

**Alcoa of Australia Limited**

**PINJARRA ALUMINA REFINERY REVISED  
PROPOSAL**

**Updated Noise Assessment for Huntly Mine  
– Myara North and Holyoake**

**GHD**

Rpt01-AU01860-Rev0-26 Oct 23

## DOCUMENT CONTROL & REVIEW INFORMATION

**Customer:** GHD

Customer Contact: Heath Morgan

Wood Contact: Jim McLoughlin

Wood Office: Perth

Wood Job No: AU01860

**Wood Document No: Rpt01-AU01860-Rev0-26 Oct 23**

| Rev | Date      | Description       | Prepared                   | Reviewed     | Approved        |          |
|-----|-----------|-------------------|----------------------------|--------------|-----------------|----------|
|     |           |                   |                            |              | Proj<br>Manager | Customer |
| A   | 29 Sep 23 | Issued for Review | J McLoughlin<br>/W Podmore | B Li         | W Podmore       |          |
| 0   | 26 Oct 23 | Issued for Use    | W Podmore                  | J McLoughlin | W Podmore       |          |
|     |           |                   |                            |              |                 |          |
|     |           |                   |                            |              |                 |          |

| Item | Page | Section | Comments |
|------|------|---------|----------|
|      |      |         |          |
|      |      |         |          |
|      |      |         |          |
|      |      |         |          |
|      |      |         |          |
|      |      |         |          |
|      |      |         |          |
|      |      |         |          |
|      |      |         |          |
|      |      |         |          |

\* Use after Rev. 0

## Disclaimer

*This Report has been prepared for GHD by Wood, based on assumptions as identified throughout the text and upon information and data supplied by others.*

*The Report is to be read in the context of the methodology, procedures and techniques used, Wood's assumptions, and the circumstances and constraints under which the Report was written. The Report is to be read as a whole, and sections or parts thereof should therefore not be read or relied upon out of context.*

*Wood has, in preparing the Report, followed methodology and procedures, and exercised due care consistent with the intended level of accuracy, using its professional judgment and reasonable care. However, no warranty should be implied as to the accuracy of estimates or other values and all estimates and other values are only valid as at the date of the Report and will vary thereafter.*

*Parts of the Report have been prepared or arranged by GHD or third party contributors, as detailed in the document. While the contents of those parts have been generally reviewed by Wood for inclusion into the Report, they have not been fully audited or sought to be verified by Wood. Wood is not in a position to, and does not, verify the accuracy or completeness of, or adopt as its own, the information and data supplied by others and disclaims all liability, damages or loss with respect to such information and data.*

*In respect of all parts of the Report, whether or not prepared by Wood no express or implied representation or warranty is made by Wood or by any person acting for and/or on behalf of Wood to any third party that the contents of the Report are verified, accurate, suitably qualified, reasonable or free from errors, omissions or other defects of any kind or nature. Third parties who rely upon the Report do so at their own risk and Wood disclaims all liability, damages or loss with respect to such reliance.*

*Wood disclaims any liability, damage and loss to GHD and to third parties in respect of the publication, reference, quoting or distribution of the Report or any of its contents to and reliance thereon by any third party.*

*This disclaimer must accompany every copy of this Report, which is an integral document and must be read in its entirety.*

## EXECUTIVE SUMMARY

Alcoa of Australia Limited (Alcoa) is proposing to increase production at the Pinjarra Alumina Refinery by 5 per cent from 5.0 million tonnes per annum (Mtpa) to 5.25 Mtpa and extend the Huntly Mine (Mine) to the proposed Myara North and Holyoake mine regions. The proposed development is located in the Peel Region of Western Australia (WA), approximately 100 km southeast of Perth. The Mine is located predominantly within the Shires of Murray, Serpentine-Jarrahdale and Boddington within the Peel Region of Western Australia. The proposed Myara North mine region is southeast of the town of Jarrahdale and the proposed Holyoake mine region is east of Dwellingup.

The Proposal will be assessed by the Environmental Protection Authority (EPA) under Part IV of the WA Environmental Protection Act 1986 (EP Act), and under the Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act) via the bilateral agreement. The Proposal will be assessed via a Public Environmental Review (PER).

An environmental review document (ERD) for the Proposal was submitted to the EPA in 2022. The scope of the ERD included an environmental noise impact assessment for the Project which was undertaken by Wood in 2021 (Wood Report No. Rpt01-AU00028-Rev2-08 Sept 2021). Following the 2021 noise impact assessment, the mine plans for both Myara North and Holyoake have been updated.

Wood has been engaged by GHD, on behalf of Alcoa, to update the noise assessment of the Proposal to support the PER based on current mine plans. This report presents the noise assessment for the Mine component of the Proposal, which involves transitioning mining into the Myara North and Holyoake mine regions.

The noise assessment includes modelling and assessment of noise emissions from operational equipment within the Myara North and Holyoake mine regions. The worst-case modelling considerations in terms of meteorological conditions and mining and mine development activities were adopted during the modelling process. The outcomes of the modelling are used to ascertain the risk of exceedance of the Assigned Levels, as defined in the Environmental Protection (Noise) Regulations 1997 (the Regulations) at identified Noise Sensitive Receptors (NSRs) located in and around the proposed Myara North and Holyoake mine regions. The assessment also includes assessment of blasting activities to determine potential blast noise and ground borne vibration impacts at the NSRs.

### Operational Noise Impacts

The results of the predictive modelling of noise emissions from operational equipment within the proposed Myara North and Holyoake mine regions demonstrate the following impacts during both daytime and nighttime periods:

- For daytime period, under the worst-case modelling considerations in terms of meteorological conditions and mining and mine development activities:

- For Myara North region, compliance with the daytime Assigned Levels for the NSRs surrounding the mine region is predicted.
- For Holyoake mine region, the modelling prediction indicates that some rural properties along the southern boundary of the mine region (H-NSR8, 9, 10 and 11) and the campsite at Inglehope (H-NSR37) have the predicted exceedances of less than 3 dB over the daytime Assigned Level of 45 dB(A).
- For nighttime period, under the worst-case modelling considerations in terms of meteorological conditions and mining and mine development activities:
  - For Myara North region, the predicted noise levels show that some rural properties along the northwest boundary of the mine region (NSR10, 11, 12, 13 and 14) and Wungong Campsite on the Munda Bididi Trail (NSR25) have the predicted exceedances of less than 5 dB over the nighttime Assigned Level of 35 dB(A).
  - For Holyoake mine region, the predicted noise levels show that a cluster of adjacent rural properties along the southern boundary of the mine region (H-NSR1 - 14), the campsite at Etmilyn Trail Rail Siding (H-NSR36), the campsite at Inglehope (H-NSR36) and Chadora Campsite (H-NSR38) exceed the Assigned Level of 35 dB(A) by up to 5 dB.

### **Historical Weather Trend**

Analysis of historical weather data from the Bureau of Meteorology's (BoM) Dwellingup station between 1 January 2016 and 31 December 2020, indicates that adverse meteorological conditions for noise propagation similar to the EPA Default Weather criteria persist for only up to 10 per cent of the total time in a given year for winds prevailing in the direction of Myara North's NSRs, which are predominantly to the west of the proposed mine operations. These adverse weather conditions for noise propagation persists for an even lower time (up to 3 per cent) in a given year for winds prevailing in the directions of Holyoake's NSRs, which are predominantly to the south and south-west of the proposed mining operations.

### **Practicality of Modelling Methodology**

Predicted exceedances are an artefact of a worst-case modelling assessment methodology which has been adopted to identify the potential risks of exceedance rather than to forecast the occurrence of actual exceedances. Mining activities are fluid and mobile in nature and it is fully expected that noise management practices currently utilised by Alcoa at its Myara mine (which includes short term operational noise modelling and, where required, noise monitoring) will be capable of alleviating the risk of exceeding the Assigned Levels at the nearby NSRs within the proposed Myara North and Holyoake mine regions.

### **Tonality Impacts**

As the dominant sources affecting NSRs are primarily emissions from mining mobile equipment (i.e. haul trucks, excavators, etc - which will have some element of tonality), Wood also undertook an assessment for the risk of exceedance due to tonality. As it is impractical to predict tonality

(due to tonal noise not being always evident at the receiver because of background masking and other factors), predicted noise levels within 5 dB of the Assigned Levels have been flagged as a risk of exceedance if tonality is present.

The inclusion of tonality indicates that the following NSRs across both the proposed Myara North and Holyoake mine region may be subject to an exceedance of Assigned Levels if tonality is present:

- For Myara North, a cluster of rural properties near the northwest boundary of the mine region (NSR6, 8, 9 – 14) and some campsites adjacent to the mine region (NSR23 at Monadnocks Campsite, NSR24 at Mt Cooke Campsite and NSR25 at Wungong Campsite).
- For Holyoake, a cluster of rural properties near the southern boundary of the mine region (H-NSR1 - 14), and some campsites adjacent to the mine region (H-NSR36 at Etmilyn Trail Rail Siding, H-NSR37 at Inglehope and H-NSR38 at Chadora Campsite).

### **Audibility**

To assess the likelihood of operational noise from Alcoa's mining operations being audible at the NSRs, the model predicted noise levels are compared against the monitored baseline noise levels.

Mining noise is assessed as audible if the model predicted values protrude above the ambient monitoring data by more than 3 dB. It is not typical for a person to audibly detect a change in noise levels below a 2 to 3 dB range (depending upon the person and frequency content of the noise). However, some aspects of the operations may still be perceivable, as a frequency shift or when tonality is present.

Audibility of mining noise at the NSRs is expected to be lower during weather conditions that are less conducive for noise propagation (e.g. during warmer periods and periods without temperature inversions) outside of the EPA default weather parameters. Additionally, the audibility of mining noise is more likely to be masked during the daytime periods due to typically higher ambient noise levels.

Due to the uncertainty factors as described above, as well as the conservative considerations that have been adopted during the noise modelling process, the audibility assessment is based on a simplified approach, i.e. the upper limit of baseline noise level  $L_{A90}$  of close to 30 dB(A) (i.e. 5 dB below nighttime Assigned Level) is tentatively set as the audibility threshold level for nighttime period. This threshold limit is used to indicate the potential for audibility at sensitive receptors adjacent to the mine regions. As a result, the following NSRs have the potential for audibility.

- For Myara North, a cluster of rural properties near the northwest boundary of the mine region (NSR6, 8, 9 – 14) and some campsites adjacent to the mine region (NSR23 at Monadnocks Campsite, NSR24 at Mt Cooke Campsite and NSR25 at Wungong Campsite).
  - For Holyoake, a cluster of rural properties near the southern boundary of the mine region (H-NSR1 - 14), and some campsites adjacent to the mine region (H-NSR 36 at Etmilyn Trail Rail Siding, H-NSR 37 at Inglehope and H-NSR 38 at Chadora Campsite).
-

### **Blast Noise Impacts**

Blast noise measurements at Alcoa's current Huntly mine operations in the Myara region indicate that a radius of 1.2 km will be required for the blast overpressure to attenuate below the 120 dB(L) maximum limit prescribed by the Regulations for residential receivers (including the recreational campsites).

The proposed Holyoake region has a number of indicative mine pits (shown in Section 8.2) located within this 1.2 km radius. Alternative caprock breaking methods, such as stemming practices and mechanical fracturing, will need to be considered in these areas. In line with the current Huntly mine operations, Alcoa is committed to establishing a 650 m safety exclusion zone around all blast locations.

### **Blast Vibration Impacts**

Based on calculation of the ground borne vibration levels from 9 kg and 7 kg maximum instantaneous blast charges from Alcoa's current Huntly Mine at the Myara region, the distances for ground borne vibration to attenuate to below the 5mm/s criteria level for building damage are 212 m and 188 m respectively. Therefore, ground borne vibration levels are not expected to be significant for any NSRs (including recreational campsites) within the proposed Myara North and Holyoake mine regions.

### **Conclusion**

Noise emissions associated with mining activities at the Myara North and Holyoake regions can be effectively managed through the implementation of noise controls and operational planning practices to minimise noise impacts and to achieve compliance with the Assigned Levels and regulatory blast noise limits.

# TABLE OF CONTENTS

|          |   |           |
|----------|---|-----------|
| <b>1</b> | <b>INTRODUCTION .....</b>                                   | <b>1</b>  |
| 1.1      | Myara North.....  | 1         |
| 1.2      | Holyoake.....   | 3         |
| 1.3      | Noise Objectives.....                                       | 5         |
| 1.4      | Objectives and Scope of Assessment.....                     | 5         |
| 1.4.1    | Assessment Objectives.....                                  | 5         |
| 1.4.2    | Scope of Assessment.....                                    | 6         |
| 1.5      | Applicable Documents.....                                   | 6         |
| <b>2</b> | <b>SUMMARY OF RELEVANT LEGISLATION.....</b>                 | <b>7</b>  |
| 2.1      | Environmental Protection (Noise) Regulations 1997 .....     | 7         |
| 2.2      | Assigned Levels for Selected Receptors.....                 | 8         |
| 2.3      | Adjustments for Intrusive Characteristics .....             | 12        |
| 2.4      | Noise Limits for Blasting Operations.....                   | 13        |
| <b>3</b> | <b>AMBIENT NOISE MONITORING .....</b>                       | <b>14</b> |
| 3.1      | Noise Monitoring Locations.....                             | 14        |
| 3.2      | Noise Monitoring Methodology .....                          | 18        |
| 3.3      | Noise Monitoring Results .....                              | 18        |
| 3.3.1    | Myara North Background Noise Levels .....                   | 18        |
| 3.3.2    | Holyoake Background Noise Levels.....                       | 20        |
| <b>4</b> | <b>NOISE MODELLING METHODOLOGY .....</b>                    | <b>24</b> |
| 4.1      | Noise Modelling Software .....                              | 24        |
| 4.2      | Noise Modelling Algorithm.....                              | 24        |
| 4.3      | Meteorological Inputs .....                                 | 25        |
| 4.4      | Ground Topography, Buildings and Barriers.....              | 25        |
| 4.5      | Noise Sources.....  | 25        |
| 4.5.1    | Mobile Equipment Fleet.....                                 | 26        |
| 4.5.2    | Fixed Plant .....   | 27        |
| 4.6      | Mining Locations.....                                       | 27        |
| 4.7      | Sensitivity Modelling.....                                  | 31        |
| 4.7.1    | Noise Sensitivity Zones .....                               | 32        |
| 4.8      | Modelling to Assess Noise Impacts .....                     | 36        |
| <b>5</b> | <b>NOISE MODELLING RESULTS.....</b>                         | <b>37</b> |
| 5.1      | Noise Modelling Results for Myara North Development.....    | 37        |
| 5.1.1    | Daytime Noise Level Predictions for Myara North.....        | 37        |
| 5.1.2    | Nighttime Noise Level Predictions for Myara North .....     | 40        |
| 5.2      | Noise Modelling Results for Holyoake Mine Development ..... | 43        |
| 5.2.1    | Daytime Noise Level Predictions for Holyoake .....          | 43        |
| 5.2.2    | Nighttime Noise Level Predictions for Holyoake.....         | 47        |
| <b>6</b> | <b>REVIEW OF HISTORICAL WEATHER DATA.....</b>               | <b>52</b> |
| 6.1      | Historical Weather Breakdown.....                           | 52        |
| <b>7</b> | <b>NOISE IMPACT ASSESSMENT .....</b>                        | <b>54</b> |

|                   |  |            |
|-------------------|--|------------|
| 7.1               | Compliance Assessment.....   | 54         |
| 7.1.1             | Day Time Assigned Levels.....  | 54         |
| 7.1.2             | Night-Time Assigned Levels.....  | 54         |
| 7.2               | Cumulative effects based on the worst-case modelling considerations.....     | 55         |
| 7.3               | Risk of tonality.....  | 56         |
| 7.4               | Audibility Assessment.....   | 56         |
| <b>8</b>          | <b>BLAST NOISE AND VIBRATION ASSESSMENT .....</b>                            | <b>58</b>  |
| 8.1               | Blast Noise Impact Area Prediction.....                                      | 58         |
| 8.1.1             | Ground Borne Vibration.....  | 59         |
| 8.2               | Blast Noise & Ground Borne Vibration Impact Areas.....                       | 60         |
| 8.2.1             | Blast Noise.....   | 60         |
| 8.2.2             | Ground Borne Vibration.....  | 63         |
| <b>9</b>          | <b>CONSTRUCTION NOISE MANAGEMENT .....</b>                                   | <b>64</b>  |
| 9.1.1             | Noise Management Requirements for Daytime Construction Activities .....      | 64         |
| 9.1.2             | Noise Management Requirements for Out of Hours Construction Activities ..... | 64         |
| <b>10</b>         | <b>CONCLUSIONS.....</b>  | <b>66</b>  |
| <b>APPENDIX A</b> | <b>BACKGROUND NOISE LEVELS.....</b>  | <b>A-1</b> |
| A.1               | Instrumentation .....  | A-1        |
| A.2               | Myara North Background Noise Levels.....                                     | A-1        |
| A.3               | Holyoake Background Noise Levels.....  | A-33       |
| <b>APPENDIX B</b> | <b>EQUIPMENT SOUND POWER LEVELS.....</b>                                     | <b>B-1</b> |
| <b>APPENDIX C</b> | <b>NOISE CONTOURS.....</b>   | <b>C-1</b> |
| C.1               | Myara North – Daytime Staging Noise Contours.....                            | C-1        |
| C.2               | Myara North – Nighttime Overall Contour.....                                 | C-20       |
| C.3               | Myara North – Nighttime Staging Noise Contours.....                          | C-23       |
| C.4               | Myara North – Nighttime Overall Contour.....                                 | C-33       |
| C.5               | Holyoake – Daytime Staging Noise Contours.....                               | C-36       |
| C.6               | Holyoake – Daytime Overall Contour.....                                      | C-53       |
| C.7               | Holyoake – Nighttime Staging Noise Contours.....                             | C-57       |
| C.8               | Holyoake – Nighttime Overall Contour.....                                    | C-66       |

# 1 INTRODUCTION

Alcoa of Australia Limited (Alcoa) is proposing to increase production at the Pinjarra Alumina Refinery by 5 per cent from 5.0 million tonnes per annum (Mtpa) to 5.25 Mtpa and extend the Huntly Mine (Mine) to the proposed Myara North and Holyoake mine regions. The proposed development is located in the Peel Region of Western Australia (WA), approximately 100 km southeast of Perth. The Mine is located predominantly within the Shires of Murray, Serpentine-Jarrahdale and Boddington within the Peel Region of Western Australia. The proposed Myara North mine region is southeast of the town of Jarrahdale and the proposed Holyoake mine region is east of Dwellingup.

The Proposal will be assessed by the Environmental Protection Authority (EPA) under Part IV of the WA Environmental Protection Act 1986 (EP Act), and under the Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act) via the bilateral agreement. The Proposal will be assessed via a Public Environmental Review (PER).

An environmental review document (ERD) for the Proposal was submitted to the EPA in 2022. The scope of the ERD included an environmental noise impact assessment for the Project which was undertaken by Wood in 2021 (Wood Report No. Rpt01-AU00028-Rev2-08 Sept 2021). Following the 2021 noise impact assessment, the mine plans for both Myara North and Holyoake have been updated.

Wood has been engaged by GHD, on behalf of Alcoa, to update the noise assessment of the Proposal to support the PER based on current mine plans. This report presents the noise assessment for the mine component of the Proposal, which involves transitioning mining into the Myara North and Holyoake mine regions.

The noise assessment includes modelling and assessment of noise emissions from operational equipment within the Myara North and Holyoake mine regions. The outcomes of the modelling are used to ascertain the risk of exceedance of the Assigned Levels, as defined in the Environmental Protection (Noise) Regulations 1997 (the Regulations) at identified Noise Sensitive Receptors (NSRs) located in and around the proposed Myara North and Holyoake mine regions. The assessment also includes assessment of blasting activities to determine potential blast noise and ground borne vibration impacts at the NSRs.

## 1.1 Myara North

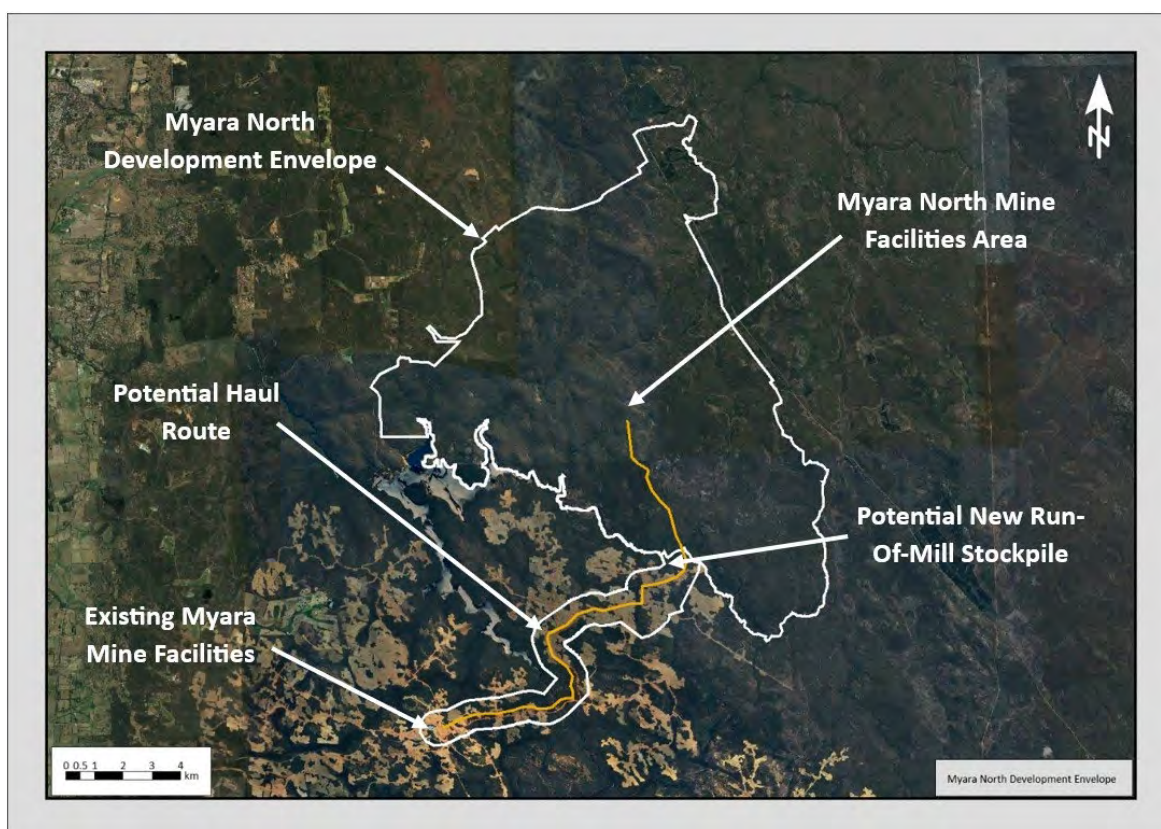
The proposed extension of the Mine into the Myara North mine region includes:

- Development of haul roads for long haul ore trucking back to the current Myara mine ore handling facilities;
- Mine development activities including drilling, logging, clearing and disposal of wood waste;

- Pre-mining activities including drill and blast operations and overburden removal using scrapers and excavators;
- Load and haul mining of bauxite ore over a Development Envelope (DE) involving a mobile equipment fleet of excavators, loaders, haul trucks, dozers;
- Rehabilitation activities using dozers and scrapers for landscaping, pre-ripping, soil return, contour ripping, followed by planting and fertilising;
- Construction of crushing/sizing facilities at the new mine facilities at Myara North;
- Construction of a facilities area containing offices, heavy and light vehicle washdown, haul truck and heavy equipment park-up area, sewage and waste-water treatment plants, potable water plant, heavy and light vehicle fuel and service facilities, and contractors' yard;
- Construction of infrastructure including a reservoir, stormwater drainage capture and re-use and sewerage, electrical substations and reticulation, communications network, water supply and distribution, roads and carparks; and
- Construction of heavy and light vehicle access roads.

Alcoa aims to begin construction and development activities in the proposed Myara North mine region from around 2026, on receipt of relevant approvals.

Figure 1-1 shows the proposed Myara North mine region development envelope, long haul route and facilities. Compared to the previous noise assessment, the development envelope has been substantially modified to minimise noise impacts at noise sensitive receptors in Jarrahdale.

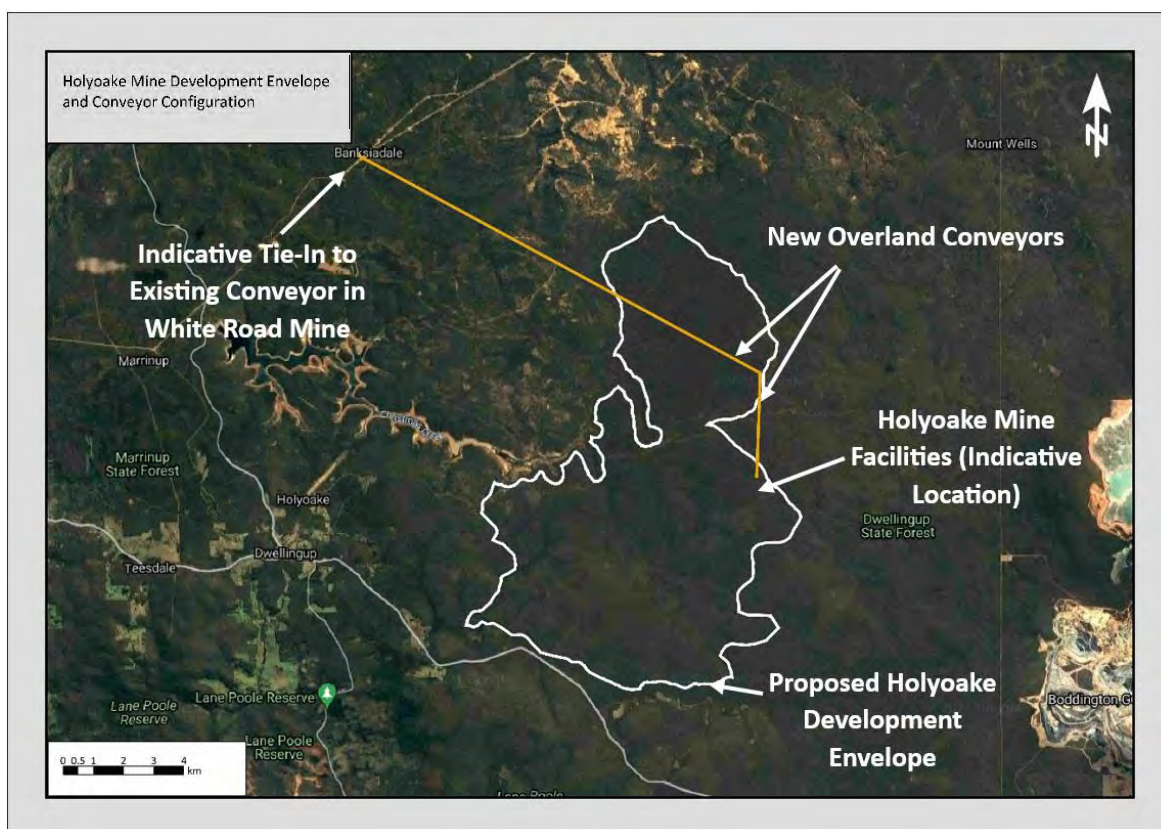


**Figure 1-1 : Proposed Myara North Development Envelope, Indicative Facilities Area and Potential Haul Route (Google Earth, Image ©2023 Airbus)**

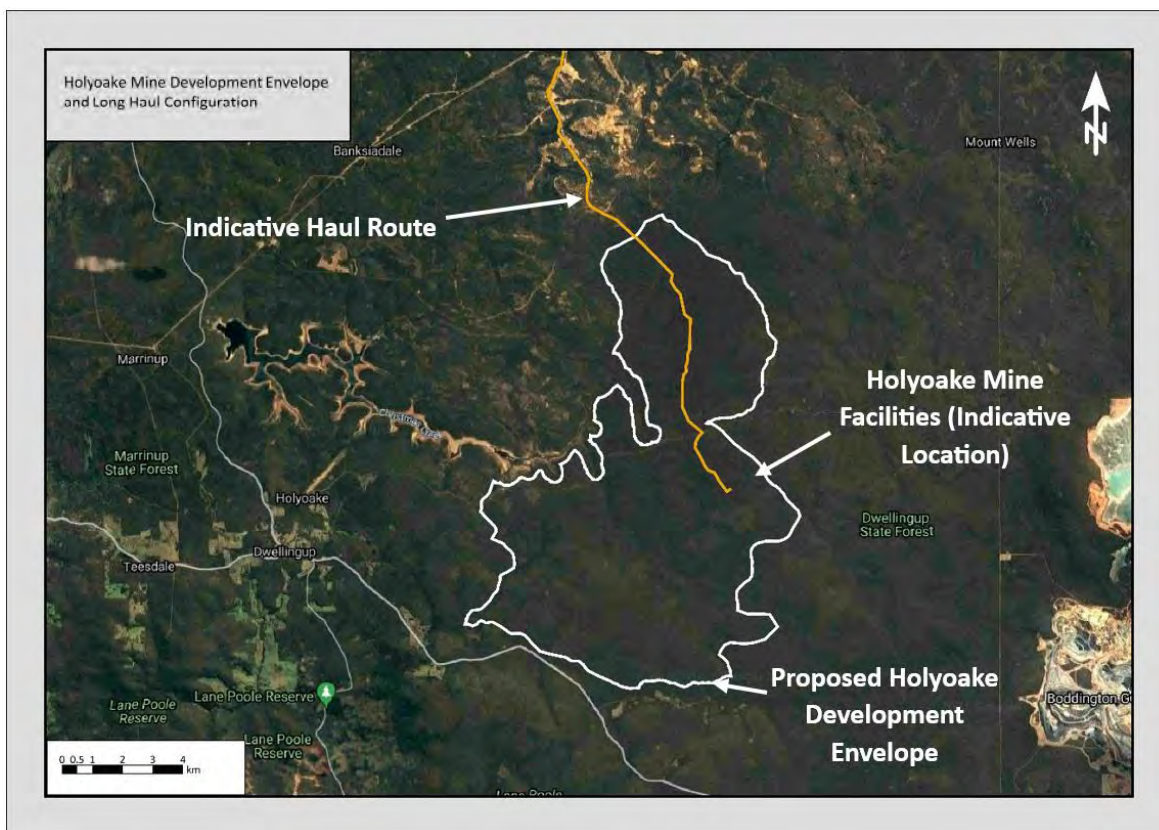
## 1.2 Holyoake

The proposed Holyoake mine region is currently in the exploration phase. At this point, the mine plan is expected to be developed in the coming years post completion of exploration. Bauxite mining in the proposed Holyoake region is currently planned to commence about 2034 (subject to approvals and final mine planning) with developmental/construction activities to commence approximately 2 years prior. For the proposed Holyoake region, assessments have been conducted based on currently available concepts.

The proposed Holyoake region is expected to involve a new mine facilities area and overland conveyors, with conveyors connecting to a tie-in at the existing conveyor in the historic White Road mine region (see Figure 1-2). Alternatively, a proposed long-hauling option to existing Myara facilities may be adopted (See Figure 1-3). The noise impact assessment has considered the potential long haul trucking option for future flexibility.



**Figure 1-2 : Proposed Holyoake Mine Development Envelope, Tie-in to Existing Conveyor, Potential Conveyor Route Configuration, and Indicative Location of New Mine Facilities (Google Earth, Image ©2023 Airbus)**



**Figure 1-3 : Proposed Holyoake Mine Development Envelope, Potential Long Hauling Route Configuration, and Indicative Location of New Mine Facilities (Google Earth, Image ©2023 Airbus)**

### 1.3 Noise Objectives

Alcoa's noise objectives for the Proposal are:

- to ensure that noise emissions associated with mine development, operations and rehabilitation for the proposed mine regions do not contribute to exceedances of the Assigned Levels prescribed by the Environmental Protection (Noise) Regulations 1997, at nearby noise sensitive receivers; and
- to manage noise emissions to minimise amenity impacts during exempt activities (i.e. construction noise).

### 1.4 Objectives and Scope of Assessment

#### 1.4.1 Assessment Objectives

The objectives of this assessment are:

- to quantify the predicted noise levels associated with the proposed Myara North and Holyoake mine regions;

- to assess predicted noise levels against the Assigned Levels specified by the Environmental Protection (Noise) Regulations 1997 at identified NSRs;
- to quantify the anticipated air blast overpressure and ground borne vibration levels from blasting activities carried out within the proposed Myara North and Holyoake mining regions; and
- to assess the predicted air blast overpressure levels against levels specified within Section 11 of the Environmental Protection (Noise) Regulations 1997;
- to assess the predicted ground borne vibration levels against ground borne vibration blast design avoidance criteria for damage to property recommended in APPENDIX J of Australian Standard (AS) 2187.2: Explosives – Storage, Transport & Use; Part 2: Use of Explosives; and
- where appropriate, to identify noise mitigation measures to achieve compliance with the noise objectives for the Myara North and Holyoake mine regions.

#### **1.4.2 Scope of Assessment**

This assessment addresses noise associated with the mine development, operations, and rehabilitation<sup>1</sup> phases of the Myara North and Holyoake mine regions. Fixed plant construction noise impacts are excluded from detailed modelling and assessment, but a general overview of noise management measures associated with the construction noise impact is provided.

#### **1.5 Applicable Documents**

The following documents are relevant to this assessment:

- Environmental Protection Act 1986;
- Environmental Protection (Noise) Regulations 1997; and
- Draft Guideline: Assessment of Environmental Noise Emissions, Department of Water and Environmental Regulation, May 2021.
- Australian Standard (AS) 2187.2: Explosives – Storage, Transport & Use; Part 2: Use of Explosives, Appendix J – Ground Vibration and Airblast Overpressure

---

<sup>1</sup> Mine Pit development refers to pit clearing and blasting activities while mining operations refers to the actual mining activities carried out within the pit. Typically, pit clearing would be classified as construction noise. However, given the size of the mining area and the progressive nature of clearing activities, a finite 'construction period' does not exist and clearing is, therefore, considered as part of normal operations. For the purposes of this assessment, construction noise is limited to noise emissions generated from the construction activities associated with the new mine facilities and has been excluded from the modelling and assessment.

## 2 SUMMARY OF RELEVANT LEGISLATION

### 2.1 Environmental Protection (Noise) Regulations 1997

Noise management in Western Australia is implemented through the Environmental Protection (Noise) Regulations 1997 (the regulations) which operate under the *Environmental Protection Act 1986*. The Regulations specify maximum noise levels (Assigned Levels) which are the highest noise levels that can be received at noise-sensitive premises, commercial and industrial premises. Table 2-1 presents the Assigned Levels.

Assigned Levels have been set differently for noise sensitive premises, commercial premises, and industrial premises. For noise sensitive premises, e.g. residences, an “influencing factor” is incorporated into the Assigned Levels. The influencing factor depends on land use zonings within circles of 100 m and 450 m radius from the noise receiver, including:

- the proportion of industrial land use zonings;
- the proportion of commercial zonings; and
- the presence of major or secondary roads.

For noise sensitive residences, the time of day also affects the Assigned Levels.

The regulations define three types of Assigned Level:

- $L_{Amax}$  Assigned Level means a noise level which is not to be exceeded at any time;
- $L_{A1}$  Assigned Level which is not to be exceeded for more than 1% of the time; and
- $L_{A10}$  Assigned Level which is not to be exceeded for more than 10% of the time.

The  $L_{A10}$  noise limit is the most relevant for this study since this is representative of continuous noise emissions from mining operations.

**Table 2-1 : Assigned Levels**

| Type of premises receiving noise                                    | Time of Day  | Assigned Level (dB)        |                            |                            |
|---|--|----------------------------|----------------------------|----------------------------|
|   |  | L <sub>A10</sub>           | L <sub>A1</sub>            | L <sub>Amax</sub>          |
| Noise sensitive premises: highly sensitive area                     | 0700 to 1900 hours<br>Monday to Saturday   | 45 +<br>Influencing factor | 55 +<br>Influencing factor | 65 +<br>Influencing factor |
|   | 0900 to 1900 hours<br>Sunday and public holidays   | 40 +<br>Influencing factor | 50 +<br>Influencing factor | 65 +<br>Influencing factor |
|   | 1900 to 2200 hours all days  | 40 +<br>Influencing factor | 50 +<br>Influencing factor | 55 +<br>Influencing factor |
|   | 2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays | 35 +<br>Influencing factor | 45 +<br>Influencing factor | 55 +<br>Influencing factor |
| Noise sensitive premises: any area other than highly sensitive area | All hours  | 60                         | 75                         | 80                         |
| Commercial premises   | All hours  | 60                         | 75                         | 80                         |
| Industrial premises   | All hours  | 65                         | 80                         | 90                         |

## 2.2 Assigned Levels for Selected Receptors

Twenty four (24)<sup>2</sup> and forty one (41) representative NSR locations surrounding the proposed Myara North and Holyoake mine respectively have been identified (see Table 2-2 and Figure 2-1 & Figure 2-2). The NSRs primarily comprise residential properties as well as a number of recreational campsites where people may be resting/ sleeping/ camping during nighttime periods when conditions are most conducive for noise propagation.

<sup>2</sup> NSR 15, which was included in the initial impact assessment, was subsequently acquired by Alcoa and has been excluded from this assessment.

The NSRs were identified in consultation with Alcoa and through review of aerial imagery, land use zoning, and Department of Biodiversity, Conservation and Attractions (DBCA) recreational facility data.

**Table 2-2 : NSRs In the Vicinity of Myara North and Holyoake Mine Regions**

| NSR ID            | Description   |
|-------------------|---|
| NSR 1             | Serpentine Café on the Dam (includes onsite Ranger residence)   |
| NSR 2, 3, 6 – 14  | Rural properties along Balmoral Road and Kingsbury Drive  |
| NSR 4, 5, 16 - 22 | Residential properties on eastern border of Jarrahdale townsite   |
| NSR 23 & 24       | Monadnocks and Mt Cooke campsites along Bibbulmun Track   |
| NSR 25            | Wungong campsite on Munda Bididi Trail  |
| H-NSR 1 - 15      | Rural properties at Inglehope, along McRae Road and Pinjarra Williams Road  |
| H-NSR 16 - 24     | Rural properties along Pinjarra Williams Road on the south western flank of the Holyoake Mine Region Development Envelope |
| H-NSR 25 - 35     | Rural properties approximately 2.5 km East South-East from Dwellingup townsite  |
| H-NSR 36          | Etmilyn Trail Rail Siding   |
| H-NSR 37          | Inglehope shelter/ campsite   |
| H-NSR 38          | Chadora campsite  |
| H-NSR 39          | Swamp Oak campsite  |
| H-NSR 40          | Mt Wells campsite   |
| H-NSR-41          | White Horse Hills campsite  |



Figure 2-1 : Locations of Myara North Noise Sensitive Receivers



Figure 2-2 : Locations of Holyoake Noise Sensitive Receivers

None of the selected receivers are within 450m of industrial or commercial zoned land, or major or secondary roads. Therefore, no influencing factors apply.

Table 2-3 presents the  $L_{A10}$  Assigned Levels, at the selected receivers.

**Table 2-3 : Assigned Levels at Selected Receivers**

| Time of Day  | Assigned Level – $L_{A10}$ dB(A) |
|--|----------------------------------|
| 0700 to 1900 hours Monday to Saturday  | 45                               |
| 0900 to 1900 hours Sunday and public holidays  | 40                               |
| 1900 to 2200 hours all days  | 40                               |
| 2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays | 35                               |

### 2.3 Adjustments for Intrusive Characteristics

Received noise levels associated with the equipment within the proposed Myara North and Holyoake mine regions must be adjusted if the noise exhibits intrusive or dominant characteristics which cannot be reasonably or practicably removed, i.e. if the noise is impulsive (e.g. banging), tonal (e.g. whining noise having a defined pitch) or modulating (e.g. noise which varies cyclically in either pitch or amplitude). Table 2-4 presents the adjustments required when intrusive or dominant characteristics cannot be reasonably and practicably removed. The adjusted noise levels must now comply with the Assigned Levels. Regulation 9 sets out objective tests to assess whether the noise is taken to be free of these characteristics.

**Table 2-4 : Adjustments for Intrusive or Dominant Noise Characteristics**

| Adjustment where noise emission is not music<br>these adjustments are cumulative to a maximum of 15 dB |                             |                                |
|--|-----------------------------|--------------------------------|
| Where tonality is present  | Where modulation is present | Where impulsiveness is present |
| +5 dB  | +5 dB                       | +10 dB                         |

## 2.4 Noise Limits for Blasting Operations

Since blasting noise is typically infrequent and of very short duration, blasting noise is generally assessed using linear peak instantaneous noise levels. Section 11 of the *Environmental Protection (Noise) Regulations 1997* states:

- No airblast level resulting from blasting on any premises or public place, when received at any other premises, may exceed ---
  - a) 125dB  $L_{Linear}$  peak between 0700 hours and 1800 hours on Monday to Saturday inclusive; or
  - b) 120dB  $L_{Linear}$  peak between 0700 hours and 1800 hours on a Sunday or public holiday.
- Notwithstanding sub-regulation above, airblast levels for 9 in any 10 consecutive blasts (regardless of the interval between each blast), when received at any other premises, must not exceed ---
  - a) 120dB  $L_{Linear}$  peak between 0700 hours and 1800 hours on Monday to Saturday inclusive; or
  - b) 115dB  $L_{Linear}$  peak between 0700 hours and 1800 hours on a Sunday or public holiday.
- No airblast level resulting from blasting on any premises or public place, when received at any other premises, may exceed ---
  - a) 90dB  $L_{Linear}$  peak outside the periods between 0700 hours and 1800 hours on any day except where that blasting is carried out in accordance with regulation 8.28 (4) of the *Mines Safety and Inspection Regulations 1995*; or
  - b) the levels specified in subregulations above outside the periods between 0700 hours and 1800 hours, as appropriate for the time when it was intended that the blast be fired, if the exception in paragraph (a) applies.

### 3 AMBIENT NOISE MONITORING

Ambient noise monitoring was conducted between the 4<sup>th</sup> July 2020 and 10<sup>th</sup> September 2020. The objectives of the monitoring are:

- To provide a baseline from which to identify the impact of noise level increases associated with operational noise from within the Myara North and Holyoake mine regions;
- To identify the likelihood of noise exceedances resulting from the combination of the existing ambient noise (including industrial noise emissions) with that of the Myara North and Holyoake mine regions; and
- To enable assessment of the likely audibility of noise from the Myara North and Holyoake mine regions including any tonal, modulation or impulsive components.

#### 3.1 Noise Monitoring Locations

Noise loggers were deployed at 16 locations, eight loggers were located to the west, north and east of the proposed Myara North region and a further eight loggers were located to the west and south of the proposed Holyoake region. Table 3-1 details the location, deployment dates and lists the NSRs represented by the loggers. Figure 3-1 and Figure 3-2 show the locations of the loggers in each proposed mine area.

The locations were selected due to their proximity to residential/ rural properties, recreational campsites and where ambient noise levels are expected to be typical of the surrounding setting. The selected locations are generally places where people reside or expected to undertake recreational activities which may be impacted by noise.

**Table 3-1 : Noise Monitoring Locations and Deployment Dates**

| Mining Area | Relevant NSRs | Logger ID | Coordinate Northing | Coordinate Easting | Deployment Dates     |
|-------------|---------------|-----------|---------------------|--------------------|----------------------|
| Myara North | NSR 1         | RASL 16   | 32.401935°S         | 116.102963°E       | 04/07/20 to 24/07/20 |
|             | NSR 3         | RASL 14   | 32.357586°S         | 116.079315°E       | 25/07/20 to 05/08/20 |
|             | NSR 14        | RASL 13   | 32.341973°S         | 116.112319°E       | 05/07/20 to 22/07/20 |
|             | NSR 18        | RASL 14   | 32.330265°S         | 116.088549°E       | 28/08/20 to 10/09/20 |
|             | NSR 20        | RASL12    | 32.334835°S         | 116.079301°E       | 6/08/20 to 26/08/20  |

| Mining Area | Relevant NSRs | Logger ID | Coordinate Northing | Coordinate Easting | Deployment Dates     |
|-------------|---------------|-----------|---------------------|--------------------|----------------------|
|             | NSR 21        | RASL10    | 32.341672°S         | 116.062103°E       | 07/08/20 to 27/08/20 |
|             | NSR 22        | RASL 14   | 32.346602°S         | 116.057855°E       | 14/08/20 to 27/08/20 |
|             | NSR 24        | RASL 12   | 32.403208°S         | 116.292179°E       | 25/07/20 to 05/08/20 |
| Holyoake    | H-NSR 4       | RASL 15   | 32.757882°S         | 116.179569°E       | 25/07/20 to 03/08/20 |
|             | H-NSR 10      | RASL 16   | 32.759523°S         | 116.201716°E       | 26/07/20 to 05/08/20 |
|             | H- NSR 13     | RASL 13   | 32.763540°S         | 116.216509°E       | 26/07/20 to 05/08/20 |
|             | H-NSR 16      | RASL 16   | 32.749182°S         | 116.119019°E       | 28/08/20 to 10/09/20 |
|             | H-NSR 17-24   | RASL 16   | 32.742983°S         | 116.108535°E       | 06/08/20 to 27/08/20 |
|             | H-NSR 25-35   | RASL 13   | 32.715345°S         | 116.094746°E       | 07/08/20 to 26/08/20 |
|             | H-NSR 36      | RASL 12   | 32.738235°S         | 116.137783°E       | 28/08/20 to 07/09/20 |
|             | H-NSR 37      | RASL 13   | 32.759758°S         | 116.168524°E       | 28/08/20 to 07/09/20 |

Monitoring was undertaken at NSR 24 Mt Cooke campsite, which was accessible by vehicle, however NSR 38 Chadora campsite was not accessible by vehicle and, therefore, noise logging equipment could not be installed at this NSR. It is expected that noise logging at Mt Cooke will be sufficient as an indication of ambient noise that may be recorded elsewhere on the Bibbulmun Track with a similar setting.

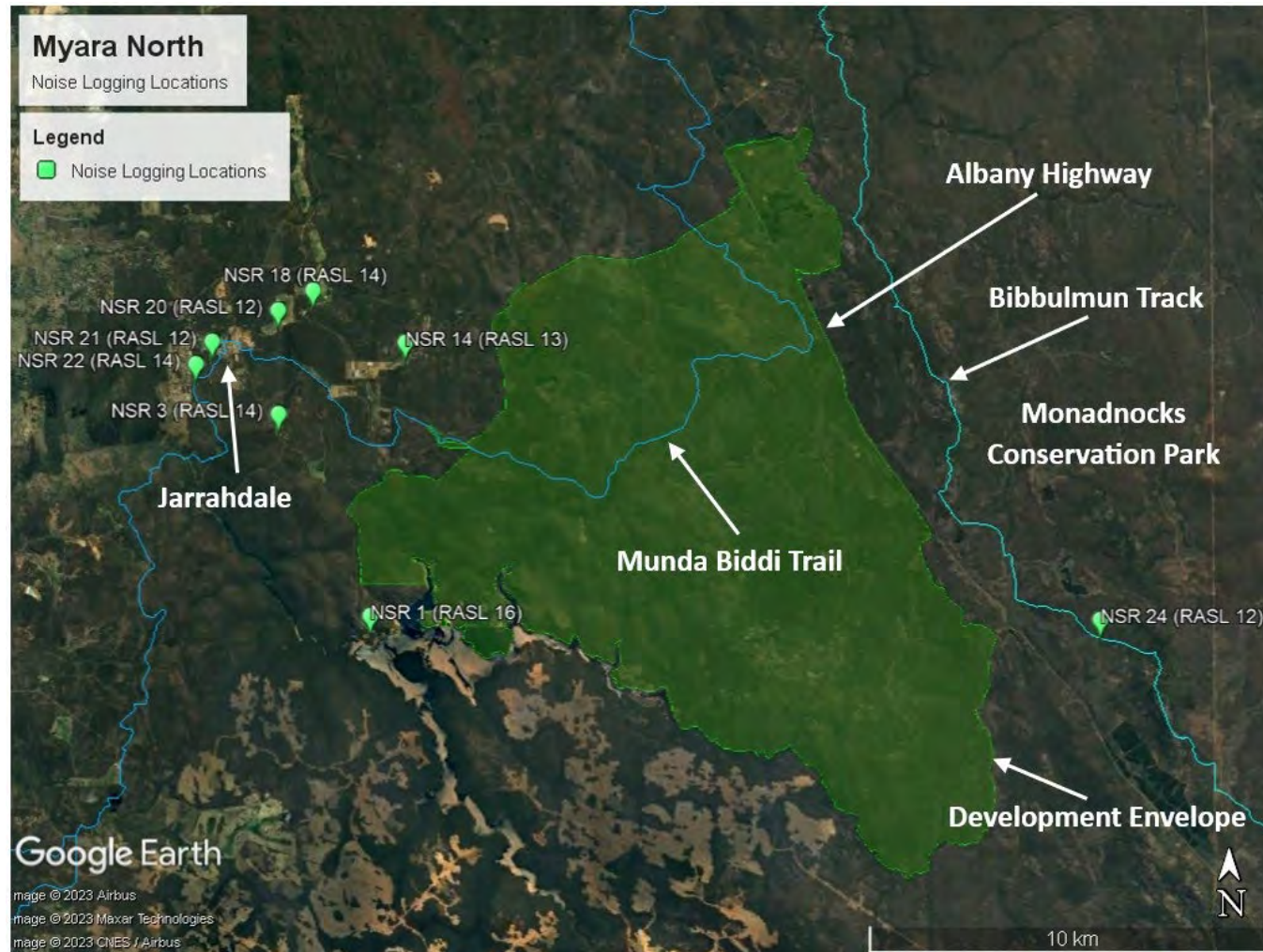


Figure 3-1 : Myara North Logger Locations



Figure 3-2 : Holyoake Noise Logger Locations

## 3.2 Noise Monitoring Methodology

The noise monitors were set to log overall and third-octave band noise levels every second and the data was processed to determine  $L_{A51}$ ,  $L_{A510}$ ,  $L_{Aeq}$  and  $L_{A590}$  noise levels for at 30-minute intervals. Audio data was also recorded.

The logged noise data was analysed by Wood and audio samples reviewed to identify day, evening and nighttime periods which contained low levels of extraneous noise and could therefore be considered as representative of the lowest background noise levels. Selected periods contained the following:

- Minimal to no road traffic noise;
- Minimal to no contribution from fauna;
- Minimal to no wind noise; and
- Transient or localised noise not representative of typical underlying background.

The meters satisfied the rules for sound measuring equipment specified in Schedule 4 of the Environmental Protection (Noise) Regulations 1997. They were calibrated before and after logging and calibration drifts were within allowable tolerances. A list of instrumentation and their serial numbers used in the baseline noise monitoring is provided in Appendix A.1.

## 3.3 Noise Monitoring Results

Summaries of the  $L_{A590}$  and  $L_{A510}$  noise levels recorded under conditions representative of lowest background noise are presented for Myara North and Holyoake in the following sections.

Charts presenting  $L_{A51}$ ,  $L_{A510}$ ,  $L_{Aeq}$  and  $L_{A590}$  noise levels for the entire monitoring periods are presented for each location in APPENDIX A.

### 3.3.1 Myara North Background Noise Levels

The ambient noise monitoring program at Myara North NSRs features typical noise associated with community activities including dogs, livestock and noise from use of hand tools. Traffic increasingly features in the soundscape from approximately 4am onwards as community members commence activities for the day and continue to feature prominently for the daylight hours. The nighttime recorded  $L_{A90}$  values are typically between 20 to 35 dB(A) and are typical of soundscape in a rural setting. Recorded  $L_{A10}$  values during nighttime periods generally range from 25 to 50 dB(A). Occasionally during quiet periods, faint rumbling and revving characteristics of emissions from mobile equipment can be heard. The source of this noise is unknown.

Table 3-2 presents a summary of background noise for the noise loggers located at Myara North for periods with little to no extraneous noise influence. Charts presenting the full data at each location are presented in Appendix A.2.

**Table 3-2 : Summary of Background Noise Levels for Myara North**

| Relevant Noise Sensitive Receptors (NSRs) | Period    | L <sub>A90</sub> Noise Levels, dB(A) | L <sub>A10</sub> Noise Levels, dB(A) | Observations  |
|---|-----------|--------------------------------------|--------------------------------------|---|
| NSR1                                      | Daytime   | 20.1-33.4                            | 44.9-53.4                            | Ambient noise includes community noise, road and air traffic, birds and localised machinery noise   |
|   | Evening   | 18.2-30.1                            | 24.7-45.1                            | Ambient noise includes dogs Barking, road and air traffic, birds and localised machinery noise  |
|   | Nighttime | 17.5-37.9                            | 19.8-52.2                            | Ambient noise includes dogs Barking, birds and localised machinery noise  |
| NSR3                                      | Daytime   | 23.2-39.4                            | 48-56                                | Ambient noise includes birds, cars passing, community noise (radio playing nearby)  |
|   | Evening   | 19.4-36.5                            | 25.4-54.8                            | Ambient noise includes occasional car / plane passing and fauna (frogs / insects)   |
|   | Nighttime | 19.1-29.1                            | 25.2-50.7                            | Ambient noise includes occasional car passing and fauna (frogs, insects and birds chirping)   |
| NSR14                                     | Daytime   | 24.5-34.3                            | 38.9-55.8                            | Ambient noise includes birds traffic and community noise (intermittent construction activities and human activity close to monitor)   |
|   | Evening   | 20.8-35.2                            | 26.5-52.5                            | Ambient noise includes air traffic, road traffic and fauna (dogs barking, birds and frogs)  |
|   | Nighttime | 21.1-39.8                            | 30.4-57.2                            | Ambient noise includes occasional road traffic and fauna (dogs barking, birds, rooster and frogs)   |
| NSR18                                     | Daytime   | 23.7-43.1                            | 47.6-59.2                            | Ambient noise includes road traffic, wind and trees rustling, bird noise and localised mobile equipment / hand tools.   |
|   | Evening   | 21.7-40.5                            | 32.5-54.2                            | Ambient noise includes road traffic, insects, frogs, community noise and localised activities – fixed plant equipment   |
|   | Nighttime | 22.5-32.3                            | 33.5-51.2                            | Ambient noise includes insects, frogs, owls. Localised activities – fixed plant equipment operational. Birds and traffic dominant from dawn until end of period.  |
| NSR20                                     | Daytime   | 25.5-37                              | 44.5-56.3                            | Ambient noise includes traffic, birds and localised machinery noise (possibly a generator). During quiet periods the sound of mobile equipment revving is faintly audible.  |
|   | Evening   | 19.9-35.9                            | 30-60.1                              | Ambient noise includes traffic, birds, frogs, insects, wind / trees rustling and localised machinery noise (possibly a generator). During quiet periods the sound of mobile equipment revving is faintly audible. |

| Relevant Noise Sensitive Receptors (NSRs) | Period    | L <sub>A90</sub> Noise Levels, dB(A) | L <sub>A10</sub> Noise Levels, dB(A) | Observations   |
|---|-----------|--------------------------------------|--------------------------------------|--|
|   | Nighttime | 20.1-30.7                            | 31.8-56                              | Ambient noise includes frogs, insects and traffic. Wind and rain present for small portions of the selected nights. During quiet periods the sound of mobile equipment revving is faintly audible.                             |
| NSR21                                     | Daytime   | 20.1-40.6                            | 35.9-55.7                            | Ambient noise includes traffic, aircraft overhead, birds and dog barking. Wind and trees rustling audible for portions of the selected periods. During quiet periods the sound of mobile equipment revving is faintly audible. |
|   | Evening   | 17.9-42                              | 22.1-60.1                            | Ambient noise occasional traffic noise and dogs barking. Faint noise from frogs and birds. During quiet periods the sound of mobile equipment revving is faintly audible.  |
|   | Nighttime | 17.6-46.1                            | 24-58.2                              | Ambient noise occasional traffic noise and dogs barking. Faint noise from frogs and birds. Traffic and bird noise become significant from ~4AM. During quiet periods the sound of mobile equipment revving is faintly audible. |
| NSR22                                     | Daytime   | 21.2-34.6                            | 37.5-49.6                            | Ambient noise includes birds, traffic, aircraft overhead and wind. A low frequency rumble is faintly audible during quiet periods.   |
|   | Evening   | 17.7-37.7                            | 20.8-57.3                            | Minimal extraneous noise during the period. However, frogs, dogs barking and birds are audible at time. A low frequency rumble is faintly audible during quiet periods.  |
|   | Nighttime | 18-29.9                              | 27.6-45.1                            | Minimal extraneous noise during the period. However, frogs, dogs barking, wind and birds are audible at times. A low frequency rumble is faintly audible during quiet periods.   |
| NSR24                                     | Daytime   | 21.2-34.6                            | 37.5-49.6                            | Ambient noise includes road traffic, airplanes overhead and wind.  |
|   | Evening   | 17.7-37.7                            | 20.8-57.3                            | Minimal extraneous noise with occasional traffic noise and airplanes overhead  |
|   | Nighttime | 18-29.9                              | 27.6-45.1                            | Minimal extraneous noise with occasional traffic noise, mainly during early morning, and is more prevalent during weekdays   |

### 3.3.2 Holyoake Background Noise Levels

The ambient noise monitoring program at Holyoake NSRs recorded typical noise associated with community activities including dogs, livestock and noise from localised equipment. Traffic

increasingly features in the soundscape from approximately 4 - 5am as community members commence activities for the day. The recorded noise levels at Holyoake indicate a slightly lower  $L_{A90}$  range than Myara North. The recorded  $L_{A90}$  values are generally from 17 to 30 dB(A) and are typical of soundscape in a rural setting. Recorded  $L_{A10}$  values during nighttime periods generally range from 25 to 55 dB(A). Occasionally during quiet periods, faint rumbling and revving characteristic of emissions from mobile heavy equipment can be heard. Source of this noise is unknown. Noise from the Dwellingup to Etmilyn Forest Train is audible at NSR 36 (Etmilyn Trail).

Table 3-3 presents a summary of background noise for the noise loggers located at Holyoake for periods with little to no extraneous noise influence. Charts presenting the full data at each location are presented in Appendix A.3.

**Table 3-3 : Summary of Background Noise Levels for Holyoake**

| Relevant Noise Sensitive Receptors (NSRs) | Period    | $L_{A90}$ Noise Levels, dB(A) | $L_{A10}$ Noise Levels, dB(A) | Observations  |
|---|-----------|-------------------------------|-------------------------------|---|
| H-NSR 4                                   | Daytime   | 25.9-36.2                     | 46.4-57.3                     | Ambient noise includes traffic and birds  |
|   | Evening   | 19.7-32.3                     | 30.2-49.8                     | Ambient noise includes traffic, birds screeching and community noise (music playing at residence)   |
|   | Nighttime | 19.1-25.8                     | 30.9-45.7                     | Ambient noise includes traffic, birds screeching, geese and community noise (music playing at residence) until 12 to 1AM  |
| H-NSR 10                                  | Daytime   | 18.7-31.0                     | 30.8-53.3                     | Ambient noise includes birds, traffic, gusts of wind and occasional aircraft noise  |
|   | Evening   | 17.0-25.3                     | 21.2-51.1                     | Ambient noise includes occasional traffic, bird noise (including an owl during post dusk) and light rain  |
|   | Nighttime | 16.6-23.6                     | 23.1-47.2                     | Ambient noise includes localised rustling noise near monitor, frogs and occasional vehicles. A rooster is audible from dawn onwards.  |
| H-NSR 13                                  | Daytime   | 18.5-34.2                     | 30.8-54.3                     | Ambient noise includes light wind and rain, trees rustling, traffic, birds and insects chirping. During periods of low background noise a faint low frequency rumbling noise is audible.  |
|   | Evening   | 17.7-26.2                     | 18.9-51.9                     | Minimal extraneous noise with the occasional bird, traffic and noise from fauna moving close to monitor. During periods of low background noise a faint low frequency rumbling noise and faint noise from heavy vehicles revving is audible.  |
|   | Nighttime | 17.6-24.7                     | 19.0-49.2                     | Minimal extraneous noise with the occasional bird, traffic and noise from fauna moving close to monitor. During periods of low background noise, a faint low frequency rumbling noise and faint noise from heavy vehicles revving is audible. |

| Relevant Noise Sensitive Receptors (NSRs) | Period    | L <sub>A90</sub> Noise Levels, dB(A) | L <sub>A10</sub> Noise Levels, dB(A) | Observations   |
|---|-----------|--------------------------------------|--------------------------------------|--|
| H-NSR 16                                  | Daytime   | 24-41.8                              | 48.4-57.8                            | Ambient noise includes fairly constant traffic, birds chirping, wind and trees rustling  |
|   | Evening   | 21.5-36.1                            | 32.7-54.9                            | Ambient noise consists of traffic, light wind, trees rustling, insects and other fauna (ducks and frogs). During periods of low background noise, faint noise from heavy vehicles revving is audible.                            |
|   | Nighttime | 18.8-32.8                            | 35.9-54.6                            | Ambient noise consists of light wind, trees rustling, insects and other fauna (ducks and frogs). Traffic becomes dominant post 0430. During periods of low background noise, faint noise from heavy vehicles revving is audible. |
| H-NSR 17-24                               | Daytime   | 29.8-37.4                            | 48.6-58.8                            | Ambient noise includes traffic, birds and periods of wind.   |
|   | Evening   | 25.6-42.9                            | 42-56.3                              | Ambient noise includes insects and frogs. During periods of low background noise, a faint low frequency rumbling noise and faint noise from heavy vehicles revving is audible.   |
|   | Nighttime | 20.4-42.1                            | 40.7-57.7                            | Ambient noise includes insects, frogs and community noise (music). During periods of low background noise, a faint low frequency rumbling noise and faint noise from heavy vehicles revving is audible.                          |
| H-NSR 25-35                               | Daytime   | 25.1-34.7                            | 37.6-53.4                            | Ambient noise includes traffic, birds and community noise (people talking). During periods of low background noise, a faint low frequency rumbling noise and faint noise from heavy vehicles revving is audible.                 |
|   | Evening   | 22.9-37.6                            | 29-57.2                              | Ambient noise includes traffic, insects, birds and ducks. During periods of low background noise a faint low frequency rumbling noise is audible.  |
|   | Nighttime | 22.7-37.2                            | 30.5-51.6                            | Ambient noise includes traffic, insects, birds and ducks. During periods of low background noise a faint low frequency rumbling noise is audible.  |
| H-NSR 36                                  | Daytime   | 19.2-39.7                            | 37.7-55.1                            | Ambient noise includes wind and trees rustling, birds, and a passenger tram / train – likely the Etmilyn Forest Tram.  |
|   | Evening   | 16.8-37.7                            | 20.1-50.6                            | Ambient noise includes light wind and trees rustling, occasional traffic noise, insects and birds. During periods of low background noise a faint low frequency rumbling noise is audible.                                       |
|   | Nighttime | 17.2-26.5                            | 24.4-49.7                            | Ambient noise includes light wind and trees rustling, occasional traffic noise, insects and birds. During periods of low background noise a faint low  |

| Relevant Noise Sensitive Receptors (NSRs) | Period    | L <sub>A90</sub> Noise Levels, dB(A) | L <sub>A10</sub> Noise Levels, dB(A) | Observations  |
|---|-----------|--------------------------------------|--------------------------------------|---|
|   |           |                                      |                                      | frequency rumbling noise is audible. Traffic is dominant post 0500  |
| H-NSR 37                                  | Daytime   | 21.4-46.1                            | 50.7-61                              | Ambient noise includes light wind and trees rustling, fairly consistent traffic and birds chirping  |
|   | Evening   | 18-40                                | 34-57.8                              | Ambient noise includes light wind and trees rustling, fairly consistent traffic and birds chirping. During periods of low background noise a faint low frequency rumbling noise is audible. |
|   | Nighttime | 17.8-35.6                            | 36.4-57.6                            | Ambient noise includes light wind, trees rustling and light rain. During periods of low background noise a faint low frequency rumbling noise is audible. Traffic is audible post 0400      |

## 4 NOISE MODELLING METHODOLOGY

### 4.1 Noise Modelling Software

Computer noise models have been developed for the proposed Myara North and Holyoake mine regions using SoundPlan noise modelling software which has been previously accepted by WA Department of Water and Environmental Regulation (DWER) as appropriate for environmental noise prediction.

The inputs required in SoundPlan are noise source data, barriers/screens, ground topographical and absorption type data, assessed meteorological conditions and receiver point locations.

The model has been used to generate predicted noise contours for the area surrounding the Myara North and Holyoake operations and to predict noise levels at the selected noise sensitive receptors.

The model does not include noise emissions from any sources other than those associated with the Myara North and Holyoake mine regions. Noise emissions from existing mining operations, other neighbouring industrial sources, road traffic, aircraft, animals, domestic sources, etc. are excluded from the modelling.

It is noted the Myara North and Holyoake mine region development involves a transition of the Huntly Mine into these regions rather than undertaking additional mining activities concurrently with the existing operations. Some operational elements of the current mine activities (such as rehabilitation) and the ore crushing plus conveying facility will continue to operate at Myara. Active mining activities at Myara will cease upon transition to Myara North and Holyoake regions.

### 4.2 Noise Modelling Algorithm

SoundPlan provides a range of published noise propagation prediction algorithms that can be selected by the user. The CONCAWE<sup>3,4</sup> prediction algorithms were selected for consistency with previous modelling undertaken for Alcoa.

The CONCAWE algorithms are also recommended by the WA Department of Water and Environmental Regulation (DWER) Draft Guideline<sup>5</sup>.

---

<sup>3</sup> CONCAWE (Conservation of Clean Air and Water in Europe) was established in 1963 by a group of oil companies to carry out research on environmental issues relevant to the oil industry.

<sup>4</sup> *The propagation of noise from petroleum and petrochemical complexes to neighbouring communities*, CONCAWE Report 4/81, 1981.

<sup>5</sup> *Draft Guideline: Assessment of Environmental Noise Emissions*, Department of Water and Environmental Regulation, May 2021

### 4.3 Meteorological Inputs

SoundPlan calculates predicted noise levels for defined meteorological conditions. In particular, the following variables are included in the prediction algorithms and will affect the predicted noise level: temperature; Pasquill stability (temperature inversion); relative humidity; wind speed; and wind direction.

The “default meteorological conditions” as suggested by the WA DWER Draft Guideline have been used to determine the worst-case overall predicted noise levels at each selected noise sensitive receiving location (see Table 4-1).

**Table 4-1 : Meteorological Inputs for Worst-Case Conditions**

| Period       | Temperature | Pasquill Stability   | Wind speed | Wind Direction                  | Relative Humidity |
|--------------|-------------|----------------------|------------|---------------------------------|-------------------|
| <b>Day</b>   | 20 C        | Pasquill Stability E | 4 m/s      | Worst-case (source to receiver) | 50 %              |
| <b>Night</b> | 15 C        | Pasquill Stability F | 3 m/s      | Worst-case (source to receiver) | 50 %              |

### 4.4 Ground Topography, Buildings and Barriers

Topographical information for the acoustic model (in the form of 5 m topographical contours and LIDAR scans) has previously been provided by GHD in AutoCAD DXF shape file format. The ground contours were directly imported into the acoustic model.

Where relevant, the acoustic barrier effects and reflections due to existing structures (e.g. existing conveyor noise walls and transfer building) have been included in the model because of their potential influence on the modelled noise levels.

A moderately absorptive ground is assumed in the acoustic model (ground factor 0.6).

### 4.5 Noise Sources

Sound power levels for new equipment associated with the proposed Myara North and Holyoake mine regions are based on measured sound power levels for similar equipment at Alcoa’s mining operations. The mining equipment sound power levels used in the modelling are based on higher-noise emitting examples of currently operating equipment to account for potential noise increases due to wear and tear.

A summary of the noise sources and assumptions are provided in the following sections of this report. Further details, including octave-band sound power levels are provided in APPENDIX B.

#### 4.5.1 Mobile Equipment Fleet

**Table 4-2 : Assumed Mobile Equipment Fleet**

| Equipment Type   | Total Proposed Fleet Units | Assumed Operational Units <sup>6</sup> |
|--|----------------------------|--|
| Excavators 250T  | 4                          | 3                                      |
| Haul Trucks 190T   | 29                         | 19                                     |
| Rock breaking Excavators   | 1                          | 1                                      |
| Loaders 993K   | 2                          | 2                                      |
| Loader 994   | 4                          | 3                                      |
| Watercarts   | 3                          | 2                                      |
| Graders  | 3                          | 2                                      |
| Floats*  | 3                          | -                                      |
| Dozers   | 7                          | 5                                      |
| Scrapers   | 7                          | 5                                      |
| Excavators for Soil & Overburden removal   | 7                          | 5                                      |
| Blast drills   | 5                          | 4                                      |
| Ancillary loaders  | 5                          | 4                                      |
| Ancillary trucks   | 3                          | 2                                      |
| Note: * Floats have been assumed to be an intermittently operational source and have been excluded from the model. |                            |  |

**Table 4-3 : Assumed Long Haul Trucking Fleet**

| Equipment Type              | Total Proposed Fleet Units | Assumed Operational Units <sup>7</sup> |
|-----------------------------|----------------------------|--|
| Haul Trucks – (Myara North) | 24                         | 20                                     |
| Haul Trucks – (Holyoake)    | 19                         | 16                                     |

<sup>6</sup> Based on an availability of ~65 per cent (rounded to the next full unit & assuming 5500 operational hours per year per operational unit)

<sup>7</sup> Based on an availability of ~85 per cent (rounded to the next full unit & assuming 5500 operational hours per operational unit)

**Table 4-4 : Assumed Development Fleet**

| Equipment Type                           | Total Proposed Fleet Units | Assumed Operational Units <sup>8</sup> |
|--|----------------------------|--|
| Scrapers                                 | 7                          | 3                                      |
| Dozers                                   | 7                          | 3                                      |
| Excavators for Soil & Overburden removal | 7                          | 3                                      |
| Blast Drills                             | 5                          | 2                                      |

#### 4.5.2 Fixed Plant

**Table 4-5 : Assumed Fixed Infrastructure**

| Equipment Type   | Total Proposed Units | Assumed Operational Units |
|--|----------------------|---------------------------|
| ROM Primary and Secondary Sizers (3,300 tph) (Myara North/Holyoake)          | 2                    | 2                         |
| Diesel Generator (0.6 MW) – Fixed Infrastructure Area (Myara North/Holyoake) | 7                    | 6                         |
| Overland Conveyors (Holyoake)  | 1                    | 1                         |

The sound power levels for minor equipment within the Fixed Infrastructure Area have been based on the following:

- Noise levels for large pumps and motors (where applicable) have been assumed to meet 85 dB(A) at 1 m per the Alcoa Equipment Noise Specification;
- Smaller pumps (120 hp or less) have been assumed to operate between 70 and 84 dB(A) at 1m depending on pump power and Wood's experience with similar noise sources.

#### 4.6 Mining Locations

The distribution of the proposed mining pits for the proposed Myara North and Holyoake mine regions are as presented Figure 4-1 and Figure 4-2.

The mining pits for Myara North are based on the current indicative mine plan developed from results of exploration programmes conducted by Alcoa.

<sup>8</sup> Based on an availability of ~50 per cent (rounded to the next full unit & Assuming 5500 operational hours per year per operational unit)

It is anticipated that the total time for an area open of pits is 3 years, broken down as follows:

- Year 1 = Clearing/pre-mining development
- Year 2 = Mining
- Year 3 = Rehabilitation

The mine plan for Holyoake is currently indicative and shown as mining blocks which are subject to further exploration. They are based on the following criteria:

- expected mining rate;
- average bauxite quality and depth;
- typical bauxite locations (i.e. Dwellingup upland landform); and
- weighting of locations 2/3 towards NSRs.

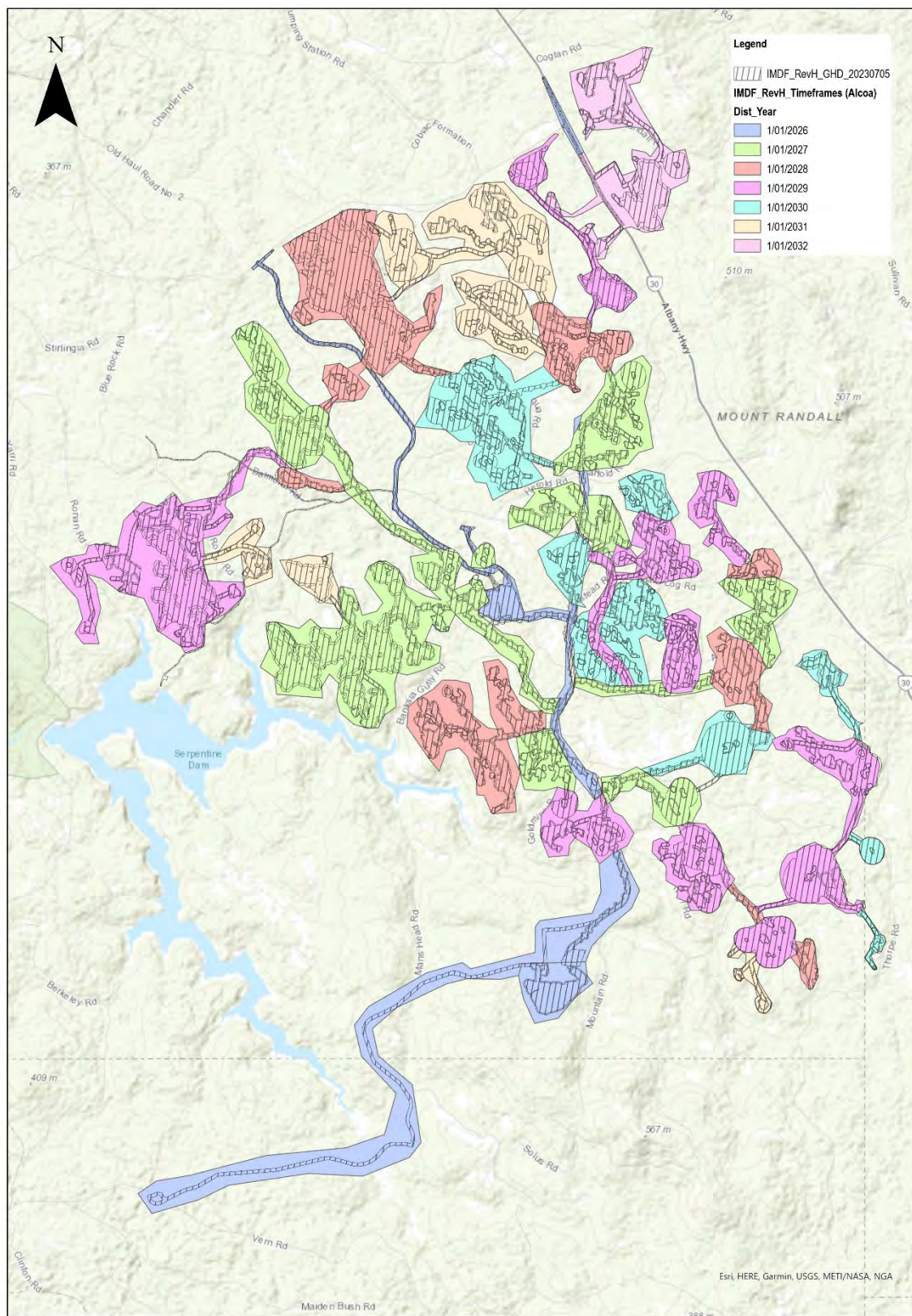


Figure 4-1 : Myara Noise Indicative Mining Locations

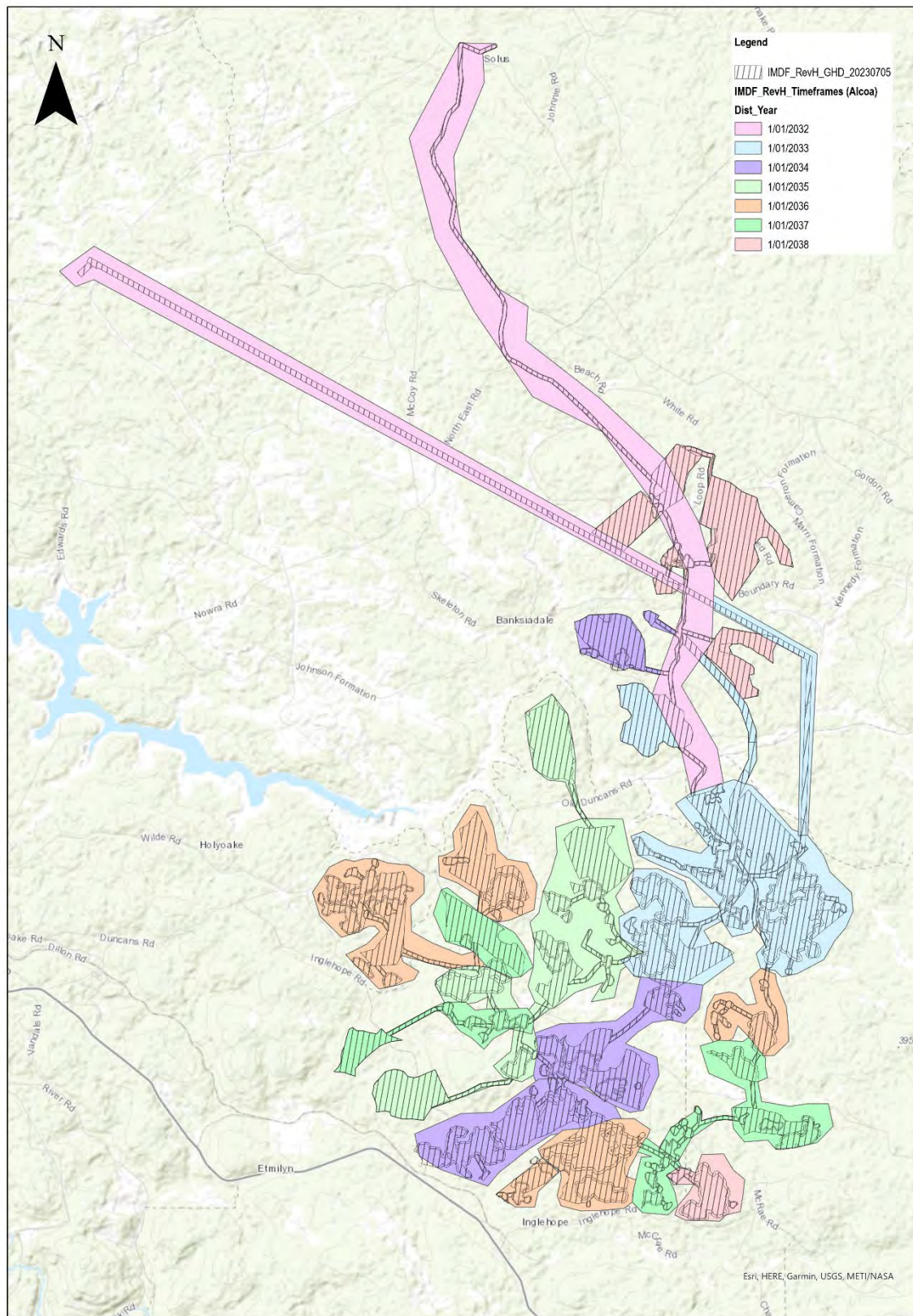


Figure 4-2 : Holyoake Noise Indicative Mining Locations

## 4.7 Sensitivity Modelling

Various modelling scenarios were investigated to determine noise sensitivity zones requiring progressive levels of noise reductions for mobile equipment fleets to achieve Alcoa's noise objectives as mining activities encroach on NSRs. Development and rehabilitation scenarios were excluded from sensitivity modelling.

The noise sensitivity zones are defined in Table 4-6.

**Table 4-6 : Noise Sensitivity Zone Definitions**

| Zone                   | Sensitivity | Definition  |
|------------------------|-------------|---|
| Restricted Mining Zone | Severe      | Zones adjacent to receivers. High risk of non-compliance and/or complaints. Compliance with Assigned Levels is likely to require no mining or highly restricted mining with extensive controls. Opportunistic mining may be possible under 'favourable' weather conditions. Careful management and noise monitoring will be required. |
| Premium Mining Zone    | High        | Zones closest, but not necessarily adjacent, to receivers. Mining noise emissions controllable through 'optimised mining' with a low noise fleet. Mining activities require evaluation through active modelling and customised noise control strategies.  |
| Attenuated Mining Zone | Medium      | Zones further away but still relatively close to receivers. Mining required with noise-controlled fleet. Activities require evaluation through active modelling to determine risk of exceedance during night mining with customised noise control strategies.   |
| Standard Mining Zone   | Low         | Mining with Alcoa's existing fleet possible without requiring additional noise controls or management.  |

The fleet types<sup>9</sup> used for the development of the sensitivity zones are as follows:

- **Standard Fleet:** Current Alcoa Myara mining fleet to be reassigned to Myara North<sup>10</sup>
- **Attenuated Fleet:** Based on the Alcoa Myara Fleet but incorporating additional noise controls (e.g. engine bay treatments and upgraded exhaust silencers) providing a noise reduction of 5 dB compared to the standard fleet; and

<sup>9</sup> Sound power levels are provided in APPENDIX A.

<sup>10</sup> The mobile equipment sound power levels used in the modelling are based on high-noise emitting examples of equipment currently operating in Myara to account for the effects of wear and tear.

- **Premium Fleet:** Based on the current Myara Fleet but assuming a 10 dB reduction compared to the standard fleet<sup>11</sup>

The modelling was used to determine setback distances from NSRs at which progressive noise reductions would be required for the mobile equipment fleets operating.

The following assumptions were adopted for the development of the noise sensitivity zones:

- Noise modelling scenarios assumed 1 mining work unit<sup>12</sup> comprising:
  - 1 x 250T excavator unit operating within the pit,
  - 1 x 190T haul truck idling at the excavator location within the pit,
  - 1 x Dozer (Komatsu 375/CAT D9 or equivalent) operating within the pit,
  - 4 x 190T haul trucks travelling between the active pit and ROM stockpile area,
  - 1 x 190T haul truck unloading at high-idle at the ROM stockpile.
- Mining operations have been conservatively assumed to be occurring at surface level<sup>13</sup>.
- Only 1 work unit operating with a 4km radius of the nearest NSRs at one time<sup>14</sup>.

#### 4.7.1 Noise Sensitivity Zones

The noise sensitivity zones for the proposed Myara North and Holyoake mining regions are presented in Figure 4-3 to Figure 4-6.

It is noted that:

- There are no mining activities proposed Indicative Mine Disturbance Footprint (IMDF) in the Night Premium Area for Myara North (refer to Figure 4-4).
- There is a small region of IMDF in the Day Premium Area for Holyoake (refer to Figure 4-5).

---

<sup>11</sup> If the required 10 dB reduction is not feasible through application of engineering controls, then smaller / lower powered equipment models will need to be considered.

<sup>12</sup> It is noted that the setback distances have been developed based on the proposed mining activities, and not development and rehabilitation activities.

<sup>13</sup> Actual in-pit mining to an average depth of 3-5 metres is currently expected. The height of the pit wall is expected to provide some localised shielding of noise emissions when mobile equipment is operating close to the wall.

<sup>14</sup> No simultaneous / multiple operations in close proximity have been considered. It is assumed that Alcoa mine planners will be able to simultaneously mine blocks outside of the 4km radii to obtain the required ore grade mix.

- There is a region of proposed IMDF which falls within Day and Night Premium Area for Holyoake (refer to Figure 4-5).

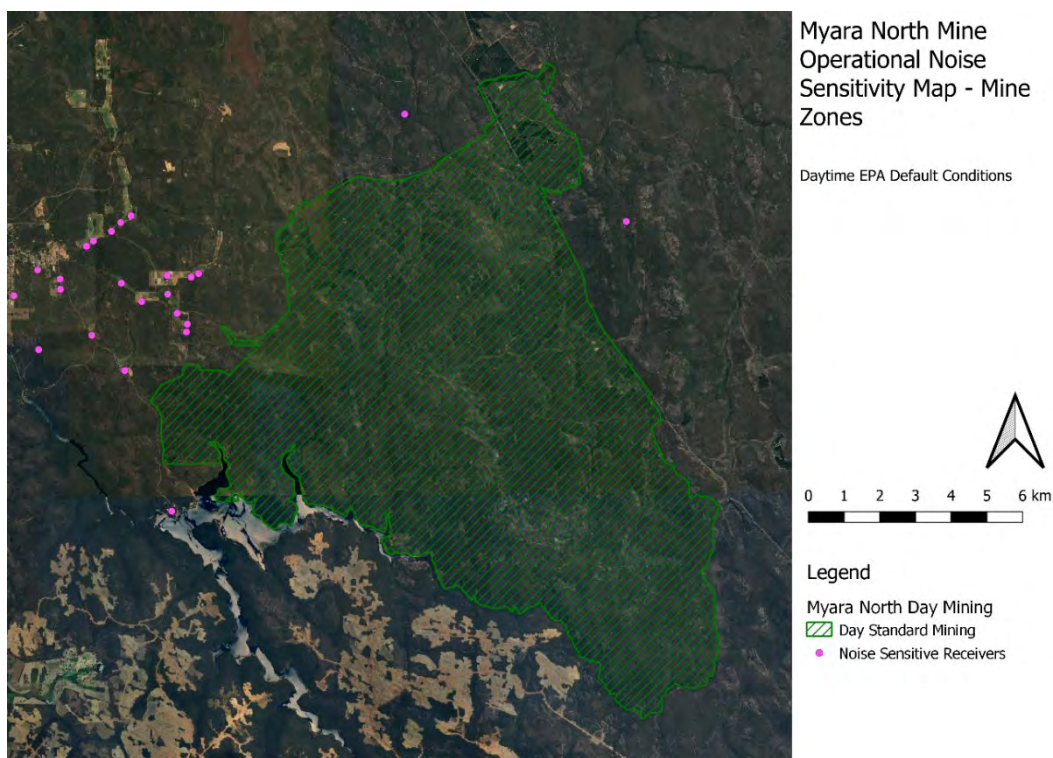


Figure 4-3 : Myara North Daytime Mining Noise Sensitivity Zones (Google Earth, Image ©2023 Airbus)

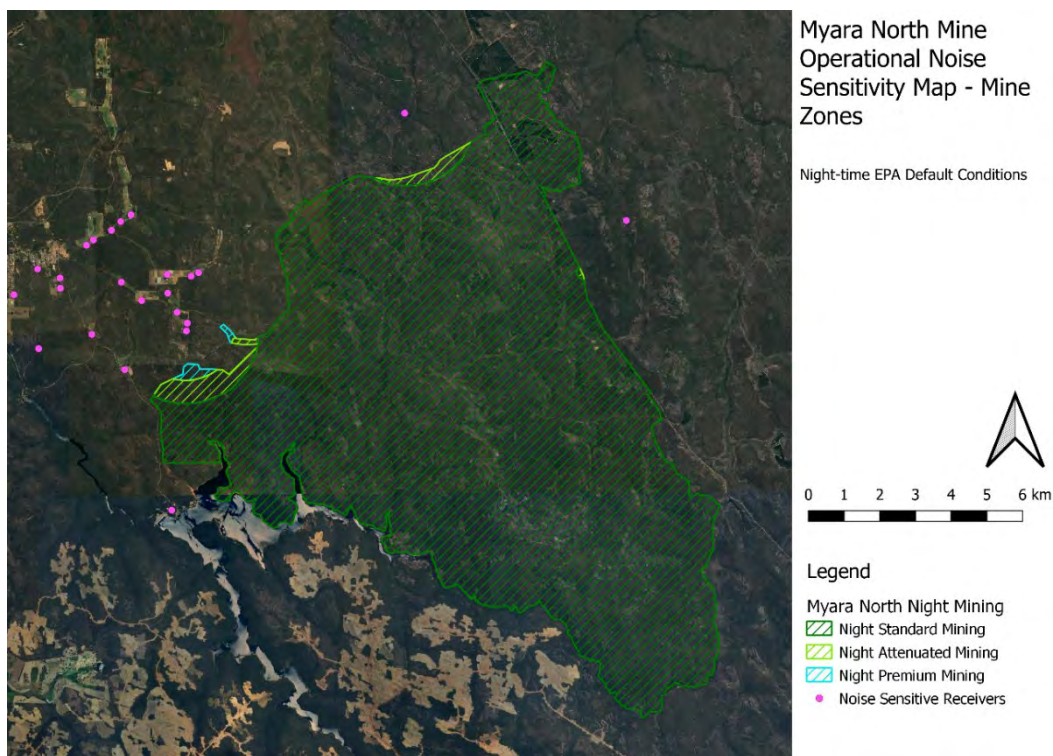


Figure 4-4 : Myara North Nighttime Mining Noise Sensitivity Zones (Google Earth, Image ©2023 Airbus)

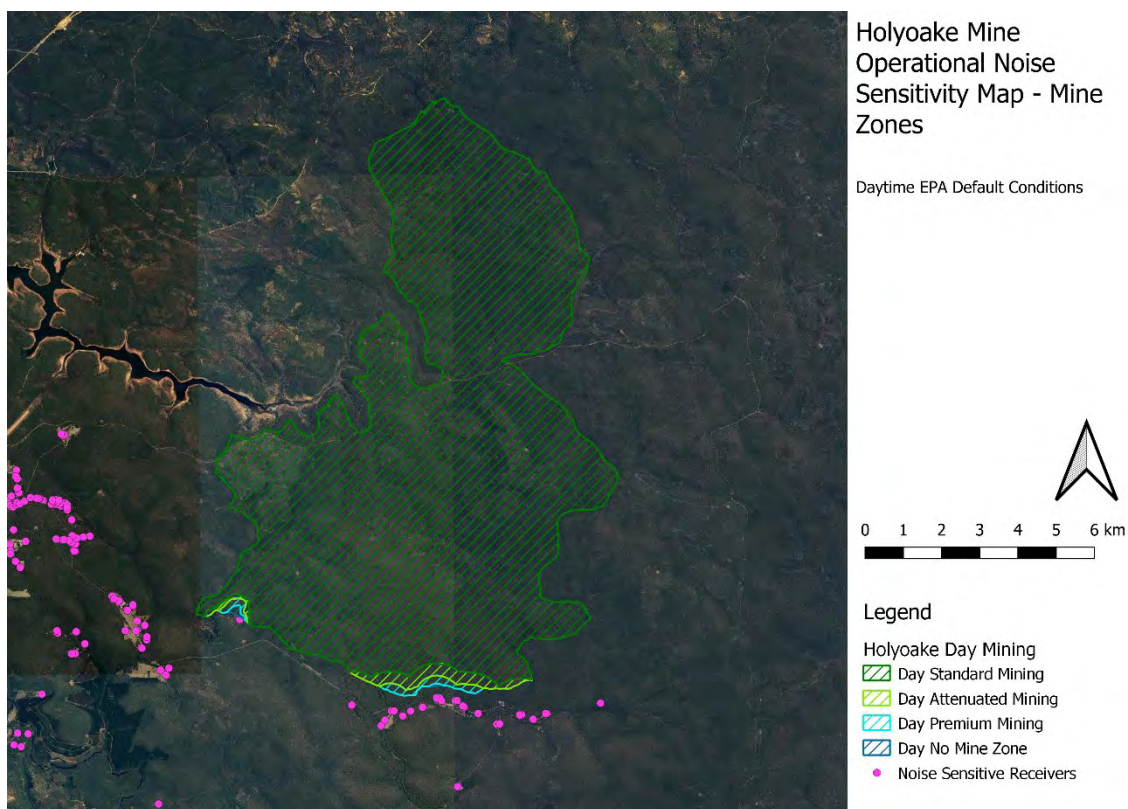


Figure 4-5 : Holyoake Daytime Mining Noise Sensitivity Zones (Google Earth, Image ©2023 Airbus)

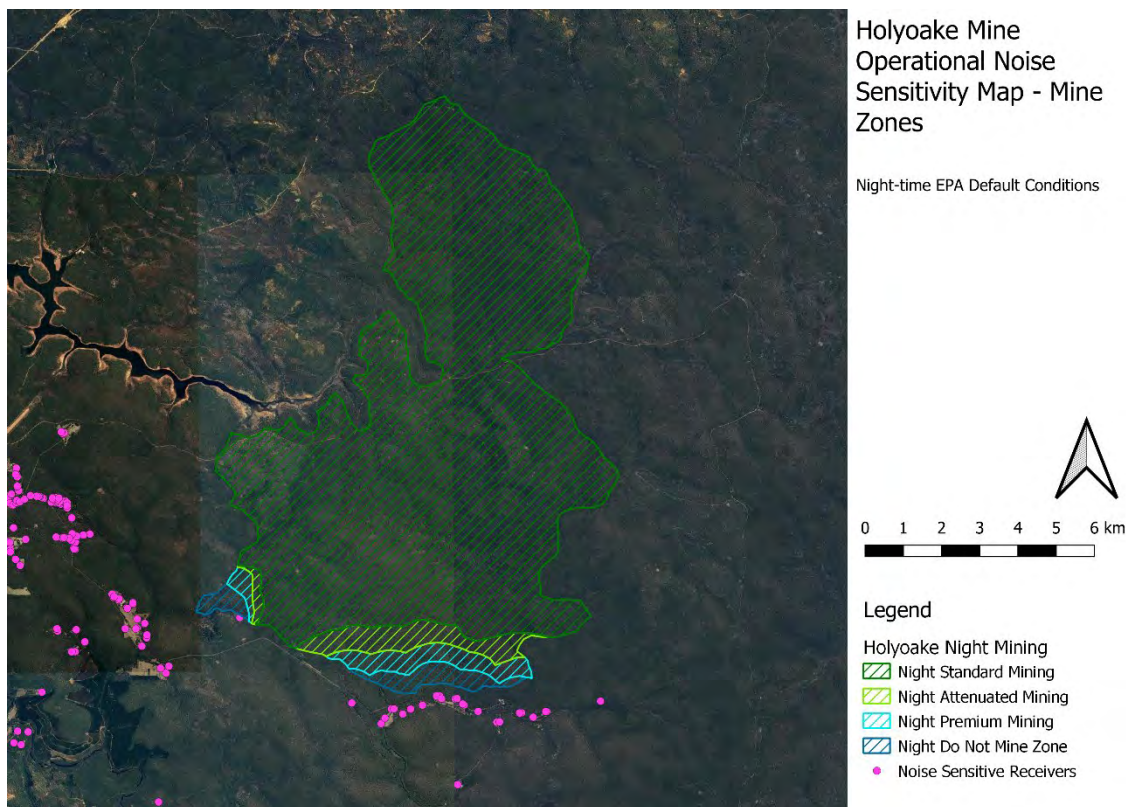


Figure 4-6 : Holyoake Nighttime Mining Noise Sensitivity Zones (Google Earth, Image ©2023 Airbus)

## 4.8 Modelling to Assess Noise Impacts

Noise modelling contours have been prepared to show the envelope of worst-case noise impacts for the mining operations at North Myara and Holyoake. The contours were developed by modelling multiple scenarios with mining operations distributed throughout the development envelope. Each scenario included sources representing fixed plant and infrastructure, mining operations, pit development and rehabilitation activities, and ore haulage.

For mining activities located within the sensitivity zones described in the previous section, noise attenuations were applied to the mining fleets as defined in section 4.7. Outside of these zones, standard mining fleets were assumed with no noise attenuation.

Noise contours are presented as noise worst-case envelopes for each year of the projected mine life as well as an overall contour for the entire life of each mining area. The noise contours include the relevant Assigned Level (45 dB(A) for daytime and 35 dB(A) for nighttime) as well as a level 5 dB below the assigned level to indicate the area which would be above the Assigned Level if tonality were to be evident in the noise emission. The 30 dBA contour is also included to provide an indication of the area over which mining operations are likely to be audible.

The highest predicted noise levels at each noise sensitive receiver are presented for each year and for the entire life of each mine. The predicted levels represent the contribution of the mining operations to overall noise levels and do not include noise emissions for existing plant and equipment. This is considered appropriate as the Myara North and Holyoake mine region development involves a future extension of the current Myara region rather than additional mining concurrent with the existing operations.

During the modeling process, the worst-case consideration in regards to the noise equipment locations for mine developmental activities (i.e. mine construction and rehabilitation activities) has been undertaken, i.e. all equipment operating at the pit edge closer to the adjacent noise sensitive receptors. This has allowed for a conservative estimate of predicted noise levels during development and rehabilitation phases. However, the realistic scenario for mine construction and rehabilitation activities for individual mine pit is that equipment will spread across the pit area during operation.

## 5 NOISE MODELLING RESULTS

The following sections provide worst-case noise level predictions for Myara North and Holyoak for each year of the mining operations. Noise contour envelopes representing the worst-case noise impact over the life of the mining operations are also included. Worst-case noise contours for each year are presented in. Results are included for both daytime and nighttime mining operations.

### 5.1 Noise Modelling Results for Myara North Development

Table 5-1 describes the mining activities included for each year of mining at Myara North.

**Table 5-1 : Noise Modelling Scenarios for Myara North**

| Scenario | Year | Mining Activities   | Long Haul Activities <sup>15</sup>              |
|----------|------|---|---|
| A        | 2026 | Construction Activities in 2027 pits  | Long haul road construction activities commence |
| B        | 2027 | Mining Operations in 2027 pits and Mine construction activities in 2028 pits                            | Long haul ore trucking commences                |
| C        | 2028 | Mining Operations in 2028 pits, Mine construction activities in 2029 pits and rehabilitation activities | long haul ore trucking continues                |
| D        | 2029 | Mining Operations in 2029 pits, Mine construction activities in 2030 pits and rehabilitation activities | Long haul ore trucking continues                |
| E        | 2030 | Mining Operations in 2030 pits, Mine construction activities in 2031 pits and rehabilitation activities | Long haul ore trucking continues                |
| F        | 2031 | Mining Operations in 2031 pits, Mine construction activities in 2032 pits and rehabilitation activities | Long haul ore trucking continues                |
| G        | 2032 | Mining Operations in 2032 pits, Mine construction activities in 2033 pits and rehabilitation activities | Long haul ore trucking continues                |
| H        | 2033 | Mining Operations in 2033 pits, Mine construction activities in 2034 pits and rehabilitation activities | Long haul ore trucking continues                |
| I        | 2034 | Rehabilitation activities   | Long haul ore trucking ceases                   |

#### 5.1.1 Daytime Noise Level Predictions for Myara North

Table 5-2 presents the highest predicted daytime noise levels in each year for Myara North in each year at each of the selected receivers under worst-case meteorological conditions. Results

<sup>15</sup> Noise impacts associated with long haul road construction have been excluded from the model.

presented in **bold text** denote the highest predictions over the life of the mining operations. Daytime predicted noise levels are not anticipated to exceed the assigned levels during the life of mine.

**Table 5-2 : Highest Predicted Daytime Noise Levels for Myara North**

| NSRs                            | Highest Predicted Daytime Noise Level at Noise Sensitive Receivers, dB(A) |      |             |             |             |             |      |      |      |      |
|---------------------------------|---|------|-------------|-------------|-------------|-------------|------|------|------|------|
|                                 | A   | B    | C           | D           | E           | F           | G    | H    | I    | Max  |
| NSR1                            | 9.1   | 19.5 | 18.6        | <b>24.5</b> | 20.5        | 23.2        | 14.4 | 13.9 | <1   | 24.5 |
| NSR2                            | 5.6   | 22.4 | 26.1        | 27.8        | <b>28.3</b> | 26.6        | 21.7 | 18.9 | 11.8 | 28.3 |
| NSR3                            | <1  | 12.7 | 13.7        | <b>20.5</b> | 18.0        | 20.1        | 10.6 | 10.3 | 1.9  | 20.5 |
| NSR4                            | 10.8  | 20.0 | 22.5        | <b>27.1</b> | 25.3        | 26.9        | 20.3 | 19.7 | 10.5 | 27.1 |
| NSR5                            | 6.7   | 18.1 | 22.1        | <b>24.8</b> | 23.5        | 24.1        | 17.7 | 16.3 | 11.3 | 24.8 |
| NSR6                            | 11.3  | 22.6 | 25.9        | <b>30.6</b> | 29.1        | 30.5        | 23.0 | 22.7 | 8.7  | 30.6 |
| NSR7                            | 6.9   | 20.5 | <b>27.2</b> | 26.7        | 26.9        | 25.5        | 19.5 | 18.9 | 12.7 | 27.2 |
| NSR8                            | 14.1  | 27.1 | 32.4        | <b>33.6</b> | 33.4        | 33.2        | 27.2 | 26.4 | 13.9 | 33.6 |
| NSR9                            | 14.5  | 27.8 | 32.1        | <b>35.2</b> | 34.6        | 34.9        | 28.2 | 27.6 | 13.9 | 35.2 |
| NSR10                           | 14.8  | 29.2 | 32.9        | <b>38.0</b> | 37.3        | 37.9        | 30.0 | 29.6 | 14.0 | 38.0 |
| NSR11                           | 16.1  | 30.5 | 33.7        | <b>41.1</b> | 40.6        | 41.0        | 32.2 | 31.6 | 12.5 | 41.1 |
| NSR12                           | 15.5  | 30.7 | 34.0        | <b>40.2</b> | 39.6        | 40.1        | 32.0 | 31.1 | 13.8 | 40.2 |
| NSR13                           | 13.8  | 29.6 | 35.1        | <b>35.4</b> | 35.2        | 34.1        | 27.4 | 25.3 | 14.6 | 35.4 |
| NSR14                           | 12.9  | 30.0 | 35.3        | <b>35.5</b> | 34.9        | 34.4        | 26.6 | 27.9 | 13.5 | 35.5 |
| NSR16                           | 10.0  | 24.8 | 27.0        | <b>28.3</b> | 27.0        | 26.4        | 20.9 | 20.4 | 10.1 | 28.3 |
| NSR17                           | 6.6   | 23.3 | 26.0        | <b>26.0</b> | 25.5        | 23.0        | 18.7 | 18.2 | 12.6 | 26.0 |
| NSR18                           | 8.7   | 22.8 | 25.2        | <b>27.0</b> | 25.6        | 25.5        | 19.9 | 19.6 | 11.1 | 27.0 |
| NSR19                           | 10.3  | 21.2 | 25.2        | <b>26.7</b> | 26.0        | 26.1        | 20.9 | 20.2 | 12.4 | 26.7 |
| NSR20                           | 9.2   | 20.4 | 24.1        | <b>26.2</b> | 25.2        | 25.7        | 19.7 | 19.4 | 11.1 | 26.2 |
| NSR21                           | 9.9   | 18.9 | 22.3        | <b>24.9</b> | 23.8        | 24.7        | 19.4 | 18.6 | 10.9 | 24.9 |
| NSR22                           | 9.5   | 17.0 | 19.7        | <b>24.2</b> | 22.2        | 24.0        | 18.4 | 17.2 | 10.0 | 24.2 |
| NSR23<br>Monadnocks<br>Campsite | 17.5  | 31.4 | 32.5        | <b>33.1</b> | 31.5        | 29.6        | 30.6 | 26.2 | 19.5 | 33.1 |
| NSR24 Mt<br>Cooke<br>Campsite   | 12.8  | 22.1 | 22.7        | 29.7        | 27.5        | <b>30.3</b> | 24.2 | 19.8 | 7.5  | 30.3 |

| NSRs                          | Highest Predicted Daytime Noise Level at Noise Sensitive Receivers, dB(A) |      |      |      |      |             |      |      |      |      |
|-------------------------------|---|------|------|------|------|-------------|------|------|------|------|
|                               | A   | B    | C    | D    | E    | F           | G    | H    | I    | Max  |
| NSR 25<br>Wungong<br>Campsite | 14.5  | 24.3 | 38.7 | 40.0 | 40.2 | <b>42.1</b> | 39.4 | 40.2 | 34.5 | 42.1 |

Figure 4-5 and Figure 4-6 shows the worst-case envelope of noise level predictions for the mining activities and development/rehabilitation respectively. Individual contours for each year are presented in APPENDIX C.

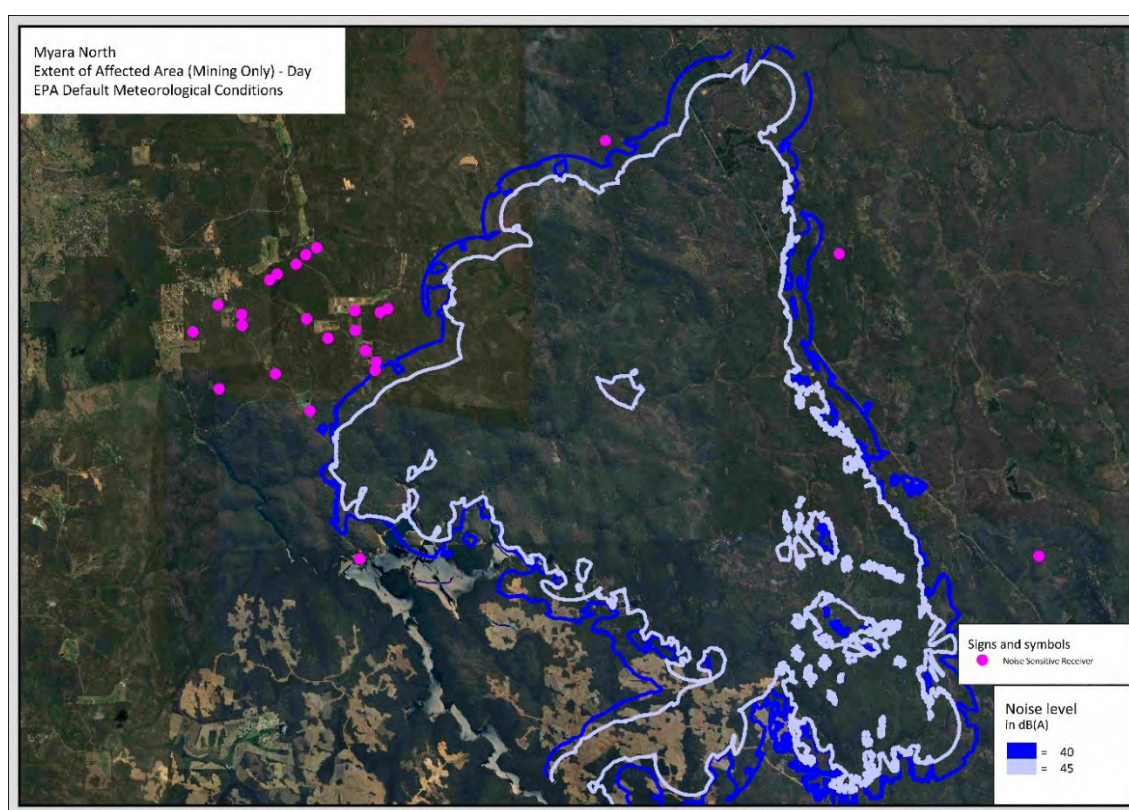


Figure 5-1 : Myara North Daytime Mining Overall Life of Mine Contour (Google Earth, Image ©2023 Airbus)

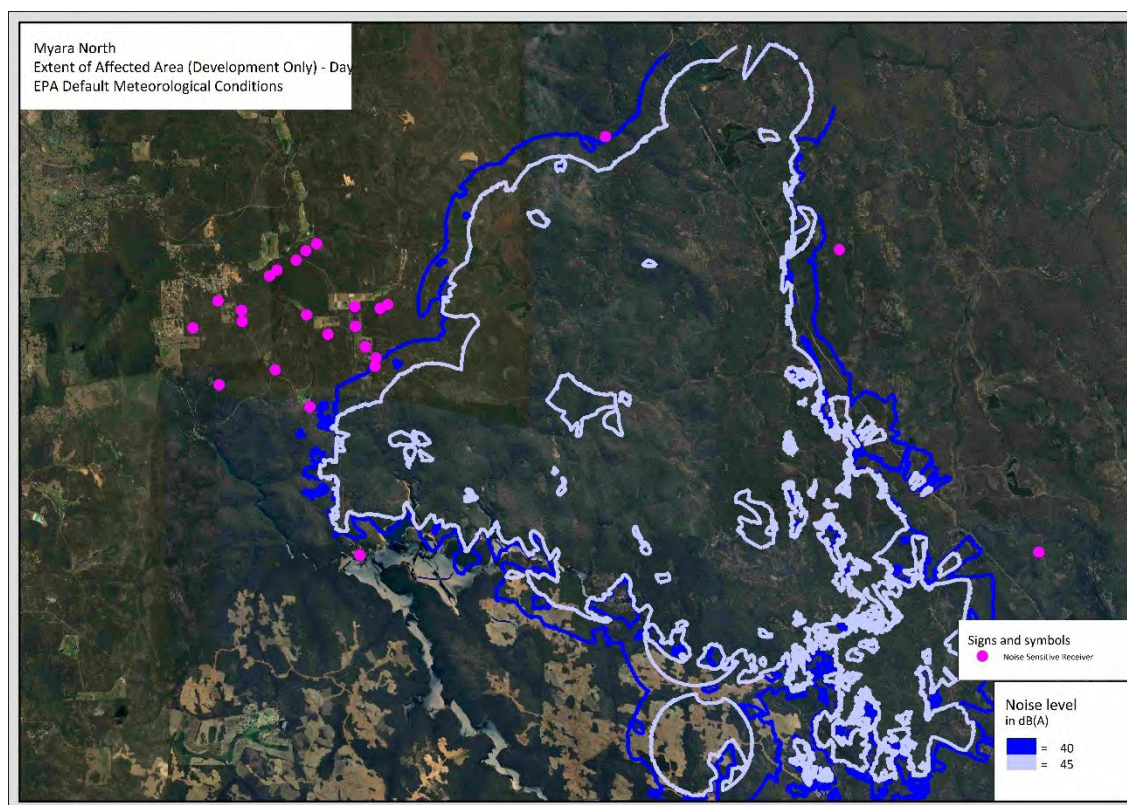


Figure 5-2 : Myara North Daytime Development/Rehabilitation Overall Life of Mine Contour (Google Earth, Image ©2023 Airbus)

### 5.1.2 Nighttime Noise Level Predictions for Myara North

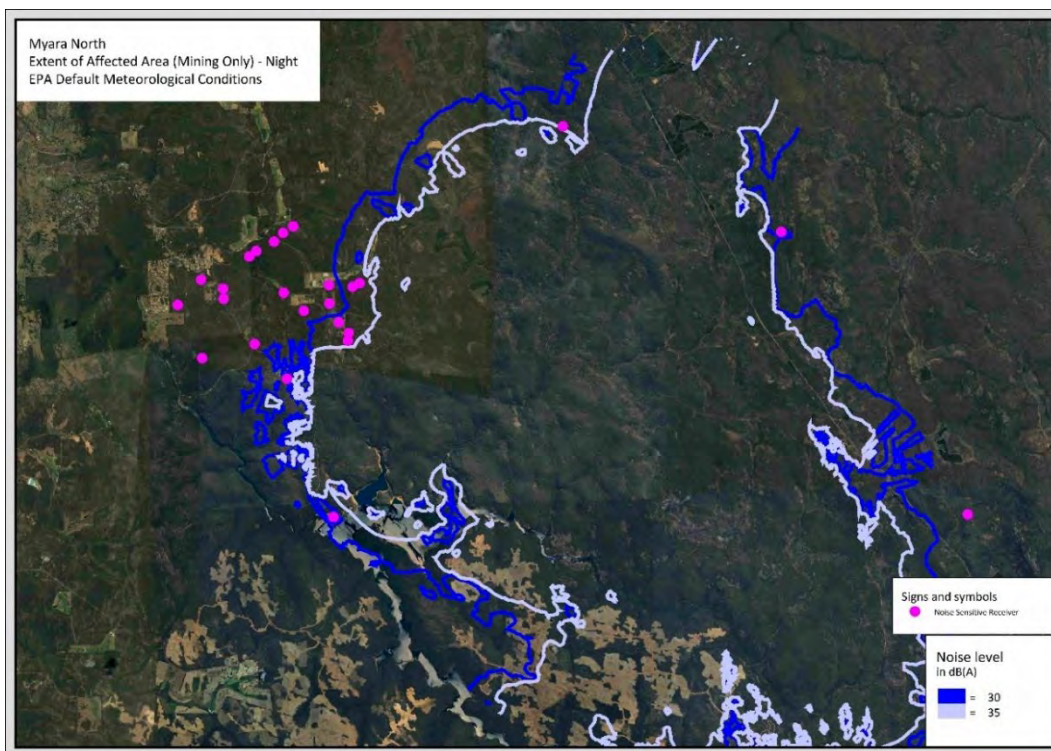
Table 5-3 presents the highest predicted nighttime noise levels in each year for Myara North at each of the selected receivers under worst-case meteorological conditions. Results presented in **bold text** denote the highest predictions over the life of the mining operations. Results highlighted in orange denote periods with the highest risk of non-compliance. As can be seen from the table, the highest exceedance (i.e. 39.4 dB(A) at NSR11) is predicted to be less than 5 dB over the nighttime Assigned Level of 35 dB(A). The dominant sources for the predicted exceedances are from mine developmental activities (i.e. mine construction and rehabilitation activities).

Table 5-3 : Highest Predicted Nighttime Noise Levels for Myara North

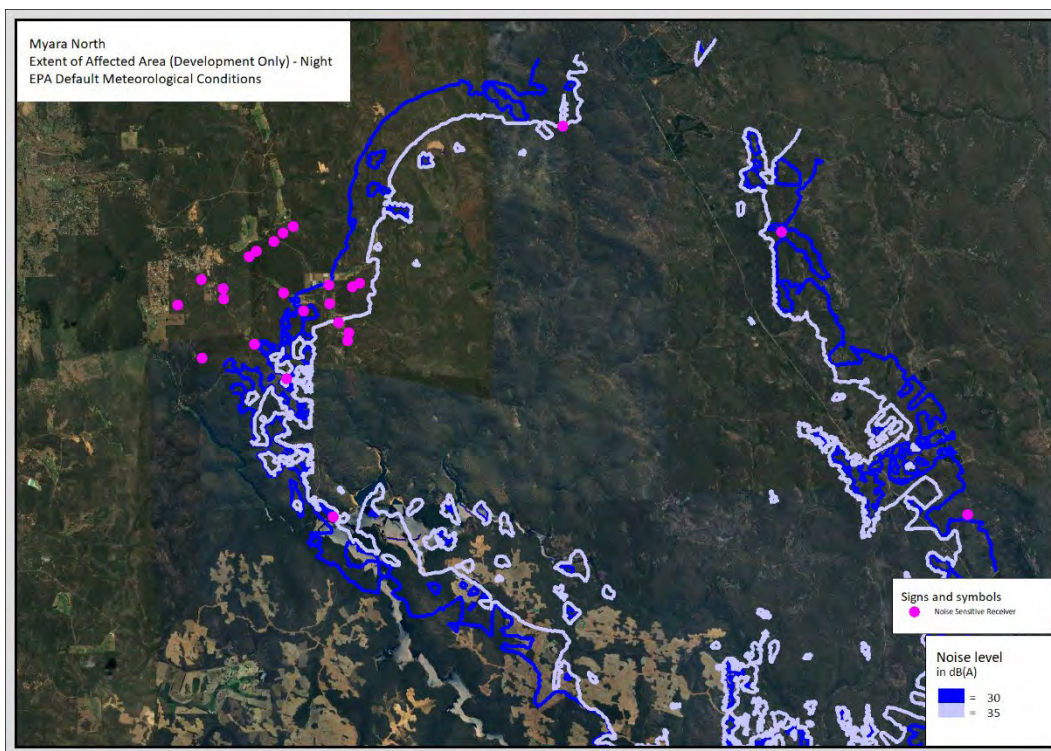
| NSRs | Highest Predicted Nighttime Noise Level at Noise Sensitive Receivers, dB(A) |      |      |             |      |      |      |      |      |      |
|------|---|------|------|-------------|------|------|------|------|------|------|
|      | A   | B    | C    | D           | E    | F    | G    | H    | I    | Max  |
| NSR1 | 9.7   | 20.2 | 19.3 | <b>24.9</b> | 21.1 | 23.5 | 15.2 | 14.6 | <1   | 24.9 |
| NSR2 | 5.0   | 23.2 | 26.9 | <b>27.7</b> | 27.6 | 26.1 | 22.5 | 19.5 | 12.5 | 27.7 |
| NSR3 | <1  | 13.2 | 14.2 | <b>20.7</b> | 18.3 | 20.2 | 11.2 | 10.8 | 2.6  | 20.7 |
| NSR4 | 10.1  | 20.8 | 23.2 | <b>27.1</b> | 25.3 | 26.9 | 21.1 | 20.5 | 11.2 | 27.1 |

| NSRs                            | Highest Predicted Nighttime Noise Level at Noise Sensitive Receivers, dB(A) |      |             |             |      |             |      |      |      |      |
|---------------------------------|---|------|-------------|-------------|------|-------------|------|------|------|------|
|                                 | A   | B    | C           | D           | E    | F           | G    | H    | I    | Max  |
| NSR5                            | 6.0   | 19.1 | 22.8        | <b>25.4</b> | 24.3 | 24.6        | 18.5 | 17.0 | 12.1 | 25.4 |
| NSR6                            | 10.5  | 23.5 | 26.8        | <b>30.5</b> | 28.4 | 30.4        | 24.0 | 23.5 | 9.5  | 30.5 |
| NSR7                            | 6.3   | 21.1 | <b>28.0</b> | 26.3        | 27.0 | 24.7        | 20.2 | 19.6 | 13.4 | 28.0 |
| NSR8                            | 13.4  | 27.9 | <b>33.1</b> | 32.8        | 32.7 | 32.1        | 28.0 | 27.2 | 14.6 | 33.1 |
| NSR9                            | 13.8  | 28.5 | 32.8        | <b>34.3</b> | 33.2 | 34.0        | 29.0 | 28.4 | 14.6 | 34.3 |
| NSR10                           | 14.1  | 30.0 | 33.6        | <b>36.8</b> | 34.9 | 36.6        | 30.8 | 30.4 | 14.6 | 36.8 |
| NSR11                           | 15.3  | 31.2 | 34.3        | <b>39.4</b> | 36.8 | 39.4        | 32.8 | 32.3 | 13.3 | 39.4 |
| NSR12                           | 14.7  | 31.4 | 34.6        | <b>38.5</b> | 36.3 | 38.3        | 32.7 | 31.8 | 14.5 | 38.5 |
| NSR13                           | 13.0  | 30.3 | <b>35.8</b> | 34.4        | 34.6 | 32.3        | 28.2 | 26.2 | 15.3 | 35.8 |
| NSR14                           | 12.0  | 30.8 | <b>36.0</b> | 34.5        | 34.2 | 32.8        | 27.4 | 28.8 | 14.3 | 36.0 |
| NSR16                           | 9.2   | 25.6 | 27.9        | <b>28.2</b> | 27.2 | 25.7        | 21.8 | 21.2 | 10.8 | 28.2 |
| NSR17                           | 6.0   | 24.2 | <b>26.8</b> | 26.4        | 26.1 | 23.0        | 19.5 | 19.0 | 13.3 | 26.8 |
| NSR18                           | 7.9   | 23.8 | 26.1        | <b>27.2</b> | 25.8 | 25.4        | 20.9 | 20.5 | 11.8 | 27.2 |
| NSR19                           | 9.6   | 22.0 | 25.9        | <b>26.6</b> | 26.1 | 25.9        | 21.7 | 21.0 | 13.1 | 26.6 |
| NSR20                           | 8.5   | 21.3 | 25.0        | <b>26.1</b> | 25.4 | 25.4        | 20.6 | 20.2 | 11.8 | 26.1 |
| NSR21                           | 9.2   | 19.8 | 23.0        | <b>24.9</b> | 24.0 | 24.5        | 20.2 | 19.4 | 11.6 | 24.9 |
| NSR22                           | 8.8   | 17.8 | 20.3        | <b>24.0</b> | 22.4 | 23.8        | 19.2 | 18.0 | 10.8 | 24.0 |
| NSR23<br>Monadnocks<br>Campsite | 16.8  | 32.0 | 33.1        | <b>33.7</b> | 32.3 | 30.3        | 31.4 | 27.0 | 20.0 | 33.7 |
| NSR24 Mt<br>Cooke<br>Campsite   | 12.6  | 22.8 | 23.3        | 30.4        | 28.4 | <b>30.7</b> | 25.2 | 20.4 | 8.3  | 30.7 |
| NSR 25<br>Wungong<br>Campsite   | 13.7  | 25.2 | 35.2        | 37.6        | 36.2 | <b>37.8</b> | 37.5 | 36.8 | 35.2 | 37.8 |

Figure 5-3 and Figure 5-4 shows the worst-case envelope of noise level predictions for the mining activities and development/rehabilitation respectively. Individual contours for each year are presented in APPENDIX C.



**Figure 5-3 : Myara North Nighttime Mining Overall Life of Mine Contour (Google Earth, Image ©2023 Airbus)**



**Figure 5-4 : Myara North Nighttime Development/Rehabilitation Overall Life of Mine Contour (Google Earth, Image ©2023 Airbus)**

## 5.2 Noise Modelling Results for Holyoake Mine Development

Table 5-4 describes the mining activities included for each year of mining at Holyoake.

**Table 5-4 : Noise Modelling Scenarios for Holyoake**

| Scenario | Year | Mining Activities   | Long Haul /Fixed Plant Activities <sup>16</sup>              |
|----------|------|---|--|
| A        | 2033 | Mine construction activities in 2034 pits   | Long haul road /fixed plant construction activities commence |
| B        | 2034 | Mining Operations in 2034 pits, Mine construction activities in 2035 pits and rehabilitation activities | Long haul ore trucking/fixed plant commences operations      |
| C        | 2035 | Mining Operations in 2035 pits, Mine construction activities in 2036 pits and rehabilitation activities | Long haul ore trucking/fixed plant continue operating        |
| D        | 2036 | Mining Operations in 2036 pits, Mine construction activities in 2037 pits and rehabilitation activities | Long haul ore trucking/fixed plant continue operating        |
| E        | 2037 | Mining Operations in 2037 pits, Mine construction activities in 2038 pits and rehabilitation activities | Long haul ore trucking/fixed plant continue operating        |
| F        | 2038 | Mining Operations in 2038 pits, Mine construction activities in 2039 pits and rehabilitation activities | Long haul ore trucking/fixed plant continue operating        |
| G        | 2039 | Mining Operations in 2039 pits, and rehabilitation activities   | Long haul ore trucking/fixed plant continue operating        |
| H        | 2040 | Rehabilitation activities   | Long haul ore trucking ceases                                |

### 5.2.1 Daytime Noise Level Predictions for Holyoake

Table 5-5 presents the highest predicted daytime noise levels in each year for Holyoake at each of the selected receivers under worst-case meteorological conditions. Results presented in **bold text** denote the highest predictions over the life of the mining operations. Results highlighted in orange denote periods with the highest risk of non-compliance. As can be seen from the table, the highest exceedance (i.e. 47.9 dB(A) at NSR10) is predicted to be less than 3 dB over the daytime Assigned Level of 45 dB(A). The dominant sources for the predicted exceedances are from mine developmental activities (i.e. mine construction and rehabilitation activities).

<sup>16</sup> Noise impacts associated with long haul road / overland conveyor construction have been excluded from the model. Predicted noise levels / contours indicate the worst case received noise levels of either the long haul road / overland conveyor option.

**Table 5-5 : Highest Predicted Daytime Noise Levels for Holyoake**

| NSRs     | Highest Predicted Daytime Noise Level at Noise Sensitive Receivers, dB(A) |      |             |             |             |             |             |      |
|----------|---|------|-------------|-------------|-------------|-------------|-------------|------|
|          | A   | B    | C           | D           | E           | F           | G           | H    |
| H-NSR1   | 24.0  | 38.0 | 34.2        | <b>42.3</b> | 38.3        | 40.6        | 33.5        | 42.3 |
| H-NSR2   | 25.2  | 38.4 | 35.0        | <b>43.2</b> | 39.1        | 41.8        | 34.4        | 43.2 |
| H-NSR3   | 28.3  | 39.5 | 36.8        | <b>44.6</b> | 40.7        | 43.2        | 36.0        | 44.6 |
| H-NSR4   | 27.9  | 39.1 | 36.4        | <b>44.1</b> | 40.5        | 42.7        | 36.3        | 44.1 |
| H-NSR5   | 26.9  | 37.7 | 35.2        | <b>42.1</b> | 40.3        | 41.0        | 37.1        | 42.1 |
| H-NSR6   | 26.5  | 37.6 | 35.1        | <b>43.2</b> | 41.9        | 42.7        | 38.7        | 43.2 |
| H-NSR7   | 25.4  | 37.4 | 34.4        | <b>43.5</b> | 43.6        | 43.7        | 41.0        | 43.7 |
| H-NSR8   | 24.8  | 37.5 | 34.1        | 44.5        | <b>47.4</b> | 46.1        | 45.7        | 47.4 |
| H-NSR9   | 25.0  | 36.7 | 33.7        | 43.2        | <b>47.3</b> | 45.6        | 46.3        | 47.3 |
| H-NSR10  | 22.2  | 33.9 | 31.4        | 39.6        | 47.7        | 46.7        | <b>47.9</b> | 47.9 |
| H-NSR11  | 21.5  | 32.1 | 29.9        | 36.5        | 44.2        | <b>46.6</b> | 45.6        | 46.6 |
| H-NSR12  | 30.3  | 29.4 | 33.1        | 33.5        | 40.4        | <b>43.8</b> | 42.6        | 43.8 |
| H-NSR13  | 22.0  | 28.7 | 28.6        | 32.3        | 38.4        | <b>43.4</b> | 41.8        | 43.4 |
| H-NSR14  | 28.7  | 26.6 | 31.5        | 29.3        | 35.2        | <b>40.1</b> | 38.9        | 40.1 |
| H-NSR15  | 17.6  | 25.3 | 25.4        | 28.2        | <b>28.3</b> | 26.1        | 26.3        | 28.3 |
| H-NSR16  | 26.4  | 25.3 | <b>31.7</b> | 28.2        | 28.4        | 19.6        | 18.7        | 31.7 |
| H-NSR17  | 4.8   | 7.2  | 13.7        | 15.7        | <b>20.0</b> | 15.8        | 14.7        | 20.0 |
| H-NSR18  | 8.4   | 11.0 | 16.7        | 17.8        | <b>23.6</b> | 19.3        | 20.8        | 23.6 |
| H-NSR19  | 14.4  | 16.9 | 31.3        | 27.4        | <b>35.7</b> | 29.4        | 33.8        | 35.7 |
| H-NSR20  | 22.3  | 22.7 | 31.1        | 27.9        | <b>32.5</b> | 25.5        | 29.1        | 32.5 |
| H-NSR21  | 10.0  | 12.5 | 18.8        | 17.1        | <b>21.7</b> | 16.7        | 19.3        | 21.7 |
| H-NSR22  | 20.2  | 21.7 | 29.8        | 28.3        | <b>32.4</b> | 27.3        | 29.5        | 32.4 |
| H-NSR23  | 13.5  | 14.2 | 20.5        | 17.9        | <b>21.6</b> | 16.1        | 18.9        | 21.6 |
| H-NSR24  | 19.9  | 20.0 | <b>24.2</b> | 21.7        | 21.7        | 17.1        | 18.6        | 24.2 |
| H-NSR 25 | 10.4  | 15.2 | 19.1        | <b>25.1</b> | 24.0        | <b>25.1</b> | 20.5        | 25.1 |
| H-NSR 26 | 13.3  | 19.3 | 25.2        | 27.8        | <b>30.3</b> | 28.2        | 27.9        | 30.3 |
| H-NSR 27 | 15.9  | 19.1 | 25.3        | 27.3        | <b>29.8</b> | 27.7        | 27.4        | 29.8 |
| H-NSR 28 | 15.9  | 18.8 | 25.4        | 23.2        | <b>27.8</b> | 20.9        | 25.1        | 27.8 |

| NSRs                               | Highest Predicted Daytime Noise Level at Noise Sensitive Receivers, dB(A) |      |             |             |             |             |             |      |
|------------------------------------|---|------|-------------|-------------|-------------|-------------|-------------|------|
|                                    | A   | B    | C           | D           | E           | F           | G           | H    |
| H-NSR 29                           | 16.3  | 19.6 | 25.8        | 28.4        | <b>30.5</b> | 28.7        | 28.1        | 30.5 |
| H-NSR 30                           | 16.1  | 19.4 | 25.4        | 27.9        | <b>30.0</b> | 28.2        | 27.6        | 30.0 |
| H-NSR 31                           | 15.2  | 19.0 | 24.9        | 26.9        | <b>29.4</b> | 27.2        | 27.0        | 29.4 |
| H-NSR 32                           | 15.6  | 19.0 | 24.9        | 27.1        | <b>29.3</b> | 27.4        | 27.0        | 29.3 |
| H-NSR 33                           | 15.2  | 18.7 | 24.4        | 26.5        | <b>28.7</b> | 26.7        | 26.3        | 28.7 |
| H-NSR 34                           | 10.8  | 11.5 | 18.0        | 16.4        | <b>19.7</b> | 15.4        | 17.0        | 19.7 |
| H-NSR 35                           | 6.3   | 9.6  | 15.7        | <b>26.7</b> | 23.0        | <b>26.7</b> | 14.8        | 26.7 |
| H-NSR 36 ETMILYN TRAIL             | 21.3  | 18.5 | 36.3        | 33.9        | <b>38.8</b> | 36.2        | 35.1        | 38.8 |
| H-NSR 37 INGLEHOPE                 | 33.8  | 43.1 | 40.6        | <b>47.8</b> | 42.4        | 45.9        | 32.6        | 47.8 |
| H-NSR 38 CHADORA CAMPSITE          | 24.3  | 25.0 | 27.5        | 27.9        | 39.6        | 33.1        | <b>39.8</b> | 39.8 |
| H-NSR 39 Swamp Oak Campsite        | 18.2  | 20.4 | <b>25.1</b> | 23.4        | 25.0        | 19.6        | 19.9        | 25.1 |
| H-NSR 40 Mt Wells Campsite         | <1  | 8.8  | 9.2         | 6.9         | 7.0         | 6.9         | <b>10.4</b> | 10.4 |
| H-NSR 41 White Horse Hill Campsite | 7.3   | 12.0 | 16.9        | 19.7        | <b>21.3</b> | 18.6        | 8.3         | 21.3 |

Figure 5-5 to Figure 5-7 shows the worst-case envelope of noise level predictions for the mining activities (both conveyor and hauling configurations) and development/rehabilitation respectively. Individual contours for each year are presented in APPENDIX C.

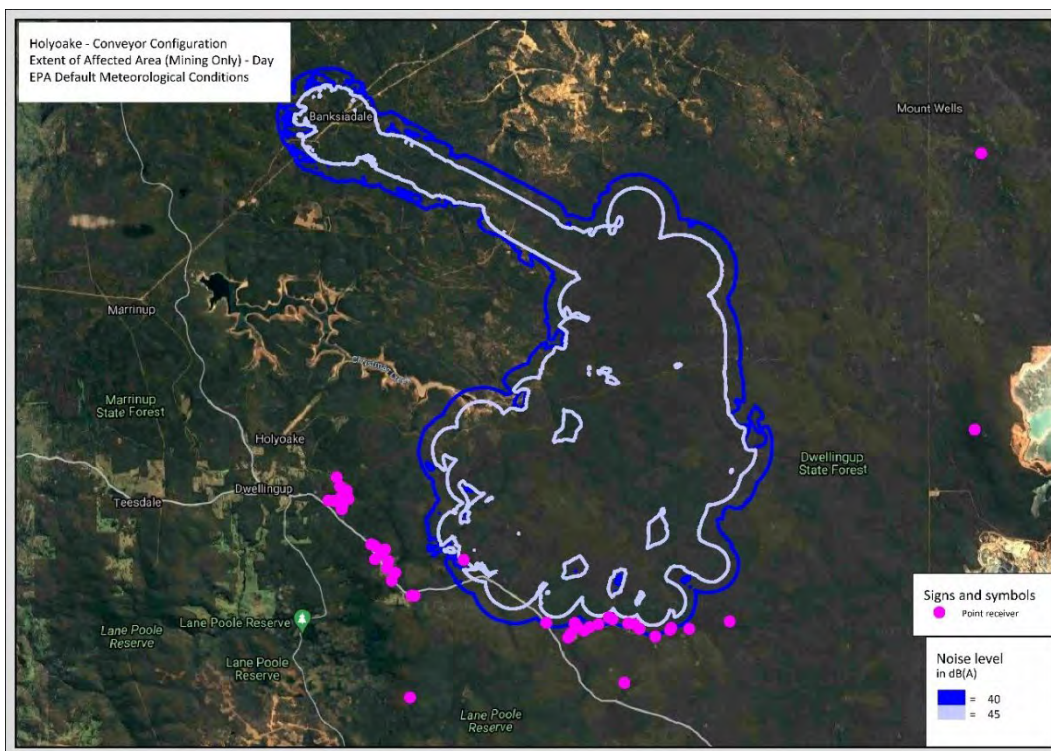


Figure 5-5 : Holyoake Daytime Mining Overall Life of Mine Contour (Conveyor Configuration) (Google Earth, Image ©2023 Airbus)

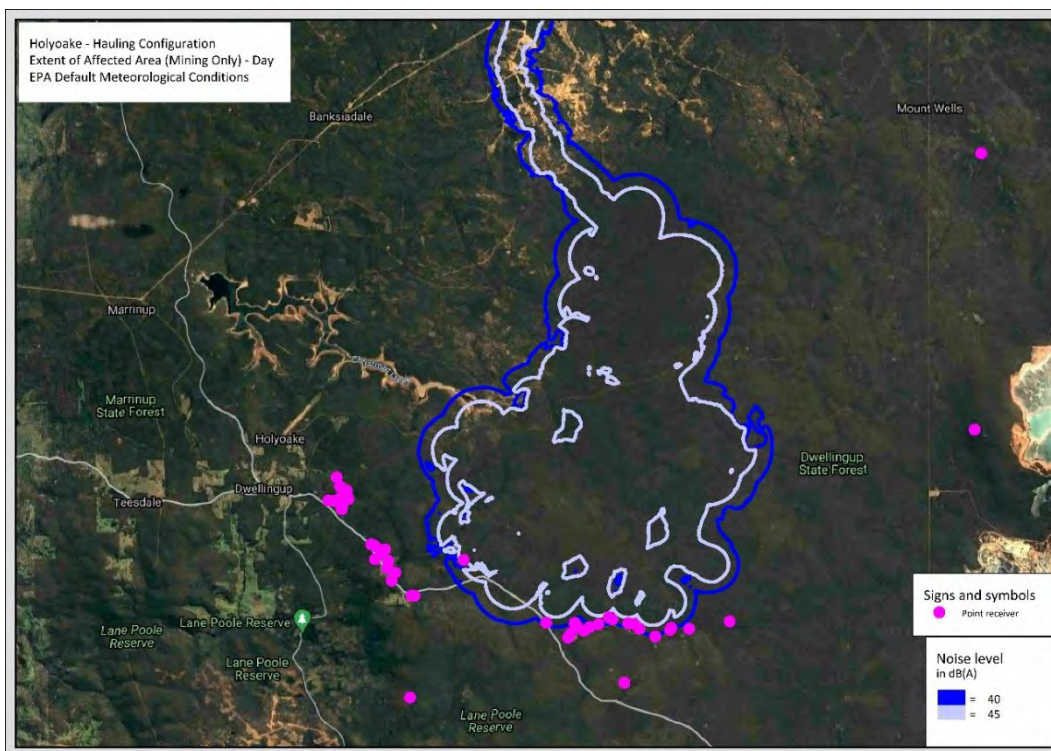
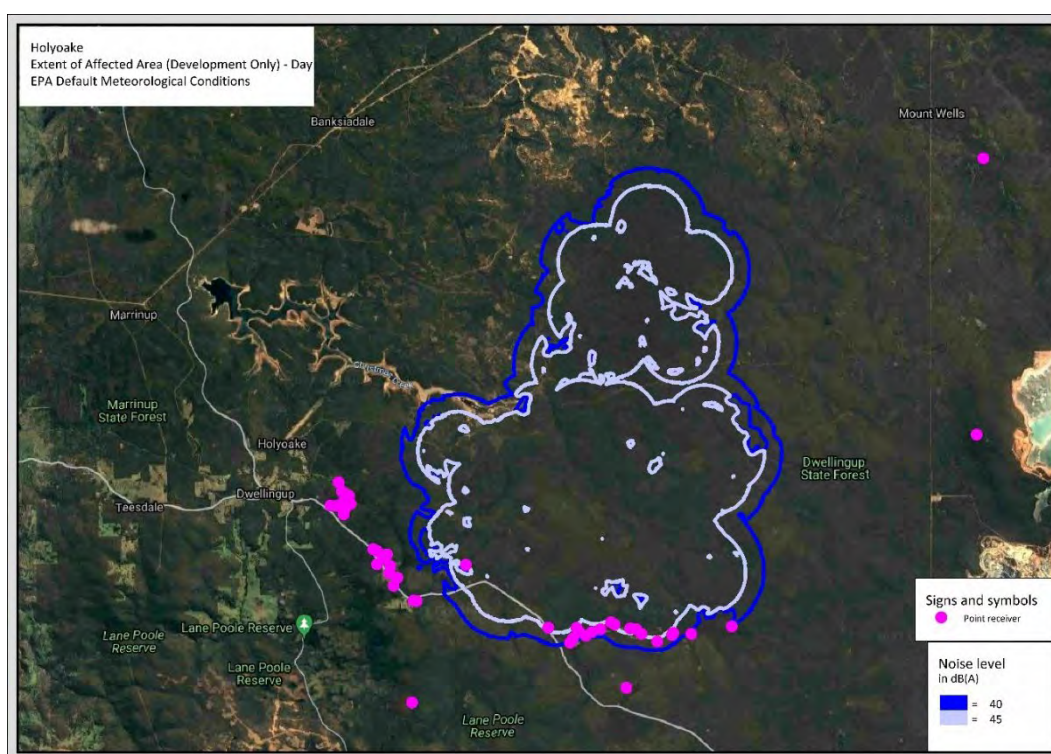


Figure 5-6 : Holyoake Daytime Mining Overall Life of Mine Contour (Hauling Configuration) (Google Earth, Image ©2023 Airbus)



**Figure 5-7 : Holyoake Daytime Development/Rehabilitation Overall Life of Mine Contour (Google Earth, Image ©2023 Airbus)**

## 5.2.2 Nighttime Noise Level Predictions for Holyoake

Table 5-6 presents the highest predicted nighttime noise levels in each year for Holyoake at each of the selected receivers under worst-case meteorological conditions. Results presented in **bold text** denote the highest predictions over the life of the mining operations. Results highlighted in orange denote periods with the highest risk of non-compliance. As can be seen from the table, the highest exceedance (i.e. 42.3 dB(A) at NSR37) is predicted to be up to 7 dB over the nighttime Assigned Level of 35 dB(A), and the remaining exceedances are predicted to be up to 5 dB over the nighttime Assigned Level. The dominant sources for the predicted exceedances are from mine developmental activities (i.e. mine construction and rehabilitation activities).

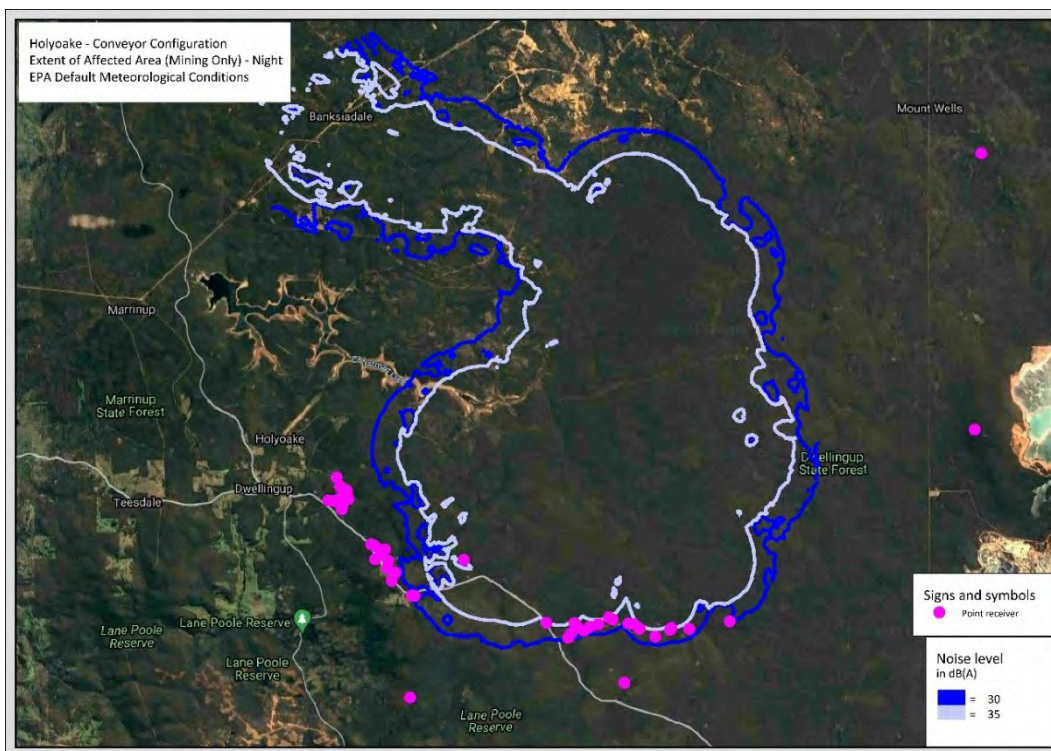
**Table 5-6 : Highest Predicted Nighttime Noise Levels for Holyoake**

| NSRs   | Highest Predicted Nighttime Noise Level at Noise Sensitive Receivers, dB(A) |      |      |             |      |      |      |      |      |
|--------|---|------|------|-------------|------|------|------|------|------|
|        | A   | B    | C    | D           | E    | F    | G    | H    | Max  |
| H-NSR1 | 24.6  | 33.6 | 33.3 | <b>37.4</b> | 34.9 | 34.9 | 28.4 | 22.6 | 37.4 |
| H-NSR2 | 25.9  | 34.0 | 34.1 | <b>38.1</b> | 35.7 | 35.7 | 28.9 | 23.2 | 38.1 |
| H-NSR3 | 29.0  | 35.1 | 35.9 | <b>39.3</b> | 37.2 | 36.8 | 30.0 | 24.4 | 39.3 |
| H-NSR4 | 28.5  | 34.7 | 35.5 | <b>39.0</b> | 36.9 | 36.7 | 30.2 | 24.9 | 39.0 |
| H-NSR5 | 27.6  | 33.4 | 34.6 | <b>37.9</b> | 36.0 | 35.9 | 30.4 | 25.6 | 37.9 |

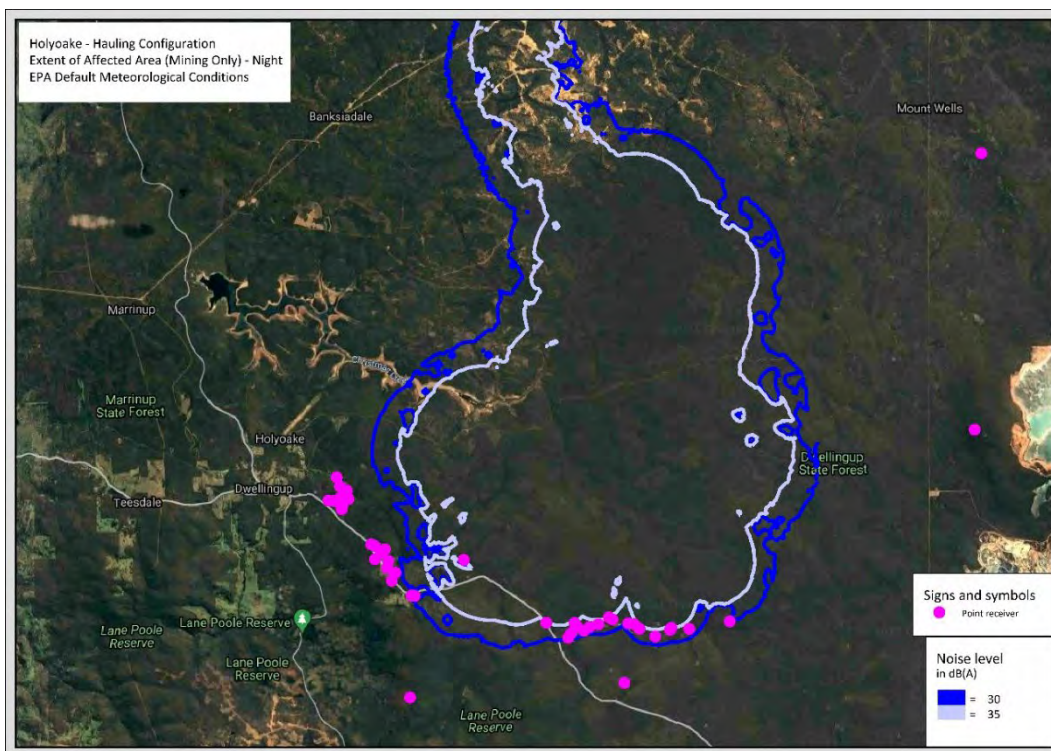
| NSRs     | Highest Predicted Nighttime Noise Level at Noise Sensitive Receivers, dB(A) |      |             |             |             |             |             |      |      |
|----------|---|------|-------------|-------------|-------------|-------------|-------------|------|------|
|          | A   | B    | C           | D           | E           | F           | G           | H    | Max  |
| H-NSR6   | 27.1  | 33.2 | 34.5        | <b>38.9</b> | 36.5        | 37.6        | 31.1        | 26.9 | 38.9 |
| H-NSR7   | 26.1  | 33.0 | 33.8        | <b>39.0</b> | 36.6        | 38.0        | 30.8        | 28.9 | 39.0 |
| H-NSR8   | 25.5  | 33.5 | 33.7        | <b>40.0</b> | 37.9        | 39.6        | 32.7        | 32.1 | 40.0 |
| H-NSR9   | 25.7  | 32.6 | 33.5        | <b>38.8</b> | 37.3        | 38.6        | 33.3        | 32.7 | 38.8 |
| H-NSR10  | 22.9  | 29.9 | 31.3        | 35.6        | 37.2        | <b>38.6</b> | 36.8        | 36.8 | 38.6 |
| H-NSR11  | 22.2  | 28.8 | 30.4        | 32.7        | 37.5        | <b>38.9</b> | 38.2        | 37.9 | 38.9 |
| H-NSR12  | 31.1  | 26.2 | 33.9        | 30.7        | 37.8        | 38.1        | <b>38.4</b> | 37.1 | 38.4 |
| H-NSR13  | 22.8  | 28.9 | 29.5        | 31.6        | 36.0        | <b>38.7</b> | 37.5        | 37.8 | 38.7 |
| H-NSR14  | 29.4  | 27.1 | 32.2        | 28.8        | 34.7        | 35.6        | <b>36.3</b> | 34.9 | 36.3 |
| H-NSR15  | 18.4  | 21.3 | 25.1        | 25.5        | <b>28.0</b> | 26.2        | 26.4        | 23.6 | 28.0 |
| H-NSR16  | 27.1  | 21.7 | <b>31.4</b> | 27.2        | 28.8        | 16.8        | 18.0        | 9.3  | 31.4 |
| H-NSR17  | 5.5   | 6.7  | 14.0        | <b>16.1</b> | 15.1        | 15.3        | 11.1        | <1   | 16.1 |
| H-NSR18  | 9.1   | 10.9 | 17.2        | 18.3        | <b>20.0</b> | 17.8        | 16.7        | 6.1  | 20.0 |
| H-NSR19  | 15.1  | 17.6 | 32.0        | 28.1        | <b>32.7</b> | 21.1        | 25.2        | <1   | 32.7 |
| H-NSR20  | 23.1  | 20.3 | <b>31.4</b> | 27.8        | 31.0        | 20.0        | 21.9        | 7.9  | 31.4 |
| H-NSR21  | 10.5  | 10.7 | 18.9        | 16.9        | <b>19.3</b> | 13.2        | 13.5        | <1   | 19.3 |
| H-NSR22  | 21.0  | 20.3 | 30.3        | 28.7        | <b>30.5</b> | 25.2        | 23.1        | 9.8  | 30.5 |
| H-NSR23  | 14.1  | 11.6 | <b>20.4</b> | 17.1        | 20.0        | 12.0        | 14.3        | 1.4  | 20.4 |
| H-NSR24  | 20.7  | 16.3 | <b>23.7</b> | 19.4        | 20.2        | 13.1        | 14.0        | 2.8  | 23.7 |
| H-NSR 25 | 11.1  | 15.2 | 19.6        | <b>25.9</b> | 22.0        | 25.8        | 18.7        | 8.5  | 25.9 |
| H-NSR 26 | 14.0  | 18.9 | 26.0        | 28.4        | <b>28.8</b> | 27.7        | 25.7        | 9.7  | 28.8 |
| H-NSR 27 | 16.7  | 18.5 | 25.8        | 27.9        | <b>28.4</b> | 27.2        | 25.3        | 9.3  | 28.4 |
| H-NSR 28 | 16.7  | 18.1 | 25.9        | 23.4        | <b>28.5</b> | 17.5        | 25.8        | 9.6  | 28.5 |
| H-NSR 29 | 17.1  | 19.2 | 26.3        | <b>29.0</b> | 28.9        | 28.4        | 25.8        | 12.3 | 29.0 |
| H-NSR 30 | 16.9  | 19.1 | 26.0        | <b>28.6</b> | <b>28.6</b> | 28.1        | 25.5        | 12.2 | 28.6 |
| H-NSR 31 | 16.0  | 18.5 | 25.5        | 27.5        | <b>28.0</b> | 26.8        | 24.8        | 7.9  | 28.0 |
| H-NSR 32 | 16.3  | 18.5 | 25.4        | 27.6        | <b>27.9</b> | 27.1        | 24.7        | 12.0 | 27.9 |
| H-NSR 33 | 16.0  | 18.3 | 24.9        | 27.1        | <b>27.4</b> | 26.5        | 24.2        | 9.5  | 27.4 |
| H-NSR 34 | 11.8  | 9.5  | 18.1        | 16.2        | <b>18.2</b> | 13.3        | 12.9        | 1.1  | 18.2 |

| NSRs                               | Highest Predicted Nighttime Noise Level at Noise Sensitive Receivers, dB(A) |      |      |             |              |             |             |      |      |
|------------------------------------|---|------|------|-------------|--------------|-------------|-------------|------|------|
|                                    | A   | B    | C    | D           | E            | F           | G           | H    | Max  |
| H-NSR 35                           | 6.9   | 9.4  | 16.4 | <b>27.6</b> | 18.2         | 27.5        | 13.5        | 1.5  | 27.6 |
| H-NSR 36 ETMILYN TRAIL             | 21.6  | 15.7 | 36.3 | 34.1        | <b>38.7</b>  | 30.6        | 35.0        | 7.8  | 38.7 |
| H-NSR 37 INGLEHOPE                 | 34.3  | 38.6 | 39.4 | <b>42.3</b> | 39.1         | 39.3        | 31.0        | 20.3 | 42.3 |
| H-NSR 38 CHADORA CAMPSITE          | 25.2  | 26.0 | 28.4 | 28.5        | <b>40.0</b>  | 32.1        | <b>40.0</b> | 25.8 | 40.0 |
| H-NSR 39 Swamp Oak Campsite        | 19.0  | 17.2 | 25.5 | 22.5        | <b>25.7</b>  | 17.8        | 20.6        | 3.8  | 25.7 |
| H-NSR 40 Mt Wells Campsite         | <1  | <1   | <1   | <1          | <b>&lt;1</b> | <1          | <1          | <1   | <1   |
| H-NSR 41 White Horse Hill Campsite | 8.1   | 11.8 | 12.3 | 11.0        | 8.6          | <b>14.0</b> | 11.3        | 12.8 | 14.0 |

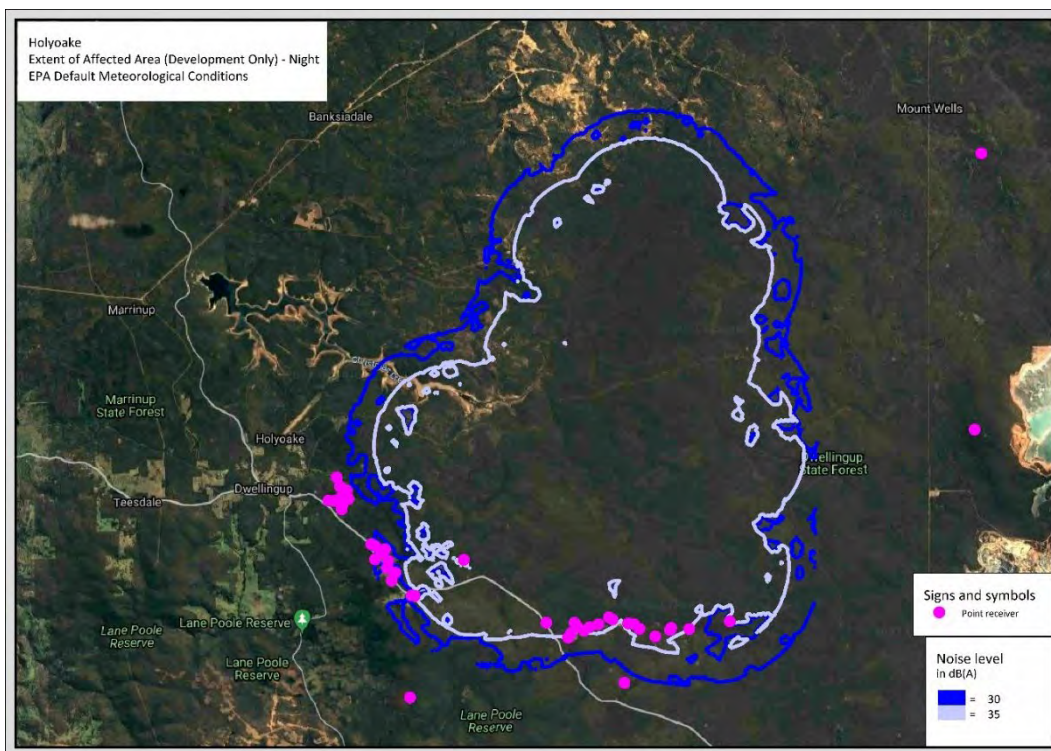
Figure 5-8 to Figure 5-10 shows the worst-case envelope of noise level predictions for the mining activities (both conveyor and hauling configurations) and development/rehabilitation respectively. Individual contours for each year are presented in APPENDIX C.



**Figure 5-8 : Holyoake Nighttime Mining Overall Life of Mine Contour (Conveyor Configuration) (Google Earth, Image ©2023 Airbus)**



**Figure 5-9 : Holyoake Nighttime Mining Overall Life of Mine Contour (Hauling Configuration) (Google Earth, Image ©2023 Airbus)**



**Figure 5-10 : Holyoake Night Development/Rehabilitation Overall Life of Mine Contour (Google Earth, Image ©2023 Airbus)**

## 6 REVIEW OF HISTORICAL WEATHER DATA

### 6.1 Historical Weather Breakdown

The likelihood of weather conditions that could result in noise emissions exceeding the night-time noise limit (35 dB(A)) was assessed. Historical wind and rainfall data from the Bureau of Meteorological (BOM) Dwellingup meteorological station<sup>17</sup> between 1 January 2016 and 31 December 2020 was analysed to determine the percentage of 'high-risk' conditions, defined as periods where:

- Calm - The wind is from any direction and the wind speed is less than 0.5 metres per second, indicative of highly stable atmospheric conditions during which, when air temperature increases with height, noise that would otherwise propagate away from the ground can refract (bend) downward and contribute to the noise level at the receiver; or
- Laminar Air Flow - The wind direction is from the mining locations and the wind speed is less than 3 metres per second, indicative of conditions when atmospheric turbulence is low and variation in windspeed with height can cause noise to refract and contribute to the noise level the receiver; and
- Noise emissions could be assessed - No rainfall was recorded, which in combination with the wind conditions above, would enable the noise level at the receiver to be measured and assessed in accordance with the Noise Regulations (1997).

Conditions causing noise exceedances at long distances from the noise source are highly dependent on the occurrence of specific vertical wind and temperature profiles which can cause sound to refract downward. The occurrence of these conditions has not been captured by the Dwellingup BOM weather station and are typically not practical to measure without deployment of specialist equipment<sup>18</sup>. Due to the significance of vertical temperature and wind profiles on noise propagation, and the requirement for these conditions to enhance noise in order to cause noise to propagate long distances, the frequency of noise exceedances is anticipated to be less than the identified occurrence of high-risk conditions.

The results of the analysis are presented in Table 6-1 to Table 6-3. The analysis results for Myara North mine region as in Table 6-1 and Table 6-2 indicate that adverse meteorological conditions for noise propagation similar to the EPA Default Weather criteria persist for only up to around 10 per cent of the total time in a given year for winds prevailing in the direction of Myara North's NSRs, which are predominantly to the west of the proposed mine operations. For Holyoake mine region, the analysis results as in Table 6-3 indicate that these adverse weather conditions for noise propagation persists for an even lower time (up to 3 per cent) in a given year for winds

---

<sup>17</sup> Data from the following 5 year period was included (1st January 2016 to 31st December 2020)

<sup>18</sup> Measurement of atmospheric vertical temperature and wind profiles requires either deployment of weather balloons or a combination of SODAR (Sonic Detection And Ranging) and RASS (Radio Acoustic Sounding System) equipment.

prevailing in the directions of Holyoake’s NSRs, which are predominantly to the south and south-west of the proposed mine operations.

**Table 6-1 : Percentage of High Risk Conditions for Noise Propagation Towards the Mt Cooke, Monadnocks and Wungong Campsite Receivers by Seasonal Periods (NSR 24 and 25)**

| Period  | Risk of high risk conditions in last 5 years (per cent) |        |        |        |
|---------|---|--------|--------|--------|
|         | Summer  | Autumn | Winter | Spring |
| Day     | 4   | 6      | 10     | 7      |
| Evening | 5   | 6      | 10     | 10     |
| Night   | 3   | 6      | 7      | 7      |

**Table 6-2 : Percentage of High Risk Conditions for Noise Propagation Towards the Jarrahdale & Serpentine Dam Receivers by Seasonal Periods**

| Period  | Risk of high risk conditions in last 5 years (per cent) |        |        |        |
|---------|---|--------|--------|--------|
|         | Summer  | Autumn | Winter | Spring |
| Day     | 6   | 8      | 12     | 7      |
| Evening | 1   | 2      | 7      | 4      |
| Night   | 2   | 3      | 9      | 6      |

**Table 6-3 : Percentage of High Risk Conditions for Noise Propagation Towards Holyoake Receivers<sup>19</sup> by Seasonal Periods**

| Period  | Risk of high risk conditions in last 5 years (per cent) |        |        |        |
|---------|---|--------|--------|--------|
|         | Summer  | Autumn | Winter | Spring |
| Day     | 1   | 1      | 3      | 1      |
| Evening | 0   | 1      | 3      | 1      |
| Night   | 1   | 1      | 3      | 2      |

<sup>19</sup> The percentage of shown is the sum of periods where high risk conditions persist for incident wind within a 122 degree arc. (i.e. wind blowing towards the receivers). Variability between individual receivers in close proximity are likely to be low.

## 7 NOISE IMPACT ASSESSMENT

### 7.1 Compliance Assessment

The results of the modelling assessment show that received noise levels at most NSRs will comply with the Assigned Levels for the majority of the time and weather conditions. Under the worst-case meteorological conditions and the worst-case modelling assumptions on mining and mine developmental activities, some NSRs are predicted to be at risk of exceeding the Assigned Levels, particularly for the nighttime scenarios in Holyoake mine region where mining and mine developmental activities are in close proximity to each other and they are adjacent to a cluster of rural properties south of the mine region.

#### 7.1.1 Day Time Assigned Levels

For Myara North region, the results of the modelling presented in Section 5.1 indicate that the noise emissions from mining and mine developmental activities over the life of the mining operations are predicted to comply with the Assigned Levels at the nearby NSRs during the day.

For Holyoake mine region, the results of the modelling presented in Section 5.2 indicate that adjacent rural properties along the southern boundary of the mine region (H-NSR8, 9, 10 and 11) and the campsite at Inglehope (H-NSR37) are predicted to have the highest potential to be impacted by operational noise during mining and development of pits close to these receivers during 2036 – 2040 modelled operational years. At these NSRs the predicted exceedances are less than 3 dB over the daytime Assigned Level of 45 dB(A) under the worst-case meteorological conditions and the worst-case modelling assumptions on mining and mine developmental activities.

#### 7.1.2 Night-Time Assigned Levels

For Myara North, the predicted night-time noise levels show that some rural properties along the northwest boundary of the mine region (NSR10, 11, 12, 13 and 14) and Wungong Campsite on the Munda Biddi Trail (NSR25) have the highest potential to be impacted by operational noise during mining and development of pits close to these receivers during the 2028 – 2034 modelled operational years. At these NSRs the predicted exceedances are less than 5 dB over the nighttime assigned level of 35 dB(A) under the worst-case meteorological conditions and the worst-case modelling assumptions on mining and mine developmental activities.

For Holyoake mine region, the noise levels from mine development activities in mine blocks at a cluster of adjacent rural properties along the southern boundary of the mine region (H-NSR1 - 14), the campsite at Etmilyn Trail Rail Siding (H-NSR36), the campsite at Inglehop (H-NSR37) and Chadora Campsite (H-NSR38) are predicted to potentially exceed the Assigned Levels by up to 5 dB during operation Year 2036 - 2040 under the worst-case meteorological conditions and the worst-case modelling assumptions on mining and mine developmental activities.

## 7.2 Cumulative effects based on the worst-case modelling considerations

It should be noted that during the modelling process, the following worst-case assumptions have been considered in terms of meteorological conditions and mining and mine developmental activities:

- **Default worst-case weather conditions.** The “default meteorological conditions” are suggested by the WA DWER Draft Guidelines and have been implemented during the modelling process. However, the analysis of historical weather data as detailed in Section 6 indicate that the adverse weather conditions for noise propagation only occur during very small percentage of time (up to 10 per cent of the time within a given year for winds prevailing towards Myara North receivers, and only up to 3 per cent of the time for winds prevailing towards Holyoake receivers). Compared with typical calm weather conditions, such worst-case weather conditions could provide a significant conservative margin in terms of noise modelling predictions (e.g. up to 6 dB margin for low frequency noise source at a distance of 2km during nighttime period<sup>20</sup>).
- **The worst-case assumptions for mining and mine developmental activities.** The modelling scenarios assessed are assumed that all noise-generating activities are occurring simultaneously. Moreover, mine developmental activities (i.e. mine construction and rehabilitation activities) are assumed to be at the pit edge closer to the adjacent noise sensitive receptors and occurring simultaneously with mining activities. As such, it is expected that such worst-case activity assumptions would have additional significant conservative margin in terms of noise modelling predictions compared with realistic activities within the pit areas.

The cumulative conservative margin from the above worst-case modelling considerations is expected to be significant (cumulatively could be up to 6 – 10 dB). More noise reduction could be achieved with potential implementation of noise controls and operational planning practices for the mining and mine development activities.

As such, the predicted noise levels at adjacent NSRs for both mine regions are expected to comply with the Assigned Levels under the weather conditions other than the worst-case adverse conditions, as well as with realistic mining and mine development activities within the mine pit areas. With implementation of noise controls and operational planning practices for the mining and mine developmental activities, the noise compliance at the adjacent NSRs for both mine regions could also be achieved, even under the worst-case modelling considerations in terms weather conditions and mining and mine development activities.

---

<sup>20</sup> EPA Guidance No.8 Environmental Noise, Draft for Public and Stakeholder Review Seminar, Presented by Environmental Noise Management and SVT Engineering Consultants, 25 June 2027.

[https://www.acoustics.asn.au/divisions/WA/EPA\\_Guidance\\_No\\_8\\_Seminar.pdf](https://www.acoustics.asn.au/divisions/WA/EPA_Guidance_No_8_Seminar.pdf)

### 7.3 Risk of tonality

Many of the items of mobile equipment are likely to have some element of tonality. And, if individual items are discernible at the receiver, there is a higher potential for tonal characteristics. However, this tonality may not always be evident at the receiver for the following reasons:

- Tonality may not protrude above ambient noise;
- Tonality from particular items of equipment may be masked by noise received from other equipment;
- The level of noise emissions from items of mobile equipment will vary depending on their locations (which may be continuously changing), depths and heights; and
- The severity and pitch of the tonality from mobile equipment will change depending on operating conditions.

Prediction of tonality at receptors from mine site mobile equipment fleet is impractical. Instead, to address the potential of tonality, the tonality buffer contour is defined as noise contour of 5 dB below the assigned levels. For any NSRs fall within the buffer contour, if tonality was present, the predicted levels would exceed the assigned levels.

APPENDIX C presents the noise contours for both Myara North and Holyoake, 5 dBA below the assigned noise levels to indicate the potential for exceedance in the event of tonality.

In summary, for nighttime periods, under the worst-case noise modelling considerations, the following NSRs have the potential for exceedance in the event of tonality.

- For Myara North, a cluster of rural properties near the northwest boundary of the mine region (NSR6, 8, 9 – 14) and some campsites adjacent to the mine region (NSR23 at Monadnocks Campsite, NSR24 at Mt Cooke Campsite and NSR25 at Wungong Campsite).
- For Holyoake, a cluster of rural properties near the southern boundary of the mine region (H-NSR1 - 14), and some campsites adjacent to the mine region (H-NSR 36 at Etmilyn Trail Rail Siding, H-NSR 37 at Inglehop and H-NSR 38 at Chadora Campsite).

### 7.4 Audibility Assessment

For mining noise to be audible at the noise sensitive locations, it must first protrude sufficiently above ambient baseline levels. To assess the likelihood of operational noise from Alcoa's mining operations being audible at the NSRs, the model predicted noise levels are compared against the monitored baseline noise levels.

Mining noise is assessed as audible if the model predicted values protrude above the ambient monitoring data by more than 3 dB. It is not typical for a person to audibly detect a change in noise levels below a 2 to 3 dB range (depending upon the person and frequency content of the noise). However, some aspects of the operations may still be perceivable, as a frequency shift or when tonality is present.

Audibility of mining noise at the NSRs is expected to be lower during weather conditions that are less conducive for noise propagation (e.g. during warmer periods and periods without temperature inversions) outside of the EPA default weather parameters. Additionally, the audibility of mining noise is more likely to be masked during the daytime periods due to typically higher ambient noise levels.

Due to the uncertainty factors as described above, as well as the conservative considerations that have been adopted during the noise modelling process, the audibility assessment is based on a simplified approach, i.e. the upper limit of baseline noise level  $L_{A90}$  of close to 30 dB(A) (i.e. 5 dB below nighttime Assigned Level) is tentatively set as the audibility threshold level for nighttime period. The 30 dB(A) contours are provided in APPENDIX C to indicate the potential for audibility at sensitive receptors adjacent to the mine regions. Based on this buffer contours, the following NSRs have the potential for audibility.

- For Myara North, a cluster of rural properties near the northwest boundary of the mine region (NSR6, 8, 9 – 14) and some campsites adjacent to the mine region (NSR23 at Monadnocks Campsite, NSR24 at Mt Cooke Campsite and NSR25 at Wungong Campsite).
- For Holyoake, a cluster of rural properties near the southern boundary of the mine region (H-NSR1 - 14), and some campsites adjacent to the mine region (H-NSR 36 at Etmilyn Trail Rail Siding, H-NSR 37 at Inglehope and H-NSR 38 at Chadora Campsite).

## 8 BLAST NOISE AND VIBRATION ASSESSMENT

### 8.1 Blast Noise Impact Area Prediction

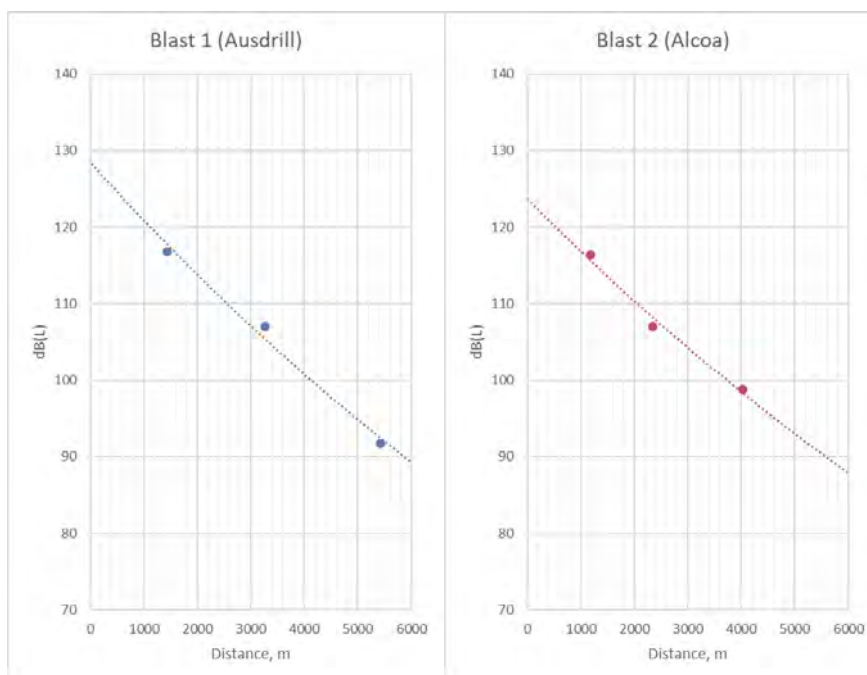
Wood mobilised to Alcoa's existing Huntly mine operations in the Myara region to measure the noise from their blasting activities in order to derive an empirical assessment criterion based on current operational practices. The new Myara North mine is expected to employ criteria and blast methodology that is similar to that currently practiced in Myara.

The results of the measurements are as shown in Table 8-1.

**Table 8-1 : Blast Overpressure Measurement Results from Alcoa's Existing Huntly Mine Operations in the Myara Region**

| Monitor            | Distance from Blast Center, m | Maximum Instantaneous Charge, kg | Measured Peak Noise Level, dB(L) |
|--------------------|-------------------------------|----------------------------------|----------------------------------|
| Blast 1 (Ausdrill) |                               |                                  |                                  |
| 1                  | 1,390                         | 9 kg per hole,<br>762 holes      | 116.8                            |
| 2                  | 2,780                         |                                  | 107.0                            |
| 3                  | 5,560                         |                                  | 91.8                             |
| Blast 2 (Alcoa)    |                               |                                  |                                  |
| 1                  | 1,090                         | 7 kg per hole,<br>40 holes       | 116.4                            |
| 2                  | 2,180                         |                                  | 107.0                            |
| 3                  | 4,360                         |                                  | 98.8                             |

The onsite blast measurement data can be translated into the following graphs as shown in Figure 8-1.



**Figure 8-1 Graphs Showing the Derived 'Site Constant' for Blast Noise Based on Measurements at Alcoa's Myara North Mine**

The recommended peak sound pressure from blasting to avoid human discomfort is provided in Section 11 of the Regulations and is summarised as follows:

| Type of Building / Structure  | Peak sound pressure level [dB(L)]                                 |
|---|---|
| Sensitive site (residential buildings, theatres, schools, and other similar buildings occupied by people) | 115 dB(L) for 95 per cent of blasts per year<br>120 dB(L) maximum |
| Occupied non-sensitive sites, such as factories and commercial premises                                   | 125 dB(L) maximum   |

Based on the results of Blast 1 (Table 6-8), peak noise level of 120 dB(L) is expected to be encountered approximately 1.2 km from the blast center.

### 8.1.1 Ground Borne Vibration

Guidance provided within APPENDIX J of AS 2187.2 recommends a limit of 5 mm/s peak vibration level to avoid damage to building and surrounding structures.

Based on the charge weight of 9kg the blasting measured at Alcoa’s existing Huntly mine in the Myara region, and using ground borne vibration estimation guidance provided in AS 2187.2 APPENDIX J, the calculated distance for ground borne vibration to attenuate below the 5 mm/s criteria is shown in Table 8-2.

**Table 8-2 : Calculated Distance for Ground Borne Vibration to Attenuate to Levels Below the 5 mm/s Criteria**

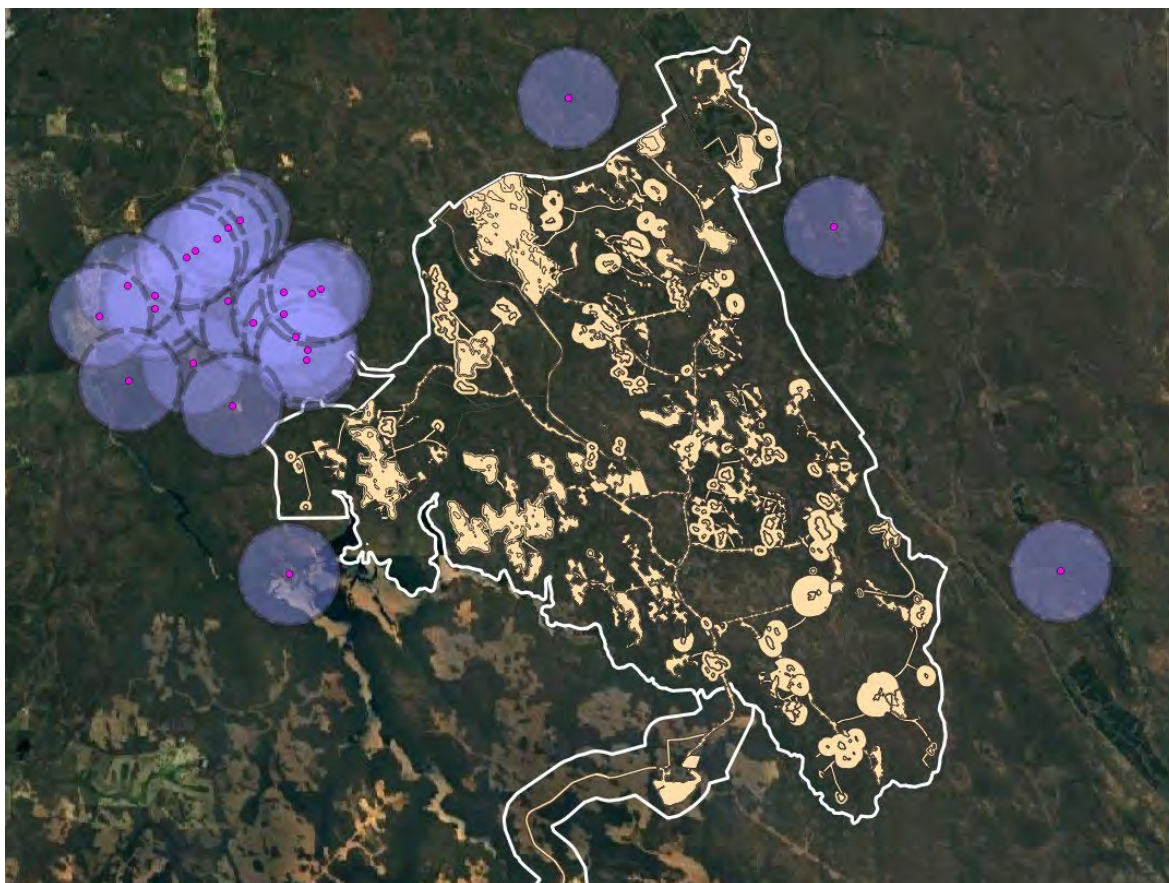
| Blast ID            | Maximum Instantaneous Charge <sup>21</sup><br>Weight, kg | Distance to Attenuate<br>to below 5 mm/s, m |
|---------------------|--|---|
| Blast 1 (AustDrill) | 9 kg   | 212 m                                       |
| Blast 2 (Alcoa)     | 7 kg   | 188 m                                       |

## 8.2 Blast Noise & Ground Borne Vibration Impact Areas

### 8.2.1 Blast Noise

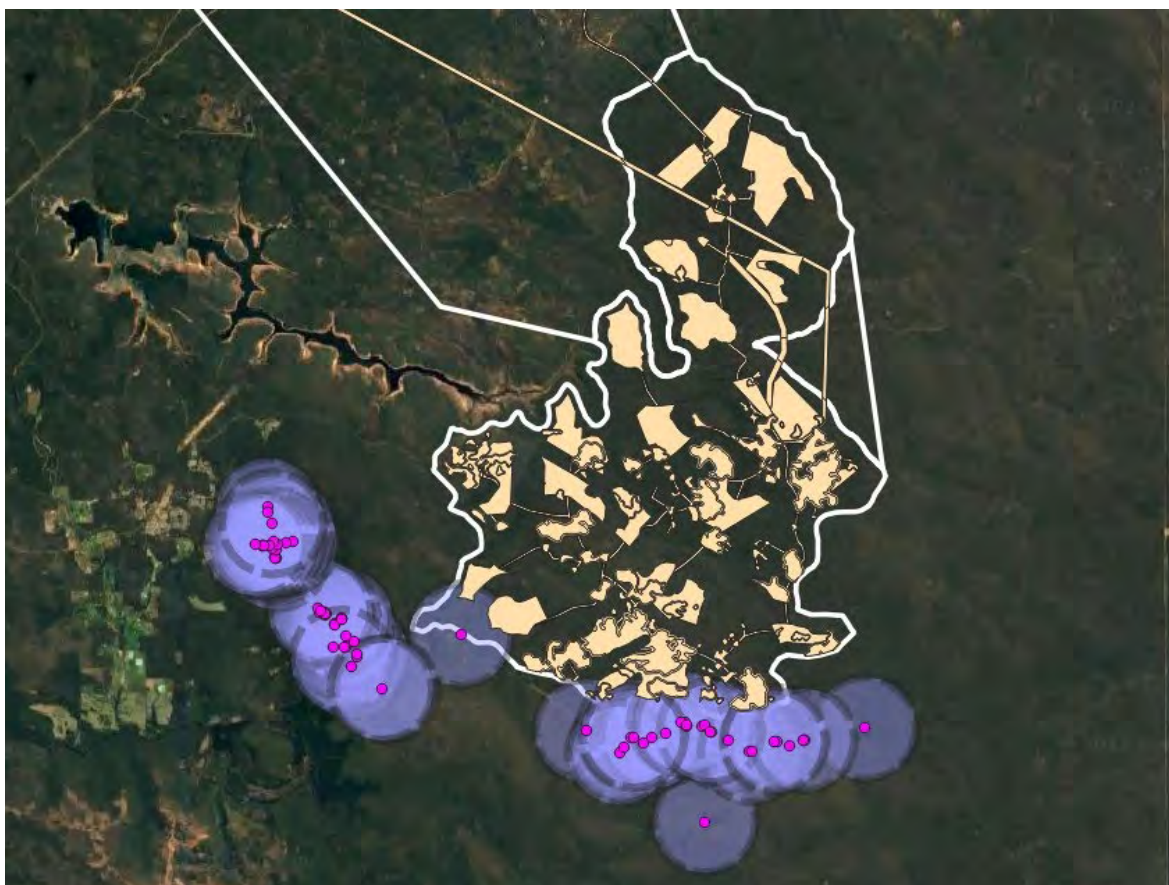
Figure 8-2 shows the indicative Myara North mine pits located within 1.2 km of the nearby noise sensitive receivers where blasting noise have the potential to exceed the maximum limit defined in Section 11 of the Regulations.

<sup>21</sup> Total charge weight detonated within a 8 ms window.



**Figure 8-2 Myara North Mining Pit Where Blast Noise Have the Potential to Exceed the 120 dB(L) Maximum (Google Earth, Image ©2023 Airbus)**

For the proposed Myara North region, the risk of exceeding the maximum 120 dB(L) limit during blasting activities is low at all noise sensitive receivers.



**Figure 8-3 Holyoake Mining Blocks Where Blast Noise Have the Potential to Exceed the 120 dB(L) Maximum (Google Earth, Image ©2023 Airbus)**

For the proposed Holyoake region, the blasting in blocks closest to the NSRs at Inglehope and the Etmilyn Trail have the potential to exceed the 120 dB(L) maximum limit.

Alcoa manages blast noise through a module within their Integrated Noise Management tool and has established an internal standard with a maximum blast noise level of 115 dB(L). Alcoa blast management practices include noise level prediction which is undertaken during the lead up to the actual blast and incorporates the mine configuration at that time. This informs the blast planning and is used to minimise impacts.

Alcoa also employs a number of different blasting techniques and management initiatives to minimise the impact of blast noise when required. Lower noise techniques that Alcoa may use include the following:

- stemming arrangements, currently used in blasting around noise sensitive receivers, where imported blue metal fill material is put in the top of the blast hole to divert blast noise into the ground instead of riffling out of the holes; and
- mechanical fracturing which could include various methods such as ripping using mobile equipment.

## 8.2.2 Ground Borne Vibration

From the calculations in Section 8.1.1, based on the blasting plan on the day the blast noise measurements were conducted at Alcoa's existing Myara region operations, the calculated distances for ground borne vibration levels to attenuate to below 5 mm/s are 212 m and 188 m for a 9 kg and 7 kg charge respectively. It is very likely the safety exclusion zone for a blasting event will exceed these distances from the blast centre. Therefore, ground borne vibration is expected to be insignificant at the all the nearby NSRs (including recreational campsites) for the proposed Myara North and Holyoake mine regions.

## 9 CONSTRUCTION NOISE MANAGEMENT

Construction noise is typically exempted from meeting the Assigned Levels. A general overview of noise management measures likely to be required during construction activities is provided below. Alcoa follow an operation procedure for managing impacts of mining noise activities.

### 9.1.1 Noise Management Requirements for Daytime Construction Activities

The Environmental Protection Noise Regulations 1997 state that for construction work carried out between 7am and 7pm on any day, which is not a Sunday or public holiday the assigned noise levels do not apply provided that:

- The construction work is carried out in accordance with control of noise practices set out in Section 6 of Australian Standard 2436-1981 “Guide to Noise Control on Construction, Maintenance and Demolition Sites”; and
- The equipment used for the construction is the quietest reasonably available.

The Chief Executive Officer<sup>22</sup> (CEO) may request that a noise management plan be submitted for the construction work at any time.

### 9.1.2 Noise Management Requirements for Out of Hours Construction Activities

For construction work done outside daytime hours or on Sundays and public holidays:

- The construction work must be carried out in accordance with control of noise practices set out in Section 6 of Australian Standard 2436-1981 “Guide to Noise Control on Construction, Maintenance and Demolition Sites”; and
- The equipment used for the construction must be the quietest reasonably available.

Furthermore, if noise emissions are likely to exceed the assigned noise levels then:

- The contractor must advise all nearby occupants or other sensitive receptors who are likely to receive noise levels which fail to comply with the standard under Regulation 7, of the work to be done at least 24 hours before it commences;
- The contractor must show that it was reasonably necessary for the work to be done out of hours; and

---

<sup>22</sup> The power of the CEO of the Department of Water and Environmental Regulation is delegated under the noise regulations to the CEOs of all local governments in the State of Western Australia.

- The contractor must submit to the CEO a Noise Management Plan at least seven days before the work starts, and the plan must be approved by the CEO. The plan must include details of:
  - Need for the work to be done out of hours;
  - Types of activities which could be noisy;
  - Predictions of the noise levels;
  - Control measures for noise and vibration;
  - Procedures to be adopted for monitoring noise emissions; and
  - Complaint response procedures to be adopted.

## 10 CONCLUSIONS

The results of the predictive modelling of noise emissions from operational equipment within the proposed Myara North and Holyoake mine regions demonstrate that:

- For daytime period, under the worst-case modelling considerations in terms of meteorological conditions and mining and mine development activities:
  - For Myara North region, compliance with the daytime Assigned Levels for the NSRs surrounding the mine region is predicted.
  - For Holyoake mine region, the modelling prediction indicates that some rural properties (rural properties H-NSR8, 9, 10 and 11) along the southern boundary of the mine region and the campsite at Inglehope (H-NSR37) have the predicted exceedances of less than 3 dB over the daytime Assigned Level of 45 dB(A).
- For nighttime period, under the worst-case modelling considerations in terms of meteorological conditions and mining and mine development activities:
  - For Myara North region, the predicted noise levels show that some rural properties along the northwest boundary of the mine region (NSR10, 11, 12, 13 and 14) and Wungong Campsite on the Munda Biddi Trail (NSR25) have the predicted exceedances of less than 5 dB over the nighttime Assigned Level of 35 dB(A).
  - For Holyoake mine region, the predicted noise levels show that a cluster of adjacent rural properties along the southern boundary of the mine region (H-NSR1 - 14), the campsite at Etmilyn Trail Rail Siding (H-NSR36), the campsite at Inglehope (H-NSR37) and Chadora Campsite (H-NSR38) exceed the Assigned Levels by up to 5 dB.
- The worst-case modelling considerations in terms of meteorological conditions and mining and mine development activities are expected to provide significant conservative margin (could be up to 6 – 10 dB) for predicted noise levels at adjacent NSRs. Therefore, it is anticipated that:
  - Noise levels at adjacent NSRs for both mine regions are expected to comply with the Assigned Levels under the weather conditions other than the worst-case adverse conditions, as well as with realistic mining and mine development activities within the mine pit areas.
  - With implementation of noise controls and operational planning practices for the mining and mine developmental activities, the noise compliance at the adjacent NSRs for both mine regions could also be achieved, even under the worst-case modelling considerations in terms weather conditions and mining and mine developmental activities.

- The dominant noise sources affecting the received levels at the NSRs are the operational mobile equipment within the mines and these are likely to have some element of tonality. The potential for exceedance in the event of tonality for the NSRs surrounding both mine regions are indicated based on noise contours 5 dBA below the assigned noise levels as presented in APPENDIX C. For nighttime periods, under the worst-case noise modelling considerations, the following NSRs have the potential for exceedance in the event of tonality
  - For Myara North, a cluster of rural properties near the northwest boundary of the mine region (NSR6, 8, 9 – 14) and some campsites adjacent to the mine region (NSR23 at Monadnocks Campsite, NSR24 at Mt Cooke Campsite and NSR25 at Wungong Campsite).
  - For Holyoake, a cluster of rural properties near the southern boundary of the mine region (H-NSR1 - 14), and some campsites adjacent to the mine region (H-NSR 36 at Etmilyn Trail Rail Siding, H-NSR 37 at Inglehope and H-NSR 38 at Chadora Campsite).
- Audibility is assessed by comparing the predicted noise levels at the NSRs against the monitored ambient noise levels. Due to the uncertainty factors in regards to meteorological conditions, as well as the conservative considerations that have been adopted during the noise modelling process, the audibility assessment is based on a simplified approach, i.e. the upper limit of baseline noise level  $LA_{90}$  of close to 30 dB(A) (i.e. 5 dB below nighttime Assigned Level) is tentatively set as the audibility threshold level for nighttime period. The 30 dB(A) contours are also provided in APPENDIX C to indicate the potential for audibility at sensitive receptors adjacent to the mine regions. Based on these buffer contours, the following NSRs have the potential for audibility:
  - For Myara North, a cluster of rural properties near the northwest boundary of the mine region (NSR6, 8, 9 – 14) and some campsites adjacent to the mine region (NSR23 at Monadnocks Campsite, NSR24 at Mt Cooke Campsite and NSR25 at Wungong Campsite).
  - For Holyoake, a cluster of rural properties near the southern boundary of the mine region (H-NSR1 - 14), and some campsites adjacent to the mine region (H-NSR 36 at Etmilyn Trail Rail Siding, H-NSR 37 at Inglehope and H-NSR 38 at Chadora Campsite).
- Measured blast noise data from Alcoa's existing Myara region operations, indicate a 1.2 km radius will be required to attenuate peak blast noise levels to be below 120 dB(L). Based on this radius, standard blasting practices at a number of indicative Myara North and Holyoake mining pits or blocks may potentially cause an exceedance of the 120 dB(L) maximum limit as prescribed in Section 11 of the Regulations for residential receivers (including all recreational campsites). These mine blocks are shown in Section 8.2. Alternative caprock breaking methods (i.e. blue metal stemming and mechanical fracturing) will be considered for these areas which, along with current blast noise management practices, are expected to be effective in managing blast noise impacts to levels below the regulatory limits;

- Calculated distances for ground borne vibration levels from 9 kg and 7 kg maximum instantaneous charges are 212 m and 188 m respectively. Ground borne vibration is not expected to be significant at any NSRs (including all recreational campsites) for the Myara North and Holyoake mine regions.

## APPENDIX A BACKGROUND NOISE LEVELS

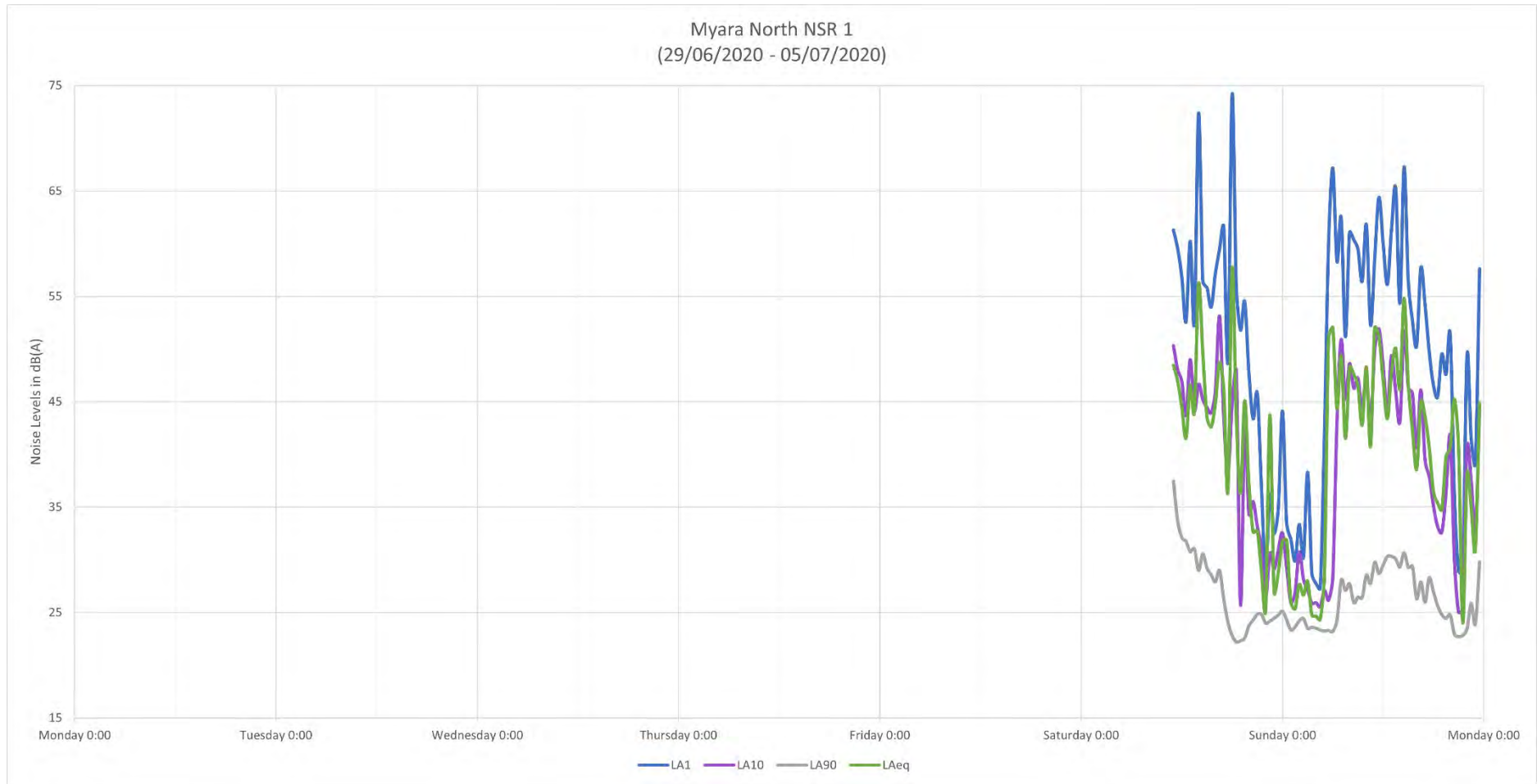
### A.1 Instrumentation

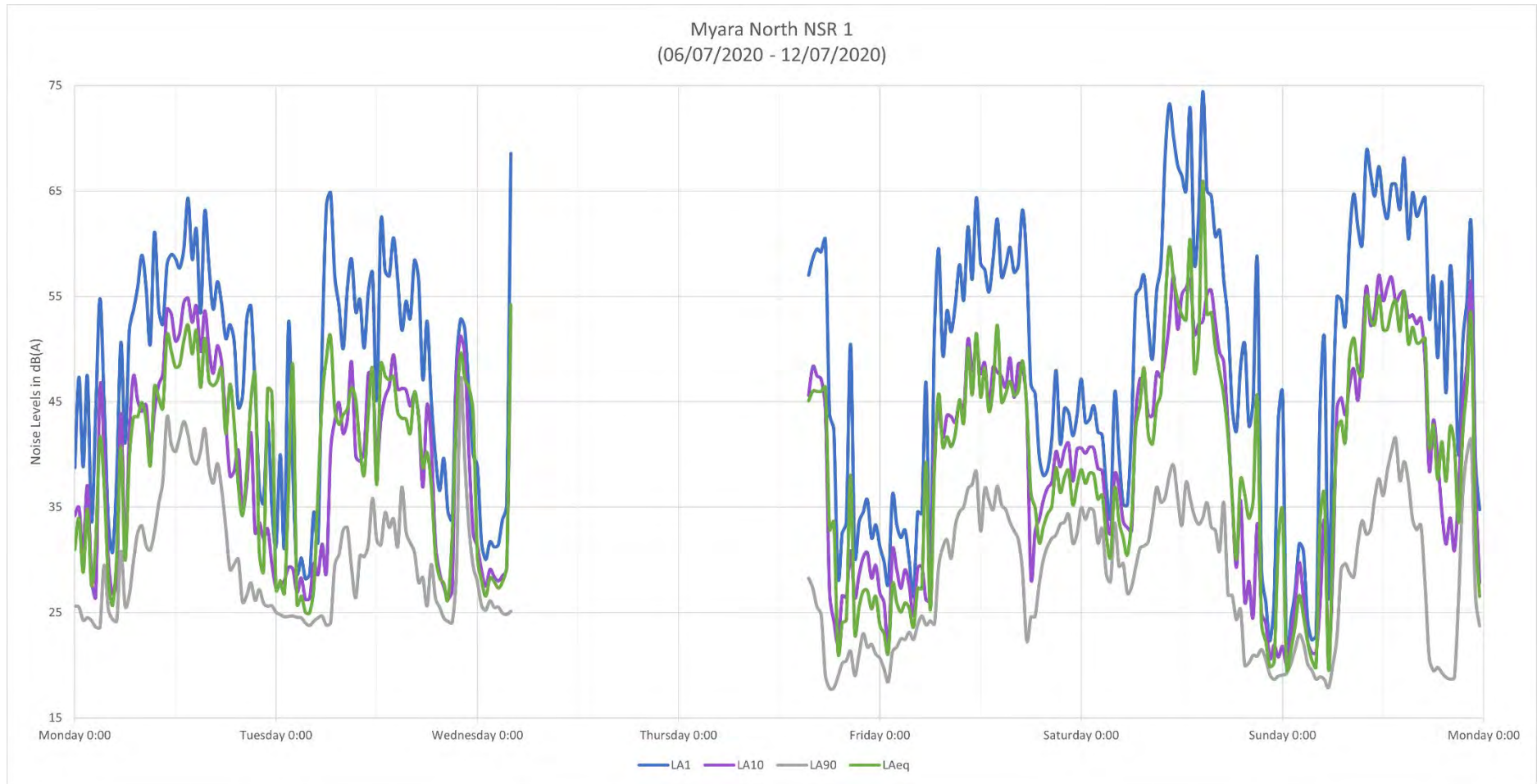
**Table A-10-1 : Instrumentation Used for the Noise Logging**

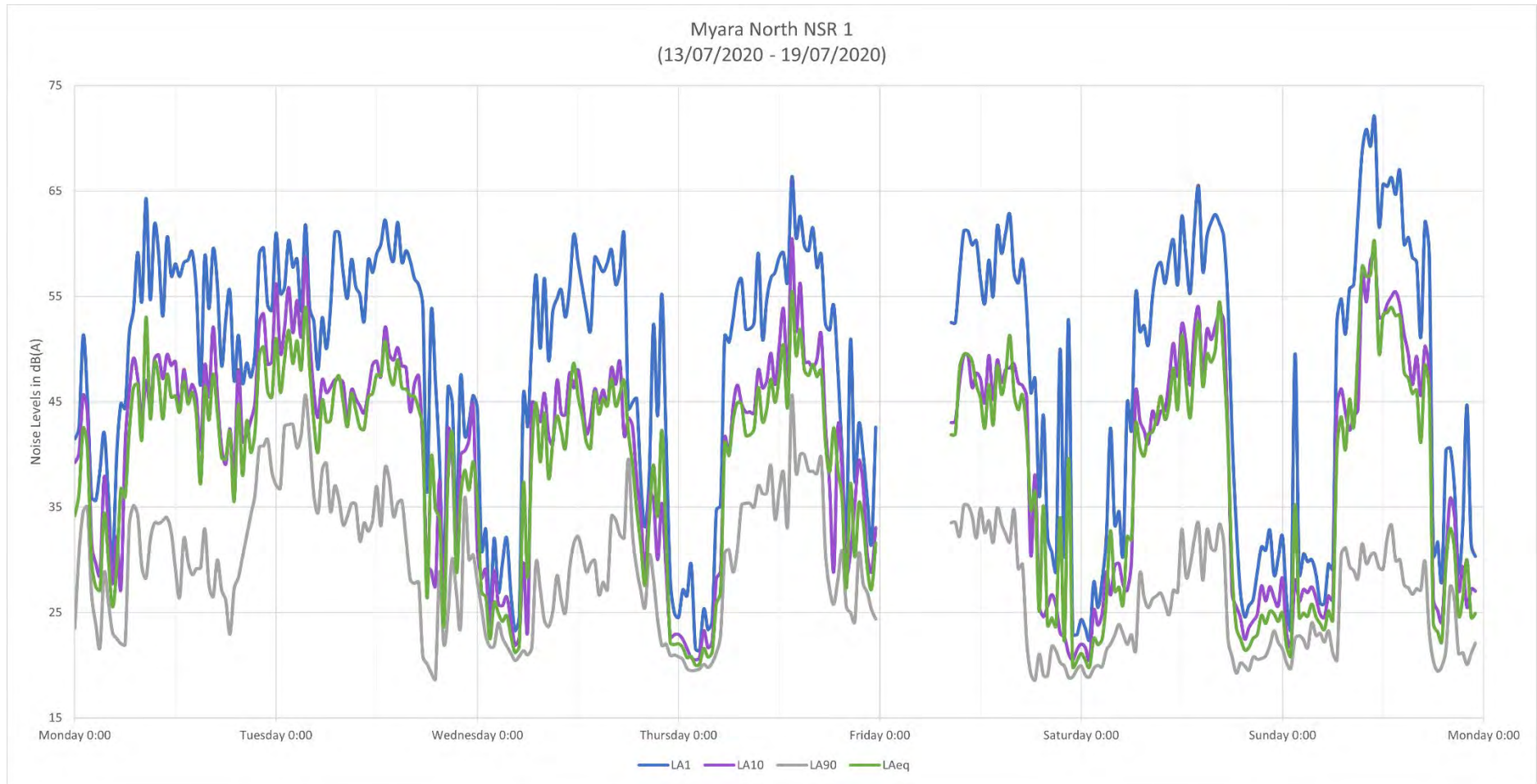
| Mining Area | Relevant NSRs | Noise Logger ID | Sound Level Meter (Make/Model) | Serial Number |
|-------------|---------------|-----------------|--------------------------------|---------------|
| Myara North | NSR 1         | RASL 16.1       | Bruel & Kjaer 2270             | 2664185       |
|             | NSR 3         | RASL 14.1       | Bruel & Kjaer 2250             | 3004058       |
|             | NSR 14        | RASL 13.1       | Bruel & Kjaer 2270             | 2679316       |
|             | NSR 18        | RASL 14.2       | Bruel & Kjaer 2250             | 3004058       |
|             | NSR 20        | RASL12.1        | Bruel & Kjaer 2270             | 2746573       |
|             | NSR 21        | RASL10          | Bruel & Kjaer 2250             | 3024400       |
|             | NSR 22        | RASL 14.3       | Bruel & Kjaer 2250             | 3004058       |
|             | NSR 24        | RASL 12.2       | Bruel & Kjaer 2270             | 2746573       |
| Holyoake    | NSR 4         | RASL 15         | Bruel & Kjaer 2270             | 3000267       |
|             | NSR 10        | RASL 16.5       | Bruel & Kjaer 2270             | 2664185       |
|             | NSR 13        | RASL 13.4       | Bruel & Kjaer 2270             | 2679316       |
|             | NSR 16        | RASL 16.3       | Bruel & Kjaer 2270             | 2664185       |
|             | NSR 17-24     | RASL 16.4       | Bruel & Kjaer 2270             | 2664185       |
|             | NSR 25-35     | RASL 13.3       | Bruel & Kjaer 2270             | 2679316       |
|             | NSR 36        | RASL 12.3       | Bruel & Kjaer 2270             | 2746573       |
|             | NSR 37        | RASL 13.2       | Bruel & Kjaer 2270             | 2679316       |

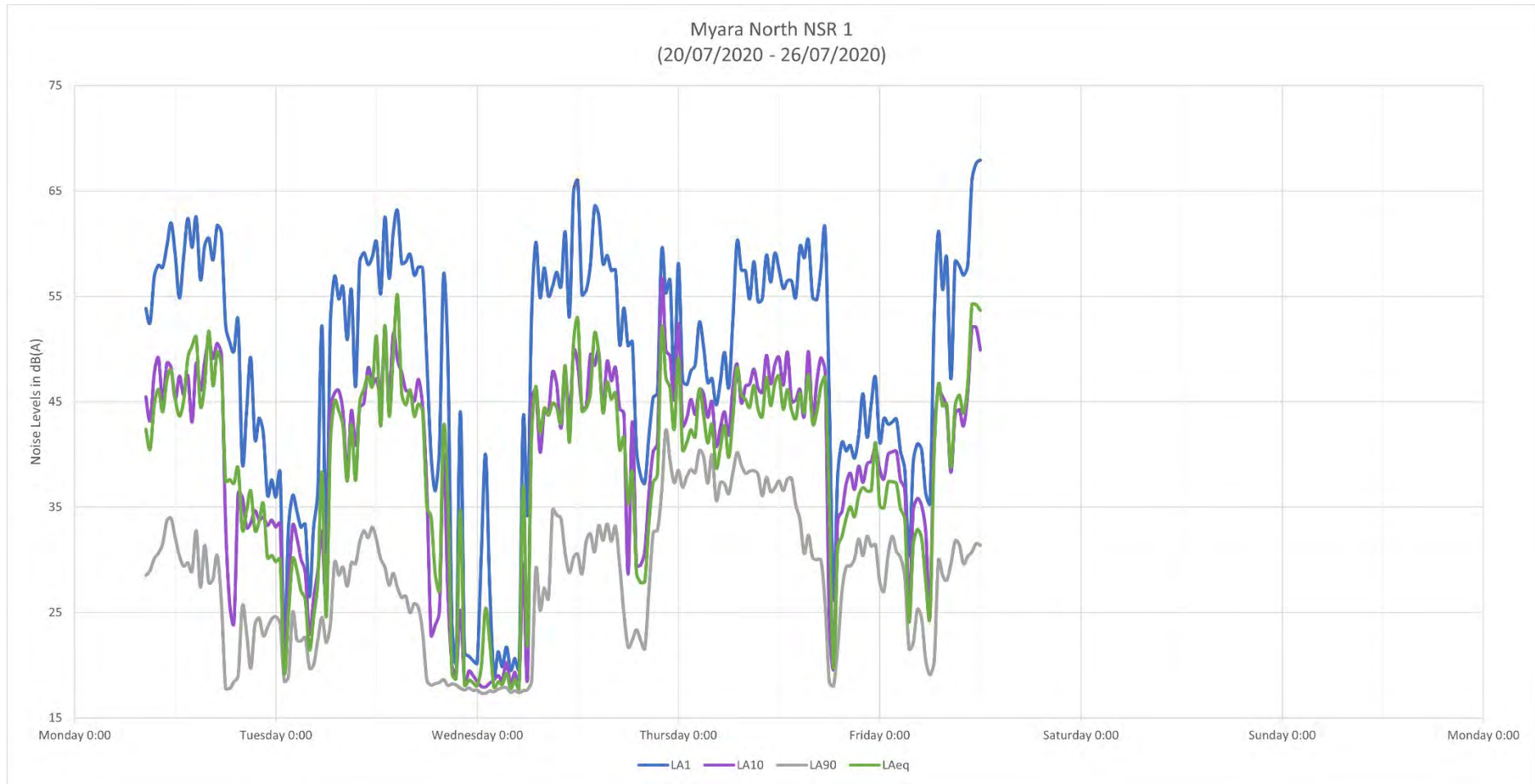
Calibration certificates for the above instrumentation are available on request.

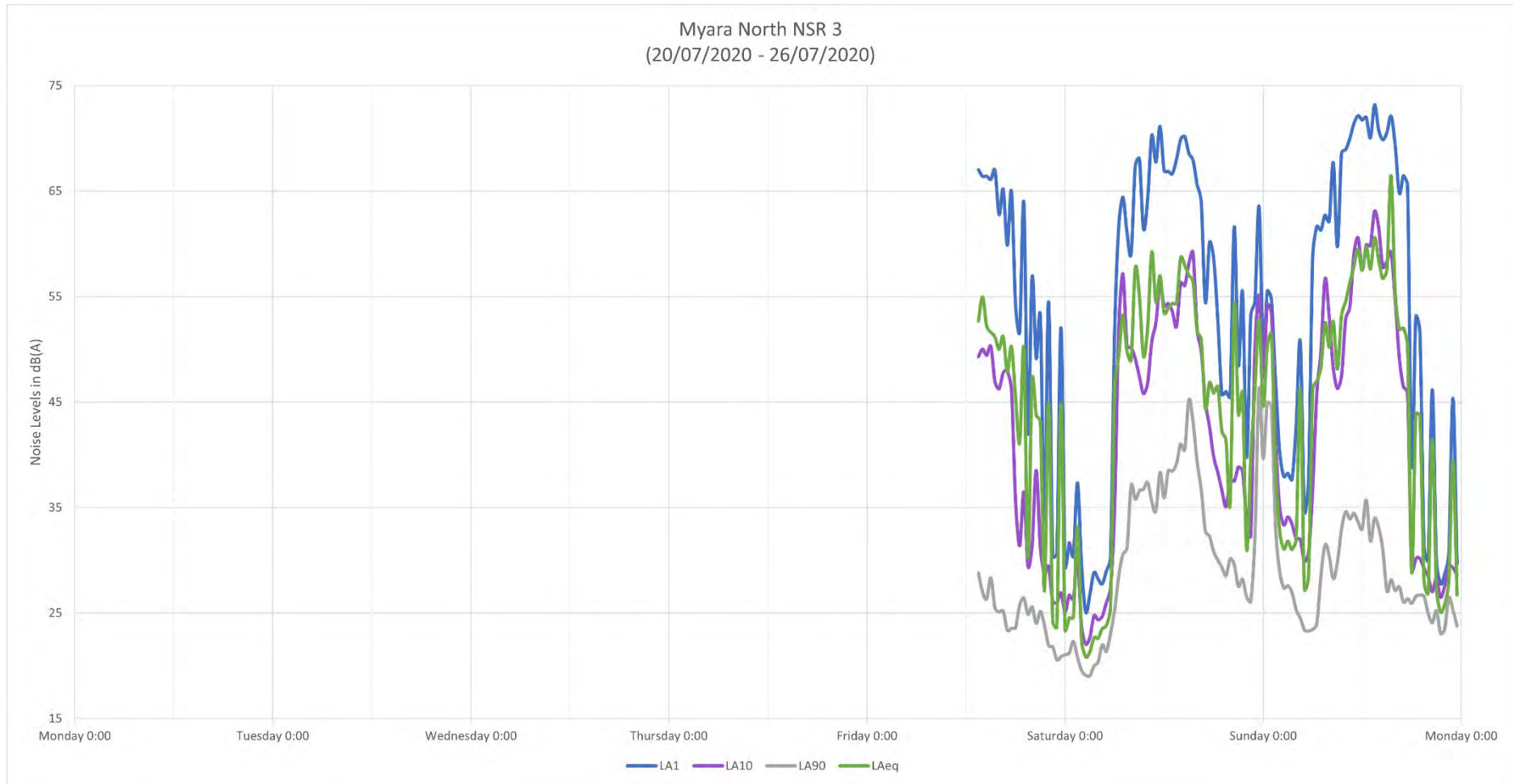
### A.2 Myara North Background Noise Levels

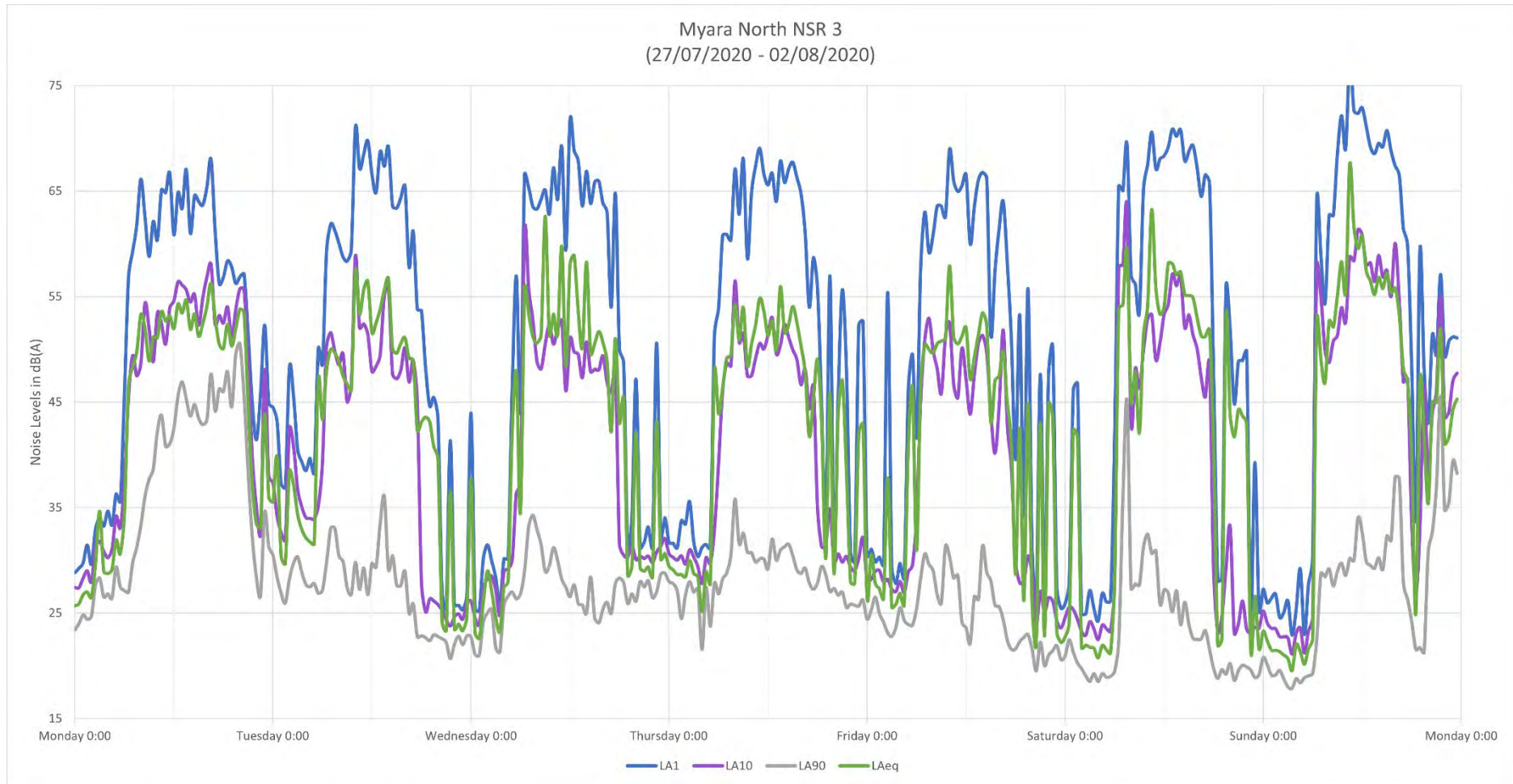


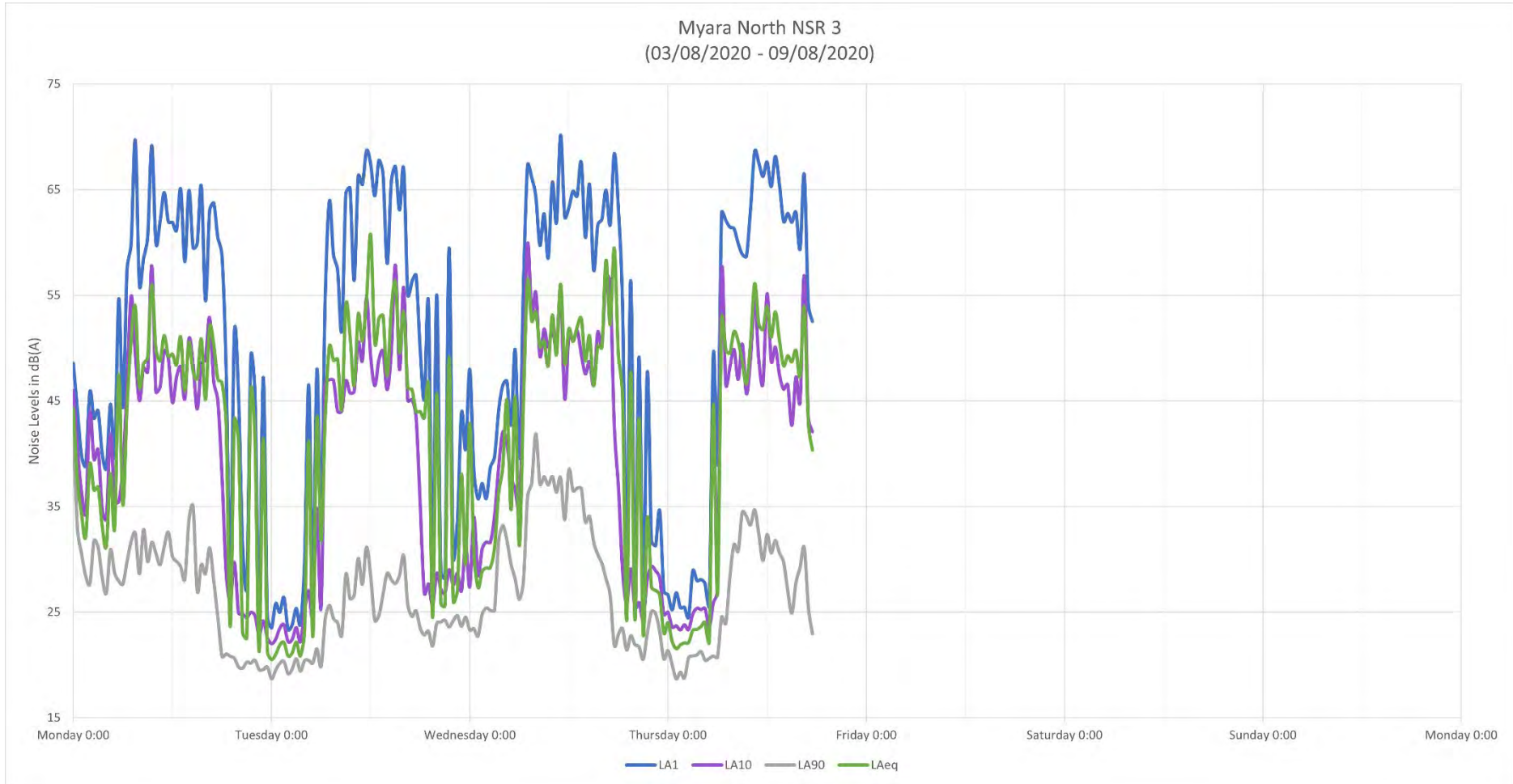


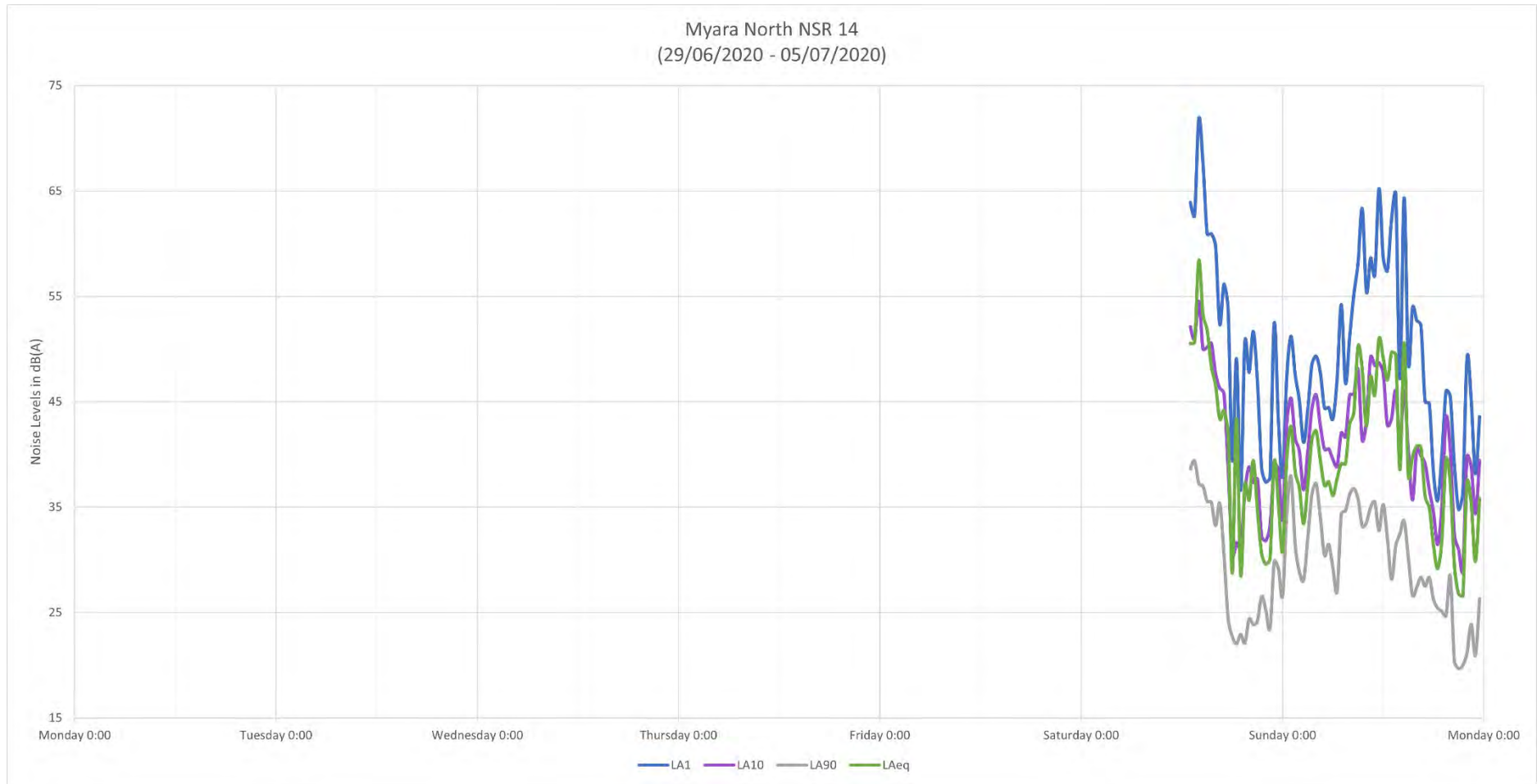


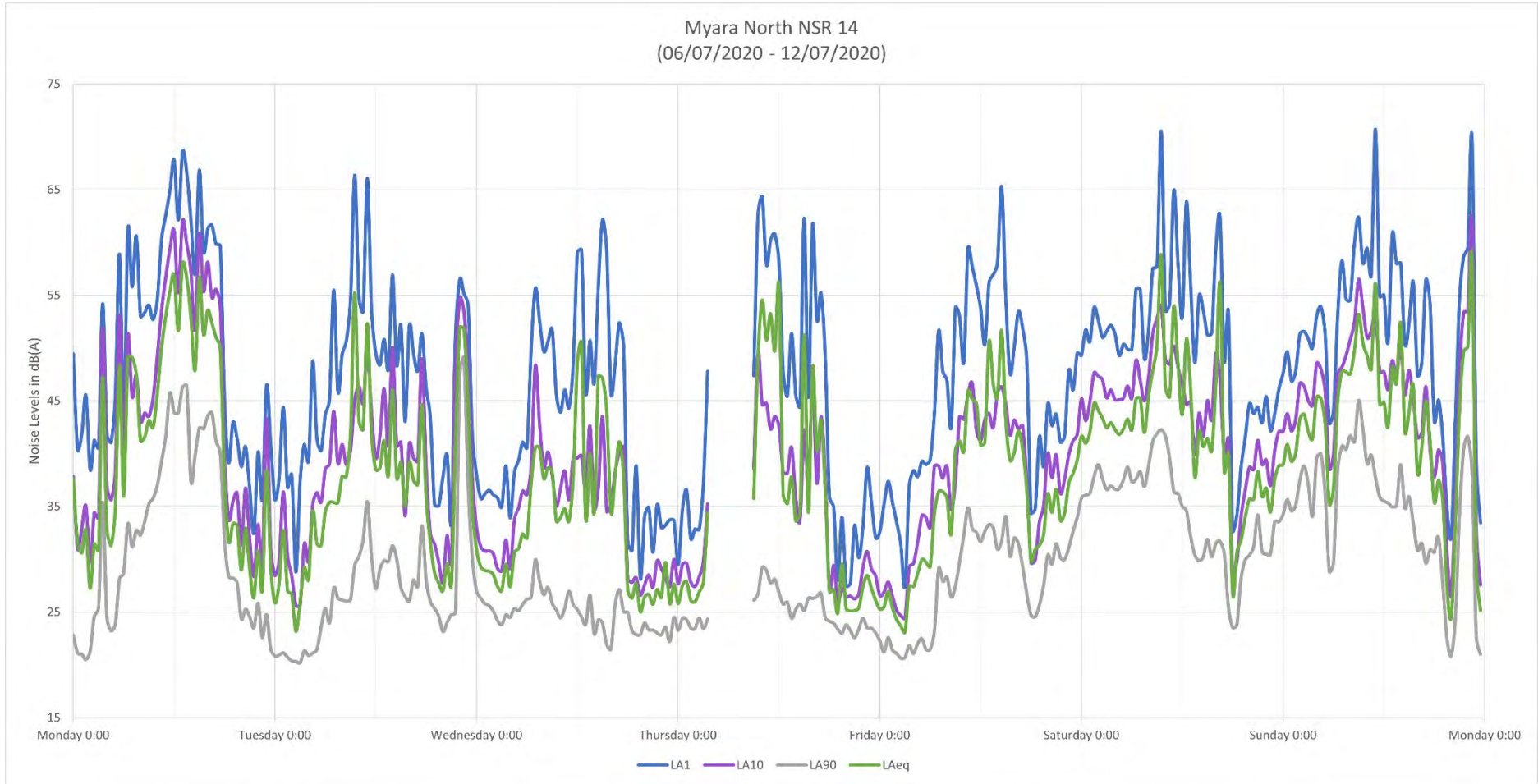


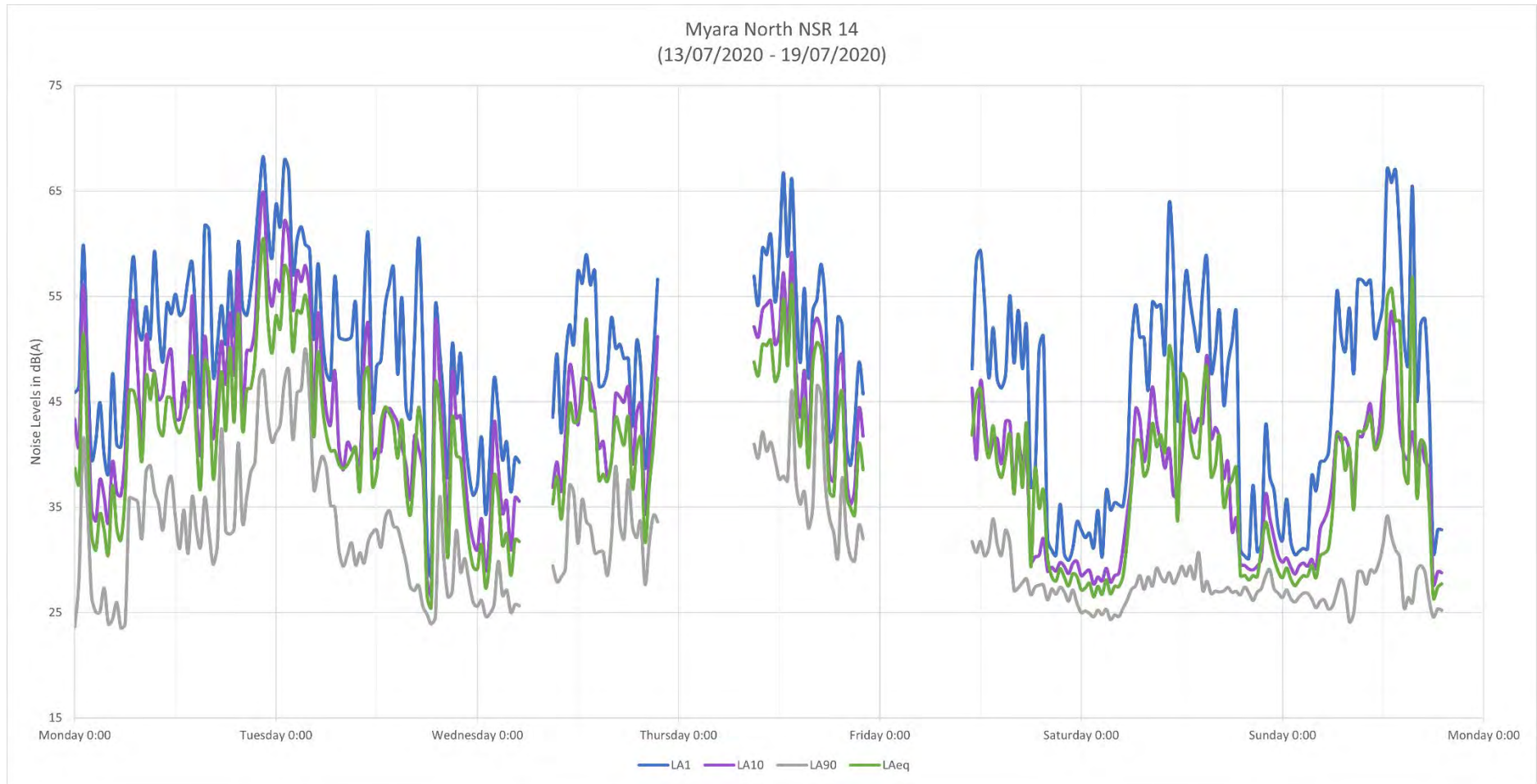


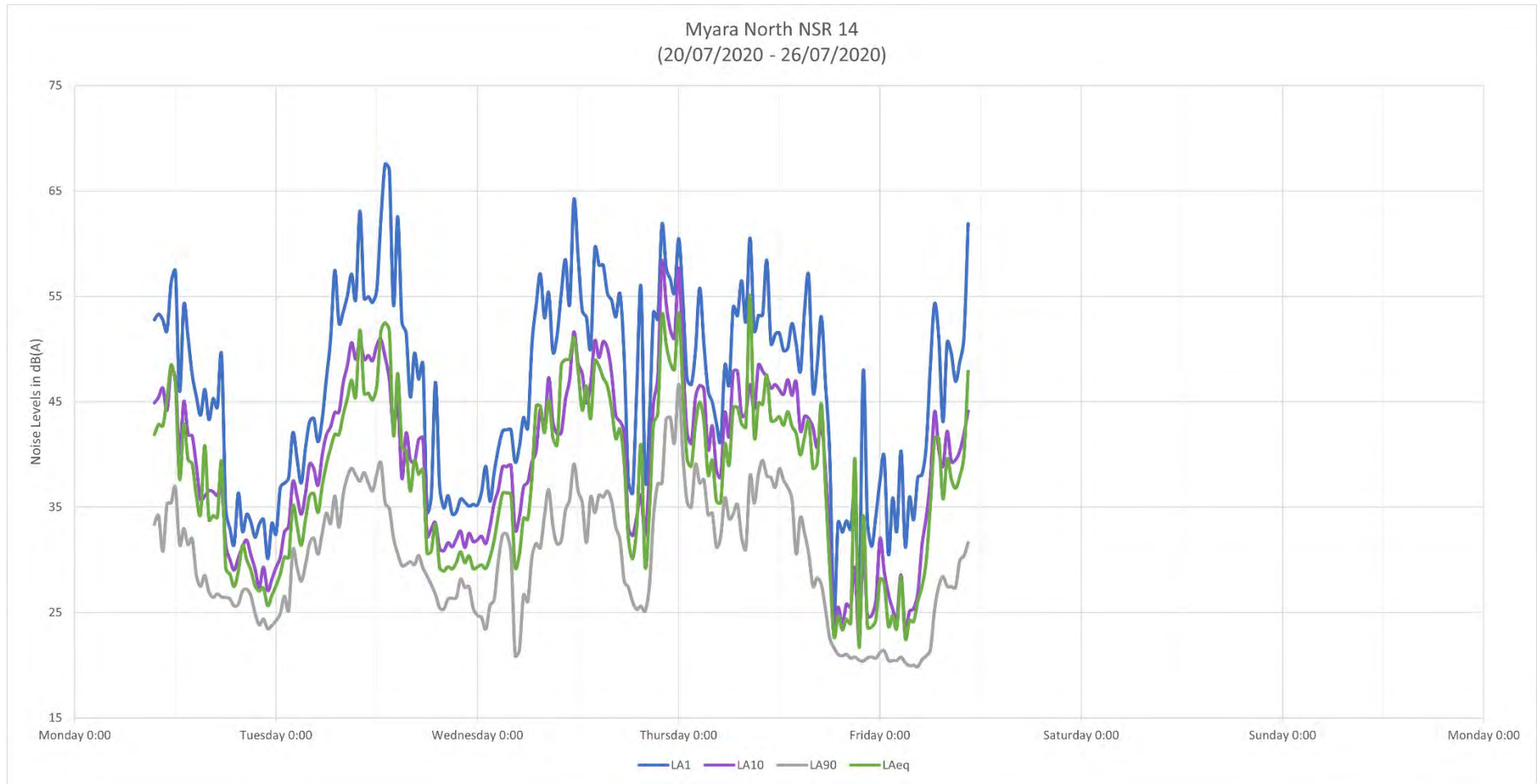


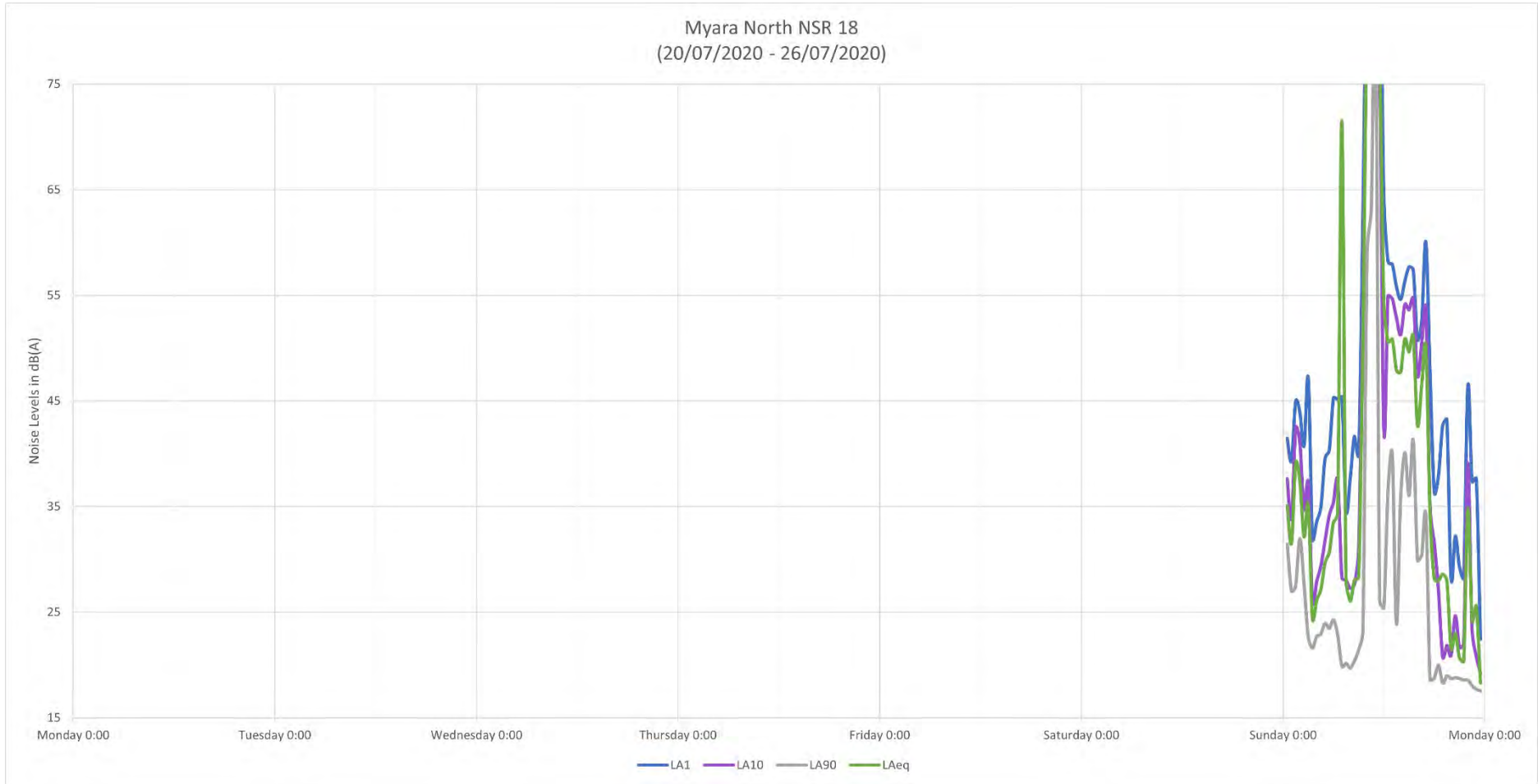


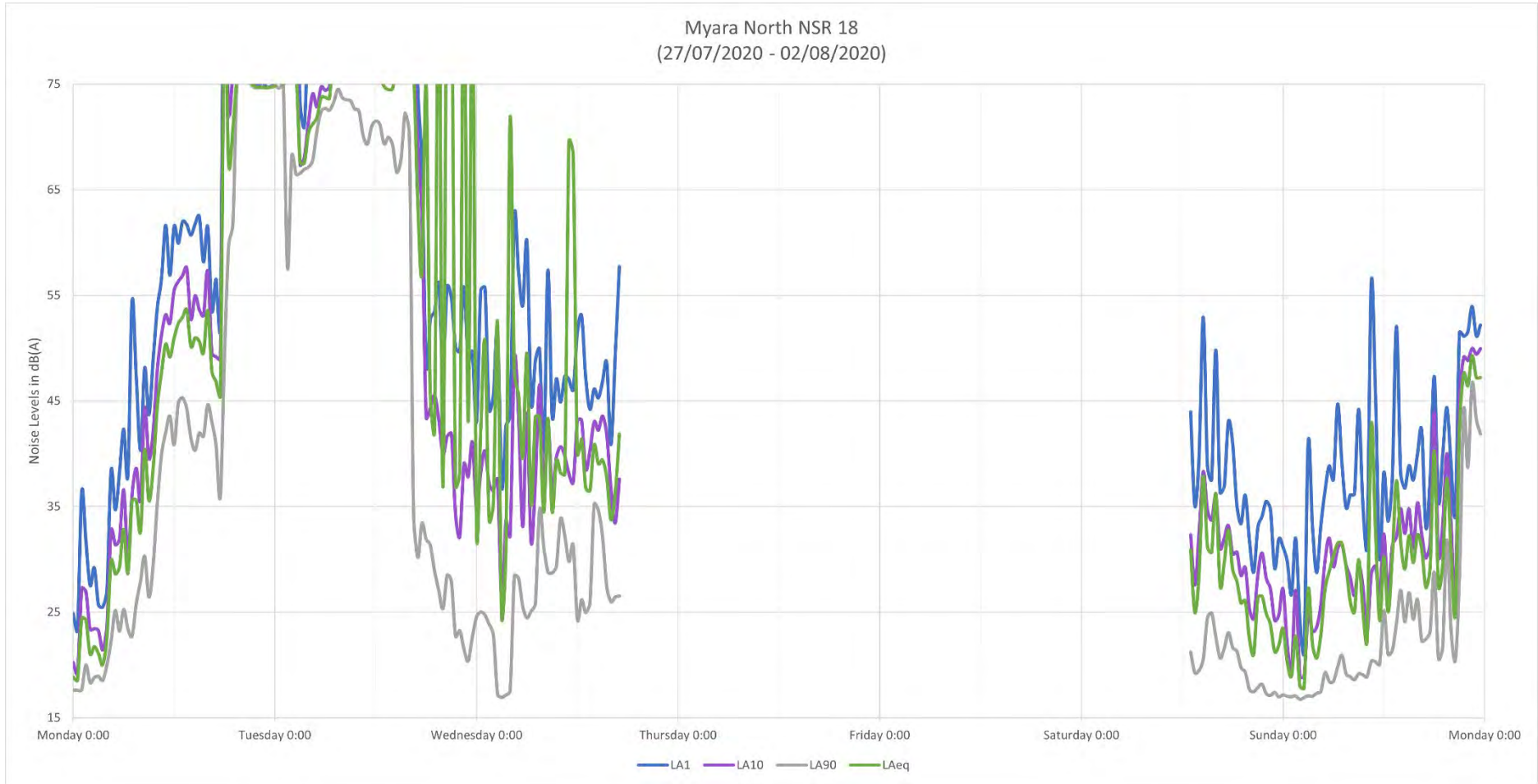


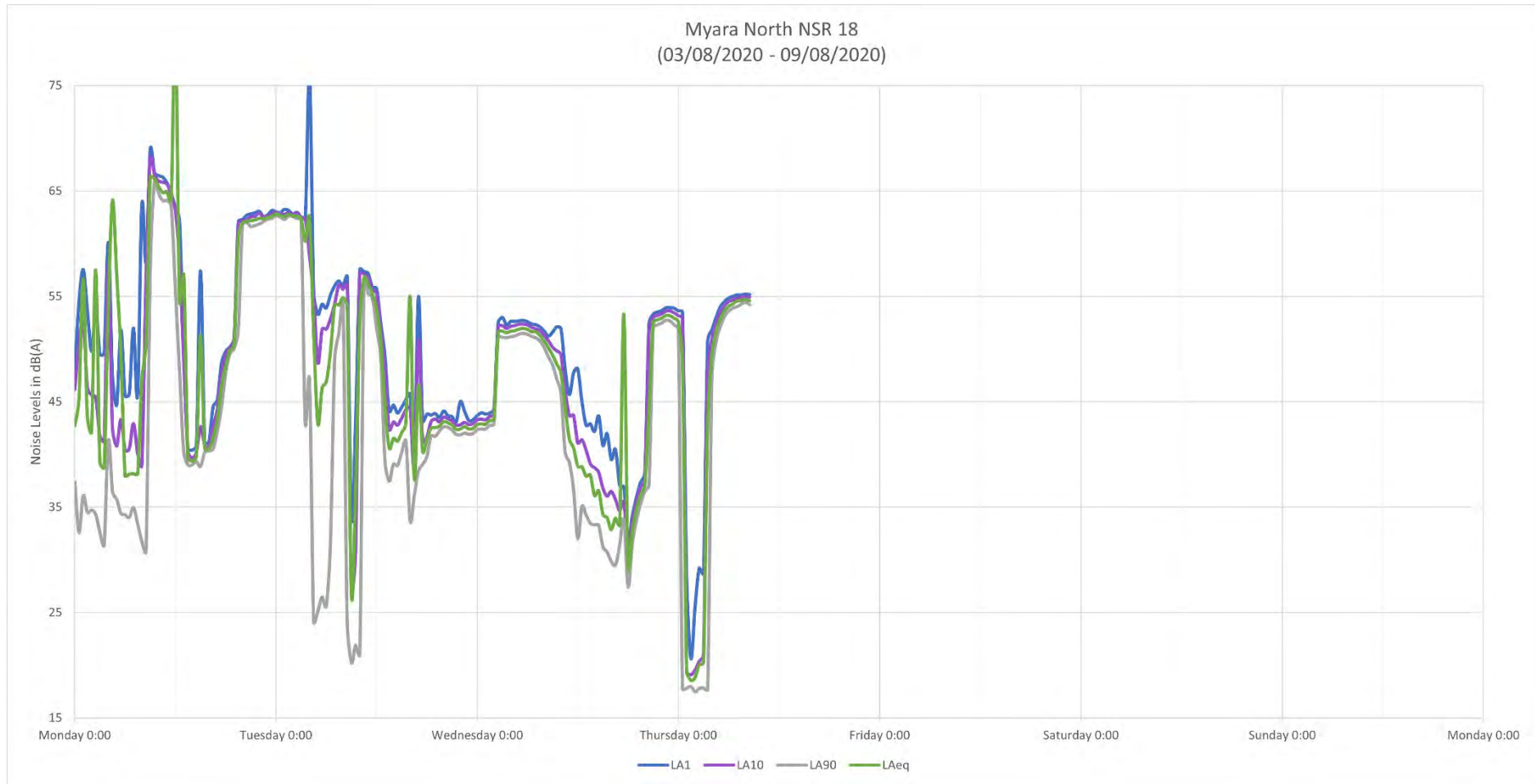


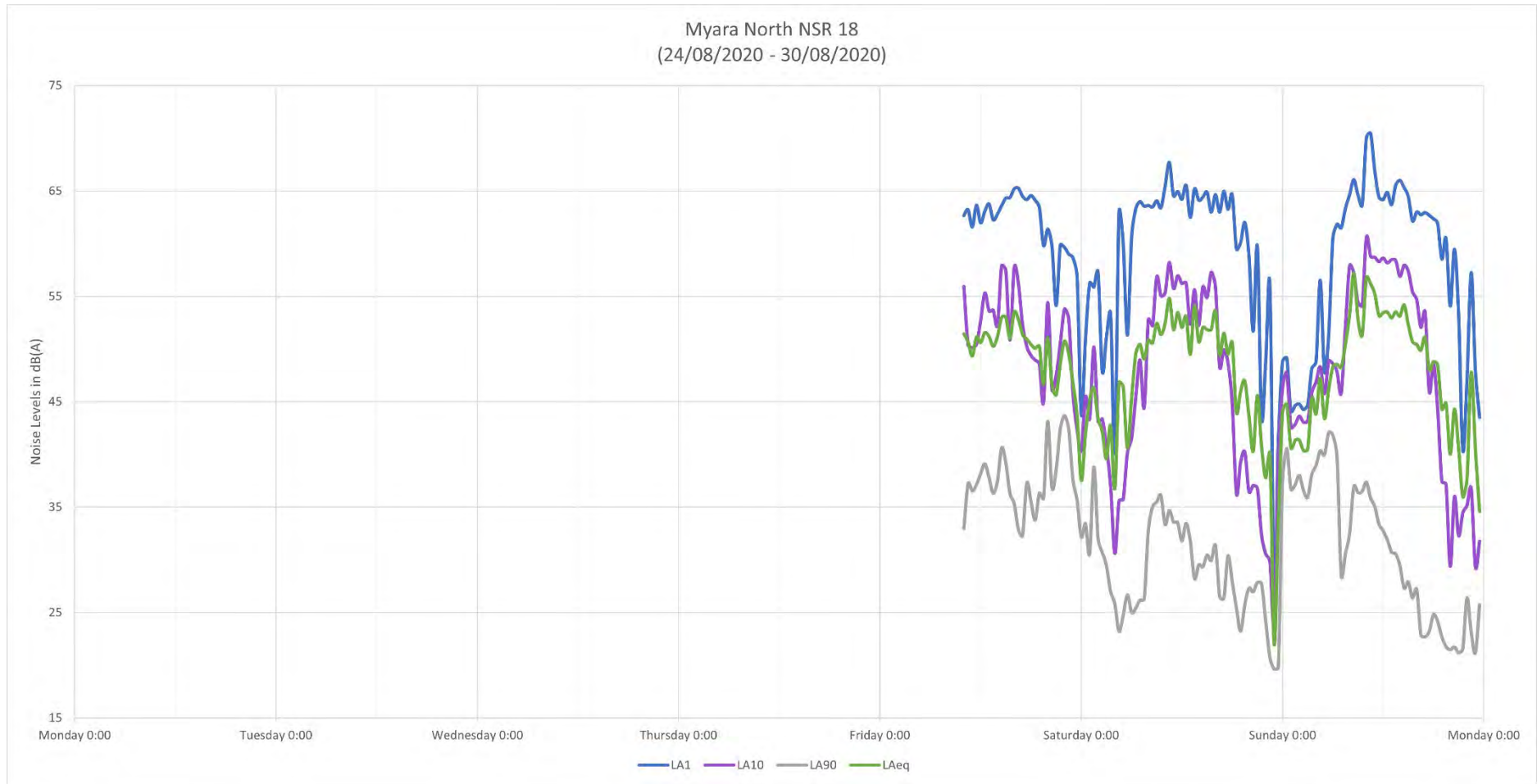


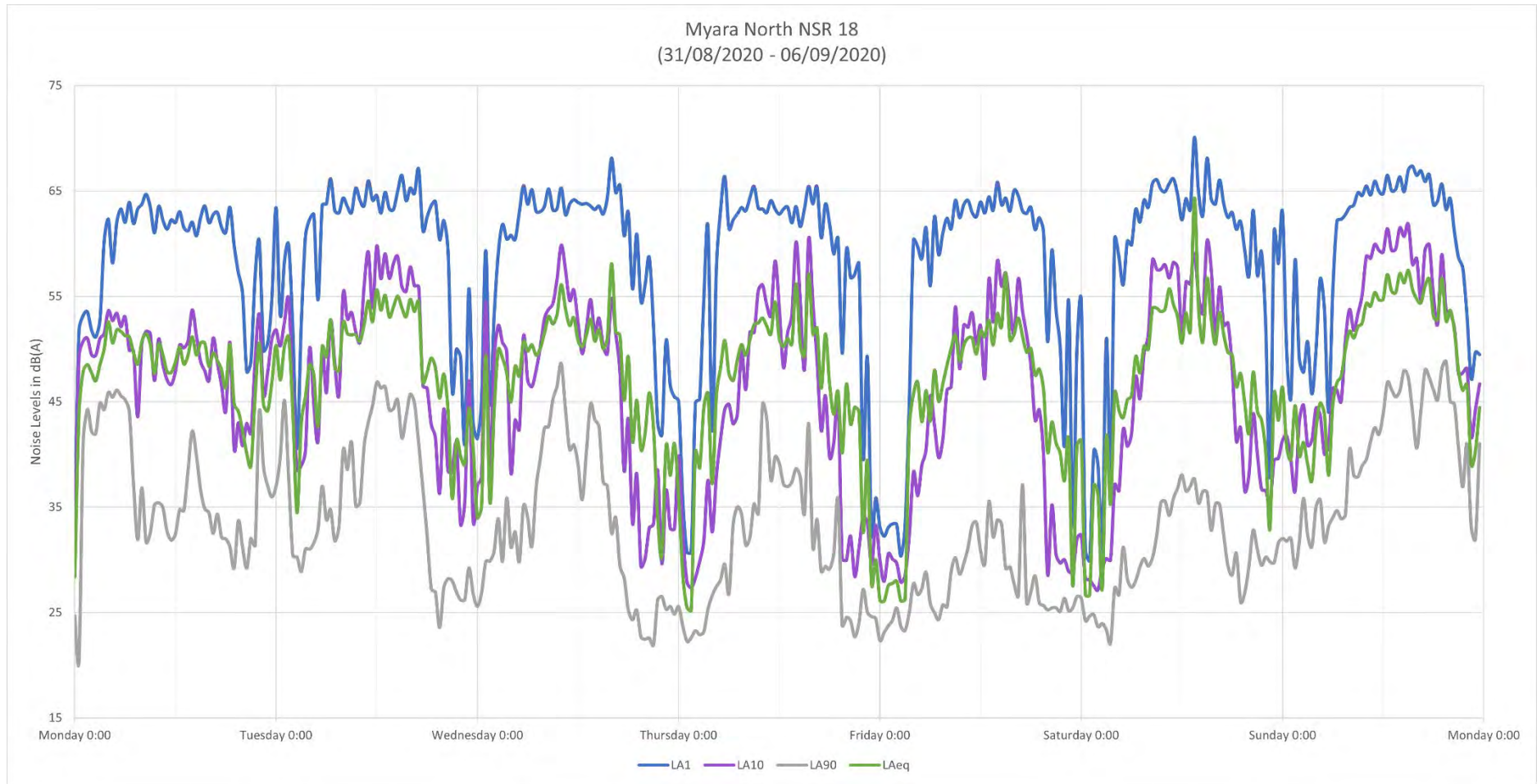


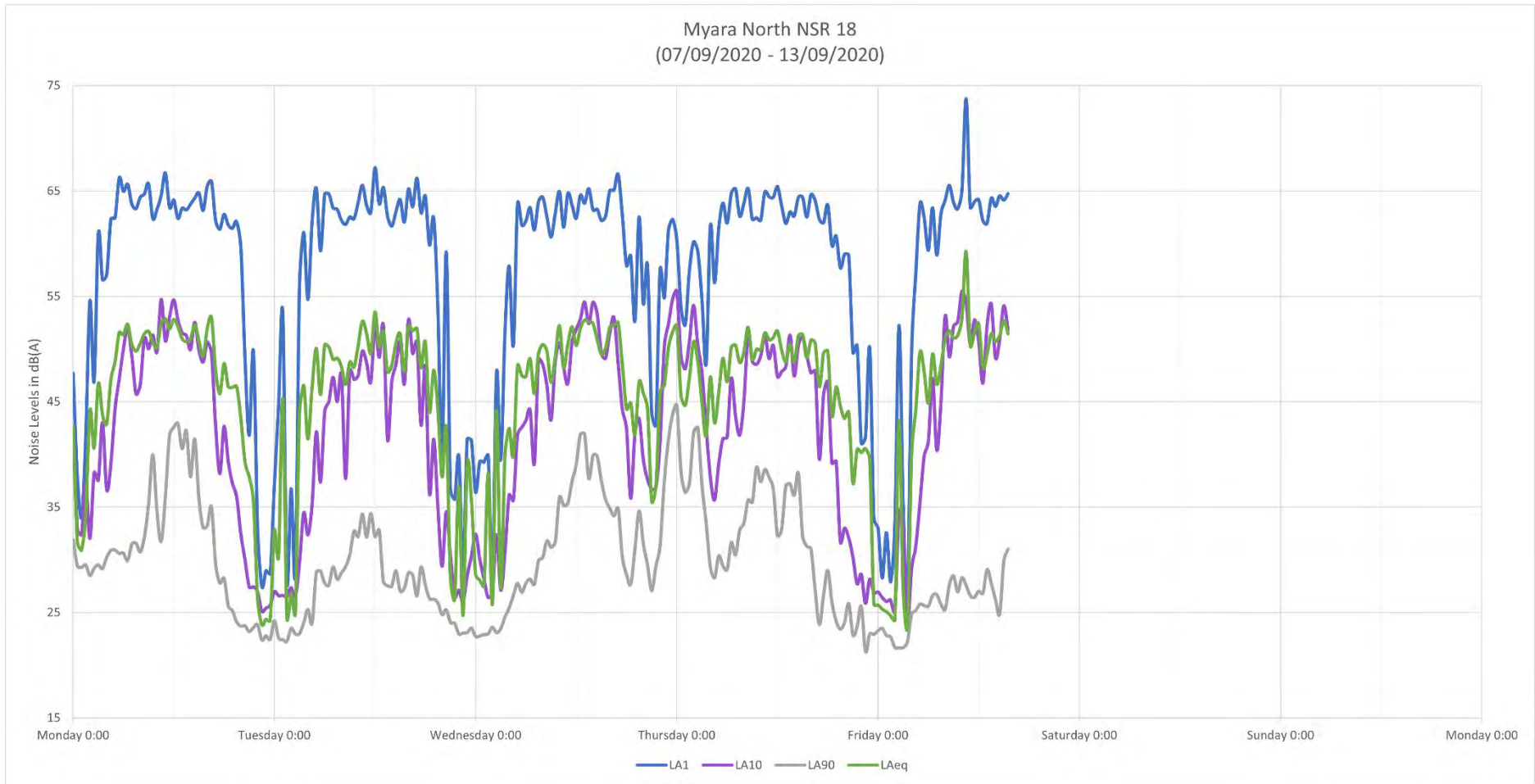


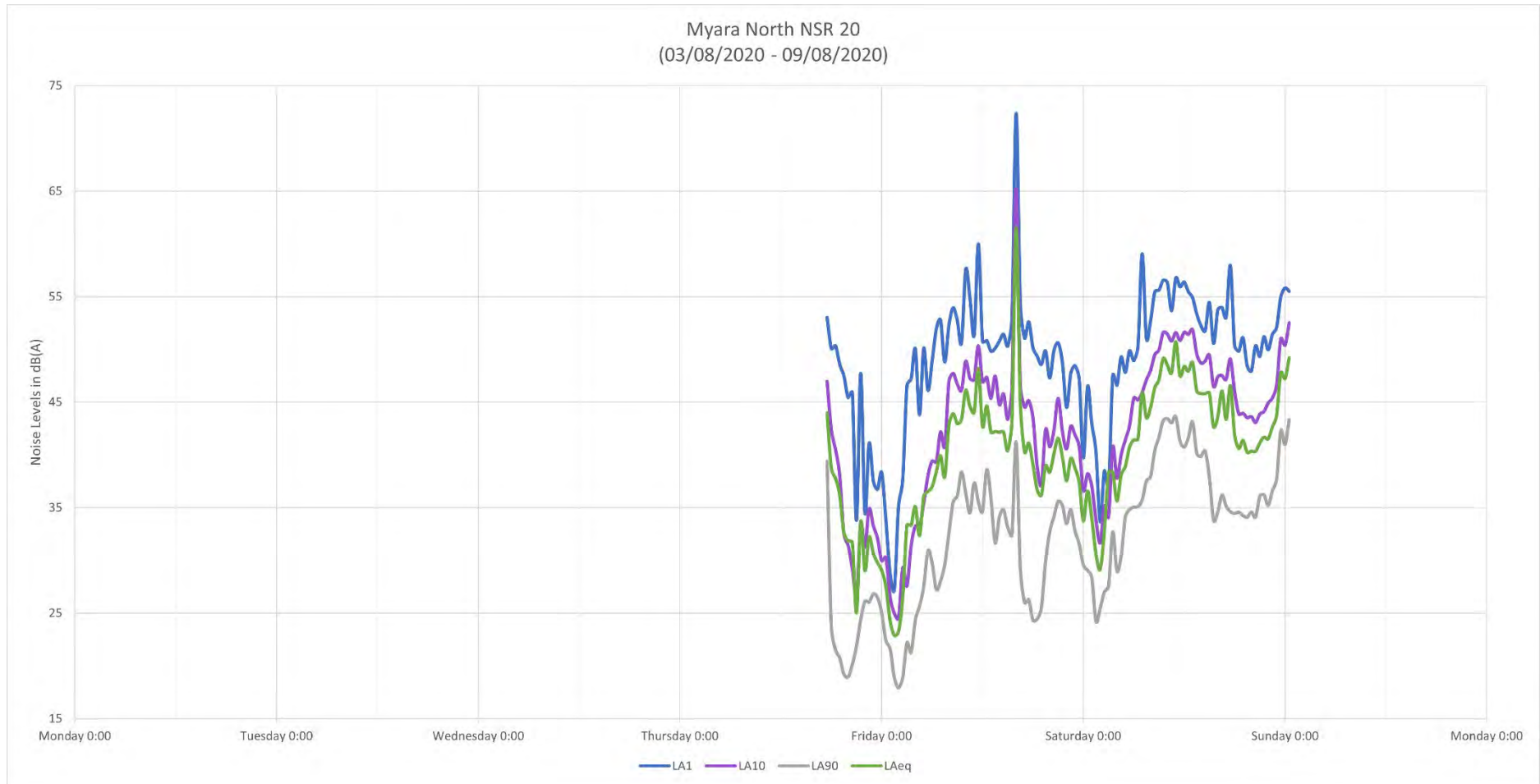


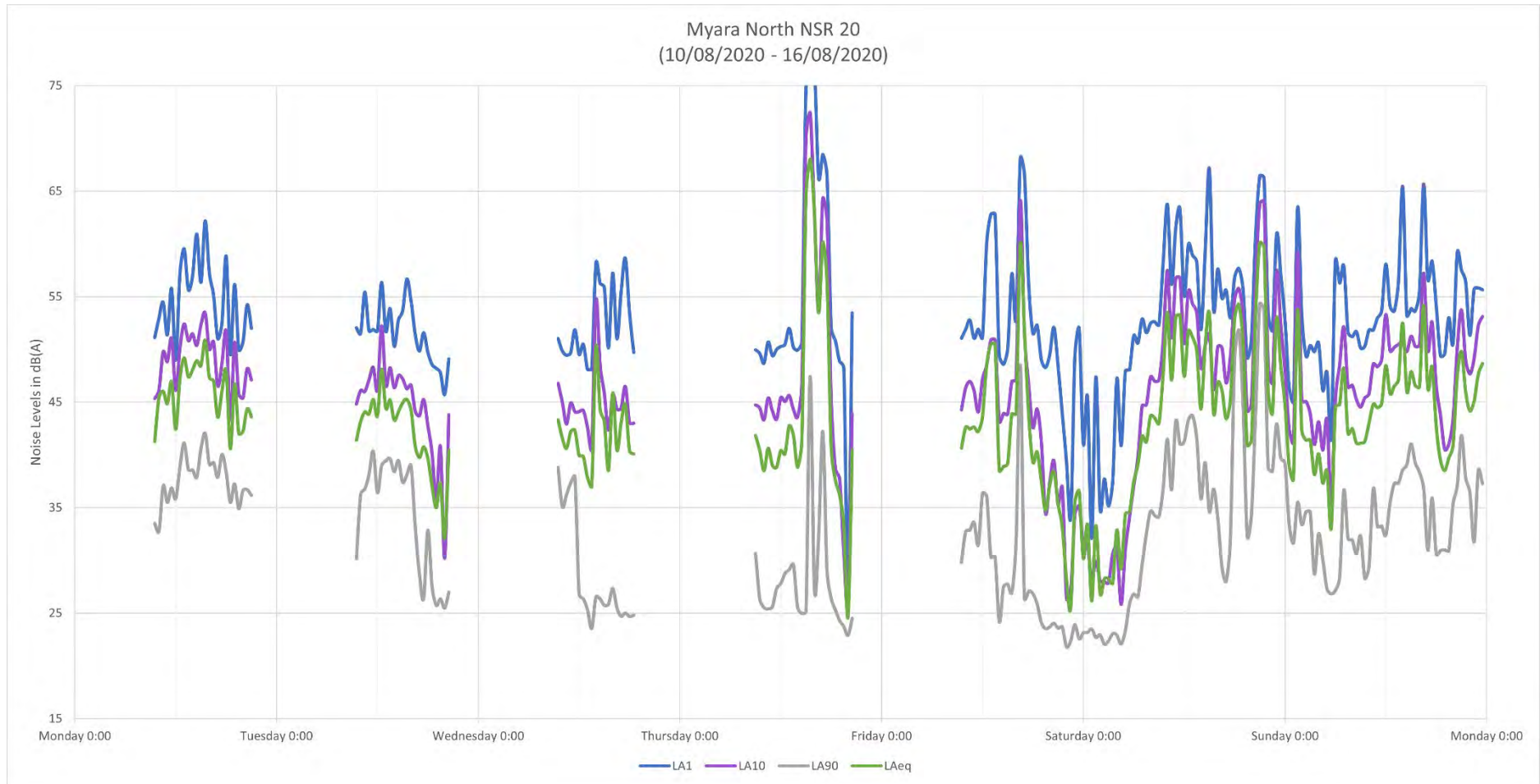


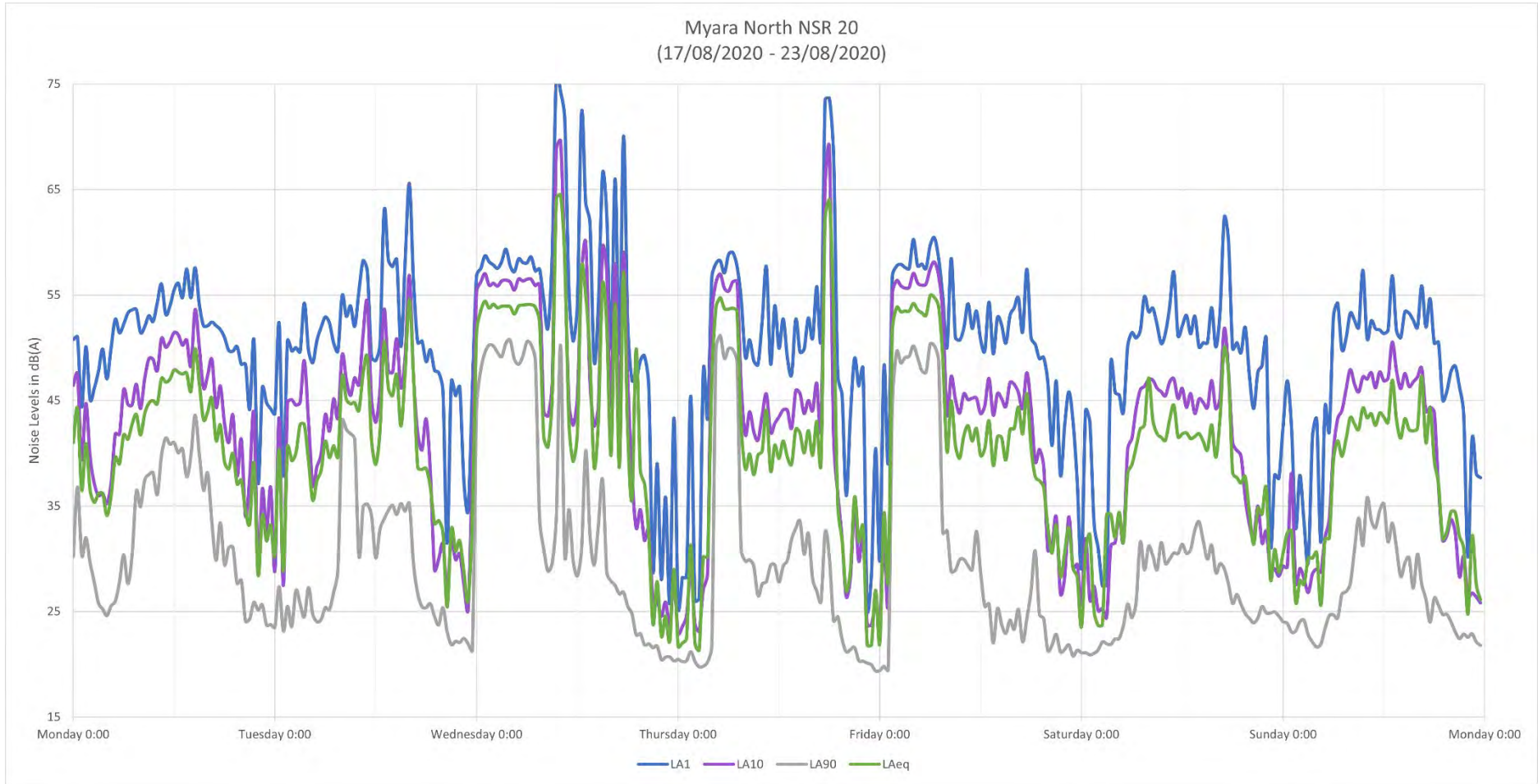


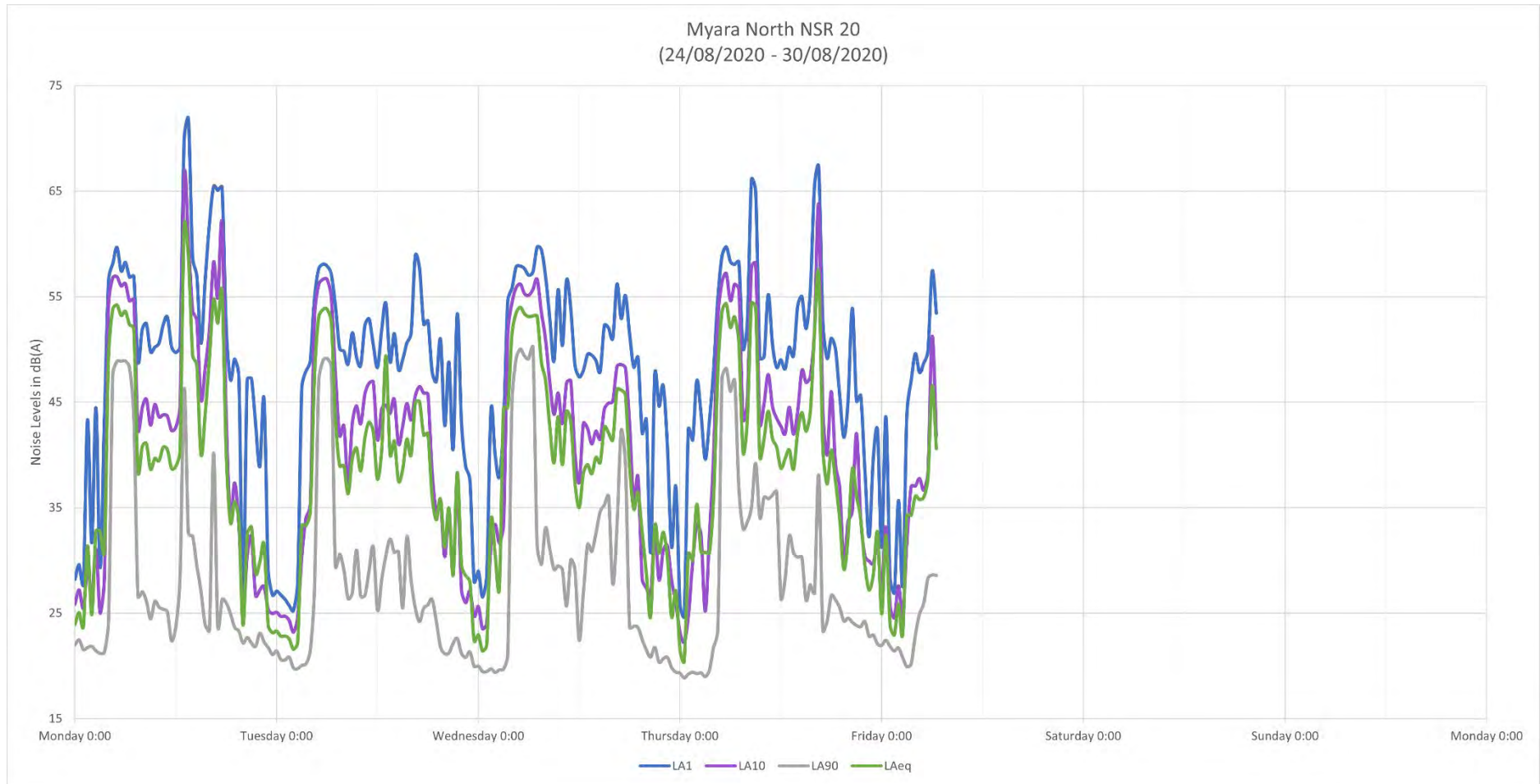


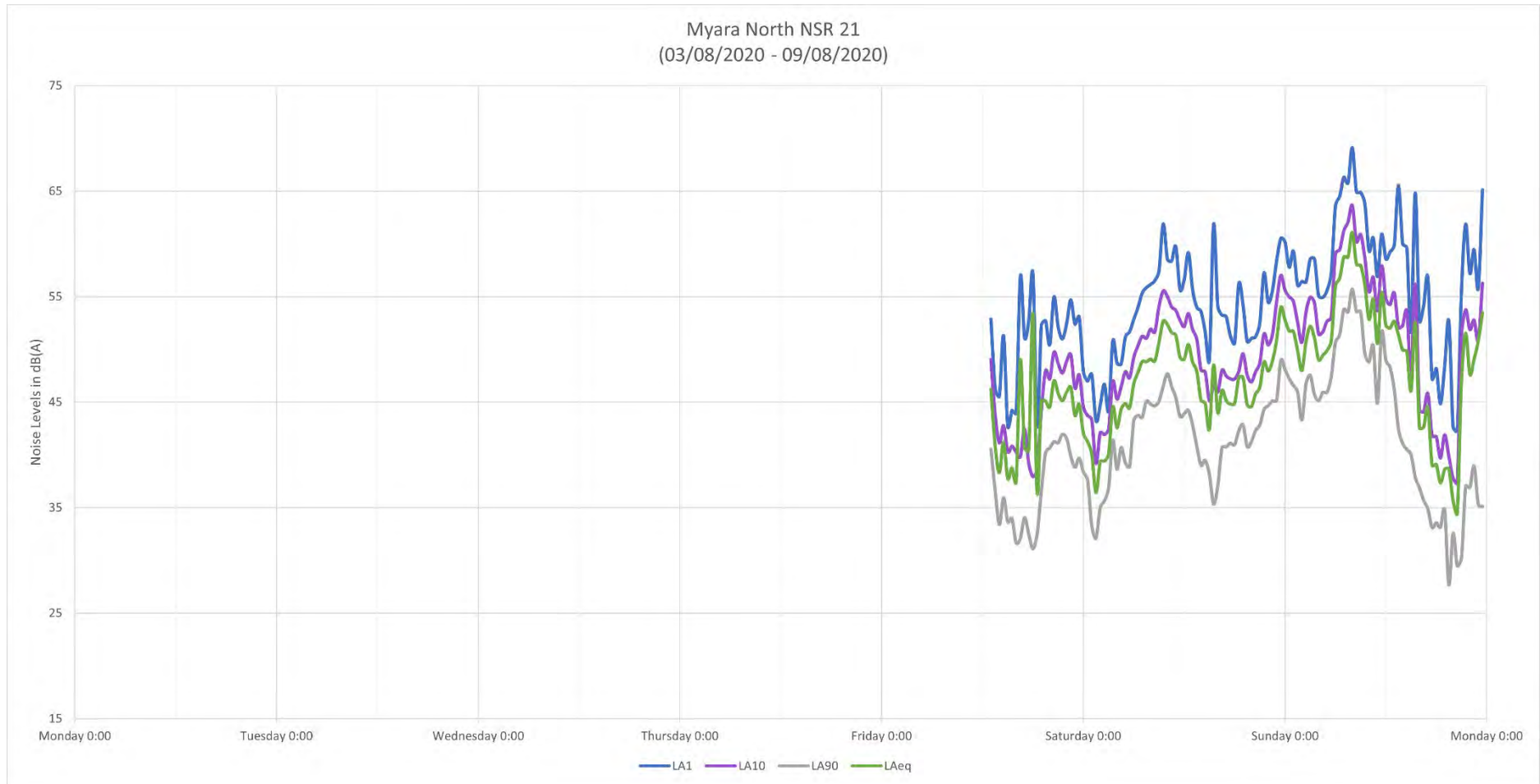


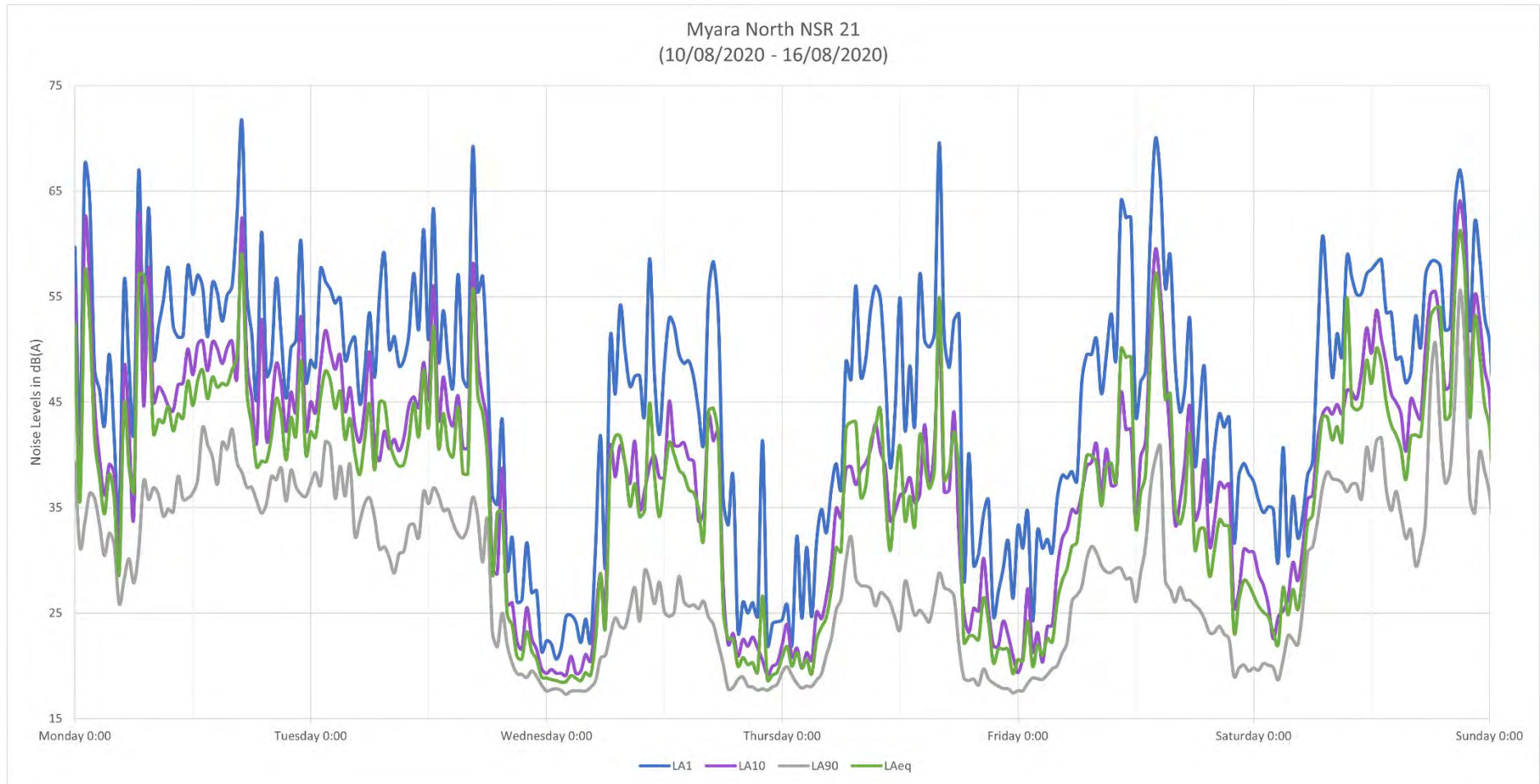


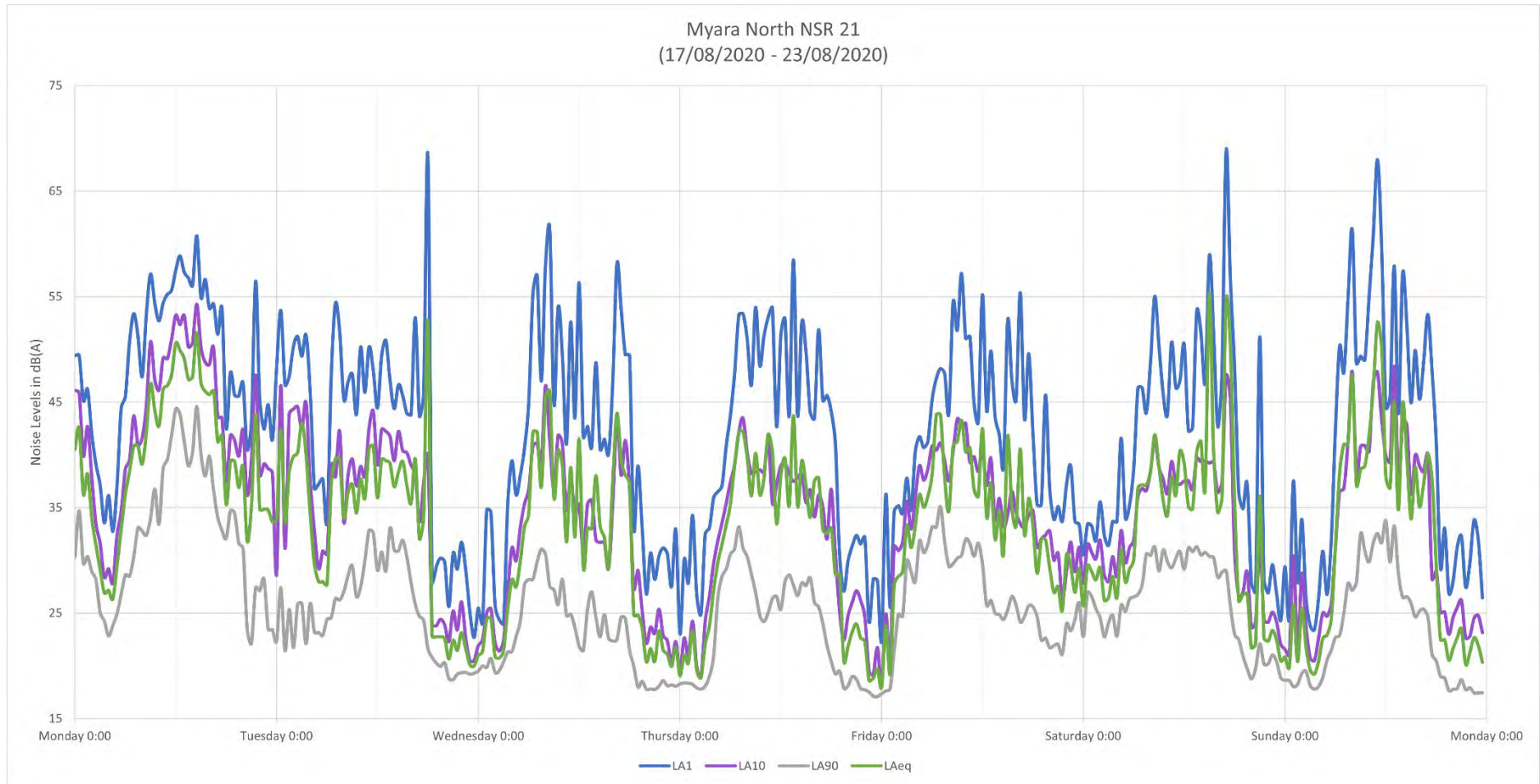


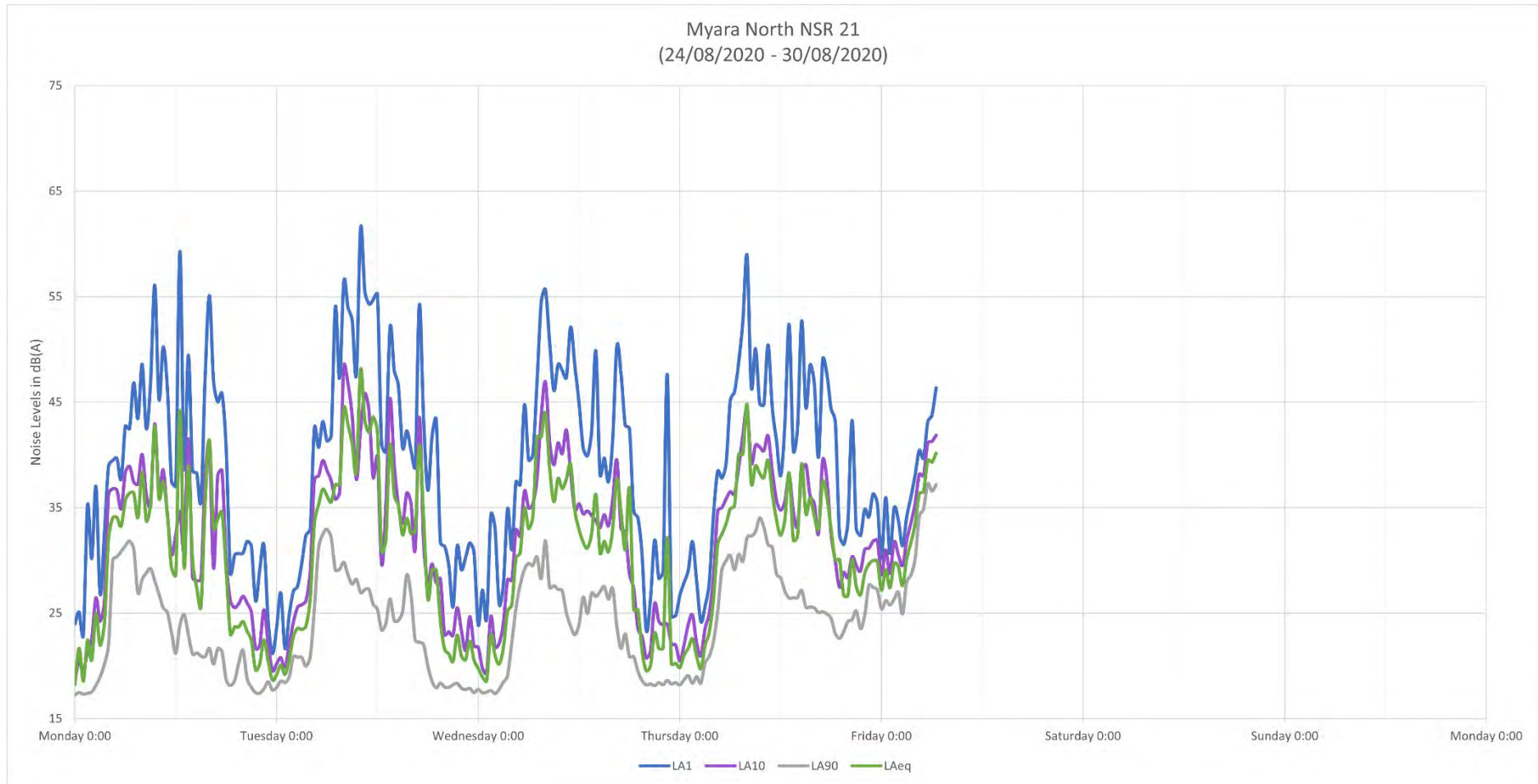


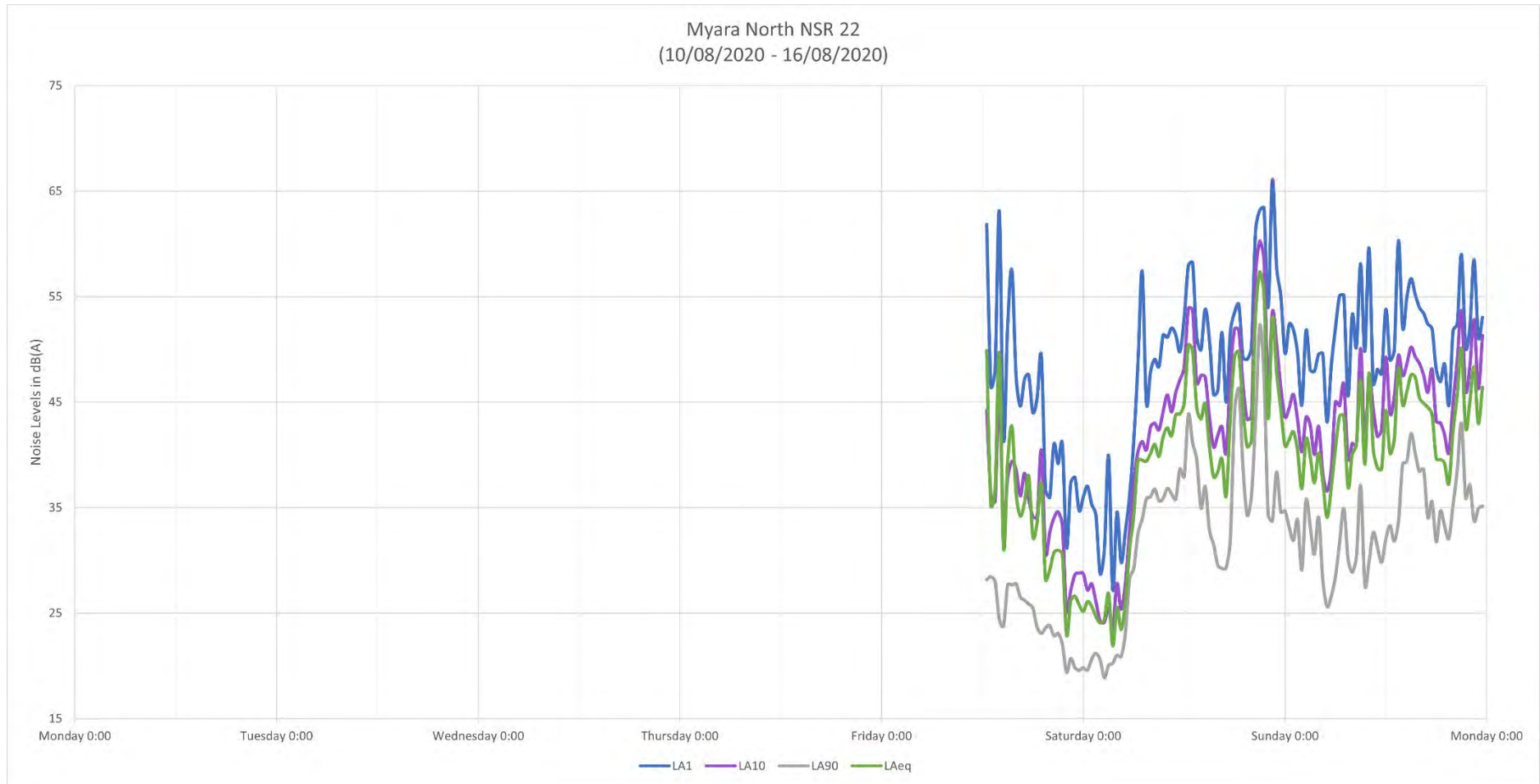


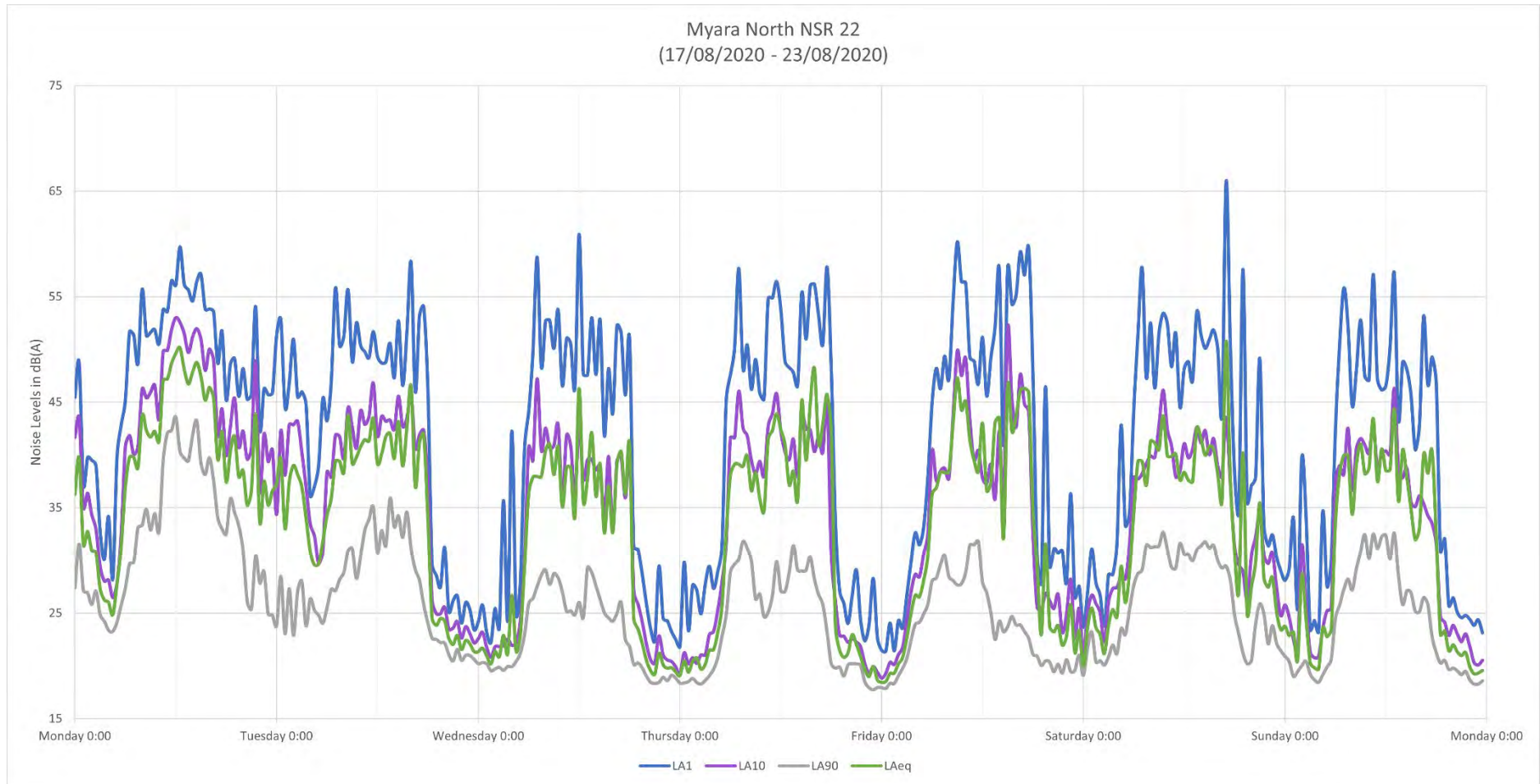


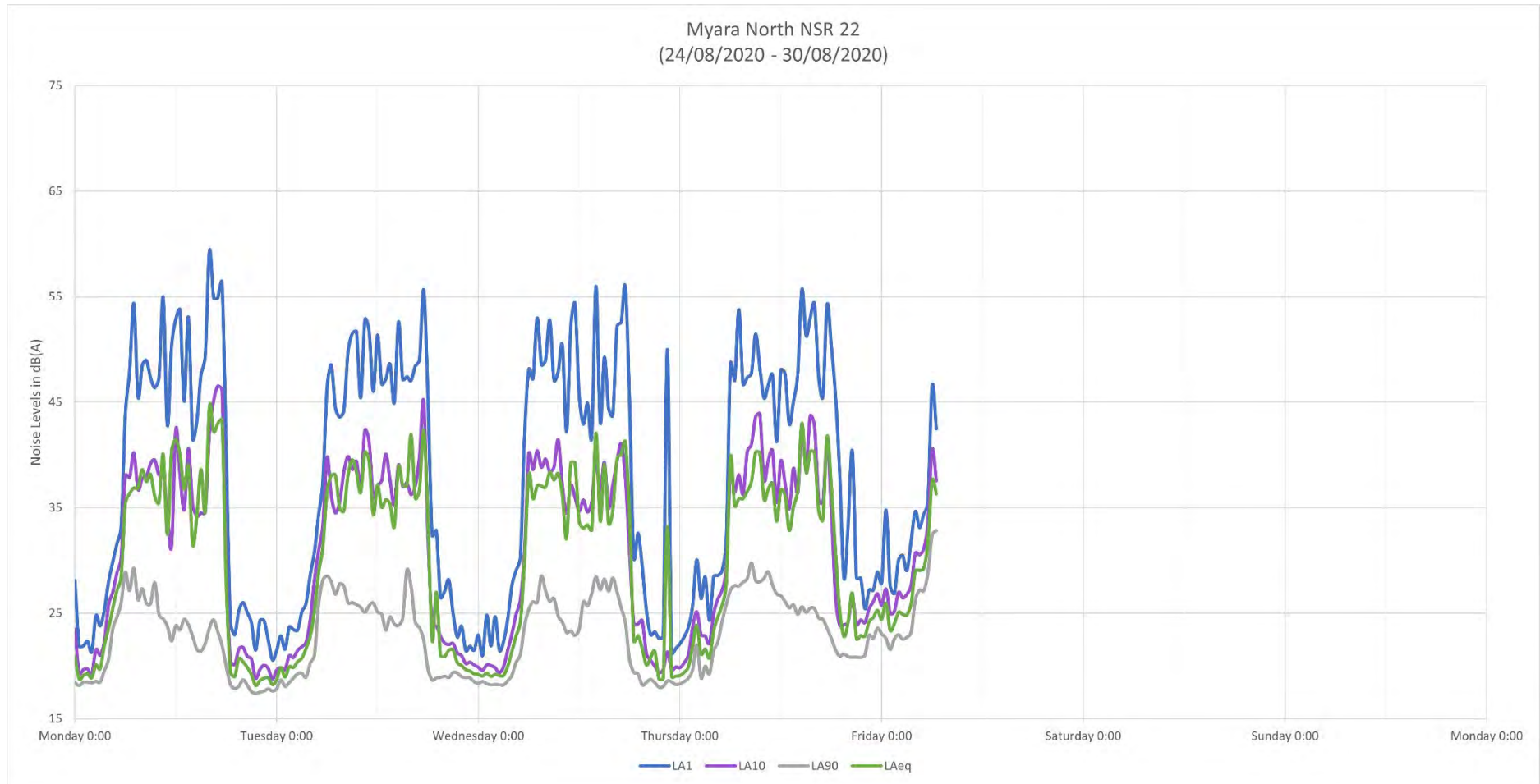


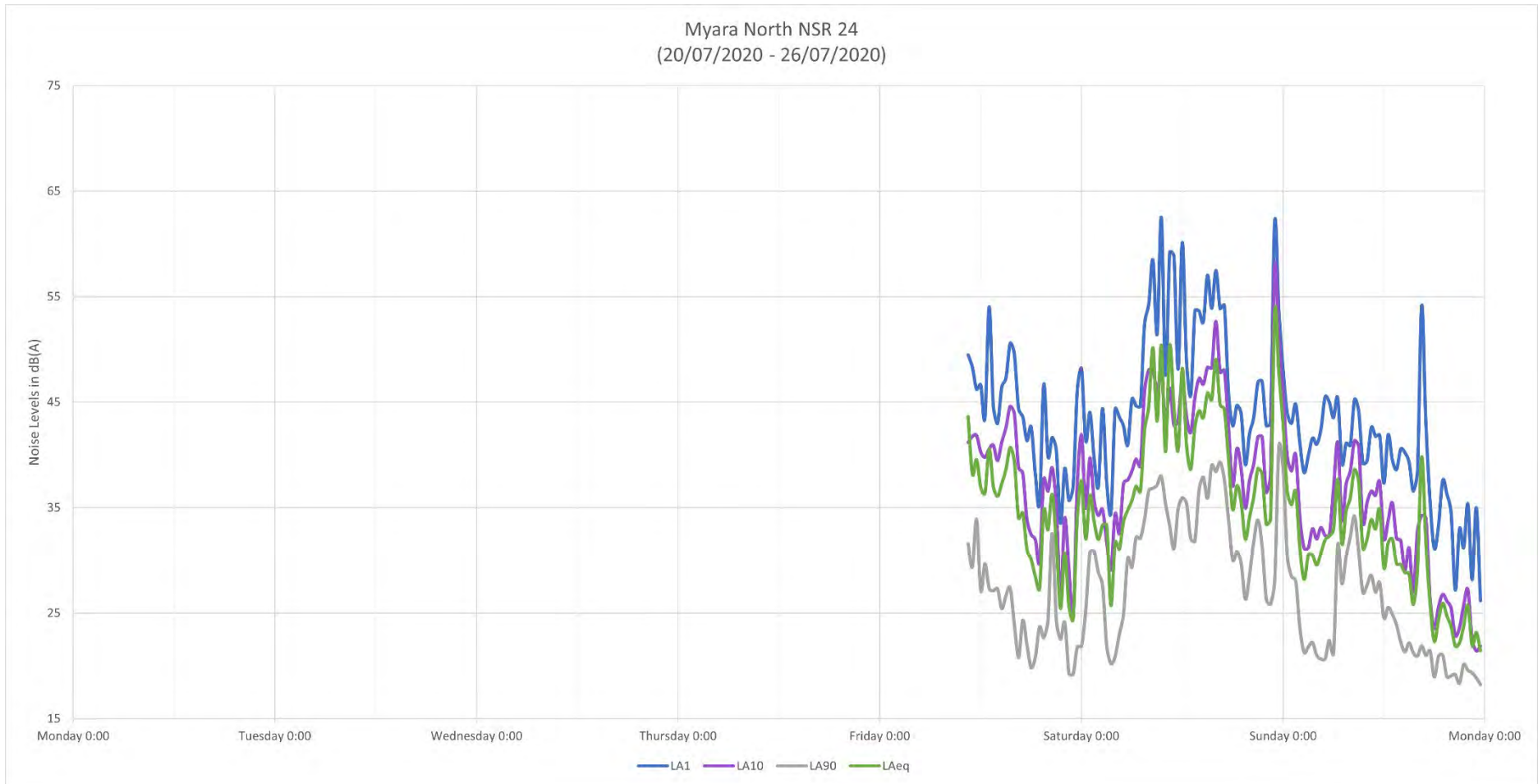


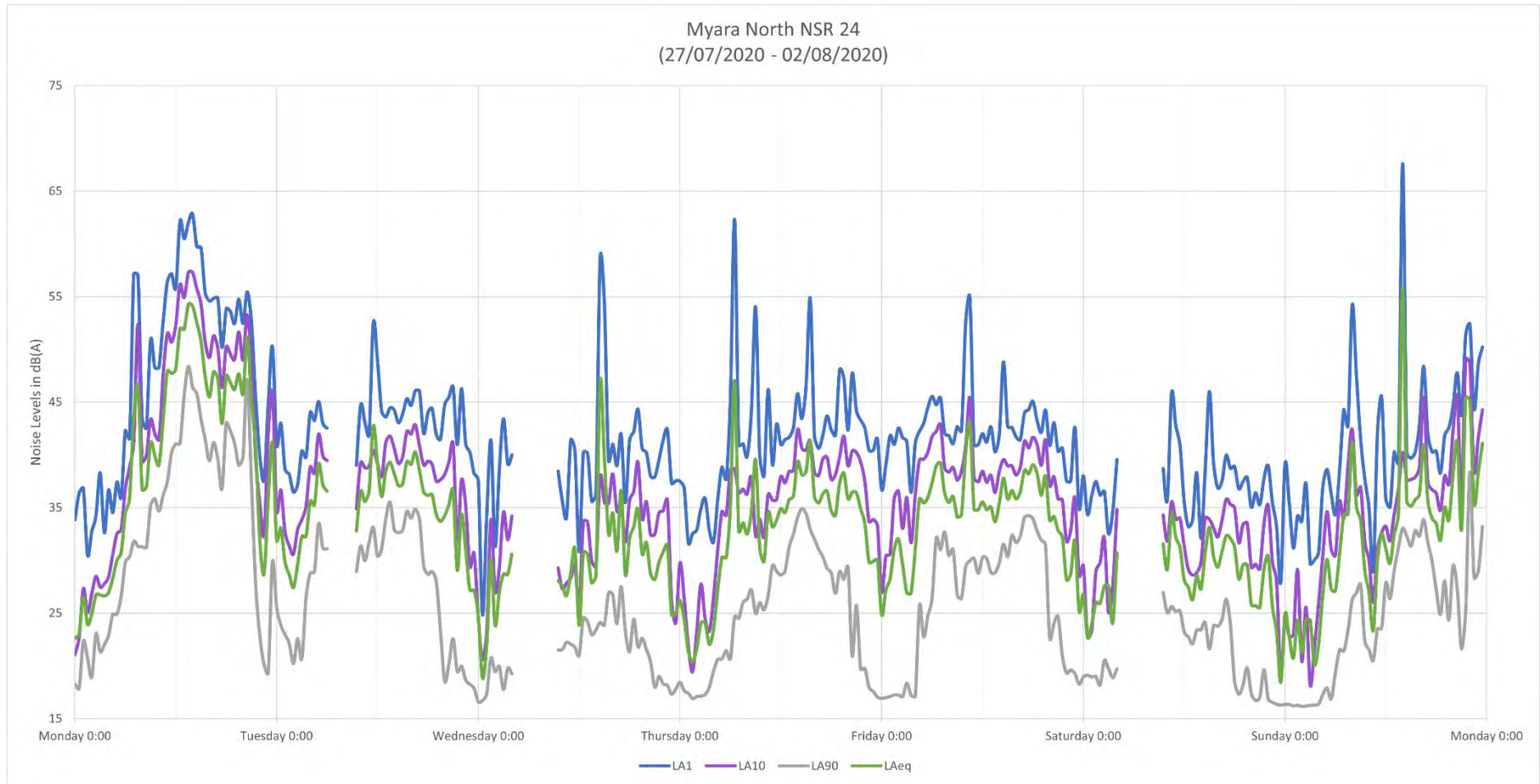


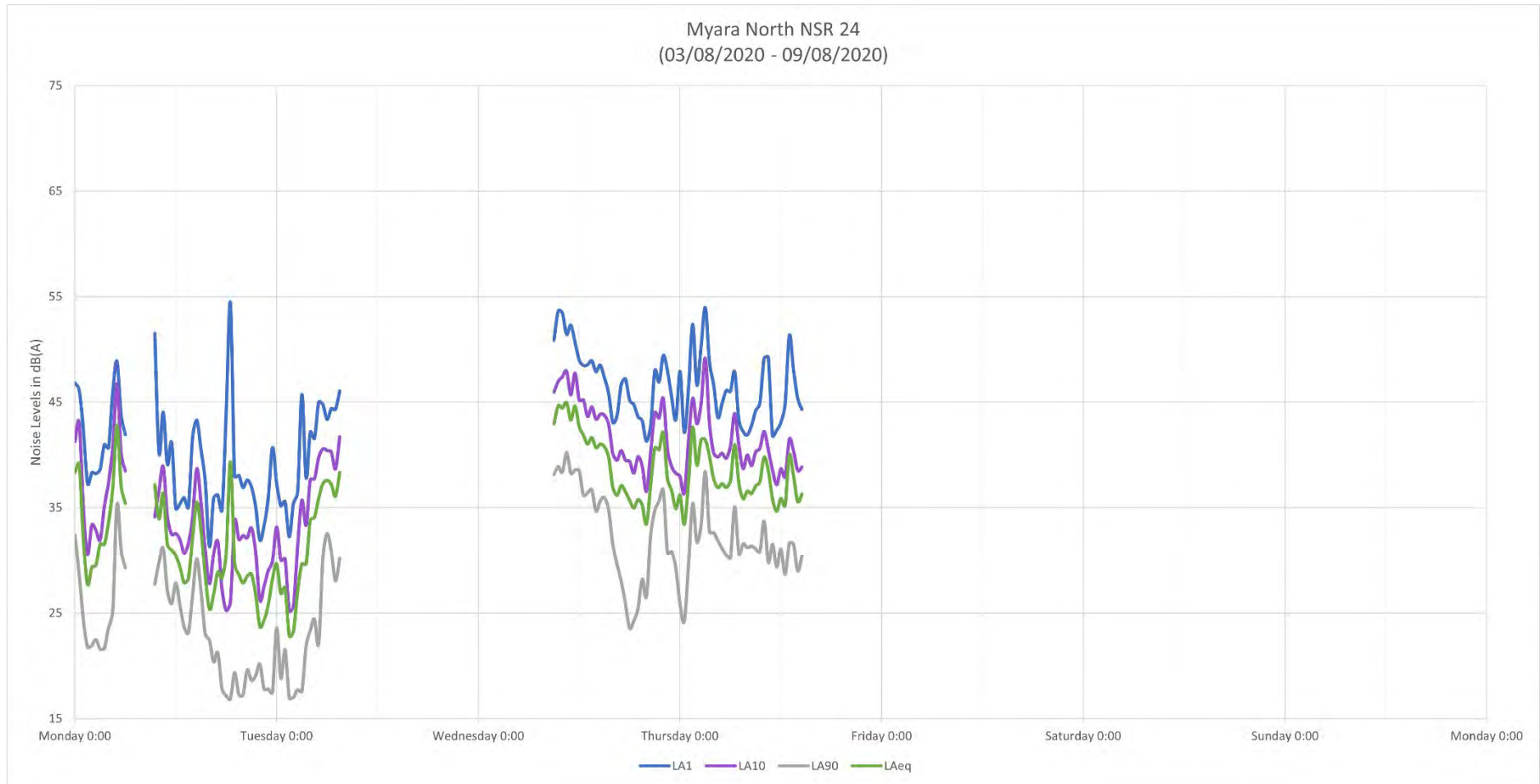




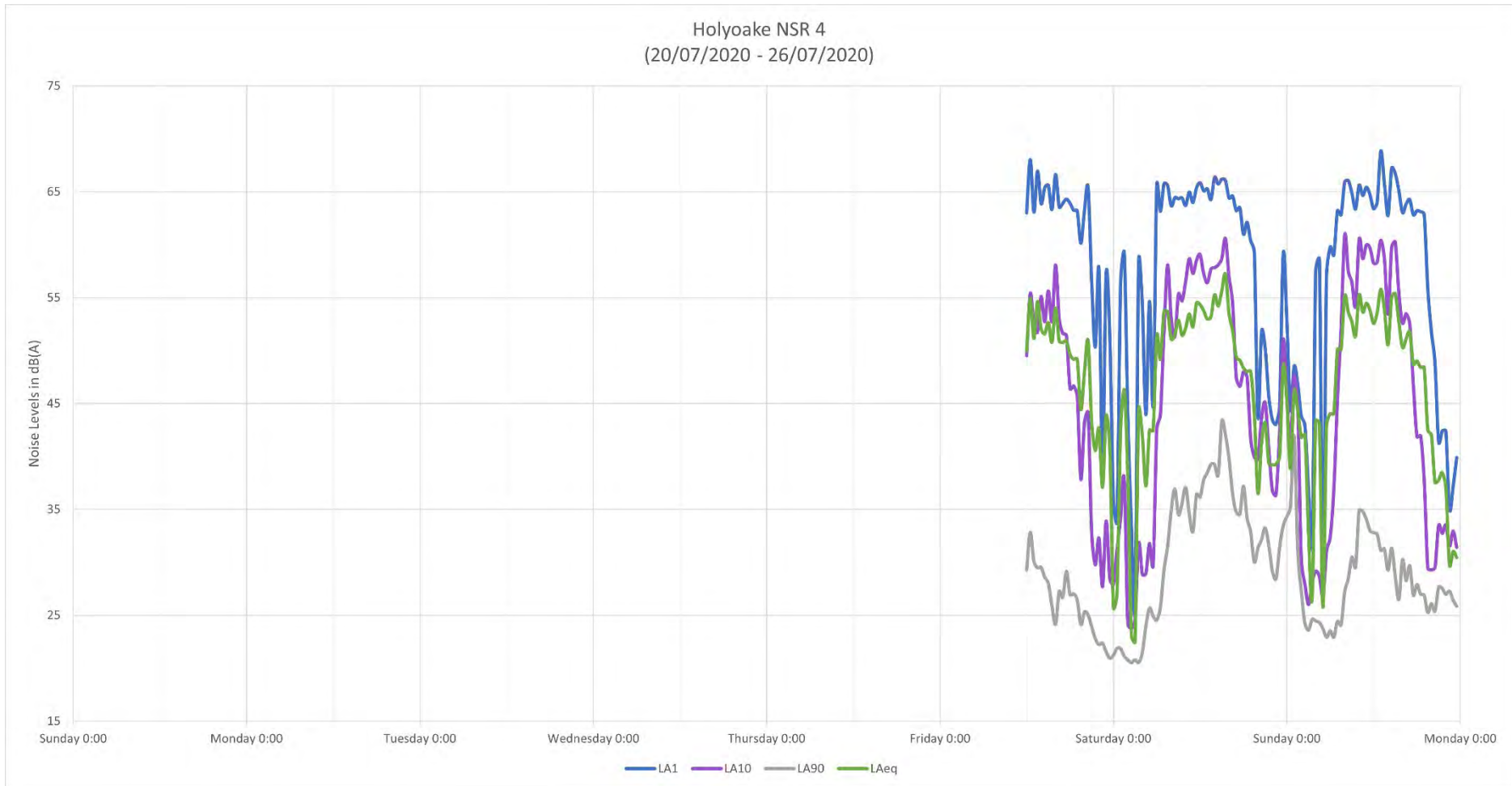


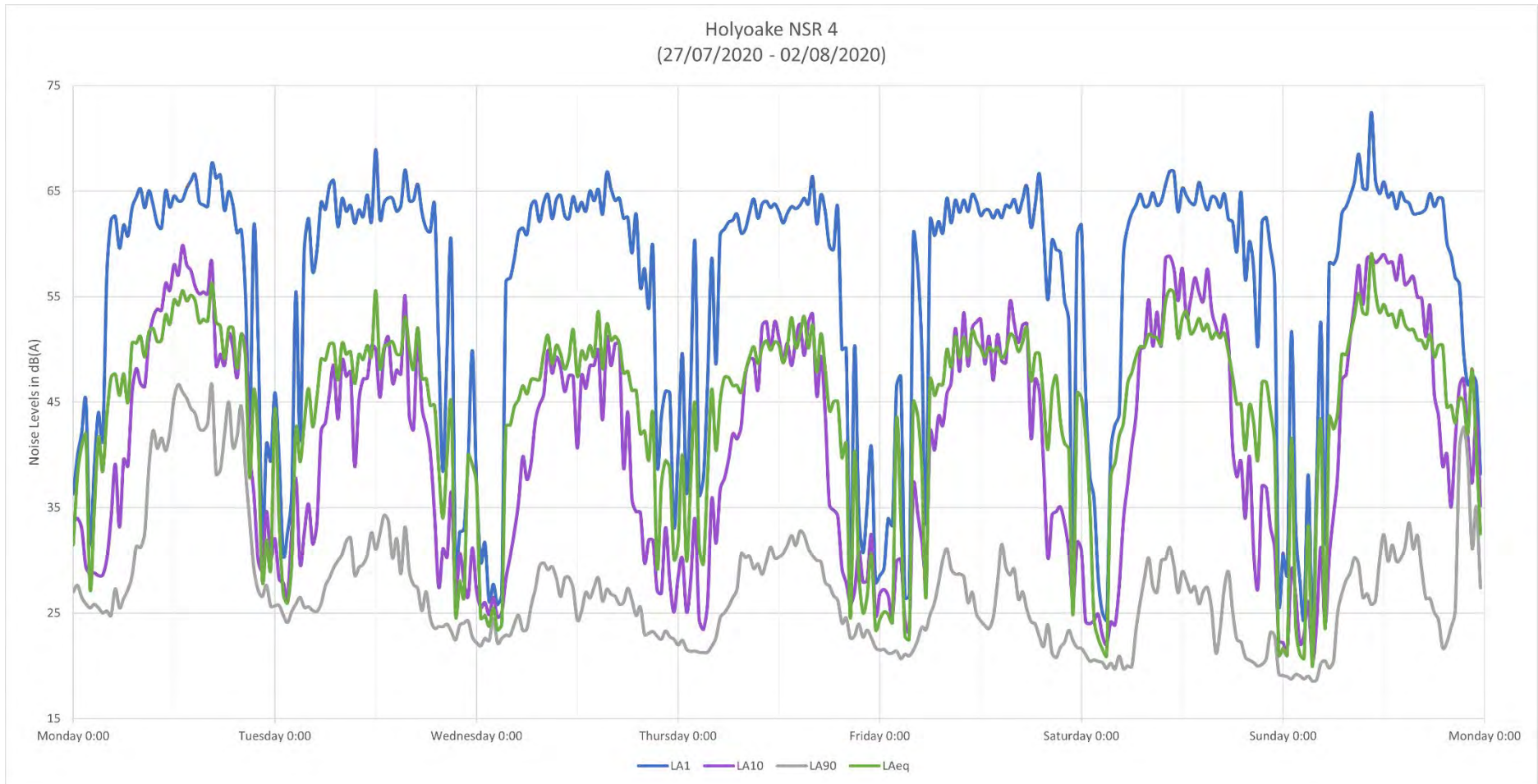


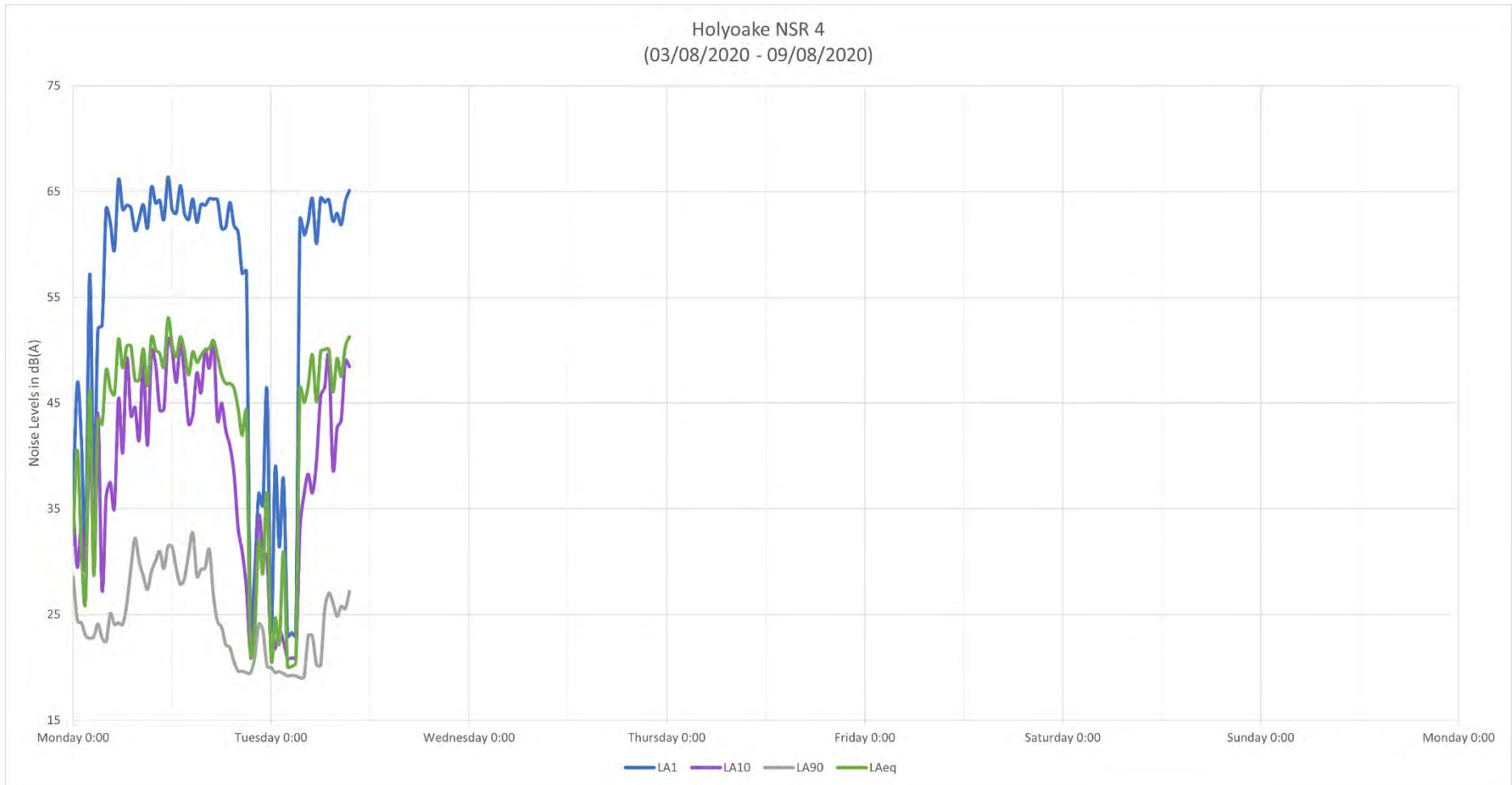


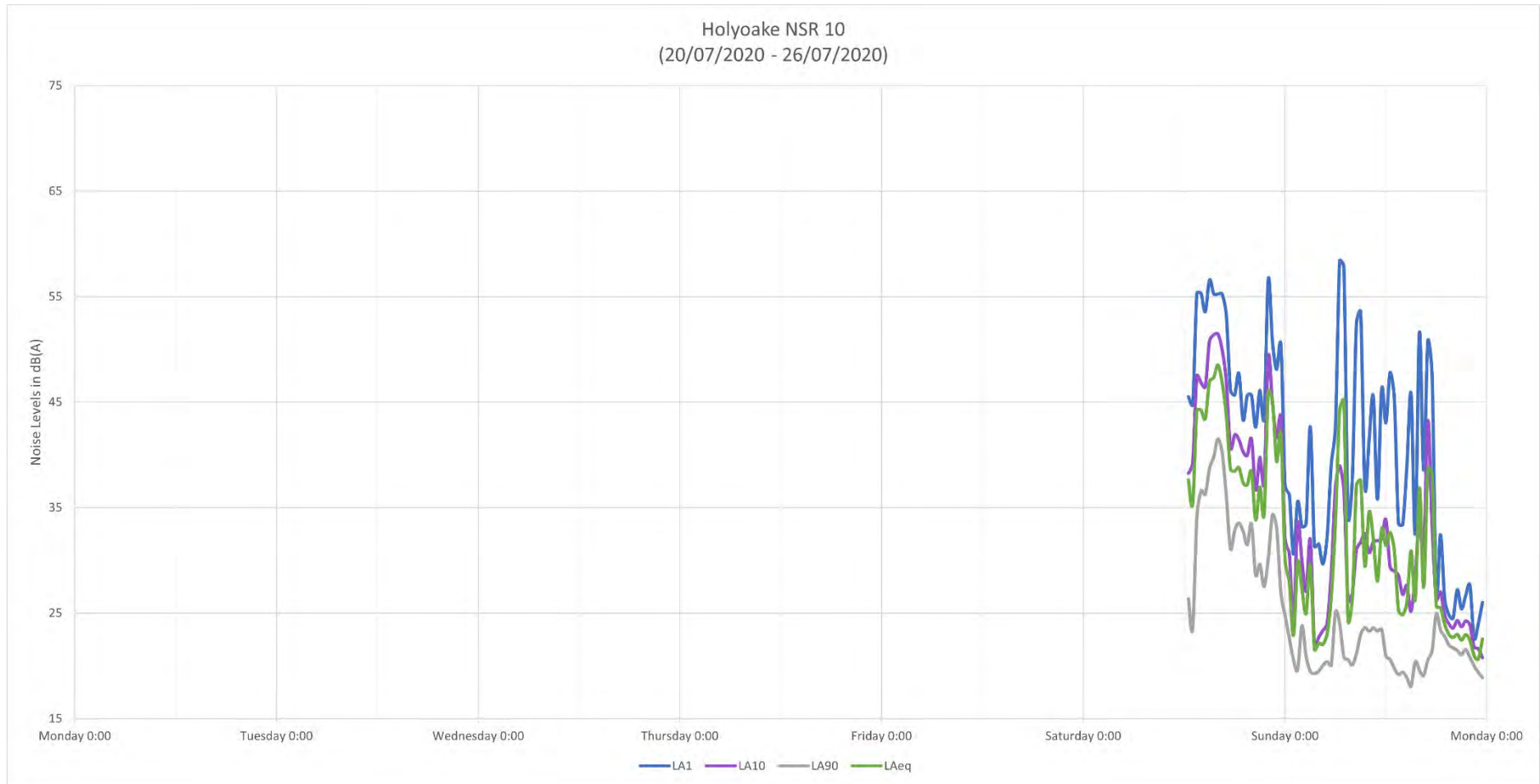


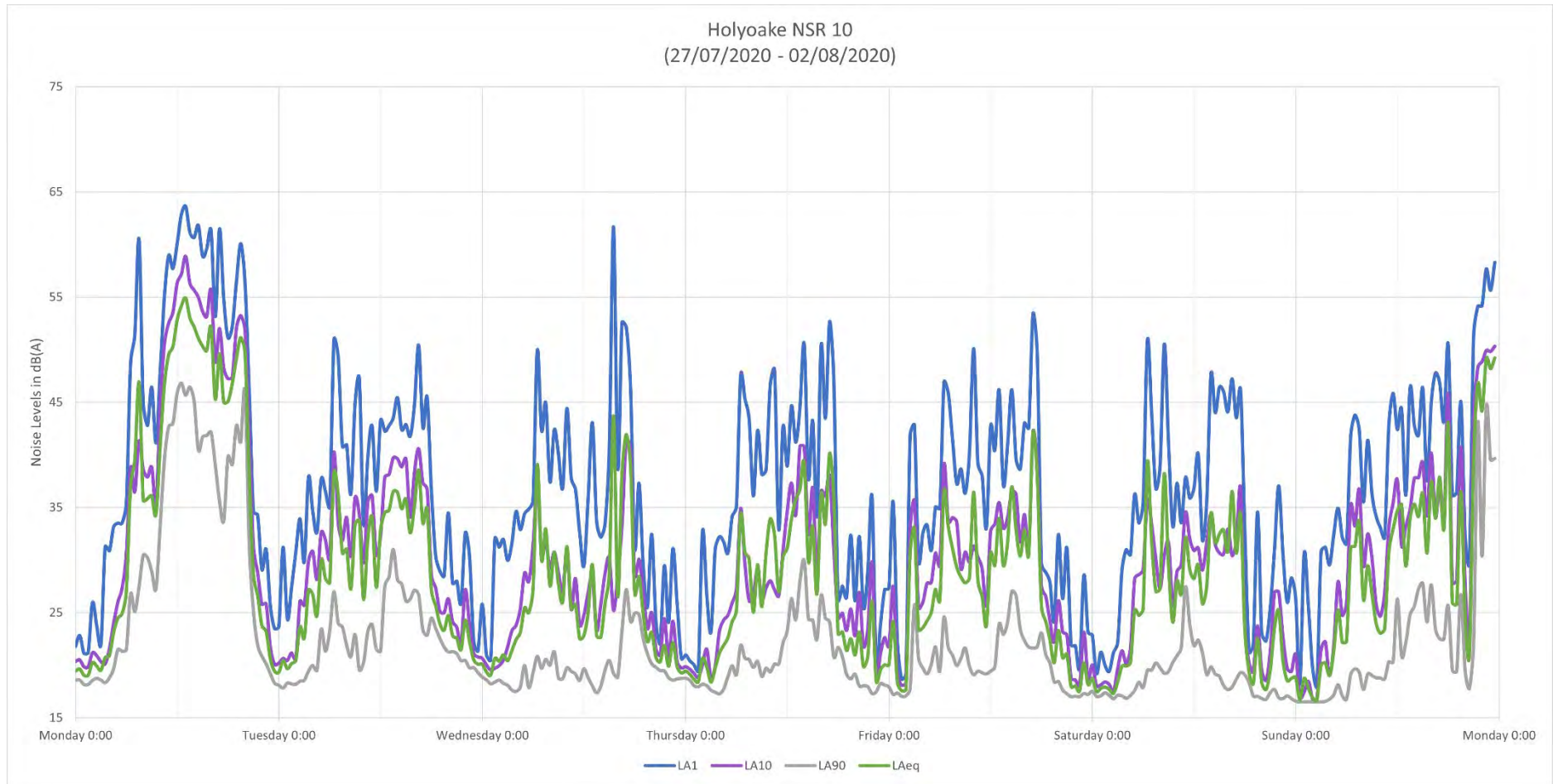
### **A.3 Holyoake Background Noise Levels**

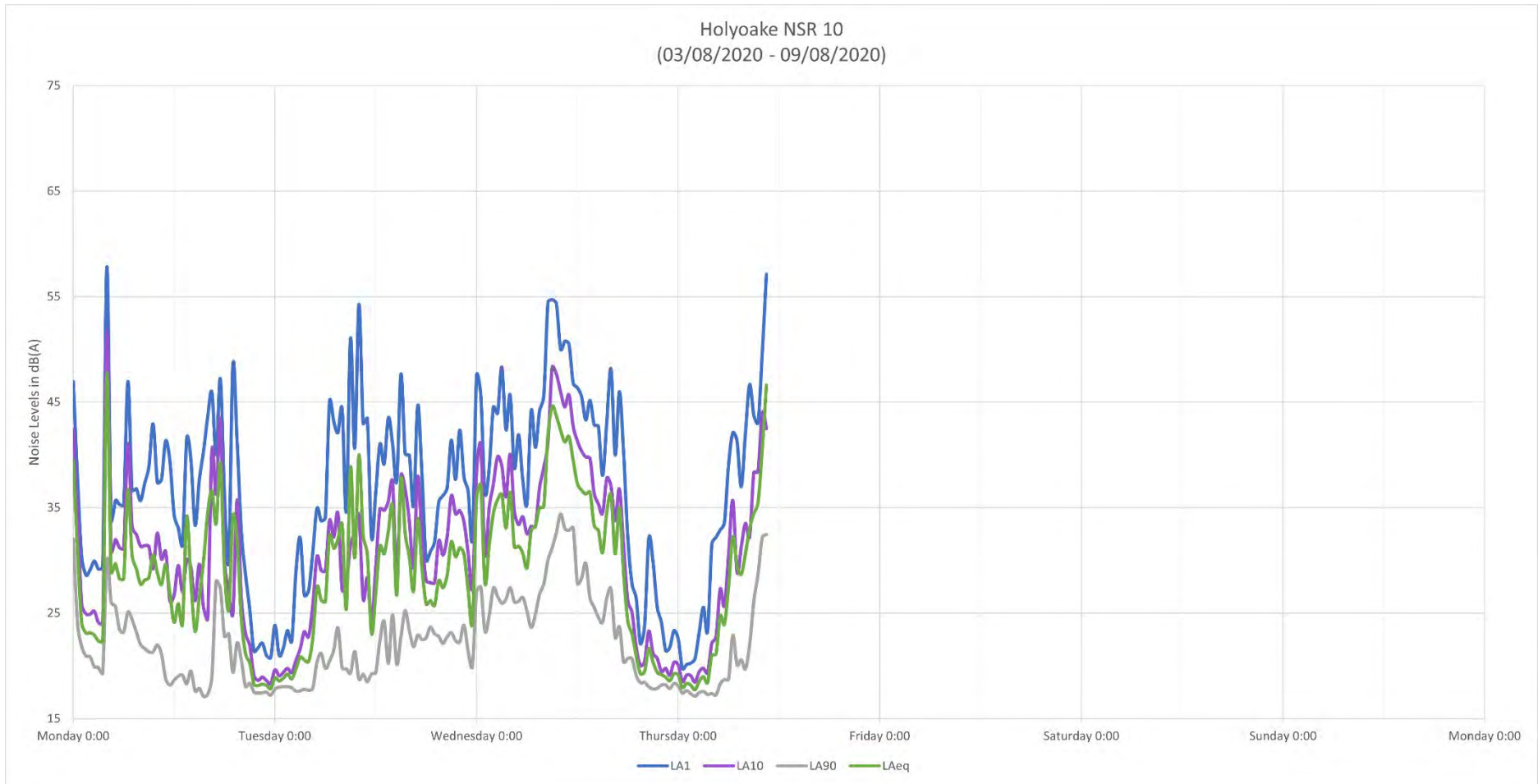


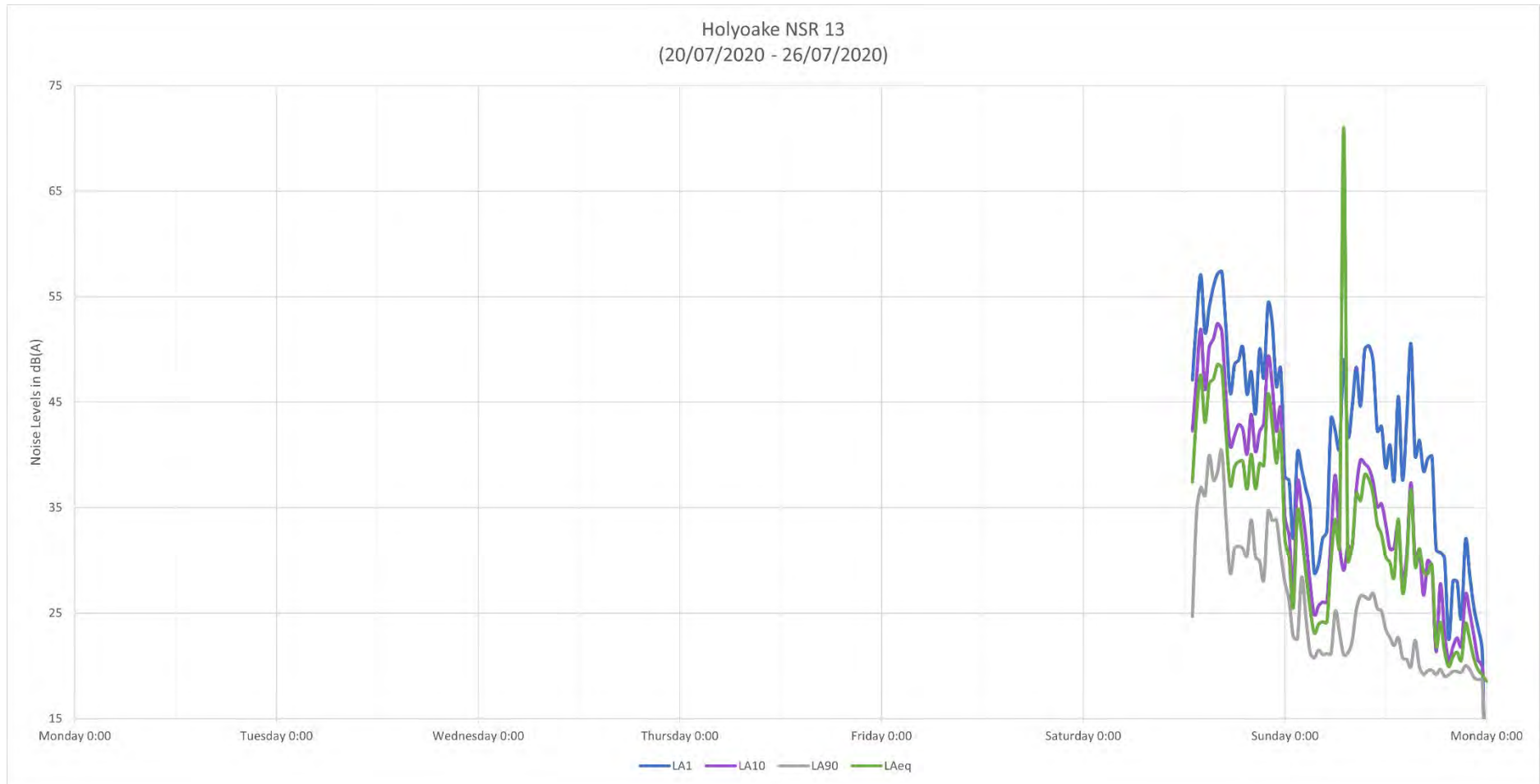


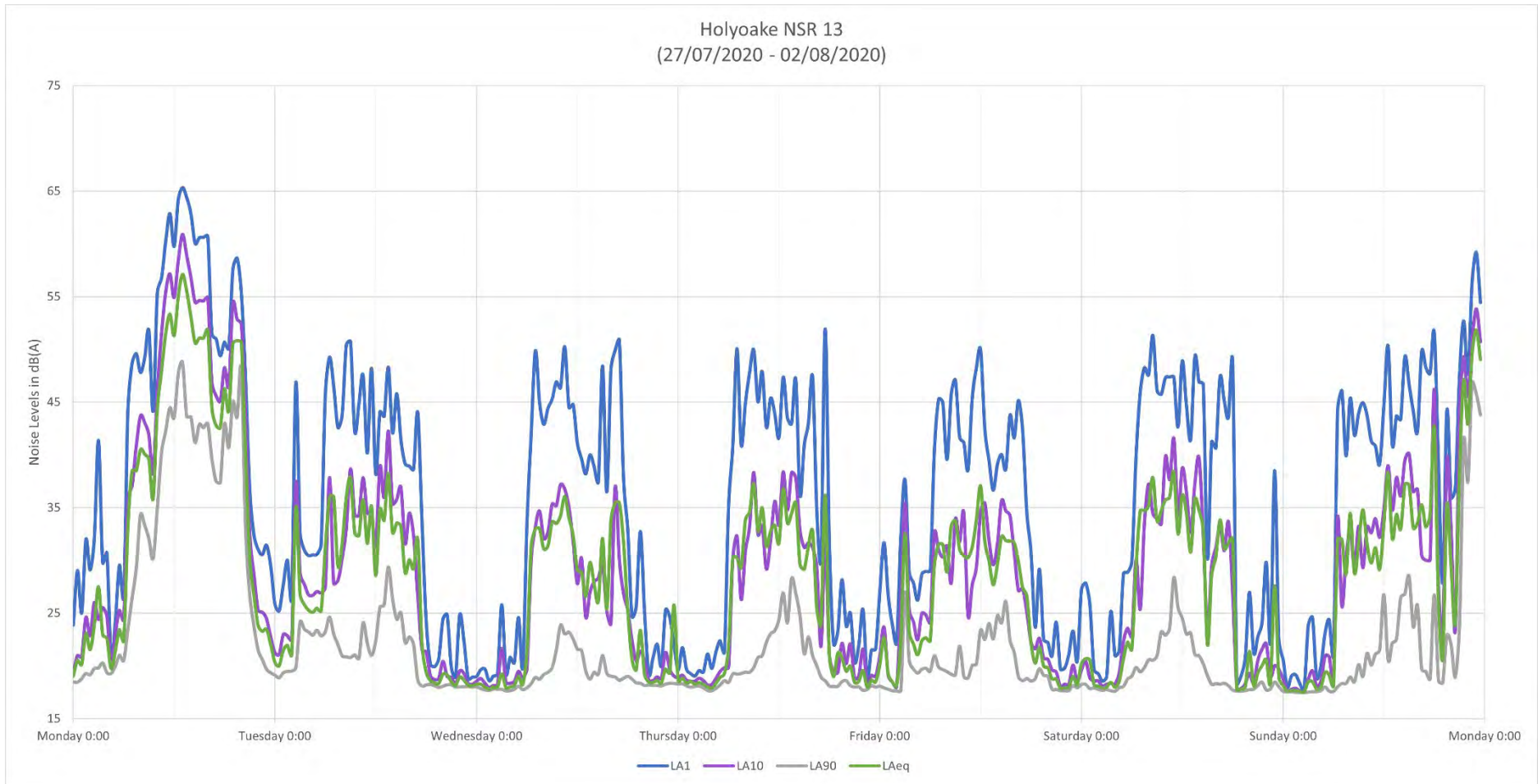


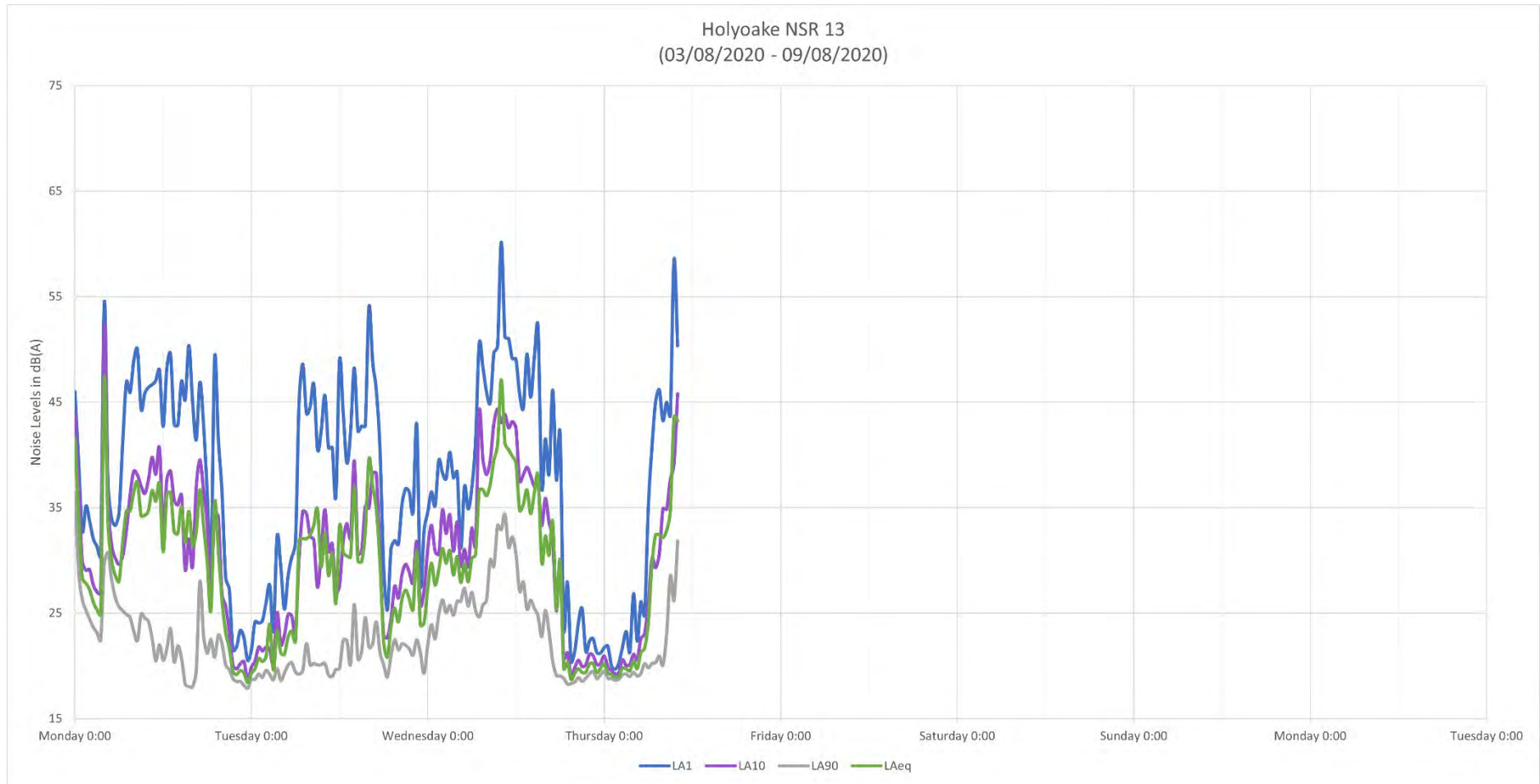


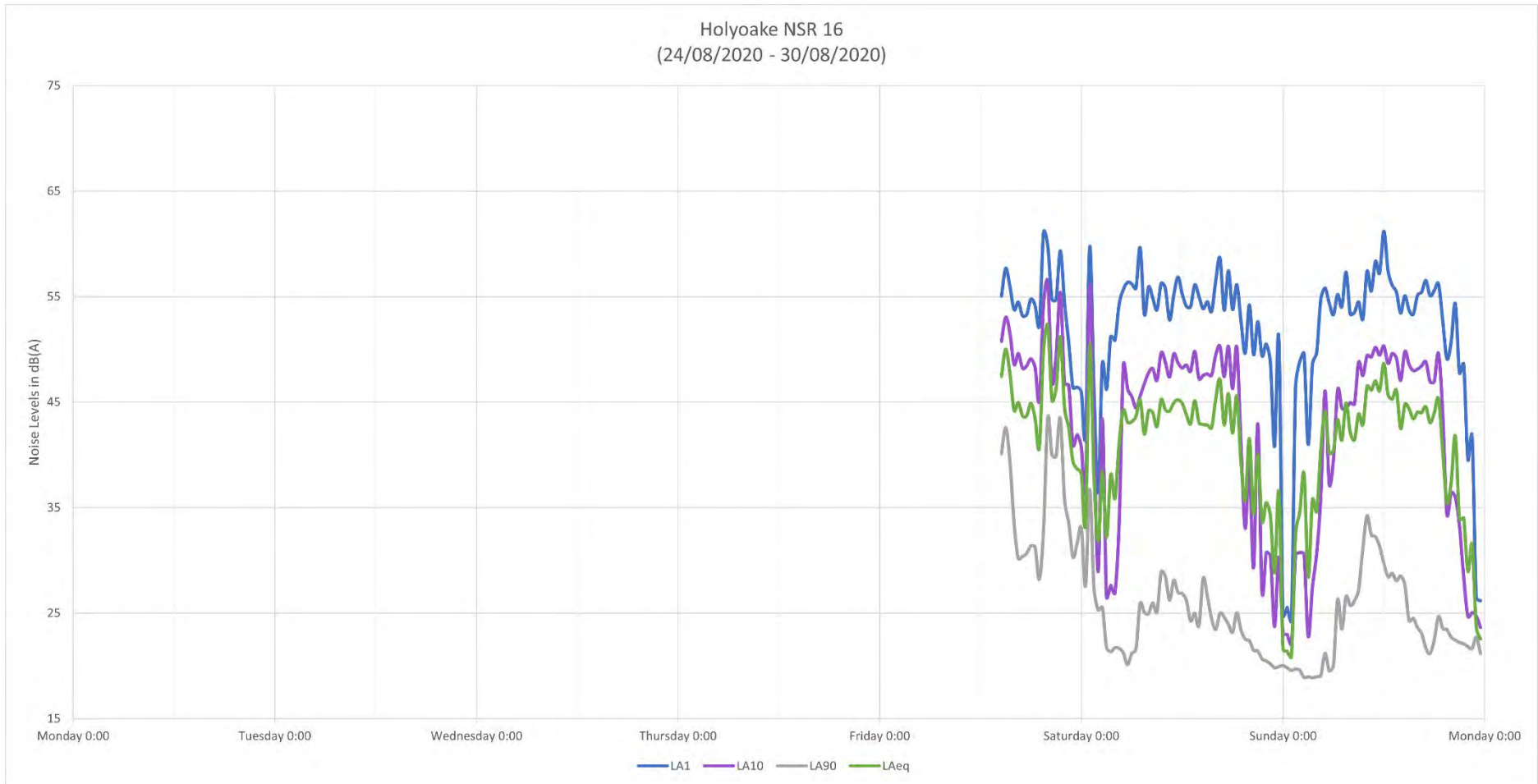


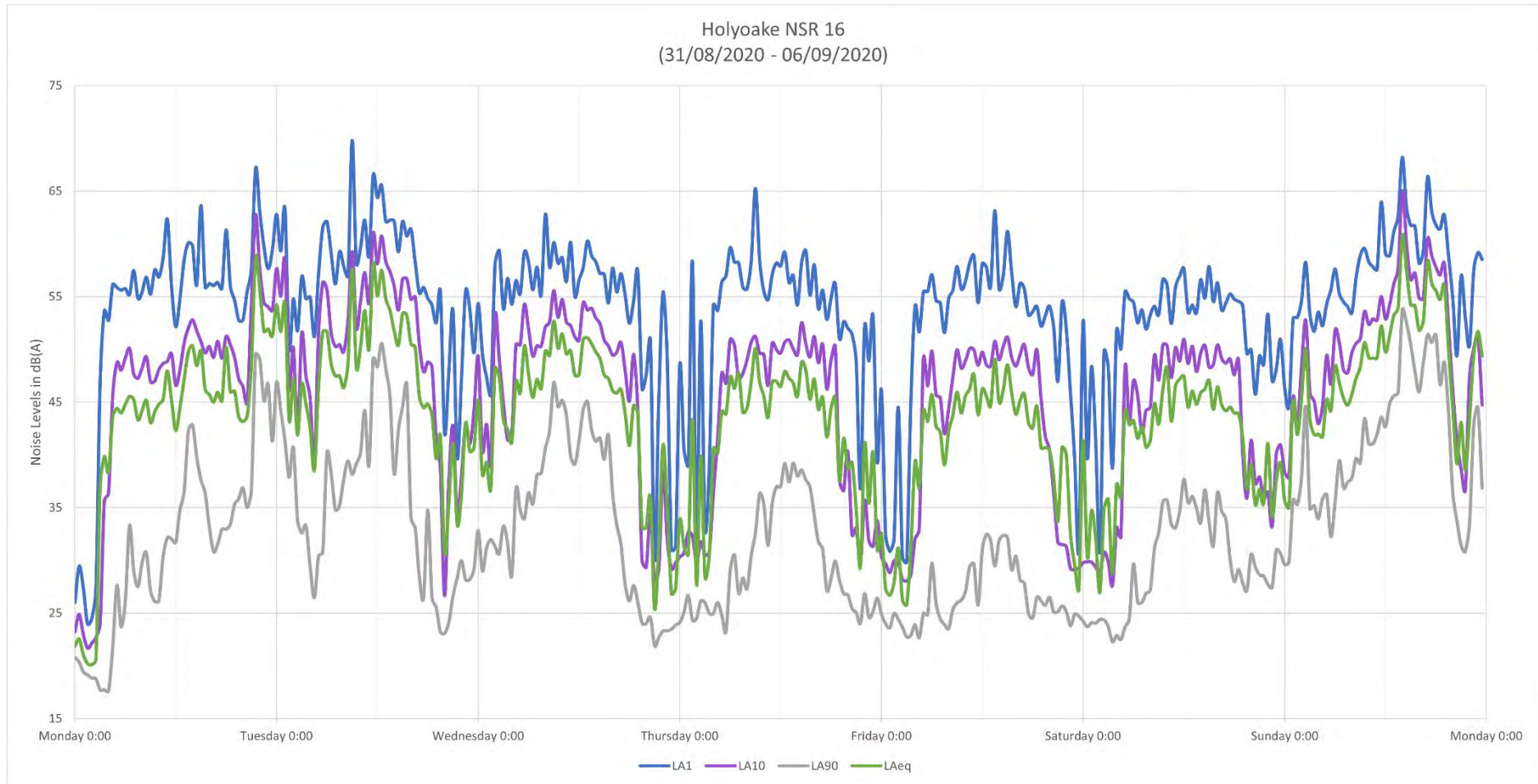


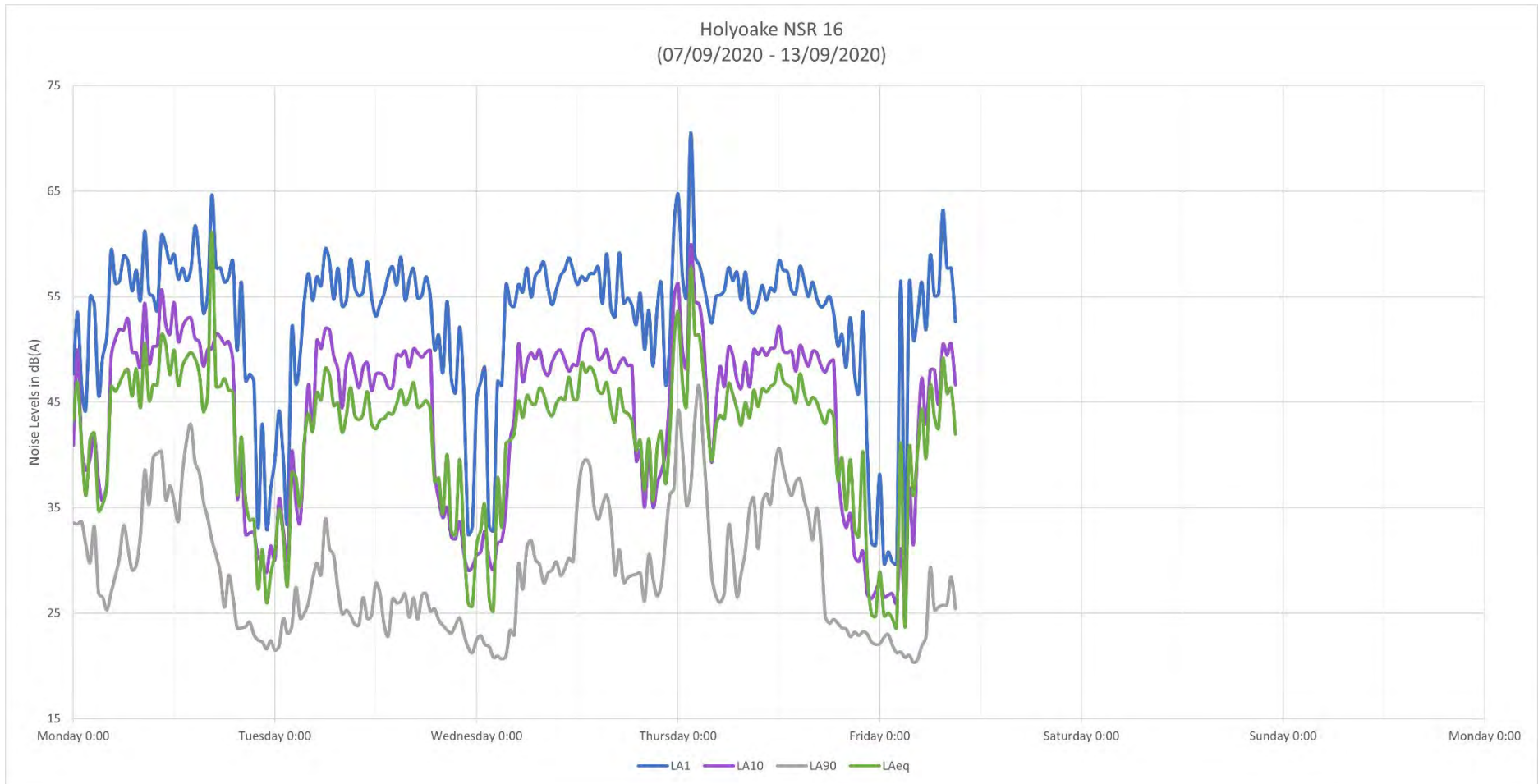


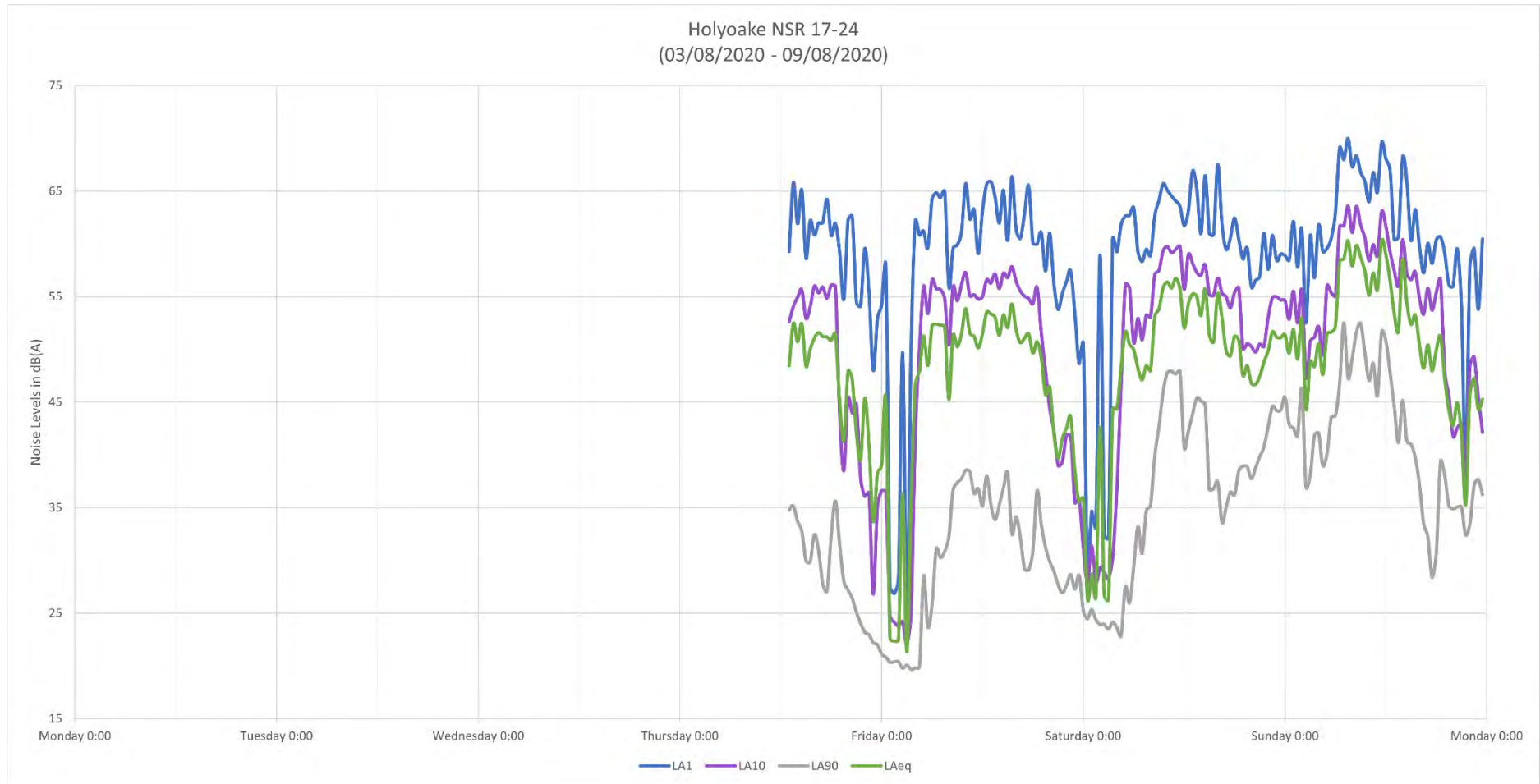


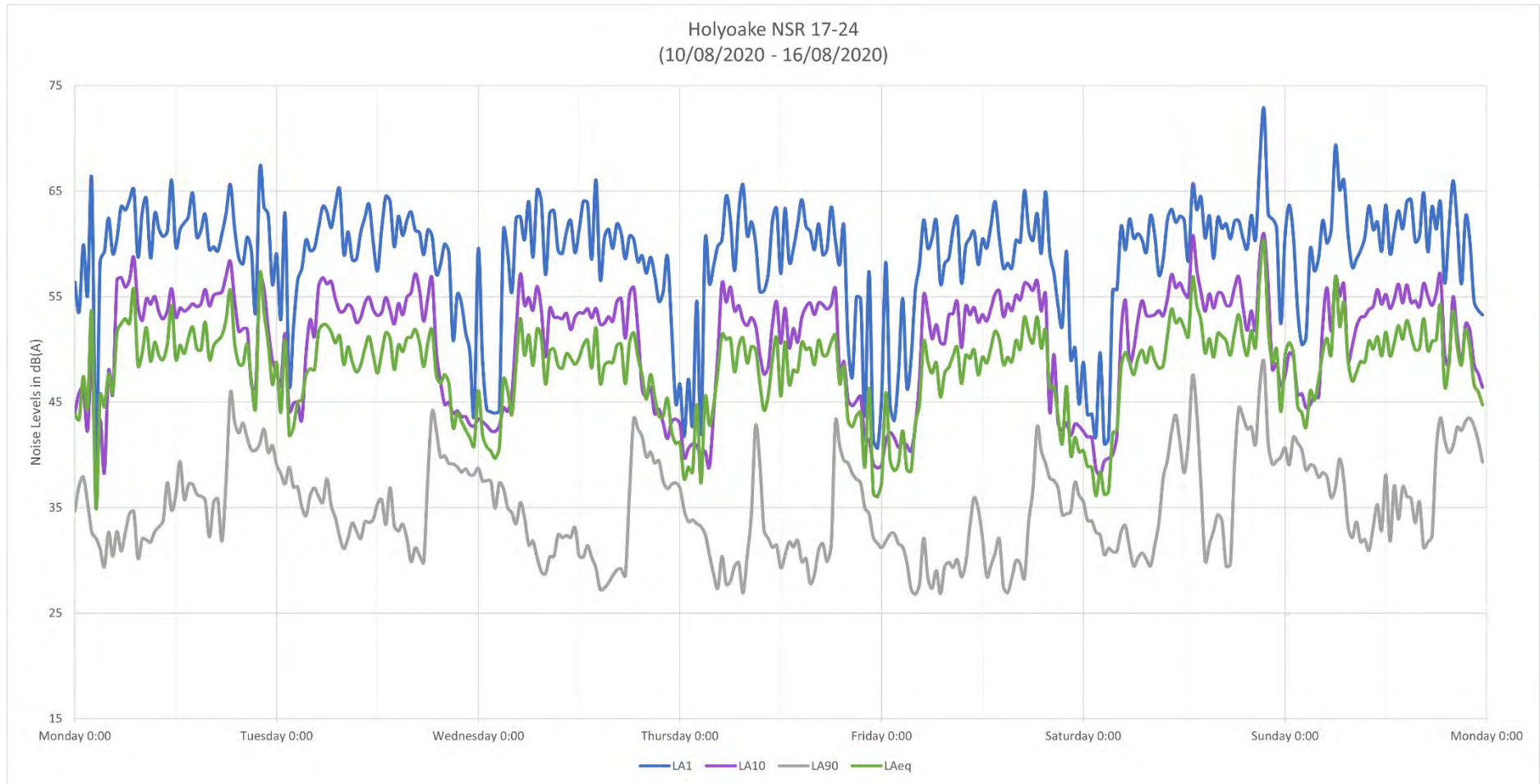


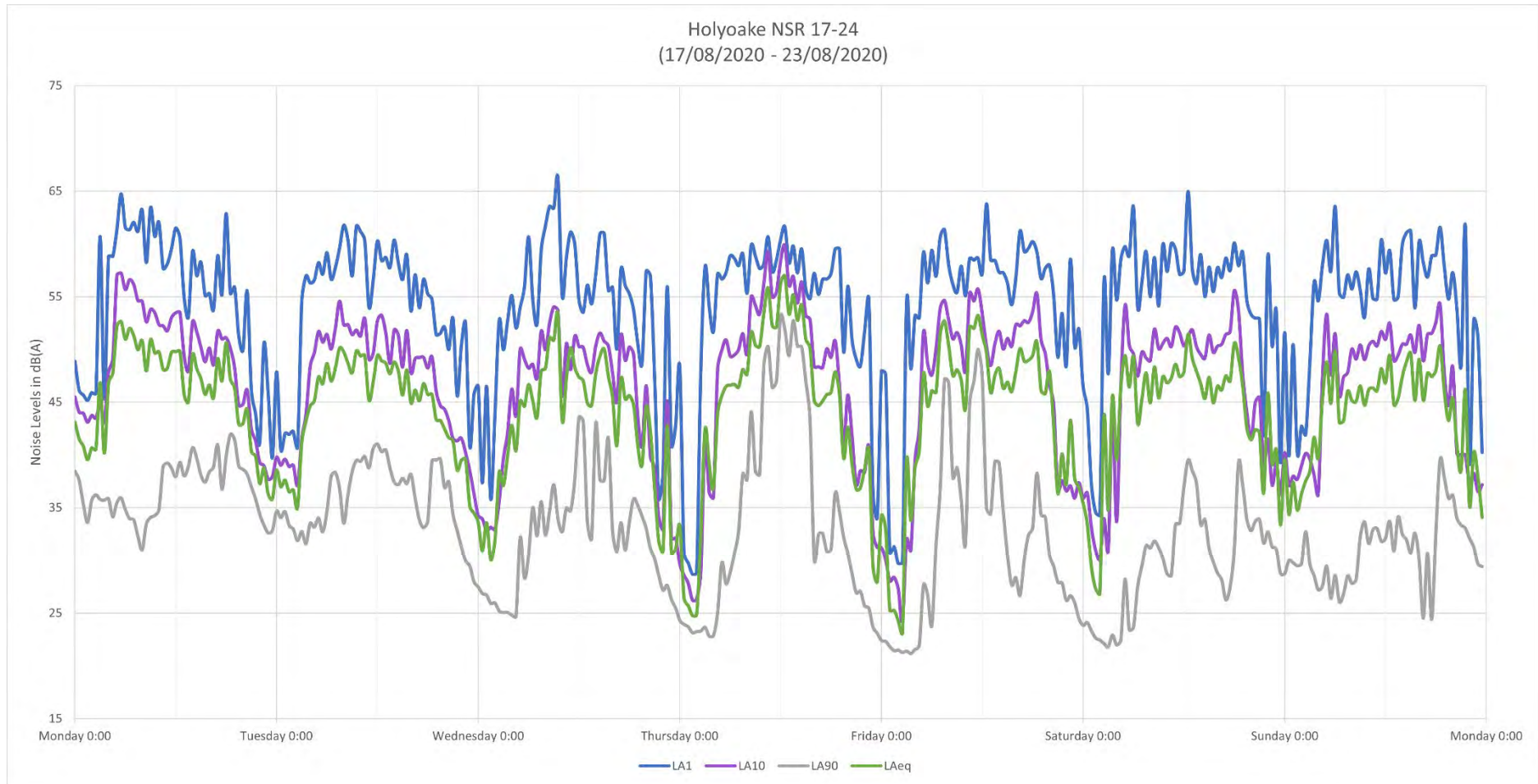


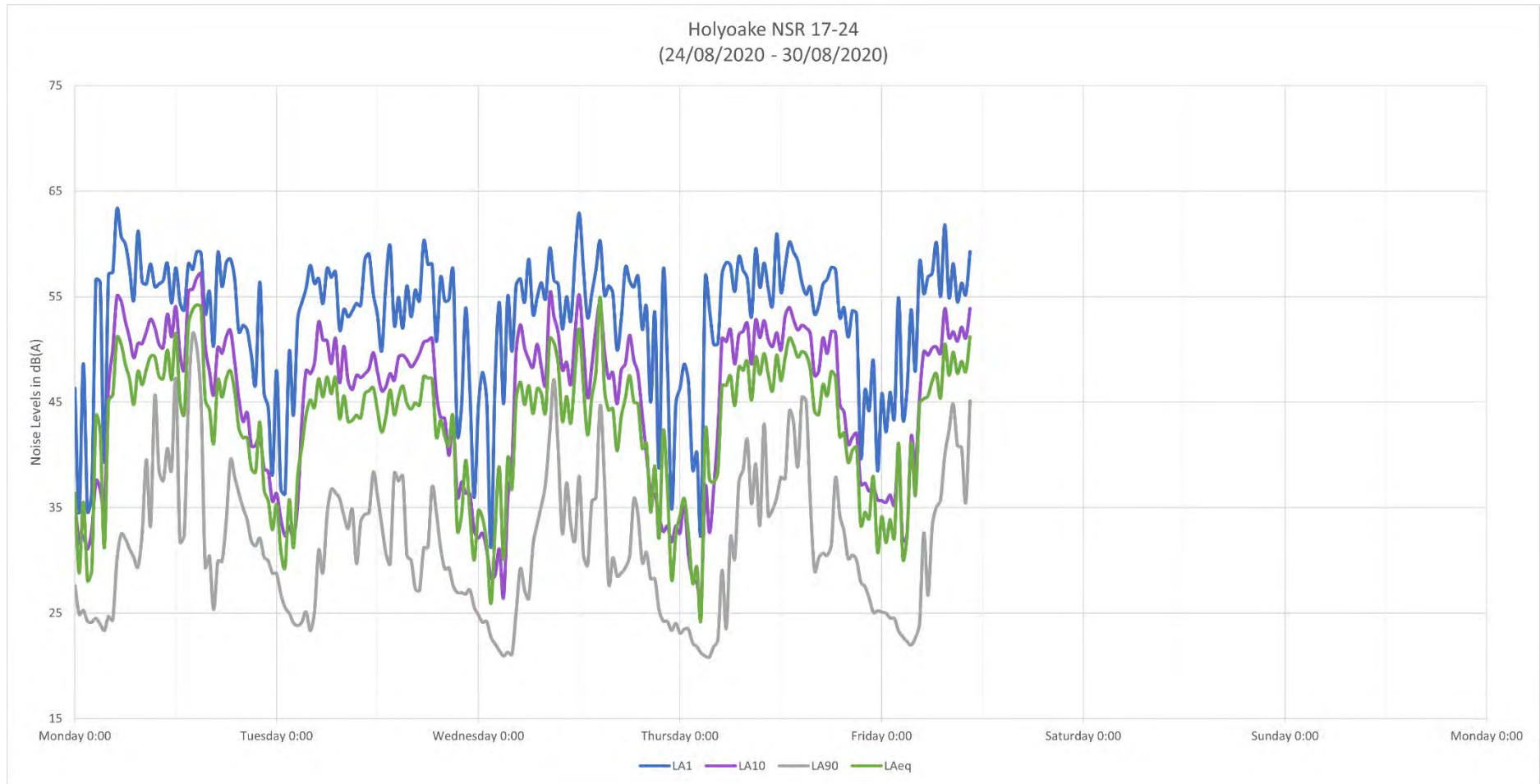


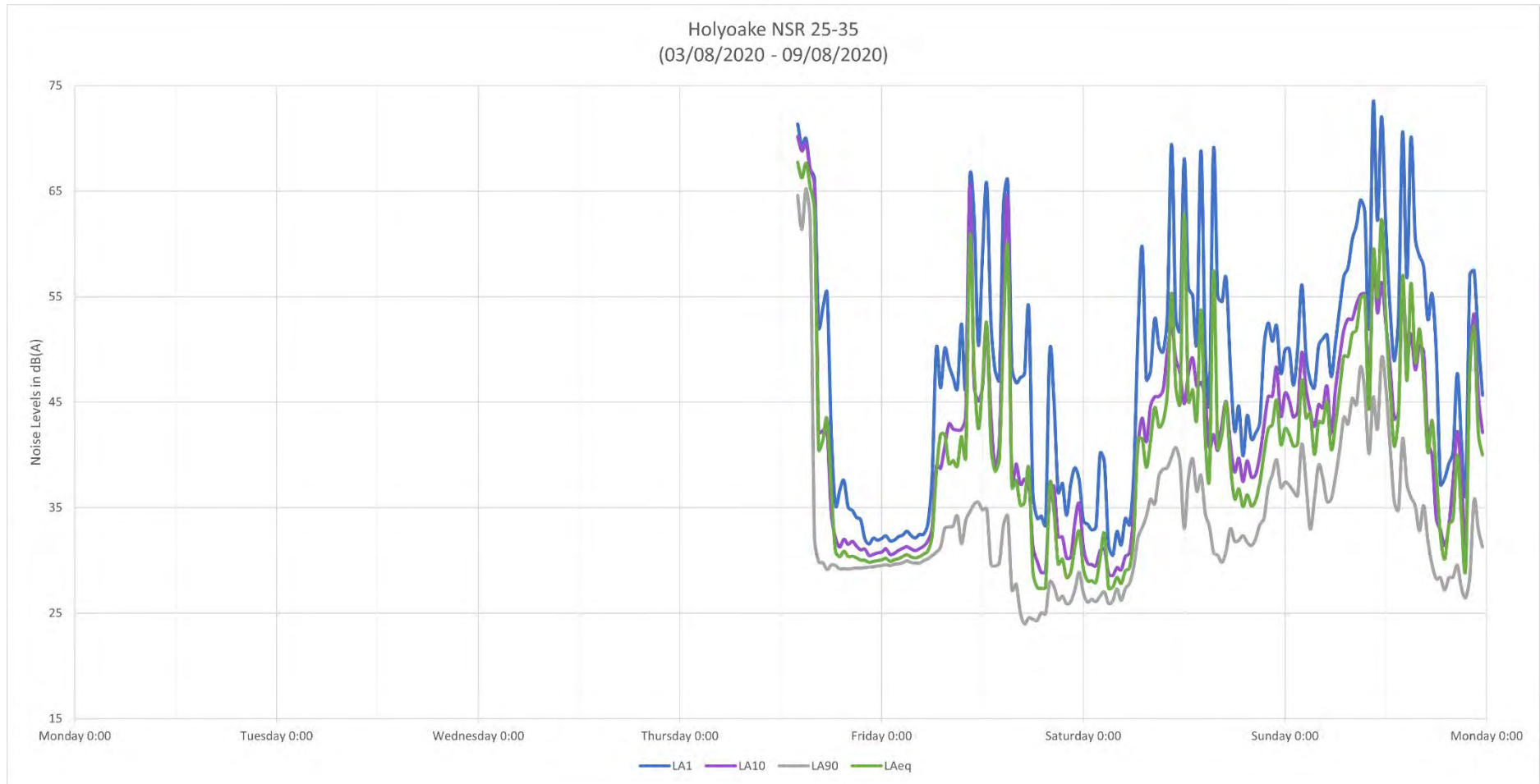


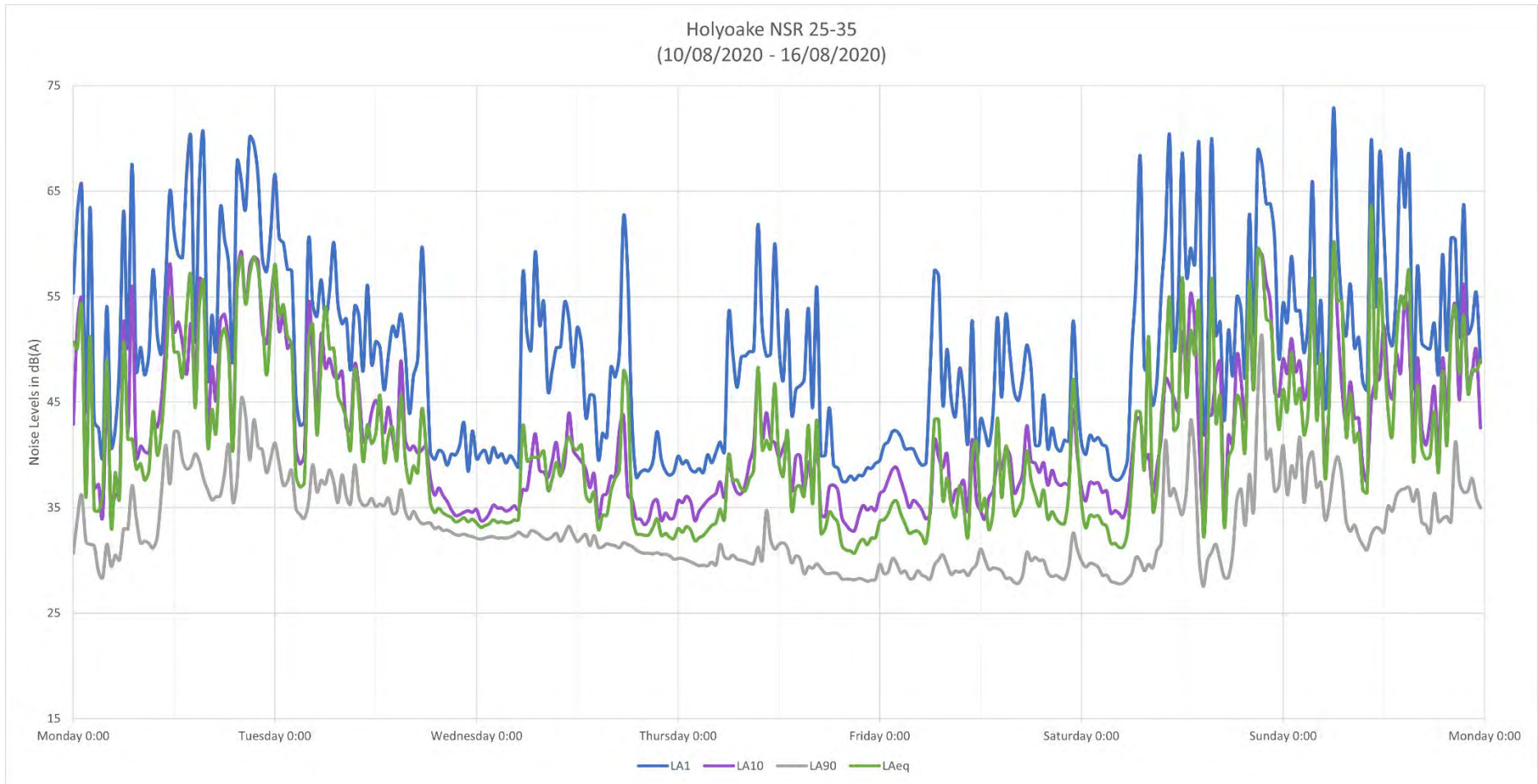


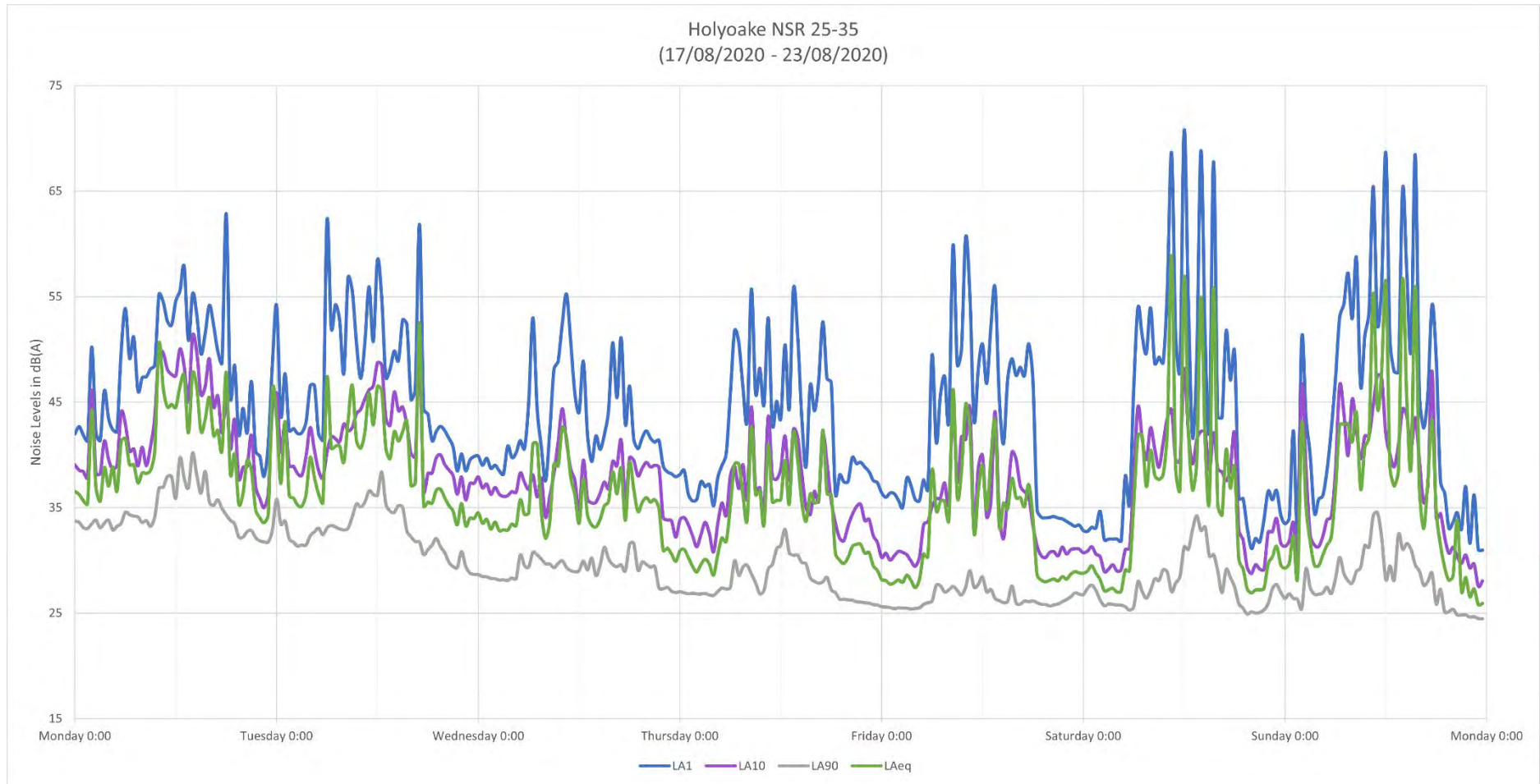


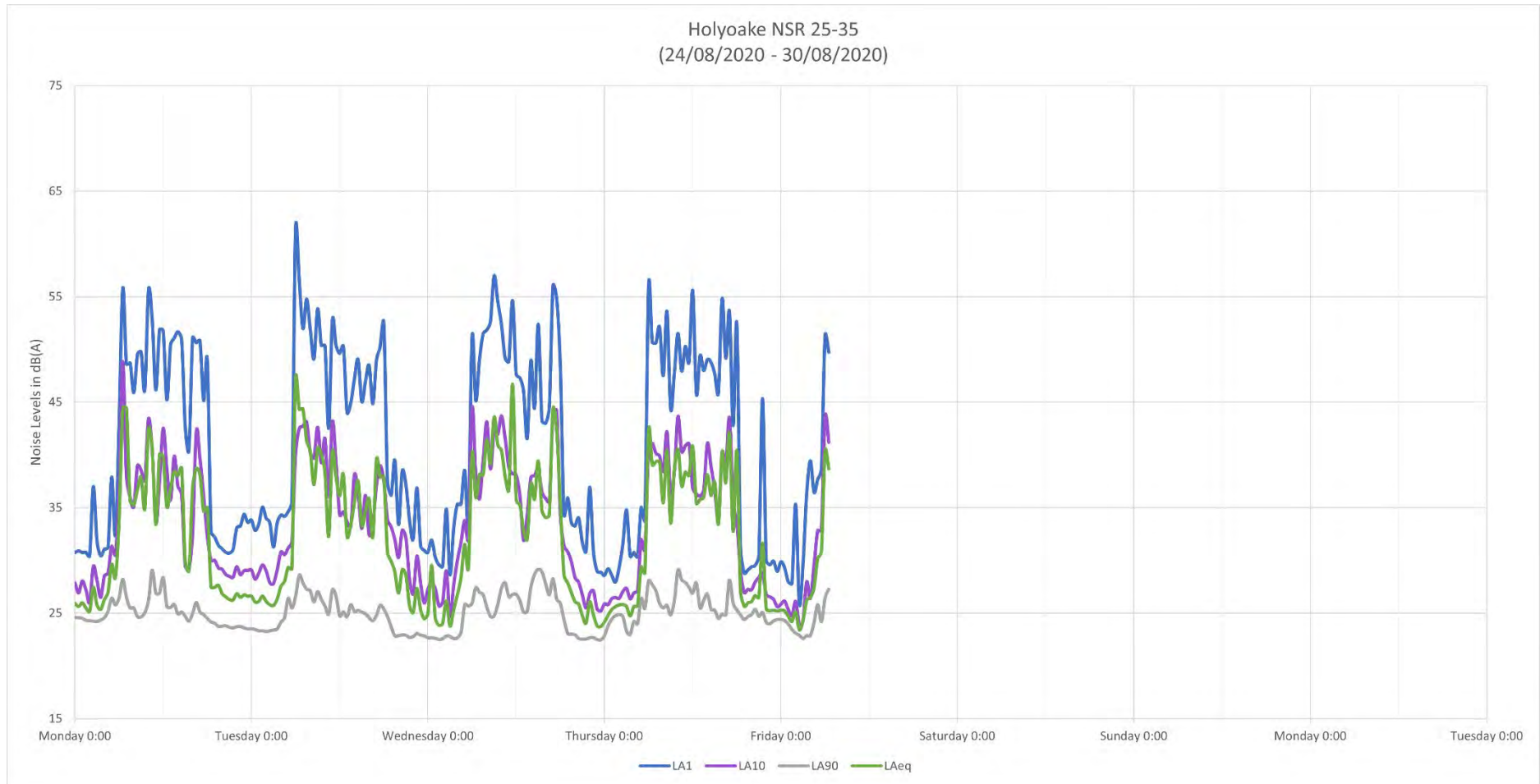


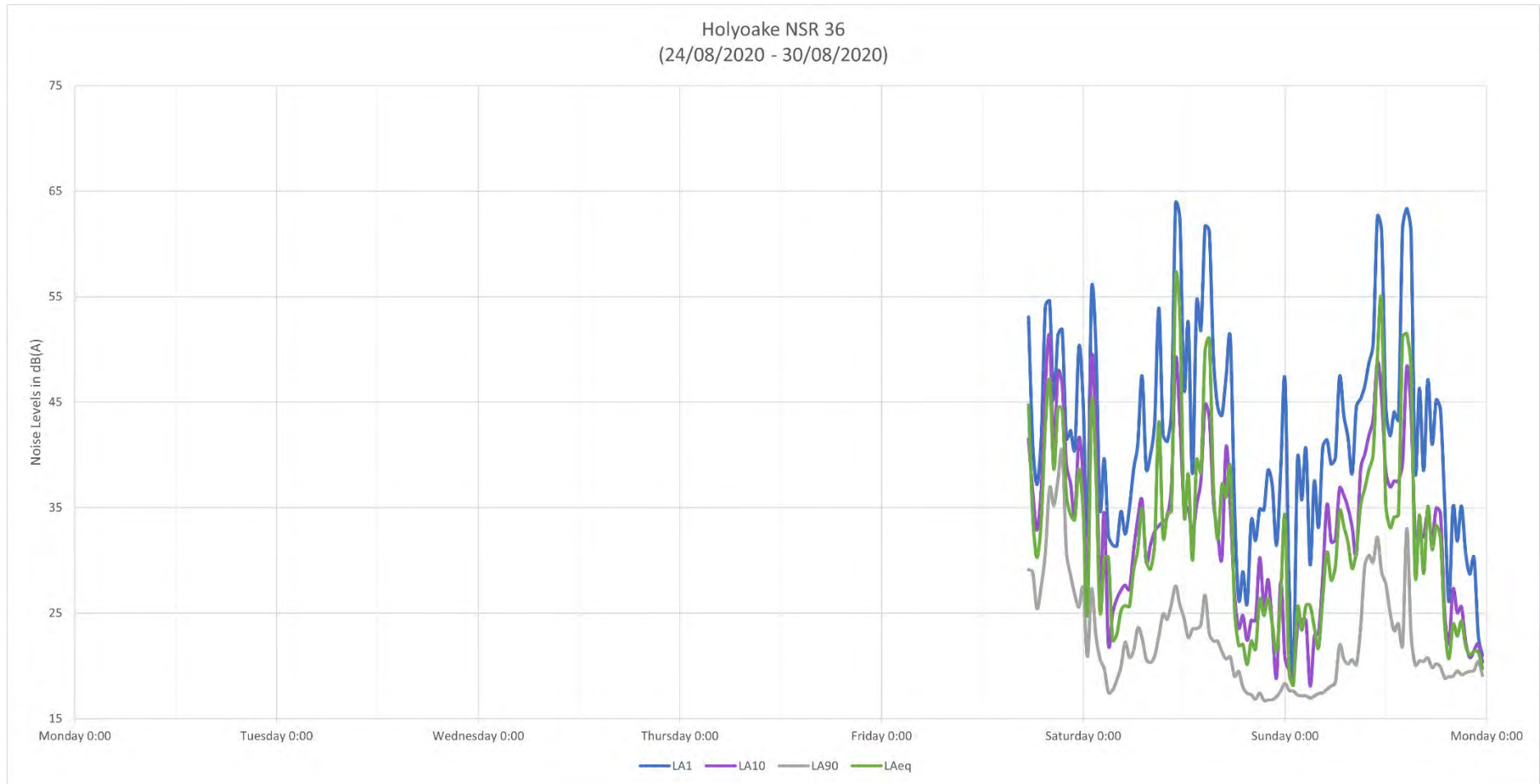


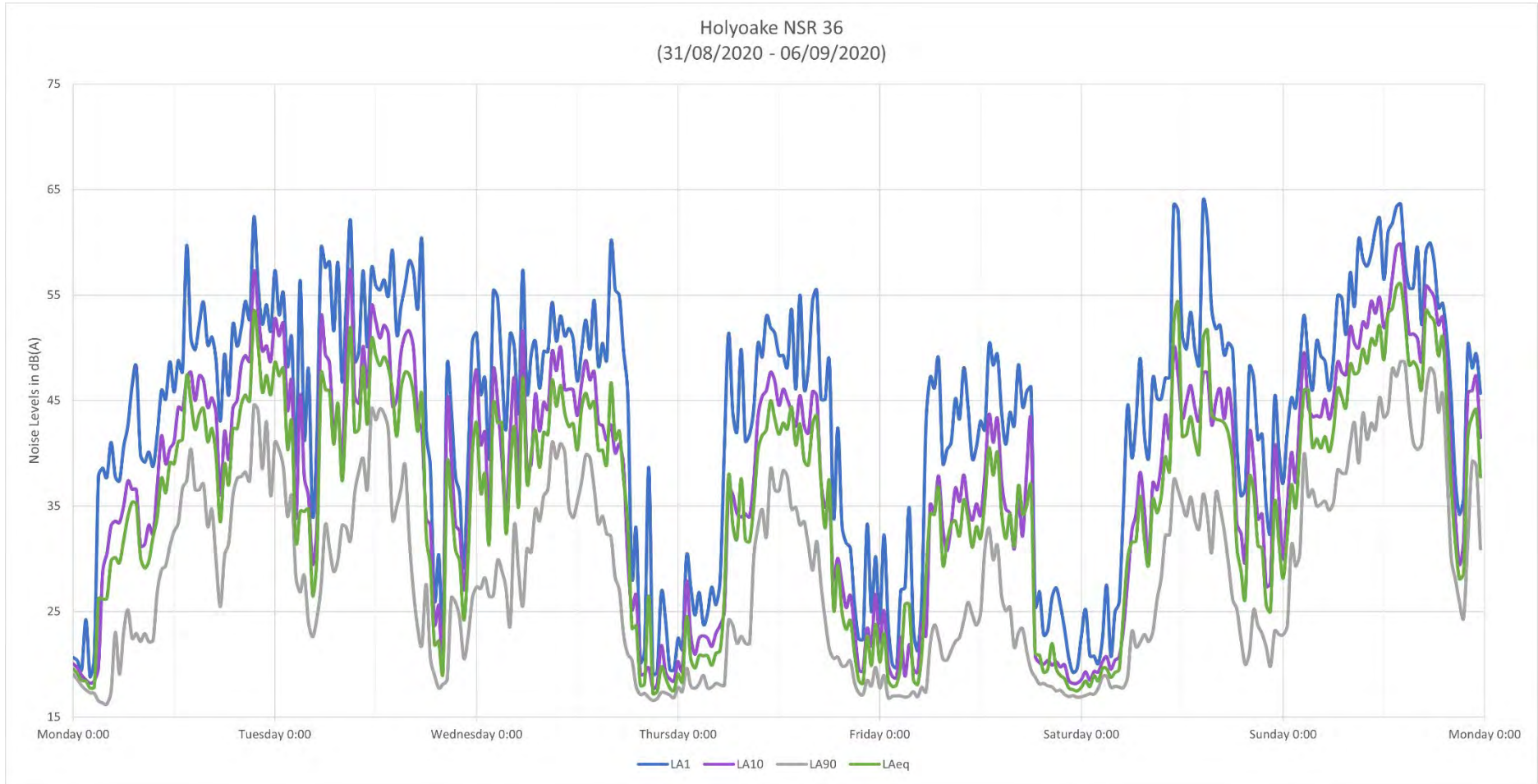


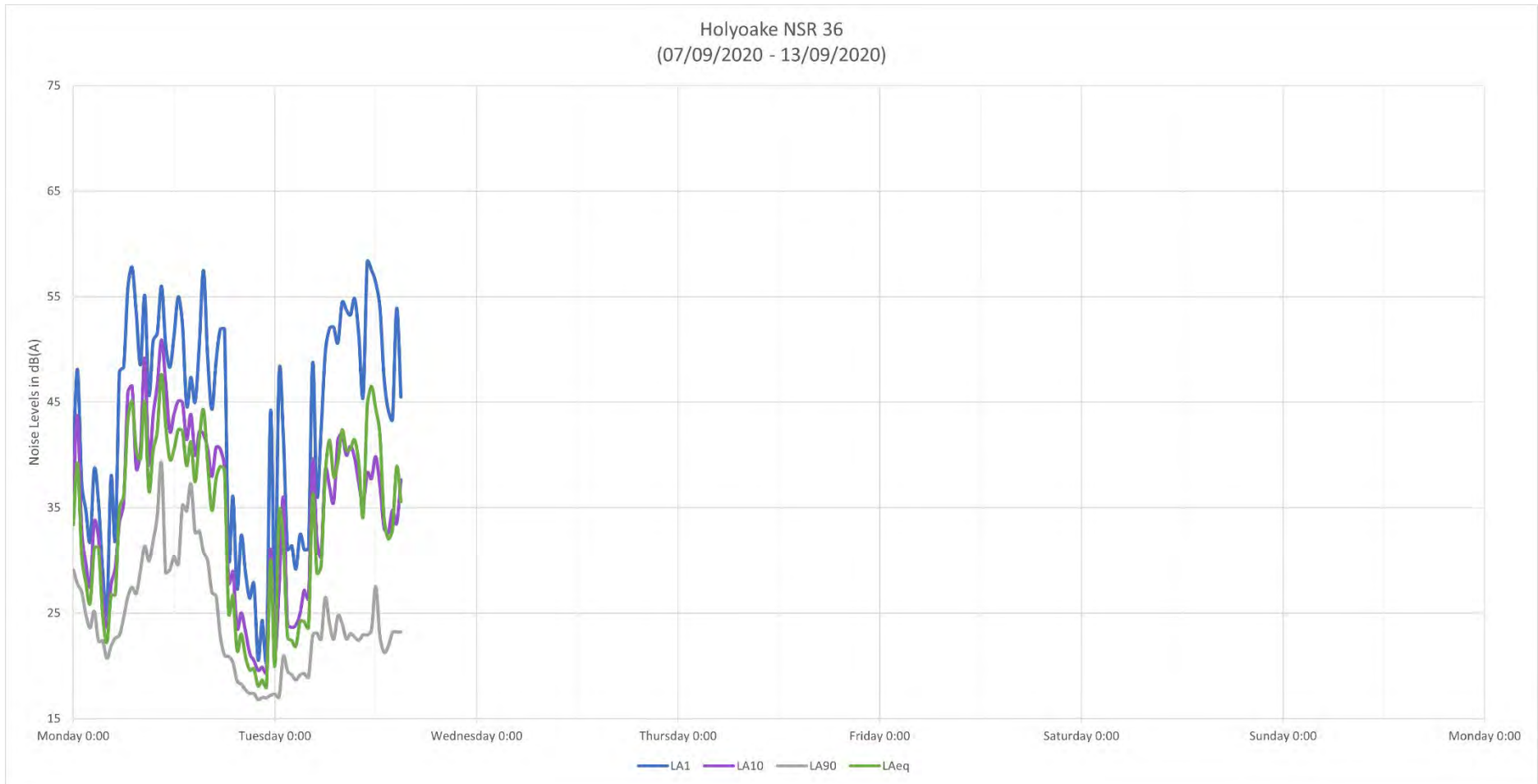


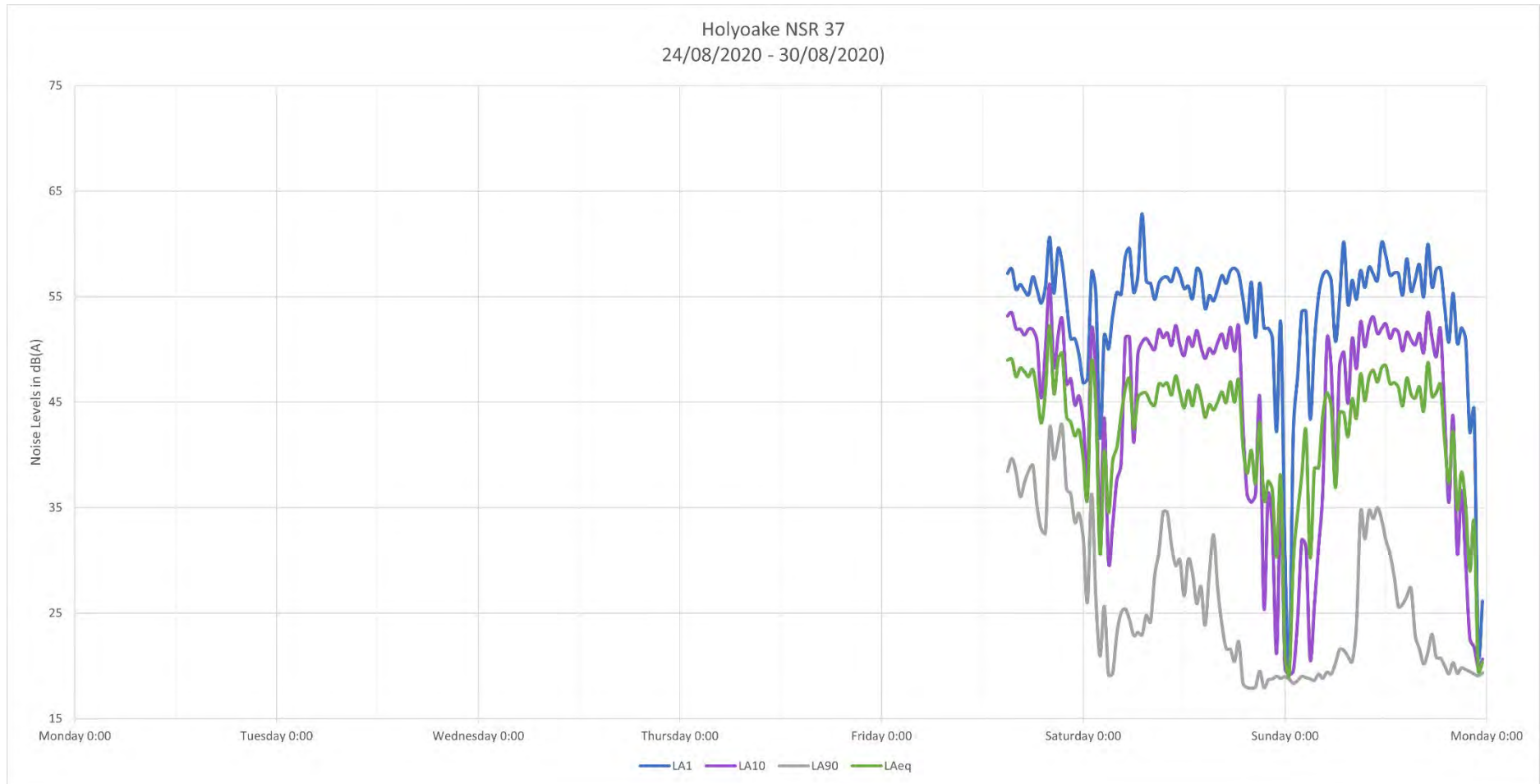


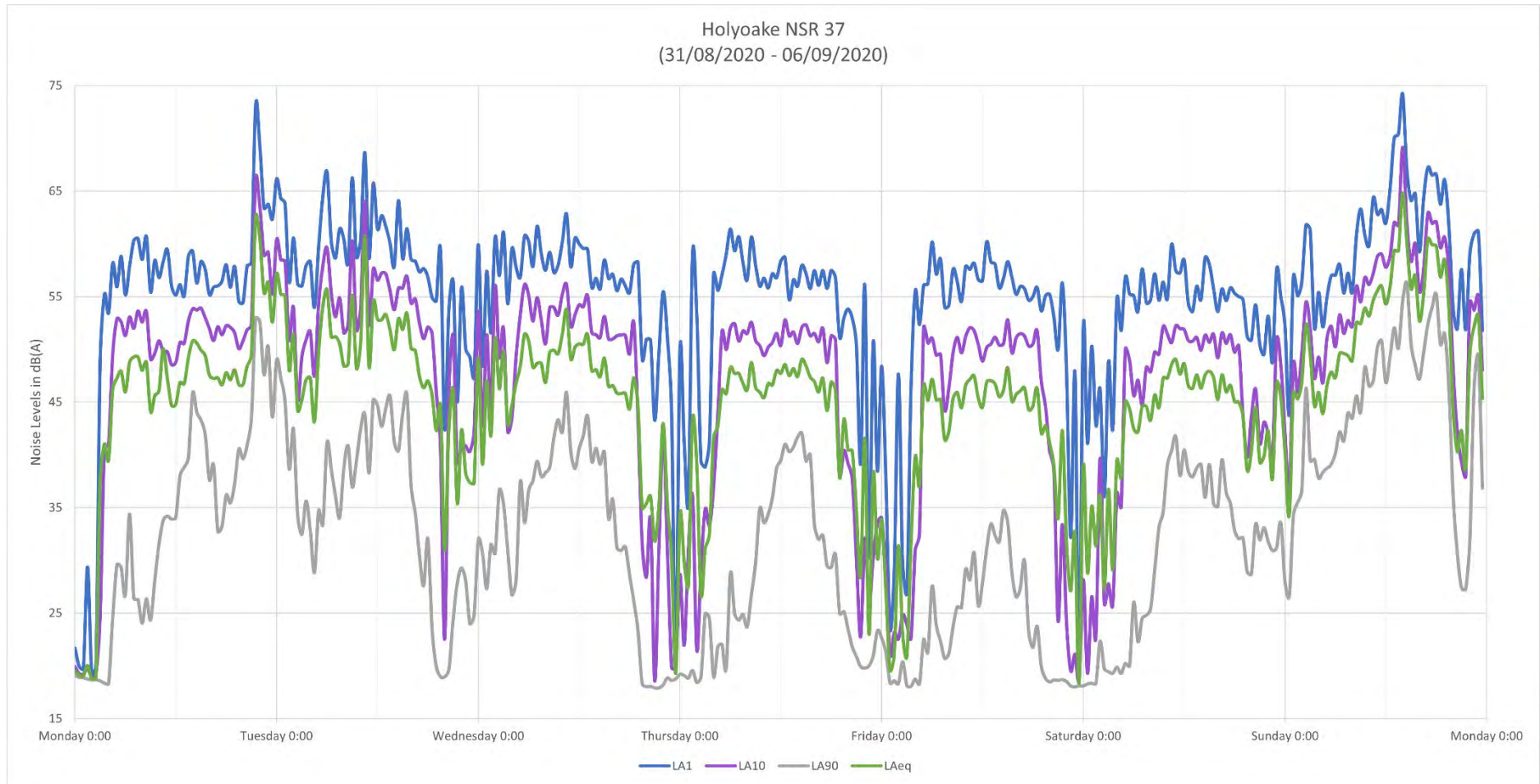


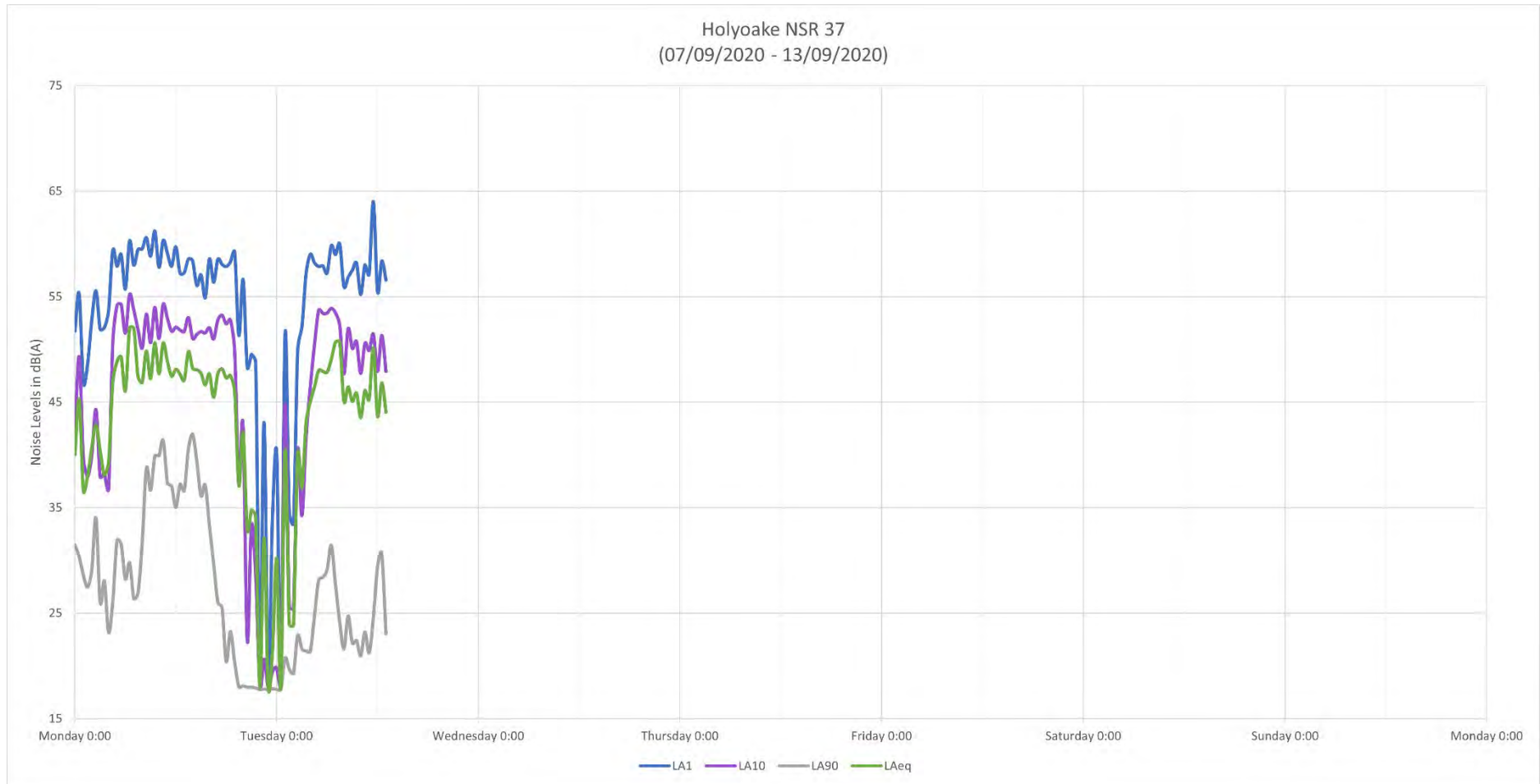












## APPENDIX B EQUIPMENT SOUND POWER LEVELS

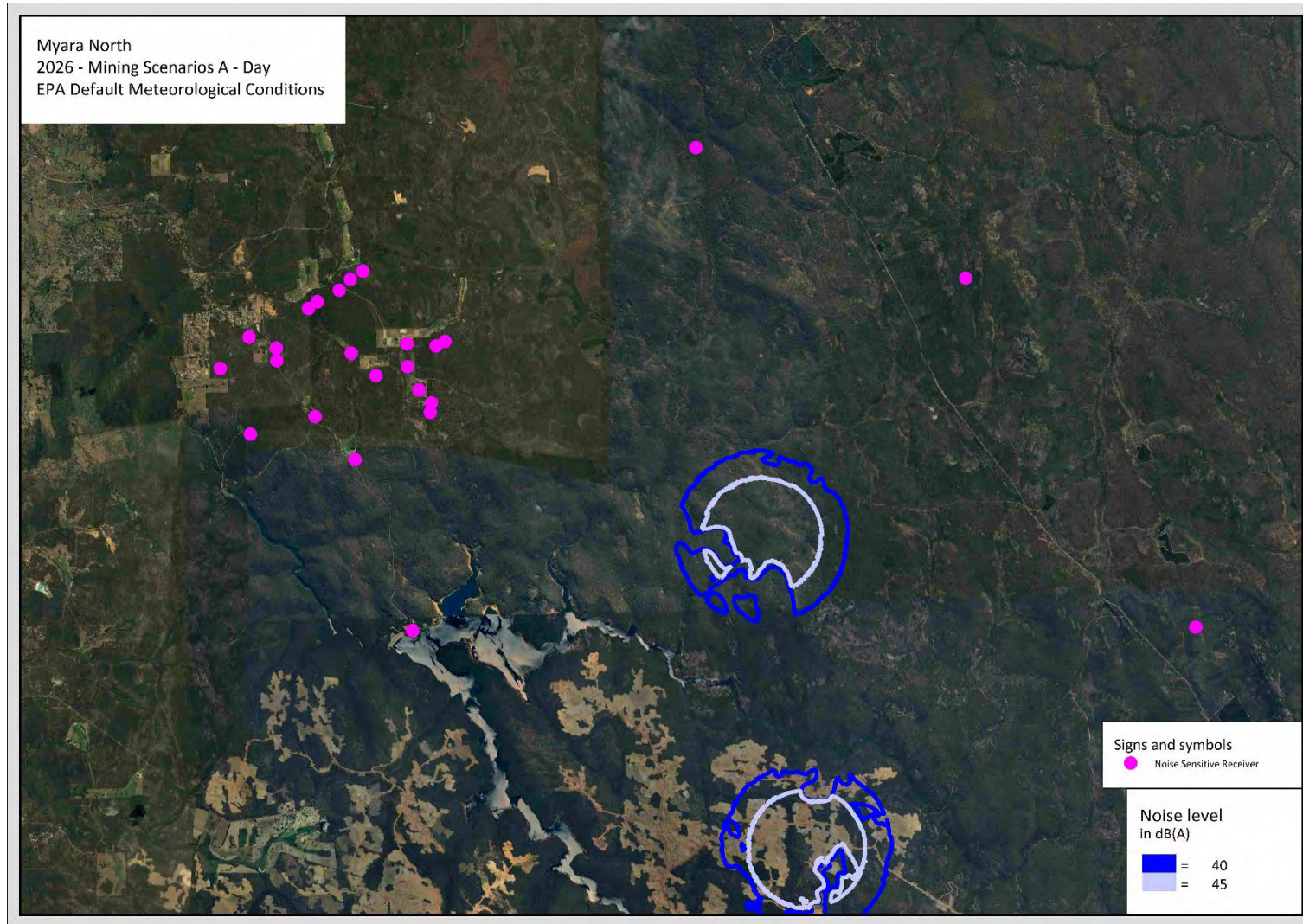
| Equipment Type           | SWL,<br>dB(A) | Octave Band Sound Power Level, (dB) |       |       |       |       |       |       |       |       | Source of SWL                        |
|--------------------------|---------------|-------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|--------------------------------------|
|                          |               | 31Hz                                | 63Hz  | 125Hz | 250Hz | 500Hz | 1kHz  | 2kHz  | 4kHz  | 8kHz  |                                      |
| <b>Mobile Equipment</b>  |               |                                     |       |       |       |       |       |       |       |       |                                      |
| Excavators 250T          | 116.0         | 106.0                               | 115.0 | 122.0 | 113.0 | 114.0 | 111.0 | 107.0 | 100.0 | 96.0  | Alcoa Wagerup 2020 SWL Measurements  |
| 180T Haul Trucks         | 120.2         | 111.0                               | 114.0 | 119.0 | 118.0 | 118.0 | 115.0 | 113.0 | 106.0 | 100.0 | Alcoa Wagerup 2020 SWL Measurements  |
| 180T Haul Trucks (Idle)  | 107.0         | 110.0                               | 119.0 | 104.0 | 101.0 | 102.0 | 103.0 | 100.0 | 91.0  | 82.0  | Alcoa Wagerup 2020 SWL Measurements  |
| Rock breaking Excavators | 109.4         | 116.0                               | 110.6 | 107.4 | 109.2 | 104.5 | 105.7 | 101.5 | 95.4  | 87.3  | Wood SWL Measurement Database        |
| Loaders 993K             | 113.0         | 100.2                               | 111.0 | 121.6 | 109.3 | 109.5 | 107.8 | 105.2 | 95.3  | 90.0  | Wood SWL Measurement Database        |
| Loader 994               | 116.4         | 101.0                               | 110.0 | 121.0 | 115.0 | 116.0 | 110.0 | 106.0 | 101.0 | 94.0  | Alcoa Wagerup 2020 SWL Measurements  |
| Graders                  | 107.7         | 100.9                               | 99.7  | 107.5 | 104.8 | 102.5 | 104.4 | 99.8  | 95.1  | 91.1  | Wood SWL Measurement Database        |
| Dozers CAT D9R           | 116.0         | 115.0                               | 120.0 | 124.0 | 118.0 | 115.0 | 108.0 | 103.0 | 95.0  | 88.0  | Wood SWL Measurement Database        |
| Scrapers                 | 115.4         | 108.4                               | 107.8 | 116.7 | 116.0 | 112.4 | 109.6 | 107.7 | 102.4 | 97.3  | Wood SWL Measurement Database        |
| Blast drills             | 114.2         | 67.3                                | 85.0  | 99.8  | 109.1 | 111.4 | 110.5 | 106.8 | 99.7  | 90.9  | Wood SWL Measurement Database        |
| Ancillary loaders        | 115.8         | 102.5                               | 123.2 | 123.0 | 113.1 | 110.9 | 110.5 | 109.1 | 101.1 | 96.8  | Alcoa Pinjarra 2019 SWL Measurements |

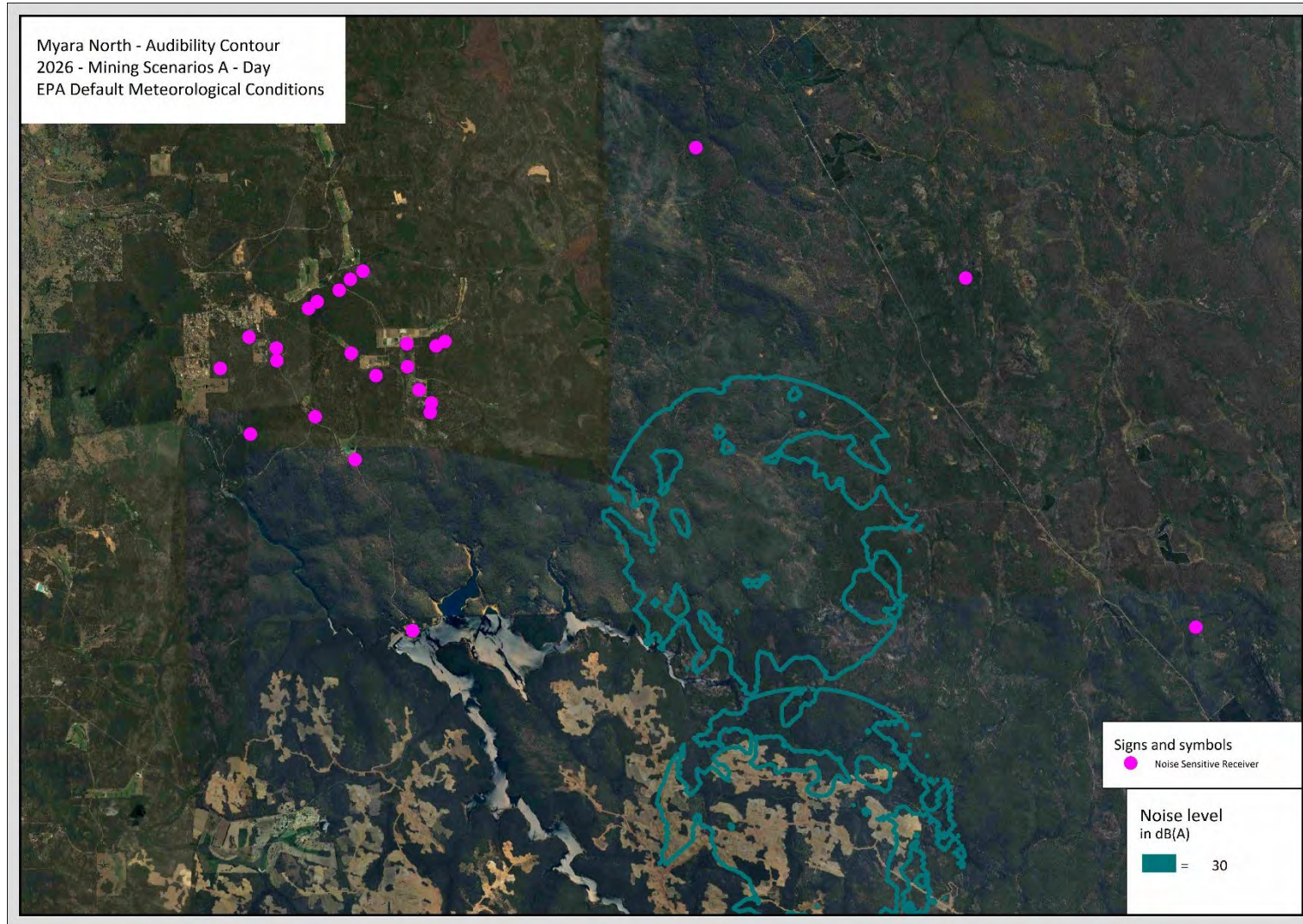
| Equipment Type   | SWL,<br>dB(A) | Octave Band Sound Power Level, (dB) |       |       |       |       |       |       |       |      | Source of SWL                        |
|--|---------------|-------------------------------------|-------|-------|-------|-------|-------|-------|-------|------|--------------------------------------|
|  |               | 31Hz                                | 63Hz  | 125Hz | 250Hz | 500Hz | 1kHz  | 2kHz  | 4kHz  | 8kHz |                                      |
| Ancillary trucks   | 120.2         | 110.3                               | 112.1 | 118.7 | 118.0 | 118.8 | 115.2 | 111.4 | 106.1 | 98.9 | Alcoa Pinjarra 2019 SWL Measurements |
| <b>Fixed Plant</b>   |               |                                     |       |       |       |       |       |       |       |      |                                      |
| ROM Primary and Secondary Sizer (3,300 tph)  | 114.1         | 119.4                               | 121.4 | 119.6 | 116.7 | 111.2 | 107.2 | 104.3 | 99.9  | 89.4 | Wood SWL Measurement Database        |
| Diesel Generator (0.6 MW) – Fixed Infrastructure Area  | 104.6         | -                                   | 85.3  | 92.2  | 95.5  | 97.0  | 98.0  | 98.0  | 96.8  | 98.3 | Wood SWL Measurement Database        |
| Overland Conveyors   | 86.1          | 77.0                                | 85.6  | 89.8  | 87.4  | 82.4  | 82.3  | 75.6  | 68.7  | 60.8 | Wood SWL Measurement Database        |
| <u>Misc Pumps</u><br>1 x Sewage Pump<br>1 x Reservoir Pump<br>1 x Chlorination/ Potable Water Pump<br>3 x HV Diesel Fuel Pump<br>1 x Waste Water Sump Pump | 95.9          | 97.2                                | 93.2  | 97.6  | 95.8  | 93.2  | 90.9  | 86.6  | 82.9  | 81.1 | Wood SWL Measurement Database        |

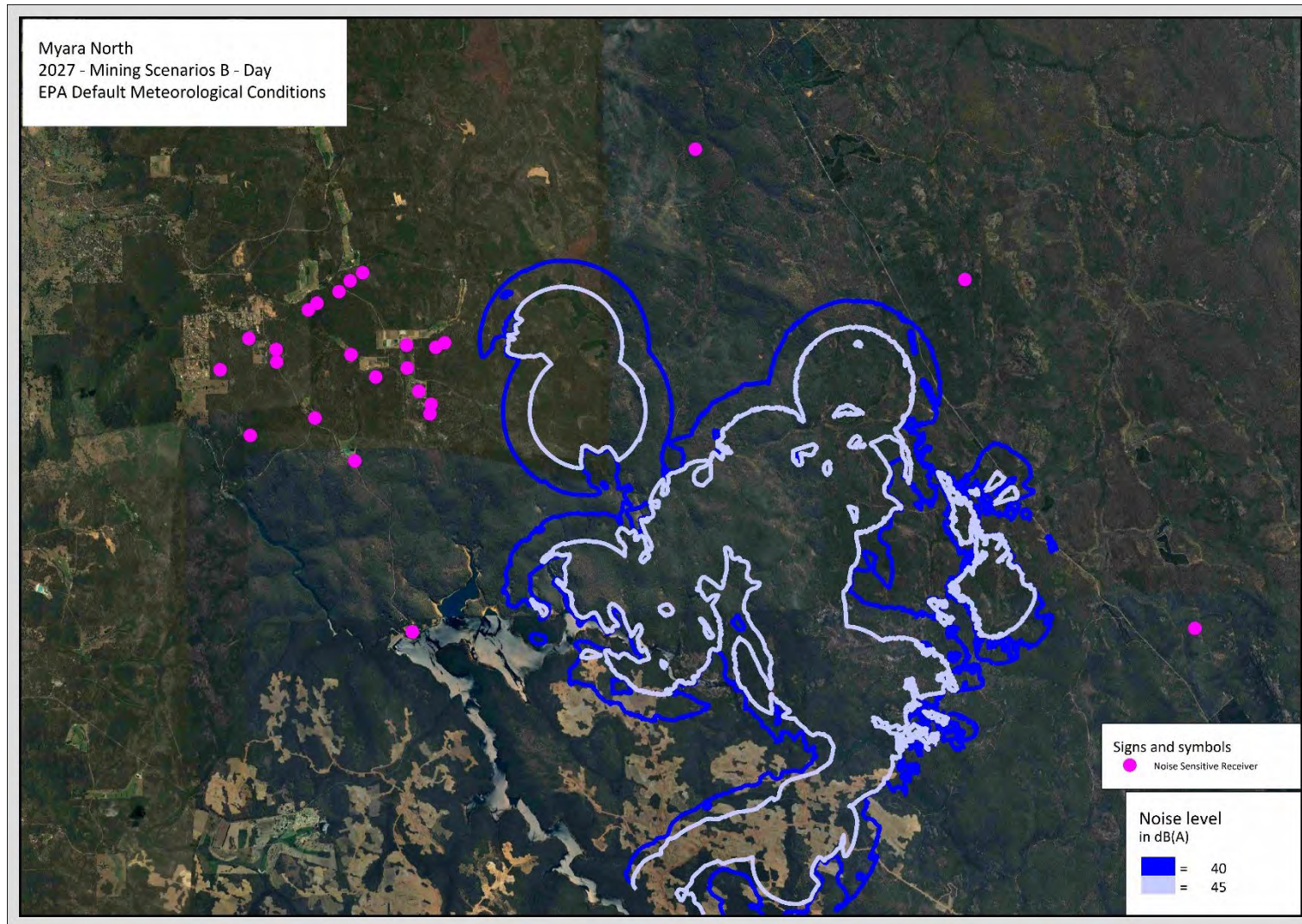
## APPENDIX C NOISE CONTOURS

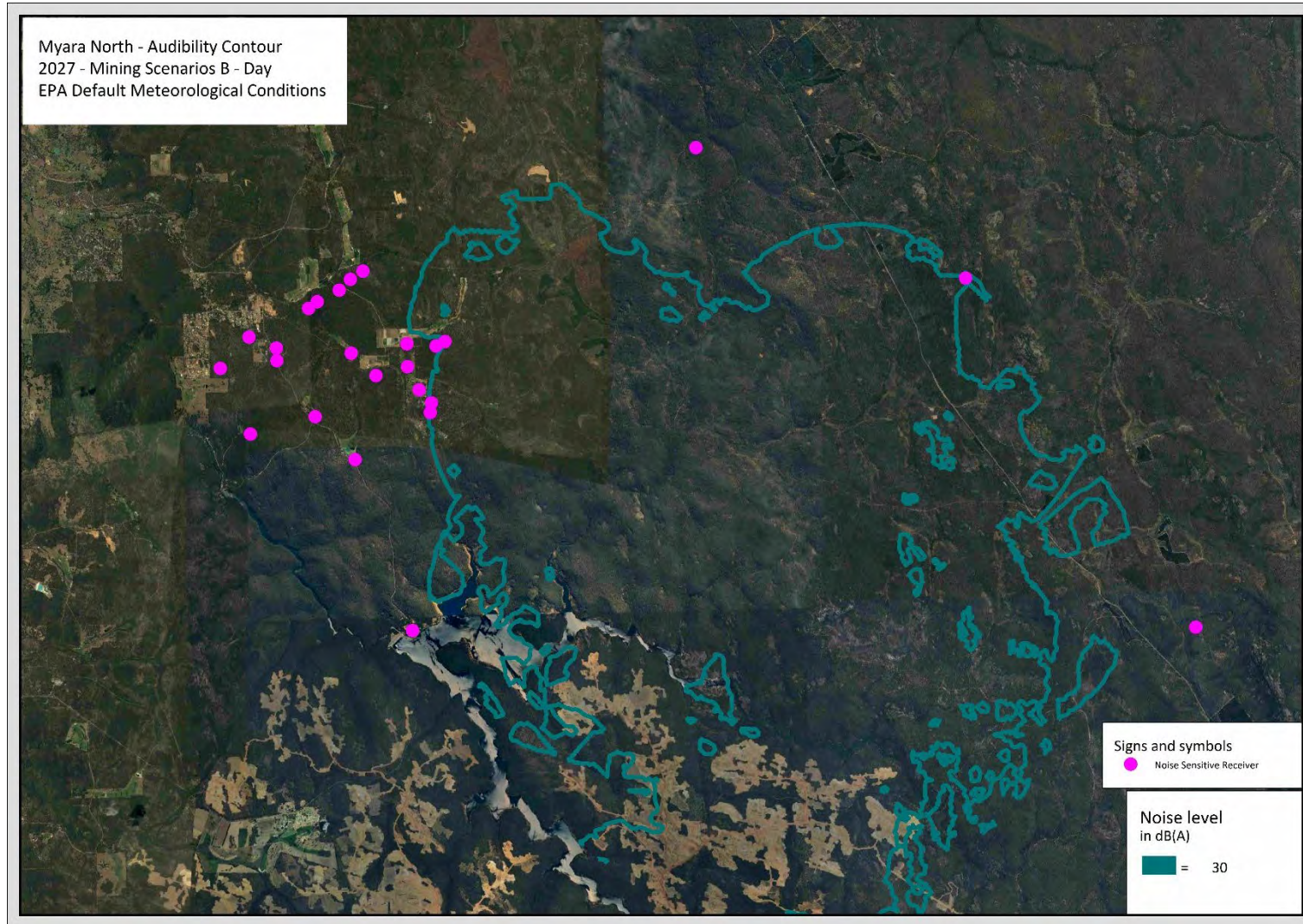
### C.1 Myara North – Daytime Staging Noise Contours

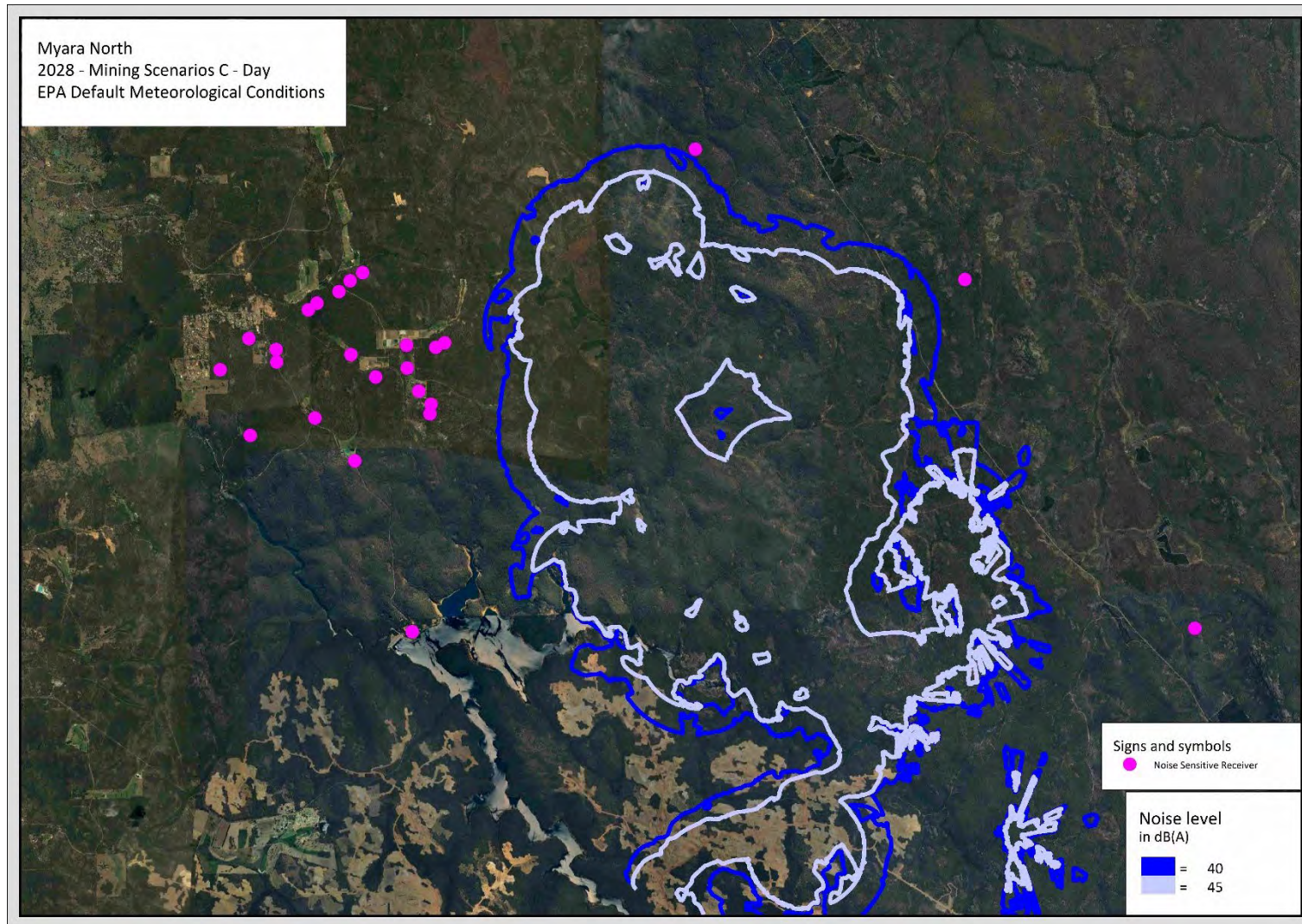
All aerial images have been attained via Google Earth (Google Earth, Image ©2023 Airbus)

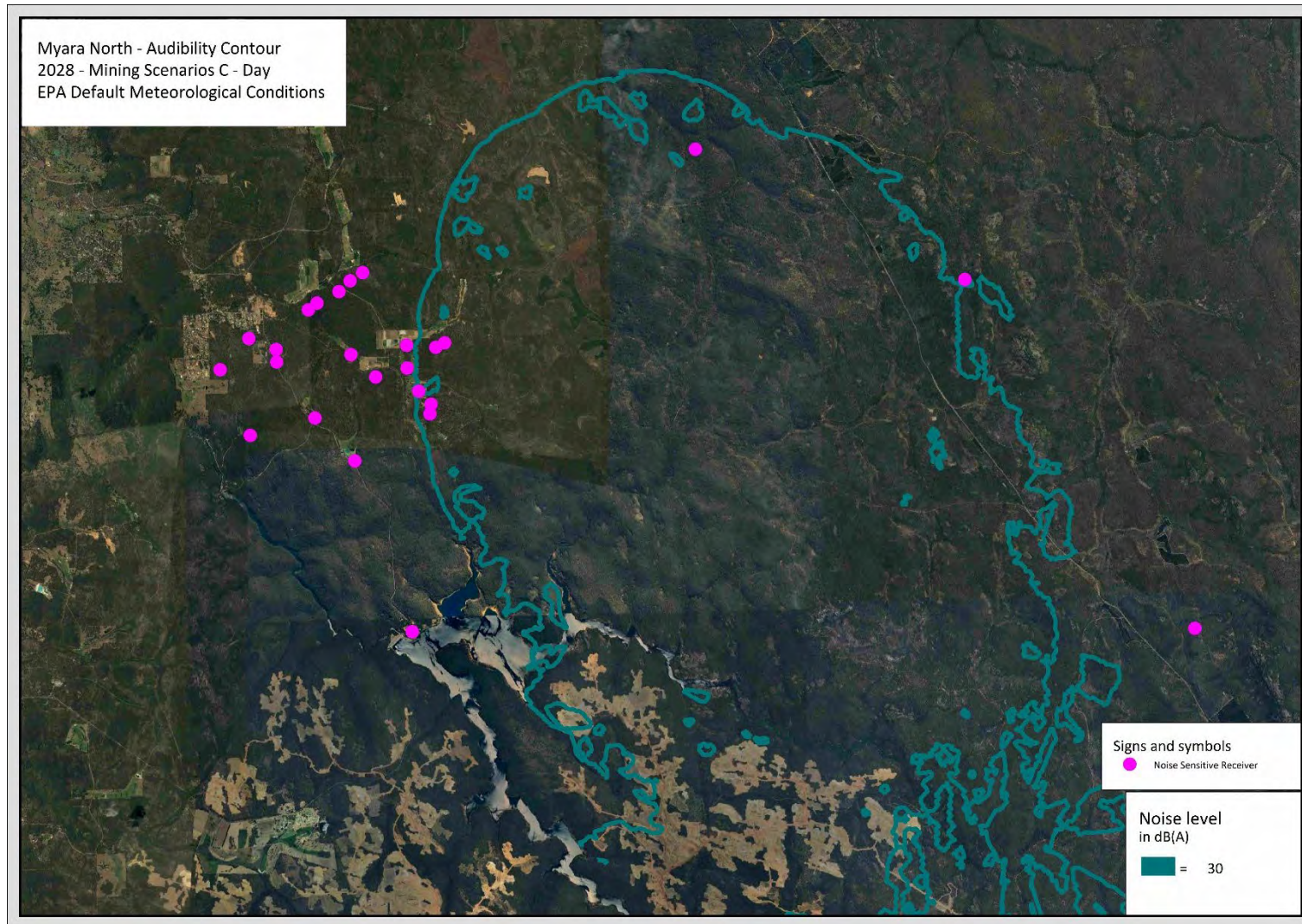


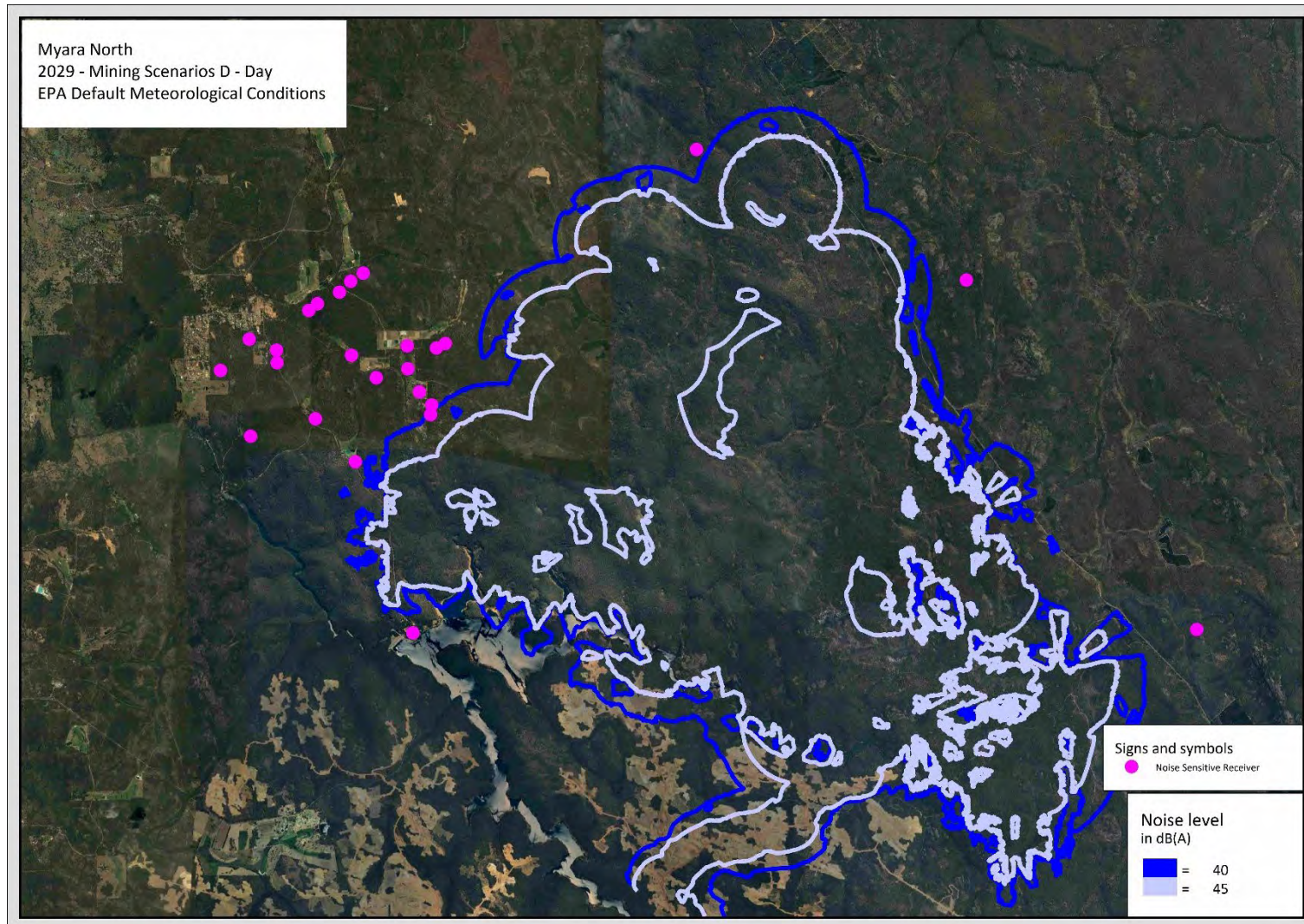


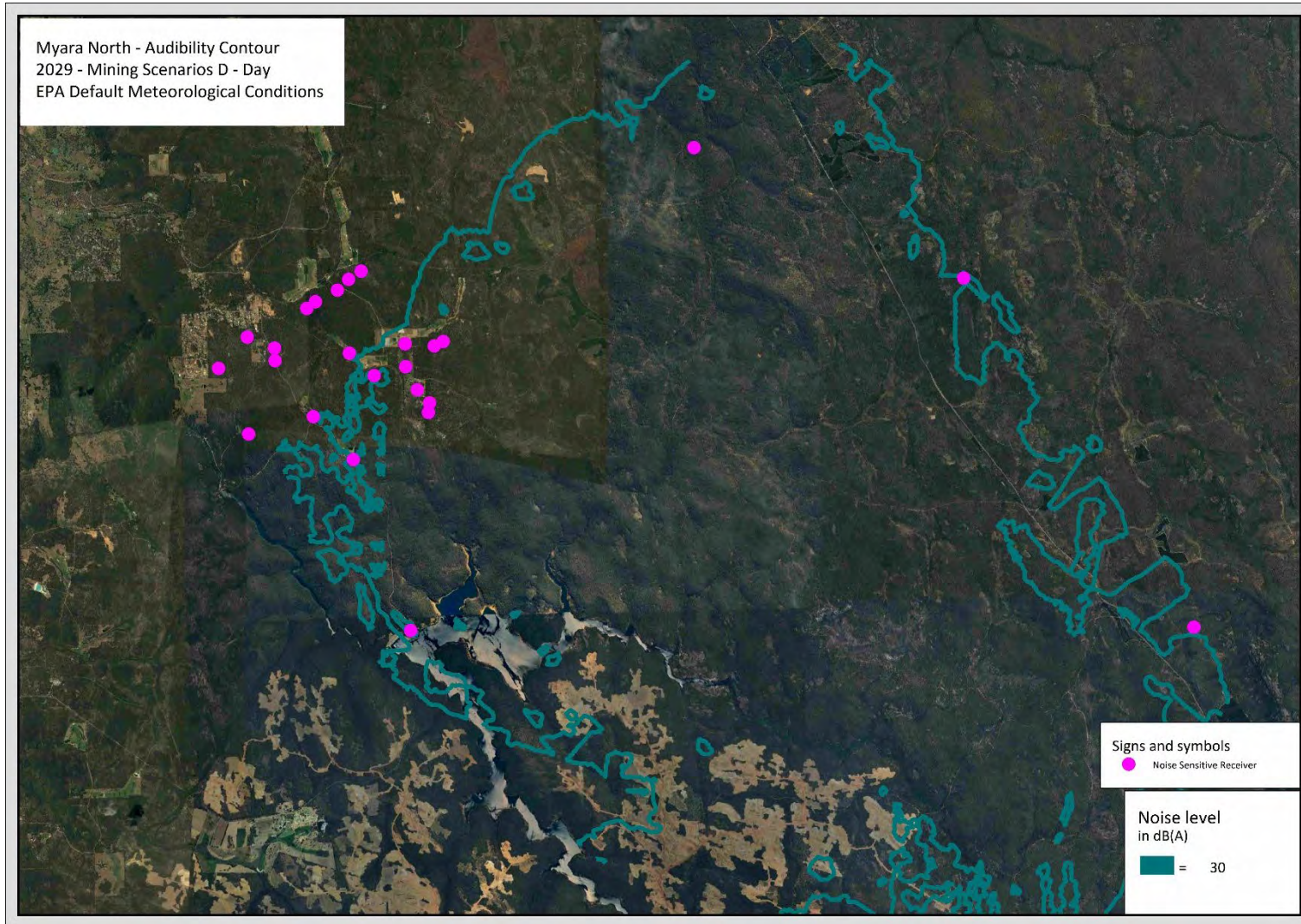


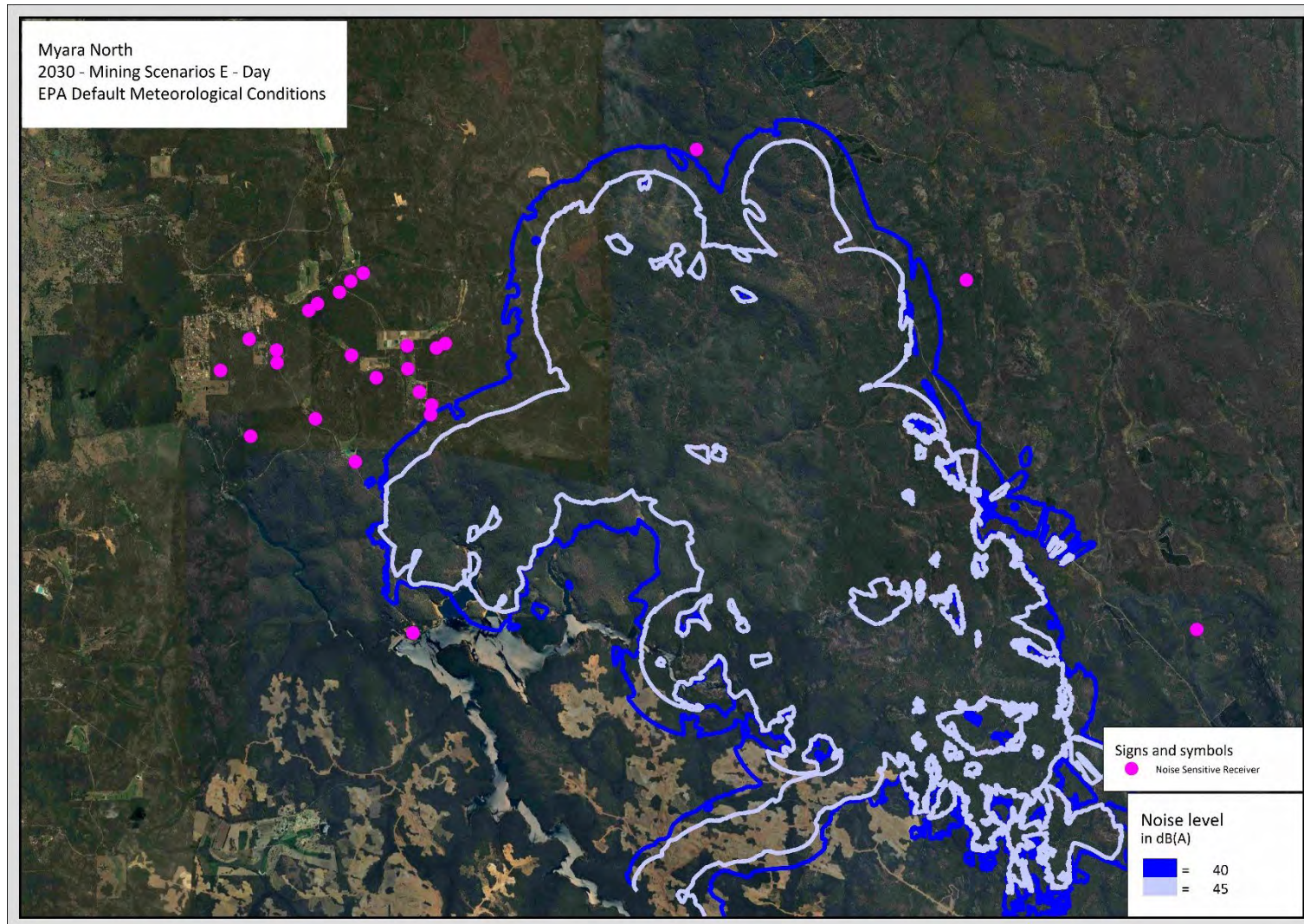


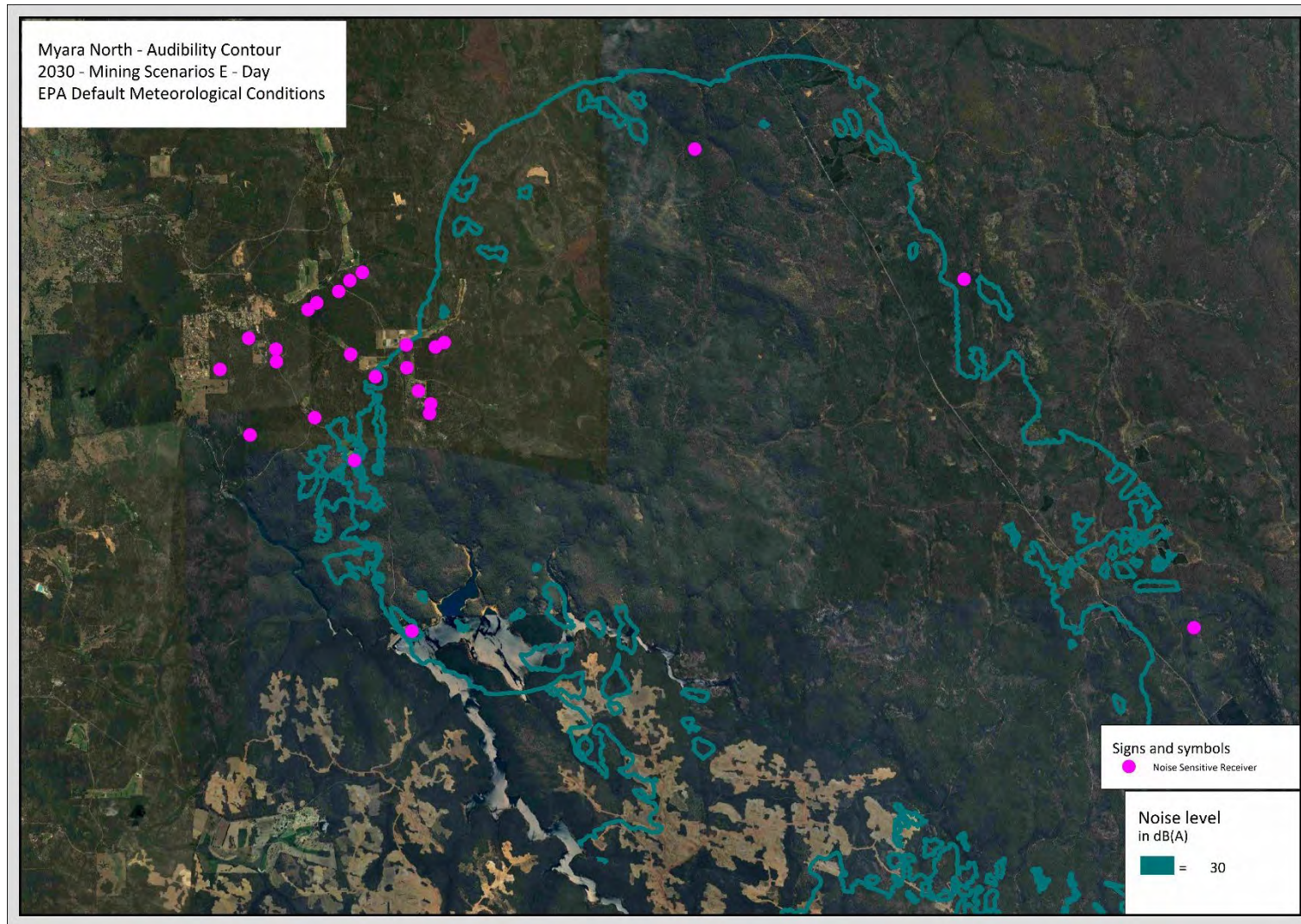


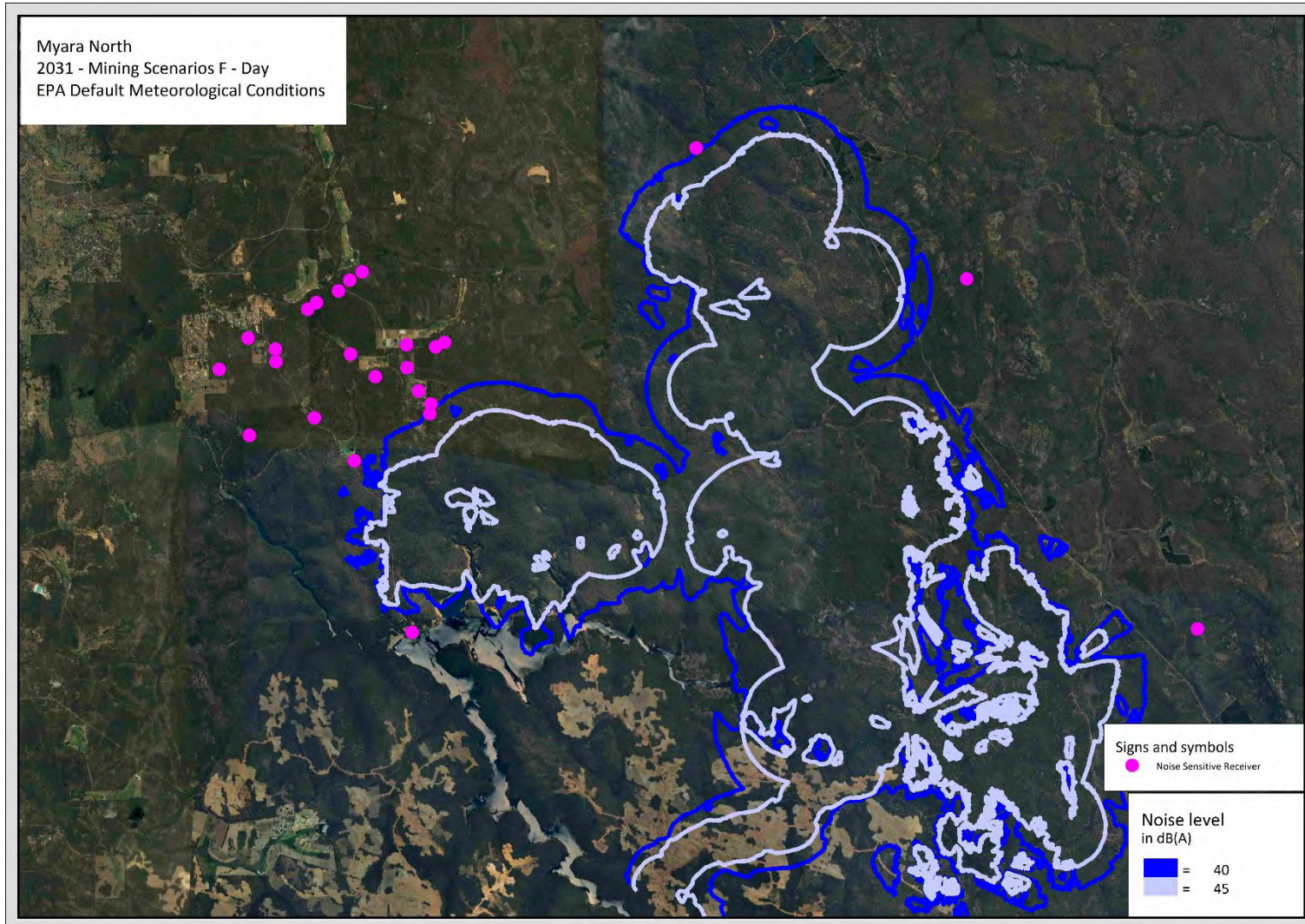


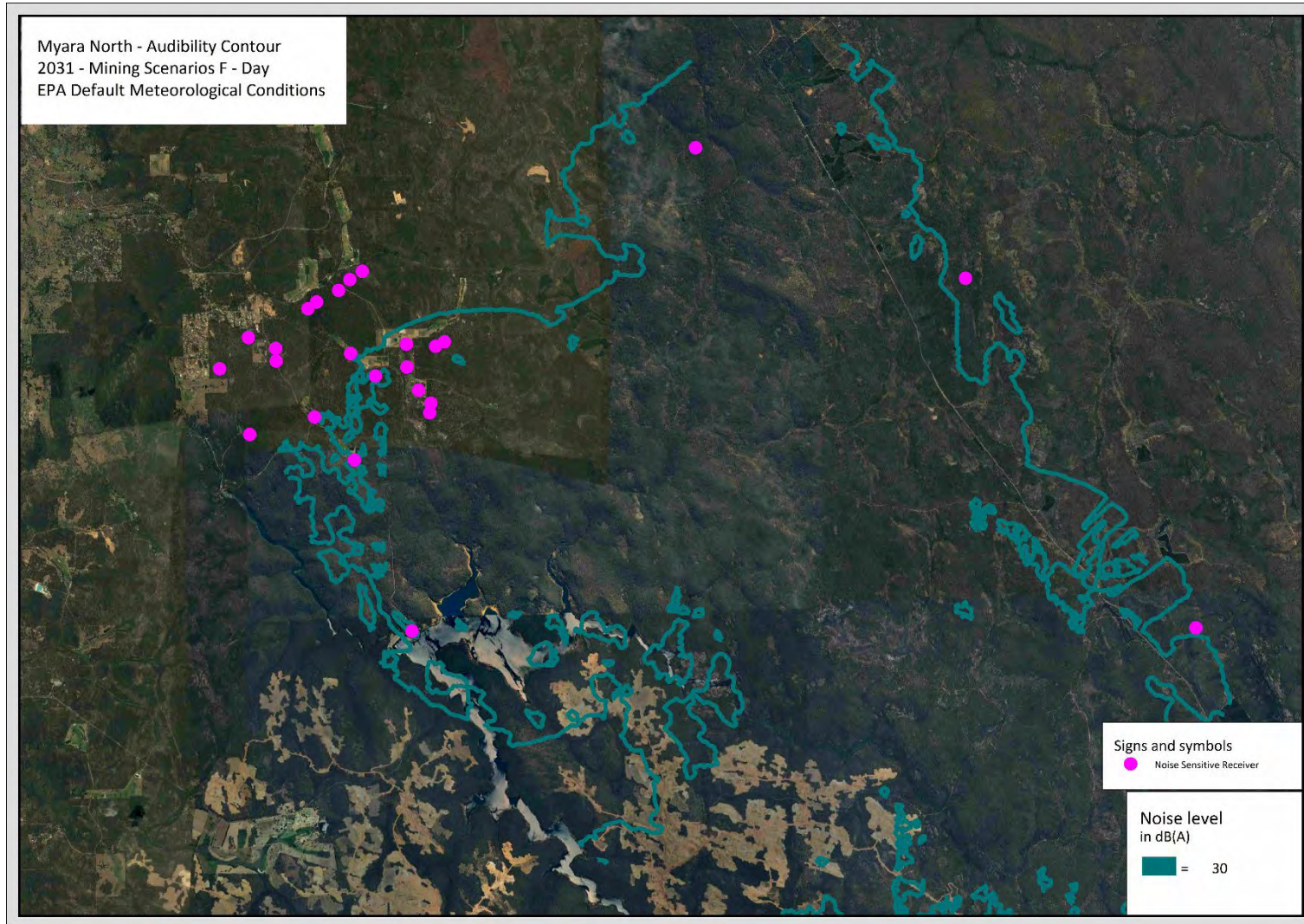


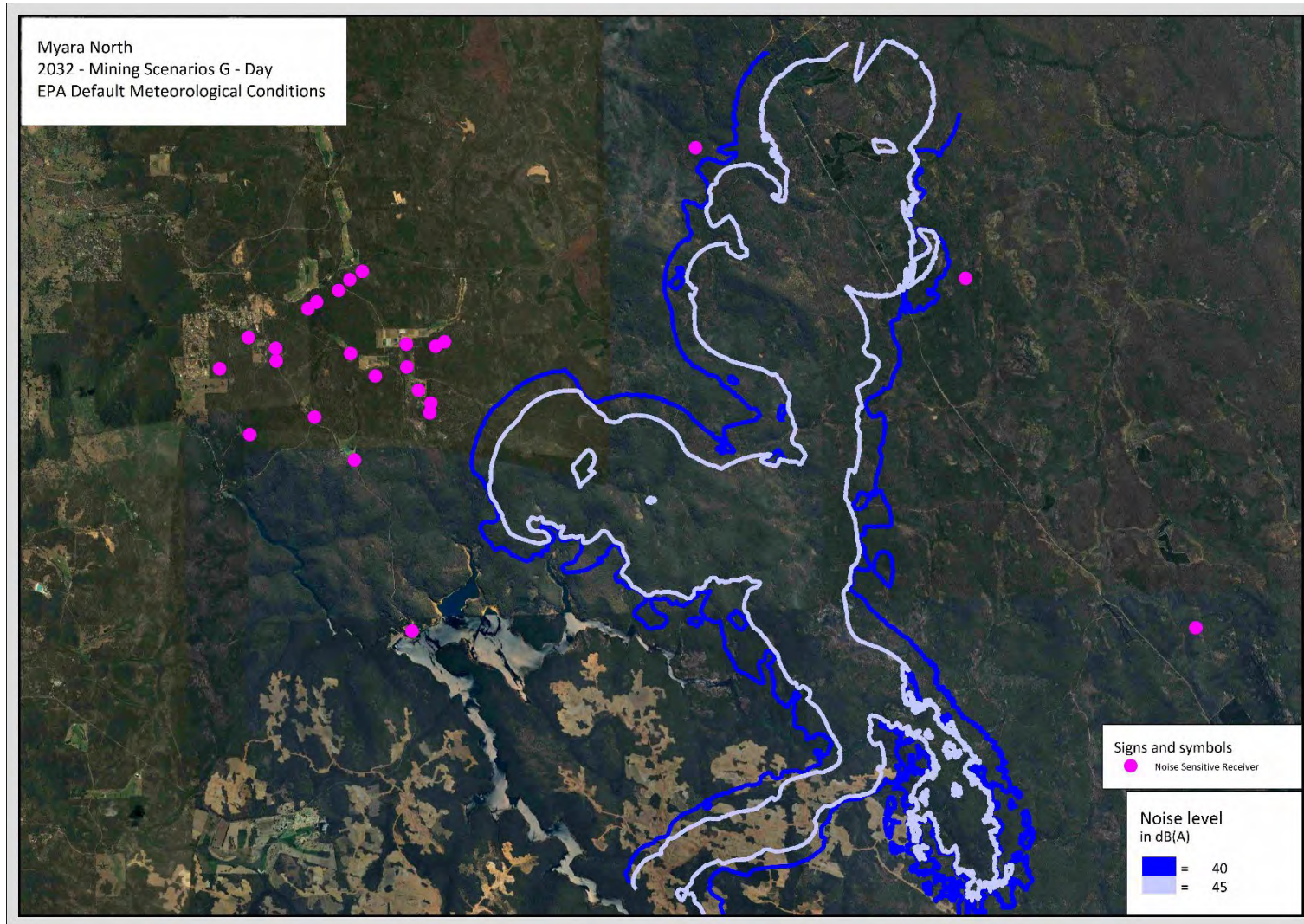


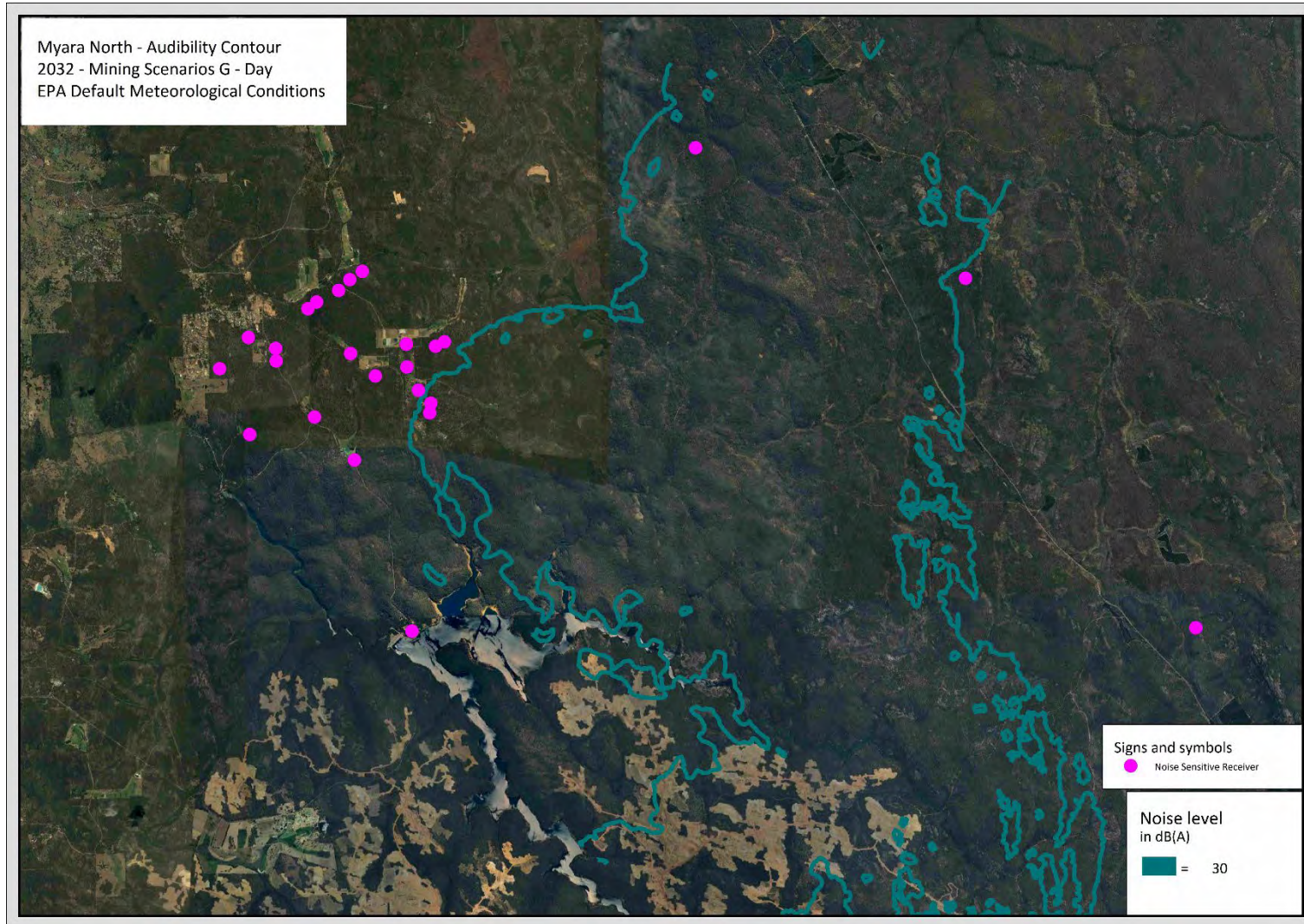


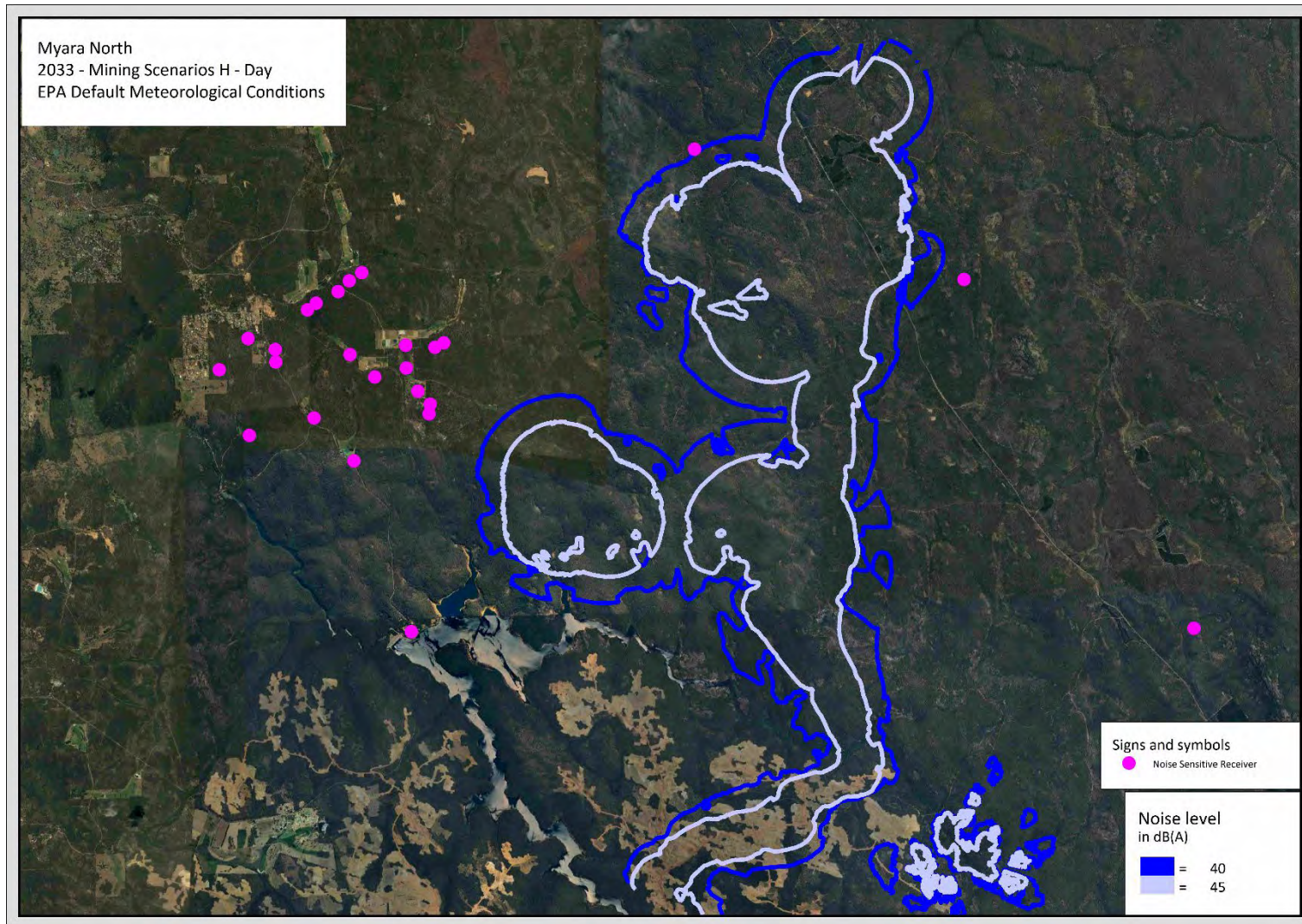


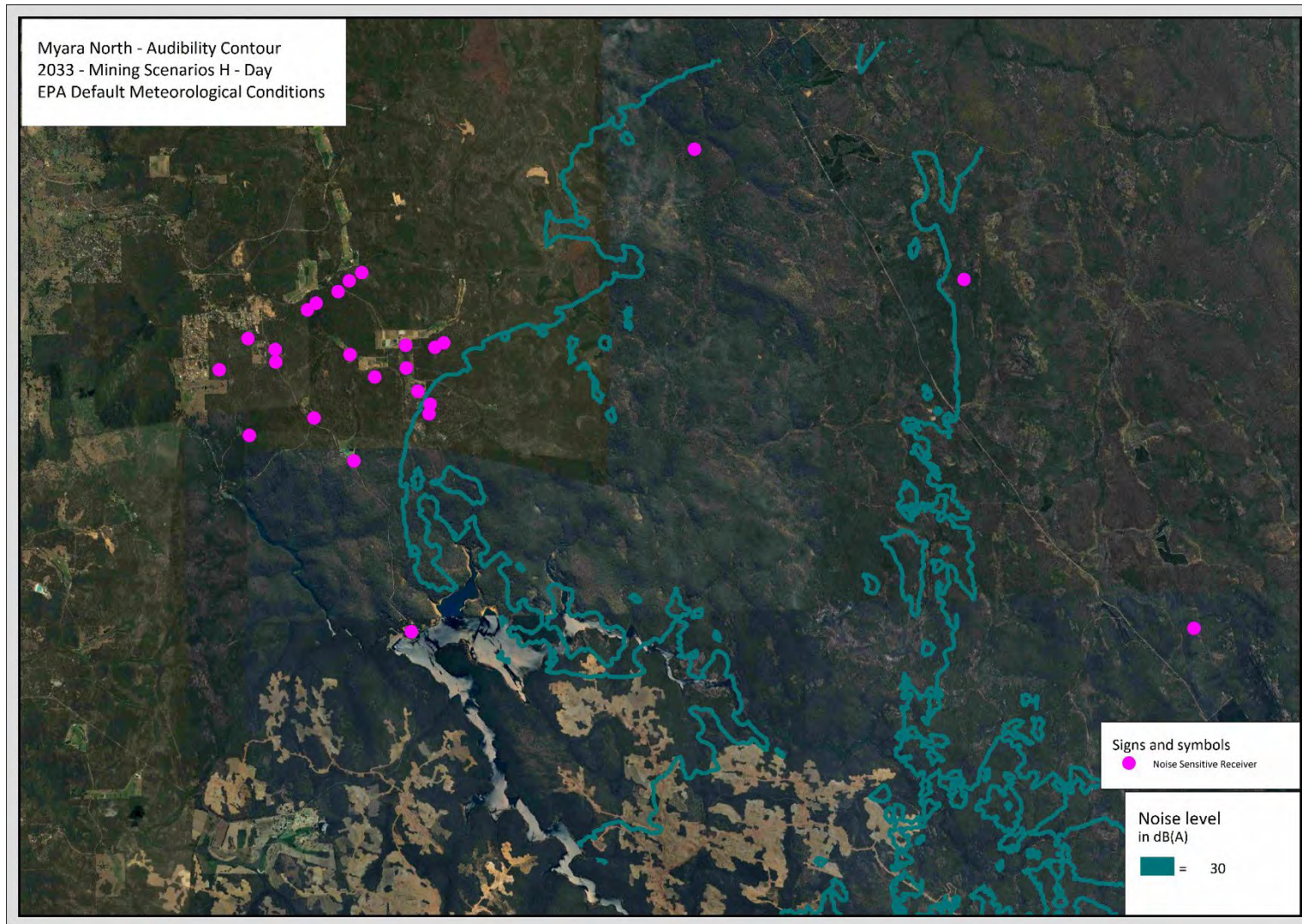


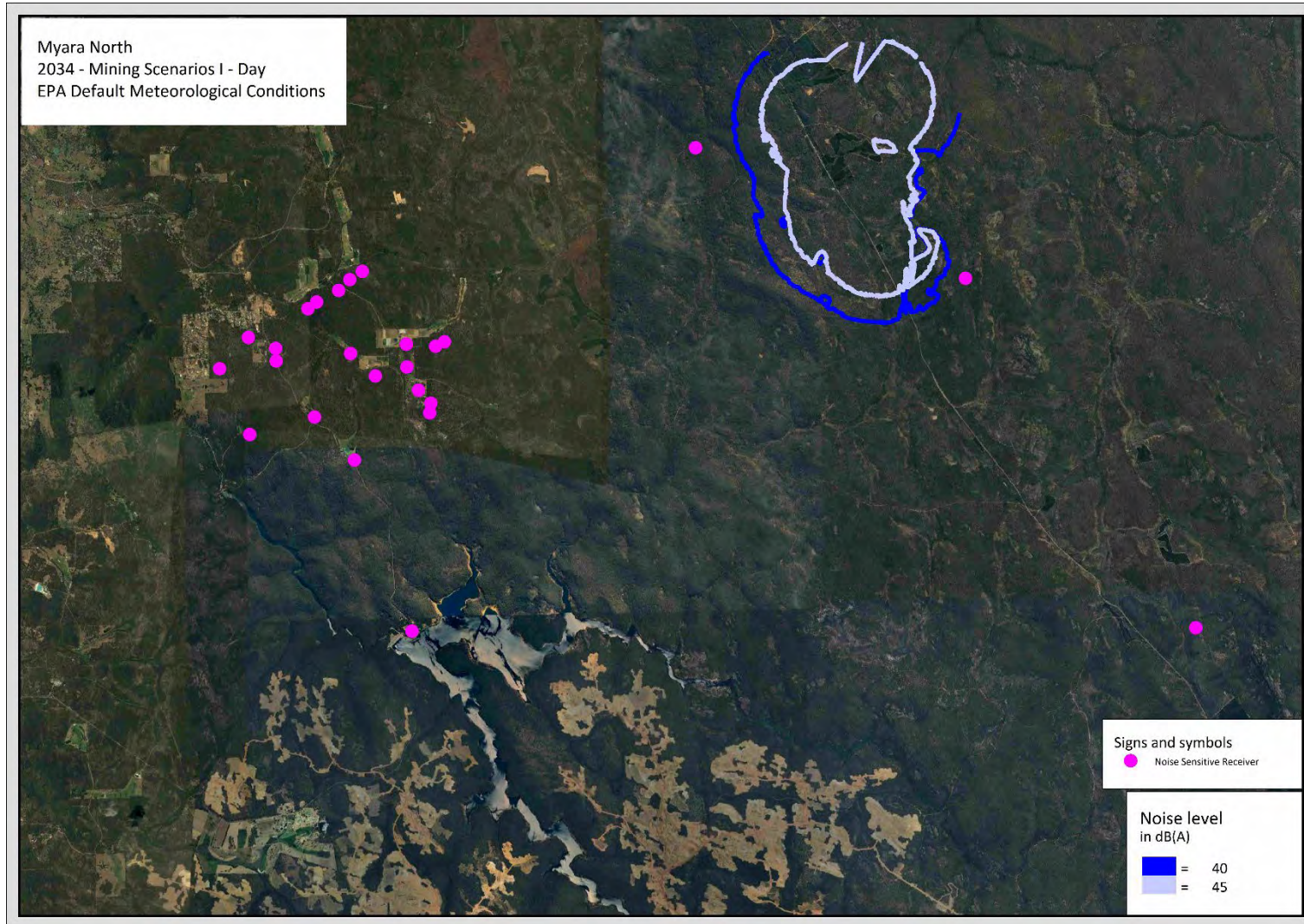


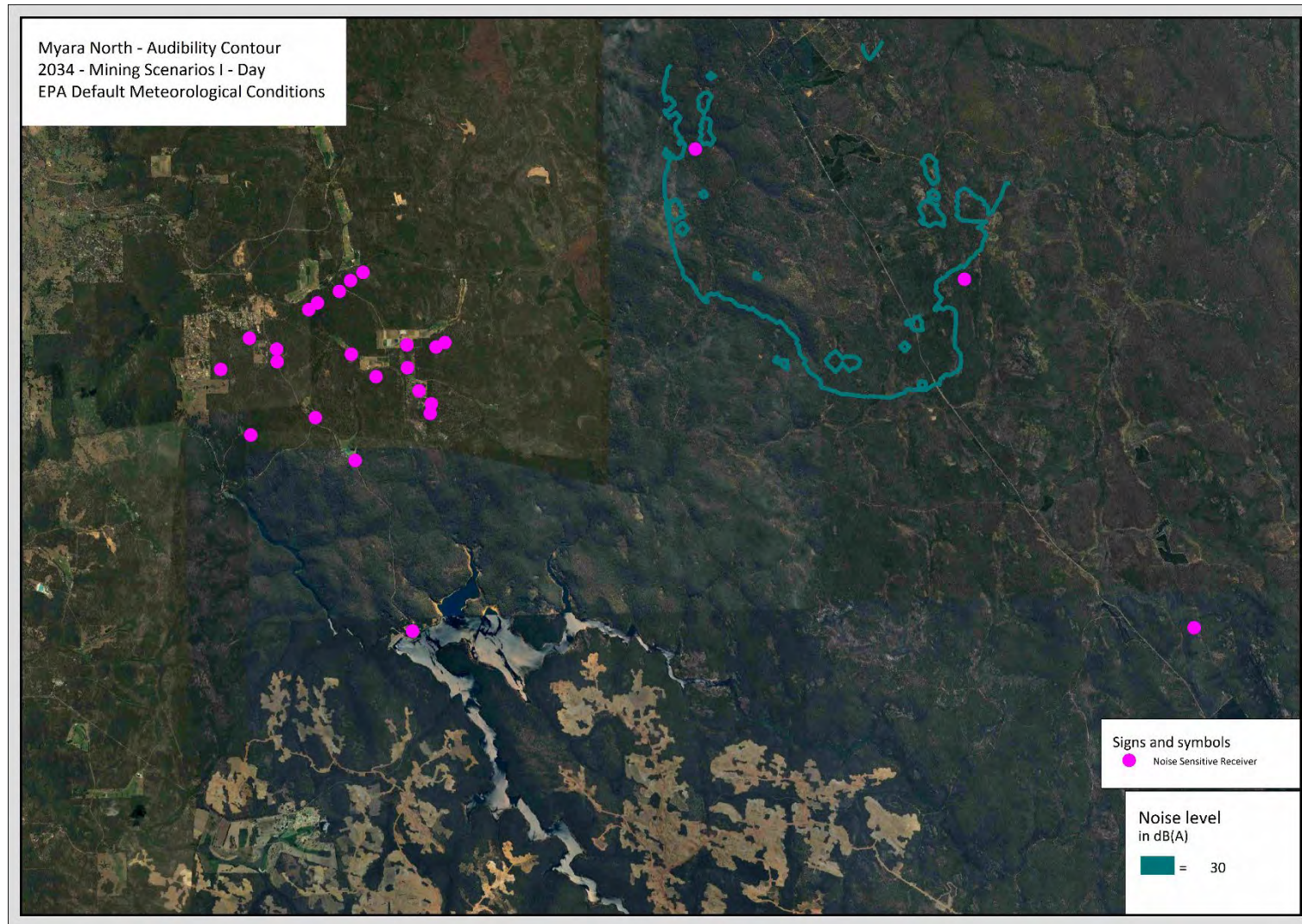






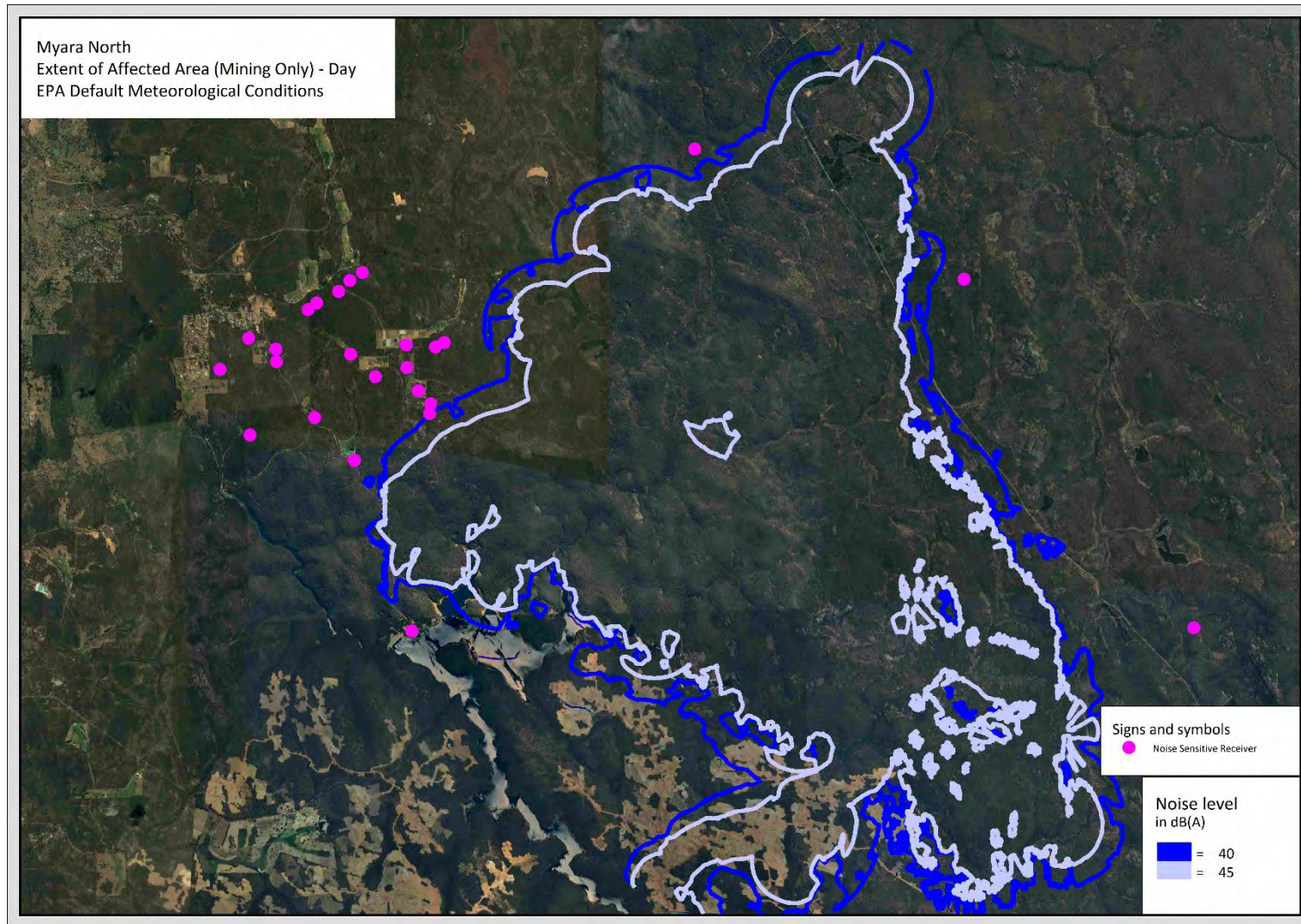


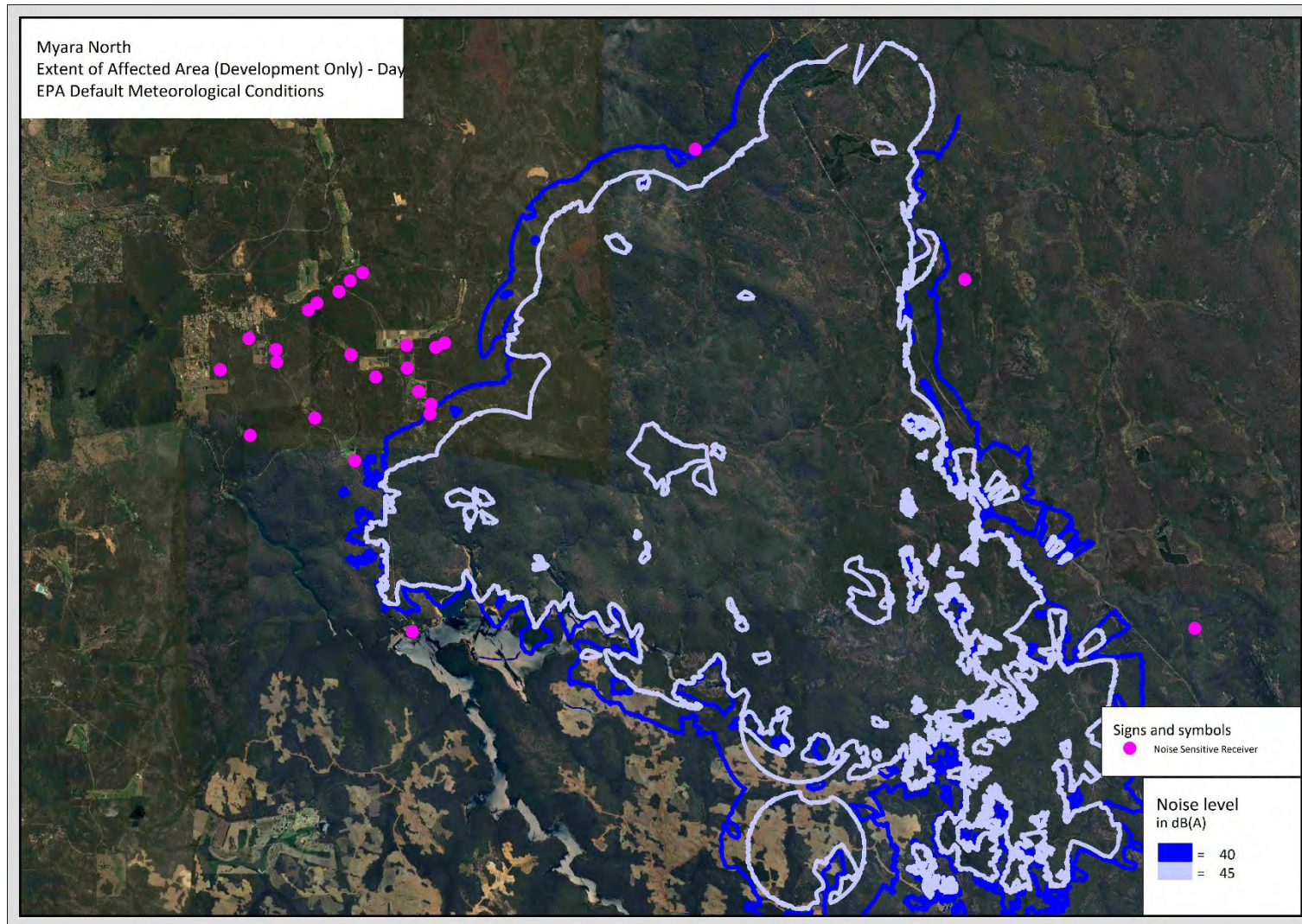




## **C.2 Myara North – Nighttime Overall Contour**

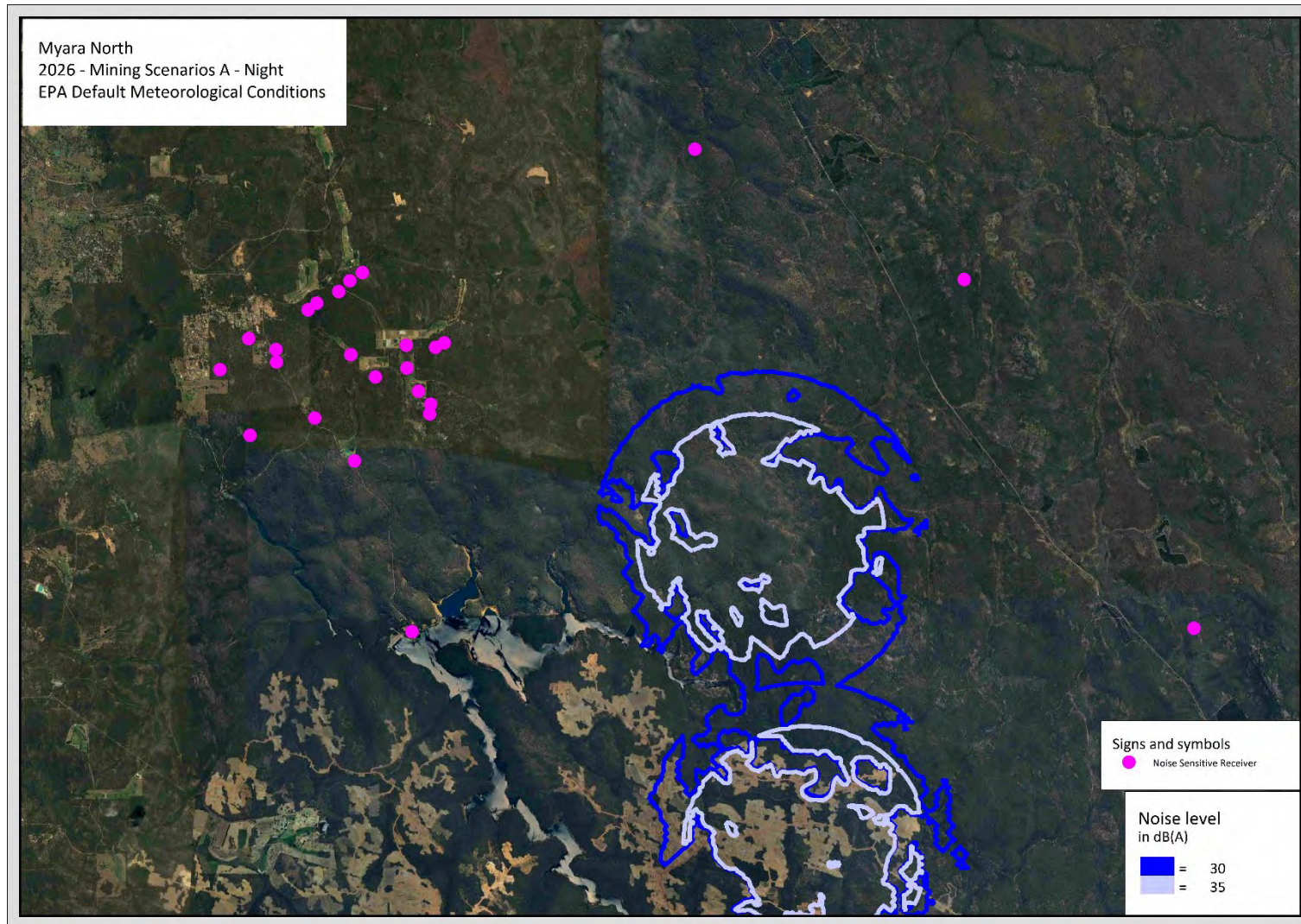
All aerial images have been attained via Google Earth (Google Earth, Image ©2023 Airbus)

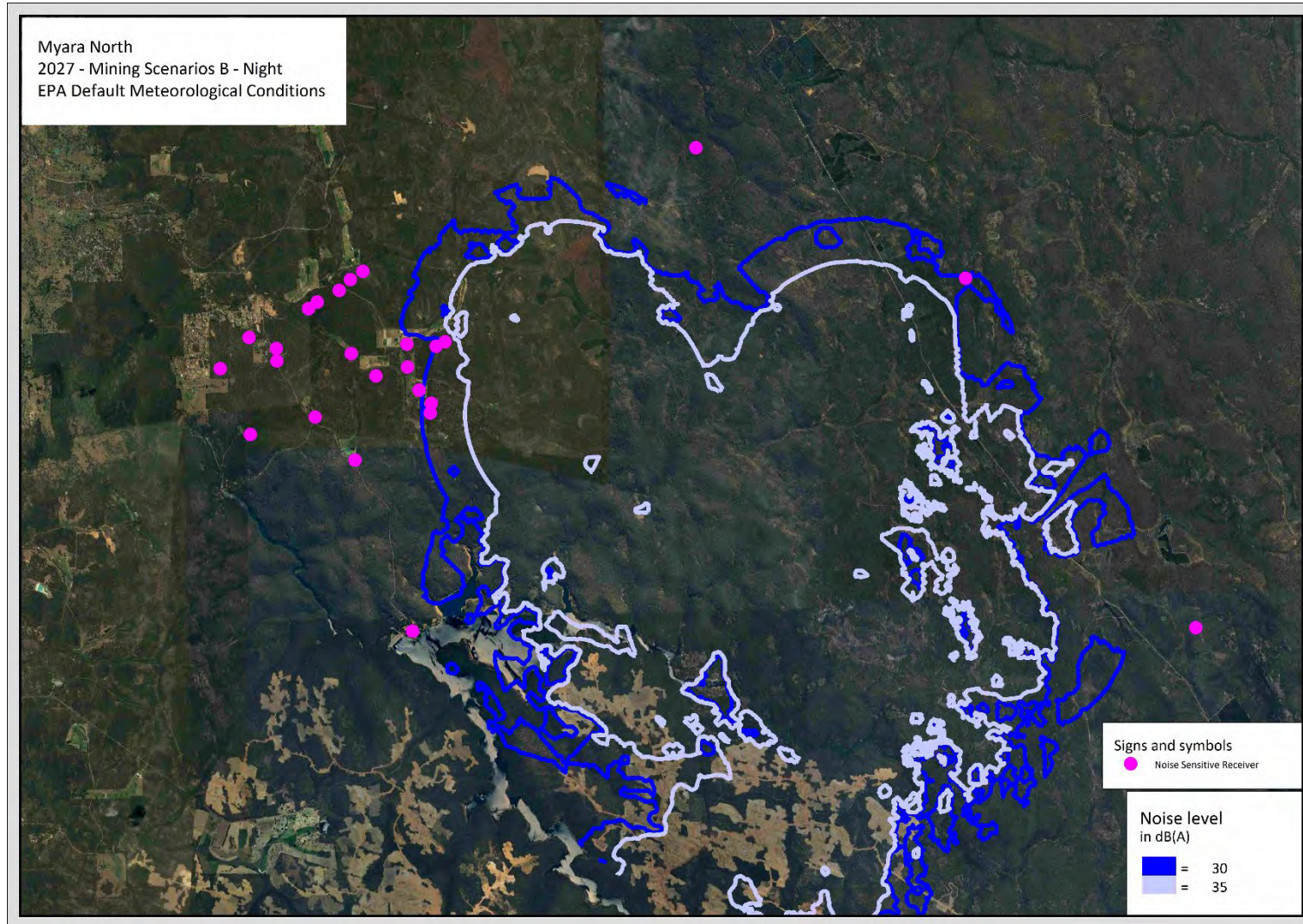


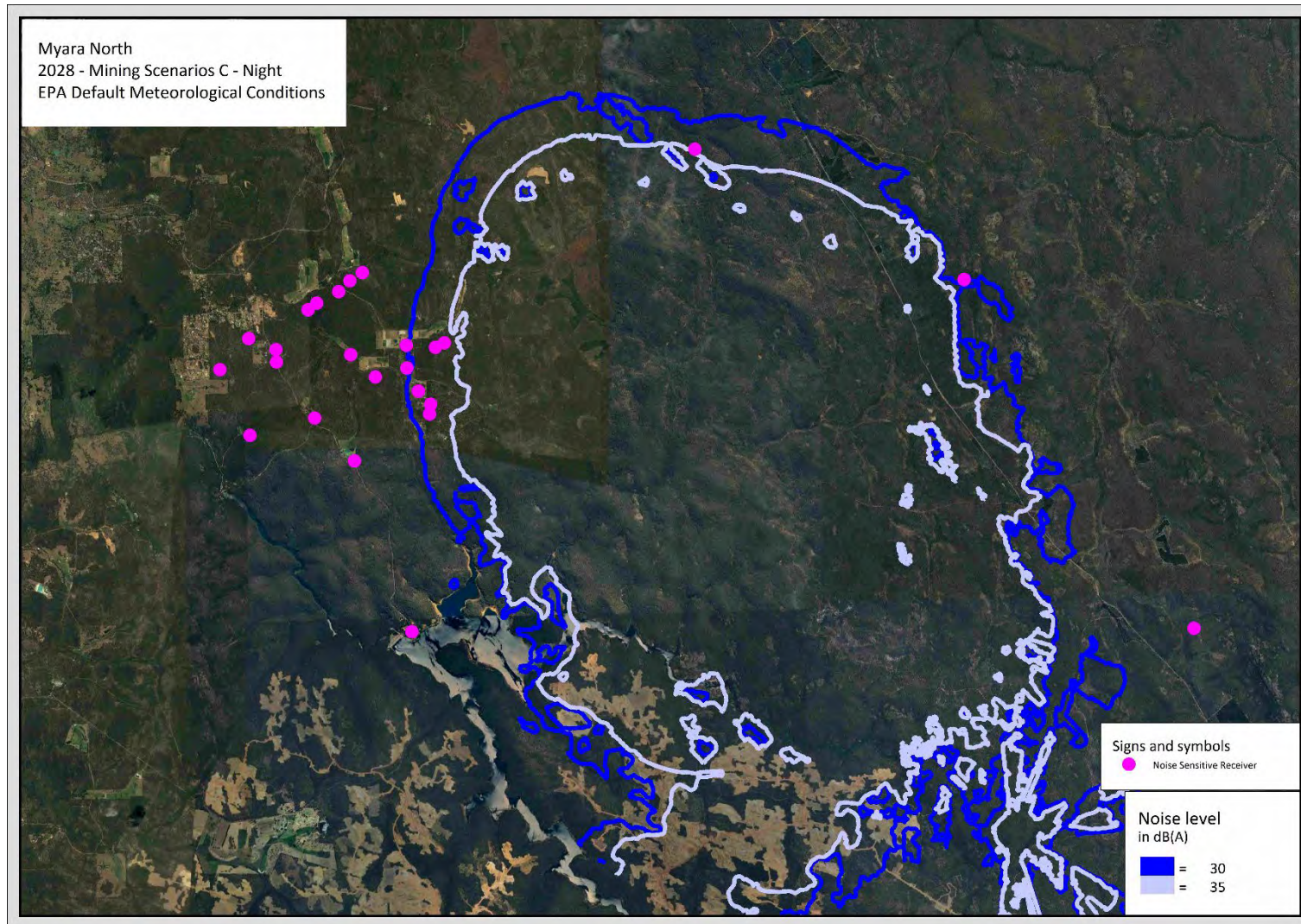


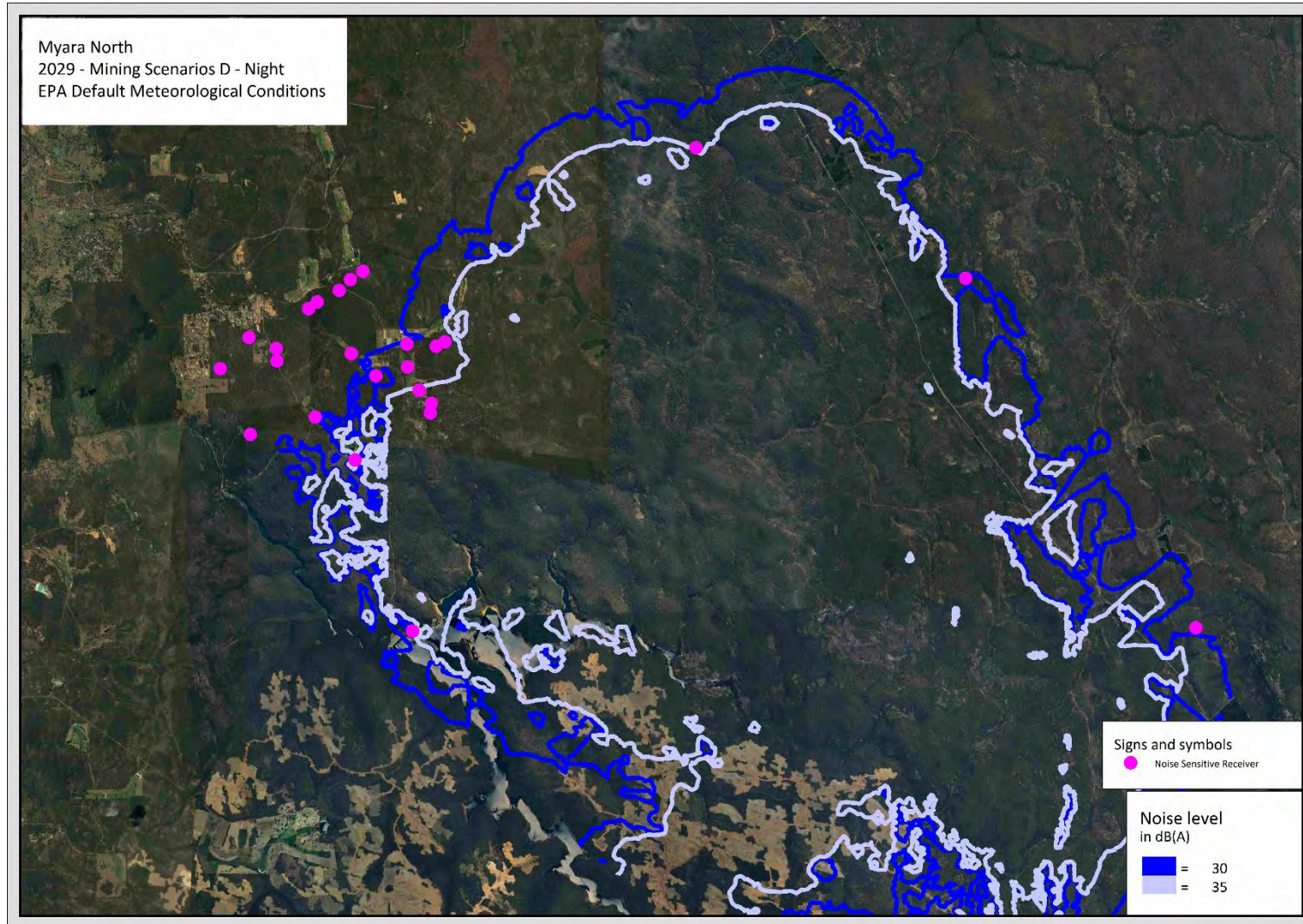
### **C.3 Myara North – Nighttime Staging Noise Contours**

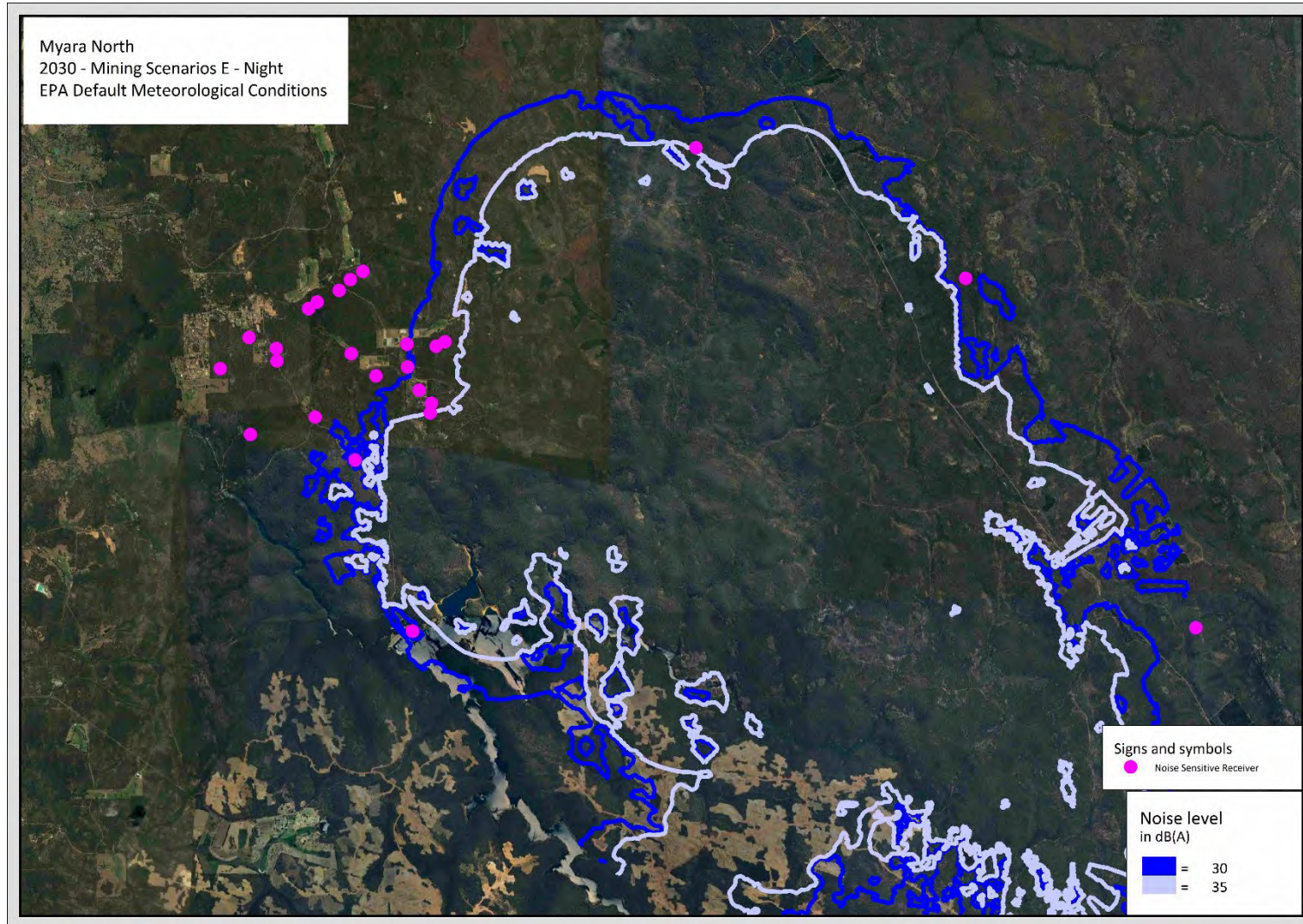
All aerial images have been attained via Google Earth (Google Earth, Image ©2023 Airbus)

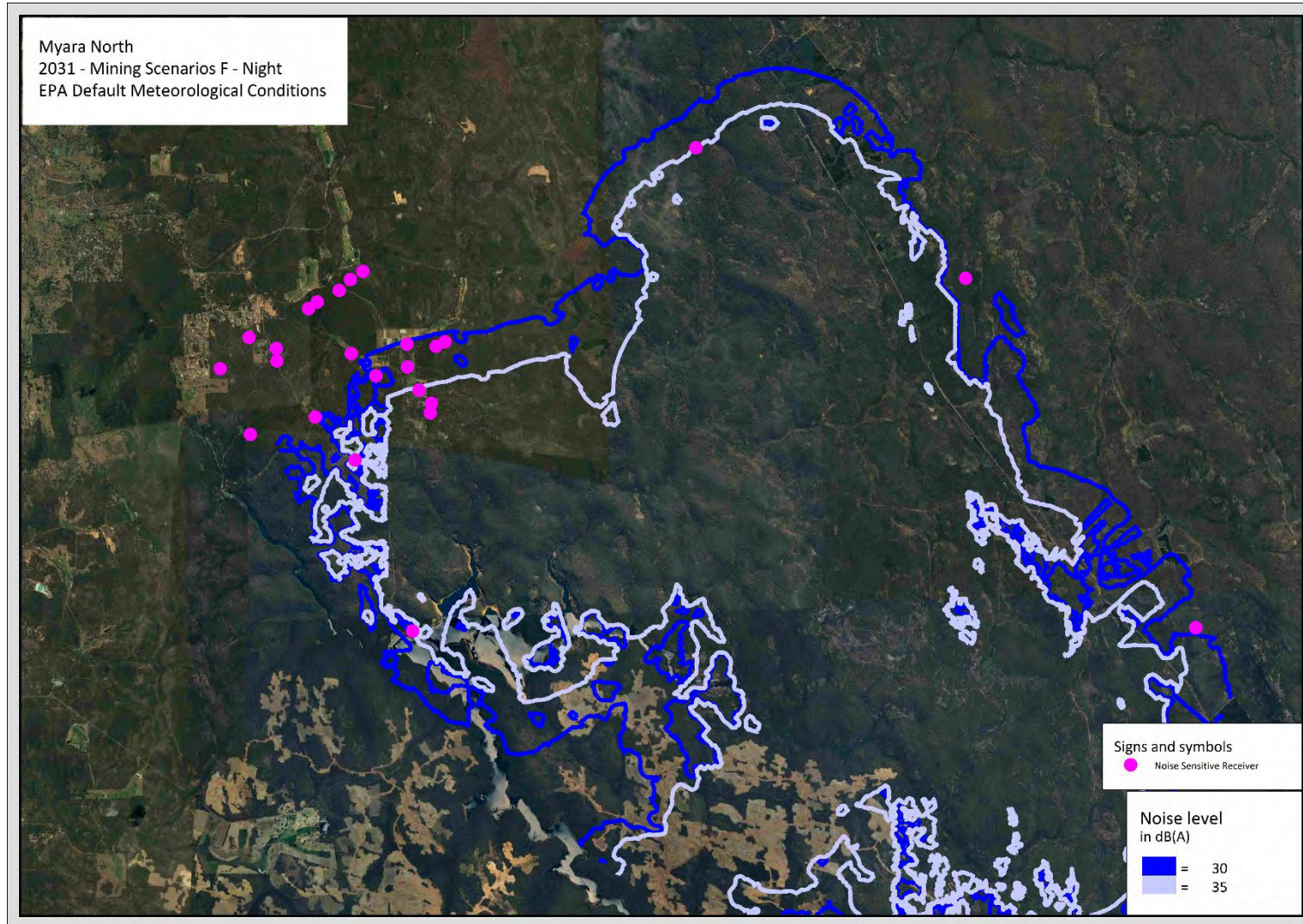


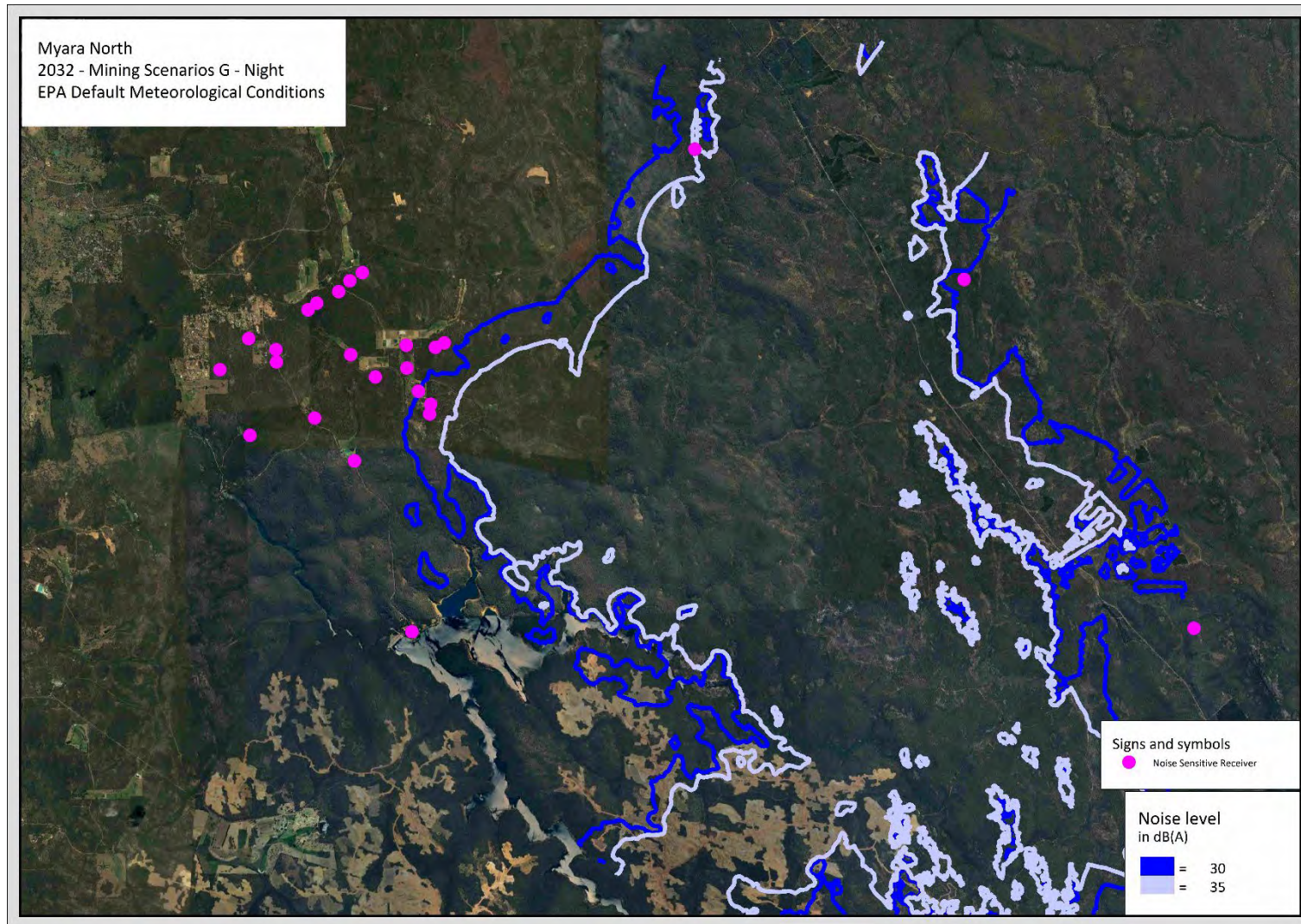


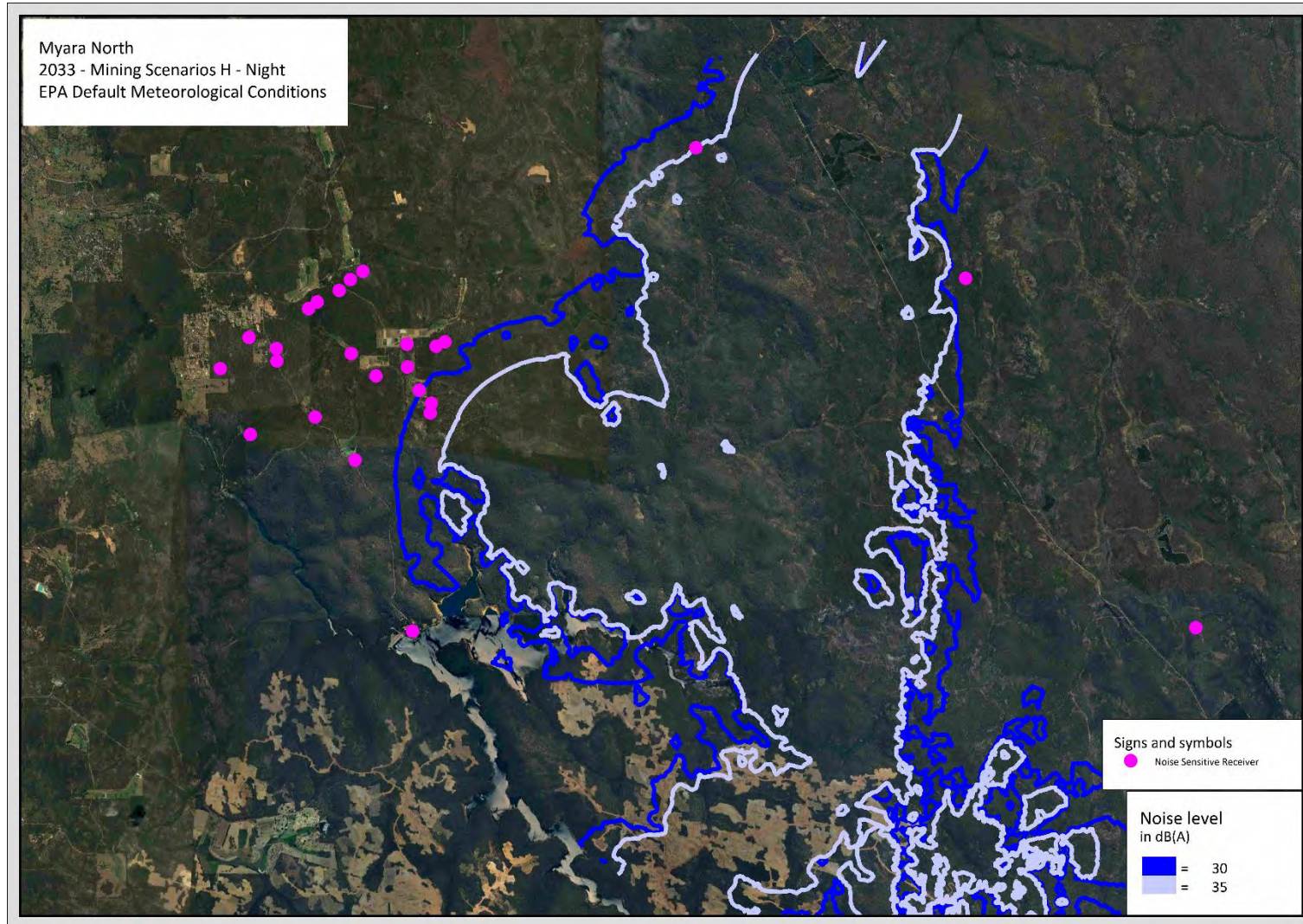


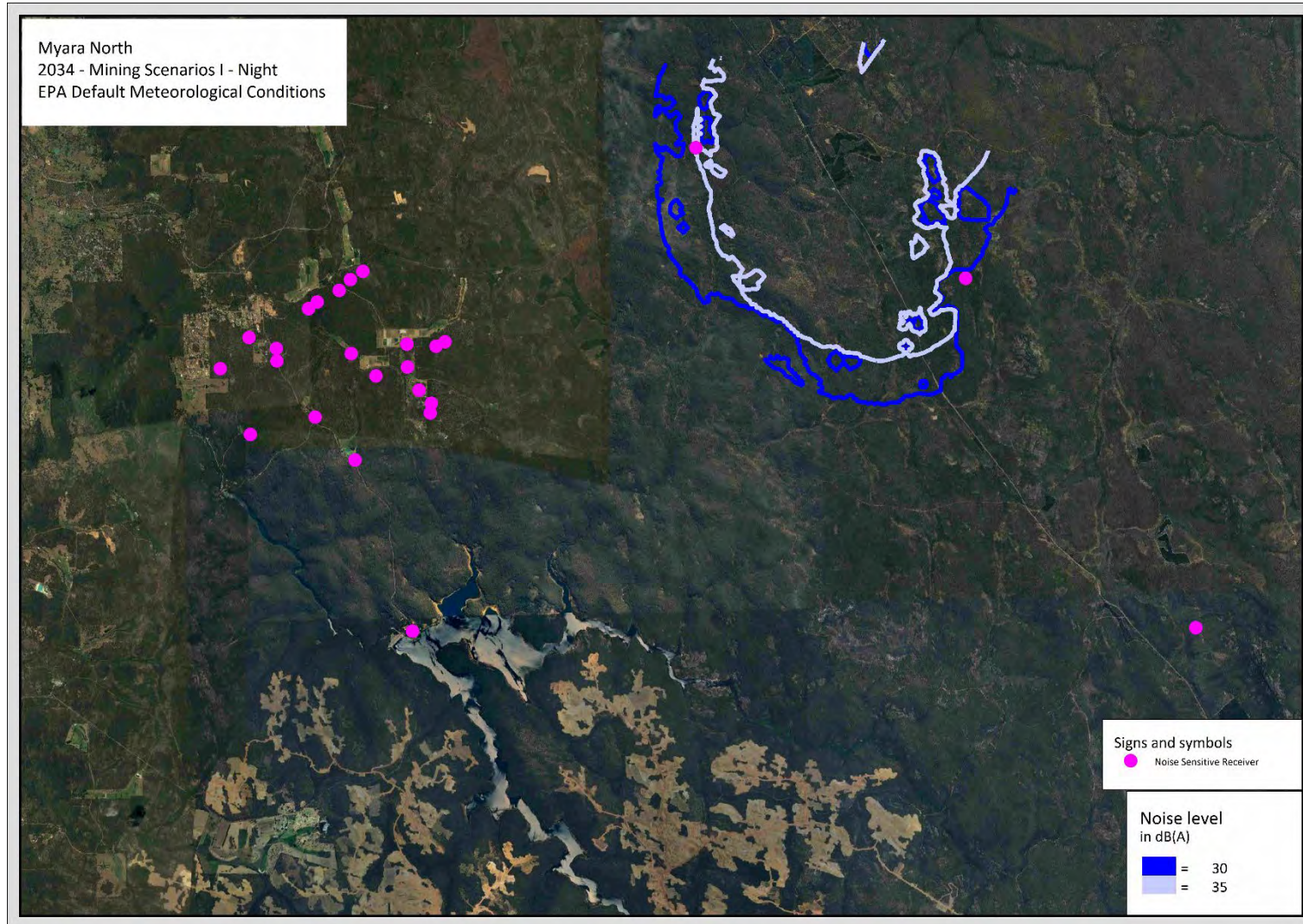






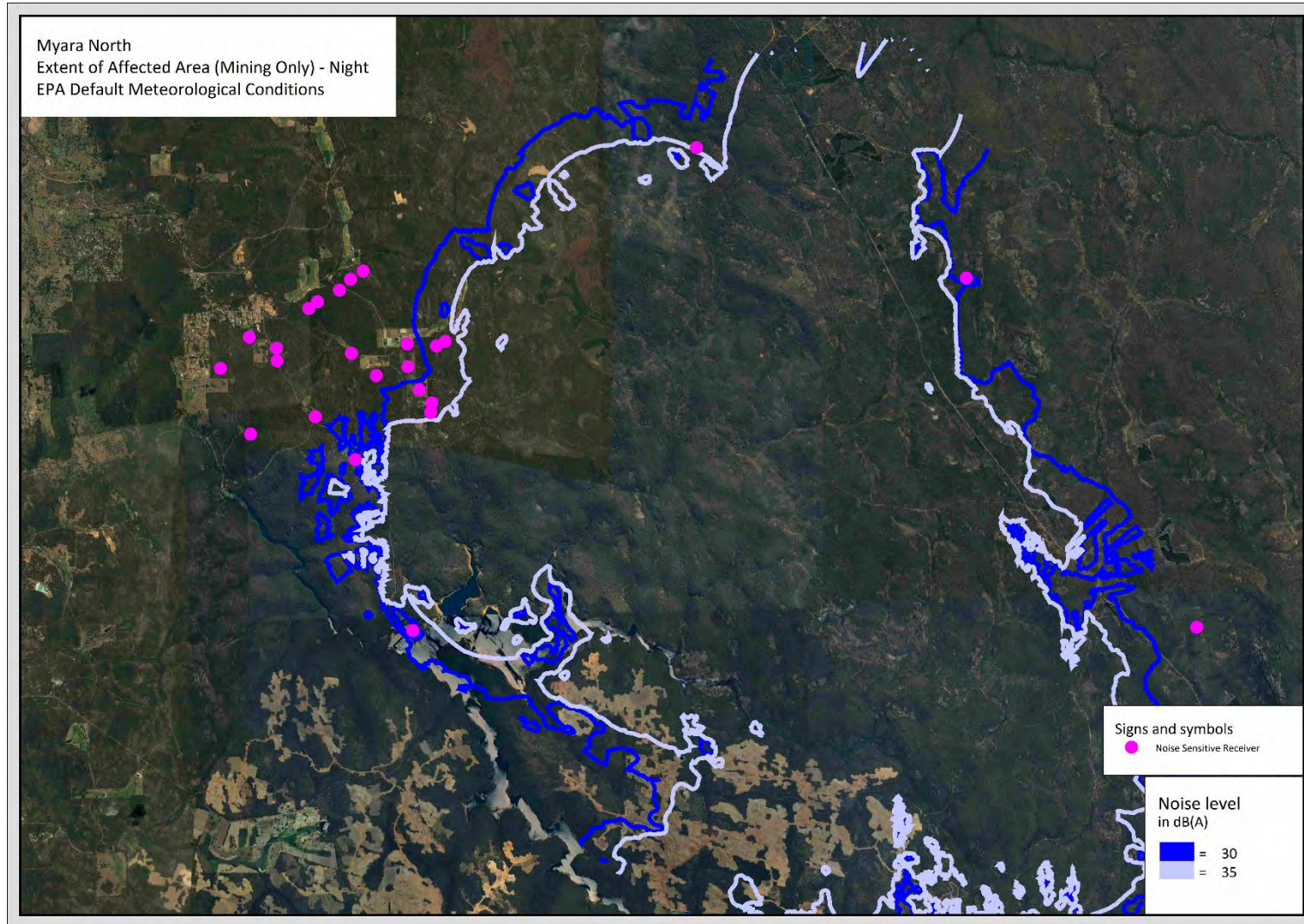


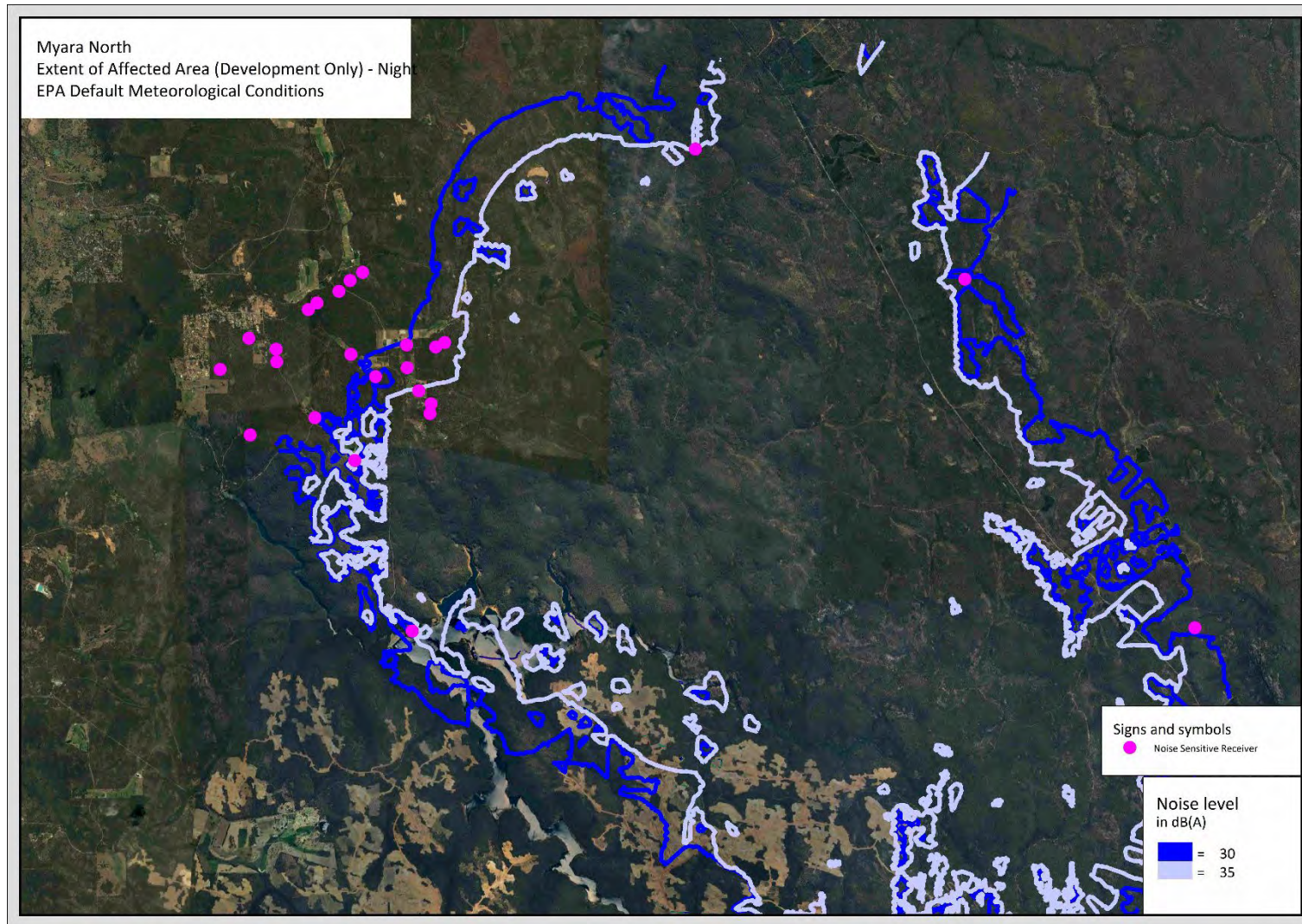




## **C.4 Myara North – Nighttime Overall Contour**

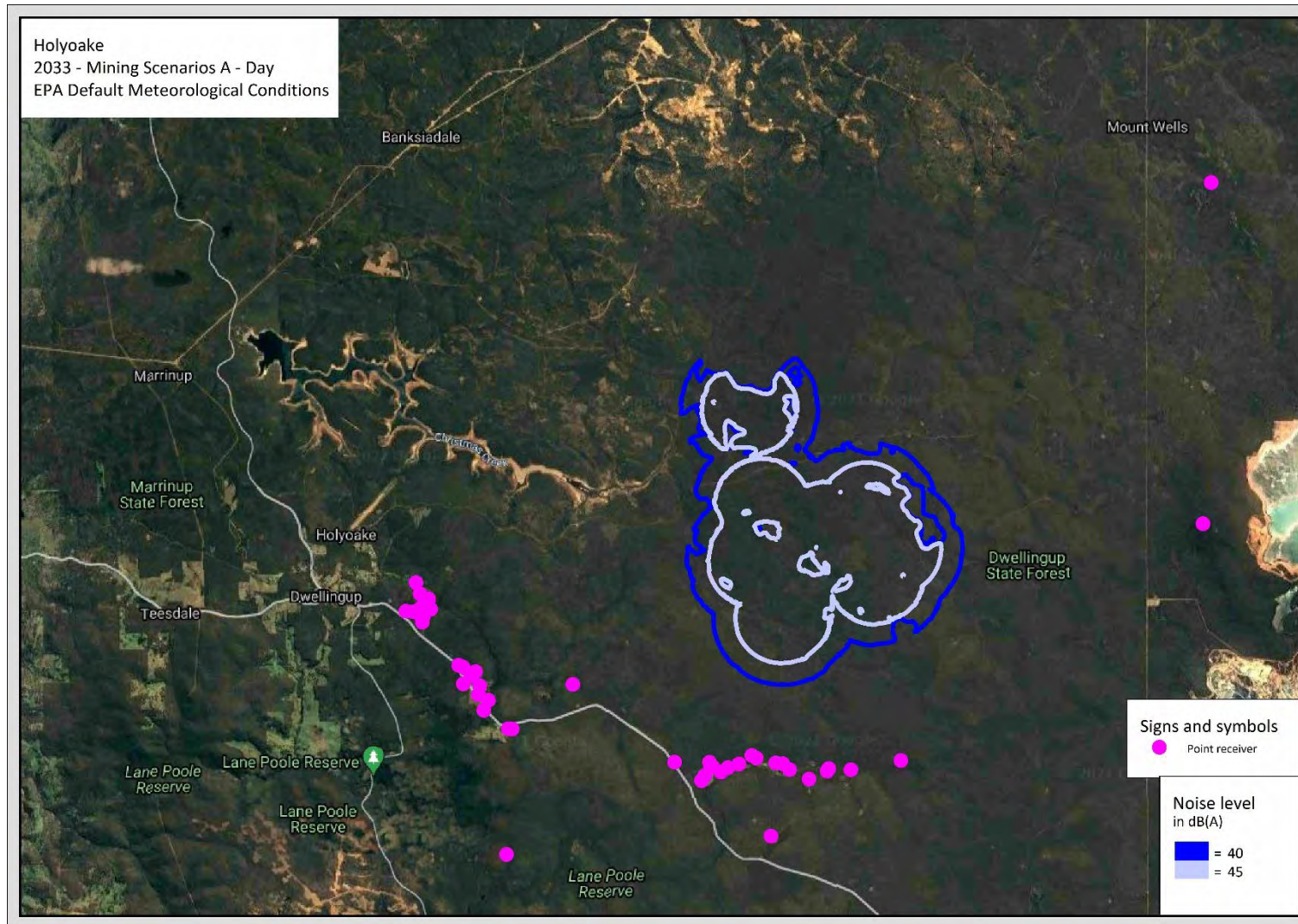
All aerial images have been attained via Google Earth (Google Earth, Image ©2023 Airbus)

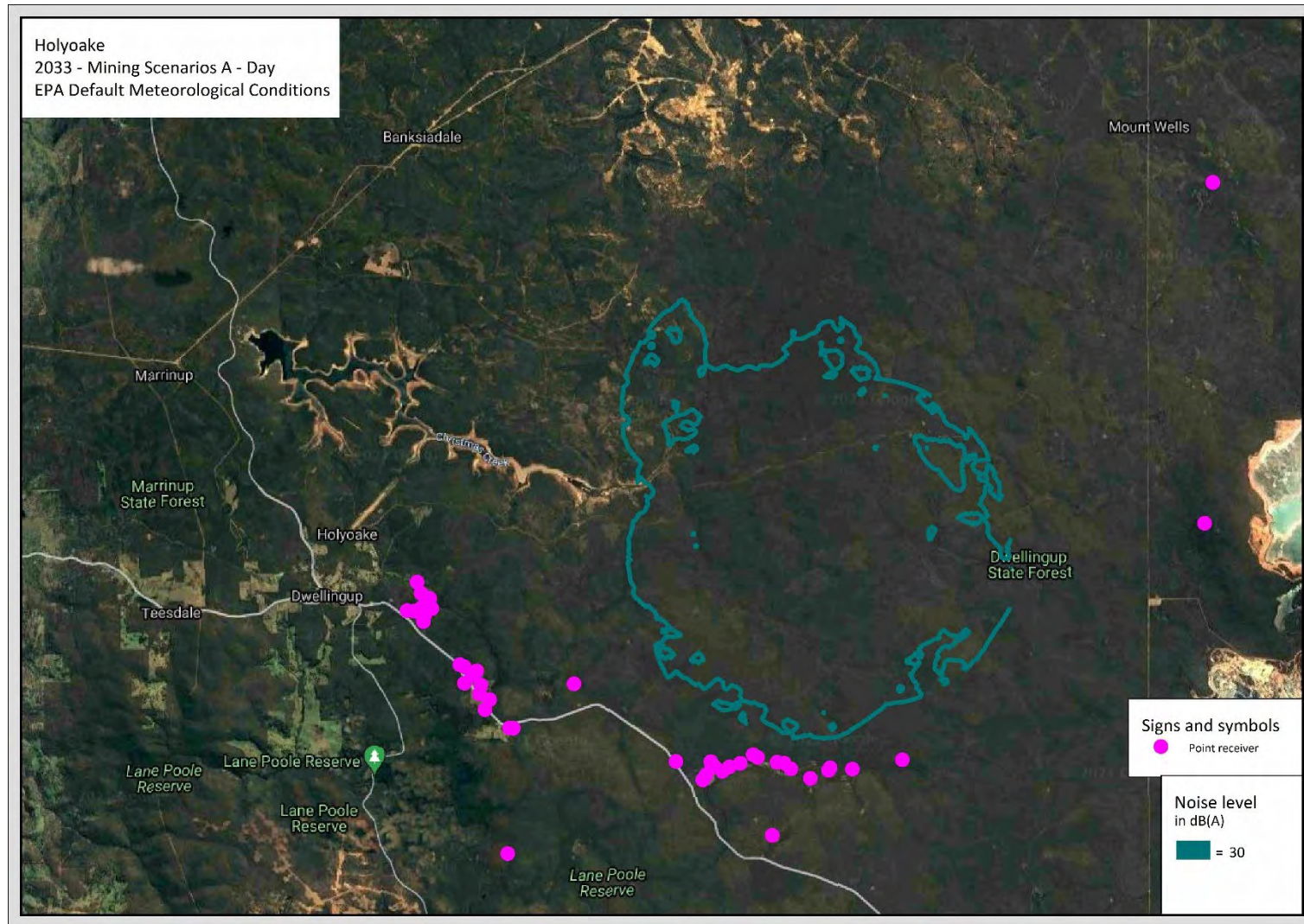


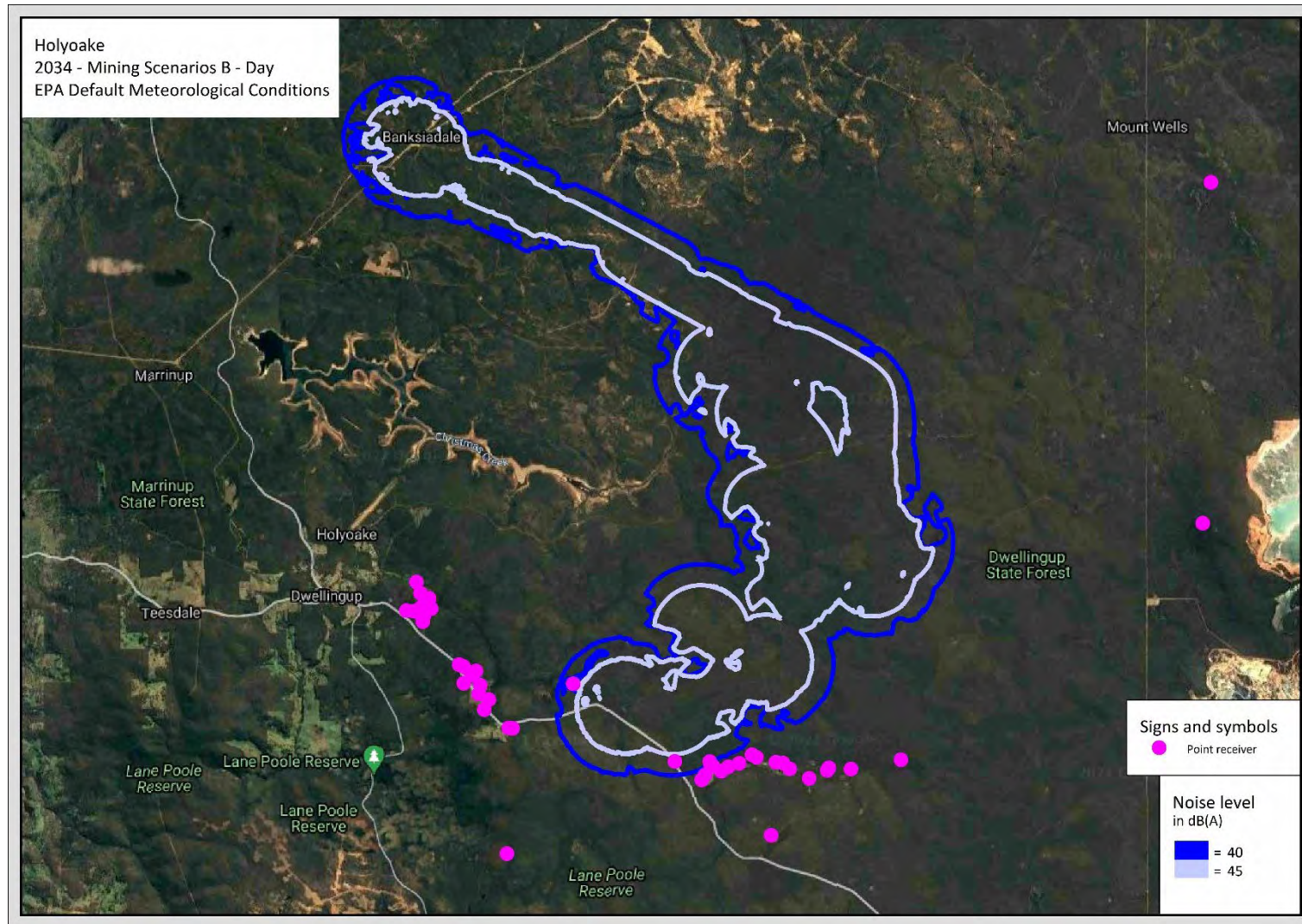


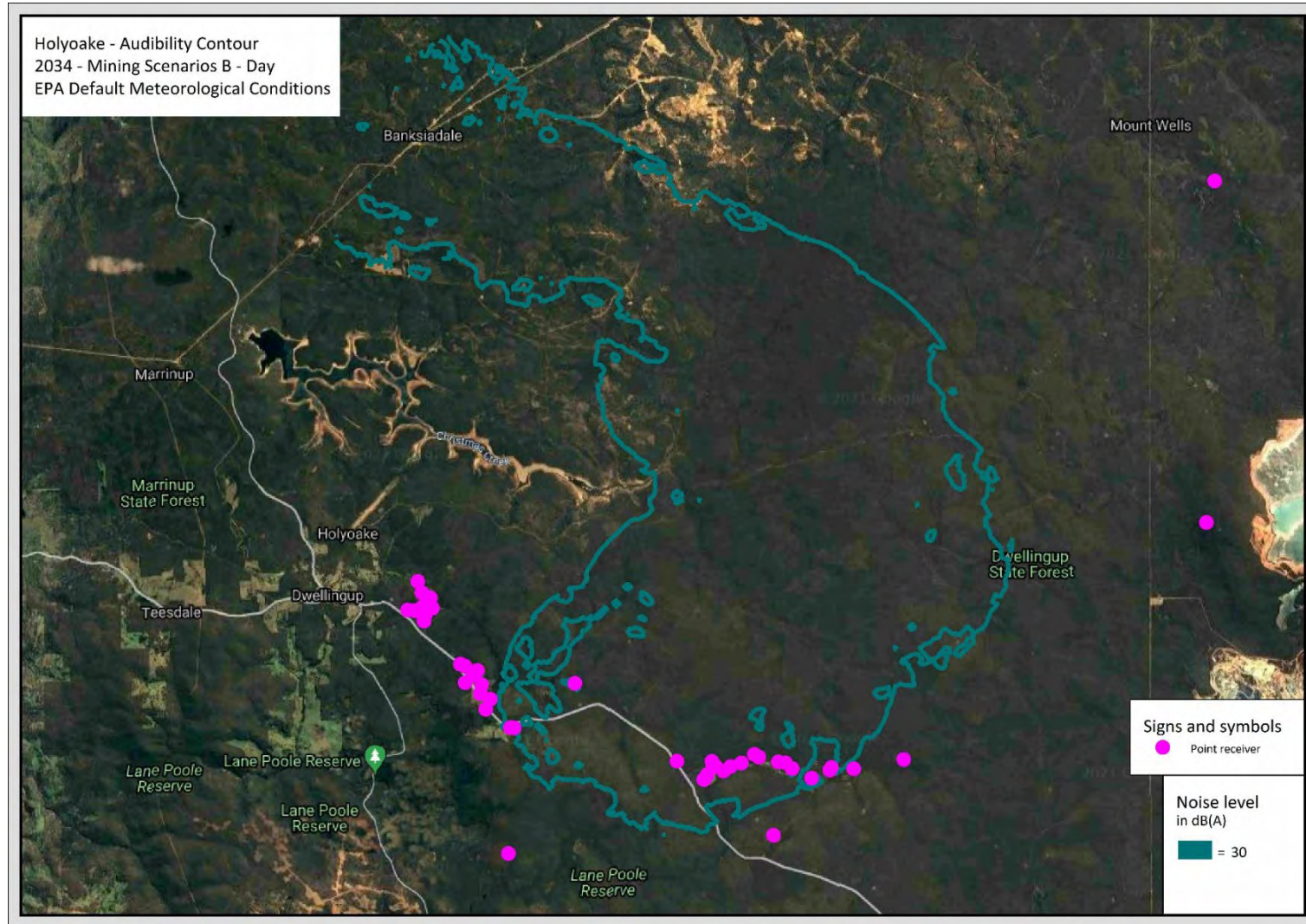
## **C.5 Holyoake – Daytime Staging Noise Contours**

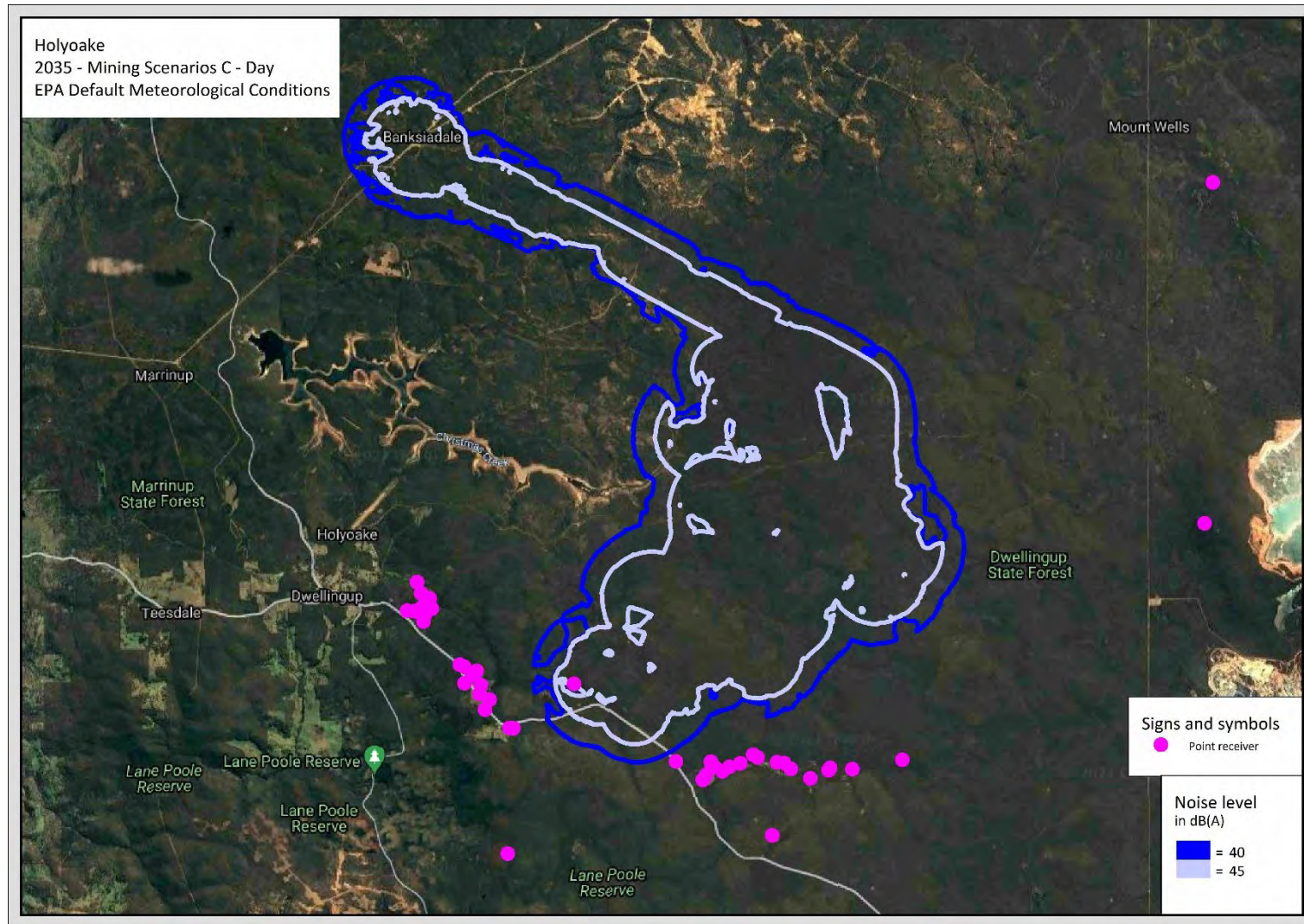
All aerial images have been attained via Google Earth (Google Earth, Image ©2023 Airbus)

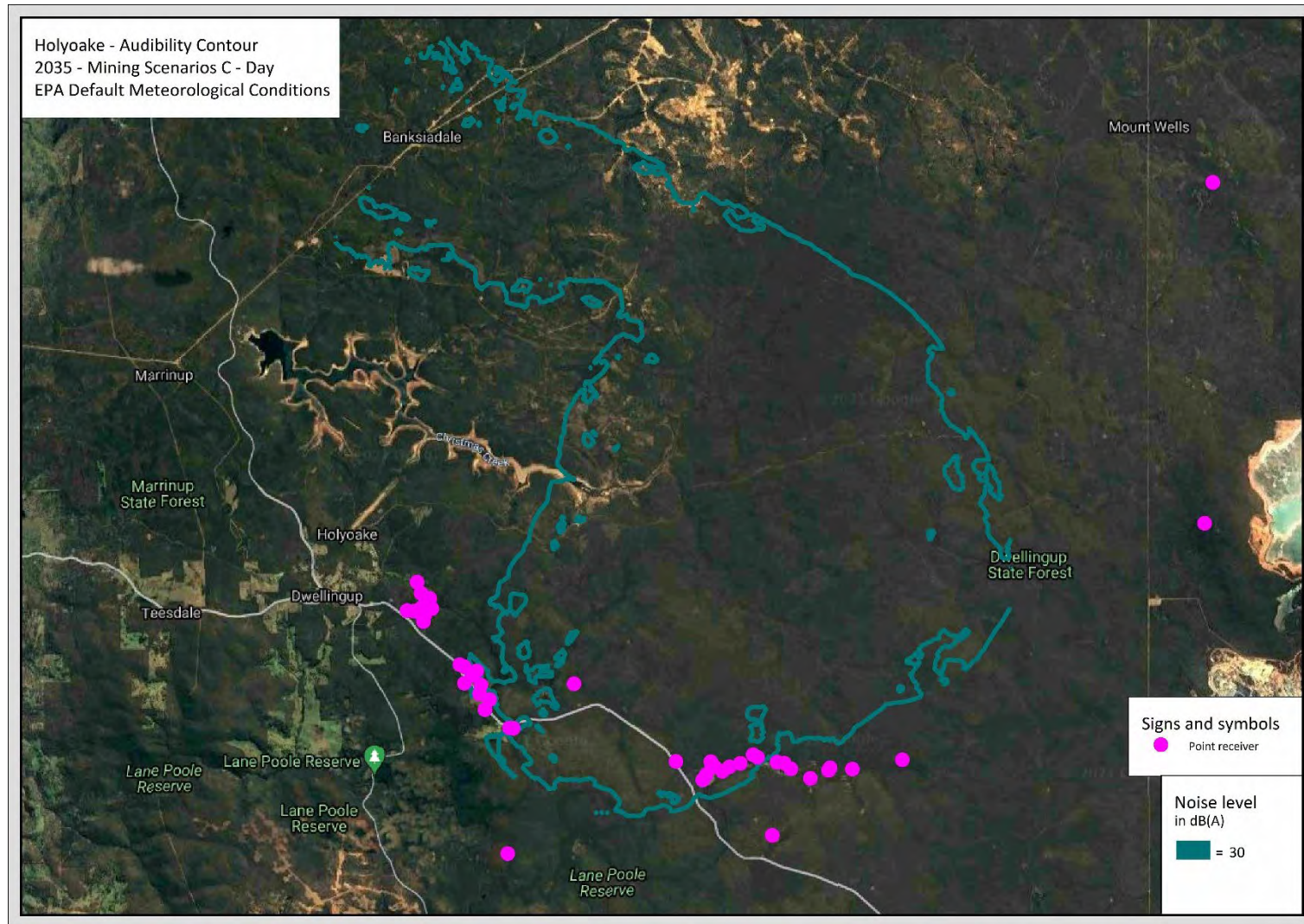


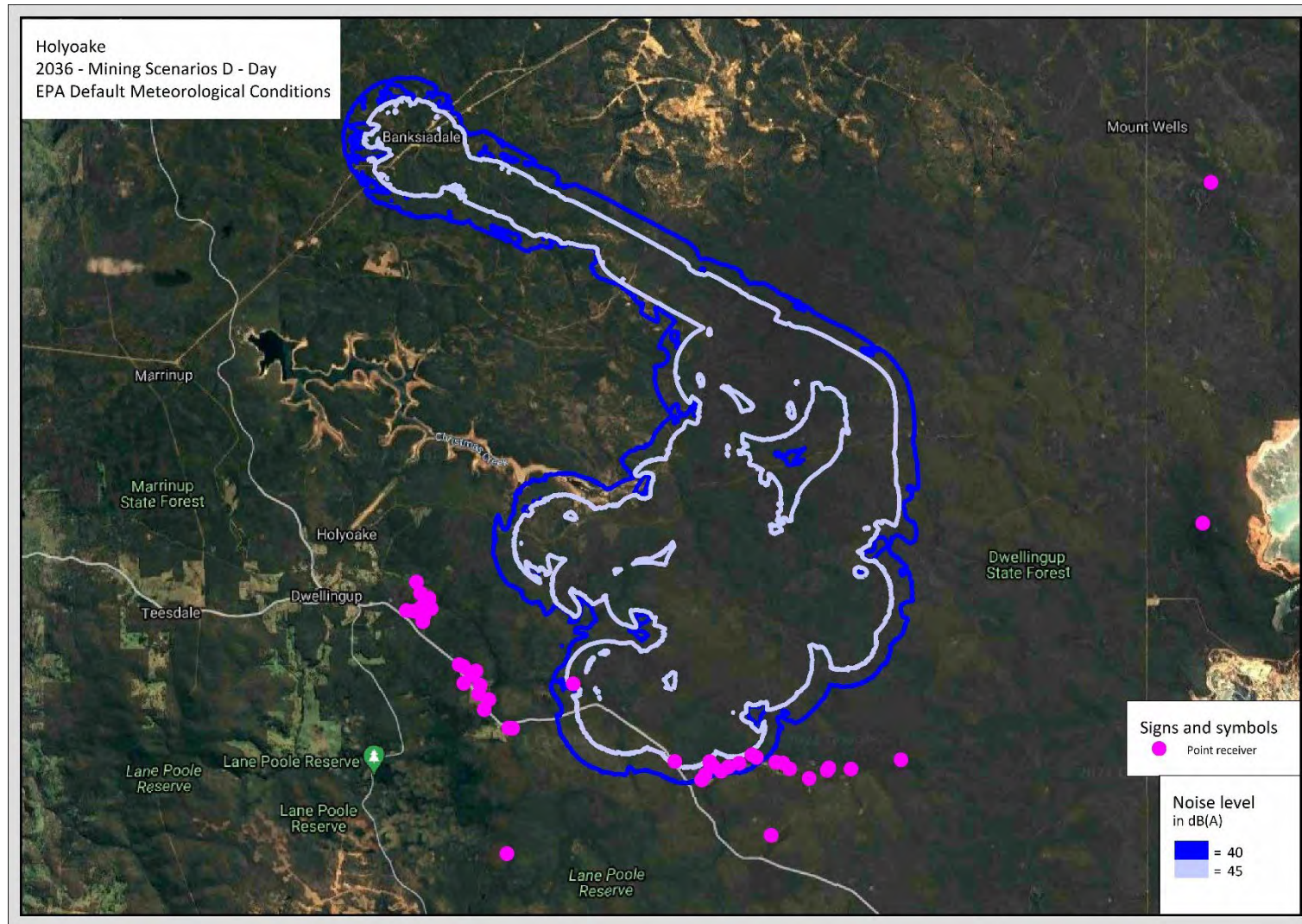


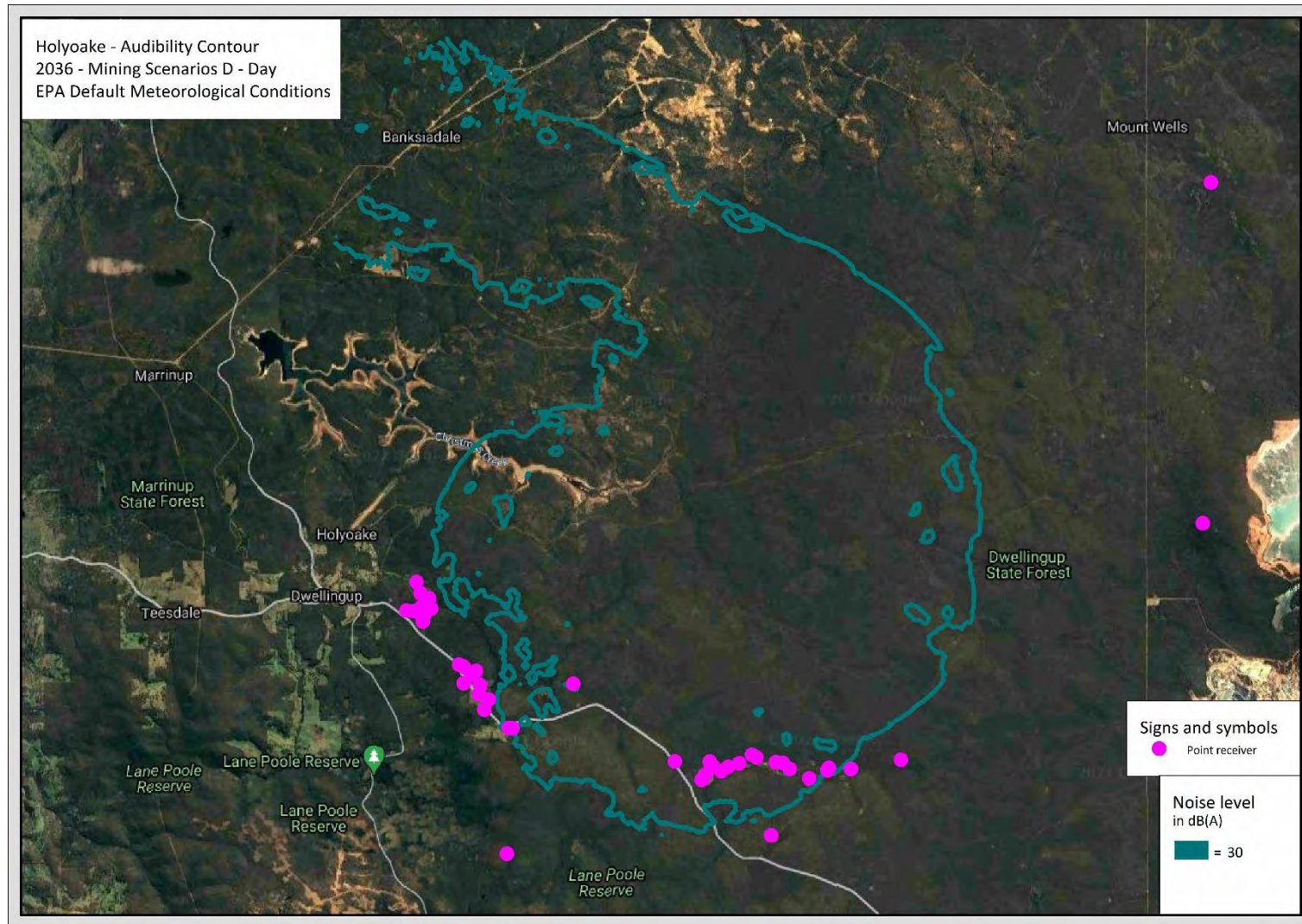




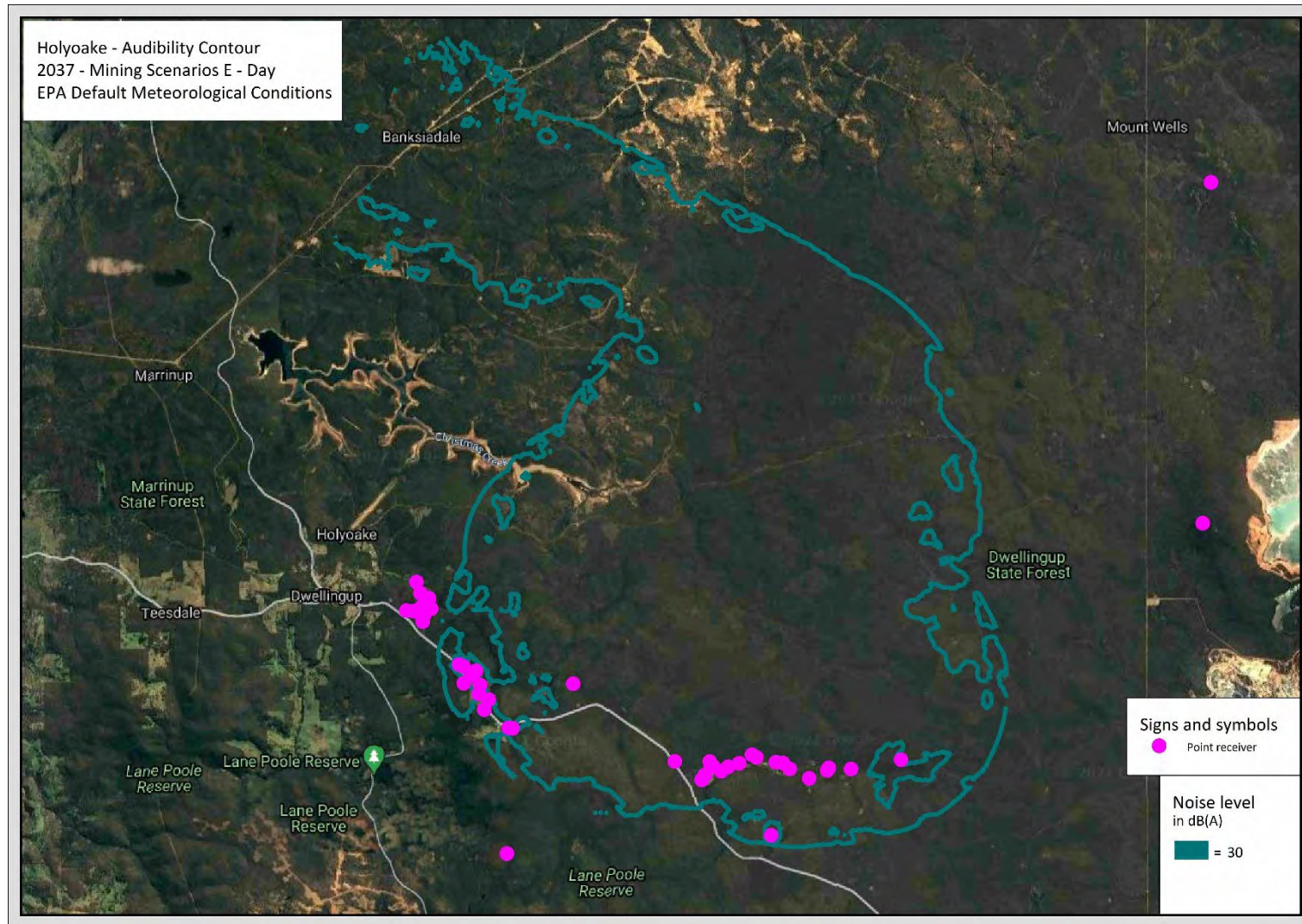


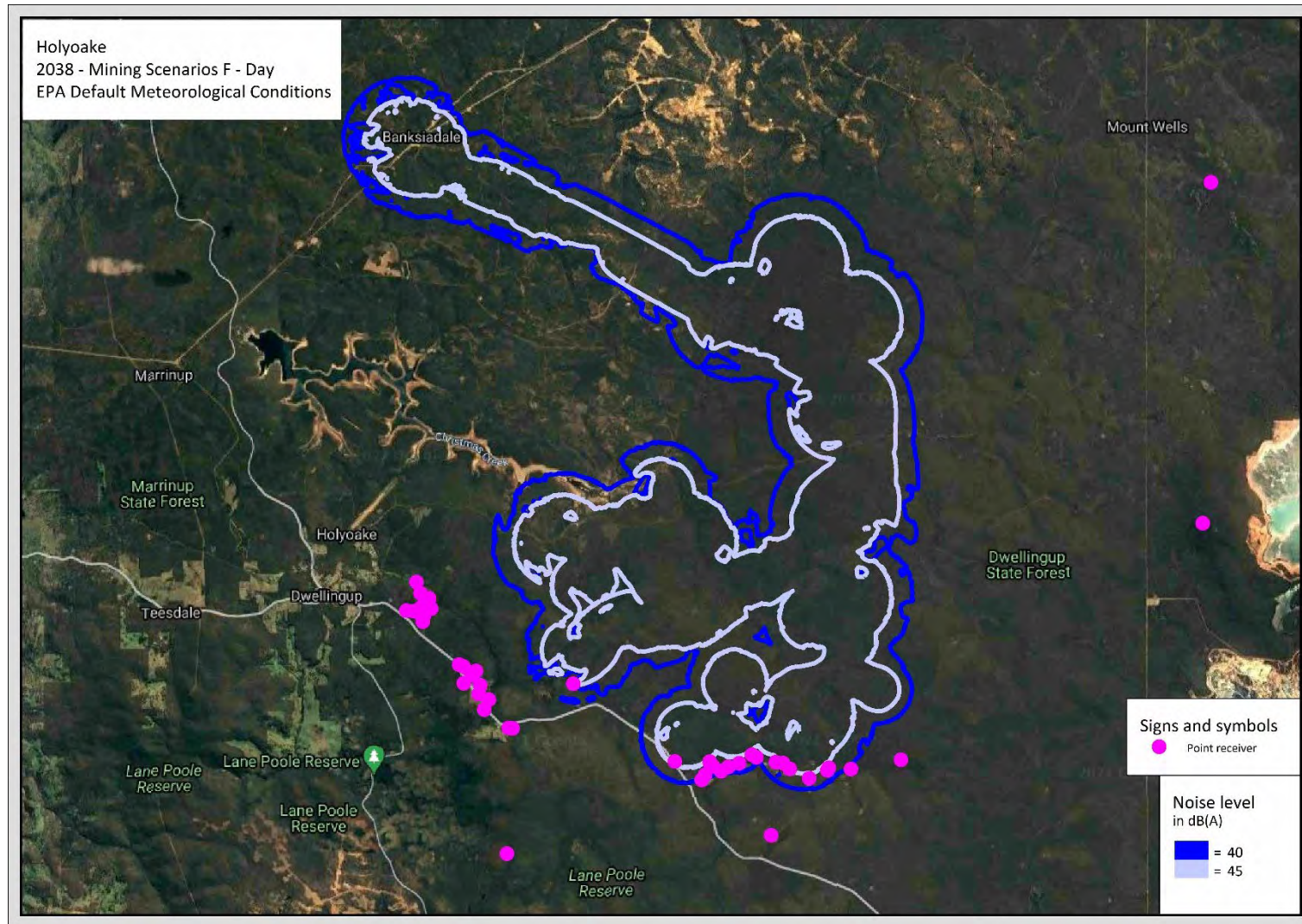


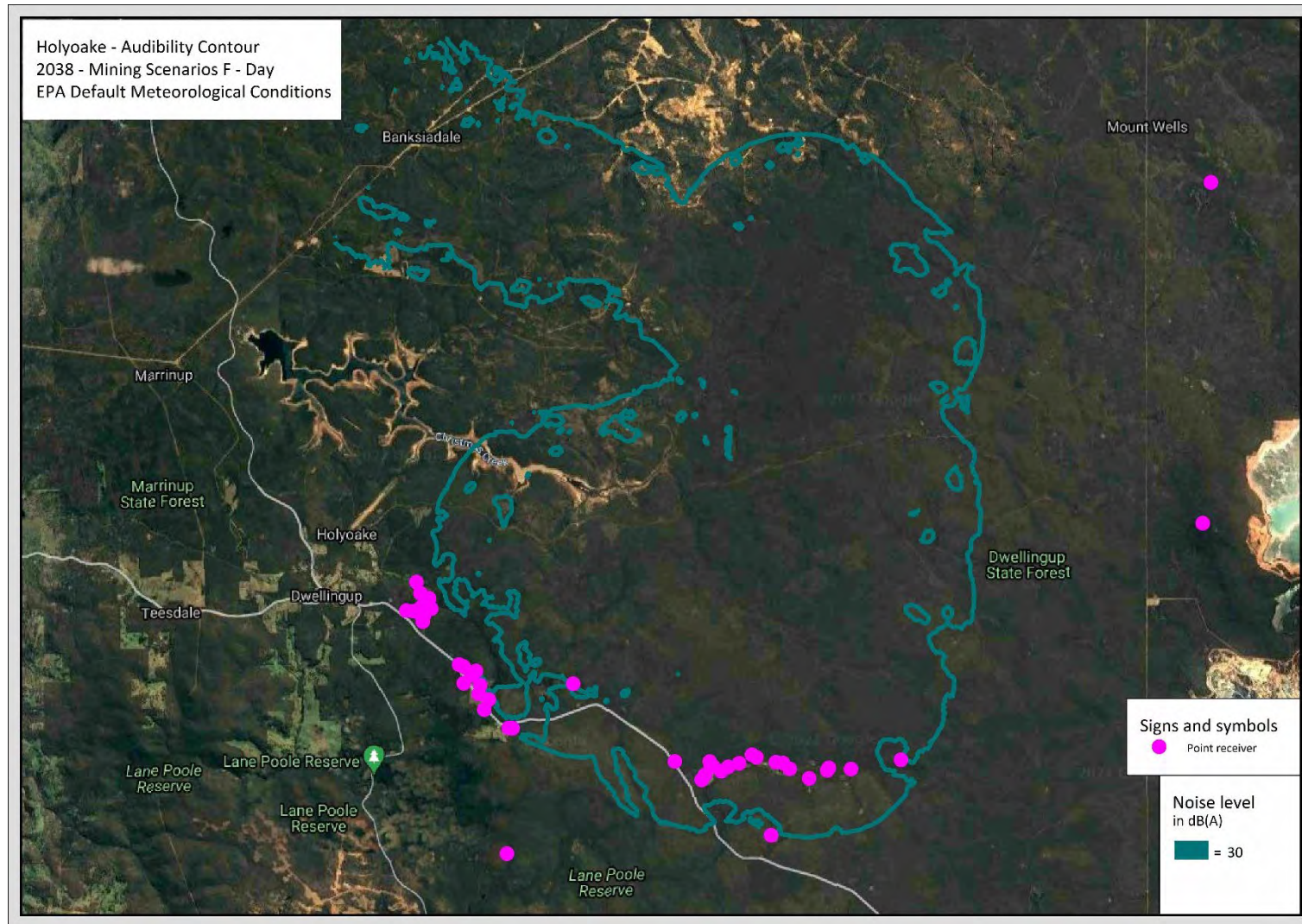




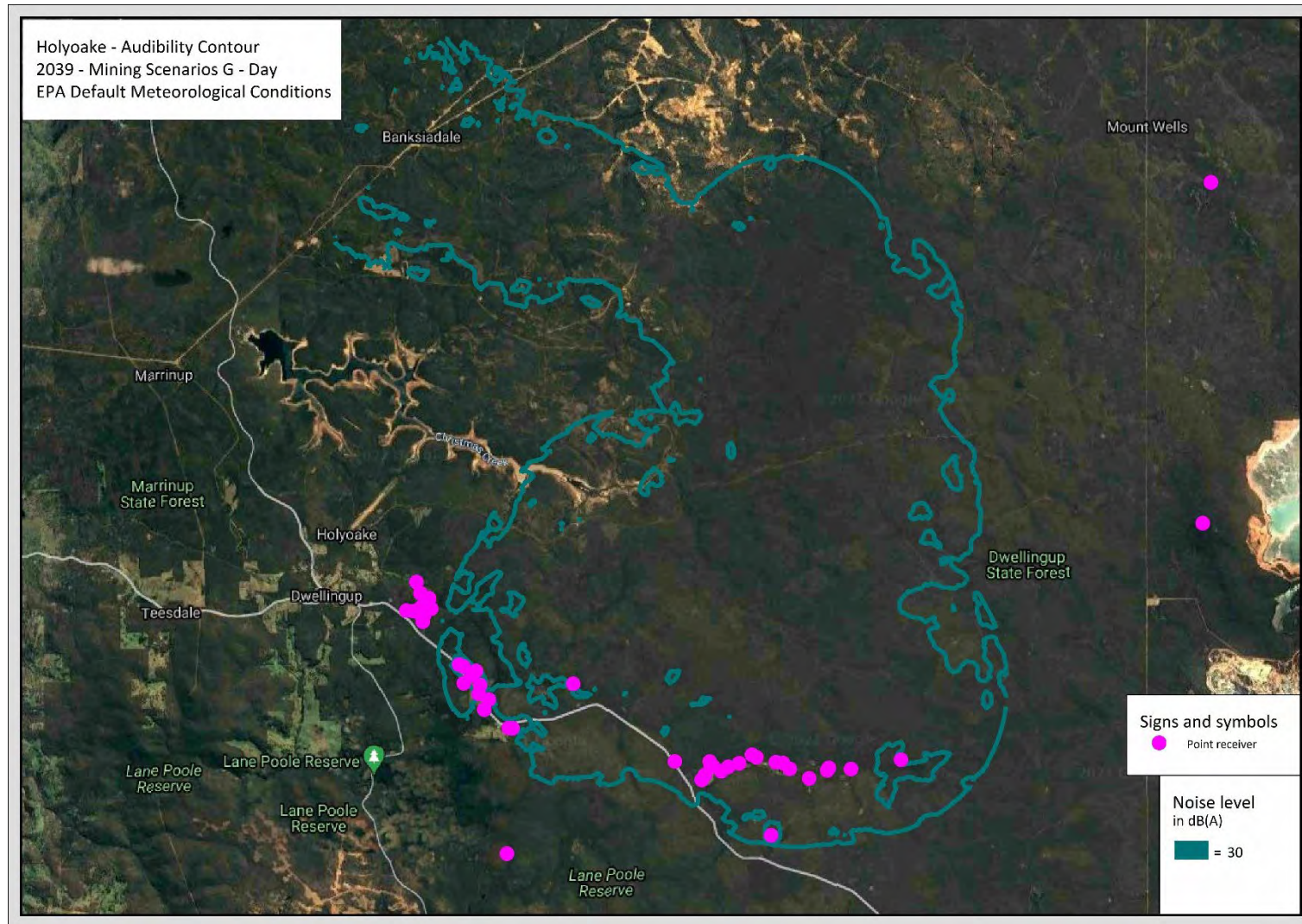


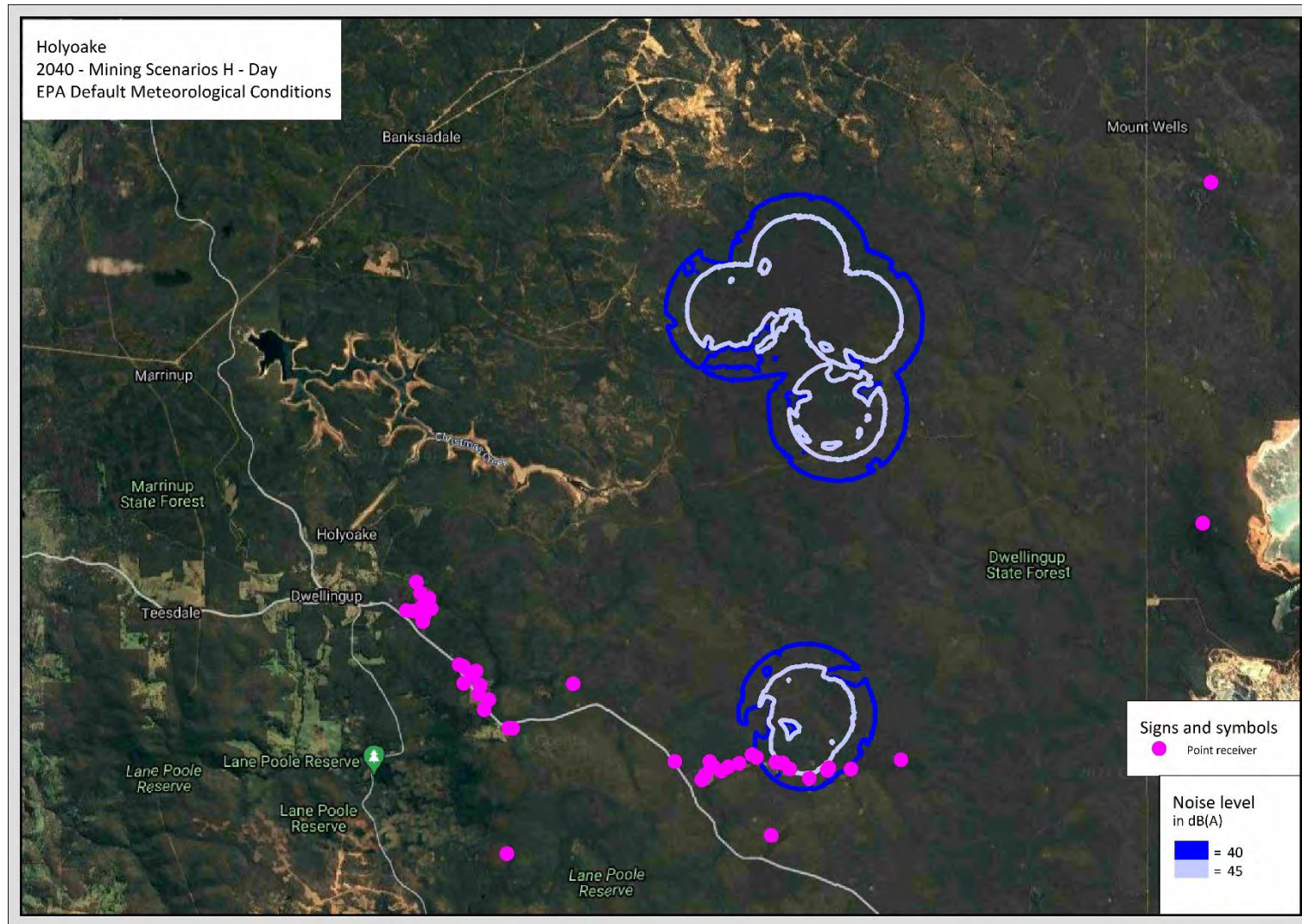


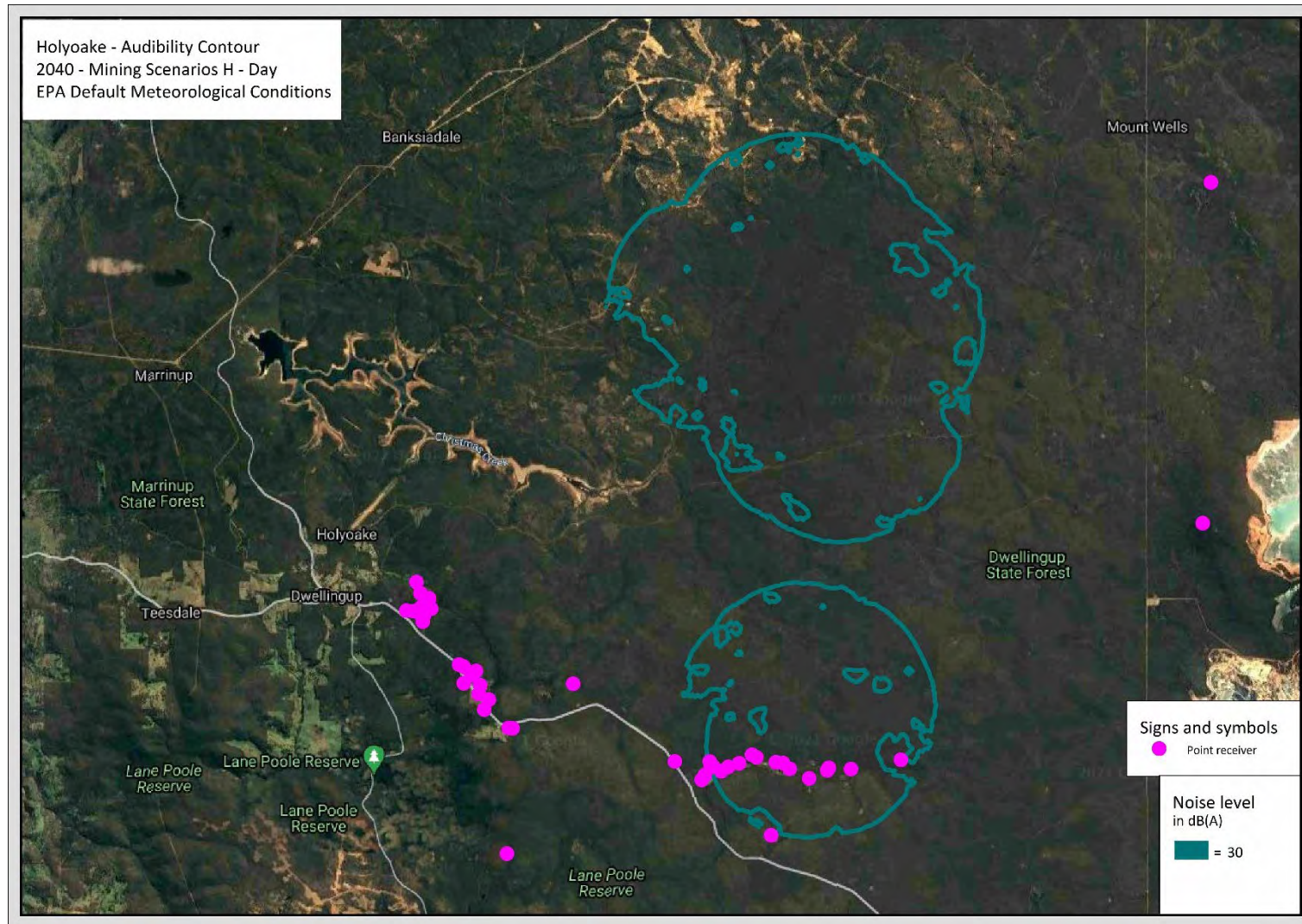






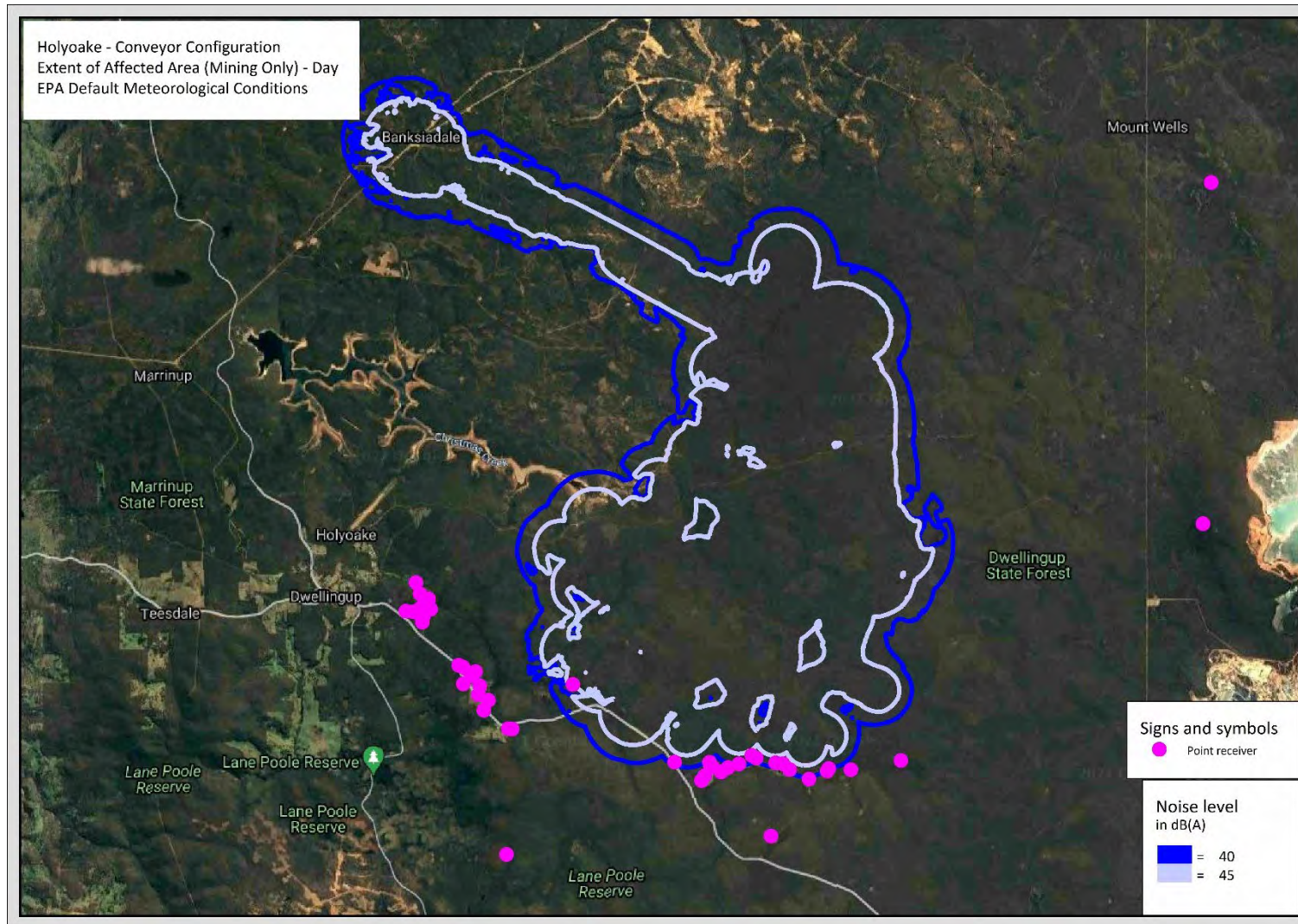


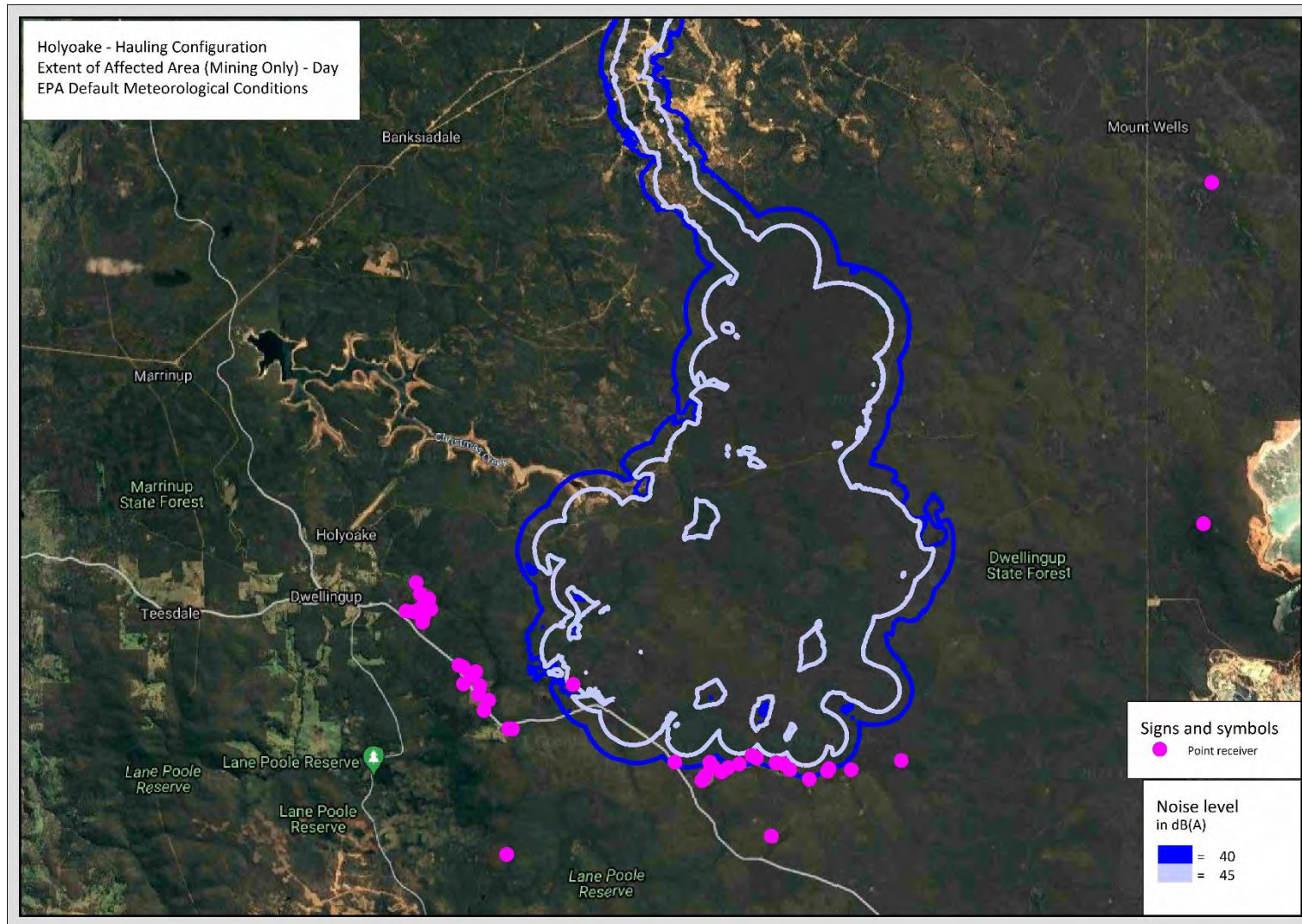


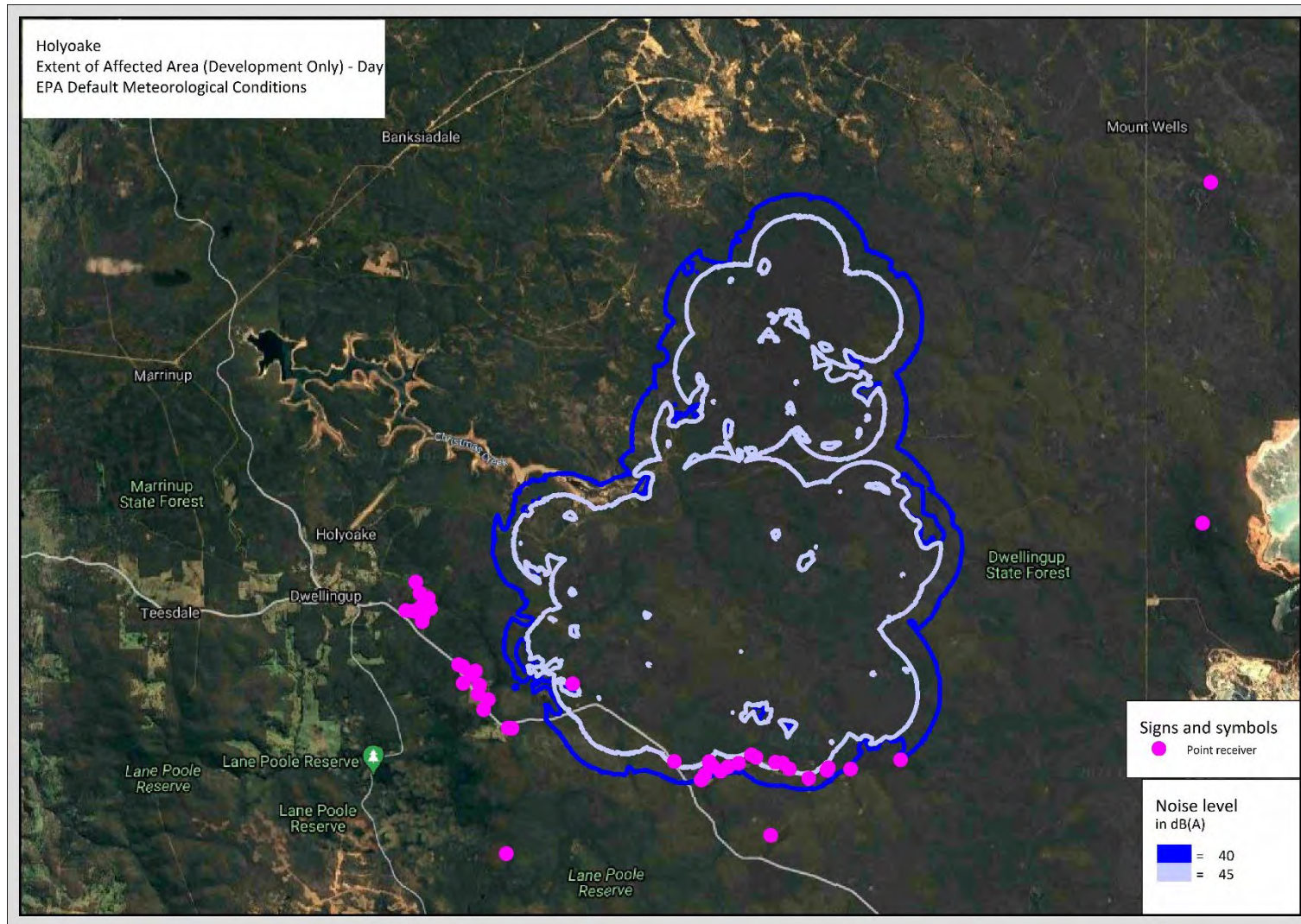


## **C.6 Holyoake – Daytime Overall Contour**

All aerial images have been attained via Google Earth (Google Earth, Image ©2023 Airbus)

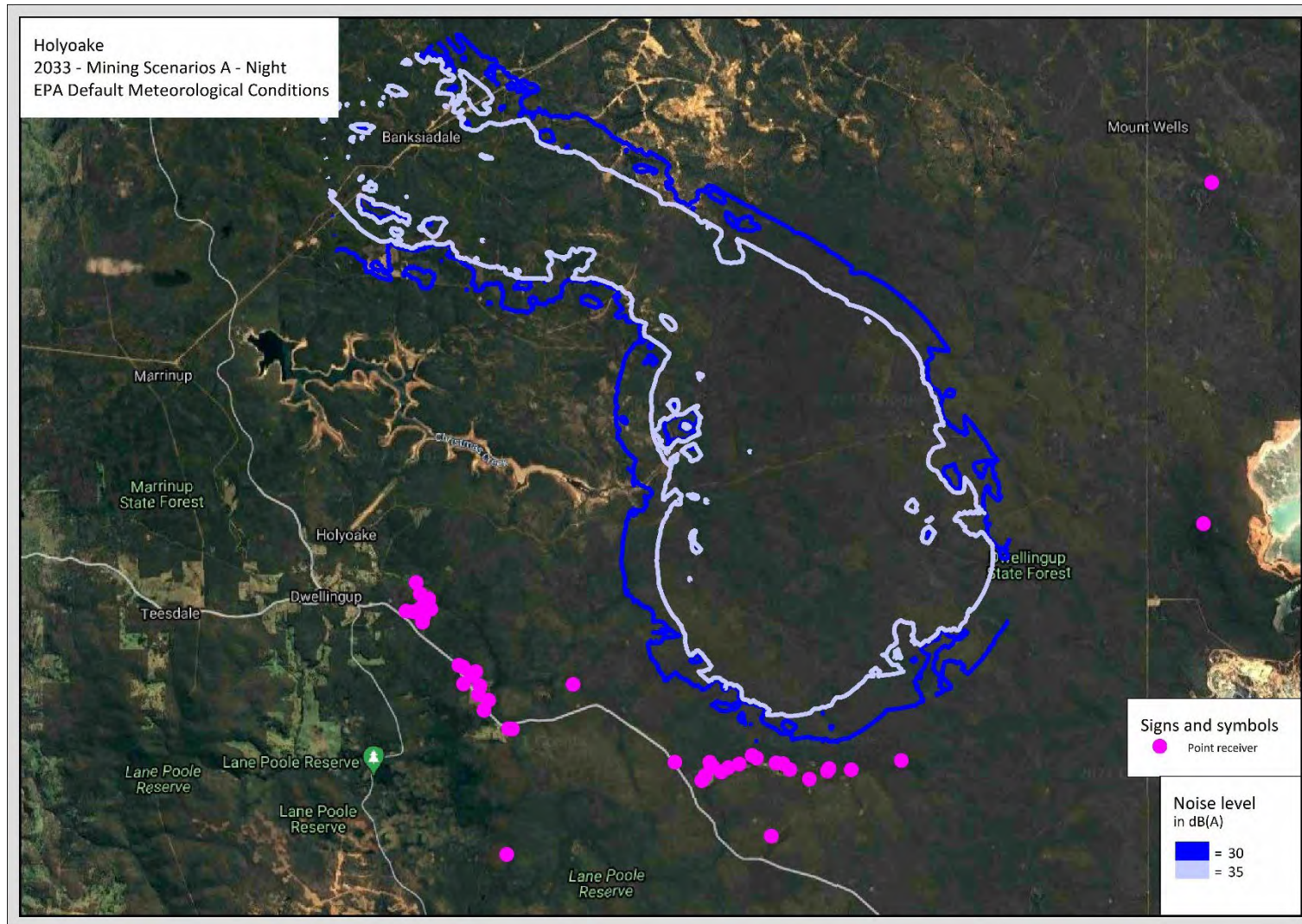




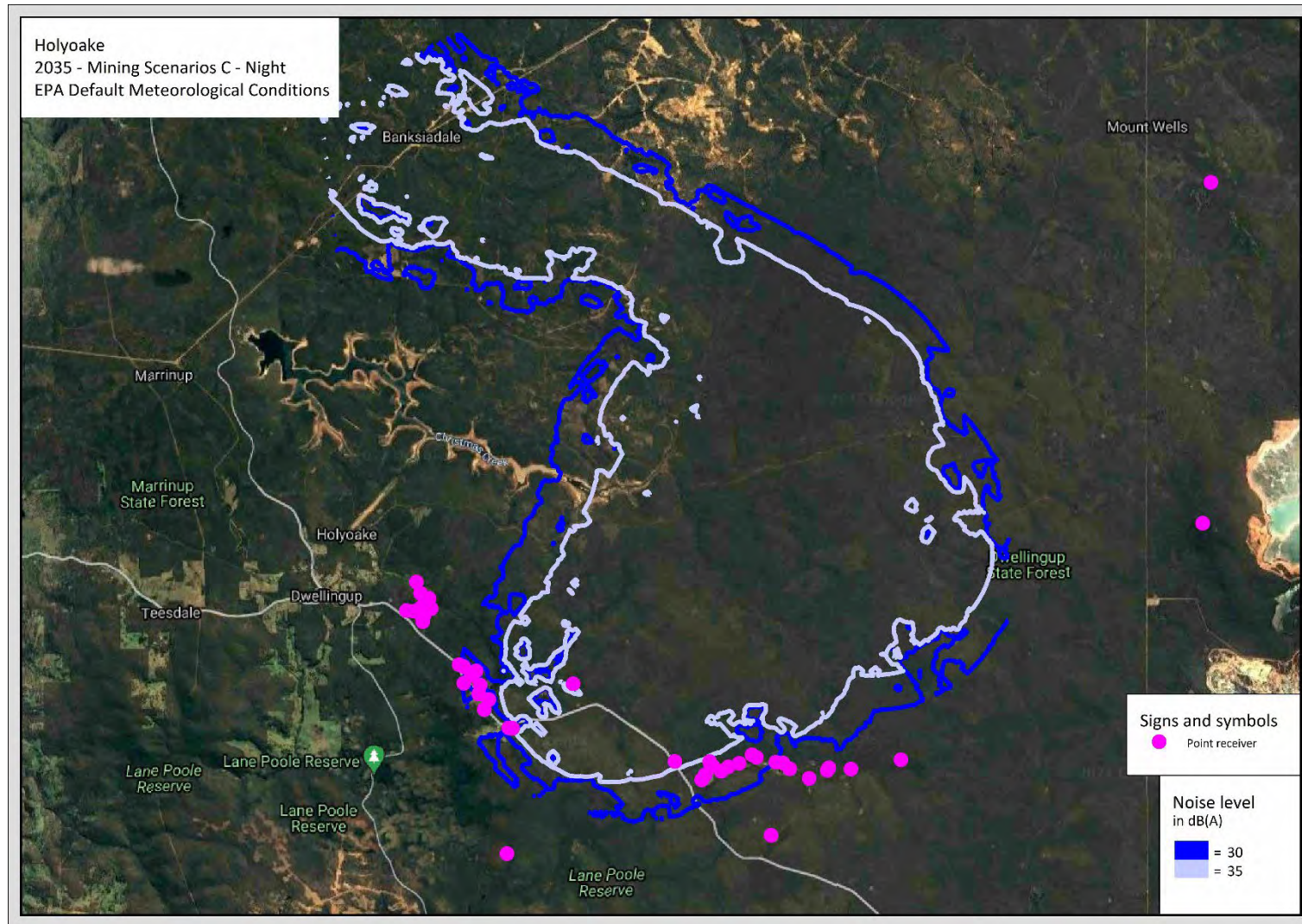


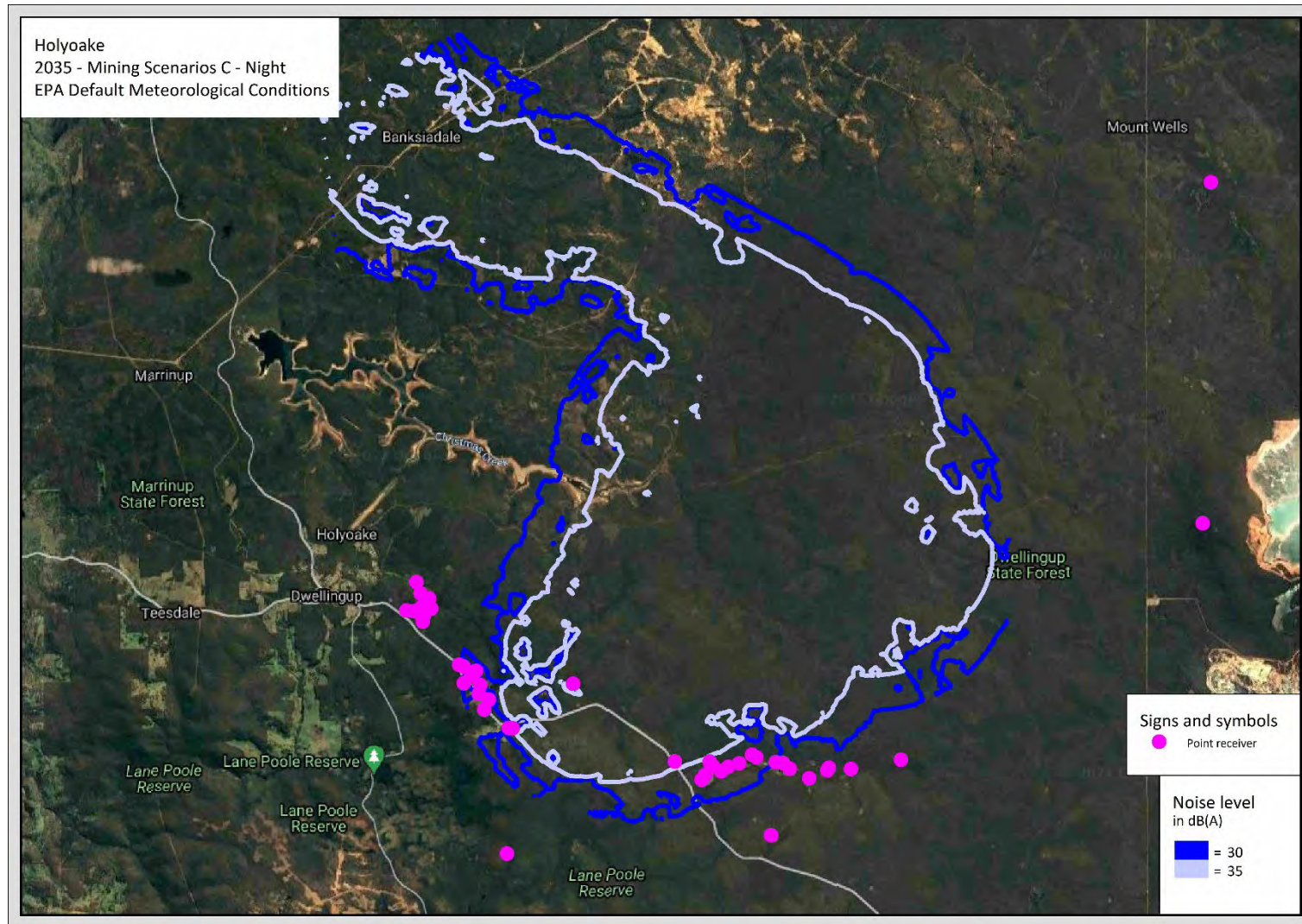
## **C.7 Holyoake – Nighttime Staging Noise Contours**

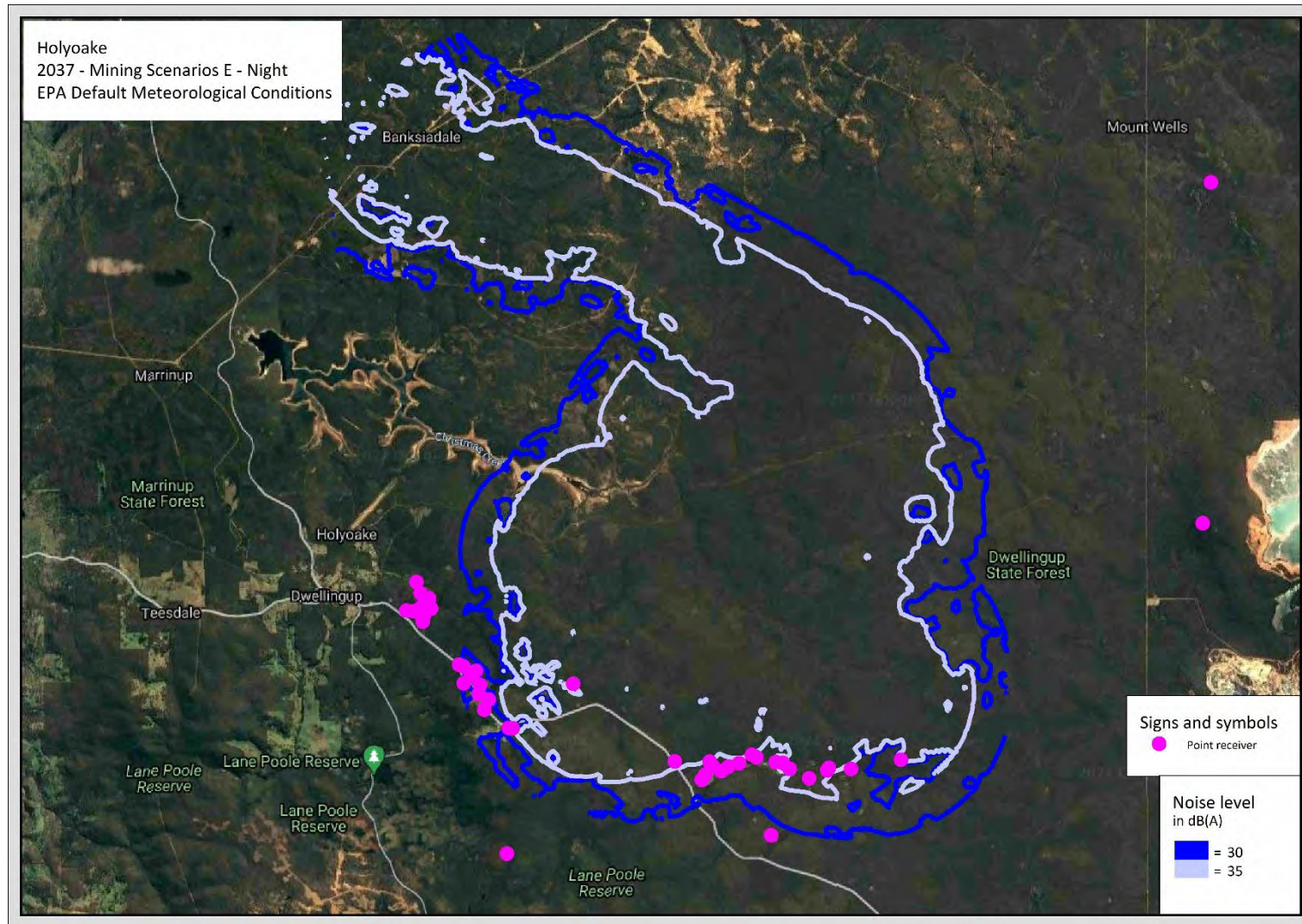
All aerial images have been attained via Google Earth (Google Earth, Image ©2023 Airbus)

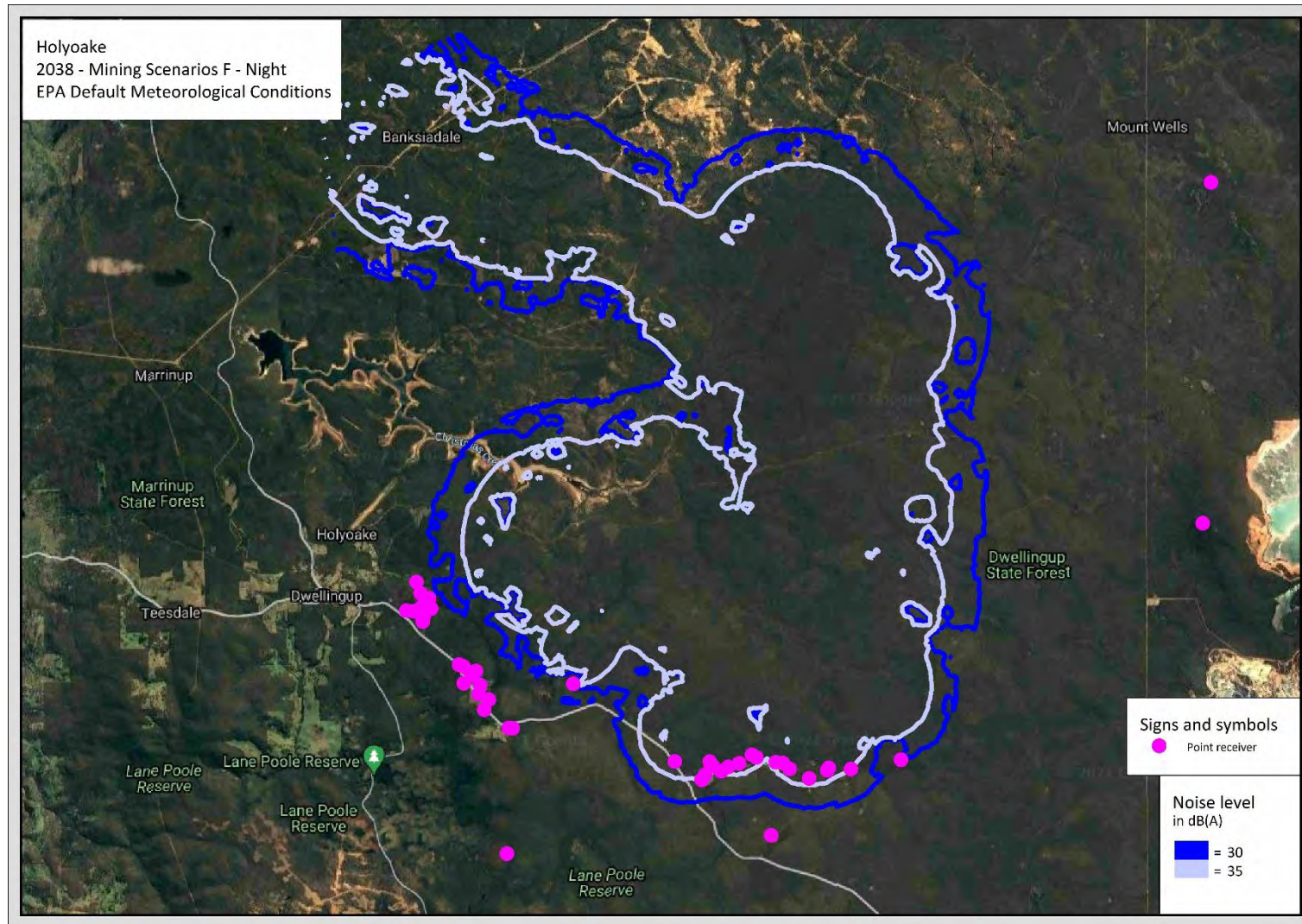


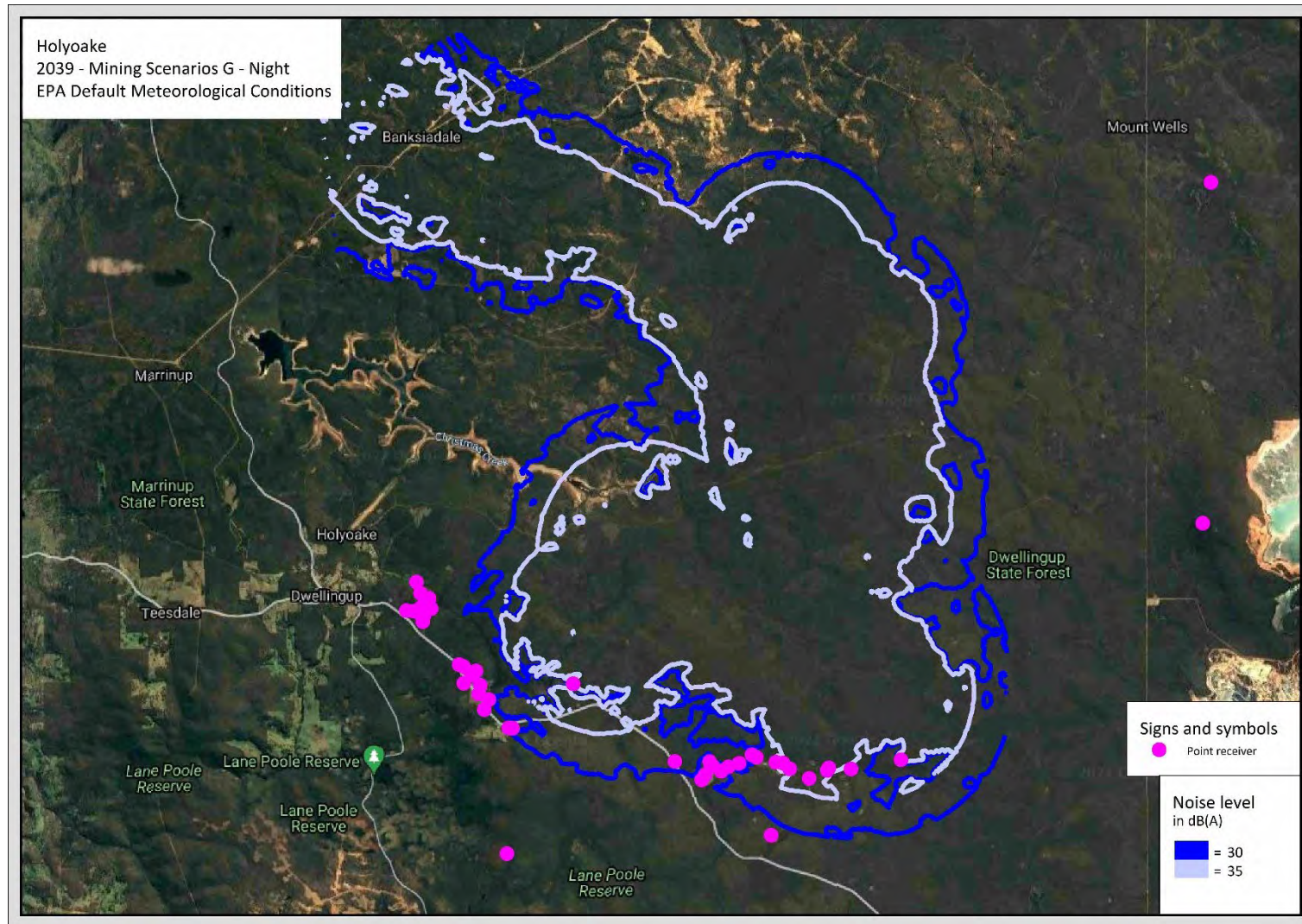


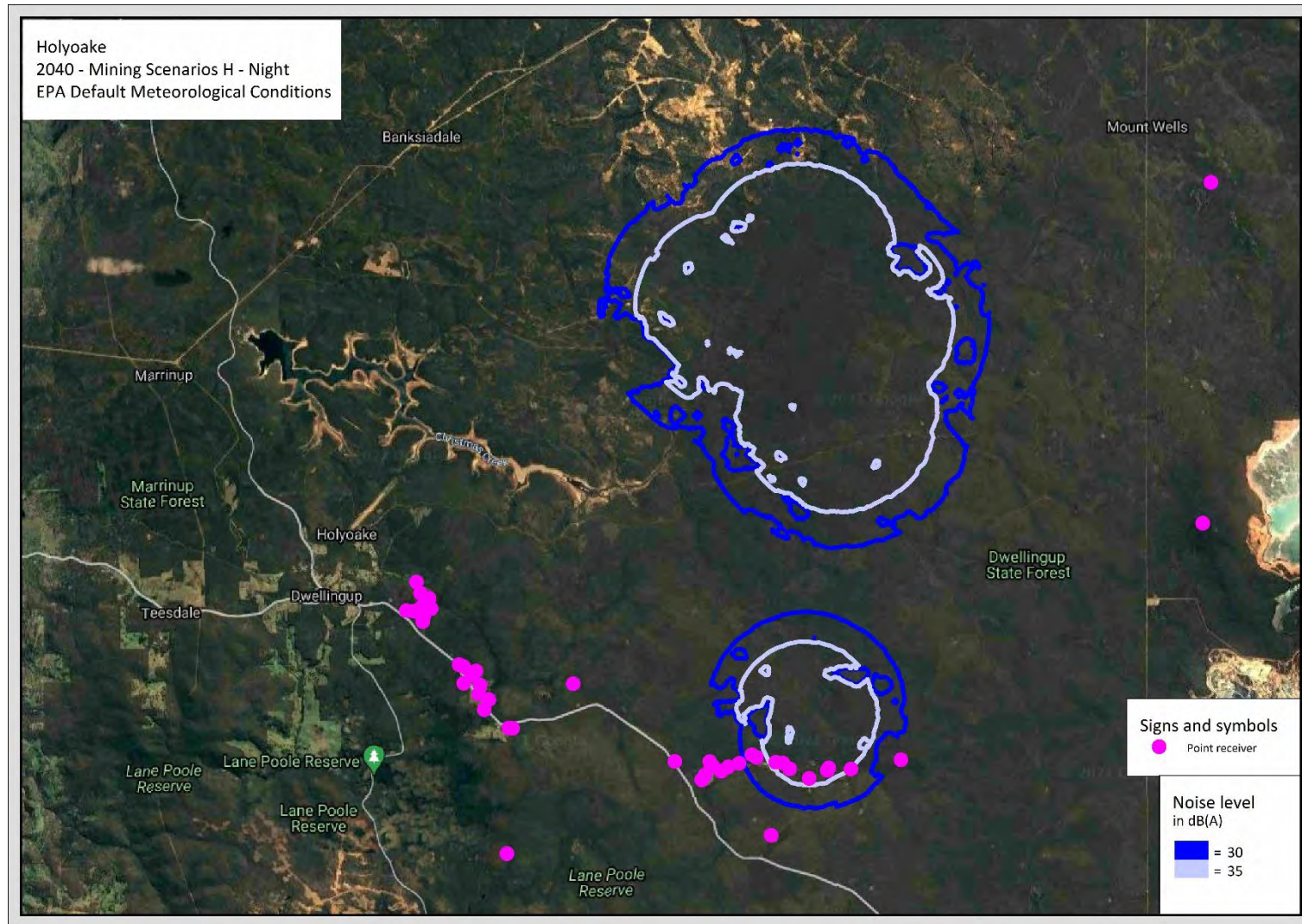












## **C.8 Holyoake – Nighttime Overall Contour**

All aerial images have been attained via Google Earth (Google Earth, Image ©2023 Airbus)

