
APPENDIX I

Noise Impact Assessment

Hunter Valley Operations Continuation Project

Noise Impact Assessment

Prepared for HV Operations Pty Ltd

September 2022

Hunter Valley Operations Continuation Project

Noise Impact Assessment

HV Operations Pty Ltd

H190408 1

September 2022

Version	Date	Prepared by	Approved by	Comments
1	8 September 2022	Robert Kirwan	Tony Welbourne	Draft
2	28 September 2022	Robert Kirwan	Tony Welbourne	Draft
3	27 October 2022	Robert Kirwan	Tony Welbourne	Final

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1 Introduction

Global Acoustics Pty Ltd (now part of EMM Consulting Pty Limited (EMM)) was engaged by Hunter Valley Operations (HVO) to complete a Noise Impact Assessment (NIA, this document) for the Hunter Valley Operations Continuation Project (the Project). The Project comprises 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 2050 at HVO North and 2045 at HVO South.

The purpose of the assessment is to inform the Environmental Impact Statement (EIS) being prepared by EMM to support two separate development applications under Division 4.1 of Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the Project. 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 the EP&A Act.

1.1 Background

Hunter Valley Operations (HVO) is a multi-pit open cut mining complex approximately 24 kilometres (km) north-west of Singleton in the Hunter Valley of New South Wales (NSW) (Figure 1.1). HVO comprises two mine sites separated by the Hunter River, HVO North and HVO South. While the two mine sites are approved under separate development consents, they are operated as one complex with fully integrated environmental management systems.

The existing HVO North operation comprises the approved mining areas of West Pit, Mitchell Pit and Carrington Pit, as shown in Figure 1.2. It operates under development consent DA 450-10-2003 which allows extraction of up to 22 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal until 12 June 2025.

HVO South operates under Project Approval (PA) 06_0261 and comprises the approved mining areas of Riverview Pit and Cheshunt Pit, where mining activities currently take place, and the Riverview South East Extension and South Lemington Pits 1 and 2. PA 06_0261 allows the extraction of up to 20 Mtpa of ROM coal until 24 March 2030.

Mining across HVO is undertaken using dragline and truck and shovel methods. ROM coal from HVO North and South is currently processed at the Hunter Valley (HV) Coal Preparation Plant (CPP) and/or the Howick CPP (both at HVO North), from which product coal is predominantly transported via overland conveyor to the HV load point (HVLP) or Newdell LP and via rail to the Port of Newcastle for export. The Lemington CPP (LCPP) and associated rail loop, which is approved under PA 06_0261 and would process and rail coal from HVO South, is yet to be constructed.

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

The HVO Continuation Project (the Project) broadly comprises 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 increase resource recovery from the existing operation, predominantly by mining through previously mined areas and to the extent of existing mining tenements and extracting coal from deeper seams at HVO North.

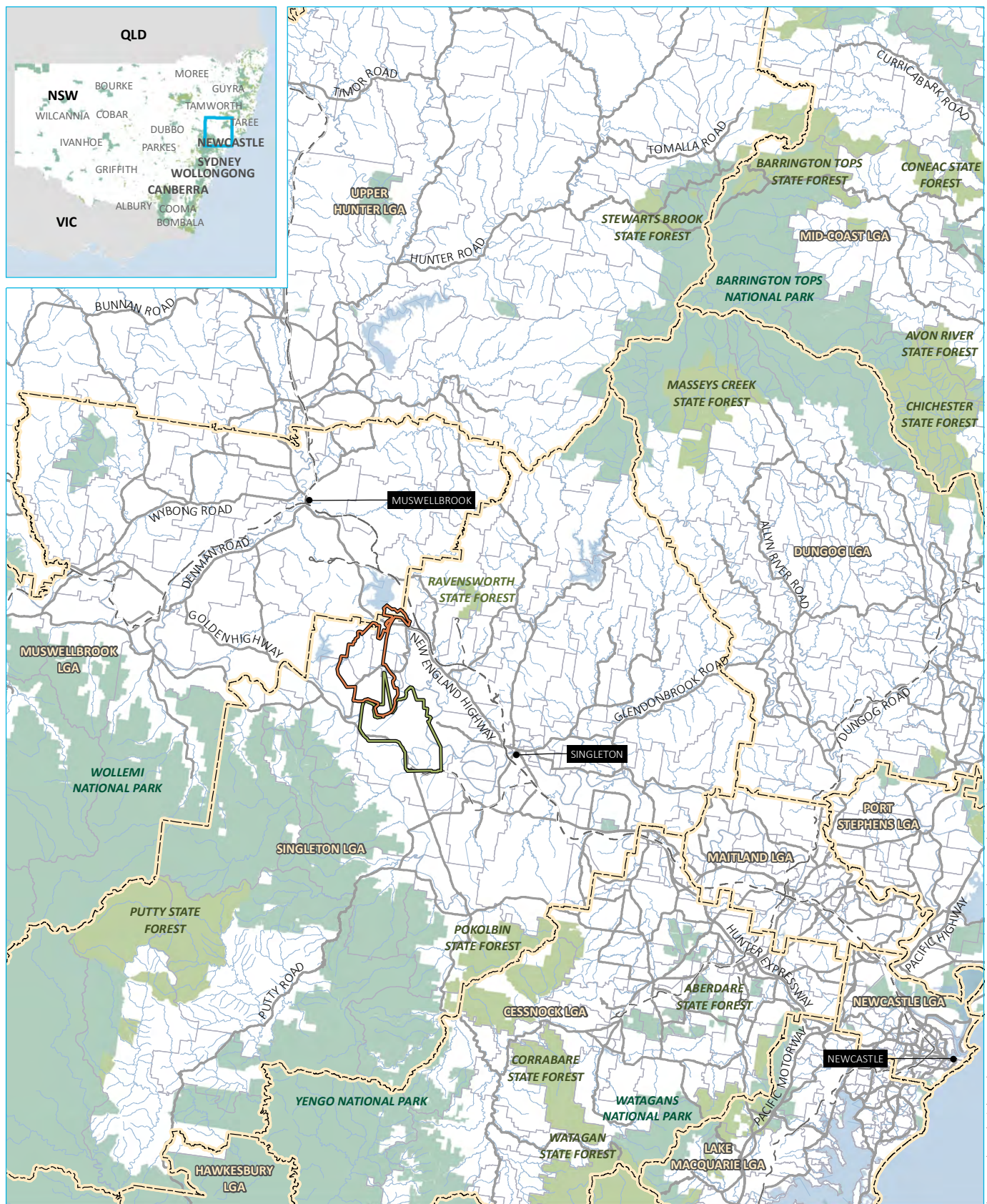
At HVO South an extension to the life of the mine is proposed to facilitate improved mine sequencing outcomes and reduction in mining rate. The Project proposes a reduced mining footprint at HVO South compared to what is approved for extraction, with the previously approved coal extraction in the Riverview South East Extension area and South Lemington Pits 1 and 2 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. The approved shorter rail loop option associated with the LCPP has also been removed from the Project.

A number of infrastructure upgrades and changes are also 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 stockpile and train loading bin, an upgrade of the HVLP product stockpile including an extension to the existing coal stockpile, and improvements to Lake James and Parnell's Dam.

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 NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The Project will seek to maintain separate development consents for HVO North and South, as is currently the case. Given that the two mine sites operate as one complex, one Environmental Impact Statement (EIS) has been prepared to support the two development applications required for the Project.

This noise impact assessment forms part of the EIS and provides an assessment of the potential noise impacts of the Project. It also assesses the potential incremental impacts of the continuation of HVO North and HVO South given separate development consents are being sought for each operation. It documents the assessment methods and results, initiatives to avoid and minimise noise impacts and additional mitigation and management measures proposed to address residual impacts not able to be avoided.

The project description is provided in Chapter 4 of the EIS (EMM 2022). The key components of the Project as they relate to HVO North and HVO South are individually listed below. The proposed conceptual layout of the Project, inclusive of both HVO North and South, is provided in Figure 1.3.

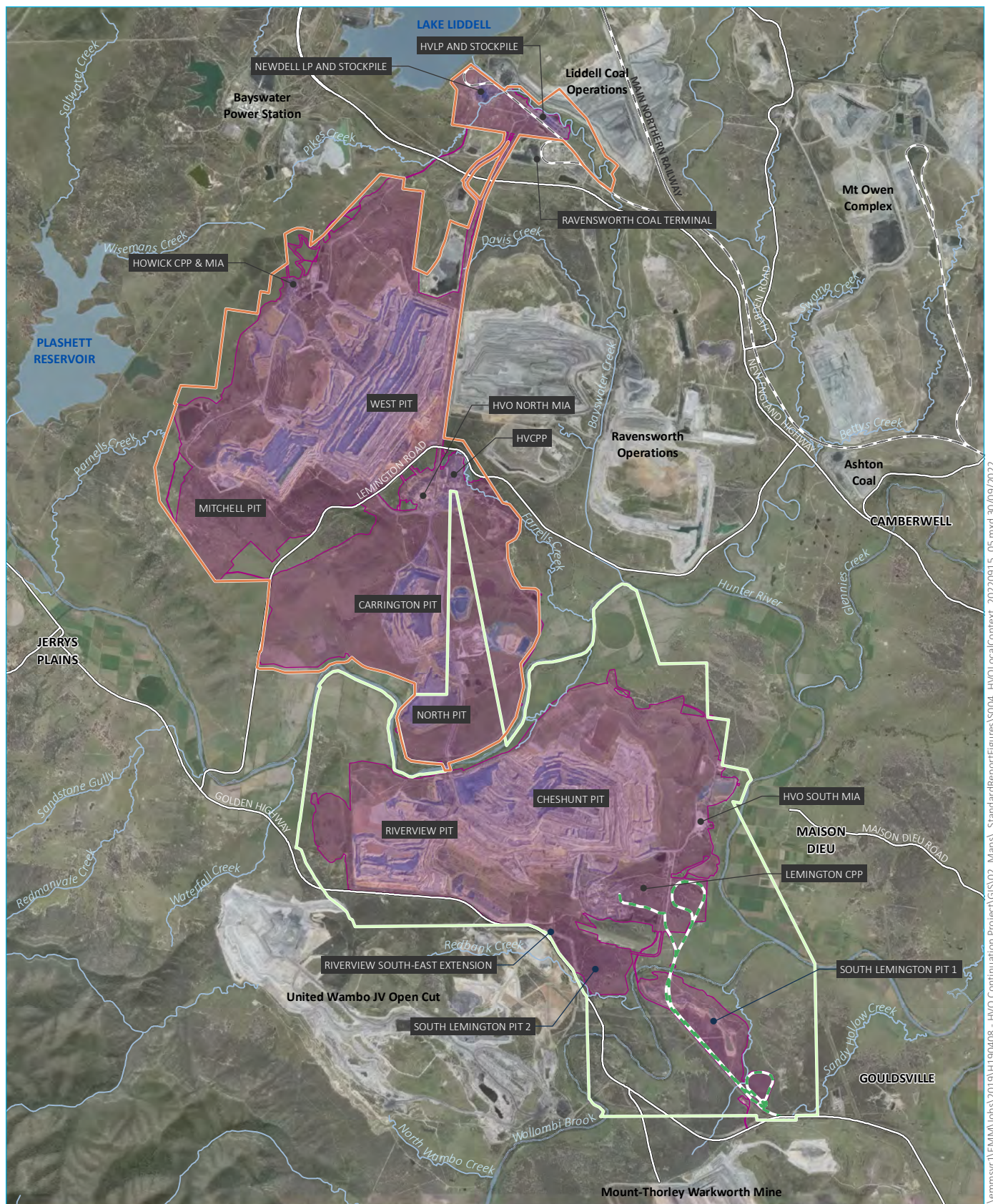


KEY

- 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
Noise Impact Assessment
Figure 1.1



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

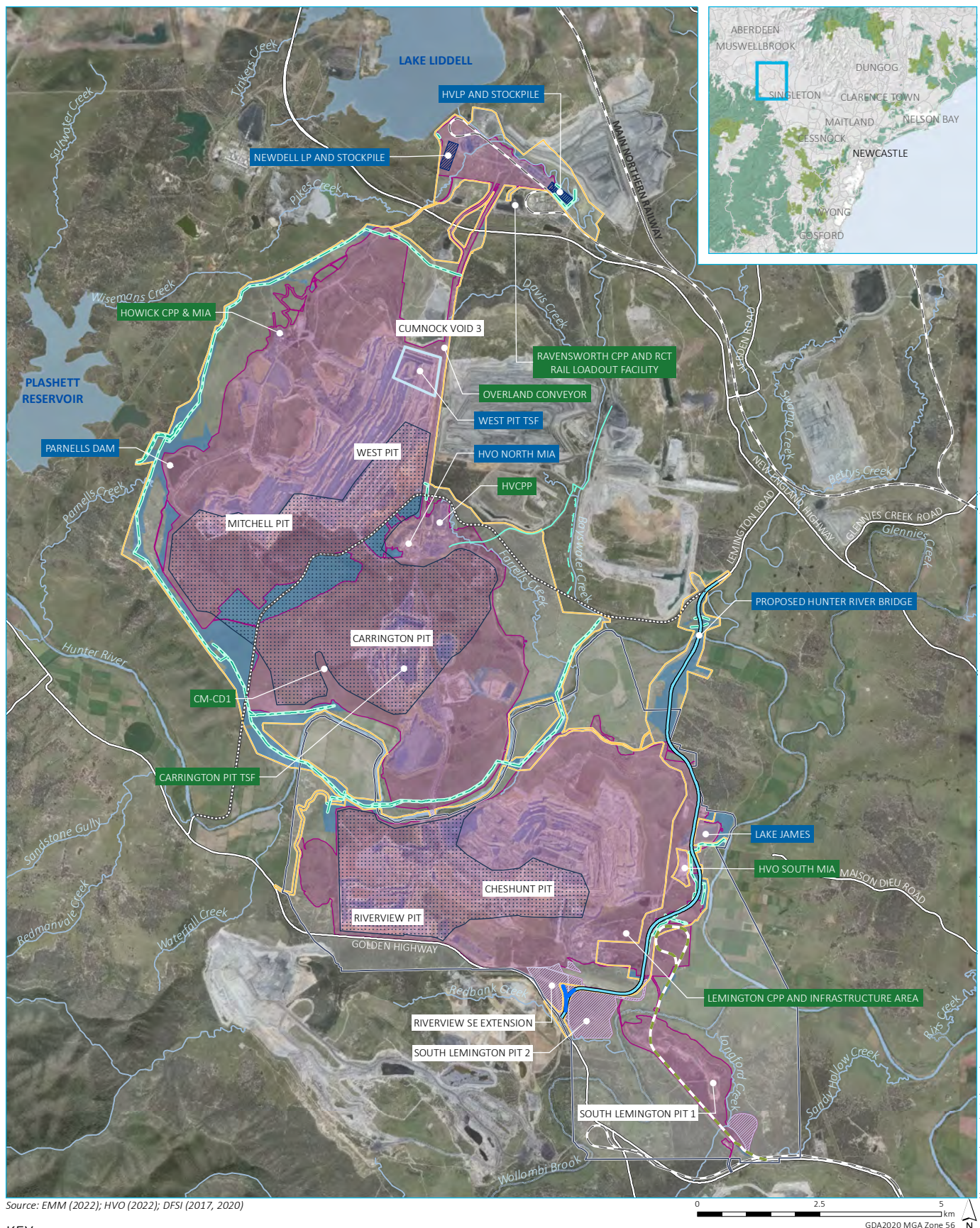
KEY

- 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
Noise Impact Assessment
Figure 1.2



KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Existing and approved disturbance area
- Previously approved area not retained
- 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
Noise Impact Assessment
Figure 1.3



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; however, are only approved to the base of the shallower Bayswater seam in the Carrington Pit;
- extraction of an additional approximate 400 Million tonnes (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 corridor is partly within the HVO South development consent boundary, the realignment is required to enable the progression of mining from the Mitchell and West Pits into the Carrington area 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 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 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;
 - upgrade of the existing Newdell LP train loading facility and construction of a new product stockpile; or
 - 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;
- progressive rehabilitation throughout the mine life; 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 road 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);
 - construction of the Cheshunt and Riverview flood protection levees;
 - realignment of transmission lines;
 - enlargement of Lake James 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;
 - 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. Progressive rehabilitation will be undertaken throughout the mine life.

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 for the Project include:

- 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 Project terminology

The following key terms are used throughout this assessment to describe the Project:

- **HVO Complex** – comprises both HVO North and HVO South operations.
- **The Project** – the Project in its entirety; 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 1.2
- **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 area** – Areas that are 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 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.

- **Proposed mining area, HVO North** – Areas where coal extraction will take place for the Project at HVO North and includes:
 - areas already disturbed by mining that will be re-disturbed to facilitate coal extraction in the deeper Barrett seam;
 - areas not previously approved for mining (eg the area between the Mitchell Pit and Carrington Pit); and
 - 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. 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 areas and form part of the Project.
- **Transmission line corridors** – Two categories of transmission line corridors have been defined for the purpose of quantifying the extent of disturbance for the Project:
 - realigned transmission lines (ie new transmission line easements) – the extent of disturbance will be limited to transmission line poles/towers and an access road for maintenance along the alignment, as well as vegetation management to maintain safe powerline clearance; and
 - existing transmission line easements to be decommissioned – disturbance will be confined to existing access tracks and cleared areas.
- **Realigned Lemington Road corridor** – The corridor extends from the 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 at a point approximately 2.3 km south of the 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 as approved under SSD 7142, and a second option that connects with the current alignment of the Golden Highway.
- **Project disturbance area** – this area is a combination of the additional disturbance area and the existing and approved disturbance area, 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 consents.

1.4 Assessment terminology and abbreviations

Some definitions of acoustic terminology which may be used in this document are as follows:

- **L_A** – the A-weighted root mean squared (RMS) noise level at any instant.
- **L_{A1}** – the noise level which is exceeded for 1% of the time.
- **L_{A1,1minute}** – corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms, this represents the maximum measured level, and is often used to assess sleep disturbance.
- **L_{A10}** – the noise level which is exceeded for 10% of the time, which is approximately the average of the maximum noise levels.

- **L_{A90}** – the level exceeded for 90% of the time, which is approximately the average of the minimum noise levels. The L_{A90} level is often referred to as the “background” noise level and is commonly used to determine noise criteria for assessment purposes.
- **L_{Aeq}** – the average noise energy during a measurement period.
- **dB(A)** – noise level measurement units are decibels (dB). The “A” weighting scale is used to describe human response to noise.
- **dB(C)** – noise level measurement units are decibels (dB). The “C” weighting scale is used as a measure of human response to high noise levels. It includes more of the low frequency range of sounds. It is often used to assess low frequency noise impact.
- **Sound power level (L_W denotes linear, L_{WA} denotes A-weighted)** – 10 times the logarithm of energy radiated from a source (as noise) divided by a reference power, the reference power being 1 picowatt.
- **Sound pressure level (L_p)** – fluctuations in pressure measured as 10 times a logarithmic scale, the reference pressure being 20 micropascals.
- **Hertz (Hz)** – cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together.
- **Assessment Background Level (ABL)** – the 10th percentile background noise level for a single period (day, evening or night) of a 24-hour monitoring period.
- **Rating Background Level (RBL)** – the background noise level for a period (day, evening or night) determined from ABL data.
- **Project Noise Trigger Level (PNTL)** – these are the benchmark levels above which noise management measures are required to be considered per the NPfI.
- **Achievable Noise Level (ANL)** – the limits determined when PNTLs are not met after consideration of all feasible and reasonable mitigation measures.
- **Noise Assessment Group (NAG)** – groups or areas of receptors, where each group is typically assessed against a singular criterion.

1.5 Purpose of the Report

1.5.1 Assessment requirements

This NIA has been prepared in accordance with requirements of the NSW Department of Planning and Environment (DPE). These were set out in the Secretary’s Environmental Assessment Requirements (SEARs) for the Project, issued on 11 March 2021. Table 1.1 lists individual requirements relevant to this NIA and where they are addressed in this report.

Table 1.1 Noise related SEARs

Requirements	Section Addressed
Noise and Blasting, including:	Section 4
A detailed assessment of the likely construction, operational and off- site transport noise impacts of the development in accordance with the Interim Construction Noise Guideline, NSW Noise Policy for Industry and the NSW Road Noise Policy respectively, and having regard to the Voluntary Land Acquisition and Mitigation Policy.	
Cumulative – including a detailed assessment of the cumulative impacts of the development, in combination with other existing and approved mining projects in the locality, with a particular focus on air quality, noise, traffic and social impacts, as well as impacts on water resources.	Section 4.8

To inform the preparation of the SEARs, DPE invited other government agencies to recommend matters to be addressed in the EIS. The NSW Environment Protection Authority (EPA) raised matters relevant to the NIA. The matters raised are listed in Table 1.2 and have been taken into account in preparing this assessment, as indicated in the table.

Table 1.2 NIA related EPA recommendations

Requirements	Section Addressed
Identify the existing noise environment (including any relevant noise assessment groupings) and identify applicable noise goals in line with relevant guidance/standards.	Section 3
Identify potential noise and vibration sources and impacts during both construction and operational stages and identify best practice mitigation measures (pollution control) and strategies to be incorporated for both stages to minimise noise and vibration emissions/impacts (with proposed timing), including validation monitoring, in line with relevant guidance/standards.	Potential sources, impacts and best practice measures in Section 4 Monitoring and management in Section 6
Propose representative noise monitoring locations for determining compliance with applicable noise goals and where relevant noise goals would be set as representative limits.	Section 6.2

Notes: 1. Blasting is not included within the scope of the NIA.

1.5.2 Noise impact assessment objectives

The primary objectives of this NIA are to:

- assess potential noise impact associated with the Project, including operational noise, construction noise, modifying factor adjustments, sleep disturbance, road traffic noise and rail noise;
- determine suitable criteria for each element of potential noise impact in accordance with relevant NSW guidelines and policies;
- identify and assess all reasonable and feasible noise mitigation controls and management strategies; and
- propose any necessary noise monitoring and management strategies.

2 Methodology

This section provides an overview of the methodology used to predict noise emissions from the Project, including how the effect of noise enhancing meteorological conditions are accounted for.

2.1 Policy and guidelines

NSW technical policy and guidelines relevant to the NIA include:

- *Noise Policy for Industry (NPfI)* (EPA 2017);
- *Interim Construction Noise Guideline (ICNG)* (DECCW 2009);
- *Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Developments (VLAMP)* (NSW Government 2018); and
- *Road Noise Policy (RNP)* (DECCW 2011).

In accordance with Section 2.2 of the NPfI and Appendix B2 of the RNP, all model predictions in this NIA are rounded to the nearest integer except change in road traffic noise for which the RNP requires results to one decimal place.

2.2 Operational noise

Consultation with the EPA and DPE was undertaken at times during the assessment process and helped determine whether the assessment methodology and pathway were satisfactory or required further consideration.

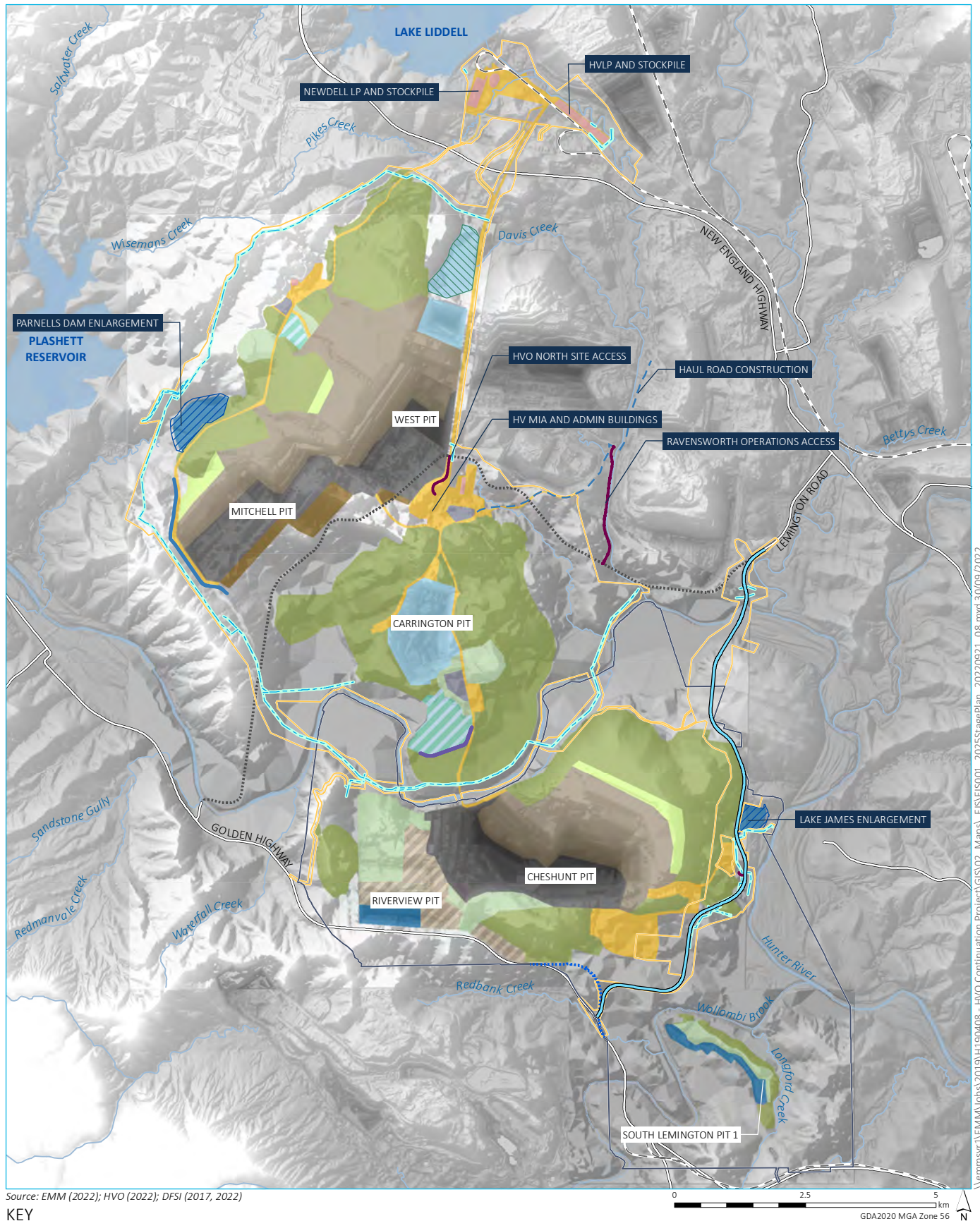
The operational noise assessment in this NIA is generally in accordance with the guidelines outlined in the NPfI. An exception is the cumulative distribution of results methodology, which was employed in lieu of the 'noise enhancing weather conditions' method outlined in the NPfI. The cumulative distribution method allows assessment of impact for a far more comprehensive set of meteorological conditions as discussed in Section 4.1.

Five indicative operational scenarios were modelled 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.

Each stage modelled is a representative typical worst case operating configuration for that period of operations. The stages nominally relate to Year 3, Year 7, Year 11, Year 18 and Year 22 of the Project. Year 3 is anticipated to be approximately 2025, subject to date of approval. Operational intrusive, cumulative, and modifying factor adjustments, and potential sleep disturbance impact associated with each of these stages is assessed. Further detail regarding the operating scenarios is provided in Section 4.2.2.

An assessment area was defined that encompasses all known private residential receptors that may be noise impacted by the Project.

Figure 2.1 to Figure 2.5 present conceptual mine plans for each of the five stages assessed.

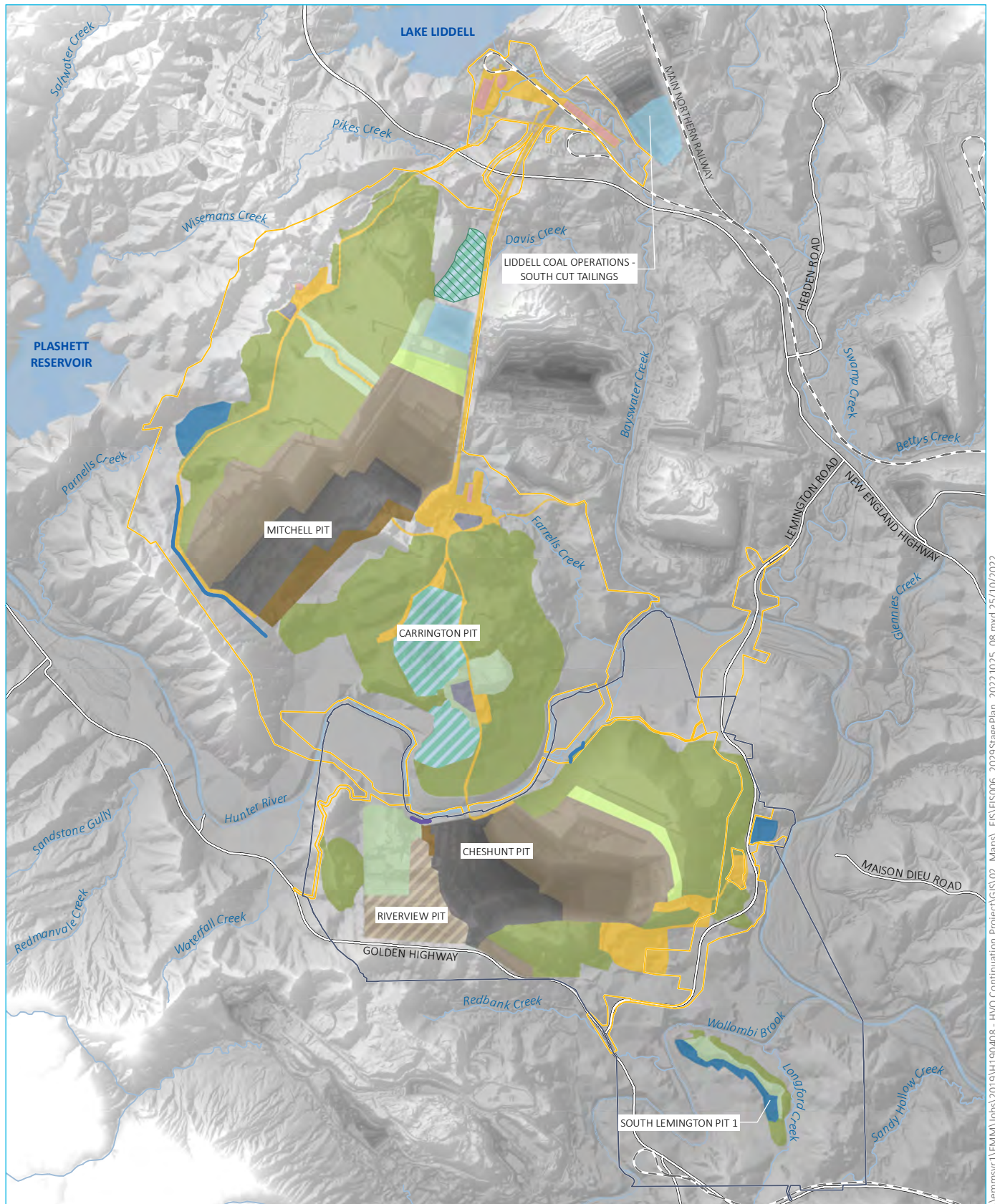


KEY

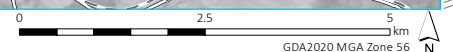
 HVO North proposed development consent boundary	 Cumnock Void 3 (managed by Ravensworth Operations)	 Shaping for final landform
 HVO South proposed development consent boundary	 Year 3 indicative mine plan	 Temporary stabilisation
 Lemington Road realignment	 Active emplacement area	 Water storage
 Mine access road	 Inactive emplacement area	 Existing environment
 Proposed haul route to Ravensworth Operations	 Active mining area	 Rail line
 Indicative location of public road closure	 Active tailings emplacement	 Major road
 Alternative Golden Highway alignment	 Inactive tailings emplacement/capping in progress	 Named watercourse
 Proposed transmission line relocation	 Infrastructure/access	 Named waterbody
 Water infrastructure	 Preparation area	
 Levee	 Product coal stockpile	
 Diversion drain	 ROM coal stockpile	
 Dam enlargement	 Rehabilitation	

Conceptual mine plan - year 3

HVO Continuation Project
Noise Impact Assessment
Figure 2.1



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

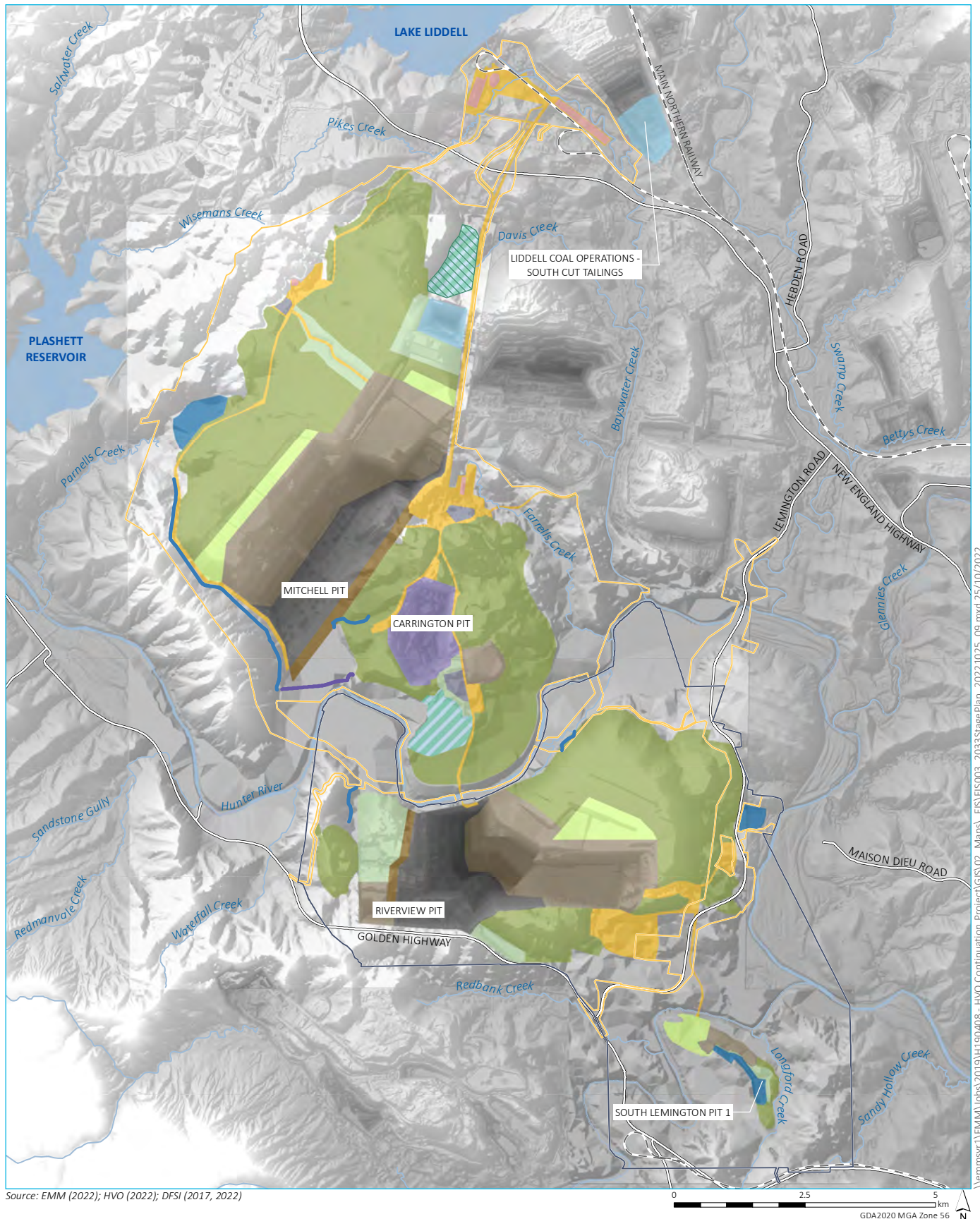


KEY

 HVO North proposed development consent boundary	 Active tailings emplacement	— Existing environment
 HVO South proposed development consent boundary	 Inactive tailings emplacement/capping in progress	— Rail line
 Water infrastructure	 Infrastructure/access	— Major road
 Levee	 Preparation area	— Named watercourse
 Diversion drain	 Product coal stockpile	 Named waterbody
 Cumnock Void 3 (managed by Ravensworth Operations)	 ROM coal stockpile	
Year 7 indicative mine plan	 Rehabilitation	
 Active emplacement area	 Shaping for final landform	
 Inactive emplacement area	 Temporary stabilisation	
 Active mining area	 Water storage	

Conceptual mine plan - year 7

HVO Continuation Project
Noise Impact Assessment
Figure 2.2



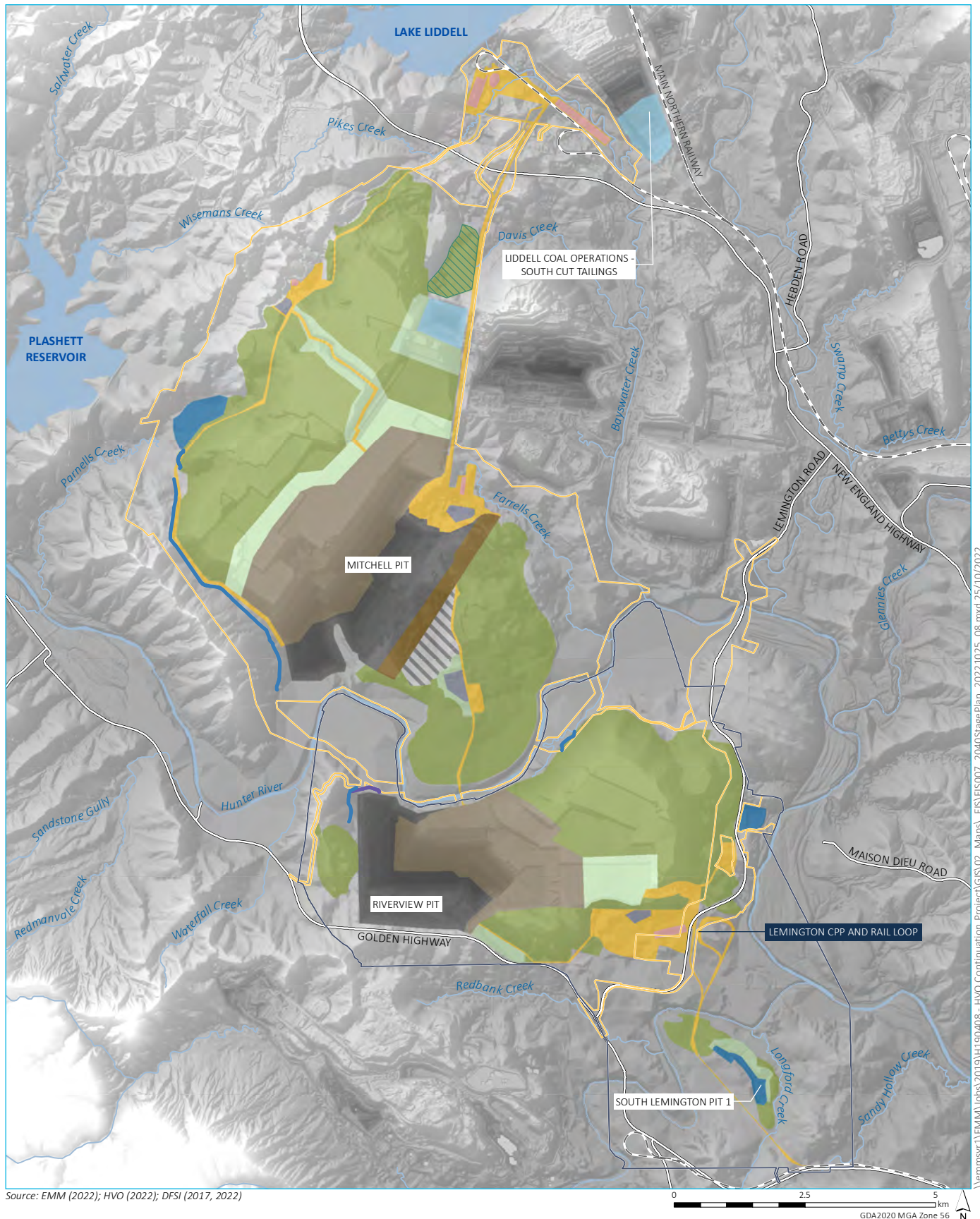
Source: EMM (2022); HVO (2022); DFSI (2017, 2022)

KEY

 HVO North proposed development consent boundary	 Inactive tailings emplacement/capping in progress	 Existing environment
 HVO South proposed development consent boundary	 Carrington Pit tailings recovery	 Rail line
Water infrastructure	 Infrastructure/access	 Major road
 Levee	 Preparation area	 Named watercourse
 Diversion drain	 Product coal stockpile	 Named waterbody
 Cumnock Void 3 (managed by Ravensworth Operations)	 ROM coal stockpile	
Year 11 indicative mine plan	 Rehabilitation	
 Active emplacement area	 Shaping for final landform	
 Active mining area	 Temporary stabilisation	
 Active tailings emplacement	 Water storage	

Conceptual mine plan - year 11

HVO Continuation Project
Noise Impact Assessment
Figure 2.3

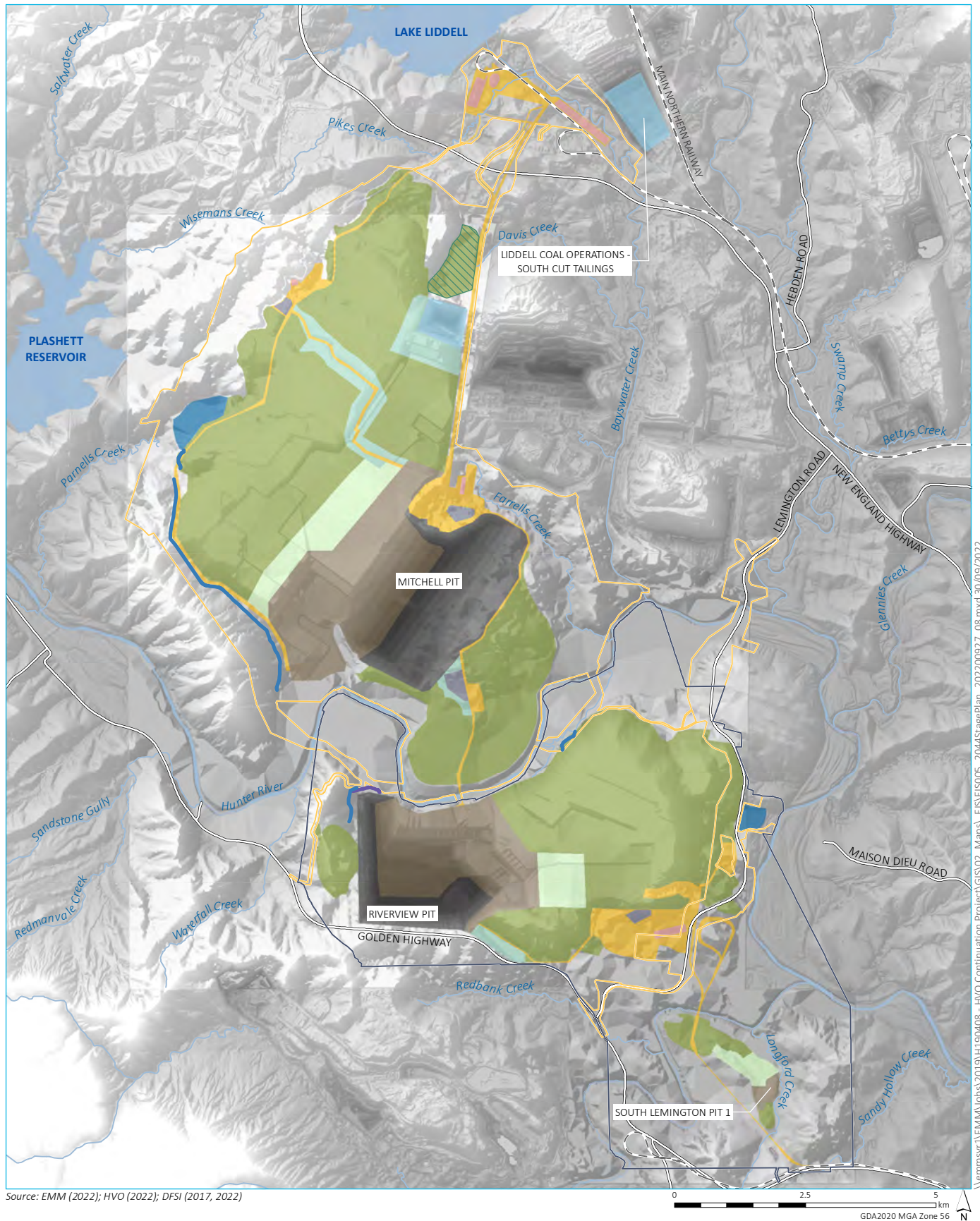


KEY

- HVO North proposed development consent boundary - HVO South proposed development consent boundary - Cumnock Void 3 (managed by Ravensworth Operations)	- 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
- Water infrastructure - Levee - Diversion drain		
- Year 18 indicative mine plan - Active emplacement area - Active mining area - Inactive mining area		

Conceptual mine plan - year 18

HVO Continuation Project
Noise Impact Assessment
Figure 2.4



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
Noise Impact Assessment
Figure 2.5

2.3 Construction noise

Construction noise in NSW is typically regulated in accordance with the ICNG. However, the ICNG states it is not applicable to construction associated with mining and quarrying activities, which it states should be assessed in accordance with the INP. However, the INP and more recent NPfI specifically exclude construction noise. Due to the lack of clear guidance in NSW guidelines as to how construction noise for mining should be assessed, it has become common practice for this to be assessed in accordance with the ICNG. Furthermore, the SEARS for this project specifically reference the ICNG as being applicable for assessment of construction noise. Therefore, assessment of construction noise impact has been conducted generally in accordance with the ICNG.

The EPA has prepared a Draft Construction Noise Guideline (DCNG), which at the time of writing is currently under review following a period of public consultation. Appendix A of the DCNG specifically addresses assessment of construction noise from mining and other extractive industries. While not yet a current guideline, the general approach for considering construction tasks associated with mining operations described in Appendix A of the DCNG has been adopted as it represents best practice and is consistent with recent contemporary NIA approaches. Activities that comprise the initial construction phase of the Project that are both temporary and facilitate mine operations are assessed as construction tasks and are evaluated against construction noise management levels presented in the ICNG. Longer term activities such as establishing internal haul roads are considered part of the ongoing operation of the mine rather than construction tasks and are therefore assessed against operational noise criteria.

Table 2.1 lists primary construction tasks proposed for the Project and the mine they are associated with (ie HVO North or HVO South).

Table 2.1 Proposed construction activities

HVO North	HVO South
Lemington Road realignment	Lake James enlargement
Transmission line relocations	Lemington CPP and Rail
Parnells Dam enlargement	Cheshunt flood protection levee
West Pit TSF	Riverview flood protection levee
HVO North site access	
Haul road to Ravensworth Operations	
Diversion drains	
Tailings pipelines and pumps	
Additional mine water/sediment dams	
HV MIA, admin building etc	
Newdell LP upgrade	
HVLP product stockpile extension	
Pumping infrastructure	
Carrington West Wing levee	

Notes: 1. Blue highlight indicates construction activities quantitatively assessed.

Each of the activities listed in Table 2.1 are both temporary and necessary to facilitate mine operations and meet the description of 'defined activities' that may be assessed as construction noise per Appendix A of the Draft Construction Noise Guideline. Of these, tasks highlighted blue have the greatest potential to cause construction noise impact and have therefore been quantitatively assessed. The remaining tasks occur well within the Project boundaries, have relatively low noise emissions and/or are at sufficient distance from private residential receptors that noise emissions would be relatively inconsequential and lower than predicted for the modelled activities.

Worst case construction scenarios were assessed and a construction noise impact assessment, prepared in accordance with the ICNG, is provided in Section 4.5 of this report.

2.4 Road traffic noise

No change in annual workforce numbers or associated traffic generation with the ongoing operation of the Project is proposed. As there is no change to operational road traffic volumes associated with the Project no change in operational road traffic noise should occur except for the case of the proposed realignment of Lemington Road.

Proposed construction activities will generate additional road traffic on the local road network during the construction phase. A quantitative road traffic noise assessment has been prepared using projected construction traffic volumes presented in the Traffic and Transport Impact Assessment (TTIA) report titled *Hunter Valley Operations Continuation Project Traffic and Transport Impact Report* (WSP 2022).

New England Highway and Golden Highway traffic noise increases during the Project construction phase were evaluated in relation to the associated change in traffic volumes. Construction traffic accessing the Project via Comleroi Road was not assessed as the nearest private residential receptors are situated more than twice the maximum distance at which the RNP considers road traffic might be an issue (ie within 600 m).

Road traffic on the proposed realignment of Lemington Road is similarly distant to the nearest private residential receptors in Maison Dieu as Comleroi Road such that road traffic noise does not need to be considered. However, a quantitative road traffic noise impact assessment has been prepared using projected traffic volumes presented in the TTIA as some Maison Dieu residents have expressed concerns about this. Noise levels were predicted using CadnaA Traffic Noise Model software implementing the TNM algorithm.

Typical worst-case peak hourly traffic volumes for construction traffic on all roads and for use of the Lemington Road realignment are included in Section 4.9 of this report.

2.5 Rail noise

The Project proposes to continue to transport coal from the site via rail to the Port of Newcastle, to deliver coal to export customers. The Project does not propose any changes to the existing demand on the rail network or the Newcastle Port. Coal will be transported in accordance with existing agreements with rail providers and the Newcastle Port. As such, there is no further consideration of this within the NIA.

2.6 Noise modelling methodology

Construction and operational noise levels were predicted using RTA Technology's Environmental Noise Model (ENM), a computer based environmental noise model. ENM is approved by the DPE and EPA as suitable for prediction of industrial noise involving large propagation distances and is currently the industry standard for NIA of this nature. The model considers geometric spreading, atmospheric absorption, and barrier and ground attenuation. ENM Terrain Category 2, representing a rural land environment, was adopted for model input.

Potential impacts were evaluated using the cumulative distribution of results methodology. This method determines a noise level that is likely to be exceeded 10% of the time in each of the four seasons. A range of results is calculated for a comprehensive set of meteorological conditions, and frequency of occurrence of each of these meteorological conditions is determined from historical meteorological data. The cumulative distribution of these results is analysed to establish a single value for comparison with the limiting criterion. It is considered appropriate to use the 90th percentile result (10 percent of results are higher than this number) to represent intrusive noise impact. Results provided are 90th percentile L_{Aeq} values; that is, a range of L_{Aeq} results (260 meteorological conditions) have been calculated for each receptor, and the 90th percentile L_{Aeq} has been determined based on the percentage distribution of meteorological conditions. Appendix E lists the 260 meteorological conditions included in this assessment.

Shorter duration weather conditions that increase noise may be an insignificant percentage of time if the assessment is based on annual distribution of meteorological conditions. Therefore, results are determined for each season and the worst-case season result is adopted as the predicted level; the worst-case season may not be the same for each receptor or receptor area.

This methodology requires more calculation than would a procedure involving a smaller set of prevailing meteorological parameters (ie NPfI noise enhancing conditions) but represents best available technology and is, in our opinion, one of the most comprehensive methods available to estimate the range of likely noise levels for a receptor. The NPfI procedures only require assessment of potentially enhancing meteorological conditions if they occur more than 30% of a time period (day, evening and night) in any season. This could mean conditions that enhance noise and result in unacceptably high levels, and which may occur for significant periods of time (right up to 30%), are not assessed.

On the other hand, the cumulative distribution method results in a level being calculated for all possible meteorological conditions. The range of wind speed, wind direction and stability class combinations is actually infinite in the real world. For the purpose of modelling, this has been broken down into 260 conditions, which can be considered to be a comprehensive analysis. Using historical meteorological data, the percentage of time each condition may occur per period and season is known. For any mining scenario modelled it is then possible to determine the likely percentage occurrence of any noise level. Further, the likely percentage of time a criterion might be exceeded can also be estimated.

2.7 Mine plan development

Modelling for this NIA commenced as part of the initial constraints analysis phase of the Project. Noise modelling was undertaken during this phase to assist HVO in the planning and development of Project mine plans to ensure that noise impacts were considered and minimised as far as practicable. Since that time, numerous major and minor mine plan and model iterations have been undertaken to achieve the outcomes presented in this report. Extensive analysis and identification of alternative haulage routes, key contributing equipment, and high and low impact mining areas were all considered. An additional sound power testing campaign was completed so that plant-based mitigation was considered where most appropriate. A series of noise controls and management strategies were then developed to ensure all reasonable and feasible mitigation controls were considered and included in the development of the Project mine plan and modelling process. Further detail regarding reasonable and feasible mitigation controls is included in Section 4.2.4 of this report.

2.8 Noise contours

Noise contours were produced over the assessment area to provide a visual representation of the model results. It should be noted that noise contours are based on interpolation of results determined for individual points, and as such are indicative, and are included for presentation purposes only.

3 Criteria

3.1 Existing acoustic environment

3.1.1 Overview

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, south-east and south-west of the HVO Complex.

Surrounding mines include Liddell Coal Operations, Ravensworth Operations, Ashton, United Wambo, Wambo Underground Mine, Mount Thorley and Warkworth mines. Bayswater and Liddell power stations are to the north-west. Major roads near HVO include the New England Highway and the Golden Highway located immediately to the east and west of the Project, respectively. Other land uses in the area include agriculture, mine-owned buffer land, biodiversity offsets, Crown land, national park, and rural residential areas. Grazing and cropping land are to the north-east of HVO South and west of HVO North. Mount Thorley and Warkworth mines northern and southern biodiversity offset areas are immediately to the east and south of HVO South and to the east and west of HVO North are the Ravensworth Operations and HVO Wandewoi biodiversity offset areas, respectively. The Wollemi National Park is approximately 5 km south-west of the HVO Complex. There are limited private residences in close proximity to the Project, with the closest residences at Maison Dieu to the east, Long Point/Gouldsville to the south-east, Camberwell to the north-east and Jerrys Plains to the west.

The nearest private sensitive receptors are shown in Figure 3.1.

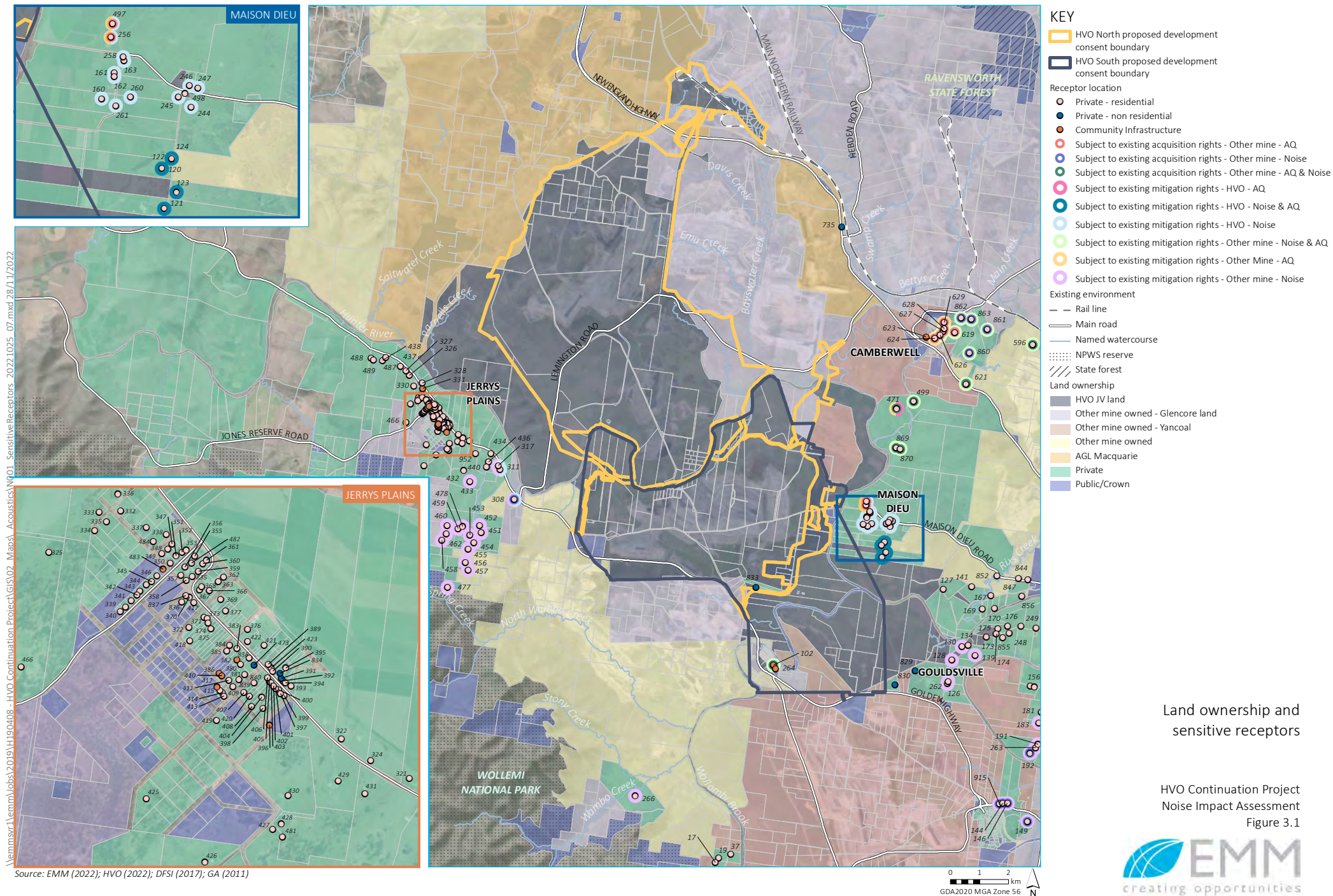
3.1.2 Background noise levels

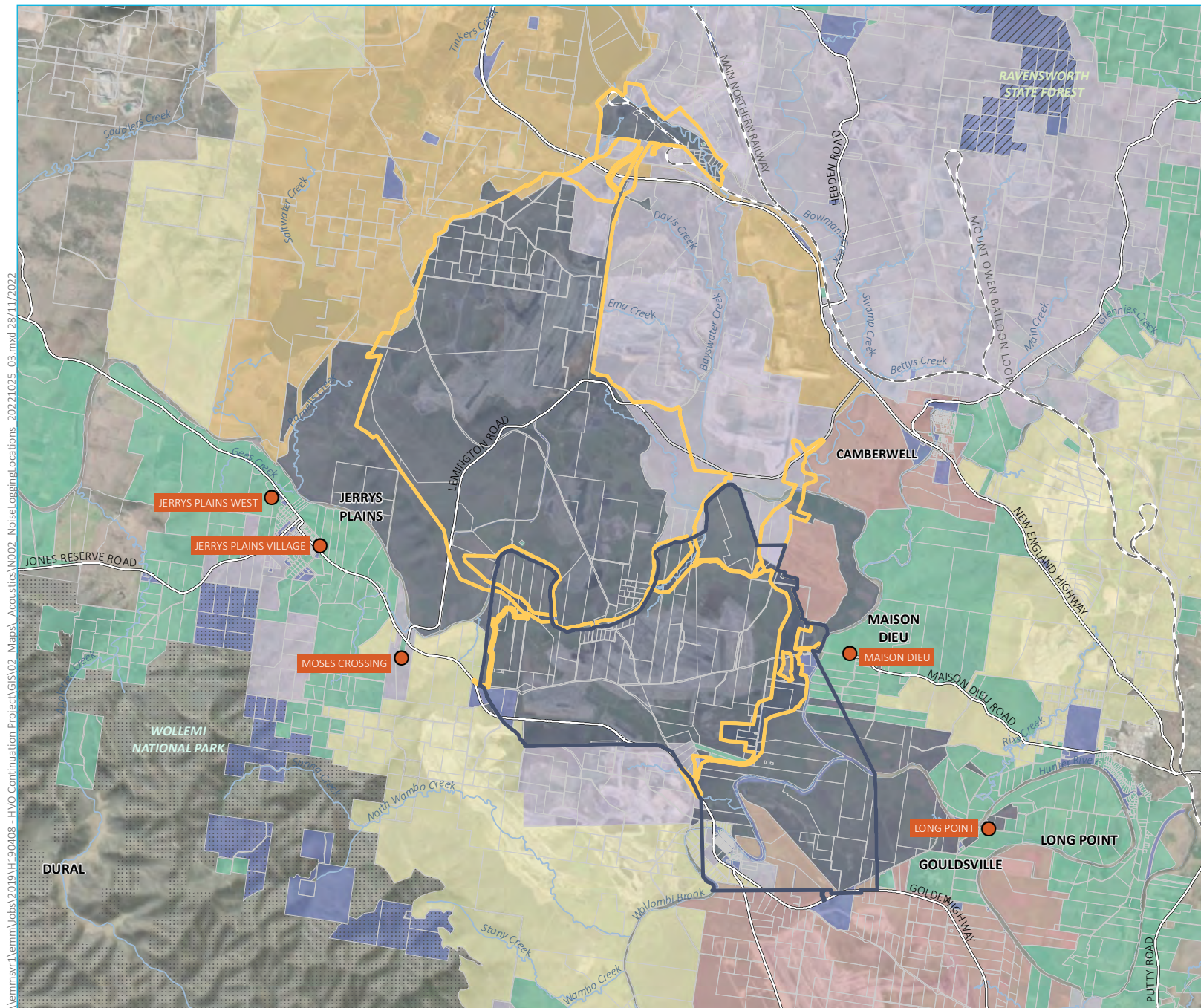
Background noise surveys were conducted to determine Rating Background levels (RBL) in receptor areas around the HVO Complex (refer to Section 3.3 for discussion on identifying noise assessment groups (NAGs) for the Project). The surveys were conducted using ARL Ngara noise loggers and the existing real-time noise monitoring units at locations as detailed in Table 3.1. 12 month data sets from the Sentinex monitor at Moses Crossing and the Environmental Noise Compass in Maison Dieu were used to determine RBL at these locations. All the Ngara units positioned adjacent to HVO real-time units were placed under the real-time microphones at a height of 1.5 metres above ground. Survey locations are shown in Figure 3.2. Appendix G provides graphical representation of the measured levels.

Table 3.1 Logging locations

Logging locality	Location description	Representative noise assessment group
Maison Dieu	HVO Environmental Noise Compass	1A, 1B and 1C
Long Point	Adjacent to the HVO Barnowl	2
Moses Crossing	United Wambo Sentinex SX17 unit	3
Jerrys Plains Village	Adjacent to the HVO Environmental Noise Compass	5A
Jerrys Plains West	2755 Jerrys Plains Road, Jerrys Plains	5B

A background noise survey was not conducted at Redmanvale Road (NAG 4) as background levels are likely to be less than the NPfl default minimum RBLs. The NPfl default minimum RBLs have been adopted for this NAG.





- KEY**
- Noise logging location
 - HVO North proposed development consent boundary
 - HVO South proposed development consent boundary
 - Existing environment
 - Rail line
 - Main road
 - Named watercourse
 - NPWS reserve
 - State forest
 - Land ownership
 - HVO JV land
 - Other mine owned - Glencore land
 - Other mine owned - Yancoal
 - Other mine owned
 - AGL Macquarie
 - Private
 - Public/Crown

Noise logging locations

HVO Continuation Project
Noise Impact Assessment
Figure 3.2



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

GDA2020 MGA Zone 56

Table 3.2 presents the RBLs determined as outlined in NPfI Section B1.3. The RBLs have been used to derive relevant noise goals for the Project in accordance with the NPfI and ICNG.

Table 3.2 Background noise monitoring results summary

NAG	Locality	RBL L _{A90} dB		
		Day	Evening	Night
1A, 1B and 1C	Maison Dieu	31	32	33
2	Long Point	34	30	31
3	Moses Crossing	36	37	33
5A	Jerrys Plains Village	36	33	32
5B	Jerrys Plains West	33	28	27

3.2 Existing project approvals

3.2.1 Development consents

Noise impacts around HVO are addressed in the two most recent development consents detailed below in Table 3.3. It is noted that this assessment is the first time HVO has been required to be assessed under the NPfI.

Table 3.3 Applicable consents for HVO

Report Descriptor	Development Consent/Project Approval	Applicable Pits
HVO North	Development Consent 450-10-2003	West Pit, Mitchell Pits, Carrington Pit and North Pit
HVO South	Project Approval 06_0261	Cheshunt Pit, Riverview pits, Riverview South East Extension, South Lemington Pits 1 and 2

3.2.2 Environment Protection Licence

HVO holds Environment Protection Licence (EPL) No. 640 issued by the EPA, most recently in March 2022. Noise requirements are detailed in L5 of the licence.

3.2.3 Current approved operational noise criteria

Table 3.4 provides a summary of the noise limits under the current HVO development consent/project approval and EPL for the key receptor areas around the HVO Complex. Many private residential receptors are not listed in the current consents, so tabulated criteria are based on the receptors that are listed, which are generally representative of neighbouring receptors. A range is provided where criteria are variable within a NAG which is because in some cases consent and EPL limits are different for the same receptor or, consent limits vary across the NAG. Limits also vary between HVO North and South consents. The EPL includes inconsistent criteria for some receptors, only those in the first eight rows of the table in licence condition L5.1 have been considered. The higher criterion listed is usually representative of the most affected receptors within the NAG.

Table 3.4 Current consent and EPL operational noise criteria – $L_{Aeq,15\text{minute}}$ dB

NAG	Locality	Lowest Criterion			Highest Criterion		
		Day	Evening	Night	Day	Evening	Night
1A	Shearers Lane and Northern receptors in Maison Dieu area	41	41	41	41	41	41
1B	Knodlers Lane and Southern receptors in Maison Dieu area	40	40	40	40	40	40
1C	North western receptors in Maison Dieu area	39	39	39	39	39	39
2	Long Point	35	35	35	37	37	37
3	Jerrys Plains South/Moses Crossing	35	35	35	40	40	40
4	Redmanvale Road	35	35	35	35	35	35
5A	Jerrys Plains Village	40	40	40	40	40	40
5B	Jerrys Plains West	35	35	35	40	40	40

3.2.4 Compliance history

Compliance monitoring for HVO has comprised routine monthly surveys. An assessment of recent monitoring data from 2016 up to and including 2021 demonstrates that operations have predominately been compliant with noise criteria. Non-compliant measurements account for a small percentage of the monitoring dataset. These are shown in Table 3.5, Table 3.6, Table 3.7 and Table 3.8. These tables also show no sustained exceedances. There have been no measured noise non-compliances in 2022 to 31 August and the last $L_{Aeq,15\text{minute}}$ non-compliance was in May 2019.

Table 3.5 Summary of noise measurements for HVO North (2016–2021)

Total measurements ($L_{Aeq,15\text{minute}}$)	675
Total measurements ($L_{A1,1\text{minute}}$)	668
Total number of non-compliances ($L_{Aeq,15\text{minute}}$)	4
Total number of non-compliances ($L_{A1,1\text{minute}}$)	Nil
Percentage of non-compliant measurements ($L_{Aeq,15\text{minute}}$)	0.6%
Percentage of non-compliant measurements ($L_{A1,1\text{minute}}$)	0%

Table 3.6 Summary of noise measurements for HVO South (2016–2021)

Total measurements ($L_{Aeq,15\text{minute}}$)	626
Total measurements ($L_{A1,1\text{minute}}$)	641
Total number of non-compliances ($L_{Aeq,15\text{minute}}$)	4
Total number of non-compliances ($L_{A1,1\text{minute}}$)	6

Table 3.6 Summary of noise measurements for HVO South (2016–2021)

Percentage of non-compliant measurements ($L_{Aeq,15\text{minute}}$)	0.6%
Percentage of non-compliant measurements ($L_{A1,1\text{minute}}$)	0.9%

Table 3.7 Yearly breakdown of noise measurements for HVO North

	2016	2017	2018	2019	2020	2021
Total measurements ($L_{Aeq,15\text{minute}}$)	109	110	107	110	119	120
Total measurements ($L_{A1,1\text{minute}}$)	109	110	108	110	111	120
Total number of non-compliances ($L_{Aeq,15\text{minute}}$)	1	0	3	0	0	0
Total number of non-compliances ($L_{A1,1\text{minute}}$)	0	0	0	0	0	0
Percentage of non-compliant measurements ($L_{Aeq,15\text{minute}}$)	0.9%	0%	2.8%	0%	0%	0%
Percentage of non-compliant measurements ($L_{A1,1\text{minute}}$)	0%	0%	0%	0%	0%	0%

Table 3.8 Yearly breakdown of noise measurements for HVO South

	2016	2017	2018	2019	2020	2021
Total measurements ($L_{Aeq,15\text{minute}}$)	109	100	108	101	99	109
Total measurements ($L_{A1,1\text{minute}}$)	109	110	108	106	99	109
Total number of non-compliances ($L_{Aeq,15\text{minute}}$)	2	1	0	1	0	0
Total number of non-compliances ($L_{A1,1\text{minute}}$)	4	0	1	0	0	0
Percentage of non-compliant measurements ($L_{Aeq,15\text{minute}}$)	1.8%	1%	0%	0.9%	0%	0%
Percentage of non-compliant measurements ($L_{A1,1\text{minute}}$)	3.6%	0%	0.9%	0%	0%	0%

3.3 Land ownership and receptors

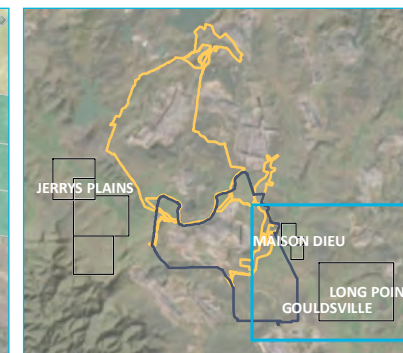
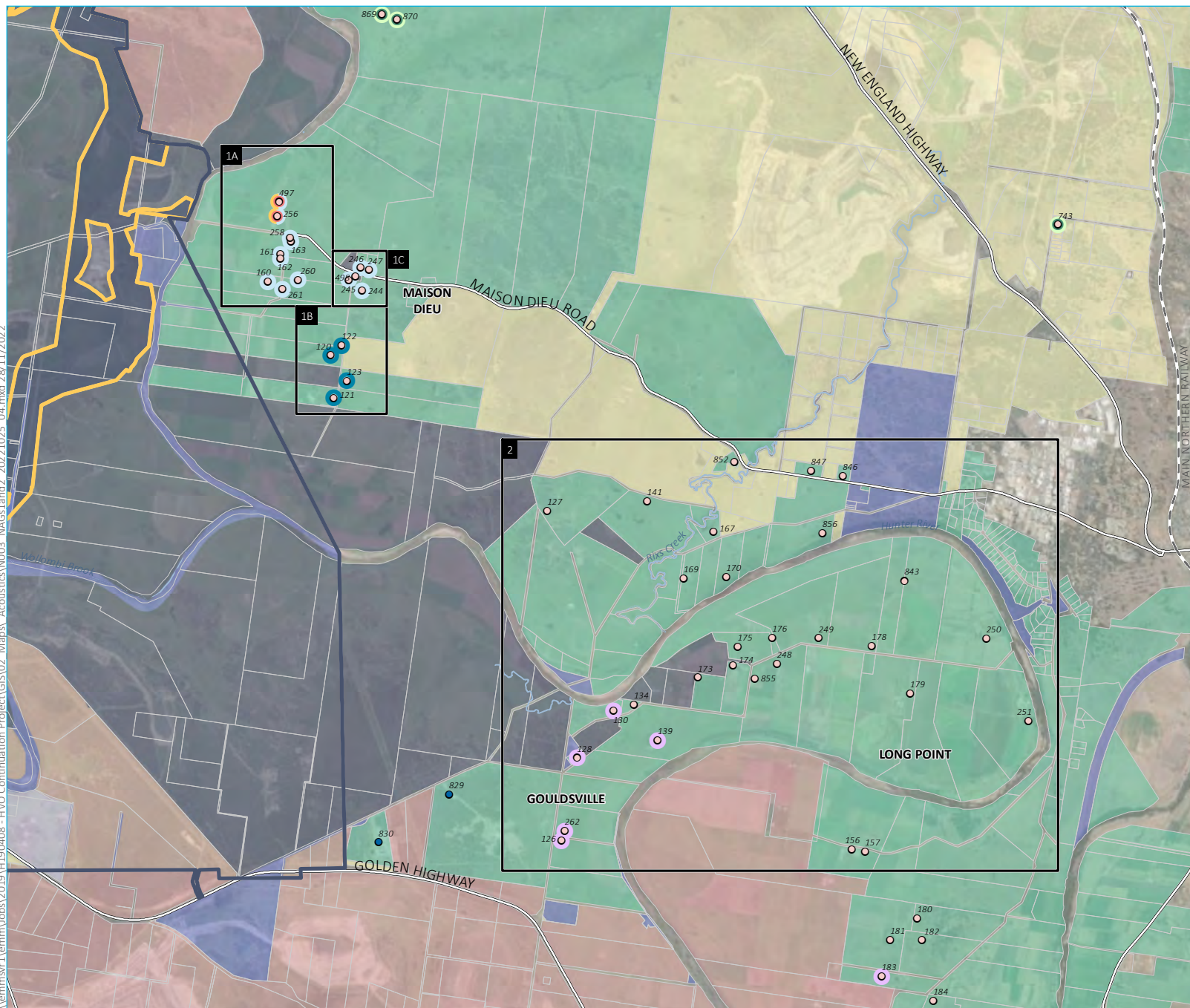
A review of logger survey data, historical attended monitoring results and existing noise monitoring groups as per the HVO EPL indicated that eight noise assessment groups (NAGs) should be established for the Project. The primary objective of NAGs is to classify receptors into groups, where each group can be represented by a single background noise level and, hence, assessed against a singular criterion. NAG identifiers and their localities are detailed in Table 3.9 and shown in Figure 3.3 and Figure 3.4.

Table 3.9 **Noise assessment groups**

NAG	Locality
1A	Shearers Lane and northern receptors in Maison Dieu area
1B	Knodlers Lane and southern receptors in Maison Dieu area
1C	North western receptors in Maison Dieu area
2	Long Point
3	Jerrys Plains South/Moses Crossing
4	Redmanvale Road
5A	Jerrys Plains Village
5B	Jerrys Plains West

All known private residential receptors that may be impacted by noise from the Project were assessed. Non-residential privately owned receptors such as schools, recreational sites, churches, industrial and commercial receptors were also assessed against appropriate amenity noise levels from Table 2.2 of the NPfI. Details of all assessed receptors are included in Appendix F. In accordance with the NPfI, this assessment considers only privately-owned residences; mine owned receptors have not been considered as assessment locations.

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KEY

- Noise assessment group
- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Receptor location**
 - Private - residential
 - Private - non residential
 - Subject to existing acquisition rights - Other mine - AQ
 - Subject to existing acquisition rights - Other mine - AQ & Noise
 - 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
- Existing environment**
 - Rail line
 - Main road
 - Named watercourse
- Land ownership**
 - HVO JV land
 - Other mine owned - Glencore land
 - Other mine owned - Yancoal
 - Other mine owned
 - AGL Macquarie
 - Private
 - Public/Crown

NAGs 1A, 1B, 1C and 2

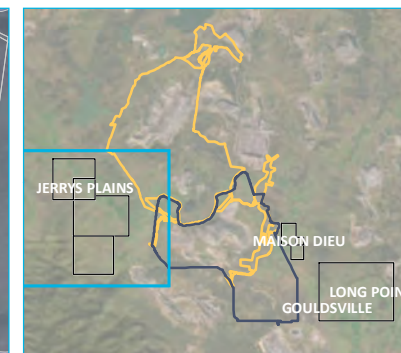
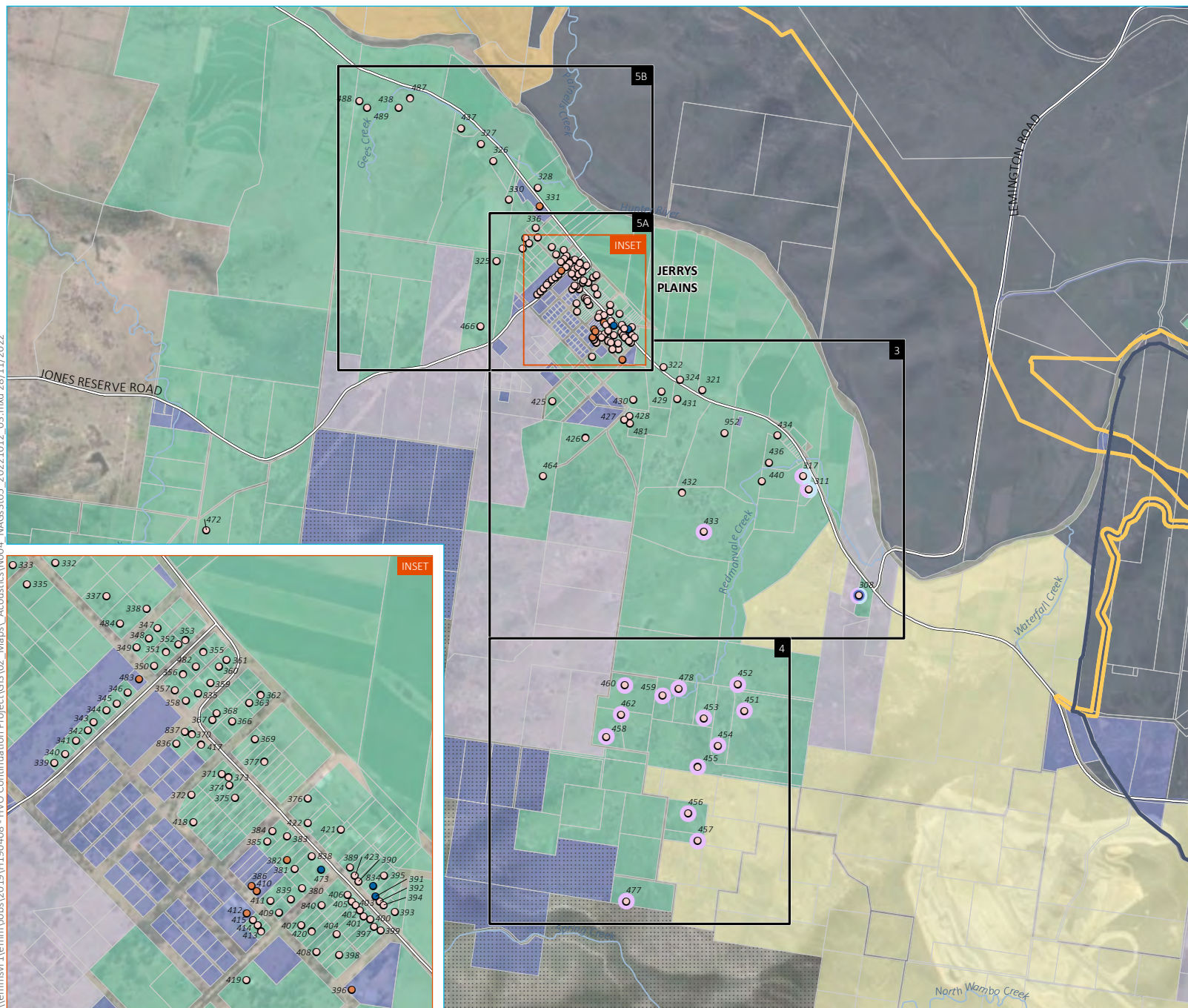
HVO Continuation Project
Noise Impact Assessment
Figure 3.3



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



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KEY

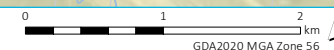
- Noise assessment group
- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Receptor location
 - Private - residential
 - Private - non residential
 - Community Infrastructure
 - Subject to existing acquisition rights - Other mine - Noise
 - Subject to existing mitigation rights - HVO - Noise
 - Subject to existing mitigation rights - Other mine - Noise
- Existing environment
 - Main road
 - Named watercourse
 - NPWS reserve
- Land ownership
 - HVO JV land
 - Other mine owned - Glencore land
 - Other mined owned
 - AGL Macquarie
 - Private
 - Public/Crown

NAGs 3, 4, 5A and 5B

HVO Continuation Project
Noise Impact Assessment
Figure 3.4



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



3.4 Operational noise assessment levels

Section 2 of the NPfI outlines the procedure to determine Project Noise Trigger Levels (PNTL) relevant to a particular industrial development and applying it to existing noise-sensitive receivers. If it is predicted that the development is likely to cause 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.

The NPfI states:

The project noise trigger level provides a benchmark or objective for assessing a proposal or site. It is not intended for use as a mandatory requirement. The project noise trigger level is a level that, if exceeded, would indicate a potential noise impact on the community, and so 'trigger' a management response; for example, further investigation of mitigation measures.

The project noise trigger level, feasible and reasonable mitigation, and consideration of residual noise impacts are used together to assess noise impact and manage the noise from a proposal or site. It is the combination of these elements that is designed to ensure that acceptable noise outcomes are determined by decision makers.

The NPfI also states:

Where a project noise trigger level is exceeded, assess the feasible and reasonable mitigation measured that could be implemented to reduce noise down towards the relevant project noise trigger level. If it is reasonable to achieve these levels, the proponent should do so. If not, then achievable noise levels should be identified. It is not mandatory to achieve the trigger levels but the assessment should provide justification if they cannot be met. An assessment of the acceptability of residual impacts should also be provided.

The key point in these extracts is that PNTL are not mandatory but are intended to be an initial screening trigger to determine if further noise controls and/or management measures need to be considered. Once all reasonable and feasible mitigation controls are determined and implemented/applied, an assessment of the significance of residual noise impacts can be made in accordance with Section 4 of the NPfI.

The PNTL is the lower (that is, the more stringent) value of the project intrusiveness noise level and project amenity noise level.

Project intrusiveness noise levels aim to protect against significant changes in noise levels relative to existing background levels. Project amenity noise levels seek to protect against cumulative noise impacts from industry and maintain amenity for particular land uses. Applying the most stringent requirement as the PNTL ensures that both intrusive noise is limited, and amenity is protected in such a way that no single industry can unacceptably change the noise level of an area.

3.4.1 Project intrusiveness noise levels

The intrusiveness noise level is expressed as:

$$L_{Aeq,15minute} = \text{Rating Background Level} + 5 \text{ dB}$$

Where:

- $L_{Aeq,15minute}$ represents the equivalent continuous (energy average) A-weighted sound pressure level of the source over 15 minutes; and
- RBL represents the background level to be used for assessment purposes.

Default minimum background levels and project intrusiveness noise levels for private residential receptors are discussed in Section 3.1.

Intrusive noise levels are only applied to residential receptors (residences). For other receptor categories, recommended amenity noise levels apply.

3.4.2 Recommended amenity noise levels

Table 2.2 of the NPfl provides recommended amenity noise levels for various land uses. Where the existing noise level from industrial sources approaches the recommended amenity noise level, noise from new sources must be limited to protect the amenity of the area. Recommended amenity noise levels are intended to protect community against noise impacts such as speech interference, annoyance, and some sleep disturbance. Ambient noise levels within an area from all industrial noise sources combined should remain below recommended amenity noise levels where feasible and reasonable.

Table 2.3 of the NPfl provides guidance on assigning residential receptor noise categories. Private residential receptors in the assessment area are categorised rural residential in accordance with Table 2.3, the relevant section of which is reproduced below.

Receiver category	Typical planning zoning – standard instrument*	Typical existing background noise levels	Description
Rural residential	RU1 – primary production RU2 – rural landscape RU4 – primary production small lots R5 – large lot residential E4 – environmental living	Daytime RBL <40 dB(A) Evening RBL <35 dB(A) Night RBL <30 dB(A)	Rural – an area with an acoustical environment that is dominated by natural sounds, having little or no road traffic noise and generally characterised by low background noise levels. Settlement patterns would be typically sparse. Note: Where background noise levels are higher than those presented in column 3 due to existing industry or intensive agricultural activities, the selection of a higher noise amenity area should be considered.

The assessment area includes several non-residential receptors. Recommended amenity noise levels for relevant receptor categories in this NIA are listed in Table 3.10.

Table 3.10 Recommended amenity noise levels – $L_{Aeq,period}$ dB

Receptor Category	Day	Evening	Night
Private residential (external)	50	45	40
School classroom (internal, when in use)	35	NA	NA
School classroom (external, when in use) ¹	45	NA	NA
Passive recreation area (external)	50	50	50
Active recreation area (external)	55	55	55
Commercial premises (when in use)	65	65	65
Industrial premises (when in use)	70	70	70
Place of worship (internal)	40	40	40
Place of worship (external) ¹	50	50	50

Notes: 1. 10 dB adjustment applied to obtain equivalent external amenity noise level.

An adjustment of 10 dB has been applied to internal amenity noise levels for schools and places of worship to obtain an equivalent external value. This adjustment is consistent with standard practice, and in keeping with Section 2.6 of the NPfI that recommends that in cases where gaining internal access for monitoring is difficult, then external noise levels 10 dB above the internal levels apply.

3.4.3 Project amenity noise levels

Recommended amenity noise levels represent the objective for total industrial noise at a receptor location. The NPfI also defines a project amenity noise level, which represents the objective for noise from a single industrial development at a receptor location. As stated in the NPfI the project amenity noise level is determined as follows:

Project amenity noise level for industrial developments = recommended amenity noise level (Table 2.2) minus 5 dB(A)

The NPfI provides exceptions for when the project amenity noise level does not apply, which are:

1. in areas with high traffic noise levels;
2. in proposed developments in major industrial clusters;
3. where the resultant project amenity noise level is 10 dB or more lower than the existing industrial noise level; and
4. where cumulative industrial noise is not a necessary consideration because no other industries are present in the area, or likely to be introduced into the area in the future.

These exceptions are not applicable to the Project. Project amenity noise levels are determined in Section 3.4.5 of this report.

3.4.4 $L_{Aeq,period}$ to $L_{Aeq,15minute}$ adjustment

Intrusiveness and amenity noise levels each use the L_{Aeq} descriptor; however, intrusiveness noise levels are averaged over a 15-minute duration whilst amenity noise levels are averaged over an assessment period (day, evening or night). The NPfI provides a method to standardise the time periods, which involves applying an adjustment factor of plus 3 dB to $L_{Aeq,period}$ noise levels to obtain equivalent $L_{Aeq,15minute}$ noise levels. Conversely, an adjustment factor of minus 3 dB can be applied to an $L_{Aeq,15minute}$ noise level to obtain an equivalent $L_{Aeq,period}$ noise level.

3.4.5 Project noise trigger levels

In determining PNTLs from RBLs, the community's expectations also need to be considered. The community generally expects greater control of noise during the more sensitive evening and night-time periods than during the less sensitive daytime period. Therefore, in determining PNTL for a particular development, it is generally recommended that the project intrusiveness noise level for evening be set at no greater than the project intrusiveness noise level for daytime. The project intrusiveness noise level for night-time should be no greater than the project intrusiveness noise level for day or evening.

Table 3.11 to Table 3.15 provide 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 PNTL of $L_{Aeq,15minute}$ 40/35/35 dB for the day/evening/night periods, respectively.

It should be noted that PNTLs are used in this assessment 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.

i NAG 1A, 1B and 1C

PNTL for NAG 1A, 1B and 1C (Maison Dieu) are provided in Table 3.11. These are $L_{Aeq,15minute}$ 40/36/36 dB for the day/evening/night periods, respectively.

Table 3.11 NAG 1A, 1B and 1C project noise triggers levels – private residential receptors

Step	Calculation Stage	Descriptor	Day	Evening	Night
1	Adopted RBL (Measured RBL) ¹	L_{A90}	35 (31)	31 ⁴ (32)	31 ⁴ (33)
2	Intrusiveness noise level	$L_{Aeq,15minute}$	40	36	36
3	Recommended amenity level	$L_{Aeq,period}$	50	45	40
4	Project amenity level adjustment ²	dB(A)	-5	-5	-5
5	Project amenity level	$L_{Aeq,period}$	45	40	35
6	$L_{Aeq,15minute}$ to $L_{Aeq,period}$ adjustment ³	dB(A)	3	3	3
7	Project amenity level	$L_{Aeq,15minute}$	48	43	38
8	PNTL (minimum of 2 and 7)	$L_{Aeq,15minute}$	40	36	36

Notes: 1. RBL refers to Rating Background Level. Default minimums are L_{A90} 35/30/30 dB for the day/evening/night periods respectively.
2. Adjustment is from Section 2.4 of the NPfI.
3. $L_{Aeq,15minute}$ to $L_{Aeq,period}$ adjustment of 3 dB sourced from the NPfI.
4. Evening RBL set no higher than day RBL, and night RBL set no higher than evening RBL.

ii NAG 2

PNTL for NAG 2 (Long Point) are provided in Table 3.12. These are based on NPfI default minimum RBLs and result in PNTL of $L_{Aeq,15minute}$ 40/35/35 dB for the day/evening/night periods, respectively.

Table 3.12 NAG 2 project noise triggers levels – private residential receptors

Step	Calculation Stage	Descriptor	Day	Evening	Night
1	Adopted RBL (Measured RBL) ¹	L_{A90}	35 (34)	30 (30)	30 ⁴ (31)
2	Intrusiveness noise level	$L_{Aeq,15minute}$	40	35	35
3	Recommended amenity level	$L_{Aeq,period}$	50	45	40
4	Project amenity level adjustment ²	dB(A)	-5	-5	-5
5	Project amenity level	$L_{Aeq,period}$	45	40	35
6	$L_{Aeq,15minute}$ to $L_{Aeq,period}$ adjustment ³	dB(A)	3	3	3
7	Project amenity level	$L_{Aeq,15minute}$	48	43	38
8	PNTL (minimum of 2 and 7)	$L_{Aeq,15minute}$	40	35	35

Notes: 1. RBL refers to Rating Background Level. Default minimums are LA_{90} 35/30/30 dB for the day/evening/night periods respectively.
2. Adjustment is from Section 2.4 of the NPfI.
3. $L_{Aeq,15minute}$ to $L_{Aeq,period}$ adjustment of 3 dB sourced from the NPfI.
4. Evening RBL set no higher than day RBL, and night RBL set no higher than evening RBL.

iii NAG 3

PNTL for NAG 3 (Jerrys Plains South/Moses Crossing) are provided in Table 3.13. These are $L_{Aeq,15minute}$ 41/41/38 dB for the day/evening/night periods, respectively.

Table 3.13 NAG 3 project noise triggers levels – private residential receptors

Step	Calculation Stage	Descriptor	Day	Evening	Night
1	Adopted RBL (Measured RBL) ¹	L_{A90}	36 (36)	36 ⁴ (37)	33 (33)
2	Intrusiveness noise level	$L_{Aeq,15minute}$	41	41	38
3	Recommended amenity level	$L_{Aeq,period}$	50	45	40
4	Project amenity level adjustment ²	dB(A)	-5	-5	-5
5	Project amenity level	$L_{Aeq,period}$	45	40	35
6	$L_{Aeq,15minute}$ to $L_{Aeq,period}$ adjustment ³	dB(A)	3	3	3
7	Project amenity level	$L_{Aeq,15minute}$	48	43	38
8	PNTL (minimum of 2 and 7)	$L_{Aeq,15minute}$	41	41	38

Notes: 1. RBL refers to Rating Background Level. Default minimums are LA_{90} 35/30/30 dB for the day/evening/night periods respectively.
2. Adjustment is from Section 2.4 of the NPfI.
3. $L_{Aeq,15minute}$ to $L_{Aeq,period}$ adjustment of 3 dB sourced from the NPfI.
4. Evening RBL set no higher than day RBL.

PNTL for NAG 4 (Redmanvale Road) are provided in Table 3.14. These are based on NPfl default minimum RBLs and result in PNTL of $L_{Aeq,15minute}$ 40/35/35 dB for the day/evening/night periods, respectively.

Table 3.14 NAG 4 project noise triggers levels – private residential receptors

Step	Calculation Stage	Descriptor	Day	Evening	Night
1	Adopted RBL ¹	L_{A90}	35	30	30
2	Intrusiveness noise level	$L_{Aeq,15minute}$	40	35	35
3	Recommended amenity level	$L_{Aeq,period}$	50	45	40
4	Project amenity level adjustment ²	dB(A)	-5	-5	-5
5	Project amenity level	$L_{Aeq,period}$	45	40	35
6	$L_{Aeq,15minute}$ to $L_{Aeq,period}$ adjustment ³	dB(A)	3	3	3
7	Project amenity level	$L_{Aeq,15minute}$	48	43	38
8	PNTL (minimum of 2 and 7)	$L_{Aeq,15minute}$	40	35	35

Notes: 1. RBL refers to Rating Background Level. Default minimums are L_{A90} 35/30/30 dB for the day/evening/night periods respectively.
 2. Adjustment is from Section 2.4 of the NPfl.
 3. $L_{Aeq,15minute}$ to $L_{Aeq,period}$ adjustment of 3 dB sourced from the NPfl.

PNTL for NAG 5A (Jerry Plains Village) are provided in Table 3.15. These are $L_{Aeq,15minute}$ 41/38/37 dB for the day/evening/night periods, respectively.

Table 3.15 NAG 5A project noise triggers levels – private residential receptors

Step	Calculation Stage	Descriptor	Day	Evening	Night
1	Adopted RBL (Measured RBL) ¹	L_{A90}	36 (36)	33 (33)	32 (32)
2	Intrusiveness noise level	$L_{Aeq,15minute}$	41	38	37
3	Recommended amenity level	$L_{Aeq,period}$	50	45	40
4	Project amenity level adjustment ²	dB(A)	-5	-5	-5
5	Project amenity level	$L_{Aeq,period}$	45	40	35
6	$L_{Aeq,15minute}$ to $L_{Aeq,period}$ adjustment ³	dB(A)	3	3	3
7	Project amenity level	$L_{Aeq,15minute}$	48	43	38
8	PNTL (minimum of 2 and 7)	$L_{Aeq,15minute}$	41	38	37

Notes: 1. RBL refers to Rating Background Level. Default minimums are L_{A90} 35/30/30 dB for the day/evening/night periods respectively.
 2. Adjustment is from Section 2.4 of the NPfl.
 3. $L_{Aeq,15minute}$ to $L_{Aeq,period}$ adjustment of 3 dB sourced from the NPfl.

PNTL for NAG 5B (Jerrys Plains West) are provided in Table 3.16. These are based on NPfI default minimum RBLs and result in PNTL of $L_{Aeq,15minute}$ 40/35/35 dB for the day/evening/night periods, respectively.

Table 3.16 NAG 5B project noise triggers levels – private residential receptors

Step	Calculation Stage	Descriptor	Day	Evening	Night
1	Adopted RBL (Measured RBL) ¹	L_{A90}	35 (33)	30 (28)	30 (27)
2	Intrusiveness noise level	$L_{Aeq,15minute}$	40	35	35
3	Recommended amenity level	$L_{Aeq,period}$	50	45	40
4	Project amenity level adjustment ²	dB(A)	-5	-5	-5
5	Project amenity level	$L_{Aeq,period}$	45	40	35
6	$L_{Aeq,15minute}$ to $L_{Aeq,period}$ adjustment ³	dB(A)	3	3	3
7	Project amenity level	$L_{Aeq,15minute}$	48	43	38
8	PNTL (minimum of 2 and 7)	$L_{Aeq,15minute}$	40	35	35

Notes: 1. RBL refers to Rating Background Level. Default minimums are L_{A90} 35/30/30 dB for the day/evening/night periods respectively.
 2. Adjustment is from Section 2.4 of the NPfI.
 3. $L_{Aeq,15minute}$ to $L_{Aeq,period}$ adjustment of 3 dB sourced from the NPfI.

3.4.6 Achievable noise levels

PNTLs were established for each NAG in accordance with the NPfI to set a benchmark for assessing the need to consider noise mitigation. Initial modelling showed noise emissions levels from the Project were above these at various noise-sensitive receptors surrounding the Project, indicating that operational constraints would be required to reduce noise. Given the preceding, an assessment of feasible and reasonable noise mitigation strategies was completed.

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 impact. HVO has made a commitment to best-in-class 400 t and 600 t excavator sound power levels and targeted other key equipment sound power levels during the analysis. All reasonable and feasible mitigation measures detailed in Section 3.4.5 were implemented to reduce noise towards the PNTLs, and noise impacts were re-evaluated before further mitigation measures (equipment shutdowns) were then considered. After considering and modelling all these measures, it was determined that PNTLs could not be reasonably or feasibly met for all receptors.

Given the above, achievable noise levels (ANL) were developed for the Project.

3.5 Voluntary and Acquisition and Mitigation Policy

In September 2018, the NSW government published the *Voluntary Land Acquisition and Mitigation Policy (the VLAMP) for State Significant Mining, Petroleum and Extractive Industry Developments* (NSW Government 2018). This document describes the NSW Government's policy for voluntary mitigation and land acquisition to address noise impacts from state significant mining, petroleum, and extractive industry developments.

3.5.1 Mitigation and acquisition criteria

The VLAMP provides the following guidance on the applicability of noise mitigation and acquisition criteria:

A consent authority can apply voluntary mitigation and voluntary land acquisition rights to reduce:

- operational noise impacts of a development on privately owned land; and
- rail noise impacts of a development on privately owned land near a non-network rail line (private rail line), that is on, or exclusively servicing an industrial site (see Appendix 3 of the RING).

But not:

- construction noise impacts, as these impacts are shorter term and can be controlled;
- noise impacts on the public road or rail network; or
- modifications of existing developments with legacy noise issues, where the modification would have beneficial or negligible noise impacts.

3.5.2 Voluntary mitigation rights

The VLAMP states:

A consent authority should only apply voluntary mitigation rights where, even with the implementation of best practice management at the mine site:

- the noise generated by the development would meet the requirements in Table 1 (see following page), such that the impacts would be characterised as marginal, moderate or significant, at any residence on privately owned land; or
- the development would increase the total industrial noise level at any residence on privately owned land by more than 1 dB(A) and noise levels at the residence are already above the recommended amenity noise levels in Table 2.2 of the Noise Policy for Industry; or
- the development includes a private rail line and the use of that private rail line would cause exceedances of the recommended acceptable levels in Table 6 of Appendix 3 of the RING by greater than or equal to 3 dB(A) at any residence on privately owned land.

All noise levels must be calculated in accordance with the NPfI or RING (as applicable).

3.5.3 Voluntary acquisition rights

The VLAMP states:

A consent authority should only apply voluntary land acquisition rights where, even with the implementation of best practice management:

- the noise generated by the development would be characterised as significant, according to Table 1 (see following page), at any residence on privately owned land; or
- the noise generated by the development would contribute to exceedances of the acceptable noise levels plus 5 dB in Table 2.2 of the NPfI on more than 25% of any privately-owned land where there is an existing dwelling or where a dwelling could be built under existing planning controls ¹; or
- the development includes a private rail line and the use of that private rail line would cause exceedances of the recommended maximum criteria in Table 6 of Appendix 3 of the RING at any residence on privately owned land.

All noise levels must be calculated in accordance with the NPfI or RING (as applicable).

Table 1 of the VLAMP outlines a procedure for characterising noise impact and provides examples of potential receptor-based treatments that could be used to mitigate residual noise impact; this table is reproduced below.

When assessing the difference between predicted noise levels and PNTL, the VLAMP uses the categories 0 to 2 dB, 3 to 5 dB, and >5 dB.

¹ Voluntary land acquisition rights should not be applied to address noise levels on vacant land other than to vacant land specifically meeting these criteria.

Table 1 – Characterisation of noise impacts and potential treatments¹⁶

If the predicted noise level minus the project noise trigger level ¹⁷ is:	And the total cumulative industrial noise level is:	Characterisation of impacts:	Potential treatment:
All time periods 0-2dB(A)	Not applicable	Impacts are considered to be negligible	The exceedances would not be discernable by the average listener and therefore would not warrant receiver based treatments or controls
All time periods 3-5dB(A)	• ≤ recommended amenity noise level in Table 2.2 of the NPfI; or • > recommended amenity noise level in Table 2.2 of the NPfI, but the increase in total cumulative industrial noise level resulting from the development is ≤1dB	Impacts are considered to be marginal	Provide mechanical ventilation / comfort condition systems to enable windows to be closed without compromising internal air quality / amenity.
All time periods 3-5dB(A)	> recommended amenity noise level in Table 2.2 of the NPfI, and the increase in total cumulative industrial noise level resulting from the development is >1dB	Impacts are considered to be moderate	As for marginal impacts but also upgraded façade elements like windows, doors or roof insulation, to further increase the ability of the building façade to reduce noise levels.
Day and evening >5dB(A)	≤ recommended amenity noise levels in Table 2.2 of the NPfI	Impacts are considered to be moderate	As for marginal impacts but also upgraded façade elements like windows, doors or roof insulation, to further increase the ability of the building façade to reduce noise levels.
Day and evening >5dB(A)	> recommended amenity noise levels in Table 2.2 of the NPfI	Impacts are considered to be significant	Provide mitigation as for moderate impacts and see voluntary land acquisition provisions above.
Night >5dB(A)	Not applicable	Impacts are considered to be significant	Provide mitigation as for moderate impacts and see voluntary land acquisition provisions above.

3.6 Residual noise impacts

Residual noise impacts occur when achievable noise levels predicted for a private residential receptor are greater than PNTL, and all feasible and reasonable noise mitigation measures have been considered (including consideration of all source mitigation and noise pathway mitigation). The significance of any residual impact can be used to assess the need for receptor-based treatment options. In extreme cases, significant levels of residual noise impact may result in voluntary acquisition status.

Both the NPfI and VLAMP provide guidance on procedures for determining the significance of residual noise impacts. When assessing total cumulative industrial noise level against recommended amenity noise levels, “recommended amenity noise level” used in the NPfI is taken as “less than or equal to recommended amenity noise level”, which is consistent with Table 1 of the VLAMP.

As noted in Section 3.5, the method of assessing residual noise impact differs between the NPfI and the VLAMP. Assessment of residual noise impact is included in Section 4.3.4 of this report and includes both methods.

3.6.1 NPfI Significance of residual noise impacts

Section 4 of the NPfI provides guidance for determining the significance of residual noise impacts. Table 4.1 of the NPfI outlines a procedure for allocating residual noise impact significance levels for each receptor on a case-by-case basis. Table 4.2 of the NPfI then provides examples of receptor-based treatments that could be used to mitigate residual noise impact. These tables are reproduced below.

Table 4.1: Significance of residual noise impacts.

If the predicted noise level minus the project noise trigger level is:	And the total cumulative industrial noise level is:	Then the significance of residual noise level is:
≤ 2 dB(A)	Not applicable	Negligible
≥ 3 but ≤ 5 dB(A)	< recommended amenity noise level or > recommended amenity noise level, but the increase in total cumulative industrial noise level resulting from the development is less than or equal to 1dB	Marginal
≥ 3 but ≤ 5 dB(A)	> recommended amenity noise level and the increase in total cumulative industrial noise level resulting from the development is more than 1 dB	Moderate
> 5 dB(A)	$\leq$ recommended amenity noise level	Moderate
> 5 dB(A)	> recommended amenity noise level	Significant

Note: This approach is designed for new and substantially-modified developments and should be applied with caution to assessments of existing operations.

Table 4.2: Examples of receiver-based treatments to mitigate residual noise impacts.

Significance of residual noise level	Example of potential treatment
Negligible	The exceedances would not be discernible by the average listener and therefore would not warrant receiver-based treatments or controls.
Marginal	Provide mechanical ventilation/comfort condition systems to enable windows to be closed without compromising internal air quality/amenity.
Moderate	As for 'marginal', but also upgraded façade elements, such as windows, doors or roof insulation, to further increase the ability of the building façade to reduce noise levels.
Significant	May include suitable commercial agreements where considered feasible and reasonable.

3.6.2 VLAMP significance of residual noise impact

The VLAMP method of determining the significance of residual noise impacts is outlined in Section 3.5.2 of this NIA. Table 1 of the VLAMP, reproduced in that section, summarises the assessment method which is generally consistent with the NPfI methodology.

3.7 Construction noise criteria

Construction noise management levels, sourced from the ICNG, are presented in Table 3.17. In certain circumstances, it can be difficult to differentiate between operational and construction noise sources. Construction noise predictions have therefore been combined with operational noise predictions for the nearest assessed stage of mining to obtain a cumulative level for assessment purposes.

The 'noise affected' levels for construction work prescribed in the ICNG are:

- $L_{Aeq,15minute}$ equal to background plus 10 dB during standard construction hours; and
- $L_{Aeq,15minute}$ equal to background plus 5 dB for work outside the standard construction hours.

The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq,15minute}$ is greater than the noise affected level, the proponent should:

- apply all feasible and reasonable work practices to meet the noise affected level; and
- also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.

The ICNG also indicates a 'highly noise affected' level of $L_{Aeq,15minute}$ 75 dB. The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account:

- times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences; and
- if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

Therefore, adopting RBL listed in Table 3.2, construction noise management levels presented in Table 3.17 apply to private residential receptors for the Project during standard construction hours. As approval for the various construction tasks is being sought under separate consents, construction tasks associated with each site (ie both HVO North and HVO South) are assessed separately against the management levels listed in Table 3.17.

Table 3.17 **Standard construction hours noise management levels, private residential receptors –**
L_{Aeq,15minute} dB

NAG	Area	Noise Affected	Highly Noise Affected
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/Moses Crossing	46	75
4	Redmanvale Road	45	75
5A	Jerrys Plains Village	46	75
5B	Jerrys Plains West	45	75

The guideline specifies standard construction hours as:

- Monday to Friday, 7.00 am to 6.00 pm;
- Saturday, 8.00 am to 1.00 pm; and
- no construction work on Sunday and public holidays.

HVO proposes to undertake primary noise generating activities during standard construction hours. Outside of these times, HVO is committed to managing noise such that the cumulative impact from the mining operations and construction activities do not exceed the operational noise limits. This will allow construction tasks to be undertaken as required but will restrict cumulative operational and construction noise to approved operational noise limits. Many construction activities will occur well within the project boundaries and/or at sufficient distance from private residential locations that noise emission would be relatively inconsequential. These activities present minimal risk of increasing operational noise levels and should therefore be able to be conducted at any time.

Construction noise impact is assessed in Section 4.5 of this report.

3.7.1 Other land uses

The ICNG provides construction noise criteria for non-residential receptor categories such as schools, places of worship, community centres, recreation areas, and commercial/industrial premises. Construction noise management levels for such land uses are listed in Table 3.18. These management levels apply when properties are in use.

Table 3.18 Noise management levels, non-private residential receptors – $L_{Aeq,15\text{minute}}$ dB

Receptor Category	Management Level
Classrooms at schools and other educational institutions (internal)	45
Classrooms at schools and other educational institutions (external) ¹	55
Place of worship (internal)	45
Place of worship (external) ¹	55
Active recreation area (external)	65
Passive recreation area (external)	60
Community centres (external) ²	60
Industrial premises (external)	75
Offices, retail outlets (external)	70

Notes: 1. 10 dB adjustment applied to obtain equivalent external amenity noise level.
2. Passive recreation area level adopted, which is consistent with the recommended 'maximum' internal levels in AS2107 for leisure centres and club buildings.

An adjustment of 10 dB has been applied to internal amenity noise levels where relevant to obtain an equivalent external value. This adjustment is consistent with standard practice, and in keeping with Section 2.6 of the NPfI that recommends that in cases where gaining internal access for monitoring is difficult, then external noise levels 10 dB above the internal levels apply.

3.8 Maximum noise level assessment

Section 2.5 of the NPfI includes a guideline for assessing maximum noise level events that have potential to cause sleep disturbance. According to the NPfI, where the subject development/premises night-time noise levels at a residential location exceed the following trigger levels, a detailed maximum noise level event assessment should be undertaken:

- $L_{Aeq,15\text{minute}}$ 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.

The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the RBL, and the number of times this happens during the night-time period.

Assessment of sleep disturbance is included in Section 4.6 of this report.

3.9 Cumulative noise criteria

Recommended amenity noise levels listed in Table 2.2 of the NPfI and Table 3.10 of this report have been used to assess cumulative noise.

Assessment of cumulative noise is included in Section 4.8 of this report.

3.10 Corrections for annoying noise characteristics (modifying factors)

Fact Sheet C of the NPfl outlines procedures for assessing modifying correction factors. These correction factors, also referred to as modifying factor penalties, are applied to predicted/measured noise levels at the receptor before comparison with relevant noise trigger levels/criteria, to account for the additional annoyance caused by these noise characteristics.

Modifying factors, as they are applicable to industrial noise, are described in more detail below.

3.10.1 Tonality and intermittent noise

As defined in the NPfl:

Tonal noise contains a prominent frequency and is characterised by a definite pitch.

Intermittent noise is noise where the level suddenly drops/increases several times during the assessment period, with a noticeable change in source noise level of at least 5 dB(A); for example, equipment cycling on and off. The intermittency correction is not intended to be applied to changes in noise level due to meteorology.

Open cut mines are not generally tonal or intermittent in nature as per the intent of the NPfl. A review of recent HVO compliance monitoring data from 2016 onwards shows that neither tonal nor intermittent modifying factors have been historically applied. No further assessment of these characteristics has been made. It is reasonable to expect that if the mine continues operations as before (regarding noise emissions) then the absence of tonal and intermittent noise characteristics will similarly continue.

3.10.2 Low frequency noise

As defined in the NPfl:

Low frequency noise is noise with an unbalanced spectrum and containing major components within the low-frequency range (10 – 160 Hz) of the frequency spectrum.

The NPfl contains the current method of assessing low frequency noise, which is a 2-step process as detailed below:

Measure/assess source contribution C- and A-weighted Leq,T levels over the same time period.

Correction to be applied where the C minus A level is 15 dB or more and:

- where any of the one-third octave noise levels in Table C2 are exceeded by up to and including 5 dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period; and
- where any of the one-third octave noise levels in Table C2 are exceeded by more than 5 dB and cannot be mitigated, a 5 dB(A) positive adjustment to measured/predicted A weighted levels applies for the evening/night period and a 2 dB(A) positive adjustment applies for the daytime period.

Table C2 and associated notes from the NPfI is reproduced below:

Table C2: One-third octave low-frequency noise thresholds.

Hz/dB(Z)	One-third octave $L_{Zeq,15min}$ threshold level												
Frequency (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
dB(Z)	92	89	86	77	69	61	54	50	50	48	48	46	44

Notes:

- dB(Z) = decibel (Z frequency weighted).
- For the assessment of low-frequency noise, care should be taken to select a wind screen that can protect the microphone from wind-induced noise characteristics at least 10 dB below the threshold values in Table C2 for wind speeds up to 5 metres per second. It is likely that high performance larger diameter wind screens (nominally 175 mm) will be required to achieve this performance (Hessler, 2008). In any case, the performance of the wind screen and wind speeds at which data will be excluded needs to be stated.
- Low-frequency noise corrections only apply under the standard and/or noise-enhancing meteorological conditions.
- Where a receiver location has had architectural acoustic treatment applied (including alternative means of mechanical ventilation satisfying the Building Code of Australia) by a proponent, as part of consent requirements or as a private negotiated agreement, alternative external low-frequency noise assessment criteria may be proposed to account for the higher transmission loss of the building façade.
- Measurements should be made between 1.2 and 1.5 metres above ground level unless otherwise approved through a planning instrument (consent/approval) or environment protection licence, and at locations nominated in the development consent or licence.

Low frequency noise is assessed in this report through comparison of one-third octave model predictions against NPfI low frequency noise thresholds. Further detail is provided in Section 4.7 of this report.

3.11 Road traffic noise criteria

The NSW Road Noise Policy (RNP) is applicable to road traffic noise generated by the Project and applies different noise limits dependent upon the development category and receptor type. 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. Road traffic on the proposed realigned Lemington Road has been assessed. Lemington Road has been designated as a sub-arterial road in accordance with Section 2.2 of the RNP.

Table 3.19 shows applicable residential noise level criteria for receptors affected by noise from new sub-arterial road corridors. These are external criteria for assessment against façade corrected noise levels.

Table 3.19 Road traffic noise criteria

Development Type / Land Use	Day Criterion	Night Criterion
Sub-arterial Roads		
Existing residences affected by new freeway/arterials/sub-arterial road corridors	$L_{Aeq,15hour}$ 55 dB	$L_{Aeq,9hour}$ 50 dB

Notes: 1. Day $L_{Aeq,15hour}$ from 7am to 10pm ~ Night $L_{Aeq,9hour}$ from 10pm to 7am.

Section 2.4 of the RNP states that in addition to the assessment criteria outlined above, any increase in traffic noise level at a location due to a proposed project or traffic generating development must be considered. Residences experiencing increases in total traffic noise level above a relative increase criterion should also be considered for mitigation. Table 3.20 shows relative increase criteria for residential land uses.

Table 3.20 **Relative increase criteria for residential land uses**

Development type/land use	Total traffic noise level increase – dB(A)	
	Day 7.00 am to 10.00 pm	Night 10.00 pm to 7.00 am
New road corridor/redevelopment of existing road/land use development with the potential to generate additional traffic on existing road.	Existing traffic $L_{Aeq,15hour} + 12$ dB (external)	Existing traffic $L_{Aeq,9hour} + 12$ dB (external)

The ‘existing’ traffic noise level refers to the level from all road categories that would occur for the relevant ‘no build’ option. Where the existing road traffic $L_{Aeq,period}$ is found to be less than 30 dB, it is deemed to be 30 dB. Given that Maison Dieu receptors currently receive little to no road traffic noise, adopting an existing traffic level $L_{Aeq,period}$ of 30 dB would result in criteria of $L_{Aeq,15hour}$ 42 dB and $L_{Aeq,9hour}$ of 42 dB, which are more stringent than the assessment criteria detailed in Table 3.19 and would apply to the Project.

Section 3.4 of the RNP outlines procedures for applying the assessment and relative increase criteria. Essentially, once the study area is identified, assessment is undertaken to identify if any criterion, either assessment or relative increase, is exceeded. Where any exceedance is determined, feasible and reasonable mitigation measures should be identified and applied.

Where controlling criteria are not achievable, and justification can be provided that reasonable and feasible mitigation measures have been applied, the RNP states:

...for existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding ‘no build option’.

The NSW Roads and Maritime Services (RMS) document Construction Noise and Vibration Guideline (RMS, 2016) provides specific guidance on assessing construction related road traffic noise.

... an initial screening test should first be applied by evaluating whether noise levels will increase by more than 2 dBA due to construction traffic or a temporary reroute due to a road closure. Where increases are 2 dBA or less then no further assessment is required. Where noise levels increase by more than 2 dBA (2.1 dBA) further assessment is required using Roads and Maritimes Criteria Guideline. This documents RMS’ approach to implementing the Road Noise Policy.

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. Provision of noise mitigation would not be reasonable, provided increases due to construction related traffic are not greater than 2 dB. Where the relative increase is predicted to be greater than 2 dB, assessment against the relevant criterion is required.

An assessment of road traffic noise is included in Section 4.9 of this report.

4 Noise impact assessment

4.1 Best Management Practice

Noise management at HVO uses Best Management Practice (BMP) consistent with contemporary industry standards. Procedures for management and monitoring are outlined in the existing Noise Management Plan (NMP).

BMP currently implemented at HVO include the following.

- real-time noise monitoring locations used for noise management;
- proactive operational planning based on predicted meteorological conditions;
- a tiered alarming system that incorporates real-time monitoring and meteorological data is used to notify site personnel when elevated noise levels occur off site. The NMP includes a detailed procedure outlining management protocols in response to noise trigger levels;
- monthly attended noise monitoring is used to assess compliance against impact assessment criteria. Monitoring is conducted at eight locations representing potentially affected privately owned residences and the Hunter Valley Gliders Club;
- sound power testing is completed on one third of the attenuated fleet annually to ensure equipment noise levels are consistent with modelled levels;
- noise management awareness is provided to all personnel as part of the induction process; and
- a detailed management procedure is in place to ensure any community complaints are recorded, investigated and communicated appropriately.

4.2 Noise model parameters

4.2.1 Meteorology

Under various wind and temperature gradient conditions, noise may be increased or decreased compared with still-isothermal conditions – that is, no wind or temperature gradient (also referred to as neutral atmospheric conditions). Atmospheric conditions that most affect noise propagation are temperature and wind velocity gradients. They can both enhance or reduce noise propagation from source to receptor due to refraction of sound propagating through the atmosphere, brought about by a change in sound speed with height.

Noise levels are increased when the wind blows from source to receptor or under temperature inversion conditions (both of which are sometimes referred to as ‘adverse weather conditions’), and decreased when the wind blows from receptor to the source or under temperature lapse conditions.

One complete year of meteorological data (2017) from the HVO Corporate automatic weather station (AWS) was analysed to determine the frequency of occurrence of each of the modelled meteorological conditions, by season and time period. The HVO Corporate AWS is located within the HVO North project area, and data recorded at this AWS are considered representative of weather conditions in the region. Multiple years of data were considered, and 2017 was selected as the most representative of long-term regional weather trends and had a very high level of completeness.

Sigma-theta data was analysed, in accordance with procedures in Section D1.4 of the NPfI, to determine the appropriate stability class and associated vertical temperature gradient for each weather record. A vertical temperature gradient of 4 degrees C per 100 metres was adopted for atmospheric stability class F to capture predictions for the upper end of the range specified in Table D2 of the NPfI.

Appendix E lists the 260 meteorological conditions included in the assessment.

4.2.2 Mining scenarios

Five operational stages were modelled, indicatively 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.

Numerous refinements of each stage were made to determine the most efficient mine layout whilst minimising noise emissions. Further details of proposed noise mitigation measures are provided in Section 4.2.4 of this NIA.

Haul road alignments were optimised to provide topographical shielding and to avoid haulage of coal and overburden in exposed areas as far as practicable. Those modelled are indicative to allow for assessment; road alignments may vary, as is usual, for actual mining operations.

All known major noise sources were included in model scenarios. Plant (other than locomotives which were modelled as idling on the rail loop) was modelled at maximum sound power, and on the assumption that all plant operates continuously and simultaneously. In reality, this rarely occurs and as such, modelled results are considered conservative. Modelled plant quantities represent in-service levels and include an allowance for availability and utilisation.

Table 4.1 and Table 4.2 list representative typical plant quantities included in each model stage for HVO North and HVO South respectively. These are indicative quantities to allow for assessment. Actual quantities will be determined by production requirements and may increase or decrease relative to those assessed. Operations should be monitored and modified as required to ensure the site operates within approved limits. Table 4.3 lists CPP plant included in all model stages. The LCPP and associated rail loop is included in Year 18 and Year 22 model stages only as it is yet to be constructed.

Figure B.1 to Figure B.5 in Appendix B show modelled plant locations and mine plan topography.

Table 4.1 HVO North open cut plant items included in models

Equipment Category		Quantities			
Representative Type	Year 3	Year 7	Year 11	Year 18	Year 22
Excavators and loaders					
P&H 4100	1	1	1	1	1
Hitachi EX5600	2	5	5	5	4
Hitachi EX5500	1	2	2	3	3
Hitachi EX3600	2	2	2	2	2
Liebherr R9800	1	1	1	1	2
LeTourneau 1850	1	2	3	3	3
Haul Trucks					
Komatsu 830E	35	57	64	89	72
Komatsu 930E	7	11	15	19	28

Table 4.1 **HVO North open cut plant items included in models**

Equipment Category	Quantities				
Representative Type	Year 3	Year 7	Year 11	Year 18	Year 22
Dozers					
Caterpillar D10	5	7	8	8	7
Caterpillar D11	13	22	23	23	25
Komatsu WD900	4	7	6	6	7
Drills					
Drill 70klb	4	7	7	6	7
Drill 50klb	1	1	1	1	1
Water trucks					
Caterpillar 785 water cart	3	3	3	4	5
Caterpillar 789 water cart	2	4	4	5	6
Graders					
Caterpillar 16M grader	3	5	6	6	7
Caterpillar 24M grader	3	5	5	6	6
Service Trucks					
Caterpillar 773 service truck	2	4	4	4	4

Notes: 1. Table shows representative typical plant that may operate at any point in time within the mine to allow for assessment.

Table 4.2 HVO South open cut plant items included in models

Equipment Category		Quantities			
Representative Type	Year 3	Year 7	Year 11	Year 18	Year 22
Excavators and loaders					
P&H 4100	1	1	1	1	-
Hitachi EX5600	2	1	2	1	2
Hitachi EX5500	1	1	1	1	-
Hitachi EX3600	2	2	2	2	2
Liebherr R9800	1	2	2	2	-
LeTourneau 1850	1	1	1	1	-
Haul Trucks					
Komatsu 830E	44	18	21	26	17
Komatsu 930E	13	29	25	25	-
Dozers					
Caterpillar D10	4	4	4	4	3
Caterpillar D11	14	14	15	15	5
Komatsu WD900	3	3	4	4	1
Drills					
Drill 70klb	3	3	3	4	1
Drill 50klb	1	1	1	1	1
Drill coal	1	1	1	1	1
Water trucks					
Caterpillar 785 water cart	3	3	3	3	1
Caterpillar 789 water cart	2	3	3	3	1
Graders					
Caterpillar 16M grader	4	4	4	4	2
Caterpillar 24M grader	3	3	3	3	1
Service trucks					
Caterpillar 773 service truck	3	2	3	3	2
Water pumps					
Water pumps	2	2	2	2	2

Notes: 1. Table shows representative typical plant that may operate at any point in time within the mine to allow for assessment.

Table 4.3 CPP plant items included in models

Description	Quantities			
	HVLP and Newdell LP	HV CPP	Howick CPP	Lemington CPP ¹
Coal Processing Plant (CPP)	-	1	1	1
Stockpile/ROM dozers	2	-	-	2
Le Tourneau L1850	-	1	-	-
Komatsu WA900	-	-	3	1
Haulage trucks (B-double)	-	-	1	-
Reject Komatsu 830E	-	1	-	-
Stockpile Komatsu 830E	-	1	-	-
Train wagon loading	2	-	-	1
Locomotives on rail loop (idle)	2	-	-	1
Locomotives on rail spur	-	-	-	1
ROM bin	1	1	1	1
ROM crusher	-	1	1	1
Secondary sizing station	-	1	1	1
Stacker	1	1	2	1
Reclaimer	2 ³	1	-	-
Rail load out bin	2	-	-	-
Conveyors	15	16	8	8
Conveyor drives ²	8	9	6	5
Feeder	-	1	1	1
Transfer station	5	3	2	1

Notes: 1. Modelled in Year 18 and 22 only.

2. Conveyor drives located in close proximity to major noise sources such as crushing plant omitted, as contribution insignificant.

3. HVLP only.

4. Table shows representative typical plant that may operate at any point in time to allow for assessment.

4.2.3 Plant sound power

All acoustically significant noise sources on site are included in the models. Regular sound power testing of mining equipment is undertaken at HVO. Sound power levels used in modelling, provided in Table 4.4, have been based on measured in-service levels of plant operating at HVO where possible. Mining equipment and associated sound power levels presented in Table 4.4 are representative of a typical mining fleet to be used for the Project for the purposes of noise impact modelling. These sound power levels represent current or anticipated fleet average levels. It is normal for equipment within an equipment category to vary, with some equipment having sound power either higher or lower than the fleet average. HVO intends to review available mining equipment and technology, as required, throughout the life of the Project and may update or replace the mining equipment from time to time, whilst managing noise impacts to within relevant noise limits.

Dozers operating in exposed locations, such as overburden emplacement areas, should be restricted to 1st gear during periods of adverse meteorological conditions; however, this restriction would not be required during all weather conditions, and this management control should be implemented as required to assist with managing noise impacts to within relevant noise limits.

Haul truck sound powers were incorporated into haul route strings created for the length of each route. This method distributes the acoustic energy of vehicles along the length of each route. Routes comprise a string of segments of fixed length, each segment having a sound power determined by the following:

- sound power for type of trucks on route. Trucks travelling down ramps greater than 5% grade were allocated a sound power reduced by 2 dB;
- number of each truck type on route in a 15-minute period, based on the load capacity of the loading unit;
- speed of loaded truck on segment grade toward dump/ROM; and
- speed of empty truck on segment grade from dump/ROM.

Truck speeds are relative to grade in the direction of travel and were allocated in accordance with truck speed data collected from mine sites in the Hunter Valley. Speed determines the duration required to traverse each segment, an important variable when calculating L_{Aeq} for a specific time period. Graders, water carts and service trucks were allocated sound power levels in a similar manner. Haul truck, watercart and service truck sound power levels shown in Table 4.4 are uphill loaded, full power levels.

Train sound power levels were incorporated by creating strings of points representing the section of track the train would traverse in a 15-minute period.

Table 4.4 **Sound power data**

Equipment Category	Representative Sound Power, $L_{Aeq,15minute}$	
	Linear (dB)	A-weighted (dB(A))
Excavators and loaders		
P&H 4100	124	116
Hitachi EX5600	125	117
Hitachi EX5500	125	117
600 t Excavator (Best In Class)	122	117
600 t Excavator (Un-attenuated)	130	126

Table 4.4 **Sound power data**

Equipment Category	Representative Sound Power, $L_{eq,15minute}$	
	Linear (dB)	A-weighted (dB(A))
Hitachi EX3600	124	116
400 t Excavator (Best In Class)	122	117
Liebherr R9800	123	114
LeTourneau L1850	123	117
Haul Trucks		
Komatsu 830E – attenuation kit 1	124	116
Komatsu 830E – attenuation kit 2	125	116
Komatsu 930E – full attenuation	123	115
Dozers		
Caterpillar D10 (1 st gear forward, 1 st gear reverse composite)	121	116
Caterpillar D10 (1 st gear forward, 2 nd gear reverse composite)	123	120
Caterpillar D11 (1 st gear forward, 1 st gear reverse composite)	121	116
Caterpillar D11 (1 st gear forward, 2 nd gear reverse composite)	123	120
Wheel Dozer	119	110
Drills		
Drill 70 klb	121	113
Drill 50 klb	121	113
Drill Coal	121	113
Water trucks		
Caterpillar 785	125	119
Caterpillar 789	123	117
Graders		
Caterpillar 16M	115	108
Caterpillar 24M	119	112
Service trucks		
Caterpillar 773	122	117
CPP and stockpile mobile equipment		
LeTourneau L1850	123	117
Komatsu WA900	123	118
Howick haulage trucks (B-double)	114	109

Table 4.4 **Sound power data**

Equipment Category	Representative Sound Power, $L_{eq,15\text{minute}}$	
	Linear (dB)	A-weighted (dB(A))
CPP fixed plant		
HV Coal Processing Plant	134	117
Howick Coal Processing Plant	130	116
Lemington Coal Processing Plant	132	115
HV and Howick ROM crusher/breaker	128	111
Lemington ROM crusher/breaker	116	109
HV and Howick secondary sizing station	126	114
Lemington secondary sizing station	123	113
HV and Howick ROM bin (with hood)	121	114
Lemington ROM bin (with hood)	118	110
HVO and Howick Stacker	112	105
Lemington Stacker	111	102
HVLP stockpile reclaimer	118	115
Other Reclaimers	118	113
Feeders	115-118	105-112
Yard Conveyors (per 100 m)	97-105	91-98
Overland Conveyor (per 100 m)	111	97
Small conv. Drives (< 250 kW)	103	96
Medium conv. Drives (250-600 kW)	105	99
Large conv. Drives (> 600 kW)	117	108
Stockpile dozers (other than Lemington CPP)	121	116
Lemington CPP stockpile dozers	121	113
Train wagon loading	113	110
Newdell LP and HVLP train load out bin	116	115
Lemington train load out bin	113	110
Train load out transfer and conveyor drives	120	114
Locomotives on rail loop (idle)	121	105
Water pumps	98	93

Notes: 1. Table shows representative typical sound powers to allow for assessment.

4.2.4 Feasible and reasonable noise controls

Section 3.4 and Fact Sheet F of the NPfI provide guidance on feasible and reasonable noise mitigation controls.

‘Feasible’ and ‘reasonable’ mitigation is defined in the NPfI as follows.

A feasible mitigation measure is a noise mitigation measure that can be engineered and is practical to build and/or implement, given project constraints such as safety, maintenance and reliability requirements. It may also include options such as amending operational practices (for example, changing a noisy operation to a less-sensitive period or location) to achieve noise reduction.

Selecting reasonable measures from those that are feasible involves judging whether the overall noise benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the mitigation measure.

The following factors should be considered in deciding whether an option is reasonable:

1. noise impacts;
2. noise mitigation benefits;
3. cost effectiveness of noise mitigation; and
4. community views.

Further details are included in Fact Sheet F of the NPfI.

Table 4.5 lists possible mitigation options, whether these are feasible and/or reasonable, and provides justification as to why each option was adopted or not. Controls implemented in this NIA are a mix of controls already included in the existing NMP, and others developed during this assessment.

It is EMM’s opinion that all feasible and reasonable noise controls have been investigated and, where applicable, included in the assessment. HVO’s commitments regarding noise control and management are included in Section 6.1 of this NIA.

Table 4.5 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 this 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.
Best Management Practice (BMP)	Yes	Yes	HVO currently implements BMP, which is described in Section 4.1 of this NIA. BMP will continue to be applied to the Project, and is applied where relevant in this NIA.

Table 4.5 Feasible and reasonable noise mitigation options

Mitigation Option	Feasible Mitigation Test	Reasonable Mitigation Test	Justification for adopting or disregarding this option
Attenuated fixed infrastructure	Yes	Yes	Significant fixed infrastructure at the yet to be constructed Lemington CPP area includes cladding and BATEA sound power. Sound power adopted for the Project reflects this.
Restrict activity to the 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 enhancing weather conditions is feasible and reasonable. This control was applied to the modelling assessment.
Restrict operation of rehabilitation dozers	Yes	Yes	Restricting operation of rehabilitation dozers during enhancing weather conditions is feasible and reasonable. This control was applied to the modelling assessment.
Restrict operation of drills in exposed locations	Yes	Yes	Restricting operation of exposed drills during enhancing weather conditions is feasible and reasonable. This control was applied to the modelling assessment.
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 is to be constructed on the exposed side of the haul road from the Mitchell Pit towards the Howick CPP for approximately 900 metres. 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 considered to evaluate 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 enhancing weather conditions. This control was applied to the modelling assessment.
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 enhancing weather conditions.
Fixed infrastructure located in protected area	Yes	Yes	The HV CPP and Howick CPP fixed infrastructure is located in suitably protected areas with a buffer distance of approximately 8,000 and 5,000 metres respectively to the nearest receptors. The yet to be constructed Lemington CPP fixed infrastructure is approximately 3,000 metres to the nearest receptor and includes BATEA sound power. Relocating the approved location is not considered reasonable.

Table 4.5 Feasible and reasonable noise mitigation options

Mitigation Option	Feasible Mitigation Test	Reasonable Mitigation Test	Justification for adopting or disregarding this option
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.
Voluntary acquisition	Yes	Yes	Voluntary acquisition rights is feasible and reasonable for receptors predicted to have 'significant' residual noise impact in accordance with NPfI and VLAMP definitions.

4.3 Operational noise assessment

4.3.1 Best achievable noise levels

Once all reasonable and feasible options in Table 4.5 were incorporated to site models, results were still higher than PNTL for many receptors, indicating additional mitigation measures would be required by the Project to further reduce noise. The only remaining option at this point is shutdown of operations during enhancing meteorological conditions.

A key benefit of cumulative distribution method modelling is that knowing the frequency occurrence of each modelled meteorological condition quantifies the frequency occurrence of each predicted result. From this, the percentage of time the Project would be required to adopt additional mitigation measures such as shutting down mining and ancillary equipment to meet PNTL can be calculated. Operational shutdown requirements to meet PNTL were determined this way; however, were not reasonable for the Project to remain viable (this on advice from HVO). This can be seen in Table 4.6 and Table 4.7 where shutdowns of up to 54% and 64% were predicted to be required for HVO North and South respectively to meet the PNTL.

Table 4.6 HVO North – Night Period PNTL and worst-case result for all stages

NAG	PNTL	Base scenario ¹		Mitigation scenario result before shutdowns ²	
		L _{Aeq,15 minute} dB	% of time above PNTL	L _{Aeq,15 minute} dB	% of time above PNTL
1A	36	31	0%	31	0%
1B	36	30	0%	30	0%
1C	36	30	0%	30	0%

Table 4.6 HVO North – Night Period PNTL and worst-case result for all stages

NAG	PNTL	Base scenario ¹		Mitigation scenario result before shutdowns ²	
		L _{Aeq,15 minute} dB	% of time above PNTL	L _{Aeq,15 minute} dB	% of time above PNTL
2	35	25	0%	25	0%
3	38	45	56%	42	45%
4	35	39	46%	37	31%
5A	37	43	69%	41	54%
5B	35	42	68%	41	42%
Other	35	32	0%	32	0%

Notes: 1. This operational scenario includes plant sound power mitigation, but does not include operational modifications, e.g. utilising alternative haulage routes and operating in more shielded locations.
2. This operational scenario includes plant sound power mitigation and operational modifications.

Table 4.7 HVO South – Night Period PNTL and worst-case result for all stages

NAG	PNTL	Base scenario ¹		Mitigation scenario result before shutdowns ²	
		L _{Aeq,15 minute} dB	% of time above PNTL	L _{Aeq,15 minute} dB	% of time above PNTL
1A	36	44	69%	40	64%
1B	36	42	63%	40	54%
1C	36	42	62%	39	37%
2	35	32	0%	31	0%
3	38	42	53%	40	44%
4	35	36	18%	34	4%
5A	37	34	0%	33	0%
5B	35	31	0%	30	0%
Other	35	39	49%	36	18%

Notes: 1. This operational scenario includes plant sound power mitigation, but does not include operational modifications, e.g. utilising alternative haulage routes and operating in more shielded locations.
2. This operational scenario includes plant sound power mitigation and operational modifications.

In accordance with the NPfl, once all reasonable and feasible mitigation options had been considered, which has been extended to include periods of plant shutdown, reasonable ANL were determined for the Project and are detailed in Table 4.8. HVO have advised that the frequency of additional operational mitigation measures (plant shutdowns) required to meet proposed ANL can be accommodated by the Project schedule. This is shown in Table 4.9 and Table 4.10 where required shutdown hours against ANL are up to 24% and 18% for HVO North and South, respectively.

Table 4.8 Achievable noise levels for the Project

NAG	Residential receptor ID	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, 952, 481	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 land	40	35	35

Table 4.9 HVO North – Night Period ANL and worst-case result for all stages

NAG	ANL	Base scenario ¹		Mitigation scenario result before shutdowns ²	
		L _{Aeq,15 minute} dB	% of time above ANL	L _{Aeq,15 minute} dB	% of time above ANL
1A	41	31	0%	31	0%
1B	40	30	0%	30	0%
1C	39	30	0%	30	0%
2	35	25	0%	25	0%
3	40	45	44%	42	24%
4	37	39	31%	37	8%

Table 4.9 HVO North – Night Period ANL and worst-case result for all stages

NAG	ANL	Base scenario ¹		Mitigation scenario result before shutdowns ²	
		L _{Aeq,15 minute} dB	% of time above ANL	L _{Aeq,15 minute} dB	% of time above ANL
5A	40	43	44%	41	20%
5B	40	42	36%	41	22%
Other	35	32	0%	32	0%

Notes: 1. This operational scenario includes plant sound power mitigation, but does not include operational modifications, e.g. utilising alternative haulage routes and operating in more shielded locations.
2. This operational scenario includes plant sound power mitigation and operational modifications.

Table 4.10 HVO South – Night Period ANL and worst-case result for all stages

NAG	ANL	Base scenario ¹		Mitigation scenario result before shutdowns ²	
		L _{Aeq,15 minute} dB	% of time above ANL	L _{Aeq,15 minute} dB	% of time above ANL
1A	41	44	32%	40	7%
1B	40	42	37%	40	6%
1C	39	42	40%	39	10%
2	35	32	0%	31	0%
3	40	42	32%	40	13%
4	37	36	0%	34	0%
5A	40	34	0%	33	0%
5B	40	31	0%	30	0%
Other	35	39	49%	36	18%

Notes: 1. This operational scenario includes plant sound power mitigation, but does not include operational modifications, e.g. utilising alternative haulage routes and operating in more shielded locations.
2. This operational scenario includes plant sound power mitigation and operational modifications.

4.3.2 Operational A-weighted predictions

Results presented in this report are 90th percentile predictions that meet or are below the ANL for the Project. The residual impact assessment outcomes based on those results are provided Table 4.11 and Table 4.12. In summary:

- 107 private residential receptors have 90th percentile predictions exceeding PNTL for HVO North; and
- 19 private residential receptors have 90th percentile predictions exceeding PNTL for HVO South.

Table 4.11 and Table 4.12 present worst-case season 90th percentile operational noise predictions for the five modelled stages for HVO North and HVO South respectively. The maximum result for the five stages is also provided for each time period. Results are presented for all receptors (126) with a prediction that exceeds PNTL in any time period.

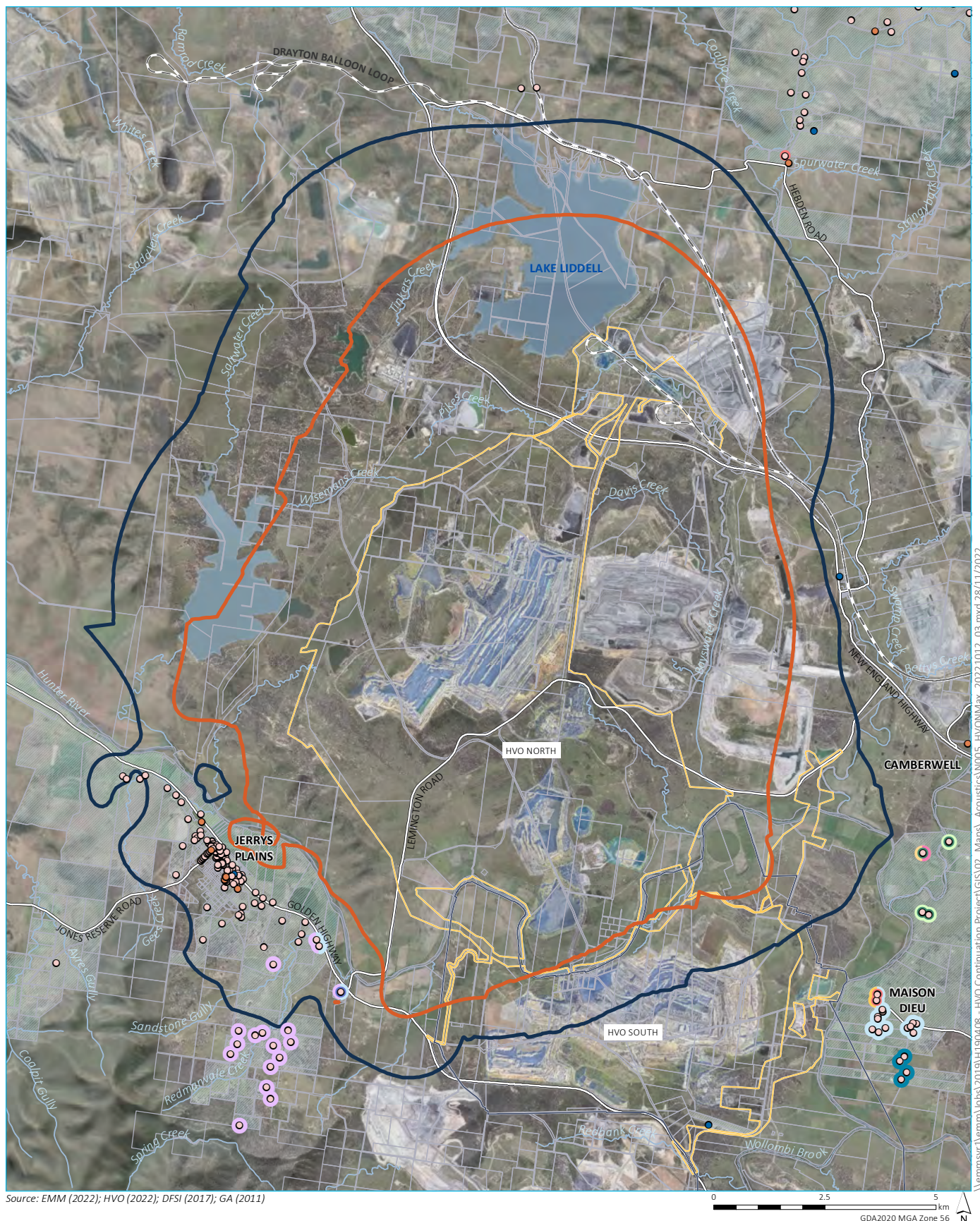
A complete set of 90th percentile predictions and neutral atmosphere predictions for all receptors is presented in Appendix A.

Figure 4.1 and Figure 4.2 illustrate indicative HVO North and HVO South maximum envelope $L_{Aeq,15minute}$ noise contours. These contours represent the maximum envelope predicted for all stages and all time periods. A complete set of noise contour figures for each individual stage is presented in Appendix C.

4.3.3 Prescribed noise limits

It should be noted that the results presented in Section 4.3.2 do not necessarily match the ANL in all cases. The ANL are levels that HVO is proposing it could meet 100% of the time, as that level of compliance with approved noise criteria is required by regulators in NSW. Results in this report represent a typical worst case operating scenario, which shows variations, as expected, in predicted levels across the assessed receptors. Some receptors will require the predicted ANL as noise limits when others don't, as key receptors determine the ANL in each NAG and there is variability across each NAG. However, results for all receptors meet or are below the ANL presented in Section 4.3.2.

Given the preceding, predicted noise levels in Table 4.11 and Table 4.12 should *not* be prescribed as approved noise limits. The Project viability has been determined on the basis of ANL being approved as noise limits.



KEY

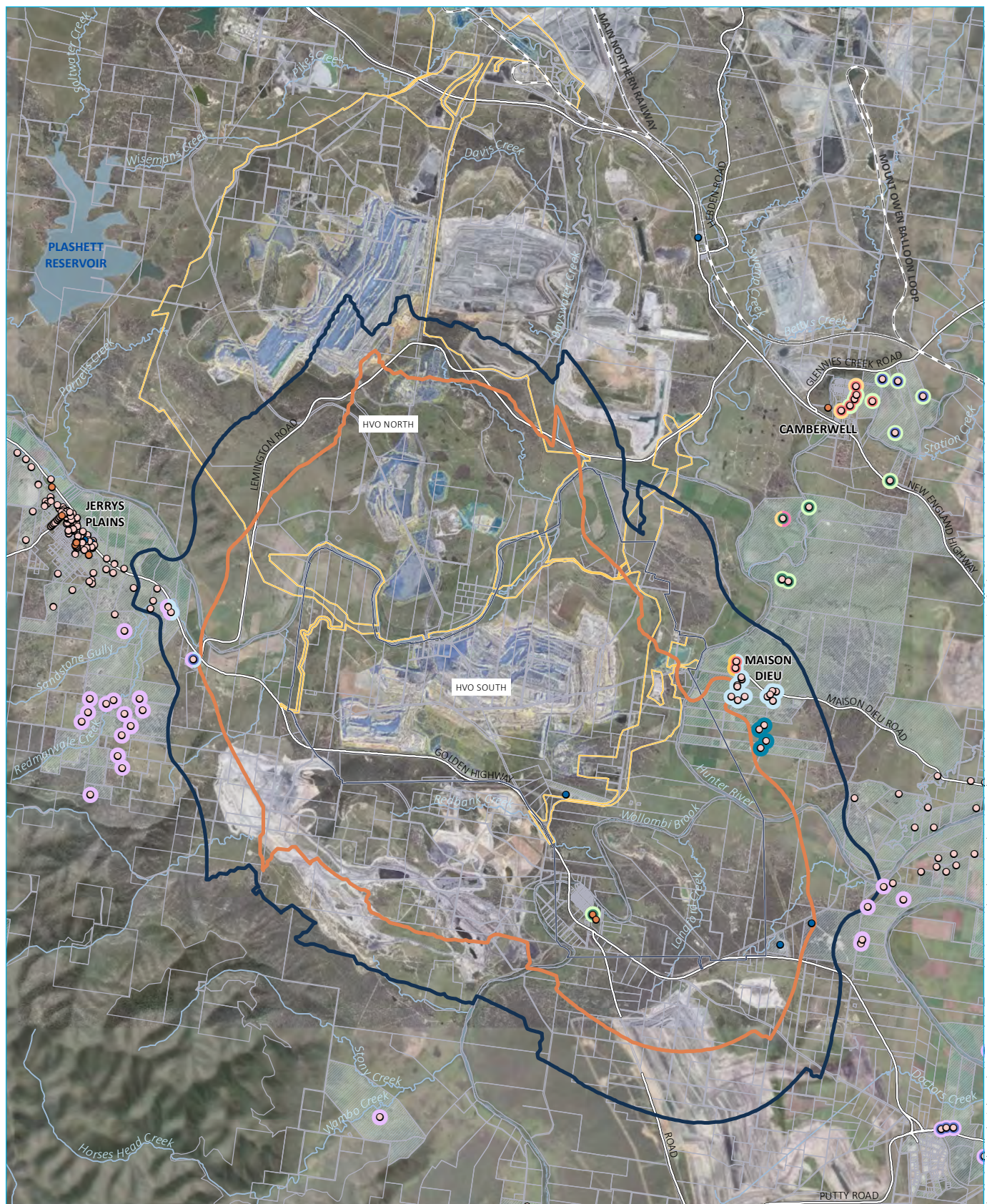
- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Receptor location
 - Private - residential
 - Private - non residential
 - Community infrastructure
 - Subject to existing acquisition rights - Other mine - AQ
 - Subject to existing acquisition rights - 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_{Aeq,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
Noise Impact Assessment
Figure 4.1



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

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_{L_{Aeq},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
Noise Impact Assessment
Figure 4.2

Table 4.11 HVO North operational noise predictions– $L_{Aeq,15\text{minute}}$ dB

Receptor ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum Envelope		
	D	E	N	D	E	N	D	E	N	D	E	N	D	E	N	D	E	N	D	E	N
317	41	41	38	25	28	37	27	26	38	28	32	39	30	34	38	33	34	37	33	34	39
321	41	41	38	25	28	38	28	32	39	32	36	40	34	36	38	34	35	36	34	36	40
322	41	41	38	27	31	39	31	33	39	34	36	39	34	36	38	34	34	36	34	36	39
324	41	41	38	26	30	38	29	33	39	33	36	39	34	36	38	34	35	36	34	36	39
326	40	35	35	36	37	39	36	35	38	35	34	38	33	32	35	32	32	34	36	37	39
327	40	35	35	37	36	39	36	34	38	35	34	38	33	32	36	32	32	34	37	36	39
328	40	35	35	35	37	40	36	36	39	35	33	38	34	33	36	33	32	35	36	37	40
330	40	35	35	36	37	39	36	35	38	35	34	38	33	33	36	32	32	34	36	37	39
332	41	38	37	35	37	39	35	36	38	35	35	38	34	33	36	33	32	34	35	37	39
333	41	38	37	35	37	39	35	36	38	35	35	38	34	33	36	33	32	34	35	37	39
334	41	38	37	35	37	39	35	36	38	35	35	38	34	33	36	33	32	34	35	37	39
335	41	38	37	35	37	39	35	36	38	35	35	38	34	33	36	33	32	34	35	37	39
336	41	38	37	35	37	40	35	36	38	35	35	38	34	33	36	33	32	35	35	37	40
337	41	38	37	35	37	39	35	36	38	35	35	38	34	33	36	33	32	35	35	37	39
338	41	38	37	35	37	39	35	36	38	35	35	38	34	33	37	33	32	35	35	37	39
339	41	38	37	34	36	38	34	35	37	35	36	38	34	33	36	33	32	34	35	36	38
340	41	38	37	34	36	39	34	35	37	35	36	38	34	33	36	33	32	34	35	36	39
341	41	38	37	34	36	39	34	35	37	35	36	38	34	33	36	33	32	34	35	36	39

Table 4.11 HVO North operational noise predictions– $L_{Aeq,15\text{minute}}$ dB

Receptor ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum Envelope		
	D	E	N	D	E	N	D	E	N	D	E	N	D	E	N	D	E	N	D	E	N
342	41	38	37	34	36	39	34	35	37	35	36	38	34	33	36	33	32	34	35	36	39
343	41	38	37	34	36	39	34	35	37	35	36	38	34	33	36	33	32	34	35	36	39
344	41	38	37	34	36	39	35	36	38	35	36	38	34	33	36	33	32	35	35	36	39
345	41	38	37	34	36	39	35	36	38	35	36	38	34	33	36	33	32	35	35	36	39
346	41	38	37	34	36	39	35	36	38	36	36	38	34	33	37	33	32	35	36	36	39
347	41	38	37	35	37	40	35	36	38	35	36	38	34	33	37	33	32	35	35	37	40
348	41	38	37	34	36	39	35	36	38	35	36	38	34	33	36	33	32	35	35	36	39
349	41	38	37	34	36	39	35	36	38	35	36	38	34	33	37	33	32	35	35	36	39
350	41	38	37	35	36	39	35	36	38	36	36	38	34	33	37	33	32	35	36	36	39
351	41	38	37	35	36	39	35	36	38	35	36	38	34	33	37	33	32	35	35	36	39
352	41	38	37	34	36	39	35	36	38	35	36	38	34	33	37	33	32	35	35	36	39
353	41	38	37	34	36	39	35	36	38	35	36	38	34	33	37	33	32	35	35	36	39
355	41	38	37	34	36	39	35	36	38	36	36	39	34	34	37	33	32	35	36	36	39
356	41	38	37	34	36	39	35	36	38	36	37	39	34	33	37	33	32	35	36	37	39
357	41	38	37	34	36	39	35	36	38	36	37	39	34	33	37	33	32	35	36	37	39
358	41	38	37	34	36	39	34	36	37	36	37	38	34	33	37	33	33	35	36	37	39
359	41	38	37	34	36	40	35	36	38	36	37	39	34	34	37	33	33	35	36	37	40
360	41	38	37	34	36	40	35	36	38	36	37	39	34	33	37	33	33	35	36	37	40

Table 4.11 HVO North operational noise predictions– $L_{Aeq,15\text{minute}}$ dB

Receptor ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum Envelope		
	D	E	N	D	E	N	D	E	N	D	E	N	D	E	N	D	E	N	D	E	N
361	41	38	37	34	36	40	35	36	38	36	37	39	34	33	37	33	33	35	36	37	40
362	41	38	37	34	36	40	34	36	38	36	37	39	34	34	37	33	33	35	36	37	40
363	41	38	37	34	36	40	34	36	38	36	37	39	34	34	37	33	33	35	36	37	40
366	41	38	37	34	36	39	34	36	38	36	37	39	34	34	37	33	33	35	36	37	39
367	41	38	37	34	36	39	34	36	38	36	37	39	34	34	37	33	33	35	36	37	39
368	41	38	37	34	36	40	34	36	38	36	37	39	34	34	37	33	33	35	36	37	40
369	41	38	37	32	35	39	34	36	38	36	37	39	34	34	37	33	33	35	36	37	39
370	41	38	37	34	36	39	34	36	38	36	37	39	34	34	37	33	33	35	36	37	39
371	41	38	37	32	35	39	34	36	38	36	37	39	34	34	37	33	33	35	36	37	39
372	41	38	37	32	35	39	34	35	38	36	37	38	34	34	37	33	33	35	36	37	39
373	41	38	37	32	35	39	34	35	38	36	37	39	34	34	37	33	33	35	36	37	39
374	41	38	37	32	35	39	34	35	38	36	37	39	34	34	37	33	33	35	36	37	39
375	41	38	37	32	34	39	34	35	38	35	37	39	34	34	37	33	33	35	35	37	39
376	41	38	37	31	34	39	34	36	39	36	37	39	34	34	37	33	33	35	36	37	39
377	41	38	37	32	35	40	34	36	38	36	37	39	34	34	37	33	33	35	36	37	40
380	41	38	37	30	33	39	33	35	38	35	37	39	34	35	37	33	33	35	35	37	39
381	41	38	37	30	33	39	33	35	38	35	37	39	34	35	37	33	33	35	35	37	39
383	41	38	37	31	34	39	33	35	38	35	37	39	34	34	37	33	33	35	35	37	39

Table 4.11 HVO North operational noise predictions– $L_{Aeq,15\text{minute}}$ dB

Receptor ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum Envelope		
	D	E	N	D	E	N	D	E	N	D	E	N	D	E	N	D	E	N	D	E	N
384	41	38	37	31	34	39	33	35	38	35	37	39	34	34	37	33	33	35	35	37	39
385	41	38	37	31	34	39	33	35	38	35	37	39	34	34	37	33	33	35	35	37	39
389	41	38	37	29	33	39	33	35	38	35	37	39	34	35	37	34	33	35	35	37	39
390	41	38	37	29	33	39	33	35	38	35	37	39	34	35	37	34	33	35	35	37	39
392	41	38	37	29	33	39	32	35	38	35	37	39	34	35	37	34	33	36	35	37	39
393	41	38	37	28	32	39	32	35	38	35	37	39	34	35	37	34	34	36	35	37	39
394	41	38	37	29	33	39	32	35	38	35	37	39	34	35	37	34	34	36	35	37	39
395	41	38	37	29	33	39	32	35	39	35	37	39	34	35	37	34	34	36	35	37	39
397	41	38	37	29	33	39	32	35	38	35	37	39	34	35	37	34	34	35	35	37	39
398	41	38	37	29	33	38	32	35	38	35	36	39	34	35	37	33	34	35	35	36	39
399	41	38	37	28	33	39	32	34	38	35	37	39	34	35	37	34	34	35	35	37	39
400	41	38	37	29	33	39	32	35	38	35	37	39	34	35	37	34	34	35	35	37	39
401	41	38	37	29	33	39	32	35	38	35	37	39	34	35	37	34	34	35	35	37	39
402	41	38	37	29	33	39	33	35	38	35	37	39	34	35	37	33	34	35	35	37	39
403	41	38	37	29	33	39	33	35	38	35	37	39	34	35	37	33	34	35	35	37	39
404	41	38	37	29	33	39	33	35	38	35	37	39	34	35	37	33	34	35	35	37	39
405	41	38	37	29	33	39	33	35	38	35	37	39	34	35	37	33	34	35	35	37	39
406	41	38	37	29	33	39	33	35	38	35	37	39	34	35	37	34	34	35	35	37	39

Table 4.11 HVO North operational noise predictions– $L_{Aeq,15\text{minute}}$ dB

Receptor ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum Envelope		
	D	E	N	D	E	N	D	E	N	D	E	N	D	E	N	D	E	N	D	E	N
407	41	38	37	30	33	39	33	35	38	35	37	39	34	35	37	33	34	35	35	37	39
408	41	38	37	29	33	38	32	35	38	35	36	39	34	35	37	33	33	35	35	36	39
409	41	38	37	30	33	39	33	35	38	35	37	39	34	35	37	33	33	35	35	37	39
411	41	38	37	30	33	38	33	35	38	35	37	38	34	35	37	33	33	35	35	37	38
413	41	38	37	30	33	38	33	35	38	35	36	38	34	35	37	33	33	35	35	36	38
414	41	38	37	30	33	38	33	35	38	35	37	38	34	35	37	33	33	35	35	37	38
415	41	38	37	30	33	38	33	35	38	35	37	39	34	35	37	33	33	35	35	37	39
417	41	38	37	34	36	39	34	36	38	36	37	39	34	34	37	33	33	35	36	37	39
418	41	38	37	32	34	39	33	35	38	35	37	38	34	34	37	33	33	35	35	37	39
419	41	38	37	30	33	38	33	34	37	34	36	38	34	35	37	33	33	35	34	36	38
420	41	38	37	29	33	39	33	35	38	35	37	39	34	35	37	33	34	35	35	37	39
421	41	38	37	30	33	39	33	35	38	35	37	39	34	34	37	34	33	35	35	37	39
422	41	38	37	31	34	39	33	35	39	35	37	39	34	34	37	34	33	35	35	37	39
423	41	38	37	29	33	39	33	35	38	35	37	39	34	35	37	34	33	35	35	37	39
429	41	41	38	27	31	38	30	33	39	33	36	38	34	36	37	34	34	36	34	36	39
430	41	41	38	28	32	38	31	33	38	34	35	39	34	35	37	33	34	35	34	35	39
431	41	41	38	27	29	38	29	32	39	33	36	39	34	36	38	34	35	36	34	36	39
432	41	41	38	27	27	36	29	30	37	31	34	39	32	34	37	32	33	35	32	34	39

Table 4.11 HVO North operational noise predictions– L_{Aeq,15minute} dB

Receptor ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum Envelope		
	D	E	N	D	E	N	D	E	N	D	E	N	D	E	N	D	E	N	D	E	N
434	41	41	38	25	27	38	27	28	38	28	33	40	32	34	38	33	34	37	33	34	40
436	41	41	38	25	27	38	27	28	38	29	33	39	32	34	38	33	34	37	33	34	39
437	40	35	35	37	36	39	35	34	38	35	34	37	33	32	35	32	31	34	37	36	39
440	41	41	38	26	27	37	28	28	37	29	32	39	31	34	38	32	34	36	32	34	39
466	40	35	35	33	35	37	33	34	37	34	35	37	33	33	35	32	32	33	34	35	37
482	41	38	37	34	36	39	35	36	38	36	37	39	34	33	37	33	32	35	36	37	39
484	41	38	37	35	36	39	35	36	38	35	36	38	34	33	37	33	32	35	35	36	39
487	40	35	35	36	34	38	35	34	37	34	33	36	32	32	34	31	31	33	36	34	38
488	40	35	35	35	34	37	34	33	36	33	32	35	31	31	33	30	29	31	35	34	37
489	40	35	35	35	34	37	34	33	36	32	31	34	28	27	30	29	28	30	35	34	37
835	41	38	37	34	36	39	34	36	38	36	37	39	34	34	37	33	33	35	36	37	39
836	41	38	37	34	35	39	34	36	38	36	37	38	34	34	37	33	33	35	36	37	39
837	41	38	37	34	36	39	34	36	38	36	37	39	34	34	37	33	33	35	36	37	39
838	41	38	37	30	33	39	33	35	38	35	37	39	34	35	37	33	33	35	35	37	39
839	41	38	37	30	33	39	33	35	38	35	37	39	34	35	37	33	33	35	35	37	39
840	41	38	37	29	33	39	33	35	38	35	37	39	34	35	37	33	34	35	35	37	39
952	41	41	38	25	28	38	27	31	38	32	35	40	33	35	38	33	35	36	33	35	40

Notes: 1. Values in bold type exceed PNTL.

Table 4.12 HVO South operational noise predictions– $L_{Aeq,15\text{minute}}$ dB

Receptor ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum Envelope		
	D	E	N	D	E	N	D	E	N	D	E	N	D	E	N	D	E	N	D	E	N
120	40	36	36	34	36	38	35	36	38	35	37	39	36	38	39	35	37	40	36	38	40
121	40	36	36	35	36	38	35	36	38	37	38	40	36	37	39	36	37	40	37	38	40
122	40	36	36	34	36	38	35	36	37	35	37	38	36	37	39	35	37	39	36	37	39
123	40	36	36	34	36	37	35	36	38	36	38	39	36	37	39	35	37	39	36	38	39
160	40	36	36	33	35	39	36	37	39	36	37	39	36	39	40	36	38	40	36	39	40
161	40	36	36	33	35	39	35	36	39	35	37	39	36	38	40	36	37	40	36	38	40
162	40	36	36	33	35	39	35	36	39	35	37	39	36	38	40	35	37	40	36	38	40
163	40	36	36	33	35	38	35	36	39	34	36	38	36	38	40	35	37	39	36	38	40
244	40	36	36	32	35	37	34	36	37	34	36	37	35	36	37	34	35	37	35	36	37
245	40	36	36	32	35	38	34	36	37	34	36	38	35	37	38	34	36	38	35	37	38
246	40	36	36	32	35	37	34	35	37	34	36	37	34	36	38	34	35	37	34	36	38
247	40	36	36	32	34	37	34	35	37	34	36	37	34	36	37	34	35	37	34	36	37
256	40	36	36	32	36	39	35	37	39	34	37	38	35	37	39	34	36	39	35	37	39
258	40	36	36	32	36	39	35	37	39	34	36	38	36	38	40	35	36	39	36	38	40
260	40	36	36	32	35	38	35	36	38	35	37	39	36	38	40	35	37	39	36	38	40
261	40	36	36	33	36	39	36	37	39	36	37	39	36	38	40	36	37	39	36	38	40
308	41	41	38	34	33	35	34	34	35	35	35	36	38	38	40	36	36	38	38	38	40

Table 4.12 HVO South operational noise predictions– $L_{Aeq,15minute}$ dB

Receptor ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum Envelope		
	D	E	N	D	E	N	D	E	N	D	E	N	D	E	N	D	E	N	D	E	N
497	40	36	36	32	36	39	34	37	39	35	37	38	35	37	39	34	36	39	35	37	39
498	40	36	36	32	35	37	34	36	37	34	36	38	35	37	38	34	35	38	35	37	38

Notes: 1. Values in bold type exceed PNTL.

4.3.4 Residual noise impact assessment

As discussed in Section 4.2.4 all reasonable and feasible mitigation controls are applied to the Project. Therefore, any predicted exceedances of PNTL can be considered residual noise impact.

Residual noise impacts were evaluated for the Project with all reasonable and feasible noise control options included. The outcomes were as follows:

- no receptors are predicted to experience a significant residual impact, 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 or marginal; and
- 28 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 the area of 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 that states that "Receiver treatment, including the extreme case of voluntary acquisition, is normally only applicable for isolated residences in rural areas."; and
 - 13 receptors (equivalent to 8 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.

It is noted that 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 not being required to by the Project (receptors 244, 245, 246, 247, 308, 311, 317).

For receptors listed in Table 4.11 and Table 4.12, residual noise impact significance levels have been determined in accordance with both Section 4 of the NPfI, and the VLAMP (refer to Section 3.6 for more detail). Assessment outcomes are presented in Table 4.14 and Table 4.15. Each column included in Table 4.14 and Table 4.15 is explained in Table 4.13.

Table 4.13 **Explanation of Table 4.14 headings**

Column Heading	Explanation
Maximum Envelope Prediction	The maximum envelope 90 th percentile prediction that meets or is below ANL for all stages and time periods. It is governed by the night period prediction in all cases.
Maximum Exceedance of PNTL	The highest predicted exceedance of PNTL due to the maximum envelope 90 th percentile prediction.
Recommended Amenity Level	The night period recommended amenity noise level for a rural area from Table 2.2 of the NPfI.
Total Cumulative Industrial Level	The total cumulative industrial noise level is the maximum $L_{Aeq,period}$ from Section 4.8 of this report.
Cumulative Industrial Level > Recommended Amenity Level Test	“yes” if total cumulative industrial noise level is greater than the recommended amenity noise level, otherwise “no”.
NPfI Residual Noise Significance Level	The residual noise significance level determined in accordance with Table 4.1 of the NPfI.
VLAMP Residual Noise Significance Level	The residual noise significance level determined in accordance with the VLAMP. Where the total cumulative industrial noise level is less than the recommended amenity noise level, and the 90 th percentile prediction exceeds PNTL by 3 to 5 dB, the marginal category is deemed to apply.

Table 4.14 HVO North residual noise significance level evaluation

Receptor ID	Maximum Envelope Prediction below ANL L _{Aeq,15minute} dB	Maximum Exceedance of PNTL dB(A)	Recommended Amenity Level L _{Aeq,period} dB	Total Cumulative Industrial Level L _{Aeq,period} dB	Cumulative Industrial Level > Recommended Amenity Level Test	NPfI Residual Noise Significance Level	VLAMP Residual Noise Significance Level
326	39	4	40	36	No	Marginal	Marginal
327	39	4	40	36	No	Marginal	Marginal
328	40	5	40	37	No	Marginal	Marginal
330	39	4	40	36	No	Marginal	Marginal
336	40	3	40	37	No	Marginal	Marginal
347	40	3	40	37	No	Marginal	Marginal
359	40	3	40	37	No	Marginal	Marginal
360	40	3	40	37	No	Marginal	Marginal
361	40	3	40	37	No	Marginal	Marginal
362	40	3	40	37	No	Marginal	Marginal
363	40	3	40	37	No	Marginal	Marginal
368	40	3	40	37	No	Marginal	Marginal
377	40	3	40	37	No	Marginal	Marginal
437	38	4	40	36	No	Marginal	Marginal
487	39	3	40	35	No	Marginal	Marginal
317 ¹	39	1	40	39	No	Negligible	Negligible
321	40	2	40	39	No	Negligible	Negligible
322	39	1	40	39	No	Negligible	Negligible

Table 4.14 HVO North residual noise significance level evaluation

Receptor ID	Maximum Envelope Prediction below ANL L _{Aeq,15minute} dB	Maximum Exceedance of PNTL dB(A)	Recommended Amenity Level L _{Aeq,period} dB	Total Cumulative Industrial Level L _{Aeq,period} dB	Cumulative Industrial Level > Recommended Amenity Level Test	NPfI Residual Noise Significance Level	VLAMP Residual Noise Significance Level
324	39	1	40	39	No	Negligible	Negligible
332	39	2	40	36	No	Negligible	Negligible
333	39	2	40	36	No	Negligible	Negligible
334	39	2	40	36	No	Negligible	Negligible
335	39	2	40	36	No	Negligible	Negligible
337	39	2	40	36	No	Negligible	Negligible
338	39	2	40	36	No	Negligible	Negligible
339	38	1	40	36	No	Negligible	Negligible
340	39	2	40	36	No	Negligible	Negligible
341	39	2	40	36	No	Negligible	Negligible
342	39	2	40	36	No	Negligible	Negligible
343	39	2	40	36	No	Negligible	Negligible
344	39	2	40	36	No	Negligible	Negligible
345	39	2	40	36	No	Negligible	Negligible
346	39	2	40	36	No	Negligible	Negligible
348	39	2	40	36	No	Negligible	Negligible
349	39	2	40	36	No	Negligible	Negligible
350	39	2	40	36	No	Negligible	Negligible

Table 4.14 HVO North residual noise significance level evaluation

Receptor ID	Maximum Envelope Prediction below ANL L _{Aeq,15minute} dB	Maximum Exceedance of PNTL dB(A)	Recommended Amenity Level L _{Aeq,period} dB	Total Cumulative Industrial Level L _{Aeq,period} dB	Cumulative Industrial Level > Recommended Amenity Level Test	NPfI Residual Noise Significance Level	VLAMP Residual Noise Significance Level
351	39	2	40	36	No	Negligible	Negligible
352	39	2	40	36	No	Negligible	Negligible
353	39	2	40	36	No	Negligible	Negligible
355	39	2	40	37	No	Negligible	Negligible
356	39	2	40	37	No	Negligible	Negligible
357	39	2	40	37	No	Negligible	Negligible
358	39	2	40	37	No	Negligible	Negligible
366	39	2	40	37	No	Negligible	Negligible
367	39	2	40	37	No	Negligible	Negligible
369	39	2	40	37	No	Negligible	Negligible
370	39	2	40	37	No	Negligible	Negligible
371	39	2	40	37	No	Negligible	Negligible
372	39	2	40	37	No	Negligible	Negligible
373	39	2	40	37	No	Negligible	Negligible
374	39	2	40	37	No	Negligible	Negligible
375	39	2	40	37	No	Negligible	Negligible
376	39	2	40	37	No	Negligible	Negligible
380	39	2	40	37	No	Negligible	Negligible

Table 4.14 HVO North residual noise significance level evaluation

Receptor ID	Maximum Envelope Prediction below ANL L _{Aeq,15minute} dB	Maximum Exceedance of PNTL dB(A)	Recommended Amenity Level L _{Aeq,period} dB	Total Cumulative Industrial Level L _{Aeq,period} dB	Cumulative Industrial Level > Recommended Amenity Level Test	NPfI Residual Noise Significance Level	VLAMP Residual Noise Significance Level
381	39	2	40	37	No	Negligible	Negligible
383	39	2	40	37	No	Negligible	Negligible
384	39	2	40	37	No	Negligible	Negligible
385	39	2	40	37	No	Negligible	Negligible
389	39	2	40	37	No	Negligible	Negligible
390	39	2	40	37	No	Negligible	Negligible
392	39	2	40	37	No	Negligible	Negligible
393	39	2	40	37	No	Negligible	Negligible
394	39	2	40	37	No	Negligible	Negligible
395	39	2	40	37	No	Negligible	Negligible
397	39	2	40	37	No	Negligible	Negligible
398	39	2	40	37	No	Negligible	Negligible
399	39	2	40	37	No	Negligible	Negligible
400	39	2	40	37	No	Negligible	Negligible
401	39	2	40	37	No	Negligible	Negligible
402	39	2	40	37	No	Negligible	Negligible
403	39	2	40	37	No	Negligible	Negligible
404	39	2	40	37	No	Negligible	Negligible

Table 4.14 HVO North residual noise significance level evaluation

Receptor ID	Maximum Envelope Prediction below ANL L _{Aeq,15minute} dB	Maximum Exceedance of PNTL dB(A)	Recommended Amenity Level L _{Aeq,period} dB	Total Cumulative Industrial Level L _{Aeq,period} dB	Cumulative Industrial Level > Recommended Amenity Level Test	NPfI Residual Noise Significance Level	VLAMP Residual Noise Significance Level
405	39	2	40	37	No	Negligible	Negligible
406	39	2	40	37	No	Negligible	Negligible
407	39	2	40	37	No	Negligible	Negligible
408	39	2	40	37	No	Negligible	Negligible
409	39	2	40	37	No	Negligible	Negligible
411	38	1	40	36	No	Negligible	Negligible
413	38	1	40	36	No	Negligible	Negligible
414	38	1	40	36	No	Negligible	Negligible
415	39	2	40	37	No	Negligible	Negligible
417	39	2	40	37	No	Negligible	Negligible
418	39	2	40	37	No	Negligible	Negligible
419	38	1	40	36	No	Negligible	Negligible
420	39	2	40	37	No	Negligible	Negligible
421	39	2	40	37	No	Negligible	Negligible
422	39	2	40	37	No	Negligible	Negligible
423	39	2	40	37	No	Negligible	Negligible
429	39	1	40	39	No	Negligible	Negligible
430	39	1	40	39	No	Negligible	Negligible

Table 4.14 HVO North residual noise significance level evaluation

Receptor ID	Maximum Envelope Prediction below ANL L _{Aeq,15minute} dB	Maximum Exceedance of PNTL dB(A)	Recommended Amenity Level L _{Aeq,period} dB	Total Cumulative Industrial Level L _{Aeq,period} dB	Cumulative Industrial Level > Recommended Amenity Level Test	NPfI Residual Noise Significance Level	VLAMP Residual Noise Significance Level
431	39	1	40	39	No	Negligible	Negligible
432	39	1	40	39	No	Negligible	Negligible
434	40	2	40	39	No	Negligible	Negligible
436	39	1	40	39	No	Negligible	Negligible
440	39	1	40	39	No	Negligible	Negligible
466	37	2	40	35	No	Negligible	Negligible
482	39	2	40	37	No	Negligible	Negligible
484	39	2	40	36	No	Negligible	Negligible
488	37	2	40	34	No	Negligible	Negligible
489	37	2	40	34	No	Negligible	Negligible
835	39	2	40	37	No	Negligible	Negligible
836	39	2	40	37	No	Negligible	Negligible
837	39	2	40	37	No	Negligible	Negligible
838	39	2	40	37	No	Negligible	Negligible
839	39	2	40	37	No	Negligible	Negligible
840	39	2	40	37	No	Negligible	Negligible
952	40	2	40	38	No	Negligible	Negligible

Notes: 1. Receptor currently has voluntary mitigation rights. Mitigation rights are to be retained.

Table 4.15 HVO South residual noise significance level evaluation

Receptor ID	Maximum Envelope Prediction below ANL L _{Aeq,15minute} dB	Maximum Exceedance of PNTL dB(A)	Recommended Amenity Level L _{Aeq,period} dB	Total Cumulative Industrial Level L _{Aeq,period} dB	Cumulative Industrial Level > Recommended Amenity Level Test	NPfI Residual Noise Significance Level	VLAMP Residual Noise Significance Level
120 ¹	40	4	40	39	No	Marginal	Marginal
121 ¹	40	4	40	40	No	Marginal	Marginal
122 ¹	39	3	40	39	No	Marginal	Marginal
123 ¹	39	3	40	39	No	Marginal	Marginal
160 ¹	40	4	40	39	No	Marginal	Marginal
161 ¹	40	4	40	39	No	Marginal	Marginal
162 ¹	40	4	40	39	No	Marginal	Marginal
163 ¹	40	4	40	39	No	Marginal	Marginal
256 ²	39	3	40	39	No	Marginal	Marginal
258 ¹	40	4	40	39	No	Marginal	Marginal
260 ¹	40	4	40	39	No	Marginal	Marginal
261 ¹	40	4	40	39	No	Marginal	Marginal
497 ²	39	3	40	39	No	Marginal	Marginal
244 ¹	37	1	40	38	No	Negligible	Negligible
245 ¹	38	2	40	39	No	Negligible	Negligible
246 ¹	38	2	40	38	No	Negligible	Negligible
247 ¹	37	1	40	38	No	Negligible	Negligible

Table 4.15 HVO South residual noise significance level evaluation

Receptor ID	Maximum Envelope Prediction below ANL L _{Aeq,15minute} dB	Maximum Exceedance of PNTL dB(A)	Recommended Amenity Level L _{Aeq,period} dB	Total Cumulative Industrial Level L _{Aeq,period} dB	Cumulative Industrial Level > Recommended Amenity Level Test	NPfI Residual Noise Significance Level	VLAMP Residual Noise Significance Level
308 ³	40	2	40	43	Yes	Negligible	Negligible
498	38	2	40	39	No	Negligible	Negligible

Notes:

1. Receptor currently has voluntary noise mitigation rights under HVO approvals. Mitigation rights are to be retained.
2. Receptor has acquisition on request rights with Ravensworth Operations for air quality and mitigation rights with Ravensworth Operations and HVO South for noise.
3. Receptor has acquisition on request rights with United Wambo Joint Venture for noise and mitigation rights with United Wambo Joint venture and HVO South for noise.

A summary of receptors allocated to each residual noise significance category is provided in Table 4.16. Table 4.2 of the NPfI provides examples of receptor-based treatments that could be used to mitigate residual noise impact. That table is reproduced in Section 3.6.1 of this report. These treatments are generally consistent with Table 1 of the VLAMP, with the exception that the VLAMP also recommends residence mitigation where the residual impact category is significant. It should be noted that 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 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 village. These are receptors 336, 347, 359, 360, 361, 362, 363, 368 and 377.

Table 4.16 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

4.4 Private land area assessment

As described in Section 3.5 an assessment of operational noise impact over contiguous privately-owned land where there is an existing dwelling or where a dwelling could be built under existing planning controls is required in accordance with the VLAMP. Additional single point 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 (Table 2.2 of the NPfI).

4.5 Construction noise assessment

Construction noise criteria and proposed construction hours are presented in Section 3.7 of this report. The following sections describe construction tasks required, scenarios assessed, and impact assessment outcomes.

Two worst case construction scenarios have been assessed as follows.

1. Concurrent construction associated with the following activities during Phase 1 of construction. Approval for the Lake James enlargement is being sought under the HVO South consent, while the other construction tasks are being sought under the HVO North consent.
 - Lake James enlargement (HVO South);
 - Lemington Road realignment (HVO North);

- Parnells Dam enlargement (HVO North); and
 - transmission and telecommunication line relocations (HVO North).
2. Concurrent construction associated with the following activities during Phase 2 of construction. Approval for these works, all LCPP related, is being sought under the HVO South consent.
- rail loop and spur;
 - CPP and ROM stockpile; and
 - product stockpile and train loadout facility.

4.5.1 Phase 1 construction

Table 4.17 lists the work areas and construction tasks assessed for phase 1, including equipment types, quantities, acoustic utilisation rates and sound powers for each task. Note that these parameters are representative of equipment typically used for such tasks; however, alternative or additional equipment may be utilised depending on final construction design.

Table 4.17 Phase 1 construction scenario details

Task	Equipment Type	Equipment Quantity	Acoustic Usage %	Sound Power $L_{Aeq,15minute}$ dB
Lemington Road Construction				
Establish sub base and base	D8 dozer	2	70	107
	D10 dozer	3	70	116
	Articulated truck	8	70	114
	Grader	2	70	108
	Water cart	3	70	100
	Bobcat	2	70	103
	Excavator – 30t	3	100	104
	Excavator 45t	1	100	108
	Compactor - small	1	70	108
	Compactor - large	2	70	113
	Roller - large	1	70	110
	Excavator – 30 t	3	100	104
Drains and Culverts	Articulated truck	2	70	114
	Grader	1	70	108
	Water cart	2	70	100
	Bobcat	2	70	103
	Excavator – 30 t	3	100	104

Table 4.17 Phase 1 construction scenario details

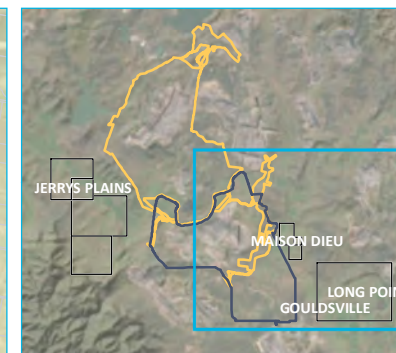
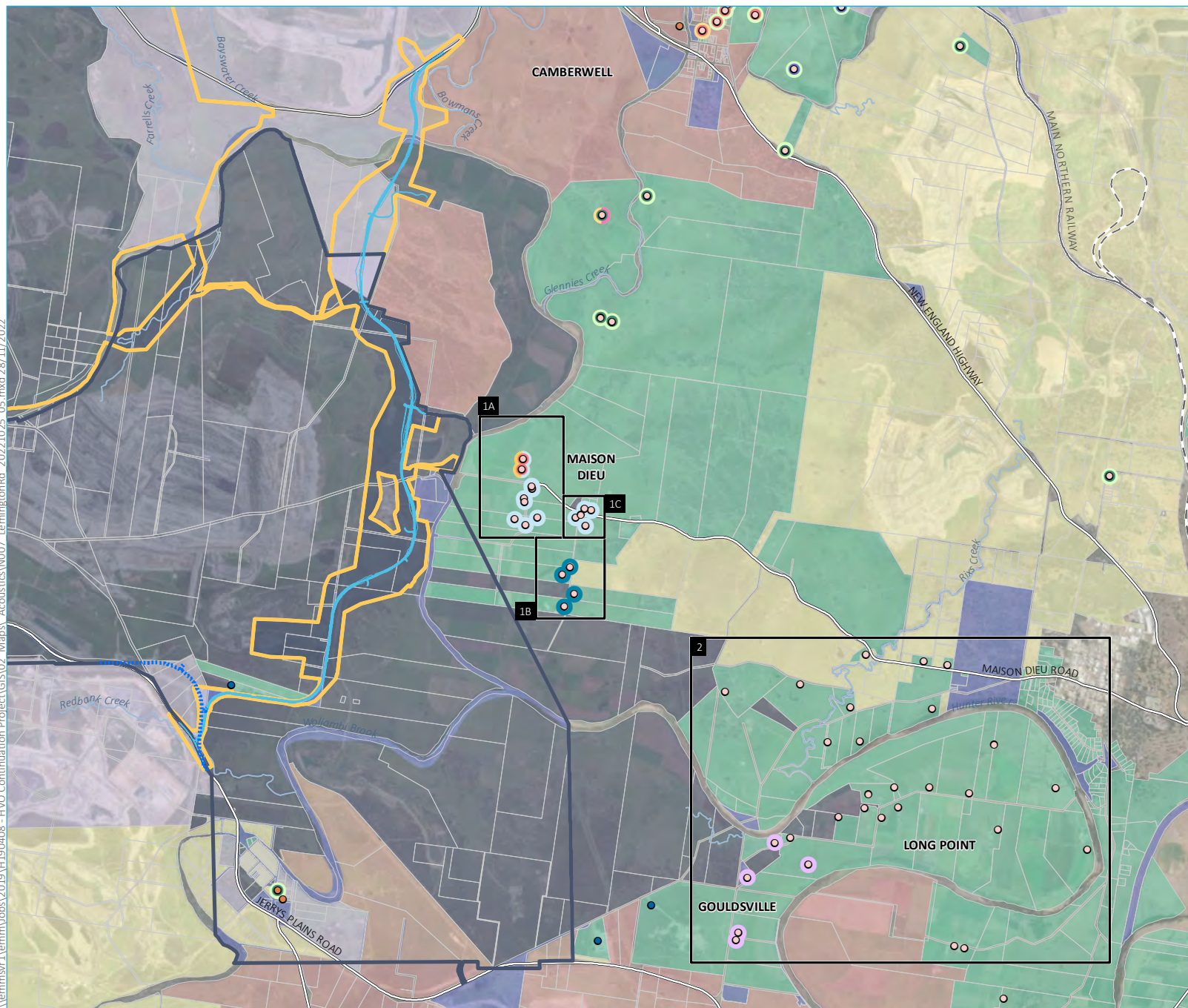
Task	Equipment Type	Equipment Quantity	Acoustic Usage %	Sound Power L _{Aeq,15minute} dB
Lemington Rd/Golden Highway intersection	Excavator – 5 t	2	100	101
	Compactor – small	2	70	108
	Articulated truck	8	70	114
	D8 dozer	1	70	107
	Excavator – 30 t	3	100	104
	Excavator – 45 t	1	100	108
	Grader	3	70	108
	Water cart	3	70	100
	Bobcat	1	70	103
	Compactor – small	3	70	108
	Roller – large	3	70	110
	D10 dozer	2	70	116
	Lake James Enlargement			
Earthworks	D8 dozer	3	70	107
	D10 dozer	2	70	116
	Highway truck	3	70	104
	Articulated truck	10	70	114
	Grader	1	70	108
	Water cart	4	70	100
	Bobcat	2	70	103
	Excavator – 50 t	2	100	108
	Excavator – 30 t	2	100	104
	Excavator – 5 t	2	100	101
	Compactor – small	1	70	108
	Compactor – large	2	70	113
	Roller - large	1	70	110
Earthworks	Parnells Dam Enlargement			
	D8 dozer	3	70	107
	D10 dozer	4	70	116

Table 4.17 **Phase 1 construction scenario details**

Task	Equipment Type	Equipment Quantity	Acoustic Usage %	Sound Power L _{Aeq,15minute} dB
	Highway truck	3	70	104
	Articulated truck	6	70	114
	Scraper 651	12	70	117
	Grader	1	70	108
	Water cart	4	70	100
	Bobcat	2	70	103
	Excavator – 50 t	2	100	108
	Excavator – 30 t	2	100	104
	Excavator – 5 t	2	100	101
	Compactor – small	1	70	108
	Compactor – large	3	70	113
	Roller – large	1	70	110
Transmission and Telecommunication Line Relocations				
Site preparation	Pole borers	3	70	112
	Articulated truck	5	70	114
	Crane	2	50	101
	Excavator – 30 t	1	100	104
	D8 dozer	1	70	107

Equipment was modelled with acoustic energy distributed over the length of each work area as appropriate. Work that is confined to a distinct area such as the Lemington Road/Golden Highway intersection is modelled within that area. As the Lemington Road construction project covers a relatively long operating strip, equipment is modelled along three separate 1,000 metre sections that cover the closest construction areas to receptors in Maison Dieu, which represents worst case impact. The highest result for each receptor is presented from the three construction areas. That is, each section was modelled separately, and the highest prediction from the three different sections was determined for each receptor. Figure 4.3 shows the proximity of NAGs 1A, 1B and 1C to the Lemington Road realignment.

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- KEY**
- Noise assessment group
 - HVO North proposed development consent boundary
 - HVO South proposed development consent boundary
 - Alternate Golden Highway alignment (as per United Wambo Joint Venture - SSD 7142)
 - Proposed Lemington Road realignment
 - 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
 - Existing environment
 - Rail line
 - Main road
 - Named watercourse
 - Land ownership
 - HVO JV land
 - Other mine owned - Glencore land
 - Other mine owned - Yancoal
 - Other mine owned
 - AGL Macquarie
 - Private
 - Public/Crown

Lemington Road realignment

HVO Continuation Project
Noise Impact Assessment
Figure 4.3

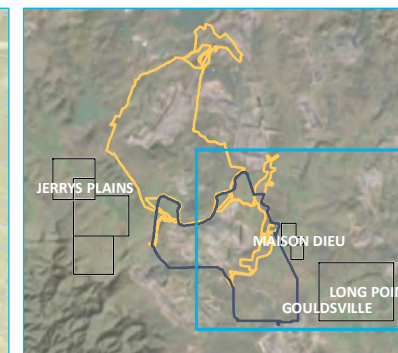
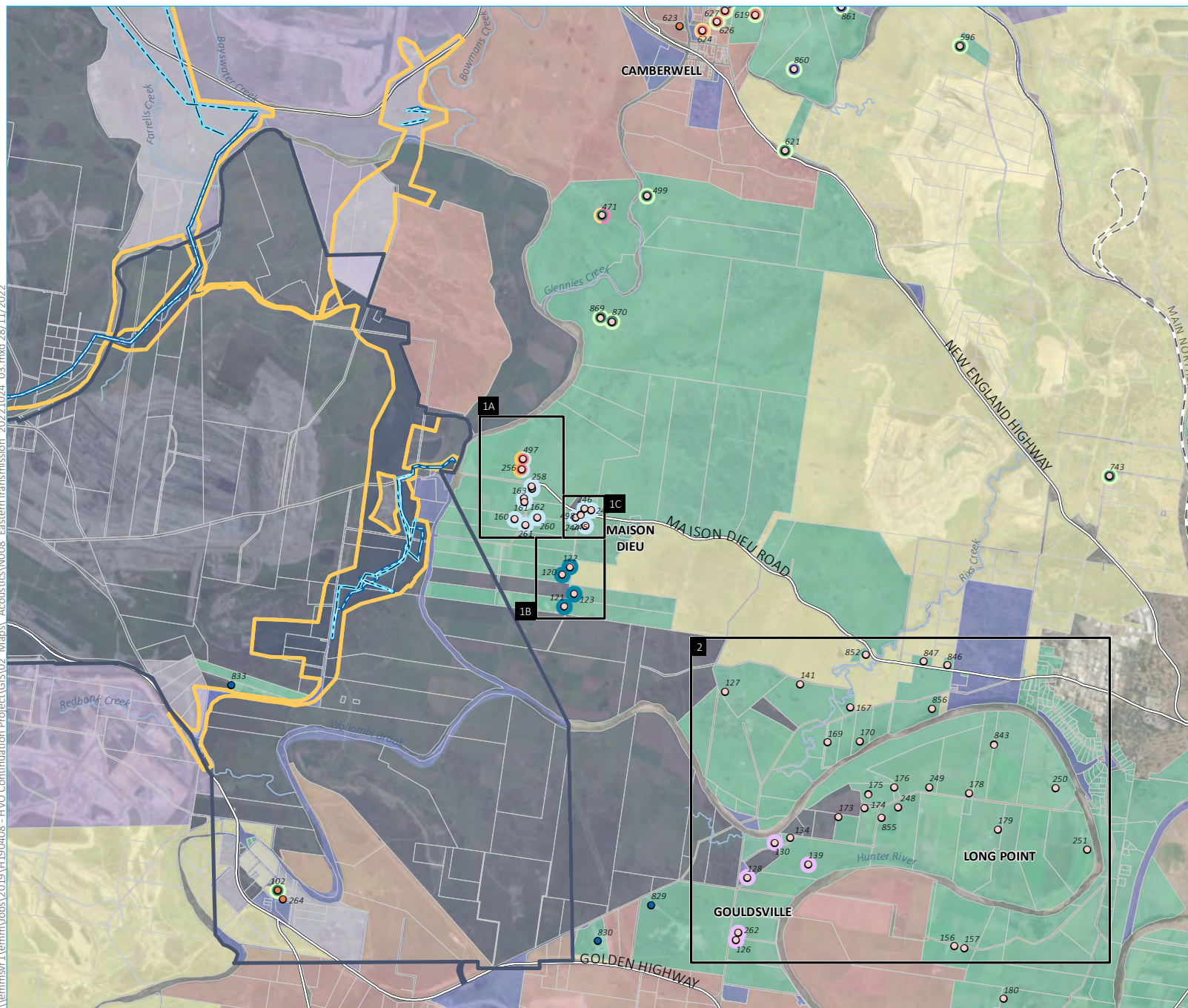


Source: EMM (2022); HVO (2022); DCSI (2017); GA (2011)

0 1 2 km
GDA2020 MGA Zone 56

Transmission and telecommunication line construction works were assessed in two areas. The first represents the worst case for receptors in NAG's 1A, 1B, 1C and 2. The second represents the worst case for receptors in NAG's 3, 4 and 5. The two areas are shown in Figure 4.4 and Figure 4.5.

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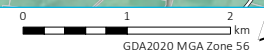
- KEY**
- Noise assessment group
 - HVO North proposed development consent boundary
 - HVO South proposed development consent boundary
 - Transmission lines
 - Ausgrid - new
 - Ausgrid - to be removed
 - Receptor location
 - Private - residential
 - Private - non residential
 - Community Infrastructure
 - 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
 - Existing environment
 - Rail line
 - Main road
 - Named watercourse
 - Land ownership
 - HVO JV land
 - Other mine owned - Glencore land
 - Other mine owned - Yancoal
 - Other mine owned
 - AGL Macquarie
 - Private
 - Public/Crown

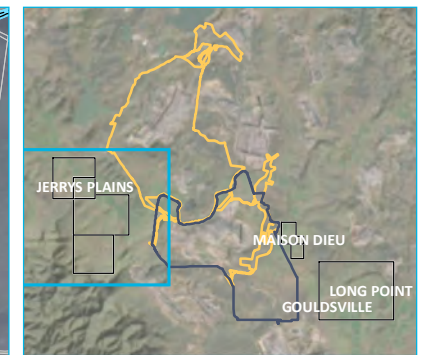
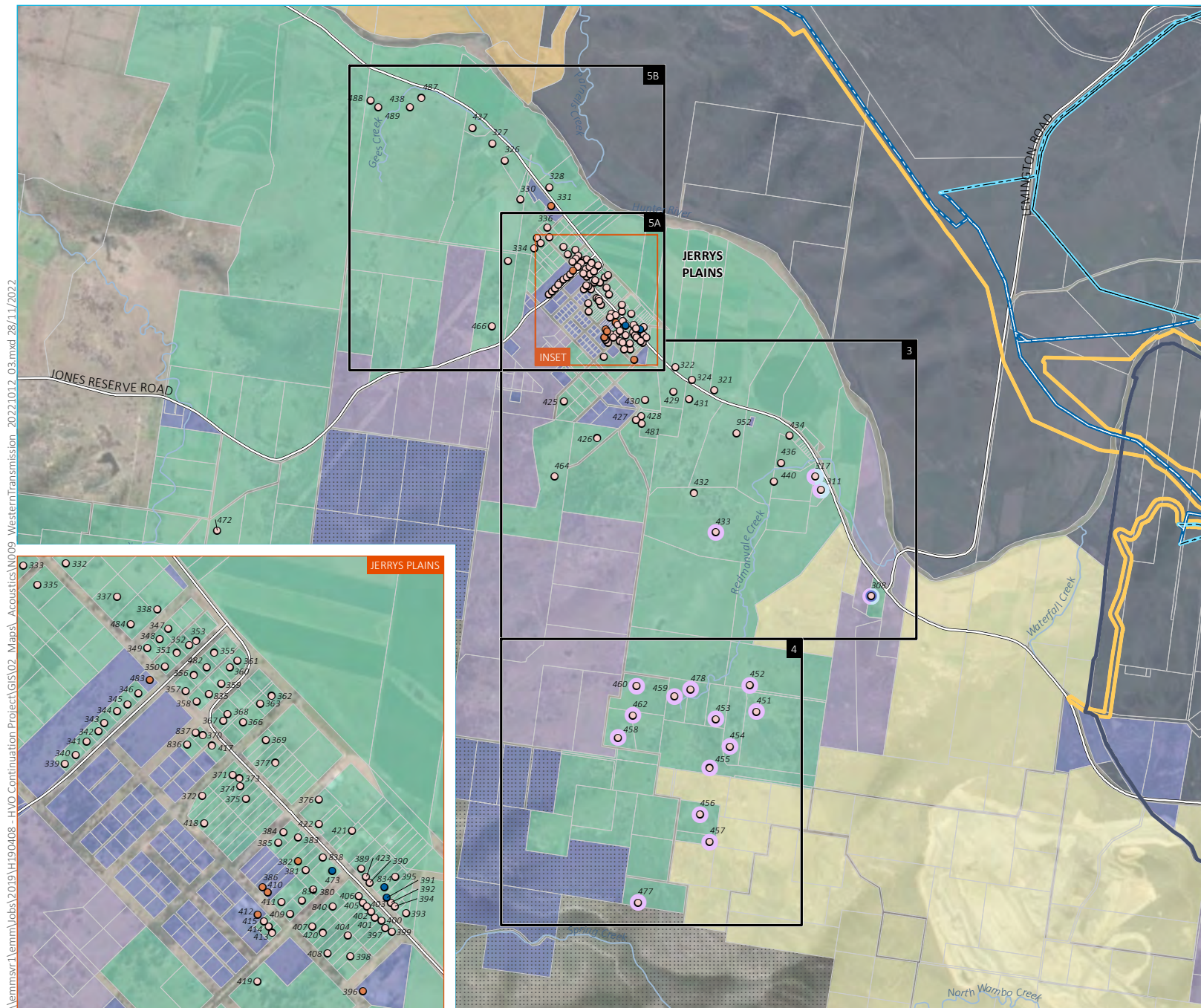
Eastern transmission line construction works

HVO Continuation Project
Noise Impact Assessment
Figure 4.4



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





- KEY**
- Noise assessment group
 - HVO North proposed development consent boundary
 - HVO South proposed development consent boundary
 - Transmission lines
 - Ausgrid - new
 - Ausgrid - to be removed
 - Receptor location
 - Private - residential
 - Private - non residential
 - Community Infrastructure
 - Subject to existing acquisition rights - Other mine - Noise
 - Subject to existing mitigation rights - HVO - Noise
 - Subject to existing mitigation rights - Other mine - Noise
 - Existing environment
 - Main road
 - Named watercourse
 - NPWS reserve
 - Land ownership
 - HVO JV land
 - Other mine owned - Glencore land
 - Other mined owned
 - AGL Macquarie
 - Private
 - Public/Crown

Western transmission line construction works

HVO Continuation Project
Noise Impact Assessment
Figure 4.5



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



Three combinations of construction and operational noise were evaluated being HVO South and HVO North construction and relevant site only, and the same construction noise combined with operational noise from both sites.

Table 4.18 presents the combinations considered.

Table 4.18 Phase 1 construction task combinations

Construction Task/Area	Site	HVON	HVOS	Combined
Lake James enlargement	HVOS	x	✓	✓
Lemington Road base/sub-base ¹	HVON	✓	x	✓
Lemington Road drains/culverts	HVON	✓	x	✓
Golden Highway intersection	HVON	✓	x	✓
Parnells Dam enlargement	HVON	✓	x	✓
Transmission line eastern area 1 ²	HVON	✓	x	✓
Transmission line western area 2 ³	HVON	✓	x	✓

Notes: 1. Includes three separate 1,000 metre sections.

2. Worst case for NAG's 1 and 2.

3. Worst case for NAG's 3 to 5.

To account for noise that may be generated concurrently by the HVO North and HVO South mining areas, day period model predictions for the Year 3 stage plan for each site were logarithmically added to construction noise predictions to obtain cumulative noise levels including both operational and construction noise.

Construction noise impact assessment predictions for private residential receptors for Phase 1 works are presented in Table 4.19. Results are 90th percentile construction noise predictions for the worst-case season during standard construction hours. Results are provided for any receptor with a 90th percentile construction noise prediction exceeding $L_{Aeq,15minute}$ 45 dB, which is the ICNG 'noise affected management level'. All other receptors have construction noise predictions less than or equal to $L_{Aeq,15minute}$ 45 dB. Of note, construction noise predictions remain below the 'noise affected level' for all receptors in NAGs 2, 3, 4, 5A and 5B. Predictions for all non-residential receptors are well below relevant management levels presented in Table 4.19.

Table 4.19 Phase 1 construction noise predictions – $L_{Aeq,15minute}$ dB

Receptor ID	NAG	Management Levels		Construction Task Combination		
		Noise Affected	Highly Noise Affected	HVON ¹	HVOS	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

Table 4.19 Phase 1 construction noise predictions – $L_{Aeq,15\text{minute}}$ dB

Receptor ID	NAG	Management Levels		Construction Task Combination		
		Noise Affected	Highly Noise Affected	HVON ¹	HVOS	Combined
162	1A	45	75	49	53	54
163	1A	45	75	49	53	54
244	1C	45	75	46	48	49
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

Results presented in Table 4.19 indicate all private residential receptors in NAGs 1A, 1B and 1C have construction noise predictions higher than the ‘noise affected’ management level, but significantly less than the ‘highly noise affected’ management level. 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 Table 4.19.

All receptors with predicted construction noise levels higher than the ‘noise affected’ management level are located in Maison Dieu (NAG 1A, 1B and 1C). Both HVO North and HVO South have potential to generate levels in the $L_{Aeq,15\text{minute}}$ 50 to 56 dB range at the nearest receptors. The construction tasks primarily responsible for predicted levels are the Lemington Road realignment and Lake James enlargement. Approval for these tasks is being sought under the HVO North and HVO South consents, respectively.

At receptors with the highest predictions, the cumulative impact due to both HVO North and HVO South construction tasks being conducted concurrently only causes an increase of 1 to 2 dB relative to just 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.

4.5.2 Phase 2 construction

Phase 2 involves concurrent construction of the Lemington CPP and rail infrastructure construction commencing in approximately Year 13. These tasks are all associated with HVO South.

Table 4.20 lists the work areas and construction tasks assessed for Phase 2, including equipment types, quantities, acoustic utilisation rates and sound powers for each task. Note that these parameters are representative of equipment typically used for such tasks; however, alternative or additional equipment may be utilised depending on final construction design.

A range of construction tasks will be required at various stages of the construction program, including earthworks, infrastructure installation and commissioning. Of these, earthworks is the worst case in terms of noise emission for each construction area, and has therefore been quantitatively assessed. Other construction activities should have lower noise emission due to lower equipment quantities and generally quieter equipment being used.

Table 4.20 Phase 2 construction scenario details

Equipment type	Equipment quantity	Acoustic usage %	Sound power $L_{Aeq,15\text{minute}}$ dB
Lemington Rail Loop Construction			
D8 dozer	2	70	107
Articulated truck	6	70	114
Grader	1	70	108
Water cart	2	70	100
Bobcat	2	70	103
Excavator – 30 t	3	100	104
Compactor – small	1	70	108
Compactor – large	1	70	113
Roller – large	1	70	110
Lemington CPP and ROM Stockpile Construction			
Articulated truck	7	70	114
Grader	1	70	108
Water cart	2	70	100
Bobcat	2	70	103
Excavator – 30 t	3	1.0	104
Excavator – 5 t	2	1.0	101
Compactor – small	2	70	108
Product Stockpile and Train Loadout Construction			
Articulated truck	10	70	114
D8 dozer	2	70	107
D10 dozer	3	70	116
Excavator – 30 t	4	100	104
Highway truck	8	70	104
Grader	2	70	108

Table 4.20 Phase 2 construction scenario details

Equipment type	Equipment quantity	Acoustic usage %	Sound power $L_{Aeq,15minute}$ dB
Water cart	4	70	100
Bobcat	3	70	103
Compactor – large	3	70	113
Roller – large	3	70	110

Equipment was modelled with acoustic energy distributed over the length of each work area as appropriate.

To account for noise that may be generated concurrently by the HVO South mining area, day period model predictions for the Year 11 stage plan, being the closest stage plan to the proposed construction timing, for each site were logarithmically added to construction noise predictions to obtain cumulative noise levels including both operational and construction noise.

Combinations for the various construction tasks and areas were evaluated to ensure potential worst-case impact was captured. Table 4.21 presents the combinations considered. L1, L2 and L3 include equipment operating within each task area combined with predicted operational noise predictions for that stage. L4 (L1+L2+L3) considers all three construction areas and operational noise concurrently.

Table 4.21 Phase 2 construction task combinations

Construction task/area	Combination ID			
	L1	L2	L3	L4
Lemington Rail Loop and Spur	✓	×	×	✓
Lemington CPP and ROM Stockpile	×	✓	×	✓
Product Stockpile and Train Loadout	×	×	✓	✓

Construction noise impact assessment predictions for private residential receptors for Phase 2 works are presented in Table 4.22. Results are 90th percentile construction noise predictions for the worst-case season during standard construction hours. As all predictions are less than the ICNG ‘noise affected’ management level, results are provided for any receptor with a 90th percentile construction noise prediction exceeding $L_{Aeq,15minute}$ 40 dB. All other receptors have construction noise predictions less than or equal to $L_{Aeq,15minute}$ 40 dB. Predictions for all non-residential receptors are well below relevant management levels presented in Table 4.22.

Table 4.22 Phase 2 construction noise predictions – $L_{Aeq,15minute}$ dB

Receptor ID	NAG	Management Levels		Construction task combination			
		Noise Affected	Highly Noise Affected	L1	L2	L3	L4
102	other	60	75	46	45	45	46
120	1B	45	75	39	38	40	41
121	1B	45	75	40	39	41	42

Table 4.22 Phase 2 construction noise predictions – $L_{Aeq,15\text{minute}}$ dB

Receptor ID	NAG	Management Levels		Construction task combination			
		Noise Affected	Highly Noise Affected	L1	L2	L3	L4
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 4.22 indicate all private residential receptors have construction noise predictions less than the 'noise affected' management level. Therefore, no construction noise impact is predicted for construction of the Lemington CPP and rail loading facility.

4.6 Sleep disturbance assessment

4.6.1 Sleep disturbance methodology

Potential sleep disturbance impact was assessed by predicting noise from plant items known to generate levels that at times stand out above the general mining continuum. Excavator bucket noise, first pass loads into empty truck bodies, rear dump truck exhaust, and dozer track noise are recognised as sources that can generate high, short term noise levels that have the potential to cause sleep disturbance.

The following sources were modelled for the purpose of assessing the potential for sleep disturbance:

- Impact 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. A sound power of $L_{\max}$ 131 dB (linear) and $L_{A\max}$ 125 dB (A-weighted) was modelled for each impact event.
- Dozer track slap was modelled at each exposed dozer operating location, typically overburden emplacement areas. A sound power of $L_{\max}$ 127 dB (linear) and $L_{A\max}$ 122 dB (A-weighted) representing dozer operation in 1st gear reverse was modelled.
- Haul truck exhaust surges were modelled by assessing a maximum sound power event of $L_{\max}$ 127 dB (linear) and $L_{A\max}$ 119 dB (A-weighted) at each overburden emplacement area, and, at exposed sections along haul routes. This sound power is an addition of 5 dB to the full rated power/uphill loaded sound power spectrum in engine and exhaust frequencies (31.5 to 500 Hz).

Assessment of sleep disturbance for each model stage involved modelling each of these sources, and then combining the highest source prediction with results for the remainder of operational plant to obtain an estimate of possible short-term maximum noise emission.

4.6.2 Sleep disturbance results

Receptors in NAG 1A have a proposed ANL of $L_{Aeq,15\text{minute}}$ 41 dB, which is above one of the maximum noise event trigger levels of $L_{Aeq,15\text{minute}}$ 40 dB. All reasonable and feasible mitigation measures have been implemented in determining ANL for the Project and the likelihood and frequency of occurrence for receptors in NAG 1A to receive levels 1 dB higher than $L_{Aeq,15\text{minute}}$ 40 dB is low. Additionally, each of these receptors will continue to be afforded voluntary mitigation rights due to the Project, therefore the requirements for a detailed assessment due to possible 1 dB exceedances of the maximum noise event trigger levels of $L_{Aeq,15\text{minute}}$ 40 dB at NAG 1A receptors is not considered necessary.

Sleep disturbance model predictions are less than the $L_{A\max}$ trigger level of 52 dB for all receptors. As such, there is no requirement for a detailed assessment of maximum noise events as per NPfI methodology.

There is only one receptor where a result greater than the current HVO South sleep disturbance criterion of $L_{A\max}$ 45 dB has been predicted. This is receptor 121, which already has voluntary mitigation rights with HVO, where $L_{A\max}$ 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 $L_{A1,1\text{minute}}$ 46 dB.

4.7 Low frequency assessment

To evaluate low frequency noise modifying factor applicability, each stage plan was modelled in ENM using one-third octave sound power inputs to obtain one-third octave model predictions. Predicted one-third octave L_{Aeq} spectra for each of 260 modelled meteorological conditions were evaluated directly against NPfI low frequency noise thresholds.

Initial model iteration results showed low frequency modifying factors were at times applicable to the Project. Analysis of equipment and associated frequencies was then done to ascertain whether improvements to equipment sound power could alleviate this. Focus on the 400t/600t excavators, drills and loaders modelled as operating on site showed attenuation of this equipment at key frequencies could significantly reduce the potential for low frequency noise emissions.

90th percentile results presented in Section 4.3.2 and Appendix A that meet or are below ANL are inclusive of low frequency noise modifying factors where applicable and Table 4.23 details receptors for each stage where the 90th percentile result has been adjusted to include a low frequency modifying factor.

Table 4.23 Low frequency modifying factor adjustment

Stage	Site	Receptors with adjustment to 90 th percentile result
Year 3	HVO North	-
	HVO South	-
Year 7	HVO North	-
	HVO South	-
Year 11	HVO North	321, 435, 837, 952
	HVO South	-
Year 18	HVO North	-
	HVO South	-
Year 22	HVO North	-
	HVO South	-

4.8 Cumulative noise assessment

4.8.1 Cumulative noise methodology

Other industrial noise sources around HVO with potential to cause cumulative noise impact to receptors within the assessment area include:

- United Wambo Joint Venture (UWJV);
- Wambo Underground (WU);
- Rixs Creek South (RCS);
- Mount Thorley Warkworth (MTW);
- Ravensworth Operations (RO);
- Ashton Coal Project (ACP); and
- Glendell.

These sources were assessed in combinations with HVO North and HVO South dependant on geographical location and directionally where there is potential to cause cumulative noise impact with HVO North and/or HVO South. When enhancement is from one direction, weather effects tend to mitigate noise from sources in other directions, and vice versa, so it's not likely that elevated noise levels would be received from sources in different directions at the same time.

The assessed combinations are detailed in Table 4.24.

Table 4.24 Cumulative noise assessment combinations

Locality	Combination 1	Combination 2	Combination 3
Camberwell	HVO North, RO, ACP, Glendell	-	-
NAG 1A, 1B and 1C	HVO South, HVO North	HVO South, UWJV, WU	HVO North, RO
NAG 2	HVO South, UWJV, WU, RCS	HVO South, UWJV, WU, MTW	
NAG 3	HVO South, HVO North	HVO South, UWJV, WU	
NAG 4	HVO South, HVO North	HVO South, UWJV, WU	
NAG 5	HVO North, HVO South	HVO South, UWJV, WU	

Predictions for other mining operations were combined with HVO North and HVO south 90th percentile predictions for privately owned receptors in Appendix A to assess cumulative noise impact.

In lieu of predictions for some operations, it has been assumed the maximum predicted intrusive noise levels for these are commensurate with intrusiveness noise criteria in their development consent.

Sources of intrusive noise levels for other operations (predicted or assumed) are as follows:

- United Wambo Open Cut Coal Mine Project Noise Impact Assessment (Umwelt, 2016).
- Rixs Creek South Continuation of Mining Project Development Consent SSD-6300.
- Warkworth Continuation Project Development Consent SSD-6464.
- Mount Thorley Continuation Project Development Consent SSD-6465.
- Ravensworth Operations Project, Project Approval 09_0176.
- Ashton Coal Project Development Consent DA 309-11-2001-i.
- Glendell Continued Operations Project Noise Impact Assessment, (Umwelt, 2019).

4.8.2 Cumulative noise results

Table D.1 in Appendix D presents the cumulative noise results. 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 current noise mitigation rights for HVO South and is subject to voluntary noise acquisition by UWJV.

4.9 Road Traffic Noise Assessment

WSP Pty Ltd has undertaken a traffic and transport impact assessment (TTIA) for the Project (PS119441-P&M-REP-001-RevA). Traffic volumes and distribution on the road network used for assessment of noise impact is based on data provided in the TTIA.

The following extracts are sourced directly from the TTIA:

In terms of traffic generation, the mine will sustain the existing operation and not increase the number of vehicle movements to support the mine's operation, primarily due to workforce numbers staying the same.

construction activities at sites accessible via Lemington Road (including the realignment of Lemington Road) would peak in mid-2024 and impact the level of service at this intersection.

During construction, this intersection would be subjected to additional traffic which includes workers travelling to construction sites and an estimate of approximately 10 rigid trucks, semi-trailers and truck and dog combined to transfer construction materials.

The road network surrounding the HVO Complex consists of the New England Highway, Golden Highway, Lemington Road, Comleroi Road, Pikes Gully Road and Liddell Station Road. Given no changes are proposed to annual workforce numbers or associated traffic generation to that currently approved, no change to road traffic noise on the main road network is expected to occur except for the case of the proposed realignment of Lemington Road.

The Project will mine through a large section of Lemington Road which requires its realignment to be east of the HVO Complex to maintain its function as a connection between the New England and Golden highways. The existing Lemington Road is proposed to be closed east of Moses Crossing to approximately 2.3 km southwest of the existing New England Highway and Lemington Road intersection. The realignment of Lemington Road will utilise the existing Comleroi Road and extend it east of HVO South to connect with Lemington Road in the north.

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. Technically, at this distance, road traffic noise need not be considered, Section 3.4.1 of the RNP titled "Process for applying the criteria" commences with "Step 1. Identify a study area comprising assessment locations within a distance of 600 metres from the centre line of the outermost traffic lane on each side of the subject road." Notwithstanding this, given some Maison Dieu residents have expressed concern about traffic noise from this realignment, road noise was calculated for that locality.

The TTIA does not include period (day and night) traffic volumes, only data for the AM and PM peak hours. The 2025 AM peak hour traffic volumes provided in the TTIA (the worst case) and used in this assessment are presented in Table 4.25.

Table 4.25 Realigned Lemington Road 2025 worst case AM hour traffic volumes

Direction	Total traffic volumes	Heavy vehicle %
Northbound	53	5.7%
Southbound	18	11.1%

Road traffic noise from the Lemington Road realignment was modelled using the traffic volumes in Table 4.25 and is predicted to range between $L_{Aeq,1hour}$ 12 and 30 dB for receptors in the Maison Dieu locality. This peak hour result is well below both the day and night period RNP criterion. Given that an $L_{Aeq,period}$ would only be lower than the predicted hourly peak traffic noise, it can be said that compliance with the relevant RNP noise limits would result at all assessed privately owned dwellings in Maison Dieu.

4.10 Construction road traffic noise assessment

Project construction will increase road traffic volumes on the New England and Golden Highways and Comleroi Road. Relative increases in peak traffic $L_{Aeq,1hour}$ noise due to additional construction traffic was calculated for the

two highways, however, not Comleroi Road because it only extends adjacent to the southern part of Maison Dieu and, is more than twice the maximum distance from private residential receptors for which the RNP considers road traffic noise needs assessing.

The peak hour $L_{Aeq,1hour}$ change due to additional construction traffic on the New England Highway is presented in Table 4.26.

Table 4.26 Construction road traffic noise assessment – New England Highway

Direction	'No build' traffic flows vph		'build' traffic flows vph		Increase vph		Relative increase dB	
	AM peak	PM peak	AM peak	PM peak	AM peak	PM peak	AM peak	PM peak
Westbound	1,577	1,450	1,866	1,736	289	286	0.7	0.8
Eastbound	1,381	1,297	1,581	1,495	200	198	0.6	0.6

Notes: 1. Peak hourly traffic flows from the TTIA.
2. "vph" denotes vehicles per hour.
3. 'Build' construction traffic volumes are 'no build' volumes combined with projected construction generated volumes.

The highest peak hour $L_{Aeq,1hour}$ change due to additional construction traffic on the New England Highway is predicted to be less than 2 dB. As noted in the RNP, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person. The change in road traffic noise levels along the New England Highway resulting from construction traffic increases due to the Project would not be measurable or perceptible.

The peak hour $L_{Aeq,1hour}$ change due to additional construction traffic on the Golden Highway is presented in Table 4.27.

Table 4.27 Construction road traffic noise assessment – Golden Highway (East of Comleroi Road)

Direction	'No build' traffic flows vph		'build' traffic flows vph		Increase vph		Relative Increase dB	
	AM peak	PM peak	AM peak	PM peak	AM peak	PM peak	AM peak	PM peak
Westbound	236	99	315	139	79	40	1.3	1.5
Eastbound	67	203	109	278	42	75	2.1	1.4

Notes: 1. Peak hourly traffic flows from the TTIA.
2. "vph" denotes vehicles per hour.
3. 'Build' construction traffic volumes are 'no build' volumes combined with projected construction generated volumes.

The highest peak hour $L_{Aeq,1hour}$ change due to additional construction traffic on the Golden Highway was predicted to be 2.1 dB on the section east of Comleroi Road as shown in Table 4.27. Three other sections of the Golden Highway subject to traffic volume increases due to construction were also evaluated with a maximum relative peak hour change of only 1.4 dB predicted.

Although the worst section Golden Highway change is more than 2 dB (the RNP requires change to be reported to one decimal place) this result is irrelevant as there are no private dwellings near the Golden Highway between Comleroi Road and Putty Road. Putty Road has higher traffic volumes than the Golden Highway such that it is expected the relative change along there would be less than 2 dB.

5 Proposed noise criteria

Based on outcomes presented in this NIA, recommended noise criteria are outlined in the following sections.

5.1 Operational noise criteria

Properties that may be afforded voluntary mitigation rights due to intrusive noise impact (marginal) are listed in Table 5.1. It should be noted that the NPfI specifies that receiver treatment is normally only applicable for isolated residences in rural areas. On this basis, all 9 receptors in NAG 5A predicted to receive noise levels 3 to 5 dB above the PNTL are not recommended to receive mitigation rights given they are within Jerrys Plains village. These are receptors 336, 347, 359, 360, 361, 362, 363, 368 and 377.

It is noted that 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 not being required to by the Project (receptors 244, 245, 246, 247, 308, 311, 317).

Table 5.1 Receptors recommended for mitigation rights

Mitigation	Property number
Mechanical ventilation/comfort condition systems to enable windows to be closed without compromising internal air quality/amenity	326, 327, 328, 330, 437, 487, 120 [^] , 121 [^] , 122 [^] , 123 [^] , 160 [^] , 161 [^] , 162 [^] , 163 [^] , 256 [^] , 258 [^] , 260 [^] , 261 [^] , 497 [^]

Notes: 1. ^ indicates receptor is currently entitled to voluntary mitigation in accordance with the HVO South Project Approval 06_0261, and HVO will continue to afford mitigation rights due to the Project.

Table 5.2 lists recommended noise impact assessment criteria based on achievable noise levels for the Project.

Table 5.2 Recommended noise impact assessment criteria, dB

NAG	Property number	Day	Evening	Night	
		L _{Aeq,15minute}	L _{Aeq,15minute}	L _{Aeq,15minute}	L _{Amax}
1A	160, 161, 162, 163, 256, 258, 260, 261, 497	41	41	41	52
1B	120, 121, 122, 123	40	40	40	52
1C	244, 245, 246, 247, 498	40	39	39	52
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	52
3	308, 311, 317, 318, 321, 322, 324, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 436, 440, 464, 481, 952	41	41	40	52
4	451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 462, 477, 478	40	37	37	52

Table 5.2 Recommended noise impact assessment criteria, dB

NAG	Property number	Day	Evening	Night	
		L _{Aeq,15minute}	L _{Aeq,15minute}	L _{Aeq,15minute}	L _{Amax}
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	52
5B	326, 327, 328, 330, 437, 438, 466, 487, 488, 489	40	40	40	52
-	All other privately owned residential land	40	35	35	52

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.

5.2 Construction noise criteria

Recommended construction noise criteria are listed in Table 5.3. Construction noise predictions presented in Section 4.5.1 of this NIA are cumulative noise levels from both construction and operational activities.

Table 5.3 Recommended construction noise criteria – L_{Aeq,15minute} dB

Construction hours	Property number	Noise affected	Highly noise affected
Standard construction hours	All privately owned residential land	45	75
Outside standard construction hours	All privately owned residential land	Approved operational noise impact assessment criteria	NA ¹

Notes: 1. Highly noise affected criterion not applicable outside standard construction hours.

Standard construction hours are:

- Monday to Friday, 7.00 am to 6.00 pm;
- Saturday, 8:00 am to 1:00 pm; and
- no construction work on Sunday and public holidays.

HVO should apply all feasible and reasonable work practices to meet the ‘noise affected’ level and should schedule construction works within standard construction hours where practical. For short duration, high noise emitting activities, for example should rock breaking be required, the ‘highly noise affected’ criterion may apply. In this case, HVO should inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details. Such activities should be scheduled for the least noise sensitive time of day.

6 Noise management and controls

6.1 Operational controls

Noise controls and management strategies described in Section 4.2.4 were included in the computer noise model for the purpose of assessing HVO noise emissions. HVO is committed to implementing the following noise mitigation controls for the Project:

- various levels (height options) will be provided for overburden emplacement to allow shielded emplacement to occur deeper in the mining area during adverse meteorological conditions;
- haul route alignments within the mining area will maximise the available topographical shielding provided by the mine design where practical;
- progressively attenuate the remaining fleet of large mining equipment and implement BATEA sound power where reasonable and feasible for significant noise generating mobile equipment;
- dozers will be restricted if deemed to be a primary source of noise during periods of meteorological enhancement;
- continue to implement BMP, which is described in Section 4.1 of this NIA;
- significant fixed infrastructure at the yet to be constructed Lemington CPP area to include cladding and BATEA sound power where practical;
- restricting operation of exposed drills if required during periods of meteorological enhancement; and
- an 8 m high roadside bund is to be constructed on the exposed side of the haul road from the Mitchell Pit towards the Howick CPP for approximately 900 m.

6.2 Noise management

The NMP will be updated to reflect project approval and licence conditions resulting from this application and will include updated management measures to ensure all commitments are implemented, and monitoring is done as required to maintain compliance with approved noise limits.

A review of both real-time and attended compliance monitoring locations will be undertaken once the approval process is complete to ensure the monitoring network provides adequate coverage of the Project area, and the existing NMP will be updated accordingly.

7 Summary

This NIA has considered potential noise impacts associated with the Project, including operational noise, construction noise, cumulative noise, modifying factor adjustments, sleep disturbance, and road traffic noise. The assessment was appropriately completed in accordance with relevant NSW guidelines and policies, including the NPfI.

7.1 Operational noise

Five operational scenarios were modelled representing stages in progression of mining operations over the proposed life of HVO North and HVO South, with emphasis on targeting the expected highest noise impact. The stages nominally relate to Year 3, Year 7, Year 11, Year 18 and Year 22 of the Project. All known private residential receptors that may be impacted by noise from the Project were modelled. Sound power levels used in modelling were primarily based on measured in-service levels of plant operating at HVO. Feasible and reasonable noise controls were identified and applied to the modelling assessment.

The cumulative distribution of results method was adopted to account for the effects of noise enhancing meteorological conditions. 90th percentile predictions for the worst-case season were used to represent intrusive noise impact. Modifying factor adjustments were evaluated and applied where required.

126 receptors had a 90th percentile prediction that exceeded PNTL in at least one time period for at least one of the five stages. None of these exceeded PNTL by more than 5 dB. The significance of residual noise impacts was determined in accordance with both Section 4 of the NPfI and the VLAMP.

This assessment has found that 19 receptors will be entitled to voluntary mitigation rights based on predicted marginal residual noise impacts, 13 of which already have existing rights under existing HVO approvals. In addition, there are 9 receptors in the village of Jerrys Plains where marginal noise impacts are predicted; however, they do not qualify for mitigation as per Section 4.2 of the NPfI. Further, 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 mitigation rights for these receptors.

Recommended operational noise criteria for the Project are outlined in Section 5.1 of this NIA.

7.2 Construction noise

Worst-case construction scenarios considered to have the greatest potential to result in construction noise impact have been quantitatively assessed in accordance with the ICNG. Results indicate all private residential receptors in NAG 1A, 1B and 1C are predicted to experience construction noise levels higher than the 'noise affected' management level, but significantly less than the 'highly noise affected' management level. 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 this report. Recommended construction noise criteria for the Project are outlined in Section 6 of this NIA.

7.3 Private land assessment

Private land was 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 privately-owned land where there is an existing dwelling or where a dwelling could be built under existing planning controls. Predictions for all privately owned land areas were below the acceptable amenity noise level plus 5 dB (Table 2.2 of the NPfI).

7.4 Cumulative noise

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 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 by UWJV.

7.5 Sleep disturbance

Potential sleep disturbance impact was assessed by predicting levels from plant items known to generate noise that can stand out above the general mining continuum. Shovel and excavator bucket noise, first pass loads into empty truck bodies, rear dump truck exhaust, and dozer track noise are recognised as sources that can generate higher short term noise levels.

Sleep disturbance model predictions were less than the L_{Amax} trigger level for all receptors. As such, there is no requirement for a detailed assessment of maximum noise events, as per NPfI methodology.

7.6 Road traffic noise

No change in annual workforce numbers or associated traffic generation with the ongoing operation of the Project is proposed. As there is no change to operational road traffic volumes associated with the Project no change in operational road traffic noise should occur except for the case of the proposed realignment of Lemington Road.

Road traffic noise from the proposed Lemington Road realignment was assessed (although technically this is not required) using the traffic volumes presented in 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.

Given that an $L_{Aeq,period}$ would only be lower than the predicted hourly peak traffic noise, it can be said that road traffic noise compliance with the RNP criteria would result at all assessed privately owned dwellings in Maison Dieu.

The relative increases in peak traffic $L_{Aeq,1hour}$ noise due to additional construction traffic on the New England Highway was assessed and predicted to be less than 2 dB. The change would not be measurable or perceptible. However, the highest peak hour $L_{Aeq,1hour}$ change due to additional construction traffic on the Golden Highway was predicted to be 2.1 dB on the section east of Comleroi Road but less than 2 dB for all other sections. This 2.1 dB result is irrelevant, however, as there are no private residential receptors near the Golden Highway between Comleroi Road and Putty Road after which the expected relative change would be less than 2 dB given the expected contribution from Putty Road traffic.

Construction road traffic noise impacts as a result of the Project are predicted to be within acceptable limits as per the RNP methodology.

8 References

Ashton Coal Project Development Consent DA309-11-2001-I.

Glendell Continued Operations Project, 2019. *Noise Impact Assessment*. Umwelt.

HVO South Project Approval 06_0261

HVO North development consent 450-10-2003

Mount Thorley Continuation Project Development Consent SSD-6465.

NSW Environment Protection Authority, 2017. *NSW Noise Policy for Industry*. Sydney: NSW Environment Protection Authority.

NSW Department of Environment, Climate Change and Water, 2011. *NSW Road Noise Policy*. Sydney: NSW Environment Protection Authority.

NSW Department of Environment and Climate Change, 2009. *Interim Construction Noise Guideline*. Sydney: NSW Environment Protection Authority.

NSW Government, 2018. *Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Developments*.

NSW Roads and Maritime Services, 2016. *Construction Noise and Vibration Guideline*.

Ravensworth Operations Project, Project Approval 09_0176.

Rixs Creek South Continuation of Mining Project Development Consent SSD-6300.

United Wambo Open Cut Coal Mine Project, 2016. *Noise Impact Assessment*. Umwelt.

Warkworth Continuation Project Development Consent SSD-6464.

Appendix A

Operational Noise Results

Table A.1 HVO North 90th percentile operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
17	40	35	35	18	19	20	19	20	21	19	20	21	19	20	21	19	20	21	19	20	21
19	40	35	35	19	20	21	19	20	21	19	21	22	19	21	22	19	20	22	19	21	22
37	40	35	35	19	20	21	19	20	21	20	21	22	19	20	21	19	20	22	20	21	22
102	53	53	53	24	25	26	24	25	26	25	26	27	24	25	26	25	26	27	25	26	27
120	40	36	36	27	28	28	27	27	28	27	28	28	26	27	28	28	29	29	28	29	29
121	40	36	36	27	28	28	27	27	28	27	28	28	26	27	27	28	28	29	28	28	29
122	40	36	36	27	28	28	27	28	28	27	28	28	26	27	28	28	29	29	28	29	29
123	40	36	36	27	28	28	27	27	28	27	28	28	26	27	27	28	28	29	28	28	29
126	40	35	35	17	17	18	17	17	18	17	17	18	16	16	17	17	18	18	17	18	18
127	40	35	35	22	23	23	22	23	23	23	23	23	23	23	24	24	24	25	24	24	25
128	40	35	35	20	21	21	21	21	22	22	22	22	22	22	22	23	23	23	23	23	23
130	40	35	35	24	24	24	23	23	24	23	24	24	23	24	24	24	24	25	24	24	25
134	40	35	35	23	24	24	23	23	23	23	23	23	23	23	24	24	24	24	24	24	24
139	40	35	35	18	19	19	19	19	20	20	20	20	18	19	19	20	20	20	20	20	20
141	40	35	35	22	22	23	21	22	22	22	22	22	20	21	21	21	22	22	22	22	23
160	40	36	36	28	29	29	28	28	29	28	29	29	27	28	28	29	30	30	29	30	30
161	40	36	36	28	29	29	28	28	29	29	29	29	27	28	28	29	30	30	29	30	30
162	40	36	36	28	29	29	28	28	29	29	29	29	27	28	28	29	30	30	29	30	30

Table A.1 HVO North 90th percentile operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
163	40	36	36	28	29	29	28	28	29	28	29	29	27	28	28	29	30	30	29	30	30
167	40	35	35	21	22	22	21	22	22	21	22	22	20	21	21	21	22	22	21	22	22
169	40	35	35	21	22	22	21	22	22	21	22	22	20	20	21	21	22	22	21	22	22
170	40	35	35	22	23	23	22	23	23	23	23	24	23	23	23	24	24	24	24	24	24
173	40	35	35	21	21	22	21	21	22	21	22	22	21	22	22	22	23	23	22	23	23
174	40	35	35	21	22	22	21	21	22	21	21	22	21	22	22	22	22	23	22	22	23
175	40	35	35	21	21	21	20	21	21	21	21	21	20	20	21	21	22	22	21	22	22
176	40	35	35	19	20	20	19	20	20	20	20	21	19	19	20	20	21	21	20	21	21
178	40	35	35	20	21	21	20	21	21	20	21	21	19	20	20	20	21	21	20	21	21
179	40	35	35	21	21	21	20	21	21	20	21	21	19	20	20	20	21	21	21	21	21
244	40	36	36	28	28	29	27	28	28	28	28	28	27	27	28	29	29	29	29	29	29
245	40	36	36	28	29	29	27	28	28	28	28	29	27	28	28	29	29	29	29	29	29
246	40	36	36	29	29	29	28	28	28	28	28	29	27	28	28	29	29	29	29	29	29
247	40	36	36	29	29	29	28	28	28	28	28	29	27	28	28	29	29	29	29	29	29
248	40	35	35	19	20	20	19	20	20	20	20	21	19	20	20	21	21	22	21	21	22
249	40	35	35	19	20	20	18	19	20	19	20	20	18	18	19	19	20	20	19	20	20
250	40	35	35	20	21	21	20	20	20	20	21	21	19	20	20	20	21	21	20	21	21
251	40	35	35	20	21	21	20	21	21	20	21	21	20	21	21	21	22	22	21	22	22

Table A.1 HVO North 90th percentile operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
256	40	36	36	28	29	29	28	28	29	28	29	29	27	28	28	29	30	30	29	30	30
258	40	36	36	28	29	29	28	28	29	28	29	29	27	28	28	29	30	30	29	30	30
260	40	36	36	28	28	29	28	28	29	28	29	29	27	28	28	29	29	30	29	29	30
261	40	36	36	28	29	29	28	28	29	28	29	29	27	28	28	29	29	30	29	29	30
262	40	35	35	22	22	23	22	22	22	22	22	23	22	22	23	23	23	24	23	23	24
264	53	53	53	24	25	26	24	25	26	25	26	27	24	25	26	25	26	27	25	26	27
266	40	35	35	18	19	22	17	19	22	19	21	23	18	20	23	18	19	23	19	21	23
308	41	41	38	29	31	35	31	30	36	32	32	38	32	31	38	33	35	38	33	35	38
311	41	41	38	26	29	37	27	26	38	29	31	38	30	33	38	32	34	37	32	34	38
317	41	41	38	25	28	37	27	26	38	28	32	39	30	34	38	33	34	37	33	34	39
321	41	41	38	25	28	38	28	32	39	32	36	40	34	36	38	34	35	36	34	36	40
322	41	41	38	27	31	39	31	33	39	34	36	39	34	36	38	34	34	36	34	36	39
324	41	41	38	26	30	38	29	33	39	33	36	39	34	36	38	34	35	36	34	36	39
326	40	35	35	36	37	39	36	35	38	35	34	38	33	32	35	32	32	34	36	37	39
327	40	35	35	37	36	39	36	34	38	35	34	38	33	32	36	32	32	34	37	36	39
328	40	35	35	35	37	40	36	36	39	35	33	38	34	33	36	33	32	35	36	37	40
330	40	35	35	36	37	39	36	35	38	35	34	38	33	33	36	32	32	34	36	37	39
331	58	58	58	35	37	40	36	36	38	36	34	38	34	33	36	33	32	35	36	37	40

Table A.1 HVO North 90th percentile operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
332	41	38	37	35	37	39	35	36	38	35	35	38	34	33	36	33	32	34	35	37	39
333	41	38	37	35	37	39	35	36	38	35	35	38	34	33	36	33	32	34	35	37	39
334	41	38	37	35	37	39	35	36	38	35	35	38	34	33	36	33	32	34	35	37	39
335	41	38	37	35	37	39	35	36	38	35	35	38	34	33	36	33	32	34	35	37	39
336	41	38	37	35	37	40	35	36	38	35	35	38	34	33	36	33	32	35	35	37	40
337	41	38	37	35	37	39	35	36	38	35	35	38	34	33	36	33	32	35	35	37	39
338	41	38	37	35	37	39	35	36	38	35	35	38	34	33	37	33	32	35	35	37	39
339	41	38	37	34	36	38	34	35	37	35	36	38	34	33	36	33	32	34	35	36	38
340	41	38	37	34	36	39	34	35	37	35	36	38	34	33	36	33	32	34	35	36	39
341	41	38	37	34	36	39	34	35	37	35	36	38	34	33	36	33	32	34	35	36	39
342	41	38	37	34	36	39	34	35	37	35	36	38	34	33	36	33	32	34	35	36	39
343	41	38	37	34	36	39	34	35	37	35	36	38	34	33	36	33	32	34	35	36	39
344	41	38	37	34	36	39	35	36	38	35	36	38	34	33	36	33	32	35	35	36	39
345	41	38	37	34	36	39	35	36	38	35	36	38	34	33	36	33	32	35	35	36	39
346	41	38	37	34	36	39	35	36	38	36	36	38	34	33	37	33	32	35	36	36	39
347	41	38	37	35	37	40	35	36	38	35	36	38	34	33	37	33	32	35	35	37	40
348	41	38	37	34	36	39	35	36	38	35	36	38	34	33	36	33	32	35	35	36	39
349	41	38	37	34	36	39	35	36	38	35	36	38	34	33	37	33	32	35	35	36	39

Table A.1 HVO North 90th percentile operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
350	41	38	37	35	36	39	35	36	38	36	36	38	34	33	37	33	32	35	36	36	39
351	41	38	37	35	36	39	35	36	38	35	36	38	34	33	37	33	32	35	35	36	39
352	41	38	37	34	36	39	35	36	38	35	36	38	34	33	37	33	32	35	35	36	39
353	41	38	37	34	36	39	35	36	38	35	36	38	34	33	37	33	32	35	35	36	39
355	41	38	37	34	36	39	35	36	38	36	36	39	34	34	37	33	32	35	36	36	39
356	41	38	37	34	36	39	35	36	38	36	37	39	34	33	37	33	32	35	36	37	39
357	41	38	37	34	36	39	35	36	38	36	37	39	34	33	37	33	32	35	36	37	39
358	41	38	37	34	36	39	34	36	37	36	37	38	34	33	37	33	33	35	36	37	39
359	41	38	37	34	36	40	35	36	38	36	37	39	34	34	37	33	33	35	36	37	40
360	41	38	37	34	36	40	35	36	38	36	37	39	34	33	37	33	33	35	36	37	40
361	41	38	37	34	36	40	35	36	38	36	37	39	34	33	37	33	33	35	36	37	40
362	41	38	37	34	36	40	34	36	38	36	37	39	34	34	37	33	33	35	36	37	40
363	41	38	37	34	36	40	34	36	38	36	37	39	34	34	37	33	33	35	36	37	40
366	41	38	37	34	36	39	34	36	38	36	37	39	34	34	37	33	33	35	36	37	39
367	41	38	37	34	36	39	34	36	38	36	37	39	34	34	37	33	33	35	36	37	39
368	41	38	37	34	36	40	34	36	38	36	37	39	34	34	37	33	33	35	36	37	40
369	41	38	37	32	35	39	34	36	38	36	37	39	34	34	37	33	33	35	36	37	39
370	41	38	37	34	36	39	34	36	38	36	37	39	34	34	37	33	33	35	36	37	39

Table A.1 HVO North 90th percentile operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
371	41	38	37	32	35	39	34	36	38	36	37	39	34	34	37	33	33	35	36	37	39
372	41	38	37	32	35	39	34	35	38	36	37	38	34	34	37	33	33	35	36	37	39
373	41	38	37	32	35	39	34	35	38	36	37	39	34	34	37	33	33	35	36	37	39
374	41	38	37	32	35	39	34	35	38	36	37	39	34	34	37	33	33	35	36	37	39
375	41	38	37	32	34	39	34	35	38	35	37	39	34	34	37	33	33	35	35	37	39
376	41	38	37	31	34	39	34	36	39	36	37	39	34	34	37	33	33	35	36	37	39
377	41	38	37	32	35	40	34	36	38	36	37	39	34	34	37	33	33	35	36	37	40
380	41	38	37	30	33	39	33	35	38	35	37	39	34	35	37	33	33	35	35	37	39
381	41	38	37	30	33	39	33	35	38	35	37	39	34	35	37	33	33	35	35	37	39
382	53	53	53	31	34	39	33	35	38	35	37	39	34	34	37	33	33	35	35	37	39
383	41	38	37	31	34	39	33	35	38	35	37	39	34	34	37	33	33	35	35	37	39
384	41	38	37	31	34	39	33	35	38	35	37	39	34	34	37	33	33	35	35	37	39
385	41	38	37	31	34	39	33	35	38	35	37	39	34	34	37	33	33	35	35	37	39
386	68	68	68	31	33	38	33	35	38	35	37	39	34	34	37	33	33	35	35	37	39
389	41	38	37	29	33	39	33	35	38	35	37	39	34	35	37	34	33	35	35	37	39
390	41	38	37	29	33	39	33	35	38	35	37	39	34	35	37	34	33	35	35	37	39
391	68	68	68	29	33	39	32	35	38	35	37	39	34	35	37	34	34	36	35	37	39
392	41	38	37	29	33	39	32	35	38	35	37	39	34	35	37	34	33	36	35	37	39

Table A.1 HVO North 90th percentile operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
393	41	38	37	28	32	39	32	35	38	35	37	39	34	35	37	34	34	36	35	37	39
394	41	38	37	29	33	39	32	35	38	35	37	39	34	35	37	34	34	36	35	37	39
395	41	38	37	29	33	39	32	35	39	35	37	39	34	35	37	34	34	36	35	37	39
396	53	53	53	28	32	38	32	34	38	34	36	39	34	35	37	33	34	35	34	36	39
397	41	38	37	29	33	39	32	35	38	35	37	39	34	35	37	34	34	35	35	37	39
398	41	38	37	29	33	38	32	35	38	35	36	39	34	35	37	33	34	35	35	36	39
399	41	38	37	28	33	39	32	34	38	35	37	39	34	35	37	34	34	35	35	37	39
400	41	38	37	29	33	39	32	35	38	35	37	39	34	35	37	34	34	35	35	37	39
401	41	38	37	29	33	39	32	35	38	35	37	39	34	35	37	34	34	35	35	37	39
402	41	38	37	29	33	39	33	35	38	35	37	39	34	35	37	33	34	35	35	37	39
403	41	38	37	29	33	39	33	35	38	35	37	39	34	35	37	33	34	35	35	37	39
404	41	38	37	29	33	39	33	35	38	35	37	39	34	35	37	33	34	35	35	37	39
405	41	38	37	29	33	39	33	35	38	35	37	39	34	35	37	33	34	35	35	37	39
406	41	38	37	29	33	39	33	35	38	35	37	39	34	35	37	34	34	35	35	37	39
407	41	38	37	30	33	39	33	35	38	35	37	39	34	35	37	33	34	35	35	37	39
408	41	38	37	29	33	38	32	35	38	35	36	39	34	35	37	33	33	35	35	36	39
409	41	38	37	30	33	39	33	35	38	35	37	39	34	35	37	33	33	35	35	37	39
410	68	68	68	31	33	39	33	35	38	35	37	38	34	35	37	33	33	35	35	37	39

Table A.1 HVO North 90th percentile operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
411	41	38	37	30	33	38	33	35	38	35	37	38	34	35	37	33	33	35	35	37	38
412	48	48	48	30	33	38	33	35	38	35	37	38	34	35	37	33	33	35	35	37	38
413	41	38	37	30	33	38	33	35	38	35	36	38	34	35	37	33	33	35	35	36	38
414	41	38	37	30	33	38	33	35	38	35	37	38	34	35	37	33	33	35	35	37	38
415	41	38	37	30	33	38	33	35	38	35	37	39	34	35	37	33	33	35	35	37	39
417	41	38	37	34	36	39	34	36	38	36	37	39	34	34	37	33	33	35	36	37	39
418	41	38	37	32	34	39	33	35	38	35	37	38	34	34	37	33	33	35	35	37	39
419	41	38	37	30	33	38	33	34	37	34	36	38	34	35	37	33	33	35	34	36	38
420	41	38	37	29	33	39	33	35	38	35	37	39	34	35	37	33	34	35	35	37	39
421	41	38	37	30	33	39	33	35	38	35	37	39	34	34	37	34	33	35	35	37	39
422	41	38	37	31	34	39	33	35	39	35	37	39	34	34	37	34	33	35	35	37	39
423	41	38	37	29	33	39	33	35	38	35	37	39	34	35	37	34	33	35	35	37	39
425	41	41	38	29	32	37	32	33	37	34	35	37	33	34	36	32	33	34	34	35	37
426	41	41	38	29	31	36	30	33	37	33	34	38	33	34	36	32	33	34	33	34	38
427	41	41	38	29	31	37	30	33	38	34	35	38	34	35	37	33	34	35	34	35	38
428	41	41	38	29	31	37	30	33	38	34	35	38	34	35	37	33	34	35	34	35	38
429	41	41	38	27	31	38	30	33	39	33	36	38	34	36	37	34	34	36	34	36	39
430	41	41	38	28	32	38	31	33	38	34	35	39	34	35	37	33	34	35	34	35	39

Table A.1 HVO North 90th percentile operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
431	41	41	38	27	29	38	29	32	39	33	36	39	34	36	38	34	35	36	34	36	39
432	41	41	38	27	27	36	29	30	37	31	34	39	32	34	37	32	33	35	32	34	39
433	41	41	38	26	26	36	28	29	36	30	32	38	31	34	37	32	33	35	32	34	38
434	41	41	38	25	27	38	27	28	38	28	33	40	32	34	38	33	34	37	33	34	40
436	41	41	38	25	27	38	27	28	38	29	33	39	32	34	38	33	34	37	33	34	39
437	40	35	35	37	36	39	35	34	38	35	34	37	33	32	35	32	31	34	37	36	39
438	40	35	35	28	28	31	27	26	29	26	24	28	24	23	26	25	24	26	28	28	31
440	41	41	38	26	27	37	28	28	37	29	32	39	31	34	38	32	34	36	32	34	39
451	40	35	35	26	28	32	28	28	34	30	29	35	28	28	33	27	28	33	30	29	35
452	40	35	35	26	28	33	27	26	34	29	28	35	28	28	33	27	28	33	29	28	35
453	40	35	35	27	27	32	27	25	34	29	29	35	28	28	33	27	29	33	29	29	35
454	40	35	35	26	28	32	27	27	33	29	29	34	28	28	33	26	29	33	29	29	34
455	40	35	35	26	27	32	27	26	33	29	29	34	28	27	33	26	28	32	29	29	34
456	40	35	35	26	27	31	27	27	32	29	29	33	27	27	32	26	28	31	29	29	33
457	40	35	35	27	27	31	27	27	32	29	29	33	27	27	32	26	27	31	29	29	33
458	40	35	35	27	25	32	26	26	33	29	29	34	29	30	34	28	29	32	29	30	34
459	40	35	35	27	26	33	26	26	34	30	29	35	29	30	34	28	30	33	30	30	35
460	40	35	35	27	26	33	27	26	34	30	30	35	29	31	35	29	30	33	30	31	35

Table A.1 HVO North 90th percentile operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
462	40	35	35	27	25	32	26	26	33	29	29	34	29	30	34	28	30	33	29	30	34
464	41	41	38	29	31	35	30	32	36	32	34	37	32	34	36	31	32	34	32	34	37
466	40	35	35	33	35	37	33	34	37	34	35	37	33	33	35	32	32	33	34	35	37
471	40	35	35	27	28	28	27	28	28	28	28	29	26	27	27	28	29	30	28	29	30
472	40	35	35	23	25	27	23	25	26	24	25	27	23	24	25	24	25	25	24	25	27
473	68	68	68	30	33	39	33	35	38	35	37	39	34	35	37	33	33	35	35	37	39
477	40	35	35	27	26	30	27	26	31	28	28	32	29	29	32	29	29	32	29	29	32
478	40	35	35	27	27	33	26	26	34	30	29	35	29	30	34	28	30	33	30	30	35
481	41	41	38	29	31	37	30	33	38	33	35	38	34	35	37	33	34	35	34	35	38
482	41	38	37	34	36	39	35	36	38	36	37	39	34	33	37	33	32	35	36	37	39
483	68	68	68	34	36	39	35	36	38	36	36	38	34	33	37	33	32	35	36	36	39
484	41	38	37	35	36	39	35	36	38	35	36	38	34	33	37	33	32	35	35	36	39
487	40	35	35	36	34	38	35	34	37	34	33	36	32	32	34	31	31	33	36	34	38
488	40	35	35	35	34	37	34	33	36	33	32	35	31	31	33	30	29	31	35	34	37
489	40	35	35	35	34	37	34	33	36	32	31	34	28	27	30	29	28	30	35	34	37
497	40	36	36	28	29	29	28	28	29	28	29	29	27	28	28	29	30	30	29	30	30
498	40	36	36	28	29	29	27	28	28	28	28	29	27	28	28	29	29	29	29	29	29
499	40	35	35	28	29	29	28	28	29	28	29	29	26	27	28	28	29	30	28	29	30

Table A.1 HVO North 90th percentile operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
507	53	53	53	24	25	26	24	25	26	24	24	25	22	23	24	23	24	25	24	25	26
511	68	68	68	20	20	21	19	20	21	20	20	21	19	20	21	19	20	21	20	20	21
592	40	35	35	22	22	23	22	22	24	22	23	24	22	23	24	23	24	25	23	24	25
596	40	35	35	26	27	27	26	27	27	27	27	28	26	27	27	27	27	28	27	27	28
598	40	35	35	19	20	22	19	20	22	19	20	22	19	20	21	19	20	22	19	20	22
599	40	35	35	19	20	21	19	20	20	19	20	21	19	19	20	19	19	20	19	20	21
613	40	35	35	20	27	32	20	27	32	21	27	32	19	26	32	21	27	32	21	27	32
614	40	35	35	20	28	31	19	28	31	20	28	31	19	27	31	21	27	31	21	28	31
619	40	35	35	27	27	28	26	27	28	27	27	28	25	26	27	27	28	29	27	28	29
621	40	35	35	30	30	30	30	30	30	30	30	30	29	29	30	30	31	31	30	31	31
623	53	53	53	27	27	28	27	27	28	27	28	29	26	26	27	27	28	29	27	28	29
624	40	35	35	27	28	28	27	27	28	27	28	29	26	26	27	27	28	30	27	28	30
626	40	35	35	27	27	28	27	27	28	27	28	29	26	26	27	27	28	29	27	28	29
627	40	35	35	27	27	28	27	27	28	27	28	29	26	26	27	27	28	29	27	28	29
628	40	35	35	27	27	28	27	27	28	27	28	29	26	26	27	27	28	29	27	28	29
629	40	35	35	26	27	27	26	27	27	26	27	28	25	26	27	27	28	29	27	28	29
735	68	68	68	31	32	34	31	32	34	31	33	34	30	32	33	31	33	34	31	33	34
797	53	53	53	20	26	32	20	26	32	20	26	32	19	25	32	21	26	32	21	26	32

Table A.1 HVO North 90th percentile operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
799	68	68	68	13	18	24	13	18	23	14	19	24	11	17	22	13	19	23	14	19	24
800	68	68	68	19	24	28	19	24	28	19	24	28	18	24	27	18	24	27	19	24	28
829	68	68	68	24	24	25	23	24	24	24	24	25	24	24	24	24	25	25	24	25	25
830	68	68	68	22	22	23	21	21	22	22	22	22	20	20	21	21	21	22	22	22	23
833	58	58	58	26	27	28	26	27	28	28	28	29	26	27	28	27	28	30	28	28	30
834	68	68	68	29	33	39	32	35	38	35	37	39	34	35	37	34	34	36	35	37	39
835	41	38	37	34	36	39	34	36	38	36	37	39	34	34	37	33	33	35	36	37	39
836	41	38	37	34	35	39	34	36	38	36	37	38	34	34	37	33	33	35	36	37	39
837	41	38	37	34	36	39	34	36	38	36	37	39	34	34	37	33	33	35	36	37	39
838	41	38	37	30	33	39	33	35	38	35	37	39	34	35	37	33	33	35	35	37	39
839	41	38	37	30	33	39	33	35	38	35	37	39	34	35	37	33	33	35	35	37	39
840	41	38	37	29	33	39	33	35	38	35	37	39	34	35	37	33	34	35	35	37	39
843	40	35	35	19	19	19	19	19	19	19	20	20	18	18	18	19	20	20	19	20	20
846	40	35	35	22	23	23	22	22	23	22	23	23	21	22	22	22	23	23	22	23	23
847	40	35	35	22	22	23	22	22	22	22	23	23	21	21	22	22	23	23	22	23	23
852	40	35	35	19	19	20	19	19	19	19	20	20	18	18	18	20	21	21	20	21	21
855	40	35	35	21	21	22	21	21	21	21	21	22	21	21	22	22	22	23	22	22	23
856	40	35	35	22	22	23	22	22	23	22	23	23	21	22	22	23	23	24	23	23	24

Table A.1 HVO North 90th percentile operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
860	40	35	35	28	29	29	28	28	29	27	28	28	26	26	27	27	28	28	28	29	29
861	40	35	35	24	24	25	24	24	25	24	25	26	23	23	24	24	25	26	24	25	26
862	40	35	35	28	28	29	27	28	29	28	29	29	27	28	29	29	29	30	29	29	30
863	40	35	35	27	28	29	27	28	29	27	27	28	25	26	26	26	27	28	27	28	29
869	40	35	35	27	27	27	26	27	27	27	27	28	26	26	26	27	28	28	27	28	28
870	40	35	35	28	29	29	28	29	29	29	29	30	28	28	28	29	30	31	29	30	31
949	40	35	35	31	33	34	31	33	34	31	33	34	31	32	34	31	32	33	31	33	34
950	40	35	35	29	32	33	29	32	34	29	32	34	29	32	33	29	32	33	29	32	34
952	41	41	38	25	28	38	27	31	38	32	35	40	33	35	38	33	35	36	33	35	40

Table A.2 HVO South 90th percentile operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
17	40	35	35	19	21	24	22	23	25	22	24	26	23	24	25	19	22	24	23	24	26
19	40	35	35	19	21	24	22	24	25	22	24	26	23	24	26	20	22	24	23	24	26
37	40	35	35	20	21	24	22	24	25	22	24	26	24	25	26	20	22	24	24	25	26
102	53	53	53	32	33	37	35	36	38	42	42	47	36	37	39	40	41	43	42	42	47
120	40	36	36	34	36	38	35	36	38	35	37	39	36	38	39	35	37	40	36	38	40
121	40	36	36	35	36	38	35	36	38	37	38	40	36	37	39	36	37	40	37	38	40
122	40	36	36	34	36	38	35	36	37	35	37	38	36	37	39	35	37	39	36	37	39
123	40	36	36	34	36	37	35	36	38	36	38	39	36	37	39	35	37	39	36	38	39
126	40	35	35	18	19	19	21	22	22	26	27	28	25	25	26	29	30	30	29	30	30
127	40	35	35	31	31	32	32	32	33	33	34	35	31	32	32	32	34	35	33	34	35
128	40	35	35	27	28	28	29	30	30	33	33	34	30	30	30	33	34	35	33	34	35
130	40	35	35	28	29	29	30	30	30	32	33	33	29	30	30	33	34	35	33	34	35
134	40	35	35	28	28	29	29	30	30	32	32	33	29	29	30	32	33	34	32	33	34
139	40	35	35	21	22	22	24	25	26	28	29	30	23	24	25	29	30	32	29	30	32
141	40	35	35	22	23	24	26	27	28	28	29	31	24	26	27	25	30	32	28	30	32
160	40	36	36	33	35	39	36	37	39	36	37	39	36	39	40	36	38	40	36	39	40
161	40	36	36	33	35	39	35	36	39	35	37	39	36	38	40	36	37	40	36	38	40
162	40	36	36	33	35	39	35	36	39	35	37	39	36	38	40	35	37	40	36	38	40

Table A.2 HVO South 90th percentile operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
163	40	36	36	33	35	38	35	36	39	34	36	38	36	38	40	35	37	39	36	38	40
167	40	35	35	22	23	24	26	26	27	27	28	30	24	26	27	25	28	29	27	28	30
169	40	35	35	22	22	23	26	26	27	28	29	30	25	26	27	29	30	31	29	30	31
170	40	35	35	27	28	28	29	29	29	29	30	31	28	28	29	29	30	31	29	30	31
173	40	35	35	24	24	24	25	26	26	26	27	29	22	23	24	23	23	25	26	27	29
174	40	35	35	26	26	26	26	27	27	27	28	29	25	25	26	25	26	27	27	28	29
175	40	35	35	26	26	27	28	28	29	29	29	31	27	27	28	28	29	30	29	29	31
176	40	35	35	21	21	22	23	23	24	22	23	25	22	22	23	25	26	28	25	26	28
178	40	35	35	20	21	21	24	24	25	25	26	27	24	25	25	23	24	25	25	26	27
179	40	35	35	24	24	25	26	26	27	26	27	28	25	26	26	24	24	25	26	27	28
244	40	36	36	32	35	37	34	36	37	34	36	37	35	36	37	34	35	37	35	36	37
245	40	36	36	32	35	38	34	36	37	34	36	38	35	37	38	34	36	38	35	37	38
246	40	36	36	32	35	37	34	35	37	34	36	37	34	36	38	34	35	37	34	36	38
247	40	36	36	32	34	37	34	35	37	34	36	37	34	36	37	34	35	37	34	36	37
248	40	35	35	25	26	26	27	28	28	28	29	30	26	27	27	24	26	27	28	29	30
249	40	35	35	20	21	22	24	25	26	25	27	28	24	25	26	25	26	27	25	27	28
250	40	35	35	20	22	22	23	24	25	23	24	25	22	23	24	20	20	22	23	24	25
251	40	35	35	23	23	23	25	25	25	25	25	26	24	24	25	22	22	23	25	25	26

Table A.2 HVO South 90th percentile operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
256	40	36	36	32	36	39	35	37	39	34	37	38	35	37	39	34	36	39	35	37	39
258	40	36	36	32	36	39	35	37	39	34	36	38	36	38	40	35	36	39	36	38	40
260	40	36	36	32	35	38	35	36	38	35	37	39	36	38	40	35	37	39	36	38	40
261	40	36	36	33	36	39	36	37	39	36	37	39	36	38	40	36	37	39	36	38	40
262	40	35	35	25	25	26	27	28	28	31	32	32	27	28	28	30	31	32	31	32	32
264	53	53	53	31	33	37	35	36	38	40	40	47	36	37	39	40	41	42	40	41	47
266	40	35	35	18	21	25	19	22	27	20	22	28	22	25	28	22	22	26	22	25	28
308	41	41	38	34	33	35	34	34	35	35	35	36	38	38	40	36	36	38	38	38	40
311	41	41	38	33	32	34	33	33	35	34	34	36	36	37	38	34	35	37	36	37	38
317	41	41	38	33	32	34	33	33	35	33	34	35	36	36	38	33	35	36	36	36	38
321	41	41	38	31	31	32	32	33	34	31	32	33	33	34	35	31	32	33	33	34	35
322	41	41	38	30	30	31	31	32	33	31	31	32	33	33	34	30	31	32	33	33	34
324	41	41	38	30	31	31	31	32	33	31	31	32	33	34	35	31	32	33	33	34	35
326	40	35	35	27	27	28	27	28	29	27	27	28	28	29	30	26	27	27	28	29	30
327	40	35	35	26	27	28	27	28	29	27	27	28	28	28	29	26	26	27	28	28	29
328	40	35	35	27	28	28	28	28	29	27	28	29	29	29	30	27	27	28	29	29	30
330	40	35	35	27	27	28	28	29	30	27	28	29	29	29	30	27	27	28	29	29	30
331	58	58	58	27	28	29	28	29	30	28	28	29	29	30	31	27	28	28	29	30	31

Table A.2 HVO South 90th percentile operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
332	41	38	37	28	28	29	29	29	30	28	28	29	30	30	31	27	28	29	30	30	31
333	41	38	37	28	28	29	29	30	30	28	28	29	29	30	31	27	28	28	29	30	31
334	41	38	37	28	28	29	29	29	30	28	28	29	30	30	31	27	28	28	30	30	31
335	41	38	37	28	28	29	29	30	31	28	28	29	30	30	31	27	28	29	30	30	31
336	41	38	37	27	28	29	29	29	30	28	28	29	30	30	31	27	28	29	30	30	31
337	41	38	37	28	28	29	29	30	31	28	29	30	30	30	31	28	28	29	30	30	31
338	41	38	37	28	28	29	29	30	31	28	29	30	30	31	32	28	28	29	30	31	32
339	41	38	37	28	28	29	29	30	30	28	29	30	30	30	31	28	28	29	30	30	31
340	41	38	37	28	28	29	29	30	31	29	29	30	30	30	31	28	28	29	30	30	31
341	41	38	37	28	28	29	29	30	31	29	29	30	30	30	31	28	28	29	30	30	31
342	41	38	37	28	28	29	29	30	31	29	29	30	30	31	31	28	28	29	30	31	31
343	41	38	37	28	28	29	29	30	31	29	29	30	30	31	31	28	28	29	30	31	31
344	41	38	37	28	28	29	30	30	31	29	29	30	30	31	32	28	28	29	30	31	32
345	41	38	37	28	28	29	30	30	31	29	29	30	30	31	32	28	28	29	30	31	32
346	41	38	37	28	28	29	30	30	31	29	29	30	30	31	32	28	28	29	30	31	32
347	41	38	37	28	28	29	29	30	31	29	29	30	30	31	32	28	28	29	30	31	32
348	41	38	37	28	28	29	29	30	31	28	29	30	30	31	32	28	28	29	30	31	32
349	41	38	37	28	28	29	30	30	31	28	29	30	30	31	31	28	28	29	30	31	31

Table A.2 HVO South 90th percentile operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
350	41	38	37	28	28	29	30	30	31	29	29	30	30	31	32	28	29	29	30	31	32
351	41	38	37	28	28	29	30	30	31	29	29	30	30	31	32	28	28	29	30	31	32
352	41	38	37	28	29	29	29	30	31	29	29	30	30	31	32	28	28	29	30	31	32
353	41	38	37	28	29	29	29	30	31	29	29	30	30	31	32	28	28	29	30	31	32
355	41	38	37	28	29	30	29	30	31	29	29	30	30	31	32	28	29	29	30	31	32
356	41	38	37	28	29	30	30	30	31	29	29	30	30	31	32	28	29	30	30	31	32
357	41	38	37	28	29	29	30	30	31	29	29	30	30	31	32	28	29	30	30	31	32
358	41	38	37	29	29	30	30	30	31	29	29	30	31	31	32	28	29	30	31	31	32
359	41	38	37	29	29	30	30	30	31	29	29	30	31	31	32	28	29	30	31	31	32
360	41	38	37	28	29	30	30	30	31	29	29	30	31	31	32	28	29	30	31	31	32
361	41	38	37	29	29	30	29	30	31	29	29	30	31	31	32	28	29	30	31	31	32
362	41	38	37	29	29	30	30	30	31	29	29	30	31	31	32	28	29	30	31	31	32
363	41	38	37	29	29	30	30	31	32	29	29	30	31	31	32	28	29	30	31	31	32
366	41	38	37	29	29	30	30	31	32	29	30	31	31	31	32	28	29	30	31	31	32
367	41	38	37	29	29	30	30	31	31	29	29	30	31	31	32	28	29	30	31	31	32
368	41	38	37	29	29	30	30	31	31	29	29	30	31	31	32	28	29	30	31	31	32
369	41	38	37	29	29	30	30	31	32	29	30	31	31	31	32	29	29	30	31	31	32
370	41	38	37	29	29	30	30	30	31	29	29	30	31	31	32	28	29	30	31	31	32

Table A.2 HVO South 90th percentile operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
371	41	38	37	29	29	30	30	31	31	29	30	31	31	31	32	28	29	30	31	31	32
372	41	38	37	29	29	30	30	30	31	29	29	30	31	31	32	29	29	30	31	31	32
373	41	38	37	29	29	30	30	31	32	29	30	31	31	31	32	29	29	30	31	31	32
374	41	38	37	29	29	30	30	31	32	29	30	31	31	31	32	29	29	30	31	31	32
375	41	38	37	29	29	30	30	31	32	29	30	31	31	31	32	29	29	30	31	31	32
376	41	38	37	29	29	30	31	31	32	30	30	31	31	32	33	29	30	31	31	32	33
377	41	38	37	29	29	30	30	31	32	29	30	31	31	32	32	29	29	30	31	32	32
380	41	38	37	29	29	30	31	31	32	30	30	31	31	32	33	29	30	31	31	32	33
381	41	38	37	29	29	30	31	31	32	30	30	31	31	32	33	29	30	31	31	32	33
382	53	53	53	29	29	30	30	31	32	30	30	31	31	32	33	29	30	31	31	32	33
383	41	38	37	29	29	30	30	31	32	30	30	31	31	32	33	29	29	30	31	32	33
384	41	38	37	29	29	30	30	31	32	29	30	31	31	32	33	29	29	30	31	32	33
385	41	38	37	29	29	30	30	31	32	30	30	31	31	32	33	29	30	31	31	32	33
386	68	68	68	29	29	30	30	31	32	29	30	31	31	32	33	29	30	31	31	32	33
389	41	38	37	29	29	30	31	31	32	30	30	31	32	32	33	29	30	31	32	32	33
390	41	38	37	29	29	30	31	31	32	30	30	31	32	32	33	30	30	31	32	32	33
391	68	68	68	30	30	31	31	31	32	30	30	31	32	32	33	30	30	31	32	32	33
392	41	38	37	30	30	31	31	31	32	30	30	31	32	32	33	30	30	31	32	32	33

Table A.2 HVO South 90th percentile operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
393	41	38	37	30	30	31	31	31	32	30	30	32	32	32	33	30	30	31	32	32	33
394	41	38	37	30	30	31	31	31	32	30	30	31	32	32	33	30	30	31	32	32	33
395	41	38	37	30	30	31	31	31	32	30	30	31	32	32	33	30	30	31	32	32	33
396	53	53	53	30	30	30	31	31	32	30	30	31	31	32	33	30	30	31	31	32	33
397	41	38	37	30	30	30	31	31	32	30	30	31	32	32	33	30	30	31	32	32	33
398	41	38	37	29	29	30	31	31	32	30	30	31	32	32	33	30	30	31	32	32	33
399	41	38	37	30	30	31	31	31	32	30	30	31	32	32	33	30	30	31	32	32	33
400	41	38	37	30	30	30	31	31	32	30	30	31	32	32	33	30	30	31	32	32	33
401	41	38	37	29	29	30	31	31	32	30	30	31	32	32	33	30	30	31	32	32	33
402	41	38	37	29	29	30	31	31	32	30	30	31	32	32	33	30	30	31	32	32	33
403	41	38	37	29	29	30	31	31	32	30	30	31	32	32	33	30	30	31	32	32	33
404	41	38	37	29	29	30	31	31	32	30	30	31	32	32	33	30	30	31	32	32	33
405	41	38	37	29	29	30	31	31	32	30	30	31	32	32	33	30	30	31	32	32	33
406	41	38	37	29	29	30	31	31	32	30	30	31	32	32	33	30	30	31	32	32	33
407	41	38	37	29	29	30	31	31	32	30	30	31	31	32	33	29	30	31	31	32	33
408	41	38	37	29	29	30	31	31	32	30	30	31	32	32	33	30	30	31	32	32	33
409	41	38	37	29	29	30	30	31	32	30	30	31	31	32	33	29	30	31	31	32	33
410	68	68	68	29	29	30	30	31	32	29	30	31	31	32	33	29	30	31	31	32	33

Table A.2 HVO South 90th percentile operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
411	41	38	37	29	29	30	30	31	32	30	30	31	31	32	33	29	30	31	31	32	33
412	48	48	48	29	29	30	30	31	32	29	30	31	31	32	32	29	30	31	31	32	32
413	41	38	37	29	29	30	30	31	32	30	30	31	31	32	33	29	30	31	31	32	33
414	41	38	37	29	29	30	30	31	32	30	30	31	31	32	33	29	30	30	31	32	33
415	41	38	37	29	29	30	30	31	32	30	30	31	31	32	33	29	29	30	31	32	33
417	41	38	37	29	29	30	30	30	31	29	29	30	31	31	32	28	29	30	31	31	32
418	41	38	37	29	29	30	30	30	31	29	29	30	31	31	32	29	29	30	31	31	32
419	41	38	37	29	29	30	30	31	32	30	30	31	31	32	33	29	30	31	31	32	33
420	41	38	37	29	29	30	31	31	32	30	30	31	31	32	33	29	30	31	31	32	33
421	41	38	37	29	29	30	31	31	32	30	30	31	32	32	33	29	30	31	32	32	33
422	41	38	37	29	29	30	31	31	32	30	30	31	31	32	33	29	30	31	31	32	33
423	41	38	37	29	29	30	31	31	32	30	30	31	32	32	33	29	30	31	32	32	33
425	41	41	38	28	28	29	30	30	31	29	29	30	31	31	32	29	29	30	31	31	32
426	41	41	38	29	29	30	30	30	31	30	30	31	32	32	33	30	30	31	32	32	33
427	41	41	38	30	29	30	31	31	32	30	31	32	32	32	33	30	31	32	32	32	33
428	41	41	38	30	30	30	31	31	32	30	31	32	32	33	33	30	31	32	32	33	33
429	41	41	38	30	30	31	31	32	33	31	31	32	33	33	34	31	31	32	33	33	34
430	41	41	38	30	30	31	31	31	32	30	31	32	32	33	34	30	31	32	32	33	34

Table A.2 HVO South 90th percentile operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
431	41	41	38	31	31	32	31	32	33	31	31	33	33	33	34	31	32	33	33	33	34
432	41	41	38	30	30	31	31	31	33	32	32	33	33	34	35	32	32	34	33	34	35
433	41	41	38	30	29	31	29	29	30	29	29	31	32	32	34	27	27	30	32	32	34
434	41	41	38	32	32	34	32	33	35	33	33	35	35	36	37	33	34	35	35	36	37
436	41	41	38	32	32	33	32	33	35	33	33	35	35	36	37	33	34	35	35	36	37
437	40	35	35	26	26	27	27	27	28	26	27	28	28	28	29	25	26	27	28	28	29
438	40	35	35	21	22	22	19	20	21	18	19	20	18	19	20	15	16	17	21	22	22
440	41	41	38	32	32	33	32	32	34	32	32	33	34	35	36	31	31	33	34	35	36
451	40	35	35	30	29	31	29	27	31	31	30	32	33	32	35	27	27	31	33	32	35
452	40	35	35	29	28	31	28	27	30	30	29	32	33	32	34	27	26	30	33	32	34
453	40	35	35	28	27	30	27	26	30	30	29	31	32	31	33	26	26	30	32	31	33
454	40	35	35	28	27	30	28	26	30	29	28	32	31	30	34	26	25	30	31	30	34
455	40	35	35	28	26	30	27	25	29	29	28	32	32	30	33	26	25	31	32	30	33
456	40	35	35	27	27	29	27	26	29	28	27	31	30	29	33	25	24	28	30	29	33
457	40	35	35	23	24	25	23	23	24	25	24	27	27	26	29	22	21	23	27	26	29
458	40	35	35	28	27	29	28	27	29	29	28	30	31	30	32	27	26	30	31	30	32
459	40	35	35	29	28	30	29	27	30	29	29	31	32	31	33	27	27	30	32	31	33
460	40	35	35	28	28	30	28	27	30	29	28	31	31	31	32	28	26	30	31	31	32

Table A.2 HVO South 90th percentile operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
462	40	35	35	28	27	29	28	27	29	29	28	31	31	30	32	27	26	30	31	30	32
464	41	41	38	28	28	29	30	30	30	29	29	30	31	31	32	29	29	30	31	31	32
466	40	35	35	27	27	28	29	29	30	28	28	29	29	30	30	27	28	28	29	30	30
471	40	35	35	25	27	32	23	26	30	27	28	30	25	28	30	22	25	28	27	28	32
472	40	35	35	18	18	21	17	17	19	18	17	20	17	17	21	14	14	17	18	18	21
473	68	68	68	29	29	30	31	31	32	30	30	31	31	32	33	29	30	31	31	32	33
477	40	35	35	26	27	28	27	27	28	27	27	29	30	30	32	25	25	29	30	30	32
478	40	35	35	29	28	30	28	27	30	29	29	31	32	31	33	27	26	30	32	31	33
481	41	41	38	30	30	30	31	31	32	31	31	32	32	33	34	31	31	32	32	33	34
482	41	38	37	28	29	30	30	30	31	29	29	30	30	31	32	28	29	29	30	31	32
483	68	68	68	28	28	29	30	30	31	29	29	30	30	31	32	28	29	29	30	31	32
484	41	38	37	28	28	29	29	30	31	28	29	30	30	30	31	28	28	29	30	30	31
487	40	35	35	24	24	25	22	22	23	22	22	23	22	22	24	18	19	20	24	24	25
488	40	35	35	23	23	24	21	22	23	22	23	24	23	24	25	19	20	22	23	24	25
489	40	35	35	23	23	24	21	22	23	21	22	24	23	23	24	18	20	21	23	23	24
497	40	36	36	32	36	39	34	37	39	35	37	38	35	37	39	34	36	39	35	37	39
498	40	36	36	32	35	37	34	36	37	34	36	38	35	37	38	34	35	38	35	37	38
499	40	35	35	25	28	31	25	28	31	27	28	30	26	28	30	23	24	27	27	28	31

Table A.2 HVO South 90th percentile operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
507	53	53	53	13	15	16	12	14	16	14	15	17	12	14	16	11	13	14	14	15	17
511	68	68	68	10	10	12	10	11	13	10	12	15	10	10	12	10	10	12	10	12	15
592	40	35	35	21	21	22	21	21	23	20	21	22	20	20	22	16	17	18	21	21	23
596	40	35	35	23	23	24	24	24	25	24	24	25	23	24	25	20	21	22	24	24	25
598	40	35	35	11	11	15	10	11	14	11	13	16	11	12	15	10	12	14	11	13	16
599	40	35	35	11	11	14	10	11	13	11	12	14	11	11	14	10	10	12	11	12	14
613	40	35	35	13	14	17	13	14	17	12	13	16	13	15	17	10	10	12	13	15	17
614	40	35	35	11	12	14	10	11	14	10	10	13	10	11	14	10	10	10	11	12	14
619	40	35	35	16	18	20	15	17	19	16	17	20	15	17	19	16	16	19	16	18	20
621	40	35	35	27	28	29	27	28	29	27	28	29	27	28	29	24	25	26	27	28	29
623	53	53	53	17	19	22	16	17	22	17	18	23	17	19	22	16	17	20	17	19	23
624	40	35	35	22	24	27	20	22	25	20	22	25	19	22	25	19	20	22	22	24	27
626	40	35	35	23	25	28	24	26	28	24	25	27	23	25	26	19	22	24	24	26	28
627	40	35	35	22	25	28	23	25	27	22	24	26	22	23	26	19	21	23	23	25	28
628	40	35	35	22	24	27	21	23	26	21	23	26	20	21	24	17	19	20	22	24	27
629	40	35	35	20	22	26	18	20	23	18	20	24	18	21	24	17	19	21	20	22	26
735	68	68	68	18	20	23	17	19	22	17	19	21	16	18	21	17	18	21	18	20	23
797	53	53	53	13	14	17	13	14	17	12	13	16	13	14	16	10	10	12	13	14	17

Table A.2 HVO South 90th percentile operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
799	68	68	68	10	10	13	10	10	14	10	10	13	10	10	14	10	10	10	10	10	14
800	68	68	68	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
829	68	68	68	27	28	28	30	31	31	36	37	37	31	31	32	39	40	41	39	40	41
830	68	68	68	25	25	26	27	27	28	36	37	38	30	31	31	42	43	43	42	43	43
833	58	58	58	39	41	43	42	44	45	45	46	48	48	48	52	48	48	52	48	48	52
834	68	68	68	29	30	31	31	31	32	30	30	31	32	32	33	30	30	31	32	32	33
835	41	38	37	28	29	30	30	30	31	29	29	30	31	31	32	28	29	30	31	31	32
836	41	38	37	29	29	30	30	30	31	29	29	30	31	31	32	28	29	30	31	31	32
837	41	38	37	29	29	30	30	30	31	29	29	30	31	31	32	28	29	30	31	31	32
838	41	38	37	29	29	30	31	31	32	30	30	31	31	32	33	29	30	31	31	32	33
839	41	38	37	29	29	30	30	31	32	30	30	31	31	32	33	29	30	31	31	32	33
840	41	38	37	29	29	30	31	31	32	30	30	31	32	32	33	29	30	31	32	32	33
843	40	35	35	19	20	20	23	24	25	24	25	26	22	23	24	23	24	25	24	25	26
846	40	35	35	24	25	26	26	26	27	26	26	28	25	26	27	25	26	27	26	26	28
847	40	35	35	21	22	23	25	26	27	25	26	28	24	25	26	25	26	27	25	26	28
852	40	35	35	15	16	17	20	21	22	23	25	26	21	21	22	21	23	24	23	25	26
855	40	35	35	26	26	26	28	28	28	28	29	30	27	27	28	26	27	29	28	29	30
856	40	35	35	25	26	26	27	27	28	26	27	28	25	26	27	26	27	28	27	27	28

Table A.2 HVO South 90th percentile operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
860	40	35	35	24	26	27	25	27	28	26	27	28	24	25	26	20	22	24	26	27	28
861	40	35	35	16	17	20	15	17	20	16	17	20	15	16	19	15	15	18	16	17	20
862	40	35	35	23	25	27	24	26	27	25	26	27	25	26	27	20	22	24	25	26	27
863	40	35	35	17	18	19	16	17	19	16	17	20	16	17	19	15	16	18	17	18	20
869	40	35	35	20	23	25	21	23	25	23	24	28	22	24	26	21	22	25	23	24	28
870	40	35	35	29	32	35	30	32	34	31	32	34	30	32	33	26	28	31	31	32	35
949	40	35	35	16	16	17	16	17	18	16	17	18	16	17	18	12	13	14	16	17	18
950	40	35	35	16	17	17	16	17	18	16	17	18	16	17	18	12	13	14	16	17	18
952	41	41	38	29	29	30	27	27	29	27	27	29	29	30	32	25	25	28	29	30	32

Table A.3 HVO North neutral atmosphere operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
17	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
19	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
37	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
102	53	53	53	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
120	40	36	36	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
121	40	36	36	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
122	40	36	36	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
123	40	36	36	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
126	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
127	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
128	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
130	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
134	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
139	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
141	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
160	40	36	36	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
161	40	36	36	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
162	40	36	36	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

Table A.3 HVO North neutral atmosphere operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
163	40	36	36	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
167	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
169	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
170	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
173	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
174	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
175	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
176	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
178	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
179	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
244	40	36	36	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
245	40	36	36	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
246	40	36	36	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
247	40	36	36	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
248	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
249	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
250	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
251	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

Table A.3 HVO North neutral atmosphere operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
256	40	36	36	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
258	40	36	36	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
260	40	36	36	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
261	40	36	36	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
262	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
264	53	53	53	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
266	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
308	41	41	38	21	21	21	21	21	21	24	24	24	24	24	24	25	25	25	25	25	25
311	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
317	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
321	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
322	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
324	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
326	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
327	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
328	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
330	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
331	58	58	58	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

Table A.3 HVO North neutral atmosphere operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
332	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
333	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
334	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
335	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
336	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
337	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
338	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
339	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
340	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
341	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
342	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
343	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
344	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
345	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
346	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
347	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
348	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
349	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

Table A.3 HVO North neutral atmosphere operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
350	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
351	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
352	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
353	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
355	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
356	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
357	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
358	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
359	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
360	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
361	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
362	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
363	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
366	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
367	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
368	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
369	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
370	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

Table A.3 HVO North neutral atmosphere operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
371	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
372	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
373	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
374	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
375	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
376	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
377	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
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382	53	53	53	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
383	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
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389	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
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Table A.3 HVO North neutral atmosphere operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
393	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
394	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
395	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
396	53	53	53	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
397	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
398	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
399	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
400	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
401	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
402	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
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405	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
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409	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
410	68	68	68	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

Table A.3 HVO North neutral atmosphere operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
411	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
412	48	48	48	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
413	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
414	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
415	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
417	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
418	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
419	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
420	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
421	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
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423	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
425	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
426	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
427	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
428	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
429	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
430	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

Table A.3 HVO North neutral atmosphere operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
431	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
432	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
433	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
434	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
436	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
437	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
438	40	35	35	21	21	21	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	21	21	21
440	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
451	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
452	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
453	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
454	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
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Table A.3 HVO North neutral atmosphere operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
462	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
464	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
466	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
471	40	35	35	21	21	21	21	21	21	21	21	21	<20	<20	<20	21	21	21	21	21	21
472	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
473	68	68	68	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
477	40	35	35	<20	<20	<20	<20	<20	<20	20	20	20	21	21	21	22	22	22	22	22	22
478	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
481	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
482	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
483	68	68	68	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
484	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
487	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
488	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
489	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
497	40	36	36	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
498	40	36	36	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
499	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

Table A.3 HVO North neutral atmosphere operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
507	53	53	53	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
511	68	68	68	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
592	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
596	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
598	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
599	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
613	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
614	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
619	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
621	40	35	35	21	21	21	20	20	20	21	21	21	<20	<20	<20	20	20	20	21	21	21
623	53	53	53	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
624	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
626	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
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628	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
629	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
735	68	68	68	22	22	22	21	21	21	21	21	21	20	20	20	21	21	21	22	22	22
797	53	53	53	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

Table A.3 HVO North neutral atmosphere operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
799	68	68	68	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
800	68	68	68	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
829	68	68	68	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
830	68	68	68	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
833	58	58	58	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
834	68	68	68	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
835	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
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838	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
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843	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
846	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
847	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
852	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
855	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
856	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

Table A.3 HVO North neutral atmosphere operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
860	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
861	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
862	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
863	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
869	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
870	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
949	40	35	35	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
950	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
952	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

Table A.4 HVO South neutral atmosphere operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
17	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
19	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
37	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
102	53	53	53	<20	<20	<20	20	20	20	36	36	36	29	29	29	33	33	33	36	36	36
120	40	36	36	<20	<20	<20	<20	<20	<20	24	24	24	27	27	27	28	28	28	28	28	28
121	40	36	36	<20	<20	<20	<20	<20	<20	26	26	26	28	28	28	29	29	29	29	29	29
122	40	36	36	<20	<20	<20	<20	<20	<20	25	25	25	27	27	27	28	28	28	28	28	28
123	40	36	36	<20	<20	<20	<20	<20	<20	26	26	26	28	28	28	29	29	29	29	29	29
126	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
127	40	35	35	<20	<20	<20	<20	<20	<20	24	24	24	<20	<20	<20	25	25	25	25	25	25
128	40	35	35	<20	<20	<20	<20	<20	<20	21	21	21	<20	<20	<20	21	21	21	21	21	21
130	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	21	21	21	21	21	21
134	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	20	20	20	20	20	20
139	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
141	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
160	40	36	36	<20	<20	<20	<20	<20	<20	30	30	30	27	27	27	29	29	29	30	30	30
161	40	36	36	<20	<20	<20	<20	<20	<20	28	28	28	27	27	27	28	28	28	28	28	28
162	40	36	36	<20	<20	<20	<20	<20	<20	28	28	28	27	27	27	29	29	29	29	29	29

Table A.4 HVO South neutral atmosphere operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
163	40	36	36	<20	<20	<20	<20	<20	<20	24	24	24	26	26	26	27	27	27	27	27	27
167	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
169	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
170	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
173	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
174	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
175	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
176	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
178	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
179	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
244	40	36	36	<20	<20	<20	<20	<20	<20	26	26	26	25	25	25	27	27	27	27	27	27
245	40	36	36	<20	<20	<20	<20	<20	<20	26	26	26	26	26	26	27	27	27	27	27	27
246	40	36	36	<20	<20	<20	<20	<20	<20	26	26	26	26	26	26	27	27	27	27	27	27
247	40	36	36	<20	<20	<20	<20	<20	<20	27	27	27	26	26	26	27	27	27	27	27	27
248	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
249	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
250	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
251	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

Table A.4 HVO South neutral atmosphere operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
256	40	36	36	<20	<20	<20	<20	<20	<20	26	26	26	25	25	25	26	26	26	26	26	26
258	40	36	36	<20	<20	<20	<20	<20	<20	25	25	25	26	26	26	27	27	27	27	27	27
260	40	36	36	<20	<20	<20	<20	<20	<20	28	28	28	26	26	26	28	28	28	28	28	28
261	40	36	36	<20	<20	<20	<20	<20	<20	29	29	29	27	27	27	29	29	29	29	29	29
262	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
264	53	53	53	<20	<20	<20	21	21	21	35	35	35	29	29	29	33	33	33	35	35	35
266	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
308	41	41	38	21	21	21	<20	<20	<20	20	20	20	21	21	21	<20	<20	<20	21	21	21
311	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
317	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
321	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
322	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
324	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
326	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
327	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
328	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
330	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
331	58	58	58	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

Table A.4 HVO South neutral atmosphere operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
332	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
333	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
334	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
335	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
336	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
337	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
338	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
339	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
340	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
341	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
342	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
343	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
344	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
345	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
346	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
347	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
348	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
349	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

Table A.4 HVO South neutral atmosphere operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
350	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
351	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
352	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
353	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
355	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
356	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
357	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
358	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
359	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
360	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
361	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
362	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
363	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
366	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
367	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
368	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
369	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
370	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

Table A.4 HVO South neutral atmosphere operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
371	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
372	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
373	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
374	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
375	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
376	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
377	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
380	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
381	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
382	53	53	53	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
383	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
384	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
385	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
386	68	68	68	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
389	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
390	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
391	68	68	68	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
392	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

Table A.4 HVO South neutral atmosphere operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
393	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
394	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
395	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
396	53	53	53	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
397	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
398	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
399	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
400	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
401	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
402	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
403	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
404	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
405	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
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407	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
408	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
409	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
410	68	68	68	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

Table A.4 HVO South neutral atmosphere operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
411	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
412	48	48	48	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
413	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
414	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
415	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
417	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
418	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
419	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
420	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
421	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
422	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
423	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
425	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
426	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
427	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
428	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
429	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
430	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

Table A.4 HVO South neutral atmosphere operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
431	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
432	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
433	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
434	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
436	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
437	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
438	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
440	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
451	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
452	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
453	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
454	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
455	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
456	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
457	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
458	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
459	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
460	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

Table A.4 HVO South neutral atmosphere operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
462	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
464	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
466	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
471	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
472	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
473	68	68	68	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
477	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
478	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
481	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
482	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
483	68	68	68	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
484	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
487	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
488	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
489	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
497	40	36	36	<20	<20	<20	<20	<20	<20	27	27	27	25	25	25	26	26	26	27	27	27
498	40	36	36	<20	<20	<20	<20	<20	<20	28	28	28	26	26	26	27	27	27	28	28	28
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Table A.4 HVO South neutral atmosphere operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
507	53	53	53	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
511	68	68	68	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
592	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
596	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
598	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
599	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
613	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
614	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
619	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
621	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
623	53	53	53	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
624	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
626	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
627	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
628	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
629	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
735	68	68	68	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
797	53	53	53	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

Table A.4 HVO South neutral atmosphere operational predictions $L_{Aeq,15\text{minute}}$ dB

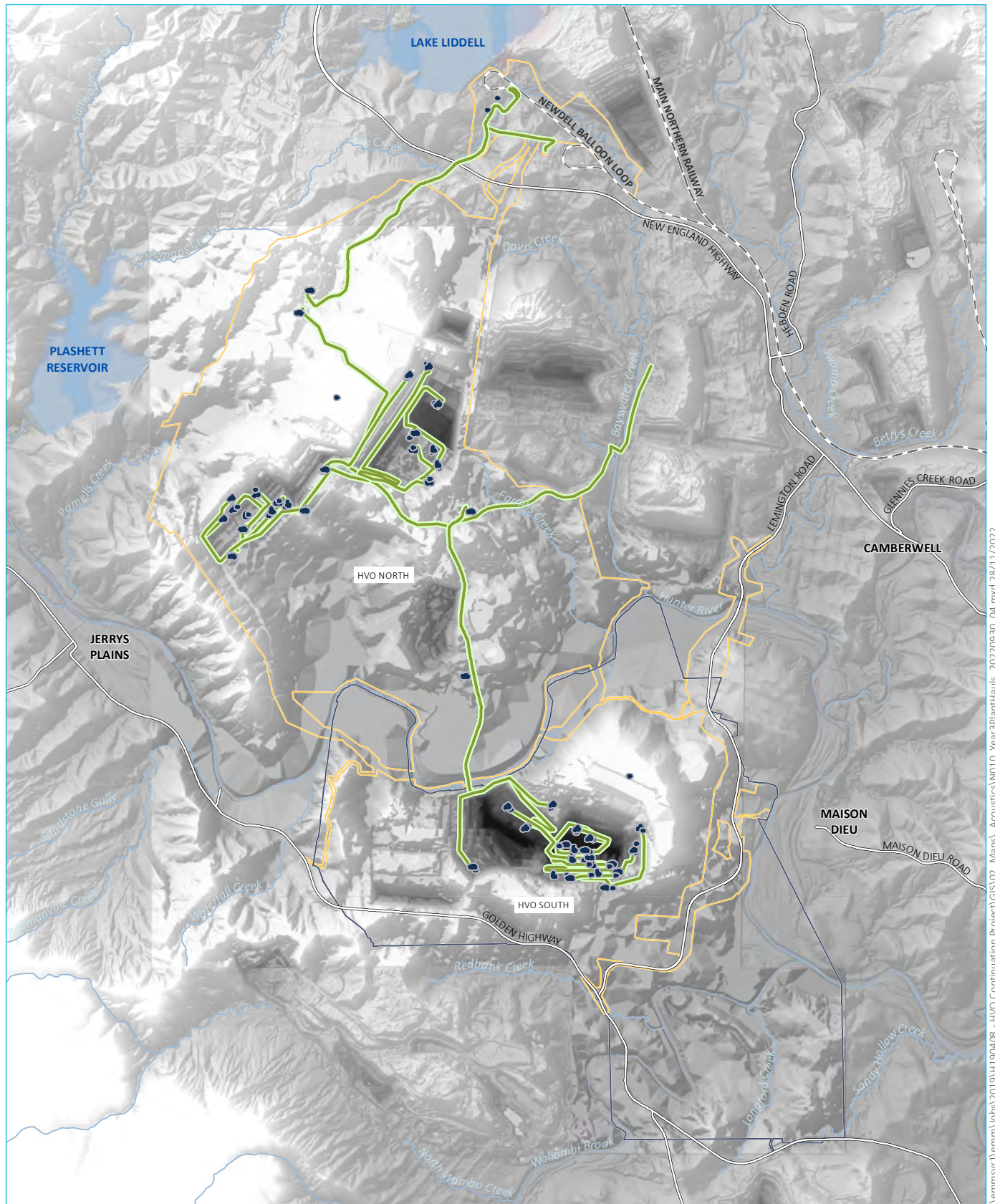
ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
799	68	68	68	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
800	68	68	68	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
829	68	68	68	<20	<20	<20	<20	<20	<20	22	22	22	<20	<20	<20	26	26	26	26	26	26
830	68	68	68	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	21	21	21	21	21	21
833	58	58	58	28	28	28	30	30	30	33	33	33	45	45	45	45	45	45	45	45	45
834	68	68	68	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
835	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
836	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
837	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
838	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
839	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
840	41	38	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
843	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
846	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
847	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
852	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
855	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
856	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

Table A.4 HVO South neutral atmosphere operational predictions $L_{Aeq,15\text{minute}}$ dB

ID	PNTL			Year 3			Year 7			Year 11			Year 18			Year 22			Maximum envelope		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
860	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
861	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
862	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
863	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
869	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
870	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
949	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
950	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
952	41	41	38	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

Appendix B

Modelled Source Locations



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

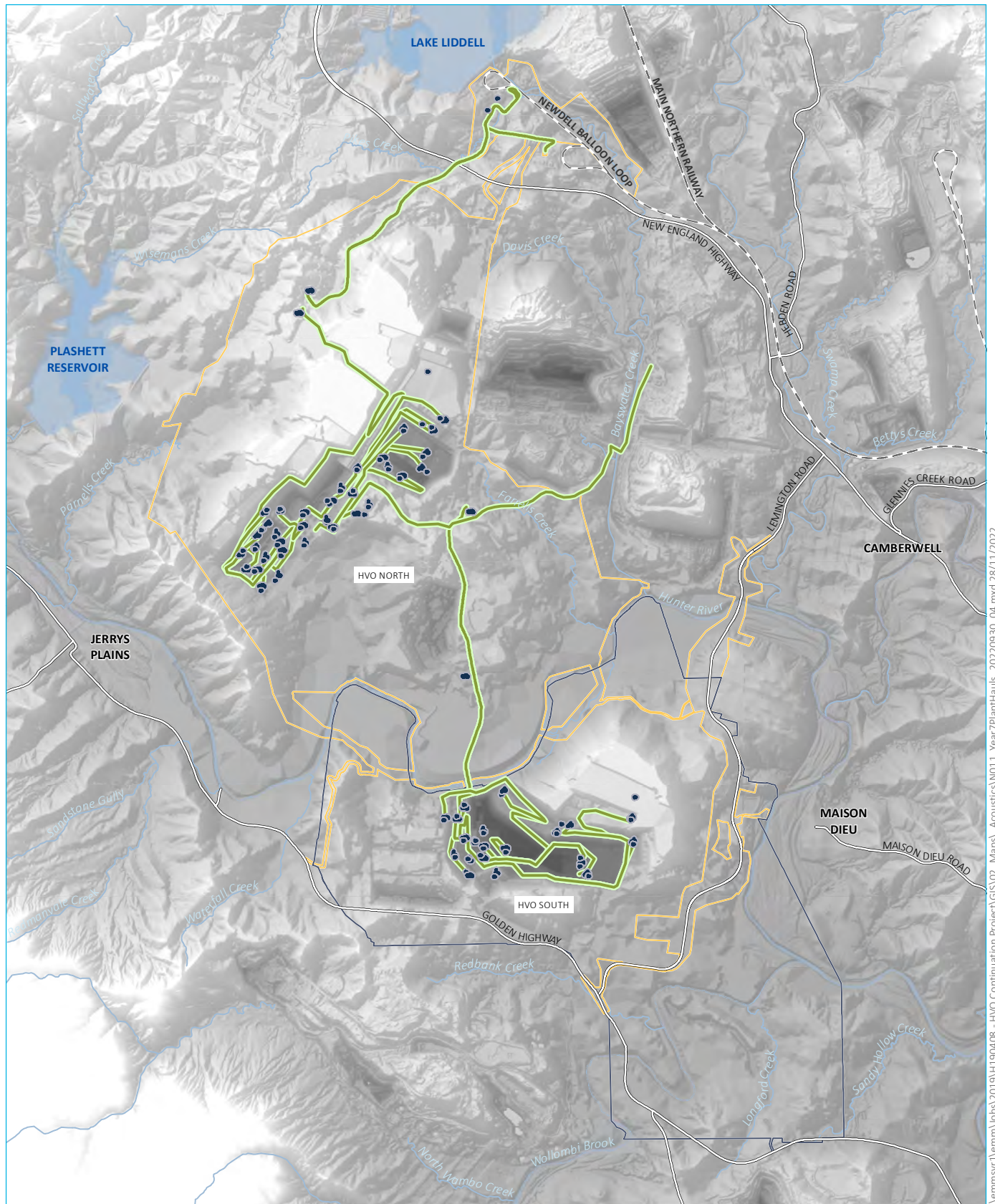
KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Modelled plant location
- Haul route
- Existing environment
- Rail line
- == Major road
- Named watercourse
- Named waterbody

0 2.5 5 km
GDA2020 MGA Zone 56

Year 3 modelled plant locations

HVO Continuation Project
Noise Impact Statement
Figure B.1



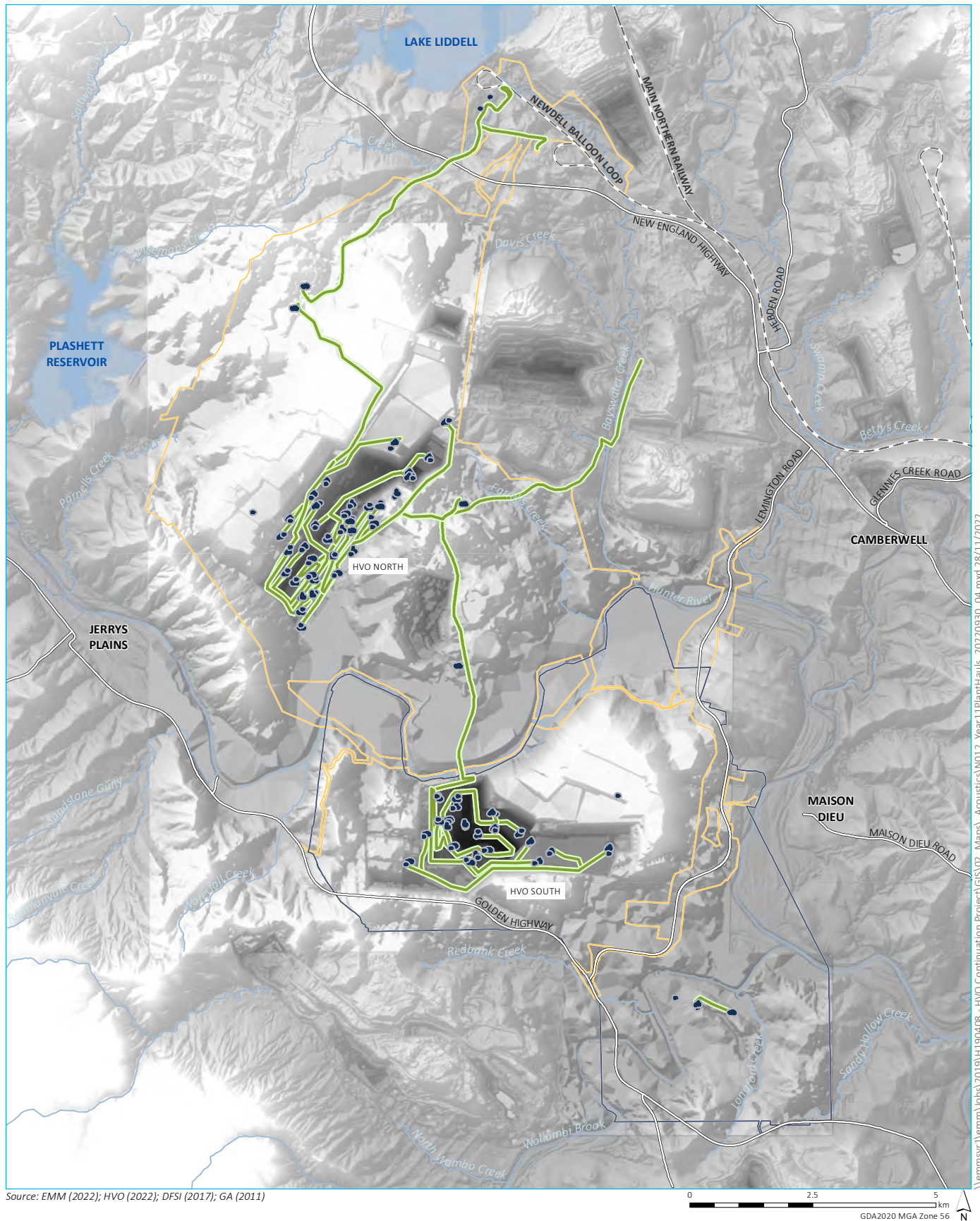
Source: EMM (2022); HVO (2022); DFSI (2017); GA (2011)

KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Modelled plant location
- Haul route
- Existing environment
- Rail line
- == Major road
- Named watercourse
- Named waterbody

Year 7 modelled plant locations

HVO Continuation Project
Noise Impact Statement
Figure B.2



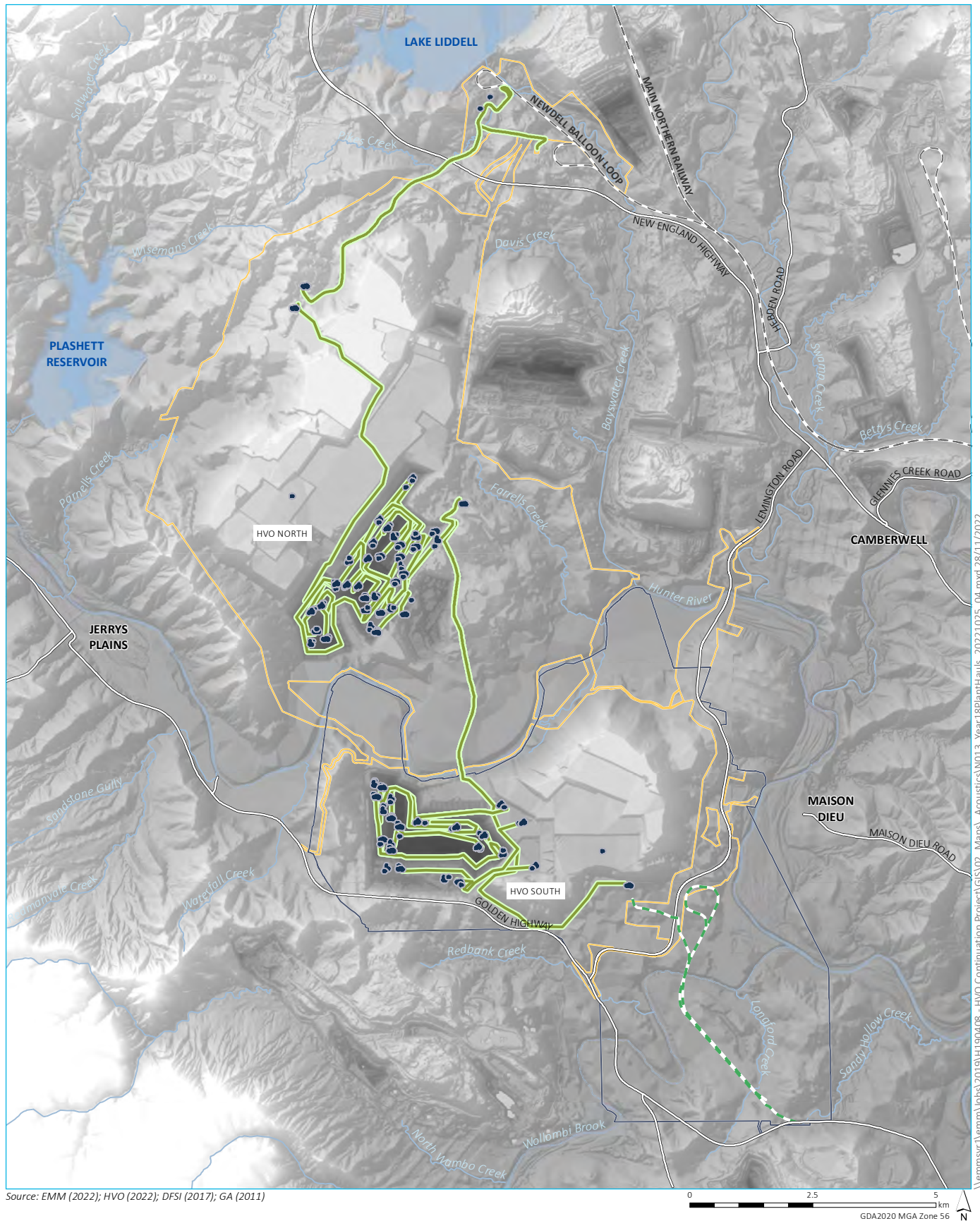
KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Modelled plant location
- Haul route

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

Year 11 modelled plant locations

HVO Continuation Project
Noise Impact Statement
Figure B.3



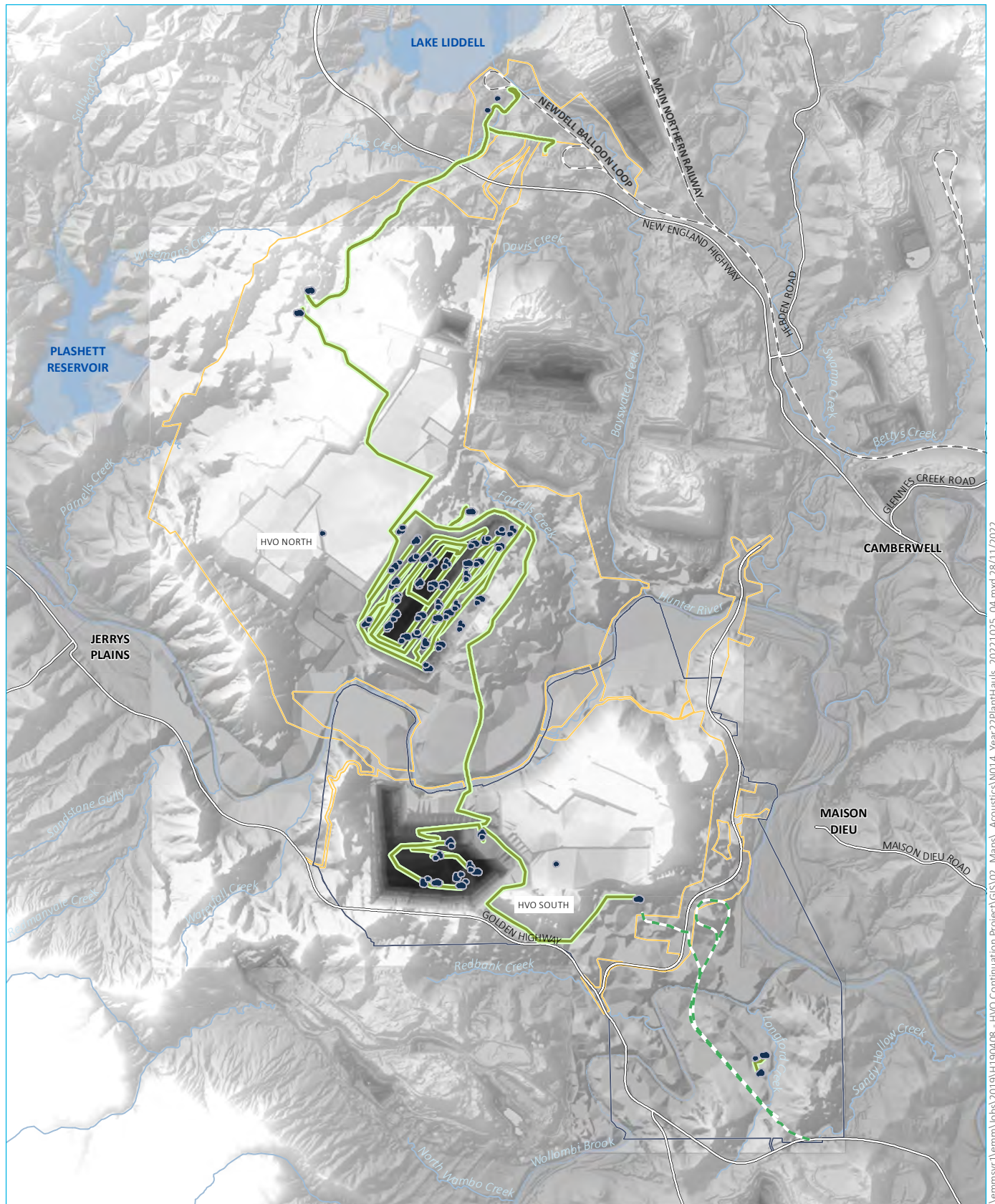
KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Modelled plant location
- Haul route
- - South Lemington Rail Loop and haul route (approved, not yet constructed)

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

Year 18 modelled plant locations

HVO Continuation Project
Noise Impact Statement
Figure B.4



KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Modelled plant location
- Haul route
- - South Lemington Rail Loop and haul route (approved, not yet constructed)

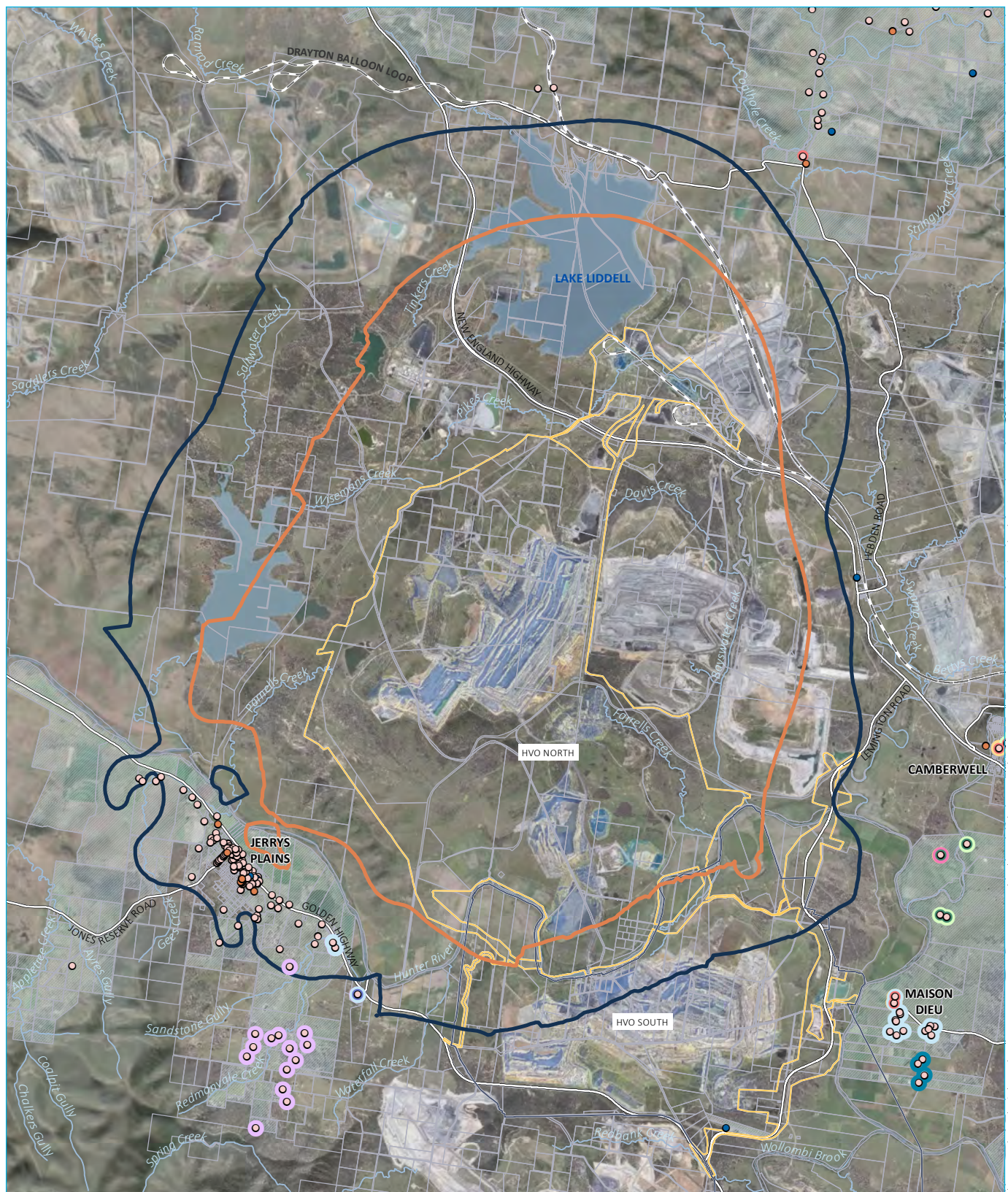
- Existing environment
- - Rail line
- Major road
- Named watercourse
- Named waterbody

Year 22 modelled plant locations

HVO Continuation Project
Noise Impact Statement
Figure B.5

Appendix C

Noise Contour Figures



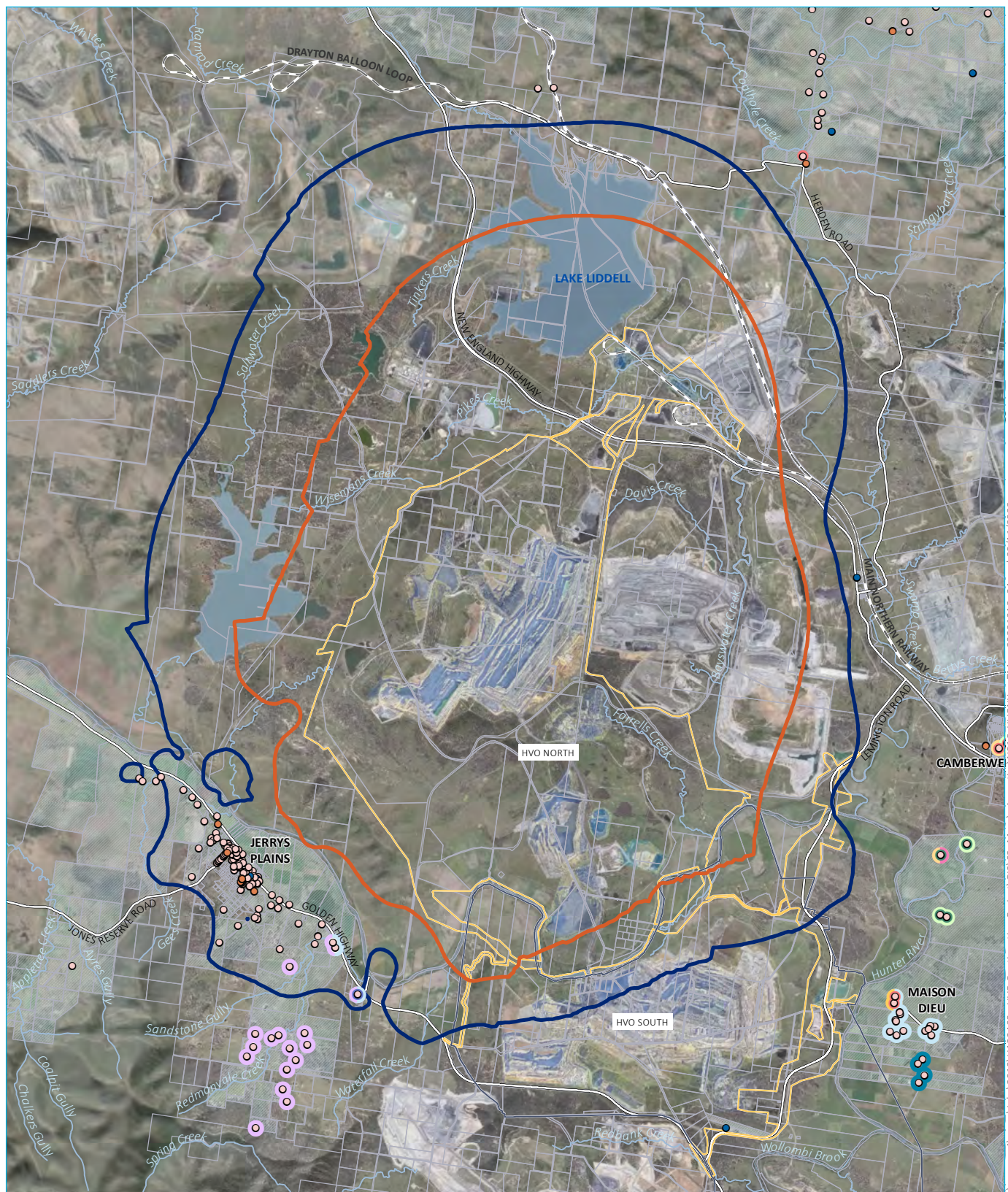
KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Privately owned land
- 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
- Noise contour (dB_{LAeq,15min})
 - 35
 - 40
- Existing environment
 - Rail line
 - Major road
 - Named watercourse
 - Named waterbody
 - Cadastre

HVO North Year 3 maximum envelope
90th percentile
L_{Aeq,15minute} noise contours

HVO Continuation Project
Noise Impact Statement
Figure C.1



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

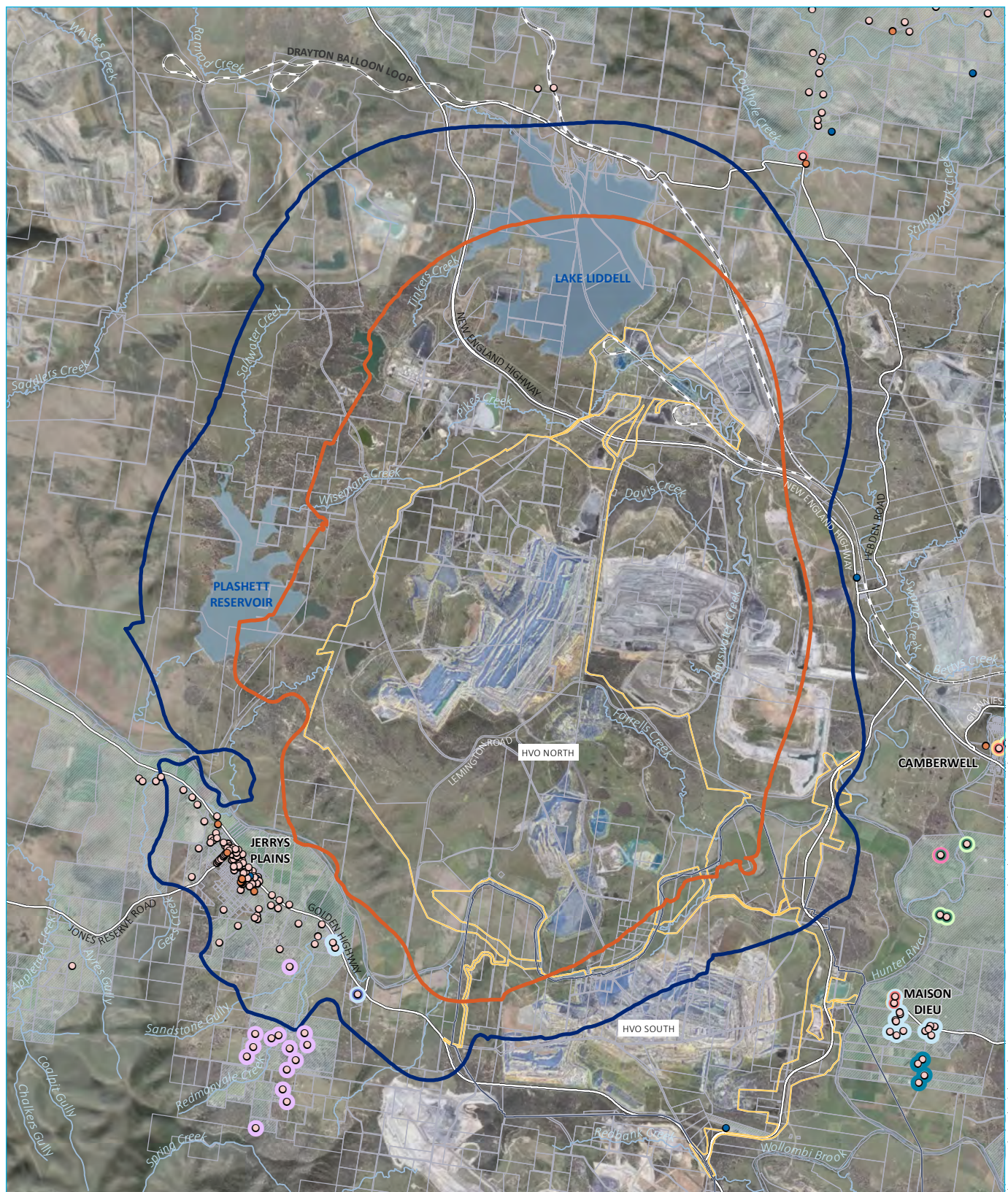
KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Privately owned land
- 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
- Noise contour (dB_{LAeq,15min})
 - 35
 - 40
- Existing environment
 - Rail line
 - Major road
 - Named watercourse
 - Named waterbody
 - Cadastre

HVO North Year 7 maximum envelope
90th percentile
LAeq,15minute noise contours

HVO Continuation Project
Noise Impact Statement
Figure C.2



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

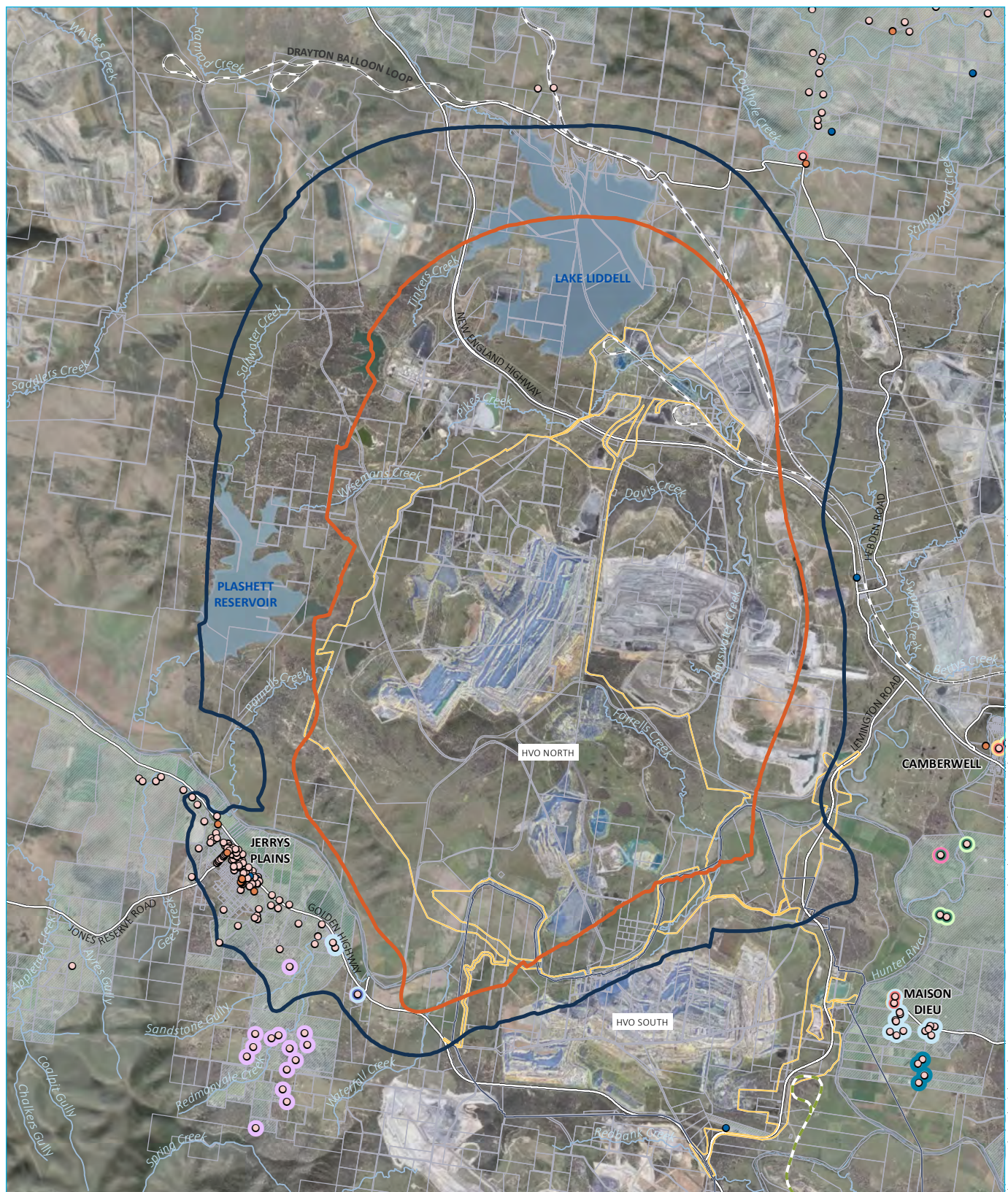
KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Privately owned land
- 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
- Noise contour (dB_{Aeq,15min})
 - 35
 - 40
- Existing environment
 - Rail line
 - Major road
 - Named watercourse
 - Named waterbody
 - Cadastre

HVO North Year 11 maximum
envelope 90th percentile
L_{Aeq,15minute} noise contours

HVO Continuation Project
Noise Impact Statement
Figure C.3



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

KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Privately owned land
- South Lemington Rail Loop (approved, not yet constructed)

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

Noise contour (dB_{Aeq,15min})

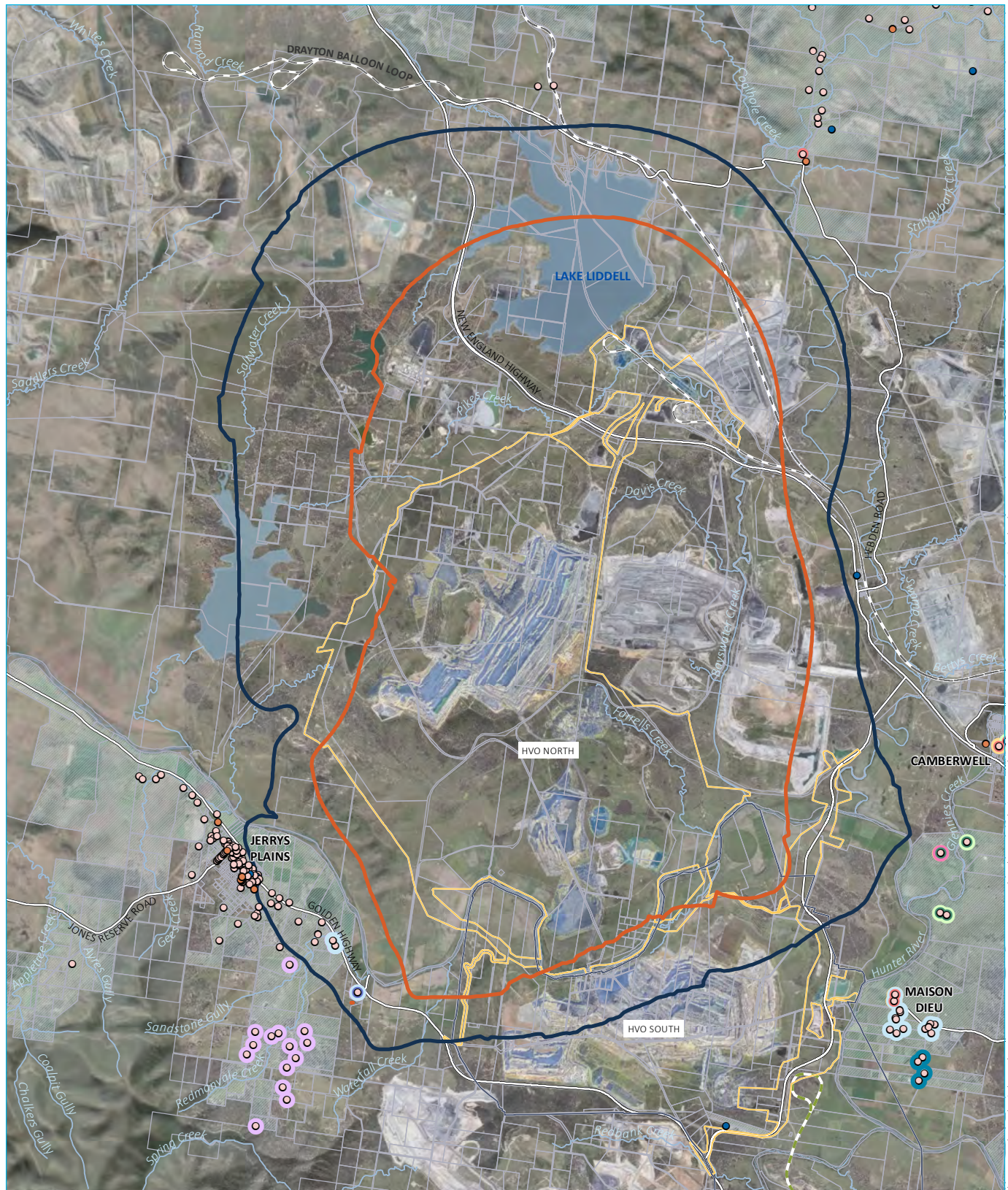
- 35
- 40

Existing environment

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

HVO North Year 18 maximum envelope
90th percentile
L_{Aeq,15minute} noise contours

HVO Continuation Project
Noise Impact Statement
Figure C.4



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

KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Privately owned land
- South Lemington Rail Loop (approved, not yet constructed)

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

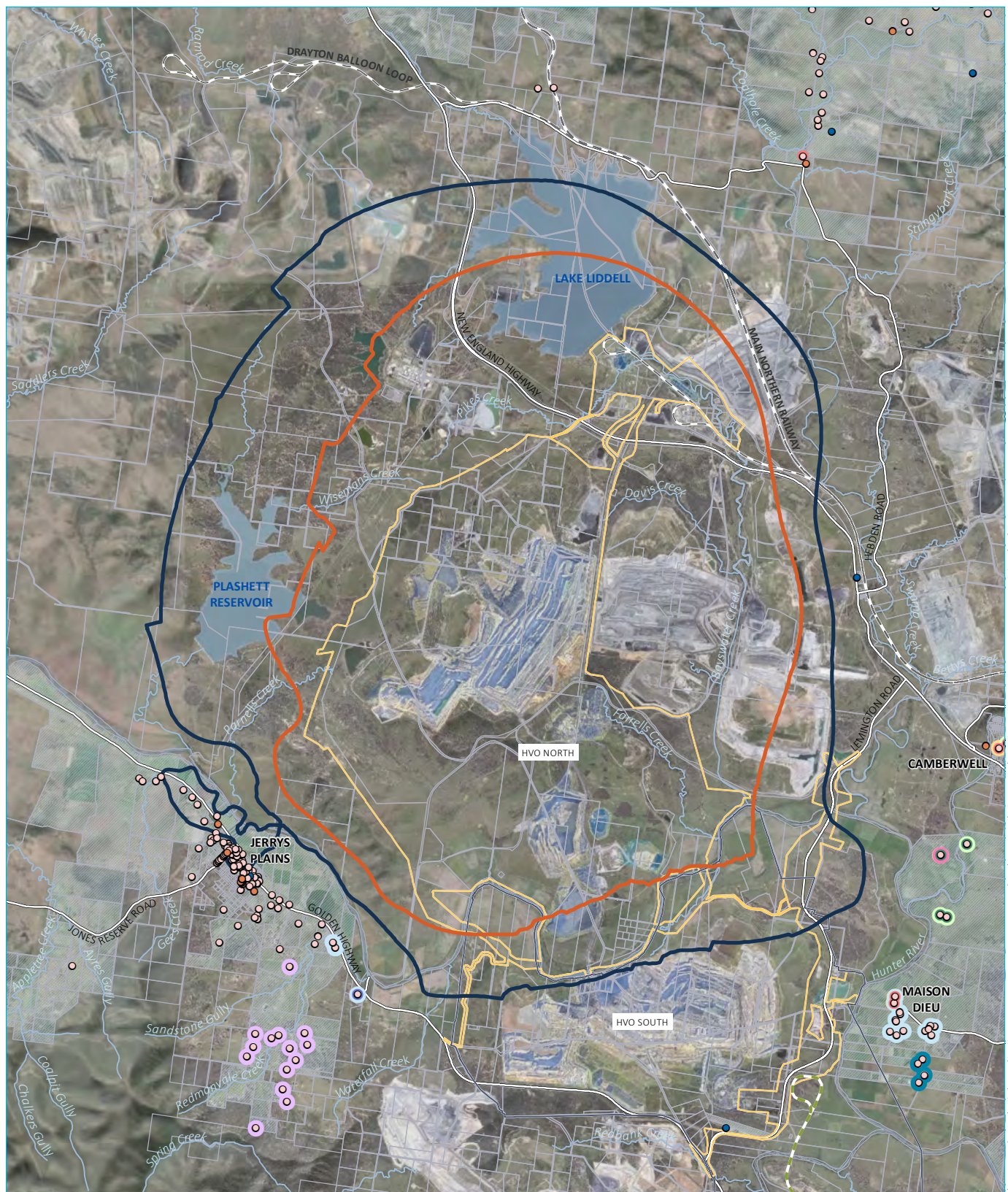
- Subject to existing mitigation rights - HVO - Noise
- Subject to existing mitigation rights - Other mine - Noise & AQ
- Subject to existing mitigation rights - Other Mine - AQ
- Subject to existing mitigation rights - Other mine - Noise

Noise contour (dB_{L_{Aeq},15min})

- 35
- 40
- Existing environment
- Rail line
- Major road
- Named watercourse
- Named waterbody
- Cadastre

HVO North Year 22 maximum envelope
90th percentile
L_{Aeq,15minute} noise contours

HVO Continuation Project
Noise Impact Statement
Figure C.5



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

KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Privately owned land
- South Lemington Rail Loop (approved, not yet constructed)

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

Noise contour (dB_{Aeq,15min})

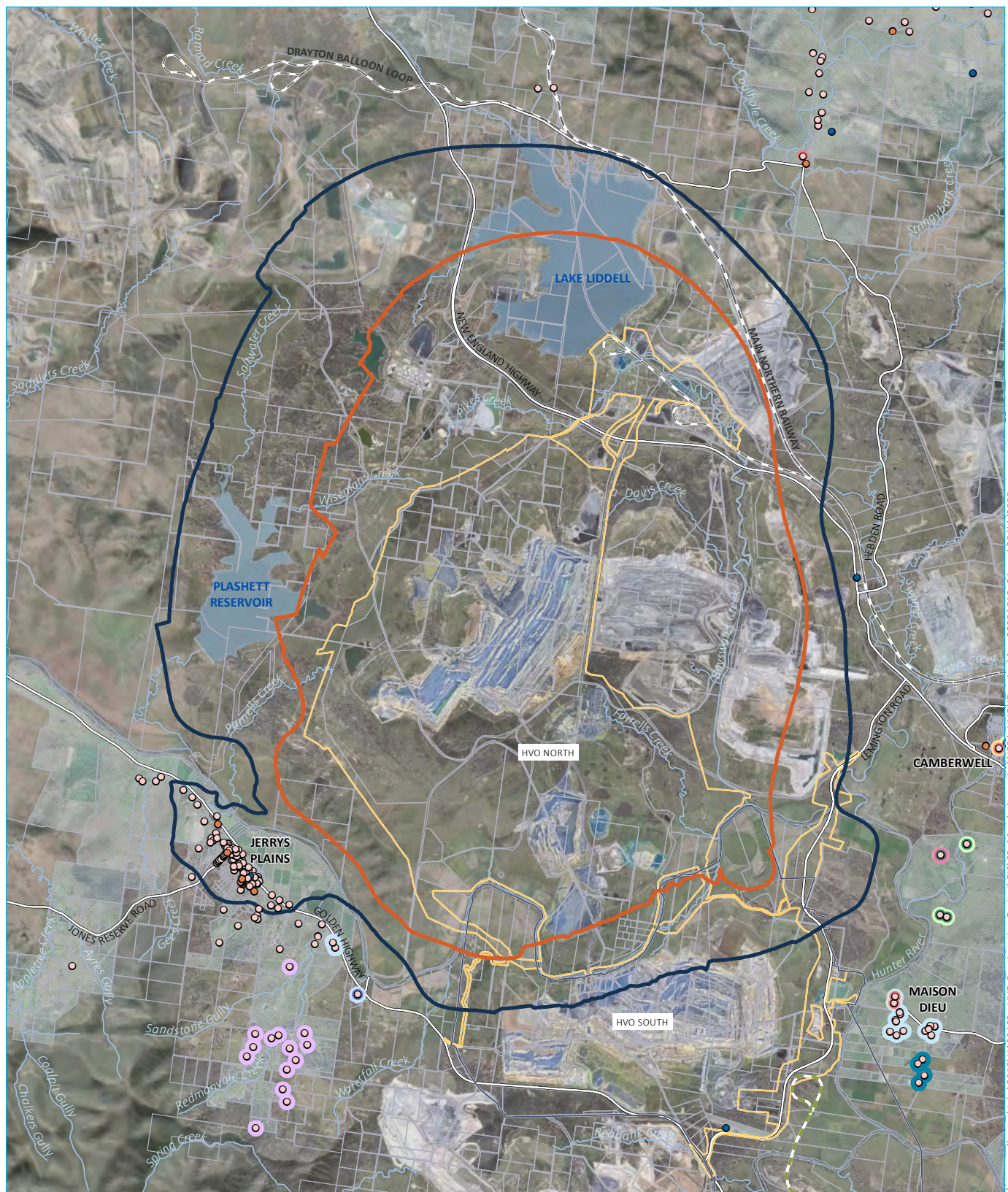
- 35
- 40

Existing environment

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

HVO North day period maximum envelope
90th percentile
LAeq,15minute noise contours

HVO Continuation Project
Noise Impact Statement
Figure C.6



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

KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Privately owned land
- South Lemington Rail Loop (approved, not yet constructed)

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

Noise contour (dB_{LAeq,15min})

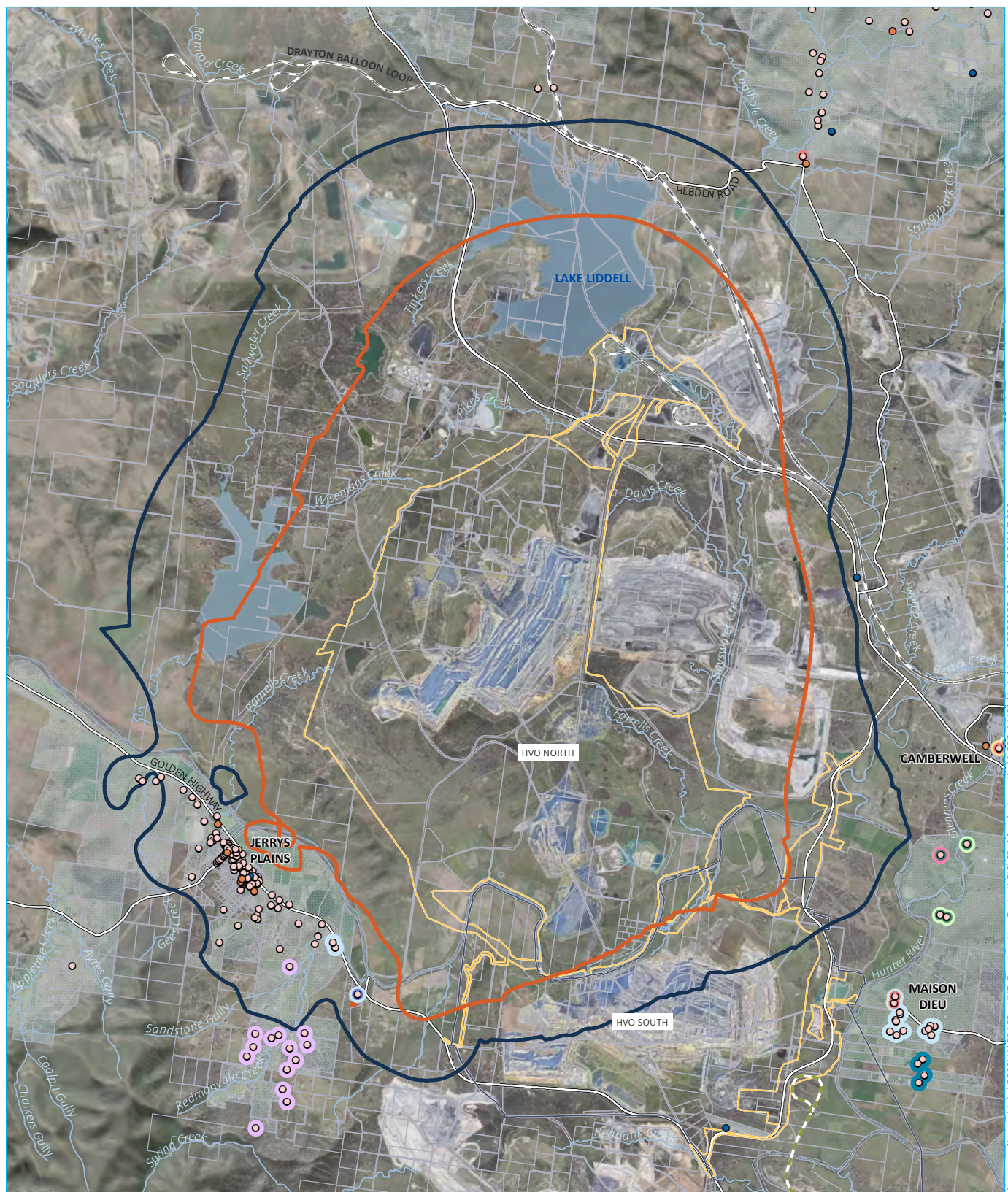
- 35
- 40

Existing environment

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

HVO North evening period maximum envelope 90th percentile $L_{Aeq,15min}$ noise contours

HVO Continuation Project
Noise Impact Statement
Figure C.7



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

KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Privately owned land
- South Lemington Rail Loop (approved, not yet constructed)

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

Noise contour (dB_{Aeq,15min})

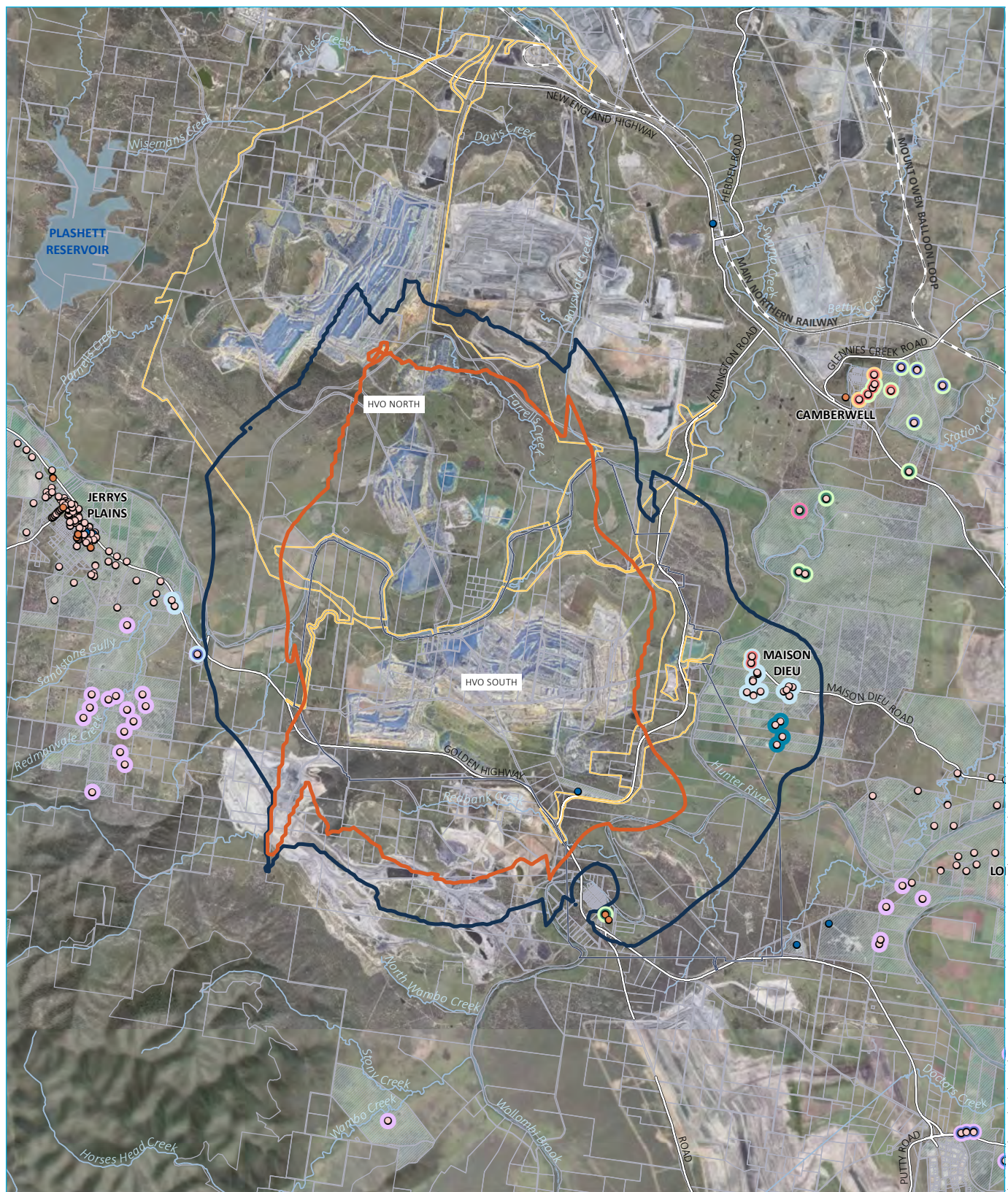
- 35
- 40

Existing environment

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

HVO North night period maximum
envelope 90th percentile
L_{Aeq,15minute} noise contours

HVO Continuation Project
Noise Impact Statement
Figure C.8



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

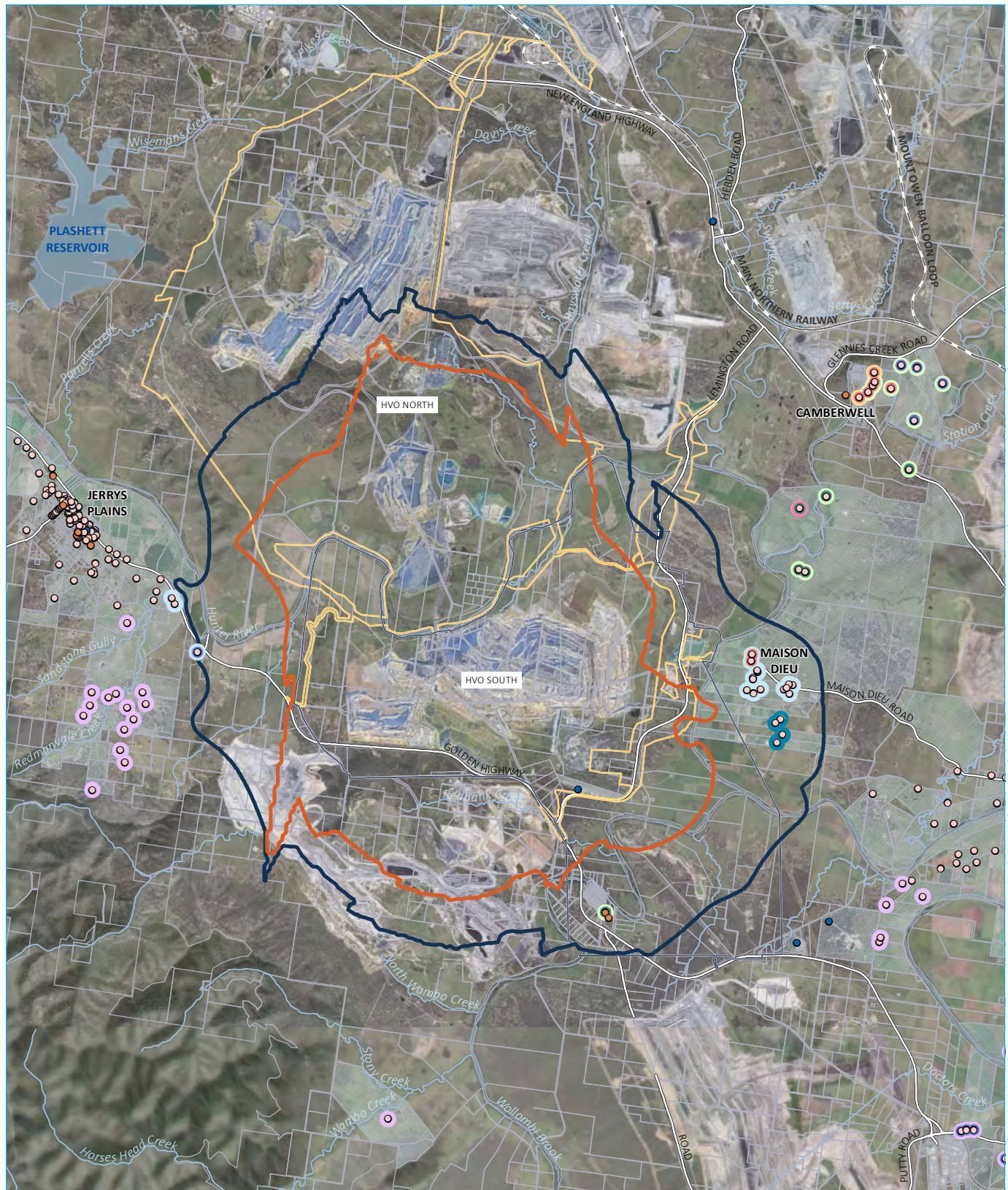
KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Privately owned land
- 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
- Noise contour (dB_{Aeq,15min})
 - 35
 - 40
- Existing environment
 - Rail line
 - Major road
 - Named watercourse
 - Named waterbody
 - Cadastre

HVO South Year 3 maximum envelope
90th percentile
L_{Aeq,15minute} noise contours

HVO Continuation Project
Noise Impact Statement
Figure C.9



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

KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Privately owned land
- 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

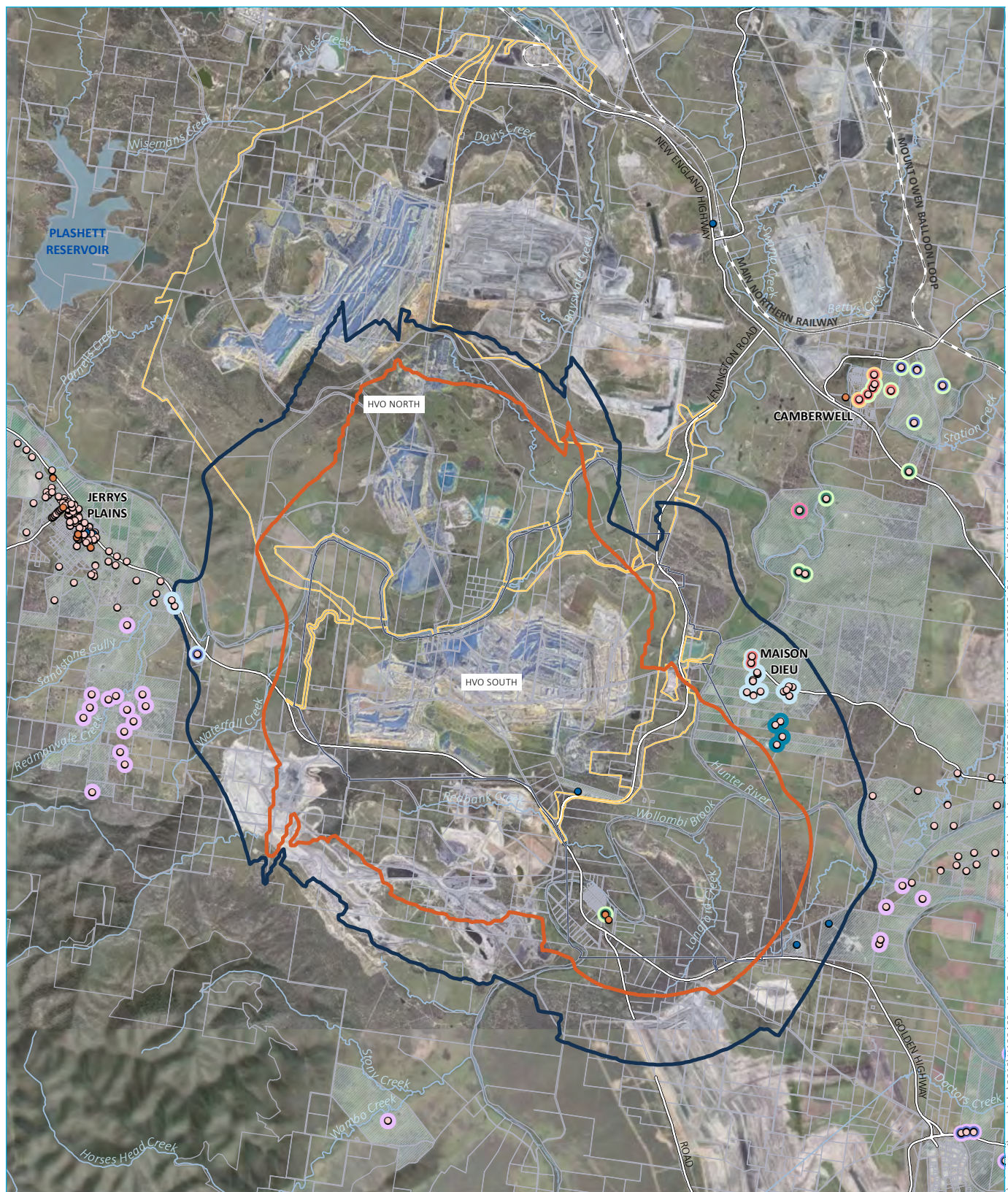
- Subject to existing mitigation rights - Other mine - Noise & AQ
- Subject to existing mitigation rights - Other Mine - AQ
- Subject to existing mitigation rights - Other mine - Noise
- Noise contour (dB_{Aeq,15min})
 - 35
 - 40
- Existing environment
 - Rail line
 - Major road
 - Named watercourse
 - Named waterbody
 - Cadastre

HVO South Year 7 maximum envelope
90th percentile
L_{Aeq,15minute} noise contours

HVO Continuation Project
Noise Impact Statement
Figure C.10



J:\emmsvr1\emmm\jobs\2019\H\1904\08 - HVO Continuation Project\GIS\02_Maps\Acoustics\W024_HVO5Year7Max_20221012_04.mxd 28/11/2022



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

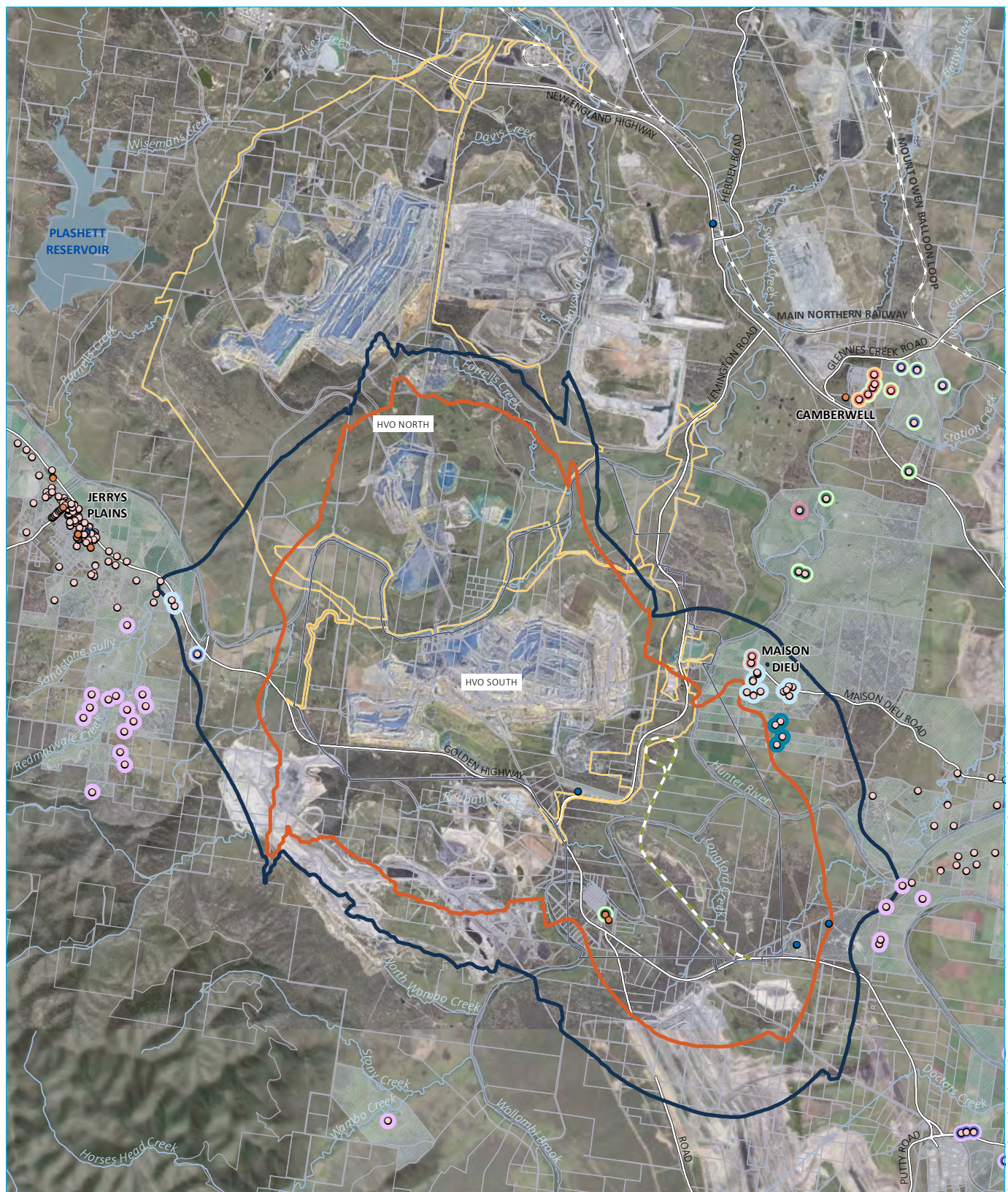
KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Privately owned land
- 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
- Noise contour (dB_{Aeq,15min})
 - 35
 - 40
- Existing environment
 - Rail line
 - Major road
 - Named watercourse
 - Named waterbody
 - Cadastre

HVO South Year 11 maximum envelope
90th percentile
L_{Aeq,15minute} noise contours

HVO Continuation Project
Noise Impact Statement
Figure C.11



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

KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Privately owned land
- South Lemington Rail Loop (approved, not yet constructed)

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

Noise contour (dB_{Aeq,15min})

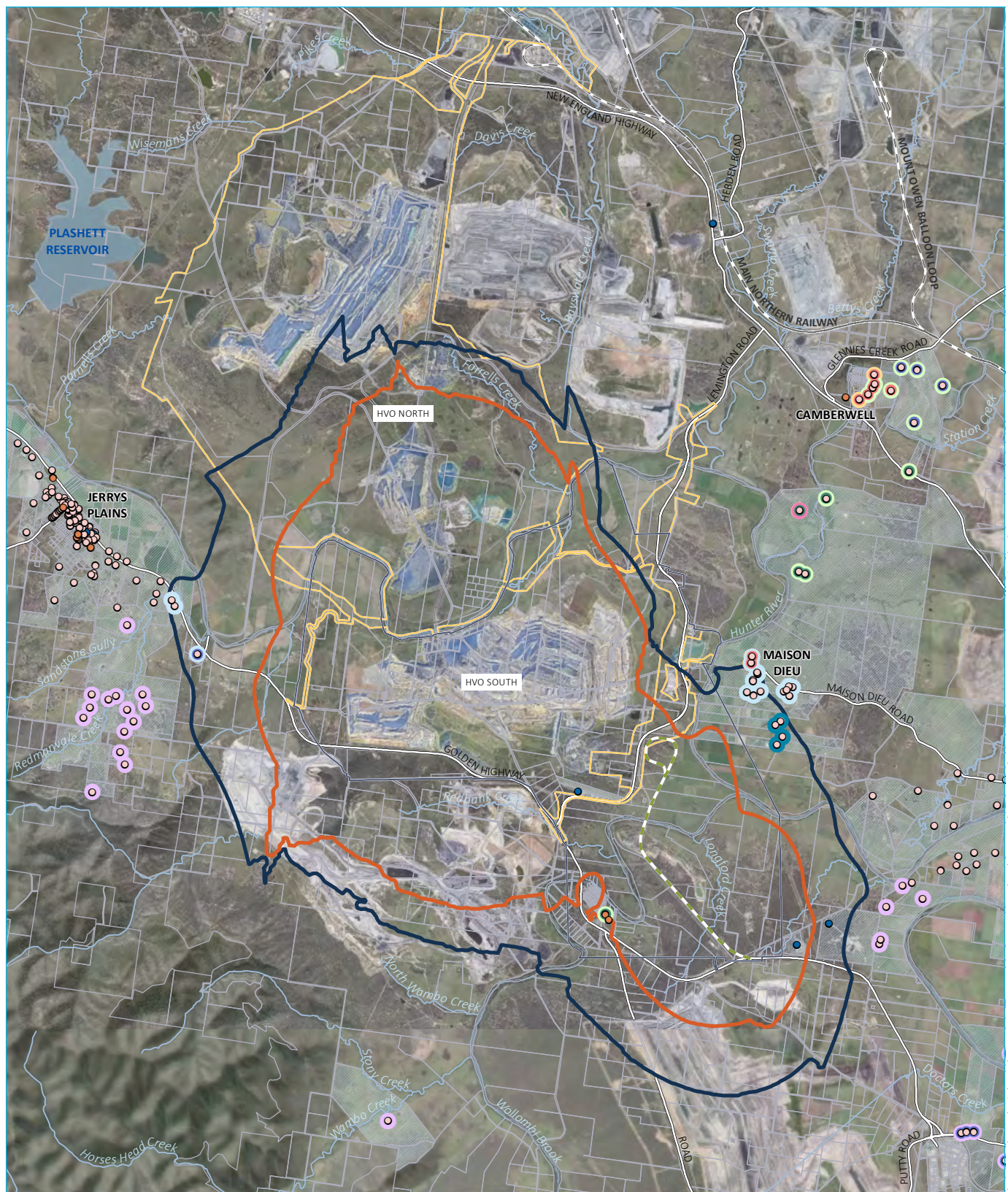
- 35
- 40

Existing environment

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

HVO South Year 22 maximum envelope
90th percentile
L_{Aeq,15minute} noise contours

HVO Continuation Project
Noise Impact Statement
Figure C.13



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

KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Privately owned land
- South Lemington Rail Loop (approved, not yet constructed)

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

Noise contour (dB_{LAeq,15min})

- 35
- 40

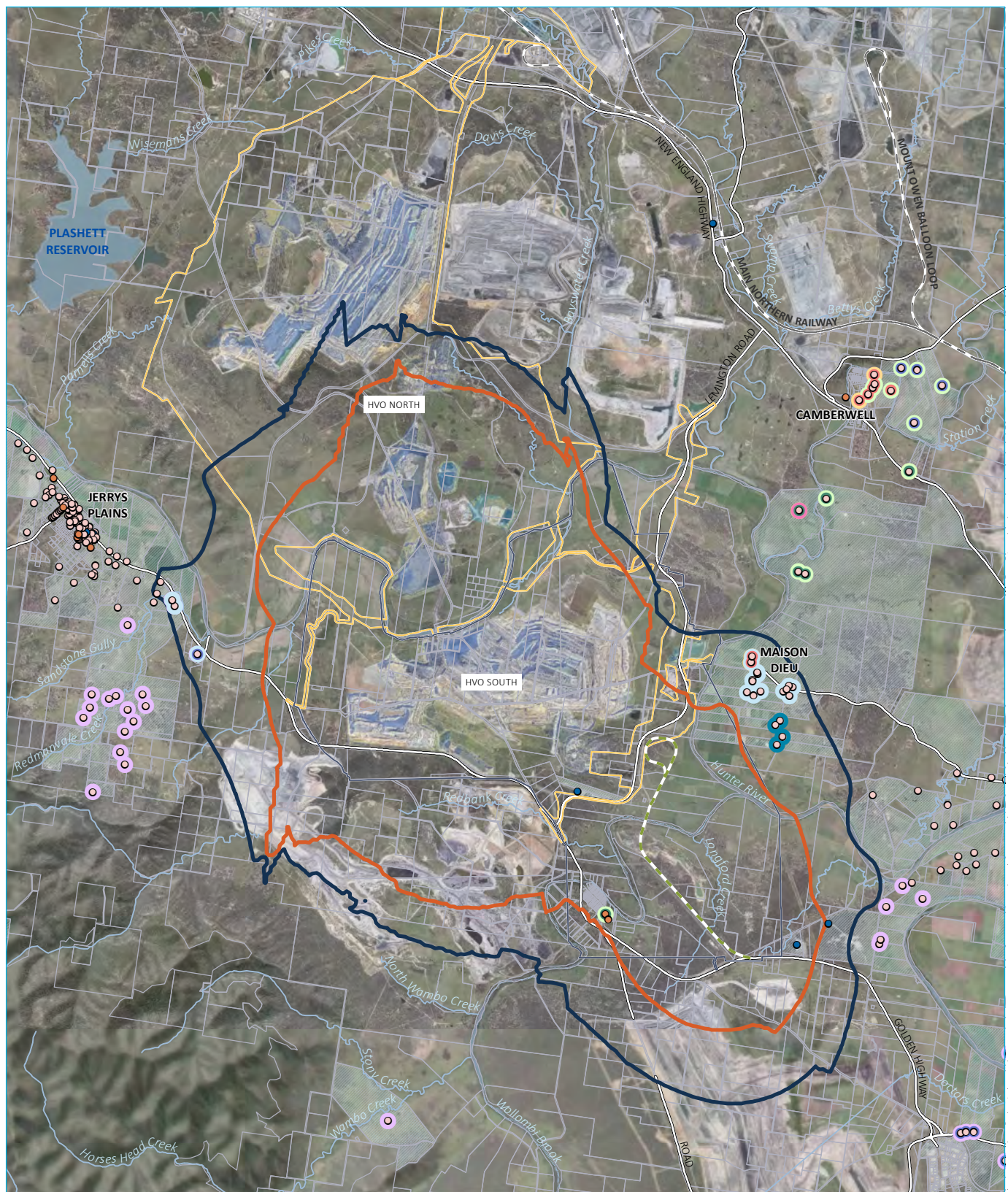
Existing environment

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

HVO South day period maximum envelope
90th percentile
L_{Aeq,15minute} noise contours

HVO Continuation Project
Noise Impact Statement
Figure C.14





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

KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Privately owned land
- South Lemington Rail Loop (approved, not yet constructed)

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

Noise contour (dB(A)eq,15min)

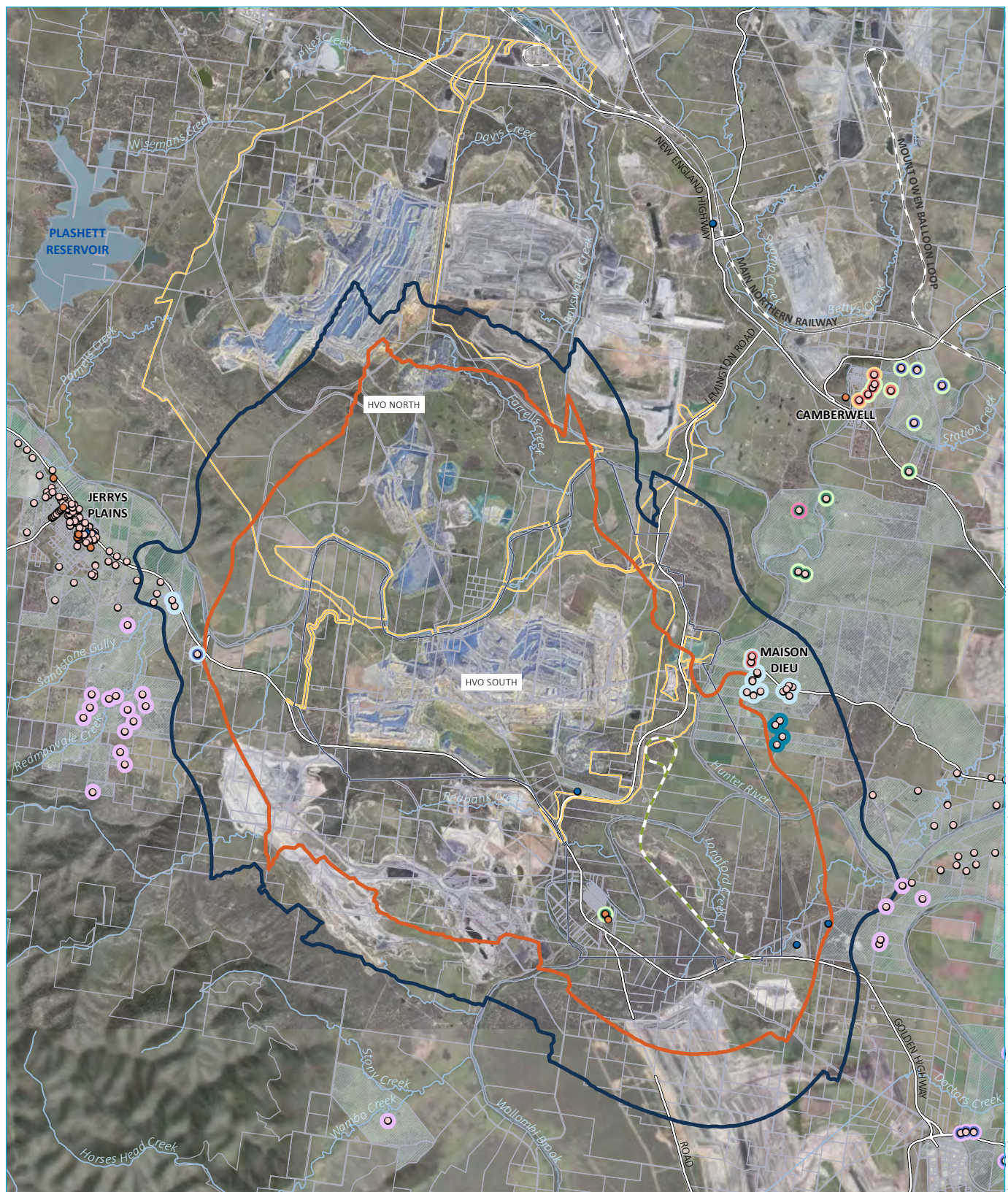
- 35
- 40

Existing environment

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

HVO South evening period
maximum envelope 90th percentile
LAeq,15minute noise contours

HVO Continuation Project
Noise Impact Statement
Figure C.15



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

KEY

- HVO North proposed development consent boundary
- HVO South proposed development consent boundary
- Privately owned land
- South Lemington Rail Loop (approved, not yet constructed)

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

Noise contour (dB_{Aeq,15min})

- 35
- 40

Existing environment

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

HVO South night period maximum
envelope 90th percentile
L_{Aeq,15minute} noise contours

HVO Continuation Project
Noise Impact Statement
Figure C.16

Appendix D

Cumulative Noise Assessment Results

Table D.1 Cumulative noise assessment predictions – $L_{Aeq,period}$ dB

Receptor ID	Amenity noise criteria $L_{Aeq,period}$ dB			Maximum cumulative predictions $L_{Aeq,period}$ dB		
	Day	Evening	Night	Day	Evening	Night
102	50	50	50	39	39	44
120	50	45	40	37	37	39
121	50	45	40	38	38	40
122	50	45	40	37	37	39
123	50	45	40	37	38	39
126	50	45	40	39	39	40
127	50	45	40	40	39	40
128	50	45	40	40	39	40
130	50	45	40	40	39	40
134	50	45	40	40	39	40
139	50	45	40	39	39	40
141	50	45	40	39	39	40
160	50	45	40	37	37	39
161	50	45	40	37	37	39
162	50	45	40	37	37	39
163	50	45	40	37	37	39
167	50	45	40	39	39	40
169	50	45	40	39	39	40
170	50	45	40	39	39	40
173	50	45	40	39	39	40
174	50	45	40	39	39	40
175	50	45	40	39	39	40
176	50	45	40	39	39	40
178	50	45	40	39	39	40
179	50	45	40	39	39	40
244	50	45	40	37	37	38
245	50	45	40	37	37	39
246	50	45	40	37	37	38
247	50	45	40	37	37	38
248	50	45	40	39	39	40

Table D.1 Cumulative noise assessment predictions – $L_{Aeq,period}$ dB

Receptor ID	Amenity noise criteria $L_{Aeq,period}$ dB			Maximum cumulative predictions $L_{Aeq,period}$ dB		
	Day	Evening	Night	Day	Evening	Night
249	50	45	40	39	39	40
250	50	45	40	39	39	40
251	50	45	40	39	39	40
256	50	45	40	37	37	39
258	50	45	40	37	37	39
260	50	45	40	37	37	39
261	50	45	40	37	37	39
262	50	45	40	40	39	40
264	50	50	50	37	37	44
308	50	45	40	39	38	43
311	50	45	40	37	37	39
317	50	45	40	37	37	39
321	50	45	40	37	37	39
322	50	45	40	37	37	39
324	50	45	40	37	37	39
325	50	45	40	33	34	35
326	50	45	40	34	34	36
327	50	45	40	34	34	36
328	50	45	40	34	35	37
330	50	45	40	34	34	36
331	55	55	55	34	35	37
332	50	45	40	33	35	36
333	50	45	40	33	35	36
334	50	45	40	33	35	36
335	50	45	40	33	35	36
336	50	45	40	33	35	37
337	50	45	40	33	35	36
338	50	45	40	33	35	36
339	50	45	40	33	34	36
340	50	45	40	33	34	36

Table D.1 Cumulative noise assessment predictions – $L_{Aeq,period}$ dB

Receptor ID	Amenity noise criteria $L_{Aeq,period}$ dB			Maximum cumulative predictions $L_{Aeq,period}$ dB		
	Day	Evening	Night	Day	Evening	Night
341	50	45	40	33	34	36
342	50	45	40	33	34	36
343	50	45	40	33	34	36
344	50	45	40	33	34	36
345	50	45	40	33	34	36
346	50	45	40	34	34	36
347	50	45	40	33	35	37
348	50	45	40	33	34	36
349	50	45	40	33	34	36
350	50	45	40	34	34	36
351	50	45	40	33	34	36
352	50	45	40	33	34	36
353	50	45	40	33	34	36
355	50	45	40	34	34	37
356	50	45	40	34	35	37
357	50	45	40	34	35	37
358	50	45	40	34	35	37
359	50	45	40	34	35	37
360	50	45	40	34	35	37
361	50	45	40	34	35	37
362	50	45	40	34	35	37
363	50	45	40	34	35	37
366	50	45	40	34	35	37
367	50	45	40	34	35	37
368	50	45	40	34	35	37
369	50	45	40	34	35	37
370	50	45	40	34	35	37
371	50	45	40	34	35	37
372	50	45	40	34	35	37
373	50	45	40	34	35	37

Table D.1 Cumulative noise assessment predictions – $L_{Aeq,period}$ dB

Receptor ID	Amenity noise criteria $L_{Aeq,period}$ dB			Maximum cumulative predictions $L_{Aeq,period}$ dB		
	Day	Evening	Night	Day	Evening	Night
374	50	45	40	34	35	37
375	50	45	40	33	35	37
376	50	45	40	34	35	37
377	50	45	40	34	35	37
380	50	45	40	34	35	37
381	50	45	40	34	35	37
382	50	50	50	33	35	37
383	50	45	40	33	35	37
384	50	45	40	33	35	37
385	50	45	40	33	35	37
386	65	65	65	33	35	37
389	50	45	40	34	35	37
390	50	45	40	34	35	37
391	65	65	65	34	35	37
392	50	45	40	34	35	37
393	50	45	40	34	35	37
394	50	45	40	34	35	37
395	50	45	40	34	35	37
396	50	50	50	34	34	37
397	50	45	40	34	35	37
398	50	45	40	34	34	37
399	50	45	40	34	35	37
400	50	45	40	34	35	37
401	50	45	40	34	35	37
402	50	45	40	34	35	37
403	50	45	40	34	35	37
404	50	45	40	34	35	37
405	50	45	40	34	35	37
406	50	45	40	34	35	37
407	50	45	40	34	35	37

Table D.1 Cumulative noise assessment predictions – $L_{Aeq,period}$ dB

Receptor ID	Amenity noise criteria $L_{Aeq,period}$ dB			Maximum cumulative predictions $L_{Aeq,period}$ dB		
	Day	Evening	Night	Day	Evening	Night
408	50	45	40	34	34	37
409	50	45	40	33	35	37
410	65	65	65	33	35	37
411	50	45	40	33	35	36
412	45	45	45	33	35	36
413	50	45	40	33	34	36
414	50	45	40	33	35	36
415	50	45	40	33	35	37
417	50	45	40	34	35	37
418	50	45	40	33	35	37
419	50	45	40	33	34	36
420	50	45	40	34	35	37
421	50	45	40	34	35	37
422	50	45	40	34	35	37
423	50	45	40	34	35	37
425	50	45	40	37	37	38
426	50	45	40	37	37	38
427	50	45	40	37	37	39
428	50	45	40	37	37	39
429	50	45	40	37	37	39
430	50	45	40	37	37	39
431	50	45	40	37	37	39
432	50	45	40	37	37	39
433	50	45	40	37	37	38
434	50	45	40	37	37	39
436	50	45	40	37	37	39
437	50	45	40	34	33	36
438	50	45	40	32	32	33
440	50	45	40	37	37	39
451	50	45	40	38	37	37

Table D.1 Cumulative noise assessment predictions – $L_{Aeq,period}$ dB

Receptor ID	Amenity noise criteria $L_{Aeq,period}$ dB			Maximum cumulative predictions $L_{Aeq,period}$ dB		
	Day	Evening	Night	Day	Evening	Night
452	50	45	40	37	37	37
453	50	45	40	37	37	37
454	50	45	40	37	37	37
455	50	45	40	37	37	37
456	50	45	40	37	37	37
457	50	45	40	37	37	36
458	50	45	40	37	37	37
459	50	45	40	37	37	37
460	50	45	40	37	37	37
462	50	45	40	37	37	37
464	50	45	40	37	37	38
466	50	45	40	33	33	35
471	50	45	40	36	35	37
472	50	45	40	32	31	33
473	65	65	65	34	35	37
477	50	45	40	37	37	37
478	50	45	40	37	37	37
481	50	45	40	37	37	39
482	50	45	40	34	35	37
483	65	65	65	34	34	36
484	50	45	40	33	34	36
487	50	45	40	33	32	35
488	50	45	40	33	32	34
489	50	45	40	33	32	34
497	50	45	40	37	37	39
498	50	45	40	37	37	39
499	50	45	40	36	35	37
596	50	45	40	39	39	38
619	50	45	40	40	40	39
621	50	45	40	40	40	39

Table D.1 Cumulative noise assessment predictions – $L_{Aeq,period}$ dB

Receptor ID	Amenity noise criteria $L_{Aeq,period}$ dB			Maximum cumulative predictions $L_{Aeq,period}$ dB		
	Day	Evening	Night	Day	Evening	Night
623	50	50	50	40	40	39
624	50	45	40	40	40	39
626	50	45	40	40	40	39
627	50	45	40	40	40	39
628	50	45	40	40	40	39
629	50	45	40	40	40	39
735	65	65	65	40	40	40
829	65	65	65	38	39	39
830	65	65	65	38	39	39
833	55	55	55	43	44	46
834	65	65	65	34	35	37
835	50	45	40	34	35	37
836	50	45	40	34	35	37
837	50	45	40	34	35	37
838	50	45	40	34	35	37
839	50	45	40	33	35	37
840	50	45	40	34	35	37
843	50	45	40	39	39	40
846	50	45	40	39	39	40
847	50	45	40	39	39	40
852	50	45	40	39	39	40
855	50	45	40	39	39	40
856	50	45	40	39	39	40
860	50	45	40	40	40	39
861	50	45	40	40	40	39
862	50	45	40	40	40	39
863	50	45	40	40	40	39
869	50	45	40	35	34	37
870	50	45	40	36	35	38
952	50	45	40	37	37	38

Appendix E

Modelled Meteorological Conditions

Temperature °C	Humidity %	Wind Speed m/s	Wind Direction (degrees)	VTG °C/100m
10	80	0	-	-1.5
10	80	0	-	-0.5
10	80	0	-	1.5
10	80	0	-	4
10	80	0.5	0	-1.5
10	80	0.5	22.5	-1.5
10	80	0.5	45	-1.5
10	80	0.5	67.5	-1.5
10	80	0.5	90	-1.5
10	80	0.5	112.5	-1.5
10	80	0.5	135	-1.5
10	80	0.5	157.5	-1.5
10	80	0.5	180	-1.5
10	80	0.5	202.5	-1.5
10	80	0.5	225	-1.5
10	80	0.5	247.5	-1.5
10	80	0.5	270	-1.5
10	80	0.5	292.5	-1.5
10	80	0.5	315	-1.5
10	80	0.5	337.5	-1.5
10	80	1.25	0	-1.5
10	80	1.25	22.5	-1.5
10	80	1.25	45	-1.5
10	80	1.25	67.5	-1.5
10	80	1.25	90	-1.5
10	80	1.25	112.5	-1.5
10	80	1.25	135	-1.5
10	80	1.25	157.5	-1.5
10	80	1.25	180	-1.5
10	80	1.25	202.5	-1.5
10	80	1.25	225	-1.5
10	80	1.25	247.5	-1.5

Temperature °C	Humidity %	Wind Speed m/s	Wind Direction (degrees)	VTG °C/100m
10	80	1.25	270	-1.5
10	80	1.25	292.5	-1.5
10	80	1.25	315	-1.5
10	80	1.25	337.5	-1.5
10	80	2	0	-1.5
10	80	2	22.5	-1.5
10	80	2	45	-1.5
10	80	2	67.5	-1.5
10	80	2	90	-1.5
10	80	2	112.5	-1.5
10	80	2	135	-1.5
10	80	2	157.5	-1.5
10	80	2	180	-1.5
10	80	2	202.5	-1.5
10	80	2	225	-1.5
10	80	2	247.5	-1.5
10	80	2	270	-1.5
10	80	2	292.5	-1.5
10	80	2	315	-1.5
10	80	2	337.5	-1.5
10	80	3	0	-1.5
10	80	3	22.5	-1.5
10	80	3	45	-1.5
10	80	3	67.5	-1.5
10	80	3	90	-1.5
10	80	3	112.5	-1.5
10	80	3	135	-1.5
10	80	3	157.5	-1.5
10	80	3	180	-1.5
10	80	3	202.5	-1.5
10	80	3	225	-1.5
10	80	3	247.5	-1.5

Temperature °C	Humidity %	Wind Speed m/s	Wind Direction (degrees)	VTG °C/100m
10	80	3	270	-1.5
10	80	3	292.5	-1.5
10	80	3	315	-1.5
10	80	3	337.5	-1.5
10	80	0.5	0	-0.5
10	80	0.5	22.5	-0.5
10	80	0.5	45	-0.5
10	80	0.5	67.5	-0.5
10	80	0.5	90	-0.5
10	80	0.5	112.5	-0.5
10	80	0.5	135	-0.5
10	80	0.5	157.5	-0.5
10	80	0.5	180	-0.5
10	80	0.5	202.5	-0.5
10	80	0.5	225	-0.5
10	80	0.5	247.5	-0.5
10	80	0.5	270	-0.5
10	80	0.5	292.5	-0.5
10	80	0.5	315	-0.5
10	80	0.5	337.5	-0.5
10	80	1.25	0	-0.5
10	80	1.25	22.5	-0.5
10	80	1.25	45	-0.5
10	80	1.25	67.5	-0.5
10	80	1.25	90	-0.5
10	80	1.25	112.5	-0.5
10	80	1.25	135	-0.5
10	80	1.25	157.5	-0.5
10	80	1.25	180	-0.5
10	80	1.25	202.5	-0.5
10	80	1.25	225	-0.5
10	80	1.25	247.5	-0.5

Temperature °C	Humidity %	Wind Speed m/s	Wind Direction (degrees)	VTG °C/100m
10	80	1.25	270	-0.5
10	80	1.25	292.5	-0.5
10	80	1.25	315	-0.5
10	80	1.25	337.5	-0.5
10	80	2	0	-0.5
10	80	2	22.5	-0.5
10	80	2	45	-0.5
10	80	2	67.5	-0.5
10	80	2	90	-0.5
10	80	2	112.5	-0.5
10	80	2	135	-0.5
10	80	2	157.5	-0.5
10	80	2	180	-0.5
10	80	2	202.5	-0.5
10	80	2	225	-0.5
10	80	2	247.5	-0.5
10	80	2	270	-0.5
10	80	2	292.5	-0.5
10	80	2	315	-0.5
10	80	2	337.5	-0.5
10	80	3	0	-0.5
10	80	3	22.5	-0.5
10	80	3	45	-0.5
10	80	3	67.5	-0.5
10	80	3	90	-0.5
10	80	3	112.5	-0.5
10	80	3	135	-0.5
10	80	3	157.5	-0.5
10	80	3	180	-0.5
10	80	3	202.5	-0.5
10	80	3	225	-0.5
10	80	3	247.5	-0.5

Temperature °C	Humidity %	Wind Speed m/s	Wind Direction (degrees)	VTG °C/100m
10	80	3	270	-0.5
10	80	3	292.5	-0.5
10	80	3	315	-0.5
10	80	3	337.5	-0.5
10	80	0.5	0	1.5
10	80	0.5	22.5	1.5
10	80	0.5	45	1.5
10	80	0.5	67.5	1.5
10	80	0.5	90	1.5
10	80	0.5	112.5	1.5
10	80	0.5	135	1.5
10	80	0.5	157.5	1.5
10	80	0.5	180	1.5
10	80	0.5	202.5	1.5
10	80	0.5	225	1.5
10	80	0.5	247.5	1.5
10	80	0.5	270	1.5
10	80	0.5	292.5	1.5
10	80	0.5	315	1.5
10	80	0.5	337.5	1.5
10	80	1.25	0	1.5
10	80	1.25	22.5	1.5
10	80	1.25	45	1.5
10	80	1.25	67.5	1.5
10	80	1.25	90	1.5
10	80	1.25	112.5	1.5
10	80	1.25	135	1.5
10	80	1.25	157.5	1.5
10	80	1.25	180	1.5
10	80	1.25	202.5	1.5
10	80	1.25	225	1.5
10	80	1.25	247.5	1.5

Temperature °C	Humidity %	Wind Speed m/s	Wind Direction (degrees)	VTG °C/100m
10	80	1.25	270	1.5
10	80	1.25	292.5	1.5
10	80	1.25	315	1.5
10	80	1.25	337.5	1.5
10	80	2	0	1.5
10	80	2	22.5	1.5
10	80	2	45	1.5
10	80	2	67.5	1.5
10	80	2	90	1.5
10	80	2	112.5	1.5
10	80	2	135	1.5
10	80	2	157.5	1.5
10	80	2	180	1.5
10	80	2	202.5	1.5
10	80	2	225	1.5
10	80	2	247.5	1.5
10	80	2	270	1.5
10	80	2	292.5	1.5
10	80	2	315	1.5
10	80	2	337.5	1.5
10	80	3	0	1.5
10	80	3	22.5	1.5
10	80	3	45	1.5
10	80	3	67.5	1.5
10	80	3	90	1.5
10	80	3	112.5	1.5
10	80	3	135	1.5
10	80	3	157.5	1.5
10	80	3	180	1.5
10	80	3	202.5	1.5
10	80	3	225	1.5
10	80	3	247.5	1.5

Temperature °C	Humidity %	Wind Speed m/s	Wind Direction (degrees)	VTG °C/100m
10	80	3	270	1.5
10	80	3	292.5	1.5
10	80	3	315	1.5
10	80	3	337.5	1.5
10	80	0.5	0	4
10	80	0.5	22.5	4
10	80	0.5	45	4
10	80	0.5	67.5	4
10	80	0.5	90	4
10	80	0.5	112.5	4
10	80	0.5	135	4
10	80	0.5	157.5	4
10	80	0.5	180	4
10	80	0.5	202.5	4
10	80	0.5	225	4
10	80	0.5	247.5	4
10	80	0.5	270	4
10	80	0.5	292.5	4
10	80	0.5	315	4
10	80	0.5	337.5	4
10	80	1.25	0	4
10	80	1.25	22.5	4
10	80	1.25	45	4
10	80	1.25	67.5	4
10	80	1.25	90	4
10	80	1.25	112.5	4
10	80	1.25	135	4
10	80	1.25	157.5	4
10	80	1.25	180	4
10	80	1.25	202.5	4
10	80	1.25	225	4
10	80	1.25	247.5	4

Temperature °C	Humidity %	Wind Speed m/s	Wind Direction (degrees)	VTG °C/100m
10	80	1.25	270	4
10	80	1.25	292.5	4
10	80	1.25	315	4
10	80	1.25	337.5	4
10	80	2	0	4
10	80	2	22.5	4
10	80	2	45	4
10	80	2	67.5	4
10	80	2	90	4
10	80	2	112.5	4
10	80	2	135	4
10	80	2	157.5	4
10	80	2	180	4
10	80	2	202.5	4
10	80	2	225	4
10	80	2	247.5	4
10	80	2	270	4
10	80	2	292.5	4
10	80	2	315	4
10	80	2	337.5	4
10	80	3	0	4
10	80	3	22.5	4
10	80	3	45	4
10	80	3	67.5	4
10	80	3	90	4
10	80	3	112.5	4
10	80	3	135	4
10	80	3	157.5	4
10	80	3	180	4
10	80	3	202.5	4
10	80	3	225	4
10	80	3	247.5	4

Temperature °C	Humidity %	Wind Speed m/s	Wind Direction (degrees)	VTG °C/100m
10	80	3	270	4
10	80	3	292.5	4
10	80	3	315	4
10	80	3	337.5	4

Appendix F

Modelled Receptors

Table F.1 **Modelled receptors**

Receptor ID	Lot/sec/DP	Assessment classification	Easting (GDA94)	Northing (GDA94)
17	280//571290	Private - Dwelling	312814	6387573
19	92//586792	Private - Dwelling	312920	6387731
37	91//586792	Private - Dwelling	313347	6387867
102	21//1109631	Community Infrastructure	314800	6394348
120	11//3005	Private - Dwelling	318504	6398457
121	9//3005	Private - Dwelling	318530	6398039
122	2//348678	Private - Dwelling	318608	6398554
123	1//937751	Private - Dwelling	318658	6398205
126	74//755267	Private - Dwelling	320764	6393699
127	4//261349	Private - Dwelling	320624	6396932
128	62//755267	Private - Dwelling	320916	6394511
130	19//621875	Private - Dwelling	321271	6394970
134	200//777038	Private - Dwelling	321472	6395034
139	201//777038	Private - Dwelling	321707	6394686
141	3//261349	Private - Dwelling	321604	6397030
160	3//3005	Private - Dwelling	317883	6399178
161	1//1217808	Private - Dwelling	318010	6399448
162	1//1217808	Private - Dwelling	318011	6399407
163	2//1217808	Private - Dwelling	318114	6399572
167	2//261349	Private - Dwelling	322254	6396725
169	45//752442	Private - Dwelling	321959	6396271
170	43//752442	Private - Dwelling	322379	6396285
173	13//732038	Private - Dwelling	322099	6395301
174	14//732038	Private - Dwelling	322442	6395419
175	17//736075	Private - Dwelling	322488	6395598
176	20//736075	Private - Dwelling	322830	6395688
178	19//736075	Private - Dwelling	323801	6395607
179	42//1186730	Private - Dwelling	324177	6395141
244	2//616940	Private - Dwelling	318808	6399092
245	2//112093	Private - Dwelling	318679	6399194

Table F.1 **Modelled receptors**

Receptor ID	Lot/sec/DP	Assessment classification	Easting (GDA94)	Northing (GDA94)
246	102//817010	Private - Dwelling	318795	6399314
247	101//817010	Private - Dwelling	318879	6399292
248	21//828765	Private - Dwelling	322876	6395431
249	18//736075	Private - Dwelling	323284	6395685
250	A//153004	Private - Dwelling	324927	6395679
251	1//37628	Private - Dwelling	325339	6394874
256	104//817010	Private - Dwelling	317979	6399821
258	2//1217808	Private - Dwelling	318104	6399611
260	14//3005	Private - Dwelling	318182	6399195
261	14//3005	Private - Dwelling	318030	6399106
262	73//755267	Private - Dwelling	320794	6393794
264	2//1171764	Community Infrastructure	314870	6394227
266	1//178612	Private - Dwelling	310074	6389857
308	3//700476	Private - Dwelling	305926	6400011
311	72//1040611	Private - Dwelling	305432	6401054
317	72//1040611	Private - Dwelling	305375	6401182
321	45//860466	Private - Dwelling	304390	6402028
322	2//234710	Private - Dwelling	304009	6402249
324	3//234710	Private - Dwelling	304172	6402127
326	2//825150	Private - Dwelling	302335	6404279
327	3//825150	Private - Dwelling	302215	6404447
328	102//1253129	Private - Dwelling	302773	6404013
330	1//37004	Private - Dwelling	302488	6403896
331	203//753817	Community Infrastructure	302791	6403833
332	144//753817	Private - Dwelling	302771	6403528
333	139//753817	Private - Dwelling	302651	6403521
334	138//753817	Private - Dwelling	302624	6403419
335	137//753817	Private - Dwelling	302691	6403468
336	143//753817	Private - Dwelling	302756	6403623
337	148//753817	Private - Dwelling	302914	6403433

Table F.1 **Modelled receptors**

Receptor ID	Lot/sec/DP	Assessment classification	Easting (GDA94)	Northing (GDA94)
338	150//753817	Private - Dwelling	303027	6403399
339	229//46777	Private - Dwelling	302768	6402966
340	228//46777	Private - Dwelling	302799	6402990
341	227//46777	Private - Dwelling	302829	6403026
342	226//46777	Private - Dwelling	302863	6403055
343	225//44377	Private - Dwelling	302879	6403079
344	224//44377	Private - Dwelling	302914	6403113
345	223//44377	Private - Dwelling	302944	6403132
346	222//44377	Private - Dwelling	302975	6403164
347	3/21/758542	Private - Dwelling	303058	6403344
348	4/21/758542	Private - Dwelling	303035	6403315
349	5/21/758542	Private - Dwelling	303000	6403289
350	6/21/758542	Private - Dwelling	303049	6403237
351	7/21/758542	Private - Dwelling	303082	6403277
352	C//395246	Private - Dwelling	303116	6403299
353	B//395246	Private - Dwelling	303137	6403310
355	2/20/758542	Private - Dwelling	303187	6403276
356	4/20/758542	Private - Dwelling	303130	6403214
357	5/20/758542	Private - Dwelling	303108	6403168
358	6/20/758542	Private - Dwelling	303138	6403141
359	8/20/758542	Private - Dwelling	303207	6403190
360	9/20/758542	Private - Dwelling	303231	6403235
361	10/20/758542	Private - Dwelling	303253	6403253
362	10/19/758542	Private - Dwelling	303348	6403156
363	9/19/758542	Private - Dwelling	303317	6403133
366	7/19/758542	Private - Dwelling	303268	6403081
367	5/19/758542	Private - Dwelling	303212	6403085
368	4/19/758542	Private - Dwelling	303224	6403105
369	1/2/758542	Private - Dwelling	303332	6403032
370	12//509516	Private - Dwelling	303155	6403045
371	9/1/758542	Private - Dwelling	303239	6402933

Table F.1 **Modelled receptors**

Receptor ID	Lot/sec/DP	Assessment classification	Easting (GDA94)	Northing (GDA94)
372	21/1/758542	Private - Dwelling	303153	6402874
373	8/1/758542	Private - Dwelling	303257	6402924
374	7/1/758542	Private - Dwelling	303261	6402901
375	6/1/758542	Private - Dwelling	303277	6402867
376	1//196169	Private - Dwelling	303481	6402864
377	5/2/758542	Private - Dwelling	303359	6402968
380	43//836894	Private - Dwelling	303466	6402611
381	4//1147127	Private - Dwelling	303443	6402666
382	6//1147127	Community Infrastructure	303423	6402691
383	8/4/758542	Private - Dwelling	303422	6402758
384	2//709673	Private - Dwelling	303381	6402774
385	1//709673	Private - Dwelling	303366	6402742
386	14/4/758542	Community Infrastructure	303323	6402619
389	1/6/758542	Private - Dwelling	303599	6402669
390	3/6/758542	Private - Dwelling	303623	6402631
391	1//529413	Private - Commercial	303672	6402589
392	8//970216	Private - Dwelling	303683	6402575
393	2//503902	Private - Dwelling	303726	6402547
394	1//503902	Private - Dwelling	303694	6402565
395	5/6/758542	Private - Dwelling	303695	6402648
396	89//753817	Community Infrastructure	303605	6402326
397	2/5/758542	Private - Dwelling	303667	6402504
398	18/5/758542	Private - Dwelling	303568	6402424
399	1/5/758542	Private - Dwelling	303686	6402494
400	3/5/758542	Private - Dwelling	303657	6402525
401	4/5/758542	Private - Dwelling	303639	6402533
402	5/5/758542	Private - Dwelling	303628	6402548
403	6/5/758542	Private - Dwelling	303615	6402565
404	16/5/758542	Private - Dwelling	303562	6402484

Table F.1 **Modelled receptors**

Receptor ID	Lot/sec/DP	Assessment classification	Easting (GDA94)	Northing (GDA94)
405	7/5/758542	Private - Dwelling	303604	6402574
406	8/5/758542	Private - Dwelling	303593	6402592
407	12/5/758542	Private - Dwelling	303462	6402509
408	16/5/758542	Private - Dwelling	303506	6402433
409	21//1172495	Private - Dwelling	303400	6402544
410	15/4/758542	Community Infrastructure	303337	6402604
411	1//803526	Private - Dwelling	303376	6402577
412	4/7/758542	Community Infrastructure	303310	6402542
413	219//39497	Private - Dwelling	303350	6402490
414	218//39497	Private - Dwelling	303340	6402509
415	217//39497	Private - Dwelling	303327	6402524
417	10/18/758542	Private - Dwelling	303181	6403016
418	14/1/758542	Private - Dwelling	303159	6402798
419	142//753817	Private - Dwelling	303309	6402354
420	13/5/758542	Private - Dwelling	303492	6402491
421	2//195724	Private - Dwelling	303575	6402776
422	32//1076955	Private - Dwelling	303481	6402796
423	2/6/758542	Private - Dwelling	303613	6402648
425	99//753817	Private - Dwelling	302915	6401913
426	141//753817	Private - Dwelling	303243	6401558
427	4//627011	Private - Dwelling	303622	6401740
428	3//627011	Private - Dwelling	303671	6401773
429	2//627011	Private - Dwelling	303989	6402014
430	1//627011	Private - Dwelling	303709	6401932
431	44//860466	Private - Dwelling	304142	6401941
432	12//234710	Private - Dwelling	304188	6401020
433	12//234710	Private - Dwelling	304403	6400637
434	11//658775	Private - Dwelling	305124	6401584
436	1//986787	Private - Dwelling	305040	6401316
437	1//825150	Private - Dwelling	302021	6404598

Table F.1 **Modelled receptors**

Receptor ID	Lot/sec/DP	Assessment classification	Easting (GDA94)	Northing (GDA94)
438	1//1253131	Private - Dwelling	301406	6404797
440	271//1147091	Private - Dwelling	304972	6401136
451	11//1076983	Private - Dwelling	304800	6398880
452	198//753817	Private - Dwelling	304734	6399141
453	3//786170	Private - Dwelling	304404	6398805
454	2//879834	Private - Dwelling	304542	6398538
455	10//1076983	Private - Dwelling	304341	6398327
456	1//1087595	Private - Dwelling	304246	6397874
457	2//1087595	Private - Dwelling	304344	6397603
458	972//618795	Private - Dwelling	303444	6398622
459	1//786170	Private - Dwelling	303996	6399030
460	971//618795	Private - Dwelling	303625	6399131
462	973//618795	Private - Dwelling	303589	6398843
464	1862//873575	Private - Dwelling	302824	6401181
466	1722//589125	Private - Dwelling	302212	6402653
471	70//1107703	Private - Dwelling	319024	6403132
472	79//753808	Private - Dwelling	299517	6400651
473	42//836894	Private - Commercial	303519	6402664
477	163//753817	Private - Dwelling	303642	6397011
478	2//786170	Private - Dwelling	304155	6399097
481	3//627011	Private - Dwelling	303679	6401699
482	3/20/758542	Private - Dwelling	303166	6403236
483	1/16/758542	Community Infrastructure	303007	6403201
484	151//753817	Private - Dwelling	302953	6403358
487	1//1253131	Private - Dwelling	301521	6404890
488	1//1253131	Private - Dwelling	301023	6404866
489	1//1253131	Private - Dwelling	301097	6404799
497	104//817010	Private - Dwelling	317994	6399960
498	1//327606	Private - Dwelling	318745	6399233
499	2//1111313	Private - Dwelling	319610	6403390

Table F.1 **Modelled receptors**

Receptor ID	Lot/sec/DP	Assessment classification	Easting (GDA94)	Northing (GDA94)
507	11//1100029	Community Infrastructure	325820	6407714
511	173//727751	Community Infrastructure	326129	6408016
592	79//1161577	Private - Dwelling	324994	6408133
596	8//246434	Private - Dwelling	323684	6405339
598	5//851867	Private - Dwelling	324934	6408827
599	4//851867	Private - Dwelling	324766	6408927
613	34//6842	Private - Dwelling	315922	6418830
614	351//853217	Private - Dwelling	316266	6419505
619	3//1088108	Private - Dwelling	321018	6405747
621	30//1018512	Private - Dwelling	321408	6403979
623	103//738182	Community Infrastructure	320035	6405594
624	5/9/758214	Private - Dwelling	320327	6405536
626	1/8/758214	Private - Dwelling	320518	6405649
627	105//855187	Private - Dwelling	320622	6405793
628	102//852484	Private - Dwelling	320660	6405877
629	103//852484	Private - Dwelling	320653	6406086
735	1//124977	Private - Commercial	317143	6409370
797	2290//1203350	Community Infrastructure	316000	6418658
799	41//877618	Community Infrastructure	317946	6421632
800	354//853217	Private - Commercial	316571	6419387
829	126//665628	Private - Commercial	319664	6394150
830	450//1119428	Private - Commercial	318970	6393684
833	92//733895	Private - Commercial	314201	6397017
834	5/6/758542	Private - Commercial	303665	6402619
835	7/20/758542	Private - Dwelling	303172	6403161
836	2/18/758542	Private - Dwelling	303112	6403020
837	11//509516	Private - Dwelling	303135	6403053
838	4//1147127	Private - Dwelling	303492	6402702

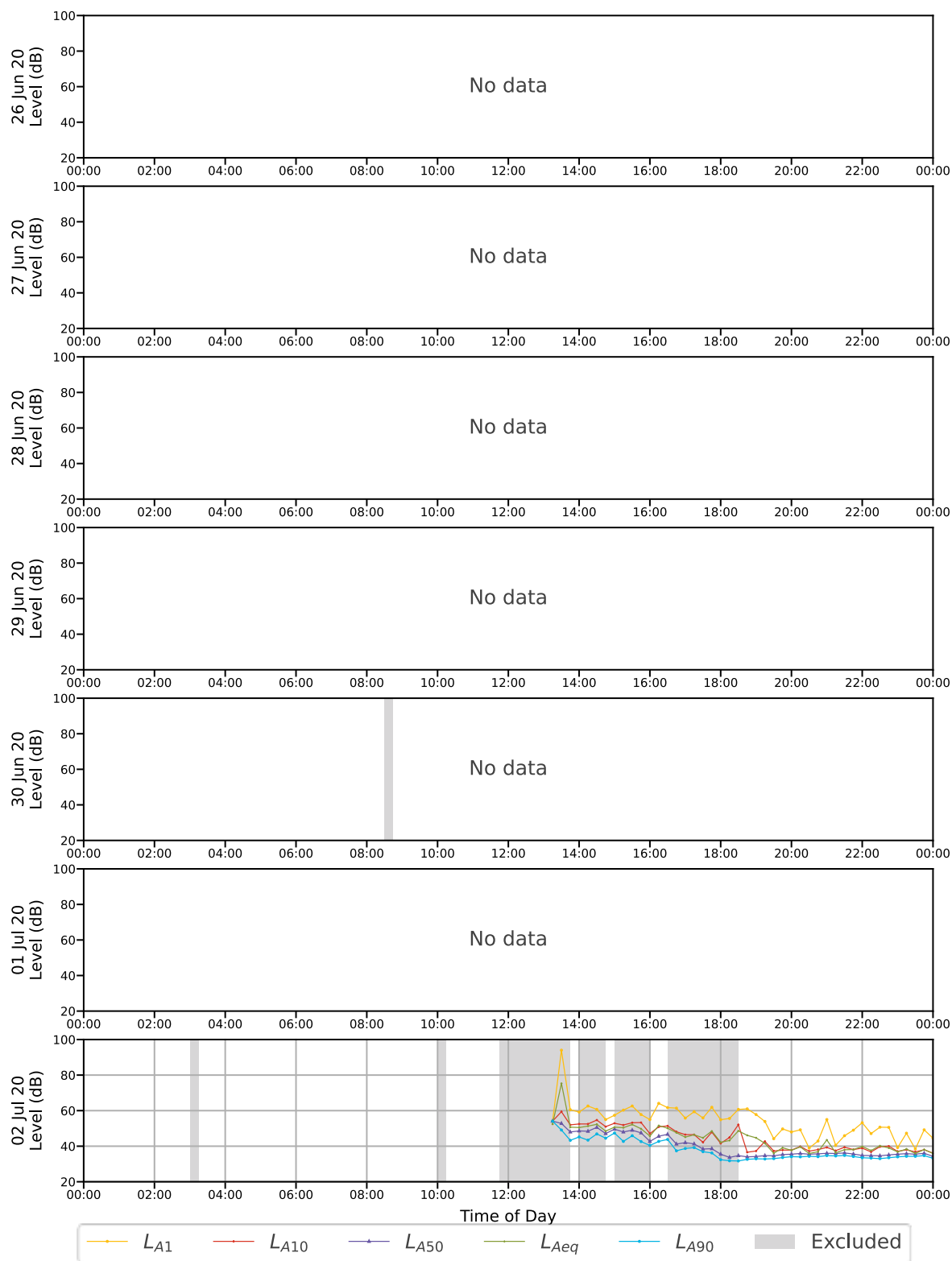
Table F.1 **Modelled receptors**

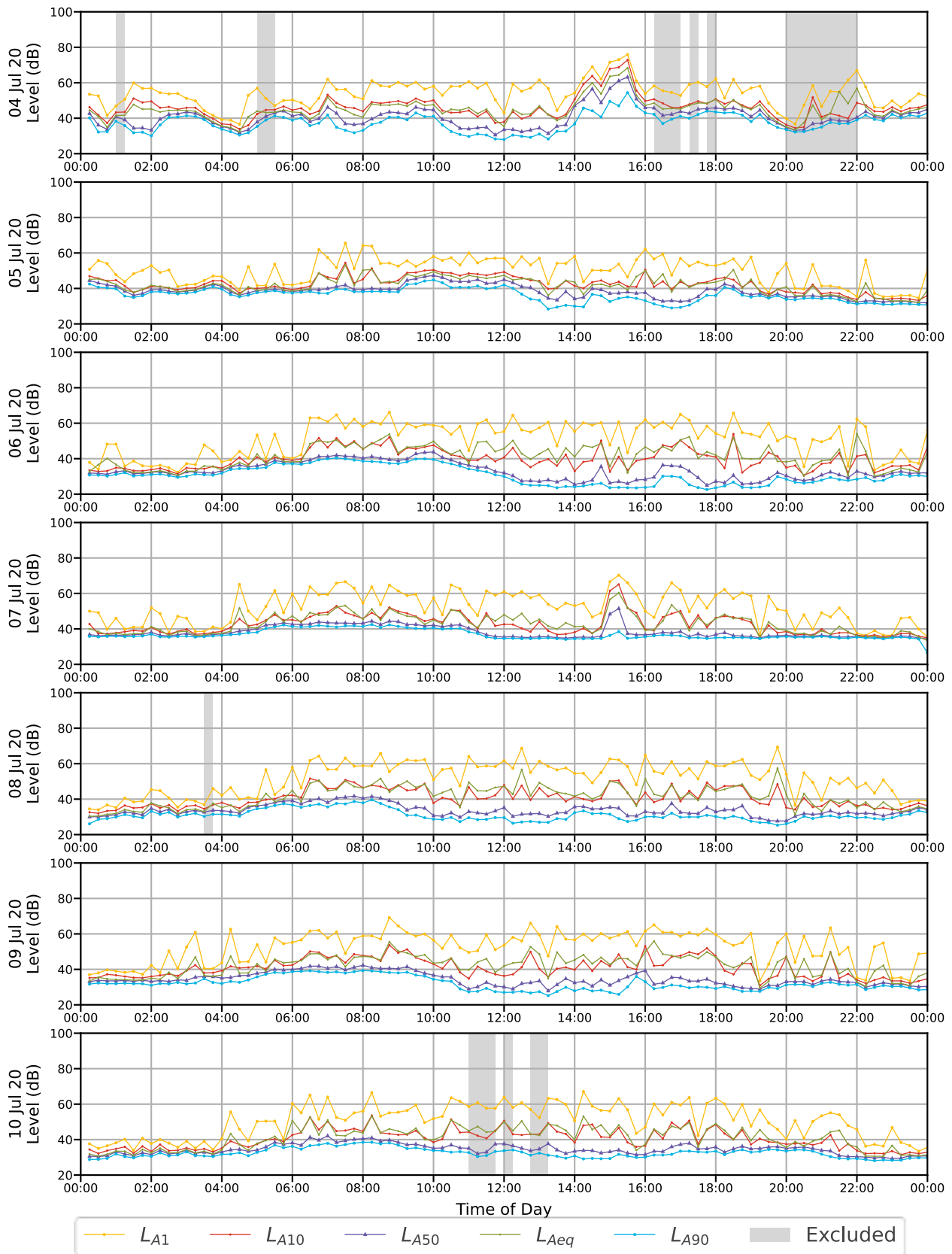
Receptor ID	Lot/sec/DP	Assessment classification	Easting (GDA94)	Northing (GDA94)
839	22//1172495	Private - Dwelling	303433	6402581
840	100//1117846	Private - Dwelling	303519	6402563
843	8//37628	Private - Dwelling	324123	6396244
846	1003//811415	Private - Dwelling	323519	6397274
847	1001//811415	Private - Dwelling	323207	6397323
852	102//777898	Private - Dwelling	322458	6397415
855	21//828765	Private - Dwelling	322658	6395288
856	11//877362	Private - Dwelling	323320	6396712
860	11//1169092	Private - Dwelling	321521	6405038
861	1//745211	Private - Dwelling	322136	6405846
862	10//1169092	Private - Dwelling	321242	6406235
863	11//1169092	Private - Dwelling	321585	6406191
869	75//1124347	Private - Dwelling	319005	6401801
870	75//1124347	Private - Dwelling	319151	6401750
949	1//929149	Private - Dwelling	310329	6420360
950	6//258548	Private - Dwelling	309980	6420344
952	10//234710	Private - Dwelling	304600	6401595

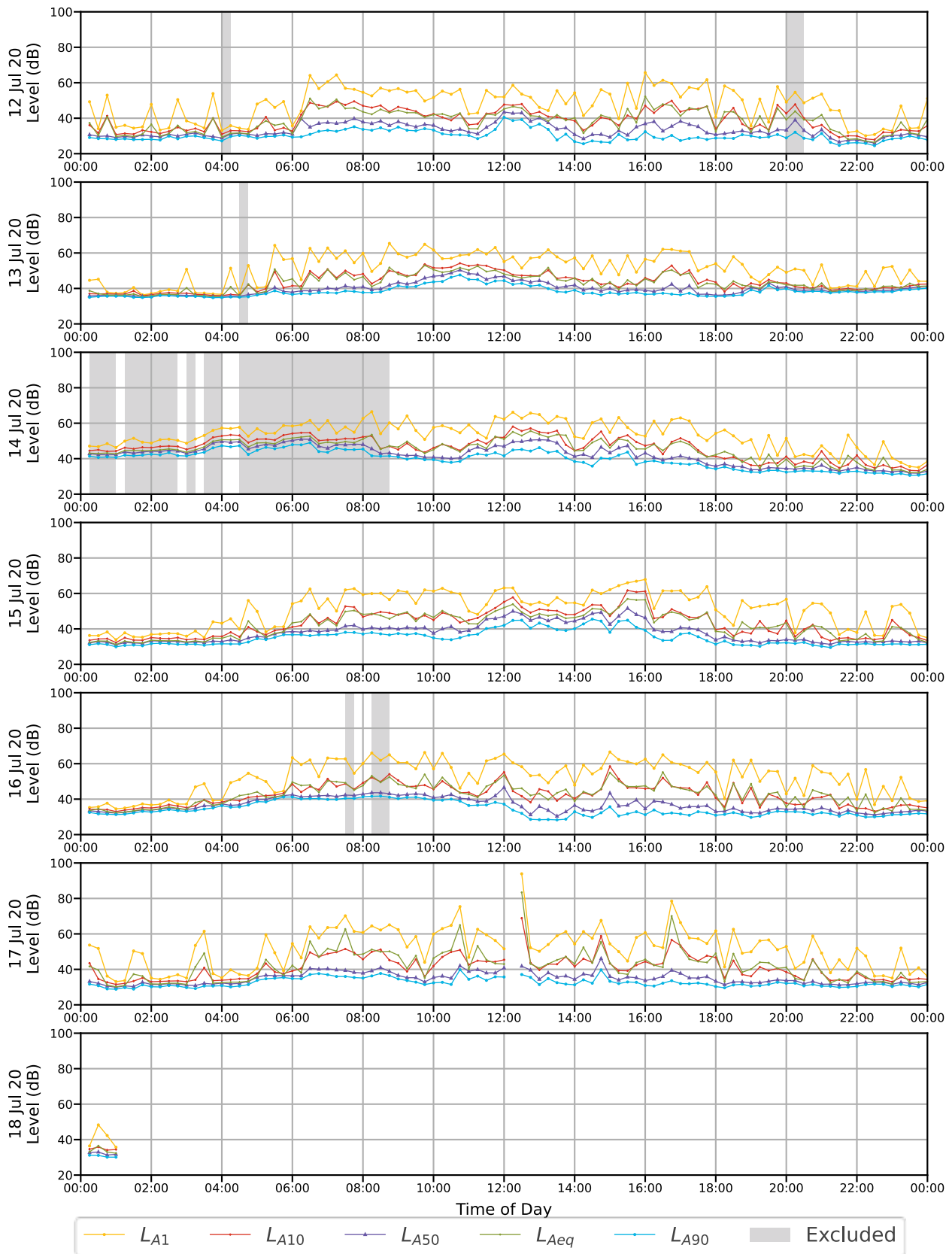
Appendix G

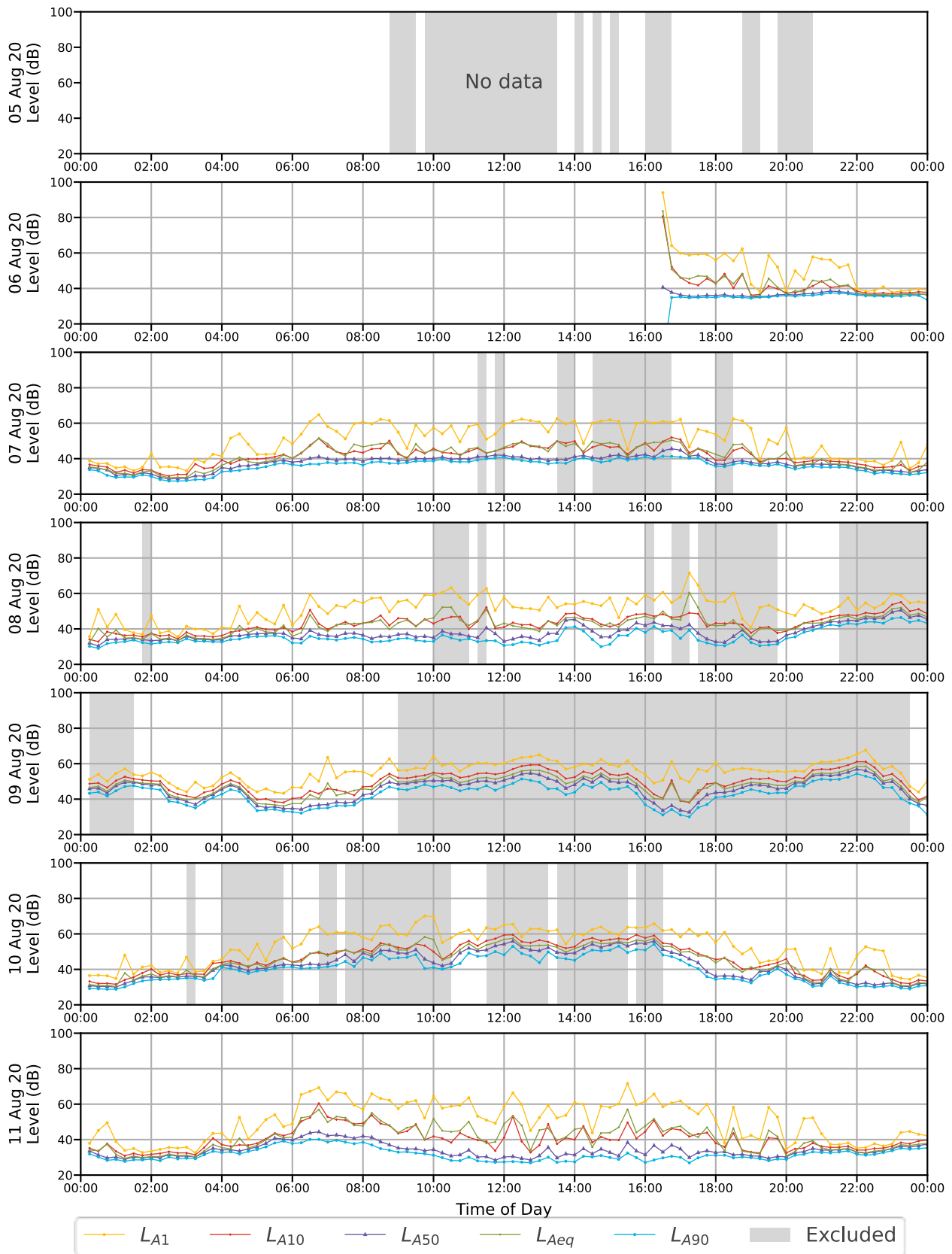
Background noise graphs

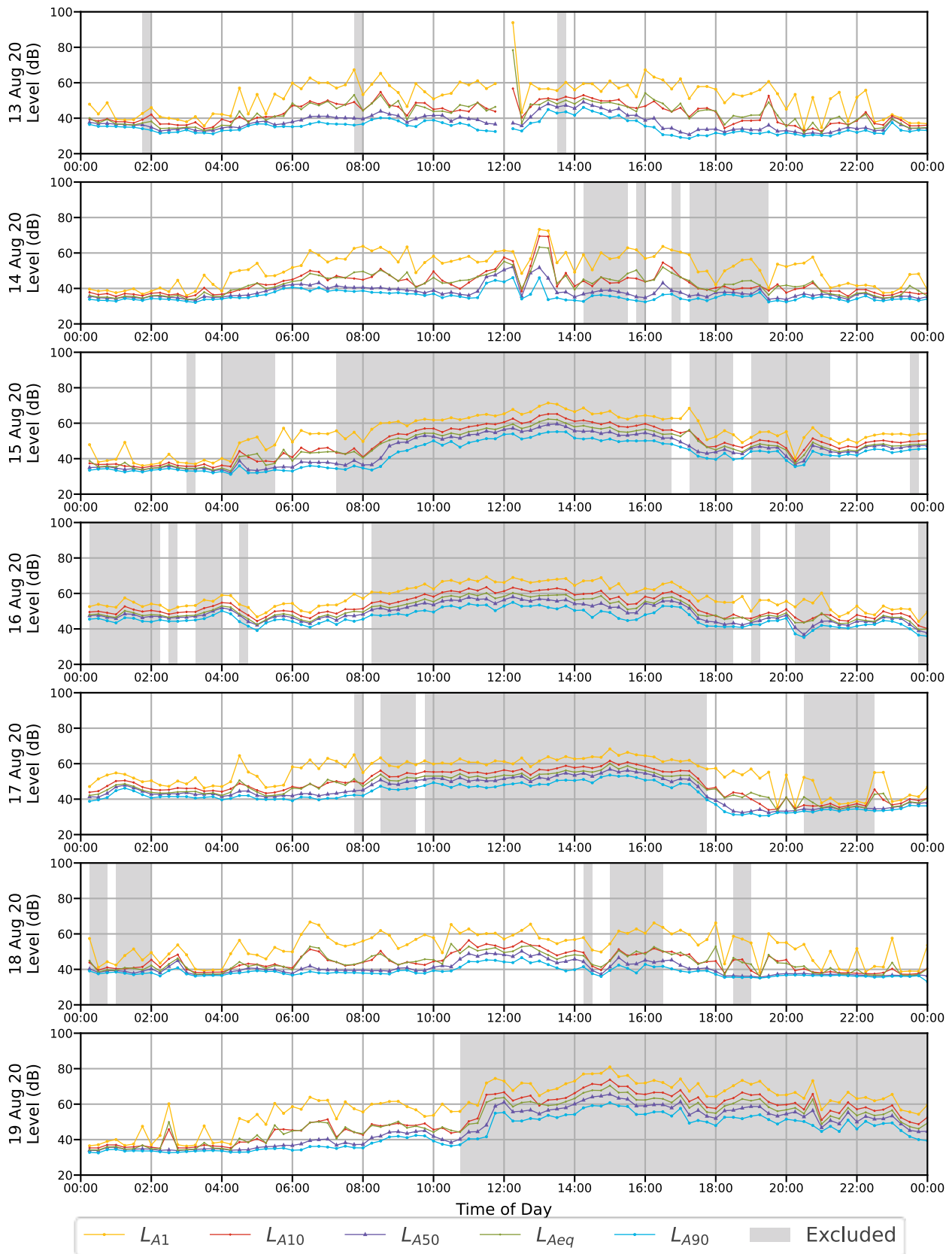
G.1 Long Point

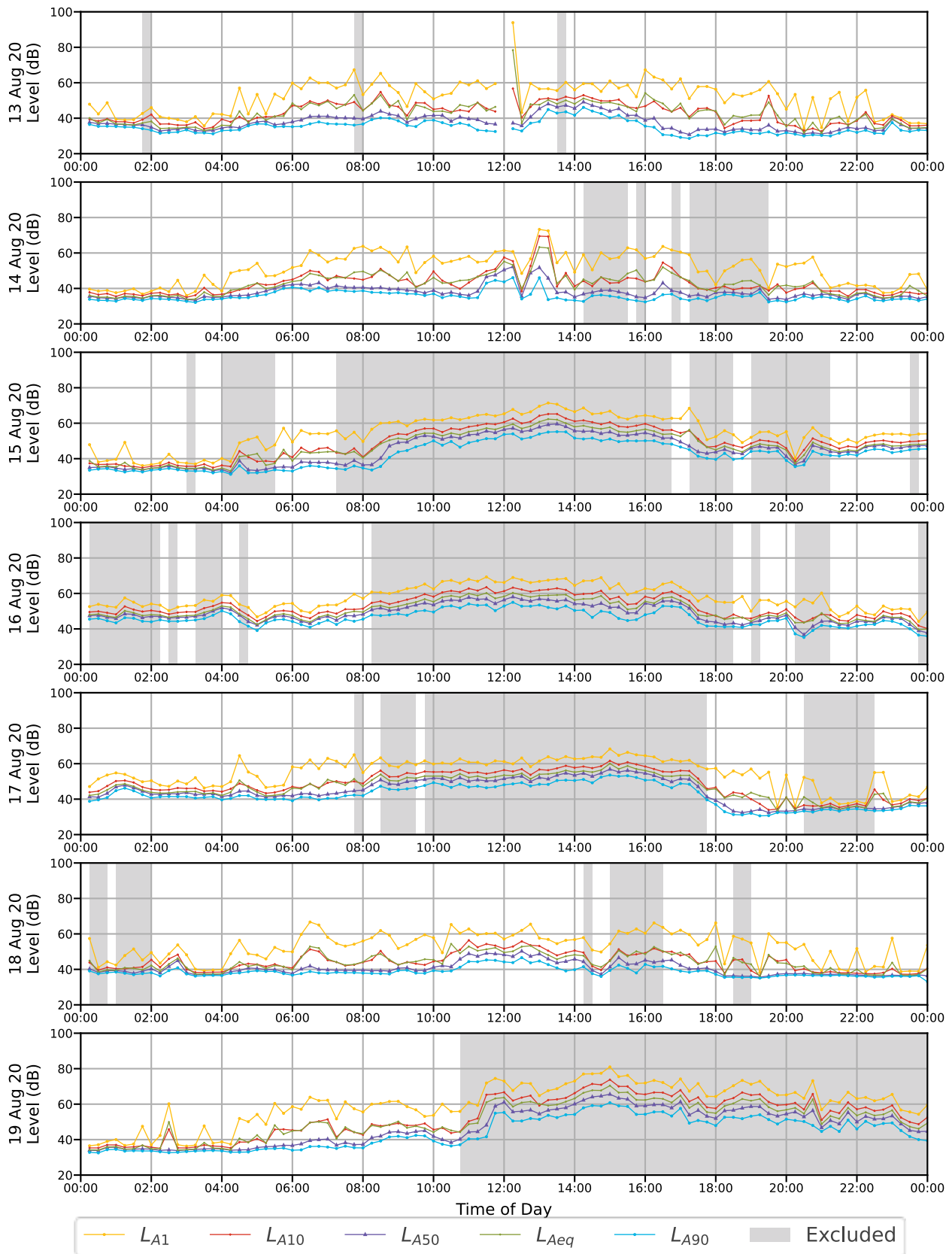


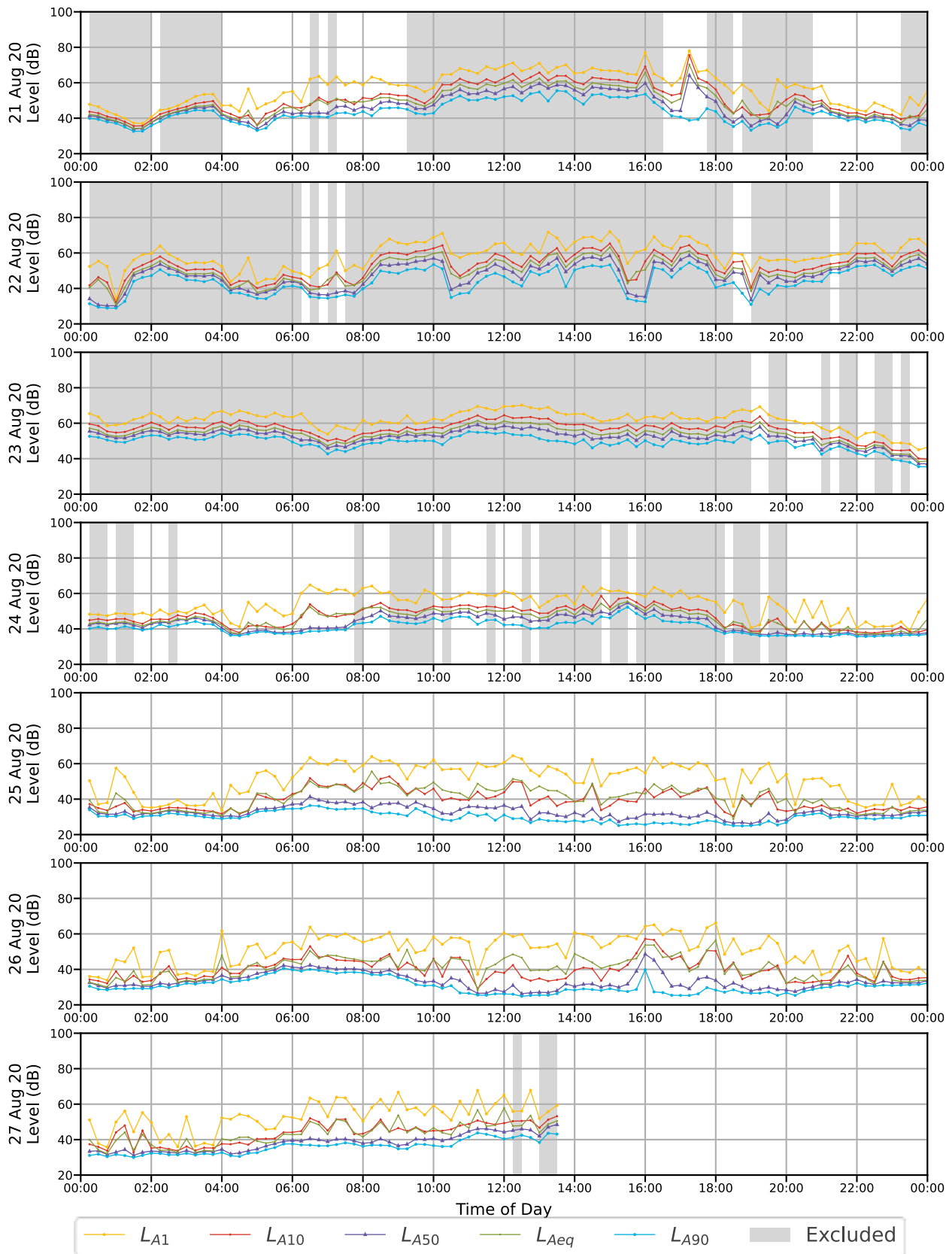




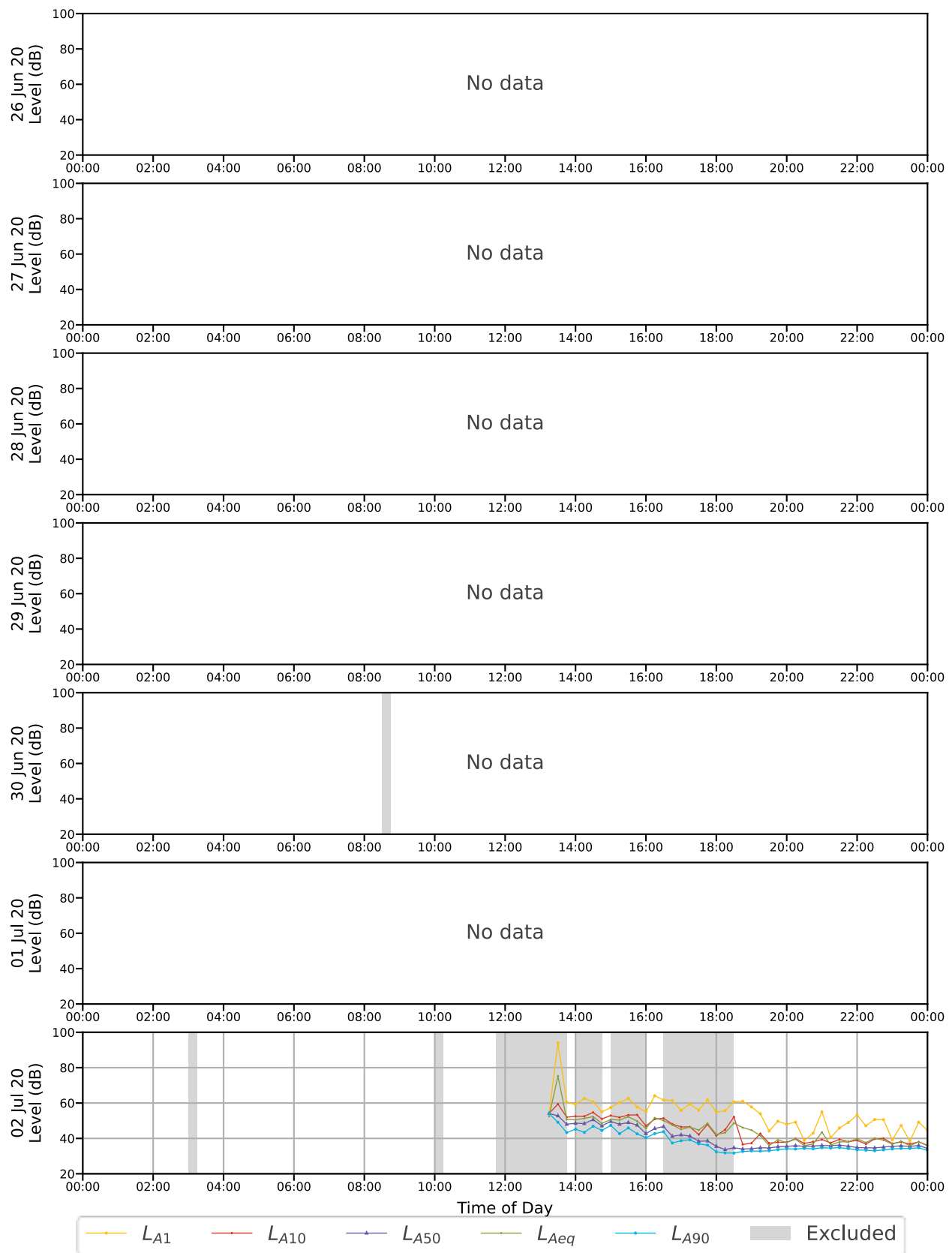


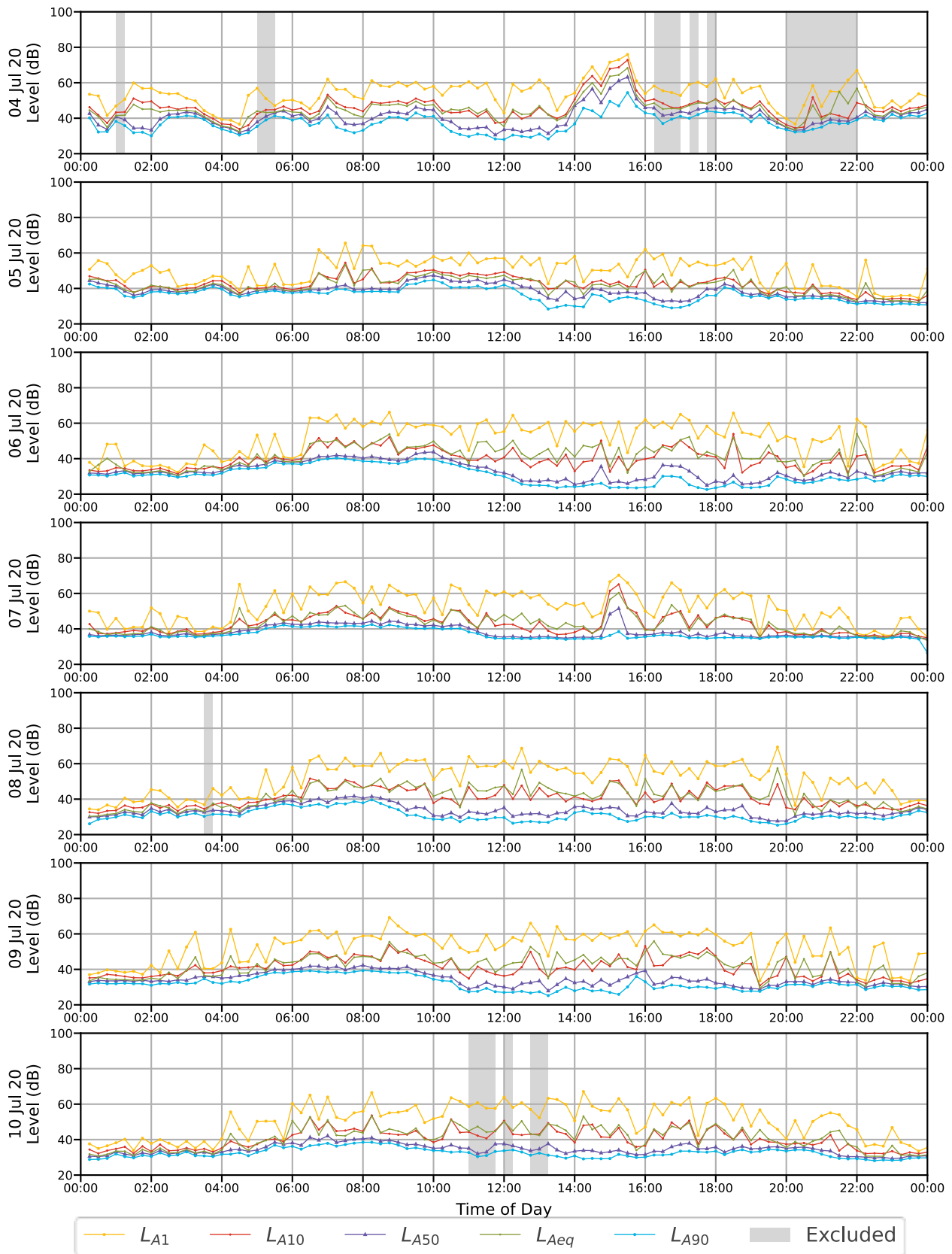


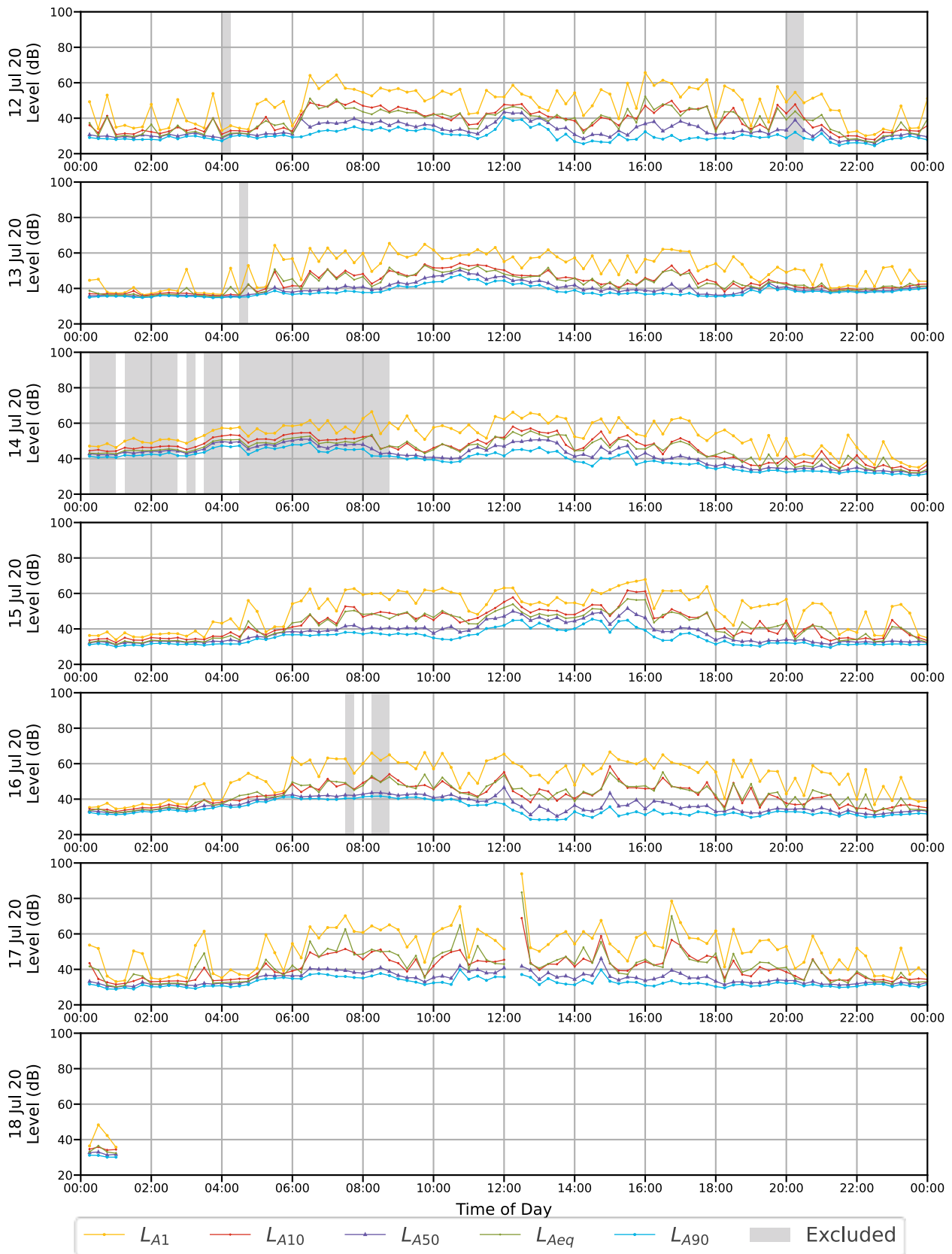


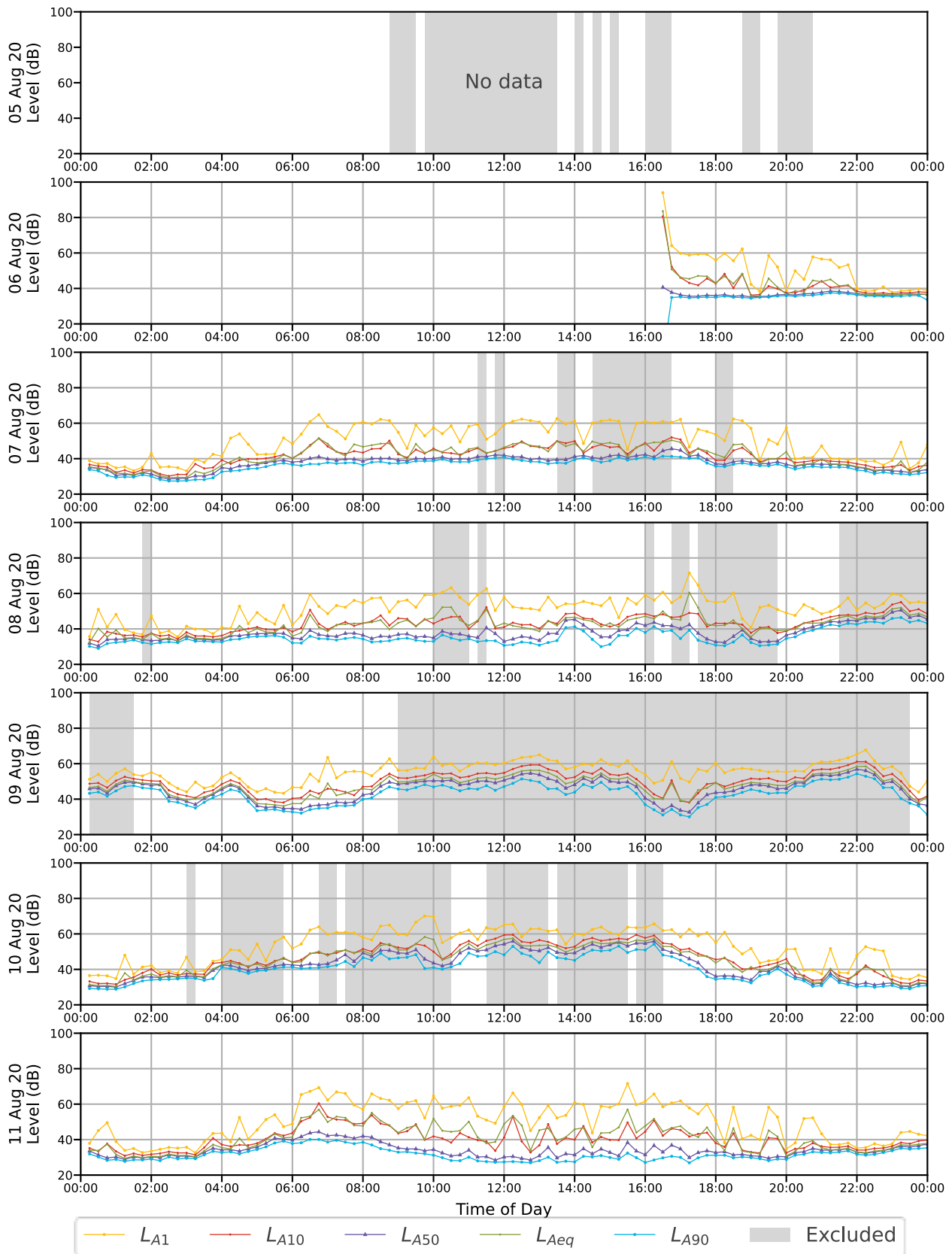


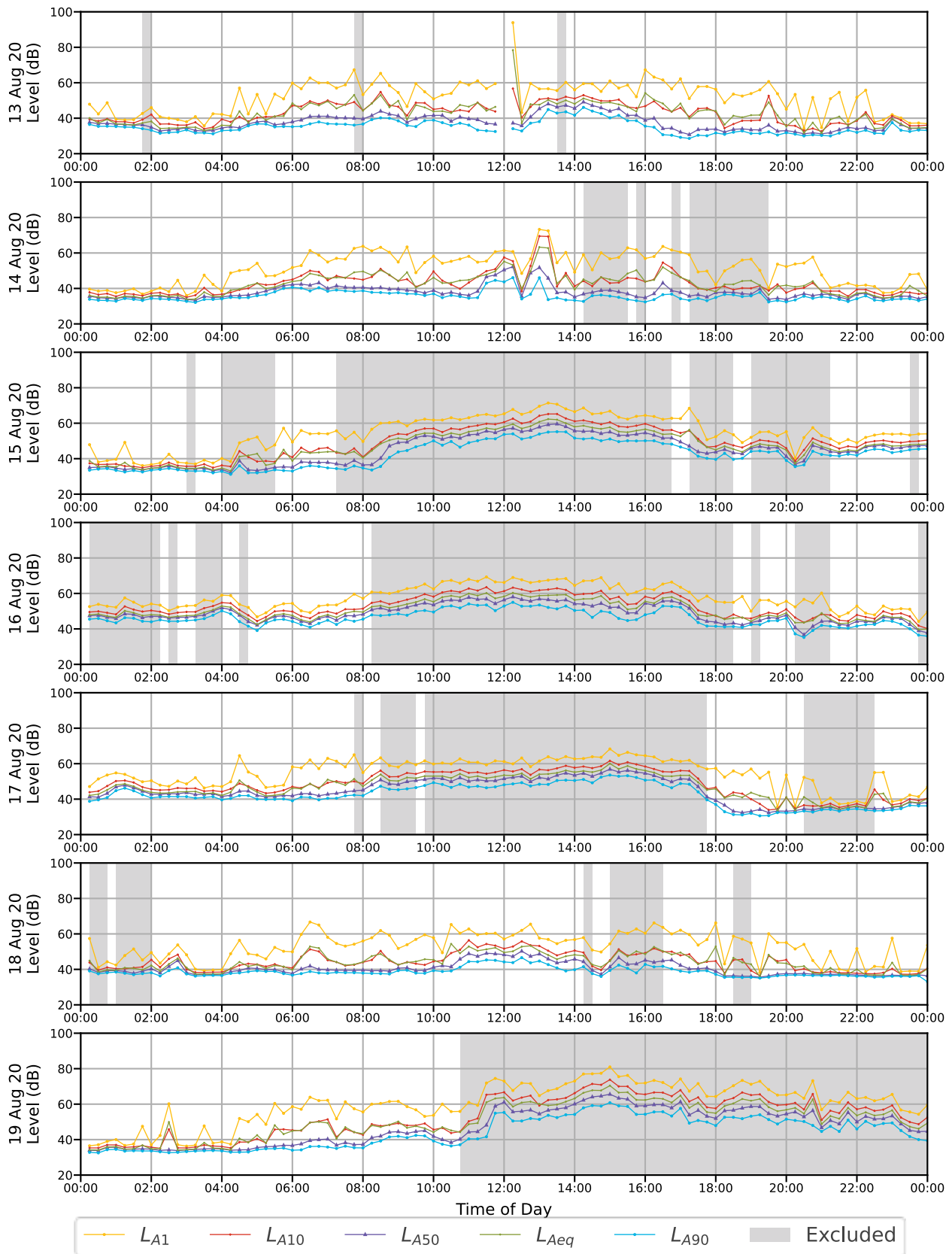
G.2 Jerrys Plains Village

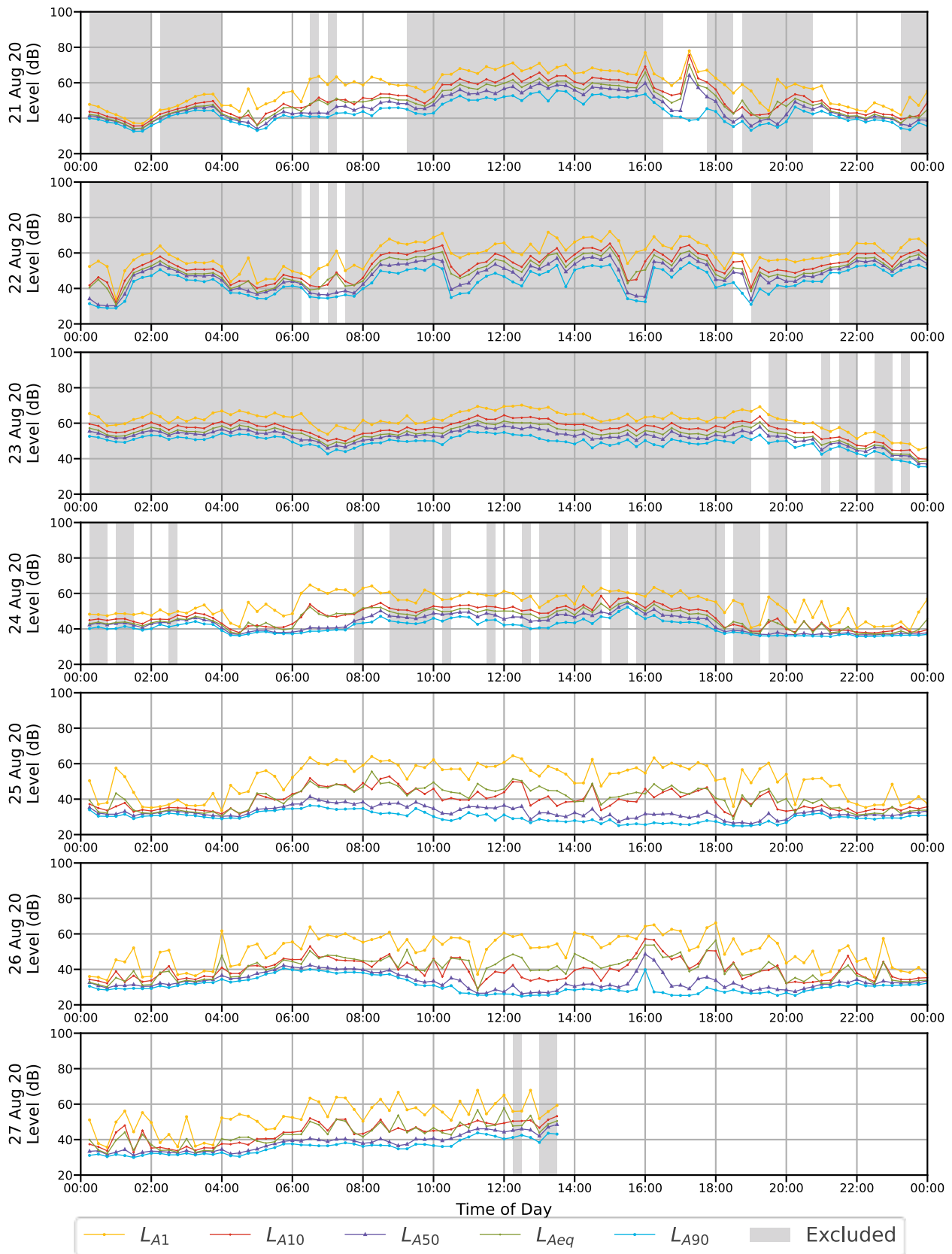




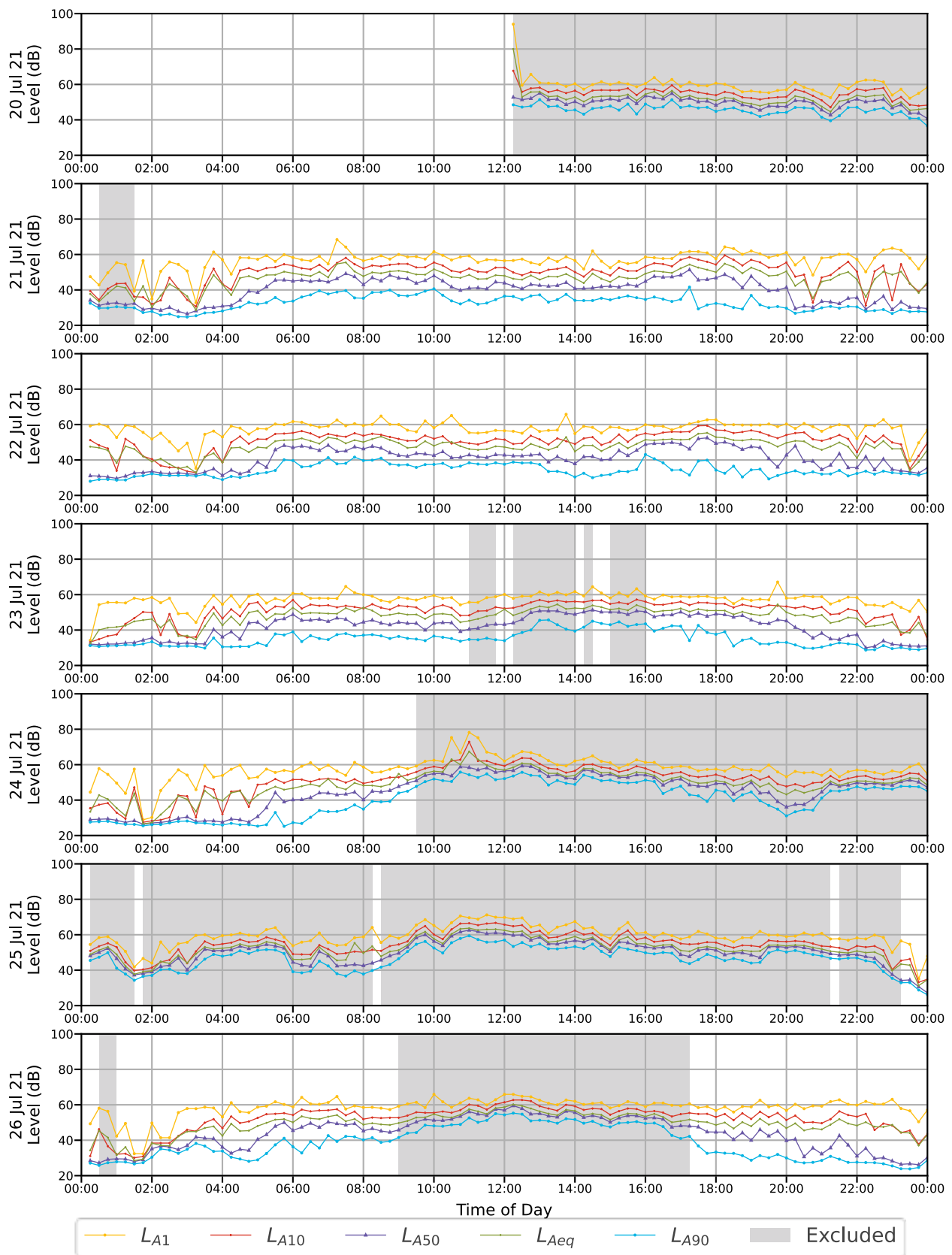


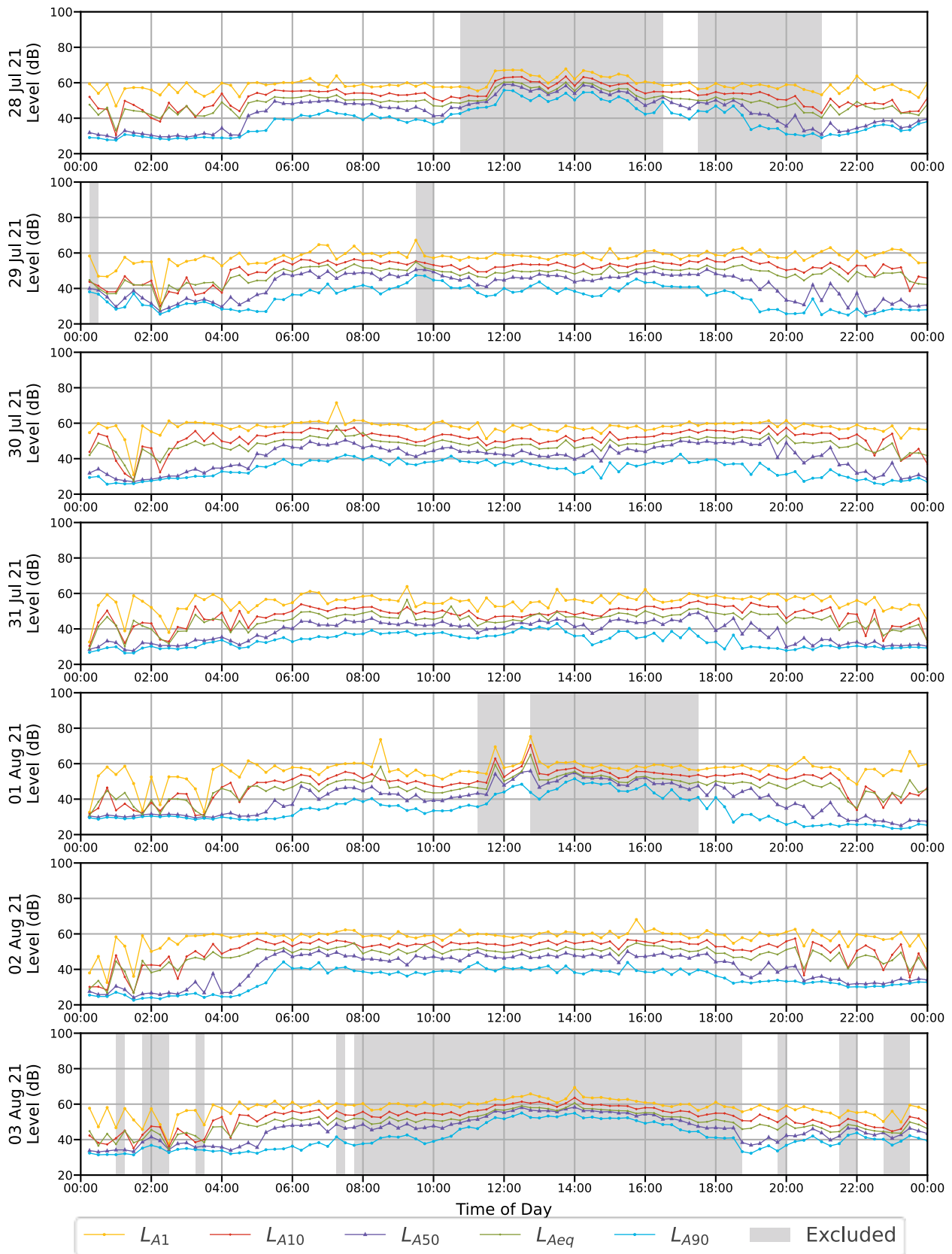


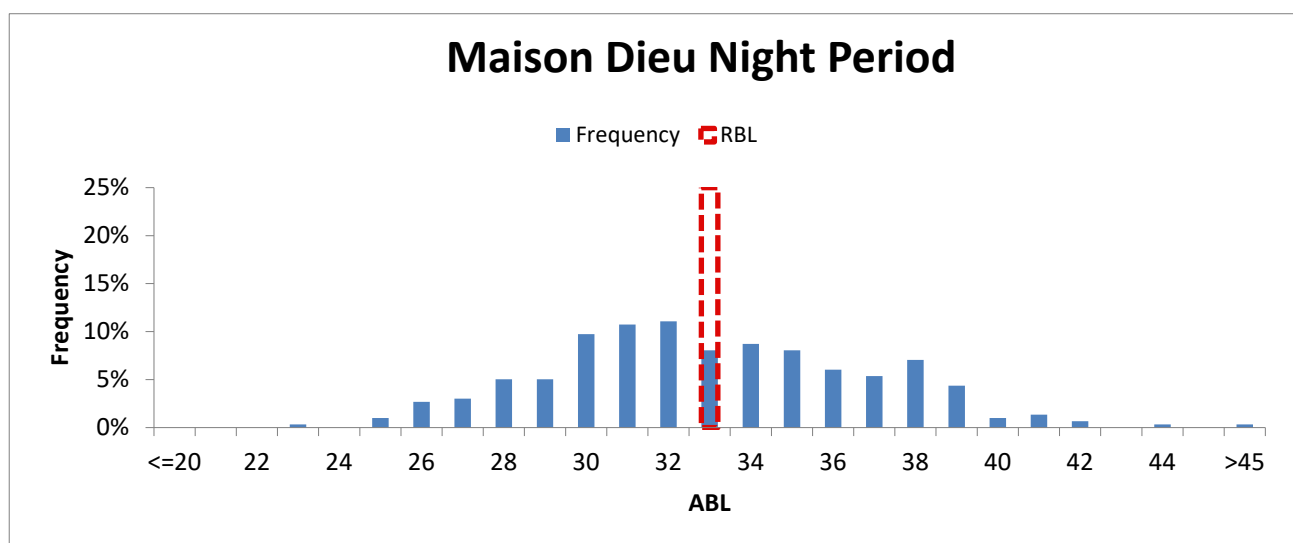
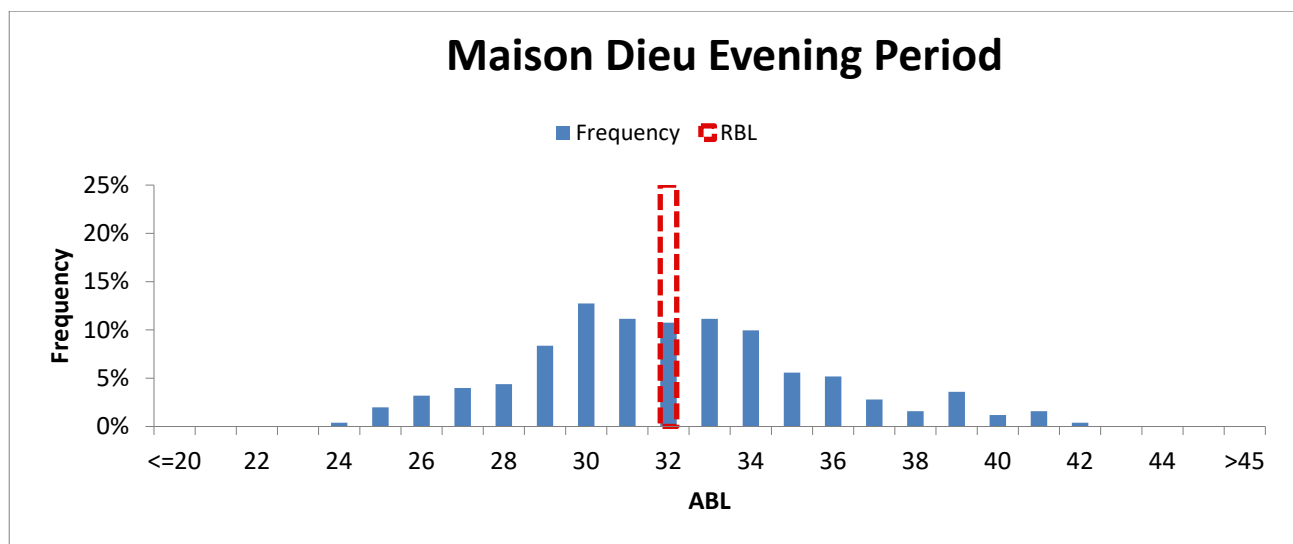
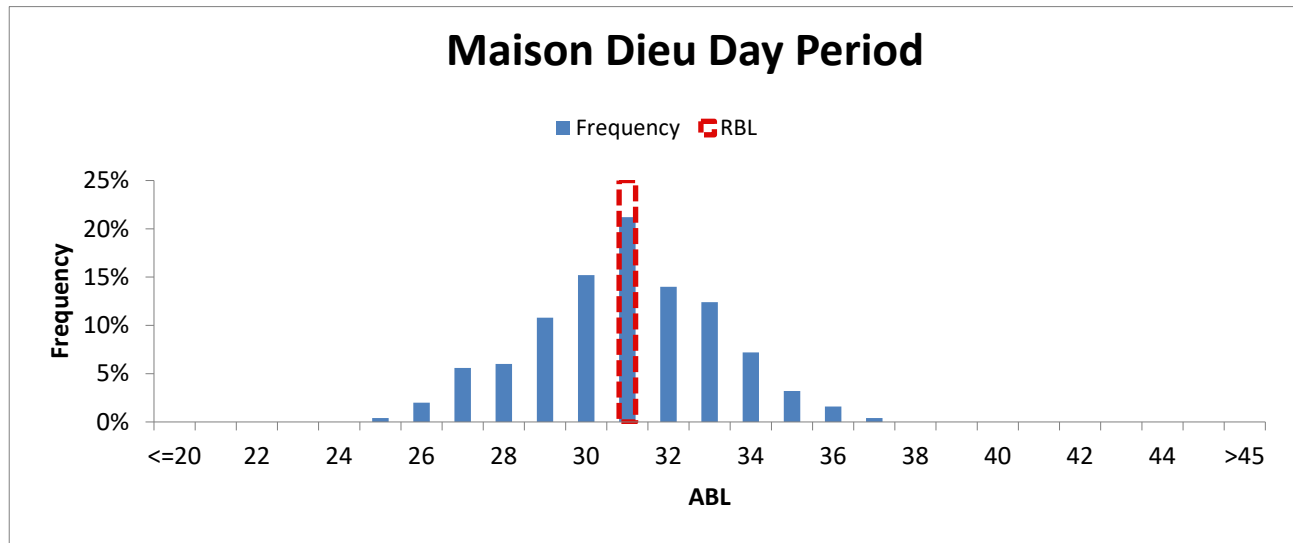


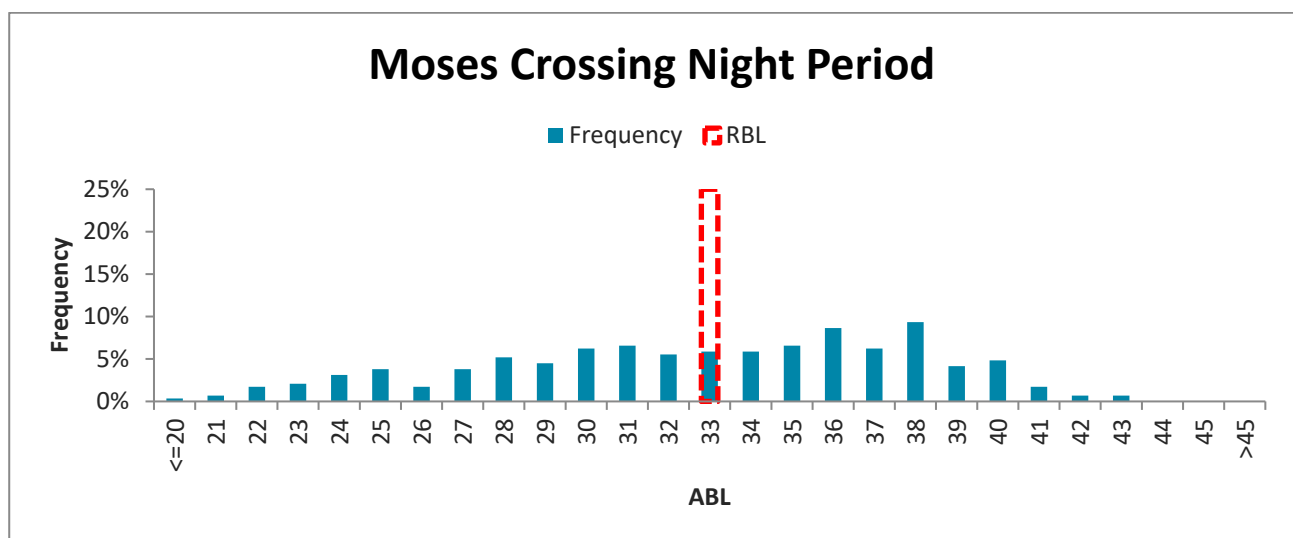
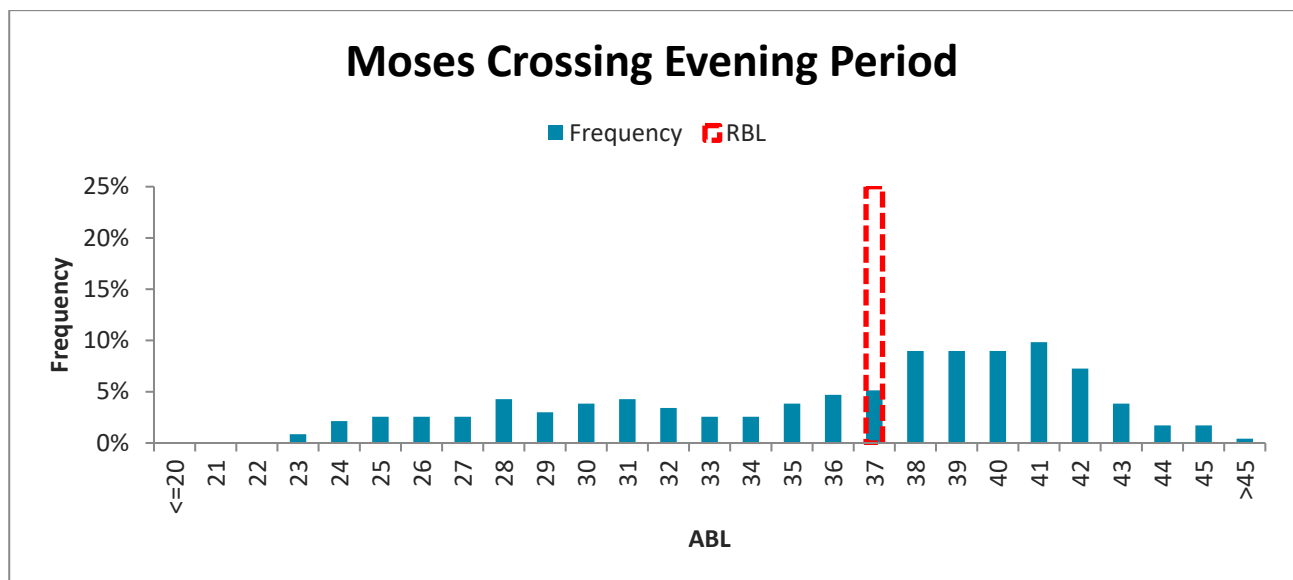
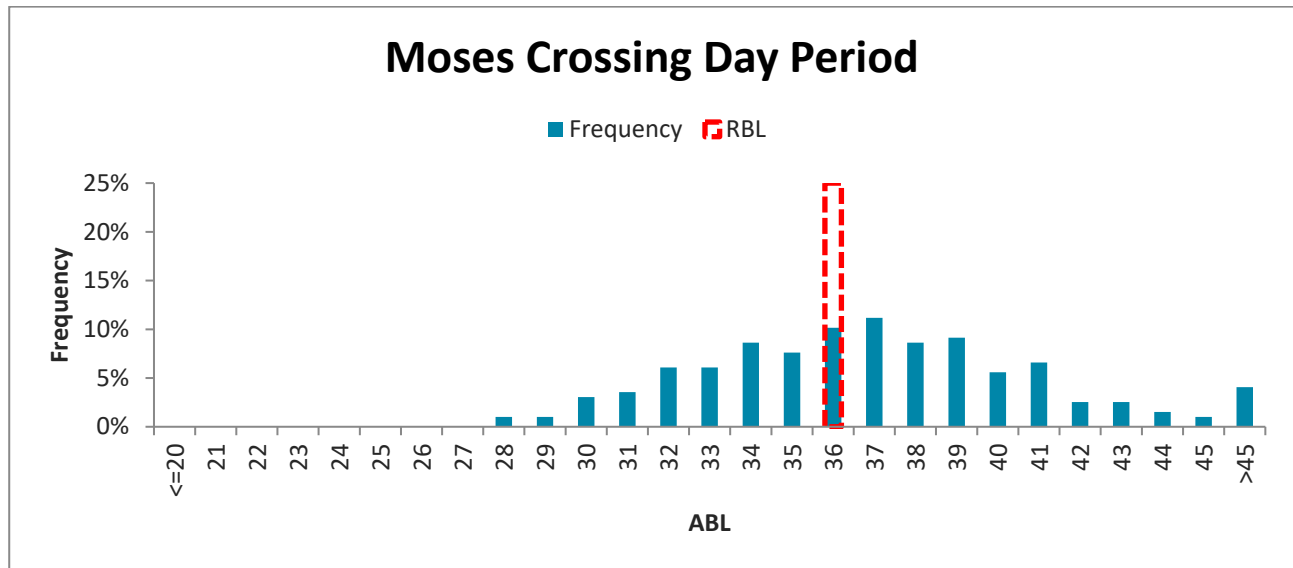


G.3 Jerrys Plains West









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