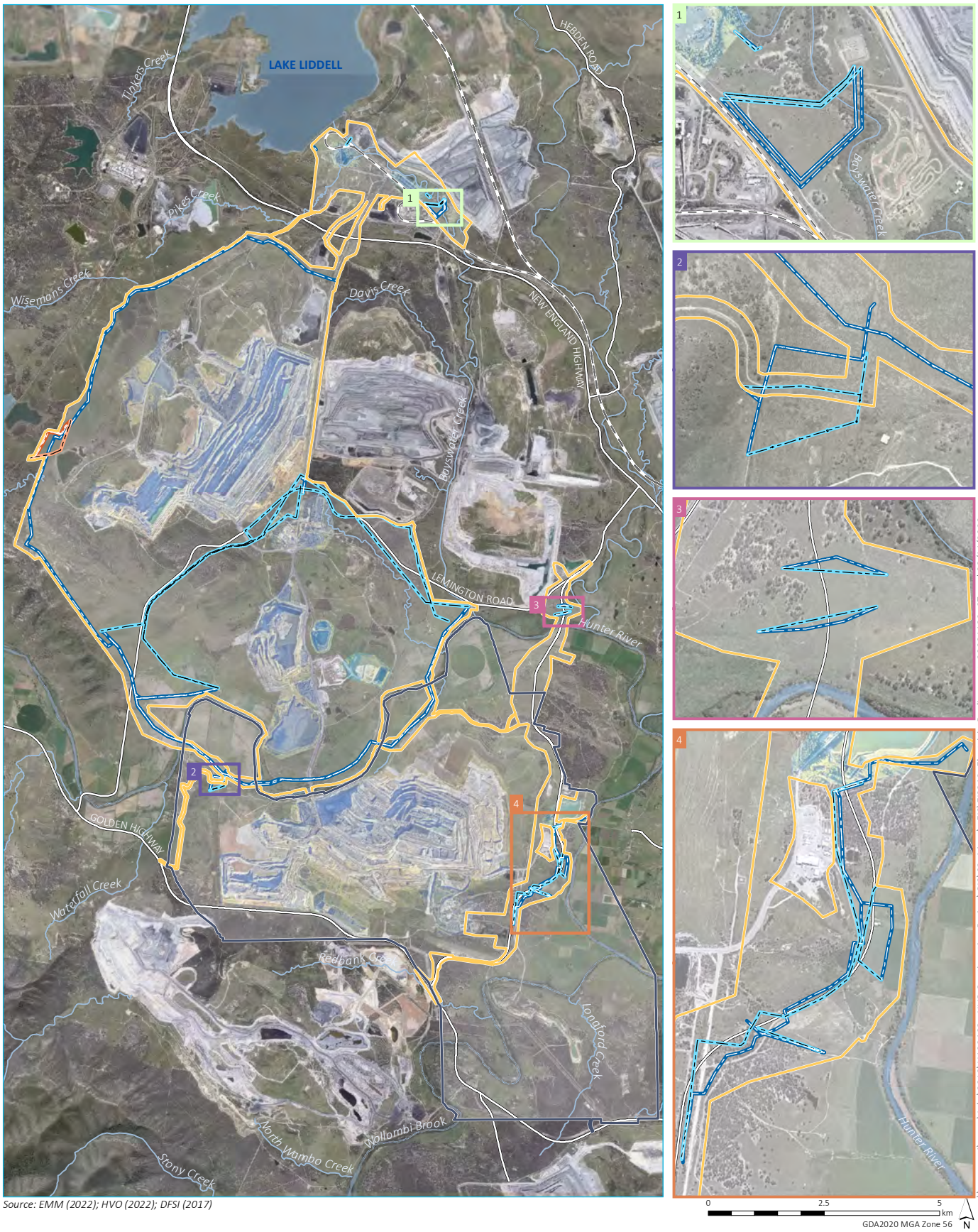
### iv Electricity and telecommunications

The Project requires the realignment of a range of electrical transmission lines, communication infrastructure assets and associated services within the proposed mining area to avoid interaction with proposed activities at HVO North. Services to be relocated include, but are not limited to, sections of Ausgrid's 132 kV, 66 kV, 33k V and 11 kV transmission infrastructure, as well as 33 kV transmission lines owned by AGL, and some Telstra owned telecommunication lines. Internal HVO owned electricity and telecommunication infrastructure will also need to be relocated. New maintenance and service accesses to realigned electricity and communication infrastructure will also be established to avoid interaction with mining activities where possible.

As a result of consultation with the infrastructure owners, the transmission and telecommunication infrastructure requiring relocation and not owned by HVO are included as part of the Project, and therefore sit within the Project disturbance area. The realignment works will be completed with agreement with the relative asset owners.

The proposed transmission line realignment paths are illustrated in Figure 4.13, with disturbance for other electrical and telecommunication infrastructure included within the Project area. As outlined in Table 4.1, the extent of disturbance associated with the new transmission lines and associated establishment of easements will be limited to transmission line pole pads and an access road for maintenance along the alignment, as well as vegetation management to maintain safe powerline clearance. The disturbance associated with decommissioning existing transmission line easements will be confined to existing access tracks and cleared areas.

As part of Project planning, the preferred realignments of services to be relocated has been carefully considered to avoid areas of environmental sensitivity as much as possible and to avoid disruption to electricity and communications distribution. Appendix D documents alternatives considered with respect to electricity and telecommunication infrastructure and details the justification of the preferred realignment paths proposed by the Project and shown in Figure 4.13.




Source: EMM (2022); HVO (2022); DFSI (2017)

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## KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Lemington Road realignment

Electricity transmission line

- Ausgrid - new
- Ausgrid - to be removed
- AGL - new
- AGL - to be removed

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

# Electricity and telecommunication realignment

HVO Continuation Project
Environmental Impact Statement
Figure 4.13

EMM
creating opportunities

### v MIA upgrades

Upgrades are proposed to the HVO North MIA to provide the necessary support for the continuation of mining activities. Proposed improvements to the HVO North MIA include the upgrade of existing and construction of new facilities as required, including the following key items:

- an extension to the existing heavy mobile equipment workshop;
- additional administration buildings;
- car park extensions and associated access roads;
- upgraded and additional bathhouse and washroom facilities inclusive of sewerage services;
- upgraded or changed access roads, electricity, communications and water infrastructure; and
- use of demountable/temporary buildings in construction compounds or for ongoing use as required.

Upgrades to existing or construction of new infrastructure at the HVO North MIA, as described above, will generally be located within the established HVO North MIA area. These upgrades and relocations are required to:

- improve existing aged facilities;
- cater for mine progression; and
- enable optimisation of infrastructure relative to active mining areas.

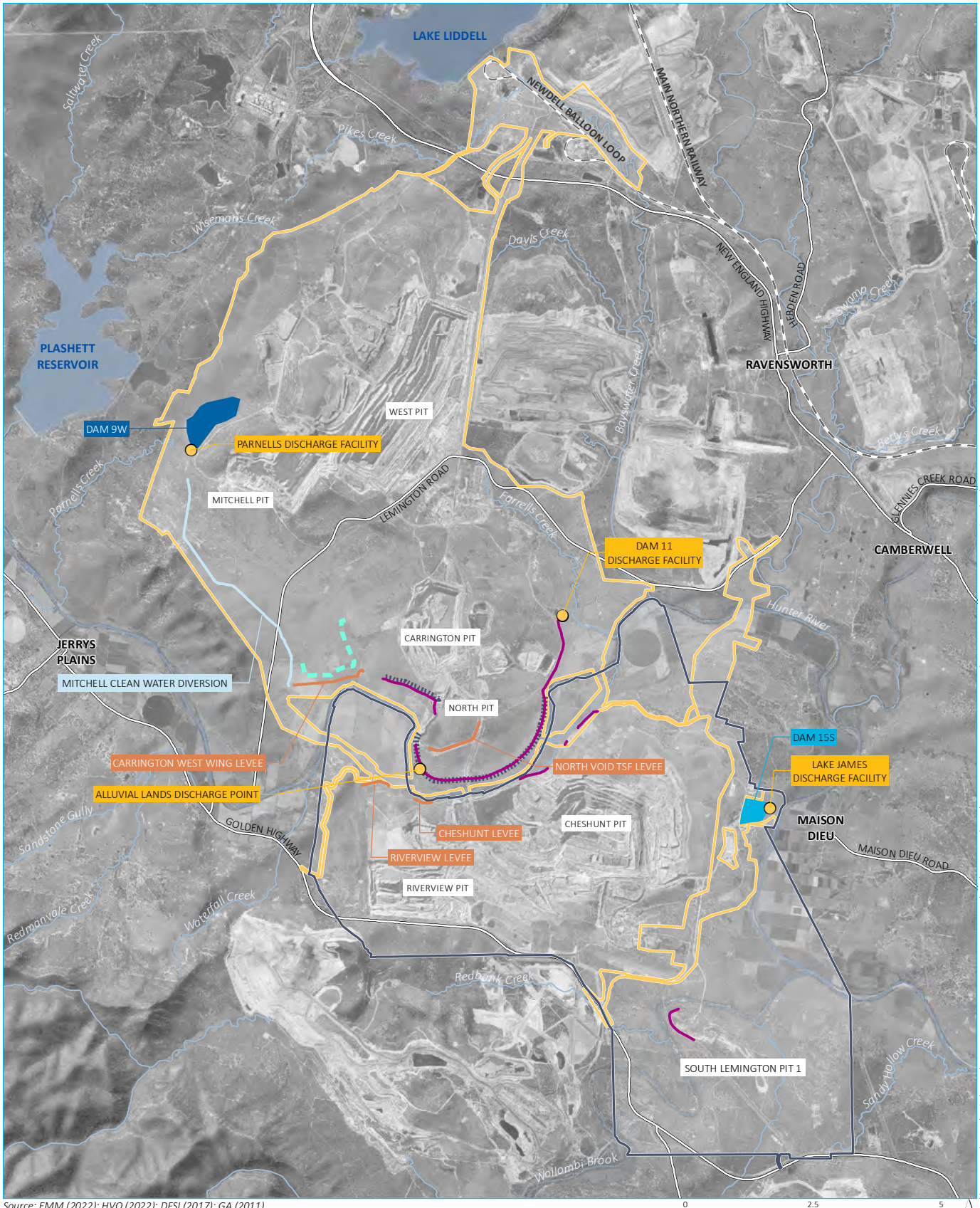
### vi Water management

An integrated water management system is in place across HVO North and South. The Project will continue the use of the existing integrated water management system, which includes water transfers to and from surrounding operations, while incorporating the following upgrades to facilitate the Project:

- construction of the North Void TSF flood protection levee up to 1,000 year ARI;
- additional mine water/sediment dams as required for progression of mining operations and construction activities;
- installation of new groundwater monitoring bores as required to inform ongoing mining operations;
- clean water diversions as required, as mining progresses, including the Mitchell clean water diversion;
- increase in the capacity of Parnells Dam from approximately 1.0 GL to approximately 4.0 GL, including construction of a new spillway and refurbishment of the existing HRSTS discharge facility (noting that changes to the EPL or HRSTS approvals and associated limits are not proposed); and
- Carrington West Wing flood protection levee construction (up to 1,000 year ARI).

The installation and maintenance of water supply works and works on waterfront land will also continue as required to maintain the water management system and associated infrastructure, such as works associated with debris removal around bridge and other instream structures, erosion and sediment control works and monitoring equipment installation and maintenance.

The existing HVO water management system and proposed Project upgrades are illustrated in Figure 4.14.




*Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011)*

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## KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- HRSTS discharge facility
- Existing levee
- Existing low permeability barrier wall

**Water management infrastructure upgrade**

- Clean water diversion
- Levee
- Low permeability barrier wall
- Lake James capacity increase
- Parnells Dam capacity increase

**Existing environment**

- Rail line
- Major road
- Named watercourse
- Named waterbody

# Water management infrastructure upgrades

HVO Continuation Project
Environmental Impact Statement
Figure 4.14

EMM
creating opportunities

### vii Temporary Hunter River crossings

As mentioned in Table 3.1 and Table 4.2, HVO has approval for temporary crossings of the Hunter River for equipment too heavy for the existing bridge. This is in accordance with condition 29 of DA 450-10-2003 for HVO North.

HVO proposes to relinquish this condition as part of the Project. This will avoid re-disturbance of approximately 1 ha of land immediately upstream of the existing Hunter River bridge which has been rehabilitated following previous temporary crossing use. The permanent bridge across the Hunter River, which is integral to operations across the HVO Complex, will remain and be maintained throughout the life of the project.

### viii Ravensworth Operations haul road

The Project seeks to construct a haul road from the HVCPP to the Ravensworth Operations ROM pad, as shown in Figure 4.1, to enable the transport of ROM coal from HVO North to Ravensworth Operations for processing in the Ravensworth CPP.

The haul road includes an overpass over the existing Lemington Road alignment and will be appropriate for both road registered and off-highway vehicles.

### ix Material recovery

Suitable material to support construction activities is known to occur within the mining area of the Project, gravels and other materials are regularly intersected by existing operations. To maximise the beneficial use of these materials, approval is sought to recover and utilise suitable construction materials where available. Materials are proposed to be used in relevant construction activities or as required by ongoing operations.

Material sourced is proposed to be transported where required via internal haul road and public roads.

### x Waste disposal

Inert waste produced by HVO, for which a beneficial use or reuse has not been identified, is proposed to be disposed of within appropriate emplacement areas across the complex. Potential waste is anticipated to include concrete, bitumen and inert materials produced by Project construction and operational activities. Waste will be managed appropriately, by means of being buried at an appropriate depth to minimise interaction with future potential land uses, and relevant approvals under the POEO Act will be sought prior to disposal. Where a use is identified for inert waste, the waste will be stockpiled within the Project disturbance area prior to re-use onsite as required.

Waste material is proposed to be transported where required via internal haul roads and public roads.

As is currently approved, the disposal of tyres within overburden emplacement areas is proposed to continue for the Project. In addition to the disposal of tyres, the Project seeks to include conveyor belt as an approved waste item. In the event it cannot be re-used or recycled, conveyor belt will be disposed of within emplacement areas as required in accordance with current tyre disposal management practices. Drilling waste will also be disposed of within TSFs or voids if required. All other waste streams will be disposed of as required at appropriately licensed facilities.

Further discussion on waste management is provided in Chapter 25.

### 4.4.6 Rehabilitation and closure

#### i Rehabilitation and final landform

Advances in rehabilitation techniques and landform technology provide an opportunity for the Project to incorporate improved contemporary natural landform design principles into the proposed final landform of areas to be disturbed by the Project.

Progressive rehabilitation is undertaken at HVO as areas disturbed by mining activities become available, with a mixture of pasture and native habitat (woodland) areas established across mined areas. In accordance with the existing development consent and Rehabilitation Management Plan, traditional engineering landform design principles are applied in the construction of final landforms at HVO North. As such, areas of HVO North which have been shaped to the approved final landform include engineered structures to drain water off the landform via contour drains and rock lined chutes.

For the Project, contemporary natural landform design principles will be applied. Areas disturbed by mining activities as a result of the Project will reflect a landform sympathetic to the surrounding landscape and incorporates micro-relief features. The conceptual landform has been designed using landform design software which produces stable final landforms that are relatively 'natural' looking.

Areas which are rehabilitated and do not require disturbance for the Project, or where rehabilitation is largely progressed or currently underway, will be rehabilitated consistent with existing approvals, as re-disturbance of these areas would cause more impacts than benefits relating to bulk material movement. Ongoing monitoring of these areas against established completion criteria will continue under the Project. The proposed final landform for the Project reflects the currently approved final landform in these areas.

Consistent with existing operations, progressive rehabilitation of mined areas will continue throughout the mine life, generally consistent with the indicative staged mine plans presented in Figure 4.5 to Figure 4.9. Rehabilitation will include the decommissioning and removal of infrastructure not required to support the final land use (anticipated to be a mixture of agriculture and native ecosystem), and the reshaping and revegetation of disturbed areas to establish a mixture of native vegetation and open grassland areas with a pit lake associated with the HVO North final void. Material required to rehabilitate the Cumnock Void 3 TSF is proposed to be sourced from HVO North also in accordance with the indicative stage plans. Further, it is noted temporary stabilisation activities may occur throughout the mine life in discrete areas which may not be subject to final rehabilitation for extended periods of time due to operational constraints.

The proposed HVO North final landform is shown in Figure 4.15 with further detail regarding rehabilitation and closure provided in Chapter 21 and Appendix T.

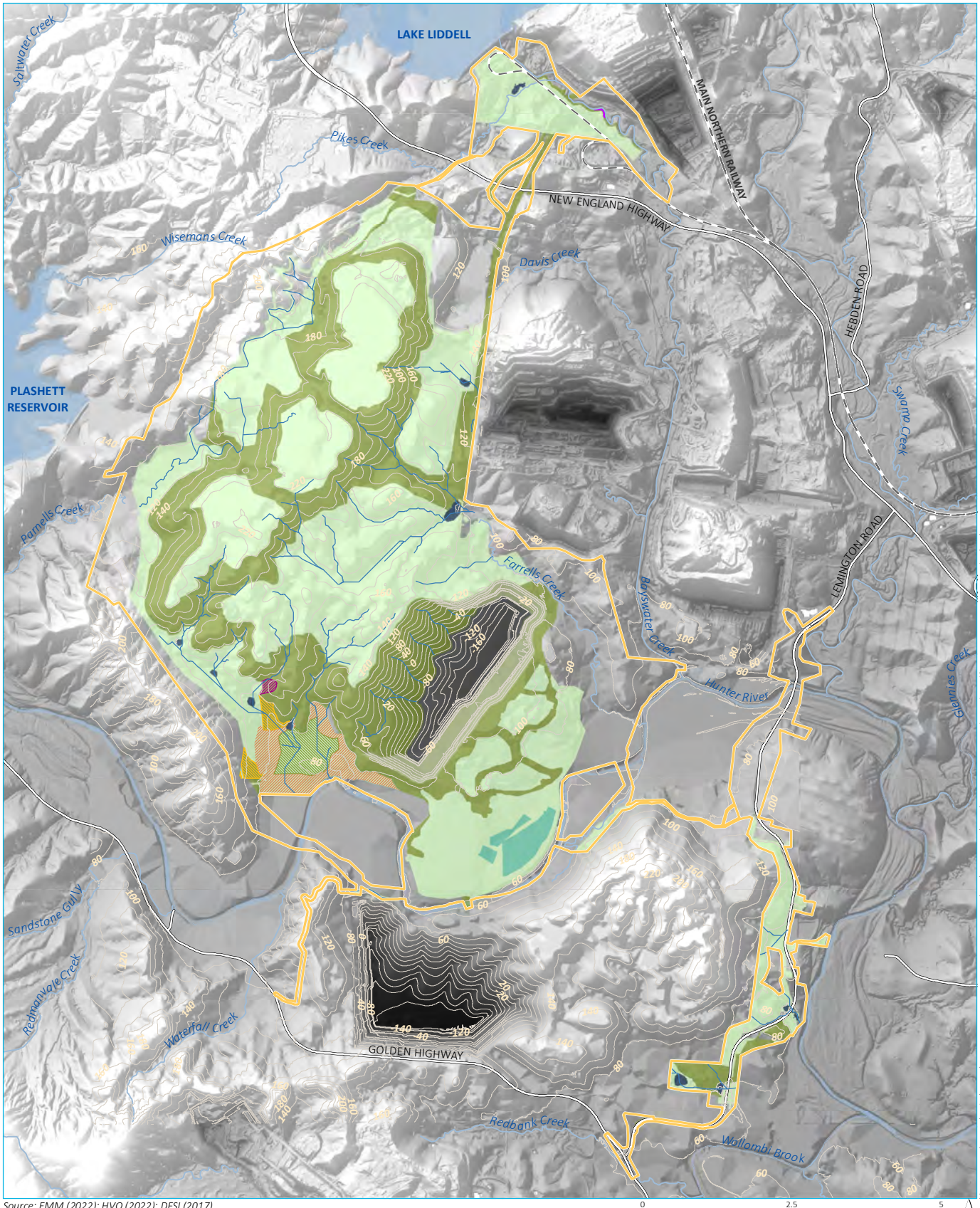
Final rehabilitation and Project closure requirements will ultimately be developed as part of a detailed closure plan, which will be produced prior to planned closure in consideration of input from key government agencies and relevant stakeholders at the time. Further, rehabilitation objectives will be reviewed throughout the life of the Project in response to stakeholder consultation and to maintain consistency with final land use objectives of the regional area as may change over time, for example as currently identified within the *Draft Hunter Regional Plan 2041* (DPE 2021b).

#### ii Final void

The final landform that is currently approved at HVO North includes three final voids, one in West Pit, one in Mitchell Pit and one in Carrington Pit (refer to Figure 3.8).

The Project will reduce the number of final voids that will remain post-mining at HVO North, from the three approved to a single void within the Carrington area, as shown in Figure 4.15. The final void is predicted to be a long-term sink in which no water is expected to be released from the void to the receiving environment. A discussion on the predicted final void water level and quality is provided in Chapter 12 and Engeny (2022).

In terms of use, the conceptual rehabilitation and closure strategy for the Project identifies the final void as a pit lake; however, the void has been designed so that other potential beneficial uses of the void have not been precluded, as discussed further in Chapter 21 and in detail in Appendix T. As described, significant work has been undertaken in determining the number of voids and the location, shape and size of the final void for which approval is sought, incorporating feedback from stakeholders during the development of this EIS. A detailed assessment of alternatives considered for the final void is provided in Appendix D.




Source: EMM (2022); HVO (2022); DFSI (2017)

0 2.5 5 km

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## KEY

HVO North proposed development consent boundary

Predicted 20 m contour

Predicted drainage

Existing environment

Rail line

Major road

Named watercourse

Named waterbody

Final land use domain

Domain A | Native ecosystem

Domain A | Native ecosystem (partial revegetation)

Domain B | Agriculture (grazing)

Domain C | Agriculture (alluvial land)

Domain F | Water management area

Domain J | Pit lake

Existing commitments maintained by the Project (indicative location)

Class 2 - DA 450-10-2003 MOD3

Class 3 - DA 450-10-2003 MOD3

Class 4 - DA 450-10-2003 MOD3

Central Hunter Box-Ironbark Woodland - DA 450-10-2003 MOD3

Swamp Oak Floodplain Forest - DA 450-10-2003 MOD5

# HVO North conceptual final landform

HVO Continuation Project
Environmental Impact Statement
Figure 4.15

EMM creating opportunities

## 4.5 HVO South Continuation Project

### 4.5.1 Summary of key elements

The key Project elements at HVO South for which approval is sought are summarised in Table 4.2, and are discussed in more detail in the sections below. Other than as set out in the table as a summary of the Project, all activities that are currently approved under the existing HVO South approval are intended to continue.

**Table 4.2 HVO South – key Project elements**

| Project element | Existing approved operations | Summary of the changes proposed by the Project |
|---|---|---|
| Project area | • Project approval boundary as shown in Figure 4.4. | Changes to the development consent boundary are proposed, primarily on the northern side of the Hunter River to reflect removal of the approval to construct a conveyor from HVO South to the HVCPP. Other small changes are proposed to the consent boundary, primarily to align with cadastral boundaries inclusive of neighbouring MTW offset areas. |
| Mining method | • Open cut mining operation, primarily using truck and shovel.<br>• Highwall mining, including auger mining and dragline, is also approved.<br>• Blasting – 7.00 am to 6.00 pm Monday to Saturday inclusive (except public holidays) to a maximum of 3 blasts per day and 15 blasts per week. | No change. |
| Resource | • Extraction to base of the Bayswater Seam in Riverview and Cheshunt Pits.<br>• Extraction to the base of the Bowfield Seam in South Lemington Pit 1.<br>• Extraction to base of Vaux Seam in South Lemington Pit 2.<br>• Extraction to base of Vaux Seam in Riverview South East Extension area. | Progression of mining generally as illustrated in the indicative staged mine plans in Figure 4.5 to Figure 4.9. Extraction of the coal resource will comprise:<br>• Continuation of coal extraction to base of the Bayswater Seam in Riverview and Cheshunt Pits.<br>• Coal extraction in South Lemington Pit 1, South Lemington Pit 2 and the Riverview South East Extension area is no longer proposed. |
| Disturbance area | • Existing and approved disturbance of approximately 3,242 ha. | • Net reduction in disturbance area associated with HVO South of approximately 173 ha; consistent with coal extraction in South Lemington Pit 1, South Lemington Pit 2 and the Riverview South East Extension area and the short rail loop option no longer being proposed. It also noted that 46 ha of this 173 ha is within the UWJV approved disturbance area.<br>• Additional disturbance area of approximately 54.9 ha, providing a net reduction in the disturbance area of 118.1 ha (or 72.1 ha, accounting for the overlapping UWJV approved disturbance area). |

**Table 4.2 HVO South – key Project elements**

| Project element | Existing approved operations | Summary of the changes proposed by the Project |
|---|---|---|
| Annual production | • Up to 20 Mtpa of ROM coal. | • Reduction in the annual ROM coal extraction rate. Approval is sought for the extraction of up to 18 Mtpa of ROM coal. |
| Mine life | • Operations are approved until 24 March 2030. | • Mining operations at HVO South until the end of 2045. |
| Total resource recovery | • 16 Mtpa ROM coal approved in 2008 for 20 years – total of 320 Mt. | Approximately 210 Mt ROM coal over the Project life from Year 1. |
| Beneficiation | • Construction and use of the LCPP (up to 16 Mtpa).<br>• ROM/product coal may be transported from all HVO South pits via internal haul road to all CPPs within HVO (HVCPP, Howick CPP, Newdell CPP and LCPP) for processing (up to 20 Mtpa).<br>• ROM coal from HVO South can also be transported via overland conveyor to HVCPP. | • No transport of ROM coal from HVO South via overland conveyor to HVCPP (ie approval for this conveyor will not be retained).<br>• Ongoing use of temporary coal stockpiles assembled within the Project disturbance footprint prior to processing or transport.<br>• No change to processing limits. |
| Management of mining waste – overburden emplacement | • Ability to dispose of overburden within all pits and out-of-pit emplacement areas across HVO.<br>• Maximum overburden emplacement area height of approximately 240 m AHD. | • No change. |
| Management of mining waste – coarse reject | • Ability to emplace coarse rejects within overburden emplacement areas across HVO. | • No change. |
| Management of mining waste – tailings | • Integrated tailings management with HVO North with emplacement of tailings within approved tailings storage facilities at HVO. | • LCPP tailings management will be integrated with HVO North when the LCPP is constructed.<br>• Removal, relocation and/or reprocessing of tailings from historic TSFs as required. |
| General infrastructure | • HVO South MIA.<br>• Maintenance and ancillary infrastructure required to facilitate operations.<br>• Wollombi Brook bridge and low level crossing.<br>• Operation of an Ammonium Nitrate Emulsion Plant (ANEP). | • Relocation of some 11 kV and 66 kV Ausgrid transmission lines.<br>• Realignment of internal transmission lines to support mining activities.<br>• Access roads to facilitate service provider access.<br>• Use of demountable/temporary buildings and other ancillary temporary facilities including laydown areas to enable construction activities and mining operations as required. |

## Table 4.2 HVO South – key Project elements

| Project element | Existing approved operations | Summary of the changes proposed by the Project |
|---|---|---|
| Product transport | • Transport product coal by truck or overland conveyor from all CPPs to all loading points (HVLP, Newdell LP and Lemington LP and adjacent to the short rail loop south of South Lemington Pit 1).<br>• Transfer of product coal to Wambo rail spur via either a rail spur and loop, overland conveyor, trucks or any combination.<br>• Construction of a coal loader and new rail loop adjacent to the LCPP. The loop and associated rail line would connect to the Wambo rail spur.<br>• Construction of a conveyor that would be utilised to transport coal via a new loop as described above. The conveyor would be constructed adjacent to the existing haul road described above. | • Only the construction of the long rail loop and coal loader adjacent to the LCPP will be retained as an option for LCPP. Approval for the short rail loop option will not be retained. |
| Rehabilitation | • Progressive rehabilitation.<br>• Final landform as approved, including some areas incorporating natural landform designs principles supporting final land use objectives including agriculture and native habitat. | • Some changes to the final landform design due to rescheduling and or infrastructure relocations. |
| Final void | • One final void in Riverview Pit.<br>• South Lemington Pit 1 void, South Lemington Pit 2 void and the Ravensworth South East Extension to be filled in and rehabilitated. | • Some change to the final void catchment and dimensions due to rescheduling, noting no change to the final void number or general location; ie one void to remain in Riverview Pit.<br>• South Lemington Pit 1 void and neighbouring strip 1 and strip 2 borrow pit to be filled with overburden material sourced from adjacent out of pit dump. |
| Water management | • Water supply works including pumps and bores.<br>• Integrated water management with HVO North.<br>• Water discharges in accordance with HRSTS.<br>• Transfer of water between HVO North, MTW and Wambo.<br>• Existing and approved flood protection levees.<br>• Construct additional bores (and associated infrastructure) at three transfer sites and adjacent to the existing LUG Bore to facilitate transfer of water into the former Lemington Underground Mine void and/or extraction of water from the void. | • Continuation of integrated water management with HVO North and water transfers with other mining operations (where permitted under the development consents that apply to those other mining operations).<br>• Construction of Cheshunt and Riverview flood protection levees.<br>• Lake James enlargement (from approximately 0.7 GL to 2.0 GL). |
| Operational workforce | • Approximately 1,500 FTE workers (HVO Complex). | • No change. |

**Table 4.2 HVO South – key Project elements**

| Project element | Existing approved operations | Summary of the changes proposed by the Project |
|---|---|---|
| Construction workforce | • N/A | • Construction workforce of around 600 will be required for the construction of the LCPP and rail loop, although these will not be built until later in the mine life (around Year 13 to Year 15 should future operational requirements and or market conditions deem it necessary). |
| Hours of operation | • Continuous operations, 24 hours per day, seven days per week | • No change. |

### 4.5.2 Mining

#### i Mining methods and equipment

No changes are proposed to current mining methods and equipment at HVO South as described in Chapter 3. Truck and shovel will remain the primary mining method supported by ancillary equipment, with the option of also using a dragline from time to time. Retaining approval for the use of the dragline will maintain flexibility as required for extraction and rehabilitation activities to occur in an efficient manner where required. The ability to recover coal by highwall or auger mining methods will also be retained.

The typical mining fleet that will continue to be used for operations at HVO South includes:

- excavators;
- shovels;
- haul trucks;
- dozers;
- loaders;
- graders;
- drills; and
- water carts.

Fleet numbers and types may vary from time to time throughout the life of the Project. Factors such as technological advances in mining equipment and varying geotechnical properties of the material being mined may require alterations to the composition of the fleet. Where this occurs, noise and dust generating activities will be considered and measures put in place to maintain compliance with conditions of approval and licences.

Ancillary equipment to support mining operations will continue to be relied upon as approved, which may include but is not limited to scrapers, backhoes, service trucks, articulated trucks, mobile cranes, rollers, mulchers, front end loaders, generators, screening/batching plant, water pumps, lighting plants and light vehicles.

#### ii Extraction rate and mine life

The Project will reduce the currently approved maximum annual ROM coal extraction rate of up to 20 Mtpa of ROM coal to up to 18 Mtpa of ROM coal. Reflective of the reduced extraction rate, the life of mining activities at HVO South is proposed to be increased by an additional 15 years, from 2030 to the end of 2045.

Further to the reduction in extraction rate, the Project will reduce the footprint of approved coal extraction activities at HVO South, as a result of not proceeding further with the approved Riverview South East Extension, South Lemington Pit 1 and South Lemington Pit 2 mining areas. Limited mining activities have previously been undertaken in the South Lemington Pit 1 and the Riverview South East Extension area; however the South Lemington Pit 2 area remains undisturbed by mining. The changes to the area now proposed to be mined compared to that approved, is outlined in Figure 4.3. Noting that highwall mining activities as currently approved are proposed to be maintained by the Project.

Reflective of changes to the extent of mining and extraction rate, some variations to the approved mine sequencing are proposed. The HVO South proposed mining area is shown in Figure 4.3, with the proposed mine sequencing (reflective of the reduced extraction rate) presented in the indicative Project staged mine plans in Figure 4.5 to Figure 4.9.

Progressive rehabilitation activities will be carried out as mining progresses; however, final rehabilitation activities will be completed following cessation of mining activities at the end of 2045. As per HVO North, it is also noted that ongoing exploration drilling within tenement areas will occur throughout the mine life, to obtain further information regarding resources to be mined, as well as geological and geotechnical information relevant to the mining and construction activities that will be undertaken. Drilling may also be undertaken as required for gas and hydrogeological monitoring and investigations. Exploration drilling cuttings and drilling fluids as part of any exploration drilling program associated with a HVO mining tenement may be disposed of within approved tailings facilities.

### 4.5.3 Coal handling and processing

Consistent with the existing Project Approval, ROM coal extracted at HVO South will continue to be transported to HVO North via haul truck for processing and transport to customers. Notably, approved activities allow for ROM coal to be transported from all HVO South pits via internal haul roads to all CPP's at HVO (HVCPP, Howick CPP, Newdell CPP and LCPP) for processing (up to 20 Mtpa). The current approval also allows the construction of a conveyor to transport ROM coal from HVO South to the HVCPP; however, this conveyor will no longer be constructed as part of the Project as the proposed HVO North mining extension precludes a cost-effective conveyor alignment.

The construction and operation of the LCPP and rail loop connecting to the Wambo rail spur, as shown in Figure 4.3, is also approved although market conditions to date have not necessitated the construction of this infrastructure. The Project will retain approval for construction and operation of the LCPP and long rail loop; however, the short rail loop option will not be retained.

Three options for the transport of coal from the LCPP are currently approved. Option 1, which will be retained by the Project, comprises the construction of a coal loader and new rail loop adjacent to the LCPP. This option involves the connection of the LCPP rail loop and associated rail line spur to the Wambo rail spur, accommodating two trains at any one time. A conveyor is also approved, to transport product coal to the train load out bin. The second option involves the transport of product coal to a shorter rail loop constructed south of South Lemington Pit 1 (short rail loop option). Under this option coal would be trucked to the loop via a haul road adjacent to South Lemington Pit 1. Option 3 involves the construction of a conveyor to transport coal to the short rail loop described in Option 2. To minimise new disturbance, particularly of the Central Hunter Grey Box – Ironbark Woodland EEC, the Project will retain Option 1 only. The LCPP and associated rail infrastructure is proposed to be constructed in approximately Year 13 to Year 15 of the Project, noting this may be brought forward or delayed subject to market conditions or operational need.

Further discussion on the options for coal transport and processing at the LCPP, including justification for the removal of the short rail loop option from the Project, is provided in Appendix D.

To enable the efficient management of ROM coal between HVO South to HVO North, temporary coal stockpile areas may be established in approved disturbance areas as required. The establishment of temporary coal stockpiles will allow the operational flexibility for ROM coal to be held within the HVO South mining area, as required such as during periods of CPP maintenance, without being immediately transported to HVO North or the LCPP for processing.

### 4.5.4 Tailings and reject management

HVO South will maintain an integrated tailings management strategy with HVO North. A discussion on the proposed integrated tailings and reject management strategy for the complex is provided in Section 4.4.4.

Specifically for HVO South, the LCPP will be configured to pump tailings to LCO.

### 4.5.5 Mine support infrastructure

#### i Summary of construction activities

A summary of the construction activities required to support the Project are listed below, generally in the order of construction (noting some will occur concurrently):

- decommissioning and realignment of transmission and telecommunications lines as required;
- water management system upgrades (refer to Figure 4.14);
- new HVO South MIA access road; and
- construction of the LCPP and rail loop in approximately Year 13–15 if market conditions require.

Further to the above, other upgrades and installation of infrastructure may be required from time to time, such as, but not limited to, upgrades to CPPs and associated infrastructure, site services (including electricity distribution), and the water management system. All works will be undertaken within the Project disturbance footprint.

Construction activities will generally be undertaken within standard construction hours (Monday to Friday 7.00 am to 6.00 pm, Saturday 8.00 am to 1.00 pm and no work on Sundays or public holidays). However, some out of hours work may be required from time to time. As described in the noise assessment for the Project (EMM 2022c), if this occurs, activities will be managed such that operational noise criteria are met.

#### ii Electricity and telecommunications

The Project requires the relocation of transmission lines located within the HVO South proposed development consent boundary, including Ausgrid owned 66 kV and 11 kV transmission lines, to avoid interaction with planned infrastructure development. The existing location of the Ausgrid 66 kV and 11 kV transmission lines and proposed relocation paths are displayed in Figure 4.13.

Consistent with HVO North, maintenance and service easements to relocated infrastructure will also be relocated to avoid interaction with mining activities where possible. Appropriate easements been included within the HVO South Project additional disturbance area.

#### iii Water management

As described in Section 4.4.3, an integrated water management system is operated across HVO North and South.

The Project seeks to rely on the existing integrated water management systems, which includes water transfers to and from surrounding operations, while incorporating the following upgrades to facilitate proposed activities:

- construction of the Cheshunt flood protection levee to 1,000 year ARI and the Riverview flood protection levee to provide protection for an Extreme Flood Event;
- increase in the capacity of the Lake James, from 0.7 GL to 2.0 GL; and
- additional mine/dirty water containment dams as required as mining progresses.

The proposed water management structures at HVO South are illustrated on the staged mine plans (Figure 4.5 to Figure 4.9), and proposed upgrades to the HVO water management system are identified in Figure 4.14.

#### iv Ammonium nitrate emulsion facility

HVO currently operates an ANEF for the purposes of manufacturing ammonium nitrate emulsion (ANE) to support blasting activities, which will continue for the Project. This facility provides for manufacturing and storage facilities to a scale required by operations, such that the facility meets all the required industry and regulatory standards (as discussed in Chapter 22). The location of this facility may change from time to time, provided that it is within the Project disturbance area, and meets all the required industry and regulatory requirements, again as discussed in Chapter 22.

#### v Material recovery and waste disposal

Material recovery and waste disposal is proposed at HVO South as per HVO North and described in Sections 4.4.5ix and 4.4.5x. Further discussion on waste management is provided in Chapter 25.

### 4.5.6 Rehabilitation and closure

#### i Rehabilitation and final landform

As described in Section 4.4.6, the Project provides an opportunity to incorporate improved contemporary natural landform design principles into the proposed final landform at the HVO Complex.

Mined areas of HVO South have generally been rehabilitated in accordance with traditional engineering landform design principles, which have been shaped to the approved final landform as per the Rehabilitation Management Plan and PA 06_0261, including contour banks and rock lined drains to facilitate a free draining landform. Modification 5 also included micro-relief into new areas of the final landform at HVO South.

The proposed final landform of areas to be disturbed by the Project has been designed using landform design software which produces stable final landforms that are relatively 'natural' looking. As such, areas disturbed by mining activities by the Project will reflect a sympathetic landform to the surrounding landscape and incorporate micro-relief features.

Areas previously disturbed and not subject of Project activities will be rehabilitated consistent with existing approvals, as rehabilitation activities within these areas are largely complete or currently underway. The final landform for the Project reflects the currently approved final landform in these areas.

Consistent with existing operations, progressive rehabilitation of mined areas will continue throughout the mine life, generally consistent with the indicative staged mine plans presented in Figure 4.5 to Figure 4.9. It is noted that the Project does not seek to change the approved maximum overburden emplacement area height of 240 mAHD. Rehabilitation will include the decommissioning and removal of infrastructure not required to support the final land use (anticipated to be a mixture of grazing/pasture and native woodland areas), and the reshaping and revegetation of disturbed areas to establish a mixture of native vegetation and open grassland areas with a pit lake associated with the HVO South final void. The proposed HVO South final landform is shown in Figure 4.16, with further detail regarding rehabilitation and closure provided in Chapter 21 and Appendix T.

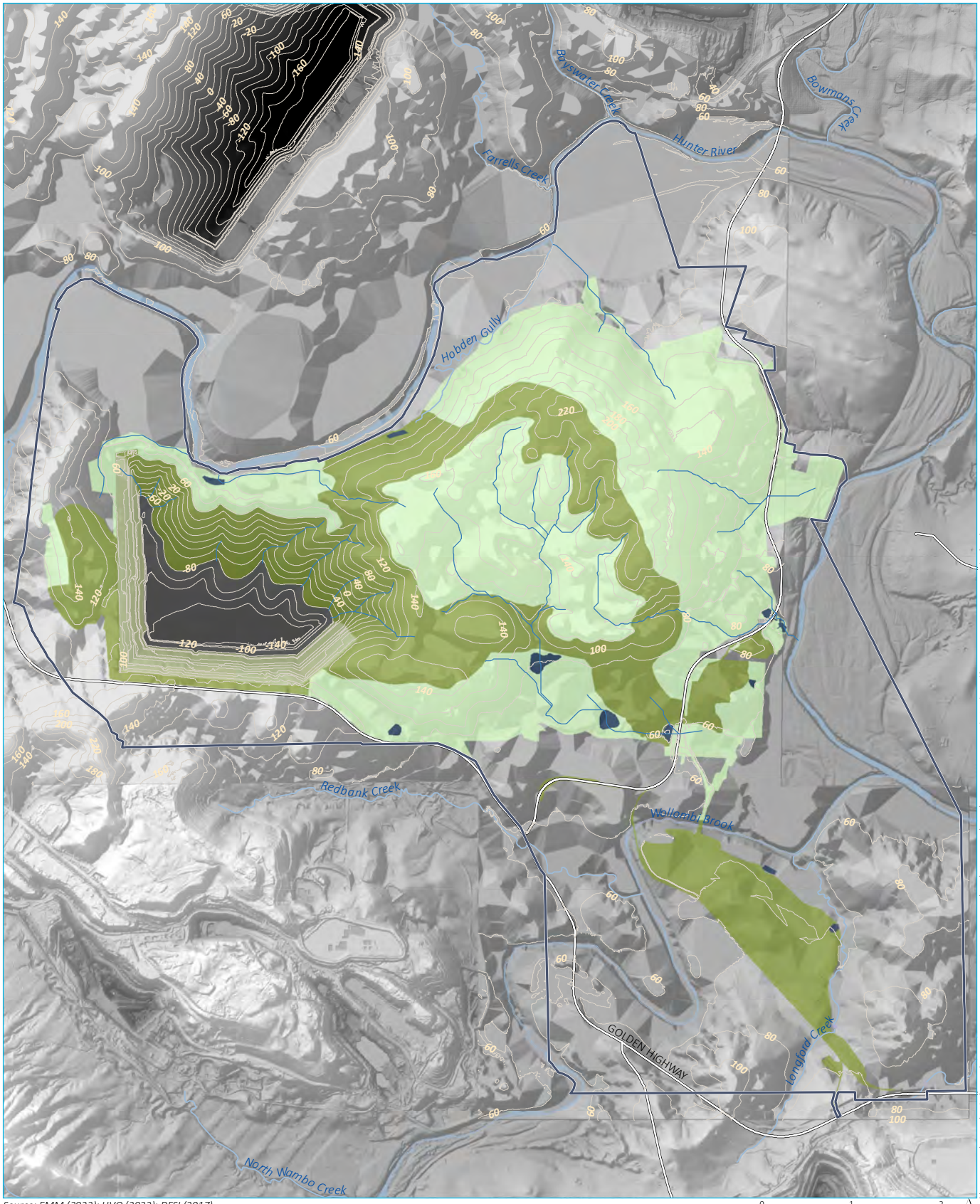
Although the currently approved Riverview South East Extension, South Lemington Pits 1 and 2 are no longer proposed to be mined at HVO South, some disturbance has previously occurred in South Lemington Pit 1 as per the existing Project Approval. Rehabilitation of this area will therefore be undertaken as part of the Project, as described further in the rehabilitation and closure strategy (refer to Chapter 21 and Appendix T). Both the South Lemington Pit 1 void, and the strip 1 and strip 2 borrow pit located to the west of South Lemington Pit 1, will be filled with overburden from the adjacent stockpiled material.

Final rehabilitation and Project closure requirements will ultimately be developed as part of a detailed closure plan, which will be produced within five years of closure in consideration of input from key government agencies and relevant stakeholders at the time. Further, rehabilitation objectives will be reviewed throughout the life of the Project in response to stakeholder consultation and to maintain consistency with final land use objectives of the regional area as may change over time, for example as currently identified within the *Draft Hunter Regional Plan 2041* (DPE 2021b).

### ii Final void

Consistent with the current Project Approval, one final void will remain at HVO South, in the south-western corner of Riverview Pit. The proposed final void dimensions will be smaller than currently approved due to mine sequencing refinement and infrastructure relocation.

In terms of use, the conceptual rehabilitation and closure strategy for the Project identifies the final void as a pit lake; however, the void has been designed so that other potential beneficial uses of the void have not been precluded, as discussed further in Chapter 21 and in detail in Appendix T.




*Source: EMM (2022); HVO (2022); DFSI (2017)*

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## KEY

- HVO South proposed development consent boundary
- Predicted 20 m contour
- Predicted drainage

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

Final land use domain

- Domain A | Native ecosystem
- Domain A | Native ecosystem (partial revegetation)
- Domain B | Agriculture (grazing)
- Domain F | Water management area
- Domain J | Pit lake

# HVO South conceptual final landform

HVO Continuation Project
Environmental Impact Statement
Figure 4.16

EMM creating opportunities

# Part B

## Statutory context

EMM
creating opportunities

# 5 Statutory context

## 5.1 Introduction

This chapter identifies the key relevant statutory requirements for the Project having regard to the EP&A Act, EP&A Regulation, other NSW and Commonwealth legislation, and environmental planning instruments.

This section covers the following:

- permissibility;
- power to grant approval (ie approval pathway);
- other approvals required to carry out the Project;
- pre-conditions to exercising the power to grant approval; and
- mandatory matters for consideration.

This chapter provides a summary of the statutory requirements that are relevant to the assessment and evaluation of the Project only. All relevant statutory requirements, including administrative requirements, are provided in Appendix F.

## 5.2 Application pathway

### 5.2.1 State significant development provisions

Approval is sought for the Project under Part 4, Division 4.7 of the EP&A Act, which specifically relates to the application pathway for SSD. Under Section 4.36 (2) of the EP&A Act, a development is State significant if it is declared to be SSD by any State Environmental Planning Policy (SEPP).

The relevant SEPP which declares the development proposed by the Project to be SSD is *State Environmental Planning Policy (Planning Systems) 2021* (the Planning Systems SEPP). In particular, Section 2.6 of the Planning Systems SEPP states:

> (1) Development is declared to be State significant development for the purposes of the Act if –
>
> (a) the development on the land concerned is, by the operation of an environmental planning instrument, not permissible without development consent under Part 4 of the Act, and
>
> (b) the development is specified in Schedule 1 or 2.

The Project is not permissible without development consent under Part 4 of the Act as detailed in Section 5.3 of this report.

Schedule 1 of the Planning Systems SEPP includes the following development:

> **5 Mining**
>
> (1) Development for the purpose of mining that –
>
> (a) is coal or mineral sands mining, or
>
> (b) is in an environmentally sensitive area of State significance, or
>
> (c) has a capital investment value of more than $30 million.
>
> …

(3) Development for the purpose of mining related works (including primary processing plants or facilities for storage, loading or transporting any mineral, ore or waste material) that –

(a) is ancillary to or an extension of another State significant development project, or

(b) has a capital investment value of more than $30 million.

...

The Project is development for the purpose of coal mining as defined by Schedule 1 of the Planning Systems SEPP. Accordingly, the Project is SSD and is subject to the provisions of Part 4, Division 4.7 of the EP&A Act.

### 5.2.2 Consent authority

Under Section 4.5(a) of the EP&A Act, the consent authority for SSD is either the NSW Independent Planning Commission (IPC) or the NSW Minister for Planning. Pursuant to Section 2.7(1) of the Planning Systems SEPP, the IPC is the consent authority for the following types of SSD (unless the application to carry out the development is made by or on behalf of a public authority or the development is declared to be State significant infrastructure, neither of which is the case for the Project):

(a) development in respect of which the council of the area in which the development is to be carried out has duly made a submission by way of objection under the mandatory requirements for community participation in Schedule 1 to the Act,

(b) development in respect of which at least 50 submissions (other than from a council) have duly been made by way of objection under the mandatory requirements for community participation in Schedule 1 to the Act,

(c) development the subject of a development application made by a person who has disclosed a reportable political donation under section 10.4 to the Act in connection with the development application.

If any of the above matters are met, the Project will be determined by the IPC; otherwise, the Minister for Planning will be the relevant consent authority.

## 5.3 Permissibility

With the exception of a small section in the northern part of the HVO North proposed development consent boundary (which is zoned SP2 Infrastructure) and a small section along the realigned Lemington Road corridor, the Project area is on land zoned RU1 Primary Production in both the *Singleton Local Environmental Plan 2013* (Singleton LEP) and the *Muswellbrook Local Environmental Plan 2009* (Muswellbrook LEP), as shown in Figure 2.3 in Chapter 2. Under the Singleton and Muswellbrook LEPs, development for the purpose of open cut mining is permissible with development consent within this land use zone.

The north-western corner of the HVO North consent boundary (adjacent to Lake Liddell) is zoned SP2 Infrastructure under the Muswellbrook LEP. Minor works related to the relocation of transmission lines are proposed within this SP2 zone as part of the Project. Development for the purposes of mining is prohibited in this zone. However, Section 4.38 (3) of the EP&A Act states that development consent for SSD may be granted despite the development being partially prohibited by an environmental planning instrument.

A small portion of the realigned Lemington Road corridor is in an area currently zoned C2 – Environmental conservation under the Singleton LEP. Roads are permitted with consent in the C2 zone. It is noted that this area is currently subject to subdivision between HVO and Warkworth Mine in accordance with the Warkworth Mine consent SSD 5464 (as modified). This will result in the C2 zone land having been rezoned to RU1 zone land by the time of determination of the Project, resulting in no C2 land in the Project area. Roads are also permitted in the RU1 Zone.

Notwithstanding the above, the permissibility of mining is also governed by the *State Environmental Planning Policy (Resources and Energy) 2021* (the Resources and Energy SEPP). Section 2.9 of the Resources and Energy SEPP provides for development that is permissible with consent, and relevantly states:

> (1) **Mining** Development for any of the following purposes may be carried out only with development consent-
>
> ...
>
> (b) mining carried out-
>
> (i) on land where development for the purposes of agriculture or industry may be carried out (with or without development consent), or
>
> (ii) on land that is, immediately before the commencement of this clause, the subject of a mining lease under the *Mining Act 1992* or a mining licence under the *Offshore Minerals Act 1999*,
>
> ...
>
> (d) facilities for the processing or transportation of minerals or mineral bearing ores on land on which mining may be carried out (with or without development consent), but only if they were mined from that land or adjoining land
>
> ...

Mining activities are proposed on land zoned RU1 under the Singleton and Muswellbrook LEPs within which agriculture and industry may be carried out. The Project's rail loading facilities are on land adjoining a mine and on land on which mining may be carried out. Therefore, the Project is also permissible with development consent under the Mining SEPP.

## 5.4 Other approvals

This section identifies other approvals that are required to carry out the Project and explains why they are required. These approvals are outlined in Table 5.1 and have been grouped into the following categories:

- consistent approvals: which are approvals that cannot be refused and must be substantially consistent with the approval under Section 4.42 of the EP&A Act;
- EPBC Act approval: whether approval is required under the EPBC Act and whether the bilateral agreement applies;
- other approvals: approvals that are not expressly integrated into the SSD application process; and
- approvals not required: approvals that would be required if the Project was not SSD as per Section 4.41 of the EP&A Act.

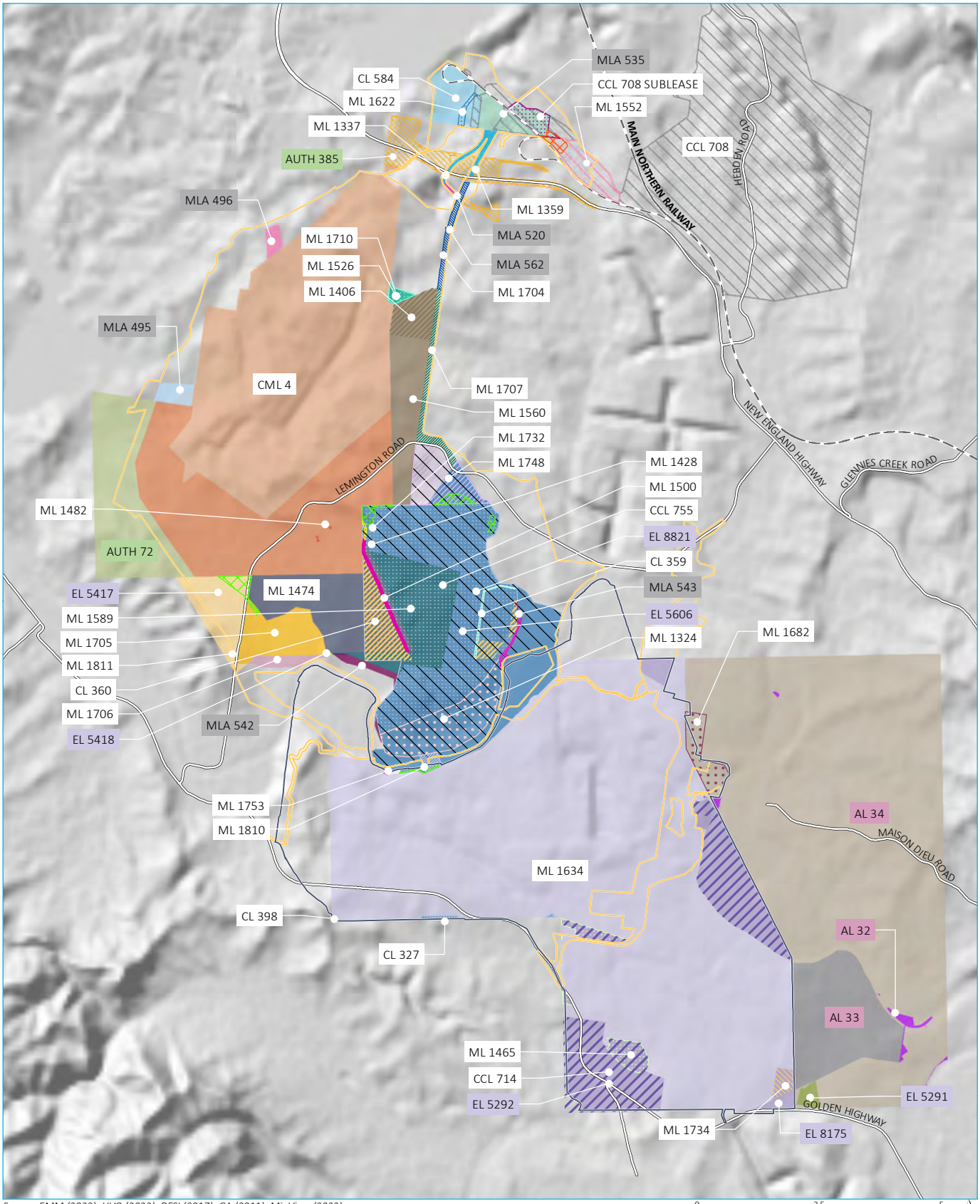
## Table 5.1 Approvals and licences required

| Approval | Requirement |
|---|---|
| **Consistent approvals** | |
| Approval under Section 22 of the *NSW Coal Mine Subsidence Compensation Act 2017*[1] | The Project is within the Patrick Plains mine subsidence district. Approval under Section 22 will be sought for new and upgraded infrastructure proposed under the Project where applicable. |
| A mining lease under the *NSW Mining Act 1992* | Additional conversion of existing exploration licences (ELs) to mining leases (MLs) will be required to enable the Project, as shown in Figure 5.1.<br>At HVO North, the Project involves the extraction of coal from deeper seams (ie down to the Barrett seam) beneath areas that have been predominantly previously mined. Despite the upper seams of these areas being previously mined, the deeper seams are covered by ELs as existing MLs do not extend to the depth of the Barrett seam across the entire proposed mining area. Therefore, application for new MLs over these ELs will be required at depth in some areas. In addition, a small area that is within the proposed mining area (between the Mitchell Pit and the Carrington area) is within a surface EL and therefore a new ML to the required depth will be required to cover this area.<br>At HVO South, the Project involves a small change to the approved footprint to straighten the highwall, and in doing so, steps outside the area covered by an existing ML into an area covered by an EL. A new ML will also be required at HVO South to cover this small area.<br>A site verification certificate (SVC – 12575722) was issued on 14 May 2021 for these areas, as required by clause 50A of the EP&A Regulation.<br>Further to this, the surface water impact assessment prepared for the Project (which includes an updated water management system for the Project, refer to Appendix J), identified the need for an additional clean water diversion and sediment dam adjacent to the Mitchell Pit at HVO North and the Riverview Pit at HVO South. A portion of these water management works will be outside of existing MLs and the area covered by SVC – 12575722.<br>The clean water diversion is an ancillary mining activity for the purposes of section 6 of the Mining Act. Therefore, it must be authorised by a mining lease or via a condition included in an adjoining mining lease. HVO holds adjoining mining leases to where these works will occur (ML 1428 and ML 1634); therefore, it is proposed that a condition be added to these MLs authorising the clean water diversion works on the land adjoining them. HVO has consulted with the Department of Regional NSW – Mining, Exploration & Geoscience on this issue, who confirmed agreement with this approach.<br>In addition, the Project seeks to extend the existing product coal stockpile at the HVLP at HVO North beyond the currently approved extent. The area in which the extension is proposed (refer to Figure 4.1) is not covered by a surface mining lease, and therefore a second SVC was applied for and issued for this area (SVC – 41389276) on 30 June 2022. |
| Environment protection licence under Section 3 of the NSW *Protection of the Environment Operations Act 1997* (POEO Act) | The HVO Complex currently operates under one EPL (EPL 640). EPL 640 will be varied as required if the Project is approved. |
| Consent under Section 138 of the NSW *Roads Act 1993* | A consent is required under Section 138 to work on or above a road or to connect a road to a classified road. Approval from Singleton Council as the appropriate road authority will be required for the Lemington Road realignment and works on Liddell Station Road. |

[1] Section 4.42(1b) of the EP&A Act refers to approval under section 15 of the Mine Subsidence Compensation Act 1961. However, this legislation was repealed in 2017 by the Coal Mine Subsidence Compensation Act 2017.

## Table 5.1 Approvals and licences required

| Approval | Requirement |
|---|---|
| **EPBC Act approval** | |
| An approval under Part 3, Division 1 of the EPBC Act | A referral was submitted to DCCEEW for the Project regarding potential impacts to listed threatened species and ecological communities, and water resources, to determine if it is a controlled action under the EPBC Act. At the time of EIS submission, DCCEEW's determination is still pending. However, it is likely that approval under Part 3, Division 1 of the EPBC Act will be required for the Project. |
| **Other approvals** | |
| Approvals under Part 2 and Part 4 of the NSW *Roads Act 1993* | Approval will be required for realignment (closure and reopening) of Lemington Road and the closure of part of Liddell Station Road to enable the extension of the HVLP product coal stockpile. |
| Aquifer interference approval under Section 91 of the NSW *Water Management Act 2000* (WM Act) | The requirement to obtain an aquifer interference approval under Section 91(3) of the WM Act is triggered only when a proclamation has been made under Section 88A that the particular type of approval is required. To date, no proclamation has been made specifying that an aquifer interference approval is required in any part of NSW. In the meantime, the *NSW Aquifer Interference Policy* (AIP) sets the policy with respect to aquifer interference. DPE Water's assessment framework for aquifer interference is included (and completed) in the Groundwater Assessment (AGE 2022, Appendix J). |
| Water access licences under the WM Act | HVO holds a number of water access licences under the *Water Sharing Plan (WSP) for the Hunter Regulated River Water Source 2016*, the *WSP for the Hunter Unregulated and Alluvial Water Sources 2009* and the *WSP for the North Coast Fractured and Porous Rock Groundwater Sources 2016*. No new WALs will be required for the Project. |
| Commonwealth *Native Title Act 1993* | There are no native claims currently over the Project area.<br>Native title has been demonstrated to have been extinguished in all locations where HVO intends to undertake development (which if on areas where Native title had not been extinguished could be considered to be a future act) as part of the Project, except for the HVLP product coal stockpile extension area option. Further investigations are being undertaken on this parcel of land to confirm extinguishment of native title, and the approach for suitable tenure over this parcel of land. |
| Approvals under Part 4 and Part 5 of the NSW *Crown Land Management Act 2016* | There are a number of Crown land parcels and roads within the Project footprint as shown in Figure 5.2. An appropriate authorisation will be obtained under the *Crown Land Management Act 2016* to enable the occupation and use of the identified Crown land and roads. |
| **Approvals not required** | |
| A permit under Section 201, 205 or 219 of the NSW *Fisheries Management Act 1994* | The Project's impacts on threatened species, populations or communities listed under the FM Act are discussed in Chapter 14 and Appendix L. |
| Approval under Part 4 of the NSW *Heritage Act 1977* | The Project's impacts on historic heritage items are discussed in Chapter 16 and Appendix O. |
| An Aboriginal heritage impact permit under Section 90 of the NSW *National parks and Wildlife Act 1974* | The Project's impacts on Aboriginal cultural heritage are discussed are described in Chapter 15 and Appendix N. |
| A water use approval under Section 89, a water management work approval under Section 90 or an activity approval (other than an aquifer interference approval) under Section 91 of the WM Act | The Project's impacts on water resources are discussed in Chapter 12 and Appendix K. |




*Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011); MinView (2022)*

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## KEY

- SVC 41389276
- SVC 12575722
- HVO North proposed development consent boundary
- HVO South proposed development consent boundary

Existing environment

- Rail line
- Major road

Mining authority (HVO)

- AL 32
- AL 33
- AL 34
- Auth 72
- CCL 708 Sublease
- CCL 714
- CCL 755
- CL 327
- CL 359
- CL 360
- CL 398
- CL 584
- CML 4
- EL 5291
- EL 5292
- EL 5417
- EL 5418
- EL 5606
- EL 8175
- EL 8821
- ML 1324
- ML 1337
- ML 1359
- ML 1406
- ML 1428
- ML 1465
- ML 1474
- ML 1482
- ML 1500
- ML 1526
- ML 1560
- ML 1589
- ML 1622
- ML 1634
- ML 1682
- ML 1704
- ML 1705
- ML 1706
- ML 1707
- ML 1710
- ML 1732
- ML 1734
- ML 1748
- ML 1753
- ML 1810
- ML 1811
- MLA 495
- MLA 496
- MLA 520
- MLA 535
- MLA 542
- MLA 543
- MLA 562

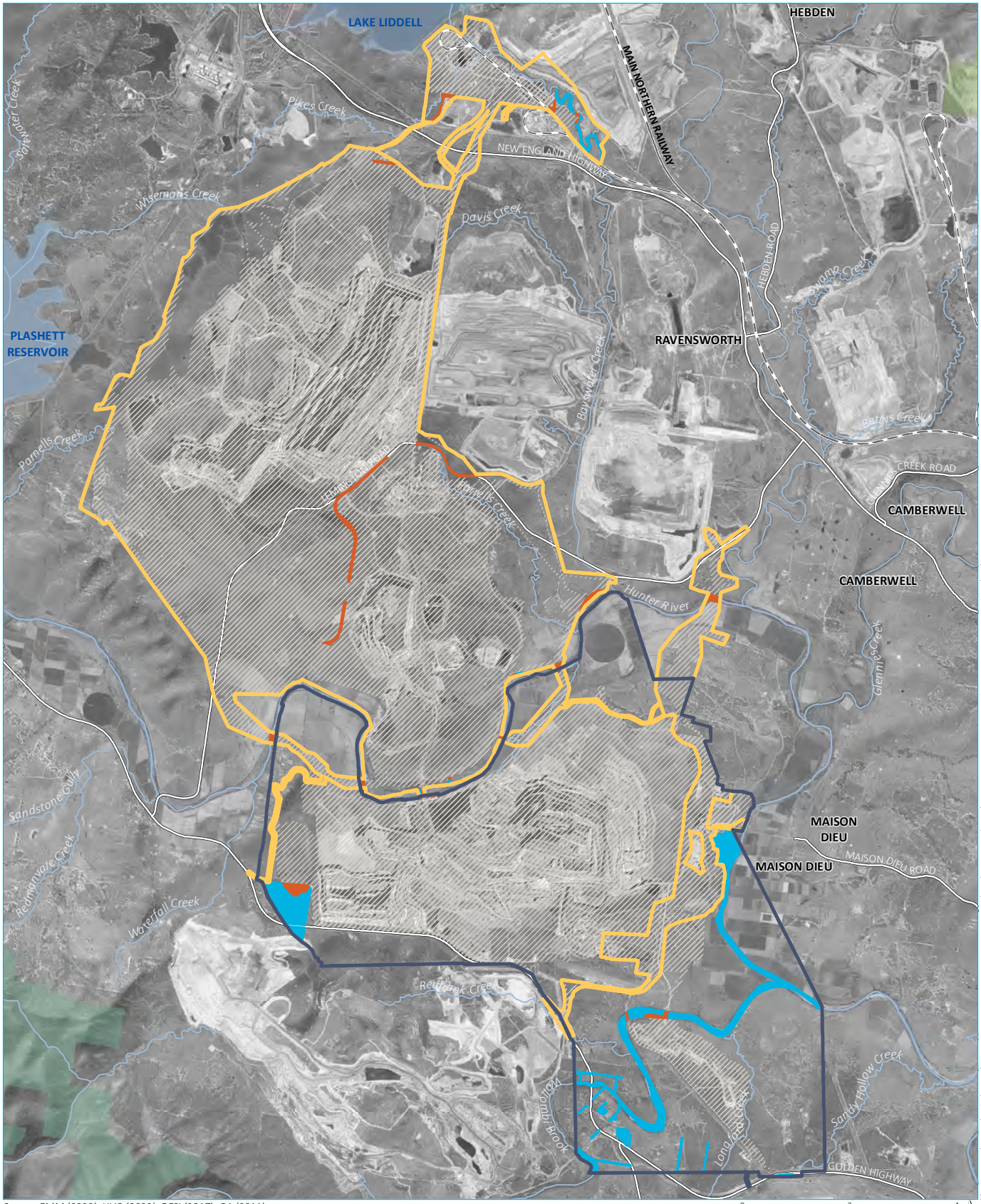
Mining authority (other)

- AUTH 385
- CCL 708
- ML 1552

## Site Verification Certificate areas

HVO Continuation Project
Environmental Impact Statement
Figure 5.1

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*Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011)*

KEY

- Crown Land within Project disturbance area
- Crown Land within Project Area
- Project disturbance area
- HVO North proposed development consent boundary
- HVO South proposed development consent boundary

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody
- NPWS reserve
- State forest
- NPWS reserve

## Crown Land within the Project area

HVO Continuation Project
Environmental Impact Statement
Figure 5.2

EMM creating opportunities

## 5.5 Pre-conditions to approvals

Pre-conditions for the consent authority in exercising the power to grant approval for the Project are provided in Table 5.2.

**Table 5.2 Pre-conditions to being able to grant approval for the project**

| Statutory reference | Pre-condition | Relevance | Where addressed in EIS |
|---|---|---|---|
| *State Environmental Planning Policy (Transport and Infrastructure) 2021* (The Transport and Infrastructure SEPP), Section 2.98(3) | The consent authority must not grant consent to development to which this clause applies without the concurrence of the rail authority for the rail corridor to which the development application relates. | The Project involves penetration of ground more than 2 m within 25 m of a rail corridor. | Chapter 4 (Project Description) |
| Transport and Infrastructure SEPP, Section 2.118(2) | The consent authority must not grant consent to development on land that has a frontage to a classified road unless it is satisfied that—<br>(a) where practicable and safe, vehicular access to the land is provided by a road other than the classified road, and<br>(b) the safety, efficiency and ongoing operation of the classified road will not be adversely affected by the development as a result of:<br>(i) the design of the vehicular access to the land, or<br>(ii) the emission of smoke or dust from the development, or<br>(iii) the nature, volume or frequency of vehicles using the classified road to gain access to the land, and<br>(c) the development is of a type that is not sensitive to traffic noise or vehicle emissions, or is appropriately located and designed, or includes measures, to ameliorate potential traffic noise or vehicle emissions within the site of the development arising from the adjacent classified road. | The Project area has frontage to a classified road, the existing Lemington Road at HVO North and the proposed Lemington Road realignment at HVO South. | Chapter 19 (Traffic and transport) |
| Resilience and Hazards SEPP | A consent authority must consider whether the land is contaminated and be satisfied that, if the land is contaminated, the land is suitable in its contaminated state (or will be suitable after remediation) for the purpose of the Project. | The Project area contains residual contaminated areas which have been investigated. These investigations concluded that these areas do not present an unacceptable risk to on or off-site human and ecological receptors and are the land is suitable for its use. | Chapter 22 (Hazards, public safety and health) |

**Table 5.2 Pre-conditions to being able to grant approval for the project**

| Statutory reference | Pre-condition | Relevance | Where addressed in EIS |
|---|---|---|---|
| Singleton LEP, clause 7.6(4) | Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that—<br>(a) the development is designed, sited and will be managed to avoid any significant adverse environmental impact, or<br>(b) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or<br>(C) if that impact cannot be minimised—the development will be managed to mitigate that impact. | The Project area contains land mapped as a watercourse. | Chapter 12 (Water resources) |

## 5.6 Mandatory matters for consideration

The mandatory conditions that must be satisfied before the consent authority may grant approval to the Project are listed in Table 5.3.

**Table 5.3 Mandatory considerations for the Project**

| Statutory document | Section reference | Mandatory consideration | Where addressed in the EIS |
|---|---|---|---|
| **Considerations under the EP&A Act and Regulation** | | | |
| EP&A Act | Section 1.3 | Relevant objects of the Act: | Chapter 28 (Project Justification) |
| | Section 4.15(1) | The provisions of any relevant environmental planning instruments:<br>• Planning Systems SEPP;<br>• Resources and Energy SEPP;<br>• Transport and Infrastructure SEPP;<br>• *State Environmental Planning Policy (Resilience and Hazards) 2021* (the Resilience and Hazards SEPP);<br>• Singleton LEP; and<br>• Muswellbrook LEP. | This table |

**Table 5.3 Mandatory considerations for the Project**

| Statutory document | Section reference | Mandatory consideration | Where addressed in the EIS |
|---|---|---|---|
| | | The provisions of any planning agreement that has been entered into or any draft planning agreement that a developer has offered to enter into. | Chapter 2 |
| | | The likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality. | Part D, Chapters 7–25 (Impact assessment) |
| | | The suitability of the site for the development. | Chapter 28 (Project Justification) |
| | | The public interest. | Chapter 28 (Project Justification) |

## Table 5.3 Mandatory considerations for the Project

| Statutory document | Section reference | Mandatory consideration | Where addressed in the EIS |
|---|---|---|---|
| **Mandatory relevant considerations under EPIs** | | | |
| Resources and Energy SEPP | Section 2.16 | Non-discretionary development standards for mining:<br>• Identifies development standards on particular matters relating to mining that, if complied with, prevents the consent authority from requiring more onerous standards for those matters:<br>– Cumulative noise level – The development does not result in a cumulative amenity noise level greater than the recommended amenity noise levels, as determined in accordance with Table 2.2 of the *Noise Policy for Industry*, for residences that are private dwellings.<br>– Cumulative air quality level – The development does not result in a cumulative annual average level greater than 25 µg/$m^3$ of $PM_{10}$ or 8 µg/m3 of $PM_{2.5}$ for private dwellings.<br>– Airblast overpressure – Airblast overpressure caused by the development does not exceed:<br>a) 120 dB (Lin Peak) at any time; and<br>b) 115 dB (Lin Peak) for more than 5% of the total number of blasts over any period of 12 months,<br>measured at any private dwelling or sensitive receiver.<br>– Ground vibration – Ground vibration caused by the development does not exceed:<br>a) 10 mm/sec (peak particle velocity) at any time; and<br>b) 5 mm/sec (peak particle velocity) for more than 5% of the total number of blasts over any period of 12 months.<br>Measured at any private dwelling or sensitive receiver.<br>– Aquifer interference – Any interference with an aquifer caused by the development does not exceed the respective water table, water pressure and water quality requirements specified for item 1 in columns 2, 3 and 4 of Table 1 of the Aquifer Interference Policy for each relevant water source listed in column 1 of that Table. | Chapter 10 (Noise)<br>Chapter 8 (Air quality)<br>Chapter 11 (Blasting)<br>Chapter 11 (Blasting)<br>Chapter 12 (Water resources) |
| | Section 2.17 | Compatibility of proposed mine, petroleum production or extractive industry with other land uses:<br>• Consider whether or not the development is likely to have a significant impact on, or be incompatible with, the existing, approved or future uses of land in the vicinity of the development.<br>• Evaluate and compare the respective public benefits of the development and the land uses referred above, and any measures proposed by the applicant to avoid or minimise any incompatibility. | Chapter 28 (Project Justification) |

## Table 5.3 Mandatory considerations for the Project

| Statutory document | Section reference | Mandatory consideration | Where addressed in the EIS |
|---|---|---|---|
| | Section 2.18 | Consideration of voluntary land acquisition and mitigation policy:<br>• Consider any applicable provisions of the voluntary land acquisition and mitigation policy. | Chapter 8 (Air) and 10 (Noise) |
| | Section 2.19 | Compatibility of proposed development with mining, petroleum production or extractive industry:<br>• Consider whether or not the development is likely to have a significant impact on, or be incompatible with, current or future extraction or recovery of minerals, petroleum or extractive materials (including by limiting access to, or impeding assessment of, those resources).<br>• Evaluate and compare the respective public benefits of the development and the uses, extraction and recovery referred to above, and evaluate any measures proposed by the applicant to avoid or minimise any incompatibility. | Chapter 2 (Strategic context) and Chapter 28 (Project justification) |
| | Section 2.20 | Natural resource and environmental management:<br>• Consider whether or not the consent should be issued subject to conditions aimed at ensuring that the development is undertaken in an environmentally responsible manner.<br>• Consider an assessment of the greenhouse gas emissions of the development.<br>• Consider any certification by the Chief Executive of the Office of Environment and Heritage or the Director-General of the Department of Primary Industries that measures to mitigate or offset the biodiversity impact of the proposed development will be adequate. | Part D, Chapters 7–25 (Impact assessment) and Chapter 28 (Project justification) |

## Table 5.3 Mandatory considerations for the Project

| Statutory document | Section reference | Mandatory consideration | Where addressed in the EIS |
|---|---|---|---|
| | Section 2.21 | Resource recovery:<br>• Consider the efficiency or otherwise of the development in terms of resource recovery.<br>• Consider whether or not the consent should be issued subject to conditions aimed at optimising the efficiency of resource recovery and the reuse or recycling of material. | Chapter 2 (Strategic context) – the key objective of the Project is to maximise resource recovery from existing tenements through the extraction of coal from deeper seams.<br>Chapter 6 (Engagement) – The Mine Development Plan was presented to The department of Regional NSW - Mining Exploration and Geoscience on 14 October 2020, and a presentation on the resource and economic assessment provided on 1 June 2022. |
| | Section 2.22 | Transport:<br>• Consider whether or not the consent should be issued subject to conditions related to the transport of materials by road. | Chapter 19 (Traffic and transport) |
| | Section 2.23 | Rehabilitation:<br>• Consider whether or not the consent should be issued subject to conditions aimed at ensuring the rehabilitation of land that will be affected by the development. | Chapter 21 (Rehabilitation and closure) |
| Transport and Infrastructure SEPP | Section 2.48(2) | Development likely to affect an electricity transmission or distribution network:<br>• Consider any response received from the electricity supply authority for the area in which the development is to be carried out. | Chapter 6 (Engagement) |
| | Section 2.97(2) | Development adjacent to rail corridors:<br>• Consider any response received from the rail authority for the rail corridor and any guidelines that are issued by the Secretary for the purposes of this clause and published in the Gazette. | Chapter 6 (Engagement) |

## Table 5.3 Mandatory considerations for the Project

| Statutory document | Section reference | Mandatory consideration | Where addressed in the EIS |
|---|---|---|---|
| | Section 2.98(2) | Excavation in, above, below or adjacent to rail corridors:<br>• Consider any response received from the rail authority for the rail corridor and any guidelines that are issued by the Secretary for the purposes of this clause and published in the Gazette. | Chapter 6 (Engagement) |
| | Section 2.121(3) | Traffic generating development:<br>• Consider any response received from TfNSW.<br>• Consider the accessibility of the site.<br>• Consider any potential traffic safety, road congestion or parking implications of the development. | Chapters 6 (Engagement) and 19 (Traffic and Transport) |
| Resilience and Hazards SEPP | Section 3.12 | Consider departmental guidelines:<br>• Applying SEPP 33.<br>• HIPAP No.3 – Risk Assessment.<br>• HIPAP No.12 – Hazards related Conditions of Consent. | Chapter 22 (Hazards, public safety and health) |
| | Section 4.6 | A consent authority must not consent to the carrying out of any development on land unless it has considered whether the land is contaminated. | Chapter 22 (Hazards, public safety and health) |
| Singleton LEP | Zone objectives | RU1 Primary Production zone | Chapter 2 (Strategic context) – Section2.3.5. |
| | Clause 5.10 | Must consider effect of proposed development on heritage significance. | Chapter 16 (Historic heritage) |
| | Clause 7.1 | Earthworks | Chapter 4 (Project description) |
| | Clause 7.6 | Riparian land and watercourses | Chapter 12 (Water Resources), 13 (Biodiversity) and 14 (Aquatic ecology) |
| Muswellbrook LEP | Zone objectives | RU1 Primary Production zone<br>SP2 Infrastructure | Chapter 2 (Strategic context) – Section 2.3.6. |
| | Clause 7.6 | Earthworks | Chapter 4 |

## Table 5.3 Mandatory considerations for the Project

| Statutory document | Section reference | Mandatory consideration | Where addressed in the EIS |
|---|---|---|---|
| **Considerations under other legislation** | | | |
| NSW *Biodiversity Conservation Act 2016* | Section 7.14 | The likely impact of the proposed development on biodiversity values as assessed in the biodiversity development assessment report. The Minister for Planning may (but is not required to) further consider under that Act the likely impact of the proposed development on biodiversity values. | Chapter 13 |

# Part C
## Engagement

EMM
creating opportunities

# 6 Engagement

## 6.1 Introduction

HVO has been part of the local community since operations commenced in 1949. A range of engagement mechanisms have been used to consult with neighbouring property owners, the local community, Federal, State and local government, regulators, service providers, local community groups, Aboriginal groups and HVO Community Consultative Committee (CCC) members.

This chapter provides an overview of community and stakeholder engagement activities carried out during preparation of the EIS, as well as proposed future engagement activities. It also summarises community views in relation to the Project, as understood by the data and information gathered from the consultation undertaken. In doing so, this chapter outlines activities carried out in accordance with the consultation requirements set out in the *Undertaking Engagement Guidelines for State Significant Projects November 2021* (SSD Engagement Guidelines 2021) (DPIE 2021f) and the SEARs for the Project.

Appendix G (Consultation Record) provides a detailed summary of the engagement activities carried out during the preparation of this EIS and consistent with the required community participation objectives within the SSD Engagement Guidelines 2021.

## 6.2 Strategic communication approach

To deliver meaningful engagement that considered the needs of all stakeholders, a Communication and Stakeholder Engagement Strategy (CSES) was prepared. The CSES was prepared in accordance with the SSD Engagement Guidelines 2021, which require proactive and ongoing engagement across all project phases to:

- provide a better understanding of the Project and potential impacts, issues and benefits;
- be able to consider responses to issues as a part of design, development and delivery of the Project; and
- help ensure engagement is undertaken at appropriate times throughout the life cycle of the Project.

The CSES identified objectives for the engagement process; Project stakeholders; and established communication channels, tools and activities mapped out for the duration of the planning and approval process for the Project.

The strategic approach to communication and engagement was underpinned by a proactive issues-management approach, open and transparent two-way communication processes, and responsiveness to the communication needs and expectations of key stakeholders and the broader community.

### 6.2.1 International Association of Public Participation Spectrum of Engagement

As required by the Guidelines, the strategic communication and engagement approach considered the *International Association of Public Participations'* (IAP2) Core Values and Spectrum of Public Participation (ie inform, consult, involve, collaborate) as part of analysing the identified Project stakeholders, and selecting the most appropriate communication tools and activities. The Spectrum of Engagement is shown in Figure 6.1.

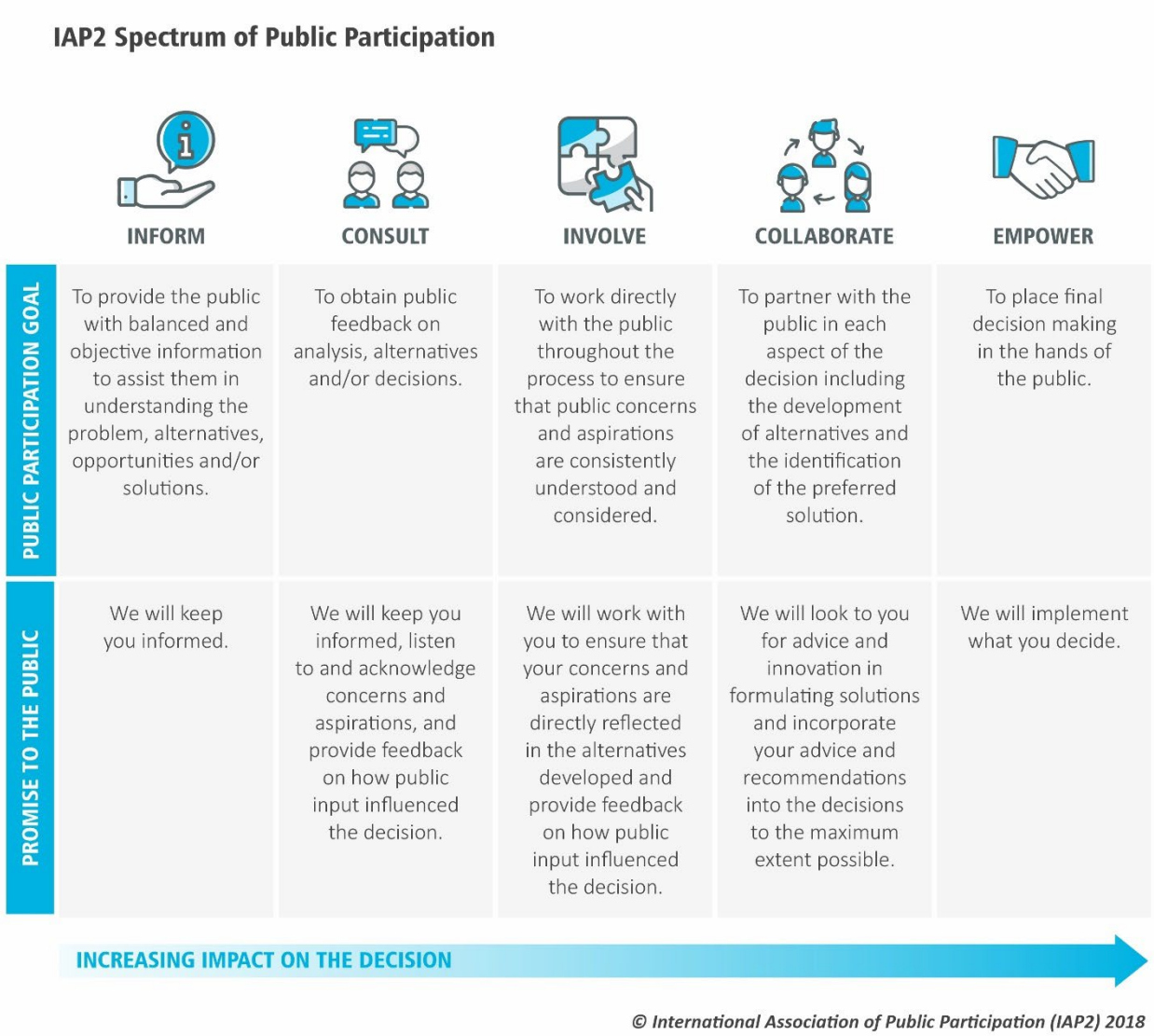



**Figure 6.1 IAP2 Spectrum of Public Participation**

### 6.2.2 Communication and engagement objectives

The objectives of the communication and engagement program are to:

- afford meaningful involvement of key stakeholders in the Project, by disseminating information on the Project, as well as gathering feedback to inform Project design and relevant technical studies;
- build and strengthen relationships between key stakeholders and HVO; and
- provide internal and external stakeholder confidence that the design of the Project has been carefully considered, and that the environmental, social and economic impacts and benefits of the Project have been comprehensively assessed in accordance with relevant legislation and guidelines.

### 6.2.3 Stakeholder engagement during the COVID-19 pandemic

The CSES was updated in 2020 in response to the COVID-19 pandemic, to ensure consultation could continue in a meaningful way, while adhering to government restrictions. Alternatives to in-person interactions were sought to ensure Project stakeholders remained informed and able to provide feedback, during EIS development. As COVID-19 restrictions eased in NSW, a hybrid engagement approach was adopted, that maintained stakeholder options for in-person and virtual meetings. In the EIS engagement overview below in Table 6.4, 'In-person' meetings includes online virtual meetings.

## 6.3 Stakeholder identification

In accordance with the principles of the IAP2 Core Values and Spectrum of Engagement, Project stakeholders and potentially impacted communities were identified using the existing HVO operational stakeholder list. Identified Project stakeholders were assessed and classified according to the anticipated levels of Project impact and their levels of interest and potential influence on project delivery outcomes. Existing knowledge of stakeholder issues from the operation of the current mine was also taken into account in designing in the Project.

Table 6.1 outlines stakeholder assessment criteria and categories.

**Table 6.1 Stakeholder assessment and classification criteria and levels**

| Details | Level 1 | Level 2 | Level 3 | Level 4 |
|---|---|---|---|---|
| Project impacts on the stakeholder | High impact | Low impact | High impact | Low impact |
| Stakeholder levels of interest/influence on project decision-making/ outcomes | High interest/influence | High interest/influence | Low/medium interest/ influence | Low interest/influence |

Table 6.2 provides an overview of key stakeholders and their level of engagement, based on the IAP2 Core Values and Spectrum of Engagement.

**Table 6.2 Project stakeholder list and engagement level**

| Classification | Stakeholder group | Stakeholder name | IAP2 Spectrum Level of Engagement |
|---|---|---|---|
| 1 | Federal regulatory authorities | • Department of Climate Change, Energy, the Environment and Water (DCCEEW). | Inform<br>Consult |

## Table 6.2 Project stakeholder list and engagement level

| Classification | Stakeholder group | Stakeholder name | IAP2 Spectrum Level of Engagement |
|---|---|---|---|
| 1 | State regulatory authorities | • Department of Planning and Environment (DPE);<br>• DPE - Biodiversity, Conservation and Science Directorate (BCS);<br>• DPE Water;<br>• DPE – Energy and Industry Committee;<br>• Heritage NSW;<br>• Mining, Exploration and Geoscience Department of Regional NSW;<br>• Rehabilitation and Securities Panel (RASP) of the NSW Resources Regulator;<br>• Environment Protection Authority (EPA);<br>• Transport for New South Wales (TfNSW); and<br>• Subsidence Advisory NSW | Inform<br>Consult |
| 2 | Local government | • Singleton Council; and<br>• Muswellbrook Shire Council. | Inform<br>Consult |
| 2 | Elected representatives | • Federal:<br>– Hon Joel Fitzgibbon MP, Member for Hunter, NSW (up to May 2022); and<br>• Mr Dan Repacholi MP, Member for Hunter, NSW (May 2022 – present). | Inform |
| | | • State:<br>– Mr Michael Johnsen MP, Member for Upper Hunter (up to May 2021); and<br>• Mr David Layzell MP, Member for Upper Hunter. | Inform |
| | | • Local:<br>– Mayor Sue Moore, Singleton Council; and<br>• Mayor Steve Reynolds, Muswellbrook Shire Council. | Inform<br>Consult |
| 2 | Government organisations | • NSW Health;<br>• Crown Lands;<br>• Hunter Local Land Services;<br>• NSW Rural Fire Service;<br>• DPI – Agriculture;<br>• DPI - Fisheries. | Inform<br>Consult |
| 2 | Utility providers | • Ausgrid;<br>• AGL;<br>• Telstra; and<br>• TransGrid. | Inform<br>Consult |

## Table 6.2 Project stakeholder list and engagement level

| Classification | Stakeholder group | Stakeholder name | IAP2 Spectrum Level of Engagement |
|---|---|---|---|
| 1 | Registered Aboriginal Parties (RAPs) | • AGA Services<br>• Aliera French Trading<br>• Bawurra Consultants<br>• Cacatua General Services<br>• Corroboree Aboriginal Corporation<br>• Culturally Aware<br>• DFTV Enterprises<br>• Didge Ngunawal Clan<br>• Devine Diggers Aboriginal Cultural Consultants<br>• Gomery Cultural Consultants<br>• Gunjeewong Cultural Heritage Corporation<br>• HTO Group<br>• Hunter Valley Aboriginal Corporation<br>• Hunter Valley Cultural Services<br>• Jarban and Mugrebea<br>• Jumbunna Traffic Management Group Pty Ltd<br>• Kauwul trading as Wonn 1<br>• Kevin Taggart<br>• Lower Hunter Aboriginal Incorporated<br>• Murra Bidgee Mullangari Aboriginal Corporation<br>• Plains Clans of the Wonnarua People<br>• Rhonda Griffiths<br>• Ungooroo Aboriginal Corporation<br>• Ungooroo Cultural and Community Services Inc<br>• Upper Hunter Wonnarua Council Incorporated<br>• Wallangan Cultural Services<br>• Wanaruah Aboriginal Custodians Corporation<br>• Wanaruah Local Aboriginal Lands Council<br>• Wattaka Wonnarua Cultural Consultants Services<br>• Widescope Indigenous Group Pty. Ltd.<br>• Wonnarua Culture and Heritage<br>• Wonnarua Elders Council Inc.<br>• Wonnarua Nation Aboriginal Corporation | Inform<br>Consult<br>Involve |
| 1 | Community Consultative Committee (CCC) | • All members of the HVO CCC. | Inform<br>Consult |
| 1 | Directly impacted landholders | • Landholders within existing and predicted acquisition zone as defined within the VLAMP; and<br>• Landholders within existing and predicted mitigation zone as defined within the VLAMP. | Inform<br>Consult |

**Table 6.2 Project stakeholder list and engagement level**

| Classification | Stakeholder group | Stakeholder name | IAP2 Spectrum Level of Engagement |
|---|---|---|---|
| 2 | Nearby landowners | Residences and businesses of:<br>• Jerrys Plains;<br>• Maison Dieu;<br>• Camberwell;<br>• Gouldsville; and<br>• Long Point. | Inform<br>Consult |
| 2 | Broader community | • Residents and businesses of Muswellbrook and Singleton. | Inform |
| 1 | Recreation groups | • Hunter Valley Gliding Club; and<br>• Singleton Clay Target Club. | Inform |
| 2 | Industry groups | • NSW Minerals Council<br>• Muswellbrook Chamber of Commerce<br>• Singleton Business Chamber | Inform<br>Consult |
| 1 | HVO workforce | • Existing HVO workforce of approximately 1,200 people, noting existing approvals allow for around 1,500. | Inform<br>Consult<br>Involve |

## 6.4 Engagement tools and reach

A variety of two-way communication tools were activated for the Project, as part of promoting inclusive, transparent, structured and meaningful engagement for all stakeholders. The tools were designed to provide information about the project and encourage feedback consistent with the SSD Engagement Guidelines 2021 (DPIE 2021d) and SEARs.

Table 6.3 provides an overview of the communication tools used, their purpose and timing.

**Table 6.3 Summary of key engagement tools**

| Tool | Summary | Timing |
|---|---|---|
| Website | Provides regular project updates, links to key project documents, and details opportunities for participation. | Ongoing from September 2020 |
| Email address | All project materials contained the email address of the Project Approvals Manager and/or the Environment and Community Manager. | Ongoing from September 2020 |
| Phone | All project materials contained the contact details of the Project Approvals Manager and/or the Environment and Community Manager. | Ongoing from September 2020 |
| Project update briefings | Briefings provided an opportunity for stakeholders to meet with the Project team to express concerns, provide feedback and receive updates. | Ongoing/as required |
| Community (drop-in) Information Sessions | In-person, drop-in community information sessions were offered as an opportunity for community members and stakeholders to receive updates, ask questions and provide verbal or written feedback to the Project team. | November 2020 (x2)<br>December 2020<br>March 2022<br>April 2022 |

**Table 6.3 Summary of key engagement tools**

| Tool | Summary | Timing |
|---|---|---|
| Aboriginal cultural heritage consultation meetings and workshop | Consultation meetings with RAPs in accordance with the Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW 2010). Further to the requirements of the noted guideline a workshop was held in an effort to facilitate discussions between HVO and the RAPs to identify specific programs or initiatives for meaningful mitigation of the Project's heritage impacts, that would contribute towards Closing the Gap. | Consult Meeting 1 – November 2020<br>Consult Meeting 2 – February 2021<br>Workshop – May 2021<br>Consult Meeting 3 – September 2022 |
| Newsletters | Newsletters provided key information on the Project, Project updates and details of upcoming activities. A Project newsletter was delivered quarterly via letter box drop to the local community and published on the Project website. | Quarterly from September 2020 |

## 6.5 Engagement carried out

### 6.5.1 Scoping phase engagement

The stakeholder list (refer to Table 6.2) was used to carry out early, targeted consultation as part of the Project Scoping phase. Consultation undertaken during the Scoping phase was presented in the Project's Scoping Report and findings are summarised in Appendix G – Consultation Record.

### 6.5.2 EIS phase engagement

Engagement with identified stakeholders continued from the Scoping phase and was ongoing throughout the development of the EIS. Stakeholder engagement and interaction was logged using HVO's existing stakeholder management platform, to record and monitor key project issues and themes, which have been addressed in the EIS.

#### i Government agencies and regulators

Table 6.4 provides a summary of the consultation activities undertaken with regulators and government agencies using the engagement tools and shown in Table 6.3. Further details of these engagement activities are shown in Appendix G – Consultation Record.

**Table 6.4 EIS engagement overview – Government agencies**

| Stakeholder/group | Method of engagement | Purpose of engagement |
|---|---|---|
| **Federal government agency**<br>• Department of Climate Change, Energy, the Environment and Water (DCCEEW). | • Correspondence and meetings | • EPBC Act referral briefings. |
| **State government agency** | | |
| • DPE | • Correspondence, meetings and site visit. | • Project briefings on key technical matters:<br>– Project updates;<br>– SVC;<br>– final void, final landform and alternatives;<br>– noise assessment outcomes;<br>– Aboriginal cultural heritage assessment and consultation;<br>– Rapid Assessment Framework;<br>– proposed approach to Commonwealth referrals; and<br>– overview of assessments proposed to inform EIS. |
| • DPE Water | • Meetings | • Meetings to discuss preliminary outcomes of assessment on Carrington West Wing barrier wall<br>• Project update and water impact assessment outcomes meeting |
| • Transport for New South Wales (TfNSW) | • Meetings and correspondence | • Project briefings and discussions on:<br>– Realignment of Lemington Road.<br>– Baselline data and traffic growth rate assumptions in the traffic assessment.<br>– Traffic assessment outcomes. |
| • Environment Protection Authority (EPA) | • Meetings and correspondence | • Project briefing.<br>• Establish approach to the noise impact assessment.<br>• Briefings on the outcomes of the noise and air quality assessments.<br>• Correspondence to confirm the approach to addressing the assessment requirements relating to contamination, and confirming that a Section A site audit statement and accompanying site audit report are not required. |
| • Biodiversity, Conservation and Science (BCS) | • Correspondence and meetings | • Briefing and correspondence relating to Category 1 land mapping<br>• Project briefing on BDAR assessment outcomes and offset strategy. |

**Table 6.4 EIS engagement overview – Government agencies**

| Stakeholder/group | Method of engagement | Purpose of engagement |
|---|---|---|
| • Heritage NSW | • Correspondence and meetings | • Project update – ACHA methodology outlined and RAP details provided.<br>• Consultation relating to the methodology to investigate CM-CD1.<br>• Notification of Aboriginal cultural heritage assessment test excavations.<br>• Overview of Aboriginal cultural heritage assessment report consultation and study outcomes. |
| • Mining, Exploration and Geoscience Department | • Meetings and site visit | • Resources and economic assessment meeting and site visit. |
| • Resources Regulator | • Meeting | • Project update– Mine design and geotechnical investigations.<br>• Project update correspondence. |
| • DPE – Energy and Industry Committee | • Meeting | • Project introduction and overview. |
| • NSW Health<br>• NSW Rural Fire Service<br>• Hunter Local Land Services<br>• Primary Industries Group (inclusive of Fisheries and Agriculture)<br>• Crown Lands Group | • Correspondence | • Project briefing and relevant assessment outcomes |
| • Subsidence Advisory | • Correspondence and meeting | • Project briefing and discussion on the realignment of Lemington Road |
| **Local government**<br>Singleton Council:<br>• Mayor and Councillors.<br>• Council Staff.<br>Muswellbrook Shire Council:<br>• Mayor and Councillors.<br>• Council Staff. | • Correspondence and meetings | • Project updates.<br>• Invitation to/ attendance at CCC Meeting.<br>• Discussion regarding the proposed Lemington Road realignment design. |

**Table 6.4 EIS engagement overview – Government agencies**

| Stakeholder/group | Method of engagement | Purpose of engagement |
|---|---|---|
| Elected Representatives (Federal):<br>• Dan Repacholi, Member for Hunter, NSW.<br>Elected Representatives (State):<br>• David Layzell, Member for Upper Hunter, NSW. | • Correspondence and meetings | • Project introduction and briefing. |

### ii Community stakeholders

Table 6.5 provides a summary of the consultation activities undertaken with regulators and government agencies using the engagement tools and shown in Table 6.3. Further details of these engagement activities are provided in Appendix G – Consultation Record.

**Table 6.5 EIS engagement overview – Community**

| Stakeholder/group | Methods of engagement | Purpose of engagement |
|---|---|---|
| **HVO Community Consultative Committee (CCC)** | • Ordinary meetings (quarterly)<br>• Project update email (monthly) | • Project update presentations.<br>• Provide an opportunity to receive feedback. |
| **Hunter Valley Gliding Club** | • Correspondence and meetings | • Project briefing.<br>• Overview of relevant assessment outcomes. |
| **Directly impacted landowners and nearby/adjacent landowners**<br>• Jerrys Plains<br>• Maison Dieu<br>• Long Point<br>• Camberwell;<br>• Long Point;<br>• Goudsville. | • Project newsletter<br>• Project website<br>• Community information sessions | • Project progress update.<br>• Outcomes of scoping phase community consultation update.<br>• Opportunity to provide feedback/advice about two-way communication channels.<br>• Invitation to attend a community information sessions.<br>• Overview of environmental assessment outcomes. |
| **Directly impacted landowners:**<br>• Jerrys Plains<br>• Maison Dieu | • Phone call<br>• Letter/email<br>• Land owner specific information sheets (18 issued)<br>• One on one meetings (9 meetings held) | • Provision of property specific information sheets for directly impacted land owners.<br>• Project progress update.<br>• Overview of environmental assessment outcomes.<br>• Briefing concerning changes to or updated mitigation/acquisition rights.<br>• Opportunity to provide feedback/advice about two-way communication channels. |
| **Registered Aboriginal Parties (RAPs)**<br>**Total: 33 RAPs** | • Project newsletters.<br>• Project website.<br>• Consultation meetings.<br>• Workshop.<br>• Distribution of Project materials for consideration and feedback.<br>• Fieldwork. | • Update about Project progress.<br>• Notification of Project proposal and registration of interest.<br>• Presentation of information about the Project.<br>• Gathering information about cultural significance and values<br>• Review of draft cultural heritage assessment report. |

## 6.5.3 Community and stakeholder views

A summary of the key findings emerging from community engagement carried out to date, including preliminary community views on the Project, is provided in Table 6.6.

Stakeholder and community views regarding the Project have been understood through:

- Established knowledge in regard to community views and concerns as result of HVO being an established operation;
- the ongoing consultation and engagement activities described above; and
- feedback received from organisations via responses to the SEARs.

Feedback from stakeholders and the broader community has been varied and includes both positive and negative views on a range of topics. Community views can be grouped into themes, as shown in Figure 6.2.




**Figure 6.2 Engagement outcome themes**

## Table 6.6 Community and stakeholder views

| Key themes | Stakeholder group raising concern | How the project addressed this issue | Relevant EIS reference |
|---|---|---|---|
| **Traffic and transport impacts**<br>• Lemington Road realignment;<br>• potential travel time delays associated with the Lemington Road realignment;<br>• loss of amenity between Jerrys Plains and Singleton;<br>• flood immunity at the Hunter River crossing;<br>• construction and connectivity issues with broader road network;<br>• potential to impact on biodiversity and cultural heritage sites; and<br>• visual and noise impacts to stakeholders located in Maison Dieu. | • State regulatory authorities.<br>• Local government.<br>• Elected representatives.<br>• Government/ Regulators.<br>• RAPs.<br>• Utility providers.<br>• Directly impacted landholders.<br>• Nearby landholders. | • Early community feedback about the Lemington Road realignment, resulted in a strong trend of Jerrys Plains residents holding concerns about loss of amenity between Jerrys Plains and Singleton, travel time and flood immunity.<br>• Mining at HVO North will progress through the existing Lemington Road alignment. The realignment of Lemington Road will improve the accessibility and reliability of the road as the primary access point between the Golden Highway and the New England Highway.<br>• Alternative designs of the Lemington Road realignment have considered community feedback, minimising travel time delays to road users, flood immunity and avoiding impacts on areas of high ecological value (ie Warkworth Sands vegetation community).<br>• The construction of a new bridge over the Hunter River will meet the requirements of a one-in-ten-year flood protection design, which will improve accessibility and safety of the crossing, compared to the existing Moses Crossing low level bridge, which is often exceeded following heavy rainfall.<br>• Construction of road upgrades, including the Hunter River crossing are to be undertaken in consultation with Transport for NSW, Singleton Council , and local residents.<br>• Construction of the road is to largely occur offline, as such impacts to road users is minimised.<br>• Tree screening proposed as part of the Project to mitigate potential visual impacts to Maison Dieu residents and local road users.<br>• Stakeholders have been kept up to date with the design as it has evolved during EIS development, via newsletters, meetings and at community information sessions. | Section 2.7 – Alternatives<br>Chapter 4 – Project description<br>Chapter 19 – Traffic and Transport<br>Mine Plan Options Report (Appendix D)<br>Traffic and Transport Impact Assessment (Appendix R) |

## Table 6.6 Community and stakeholder views

| Key themes | Stakeholder group raising concern | How the project addressed this issue | Relevant EIS reference |
|---|---|---|---|
| **Air quality**<br>• increased dust;<br>• emissions and climate change;<br>• health impacts; and<br>• impacts to dwellings and associated infrastructure | • State regulatory authorities.<br>• Elected representatives.<br>• Government/ Regulators.<br>• Directly impacted landholders. | • During consultation, nearby landowners raised concerns about poor air quality, as a result of the proposed Project, including:<br>– coal dust causing property damage (ie to dwellings, solar panels, water tanks and vehicles); and<br>– risks to health, as a result of poor air quality.<br>• Modelling results concluded that operational dust emissions due to ongoing mining activities are not expected to cause adverse air quality impacts at nearby privately-owned residential sensitive receptors. With the exception of, two private receptors that are eligible for voluntary acquisition rights under the VLMAP as criteria is exceeded on more than 25% of their property. These receptors currently have mitigation rights from HVO, with one receptor (308) also holding acquisition rights under a neighboring mine development consent.<br>• Nearby landowners were contacted by HVO via letters/emails and meetings regarding any proposed changes in mitigation rights. Mitigation measures will be offered in accordance with the conditions of consent with each affected landowner post project approval.<br>• Stakeholders have been further advised of the following management and mitigation measures, via newsletters, meetings and community information sessions:<br>– an Air Quality Management Plan will continue to be implemented to manage dust;<br>– a Blast Management Plan will continue to be implemented to manage post blast fumes;<br>– impacts are predicted in accordance with the Air Quality and Greenhouse Gas Impact Assessment, see Appendix H; and<br>– separate to the properties who are already afforded air quality mitigation rights, HVO currently operates a near neighbour amenity resource program, which is a voluntary commitment to offer water tank cleaning or supply of water filters to neighbours that request such a service. HVO proposes to replace this program with a more structured program whereby private residences within 4 km of the proposed mining area will be eligible for tank inspections and cleaning and installation of first flush filter systems for residential water tanks and domestic taps. | Chapter 8 – Air quality<br>Air quality and GHG Impact Assessment (Appendix H) |

## Table 6.6 Community and stakeholder views

| Key themes | Stakeholder group raising concern | How the project addressed this issue | Relevant EIS reference |
|---|---|---|---|
| **Noise impacts**<br>• mitigations for properties where noise levels exceed criteria; and<br>• increase in noise levels. | • State regulatory authorities.<br>• Elected representatives.<br>• Government/ Regulators.<br>• Directly impacted landholders. | • Noise impacts as a result of the Project and cumulative noise impacts with other nearby mining operations. Specifically, nearby landholders have indicated that the noise from blasting and heavy vehicles is especially noticeable.<br>• Nearby landowners have been generally accepting of the noise associated with nearby mining operations. Stakeholders have been advised of the following proposed noise mitigation and management measures:<br>– Nearby landowners were contacted by HVO via letters/emails and meetings regarding any proposed changes in mitigation rights. Mitigation measures will be negotiated with each affected landowner post project approval.<br>• HVO has further committed to the following on site noise management measures:<br>– a Noise Management Plan will continue to be implemented and updated to manage potential noise impacts associated with the Project, key mitigation measures include:<br>▪ commitment to best-in-class 400 t and 600 t excavator replacement schedule;<br>▪ permanent noise bund in the north west corner of Mitchell Pit; and<br>▪ construction activities restricted to the standard construction hours (Monday to Friday 7.00 am to 6.00 pm, Saturday 8.00 am to 1.00 pm and no work on Sundays or public holidays). However, some out of hours work may be required from time to time. As described in the Noise Impact Assessment for the Project (Appendix I), if this occurs, activities will be managed such that operational noise criteria are met.<br>• Community consultation will be undertaken prior to the commencement and during construction with all potentially impacted stakeholders regarding the nature of works to be carried out, the duration of the works, as well as contact details for issues and complaints. | Chapter 10 – Noise<br>Noise Impact Assessment (Appendix I) |

## Table 6.6 Community and stakeholder views

| Key themes | Stakeholder group raising concern | How the project addressed this issue | Relevant EIS reference |
|---|---|---|---|
| **Mine rehabilitation and final landform**<br>• appearance of final landform;<br>• use for final void;<br>• progressive rehabilitation of mined lands; and<br>• land use for rehabilitated land.<br>• opportunity for RAP participation in rehabilitation works. | • Federal regulatory authorities.<br>• State regulatory authorities.<br>• Local government.<br>• Elected representatives.<br>• Government/ Regulators.<br>• Directly impacted landholders.<br>• Nearby landholders.<br>• RAPs. | • During early consultation, community and stakeholders were generally accepting of the mine rehabilitation and final landform plans presented.<br>• Stakeholders have been advised via meetings, newsletters and community information sessions that:<br>– the site will be progressively rehabilitated, ensuring that the site is safe, stable and non-polluting;<br>– the final landform will be rehabilitated in a way that is sympathetic to surrounding landscape; and<br>– rehabilitation of the land will involve a combination of grassland and woodland vegetation, and habitat corridors.<br>• Consistent with existing operations, land will be progressively rehabilitated as land is no longer required for mining activities.<br>• Mine planning investigated various options regarding the final void, with the preferred option that best met project objectives being a reduction of the existing approved voids at HVO North from three voids to a single void.<br>• Natural landform design principles have been incorporated into the mine design such that the final landform will be integrated into the surrounding landscape providing for an improved outcome compared to the existing approved final landform.<br>• Future land uses considered and integrated into mine closure and rehabilitation strategy are:<br>– grazing;<br>– intensive agricultural practices on the Hunter River alluvial flats;<br>– biodiversity and habitat; and<br>– water storages within the final voids.<br>• Viable alternative future post-mining land uses are yet to be determined due to the long life of the Project (to 2050), however these may include a range of land use options at various locations across the site including solar farms and battery energy storage systems, pumped hydro energy storage systems, water storage for various uses such as irrigation, energy or industrial use, or a range of industrial uses of mining infrastructure areas including industrial buildings, access roads, rail loop etc.<br>• During consultation with RAPs, feedback about potential impacts to the existing landscape and sympathetic rehabilitation was raised. RAPs also advised that they would welcome the opportunity to be involved in re-vegetation of the site, as part of ongoing employment opportunities and to maintain connection to Country.<br>• Opportunities for RAPs to have continued involvement in re-vegetation of the site will be addressed as part of the Social Impact Management Plan and Aboriginal Cultural Heritage Management Plan, beyond project approval. | Section 2.7 – Alternatives<br>Chapter 4 – Project description<br>Chapter 21 – Rehabilitation and closure<br>Mine Plan Options Report (Appendix D)<br>Mine Closure and Rehabilitation Strategy (Appendix T)<br>Aboriginal Cultural Heritage Assessment (Appendix N)<br>Social Impact Assessment (Appendix V) |

## Table 6.6 Community and stakeholder views

| Key themes | Stakeholder group raising concern | How the project addressed this issue | Relevant EIS reference |
|---|---|---|---|
| **Visual amenity**<br>• height of overburden dumps during operation; and<br>• viewpoints at Jerrys Plains and Maison Dieu to be considered as part of the Visual Impact Assessment. | • State regulatory authorities.<br>• Local government.<br>• Directly impacted landholders.<br>• Nearby landholders. | • During early consultation, residents of Jerrys Plains, Maison Dieu and Long Point indicated that they were concerned about operations encroaching further towards their properties, resulting in a loss of visual amenity and light disturbance.<br>• Stakeholders have been advised via newsletters and community information sessions that:<br>– a visual impact assessment has been undertaken; it has determined that Project elements may be visible to varying degrees based on the distance between private properties and HVO, existing view types and context, variable elevation and undulation in the landscape, and the presence of vegetation; and<br>– there will be a low or negligible magnitude of change in views as a result of the Project. Significant visual impacts are not predicted as a result of the Project. | Chapter 20 – Visual amenity<br>Visual Impact Assessment (Appendix S) |
| **Human health**<br>• Cumulative impacts of the project, and nearby mines, on human health. | • Directly impacted landholders.<br>• Nearby landholders.<br>• NSW Health. | • Stakeholders have raised concerns regarding potential impacts to human health as a result of the Project. Stakeholders have been advised via in-person meetings, newsletters and community information sessions that where relevant, potential risks to human health have been assessed against accepted safety or health-based assessment criteria established by the NSW Government. Where relevant, criteria is predicted to be met, or where NSW Government policy stipulates, mitigation measures are to be implemented (eg imposition of voluntary acquisition clauses in any development consent).<br>• Risk to human health as a result of the Project will continue to be monitored. Results of HVO monitoring programs will continue to be provided to the community and stakeholders, as per the conditions of the development consent. | Chapter 22 – Hazards, public safety and health<br>Preliminary Hazard Analysis (Appendix U) |

## Table 6.6 Community and stakeholder views

| Key themes | Stakeholder group raising concern | How the project addressed this issue | Relevant EIS reference |
|---|---|---|---|
| **Local economy**<br>• Maintaining a strong economy is noted as being a priority for government, HVO workforce, HVO suppliers and the local community. | • Local government.<br>• Elected representatives.<br>• Community groups.<br>• Nearby landholders. | • Stakeholders have consistently provided feedback about the economic benefits of the Project, indicating the positive flow on from employment, community grants and other benefits provided by HVO.<br>• A detailed economic study over the life of the Project was carried out which concluded:<br>– The cost-benefit analysis (CBA) estimated net benefits of the Project to be $4,848.5 million. Indirect costs are estimated to be $13.7 million in NPV terms.<br>– Of the indirect benefits related to the Project, analysis showed the following:<br>▪ net economic benefits to workers will be $1,023.8 million in NPV terms; and<br>▪ net economic benefits to suppliers will be $1,715.8 million in NPV terms, representing direct value add generated by NSW suppliers providing goods and services to the Project.<br>– The local effects analysis (LEA) considered the costs and benefits on residents in the Lower Hunter and estimated the following:<br>▪ net economic benefits to local workers will be $954.5 million in NPV terms, assuming a similar proportion of workers are sourced from the Lower Hunter region as the current situation; and<br>▪ net economic benefits to local suppliers will be $760.3 million in NPV terms, assuming the proportion of inputs sourced from the Lower Hunter remains consistent.<br>• The Project is projected to provide significant positive economy-wide impacts to both the local region of Lower Hunter and to NSW. | Chapter 23 – Social<br>Chapter 24 – Economics<br>Social Impact Assessment (Appendix V)<br>Economics Assessment (Appendix W) |
| **Biodiversity**<br>• Impacts to the Warkworth Sands to be avoided, as well as other identified threatened ecological communities (TECs). | • Federal regulatory authorities.<br>• State regulatory authorities.<br>• CCC. | • During ecological field surveys an area of ecological significance, including Warkworth Sands Woodland, were identified. This information was used in the Project design process to target avoidance of impacts to this and other known TECs wherever possible. HVO has redesigned the Project to largely avoid Warkworth Sands Woodland, with only minor impacts limited to discrete areas of the realigned Lemington Road and Lemington rail loop.<br>• Stakeholders were provided advice via meetings and community information sessions, that in addition to the avoidance of Warkworth Sands, a Biodiversity Offset Strategy will be developed. | Mine Plan Options Report (Appendix D)<br>Infrastructure Options and Avoidance Report (Appendix D)<br>Chapter 13 – Biodiversity<br>Biodiversity Development Assessment Report (Appendix L) |

## Table 6.6 Community and stakeholder views

| Key themes | Stakeholder group raising concern | How the project addressed this issue | Relevant EIS reference |
|---|---|---|---|
| **Cumulative impacts**<br>• Consideration to localised cumulative impacts of mining. | • Federal regulatory authorities.<br>• State regulatory authorities.<br>• Local government.<br>• Elected representatives.<br>• Government/ Regulators.<br>• Utility providers.<br>• Directly impacted landholders. | • Consultation with landowners at Jerrys Plains and Maison Dieu raised concerns about the impacts of not only HVO, but other nearby mining operations, advising that they felt like mining is moving closer to them from all directions.<br>• Stakeholders were advised that the Project does not seek to mine any closer to the Jerrys Plans and Maison Dieu then currently approved.<br>• Nearby landowners have also raised concerns about cumulative air quality and noise impacts. Extensive noise and air quality studies were carried out to inform the Project design to avoid and minimise emissions received at nearby residences. These studies considered cumulative contributions and impacts from surrounding mining operations.<br>• The EIS has been developed in consultation with nearby mining operations, as part of understanding and managing cumulative impacts. | Within Chapters 7 to 26 |

## 6.6 Further technical study engagement

SIA technical teams were tasked with communicating directly with the community and Project stakeholders during EIS preparation, providing additional layers of community consultation to inform decision making and outcomes. The nature of these interactions is detailed below.

### 6.6.1 Social impact assessment

EMM has undertaken consultation specifically to inform the SIA. A full description of the SIA engagement program and its outcomes is provided in the SIA (Appendix V).

In summary, the methods used for the SIA engagement during the preparation of the EIS included:

- in-depth interviews with near-neighbours predicted to be directly impacted and other community members in the local area;
- in-depth interviews with 27 service providers;
- in-depth interviews with 5 local council representatives;
- community, workforce and supplier surveys;
- community information sessions; and
- RAP social and cultural mitigation workshop.

### 6.6.2 Aboriginal cultural heritage assessment

Aboriginal consultation for the Project has been undertaken in accordance with the processes and methods outlined in the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW, 2010a), as well as more activities between HVO and the RAPs which enabled the identification of a number of initiatives across key Closing the Gap themes.

Overall, the Project has been liaising with 33 RAPs since September 2020. Details of the Aboriginal consultation for the Project are provided in the Aboriginal Cultural Heritage Assessment (Appendix N).

In addition to consultation requirements outlined in the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010,* HVO facilitated a two-day social and cultural mitigation workshop held on 25 and 26 May 2021. The overarching goal of the workshop was to facilitate discussions between HVO and the RAPs to identify specific programs or initiatives for meaningful mitigation of the Project's heritage impacts, that would contribute towards Closing the Gap. Initiatives across eight key Closing the Gap themes including health, education, business, financial, employment, cultural, and community were raised. Initiatives raised are considered within the Aboriginal Cultural Heritage Assessment and SIA.

## 6.7 Future engagement

This section provides a summary of the community engagement that will be carried out during the EIS Public Exhibition period through to determination, and if the Project is approved ongoing community engagement will align with the community participation objectives in the SSD Engagement Guidelines 2021.

### 6.7.1 EIS exhibition period

Following EIS submission, DPE will exhibit the EIS and supporting technical reports and plans on the Major Projects NSW website, and invite submissions from government agencies and the general public. This will provide additional opportunities for members of the public to comment on the Project.

Once the exhibition period is complete, DPE may require HVO to prepare a Submissions Report to address any matters raised as a result of the public exhibition of the EIS.

Concurrent to this process, HVO will hold community information sessions in Jerrys Plains and Maison Dieu, to present EIS outcomes to the community, with members of the Project team available to answer questions about the Project in more detail. These information sessions also provide an opportunity to ensure that members of the community know how to view the EIS and make a submission, should they so wish.

In summary, engagement with key stakeholders will continue through EIS exhibition through to determination, including:

- ongoing consultation with Council, government agencies and utility providers relating to project planning and design integrations;
- ongoing consultation with other agencies as required to address issues raised during exhibition of the EIS and in the preparation of responses for the Submissions Report; and
- ongoing consultation with directly affected landowners and nearby neighbours, with the provision of Project updates via email, website, newsletters, and further information sessions.

### 6.7.2 Beyond determination

Once the Project has been determined the outcome will be communicated with the local community and relevant stakeholders, including:

- EIS determination outcomes, communicated via the website and newsletter; and
- targeted stakeholder briefings and meetings.

### 6.7.3 Continued operational engagement

HVO will continue its existing operational community and stakeholder engagement initiatives, in line with the current practices. If development consent is granted for the Project, HVO will develop a Social Impact Management Plan (SIMP), ensuring that all consultation commitments are upheld, throughout the construction and operation of the Project. Figure 6.3 shows existing consultation initiatives at HVO.




**Figure 6.3 Operational consultation initiatives**

### 6.7.4 Enquiry management

The existing HVO enquiry management system will remain active, during the assessment stage and following determination should the Project be approved. Enquiries are registered to maintain an accurate record of stakeholder interactions and ensure that requests for information are closed out. The system involves:

- steps to receive, manage and take appropriate action in relation to community enquiries and complaints; and
- preparing verbal and written responses describing what action will be taken, and providing this response to the complainant within agreed timeframes.

# Part D

## Impact assessment

EMM
creating opportunities

# 7 Assessment approach

## 7.1 Identification of key issues

Preliminary environmental investigations were carried out during the preparation of the Scoping Report for the Project (EMM 2020) to identify the relevant key matters to be addressed in the EIS, and the required level of assessment.

In addition, identification of key matters included consideration of:

- the EP&A Act, its objectives and all subordinate regulations and instruments relevant to the Project;
- the SEARs for the Project (refer to Appendix B);
- outcomes of stakeholder engagement carried out through the scoping phase, as well as ongoing engagement that occurs as part of operations at HVO, and has occurred throughout its 70 year life;
- the environmental and planning context for the locality, as well as the strategic context and planning policy framework relevant to the Project; and
- outcomes of baseline studies prepared as part of the EIS.

The above resulted in the engagement of technical specialists to undertake numerous studies to inform the project design refinement process and this EIS, which include air quality, greenhouse gas emissions, noise, blasting, groundwater, surface water, geochemistry, biodiversity, aquatic ecology, Aboriginal cultural heritage, historic heritage, soil and land resources, agriculture, traffic and transport, visual amenity, rehabilitation and closure, hazards, social and economics.

The technical assessments for each aspect have been carried out in accordance with the relevant policies, guidelines and regulatory requirements specific to the particular matter. The assessment methods used generally comprised a significance assessment, where an understanding of the vulnerability or sensitivity of the environment (eg biodiversity or heritage) is assessed and used to determine the severity of potential impacts, or a compliance assessment, for aspects such as noise and air quality which are regulated by statutory guidelines.

Another important part of defining the scope for each assessment was defining this in the context of activities previously assessed and approved at HVO. As described in Chapter 5, two new SSD consents are being sought for the Project, one for HVO North and HVO South respectively, and if approved, HVO will surrender existing approvals relating to the complex. Section 4.63 of the EP&A Act states:

**4.63 Voluntary surrender of development consent**

(1) A development consent may be surrendered, subject to and in accordance with the regulations, by any person entitled to act on the consent.

(2) A development consent may be surrendered under this section even if, on an appeal under Part 8, the consent has ceased to be, or does not become, effective.

(3) If a development consent is to be surrendered as a condition of a new development consent and the development to be authorised by that new development consent includes the continuation of any of the development authorised by the consent to be surrendered—

(a) the consent authority is not required to re-assess the likely impact of the continued development to the extent that it could have been carried out but for the surrender of the consent, and

(b) the consent authority is not required to re-determine whether to authorise that continued development under the new development consent (or the manner in which it is to be carried out), and

(c) the consent authority may modify the manner in which that continued development is to be carried out for the purpose of the consolidation of the development consents applying to the land concerned.

In this subsection, a reference to a development consent that is to be surrendered includes a reference to the surrender of a development consent under section 4.17(5) or the surrender of an approval given under Part 3A when that Part was in force or continued in operation.

Therefore, technical studies did not re-assess development that has already been assessed and approved under previous development consents which are being continued as part of the Project. Such aspects were considered along with the additional elements being introduced by the Project, for the purposes of assessing cumulative impacts of ongoing operations as proposed by the Project.

Further, as two separate SSD consents are being sought, the incremental impacts of the Project at HVO North and HVO South were considered where practical, along with the impacts of the complex as a whole.

## 7.2 Assessed mine plan scenarios

As described in Section 4.3, conceptual mine plans have been developed for various stages over the Project life and are presented in Figure 4.5 to Figure 4.9. The conceptual mine years were chosen for assessment as they are considered representative of key mining stages for the Project and to capture the range of conservative scenarios (such as maximum material movement and closest proximity of activity) for assessment in terms of potential impacts to neighbouring properties with respect to air quality, noise and visual amenity. Actual mining may progress at a different rate depending on a number of factors.

The indicative Project years identified for assessment in relevant technical assessments, and the associated conceptual mine plan, generally represent the following:

- Year 3 – relatively high volume of overburden material movement at HVO South in the early Project years. Construction activities occurring during this Project year include:
  - Parnells dam enlargement;
  - upgrades to the HVO North and South MIAs and the HVLP;
  - construction of the Newdell product stockpile, or extension to the HVLP product stockpile; and
  - improvements to water infrastructure.
- Year 7 – this stage plan represents the highest volume of material movement across the complex in the early Project years, from Year 1 to Year 9. This Project stage was also selected due to the location of overburden emplacement activities at HVO South and proximity to key receptors areas including Maison Dieu and Long Point.
- Year 11 – the highest volume of material movement in this stage across the period from approximately Year 9 to Year 15, and includes the commencement of excavation activities in the Carrington West Wing area in HVO North, where the distance to nearby Jerrys Plains is the shortest. Overburden emplacement and overburden shaping for rehabilitation occurs at this stage in South Lemington Pit 1, being the closest mining-related activities to Maison Dieu and Long Point.

- Year 18 – this stage includes the highest volume over the life of the Project of:
  - overburden extracted and transported across the complex;
  - ROM coal extracted at HVO South;
  - ROM coal across the complex; and
  - total material moved across the complex (inclusive of overburden and coal).
- Year 22 – the final stage with relatively high material movements, after which the volume of material moved in subsequent years decreases significantly towards the cessation of mining in HVO South around 2045. During this Project year, final overburden emplacement is undertaken in South Lemington Pit 1 alongside overburden shaping for rehabilitation which continues past Year 22.

Figure 7.1 illustrates the indicative material movement over the life of the mine, illustrating the above.

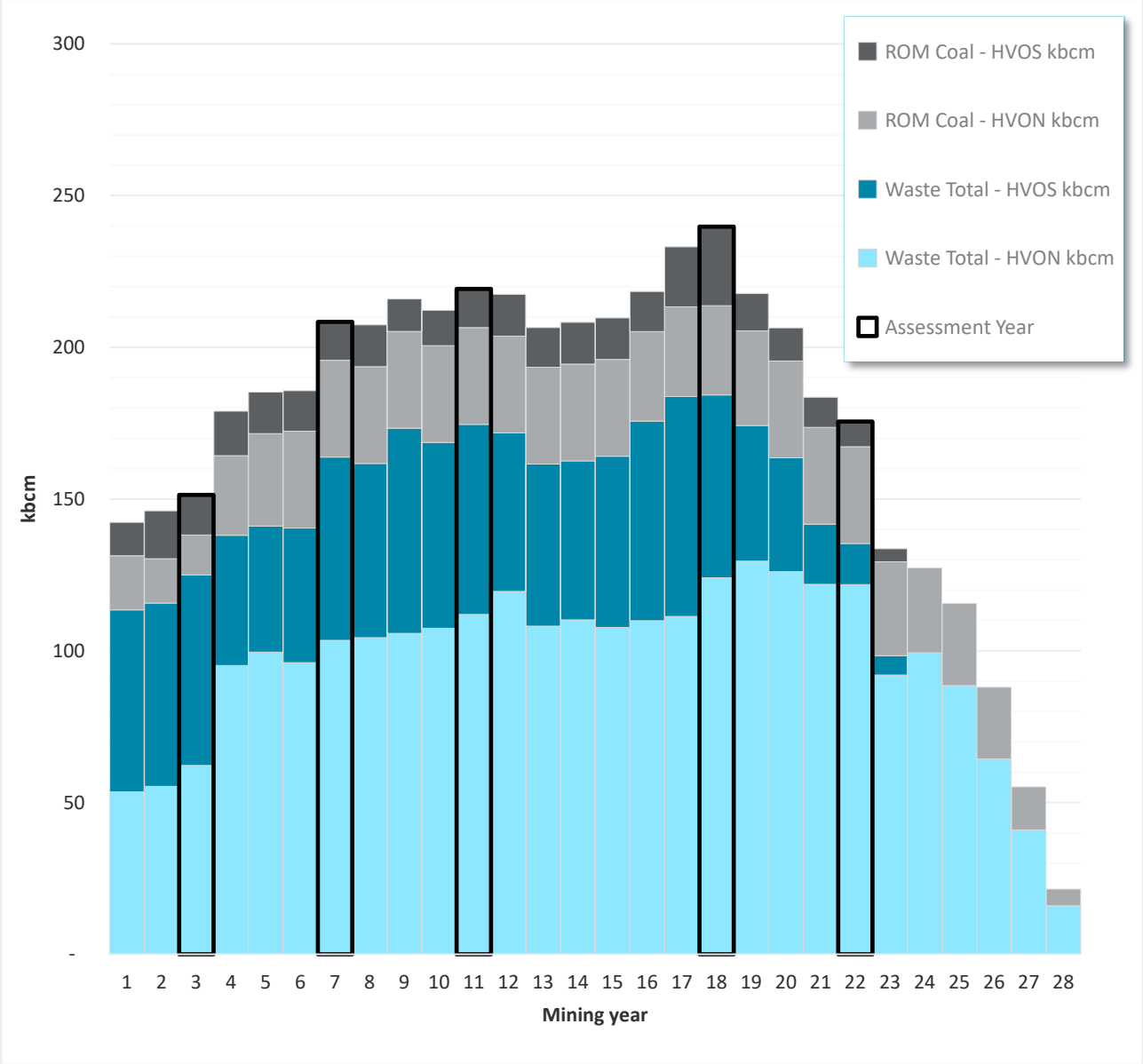



**Figure 7.1 Mining schedule for EIS assessment**

## 7.3 Basis for Project tonnages

The Project is a continuation of an existing approved mining complex, which itself is comprised of multiple pits and has been the subject of numerous historical approvals. The purpose of this section is to provide a breakdown of the production volumes that are quoted in this EIS and the associated technical studies. These production volumes are mostly quoted as ROM tonnes but production tonnes are also sometimes quoted. The difference between the two is the processing to improve final saleable product quality and to meet market specification.

The mine schedule prepared for the Project assumes that Year 1 is 2023 and that mining continues at HVO South until 2045 and at HVO North to 2050. This is known as the 'life of mine' production, and the total life of mine production volume for the Project is stated in this EIS as being approximately 737 million ROM tonnes, or 535 million product tonnes.

The life of mine production figure includes coal that could be extracted under the current approvals even if the Project was not approved. In the table below, that coal production is referred to as the 'base case' and recognises that the existing approval at HVO North does not permit coal extraction to continue beyond June 2025. It reflects the fact that HVO South currently relies on HVO North for coal processing and transport and assumes that there is not adequate time before expiry of the HVO South Project Approval in 2030 to construct the Lemington CPP, and therefore assumes that all mining operations at the HVO Complex will cease at the expiry of the HVO North consent in June 2025. In that scenario, approximately 52 million ROM tonnes would be extracted before operations cease at HVO and this is referred to as the 'base case' production volume.

Except for the Economic Impact Assessment (EIA), where required the technical studies in this EIS have adopted the life of mine production volume, such as air quality and GHG.

The EIA assesses the difference between the 'life of mine' production and the 'base case' production, since this represents the incremental additional mining that will be able to be undertaken should the Project be approved (as compared to the mining that can occur in the absence of the Project being approved). As such, the total production volume assessed for the Project in the EIA is 684 million ROM tonnes. In the table below, this is referred to as the 'Project' production volume.

This EIS states that the Project involves the extraction of approximately an additional 400 million ROM tonnes from what is currently approved. This is referred to as the 'additional' production and represents the proportion of the 'life of mine' production in ROM tonnes that will be extracted from areas of the mine that are not currently authorised by HVO's existing approvals for coal extraction (being the additional area between the Mitchell Pit and Carrington Pit and the seams from the base of the Bayswater seam in the Carrington Pit to the base of the Barrett seam). The reason the additional production is different to the 'Project' production is that not all of the currently approved coal will be mined before June 2025.

As described in the Mine Planning Options Report (HVO 2022a) there are extents of Carrington West Wing in HVO North and South Lemington Pit 1, South Lemington Pit 2 and Riverview South East Extension in HVO South that are currently approved but are not proposed to be retained by the Project. The production volumes from those pits have been removed from the total production for the complex, equating to approximately 22 million ROM tonnes in these areas which have been removed from the proposed mining extents.

**Table 7.1 Project tonnes**

| Scenario | | ROM (Mt) | | |
|---|---|---|---|---|
| | Period | HVO Complex | NVO North | HVO South |
| Base case (ie remaining approved LOM) | 2023 to Jun 2025 | 52 | 31 | 22 |
| Project life of mine | 2023 to 2050 (2045) | 737 | 528 | 208 |
| Project | LOM – Base | 684 | 498 | 187 |

# 8 Air quality

## 8.1 Introduction

An air quality and greenhouse gas assessment (AQGHGA) has been prepared for the Project in general accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA 2022) (the Approved Methods), and the air quality impact assessment criteria specified therein. This section summarises the air quality assessment component of the AQGHGA with the full technical report attached in Appendix H. The greenhouse gas assessment summary can be found in Chapter 9.

The AQGHGA identifies air quality matters relevant to the Project and provides an assessment of predicted impacts relative to criteria. Detailed assessment methodology can be found in the AQGHGA; however, it generally involved:

- defining meteorological conditions using data from Bureau of Meteorology (BoM) and Project-related stations, in combination with meteorological modelling;
- selection of representative years to be modelled which address the maximum material handling quantities, maximum haul distances, varying proximities to sensitive receptors, and combined interactions with other existing or approved mining operations. The representative years selected are discussed in Chapter 7;
- dispersion modelling using the CALPUFF model to predict ground-level particulate matter concentrations and deposition levels due to the Project and other sources for five representative operational scenarios in approximately Year 3, Year 7, Year 11, Year 18 and Year 22;
- post blast fume modelling;
- estimation of $NO_x$ emissions based on fuel consumption data and subsequent modelling to provide an indication of the potential off-site $NO_2$ concentrations; and
- a qualitative assessment of construction dust, taking into consideration the intensity, scale, location and duration of the proposed construction works.

It is also noted that proposed but not yet approved projects in the vicinity of HVO have been assumed to be operating as per currently proposed schedules, meaning that the model predictions will likely be conservative.

## 8.2 Background air quality

Background air quality is strongly influenced by climatic conditions, as well as being influenced by local industry including operating coal mines and power stations, and agricultural activities.

Meteorological conditions do not vary significantly from year to year at HVO, except for rainfall. The most common winds in the area are from the south-east and west to north-west, which is common for many parts of the Hunter Valley. Conditions in 2014 were identified as most representative of the long term, local conditions around the HVO Complex and suitable for informing the air quality impacts of the Project. The AQGHGA also found that consideration of an alternative representative meteorological year does not change the assessment outcomes.

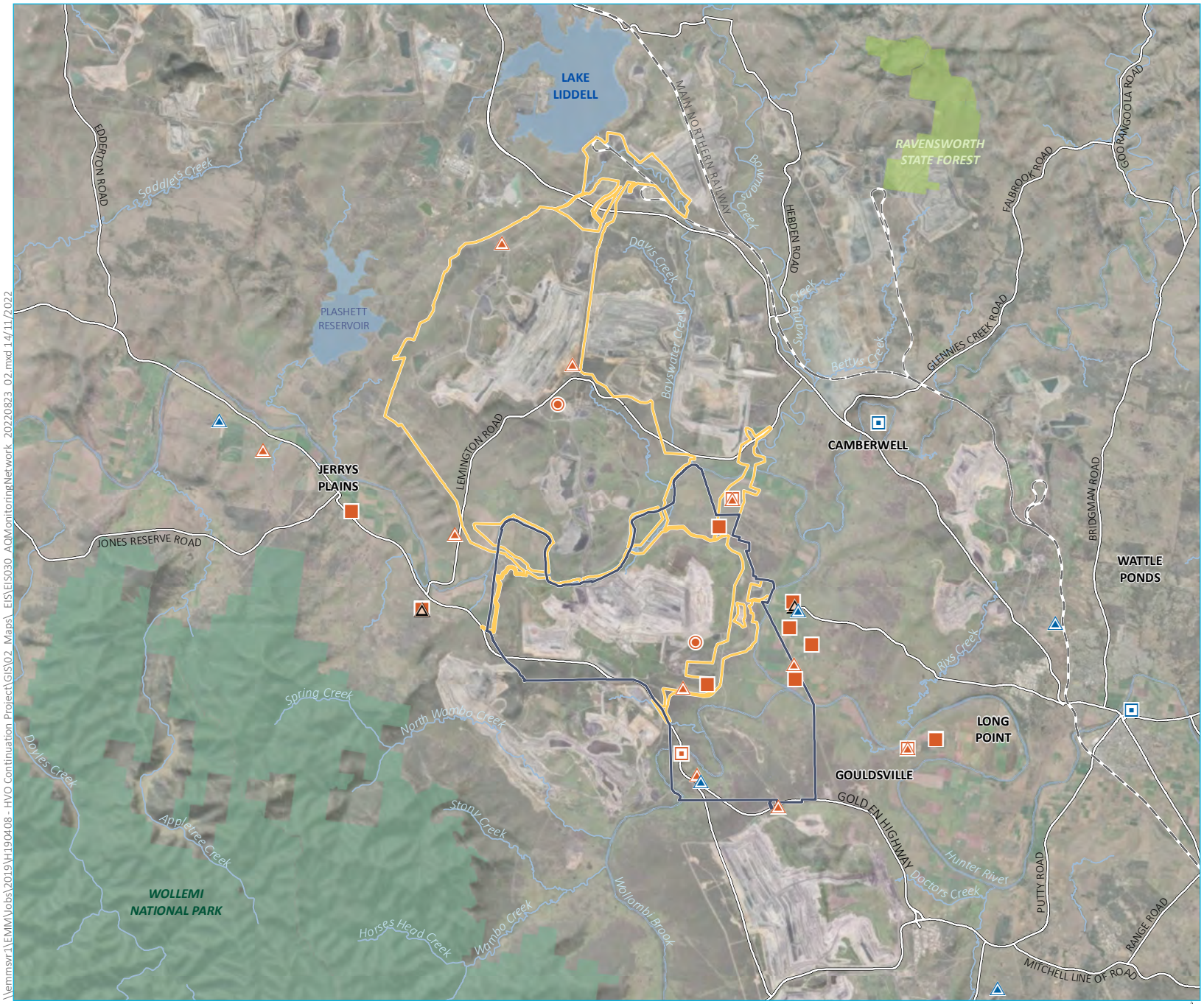
HVO conducts air quality monitoring at the locations shown on Figure 8.1, which includes monitoring of particulate matter (TSP, $PM_{10}$ and $PM_{2.5}$), deposited dust, and two meteorological weather monitoring stations. Air quality monitoring is also undertaken at occupied residences on HVO mine-owned land in accordance with Schedule 3 Condition 4C of the HVO North development consent and Schedule 3, Condition 21A of the HVO South Project Approval. The air quality monitoring network is regularly reviewed and, if required, updated in consultation with the EPA and DPE, noting that the network shown in Figure 8.1 is current as of October 2022. The data collected over many years of air quality monitoring at HVO has provided an extensive data set against which to validate the air quality model for the Project.

Background values adopted for sensitive receptors in the air quality model for the Project, based on the analysis presented in Chapter 4, Appendix F of the AQGHGA (refer to Appendix H of this EIS), are presented in Table 8.1, along with the relevant EPA assessment criterion. The EPA air quality assessment criteria relate to the total concentration of pollutants in the air (that is, cumulative) and not just the contribution from Project-specific sources. Therefore, some consideration of background levels needs to be made when using these criteria to assess the potential impacts.

**Table 8.1 Background air quality at sensitive receptors and assessment criterion**

| Air quality indicator | Averaging time(s) | Assumed background level at sensitive receptors | Assessment criterion |
|---|---|---|---|
| Particulate matter ($PM_{10}$) | 24 hour | Maximum 24 hour average = 41 µg/m$^3$ | 50 µg/m$^3$ |
| | Annual | Annual average = 14 µg/m$^3$ (Variable by day) | 25 µg/m$^3$ |
| Particulate matter ($PM_{2.5}$) | 24 hour | Maximum 24 hour average = 15.3 µg/m$^3$ | 25 µg/m$^3$ |
| | Annual | Annual average = 5.2 µg/m$^3$ (Variable by day) | 8 µg/m$^3$ |
| Particulate matter (TSP) | Annual | 57 µg/m$^3$ | 90 µg/m$^3$ |
| [c] Deposited dust | Annual (max total) | 2.5 g/m$^2$/month | 4 g/m$^2$/month |
| | Annual (max increase) | - | 2 g/m$^2$/month |
| Nitrogen dioxide ($NO_2$) | 1 hour | 74 µg/m$^3$ | 164 µg/m$^3$ |
| | Annual | 16 µg/m$^3$ | 31 µg/m$^3$ |

The HVO Complex currently operates in accordance with the HVO Air Quality and Greenhouse Gas Management Plan. This management plan is a requirement of the existing HVO Complex approvals and aims to reduce, monitor and mitigate potential sources which may decrease air quality in the vicinity of the HVO Complex.




KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary

HVO Air Quality monitoring

- PM10
- PM 2.5
- TSP
- Depositional Dust Gauge
- Meteorological Station

Department of Planning and Environment Air Quality monitoring

- PM10
- TSP, PM10 and PM2.5

Existing environment

- Rail line
- Main road
- Named watercourse
- NPWS reserve
- State forest

Note: Locations of Department of Planning and Environment air quality monitoring symbology has been offset for viewing purposes when there are overlapping features.

Source: EMM (2022); HVO (2022); ESRI (2022); DFSI (2017); GA (2011); DPE (2021)

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# Air quality monitoring network

HVO Continuation Project
Environmental Impact Statement
Figure 8.1

EMM creating opportunities

## 8.3 Modelled control measures

Operational controls in place at the HVO Complex have a direct effect on emissions to air. Operational controls identified in Table 8.2 have been adopted in the air quality model for the Project, and are consistent with best practice measures and the existing air quality and greenhouse gas management plan, as discussed in Section 9.1 of Appendix H.

**Table 8.2 Control measures adopted in air quality model**

| Activity | Emission management measure |
|---|---|
| Topsoil stripping | • Watering of haul routes.<br>• Restricting vehicle speeds.<br>• Manage dust in accordance with the *Dust Assessment Handbook* (NSW Environment Protection Authority 2019).<br>• Minimise advance clearing to reduce exposed area for wind erosion. |
| Drilling | • Use of water suppression during drilling.<br>• Dust curtains.<br>• Manage dust in accordance with the *Dust Assessment Handbook* (NSW Environment Protection Authority 2019). |
| Blasting | • Pre-blast checks including review of meteorological conditions. |
| Hauling overburden/coal | • Watering of haul routes.<br>• Regular maintenance of haul routes.<br>• Restricting vehicle speeds.<br>• Clearly marked haul routes.<br>• Fleet optimisation to reduce vehicle kilometres travelled. |
| Loading and unloading of overburden | • Minimisation of material drop height during loading.<br>• Having less wind exposed dump locations to use during high wind conditions.<br>• Modifying or ceasing operations during adverse dust conditions. |
| Unloading coal to ROM hoppers | • Water sprays. |
| Handling coal at ROM pad/CPP | • Water sprays/enclosure. |
| Dozers on coal stockpiles | • Modify or cease operations during adverse dust conditions.<br>• Reduced travel speed during adverse dust conditions. |
| Conveyors | • Covered/enclosure where reasonable and feasible.<br>• Belt cleaning.<br>• Water sprays. |
| Wind erosion | • Progressive primary rehabilitation.<br>• Temporary seeding/stabilisation of long term inactive overburden dumps. |
| Wind erosion from ROM and product stockpiles | • Water sprays used in adverse wind conditions. |
| Grading roads | • Watering of haul routes.<br>• Restricting vehicle speeds. |

## 8.4 Predicted impacts

This section provides a summary of the predicted air quality impacts of the Project and the cumulative effects on sensitive receptors (refer to Figure 8.2) when considered with surrounding emission sources in the modelled domain. Results are presented for locations representative of the nearest residential areas around HVO and consider the HVO Complex as a whole. Appendix F of the AQGHGA (refer to Appendix H of this EIS) provides tabulated results for all receptors within the modelled domain, including the split of results (ie contribution) between HVO North and HVO South.

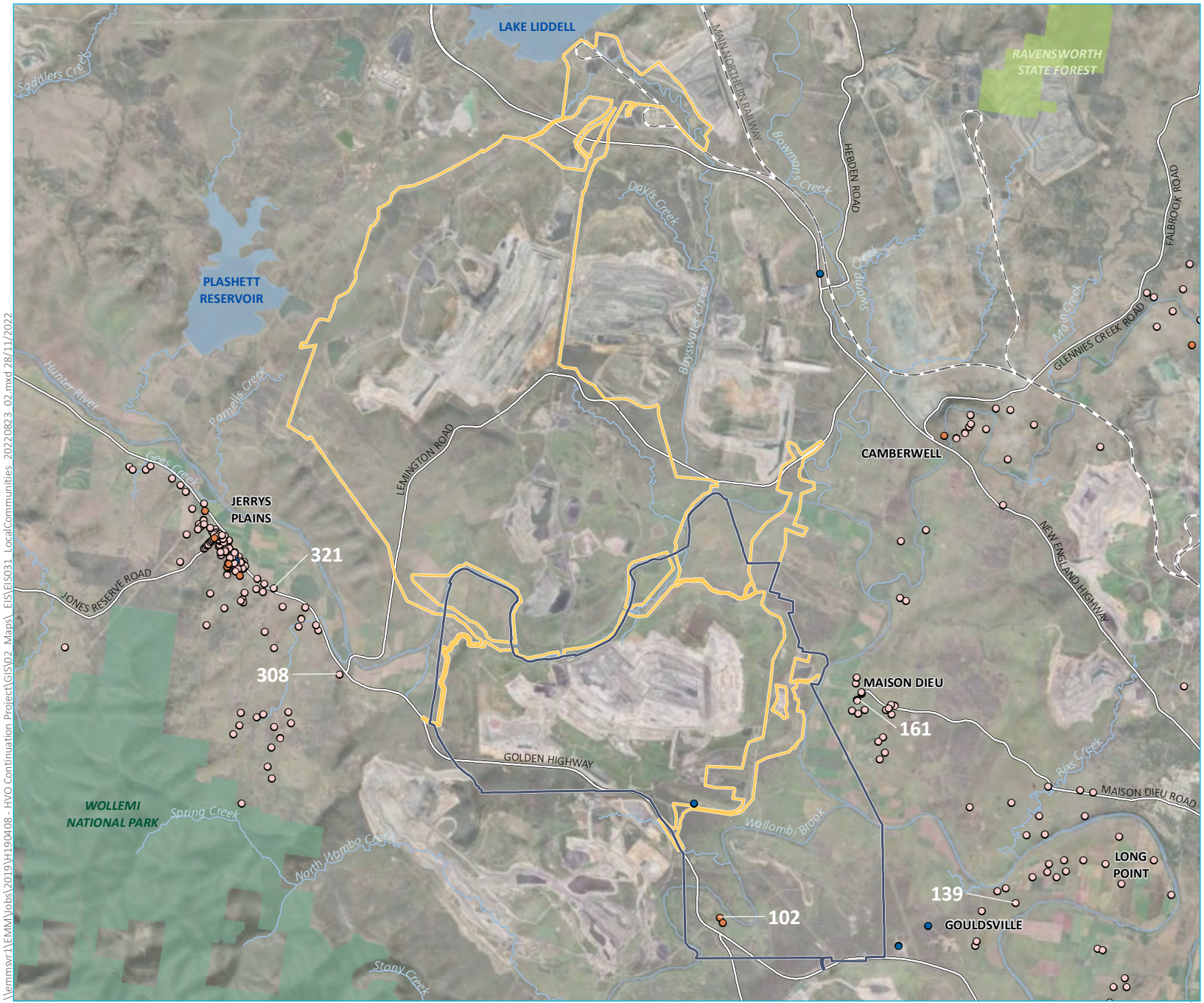
### 8.4.1 Construction dust

Air quality impacts during construction will largely result from dust generated during earthworks. Table 8.3 shows the calculated annual emissions due to construction works in Year 3 which is anticipated to be the peak construction period, compared to Year 3 of operations. A conservative approach was taken for all assumptions, meaning that the resultant construction emission estimates in Table 8.3 are worst case estimates.

**Table 8.3 Estimated construction emissions compared to operations**

| Air quality indicator | Annual emissions in Year 3 (kg/y) | | Construction as a percentage of operation |
|---|---|---|---|
| | Construction | Operation | |
| TSP | 477,052 | 14,616,209 | 3% |
| $PM_{10}$ | 216,977 | 4,916,734 | 4% |
| $PM_{2.5}$ | 31,105 | 764,283 | 4% |

Construction emissions have the potential to increase annual total emissions (ie when combined with operational emissions) in Year 3 by a maximum of 3% for TSP, 4% for $PM_{10}$ and 4% for $PM_{2.5}$. These increases are not of a magnitude that will change the air quality outcomes at sensitive receptors.




KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary

Receptor location

- Private - residential
- Private - non residential
- Community Infrastructure

Existing environment

- Rail line
- Main road
- Named watercourse
- NPWS reserve
- State forest

Sensitive receptors assessed (air quality)

HVO Continuation Project
Environmental Impact Statement
Figure 8.2

Source: EMM (2022); HVO (2022); ESRI (2022); DFSI (2017); GA (2011)

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creating opportunities

### 8.4.2 Operational dust

#### i Particulate matter ($PM_{10}$)

The EPA does not prescribe a Project only assessment criteria for 24 hour average $PM_{10}$; however, the *Voluntary Land Acquisition and Mitigation Policy* (NSW Government 2018) (VLAMP) refers to 50 µg/m$^3$ for the purposes of determining land acquisition and mitigation for private properties. The modelling predicts that the 50 µg/m$^3$ criterion will not be exceeded at any privately owned residential sensitive receptor due to emissions from the Project alone.

Compliance with the EPA's 24 hour average $PM_{10}$ criterion of 50 µg/m$^3$ was also assessed, noting that the EPA's criteria for pollutants relates to the total concentration of pollutants in the air (that is, cumulative) and not just the contribution from Project-specific sources. In a representative year, Jerrys Plains, Maison Dieu and Long Point are expected to experience in the order of between one and five days per year when $PM_{10}$ concentrations exceed 50 µg/m$^3$. This result is within the range of historically measured days when $PM_{10}$ concentrations have exceeded 50 µg/m$^3$, apart from extraordinary years such as those with increased occurrences of events such as prolonged drought, dust storms and bushfires, and the Project is not expected to change this outcome. As described in Appendix H, most locations around the HVO Complex, and in fact NSW, have historically recorded one or more days each year when the 24 hour average $PM_{10}$ concentration exceeded 50 µg/m$^3$.

Further investigation in the form of a 'Level 2' assessment, in accordance with the EPA's Approved Methods, was undertaken into the predicted exceedances of the 24 hour average $PM_{10}$ criterion at the two nearest rural residential areas to HVO with privately owned receptors; Maison Dieu and Jerrys Plains. This found that $PM_{10}$ concentrations are unlikely to exceed 50 µg/m$^3$ at Maison Dieu (outside extraordinary events), while at Jerrys Plains, the highest risk of $PM_{10}$ concentrations exceeding 50 µg/m$^3$ will be when contributions from background sources and other mines are elevated and around Year 11 of the Project, for up to five days. Based on HVO's compliance history, it is expected that these exceedances can be managed through HVO's existing air quality management measures.

In relation to predicted annual average $PM_{10}$ concentrations, compliance is predicted at all privately owned residential sensitive receptors (not subject to existing air quality acquisition rights) except for receptor 308 in modelled Year 11. This result is influenced by the combined contributions from the Project, and external sources of $PM_{10}$. The contribution of the Project to annual average $PM_{10}$ concentrations is in the order of 5 µg/m$^3$ or less. This suggests that the modelled non-compliance at receptor 308 is a conservative estimate and is unlikely to eventuate, given that historical air quality monitoring has shown that annual average $PM_{10}$ concentrations near this location in non-extraordinary years (with respect to climatic conditions) have not exceeded 21 µg/m$^3$ with levels ranging from 16 to 21 µg/m$^3$.

Table 8.4 provides a summary of the modelled operational $PM_{10}$ concentrations at sensitive receptors representative of the nearest residential areas around HVO, with exceedances highlighted in blue. It is noted that in addition to the results discussed above, exceedances of the EPA's $PM_{10}$ criterion are predicted at the locality of Warkworth as shown in Table 8.4. There are no privately owned residential receptors in Warkworth, with all residences previously acquired by surrounding mining operations.

### Table 8.4 $PM_{10}$ concentrations at representative sensitive receptors

| Sensitive receptor | Due to the Project | | | | | Cumulative | | | | | | Criterion |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Yr 3 | Yr 7 | Yr 11 | Yr 18 | Yr 22 | 2014 | Yr 3 | Yr 7 | Yr 11 | Yr 18 | Yr 22 | |
| **Maximum 24 hour average $PM_{10}$ (µg/m³)** | | | | | | | | | | | | |
| Jerrys Plains (308) | 16 | 17 | 18 | 27 | 18 | 50 | 55 | 53 | 58 | 55 | 47 | 50 |
| Jerrys Plains (321) | 11 | 14 | 16 | 29 | 23 | 49 | 47 | 48 | 52 | 59 | 51 | 50 |
| Long Point (139) | 16 | 17 | 17 | 18 | 12 | 41 | 42 | 42 | 42 | 41 | 41 | 50 |
| Maison Dieu (161) | 28 | 18 | 19 | 24 | 28 | 44 | 46 | 47 | 47 | 46 | 41 | 50 |
| Warkworth (102)[1] | 12 | 18 | 25 | 27 | 11 | 56 | 66 | 65 | 65 | 50 | 41 | 50 |
| **Number of days exceeding 50 µg/m³ $PM_{10}$** | | | | | | | | | | | | |
| Jerrys Plains (308) | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 2 | 6 | 2 | 0 | - |
| Jerrys Plains (321) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | - |
| Long Point (139) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| Maison Dieu (161) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| Warkworth (102)[1] | 0 | 0 | 0 | 0 | 0 | 2 | 36 | 27 | 24 | 0 | 0 | - |
| **Annual average $PM_{10}$ (µg/m³)** | | | | | | | | | | | | |
| Jerrys Plains (308) | 2.3 | 3.2 | 3.9 | 5.5 | 2.9 | 20 | 24 | 23 | 27 | 23 | 17 | 25 |
| Jerrys Plains (321) | 2.6 | 3.4 | 3.9 | 5.3 | 3.0 | 19 | 20 | 20 | 22 | 21 | 17 | 25 |
| Long Point (139) | 2.7 | 2.9 | 2.9 | 3.0 | 1.9 | 19 | 20 | 20 | 20 | 18 | 16 | 25 |
| Maison Dieu (161) | 3.2 | 3.6 | 4.1 | 5.0 | 5.1 | 20 | 22 | 22 | 22 | 21 | 19 | 25 |
| Warkworth (102)[1] | 2.0 | 2.9 | 3.8 | 3.8 | 1.8 | 26 | 38 | 37 | 35 | 21 | 16 | 25 |

Note: 1 – Representative receptor 102 in Warkworth is the Warkworth Community Hall, and not a privately owned residential sensitive receptor. There are no privately owned residential receptors in Warkworth.

### ii Particulate matter ($PM_{2.5}$)

Table 8.5 provides a summary of the modelled operational $PM_{2.5}$ concentrations at sensitive receptors representative of the nearest residential areas.

The EPA does not prescribe a Project only assessment criteria for maximum 24 hour average $PM_{2.5}$; however, the VLAMP refers to 25 µg/m³ for the purposes of determining land acquisition and mitigation. The modelling shows that the 25 µg/m³ criterion is not predicted to be exceeded at any privately owned residential sensitive receptor.

Compliance with the EPA's 24 hour average $PM_{2.5}$ criterion of 25 µg/m$^3$ was assessed, which relates to the total (cumulative) concentration in the air, and not just the contribution from the Project. For the assessed years, Jerrys Plains, Maison Dieu and Long Point are expected to experience one or less days per year when $PM_{2.5}$ concentrations exceed the EPA's 24 hour average $PM_{2.5}$ criterion of 25 µg/m$^3$, with the exception of extraordinary years such as those years with increased occurrence of dust storms and bushfires. The review of recent and historical air quality monitoring data at HVO showed that, in the representative year (2014), all monitoring locations recorded between one and two days above 25 µg/m$^3$. Based on the modelling the Project is not anticipated to change this outcome.

The assessment also found that compliance of the EPA's annual average $PM_{2.5}$ criterion of 8 µg/m$^3$ is expected at all privately owned residential sensitive receptors not subject to air quality acquisition rights, except for one receptor, 308, where exceedance of this cumulative level is predicted in Year 11. This receptor already holds acquisition rights relating to noise under the UWJV development consent. Notably also, modelling result show that the contribution of the Project to annual average $PM_{2.5}$ concentrations at the nearest local communities will be in the order of 1 to 2 µg/m$^3$.

While some distant areas, such as Camberwell, are anticipated to experience annual average $PM_{2.5}$ above 8 µg/m$^3$, these locations are not directly adjacent to the HVO Complex. The primary influence on air quality will be other mining operations or sources which exist in closer proximity, rather than HVO.

**Table 8.5 $PM_{2.5}$ concentrations at representative sensitive receptors**

| Sensitive receptor | Due to the Project | | | | | | Cumulative | | | | | Criterion |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Yr 3 | Yr 7 | Yr 11 | Yr 18 | Yr 22 | 2014 | Yr 3 | Yr 7 | Yr 11 | Yr 18 | Yr 22 | |
| **Maximum 24 hour average $PM_{2.5}$ (µg/m$^3$)** | | | | | | | | | | | | |
| Jerrys Plains (308) | 4.1 | 4.6 | 4.7 | 8.3 | 6.2 | 17 | 17 | 17 | 19 | 18 | 17 | 25 |
| Jerrys Plains (321) | 3.2 | 4.4 | 4.7 | 8.3 | 7.5 | 16 | 16 | 16 | 17 | 18 | 17 | 25 |
| Long Point (139) | 3.2 | 3.7 | 3.8 | 4.1 | 2.6 | 15 | 15 | 15 | 15 | 15 | 15 | 25 |
| Maison Dieu (161) | 6.3 | 4.7 | 5.1 | 5.8 | 5.6 | 16 | 16 | 16 | 16 | 16 | 15 | 25 |
| Warkworth (102)[1] | 3.7 | 4.5 | 5.7 | 5.7 | 3.1 | 18 | 20 | 19 | 19 | 17 | 15 | 25 |
| **Number of days exceeding 25 µg/m$^3$ $PM_{2.5}$** | | | | | | | | | | | | |
| Jerrys Plains (308) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| Jerrys Plains (321) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| Long Point (139) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| Maison Dieu (161) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| Warkworth (102)[1] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| **Annual average $PM_{2.5}$ (µg/m$^3$)** | | | | | | | | | | | | |
| Jerrys Plains (308) | 0.5 | 0.8 | 0.9 | 1.3 | 0.8 | 6.6 | 7.0 | 7.0 | 8.3 | 7.3 | 6.0 | 8 |
| Jerrys Plains (321) | 0.6 | 0.8 | 0.9 | 1.3 | 0.9 | 6.4 | 6.5 | 6.7 | 7.1 | 6.9 | 6.1 | 8 |
| Long Point (139) | 0.6 | 0.7 | 0.7 | 0.7 | 0.5 | 6.4 | 6.6 | 6.7 | 6.7 | 6.2 | 5.7 | 8 |
| Maison Dieu (161) | 0.8 | 0.9 | 1.0 | 1.2 | 1.2 | 6.9 | 7.2 | 7.3 | 7.3 | 6.9 | 6.4 | 8 |
| Warkworth (102)[1] | 0.5 | 0.7 | 0.9 | 0.9 | 0.5 | 7.5 | 10.6 | 9.9 | 9.4 | 6.7 | 5.7 | 8 |

Note: 1 – Representative receptor 102 in Warkworth is the Warkworth Community Hall, and not a privately owned residential sensitive receptor. There are no privately owned residential receptors in Warkworth.

### iii Particulate matter (TSP)

Table 8.6 provides a summary of the modelled operational TSP concentrations at sensitive receptors representative of the nearest residential areas. Annual average project contributions to TSP concentrations are expected to be in the order of 2 to 5 µg/m$^3$.

The modelling results indicate compliance with the EPA's assessment criterion for annual average TSP (90 µg/m$^3$) at all privately owned sensitive receptors. Therefore, the Project is not anticipated to cause adverse air quality impacts due to TSP concentrations.

**Table 8.6 Modelled TSP concentrations at representative sensitive receptors**

| Sensitive receptor | Due to Project | | | | | Cumulative | | | | | | Criterion |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Yr 3 | Yr 7 | Yr 11 | Yr 18 | Yr 22 | 2014 | Yr 3 | Yr 7 | Yr 11 | Yr 18 | Yr 22 | |
| **Annual average TSP (µg/m$^3$)** | | | | | | | | | | | | |
| Jerrys Plains (308) | 1.3 | 1.9 | 2.6 | 3.1 | 1.4 | 61 | 62 | 62 | 67 | 63 | 58 | 90 |
| Jerrys Plains (321) | 1.6 | 2.0 | 2.4 | 2.9 | 1.4 | 60 | 60 | 60 | 62 | 61 | 58 | 90 |
| Long Point (139) | 2.5 | 2.4 | 2.4 | 2.1 | 1.0 | 60 | 60 | 60 | 60 | 59 | 58 | 90 |
| Maison Dieu (161) | 2.6 | 2.0 | 2.2 | 2.7 | 2.7 | 60 | 60 | 60 | 60 | 60 | 60 | 90 |
| Warkworth (102)[1] | 0.7 | 1.3 | 2.3 | 1.8 | 0.8 | 63 | 73 | 71 | 71 | 61 | 58 | 90 |

Note: 1 – Representative receptor 102 in Warkworth is the Warkworth Community Hall, and not a privately owned residential sensitive receptor. There are no privately owned residential receptors in Warkworth.

### iv Deposited dust

Table 8.7 provides a summary of the modelled operational deposited dust at sensitive receptors representative of the nearest residential areas. The results show that the EPA's assessment criterion for incremental deposited dust due to the Project on its own (2 g/m$^2$/month) is not predicted to be exceeded at any privately owned sensitive receptor. The cumulative assessment indicates compliance with the EPA's assessment criterion for total deposited dust (4 g/m$^2$/month) at all privately owned residential sensitive receptors not subject to existing air quality acquisition rights.

The Project is not anticipated to cause adverse air quality impacts in terms of deposited dust levels.

**Table 8.7 Modelled deposited dust at representative sensitive receptors**

| Representative receptors (property ID)[1] | Due to Project (HVO Complex) | | | | | Cumulative | | | | | | Criterion [2] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Yr 3 | Yr 7 | Yr 11 | Yr 8 | Yr 22 | 2014 | Yr 3 | Yr 7 | Yr 11 | Yr 18 | Yr 22 | |
| **Annual average deposited dust (g/m$^2$/month)** | | | | | | | | | | | | |
| Jerrys Plains (308) | 0.2 | 0.2 | 0.3 | 0.4 | 0.2 | 2.9 | 3.0 | 3.1 | 3.5 | 3.2 | 2.7 | 2/4 |
| Jerrys Plains (321) | 0.2 | 0.2 | 0.3 | 0.4 | 0.2 | 2.8 | 2.9 | 2.9 | 3.0 | 2.9 | 2.7 | 2/4 |

### Table 8.7 Modelled deposited dust at representative sensitive receptors

| Representative receptors (property ID)[1] | Due to Project (HVO Complex) | | | | | Cumulative | | | | | | Criterion [2] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Yr 3 | Yr 7 | Yr 11 | Yr 8 | Yr 22 | 2014 | Yr 3 | Yr 7 | Yr 11 | Yr 18 | Yr 22 | |
| Long Point (139) | 0.3 | 0.3 | 0.3 | 0.3 | 0.1 | 2.8 | 2.9 | 2.9 | 2.9 | 2.8 | 2.6 | 2/4 |
| Maison Dieu (161) | 0.3 | 0.2 | 0.3 | 0.3 | 0.3 | 2.8 | 2.9 | 2.8 | 2.8 | 2.9 | 2.8 | 2/4 |
| Warkworth (102) | 0.1 | 0.1 | 0.2 | 0.2 | 0.1 | 3.1 | 4.1 | 3.9 | 3.8 | 2.9 | 2.6 | 2/4 |

Note: 1 – Representative receptor 102 in Warkworth is the Warkworth Community Hall, and not a privately owned residential sensitive receptor. There are no privately owned residential receptors in Warkworth.

2 – Project only criterion is 2 g/m$^2$/month. Cumulative criterion is 4 g/m$^2$/month.

#### v VLAMP Assessment

Under the VLAMP, voluntary acquisition rights may apply to a landholder where, even with best practice management, the development contributes to exceedances of the specified criteria (provided in Table 8.8) at any residence or workplace (excluding heavy, hazardous or offensive industry or businesses intentionally located close to mining operations) on privately owned land, or on more than 25% of any privately owned land where there is an existing dwelling or where a dwelling could be built under existing planning controls.

The assessment found that the Project may contribute to an exceedance of the VLAMP criteria for annual average $PM_{10}$ and $PM_{2.5}$ at properties owned by two landholders:

- Receptor 308 – This receptor currently has acquisition rights under the UWJV development consent relating to noise, and mitigation rights relating to noise under the HVO South Project Approval.
- Receptor 121 – This receptor currently has mitigation rights for air quality and noise under the HVO South Project Approval.

The results of the VLAMP assessment for all air quality parameters are summarised in Table 8.8 and illustrated in Figure 8.3.

### Table 8.8 VLAMP assessment results for air quality

| Air quality indicator | Averaging time | Acquisition criterion | Model assessment outcome |
|---|---|---|---|
| $PM_{10}$ | 24 hour | 50 µg/m$^3$ ** | Compliant |
| | Annual | 25 µg/m$^3$* | Project may contribute to an exceedance of the criteria on more than 25% of privately owned land where there is an existing dwelling for the following properties (shown on Figure 8.3):<br>• 3//700476 (Receptor 308); and<br>• contiguous land holding consisting of lots 5//251617, 8//3005 and 9//3005 (Receptor 121). |
| $PM_{2.5}$ | 24 hour | 25 µg/m$^3$** | Compliant |

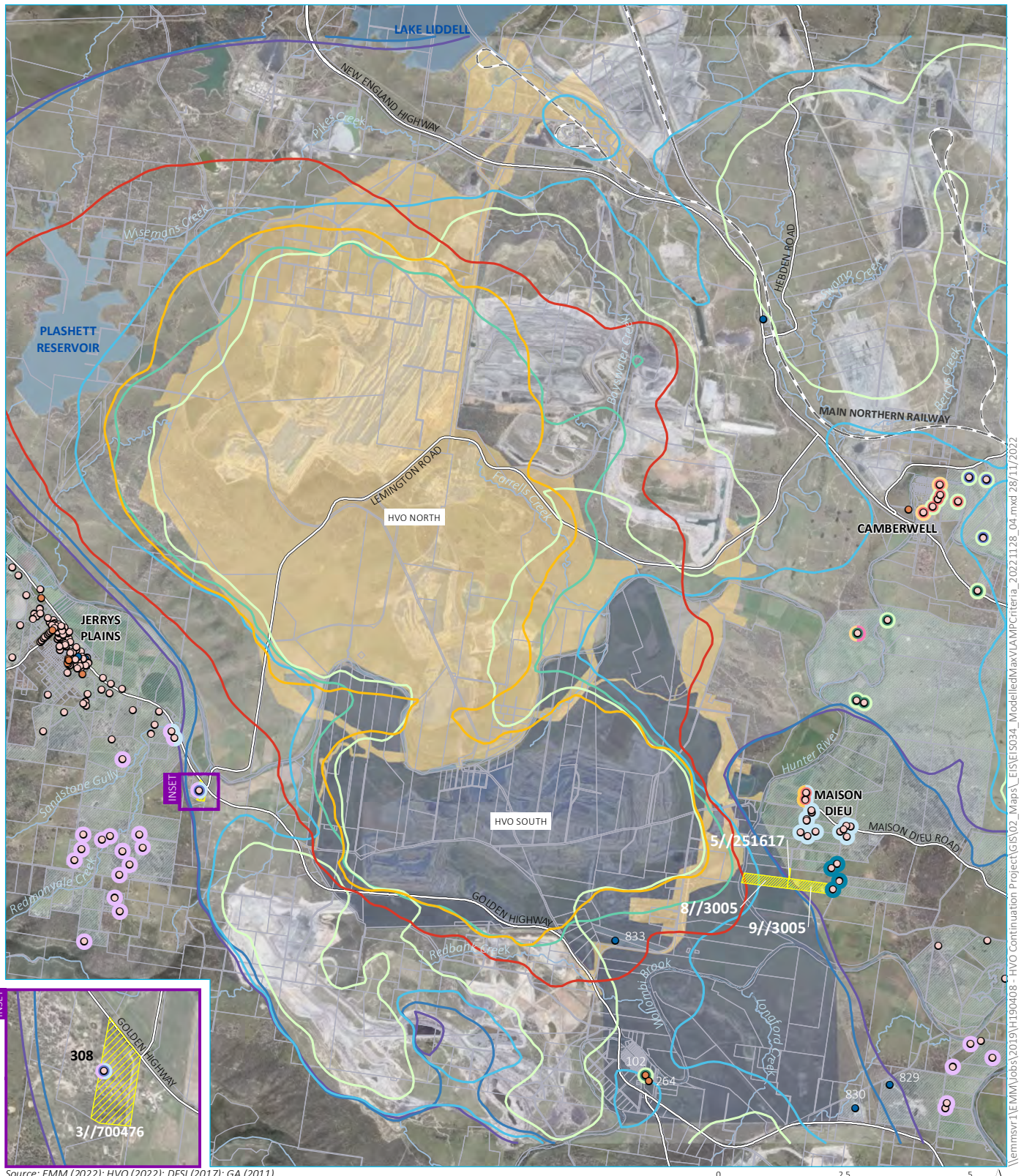
**Table 8.8 VLAMP assessment results for air quality**

| Air quality indicator | Averaging time | Acquisition criterion | Model assessment outcome |
|---|---|---|---|
| | Annual | 8 µg/m$^3$ * | Project may contribute to an exceedance of the criteria on more than 25% of privately owned land where there is an existing dwelling for the following properties (shown on Figure 8.3):<br>• 3//700476 (Receptor 308); and<br>• contiguous land holding consisting of lots 5//251617, 8//3005 and 9//3005 (Receptor 121). |
| TSP | Annual | 90 µg/m$^3$ * | Compliant |
| Deposited dust | Annual (maximum increase) | 2 g/m$^2$/month ** | Compliant |
| | Annual (maximum total) | 4 g/m$^2$/month * | Compliant |

Notes: * Cumulative impact (ie increase in concentrations due to the development plus background concentrations due to all other sources).

** Incremental impact (ie increase in concentrations due to the development alone), with up to five allowable exceedances of the criteria over the life of the development.

Several other receptors are also shown on Figure 8.3 as experiencing exceedances of the VLAMP criteria, including the Hunter Valley Gliding Club (HVGC) (ID 833) (noting that in accordance with HVO South's existing Project Approval an amenity management plan is in place for the HVGC facilities), the Warkworth Community Hall (ID 102) and St. Phillips Church (ID 264). However, these receptors are not residences and are not regularly occupied and therefore are not considered sensitive receptors. Receptors 829 (Dyno Nobel depot) and 830 (former Redbank power station) in Gouldsville also show an exceedance; however, have also been excluded in accordance with the VLAMP based on the definition of 'workplace' which excludes "heavy, hazardous or offensive industry or businesses intentionally located close to mining operations." In addition, while some distant areas, such as Camberwell, are anticipated to experience exceedances of the VLAMP criteria, these locations are not directly adjacent to the HVO Complex. The primary influence on air quality will be other mining operations or sources.




Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011)

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## KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Privately owned land
- VLAMP criteria exceedance lot

Receptor location

- Private - residential
- Private - non residential
- Community Infrastructure
- Subject to existing acquisition rights - Other mine - AQ
- Subject to existing acquisition rights - Other mine - Noise
- Subject to existing acquisition rights - Other mine - AQ & Noise
- Subject to existing mitigation rights - HVO - AQ
- Subject to existing mitigation rights - HVO - Noise & AQ
- Subject to existing mitigation rights - HVO - Noise
- Subject to existing mitigation rights - Other mine - Noise & AQ
- Subject to existing mitigation rights - Other Mine - AQ
- Subject to existing mitigation rights - Other mine - Noise

Extent of VLAMP criteria from all assessment years

- Days above 50 µg/m³ $PM_{10}$ (increment)
- Days above 25 µg/m³ $PM_{2.5}$ (increment)
- Annual average TSP (cumulative)
- Annual average deposited dust (increment)
- Annual average deposited dust (cumulative)
- Annual average $PM_{2.5}$ (cumulative)
- Annual average $PM_{10}$ (cumulative)

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody
- Cadastre

# Modelled maximum extent of VLAMP criteria

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Environmental Impact Statement
Figure 8.3

EMM creating opportunities

### vi Operational post blast fume

Under worst-case meteorological conditions, blasting on permitted days between 9.00 am and 5.00 pm and maximum background $NO_2$ concentrations from Singleton, the maximum 1 hour average $NO_2$ concentrations are not predicted to exceed the EPA's criterion of 164 µg/m$^3$ as a result of the Project at any privately owned sensitive receptor.

The Project is also not expected to lead to adverse air quality impacts with respect to post blast fume, based on dispersion modelling with predominantly worst-case assumptions, and proposed implementation of site-specific pre-blast procedures.

### vii Operational diesel exhaust

Modelled maximum 1 hour average $NO_2$ concentrations (assuming 20% of the $NO_x$ is $NO_2$ at the locations of maximum ground-level concentrations and a maximum background concentration of 74 µg/m$^3$) comply with the EPA's 164 µg/m$^3$ criterion at all privately owned sensitive receptors. Modelled annual average $NO_2$ concentrations (assuming 100% of the $NO_x$ is $NO_2$ and 16 µg/m$^3$ background levels) comply with the EPA's 31 µg/m$^3$ criterion at all private sensitive receptors.

The Project will not lead to adverse air quality impacts with respect to diesel exhaust.

## 8.5 Management, mitigation and monitoring

The best practice air quality management measures, as summarised in Table 8.9 and included in the air quality model for the Project, will continue to be implemented at HVO. In addition, two new mitigation measures have been identified for the Project with respect to air quality, as follows:

- A review of the existing air quality monitoring locations will be undertaken prior to the commencement of the Project so that the monitoring network provides adequate coverage of the Project area, particularly in areas identified by the modelling with a potential for increased air quality impact risk. Any changes to the monitoring network will also be included in a revised Air Quality and Greenhouse Gas Management Plan.

- Separate to the properties who are afforded mitigation rights, HVO currently operates a near neighbour amenity resource program, which is a voluntary commitment to offer water tank cleaning or supply of water filters to neighbours that request such a service. HVO proposes to replace this program with a more structured program whereby private residences within 4 km of the proposed mining area will be eligible for tank inspections, cleaning and installation of first flush filter systems for residential water tanks and domestic taps.

A summary of the key management and mitigation measures is provided in Table 8.9, noting that, except for the two new measures noted above (and listed as AQ16 and AQ17 below), these mitigation measures are currently in place as part of the existing HVO Air Quality and Greenhouse Gas Management Plan.

**Table 8.9 Air quality mitigation measures**

| ID | Mitigation measures |
|---|---|
| AQ1 | Air quality will continue to be managed and monitored as per the HVO Air Quality and Greenhouse Gas Management Plan (AQGHGMP), which will be updated to reflect the Project. The AQGHGMP will detail the monitoring and management controls to be implemented to manage air quality impacts associated with the Project including ongoing implementation of the proactive and reactive management protocols and include control measures for managing other air quality aspects such as blast fume and spontaneous combustion. |

**Table 8.9 Air quality mitigation measures**

| ID | Mitigation measures |
|---|---|
| AQ2 | Reactive air quality management will continue to assess the need to modify the activities in response to the following triggers:<br>• visual conditions, such as excessive visible dust, identified through the use of cameras as well as visual observations;<br>• meteorological conditions, such as dry, strong wind conditions;<br>• ambient air quality conditions (that is, elevated short-term $PM_{10}$ concentrations, observed through air quality monitoring results); and<br>• a Trigger Action Response Plan (TARP) process will be implemented, and dust levels investigated when the TARP process is enacted to identify likely sources of dust. |
| AQ3 | Proactive air quality management measures will include daily forecasts alerting operations of the potential requirement to modify mining activities, as appropriate, to minimise or avoid the potential dust impacts. |
| AQ4 | It is anticipated that receptors 121 and 308 will be afforded voluntary air quality acquisition rights as a result of the Project in accordance with the VLAMP. |
| AQ5 | A review of the existing air quality monitoring locations will be undertaken within 12 months of the commencement of the Project, so that the monitoring network provides adequate coverage of the Project area. |
| AQ6 | A program will be established for all private residences within 4 km of the proposed mining area whereby these residences will be eligible for tank inspections, and cleaning and installation of first flush filter systems for residential water tanks and domestic taps. |

## 8.6 Conclusion

The air quality assessment considered the potential impacts relating to construction dust, operational dust, operational post-blast fume and operational diesel exhaust, associated with the Project.

Construction activities, largely through the realignment of Lemington Road, have the potential to increase the overall dust emissions in the early phase of the Project (that is, the first two to three years) but these increases are not predicted to be of a magnitude that will change the air quality outcomes for privately owned sensitive receptors. Nevertheless, appropriate management and monitoring will need to continue during the construction activities.

Table 8.10 summarises the predicted cumulative operational impacts.

**Table 8.10 Predicted air quality impacts summary**

| Air quality impact | Parameters | Predicted impact |
|---|---|---|
| Particulate matter ($PM_{10}$) | Maximum 24 hour average | The 50 µg/$m^3$ criterion will not be exceeded at any privately owned residential sensitive receptor due to emissions from the Project alone.<br>While 24 hour $PM_{10}$ concentrations may continue to exceed the EPA's cumulative air quality criteria from time-to-time, these events are predicted to be within the range of historically measured days above the criterion, excluding extraordinary events.<br>The review of recent and historical air quality monitoring data showed that, in the representative year (2014), all monitoring locations recorded between one and six days above the air quality criteria. Based on the modelling the Project is not anticipated to change this outcome. |

## Table 8.10 Predicted air quality impacts summary

| Air quality impact | Parameters | Predicted impact |
|---|---|---|
| | Annual average | The contribution of the Project to annual average $PM_{10}$ concentrations at the nearest local communities is predicted to be in the order of 5 µg/m$^3$ or less (against a cumulative criterion of 25 µg/m$^3$).<br>Annual average $PM_{10}$ concentrations will comply with air quality criteria at all privately owned sensitive receptors not subject to existing air quality acquisition rights except for receptor 308 in Jerrys Plains in Year 11. The modelling result is influenced by the combined contributions from the Project, other mining operations and other sources of $PM_{10}$ and is considered unlikely to eventuate based on the conservative approach to the modelling and historical monitoring in this area that show $PM_{10}$ concentrations 25% lower than the criteria.<br>Under the VLAMP, Receptors 121 and 308 trigger voluntary acquisition rights as the Project may contribute to an exceedance of the criteria on more than 25% of privately owned land where there is an existing dwelling (Figure 8.3). |
| Particulate matter ($PM_{2.5}$) | Maximum 24 hour average | 24 hour $PM_{2.5}$ concentrations may continue to exceed air quality criteria from time-to-time; however, these events would be within the range of historically measured days above the criteria, excluding extraordinary events.<br>The review of recent and historical air quality monitoring data showed that, in the representative year, all monitoring locations recorded between one and two days above the air quality criteria. Based on the modelling the Project is not anticipated to change this outcome, and the potential for exceedances is expected to be successfully managed using existing management measures, as demonstrated by HVO's air quality compliance history. |
| | Annual average | The contribution of the Project to annual average $PM_{2.5}$ concentrations at the nearest local communities will be in the order of 1 to 2 µg/m$^3$ (against a criterion of 8 µg/m$^3$).<br>Annual average $PM_{2.5}$ concentrations will comply with air quality criteria at all privately owned sensitive receptors not subject to existing air quality acquisition rights, except for one receptor, 308, in around Year 11. This receptor already holds acquisition rights relating to noise under the UWJV development consent.<br>Under the VLAMP, Receptors 121 and 308 trigger voluntary acquisition rights as the Project may contribute to an exceedance of the criteria on more than 25% of privately owned land where there is an existing dwelling (Figure 8.3). |
| Particulate matter (TSP) | Annual Average | Annual average TSP concentrations will comply with air quality criteria at all privately owned sensitive receptors not subject to existing air quality acquisition rights. The Project will not be the cause of any exceedance. |
| Deposited dust | Annual average | Annual average deposited dust levels will comply with air quality criteria at all private sensitive receptors not subject to existing air quality acquisition rights. The Project will not be the cause of any exceedance.<br>Dust concentrations and deposition levels will comply with VLAMP criteria at all private sensitive receptors not subject to existing air quality acquisition rights. |
| Operational post blast fume emissions | - | No expected adverse air quality impacts. |
| Operational diesel exhaust emissions | - | Operational diesel exhaust emissions associated with off-road vehicles and equipment are not expected to result in any adverse air quality impacts. |

# 9 Greenhouse gas

## 9.1 Introduction

An air quality and greenhouse gas assessment has been prepared for the Project. This chapter summarises the greenhouse gas assessment component, with the full technical report provided in Appendix H. The summary of the air quality assessment can be found in Chapter 8.

GHG emissions, as reported in this chapter, are split into three categories known as scopes:

- Scope 1 – direct emissions from sources that are owned or operated by the organisation (examples include combustion of diesel in company owned vehicles or used in on-site generators).
- Scope 2 – indirect emissions associated with the import of energy from another sources (examples include importation of electricity or heat).
- Scope 3 – other indirect emissions (other than Scope 2 energy imports) which are a direct result of the operations of the organisation but from sources not owned or operated by them (examples include business travel and product usage).

## 9.2 Existing environment

GHG emissions from HVO are calculated using the *National Greenhouse and Energy Reporting (Measurement) Determination 2008* and reported in accordance with the NGER Act. GHG emissions reported from HVO for recent years are summarised in Table 9.1. In relation to calculating Scope 1 fugitive emissions, HVO moved to Method 2 in FY 2015/2016 instead of Method 1 over the period reported in Table 9.1, which is a higher order method of reporting fugitive emissions, resulting in the change over time that can be seen in the table.

**Table 9.1 Reported greenhouse gas emissions for HVO (2013–2021)**

| Reporting year | ROM coal production (Mt) | Direct emissions (Mt $CO_{2-e}$) | | Direct emission intensity (Mt $CO_{2-e}$/Mt ROM) |
|---|---|---|---|---|
| | | Scope 1 | Scope 2 | |
| 2013/2014 | 17.67 | 1.12 | 0.13 | 0.07 |
| 2014/2015 | 17.58 | 1.11 | 0.12 | 0.07 |
| 2015/2016 | 17.75 | 0.48 | 0.12 | 0.03 |
| 2016/2017 | 20.48 | 0.55 | 0.12 | 0.03 |
| 2017/2018 | 18.85 | 0.62 | 0.11 | 0.04 |
| 2018/2019 | 18.63 | 0.58 | 0.11 | 0.04 |
| 2019/2020 | 18.80 | 0.56 | 0.11 | 0.04 |
| 2020/2021 | 14.87 | 0.56 | 0.09 | 0.04 |

## 9.3 Impact assessment

### 9.3.1 Project emission sources

The GHG emissions associated with the operation of HVO are well understood, given the long history of operations. Future projections of production, fuel usage and electricity usage were used to determine the anticipated GHG emissions from the Project.

The key emission sources that were identified and included in GHG calculations are presented in Table 9.2.

**Table 9.2 HVO GHG emission sources**

| Activity | Description | Scope(s) |
|---|---|---|
| **Construction** | | |
| Diesel usage | Combustion of diesel fuel from mobile and stationary plant and equipment. | 1 |
| Materials | Embodied energy of materials. | 3 |
| Materials and support | Transport of material to site. | 3 |
| **Operation** | | |
| Diesel usage | Combustion of diesel fuel from mobile and stationary plant and equipment. | 1 |
| Fugitive | Fugitive emissions from the extraction of coal. | 1 |
| Blasting | Detonation of explosives used for blasting. | 1 |
| Electricity | Electricity usage. | 2, 3 |
| Transport (rail) | Transport of product coal by rail to port. | 3 |
| Transport (shipping) | Transport of product coal by ship to market. | 3 |
| Energy production | Combustion of thermal coal in power generators by end users. | 3 |
| Coking coal | Combustion of coking coal by end users. | 3 |

### 9.3.2 Project emissions

The estimated GHG emissions from the Project for Scope 1, Scope 2 and Scope 3, are summarised in Table 9.3. Over the life of the Project, from approximately 2023 to 2050, Scope 1 and 2 emissions (ie direct emissions as per shaded cells in the table) are estimated to average 1.26 Mt $CO_2$-e per year. The full technical report provides a more detailed breakdown of the estimated emissions (refer to Appendix H).

**Table 9.3 Summary of estimated GHG emissions for the Project**

| Period | Estimated GHG emissions (Mt $CO_2$-e) | | |
|---|---|---|---|
| | Scope 1 | Scope 2 | Scope 3 |
| Annual average | 1.19 | 0.07 | 41.67 |
| Total over life of the Project (2023–2050) | 33.28 | 1.88 | 1,166.86 |

A breakdown of the predicted Scope 1 GHG emissions between HVO North and HVO South is provided is Table 9.4, including estimates of the emission intensities. The data shows that the direct (Scope 1) emission intensity of the HVO Complex would be, on average, 0.05 t CO2-e/t ROM coal. This result is within the range of emission intensities published by other operations, as discussed in Chapter 8 of Appendix H, with some examples provided in Table 9.4. Some differences can also be explained by the features of each operation. For example, there is generally a higher emission intensity for operations that mine deeper seams, such as HVO.

**Table 9.4 Project GHG emission intensity and comparison to other mining operations**

| Operation | ROM coal (Mt/y)* | Scope 1 (Mt $CO_2$-e/y) | Intensity (t $CO_2$-e/t ROM) |
|---|---|---|---|
| **Project (2023–2050)** | | | |
| HVO North | 18.87 | 0.73 | 0.04 |
| HVO South | 7.44 | 0.46 | 0.06 |
| **HVO Complex** | **26.31** | **1.19** | **0.05** |
| **Other operations for comparison** | | | |
| Mt Pleasant Optimisation Project | 16 | 0.54 | 0.03 |
| Mangoola Continued Operation Project | 13.5 | 0.46 | 0.03 |
| Mount Thorley Warkworth | 18 | 0.47 | 0.03 |
| Bengalla | 15 | 0.77 | 0.05 |
| Mt Arthur | 32 | 2.2 | 0.07 |

* Based on the average ROM coal production over the life of the Project.

### 9.3.3 Impact and context

To gain an understanding of the Project in the context of the global coal market and global GHG emissions, the Project's annual coal production volume can be compared to the current global coal demand and the Project's GHG can be compared to total estimated anthropogenic GHG emissions.

To put the projected GHG emissions from the Project in context, they have been compared with the latest emissions officially recorded on the National Greenhouse Gas Inventory. The latest available data through the inventory is from 2020.

The national and state figures in context with the projected emissions from the Project are presented below in Table 9.5.

**Table 9.5 HVO GHG emissions in the State and National context**

| Parameter | Value |
|---|---|
| **National statistics** | |
| 2020 Total Australia GHG emissions (Mt $CO_2$-e) | 497.7 |
| 2020 Total NSW GHG emissions (Mt $CO_2$-e) | 132.4 |

**Table 9.5 HVO GHG emissions in the State and National context**

| Parameter | Value |
|---|---|
| **Project statistics** | |
| Average projected Scope 1 and 2 GHG emissions per year (Mt $CO_2$-e)* | 1.26 |
| Proportion of 2020 total Australia emissions | 0.25% |
| Proportion of 2020 total NSW emissions | 0.95% |

*Scope 2 emissions for the Project have been included in the Project statistics above, despite Scope 2 not being included in the National statistics (since the Scope 2 emissions of all facilities within Australia and NSW are accounted for as the Scope 1 emissions of other facilities). The proportions stated in the above table are therefore conservative.

The estimated annual average Scope 1 and 2 emissions from the Project (1.26 Mt $CO_2$-e) represent approximately 0.25% of Australia's 2020 emissions.

In relation to coal demand, the IEA (2022) estimates the current total global coal demand to be in the order of 5,644 Mt of coal per annum. The proposed peak annual production rate of the Project of just under 40 Mt ROM, or 28 Mt of total product, represents approximately 0.5% of this global demand. Demand for coal will vary over the life of the Project, which the IEA has modelled under various scenarios, as described in Section 2.1.3. The IEA predicts that the future demand for coal will range under the various scenarios modelled, from 5,149 Mt (STEPS) to 3,024 Mt (NZE) in 2030, to within the range of 3,828 Mt (STEPS) to 539 Mt (NZE) in 2050. In all scenarios, the supply of coal from HVO will continue to represent a relatively low percentage of overall demand at around 0.4% by 2030 under the STEPS (or 0.8% under NZE), and less than 0.1% by 2050 under the STEPS (or 0.6% under NZE), assuming a reduced production from HVO as the mine winds down to closure in 2050.

The Project's contribution to global climate change effects would be proportional to its contribution to global GHG emissions. These emissions would be small in the context of global emissions (approximately 50 gigatonnes CO2-e). It is acknowledged that all sources of greenhouse gas emissions will contribute in some way towards the potential global, national, state and regional effects of climate change.

The HVO thermal product is high quality, high energy bituminous coal suitable for high efficiency power generation. Should this high quality coal not be available for export, markets will turn to lower quality sub-bituminous and even lignite (brown coal) from Indonesia or lignite quality brown coal from India. The combustion efficiency of bituminous coals in high efficiency, low emission (HELE) power stations produces around 10% less carbon emissions that the equivalent power generated from sub-bituminous coal and around 20% less emissions that lignite. This is an important consideration in the transition to a low emissions future and the importance of coal in the transition, particularly in south-east Asia.

## 9.4 Mitigation, monitoring, and abatement

### 9.4.1 Mitigation and abatement options

GHG emission mitigation is a key consideration in the development of the mine plan. For example, reducing fuel usage by mobile plant and equipment (which is a major component of direct GHG emissions) is an objective of mine planning and good practice. As diesel fuel consumption represents nearly half of estimated direct GHG emissions, measures to minimise GHG emissions at HVO are generally focused on the efficient use of diesel. At a broader business level, both Yancoal and Glencore (as the JV partners of HVO) have announced commitments relating to GHG emissions from their operations. These are discussed in detail in Chapter 2 (refer Section 2.2).

Measures to minimise or mitigate Scope 1 and Scope 2 GHG emissions have been considered throughout the development and assessment of the Project. These include, but are not limited to, measures considered below in Table 9.6. HVO is also committed to the ongoing consideration of reasonable and economically feasible technologies as they become available and will review technologies throughout the life of the mine to improve efficiencies and reduce emissions.

**Table 9.6 GHG mitigation measures considered in the Project design**

| Potential mitigation measures | Included in the Project | Comments |
|---|---|---|
| **Scope 1 emissions – fuel use** | | |
| Minimise the length of haulage routes | Yes | Length of haulage routes has been optimised to minimise fuel use, dust and noise emissions. |
| Optimise ramp gradients | Yes | Ramp gradients have been optimised in the mine design based on pit geometry. |
| Payload management and loading equipment productivities | Yes | Payload and equipment productivities will continue to be constantly monitored and actively managed to maintain efficient haulage. |
| Fuel efficient haul trucks and other mobile plant | Yes | Fuel use efficiency has been an important selection criterion when procuring existing trucks at HVO. New fuel use technology will be considered should any new trucks be purchased, or engine repowers are required over the life of the Project. |
| Scheduling activities so that equipment use and vehicle operation is optimised | Yes | Scheduling the location and use of equipment and mobile plant is a routine part of mining operations. HVO will continue to prepare short, medium and long term production plans to optimise production. |
| Replacing trucks with conveyors | No (noting some conveyors are already in use at HVO) | Replacing trucks with conveyors is not necessarily feasible or economically viable given the dynamic nature of the open cut mining operation and relatively short haulage distances. Where conveyors do make economic sense, for example the overland product coal conveyor which is in place from HVCHPP to the train load points in the north, they will be considered. |
| Use of alternate fuels | Ongoing consideration | HVO will regularly review options for the use of alternate fuels to diesel, such as biofuels. Additionally, hydrogen and electric powered trucks will be considered as technological advances are made. |
| **Scope 1 – fugitives** | | |
| Pre-drainage of coal seam methane | No | Pre-drainage is not currently economically viable for a multi-seam open-cut mining operation such as HVO. Notwithstanding this, HVO will continue to review this option over the mine life as technologies for pre-drainage improve and may potentially become feasible. |

### 9.4.2 The safeguard mechanism

The Commonwealth Government's *Climate Change Act 2022* recently commenced, enshrining into law Australia's commitment under the Paris Agreement to reduce GHG emissions to 43% below 2005 levels by 2030 and net zero by 2050. One of the government's key policy measures designed to achieve these emission reduction commitments are the proposed amendments to the Safeguard Mechanism, which are currently being developed by the Commonwealth Government with an announced commencement date of 1 July 2023.

The Safeguard Mechanism applies to 215 designated large facilities in Australia (being facilities that emit more than 100,000 t CO2e Scope 1 emissions per year) and currently requires that the net covered emissions of GHG from the operation of a designated large facility do not exceed the baseline applicable to the facility.

Under the proposed reforms to the Safeguard Mechanism, the Commonwealth Government proposes to:

- establish new baselines for individual facilities;
- reduce baselines for individual facilities over time to help Australia reach its emissions reduction commitments;
- maintain the existing requirement in the Safeguard Mechanism where facilities that exceed their emissions baseline must purchase and surrender carbon credits (known as Australian Carbon Credit Units) for the exceedance; and
- introduce credits (known as Safeguard Mechanism Credits) for facilities that emit less than their baseline, which can be transferred to facilities that exceed their baseline.

These legislative amendments have been announced by the Commonwealth Government and constitute the policy measure that is designed to reduce emissions from the industrial sector in Australia, which includes mining.

HVO is, and will continue to be, a designated large facility as defined by the NGER Act. The Safeguard Mechanism therefore applies to HVO and will continue to apply to HVO once the reforms to the mechanism take effect.

At the time of publication of this EIS, the final details of the Safeguard Mechanism amendments had not been released by the Commonwealth Government. However, based on the government's public announcements, the extensive consultation undertaken by the government to date, and the draft Bill that has been released for public comment, it is clear that the following requirements will apply to HVO once the amendments to the Safeguard Mechanism have been finalised:

- HVO will have an emissions baseline which declines over time.
- If HVO is unable to reduce its emissions so that they are below the declining baseline, HVO will be required by law to acquire and surrender carbon credits (such as Australian Carbon Credit Units or Safeguard Mechanism Credits).
- As a result, HVO will be required to offset that portion of HVO's emissions which exceed the declining baseline.

### 9.4.3 Summary

Specific mitigation measures to reduce the level of future GHG emissions from the Project are summarised in Table 9.7.

**Table 9.7 Greenhouse gas mitigation measures**

| ID | Mitigation measures |
|---|---|
| GHG1 | Over the life of the Project, available technologies will be regularly reviewed in consideration of reasonable and feasible abatement measures to minimise Scope 1 and Scope 2 GHG emissions, including but not limited to:<br>• options for fuel switching (eg hydrogen and electric powered); and<br>• sourcing electricity for operations from renewable sources, and battery storage. |
| GHG2 | The AQGHGMP will be updated to reflect the Project, and will include a 3-year action plan (updated every 3 years) for investigating and implementing all reasonable and feasible abatement measures to minimise GHG emissions. |

## 9.5 Conclusion

The estimated annual average Scope 1 and 2 GHG emissions from the Project (1.26 Mt $CO_2$-e) represent approximately 0.25% of Australia's 2020 emissions. In total, approximately 33.28 Mt $CO_2$-e of Scope 1 and 1.88 Mt $CO_2$-e Scope 2 are anticipated to be emitted over the Project life.

HVO will continue to manage its contribution to Australian GHG emissions inventories through reporting under the NGER Act, as well as other government initiatives implemented to manage emissions at a national level. As a designated large facility under the NGER Act, the Safeguard Mechanism applies to HVO, and therefore ongoing operations at HVO will be subject to the emissions reduction requirements that are contained within it.

Under the NGER Act, relevant sources of GHG emissions and energy consumption must be measured and reported on an annual basis, enabling major sources and trends in emissions and energy consumption to be identified. HVO will continue to use this information, combined with regular reviews of all reasonable and feasible technologies as they become available and throughout the life of the Project, to improve efficiencies and reduce emissions.

# 10 Noise

## 10.1 Introduction

A noise impact assessment (NIA) was conducted to assess the predicted noise impacts associated with the Project, including the ongoing operation of HVO and the associated construction activities. The NIA also describes the initiatives built into the Project to avoid and minimise noise and identifies the additional mitigation and management measures to be implemented to address residual impacts. The NIA is provided in full in Appendix I.

The Project design, in conjunction with the noise assessment, considered feasible and reasonable mitigation measures in accordance with the guidance provided in the *Noise Policy for Industry* (NPfI) (EPA 2017) to minimise noise and vibration impacts on sensitive receptors. The design process was therefore an iterative one, with Project aspects altered as various scenarios were modelled, as outlined in this chapter.

The NIA was prepared to address the SEARs (refer to Appendix B) and in consideration of the following guidelines, policies and industry requirements:

- NPfI (EPA 2017);
- *Interim Construction Noise Guideline* (EPA 2009) (ICNG);
- *Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Developments* (NSW Government 2018) (VLAMP); and
- *Road Noise Policy* (DECCW 2011) (RNP).

## 10.2 Existing environment and criteria

### 10.2.1 Meteorology

One complete year of meteorological data (2017) from the HVO Corporate automatic weather station was analysed to determine the frequency of occurrence of modelled meteorological conditions, by season and time period. Multiple years of data were considered, and 2017 was selected as the most representative of long-term regional weather trends relevant to the noise assessment and had a very high level of completeness. Further information on the meteorological conditions included in the NIA is provided in in Appendix E of that report (refer to Appendix I of this EIS).

### 10.2.2 Background noise levels

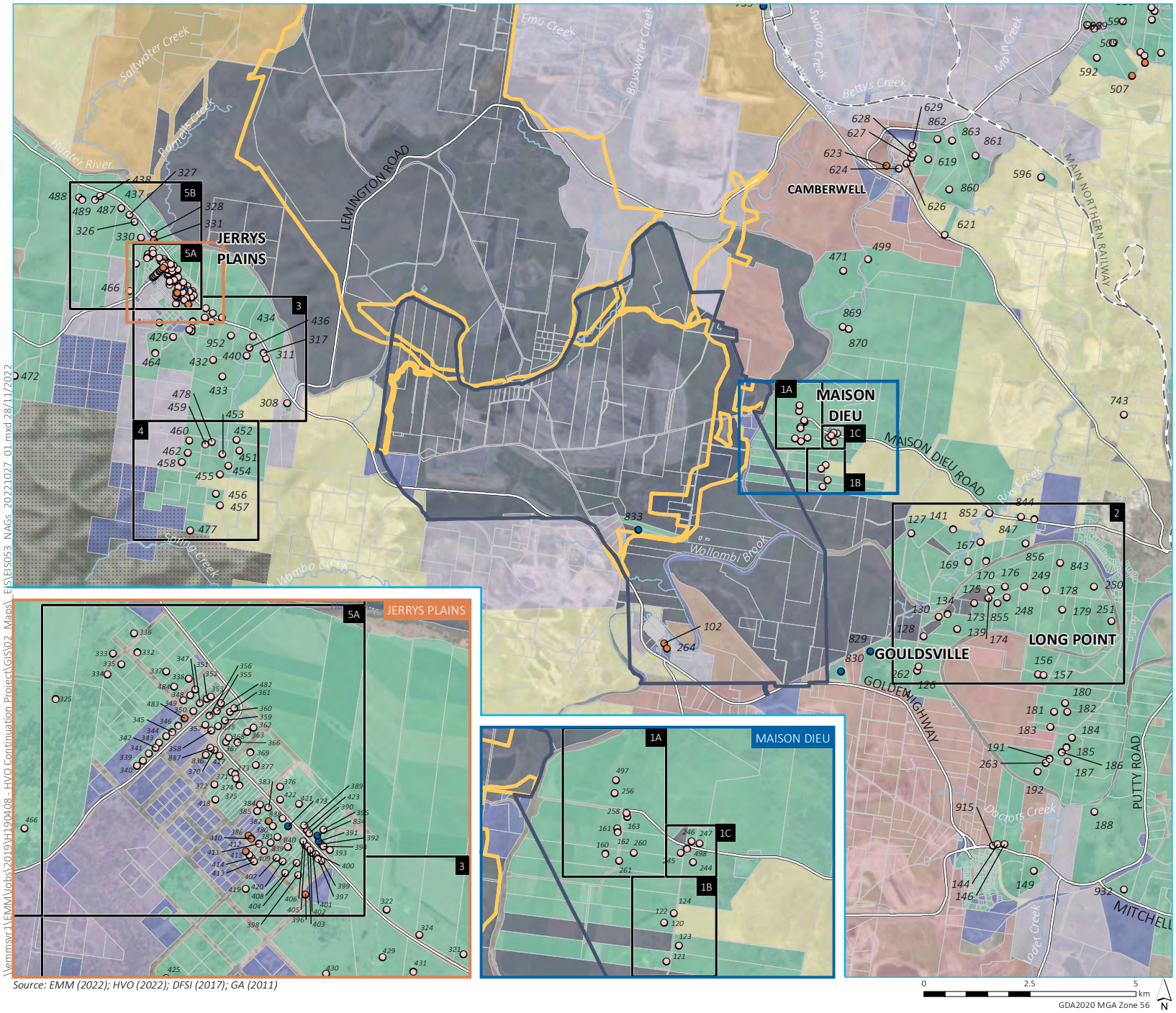
Background noise surveys were conducted around HVO to determine rating background levels (RBL) in the areas where sensitive receptors have been identified (refer to Section 2.4.2 for discussion on sensitive receptors around HVO). Review of this data and results from historical attended monitoring, as well as consideration of the existing noise monitoring groups established for HVO, enabled identification of appropriate noise assessment groups (NAGs) for the Project, which are considered representative of the receptors surrounding the Project. The primary objective of the NAGs is to classify receptors into groups, where each group can be represented by a single background noise level and, hence, is assessed against a singular criterion.

Figure 10.1 illustrates the NAGs established around HVO for the Project. Table 10.1 presents the RBLs used to derive relevant noise goals for the Project in accordance with the NPfI and the ICNG.

### Table 10.1 Background noise monitoring results summary

| NAG | Locality | RBL $L_{A90}$ dB | | |
|---|---|---|---|---|
| | | Day | Evening | Night |
| 1A | Maison Dieu – Shearers Lane and northern receptors | 31 | 32 | 33 |
| 1B | Maison Dieu – Knodlers Lane and southern receptors | | | |
| 1C | Maison Dieu – North western receptors | | | |
| 2 | Long Point | 34 | 30 | 31 |
| 3 | Jerrys Plains South | 36 | 37 | 33 |
| 4 | Redmanvale Road* | 35 | 30 | 30 |
| 5A | Jerrys Plains Village | 36 | 33 | 32 |
| 5B | Jerrys Plains West | 33 | 28 | 27 |

*A background noise survey was not conducted at Redmanvale Road (NAG 4) as background levels are likely to be less than the NPfI default minimum RBLs. The NPfI default minimum RBLs have been adopted for this NAG.




Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011)

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Noise assessment groups

HVO Continuation Project
Environmental Impact Statement
Figure 10.1

EMM
creating opportunities

### 10.2.3 Construction noise criteria

The ICNG sets out construction noise criteria for residential receptors, called noise management levels, which are divided into 'noise affected' and 'highly noise affected'. The 'noise affected' level represents the point above which there may be some community reaction to noise. The 'noise affected' levels for construction are:

- $L_{Aeq,15minute}$ equal to background plus 10 dB during standard construction hours; and
- $L_{LAeq,15minute}$ equal to background plus 5 dB for work outside standard construction hours.

The 'highly noise affected' level represents the point above which there may be strong community reaction to noise, as per the ICNG. The 'highly noise affected' level during construction hours is 75 dB.

The construction noise management levels for the Project are presented in Table 10.2.

**Table 10.2 Noise management levels - standard construction hours**

| NAG | Area | Noise Affected $L_{Aeq,15minute}$ dB | Highly Noise Affected $L_{Aeq,15minute}$ dB |
|---|---|---|---|
| 1A | Shearers Lane and northern receptors in Maison Dieu area | 45 | 75 |
| 1B | Knodlers Lane and southern receptors in Maison Dieu area | 45 | 75 |
| 1C | North western receptors in Maison Dieu area | 45 | 75 |
| 2 | Long Point | 45 | 75 |
| 3 | Jerrys Plains South | 46 | 75 |
| 4 | Redmanvale Road | 45 | 75 |
| 5A | Jerrys Plains Village | 46 | 75 |
| 5B | Jerrys Plains West | 45 | 75 |

Some out of hours work may be required from time to time. As described in the NIA (Appendix I), if this occurs, activities will be managed such that operational noise criteria are met.

### 10.2.4 Operational noise assessment levels

The objectives of noise assessment criteria for industry are to protect the community from excessive intrusive noise and to preserve amenity for specific land uses.

Chapter 2 of the NPfI outlines the procedure for determining Project Noise Trigger Levels (PNTL) relevant to a particular industrial development and applying it to existing noise-sensitive receptors. If it is predicted that the development is likely to cause the PNTL to be exceeded at existing private residential receptors, reasonable and feasible noise controls and/or management measures should be considered to reduce predicted noise as far as practicable.

Table 10.3 provides the calculated PNTL for each NAG, determined in accordance with the NPfI for private residential receptors. Where private residential receptors fall outside of the identified NAGs, the NPfI default minimum RBLs have been adopted and result in PNTLs of $L_{Aeq,15minute}$ 40/35/35 dB for the day/evening/night periods, respectively. It is noted that PNTLs are used in the NIA as a benchmark level above which noise management measures are required to be considered (in accordance with the NPfI) and to evaluate the significance of residual noise impacts.

Table 10.3 also shows the highest current criteria for each NAG (from either HVO North or HVO South) as a comparison to the PNTLs derived for the Project in accordance with the NPfI. For the sensitive night-time period, all PNTLs are lower than or equal to the highest current criteria (existing HVO North and South development consents or EPL640) applicable to each NAG. The same applies to the evening period, except for the Jerrys Plains South area (NAG 3), where the PNTL is 41, compared to 40 as the current highest criterion.

**Table 10.3 Project noise trigger levels**

| NAG | PNTL ($L_{Aeq,15minute}$) | | | Highest current NAG criteria of HVON and HVOS (Consent or EPL) $L_{Aeq, 15minute}$ | | |
|---|---|---|---|---|---|---|
| | Day | Evening | Night | Day | Evening | Night |
| 1A | 40 | 36 | 36 | 41 | 41 | 41 |
| 1B | 40 | 36 | 36 | 40 | 40 | 40 |
| 1C | 40 | 36 | 36 | 39 | 39 | 39 |
| 2 | 40 | 35 | 35 | 37 | 37 | 37 |
| 3 | 41 | 41 | 38 | 40 | 40 | 40 |
| 4 | 40 | 35 | 35 | 35 | 35 | 35 |
| 5A | 41 | 38 | 37 | 40 | 40 | 40 |
| 5B | 40 | 35 | 35 | 40 | 40 | 40 |

Further information on the current criteria and how the PNTLs were derived can be found in Section 3.4 of the NIA (Appendix I).

### 10.2.5 Maximum noise level

In accordance with the NPfI, events that have potential to cause sleep disturbance require a maximum noise level assessment. The night time noise level criteria which triggers a maximum noise level assessment includes exceedance of:

- $L_{Aeq,15minute}$ 40 dB or the prevailing RBL plus 5 dB, whichever is the greater; and/or
- $L_{AF,max}$ 52 dB or the prevailing RBL plus 15 dB, whichever is the greater.

### 10.2.6 Road traffic noise

The RNP is applicable to road traffic noise generated by the Project and applies different noise limits depending upon the development category and receptor type. Given no changes are proposed to the maximum, approved workforce numbers or operational traffic to that currently approved, no change to road traffic noise on the main road network is expected to occur as a result of the Project. However, road traffic on the proposed realigned Lemington Road has been assessed, given the change to the alignment and proximity to residential receptors. Lemington Road has been designated as a sub-arterial road in accordance with Section 2.2 of the RNP.

The RNP states that any increase in the total traffic noise level as a result of a development should be limited to 2 dB. For assessment of additional road traffic due to Project construction activities, the allowable increase criterion of 2 dB is deemed applicable, as any increases will be temporary and limited to the construction phase of the Project. As noted in Section 3.4 of the RNP, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.

## 10.3 Avoidance and minimisation through design

In accordance with the NPfI, all reasonable and feasible noise mitigation measures were considered in the noise model for the Project. Table 10.4 lists mitigation options considered, whether they are feasible and/or reasonable, and provides justification as to why each option was adopted or not. Controls included in the NIA are a mix of controls already included in the existing HVO noise management plan (NMP), and others developed during the assessment of the Project.

As noted in the NIA, it is EMM's opinion that all feasible and reasonable noise controls have been investigated and, where applicable, included in the NIA. Reasonable and feasible noise control have been considered in accordance with the definition noted in the HVO South Project Approval, in which reasonable is defined as:

> Means applying judgement in arriving at a decision, taking into account: mitigation benefits, cost of mitigation versus benefits provided, community views and the nature and extent of potential improvements.

Feasible means what is possible and practical in the circumstances.

HVO's commitments regarding noise control and management are discussed in Section 10.5.

**Table 10.4 Feasible and reasonable noise mitigation options**

| Mitigation Option | Feasible mitigation test | Reasonable mitigation test | Justification for adopting or disregarding this option |
|---|---|---|---|
| **Mitigation at the source** | | | |
| Best Available Technology Economically Achievable (BATEA) equipment | Yes | Yes | HVO currently operates a combined attenuated and unattenuated mining fleet and is progressively attenuating the remaining fleet of large mining equipment. BATEA sound power has been adopted where reasonable and feasible in the NIA for significant noise generating mobile equipment. |
| Immediate replacement of all unattenuated equipment with BATEA equipment | Yes | No | It would not be reasonable for HVO to immediately replace serviceable unattenuated equipment in good working order with BATEA equipment. Existing equipment still has significant remaining operational life. |
| Best Management Practice (BMP) | Yes | Yes | HVO currently implements BMP, which is described in Section 4.1 of the NIA. BMP will continue to be applied to the Project and is applied where relevant in the NIA. |
| Attenuated fixed infrastructure | Yes | Yes | Significant fixed infrastructure at the yet to be constructed Lemington CPP area will include cladding and BATEA sound power. Sound power adopted for the Project reflects this. |
| Optimised coal haul route to minimise noise impacts | Yes | Yes | An additional coal haul route from West Pit to Howick CPP was identified and included in mine scheduling to minimise noise to Jerrys Plains when needed. |
| Restrict activity to day and evening only | Yes | No | Restricting operations to the day and evening would render the Project unviable. |
| Dozers restricted to 1$^{st}$ gear | Yes | Yes | Restricting dozers to 1$^{st}$ gear operation during noise enhancing weather conditions is feasible and reasonable. This control was applied to the modelling. |
| Restrict operation of rehabilitation dozers | Yes | Yes | Restricting operation of rehabilitation dozers during noise enhancing weather conditions is feasible and reasonable. This control was applied to the modelling. |

### Table 10.4 Feasible and reasonable noise mitigation options

| Mitigation Option | Feasible mitigation test | Reasonable mitigation test | Justification for adopting or disregarding this option |
|---|---|---|---|
| Restrict operation of drills in exposed locations | Yes | Yes | Restricting operation of exposed drills during noise enhancing weather conditions is feasible and reasonable. This control was applied to the modelling. |
| **Mitigation in the transmission path to the receptor** | | | |
| Roadside bunds | Yes | Constructing roadside bunds on long term haul roads is reasonable. The cost of constructing bunds on short term haul roads is prohibitive. | An 8 m high roadside bund will be constructed on the exposed side of the haul road from the Mitchell Pit towards the Howick CPP for approximately 900 m. Other roads are designed to maximise shielding from natural topography within the mining areas. |
| Low level dumps | Yes | Yes | Emplacement areas at varying elevations were assessed to evaluate the benefit of dumping of overburden in more shielded locations. |
| Alternative haulage routes | Yes | Yes | Where reasonable and feasible, alternative haul routes and roads will be utilised during noise enhancing weather conditions. This control was applied to the modelling. |
| Relocation of attenuated equipment to high impact areas | Yes | Yes | Identification of high and low impact areas will determine if allocation of attenuated equipment is required. This may be required during periods of noise enhancing weather conditions. |
| Fixed infrastructure located in protected area | Yes | Yes | The HV CPP and Howick CPP fixed infrastructure is in suitably protected areas with a buffer distance of approximately 8,000 m and 5,000 m respectively to the nearest receptors. The yet to be constructed Lemington CPP fixed infrastructure is approximately 3,000 m to the nearest receptor and includes BATEA sound power. Relocating the approved location is not considered reasonable. |
| **Mitigation at the receptor** | | | |
| Mechanical ventilation/comfort condition systems to enable windows to be closed without compromising internal air quality/amenity | Yes | Yes | This level of mitigation is feasible and reasonable for receptors predicted to have 'marginal' residual noise impact in accordance with NPfI definitions. |
| Upgrading façade elements, such as windows, doors or roof insulation, to further increase the ability of the building façade to reduce noise levels | Yes | Yes | This level of mitigation is feasible and reasonable for receptors predicted to have 'moderate' and 'significant' residual noise impact in accordance with NPfI definitions. |

**Table 10.4 Feasible and reasonable noise mitigation options**

| Mitigation Option | Feasible mitigation test | Reasonable mitigation test | Justification for adopting or disregarding this option |
|---|---|---|---|
| Voluntary acquisition | Yes | Yes | Voluntary acquisition rights are feasible and reasonable for receptors predicted to have 'significant' residual noise impact in accordance with NPfI and VLAMP definitions. Note, predicted Project noise levels do not trigger acquisition rights at any receptor (refer to Section 10.4.2). |

Initial noise modelling was undertaken with the above mentioned reasonable and feasible mitigation measures included. This modelling showed noise emissions levels from the Project were above the PNTLs at various privately owned noise-sensitive receptors around HVO, indicating that further operational constraints would be required to reduce noise, and therefore an assessment of feasible and reasonable noise mitigation strategies, over and above those listed in Table 10.4, was completed to determine achievable noise levels.

Mine plan iterations and equipment sound power level analysis formed the basis of the mitigation assessment, with many model iterations completed to reduce predicted noise impacts. Model iterations considered the following:

- identification of key equipment and the highest contributing sources, including haul routes and identifying specific sections of each haul road;
- extensive iterations and analysis of mine plans;
- where reasonable and relevant, alternative haulage routes and roads created;
- allocation of equipment to low impact areas;
- analysis of sound power assumptions, sound power measurement campaign and commitment to best-in-class sound power levels where reasonable and feasible (ie best-in-class 400 t and 600 t excavators replacements); and
- mitigation designed for key frequencies, particularly focusing on equipment triggering low frequency penalties.

After considering and modelling these measures, it was determined that PNTLs could not be reasonably or feasibly met for all privately owned receptors. The only remaining option at this point is shutdown of operations during enhancing noise meteorological conditions if monitoring indicates noise levels are approaching pre-defined trigger levels. Subsequently, a delay hours assessment was undertaken to determine the achievable noise levels (ANL) for the Project, that would require some equipment shutdown but remain economically viable.

A summary of the reasonable and feasible noise mitigation measures committed to for the Project is provided in Section 10.5, and the ANLs are summarised in Section 10.4.2.

## 10.4 Impact assessment

### 10.4.1 Construction noise

Construction activities associated with the Project will occur concurrently with the continued mining operations at HVO. Therefore, the NIA combined construction noise predictions with operational noise predictions for the nearest assessed stage of mining to obtain a cumulative level for assessment purposes.

Two worst case construction scenarios were assessed and include:

1. Phase 1 – concurrent construction of:
   - Lemington Road realignment (HVO North);
   - enlargement of Lake James (Dam 15S) (HVO South);
   - enlargement of Parnells Dam (Dam 9N) (HVO North); and
   - transmission and telecommunication lines relocations (HVO North).
2. Phase 2 – concurrent construction of the LCPP (approved under the HVO South Project Approval), including:
   - rail loop and spur;
   - CPP and ROM stockpile; and
   - product stockpile and train loadout facility.

### i Phase 1 construction

Construction noise impact assessment predictions for private residential receptors for Phase 1 works are presented in Table 10.5. The results presented are for those receptors where the 90$^{th}$ percentile construction noise prediction exceeds $L_{Aeq,15minute}$ 45 dB, which is the ICNG 'noise affected management level', and are all in NAG 1A, 1B and 1C. Construction noise predictions remain below the 'noise affected level' for all receptors in NAGs 2, 3, 4, 5A and 5B. To account for concurrent operational noise, day period model predictions for the Year 3 stage plan (approximately 2025) were logarithmically added to construction noise to obtain cumulative noise predictions.

**Table 10.5 Phase 1 (approx. Year 3) construction noise predictions – $L_{Aeq,15minute}$ dB**

| Receptor ID | NAG | Management levels ($L_{Aeq,15minute}$ dB) | | Construction task combination ($L_{Aeq,15minute}$ dB) | | |
|---|---|---|---|---|---|---|
| | | Noise affected | Highly noise affected | HVO North[1, 2] | HVO South[2] | Combined |
| 120 | 1B | 45 | 75 | **47** | **44** | 48 |
| 121 | 1B | 45 | 75 | **46** | **45** | 49 |
| 122 | 1B | 45 | 75 | **46** | **46** | 48 |
| 123 | 1B | 45 | 75 | **46** | **46** | 49 |
| 160 | 1A | 45 | 75 | **51** | **53** | 54 |
| 161 | 1A | 45 | 75 | **49** | **53** | 55 |
| 162 | 1A | 45 | 75 | **49** | **53** | 54 |
| 163 | 1A | 45 | 75 | **49** | **53** | 54 |
| 244 | 1C | 45 | 75 | **46** | **48** | 49 |

**Table 10.5 Phase 1 (approx. Year 3) construction noise predictions – $L_{Aeq,15minute}$ dB**

| Receptor ID | NAG | Management levels ($L_{Aeq,15minute}$ dB) | | Construction task combination ($L_{Aeq,15minute}$ dB) | | |
|---|---|---|---|---|---|---|
| | | Noise affected | Highly noise affected | HVO North[1, 2] | HVO South[2] | Combined |
| 245 | 1C | 45 | 75 | **46** | **49** | 50 |
| 246 | 1C | 45 | 75 | **46** | **47** | 49 |
| 247 | 1C | 45 | 75 | **45** | **47** | 49 |
| 256 | 1A | 45 | 75 | **50** | **55** | 56 |
| 258 | 1A | 45 | 75 | **49** | **53** | 54 |
| 260 | 1A | 45 | 75 | **48** | **51** | 53 |
| 261 | 1A | 45 | 75 | **50** | **52** | 54 |
| 497 | 1A | 45 | 75 | **50** | **55** | 56 |
| 498 | 1C | 45 | 75 | **46** | **48** | 49 |

Notes: 1. Highest result for all modelled construction activities.

2. Bold indicates levels above the 'noise affected' level.

The noise predictions in Table 10.5 show that all private residential receptors in NAG 1A, 1B and 1C are predicted to exceed the 'noise affected' management level, but not exceed the 'highly noise affected' management level. All of these residential receptors are in Maison Dieu. These are worst case construction noise predictions that may occur during noise enhancing weather conditions during the peak of the construction period, that is, an expected infrequent occurrence.

The construction tasks primarily responsible for the predicted levels are the Lemington Road realignment and the enlargement of Lake James (Dam 15S). Approval for these tasks is being sought under the HVO North and HVO South consents, respectively.

At the receptors with the highest predictions, the cumulative impact of HVO North and HVO South construction activities being conducted concurrently only causes an increase of 1–2 dB in comparison to HVO South works being conducted in isolation. Given that listeners in Maison Dieu would not be able to distinguish which site is generating received noise levels, and an increase of up 2 dB would not be perceptible to the human ear, it is recommended that all construction tasks be allowed to occur concurrently. This has potential to significantly reduce the duration of construction noise, with only a minor and likely imperceptible increase in received noise levels in Maison Dieu.

### ii Phase 2 construction

Phase 2 involves the concurrent construction of the Lemington CPP and rail infrastructure, associated with HVO South. The construction noise impact predictions associated with these activities on private residential receptors are presented in Table 10.6. To account for noise that may be generated concurrently by the HVO South operations, day period model predictions for the Year 11 stage plan, being the closest stage plan to the proposed construction timing, were logarithmically added to construction noise predictions to obtain cumulative noise predictions.

**Table 10.6 Phase 2 construction noise predictions – $L_{Aeq,15minute}$ dB**

| Receptor ID | NAG | Management levels ($L_{Aeq,15minute}$ dB) | | Construction task combination ($L_{Aeq,15minute}$ dB) | | | |
|---|---|---|---|---|---|---|---|
| | | Noise affected | Highly noise affected | 1 – Lemington Rail loop and spur | 2 – Lemington CPP | 3 – Lemington stockpile and loadout | Cumulative (1, 2 and 3) |
| 102 | other | 60 | 75 | 46 | 45 | 45 | 46 |
| 120 | 1B | 45 | 75 | 39 | 38 | 40 | 41 |
| 121 | 1B | 45 | 75 | 40 | 39 | 41 | 42 |
| 122 | 1B | 45 | 75 | 39 | 38 | 39 | 41 |
| 123 | 1B | 45 | 75 | 40 | 39 | 41 | 42 |
| 124 | 1B | 45 | 75 | 39 | 38 | 39 | 41 |
| 160 | 1A | 45 | 75 | 41 | 40 | 43 | 44 |
| 161 | 1A | 45 | 75 | 40 | 39 | 42 | 42 |
| 162 | 1A | 45 | 75 | 40 | 39 | 42 | 43 |
| 163 | 1A | 45 | 75 | 39 | 38 | 41 | 41 |
| 244 | 1C | 45 | 75 | 38 | 38 | 40 | 41 |
| 245 | 1C | 45 | 75 | 38 | 38 | 41 | 41 |
| 246 | 1C | 45 | 75 | 38 | 38 | 40 | 41 |
| 256 | 1A | 45 | 75 | 38 | 38 | 41 | 41 |
| 258 | 1A | 45 | 75 | 39 | 38 | 40 | 41 |
| 260 | 1A | 45 | 75 | 40 | 39 | 42 | 44 |
| 261 | 1A | 45 | 75 | 40 | 40 | 43 | 44 |
| 497 | 1A | 45 | 75 | 38 | 38 | 41 | 41 |
| 498 | 1C | 45 | 75 | 38 | 38 | 40 | 41 |

Model predictions in Table 10.6 show that all private residential receptors are expected to experience construction noise levels less than the 'noise affected' management level. Therefore, no construction noise impacts are predicted as a result of the construction of the Lemington CPP and rail loading facility.

### 10.4.2 Operational noise assessment

The operational noise assessment was undertaken generally in accordance with the guidelines outlined in the NPfI, except for the use of the cumulative distribution of results methodology. This was employed in lieu of the 'noise enhancing weather conditions' method outlined in the NPfI. The cumulative distribution method allows assessment of impact for a far more comprehensive set of meteorological conditions, as discussed in Section 4.1 of the NIA. Consultation with the EPA and DPE was undertaken by EMM at times during the assessment process and helped determine whether the assessment methodology and pathway were satisfactory.

Five indicative operational scenarios were modelled, as described in Chapter 7 and consistent with the air quality assessment (refer to Chapter 8), representing stages in progression of mining operations over the proposed life of mine, with emphasis on targeting the highest noise impact, including periods when operations will be closest to identified private residential receptors and maximum extraction periods.

### i Best achievable noise levels

As described in Section 10.3, once all reasonable and feasible options (outlined in Table 10.4) were incorporated into the noise model, results were still higher than PNTL for many receptors, indicating additional mitigation measures (ie equipment shutdowns during noise enhancing meteorological conditions) would be required to further reduce noise.

In developing the achievable project criteria (ANLs) a range of equipment shutdown scenarios have been considered to achieve these levels. However, the level of shutdown to achieve the PNTLs would make the mine unviable. Further discussion is provided in Section 4.3 of the NIA in Appendix I.

The resulting ANLs, which form the recommended noise criteria for the Project, are summarised in Table 10.7.

**Table 10.7 Achievable noise levels for the Project**

| NAG | Property/receptor identification number | Day | Evening | Night |
|---|---|---|---|---|
| | | $L_{Aeq,15minute}$ (dB) | $L_{Aeq,15minute}$ (dB) | $L_{Aeq,15minute}$ (dB) |
| 1A | 160, 161, 162, 163, 256, 258, 260, 261, 497 | 41 | 41 | 41 |
| 1B | 120, 121, 122, 123 | 40 | 40 | 40 |
| 1C | 244, 245, 246, 247, 498 | 40 | 39 | 39 |
| 2 | 126, 127, 128, 130, 134, 139, 141, 156, 157, 167, 169, 170, 173, 174, 175, 176, 178, 179, 248, 249, 250, 251, 262, 843, 846, 847, 852, 855, 856 | 40 | 35 | 35 |
| 3 | 308, 311, 317, 321, 322, 324, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 436, 440, 464, 481, 952 | 41 | 41 | 40 |
| 4 | 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 462, 477, 478 | 40 | 37 | 37 |
| 5A | 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353 355, 356, 357, 358, 359, 360, 361, 362, 363, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 380, 381, 383, 384, 385, 389, 390, 392, 393, 394, 395, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 411, 413, 414, 415, 417, 418, 419, 420, 421, 422, 423, 482, 484, 835, 836, 837, 838, 839, 840 | 40 | 40 | 40 |
| 5B | 326, 327, 328, 330, 437, 438, 466, 487, 488, 489 | 40 | 40 | 40 |
| - | All other privately owned residential land | 40 | 35 | 35 |

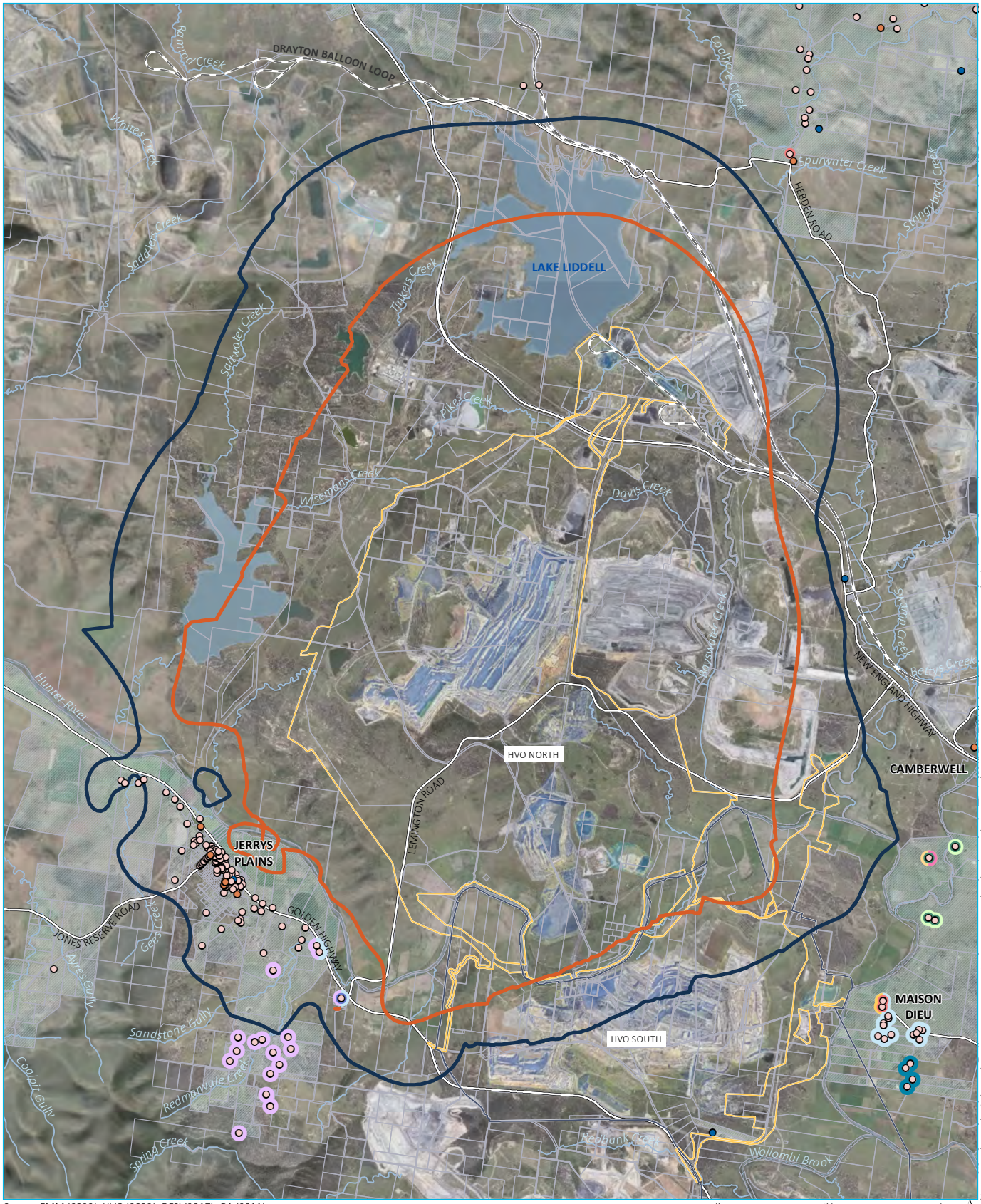
Recommended noise criteria for non-residential privately owned receptors such as schools, recreational sites, churches, industrial and commercial receptors are the appropriate amenity noise levels as specified Table 2.2 of the NPfI.

### ii Operational A-weighted predictions

Five operational stages were modelled representing Year 3, Year 7, Year 11, Year 18 and Year 22 of the Project; these nominally correspond to years 2025, 2029, 2033, 2040 and 2044.

Figure 10.2 and Figure 10.3 illustrate the indicative maximum envelope $L_{Aeq,15minute}$ noise contours for HVO North and HVO South, respectively. These contours represent the maximum envelope predicted for all stages, and all time periods.

A complete set of 90$^{th}$ percentile predictions and neutral atmosphere predictions for all receptors is presented in Appendix A of the NIA (attached as Appendix I of this report). It is noted that results represent a typical worst case operating scenario, which shows variations, as expected, in predicted levels across the assessed receptors. Some receptors may require the proposed ANL when others do not, as key receptors determine the proposed ANL in each NAG and there is variability across each NAG. However, results for all receptors meet or are below the ANL presented in the NIA. Given this, presented predicted levels should not be prescribed as approved noise limits. The Project viability has been determined on the basis of ANL being approved as noise limits.




Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011)

0 2.5 5 km

GDA2020 MGA Zone 56

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## KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary

Receptor location

- Private - residential
- Private - non residential
- Community infrastructure
- Subject to existing acquisition rights - Other mine - AQ
- Subject to existing acquisition rights - Other mine - Noise
- Subject to existing acquisition rights - Other mine - AQ & Noise
- Subject to existing mitigation rights - HVO - AQ
- Subject to existing mitigation rights - HVO - Noise & AQ
- Subject to existing mitigation rights - HVO - Noise
- Subject to existing mitigation rights - Other mine - Noise & AQ
- Subject to existing mitigation rights - Other Mine - AQ
- Subject to existing mitigation rights - Other mine - Noise
- Privately owned land

Noise contour ($dB_{LAeq,15min}$)

- 35
- 40

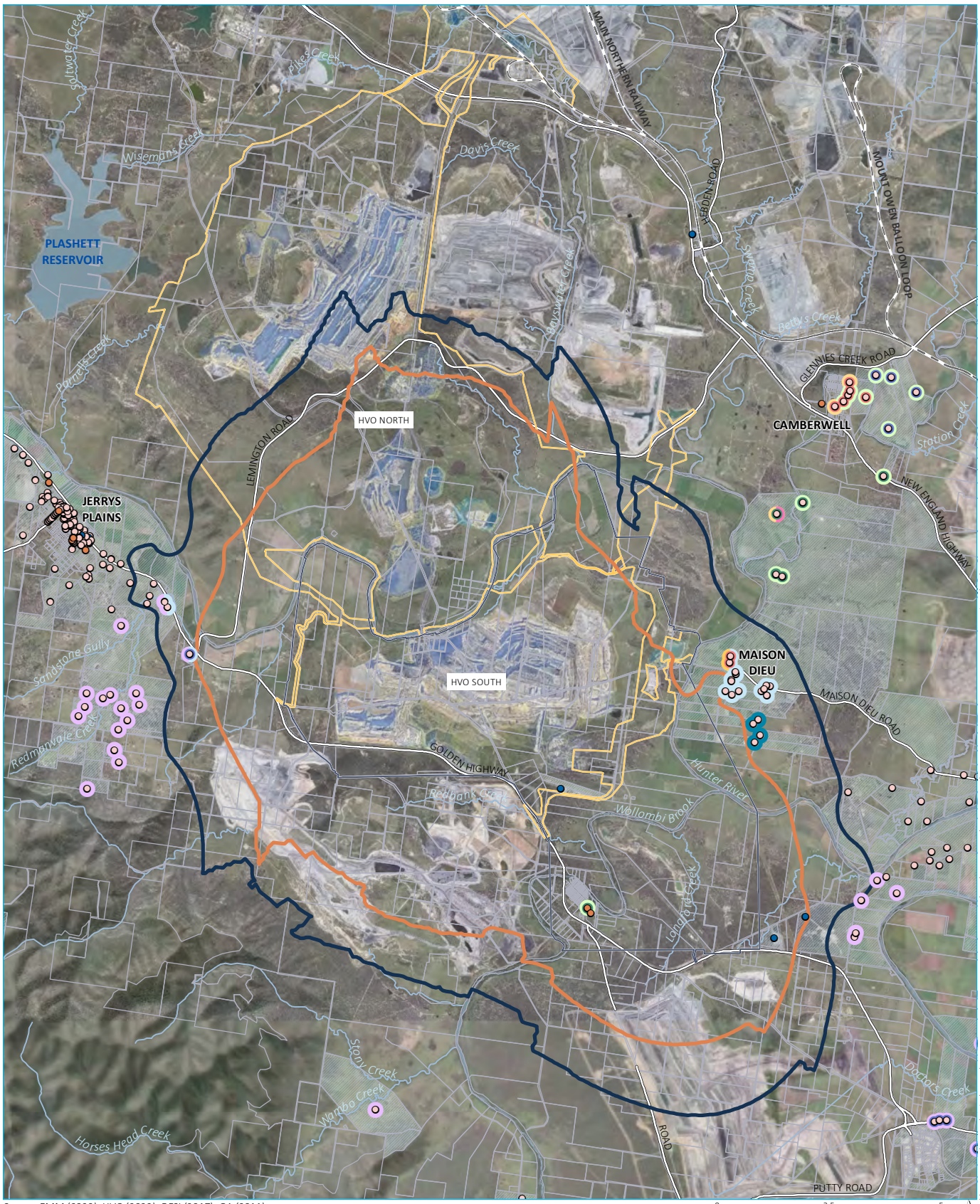
Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody
- Cadastre

# HVO North maximum envelope $L_{Aeq,15minute}$ noise contours

HVO Continuation Project
Environmental Impact Statement
Figure 10.2

EMM creating opportunities




Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011)

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## KEY

HVO North proposed development consent boundary

HVO South proposed development consent boundary

Receptor location

- Private - residential
- Private - non residential
- Community infrastructure
- Subject to existing acquisition rights - Other mine - AQ
- Subject to existing acquisition rights - Other mine - Noise
- Subject to existing acquisition rights - Other mine - AQ & Noise
- Subject to existing mitigation rights - HVO - AQ
- Subject to existing mitigation rights - HVO - Noise & AQ
- Subject to existing mitigation rights - HVO - Noise
- Subject to existing mitigation rights - Other mine - Noise & AQ
- Subject to existing mitigation rights - Other Mine - AQ
- Subject to existing mitigation rights - Other mine - Noise

Privately owned land

Noise contour ($dB_{LAeq,15min}$)

- 35
- 40

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody
- Cadastre

# HVO South maximum envelope 90th percentile $L_{Aeq,15minute}$ noise contours

HVO Continuation Project
Environmental Impact Statement
Figure 10.3

EMM creating opportunities

### iii Residual noise impact assessment

As described above in Section 10.3, all reasonable and feasible mitigation controls have been applied to the Project. Therefore, any predicted exceedances of the PNTLs can be considered a residual noise impact.

Residual noise impacts were therefore evaluated for the Project, with the outcomes as follows:

- no receptors are predicted to experience a significant residual impact (ie >5 dB above PNTL), meaning that voluntary acquisition rights are not triggered at any receptor as a result of the Project;
- the residual impact at all receptors is predicted to be either negligible (1–2 dB above PNTL) or marginal (3–5 dB above PNTL);
- 28 private receptors (equivalent to 19 landholders) are predicted to experience a marginal impact due to the Project, as follows:
  - 15 receptors (equivalent to 11 landholders) are in new areas of marginal impact, being NAGs 5A and 5B in Jerry Plains. Of these, six are 'isolated' and therefore qualify for voluntary noise mitigation rights. The remaining nine are within the Jerrys Plains village and therefore do not qualify for mitigation as per Section 4.2 of the NPfI, which states that "*receiver treatment, including the extreme case of voluntary acquisition, is normally only applicable for isolated residences in rural areas*"; and
  - 13 receptors[2] (equivalent to eight landholders) are in areas of existing marginal impact (NAGs 1A and 1B in Maison Dieu), and therefore currently have noise mitigation rights which will continue.

A summary of the residual noise impact assessment and the receptors allocated to each residual noise significance category, split between HVO North and HVO South, is provided in Table 10.8.

**Table 10.8 Residual noise significance summary**

| Significance category | HVO North Receptors | HVO South Receptors |
|---|---|---|
| Significant | - | - |
| Moderate | - | - |
| Marginal | 326, 327, 328, 330, 336, 347, 359, 360, 361, 362, 363, 368, 377, 437, 487 | 120, 121, 122, 123, 160, 161, 162, 163, 256, 258, 260, 261, 497 |
| Negligible | 317, 321, 322, 324, 332, 333, 334, 335, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 348, 349, 350, 351, 352, 353, 355, 356, 357, 358, 366, 367, 369, 370, 371, 372, 373, 374, 375, 376, 380, 381, 383, 384, 385, 389, 390, 392, 393, 394, 395, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 411, 413, 414, 415, 417, 418, 419, 420, 421, 422, 423, 429, 430, 431, 432, 434, 436, 440, 466, 482, 484, 488, 489, 835, 836, 837, 838, 839, 840, 952 | 244, 245, 246, 247, 308, 498 |

[2] The 13 receptors located in areas of existing marginal impact (NAGs 1A and 1B in Maison Dieu), and currently have noise mitigation rights which will therefore continue, are 120, 121, 122, 123, 160, 161, 162, 163, 260, 261, 256, 258 and 497.

Further to the above, there are an additional seven receptors that hold existing noise mitigation rights under the HVO South Project approval, and will be offered to maintain their rights, despite predictions being lower than applicable criteria by the Project (receptors 244, 245, 246, 247, 308, 311, 317).

In summary, 19 receptors will be entitled to voluntary mitigation rights as a result of the Project; 13 receptors in Maison Dieu who already hold voluntary mitigation rights, and six new receptors in Jerry Plains. While a marginal noise impact is predicted at these new six receptors due to the Project, it is noted that the PNTLs for these receptors in the evening and night periods are less than the current EPL limit applicable there (NAG 6), and the recommended noise criteria for these receptors are consistent with current EPL criteria. A further seven will maintain existing rights, while not being triggered by the Project. Therefore, 26 receptors will hold voluntary noise mitigation rights with the HVO Complex if the Project is approved, as summarised in Table 10.9. In relation to receptors in Jerrys Plains, the NPfI specifies that receiver treatment is normally only applicable for isolated residences in rural areas. On this basis, all nine receptors in NAG 5A that are predicted to receive noise levels 3 to 5 dB above the PNTL are not recommended to receive mitigation rights given they are within the Jerrys Plains township. These are receptors 336, 347, 359, 360, 361, 362, 363, 368 and 377.

**Table 10.9 Summary of receptors with noise mitigation rights for the Project**

| Trigger | HVO North receptors | HVO South receptors |
|---|---|---|
| 'Marginal' impact as a result of the Project. | 326, 327, 328, 330, 437, 487 | 120, 121, 122, 123, 160, 161, 162, 163, 256, 258, 260, 261, 497 |
| Existing rights that will continue, despite not being triggered by the Project. | - | 244, 245, 246, 247, 308, 311, 317 |

### 10.4.3 Private land area assessment

An assessment of operational noise impact over contiguous privately owned landholdings where there is an existing dwelling or where a dwelling could be built under existing planning controls is required by the VLAMP. Additional single point noise predictions were generated over contiguous private lot areas for each of the five modelled stages to determine the maximum extent of noise impact over the life of the Project. Predictions for all privately owned land areas were below the acceptable amenity noise level plus 5 dB.

### 10.4.4 Sleep disturbance assessment

Potential sleep disturbance impact was assessed by predicting noise levels from plant items known to generate noise levels that at times stand out above the general mining continuum.

The following sources were modelled to assess sleep disturbance:

- noise generated by excavator buckets impacting truck bodies or hard ground material, or rocks impacting the bottom of empty haul truck trays was modelled at each dig location;
- dozer track slap at each exposed dozer operating location, typically overburden emplacement areas; and
- haul truck exhaust surges were modelled by assessing a maximum sound power event at each overburden emplacement area, and, at exposed sections along haul routes.

The sleep disturbance model predictions were less than the $L_{Amax}$ trigger level of 52 dB for all receptors. As such, there is no requirement for a detailed assessment of maximum noise events as per the NPfI.

### 10.4.5 Cumulative assessment

Other industrial noise sources around HVO with potential to cause cumulative noise impact to receptors include:

- United Wambo Joint Venture;
- Wambo Underground;
- Rix's Creek South;
- Mount Thorley Warkworth;
- Ravensworth Operations;
- Mt Owen Complex; and
- Ashton Coal.

These sources were divided and assessed in combinations dependant on geographical location and directionally where there is potential to cause cumulative noise impact with HVO North and/or HVO South.

Results were below the recommended amenity noise levels at all privately owned receptors except for receptor 308 in NAG 3. This receptor currently has mitigation rights under the HVO South approval (PA 06_0261) and acquisition rights with UWJV. It is also noted that this receptor will be entitled to voluntary acquisition rights due to air quality predictions for the Project, as described in Chapter 7.

### 10.4.6 Road traffic noise assessment

No change in annual maximum workforce numbers or associated traffic generation with the ongoing operation of the Project is proposed, and therefore, except for the proposed realignment of Lemington Road, no change to road traffic noise on the main road network is expected to occur.

Road traffic noise from the proposed Lemington Road realignment was assessed using the traffic volumes presented in the traffic and transport impact assessment (WSP 2022). The nearest private residential property to the new alignment of Lemington Road is in Maison Dieu, located approximately 1.3 km from the nearest road section. At this distance, road traffic noise does not need to be considered in accordance with the guidance provided in the RNP, which identifies receptors within 600 m of the centre line of the outermost traffic lane as requiring assessment. Notwithstanding, given that some residents in Maison Dieu expressed concern about traffic noise from this realignment, road noise was calculated for that locality.

The predicted noise from traffic along the realigned Lemington Road ranged between $L_{Aeq,1hour}$ 12 and 30 dB for all receptors in Maison Dieu, which complies with the relevant RNP noise limits.

Construction road traffic noise was also assessed along the New England and Golden Highways, given that Project construction activities will increase road traffic volumes on these roads for periods of time. The assessment found that the change in road traffic noise levels resulting from construction traffic increases due to the Project along the New England Highway and along the Golden Highway (where there are private dwellings) would not be measurable or perceptible.

## 10.5 Management, mitigation and monitoring

The mitigation measures outlined in Table 10.10 will be implemented for the Project.

**Table 10.10 Noise mitigation measures**

| ID | Mitigation measures |
|---|---|
| NOS1 | Noise will continue to be managed and monitored as per the HVO Noise Management Plan, which will be updated to reflect the Project. The management plan will describe aspects such as:<br>• Best practice noise management measures to be implemented across the site, as described in Section 4.1 of the NIA.<br>• Noise monitoring.<br>• Triggers for the modification of equipment operation during periods of elevated noise.<br>A review of both real-time and attended compliance monitoring locations will be undertaken within 12 months of the commencement of the Project, to ensure the monitoring network provides adequate coverage of the Project area, and the existing Noise Management Plan will be updated accordingly. |
| NOS2 | The remaining fleet of large mining equipment will be progressively attenuated and BATEA sound power levels will be implemented, where reasonable and feasible, for significant noise generating mobile equipment. |
| NOS3 | Significant fixed infrastructure at the yet to be constructed Lemington CPP area will include cladding and BATEA sound power, where practical. |
| NOS4 | An 8 m high roadside bund will be constructed on the exposed side of the haul road from the HVO Mitchell Pit towards the Howick CPP for approximately 900 m. |
| NOS5 | The following receptors identified by the NIA are anticipated to be afforded voluntary noise mitigation rights in accordance with the VLAMP:<br>• HVO North: 326, 327, 328, 330, 437, 487<br>• HVO South: 120, 121, 122, 123, 160, 161, 162, 163, 256, 258, 260, 261, 497, 244, 245, 246, 247, 308, 311, 317 |

## 10.6 Summary and conclusion

Development of the Project design has been an iterative one, undertaken in conjunction with the noise assessment, in which all reasonable and feasible mitigation measures have been considered in accordance with the NPfI to minimise noise impacts on sensitive receptors. These measures include progressive attenuation of the mining fleet, haul route selection to minimise exposure of significant noise generating mobile fleet, construction of a roadside bund on the exposed side of the haul road from the Mitchell Pit towards the Howick CPP, and equipment shutdowns during enhancing meteorological conditions. With all of these measures considered, achievable noise levels have been developed for HVO in accordance with the NPfI, which are proposed as the noise criteria for the Project, as presented in Table 10.7.

The assessment found that 19 receptors will be entitled to voluntary mitigation rights based on predicted marginal residual noise impacts as a result of the Project, 13 of which already have existing rights under current HVO approvals. The other six are in the outskirts of Jerrys Plains, and while a marginal noise impact is predicted at these receptors due to the Project, it is noted that the PNTLs for these receptors in the evening and night-time periods are less than the current EPL limits that apply to these residences, and the recommended noise criteria for these receptors is consistent with the current EPL criteria. Further, seven receptors that already have mitigation rights in accordance with the HVO South Project approval are not predicted to experience noise levels such that they would be entitled to voluntary mitigation rights for the Project; however, HVO proposes to retain voluntary noise mitigation rights for these receptors.

In relation to construction activities, model predictions indicate that privately owned residences in NAG 1A, 1B and 1C (in Maison Dieu) are expected to experience noise levels that are higher than the 'noise affected' management level, but well below the 'highly noise affected' management level, as specified in the ICNG. These are worst case construction noise predictions that may occur during noise enhancing weather conditions during the peak of the construction period, that is, an expected infrequent occurrence. Consequently, received levels should typically be less than those presented in the NIA. Construction noise predictions are below the 'noise affected level' for all other receptors around HVO. Construction road traffic noise impacts are not predicted, with changes in road traffic noise levels resulting from Project construction traffic increases found not to be measurable or perceptible at privately owned residences.

Privately owned land was also assessed in accordance with the VLAMP, to determine whether acceptable amenity noise levels plus 5 dB would be exceeded over more than 25% of any property area. Predictions for all privately owned land areas did not trigger the VLAMP criteria.

No sleep disturbance impacts are predicted as a result of the Project.

In relation to road traffic noise during ongoing operations, given no changes are proposed to workforce numbers or operational traffic to that currently approved, no change to road traffic noise on the main road network is expected to occur. The predicted noise from traffic along the realigned Lemington Road is predicted to comply with the relevant RNP noise limits at all of the closest receptors in Maison Dieu.

# 11 Blasting

## 11.1 Introduction

A blasting impact assessment (BIA) has been prepared for the Project and is included as Appendix J. The BIA outlines the assessment criteria and methods and assesses the blast impacts associated with the Project on the surrounding environment, including private residential receivers, heritage items and historical sites, infrastructure and adjacent mines.

The limits adopted within the BIA are consistent with those provided in the Australian and New Zealand Environment and Conservation Council (ANZECC) guideline *Technical Basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration* (ANZECC 1990). The BIA is based on ground vibration and airblast overpressure modelling, utilising parameters representative of the individual Project areas for HVO North and HVO South.

## 11.2 Existing environment and criteria

### 11.2.1 Blast sensitive locations

The locations identified in the BIA as being blast sensitive are outlined in Table 11.1. These are shown on Figure 11.1 and Figure 11.2.

**Table 11.1 Blast sensitive locations**

| Aspect | Blast sensitive locations | |
|---|---|---|
| | **HVO North** | **HVO South** |
| Private residential receptors | 117 private residential residences within 5 km of HVO North. The closest private residence is approximately 2.9 km to the south-west. | 36 private residential residences within 5 km of HVO South. The closest private residence is approximately 3.2 km to the west. |
| Heritage sites | Within 2 km of proposed mining area:<br>• Great Lodge;<br>• Carrington Homestead;<br>• Wandewoi Homestead;<br>• Oaklands Homestead and Associated Structures;<br>• Remnant Stockyards; and<br>• Aboriginal Cultural Heritage Site CM-CD1 and the Older Stratum.<br>Within 2–5 km of proposed mining area:<br>• Old Anglican Cemetery (Jerrys Plains);<br>• St James Anglican Church (Jerrys Plains);<br>• Jerrys Plains Catholic Church (Jerrys Plains);<br>• Public School (Jerrys Plains);<br>• Police Station (Jerrys Plains); and<br>• former Post Office. | Within 2 km of proposed mining area<br>• Great Lodge;<br>• Carrington Homestead;<br>• WWII Airstrip/Warkworth Airfield (Hunter Valley Glider Club); and<br>• Dog Leg fence.<br>Within 2–5 km of proposed mining area:<br>• St. Phillips Anglican Church at Warkworth;<br>• Archerfield homestead and outbuildings;<br>• Oaklands Homestead and Associated Structures;<br>• Wandewoi Homestead;<br>• Wambo Homestead Complex; and<br>• the former Queen Victoria Inn Ruins. |

## Table 11.1 Blast sensitive locations

| Aspect | Blast sensitive locations | |
|---|---|---|
| | **HVO North** | **HVO South** |
| Infrastructure facilities | • Public roadways and bridges including:<br>– Lemington Road;<br>– Golden Highway; and<br>– Moses Crossing Bridge over Hunter River.<br>• Telstra telecommunication infrastructure.<br>• Electrical substations: 516 Lemington 66 kV zone substation and HVCPP zone substation.<br>• High voltage powerlines and transmission poles/towers including 330, 132, 66, 33 and 11 kV voltages.<br>• Declared dams with no imposed vibration limits: Parnell Creek Mine Water Dam (Dam ID 1276) and Cumnock Tailings Storage Facility No3 (Dam ID 1217).<br>• Ravensworth Operations infrastructure. | • Hunter Valley Gliding Club.<br>• Public roadways and bridges including:<br>– Golden Highway;<br>– Comleroi Road;<br>– Lemington Road (existing alignment);<br>– Realigned section of Lemington Road; and<br>– Moses Crossing Bridge over Hunter River.<br>• Telstra telecommunication infrastructure.<br>• Electrical Substation: 516 Lemington 66 kV zone substation.<br>• High voltage powerlines and transmission poles/towers including 330, 132, 66 and 11 kV voltages.<br>• Declared dams with imposed vibration limits: Wambo Hunter Pit Tails (Dam ID 888).<br>• Declared dams with no imposed vibration limits: HVO Lake James Water Dam (Dam ID 1129), Riverview Void in-pit Water Storage (Dam ID 1126) and United Colliery Tailings 2 (Dam ID 909).<br>• United Wambo infrastructure. |
| Grazing and equine industry | • Privately owned grazing land.<br>• Commercial horse breeding operations. | • Privately owned grazing land. |




*Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011)*

0 2.5 5 km

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N

## KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- 5 km blasting area radius
- Mining area
- Critical Industry Cluster (Equine)
- Blasting limit for HVO North and HVO South

Receptor

- Private - residential
- Private - subject to acquisition or mitigation rights (HVO JV)
- Private - subject to acquisition or mitigation rights (other mine)

Existing environment

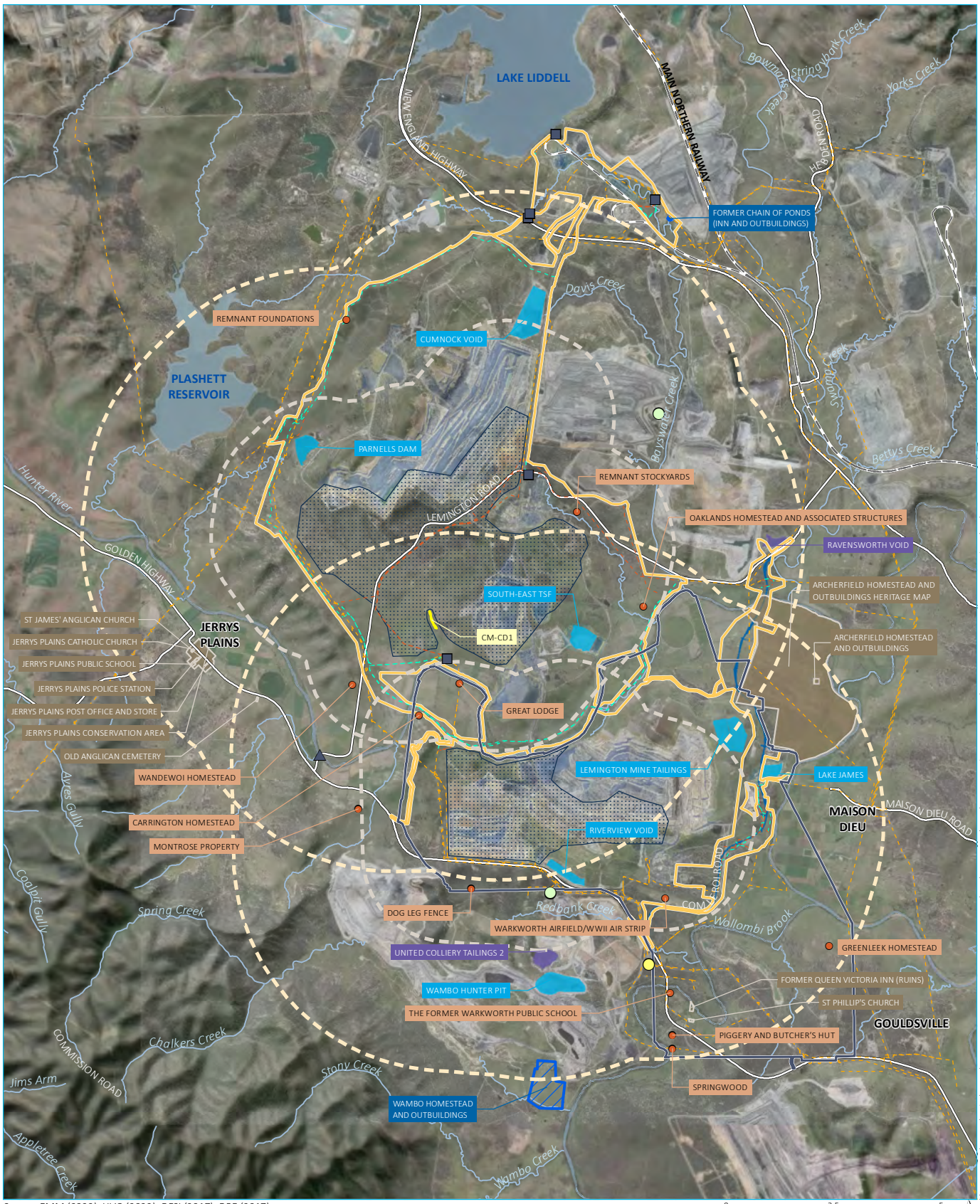
- Rail line
- Major road
- Named watercourse
- Named waterbody

# Blast sensitive locations – private residential receptors and equine industry

HVO Continuation Project
Environmental Impact Statement
Figure 11.1

EMM creating opportunities

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*Source: EMM (2022); HVO (2022); DFSI (2017); DPE (2017)*

0 2.5 5 km

GDA2020 MGA Zone 56

N

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## KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Proposed mining area
- 2 km blasting area radius
- 5 km blasting area radius
- Lemington Road realignment
- Registered AHIMS site

Historic heritage item

- Listed item - Singleton LEP (local significance)
- Listed item - State Heritage Register (state significance)
- Unlisted heritage item

- Surrounding mine infrastructure
- Telstra tower
- Moses crossing
- Electrical substation

Declared dam

- Imposed vibration limit
- No vibration limit

Transmission line

- Proposed
- Existing
- To be removed

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

# Blast sensitive locations - heritage sites and infrastructure

HVO Continuation Project
Environmental Impact Statement
Figure 11.2

EMM creating opportunities

### 11.2.2 Approved blasting frequencies

The approved blasting frequencies for HVO are outlined in Table 11.2. The Project seeks to maintain the current blasting times and frequency allowed under the existing development consents.

**Table 11.2 Approved blasting frequencies**

| Site | Approval | Approved blasts per week | Approved blasts per day | Approved blasting times |
|---|---|---|---|---|
| HVO North | DA 450-10-2003 | 12 | 3 | • Monday–Saturday: 7.00 am–6.00 pm.<br>• Sunday, public holidays or other times: no blasting. |
| HVO South | PA 06_0261 | 15 | 3 | |

### 11.2.3 Criteria

Table 11.3 summarises the ground vibration and airblast overpressure assessment criteria for the Project. Further detail on how these criteria has been derived can be found in the BIA.

**Table 11.3 Blast assessment criteria**

| Item | Ground vibration criteria (mm/s) | Airblast overpressure criteria (dBL) |
|---|---|---|
| Private residences. [1, 2] | 5/10 | 115/120 |
| **Heritage sites** | | |
| • St. Phillips Church, Warkworth. [2]<br>• Archerfield homestead and outbuildings. [2] | 5 | n/a |
| Wambo Homestead Complex. [3] | 5 | 120 |
| Other heritage items: [4]<br>• Within 2 km of proposed mining area:<br>– Great Lodge, Carrington Homestead, Wandewoi Homestead, Oaklands Homestead.<br>• Within 2–5 km of proposed mining area:<br>– Warkworth area: Former Queen Victoria Inn; and<br>– Jerrys Plains area: St James Anglican Church, Catholic Church, Public School, Police Station, Post Office. | 5 | 133 |
| Jerrys Plains area: Old Anglican Cemetery | 5 | n/a |
| **Infrastructure** | | |
| Occupied infrastructure [4] including:<br>• Hunter Valley Gilding Club[2]. | 25 | 133 |
| Unoccupied infrastructure, including:<br>• public roads and bridges, Telstra tower – the repeater, buried communication cables, pipelines. | 100 | n/a |
| High voltage transmission towers/poles. [5] | 50/100 | n/a |
| Electrical substation. [6] | 20/25 | n/a |

**Table 11.3 Blast assessment criteria**

| Item | Ground vibration criteria (mm/s) | Airblast overpressure criteria (dBL) |
|---|---|---|
| Water and tailings dams:<br>• Ravensworth Mine Inpit Storage Dam [7] (Dam ID 245) and Wambo Hunter Pit Tails Dam [8] (Dam ID 888). | 50 | n/a |
| **Adjacent mines** | | |
| Surface infrastructure – occupied. | 25 | 133 |
| Surface infrastructure – unoccupied. | 100 | 133 |
| **Other conditions** | | |
| Carrington West Wing LPBW. [1] | Not applicable.<br>It is also noted that blasting will not cause damage to the barrier. | |
| Aboriginal Cultural Heritage Site CM-CD1 and the Older Stratum. [1] | • No mining activities are to be undertaken within 20 m of the site.<br>• Mining activities including blasting do not cause any impact. | |

1 – Consistent with the existing HVO North Development Consent Conditions DA 450-10-2003.

2 – Consistent with the existing HVO South Project Approval Conditions PA 06_0261.

3 – Specified in the United Wambo Development Consent Conditions SSD 7142.

4 – Referenced in the Australian Standard AS2187.2-2006.

5 – Limits of 50 mm/s applies to tension towers, 100 mm/s applies to free standing towers.

6 – Specified in the Liddell Coal Operations Development Consent Conditions DA 305-11-01.

7 – Specified in the Ravensworth Operations Blast Management Plan (BMP) (2020).

8 – Specified in the United Wambo BMP (2022).

## 11.3 Impact assessment

### 11.3.1 Private residences

The modelling evaluated potential impacts for private receptors within 5 km of the proposed mining areas. The estimated ground vibration exposure for private residential receptors is predicted to be within the range of 0.1 to 1.6 mm/s for HVO North and 0.1 to 1.0 mm/s for HVO South. This is below the applicable ground vibration limits specified as 5 mm/s (for 95% of blasts) and 10 mm/s (not to be exceeded).

For HVO North, to manage compliance with airblast overpressure criteria at several residential receptors along the western border of the blasting area (refer to Figure 11.3) within approximately 3–4 km, specific management will be carried out. This will require appropriate blast design, such as reduced bench heights and charge mass. The modelling for reduced charge masses confirmed that overpressure levels will remain below the applicable limits specified in Table 11.3.

The estimated airblast overpressure exposure for residences within a 4–5 km range of the proposed mining area for HVO North is in the order of 98 to 114 dBL. This is below the applicable limits.

For HVO South, the potential airblast overpressure exposure is estimated to be in the range of 97–114 dBL for all receptors, except for Receptor 308. However, with the introduction of some limited blast management measures eg the application of reduced charge masses, the applicable limits can be met at Receptor 308.

The closest identified residence is over 2.9 km away from the proposed mining area, therefore the potential risk of flyrock is considered negligible.




Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011)

0 2.5 5 km

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## KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Area requiring increased control measures (MIC reduction)
- Proposed mining area
- 2 km blasting area radius
- 5 km blasting area radius
- Blasting limit for HVO North and HVO South

Receptor location

- Mine owned - other mine
- Private - residential
- Private - non residential
- Community Infrastructure

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

# Areas requiring increased blast control measures to manage airblast overpressure levels below the applicable limits for private residential receptors

HVO Continuation Project
Environmental Impact Statement
Figure 11.3

EMM creating opportunities

### 11.3.2 Heritage sites

Blasting activities can be effectively managed to meet criteria at the identified heritage sites, as identified in Table 11.3.

Similar to current blasting practices occurring in proximity to heritage sites, modelling identified conditions where specific blasting activities may be required to meet criteria at identified sites. These are summarised below:

- when blasting within 1,500 m of the Great Lodge, Carrington Homestead and Wandewoi Homestead, blast design measures will be carried out to meet ground vibration criteria of 5 mm/s (refer to Figure 11.4);
- in accordance with the HVO Blast Management Plan (BMP), precautionary measures will continue when blasting within 500 m of the CM-CD1 Aboriginal cultural heritage site, with no blasting occurring within 20 m; and
- the risk of flyrock for all sites excluding the remnant stockyards, is considered negligible as they are outside of the exclusion zone of 500 m. The remnant stockyards are 330 m from the proposed mining area at the closest point and will be managed in accordance with the BMP. It is noted that the remnant stockyards are proposed to be removed by the Project as discussed in Chapter 16.

### 11.3.3 Infrastructure

#### i Hunter Valley Gliding Club

The Hunter Valley Gliding Club is not predicted to be exposed to vibrations higher than 5 mm/s, which is below the applicable vibration limit of 25 mm/s.

Airblast overpressure exposure is below the applicable airblast overpressure limit of 133 dBL.

#### ii Roads and bridges

Until the Lemington Road realignment is complete in years 1 to 2, vibration impacts at HVO North will be managed via the application of lower charge masses to comply with assessment criterion, and in accordance with the Road Closure Management Plan.

With regards to HVO South, impact of vibrations on the Golden Highway can be managed effectively below the applicable vibration limit of 100 mm/s via the application of lower charge masses. This will apply to approximately a 2 km stretch along a section of the southern boundary during stages 3 to 5 (representing Year 11 to Year 22) of the Project.

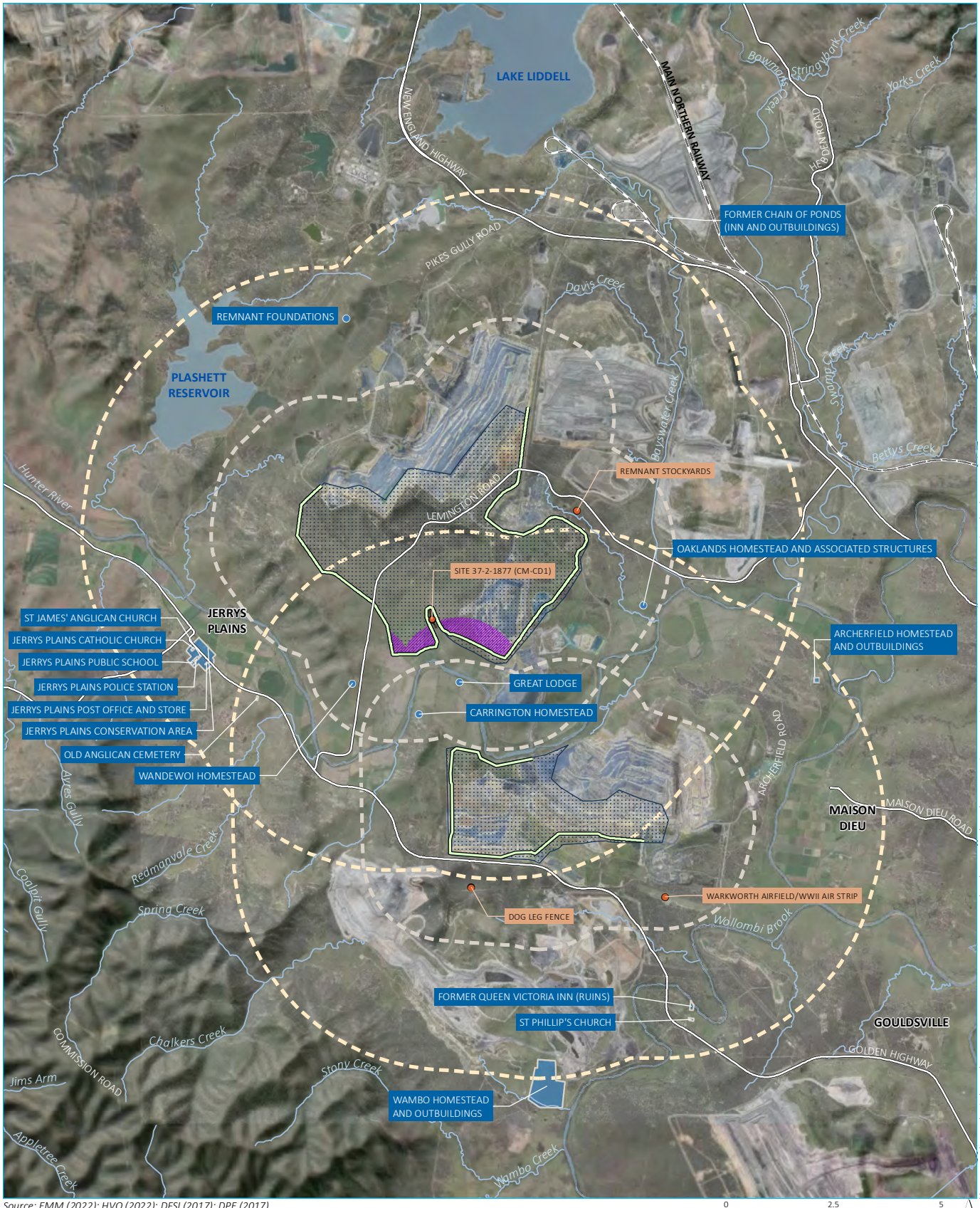
All other public roads and bridges in the vicinity of the Project are predicted to experience vibration levels below the applicable vibration criteria of 100 mm/s.

Blasting is proposed to occur within 500 m of public roads. Flyrock will be managed in accordance with the existing two road closure management plans (one for the Golden Highway and another for Lemington Road) included in the BMP.

#### iii Telecommunications

The impact of vibrations on buried telecommunication lines (near the existing Lemington Road and near the Golden Highway) can be managed effectively via the application of lower charge masses to comply with the applicable 100 mm/s criterion.

The Telstra Tower at Warkworth will be exposed to vibrations no higher than 2 mm/s, which is below the applicable vibration limit of 100 mm/s.




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*Source: EMM (2022); HVO (2022); DFSI (2017); DPE (2017)*

0 2.5 5 km

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N

## KEY

- Proposed mining area
- Area requiring Increased Control Measures
- 2 km blasting area radius
- 5 km blasting area radius
- Blasting limit for HVO North and HVO South
- Heritage item with applicable imposed blasting conditions
- Heritage item with no applicable vibration limit

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

# Areas requiring increased blast control measures to manage ground vibration levels below the applicable limits for heritage items

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Figure 11.4

EMM creating opportunities

#### iv Electrical substations and powerlines

The impact of vibrations on the electrical substations (516 Lemington 66 kV and HVCPP zone substations) can be managed effectively to comply with the vibration limits of 20/25 mm/s via the application of lower charge masses. The electrical substation (516 Lemington 66 kV Zone Substation) will be exposed to vibration levels no higher than 2 mm/s, which is below the assessed vibration limit criteria of 20/25 mm/s.

Ground vibration impacts to powerlines can also be managed effectively to a level below the applicable vibration limit criteria (ie 50 mm/s for tension towers and poles, and 100 mm/s for suspension towers and poles) via the application of lower charge masses. The areas requiring additional management measures are shown on Figure 11.5 and include:

- HVO North within 350 m to the powerlines:
  - along a section of the western boundary (with respect to 66, 132 and 330 kV);
  - along a section of the southern boundary (with respect to 11 and 66 kV); and
  - along a section of the eastern boundary (with respect to 66 kV).
- HVO South within 250 m to the powerlines:
  - along a section of the western and southern boundary (with respect to 66 and 330 kV); and
  - along a small section of the north-western boundary (with respect to 11 and 132 kV).

Blasting is proposed to occur within 500 m of adjacent powerlines. Flyrock will be managed in accordance with the appropriate flyrock management strategy for blasting adjacent to powerlines.

#### v Dams

Wambo Hunter Pit Tails dam, identified in Figure 11.2, will be exposed to vibration levels no higher than 2 mm/s, which is below the applicable limit of 50 mm/s. All other declared dams will be inspected, assessed and reported in accordance with the current protocol (including Dams Safety NSW requirements) to ensure safe operation of these dams.

#### vi Neighbouring mines

Infrastructure from the adjacent Ravensworth Operations and United Wambo JV will be exposed to vibrations below the applicable vibration limit of 25 mm/s and airblast overpressure below the limit of 133 dBL.

### 11.3.4 Livestock and equine industry

There are no concerns for the wellbeing of livestock (including equine industry) on private land surrounding the Project area. Given the significant distances from any potential blasting area to private grazing land (ie outside the 500 m flyrock exclusion zone) there is no risk of injury to livestock from flyrock. The proposed blasting will not be undertaken any closer to this private land than already approved.

A Crown land parcel is located within the 500 m fly rock exclusion zone directly west of the Riverview Pit at HVO South, which is managed under licence by HVO. As such adequate controls to ensure the wellbeing of livestock are enacted via the licence. Proposed blasting will not be undertaken any closer to Crown land than already approved.




Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011)

0 2.5 5 km

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N

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## KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Area requiring increased control measures
- Proposed mining area
- 2 km blasting area radius
- 5 km blasting area radius
- Blasting limit for HVO North and HVO South
- Electrical substation

Existing transmission line
- 330 kV
- 132 kV
- 66 kV
- 33 kV
- 11 kV

Proposed transmission line
- 132 kV
- 66 kV
- 33 kV
- 11 kV

Existing environment
- Rail line
- Major road
- Named watercourse
- Named waterbody

# Areas requiring increased blast control measures to manage ground vibration levels below the applicable limits for electrical infrastructure

HVO Continuation Project
Environmental Impact Statement
Figure 11.5

EMM creating opportunities

## 11.4 Management, mitigation and monitoring

Best practice blast management protocols will continue to be implemented at HVO. In addition to these measures, further mitigation measures identified for the Project are:

- three additional blast monitors will be installed, as follows:
  - one to monitor a location representative of private residence 317 or 311 at Jerrys Plains, to be installed within 12 months of the commencement of the Project and approval of the updated Blast Management Plan required for the Project;
  - one to monitor the Great Lodge (heritage site). The installation of this monitor will be delayed until the commencement of Stage 3 (representing Year 11 of the Project); and
  - one to monitor Oaklands Homestead and associated structures. The installation of this monitor can be delayed until the commencement of Stage 5 (representing Year 22 of the Project);
- one additional portable monitor will be positioned at a location representative of the closest heritage site to the active blasting area out of the Carrington Homestead and Wandewoi Homestead. The installation of this monitor will be delayed until the commencement of Stage 3 (representing Year 11 of the Project);
- additional controls will be used to manage overpressure levels below the applicable criteria at residential receptors, as shown in Figure 11.3;
- when blasting within 1,500 m of the heritage sites the Great Lodge, Carrington Homestead and Wandewoi Homestead, blast design measures will be carried out to meet applicable ground vibration criteria, as shown in Figure 11.4; and
- increased ground vibration control measures will be required to manage vibration levels below applicable limits for infrastructure (ie public roads and high voltage powerlines) as shown in Figure 11.5, ie blasting in these sections will require reduction in charge masses.

A summary of the key management and mitigation measures is provided in Table 11.4, noting that, except for the new measures noted above, these mitigation measures are currently in place as part of the existing blast management plan.

**Table 11.4 Blasting mitigation measures**

| ID | Mitigation measures |
|---|---|
| BLA1 | Blasting and vibration will continue to be managed and monitored as per the HVO Blasting Management Plan, which will be updated to reflect the Project. The BMP will describe aspects such as:<br>• blasting times and frequency;<br>• pre-blast assessment protocol;<br>• road closure protocols;<br>• notification protocols;<br>• blast model review and optimisation; and<br>• blast and vibration monitoring. |

**Table 11.4 Blasting mitigation measures**

| ID | Mitigation measures |
|---|---|
| BLA2 | Blasting will be undertaken:<br>• between the hours of 7am and 6pm, Monday to Saturday;<br>• no blasts on Sundays or public holidays;<br>• up to 3 blasts per day and 12 blasts per week at HVO North; and<br>• up to 3 balsts per day and 15 blasts per week at HVO South. |
| BLA3 | When blasting within 1,500 m of the heritage sites the Great Lodge, Carrington Homestead and Wandewoi Homestead, blast design measures will be carried out to meet applicable ground vibration criteria. |
| BLA4 | Increased blast control measures will be employed when blasting within the identified sections of HVO North and HVO South (shown in Figures 11.3, 11.4 and 11.5 of this EIS) to manage relevant overpressure and vibration levels below applicable limits for public infrastructure, private residences and heritage items. |
| BLA5 | The existing blast monitoring system will continue to be utilised for the Project. An additional three monitoring units will be installed and one portable monitor will be used as follows:<br>• one monitor at a location representative of identified private residences in Jerrys Plains;<br>• one monitor at a location representative of the Great Lodge (heritage site) (at commencement of Stage 3 (approximately Year 11) of the Project);<br>• one monitor at a location representative of the Oaklands Homestead and associated structures (at commencement of Stage 5 (approximately Year 22) of the Project); and<br>• one portable monitor positioned at a location representative of the closest heritage site (Carrington or Wandewoi Homestead) to the active blasting area (after commencement of Stage 3 (approximately Year 11) of the Project). |

## 11.5 Summary and conclusion

The BIA determined that exposure to vibration and airblast overpressure can be effectively managed via the application of reduced charge masses for private residential receptors at Maison Dieu and Jerrys Plains, heritage items (Great Lodge, Carrington Homestead and Wandewoi Homestead), infrastructure (public roads and bridges, high voltage powerlines and electrical substations) and livestock and the equine industry in Jerrys Plains.

There will be no impacts to declared dams, adjacent mines or the Hunter Valley Gliding Club from vibration or airblast overpressure.

Blasting will be undertaken within a 500 m radius of public roads and powerlines (ie within the 500 m flyrock exclusion zone applicable to the public). This will be managed in accordance with the existing two Road Closure Management Plans (one for the Golden Highway and another for Lemington Road) included in the BMP and an appropriate flyrock management strategy for blasting adjacent to powerlines.

HVO currently implements a BMP, pre-blast assessment protocol, blast monitoring system and weather monitoring system. These will continue to be implemented for the Project.

Consultation and blast notifications will also continue in accordance with the relevant approvals and the BMP.

# 12 Water resources

## 12.1 Introduction

This chapter provides a summary of the water assessment prepared for the Project, with the full technical report included as Appendix K.

The water assessment is an overarching report documenting and summarising the findings of a number of water-related technical assessments, including:

- groundwater impact assessment (GIA) (AGE 2022) – Appendix A of the water assessment;
- surface water impact assessment (SWIA) (Engeny 2022) – Appendix B of the water assessment;
- geochemical assessment (EGi 2022) – Appendix C of the water assessment; and
- aquatic ecology and groundwater dependent ecosystems (GDE) assessment (ELA 2022) – Appendix M.

The water assessment provides an assessment of the potential impacts of the Project on water resources and water-dependent assets. It documents the methods and results of the assessments listed above, initiatives to avoid and minimise impacts, and additional mitigation and management measures proposed to address residual impacts not able to be avoided.

Figure 12.1 illustrates the overall assessment approach to the water-related studies, their inter-relationships and the role of this overarching water assessment.

The Study Area for each technical assessment is detailed in Table 12.1 and shown on Figure 12.2.

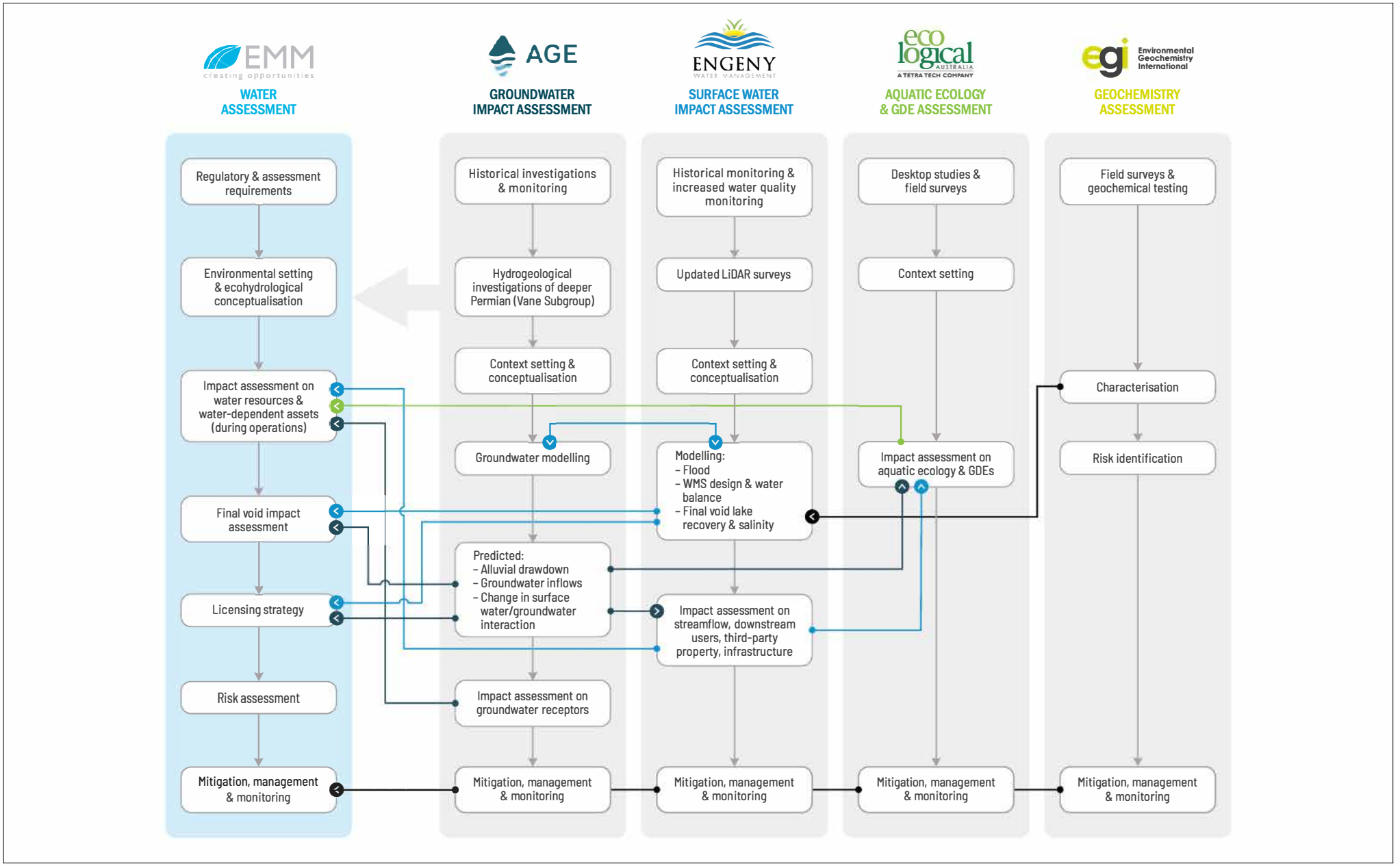
**Table 12.1 Study areas for each technical assessment**

| Technical assessment | Study Area |
|---|---|
| Water management system and water balance model | HVO North and HVO South proposed development consent boundaries. |
| Streamflow impact assessment and water quality assessment | The Hunter River in the Project area and associated tributaries:<br>• Parnells Creek;<br>• Farrells Creek;<br>• Pikes Creek;<br>• Bayswater Creek;<br>• Wollombi Brook; and<br>• unnamed tributaries draining into Hunter River and Wollombi Brook in the Project area. |
| Flooding | Floodplain of the Hunter River and Wollombi Brook.<br>Model downstream boundary:<br>• approximately 3 km downstream of Singleton.<br>Upstream boundaries:<br>• Hunter River – approximately 2 km upstream of the Liddell gauge;<br>• Bowmans Creek – at the confluence of Bowmans Creek and the Hunter River;<br>• Glennies Creek – approximately 5 km upstream of the confluence with the Hunter River; and<br>• Wollombi Brook – in the vicinity of the Warkworth Gauge, approximately 6.5 km upstream of the confluence with the Hunter River. |
| Groundwater model | Combination of the most recent groundwater models completed for the Glendell Continued Operations Project[1] (AGE 2019) and HVO South Mod 5 (AGE 2017). |

## Table 12.1 Study areas for each technical assessment

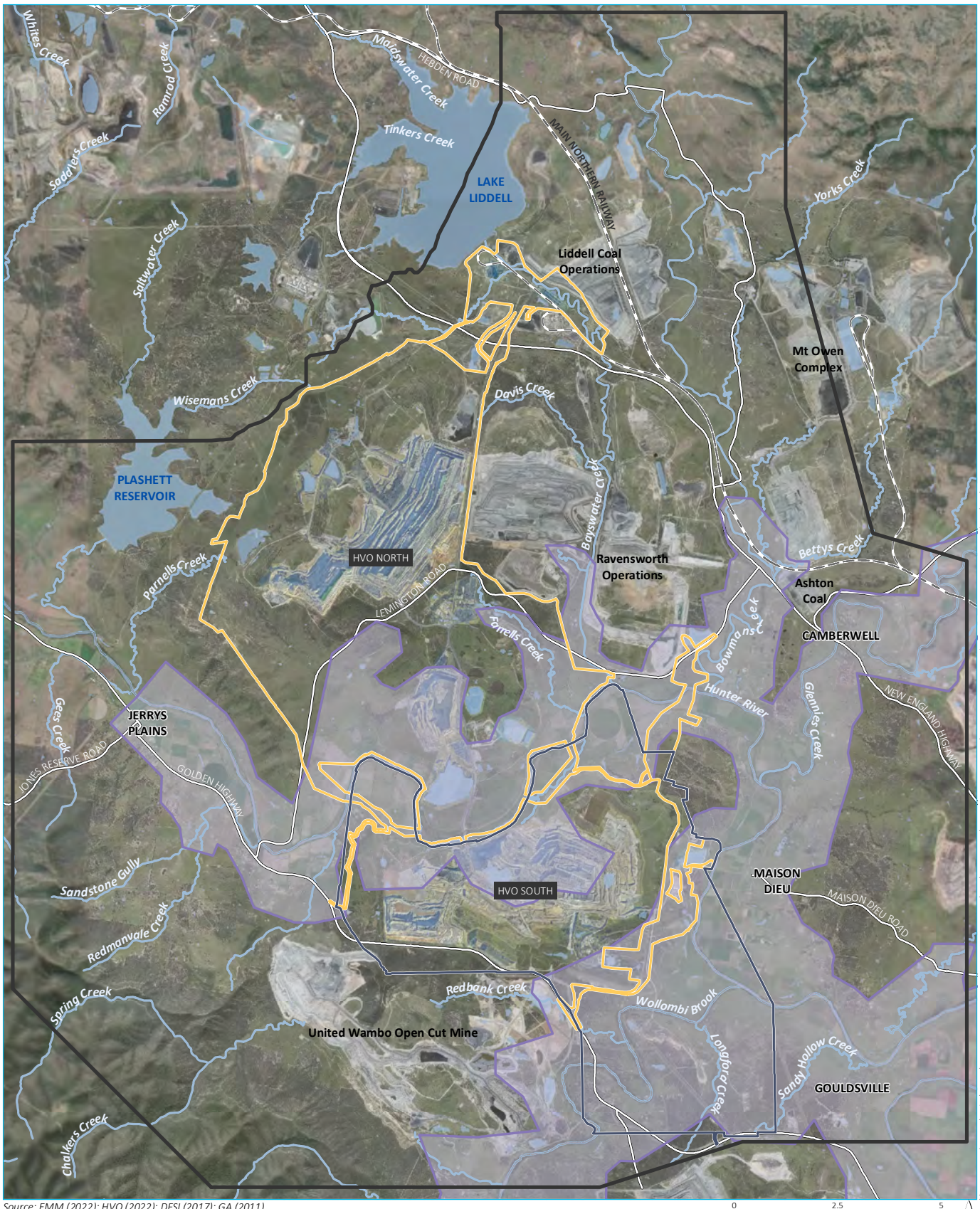
| Technical assessment | Study Area |
|---|---|
| Geochemistry characterisation | HVO North and HVO South proposed development consent boundaries. |
| Aquatic ecology and GDE assessment | Hunter River in the Project area including survey locations from approximately 6 km upstream of Parnells Creek confluence and approximately 2km downstream of the Wollombi Brook confluence.<br>Surveys were also conducted at locations:<br>• within the Project area;<br>• Bayswater Creek upstream;<br>• Farrells Creek;<br>• Parnells Creek, downstream of the HRSTS licensed discharge point;<br>• Bowmans Creek, just upstream of the confluence with the Hunter River; and<br>• Wollombi Brook near HVO South and Warkworth Bridge. |

Notes: 1. At the time of the modelling and impact assessment, a decision on the proposed Glendell Continued Operations Project was still pending and so the modelling is conservative (as it assumes mining at Glendell will continue).




Assessment approach and inter-relationships of the water studies

HVO Continuation Project
Water Assessment
Figure 12.1

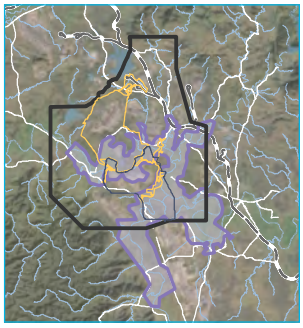



Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011)

0 2.5 5 km

GDA2020 MGA Zone 56

N



KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Groundwater model extent
- Flood model boundary

Existing environment

- Rail line
- Major road
- Named watercourse
- Waterbody

# Water study areas

HVO Continuation Project
Environmental Impact Statement
Figure 12.2

EMM creating opportunities

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The Project involves continued operations within portions of catchments that are currently or have been historically subject to approved mining and its associated impacts. The existing operation has a well-established water management system (WMS) in place to manage water within the objectives of the approved water management plan (minimising impacts on surface water) and requirements of existing WALs (for surface water and groundwater take) and EPL 640, as well as the HRSTS to manage excess water.

The existing WMS (described in Chapter 3) will continue to be used to manage runoff with all water captured in active mining areas and mine surface runoff directed to the WMS. The existing approved clean water diversions will continue to divert runoff around the WMS. There are no new creek diversions proposed or required as part of the Project, and there are no proposed changes to WALs or HRSTS credits.

The Project proposes the following key changes at HVO North which are relevant to impacts on water resources:

- Extending the mine life from the current approval of June 2025 until the end of 2050, including extending mining from the Bayswater seam in the Carrington Pit area to the base of the Barrett seam, and increasing the mining extent in a small area between the existing West and Mitchell Pits to Carrington Pit.
- Realignment of Lemington Road and construction of a new Hunter River bridge crossing, which will significantly improve the flood immunity of this road adjacent to the Hunter River, reducing road closures in flooding events.
- Improved flood protection levee for North Pit (up to 0.1% Annual Exceedance Probability (AEP)) as per HVO's operating standard.
- Improved flood protection for the Carrington West Wing levee (up to 0.1% AEP).
- Following mining, flood levees will be left in place, with the exception of the Carrington West Wing levee, which will be partially removed and incorporated into the final landform.
- Additional mine/sediment water containment dams in new mining areas as required, as mining progresses.
- Clean water diversion as required, as mining progresses, including an extension of the Mitchell clean water diversion.
- An increase in the capacity of Parnells Dam (Dam 9W) from approximately 1 GL to approximately 4 GL.
- Mining to the base of the Barrett Seam at HVO North.
- As currently approved, a barrier wall is to be constructed in the western arm of the paleochannel in the Carrington West Wing area to limit groundwater migration from the Hunter River (and associated alluvium) into the HVO North mining area and potential migration of water from the backfilled HVO North pit into the Hunter River alluvium. HVO proposes to construct the barrier wall following mining in the Carrington West Wing area but prior to backfilling with overburden and interburden material. The proposed approach will be consistent with the approved construction methodology of the existing Carrington Pit barrier wall. The barrier wall will be designed to meet the existing development consent specifications of a permeability of $1 \times 10^{-8}$ metres per second (m/sec), equivalent to $1 \times 10^{-3}$ metres per day (m/day).
- Reducing the number of final voids that will remain post-closure at HVO North from three to one final void, resulting in a reduction in catchment area draining to the void and total void surface area when compared to the currently approved operation.

At HVO South, there are limited changes proposed that will affect water resources, given that while changes to the approved mine sequencing are proposed, mining will remain generally within the same footprint and will mine the same seams as approved. Changes proposed that are relevant to water resources are:

- extending the mine life from the current approval of March 2030 until the end of 2045; however, the rate of mining will decrease from that currently approved;
- construction of the Cheshunt and Riverview Pit flood protection levees;
- enlargement of Lake James (Dam 15S) from approximately 0.7 GL to approximately 2 GL; and
- removal of coal extraction from the mine plan in the Riverview South East Extension, South Lemington Pit 1 and South Lemington Pit 2 mining areas (and therefore reducing the disturbance area).

Notably, the final void will remain largely the same as that currently approved at HVO South.

Key aspects of the WMS changes for the Project are shown on Figure 4.14.

## 12.2 Existing environment

### 12.2.1 Surface water resources

Surface water resources in the vicinity of the HVO Complex include the Hunter River, Wollombi Brook and other minor watercourses such as Farrells Creek and Parnells Creek (refer to Figure 12.3). The Hunter River, and highly connected alluvial groundwater within 40 m of the river bank, is managed under the NSW Water Sharing Plan (WSP) for the Hunter Regulated River Water Source 2016 (Hunter Regulated River WSP). The tributaries to the Hunter River are managed under the WSP for the Hunter Unregulated and Alluvial Water Sources 2022 (Hunter Unregulated and Alluvial WSP).

The Hunter River is a regulated river controlled by releases from Glenbawn Dam (upstream of HVO) and Glennies Creek Dam (downstream of HVO), maintaining streamflow and supply to downstream entitlement holders and for basic landholder rights. Daily flows in the Hunter River (at Maison Dieu gauge 210128) exceed 100 megalitres per day (ML/day) 90% of the time.

The tributaries to the Hunter River are unregulated and as such are ephemeral. Some of the smaller watercourses (such as Farrells Creek and Parnells Creek) are mostly dry and only flow following high rainfall events. The flow duration curve analysis at the Warkworth gauge developed by Engeny (2022) shows that daily flows along Wollombi Brook exceed 100 ML/day only 30% of the time at Warkworth and that it stops flowing (ie is dry) 14% of the time.

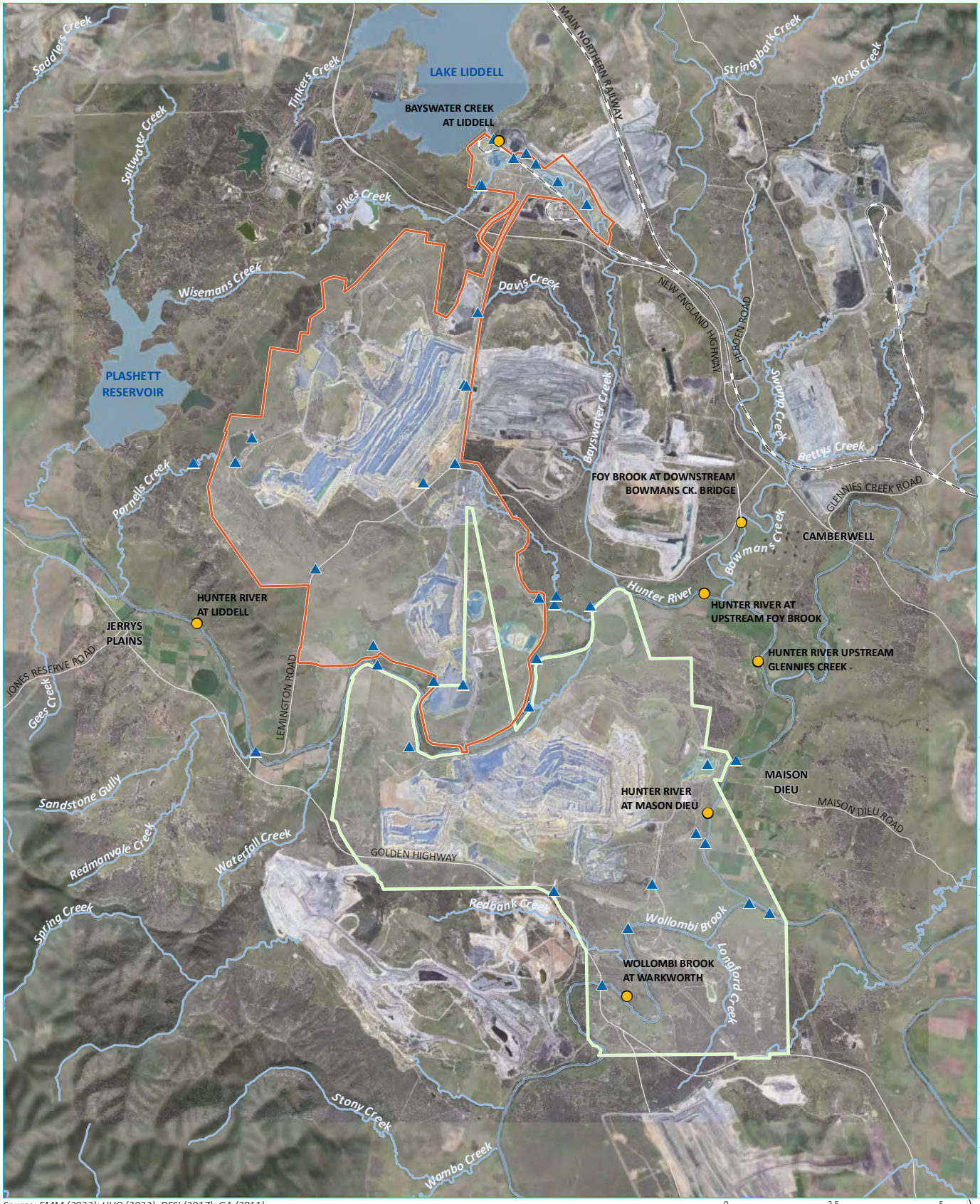
Extensive monitoring at watercourses and within the HVO WMS has been occurring in the Project area since 2011, in accordance with the approved water management plan (refer Figure 12.3).

Water quality is generally poor due to typically high salt concentrations in the Hunter River basin. This is largely due to the geology of the area and groundwater discharge contributing to the high salinity in the Hunter River catchment (McVickar et al 2015).

Historical water quality data (2011 to 2022) for the Hunter River, Wollombi Brook and the ephemeral creeks, generally complies with relevant water quality objectives for pH and electrical conductivity, with the following observations:

- pH is generally neutral to alkaline, and the 80$^{th}$ percentile at the Hunter River can be above the ANZG (2018) default guideline value; and
- salinity (as electrical conductivity) is below the ANZG (2018) default guideline value and is generally higher in the Hunter River than Wollombi Brook and ephemeral creeks.

In addition to routine parameters, surface water quality monitoring has been undertaken regarding nutrients and metals/metalloids in all clean water systems, the sediment water system and mine water system for the complex. The statistical analysis for metals and nutrients at each monitoring location is detailed in Appendix D of the SWIA (Engeny 2022).




Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011)

0 2.5 5 km

GDA2020 MGA Zone 56

N

KEY

- Existing HVO North development consent boundary (DA 450-10-2003)
- Existing HVO South project approval boundary (PA 06_0261)
- WNSW stream gauge
- HVO surface water monitoring location

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

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Surface water context

HVO Continuation Project
Environmental Impact Statement
Figure 12.3

EMM creating opportunities

### i Environmental and community values

The Hunter River supports a variety of uses including irrigation, town water supply, mining and power generation. Downstream of the HVO Complex, the town of Singleton relies on the river for its industries and water supply.

Landholders also access water through basic landholder rights and/or through WALs.

The NSW water quality objectives for "uncontrolled streams" and "major regulated rivers" relate to the protection of:[3]

- aquatic ecosystems;
- visual amenity;
- primary and secondary contact recreation;
- livestock water supply;
- irrigation water supply;
- homestead water supply; and
- aquatic foods (cooked).

In addition to environmental, social and economic value, the Hunter River also has cultural value for Aboriginal people.

### ii Existing surface water use entitlements

The Hunter Regulated River water source is divided into management zones, defined from the confluence of major tributaries (such as Glennies Creek) with the Hunter River. HVO holds entitlements in the following management zones:

- Zone 1B (from Goulburn River junction to Glennies Creek junction):
  - high security regulated river: 3,183 units (approximately 60% of total shares);
  - general security regulated river: 5,244 units (approximately 18% of total shares); and
  - supplementary: 98 units (approximately 2% of total shares).
- Zone 2A (from Glennies Creek junction to Wollombi Creek junction):
  - high security regulated river: 1,506 units (approximately 54% of total shares);
  - general security regulated river: 1,393 units (approximately 45% of total shares); and
  - supplementary: 302 units (approximately 60% of total shares).
- Zone 2B (from Wollombi Creek junction to Oakhampton rail bridge):
  - general security regulated river: 613 units (approximately 9% of total shares); and

[3] https://www.environment.nsw.gov.au/ieo/Hunter/report-02.htm#P178_22807

- supplementary: 128 units (approximately 4% of total shares).

The Hunter unregulated river comprises different water sources, including the Jerrys Water Source, Lower Wollombi Brook Water Source and Singleton Water Source. HVO holds the following surface water entitlements in those water sources:

- Jerrys Water Source: 705 units (approximately 34% of total shares);
- Lower Wollombi Brook Water Source: 88 units (approximately 1% of total shares); and
- Singleton Water Source: 0 units.

Further details on other water entitlements in the relevant surface water sources is provided in Appendix K.

### 12.2.2 Geological setting

The coal seams at HVO are contained within the Late Permian Wittingham Coal Measures which are further sub-divided into the Vane subgroup and the Jerrys Plains subgroup. The coal measures are stratified sequences dipping in a general west to south-easterly direction and outcrop over most of the mapped extent.

In the Project area, most of the younger Permian and Triassic units overlying the Wittingham Coal Measures have been eroded. Consequently, the Permian Wittingham Coal Measures, forming the bedrock, is now unconformably overlain by thin meandering Quaternary alluvial sediments deposited along the Hunter River floodplain and its tributaries.

A weathering profile is typically present as a thin heterogeneous layer of unconsolidated weathered material (regolith) grading through weathered rock to fresh bedrock. The depth of weathering varies in the area and can extend to 50 m below ground surface (AGE 2022).

The Quaternary alluvium occurring along the Hunter River and Wollombi Brook floodplains contains two main depositional units, a surficial fine-grained sediment (clay, silt and sand) overlying a coarser basal material (sand and gravel). The alluvial sediments are generally confined to the current course of the Hunter River and some tributaries near the confluence with the Hunter River.

An ancient river meander carved into the Permian sediments at HVO and infilled with alluvial sediments forming a paleochannel to the north of the Hunter River near Carrington Pit (Figure 12.4).

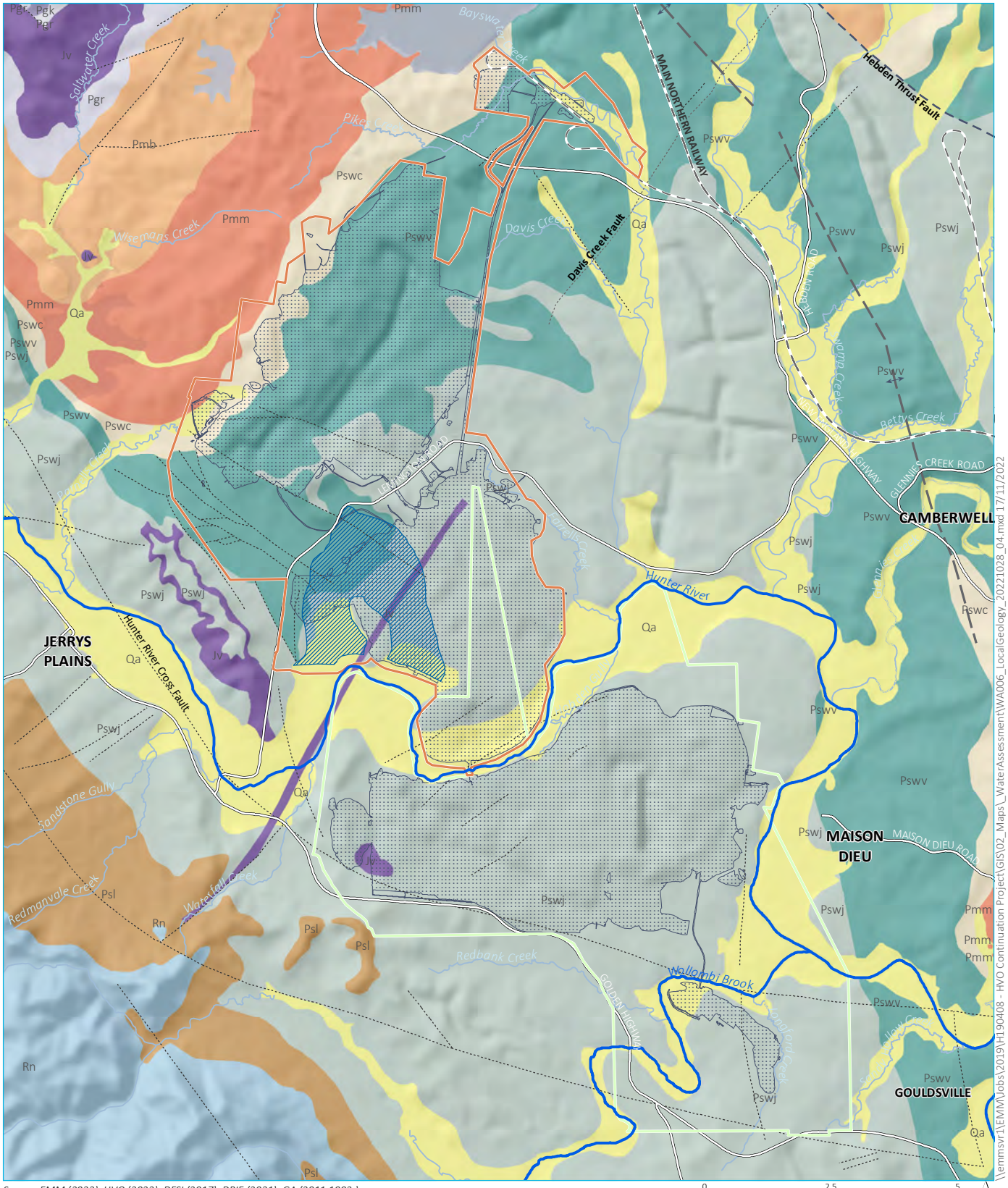
MER (2010) discusses the investigations conducted in the paleochannel area to define the geometry, lithology and hydrogeological properties of the paleochannel. Exploration drilling and groundwater monitoring installations, and associated monitoring, has resulted in a robust conceptual understanding of the paleochannel.

The depositional environment for the unconsolidated paleochannel alluvium was characterised by frequent flooding and resulting deposition of gravelly sandy material with silts and clays. Colluvial deposits are also present from hill slope runoff and sheet wash from surrounding hard rock (MER 2010).

The alluvium thickness varies and ranges from 11 to 18 m, pinching out at the channel perimeter. The bottom 3 to 6 m generally comprises fine to coarse gravel contained within a silty-clayey matrix that is overlain by clay 2 to 8 m in thickness. This clay is overlain by relatively thin surficial sands, silts, clays and loams (MER 2010).

In the Hunter Coalfield, a group of small thrust faults running parallel to subparallel to the Hunter-Mooki thrust fault and a series of northerly trending folds displaces the Permian sequences. The Project area is incised by a series of faults that trend in a north-west to south-east direction.

Geological structures are discussed in further detail in the GIA (AGE 2022, Appendix K).




*Source: EMM (2022); HVO (2022); DFSI (2017); DPIE (2021); GA (2011,1993 )*

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## KEY

- Hunter River and Wollombi Brook
- Other named watercourse
- Former extent of paleochannel
- Previous mining disturbance
- Existing HVO North development consent boundary (DA 450-10-2003)
- Existing HVO South project approval boundary (PA 06_0261)

Geology - Hunter coalfield 100K

- Qa - Quaternary Alluvium
- Jv - Jurassic Volcanics
- Rn - Narrabeen Group
- Psl - Wollombi Coal Measures
- Pswj - Wittingham Coal Measures, Jerrys Plains Subgroup
- Pswv - Archerfield sandstone, Vane Subgroup
- Pswc - Wittingham Coal Measures, Saltwater Creek Formation
- Pmm - Maitland Group, Mulbring Siltstone
- Pmb - Maitland Group, Branxton Formation
- Pgr - Greta Coal Measures, Rowan Formation
- Pgk - Greta Coal Measures, Skeletar Formation
- Water

Geological feature

- Anticline
- Thrust fault
- Fault

Existing environment

- Rail line
- Major road

# Geological setting

HVO Continuation Project
Environmental Impact Statement
Figure 12.4

EMM creating opportunities

### 12.2.3 Groundwater resources

The main groundwater resources in the Study Area include:

- Alluvial aquifers (including the paleochannel) forming unconfined aquifers (mainly along the Hunter River and Wollombi Brook).
- Permian groundwater systems:
  - thin and variably permeable regolith, with limited saturated thickness;
  - interburden aquitards; and
  - low to moderately permeable coal seams.

Groundwater associated with the alluvial aquifers is managed under the Hunter Unregulated and Alluvial WSP.

The *WSP for the North Coast Fractured and Porous Rock Groundwater Sources 2016* (North Coast WSP) applies to the Permian groundwater resources within the Project area.

Under the aquifer interference policy, the alluvium associated with the Hunter River and Wollombi Brook is classed as a "highly productive" aquifer, whereas the Permian groundwater systems are classed as a "less productive" porous and fractured rock groundwater source.

The proposed mine plan will intercept groundwater and result in changes to the existing groundwater and surface water environment. However, the HVO Complex already comprises active and approved open cut mines and the potential for the Project to result in a significant incremental impact on water resources is low.

There is an extensive groundwater monitoring network at HVO that spans the various mining areas, targeting various lithologies including the alluvium and deeper Permian units (refer Figure 3.9 in Chapter 3). Groundwater monitoring commenced in 1995. Monitoring locations and frequency have been revised and updated over the operating years and in accordance with the WMP. Groundwater monitoring is also undertaken at surrounding mines including Ravensworth Operations, LCO, Mt Owen Complex, Integra, Mt Thorley Warkworth, and United Wambo JV. In addition, there is groundwater monitoring data available from Government-owned/monitored bores in the Study Area.

#### i Existing groundwater use entitlements

In addition to alluvium associated with unregulated tributaries in the Jerrys Water Source, Lower Wollombi Brook Water Source and so on, the alluvium associated with the Hunter Regulated River is defined as a separate water source in the Hunter Unregulated and Alluvial WSP. The Hunter Regulated River Alluvial Water Source has the following management zones of relevance to the Project area:

- Upstream Glennies Management Zone;
- Glennies Management Zone; and
- Downstream Glennies Management Zone.

Table 12.2 lists the number of entitlements held by HVO in the various alluvial water sources in the Project area.

**Table 12.2 Summary of entitlements held by HVO in the Hunter Regulated River Alluvial Water Sources**

| Entitlement category | Hunter Regulated River Alluvial Water Source | | | Jerrys Water Source (Jerrys MZ) | Lower Wollombi Brook Water Source | Singleton Water Source | Glennies Water Source |
|---|---|---|---|---|---|---|---|
| | D/S Glennies Creek MZ | Glennies Creek MZ | U/S Glennies Creek MZ | | | | |
| Aquifer (unit shares) | 289 | 0 | 448 | 120 | 144 | 225 | 0 |

Notes: MZ = management zone; D/S = downstream; US = upstream

Under the North Coast WSP, the water source of relevance to the Project area is the Sydney Basin-North Coast Groundwater Source. HVO holds 5,560 entitlement shares of a total 67,484 shares in this water source. The long-term average annual extraction limit for this water source is 90,000 ML.

Further details on other water entitlements in the relevant groundwater sources is provided in Appendix K.

### 12.2.4 Water receptors

Water receptors include:

- downstream water users accessing surface water via WALs and basic landholder rights;
- third-party landholder bores located upstream and downstream of the HVO Complex, typically installed in the Quaternary alluvium; and
- ecosystems that potentially rely on surface water and/or groundwater:
  - river red gum communities (including in the Carrington Billabong area) that opportunistically access shallow groundwater recharged by leakage from the Hunter River and Wollombi Brook, and rely on flooding for germination;
  - stygofauna occurring principally in alluvial sediments along the Hunter River and its tributaries;
  - aquatic ecosystems; and
  - Warkworth Sand Woodland communities which rely principally on rainfall infiltration and a seasonal perched watertable observed to occur after large rainfall events.

The ecological surveys conducted for the Project observed that all vegetation stands were in low to moderate condition. In addition, the aquatic ecosystems surveyed as part of the aquatic ecology and GDE assessment (Appendix M) are considered to be in poor ecological condition, based on the macroinvertebrate community and water quality (the ecological condition of the Hunter River is classed as poor to moderate). Macroinvertebrate communities were dominated by taxa that are robust and tolerant of pollution and poor environmental conditions.

### 12.2.5 Conceptual model

The conceptual hydrological and hydrogeological model for the Project area has been informed by the well-established monitoring network, historical investigations and assessments, and annual reviews. Figure 12.5 provides a generalised illustration of the conceptual model under the existing conditions, which is discussed in above and in Appendix K (including the GIA and SWIA). The following points summarise the processes/activities shown with the corresponding numbers on Figure 12.5.

1. The Hunter River is a regulated river controlled by releases from Glenbawn Dam and Glennies Creek Dam, maintaining streamflow and supply to downstream entitlement holders and basic landholder rights.

2. The tributaries to the Hunter River are unregulated and as such are ephemeral. Some of the smaller watercourses are mostly dry and only flow following high rainfall events.

3. Groundwater systems include:

    a) Alluvial aquifers (including the paleochannel) form unconfined aquifers, and quality is fresh to brackish. The alluvium is generally more permeable than other lithologies, with recorded hydraulic conductivities ranging from $10^{-2}$ m/day to $10^{2}$ m/day (AGE 2022).

    b) The regolith does not form aquifers due to limited saturated thickness.

    c) Permian interburden layers form aquitards and have poor groundwater quality.

    d) Permian coal seams generally form low to moderately permeable confined aquifers, with poor groundwater quality. Hydraulic conductivity generally decreases with depth due to increased rock mass strength (AGE 2022).

4. Recharge to the alluvium occurs via infiltration of rainfall and leakage from surface water to the watertable. In the Hunter River alluvium, groundwater levels and aquifer saturation is predominantly due to leakage from the Hunter River, which is mostly a losing watercourse in the Project area. River leakage into the alluvium is up to four times greater than direct rainfall recharge (McVicar et al 2015). The saturated thickness of the paleochannel ranges from 1 m to 6 m.

5. Recharge to the Permian groundwater system(s) occurs via downward leakage from the overlying saturated alluvium (with seepage rates limited by the vertical hydraulic conductivity of the regolith, overburden and interburden) and/or gradual infiltration of rainfall where the Permian outcrops.

6. Groundwater discharge occurs via:

    a) Evapotranspiration from vegetation, such as the river red gums, where the watertable is sufficiently shallow.

    b) Seepage to active or disused mining areas (where in hydraulic connection).

    c) As baseflow to watercourses in areas where the watertable is in hydraulic connection with the watercourse and at higher elevation than the height of water in the watercourse (this may occur seasonally).

    d) From the alluvium to Permian strata via downward leakage where Permian potentiometric surfaces are lower than the base of the alluvium.

    e) Active pumping from bores.

7. The vertical hydraulic gradient between the alluvium and the Permian is generally downward in the Project area, due to historical mining depressurising the Permian.

8. Surface water users in the Study area include water extracted from the Hunter River for industrial, mining, domestic and stock or agricultural purposes. Landholders with waterfront land also access have basic landholder rights.

9. The existing HVO WMS includes levees for flood protection and drains to divert clean water from undisturbed or rehabilitated areas.

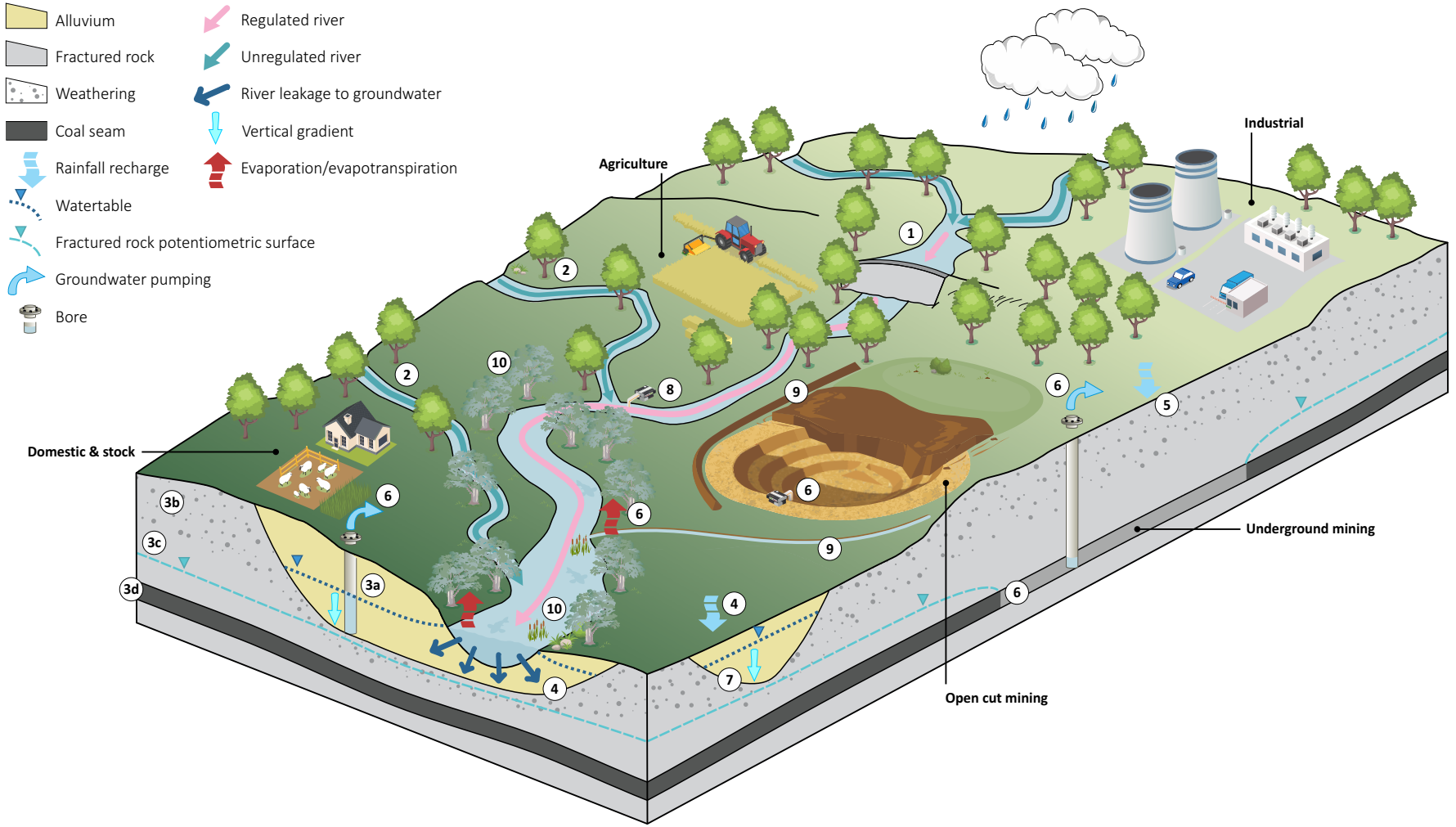
10. Ecosystems that potentially rely on surface water and/or groundwater:

    a) River red gum communities (including in the Carrington Billabong area) that opportunistically access shallow groundwater recharged by leakage from the Hunter River and Wollombi Brook, and rely on flooding for germination.

    b) Stygofauna occurring principally in alluvial sediments along the Hunter River and its tributaries.

    c) Aquatic ecosystems.

    d) Warkworth Sand Woodland communities which rely principally on rainfall infiltration and a seasonal perched watertable observed to occur after large rainfall events.




**NOT TO SCALE**

*Note: Conceptual representation only.*

Conceptual Model

HVO Continuation Project

Water Assessment

Figure 12.5

## 12.3 Impact assessment

The assessment of potential Project-related impacts to water resources and water receptors considers the requirements of the WM Act (and associated regulations), NSW Government policies and guidelines, relevant WSPs and the AIP. The assessment also considers consultation undertaken with the NSW Government through the development of the assessments.

As described, the potential impacts of the Project on water resources are minor given the Project predominantly comprises continuing mining in existing approved mining areas (including at HVO South and the HVO North Carrington West Wing area), including mining deeper in existing approved areas, and mining through previously mined areas (such as in the Carrington Pit area at HVO North). Some minor changes in impacts are predicted, including changes to timing as per the proposed changes to the mine life and mining schedule.

### 12.3.1 Surface water impact assessment

Due to the integrated nature of the WMS, some aspects of the SWIA have been considered together. In general, impacts are presented for the HVO Complex with discussion provided on the two sites where appropriate.

#### i Water management system performance

Model results indicate that average inflows are dominated by rainfall runoff (47% of the total inflow) while groundwater is only a small contributor (4% of the total inflow). Hunter River extraction via existing high security WALs represent the main water source (19% of the total inflow on average) while general security WALs are a minor inflow (1% or less through the Project).

The majority of water used on site is for coal processing (38% on average) and dust suppression (25% on average). Discharge via the HRSTS represents approximately 12% of the average outflows over the life of the Project.

Model results indicate the WMS can accommodate the site inventory during median climate and very wet conditions (95$^{th}$ percentile) within the storage capacity, operating in accordance with existing EPL and HRSTS release conditions. The Project WMS is well optimised to allow operation to progress with minimal business interruption during wet conditions.

Median and very dry conditions (5$^{th}$ percentile) forecast inventories show there is low likelihood of total site inventory dropping below 2 GL through the life of the Project, which indicates a high reliability of supply to various mine water demands (eg CPPs and dust suppression).

The Project WMS is forecast to maintain a sufficient water supply for the operation and discharge capacity to prevent flooding of operational areas of the mine.

#### ii Streamflow impacts

The WMS for the Project will be consistent with the requirements of the approved operations, with the exception of mining through new areas (between Mitchell Pit and Carrington Pit) and re-disturbance of some rehabilitated areas. The streamflow assessment indicates there will be minimal to no changes to the annual flow and average duration of dry periods for Hunter River and most of its tributaries due to the Project. Only three ephemeral watercourses were found to have changes of 1% or more due to the Project:

- Parnells Creek: average duration of dry periods within the representative “dry” year increased from 152 days to 154 days (1% increase) during Project operations;
- unnamed Tributary 1 at HVO North: average duration of dry periods within the representative “dry” year increased from 157 days to 164 days (4% increase) during Project operations; and

- Farrells Creek: average duration of dry periods within the representative “dry” year increased from 158 days to 161 days (2% increase) during operations.

Potential impacts on surface water downstream users, including basic landholder users will be negligible.

At Wollombi Brook, the duration of dry days is predicted to be less for the Project than the Approved Operations, due to the reduction in groundwater-induced impact and ground disturbance due to the removal of mining at South Lemington Pit 1 and 2.

The predicted minor change in streamflow and duration of dry days (due to the Project) is predicted to have a negligible impact on aquatic ecology in the Hunter River and only minor impact on aquatic ecology associated with the Hunter River tributaries (refer Appendix M for further information).

### iii Surface water quality

Potential impacts to water quality will be managed through an appropriately sized, designed and operated WMS. This includes release from sediment dams in accordance with their design and discharge of mine water in accordance with approved EPL limits and HRSTS credits.

In conjunction with the proposed WMS, a series of erosion and sediment control measures will be utilised during operational and rehabilitation phases to manage water quality.

Engeny (2022) assessed the potential for water quality impacts on the Hunter River due to discharge via the HRSTS using a mixing calculation of the diluted water quality in the river. Results indicate the exceedances of the 80$^{th}$ percentile background concentrations are of small magnitude (generally less than 5%) and all mixed concentrations were found to remain below the 95$^{th}$ percentile background concentration indicating that the expected water quality is within the existing natural range in the Hunter River.

Therefore, the water quality is expected to remain within the existing range observed in the Hunter River with no significant adverse impacts identified on environmental, community or cultural values.

### iv Flooding assessment

The flood model development and detailed results are provided in the SWIA report (Engeny 2022). The modelled scenarios are summarised below:

- Project Baseline: Baseline conditions utilising the available topographic data (2016 and 2020) with adjustments for operational changes planned for completion prior to the Project, including haul road approach to Cheshunt Pit at the Hunter River crossing, construction of the North Void TSF Levee 1 (north-west levee) and construction of the South Lemington Pit 1 flood protection upgrade at the haul road ramp.

- Project Operation: Construction of Project infrastructure including Carrington West Wing Levee, North Void TSF Levee 2 (south-east levee), Riverview Levee, Cheshunt Levee and Lake James upgrades, as well as construction of the Lemington Road realignment. This scenario also includes incorporation of the planned mine progression as per the Year 22 stage plan (approximately 2044) as the worst case for potential impact on the floodplain during operations.

- Project Closure: Consistent with Project Operations with the incorporation of the final landform design and decommissioning of most of the levees (some incorporated into the final landform), except for the Riverview Levee and Alluvial Lands Levee.

### a Impacts to mine infrastructure

The results of the flood modelling in regards to immunity of key mine infrastructure show:

- All active open cut pits are shown to meet the minimum 0.1% AEP flood immunity (plus freeboard) standard adopted by HVO during the operational phase of the Project. During the later years of operations, mining at HVO North will be exposed to a risk of flood ingress during Extreme Events (defined as four times the 1% AEP) via overtopping of the Carrington West Wing levee.
- The final voids will have flood immunity up to and including the Extreme Event.

### b Impacts to public infrastructure and other properties

The main public infrastructure prone to flooding impacts is Lemington Road. Currently, Lemington Road at Moses Crossing becomes inundated regularly and has been closed for an average of 60 days per year, since 2010. The proposed realignment and new Hunter River bridge crossing of Lemington Road will significantly improve the flood immunity of this road adjacent to the Hunter River. The new Hunter River crossing will have flood immunity up to and including the 10% AEP event during the Project and post-closure.

Flood impacts to non-JV owned properties are predicted to be minor. Relative to baseline conditions these changes result in negligible changes to flood affected areas and will not have an impact on the use of the land.

### c Emergency management

The flood hazard categorisation as presented in the *Australian Rainfall Runoff – a Guide to Estimation* (Ball et al 2019) has been adopted to inform impacts on Emergency Management.

Flood model results indicate there are no broad scale changes to flood hazard categories predicted due to the Project. Small changes in road inundation durations are predicted; however, the small changes are not expected to have an impact on use of the land or public safety or emergency management.

All levees have been designed specifically for management of flooding and are appropriate for the flood hazard of the land. Overall, there is a significant benefit to the local community through improved immunity and access of the realigned Lemington Road.

### d Geomorphology, riparian and ecological values

Predicted velocity impacts are generally localised around Project infrastructure (eg levees, Lemington Road, South Lemington Pit 1). The magnitude of velocities in areas of impact generally remain within the existing ranges experienced and remain a low likelihood of causing scour (<2 metres per second). This includes potential scour and geomorphic changes due to constriction caused by construction of the approved Carrington West Wing Levee. This levee is already approved under the existing development consent at HVO North (designed up to 1% AEP). The changes in predicted velocities in this area are not expected to change the existing geomorphic regime, and would occur under the current approved design of the levee (that is, these changes are not specific to the Project).

No significant change to flood velocities was observed on properties not owned by the JV partners.

The outcomes of the SWIA show the potential for adverse changes to the flow and flooding regime of the Hunter River to be minor. Therefore, riparian vegetation such as the river red gum communities will continue to rely on flooding for germination.

### 12.3.2 Groundwater impact assessment

The potential impact of the Project on the groundwater flow regime and groundwater receptors has been assessed from an incremental (comparison between approved and proposed) and cumulative perspective (estimating the effects of historic approved, the Project and other planned mining activities).

The proposed change to mining at HVO South will result in less groundwater drawdown in the Wollombi Brook alluvium in comparison to the approved operations, through the removal of mining in the South Lemington Pit 1 and 2 area from the mine plan. As such, the incremental drawdown in the Wollombi Brook alluvium due to proposed changes to mining at HVO South is not presented.

At HVO North, as mining will mainly be progressing deeper through previously disturbed or currently approved mining areas, the incremental effects of the Project at HVO North on groundwater are expected to be minor.

The predicted incremental and cumulative drawdown is focused on the alluvium, as it provides habitat for and access to water for water-dependent assets.

This section is focused on the potential impacts during operations. Assessment of potential post-mining impacts is provided in Section 12.3.3, as this is inter-related with the final void water balance modelling completed by Engeny (2022).

#### i Watertable drawdown

#### a Incremental drawdown

The maximum drawdown is predicted to occur during mining prior to the installation of the Carrington West Wing barrier wall (noting that mining to the base of the Bayswater Seam is approved in this area). Figure 12.6 shows the maximum incremental drawdown predicted to occur within the Hunter River alluvium. This represents a short-term peak drawdown that is predicted to occur prior to installation of the barrier wall.

A hydrograph of the predicted alluvial groundwater level at monitoring bore 4040P is also presented in Figure 12.6. This figure shows the gradual decline in the watertable as mining progresses south-east into the Carrington West Wing area, followed by recovery after installation of the barrier wall. The hydrograph also shows the alluvium is predicted to remain saturated during the period of peak drawdown, due to the strong connection between the Hunter Regulated River and the alluvium.

Low permeability barrier walls in the Alluvial Lands and Carrington Pit highwall (across the eastern arm of the paleochannel) were constructed to reduce the extent of drawdown in the alluvium. Depressurisation of the interburden and coal strata and associated vertical gradient between the Permian and the alluvium induces minor drawdown in the alluvium. The Carrington West Wing barrier wall is predicted to similarly limit drawdown in the alluvium following installation.

The groundwater model predicts minor additional drawdown in the Carrington Billabong area (between 0.2 and 0.5 m; Figure 12.6) due to mining to the deeper Permian seams in this area.

The aquatic ecology and GDE assessment (ELA 2022) used the results of the groundwater modelling to assess the potential impact on identified GDEs (mainly stygofauna and river red gum communities). During periods of drawdown, riparian vegetation will continue to have access to shallow alluvial groundwater. As such, no significant impact on groundwater dependent vegetation and stygofauna is predicted due to the Project.

There are no third-party water supply bores within the predicted extent of drawdown. Therefore, no third-party bores will be impacted by the Project.

### b Cumulative drawdown

The predicted cumulative drawdown was calculated by comparing the results of a model scenario of the proposed mine plan (ie the Project) to a scenario where simulated mining ceases after 2009 (which is when the Hunter Unregulated and Alluvial WSP commenced), effectively allowing groundwater levels to recover in this baseline 2009 scenario. Climate stresses in the model domain are simulated. This scenario is therefore conservative and results in exaggerated predictions of groundwater drawdown and changes in surface water-groundwater interaction due to the Project. This represents a limitation in the groundwater modelling and the requirements of the aquifer interference policy to estimate cumulative drawdown effects 'post-WSP'.

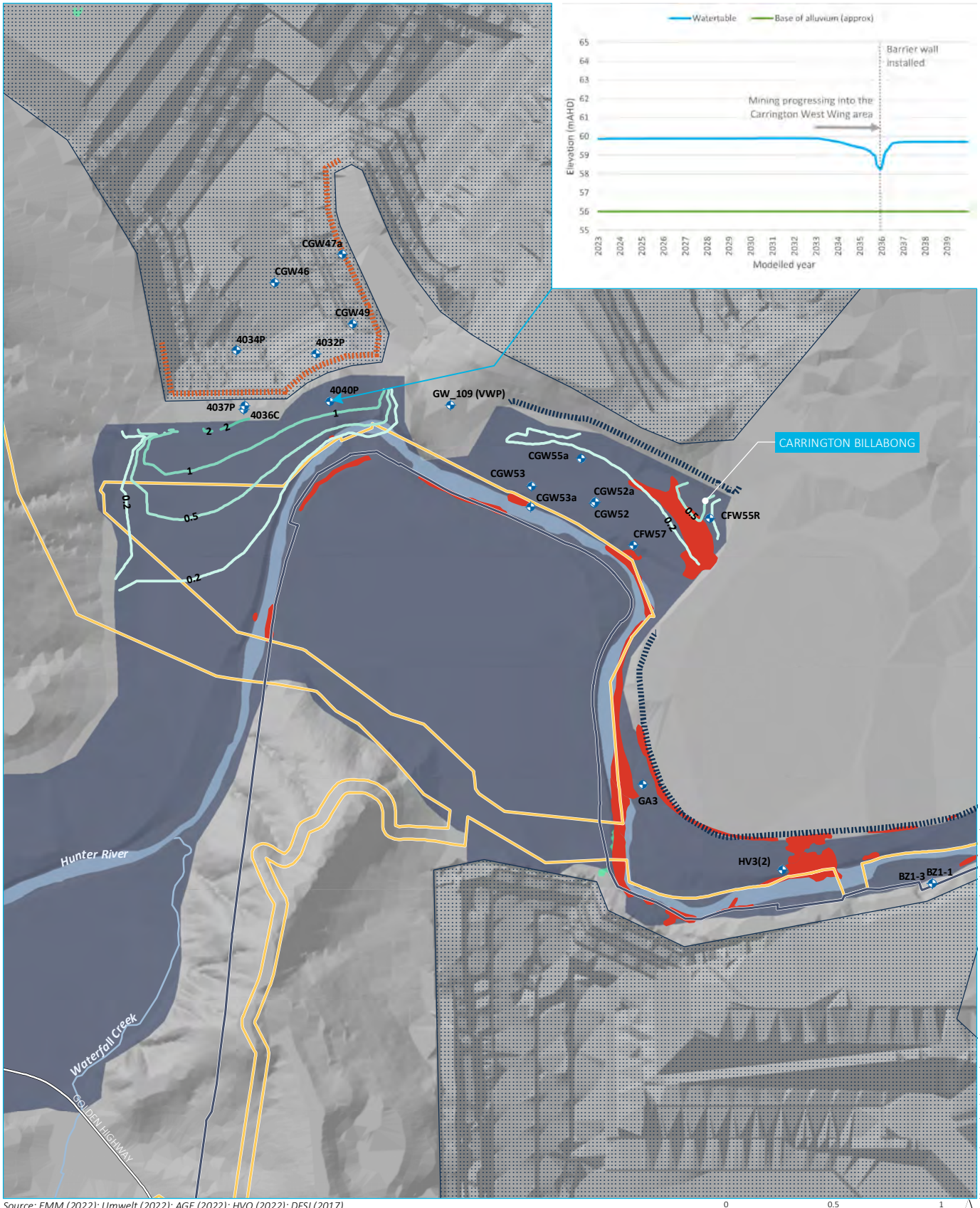
Figure 12.8 and Figure 12.9 show the maximum cumulative drawdown predicted to occur within the Hunter River alluvium and the Wollombi Brook alluvium over the operational life of the Project.

The cumulative maximum drawdown predicted in the Hunter River alluvium (during operations) is similar to the predicted incremental drawdown, indicating the majority of the drawdown is attributable to the short-term drawdown prior to installation of the Carrington West Wing barrier wall.

In the Wollombi Brook alluvium, a peak cumulative drawdown of up to 5 m is predicted in the area near South Lemington Pit 1 and above the Lemington underground (Figure 12.9). Drawdown is predicted due to the simulated continued extraction of groundwater from the Lemington Underground bore for Project water use, continuing the downward vertical gradient between the Permian groundwater systems and the Wollombi Brook alluvium, compared to the 'baseline' model scenario that simulates cessation of pumping from the Lemington Underground in 2009 at commencement of the WSP.

The predicted conservative cumulative alluvial drawdown exceeds the aquifer interference policy level 1 minimal impact considerations[4] in a small area; however, the aquatic ecology and GDE assessment demonstrates that the variation will not prevent the long-term viability of the ecosystems.

[4] Defined in the AIP as less than or equal to 10% cumulative variation in the watertable allowing for typical climatic 'post-WSP' variations




*Source: EMM (2022); Umwelt (2022); AGE (2022); HVO (2022); DFSI (2017)*

0 0.5 1 km

GDA2020 MGA Zone 56

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## KEY

- Groundwater monitoring location (HVO)
- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Proposed mining area
- Alluvial extent
- Carrington West Wing barrier wall
- Existing low permeability barrier wall

Maximum incremental drawdown during operations contour (m)

- 0.2
- 0.5
- 1
- 2

Vegetation community

- Hunter Floodplain Red Gum Woodland EEC (Umwelt, 2022)
- River Red Gum (HVO, 2020)

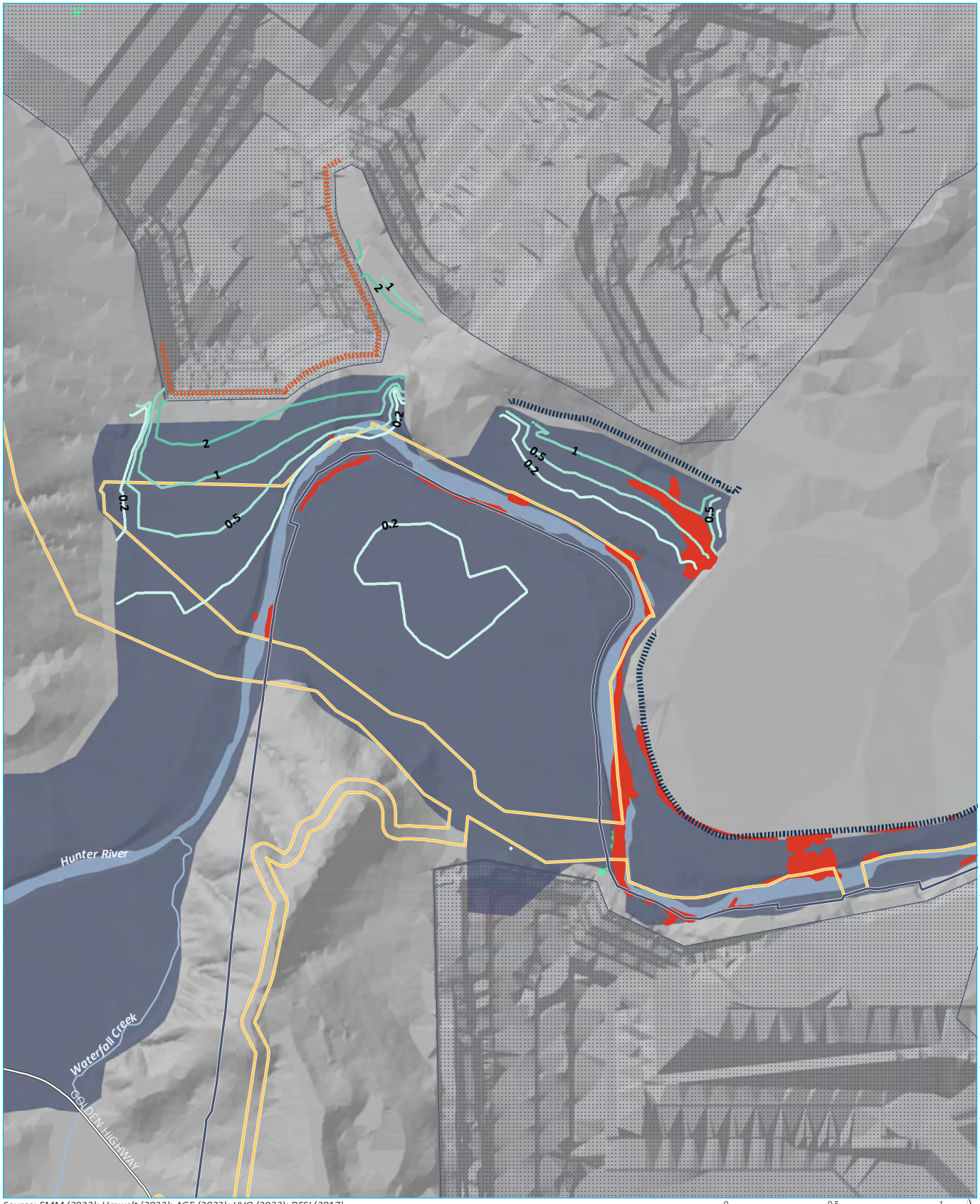
Existing environment

- Major road
- Named watercourse

# Hunter River alluvium - maximum incremental drawdown

HVO Continuation Project
Environmental Impact Statement
Figure 12.6

EMM creating opportunities




*Source: EMM (2022); Umwelt (2022); AGE (2022); HVO (2022); DFSI (2017)*

0 0.5 1 km

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## KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Proposed mining area
- Alluvial extent
- Carrington West Wing barrier wall
- Existing low permeability barrier wall

Maximum cumulative drawdown during operations contour (m)

- 0.2
- 0.5
- 1
- 2

Vegetation community

- Hunter Floodplain Red Gum Woodland EEC (Umwelt, 2022)
- River Red Gum (HVO, 2020)

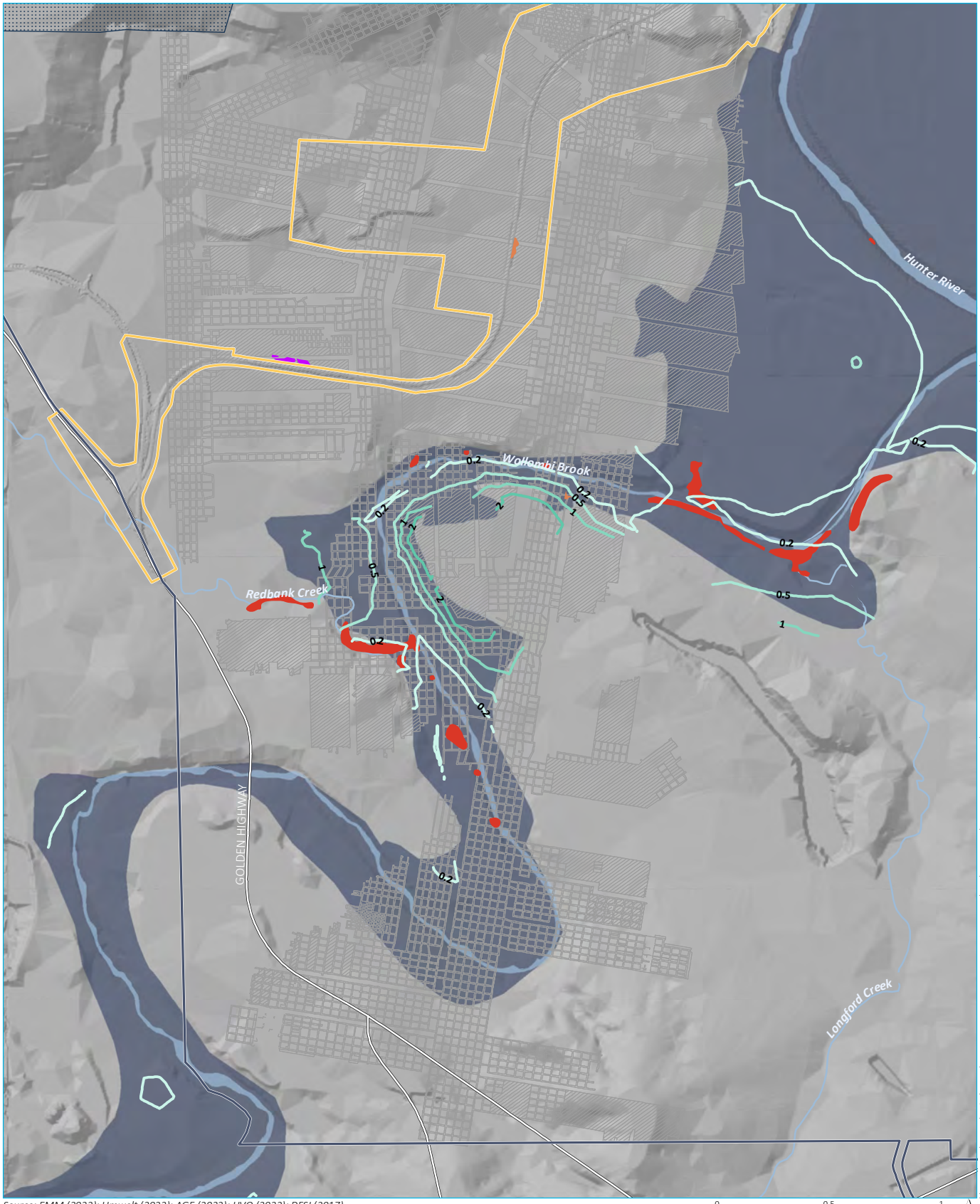
Existing environment

- Major road
- Named watercourse
- Named waterbody

# Hunter River alluvium - maximum cumulative drawdown during operations

HVO Continuation Project
Environmental Impact Statement
Figure 12.7

EMM creating opportunities




*Source: EMM (2022); Umwelt (2022); AGE (2022); HVO (2022); DFSI (2017)*

0 0.5 1 km

GDA2020 MGA Zone 56

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KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Proposed mining area
- Alluvial extent
- Lemington Underground mine plan

Existing environment

- Major road
- Named watercourse
- PCT 42 | River Red Gum (HVO, 2020)

Vegetation community (Umwelt, 2022)

- PCT 42 | River Red Gum/ River Oak Riparian Woodland
- PCT 1692 | Bull Oak Grassy Woodland of the Central Hunter Valley

Maximum cumulative drawdown during operations contour (m)

- 0.2
- 0.5
- 1
- 2

# Wollombi Brook alluvium - maximum cumulative drawdown during operations

HVO Continuation Project
Environmental Impact Statement
Figure 12.8

EMM creating opportunities

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### ii Groundwater quality

Activities that have the potential to impact groundwater quality in the alluvium or water quality in the Hunter River is the potential for seepage from mining areas backfilled with dry overburden and interburden material and the potential for production of acid rock drainage and metalloid leachate during operations. The assessment of potential impacts on water quality has been informed by the geochemistry assessment (EGi 2022) and the groundwater modelling for the Project (AGE 2022).

The geochemistry assessment indicates the majority of rejects generated by the Project are likely to be non-acid forming. Although 15% of the rejects samples tested were potentially acid forming, the thorough intermingling of rejects and overburden, and the excess acid neutralising capacity in the overburden, indicates these bulk fill zones are unlikely to result in any significant acid rock drainage issues or effects on rehabilitation.

Extracts from low sulphur non-acid forming materials indicates that drainage from these materials is likely to be slightly saline to moderately saline and is unlikely to contain significant metal/metalloid concentrations. However, elevated sulphate may occur from non-acid forming materials with significant pyrite.

Waste material (overburden and interburden) will continue to be managed in accordance with current site management practices which are effective, as observed in the surface water quality monitoring data, where water quality within the mine water system is generally neutral to alkaline, and salinity up to 5,170 mg/L total dissolved solids (TDS).

Therefore, the proposed operations will have negligible impact on groundwater or surface water quality, including the beneficial use category, environmental or cultural values.

#### a Backfilling in the Carrington West Wing area at HVO North

In contrast to the existing approved operation at HVO North, mining for the Project will occur as one main pit, advancing in a south-east direction towards the ultimate final void location in the current Carrington Pit area.

Consistent with the current approved operations, the mine plan involves progressively backfilling of mined areas with overburden and interburden waste material, followed by progressive rehabilitation. During mining, the floor of the main pit will be deep and intercepted groundwater will be actively managed as part of the mine water system. This will result in depressurisation of the Permian strata and development of a steep hydraulic gradient towards the pit area. Therefore, the active mining area will be a groundwater sink.

Prior to backfilling the mined area in the Carrington West Wing area, the barrier wall will be constructed on the highwall across the alluvium (and keyed into the Permian). This approach is consistent with the Carrington Pit barrier wall on the eastern arm of the paleochannel. In addition, constructing the barrier wall prior to backfilling would have similar outcomes, in regards to potential for seepage from backfilled areas, as the current approved operations.

Groundwater monitoring shows that groundwater levels in the rehabilitated Alluvial Lands area are lower than the Hunter River alluvium. This observation supports the conceptual understanding and modelling results that the potential for the watertable in the backfilled Carrington West Wing area to rise to a similar or higher elevation than the alluvium is unlikely. Therefore the potential for seepage to migrate from the backfilled Carrington West Wing area towards the Hunter River alluvium is negligible. AGE (2022) conducted additional sensitivity modelling to assess the potential for a shallow watertable to develop in the backfilled Carrington West Wing area under increased recharge and reduced hydraulic conductivity and storage parameters.

The modelling supported the base case modelling and conceptual understanding that the voids will remain strong sinks and the potential for seepage from the backfilled mine areas to the Hunter River alluvium is negligible.

Therefore, the Project, through the proposed mitigation measures, is predicted to have a negligible impact on groundwater quality in the HVO North area, including potential to alter the beneficial use of groundwater.

### 12.3.3 Final void assessment

The voids will remain long-term sinks. As described in the SWIA, drainage systems will be established on rehabilitated overburden emplacement areas, as well as around the perimeter of the final voids in order to convey upstream catchment runoff away from the final voids and to downstream watercourses. As such, the final landform design minimises capture of surface water and thereby limiting long-term impacts on streamflow. Closure options and strategies including the final land use are described in the Mine Closure and Rehabilitation Strategy (Appendix T).

Key outcomes of the final void assessment are:

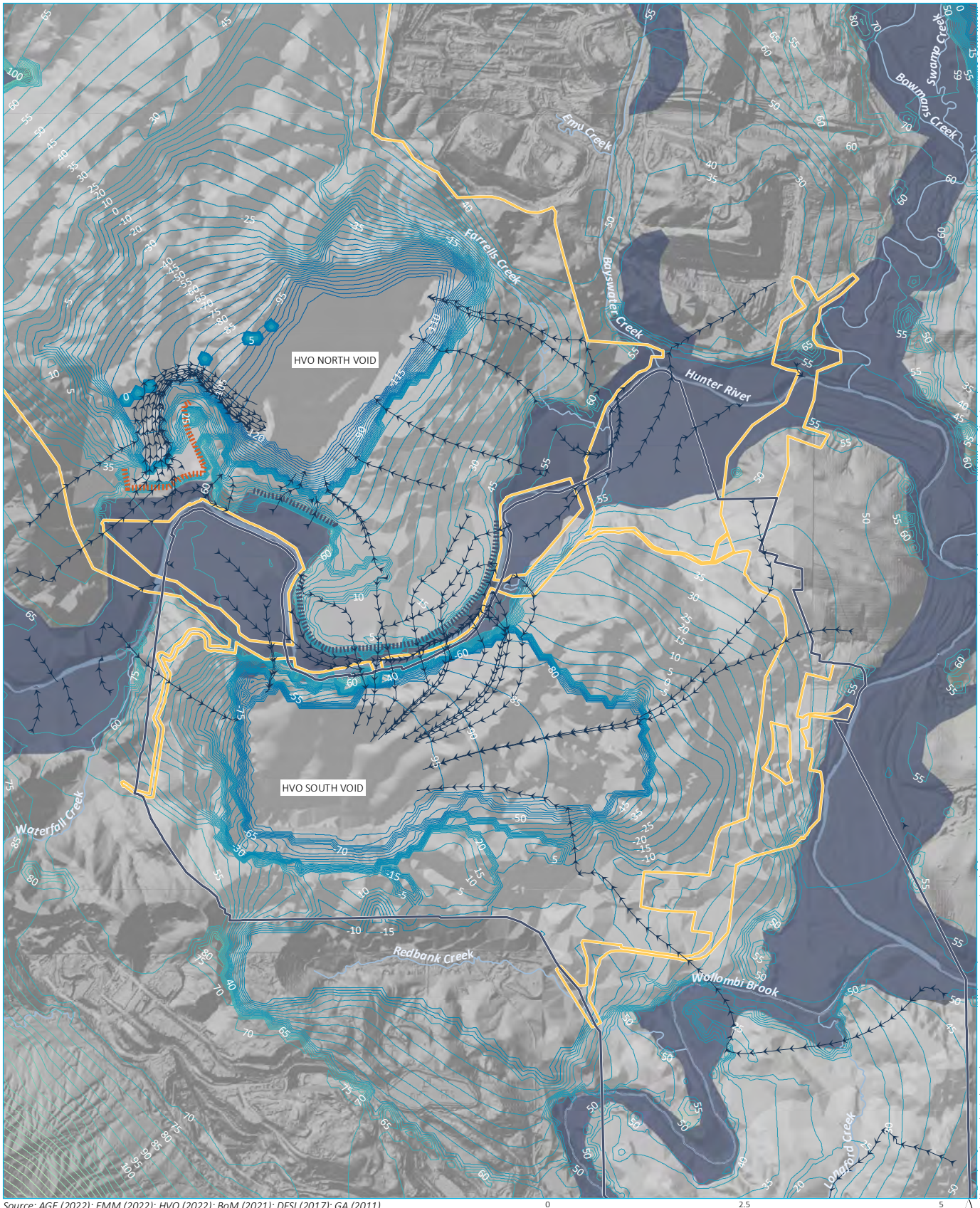
- The predicted long-term watertable and void level will be depressed, with groundwater flow directions towards the voids:
    - The HVO North void lake level is predicted to reach an equilibrium level of approximately -80 m Australian Height Datum (mAHD) after 1,000 years, which is approximately 120 m deeper than the predicted void lake for the approved Carrington void at HVO North. As such, the single proposed HVO North void will act as a stronger sink than the current approved voids at HVO North.
    - The HVO South void lake level is predicted to reach an equilibrium level of approximately -84 mAHD after 1,000 years. The assessment for HVO South Mod 5 estimated a long-term lake elevation of 30 mAHD. The modelling completed for the Project indicates the HVO South void lake will be considerably deeper than previously predicted, with the HVO South void predicted to act as a regional sink, acting as a terminal for potentially saline groundwater developing in other voids in the region. The difference in predicted long-term lake levels is likely due to: interaction with the proposed deep HVO North void, reduced catchment area reporting to the HVO South void (in comparison to the current approved landform) and greater evaporative losses from the proposed HVO North void (in comparison to the current approved voids).
- The Hunter River alluvium is predicted to remain saturated due to the strong hydraulic connection with the Hunter River. The groundwater model was used to predict groundwater flow movement over time (particle tracking; Figure 12.10), focusing on:
    - Watertable recovery and groundwater flow direction in backfilled emplacement areas to evaluate the potential for groundwater to seep from these backfilled areas towards the alluvium and Hunter River.
    - The watertable in the Hunter River alluvium to evaluate groundwater flow direction and interaction with the voids long-term.
- Evaporation will be the dominant loss from the void lakes and the voids are predicted to remain groundwater sinks.
- The long-term void lake level is considerably deeper than the base of the alluvium and the base of weathering, therefore the risk of seepage from the void lakes to shallow groundwater is negligible. In addition, infiltration of rainfall in the backfilled mine areas will gradually flow towards the void lakes, as evidenced by the groundwater particle tracking completed as part of the GIA (Figure 12.10), and the risk of seepage from the backfilled mine areas migrating through the existing and proposed barrier walls to the Hunter River alluvium is negligible.

- The risk of spill from the void lakes is negligible:
    - the long-term HVO North void lake level is predicted to be approximately 155 m below ground surface (freeboard); and
    - the long-term HVO South void lake level is predicted to be approximately 160 m below ground surface (freeboard).
- The runoff area contributing to the voids is sufficiently small so that evaporation dominates, and the voids remain as strong long-term groundwater sinks thereby attracting seepage from the surrounding strata (at a very low rate) and inhibiting advective dispersion of salinity back into the coal measures.
- The void lakes will be alkaline and brackish in the long term.

Consistent with the predicted drawdown during operations, the post-mining incremental alluvial drawdown is not predicted to have a significant impact on GDEs or surface water.

The conservative predicted post-mining cumulative drawdown, exceeds the aquifer interference policy level 1 minimal impact considerations; however, the aquatic ecology and GDE assessment (ELA 2022) demonstrates that the predicted change in watertable will not prevent the long-term viability of the ecosystem. This is illustrated in Figure 12.11.

River red gums and other riparian vegetation that opportunistically use shallow groundwater will continue to have access to shallow alluvial groundwater. In addition, the Project is predicted to have a negligible impact on Hunter River flow and flooding regime post-mining. Therefore, river red gum communities will continue to rely on flooding for germination.




Source: AGE (2022); EMM (2022); HVO (2022); BoM (2021); DFSI (2017); GA (2011)

0 2.5 5 km

GDA2020 MGA Zone 56

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KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Alluvial extent
- Carrington West Wing barrier wall
- Existing low permeability barrier wall
- Particle tracking result
- Named watercourse
- Named waterbody

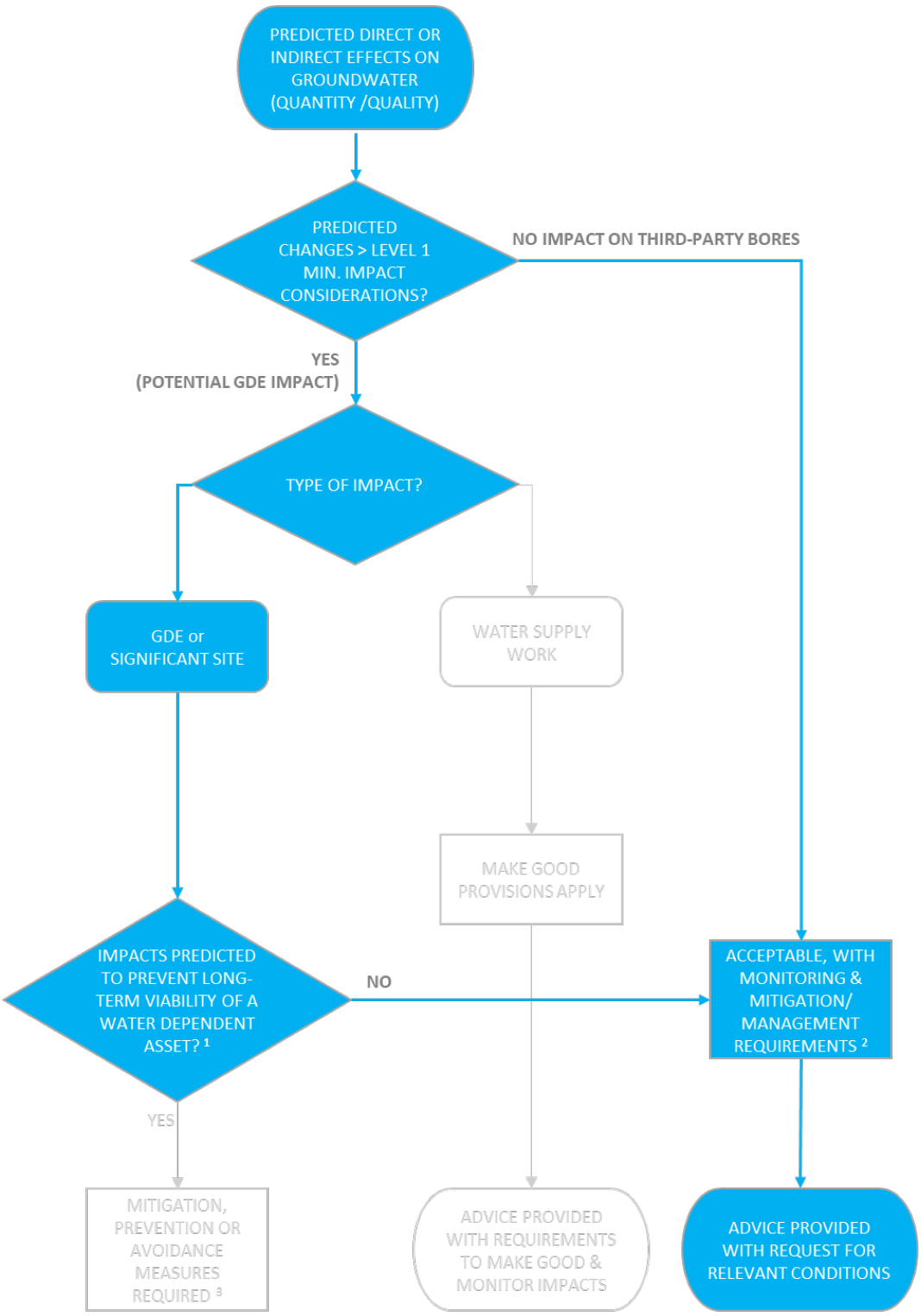
2150 predicted watertable (mAHD)

- < -100
- -100 to -50
- -50 to 0
- 0 to 50
- 50 to 75
- 75 to 100
- 100 to 125
- 125 to 150
- 150 to 200

# Post-mining groundwater levels and flow direction (particle tracking)

HVO Continuation Project
Environmental Impact Statement
Figure 12.9

EMM creating opportunities




1. Assessment as per Serov et al 2012, with consideration of uniqueness, ecological/cultural value and timeframe of the impact.
2. Conditions of approval may include requirements for adaptive management to monitor and mitigate or remediate impacts that exceed level 1 thresholds.
3. Where there are no suitable or practical mitigation or prevention options, the proponent may be asked to avoid impacts by modifying the proposed activity.

**Figure 12.10 Overview of Project impact assessment against the NSW Aquifer Interference Policy minimal impact considerations process**

## 12.4 Water licensing

HVO holds considerable water entitlement in the relevant surface water and groundwater sources in the Project area, which is sufficient to account for the predicted takes in all modelled operational scenarios. Refer to Appendix K for further details.

- During operations:
  - The peak water take from the Hunter Regulated River is within HVO's existing high security entitlement. During dry periods, when additional extraction from the Hunter River may occur to meet water demand, HVO holds additional high security WALs and adequate general security entitlement.
  - The peak surface water take from the Jerrys Water Source, managed under the Hunter Unregulated River and Alluvial WSP, is below the existing entitlement held by HVO.
  - There is no predicted surface water take from the Lower Wollombi Brook Water Source.
  - The predicted groundwater take from the Hunter Regulated River Alluvial Water Source and alluvium associated with the Lower Wollombi Brook and Singleton Water Sources is below the existing entitlement held by HVO.
  - HVO hold sufficient entitlement for the predicted peak take from the Sydney Basin-North Coast Groundwater Source.
- Post-mining:
  - Catchment runoff into the final voids will be accounted for against harvestable rights and HVO's existing entitlement held in the Jerrys Water Source.
  - HVO holds sufficient entitlement for the indirect surface water take post-mining.
  - Most of the predicted indirect groundwater take post-mining is within HVO's existing water entitlement. However, an additional 20 shares from the Hunter Regulated River Alluvial Water Source (upstream of Glennies Creek) may be required to be purchased from the open market.
  - The post-mining predicted take will be reviewed as part of groundwater model validation during operations and as part of closure planning.

## 12.5 Management, mitigation, and monitoring

HVO will continue to manage water in accordance with the objectives of the water management plan and requirements of the EPL, WALs and HRSTS. In addition, six new management and mitigation measures have been identified for the Project with respect to water, as follows:

1. The Carrington West Wing Levee and associated alluvial lands area will be monitored during operations, particularly following large flood events (5% AEP or larger) to identify signs of instability due to scour and identify corrective actions.
2. The frequency of comprehensive surface water quality analysis will be increased from an annual basis to six monthly for all sites.
3. The Carrington West Wing LPBW will be constructed following mining in that area and prior to backfilling.

4. Piezometers will be installed within the Carrington West Wing LPBW, consistent with the approach used for the Carrington Pit barrier wall. The purpose of the piezometers will be to monitor for changes in salinity and pressure.

5. Additional monitoring bores will be installed within the zone of predicted short-term incremental drawdown, approximately one year prior to mining recommencing in the remnant paleochannel. A network of eight nested monitoring bores are proposed. The locations will be documented in the water management plan.

6. The Carrington West Wing Levee will be decommissioned at closure to reinstate floodplain storage in this area.

A summary of the key management and mitigation measures is provided in Table 12.3, noting that, with except for the six new measures noted above (and listed below), these measures are currently in place as part of the existing HVO water management plan.

**Table 12.3 Water management and mitigation measures**

| ID | Management and mitigation measure |
|---|---|
| WAT1 | The HVO Water Management Plan will be updated to include the Project, will describe aspects such as:<br>• erosion and sediment control measures<br>• water sharing arrangements with neighbouring mines<br>• methods for measuring and estimating water take (where practical), which will be reviewed for compliance with the NSW *Non-Urban Water Metering Policy*<br>• tailings management<br>• groundwater model review and validation<br>• groundwater and surface water monitoring, including trigger action response plans for unexpected changes in surface and groundwater results |
| WAT2 | The Carrington West Wing Levee will be monitored during operational life of the Project, particularly following large flood events (5% AEP or larger) to identify signs of instability and potential corrective action. |
| WAT3 | The frequency of comprehensive surface water quality analysis will be increased from an annual basis to six monthly. |
| WAT4 | Improved flood protection levees will be implemented as follows:<br>• HVO North:<br>– North Pit levee - up to 0.1% AEP<br>– Carrington West Wing levee - up to 0.1% AEP<br>• HVO South<br>– Cheshunt levee - up to 0.1% AEP<br>– Riverview levee - up to the Extreme Flood Event (defined as four times the 1% AEP) |
| WAT5 | Consistent with the methodology used for the Carrington Pit LPBW, the Carrington West Wing LPBW will be constructed on the alluvial benches of the highwall following mining in that area and prior to backfilling. The barrier wall will be keyed into the Permian bedrock and will be designed to meet the current development consent requirement of a permeability of 1 x $10^{-8}$ m/sec. |
| WAT6 | Additional monitoring bores will be installed within the zone of predicted short-term incremental drawdown, approximately one year prior to mining recommencing in the remnant paleochannel. A network of eight nested monitoring bores are proposed and will be included in the updated water management plan. |
| WAT7 | Piezometers will be installed within the Carrington West Wing LPBW, consistent with the approach used for the Carrington Pit LPBW. The purpose of the piezometers will be to monitor for changes in salinity and pressure. |

**Table 12.3 Water management and mitigation measures**

| ID | Management and mitigation measure |
|---|---|
| WAT8 | A LPBW monitoring and management plan will be prepared in consultation with DPE Water (which will include assigned trigger levels and a response plan for trigger level exceedance and deviations from predictions). |
| WAT9 | The Carrington West Wing levee will be decommissioned at closure to reinstate floodplain storage in this area. |

## 12.6 Summary and conclusion

The assessments show the Project can operate within and meet the requirements of the water regulatory framework. The following is a summary of the outcomes of the assessed impacts of the Project on water resources:

- The WMS is predicted to maintain an overall balance without excess accumulation or shortfall of mine water demands, minimising business disruption and potential impacts on surface water resources.
- Impacts on Hunter River and Wollombi Brook streamflow will be negligible.
- Minor changes in streamflow in ephemeral watercourses (during operations) will have a minor impact on aquatic ecology.
- HVO holds sufficient entitlement for the predicted reduction in Hunter River streamflow due to the Project.
- The flood modelling for the Project indicates no changes to flooding at third-party properties (ie those not owned by the JV partners) along the Hunter River, and no impact on the use of the land (grazing and cropping or crown land).
- The proposed realignment of Lemington Road will significantly improve flood immunity of this road adjacent to the Hunter River.
- The Project is not predicted to change the flood hazard categories, or have an impact on use of the land, public safety or emergency management.
- Changes in velocity are presented to be localised around Project infrastructure and will remain within the existing ranges experienced, with a low likelihood of causing scour.
- No impact is predicted at third-party bores.
- In comparison to the approved HVO South operations, the Project will result in less drawdown in the Wollombi Brook and there is no incremental drawdown predicted for the Project in that area.
- Construction of the Carrington West Wing barrier wall after mining will limit long-term drawdown in the Hunter River alluvium and the potential for seepage from the backfilled mine area to the alluvium. The predicted drawdown will be of short duration, and saturation will remain in the alluvial aquifer.
- The Project is predicted to have a minor impact on GDEs (the Project is not predicted to affect the long-term viability of the ecosystems). River red gums and other riparian vegetation that opportunistically use shallow groundwater will continue to have access to shallow alluvial groundwater. In addition, the Project is predicted to have a negligible impact on Hunter River flow and flooding regime post-mining. Therefore, river red gum communities will continue to rely on flooding for germination.

- The final voids will act as regional groundwater sinks and the long-term lake level will be considerably deeper than the base of the alluvium and the base of weathering. Therefore, the risk of seepage from the void lakes or backfilled mine areas is minor.
- The risk of spill from the void lakes is negligible.
- The Project will not result in adverse changes to the environmental, cultural and community values of groundwater or surface water.
- HVO holds considerable water entitlement in the relevant surface water and groundwater sources in the Project area, which is sufficient to account for the predicted direct and indirect takes during operations.

# 13 Biodiversity

## 13.1 Introduction

This section summarises the biodiversity development assessment report (BDAR) that has been prepared for the Project, with the full technical report attached in Appendix L.

The BDAR was prepared using the biodiversity assessment method (BAM 2020) in accordance with the *Biodiversity Conservation Act 2016* (BC Act) to determine the potential impacts of the Project on biodiversity values, and to identify offsetting requirements to mitigate residual impacts following the implementation of all feasible and reasonable avoidance and minimisation measures.

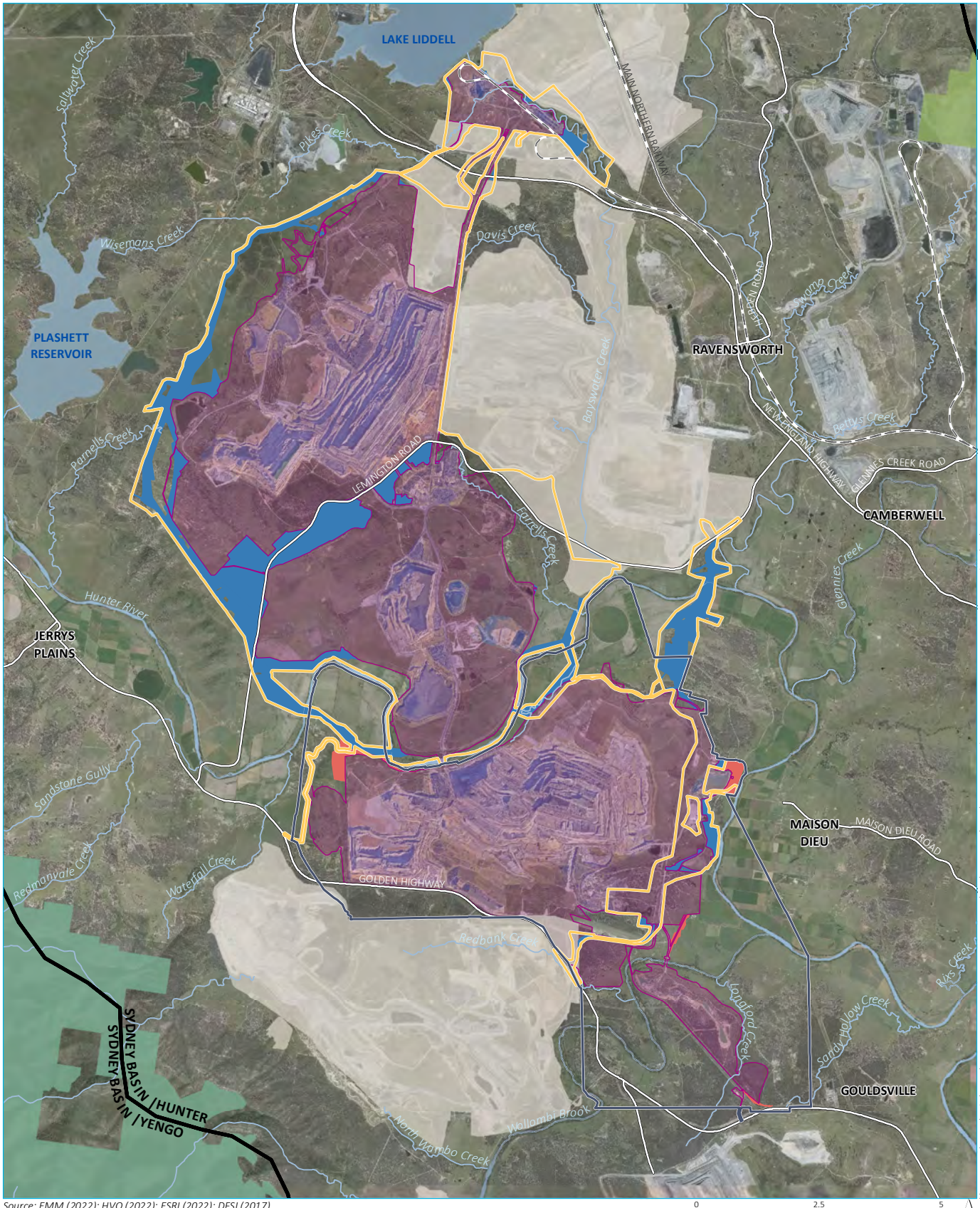
A key part of defining the scope for each technical assessment for the Project was defining the scope in the context of activities previously assessed and approved at HVO. This was particularly important for biodiversity, given that a large part of the Project involves the progression of mining and other related activities within previously disturbed areas or areas that are approved to be disturbed.

Accordingly, two development footprints have been defined for assessment in the BDAR, which are the areas subject to impacts that require assessment under the BC Act; one for HVO North and one for HVO South. Areas within the HVO North and HVO South Project areas that are already approved to be disturbed under a NSW development consent (including areas within the HVO, Liddell Coal Operations (DA 305-11-01), United Wambo JV (SSD-7142) and Ravensworth Operations (MP 09_0176) approval areas) are not included in the HVO North and HVO South development footprints and do not require further assessment in the BDAR. The development footprints are illustrated in Figure 13.1, and Table 13.1 provides details of these areas.

**Table 13.1 Development footprint details**

| Detail | HVO North | HVO South |
|---|---|---|
| **Name** | HVO North development footprint | HVO South development footprint |
| **Size** | 926.0 ha | 54.9 ha |
| **Current land use** | Agricultural, mining and power generation | Agricultural and mining |
| **LGA** | Singleton Council<br>Muswellbrook Shire Council | Singleton Council |
| **Zoning** | RU1 – primary production<br>SP2 – infrastructure<br>C2 – environmental conservation[1] | RU1 – primary production<br>C2 – environmental conservation[1] |
| **Assessment type** | Major Project (site-based) | Major Project (site-based) |
| **Assessment ID** | 00026520/BAAS17005/21/00026521 | 00026544/BAAS17005/21/00026545 |

1 – A small portion of the realigned Lemington Road corridor is in an area currently zoned C2 under the Singleton LEP. This area is currently subject to subdivision between HVO and Warkworth Mine in accordance with the Warkworth Mine consent SSD 5464 (as modified). This will result in the C2 zone land having been rezoned to RU1 zone land by the time of determination of the Project. There will therefore be no C2 land in the Project area.




Source: EMM (2022); HVO (2022); ESRI (2022); DFSI (2017)

0 2.5 5 km

GDA2020 MGA Zone 56

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KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- HVO North development footprint
- HVO South development footprint
- Existing and approved disturbance area
- Approved disturbance area - other mine
- IBRA region/subregion boundary

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody
- NPWS reserve
- State forest

# Development footprints for biodiversity assessment

HVO Continuation Project
Environmental Impact Statement
Figure 13.1

EMM
creating opportunities

## 13.2 Existing environment

### 13.2.1 Landscape context and features

The central Hunter Valley has been largely cleared of intact native vegetation, primarily for agriculture but also other land uses, such as mining and urban development. Similar land use patterns occur in the vicinity of the HVO North and HVO South development footprints, which are predominantly surrounded by coal mining operations and agricultural land, with small and scattered patches of native vegetation.

A summary of the other landscape features relevant to biodiversity are outlined in Table 13.2.

**Table 13.2 Landscape features within the development footprints**

| Landscape features | HVO North | HVO South |
|---|---|---|
| **IBRA bioregion** | Sydney Basin | Sydney Basin |
| **IBRA subregion** | Hunter | Hunter |
| **NSW (Mitchel) landscape (dominant)** | Central Hunter Foothills | Central Hunter Foothills |
| **Native vegetation cover** | 40% | 35% |
| **Strahler (1952) streams** | 9th Order – Hunter River<br>5th Order – Bayswater Creek<br>4th Order – Unnamed tributary of the Hunter River southwest of Carrington Billabong<br>3rd Order – Parnells Creek and Farrells Creek<br>Numerous unnamed 1st and 2nd Order creeks | 9th Order – Hunter River<br>8th Order – Wollombi Brook<br>4th Order – Unnamed tributary of the Hunter River north of Riverview Pit<br>Several 1st, 2nd and 3rd Order creeks intersecting the HVO South development footprint |
| **Important and local wetlands** | Not present | Not present |
| **Areas of geological significance and soil hazard features** | None identified | None identified |
| **Areas of outstanding biodiversity value** | Not present | Not present |
| **Connectivity features** | Hunter River | Hunter River |
| **Priority investment areas** | None identified | None identified |

The landscape within the HVO North and HVO South development footprints, consistent with surrounding areas, has been significantly shaped by historical clearing for agricultural, mining and rural development. As such, much of the land associated with the Project conforms to Category 1 – Exempt Land under the *Local Land Services Act 2013* (LLS Act), being lawfully cleared areas and/or low conservation vegetation. Appendix B of the BDAR (refer to Appendix L of this EIS) contains a summary of the process used to identify the Category 1 – Exempt Land within the Project areas.

Impacts to biodiversity values on Category 1 – Exempt Land were not assessed further in the BDAR, other than prescribed impacts, as per the intent of this mapping category.

### 13.2.2 Native vegetation

#### i Native vegetation extent

As shown in Table 13.3, the development footprints are substantially (47%) dominated by derived and modified vegetation types (ie native and exotic grasslands) and Category 1 – Exempt Land under the *Local Land Services Act 2013*. Only approximately 22% of the combined development footprints are covered by native (woody) vegetation. Further, a large area across the development footprints (approximately 316 ha) occurs within the wider transmission easement area, where transmission lines will be realigned for the Project. Direct impacts are not currently proposed across the full width of the identified easement area, but has been included in the development footprint until the final design of the realigned transmission lines is determined.

**Table 13.3 Vegetation and non-native cover of development footprints**

| Cover type | Condition types | Area (ha) | | | Overall % cover |
|---|---|---|---|---|---|
| | | HVO North | HVO South | Total | |
| Native vegetation cover | Native vegetation (woody) | 205.4 | 5.2 | 210.6 | 21.5% |
| | Derived native grassland (non-woody) | 295.2 | 11.5 | 306.7 | 31.2% |
| **Total native cover** | | **500.6** | **16.7** | **517.3** | **52.7%** |
| Non-native vegetation and excluded lands | Exotic vegetation* | 88.2 | 13.0 | 101.2 | 10.3% |
| | Category 1 – Exempt Land under the LLS Act | 334.6 | 25.0 | 359.6 | 36.7% |
| | Cleared land (roads, infrastructure, dams) | 2.7 | 0.2 | 2.9 | 0.3% |
| **Total non-native/excluded lands cover** | | **425.5** | **38.2** | **463.7** | **47.3%** |

*Includes Exotic Grassland condition types (Vegetation Zones 5, 12 and 20). While it is acknowledged these areas include some native species, they are primarily dominated by exotic vegetation (ie on average greater than 50% exotic cover and less than 15% native cover). Furthermore, these zones are below the minimum offsetting threshold in the BAM assessment.

#### ii Plant community types and vegetation zones

Surveys identified a total of seven plant community types (PCTs) across 22 condition classes in the development footprints, as summarised in Table 13.4 and shown in Figure 13.2 and Figure 13.3. These communities were aligned with PCTs in accordance with the NSW PCT classification, as described in the BioNet vegetation classification. The PCTs were then stratified into broad condition states (vegetation zones).

Note that the areas quoted in Table 13.4 include all vegetation within the development footprints. This includes all native woody and non-woody vegetation and exotic vegetation as listed in Table 13.3.

## Table 13.4 Plant community types and vegetation zones in the development footprints

| Plant community type | Vegetation zone and condition | Area (ha) | | |
|---|---|---|---|---|
| | | HVO North | HVO South | Total |
| 42 – River Red Gum/River Oak riparian woodland wetland in the Hunter Valley | 1. Moderate | 1.0 | 0.0 | 1.0 |
| | 2. Low to Moderate | 0.7 | 0.2 | 0.9 |
| | 3. Cooba Woodland | 0.2 | 0.5 | 0.7 |
| | 4. Derived Native Grassland | 5.0 | 0.0 | 5.0 |
| | 5. Exotic Grassland (refer to Photograph 13.1) | 25.7 | 4.7 | 30.4 |
| | **Total for PCT 42** | **32.6** | **5.4** | **38.0** |
| 485 – River Oak riparian grassy tall woodland of the western Hunter Valley | 6. Moderate | 4.0 | 0.0 | 4.0 |
| | **Total for PCT 485** | **4.0** | **0.0** | **4.0** |
| 1655 – Grey Box – Slaty Box shrub – grass woodland on sandstone slopes of the upper Hunter and Sydney Basin | 7. Moderate | 7.0 | 0.0 | 7.0 |
| | **Total for PCT 1655** | **7.0** | **0.0** | **7.0** |
| 1658 – Rough-barked Apple – Narrow-leaved Ironbark – Blakely's Red Gum – Bull Oak – Coast Banksia woodland on sands of the Warkworth area | 8. Moderate | 1.8 | 0.0 | 1.8 |
| | 9. Low to Moderate | 0.9 | 0.0 | 0.9 |
| | 10. Disturbed | 0.0 | 0.1 | 0.1 |
| | 11. Regeneration | 0.0 | 0.2 | 0.2 |
| | 12. Exotic Grassland | 0.4 | 0.0 | 0.4 |
| | **Total for PCT 1658** | **3.1** | **0.3** | **3.4** |
| 1691 – Narrow-leaved Ironbark – Grey Box grassy woodland of the central and upper Hunter | 13. Moderate | 64.3 | 1.3 | 65.6 |
| | 14. Thinned Woodland | 10.5 | 2.7 | 13.2 |
| | 15. Woodland with Exotic Understorey | 5.4 | 0.0 | 5.4 |
| | 16. Plantation | 8.2 | 0.0 | 8.2 |
| | 17. Scattered Regeneration | 48.6 | 0.0 | 48.6 |
| | 18. Cooba Woodland | 12.8 | 0.2 | 13.0 |
| | 19. Poor Condition Derived Native Grassland (refer to Photograph 13.2) | 290.2 | 11.5 | 301.7 |

**Table 13.4 Plant community types and vegetation zones in the development footprints**

| Plant community type | Vegetation zone and condition | Area (ha) | | |
|---|---|---|---|---|
| | | HVO North | HVO South | Total |
| | 20. Exotic Grassland | 62.1 | 8.3 | 70.4 |
| | **Total for PCT 1691** | **502.1** | **24.0** | **526.1** |
| 1692 – Bull Oak grassy woodland of the central Hunter Valley | 21. Moderate | 36.9 | 0.0 | 36.9 |
| | **Total for PCT 1692** | **36.9** | **0.0** | **36.9** |
| 1731 – Swamp Oak – Weeping Grass grassy riparian forest of the Hunter Valley | 22. Moderate | 3.0 | 0.0 | 3.0 |
| | **Total for PCT 1731** | **3.0** | **0.0** | **3.0** |
| **Total vegetation** | | **588.7** | **29.7** | **618.4** |



**Photograph 13.1 Vegetation zone 5: PCT 42 –– Exotic grassland**



**Photograph 13.2 Vegetation zone 19: PCT 1691 – Poor condition derived native grassland**

### iii Threatened ecological communities

Thirteen of the vegetation zones described above and mapped within the development footprints conform to threatened ecological communities (TECs) listed under the BC Act, with four listed TECs identified. All four occur within the HVO North development footprint and three occur in the HVO South development footprint.

A summary of the TECs recorded in the development footprints is provided in Table 13.5 and show on Figure 13.2 and Figure 13.3.

## Table 13.5 Summary of TECs within the development footprints

| Threatened Ecological Community listed under the NSW BC Act | Vegetation Zone | Area (ha) in Development Footprint | |
|---|---|---|---|
| | | HVO North | HVO South |
| Central Hunter Grey Box – Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions EEC | 13. PCT 1691 – *Moderate* | 63.6 | 1.3 |
| | 14. PCT 1691 – *Thinned Woodland* | 10.5 | 2.7 |
| | 15. PCT 1691 – *Woodland with Exotic Understorey* | 5.4 | 0.0 |
| | 16. PCT 1691 – *Plantation* | 4.7 | 0.0 |
| | **Total EEC** | **84.2** | **4.0** |
| Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions EEC | 1. PCT 42 – *Moderate* | 1.0 | 0.0 |
| | 2. PCT 42 – *Low to Moderate* | 0.7 | 0.2 |
| | **Total EEC** | **1.7** | **0.2** |
| Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion VEC | 7. PCT 1655 – *Moderate* | 7.0 | 0.0 |
| | **Total VEC** | **7.0** | **0.0** |
| Warkworth Sands Woodland in the Sydney Basin Bioregion EEC | 8. PCT1658 – *Moderate* | 1.8 | 0.0 |
| | 9. PCT 1658 – *Low to Moderate* | 0.9 | 0.0 |
| | 10. PCT 1658 – *Disturbed* | 0.0 | 0.1 |
| | 11. PCT 1658 – *Regeneration* | 0.0 | 0.2 |
| | 13. PCT 1691^ – *Moderate* | 0.7 | 0.0 |
| | 21. PCT 1692^ – *Moderate* | 1.5 | 0.0 |
| | **Total EEC** | **4.9** | **0.3** |




Source: EMM (2022); HVO (2022); Umwelt (2022); DFSI (2017); GA (2011)

0 2.5 5 km

GDA2020 MGA Zone 56

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## KEY

HVO North proposed development consent boundary

HVO North development footprint

Vegetation community | Condition

Category 1 - Exempt Land

PCT 42

Cooba woodland
Moderate
Low to moderate
Derived native grassland
Exotic grassland

PCT 485

Moderate

PCT 1655

Moderate

PCT 1658

Moderate
Low to moderate
Exotic grassland

PCT 1691

Cooba woodland
Woodland with exotic understory
Thinned woodland
Moderate
Plantation
Scattered regeneration
Poor condition derived native grassland
Exotic grassland

PCT 1692

Moderate

PCT 1731

Moderate

Listed under *Environment Protection and Biodiversity Conservation Act 1999*

Central Hunter Valley Eucalypt Forest and Woodland CEEC
Warkworth Sands Woodland of the Hunter Valley CEEC
White Box - Yellow Box - Blakely's Red Gum Grassy Woodlands and Derived Native Grassland CEEC

Listed under NSW <ITA>Biodiversity Conservation Act 2016<ITA>

Central Hunter Grey Box - Ironbark Woodland EEC
Hunter Floodplain Red Gum Woodland EEC
Hunter Valley Footslopes Slaty Gum Woodland VEC
Warkworth Sands Woodland EEC

Existing environment

Rail line
Major road
Named watercourse
Named waterbody

# HVO North PCTs, vegetation zone mapping and threatened ecological communities

HVO Continuation Project
Environmental Impact Statement
Figure 13.2

EMM creating opportunities




*Source: EMM (2022); HVO (2022); Umwelt (2022); DFSI (2017); GA (2011)*

0 1 2 km

GDA2020 MGA Zone 56

N

## KEY

- HVO South proposed development consent boundary
- HVO South development footprint

Vegetation community | Condition

- Category 1 - Exempt Land

PCT 42

- Cooba woodland
- Low to moderate
- Derived native grassland
- Exotic grassland

PCT 1658

- Regeneration
- Disturbed

PCT 1691

- Cooba woodland
- Thinned woodland
- Moderate
- Poor condition derived native grassland
- Exotic grassland

Environmental Protection & Biodiversity Conservation Act

- Central Hunter Valley Eucalypt Forest and Woodland CEEC
- Warkworth Sands Woodland of the Hunter Valley CEEC

Biodiversity Conservation Act

- Central Hunter Grey Box - Ironbark Woodland EEC
- Hunter Floodplain Red Gum Woodland EEC
- Warkworth Sands Woodland EEC

Existing environment

- Major road
- Named watercourse

# HVO South PCTs, vegetation zone mapping and threatened ecological communities

HVO Continuation Project
Environmental Impact Statement
Figure 13.3

EMM creating opportunities

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### 13.2.3 Threatened species

#### i Ecosystem credit species

Table 13.6 provides a list of the ecosystem-credit species predicted to occur by the BAM-C and included in the BAM-C assessment for the Project.

**Table 13.6 Ecosystem-credit species predicted to occur in the development footprints**

| Species name | Sensitivity to gain | Predicted occurrence in PCTs by BAM-C | Predicted by BAM-C assessment | |
|---|---|---|---|---|
| | | | HVO North | HVO South |
| Barking owl – *Ninox connivens* | High | 42, 485, 1655, 1658, 1691, 1692, 1731 | ✓ | ✓ |
| Black falcon – *Falco subniger* | Moderate | 42, 485, 1658, 1691 | ✓ | ✓ |
| Black-chinned honeyeater – *Melithreptus gularis gularis* | Moderate | 1655, 1691, 1692 | ✓ | ✓ |
| Brown treecreeper – *Climacteris picumnus victoriae* | High | 42, 1655, 1658, 1691 | ✓ | ✓ |
| Corben's long-eared bat – *Nyctophilus corbeni* | High | 1655 | ✓ | - |
| Diamond firetail – *Stagonopleura guttata* | Moderate | 42, 1655 | ✓ | ✓ |
| Eastern coastal free-tailed bat – *Micronomus norfolkensis* | High | 42, 1691, 1692 | ✓ | ✓ |
| Eastern false pipistrelle – *Falsistrellus tasmaniensis* | High | 42, 1655, 1691, 1692 | ✓ | ✓ |
| Eastern grass owl – *Tyto longimembris* | Moderate | 1731 | ✓ | - |
| Flame robin – *Petroica phoenicea* | Moderate | 42, 1655, 1691, 1692 | ✓ | ✓ |
| Freckled duck – *Stictonetta naevosa* | Moderate | 42 | ✓ | ✓ |
| Gang-gang cockatoo – *Callocephalon fimbriatum* | Moderate | 42, 1655, 1691, 1692, 1731 | ✓ | ✓ |
| Glossy black-cockatoo – *Calyptorhynchus lathami* | High | 42, 1655, 1691, 1692 | ✓ | ✓ |
| Greater broad-nosed bat – *Scoteanax rueppellii* | High | 42, 1655, 1691, 1692 | ✓ | ✓ |
| Grey-crowned babbler – *Pomatostomus temporalis temporalis* | Moderate | 1655, 1691, 1692 | ✓ | ✓ |
| Grey-headed flying-fox – *Pteropus poliocephalus* | High | 42, 1655, 1691, 1692 | ✓ | ✓ |
| Hooded robin – *Melanodryas cucullata cucullata* | Moderate | 1655, 1691, 1692 | ✓ | ✓ |

## Table 13.6 Ecosystem-credit species predicted to occur in the development footprints

| Species name | Sensitivity to gain | Predicted occurrence in PCTs by BAM-C | Predicted by BAM-C assessment | |
|---|---|---|---|---|
| | | | HVO North | HVO South |
| Koala – *Phascolarctos cinereus* | High | 42, 1655 | ✓ | ✓ |
| Large bent-winged bat – *Miniopterus orianae oceanensis* | High | 42, 1655, 1691, 1692 | ✓ | ✓ |
| Little bent-winged bat – *Miniopterus australis* | High | 42 | ✓ | ✓ |
| Little eagle – *Hieraaetus morphnoides* | Moderate | 42, 1655, 1691, 1692, 1731 | ✓ | ✓ |
| Little lorikeet – *Glossopsitta pusilla* | High | 42, 485, 1655, 1691, 1692, 1731 | ✓ | ✓ |
| Masked owl – *Tyto novaehollandiae* | High | 1655, 1691, 1692 | ✓ | ✓ |
| Painted honeyeater – *Grantiella picta* | Moderate | 42, 485, 1655, 1658, 1691, 1692 | ✓ | ✓ |
| Powerful owl – *Ninox strenua* | High | 1655, 1691, 1692 | ✓ | ✓ |
| Regent honeyeater – *Anthochaera phrygia* | High | 42, 485, 1655, 1691 | ✓ | ✓ |
| Scarlet robin – *Petroica boodang* | Moderate | 42, 1655, 1691, 1692 | ✓ | ✓ |
| Speckled warbler – *Chthonicola sagittata* | High | 42, 1655, 1658, 1691, 1692 | ✓ | ✓ |
| Spotted harrier – *Circus assimilis* | Moderate | 42, 1731 | ✓ | ✓ |
| Spotted-tailed quoll – *Dasyurus maculatus* | High | 42, 1655, 1658, 1691, 1692, 1731 | ✓ | ✓ |
| Square-tailed kite – *Lophoictinia isura* | Moderate | 1655, 1658, 1691, 1692 | ✓ | ✓ |
| Superb fruit-dove – *Ptilinopus superbus* | Moderate | 42 | ✓ | ✓ |
| Swift parrot – *Lathamus discolor* | Moderate | 42, 1655, 1691, 1692 | ✓ | ✓ |
| Turquoise parrot – *Neophema pulchella* | High | 1655, 1658, 1691, 1692 | ✓ | ✓ |
| Varied sittella – *Daphoenositta chrysoptera* | Moderate | 42, 1655, 1658, 1691, 1731 | ✓ | ✓ |
| White-bellied sea-eagle – *Haliaeetus leucogaster* | High | 42, 1691, 1692, 1731 | ✓ | ✓ |
| White-throated needletail – *Hirundapus caudacutus* | High | 42, 485, 1655, 1658, 1691, 1692 | ✓ | ✓ |
| Yellow-bellied sheathtail-bat – *Saccolaimus flaviventris* | High | 42, 1655, 1691, 1692 | ✓ | ✓ |

A range of ecosystem-credit species were recorded during the surveys undertaken for the Project, including:

- woodland birds – speckled warbler (*Chthonicola sagittata*), varied sittella (*Daphoenositta chrysoptera*), scarlet robin (*Petroica boodang*) and grey-crowned babbler (*Pomatostomus temporalis temporalis*);
- micro-bat species – east coastal free-tailed bat (*Micronomus norfolkensis*) and little bent-winged bat (*Miniopterus australis*);
- ground-dwelling mammals – spotted-tailed quoll (*Dasyurus maculatus*); and
- birds of prey – spotted harrier (*Circus assimilis*).

#### ii Species credit species

Three species-credit species were recorded in the development footprints during the targeted species-credit surveys that will generate credits as part of the Project, and one species has been assumed present based on the prevalence of records in the local area and region.

Assumed present:

- southern myotis (*Myotis macropus*).

Recorded:

- *Eucalyptus camaldulensis* – River Red Gum endangered population in the Hunter catchment;
- Hunter Valley delma (*Delma vescolineata*); and
- brush-tailed phascogale (*Phascogale tapoatafa*).

Large-eared pied bat (*Chalinolobus dwyeri*) and little bent-winged bat (*Miniopterus australis*) were also positively recorded during Anabat surveys; however, given that no areas containing breeding habitat occur in or within 2 km of the development footprints, habitat polygons are not required for these species.

## 13.3 Avoidance and minimisation

HVO has sought to avoid and minimise potential impacts on biodiversity values through Project design. This included targeted avoidance and minimisation of disturbance of key high conservation value vegetation communities and fauna habitats through designing the Project to maximise use of existing mining facilities and existing and approved disturbance areas, reducing the proposed mining areas and relocating infrastructure, where possible and implementing a range of biodiversity mitigation measures.

HVO undertook a detailed biodiversity constraints study as part of the Project's pre-feasibility assessment to guide the development and detailed design of the Project. Targeted avoidance and minimisation measures were implemented to reduce the Project's impact on areas of higher value vegetation and habitat, including (but not limited to):

- locating impacts predominantly in previously mined and/or disturbed areas, and areas approved to be disturbed;
- refinement and location selection of the Lemington Road realignment to avoid larger areas of *Warkworth Sands Woodland in the Sydney Basin Bioregion EEC*;

- careful consideration of proposed transmission line easement alignment to avoid areas of higher quality vegetation and habitats, and to provide for maximum vegetation and habitat retention in easement corridors;
- habitat retention following decommissioning of existing transmission lines; and
- removal from the Project of some components previously approved under HVO South's existing Project Approval, including coal extraction from the Riverview South East Extension, mining in the South Lemington Pits 1 and 2 and the construction of the short rail loop associated with the Lemington Coal Preparation Plant.

A summary of the areas containing biodiversity values that have been avoided through refinement of the Project is contained in Table 13.7.

**Table 13.7 Summary of avoidance**

| Biodiversity feature | Project component area avoided (ha) | | | | Total (ha) |
|---|---|---|---|---|---|
| | Lemington Road realignment | Transmission line alignment* | RRG additional disturbance area | Removal of previously approved impacts | |
| Native forest and woodland habitat | 19.5 | 11.8 | 5.8 | 90.2 | **127.3** |
| Native and exotic grasslands | 6.3 | 163.5 | N/A | 33.7 | **203.5** |
| Hunter Valley delma (*Delma vescolineata*) habitat^ | 4.7 | 194 | N/A | 0.0 | **198.7** |
| **BC Act listed features** | | | | | |
| Warkworth Sands Woodland EEC | 7.2 | 0.0 | 0.0 | 0.0 | **7.2** |
| Central Hunter Grey Box – Ironbark Woodland EEC | 9.1 | 4.6 | 0.0 | 87.4 | **101.1** |
| Hunter Floodplain Red Gum Woodland EEC | 0.0 | 0.4 | 5.8 | 1.3 | **7.5** |
| Hunter Valley Footslopes Slaty Gum Woodland VEC | 2.6 | 0.0 | 0.0 | 1.5 | **4.1** |
| River Red Gum (Eucalyptus camaldulensis) | 0 | 5 individuals | 255 individuals | 0 | **260** |

^ PCT1691 DNG, Thinned Woodland, Scattered Regeneration and PCT42 DNG. Noting the Hunter Valley delma is not currently listed.

*Subject to final design.

HVO has committed to the design and implementation of a comprehensive biodiversity mitigation strategy to mitigate the unavoidable impacts of the Project.

## 13.4 Impact assessment

### 13.4.1 Direct impacts

Following the application of the avoidance and minimisation measures, the Project will result in residual direct impacts on biodiversity values. Direct impacts include the loss of native vegetation and fauna habitats as a result of clearance works and subsequent mining activity.

Table 13.8 details the direct impacts to PCTs that will occur as a result of the Project while Table 13.9 outlines the direct impacts on species-credit species. Table 13.10 provides a summary of the direct impacts to TECs as a result of the Project.

**Table 13.8 Direct impacts on PCTs**

| PCT | HVO North (ha) | HVO South (ha) | Total area (ha) |
|---|---|---|---|
| 42 – River Red Gum/River Oak riparian woodland wetland in the Hunter Valley | 12.2 | 5.4 | 17.6 |
| 485 – River Oak riparian grassy tall woodland of the western Hunter Valley | 1.5 | 0.0 | 1.5 |
| 1655 – Grey Box – Slaty Box shrub – grass woodland on sandstone slopes of the upper Hunter and Sydney Basin | 7.0 | 0.0 | 7.0 |
| 1658 – Rough-barked Apple – Narrow-leaved Ironbark – Blakely's Red Gum – Bull Oak – Coast Banksia woodland on sands of the Warkworth area | 3.1 | 0.3 | 3.4 |
| 1691 – Narrow-leaved Ironbark – Grey Box grassy woodland of the central and upper Hunter | 338.7 | 22.1 | 360.8 |
| 1692 – Bull Oak grassy woodland of the central Hunter Valley | 34.4 | 0.0 | 34.4 |
| 1731 – Swamp Oak – Weeping Grass grassy riparian forest of the Hunter Valley | 2.3 | 0.0 | 2.3 |
| **Total vegetation** | **399.2** | **27.8** | **427.0** |

**Table 13.9 Direct impacts on species-credit species**

| Species-credit species | Habitat polygon area (ha) | | | Serious and irreversible impacts (SAII) entity |
|---|---|---|---|---|
| | HVO North | HVO South | Total | |
| Southern myotis – *Myotis macropus* | 36.5 | 4.2 | 40.7 | No |
| River red gum endangered population in the Hunter catchment – *Eucalyptus camaldulensis* | 1.1* | 0.4 | 1.5 | No |
| Hunter Valley delma – *Delma vescolineata*^ | 179.1 | 11.9 | 191.0 | No |
| Brush-tailed phascogale – *Phascogale tapoatafa* | 120.9 | 4.2 | 125.1 | No |

* Includes River red gum Additional Disturbance Area impacts.
^As the Hunter Valley delma – *Delma vescolineata* is not current listed species credits have been calculated on the basis of the Striped legless lizard – *Delma impar*

**Table 13.10 Direct impacts on TECs**

| Threatened Ecological Community | Listing Status | SAII Entity | Area (ha) | |
|---|---|---|---|---|
| | | | HVO North | HVO South |
| **BC Act** | | | | |
| Central Hunter Grey Box-Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions | EEC | No | 79.6 | 4.0 |
| Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions | EEC | Yes | 1.3 | 0.2 |
| Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion | VEC | No | 7.0 | 0.0 |
| Warkworth Sands Woodland in the Sydney Basin Bioregion | EEC | Yes | 4.9 | 0.3 |

### 13.4.2 Indirect impacts

Indirect impacts are those that occur when the Project affects native vegetation and threatened species habitat beyond the development footprint in an indirect manner. Some indirect impacts associated with the Project that have the potential to impact on biodiversity features in the locality include:

- Drawdown impacts on surrounding groundwater dependant ecosystems, in particular the River Red Gum (*Eucalyptus camaldulensis*) endangered population in the Hunter. Refer to Chapter 14 for discussion on impacts to GDEs, including River Red Gum.
- Rubbish dumping along the re-aligned Lemington Road:
  - Rubbish dumping along the existing Lemington Road is considered to be minimal and not known to be a significant problem. The risk is expected to be low for the realigned road.
- Edge effects (weeds and other disturbances) reducing the viability of surrounding habitats:
  - The majority of edge effects are likely to be captured in the development footprints, as these footprints allow for buffers around the actual area subject to direct impacts.
- Cumulative impacts of the Project for biodiversity in the wider locality:
  - Cumulative impacts are discussed in Chapter 26.
- Fugitive light emissions, noise and dust impacts into surrounding habitats:
  - As the Project is in a highly fragmented and disturbed landscape subject to current extensive mining areas, indirect impacts such as fugitive light emissions, air quality and noise/vibration associated with mining will not be substantially altered because of the Project. Much of the new mining areas and ancillary facilities will be in areas surrounded by existing mining operations and not near intact vegetation and habitats.

### 13.4.3 Prescribed impacts

Prescribed impacts have been considered for the HVO North and HVO South development footprints for the Project, which includes those areas mapped as Category 1 – Exempt land.

Table 13.11 outlines the 'prescribed impacts' under the *Biodiversity Regulation 2017* (BC Regulation) and their applicability to the Project. A detailed assessment of the impacts is provided in Table 6.6 of the BDAR (Appendix L).

**Table 13.11 Prescribed impacts**

| Prescribed impact | Applicable to Project? | | Potential impact |
|---|---|---|---|
| | HVO North | HVO South | |
| Impacts on the habitat of threatened species or ecological communities associated with:<br>• Karst, caves, crevices, cliffs and other geological features of significance, rocks, human-made structures or non-native vegetation. | Yes | Yes | Category 1 – Exempt Land mapped in the development footprints may provide suitable habitat for the Hunter Valley delma. |
| The connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range. | Yes | Yes | Removal of vegetation and habitats associated with movement corridors. |
| Movement of threatened species that maintains their life cycle. | No | No | No impacts on movement habitat important for maintaining species life cycles. Impacts on connectivity are captured in Table 6.4 of BDAR. |
| Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities. | No | No | Drawdown of groundwater in the locality – no significant impact predicted. Refer to Table 6.4 and Groundwater Assessment (Appenidx K of this EIS). |
| Impacts of wind turbine strikes on protected animals. | No | No | N/A – not a wind farm project. |
| Impacts of vehicle strikes on threatened species or on animals that are part of a TEC. | Yes | No | Establishment of Lemington Road realignment. |

### 13.4.4 Serious irreversible impacts

Under the BC Act, a determination of whether an impact is serious and irreversible must be made in accordance with four principles prescribed in the BC Regulation. Two TECs and two species-credit species are listed as potential serious and irreversible impact (SAII) entities on the DPE website and the threatened biodiversity data collection, at the time of writing. These are:

- *Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions EEC*;
- *Warkworth Sands Woodland in the Sydney Basin Bioregion EEC*;
- large-eared pied bat (Chalinolobus dwyeri); and
- little bent-winged bat (Miniopterus australis).

While the development footprints are likely to contain foraging habitat for the above micro-bat species, no areas containing caves, overhangs or crevices, or old tunnels or culverts for breeding habitat occur within the Project area or in the immediate locality. These species are listed as SAII entities for breeding habitat only and therefore the Project is not expected to result in a serious and irreversible impact on these fauna species.

Table 13.12 outlines the principles relevant for each SAII that are subject to further assessment. The full details of the assessment are provided in Section 6.4 of the BDAR (refer to Appendix L).

**Table 13.12 Relevant principles for SAII entities**

| SAII Entity | SAII principle | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions EEC | ✓ | ✓ | ✓ | - |
| Warkworth Sands Woodland in the Sydney Basin Bioregion EEC | - | - | ✓ | - |

### 13.4.5 Uncertain Impacts

There are no uncertain impacts predicted to occur as a result of the Project. It is considered that the potential impacts associated with the Projects are well known, as outlined in the sections above, and due to the history of mining and associated data and understanding of the environment obtained over 70 years of mining at HVO, and similar operations in the Hunter Valley.

### 13.4.6 Impacts summary

#### i Impacts not requiring assessment

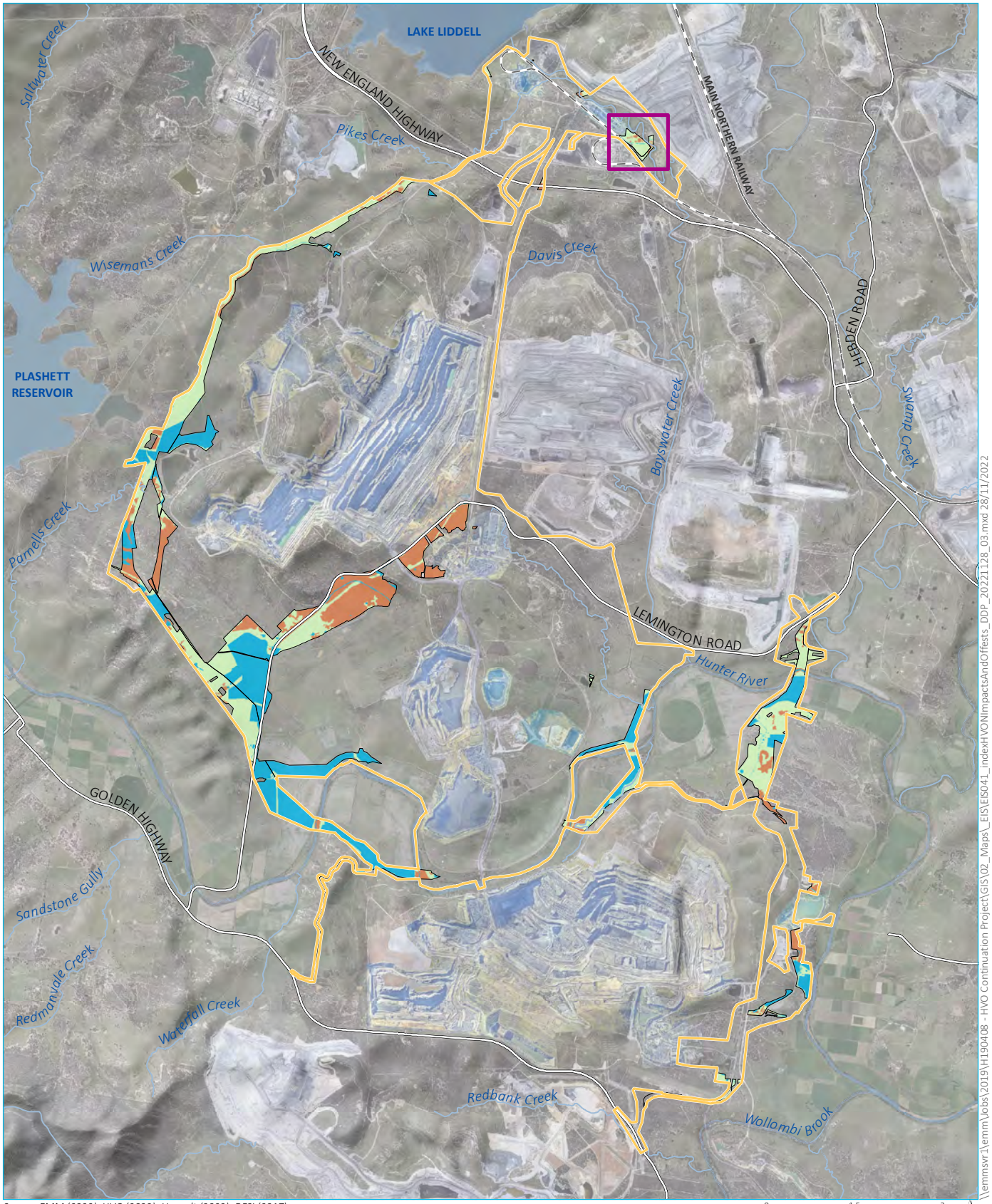
Impacts not requiring further assessment under the BAM include areas of land without native vegetation. The development footprints contain approximately 231 ha of Category 1 – Exempt Land and cleared land (including disturbed land and dams) that will be impacted by the Project. This can be broken down into 209.7 ha for HVO North and 21.7 ha for HVO South.

These areas are illustrated on Figure 13.4 and Figure 13.5. These figures also identify the proposed staging of offsets, which is discussed further in Section 13.4.7.

#### ii Impacts not requiring offset

Five vegetation zones identified within the Project area have a vegetation integrity score lower than the thresholds and consequently, do not require offsetting. These are shown on Figure 13.4 and Figure 13.5 and include:

- vegetation zone 4 – PCT 42: River Red Gum/River Oak riparian woodland wetland in the Hunter Valley (derived native grassland);
- vegetation zone 5 – PCT 42: River Red Gum/River Oak riparian woodland wetland in the Hunter Valley (exotic grassland);
- vegetation zone 12 – PCT 1658: Rough-barked Apple – Narrow-leaved Ironbark – Blakely's Red Gum – Bull Oak – Coast Banksia woodland on sands of the Warkworth area (exotic grassland);
- vegetation zone 19 – PCT 1691: Narrow-leaved Ironbark – Grey Box grassy woodland of the central and upper Hunter (poor condition derived native grassland); and
- vegetation zone 20 – PCT 1691: Narrow-leaved Ironbark – Grey Box grassy woodland of the central and upper Hunter (exotic grassland).




Source: EMM (2022); HVO (2022); Umwelt (2022); DFSI (2017)

0 1.5 3 km

GDA2020 MGA Zone 56

N

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KEY

- HVO North proposed development consent boundary
- Additional disturbance area
- Area not requiring assessment
- Impacts that do not require offsets (i.e under the offset threshold)
- Residual impacts that require offsets
- Offset stage 2 (Note: All areas requiring offsetting not identified as Stage 2, will be offset in Stage 1)
- Major road
- Rail line
- Named watercourse
- Named waterbody

# Summary of impacts and offsets required for HVO North

HVO Continuation Project
Environmental Impact Statement
Figure 13.4

EMM creating opportunities




*Source: EMM (2022); HVO (2022); Umwelt (2022); DFSI (2017)*

0 1 2 km

GDA2020 MGA Zone 56

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## KEY

- HVO South proposed development consent boundary
- Additional disturbance area
- Area not requiring assessment
- Impacts that do not require offsets (i.e under the offset threshold)
- Residual impacts that require offsets
- Offset stage 1
- Offset stage 3

Existing environment

- Major road
- Named watercourse

# Summary of impacts and offsets required for HVO South

HVO Continuation Project
Environmental Impact Statement
Figure 13.5

EMM
creating opportunities

### iii Residual impacts requiring offset

The vegetation zones that require offsetting as part of the Project are listed in Table 13.13 and illustrated in Figure 13.4 and Figure 13.5.

**Table 13.13 Vegetation zones requiring offset and ecosystem credits**

| Vegetation Zone No. and Condition | HVO North | | | | HVO South | | | |
|---|---|---|---|---|---|---|---|---|
| | VI Score | VI Loss | Area (ha) | Credits | VI Score | VI Loss | Area (ha) | Credits |
| **42 – River Red Gum/River Oak riparian woodland wetland in the Hunter Valley** | | | | | | | | |
| 1. Moderate | 72.6 | -72.6 | 1.0 | 36 | - | - | 0.0 | 0 |
| 2. Low to Moderate | 15.1 | -15.1 | 0.4 | 3 | 15.1 | -15.1 | 0.2 | 2 |
| 3. Cooba Woodland | 36.0 | -36.0 | 0.1 | 2 | 36.0 | -36.0 | 0.5 | 11 |
| **485 – River Oak riparian grassy tall woodland of the western Hunter Valley** | | | | | | | | |
| 6. Moderate | 23.2 | -23.2 | 1.5 | 15 | - | - | 0.0 | 0 |
| **1655 – Grey Box - Slaty Box shrub – grass woodland on sandstone slopes of the upper Hunter and Sydney Basin** | | | | | | | | |
| 7. Moderate | 59.9 | -59.9 | 7.0 | 183 | - | - | 0.0 | 0 |
| **1658 – Rough-barked Apple – Narrow-leaved Ironbark – Blakely's Red Gum – Bull Oak – Coast Banksia woodland on sands of the Warkworth area** | | | | | | | | |
| 8. Moderate | 43.9 | -43.9 | 1.8 | 39 | - | - | 0.0 | 0 |
| 9. Low to Moderate | 33.9 | -33.9 | 0.9 | 15 | - | - | 0.0 | 0 |
| 10. Disturbed | 39.3 | -39.3 | 0.0 | 0 | 39.3 | -39.3 | 0.1 | 2 |
| 11. Regeneration | 29.8 | -29.8 | 0.0 | 0 | 29.8 | -29.8 | 0.2 | 3 |
| **1691 – Narrow-leaved Ironbark – Grey Box grassy woodland of the central and upper Hunter** | | | | | | | | |
| 13. Moderate | 61.8 | -61.8 | 64.1 | 1,981 | 61.8 | -61.8 | 1.3 | 40 |
| 14. Thinned Woodland | 57.7 | -55.7 | 8.7 | 242 | 57.7 | -57.7 | 2.7 | 78 |
| 15. Woodland with Exotic Understorey | 25.3 | -24.6 | 5.4 | 66 | - | - | 0.0 | 0 |
| 16. Plantation | 60.0 | -60.0 | 4.6 | 114 | - | - | 0.0 | 0 |
| 17. Scattered Regeneration | 45.2 | -45.2 | 39.6 | 895 | - | - | 0.0 | 0 |
| 18. Cooba Woodland | 57.7 | -57.7 | 11.8 | 340 | 57.7 | -57.7 | 0.2 | 6 |
| **1692 – Bull Oak grassy woodland of the central Hunter Valley** | | | | | | | | |
| 21. Moderate | 44.6 | -44.6 | 34.4 | 672 | - | - | 0.0 | 0 |
| **1731 – Swamp Oak – Weeping Grass grassy riparian forest of the Hunter Valley** | | | | | | | | |
| 22. Moderate | 63.4 | -63.4 | 2.3 | 64 | - | - | 0.0 | 0 |
| **Total** | **-** | **-** | **183.6** | **4,667** | **-** | **-** | **5.2** | **142** |

Credits required for species-credit species are outlined in Table 13.14.

### Table 13.14 Species-credit species requiring offset

| Species | Biodiversity Risk Weighting | HVO North | | HVO South | |
|---|---|---|---|---|---|
| | | Area (ha) | Credits | Area (ha) | Credits |
| Southern myotis – *Myotis macropus* | 2.0 | 36.5 | 1,011 | 4.2 | 114 |
| *Eucalyptus camaldulensis* – endangered population in the Hunter catchment | 2.0 | 1.1 | 5 | 1.4 | 4 |
| Brush-tailed phascogale – *Phascogale tapoatafa* | 2.0 | 120.9 | 3,282 | 4.2 | 120 |

Table 13.15 outlines the potential credit requirement for the Hunter Valley delma if the species is listed as threatened under the BC Act.

In the early stages of the biodiversity assessment, the BAM-C predicted the potential occurrence of striped legless lizard (*Delma impar*), which is better known for its populations in the southern tablelands and south-west slopes of NSW and listed as vulnerable on the BC and EPBC Acts. Records of a legless lizard attributed to *Delma impar* have been previously recorded in the Hunter Valley at the Maxwell and Mt Pleasant mine sites and Bayswater Power Station, north and north-west of the HVO Complex. It has been recently determined that a newly-described species of legless lizard occurs in the Hunter, being the Hunter Valley delma (*Delma vescolineata*) (Mahony *et al.* 2022).

As surveys were undertaken prior to the identification of the new species, Umwelt undertook a comparison of the photos of legless lizards that were recorded at HVO to identify if they demonstrated the morphological features of the newly described Hunter Valley legless delma and compared these with features of striped legless lizard (*Delma impar*). Using the precautionary principle, it is assumed that the legless lizards attributed to striped legless lizard (*Delma impar*) at HVO prior to identification of the newly-described Hunter Valley delma, will be considered as *Delma vescolineata*.

Targeted artificial shelter surveys were undertaken in the HVO North and HVO South development footprints. Despite extensive survey, the species was not recorded in highly degraded, exotic grasslands or areas of intact woodlands. While the species was only recorded in and adjacent to the HVO North development footprint, it has been assumed that it also occurs in the similar habitats in the HVO South development footprint despite not being recorded there.

While the Hunter Valley delma is not currently listed as a threatened species, it is expected that it soon will be. It is unknown at this stage what conservation status the species will be given under the BC Act.

As the potential listing status is currently unknown, and listing status partially determines the biodiversity risk weighting for species credits, the three possible risk weighting scores are presented in accordance with Equation 2 of the BAM. This approach is consistent with the precedent recently provided on other projects.

### Table 13.15 Nominal credit calculations for Hunter Valley delma (*Delma vescolineata*)

| Species | Biodiversity Risk Weighting | HVO North | | HVO South | |
|---|---|---|---|---|---|
| | | Area (ha) | Credits | Area (ha) | Credits |
| Hunter Valley delma – *Delma vescolineata* | 1.5 | 179.1 | 1,490 | 11.9 | 104 |
| | 2.0 | | 1,986 | | 139 |
| | 3.0 | | 2,979 | | 209 |

#### iv Offsets for indirect and prescribed impacts

The mitigation of indirect and prescribed impacts are summarised as follows:

- Indirect impacts:
  - Drawdown impacts – as no significant impacts are expected to occur in relation to drawdown impacts, no specific offset measures are proposed.
  - Edge effects (weeds, light emissions, noise, dust, rubbish dumping along Lemington Road realignment) – no additional offsets are proposed, given no significant impacts are anticipated as described in Section 13.4.2.
  - Cumulative impacts – the cumulative impacts of HVO North and South are captured with the combined credit assessments.
- Prescribed impacts:
  - Impacts on the habitat of threatened species associated with Category 1 – Exempt Land: Up to approximately 229 ha of grasslands within the Category 1 – Exempt Land mapping may provide habitat for the Hunter Valley delma, noting there is no formal requirement for credit obligations for impacts on Category 1 – Exempt Land. Hunter Valley delma is not currently listed as threatened under the BC Act. Should the species be listed prior to the determination of the Project, HVO will consider the suitability of additional contributions to the offsetting strategy acknowledging the potential impacts to the species on Category 1 – Exempt Land in the development footprint.
  - Impacts on the habitat of threatened species or ecological communities associated with connectivity: the proposed rehabilitation strategy for the Project (refer to Chapter 21) is proposed to result in long-term connectivity around the HVO Complex. No additional offsets are proposed.
  - Impacts of development on water quality, water bodies and hydrological processes – drawdown impacts: As no significant impacts are expected to occur in relation to drawdown impacts, no specific offset measures are proposed.
  - Impacts of vehicle strikes on threatened species – Lemington Road realignment: Mitigation measures are proposed to address the impact of vehicle strike on local fauna (see Section 13.5), which are considered the best scenario for reducing this impact as a result of the Project. No additional offsets are proposed.

### 13.4.7 Biodiversity offset strategy

#### i Biodiversity credit summary

Table 13.16 provides a summary of the ecosystem and species credits and their credit classes required to offset the Project under the “like-for-like” rules of the Biodiversity Offset Scheme (BOS). The credits are divided into offset areas that must include hollow-bearing trees (HBTs) and areas that do not require HBTs.

## Table 13.16 Ecosystem and species credits required to offset the Project

| Name | Credit Class | HVO North | | HVO South | | Total |
|---|---|---|---|---|---|---|
| | | With HBTs | Without HBTs | With HBTs | Without HBTs | |
| **PCT42 – River Red Gum/River Oak riparian woodland wetland in the Hunter Valley** | | | | | | |
| Conforming to *Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions EEC* | Any PCT in the *Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions EEC* (may include PCTs 42, 1106, 1698). | 39 | 0 | 2 | 0 | 41 |
| Non-TEC | Eastern Riverine Forests – ≥ 90% cleared group (including Tier 1 or higher threat status) (may include PCT 42, 1106). | 2 | 0 | 11 | 0 | 13 |
| **PCT485 – River Oak riparian grassy tall woodland of the western Hunter Valley (Brigalow Belt South Bioregion and Sydney Basin Bioregion)** | | | | | | |
| Non-TEC | Eastern Riverine Forests - ≥ 50% - < 70% cleared group (including Tier 3 or higher threat status) (may include PCTs 42, 85, 485, 1106, 1108, 1318, 1714). | 0 | 15 | - | - | 15 |
| **PCT1655 – Grey Box – Slaty Box shrub – grass woodland on sandstone slopes of the upper Hunter and Sydney Basin** | | | | | | |
| Conforming to *Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion VEC* | Any PCT in the *Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion VEC* (may include PCTs 1176, 1655). | 183 | 0 | - | - | 183 |
| **PCT 1658 – Rough-barked Apple – Narrow-leaved Ironbark – Blakely's Red Gum – Bull Oak – Coast Banksia woodland on sands of the Warkworth area** | | | | | | |
| Conforming to *Warkworth Sands Woodland in the Sydney Basin Bioregion EEC* | Any PCT in the *Warkworth Sands Woodland in the Sydney Basin Bioregion EEC* (may include PCT 1658). | 39 | 15 | 0 | 5 | 59 |
| **PCT 1691 – Narrow-leaved Ironbark – Grey Box grassy woodland of the central and upper Hunter** | | | | | | |
| Conforming to *Central Hunter Grey Box—Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions EEC* | Any PCT in the *Central Hunter Grey Box – Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions EEC* (may include PCTs 1603, 1605, 1691, 1692). | 2,289 | 63 | 118 | 0 | 2,470 |

## Table 13.16 Ecosystem and species credits required to offset the Project

| Name | Credit Class | HVO North | | HVO South | | Total |
|---|---|---|---|---|---|---|
| | | With HBTs | Without HBTs | With HBTs | Without HBTs | |
| Non-TEC | Coastal Valley Grassy Woodlands – ≥ 70% – <90% cleared group (including Tier 2 or higher threat status) (may include PCTs 116, 618, 760, 761, 762, 830, 834, 838, 849, 850, 1326, 1395, 1603, 1604, 1691). | 0 | 1,286 | 0 | 6 | 1,292 |
| **PCT 1692 – Bull Oak grassy woodland of the central Hunter Valley** | | | | | | |
| Non-TEC | Coastal Valley Grassy Woodlands – ≥ 50% – < 70% cleared group (including Tier 3 or higher threat status (may include PCTs 116, 618, 622, 623, 760, 761, 762, 829, 830, 834, 837, 838, 849, 850, 1326, 1395, 1603, 1604, 1691, 1692). | 672 | 0 | - | - | 672 |
| **PCT 1731 – Swamp Oak – Weeping Grass grassy riparian forest of the Hunter Valley** | | | | | | |
| Non-TEC | Coastal Swamp Forests – ≥ 50% – < 70% cleared group (including Tier 3 or higher threat status (may include PCTs 839, 1064, 1227, 1230, 1231, 1232, 1716, 1717, 1718, 1719, 1723, 1730, 1731, 1795, 1798). | 0 | 64 | - | - | 64 |
| **Other** | | | | | | |
| *Eucalyptus camaldulensis* – endangered population in the Hunter catchment | *Eucalyptus camaldulensis* – endangered population in the Hunter catchment species credits anywhere in NSW. | 5 | | 4 | | 9 |
| Hunter Valley delma – *Delma vescolineata* | Hunter Valley delma species credits anywhere in NSW. | 1,490 | | 104 | | 1,594 |
| southern myotis – *Myotis macropus* | Southern myotis species credits anywhere in NSW. | 1,011 | | 114 | | 1,125 |
| brush-tailed phascogale – *Phascogale tapoatafa* | Brush-tailed phascogale species credits anywhere in NSW. | 3,282 | | 120 | | 3,402 |

### ii Preliminary offset strategy

Yancoal and Glencore, as participants in the HVO JV, have a strong record in preparing and implementing biodiversity offset strategies that address significant biodiversity matters and adequately offset impacts on them. HVO is committed to delivering a biodiversity offset strategy that appropriately compensates for the unavoidable loss of ecological values as a result of the Project, as identified in BDAR. The offset strategy will developed in consultation with DPE and BCS, and will be implemented prior to clearing occurring and in accordance with the process outlined in the BC Act.

HVO proposes to stage the retirement of credits as clearing of the development footprint occurs, given that some aspects of the Project (for example construction of the LCPP) will not occur for some time. The proposed staging of offsets is illustrated in Figure 13.4 (HVO North) and Figure 13.5 (HVO South).

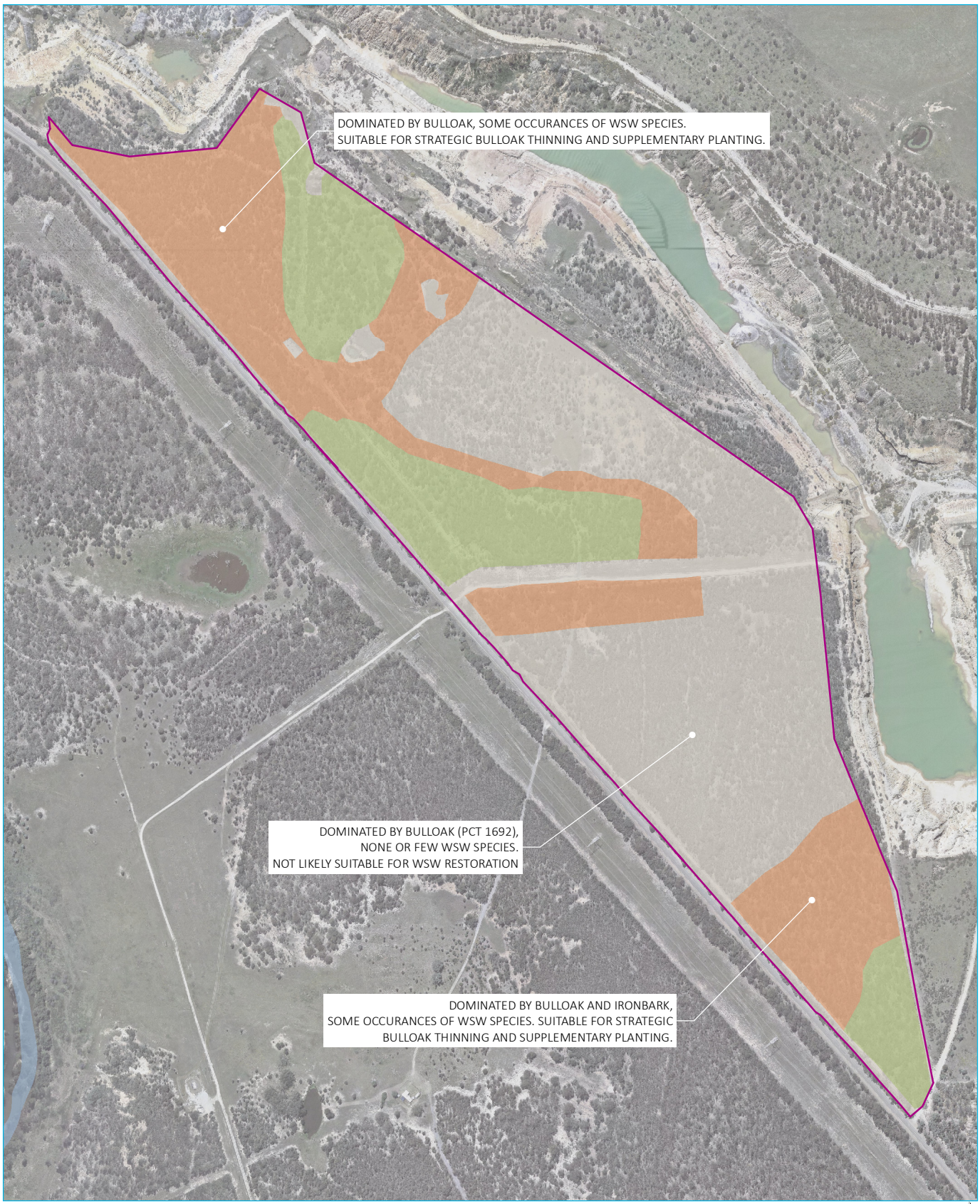
Broadly, the staging of offsets is proposed to occur as follows:

- Stage 1 – this comprises all areas that are to be disturbed at HVO North and HVO South, excluding Stage 2 and Stage 3 areas. Stage 1 includes areas to be disturbed associated with the additional disturbance areas (ie additional mining area, Lemington Road realignment and infrastructure construction). Stage 1 activities will generally be undertaken in the first few years of the Project.

- Stage 2 – disturbance required that is associated with the HVLP product stockpile extension (if constructed). This stage is for HVO North only and has been separated out as an individual stage, due to the HVLP being an option that may not be constructed. As described in Chapter 1, approval is sought for upgrades at both the Newdell LP and the HVLP; however, only one will be constructed.

- Stage 3 – disturbance required for the Lemington CPP and rail. This applies to HVO South only, and has been identified as a separate stage as this clearing will not be undertaken until around Year 13 of the Project.

A summary of the credits required in the stages in which they are proposed to be met is provided in Table 13.17 and Table 13.18 for HVO North and HVO South, respectively.



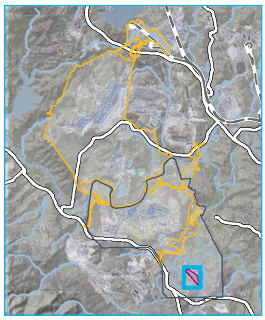

*Source: EMM (2022); HVO (2022); Umwelt (2022); DFSI (2017)*

0 100 200 m

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KEY

- HVO North proposed development consent boundary (refer to inset)
- HVO South proposed development consent boundary (refer to inset)
- Proposed South Lemington offset
- Accepted/known WSW
- Possible WSW - thinning and supplementary planting proposed
- Not WSW - likely to generate credits for other PCTs
- Named watercourse
- Named waterbody

## Proposed South Lemington offset

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Figure 13.6

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creating opportunities

## Table 13.17 HVO North – staged credit requirements

| Biodiversity Feature | Stage 1 | | Stage 2 | |
|---|---|---|---|---|
| | Area (ha) | Credits | Area (ha) | Credits |
| **TEC Ecosystem Credits** | | | | |
| *Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions EEC* | 1.4 | 39 | 0.0 | 0 |
| *Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion VEC* | 7.0 | 183 | 0.0 | 0 |
| *Warkworth Sands Woodland in the Sydney Basin Bioregion EEC* | 4.9 | 54 | 0.0 | 0 |
| *Central Hunter Grey Box – Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions EEC* | 78.3 | 2,314 | 1.3 | 38 |
| **Non-TEC Ecosystem Credits** | | | | |
| PCT42 – River Red Gum/River Oak riparian woodland wetland in the Hunter Valley | 0.1 | 1 | 0.0 | 0 |
| PCT485 – River Oak riparian grassy tall woodland of the western Hunter Valley (Brigalow Belt South Bioregion and Sydney Basin Bioregion) | 1.5 | 15 | 0.0 | 0 |
| PCT 1691 – Narrow-leaved Ironbark – Grey Box grassy woodland of the central and upper Hunter | 53.8 | 1,284 | 0.1 | 2 |
| PCT 1692 – Bull Oak grassy woodland of the central Hunter Valley | 32.9 | 672 | 0.0 | 0 |
| PCT 1731 – Swamp Oak – Weeping Grass grassy riparian forest of the Hunter Valley | 1.7 | 47 | 0.6 | 17 |
| **Species Credits** | | | | |
| *Eucalyptus camaldulensis* – endangered population in the Hunter catchment | 1.1 | 5 | 0.0 | 0 |
| Hunter Valley delma<br>*Delma vescolineata* | 178.7 | 1,487 | 0.4 | 3 |
| Southern myotis<br>*Myotis macropus* | 35.2 | 978 | 1.2 | 33 |
| Brush-tailed phascogale<br>*Phascogale tapoatafa* | 118.9 | 3,228 | 2.0 | 54 |

### Table 13.18 HVO South – staged credit requirements

| Biodiversity Feature | Stage 1 | | Stage 3 | |
|---|---|---|---|---|
| | Area (ha) | Credits | Area (ha) | Credits |
| **TEC Ecosystem Credits** | | | | |
| *Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions EEC* | 0.2 | 2 | 0.0 | 0 |
| *Warkworth Sands Woodland in the Sydney Basin Bioregion EEC* | 0.0 | 0 | 0.3 | 5 |
| *Central Hunter Grey Box – Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions EEC* | 2.4 | 71 | 1.6 | 47 |
| **Non-TEC Ecosystem Credits** | | | | |
| PCT42 – River Red Gum/River Oak riparian woodland wetland in the Hunter Valley | 0.5 | 11 | 0.0 | 0 |
| PCT 1691 – Narrow-leaved Ironbark – Grey Box grassy woodland of the central and upper Hunter | 0.2 | 6 | 0.0 | 0 |
| **Species Credits** | | | | |
| *Eucalyptus camaldulensis* – endangered population in the Hunter catchment | 0.4 | 4 | 0.0 | 0 |
| Hunter Valley delma<br>*Delma vescolineata* | 6.7 | 59 | 5.2 | 45 |
| Southern myotis<br>*Myotis macropus* | 2.6 | 72 | 1.5 | 42 |
| Brush-tailed phascogale<br>*Phascogale tapoatafa* | 2.5 | 71 | 1.7 | 49 |

The biodiversity offset strategy will be based on the credits required to be retired to offset the impacts of the Project as specified in Table 13.6, and the offset options available under the BC Act and BC Regulation including the following options:

- land based offsets (HVO will retire the required number and class of credits determined in accordance with the BDAR and the offset rules in the BC Regulation through the establishment of new stewardship sites (and the subsequent retirement of credits) or by retiring credits from existing stewardship sites);
- ecological rehabilitation (allowable for mining projects);
- purchasing credits from the market; and/or
- paying into the Biodiversity Conservation Fund.

The final offset strategy will likely comprise a combination of one or more of the above listed options. It is HVO's intention that the offset strategy for the Project will focus on suitable land-based offset options both in a local and regionally strategic approach. As such, this may include new stewardship sites established and managed by HVO and sourcing credits from existing stewardship sites which will assist in the management and improvement of stewardship sites in the region.

The Project is currently proposing to impact 5.2 ha of the Warkworth Sands Woodland EEC (4.9 ha in HVO North and 0.3 ha in HVO South) which represents an estimated 1.6% of the remaining extent of the community. This EEC is also listed as a potential SAII entity under the BOS. Following substantial efforts to avoid and mitigate impacts through Project design and site location selection (refer to Section 13.3), this impact is acknowledged as a key impact on a highly restricted TEC.

HVO has therefore been proactive in seeking a suitable local offset that combines the conservation of an area of existing Warkworth Sands Woodland EEC as well as the management and improvement of surrounding land to restore this community in the locality.

The South Lemington Offset Site has subsequently been identified at South Lemington Pit 1 as a proposed Warkworth Sands Woodland EEC offset site, covering approximately 50 ha between the Hunter River and the New England Highway in the Warkworth locality (refer to Figure 13.6). The Warkworth Sands Woodland community is highly variable at the proposed South Lemington Offset Site in its structure, floristic composition and ecological condition, possibly due to the varying depths of aeolian sands present. These areas have also been subject to different levels of historical disturbance, resulting in weed invasion in many places and recolonisation by bulloak (*Allocasuarina luehmannii*) and/or narrow-leaved ironbark (*Eucalyptus crebra*).

In addition to securing an offset site, the BOS recognises the value of restoring native vegetation through assisted regeneration and revegetation programs. As the Warkworth Sands Woodland EEC is highly restricted in the Hunter Valley, the opportunity to restore this community in areas that have been subject to previous disturbances represents a potential net-gain and a good conservation outcome for the community in the locality.

HVO also therefore proposes to include vegetation restoration measures in the offset strategy for the Project. Areas proposed for restoration include patches of vegetation that indicate ecotonal characteristics between Warkworth Sands Woodland EEC and box-ironbark woodland vegetation communities while also exhibiting varying levels of sandy soils that could be of aeolian origin. In some areas of previous disturbance where colonising species such as bulloak (*Allocasuarina luehmannii*) have potentially outcompeted species more characteristic of the Warkworth Sands Woodland EEC, there is an opportunity to develop a selective thinning and supplementary planting program aiming to restore Warkworth Sands Woodland as part of the Project's biodiversity offset strategy.

The following key restoration measures would be proposed for the restoration of Warkworth Sands Woodland EEC:

- Careful thinning of bulloak (*Allocasuarina luehmannii*) where this is the dominant canopy species.
- Supplementary planting of species characteristic to *Warkworth Sands Woodland EEC* (e.g. *Angophora floribunda, Banksia integrifolia, Brachyloma daphnoides, Hibbertia linearis, Pimelea linifolia, Grevillea montana, Acacia filicifolia, Pteridium esculentum* and *Imperata cylindrica*).
- Active weed management, ensuring exotic species are not impacting the improvement of native species richness.

Preliminary investigations indicate that the South Lemington Offset Site, with the inclusion of the proposed restoration strategy, has the potential to provide all the Warkworth Sands Woodland EEC credit requirements for the Project (59 credits). In addition, other areas of the site (up to approximately 16.6 ha) could generate approximately 65 credits for other PCTs such as PCT 1691 and PCT 1692.

## 13.5 Management, mitigation and monitoring

As stated in Section 13.3, a comprehensive biodiversity mitigation strategy will be implemented for construction and operation. The existing HVO Integrated Biodiversity Management Plan will be updated following determination of the Project.

The mitigation measures outlined in Table 13.19 will also be implemented, noting that these measures are generally consistent with biodiversity mitigation and management measures currently employed at HVO.

**Table 13.19 Biodiversity mitigation measures**

| ID | Mitigation measure |
|---|---|
| **Salvage of biodiversity features** | |
| BIO1 | Biodiversity will continue to be managed as per the Biodiversity Management Plan, which will be updated to reflect the Project. The management plan will describe aspects such as:<br>• Pre-clearance and clearance protocols for vegetation and fauna<br>• Pest, weed and pathogen control measures<br>• Bushfire management actions<br>• Monitoring and adaptive management strategies |
| BIO2 | Wildlife warning signs and 'Injured Native Wildlife' signs will be installed in likely high impact locations along the realigned Lemington Road. |
| BIO3 | Measures will be implemented to protect the river red gum populations located within the River Red Gum Additional Disturbance Area during construction of the realigned transmission lines in this area. |
| BIO4 | River red gum health monitoring will continue, in accordance with the River Red Gum Rehabilitation and Restoration Strategy, which will be updated for the Project. This will include a change in classification for the River Red Gum Additional Disturbance Area from a 'low priority' to a 'priority site'. |
| BIO5 | A biodiversity offset strategy will be developed for the Project based on the credits required to be retired to offset the impacts of the Project as specified in Table 13.6 and the options available under the BC Act and BC Regulation including:<br>• land based offsets (HVO will retire the required number and class of credits determined in accordance with the BDAR and the offset rules in the BC Regulation through the establishment of new stewardship sites (and the subsequent retirement of credits) or by retiring credits from existing stewardship sites);<br>• ecological rehabilitation (allowable for mining projects);<br>• purchasing credits from the market; and<br>• paying into the Biodiversity Conservation Fund. |

## 13.6 Summary and conclusion

The landscape within and surrounding the Project is characterised by extensive historical clearing for agricultural, mining and rural development. As such, much of the land associated with the Project conforms to Category 1 – Exempt Land and only approximately 22% of the combined development footprints are covered by native (woody) vegetation.

Avoidance and minimisation strategies include refinement and location selection of the Lemington Road realignment to avoid larger areas of Warkworth Sands Woodland EEC, careful consideration of proposed transmission easement alignment and habitat retention following decommissioning of existing transmission lines.

After accounting for the implementation of avoidance and minimisation strategies, the Project will directly impact 397 ha of native vegetation, of which 188.8 ha will require offsetting in accordance with the BOS. Within the development footprints for the Project, the native vegetation present conforms to four TECs listed under the BC Act. All of these TECs occur within the HVO North development footprint and three are present in the HVO South development footprint.

A BAM-C assessment has been undertaken to identify the biodiversity credits required to offset the impacts of the Project. HVO is committed to delivering a biodiversity offset strategy that appropriately compensates for the unavoidable loss of biodiversity values and residual impacts of the Project and has identified a proposed Warkworth Sands Woodland EEC offset site of approximately 50 ha at South Lemington Pit 1. Preliminary investigations indicate that the South Lemington Offset Site, with the inclusion of the proposed restoration strategy, has the potential to provide all the Warkworth Sands Woodland EEC credit requirements for the Project.

HVO proposes to stage the retirement of credits as clearing of the additional disturbance area occurs. The biodiversity offset strategy will be developed in consultation with DPE and BCS and will be designed so that there is a net beneficial outcome for biodiversity values as a result of the Project.

# 14 Aquatic ecology

## 14.1 Introduction

An aquatic ecology and GDE assessment has been prepared for the Project and included as Appendix M.

The study assesses the potential incremental and cumulative impacts of the Project and documents the assessment methods and results, initiatives to avoid and minimise impacts to aquatic and GDEs, and additional mitigation and management measures proposed to address residual impacts not able to be avoided.

## 14.2 Existing environment

### 14.2.1 Aquatic ecology

Three field surveys were conducted between 2020 and 2022 (when climate conditions allowed) that included habitat assessment, and macroinvertebrate and water quality sampling at 18 sites along the Hunter River, and at sites on Bayswater Creek, Wollombi Brook, Bowmans Creek, and Farrells Creek.

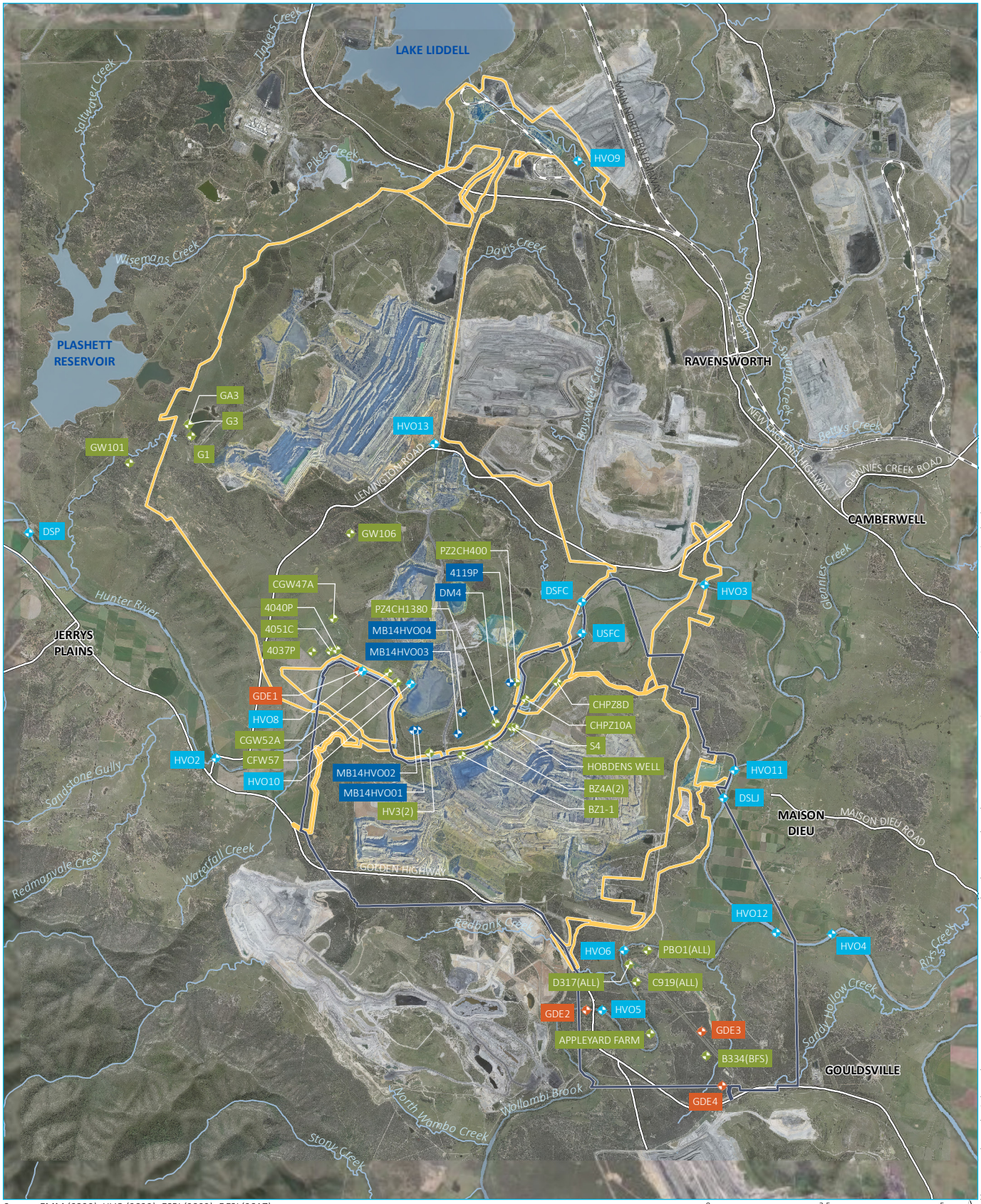
Figure 14.1 provide detail regarding the survey sites.

The aquatic ecosystems surveyed as part of the aquatic ecology and GDE assessment (Appendix M) are considered to be in poor ecological condition, based on the macroinvertebrate community and water quality (the ecological condition of the Hunter River is classed as poor to moderate). Macroinvertebrate communities were dominated by taxa that are robust and tolerant of pollution and poor environmental conditions.

Hunter River fish communities are mapped as being in good condition by DPI Fisheries, which suggests the community is dominated by native species and that recruitment is at a sustainable level. While there was potential habitat for Purple-spotted gudgeon, the species is considered unlikely to occur at any of the surveyed sites, nor in the Hunter River given the absence of historical records in the Hunter Valley.

The following was observed during the aquatic ecology surveys:

- large flow events have result in erosion and movement of sand and gravel beds along the Hunter River;
- Wollombi Brook (in the Study area) had moderate flow and high turbidity;
- Bowmans Creek had shallow isolated pools in April and September 2020, and was flowing in January 2022;
- Bayswater Creek was dry in April and September 2020, and the channel was full of terrestrial weeds, and was assessed to be poor aquatic habitat; and
- Farrells Creek was dry, no macrophytes or other habitat features were present.




Source: EMM (2022); HVO (2022); ESRI (2022); DFSI (2017)

0 2.5 5 km

GDA2020 MGA Zone 56

N

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## KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary

Survey location

- Monitoring bore
- GDE vegetation site
- Rehabilitated alluvial lands rehabilitation bore
- Aquatic ecology site

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

# Aquatic ecology and GDE survey sites

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### 14.2.2 Water quality

The results of the samples show that electrical conductivity (EC) was below 1,000 µS/cm for all sites except HVO7 (Bowmans Creek) in April and HVO3 (Hunter River at Lemington Road realignment) in September 2020. Dissolved oxygen concentration in April 2020 was below the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG) (ANZG 2018) for all sites except HVO3, but was only low at four sites each in September 2020 and January 2022. At many sites, pH was high in April 2020 and low in September 2020. In January 2022, pH was slightly above the ANZG (2018) default guideline value at eight sites. Turbidity for all Hunter River sites exceeded recommended guidelines in April, with measurements exceeding 100 NTU. Most of the Hunter River sites were still relatively turbid in September 2020 and January 2022.

Detailed sampling results can be found in Table 14 of the aquatic ecology and GDE assessment (Appendix M).

### 14.2.3 Groundwater dependent ecosystems

#### i Groundwater dependent vegetation

The condition of the vegetation in potential GDE areas was assessed using BAM plots to obtain a vegetation integrity score, based on field surveys. A total of four plots were completed as outlined in Table 14.1 and shown on Figure 14.1.

## Table 14.1 Groundwater dependent vegetation condition

| Plot | PCT | Composition (native plant species richness) | Structure (native plant foliage cover) | Function | Vegetation integrity score | Comment |
|---|---|---|---|---|---|---|
| GDE 1 | 1692 – Bull Oak Grassy Woodland of the Central Hunter Valley | 12.1 | 25.2 | 50 | 24.8 – low condition | Low species composition and structure scores, indicating that vegetation in this area has relatively low diversity and cover of native plant species. As this site was on a large gravel bar beside the Hunter River, it is likely that only shallow alluvial groundwater sourced from the river supports this community. |
| GDE 2 | 42 – River Red Gum/River Oak riparian woodland in the Hunter Valley | 60.8 | 42 | 54.8 | 51.9 – moderate condition | Minimal cover of native shrub and ground layer vegetation contributed to lowering the overall score. River red gums potentially use groundwater that is recharged from river leakage from Wollombi Brook. |
| GDE 3 and 4 | 1692 – Bull Oak Grassy Woodland of the Central Hunter Valley | 54.7 | 28.8 | 65.2 | 45.2 – moderate condition | Results were combined as they represent the same potential GDE area. Minimal cover of native shrub and ground layer vegetation contributed to lowering the overall score. |

### ii Aquifer ecosystems

Groundwater invertebrate (stygofauna) communities were used to indicate ecological condition of aquifer ecosystems. Stygofauna are known to occur in alluvial sediments within the Hunter Valley, including along the Hunter River, Bowmans Creek, Glennies Creek and Wollombi Brook (ELA 2022). They may also occur in the shallow fractured rock up to 60 m depth where they colonise fracture networks of secondary porosity. The presence of stygofauna becomes increasingly uncommon in the deeper, unweathered rock where higher groundwater salinity, and low dissolved oxygen levels limit their occurrence.

Stygofauna surveys were conducted at 30 bores (in various lithologies) across the HVO Complex, of which 11 were dry and could not be sampled. The following were collected during sampling (invertebrates were only present in bores screened in the alluvium):

- Stygofauna:
  - Anaspidacea, Psammaspididae;
  - Parabathynellidae, *Onychobathynella bifurcate;*
  - Parabathynellidae, *Notobathynella* sp.;
  - Amphipoda, Paramelitidae; and
  - Harpacticoida, Parastenocaridae.
- Possible stygofauna:
  - Cyclopoida; and
  - Oligochaeta.
- Surface aquatic:
  - Acarina;
  - Chironomidae; and
  - Baetidae.
- Soil fauna:
  - Collembola.

## 14.3 Avoidance and minimisation through design

The Project considers a design that avoids and minimises impacts to water resources and water dependent assets, including:

- removing the currently approved coal extraction in South Lemington Pit 1 and 2 from the Project mine plan;
- mainly limiting disturbance to previously disturbed or approved areas, thereby limiting avoiding disturbing new catchments;

- revised design of the Carrington West Wing barrier wall such that it is constructed on the highwall alluvial benches following mining and prior to backfilling, still meeting the main objectives of the current approved barrier wall;
- continued operation of the existing WMS, including preferential use of sediment-laden and mine water over extraction from the Hunter River; and
- operating in accordance with the requirements of EPL 640 and WALs.

## 14.4 Impact assessment

### 14.4.1 Aquatic ecology

Some species of fish living in the Hunter River require access to estuarine reaches to spawn. Such species of fish could be impacted if river levels reduce to an extent where this migration is impaired for long periods of time. Flow in the Hunter Regulated River is maintained by releases from Glenbawn Dam and inflow from tributaries, rather than from contribution from groundwater. The results of the streamflow analysis (summarised in Chapter 12 and discussed in detail in Appendix K), show minor to negligible change in streamflow and the duration of dry days due to the Project.

The findings of the aquatic ecology and GDE assessment (ELA 2022) is that there will be no additional impact to aquatic ecology in the Hunter River, and only minor impacts to the aquatic ecology in the Hunter River tributaries due to the Project.

#### i Water quality

The potential for changes to surface water quality has been assessed as part of the SWIA (Engeny 2022) and the Water Assessment (Appendix K). As summarised in Chapter 12, surface water quality is expected to remain within the existing natural range in the Hunter River and Wollombi Brook. The potential for water quality impacts on the Hunter River due to discharge via the HRSTS is unlikely. The WMS will continue to operate to meet the water management plan objectives, ensuring the Project operates in accordance with approved EPL limits and HRSTS credits.

As there are no predicted changes to surface water quality due to the Project, potential indirect impacts on aquatic ecology are negligible.

### 14.4.2 Groundwater dependent ecosystems

#### i Groundwater dependent vegetation

Four potentially groundwater dependent vegetation communities were visited during the field survey, although none of these occur in areas of modelled incremental drawdown (AGE 2022). All sites were in moderate or low ecological condition and are considered as having poor ecological value. GDE 3 and 4 are on shallow sandy substrate near Warkworth, and vegetation communities may use water in the sands. These vegetation communities showed very little change in their normalised difference vegetation index (NDVI), even during dry periods, so are likely to have some dependence on subsurface water in the perched aquifer. In this location, the geology is dominated by Warkworth Sands, which are disconnected from the deeper Permian groundwater systems.

GDE 1 and 2 were close to the Hunter River and Wollombi Brook, respectively, and much of the groundwater at these sites would contain high proportions of surface water. Drawdown of the alluvial watertable is not predicted for either site (incremental or cumulative). GDE 1 is on a sand and gravel bar beside the Hunter River between HVO North and South and is buffered from drawdown by the groundwater barrier in place between Carrington Pit and leakage from the river. Given no predicted drawdown and the strong connection to surface water at these sites, the potential for the Project to have a significant impact on vegetation at GDE1 and 2 is negligible.

River red gum communities are thought to be groundwater dependent, so are potentially impacted by changes to groundwater regime. Modelling predicts some drawdown in the Quaternary alluvium of the Hunter River near the riparian river red gum sites, however, the incremental drawdown is predicted to be less than 0.5 m and no widespread dewatering will occur. Minor incremental drawdown (0.2–0.5 m) of the alluvial watertable is predicted at Carrington Billabong. Any decline in the watertable due to mining activities is likely to be replaced by the leakage of surface water through the bed of the Hunter River. River red gum populations close to the Hunter River will continue to have access to shallow groundwater due to drainage from the Hunter River. No significant impact is expected.

The river red gum community is considered a threatened population under the BC Act, but at HVO it is highly disturbed so is classified in the *Risk Assessment Guidelines for Groundwater Dependent Ecosystems* (GDE Assessment Guidelines) (Serov et al. 2012) as having a moderate ecological value. Under the GDE Risk Matrix, the ecosystem is classified as D (moderate ecological value, low risk).

### ii Aquifer ecosystems

The Hunter River alluvium in the Project area is a stygofauna habitat and hosts diverse stygofauna communities. As such, it is considered High Ecological Value in accordance with the GDE Assessment Guidelines). All of the stygofauna taxa collected during the HVO surveys are widespread throughout the Hunter Valley. *Onychobathynella bifuricata* has previously been collected from the Hunter River alluvium near Aberdeen, while *Notobathynella* sp. and Paramelitidae are known to occur along the Hunter River alluvium between Aberdeen and Singleton.

As discussed in Chapter 12 and Appendix K, the predicted maximum incremental drawdown is only predicted for small sections of the Hunter River alluvial aquifer and reaches a maximum of 2 m in the Carrington West Wing area prior to the installation of the barrier wall. This represents a short duration peak drawdown and groundwater levels are predicted to recover following installation of the barrier wall. In addition, the alluvial aquifer is predicted to remain saturated as downward leakage of water through the bed of the Hunter River will maintain the watertable.

The stygofauna community may experience minor impact from the short term predicted watertable decline due to the Project.

The western arm of the paleochannel will be mined during the excavation of Carrington West Wing as part of approved operations. There will be some impact to the local stygofauna community in the paleochannel, as they will not be able to migrate out of the impact area prior to excavation. However, this mining is already approved as part of Carrington West Wing extension (HVO North Mod 3, MER 2010).

The risk to the stygofauna community associated with the Project is low because there will be no additional excavation to the alluvium beyond what has already been approved. The impact to the stygofauna community from already-approved mining in the paleochannel is high and is categorised in the GDE Risk Matrix as C (High Ecological Value, High Risk).

The predicted cumulative drawdown impact exceeds the aquifer interference policy level 1 minimal impact considerations, however, the aquatic ecology and GDE assessment demonstrates that the variation will not prevent the long-term viability of the ecosystem in the Hunter River alluvium in the Project area, outside of the paleochannel area.

## 14.5 Management, mitigation and monitoring

The mitigation measures relevant to aquatic ecology and GDEs have been listed in Table 12.3 in the Water Resources chapter, and are re-listed below in Table 14.2.

**Table 14.2 Aquatic ecology and GDE management and mitigation measures**

| ID | Management and mitigation measure |
|---|---|
| WAT2 | The Carrington West Wing Levee and associated alluvial lands area will be monitored during operational life of the Project, particularly following large flood events (1:20 AEP or larger) to identify signs of instability and potential corrective action. |
| WAT5 | Consistent with the methodology used for the Carrington Pit LPBW, the Carrington West Wing LPBW will be constructed on the alluvial benches of the highwall following mining in that area and prior to backfilling. The barrier wall will be keyed into the Permian bedrock and will be designed to meet the current development consent requirement of a permeability of $1 \times 10^{-8}$ m/sec. |
| WAT6 | Additional monitoring bores will be installed within the zone of predicted short-term incremental drawdown, approximately one year prior to mining recommencing in the remnant paleochannel. A network of eight nested monitoring bores are proposed and will be included in the updated water management plan. |
| WAT7 | Piezometers will be installed within the Carrington West Wing LPBW, consistent with the approach used for the Carrington Pit barrier wall. The purpose of the piezometers will be to monitor for changes in salinity and pressure. |
| WAT8 | A LPBW monitoring and management plan will be prepared in consultation with DPE Water (which will include assigned trigger levels and a response plan for trigger level exceedance and deviations from predictions). |
| WAT9 | The Carrington West Wing levee will be decommissioned at closure to reinstate floodplain storage in this area. |

## 14.6 Summary and conclusion

Field surveys occurred at 13 sites along watercourses (7 Hunter River sites, and 6 sites on other waterways), 30 bores, and 4 potentially groundwater dependent vegetation sites in the Study area.

Ecological condition in the Hunter River sites was found to be poor to moderate. Macroinvertebrate communities were dominated by pollution-tolerant taxa. While there was potential habitat for Purple-spotted gudgeon (*Mogurnda adspersa*), the species was considered unlikely to occur at any of the sites, nor in the Hunter River given the absence of historical records in the Hunter Valley. Sites along other watercourses were also in poor condition.

The alluvial aquifer of the Hunter River (and larger tributaries) has previously been established as stygofauna habitat. Five stygofauna taxa were collected from the bores sampled during the current surveys. Stygofauna were collected from the Hunter River alluvium, including the paleochannel aquifer adjacent to HVO North.

The vegetation sites identified using the BAM consisted of:

- Swamp Oak-Weeping Grass grassy riparian forest of Hunter Valley on a lateral sand/gravel bar of the Hunter River between HVO North and South;
- a small stand of river redgum along Wollombi Brook; and
- a relatively large stand of Bull Oak Grassy Woodland of the Central Hunter Valley near Warkworth.

All vegetation stands were found to be in low to moderate condition. The Bull Oak Grassy Woodland sites near Warkworth are considered potential GDEs, but they are situated south of the Project area and will not experience any drawdown due to the Project. The Swamp Oak Weeping Grass riparian forest on a gravel bar of the Hunter River, is potentially dependent on groundwater, although is likely to have a stronger dependence on surface water. The river red gum forest of Wollombi Brook potentially uses groundwater, although is likely to be more dependent on surface water and no additional drawdown is predicted in this area.

Additional stands of river red gum forest have previously been identified in the Project area. As the condition of these stands is already known, were not sampled during the surveys but impacts to them from groundwater drawdown were considered.

Groundwater modelling (AGE 2022) predicts a short term increase in incremental drawdown in only small parts of the alluvial aquifer. Alluvium along the main channel of the Hunter River is largely buffered from drawdown by impermeable groundwater barriers installed along sections of the aquifer and because infiltration from the Hunter River recharges the aquifer, so impacts to this aquifer ecosystem and the river red gum populations are likely to be minor or negligible. The alluvial aquifer will continue to be recharged from regulated flows in the Hunter River.

Most of the stygofauna collected during sampling came from the paleochannel aquifer north of the Hunter River and west of the existing mine. This is already approved for excavation as part of the approved Carrington West Wing area at HVO North. However, the regional impact is likely to be minor as all taxa collected from the paleochannel were also collected at other locations along the Hunter River and within the Hunter Valley.

No impacts are predicted on the aquatic ecology of the Hunter River, particularly as flow will be mitigated through regulated releases from Glenbawn Dam, and only minor impacts to the aquatic ecology in the tributaries to the Hunter River are expected.

Changes to the groundwater systems, as a result of the Project, are unlikely to have a significant impact on any of the GDEs studied. To mitigate against potential impacts to GDEs, groundwater level and quality will continue to be monitored, including at proposed additional monitoring bores. Groundwater observation data will be used to validate the groundwater model predictions so that any unexpected drawdown that is beyond that predicted by current models, can be forecast.

# 15 Aboriginal cultural heritage

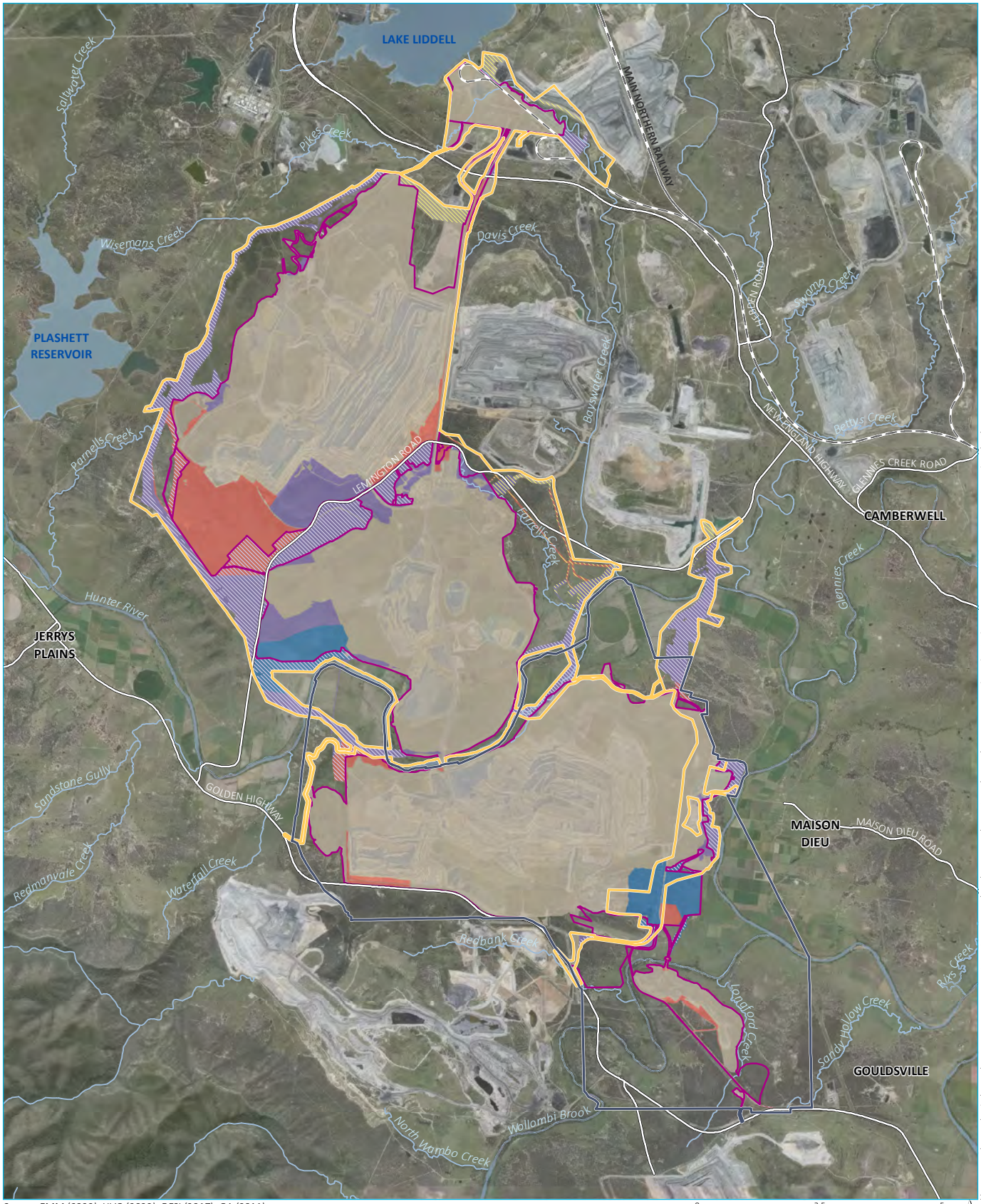
## 15.1 Introduction

This chapter provides a summary of the Aboriginal cultural heritage assessment (ACHA) undertaken for the Project, which is provided in full in Appendix N. The ACHA was prepared to address the SEARs and comments raised by Heritage NSW, and in consideration of the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011), *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010a) and *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (the Code of Practice) (DECCW 2010b).

The assessment of potential impacts of the Project on Aboriginal cultural heritage included the following:

- Archaeological assessment, which included:
  - a review of existing environmental and archaeological information for the Project disturbance area;
  - consultation with Aboriginal community to identify areas and places of cultural value within or in the vicinity of the Project disturbance area;
  - identification of any Aboriginal sites, objects, potential archaeological deposits, and/or cultural values areas within the Project disturbance area and assess their significance (archaeological and cultural); and
  - assessment of the potential impacts of the Project and identify and recommend measures to avoid or mitigate any Aboriginal heritage impacts.
- Cultural values mapping, undertaken by Dr Philip Clarke – Cultural values mapping uses a range of research techniques and scholarly tools that are employed to 'map' the tangible and intangible cultural assets of people within the local landscape. All RAPs were invited to participate in the Cultural mapping exercise via self-nomination. The mapping included:
  - a review of existing anthropological literature to establish an ethnographic model to contextualise and allow verification of oral history;
  - on-site investigations with Aboriginal community to capture relevant oral histories and document the local areas/features of traditional or contemporary value; and
  - production of a report that presents the methods and findings of the assessment and provides a map of cultural values requiring further consideration. The cultural mapping report is included as Appendix C of the ACHA (refer to Appendix N of this EIS).
- Social mitigation strategies – this is a HVO led initiative in consultation with Aboriginal community and in conjunction with the social impact assessment (SIA), with the aim of identifying social impacts and opportunities to improve outcomes within the local community.

An Assessment Area was defined for the ACHA, as shown in Figure 15.1, which comprises the Project disturbance area, excluding areas of significant disturbance and or areas where impacts to Aboriginal heritage have previously been approved and completed under current development consents and/or project approvals. Figure 15.1 also identifies the different methods of survey completed across the Assessment Area, which is explained in Section 15.2.4iv.




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*Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011)*

0 2.5 5 km

GDA2020 MGA Zone 56

N

## KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Existing and approved disturbance area
- Approved disturbance area - other mine
- Additional disturbance area

Assessment area

- Category 1: Comprehensive survey area
- Category 2: Targeted inspection area
- Category 3: Significantly disturbed (excluded)
- Category 4: Previously assessed and/or salvaged (excluded)

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

ACHA assessment area

HVO Continuation Project
Environmental Impact Statement
Figure 15.1

EMM creating opportunities

## 15.2 Consultation

As noted previously, consultation with Aboriginal community was undertaken to inform the ACHA as per the methods outlined in the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010). The consultation process resulted in the registration of 33 Aboriginal organisations/individuals wishing to be consulted throughout the Project, as listed in Table 6.2. Consultation undertaken in accordance with DECCW 2010 is outlined in Table 15.1 below.

**Table 15.1 Aboriginal Consultation Process Summary (DECCW 2010)**

| Stage | Description | Date started | Date completed |
|---|---|---|---|
| 1 | **Stage 1 – Notification of project proposal and registration of interest**. This process involves: | | |
| | a) Pre-notification – identification of the Aboriginal individuals and/or communities relevant to the Project Area by contacting several agencies | 17 September 2020 | 28 September 2020 |
| | b) Notification – contacting all Aboriginal individuals and/or communities identified in (1a) via email and letter to determine their interest in being consulted for the Project. | 28 September 2020<br>7 October 2020 | Registrations accepted throughout Project duration. |
| | c) Notification – placement of advertisements in local media seeking further expressions of interest from Aboriginal individuals and/or communities that may have been missed through (1b). Advertisements were placed in: Hunter River Times; Muswellbrook Chronicle; Singleton Argus; and The Koori Mail. | 1–7 October 2020 | 21 October 2020 |
| 2 | **Stage 2 – Presentation of information about the proposed Project** – presentation of Project information/assessment methodology – briefing RAPs about the Project and scope of any Aboriginal heritage assessment and investigations. | 6 November 2020 | 4 December 2020 |
| 3 | **Stage 3 – Gathering information about cultural significance** – facilitating a process to gather cultural information from RAPs and requesting feedback about proposed assessment methodologies. This stage also sought upfront input and discussion around potential impacts to cultural materials and mitigation options with the RAPs prior to developing the ACHA.<br>Undertaken concurrently with Stage 2. | 6 November 2020 | 4 December 2020 |
| 4 | **Stage 4 – Review of draft cultural heritage assessment report** – the RAPs are provided an opportunity to review and comment upon the draft ACHAR, to contribute input into the overall findings, significance, and management of cultural heritage. | 3 November 2022 | Review period currently underway, comments requested by 1 December 2022. |

Opportunity for Aboriginal involvement in the Project was provided throughout the preparation of the ACHA to all RAPs, including invitations to attend three consultation meetings which included on-site tours, participation in a two-day workshop to discuss social and cultural mitigation strategies and initiatives, participation in a 56 day field program including survey, test excavation and scarred tree assessment, and participation of RAPs in cultural values mapping. Upon request, additional meetings and site visits were facilitated where RAPs were unable or elected not to attend scheduled meetings.

Discussions between HVO and the RAPs facilitated as part of the consultation process for the Project have enabled the identification of a number of initiatives across key Closing the Gap themes including health, education, business, finance, employment, culture, and community, to which HVO has committed to for meaningful mitigation of Aboriginal cultural heritage impacts of the Project. This is described further in Section 15.5.2.

## 15.3 Existing environment

### 15.3.1 Landscape context

In terms of landform, much of the Project area is disturbed and/or rehabilitated (reshaped and revegetated) terrain. Remnant areas of natural topography mainly comprise low to moderate gradient slopes with very occasional steep gradients. The central and southern parts of the Project Area include substantial flats and floodplains, near the Hunter River and its associated tributaries. The proposed realigned Lemington Road corridor intersects a prominent, elevated terrace associated with the Hunter River. The terrace is associated with the Warkworth Land System and represents a unique landform within the Project area.

The Project area also contains a number of watercourses including the Hunter River, Bowmans Creek, Bayswater Creek, Pikes Creek, Parnells Creek, and Farrells Creek in addition to various unnamed tributaries and ephemeral drainage lines. Evidence of past occupation is more likely to survive on elevated areas (eg terraces) above floodplains beside watercourses.

The geology of the region includes a range of raw materials such as mudstone, silcrete and chert, that were used by Aboriginal people in the past for producing stone artefacts.

The majority of the soil landscapes which comprise the Project area are characterised by duplex soils which consist of an upper soil A-horizon and underlying B-horizon. These duplex soils tend to be shallow with the A-Horizon generally less than 20 cm. To date, artefacts within the Project area have mainly been found within the A-Horizon and most commonly dated to between 200 and 3000 years old (ie mid-to-late Holocene period). Extensive sheet and gully erosion occurs throughout the Project area, resulting in artefacts that were originally deposited on or within the A-horizon being exposed.

The Project area has been subject to both natural and anthropogenic disturbance that will affect the survivability of cultural materials if present. These include agricultural, pastoral and vegetation clearance across most of the Assessment Area that would have resulted in disruption or removal of the upper soil profile and any associated cultural materials.

### 15.3.2 Ethnography and cultural mapping

The Project area is located on the traditional lands of the Wonnarua people, sometimes called Wanaruah and by other variations.

Ethnohistorical information provides several observations in relation to the early nineteenth century Aboriginal society in the region, but no site-specific areas of activity within the Project area.

To further understand traditional and contemporary cultural values associated with the Project area, cultural mapping was undertaken by Dr Philip Clarke, in which all RAPS were provided the opportunity to participate. The RAPS that self-nominated to participate were the Upper Hunter Wonnarua Council Incorporated, Wonnarua Nation Aboriginal Corporation, Ungooroo Aboriginal Corporation, and Widescope Indigenous Group Pty Ltd.

No Aboriginal cultural values or places, beyond archaeological sites already identified by the ACHA, were identified within the Project area as a result of cultural values mapping. The RAP participants identified seven places of significant cultural value in the broader region, as shown on Figure 15.2, including:

- Baiame Cave (story place and archaeological site, a declared Aboriginal Place under the NPW Act);
- Broke Cemetery (historic place);
- Loder/s Creek (archaeological place);
- Lookout Point (story place);

- Redbournberry Hill (a declared Aboriginal Place under the NPW Act);
- St Clair Mission (a declared Aboriginal Place under the NPW Act including both the Mission Church School and the Corroboree ground); and
- Wallaby Scrub Bora Ground (story place and archaeological site).

### 15.3.3 Existing management of Aboriginal heritage sites at HVO

Management of Aboriginal heritage sites across the HVO Complex is undertaken in accordance with the HVO North Aboriginal Heritage Management Plan (AHMP) and the HVO South Aboriginal Cultural Heritage Management Plan (ACHMP), which have been developed in consultation with RAPs. The plans also includes a protocol for the ongoing consultation and involvement of the Aboriginal community in the conservation and management offsites.

At HVO North, Aboriginal Heritage Impact Permits (AHIPs) are required to be approved by Heritage NSW prior to any impacts to Aboriginal sites as mining progresses. The current development consent provides approval for impacts to Aboriginal sites in the West Pit Extension and provides for the protection of CM–CD1; protection that will be continued by the Project.

At HVO South, impacts to sites are carried out in accordance with the existing PA and protocols of the ACHMP, and can be carried out throughout the life of the mine. A number of sites are protected under the PA, with Restricted Access Zones identified to protect sites HVO26–44, 47–58, 84–100, 102–104 and 107–109 from disturbance.

### 15.3.4 Archaeological context

#### i Database searches

Searches of the databases outlined in Table 15.2 were undertaken to identify previously recorded heritage within the Project area.

**Table 15.2 Database search results**

| Name of database | Date of search | Search details | Results |
|---|---|---|---|
| Commonwealth Heritage Listings | 14 May 2020 | Singleton LGA | No places listed on either the National or Commonwealth heritage lists are located within the Project Area. |
| Native Title Claims Search | 14 May 2020 | NSW | No active Native Title Claims interact with the Project Area. |
| Aboriginal Heritage Information Management System (AHIMS) database | • 10 May 2021<br>• 8–9 June 2021<br>• 16 September 2021 | • Shape (.shp) file extract: HVO Complex plus 1 km buffer.<br>• Extensive searches x 17.<br>• Updated data redownloaded from AHIMS. | Total of 1,786 previously recorded Aboriginal sites within a 18,300 ha search area centred on the Project area. |
| LEP | 14 May 2020 | *Singleton Local Environmental Plan 2013*<br>*Muswellbrook Local Environmental Plan 2009* | No Aboriginal places or archaeological sites noted in the LEP occur within the Project area. |

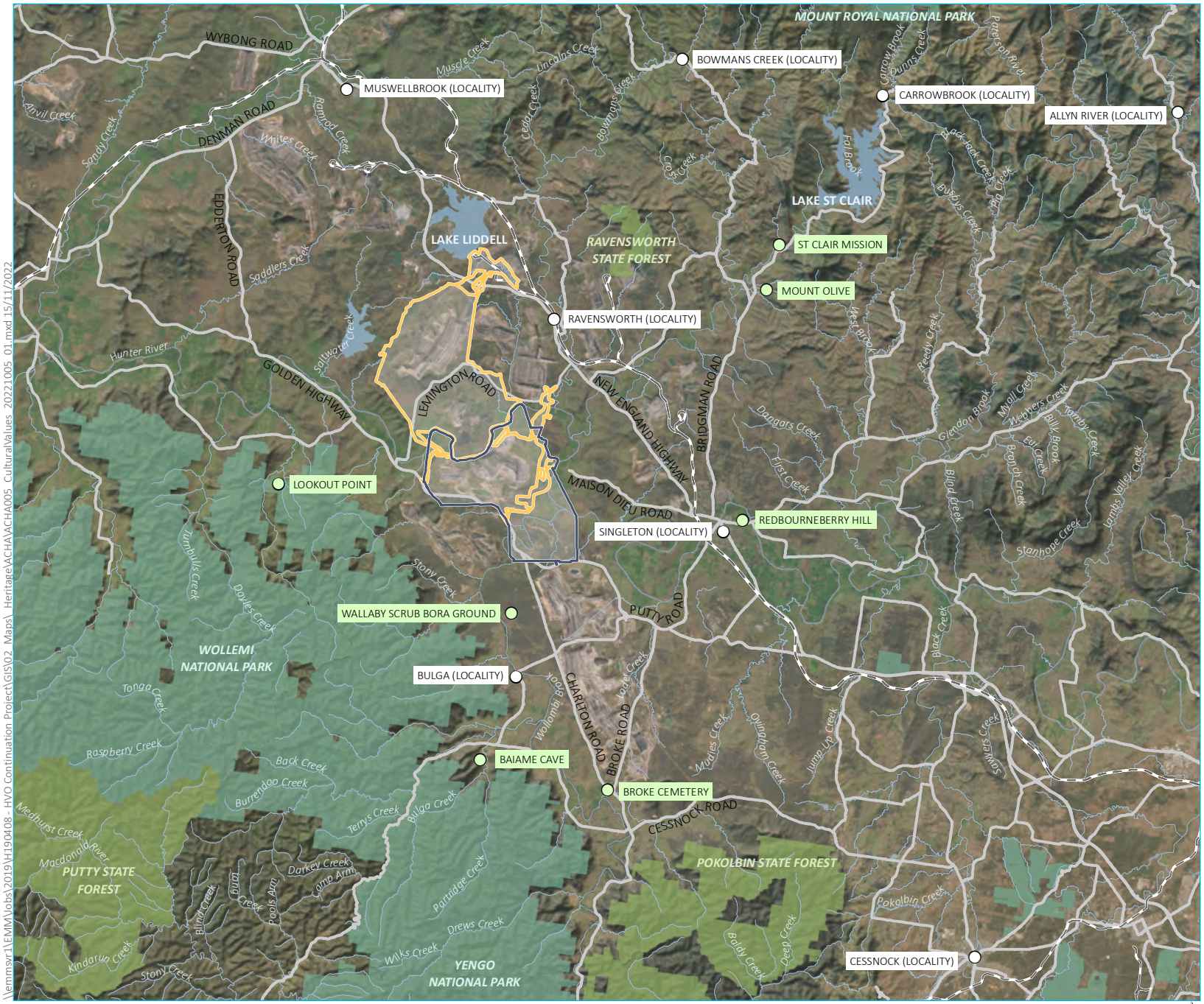
Table 15.3 and Figure 15.3 show the results of the AHIMS search within the additional, existing and approved disturbance areas.

A total of 104 previously recorded AHIMS sites are within the additional disturbance area associated with the Project, or areas that are approved to be disturbed under adjacent mine's development consents that overlap with the Project. Of the 104 sites, 87 are extant (valid or partially destroyed) at the time the assessment was completed.

A further 642 previously recorded AHIMS sites are within the existing and approved disturbance area at HVO. Of the 642 sites, 141 are extant.

Results of the database searches demonstrate that the most common site type in the region are artefactual sites (95%), comprising isolated finds or artefact scatters, with lesser occurrences of rarer site types such as culturally modified trees (1%), rockshelters (0.1%), quarries (0.2%), and grinding grooves (0.1%).

Generally, distribution of sites shows a strong correlation with proximity to water as well as elevated landforms such as ridgelines, spurs or terraces. Relatively few sites have been registered as featuring potential archaeological deposit (PAD) (3%), likely reflective of skeletal or eroded soil profiles prevalent throughout the Hunter Valley.




KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Locality
- Aboriginal cultural place

Existing environment

- Major road
- Named watercourse
- Rail line
- Named waterbody
- NPWS reserve
- State forest

Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011)

0 10 20 km

GDA2020 MGA Zone 56

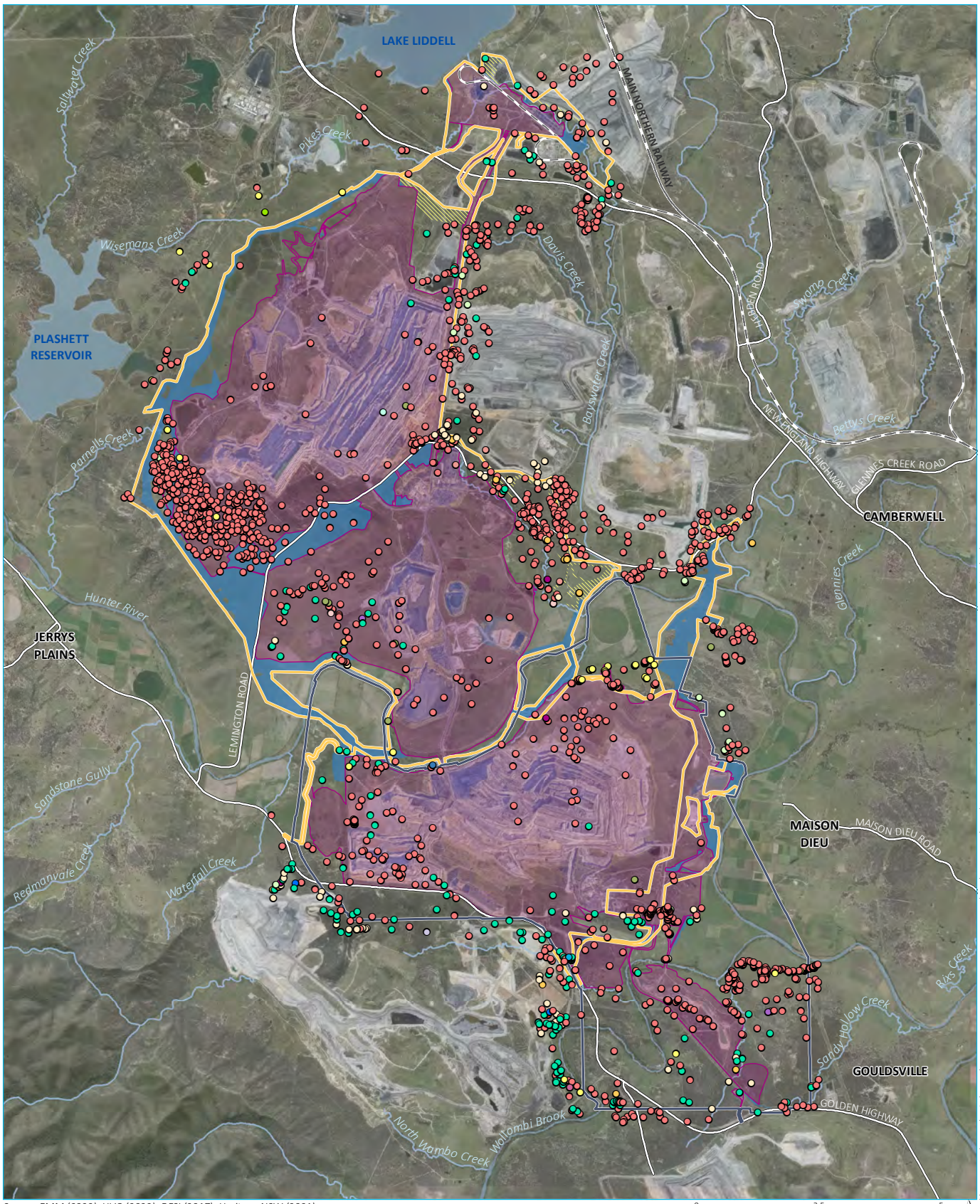
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# Cultural values mapping - significant cultural places identified by RAPs

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Figure 15.2

EMM creating opportunities




*Source: EMM (2022); HVO (2022); DFSI (2017); Heritage NSW (2021)*

0 2.5 5 km

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## KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Existing and approved disturbance area
- Additional disturbance area
- Approved disturbance area - other mine

AHIMS - Site type

- Artefact reburial location
- Culturally modified tree
- Culturally modified tree with artefact(s)
- Grinding groove site with artefact(s)
- High density artefact scatter (31-100)
- High density artefact scatter (31-100) with associated archaeological deposit
- Isolated find
- Low density artefact scatter (0-10)
- Medium density artefact scatter (11-30)
- Ochre quarry site with artefact(s)
- Potential archaeological deposit
- Shelter with deposit
- Stone quarry site with artefact(s)
- Undefined artefact site
- Undefined artefact site with associated potential archaeological deposit
- Undefined artefact site with heart and associated potential archaeological deposit
- Undefined artefact site with hearth
- Very high density artefact scatter (100+)
- Very high density artefact scatter (100+) with associated potential archaeological deposit

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

# Distribution of AHIMS Data

HVO Continuation Project
Environmental Impact Statement
Figure 15.3

EMM creating opportunities

**Table 15.3 AHIMS data: extant sites within the Project disturbance area**

| Site type | Additional disturbance area/approved disturbance area – other mine | | Existing and approved disturbance areas | |
|---|---|---|---|---|
| | HVO North | HVO South | HVO North | HVO South |
| **Artefact sites** | **79** | **4** | **75** | **61** |
| Low density artefact scatter (0–10) | 34 | 2 | 25 | 25 |
| Medium density artefact scatter (11–30) | 6 | 1 | 11 | 2 |
| High density artefact scatter (31–100) | 6 | - | 4 | 3 |
| Very high density artefact scatter (101+) | 5 | - | 4 | - |
| Isolated find | 28 | 1 | 31 | 31 |
| **Potential archaeological deposit** | **4** | **-** | **3** | **-** |
| PAD | 1 | - | 1 | - |
| Artefact site with PAD | 3 | - | 2 | - |
| **Culturally modified tree** | **-** | **-** | **1** | **1** |
| Culturally modified tree | - | - | - | 1 |
| Culturally modified tree with artefact(s) | - | - | 1 | - |
| **Total** | **83** | **4** | **79** | **62** |

### ii Predictive model

A predictive model of Aboriginal site locations was formed by an analysis of:

- landscape features in the Assessment Area and surrounds;
- pre-colonial period ecological conditions;
- advice from Aboriginal knowledge holders including RAPs;
- ethno-historical information about Aboriginal life and material culture; and
- the type and distribution of Aboriginal sites described in previous reports and AHIMS data.

Predictive modelling indicates the most likely Aboriginal site types to be identified are:

- open artefact scatters and isolated finds are the most likely to be identified. These sites may occur anywhere as background scatter but are most likely to occur close to reliable water sources;
- culturally modified trees may occur where mature, native vegetation has been preserved; however, high levels of clearing across the Project area reduces this likelihood; and
- grinding grooves and/or quarry sites have the potential to be identified where outcropping stone is present.

### iii Archaeological survey

Field investigations consisted of 24 days of archaeological survey and 32 days of test excavation undertaken by EMM archaeologists and RAP representatives.

The Assessment Area was divided into four categories, as shown on Figure 15.1:

- Category 1: areas which have not been previously assessed and therefore require *comprehensive* survey and test excavation where required.
- Category 2: areas which have previously been assessed; however, due to methodologies considered below current comprehensive assessment standards and/or time elapsed since that assessment was completed (ie greater than 10 years), the area warrants revisiting via a *targeted* inspection approach and test excavation where required.
- Category 3: areas which are significantly disturbed by approved activities, and therefore were *excluded* from the Assessment Area.
- Category 4: areas where impacts to Aboriginal heritage have been approved and/or completed (ie salvaged) under current Project approvals, and therefore were also excluded from the Assessment Area.

The survey team identified 78 previously undocumented artefact sites and four possible scarred trees during the archaeological field survey, as listed in Table 15.4 and shown in Figure 15.4.

Following identification of the four possible scarred trees, scarred tree specialists Urban Tree Management Australia Pty Ltd and Andrew Long and Associates Pty Ltd were engaged to undertake independent assessments of the trees, including a field inspection with RAP representatives. One of the trees was confirmed not to be a culturally scarred tree, while there were differing opinions on the origin of scars on the other three trees. A precautionary approach was therefore adopted whereby the three trees will be managed as being of likely cultural origin (TR178-ST1, TR212-ST1 and TR216-ST1).

Of the previously undocumented Aboriginal sites found, 72 are at HVO North and four are at HVO South. The most frequent and widely distributed Aboriginal objects are stone artefacts, which are present in 78 of the total 81 sites (96%), including artefact scatters, artefact scatters with PAD, and isolated finds. It is also noted that five of the sites found in HVO North are now outside of proposed disturbance areas due to Project design refinement, resulting in 76 newly identified sites in the Assessment Area.

**Table 15.4 Results summary: previously undocumented Aboriginal heritage sites**

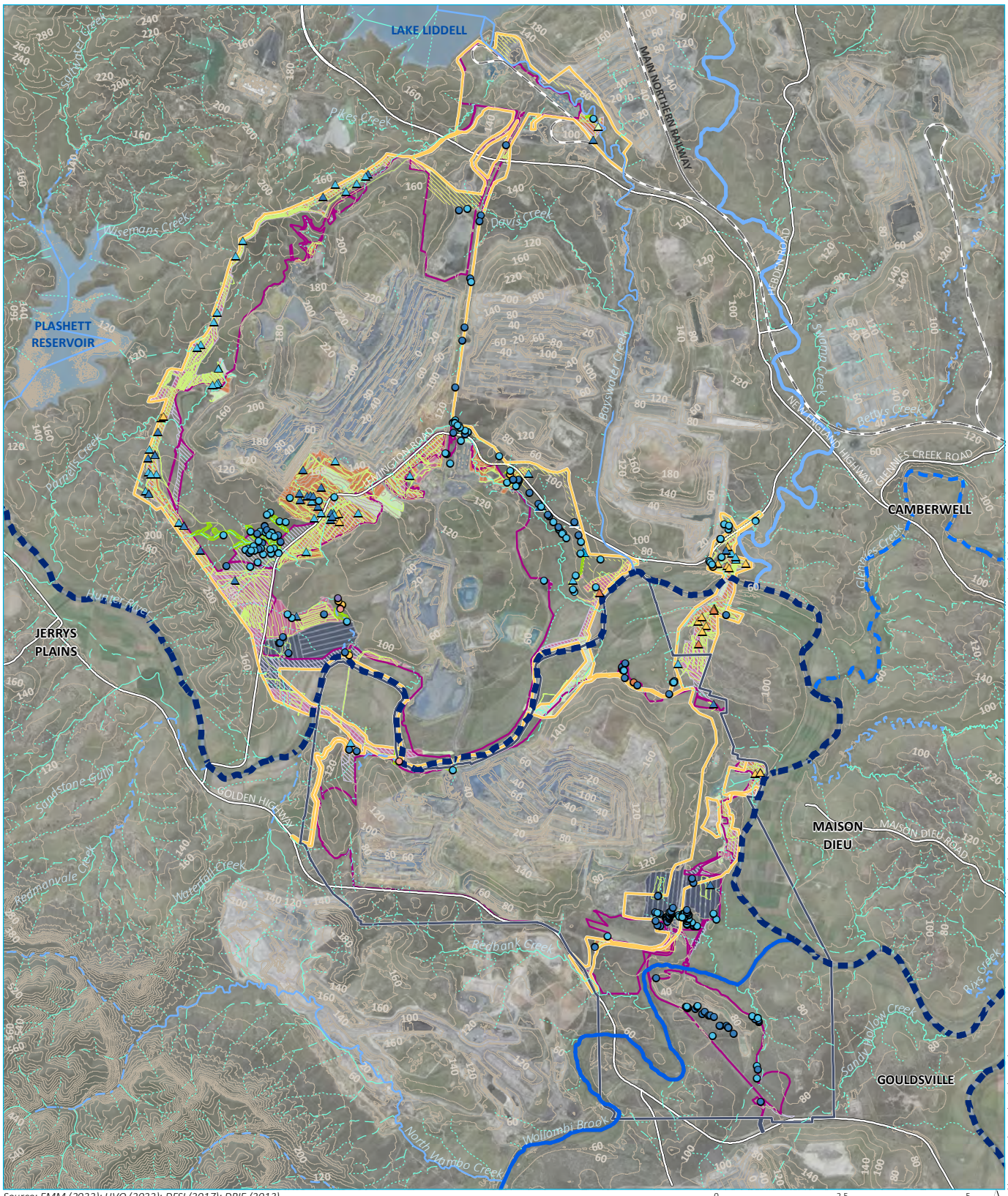
| Site type | HVO North proposed development consent boundary | | | HVO South proposed development consent boundary | | Total |
|---|---|---|---|---|---|---|
| | Additional disturbance area/ approved disturbance area – other mine | Existing and approved disturbance area | N/A[1] | Additional disturbance area/ approved disturbance area – other mine | Existing and approved disturbance area | |
| **Artefact sites** | **37** | **17** | **5** | **1** | **1** | **61** |
| Isolated find | 14 | 10 | | | 1 | 25 |
| Low density artefact scatter (0–10) | 20 | 6 | 5 | 1 | | 32 |
| Medium density artefact scatter (11–30) | 3 | 1 | | | | 4 |

**Table 15.4 Results summary: previously undocumented Aboriginal heritage sites**

| Site type | HVO North proposed development consent boundary | | | HVO South proposed development consent boundary | | Total |
|---|---|---|---|---|---|---|
| | Additional disturbance area/ approved disturbance area – other mine | Existing and approved disturbance area | N/A[1] | Additional disturbance area/ approved disturbance area – other mine | Existing and approved disturbance area | |
| **Potential archaeological deposit** | **15** | | | **2** | | **17** |
| Isolated Find with PAD | 1 | | | | | **1** |
| Artefact scatter with PAD | 14 | | | 2 | | **16** |
| **Scarred tree** | **3** | | | | | **3** |
| **Total** | **55** | **17** | **5** | **3** | **1** | **81** |

1. As a result of project design refinements, five artefact scatters identified during survey are now located outside of disturbance areas.

In addition to the previously undocumented sites found by archaeological survey, there are 228 extant (valid or partially destroyed) previously recorded AHIMS sites within the existing and approved disturbance area. A total of 59 extant AHIMS sites are within the Assessment Area for the Project, and of these, all 25 (100%) extant AHIMS sites in Category 1 (comprehensive survey) areas were reidentified during field survey, and nine of the 33 extant AHIMS sites within Category 2 (targeted inspection) areas were re-identified.




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*Source: EMM (2022); HVO (2022); DFSI (2017); DPIE (2013)*

0 2.5 5 km

GDA2020 MGA Zone 56

N

## KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Additional disturbance area
- Approved disturbance area - other mine
- Existing and approved disturbance area
- Site extent
- GPS survey track

Transect method

- Category 1: Pedestrian survey
- Category 1: Vehicle traverse
- Category 1: Visual inspection
- Category 2: Targeted inspection

Extant AHIMS sites within assessment area

- Isolated Find
- Open Artefact Scatter
- Open Artefact Scatter with PAD
- Possible Scarred Tree with Artefacts
- Potential Archaeological Deposit
- Scarred Tree

Previously undocumented Aboriginal Sites

- Isolated Find
- Isolated Find with PAD
- Open Artefact Scatter
- Open Artefact Scatter with PAD
- Scarred Tree

Strahler stream order

- 1st order
- 2nd order
- 3rd order
- 4th order
- 5th order
- 6th order
- 7th order
- 8th order
- 9th order

Existing environment

- Rail line
- Major road
- 20 m contour
- Named waterbody

# Archaeological assessment area: survey coverage and Aboriginal Site results

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Figure 15.4

EMM creating opportunities

### iv Test excavation

Based on the results of the archaeological survey, 12 locations within the Assessment Area were identified for test excavation because:

a) they were identified as likely to contain potential archaeological deposit; and/or

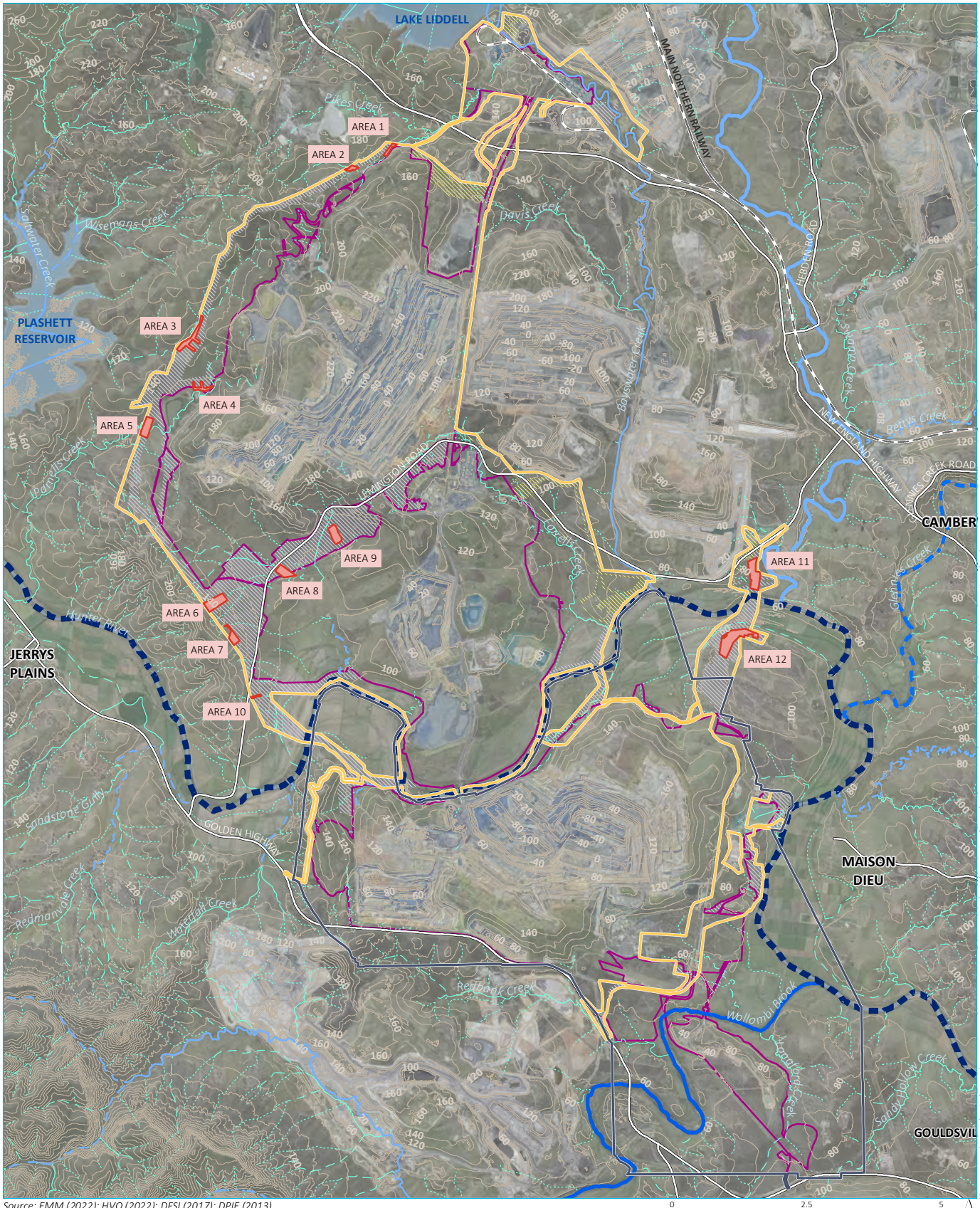
b) to counter poor ground surface visibility conditions at the time of survey and to confirm assessments of low archaeological potential.

EMM conducted archaeological test excavation across the Project area, with the assistance of RAPs over a five-week period (19 April to 21 May 2021).

Overall, 336 test pits were excavated, targeting the 12 investigation areas shown on Figure 15.5. On average, the excavated test pit depths were relatively shallow (average of 30 cm), reflective of the limited A-horizon of duplex soil profiles that are present across large parts of the Project area and Hunter Valley in general. The exception to this was in Area 12, where alluvial deposits of the Warkworth sand sheet were encountered on an elevated terrace overlooking the floodplain of the Hunter River.

A total of 564 artefacts were recovered over the course of the excavation program. Artefacts were recovered from 106 test pits (31%), while 232 (69%) were culturally sterile. Of the artefact bearing test pits, 33 test pits (31% of artefact bearing test pits, 10% of all test pits) contained a single artefact; and 67 test pits (63% of artefact bearing test pits, 20% of all test pits) contained ≥5 artefacts. The area with the greatest artefact concentration was Area 11 with 310 artefacts. This was followed by Area 12, which recovered 148 artefacts, and Area 5, which recovered 59 artefacts, and Area 9, which recovered a total of 30 artefacts. The remaining areas yielded very low densities of cultural material (less than 10 artefacts), or no cultural material at all.

Photos from the test excavation in Area 11 are provided in Plate 15.1 to Plate 15.3.




Source: EMM (2022); HVO (2022); DFSI (2017); DPIE (2013)

0 2.5 5 km

GDA2020 MGA Zone 56

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## KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Existing and approved disturbance area
- Additional disturbance area
- Approved disturbance area - other mine
- Location of test excavation area

Existing environment

- Rail line
- Major road
- 20 m contour
- Named waterbody

Strahler stream order

- 1st order
- 2nd order
- 3rd order
- 4th order
- 5th order
- 6th order
- 7th order
- 8th order
- 9th order

# Archaeological assessment area: location of test excavation areas

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Figure 15.5

EMM creating opportunities



Plate 15.1 View south on terrace flat landform towards Hunter River, TP11-04



Plate 15.2 View south over artefact scatter TR195-AS2 site on terrace flat, TP11-14



Plate 15.3 Examples of IMTC blades found in TP11-14, TR195-AS2 (Scale 1 cm)

Test excavation was also undertaken of AHIMS Site 37-2-1877 (CM-CD1), with the primary aim of collecting Optically Stimulated Luminescence (OSL) samples to confirm the age of the deposits, as requested by Heritage NSW in their assessment recommendations included with the SEARs for the Project. The test excavation was undertaken over seven days with RAPs, using manual methods in accordance with the Code of Practice (DECCW 2010b).

OSL samples were obtained to resolve chronological uncertainties for the site. Results from ten samples submitted for OSL dating support that the 'Older Stratum' of CM-CD1 is of significant age relating to the early Holocene and late Pleistocene periods (10,000–12,000 years ago).

## 15.4 Assessment

### 15.4.1 Significance assessment

Cultural significance is described in Article 1.2 of *The Burra Charter: the Australia ICOMOS Charter for Places of Cultural Significance* (Australia ICOMOS 2013) as "aesthetic, historic, scientific, social, or spiritual value for past, present or future generations". Assessment of scientific (archaeological) significance considers research potential, rarity and representativeness, integrity, and educational value.

The Project area has significance for its social, scientific (archaeological) and aesthetic values. The significance of Aboriginal sites varies across the landscape of the Project area. The majority of sites are artefact scatters, and where these occur in relatively undisturbed contexts, particularly where they are near creeks and with sub-surface potential, they have greater archaeological significance. By contrast, isolated finds, while indicative of human occupation, are predominantly situated on landforms that have been disturbed by agricultural development and have low significance, particularly when located on skeletal soils with limited subsurface potential.

An overall significance rating was determined on the basis of the average of the 4 criterion list above. The majority (84%) of extant Aboriginal sites (previously undocumented and AHIMS sites) were found to have low scientific significance, because they generally have:

- a low artefact density;
- no associated subsurface deposits;
- no remarkable features and are generally representative of other artefact sites in the upper Hunter Valley;
- a high likelihood of being in a secondary context; and
- a limited ability to inform on the nature and spatial extent of past Aboriginal occupation.

Three sites in the additional disturbance area at HVO North were found to have high significance: two scarred trees and CM-CD1 (artefact scatter with PAD). No sites of high significance were identified within the additional disturbance area at HVO South.

### 15.4.2 Impact assessment

#### i Cultural mapping

No Aboriginal cultural values or places, beyond archaeological sites already identified by the ACHA, were identified within the Project area by the cultural values mapping. The Project will have no impact on the identified sites (shown in Figure 15.2), primarily due to the reasonable distance from the Project area.

#### ii Archaeology

Sources of impact associated with the Project have been split into two categories: mining and infrastructure:

- impacts associated with mining include:
  - general mining activities, ie pre stripping, overburden removal, coal extraction and rehabilitation activities; and
  - development of clean water drains and diversions, levees and dams required to support mining activities;
- impacts associated with infrastructure, include:
  - construction or removal of electricity transmission lines (ETL);
  - access roads;
  - Lemington Road realignment; and

- rail and road construction.

Degrees of impact include partial (disturbance of part of a site) or total (disturbance of the entirety of the site) disturbance resulting in partial or total harm (loss of a site's components).

A summary of impacts and harm to extant Aboriginal sites within the Project disturbance area is presented in Table 15.5 and shown in Figure 15.7.

Of the total 304 extant Aboriginal sites (228 previously recorded and 76 newly identified):

- 145 (48%) are in the additional disturbance area/approved disturbance area – other mine (138/45% at HVO North, and 7/2% at HVO South); and
- 159 (52%) are in the existing and approved disturbance area (96/32% at HVO North, 63/21% at HVO South).

Impacts associated with the Project will result in partial harm to 38 sites (13%) and totally harm to 182 sites (60%). The Project will avoid impacts/harm to 84 (28%) Aboriginal sites.

Of the 220 Aboriginal sites to be impacted by the Project, 86% (189) are assessed as being of low scientific significance, 28% (14) are low-moderate significance, 28% (14) are of moderate significance, and 1% (3) are of high significance (Figure 15.6).

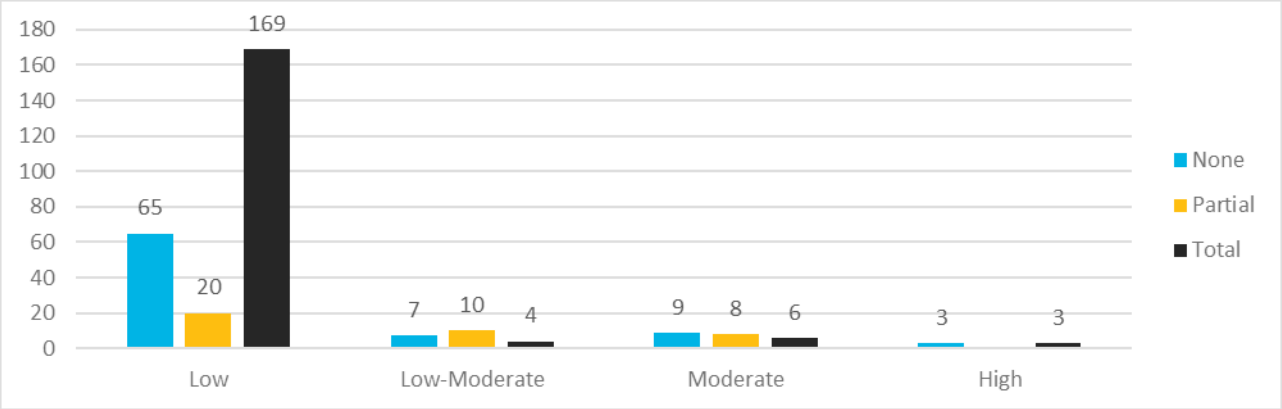
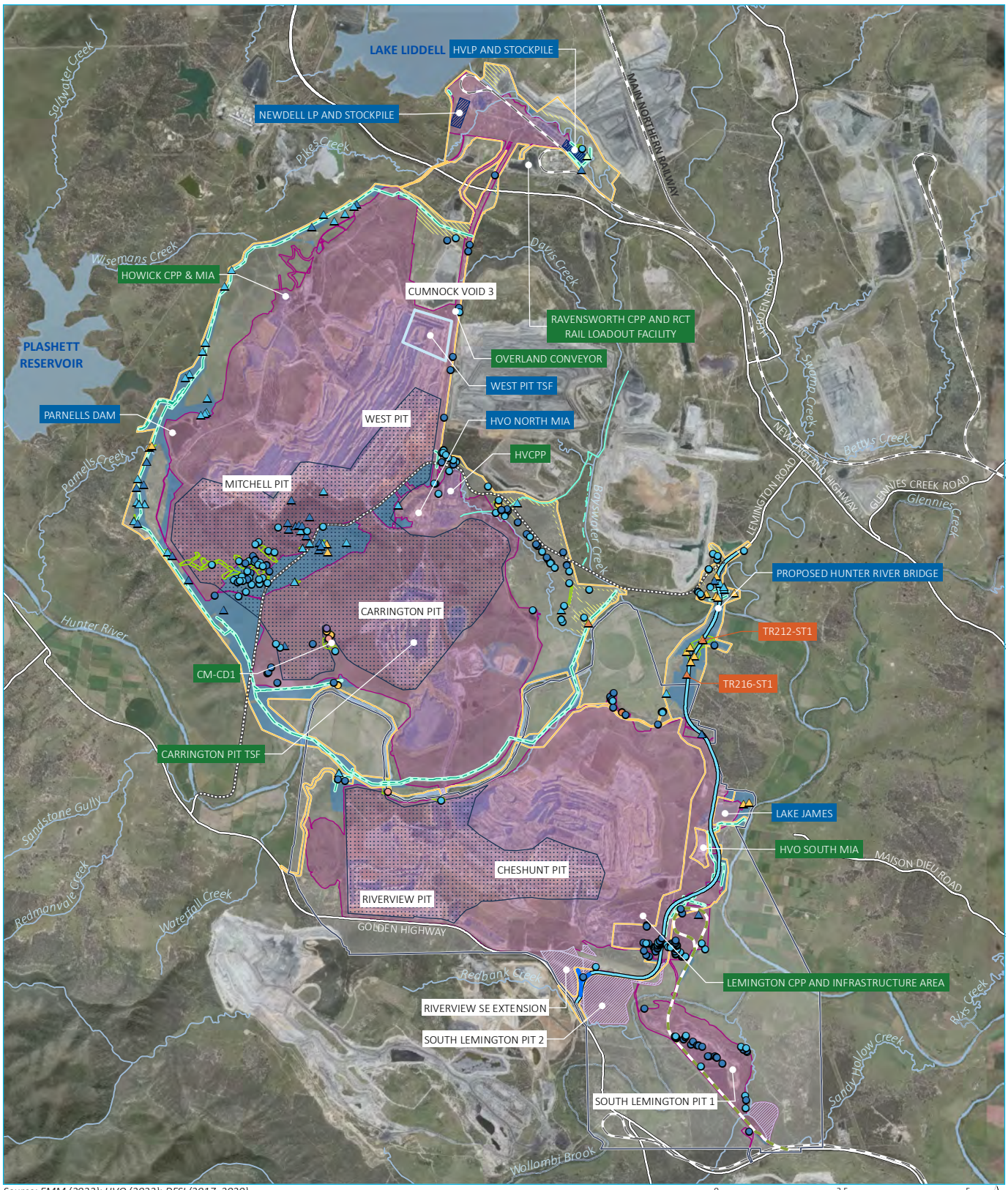



**Figure 15.6 Degree of Project impacts to Aboriginal sites by assessed scientific significance**




*Source: EMM (2022); HVO (2022); DFSI (2017, 2020)*

0 2.5 5 km

GDA2020 MGA Zone 56

N

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## KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Existing and approved disturbance area
- Previously approved area not retained
- Approved disturbance area - other mine
- Site extent

Previously recorded AHIMS site

- IsolatedFfind
- Open Artefact Scatter
- Open Artefact Scatter with PAD
- Possible Scarred Tree with Artefacts
- Potential Archaeological Deposit
- Scarred Tree

Previously undocumented Aboriginal Sites

- Isolated Find
- Isolated Find with PAD
- Open Artefact Scatter
- Open Artefact Scatter with PAD
- Scarred Tree

Proposed HVO Continuation Project elements

- Lemington Road realignment
- Indicative location of public road closure
- Haul route to Ravensworth Operations
- Transmission line relocation
- Alternative Golden Highway intersection
- Proposed mining area
- Product stockpile
- Additional disturbance area
- West Pit TSF

Existing HVO elements to be maintained

- South Lemington Rail Loop (approved, not yet constructed)

Existing environment

- Rail line
- Major road
- Ravensworth Operations access road
- Named watercourse
- Named waterbody

# Impact assessment summary - Aboriginal heritage sites

HVO Continuation Project
Environmental Impact Statement
Figure 15.7

EMM creating opportunities

## Table 15.5 Degree of harm by Project impact element and site type

| Impact element/site type | Additional disturbance area/approved disturbance area other mine | | | | | | Existing and approved disturbance area | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | HVO North | | | HVO South | | | HVO North | | | HVO South | | | |
| | None | Partial | Total | None | Partial | Total | None | Partial | Total | None | Partial | Total | |
| **No Impact** | | | | **1** | | | **26** | | | **27** | | | **54** |
| Isolated find | | | | | | | 9 | | | 9 | | | 18 |
| Open artefact scatter | | | | 1 | | | 16 | | | 18 | | | 35 |
| Possible scarred tree with artefacts | | | | | | | | 1 | | | | | 1 |
| Potential archaeological deposit | | | | | | | 1 | | | | | | 1 |
| **Mining** | | **2** | **31** | | **1** | **2** | **1** | **2** | **49** | **1** | | **32** | **123** |
| Isolated find | | | 10 | | | 1 | 1 | | 24 | | | 21 | 57 |
| Isolated find with PAD | | 1 | | | | | | | | | | | 1 |
| Open artefact scatter | | 1 | 19 | | 1 | 1 | | | 25 | | | 11 | 59 |
| Open artefact scatter with PAD | | | 2 | | | | | 2 | | | | | 4 |
| Possible scarred tree with artefacts | | | | | | | | 1 | | | | | 1 |
| Scarred tree | | | | | | | | | | 1 | | | 1 |
| **Infrastructure** | **25** | **30** | **50** | | **1** | **2** | **2** | **1** | **13** | | | **3** | **127** |
| Isolated find | 8 | | 24 | | | | 1 | | 6 | | | 2 | 41 |
| Open artefact scatter | 11 | 22 | 21 | | 1 | | 1 | 1 | 7 | | | 1 | 65 |
| Open artefact scatter with PAD | 4 | 7 | 4 | | | 2 | | | | | | | 17 |
| Potential archaeological deposit | | 1 | | | | | | | | | | | 1 |

## Table 15.5 Degree of harm by Project impact element and site type

| Impact element/site type | Additional disturbance area/approved disturbance area other mine | | | | | | Existing and approved disturbance area | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | HVO North | | | HVO South | | | HVO North | | | HVO South | | | |
| | None | Partial | Total | None | Partial | Total | None | Partial | Total | None | Partial | Total | |
| Scarred tree | 1 | | 2 | | | | | | | | | | 3 |
| **Total** | **24** | **32** | **82** | **1** | **2** | **4** | **29** | **5** | **62** | **28** | | **35** | **304** |

### 15.4.3 Measures to minimise harm and alternatives

In developing the design of the Project, HVO considered mining options, layouts, overburden emplacements and infrastructure arrangements to optimise the Project's final design in conjunction with constraints and efforts to reduce the impacts to cultural heritage.

Impact areas and Project aspects where particular consideration of minimising harm was part of the Project design, include the area around Site 37-2-1877 (CM-CD1), the Lemington Road realignment, ETL construction corridors and restricted access zones.

#### i AHIMS Site 37-2-1877 (CM-CD1)

As described in Section 15.2.4iv, results from OSL dating of CM-CD1 confirmed the site is of high scientific (archaeological) and cultural significance, dating to the early Holocene and late Pleistocene periods (10,000–12,000 years ago).

Once the high significance of this site was understood, HVO committed to continued avoidance of this site.

The aesthetic value of the cultural landscape in which CM-CD1 is located was also considered in defining the area to be excluded from mining operations, and in the development of the final landform. The area excluded from mining has been designed to maintain the contextual connection of CM-CD1, connecting the site to the Hunter River and surrounding floodplains (as shown on Figure 4.1 in Chapter 4). The final landform design has sought to recreate the current topographical context post-mining, including floodplain flats and hillslope landforms extending to the west to connect with the prominent Wandewoi ridgeline, which is adjacent to the south-west boundary of the Project area.

#### ii Lemington Road realignment

Following the identification of two Aboriginal scarred trees (TR212-ST1/AHIMS #37-3-1629 and TR216-ST1/AHIMS #37-3-1635) within the proposed realigned Lemington Road corridor, HVO commissioned an engineering study (WSP 2021) to review the road design and investigate options to avoid harm to these sites.

Due to an extremely constrained alignment as a result primarily of local topology and established biodiversity offset area in proximity of the items, avoidance of direct impacts to the two scarred trees was found not to be achievable.

A key outcome of consultation with RAPs was agreement that the culturally scarred portions of the two trees will be salvaged, with preference for long-term management of the salvaged portions involving keeping them near to their original location or at an established HVO/Glencore keeping place (eg Wollombi Brook Keeping Place).

#### iii ETL construction

Flexibility in the location of transmission towers and the span between towers means that harm to some of the Aboriginal sites within the proposed ETL construction corridors can be avoided. Of the 73 Aboriginal sites identified within proposed ETL corridors, harm to 33% (24 sites) has been avoided, including scarred tree TR178-ST1 and artefact scatters with PAD TR47-AS2 and AS3, and 37% (27 sites) will be only partially harmed.

#### iv Restricted access zones

HVO maintains its commitment to protecting Aboriginal sites within designated Restricted Access Zones in accordance with Schedule 3, Condition 40 of PA 06_0261 (HVO South). Restricted access zones protect 53 Aboriginal sites, HVO26-43, 47-58, 84-100, 102-104 and 107-109.

Possible scarred tree (HVO-44/AHIMS #37-6-3243) was previously included as an Aboriginal site within the restricted access zone. The tree has subsequently been assessed by a scarred tree specialist in consultation with RAPs and determined to not be of cultural origin. The site status in AHIMS has been updated to "not a site" and no further management is required.

## 15.5 Management, mitigation and monitoring

### 15.5.1 Archaeology

Proposed management for the 304 extant Aboriginal sites include:

- avoidance (active and passive) of 84 (28%) of Aboriginal sites;
- surface collection of 198 (65%) Aboriginal sites;
- surface collection and salvage excavation of 19 (6%) Aboriginal sites;
- salvage excavation only of one (<1%) Aboriginal sites; and
- salvage and relocation of the scarred portions of two (<1%) Aboriginal sites.

The mitigation measures detailed in Table 15.6 will be implemented for the Project.

**Table 15.6 Aboriginal cultural heritage archaeology mitigation measures**

| ID | Mitigation measures |
|---|---|
| ACH1 | Continue avoidance of the high scientific (archaeological) and cultural significance, Aboriginal cultural heritage site CM-CD1 (AHIMS Site 37-2-1877). |
| ACH2 | A consolidated Aboriginal Cultural Heritage Management Plan (including HVO North and HVO South) will be developed for the Project in consultation with RAPs and Heritage NSW. This will include:<br>• Mitigation and management measures for identified Aboriginal heritage sites.<br>• Unexpected finds protocols.<br>• Consultation. |
| ACH3 | The Aboriginal Cultural Heritage Management Plan will describe the management for the 304 extant Aboriginal sites including:<br>• avoidance (active and passive) of 84 (28%) of Aboriginal sites;<br>• surface collection of 198 (65%) Aboriginal sites;<br>• surface collection and salvage excavation of 19 (6%) Aboriginal sites;<br>• salvage excavation only of one (<1%) Aboriginal sites; and<br>salvage and relocation of the scarred portions of two (<1%) Aboriginal sites. |

### 15.5.2 Social mitigation

Discussions between HVO and RAPs, facilitated as part of the Aboriginal consultation process for the Project and the SIA, identified a number of initiatives across key Closing the Gap themes including health, education, business, finance, employment, culture, and community.

Table 15.7 details the initiatives that will be implemented for the Project.

**Table 15.7 Aboriginal cultural heritage social mitigation measures**

| ID | Mitigation measures |
|---|---|
| SOC2 | HVO will continue to administer the community grants programme which invests in programs, events and services that promote community cohesion, connectedness and support. |
| SOC3 | As part of the development of the SIMP, HVO will develop a funding framework to enable funding of programs and projects that align with Closing the Gap initiatives, including job readiness programs, assistance relating to tendering for work at HVO by Aboriginal suppliers, and a commitment of $1,000,000 over the first 10 years of the Project. These initiatives will be developed as part of the preparation of the SIMP, which will also outline the proposed implementation plan. |

## 15.6 Summary and conclusion

The Project area has been largely disturbed by a long history of mining and agricultural activities, that will have affected the survivability of cultural materials if present.

Extensive fieldwork has been carried out across the Project area with RAPs, comprising archaeological survey and test excavation programs, to determine the presence of Aboriginal sites within the Project disturbance area.

A total of 304 extant Aboriginal sites were identified within the Project disturbance area. Of these, 145 (138 at HVO North and 7 at HVO South) are in the additional disturbance area associated with the Project or approved disturbance areas associated with another mine that overlaps the Project, and 159 (96 at HVO North and 63 at HVO South) are in the existing and approved disturbance area.

In relation to the proposed management of identified sites, 84 (28%) will be avoided, 198 (65%) will be collected via surface collection, 19 (6%) will involve surface collection and salvage excavation, one (<1%) will be salvaged via salvage excavation only, and the scarred portions of two sites (<1%) ie scarred trees will be salvaged and relocated.

The majority (84%) of the extant sites identified were found to be of low scientific significance. Of the three sites of high significance, which were found at HVO North, one will continue to be avoided (CM-CD1) and two (scarred trees) will be salvaged.

Cultural values mapping of the Project area was also undertaken Dr Philip Clarke to inform the ACHA, in which all RAPs were invited to participate. No Aboriginal cultural values or places, beyond archaeological sites already identified by the ACHA, were identified within the Project Area as a result of this work.

The existing AHMP will be updated and consolidated in consultation with the RAPs and Heritage NSW, to guide the mitigation and management of sites in the Project area and to avoid inadvertent impacts.

# 16 Historic heritage

## 16.1 Introduction

This chapter provides a summary of the historic heritage assessment undertaken for the Project, with the full technical report contained in Appendix O. It describes the historic heritage context of the Project area, identifies relevant items listed on applicable statutory and non-statutory heritage databases and inventories, and assesses the potential impact of the Project on identified historic heritage items.

Historic heritage is the study of the past using documentary sources, and in Australia dates from 1788. Aboriginal cultural heritage is assessed separately in Chapter 15 of this EIS and in Appendix N.

The study area for this assessment comprises the Project disturbance area as well as a buffer of 2 km from the proposed mining area at HVO North and HVO South, as shown in Figure 16.1.

## 16.2 Existing environment

The Project area primarily comprises an active mining operation and includes previously mined and rehabilitated land, as well as current and former rural agricultural land. A search of heritage registers revealed that a small portion of the mapped area associated with a single locally listed heritage item, the *Archerfield Homestead and Outbuildings* (Archerfield), is within the study area, noting that the physical homestead and associated buildings the subject of the listing, are not. A small number of unlisted items with potential heritage significance occur within the study area. A summary of these heritage items is provided in Table 16.1 and shown on Figure 16.1.

There are also several listed and unlisted heritage items beyond 2 km but within 5 km of the proposed mining area for the Project. A summary of these heritage items is provided in Table 16.2 and shown on Figure 16.1. These items were considered in the blast impact assessment conducted for the Project (ESC 2022), which concluded that vibration levels will be well below the applicable criteria at these sites, and no additional blast management measures are required. These sites are therefore not considered further; however, are identified in Table 16.2.

It is also acknowledged that the State Heritage listed *Former Chain of Ponds (Inn and Outbuildings)* (Chain of Ponds Inn) is within the HVO North development consent boundary. The Chain of Ponds Inn is listed on the State Heritage Register (SHR) (No. 00242) and the Singleton LEP (Item No. I34). However, it is not located within the study area or Project disturbance area, or the existing and approved disturbance area at HVO. The Chain of Ponds Inn is managed by LCO in accordance with the conditions of its development consent (DA 305-11-01 as modified).

To inform the historic heritage impact assessment, a targeted site inspection was undertaken of known historic heritage sites identified in Table 16.1, excluding Archerfield. Inspections were undertaken on 17–18 June 2021. In addition to the items in Table 16.1, and as requested by the NSW Heritage Council in its assessment recommendations, the Chain of Ponds Inn was also inspected.

It is noted that except for the Chain of Ponds Inn and Archerfield, each of the sites inspected are not listed on a gazetted register.

## Table 16.1 Summary of items with historic heritage values within the study area

| Item name | Listing no. | Address | Significance | Easting (GDA2020 MGA56) | Northing (GDA2020 MGA56) |
|---|---|---|---|---|---|
| **Listed heritage items** | | | | | |
| Portion of the mapped area of *Archerfield Homestead and Outbuildings* | Singleton LEP Item No. I141 | Archerfield Road, Warkworth, NSW 2330 | Local | 317297 | 6402223 |
| **Un-listed heritage items** | | | | | |
| Dog Leg Fence | Not listed on a gazetted register | Jerry Plains Road, Warkworth, NSW 2330 | Assessed significance – State | 309733 | 6397328 |
| Oaklands Homestead and associated structures | Not listed on a gazetted register | Lemington Road, Ravensworth, NSW 2330 | Assessed significance – local | 313698 | 6403934 |
| Warkworth Airstrip/ WWII Airfield | Not listed on a gazetted register | Comleroi Road, Warkworth, NSW 2330 | Assessed significance – local | 314234 | 6397109 |
| Carrington Homestead | Not listed on a gazetted register | Jerry Plains Road, Warkworth, NSW 2330 | Assessed significance – local | 308515 | 6401346 |
| Great Lodge | Not listed on a gazetted register | Jerry Plains Road, Warkworth, NSW 2330 | Assessed significance – local | 309455 | 6402096 |
| Wandewoi Homestead | Not listed on a gazetted register | Lemington Road, Lemington, NSW 2330 | Assessed significance – local | 306966 | 6402071 |
| Remnant foundations | Not listed on a gazetted register (identified by EMM) | off The Mitchell Line, Howick, NSW 2330 (Lot 101 DP752468 | Assessed significance – local | 306825 | 6410492 |
| Remnant stockyards | Not listed on a gazetted register (identified by EMM) | Lemington Road, Lemington, NSW 2330 (Lot 2 DP1193186) | Assessed significance – local contributory | 312186 | 6406083 |

## Table 16.2 Summary of items with historic heritage values between 2 km and 5 km of the proposed mining area

| Item name | Listing no. | Address | Significance | Easting (GDA2020 MGA56) | Northing (GDA2020 MGA56) |
|---|---|---|---|---|---|
| **Listed heritage items** | | | | | |
| Wambo Homestead and Outbuildings | SHR Listing No. 00200<br>Singleton LEP Item No. I144 | Off the Golden Highway, Lot 82, DP 548749 | State | 311481 | 6392711 |
| Former Queen Victoria Inn – (ruins) Archaeological site | Singleton LEP Item No. A6 | Jerrys Plains Road, Warkworth Lot 1, DP 770904 | Local | 314849 | 6394561 |
| Jerrys Plains Public School | Singleton LEP Item No. I25 | 27–31 Doyle Street, Jerrys Plains | Local | 303257 | 6402539 |
| Jerrys Plains Police Station | Singleton LEP Item No. I26 | 26–30 Doyle Street, Jerrys Plains | Local | 303345 | 6402637 |
| Jerrys Plains Post office and store | Singleton LEP Item No. I27 | 13 Pagan Street, Jerrys Plains | Local | 303578 | 6402539 |
| St James' Anglican Church | Singleton LEP Item No. I28 | 27–31 Pagan Street, Jerrys Plains | Local | 303425 | 6402699 |
| Jerrys Plains Catholic Church | Singleton LEP Item No. I29 | 45–47 Pagan Street, Jerrys Plains | Local | 303265 | 6402865 |
| Old Anglican cemetery | Singleton LEP Item No. I30 | The Golden Highway, Jerrys Plains | Local | 304752 | 6401721 |
| St Phillips Church, Warkworth | Singleton LEP Item No. I143 | Off High Road, Warkworth Part Lot 21, DP 755267 | Local | 314841 | 6394259 |
| Jerrys Plains Conservation Area | Singleton LEP conservation area 'C1' | N/A | Local | 303440 | 6402728 |
| **Un-listed heritage items** | | | | | |
| Greenleek Homestead | Not listed on a gazetted register | Jerrys Plains Road, Warkworth, NSW 2330 | Assessed significance – Local | 318051 | 6396001 |
| Montrose Property | Not listed on a gazetted register | Golden Highway | Assessed Local Significance (Umwelt, 2016) | 307106 | 6399174 |

**Table 16.2 Summary of items with historic heritage values between 2 km and 5 km of the proposed mining area**

| Item name | Listing no. | Address | Significance | Easting (GDA2020 MGA56) | Northing (GDA2020 MGA56) |
|---|---|---|---|---|---|
| Piggery and Butcher's Hut | Not listed on a gazetted register | Warkworth | Assessed Local Significance (Umwelt, 2016) | 314410 | 6393922 |
| Springwood | Not listed on a gazetted register | Warkworth | Assessed Local Significance (Umwelt, 2016) | 314410 | 6393922 |
| Former Warkworth public school | Not listed on a gazetted register | Warkworth | Assessed Local Significance (Umwelt, 2016) | 314356.24 | 6394899 |




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*Source: EMM (2022); HVO (2022); DFSI (2017); DPE (2017)*

0 2.5 5 km

GDA2020 MGA Zone 56

N

## KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Study area
- Proposed mining area
- Project disturbance area
- Proposed mining area 2 km radius
- Proposed mining area 5 km radius

Historic heritage item

- Listed item - Singleton LEP (local significance)
- Listed item - State Heritage Register (state significance)
- Unlisted heritage item

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

# Historic heritage items and study area

HVO Continuation Project
Environmental Impact Assessment
Figure 16.1

EMM creating opportunities

## 16.3 Statement of significance

Table 16.3 provides a summary of the statement of significance for the heritage items located within the study area.

**Table 16.3 Statement of significance**

| Item | Statement of significance | Significance |
|---|---|---|
| Former Chain of Ponds (Inn and Outbuildings)<br>Listed on the SHR | The Chain of Ponds Inn is important for its ability to reveal information in the context of physical, historical, and archaeological significance.<br>The significance of the place can further be divided into its level of importance at a State and local level.<br>At a State level, the Chain of Ponds Inn is important for its ability to demonstrate the travelling habits and the wayside coaching industry of the mid-nineteenth century prior to the introduction of the railway. It is also important for its ability to provide evidence of the difficulties of moving criminals by road and the need for secure places for resting during the journey.<br>Archaeologically, the site is significant for its ability to provide further information relevant to the role and use of mid-nineteenth century coaching inns in rural NSW. This, along with evidence gathered from other surviving wayside inns, could help to provide more detailed historical evidence about this long obsolete industry. The Inn buildings are also important as exemplifying the key characteristics of a sophisticated 1840s wayside inn.<br>At a local level, the Inn is significant due to its association with Henry Nowland, its ability to demonstrate the Old Colonial Style and as a rare surviving example of a wayside inn on the Great Northern Road (ERM 2008, p. 49). | State |
| Archerfield and outbuildings<br>Listed on the Singleton LEP | The Archerfield homestead and outbuildings possess historic significance at the local level. They are located within landholdings made to the Bowman family between 1837 and 1843. George Bowman held several land grants within the area including Archerfield (1825), Arrowfield (1824), and Strowan (c1820s). The Bowmans are known to have reared sheep, cattle, and horses.<br>Whilst the original homestead is known to have burnt down and replaced by existing federations style homestead, believed to be constructed in c1930's, the outbuildings and remaining historical farm equipment provide an insight to the daily operation of an agricultural enterprise during mid nineteenth century. Providing both potential archaeological and architectural research potential. | Local |
| Dog Leg Fence<br>Not listed on a gazetted register | General evidence of rural fences may provide information about how the landscape was used and changed during its use as pastoral land. However, in general, as individual items they have little research potential beyond the immediate physical presence of their type.<br>Although the condition of the Dog Leg Fence has been assessed as being poor, it is a unique example of the former private and government Dog Leg fences once common across NSW and could be seen as an important icon in Australian history. Its physical presence within the proposal boundary provides an opportunity to study better understand this form of early fence.<br>As such, the Dog Leg Fence is of State significance as it is a unique example of a rare and endangered type of fence. Only one other example of a Dog Leg fence, at Mt Trooper south of Ingebyra NSW, is known to have been recorded. The Dog Leg Fence at Mt Trooper does not have the unique stone supporting blocks of the fence discussed in this report (Pickard 2009, p. 45). | State |

## Table 16.3 Statement of significance

| Item | Statement of significance | Significance |
|---|---|---|
| Oaklands Homestead and associated structures | The Oaklands Homestead and associated structures possess historic and aesthetic significance at the local level as a good example of a vernacular weatherboard style residence constructed in the mid 1800's.<br>Alexander Bowman settled Oaklands (son of the George Bowman) in the mid 1800's utilising the property to bred and train a number of successful race horses. Alexander Bowman acquired large tracts of land in the Ravensworth locality largely neighbouring his father property Archerfield, prior to selling Oaklands in the late 1800's.<br>The residence may hold social significance at the local level for descendants of the Bowman family, as well as local residents, interested in local history. The property is likely to possess associative local significance noting that Alexander Bowman resided at the property for several years. As such, it is expected that archaeological resources may be present at the site. | Local |
| Warkworth Airstrip/ WWII Airfield<br>Not listed on a gazetted register. | The Warkworth Airstrip/WWII Airfield has historic significance as one of three dispersal grounds attached to Bulga Aerodrome, the others being located at Stowan and Broke. Bulga was one of three 'parent aerodromes' in the Newcastle-Singleton region identified by the 73 Squadron Plan of 1942. Collectively, this system of aerodromes and dispersal grounds demonstrate the Australian response to the threat of Japanese attach during the early stages of the Pacific War when the attack on Pearl Harbour, the fall of Singapore and the bombing of Darwin made the prospect of Japanese attack on the industrial areas of the east coast of Australia imminent.<br>The difference between the initial plans and the work realised on the site demonstrates a range of aspects of the prosecution of the war including; the difficulties encountered by a massive increase in public works placing a stain on a wide range of resources; the time taken by a bureaucracy to plan and activate works even when deemed to be of the utmost urgency; and the rapidity with which priorities change as war progresses.<br>This significance lies solely in records. With the exception of the airstrip, there are no remaining World War II period structures at Warkworth.<br>Arising out of this significance, Warkworth Aerodrome does not warrant listing as an item of cultural significance (Weir & Phillips 2007). | Local |
| Carrington Homestead<br>Not listed on a gazetted register. | The Carrington Homestead possesses historic and aesthetic significance at the local level as a good example of an Inter-War Georgian Revival style residence constructed during the 1920s. The place is associated with a succession of horse breeding entities including the White family, Foyster Brothers, and Ingham family.<br>The property falls within an original land grant made to Richard Hobden during the 1820s. Hobden is known to have been a prominent pastoralist within the region. If archaeological resources were to be present within the site relating to occupation ranging from the 1820s, to the mid-twentieth century, they may reveal information regarding the lifeways of local residents within the region. | Local |

## Table 16.3 Statement of significance

| Item | Statement of significance | Significance |
|---|---|---|
| Great Lodge<br>Not listed on a gazetted register. | The Great Lodge possesses historic, associative, and aesthetic significance at the local level, but potentially at the State level, as an original 1820s timber cottage constructed by Richard Hobden, a prominent pastoralist during the first decade of settlement within the Hunter Valley region. The residence was constructed by letting split logs into the ground and filling inner gaps with mud and pebbles. This was smoothed over, papered, and whitewashed. The floors were timber, with timber roof shingles cut from trees on the property.<br>The residence may hold social significance at the local level for descendants of the Hobden family, as well as local residents, interested in local history. The property is likely to possess research potential at a State level of significance, revealing information regarding 1820s building techniques. In addition, the Hobden family are known to have resided at the property for several years. As such, it is expected that archaeological resources may be present at the site.<br>The Great Lodge is considered rare within the Hunter Valley and wider NSW, the structure is a good representative example of structures built during this period, providing information regarding lifeways of local Hunter Valley residents. It is likely to meet criteria for rarity (F) and representativeness (G) at a State level. | State (potential) |
| Greenleek Homestead<br>Not listed on a gazetted register. | The Greenleek Homestead maintains historic, associative, and aesthetic significance at the local level as a good example of a Federation cottage, constructed upon the original land grant made to Joseph Brown in 1826. The residence may hold social significance for descendants of the Brown family, and local residents within the wider region.<br>The homestead may hold research potential as although it is thought to have been constructed between 1890–1915, the Brown family are known to have resided on the property from the c1830s. As such, there may be archaeological evidence of a former residence, along with undocumented structural resources and subsurface features at the site. Archaeological resources of this nature may provide information relating to construction techniques and lifeways of local residents with the Hunter Valley during the nineteenth century. | Local |
| Remnant foundations<br>Not listed on a gazetted register. | The remnant historic foundations maintain historic significance at the local level as remnants of a structure built within the original land grant made to John Sheppard. The land holding remained within the Sheppard family until being sold to Novacaol Australia Pty and Mitsubishi Development Pty Ltd in 1964.<br>If substantial archaeological resources were uncovered, they are likely to reveal information regarding the Sheppard family occupation of the site, providing evidence of nineteenth century lifeways. | Local (if relics survive) |
| Wandewoi Homestead<br>Not listed on a gazetted register. | The Wandewoi Homestead possesses historic, associative, and aesthetic significance at the local level as an Inter-War Mediterranean style residence constructed during the 1930s by the Moses family, successful horse breeders at Arrowfield Stud (present-day Coolmore). The residence occupies a prominent position within the surrounding landscape. | Local |
| Remnant stockyards<br>Not listed on a gazetted register. | The remnant stockyards possess historic significance at the local level. They are located within land holdings made to the Bowman family between 1837 and 1843. George Bowman held several land grants within the area including Archerfield (1825), Arrowfield (1824), and Strowan (c1820s). The Bowmans are known to have reared sheep, cattle, and horses. The area was gazetted as State Coal Mine Reserve in 1964. It is likely that the stockyards were constructed during the mid-twentieth century.<br>The remnant stockyards may reveal information regarding fence construction techniques, whilst revealing evidence of lifeways and agricultural activities within the local area and wider region. | Local contributory |

## 16.4 Impact assessment

The potential impacts of the Project can be characterised into three main types:

- Direct (physical) impacts are those impacts that will materially affect the features and sites that are present within the Project disturbance area whether they were found or if they are unanticipated.
- Indirect (visual) impacts are those impacts that will affect the views and the setting of the cultural landscape and nearby built items within the Project disturbance area and surrounds.
- Potential direct (vibration and flyrock) impacts are those that may materially affect the features and sites present within the Project disturbance area.

The potential impacts of the Project on the heritage items identified in the study area (and outlined in Section 16.2), are summarised in Table 16.4.

**Table 16.4 Summary of heritage impacts**

| Heritage item | Direct (physical) impact | Indirect (visual) impact | Potential direct (vibration and flyrock) | Archaeological Impacts |
|---|---|---|---|---|
| Former Chain of Ponds (Inn and Outbuildings) | Nil | Nil | Nil | Nil |
| Archerfield and outbuildings | Nil | Nil | Nil | Nil |
| Dog Leg Fence | Nil | Nil | Nil | Nil |
| Oaklands Homestead and associated structures | Nil | Minor | Nil | Nil |
| Warkworth Airstrip/WWII Airfield | Nil | Nil | Nil | Nil |
| Carrington Homestead | Nil | Minor | Nil | Nil |
| Great Lodge | Nil | Nil | Nil | Nil |
| Wandewoi Homestead | Nil | Nil | Nil | Nil |
| Remnant foundations | Nil | Nil | Nil | Nil |
| Remnant stockyards | Total | N/A | N/A | N/A |

Impacts to known heritage items expected to be experienced through construction and operational activities associated with the Project are therefore as follows:

- At HVO North, direct impacts will occur to the remnant stockyards (ungazetted item of local significance), which are within the Project disturbance area associated with the proposed internal haul road from HVO to Ravensworth Operations. Minor indirect impacts (visual amenity related) will occur at the Oaklands Homestead and associated structures relating to transmission lines.
- At HVO South, a minor visual impact on the view from the Carrington Homestead will occur relating to transmission lines, noting that existing transmission lines are currently visible from the homestead.
- No impacts will occur to the remainder of the identified historic heritage items within the study area.

Unlisted remnant foundations are also located within the study area and the Project disturbance area at HVO North; however, appropriate sighting of the transmission line infrastructure and access tracks will ensure no direct impact to this heritage item.

It is also noted that the proposed realignment of Lemington Road intersects a portion of the area mapped as part of Archerfield Homestead and Outbuildings. However, no known physical items of heritage significance associated with the Archerfield Homestead and Outbuildings are within the Lemington Road realignment area where it intersects the mapped area. The realigned road corridor is approximately 1,500 m from the existing homestead and outbuildings at its closest point, and no impacts on the buildings are predicted as a result of the Project.

## 16.5 Management, mitigation and monitoring

The mitigation measures detailed in Table 16.5 will be implemented for the Project to avoid, mitigate and mange impacts to historic heritage items in the study area.

**Table 16.5 Historic heritage mitigation measures**

| ID | Mitigation measures |
|---|---|
| HH1 | A historic heritage management plan (HHMP) will be prepared for the Project, which will include the historic heritage items identified in the historic heritage study area, and will include:<br>• a description of the condition and significance assessment of identified items;<br>• management measures and guidelines for the protection and conservation of each item; and<br>• an unanticipated finds protocol. |
| HH2 | Archival recording in the form of digital photography will be undertaken to capture the pre-development state prior to disturbance of the remnant stockyards and remnant foundations at HVO North. |
| HH3 | Realigned transmission line structures will be sited so that no direct impacts occur to the remnant foundations identified at HVO North (as described in Appendix O). |
| HH4 | An assessment of significance will be prepared for the Great Lodge at HVO South. |

## 16.6 Summary and conclusion

A number of heritage items are within the existing and proposed development consent boundaries for the Project. Notably however, mining activities will not occur closer to identified heritage items to that previously occurred or as currently approved.

At HVO North:

- One unlisted item assessed as having local contributory significance will be directly impacted by the Project at HVO North, being the remnant stockyards. Mitigation measures comprising archival recording are proposed for this item. No other historic heritage item will be directly impacted by the Project.
- Unlisted remnant foundations are also located within the Project disturbance area at HVO North; however, appropriate siting of transmission line infrastructure and access tracks proposed in the vicinity of these foundations will ensure no direct impacts to this heritage item.
- While the proposed realigned Lemington Road corridor at HVO North intersects with a portion of the mapped area related to the locally listed Archerfield Homestead and Outbuildings, no physical items of heritage significance associated with the Archerfield Homestead and Outbuildings are within the Lemington Road alignment, and no direct impacts will occur.

- The introduction of a new electricity transmission line directly south of the Oaklands Homestead and Associated Structures will introduce new visual elements in the immediate view lines of the heritage item, ultimately adding an additional element to the existing setting. It is considered that this new element will be readily absorbed into the visual landscape.

- The State listed Chain of Ponds Inn is within the HVO North existing and proposed development consent boundary. However, this item is outside of the existing and approved disturbance area associated with HVO and the additional disturbance area for the Project. It is also more than 5 km from the proposed mining area associated with the Project. Therefore, Project related impacts are not predicted to occur to the Chain of Ponds Inn, which is also adjacent to, and managed by, LCO in accordance with the conditions of its development consent (DA 305-11-01, as modified).

At HVO South:

- No historic heritage items will be directly impacted by the Project.

- The Dog Leg Fence, an ungazetted item but assessed as potential State significance, is located within the HVO South proposed development consent boundary; however, it is not within the Project disturbance area. No direct impacts will occur due to the Project and blasting activities are not proposed to occur any closer then currently approved.

- The Great Lodge, an ungazetted item but assessed as potentially State significant, has been identified within the HVO South proposed development consent boundary; however, it is outside of the Project disturbance area. No direct impacts will therefore occur because of the Project, and the blasting assessment found that potential impacts to the Great Lodge can be managed effectively via appropriate blast design. Given the nature of the item's condition, monitoring and further assessment to determine significance will be undertaken.

- A minor visual impact on the view from the Carrington Homestead will occur relating to transmission lines, noting that existing transmission lines are currently visible from the homestead.

A HHMP will be prepared which will outline the measures committed to effectively avoid, mitigate and manage impacts to know historic heritage items identified in Table 16.1 as a result of the Project.

# 17 Soil and land resources

## 17.1 Introduction

A soils and land impact assessment (SLIA) was prepared for the Project and is attached as Appendix P. The SLIA satisfies the requirements of the SEARs which requested an assessment of the likely impacts of the Project on soil and land capability. The SLIA also provides an assessment of the potential for acid sulphate soils, as requested by BCS, and identifies best practice mitigation measures and strategies, as requested by the EPA.

An assessment of the impacts to agriculture, and rehabilitation and closure, can be found in Chapter 18 and Chapter 21, respectively.

The Study Area for the SLIA has been defined by identifying areas that will be re-disturbed throughout the Project life and the additional disturbance area associated with the Project, excluding infrastructure areas where soil will not be stripped (eg transmission line easements and road corridors) and areas approved for disturbance under current development consents that apply to other neighbouring mines (Ravensworth Operations, United Wambo and Liddell Coal Operations).

The Study Area for the SLIA covers a total area of 6,777 ha (refer to Figure 17.1) and is comprised of:

- Undisturbed areas – land that has not been disturbed by mining activity. This includes areas approved for disturbance, as well as areas that are not currently approved to be disturbed.
- Current disturbance – land already disturbed due to mining activity at the commencement of the Project.
- Current rehabilitation – land rehabilitated following previous mining activity at the commencement of the Project.

## 17.2 Existing environment

### 17.2.1 Climate

The regional climate of the Project area is characterised by hot summers and mild dry winters. Temperatures range from a maximum average of 32.1°C in January, down to a minimum average of 4.3°C in July and August (Singleton STP Bureau of Meteorology (BOM) station No. 061397, 2022).

The annual rainfall averages 656 mm, while the annual evaporation is 1,544 mm. Evaporation exceeds rainfall throughout the year and a soil moisture deficit is likely (especially in the summer months).

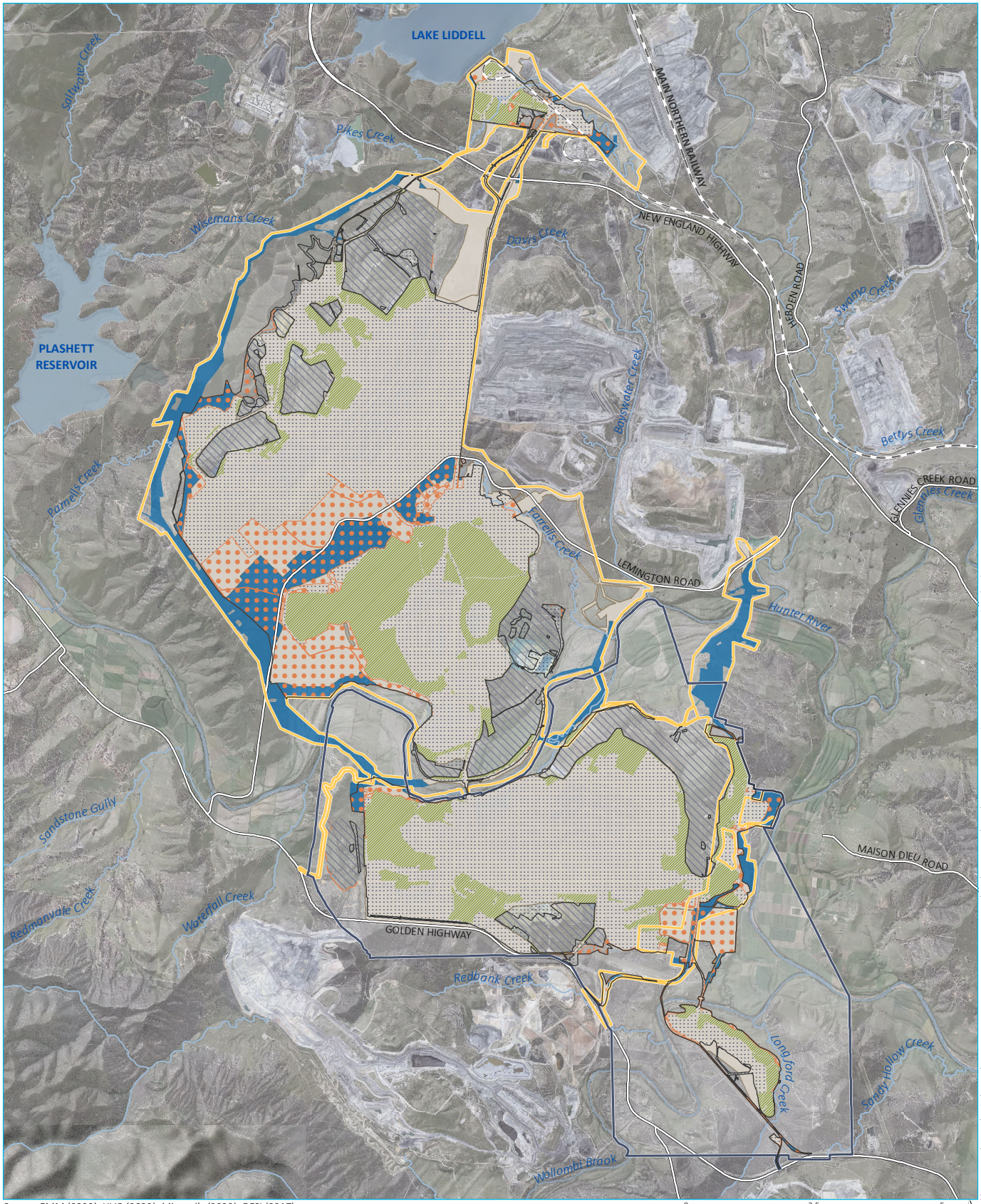
### 17.2.2 Land use

Land use within the Study Area consists of mining activity for current disturbance areas, with some low intensity cattle grazing on current rehabilitation areas. Undisturbed areas are largely cleared for agriculture, with some areas subject to cattle grazing activities.

### 17.2.3 Geology topography and slope

The Project area is within the Sydney Basin which formed in the Late Carboniferous – Early Permian due to igneous rifting and crustal thinning, which resulted in the deposition of Permian and Triassic aged sedimentary sequences. HVO extracts coal seams within the Permian aged Jerrys Plains Subgroup of the Hunter Coalfields. The Jerrys Plains Subgroup comprise coal seams, along with overburden and interburden consisting of sandstone, siltstone, tuffaceous mudstone and conglomerate.

The topography of the Project area is characterised by an undulating hillslope, gently sloping alluvial plains associated with stream floodplains and large areas of manmade disturbance to the natural topography due to coal mining. Natural local relief typically ranges from 60–150 mAHD, and down to approximately 50 mAHD along the Hunter River. Within the Study Area, slope on rehabilitated areas and previously undisturbed areas alike ranges from very gently undulating to steep, with significant expanses greater than 10% slope (refer to Figure 17.2). Elevation of emplacement areas are up to approximately 240 mAHD and pit voids extend down to depths of approximately -130 mAHD (refer to Figure 17.3).




Source: EMM (2022); HVO (2022); Minesoils (2022); DFSI (2017)

0 2.5 5 km

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## KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Area of redisturbance
- Additional disturbance area
- Soil study area
- Current disturbance
- Current rehabilitation
- Rehabilitated area not subject to the Project
- Undisturbed area within approved disturbance area

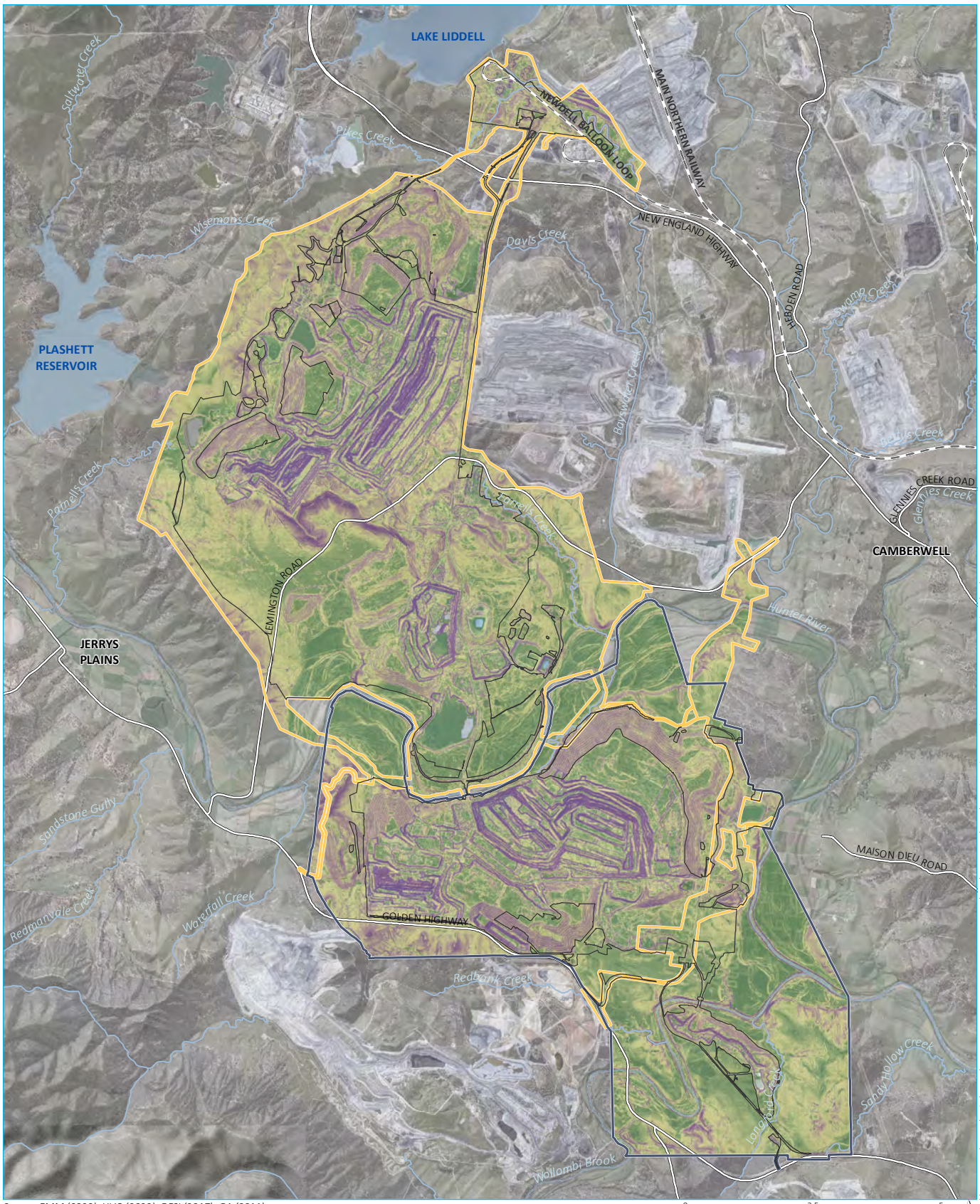
Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

# Soils and land impact assessment study area

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Environmental Impact Statement
Figure 17.1

EMM
creating opportunities




*Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011)*

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N

## KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Soil study area

Slope (%)

- 0 - 1
- 1 - 3
- 3 - 5
- 5 - 10
- 10 - 18
- 18 - 32
- > 32

Existing environment

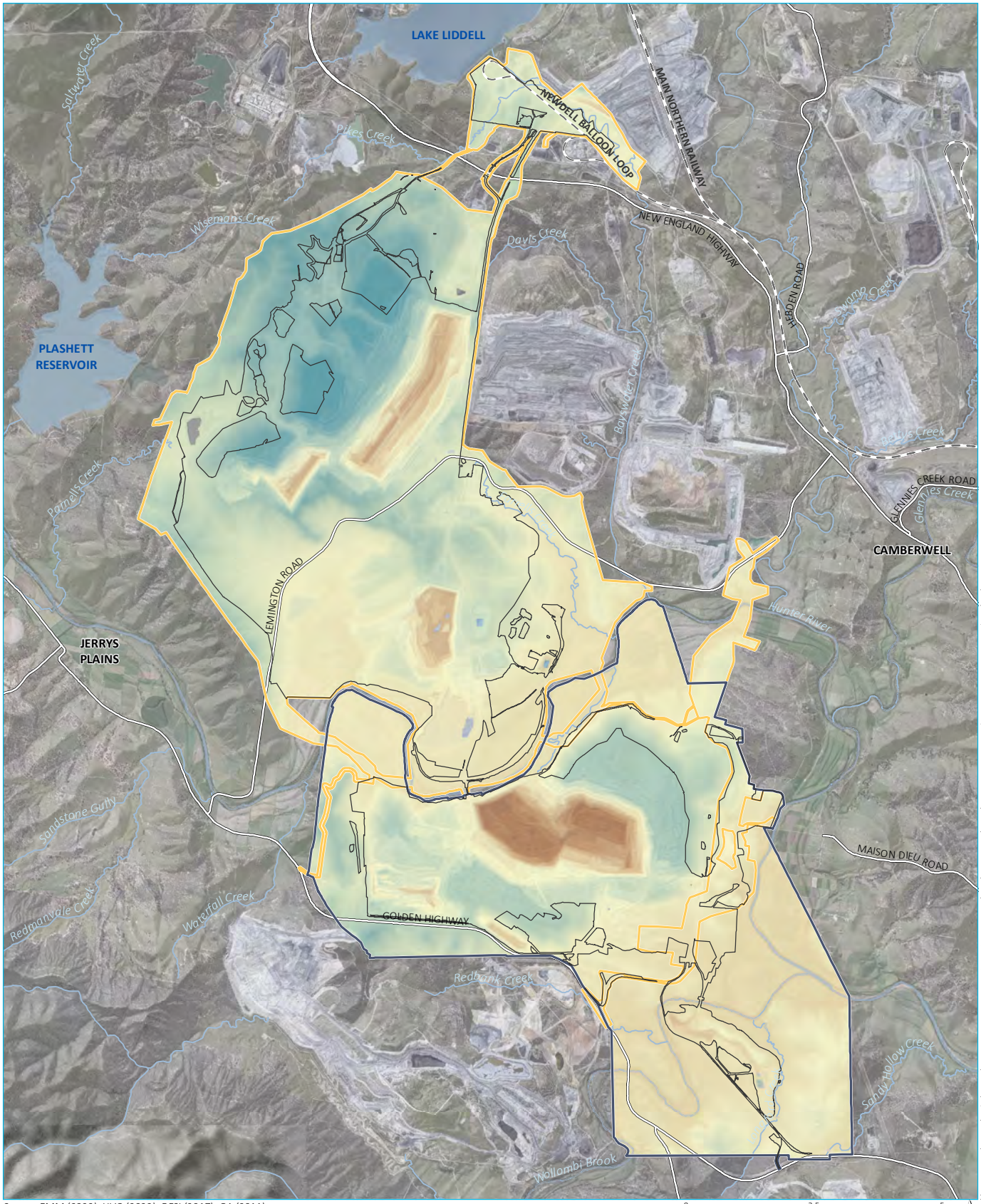
- Rail line
- Major road
- Named watercourse
- Named waterbody

# Slope analysis

HVO Continuation Project
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Figure 17.2

EMM creating opportunities

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*Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011)*

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## KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Soil study area

Elevation (m)

236

-115

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

# Topography

HVO Continuation Project
Environmental Impact Statement
Figure 17.3

EMM
creating opportunities

### 17.2.4 Soil landscapes

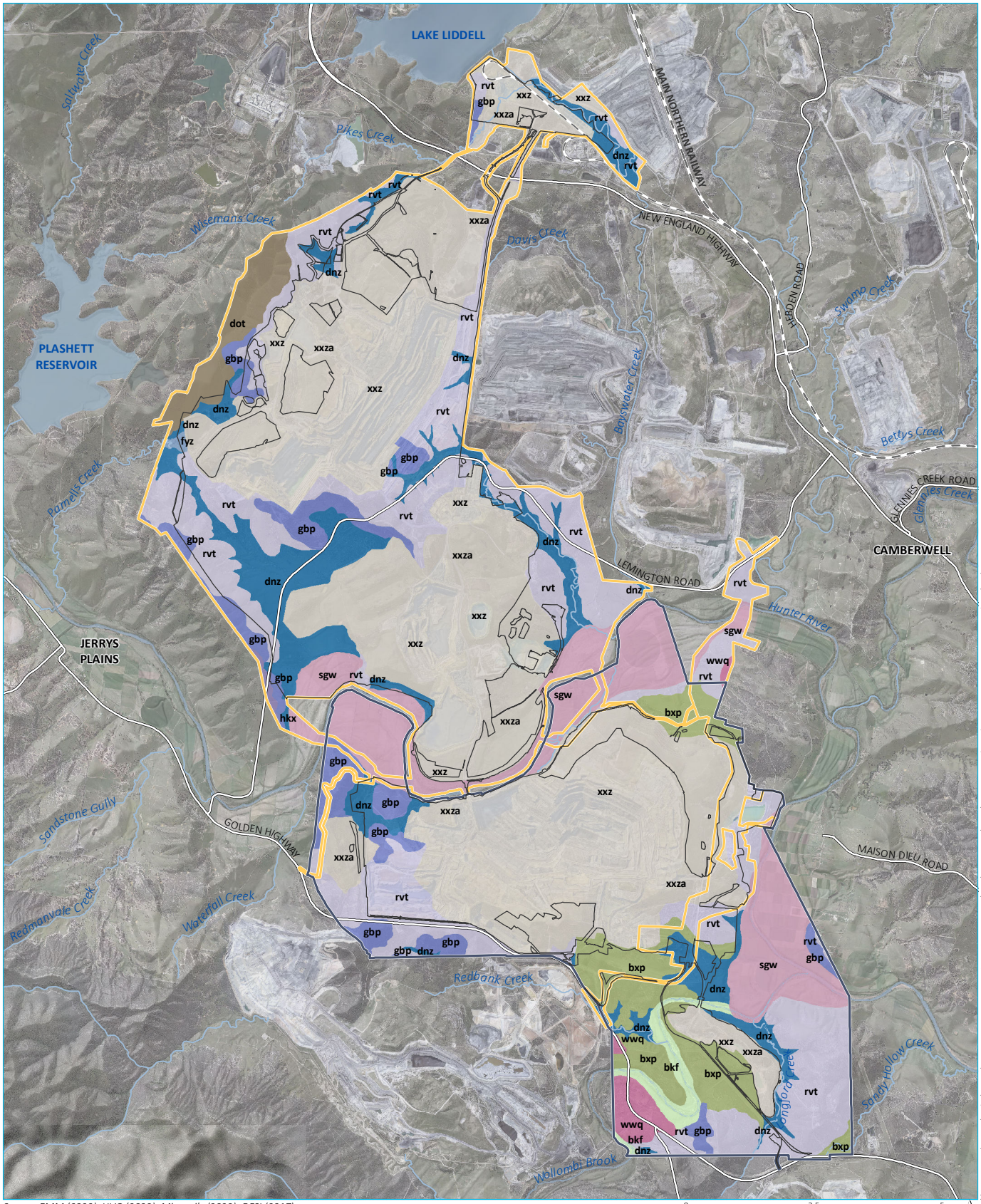
The soil landscapes that occur within the undisturbed components of the Study Area are described in Table 17.1 and shown on Figure 17.4.

**Table 17.1 Soil landscapes**

| Soil landscape | Landscape characterisation | Soils | Qualities and limitations |
|---|---|---|---|
| Donalds Gully | • Slopes: 1–5%<br>• Local relief; <30 m<br>• Elevation: 250–510 m<br>• Extensively cleared woodland and open woodland | • Brown, Yellow and Grey Sodosols and Natric Kurosols (Solodic Soils and Soloths)<br>• Chromosols (Grey Brown and Yellow Podzolic Soils and Non-calcic Brown Soils)<br>• Red Dermosols and Chromosols (Red Brown Earths)<br>• Hypocalcic Calcarosols (Terra Rossa Soils)<br>• Red and Brown Vertosols (Red and Brown Clays)<br>• Black Dermosols (Redzinas and Prairie Soils) | • Localised foundation hazard, productive arable land, recharge zone, discharge zone, salinity hazard, gully erosion hazard, poor drainage, flood hazard.<br>• Widespread sheet erosion hazard, high run-on, seasonal waterlogging. |
| Ravensworth | • Slopes: 3–10% (locally to 20%)<br>• Local relief: 20–90 m<br>• Elevation: 30 - 280 m<br>• Extensively cleared woodlands and open woodland<br>• Areas of widespread land degradation present | • Red, Brown and Yellow Kurosols (Red and Yellow Podzolic Soils)<br>• Chromosols (Red Brown Earths and Non-calcic Brown Soils) | • Localised foundation hazard, discharge zone, salinity hazard, gully erosion hazard.<br>• Widespread recharge zone, complex soils, sheet erosion hazard |
| Singleton | • Slopes: <3%<br>• Local relief: <10 m<br>• Elevation: 10–200 m<br>• Extensively cleared woodland, dominated by improved pastures | • Brown and Black Dermosols (Prairie Soils and Chernozems)<br>• Red and Brown Kandosols (Red Earths and Brown Earths)<br>• Haplic Epipedal Black Vertosols (Black Earths)<br>• Red Chromosols (Red Podzolic Soils and Red Soloths)<br>• Stratic Rudosols (Alluvial Soils) | • Localised complex soils, non-cohesive soils, wind erosion hazard, gully erosion hazard, sheet erosion hazard, high run-on, poor drainage, permanently high watertables, permanent waterlogging, seasonal waterlogging.<br>• Widespread foundation hazard, productive arable land, recharge zone, streambank erosion hazard, widespread flood hazard. |

## Table 17.1 Soil landscapes

| Soil landscape | Landscape characterisation | Soils | Qualities and limitations |
|---|---|---|---|
| Branxton | • Slopes: 1–5%<br>• Local relief: 20–50 m<br>• Elevation: 40–130 m<br>• Partial to extensively cleared woodlands for viticulture and grazing on native pastures | • Red, Brown and Yellow Kurosols (Red and Yellow Podzolic Soils)<br>• Brown and Yellow Sodosols (Solodic Soils)<br>• Grey and Yellow Sodosols (Grey and Yellow Solodic Soils)<br>• Black and Grey Kurosols (Grey and Brown Podzolic Soils) | • Localised foundation hazard, discharge zone, salinity hazard, gully erosion hazard, sheet erosion hazard, high run-on, poor drainage, seasonal waterlogging.<br>• Widespread recharge zone. |
| Foy Brook | • Slopes: 0–3%<br>• Local relief: <5 m<br>• Elevation: 30–330 m<br>• Extensively cleared riparian forests | • Brown Kandosols (Brown Earths and Alluvial Soils)<br>• Brown Dermosols (Brown Earths)<br>• Brown Dermosols and Kandosols (Brown Earths)<br>• Brown Sodosols (Solodic Soils)<br>• Brown Kurosols (Yellow Podzolic Soils) | • Localised non-cohesive soils, foundation hazard, discharge zone, poor drainage, seasonal waterlogging, flood hazard.<br>• Widespread streambank erosion hazard, high run-on, recharge zone. |
| Dochra | • Slopes: 5–10% (occasionally up to 15%)<br>• Local relief: 30–70 m<br>• Elevation: 40–170 m<br>• Includes areas of made land (rehabilitated mine spoil)<br>• Extensively cleared open forest | • Eutrophic Subnatric Brown Sodosols (Solodic Soils)<br>• Acidic-Sodic Magnesic Brown Dermosols (Soloths)<br>• Eutrophic Subnatric Red and Brown Sodosols (Solodic Soils)<br>• Haplic Natric Red Kurosols (Soloths) | • Localised complex soils, mass movement hazard, foundation hazard, complex terrain, recharge zone, discharge zone, salinity hazard, streambank erosion hazard, high run-on, poor drainage, seasonal waterlogging.<br>• Widespread gully erosion hazard, sheet erosion hazard. |
| Granbalang | • Slopes: 10–20% (locally to 32%)<br>• Local relief: 30–120 m<br>• Elevation: 30–350 m<br>• Partially cleared woodlands and open woodlands<br>• Contains extensive areas of land degradation | • Brown Kurosols (Yellow Podzolic Soils)<br>• Red and Brown Chromosols (Red Brown Earths and Non-calcic Brown Soils) | • Localised shallow soils, foundation hazard, gully erosion hazard.<br>• Widespread complex soils, recharge zone, sheet erosion hazard. |




Source: EMM (2022); HVO (2022); Minesoils (2022); DFSI (2017)

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## KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Soil study area

Soil landscape (2018)

- Branxton (bxp)
- Broke (bkf)
- Dochra (dot)
- Donalds Gully (dnz)
- Foy Brook (fyz)
- Granbalang (gbp)
- Howick (hkx)
- Ravensworth (rvt)
- Singleton (sgw)
- Warkworth (wwq)
- Disturbed Terrain (xxz, xxza)

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

# Soil landscapes

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Environmental Impact Statement
Figure 17.4

EMM
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### 17.2.5 Land and soil capability

Table 17.2 provides the definitions of the land and soil capability (LSC) classification in accordance with *The land and soil capability assessment scheme; Second approximation* (LSC Guideline) (OEH 2012).

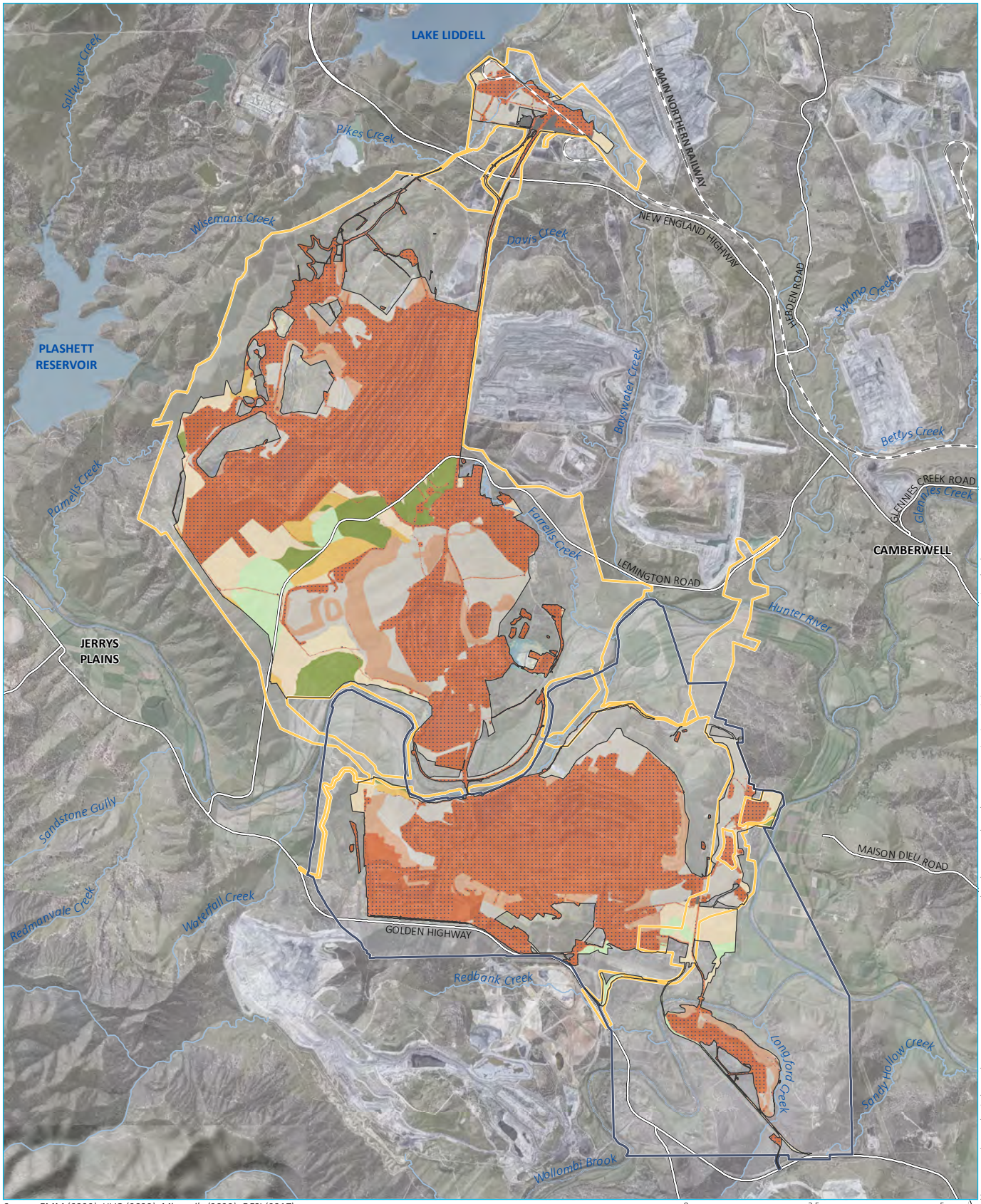
**Table 17.2 Land and soil capability**

| Class | Land and soil capability |
|---|---|
| **Land capable of a wide variety of land uses (cropping, grazing, horticulture, forestry, nature conservation)** | |
| 1 | **Extremely high capability land**: Land has no limitations. No special land management practices required. Land capable of all rural land uses and land management practices. |
| 2 | **Very high capability land**: Land has slight limitations. These can be managed by readily available, easily implemented management practices. Land is capable of most land uses and land management practices, including intensive cropping with cultivation. |
| 3 | **High capability land**: Land has moderate limitations and is capable of sustaining high-impact land uses, such as cropping with cultivation, using more intensive, readily available and widely accepted management practices. However, careful management of limitations is required for cropping and intensive grazing to avoid land and environmental degradation. |
| **Land capable of a variety of land uses (cropping with restricted cultivation, pasture cropping, grazing, some horticulture, forestry, nature conservation)** | |
| 4 | **Moderate capability land**: Land has moderate to high limitations for high-impact land uses. Will restrict land management options for regular high-impact land uses such as cropping, high-intensity grazing and horticulture. These limitations can only be managed by specialised management practices with a high level of knowledge, expertise, inputs, investment and technology. |
| 5 | **Moderate–low capability land**: Land has high limitations for high-impact land uses. Will largely restrict land use to grazing, some horticulture (orchards), forestry and nature conservation. The limitations need to be carefully managed to prevent long-term degradation. |
| **Land capable for a limited set of land uses (grazing, forestry and nature conservation, some horticulture)** | |
| 6 | **Low capability land**: Land has very high limitations for high-impact land uses. Land use restricted to low-impact land uses such as grazing, forestry and nature conservation. Careful management of limitations is required to prevent severe land and environmental degradation. |
| **Land generally incapable of agricultural land use (selective forestry and nature conservation)** | |
| 7 | **Very low capability land**: Land has severe limitations that restrict most land uses and generally cannot be overcome. On-site and off-site impacts of land management practices can be extremely severe if limitations not managed. There should be minimal disturbance of native vegetation. |
| 8 | **Extremely low capability land**: Limitations are so severe that the land is incapable of sustaining any land use apart from nature conservation. There should be no disturbance of native vegetation. |

The LSC classes and total areas for the Study Area at Project commencement are presented in Table 17.3 and shown in Figure 17.5.

## Table 17.3 Land and soil capability at Project commencement

| Study Area | Class | Location | Area (ha) | | |
|---|---|---|---|---|---|
| | | | HVO North | HVO South | Overall total |
| **Undisturbed areas** | 3 | Covers a significant portion of the undisturbed areas, primarily in the area subject to site verification of LSC, but also in association with the alluvial soils of the Carrington West Wing area. | 261 | 10 | 271 |
| | 4 | Covers a portion of the undisturbed areas, primarily in the area subject to site verification of LSC. | 146 | 56 | 202 |
| | 5 | Covers the largest portion of the undisturbed areas, primarily based on regional mapping where no ground truthed soil investigations were undertaken. | 392 | 158 | 550 |
| | 6 | Covers a small portion of the undisturbed areas. | 118 | 9 | 127 |
| **Current rehabilitation** | 4/5/6 | Current rehabilitation areas that are currently approved for a final land use of grazing on pasture. | 618 | 299 | 917 |
| | 6/7 | Current rehabilitation areas that are currently approved for a final land use of woodland. | 335 | 210 | 545 |
| **Current disturbance** | 8 | Final pit voids and water management areas of the current disturbance areas. | 2,497 | 1,668 | 4,165 |
| **Total** | | | **4,367** | **2,410** | **6,777** |




*Source: EMM (2022); HVO (2022); Minesoils (2022); DFSI (2017)*

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KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Soil study area
- Current disturbance

Current land and soil capability

- Class 3
- Class 4
- Class 4/5/6
- Class 5
- Class 6
- Class 6/7
- Class 8
- No regional LSC mapping

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

## Land and soil capability

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Environmental Impact Statement
Figure 17.5

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## 17.3 Impact assessment

### 17.3.1 Soil resource assessment

#### i Soil mapping units

The results of the soil sampling program determined the following soil mapping units are within the undisturbed areas of the Study Area (refer to Figure 17.6):

- Soil mapping unit 1: Sodosols;
- Soil mapping unit 2: Vertosol/dermosol complex;
- Soil mapping unit 3: Alluvial soils; and
- Soil mapping unit 4: Natric kurosols.

#### ii Soil resources

As shown in Table 17.4, the total estimated soil volume of suitable material available is approximately 7,336,370 $m^3$. Table 17.5 shows the total volume of material required to meet the final land use to be approximately 7,791,000 $m^3$. Therefore, there will be a soil deficiency of approximately 454,630 $m^3$ or approximately 6% of the soil bank.

**Table 17.4 Soil stripping depths and available soil volume**

| Study Area | | Area (ha) | | Area (ha) | Recommended stripping depth (m) | Soil Volume ($m^3$) |
|---|---|---|---|---|---|---|
| | | HVO North | HVO South | | | |
| **Undisturbed areas** | Soil mapping unit 1: Sodosols | 423 | 202 | 625 | 0.2 | 1,250,000 |
| | Soil mapping unit 2: Vertosol/dermosol complex | 366 | 0 | 366 | 0.3 | 1,098,000 |
| | Soil mapping unit 3: Alluvial soils | 94 | 30 | 124 | 1.2 | 1,488,000 |
| | Soil mapping unit 4: Natric kurosols | 46 | 0 | 46 | 0.2 | 92,000 |
| **Current rehabilitation** | | 941 | 574 | 1,515 | 0.1 | 1,515,000 |
| **Stockpiled soil** | | | | | | 1,893,370 |
| **Total volume** | | | | | | **7,336,370** |

Additional alternate growth medium enhancement strategies may be employed to mitigate this deficit. These could include a mulch recovery factor which would result in an additional approximate 171,800 $m^3$ of material; possible recovery of additional subsoils of Soil Unit 1: Sodosols, which would require specialised management inputs to provide up to approximately 5,008,000 $m^3$ of additional soil volume; or soil may be respread at depths shallower than the recommended respread depths where a rootzone depth is achieved through supplementing soil with imported organic material. This would be most effective for the native ecosystem rehabilitation domain where topsoil weed load can be an inhibitor of rehabilitation success.

Topsoil should be respread to the minimum depths listed in Table 17.5 or alternative methods used to create a similar soil growth medium.

**Table 17.5 Soil respread depths and required soil volume**

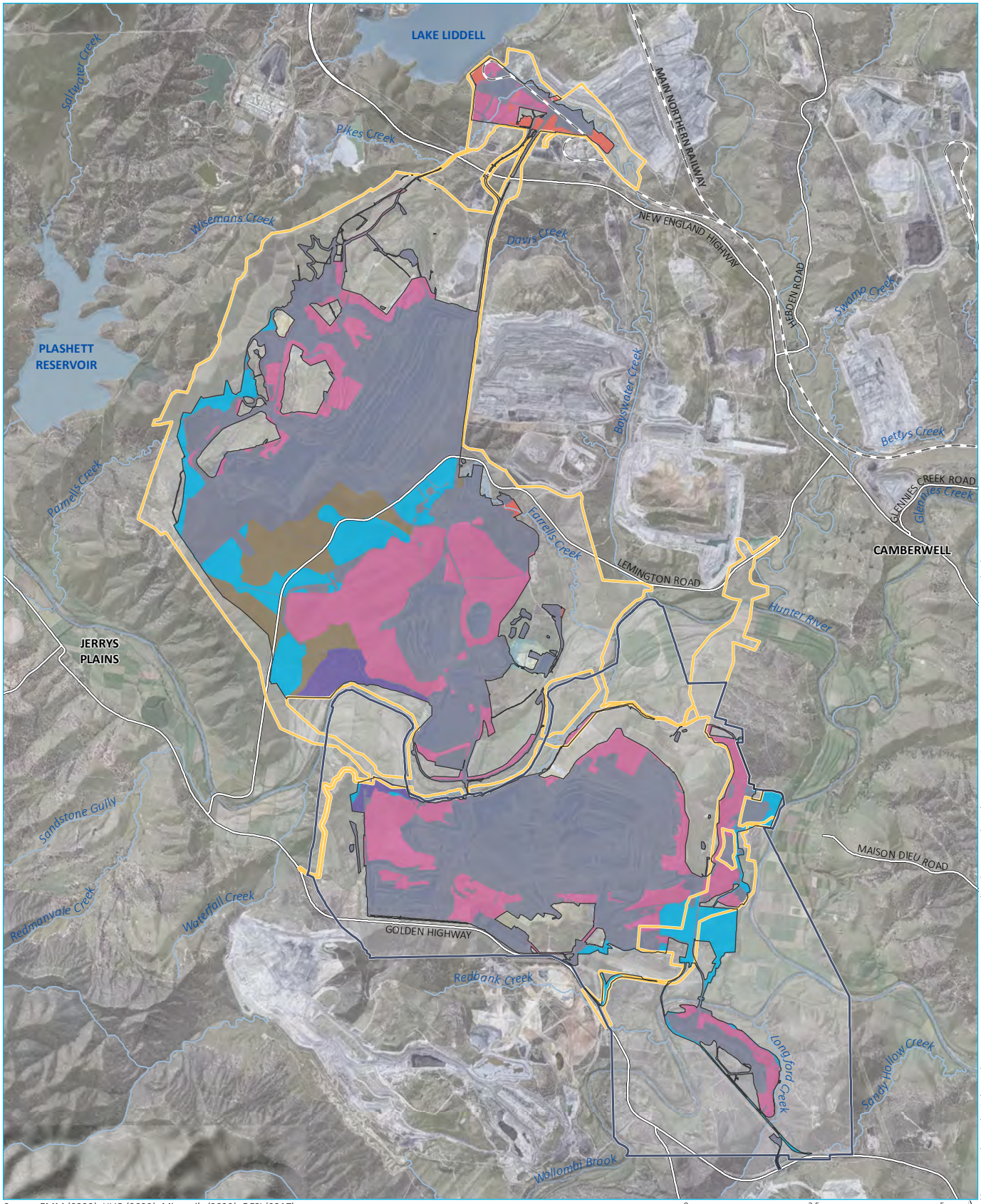
| Domain | Name | Area (ha) | Post-mining LSC class | Minimum respread depth (m) | Required soil volume ($m^3$) |
|---|---|---|---|---|---|
| A and Ka | Native ecosystem | 2,823 | 5/6/7 | 0.1 | 2,823,000 |
| B | Agricultural – grazing | 3,408 | 4/5/6 | 0.1 | 3,408,000 |
| | Alluvial areas - grazing | 65 | 2 | 1.4 | 650,000 |
| | Alluvial areas - grazing | 65 | 3 | 1.4 | 910,000 |
| F | Water management area | 32 | 8 | 0.0 | 0 |
| J | Pit lake | 384 | 8 | 0.0 | 0 |
| **Total volume** | | | | | **7,791,000** |

### iii Acid sulphate soils

Assessing land elevation and distance from the coast, in conjunction with existing acid sulphate soil (ASS) mapping for NSW, the potential for ASS is considered a very low risk.

Further, there was no evidence of ASS indicators such as soil gleying, odour, marine sediments and organic materials recorded as part of the soils survey.

The Study Area does not contain any ASS in accordance with the NSW Acid Sulfate Soil Planning Map.




*Source: EMM (2022); HVO (2022); Minesoils (2022); DFSI (2017)*

0 2.5 5 km

GDA2020 MGA Zone 56

N

## KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Soil study area

Soil unit
- Soil Unit 1: Sodosol
- Soil Unit 2: Dermosol/Vertosol Complex
- Soil Unit 3: Alluvial Soils
- Soil Unit 4: Natric Kurosols

Disturbed soil
- Current disturbance
- Spolic Anthroposol

Existing environment
- Rail line
- Major road
- Named watercourse
- Named waterbody

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# Soil mapping units

HVO Continuation Project
Environmental Impact Statement
Figure 17.6

EMM creating opportunities

### 17.3.2 Land and soil capability assessment

The final land use domains for the Project Area have been selected to be consistent with those specified in *Form and way: rehabilitation management plan for large mines* (RR 2021) and are listed with their descriptions in Table 17.6. More information on rehabilitation and closure can be found in Chapter 21.

**Table 17.6 Final land use domains**

| Domain | Name | Description |
|---|---|---|
| A | Native ecosystem | Areas to be rehabilitated with woodland species commensurate with adjacent remnant vegetation. This will also include a network of tree corridors to ensure connectivity of woodland community areas. |
| B | Agricultural – grazing | Areas to be rehabilitated with selected native and exotic grasses and pasture species to facilitate grazing. |
| G | Water storages | A network of dams and surface water management structures are planned to be retained to assist in ongoing water and land management (eg stock watering). |
| J | Pit lake | Pit lakes, commonly referred to as final voids, will create permanent water bodies. Landforms above pit water level will be vegetated where practical with woodland vegetation communities. |
| Ka | Other – native ecosystem – partial vegetation on highwall benches | Areas of highwall benches are to be partially revegetated with native vegetation. Areas (ha) included in Domain A, shown on figures for clarity due to different objectives and completion criteria will apply. |
| Kb | Other – agriculture – grazing alluvial areas | Includes 65 ha of Rural Land Capability Class II and 65 ha of Class III land* subject to proposed mining occurring in the Carrington West Wing area in accordance with previous management commitment. Area (ha) included in Domain B for analysis purposes, delineated as a separate Domain as different completion criteria and management commitments apply. |

Note: commitments to rural land capability classes are as per the now outdated rural land capability classification scheme (OEH 1988). A conversion has been applied to identify these areas LSC classes 2 and 3, respectively.

The post-mining LSC of the Study Area is detailed in Table 17.7 and shown on Figure 17.7.

**Table 17.7 Post-mining LSC of Study Area**

| Domain | LSC range | Area (ha) | | |
|---|---|---|---|---|
| | | HVO North | HVO South | Overall |
| A | 5/6/7 | 1,691 | 1,132 | 2,823 |
| B | 4/5/6 | 2,336 | 1,072 | 3,408 |
| | (Domain Kb) 2 | 65 | 0 | 65 |
| | (Domain Kb) 3 | 65 | 0 | 65 |
| G | 8 | 15 | 17 | 32 |
| J | 8 | 202 | 182 | 384 |
| **Total** | | **4,374** | **2,403** | **6,777** |

### i Domain B LSC

The final land use Domain B: Agricultural – grazing (excluding Domain kb) has been presented as a post-mining LSC class range of 4/5/6. This classification directly aligns with the classes of the LSC scheme that are generally considered the most suitable for a grazing land use. The LSC 4/5/6 classification considers final landform and soil characteristics but has primarily been applied based on the intended final land use of grazing.

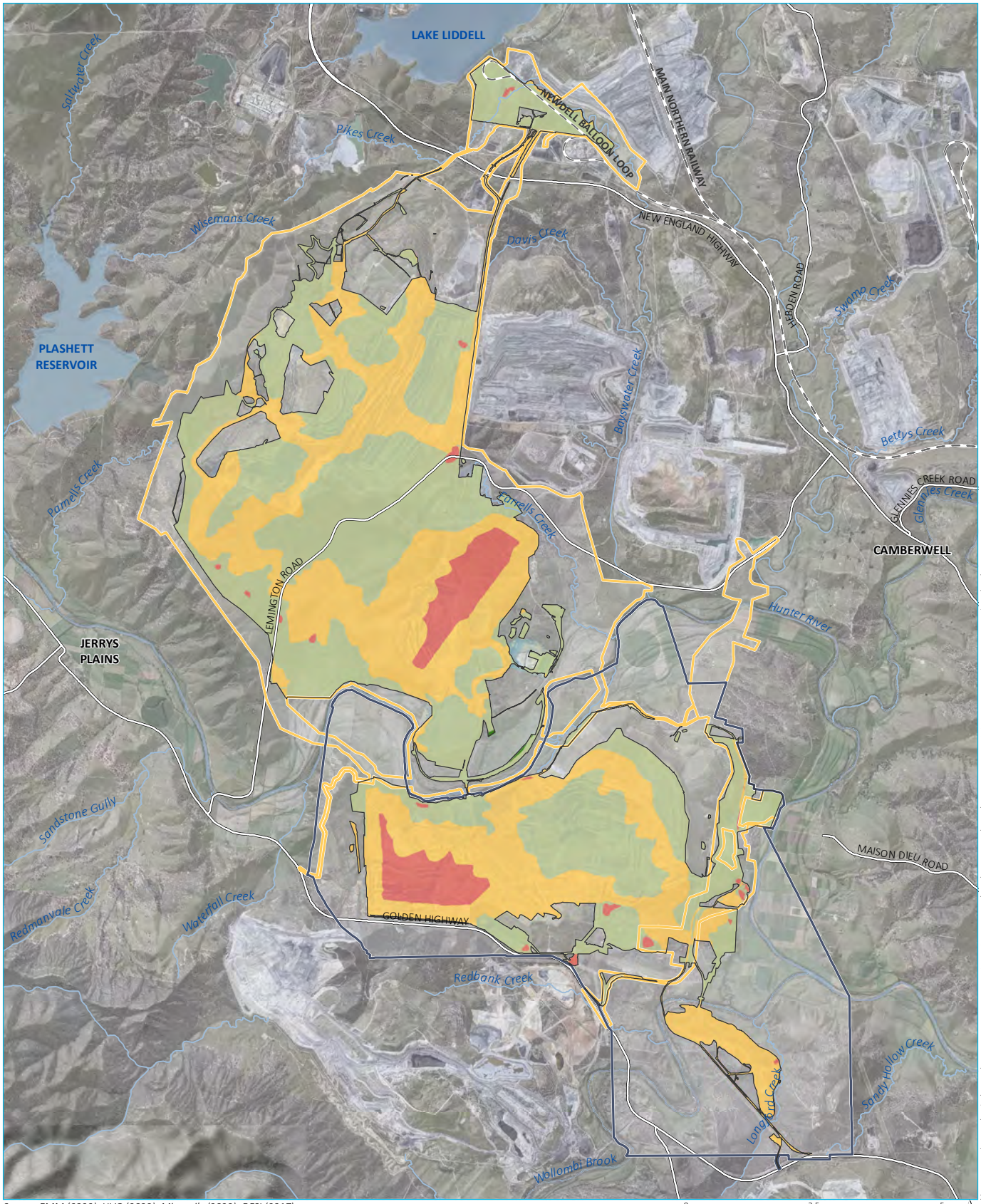
As outlined in Table 17.5, a soil respread depth of 0.1 m will be applied to these areas during rehabilitation. Soil depth is considered for LSC, as shallow soil means less volume of soil available for storing nutrients and water. In accordance with the LSC scheme, a soil depth of 0.1 m would typically default land to a LSC class of 7.

By definition LSC class 7 land has extremely severe limitations for most land uses and is not capable of any cultivation or grazing by stock. Use of LSC class 7 land for these purposes may result in severe erosion and degradation.

Minesoils have chosen not to apply a post mining LSC of class 7, as this classification is not considered a true representation of the intended land use and agricultural capability of mined land rehabilitation of Domain B, based on local experience with grazing on rehabilitated land and grazing trials evidence.

HVO currently undertakes grazing on rehabilitated land. The rehabilitated landform has demonstrated capacity to facilitate grazing at an intensity and productivity equivalent to that of unmined analogue sites and areas within the additional disturbance area that are currently subject to grazing activity. Soil respread depths on overburden in these areas at the time of rehabilitation was 0.1 m.

More information on the justification for this approach is found in Section 4.4 of the SLIA (Appendix P).




Source: EMM (2022); HVO (2022); Minesoils (2022); DFSI (2017)

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## KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Soil study area

Post-mining land and soil capability

- Class 2
- Class 4/5/6
- Class 5/6/7
- Class 8

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

## Post-mining land and soil capability

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Figure 17.7

EMM creating opportunities

## 17.4 Management and mitigation measures

A summary of the key management and mitigation measures are provided in Table 17.8. These measures are currently in place as part of the rehabilitation management plan and will continue to be implemented for the Project.

**Table 17.8 Soil and land resource mitigation measures**

| ID | Mitigation measures |
|---|---|
| LSR1 | Prior to stripping of soil, appropriate sediment controls will be installed to prevent off-site loss of soil sediments, in accordance with the Blue Book (Landcom 2004). |
| LSR2 | Desirable soil material will be stripped to maximum excavation depths, subject to further investigation as required. |
| LSR3 | Stripping of saturated soils will be avoided where possible. |
| LSR4 | Soil transported by dump trucks will be placed directly onto rehabilitation areas or into storage. |
| LSR5 | The surface of soil stockpiles will be stored less than 3 m in height or ripped in order to promote infiltration and minimise erosion until vegetation is established, and to prevent anaerobic zones forming. |
| LSR6 | Stockpiles will be located away from active mining areas, watercourses and will be placed on areas of flat topography or along the contour to minimise erosion. |
| LSR7 | A flow diversion bank or catch drain will be placed up-slope of a topsoil stockpile to direct surface water flows away, where necessary. |
| LSR8 | Erosion and sediment control measures will be implemented around topsoil stockpiles or stripped areas in accordance with the Blue Book (Landcom 2004), where necessary. |
| LSR9 | A register of available soil will be maintained to ensure adequate materials are available for planned rehabilitation activities when the time comes. The register will be updated periodically and reviewed annually in association with annual reporting processes. |
| LSR10 | Stockpiles will be sown with a cover crop to help maintain topsoil viability and minimise erosion and weed infestation if not being reused for prolonged periods. Final rehabilitation target pasture or native grass species will be established on stockpiles to build up a desirable species seed bank in the topsoil. |
| LSR11 | Inspections of stockpiled soils will be undertaken to inform ongoing management of the resource and to assist in limiting potential degradation of soil quality while held in storage. |
| LSR12 | Prior to respreading stockpiled topsoil onto the disturbance area, an assessment of weed infestation on stockpiles will be undertaken to determine if individual stockpiles require weed control. |

## 17.5 Summary and conclusion

The LSC assessment consisted of a site verification for undisturbed areas of LSC in accordance with the LSC Guideline (OEH 2012). The commitments of the currently approved final landform were used to assess LSC for the current rehabilitation areas of the Study Area. Further, current disturbance areas of the Study Area were presumed to default to LSC Class 8.

The LSC classes for the Study Area at Project commencement are as follows:

- Undisturbed areas: LSC Class 3 – covering 271 ha, LSC Class 4 – covering 202 ha, LSC Class 5 – covering 550 ha, LSC Class 6 – covering 127 ha.
- Current rehabilitation: LSC Class 4/5/6 – covering 917 ha, LSC Class 6/7 – covering 545 ha.
- Current disturbance: LSC Class 8 – covering 4,165 ha.

The proposed post-mining LSC is based on the application of available soil materials on a rehabilitated landform according to final land use domains. These domains are to be rehabilitated to a suitable LSC to facilitate the final land uses. The post-mining LSC is as follows:

- Domain A and Ka – Native ecosystem: LSC Class 5/6/7 – covering approximately 2,823 ha;
- Domain B – Agricultural:
    - Grazing: LSC Class 4/5/6 – covering approximately 3,408 ha;
    - Domain Kb – Grazing alluvial areas: LSC Class 2 – covering 65 ha; and
    - Domain Kb – Grazing alluvial areas: LSC Class 3 – covering 65 ha;
- Domains G – Water storages and Domain J – Pit lake: LSC Class 8 – covering approximately 416 ha.

Soil resources have been assessed for suitability in post mining landforms for intended land uses, with a total estimated volume of material available being approximately 7,336,370 $m^3$. The total volume of material required to meet the final land use and LSC objectives is calculated to be approximately 7,791,000 $m^3$. Therefore, there will be a soil deficiency of approximately 454,630 $m^3$. Additional alternate growth medium enhancement strategies may be employed to mitigate this deficit.

# 18 Agriculture

## 18.1 Introduction

An agricultural impact statement (AIS) has been prepared for the Project and is attached as Appendix Q.

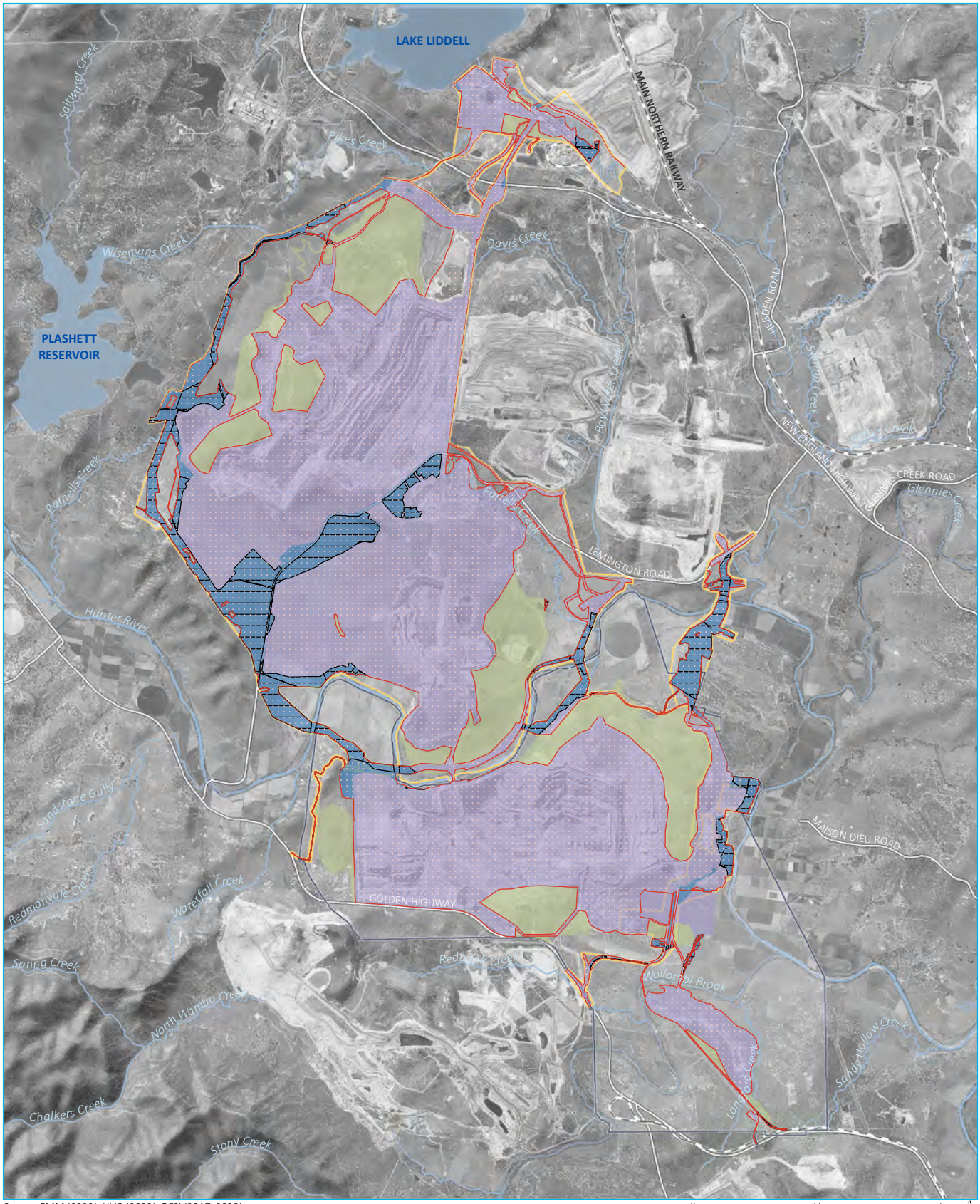
The AIS was developed in accordance with the *Guideline for Agricultural Impact Statements* (DTIRIS 2012) to present a focussed assessment of potential impacts to agricultural resources and industries because of the Project. The AIS also satisfies the requirements of the SEARs which require an assessment of the impacts to strategic agricultural land.

The Study Area for the AIS is outlined in Table 18.1 and shown on Figure 18.1.

**Table 18.1 AIS study area**

| Assessment component | Area (ha) | | |
|---|---|---|---|
| | HVO North | HVO South | Overall |
| Re-disturbance area | 4,195 | 2,342 | 6,537 |
| Additional disturbance area | 717 | 263 | 980 |
| **Study area** | **4,912** | **2,605** | **7,517** |

It is noted that the Study Area for the SLIA differs from the AIS Study Area. The AIS Study Area assesses the potential impacts to agriculture based on the approved final landform. The SLIA Study Area assesses the soil resources available at Project commencement.




Source: EMM (2022); HVO (2022); DFSI (2017, 2020)

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KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Agricultural assessment study area
- Existing agricultural landuse within additional disturbance area
- Rehabilitated areas not subject to the Project
- Additional disturbance area
- Redisturbance area

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

AIS study area

HVO Continuation Project
Environmental Impact Statement
Figure 18.1

EMM creating opportunities

## 18.2 Existing environment

### 18.2.1 Project Area

#### i Agricultural use of re-disturbance areas

For re-disturbance areas, in order to establish a frame of reference by which to determine impacts on agriculture as a result of the Project, the anticipated agriculture enterprises and resources of the approved final landform and its land use domains were used as a baseline.

The rehabilitated land of the approved final landform and land use domains is shown on Figure 3.8 and includes:

- Native ecosystem: Areas to be rehabilitated with woodland species commensurate with adjacent remnant vegetation. Approximately 30% (HVO North) and 30–40% (HVO South) of mined land will be returned to woodland. This will also include a network of tree corridors to ensure connectivity of woodland community areas, as well as 4 ha of land consistent with the Central Hunter Grey Box Ironbark Woodland.
- Agricultural – grazing: Areas to be rehabilitated with selected native and exotic grasses and pasture species. Approximately 70% (HVO North) and 60–70% (HVO South) of mined land will be returned to pasture. Includes 65 ha of RLC Class II and 65 ha of RLC Class III land.
- Water management area: A network of dams and surface water management structures are planned to be retained to assist in ongoing water and land management (eg stock watering).
- Water storage (excluding final voids): Two large water storage dams (Parnells Dam and Lake James) are proposed to remain in the final landform.
- Final void: Three final voids are planned to remain in place at completion of mining at HVO North. Two separate voids will remain in West Pit and a single final void in Carrington Pit. One final void is planned to remain in place at HVO South following the cessation of mining. This is in the southwestern corner of the Riverview Pit. Final voids will create permanent water bodies. Landforms above pit water level will be vegetated, where practical, with woodland vegetation communities.
- The approved final landform of Liddell Coal Operations, Ravensworth Operations, and United Wambo JV were also used to establish baseline status where the rehabilitation liabilities of other mines are present in the re-disturbance area.

#### ii Agricultural use of additional disturbance areas

Based on aerial photography, site observation, soil and land capability, and local knowledge, it is determined that undisturbed areas of land within the Study Area have historically been used for cattle grazing on improved pastures with occasional minimal cropping of oats, ryegrass and clover pasture for cattle feed.

Lands within the Project area that are not utilised for mining operations are currently used for cattle grazing. The cattle are watered through surface dams or pumped groundwater. No additional feeding is carried out. Currently, the Project Area is not fertilised, and no other land improvement strategies for grazing are being undertaken.

No sensitive agricultural activities (eg intensive plant or livestock agriculture, or livestock breeding) are being undertaken within the Project Area or its immediate surrounds.

### iii Baseline land and production value

The total baseline land that would be used for agriculture within the Project Area (if the Project area was rehabilitated in accordance with current approvals), combined with the additional disturbance area for the Project is approximately 4,182 ha, as outlined in Table 18.2.

**Table 18.2 Baseline land area used for agriculture**

| Study area | Approved final land use domain | Land used for agriculture (ha) | | |
|---|---|---|---|---|
| | | HVO North | HVO South | Overall |
| Re-disturbance areas | Agricultural – grazing | 2,252 | 1,333 | 3,585 |
| | Other (including native ecosystem, water storage, pit lake) | 0 | 0 | 0 |
| Additional disturbance areas | Land subject to grazing activity | 458 | 125 | 583 |
| | Land subject to cropping activity | 14 | 0 | 14 |
| | Other land use (including land vacancy) | 0 | 0 | 0 |
| **Total** | | **2,724** | **1,458** | **4,182** |

The estimated productivity of the study area ranges from approximately $716,618 per annum based on a feeder steers grazing enterprise to $1,698,840 per annum based on a growing-out steers 240–460 kg enterprise, as outlined in Table 18.3.

**Table 18.3 Estimated baseline agricultural productivity of Study Area**

| Enterprise | Estimated gross margin ($/ha/year) | Land used for area (ha) | Study Area gross margin ($/year) |
|---|---|---|---|
| Feeder steers | 173.81 | 4,182 | 726,873 |
| Growing-out steers 240–460 kg | 412.04 | 4,182 | 1,723,151 |

## 18.2.2 Project locality

The Project locality is defined as the district surrounding the Study Area with an approximate proportional area of a parish. The Study Area crosses the Liddell, Howick, Lemington and Ravensworth parishes. The Project locality in this AIS refers to a 5 km buffer area around the Study Area (refer to Figure 18.2).

Large areas within the Project locality are owned by various mining companies and used for mining activities. The largely industrial environment also includes the Bayswater and Liddell power stations. Historically the region has been used for intensive agriculture on the rich alluvial soils in narrow corridors along the floodplains of the Hunter River. Less intensive activities, such as grazing on non-improved pasture, occur on the undulating slopes of the surrounding areas.

The prevailing agricultural land use of the locality is cattle grazing, predominantly on areas cleared of vegetation because of historic agricultural use, or on rehabilitated areas following mining use. Cropping activities are carried out on alluvial soils throughout the Project locality, with key cropping zones being between the Hunter River and Golden highway to the west of the Project area and a portion of land to the south-east of the Project locality. In the south-western portion of the Project locality lies Wollemi National Park, which has not been subject to clearing or agricultural use.

There is an area of equine critical industry cluster (CIC) where the Golden Highway meets the western boundary of the Project locality area (refer Figure 18.2). This includes horse paddocks of the Coolmore Horse Stud. The nearest point of this CIC is approximately 3 km from the HVO North proposed development consent boundary.

### i Agriculture industry

The general agricultural land use of the Project locality is low intensity cattle grazing. It should be noted that the broader Upper Hunter Region (north-west of the Project Locality) generally has higher quality soils and a more diverse agricultural sector.

A decline of the dairying industry began in the second half of the twentieth century, with the number of dairy farms almost halving between 1970 and 1976.

The development of coal resources began on a limited scale in the early 1900s. Rapid expansion took place in the 1950s with the establishment of large open-cut mines to supply power stations and increasingly to meet export demand. Today coal mining employs approximately 40% of workers in the Singleton LGA and 30% of workers in the Muswellbrook LGA.

Table 18.4 provides a breakdown by LGA of the employment and economic output generated by each industry.

## Table 18.4 Industry employment and economic output

| Industry | Employment – Singleton LGA | | Employment – Muswellbrook LGA | | Economic output – Singleton LGA | | Economic output – Muswellbrook LGA | |
|---|---|---|---|---|---|---|---|---|
| | Jobs | % | Jobs | % | $ | % | $ | % |
| **Agriculture, forestry and fishing** | **455** | **2.8** | **541** | **5.4** | **159,987,833** | **1.0** | **193,920,079** | **2.1** |
| Mining | 6,626 | 40.6 | 3,120 | 31.2 | 11,868,473,483 | 75.3 | 5,543,536,420 | 61.2 |
| Public administration and safety | 1,061 | 6.5 | 479 | 4.8 | 575,062,401 | 3.6 | 132,736,300 | 1.5 |
| Construction | 950 | 5.8 | 515 | 5.1 | 517,087,794 | 3.3 | 267,483,031 | 3.0 |
| Retail trade | 931 | 5.7 | 679 | 6.8 | 122,826,311 | 0.8 | 89,580,092 | 1.0 |
| Accommodation and food services | 878 | 5.4 | 505 | 5.0 | 117,824,894 | 0.7 | 62,481,164 | 0.7 |
| Health care and social assistance | 815 | 5.0 | 694 | 6.9 | 119,406,455 | 0.8 | 101,559,608 | 1.1 |
| Manufacturing | 761 | 4.7 | 321 | 3.2 | 714,991,223 | 4.5 | 288,956,925 | 3.2 |
| Administrative and support services | 739 | 4.5 | 363 | 3.6 | 166,144,706 | 1.1 | 80,099,717 | 0.9 |
| Education and training | 720 | 4.4 | 441 | 4.4 | 106,204,720 | 0.7 | 65,253,539 | 0.7 |
| Other services | 685 | 4.2 | 366 | 3.7 | 143,040,375 | 0.9 | 73,646,766 | 0.8 |
| Transport, postal and warehousing | 390 | 2.4 | 275 | 2.8 | 123,405,385 | 0.8 | 101,262,993 | 1.1 |
| Wholesale trade | 383 | 2.4 | 297 | 3.0 | 148,652,241 | 0.9 | 115,273,409 | 1.3 |
| Professional, scientific and technical services | 353 | 2.2 | 244 | 2.4 | 106,150,929 | 0.7 | 72,977,643 | 0.8 |
| Rental, hiring and real estate services | 201 | 1.2 | 95 | 1.0 | 453,630,283 | 2.9 | 273,888,208 | 3.0 |
| Financial and insurance services | 133 | 0.8 | 70 | 0.7 | 99,613,654 | 0.6 | 51,975,877 | 0.6 |
| Electricity, gas, water and waste services | 121 | 0.7 | 887 | 8.9 | 173,028,496 | 1.1 | 1,498,231,455 | 16.5 |
| Arts and recreation services | 73 | 0.5 | 67 | 0.7 | 12,799,159 | 0.1 | 11,794,956 | 0.1 |

## Table 18.4 Industry employment and economic output

| Industry | Employment – Singleton LGA | | Employment – Muswellbrook LGA | | Economic output – Singleton LGA | | Economic output – Muswellbrook LGA | |
|---|---|---|---|---|---|---|---|---|
| | Jobs | % | Jobs | % | $ | % | $ | % |
| Information media and telecommunications | 50 | 0.3 | 58 | 0.6 | 31,669,648 | 0.2 | 35,505,670 | 0.4 |
| **Total** | **16,325** | **100.0** | **10,017** | **100.0** | **15,759,999,990** | **100.0** | **$9,060,163,853** | **100.0** |




Source: EMM (2022); HVO (2022); DFSI (2017, 2020)

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KEY

- Project locality for assessment
- Equine critical industry cluster
- Regionally mapped biophysical strategic agricultural land
- Viticulture critical industry cluster
- HVO North proposed development consent boundary
- HVO South proposed development consent boundary

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody
- NPWS reserve
- State forest

# Regionally mapped BSAL and CIC

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Figure 18.2

EMM creating opportunities

### ii Regional and local agricultural enterprises

Beef cattle is an established and dominant agricultural industry in the Hunter region. Across much of the Hunter region are shallow soil depths, erodible sub soils, low soil phosphorous levels and naturally moderate to high acidity soils which are best suited for permanent pastures ie grazing enterprises.

In terms of area of land used and estimated gross value generated, cattle grazing as the most common agricultural enterprise.

Table 18.5 details the agricultural land use for the Hunter Valley (excluding Newcastle) from 2015–2021. The total land holdings have seen a reduction over the five years, with 981,538 ha of agricultural land holdings in 2016–2017 down to 754,861 ha in 2019–2020 and returning to 826,769 in 2020–2021.

**Table 18.5 Hunter Valley agricultural land use**

| | Financial year | | | | | |
|---|---|---|---|---|---|---|
| | **2015–2016** | **2016–2017** | **2017–2018** | **2018–2019** | **2019–2020** | **2020–2021** |
| Total area of agricultural land holding (ha) | 870,710 | 981,538 | 861,736 | 795,933 | 754,851 | 826,769 |
| Land mainly used for agricultural production (ha) | - | - | 763,365 | 688,067 | 682,818 | 750,961 |
| Land mainly used for crops (ha) | 21,165 | 31,076 | 41,203 | 30,419 | 25,214 | 37,746 |
| Land mainly used for grazing (ha) | - | - | 694,078 | 652,714 | 651,169 | 691,325 |
| Land mainly used for grazing on improved pastures (ha) | - | - | 185,464 | 235,990 | 350,856 | 291,186 |
| Land mainly used for grazing on other land (ha) | - | - | 508,614 | 416,724 | 300,313 | 400,139 |

The total estimated gross value of agriculture in the Hunter Valley (excluding Newcastle) is presented in Table 18.6.

In a wider regional context, livestock slaughtering dominates the estimated gross revenue for agriculture. Livestock slaughtering represent approximately 66% of the total estimated gross value of agriculture over the period (excluding 2012–2013). The estimated gross values of crops have shown a moderate decrease over the ten year period, and have lower estimated gross value than livestock slaughters or livestock products.

**Table 18.6 Total estimated gross value of agriculture in the Hunter Valley**

| Financial Year | Crops ($) | Livestock slaughtering ($) | Livestock products ($) | Total Agriculture ($) |
|---|---|---|---|---|
| 2020–2021 | 50,345,656 | 252,011,102 | 93,313,091 | 395,669,848 |
| 2019–2020 | 34,070,212 | 206,211,313 | 66,501,576 | 306,783,101 |
| 2018–2019 | 31,709,918 | 181,517,110 | 96,807,232 | 310,034,260 |
| 2017–2018 | 27,725,861 | 180,270,871 | 101,879,781 | 309,876,513 |
| 2016–2017 | 45,824,784 | 282,501,566 | 69,725,432 | 398,051,783 |
| 2015–2016 | 31,458,027 | 287,806,775 | 42,927,267 | 362,092,069 |

**Table 18.6 Total estimated gross value of agriculture in the Hunter Valley**

| Financial Year | Crops ($) | Livestock slaughtering ($) | Livestock products ($) | Total Agriculture ($) |
|---|---|---|---|---|
| 2014–2015 | 33,633,355 | 261,995,303 | 91,411,011 | 387,039,670 |
| 2013–2014 | 35,019,163 | 189,573,650 | 69,974,188 | 294,567,002 |
| 2012–2013 | - | 180,120,000 | - | 324,790,000 |
| 2011–2012 | 50,800,00 | 183,800,000 | 56,300,000 | 290,900,000 |
| 2010–2011 | 51,900,000 | 206,000,000 | 72,700,000 | 330,600,000 |

#### iii Agriculture support infrastructure

Both the Singleton and Muswellbrook LGAs have a well-developed road network that connects the agricultural industry to markets, services and suppliers. The Main Northern Railway also provides connections to northern and southern centres for freight and passengers.

The Hunter Regional Livestock Exchange (HRLX), formally known as the Singleton Regional Livestock Market is an important economic and historic facility for the local community providing the regions producers with a competitive market to sell livestock. The closest abattoirs are in Scone and Singleton.

Local businesses in Singleton and Muswellbrook provide agricultural equipment and supplies, including animal fencing, animal vaccinations, livestock ID, stock supplements, seed, fertiliser and crop protection.

## 18.3 Impact assessment

This section assesses the temporary and permanent impacts of the Project on agricultural resource, enterprises and agricultural related socio-economic impacts.

### 18.3.1 Impacts to agricultural land use

#### i Proposed final land use

As discussed in Section 18.3.2, the final land use domains for the Project are:

- Domain A: native ecosystem;
- Domain B: agricultural – grazing;
- Domain G: water storages;
- Domain J: pit lake;
- Domain Ka: other – native ecosystem – partial vegetation on highwall benches; and
- Domain Kb: other – agriculture – grazing alluvial areas.

#### ii Land to be temporarily removed from agriculture

The Project will disturb approximately 3,585 ha within the re-disturbance area that is approved to be rehabilitated to an agricultural final land use, and approximately 597 ha within the additional disturbance area (totalling 4,182 ha). Of the 597 ha of additional disturbance, 583 ha is land used for grazing activity and 14 ha is used for cropping activity.

This land will not be suitable for agricultural use for the duration of the Project. Therefore, 597 ha will be temporarily removed from agriculture by the Project, while a further 3,585 ha that would be rehabilitated at the cessation of approved operations to an agricultural land use, will remain part of an active mining operation, and therefore reinstatement of this agricultural land use will be delayed.

All land within the Project area currently used for agriculture will be returned to an equivalent level of service following mining activities.

#### iii Land to be returned to agriculture post Project

The total area allocated for agriculture land use (Domain B: Agricultural – grazing) following the life of the Project is approximately 4,320 ha. This is a net increase of approximately 138 ha from the baseline area of land use for agriculture (that is, compared to what land would be available for an agricultural land use if the site was rehabilitated as per existing approvals).

#### iv Land that will not be returned to agriculture

There will be no net loss of land used for agricultural purposes as a result of the Project.

### 18.3.2 Impacts to agricultural resources

The Project will have a negligible impact on local and regional agricultural infrastructure. There will be very minor impacts on the road network and no impacts on the railway that connects the agricultural industry to markets, services and suppliers.

Following the Lemington Road realignment, dependant on direction and final destination of travel, some road users may be subject to minor travel time increases. However, as part of the Lemington Road realignment, the quality of Lemington Road will be improved to enable a more reliable travel route and safer road features. Access reliability of Lemington Road will also be improved as it is not subjected to road closure at Moses Crossing over the Hunter River during flood events.

Stock fences, dams and access tracks will be established as part of the rehabilitation of the site in areas accommodating a final land use of cattle grazing. The condition of this infrastructure will be assessed during an annual rehabilitation walkover and targeted agricultural or pastoral assessments completed as part of grazing activities conducted by leases.

For further information regarding impacts to soils resources and LSC, refer to Chapter 17. With regards to impacts to water resources, refer to Chapter 12. Notably, no known privately owned water supply bores are situated within the zone where groundwater drawdown is predicted. Further, the streamflow assessment found that potential impacts on surface water downstream users, including basic landholder users, will be negligible.

### 18.3.3 Agricultural productivity

The estimated agricultural productivity of the Study Area post mining ranges from approximately $732,783 per annum based on a feeder steers grazing enterprise to $1,737,161 per annum based on a growing-out steers 240–460 kg enterprise, as outlined in Table 18.7.

**Table 18.7 Post mining Study Area estimated agricultural productivity**

| Enterprise | Estimated gross margin ($/ha/year) | Area (ha) | Study Area gross margin ($/year) |
|---|---|---|---|
| Feeder steers | 173.81 | 4,320 | 750,859 |
| Growing-out steers 240–460 kg | 412.04 | 4,320 | 1,780,013 |

By comparing the productivity of the final landform for the Project against the baseline productivity (refer to Section 18.2.1iii), the impact of the Project on productivity of agricultural land based on change in land use area is shown to be an increase of approximately $23,986–$56,862 per annum, as highlighted in Table 18.8.

**Table 18.8 Estimated agricultural productivity of Study Area**

| Assessment stage | Agriculture area (ha) | Study Area gross margin range ($/year) |
|---|---|---|
| Pre-Project | 4,182 | 726,873–1,723,151 |
| Post-Project | 4,320 | 750,859–1,780,013 |
| | **Net change** | +23,986–56,862 |

### 18.3.4 Socio-economic

The Project will have a minimal impact on local and regional agricultural services and infrastructure. Changes to the supply and viability of agricultural support services in the main service centres are the towns of Singleton and Muswellbrook are generally driven by social trends exceeding the scale of the Project locality. The reduction in cattle being sold will not be a significant impact on the Singleton saleyards, as this reduction is estimated to represents <0.1% of all cattle sold.

The Project will have minimal negative impact existing agricultural enterprises outside of the study area, therefore there will be no direct impact to associated employment. HVO will maintain employment opportunities for its operational workforce of approximately 1,500 FTE personal during the life of the Project. Noting the workforce is existing and currently employed by HVO, no impacts to labour availability is predicted to be experienced by the agricultural sector.

Due to the limited reduction in agricultural activity as a result of the Project, there will be no impact to critical mass thresholds of agricultural enterprises needed to attract and maintain investment in agricultural service industries and infrastructure.

## 18.4 Management and mitigation measures

A summary of the key management and mitigation measures are provided in Table 18.9. These measures are currently in place as part the management plan prepared for HVO and will continue to be implemented for the Project.

**Table 18.9 Agriculture mitigation management and measures**

| ID | Management and mitigation measures |
|---|---|
| AG1 | The area of agricultural land disturbed by the Project at any one time will be minimised so that agricultural uses can continue, where practicable. |
| AG2 | Rehabilitated agricultural land will be returned to a productive agricultural capacity, as soon as practical. |

## 18.5 Summary and conclusion

Within the additional disturbance area for the Project, 583 ha of land is used for grazing and 14 ha is used for cropping, totalling 597 ha currently used for an agricultural land use. This land will not be suitable for agricultural use for the duration of the Project. Therefore, 597 ha will be temporarily removed from agriculture by the Project, while a further 3,585 ha that would be rehabilitated at the cessation of approved operations to an agricultural land use, will remain part of an active mining operation, and therefore reinstatement of an agricultural land use across these areas will be delayed.

At the end of the Project life and the site is rehabilitated, there will be a net increase of approximately 138 ha of land use for agriculture, compared to what would be achieved if the site was rehabilitated in accordance with the currently approved final landform.

The Project is not predicted to result in significant adverse impacts on surrounding private agricultural land and mining operations are expected to successfully continue to coexist with the surrounding agricultural land uses.

# 19 Traffic and transport

## 19.1 Introduction

This chapter provides a summary of the traffic impact assessment (TIA) for the Project. The TIA is attached as Appendix R.

The TIA assesses impacts of the Project as described in Chapter 4 on the local road network during construction and operation. Key Project considerations for the TIA, described within Chapter 4 include:

- operational and construction traffic movements, noting that no changes are proposed to the operational traffic movements associated with HVO;
- realignment of Lemington Road;
- Comleroi Road and Golden Highway intersection upgrade;
- access to Ravensworth Operations;
- access and operation of access road to HVO North MIA and HVCPP; and
- new intersection off the realigned Lemington Road to maintain access to HVO South MIA.

The TIA was prepared in consideration of the *Guide to Traffic Generating Developments* (RTA 2002) in addition to the relevant guidelines by Austroads. It describes the existing local and regional traffic network surrounding HVO and assesses the predicted impacts of the Project on that network.

The TIA assessed both the operational and construction related impacts of the Project by undertaking the following:

- collection of data including intersection traffic counts, automatic traffic counters and origin-destination survey during a site visit in September 2020;
- analysis of trip generation and distribution based on construction activities, staging, haulage route and site compound locations required for the. Trip assignment from/to the mine was also reviewed to account for the new alignment of Lemington Road and its respective changes to mine access;
- origin-destination analysis of the Lemington Road realignment;
- evaluation of traffic growth rates including population forecasts, historical traffic growth rates of the New England Highway, and forecasted growth rates of Singleton Bypass, and identifying appropriate adopted traffic growth rates for the Project;
- consideration of nearby operating mine sites as part of the cumulative assessment; and
- traffic and intersection modelling using SIDRA 8 modelling software.

## 19.2 Existing environment

The principal road network that provides access to HVO includes the New England Highway, Golden Highway, Lemington Road, Comleroi Road, Pikes Gully Road and Liddell Station Road (Figure 19.1). Additionally, the Newdell LP and the HVLP at the northern tip of HVO North loads coal onto the heavy freight rail network for transportation to the Port of Newcastle. Other mines surrounding HVO, including Ravensworth Operations and Liddell Coal Operations, also have rail loading infrastructure used for the same purposes.

The existing road and rail networks are shown in Figure 19.1.




Source: EMM (2022); HVO (2022); DFSI (2017); RMS (2017); GA (2011)

0 2.5 5 km

GDA2020 MGA Zone 56

N

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KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Named waterbody
- Named watercourse
- Rail line
- South Lemington Rail Loop (approved, not yet constructed)

NSW road network classificaion

- Local road
- State road

Existing road and rail environment

HVO Continuation Project
Environmental Impact Statement
Figure 19.1

EMM creating opportunities

### 19.2.1 Local road network

#### i New England Highway

The New England Highway is a classified state road (highway route number 9) which extends from the Pacific Highway at Hexham and travels inland to the regional cities of Maitland, Singleton, Muswellbrook, Tamworth, Armidale and to the Queensland boarder at Wallangarra. The New England Highway provides a key function in servicing mine operations on either side of the highway including HVO, Ravensworth Operations, Glendell, Liddell Coal Operations, Mount Owen, Ashton Coal Project and Rixs Creek north and south.

In the vicinity of HVO, the New England Highway is predominately a two-way, two-lane road with channelised right-turn (CHR) and auxiliary left-turn (AUL) treatment commonly found at intersections with side roads. Overtaking lanes are also available in both directions at regular distances. The sealed road shoulders are approximately 3 m wide throughout, although narrow down across road bridges. The posted speed limit transitions from 90 km/h to 100 km/h, approximately 1.7 km north of its intersection with Hebden Road, Ravensworth with 100 km/h existing to the north of this point.

There are currently no regular public buses servicing the New England Highway.

#### ii Golden Highway

The Golden Highway is a classified state road (highway route number 27) which extends from the New England Highway at Minimbah and travels west via Warkworth, Jerrys Plains, Denman, Dunedoo, Ballimore and to the Newell Highway at Dubbo.

In the vicinity of HVO, the Golden Highway is predominately a two-way, two-lane road with a channelised right turn (CHR) and auxiliary left turn (AUL) treatment at the intersection with Comleroi Road, as is commonly found at intersections with side roads. The quality of the road is generally inferior compared to the New England Highway with overtaking lanes generally unavailable and with narrower sealed road shoulders measuring approximately 1.2–1.5 m wide throughout, with no shoulder observed on the bridge across Wollombi Brook.

The Golden Highway is a high-speed road with a posted speed limit of 100 km/h in the vicinity of HVO, reducing to 80 km/h through Warkworth and 60 km/h through Jerrys Plains. The road provides a key function in servicing mine operations on either side of the highway including the HVO, Ravensworth Operations, United Wambo and Mount Thorley Warkworth.

There are currently no regular public buses servicing the Golden Highway, except for school buses connecting Jerrys Plains to Singleton High School.

#### iii Lemington Road

Lemington Road is a local road within the Singleton LGA with a posted speed limit of 100 km/h. It links the New England Highway in the north to the Golden Highway in the south. It provides access to HVO and Ravensworth Operations mines, and several mine-owned rural residential properties further south towards the Golden Highway.

Lemington Road is a sealed two-way, two-lane road throughout its length. Between the Golden Highway and the existing Ravensworth Operations access, it measures approximately 8–9.5 m across with centre line marking applicable along the centre of road and no road shoulders. Between the New England Highway and the existing Ravensworth Operations access it measures approximately 13 m, with 3.5 m lanes and 3 m shoulders in each direction. This section also consists of better provision of clear zones, a larger curve radius corresponding to the posted speed limit, provision of auxiliary turning lanes at intersections, higher quality delineation and pavement quality.

The difference in quality of road infrastructure was due to a realignment of the road undertaken as part of the Ravensworth Operations Project, with the alignment east of the existing Ravensworth Operations access being subject to more recent road design standards/guidelines having been approved in 2011 under Project Approval 09_0176.

The number of full trips along Lemington Road between the Golden Highway to the New England Highway is generally low, making up to 4% of the total daily trips recorded on Lemington Road (1,780 trips) during the origin-destination traffic survey.

Lemington Road crosses the Hunter River within 500 m of the intersection with the Golden Highway at a crossing known locally as Moses Crossing. The crossing is a very low-level concrete bridge structure that is inundated frequently following moderate rainfall events. Adjacent to the main river channel, the road crosses the river bed as a graded gravel road. Following heavier rainfall events, a secondary channel cuts this section of road which cannot be repaired until the river drops to well below the level of the current bridge crossing. Modelling indicates that Lemington Road has been closed at the river crossing a cumulative total of almost 8 months since the crossing was upgraded in 2010.

#### iv Comleroi Road

Comleroi Road is a local road linking the Golden Highway in the south to Archerfield Road in the north. It provides access to the Hunter Valley Gliding Club and access to the HVO South mine entrance road. Comleroi Road is an unmarked sealed two-way, two-lane road measuring approximately 7–8 m across with approximately 3.5 m travel lanes in each direction.

#### v Archerfield Road

Archerfield Road is a minor gravel road which provides access to land east of HVO South boarded by the Hunter River from Comleroi Road. Archerfield Road provides access to largely mine owned land used for agricultural purposes and environmental stewardship. Two mine owned residential dwellings utilise Archerfield Road for access.

#### vi Pikes Gully Road and Liddell Station Road

Pikes Gully Road and Liddell Station Road are linked local roads towards the north-western part of the Project boundary which runs off the New England Highway. Pikes Gully Road travels south from the New England Highway underpass to Howick CPP. Liddell Station Road travels north from the New England Highway underpass to service the Newdell LP, Ravensworth Operations CPP and HVLP.

Both roads are also used for product coal haulage from Howick CPP, waste material haulage and mine access between the facilities within HVO. However, haulage activities do not need to travel on and interrupt the New England Highway as it underpasses the highway. HVO currently maintains all of Pikes Gully Road and manages the section of Liddell Station Road closed to the public, as approved under DA 450-10-2003.

Pikes Gully Road and Liddell Station Road are sealed and unmarked two-way, two-lane roads measuring approximately 7–8 m across with minimal provision for road shoulders. Their posted speed limit is 60 km/h.

### 19.2.2 Road intersections

The TIA considered the following road intersections:

- Lemington Road/Ravensworth Operations access;
- New England Highway/Lemington Road;
- Golden Highway/Comleroi Road;

- Golden Highway/Lemington Road;
- New England Highway/Liddell Station Road access;
- Liddell Station Road/Liddell Station Road access;
- New England Highway on-ramp/Pikes Gully Road;
- New England Highway/Old New England Highway; and
- Lemington Road/HVO North access.

The existing status of these intersections is described in detail in Section 3.2 of the TIA (Appendix R).

### 19.2.3 Rail network

The Australian Rail Track Corporation (ARTC) regularly runs coal, general freight and passenger heavy rail services using the double-track Hunter Line which runs north of the Project.

Currently, processed coal is transported from the Newdell LP and HVLP at HVO North. Both train loading facilities are on the Newdell balloon loop. Coal is predominantly railed to the Port of Newcastle.

### 19.2.4 Road safety

The latest available crash data (2016–2020) from TfNSW's *Centre for Road Safety: Crash map* was analysed for roads within the study area. The crash type and severity of crashes are summarised in Table 19.1. This table shows that a high number of crashes involving vehicles travelling in the opposing direction (ie head-on) and off path crashes on a straight section of road.

Crashes at key intersections include:

- Golden Highway/Lemington Road – a right-rear (ie a rear-end crash involving a vehicle turning right at the intersection) minor-injury crash has been recorded at the intersection. Several other crashes (head-on, loss of control) have been recorded on Golden Highway at the approach to this intersection.
- New England Highway/Lemington Road – a rear end moderate injury crash has been recorded at the right turn acceleration lane out of Lemington Road and a non-casualty out-of-control overtake crash was recorded at the intersection.
- New England Highway/Pikes Gully Road – a rear-end minor injury crash has been recorded at this intersection.
- Golden Highway/Comleroi Road – a run-off crash was recorded at this intersection.

The data revealed that there were no crashes recorded on the existing alignment of Lemington Road, Pikes Gully Road and Liddell Station Road within the assessed 5 year period.

**Table 19.1 Number of crashes by crash type and severity summary (2014–2018)**

| Type of crashes | Fatality | Serious injury | Moderate injury | Minor injury | Non-casualty (Tow-away) | Total |
|---|---|---|---|---|---|---|
| Pedestrian | 0 | 0 | 0 | 0 | 0 | **0** |
| Intersection | 0 | 0 | 4 | 1 | 0 | **5** |
| Opposing direction | 1 | 3 | 6 | 1 | 1 | **12** |
| Same direction of travel | 0 | 1 | 1 | 0 | 2 | **4** |
| Overtaking | 0 | 0 | 1 | 0 | 0 | **1** |
| On-path[1] | 0 | 0 | 0 | 0 | 1 | **1** |
| Off-path on straight | 0 | 0 | 3 | 0 | 2 | **5** |
| Off-path on curve or turning | 1 | 4 | 4 | 1 | 4 | **14** |
| **Total** | **0** | **1** | **2** | **0** | **3** | **6** |

1. On-path crashes include crashes with parked vehicles, broken down vehicles, vehicle doors, permanent obstruction on carriageway, road works and collision with animal.

## 19.3 Impact assessment

### 19.3.1 Construction phase

#### i Traffic movements

For the most part, construction activities will generally be undertaken onsite, outside of the road corridor to minimise their interruption with the operations of the road network. This includes the construction of Lemington Road where the new alignment will be completed prior to closing access from the existing alignment. Tie-in works for Lemington Road will be undertaken with appropriate temporary traffic controls and will be manageable given the low traffic demand on this road.

Interaction with the road network is expected at the access points to the construction sites, at tie-in locations of Lemington Road realignment works and some material transporting activities (internal haulage) between work sites.

The traffic movements for the Project considers the combination of light and heavy vehicle movements at peak construction which is forecasted to occur at the end of Year 2. The anticipated distribution of truck movements by month and year, broken down by construction area, is shown in Figure 19.2.

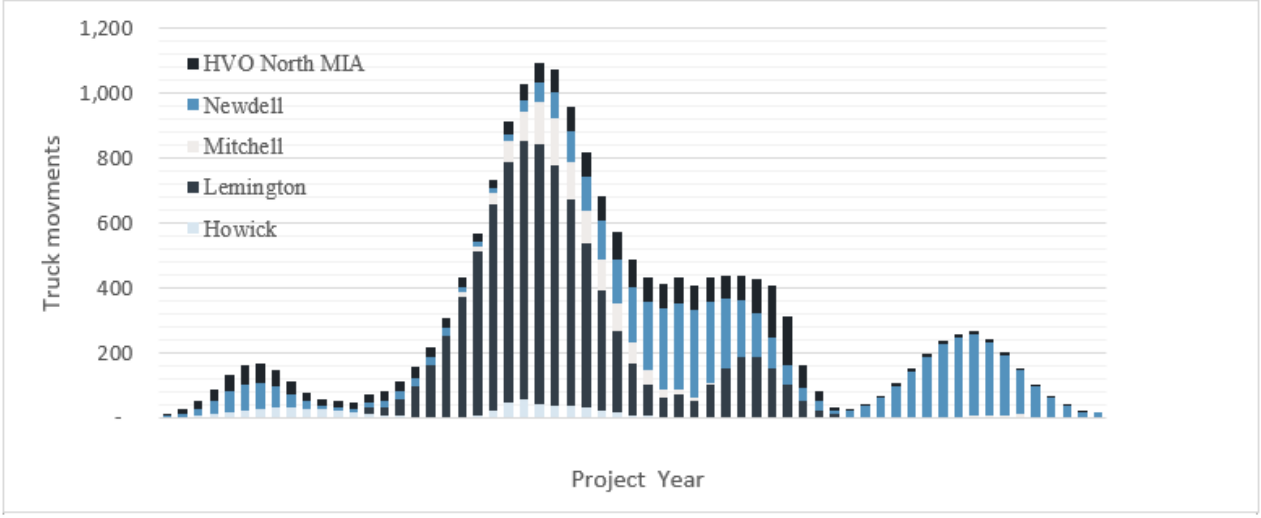



**Figure 19.2 Estimated construction truck movements**

In terms of vehicle types, it is envisaged that construction materials transportation will predominantly use a truck only (20 tonnes) or truck-and-dog trailer (32 tonnes). Oversize and/or overmass (OSOM) vehicles (vehicles exceeding 42.5 tonnes) may be required for the transportation of heavy construction plant or materials. The use and travel routes of these vehicles require individual permit applications submitted to the relevant road authority.

Figure 19.3 shows the estimated combined traffic activities for the Project.

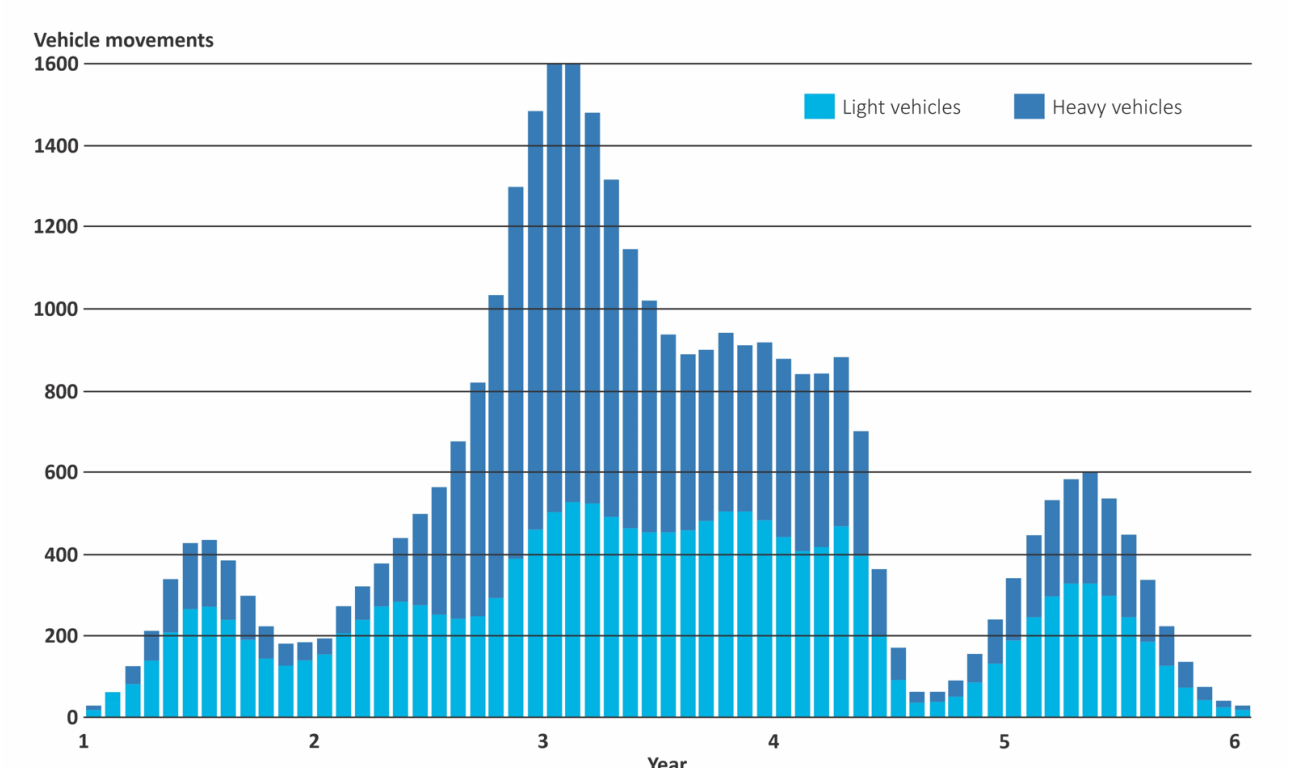



**Figure 19.3 Estimated total construction vehicle movements (monthly totals)**

### ii Intersection impacts

#### a AM peak

In the AM peak, most of the intersections will operate satisfactorily at Level of Service (LoS) A or LoS B with minimal delays across all sites except for those intersecting the New England Highway. LoS is defined by Austroads as a measure for ranking operating road and intersection conditions, based on factors such as speed, travel time, freedom to manoeuvre, interruptions, comfort and convenience, with 'A' operating at the best levels of service and 'F' at an unsatisfactory level of service.

The combination of increased traffic due to construction activities and the background traffic growth on the New England Highway could result in a reduced level of service at intersections along the New England Highway including at:

- Lemington Road (LoS F, existing condition of LoS B) – construction-related traffic at sites accessible via Lemington Road (including the realigned Lemington Road) will peak around the end of Year 2 between 5.00 am and 6.00 am and impact the level of service at this intersection. A LoS F is predicted with the assumption that an equal amount of inbound and outbound trucks will enter/exit the construction sites to pick-up/drop-off materials or plant. This was revisited noting that it takes time for trucks to load/unload at a construction site, and therefore a sensitivity test was done to remove outbound truck movements. Taking this into consideration, the intersection performance will improve to LoS E and queueing reduced to approximately 20 m (three car lengths). The queuing can be contained on Lemington Road without affecting safety at the intersection or performance on New England Highway, with impacts predominantly affecting traffic movements to/from the mines.

- Old New England Highway (LoS E, existing condition of LoS C) – there will be minimal HVO construction traffic movements accessing the Old New England Highway given that it is not the main access point to HVO's Newdell construction area. The LoS E was largely influenced by regional traffic growth on New England Highway during construction; however, queueing on the Old New England Highway will remain short. Further, a sensitivity analysis was undertaken for this intersection without LCO operating, given it is anticipated to close by this time, finding that in this scenario the LoS will be D rather than E.

- Liddell Station Road access (LoS D, existing condition of LoS C) – most construction vehicles accessing the Newdell construction area will enter/exit via Liddell Station Road access. The intersection is predicted to operate at LoS D; a change from the existing condition of LoS C. This is considered a minor impact.

#### b PM peak

The performance of New England Highway intersections at Lemington Road and Liddell Station Road access will decrease in the PM peak period, operating at a LoS C (from LoS A in existing conditions) and LoS D (from a LoS C in existing conditions) respectively. The New England Highway/Old New England Highway will also operate at a LoS D compared to the existing LoS C. These are minor impacts as the intersections will still operate suitably.

### iii Freight

The largest vehicle typically required daily during construction will consist of a truck-and-dog within the limitation of a general access vehicle of 19 m long. Class 1 (OSOM) vehicles will also be needed to transport construction plant or materials to the site. Lemington Road currently permits the use of OSOM, and therefore no additional mitigation measures are required to allow these vehicles to access the construction sites.

Additionally, the construction activities will mainly be undertaken offline from the State road network. Some works may occur on local roads (ie Lemington Road); however, traffic control will be in place to maintain access on all road network throughout the construction. As such, no adverse impacts are anticipated to the accessibility of freight movements resulting from Project construction activities.

#### iv Parking

All car parking spaces will be off-street to minimise interaction with the operation of the road network.

#### v Public transport

There are no regular public bus services on the roads within the study area except for school buses on Comleroi Road and train replacement buses on the New England Highway between Scone, Muswellbrook, Singleton and Maitland. School buses currently using Comleroi Road may be affected by Lemington Road realignment construction works where the Comleroi Road/Golden Highway intersection requires upgrading; however, operation of the existing road network is expected to be maintained during construction and therefore impacts are anticipated to be negligible. Transport for NSW, relevant schools and bus operators will be notified of interruptions required to occur on the road network. It is also noted that residential dwellings along Comleroi Road are mine owned, and HVO will notify tenants of proposed activities to minimise the risk of impacts to school bus access.

#### vi Active transport

Most of the construction activities, including the realignment of Lemington Road, will occur outside of the road corridor to minimise their interruption with the operations of the road network. Interaction with the road network is expected at the access points to the construction sites, at tie-in locations of Lemington Road realignment works and some material transporting activities between work sites on Lemington Road only.

Tie-in works on Lemington Road will be undertaken with appropriate temporary traffic controls and will ensure safe management of pedestrian and cyclists around the work site.

Interaction at access points and tie-in locations are to be managed with the development of a traffic management plan (TMP) to ensure safety and accessibility for workers and all road users, including cyclists and pedestrians.

#### vii Property access

The operation of the existing road network will be maintained during construction. There are currently no private properties along Lemington Road, Comleroi Road, Liddell Station Road, Pikes Gully Road or the Old New England Highway.

### 19.3.2 Operational phase

The annual ROM coal extraction rate at HVO North will be maintained at 22 Mtpa, while the annual extraction rate at HVO South will reduce from 20 Mtpa to 18 Mtpa. Workforce numbers will remain approximately as approved. Therefore, in terms of traffic generation, the Project is not expected to change vehicle movements associated with the operation of HVO.

#### i Intersection impacts

Key intersections were analysed in SIDRA for the future scenarios of approximately Year 3 (2025), to account for opening year traffic of the Lemington Road realignment, and Year 13 (2035) and Year 23 (2045), to account for the continuation of HVO North 10 years post-opening and 20 years post-opening, respectively.

### a Year 3 (2025) scenario

In the AM period, only minor or negligible impacts are anticipated. The Project is predicted to have a minor impact on the New England Highway/Lemington Road intersection with the LoS changing from a LoS B to LoS C (less than one additional car in the queue). The New England Highway/Old New England Highway intersection will remain operating at LoS C (with LCO being closed) and the New England Highway/Liddell Station Road access will also remaining operating at a LoS C.

In the PM, the Project will result in a minor increase in the LoS from A to B at the New England Highway/Lemington Road intersection and from a LoS C to D at the New England Highway/Old New England Highway intersection (although this will remain at LoS C without LCO).

### b Year 13 (2035) scenario

This scenario was selected to align with Austroads' guideline, assessing the road network's performance 10 years following the scheduled completion of Lemington Road realignment.

Intersection modelling, taking into consideration the assumed background growth, indicates that several intersections will become constrained even without the Project. Background growth is anticipated to result in the New England Highway/Lemington Road intersection operating at a LoS D and the New England Highway/Old New England Highway at a LoS E; however this reduces to a LoS D by taking into account the closure of LCO in 2023. Noting this, HVO as detailed in Section 19.5, will minimise outbound construction truck movements during the AM peak period to minimise potential constraints on intersection serviceability.

The Project will increase the LoS to a LoS E at the New England Highway/Lemington Road intersection (which equates to less than 3 cars), a LoS E at the New England Highway/Liddell Station Road access intersection (increase in average delay by 19) and to a LoS E at the New England Highway/Old New England Highway intersection (equating to less than one car with LCO ceasing from 2023).

While a LoS E is generally not desirable for intersection performance, traffic demand and traffic queues at the affected intersections are minor and can be cleared effectively well. Queuing at the New England Highway intersections at Liddell Station Road access and Old New England Highway would not exceed the length of one car, and a 95$^{th}$ percentile traffic queue on Lemington Road of up to three cars.

In the PM peak period, minor increases in traffic delays are also anticipated; however, the lower overall traffic demand in this period means that intersections will operate with better LoS than the AM peak.

In summary, some deterioration in the level of service at intersections along the New England Highway are expected around 2035; however, this deterioration is mainly due to the assumed background traffic growth on the highway and not the contribution of the Project. In addition, despite the longer delay which the intersections abutting New England Highway will be subjected to, these movements will only result in 95$^{th}$ percentile queueing of no longer than one car length. The majority of traffic on the New England Highway will be generally uninterrupted. As such, the TIA found that no mitigation measures are required on the road network to address the minor impact associated with the continuation of HVO.

### c Year 23 (2045) scenario

This scenario was selected to align with Austroads' guideline, assessing the road network's performance 20 years following the scheduled completion of the Lemington Road realignment.

Without the Project, the background growth assumptions considered in the model result in several intersections operating at a LoS F. In the AM peak, the intersections of Lemington Road, Liddell Station Road Access and the Old New England Highway with the New England Highway will be operating at a LoS F, and this will remain the case with the Project. Similarly in the PM peak, the New England Highway/Liddell Station Road Access and the New England Highway/Old New England Highway will also both be operating at a LoS F. That is, the Project will not materially contribute to change in the operation of these intersections.

The continuation of the Project will result in minor increases in the AM peak period in traffic delays at the New England Highway/Lemington Road intersection (approximately one additional car) and the New England Highway/Liddell Station Road access intersection (less than one car). The New England Highway/Old New England Highway intersection is not expected to be materially impacted.

A LoS F is generally not desirable for intersection performance; however, the impact is predominantly due to background growth and the delay will be subjected mainly to the side streets and existing auxiliary lanes, thus, not impacting on the overall operation of New England Highway.

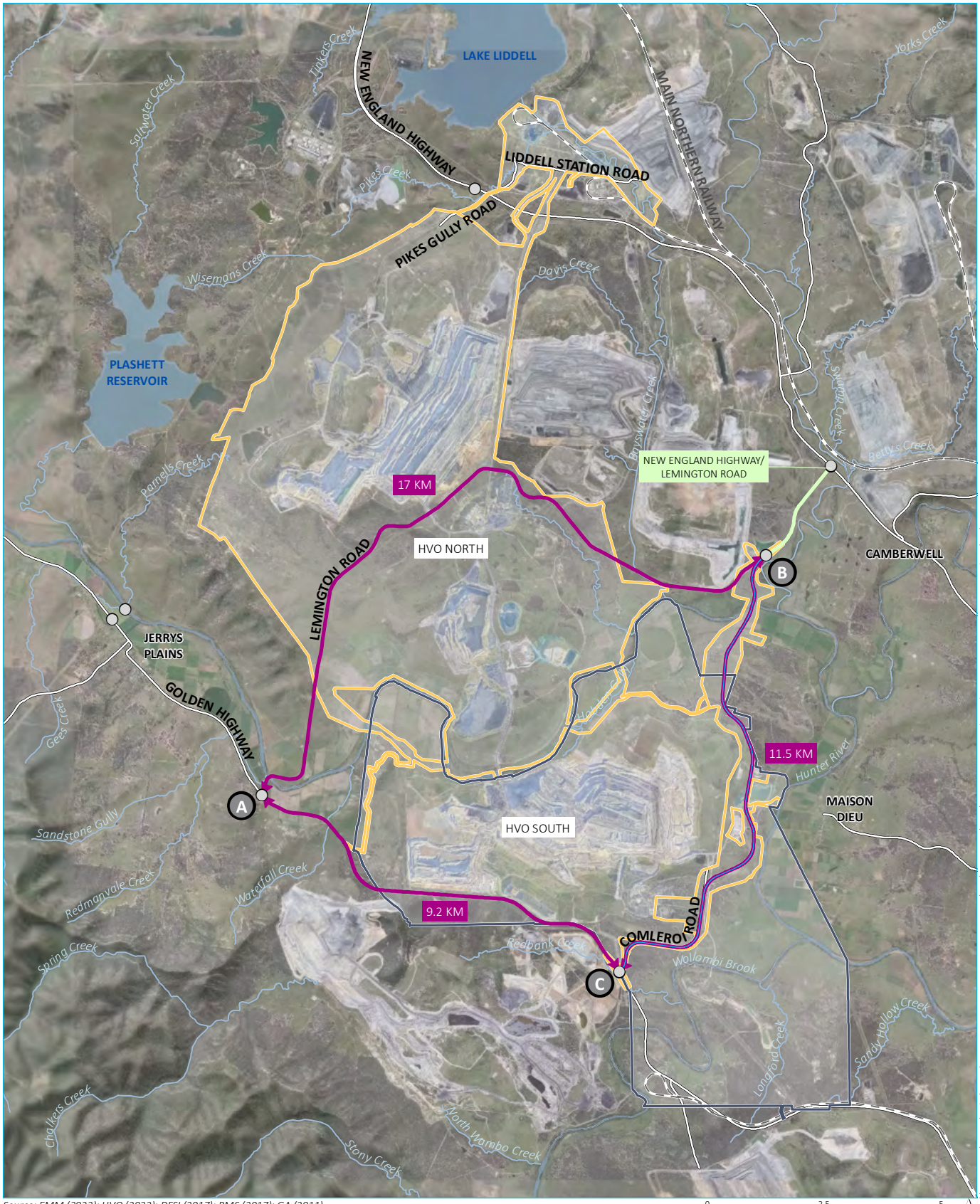
In the PM, the Project will also result in minor increases in traffic delays. Like those observed in the 2035 model, the deterioration of level of service at intersections along the New England Highway are contributed mainly due to the assumed background growth on the highway.

### ii Travel time and condition on Lemington Road

As part of the Lemington Road realignment (refer to Figure 4.11), the quality of Lemington Road (horizontal alignment, road width, provision of road shoulders and clear zones) will be improved to enable a more reliable travel route and safer road features.

To assess the change in travel time that will occur with the realignment of Lemington Road, the following nodes (Figure 19.3) were selected:

- Node A: Lemington Road/Golden Highway;
- Node B: Lemington Road/new Lemington Road alignment; and
- Node C: Comleroi Road/Golden Highway.




Source: EMM (2022); HVO (2022); DFSI (2017); RMS (2017); GA (2011)

0 2.5 5 km

GDA2020 MGA Zone 56

N

KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Key intersection
- Key road segment
- Lemington Road connection to New England Highway
- Lemington Road realignment
- Rail line
- Major road
- Named watercourse
- Named waterbody

# Lemington Road realignment travel distance

HVO Continuation Project
Environmental Impact Statement
Figure 19.4

EMM creating opportunities

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Table 19.2 summarises the estimate of travel time between the nodes.

**Table 19.2 Lemington Road realignment travel times**

| Route | Existing | | With realignment | | |
|---|---|---|---|---|---|
| | Distance (km) | Travel time at 85–95 km/h (minutes) | Distance (km) | Travel time at 85–95 km/h (minutes) | Travel time at 100 km/h (minutes) |
| A–B | 17 | 10.7–12 | 20.7 | 13–14.6 | 12.4 |
| B–C | 26.2 | 16.5–18.5 | 11.5 | 7.3–8.1 | 6.9 |

Based on the predicted travel times:

- Trips to/from the east of the Lemington Road would be faster by approximately 9–10 minutes indicating a moderate improvement in travel time.
- Trips to/from the west of the current Lemington Road alignment would be longer by approximately 2–2.5 minutes if vehicles were to travel at the current observed speed on Lemington Road. This indicates a moderate impact to travel time which affects approximately 5% of the trips currently recorded on Lemington Road. With the realignment, the quality of the road condition on Lemington Road will be improved with road curves designed to the speed limit, therefore a higher average travel speed on Lemington Road should occur. Assuming a travel speed of 100 km/h, the realignment of Lemington Road would increase the travel time by up to 1 minute 40 seconds in comparison to the existing travel time.

An origin-destination survey was undertaken to inform an understanding of road users currently using Lemington Road who may be affected by the realignment of Lemington Road. The number of full daily trips from the Golden Highway to the New England Highway is generally low, making up to 4% of the total trips recorded on Lemington Road (1,780 trips daily, based on surveys undertaken September 2020). This similar proportion is also observed for full trips from the New England Highway to the Golden Highway, being the opposite direction. The majority of traffic on Lemington Road use the road to access HVO and Ravensworth Operations from the New England Highway.

### iii Lemington Road flood immunity

The realigned Lemington Road includes the construction of a new bridge over the Hunter River (refer to Figure 4.1), which will be constructed to meet the requirements of a 1 in 10 ARI flood protection design. This design will provide improved accessibility and safety outcomes in comparison to the existing Moses Crossing, which is a low-level bridge across the Hunter River at the southern end of the existing Lemington Road.

River level data, extrapolated from data from the upstream Liddell Pump Station monitoring point (210083), indicates Moses Crossing has been underwater for over 19,000 hours since 2010 or the cumulative equivalent of approximately 26 months, as shown in Figure 19.5. However, the proposed new bridge would have been accessible throughout the same period as shown in Figure 19.6.

It is also notable that the existing crossing only spans the deepest channel of the Hunter River, as shown in Plate 19.1. During high flood water events a secondary channel is formed on the northern side of the bridge. Due to the additional channel, road reopening is often some time after water recedes below deck level as repairs to the approach are required. The figures quoted above relating to the amount of time Moses Crossing has been closed are based on the water level relative to the crossing deck only and can therefore be considered conservative.



**Plate 19.1 Moses Crossing in Flood (31 July 2022)**



**Photograph 19.1 Moses Crossing in Flood (3 November 2022)**

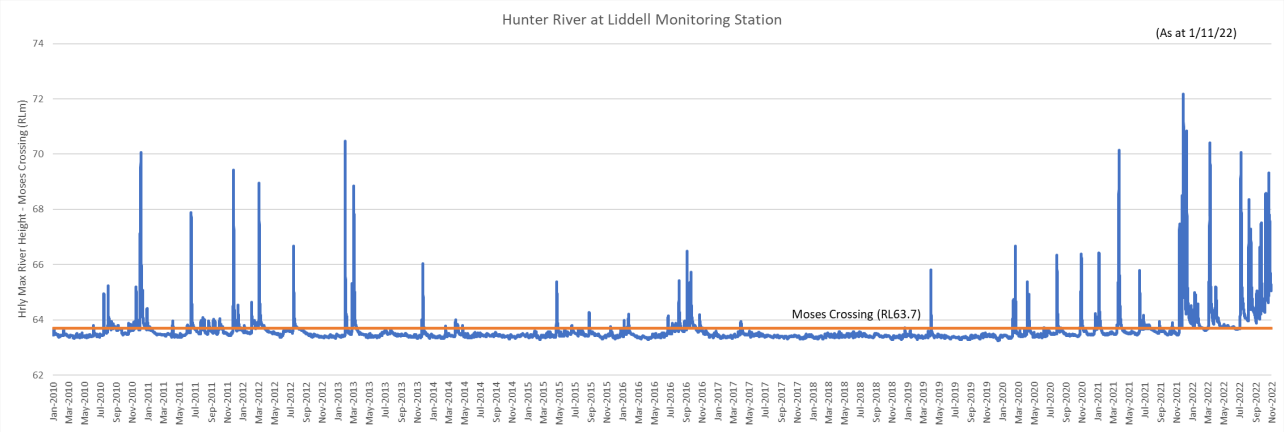



**Figure 19.5 Hunter River height at Moses Crossing (Current)**

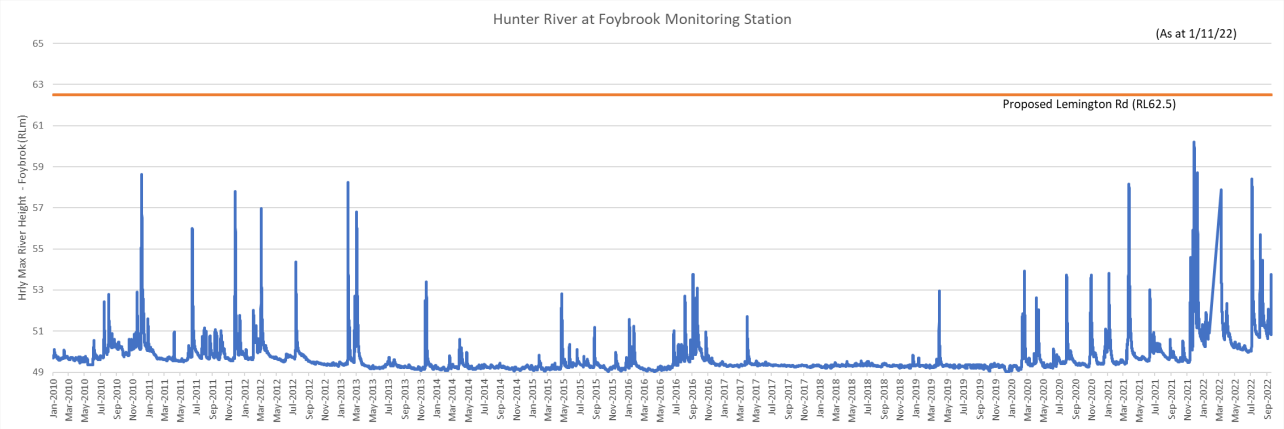



**Figure 19.6 Hunter River height and proposed flood clearance level (Project)**

### iv Freight

The realigned Lemington Road will improve access for heavy vehicles between the Golden Highway and New England Highway, which will open an opportunity for TfNSW to gazette Lemington Road as a B double (RAV) and OSOM route throughout its length and improve accessibility to mines via the Golden Highway. The realignment will also remove the need for vehicles to travel via Moses Crossing, which as discussed above can be subject to road closure during flood events and less suitable for frequent and high-volume use of heavy vehicles.

### v Parking

There will be no changes to parking. All car parking will be off-street parking.

### vi Public transport

The school bus route through Lemington Road will be maintained with the realignment of Lemington Road, and therefore there will be no impact to this service.

#### vii Active transport

The realigned Lemington Road will improve accessibility for cyclist and pedestrians in general with road shoulders providing separation from the adjacent travel lane. The existing Lemington Road alignment, west of the improvements made under the Ravensworth Operations Project (PA 09_0176), does not presently include an appropriate road shoulder to provide separation.

The road condition post realignment is still considered rural and the continuation of mining activities at HVO are not expected to generate pedestrian or bicyclist activities.

#### viii Property access

Following the Lemington Road realignment, a number of mine-owned rural farm properties off Lemington Road north of the Golden Highway, will experience minor increases in travel time. Access to Ravensworth Operations will be shifted further east; however, the layout of the intersection will be maintained with CHR and basic left (BAL) treatment for the right and left turn movements, respectively. The realignment of Lemington Road will have a minor travel time impact to Ravensworth Operations.

### 19.3.3 Cumulative impact

#### i Mining operations

HVO is surrounded by other neighbouring mines of varying stages in their mine life, with most already in operation, and therefore traffic demand generated by these mines has been included in the surveyed traffic volumes and does not result in residual cumulative impact. As discussed in Chapter 2, based on currently approved and proposed (ie under assessment) mines in the Hunter Valley, there will generally be a gradual decrease in mining activities from around 2026 onwards. Consequently, traffic activities within this region area also expected to decrease.

#### ii Road transport projects

There are three state level road upgrade projects which have been considered as part of the cumulative assessment:

- Muswellbrook Bypass – a high-capacity carriageway which bypasses the Muswellbrook town centre;
- Singleton Bypass – a high-capacity carriageway which bypasses the Singleton town centre; and
- Golden Highway upgrades – a series of varying work types of road widening, intersection improvements and installation of new overtaking lanes along the 313 kms of the Golden Highway between Belford to Dubbo.

These projects are not envisaged to have significant interaction with the Project.

## 19.4 Mitigation measures

Table 19.3 details the mitigation measures to be implemented during the construction phase of the Project.

**Table 19.3 Traffic mitigation measures**

| ID | Mitigation measures |
|---|---|
| TT1 | A Traffic Management Plan will be developed for the Project and will include:<br>• measures to be implemented to minimise interruption to the local road network during construction activities, and ensure the safe ingress and egress of construction vehicles<br>• liaison with relevant road authorities and local school and bus providers |
| TT2 | To manage intersection performance affected by increased demand by construction traffic:<br>• Lemington Road/New England Highway – minimise outbound construction truck movements during the AM peak period (6.00 am–7.00 am); and<br>• Old New England Highway/New England Highway –The primary access will be via the Liddell Station Road access, so that the Old New England Highway is used as a secondary access only. |
| TT3 | The new portion of Lemington Road will be constructed and complete prior to the closure of the existing alignment. Other than managed traffic control during the tie-in work, the construction of the new alignment will not restrict access or use of the existing Lemington Road. |

It is predicted that there will be minor operational traffic impacts associated with the Project. The deterioration in LoS at some intersections, particularly on the New England Highway was due to the assumed background regional traffic growth of the highway. Consequently, no mitigation measures are recommended for the operation of the Project.

## 19.5 Summary and conclusion

A key aspect of the Project is the realignment of Lemington road to facilitate the progression of mining from the Mitchell Pit area through to the Carrington Pit area at HVO North. The realigned Lemington Road will deliver an improved travel experience for users in terms of reliability, safety and average speed, by providing improved travel conditions via a larger radius, improved clear zone and shoulder widths, and replacement of the existing single-lane low level bridge crossing over the Hunter River (Moses Crossing) with a new bridge.

The TIA assessed the impact of the Project on the surrounding road network during the construction stage (envisaged to peak at the end of Year 2), at the year of opening of Lemington Road (around Year 3, 2025), and the following 10 years (approximately 2035) and 20 years (approximately 2045).

The construction program for the Project will occur across an approximate five-year period. All intersections in the study area are expected to operate at acceptable levels of service with minimal mitigation treatments required, except for the Lemington Road/New England Highway intersection (AM peak only) and the Old New England Highway/New England Highway intersection, where the intersections were found to operate at capacity. To minimise this impact, outbound heavy vehicle activities accessing Lemington Road will be minimised where practical during the peak hour (6.00 am–7.00 am). The Old New England Highway will also not be used as a primary construction haul road and will be formalised through the TMP and VMP to ensure traffic demand using this road is low.

During continued operations, the impact of Project on the local road network is anticipated to be minor. Beyond 2035 (around Year 13 of the Project), some intersections are predicted to perform at LoS F; however, this will be mainly due to background traffic growth on the road network, not contribution of traffic from HVO. This was found at intersections along the New England Highway (Lemington Road, Old New England Highway and Liddell Station Road access) and is generally caused by the forecasted background traffic growth in New England Highway given that the intersections would operate at similar LoS without the continuation of HVO.

In terms of changes to travel time due to the Lemington Road realignment, it was found that:

- trips to/from the west of the Lemington Road/Golden Highway intersection will increase between 1.40 minutes and 2.30 minutes indicating minor impact to travel time, affecting approximately 5% of the trips currently recorded on Lemington Road; and
- trips to/from the east of the Lemington Road/Golden Highway intersection will decrease by approximately 9–10 minutes, which is an improvement in travel time.

It is noted that as the majority of Lemington Road users are mine workers, either accessing HVO or Ravensworth Operations, as such mine workers will be the most impacted by construction and ongoing operational traffic related aspects of the Project.

With the realignment of Lemington Road, vehicles will no longer need to travel via Moses Crossing to cross the Hunter River. The new bridge across the Hunter River will substantially improve the flood resilience of the road, providing a significantly more reliable access between the New England Highway and Golden Highway, thereby improving access for the community.

# 20 Visual amenity

## 20.1 Introduction

A visual impact assessment (VIA) has been completed (Appendix S) in accordance with the relevant governmental assessment requirements. There are no Commonwealth, NSW or local government planning policies, guidelines or standards directly applicable to this assessment. The VIA was prepared with reference to the methods outlined in:

- *Guidelines for Landscape and Visual Impact Assessment Third Edition* (2013) (the GLVIA), prepared by the Landscape Institute and Institute of Environmental Management and Assessment; and
- *Wind Energy: Visual Assessment Bulletin AB 01 For State Significant Wind Energy Development* (2016b) (the VA Bulletin) prepared by DPE.

It is noted that the VA Bulletin specifically relates to assessment of visual impacts of wind farms in NSW; however, a number of the methods for describing visual sensitivity and landscape character are considered relevant to the VIA. In the absence of other directly applicable guidelines/standards, the relevant elements from the VA Bulletin have been adopted for this assessment.

The VIA also considered post-mining land use principles and region-specific strategic plans.

Key Project considerations for the VIA, described within Chapter 4, include:

- the continuation of mining operations beyond the approved completion dates at HVO North for a further 25 years and HVO South by 15 years;
- the Project will operate within existing mining tenements and predominately within existing and approved disturbance footprints;
- proposed mining activities will preserve the existing ridgeline between HVO North and the Jerrys Plains township, continuing to provide an amenity barrier;
- no increase is proposed to approved heights of overburden emplacement areas; and
- the Project provides the opportunity to contemporise the HVO final landform by incorporating natural landform design principles. Areas disturbed by mining activities as a result of the Project will reflect a landform that is sympathetic to the surrounding landscape.

## 20.2 Assessment methodology

The VIA assessed the potential visual amenity impacts of the Project and provides an assessment of the incremental impacts of the continuation of HVO North and HVO South. Detailed information on the assessment methodology is provided in Chapter 2 of the VIA (Appendix S). The assessment involved the following stages:

1. View type and context – the existing landscape baseline was described noting its character and complexity.
2. Visibility baseline assessment – the zone of visual influence of the Project was established based on topographical data and fieldwork analysis.
3. Viewpoint selection – 12 representative viewpoints of the Project area were selected and the Project's existing and predicted level of exposure to them was determined.

4. Magnitude of change – the magnitude of visual change and the changes arising from the Project were assessed and the need for project modifications or other mitigation measures was evaluated.

5. Visual sensitivity – the capacity of the landscape to absorb change without a loss of quality was determined.

6. Evaluation of significance – the significance of change in the landscape was established (which was a function of the magnitude of change when considered against the view type/context and the sensitivity of a receptor).

While it is acknowledged that there are privately-owned residences and road corridors that are already subject to a high visual impact from HVO's approved, existing mining operations, the VIA focused on what will change from approved operations as a result of the Project (eg changes to mining operations within the Project area and new/upgraded infrastructure associated with the Project), and the proposed timing of mining activities through to completion of the Project.

## 20.3 Existing environment

HVO is within a well-established coal mining and power generation region in the Hunter Valley. The general area surrounding the HVO Complex is comprised of various operating open cut and underground coal mining operations. Existing open cut pits, mine-related infrastructure and rehabilitated former mining areas are to the north, east, south-east and south-west of the HVO Complex (Figure 1.3). Other land uses in the area include agriculture, mine-owned buffer land, biodiversity offsets, rural residential areas and the Wollemi National Park.

There are limited private residences in close proximity to the Project area, with the closest residences at Maison Dieu (2.5 km east), Long Point (7 km south-east), Camberwell (3 km east) and Jerrys Plains (3 km west). A few private residences are also within the suburb of Gouldsville, next to Long Point. Receptor localities are shown on Figure 2.4. All residences within Warkworth (1.5 km south-west of the Project area) are mine-owned.

Visual impacts associated with HVO's existing mining operations have previously been assessed and approved and are considered as part of the existing environment. An overview of the existing visual impact of the HVO Complex and how this is currently managed is provided in Table 20.1.

**Table 20.1 Existing visual impact of the HVO Complex**

| Aspect | Details |
|---|---|
| Existing environment | • Long distance views of the HVO Complex are limited by the surrounding area's moderately undulating topography. These views are generally of HVO South from Maison Dieu to the east and further away at Long Point to the south-east. Wandewoi Ridge, west of HVO North, obscures views from Jerrys Plains.<br>• HVO South is significantly more visible from privately-owned dwellings and the local road network than HVO North. The dominant visible element for HVO South is the eastern part of the Cheshunt Pit overburden emplacement area, which is currently being rehabilitated (including revegetation). Rehabilitated land and overburden emplacement areas associated with Riverview Pit and South Lemington Pit 1 are also visible.<br>• Views of HVO North are limited to passing motorists on the New England Highway and partially obstructed views from privately-owned dwellings off Jerrys Plains Road (at a distance of approximately 4.7 km). Visible elements of HVO North include rehabilitated land and overburden emplacement areas associated with Carrington Pit, as well as rail load out facilities and stockpiles north of New England Highway.<br>• The HVO Complex lies between the Golden Highway and the New England Highway. Significant areas of mining and power generation-related infrastructure are visible from both the Golden Highway and the New England Highway within proximity of the HVO Complex. Motorists travelling along the Golden Highway and New England Highway experience transitory views of elements of the HVO Complex.<br>• If constructed, and assuming no screening in the landscape, the approved LCPP and rail loop may become visible from residences in Long Point and Maison Dieu. |

**Table 20.1 Existing visual impact of the HVO Complex**

| Aspect | Details |
|---|---|
| Existing mitigation of visual impacts | Visual impacts at the HVO Complex are currently managed in accordance with the relevant conditions of DA 450-10-2003 (HVO North) and PA 06_0261 (HVO South). Control measures already in place at HVO to minimise impacts to visual amenity include:<br>• raising awareness to ensure that the relevant workforce are aware of potential impacts of equipment and lighting on sensitive locations;<br>• ensuring lighting is directed away from residences through the use of directional lighting equipment and shielding but in accordance with safety regulations;<br>• the use of colours that will complement the surrounding environment (eg muted greens or beige are preferred over bright colours unless necessary for safety) where feasible and infrastructure can be viewed from private vantage points;<br>• overburden emplacement areas are designed to provide visual shielding to active mining operations; and<br>• progressive rehabilitation. |

## 20.4 Impact assessment

### 20.4.1 Visual elements of the Project

#### i HVO North

#### a Construction

Construction activities at HVO North are described in full in Chapter 4 and includes a number of infrastructure upgrades and changes required to facilitate the Project, including the realignment of part of Lemington Road, relocation of transmission and telecommunication lines, and an upgrade of the existing Newdell LP train loading facility including construction of a new product stockpile and train loading bin, an upgrade of the HVLP product stockpile including an extension to the existing coal stockpile, and improvements to water management infrastructure.

#### b Operations

Mining will continue at HVO North in the current West and Mitchell Pit areas. Mining will then progress in a southerly direction towards the Carrington area, mining through the existing pit separation (including Lemington Road). No increase to approved heights of overburden emplacement areas are proposed. Coal from HVO North will continue to be predominantly processed at the HV and Howick CPPs. Once operational, the realigned Lemington Road and motorists travelling along the new road corridor may become visible from residences and local roads in Maison Dieu and Long Point.

#### c Rehabilitation and final landform

Areas which are rehabilitated and do not require disturbance for the Project, or where rehabilitation is largely progressed or currently underway, will be rehabilitated consistent with existing approvals. Areas disturbed by mining activities because of the Project will reflect a landform that is sympathetic to the surrounding landscape and will incorporate contemporary natural landform design principles. The Project will reduce the number of final voids that will remain post-mining at HVO North, from three to one (within the Carrington area).

#### ii HVO South

##### a Construction

Approval to construct and use the LCPP will be retained as part of the Project; however, only the construction of the long rail loop adjacent to the LCPP will be retained. Construction of the LCPP and rail loop is unlikely until later in the mine life (around Year 13–15) should future operational requirements and or market conditions deem it necessary. Other construction activities required to support the Project are:

- decommissioning and realignment of powerlines and telecommunications infrastructure; and
- upgrades to water management infrastructure (eg the enlargement of Lake James and the construction of flood protection levees).

##### b Operations

Mining activities at HVO South will continue largely consistent with currently approved activities albeit at a slower rate. Mining is proposed to continue in the existing Cheshunt Pit area in a south-westerly direction, transitioning towards the west. Mining will continue to progress west, including beneath parts of the previously excavated Riverview Pit, before progressing south again towards the tenement boundary. Coal extraction activities within HVO South will be complete in 2045. Overburden emplacement will occur within the Cheshunt/Riverview pit area. No increase to approved heights of overburden emplacement areas are proposed.

##### c Rehabilitation and final landform

Mined areas of HVO South have been rehabilitated in accordance with traditional engineering landform design principles, which have been shaped to the approved final landform as per the RMP (ERR Australia 2022) and PA 06_0261. Areas previously disturbed and not subject of Project activities will be rehabilitated consistent with existing approvals. Areas disturbed by mining activities as a result of the Project will reflect a sympathetic landform to the surrounding landscape and incorporate micro-relief features. Consistent with PA 06_0261, one final void will remain at HVO South, in the south-western corner of Riverview Pit. South Lemington Pit 1 void will be filled with overburden material from the adjacent stockpiled material.

### 20.4.2 Assessed viewpoints

A total of 12 representative viewpoints were identified and ground-truthed as part of the VIA. Viewpoints were selected based on the following criteria:

- proximity to the Project area;
- the location of receptors;
- local topography;
- stakeholder engagement outcomes during the scoping phase of the Project;
- visual simulations of the HVO Complex using the proposed mining stage plans;
- previous VIAs and lighting audits undertaken for the HVO Complex; and
- the positioning of regional and local roads and potential impacts on passing motorists.

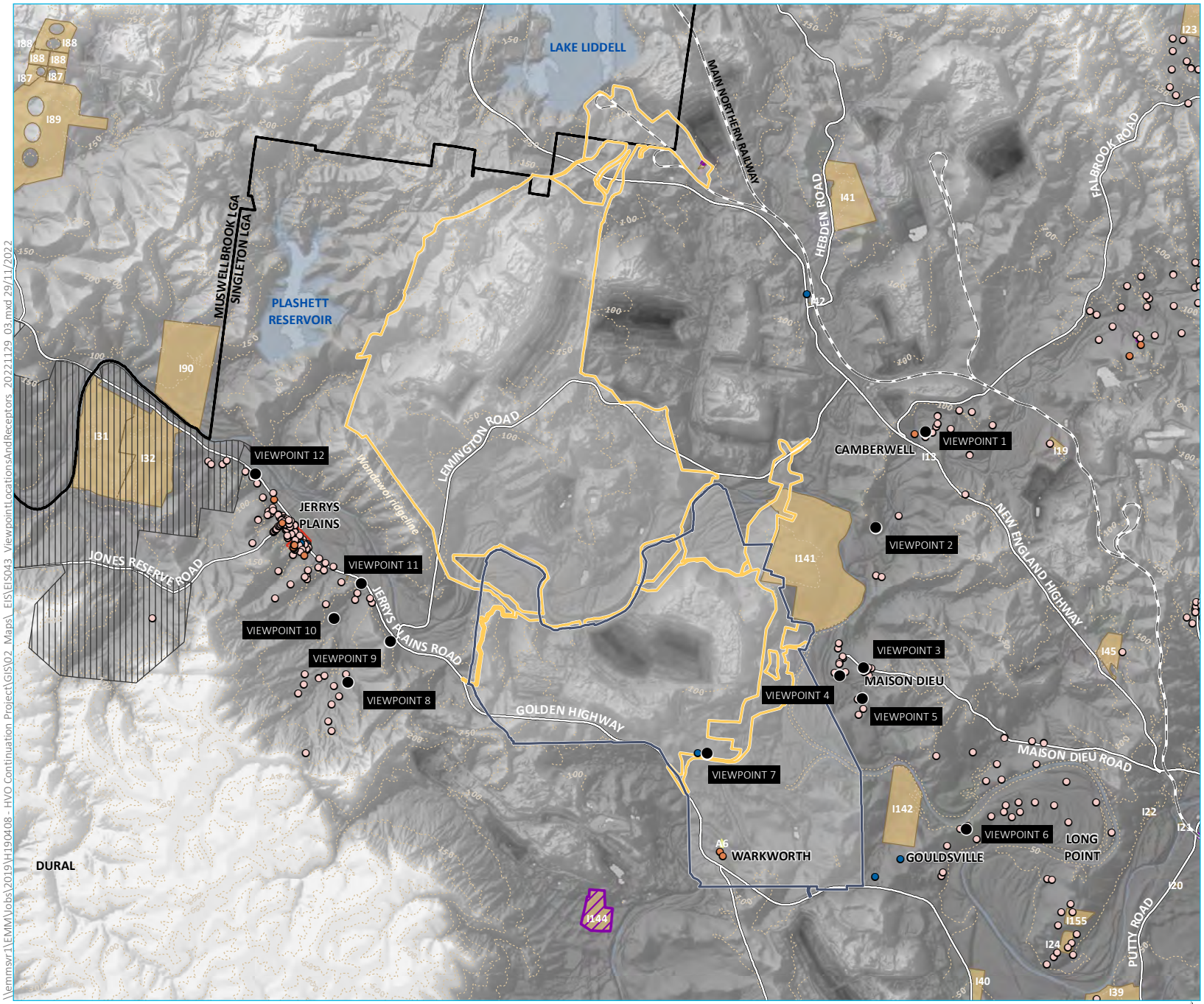
The viewpoint locations and their rationale for selection are described in Table 20.2 and shown in Figure 20.1.

## Table 20.2 Assessed viewpoints, receptors and rationale for selection

| Assessment location | Viewpoint type(s) | Representative receptors | View direction | Distance from Project area | Rationale for selection |
|---|---|---|---|---|---|
| Viewpoint 1 | Dwellings | 624 and 626 | South-west | 3,090 m | Views are representative of receptors (ie dwellings) on Dulwich Place (Camberwell), east of Glennies Creek and the Project area. |
| Viewpoint 2 | Dwelling | 471 | South-west | 2,180 m | Views are representative of a receptor (ie dwelling) in the south of Camberwell, east of the Hunter River and the Project area. |
| Viewpoint 3 | Dwellings | 246; 247; 498; 244 and 245 | West | 1,330 m | Views are representative of receptors (ie dwellings) near the intersection of Maison Dieu Road and Knodlers Lane (Maison Dieu), east of the Project area. |
| Viewpoint 4 | Dwellings | 261; 160; 260; 162 and 161 | West | 660 m | Views are representative of receptors (ie dwellings) on Shearers Lane (Maison Dieu), east of the Hunter River and the Project area. |
| Viewpoint 5 | Dwellings | 120; 122; 124 and 123 | West | 920 m | Views are representative of receptors (ie dwellings) on Knodlers Lane (Maison Dieu), east of the Hunter River and the Project area.<br>Visual amenity impacts were raised as a concern in stakeholder engagement activities for the Project with residents close to this viewpoint. |
| Viewpoint 6 | Dwellings | 134 and 130 | North-west | 2,820 m | Views are representative of receptors (ie dwellings) on Long Point Road (Long Point), south of the Hunter River and south-east of the Project area.<br>A lighting complaint against HVO's existing operations was lodged by a resident close to this viewpoint in 2020. |
| Viewpoint 7 | Recreational | HVGC (833) | North-west | 0 m | Views are representative of those experienced by recreational users of the HVGC, a private commercial glider operation and runway accessible from Comleroi Road (Warkworth). |
| Viewpoint 8 | Dwellings | 451 and 452 | East | 3,070 m | Views are representative of a receptor (ie dwelling) on Redmanvale Road (Jerrys Plains), south-west of the Golden Highway and the Project area.<br>Views from this viewpoint can also be used to demonstrate the screening potential of the ridgeline separating Jerrys Plains township and the Project area. |
| Viewpoint 9 | Dwelling | 308 | North-east | 2,410 m | Views are representative of a receptor (ie dwelling) on Jerrys Plains Road (Golden Highway) near the intersection with Lemington Road (Jerrys Plains), west of the Project area.<br>Views from this viewpoint can also be used to demonstrate the screening potential of the ridgeline separating Jerrys Plains township and the Project area. |

**Table 20.2 Assessed viewpoints, receptors and rationale for selection**

| Assessment location | Viewpoint type(s) | Representative receptors | View direction | Distance from Project area | Rationale for selection |
|---|---|---|---|---|---|
| Viewpoint 10 | Dwelling | 433 | South-east | 3,280 m | Views are representative of receptor (ie dwelling) on Redmanvale Road (Jerrys Plains), south-west of the Golden Highway and the Project area.<br>Visual amenity impacts were raised as a concern in stakeholder engagement activities for the Project with the resident at this viewpoint.<br>Views from this viewpoint can also be used to demonstrate the screening potential of the ridgeline separating Jerrys Plains township and the Project area. |
| Viewpoint 11 | Dwelling | 434 | South-east | 2,210 m | Views are representative of a receptor (ie dwelling) on Jerrys Plains Road (Jerrys Plains), west of the Hunter River and Project area.<br>Visual amenity impacts were raised as a concern in stakeholder engagement activities with the resident at this viewpoint. A lighting complaint against HVO's existing operations was also lodged by this resident in 2020.<br>Views from this viewpoint can also be used to demonstrate the screening potential of the ridgeline separating Jerrys Plains township and the Project area. |
| Viewpoint 12 | Dwellings<br>Motorists<br>Coolmore Australia facilities | 326; 327 and 437. | South-east | 2,760 m | Views are representative of receptors (ie dwellings) and Coolmore Australia facilities on Jerrys Plains Road (Jerrys Plains), west of the Hunter River and Project area.<br>Views are also representative of those experienced by motorists travelling south along Jerrys Plains Road/Golden Highway.<br>Views from this viewpoint can also be used to demonstrate the screening potential of the ridgeline separating Jerrys Plains township and the Project area. |




KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Critical Industry Cluster (Equine)

Heritage items

- Item - General
- Item - Archaeological
- Conservation Area - General
- State Heritage Act

Receptor location

- Private - residential
- Private - non residential
- Community Infrastructure
- Viewpoint

Existing environment

- Local government area
- Named waterbody
- Rail line
- Main road
- Topographic contour (50 m)

Viewpoint locations and receptors

HVO Continuation Project
Environmental Impact Statement
Figure 20.1

EMM creating opportunities

*Source: EMM (2022); HVO (2022); DPIE (2021); DFSI (2017)*

0 5 10 km

GDA2020 MGA Zone 56

N

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### 20.4.3 Construction impacts

#### i HVO North

The most visible activities during the proposed construction activities at HVO North will be experienced by receptors with views of active work areas during the realignment of Lemington Road.

This infrastructure will add new features to the visual landscape east of the Project area and may become visible from scattered rural residences within Camberwell (at a distance of at least 2.5 km) and Maison Dieu (at a distance of at least 1.3 km) and motorists on Maison Dieu Road, Knodlers Lane, Shearers Lane and New England Highway. The Hunter River and associated riparian vegetation, remnant vegetation east of the Project area and undulation in the landscape will help to screen views of this infrastructure from rural residences.

Other construction activities at HVO North are expected to have limited visual amenity impacts on nearby receptors and motorists due to:

- the presence of existing vegetation screening adjacent to the New England Highway, which will mitigate the visibility of construction activities associated with the replacement of the Newdell LP and construction of a new product stockpile at the facility, or extension to the HVLP product coal stockpile;
- the prevalence of electricity transmission line infrastructure within the existing visual landscape (limiting visual impacts of the realignment of transmission infrastructure as part of Project-related construction activities); and
- intervening topography between the Project area and surrounding private receptors or key public vantage points.

Other infrastructure upgrades are minor and are not expected to significantly impact visual amenity from surrounding viewpoints.

No additional mitigation measures during the construction activities associated with HVO North are warranted.

#### ii HVO South

The prevalence of electricity transmission line infrastructure within the existing visual landscape will limit the visual impacts of the realignment of transmission infrastructure as part of Project-related construction activities at HVO South.

Part of Lake James (Dam 15S) is currently visible from Maison Dieu. As part of the Project, Lake James will increase in capacity from around 0.7 GL to approximately 2.0 GL. Construction works associated with the enlargement of Lake James may be visible from Maison Dieu; however, impacts will be temporary and limited to the approximately 13 month duration of construction.

Other infrastructure upgrades are minor and are not expected to significantly impact the visual amenity from surrounding viewpoints.

No additional mitigation measures during the construction activities associated with HVO South are warranted.

### 20.4.4 Impacts during mining operations

To determine potential visibility of the Project, a viewshed analysis was completed. The results of the viewshed analysis are presented in the VIA (Appendix S). The figures identify the likely changes to views experienced at each of the 12 viewpoints due to the Project.

The viewshed analysis was generated using both a digital elevation model (DEM) and a digital surface model (DSM), both of which cover the Project area, the 12 selected viewpoints and their immediate surrounds. The DEM is representative of the bare earth surface and only considers the topography of the landscape. The DSM is representative of the actual surface of the earth and takes into account a variety of different features in the landscape, including vegetation and built structures (eg rural dwellings, farm sheds and industrial and agricultural infrastructure).

The viewshed analysis considered the height and/or change in height of the following Project elements over time (ie between the existing environment, Year 7, Year 18 and final landform):

- active and inactive overburden emplacement areas;
- active and inactive tailings storage facilities;
- active mining areas;
- rehabilitation areas;
- Lemington Road realignment; and
- final landform.

Other existing Project elements, such as HVCPP and the HVO North MIA, have also been considered as part of the viewshed analysis.

When considering the bare earth surface (ie topography) within the Project area and surrounds, the results of the viewshed analysis indicate that Project elements would be visible to varying degrees from 10 of the 12 viewpoints. As identified by the contours presented on Figure 20.1, the surrounding topography is characterised by steep escarpment to the south-west (forming part of Wollemi National Park), open terrain to the north and east (forming part of the Hunter Valley) and a the Wandewoi ridgeline to the west separating the Project area from Jerrys Plains and beyond. At several selected viewpoints, intervening topography and distance limits the extent of the visual landscape affected by Project elements.

By accounting for potential shielding features within the landscape (eg vegetation) both within the Project area and surrounds, the extent of Project elements visible from the representative viewpoints reduces. The results of the viewshed analysis indicate the potential for shielding features in the landscape to reduce the visibility of Project elements from a number of the selected viewpoints. This is largely due to scattered remnant vegetation and vegetation screens around the boundaries of rural residential dwellings.

In relation to historic heritage items, the historic heritage assessment (Appendix O) concludes that the Project will not result in any significant additional visual impacts at known heritage items.

Impacts to the HVGC will be reduced compared to what is currently approved at HVO South, given that mining is no longer proposed within the Riverview South-East Extension and South Lemington Pit 2 mining areas, which border the HVGC. Access to the HVGC will be maintained throughout the Lemington Road realignment construction works.

The New England Highway is approximately 2 km north of West Pit and travels in a south-east to north-west direction between the Newdell LP in the north and West Pit and Cumnock Void TSF in the south. As part of the VIA, the potential for Project elements to become more visible from the New England Highway has been considered.

Significant areas of mining and power generation-related infrastructure are visible from the New England Highway within proximity of the Project area; however, views of HVO North are interrupted by dense roadside vegetation. Existing vegetation screening adjacent to the New England Highway will mitigate the visibility of the new product stockpile (should it be constructed at the Newdell LP) or the extension to the HVLP product coal stockpile. Further, it is assumed that the focus of motorists on the New England Highway will continue to be in line with their direction of travel along this road corridor and, therefore, potential views are considered insignificant and will not be materially different because of the Project.

In general, visual impacts will continue to decrease over time as progressive rehabilitation proceeds and as mining ceases at the end of 2050 at HVO North and 2045 at HVO South.

A summary of the results of the analysis of visual impacts for each of the 12 viewpoints is provided in Table 20.3. The VIA determined that, of the viewpoints assessed, Project elements may be visible to varying degrees from 10 of the 12 viewpoints (as is currently the case). Based on distance to the Project area, existing view types and context, variable elevation and undulation in the landscape and the presence of vegetation, the assessment predicts:

- no visual impact for viewpoints 8 and 10 (in Jerrys Plains);
- a negligible visual impact for viewpoints 1 and 2 (in Camberwell), and 9, 11 and 12 (in Jerry Plains); and
- a slight/moderate visual impact for viewpoints 3, 4 and 5 (in Maison Dieu), 6 (in Long Point) and 7 (HVGC).

## Table 20.3 Summary of results of visual impacts at each viewpoint

| Viewpoint | Distance to Project area | Representative receptors | Viewpoint type | Project elements visible based on viewshed analysis | Magnitude of change | Visual sensitivity[1] | Evaluation of impact | Significant impact? | Additional mitigation proposed | Potential for cumulative impacts |
|---|---|---|---|---|---|---|---|---|---|---|
| Viewpoint 1 | 3,090 m | 624 and 626 | Dwellings | Yes | Year 7 – negligible<br>Year 18 – negligible<br>Final landform – negligible | Moderate | Negligible | No | No | Yes |
| Viewpoint 2 | 2,180 m | 471 | Dwelling | Yes | Year 7 – negligible<br>Year 18 – negligible<br>Final landform – negligible | Moderate | Negligible | No | No | Yes |
| Viewpoint 3 | 1,330 m | 246; 247; 498; 244 and 245 | Dwellings | Yes | Year 7 – low<br>Year 18 – low<br>Final landform – low | Moderate | Slight/moderate | No | No | Yes |
| Viewpoint 4 | 660 m | 261; 160; 260; 162 and 161 | Dwellings | Yes | Year 7 – low<br>Year 18 – low<br>Final landform – low | Moderate | Slight/moderate | No | No | Yes |
| Viewpoint 5 | 920 m | 120; 122; 124 and 123 | Dwellings | Yes | Year 7 – low<br>Year 18 – low<br>Final landform – low | Moderate | Slight/moderate | No | No | Yes |
| Viewpoint 6 | 2,820 m | 134 and 130 | Dwellings | Yes | Year 7 – low<br>Year 18 – low<br>Final landform – low | Moderate | Slight/moderate | No | No | Yes |
| Viewpoint 7 | 0 m | HVGC (833) | Recreational | Yes | Year 7 – low<br>Year 18 – low<br>Final landform – low | Moderate | Slight/moderate | No | No | Yes |

## Table 20.3 Summary of results of visual impacts at each viewpoint

| Viewpoint | Distance to Project area | Representative receptors | Viewpoint type | Project elements visible based on viewshed analysis | Magnitude of change | Visual sensitivity[1] | Evaluation of impact | Significant impact? | Additional mitigation proposed | Potential for cumulative impacts |
|---|---|---|---|---|---|---|---|---|---|---|
| Viewpoint 8 | 3,070 m | 451 and 452 | Dwellings | No | Year 7 – no change<br>Year 18 – no change<br>Final landform – no change | Moderate | No impact | No | No | No |
| Viewpoint 9 | 2,410 m | 308 | Dwelling | Yes | Year 7 – negligible<br>Year 18 – negligible<br>Final landform – negligible | Moderate | Negligible | No | No | Yes |
| Viewpoint 10 | 3,280 m | 433 | Dwelling | No | Year 7 – no change<br>Year 18 – no change<br>Final landform – no change | Moderate | No impact | No | No | No |
| Viewpoint 11 | 2,210 m | 434 | Dwelling | Yes | Year 7 – negligible<br>Year 18 – negligible<br>Final landform – negligible | Moderate | Negligible | No | No | Yes |
| Viewpoint 12 | 2,760 m | 326; 327 and 437 | Dwellings<br>Motorists<br>Coolmore Australia facilities | Yes | Year 7 – no change<br>Year 18 – no change<br>Final landform – negligible | Moderate | Negligible | No | No | Yes |

1. Where multiple view types have been considered (eg motorists and residents), the highest applicable visual sensitivity has been applied.

### 20.4.5 Cumulative impacts

The Project is within a rural environment close to several other mining operations. The character of the immediate visual environment surrounding HVO is strongly influenced by existing mining operations within the Project area and surrounds. Viewpoints that already do, and will continue to, experience cumulative visual amenity impacts (ie concurrent views of the HVO Complex and other mining operations) are:

- Viewpoint 1 – distant views of Ashton;
- Viewpoint 2 – distant views of Ashton, United Wambo and Mount Thorley Warkworth;
- Viewpoints 3 and 4 – distant views of United Wambo, Mount Thorley Warkworth and Ravensworth Operations;
- Viewpoints 5 and 7 – distant views of United Wambo and Mount Thorley Warkworth;
- Viewpoint 6 – distant views of Mount Thorley Warkworth;
- Viewpoint 9 – distant views of Ravensworth Operations and United Wambo; and
- Viewpoints 11 and 12 – distant views of United Wambo.

Each of these operations are well-established features of the visual landscape surrounding the Project area and are predicted to close prior to the completion of the Project. Therefore, the visual landscape surrounding the Project area will undergo significant changes over the life of the Project.

Over time, the closure of these operations will result in a reduction in the visibility of active mining and power generation operations from residences and the local and regional road network.

## 20.5 Mitigation measures

Control measures already in place at HVO to minimise impacts to visual amenity will continue throughout the extended mine life. In addition, the mitigation measures in Table 20.4 will be implemented for the Project.

**Table 20.4 Visual amenity mitigation measures**

| ID | Mitigation measures |
|---|---|
| VA1 | As part of detailed design, HVO will investigate the feasibility of planting vegetation adjacent to the realigned Lemington Road to provide an effective visual screen and reduce views of the road from residences and local roads. |
| VA2 | Consistent with the commitments made in the *Hunter Valley Operations South Coal Project Environmental Assessment* (ERM 2008), should the LCPP and the rail loop be required, a review will be undertaken prior to construction to determine if additional screening is required. |

## 20.6 Summary and conclusion

Visual impacts will occur during the construction and operational stages of the Project. The realignment of Lemington Road required at HVO North, and the relocation of transmission infrastructure will result in some changes to the visual landscape from nearby receptors and motorists. At HVO South, the approved and progressively rehabilitated eastern face of the Cheshunt Pit overburden emplacement area will continue to be the dominant visible feature throughout the extended mine life. Some views of the enlargement of Lake James are also expected from Maison Dieu. If constructed, and assuming no screening in the landscape, the LCPP and rail loop may also become visible from residences in Long Point and Maison Dieu, although noting that a review will be undertaken by HVO prior to construction to determine if additional screening is required to minimise views of this infrastructure.

Visual impacts associated with HVO's existing mining operations have previously been assessed and approved and are considered as part of the existing environment. While it is acknowledged that there are privately-owned receptors and road corridors that are already subject to a high visual impact from HVO's existing mining operations and other surrounding mining operations, the level of visual impact on these properties will not materially change when compared with the approved Project.

Views experienced from the assessed viewpoints (including viewpoints 3, 4, 5, 6 and 7 where a slight to moderate impact has been identified) will be consistent with previously assessed and approved impacts. Given the low or negligible magnitude of change predicted at all viewpoints, significant visual impacts are not predicted as a result of the Project. In general, visual impacts will continue to decrease over time as progressive rehabilitation proceeds and as mining ceases at the end of 2050 at HVO North and 2045 at HVO South.

A number of the selected viewpoints already do, and will continue to, experience cumulative visual amenity impacts. Neighbouring mining operations, like HVO, are committed to the implementation of progressive rehabilitation to reduce the duration of the visual impact of their operations when viewed from surrounding land. Visible elements of neighbouring mining operations are anticipated to change over time as these operations progress through their approved mining activities and work towards achieving their proposed final landforms.

Control measures already in place at HVO to minimise impacts to visual amenity will continue throughout the extended mine life.

# 21 Rehabilitation and closure

## 21.1 Introduction

This chapter provides a summary of the mine closure and rehabilitation actions for the Project, which is presented in full in the mine closure and rehabilitation strategy (the rehabilitation strategy), attached as Appendix T. The overarching objective of the rehabilitation strategy is to create safe, stable, and non-polluting post mining landforms consistent with agreed post mining land uses, which are proposed to be biodiversity/habitat areas and agriculture, consistent with current approvals. However, given the location of HVO and the proposed post mining landforms a number of alternate future land uses may be suitable at the time of closure, including but not limited to intensive agriculture, electricity transmission, pumped hydro energy generation, solar energy generation, wind energy generation and battery energy storage.

The rehabilitation strategy for the Project has been prepared recognising that, should the Project be approved, the existing rehabilitation management plan (RMP) will be updated and submitted to the NSW Resources Regulator. Final rehabilitation and Project closure requirements will ultimately be formulated in consultation with key government agencies and other relevant stakeholders, to be undertaken during the detailed closure planning phase.

The rehabilitation strategy has been prepared in accordance with requirements of the SEARs for the Project and has been prepared in consideration of the appropriate legislation, guidelines, policies and industry requirements as well as existing activities and practices on site and documented within the existing RMP.

## 21.2 Rehabilitation principles and objectives

The Project does not propose to change the overarching rehabilitation and closure objectives currently approved for HVO, which is to restore the land to a combination of grazing and native ecosystem woodland final land uses. These land uses include stable landforms and self-sustaining vegetation developed in consideration of several factors including opportunities (such as proximity to remnant native vegetation areas) and constraints (such as slope and soil quality), ecological and rural land use values and existing strategic land use objectives.

The proportion of land rehabilitated to native ecosystem across the final landform for the Project will be greater than is currently approved, due to the adoption of revised geomorphic landform designs for the overburden emplacements. These landforms are designed to be stable in the long-term, without relying on constructed surface flow drainage control structures that require ongoing maintenance to ensure durability into the future. This design process incorporates a higher drainage density in the final landform to accommodate surface runoff, resulting in a smaller proportion of the surface remaining at flat or low slope gradients, and therefore a smaller proportion of the final landform is suitable for grazing land use purposes.

The rehabilitation objectives for the Project are set out in Table 21.1.

**Table 21.1 Closure and rehabilitation objectives**

| Aspect | Objective |
|---|---|
| **Mine site (as a whole)** | • Safe, stable and non-polluting.<br>• Landforms designed to incorporate micro-relief and integrate with existing rehabilitated landforms and surrounding natural landforms.<br>• Constructed landforms that maximise surface water drainage to the natural environment (excluding final void catchments).<br>• Minimise visual impact of final landforms as far as is reasonable and feasible. |
| **Voids** | • Minimise water inflows to prevent risk of discharge to surface waters.<br>• Minimise to the greatest extent practicable the safety risk to humans, stock and fauna. |
| **Native woodland habitat** | • Establish self-sustaining native woodland ecosystems characteristic of vegetation communities found in the Project area.<br>• Establish native woodland corridors to link remnant native vegetation and biodiversity offset areas. |
| **Grazing** | • Reinstate target and mandated land and soil capability classes.<br>• Rehabilitate grassland areas so that they can support sustainable grazing activities. |
| **Clean water diversion channel(s)** | • Engineered to be hydraulically and geomorphologically stable.<br>• Incorporate erosion control measures based on natural channel design principles.<br>• Revegetate with suitable native species and establish areas of self-sustaining riparian habitat. |
| **Surface infrastructure** | • To be decommissioned and removed, unless agreed otherwise as part of the detailed closure planning process. |
| **Community** | • Ensure public safety.<br>• Minimise direct adverse socio-economic effects of mine closure via community and workforce consultation and updates throughout the life of Project and leading up to closure to allow adequate time for transition planning |

## 21.3 Final land use

### 21.3.1 Approved land use

Approved post mining land use for the existing operations include:

- grazing;
- cropping on the Hunter River alluvial flats;
- biodiversity and habitat; and
- water storages and evaporative sinks in the final voids.

The proposed final land uses for the Project will carry forward the currently approved final land uses for HVO North and South, identified above. The existing and proposed woodland areas will create corridors that link remnant vegetation areas and biodiversity offset areas to create regional corridors consistent with the intent of the Synoptic Plan (Andrews Neil Architects Planners 1999).

### 21.3.2 Proposed final land use domains

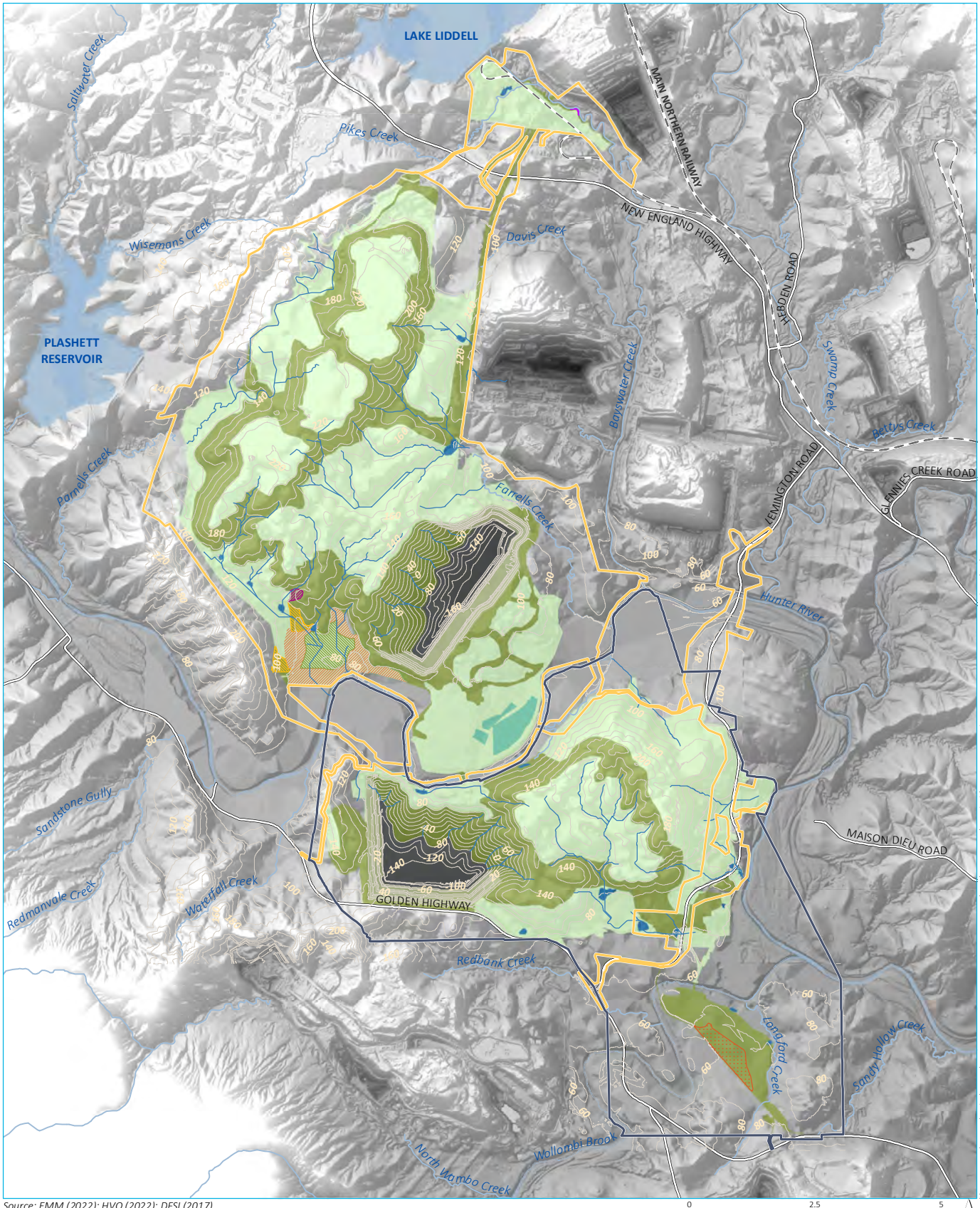
Table 21.2 and Figure 21.1 detail the proposed final land use domains for the Project.

## Table 21.2 Final land use domains

| Domain code | Final land use domain | Domain information |
|---|---|---|
| A | Native ecosystem – woodland and riparian vegetation communities depending on position in the landscape | Areas of native ecosystem will be established to provide woodland habitat and to provide wildlife corridor linkages to other areas of habitat rehabilitation in adjoining mines, or areas of remnant habitat in adjoining non mined land.<br>It is anticipated that native ecosystem habitat rehabilitation will be fenced to exclude grazing particularly on the steeper slopes such as the void highwalls and low walls, although some stock corridors and farm machinery access will be required through these areas for stock and land management. Carefully managed short 'crash' grazing will be able to be permitted in some native woodland habitat rehabilitation areas to manage fire risk fuel loads.<br>The percent of native vegetation to be established for the Project is approximately 39%.<br>Currently approved rehabilitation focused on establishing between approximately 30% to 40% native vegetation across the HVO Complex. At HVO North, approximately 37% of land is proposed to be rehabilitated to native vegetation, whereas at HVO South the area of land proposed to be rehabilitated to native vegetation is approximately 42%. These proportions differ slightly from the currently approved native vegetation areas (being 30% at HVO North and 30% to 40% at HVO South); however, this is due to the newly designed final landform incorporating natural landform design principles with higher drainage density, discussed in Appendix T, reducing the area suitable for agricultural land use. |
| B | Agriculture – grazing | The remaining areas of land will be rehabilitated with native and introduced pasture species to facilitate cattle grazing consistent with historical and surrounding agricultural practices. Suitable stocking rate for these areas would be determined to ensure these areas are appropriately managed.<br>Pastures will be a combination of native and introduced species consistent with pasture rehabilitation undertaken on site with LSC classes ranging from 4–6 depending on soil depth, stoniness, slope and chemical limitations.<br>Previously approved rehabilitation focused on establishing between approximately 60 to 70% grazing land across the HVO Complex. The Project will establish grazing land across approximately 56% of rehabilitated areas across the HVO Complex (including Domains B and subdomain Kb), comprising approximately 59% of rehabilitated land at HVO North and approximately 51% at HVO South. This is a slight reduction to the currently approved agricultural grazing land use. This is due to the newly designed final landform incorporating natural landform design principles with higher drainage density, discussed in Appendix T, reducing the area suitable for agricultural land use.<br>It is noted that clean water diversion and levees which are incorporated into the post mining final landform, shown in Figure 21.1, are proposed to be rehabilitated as to support the final land use of grazing. |
| G | Water storages | This domain includes water storages to be established to supply water to the final land use. Figure 21.1 shows conceptual locations of water storages established on drainage lines established in the final landform which will initially be used to control runoff water quality by retaining sediment until adequate vegetation cover is established. When the vegetation cover criteria have been met the dams will be inspected, and sediment removed (if required) and dam sizes adjusted, or if necessary removed, to suit the final land use, with regard to catchment harvesting water licence requirements at the time of closure.<br>This domain includes any dams that will be converted to water dams for future grazing or habitat purposes. Major water storages Lake James and Parnells Dam will be decommissioned and mine related infrastructure removed. Stock water and habitat dams may be constructed as replacement water supplies to support final land use purposes. |

## Table 21.2 Final land use domains

| Domain code | Final land use domain | Domain information |
|---|---|---|
| J | Pit lake | Two pit lakes, commonly referred to as final voids, will remain post mining, one each at HVO North and HVO South respectively, which is two less than the currently approved projects.<br>The HVO North pit lake will have a catchment area of approximately 720 ha at closure, including the rehabilitated low wall overburden emplacement and the remaining exposed high walls. This represents a 7% reduction in catchment to that of the currently approved pit lakes at HVO North. The HVO North pit lake equilibrium water level predicted to be approximately -80 m AHD represents a water storage volume of approximately 126 GL and approximately 155 m of freeboard to the natural ground level (Appendix K).<br>The HVO South pit lake will have a catchment area of approximately 714 ha at closure including the rehabilitated low wall overburden emplacement, the remaining exposed high walls. This is a 38% reduction in catchment to that of the currently approved final pit lake at HVO South. The HVO South pit lake equilibrium water level predicted to be approximately -84 m AHD represents a water storage volume of approximately 71 GL and approximately 160 m of freeboard to the natural ground level (Appendix K).<br>The pit lakes will be permanent water bodies functioning as groundwater sinks (AGE 2022). Salinity levels are expected to increase over time due to evaporation and groundwater seepage prior to reaching equilibrium. Modelled Total Dissolved Solids (TDS) levels after 1,000 years are predicted to be approximately 11,000 mg/L and 6,600 mg/L at HVO North and HVO South, respectively (Appendix K). This assumes pit lakes reach equilibrium naturally and are not filled by relying on existing HVO water licenses, or as appropriate as determined by any number of potential future land uses.<br>The pit lake water margins will be planted with appropriate riparian and estuarine species, with the low walls and highwall benches planted with woodland species for a native woodland habitat final land use.<br>The two pit lakes shown on Figure 21.1 represent the area of the final water level predicted at equilibrium, which will occupy approximately 202 ha at HVO North and approximately 182 ha at HVO South (subject to future refinements of the final landform). |
| Sub domain Ka | Other – native ecosystem – partial vegetation on highwall benches | Approximately 187 ha at HVO North and 140 ha at HVO South of final highwall will be revegetated to achieve partial revegetation on highwall benches with appropriate native habitat species. This revegetation will provide some habitat values and will assist to soften the geometric visual form of the highwalls. This is defined as a separate domain due to the revegetation methods and completion criteria being different to other native vegetation establishment areas in Domain A.<br>Total areas reported for native vegetation calculations include Domain Ka, as it is native vegetation. |
| Sub domain Kb | Other – agriculture – grazing alluvial land | HVO has previously successfully rehabilitated strategic agricultural land. In May 1993, consent was granted to mine 170 ha of Hunter River alluvial flood plain (Alluvial Lands Project). The approval required verification that mining and subsequent rehabilitation would not result in the loss of prime agricultural land and that a sustainable post mining land use could be achieved once mining had been completed.<br>Following mining, HVO successfully rehabilitated 63 ha of Class I and Class II agricultural land, in accordance with the former rural land classification scheme (Cunningham et al, 1988). This was able to achieve a lucerne hay productivity yield of 'at least equivalent to the average crop productivity yields for the Upper Hunter Region for three consecutive years'. The remaining 102 ha was rehabilitated to Class IV grazing land in accordance with the consent requirements.<br>It is noted that this domain is inclusive of minor areas of native woodland habitat rehabilitation requirements, as per the Alluvial Lands Project, located along drainage pathways and will continue to focus on the establishment of the structurally dominant species representative of PCT 1731 Swamp Oak – Weeping Grass grassy riparian forest of the Hunter Valley. This PCT is considered appropriate given the alluvial soils and slope and aspect of the proposed final landforms. Non-targeted native woodland completion criteria per the rehabilitation strategy will apply. |




*Source: EMM (2022); HVO (2022); DFSI (2017)*

0 2.5 5 km

GDA2020 MGA Zone 56

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## KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Proposed South Lemington offset
- Predicted 20 m contour
- Predicted drainage

Existing environment

- Rail line
- Major road
- Named watercourse
- Named waterbody

Final land use domain

- Domain A | Native ecosystem
- Domain A - Sub domain Ka | Other - Native ecosystem - partial vegetation on highwall benches
- Domain B | Agriculture - grazing
- Domain B - Sub domain Kb | Other - Agriculture - alluvial land
- Domain G | Water storages
- Domain J | Pit Lake

Existing commitments maintained by the Project (indicative location)

Rural land capability

- Class 2 - DA 450-10-2003 MOD3
- Class 3 - DA 450-10-2003 MOD3
- Class 4 - DA 450-10-2003 MOD3

Native Ecosystem

- Central Hunter Box-Ironbark Woodland - DA 450-10-2003 MOD3
- Swamp Oak Floodplain Forest - DA 450-10-2003 MOD5

# Final land use domains

HVO Continuation Project
Environmental Impact Statement
Figure 21.1

EMM creating opportunities

### 21.3.3 Alternate post-mining land uses

The proposed land uses are consistent with the objectives of current strategic State and local government planning documents for the Upper Hunter which encourage economic diversity and lower dependence on mining in the future whilst largely meeting the objective of current approvals.

It is noted that the approval and implementation of alternate land uses post the Project will be subject to local, State and potentially Commonwealth environmental planning controls in place at the time (ie after 2050), and will also be subject to commercial feasibility assessments at the time.

Significant infrastructure features such as water storages, railway lines, industrial buildings, access roads, pipelines and electricity transmission infrastructure may be suitable for use as part of future alternate land uses; however, the viability of these alternate land uses cannot be anticipated at this stage. Commercial negotiations over the ownership and use of mine infrastructure could be undertaken closer to the time when coal mining is planned to cease, and detailed mine closure planning can be undertaken.

In determining the final landform proposed by the Project, HVO did so in consideration of potential alternate future land uses, so that the landform does not preclude future possible land uses. Alternate land uses which may be suitable at the time of closure include, but are not limited to, intensive agriculture, electricity transmissions, pumped hydro energy generation, solar energy generation, wind energy generation and battery energy storage.

Potential renewable energy land uses of the HVO rehabilitated area align with the recently announced Hunter-Central Coast Renewable Energy Zone (REZ) by the NSW Government. REZs will group new wind and solar power generation into locations where it can be efficiently stored and transmitted across NSW. HVO is located approximately in the middle of the Hunter-Central Coast REZ, and neighbours existing electrical transmission networks. The location of HVO and the proposed final landform and pit lakes described in Table 21.2 align well with the strategic planning of the Hunter-Central Coast REZ.

Final rehabilitation and project closure requirements will ultimately be formulated in consultation with key government agencies and other relevant stakeholders to be undertaken during the detailed closure planning phase, which will occur within five years of planned closure.

The holders of HVO mining tenements are currently required to remove all mining related infrastructure from the site during mine closure, in accordance with current mining tenement conditions issued pursuant to the NSW *Mining Act 1992*. These facilities may be retained on site post-mining where alternate uses and ownership is resolved, and the retention of mining infrastructure is agreed by the NSW Resources Regulator. The process of identifying viable alternative uses of mining infrastructure and seeking approval for the retention of that infrastructure may be undertaken during detailed closure planning.

## 21.4 Final landform

### 21.4.1 Final landform design

A rigorous landform design and refinement process has been undertaken for the Project so that the landforms are appropriate for the site overburden and soils, and can be rehabilitated to be stable to support the nominated post mining land uses. This involved the following key steps:

- bulk samples of representative spoils and soils were collected and sent for laboratory erodibility testing using simulated rain and overland flow;
- target tolerable annual average and peak erosion rates were determined for the landforms;
- the overland flow and simulated rain data was input into the Water Erosion Prediction Project (WEPP) erosion model to develop slope length, steepness and profile design rules for the geomorphic landform design;

- Golder further developed HVO's final landform using geomorphic landform design principles, informed by the design parameters developed by the erodibility parameters;
- the WEPP erosion model was used to provide guidance on the percentage vegetative soil surface required to achieve the target erosion rates; and
- landform evolution modelling was undertaken on the geomorphic landform design to identify any locations where unacceptable rates of erosion may occur and the design was modified accordingly.

The final landform design and land use are shown on Figure 21.1.

### 21.4.2 Landform design options

The mine designs provided by HVO include the re-mining of extensive areas of previously mined land, which avoids the need to disturb large areas of undisturbed land and reduces the overall impact of mining. The preferred mine plan design includes the placement of overburden material to achieve the final land use and landform objectives including the minimisation of external overburden emplacement areas and the maximisation of overburden emplacement into mining voids. These design outcomes are also driven by the need to achieve an acceptable final landform in the most efficient and cost-effective manner at the time of closure.

Outcomes from this process have resulted in the reduction of the number of final voids from four currently approved final voids to two void pit lakes proposed for the Project.

Consideration was given to the option of no final voids which would require backfilling the final voids post the cessation of coal mining to achieve a free-draining landform. This would require the excavation, haulage and emplacement of an additional approximately 1.34 billion cubic meters of overburden with two fleets of 3 x 800 t excavators and a fleet of approximately 60 x 300 t haul trucks and would take up to 21 years to fill the voids, resulting in extensive delays to rehabilitation of the site. Backfilling the voids would also result in the following impacts for the Project:

- Requires approximately 730 million cubic metres of material mined from existing rehabilitated dumps to fill the proposed HVO North void, and approximately 610 million cubic metres to fill the proposed HVO South mining void.
- Disturbs more than 1,100 ha of rehabilitated land at HVO North established during the Project, and more than 850 ha at HVO South.
- Approximately 21-year extension of site works at HVO North post-mining, and approximately 18-years extension of site works post-mining at HVO South. This ongoing excavation and rehandling of overburden would result in prolongation of potential air quality, noise impacts, additional Scope 1 GHG emissions, and delay in mine site rehabilitation with no economic return.

The mine design option of backfilling the final voids was not considered reasonable or feasible.

### 21.4.3 Geomorphic landform design

The landform design methodology undertaken for the Project is based on a geomorphic approach, moving away from the use of linear slopes with contour banks and drop structures. Geomorphology refers to the natural processes of erosion and deposition associated with the flow of water. A geomorphic approach uses stable natural analogues in the local environment to understand what makes natural landforms stable under certain climatic conditions and then applies these principles to new engineered landforms.

Landforms designed using a geomorphic approach tend to have dendritic drainage with an appropriate drainage density, and drainage lines flatten with increasing catchment areas. They are also non-linear, with convex ridges shedding to the concave drainage lines.

Key objectives of the design process are to address the concerns around the more traditional engineered designs in the context of a post closure landform required to be stable for hundreds of years, including:

- limiting ongoing maintenance associated with engineered features such as contour banks and drop structures;
- ensuring the final landforms are hydraulically and visually integrated with the downstream catchments and natural environment; and
- the preference for more diverse habitat and associated ecosystem for future generations.

LEM modelling has been undertaken by Landloch (2022) using the designed geomorphic surfaces to help predict the long-term erosion rates for the final surface. This will inform future management practices in terms of areas of potential erosion risk and to confirm the potential need for erosion mitigation measures.

Further details of the geomorphic design process are provided in the rehabilitation strategy (Appendix T).

### 21.4.4 Final void design aspects

The proposed final voids will consist of reshaped overburden emplacements sloping down into the void using a geomorphic design to reduce the risks of erosion and improve landform stability. These areas will be revegetated to provide native vegetation habitat areas. It is noted that final voids for the Project were designed with consideration of flood modelling to ensure flood immunity during an extreme event.

The final highwalls will incorporate the following design features:

- highwalls will be designed with benches in competent strata to achieve long term geotechnical stability. These benches will be partially vegetated with native species to soften the appearance of the engineered profile;
- the top section of the highwall consisting of weathered strata will be battered at an appropriate angle to improve long term stability and reduce the risk of block failures; and
- a security bund will be constructed around the top of highwalls to reduce the risk of access to the highwall, and to control surface water runoff and floodwaters from over-topping the highwall.

A geotechnical assessment was undertaken by Encompass Mining of the final voids proposed at HVO North and South. The assessments undertaken of both final voids determined:

> Based on stability modelling, all slopes assessed in this design achieved an acceptable factor of safety and indicate safe and stable slopes during mining, considering both magnitude greater than individual and inter-ramp scale failure, and long-term safe and stable slopes within the final void.

## 21.5 Rehabilitation planning and implementation

The rehabilitation strategy adopted a risk review process to identify and consider the management of rehabilitation risks for the site. Key risks identified and analysed include soil types and erodibility, spoil erodibility and erosion hazard mitigation, spoil geochemistry, weed control, pest management and bush fire risk.

### 21.5.1 Rehabilitation methods

The following section provides a summary of the rehabilitation methods detailed in the rehabilitation strategy (Appendix T). Soil and land resources are further described in Chapter 17.

The rehabilitation strategy includes details on soil resources in both areas yet to be disturbed, and the recovery of soil resources form previously rehabilitated areas and from topsoil stockpiles. Soil management details include:

- soil stripping procedures and soil stockpile management; and
- soil amelioration and management, including:
    - application to soil prior to stripping;
    - treatment of soil stockpiles; and
    - treatment of soil on rehabilitation areas.

Vegetation establishment is a key management measure to control soil erosion and to ensure long term landform stability for the Project. The rehabilitation methods outlined in the rehabilitation strategy include the identification of appropriate species for revegetation including seed collection from vegetation clearing areas, and salvaging of habitat features such as tree hollows, logs and stags to be salvaged for use in rehabilitation and habitat enhancement programs or for use in enhancing HVO's biodiversity offset areas.

An assessment of soil erosion hazard was undertaken for the Project and ranges from very low to very high. The key erosion risks for the project are:

- erodible dispersible overburden, subsoils and topsoils;
- long and steep slopes; and
- numerous unlined and lined drainage lines on established rehabilitated overburden landforms.

Erosion and sediment control management and mitigation measures are described in the approved Erosion and Sediment Control Plan which will be revised following Project approval to address the characteristics of the geomorphic landforms.

The adoption of geomorphic designed overburden dumps requires some modification to erosion and sediment control practices currently on rehabilitated landforms at HVO. On steep slopes where 70% or greater soil surface cover cannot be achieved it may be necessary to use rocky material to protect the slopes from the shear stresses of overland flow.

Disturbed areas within the Project will report to sediment dams such that any eroded sediments will be contained (up to and including the design storm event). Contained water is re-used on site. Water captured within sediment dams will managed within the mine water management system or discharged should quality requirements be met.

### 21.5.2 Completion criteria

Rehabilitation completion criteria are used as the basis for assessing when rehabilitation of the Project is complete. Indicators are measured against the criteria.

Indicative rehabilitation criteria for the Project have been developed with the current knowledge of rehabilitation practices and success at HVO and in similar environments and are provided in Appendix C of the rehabilitation strategy (refer to Appendix T).

The rehabilitation criteria need to demonstrate that the rehabilitation objective has been achieved. These criteria will be refined over the life of the Project in response to advances in rehabilitation techniques, outcomes of rehabilitation research, and influences such as climate change or changes to the agreed final land uses. Refined criteria will be submitted and confirmed with each RMP renewal provided to the Resource Regulator.

## 21.6 Management, mitigation, and monitoring

The mitigation measures detailed in Table 21.3 will be implemented for the Project.

**Table 21.3 Rehabilitation and closure mitigation measures**

| ID | Mitigation measures |
|---|---|
| RC1 | The Rehabilitation Management Plan will be updated for the Project. |
| RC2 | The final landform in areas disturbed by the Project will incorporate natural design elements generally in accordance with the conceptual design presented in this EIS. |
| RC3 | The final land use across rehabilitated areas of the site will include a combination of grazing and native woodland ecosystem land uses, or as determined as part of detailed closure planning processes. |
| RC4 | A detailed closure plan will be developed within five years of cessation of mining. |
| RC5 | Rehabilitation monitoring will be undertaken using analogue sites and landscape function analysis to assess rehabilitation progress and success, as detailed in the Rehabilitation Management Plan. |

## 21.7 Conclusion

The final landform and final land use domains proposed to be achieved by the Project are presented in Figure 21.1. Project closure requirements will be formulated in consultation with key government agencies and other relevant stakeholders to be undertaken during the detailed closure planning phase.

The Project, including the proposed continuation of mining and associated infrastructure, do not change the existing approved mine closure, rehabilitation or post mining land use objectives. The final land use objectives for the Project have been maintained largely consistent with currently approved land use objectives, with agricultural grazing and native ecosystem woodland areas achievable across the complex. The proposed ratio of agricultural grazing and native ecosystem woodland final land uses are approximately 59% and 37% at HVO North and 51% and 42% at HVO South respectively, which is an increase of land proposed to be rehabilitated to native ecosystem woodland compared to what is currently approved, being 30% at HVO North and a range of 30% to 40% at HVO South. The change is the result of the newly designed final landform incorporating natural landform design principles with higher drainage density reducing the area suitable for agricultural land use.

In addition, as the Project does not seek to retain the approved mining areas of South Lemington Pit 1, South Lemington Pit 2 and the Riverview South East Extension, which were proposed to be rehabilitated to agricultural grazing, the total area previously proposed to be rehabilitated to achieve an agricultural grazing final land use has been reduced. The remainder of the final landform will comprise pit lakes or water storages in support of final land uses. Rehabilitation progress will be regularly monitored in accordance with the completion criteria, with the results of the monitoring to be reported in the Annual Review for the complex.

# 22 Hazards, public safety, and health

## 22.1 Introduction

This chapter provides an assessment of the hazards, contamination and health aspects of the Project in accordance with the SEARs, and relevant legislation and guidelines.

## 22.2 Hazards

A preliminary hazardous analysis (PHA) has been prepared by Riskcon Engineering and is attached as Appendix U. The PHA has been prepared to in accordance with the *Hazardous Industry Planning Advisory Paper No.6 – Hazard Analysis* (HIPAP 6) (DoP 2011b), assesses the PHA results using the criteria in *Hazardous Industry Planning Advisory Paper No. 4 – Risk Criteria for Land Use Planning* (HIPAP 4) (DoP 2011a) and demonstrates compliance of the site with the relevant codes, standards and regulations.

### 22.2.1 Methodology

The methodology used for the PHA include:

- Hazard Analysis – a detailed hazard identification was conducted for the site facilities and operations. Where an incident was identified to have a potential off-site impact, it was included in the recorded hazard identification word diagram (type, causes, consequences and safeguards) in accordance with HIPAP 6.
- Consequence Analysis – the analysis modelled the various postulated hazardous incidents and determined impact distances from the incident source.
- Frequency Analysis – in the event a simple solution for managing consequence impacts was not evident, each incident identified to have potential offsite impact was subjected to a frequency analysis.
- Risk Assessment and Reduction – where incidents were identified to impact offsite and where a consequence and frequency analysis was conducted, the consequence and frequency analysis for each incident were combined to determine the risk and then compared to the risk criteria published in HIPAP 4.

### 22.2.2 Hazardous materials

#### i Storage

The classes and quantities stored at the sites are summarised in Table 22.1. The quantities and locations of materials are dynamic and may change subject to the requirements of relevant Australian Standards/codes of practice in place at the time.

**Table 22.1 Maximum classes and quantities of dangerous goods stored**

| UN Number | Material | Storage location | Storage type | ADG code class/division | Packing group | Storage capacity |
|---|---|---|---|---|---|---|
| **HVO North** | | | | | | |
| 00C1 | Diesel | HVO North | Above ground tanks | C1 | - | 2,125,000 L |
| 00C1 | Combustible liquids C1 | Howick w/shop waste oil/diesel tank | Above ground tank | C1 | - | 5,200 L |

## Table 22.1 Maximum classes and quantities of dangerous goods stored

| UN Number | Material | Storage location | Storage type | ADG code class/division | Packing group | Storage capacity |
|---|---|---|---|---|---|---|
| 3375 | Ammonium nitrate emulsion (ANE) | HVO North | Above ground tanks | 5.1 | II | 180,000 kg |
| 1942 | Ammonium nitrate (AN) | HVO North | Above ground tank | 5.1 | III | 94,000 kg |
| 3099 | Oxidising liquid toxic, N.O.S. | HVO North | Outdoor bunded store | 5.1 | III | 1,000 L |
| NA | Detonators, boosters without detonators, cords | HVO North | External magazine | 1.1B, 1.4S | 1 | 204,000 |
| **HVO South** | | | | | | |
| 00C1 | Diesel | HVO South | Above ground tanks | C1 | - | 1,320,000 L |
| 00C1 | Combustible liquids C1 | Light vehicle w/shop waste oil/diesel tank | Above ground tank | C1 | - | 2,000 L |
| 00C2 | Combustible liquids C2 | HVO South | Above ground tank | C2 | - | 15,000 L |
| 1075 | Petroleum gases, liquified | South fuel farm (Lemington) | Above ground tank | 2.1 | - | 75,000 L |
| 3375 | ANE | South ANE Facility – ANE Tank 1 | Above ground tank | 5.1 | II | 140,000 kg |
| 2426 | AN, liquid (hot concentrated solution) | AECI South ANE Facility – AN solution tanks 1–4 | Above ground tank | 5.1 | II | 80,000 L |
| 1942 | AN | South ANE Facility – AN Transit Bin | Above ground tank | 5.1 | III | 194,000 kg |
| 1942 | AN (subject to MOD 8) | South ANE Facility – AN Storage Stack | Open storage stack | 5.1 | III | 7,250,000 kg |
| 1500 | Sodium nitrite | South ANE Facility – Gasser Shed | Indoor dry store | 5.1 | III | 5,000 kg |
| 3099 | Oxidising liquid toxic, N.O.S. | South ANE Facility – Gasser Shed | Indoor IBC store | 5.1 | III | 5,000 L |
| 2811 | Environmentally hazardous substance, solid, N.O.S. (Thiourea) | South ANE Facility – Thiourea Store | Dry store container | 6.1 | III | 5,000 kg |

**Table 22.1 Maximum classes and quantities of dangerous goods stored**

| UN Number | Material | Storage location | Storage type | ADG code class/division | Packing group | Storage capacity |
|---|---|---|---|---|---|---|
| 2790 | Acetic acid solution | South ANE Facility – Acetic Acid Store | Outdoor bunded store | 8 | II | 5,000 L |

It is also noted that a proposed modification (modification 8) to PA 06_0261 has been submitted which covers the following:

> HV Operations seeks approval to allow up to 7,250 t of additional AN storage within an area proximate to the existing ANE Plant at HVO South. In addition, an increase in the approved storage quantity of various materials associated with AN production is sought. The proposed AN compound is within a previously disturbed area and exceeds Australian Standard AS4326.

The storage arrangement of an additional 7,250 t of AN will involve open-air storage in stacks of a maximum of 250 t, with each stack separated from adjacent stacks by a minimum of 9 m.

For the purpose of the PHA (Riskcon Engineering 2022), it was assumed that this modification application will be approved.

### ii Hazard identification

It is noted that diesel and LPG are stored in large quantities across the site, however, AN is identified as the product of highest risk so the hazards associated with AN were the focus of the PHA.

Based on the hazard identification table presented in Appendix A of the PHA (refer to Appendix U of this EIS), the following hazardous scenarios have been developed:

- HVO North ANE reload area (West Pit) AN fire and explosion;
- HVO South ANE facility AN fire and explosion;
- diesel tank pool fire;
- AN decomposition and toxic gas dispersion;
- LPG release, ignition and jet fire, flash fire, explosion or boiling liquid expanding vapour explosion (BLEVE); and
- potentially contaminated water from firefighting activities.

### iii Consequence analysis

Of the scenarios identified above, two were identified to have the potential to propagate an incident or significantly damage equipment.

**Table 22.2 Incident consequence analysis**

| Incident | Consequence analysis |
|---|---|
| HVO North ANE reload area (West Pit) AN fire and explosion | In the event the AN storage bins or ANE tanks are impacted by a fire (bushfire or vehicle fire) to the point that the AN decomposes, the bins/tanks may explode resulting in substantial overpressure impacts.<br>For conservatism, an explosion has been modelled based upon the contribution of the entire contents of the store. In reality, this is extremely unlikely due to separation between the vessels and the unlikelihood of the vessels to be full simultaneously and at the time of explosion.<br>There is a total of 274,000 kg of AN and ANE stored at HVO North (West Pit), of which the net explosive quantity (NEQ) has been modelled as 174,080 kg. In accordance with the ANE Code and AS 2187.1:1998, the separation distance for 174,080 kg is 825 m. However, this distance can be reduced to 620 m based on the provision of a warning and ability to evacuate.<br>The storage area is greater than 620 m from the Protected Works Class A (ie sensitive receptors such as public streets) and so will not result in an "offsite" fatality. Therefore, this scenario has not been considered further. |
| HVO South ANE facility AN fire and explosion | In the event the AN storage bins or ANE tanks are impacted by a fire (bushfire or vehicle fire) to the point that the AN decomposes, the bins/tanks may explode resulting in substantial overpressure impacts.<br>There is a total of 7,664,000 kg of AN and ANE stored at HVO North (reload facility), of which the highest single NEQ has been modelled as 80,000 kg. In accordance with the ANE Code and AS 2187.1:1998, the separation distance is 940 m. However, this distance can be reduced to 700 m based on the provision of a warning and ability to evacuate.<br>The storage area is greater than 700 m from the Protected Works Class A (i.e. sensitive receptors such as public streets) and so will not result in an "offsite" fatality. Therefore, this scenario has not been considered further. |

## 22.3 Contamination

This section provides a summary of previous contamination assessments completed for HVO. The three previous site investigations were:

- Preliminary Site Investigation, SLR 2018;
- Detailed Site Investigation, AECOM 2020; and
- Supplementary Detailed Site Assessment, AECOM 2021.

The EPA requested a "Section A site audit statement (SAS) and accompanying site audit report (SAR) certifying suitability of the land for the proposed land use" as part of their SEARs submissions for the Project. In a letter dated 29 June 2022, the EPA agreed that a Section A site audit statement and accompanying site audit report are not required to be completed as part of the EIS.

The EPA stated that:

> the EPA acknowledges that the proponent has completed contamination assessments at the site between 2018 and 2021. The most recent report referred to as Detailed Site Investigation Addendum – South Lemington Area (2020), completed in June 2021 included an objective to "evaluate whether there is a potential unacceptable risk of harm to both human health and ecological receptors as a result of potential exposure of future land users located downgradient (and potentially off-site) of the eastern and the southern SLA boundaries." The EPA notes reference to the need to investigate the potential for off-site contamination, and notes the findings of the contamination investigations were not provided in the email summary.

### 22.3.1 Preliminary site investigation, SLR 2018

SLR was engaged by HVO to undertake a Preliminary Site Investigation (PSI) during 2018 the HVO hydrocarbon facilities. Areas and facilities assessed as part of the PSI that are within the study area include the following:

- HVO North facilities;
- Newdell/train load-out facilities;
- HVO South facilities; and
- Old Lemington facilities.

The objectives of the PSI were to:

- assess the potential for contamination that could pose an unacceptable risk to current and future site users to be present at the site(s), as a result of past and present land use activities;
- assess potential liabilities relating to the site(s) contamination status;
- provide advice on the suitability of the land (with respect to contamination) for the current land use; and
- provide recommendations on further investigations or contamination management or remediation measures to render the site suitable for the current land use, if required.

SLR concluded that while the overall potential for contamination to be present was moderate to high, the site was considered suitable (with respect to contamination), for the current land use subject to the continual implementation of the site hydrocarbon practices and PIRMP.

### 22.3.2 Detailed site investigation, AECOM 2020

Based on the information provided in the SLR (2018) PSI, AECOM was engaged by HVO to conduct a DSI of the South Lemington area. Objectives of the investigation were to:

- assess the nature and extent of potential contamination issues, taking into consideration areas of environmental concern (AEC) identified in the SLR (2018) PSI and desktop review;
- provide advice on site suitability (within the context of land contamination) based on potentially complete source-pathway-receptor (SPR) linkages for the current and proposed future land use (ie assessed under commercial/industrial guidelines); and
- provide recommendations for further investigation, management and/or remediation (if considered necessary).

AECOM (2020) concluded that the reported exceedances were generally related to ecological receptors and did not present an unacceptable risk to current on-site human receptors. It was recommended that any equipment/plant brought to the equipment graveyard (near South Lemington Pit 2) for storage should be appropriately drained of all fluids with drip trays placed to prevent localised contamination of shallow soils. The site was considered suitable for the proposed future use.

### 22.3.3 Supplementary detailed site assessment, AECOM 2021

AECOM (2021) completed a supplementary detailed site assessment as an addendum to the AECOM (2020) DSI. Objectives of the supplementary assessment were to:

- characterise the nature and distribution of hydrocarbon impacts identified in soils within the bioremediation area and equipment graveyard sampling locations BA03 and EG12; and
- evaluate whether there was a potential unacceptable risk of harm to both human health and ecological receptors as a result of potential exposure of future land users located downgradient (and potentially off-site) of the eastern and the southern South Lemington Area boundaries.

AECOM (2021) concluded that the hydrocarbon impacts were unlikely to present an unacceptable risk to on- or off-site human and ecological receptors and no further assessment of potential off-site risks was recommended. AECOM considered that based on the results of the DSI and the supplementary assessment, remediation of the identified hydrocarbon impacts was not required within the context of the proposed future land use where application of overburden was proposed.

## 22.4 Human health

To identify potential adverse impacts on human health, a health risk-assessment was completed with consideration of the *Environmental Health Risk Assessment: Guidelines for assessing human health risk from environmental hazards* (enHealth 2012) and relevant legislation.

Where relevant, potential risks to human health have been assessed against accepted safety or health-based assessment criteria established by the NSW Government. Where relevant criteria are predicted to be met or where NSW Government policy stipulates mitigation measures that are to be implemented (eg imposition of voluntary acquisition clauses in any development consent), no further detailed health risk assessment was determined to be required.

The identified risks to human health, and a summary of the key assessment findings rare provided in Table 22.3.

## Table 22.3 Identified risks to public safety and associated assessment findings

| Issue identification | Description of risk to public safety or health | Relevant assessment | Summary of key findings |
|---|---|---|---|
| **Air quality** | Human exposure to particulates ($PM_{10}$ and $PM_{2.5}$). | Chapter 8<br>Appendix H | Maximum 24-hour average $PM_{10}$ and $PM_{2.5}$ concentrations would be within the range of historically measured days above the criteria, excluding extraordinary events.<br>Annual average $PM_{10}$ and $PM_{2.5}$ concentrations will comply with EPA air quality assessment criteria at all privately owned sensitive receptors not subject to existing air quality acquisition rights; however, an increased air quality impact risk was identified for one property in Jerrys Plains (308) in the later years of the Project (around Year 11). |
| | Human exposure to $NO_2$ from blasting. | Chapter 8<br>Appendix H | Operational post blast fume concentrations will not exceed EPA's criterion of 246 µg/m$^3$ at the sensitive receptors.<br>Based on dispersion modelling, with predominantly worst-case assumptions, and proposed implementation of site-specific pre-blast procedures, the Project will not lead to adverse air quality impacts with respect to post blast fume.<br>Blast fume will be managed in accordance with the blast management plan (refer to Chapter 11). |
| | Human exposure to diesel emissions. | Chapter 8<br>Appendix H | Modelled maximum 1-hour average $NO_2$ concentrations (assuming 20% of the $NO_x$ is $NO_2$ at the locations of maximum ground-level concentrations and a maximum background concentration of 74 µg/m$^3$) comply with the EPA's 246 µg/m$^3$ criterion at all sensitive receptors. Modelled annual average $NO_2$ concentrations (assuming 100% of the $NO_x$ is $NO_2$ and 16 µg/m$^3$ background levels) comply with the EPA's 62 µg/m$^3$ criterion at all sensitive receptors.<br>The Project will not lead to adverse air quality impacts with respect to diesel exhaust.<br>Mitigation measures to manage diesel combustion emissions includes servicing machinery in accordance with maintenance contracts and adopting original equipment manufacturer recommendations for maintenance. |
| **Noise** | Human exposure to acute and cumulative impact of noise during construction. | Chapter 10<br>Appendix I | Noise from other industrial sources with the potential to cause cumulative impact when combined with HVO North and HVO South noise emissions were evaluated. These sources were grouped and combined with HVO North and HVO South dependant on geographical location and directionally, as relevant, for each NAG. All results met or were below the recommended amenity noise levels, except for receptor 308. This receptor has existing mitigation rights for HVO South that will continue to be afforded and is also subject to voluntary acquisition by UWJV.<br>Predicted noise levels resulting from construction of the Project are anticipated to be below the ICNG 'highly noise affected' criterion. |

## Table 22.3 Identified risks to public safety and associated assessment findings

| Issue identification | Description of risk to public safety or health | Relevant assessment | Summary of key findings |
|---|---|---|---|
| | Sleep disturbance from transient noises often with tonal characteristics. | Chapter 10<br>Appendix I | Sleep disturbance model predictions are less than the $L_{Amax}$ trigger level of 52 dB for all receptors.<br>There is only one receptor where a result greater than the current HVO South sleep disturbance criterion of $L_{Amax}$ 45 dB has been predicted. This is receptor 121, which already has voluntary mitigation rights with HVO, where $L_{Amax}$ 46 dB has been calculated for the years 11 (approximately 2033) and 22 (approximately 2040). All other receptor results are less than the criterion. The current HVO North sleep disturbance criterion is $L_{A1,1minute}$ 46 dB. |
| | Direct impacts from road traffic noise. | Chapter 10<br>Appendix I | Road traffic noise from the proposed Lemington Road realignment was assessed as part of the TTIA. The worst-case peak hour results (the TTIA does not include period (day and night) traffic volumes, only data for the AM and PM peak hours) are predicted to range between $L_{Aeq,1hour}$ 12 and 30 dB for receptors in the Maison Dieu locality. This peak hour result is significantly below both the day and night period RNP criteria. |
| **Blasting** | Direct and indirect health risks associated with blasting including risk to life, air quality and noise impacts. | Chapter 11<br>Appendix J | Ground vibration and airblast overpressure can be managed to meet relevant blast emission criteria at all sensitive receiver locations through appropriate blast design and the implementation of appropriate control measures.<br>Risks to the public associated with flyrock will be managed through the implementation of face scanning techniques and modified blast design. |
| **Water** | Contamination of water and health risks associated with human exposure. | Chapter 12<br>Appendix K | Discharge under the HRSTS is not expected to have an adverse effect on surface water quality or change the beneficial use.<br>At HVO North, the residual activities that have the potential to impact groundwater quality in the alluvium or water quality in the Hunter River is the potential for seepage from mining areas backfilled with overburden and interburden material and the potential for production of acid rock drainage and metalloid leachate during operations.<br>There is no proposed change to water management at HVO South from the existing approved operation. Therefore, the proposed operations at HVO South will have negligible impact on groundwater quality, including the beneficial use of groundwater. |

## Table 22.3 Identified risks to public safety and associated assessment findings

| Issue identification | Description of risk to public safety or health | Relevant assessment | Summary of key findings |
|---|---|---|---|
| **Traffic** | Direct risk of road safety. | Chapter 19<br>Appendix R | Road safety has been considered as part of the development of the TIA. It was found that restricting outbound truck movements from Lemington Road to New England Highway during the AM peak during construction would ensure manageable delay and queueing at the intersection. Limiting access to Old New England Highway and utilising the Liddell Station Road access intersection would also assist to manage traffic issues at construction sites to the north of New England Highway.<br>The quality improvement in road elements on Lemington Road (wider road width, provision of road shoulders, clear zone and avoidance for vehicles to travel on the one-way river crossing) would have significant benefits for road safety along Lemington Road. |
| **Bushfire** | Direct and indirect health risks associated with bushfire. | Chapter 22 | The Project has multiple access points with internal roads and bushfire trails providing access for four wheel drive vehicles. The site has a permanent and dedicated water supply for firefighting purposes as well as access to the internal water management system, which is suitable for both aerial and ground firefighting support. HVO currently implement a bushfire management plan for the site. The bushfire management measures have been designed to appropriately manage potential bushfire risk from the Project. |
| **Hazardous materials** | Direct impact from an incident related to hazard materials. | Chapter 22<br>Appendix U | The hazard identification and consequence analysis identified that there would be no incidents which would result in offsite impacts; hence, the potential for fatality or injury or environmental impact to occur would be negligible. As the potential for offsite impacts is low to the point of negligibility, it is considered that the acceptable risk criteria published in HIPAP 4 would not be exceeded. |
| **Contaminated land** | Health related risks from human exposure to contaminated land. | Chapter 22 | Previous site investigations completed for HVO confirmed there are no known areas of contamination that may cause a significant risk of harm to human health or the environment.<br>HVO will continue to implement existing contamination mitigation measures and additional mitigation measures including waste management systems, spill and emergency response procedures, and regular inspection/reporting processes.<br>In the event that contamination is identified, the contamination will be reported to the EPA. |
| **Waste** | Health risks associated with the handling and disposal of waste including hazardous waste. | Chapter 25 | Waste management will be undertaken in accordance with HVO's waste management systems.<br>Waste will continue to be recycled and reused, where possible. In accordance with EPL 640, tyres and the conveyor belt will be disposed of in the emplacement areas.<br>Where waste that cannot be reused or recycled, it will be transported off site by licensed waste management contractors to a facility licenced to receive the waste. The risk to human health from waste generated by the Project is considered low. |

## 22.5 Mitigation measures

The mitigation measures in Table 22.4 continue to be implemented for the Project.

**Table 22.4 Hazards, contamination and health mitigation measures**

| ID | Mitigation measure |
|---|---|
| HCH1 | Implementation of the site hydrocarbon practices and PIRMP. |

## 22.6 Summary and conclusion

The PHA developed a hazard identification and consequence analysis process for the Project based on the hazards materials and quantities stored on site at HVO.

The consequence analysis identified that there would be no incidents which would result in offsite impacts; hence, the potential for fatality or injury or environmental impact to occur would be negligible. As the potential for offsite impacts is low to the point of negligibility, it is considered that the acceptable risk criteria published in HIPAP 4 would not be exceeded and that the Project would be appropriate for the proposed land use.

Previous investigations within the study area reviewed as part of this contamination assessment found that contamination identified during previous investigations (AECOM 2020, 2021) does not appear to present an unacceptable risk to on or off-site human and ecological receptors. Consequently, remediation of the identified hydrocarbon impacts is not considered necessary and the areas investigated are considered suitable for continued commercial/industrial (coal mining) land use. Furthermore, the presence of the identified contamination would not preclude the continuation and further development of existing mining operations within the study area. If contamination is identified during current or future operations, consideration of the EPA's duty to report guidelines should be undertaken to evaluate whether notification of contamination to the EPA is required.

Based on the evidence presented in Table 22.3, it is considered that the Project will not generate impacts to human health.

# 23 Social

## 23.1 Introduction

This chapter provides a summary of the Social Impact Assessment completed by EMM (2022h) for the Project, which is provided in full in Appendix V. The SIA has been prepared in accordance with the SEARs as well as relevant government assessment requirements, guidelines and policies, and in consultation with the responsible government agencies, including:

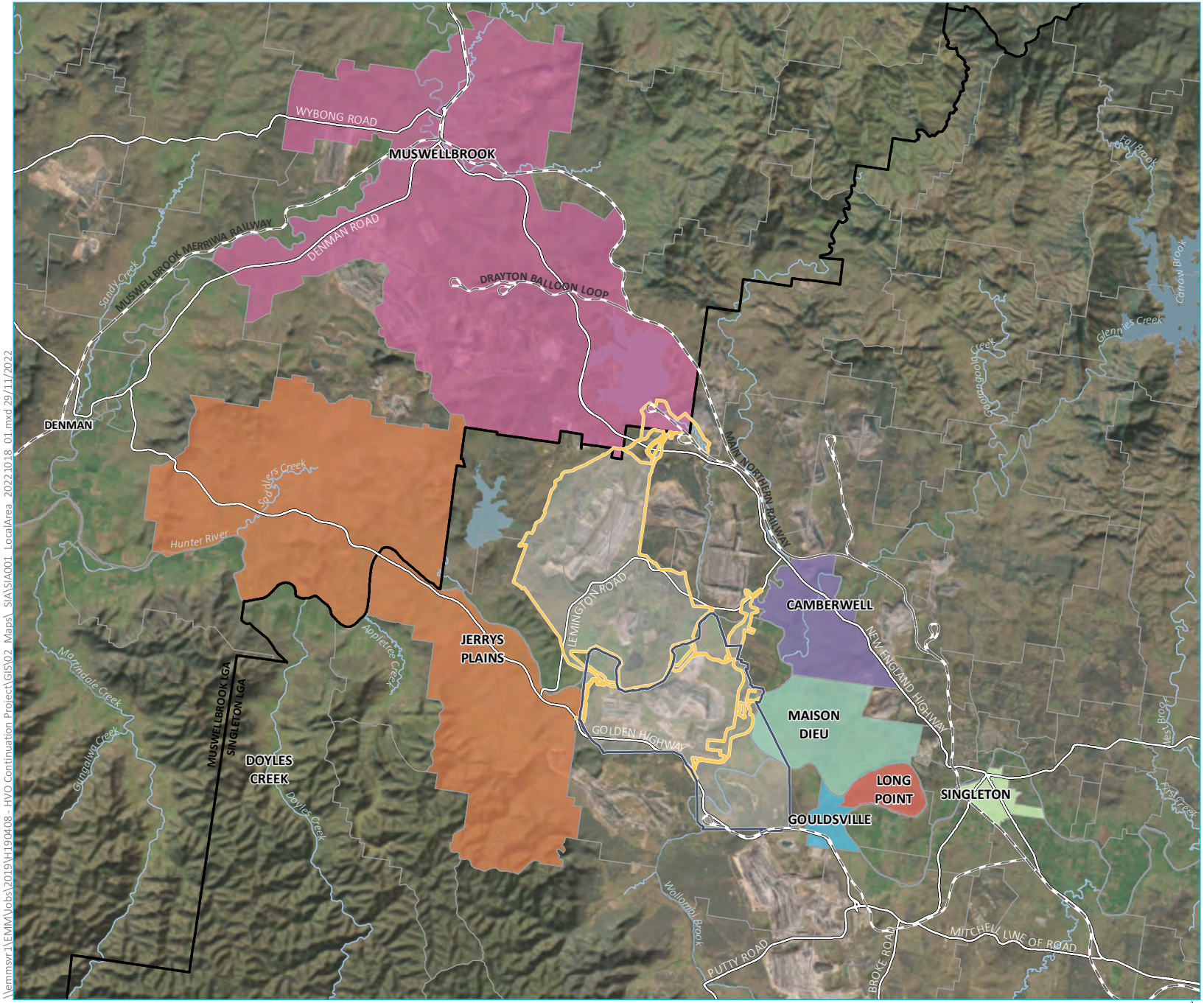
- the *Social Impact Assessment Guideline for State Significant Projects* (SIA Guideline) (DPE 2021c);
- the *Technical Supplement: Social Impact Assessment Guideline for State Significant Projects* (SIA Technical Supplement 2021) (DPE 2021e); and
- the *Cumulative Impact Assessment Guidelines for State Significant Projects* (DPE 2021a).

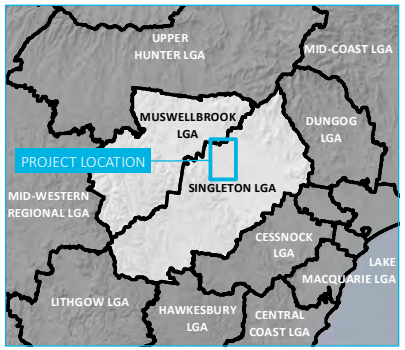
## 23.2 Existing environment

A Town Resource Cluster (TRC) analysis was undertaken to examine social and economic linkages between the Project and key towns across the broader region. To inform the TRC analysis, eight localities were identified as resource centres which may experience social and economic effects associated with the Project such as employment, Project workforce expenditure and participation within the local community and suppliers' business expenditure. The localities identified as resource centres were Singleton, Maitland, Cessnock, Muswellbrook, Lake Macquarie, Newcastle, Scone and Port Stephens.

While the impacts and benefits of the Project will be experienced locally, direct and indirect impacts (both positive and negative) may be farther reaching. In accordance with the SIA Guideline (DPE 2021c), the SIA adopted a local study area (refer to Figure 23.2) along with a regional study area set within a broader social area of reference (refer to Figure 23.2).

Baseline information used to identify key existing social conditions, including access to housing, social services, health and wellbeing, employment and economic livelihoods, has been obtained for the local, regional and reference areas and presented as the social baseline. The key elements of the social baseline with relevance to the Project are summarised in Figure 23.3, and is derived from the 2016 Census of Population and Housing (ABS, 2006a, 2011, 2016a, 2016b, 2016c) unless stated otherwise.




KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary

Existing environment

- Main road
- Rail line
- Named watercourse
- Named waterbody
- Local government area
- Suburb boundary
- Singleton ABS SA2 area
- Muswellbrook ABS SA2 area
- Jerrys Plains SSC
- Mason Dieu SSC
- Camberwell SSC
- Gouldsville SSC
- Long Point SSC

SIA local area

\\emmsvr1\EMM\Jobs\2019\H190408 - HVO Continuation Project\GIS\02_Maps_SIA\SIA001_LocalArea_20221018_01.mxd 29/11/2022

*Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011); ASGC (2006)*

0 5 10 km

GDA2020 MGA Zone 56

N

HVO Continuation Project
Environmental Impact Statement
Figure 23.1

EMM creating opportunities

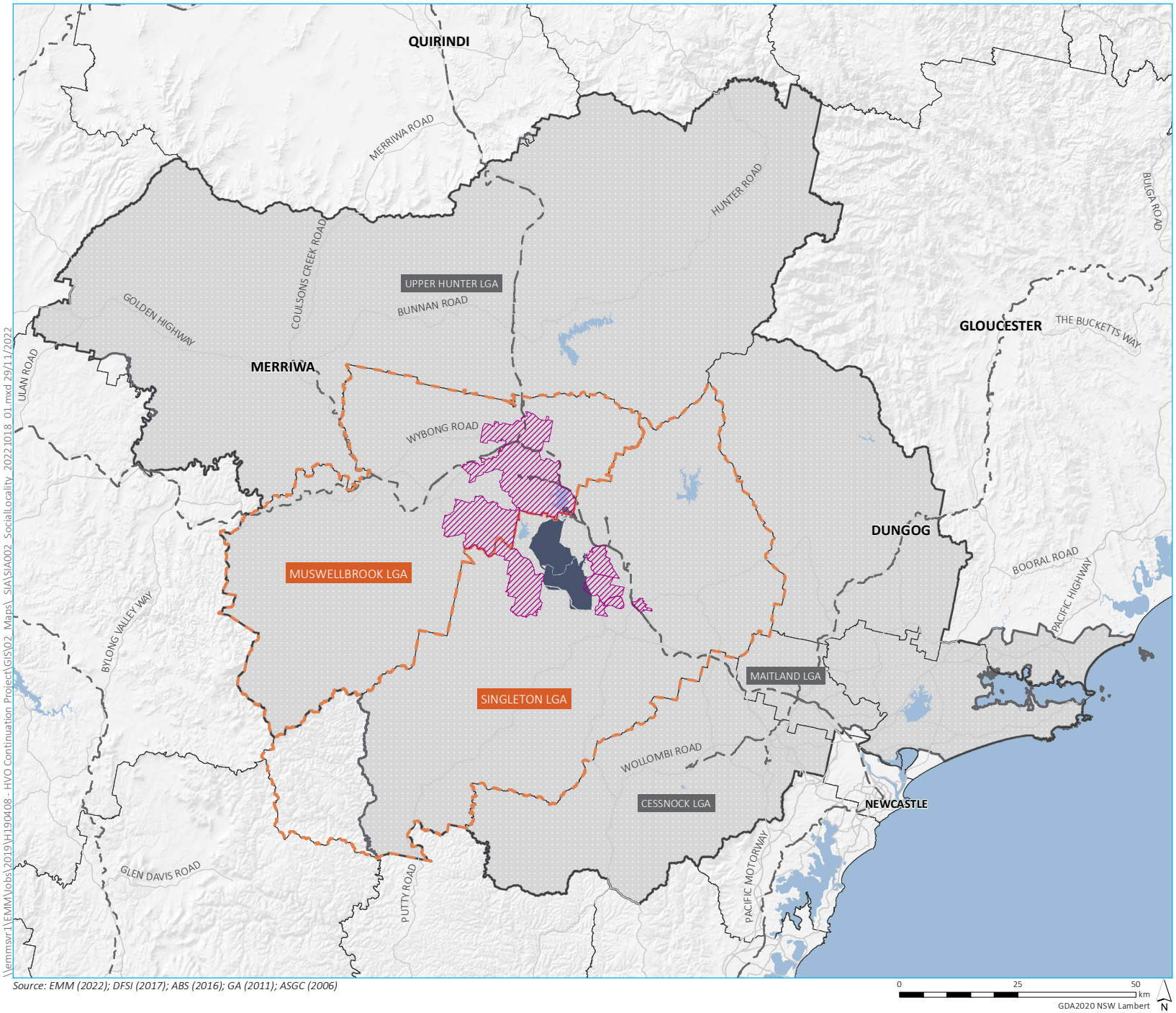
## 23.3 SIA engagement

Extensive engagement with a variety of stakeholders was undertake during the EIS engagement phase for the Project (refer to Chapter 6). Feedback from stakeholders and the broader community has been varied and includes both positive and negative views on a range of topics including traffic and transport impacts, mine rehabilitation and final landform, visual amenity, noise impacts and air quality concerns, and benefits for the local economy. Full details of community engagement findings are provided in Chapter 6 of this EIS.

Particular engagement was undertaken specifically to inform the SIA. This consisted of:

- in-depth interviews with the near neighbours and landholders, local community members, local government key stakeholders and service providers (conducted via face-to-face, telephone and videoconference);
- a community survey (administered online);
- workforce and supplier surveys (administered online); and
- consultation with Aboriginal stakeholders (conducted face to face via workshops and telephone).

All consultation activities sought to understand how participants viewed their community, including identified values, strengths and vulnerabilities, and identify how the Project may impact on their community including the key issues or potential impacts, and opportunities or potential benefits.




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*Source: EMM (2022); DFSI (2017); ABS (2016); GA (2011); ASGC (2006)*

SIA social locality

HVO Continuation Project
Environmental Impact Statement
Figure 23.2

EMM
creating opportunities

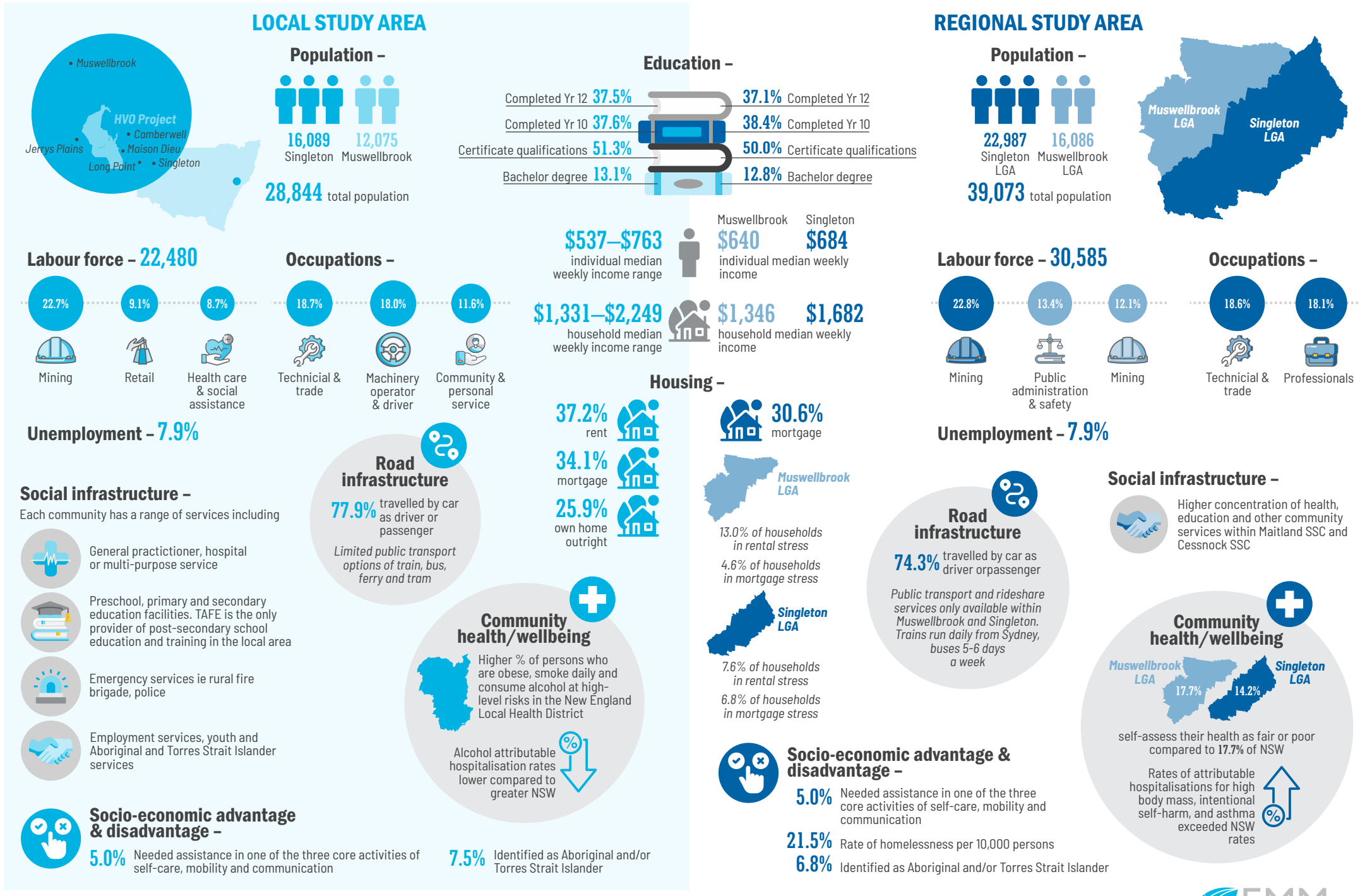



Figure 23.3 Socio-economic profile of study area

## 23.4 Social impacts and benefits

### 23.4.1 Methodology

The methodology for the SIA has been specifically tailored to meet the requirements of the SEARs, in particular the SIA Guideline (DPE 2021c). This SIA has been informed by best practice guidance and standards set out by the International Association for Impact Assessment (IAIA) and International Finance Corporation (IFC).

Figure 23.3 illustrates the phases of the SIA methodology which was adopted based on the applicable requirements and standards. The SIA report, which is the output of Phase 2, will be placed on public exhibition with the EIS, where submissions are received during Phase 3.

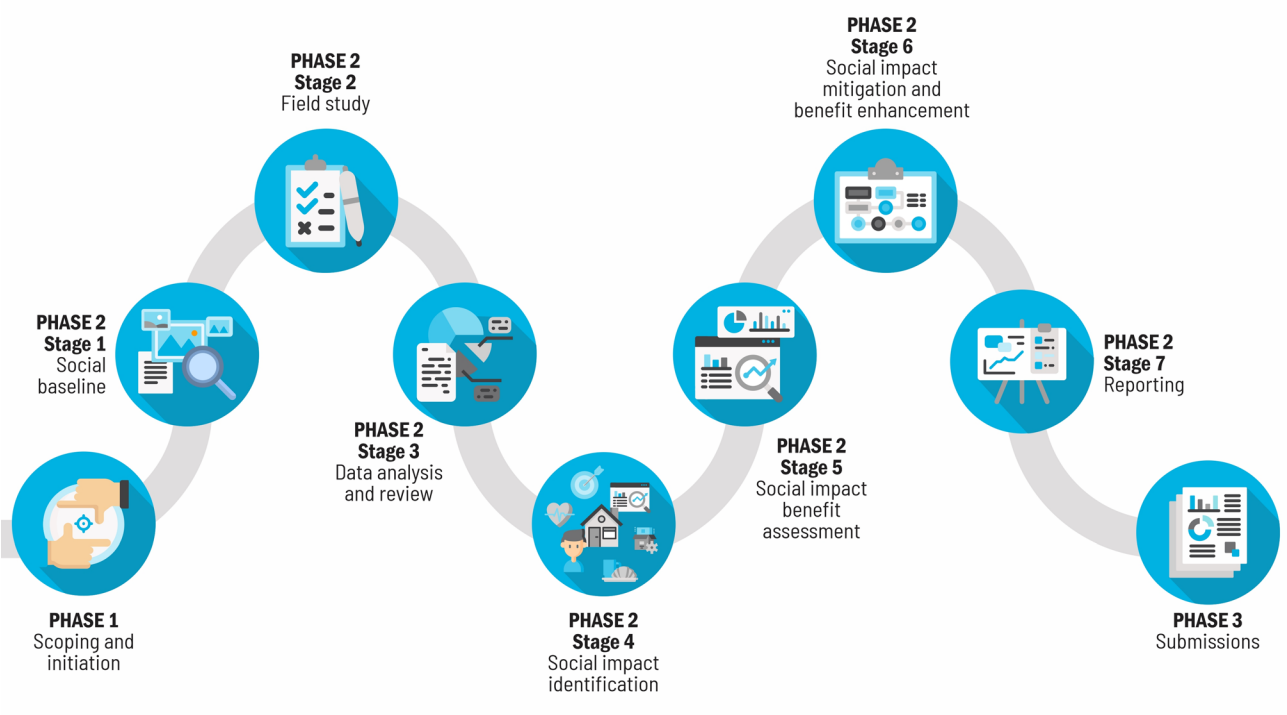



**Figure 23.4 Phases of the SIA methodology**

With a clear understanding of the scope of the Project, social baseline, and input from the field studies, suitably qualified social scientists (refer to Appendix V) identified the Project's potential social impacts. This analysis informed the social risk assessment (approach to Stage 4).

Identification of the Project's potential social impacts and benefits was completed through several complementary approaches, helping to triangulate the findings and confirm their accuracy. These approaches included:

- consideration of environmental impacts – review of similar Projects in the area, as well as available academic and grey literature to identify potential impacts;
- consideration of local plans and policies – findings from the review aided to contextualise and understand the local priorities as well as to identify local values;
- consideration of the existing social environment – demographic and social analysis in the form of a social baseline study;
- consideration of feedback generated through stakeholder engagement including findings from SIA field studies along with broader engagement undertaken as part of the EIS process;

- findings from other technical disciplines that contributed to the EIS were reviewed and potential social impacts defined; and
- consideration of cumulative impacts – review of documentation from other existing and proposed projects in the study area.

The social risk assessment stage assessed each of the social impacts identified to predict the nature and scale of potential social impacts during construction and operation of the Project. A social risk approach was adopted to assess the consequence and likelihood of potential positive and negative social impacts with and without mitigation. The social risk assessment matrix, including the assessment framework used for the assessment, is provided in the SIA Guideline Technical Supplement (DPE 2021e, Section 2.3).

The following data and information have been used to identify the potential social impacts and their associated risks:

- data collected as part of the social baseline analysis including the findings from SIA field study and EIS engagement activities;
- academic research;
- relevant previously conducted SIAs; and
- relevant government and agency reports.

### 23.4.2 Key social impacts

A summary of the Project's social impacts which have an assessed residual significance of medium or higher are presented in Table 23.1. No mitigated social impacts rated as a high risk have been identified for the Project, with all potential impacts ranked as medium or low. The full assessment of potential impacts is provided in Chapter 6 of the SIA.

**Table 23.1 Key social impacts**

| Impact/challenge | Significance (mitigated) |
|---|---|
| **Impact of continued traffic congestion and road delays – construction** | **Medium** |
| Construction activities for the Project predominantly involve upgrades to a number of existing facilities and the realignment of Lemington Road. The peak construction workforce requirement is anticipated to be around 600 workers. The estimated peak number of construction related truck movements would occur towards the end of Year 2, where up to 1,072 truck movements (combined inbound and outbound) are forecasted. Light vehicle traffic generation includes a conservative assumption that all workers (peak of 600) would travel individually by car, arriving/departing across a two-hour period in the morning and afternoon peak periods.<br>Whilst the additional traffic generated by Project construction is relatively small, it represents an incremental increase on a road network already operating under pressure. The TIA concluded that appropriate treatments were warranted to mitigate traffic impacts associated with construction. | |

## Table 23.1 Key social impacts

| Impact/challenge | Significance (mitigated) |
|---|---|
| **Impacts due to continued generation of dust and diminished air quality** | **Medium** |
| Continued generation of dust and exposure to diminished air quality was a key concern raised by stakeholders. AQGHGA report notes that dust generation in the construction phase will largely be associated with works on the realignment of Lemington Road and has the potential to increase overall dust emissions in the early phase of the Project by 3 to 4%. This level of increase is not predicted to be of a magnitude that will change air quality outcomes for nearby neighbours.<br>During continued operations modelling undertaken for the air quality assessment found that TSP and deposited dust concentrations will comply with air quality criteria at all privately owned sensitive receptors not subject to existing air quality acquisition rights. The Project will not be the cause of any exceedance of criteria relating to TSP and deposited dust at neighbouring residences, nor are exceedances of criteria predicted when contributions from other mines are also accounted for.<br>In relation to finer dust particles ($PM_{10}$ and $PM_{2.5}$), the air quality assessment found that the maximum 24-hour $PM_{10}$ and $PM_{2.5}$ concentrations may continue to exceed air quality criteria from time-to-time; however, these events would be within the range of historically measured days above the criteria, excluding extraordinary events. A review of recent and historical air quality monitoring data showed that, in the representative year, all monitoring locations operated by HVO recorded between one and two days above the air quality criteria. Based on modelling outputs, the Project is not anticipated to change this outcome, and the potential for exceedances is expected to be successfully managed using existing management measures, as demonstrated by HVO's air quality compliance history and reported in the Annual Environmental Reviews.<br>The assessment found that the Project may contribute to an exceedance of the NSW Government's *Voluntary Land Acquisition and Mitigation Policy* criteria for annual average $PM_{10}$ and $PM_{2.5}$ at two properties:<br>• Receptor 308 (in Jerrys Plains). This receptor already has acquisition rights under the United Wambo JV development consent relating to noise, and mitigation rights relating to noise under the existing HVO South Project Approval.<br>• Receptor 121 (in Maison Dieu). This receptor already has mitigation rights for air quality and noise under the HVO South Project Approval.<br>Separate to the properties who are afforded mitigation rights, HVO currently operates a near neighbour amenity resource program, which is a voluntary commitment to offer water tank cleaning or supply of water filters to neighbours that request such a service. HVO proposes to replace this program with a more structured program, in which the eligibility to partake in the program will be communicated to all residents with 4 km. | |
| **Impact on community cohesion due to divergent opinions on the Project** | **Medium** |
| Differing community values and opinions around economic, social and environmental impacts and benefits of the Project have the potential to create community dis-harmony. Construction and operation of the Project will support further coal extraction as a resource for energy production. Climate change is an indirect impact of coal resource extraction and consumption through greenhouse gas emissions. While the Project forms a small piece of the puzzle when it comes to climate change, this matter is of high importance to the broader Australian community.<br>Greenhouse gas emission mitigation is a key consideration in the development of the mine plan. For example, reducing fuel usage by mobile plant and equipment (which represents nearly half of estimated direct greenhouse gas emissions emissions) is an objective of mine planning and good practice. At a broader business level, both Yancoal and Glencore (as the JV partners of HVO) have announced commitments relating to GHG emissions from their operations, supporting the transition to a low carbon future.<br>HVO will regularly review and update greenhouse gas minimisation measures, including consideration of electricity efficiency and source and fuel efficiency measures where reasonable and feasible. The HVO Air Quality and Greenhouse Gas Management Plan will also be updated to incorporate the Project, subject to conditions of any development consent, and this plan will be made publicly available through the HVO website. | |

## Table 23.1 Key social impacts

| Impact/challenge | Significance (mitigated) |
|---|---|
| **Impact on an increased housing demand impacting rental affordability and availability** | **Medium** |
| During construction phase up to 180 construction workers would require accommodation when working on the Project. It is anticipated that the preferred form of accommodation sought by these workers would be short-term accommodation (hotels/ motels etc); however, due to the limited availability of short-term accommodation, rental accommodation may also be sought.<br>The influx of up to 180 construction workers may result in additional demand for rental accommodation which places upward pressure on rental prices. However, it is also noted that the peak construction period in which there is the potential for heightened demand for accommodation is only anticipated to occur for up to 6 months. Subsequently any upward pressure on rental prices is likely to be marginal and short lived and therefore potential impacts on vulnerable groups would possibly not eventuate. Effective mitigation of this impact requires a planned approach to workforce accommodation to avoid negative impacts on the rental market in the local and regional area. Mitigations which serve to avoid negative impacts on the capacity and affordability of the local rental market include:<br>• where possible, prioritisation of short-term accommodation rather than rental accommodation to meet construction workforce requirements; and<br>• maximising the number of workers with applicable skills able to be sourced from within a one hour commute from the Project site. | |
| **Impacts from noise and vibration** | **Medium** |
| Impacts on the health and wellbeing of nearby residents due to noise and vibration generated by construction and operational activities was raised as a concern by multiple stakeholders.<br>In relation to construction activities, predictions from modelling undertaken as part of the NIA for the Project (EMM 2022c) indicate that privately owned residences in Maison Dieu are expected to experience noise levels that are higher than the 'noise affected' management level, but well below the 'highly noise affected' management level, as specified in the *Interim Construction Noise Guideline* (ICNG) (EPA 2009). These are worst case construction noise predictions that may occur during noise enhancing weather conditions during the peak of the construction period, that is, an expected infrequent occurrence. Consequently, received levels should typically be less than those presented in the NIA. Construction noise predictions are below the 'noise affected level' for all other receptors around HVO. Construction road traffic noise impacts are not predicted, with changes in road traffic noise levels resulting from Project construction traffic increases found not to be measurable or perceptible at privately owned residences.<br>In relation to ongoing operations, the design of the Project has been an iterative one, taking into account outcomes of the NIA and involved an extensive investigation into reasonable and feasible measures that could be included in the Project design to reduce residual noise levels at nearby residences. With these measures implemented, the assessment found that:<br>• Nineteen receptors will be entitled to voluntary mitigation rights based on predicted marginal residual noise impacts as a result of the Project, of which:<br>– Thirteen already have existing rights under current HVO approvals.<br>– Six are on the outskirts of Jerrys Plains, and while a marginal noise impact is predicted at these receptors due to the Project, it is noted that the noise criteria for the Project (known as Project Noise trigger Levels (PNTLs) for these receptors in the evening and night time periods are less than the current criteria that applies to these residences, and the recommended noise criteria for these receptors is consistent with the current criteria that applies.<br>• Seven receptors that already have mitigation rights in accordance with the HVO South Project approval are not predicted to experience noise levels such that they would be entitled to voluntary mitigation rights for the Project; however, HVO proposes to retain voluntary noise mitigation rights for these receptors.<br>The blast impact assessment conducted for the Project concluded that exposure to vibration and airblast overpressure can be effectively managed via existing blast management practices on site and through the application of reduced charge masses where required for private residential receptors in Maison Dieu and Jerrys Plains. An additional four blast monitors will be deployed by the Project to ensure effective monitoring and management of blasting activities. | |

**Table 23.1 Key social impacts**

| Impact/challenge | Significance (mitigated) |
|---|---|
| **Impact of continued anxiety about potential effects on water quality** | **Medium** |
| The Project will generate dust through proposed construction activities and due to mining operations. Feedback received from local residents included concerns about potential effects on water quality and the continued anxiety about potential effects on water quality in the surrounding area. More specifically, the community raised concerns about the possibility of dust entering privately-owned water tanks, or in other ground water sources, and hence impacting the quality of available drinking water.<br>To ease anxiety about potential dust related impact on water tanks, HVO will Implement a more structured water tank cleaning service for all privately owned resentences within 4 km of the proposed mining area, whereby private residences within 4 km of the proposed mining area will be eligible for tank inspections and cleaning and installation of first flush filter systems for residential water tanks and domestic taps. | |
| **Impact on land management and pest control** | **Medium** |
| Several near neighbours reported issues with pest animals including dogs, foxes and pigs which were potentially contributed to by adjoining HVO managed land. Pest and feral animal control measures will be undertaken during construction and operation in accordance with current mine practices and as outlined in the HVO Integrated Biodiversity Management. Successful pest control programs rely on coordination with other mine sites and landholders. The community perception of the problem is ongoing, which suggests that more coordination and community consultation and engagement is required to manage the perception of the issue. | |

### 23.4.3 Key social benefits

A summary of the Project's social benefits which have an assessed residual significance of medium or higher are presented in Table 23.2. A number of social benefits have been identified with a very high or high benefit rating. The full assessment of potential benefits is provided in Chapter 6 of the SIA (Appendix V).

**Table 23.2 Key social benefits**

| Impact/challenge | Enhanced benefit |
|---|---|
| **Benefit of the realigned Lemington Road and new bridge over the Hunter River** | **Very high** |
| Stakeholders recognised the potential benefits of improved road conditions delivered through the realigned Lemington Road and construction of a new bridge over the Hunter River. As noted above, the realignment of Lemington Road will deliver improved road conditions and decrease travel time by approximately 9–10 minutes if travelling to/from the east of Comleroi Road/New England Road alignment (ie travelling from Bulga or Mount Thorley). However, there will be a minor increase in travel time by about 1 minute 40 seconds if travelling to/from communities west of the current Lemington Road alignment such as Jerrys Plains, when travelling at the posted speed of 100 km/hr.<br>The new bridge over the Hunter River will substantially improve flood resilience. The current crossing has been underwater for a combined total of more than eight months since 2010. The improved design of the proposed new bridge would have kept Lemington Road clear of flooding for all of these rainfall events. The new Lemington Road alignment will therefore provide a more reliable access between the New England Highway and Golden Highway and will accommodate most flood events, thereby improving access for the community. | |
| **Benefit of the Project contributing to ongoing stability of the local population** | **Very high** |
| The continuation of the current HVO operational workforce will contribute to population stability, which provides certainty in planning and delivering social infrastructure and services. Such population stability also maintains community social cohesion with social networks and social capital being preserved.<br>To further enhance the benefits of workforce and population stability there is an opportunity for HVO to take a coordinated and planned approach to mine closure. As per the *Integrated Mine Closure: Good practice guide*, it is a requirement that a full assessment of social impacts is undertaken well before the cessation of operations. This would enable HVO to further understand and manage the impacts on the community of operational closure, further minimising population change impacts on the local and regional provision of social infrastructure and services. Such planning would involve consultation with local and regional stakeholders and would explore potential legacy benefits for the community. | |

## Table 23.2 Key social benefits

| Impact/challenge | Enhanced benefit |
|---|---|
| **Benefit of continued royalty payments to the NSW state government** | **High** |
| The Minerals Council of Australia (2021) identified that between 2010–2011 and 2019–2020, the minerals sector (including coal) contributed $238.8 billion in taxes and royalties to federal, state and territory governments – $132.8 billion in tax and $106 billion in royalties.<br>The Economic Impact Assessment (EIA) undertaken for the EIS (EY 2022) found the total estimated net benefit of the Project to NSW will be $4,848.5 million in Net Present Value (NPV) terms, comprised of $2,122.5 million in direct benefits created from the operation of the Project, $2,739.6 million in indirect benefits and an estimated at $13.7 million in indirect costs. The direct benefits of the Project include $1,555.7 million in royalty payments, $129.6 million in payroll taxes and $39.7 million in council rates.<br>In the regional area, coal mining royalties make a significant contribution to delivery of infrastructure and services. In future years, state government planning for royalty allocation is anticipated to deliver this funding to impacted communities more directly and with additional transparency. While the Project has no control over how royalties are allocated, some interview respondents expressed the desire for a clearer line of sight on how royalties benefit impacted communities. | |
| **Benefit related to community grants and sponsorship** | **High** |
| Participants in research conducted to inform the SIA discussed the benefits related to HVO community grants and sponsorship and noted the Project would allow the continuation of such support for local community groups. HVO has provided more than $240,700 in funding to 79 projects since 2018.<br>Possible enhancement of the community grants and sponsorships programs may be achieved through partnerships to deliver funding to support community capacity building and future transition planning. The strategic targeting of grant investment may also lead to improvements for communities experiencing extreme social disadvantage in the region.<br>The ACHA (Appendix N) discusses social enhancement strategies which will be implemented for the Project, and include:<br>• To assist in closing the gap HVO will consider a program to assist in increasing job readiness and work experience for local Aboriginal people. The program will initially run for the first 5 years of the operations and may be continued following an implementation review.<br>• As part of the development of the Social Impact Management Plan (SIMP) for the Project, HVO will liaise further with the Aboriginal Community to define an appropriate location and a frequency where briefings could be held on the HVO procurement processes to enable Aboriginal suppliers to be able to tender for work.<br>• As part of the SIMP for the Project, HVO will develop a funding framework to enable funding of programs and projects that align to Closing the Gap initiatives or community mental health, to the value of $1,000,000 over the first 10 years of the Project. | |
| **Benefit of rehabilitation, future land use and ongoing land management** | **High** |
| The Project will enable improved rehabilitation outcomes for the HVO Complex through contemporising the proposed final landform for areas to be disturbed by the Project, incorporating natural design landform features. Stakeholders noted that rehabilitation and final landform was a key positive outcome of the continuation of the Project.<br>Future rehabilitation will occur in accordance with an updated Rehabilitation Management Plan. Should the Project not proceed, existing development approvals for the site would continue to apply. | |
| **Benefit of the continued opportunities for local employment and training opportunities – construction and operation** | **High** |
| Construction of the Project will create a peak of 600 construction jobs over a five-year total construction period. It is anticipated that a local workforce will be engaged, where possible. Employment providers in the region reported construction jobs presented an opportunity for local jobseekers to gain meaningful employment. There was reported optimism that the Project would provide employment and training opportunities for young people and contribute to an improvement in the retention of young people in the area.<br>The operation of the Project has an opportunity to provide long term employment and training for the existing workforce and new employees where natural attrition and retirement occurs. The EIA estimated the total wages paid to the workforce as a result of the Project will be $2,378.6 million in NPV terms. Employee contributions to the regional economy would be substantially reduced should job losses occur and current employees either leave the region to find employment, stay in the region but are unable to find employment or have their incomes reduced.<br>It is also noted that HVO currently employs 30 full-time Aboriginal and Torres Strait Islander employees. It is anticipated the Project will provide new employment opportunities and training pathways for Aboriginal and/or Torres Strait Islander people during the construction and operational phases. | |

**Table 23.2 Key social benefits**

| Impact/challenge | Enhanced benefit |
|---|---|
| **Benefit of the continuation of procurement opportunities for local businesses – construction and operation** | **High** |
| The Project will continue to provide commercial opportunities for local contractors, local businesses and suppliers during the construction and operation phase. An analysis of current supply chains indicates HVO has procured goods and services worth approximately $315 million from approximately 400 businesses across the Hunter Valley and greater Newcastle region.<br>The Project will generate indirect benefits to local suppliers of an estimated $760.3 million in NPV terms. The Project is expected to confer a net benefit on the Lower Hunter SA3 region of $1,739 million in NPV terms. This includes potential opportunities for businesses to participate in the Project supply chain. | |
| **Benefit of allowing more time for transition planning** | **High** |
| The Project will deliver an additional 25 years of mining at HVO North, and a further 15 years of mining at HVO South, beyond that currently approved. The Project will secure continued support for local businesses and employment of around 1,500 FTE and would provide the community additional time to transition before mine closure, including opportunities for:<br>• workers to transition to new industries through reskilling;<br>• transition planning to manage withdrawal of the mine's direct and indirect economic contributions to business and community organisations, allowing these groups to adapt their approach and offerings;<br>• the local and regional community to make informed decisions and extending the time within which these decisions can be made; and<br>• new infrastructure and employment opportunities in the region are likely to develop and become viable, for example employment opportunities in the renewable energy sector, as there is a strong local and regional planning context for transitioning away from the economic reliance on the mining sector, which has not yet been fully realised.<br>Effective transition planning is reliant on the Project's preparation and implementation of a workforce and business stakeholder transition plan and, particularly around commercial and business opportunities. | |

### 23.4.4 Cumulative impacts

A summary of the potential cumulative impacts during the Project's construction phase and operation phase is given below in Table 23.3 and Table 23.4, respectively.

**Table 23.3 Key cumulative impacts – construction**

| Impact/challenge |
|---|
| **Construction workforce demands** |
| Cumulative workforce demands across all projects is expected to peak at 1,909 construction workers in around 2025. The contribution of the Project to estimated peak cumulative construction employment demand in 2025 is approximately 26%.<br>Given the long history of mining in the Hunter Valley, there are a large number of well-established businesses providing support services to mining projects and a regional labour force with applicable skills. Analysis of labour force characteristics of Singleton and Muswellbrook LGA's suggests that the total labour force with skills applicable for mine construction (includes industries of construction, electrical, gas and water and mining) is approximately 5,624 workers. Construction skills may be also sourced from the broader region. The size of the labour force of the Hunter Valley including Newcastle with skills applicable to mine construction is 24,807 workers. This suggests there is a sufficient labour pool in the local and regional areas as well as the area of reference, to meet the cumulative construction demand. |

## Table 23.3 Key cumulative impacts – construction

| Impact/challenge |
|---|
| **Employment and population change** |
| For the purposes of assessment, it was conservatively estimated that up to 30% of cumulative demand for construction labour would need to be sourced from areas outside of the region and area of reference. This could generate short-term population change as these workers come into the region to work on construction Projects. It is not anticipated that there would be any significant permanent population change due to cumulative demand for construction labour.<br>The temporary influx of 30% of the cumulative construction workforce (approximately 573 workers) would result in a 2.0% increase to the population of the local study area, a 1.5% increase to the regional population and a 0.2% increase to the area of reference. Such population change could cause minor disruption to the existing social networks and relationships and affect community cohesion in the local study area. |
| **Competition for labour** |
| The cumulative demand for up to 1,909 construction workers between 2023–2028 could affect existing businesses and initiatives which require similar skills.<br>Estimates from the Australian Constructors Association (ACA) suggest that the Australian construction industry faces a critical workforce shortage of more than 100,000 workers (Paper submitted to the Jobs Summit September 2022). In August 2022, the Newcastle Herald published an article speaking to the pressures of ongoing construction labour shortages in the Hunter Valley Region (Parris 2022). The article demonstrates that the construction industry in the Hunter region is facing an unprecedented amount of demand with increased volatility in the levels of staffing, due to reliance on immigration for key trades. This has been exacerbated by the effects of COVID-19, with migrant workers not being able to come to Australia to fulfil this labour demand.<br>Competition for labour due to the cumulative demand for construction skills could affect the viability of some existing businesses in the local and regional study area and the livelihoods which they support. However, as noted under 'construciton workforce demands', the data suggests there is a sufficient labour pool in the local and regional areas as well as the area of reference, to meet the cumulative construction demand. |

## Table 23.3 Key cumulative impacts – construction

| Impact/challenge |
|---|
| **Housing and accommodation** |
| The availability of rental and short-term accommodation in the local and regional study areas is constrained. Construction labour sourced from outside of a distance of a 1 hour commute each way may require accommodation which may place further strain on the availability of rental housing and short-term accommodation.<br>Cumulative demand for accommodation of temporary construction could have:<br>• an impact on low-income and vulnerable groups in the regional area who seek access to affordable rental housing;<br>• accessibility impacts on vulnerable groups needing access to short-term emergency accommodation through specialist homelessness providers relying on hotels, motels etc;<br>• an impact on the growing tourism industry by reducing access to short-term accommodation for visitors to the region, particularly visitors attending for key regional events; and<br>• impacts on service workers (people not employed by the mining industry) who seek affordable housing.<br>The cumulative concern most frequently raised by stakeholders related to housing and accommodation. Representatives from both Singleton Council and MSC noted that the local area had limited capacity to absorb the housing demand generated by construction projects given the multiple developments in the area. Both councils highlighted that demand for temporary accommodation in the regional area is set to only increase given the multiple construction phases occurring over the next 5 years. Cumulative impacts on both rental housing and short-term accommodation were identified as critical issues during consultation with both councils and a number of service providers.<br>Commitments to local hiring, provision of training and apprenticeship opportunities for local workers, and partnerships with local employment and training services could reduce the need for outsourcing of workers.<br>The number of projects in the regional area suggests a long-term pipeline (possibly upwards of 10 years) of construction work opportunities in the regional area. With industry collaboration there is an opportunity to draw a larger permanent resident construction workforce to the regional area. This would have a positive effect on accommodation demand as workers may seek to buy in the regional area and relocate permanently if there is a clear pathway forward for long-term employment. Encouraging a larger permanent construction workforce in the regional area would benefit long term sustainability of these communities and the services and facilities they provide, as well as supporting long term economic benefits for business operators. |
| **Traffic** |
| There are a number of projects in the regional area that are anticipated to have overlapping construction phases, and thus have a cumulative impact on traffic congestion and potentially on road safety. Specific projects to note include the New England Highway Singleton Bypass and the Muswellbrook Bypass. These concurrent construction phases will increase the number of vehicles (both light and heavy) travelling in and out of the local and regional area.<br>Traffic was raised as a key issue by stakeholders in relation to concurrent projects and developments in the local area. MSC raised the concern that scarcity of rental housing and short-term accommodation due to the multiple construction demands of the regional area, will:<br>"encourage drive in drive out employment as they are prepared to drive long distances and it's not good from road capacity and road safety"<br>Many stakeholders felt that local roads are unable to accommodate increased traffic and truck movements due to their condition.<br>Notably in relation to the Project, only two intersections were predicted to be affected by the Project construction workforce, with background traffic growth taken into account, and that is at the Lemington Road/New England Highway intersection (AM peak only) and the Old New England Highway/New England Highway intersection, where the intersections were found to operate at capacity. To minimise this impact, outbound heavy vehicle activities accessing Lemington Road will be minimised where practical during the peak hour (6.00 am–7.00 am). The Old New England Highway will also not be used as a primary construction haul road. It is understood that no other approved or proposed projects will further exacerbate this impact. |
| **Social infrastructure** |
| Prolonged demand on social infrastructure is not anticipated; however, health services such as GPs and emergency services will likely experience temporary elevated demand with multiple SSD construction phases occurring within a 5 year period. It is assumed that at least 70% of construction workforces will have their place of residence within the broader area of reference. The social baseline suggests that social infrastructure in the area of reference can support greater demand; however, locally and regional, services may be placed under strain.<br>Beneficially, local socio-economic growth (temporary or permanent) associated with projects and development can justify increased funding for the provision of services. |

## Table 23.3 Key cumulative impacts – construction

| Impact/challenge |
|---|
| **Amenity** |
| Potential cumulative impacts to regional amenity may occur due to the number of SSD Projects in the region, as well as the proximity of projects to residential areas and towns. A key issue raised by stakeholders was the impact on amenity caused by noise and dust from mining operations throughout the local and regional area.<br>The air quality and noise impacts of the Project during construction in the context of surrounding developments have been considered in Chapters 8 and 10. With respect to air quality, construction emissions, largely from the construction of the Lemington Road realignment, have the potential to increase annual total emissions (ie when combined with operational emissions) by around 3% for TSP, 4% for $PM_{10}$ and 4% for $PM_{2.5}$. These increases are not of a magnitude that will change the air quality outcomes at sensitive receptors, with similar outcomes predicted for noise impacts at these receivers. |

## Table 23.4 Key cumulative impacts – operation

| Impact/challenge |
|---|
| **Operational workforce demands** |
| Operational workforces sustained by resource sector projects (total of 8,547 jobs) are far larger than that of renewable energy and other projects (total of 67 jobs). Operational employment for resource sector projects in the Singleton and Muswellbrook LGA's is predicted to decline steadily from a 2022 estimate of 10,047 operations workers to 4,491 by 2040 if not including the 1,500 operational jobs at HVO. From 2040–2048, there will be a further reduction of 2,912 jobs, with the full job requirement of 386 workers ceasing in 2050. |
| **Employment and population change** |
| There are a number of mines closing in the regional area in the period up until around 2030. This includes Liddell Coal Operations, Mount Arthur, Mangoola, and Muswellbrook Coal. There will be an estimated cumulative job loss in the regional area associated with these Projects of approximately 1,691 jobs up to 2030. In this period alone, if the assumption is made that 30% of the mine workers are unable to find alternative work in the regional area and relocate with their families, this would mean that a predicted 1,319 people would leave the regional area. Between 2030–2040, mine closures in the regional area would result in the loss of in the order 4,105 jobs which could equate to 3,202 people leaving the region. |
| **Housing and accommodation** |
| Many resource projects in the regional area are continuations of current operations, with non-resource projects having significantly smaller operational workforces. It is not anticipated that the operational workforces for these projects will significantly change the demand for housing and accommodation.<br>The housing market in the regional area is connected to mining project activity, with a large proportion of dwellings being associated with mines in the area, either directly or indirectly. With mine closures occurring over the next 25 years with associated job losses, the property market may be adversely impacted by declining property values. This would affect homeowners and investors. However, declining property prices also has a positive impact for low-income and vulnerable people in being able to access the private housing market. |
| **Social infrastructure** |
| The continued stability of job provision that the Project would provide is beneficial in a cumulative scenario of multiple mine closures over the next 10 years. It will help to ensure planned and well managed demand and service delivery whilst the region begins its transition away from mining. |
| **Amenity** |
| The cumulative amenity concerns most frequently raised by stakeholders related to the effects of dust, visual and noise. Multiple projects near each other can result in cumulative amenity impacts that impact the way a landscape and environment is experienced. Cumulative amenity impacts can arise from the presence of similar Projects that may have a low impact individually, but when experienced together, can have a significant amenity impact on the local and regional environment. |

## Table 23.4 Key cumulative impacts – operation

| Impact/challenge |
| --- |
| **Air quality**<br>Whilst the current conditions of air quality experienced by local residents will continue in the short term, the cumulative impact of dust and diminished air quality should decrease over time as other mines in the region cease operations. Effective rehabilitation of mine sites will play an important role in the improvement of air quality. |
| **Visual**<br>A number of viewpoints of HVO will continue to experience cumulative visual amenity impacts (ie concurrent views of multiple open cut mining operations). Each of the mining and industrial developments are well-established features of the visual landscape surrounding the Project area and are predicted to close prior to the completion of the Project. Therefore, the visual landscape surrounding the Project area will undergo significant (positive) change over the life of the Project. |
| **Noise and vibration**<br>As other mines in the local area close (thus ceasing their noise impacts), the Project's proportional contribution to cumulative noise impacts will increase. Cumulative noise impacts have been assessed and considered by the Noise Assessment prepared for the Project, and voluntary mitigation rights will be afforded to properties as triggered by the VLAMP. Notably, HVO will continue to offer voluntary mitigation rights to all residences that currently hold them around the complex, despite these rights not being triggered by predicted noise levels associated with the Project at all of these properties. It is also noted that several residences already hold voluntary mitigation and acquisition rights with numerous mines in the area.<br>In relation to blasting, the risks associated with different open cut operations acting simultaneously can be effectively managed via the implementation of appropriate protocols (Enviro Strata Consulting 2022). There is a well-developed system of notification and interaction with the adjacent mines already in place. |

### Table 23.4 Key cumulative impacts – operation

| Impact/challenge |
|---|
| **Decision making systems** |
| **Concerns regarding community cohesion, climate change and sustainable production and consumption**<br>Progressive closure of coal mines in the region will reduce social pressure associated with mining practices contributing to climate change, though it will not resolve existing climate change impacts such as the increased frequency of extreme weather events. Social discourse on climate change and responsibility for sustainable production and consumption will continue to evolve over the coming decades. |
| **Access to and use of local environments which have sustained biodiversity and ecological health**<br>The BDAR report (Appendix L) identifies that cumulative impacts to biodiversity will only occur in the medium term, as it is expected that the proposed rehabilitation strategy will restore habitats and connectivity in the locality in the long-term. Therefore, it is not expected that access to biologically diverse environments will be impeded for future generations, though existing generations will and are experiencing the impact of fragmented environments. Chapter 21 describes the rehabilitation benefits in the long-term outcomes as a result of the Project. In the interim, mine closures and rehabilitation will be occurring, likely providing a progressive improvement in the region's biodiversity and improved community access to the benefits offered by these large rehabilitated areas. |
| **Impacts to access and quality of places of local social and cultural significance**<br>The ACHA prepared for the Project identifies that, while a number of Aboriginal cultural heritage sites are within the Project's disturbance area, the investigations of the Project area have contributed to the archaeological and scientific understanding of the region.<br>The RAPs have also expressed a desire to place any salvaged artefacts from the Project in a keeping place accessible to the Aboriginal community, creating a new 'Aboriginal place' which would form an important continuation and re-imagining of cultural heritage of the region for future generations. The Project has also been designed to continue avoidance of the highly significant cultural heritage site, CM-CD1, in HVO North.<br>These proposed management measures are anticipated to provide opportunities the local Aboriginal community to maintain a cultural connection with the landscape by having continued access to sites of high significance and will help to achieve intergenerational equity by allowing retention of cultural materials for cultural and educational purposes.<br>Discussions between HVO and the RAPs facilitated the identification of a number of initiatives across key Closing the Gap themes including health, education, business, finance, employment, culture, and community. |
| **Equity in economic opportunity**<br>Other than HVO, the Mount Pleasant Optimisation Project is anticipated to be the only remaining resource sector (coal) Project past 2042 and will only offer 1,670 jobs. AGL has also announced the planned closure of the two power stations in the Hunter Valley, both of which are in close proximity to HVO; with Liddell to close in 2022–2023 (AGL 2022) and Bayswater between 2030 and 2033. This will result in further pressure and job competition as local workers transition to alternate employment.<br>The Government's position around transition planning for the region is principally to secure alternate employment in similar sectors, particularly focusing on renewable energy. It is noted that the *Hunter Regional Plan 2041* is still in draft. Of particular concern is securing equity in employment opportunities for mature people, particularly given the possible need for skills transitioning, although renewables and government projects are now required to deliver Indigenous Participation Plans under the First Nations Guidelines for major energy projects (DPE 2022).<br>While the broader planning context of transitioning to renewables may improve cumulative employment equity for indigenous employment in the region, this is reliant on realisation of planned transition outcomes for the region. Furthermore, management of transition opportunities for mature employees is particularly important, as this is not enabled under existing structures and the proposed transitions to "new" industries.<br>Within the cumulative context of regional employment, the Project will contribute to intergenerational equity within the region as it adds further defined provision of employment and training opportunities, and a structure within which transition planning and related upskilling can occur over the Project lifetime. A defined workforce management plan is critical to defining need, setting Project responsibilities and providing clear outcomes for the workforce within the context of regional transition from mining. |

## 23.5 Management and mitigation measures

Chapter 7 of the SIA identifies several measures proposed to mitigate social impacts or enhance social benefits of the Project.

New mitigation measures which will be implemented for the Project, include:

- development of a:
  - social impact management plan (SIMP);
  - local participation plan;
  - construction workforce accommodation strategy (CWAS); and
  - Closing the Gap funding program.

A summary of the social impact mitigation measures is provided in Table 23.5.

**Table 23.5 Social impact mitigation measures**

| ID | Mitigation measures |
|---|---|
| SOC1 | A SIMP will be developed for the Project which will include a monitoring and management framework. |
| SOC2 | HVO will continue to administer the community grants programme which invests in programs, events and services that promote community cohesion, connectedness and support. |
| SOC3 | As part of the development of the SIMP, HVO will develop a funding framework to enable funding of programs and projects that align with Closing the Gap initiatives, including job readiness programs, assistance relating to tendering for work at HVO by Aboriginal suppliers, and a commitment of $1,000,000 over the first 10 years of the Project. These initiatives will be developed as part of the preparation of the SIMP, which will also outline the proposed implementation plan. |

## 23.6 Summary and conclusion

Impacts and benefits associated with the Project are likely to be experienced most acutely by those people who live nearby; however, they also extend throughout the broader region. Accordingly, the SIA has examined a local study area along with a regional study area set within a broader social area of reference.

The local study area includes the communities which directly surround HVO, being Jerrys Plains, Maison Dieu, Camberwell, and Long Point and Camberwell, along with the two key nearby townships of Singleton and Muswellbrook. The communities of the local study area are likely to experience direct social impacts associated with the Project including residential amenity, traffic, demands on social infrastructure and services, housing and accommodation, and community health and wellbeing.

Economic activity in the local area is dominated by coal mining with numerous other coal mines currently operating employing approximately 11,500 people. Mining is the leading industry sector with respect to employment share in the local area followed by retail trade, health care and social assistance. Agriculture is also an important industry and accounts for the largest proportion of registered business.

No mitigated social impacts rated as a high risk have been identified for the Project, with all potential impacts ranked as medium or low. The key social impacts identified relate to the continued generation of dust and noise associated with ongoing operations, traffic congestion during construction activities, divergent opinions on the Project and the possible impact on community cohesion, and issues relating to pest and land management. A number of social benefits have also been identified with a very high or high benefit rating, including the realignment of Lemington Road and the improved, safer road conditions and accessibility this will deliver to the community, ongoing employment and stability of the local population, continued royalty payments to the State government, ongoing provision of community grants, improved rehabilitation outcomes, continuation of procurement opportunities for local businesses, and the benefit of allowing more time for transition planning in the Hunter Valley through the ongoing provision of jobs and flow on benefits.

Key mitigation measures to mitigate the potential social impacts include the implementation of a tank inspection and cleaning program, for which all private residences within 4 km of the proposed mining area will be eligible, and the development of a funding framework to enable funding of programs and projects that align with Closing the Gap initiatives, to the value of $1,000,000 over the first 10 years of the Project.

These mitigation measures, including the funding framework described, will be detailed in a SIMP to be developed for the Project.

# 24 Economics

## 24.1 Introduction

An economic impact assessment (EIA) has been prepared for the Project and is included in Appendix W. The EIA is based on the economic assessment framework set out in the *Guidelines for the economic assessment of mining and coal seam gas proposals* (DPIE 2015) (the Guidelines) and the methods outlined in the *Technical Notes supporting the Guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals* (DPIE 2018).

Consistent with the Guidelines, the EIA includes a Cost Benefit Analysis (CBA) and a Local Effects Analysis (LEA). The CBA provides an estimate of the net benefits of the Project to NSW, and the LEA is based on analysis for the Lower Hunter region (as defined by the Australian Bureau of Statistics SA3 10601 region).

## 24.2 Cost benefit analysis

Consistent with the Guidelines, the CBA is based on determining the net direct and indirect benefits and subtracting the indirect costs of the Project, and comparing this against the scenario where the Project does not occur (ie the baseline scenario).

To define the baseline scenario, it is noted that the existing approval for mining operations at HVO North ceases in June 2025 while HVO South's Project Approval allows mining until March 2030. However, HVO South is currently dependant on HVO North for coal processing and transport. Therefore, the baseline for the EIA considers that both mines cease operations at the end of the currently approved HVO North mine life in 2025. As such, the economic benefits and costs associated with extraction of coal up to June 2025 across the complex have been included in the baseline, and therefore excluded for the purposes of assessing the incremental net benefits of the Project.

The direct benefits of the Project are a function of the profitability of the Project which, in turn, depends on the prevailing coal price (discussed further in Section 24.4). The indirect benefits of the Project are related to the linkages that the Project has to the NSW economy through both the labour market and suppliers. The indirect costs of the Project are related to the costs borne by the NSW community through the generation of externalities by the Project.

### 24.2.1 HVO Complex

As a complex, HVO is estimated to produce a net benefit of $4,848.5 million in Net Present Value (NPV) terms to NSW. If the individual mine sites are considered separately, the net benefit to NSW from HVO North and HVO South is $3,391.7 million and $1,316.7 million, respectively. The net benefit of HVO operating as a complex is therefore an additional $140 million in NPV terms in comparison to the benefits of the individual operations. This is due to the higher operation and capital expenditure costs when HVO North and HVO South are run as individual mine sites in comparison to a combined, more efficient approach where both sites continue to remain operational. The results of the CBA are summarised in Table 24.1.

### Table 24.1 Cost benefit analysis – HVO Complex

| | HVO Complex* ($million) | HVO North* ($million) | HVO South* ($million) |
|---|---|---|---|
| Direct benefits | $2,122.5 | $1,398.3 | $627.1 |
| Indirect benefits | $2,739.6 | $2,002.8 | $693.5 |
| Incremental indirect costs | $13.7 | $9.4 | $3.8 |
| **Net benefits** | **$4,848.5** | **$3,391.7** | **$1,316.7** |

*NPV in 2022 Australian dollars based on a 7 per cent real discount rate.

As shown in Table 24.1, the estimated total net benefit of the Project in NPV terms is comprised of:

- $2,122.5 million in direct benefits;
- $2,739.6 million indirect benefits; and
- $13.7 million in incremental indirect costs (comprising costs associated with GHG emissions and traffic and transport costs related to the realignment of Lemington Road).

The breakdown of these costs is presented in Table 24.2.

It is also noted that mitigation costs of $8 million (NPV) have been accounted for in operational expenditure for the Project (approximately $4.8 million at HVO North and $3.1 million at HVO South), which includes the costs of mitigation measures to be implemented to minimise, manage or avoid impacts relating to blasting, air quality, biodiversity, noise, water resources, visual amenity, historic heritage, Aboriginal heritage and social impacts.

### Table 24.2 Estimated net benefits of the Project

| Benefits | NPV ($million) | Costs | NPV ($million) |
|---|---|---|---|
| **Direct benefits** | | **Direct costs** | |
| Net producer surplus attributed to NSW | - | | |
| Royalties, payroll tax and Council rates | $1,725.1 | | |
| Company income tax apportioned to NSW | $397.4 | | |
| **Total direct benefits** | **$2,122.5** | **Total direct costs** | **-** |
| **Indirect benefits** | | **Indirect costs** | |
| Net economic benefit to landholders | - | Air quality impact^ | - |
| Net economic benefit to NSW workers | $1,023.8 | Greenhouse gas emissions | $1.3 |
| Net economic benefit to NSW suppliers | $1,715.8 | Noise impact^ | - |
| | | Traffic and transport impact | $0.7 |
| | | Net public infrastructure cost | - |
| | | Surface water impact^ | |
| | | Groundwater impact^ | - |

**Table 24.2 Estimated net benefits of the Project**

| Benefits | NPV ($million) | Costs | NPV ($million) |
|---|---|---|---|
| | | Biodiversity impact^ | $28.2 |
| | | Loss of surplus to other industries | $11.7 |
| | | Visual amenity impact^ | - |
| | | Historical and Aboriginal cultural heritage impact^ | - |
| | | Other^ | - |
| **Total indirect benefits** | **$2,739.6** | **Indirect cost^^** | **$49.8** |
| **Total economic benefit of Project** | **$4,862.1** | **Total incremental cost of the Project that have not been accounted for in operating costs** | **$13.7** |
| **NPV of Project** | **$4,848.5** | | |

^ Management and mitigation costs are included in the operating and capital costs.
^^ Includes $8 million for management and mitigation costs

As shown in Table 24.2, the indirect costs to NSW associated with the Project due to the predicted scope 1 and scope 2 GHG emissions have been estimated at $1.3 million in NPV terms. The costs arising from Project GHG emissions have been derived based on the average yearly emissions multiplied by the carbon price of a tonne of $CO_2$-e (based on the US EPA Social Cost of Carbon) over the life of the Project. The tonne of $CO_2$-e carbon price averages over the life of the Project at $90.57 AUD per $tCO_2$-e, with initial prices starting at $75.42 AUD per $tCO_2$-e to a peak price of $109.98 AUD $tCO_2$-e.

The impacts of GHG emissions are global in nature, and as a result, apportioning all the costs of climate change impacts associated with the Project to NSW overstates the cost of these impacts to NSW. To estimate the impacts on NSW, a component of the total global costs is apportioned to NSW. The approach adopted is to apportion the global GHG costs using the ratio of the NSW population to the global population.

On a global basis, the total estimated GHG cost is $1,186.1 million in NPV terms. Attributing the GHG costs based on the NSW population, consistent with the Guidelines, results in an attributed GHG cost of $1.3 million to NSW in NPV terms.

In relation to traffic and transport costs, the indirect costs identified for the Project are associated with mitigation measures required during construction, and the change in travel time for vehicles travelling on the realigned Lemington Road compared with travelling along the current alignment.

Finally, the loss of surplus identified as a result of the Project ($11.7 million) is the potential loss of surplus to the agricultural industry, due to the temporary removal of land from agricultural use.

The individual CBA results for HVO North and HVO South are surmised in the sections below.

### 24.2.2 HVO North

The results for HVO North are summarised below in Table 24.3. If operated on its own, the CBA found HVO North would provide a net benefit to NSW of $3,391.7 million in NPV terms. This is comprised of $1,398.3 million and $2,002.8 million in direct and indirect benefits respectively and estimated incremental indirect costs of $9.4 million in NPV terms.

**Table 24.3 Cost benefit analysis – HVO North**

| Benefit | NPV (million) | Costs | NPV (million) |
|---|---|---|---|
| **Direct benefits** | | **Direct costs** | |
| Net producer surplus attributed to NSW | - | | - |
| Royalties, payroll tax and Council rates | $1,178.2 | | - |
| Company income tax apportioned to NSW | $220.1 | | - |
| **Total direct benefits** | $1,398.3 | **Total direct costs** | - |
| **Indirect benefits** | | **Indirect costs** | |
| Net economic benefit to landholders | - | Air quality impact^ | - |
| Net economic benefit to NSW workers | $737.5 | Greenhouse gas emissions^ | $0.9 |
| Net economic benefit to NSW suppliers | $1,265.4 | Noise impact^ | - |
| | | Traffic and Transport impact | $0.7 |
| | | Net public infrastructure cost | - |
| | | Surface water impact^ | - |
| | | Groundwater impact^ | - |
| | | Biodiversity impact^ | $26.3 |
| | | Loss of surplus to other industries | $7.8 |
| | | Visual amenity impact^ | - |
| | | Historical and Aboriginal cultural heritage impact^ | - |
| | | Other | - |
| **Total indirect benefits** | **$2,002.8** | **Indirect costs^^** | **$40.5** |
| **Total economic benefit of Project** | **$3,401.1** | **Total incremental cost of Project** | **$9.4** |
| **NPV of Project – ($m)** | **$3,391.7** | | |

^ Management and mitigation costs are included in the operating and capital costs.

^^ Includes $4.8 million for management and mitigation costs

### 24.2.3 HVO South

The results for HVO South are summarised in Table 24.4. If operated on its own, the CBA found HVO South would provide a net benefit to NSW of $1,316.7 million in NPV terms. This is comprised of $627.1 million and $693.5 million in direct and indirect benefits respectively and estimated incremental indirect costs of $3.6 million in NPV terms.

**Table 24.4 Cost benefit analysis – HVO South**

| Benefit | NPV (million) | Costs | NPV (million) |
|---|---|---|---|
| **Direct benefits** | | **Direct costs** | |
| Net producer surplus attributed to NSW | - | | - |
| Royalties, payroll tax and Council rates | $552.2 | | - |
| Company income tax apportioned to NSW | $74.9 | | - |
| **Total direct benefits** | **$627.1** | **Total direct costs** | - |
| **Indirect benefits** | | **Indirect costs** | |
| Net economic benefit to landholders | - | Air quality impact^ | - |
| Net economic benefit to NSW workers | $344.8 | Greenhouse gas emissions^ | $0.2 |
| Net economic benefit to NSW suppliers | $348.7 | Noise impact^ | - |
| | | Traffic and Transport impact | - |
| | | Net public infrastructure cost | - |
| | | Surface water impact^ | - |
| | | Groundwater impact^ | - |
| | | Biodiversity impact^ | $1.9 |
| | | Loss of surplus to other industries | $3.6 |
| | | Visual amenity impact^ | - |
| | | Historical and Aboriginal cultural heritage impact^ | - |
| | | Other | - |
| **Total indirect benefits** | **$693.5** | **Indirect costs** | **$8.8** |
| **Total economic benefit of Project** | **$1,320.5** | **Total incremental cost of Project** | **$3.8** |
| **NPV of Project – ($m)** | **$1,316.7** | | |

^ Management and mitigation costs are included in the operating and capital costs.

^^ Includes $3.1 million for management and mitigation costs

## 24.3 Sensitivity analysis

A systematic sensitivity analysis of the estimated net benefits of the Project was undertaken as part of the EIA, consistent with the Guidelines. This sensitivity analysis shows that the estimated net benefits are robust in the sense that they remain strongly positive after testing all key assumptions underpinning the analysis.

In isolation, the estimated net benefit of the Project is most sensitive to the coal price assumptions underpinning the analysis. For example, assuming coal prices are 25% lower than the central case assumptions, the net benefits to NSW are estimated to be $4,068.3 million in NPV terms (a 16.1% reduction in net benefit), as shown in Figure 24.1. The coal price used in the central case (ie the results presented in this chapter), was an average realised Australian dollar price of $94.0 per tonne for thermal coal and $105.9 per tonne for coking coal in real terms.

The lower bound estimate of net benefits, which takes the most pessimistic assumptions around coal prices, capital expenditure, operational expenditure, worker and supplier benefits as well as indirect costs, yields an estimated net benefit to NSW of $3,728.2 million in NPV terms. The upper bound estimate, based on the most optimistic assumptions, is $5,761.0 million in NPV terms.

The results are equally very sensitive to the choice of discount rate chosen due to the relatively long timeframe of the Project. The NPV of the estimated net benefits to NSW range from between $3,560.1 million and $6,865.6 million under real discount rates of 10% and 4%, respectively.

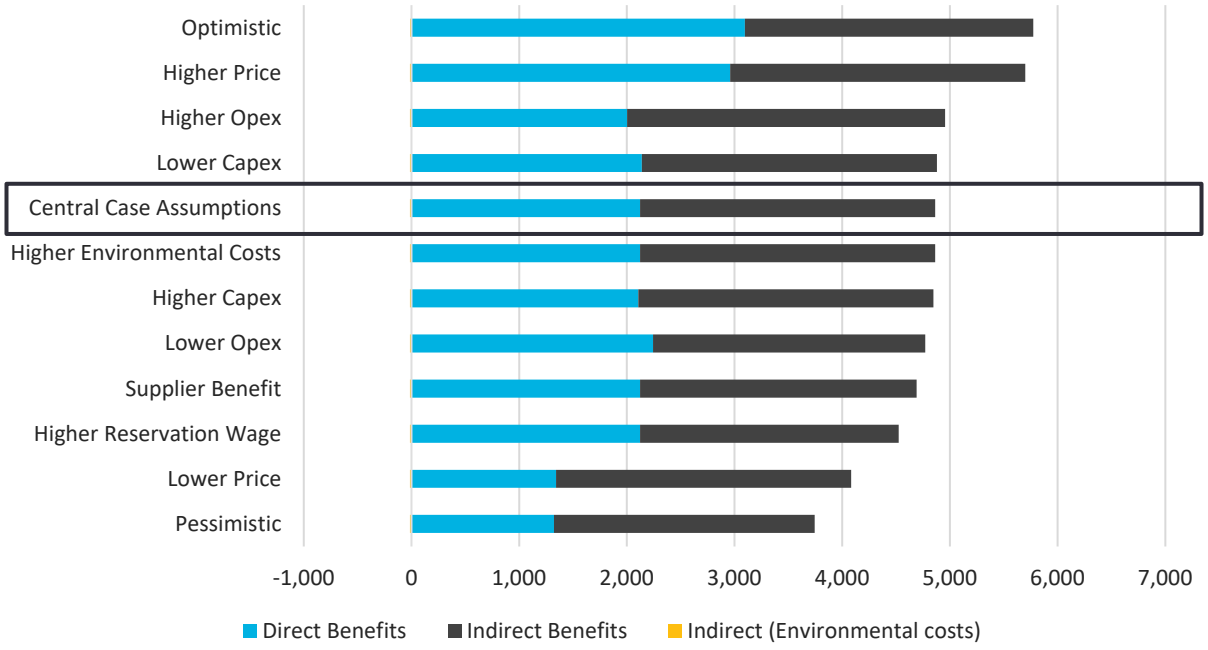



**Figure 24.1 Systematic sensitivity analyses of the results of the CBA to key assumptions (NPV $ million^)**

^ Real 2022 Australian dollars.

* NPV in 2022 Australian dollars based on a 7% real discount rate.

Indirect costs have been included in the figure.

## 24.4 Local effects analysis

Consistent with the Guidelines, the LEA uses a similar framework to the CBA but is focussed on the net economic impacts to the local community. The Guidelines refer to the local area as being consistent with the relevant SA3 as defined by the ABS. For the Project the Lower Hunter SA3 area is used in the LEA.

The majority of the Project area is in the north-west Lower Hunter on the border between the Lower Hunter and Upper Hunter SA3. HVO South is situated completely in Lower Hunter, whereas a small portion of HVO North is situated in Upper Hunter. As a result, it is conservatively assumed that the majority of local effects of the Project are attributed to the Lower Hunter SA3 region.

However, given the Project's central location between Muswellbrook and Singleton, it is not unreasonable to assume that many of the benefits that accrue to the Lower Hunter region, could also accrue to the neighbouring Upper Hunter region nearby, noting that the majority of the workforce comes from Singleton compared to Muswellbrook.

Given the nature of mining operations, it is also acknowledged that many of the inputs may be supplied from the broader NSW region. It is expected though, based on current operations, that only a proportion of the inputs will be supplied from the Lower Hunter region and some of the workforce are sourced from the wider region. As a result, this Project would generate economic benefits to a broader region; for example, due to supplies that are sourced from the wider Upper Hunter region, Newcastle and some of the surrounding regional communities situated near the Project.

Underpinning the LEA are the assumptions that:

- local rates, of $36.6 million in NPV terms are paid to local council under the Project case;
- no net producer surplus accrues to the region (conservative assumption);
- no company income tax accrues to the Lower Hunter SA3 region (conservative assumption); and
- based on information provided by HVO, 75% of the Project workforce comes from the SA3 region.

The LEA found that the Project will deliver an estimated net benefit of $1,739.0 million to the Lower Hunter region in NPV terms. Table 24.5 summarises the net benefit of the HVO Complex, as well as the estimated net benefit of HVO North and HVO South, if they were to be operated as separate mine sites.

**Table 24.5 Net Benefits to the LEA for HVO North, HVO South and the Complex**

| Benefits | HVO Complex (million*) | HVO North (million*) | HVO South (million*) |
|---|---|---|---|
| **Direct benefits** | | | |
| Net producer surplus attributed to Low Hunter | - | - | - |
| Royalties, payroll tax and Council rates | $36.6 | $18.3 | $17.1 |
| Company income tax apportioned to NSW | - | - | - |
| **Total direct benefits** | **$36.6** | **$18.3** | **$17.1** |
| **Indirect benefits** | | | |
| Net economic benefit to landholders | - | - | - |
| Net economic benefit to NSW workers | $954.5 | $687.0 | $320.6 |
| Net economic benefit to NSW suppliers | $760.3 | $560.7 | $154.5 |
| **Total indirect benefits** | **$1,714.8** | **$1,247.7** | **$475.2** |
| **Total Project economic benefit** | **$1,751.4** | **$1,266.0** | **$492.2** |
| **Indirect costs** | **$12.4** | **$8.5** | **$3.6** |
| **NPV of Project – ($m)** | **$1,739.0** | **$1,257.5** | **$488.7** |

*NPV in 2022 Australian dollars based on a 7 per cent real discount rate.

The net benefit is driven by:

- Benefits to local workers of $954.5 million in NPV terms for the HVO Complex, and $687.0 million $320.6 million for HVO North and HVO South respectively. It is assumed that the proportion of workers sourced from the Lower Hunter region would remain consistent at the complex level, and between HVO North and HVO South. It is estimated that around 75% of the workforce expected for the Project is sourced from the Lower Hunter region.[5]

- Benefits to local suppliers of $760.3 million in NPV terms for the HVO Complex, and $560.7 million and $154.5 million for HVO North and HVO South respectively. These estimates are based on the assumption that 37%[6] of the inputs to production are from the region. It is also assumed that the proportion of inputs that are sourced from the local region would remain constant at the complex level and between HVO North and HVO South.

- Payment of local council rates of $36.6 million in NPV terms over the life of the Project, which his comprised of the estimated land tax and payments to the Singleton Council. For HVO North and HVO South, the total payments to council are estimated to be $18.3 million and $17.1 million in NPV terms.

A sensitivity analysis was also conducted for the LEA, which demonstrated that the estimated local effects are robust, with a lower bound estimate of net benefits to the Lower Hunter region of $1,534.6 million and upper bound estimate of $1,713.2 million in NPV terms for the HVO Complex.

## 24.5 Summary and conclusion

The results of the EIA indicate that overall, the Project is expected to generate significant net benefits and is also expected to generate increased economic activity and employment within the NSW community.

The estimated net benefit of the Project is $4,848.5 million in NPV terms. The net benefit is most sensitive to the coal price assumption use in the CBA; however, the sensitivity analysis demonstrated that even with the most pessimistic assumptions around coal prices, capital expenditure, operational expenditure, worker and supplier benefits as well as indirect costs, the net benefits to NSW will remain significant at $4,068.3 million in NPV terms.

The LEA considered the costs and benefits of the Project on residents of the Lower Hunter region and found that the Project is expected to deliver a net benefit to the region of $1,739.0 million.

The results are equally sensitive to the choice of discount rate chosen due to the relatively long timeframe of the Project. The NPV of the estimated net benefits to NSW range from between $3,560.1 million and $6,865.6 million under real discount rates of 10% and 4%, respectively.

Given the significant net benefits of the Project as demonstrated by the outcomes of the EIA, the Project is desirable and justified from an economic efficiency perspective.

[5] Estimates derived from surveys conducted on current workforce to determine the proportion of their SA2 geographical area.

[6] Estimates derived from supplier list where companies are weighted based on size, using employee numbers.

# 25 Waste management

## 25.1 Introduction

The SEARs for the Project identify waste management for consideration (refer to Appendix B). There are several different types of wastes that will be produced by the Project. Section 3.2.4 outlines the existing approach for the management of reject material and tailings produced from coal processing as well as overburden management, with management of wastewater discussed in Section 3.2.5. Section 4.4.3 and Section 4.5.4 then describe the key aspects of the tailings and reject management strategy throughout the life of the Project at HVO North and HVO South, respectively. The focus of this section is to identify and discuss the management of other waste material that will be produced as a result of the Project.

## 25.2 Waste management principles and processes

Waste will continue to be managed in accordance with well-established site waste management protocols, which have been developed in accordance with the requirements of the POEO Act, *Waste Avoidance and Resource Recovery Act 2001* (WARR Act), Protection of the Environment Operations (Waste) Regulation 2014, *Waste Classification Guidelines* (EPA 2014b) and the *Waste Avoidance and Resource Recovery Strategy 2014–21* (EPA 2014a).

As an existing operation, HVO has well developed waste management practices that will continue to be applied in the management of waste materials generated by the construction and operation of the Project. HVO applies the waste minimisation principles including:

- waste avoidance through the minimisation of waste generation;
- waste re-use;
- waste recycling; and
- waste removal and disposal (all waste that cannot be reused, with the exception of inert wastes that may be disposed of on-site in open cut mining areas with the approval of the EPA, and used large tyres that will be buried in controlled areas within open cut mining areas with the approval of the EPA).

The underpinning strategies for management of waste are focused on minimisation through the aforementioned principles, as well as the appropriate training, segregation, storage and disposal of waste generated on site.

The minimisation of waste will continue to be achieved through the following processes:

- consideration of potential waste streams in procurement of materials;
- identification and segregation of re-usable and recyclable materials;
- education of workforce on waste avoidance, waste stream segregation and recycling;
- considering environmental impacts for waste removal and disposal processes; and
- waste monitoring and inspection regimes.

The waste management protocols will continue to include:

- methods, schedules and procedures for the management and responsible disposal of each major waste stream;
- methods for monitoring performance against procedures and targets;
- documentation on waste disposal methods, locations and quantities;
- accountabilities for development, monitoring, control and auditing; and

Under the Project and consistent with the principles of the POEO Act, WARR Act and *Waste Classification Guidelines* (EPA 2014b), HVO seeks to improve the efficiency of the established waste management protocols. To achieve this the Project seeks approval for the effective management of the below listed waste streams, to that currently approved:

- Conveyor belt that is unable to be recycled and waste tyres are proposed to be disposed of within emplacement areas consistent with the current approved tyre disposal management practices.
- Inert construction waste, such as concrete is proposed to be re-used onsite or disposed of at an appropriate depth within emplacement areas across the HVO Complex. Inert construction waste would be transported via HVO internal haul roads and public roads.
- Bitumen recovered from Lemington Road realignment or maintenance of internal roads and hardstands is proposed to be stockpiled and re-used onsite if required.
- If required, virgin excavated natural material (VENM) will be disposed of at Ravensworth Operations should this represent the most efficient disposal, ie closest proximity to disposal location from waste generation.
- Recoverable fill (being fill which presents a beneficial reuse, for example gravels recovered from operational or construction areas) where a beneficial use is identified is proposed to be reused across both operational and construction areas at the HVO Complex and Ravensworth Operations. Recoverable fill would reduce the overall waste produced by HVO and present improved environmental outcomes. Recoverable fill would be transported via HVO and Ravensworth Operations internal haul roads and public roads. Should a beneficial use not be identified, recoverable fill may be disposed consistent with inert construction waste.

## 25.3 Predicted waste streams and management

Waste streams associated with both construction and operational waste are outlined in Table 25.1. Waste will continue to be classified in accordance with the POEO Act, WARR Act and *Waste Classification Guidelines* (EPA 2014b).

## Table 25.1 Waste streams

| Waste stream | Storage | Disposal | Estimated annual average quantity [1] |
|---|---|---|---|
| **Special waste** | | | |
| Tyres | Stored in designated areas. | Small tyres will be removed from site for re-use, recycling or disposal. Heavy earthmoving tyres will continue to be disposed of within emplacement areas as required in accordance with current tyre disposal management practices, as approved under EPL 640. | Heavy earthmoving tyres – 700 |
| Conveyor belt | Stored in designated areas. | Conveyor belt will be removed from site if able to be recycled or disposed of within emplacement areas as required in accordance with current tyre disposal management practices, as approved under EPL 640. Small quantities may be disposed of to a licenced waste facility. | 21,000 kg |
| Sharps/ medical | Stored in sealed containers. | Collected by an appropriately licenced contractor for off-site disposal at a facility approved to accept such waste. | 3,000 kg |
| **Liquid waste** | | | |
| Oil | Waste oil will be primarily limited to the routine maintenance of plant and equipment will include parts and packaging (for example, cartridges, filters and waste oil drums).<br>This waste will be recovered from work areas and transferred to a centrally located bunded waste oil collection facility or removed from site.<br>Oily water from the workshop area and washdown bay areas will be collected in sumps or tanks and drained to an on-site oil-water separator. | Collected by appropriately licenced contractor and reused or recycled.<br>Waste oil will be regularly collected by a licenced waste contractor for recycling and/or off-site disposal at a waste facility approved to accept such waste. | 1,000,000 kg |
| Coolant | Recovered from work areas and transferred to bulk storage tanks or removed from site | Collected by appropriately licenced contractor and reused or recycled. | 61,000 kg |
| Solvent | Stored in labelled sealed drums within the workshop area. | Collected by appropriately licenced contractor and reused or recycled. | 11,000 kg |
| **General solid waste (non-putrescible)** | | | |
| Grease | Collected from work areas and transferred to a centrally located bunded facility or removed from site. | Collected by a licenced waste contractor for recycling and/or off-site disposal at a waste facility approved to accept such waste. | 24,000 kg |
| Batteries | Stored in a designated area and covered. | Collected by an appropriately licenced contractor and recycled, if possible. | 20,000 kg |
| Scrap steel/metal | Stored in designated scrap metal skip bins or specified areas. | Collected by a scrap metal recycler. | 1,200,000 kg |

## Table 25.1 Waste streams

| Waste stream | Storage | Disposal | Estimated annual average quantity [1] |
|---|---|---|---|
| Oil filters | Stored in designated bins. | Collected by appropriately licenced contractor, and recycled where possible or disposed at a waste facility approved to accept such waste. | 52,000 kg |
| Inert construction waste | Stored in designated stockpile area. | Inert construction waste may be reused onsite or disposed of at an appropriate depth within emplacement areas across the HVO Complex. If necessary, where re-use or disposal onsite is not possible, the waste would be removed from site for recycling or disposal. | - |
| Recoverable fill | Stored in designated stockpile area. | Recoverable fill is proposed to be reused across both operational and construction areas. Should a beneficial use not be identified, recoverable fill may be disposed of consistent with inert construction waste. | - |
| Exploration and geotechnical drilling waste | Stored in a designated stockpile area. | Exploration drill cuttings and muds is proposed to be disposed of within overburden areas, drill holes, or TSFs, if required. | - |
| Non-hazardous recyclables | Stored in designated bins. | Recyclables will be regularly collected by an appropriately licenced contractor and taken to a licenced waste facility. | 1,500,000 kg |
| **General solid waste (putrescible)** | | | |
| General waste | Stored in designated bins | General waste will be regularly collected by an appropriately licenced contractor for off-site disposal at a facility approved to accept such waste. | |
| **Hazardous waste** | | | |
| Hazardous waste classes or divisions of the ADG Code | Stored in appropriate containers in a bunded area at required distances from incompatible groups. | Hazardous waste will be collected by an appropriately licenced contractor and taken to a licenced facility for treatment or disposal. | 50,000 kg |

1. Quantities based off data provided by HVO for January 2020 – August 2022.

The quantities of waste outlined in Table 25.2 are associated with the demolition of the Newdell LP and will only be a singular occurrence.

### Table 25.2 Newdell LP demolition waste quantities

| Waste stream | Storage | Disposal | Estimated quantity |
|---|---|---|---|
| Ferrous metals | Stored in designated onsite laydown area. | Collected by appropriately licenced contractor and reused or recycled. | 2,000 t |
| Concrete/ bricks | Stored in designated onsite laydown area. | Collected by appropriately licenced contractor and reused or recycled. | 9,000 t |
| General demolition waste (on-site) | These will be stored in segregated designated stockpile areas. | N/A | 100t |
| General demolition waste (off-site) | | Collected by appropriately licenced contractor and reused or recycled. | 100 t |
| Asbestos (off-site) | Asbestos will be stored in accordance with the relevant guidelines. | Asbestos will be removed from site by an appropriately qualified and licenced professional and disposed from at a facility licenced to receive the waste. | 10 t |

Table 25.3 outlines the quantities of waste associated with the demolition of the power poles and wires removed as part of the Project.

### Table 25.3 Power pole and wire demolition waste quantities

| Waste stream | Storage | Disposal | Estimated quantity |
|---|---|---|---|
| Power poles (timber) | Stored in designated stockpile area. | Disposed of at a local waste facility licenced to receive the waste. | 300 |
| Power poles (concrete) | Stored in designated stockpile area. | | 200 |
| Aluminium and galvanised wire | Stored in designated stockpile area. | Disposed of at a local scrap/waste facility licenced to receive the waste. | 200 km |

The mitigation measures summarised in Table 25.4 will be implemented to manage waste for the Project. These measures largely already form part of the activities carried out at HVO, with the inclusion of additional mitigation measures consistent with the proposed additional waste streams.

## Table 25.4 Waste management and mitigation

| ID | Mitigation measure |
|---|---|
| WAS1 | Waste streams will be classified and managed in accordance with the POEO Act, WARR Act and the *Waste Classification Guidelines* (EPA 2014b). |
| WAS2 | Each waste stream will be appropriately segregated and stored as described in Table 25.1, Table 25.2 and Table 25.3, prior to reuse, recycling or disposal. |
| WAS3 | Designated waste storage bins or areas will be regularly inspected. |
| WAS4 | Designated waste storage bins and areas will be appropriately labelled. |
| WAS5 | Site induction training for employees, contractors and visitors will include detail of where on site to correctly dispose of each non-production waste stream including mitigation measures to ensure non-production waste is reduced, reused or recycled, where possible. |
| WAS6 | Performance in waste reduction and management, reuse, source separation and recycling initiatives will be tracked and reported. |
| WAS7 | Waste quantities will be recorded as required. |
| WAS8 | If any asbestos is identified during demolition works, works will stop immediately and an appropriately licenced asbestos removalist will be contacted. |

# 26 Cumulative impacts

## 26.1 Overview

This chapter provides an assessment of the Project's potential to generate cumulative impacts. The assessment has been completed with consideration of the *Cumulative Impact Assessment Guidelines for State Significant Projects* (DPIE 2021a), and the *Social Impact Assessment Guideline for State Significant mining, petroleum production and extractive industry development* (DPIE 2021c).

Criteria for cumulative noise impacts and cumulative air quality particulate impacts are defined in Clause 12AB of the Mining SEPP – Non-discretionary development standards for mining. These criteria are explained further in the *NSW Voluntary Land Acquisition and Mitigation Policy* (VLAMP) (NSW Government 2018) which includes processes for the granting of voluntary mitigation and land acquisition rights to landowners whose eligible properties are subject to cumulative impacts from mining projects.

The *Cumulative Impact Assessment Guidelines for State Significant Projects* (DPIE 2021a) defines two broad assessment approaches, comprising:

- Incremental types:
  - Incremental assessment – including impacts of the Project to the existing baseline condition of each relevant assessment matter (eg air quality, noise, water, biodiversity, heritage, traffic, and social). The impacts from existing developments have been assumed as part of the baseline conditions, and the incremental impacts of the Project have been considered to identify the change in baseline. This is completed in relevant technical assessments and summarised in the relevant sections above in Part D of this EIS.
  - Combined incremental assessment – combined effect of the different impacts of the Project, summarised in this section. Existing and approved developments within the local area (known at the time of EIS finalisation) have been considered in the cumulative assessments of each of the technical assessments. Cumulative impacts with other existing developments in the local area have all been considered.
- Cumulative types:
  - Issue-specific cumulative assessment – impacts of the Project together with the impacts of other relevant future projects on specific issues within an identified area, summarised in this section.
  - Combined cumulative assessment – combined effect of the different cumulative impacts of the Project with other cumulative impacts of the relevant future projects within an identified area. The assessment of cumulative impacts is presented in this chapter.

## 26.2 Coal mines contributing to cumulative impacts

A key input to the assessment of cumulative impacts is the production rate of surrounding mines. The general area surrounding the HVO Complex is comprised of a number of operating and former open-cut and underground coal mining operations. Existing open cut pits, mine-related infrastructure and rehabilitated former mining areas are to the north, south-east and south-west of the HVO Complex. The approved and/or proposed ROM coal extraction rates (as at October 2022) of nearby mines over the proposed Project life is illustrated in Figure 26.1. As shown, approved production rates steadily decline across the Hunter Valley over the Project life, with cumulative impacts reducing accordingly over time. Table 26.1 provides details of the coal mines near to the Project and the anticipated life of these mines. Figure 26.2 shows the locations of nearby coal mines.

## Table 26.1 Nearby coal mines

| Project name | Current approval period under existing development consents |
|---|---|
| Bulga Underground | Operations ceased in 2018, however mining operations may take place until 2031 |
| Muswellbrook Coal | Mining operations may take place until December 2022 |
| Liddell Coal Operations | Ceasing operations in 2023 |
| Glendell Coal Mine | Mining operations may take place until 2024 |
| Mount Arthur Mine Complex | Mining operations may take place until 2026* |
| Mangoola Open Cut | Mining operations may take place until 2030 |
| Integra Underground Mine | Mining operations may take place until 2035 |
| Ashton Coal Project | Mining operations may take place until 2035 |
| Rixs Creek North Open Cut | Mining operations may take place until 2035 |
| Mt Thorley Continuation Project | Mining operations may take place until 2036 |
| Warkworth Continuation Project | Mining operations may take place until 2036 |
| Mt Owen Continued Operations | Mining operations may take place until 2037 |
| Ravensworth Operations | Mining operations may take place until 2039 |
| Bulga Open Cut | Mining operations may take place until 2039 |
| Bengalla Mine | Mining operations may take place until 2039 |
| Rixs Creek South Coal Mine | Mining operations may take place until 2040 |
| United Wambo Open Cut Coal Mine | Mining operations may take place until 2042 |
| Wambo Coal Underground mine | Mining operations may take place until 2042 |
| Maxwell Underground Coal Mine | Mining operations may take place until 2047 |
| Mount Pleasant Optimisation Project | Mining operations may take place until 2048 |

Note: * A modification report is currently being prepared to continue mining at Mt Arthur Coal until 2030.

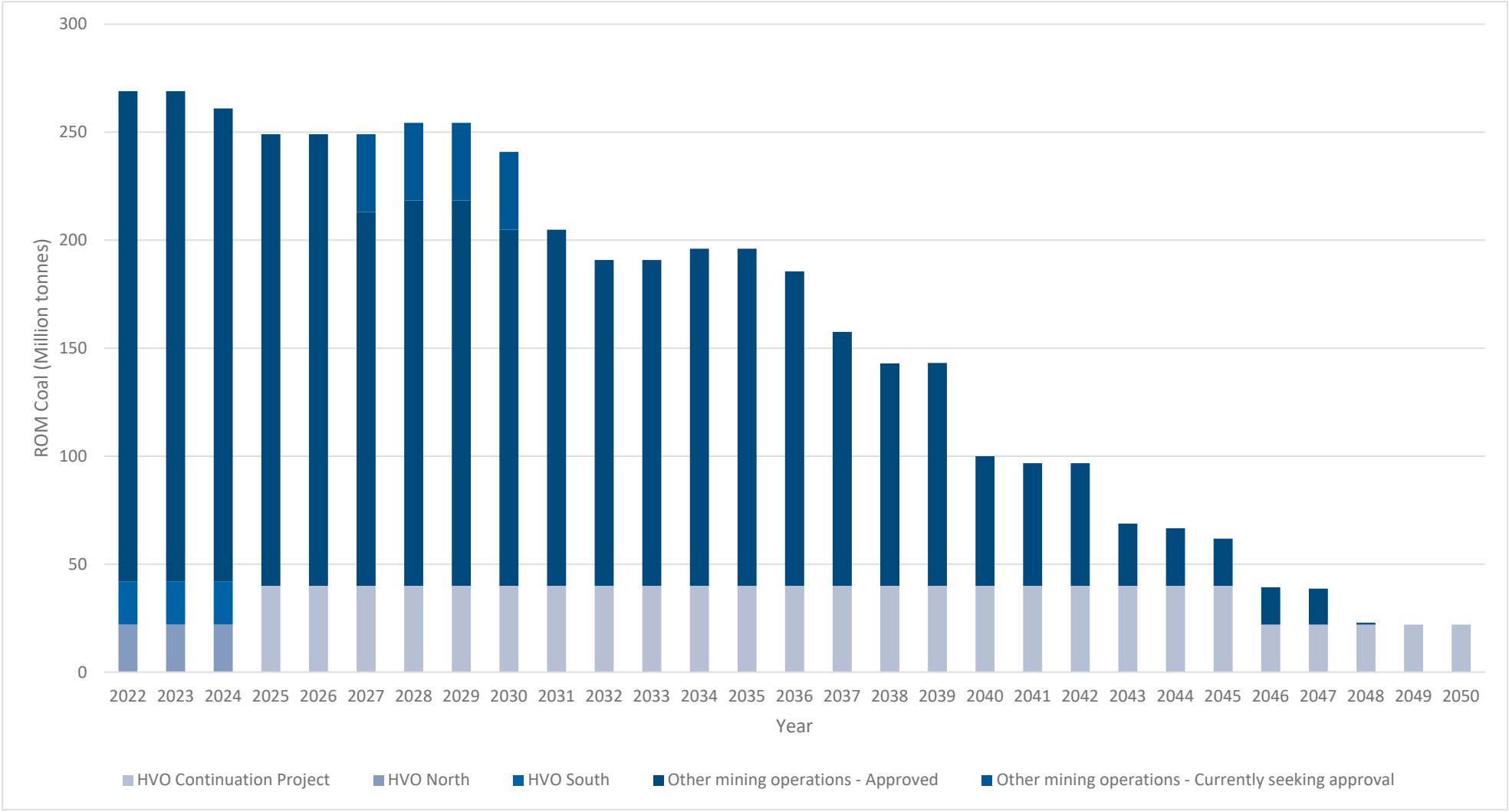
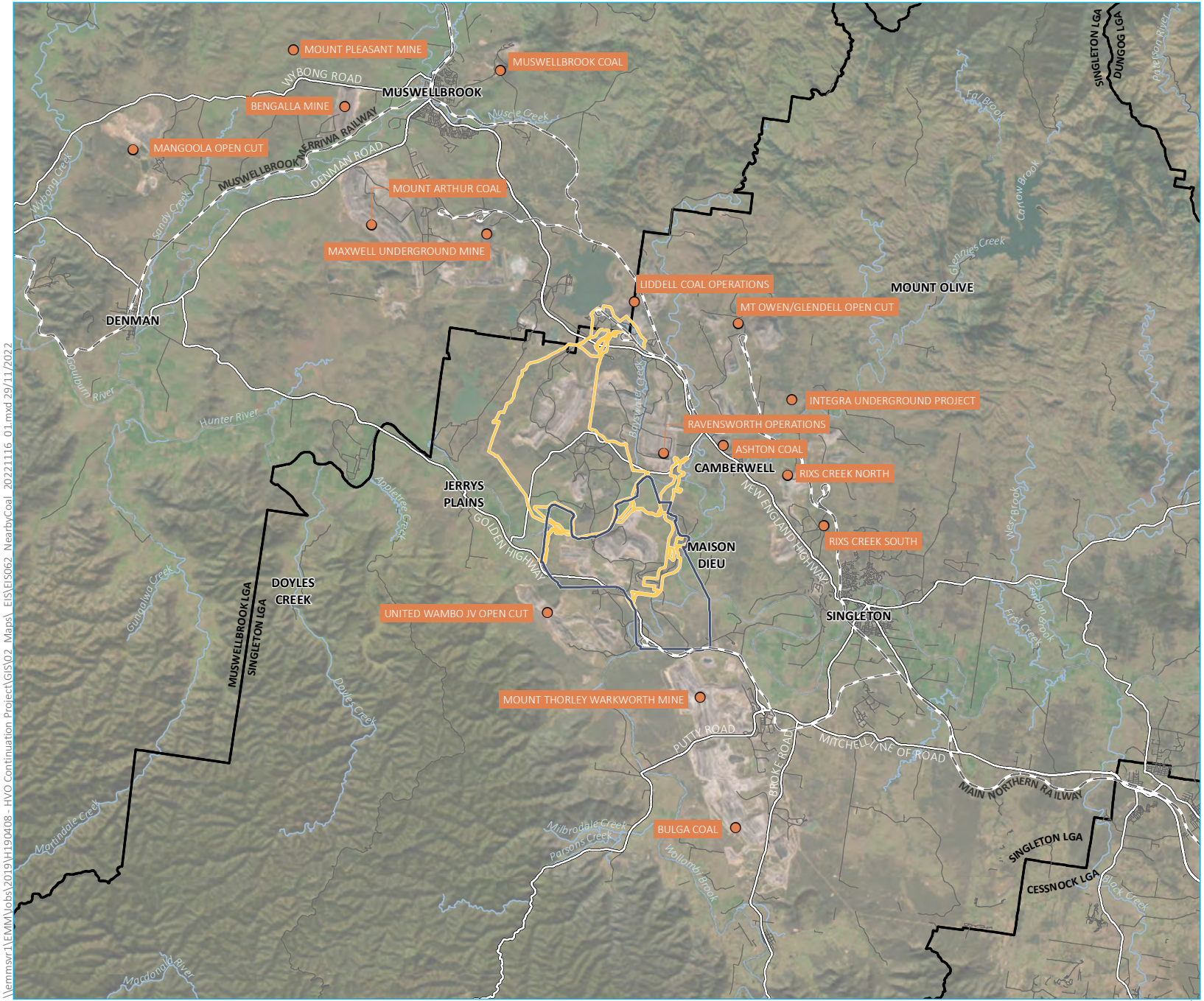



**Figure 26.1 Approved and proposed ROM coal production of Hunter Valley mines over the proposed Project life (2022)**




KEY

- Existing nearby coal mine
- HVO North proposed development consent boundary
- HVO South proposed development consent boundary

Existing environment

- Main road
- Rail line
- Named watercourse
- Local government area

Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011); ASGC (2006)

0 10 20 km

GDA2020 MGA Zone 56

N

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# Nearby coal mines

HVO Continuation Project
Environmental Impact Statement
Figure 26.2

EMM
creating opportunities

## 26.3 Assessment of cumulative impacts

Potential cumulative impacts associated with the Project have been addressed in the relevant specialist assessments as part of an incremental type assessment and the relevant key findings are summarised in Part D of this EIS. A summary of the cumulative impacts is outlined in Table 26.2.

**Table 26.2 Cumulative impacts**

| Aspect | Methodology | Outcomes |
|---|---|---|
| Air quality | For the AQGHGIA, the approach of recalculating emissions from other mining operations in the model domain was carried out. This approach was favoured because it maintains consistency in the emission calculation methods for all mining operations.<br>Mining operations were represented by a series of volume sources located according to the location of activities for each modelled scenario. Emissions from the dust generating activities at each operations were assigned to one or more source location.<br>Dust emissions for all modelled mine-related sources were considered to fit in one of three categories:<br>• Wind insensitive sources, where emissions are relatively insensitive to wind speed (for example, dozers).<br>• Wind sensitive sources, where emissions vary with the hourly wind speed, raised to the power of 1.3. This relationship was applied to sources such as loading and unloading of waste to/from trucks and results in increased emissions with increased wind speed.<br>• Wind sensitive sources, where emissions also vary with the hourly wind speed, but raised to the power of 3. This relationship was applied to sources including wind erosion from stockpiles, overburden emplacement areas or active pits, and results in increased emissions with increased wind speed. | For operational dust, cumulative impacts were assessed five representative operational scenarios in approximately Year 3, Year 7, Year 11, Year 18 and Year 22.<br>For $PM_{10}$ concentrations:<br>• Maximum 24 hour average $PM_{10}$ ($\mu g/m^3$) – the 50 $\mu g/m^3$ criterion will not be exceeded at any privately owned residential sensitive receptor due to emissions from the Project alone.<br>While 24-hour $PM_{10}$ concentrations may continue to exceed the EPA's cumulative air quality criteria from time-to-time, these events are predicted to be within the range of historically measured days above the criterion, excluding extraordinary events.<br>• Annual average $PM_{10}$ ($\mu g/m^3$) – concentrations will comply with air quality criteria at all privately owned sensitive receptors not subject to existing air quality acquisition rights except for receptor 308 in Jerrys Plains in Year 11.<br>For $PM_{2.5}$ concentrations:<br>• Maximum 24 hour average $PM_{10}$ ($\mu g/m^3$) – concentrations may continue to exceed air quality criteria from time-to-time; however, these events would be within the range of historically measured days above the criteria, excluding extraordinary events.<br>• Annual average $PM_{10}$ ($\mu g/m^3$) – concentrations will comply with air quality criteria at all privately owned sensitive receptors not subject to existing air quality acquisition rights, except for one receptor, 308, in around Year 11.<br>Under the VLAMP, Receptors 121 and 308 trigger voluntary acquisition rights as the Project may contribute to an exceedance of the criteria on more than 25% of privately owned land where there is an existing dwelling.<br>Annual average TSP and deposited dust concentrations will comply with air quality criteria at all privately owned sensitive receptors not subject to existing air quality acquisition rights.<br>Cumulative air quality impacts in the region around HVO are expected to reduce during the life of the Project as mining operations and adjacent coal fired power generators reduce in the area (refer to Figure 26.1). |

## Table 26.2 Cumulative impacts

<table>
<tr><th>Aspect</th><th>Methodology</th><th>Outcomes</th></tr>
<tr><td></td><td></td><td>The Upper Hunter Air Quality Monitoring Network was created by DPE, in partnership with the Upper Hunter coal and power industries, in response to community concern about the effect of coal mining on air quality in the region. 12 monitoring stations in the Upper Hunter were established between 2010 and 2012. Particulate Matter $(PM)_{10}$ is monitored at Jerrys Plains, Camberwell and Maison Dieu. $PM_{2.5}$ is monitored at Camberwell.<br><br>No change to the maximum ROM coal production rate is proposed at HVO North by the Project, and a reduction of 2 Mtpa is proposed at HVO South. The air quality impacts of the Project are not predicted to be materially different to current air quality impacts, as discussed in detail in Chapter 7. The comprehensive on-site monitoring regime will continue to operate, with ongoing reporting to government on air quality results.</td></tr>
<tr><td>Noise</td><td>The cumulative noise assessment considered the below scenarios.<br><br>Cumulative noise assessment combinations<br><table><tr><th>Locality</th><th>Combination 1</th><th>Combination 2</th><th>Combination 3</th></tr><tr><td>Camberwell</td><td>HVO North, Ravensworth Operations (RO), Ashton Coal Project (ACP), Glendell</td><td>-</td><td>-</td></tr><tr><td>NAG 1A, 1B and 1C</td><td>HVO South, HVO North</td><td>HVO South, United Wambo Joint Venture (UWJV), Wambo Underground (WU)</td><td>HVO North, RO</td></tr><tr><td>NAG 2</td><td>HVO South, UWJV, WU, RCS</td><td>HVO South, UWJV, WU, Mount Thorley Warkworth (MTW)</td><td></td></tr><tr><td>NAG 3</td><td>HVO South, HVO North</td><td>HVO South, UWJV, WU</td><td></td></tr><tr><td>NAG 4</td><td>HVO South, HVO North</td><td>HVO South, UWJV, WU</td><td></td></tr><tr><td>NAG 5</td><td>HVO North, HVO South</td><td>HVO South, UWJV, WU</td><td></td></tr></table></td><td>Noise from other industrial sources with the potential to cause cumulative impact when combined with HVO North and HVO South noise emissions were evaluated. These sources were grouped and combined with HVO North and HVO South dependant on geographical location and directionally, as relevant, for each NAG.<br><br>All results met or were below the recommended amenity noise levels listed in Table 2.2 of the NPfI, with the exception of receptor 308 in NAG 3. This receptor has existing mitigation rights for HVO South that will continue to be afforded and is also subject to voluntary acquisition rights under the UWJV development consent.<br><br>Further, the Project does not seek to increase production levels or generally change the nature of the operations of the HVO Complex. Therefore, it is expected that cumulative noise impacts will be similar to that already assessed and effectively regulated for HVO, as demonstrated by the results of the noise assessment discussed above (refer to Chapter 11).<br><br>Cumulative noise impacts in the region around HVO are expected to reduce during the life of the Project as mining operations and adjacent coal fired power generators reduce in the area.</td></tr>
</table>

## Table 26.2 Cumulative impacts

| Aspect | Methodology | Outcomes |
|---|---|---|
| Blasting | N/A | HVO already operates a successful blast notification and management system with nearby mines. This will continue for the life of the Project.<br>Blasting permissions and pre-blast risk assessments will continue to mitigate cumulative impacts of blasting from the two operational areas (HVO North and HVO South). |
| Surface water | An assessment of potential cumulative impacts changes to groundwater-surface water interaction on streamflow was undertaken using the regional groundwater model developed for the Project. The groundwater model, which results indicated estimated cumulative baseflow and river leakage impacts changes for both operations and closure. A review of the data indicates that the cumulative closure case is the potential worst case for impacts to baseflow and river leakage. To determine whether further assessment of surface water impacts is required, two criteria were considered:<br>• the Project is forecast to have an impact on baseflow and river leakage at closure (defined as 1 ML/year or more); and<br>• Project closure impact is more than 1% of cumulative impact.<br>Five watercourses were identified for cumulative assessment including the Hunter River, Wollombi Brook, Parnells Creek, Hobden Gully and Unnamed Tributary 5. | Key cumulative impact outcomes are:<br>• For the five watercourses assessed, the average annual flow is predicted to be reduced by 0.5% or less. The largest percent changes are predicted to occur in the ephemeral streams but are of a small magnitude (eg Hobden Gully reduces by 0.5% from 223 ML/year to 222 ML/year). The largest volumetric changes are predicted to occur in the Hunter River (200 ML reduction, which is 0.1% of the 320 GL/year average annual flow volumes) and Wollombi Brook (40 ML reduction, which is less than 0.1% of the 176 GL/year average annual flow volumes).<br>• The greatest increase in average annual dry days is predicted for Wollombi Brook (5.9% increase from 53 to 56 days/year) and Parnells Creek (3.0% from 225 to 232 days/year). For the representative dry year (2006) the increase in dry days is 12 days (31 to 43 days) for Wollombi Brook and 5 days (312 to 317 days) for Parnells Creek.<br>The cumulative impact of the Project on surface water systems is generally expected to be minor or negligible and will be managed through HVO's allocated water licences. The Project will not require additional licence allocations.<br>No other cumulative impacts to stream flow, water quality or flooding are predicted. |

## Table 26.2 Cumulative impacts

| Aspect | Methodology | Outcomes |
|---|---|---|
| Groundwater | The predicted cumulative drawdown was calculated by comparing the results of a model scenario of the proposed mine plan (ie the Project) to a scenario where simulated mining at HVO ceases after 2009 (which is when the Hunter Unregulated and Alluvial WSP commenced), effectively allowing groundwater levels to recover in this baseline 2009 scenario. Climate stresses and other approved mining activities in the model domain are simulated. This scenario is therefore conservative and results in exaggerated predictions of groundwater drawdown and changes in surface water-groundwater interaction due to the Project. This represents a limitation in the groundwater modelling and the requirements of the aquifer interference policy to estimate cumulative drawdown effects. | The maximum drawdown predicted to occur is due to the cumulative effect of historical approved and proposed mining at HVO and at other surrounding mining operations.<br>The cumulative maximum drawdown predicted in the Hunter River alluvium (during operations) is similar to the predicted incremental drawdown, indicating the majority of the drawdown is attributable to the short-term drawdown prior to installation of the Carrington West Wing barrier wall.<br>In the Wollombi Brook alluvium, a peak cumulative drawdown of up to 5 m is predicted in South Lemington Pit 1 area. Drawdown is predicted due to the simulated continued extraction of groundwater from the Lemington Underground bore for Project water use, creating lower groundwater levels compared to the 'baseline' model scenario that simulates cessation of pumping from the Lemington Underground in 2009 at commencement of the WSP.<br>The predicted conservative cumulative alluvial drawdown exceeds the AIP level 1 minimal impact considerations in a small area; however, the aquatic ecology and GDE assessment demonstrates that the variation will not prevent the long-term viability of the ecosystems. |

## Table 26.2 Cumulative impacts

| Aspect | Methodology | Outcomes |
|---|---|---|
| Biodiversity | The cumulative impacts of HVO North and South are accounted for within the combined credit assessments as part of the BDAR.<br>The cumulative impacts biodiversity also considers the wider locality and recent approved projects in the region such as the United Wambo JV Open Cut, Mount Pleasant Optimisation Project and the Warkworth Continued Operations Project. | The Project is in a landscape that is characterised by agricultural land and mining land. The history of land clearing, agriculture and mining development has resulted in an incremental loss of vegetation and fauna habitat surrounding the Project additional disturbance area, and within the Hunter Valley more generally. Being a brownfield development, the Project will be undertaken largely within existing and approved disturbance areas, thereby minimising the contribution to cumulative impacts on the biodiversity of the region. Where activities are proposed in areas not previously approved to be cleared of vegetation, biodiversity impacts have been assessed in accordance with the BAM. Impacts to threatened ecological communities and species will be offset to enable a net positive outcome in relation to biodiversity.<br>The Project will remove vegetation and further increase fragmentation and isolation of habitats in the vicinity of the Project, and thus contribute to cumulative habitat loss and vegetation clearance in the locality. The Project will result in a loss of approximately 189 ha of native woodland and forest vegetation in a highly fragmented and disturbed landscape. It is expected that up to approximately 191 ha of grassland habitats suitable for the recently discovered Hunter Valley delma (*Delma vescolineata*) will be removed as part of the Project.<br>The HVO Complex has cleared over 7,100 ha of land to date and other recently approved projects in the locality contribute to the removal of native habitats such as United Wambo JV Open Cut (approximately 530 ha), Mount Pleasant Optimisation Project (approximately 475 ha) and Warkworth Continued Operations Project (approximately 700 ha).<br>This represents a medium term impact, with habitats and connectivity to be restored as part of each project's long term rehabilitation strategy. Cumulative impacts will reduce over time as the site is progressively rehabilitated in accordance with the HVO Rehabilitation Management Plan.<br>A key aspect of the Project is the removal of several areas from the mine plan that are currently state approved for coal extraction (South Lemington Pit 1, South Lemington Pit 2 and the Riverview South East extension), as well as relinquishment of the approval to build the short rail loop associated with the LCPP. As discussed in Chapter 13, this important aspect of the Project reduces the impact on native woodland habitat by approximately 90.2 ha and native and exotic grassland by 33.7 ha, and subsequently reducing the cumulative biodiversity impact of mining operations in the region. |

## Table 26.2 Cumulative impacts

| Aspect | Methodology | Outcomes |
|---|---|---|
| Aquatic ecology and GDEs | As discussed in the above, groundwater levels and drawdown were modelled in response to the proposed mine plan. | The risk to the stygofauna community associated with the Project is low because there will be no additional excavation to the alluvium beyond what has already been approved. However, the cumulative impact to the stygofauna community from already-approved mining in the paleochannel is high and is categorised in the GDE Risk Matrix as C (High Ecological Value, High Risk).<br>The conservative predicted cumulative impact exceeds the AIP level 1 minimal impact considerations in a small area; however, the aquatic ecology and GDE assessment demonstrates that the variation will not prevent the long-term viability of the ecosystem in the Hunter River alluvium in the Project area, outside of the paleochannel area. |

## Table 26.2 Cumulative impacts

| Aspect | Methodology | Outcomes |
|---|---|---|
| Aboriginal cultural heritage | Intergenerational equity is the principle whereby the current generation should maintain the health, diversity and longevity of the environment for the benefit of future society. For Aboriginal heritage management, intergenerational equity can be considered primarily in terms of the cumulative impacts to Aboriginal objects, sites and/or places in a region. If few Aboriginal objects and places remain in a region (eg due to development impacts), there are fewer opportunities for future generations of Aboriginal people and the broader community to enjoy the cultural benefits.<br><br>Information about the integrity, rarity and representativeness of the Aboriginal objects, sites and places that may be impacted, and how they inform the past visitation and occupation of land by Aboriginal people, are relevant to the consideration of intergenerational equity and the understanding of the cumulative impacts of a project. | HVO North and HVO South have been subject to extensive Aboriginal cultural heritage surveys over many years. The Upper Hunter Valley coal mines have similarly been extensively assessed for their cultural heritage impacts over time. Therefore, there is a substantial amount of data with which to assess the cumulative impacts of the Project on the cultural landscape.<br><br>Overall, the Project would result in total harm to 182 Aboriginal sites and partial harm to 38 sites. Collated results of the AHIMS database identified 1,786 records for previously recorded Aboriginal heritage sites within a 18,300 ha search area centred on the Project area. Due to the high intensity of development and mining related industry, 54% (n = 970) of sites are listed as destroyed, 2% (n = 42) as partially destroyed, and 43% (n = 765) as valid. Considering the 81 previously undocumented Aboriginal sites recorded by the assessment for the Project in the assemblage sum, total harm to 182 Aboriginal sites by the Project would raise the total of destroyed Aboriginal sites to 65%, and partially destroyed sites to 4%, whilst avoidance of 84 Aboriginal sites would raise the total of valid sites to 48%.<br><br>The Project provides the Aboriginal community with opportunities to directly engage with tangible and intangible heritage values via field activities in locations which would not typically be accessible. The RAPs have also expressed a desire to focus any salvage material from the Project to a keeping place accessible by the Aboriginal community, creating a new 'Aboriginal place' which would form an important continuation and re-imagining of cultural heritage of the region for future generations. This is anticipated to provide opportunities the local Aboriginal community to maintain a cultural connection with the landscape by having continued access to sites of high significance and will help to achieve intergenerational equity by allowing retention of cultural materials for cultural and educational purposes.<br><br>Discussions between HVO and the RAPs facilitated as part of the Aboriginal consultation process for the Project) have enabled the identification of a number of initiatives across key Closing the Gap themes including health, education, business, finance, employment, culture, and community. HVO has committed to meaningful mitigation of Aboriginal cultural heritage impacts of the Project with support for a number of Closing the Gap initiatives. |

## Table 26.2 Cumulative impacts

| Aspect | Methodology | Outcomes |
|---|---|---|
| Agriculture | An assessment of the agricultural land that will be temporarily removed for the Project was completed as part of the AIS. The AIS also outlines the area of agricultural land to be reinstated and the net increase of agricultural land following the cessation of the Project. | Large areas within the Project locality are owned by various mining companies and used for mining activities. Historically the region has been used for intensive agriculture on the rich alluvial soils in narrow corridors along the floodplains of the Hunter River. The prevailing agricultural land use of the locality is cattle grazing, predominantly on areas cleared of vegetation from historic agricultural use, or on rehabilitated areas following mining use.<br>The Project will disturb approximately 597 ha within the additional disturbance area. This land will not be suitable for agricultural use for the duration of the Project.<br>However, the total area allocated for agriculture land use following mine closure and rehabilitation is 4,320 ha, which is a net increase of 138 ha compared to land that would have been established for agriculture in the currently approved final landform at HVO.<br>There will be areas where land used for agriculture will become part of the final void or allocated to biodiversity outcomes. Alternatively, there are areas of land at baseline not used for agricultural purposes, which will have a final land use allocation to agricultural. Overall, there will be no net loss of land used for agricultural purposes as a result of the Project. |

## Table 26.2 Cumulative impacts

| Aspect | Methodology | Outcomes |
|---|---|---|
| Traffic and transport | HVO is surrounded by other neighbouring mines of varying stages in their mining life with most already in operation. As such traffic demand generated by these mines is included in the surveyed traffic volumes and considered. | No changes to the existing workforce are proposed by the Project, and therefore cumulative traffic impacts as contributed to by HVO during ongoing operations are not expected to be different to levels currently experienced. The traffic impact assessment considered the predicted traffic growth rate on the New England Highway with the continuation of HVO. The assessment found that with the continuation of HVO (ie the Project), some intersections are predicted to reach a level of service (LoS) F beyond 2035, indicating longer delays. However, the impact is generally limited to side streets and auxiliary lanes into/out of the side streets. This was found at intersections along the New England Highway with Lemington Road, Old New England Highway and Liddell Station Road access, and were found to generally be caused by the forecasted background traffic growth on the New England Highway, not the Project, given that these intersections will also operate at a similar LoS without the continuation of HVO.<br><br>The Project will require Lemington Road to be realigned. This will happen prior to mining in that area, and the existing road will remain open during construction, so that there will be minimal disruption to local traffic. The Project will increase construction traffic levels during the initial construction stage before generally returning to current traffic levels. A Traffic Management Plan will be developed for the Project which will outline measures to minimise traffic impacts during construction as recommended by the traffic impact assessment, such as minimising the outbound heavy vehicles accessing New England Highway from the Lemington Road during the peak hour (6.00 am–7.00 am) to reduce the risk of adverse traffic queueing at the intersection.<br><br>Further, there is anticipated to be a gradual decrease in mining activities in the Hunter Valley from 2024 onwards, based on currently approved operations. Consequently, traffic activities within this region are also expected to decrease. |

## Table 26.2 Cumulative impacts

| Aspect | Methodology | Outcomes |
|---|---|---|
| Visual amenity | To determine potential visibility of the Project, a viewshed analysis was completed for the Project. Viewshed analysis has been used to simulate visibility from viewpoints and the surrounding landscape prior to the commencement of the Project. | The Project is proposed in a landscape that has been impacted by open cut mining operations and other industrial developments (eg Liddell and Bayswater Power Stations) over a long period. As the Project will not significantly expand existing and approved disturbance, it will not materially contribute to potential cumulative impacts on the landscape and visual character over that already present and approved. The contribution to cumulative changes in the landscape by the Project is not expected to change. The progressive rehabilitation of the site will reduce the visual impact of mining operations over time. The incorporation of natural landform design elements into the Project's conceptual final landform will also improve the visual amenity of the final landform, as it is designed to be sympathetic to the surrounding landscape.<br>The results of the viewshed analysis indicate that a number of the selected viewpoints already do, and will continue to, experience cumulative visual amenity impacts. Ten of the viewpoints assessed are anticipated to continue to view neighbouring mining operations, including distant views of Ashton, United Wambo JV Open Cut, Mount Thorley Warkworth and Ravensworth Operations.<br>Neighbouring mining operations, like HVO, are committed to the implementation of progressive rehabilitation to reduce the duration of the visual impact of their operations when viewed from surrounding land. Visible elements of neighbouring mining operations are anticipated to change over time as these operations progress through their approved mining activities and work towards achieving their proposed final landforms. |
| Social | The SIA (Appendix V) considered the cumulative impacts of the Project with regard to construction workforce demands, employment and population change, labour competition, housing and accommodation, social infrastructure (ie health services), amenity (air quality, noise and visual amenity), and decision making systems. | A detailed assessment of the cumulative social impacts from the Project can be found in Chapter 23 (Section 23.4.4). |
| Economics | The economic assessment considers the contribution of the Project to both the state of NSW and the local economy. | The Project will provide significant ongoing employment opportunities and flow on economic benefits across the Hunter Valley while other parts of the mining and coal fired power generation industry reduce over the coming decades, as discussed in detail in Section 2.1. |

# 27 Summary of commitments

## 27.1 Introduction

This chapter provides a consolidated summary of the commitments made to manage, mitigate and/or monitor impacts during the construction and operation of the Project.

## 27.2 Environmental management system

HVO operates under an existing EMS which outlines how HVO manages environment and community aspects, impacts and performance. It provides a framework for the standards, plans and procedures implemented so operations are managed in accordance with all relevant approvals and licences held by HVO. The EMS outlines HVO's commitment to proactive community and environmental management and demonstrates HVO's commitment to reducing environmental and community impacts.

The objectives of the EMS are to provide an overarching framework for the environmental management and monitoring of activities undertaken at each operation, which incorporates the principles of continuous improvement and is consistent with the five pillars of ISO 14001: Environmental Management Systems, and to maintain compliance with the HVO North and HVO South development consents and other permits, leases and licences.

If the Project is approved, the EMS and relevant management plans will be updated to reflect the Project.

## 27.3 Summary of commitments

A summary of the proposed mitigation, management and monitoring commitments for the Project is presented in Table 27.1.

**Table 27.1 Summary of commitments**

| ID | Mitigation, management and monitoring commitments |
|---|---|
| **Air quality** | |
| AQ1 | Air quality will continue to be managed and monitored as per the HVO Air Quality and Greenhouse Gas Management Plan (AQGHGMP), which will be updated to reflect the Project. The AQGHGMP will detail the monitoring and management controls to be implemented to manage air quality impacts associated with the Project including ongoing implementation of the proactive and reactive management protocols and include control measures for managing other air quality aspects such as blast fume and spontaneous combustion. |
| AQ2 | Reactive air quality management will continue to assess the need to modify the activities in response to the following triggers:<br>• visual conditions, such as excessive visible dust, identified through the use of cameras as well as visual observations;<br>• meteorological conditions, such as dry, strong wind conditions;<br>• ambient air quality conditions (that is, elevated short-term $PM_{10}$ concentrations, observed through air quality monitoring results); and<br>• a Trigger Action Response Plan (TARP) process will be implemented, and dust levels investigated when the TARP process is enacted to identify likely sources of dust. |
| AQ3 | Proactive air quality management measures will include daily forecasts, alerting operations of the potential requirement to modify mining activities, as appropriate, to minimise or avoid the potential dust impacts |
| AQ4 | It is anticipated that receptors 121 and 308 will be afforded voluntary air quality acquisition rights as a result of the Project in accordance with the VLAMP. |

## Table 27.1 Summary of commitments

| ID | Mitigation, management and monitoring commitments |
|---|---|
| AQ5 | A review of the existing air quality monitoring locations will be undertaken within 12 months of the commencement of the Project, so that the monitoring network provides adequate coverage of the Project area. |
| AQ6 | A program will be established for all private residences within 4 km of the proposed mining area whereby these residences will be eligible for tank inspections, and cleaning and installation of first flush filter systems for residential water tanks and domestic taps. |
| **Greenhouse gas** | |
| GHG1 | Over the life of the Project, available technologies will be regularly reviewed in consideration of reasonable and feasible abatement measures to minimise Scope 1 and Scope 2 GHG emissions, including but not limited to:<br>• options for fuel switching (eg hydrogen and electric powered); and<br>• sourcing electricity for operations from renewable sources, and battery storage. |
| GHG2 | The AQGHGMP will be updated to reflect the Project, and will include a 3-year action plan (updated every 3 years) for investigating and implementing all reasonable and feasible abatement measures to minimise GHG emissions. |
| **Noise** | |
| NOS1 | Noise will continue to be managed and monitored as per the HVO Noise Management Plan, which will be updated to reflect the Project. The management plan will describe aspects such as:<br>• Best practice noise management measures to be implemented across the site, as described in Section 4.1 of the NIA.<br>• Noise monitoring<br>• Triggers for the modification of eqipment operation during periods of elevated noise.<br>• A review of both real-time and attended compliance monitoring locations will be undertaken within 12 months of the commencement of the Project, to ensure the monitoring network provides adequate coverage of the Project area, and the existing Noise Management Plan will be updated accordingly. |
| NOS2 | The remaining fleet of large mining equipment will be progressively attenuated and BATEA sound power levels will be implemented, where reasonable and feasible, for significant noise generating mobile equipment. |
| NOS3 | Significant fixed infrastructure at the yet to be constructed Lemington CPP area will include cladding and BATEA sound power, where practical. |
| NOS4 | An 8 m high roadside bund will be constructed on the exposed side of the haul road from the HVO Mitchell Pit towards the Howick CPP for approximately 900 m. |
| NOS5 | The following receptors identified by the NIA are anticipated to be afforded voluntary noise mitigation rights in accordance with the VLAMP:<br>• HVO North: 326, 327, 328, 330, 437, 487<br>• HVO South: 120, 121, 122, 123, 160, 161, 162, 163, 256, 258, 260, 261, 497, 244, 245, 246, 247, 308, 311, 317 |

## Table 27.1 Summary of commitments

| ID | Mitigation, management and monitoring commitments |
|---|---|
| **Blasting** | |
| BLA1 | Blasting and vibration will continue to be managed and monitored as per the HVO Blasting Management Plan, which will be updated to reflect the Project. The BMP will describe aspects such as:<br>• blasting times and frequency<br>• pre-blast assessment protocol<br>• road closure protocols<br>• notification protocols<br>• blast model review and optimisation<br>• blast and vibration monitoring |
| BLA2 | Blasting will be undertaken:<br>• between the hours of 7am and 6pm, Monday to Saturday;<br>• no blasts on Sundays or public holidays;<br>• up to 3 blasts per day and 12 blasts per week at HVO North; and<br>• up to 3 blasts per day and 15 blasts per week at HVO South. |
| BLA3 | When blasting within 1,500 m of the heritage sites the Great Lodge, Carrington Homestead and Wandewoi Homestead, blast design measures will be carried out to meet applicable ground vibration criteria. |
| BLA4 | Increased blast control measures will be employed when blasting within the identified sections of HVO North and HVO South (shown in Figures 11.3, 11.4 and 11.5 of this EIS) to manage relevant overpressure and vibration levels below applicable limits for public infrastructure, private residences and heritage items. |
| BLA5 | The existing blast monitoring system will continue to be utilised for the Project. An additional three monitoring units will be installed and one portable monitor will be used as follows:<br>• one monitor at a location representative of identified private residences in Jerrys Plains;<br>• one monitor at a location representative of the Great Lodge (heritage site) (at commencement of Stage 3 (approximately Year 11) of the Project);<br>• one monitor at a location representative of the Oaklands Homestead and associated structures (at commencement of Stage 5 (approximately Year 22) of the Project); and<br>• one portable monitor positioned at a location representative of the closest heritage site (Carrington or Wandewoi Homestead) to the active blasting area (after commencement of Stage 3 (approximately Year 11) of the Project). |
| **Water resources** | |
| WAT1 | The HVO Water Management Plan will be updated to include the Project, will describe aspects such as:<br>• erosion and sediment control measures<br>• water sharing arrangements with neighbouring mines<br>• methods for measuring and estimating water take (where practical), which will be reviewed for compliance with the NSW *Non-Urban Water Metering Policy*<br>• tailings management<br>• groundwater model review and validation<br>• groundwater and surface water monitoring, including review and adaptive management procedures<br>• trigger action response plans, including trigger action response plans for unexpected changes in surface and groundwater results |
| WAT2 | The Carrington West Wing Levee will be monitored during operational life of the Project, particularly following large flood events (5% AEP or larger) to identify signs of instability and potential corrective action. |
| WAT3 | The frequency of comprehensive surface water quality analysis will be increased from an annual basis to six monthly. |

## Table 27.1 Summary of commitments

| ID | Mitigation, management and monitoring commitments |
|---|---|
| WAT4 | Improved flood protection levees will be implemented as follows:<br>• HVO North:<br>– North Pit levee - up to 0.1% AEP<br>– Carrington West Wing levee - up to 0.1% AEP<br>• HVO South<br>– Cheshunt levee - up to 0.1% AEP<br>– Riverview levee - up to the Extreme Flood Event (defined as four times the 1% AEP) |
| WAT5 | Consistent with the methodology used for the Carrington Pit LPBW, the Carrington West Wing LPBW will be constructed on the alluvial benches of the highwall following mining in that area and prior to backfilling. The barrier wall will be keyed into the Permian bedrock and will be designed to meet the current development consent requirement of a permeability of $1 \times 10^{-8}$ m/sec. |
| WAT6 | Additional monitoring bores will be installed within the zone of predicted short-term incremental drawdown, approximately one year prior to mining recommencing in the remnant paleochannel. A network of eight nested monitoring bores are proposed and will be included in the updated water management plan. |
| WAT7 | Piezometers will be installed within the Carrington West Wing LPBW, consistent with the approach used for the Carrington Pit LPBW. The purpose of the piezometers will be to monitor for changes in salinity and pressure. |
| WAT8 | A LPBW monitoring and management plan will be prepared in consultation with DPE Water (which will include assigned trigger levels and a response plan for trigger level exceedance and deviations from predictions). |
| WAT9 | The Carrington West Wing levee will be decommissioned at closure to reinstate floodplain storage in this area. |
| **Biodiversity** | |
| BIO1 | Biodiversity will continue to be managed as per the Biodiversity Management Plan, which will be updated to reflect the Project. The management plan will describe aspects such as:<br>• Pre-clearance and clearance protocols for vegetation and fauna.<br>• Pest, weed and pathogen control measures.<br>• Bushfire management actions.<br>• Monitoring and adaptive management strategies. |
| BIO2 | Wildlife warning signs and 'Injured Native Wildlife' signs will be installed in likely high impact locations along the realigned Lemington Road. |
| BIO3 | Measures will be implemented to protect the river red gum populations located within the River Red Gum Additional Disturbance Area during construction of the realigned transmission lines in this area. |
| BIO4 | River red gum health monitoring will continue, in accordance with the River Red Gum Rehabilitation and Restoration Strategy, which will be updated for the Project. This will include a change in classification for the River Red Gum Additional Disturbance Area from a 'low priority' to a 'priority site'. |
| BIO5 | A biodiversity offset strategy will be developed for the Project based on the credits required to be retired to offset the impacts of the Project as specified in Table 13.14 and the options available under the BC Act and BC Regulation including:<br>• land based offsets (HVO will retire the required number and class of credits determined in accordance with the BDAR and the offset rules in the BC Regulation through the establishment of new stewardship sites (and the subsequent retirement of credits) or by retiring credits from existing stewardship sites);<br>• ecological rehabilitation (allowable for mining projects);<br>• purchasing credits from the market; and<br>• paying into the Biodiversity Conservation Fund |

## Table 27.1 Summary of commitments

| ID | Mitigation, management and monitoring commitments |
|---|---|
| **Aboriginal cultural heritage** | |
| ACH1 | Continue avoidance of the high scientific (archaeological) and cultural significance, Aboriginal cultural heritage site CM-CD1 (AHIMS Site 37-2-1877). |
| ACH2 | A consolidated Aboriginal Cultural Heritage Management Plan (including HVO North and HVO South) will be developed for the Project in consultation with RAPs and Heritage NSW. This will include:<br>• Mitigation and management measures for identified Aboriginal heritage sites.<br>• Unexpected finds protocols.<br>• Consultation. |
| ACH3 | The Aboriginal Cultural Heritage Management Plan will describe the management for the 304 extant Aboriginal sites including:<br>• avoidance (active and passive) of 84 (28%) of Aboriginal sites;<br>• surface collection of 198 (65%) Aboriginal sites;<br>• surface collection and salvage excavation of 19 (6%) Aboriginal sites;<br>• salvage excavation only of one (<1%) Aboriginal sites; and<br>• salvage and relocation of the scarred portions of two (<1%) Aboriginal sites. |
| **Historic heritage** | |
| HH1 | A historic heritage management plan (HHMP) will be prepared for the Project, which will include the historic heritage items identified in the historic heritage study area, and will include:<br>• a description of the condition and significance assessment of identified items;<br>• management measures and guidelines for the protection and conservation of each item; and<br>• an unanticipated finds protocol. |
| HH2 | Archival recording in the form of digital photography will be undertaken to capture the pre-development state prior to disturbance of the remnant stockyards and remnant foundations at HVO North. |
| HH3 | Realigned transmission line structures will be sited so that no direct impacts occur to the remnant foundations identified at HVO North, as described in Appendix O. |
| HH4 | An assessment of significance will be prepared for the Great Lodge at HVO South. |
| **Traffic and transport** | |
| TT1 | A Traffic Management Plan will be developed for the Project and will include:<br>• measures to be implemented to minimise interruption to the local road network during construction activities, and ensure the safe ingress and egress of construction vehicles<br>• liaison with relevant road authorities and local school and bus providers |
| TT2 | To manage intersection performance affected by increased demand by construction traffic:<br>• Lemington Road/New England Highway – minimise outbound construction truck movements during the AM peak period (6.00 am–7.00 am); and<br>• Old New England Highway/New England Highway –The primary access will be via the Liddell Station Road access, so that the Old New England Highway is used as a secondary access only. |
| TT3 | The new portion of Lemington Road will be constructed and complete prior to the closure of the existing alignment. Other than managed traffic control during the tie-in work, the construction of the new alignment will not restrict access or use of the existing Lemington Road. |
| **Visual amenity** | |
| VA1 | As part of detailed design, HVO will investigate the feasibility of planting vegetation adjacent to the realigned Lemington Road to provide an effective visual screen and reduce views of the road from residences and local roads. |

## Table 27.1 Summary of commitments

| ID | Mitigation, management and monitoring commitments |
|---|---|
| VA2 | Consistent with the commitments made in the *Hunter Valley Operations South Coal Project Environmental Assessment* (ERM 2008), should the LCPP and the rail loop be required, a review will be undertaken prior to construction to determine if additional screening is required. |
| **Rehabilitation and closure** | |
| RC1 | The Rehabilitation Management Plan will be updated for the Project. |
| RC2 | The final landform in areas disturbed by the Project will incorporate natural design elements generally in accordance with the conceptual design presented in this EIS. |
| RC3 | The final land use across rehabilitated areas of the site will include a combination of grazing and native woodland ecosystem land uses, or as determined as part of detailed closure planning processes. |
| RC4 | A detailed closure plan will be developed within 5 years of cessation of mining. |
| RC5 | Rehabilitation monitoring will be undertaken using analogue sites and landscape function analysis to assess rehabilitation progress and success, as detailed in the Rehabilitation Management Plan. |
| **Social** | |
| SOC1 | A Social Impact Management Plan will be developed for the Project which will include a monitoring and management framework. |
| SOC2 | HVO will continue to administer the community grants programme which invests in programs, events and services that promote community cohesion, connectedness and support. |
| SOC3 | As part of the development of the SIMP, HVO will develop a funding framework to enable funding of programs and projects that align with Closing the Gap initiatives, including job readiness programs, assistance relating to tendering for work at HVO by Aboriginal suppliers, and a commitment of $1,000,000 over the first 10 years of the Project. These initiatives will be developed as part of the preparation of the SIMP, which will also outline the proposed implementation plan. |
| **Hazards, public safety, and health** | |
| HCH1 | Implementation of the site hydrocarbon practices and PIRMP. |

# Part E

## Justification and conclusion

EMM
creating opportunities

# 28 Justification and conclusion

## 28.1 Introduction

This chapter provides justification and evaluation for the Project as a whole, having regard to the economic, environmental and social impacts of the Project and the principles of ESD.

## 28.2 Project design

The development of the Project design for which approval is sought has been an iterative one developed over a number of years. Detailed concept and pre-feasibility studies considering both mining options and infrastructure arrangements were carried out, and each of these studies evaluated potential environmental and social impacts to inform the Project design as results from studies became available. The Project has therefore been developed to avoid and minimise impacts where reasonable and feasible to do so. Key aspects where the principles of avoidance and minimisation through design have been adopted are:

- CM-CD1: The proposed mining area of one of the early mine plans considered for the Project included the disturbance of this Aboriginal heritage site. However, once test excavation and subject analysis was completed and the high significance of CM-CD1 was understood, HVO committed to continue the avoidance of this site and the proposed mine plan was changed to avoid the area.

- Lemington Road realignment: Additional engineering design was undertaken following early prefeasibility design works, with the objective of modifying the road design to avoid areas of high biodiversity value identified by ecologists conducting the biodiversity assessment for the Project. The refinement of the road design resulted in the avoidance of 7.2 ha of Warkworth Sands Woodland EEC, 9.1 ha of Central Hunter Grey Box – Ironbark Woodland EEC and 2.6 ha of Hunter Valley Footslopes Slaty Gum Woodland VEC.

- Transmission line realignment:

    - Biodiversity – Early designs prepared in the pre-feasibility stage for the Ausgrid 132 kV transmission line interacted with stands of River Red Gums. Changes to the proposed alignment were made to avoid over 250 individual river red gums trees, and 5.8 ha of the Hunter Floodplain RedgGum Woodland EEC. A further 47 ha of existing native vegetation (grassland, woodland and shrubland), 147 ha of Hunter Valley delma habitat, 21.8 ha of native forest and woodland habitat (including 4.6 ha of Central Hunter Grey Box – Ironbark Forest EEC and 0.3 ha of Hunter Floodplain Redgum Woodland EEC) and 163.5 ha of exotic and native grassland habitat were also avoided by the refined design.

    - Aboriginal heritage – Direct impact to an identified scarred tree (TR178-ST1) will be avoided by sighting of transmissions line structures.

    - Historic heritage – Direct impacts to the historic remnant foundations identified at HVO North will be avoided by sighting of transmissions line structures away from this heritage item.

- Lemington CPP and associated rail loop:

    - Biodiversity – The existing HVO South Project Approval allows the construction and operation of the LCPP and to construct two options for an associated rail loop. The construction of this infrastructure has not been required to date with coal from HVO South being transferred to coal processing facilities at HVO North. HVO proposes to maintain approval for the LCPP and the long rail loop; however, approval for construction and operation of the short rail loop option will not be retained. This means that 24.8 ha of *Central Hunter Grey Box – Ironbark Woodland EEC* and 1.3 ha of *Hunter Lowland Redgum Forest EEC* will no longer be disturbed by the Project for which there is currently approval to clear.

## 28.3 Project objectives and need

The primary objective of the Project is to efficiently and economically recover an additional approximate 400 Mt of ROM coal reserves over and above coal that is approved to be extracted across HVO, over approximately 25 years. Mining operations will continue within existing mining tenements and predominantly within existing and approved disturbance areas across the HVO Complex, using existing infrastructure. The Project will:

- enable the continuation of a brownfield mining complex in a long-established coal mining and power generation precinct;
- maximise resource recovery by mining the deeper Barrett seam in HVO North, within existing mining tenements utilising existing or already approved infrastructure minimising further disturbance;
- provide ongoing employment opportunities for the existing approximate 1,500 FTE workforce well beyond the life of the current planning approvals under which the complex operates, which will become increasingly important as the local and regional Hunter Valley economy continues to diversify beyond coal;
- provide improvements in terms of reliability and accessibility of Lemington Road in heavy rainfall through the realignment of the road, which will include the construction of a new bridge over the Hunter River;
- provide the opportunity to contemporise the HVO final landform by incorporating natural landform design principles. Areas disturbed by mining activities as a result of the Project will reflect a landform that is sympathetic to the surrounding landscape; and
- continue the ongoing contribution to the local, regional, and State economies from a well-established mining operation.

In relation to the demand for coal, the IEA (2022) predicts that future demand will range under a variety of scenarios modelled. Coal demand is predicted to range from 5,149 Mt (STEPS) to 3,024 Mt (NZE scenario) in 2030, to within the range of 3,828 Mt (STEPS) to 539 Mt (NZE) in 2050. In all scenarios, the production from HVO will continue to represent a relatively low percentage, albeit an important one providing high quality thermal coal over the modelled period, assisting to meet global demand as investment in coal continues to decline. While coal demand is predicted to continue to reduce over time in advanced economies under all scenarios modelled by the IEA, in developing and emerging market economies, overall coal consumption shows a more sustained rise in a few fast-growing countries and regions, notably India and south-east Asia, which is a key market for HVO.

## 28.4 Consistency with the strategic context

As described in Chapter 2, the Project involves the continuation of an existing mine in an established coal mining and power generation precinct, providing employment and other socio-economic contributions to the local and regional community. The strategic planning framework for the area is well established, and mining projects are permissible with development consent on the land within the site.

The Project represents a brownfield mining proposal that aligns with strategic direction and policy objectives at a local, state and national level. Current national and NSW state policy recognises the ongoing demand for coal, particularly in the Asian export market (which is the primary current key market for HVO) and its importance to the NSW and Australian economy (IPC 2022a and IPC 2022b). In NSW, the state government's strategic statement on coal recognises that mining will continue to be an important part of the State economy into the future. Further, the strategic statement makes it clear that the NSW Government seeks to recognise existing industry investment by continuing to consider responsible applications to extend the life of current coal mines. The Project is such an application.

At a Commonwealth level, the government's Climate Change Act commenced on 14 September 2022, which enshrines Australia's commitments under the Paris Agreement to reduce Australia's national GHG emissions to net zero by 2050. The life of the Project (2045 at HVO South and 2050 at HVO North) is consistent with the assumptions which underpin the net zero commitment timeline. One of the Federal Government's key policy measures designed to achieve its emissions reduction target is the proposed amendments to the safeguard mechanism. The safeguard mechanism applies to 215 designated large facilities as defined by the NGER Act. HVO is a designated large facility, and therefore the safeguard mechanism applies and HVO will be subject to the emissions reduction requirements contained within it.

Both Yancoal and Glenore have developed robust climate change strategies for their global operations. Glencore has carefully considered its position regarding the future of its coal mining operations and how it intends to support the global transition to a low-carbon future. In 2020, Glencore announced it would adopt a responsibly managed decline of its global coal portfolio. Glencore believes that by managing the depletion of its coal portfolio and responsibly realising the remaining value in these assets it can make a meaningful contribution to global climate change goals. Glencore has factored the continued development of its coal project pipeline, including HVO, into its this plan.

Yancoal also recognises that energy production associated with the consumption of traditional fossil fuel energy sources contributes to global warming through the release of GHG emissions, and it therefore has an important role to proactively manage the direct (Scope 1) and indirect (Scope 2) emissions and energy intensity of its operations, and to support research into technologies that will reduce GHG emissions from the downstream consumption of its products (Scope 3). In this regard, GHG emission mitigation is a key consideration in the development of the mine plan, and measures to minimise or mitigate Scope 1 and Scope 2 GHG emissions have been considered throughout the development and assessment of the Project.

## 28.5 Compliance with statutory requirements

The compliance of the Project with statutory requirements is explained in detail in Chapter 5, and in the tables in Appendix F, demonstrating compliance with all relevant requirements.

An assessment of the consistency of the Project with the objects of the EP&A Act is provided in Table 28.1.

## Table 28.1 Project's consistency with the objects of the EP&A Act

| Object | Consistency with the project |
|---|---|
| To promote the social and economic welfare of the community and better environment by the proper management, development and conservation of the State's natural and other resources. | The Project involves a mining operation that will, consistent with the objects of the Mining Act, extract a State-owned resource for the benefit of the State of NSW. The Project will facilitate the extraction of 737 Mt of ROM coal from a brownfield mine in a well-established mining and power generation precinct. Through the Project, HVO will therefore develop a valuable resource by providing the necessary capital and skills, without which the resource would likely remain in situ and the economic benefits documented in Chapter 24 and social benefits documented in Chapter 23 would not be realised. |
| To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment. | This EIS describes the economic, environmental and social context of the project and the potential impacts of it to allow informed consideration of these aspects in determining the development application. |
| To promote the orderly and economic use and development of land. | The orderly and economic use of land is best served by development that is permissible under the relevant planning regime and predominately in accordance with the prevailing planning controls.<br>The Project is permissible with development consent and is consistent with statutory and strategic planning controls. It is a brownfield mining proposal involving the continuation of a well-established mining operation using predominantly existing infrastructure.<br>As detailed in this EIS, the Project will result in positive economic impacts, with appropriate mitigation measures and management strategies being proposed to minimise any adverse environmental and social impacts. |
| To promote the delivery and maintenance of affordable housing. | Not directly applicable to the Project. |
| To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats. | Measures to avoid and minimise impacts to native vegetation and threatened species habitat were considered during the initial design stages of the project, resulting in avoidance of significant biodiversity values and minimisation of impacts on other areas of native vegetation. All unavoidable impacts will be offset in accordance with NSW Government biodiversity offset scheme. Establishing offsets will enhance biodiversity values in the medium to short-term. |
| To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage). | Avoidance of Aboriginal cultural heritage values has been a key aspect of the Project refinement process, with the Project specifically designed to avoid CM-CD1. |
| To promote good design and amenity of the built environment. | Potential air, noise and visual impacts on sensitive receptors have been fully assessed and described in Chapters 8, 10 and 20 respectively. |
| To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants. | Over the life of the Project, infrastructure will be maintained, or upgraded, to ensure safe and efficient operations.<br>Construction associated with the Project will be compliant with the Building Code of Australia, as relevant, and all other relevant statutory requirements. |
| To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State. | This is a matter for the different levels of government in the State. As summarised in Chapter 6, a wide range of government agencies have been consulted regarding the project, including Singleton Council, Muswellbrook Shire Council, DPE and DCCEEW. |

**Table 28.1 Project's consistency with the objects of the EP&A Act**

| Object | Consistency with the project |
|---|---|
| To provide increased opportunity for community participation in environmental planning and assessment. | As described in Chapter 6, a range of engagement activities have been undertaken to inform the community about the Project and to seek community (and other stakeholder) feedback. This EIS provides further detailed information regarding the Project and its potential impacts. It will be placed on public exhibition by DPE, and community members will be able to make formal submissions. HVO will prepare a report responding to these submissions. |

## 28.6 Consideration of community views

A variety of two-way communication tools were activated for the Project, as part of promoting inclusive, transparent, structured and meaningful engagement for all stakeholders. The tools were designed to provide information about the Project and encourage feedback consistent with the SSD Engagement Guidelines 2021 (DPIE 2021f) and SEARs. Stakeholder and community views regarding the Project have been understood through ongoing consultation and engagement activities including:

- around 1,260 Project newsletters distributed to the local community;
- 5 community (drop-in) information sessions held in Jerrys Plains, Maison Dieu and Long Point;
- around 100 community and stakeholder meetings held with directly-impacted and nearby landowners;
- Over 7,500 visits to the Project website; and
- approximately 230 emails sent and received from the Project email address.

Feedback from stakeholders and the broader community was varied and includes both positive and negative views on a range of topics. Community views were provided on traffic and transport, air quality, noise, mine rehabilitation and final landform, visual amenity, human health, the local economy, biodiversity and cumulative impacts. Technical studies prepared to inform this EIS considered community views. Examples where changes to the Project have occurred due to community feedback include:

- revisions of mine plans to avoid and minimise dust and noise impacts to nearby landowners in Maison Dieu and Jerrys Plains;
- avoidance of high value biodiversity such as Warkworth Sands Woodland EEC in the Lemington Road realignment;
- continued avoidance of CM-CD1 cultural heritage site and a scarred tree;
- improved final landform design using natural landform design principles;
- investigation of the feasibility of planting vegetation adjacent to the realigned Lemington Road to provide an effective visual screen and reduce views of this infrastructure from residences and local roads; and
- improved flood immunity for the realigned Lemington Road to compensate for those whose travel distances have been increased.

Details of community views and how the EIS addressed these matters are included in Chapter 6 with further information gathered as part of the SIA documented in Chapter 23 and Appendix V.

## 28.7 Summary of Project impacts

### 28.7.1 Environmental

This EIS has assessed potential impacts to the biophysical environment which are summarised in Table 28.2.

**Table 28.2 Summary of environmental impacts**

| Environmental aspect | Key findings |
|---|---|
| Air quality | • Construction activities, largely through the realignment of Lemington Road, have the potential to increase the overall dust emissions in the early phase of the Project (that is, the first two to three years) but these increases are not predicted to be of a magnitude that will change the air quality outcomes for privately owned sensitive receptors. Nevertheless, appropriate management and monitoring will need to continue during the construction activities.<br>• Operational dust emissions due to ongoing mining activities are not expected to cause significant adverse air quality impacts at nearby privately owned residential sensitive receptors. 24 hour $PM_{10}$ and $PM_{2.5}$ concentrations may continue to exceed air quality criteria from time-to-time; however, these events would be within the range of historically measured days above the criteria, excluding extraordinary events.<br>• Under the VLAMP, two receptors (121 and 308) are anticipated to be afforded voluntary acquisition rights due to predicted exceedances of applicable criteria. |
| GHG | • The estimated annual average Scope 1 and 2 GHG emissions from the Project (1.26 Mt $CO_2$-e, comprising 0.78 Mt $CO_2$-e and 0.48 Mt $CO_2$-e at HVO North and HVO South, respectively) represent approximately 0.25% of Australia's 2020 emissions. In total, approximately 33.28 Mt $CO_2$-e of Scope 1 and 1.88 Mt $CO_2$-e Scope 2 are anticipated to be emitted over the Project life.<br>• HVO will continue to manage its contribution to Australian GHG emissions inventories through reporting under the NGER Act, as well as other government initiatives implemented to manage emissions at a national level. As a designated large facility under the NGER Act, the Safeguard Mechanism applies to HVO, and therefore ongoing operations at HVO will be subject to the emissions reduction requirements that are contained within it. |

## Table 28.2 Summary of environmental impacts

| Environmental aspect | Key findings |
|---|---|
| Noise | • Development of the Project design has been an iterative one, undertaken in conjunction with the noise assessment, in which all reasonable and feasible mitigation measures have been considered in accordance with the NPfI to minimise noise impacts on sensitive receptors. These measures include progressive attenuation of the mining fleet, haul route selection to minimise exposure of significant noise generating mobile fleet, construction of a roadside bund on the exposed side of the haul road from the Mitchell Pit towards the Howick CPP, and equipment shutdowns during enhancing meteorological conditions. With all of these measures considered, achievable noise levels have been developed for HVO in accordance with the NPfI, which are proposed as the noise criteria for the Project, as presented in Table 10.7 (refer to Chapter 10).<br>• Residual noise impacts were evaluated for the Project, with the outcomes as follows:<br>– no receptors are predicted to experience a significant residual impact (ie >5 dB above PNTL), meaning that voluntary acquisition rights are not triggered at any receptor as a result of the Project;<br>– the residual impact at all receptors is predicted to be either negligible (1–2 dB above PNTL) or marginal (3–5 dB above PNTL); and<br>– 28 receptors (equivalent to 19 landholders) are predicted to experience a marginal impact due to the Project, as follows:<br>▪ 15 receptors (equivalent to 11 landholders) are in new areas of marginal impact, being NAGs 5A and 5B in Jerry Plains. Of these, six are 'isolated' and therefore qualify for voluntary noise mitigation rights; and<br>▪ 13 receptors (equivalent to eight landholders) are in areas of existing marginal impact (NAGs 1A and 1B in Maison Dieu), and therefore currently have noise mitigation rights which will continue.<br>• 7 receptors that already have mitigation rights in accordance with the HVO South Project approval are not predicted to experience noise levels such that they would be entitled to voluntary mitigation rights for the Project; however, HVO proposes to retain voluntary noise mitigation rights for these receptors.<br>• Receptors that will therefore be entitled to voluntary mitgaton rights if the Project is approved are:<br>– HVO South: 120, 121, 122, 123, 160, 161, 162, 163, 256, 258, 260, 261, 497, 244, 245, 246, 247, 308, 311, 317.<br>– HVO North: 326, 327, 328, 330, 437, 487. |
| Blasting | • Exposure to vibration and airblast overpressure will be effectively managed by the Project via the application of reduced charge masses for private residential receptors at Maison Dieu and Jerrys Plains, heritage items (Great Lodge, Carrington Homestead and Wandewoi Homestead), infrastructure (public roads and bridges, high voltage powerlines and electrical substations) and livestock and the equine industry in Jerrys Plains.<br>• HVO has a well-established pre-blast assessment protocol, blast monitoring system and weather monitoring system in place, that will continue to be implemented for the Project. |

## Table 28.2 Summary of environmental impacts

| Environmental aspect | Key findings |
|---|---|
| Water resources | • The groundwater and surface water assessments demonstrate that the Project can operate within and meet the requirements of the water regulatory framework.<br>• The water management system is predicted to maintain an overall balance without excess accumulation or shortfall of mine water demands.<br>• Impacts on Hunter River and Wollombi Brook streamflow will be negligible.<br>• HVO holds sufficient entitlement for the predicted reduction in Hunter River streamflow due to the Project.<br>• The Project is not anticipated to result in a lowering of the beneficial use category of the local water sources.<br>• The flood modelling for the Project indicates no changes to flooding at third-party owned dwellings along the Hunter River, and no impact on the use of the land (grazing and cropping or crown land).<br>• The proposed realignment of Lemington Road will significantly improve flood immunity of this road as it crossed the Hunter River.<br>• The Project is not predicted to change the flood hazard categories, or have an impact on use of the land, public safety or emergency management.<br>• Changes in velocity are presented to be localised around Project infrastructure and will remain within the existing ranges experienced, with a low likelihood of causing scour.<br>• No impact is predicted at third-party groundwater bores.<br>• In comparison to the approved HVO South operations, the Project will result in less drawdown in the Wollombi Brook and there is no incremental drawdown predicted for the Project in that area.<br>• Construction of the Carrington West Wing LPBW after mining will limit long-term drawdown in the Hunter River alluvium and the potential for seepage from the backfilled mine area to the alluvium. The predicted drawdown will be of short duration, and saturation will remain in the alluvial aquifer.<br>• The final voids will act as regional groundwater sinks and the long-term lake level will be considerably deeper than the base of the alluvium and the base of weathering. Therefore, the risk of seepage from the void lakes or backfilled mine areas is minor.<br>• The risk of spill from the void lakes is negligible.<br>• HVO holds considerable water entitlement in the relevant surface water and groundwater sources in the Project area, which is sufficient to account for the predicted direct and indirect takes. |
| Biodiversity | • The landscape within and surrounding the Project is characterised by extensive historical clearing for agricultural, mining and rural development.<br>• After accounting for the implementation of avoidance and minimisation strategies, the Project will directly impact 397 ha of native vegetation of which 188.8 ha meets the offsetting threshold under the Biodiversity Offset Scheme. Of this, 97.4 ha conforms to TECs under the BC Act (92.9 ha in HVO North and 4.5 ha in HVO South).<br>• HVO is committed to delivering a biodiversity offset strategy that appropriately compensates for the unavoidable loss of biodiversity values and residual impacts of the Project and has identified a proposed Warkworth Sands Woodland EEC offset site at South Lemington Pit 1. Preliminary investigations indicate that the South Lemington Offset Site, with the inclusion of a proposed restoration strategy, has the potential to provide all the Warkworth Sands Woodland EEC credit requirements for the Project.<br>• HVO proposes to stage the retirement of credits as clearing of the additional disturbance area occurs. The biodiversity offset strategy will be finalised in consultation with DPE and BCS and will be developed so that there is a net beneficial outcome for biodiversity values as a result of the Project. |

## Table 28.2 Summary of environmental impacts

| Environmental aspect | Key findings |
|---|---|
| Aquatic ecology | • No impacts are predicted on the aquatic ecology of the Hunter River, particularly as flow will be mitigated through regulated releases from Glenbawn Dam, and only minor impacts to the aquatic ecology in the tributaries to the Hunter River are expected.<br>• Groundwater modelling predicts a short term increase in incremental drawdown as a result of the Project in only small parts of the alluvial aquifer. Alluvium along the main channel of the Hunter River is largely buffered from drawdown by impermeable groundwater barriers installed along sections of the aquifer and because infiltration from the Hunter River recharges the aquifer, so impacts to this aquifer ecosystem and the river red gum populations are likely to be minor or negligible. The alluvial aquifer will continue to be recharged from regulated flows in the Hunter River.<br>• River red gums that opportunistically use shallow groundwater will continue to have access to shallow alluvial groundwater.<br>• In addition, the Project is predicted to have a negligible impact on Hunter River flow and flooding regime post-mining. Therefore, river red gum communities will continue to rely on flooding for germination.<br>• Stygofauna was collected during sampling, and most came from the paleochannel aquifer north of the Hunter River and west of the existing mine. This area is already planned for excavation as part of the approved Carrington West Wing pit for HVO North. However, the regional impact is likely to be minor as all taxa collected from the paleochannel were also collected at other locations along the Hunter River and within the Hunter Valley. |
| Aboriginal cultural heritage | • 304 extant Aboriginal sites were identified within the Project disturbance area. Of these, 145 (138 at HVO North and 7 at HVO South) are in the additional disturbance area associated with the Project or approved disturbance areas associated with another mine that overlaps the Project, and 159 (96 at HVO North and 63 at HVO South) are in the existing and approved disturbance area.<br>• Of the sites identified in the Project disturbance area, 84 (28%) will be avoided, 198 (65%) will be collected via surface collection, 19 (6%) will involve surface collection and salvage excavation, one (<1%) will be salvaged via salvage excavation only, and the scarred portions of two scarred trees (<1%) will be salvaged and relocated.<br>• The majority (84%) of the extant sites identified were found to be of low scientific significance. Three sites of high significance were identified at HVO North, one of which will continue to be avoided (CM-CD1) and two (scarred trees) will be salvaged.<br>• Cultural values mapping of the Project area, which was undertaken by Dr Philip Clarke with involvement from RAPs, identified no Aboriginal cultural values or places, beyond archaeological sites already identified by the ACHA, within the Project Area.<br>• The existing AHMPs will be revised and consolidated in consultation with the RAPs and Heritage NSW, to guide the mitigation and management of sites in the Project area and to avoid inadvertent impacts. |

## Table 28.2 Summary of environmental impacts

| Environmental aspect | Key findings |
|---|---|
| Historic heritage | At HVO North:<br>• One unlisted item assessed as having local contributory significance, remnant stockyards, will be directly impacted by the Project at HVO North. Mitigation measures comprising archival recording are proposed for this item. No other historic heritage item will be directly impacted by the Project.<br>• While the proposed realigned Lemington Road corridor at HVO North intersects with a portion of the mapped area related to the locally listed Archerfield, no physical items of heritage significance associated with the Archerfield Homestead and Outbuildings are within the Lemington Road alignment, and no direct impacts will occur.<br>• The State listed Chain of Ponds Inn is within the HVO North existing and proposed development consent boundary. However, this item is outside of the existing and approved disturbance area associated with HVO and the additional disturbance area for the Project, as is more than 5 km from the proposed mining area. Therefore, Project related impacts are not predicted to occur to the Chain of Ponds Inn.<br>At HVO South:<br>• No direct impacts will occur to historic heritage items.<br>• The Dog Leg Fence, an ungazetted item but assessed as potential State significance, is located within the HVO South proposed development consent boundary; however, it is not within the Project disturbance area. No direct impacts will occur due to the Project and blasting activities are not proposed to occur any closer then currently approved.<br>• The Great Lodge, an ungazetted item but assessed as potentially State significant, has been identified within the HVO South proposed development consent boundary; however, it is outside of the Project disturbance area. No direct impacts will therefore occur because of the Project, and the blasting assessment found that potential impacts to the Great Lodge can be managed effectively via appropriate blast design. Given the nature of the item's condition, monitoring and further assessment to determine significance will be undertaken. |
| Soil resources | • Soil resources have been assessed for suitability in post mining landforms for intended land uses, with a total estimated volume of material available being approximately 7,336,370 $m^3$.<br>• The total volume of material required to meet the final land use objectives is calculated to be approximately 7,791,000 $m^3$. Therefore, there will be a soil deficiency of approximately 454,630 $m^3$, or 6% of the soil bank. Additional alternate growth medium enhancement strategies, specialised management of salvaged soils and ongoing assessment of soil resources prior to stripping will be employed to manage this deficit. |
| Agriculture | • The Project disturbance area primarily consist of existing mining areas, existing rehabilitation areas and low intensity grazing land.<br>• The Project is not predicted to result in significant adverse impacts on surrounding private agricultural land and mining operations are expected to successfully continue to coexist with the surrounding agricultural land uses.<br>• Once the Project area is rehabilitated (ie to the final landform), overall the Project will deliver a net increase of approximately 138 ha of land use for agriculture, compared to the currently approved final landform for the complex. |
| Traffic and transport | • During continued operations, the impact of Project on the local road network is anticipated to be minor.<br>• The realigned Lemington Road will deliver an improved travel experience for users in terms of reliability, safety and average speed, by providing improved travel conditions via a larger radius, improved clear zone and shoulder widths, and replacement of the existing single-lane low level bridge crossing over the Hunter River (Moses Crossing) with a new bridge.<br>• In terms of changes to travel time due to the Lemington Road realignment, it was found that:<br>– trips to/from the west of the Lemington Road/Golden Highway intersection will increase between 1.40 minutes and 2.30 minutes indicating minor impact to travel time, affecting approximately 5% of the trips currently recorded on Lemington Road; and<br>– trips to/from the east of the Lemington Road/Golden Highway intersection will decrease by approximately 9–10 minutes, which is an improvement in travel time. |

### Table 28.2 Summary of environmental impacts

| Environmental aspect | Key findings |
|---|---|
| Visual amenity | • Visual impacts associated with HVO's existing mining operations have previously been assessed and approved and are considered as part of the existing environment. While it is acknowledged that there are privately-owned receptors and road corridors that are already subject to a high visual impact from HVO's existing mining operations and other surrounding mining operations, the level of visual impact on these properties will not materially change when compared with the approved Project. |

### i Ecologically sustainable development

The Commonwealth's *National Strategy for Ecologically Sustainable Development* defines ESD as 'using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased'. The NSW EP&A Act adds to this by providing a set of ESD principles.

Table 28.3 evaluates the principles of ESD against the Project.

### Table 28.3 Evaluation of ESD principles

| Principles | Evaluation against Project |
|---|---|
| Precautionary principle | The precautionary principle holds that where there are threats of serious or irreversible environmental damage, a lack of full scientific certainty should not be used as a reason for postponing measures to prevent such damage.<br>The proposed mine plan and overall project design has been developed based on the assessment of environmental, engineering and financial considerations. The Project has been designed to avoid and minimise potential environmental and social impacts whilst achieving positive Project outcomes. Each technical assessment has included multiple rounds of review and refinement to avoid impacts or, if unavoidable, minimise or offset them. Importantly, the principle of avoidance has been adopted wherever possible, particularly with respect to:<br>• CM-CD1;<br>• noise and visual amenity impacts to sensitive receptors, notable the Jerrys Plains locality, associated with mining north-west of Mitchell Pit;<br>• Aboriginal heritage items and biodiversity features associated with the Lemington Road realignment, transmission line realignment, and Lemington CPP and associated rail loop; and<br>• historic heritage items associated with the transmission line realignment.<br>A biodiversity offset strategy will also be implemented to achieve a net positive biodiversity outcome.<br>Unavoidable impacts will meet applicable regulatory criteria. An extensive list of mitigation measures is proposed to mitigate and manage the impacts, where unavoidable. These mitigation measures have been informed by the technical assessments prepared in support of this EIS which have been prepared by technical experts in each relevant field. For environmental aspects where a potential high risk or particular community concern was identified in the early stage of project planning, further experts were engaged to peer review technical studies to ensure the robustness of the project design and the environmental assessment.<br>Therefore, the project addresses the precautionary principle because there will be no serious or irreversible environmental damage. |

**Table 28.3 Evaluation of ESD principles**

| Principles | Evaluation against Project |
|---|---|
| Inter-generational equity | Inter-generational equity is the concept that the present generation should ensure the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.<br>The only beneficial land use that could be affected by the Project is agriculture. In this regard, the agricultural capability of the land to be disturbed will be progressively reinstated so that, with the exception of the final void, the Project area can be used for agriculture at the end of the mine life. The total area allocated for agriculture land use (Domain B: Agricultural – grazing) following the life of the Project is 4,216 ha. This is a net increase of 138 ha from the baseline area of land use for agriculture.<br>Some impacts to biodiversity will occur through the disturbance of native vegetation and habitat for species credit species listed under the BC Act. However, an offset strategy has been developed and once implemented, will mean a net beneficial gain in biological resources.<br>The water management system for the Project is predicted to maintain an overall balance without excess accumulation or shortfall of mine water demands, minimising business disruption and potential impacts on surface water resources. The Project will not result in adverse changes to the environmental and community values of groundwater or surface water.<br>The mitigation measures outlined in Chapter 27 will be implemented for the life of the Project to ensure the health, diversity and productivity of the environment for the present generation and generations to come. |
| Conservation of biological diversity and ecological integrity | This principle holds that the conservation of biological diversity and the maintenance of ecological integrity should be a fundamental consideration for development proposals.<br>The Project is on land that has a long history of disturbance from mining and agricultural land uses.<br>There have been many refinements in the Project design to avoid impacts to biodiversity and to maintain ecological integrity. HVO has undertaken investigations into biodiversity offsetting options, and as a result identified land in the South Lemington Pit 1 area that is proposed to offset impacts to the *Warkworth Sands Woodland EEC.* A final biodiversity offset strategy will be developed in consultation with DPE and BCS. |
| Improved valuation, pricing and incentive mechanisms | This principle includes activities which involve valuation, pricing and/or incentive mechanisms for the production, delivery, distribution or consumption of goods and services, especially those that are derived from natural or social capital or from ecological services.<br>As demonstrated by the EIA, the Project's benefits significantly outweigh its costs.<br>HVO accepts the financial costs associated with all the measures required for the Project to avoid, minimise, mitigate and manage potential environmental and social impacts. |

### 28.7.2 Social

The impacts and benefits associated with the Project are likely to be experienced most acutely by those people who live nearby; however, they also extend throughout the broader region. No mitigated social impacts rated as a high risk have been identified for the Project, with all potential impacts ranked as medium or low. A number of social benefits have also been identified with a very high or high benefit rating.

The key social impacts that were identified by the SIA for the Project (all ranked as 'medium' risks) are:

- impact of continued traffic congestion and road delays during construction;
- impacts due to continued generation of dust;
- impact on community cohesion due to divergent opinions on the Project;
- impacts from ongoing noise and vibration; and
- impact on perceived safety due to realignment of Lemington Road.

A range of mitigation measures are proposed to minimise these impacts.

The key social benefits of the Project that were identified by the SIA are:

- benefit of the realigned Lemington Road and new bridge over the Hunter River, improving the reliability and safety of this road;
- benefit of the Project contributing to ongoing stability of the local population;
- benefit of continued royalty payments to the NSW state government;
- benefit related to ongoing community grants and sponsorship;
- benefit of rehabilitation, future land use and ongoing land management, with natural design principles being incorporated into the final landform;
- benefit of the continued opportunities for local employment and training;
- benefit of the continuation of procurement opportunities for local businesses; and
- benefit of allowing more time for transition planning.

These benefits were all ranked as being either a 'high', or 'very high' benefit of the Project.

In addition to these identified benefits, HVO has committed to the establishment of a social mitigation funding framework, which will be further developed as part of the preparation of the SIMP for the Project and will be focussed on funding Closing the Gap initiatives. The framework will include:

- a program to assist in increasing job readiness and work experience for local Aboriginal people;
- a funding framework to enable funding of programs and projects that align to Closing the Gap initiatives or community mental health, to the value of $1,000,000 over the first 10 years of the Project; and
- HVO will liaise further with the Aboriginal Community to define an appropriate location and frequency where briefings could be held on the HVO procurement processes to enable Aboriginal suppliers to be able to tender for work. In addition to briefings, HVO will consider providing funding to support business/procurement training programs.

### 28.7.3 Economic

The Project is justified economically due to the net economic benefits and the economic stimulus it will provide locally and to NSW. Importantly, the Project involves a mining operation that will, consistent with the objects of the Mining Act, extract a State-owned resource for the benefit of the State of NSW.

A project is economically beneficial if its benefits exceed its costs measured in today's values. The net benefit of the Project for NSW is estimated at $4,848.5 million in NPV terms (present values at 7% discount rate), comprised of the following:

- direct benefits of $2,122.5 million (NPV), comprising;
  - royalties, payroll tax and council rates of $1,725.1 million;
  - company income tax apportioned to NSW of $397.4 million;
- indirect benefits of $2,739.6 million (NPV), comprising:
  - net economic benefit to NSW workers of $1,023.8 million;

- net economic benefit to NSW suppliers of $1,715.8 million; and

- incremental indirect costs of $13.7 million.

A number of flow-on effects will occur as a result of the Projects capital and operating expenditure, and ongoing employment opportunities, which will benefit the regional economy.

The Project will deliver an estimated net benefit of $1,739.0 million to the Lower Hunter region (SA3) in NPV terms, comprised of:

- royalties, payroll tax and council rates of $36.6 million;
- net economic benefit to NSW workers of $954.5 million;
- net economic benefit to NSW suppliers of $760.3 million; and
- indirect costs $12.4 million.

Given the significant net benefits of the Project as demonstrated by the outcomes of the EIA, the Project is desirable and justified from an economic efficiency perspective.

### 28.7.4 Cumulative

HVO has a long history of operations, and in this time has developed an extensive understanding of the environment which it operates, and its interaction with neighbouring mines. An extensive monitoring network assists HVO in adapting its operations so that operations meet relevant criteria in conjunction with surrounding mines and other industry. The technical studies undertaken to inform this EIS considered cumulative impacts of surrounding development, which is discussed in detail in Chapter 26.

## 28.8 Conclusion

HVO is seeking approval to continue mining operations at the HVO Complex beyond the life of current approvals. Significant coal resources remain across the HVO Complex beyond what is currently approved for extraction, and the Project will facilitate the efficient extraction of this high quality coal resource, via mining through existing tenements and predominantly within existing or previously approved disturbance areas.

Numerous technical investigations have been carried out to support this EIS. These assessments identified residual impacts of the Project and appropriate mitigation measures to address these impacts. The Project's design and proposed management measures are based on a comprehensive understanding of the environmental conditions in and around the Project area, gained over a very long history of mining at HVO.

The Project represents a brownfield mining proposal that aligns with the strategic direction and policy objectives at a local, state and national level. It will provide ongoing employment opportunities for around 1,500 workers and will deliver significant economic benefits to the State and local region.

# 29 References


ABS (Australian Bureau of Statistics) 2016 and 2021, *Census Data*, https://abs.gov.au/census/find-census-data/search-by-area.

AFR (Australian Financial Review) 2022, A*ustralia 'Missed Big Opportunity in CCS': IEA head*, published 15 July 2022.

AGE (Australasian Groundwater and Environmental Consultants) 2017, *HVO South Modification 5 Groundwater Study,* prepared for EMM Consulting Pty Ltd.

- 2019, *Glendell Continued Operations Project EIS - Groundwater Impact Assessment,* prepared for Umwelt (Australia) Pty Limited.
- 2022, *HVO Continuation Project: Groundwater Impact Assessment,* prepared for EMM Consulting Pty Limited.

Andrew Long and Associates Pty Ltd 2022, *Assessment of Potential Aboriginal Culturally Modified Trees, Hunter Valley Operations, Singleton, NSW.*

Andrews Neil Architects Planners 1999, *Synoptic Plan: Integrated Landscapes for Coal Mine Rehabilitation in the Hunter Valley of NSW*, NSW Department of Mineral Resources.

ANZECC (Australian and New Zealand Environment Council) 1990, *Technical Basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration*.

Australian Government 2018, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Department of Agriculture and Water Resources.

Australia ICOMOS (International Council on Monuments and Sites) 2013, *The Burra Charter: the Australia ICOMOS Charter for Places of Cultural Significance*.

Butler G, Brooks S & Raadik T 2019, *Percalates novemaculeata. The IUCN Red List of Threatened Species 2019: e.T83130397A129086006*, https://www.iucnredlist.org/species/83130397/129086006.

Commonwealth of Australia 2021, *Australia's Long-Term Emissions Reduction Plan*, Department of Climate Change, Energy, the Environment and Water.

CQCHM (Central Queensland Cultural Heritage Management Pty Ltd) 2009, *CM-CD1 Cultural heritage Area: Background, Issues and Strategy Options Paper, Carrington West, Hunter Valley*.

DCCEEW (Department of Climate Change, Energy, the Environment and Water) 2022a, *Electricity Generation*, https://www.energy.gov.au/data/electricity-generation.

- 2022b, *States and territories*, https://www.energy.gov.au/data/states-and-territories#:~:text=New%20South%20Wales'%20energy%20mix,and%20Western%20Australia%20(54%25).

DECCW (NSW Department of Environment and Climate Change) 2009, *Interim Construction Noise Guideline*.

- 2010a*, Aboriginal Cultural Heritage Consultation Requirements for Proponents.*
- 2010b, *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales.*
- 2011, *NSW Road Noise Policy*.

DPE (NSW Department of Planning and Environment) 2015, *Guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals.*

- 2016a, *Hunter Regional Plan 2036.*
- 2016b, *Wind Energy: Visual Assessment Bulletin AB 01 for State Significant Wind Energy Development*.
- 2017, *Improving Mine Rehabilitation in NSW Discussion Paper*.
- 2018, *Technical Notes supporting the guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals.*

DPI (NSW Department of Planning and Infrastructure) 2012a, *NSW Aquifer Interference Policy*.

- 2012b, *Upper Hunter Strategic Regional Land Use Plan*.

DPIE (NSW Department of Planning, Industry and Environment) 2021a, *Cumulative Impact Assessment Guidelines for State Significant Projects.*

- 2021b, *Draft Hunter Regional Plan 2041.*
- 2021c, *Social Impact Assessment Guideline for State Significant mining, petroleum production and extractive industry development*.
- 2021d, *State Significant Development Guidelines.*
- 2021e, *Technical Supplement: Social Impact Assessment Guideline for State Significant Projects.*
- 2021f, *Undertaking Engagement Guidelines for State Significant Projects November 2021.*

DTIRIS (NSW Department of Trade, Investment, Regional Infrastructure and Services) 2012, *Guideline for Agricultural Impact Statements*.

Eco Logical Australia 2022, *Hunter Valley Operations Continuation Project – aquatic ecology and groundwater dependent ecosystem assessment.*

Egi (Environmental Geochemistry International) 2022, *HVO Continuation Project: Geochemical Assessment,* prepared for HV Operations Ltd.

EMM 2022a, *Aboriginal Cultural Heritage Assessment – HVO Continuation Project*.

- 2022b, *Historic Heritage Assessment – HVO Continuation Project.*
- 2022c, *Hunter Valley Operations Continuation Project – Noise Impact Assessment.*
- 2022d, *HVO Continuation Project – Contamination Assessment Review*.
- 2022e, *HVO Continuation Project – Mine Closure and Rehabilitation Strategy.*
- 2022f, *HVO Continuation Project – Visual Impact Assessment.*
- 2022g, *HVO Continuation Project – Water Assessment*.
- 2022h, *Social Impact Assessment – HVO Continuation Project.*

Engeny (Engeny Water Management) 2022, *HVO Continuation Project: Surface Water Impact Assessment*, prepared for EMM Consulting Pty Ltd on behalf of HV Operations.

enHealth 2012, *Environmental Health Risk Assessment: Guidelines for assessing human health risk from environmental hazards.*

Enviro Strata Consulting 2022, *Hunter Valley Operations Continuation Project – Blasting Impact Assessment*.

EPA (NSW Environment Protection Authority) 2009, *Interim Construction Noise Guideline.*

- 2014a, *Waste Avoidance and Resource Recovery Strategy 2014-21*.
- 2014b, *Waste Classification Guidelines.*
- 2017, *Noise Policy for Industry*.
- 2019, Dust Assessment Handbook.
- 2022, *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*.

ERM 2008, *Hunter Valley Operations South Coal Project Environmental Assessment*, report for Coal and Allied Operations.

Ernst & Young 2022, *Economic Impact Assessment of the Hunter Valley Operations Continuation Project.*

Golder 2022, *HVO Continuation Project Final Landform Design – Geomorphic Design Report.*

IEA (International Energy Agency) 2016, *World Energy Outlook*.

IPC (Independent Planning Commission) 2020, *Vickery Extension Project SSD 7480, Statement of Reasons for Decision.*

- 2021a, *Mangoola Coal Continued Operations Project SSD 8642, Statement of Reasons for Decision.*
- 2021b, *Dendrobium Extension Project SSD 8194, Statement of Reasons for Decision.*
- 2022c, *Narrabri Underground Mine Stage 3 Extension Project SSD 10269, Statement of Reasons for Decision.*
- 2022d, *Mount Pleasant Optimisation Project SSD 10418, Statement of Reasons for Decision.*

Jacobs 2022, *Hunter Valley Operations Continuation Project – Air Quality and Greenhouse Gas Assessment.*

Landloch 2022, *Hunter Valley Operations Continuation Project Landform Design for Waste Emplacement Area – Erodibility Testing and Landform Evolution Modelling Report.*

Landscape Institute and Institute of Environmental Management and Assessment 2013, *Guidelines for Landscape and Visual Impact Assessment*, third edition.

McDowall, R. 1996, *Freshwater Fishes of South-eastern Australia*, Reed Publishers.

Minchener, A (undated), *The importance of high efficiency low emissions technologies for sustainable coal utilisation*, https://unece.org/fileadmin/DAM/energy/se/pdfs/CES/ge15_2019/HELE_report.pdf, published by the IEA Clean Coal Centre.

Minerals Council of Australia 2021*, Australian mining contributes record tax and royalty payments to fund better services and infrastructure.*

Minesoils Pty Ltd 2022a, *Hunter Valley Operations Continuation Project – Agricultural Impact Statement.*

- 2022b, *Hunter Valley Operations Continuation Project – Soils and Land Impact Assessment Report.*

Muswellbrook Shire Council 2017, *Muswellbrook Shire Council Community Strategic Plan.*

NOW (NSW Office of Water) 2012, *Aquifer Interference Policy*

NSW Government 2013, *Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land.*

- 2018, *Voluntary Land Acquisition and Mitigation Policy.*
- 2020, *Net Zero Plan Stage 1: 2020-2030*.

OCE (Office of the Chief Economist) 2021, *Resources and energy quarterly: December 2021*, https://webarchive.nla.gov.au/awa/20220312043908/https://publications.industry.gov.au/publications/resourcesandenergyquarterlydecember2021/index.html.

OEH (NSW Office of Environment and Heritage) 2011, *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW*.

- 2012, *The land and soil capability assessment scheme; Second approximation*.
- 2016, *NSW Climate Change Policy Framework.*

Parris 2022, *Property industry leaders say labour, material costs building pressure on Hunter companies,* Newcastle Herald, https://www.newcastleherald.com.au/story/7858913/labour-shortage-builds-pressure-on-construction-industry/.

Regional NSW, *Royalties*, https://www.regional.nsw.gov.au/meg/community/royalties.

Riskcon Engineering 2022, *Preliminary Hazardous Analysis – HVO Continuation Project.*

RR (NSW Resources Regulator) 2021, *Form and way: rehabilitation management plan for large mines*.

RTA (NSW Roads and Traffic Authority) 2002, *Guide to Traffic Generating Developments*.

Serov P, Kuginis L & Williams J.P. 2012, *Risk assessment guidelines for groundwater dependent ecosystems*, Volume 1 – The conceptual framework, NSW Department of Primary Industries, Office of Water, Sydney.

Singleton Council 2020, *Singleton Local Strategic Planning Statement 2041*.

TfNSW (Transport for New South Wales) 2022, *Centre for Road Safety: Crash map,* https://roadsafety.transport.nsw.gov.au/statistics/interactivecrashstats.

Umwelt 2010, *River Red Gum Rehabilitation and Restoration Strategy*.

- 2022, *Biodiversity Development Assessment Report – Hunter Valley Operations Continuation Project.*

Urban Tree Management Pty Ltd 2021, *Arboricultural Assessment of Scarred Tree/s at Hunter Valley Operations (HVO) Joint Venture.*

Weir & Phillips 2007, *Warkworth Aerodrome Heritage Impact Statement*, report for Coal & Allied Industries Ltd.

Wood Mackenzie 2021, *Semi-Soft Metallurgical market overview and Donkin assessment.*

WSP 2022, *Hunter Valley Operations Continuation Project – Traffic and Transport Impact Assessment.*

Yancoal 2021, *Our Path to Transition, Focussed on Australian Futures*, ESG Report 2021

# Part F

## EIS study team and abbreviations

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# Study team

The EIS was prepared by EMM Consulting Pty Limited on behalf of HV Operations Pty Ltd. The full EIS study team, their roles and qualifications are listed below.

### Study team: HVO Continuation Project – Environmental Impact Statement

| Role | Person | Organisation | Qualifications |
|---|---|---|---|
| **EIS Management** | | | |
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| | Brigitta Fowler | EMM Consulting | |
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## Study team: HVO Continuation Project – Environmental Impact Statement

| Role | Person | Organisation | Qualifications |
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| | Matthew Hemingway | Minesoils | BEnvMgmt (Environmental Science and Management) |
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| Groundwater | Doug Weatherill | EMM Consulting | BSc (Hons I), BSc (Earth Science), PhD |

# Abbreviations

## Abbreviations

| Abbreviation | Definition |
|---|---|
| ABS | Australian Bureau of Statistics |
| ACA | Australian constructors association |
| ACHA | Aboriginal cultural heritage assessment |
| ACP | Ashton Coal Project |
| AEP | Annual exceedance probability |
| AGE | Australasian Groundwater and Environmental Consultants Pty Ltd |
| AHD | Australian height datum |
| AHIMS | Aboriginal heritage information management system |
| AIP | Aquifer Interference Policy |
| AIS | Agricultural impact statement |
| ALERP | Australia's Long-term Emissions Reduction Plan |
| ANL | Achievable noise limits |
| ANZG | Australian and New Zealand guidelines for fresh and marine water quality |
| AQGDEA | Aquatic ecology and groundwater dependent ecosystem assessment |
| AQGHGA | Air quality and greenhouse gas assessment |
| AQGHGMP | Air quality and greenhouse gas management plan |
| ARI | Average recurrence interval |
| ARTC | Australian Rail Track Corporation |
| ASS | Acid sulphate soils |
| AUL | Auxiliary left-turn |
| BAL | Basic left |
| BAM | Biodiversity assessment method |
| BATEA | Best available technology economically achievable |
| BC Act | NSW *Biodiversity Conservation Act 2016* |
| BCS | NSW Biodiversity, Conservation and Science Directorate |
| bcm | Bank cubic meters |
| BDAR | Biodiversity development assessment report |
| BIA | Blasting impact assessment |
| BMP | Blast management plan |
| BoM | Bureau of Meteorology |

## Abbreviations

| Abbreviation | Definition |
|---|---|
| BSAL | Biophysical strategic agricultural land |
| CBA | Cost benefit analysis |
| CCC | Community consultive committee |
| CCPF | NSW Climate Change Policy Framework |
| CCUS | Carbon capture, utilisation and storage |
| CEEC | Critically endangered ecological community |
| CEMP | Construction environmental management plan |
| CEO | Chief executive officer |
| CHR | Channelised right-turn |
| CIC | Critical industry cluster |
| CM-CD1 | Carrington Mine Colluvial Deposit 1 |
| CPP | Coal preparation plant |
| CQCHM | Central Queensland Cultural Heritage Management Pty Ltd |
| CSES | Communication and stakeholder engagement strategy |
| CWAS | Construction workforce accommodation strategy |
| dB | Decibels |
| dBL | Decibel linear |
| DECCW | NSW Department of Environment, Climate Change and Water |
| DEM | Digital elevation model |
| DPE | NSW Department of Planning and Environment |
| DSE | Dry sheep equivalent |
| DSM | Digital surface model |
| EC | Electrical conductivity |
| EEC | Endangered ecological communities |
| EGi | Environmental Geochemistry International Pty Ltd |
| EIA | Economic impact assessment |
| EIS | Environmental impact statement |
| EL | Exploration licence |
| ELA | Eco Logical Australia |
| EMM | EMM Consulting Pty Limited |
| EMS | Environmental management system |

## Abbreviations

| Abbreviation | Definition |
|---|---|
| EPA | NSW Environment Protection Authority |
| EP&A Act | NSW *Environmental Planning and Assessment Act 1979* |
| EP&A Reg | NSW Environmental Planning and Assessment Regulation 2021 |
| EPBC Act | *Environment Protection and Biodiversity Conservation Act 1999* |
| EPL | Environment protection licence |
| ESD | Ecologically sustainable development |
| ESG | Environmental, social and governance |
| ETL | Electricity transmission lines |
| EY | Ernst & Young |
| FEL | Front end loader |
| FTE | Full time equivalent |
| GDE | Groundwater dependent ecosystems |
| GHG | Greenhouse gas |
| GIA | Groundwater impact assessment |
| GL | Gigalitre |
| GLVIA | Guidelines for Landscape and Visual Impact Assessment |
| GP | General practitioner |
| GW | Gigawatt |
| HBT | Hollow-bearing tree |
| HELE | High efficiency low emissions |
| HRLX | Hunter Regional Livestock Exchange |
| HRP | Hunter Regional Plan 2036 |
| HRSTS | Hunter River Salinity Trading Scheme |
| HV | Hunter Valley |
| HVGC | Hunter Valley Gliding Club |
| HVLP | Hunter Valley Load Point |
| HVO | Hunter Valley Operations |
| IAIA | International Association for Impact Assessment |
| IAP2 | International Association of Public Participations |
| IBRA | Interim Biogeographic Regionalisation for Australia |
| ICNG | Interim Construction Noise Guideline |

## Abbreviations

| Abbreviation | Definition |
|---|---|
| ICOMOS | International Council on Monuments and Sites |
| IEA | International Energy Agency |
| IFC | International Finance Corporation |
| IOAR | Infrastructure Options and Avoidance Report (HVO 2022b) |
| IPC | Independent Planning Commission |
| JV | Joint venture |
| km | Kilometre |
| ktpa | Kilotonne per annum |
| kV | Kilovolt |
| LCPP | Lemington Preparation Plant |
| LEA | Local effects analysis |
| LEM | Landscape evolution model |
| LEP | Local environmental plan |
| LGA | Local government area |
| LHD | Local health district |
| LLS Act | NSW *Local Land Services Act 2013* |
| LoS | Level of service |
| LP | Load point |
| LPBW | Low permeability barrier wall |
| LPD | Licensed discharge point |
| LSC | Land and soil capability |
| Mbcm | Million bulk cubic meters |
| MIA | Mine infrastructure area |
| ML | Mining lease |
| MPOR | Mine Planning Options Report (HVO 2022a) |
| mm/s | Millimetres per second |
| Mod | Modification |
| MPIOR | Mine planning and infrastructure options report |
| MPS | Multi-purpose service |
| µS/cm | Microsiemens per centimetre |
| Mt | Metric tons |

## Abbreviations

| Abbreviation | Definition |
|---|---|
| Mt $CO_{2-e}$ | Metric tons of carbon dioxide equivalent |
| Mtpa | Million tonnes per annum |
| MTW | Mount Thorley Warkworth |
| NAG | Noise assessment group |
| NGER Act | *National Greenhouse and Energy Reporting Act 2007* |
| NHVR | National Heavy Vehicle Regulator |
| NIA | Noise impact assessment |
| $NO_x$ | Nitric oxide |
| $NO_2$ | Nitrogen dioxide |
| NPfI | Noise Policy for Industry |
| NPV | Net present value |
| NRAR | NSW Natural Resources Access Regulator |
| NSW | New South Wales |
| NTU | Nephelometric turbidity units |
| OCE | Commonwealth Office of the Chief Economist |
| OEH | NSW Office of Environment and Heritage |
| OEMP | Operational environmental management plan |
| OSL | Optically stimulate luminescence |
| OSOM | Oversize and/or overmass |
| PA | Project approval |
| PAD | Potential archaeological deposit |
| PCT | Plant community type |
| PHA | Preliminary hazardous analysis |
| $PM_{2.5}$ | Particulate matter (2.5 microns or less) |
| $PM_{10}$ | Particulate matter (10 microns or less) |
| PNTL | Project noise trigger levels |
| POEO Act | NSW *Protection of the Environment Operations Act 1997* |
| PV | Photovoltaics |
| RAPs | Registered Aboriginal parties |
| RASP | Rehabilitation and Securities Panel |
| RBL | Rating background levels |

## Abbreviations

| Abbreviation | Definition |
|---|---|
| RCT | Ravensworth Coal Terminal |
| REQ | Resources and Energy Quarterly |
| RL | Reduced level |
| RMP | Rehabilitation management plan |
| RO | Ravensworth Operations |
| ROL | Road occupancy licence |
| ROM | Run of-mine |
| RR | NSW Resources Regulator |
| SAII | Serious and irreversible impact |
| SEARs | Secretary's Environmental Assessment Requirements |
| SEPP | State Environmental Planning Policy |
| SHR | State heritage register |
| SIA | Social impact assessment |
| SIGNAL | Stream invertebrate grade number-average level |
| SIMP | Social impact management plan |
| SLIA | Soils and land impact assessment |
| SLSPS | Singleton Local Strategic Planning Statement 2041 |
| SRLUP | Strategic Regional Land Use Plan |
| SSD | State significant development |
| SVC | Site verification certificate |
| SWIA | Surface water impact assessment |
| TARP | Trigger action response plan |
| TBDC | Threatened biodiversity data collection |
| TDS | Total dissolved solids |
| TEC | Threatened ecological communities |
| TfNSW | Transport for New South Wales |
| TGS | Traffic guidance scheme |
| TMP | Traffic management plan |
| tph | Tonnes per hour |
| TSF | Tailings storage facility |
| TSP | Total suspended particles |

## Abbreviations

| Abbreviation | Definition |
|---|---|
| TSS | Total suspended solids |
| TRC | Town resource cluster |
| TTIA | Traffic and transport impact assessment |
| UNESCO | United Nations Educational, Scientific and Cultural Organization |
| UWJV | United Wambo Joint Venture |
| VA Bulletin | Wind Energy: Visual Assessment Bulletin AB 01 For State Significant Wind Energy Development |
| VEC | Vulnerable ecological community |
| VIA | Visual impact assessment |
| VLAMP | Voluntary Land Acquisition and Mitigation Policy |
| VMP | Vehicle movement plan |
| VPA | Voluntary planning agreement |
| WAL | Water access licence |
| WARR Act | NSW *Waste Avoidance and Resource Recovery Act 2001* |
| WEO | World Energy Outlook |
| WEPP | Water erosion prediction project |
| WMS | Water management system |
| WU | Wambo Underground |
| WWII | World war two |



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