APPENDIX J

Noise and Blasting Assessment

RENZO TONIN & ASSOCIATES
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DENDROBIUM MINE EXTENSION PROJECT

Noise and Blasting Assessment

1 April 2022

IMC

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Executive summary

Renzo Tonin & Associates was engaged to conduct an assessment examining the potential noise and blasting impacts of the Dendrobium Mine Extension Project (the Project). The Project proposes access to additional coal within Consolidated Coal Lease 768 in the future underground mining area, namely Area 5. This extension would be supported by the development of supporting infrastructure and an extension to the life of approved surface operations to 2041.

This report assesses the potential noise and blasting impacts from the Project against relevant noise and blasting objectives.

This report identifies and addresses the following items:

- sensitive receptors potentially affected by Project noise;
- existing noise and vibration environment at the nearest receptors;
- relevant noise and vibration objectives;
- types of fixed plant and mobile equipment that would be used and locations during key stages of Project, including construction and operational stages;
- road and rail traffic volumes during key stages of Project
- predicted Project noise levels at the nearest receptors; and
- recommendation for noise control measures, where required.

The majority of noise sources at the Project surface facilities most proximal to private receivers would largely be unchanged from the existing operations and noise emissions of the approved Mine.

Noise impacts are assessed following a number of policies, guidelines and standards, including:

- NSW *Noise Policy for Industry* (NPfI) (Environment Protection Authority [EPA], 2017);
- NSW *Interim Construction Noise Guideline* (ICNG) (Department of Environment and Climate Change, 2009);
- *NSW Road Noise Policy* (RNP) (Department of Environment, Climate Change and Water, 2011);
- *Assessing Vibration: A Technical Guideline* (Department of Environment and Conservation, 2006);
- NSW *Rail Infrastructure Noise Guideline* (RING) (EPA, 2013);
- *Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration* (Australian and New Zealand Environment Council, 1990); and

- *Voluntary Land Acquisition and Mitigation Policy - For State Significant Mining, Petroleum and Extractive Industry Developments* (NSW Government, 2018).

Construction Noise

- Surface construction activities would occur generally during the standard ICNG daytime only at surface facilities, while some construction activities would occur outside of standard hours. Drilling for ventilation shaft and underground development activities, would occur 24 hours per day, seven days per week, however these activities are remotely located within the Metropolitan Special Area and are isolated from residential receivers.

- A number of privately-owned receivers were predicted to exceed the ICNG 'noise affected' Noise Management Level (NML) with a full construction fleet. However, following the completion of the Dendrobium Pit Top Carpark Extension, the construction fleet would be reduced, and only three privately owned receivers are predicted to exceed the ICNG standard hours 'noise affected' NML. Construction activities for the Project would be temporary, and recommendations for the mitigation and management of construction noise at these receivers while construction activities are occurring have been provided. IMC has committed to limiting construction of the identified major construction noise generating activity (i.e. Dendrobium Pit Top Carpark Extension) to within ICNG standard hours. All privately-owned receivers would remain well below 'highly noise affected' NMLs specified in the ICNG.

Operational Noise

- Five (5) privately owned receivers are predicted to experience negligible or moderate exceedances of the Project Specific Trigger Level (PSTL). Although these receivers are located very proximal to the Dendrobium Pit Top and Kemira Valley Coal Loading Facility, the predicted exceedances of the NPfI criteria are not significant. Feasible and reasonable mitigation measures have been incorporated to reduce potential noise emissions from the Project (including IMC imposed curfews and Drivers Code of Conduct).

- One (1) privately owned receiver is predicted to experience night-time $L_{Aeq,15min}$ noise levels slightly above the sleep disturbance assessment level; however, this exceedance is only 2 dB(A) and is therefore considered negligible, while the predicted L_{Fmax} noise level is within the applicable assessment level. With IMC current self-imposed night time restrictions, the likelihood of sleep disturbance events is limited.

Road Traffic Noise

- Road traffic noise was assessed for the years 2023 and 2037 along Cordeaux Road, East of Mount Kembla, and predicted road traffic noise levels at all locations for all periods were found to comply with the RNP criteria.

Rail Traffic Noise

- Minimum setback distances to comply with the RING criteria were determined based on the Project rail movements. Review of the required minimum setback distances showed that there would be a number of dwellings exceeding the RING criteria along the length of the Kemira Valley Rail Line.
- It is noted that the Dendrobium Mine is a legacy site which is predicted to be compliant with the conditions of Development Consent DA 60-03-2001 for rail haulage impact assessment. As a legacy site, the provisions of the *Voluntary Land Acquisition and Mitigation Policy - For State Significant Mining, Petroleum and Extractive Industry Developments* (NSW Government, 2018) specify that at receiver mitigation or voluntary acquisition rights would not be afforded to receivers exceeding the RING in close proximity to the Kemira Valley Rail Line.

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1 Introduction

The Dendrobium Mine is an existing underground coal mine situated in the Southern Coalfield of New South Wales (NSW), approximately 8 kilometres (km) west of Wollongong. Illawarra Coal Holdings Pty Ltd (Illawarra Metallurgical Coal [IMC]), a wholly owned subsidiary of South32 Limited (South32), is the owner and operator of the Dendrobium Mine. The Dendrobium Mine, Appin Mine and supporting operations are managed by IMC. Renzo Tonin & Associates was engaged by IMC, to conduct an assessment examining the potential noise and blasting impacts of the Dendrobium Mine Extension Project (the Project).

The issues addressed in this study include potential noise emissions from the Project:

- construction and decommissioning activities;
- operational activities;
- blasting activities;
- road traffic; and
- rail traffic.

It should be noted that many of the potential noise sources for the Project would be effectively unchanged from the existing operations of the approved Mine. Notwithstanding, the Secretary's Environmental Assessment Requirements (SEARs) for the Project nominate the following specific noise issues to be addressed in this assessment (Table 1.1).

Table 1.1 – Relevant Noise Related SEARs

SEARs – Noise	Section of Report Addressing SEARs
• an assessment of the likely construction, operational and traffic noise impacts of the development, in accordance with the *Interim Construction Noise Guideline, NSW Noise Policy for Industry (EPA)* and *NSW Road Noise Policy*, and having regard to the *Voluntary Land Acquisition and Mitigation Policy*	Construction noise impacts - Section 7 Operational noise impacts - Section 8 Traffic noise impacts - Section 10

Noise impacts are assessed following a number of policies, guidelines and standards, including:

- NSW *Noise Policy for Industry* (NPfI) (Environment Protection Authority [EPA], 2017);
- NSW *Interim Construction Noise Guideline* (Department of Environment and Climate Change, 2009);
- *NSW Road Noise Policy* (RNP) (Department of Environment, Climate Change and Water, 2011);
- *Assessing Vibration: A Technical Guideline* (Department of Environment and Conservation, 2006);
- NSW *Rail Infrastructure Noise Guideline* (RING) (EPA, 2013);

- *Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration* (Australian and New Zealand Environment Council, 1990); and
- *Voluntary Land Acquisition and Mitigation Policy - For State Significant Mining, Petroleum and Extractive Industry Developments* (NSW Government, 2018).

The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard (AS)/New Zealand Standard(NZS) ISO 9001. Appendix A contains a glossary of acoustic terms used in this report.

2 Project Overview

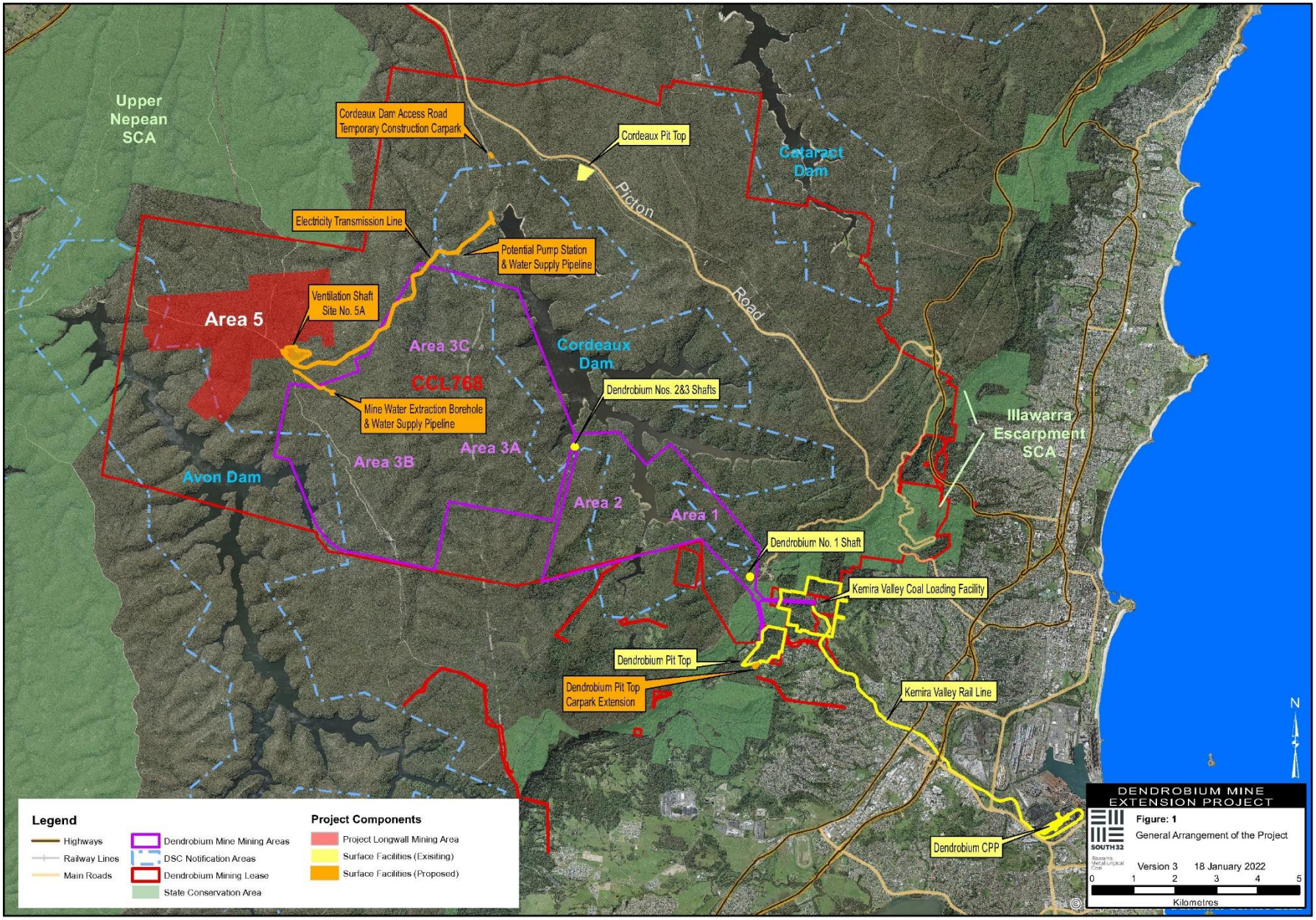
IMC is seeking approval for the Dendrobium Mine Extension Project (the Project), which would support the extraction of approximately 31 million tonnes (Mt) of run of mine (ROM) coal from Area 5 (Figure 1), within CCL 768. The life of the Project includes longwall mining in Area 5 up to approximately 31 December 2034, and ongoing use of existing surface facilities for handling of Area 3C ROM coal until 2041.

The Project would include the following activities:

- longwall mining of the Bulli Seam in a new underground mining area (Area 5);
- development of underground roadways from existing Dendrobium Mine underground areas (namely Area 3) to Area 5;
- use of existing Dendrobium Mine underground roadways and drifts for personnel and materials access, ventilation, dewatering and other ancillary activities related to Area 5;
- development of new surface infrastructure associated with mine ventilation and gas management and abatement, water management and other ancillary infrastructure;
- handling and processing of up to 5.2 million tonnes per annum of ROM coal (no change from the approved Dendrobium Mine);
- extension of underground mining operations within Area 5 until approximately 2035;
- use of the existing Dendrobium Pit Top, Kemira Valley Coal Loading Facility, Dendrobium Coal Preparation Plant (CPP) and Dendrobium Shafts with minor upgrades and extensions until approximately 2041;
- transport of ROM coal from the Kemira Valley Coal Loading Facility to the Dendrobium CPP via the Kemira Valley Rail Line;
- handling and processing of coal from the Dendrobium Mine (including the Project) and IMC's Appin Mine (if required) to the Dendrobium CPP to 2041;
- delivery of coal from the Dendrobium CPP to Port Kembla for domestic use at the Port Kembla Steelworks and Liberty Primary Steel Whyalla Steelworks or export through the Port Kembla Coal Terminal (PKCT);
- transport of coal wash by road to customers for engineering purposes (e.g. civil construction fill) for other beneficial uses and/or for emplacement at the West Cliff Stage 3 and/or Stage 4 Coal Wash Emplacement;

- development and rehabilitation of the West Cliff Stage 3 Coal Wash Emplacement (noting that opportunities for beneficial use of coal wash would be maximised);
- continued use of the Cordeaux Pit Top for mining support activities such as exploration, environmental monitoring, survey, rehabilitation, administration and other ancillary activities;
- progressive development of sumps, pumps, pipelines, water storages and other water management infrastructure;
- controlled release of excess water in accordance with the conditions of Environment Protection Licence 3241 and/or beneficial use;
- monitoring, rehabilitation and remediation of subsidence and other mining effects; and
- other associated infrastructure, plant, equipment and activities.

Figure 1 – General Arrangement of the Project



3 Noise Sensitive Receivers

Land use in the vicinity of the Project major surface facilities is a mixture of agricultural operations (rural) and suburban properties. The majority of properties surrounding the Project surface facilities are privately owned and the remainder are a mixture of community properties, commercial properties and mine owned. Existing and proposed surface infrastructure within the Sydney Drinking Water Catchment area is typically remote from potential private receivers.

The representative noise sensitive receiver locations considered in this assessment for the Dendrobium Pit Top, Kemira Valley Coal Loading Facility and Shaft Site No. 5A are listed in Table 3.1 and Table 3.2 and are shown on Figure 2 to Figure 8. This includes approximately 166 potential receivers that have been identified by IMC that are not currently listed in the Dendrobium Mine Development Consent DA 60-03-2001.

It is noted that the Dendrobium CPP is part of the Port Kembla Steelworks precinct and would not be subject to any Project modifications that would materially alter the noise emissions of this facility. Notwithstanding, an additional four dwellings have also been modelled as representative of receivers close to the Dendrobium CPP (Table 3.3) to confirm that continued operations at the existing Dendrobium CPP would not result in noise exceedances at nearby residential suburbs.

Although part of the Project, there is no proposed increase in the transport and emplacement of coal wash from the Dendrobium CPP to the West Cliff Coal Wash Emplacement. Local noise impacts from this Project component have already been assessed and described in the *Bulli Seam Operations Noise Impact Statement* (Wilkinson Murray, 2009) and the conclusions remain the same. As such, receivers representative of the approved West Cliff Coal Wash Emplacement or associated traffic movements will not be considered further in this assessment.

Table 3.1 – Receiver Locations and Ownership Details – Additional IMC Identified Assessment Locations

ID	Description	Easting	Northing	Category	Ownership
D0002	Dendrobium Pit Top	298909	6188075	Commercial	Mine-owned
D0003	Dendrobium Pit Top	298702	6187827	Commercial	Mine-owned
D0005	323-327 Cordeaux Rd Mount Kembla	299434	6187701	School	-
D0006	214 Cordeaux Rd Mount Kembla	300349	6187985	Residential	-
D0008	Kemira Valley	300273	6188795	Commercial	Mine-owned
D0010	Kemira Valley Coal Loader	300344	6189321	Commercial	-
D0011	13 Harry Graham Dr Kembla Heights	298478	6187751	Residential	Mine-owned
D0012	17 Harry Graham Dr Kembla Heights	298493	6187792	Residential	Mine-owned
D0013	25 View St Kembla Heights	298521	6187849	Residential	Mine-owned
D0014	21 Harry Graham Dr Kembla Heights	298477	6187849	Residential	Mine-owned

ID	Description	Easting	Northing	Category	Ownership
D0015	23 Harry Graham Dr Kembla Heights	298491	6187863	Residential	Mine-owned
D0016	26 View St Kembla Heights	298533	6187865	Residential	Mine-owned
D0017	25 Harry Graham Dr Kembla Heights	298471	6187893	Residential	Mine-owned
D0018	28 Harry Graham Dr Kembla Heights	298441	6187921	Residential	Mine-owned
D0019	29 Harry Graham Dr Kembla Heights	298499	6187909	Recreation Facility	-
D0020	34 View St Kembla Heights	298578	6187909	Residential	Mine-owned
D0021	47 Harry Graham Dr Kembla Heights	298573	6188012	Residential	Mine-owned
D0022	5 Mount St Kembla Heights	298718	6188081	Residential	Mine-owned
D0023	2 Central Ave Kembla Heights	298723	6188114	Residential	Mine-owned
D0024	4 Central Ave Kembla Heights	298738	6188129	Residential	Mine-owned
D0025	7 Central Ave Kembla Heights	298787	6188125	Residential	Mine-owned
D0026	11 Central Ave Kembla Heights	298799	6188138	Residential	Mine-owned
D0027	11 Central Ave Kembla Heights	298805	6188147	Residential	Mine-owned
D0028	13 Central Ave Kembla Heights	298812	6188158	Residential	Mine-owned
D0029	6 Central Ave Kembla Heights	298744	6188152	Residential	Mine-owned
D0030	59 Harry Graham Dr Kembla Heights	298682	6188155	Residential	Mine-owned
D0031	61 Harry Graham Dr Kembla Heights	298693	6188165	Residential	Mine-owned
D0032	63 Harry Graham Dr Kembla Heights	298699	6188183	Residential	Mine-owned
D0033	62 Harry Graham Dr Kembla Heights	298663	6188198	Residential	Mine-owned
D0034	5 High St Kembla Heights	298727	6188215	Residential	Mine-owned
D0035	55 Harry Graham Dr Kembla Heights	298657	6188133	Residential	Mine-owned
D0036	7 High St Kembla Heights	298738	6188227	Residential	Mine-owned
D0037	12 Central Ave Kembla Heights	298776	6188206	Residential	Mine-owned
D0038	15 High St Kembla Heights	298770	6188264	Residential	Mine-owned
D0039	82 Harry Graham Dr Kembla Heights	298887	6188536	Residential	Mine-owned
D0040	84 Harry Graham Dr Kembla Heights	298905	6188571	Residential	Mine-owned
D0041	1 Church Lane Kembla Heights	298595	6187990	Recreation Facility	-
D0042	6 Church Lane Kembla Heights	298603	6187972	Residential	Mine-owned
D0043	41 Harry Graham Dr Kembla Heights	298525	6187965	Commercial Premises	Mine-owned
D0044	43 Harry Graham Dr Kembla Heights	298544	6187981	Residential	Mine-owned

ID	Description	Easting	Northing	Category	Ownership
D0045	30 Harry Graham Dr Kembla Heights	298441	6187940	Residential	Mine-owned
D0046	32 Harry Graham Dr Kembla Heights	298449	6187952	Residential	Mine-owned
D0047	34 Harry Graham Dr Kembla Heights	298458	6187963	Residential	Mine-owned
D0048	36 Harry Graham Dr Kembla Heights	298466	6187975	Residential	Mine-owned
D0050	38 Harry Graham Dr Kembla Heights	298478	6187983	Residential	Mine-owned
D0051	3 Mount St Kembla Heights	298698	6188099	Residential	Mine-owned
D0052	141 Cordeaux Rd Kembla Heights	298163	6187478	Residential	Mine-owned
D0053	617 Cordeaux Rd Kembla Heights	297775	6187197	Place of Worship	-
D0054	147 Cordeaux Rd Kembla Heights	297818	6187249	Residential	-
D0055	145 Cordeaux Rd Kembla Heights	297922	6187238	Residential	-
D0056	145 Cordeaux Rd Kembla Heights	297992	6187279	Residential	-
D0057	617 Cordeaux Rd Kembla Heights	297759	6187218	Residential	-
D0058	145 Cordeaux Rd Kembla Heights	297835	6187266	Residential	-
D0059	26 Stones Rd Mount Kembla	300003	6188477	Residential	-
D0060	4-6 Kirkwood Pl Mount Kembla	299549	6188136	Residential	-
D0061	336 Cordeaux Rd Mount Kembla	299301	6187892	Residential	-
D0062	381 Cordeaux Rd Mount Kembla	298944	6187670	Residential	-
D0063	379 Cordeaux Rd Mount Kembla	298959	6187669	Residential	-
D0064	377 Cordeaux Rd Mount Kembla	298973	6187668	Residential	-
D0065	372 Cordeaux Rd Mt Kembla	298973	6187718	Residential	-
D0066	364 Cordeaux Rd Mount Kembla	299026	6187719	Residential	-
D0067	358 Cordeaux Rd Mount Kembla	299067	6187710	Residential	-
D0068	369 Cordeaux Rd Mount Kembla	299027	6187653	Residential	-
D0069	367 Cordeaux Rd Mount Kembla	299045	6187653	Residential	-
D0070	2 Araluen Ave Mount Kembla	298984	6187616	Residential	-
D0071	Araluen Ave Mount Kembla	298970	6187542	Residential	-
D0072	4 Araluen Ave Mount Kembla	299053	6187595	Residential	-
D0073	6 Araluen Ave Mount Kembla	299067	6187589	Residential	-
D0074	8 Araluen Ave Mount Kembla	299081	6187583	Residential	-
D0075	10 Araluen Ave Mount Kembla	299094	6187574	Residential	-
D0076	12 Araluen Ave Mount Kembla	299106	6187564	Residential	-
D0077	14 Araluen Ave Mount Kembla	299120	6187551	Residential	-
D0078	18 Araluen Ave Mount Kembla	299142	6187518	Residential	-
D0079	20 Araluen Ave Mount Kembla	299163	6187522	Residential	-
D0080	17 Araluen Ave Mount Kembla	299180	6187534	Residential	-

ID	Description	Easting	Northing	Category	Ownership
D0081	11-13 Araluen Ave Mount Kembla	299156	6187580	Residential	-
D0081A	9 Araluen Ave Mount Kembla	299146	6187595	Residential	-
D0082	7 Araluen Ave Mount Kembla	299132	6187603	Residential	-
D0083	5 Araluen Ave Mount Kembla	299119	6187610	Residential	-
D0084	3 Araluen Ave Mount Kembla	299108	6187623	Residential	-
D0085	1 Araluen Ave Mount Kembla	299091	6187626	Residential	-
D0086	2 Cudgee Cres Mount Kembla	299215	6187670	Residential	-
D0087	4 Cudgee Cres Mount Kembla	299234	6187657	Residential	-
D0088	6 Cudgee Cres Mount Kembla	299247	6187645	Residential	-
D0089	8 Cudgee Cres Mount Kembla	299245	6187622	Residential	-
D0090	10 Cudgee Cres Mount Kembla	299250	6187609	Residential	-
D0091	12 Cudgee Cres Mount Kembla	299255	6187594	Residential	-
D0092	14 Cudgee Cres Mount Kembla	299244	6187577	Residential	-
D0093	16 Cudgee Cres Mount Kembla	299249	6187560	Residential	-
D0094	18 Cudgee Cres Mount Kembla	299265	6187539	Residential	-
D0095	17 Cudgee Cres Mount Kembla	299304	6187582	Residential	-
D0096	15 Cudgee Cres Mount Kembla	299302	6187598	Residential	-
D0096A	13 Cudgee Cres Mount Kembla	299301	6187614	Residential	-
D0097	11 Cudgee Cres Mount Kembla	299297	6187627	Residential	-
D0098	9 Cudgee Cres Mount Kembla	299297	6187643	Residential	-
D0099	7 Cudgee Cres Mount Kembla	299291	6187659	Residential	-
D0100	5 Cudgee Cres Mount Kembla	299293	6187673	Residential	-
D0101	3 Cudgee Cres Mount Kembla	299273	6187686	Residential	-
D0102	1 Cudgee Cres Mount Kembla	299249	6187697	Residential	-
D0103	14 Benjamin Rd Mount Kembla	299438	6187906	Residential	-
D0104	39 Stones Rd Mount Kembla	300109	6188114	Residential	-
D0105	340 Harry Graham Dr Kembla Heights	299164	6189847	Recreation Facility	-
D0106	Stafford Rd Mount Kembla	299611	6187863	Recreation Facility	-
D0107	301 Cordeaux Rd Mount Kembla	299619	6187726	Place of Worship	-
D0108	Cordeaux Rd Mt Kembla	299733	6187730	Commercial	-
D0109	274 Cordeaux Rd Mount Kembla	299807	6187787	Commercial	-
D0110	Stones Rd Mount Kembla	300006	6188179	Recreation Facility	-
D0111	69 William James Dr Cordeaux Heights	300261	6187372	Residential	-
D0112	18 Ridgecrest Cordeaux Heights	300001	6187286	Residential	-
D0113	46 Natan Pl Cordeaux Heights	301246	6187096	Residential	-
D0114	246 O'Briens Rd Figtree	301611	6188854	Residential	-

ID	Description	Easting	Northing	Category	Ownership
D0115	244 O'Briens Rd Figtree	301618	6188830	Residential	-
D0116	20 Stones Rd Mount Kembla	300092	6188451	Residential	-
D0117	Stones Rd Mount Kembla	300718	6188499	Residential	-
D0118	121 O'Briens Rd Figtree	300987	6188546	Residential	-
D0119	117 O'Briens Rd Figtree	301399	6188357	Residential	-
D0120	Cordeaux Rd Mount Kembla	300707	6188164	Residential	-
D0121	Cordeaux Dam Rd Cataract	292632	6199555	Commercial	-
D0122	Cordeaux Dam Rd Cataract	292575	6199200	Caretaker's Quarters[1]	-
D0123	Cordeaux Dam Rd Cataract	292558	6199320	Recreation Facility	-
D0124	Upper Cordeaux Lake No.2	296163	6190595	Caretaker's Quarters[1]	-
D0125	200 Cordeaux Rd Mount Kembla	300476	6187936	Residential	-
D0126	200 Cordeaux Rd Mount Kembla	300533	6187883	Commercial	-
D0127	2 William James Dr Mount Kembla	301017	6187419	Residential	-
D0128	7 William James Dr Mount Kembla	301212	6187296	Residential	-
D0129	9 William James Dr Mount Kembla	301218	6187238	Residential	-
D0130	48 Natan Pl Cordeaux Heights	301249	6187063	Residential	-
D0131	112 Booreea Blvd Cordeaux Heights	301292	6187041	Residential	-
D0132	110 Booreea Blvd Cordeaux Heights	301295	6187014	Residential	-
D0133	108 Booreea Blvd Cordeaux Heights	301306	6186994	Residential	-
D0134	5 Alukea Rd Cordeaux Heights	301784	6186464	Residential	-
D0135	2 Central Ave Cordeaux Heights	301826	6186427	Residential	-
D0136	49-55 Cordeaux Rd Figtree	301899	6186448	Residential	-
D0137	4 Leigh Cres Unanderra	301928	6186349	Residential	-
D0138	2 Leigh Cres Unanderra	301957	6186328	Residential	-
D0139	1A Leigh Cres Unanderra	301993	6186300	Residential	-
D0140	41A Cordeaux Rd Figtree	301978	6186388	Residential	-
D0141	39 Cordeaux Rd Figtree	302015	6186360	Residential	-
D0142	37 Cordeaux Rd Figtree	302054	6186321	Residential	-
D0143	31/21 Cordeaux Rd Figtree	302106	6186315	Residential	-
D0144	72 Albert St Unanderra	302019	6186250	Residential	-
D0145	70 Albert St Unanderra	302035	6186244	Residential	-
D0146	68 Albert St Unanderra	302051	6186241	Residential	-

[1] RTA understands not a residential facility, but conservatively assessed as such.

ID	Description	Easting	Northing	Category	Ownership
D0147	66 Albert St Unanderra	302068	6186232	Residential	-
D0148	64 Albert St Unanderra	302084	6186226	Residential	-
D0149	62 Albert St Unanderra	302101	6186218	Residential	-
D0150	60 Albert St Unanderra	302113	6186206	Residential	-
D0151	58A Albert St Unanderra	302141	6186219	Residential	-
D0152	58 Hurt Pde Unanderra	302166	6186192	Residential	-
D0153	56 Hurt Pde Unanderra	302187	6186193	Residential	-
D0154	54 Hurt Pde Unanderra	302209	6186188	Residential	-
D0155	52 Hurt Pde Unanderra	302228	6186183	Residential	-
D0156	50 Hurt Pde Unanderra	302247	6186171	Residential	-
D0157	48 Hurt Pde Unanderra	302267	6186166	Residential	-
D0158	46 Hurt Pde Unanderra	302284	6186157	Residential	-
D0159	44 Hurt Pde Unanderra	302300	6186149	Residential	-
D0160	42 Hurt Pde Unanderra	302309	6186135	Residential	-
D0161	40 Hurt Pde Unanderra	302351	6186146	Residential	-
D0162	1 Cordeaux Rd Figtree	302355	6186213	Residential	-
D0163	354 Cordeaux Rd Mount Kembla	299152	6187741	Residential	-
D0164	15 Benjamin Rd Mount Kembla	300622	6187387	Residential	-
D0165	23 William James Dr Mount Kembla	299505	6187978	Residential	-
D0166	10 William James Dr Mount Kembla	300841	6187378	Residential	-
D0167	8 William James Dr Mount Kembla	300895	6187386	Residential	-
D0168	6 William James Dr Mount Kembla	300941	6187401	Residential	-
D0169	15 Leigh Cres Unanderra	301820	6186300	Residential	-

Table 3.2 – Existing Development Consent Receiver Locations and Ownership Details

ID	Description	Easting	Northing	Category	Ownership
R1	17 High Street Kembla Heights	298990	6188274	Residential	Mine-owned
R2	20 Stones Road Kembla Heights	300062	6188449	Residential	-
R3a	30 Avon Parade Kembla Heights	299545	6188132	Residential	-
R5a	8 Benjamin Road Kembla Heights	299437	6187910	Residential	-
R6a	374 Cordeaux Road Kembla Heights	298965	6187725	Residential	-
R6b	1 Araluen Avenue Mount Kembla	299099	6187622	Residential	-
R9	View Street Kembla Heights	298478	6187750	Residential	Mine-owned
R15a	View Street Kembla Heights	298588	6187903	Residential	Mine-owned
R22	Central Avenue Kembla Heights	298797	6188120	Residential	Mine-owned
R39a	Location off O'Briens Road Figtree	300793	6188421	Residential	-

Table 3.3 – Representative Receivers of the Dendrobium CPP

ID	Description	Easting	Northing	Category
CPP001	2 Birmingham Street Cringila	304847	6183930	Residential
CPP002	48 Flagstaff Road Warrawong	305631	6182835	Residential
CPP003	117 Gladstone Road Coniston	305382	6186950	Residential
CPP004	392 Keira Street Coniston	306239	6187296	Residential

Figure 2 – Noise Sensitive Receiver Locations

Noise Sensitive Receivers

Figure 3 – Noise Sensitive Receiver Locations

Figure 4 – Noise Sensitive Receiver Locations

Figure 5 – Noise Sensitive Receiver Locations

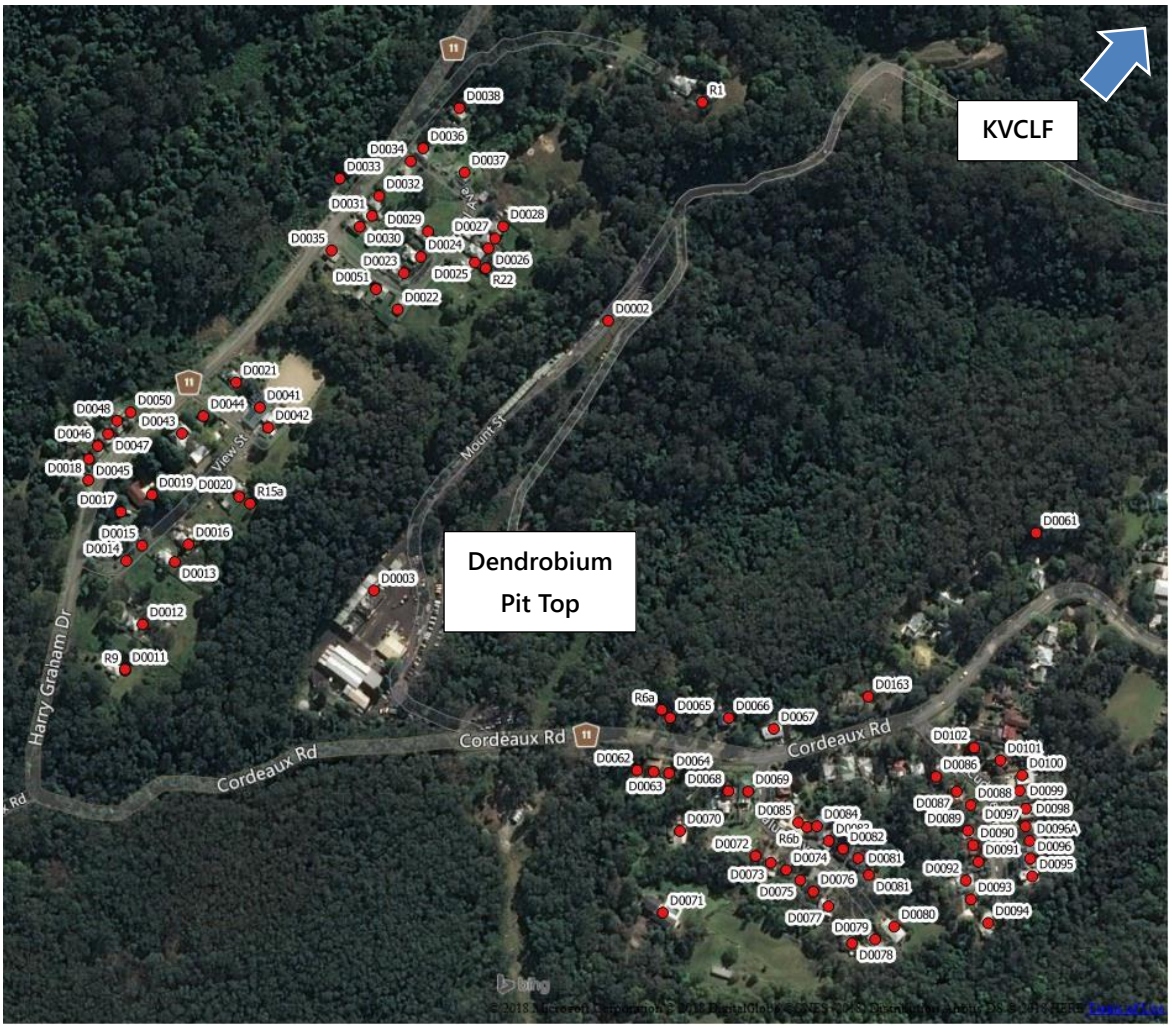


Figure 6 – Noise Sensitive Receiver Locations

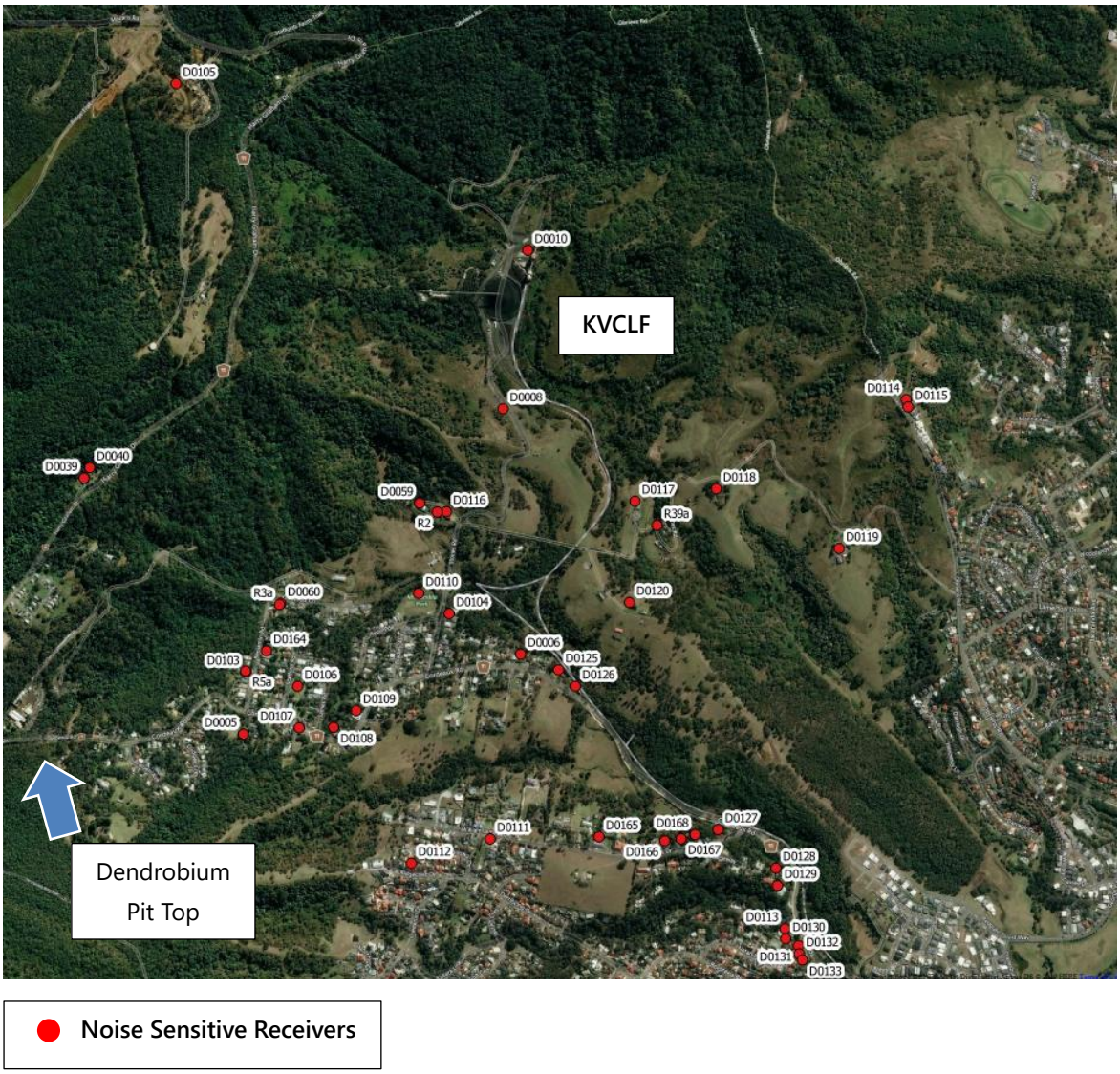


Figure 7 – Noise Sensitive Receiver Locations

Figure 8 – Noise Sensitive Receiver Locations

● Noise Sensitive Receivers

4 Existing Acoustic Environment

As the noise environment of an area almost always varies over time, background and ambient noise levels need to be determined for the operational times of the proposed development. For example, in a suburban or urban area the noise environment is typically at its minimum at 3:00 am in the morning and at its maximum during the morning and afternoon traffic peak hours. The NPfI outlines the following standard time periods over which the background and ambient noise levels are to be determined:

- Day: 7:00 am - 6:00 pm Monday to Saturday and 8:00 am - 6:00 pm Sundays and Public Holidays.
- Evening: 6:00 pm - 10:00 pm Monday to Sunday and Public Holidays.
- Night: 10:00 pm - 7:00 am Monday to Saturday and 10:00 pm - 8:00 am Sundays and Public Holidays.

Criteria for the assessment of operational noise are usually derived from the existing noise environment of an area, excluding noise from the subject development. For the assessment of modifications to existing premises, the noise from the existing premises should be excluded from background noise measurements. The exception is where the premises has been operating for a significant period of time and is considered a normal part of the acoustic environment; it may be included in the background noise assessment under the following circumstances (EPA, 2017):

- *the development must have been operating for a period in excess of 10 years in the assessment period/s being considered and is considered a normal part of the acoustic environment; and,*
- *the development must be operating in accordance with noise limits and requirements imposed in a consent or licence and/or be applying best practice.*

Where a project intrusiveness noise level has been derived in this way, the derived level applies for a period of 10 years to avoid continuous incremental increases in intrusiveness noise levels. The Dendrobium Mine has been in operation since 2000, which exceeds 10 years of operation and has generally been operating in accordance with the noise limits within Development Consent DA 60-03-2001 (as modified) as well as the Approval Decision (EPBC 2001/214) under the Environment Planning and Biodiversity Conservation Act 1999. Therefore, the noise from the operation of the Dendrobium Mine can be included in the background noise assessment.

It is also noted that the Kemira Valley Rail Line pre-dates the Dendrobium Mine and also serviced other mining operations before the Dendrobium Mine was developed.

4.1 Noise Measurement Locations

Noise measurements are ideally carried out at the nearest or most potentially affected locations surrounding a development. An alternative, representative location should be established in the case of access restrictions or if a safe and secure location cannot be identified.

Furthermore, representative locations may be established in the case of multiple receivers as it is usually impractical to carry out measurements at all locations surrounding a site.

Long-term and short-term noise measurements were undertaken for the Project at locations outlined in Table 4.1 and shown in Figure 9 to Figure 11. Short-term measurements were undertaken adjacent to the installed long-term monitoring locations.

Table 4.1 – Noise Monitoring Locations

ID	Location	Description
L1	374 Cordeaux Road, Mount Kembla	The monitor was located along the north-western property boundary. The monitor was placed in the free-field. The noise monitoring location is considered representative of rural receiver locations surrounding the Dendrobium Pit Top.
L2	Location off O'Briens Road, Figtree	The monitor was located to the north-west of the dwelling. The monitor was placed in the free-field. The noise monitoring location is considered representative of rural receiver locations surrounding the Kemira Valley Coal Loading Facility.
L3	2 Birmingham Street, Cringila	The monitor was located along the southern property boundary. The monitor was placed in the free-field. The noise monitoring location is considered representative of suburban receiver locations to the west and south of the Dendrobium CPP.

4.2 Long-term Noise Measurement Results

Long-term noise monitoring was carried out from Wednesday 20 June 2018 to Monday 2 July 2018, to characterise the existing background noise levels including existing approved operation of the Dendrobium Mine. The long-term noise monitoring methodology is detailed in Appendix B, and noise level-vs-time graphs of the data are included in Appendix C. Table 4.2 presents the overall single Rating Background Levels (RBL) and representative ambient L_{eq} noise levels for each assessment period, determined in accordance with the NPfI.

Table 4.2 – Long-term Noise Monitoring Results, dB(A)

Monitoring location	L_{A90} RBL			L_{Aeq} Ambient noise levels[4]		
	Day[1]	Evening[2]	Night[3]	Day[1]	Evening[2]	Night[3]
L1 – 374 Cordeaux Road, Mount Kembla	34	32	32	52	46	44
L2 – Location off O'Briens Road, Figtree	34	35	34	50	41	49
L3 – 2 Birmingham Street, Cringila	40	42	41	55	48	47

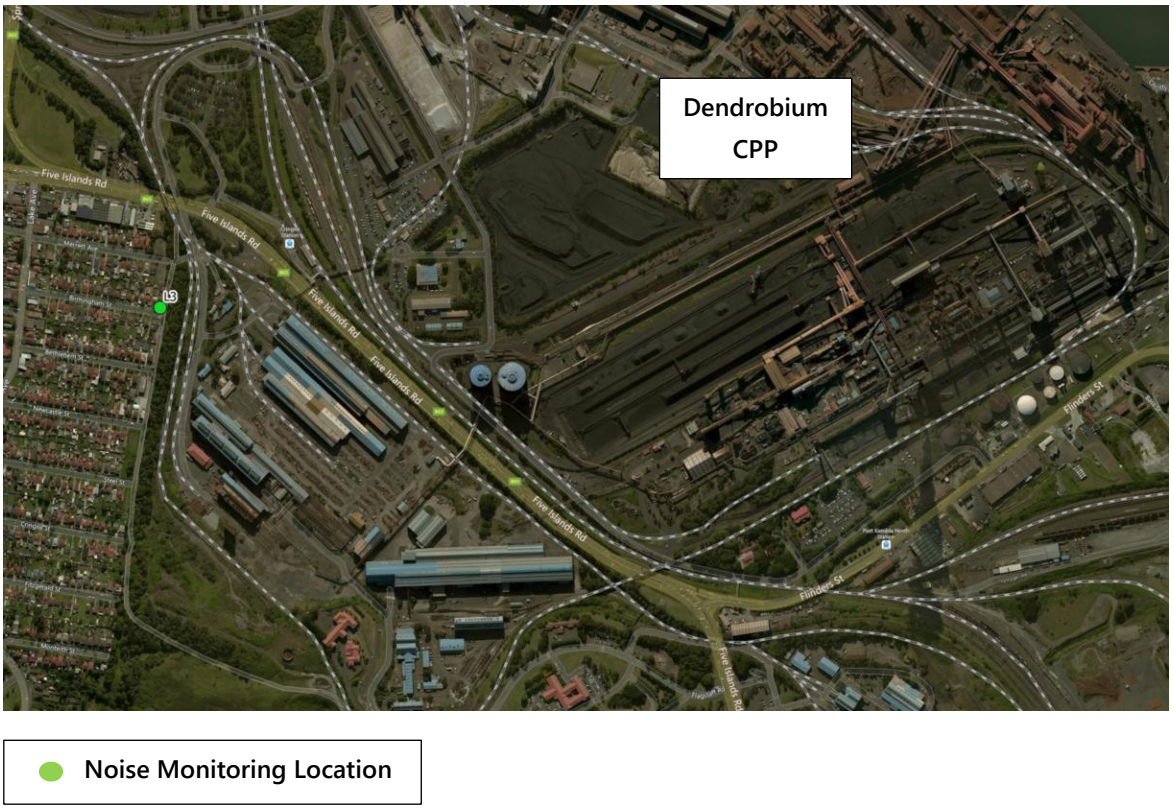
Notes:
1. Day: 7:00 am – 6:00 pm Monday to Saturday and 8:00 am – 6:00 pm Sundays and Public Holidays.
2. Evening: 6:00 pm – 10:00 pm Monday to Sunday and Public Holidays.
3. Night: 10:00 pm – 7:00 am Monday to Saturday and 10:00 pm – 8:00 am Sundays and Public Holidays.
4. As required by the NPfI, the external ambient noise levels presented are free-field noise levels (ie. No façade reflection is incorporated).

It is noted that similar background noise monitoring undertaken in Mount Kembla in 2000, prior to the Dendrobium Mine being developed, recorded background noise levels that were typically higher than, albeit similar to, the 2018 monitoring results.

Figure 9 – Noise Monitoring Locations

Figure 10 – Noise Monitoring Locations

Figure 11 – Noise Monitoring Locations



4.3 Short-term Noise Measurement Results

Short-term noise measurements were undertaken on Wednesday 20 June 2018 and Monday 2 July 2018 during various day, evening and night periods, in order to supplement the long-term noise monitoring and provide greater detail of the surrounding noise environment.

The equipment used for noise measurements was a Brüel & Kjaer Type 2250 precision sound level analyser which is a Class 1 instrument having accuracy suitable for field and laboratory use. The instrument was calibrated prior and subsequent to measurements using a Brüel & Kjaer Type 4231 calibrator. No significant drift in calibration was observed. All instrumentation complies with AS IEC 61672.1 2004 *Electroacoustics - Sound Level Meters* and carries current NATA certification (or if less than 2 years old, manufacturers certification).

A summary of the short-term measurement results is presented in Table 4.3.

Table 4.3 – Short-term Noise Monitoring Results, dB(A)

Location	Period /Time	Measured noise level, dB(A)		Comments on measured noise levels
		L_{Aeq}	L_{A90}	
L1 – 374 Cordeaux Road, Mount Kembla	Day 2/7/2018 11:45 am-12:15 pm	47	38	Noise environment consists of natural noises (birds, trees, etc.). Plant noise, tonal reversing beepers, dumping noises, large machinery and truck movements audible from direction of mine. Traffic from Cordeaux Road audible.
	Evening 20/6/2018 7:30 pm-8:00 pm	53	33	Noise environment consists mainly of natural noises (birds, insects, trees, etc.). Occasional traffic along Cordeaux Road. High frequency buzz from street lamp / electricity pole audible.
	Night 20/6/2018 11:00 pm-11:30 pm	46	35	Noise environment consists mainly of natural noises (birds, insects, trees, etc.) Occasional traffic along Cordeaux Road. High frequency buzz from street lamp / electricity pole audible. Distant low frequency plant noise audible from opposite direction to mine.
L2 – Location off O'Briens Road, Figtree	Day 2/7/2018 12:45 pm-1:15 pm	47	36	Noise environment consists of natural noises (birds, rooster, dogs, etc.). Distant traffic from Cordeaux Road. Occasional aircraft passing. Tractor operating on neighbouring property. Plant noise hum audible in direction of mine when no other events occurring.
	Evening 20/6/2018 9:30 pm-10:00 pm	38	34	Noise environment consists mainly of natural noises (insects, trees, etc.). Plant noise hum audible in direction of mine. Traffic audible in direction of Cordeaux Road.
	Night 20/6/2014 10:00 pm-10:30 pm	37	34	Noise environment consists mainly of natural noises (insects, trees, etc.). Plant noise hum audible in direction of mine. Occasional traffic audible in direction of Cordeaux Road.

Location	Period /Time	Measured noise level, dB(A)		Comments on measured noise levels
		L_{Aeq}	L_{A90}	
L3 – 2 Birmingham Street, Cringila	Day 2/7/2018 2:00 pm-2:30 pm	46	42	Noise environment consists of natural and general neighbourhood noises (birds, dogs barking, gates closing, people conversing, etc.). Traffic audible from Five Islands Road. Occasional traffic on Birmingham Road and Lake Avenue. Occasional train horn. Low frequency hum audible in direction of port when no other events occurring.
	Evening 20/6/2018 6:45 pm-7:15 pm	51	42	Noise environment consists mainly of natural noises (insects, trees, etc.). Distant traffic audible from Five Islands Road.
	Night 20/6/2018 11:45 pm-12:15 am	45	43	Noise environment consists mainly of natural noises (insects, trees, etc.). High frequency whine and low frequency hum audible from the direction of the port.

4.4 Ongoing Noise Monitoring

Noise management is an important aspect of the Dendrobium Mine operations as the Dendrobium Pit Top and Kemira Valley Coal Loading Facility sites are located adjacent to residences in Mt Kembla and Kembla Heights. Quarterly noise monitoring is conducted to satisfy requirements of the Dendrobium Development Consent DA 60-03-2001 and the approved Noise Management Plan.

Attended noise monitoring for operational noise was conducted quarterly at receiver locations R1, R6a and R39a, as required in the Dendrobium Mine Development Consent DA 60-03-2001. For the financial year (FY) 2020 reporting period, Dendrobium Mine achieved noise levels at or below the applicable $L_{Aeq,15minute}$ criteria for 96 percent (%) of the reporting period, with two (2) of the three (3) sites achieving noise levels at or below the applicable $L_{Aeq,15minute}$ criteria for 100% for the reporting period. For the financial year (FY) 2021 reporting period, Dendrobium Mine achieved noise levels at or below the applicable $L_{Aeq,15minute}$ criteria for 97% of the reporting period, with two (2) of the three (3) sites achieving noise levels at or below the applicable $L_{Aeq,15minute}$ criteria for 100% for the reporting period.

Attended rail haulage noise measurements for the 82 class locomotive used on the Kemira Valley Rail Line was conducted during the FY 2020 and FY 2021 periods and overall locomotive noise was compliant with Dendrobium Mine Development Consent DA 60-03-2001 criteria.

An independent environmental audit was conducted in 2020, and issued in March 2021 by Environmental Resources Management Australia Pty Ltd (ERM). The exceedances of the operational noise criteria as detailed above were presented in the audit and the recommendation from the audit is to continue to implement all reasonable and feasible noise mitigation measures for ongoing improvement of the surface facilities noise emissions. No recommendation was provided for the rail haulage impact as it was determined to be compliant.

4.5 Noise Complaints Record

Complaints in regard to noise received over the auditing periods for FY2018 to FY2021 include (ERM, 2021):

- FY 2018 – 10 noise related complaints were received, four of which were related to rail noise and six to other Mine (Dendrobium Pit Top) generated noise.
- FY 2019 – 33 complaints were received relating to rail noise and five were related to other Mine (Dendrobium Pit Top) generated noise. The majority of the total complaints made during the reporting period were from one resident.
- FY 2020 – 28 complaints were received relating to rail noise and 48 were related to other Mine (Dendrobium Pit Top) generated noise. The majority of the total complaints received in the reporting period (69% of all complaints) were from two residents.

For FY 2021, 102 of the complaints received were noise related, with the majority of the total complaints (72% of all complaints) made during the reporting period from one resident. It is noted that this resident moved to a grievance process with IMC in June 2021 and complaints under the grievance would be reported separately in future and subject to independent mediation. IMC has continued to consult with the affected receiver and has implemented noise mitigation at this receiver in response to the complaints received (e.g. installation of ducted air conditioner system).

A discussion of IMC's rail noise mitigation investigations and implementation of the measures is provided in Section 11.3.

Further information regarding complaints received in each year and their resolution are described in the Dendrobium Mine Annual Review.

5 Meteorology

Certain meteorological conditions may increase noise levels by focusing sound-wave propagation paths at a single point. Such refraction of sound waves occur during temperature inversions (atmospheric conditions where temperatures increase with height above ground level) and where there is a wind gradient (that is, wind velocities increasing with height) with wind direction from the source to the receiver.

Temperature inversions occurring within the lowest 50 m to 100 m of atmosphere can affect noise levels measured on the ground. Temperature inversions are most commonly caused by radiative cooling of the ground at night, leading to the cooling of the air in contact with the ground. This is especially prevalent on cloudless nights with little wind. Air that is somewhat removed from contact with the ground will not cool as much, resulting in warmer air aloft than nearer the ground.

Similarly, when significant wind exists, the conditions can significantly affect noise levels at receptor points downwind of a noise source. This would depend, however, on the particular direction and the velocity of the wind at that time. It should also be noted that although wind can increase noise emission levels as perceived from a downstream assessment point, background noise also tends to increase as a result of increased wind activity. This often causes masking of potential increases in intrusive noise.

The NPfI (EPA, 2017) recommends that project noise criteria are to apply under weather conditions characteristic of an area. These conditions may include calm, wind and temperature inversions. In this regard, the increase in noise that results from atmospheric temperature inversions and wind effects may need to be assessed. The noise levels predicted under characteristic meteorological conditions for each receiver are then compared with the criteria to establish whether the meteorological effect will cause a significant impact.

The NPfI (EPA, 2017) permits two approaches for assessing these effects – use of default parameters and use of site-specific parameters:

- When using default parameters, general meteorological values are used to predict noise levels, foregoing detailed analyses of site-specific meteorological data. This approach assumes that meteorological effects are conservative, in that it is likely to predict the upper range of increases in noise levels. Actual noise levels may be less than predicted.
- The use of site-specific parameters is a more detailed approach, which involves analysing site meteorological data to determine whether inversion and/or wind effects are significant features warranting assessment. Where assessment is warranted, default parameters are available for use in predicting noise or, where preferred, measured values may be used instead. The use of site-specific parameters provides a more accurate prediction of noise increases due to meteorological factors.

For this assessment, the more detailed approach using site-specific meteorological parameters was conducted. Weather data was provided by Ramboll Environ taken from the Kemira Valley weather station for the year 2016.

5.1 Temperature Inversions

Assessment of impacts from temperature inversions is confined to the winter night-time period, as this is the time likely to have temperature inversions and produce the greatest impact on amenity of nearby residences. As the Project operates at night-time, there is potential for noise impact due to inversions and further consideration of these effects is required.

Following the NPfI procedure, the likelihood of temperature inversion occurrence was determined based on Pasquill-Gifford stability classes for the winter night-time periods in the weather data. A summary of the likelihood of temperature inversions for night-time is presented in Table 5.1 below.

Table 5.1 – Winter Night-time Temperature Inversion (TI) Likelihood, %

Season	Pasquill-Gifford Stability Class							TI Likelihood (F+G)
	A	B	C	D	E	F	G	
Winter	0.0	0.0	0.0	16.2	44.2	33.3	6.3	39.6

The results above indicate that the F class temperature inversions are above the 30% occurrence threshold nominated in the NPfI for the night-time period, and therefore, temperature inversions will need to be considered in the assessment for the night-time period.

5.2 Wind Effects

The NPfI specifies a procedure for assessing the significance of wind effects, and a default wind speed to be used in the assessment (3 metres per second [m/s]) where these effects are found to be significant. The procedure requires that wind effects be assessed where wind is a feature of the area. The assessment considers each of the four seasons and assessment periods (day, evening, and night) individually.

Wind is considered to be a feature where source-to-receiver wind speeds (at 10 m height) of 0.5 to 3 m/s occur for 30% of the time or more in any assessment period (day, evening and night) in any season. Winds with velocities less than 0.5 m/s (calm conditions) and greater than 3 m/s (at 10 m height), are not included in the calculations of wind occurrence.

Analysis of the wind data was undertaken using the EPA's Noise Enhancement Wind Analysis program to determine if wind is a 'feature' of the area as defined by the NPfI. The program determines whether there are prevailing source-to-receiver wind conditions. The results of the analysis are presented in Table 5.2 below.

Table 5.2 – Percentage of Wind Records (up to 3 m/s) from Subject Site to Receiver, %

Direction	Summer			Autumn			Winter			Spring		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
N	3.1	1.6	2.1	1.9	0.3	0.2	0.9	0.0	0.0	1.2	0.3	0.0
NNE	13.8	9.3	6.5	7.1	1.4	1.1	4.7	0.0	0.5	6.9	2.2	0.5
NE	23.6	12.9	8.1	12.3	2.2	1.9	7.8	1.1	1.1	11.6	4.7	1.3
ENE	**32.2**	16.5	11.4	17.4	2.7	3.1	9.8	1.6	1.6	18.3	7.1	2.7
E	**43.5**	20.9	13.7	23.3	5.4	4.2	13.5	3.0	2.3	26.2	9.3	4.0
ESE	**39.0**	15.7	10.6	23.7	4.9	5.4	12.5	4.6	3.0	25.6	9.9	5.5
SE	**31.4**	15.7	9.8	25.7	8.2	7.6	14.2	8.7	4.1	24.9	12.4	10.5
SSE	21.8	11.5	7.0	19.1	7.3	6.6	11.8	7.9	3.4	18.3	9.9	9.2
S	18.6	21.2	12.8	28.5	20.7	14.3	28.6	16.8	14.3	28.5	22.8	17.9
SSW	17.5	29.4	25.2	**32.0**	**34.0**	24.0	**38.8**	23.9	21.9	**30.8**	**32.7**	26.9
SW	14.7	**42.6**	**48.7**	**37.6**	**60.1**	**47.2**	**49.3**	**38.9**	**38.3**	29.0	**58.0**	**43.2**
WSW	11.6	**36.3**	**40.7**	**30.2**	**52.4**	**39.7**	**42.6**	**33.2**	**30.3**	23.7	**53.6**	**40.7**
W	9.2	29.7	**38.0**	22.8	**41.0**	**35.4**	**31.4**	26.9	23.6	16.8	**42.0**	**34.7**
WNW	4.8	19.0	**30.2**	16.4	**32.3**	**32.4**	22.0	24.5	22.5	8.7	**34.6**	**30.8**
NW	0.4	1.9	3.9	2.5	3.8	5.6	5.9	6.5	6.4	1.8	4.9	8.8
NNW	0.1	0.8	0.1	0.2	0.0	0.5	0.5	0.5	0.1	0.1	0.3	0.2

Notes Bold denotes greater than 30% occurrence of wind scenario.

The results above indicate that there are greater than 30% occurrence of winds between 0.5 m/s and 3 m/s (source-to-receiver component) for certain directions. Therefore, there are prevailing wind (i.e. adverse) conditions in accordance with the NPfI, and wind effects are considered in this assessment for the directions.

5.3 Summary of Meteorological Assessment Conditions

Based on the findings in Section 5.1 and Section 5.2, Table 5.3 below presents a summary of the meteorological conditions considered for the operational noise computer modelling.

Table 5.3 – Summary of Meteorological Assessment Conditions

Period	Meteorological Condition Type	Wind Speed (Default)	Wind Direction	TI
Day	Calm	-	-	-
	Adverse Conditions	3 m/s	East-northeast	-
		3 m/s	East	-
		3 m/s	East-southeast	-
		3 m/s	Southeast	-
		3 m/s	South-southwest	-
		3 m/s	Southwest	-

Period	Meteorological Condition Type	Wind Speed (Default)	Wind Direction	TI
		3 m/s	West-southwest	-
		3 m/s	West	-
Evening and Night	Calm	-	-	-
	Adverse Conditions	3 m/s	South-southwest	-
		3 m/s	Southwest	-
		3 m/s	West-southwest	-
		3 m/s	West	-
		3 m/s	West-northwest	-
		-	-	4°C / 100 m
		2 m/s	Southwest	4°C / 100 m
		2 m/s	West-southwest	4°C / 100 m

Notes: 1. Temperature inversion only applicable for night time period only.

6 Criteria

6.1 Construction Noise

The NSW *Interim Construction Noise Guideline* (ICNG) (Department of Environment and Climate Change, 2009) provides guidelines for assessing noise generated during the construction phase of development.

The key components of the Guideline that are incorporated into this assessment include:

- Use of L_{Aeq} as the descriptor for measuring and assessing construction noise.
- Application of reasonable and feasible noise mitigation measures.

NSW noise policies, including the NPfI, RNP and Rail Infrastructure Noise Guideline (RING) (EPA, 2013) have moved to the primary use of L_{Aeq} over any other descriptor. As an energy average, L_{Aeq} provides ease of use when measuring or calculating noise levels since a full statistical analysis is not required as when using, for example, the L_{A10} descriptor.

As stated in the ICNG, a noise mitigation measure is feasible if it is capable of being put into practice and is practical to build given the project constraints. Selecting reasonable mitigation measures from those that are feasible involves making a judgement to determine whether the overall noise benefit outweighs the overall social, economic and environmental effects.

The ICNG provides two methods for assessment of construction noise, being either a quantitative or a qualitative assessment. A quantitative assessment is recommended for major construction projects of significant duration, and involves the measurement and prediction of noise levels, and assessment against set criteria. A qualitative assessment is recommended for small projects with a duration of less than three weeks and focuses on minimising noise disturbance through the implementation of reasonable and feasible work practices, and community notification.

Given the scale and duration of the construction works proposed for the Project, a quantitative assessment is carried out herein, consistent with the ICNG.

Table 6.1, reproduced from the ICNG, sets out the Noise Management Levels (NMLs) and how they are to be applied for residential receivers.

Table 6.1 – NMLs at Residential Receivers

Time of Day	Management Level $L_{Aeq\ (15\ min)}$	How to Apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10 dB(A)	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured LAeq (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: • times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences; and • if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB(A)	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see section 7.2.2 of the ICNG.

Based on the above ICNG requirements, Table 6.2 presents the construction NMLs established for the nearest noise sensitive residential receivers based upon the noise monitoring outlined in Section 4.

Table 6.2 – Construction NMLs at Residential Receivers

Locality	Receiver Location	Corresponding Noise Monitoring Location	L_{A90} RBL[5]			NML $L_{Aeq(15min)}$			
			Day	Evening	Night	Day	Day Outside Standard Hours	Evening	Night
Kembla Heights/Mount Kembla	D0001, D0011-D0018, D0020-D0040, D0042, D0044-48, D0050-D0058, D0060-D0103, D0163, D0164, R1, R3a, R5a, R6a, R6b, R9, R15a, R22	374 Cordeaux Road, Mount Kembla[3]	35[1]	32	32	45	40	37	37

Locality	Receiver Location	Corresponding Noise Monitoring Location	L_{A90} RBL[5]			NML $L_{Aeq(15min)}$			
			Day	Evening	Night	Day	Day Outside Standard Hours	Evening	Night
Mount Kembla/Figtree	D0006, D0059, D0104, D0114-D0120, D0125, R2, R39a	Location off O'Briens Road, Figtree[3]	35[1]	35	34	45	40	40	39
Cringila/ Warrawong	Various – refer to Figure 8	2 Birmingham Street, Cringila[4]	40	40[2]	40[2]	50	45	45	45

Notes:
1. RBLs have adopted the minimum background noise levels nominated in the NPfI as long term background noise levels were recorded at below the minimum.
2. Where evening and night time RBLs are recorded to be higher than the day time, the day time RBL is adopted.
3. Area is rural
4. Area is suburban
5. Descriptor for long-term noise monitoring (Table 4.2)

For all potential residential receivers, a 'highly affected' noise objective of $L_{Aeq(15min)}$ 75 dB(A) is also adopted, with exceedances addressed as described in Table 6.1. Table 6.3 sets out the ICNG NMLs for other noise sensitive receiver locations.

Table 6.3 – NMLs at Other Noise Sensitive Land Uses

Land Use	Where Objective Applies	NML $L_{Aeq\ (15\ min)}$
Classrooms at schools and other educational institutions	Internal noise level	45 dB(A)
Hospital wards and operating theatres	Internal noise level	45 dB(A)
Places of worship	Internal noise level	45 dB(A)
Active recreation areas	External noise level	65 dB(A)
Passive recreation areas	External noise level	60 dB(A)
Community centres	Depends on the intended use of the centre.	Refer to the 'maximum' internal levels in AS/NZS 2107:2016 for specific uses.
Commercial premises	External noise level	70 dB(A)
Industrial premises	External noise level	75 dB(A)

Notes: NMLs apply when receiver areas are in use only.

It is noted that as a general rule, building structures would typically provide a minimum of 10 dB(A) reduction from external noise levels to internal noise levels, with windows opened sufficiently for fresh air ventilation. Therefore, the equivalent external construction noise management levels for the classrooms, hospitals and places of worship are **55 dB(A)**.

6.2 Operational Noise

Operational noise from the Project is assessed in accordance with the NPfI. The NPfI has recently been introduced to replace EPA's *NSW Industrial Noise Policy* (INP) (2000). The NPfI is used as a guide by the EPA for setting statutory limits in licences for scheduled noise sources.

The NPfI has two components:

- Controlling intrusive noise impacts in the short term for residences.
- Maintaining noise level amenity for particular land uses for residences and other land uses.

6.2.1 Intrusive Noise Impacts

According to the NPfI, the intrusiveness of a noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the $L_{Aeq,15min}$ descriptor) does not exceed the background noise level measured in the absence of the source by more than 5 dB(A). The intrusiveness criterion is only applicable to residential type receivers and is summarised as follows:

- **$L_{Aeq,15min}$ Intrusiveness noise level = RBL plus 5dB(A).**

Table 6.4 presents the adopted RBLs and the Project intrusiveness noise criteria established for the nearest noise sensitive residential receivers based upon the noise monitoring outlined in Section 4.

Table 6.4 – Project Intrusiveness Criteria

Locality	Receiver Location	Corresponding Noise Monitoring Location	L_{A90} RBL			Intrusiveness Criteria $L_{Aeq,15minute}$		
			Day	Evening	Night	Day	Evening	Night
Kembla Heights/Mount Kembla	D0001, D0011-D0018, D0020-D0040, D0042, D0044-48, D0050-D0058, D0060-D0103, D0163, D0164, R1, R3a, R5a, R6a, R6b, R9, R15a, R22	374 Cordeaux Road, Mount Kembla[3]	35[1]	32	32	40	37	37
Mount Kembla/Figtree	D0006, D0059, D0104, D0114-D0120, D0125, R2, R39a	Location off O'Briens Road, Figtree[3]	35[1]	35	34	40	40	39
Cringila/ Warrawong[5]	Various – refer to Figure 8	2 Birmingham Street, Cringila[4]	40	40[2]	40[2]	45	45	45

Notes:
1. RBLs have adopted the minimum background noise levels nominated in the NPfI as long-term background noise levels were recorded at approximately the minimum.
2. Where evening and night time RBLs are recorded to be higher than the day time, the day time RBL is adopted.
3. Area is rural.
4. Area is suburban.
5. RBLs adopted are considered representative of Dendrobium CPP potential receptor locations (Figure 8). Review of RBLs adopted for other projects within the Port Kembla industrial precinct (i.e. the proposed Port Kemba Gas Terminal) show the RBLs adopted for the Project are comparable and Cringila is the closest potentially impacted locality to the Dendrobium CPP.

It is noted that under the NPfI assessment approach the Project intrusiveness criteria are in some cases lower or higher than existing noise impact assessment criteria set under Development Consent DA 60-03-2001.

6.2.2 Amenity Noise Levels

The amenity noise levels are determined in accordance with Chapter 2.4 of the NPfI. The NPfI recommends base acceptable noise levels for various receivers, including residential, commercial, industrial receivers and sensitive receivers such as schools, hospitals, churches and parks.

To limit continuing increases in noise levels, the maximum ambient noise level within an area from industrial noise sources should not normally exceed the acceptable noise levels specified in Table 2.2 of the NPfI, the applicable parts of which are reproduced in Table 6.5 below.

It is noted that as a general rule, building structures would typically provide a minimum of 10 dB(A) reduction from external noise levels to internal noise levels, with windows opened sufficiently for fresh air ventilation. Therefore, the equivalent external management levels for the school classrooms, hospital wards and places of worship are **45 dB(A), 45 dB(A)** and **50 dB(A)**, respectively.

Table 6.5 – Amenity Noise Levels – Recommended L_{Aeq} Noise Levels from Industrial Sources

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended $L_{Aeq(Period)}$ Amenity Noise Level
Residence	Rural	Day	50
		Evening	45
		Night	40
	Suburban	Day	55
		Evening	45
		Night	40
Hotels, motels, caretakers' quarters, holiday accommodation, permanent resident caravan parks	See column 4	See column 4	5dB(A) above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day
School classrooms – internal	All	Noisiest 1 hour period when in use	35
Hospital ward	All	Noisiest 1 hour period	
- internal			35
- external			50
Place of worship – internal	All	When in use	40
Area specifically reserved for passive recreation (e.g. National Park)	All	When in use	50
Active recreation area (e.g. school playground, golf course)	All	When in use	55
Commercial premises	All	When in use	65

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended $L_{Aeq(Period)}$ Amenity Noise Level
Industrial premises	All	When in use	70
Industrial interface (applicable only to residential noise amenity areas)	All	All	Add 5 dB(A) to recommended noise amenity area

Notes: 1. Daytime 7.00 am - 6.00 pm; Evening 6.00 pm - 10.00 pm; Night-time 10.00 pm - 7.00 am
2. On Sundays and Public Holidays, Daytime 8.00 am - 6.00 pm; Evening 6.00 pm - 10.00 pm; Night-time 10.00 pm - 8.00 am.
3. The L_{Aeq} index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

The recommended amenity noise levels represent the objective for total industrial noise at a receiver location, whereas the project amenity noise level represents the objective for noise from a single industrial development at a receiver location.

To ensure that industrial levels (existing plus new) remain within the recommended amenity noise levels for an area, a project amenity noise level applies for each new source of industrial noise as follows:

- **Project amenity noise level for industrial developments = recommended amenity noise level (NSW NPfI Table 2.2) minus 5 dB(A).**

The relevant recommended amenity noise levels as well as Project amenity noise levels are summarised below in Table 6.6.

Table 6.6 – Project Amenity Noise Levels

Locality	Land Use	Recommended $L_{Aeq(Period)}$ Amenity Noise Level			Project Amenity Noise Level, $L_{Aeq,period}$, dB(A)		
		Day	Evening	Night	Day	Evening	Night
Dendrobium Pit Top	Rural Residential	50	45	40	45	40	35
Kemira Valley Coal Loading Facility	Rural Residential	50	45	40	45	40	39[2]
Dendrobium CPP	Suburban Residential	55 (60)[1]	45 (50)[1]	40 (45)[1]	50 (55)[1]	40 (45)[1]	37[2] (40)[1]
Shaft Site No. 5A	Caretakers' Quarters (Rural)	55	50	45	55[3]	50[3]	45[3]
Any	School Classrooms	N/A	N/A	N/A	External 45 dB(A) when in use		
Any	Place of Worship	N/A	N/A	N/A	External 50 dB(A) when in use		
Any	Passive Recreational	N/A	N/A	N/A	50 dB(A) when in use		
Any	Commercial Premises	N/A	N/A	N/A	65 dB(A) when in use		
Any	Industrial Premises	N/A	N/A	N/A	70 dB(A) when in use		

Notes: 1. Criterion in brackets specifies the amenity noise levels and Project amenity noise levels representing the application of the 'industrial interface' criteria adjustment for receivers proximal to the Port Kembla industrial precinct.
2. In accordance with Section 2.4 of the NPfI, where the resultant project amenity noise level is 10 dB or more lower than the existing industrial noise level, the project amenity noise level can be set at 10 dB below existing industrial noise levels if it can be demonstrated that existing industrial noise levels are unlikely to reduce over time.
3. In accordance with Section 2,4 of the NPfI, where cumulative industrial noise is not a necessary consideration because no other industries are present in the area, or likely to be introduced into the area in the future, in such cases the relevant amenity noise level is assigned as the project amenity noise level.

In accordance with the NPfI, receivers most proximal to the Dendrobium CPP (i.e. located in the Port Kembla Steelworks or Port precincts) could be considered as 'industrial interface' receivers, as the NPfI recognises that a reduced acoustic amenity is acceptable for existing residences co-located with existing industry (i.e. receivers proximal to the various major industrial facilities at Port Kembla). As such, Project amenity noise levels for these receivers if assessed as 'industrial interface' receivers would be less stringent (Table 6.6), the PSTLs for the evening and night period for receivers proximal to the Dendrobium CPP would also increase where the amenity criteria are the most stringent of the two criteria.

Renzo Tonin & Associates has therefore assessed Dendrobium CPP noise levels with and without application of the 'industrial interface' allowance for receivers proximal to the Dendrobium CPP and associated internal road haulage activities to the Port Kembla Coal Terminal.

6.2.3 Project Specific Trigger Levels

In accordance with the NPfI, noise impact should be assessed in terms of both intrusiveness and amenity. The NPfI describes the 'Project noise trigger levels' as being the lower (i.e. more stringent) of the Project intrusiveness noise level and Project amenity noise levels. The NPfI also stipulates that Project trigger noise levels should be expressed as $L_{Aeq,15min}$ levels as follows:

- **$L_{Aeq,15min}$ = $L_{Aeq,period}$ plus 3 dB**

Based on the background and ambient noise monitoring carried out at the nearest affected receiver locations, the PSTLs are outlined in Table 6.7 below.

Table 6.7 – PSTLs

Locality	Land Use	Intrusiveness, $L_{Aeq,15min}$, dB(A)			Amenity, $L_{Aeq,15min}$, dB(A)		
		Day	Evening	Night	Day	Evening	Night
Dendrobium Pit Top	Rural Residential	**40**	**37**	**37**	48	43	38
Kemira Valley Coal Loading Facility	Rural Residential	**40**	**40**	**39**	48	43	42
Dendrobium CPP	Suburban Residential	**45**	45	45	53 (58)[1]	**43** (48)[1]	**40** (43)[1]
Shaft No. 5A	Caretakers' Quarters (Rural)	N/A	N/A	N/A	**58**	**53**	**48**
Any	School Classrooms	N/A	N/A	N/A	**External 48 dB(A) when in use**		
Any	Place of Worship	N/A	N/A	N/A	**External 53 dB(A) when in use**		
Any	Passive Recreational	N/A	N/A	N/A	**53 dB(A) when in use**		
Any	Commercial Premises	N/A	N/A	N/A	**68 dB(A) when in use**		
Any	Industrial Premises	N/A	N/A	N/A	**73 dB(A) when in use**		

Notes: 1. **Bold** text denotes the lower of the Project intrusiveness noise levels and Project amenity noise levels (i.e. PSTLs)

2. Criterion in brackets specifies the amenity noise levels and Project amenity noise levels representing the application of the 'industrial interface' criteria adjustment for receivers proximal to the Port Kembla industrial precinct.

6.2.4 Voluntary Land Acquisition and Mitigation Policy

The NSW Government's *Voluntary Land Acquisition and Mitigation Policy - For State Significant Mining, Petroleum and Extractive Industry Developments* refers to the criteria in the NPfI. The term Project Specific Noise Levels in the INP has been replaced with the term PSTLs in the NPfI. Therefore, the criteria reproduced in this section of the report will utilise the term PSTL.

The NPfI considers the assessment of intrusiveness and amenity noise levels and states that the intrusiveness and amenity noise levels have been selected to protect at least 90% of the population living in the vicinity of industrial noise sources from the adverse effects of noise for at least 90% of the time. Provided the intrusiveness and amenity noise levels in the policies are achieved, then it is unlikely that most people would consider the resultant noise levels excessive.

In those cases when the PSTLs are not, or cannot be, achieved, then it does not automatically follow that those people affected by the noise would find the noise unacceptable. In subjective terms, exceedances of the PSTLs are described in the NSW Government's *Voluntary Land Acquisition and Mitigation Policy - For State Significant Mining, Petroleum and Extractive Industry Developments* (NSW Government, 2018) and reproduced in Table 6.8 below.

Table 6.8 – Characterisation of Noise Impacts & Potential Treatments

If the Predicted Noise Level minus the Project Noise Trigger Level is:	And the Total Cumulative Industrial Noise Level is:	Characterisation of Impacts:	Potential Treatment:
All time periods 0-2 dB(A)	Not applicable	Impacts are considered to be **negligible**	The exceedances would not be discernible by the average listener and therefore would not warrant receiver based treatments or controls.
All time periods 3-5 dB(A)	• < recommended amenity noise level in Table 2.2 of the NPfI; or • > recommended amenity noise level in Table 2.2 of the NPfI, but the increase in total cumulative industrial noise level resulting from the development is ≤ 1 dB	Impacts are considered to be **marginal**	Provide mechanical ventilation/comfort condition systems to enable windows to be closed without compromising internal air quality/amenity.
All time periods 3-5 dB(A)	> recommended amenity noise level in Table 2.2 of the NPfI, and the increase in total cumulative industrial noise level resulting from the development is > 1dB	Impacts are considered to be **moderate**	As for marginal impacts but also upgraded facade elements such as windows, doors or roof insulation, to further increase the ability of the building façade to noise levels.
Day and evening >5 dB(A)	≤ recommended amenity noise levels in Table 2.2 of the NPfI	Impacts are considered to be **moderate**	As for marginal impacts but also upgraded facade elements such as windows, doors or roof insulation, to further increase the ability of the building façade to noise levels.

If the Predicted Noise Level minus the Project Noise Trigger Level is:	And the Total Cumulative Industrial Noise Level is:	Characterisation of Impacts:	Potential Treatment:
Day and evening >5 dB(A)	> recommended amenity noise levels in Table 2.2 of the NPfI	Impacts are considered to be **significant**	Provide mitigation as for moderate impacts and see voluntary land acquisition provisions below.
Night >5 dB(A)	Not applicable	Impacts are considered to be **significant**	Provide mitigation as for moderate impacts and see voluntary land acquisition provisions below.

Furthermore, the policy also presents information regarding the requirements for voluntary mitigation and voluntary acquisition. A consent authority can apply voluntary mitigation and voluntary land acquisition rights to reduce (NSW Government, 2018):

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

But not:

- *construction noise impacts, as these impacts are shorter term and can be controlled;*
- *noise impacts on the public road or rail network; or*
- *modifications of existing developments with legacy noise issues, where the modification would have beneficial or negligible noise impacts*[2].

Voluntary Mitigation Rights

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

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

[2] *Noise issues for existing premises may be addressed through site-specific pollution reduction programs under the Protection of the Environment Operations Act 1997.*

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

The selection of mitigation measures in cases when the PSTLs are not, or cannot be, achieved, should be guided by the potential treatments identified in Table 6.8.

Voluntary Land Acquisition Rights

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

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

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

6.2.5 Cumulative Noise Levels

For cumulative noise levels, the NPfI amenity criteria is applicable as it is intended to control the total noise level at a receiver location from all industrial or mining developments. Cumulative noise levels are therefore assessed against the recommended amenity level nominated in Table 6.5.

Recommended amenity noise levels for receivers if assessed as 'industrial interface' receivers would be less stringent for all periods (Table 6.6). Renzo Tonin & Associates has therefore assessed cumulative noise levels with and without application of the 'industrial interface' adjustment.

6.2.6 Sleep Disturbance

The potential for sleep disturbance from maximum noise level events from the Project during the night time period needs to be considered. Section 2.5 of the NPfI provides sleep disturbance trigger levels and the relevant trigger levels as summarised below:

- *$L_{Aeq,15min}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or*
- *L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater,*

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

For the RBLs in Table 6.4, the relevant trigger levels for the Project are summarised in Table 6.9 below.

Table 6.9 – Sleep Disturbance Trigger Levels

Representative Receiver Location	Sleep Disturbance Trigger Levels, 10:00 pm - 7:00 am	
	$L_{Aeq,15\ minute}$	L_{AFmax}
374 Cordeaux Road, Mount Kembla	40 dB(A)	52 dB(A)
Location off O'Briens Road, Figtree	40 dB(A)	52dB(A)
2 Birmingham Street, Cringila	45 dB(A)	55dB(A)

6.3 Blasting

Blasting produces ground-borne vibration and when close to the surface, air blast overpressure, both of which can cause discomfort, and at higher levels, damage to property.

Blasting for the Dendrobium Mine underground operations is typically only required for minor activities and therefore only utilises a small maximum instantaneous charge (MIC). Any blasting within the mining area is confined to the deep coal seams, greater than 300 m underground. Some small blasts may also be required during Project construction activities or demolition, which would include potential blasting for the construction of the proposed ventilation shaft site, however, this is subject to detailed design, local geotechnical conditions and the feasibility of the proposed construction methods.

Blasting activities would be temporary in nature and due to the location of the proposed ventilation shaft site, would be isolated from receivers. Notwithstanding, the infrastructure and properties potentially affected by Project underground blasting, should it be required, which have been considered for the purposes of this Noise and Blasting Assessment includes:

- Private residences.
- Endeavour Energy 33 kV aerial powerlines which cross the extent of the proposed longwall mining area.
- Water pipelines owned by Sydney Water within the extent of the Project underground mining area.
- Disused Maldon-Dombarton Rail Corridor owned by Australian Rail Track Corporation, which crosses Area 5 for the Project.
- Mine-owned infrastructure and private residences within the vicinity of the Project underground mining area.

6.3.1 Ground Vibration and Airblast Overpressure Criteria

The Australian and New Zealand Environment Council *Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration* has been adopted by the EPA and establish ground vibration and airblast overpressure criteria for potentially effected locations.

Any blast charge configuration should be selected to ensure that EPA goals are not exceeded. Before blasting can commence at a site, critical locations should be identified and appropriate measures taken to limit over pressure and vibration to acceptable levels. Blasts should initially be monitored at these locations to ensure that predicted over pressure and vibration levels are not exceeded.

The recommended goals for blasting are based on NSW EPA's *Environmental Noise Control Manual* guidelines (EPA, 1994). These state that:

> *"Blasting operations should in most cases be confined to the periods Mondays to Saturdays, 9am to 3pm. Blasting outside of those times should be approved only where blasting during the preferred times is clearly impracticable, and should then be limited in number. Blasting at night should be avoided unless it is absolutely necessary."*

Table 6.10 presents the criteria for blast over pressure and ground vibration for the control of blasting impact on residential premises.

Table 6.10 – Criteria for the Control of Blasting Impact at Residences

Day	Time of Blasting	Blast Overpressure Level, dB(Lin)	Ground Vibration, peak particle velocity, (mm/sec)
Monday to Saturday	9:00 am – 3:00 pm	115	5
Monday to Saturday	6:00 am – 9:00 am, 3:00 pm – 8:00 pm	105	2
Sunday, Public Holiday	6:00 am – 8:00 pm	95	1
Any day	8:00 pm – 6:00 am	95	1

The recommended maximum level for airblast is 155 dB(Lin). In addition, any exceedance above a blast over pressure of 115 dB(Lin) should be limited to not more than 5% of the total number of blasts in a 12 month period. On these infrequent occasions a maximum limit of 120 dB(Lin) should not be exceeded at any time.

The recommended maximum for ground vibration is a vibration velocity of 5 mm/sec. Ground vibration above 5 mm/sec should also be limited to not more than 5% of the total number of blasts in a 12 month period. On these infrequent occasions a maximum limit of 10 mm/sec should not be exceeded at any time.

6.3.2 Structural Considerations

For assessment of structural damage due to airblast over pressure, AS 2187.2-2006 *Explosives – Storage, Transport and Use – Part 2 Use of Explosive* recommends a 133 dB(Lin) level as a safe level that will prevent structural/architectural damage from airblast over pressure. The limiting criteria for the control of airblast over pressure impact at residences presented in Table 6.10 are more stringent than the AS 2187.2-2006 structural damage limits. If compliance with the limiting criteria is achieved then compliance with the structural damage criteria is also achieved. Therefore the structural criteria from airblast over pressure for residences are not considered further from here on.

For assessment of structural damage due to ground vibration, AS 2187.2-2006 recommends frequency dependent criteria taken from British Standard BS 7385-2 and the United States Bureau of Mines RI 8507. In practice, the limiting criteria for the control of ground vibration impact at residences presented in Table 6.10 are more stringent than the AS 2187.2-2006 structural damage limits.

If compliance with the limiting criteria is achieved then compliance with the structural damage criteria is also achieved. Therefore, the structural criteria from ground vibration for residences are not considered further from here on.

Compliance with the limiting criteria presented in Table 6.10 will also be considered when assessing potential blasting impacts on non-residential receivers, as this represents more stringent criteria.

6.4 Road Traffic Noise

Noise impact from the potential increase in traffic on the surrounding road network due to construction and operational activities is assessed against the RNP. The RNP sets out criteria to be applied to particular types of road and land uses. These noise criteria are to be applied when assessing noise impact and determining mitigation measures for sensitive receivers that are potentially affected by road traffic noise associated with the construction and operation of the subject site, with the aim of preserving the amenity appropriate to the land use.

Table 6.11 sets out the assessment criteria for residences, to be applied to particular types of projects, road category and land use. These criteria are for assessment against facade corrected noise levels when measured in front of a building facade.

The surrounding road network potentially impacted by the Project traffic primarily consists of roads classified as sub-arterial roads. It is noted that trucks hauling Project coal-wash reject material would typically be undertaken on a combination of arterial and sub-arterial roads, but does not warrant additional traffic assessment as this activity is already approved, and includes backloading approved Appin Mine coal haulage trucks operating on major roads.

In Table 6.11 below and in accordance with the RNP, freeways, arterial roads and sub-arterial roads are grouped together and attract the same criteria.

Table 6.11 – Road Traffic Noise Assessment Criteria for Residential Land Uses

Road Category	Type of Project/Land Use	Assessment Criteria, dB(A)	
		Day 7:00 am – 10:00 pm	Night 10:00 pm – 7:00 am
Freeway/arterial/sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq,(15\ hour)}$ 60 (external)	$L_{Aeq,(9\ hour)}$ 55 (external)

Where existing traffic noise levels are above the noise assessment criteria, the primary objective is to reduce these through feasible and reasonable measures to meet the assessment criteria.

As described in the RNP, in assessing feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.

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

6.4.1 Relative Increase Criteria

The traffic noise impact from the 'land use development with potential to generate additional traffic on existing road' would need to also comply with the 'Relative Increase Criteria' as discussed in Section 2.4 of the RNP. The relative increase criteria are to be applied to the external areas of existing residential and sensitive land uses impacted upon by traffic noise.

The relative increase criteria as set out in the RNP applicable to the Project are reproduced in Table 6.12.

Table 6.12 – Relative Increase Criteria

Type of Development	Total Traffic Noise Level Increase, dB(A)
Land use development with the potential to generate additional traffic on existing road	Existing traffic $L_{Aeq(period)}$ + 12 dB (external)

6.5 Rail Traffic Noise

Noise impact from rail traffic is assessed against the RING. The RING sets out the methodology for assessing rail traffic generation on existing rail network and non-network rail lines on or exclusively servicing industrial sites. As the Kemira Valley Rail Line is used exclusively by the Project, the assessment for rail operational noise is based on the methodology for assessing rail traffic generation on non-network rail lines on or exclusively servicing industrial sites.

The RING states that rail related activities (such as movement of rolling stock on rail loops or sidings loading and shunting activities, etc.) occurring within the boundary of an industrial premises as defined in an EPL are to be assessed as part of the industrial premises using the NSW INP (superseded by the NPfI). Therefore, rail related activities occurring within the boundary of the Project surface facilities has been considered as part of the operational noise assessment scenarios.

For a non-network rail line exclusively servicing one or more industrial sites extending beyond the boundary of the industrial premises, the RING states that noise from this section of track should be assessed against the recommended acceptable L_{Aeq} noise levels from industrial noise sources for the relevant receiver type and indicative noise amenity area in Table 2.1 of the INP which is reproduced in Table 6.5 (based on the NPfI which supersedes the INP).

7 Construction Noise Assessment

7.1 Construction Noise Modelling Scenario

The construction noise modelling scenario is based on the initial phase commencing in Year 1 of the Project. Surface construction activities would generally occur during the daytime only (e.g. construction of the Dendrobium Pit Top Carpark Extension), while some construction and development works (e.g. drilling for ventilation shafts and underground development activities) would occur 24 hours per day, seven days per week. It is noted that some daytime construction activities are proposed outside of ICNG standard construction hours (e.g. Saturday afternoons).

It is noted that construction activities associated with other ancillary infrastructure for Shaft Site No. 5A, including the construction of electrical transmission line, temporary pumping station and pipelines and temporary construction carparking facilities, have not been included in the modelling scenario. The nearest receiver is located in excess of 3 km away from the site, and based on the temporary and transient nature of these construction works, the estimated construction noise at the nearest receiver would be well below the most stringent construction NML presented and do not need to be considered in the modelling.

7.2 Construction Noise Sources

The Sound Power Levels (SWLs) of plant likely to be used during the construction activities have been determined based on manufacturer's specifications, or other available information including Renzo Tonin & Associates' database of noise levels and previous studies.

Modifying factor adjustments, as per Fact Sheet C of the NPfI, has been considered for all proposed plant and equipment. Based on Renzo Tonin & Associates' experience, noise from all proposed plant and equipment, individually and in combination were determined not to exhibit tonal, low-frequency, impulsive, and/or intermittent characteristics. Therefore, no modifying factors corrections are required.

A summary of plant and equipment included in the noise modelling for the construction scenarios, and relevant SWLs, is provided in Table 7.1 and 7.2.

Table 7.1 – Indicative Construction Plant and Equipment Fleet List and SWLs – Dendrobium Pit Top

Plant Item	Specification	SWLs, dB(A) re. 1pW (per Item)	Number of Items	
			Full Fleet	Full Fleet minus Carpark Extension Construction Fleet
Dendrobium Pit Top				
Bitumen Plant	-	113	1	1
Low Loader	-	112	1	1
Water Cart	-	110	1	-
Tool Carrier	10t	110	1	1

Plant Item	Specification	SWLs, dB(A) re. 1pW (per Item)	Number of Items	
			Full Fleet	Full Fleet minus Carpark Extension Construction Fleet
Dozer	-	109	1	-
Delivery Truck	-	108	1	1
Backhoe/excavator	-	107	1	1
Grader	-	107	1	-
Concrete Truck	-	106	1	-
Concrete Pump	-	102	1	-
Elevating Work Platform	-	98	1	1
Forklift	5t	98	1	1

Table 7.2 – Indicative Construction Plant and Equipment Fleet List and SWLs – Shaft Site No. 5A

Plant Item	Specification	SWLs, dB(A) re. 1pW (per Item)	Number of Items
			Full Fleet
Shaft Site No. 5A			
Low Loader	-	112	1
Drill	Blind Bore	112	1
Crane	-	110	1
Water Cart	-	110	1
Tool Carrier	10t	110	2
Dump truck	-	110	4
Dozer	-	109	1
Delivery Truck	-	108	1
Backhoe/excavator	-	107	1
Grader	-	107	1
Concrete Truck	-	106	1
Concrete Pump	-	102	1
Elevating Work Platform	-	98	1
Forklift	5t	98	1
Compressor	-	98	2

7.3 Noise Modelling Methodology

Noise emissions from the various plant and equipment listed in Table 7.1 and 7.2 were calculated to the nearest and potentially most affected residential receiver locations identified in Section 3. Noise emissions were determined by modelling the noise sources, receiver locations, topographical features of the intervening area and recommended noise control treatments, using the SoundPLAN computer program. SoundPLAN is an industry accepted noise modelling program which calculates the contribution of each noise source at each specified receptor point and allows for the prediction of the total noise from a site. SoundPLAN is endorsed by the EPA and its environmental noise predictions have been verified on many occasions using noise monitoring measurements in the field.

Noise levels were calculated at the nearest affected residential locations considering the worst case scenario of all plant operating simultaneously. A sub-scenario was also conducted for the Dendrobium Pit Top construction activities without carpark extension construction activities.

7.4 Predicted Construction Noise Levels

Table 7.3 below presents the number of private residences predicted to exceed the ICNG construction noise management levels for the worst case construction noise levels for Year 1 at the nearest potentially affected receivers to the Dendrobium Pit Top. Compliance is predicted for the other two construction localities at all private receivers. Detailed predicted construction noise levels for all receivers are presented in Appendix D and construction noise contours are presented in Appendix E.

Table 7.3– Predicted Construction Noise Levels at Nearest Potentially Affected Private Receivers ($L_{Aeq,15minute}$)

Construction Noise Management Level, dB(A)				Predicted Number of Private Residences Exceeding Construction Noise Management Levels for Year 1, dB(A)			
				Outside Standard Hours NML		Standard Hours NML	
Day Standard Hours	Day Outside Standard Hours	Evening	Night	Full Fleet[1]	Full Fleet minus Carpark Construction Fleet	Full Fleet	Full Fleet minus Carpark Construction Fleet
45	40	N/A	N/A	41	6	25	3

Notes: 1. Not applicable with the IMC commitment to conduct carpark extension works during ICNG standard hours only.

From Appendix D, it can be seen that for the predicted construction noise levels, all receivers would experience noise levels well within the highly affected noise level of 75 dB(A).

The major construction noise source is the development of the Dendrobium Pit Top Carpark Extension, as shown in Table 7.3. During the full-fleet construction phase (i.e. general Dendrobium Pit Top and carpark extension construction activities), exceedances of the ICNG outside standard hours NML was initially predicted at 41 private receivers. For full-fleet construction activities occurring within ICNG standard hours, exceedances are predicted at 25 private receivers (Table 7.3). These exceedances are predicted to range from 1 dB(A) to 17 dB(A), but would remain well below the highly affected noise level.

The construction of the Dendrobium Pit Top Carpark Extension is only a temporary activity, and once completed, there would be a limited number of predicted construction noise exceedances at private residences (associated with general Dendrobium Pit Top construction activities). During the full-fleet minus carpark extension construction phase, exceedances of the ICNG outside standard hours NML are predicted at 6 private receivers (i.e. R6a, D0066, D0069, D0070, D0071 and D0078). For full-fleet minus carpark extension construction activities occurring within ICNG standard hours, exceedances are predicted at only 3 private receivers (i.e. R6a, D0066 and D0071) (Appendix D).

IMC has committed to limit construction of the Dendrobium Pit Top Carpark Extension to ICNG standard hours, to reduce potential construction noise impacts during this activity.

Additional construction noise mitigation should be considered for these Mount Kembla proximal locations during daytime construction at the Dendrobium Pit Top if the works would involve the full construction fleet (Section 7.5).

Predicted construction noise levels for receivers located nearest to Shaft Site No. 5A construction activities (D121, D122 and D123) would comply with the NMLs for all periods (Appendix D).

Mine owned dwellings predictions are provided in Appendix D.

7.5 Construction Noise Mitigation

The following recommendations provide in-principle noise control solutions to reduce construction noise impacts to noise affected receivers proximal to the Dendrobium Pit Top. Where actual construction activities differ from those assessed in this report, more detailed design of noise control measures may be required.

IMC has committed to construction of the Dendrobium Pit Top Carpark Extension during ICNG standard hours only, to reduce potential construction noise impacts.

Table 7.4 sets out general noise mitigation measures to be implemented, as required. These measures are considered to by industry best practice and considered to be feasible and reasonable for the Project.

Table 7.4 – General Mitigation Measures for Construction Noise

Action Required	Details
Management Measures	
Implement community consultation measures – inform community of construction activity and potential impacts	Incorporate into community consultation strategy.
Site inductions	All employees, contractors and subcontractors are to receive a Project induction. The environmental component may be covered in toolbox talks and should include: • all relevant project specific and standard noise mitigation measures; • relevant licence and approval conditions; • permissible hours of work; • any limitations on high noise generating activities; • location of nearest sensitive receivers; • construction employee parking areas; • designated loading/unloading areas and procedures; • site opening/closing times (including deliveries); and • environmental incident procedures.
Monitoring	Noise monitoring should be considered.
Complaints handling	Each complaint to be investigated and appropriate noise amelioration measures put in place to mitigate future occurrences, where the noise in question is in excess of allowable limits.
Source Controls	
Construction respite period	Noise generating activities with impulsive characteristics (such as impact piling, jack hammering, etc) should only be carried out: • in continuous blocks, up to but not exceeding 3 hours each; and • with a minimum respite period of one hour between each block.
Equipment selection	Use quieter and less noise emitting construction methods where feasible and reasonable.
Maximum noise levels	All plant and equipment to be appropriately maintained to ensure optimum running conditions, with periodic monitoring.
Use of plant and equipment	The SWLs of plant and equipment items are to be considered in procurement decisions and should be consistent with Tables 7.1 and 7.2.
Use and siting of plant	Simultaneous operation of noisy plant within discernible range of a sensitive receiver is to be limited/avoided where possible. The offset distance between noisy plant and adjacent sensitive receivers is to be maximised where practicable. Plant used intermittently to be throttled down or shut down when not in use where practicable. Noise-emitting plant to be directed away from sensitive receivers where practical.

Action Required	Details
Plan worksites and activities to minimise noise	Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site.
Non-tonal reversing alarms	Non-tonal reversing beepers (or an equivalent mechanism) should be fitted and used on all construction vehicles and mobile plant regularly used on site for periods of over two months where practicable.
Path Controls	
Shield sensitive receivers from noisy activities	Where reasonable and feasible, use structures to shield residential receivers from noise such as: • site shed placement; • earth bunds; • temporary or mobile noise screens (where practicable); • enclosures to shield fixed noise sources such as pumps, compressors, fans etc (where practicable); and • consideration of site topography when situating plant.

8 Operational Noise Assessment

8.1 Operational Noise Modelling Scenario

The operational noise modelling scenario is based on the utilisation of the maximum operational fleet.

Operational noise for the Project would be largely unchanged from the existing operations of the approved Mine, with the most material changes arising from the operation of the proposed new upcast ventilation shaft site (in the Metropolitan Special Area).

8.2 Operational Noise Sources

The SWLs of plant likely to be used during the operation of the Project have been determined based on manufacturer's specifications, or other available information including Renzo Tonin & Associates database of noise levels and previous studies.

Modifying factor adjustments, as per Fact Sheet C of the NPfI, have been considered for all proposed plant and equipment. Noise from all proposed plant and equipment, individually and in combination were determined not to exhibit tonal, low-frequency, impulsive, and/or intermittent characteristics. Therefore, no modifying factor corrections are required.

It is noted that IMC implemented a number of self-imposed night time restrictions and management processes to minimise Dendrobium Pit Top noise generation. These include:

- Night-time curfew from 10:00 pm to 6:00 am. During the curfew, surface vehicle movements (e.g. operating forklifts) are minimised.
- Vehicle access restrictions (other than personnel passenger vehicles) are controlled through the Driver's Code of Conduct which specifies allowable travel times to the Dendrobium Pit Top. Vehicle access to the Dendrobium Pit top is limited to the hours of:
  - Monday to Friday: 7:00 am to 8:00 am, 9:30 am to 2:30 pm, 4:00 pm to 5:00 pm.
  - Saturday: 8:00 am to 1:00 pm.
- Closure of the workshop door during the evening and night periods.
- Low frequency alarms fitted to select permanent surface mining equipment and mine vehicles.

The proposed Shaft Site No. 5A includes one downcast shaft and one upcast shaft. Renzo Tonin & Associates has considered this and modelled the ventilation shaft site operating as an upcast ventilation shaft for the purposes of the Noise Assessment (i.e. downcast ventilation shafts would not have material noise emissions). The proposed ventilation shaft in Area 5 is located further than 4.5 km from the most proximal receivers (i.e. Caretaker's Quarters). It is noted that there are compressor units located at both the Dendrobium Pit Top and Kemira Valley Coal Loading Facility which have not been included in the indicative operational plant and equipment items modelled for the Project. However, these units are situated within buildings and would, therefore, not contribute materially to noise emissions. Compressor units not located within buildings (i.e. one external unit at each site) would not be significant noise sources at either location.

A summary of plant and equipment included in the operational noise modelling and relevant SWLs are provided in Table 8.1.

Table 8.1 – Indicative Operational Plant and Equipment List and SWLs

Plant Item	Specification	SWL dB(A) re. 1pW (per Item)	Number of Items			
			Day	Evening	Night Scenario 1 (10:00 pm – 6:15 am)[1]	Night Scenario 2 (6:15 am – 7:00 am)[2]
Kemira Valley Coal Loading Facility						
Dozer	-	109	1	1	1	1
Excavator	-	107	1	1	1	1
Rill Tower		106	1	1	1	1
Coal Sizer/Conveyor Motor Room	-	102	1	1	1	1
Trains	2x 2,000 Hp Diesel (loading)	97	1	1	1	1
Utilities/Light Vehicles	-	88	4	4	4	4
Conveyor	-	87/m	1	1	1	1
Dendrobium Pit Top						
Ballast Dumping	-	108	1	-	-	-
Ballast Truck Moving	-	106	1	-	-	-
Personnel Transporters	-	103	10	10	10	-
Large Forklift	-	98	1	1	-	1
Medium Forklift		98	1	1	-	1
Small Forklift		85	1	1	1	1
Workshop	-	99	1	-	-	-
Workshop – with door closed	-	89	-	1	1	1
Delivery Truck Idling	-	96	2	-	-	-
Utilities/Light Vehicle	-	88	3	1	1	1
Dendrobium CPP						
Coal Wash Haulage Truck (CPP to External Customers)	Truck and Dog	105 travelling	3	2	-	-
		96 idling	3	3		
Product Coal Haulage Truck (CPP to PKCT)	A Double	105 travelling	6	6	6	6
		96 idling	3	3	3	3
Front End Loader (CPP reject area to External Customers)	Cat 988	110	1	1	-	-
Front End Loader (CPP product area to PKCT)	Cat 988	110	2	2	2	2
Dozer (CPP product area)	D8 Cat	109	2	2	2	2
Train (unloading)	-	97	2	2	2	2

Plant Item	Specification	SWL dB(A) re. 1pW (per Item)	Number of Items			
			Day	Evening	Night Scenario 1 (10:00 pm – 6:15 am)[1]	Night Scenario 2 (6:15 am – 7:00 am)[2]
Water Truck	-	107	1	1	1	1
Workshop	-	99	1	1	1	1
CPP (including conveyors)	-	110	1	1	1	1
Utilities/Light Vehicle	-	88	1	1	1	1
Shaft Site No. 5A						
Fan	-	115	3	3	3	3

Notes: 1. IMC imposed curfew and road curfew to reduce vehicle movements
2. Road curfew only.

8.3 Noise Modelling Methodology

Noise emissions from the various plant and equipment listed in Table 8.1 were calculated to the nearest and potentially most affected residential receiver locations. Noise emissions were determined by modelling the noise sources, receiver locations, topographical features of the intervening area and recommended noise control treatments, using the SoundPLAN program.

Noise levels were calculated at the nearest affected residential locations considering the worst-case scenario of all plant operating simultaneously. As a further exercise, the noise levels resulting from adverse meteorological conditions, potentially increasing noise emissions at the nearest residences, were computed using the SoundPLAN program. These occurrences are expected to be infrequent based on typical weather patterns for the study area and present extreme cases.

Where feasible and reasonable, mitigation measures have been incorporated to reduce potential noise emissions. The iterative steps undertaken are described below:

1. Preliminary noise modelling of scenarios representative of the maximum noise emissions from the Project to identify the potential for noise exceedances.

2. Evaluation of various combinations of self-imposed night time restrictions and/or additional noise management and mitigation measures to assess their relative effectiveness.

3. Review of the effectiveness of these measures and assessment of their feasibility by IMC.

4. Adoption of management and mitigation measures to appreciably reduce noise emissions in comparison to unmitigated scenarios.

In summary, the key noise mitigation measures for the Project comprise:

- restriction of surface vehicle movements due to IMC's self-imposed night time restrictions from 10:00 pm to 6:00 am;

- vehicle access restrictions to the Dendrobium Pit Top (other than personnel passenger vehicles) controlled through the allowable travel times specified in the Driver's Code of Conduct;
- closure of the workshop door during the evening and night periods (6:00 pm to 7:00 am);
- modified underground machinery (rubber tyred vehicles); and
- introduction of low frequency alarms fitted to select permanent surface mining equipment and mine vehicles.

8.4 Predicted Operational Noise Levels

Table 8.2 below presents predicted maximum operational noise levels at the nearest potentially affected receivers assuming all noise control mitigation measures recommended above are fully implemented. Detailed predicted operational noise levels for all receivers are presented in Appendix F and operational noise contours are presented in Appendix G.

With regard to noise contours, the calculation involves numerical interpolation from a series of calculations to specific points within a regular spaced grid, 1.5 m above ground level. It is noted that the noise contours are estimates of the predicted noise levels, and the contour values may differ slightly from equivalent calculations at individual residences[4].

[4] Note that due to specific topographical features at receiver D0071, the predicted operational noise levels in Table 8.2 and Appendix F do not correspond to the operational noise contour diagrams in Appendix G (Figure 37 and Figure 38).

Table 8.2 – Predicted Operational Noise Levels at Nearest Potentially Affected Private Receivers ($L_{Aeq,15min}$)

Receiver	PSTL ($L_{Aeq,15min}$)			Recommended Amenity Level ($L_{Aeq,15min}$)			Predicted Operational Noise Levels, dB(A)			
	Day	Evening	Night	Day	Evening	Night	Day (max)	Evening (max)	Night Scenario 1 (max)	Night Scenario 2 (max)
Privately-owned Dwellings										
R2	*40*	*40*	*39*	*50*	*45*	*40*	26	26	26	24
R3a	*40*	*37*	*37*	*50*	*45*	*40*	31	28	28	15
R5a	*40*	*37*	*37*	*50*	*45*	*40*	34	31	31	19
R6a	*40*	*37*	*37*	*50*	*45*	*40*	44	42	42	31
R6b	*40*	*37*	*37*	*50*	*45*	*40*	38	35	35	24
D0065	*40*	*37*	*37*	*50*	*45*	*40*	40	39	39	25
D0066	*40*	*37*	*37*	*50*	*45*	*40*	41	39	39	28
D0071	*40*	*37*	*37*	*50*	*45*	*40*	41	39	38	38
R39a	*40*	*40*	*39*	*50*	*45*	*40*	39	40	40	40
CPP001	*45*	*43 (45)[4]*	*40 (43)[4]*	*55 (58)*	*45 (48)[4]*	*40 (43)[4]*	42	42	38	38
CPP002	*45*	*43 (45)[4]*	*40 (43)[4]*	*55 (58)*	*45 (48)[4]*	*40 (43)[4]*	40	41	40	40
CPP003	*45*	*43 (45)[4]*	*40 (43)[4]*	*55 (58)*	*45 (48)[4]*	*40 (43)[4]*	36	37	36	36
CPP004	*45*	*43 (45)[4]*	*40 (43)[4]*	*55 (58)*	*45 (48)[4]*	*40 (43)[4]*	37	38	37	37
Non-Residential Receivers										
D0121	*58*	*53*	*48*	*N/A*	*N/A*	*N/A*	<20	<20	<20	<20
D0122	*58*	*53*	*48*	*N/A*	*N/A*	*N/A*	<20	<20	<20	<20
D0123	*50 when in use*			*N/A*	*N/A*	*N/A*	<20	<20	<20	<20

Notes
1. Predictions for mine-owned dwellings are provided in Appendix D.
2. **Green** denotes a **negligible** exceedance of 0-2 dB(A) above the PSTL.
3. **Orange** denotes a **marginal** exceedance of 3-5 dB(A) above the PSTL, and the total cumulative industrial noise level is ≤ recommended amenity noise level.
4. **Blue** denotes a **moderate** exceedance of 3-5 dB(A) above the PSTL, and the total cumulative industrial noise level is > recommended amenity noise level.
5. Revised PSTLs if 'industrial interface' criteria adjustment is applied.

A summary of the properties with PSTL exceedances during the operation phase are presented in Table 8.3 below.

Table 8.3 – Summary of Properties with PSTL Exceedances

Property Ownership	Negligible 0-2 dB(A) above PSTL	Marginal 3-5 dB(A) above PSTL	Moderate 3-5 dB(A) above PSTL	Moderate >5 dB(A) above PSTL	Significant >5 dB(A) above PSTL (Day and Evening)	Significant >5 dB(A) above PSTL (Night)
Privately Owned	D0065, D0066, D0071, R39A	-	R6a	-	-	-

Private receivers D0065, D0066, D0071 and R39a are predicted to experience negligible exceedances above the PSTL derived in accordance with the NPfI and are not considered further as per NSW Government (2018) policy.

One private receiver (R6a) would experience marginal exceedances above the PSTL during the day and evening periods, and would experience moderate exceedance above the PSTL during the night (Scenario 1) period. It is noted that the total cumulative noise levels would be below the recommended amenity noise levels for the day, evening and night (Scenario 2) periods.

8.5 Amenity Noise Levels

The following receivers identified in Table 8.4 were classified as non-residential and required assessment against the NPfI Amenity criteria.

Table 8.4 – Summary of Non-Residential Properties

Receiver ID	Project Location	Category	Amenity Trigger Level, $L_{Aeq,15min}$, dB(A)			Operational Noise Prediction, $L_{Aeq,15min}$, dB(A)			
			Day	Evening	Night	Day	Evening	Night 1	Night 2
D0002	Dendrobium Pit Top	Commercial	*68 (when in use)*			67	66	66	47
D0003	Dendrobium Pit Top	Commercial	*68 (when in use)*			6/	64	56	66
D0005	323-327 Cordeaux Rd Mount Kembla	School	*External 48 (when in use)*			33	31	31	19
D0019	29 Harry Graham Dr Kembla Heights	Recreation Facility	*53 (when in use)*			30	26	26	23
D0041	1 Church Lane Kembla Heights	Recreation Facility	*53 (when in use)*			32	28	27	26
D0043	41 Harry Graham Dr Kembla Heights	Commercial	*68 (when in use)*			28	24	24	24
D0053	617 Cordeaux Rd Kembla Heights	Place of Worship	*External 53 (when in use)*			<20	<20	<20	<20
D0105	340 Harry Graham Dr Kembla Heights	Recreation Facility	*53 (when in use)*			26	26	26	26
D0106	Stafford Rd Mount Kembla	Recreation Facility	*53 (when in use)*			30	26	26	26

Receiver ID	Project Location	Category	Amenity Trigger Level, $L_{Aeq,15min}$, dB(A)			Operational Noise Prediction, $L_{Aeq,15min}$, dB(A)			
			Day	Evening	Night	Day	Evening	Night 1	Night 2
D0107	301 Cordeaux Rd Mount Kembla	Place of Worship	*External 53 (when in use*			30	29	29	18
D0108	Cordeaux Rd Mount Kembla	Commercial	*68 (when in use)*			29	29	28	17
D0109	274 Cordeaux Rd Mount Kembla	Commercial	*68 (when in use)*			28	27	27	17
D0110	Stones Rd Mount Kembla	Recreation Facility	*53 (when in use)*			26	27	27	18
D0121	Cordeaux Dam Rd Cataract	Commercial	*68 (when is use)*			<20	<20	<20	<20
D0122	Cordeaux Dam Rd Cataract	Caretakers Quarters	*58*	*53*	*48*	<20	<20	<20	<20
D0123	Cordeaux Dam Rd Cataract	Recreation Facility	*53 (when in use)*			<20	<20	<20	<20
D0124	Upper Cordeaux Lake No.2	Caretakers Quarters	*58*	*53*	*48*	<20	<20	<20	<20
D0126	200 Cordeaux Rd Mount Kembla	Commercial	*68 (when in use)*			28	24	24	22

Whilst the predicted operational noise levels presented in Appendix F for these receivers are in $L_{Aeq(15\ minute)}$ levels, rather than $L_{Aeq(period)}$ levels required by the amenity criteria (Section 6.2.2), it is clear from review of the predicted operational noise levels that the relevant criteria in Section 6.2.2 would be met for all these receivers.

8.6 Cumulative Noise Levels

The assessment of cumulative noise impacts considers the total and relative noise from the Project and the adjacent BlueScope Steel Port Kembla site, the proposed Port Kembla Gas Terminal and the operating Port Kembla Coal Terminal. The contribution of noise from the BlueScope Steel Port Kembla site, the proposed Port Kembla Gas Terminal and the Port Kembla Coal Terminal has been taken from predicted noise levels presented in the *BlueScope Steel Limited Port Kembla Steelworks Ore Preparation Area Upgrade Noise Impact Statement* prepared by Bridges Acoustics (2006), *Port Kembla Gas Terminal Noise and Vibration Impact Assessment* prepared by Australian Industrial Energy (2018) and the *Proposed Expansion of General Cargo Handling Facility Environmental Assessment Report* prepared by SKM (2005), respectively.

The cumulative noise impacts of the BlueScope Steel Port Kembla site are most relevant to the Dendrobium CPP (i.e. receivers represented by CPP001 and CPP002), while cumulative noise impacts of the proposed Port Kembla Gas Terminal and from Port Kembla Coal Terminal are most relevant to product coal haulage activities from the Dendrobium CPP to the Port Kembla Coal Terminal (i.e. receivers represented by CPP003 and CPP004).

It is noted that the assessment of cumulative noise impacts is undertaken in consideration of the average L_{Aeq} noise level over a period (day, evening and night). For a conservative assessment, the predicted $L_{Aeq(15\ min)}$ for each period has been used which corresponds to the worst case 15 minute noise emissions occurring continuously over the entire period. The assessment is, therefore, conservative as the worst case 15-minute noise emissions would generally not occur from all sites over the entire period.

From Table 8.5, the cumulative noise levels were found to be within the nominated criteria for all periods for receivers CPP001, CPP002 and CPP004. Noise emissions from the Port Kembla Coal Terminal currently exceed the recommended amenity noise level at receiver CPP004 in the absence of an 'industrial interface' adjustment and noise emissions from the Project would increase cumulative noise levels by up to 1 dB(A), which is an insignificant increase in noise level. Due to the high existing noise environment in this area it is noted that during the worst-case night-time scenario the predicted cumulative noise levels would be at the measured background noise level of 45 dB(A) (SKM, 2005). Therefore, the noise emissions would likely be masked by existing surrounding noise and not be noticeable to residences. It is noted that receivers CPP001, CPP002, CPP003 and CPP004 would all comply with the recommended amenity criteria with the application of the 'industrial interface' amenity noise level adjustment.

It is also noted that the above cumulative predictions are based on conservative assumptions and the Project coal haulage activities from the Dendrobium CPP to the Port Kembla Coal Terminal are already approved and occurring under DA 60-03-2001 for the approved Mine. The Project would therefore represent a continuation of this current activity.

8.7 Sleep Disturbance

From Table 8.2, the night time sleep disturbance assessment level of $L_{Aeq,15min}$ 40dB(A) is exceeded at one privately owned residence, Receiver R6a, by 2dB(A), which is considered negligible. IMC currently enforces a self-imposed night time restriction to limit the likelihood of sleep disturbance events and maximum L_{AFmax} levels at surrounding receivers are expected to be no more than 5dB(A) higher than the predicted $L_{Aeq,15min}$ levels in Table 8.2. Therefore, L_{AFmax} levels at surrounding receivers will be within the sleep disturbance assessment level of L_{AFmax} 52dB(A) and L_{AFmax} 55 dB(A) (for receivers representative of the Dendrobium CPP).

Table 8.5 – Cumulative Noise Levels from the Project and BlueScope Steel Port Kembla, Proposed Port Kembla Gas Terminal and PKCT dB(A)

Receiver ID	Criteria			Project				BlueScope Steel Port Kembla				Port Kembla Gas Terminal				PKCT				Cumulative Noise			
	Recommended Amenity Level			Day	Eve	Night Sc. 1	Night Sc. 2	Day	Eve	Night Sc. 1	Night Sc. 2	Day	Eve	Night Sc. 1	Night Sc. 2	Day	Eve	Night Sc. 1	Night Sc. 2	Day	Eve	Night Sc. 1	Night Sc. 2
	Day	Evening	Night																				
CPP001	*55 (63)[1]*	*45 (53)[1]*	*40 (48)[1]*	42	42	38	38	33	33	33	33	<30	<30	<30	<30	-	-	-	-	42	42	39	39
CPP002	*55 (63)[1]*	*45 (53)[1]*	*40 (48)[1]*	40	41	40	40	31	31	31	31	<30	<30	<30	<30	-	-	-	-	40	41	40	40
CPP003	*55 (63)[1]*	*45 (53)[1]*	*40 (48)[1]*	36	37	36	36	31	31	31	31	22	22	22	22	-	-	-	-	37	38	37	37
CPP004	*55 (63)[1]*	*45 (53)[1]*	*40 (48)[1]*	37	38	37	37	31	31	31	31	25	25	25	25	44	44	44	44	45	45	45	45

Notes: 1. Criterion in brackets specifies the recommended amenity noise levels representing the application of the 'industrial interface' criteria adjustment for receivers proximal to the Port Kembla industrial precinct.

9 Blasting

9.1 Proposed Blasting Activities

Explosives are not required for general underground mining operations. However, on occasion, development works or the longwall mining operation could intercept geological structures that require the use of explosive charges to break up the feature, and avoid damage to underground mining equipment. The explosive charges required for such management are very small, with a maximum instantaneous charge (MIC) of approximately 15 kilograms (kg) Ammonium Nitrate Fuel Oil equivalent. Such blast may be undertaken at any time as required (i.e. 24 hours, 7 days).

Additionally, some small blasts may also be required during Project construction or demolition activities, which would include potential blasting for the construction of the proposed ventilation shaft site, however, would be subject to detailed design, local geotechnical conditions and the feasibility of the proposed construction method. These activities would be temporary in nature and due to the location of the proposed ventilation shaft site, would be isolated from receivers.

9.2 Blasting Assessment Methodology

Given that the proposed blasting activities for the operational stages would occur underground, it is not considered necessary to assess impacts from blast overpressure. Airblast overpressure propagating from underground (e.g. from shafts and drifts) would be negligible due to the attenuation associated with the underground workings. Consequently, the blasting assessment will focus on blast vibration.

The maximum predicted ground vibration that can be expected to impact relevant residential and non-residential infrastructure (Section 6.3) has been predicted at a location directly above the surface of the minimum depth of cover in the proposed Project underground mining area. This therefore represents the maximum level of ground vibration that can be expected at the surface above the blast.

In the absence of specific blasting information and seismic details of the site, the 'minimum distance limits' from blasting in terms of the vibration have been determined using the attenuation formula in AS 2187.2-1993 *Explosives – Storage, Transport and Use – Part 2 Use of Explosives*. It is noted that although AS 2187.2-1993 has been superseded by AS 2187.2-2006, AS 2187.2-1993 presents information for estimating free face blasting in hard or highly structured rock in addition to the estimation method for free face blasting in 'average field conditions'. Therefore, estimation of 'minimum distance limits' is based upon AS 2187.2-1993.

$$V = K\left(\frac{R}{Q^{1/2}}\right)^{-1.6}$$

where

V = ground vibration as peak particle velocity in mm/s

K = constant related to site and rock properties for estimation purposes. K = 500 for free face blasting in hard or highly structured rock and K = 1,140 for free face blasting in 'average field conditions'

R = distance between charge and point of measurement in metres

Q = effective charge mass per delay or MIC in kilograms

9.3 Blasting Impact Assessment

9.3.1 Minimum Distance Limits for Receivers

Based on the blasting assessment methodology in Section 9.2, the minimum distance limits, from blasting activities to the nearest receivers, to comply with blasting criteria for ground vibration are presented in Table 9.1. The minimum distance limits have been determined for both free face blasting in 'hard or highly structured rock' and free face blasting in 'average field conditions'.

Table 9.1 – Minimum Distance Limits to Comply with Blasting Vibration

Phase of Work	Day	Time of Blasting	Ground Vibration Criteria, (mm/sec)	MIC, kg	Minimum Distance Limits, m	
					Hard Rock	Average Conditions
Operation	Monday to Saturday	9:00 am – 3:00 pm	5	15	69	132
	Monday to Saturday	6:00 am – 9:00 am, 3:00 pm – 8:00 pm	2		122	204
	Sunday, Public Holiday	6:00 am – 8:00 pm	1		188	315
	Any day	8:00 pm – 6:00 am	1		188	315

Based on minimum depths of cover and the distance of residential receivers from the Project underground mining area, blasting impacts on receivers is predicted to be negligible given the minimum distance limits specified in Table 9.1.

9.3.2 Predicted Ground Vibration for Infrastructure

In addition to the above, the maximum predicted ground vibration that can be expected to impact relevant infrastructure (Section 6.3) has been predicted at a location directly above the surface of the minimum depth of cover in the proposed Project underground mining areas. This therefore represents the maximum level of ground vibration that can be expected at the surface immediately above the blast (Table 9.2).

Table 9.2 – Predicted Maximum Vibration Emission Levels

Project Underground Mining Area	Minimum Depth of Cover (m)	Predicted Surface Vibration Level (mm/s)		MIC, kg
		Hard Rock	Average Conditions	
Area 5	250	0.6	0.3	15

In summary, the maximum predicted ground vibration for Area 5 is 0.3 mm/s. As this is well below structural damage criterion for infrastructure items (e.g. buried pipelines), no adverse impacts are predicted, regardless of blast location, for all infrastructure at the surface (due to the minimum depths of cover of the Project underground mining area).

Potential minor blasts for surface construction or demolition activities, if required, would be designed to comply with relevant blast limits.

10 Road Traffic Noise Assessment

A Road Transport Assessment for the Project was prepared by The Transport Planning Partnership (TTPP) (2021). The Road Transport Assessment (TTPP, 2021) identified Cordeaux Road, East of Mount Kembla, as the road with the greatest increase in traffic volumes from the Project. As Cordeaux Road is an undivided collector road, it is therefore classified as sub-arterial. Future traffic volumes on Cordeaux Road, with and without the Project, were forecast by TTPP for the years 2023 and 2037. Table 10.1 presents the future day (7:00 am to 10:00 pm) and night (10:00 pm to 7:00 am) total traffic volumes for the non-mine traffic, Dendrobium Mine traffic and total traffic on Cordeaux Road, as supplied by TTPP, including a breakdown of light and heavy vehicles. It is noted that this represents an extension of and some increase to existing Mine traffic levels.

Table 10.1 – Forecast Future Traffic Volumes on Cordeaux Road

Scenario	Total Traffic (vehicles per day)					
	Day (7:00 am – 10:00 pm)			Night (10:00 pm - 7:00 am)		
	Light	Heavy	Total	Light	Heavy	Total
Non-Mine Traffic						
1. Year 2023 without Project	2,781	161	2,942	301	10	311
2. Year 2037 without Project	3,198	184	3,382	346	12	358
3. Year 2023 with Project	2,781	161	2,942	301	10	311
4. Year 2037 with Project	3,198	184	3,382	346	12	358
Dendrobium Mine Traffic						
1. Year 2023 without Project	493	37	530	272	14	286
2. Year 2037 without Project	0	0	0	0	0	0
3. Year 2023 with Project	544	57	601	293	14	307
4. Year 2037 with Project	548	41	589	303	14	317
Total Traffic						
1. Year 2023 without Project	3,274	198	3,472	573	24	597
2. Year 2037 without Project	3,198	184	3,382	346	12	358
3. Year 2023 with Project	3,325	218	3,543	594	24	618
4. Year 2037 with Project	3,746	225	3,971	649	26	675

Based on the traffic volumes in Table 10.1 and the nearest distance from Cordeaux Road to residential receivers, Table 10.2 presents the Dendrobium Mine traffic noise levels at the worst affected receiver location predicted for the years 2023 and 2037 and compared against the non-mine traffic. If the predicted traffic noise levels at the closest residential receiver meets the proposed criteria then the criteria would be met at all other residential receivers along the same road.

Table 10.2 – Predicted Day $L_{Aeq, 15hour}$ and Night $L_{Aeq, 9hour}$ Traffic Noise Levels

Scenario	Distance to Nearest Receiver, m	Day $L_{Aeq, 15hour}$ dB(A) (7:00 am – 10:00 pm)			Night $L_{Aeq, 9hour}$ dB(A) (10:00 pm - 7:00 am)		
		Total Traffic	Non-mine Traffic	Difference	Total Traffic	Non-mine Traffic	Difference
1. Year 2023 without Project	9	61	60	0.9	55	52	3.0
2. Year 2037 without Project	9	61	61	0.0	53	53	0.0
3. Year 2023 with Project	9	61	60	1.0	55	52	3.2
4. Year 2037 with Project	9	61	61	0.8	55	53	2.9

From Table 10.2, the daytime $L_{Aeq\ 15hour}$ traffic noise levels for non-mine traffic are predicted to exceed the RNP $L_{Aeq\ 15hour}$ noise criterion of 60 dB(A) for all years and scenarios. When considering the total traffic (inclusive of the Project), the increase in traffic noise is within the 2 dB(A) of the traffic noise level for all scenarios.

From Table 10.2, the night time $L_{Aeq\ 9hour}$ traffic noise levels predicted for non-mine traffic are within the RNP $L_{Aeq\ 9hour}$ noise criterion of 55 dB(A) for all years and scenarios. For years 2023 and 2037, total traffic noise levels for scenarios 1, 3 and 4 are more than 2 dB(A) higher than the non-mine traffic noise level; however, predicted total $L_{Aeq\ 9hour}$ traffic noise levels with the Project are within the RNP noise criterion of 55 dB(A).

From Table 10.2, the noise level change between the approved Mine and the Project scenarios are small at the receiver location, well below 12 dB. There are no scenarios where the Project would cause an increase of more than 12 dB over the approved scenario noise levels. The Project therefore complies with the relative increase criteria.

11 Rail Traffic Noise Assessment

11.1 Rail Operational Traffic Noise

Rail traffic noise occurs from the transport of sized ROM coal from the Kemira Valley Coal Loading Facility to the Dendrobium CPP via the Kemira Valley Rail Line. Prior to the operation of the Dendrobium Mine, the train transport system had historically operated seven days per week at a typical one train per hour.

The current typical rail movements along the Kemira Valley Rail Line for the Dendrobium Mine are shown in Table 11.1 below. There are no proposed changes to the current rail movements as a result of the Project, as well as no proposed changes to the currently approved operating hours of the Kemira Valley Rail Line (6:00 am to 11:00 pm).

Table 11.1 – Project Rail Movements

Period	Trains CPP to Kemira Valley Coal Loading Facility		Trains Kemira Valley Coal Loading Facility to CPP		Total Train Pass-bys	
	Average	Maximum	Average	Maximum	Average	Maximum
Mondays to Saturday						
Day	6	8	8	8	14	16
Evening	3	3	2	3	5	6
Night	2	2	1	2	3	4
Sunday and Public Holidays						
Day	5	7	8	8	13	15
Evening	3	3	2	2	5	5
Night	3	3	1	3	4	6

For the sections of the Kemira Valley Rail Line that are not within the Project surface facilities, the RING states that noise from this section of track should be assessed against the recommended acceptable L_{Aeq} noise levels from industrial noise sources for the relevant receiver type and indicative noise amenity area in Table 2.1 of the INP. As the INP has been superseded by the NPfI, this assessment has been made to Table 2.2 of the NPfI.

Based on the typical rail movements outlined in Table 11.1, which would remain unchanged for the Project, the required minimum setback distances from the Kemira Valley Rail Line for residential receivers to be compliant in accordance with assessment under RING criteria are shown below in the Table 11.2.

Table 11.2 – Minimum Setback Distances

Period	Amenity Noise Level, dB(A)	Minimum Compliance Setback Distance, m		Minimum Mitigation Setback Distance, m		Minimum Acquisition Setback Distance, m	
		Average	Maximum	Average	Maximum	Average	Maximum
Suburban Amenity							
Day	*55*	31	34	22	24	18	19
Evening	*45*	97	107	69	76	55	60
Night	*40*	103	126	74	89	58	72
Rural Amenity							
Day	*50*	55	59	40	42	31	34
Evening	*45*	97	107	69	76	55	60
Night	*40*	103	126	74	89	58	72

The minimum setback distances shown in Table 11.2 are large, in excess of 100 m, in order to comply with the nominated criteria for both the average and maximum Project rail movement scenarios. At the largest minimum setback distance of 126 m, there would be a number of dwellings within this distance along the length of the Kemira Valley Rail Line with predicted exceedances above the criteria.

As the Project is a legacy site, the following provisions of the *Voluntary Land Acquisition and Mitigation Policy - For State Significant Mining, Petroleum and Extractive Industry Developments* (NSW Government, 2018) specify that there should be no at receiver mitigation or voluntary acquisition rights afforded to receivers in close proximity to the Kemira Valley Rail Line.

> ***Mitigation and acquisition criteria***
>
> *A consent authority can apply voluntary mitigation and voluntary land acquisition rights to reduce:*
>
> - *Operational noise impacts of a development on privately owned land; and*
> - *Rail noise impacts of a development on privately owned land near a non-network rail line (private rail line), that is on, or exclusively servicing an industrial site (see Appendix 3 of the RING);*
>
> *But not:*
>
> - *Construction noise impacts, as these impacts are shorter term and can be controlled;*
> - *Noise impacts on the public road or rail network; or*
> - *Modifications of existing developments with legacy noise issues, where the modification would have beneficial or negligible noise impacts[5].*

[5] *Noise issues for existing premises may be addressed through site-specific pollution reduction programs under the Protection of the Environment Operations Act 1997.*

It is noted that the majority of rail noise complaints historically received by IMC were related to brake and wheel squeal and not related to general rail traffic noise (Section 4.5). As part of IMC's ongoing commitment to reduce noise impacts from the Kemira Valley Rail Line, there has been, and would continue to be, ongoing works to reduce brake squeal noise as discussed in Section 11.2.

11.2 Review of Brake Squeal on the Kemira Valley Rail Line

Based on the results of changed driver practices, brake squeal noise investigations on the Kemira Valley Rail Line and the subsequent replacement of brake pads on all trains operating on the line, measurement results indicate a significant reduction in the overall noise levels due to brake squeal events and the percentage of trains that generate brake squeal. Furthermore, the rail noise monitoring results presented in this report quantify noise reductions that have been achieved as a result of the joint Transport for NSW (TfNSW)/Pacific National investigation.

Details of the analysis of break squeal is presented in Appendix H.

11.3 Rail Noise Mitigation

IMC would continue to investigate and implement reasonable and feasible rail noise mitigation measures, that are industry best practice, over the life of the Project. This would include ongoing consultation with the Rail Noise Working Group (RNWG) to address rail noise through the below objectives:

- Reviewing noise results and identify rail noise mitigation options.
- Improving targeted track maintenance.
- Developing strategies for positive proactive community engagement.

Periodic rail noise monitoring and where necessary investigations and trials to address any further brake or wheel squeal issues that arise would be undertaken.

12 Conclusion

12.1 General

- The Project proposes access to additional coal within CCL 768 in the future underground mining area, namely Area 5. This extension would be supported by the development of supporting infrastructure and an extension to the life of approved surface operations to 2041.
- It is noted that the majority of noise sources at the Project surface facilities most proximal to private receivers would largely be unchanged from the existing operations and noise emissions of the approved Mine.
- A background noise survey for the Project has been conducted and the RBLs were determined to establish appropriate assessment noise levels for surrounding receivers in accordance with contemporary criteria including the NPfI and RING.
- An analysis of noise enhancement from adverse meteorological conditions has been conducted in accordance with the NPfI based upon meteorological data collected at the Kemira Valley weather station. Noise modelling for the operational phase was undertaken under a varied set of adverse meteorological conditions.

12.2 Project Construction Noise

- Surface construction activities would occur generally during the standard ICNG daytime only at surface facilities, while some construction activities would occur outside of standard hours. Drilling for ventilation shaft and underground development activities, would occur 24 hours per day, seven days per week, however these activities would be remotely located within the Metropolitan Special Area and are isolated from residential receivers.
- A number of privately-owned receivers were predicted to exceed the ICNG criterion with a full construction fleet, however, following the completion of the Dendrobium Pit Top Carpark Extension, the construction fleet would be reduced, and only three privately owned receivers are predicted to exceed the ICNG standard hours criterion. Construction activities for the Project would be temporary, and recommendations for the mitigation and management of construction noise at these receivers while construction activities are occurring have been provided. IMC has committed to limiting construction of the identified major construction noise generating activity (i.e. Dendrobium Pit Top Carpark Extension) to within ICNG standard hours. All privately-owned receivers would remain well below highly noise affected noise levels specified in the ICNG.

12.3 Project Operational Noise

- Five (5) privately owned receivers are predicted to experience negligible or moderate exceedances of the PSTL. Although these receivers are located very proximal to the Dendrobium Pit Top and Kemira Valley Coal Loading Facility, the predicted exceedances of the NPfI criteria are not significant. Feasible and reasonable mitigation measures have been incorporated to reduce potential noise emissions from the Project (including IMC imposed curfews and Drivers Code of Conduct).
- One (1) privately owned receiver is predicted to experience night-time $L_{Aeq,15min}$ noise levels slightly above the sleep disturbance assessment level; however, this exceedance is only 2 dB(A) and is therefore considered negligible, while the predicted L_{Fmax} noise level is within the applicable assessment level. With IMC current self-imposed night time restrictions, the likelihood of sleep disturbance events is limited.
- It is noted that there are currently no operational noise criteria for receivers proximal to the Dendrobium CPP under Development Consent DA 60-03-2001. If noise criteria are to be applied for the Project to potential Dendrobium CPP receivers, it is recommended that the 'industrial interface' adjustment be applied to reflect proximity to the Port Kembla industrial precinct.

12.4 Project Blasting Activities

- Underground blasting activities are proposed for the construction and operational phase of the Project.
- Based on proposed minor MIC sizes for blasting during the construction and operational phases, the minimum distance limits to comply with ground vibration have been determined. Due to the depths of cover and distance of receivers from potential underground blasting activities, no exceedances of the blasting impact criteria is predicted.

12.5 Project Road Traffic Noise

- Road traffic noise was assessed for the years 2023 and 2037 along Cordeaux Road, East of Mount Kembla, as determined by the Road Transport Assessment for the Project (TTPP, 2021).
- Predicted road traffic noise levels at all locations for all periods were found to comply with the RNP criteria.

12.6 Rail Traffic Noise

12.6.1 Rail Operational Traffic Noise

- Minimum setback distances to comply with the RING criteria were determined based on the Project rail movements. Review of the required minimum setback distances showed that there would be a number of dwellings exceeding the RING criteria along the length of the Kemira Valley Rail Line.
- It is noted that the Dendrobium Mine is a legacy site which is predicted to be compliant with the conditions of Development Consent DA 60-03-2001 for rail haulage impact assessment. As a legacy site, the provisions of the *Voluntary Land Acquisition and Mitigation Policy - For State Significant Mining, Petroleum and Extractive Industry Developments* (NSW Government, 2018) specify that at receiver mitigation or voluntary acquisition rights would not be afforded to receivers exceeding the RING in close proximity to the Kemira Valley Rail Line.

12.6.2 Brake Squeal Noise

- Based on the results of changed driver practices, brake squeal noise investigations on the Kemira Valley Rail Line and the subsequent replacement of brake pads on all trains operating on the line, measurement results indicate a significant reduction in the overall noise levels due to brake squeal events and the percentage of trains that generate brake squeal.
- Furthermore, the rail noise monitoring results presented in this report quantify noise reductions that have been achieved as a result of the joint TfNSW/Pacific National investigation.
- IMC would continue to implement reasonable and feasible rail noise mitigation measures over the life of the Project in consultation with the RNWG, to address rail noise through the below objectives:
    - Reviewing noise results and identify rail noise mitigation options.
    - Improving targeted track maintenance.
    - Developing strategies for positive proactive community engagement.

References

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13. SKM (2005) *Proposed Expansion of General Cargo Handling Facility Environmental Assessment Report*.
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15. Wilkinson Murray (2009) *Bulli Seam Operations Noise Impact Assessment*.

APPENDIX A Glossary of Terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Assessment period	The period in a day over which assessments are made.
Assessment point	A point at which noise measurements are taken or estimated.
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L_{90} noise level (see below).
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of every day sounds: 0 dB The faintest sound we can hear 30 dB A quiet library or in a quiet location in the country 45 dB Typical office space. Ambience in the city at night 60 dB CBD mall at lunch time 70 dB The sound of a car passing on the street 80 dB Loud music played at home 90 dB The sound of a truck passing on the street 100 dB The sound of a rock band 110 dB Operation of a jackhammer or chainsaw 120 dB Deafening
dB(A)	A-weighted decibels. The A-weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L_{Max}	The maximum sound pressure level measured over a given period.
L_{Min}	The minimum sound pressure level measured over a given period.
L_1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.

L_{10}	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L_{90}	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L_{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.

APPENDIX B Long-term Noise Monitoring Methodology

B.1 Noise Monitoring Equipment

A long-term unattended noise monitor consists of a sound level meter housed inside a weather resistant enclosure. Noise levels are monitored continuously with statistical data stored in memory for every 15-minute period.

Long term noise monitoring was conducted using the following instrumentation:

Description	Type	Octave band data	Logger location(s)
RTA05 (NTi Audio XL2)	Type 1	1/1 & 1/3	L3
RTA06 (NTi Audio XL2, with low noise microphone)	Type 1	1/1 & 1/3	L1, L2

Notes: All meters comply with AS IEC 61672.1 2004 "Electroacoustics - Sound Level Meters" and designated either Type 1 or Type 2 as per table, and are suitable for field use.

The equipment was calibrated prior and subsequent to the measurement period using a Brüel & Kjaer Type 4231 calibrator. No significant drift in calibration was observed.

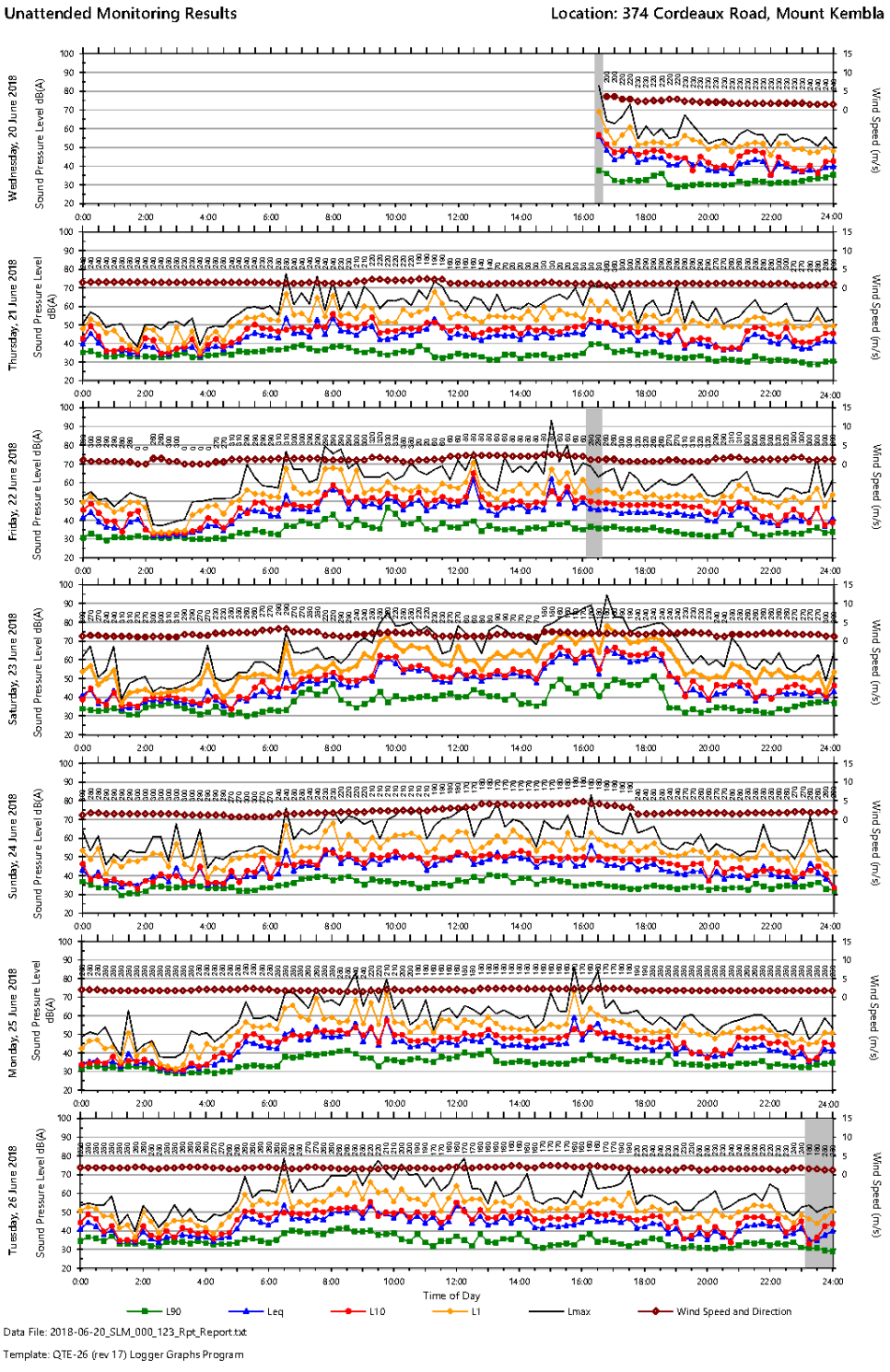
B.2 Meteorology During Monitoring

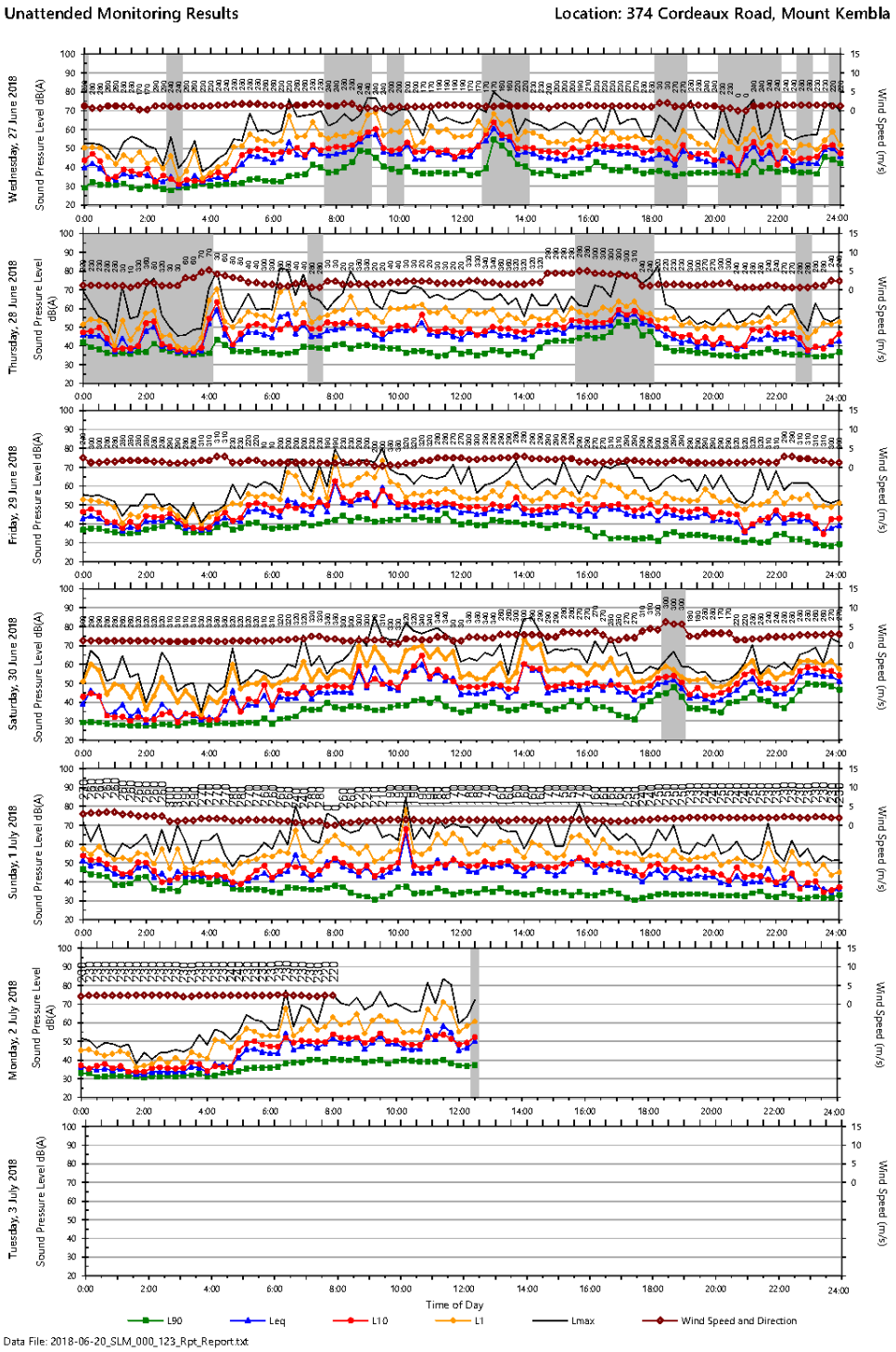
Measurements affected by extraneous noise, wind (greater than 5m/s) or rain were excluded from the recorded data in accordance with the New South Wales Industrial Noise Policy (EPA, 2000). Determination of extraneous meteorological conditions was based on data from the weather station installed at Caroona over the monitoring period.

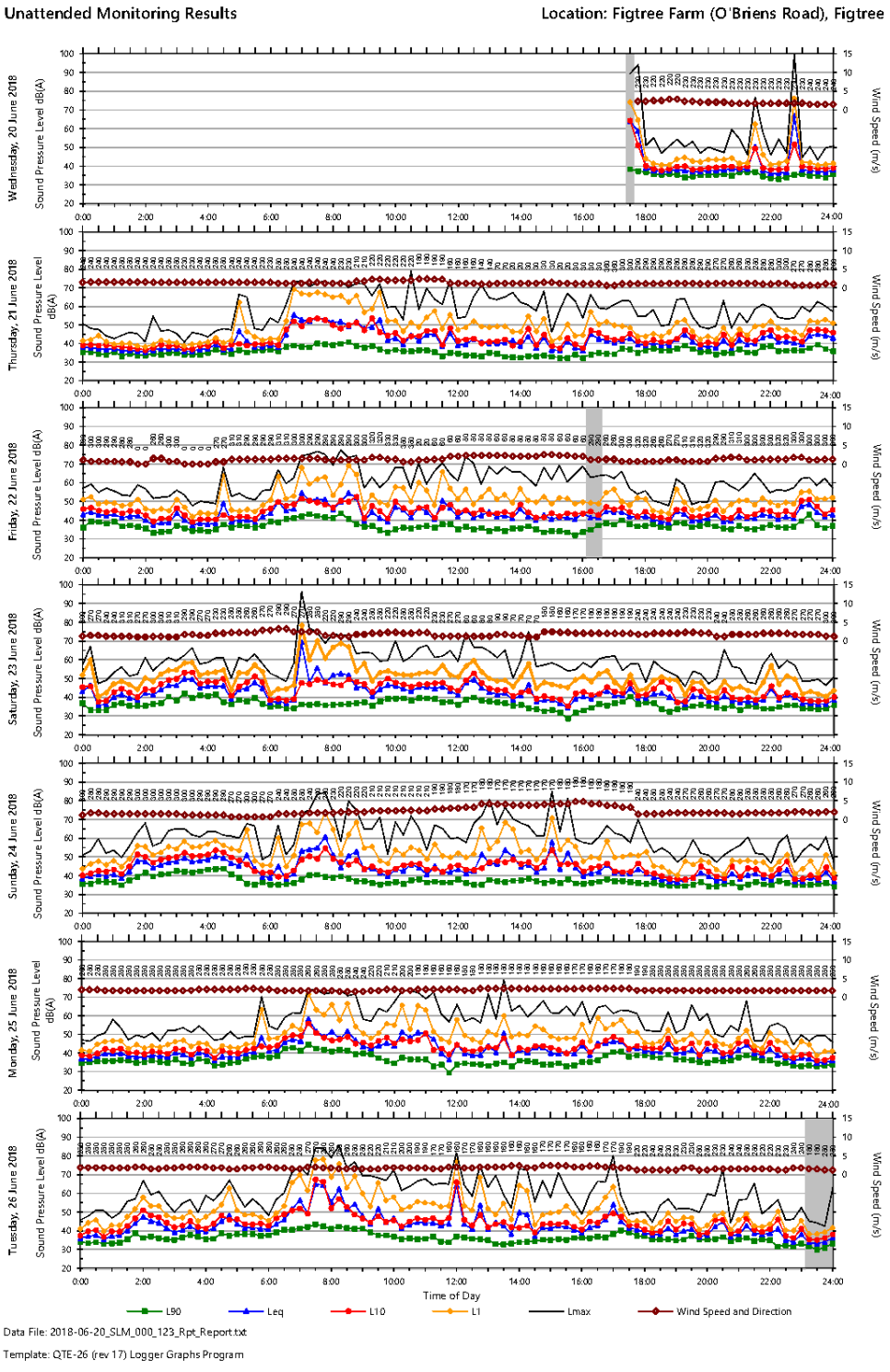
B.3 Noise vs Time Graphs

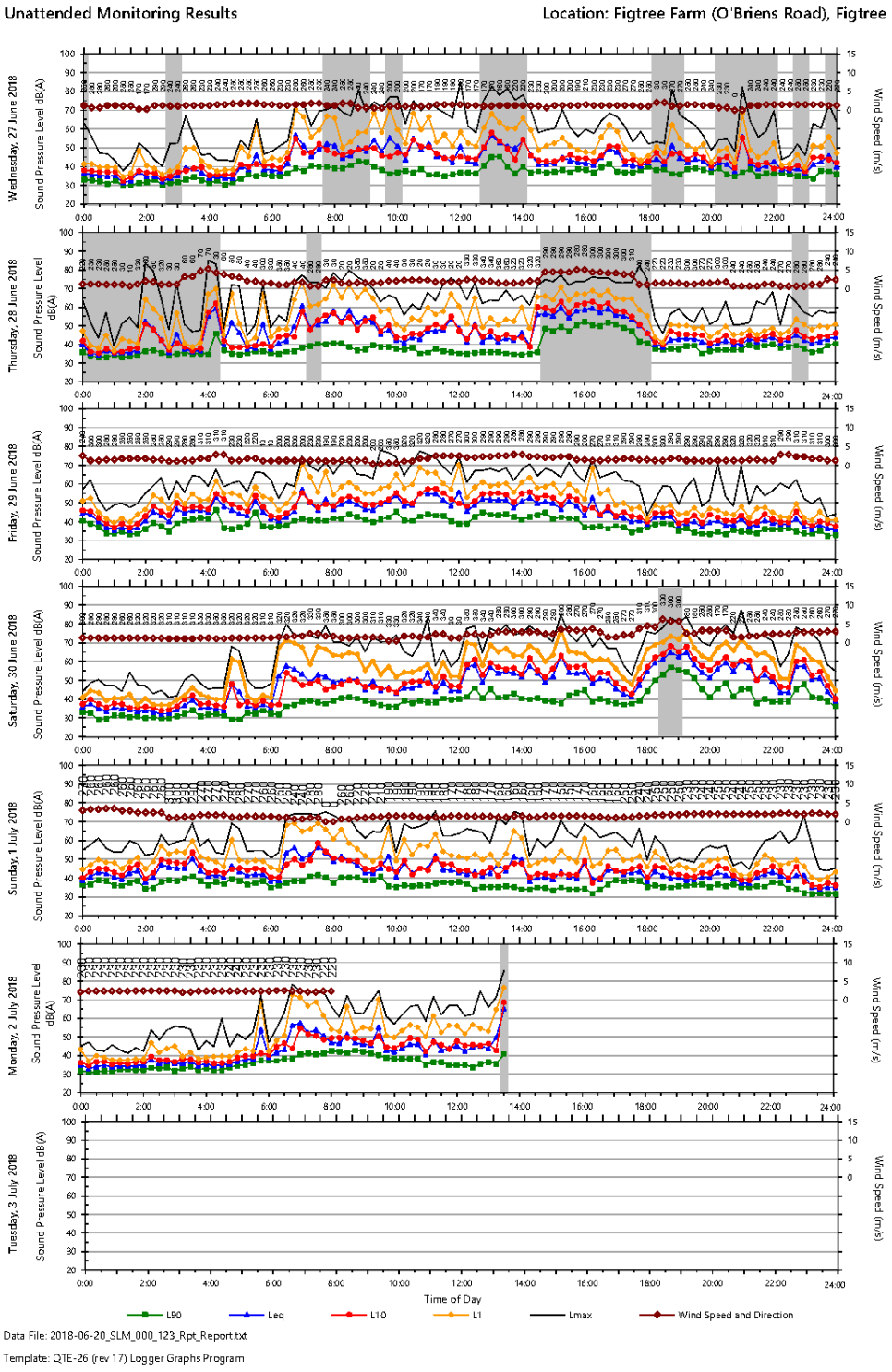
Noise almost always varies with time. Noise environments can be described using various descriptors to show how a noise ranges about a level. In this report, noise values measured or referred to include the L_{10}, L_{90}, and L_{eq} levels. The statistical descriptors L_{10} and L_{90} measure the noise level exceeded for 10% and 90% of the sample measurement time. The L_{eq} level is the equivalent continuous noise level or the level averaged on an equal energy basis. Measurement sample periods are usually 10 to 15 minutes. The Noise -vs- Time graphs representing measured noise levels, as presented in this report, illustrate these concepts for the broadband dB(A) results.

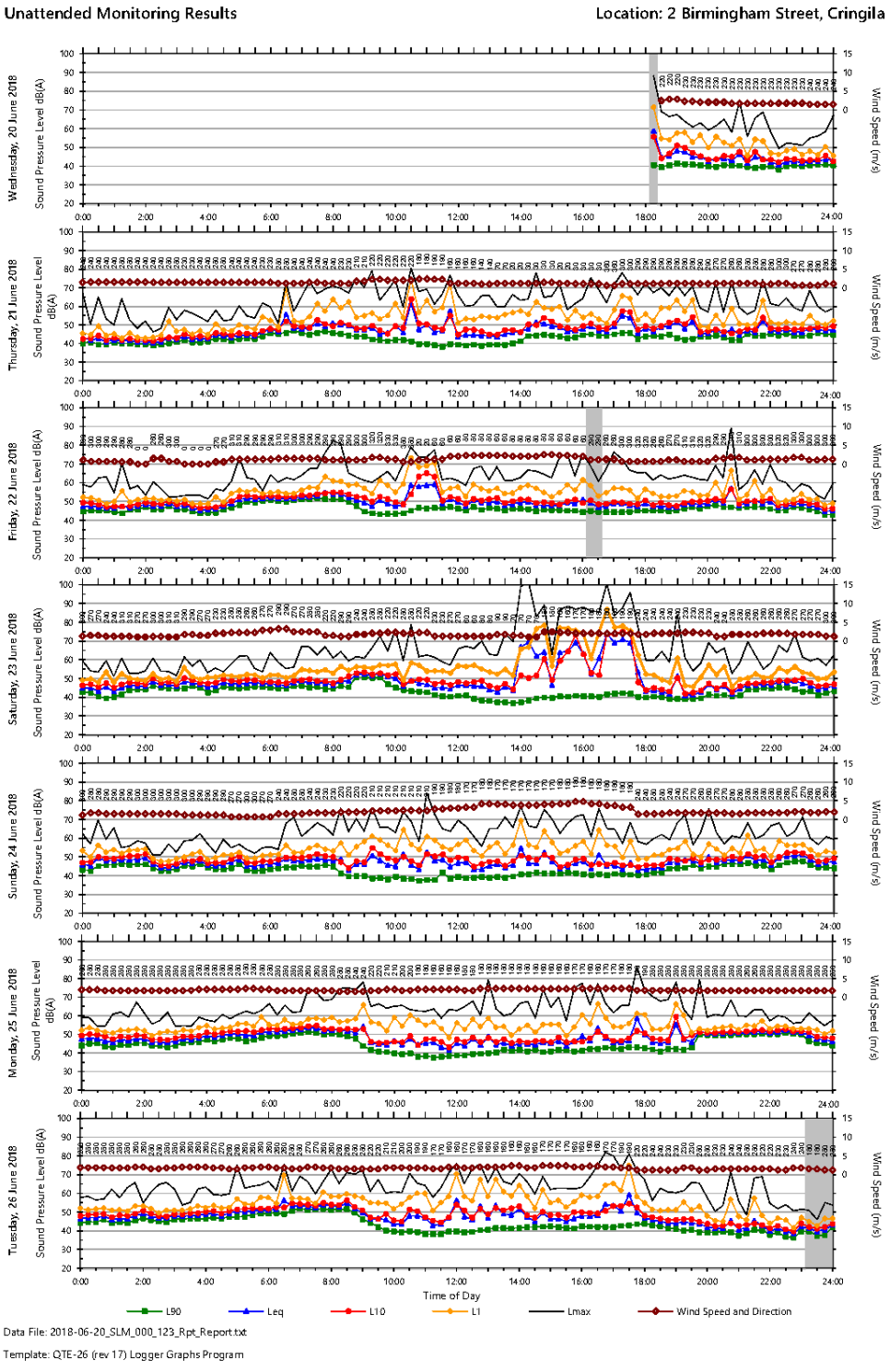
APPENDIX C Long-term Noise Monitoring Results


Unattended Monitoring Results
Location: 374 Cordeaux Road, Mount Kembla
Wednesday, 20 June 2018
Thursday, 21 June 2018
Friday, 22 June 2018
Saturday, 23 June 2018
Sunday, 24 June 2018
Monday, 25 June 2018
Tuesday, 26 June 2018
Sound Pressure Level dB(A)
Wind Speed (m/s)
Time of Day
L90
Leq
L10
L1
Lmax
Wind Speed and Direction
Data File: 2018-06-20_SLM_000_123_Rpt_Report.txt
Template: QTE-26 (rev 17) Logger Graphs Program

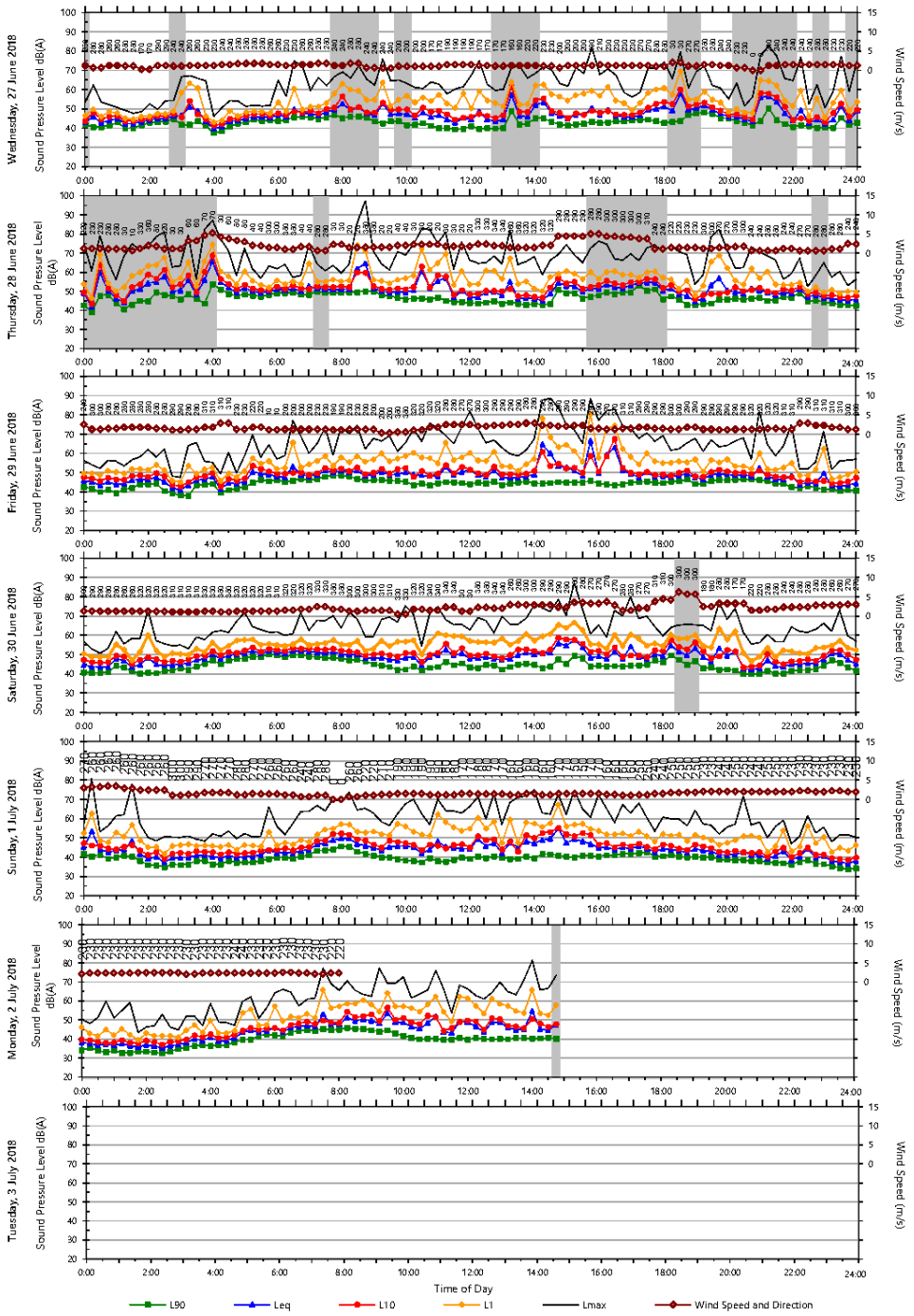

Unattended Monitoring Results
Location: 374 Cordeaux Road, Mount Kembla
Wednesday, 27 June 2018
Thursday, 28 June 2018
Friday, 29 June 2018
Saturday, 30 June 2018
Sunday, 1 July 2018
Monday, 2 July 2018
Tuesday, 3 July 2018
Sound Pressure Level dB(A)
Wind Speed (m/s)
Time of Day
L90
Leq
L10
L1
Lmax
Wind Speed and Direction
Data File: 2018-06-20_SLM_000_123_Rpt_Report.txt
Template: QTE-26 (rev 17) Logger Graphs Program


Unattended Monitoring Results
Location: Figtree Farm (O'Briens Road), Figtree
Wednesday, 20 June 2018
Thursday, 21 June 2018
Friday, 22 June 2018
Saturday, 23 June 2018
Sunday, 24 June 2018
Monday, 25 June 2018
Tuesday, 26 June 2018
Sound Pressure Level dB(A)
Wind Speed (m/s)
Time of Day
L90
Leq
L10
L1
Lmax
Wind Speed and Direction
Data File: 2018-06-20_SLM_000_123_Rpt_Report.txt
Template: QTE-26 (rev 17) Logger Graphs Program


Unattended Monitoring Results
Location: Figtree Farm (O'Briens Road), Figtree
Wednesday, 27 June 2018
Thursday, 28 June 2018
Friday, 29 June 2018
Saturday, 30 June 2018
Sunday, 1 July 2018
Monday, 2 July 2018
Tuesday, 3 July 2018
Sound Pressure Level dB(A)
Wind Speed (m/s)
Time of Day
L90
Leq
L10
L1
Lmax
Wind Speed and Direction
Data File: 2018-06-20_SLM_000_123_Rpt_Report.txt
Template: QTE-26 (rev 17) Logger Graphs Program


Unattended Monitoring Results
Location: 2 Birmingham Street, Cringila
Wednesday, 20 June 2018
Thursday, 21 June 2018
Friday, 22 June 2018
Saturday, 23 June 2018
Sunday, 24 June 2018
Monday, 25 June 2018
Tuesday, 26 June 2018
Sound Pressure Level dB(A)
Wind Speed (m/s)
Time of Day
L90
Leq
L10
L1
Lmax
Wind Speed and Direction
Data File: 2018-06-20_SLM_000_123_Rpt_Report.txt
Template: QTE-26 (rev 17) Logger Graphs Program

Unattended Monitoring Results **Location: 2 Birmingham Street, Cringila**



Data File: 2018-06-20_SLM_000_123_Rpt_Report.txt

Template: QTE-26 (rev 17) Logger Graphs Program

APPENDIX D Detailed Predicted Construction Noise Levels

Table D.1– Predicted Construction Noise Levels, $L_{Aeq,15minute}$

Receiver ID	Construction Noise Management Level, dB(A)				Predicted Construction Noise Levels for Year 1, dB(A)	
	Day Standard Hours	Day Outside Standard Hours	Evening	Night	Full Fleet	Full Fleet minus Carpark Construction Fleet
D0002	70 (when in use)				53	53
D0003	70 (when in use)				87	87
D0005	55 (when in use)				40	31
D0006	45	40	N/A	N/A	34	32
D0008	70 (when in use)				<20	<20
D0010	70 (when in use)				<20	<20
D0011	45	40	N/A	N/A	55	54
D0012	45	40	N/A	N/A	52	51
D0013	45	40	N/A	N/A	55	55
D0014	45	40	N/A	N/A	39	39
D0015	45	40	N/A	N/A	41	40
D0016	45	40	N/A	N/A	55	54
D0017	45	40	N/A	N/A	37	36
D0018	45	40	N/A	N/A	35	34
D0019	60 (when in use)				38	37
D0020	45	40	N/A	N/A	51	48
D0021	45	40	N/A	N/A	37	35
D0022	45	40	N/A	N/A	50	48
D0023	45	40	N/A	N/A	48	47
D0024	45	40	N/A	N/A	47	44
D0025	45	40	N/A	N/A	52	51
D0026	45	40	N/A	N/A	52	51
D0027	45	40	N/A	N/A	50	49
D0028	45	40	N/A	N/A	50	49
D0029	45	40	N/A	N/A	44	40
D0030	45	40	N/A	N/A	39	35
D0031	45	40	N/A	N/A	38	35
D0032	45	40	N/A	N/A	34	30
D0033	45	40	N/A	N/A	37	32
D0034	45	40	N/A	N/A	37	33
D0035	45	40	N/A	N/A	43	35
D0036	45	40	N/A	N/A	38	31
D0037	45	40	N/A	N/A	42	36
D0038	45	40	N/A	N/A	41	32

Receiver ID	Construction Noise Management Level, dB(A)				Predicted Construction Noise Levels for Year 1, dB(A)	
	Day Standard Hours	Day Outside Standard Hours	Evening	Night	Full Fleet	Full Fleet minus Carpark Construction Fleet
D0039	45	40	N/A	N/A	43	41
D0040	45	40	N/A	N/A	43	42
D0041	60 (when in use)				46	40
D0042	45	40	N/A	N/A	47	41
D0043	70 (when in use)				38	37
D0044	45	40	N/A	N/A	38	37
D0045	45	40	N/A	N/A	35	34
D0046	45	40	N/A	N/A	35	34
D0047	45	40	N/A	N/A	35	34
D0048	45	40	N/A	N/A	35	34
D0050	45	40	N/A	N/A	35	35
D0051	45	40	N/A	N/A	46	41
D0052	45	40	N/A	N/A	39	38
D0053	External 55 (when in use)				<20	<20
D0054	45	40	N/A	N/A	<20	<20
D0055	45	40	N/A	N/A	24	24
D0056	45	40	N/A	N/A	33	33
D0057	45	40	N/A	N/A	<20	<20
D0058	45	40	N/A	N/A	<20	<20
D0059	45	40	N/A	N/A	28	<20
D0060	45	40	N/A	N/A	34	27
D0061	45	40	N/A	N/A	41	33
D0062	45	40	N/A	N/A	55	38
D0063	45	40	N/A	N/A	55	35
D0064	45	40	N/A	N/A	43	34
D0065	45	40	N/A	N/A	55	36
D0066	45	40	N/A	N/A	52	46
D0067	45	40	N/A	N/A	48	31
D0068	45	40	N/A	N/A	51	37
D0069	45	40	N/A	N/A	49	41
D0070	45	40	N/A	N/A	57	41
D0071	45	40	N/A	N/A	57	49
D0072	45	40	N/A	N/A	52	39
D0073	45	40	N/A	N/A	51	38
D0074	45	40	N/A	N/A	50	38

Receiver ID	Construction Noise Management Level, dB(A)				Predicted Construction Noise Levels for Year 1, dB(A)	
	Day Standard Hours	Day Outside Standard Hours	Evening	Night	Full Fleet	Full Fleet minus Carpark Construction Fleet
D0075	45	40	N/A	N/A	50	38
D0076	45	40	N/A	N/A	49	39
D0077	45	40	N/A	N/A	49	39
D0078	45	40	N/A	N/A	43	41
D0079	45	40	N/A	N/A	43	37
D0080	45	40	N/A	N/A	46	36
D0081	45	40	N/A	N/A	47	36
D0081	45	40	N/A	N/A	48	37
D0082	45	40	N/A	N/A	48	37
D0083	45	40	N/A	N/A	49	37
D0084	45	40	N/A	N/A	49	38
D0085	45	40	N/A	N/A	50	38
D0086	45	40	N/A	N/A	45	31
D0087	45	40	N/A	N/A	36	26
D0088	45	40	N/A	N/A	34	24
D0089	45	40	N/A	N/A	34	24
D0090	45	40	N/A	N/A	34	25
D0091	45	40	N/A	N/A	35	25
D0092	45	40	N/A	N/A	44	33
D0093	45	40	N/A	N/A	41	33
D0094	45	40	N/A	N/A	34	25
D0095	45	40	N/A	N/A	43	32
D0096	45	40	N/A	N/A	43	32
D0096A	45	40	N/A	N/A	43	31
D0097	45	40	N/A	N/A	42	28
D0098	45	40	N/A	N/A	43	28
D0099	45	40	N/A	N/A	43	31
D0100	45	40	N/A	N/A	43	32
D0101	45	40	N/A	N/A	43	32
D0102	45	40	N/A	N/A	44	32
D0103	45	40	N/A	N/A	38	30
D0104	45	40	N/A	N/A	30	24
D0105		60 (when in use)			<20	<20
D0106		60 (when in use)			36	28
D0107		External 55 (when in use)			37	27
D0108	45	40	N/A	N/A	35	26

Receiver ID	Construction Noise Management Level, dB(A)				Predicted Construction Noise Levels for Year 1, dB(A)	
	Day Standard Hours	Day Outside Standard Hours	Evening	Night	Full Fleet	Full Fleet minus Carpark Construction Fleet
D0109		70 (when in use)			34	26
D0110		60 (when in use)			30	23
D0111	45	40	N/A	N/A	30	23
D0112	45	40	N/A	N/A	32	25
D0113	45	40	N/A	N/A	23	<20
D0114	45	40	N/A	N/A	22	21
D0115	45	40	N/A	N/A	22	21
D0116	45	40	N/A	N/A	29	24
D0117	45	40	N/A	N/A	<20	<20
D0118	45	40	N/A	N/A	26	24
D0119	45	40	N/A	N/A	23	21
D0120	45	40	N/A	N/A	27	25
D0121		70 (when in use)			<20	<20
D0122	45	40	35	35	<20	<20
D0123		60 (when in use)			<20	<20
D0124	45	40	N/A	N/A	<20	<20
D0125	45	40	N/A	N/A	29	26
D0126		70 (when in use)			28	25
D0127	45	40	N/A	N/A	25	21
D0128	45	40	N/A	N/A	24	<20
D0129	45	40	N/A	N/A	<20	<20
D0130	45	40	N/A	N/A	23	<20
D0131	45	40	N/A	N/A	23	<20
D0132	45	40	N/A	N/A	23	<20
D0133	45	40	N/A	N/A	21	<20
D0134	45	40	N/A	N/A	20	<20
D0135	45	40	N/A	N/A	20	<20
D0136	45	40	N/A	N/A	<20	<20
D0137	45	40	N/A	N/A	<20	<20
D0138	45	40	N/A	N/A	<20	<20
D0139	45	40	N/A	N/A	<20	<20
D0140	45	40	N/A	N/A	<20	<20
D0141	45	40	N/A	N/A	<20	<20
D0142	45	40	N/A	N/A	<20	<20
D0143	45	40	N/A	N/A	<20	<20
D0144	45	40	N/A	N/A	<20	<20

Receiver ID	Construction Noise Management Level, dB(A)				Predicted Construction Noise Levels for Year 1, dB(A)	
	Day Standard Hours	Day Outside Standard Hours	Evening	Night	Full Fleet	Full Fleet minus Carpark Construction Fleet
D0145	45	40	N/A	N/A	<20	<20
D0146	45	40	N/A	N/A	<20	<20
D0147	45	40	N/A	N/A	<20	<20
D0148	45	40	N/A	N/A	<20	<20
D0149	45	40	N/A	N/A	<20	<20
D0150	45	40	N/A	N/A	<20	<20
D0151	45	40	N/A	N/A	<20	<20
D0152	45	40	N/A	N/A	<20	<20
D0153	45	40	N/A	N/A	<20	<20
D0154	45	40	N/A	N/A	<20	<20
D0155	45	40	N/A	N/A	<20	<20
D0156	45	40	N/A	N/A	<20	<20
D0157	45	40	N/A	N/A	<20	<20
D0158	45	40	N/A	N/A	<20	<20
D0159	45	40	N/A	N/A	<20	<20
D0160	45	40	N/A	N/A	<20	<20
D0161	45	40	N/A	N/A	<20	<20
D0162	45	40	N/A	N/A	<20	<20
D0163	45	40	N/A	N/A	45	36
D0164	45	40	N/A	N/A	36	28
D0165	45	40	N/A	N/A	28	22
D0166	45	40	N/A	N/A	27	22
D0167	45	40	N/A	N/A	26	21
D0168	45	40	N/A	N/A	26	21
D0169	45	40	N/A	N/A	20	<20
R1	45	40	N/A	N/A	48	47
R2	45	40	N/A	N/A	29	24
R3a	45	40	N/A	N/A	34	27
R5a	45	40	N/A	N/A	38	30
R6a	45	40	N/A	N/A	55	47
R6b	45	40	N/A	N/A	50	38
R9	45	40	N/A	N/A	55	54
R15a	45	40	N/A	N/A	53	51
R22	45	40	N/A	N/A	53	52
R39a	45	40	N/A	N/A	<20	<20
CPP001	50	45	N/A	N/A	<20	<20

Receiver ID	Construction Noise Management Level, dB(A)				Predicted Construction Noise Levels for Year 1, dB(A)	
	Day Standard Hours	Day Outside Standard Hours	Evening	Night	Full Fleet	Full Fleet minus Carpark Construction Fleet
CPP002	50	45	N/A	N/A	<20	<20
CPP003	50	45	N/A	N/A	<20	<20
CPP004	50	45	N/A	N/A	<20	<20

APPENDIX E Construction Noise Contours

Figure 12 – Construction Noise Contours – Full Fleet - $L_{Aeq, 15min}$, dB(A)

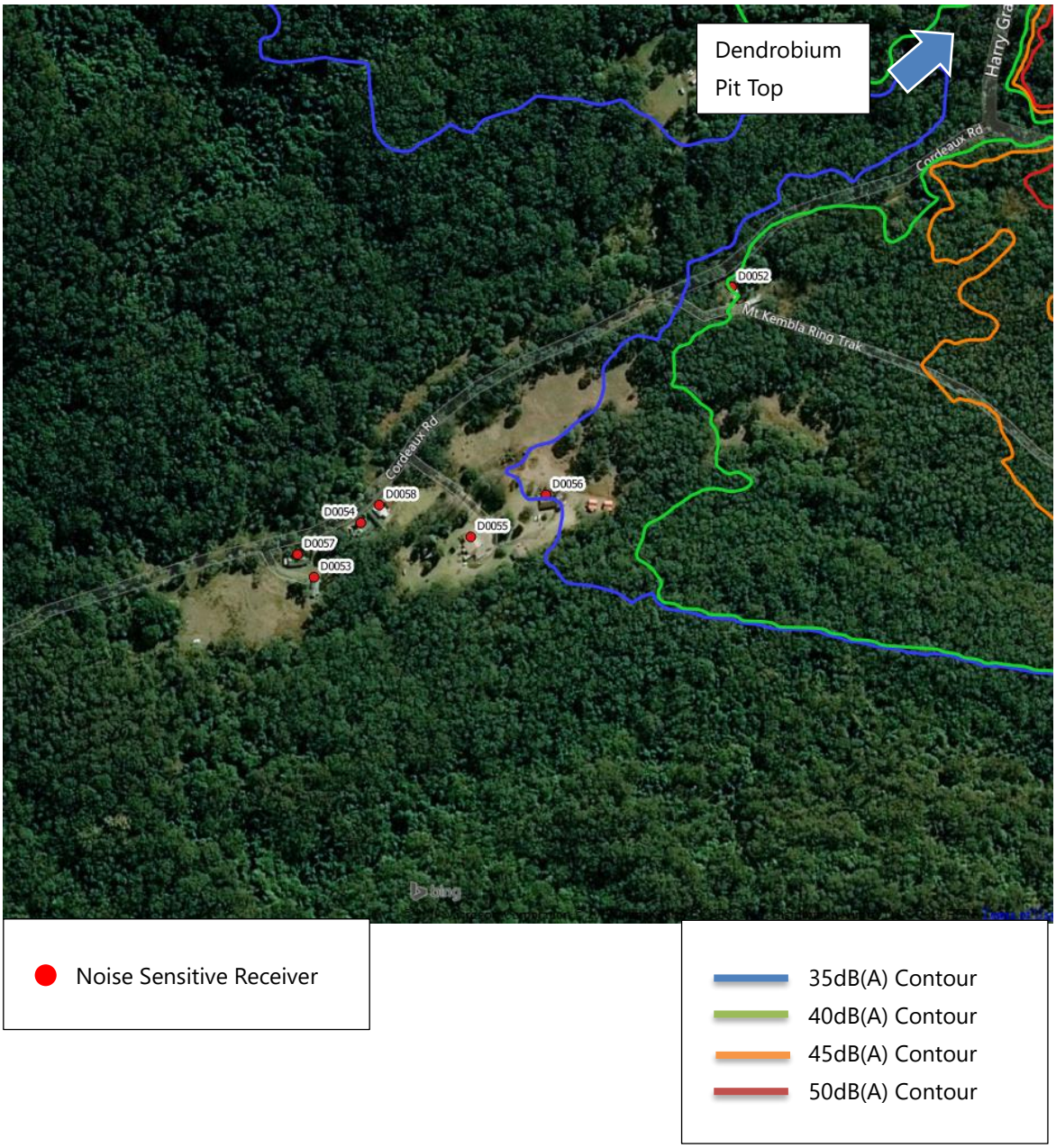


Figure 13 – Construction Noise Contours - Full Fleet - $L_{Aeq, 15min}$, dB(A)

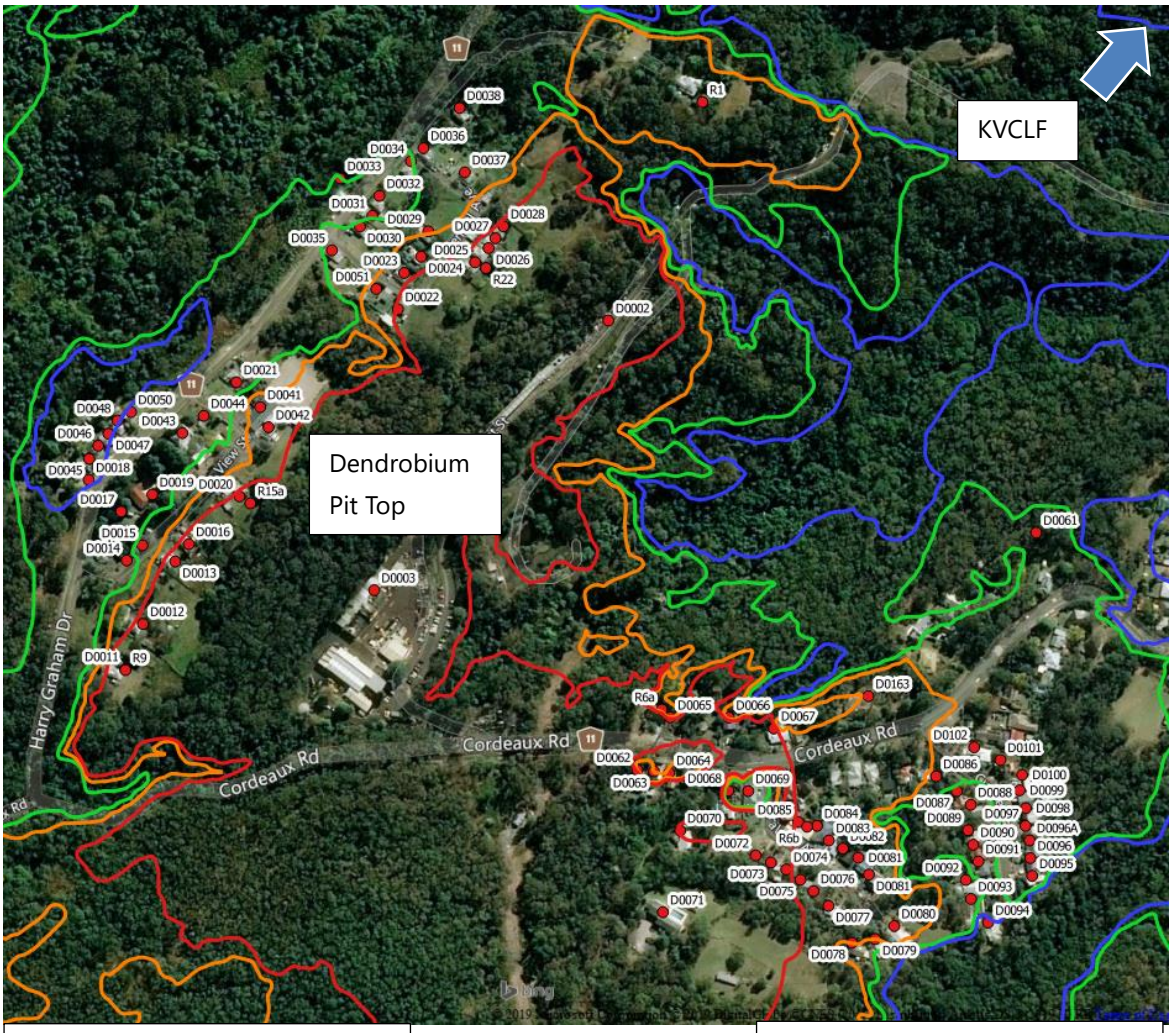


Figure 14 – Construction Noise Contours – Full Fleet - $L_{Aeq, 15min}$, dB(A)

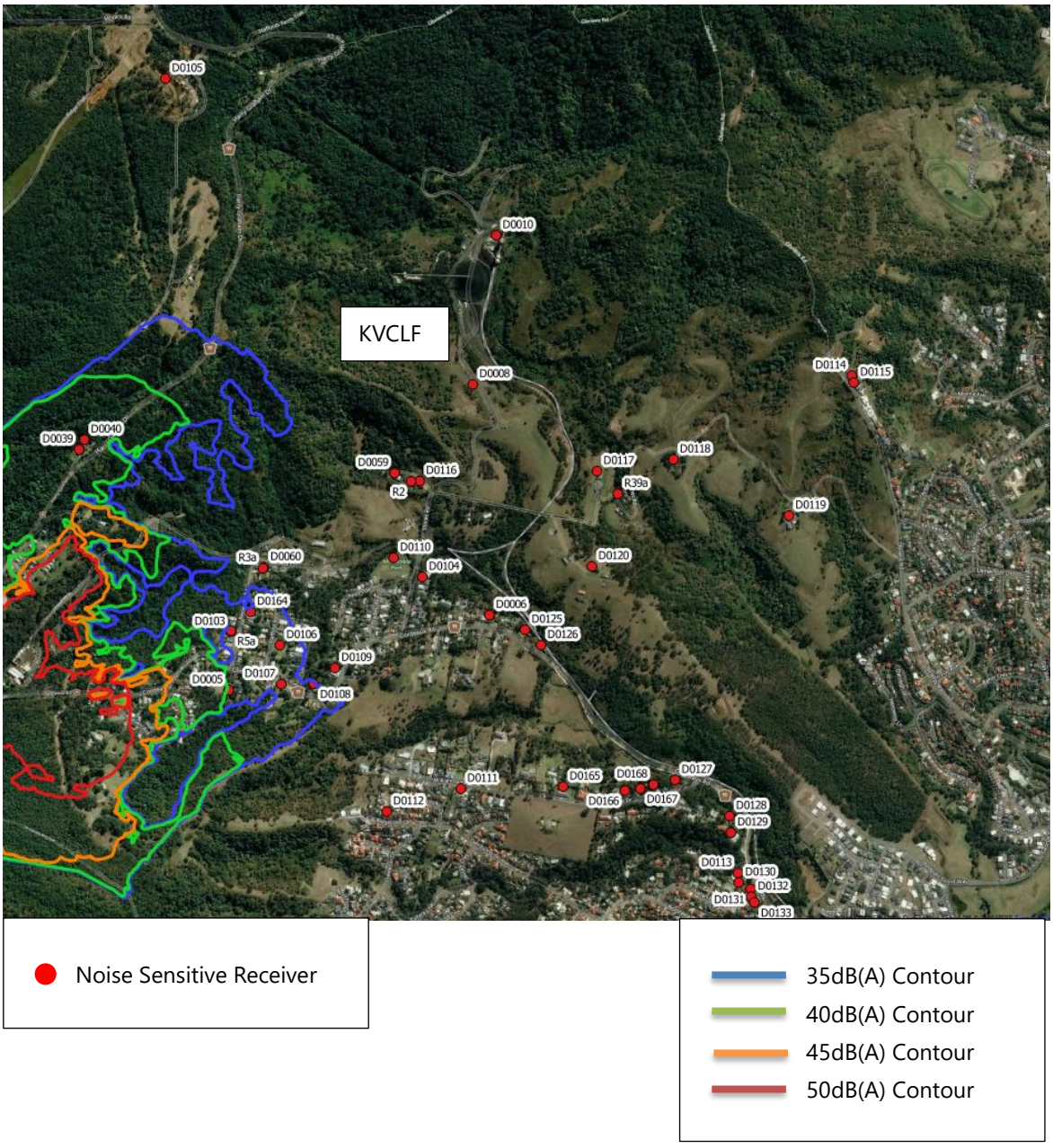


Figure 15 – Construction Noise Contours – Full Fleet minus Carpark Extension Construction Fleet - $L_{Aeq, 15min}$, dB(A)

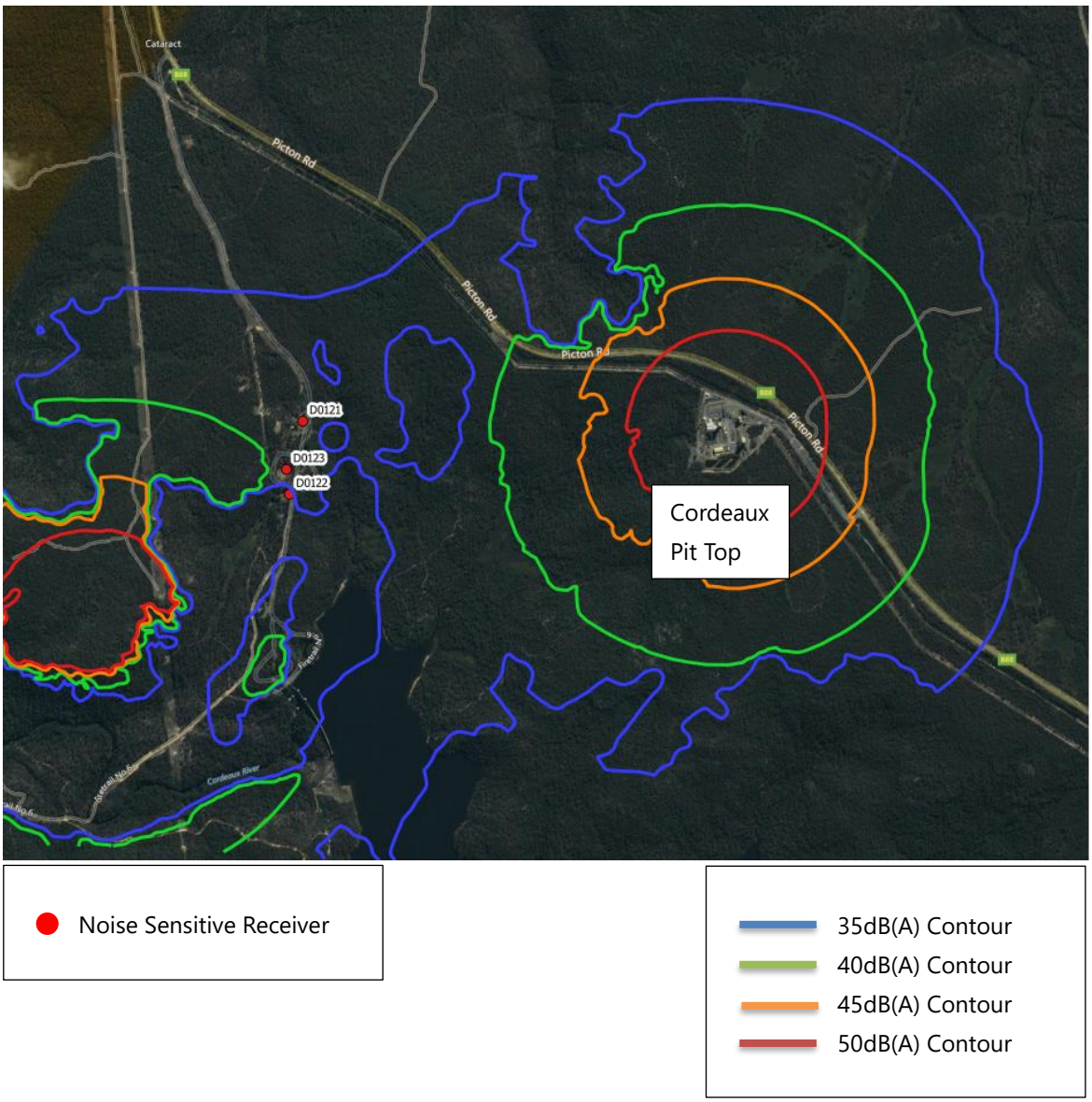


Figure 16 – Construction Noise Contours – Full Fleet minus Carpark Extension Construction Fleet - $L_{Aeq, 15min}$, dB(A)

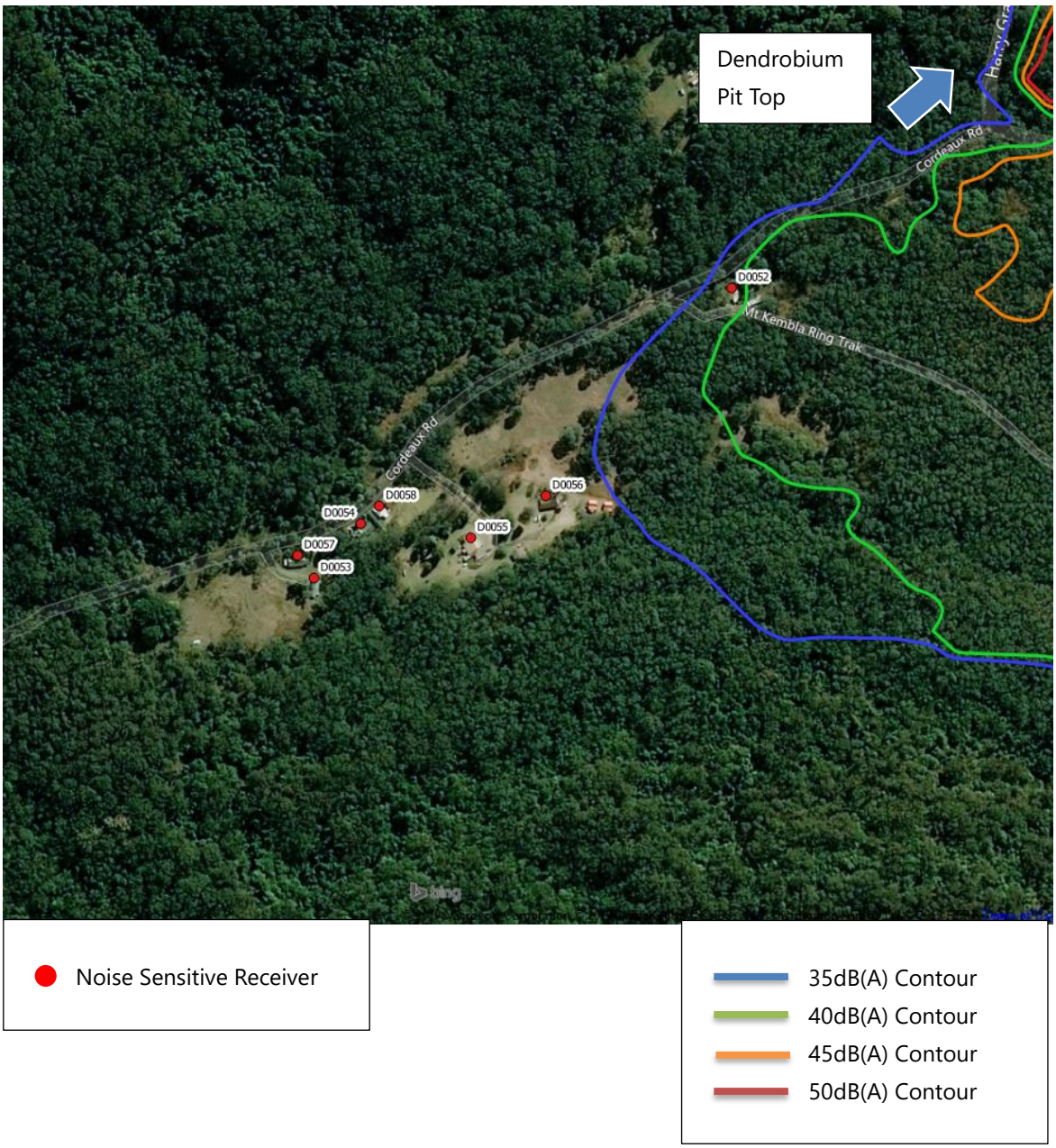


Figure 17 – Construction Noise Contours – Full Fleet minus Carpark Extension Construction Fleet - $L_{Aeq,\ 15min}$, dB(A)

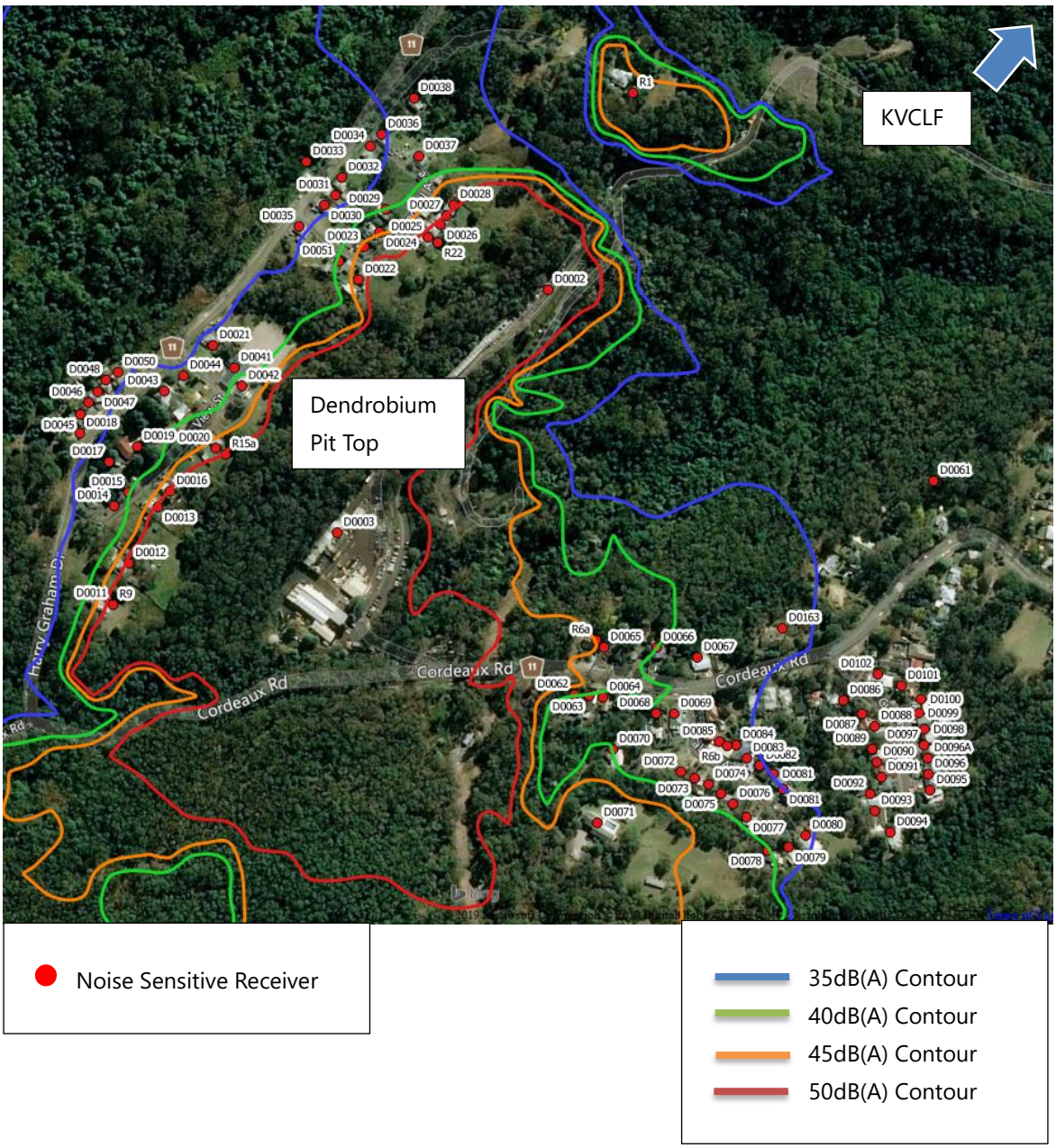
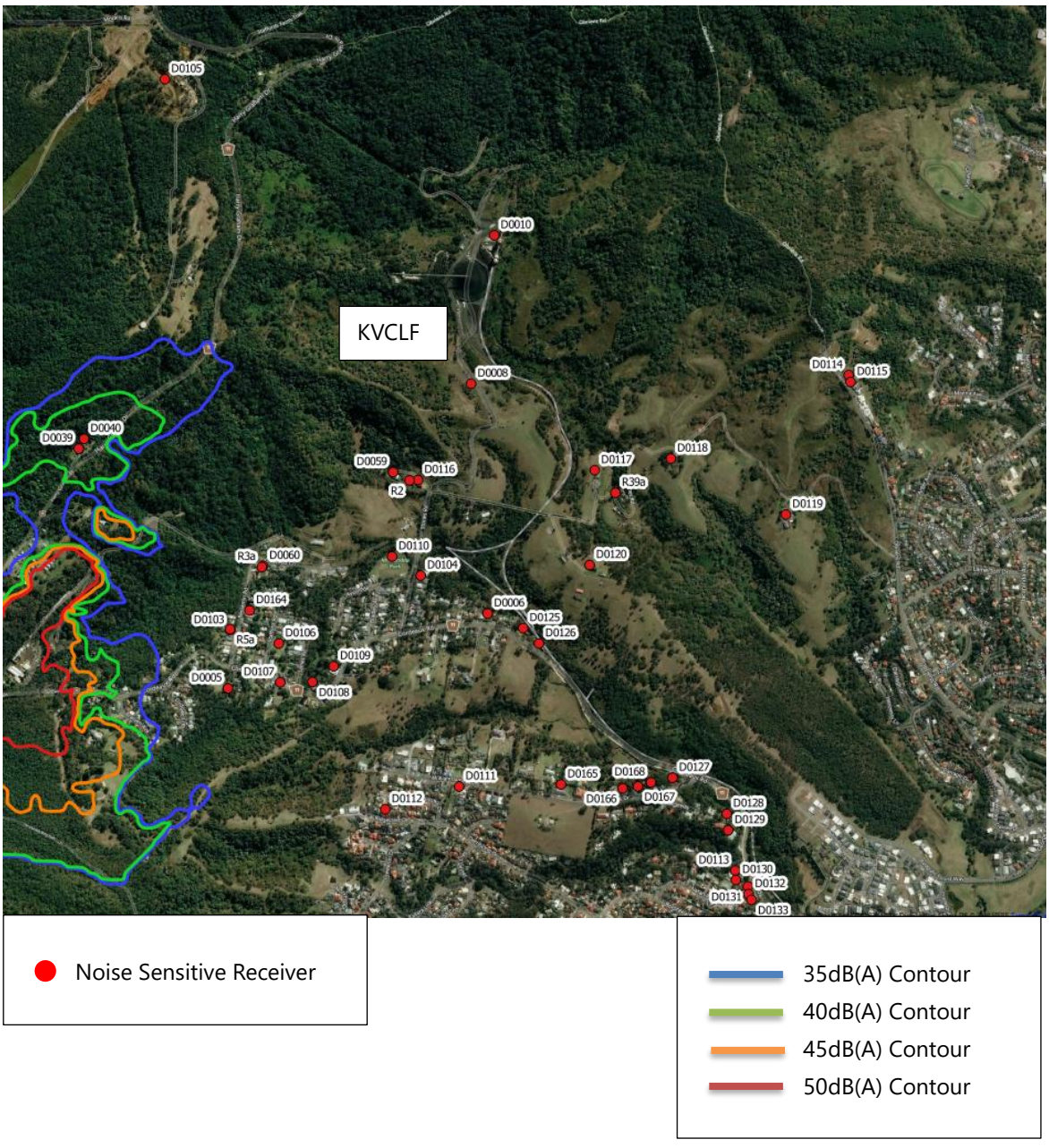


Figure 18 – Construction Noise Contours – Full Fleet minus Carpark Extension Construction Fleet - $L_{Aeq, 15min}$, dB(A)



APPENDIX F Detailed Predicted Operational Noise Levels

Table F.1– Predicted Day and Evening Operational Noise Levels, $L_{Aeq,15minute}$

Receiver ID	PSTL			Predicted Operational Noise Levels, dB(A)																
				Day									Evening							
					Wind									Wind						
	Day	Eve	Night	Calm	ENE	E	ESE	SE	SSW	SW	WSW	W	Calm	SSW	SW	WSW	W	WNW	F-Class Inversion	F-Class Inversion with SW	F-Class Inversion with WSW
D0002	68 (when in use)			67	67	67	67	67	67	67	67	67	66	66	66	66	66	66	66	66	66
D0003	68 (when in use)			68	68	68	68	68	68	68	68	67	64	64	64	64	63	63	64	64	64
D0005	External 48 (when in use)			28	22	21	20	20	27	31	32	33	26	25	29	31	31	31	30	31	31
D0006	40	40	39	31	34	30	28	27	28	29	30	33	32	28	29	31	33	35	35	32	34
D0008	68 (when in use)			49	50	49	48	48	48	48	49	50	49	48	48	49	50	51	51	49	50
D0010	68 (when in use)			57	56	56	56	57	59	59	59	58	57	58	58	58	58	58	58	58	58
D0011	40	37	37	42	47	47	46	46	38	36	36	36	38	32	31	30	31	31	41	36	35
D0012	40	37	37	38	43	43	43	42	36	33	32	32	34	28	27	27	27	28	38	32	32
D0013	40	37	37	40	44	44	44	43	39	35	34	33	36	32	30	30	30	30	39	35	34
D0014	40	37	37	24	27	28	27	27	22	20	<20	<20	21	<20	<20	<20	<20	<20	24	20	<20
D0015	40	37	37	25	29	29	29	29	24	22	21	21	23	<20	<20	<20	<20	<20	26	22	22
D0016	40	37	37	42	46	46	46	46	43	39	38	37	36	34	32	31	31	31	40	36	35
D0017	40	37	37	24	28	28	28	28	23	20	<20	<20	21	<20	<20	<20	<20	<20	24	20	<20
D0018	40	37	37	21	25	26	26	25	21	<20	<20	<20	<20	<20	<20	<20	<20	<20	22	<20	<20
D0019	53 (when in use)			25	29	29	29	29	24	21	20	20	23	20	<20	<20	<20	<20	26	22	21
D0020	40	37	37	40	43	44	44	44	41	38	35	34	35	33	31	30	30	30	39	42	43
D0021	40	37	37	23	26	26	27	27	25	23	20	<20	21	22	20	<20	<20	<20	23	26	26
D0022	40	37	37	36	35	37	39	40	40	39	38	34	32	34	34	33	30	27	35	34	36
D0023	40	37	37	35	33	36	38	39	38	38	37	33	30	33	33	32	28	25	33	32	35
D0024	40	37	37	34	32	35	38	38	38	37	37	33	29	32	31	31	28	24	33	32	34
D0025	40	37	37	38	36	38	40	41	41	41	40	38	35	38	37	37	35	31	37	36	37
D0026	40	37	37	37	35	37	39	40	40	40	39	37	34	37	36	36	34	31	36	35	36
D0027	40	37	37	36	35	36	38	39	40	39	39	37	33	36	35	35	33	30	36	34	36
D0028	40	37	37	36	34	35	38	39	39	39	39	37	32	35	35	35	33	29	35	34	35

Receiver ID	PSTL			Predicted Operational Noise Levels, dB(A)																
				Day									Evening							
					Wind									Wind					F-Class Inversion with	
	Day	Eve	Night	Calm	ENE	E	ESE	SE	SSW	SW	WSW	W	Calm	SSW	SW	WSW	W	WNW	F-Class Inversion	SW	WSW
D0029	40	37	37	32	30	33	36	36	36	36	35	31	25	28	27	26	24	21	30	30	32
D0030	40	37	37	24	25	26	28	28	27	26	24	21	20	22	21	<20	<20	<20	23	25	26
D0031	40	37	37	24	25	26	27	27	26	26	24	21	20	22	21	<20	<20	<20	23	24	26
D0032	40	37	37	22	24	25	26	26	25	24	23	20	<20	21	20	<20	<20	<20	22	24	25
D0033	40	37	37	22	23	25	26	26	25	24	22	<20	<20	21	<20	<20	<20	<20	21	23	24
D0034	40	37	37	23	24	25	26	26	25	25	24	21	<20	22	21	20	<20	<20	22	24	25
D0035	40	37	37	23	25	26	27	27	26	25	23	20	20	22	20	<20	<20	<20	23	24	26
D0036	40	37	37	23	24	25	27	27	26	25	24	21	20	22	21	20	<20	<20	23	24	25
D0037	40	37	37	28	27	29	32	32	32	32	31	28	23	26	25	24	22	<20	27	27	29
D0038	40	37	37	24	24	25	27	28	27	27	26	23	20	24	23	21	<20	<20	23	23	25
D0039	40	37	37	29	25	29	32	34	34	34	33	30	23	28	28	28	25	20	29	25	29
D0040	40	37	37	29	25	29	32	33	34	33	33	30	23	28	28	28	25	21	28	25	28
D0041	53 (when in use)			28	31	32	32	32	30	28	26	24	25	25	23	21	20	20	28	26	25
D0042	40	37	37	30	33	34	34	34	32	30	28	26	27	26	25	23	22	22	30	27	26
D0043	68 (when in use)			24	28	28	28	28	26	23	20	<20	21	21	<20	<20	<20	<20	24	27	28
D0044	40	37	37	24	27	28	28	28	26	24	21	20	21	21	<20	<20	<20	<20	24	22	20
D0045	40	37	37	21	25	25	25	25	21	<20	<20	<20	<20	<20	<20	<20	<20	<20	22	<20	<20
D0046	40	37	37	21	25	25	26	25	21	<20	<20	<20	<20	<20	<20	<20	<20	<20	22	<20	<20
D0047	40	37	37	21	25	25	25	25	22	<20	<20	<20	<20	<20	<20	<20	<20	<20	22	<20	<20
D0048	40	37	37	21	25	26	26	26	22	<20	<20	<20	<20	<20	<20	<20	<20	<20	23	<20	<20
D0050	40	37	37	22	26	26	26	26	23	20	<20	<20	<20	<20	<20	<20	<20	<20	22	20	<20
D0051	40	35	35	33	32	35	37	37	37	37	35	31	26	27	26	25	22	21	28	28	27
D0052	40	35	35	28	33	33	32	30	20	<20	<20	20	26	<20	<20	<20	<20	20	31	24	24
D0053	External 53 (when in use)			<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0054	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0055	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

Receiver ID	PSTL			Predicted Operational Noise Levels, dB(A)																
				Day									Evening							
					Wind									Wind					F-Class Inversion with	
	Day	Eve	Night	Calm	ENE	E	ESE	SE	SSW	SW	WSW	W	Calm	SSW	SW	WSW	W	WNW	F-Class Inversion	SW	WSW
D0056	40	35	35	24	29	29	29	25	<20	<20	<20	<20	23	<20	<20	<20	<20	<20	28	21	21
D0057	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0058	40	37	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0059	40	40	39	22	24	23	20	<20	21	21	22	22	22	<20	<20	20	21	23	25	21	22
D0060	40	37	37	26	<20	<20	<20	20	30	31	31	31	23	28	28	28	28	28	28	28	28
D0061	40	37	37	31	25	24	24	24	33	35	36	36	29	31	33	34	34	34	33	34	34
D0062	40	37	37	36	36	33	31	30	35	37	38	39	32	26	29	32	35	36	36	34	35
D0063	40	37	37	35	35	32	30	29	32	35	37	39	33	28	31	34	36	36	36	35	36
D0064	40	37	37	35	36	32	29	28	29	31	35	38	33	27	29	33	36	37	37	34	36
D0065	40	37	37	37	38	34	31	30	31	33	37	40	35	29	31	35	38	39	39	36	38
D0066	40	37	37	37	36	32	31	30	33	36	39	41	35	30	34	37	39	39	39	38	39
D0067	40	37	37	35	33	29	28	27	29	32	37	39	33	27	31	35	37	37	37	35	37
D0068	40	37	37	35	34	30	28	28	31	34	37	39	33	27	31	35	37	37	37	35	37
D0069	40	37	37	35	33	30	29	28	33	36	38	39	33	28	32	36	37	37	37	36	37
D0070	40	37	37	36	36	32	30	29	33	36	37	39	33	26	29	33	36	37	37	34	36
D0071	40	37	37	38	37	33	31	30	33	36	40	41	35	28	32	36	38	39	39	37	38
D0072	40	37	37	35	32	29	28	27	32	36	38	39	31	25	29	33	35	35	35	33	35
D0073	40	37	37	34	31	28	27	26	31	35	37	38	30	25	28	33	35	35	35	33	35
D0074	40	37	37	34	31	28	27	26	31	35	37	38	30	24	28	32	34	35	34	33	34
D0075	40	37	37	34	31	28	27	26	32	36	38	39	30	24	28	32	34	35	34	33	34
D0076	40	37	37	34	31	28	27	26	32	36	37	38	30	24	28	32	34	34	34	33	34
D0077	40	37	37	34	30	27	26	26	31	35	37	38	29	24	28	32	34	34	33	32	34
D0078	40	37	37	34	30	27	26	26	31	35	37	38	29	23	28	32	33	34	33	32	33
D0079	40	37	37	32	29	26	25	24	30	34	36	37	28	23	27	31	33	33	33	31	33
D0080	40	37	37	32	28	26	24	24	30	34	36	37	28	23	27	31	33	33	32	31	33
D0081	40	37	37	33	29	26	25	25	31	35	37	38	29	24	28	32	34	34	33	32	34

Receiver ID	PSTL			Predicted Operational Noise Levels, dB(A)																	
				Day									Evening								
					Wind									Wind					F-Class Inversion	F-Class Inversion with	
	Day	Eve	Night	Calm	ENE	E	ESE	SE	SSW	SW	WSW	W	Calm	SSW	SW	WSW	W	WNW		SW	WSW
D0081	40	37	37	33	29	27	26	25	31	35	37	38	29	24	29	33	34	34	34	33	34
D0082	40	37	37	34	30	27	26	26	32	36	37	38	30	25	29	33	34	35	34	33	34
D0083	40	37	37	34	30	28	27	26	32	35	37	38	30	25	29	33	34	35	34	33	35
D0084	40	37	37	34	30	28	27	26	32	35	37	38	30	25	30	33	35	35	35	34	35
D0085	40	37	37	33	31	28	26	26	30	33	36	38	31	26	30	33	35	35	35	34	35
D0086	40	37	37	31	27	25	24	24	29	32	35	36	29	26	30	33	34	34	33	33	34
D0087	40	37	37	30	26	24	23	22	26	31	34	35	28	25	29	32	33	33	33	32	33
D0088	40	37	37	28	24	22	21	20	23	28	32	33	26	21	26	30	31	31	31	30	31
D0089	40	37	37	29	25	23	21	21	24	28	32	33	27	22	27	31	32	32	31	31	32
D0090	40	37	37	29	25	23	22	21	25	29	33	34	27	23	28	31	32	32	32	31	32
D0091	40	37	37	29	25	23	21	21	24	29	32	33	27	22	27	31	32	32	31	31	32
D0092	40	37	37	30	26	24	22	22	26	30	33	34	27	23	28	31	32	32	32	31	32
D0093	40	37	37	30	26	24	22	22	26	30	33	34	27	23	27	31	32	32	32	31	32
D0094	40	37	37	28	25	22	21	20	23	27	31	32	26	21	25	29	31	31	30	30	31
D0095	40	37	37	29	24	23	21	21	26	30	33	33	27	23	28	31	32	32	31	31	32
D0096	40	37	37	29	24	23	21	21	26	30	33	33	27	23	28	31	32	32	31	31	32
D0096A	40	37	37	29	24	23	21	21	26	30	33	34	27	24	28	31	32	32	31	31	32
D0097	40	37	37	29	24	23	21	21	26	30	33	34	27	24	29	31	32	32	32	32	32
D0098	40	37	37	29	25	23	22	21	27	31	33	34	27	24	29	32	32	32	32	32	32
D0099	40	37	37	30	25	23	22	22	27	32	34	34	28	25	30	32	33	33	32	32	33
D0100	40	37	37	30	25	23	22	22	28	32	34	35	28	25	30	32	33	33	32	32	33
D0101	40	37	37	30	25	24	23	23	28	32	34	35	28	26	30	33	33	33	33	33	33
D0102	40	37	37	31	26	24	23	23	29	33	35	35	29	26	31	33	34	34	33	33	34
D0103	40	37	37	29	22	22	21	21	31	33	33	33	27	29	31	31	32	32	31	32	32
D0104	40	40	39	21	20	<20	<20	<20	24	25	25	25	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0105	53 (when in use)			22	25	26	26	26	23	20	<20	<20	22	24	21	<20	<20	<20	26	24	22

Receiver ID	PSTL			Predicted Operational Noise Levels, dB(A)																
				Day									Evening							
					Wind									Wind					F-Class Inversion with	
	Day	Eve	Night	Calm	ENE	E	ESE	SE	SSW	SW	WSW	W	Calm	SSW	SW	WSW	W	WNW	F-Class Inversion	SW	WSW
D0106	53 (when in use)			26	20	<20	<20	<20	28	30	30	30	24	26	28	28	29	29	28	29	29
D0107	External 53 (when in use)			25	20	<20	<20	<20	25	29	30	30	23	24	28	28	28	29	28	28	28
D0108	68 (when in use)			24	<20	<20	<20	<20	25	28	28	29	22	23	26	27	27	27	27	27	27
D0109	68 (when in use)			23	<20	<20	<20	<20	25	28	28	28	22	23	26	26	27	27	26	27	27
D0110	53 (when in use)			22	21	<20	<20	<20	25	26	26	26	21	24	24	24	25	25	25	25	25
D0111	40	35	35	23	25	21	<20	<20	21	25	25	26	23	20	23	24	25	27	27	25	26
D0112	40	35	35	21	<20	<20	<20	<20	20	24	26	26	<20	<20	22	24	24	25	24	24	24
D0113	40	35	35	22	21	<20	<20	<20	<20	21	24	28	23	<20	22	25	28	29	28	26	28
D0114	40	40	39	31	26	25	25	26	32	35	35	35	31	33	35	36	36	36	35	36	36
D0115	40	40	39	31	26	26	26	26	32	35	35	35	31	33	35	35	36	36	35	36	36
D0116	40	40	39	23	24	22	20	20	25	26	26	26	23	24	24	24	25	26	26	25	25
D0117	40	40	39	25	24	23	22	22	23	25	27	28	26	23	25	27	28	29	28	28	28
D0118	40	40	39	36	32	32	31	31	34	37	39	39	35	34	37	39	39	39	39	39	39
D0119	40	40	39	30	26	25	25	25	29	32	35	35	30	29	32	34	35	35	34	34	35
D0120	40	40	39	33	32	30	29	28	30	31	34	37	34	30	32	35	37	37	37	35	37
D0121	58	53	48	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0122	58	53	48	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0123	53 (when in use)			<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0124	58	53	48	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0125	40	35	35	20	<20	<20	<20	<20	21	22	23	24	<20	21	21	22	23	24	24	22	23
D0126	68 (when in use)			24	24	21	20	<20	23	24	25	28	24	22	23	25	28	29	28	26	28
D0127	40	35	35	25	24	21	20	<20	21	23	26	30	26	22	24	27	30	31	30	28	30
D0128	40	35	35	24	22	20	<20	<20	20	23	26	29	24	20	23	26	29	29	29	27	29
D0129	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0130	40	35	35	22	21	<20	<20	<20	<20	21	24	27	23	<20	21	25	28	28	28	26	28
D0131	40	35	35	22	20	<20	<20	<20	<20	21	24	27	23	<20	21	24	28	28	28	25	28

Receiver ID	PSTL			Predicted Operational Noise Levels, dB(A)																
				Day									Evening							
					Wind									Wind					F-Class Inversion with	
	Day	Eve	Night	Calm	ENE	E	ESE	SE	SSW	SW	WSW	W	Calm	SSW	SW	WSW	W	WNW	F-Class Inversion	SW	WSW
D0132	40	35	35	22	20	<20	<20	<20	<20	21	24	27	22	<20	21	24	28	28	28	25	28
D0133	40	35	35	20	<20	<20	<20	<20	<20	<20	22	25	21	<20	<20	23	26	26	26	23	26
D0134	40	35	35	<20	<20	<20	<20	<20	<20	<20	21	24	<20	<20	<20	22	25	25	25	23	25
D0135	40	35	35	<20	<20	<20	<20	<20	<20	<20	21	23	<20	<20	<20	22	24	24	26	23	25
D0136	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	23	20	<20
D0137	40	35	35	<20	20	<20	<20	<20	<20	<20	20	23	<20	<20	<20	21	24	24	26	23	24
D0138	40	35	35	<20	21	20	<20	<20	<20	<20	20	23	20	<20	<20	21	24	24	26	23	24
D0139	40	35	35	<20	21	20	<20	<20	<20	<20	20	23	<20	<20	<20	21	24	24	26	23	24
D0140	40	35	35	<20	20	<20	<20	<20	<20	<20	21	23	<20	<20	<20	22	24	24	26	23	24
D0141	40	35	35	<20	20	<20	<20	<20	<20	<20	21	23	<20	<20	<20	22	24	24	26	23	24
D0142	40	35	35	<20	21	20	<20	<20	<20	<20	20	23	<20	<20	<20	21	24	24	26	23	24
D0143	40	35	35	<20	21	20	20	20	<20	<20	20	22	<20	<20	<20	21	24	23	26	23	24
D0144	40	35	35	<20	21	20	<20	<20	<20	<20	20	22	<20	<20	<20	21	24	23	26	23	24
D0145	40	35	35	<20	21	20	<20	<20	<20	<20	20	22	<20	<20	<20	21	24	23	26	23	24
D0146	40	35	35	<20	21	20	20	20	<20	<20	20	22	<20	<20	<20	21	23	23	26	23	24
D0147	40	35	35	<20	21	20	20	20	<20	<20	20	22	<20	<20	<20	21	23	23	25	23	24
D0148	40	35	35	<20	21	20	20	20	<20	<20	<20	22	<20	<20	<20	20	23	23	25	23	23
D0149	40	35	35	<20	20	<20	<20	<20	<20	<20	<20	21	<20	<20	<20	20	22	22	25	22	22
D0150	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	22	<20	<20	<20	20	23	23	25	22	23
D0151	40	35	35	<20	21	20	20	20	<20	<20	20	22	<20	<20	<20	21	23	23	26	23	24
D0152	40	35	35	<20	21	20	20	20	<20	<20	20	22	<20	<20	<20	21	23	23	25	23	23
D0153	40	35	35	<20	21	20	20	20	<20	<20	20	22	<20	<20	<20	21	23	23	26	23	24
D0154	40	35	35	<20	21	20	20	20	<20	<20	20	22	<20	<20	<20	21	23	23	26	23	23
D0155	40	35	35	<20	21	20	20	20	<20	<20	20	22	<20	<20	<20	21	23	23	26	23	23
D0156	40	35	35	<20	21	20	20	20	<20	<20	20	22	<20	<20	<20	21	23	23	25	23	23
D0157	40	35	35	<20	21	21	20	20	<20	<20	20	22	<20	<20	<20	21	23	23	26	23	23

Receiver ID	PSTL			Predicted Operational Noise Levels, dB(A)																
				Day									Evening							
					Wind									Wind					F-Class Inversion with	
	Day	Eve	Night	Calm	ENE	E	ESE	SE	SSW	SW	WSW	W	Calm	SSW	SW	WSW	W	WNW	F-Class Inversion	SW	WSW
D0158	40	35	35	<20	21	21	20	20	<20	<20	20	21	<20	<20	<20	21	23	22	25	23	23
D0159	40	35	35	<20	21	20	20	20	<20	<20	20	21	<20	<20	<20	21	23	22	25	23	23
D0160	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	21	<20	<20	<20	20	22	22	24	22	23
D0161	40	35	35	<20	21	21	21	21	<20	<20	20	21	<20	<20	<20	21	22	22	26	23	23
D0162	40	35	35	<20	20	<20	<20	<20	<20	<20	20	21	<20	<20	<20	21	23	22	25	23	23
D0163	40	37	37	33	29	27	26	26	31	35	37	38	31	29	33	35	36	36	35	35	36
D0164	40	37	37	27	21	20	20	20	30	32	32	32	25	29	30	30	30	30	30	30	30
D0165	40	35	35	26	27	23	21	21	22	25	26	30	27	22	24	26	30	32	31	28	30
D0166	40	35	35	25	25	22	21	20	22	24	26	30	26	22	24	26	31	31	31	28	31
D0167	40	35	35	25	25	22	20	20	22	24	26	30	26	22	24	27	31	31	31	28	31
D0168	40	35	35	25	25	21	20	<20	22	24	26	30	26	22	24	27	31	31	31	28	31
D0169	40	35	35	<20	20	<20	<20	<20	<20	<20	20	23	<20	<20	<20	21	24	24	26	23	24
R1	40	37	37	43	39	40	43	46	47	46	46	46	39	43	43	43	42	40	42	43	43
R2	40	40	39	23	24	23	20	20	26	26	26	26	23	24	24	24	25	26	26	25	25
R3a	40	37	37	26	<20	<20	<20	20	30	31	31	31	23	28	28	28	28	28	28	28	28
R5a	40	37	37	29	22	22	21	21	31	33	33	34	26	29	31	31	31	31	31	31	31
R6a	40	37	37	40	40	36	34	34	37	40	42	44	36	31	34	37	39	40	39	38	39
R6b	40	37	37	34	31	28	27	26	32	35	37	38	31	26	30	33	35	35	35	34	35
R9	40	37	37	42	47	47	46	46	38	36	36	36	38	32	31	30	31	31	41	36	35
R15a	40	37	37	41	44	45	45	44	42	40	37	36	37	35	33	32	31	32	40	37	36
R22	40	37	37	38	37	38	41	41	42	41	41	39	35	38	38	37	36	33	38	38	38
R39a	40	40	39	36	34	32	32	31	33	35	38	39	36	33	35	39	39	40	39	39	39
CPP001	45	43	40	37	42	41	40	39	31	31	33	36	37	31	31	32	35	37	42	36	37
CPP002	45	43	40	36	40	39	35	32	30	30	32	34	37	30	31	32	34	38	41	35	37
CPP003	45	43	40	31	34	35	36	36	35	34	31	27	32	36	34	32	28	23	37	36	35
CPP004	45	43	40	32	33	35	36	37	37	36	34	30	33	38	36	35	31	25	37	38	37

Table F.2– Predicted Night Scenario 1 and Night Scenario 2 Operational Noise Levels, $L_{Aeq,15minute}$

Receiver ID	PSTL			Predicted Operational Noise Levels, dB(A)																
				Night Scenario 1									Night Scenario 2							
					Wind						F-Class Inversion with			Wind						F-Class Inversion with	
	Day	Eve	Night	Calm	SSW	SW	WSW	W	WNW	F-Class Inversion	SW	WSW	Calm	SSW	SW	WSW	W	WNW	F-Class Inversion	SW	WSW
D0002	68 (when in use)			66	66	66	66	66	66	66	66	66	47	47	47	47	47	47	47	47	47
D0003	68 (when in use)			56	55	55	55	55	55	56	56	56	65	66	66	65	65	65	66	66	66
D0005	External 48 (when in use)			26	25	29	30	31	31	30	31	31	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0006	40	40	39	32	28	29	31	33	35	35	32	34	32	28	28	30	33	35	35	32	34
D0008	68 (when in use)			49	48	48	49	50	51	51	49	50	49	48	48	49	50	51	51	49	50
D0010	68 (when in use)			57	58	58	58	58	58	58	58	58	57	58	58	58	58	58	58	58	58
D0011	40	37	37	37	30	30	29	30	31	40	35	34	39	35	34	33	33	34	42	38	37
D0012	40	37	37	32	26	25	25	25	27	36	30	30	31	26	25	25	25	25	34	30	29
D0013	40	37	37	33	28	27	27	27	28	37	32	31	34	31	29	28	28	28	37	33	32
D0014	40	37	37	<20	<20	<20	<20	<20	<20	23	<20	<20	<20	<20	<20	<20	<20	<20	21	<20	<20
D0015	40	37	37	22	<20	<20	<20	<20	<20	26	21	21	21	<20	<20	<20	<20	<20	24	21	20
D0016	40	37	37	34	32	29	29	29	29	38	34	33	40	40	37	36	35	35	42	41	39
D0017	40	37	37	20	<20	<20	<20	<20	<20	24	<20	<20	20	20	<20	<20	<20	<20	23	21	<20
D0018	40	37	37	<20	<20	<20	<20	<20	<20	21	<20	<20	<20	<20	<20	<20	<20	<20	21	<20	<20
D0019	53 (when in use)			22	<20	<20	<20	<20	<20	26	21	21	20	21	<20	<20	<20	<20	23	21	20
D0020	40	37	37	35	30	29	29	29	29	38	33	33	31	32	30	28	27	27	34	33	31
D0021	40	37	37	20	20	<20	<20	<20	<20	23	21	20	<20	22	21	<20	<20	<20	23	22	21
D0022	40	37	37	28	29	28	26	25	24	31	30	29	29	33	33	32	28	24	33	33	33
D0023	40	37	37	27	28	27	25	24	23	29	29	28	28	32	32	31	27	23	31	32	32
D0024	40	37	37	27	28	27	25	23	22	29	28	28	26	30	30	30	26	22	30	31	30
D0025	40	37	37	33	35	34	33	31	30	35	35	35	31	36	35	35	33	29	35	36	36
D0026	40	37	37	32	33	33	32	30	29	34	34	33	30	35	34	34	32	28	34	35	35
D0027	40	37	37	31	32	32	31	29	27	33	33	32	30	34	34	33	31	27	33	34	34
D0028	40	37	37	30	32	32	31	29	27	33	32	32	29	34	33	33	31	27	33	34	34

Receiver ID	PSTL			Predicted Operational Noise Levels, dB(A)																
				Night Scenario 1									Night Scenario 2							
					Wind						F-Class Inversion with			Wind						F-Class Inversion with	
	Day	Eve	Night	Calm	SSW	SW	WSW	W	WNW	F-Class Inversion	SW	WSW	Calm	SSW	SW	WSW	W	WNW	F-Class Inversion	SW	WSW
D0029	40	37	37	24	26	25	24	22	20	27	26	26	21	25	24	24	21	<20	25	25	25
D0030	40	37	37	<20	20	<20	<20	<20	<20	22	21	20	<20	<20	<20	<20	<20	<20	20	<20	<20
D0031	40	37	37	<20	20	<20	<20	<20	<20	22	21	20	<20	<20	<20	<20	<20	<20	20	<20	<20
D0032	40	37	37	<20	20	<20	<20	<20	<20	22	21	20	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0033	40	37	37	<20	<20	<20	<20	<20	<20	21	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0034	40	37	37	<20	20	<20	<20	<20	<20	22	21	20	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0035	40	37	37	<20	20	<20	<20	<20	<20	22	21	20	<20	<20	<20	<20	<20	<20	20	20	<20
D0036	40	37	37	<20	21	20	<20	<20	<20	22	21	21	<20	<20	<20	<20	<20	<20	20	<20	<20
D0037	40	37	37	23	25	24	23	20	<20	26	25	25	<20	21	21	21	<20	<20	22	22	22
D0038	40	37	37	20	23	22	20	<20	<20	23	23	22	<20	<20	<20	<20	<20	<20	20	<20	<20
D0039	40	37	37	<20	24	24	23	20	<20	23	24	24	22	27	27	26	24	<20	26	27	27
D0040	40	37	37	20	24	24	24	21	<20	24	24	24	22	27	27	26	25	20	27	27	27
D0041	53 (when in use)			24	23	21	20	<20	<20	27	24	23	23	25	24	22	<20	<20	25	26	24
D0042	40	37	37	26	25	23	22	21	21	29	26	25	24	27	25	23	21	21	27	27	26
D0043	68 (when in use)			20	<20	<20	<20	<20	<20	24	20	<20	21	23	20	<20	<20	<20	24	23	21
D0044	40	37	37	20	<20	<20	<20	<20	<20	23	20	<20	21	23	21	<20	<20	<20	24	23	22
D0045	40	37	37	<20	<20	<20	<20	<20	<20	21	<20	<20	<20	<20	<20	<20	<20	<20	20	<20	<20
D0046	40	37	37	<20	<20	<20	<20	<20	<20	21	<20	<20	<20	<20	<20	<20	<20	<20	20	<20	<20
D0047	40	37	37	<20	<20	<20	<20	<20	<20	21	<20	<20	<20	<20	<20	<20	<20	<20	20	<20	<20
D0048	40	37	37	<20	<20	<20	<20	<20	<20	22	<20	<20	<20	<20	<20	<20	<20	<20	20	<20	<20
D0050	40	37	37	<20	<20	<20	<20	<20	<20	21	<20	<20	<20	20	<20	<20	<20	<20	22	21	<20
D0051	40	35	35	24	25	24	22	20	20	27	26	25	21	24	24	23	<20	<20	24	24	24
D0052	40	35	35	26	<20	<20	<20	<20	20	31	24	24	<20	<20	<20	<20	<20	<20	22	<20	<20
D0053	External 53 (when in use)			<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0054	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0055	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

Receiver ID	PSTL			Predicted Operational Noise Levels, dB(A)																
				Night Scenario 1									Night Scenario 2							
					Wind						F-Class Inversion with			Wind						F-Class Inversion with	
	Day	Eve	Night	Calm	SSW	SW	WSW	W	WNW	F-Class Inversion	SW	WSW	Calm	SSW	SW	WSW	W	WNW	F-Class Inversion	SW	WSW
D0056	40	35	35	23	<20	<20	<20	<20	<20	27	20	21	<20	<20	<20	<20	<20	<20	20	<20	<20
D0057	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0058	40	37	37	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0059	40	40	39	22	<20	<20	20	21	23	25	21	22	22	<20	<20	<20	20	23	24	21	22
D0060	40	37	37	23	28	28	28	28	28	28	28	28	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0061	40	37	37	29	30	33	33	34	34	33	34	34	<20	<20	<20	<20	20	20	20	20	20
D0062	40	37	37	32	26	28	32	35	36	36	33	35	23	21	24	26	27	27	27	26	27
D0063	40	37	37	33	27	30	34	36	37	36	34	36	23	22	25	26	27	27	26	26	27
D0064	40	37	37	33	27	29	33	36	37	37	34	36	20	<20	20	21	23	24	24	22	23
D0065	40	37	37	35	29	31	35	38	39	39	36	38	21	<20	20	22	24	25	25	23	24
D0066	40	37	37	35	30	34	37	39	39	39	37	39	24	23	26	27	27	28	27	27	27
D0067	40	37	37	33	27	31	35	37	37	37	35	37	<20	<20	<20	20	21	22	21	20	21
D0068	40	37	37	33	27	30	35	37	37	37	35	37	20	<20	22	23	24	25	23	24	24
D0069	40	37	37	32	28	32	35	37	37	36	36	37	23	23	26	27	27	28	27	27	28
D0070	40	37	37	32	26	28	32	36	37	36	33	36	24	22	25	27	28	28	28	28	28
D0071	40	37	37	33	27	30	34	37	38	37	35	37	33	29	34	37	38	38	37	37	38
D0072	40	37	37	31	25	28	33	35	35	35	33	35	20	<20	21	23	24	24	24	23	24
D0073	40	37	37	30	24	28	32	34	35	34	33	34	20	<20	21	23	23	24	24	23	24
D0074	40	37	37	30	24	28	32	34	35	34	33	34	20	<20	21	23	23	24	24	23	24
D0075	40	37	37	30	24	28	32	34	34	34	32	34	20	<20	21	23	24	24	24	23	24
D0076	40	37	37	29	24	27	32	34	34	34	32	34	20	<20	22	24	24	25	24	24	25
D0077	40	37	37	29	23	27	31	33	34	33	32	33	21	<20	22	24	25	25	25	24	25
D0078	40	37	37	28	23	27	31	33	33	33	31	33	27	25	29	31	32	32	31	31	32
D0079	40	37	37	28	22	26	31	32	33	32	31	33	20	<20	21	23	24	24	24	24	24
D0080	40	37	37	28	22	27	31	32	33	32	31	33	<20	<20	20	22	22	23	23	22	23
D0081	40	37	37	29	24	28	32	33	34	33	32	34	<20	<20	20	22	22	23	23	22	23

Receiver ID	PSTL			Predicted Operational Noise Levels, dB(A)																
				Night Scenario 1									Night Scenario 2							
					Wind						F-Class Inversion with			Wind					F-Class Inversion with	
	Day	Eve	Night	Calm	SSW	SW	WSW	W	WNW	F-Class Inversion	SW	WSW	Calm	SSW	SW	WSW	W	WNW	F-Class Inversion	SW	WSW
D0081	40	37	37	29	24	28	32	34	34	34	33	34	<20	<20	20	22	22	23	23	22	23
D0082	40	37	37	30	24	29	33	34	34	34	33	34	<20	<20	21	22	23	23	23	23	23
D0083	40	37	37	30	25	29	33	34	35	34	33	34	<20	<20	21	22	23	23	23	23	23
D0084	40	37	37	30	25	29	33	35	35	34	33	35	20	<20	21	23	23	24	23	23	24
D0085	40	37	37	31	25	29	33	35	35	35	34	35	20	<20	21	23	23	24	23	23	24
D0086	40	37	37	29	26	30	33	34	34	33	33	34	<20	<20	<20	<20	20	20	21	20	20
D0087	40	37	37	28	25	29	32	33	33	33	32	33	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0088	40	37	37	26	21	26	30	31	31	31	30	31	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0089	40	37	37	27	22	27	31	32	32	31	31	32	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0090	40	37	37	27	23	28	31	32	32	32	31	32	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0091	40	37	37	27	22	27	31	32	32	31	31	32	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0092	40	37	37	27	23	27	31	32	32	32	31	32	<20	<20	<20	<20	20	20	21	<20	20
D0093	40	37	37	27	22	27	31	32	32	32	31	32	<20	<20	<20	<20	<20	20	21	<20	20
D0094	40	37	37	26	21	25	29	31	31	30	30	31	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0095	40	37	37	27	23	28	31	31	32	31	31	32	<20	<20	<20	<20	<20	<20	20	<20	<20
D0096	40	37	37	27	23	28	31	32	32	31	31	32	<20	<20	<20	<20	<20	<20	20	<20	<20
D0096A	40	37	37	27	24	28	31	32	32	31	31	32	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0097	40	37	37	27	24	29	31	32	32	32	31	32	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0098	40	37	37	27	24	29	32	32	32	32	32	32	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0099	40	37	37	28	25	30	32	32	33	32	32	33	<20	<20	<20	<20	<20	<20	20	<20	<20
D0100	40	37	37	28	25	30	32	33	33	32	32	33	<20	<20	<20	<20	<20	<20	20	<20	<20
D0101	40	37	37	28	26	30	33	33	33	33	33	33	<20	<20	<20	<20	<20	20	20	<20	20
D0102	40	37	37	29	26	31	33	33	34	33	33	34	<20	<20	<20	<20	20	20	21	20	20
D0103	40	37	37	27	29	31	31	31	32	31	31	32	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0104	40	40	39	20	23	23	24	24	25	24	24	24	<20	<20	<20	<20	<20	20	20	<20	<20
D0105	53 (when in use)			22	24	21	<20	<20	<20	26	24	22	22	24	21	<20	<20	<20	26	24	22

Receiver ID	PSTL			Predicted Operational Noise Levels, dB(A)																
				Night Scenario 1									Night Scenario 2							
					Wind						F-Class Inversion with			Wind						F-Class Inversion with	
	Day	Eve	Night	Calm	SSW	SW	WSW	W	WNW	F-Class Inversion	SW	WSW	Calm	SSW	SW	WSW	W	WNW	F-Class Inversion	SW	WSW
D0106	53 (when in use)			24	26	28	28	29	29	28	29	29	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0107	External 53 (when in use)			23	24	27	28	28	28	28	28	28	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0108	68 (when in use)			22	23	26	27	27	27	27	27	27	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0109	68 (when in use)			22	23	26	26	26	27	26	26	27	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0110	53 (when in use)			21	24	24	24	25	25	25	25	25	<20	<20	<20	<20	<20	<20	21	<20	<20
D0111	40	35	35	23	20	23	24	25	27	27	25	26	22	<20	<20	20	22	26	26	22	23
D0112	40	35	35	<20	<20	22	24	24	25	24	24	24	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0113	40	35	35	23	<20	22	25	28	29	28	26	28	23	<20	20	24	28	28	28	25	28
D0114	40	40	39	31	33	35	36	36	36	35	36	36	31	33	35	36	36	36	35	36	36
D0115	40	40	39	31	33	35	35	36	36	35	36	36	31	33	35	35	36	36	35	36	36
D0116	40	40	39	23	24	24	24	25	26	26	25	25	22	<20	<20	<20	21	24	24	21	22
D0117	40	40	39	26	23	25	27	28	29	28	28	28	26	23	25	27	28	29	28	28	28
D0118	40	40	39	35	34	37	39	39	39	39	39	39	35	34	37	39	39	39	38	39	39
D0119	40	40	39	30	29	32	34	35	35	34	34	35	30	29	32	34	34	35	34	34	35
D0120	40	40	39	34	30	32	35	37	37	37	35	37	34	30	31	35	37	37	37	35	37
D0121	58	53	48	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0122	58	53	48	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0123	53 (when in use)			<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0124	58	53	48	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0125	40	35	35	<20	20	21	22	23	24	24	22	23	<20	<20	<20	<20	20	22	22	<20	21
D0126	68 (when in use)			24	22	23	25	28	29	28	26	28	24	20	21	23	27	28	28	25	27
D0127	40	35	35	26	22	24	27	30	31	30	28	30	26	21	23	26	30	30	30	28	30
D0128	40	35	35	24	20	23	26	29	29	29	27	29	24	20	22	26	29	29	29	27	29
D0129	40	35	35	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0130	40	35	35	23	<20	21	25	28	28	28	26	28	23	<20	20	24	28	28	28	25	28
D0131	40	35	35	23	<20	21	24	28	28	28	25	28	22	<20	20	24	28	28	28	25	28

Receiver ID	PSTL			Predicted Operational Noise Levels, dB(A)																
				Night Scenario 1									Night Scenario 2							
	Day	Eve	Night	Wind						F-Class Inversion	F-Class Inversion with		Wind						F-Class Inversion	F-Class Inversion with	
				Calm	SSW	SW	WSW	W	WNW		SW	WSW	Calm	SSW	SW	WSW	W	WNW		SW	WSW
D0132	40	35	35	22	<20	21	24	28	28	28	25	28	22	<20	20	24	28	28	28	25	28
D0133	40	35	35	21	<20	<20	22	26	26	26	23	26	21	<20	<20	22	26	26	26	23	26
D0134	40	35	35	<20	<20	<20	22	25	25	25	23	25	<20	<20	<20	21	25	24	25	23	25
D0135	40	35	35	<20	<20	<20	21	24	24	26	23	25	<20	<20	<20	21	24	24	25	23	24
D0136	40	35	35	<20	<20	<20	<20	<20	<20	23	20	<20	<20	<20	<20	<20	<20	<20	22	20	<20
D0137	40	35	35	<20	<20	<20	21	24	24	26	23	24	<20	<20	<20	21	24	24	26	23	24
D0138	40	35	35	20	<20	<20	21	24	24	26	23	24	<20	<20	<20	21	24	24	26	23	24
D0139	40	35	35	<20	<20	<20	21	24	24	26	23	24	<20	<20	<20	21	24	23	26	23	24
D0140	40	35	35	<20	<20	<20	22	24	24	26	23	24	<20	<20	<20	21	24	24	26	23	24
D0141	40	35	35	<20	<20	<20	22	24	24	26	23	24	<20	<20	<20	21	24	24	26	23	24
D0142	40	35	35	<20	<20	<20	21	24	24	26	23	24	<20	<20	<20	21	24	23	26	23	24
D0143	40	35	35	<20	<20	<20	21	24	23	26	23	24	<20	<20	<20	21	23	23	26	23	24
D0144	40	35	35	<20	<20	<20	21	24	23	26	23	24	<20	<20	<20	20	23	23	25	23	24
D0145	40	35	35	<20	<20	<20	21	23	23	26	23	24	<20	<20	<20	20	23	23	25	23	24
D0146	40	35	35	<20	<20	<20	21	23	23	26	23	24	<20	<20	<20	21	23	23	25	23	24
D0147	40	35	35	<20	<20	<20	21	23	23	25	23	24	<20	<20	<20	20	23	23	25	23	23
D0148	40	35	35	<20	<20	<20	20	23	23	25	23	23	<20	<20	<20	20	23	22	25	22	23
D0149	40	35	35	<20	<20	<20	20	22	22	25	22	22	<20	<20	<20	<20	22	21	24	22	22
D0150	40	35	35	<20	<20	<20	20	23	23	25	22	23	<20	<20	<20	20	23	23	24	22	23
D0151	40	35	35	<20	<20	<20	21	23	23	26	23	24	<20	<20	<20	21	23	23	25	23	23
D0152	40	35	35	<20	<20	<20	21	23	23	25	23	23	<20	<20	<20	20	23	23	25	23	23
D0153	40	35	35	<20	<20	<20	21	23	23	26	23	24	<20	<20	<20	21	23	23	25	23	23
D0154	40	35	35	<20	<20	<20	21	23	23	26	23	23	<20	<20	<20	21	23	23	25	23	23
D0155	40	35	35	<20	<20	<20	21	23	23	26	23	23	<20	<20	<20	20	23	22	25	23	23
D0156	40	35	35	<20	<20	<20	21	23	22	25	23	23	<20	<20	<20	20	23	22	25	23	23
D0157	40	35	35	<20	<20	<20	21	23	23	26	23	23	<20	<20	<20	20	23	22	25	23	23

Receiver ID	PSTL			Predicted Operational Noise Levels, dB(A)																
				Night Scenario 1									Night Scenario 2							
	Day	Eve	Night	Calm	Wind					F-Class Inversion	F-Class Inversion with		Calm	Wind					F-Class Inversion	F-Class Inversion with	
					SSW	SW	WSW	W	WNW		SW	WSW		SSW	SW	WSW	W	WNW		SW	WSW
D0158	40	35	35	<20	<20	<20	21	23	22	25	23	23	<20	<20	<20	20	22	22	25	23	23
D0159	40	35	35	<20	<20	<20	21	23	22	25	23	23	<20	<20	<20	20	22	22	25	23	23
D0160	40	35	35	<20	<20	<20	20	22	22	24	22	23	<20	<20	<20	20	22	22	24	22	22
D0161	40	35	35	<20	<20	<20	21	22	22	26	23	23	<20	<20	<20	20	22	22	25	23	23
D0162	40	35	35	<20	<20	<20	21	23	22	25	23	23	<20	<20	<20	21	22	22	25	23	23
D0163	40	37	37	31	28	33	35	36	36	35	35	36	<20	<20	21	22	23	23	23	23	23
D0164	40	37	37	25	29	30	30	30	30	29	30	30	<20	<20	<20	<20	<20	<20	<20	<20	<20
D0165	40	35	35	27	22	24	26	30	32	31	28	30	27	21	23	25	30	31	31	27	30
D0166	40	35	35	26	22	24	26	31	31	31	28	31	26	21	22	26	30	31	31	27	30
D0167	40	35	35	26	22	24	27	31	31	31	28	31	26	21	22	26	30	31	31	27	30
D0168	40	35	35	26	22	24	27	31	31	31	28	31	26	21	23	26	30	31	30	27	30
D0169	40	35	35	<20	<20	<20	21	24	24	26	23	24	<20	<20	<20	21	24	24	26	23	24
R1	40	37	37	39	43	43	43	42	39	42	43	43	30	34	34	34	33	31	34	34	34
R2	40	40	39	23	24	24	24	25	26	26	25	25	21	<20	<20	<20	21	23	24	21	22
R3a	40	37	37	23	28	28	28	28	28	28	28	28	<20	<20	<20	<20	<20	<20	<20	<20	<20
R5a	40	37	37	26	29	31	31	31	31	31	31	31	<20	<20	<20	<20	<20	<20	<20	<20	<20
R6a	40	37	37	36	31	34	37	39	40	39	38	39	23	23	25	26	27	27	26	26	27
R6b	40	37	37	30	25	29	33	35	35	35	34	35	20	<20	21	23	23	24	24	23	24
R9	40	37	37	37	30	30	29	30	31	40	35	34	39	34	34	33	33	34	42	38	37
R15a	40	37	37	35	32	31	30	30	30	39	34	34	34	36	33	31	30	30	37	36	35
R22	40	37	37	34	36	35	35	33	31	36	36	36	32	36	36	35	33	29	35	36	36
R39a	40	40	39	36	33	35	39	39	40	39	39	39	36	33	35	39	39	40	39	39	39
CPP001	45	43	40	33	28	27	27	28	30	38	32	32	33	28	27	27	28	30	38	32	32
CPP002	45	43	40	36	30	30	31	33	37	40	35	36	36	30	30	31	33	37	40	35	36
CPP003	45	43	40	31	35	34	31	26	24	36	35	34	31	35	34	31	26	24	36	35	34
CPP004	45	43	40	32	37	36	34	30	26	37	37	36	32	37	36	34	30	26	37	37	36

APPENDIX G Operational Noise Contours

Figure 19 – Day Operational Noise Contours - $L_{Aeq, 15min}$, dB(A)

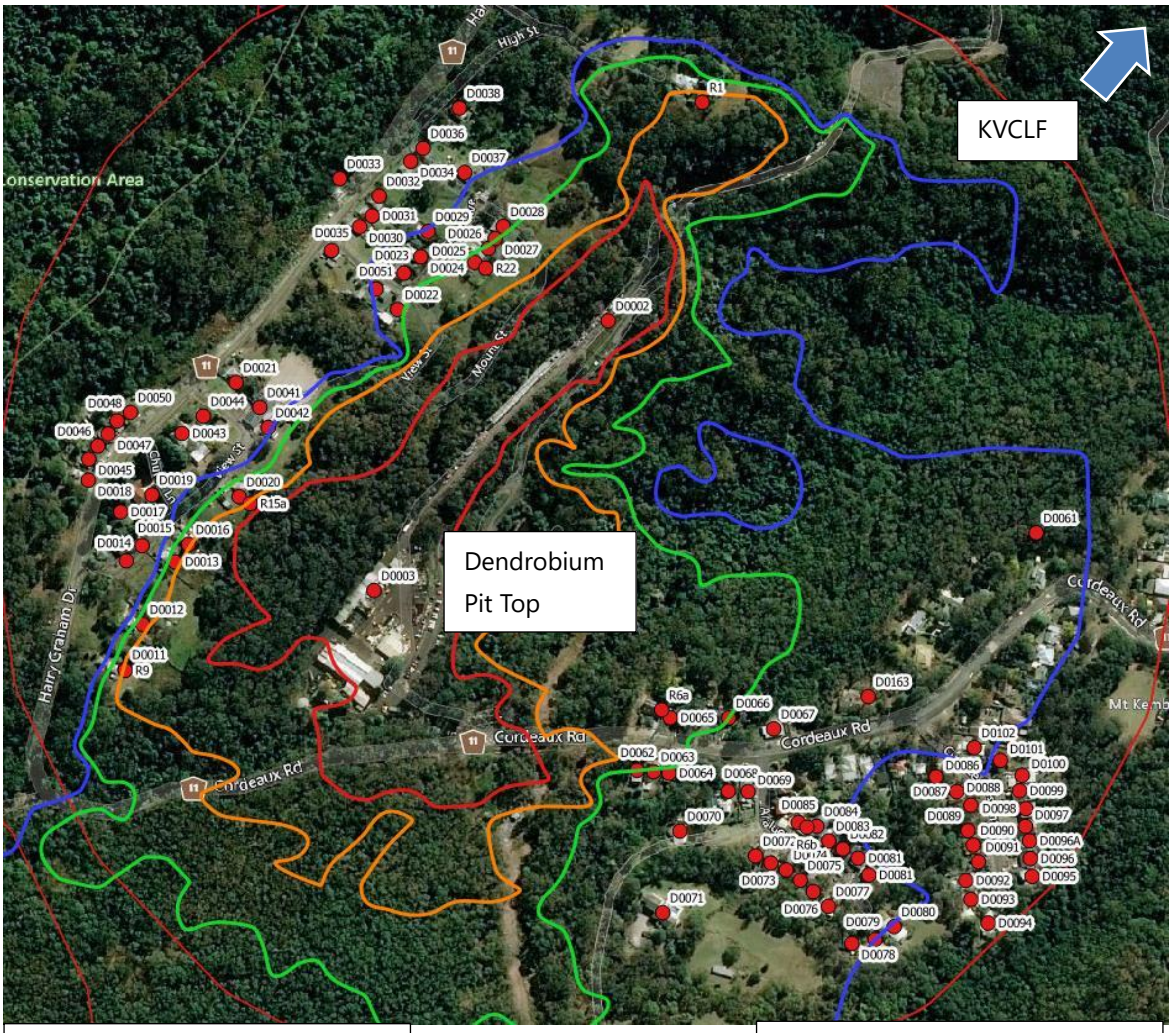


Figure 20 – Day Operational Noise Contours - $L_{Aeq, 15min}$, dB(A)

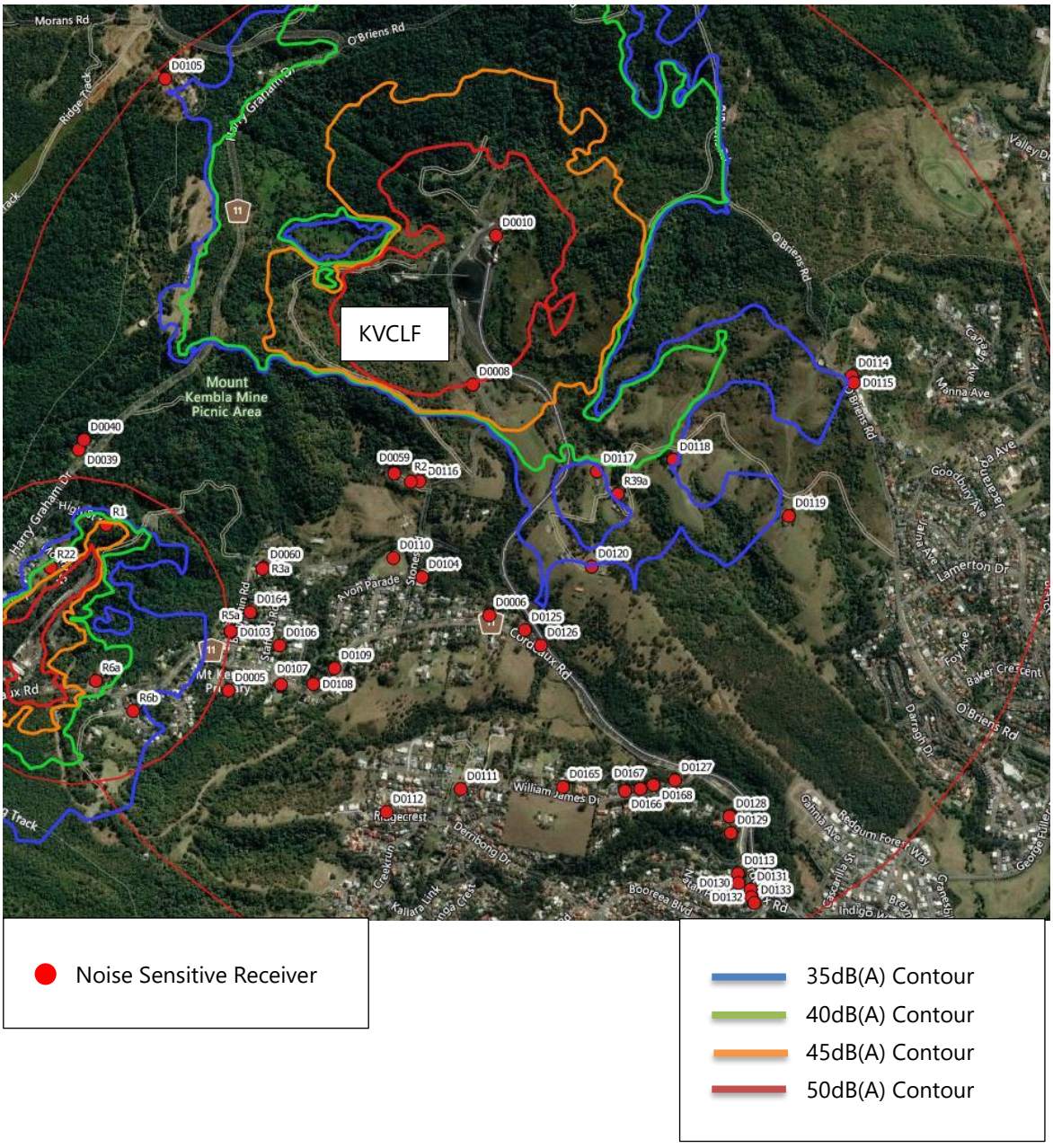


Figure 21 – Day Operational Noise Contours - $L_{Aeq, 15min}$, dB(A)

Figure 22 – Evening Operational Noise Contours - $L_{Aeq, 15min}$, dB(A)

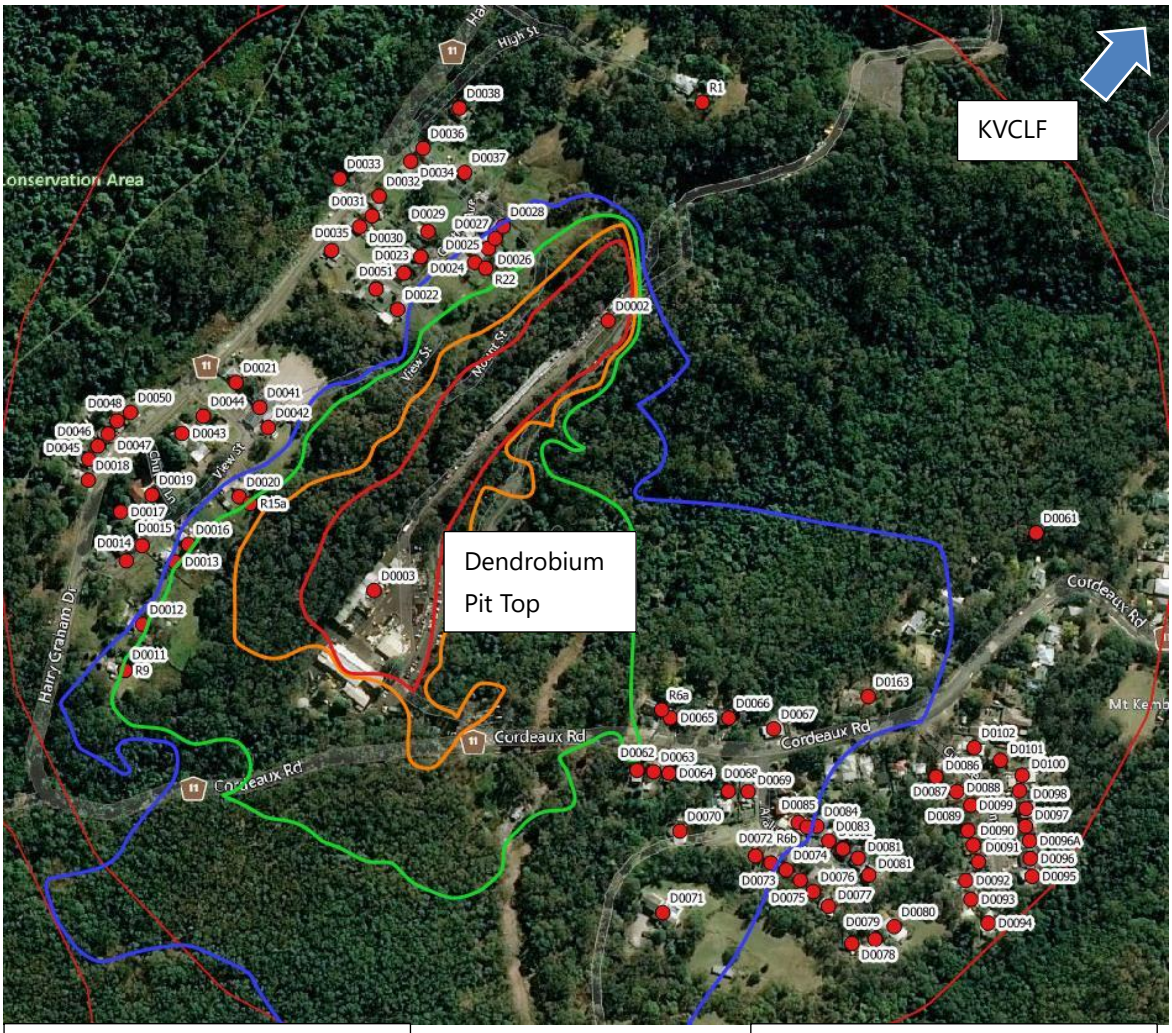


Figure 23 – Evening Operational Noise Contours - $L_{Aeq, 15min}$, dB(A)

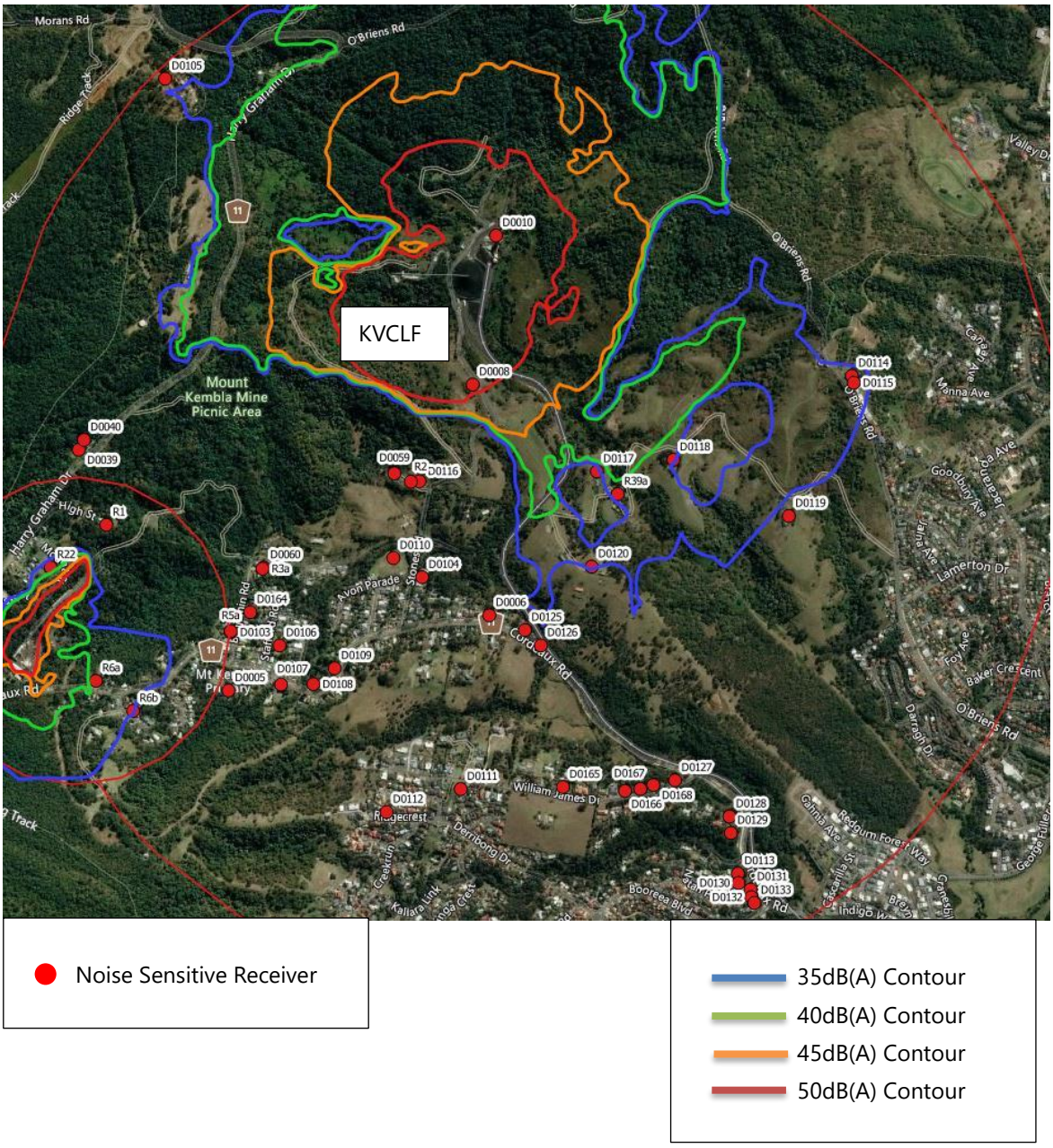


Figure 24 – Evening Operational Noise Contours - $L_{Aeq, 15min}$, dB(A)

Figure 25 – Night Scenario 1 Operational Noise Contours - $L_{Aeq, 15min}$, dB(A)

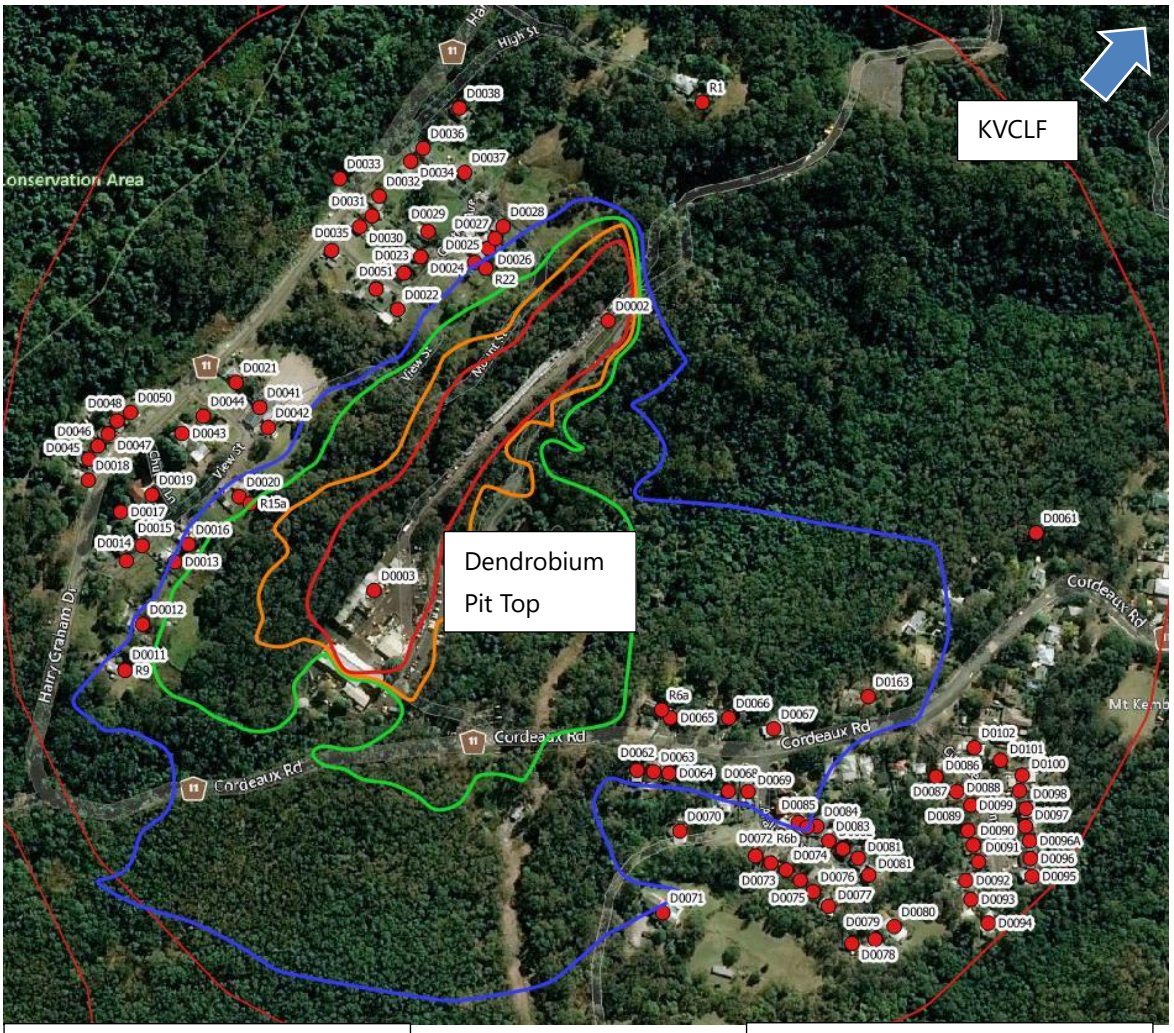


Figure 26 – Night Scenario 1 Operational Noise Contours - $L_{Aeq, 15min}$, dB(A)

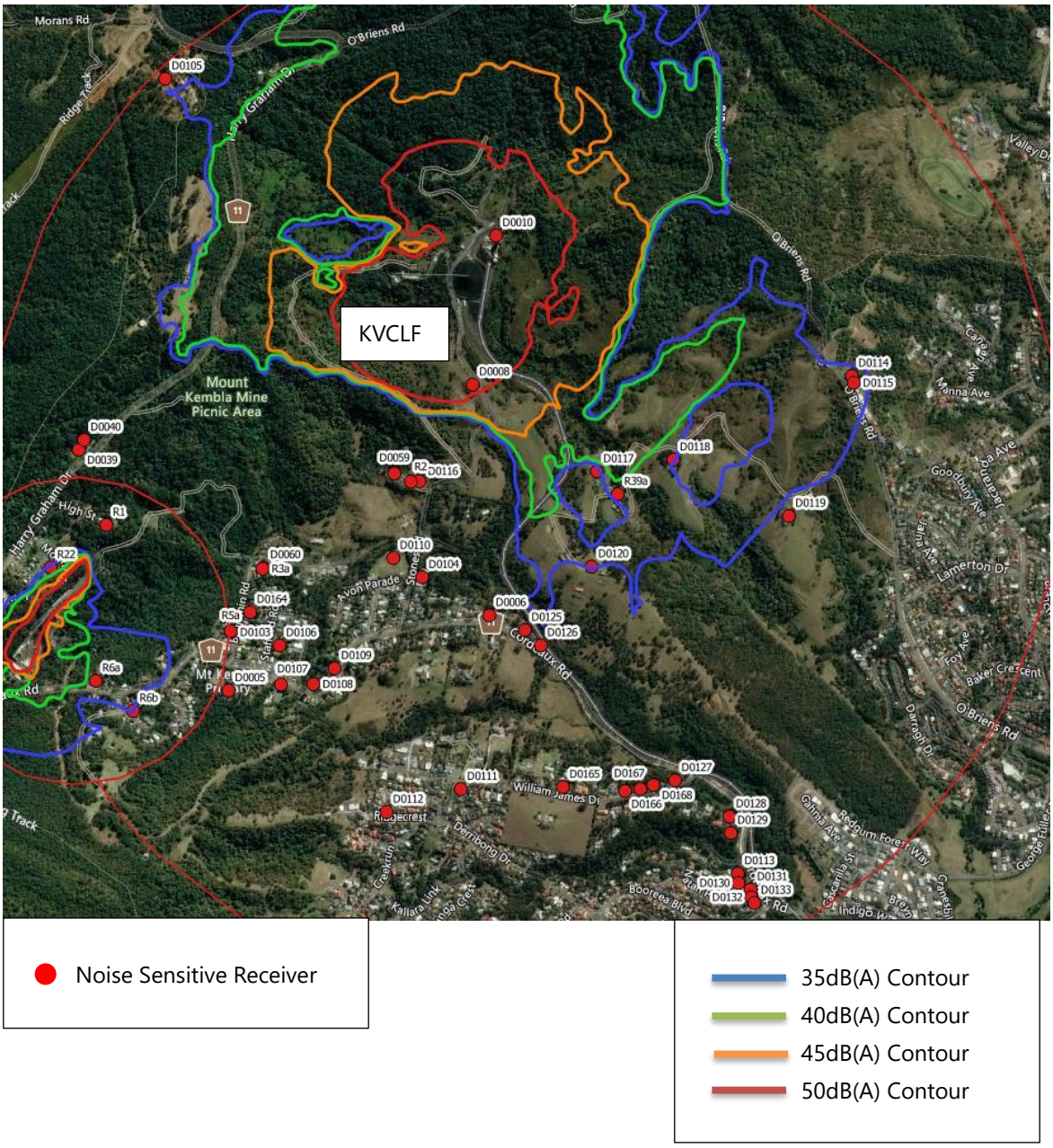


Figure 27 – Night Scenario 1 Operational Noise Contours - $L_{Aeq, 15min}$, dB(A)

Figure 28 – Night Scenario 2 Operational Noise Contours - $L_{Aeq, 15min}$, dB(A)

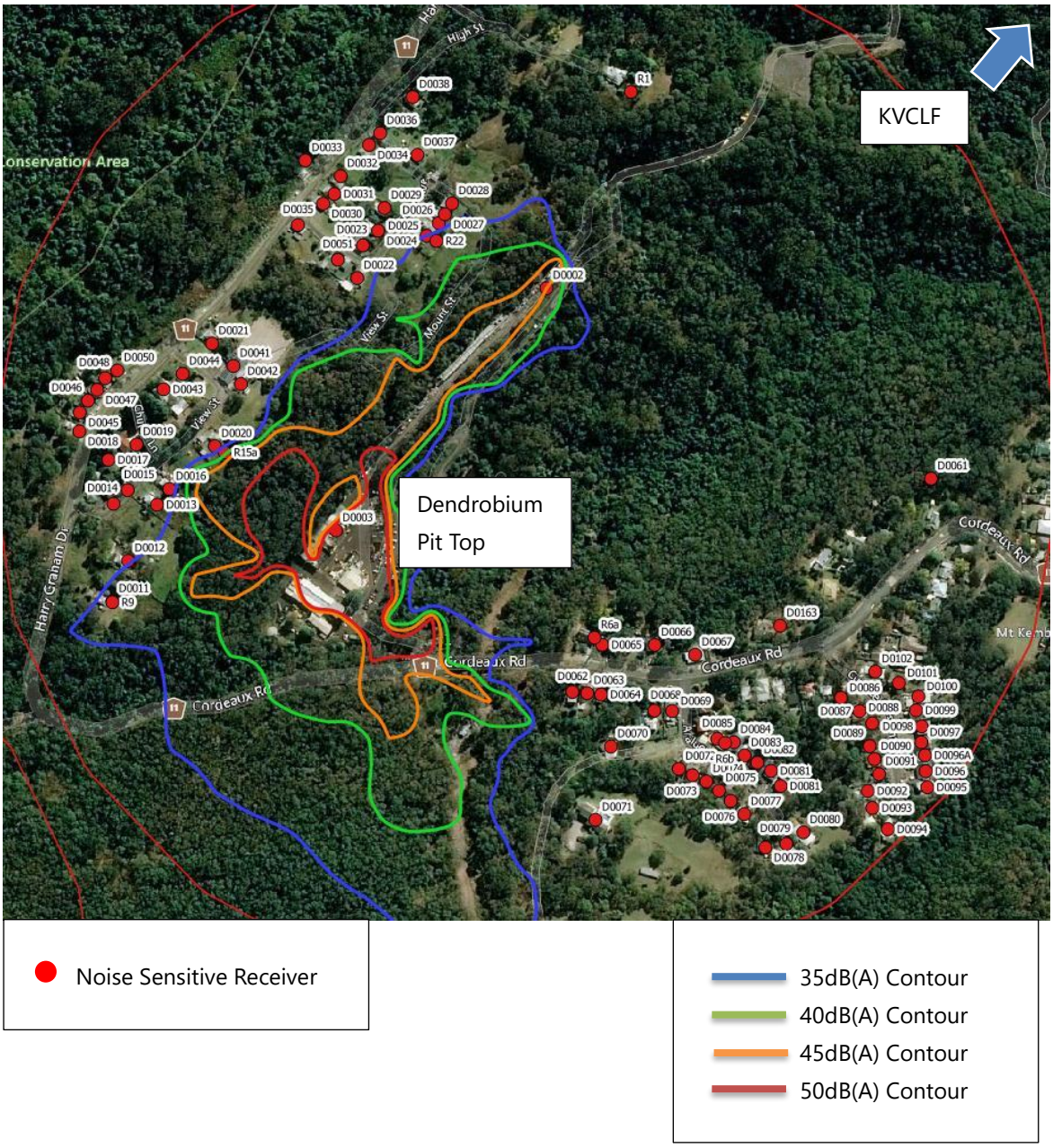


Figure 29 – Night Scenario 2 Operational Noise Contours - $L_{Aeq, 15min}$, dB(A)

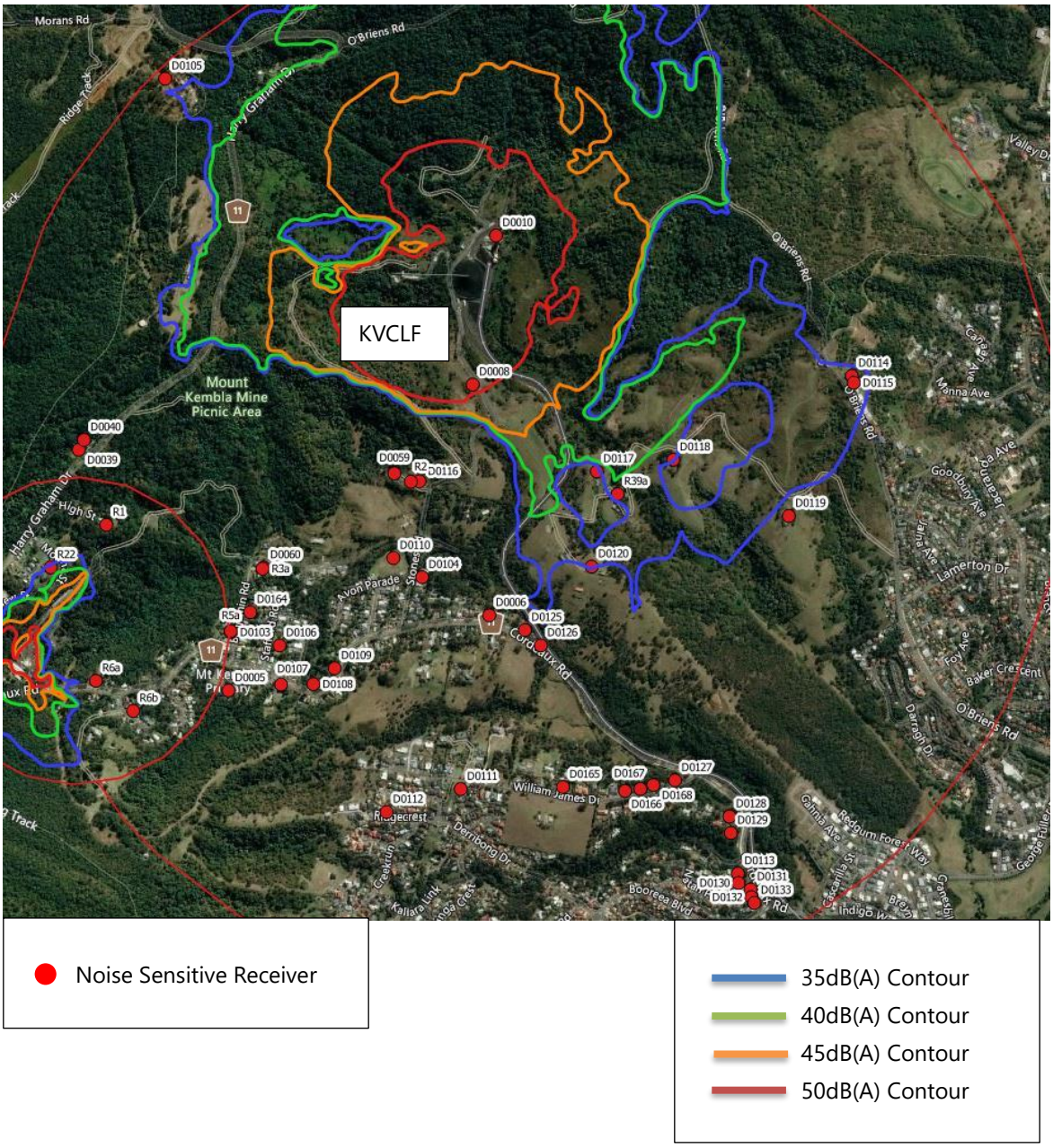


Figure 30 – Night Scenario 2 Operational Noise Contours - $L_{Aeq, 15min}$, dB(A)

APPENDIX H Review of Brake Squeal on the Kemira Valley Rail Line

As noted in the EPA recommendations, noise associated with rail operations on the existing Kemira Valley Rail Line has been a long-standing source of complaints from local residents. In particular, noise associated with rail wheel/brake squeal were identified as the major sources of noise impacting on the local communities. However, it is understood that all trains operating on the Kemira Valley Rail Line have been modified with new brake pads and that the current noise situation is significantly improved compared with the situation when the EPA's recommendation was developed.

In FY 2015, IMC trialled and implemented a range of improvements to braking activities on the Kemira Valley Rail Line, including:

- Use of on-board data loggers to increase consistency of driver behaviour;
- Review and trial of dynamic/dual braking (engine and brakes);
- Dynamic braking was incorporated into standard practices for a key rail section; and
- Standardisation of braking durations.

Also in 2015, Transport for NSW , in partnership with Pacific National, commenced a detailed investigation of wheel and brake squeal on the Kemira Valley Rail Line. Four phases of the study were completed between 2015 and 2017.

A summary of the four phases of the brake noise study is provided below. A detailed review of the noise modelling results for Phase 4 is provided in the following section:

1. Phase 1 (December 2015 to April 2016) – Detailed noise measurements were undertaken to identify which individual wheels on freight trains were emitting [excessive] noise, to identify the source of this noise (wheel squeal, flanging, brake noise, other) and to provide guidance for further phases of the Project.

2. Phase 2 (June 2016 to July 2016) - A laboratory study was undertaken at the FIP brake testing facility to investigate specific elements of the brake system that could generate the noise identified in Phase 1. The study identified that there was a link between the brake shoe fit and squeal and that the next phase of the project should include on track testing and trials to investigate if a conformal fit reduces brake squeal and vibration.

3. Phase 3 (November 2016 to March 2017) – For this study, detailed noise measurements were undertaken to investigate the noise reduction associated with three types of brake pads: one with brake shoes with a new friction compound and two with brake shoes with backing plates of a larger radius than the seat. The study found that brake shoes with larger radius backing plates were effective in essentially eliminating brake noise, with only a single brake noise event observed during two weeks of post-modification monitoring. The use of brake shoes with a modified compound were found to reduce the occurrence of brake noise events from 32% of all train runs to 16% of runs.

4. Phase 4 (May 2017 to July 2017) – In this study, modified brake shoes with backing plates of a larger radius than the seat were fitted to the bogies of one freight train (22 wagons). A comparison of noise levels between modified and unmodified trains was undertaken and is described in the following section.

As a result of the positive outcomes of the trial, all trains operating on the Kemira Valley Rail Line were modified with new brake pads during FY 2018. In addition, during FY 2019 a number of actions were undertaken to address localised wheel squeal on a section of track proximal to William James Drive (e.g. review and trialling of different train speeds, track adjustments and track tamping and installation of new greasing unit).

During FY 2020 and FY 2021, the following actions were taken to address wheel squeal including:

- installation of greasing units;
- relocation of lubricators;
- installation of friction modifiers; and
- ongoing track replacements.

Subsequent monitoring indicated that there was a reduction in the frequency and level of squeal events as a result of the mitigation measures implemented.

Up to FY 2018, rail related noise complaints dropped considerably (Section H.1) in parallel with the implementation of ongoing brake squeal evaluation and mitigation strategies and associated community consultation. While the number of rail noise related complaints increased in FY 2018 to FY 2021, it is noted that the majority of the complaints made during these reporting periods were from one resident. Overall, performance of the modified trains with modified driver practices and brake shoe modifications is significantly improved compared with the brake squeal noise situation (Section H.1).

H.1 Summary of Phase 4 Noise Monitoring Results

Modified brake shoes with backing plates of a larger radius than the seat, were fitted to the bogies of one freight train (22 wagons) operating on the Kemira Valley Rail Line. After allowing two weeks for the new brake shoes to 'run in', wayside noise monitoring equipment was installed at two locations within the downhill braking zone.

The noise monitoring results were used to compare the train with modified brake shoes to the remaining unmodified wagons on other trains. To quantify the effectiveness of the modifications, the overall noise levels of train passbys ($L_{Aeq,tp}$ and L_{AFmax})[6] and the occurrence of tonal brake noise events was compared between the modified and unmodified trains.

Monitoring Locations

Noise monitoring was undertaken at two locations within the braking zone of trains travelling from the Kemira Valley Coal Loading Facility to the BlueScope Steel Port Kembla site (Figure 31). At both sites, unattended noise loggers were placed at locations with a clear line-of-sight to passing trains. The height of the microphones were positioned approximately 1.2 m above the top of rail and 3.5 m (Site B) to 4.6 m (Site A) from the near rail. The locations that were selected had an unobstructed view of the rail line, no significant reflective objects and screening from public areas to assist in keeping the equipment secure.

At both sites, unattended noise loggers were placed at locations with a clear line-of-sight to passing trains. The height of the microphones were positioned approximately 1.2 m above the top of rail and 3.5 m (Site B) to 4.6 m (Site A) from the near rail.

[6] $L_{Aeq,Tp}$ is the A-weighted equivalent passby noise level where Tp is the passby time of the train unit under investigation. L_{AFmax} is the maximum value of the A-weighted sound pressure level during the measurement time interval using time weighting F (fast). These measurement parameters are defined in ISO 3095:2013.

Figure 31 – Freight train route between Kemira Valley Coal Loading Facility and BlueScope Steel Port Kembla, including two wayside monitoring locations within the braking zone.

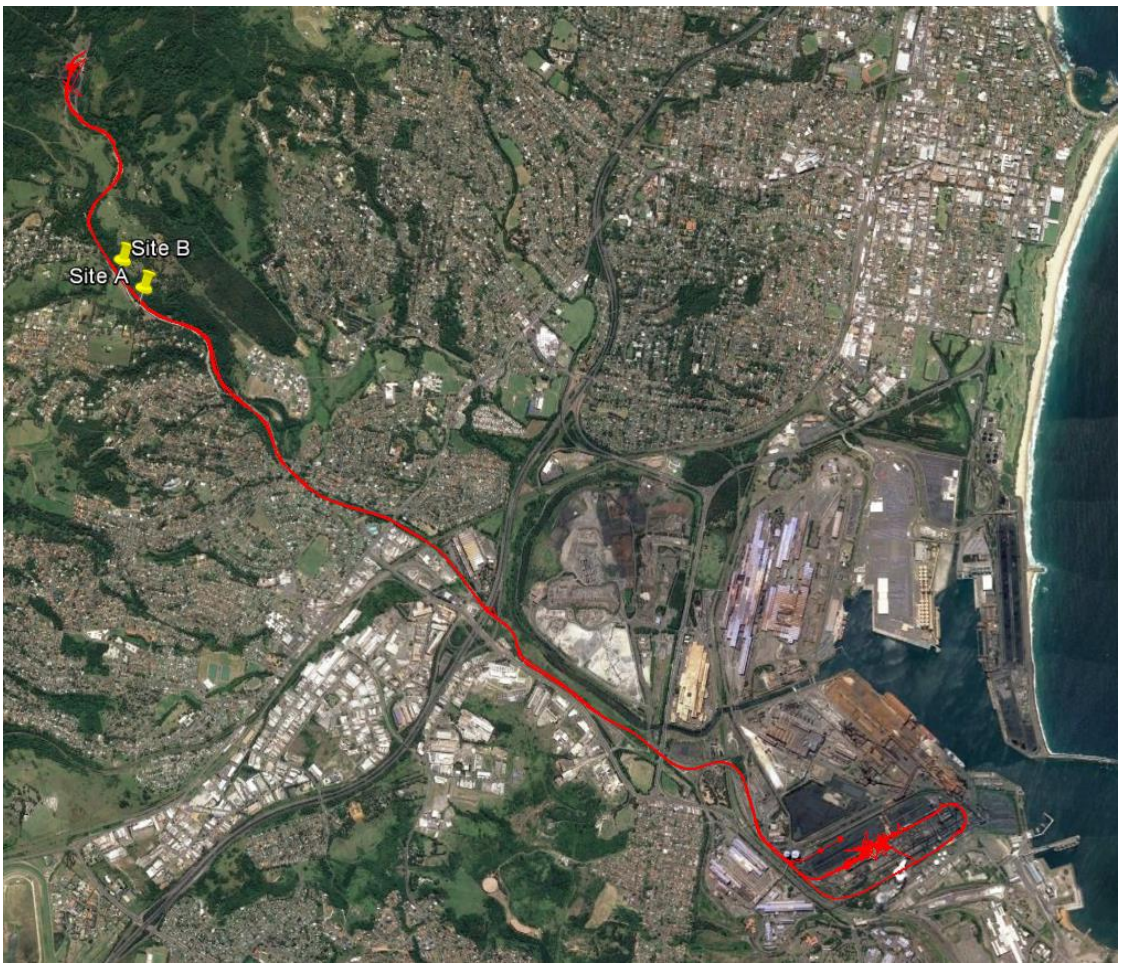


Table H.1 – Comparison of the Overall Passby Noise Levels at Site A

	Downhill			Uphill		
	Number of passbys	$L_{Aeq,Tp}$ dB(A)*	L_{AFmax} dB(A)*	Number of passbys	$L_{Aeq,Tp}$ dB(A)*	L_{AFmax} dB(A)*
Not Modified	144	80	96	143	82	96
Modified	69	76	92	68	81	94
Difference		-4.0	-3.4		-0.8	-1.5

* Noise levels are logarithmically averaged.

Measurement Parameters and Data Analysis

The XL2 noise loggers were set up to measure the L_{Aeq} and L_{AFmax} noise levels in consecutive 0.1 second intervals throughout the survey period. The loggers also recorded noise levels in one-third octave centre frequency bands.

Train passby events were extracted from the continuous recordings and post-processed to determine the relevant noise parameters for each train passby.

The time, direction, locomotive number and wagon IDs for each train run during the monitoring period was provided by Pacific National as a scheduled run sheet.

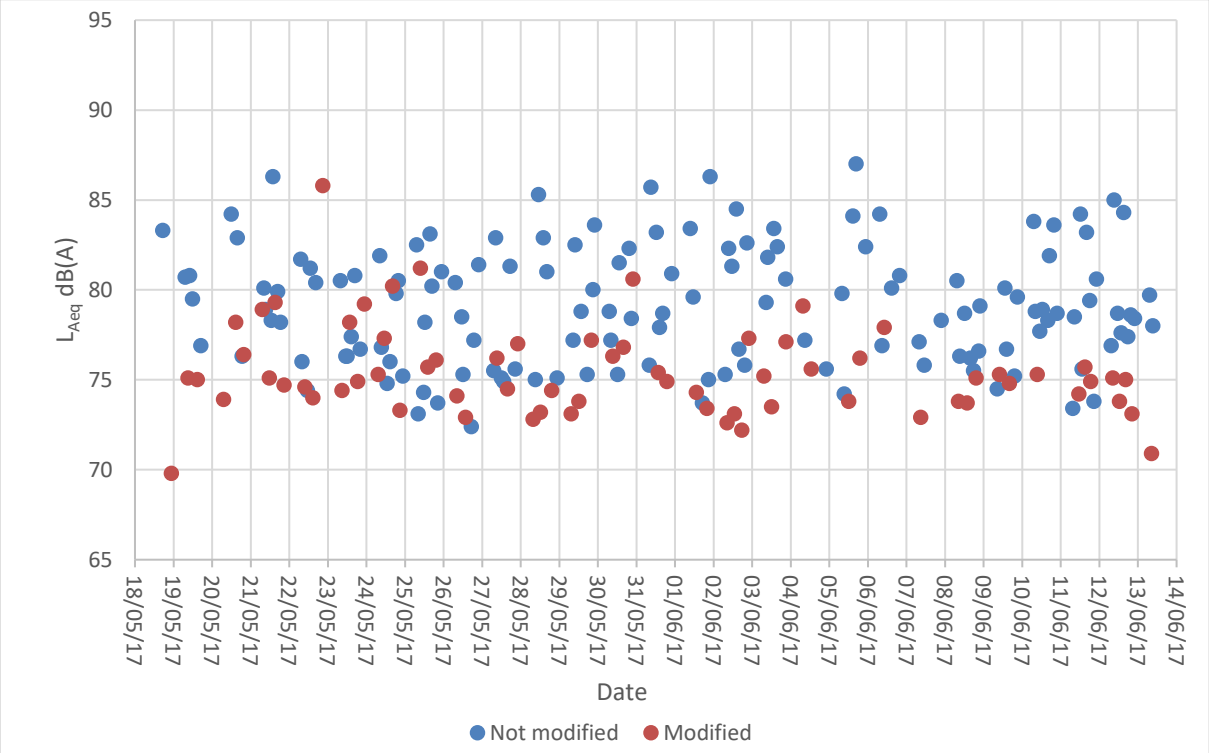
Measurement Results

Site A

Average $L_{Aeq,Tp}$ and L_{AFmax} noise levels for modified and unmodified trains at Site A have been compared in both downhill and uphill directions in Table 11.3. The average $L_{Aeq,Tp}$ noise level of downhill trains was 4 dB lower for the train with the modified brake shoes compared to the unmodified trains. Passbys in the uphill direction act as control measurements that do not feature train braking. The difference in average LAeq,Tp and LAFmax noise levels of uphill trains were 0.8 dB and 1.5 dB respectively. These differences are within normal measurement tolerances, with the LAeq,Tp noise parameter being less volatile than the L_{AFmax} noise parameter.

Figure 32 shows a time history of the downhill passbys noise levels (L_{Aeq}) at Site A. It is evident that passbys of the modified train produced generally lower noise levels compared to the unmodified trains.

Figure 32 – Time History of LAeq Noise Levels of Downhill Train Passbys for the Duration of the Monitoring Period at Site A (4.6m from near track)

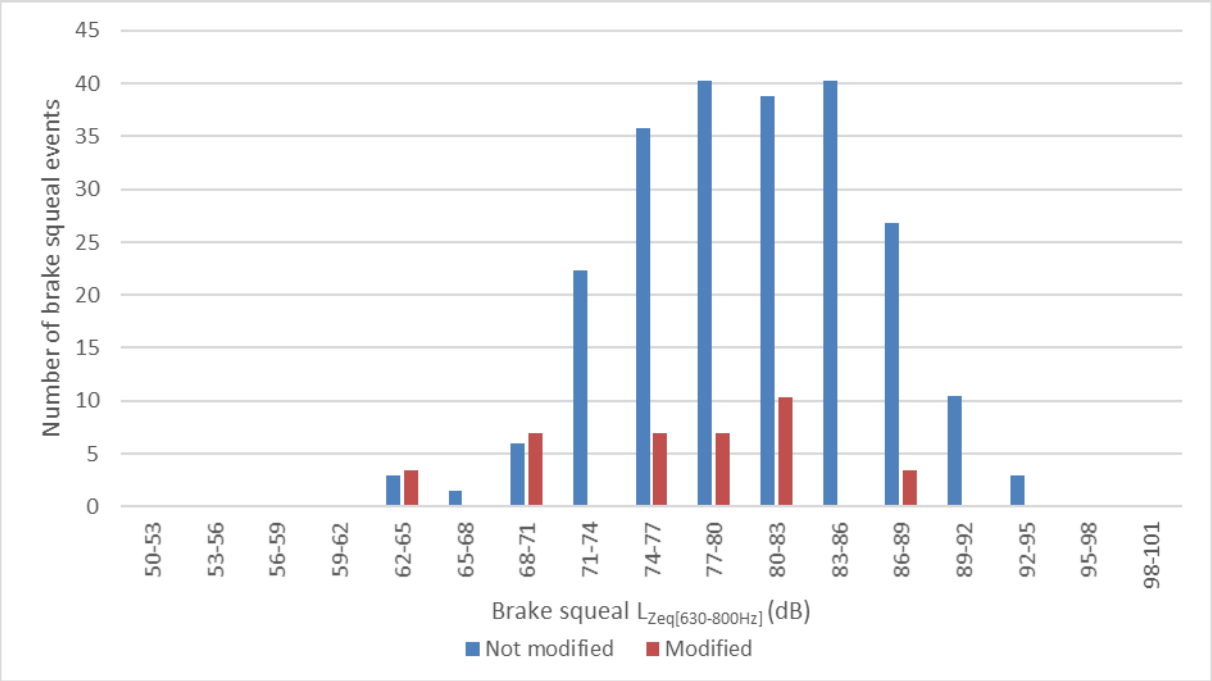


To compare brake squeal data for the modified and unmodified trains, the results were normalised to 100 passbys of each type of train.

Figure 33 demonstrates that not only did passbys of the modified train have fewer brake squeal events, but that noise levels in the 630-800 Hz frequency range were lower. Similarly, Figure 34 shows that brake squeals from the modified train were generally shorter in duration.

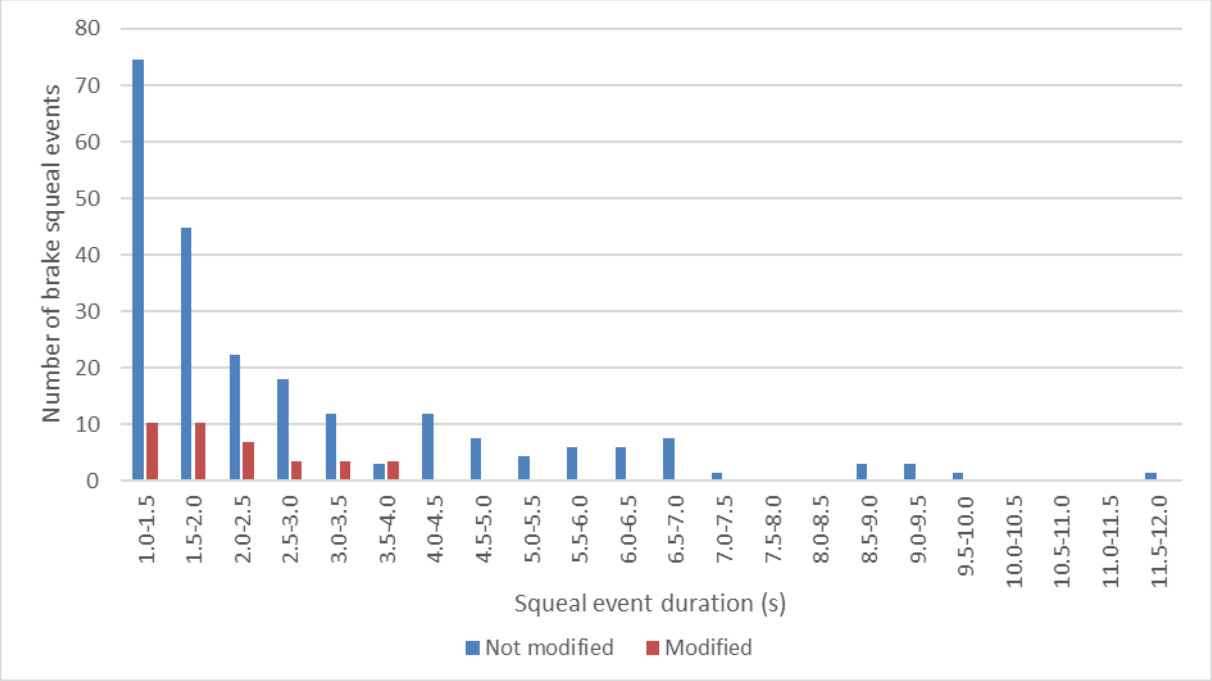
A significant difference in the occurrence of brake squeal events and severity was observed. For unmodified trains, 42% of train passbys were observed with squeal events greater than 85 dB[7]. For modified trains, only 3% of train passbys (1 out of 29) were observed with squeal events greater than 85 dB.

Figure 33 – Histogram of Noise Levels of Brake Squeal Events at Site A, Normalised to 100 passbys



[7] 85 dB noise threshold for squeal based on $L_{Zeq[630-800Hz]}$ noise descriptor

Figure 34 – Histogram of Durations of Brake Squeal Events at Site A, Normalised to 100 passbys



Site B

Average $L_{Aeq,Tp}$ and L_{AFmax} noise levels for modified and unmodified trains have been compared for Site B in Table H.2. The average $L_{Aeq,Tp}$ noise level of downhill trains was 6 dB lower for the train with the modified brake shoes compared to the unmodified trains. There was less than 0.5 dB difference in the average $L_{Aeq,Tp}$ noise level of uphill trains. These differences are within normal measurement tolerances.

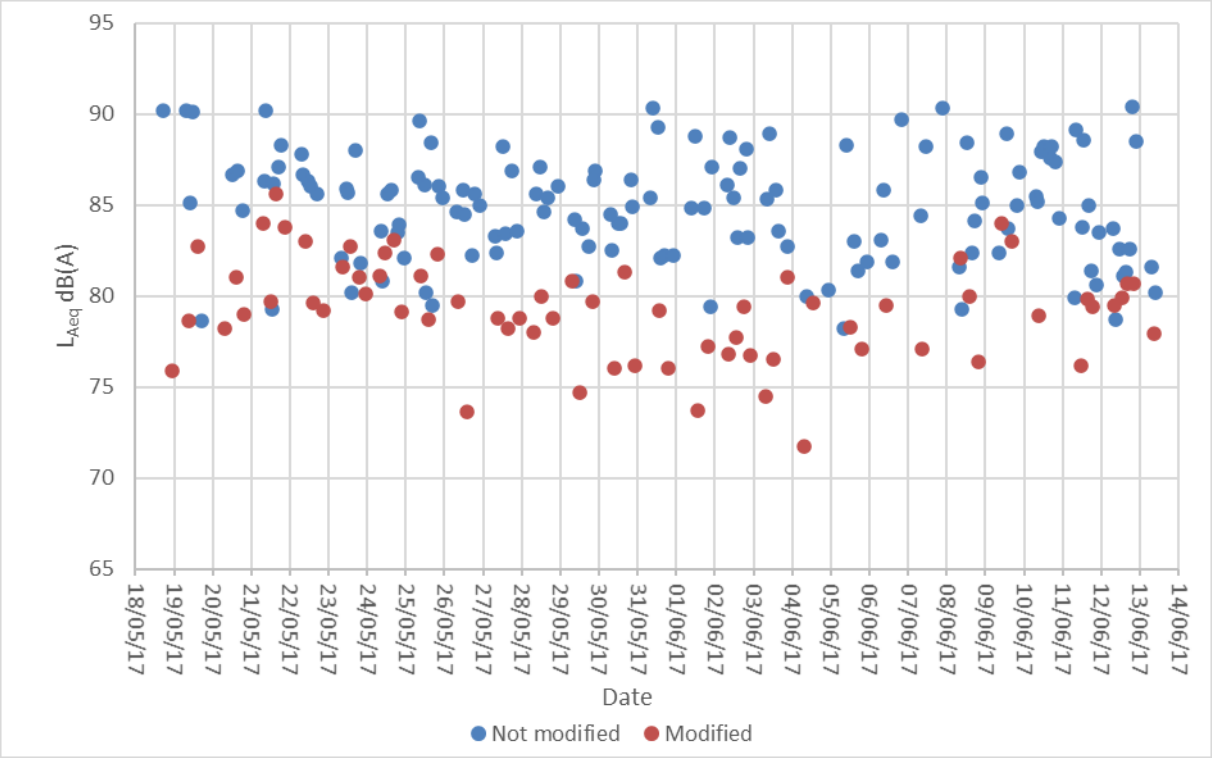
Table H.2 – Comparison of the Overall Passby Noise Levels at Site B

	Downhill			Uphill		
	Number of passbys	$L_{Aeq,Tp}$ dB(A)*	L_{AFmax} dB(A)*	Number of passbys	$L_{Aeq,Tp}$ dB(A)*	L_{AFmax} dB(A)*
Not Modified	145	86	100	145	82	93
Modified	70	80	95	70	81	94
Difference		-5.7	-5.0		-0.3	+0.5

* Noise levels are logarithmically averaged.

Figure 35 shows a time history of the downhill passbys noise levels at Site B. It is evident that passbys of the modified train produced a lower range of noise levels compared to the unmodified trains.

Figure 35 – Time History of LAeq Noise Levels of Downhill Train Passbys for the Duration of the Monitoring Period at Site B (3.5m from near track)



Histograms of the brake squeal events normalised to 100 passbys are shown in Figure 36 and Figure 37.

Figure 36 – Histogram of noise levels of brake squeal events at Site B, normalised for 100 passbys

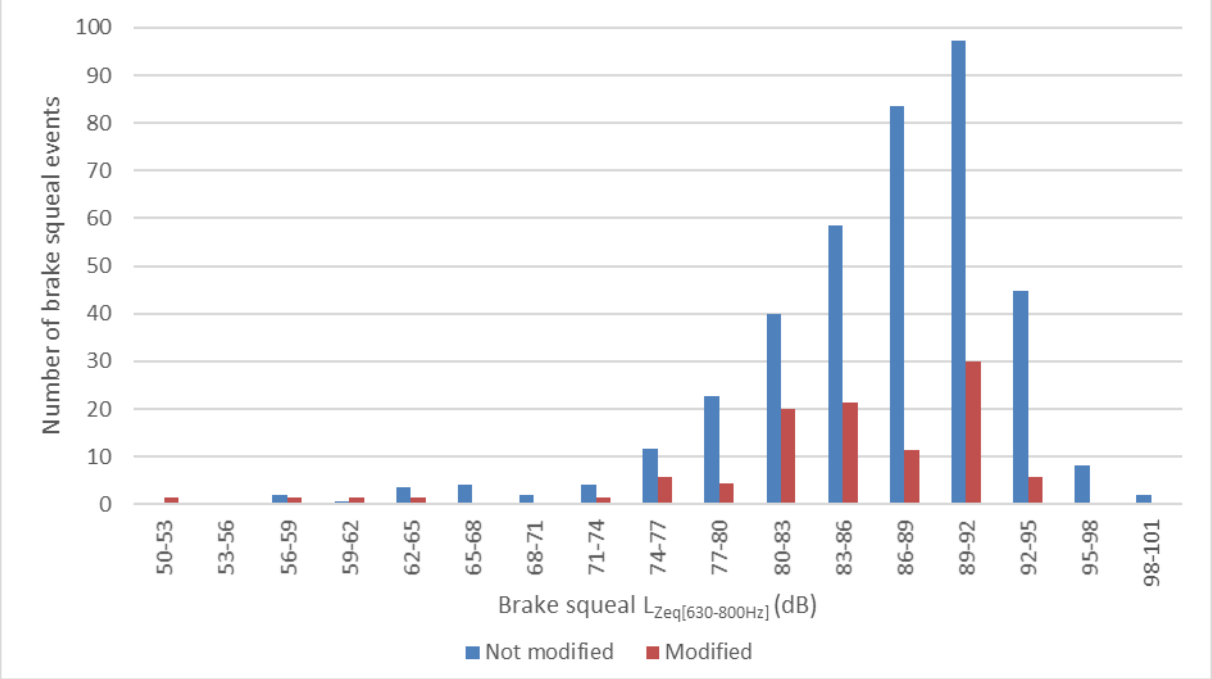
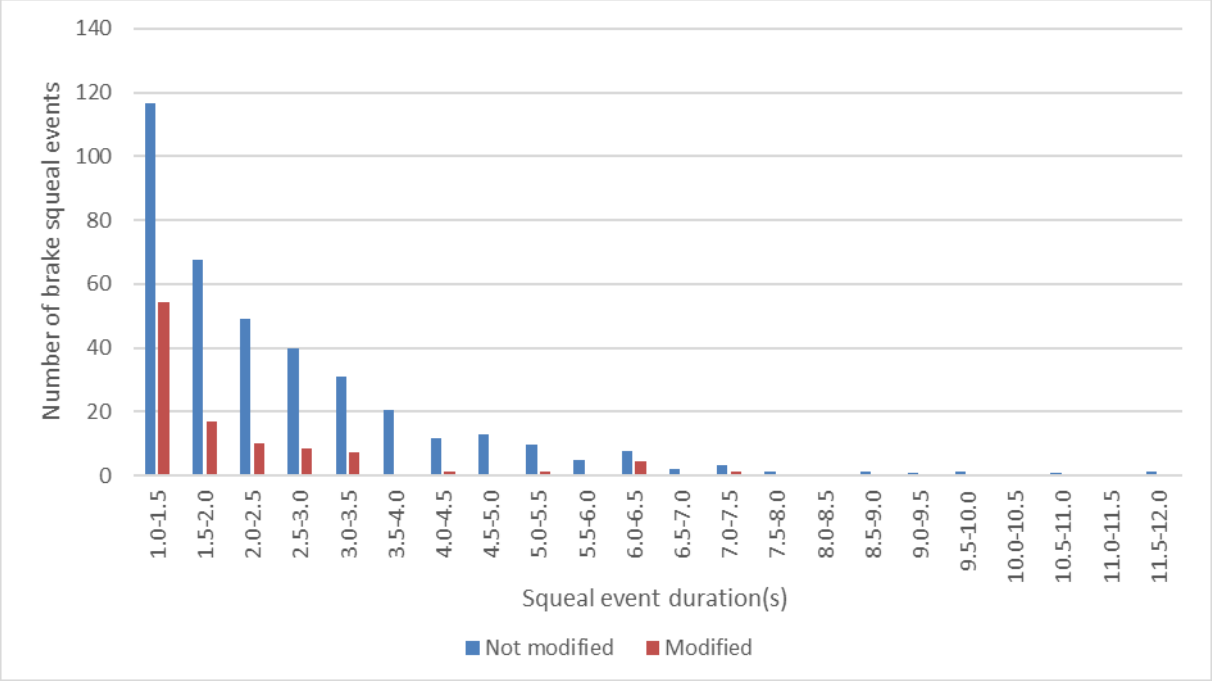


Figure 37 – Histogram of durations of brake squeal events at Site B, normalised to 100 passbys



Brake squealing was more prevalent and severe at Site B compared to Site A. At Site B, 92% of unmodified train passbys were observed with squeal events greater than 85 dB (see note 6). For modified trains, 41% of train passbys were observed with squeal events greater than 85 dB.

Observations

The following differences between modified and unmodified trains were observed:

- Downhill $L_{Aeq,Tp}$ noise levels of modified trains were 4 dB lower at Site A and 6 dB lower at Site B where rail brake squeal was more prevalent.
- At Site A 42% of the unmodified trains featured at least one brake squeal event above 85 dB(A), compared to 3% for the modified train. At Site B 92% of the unmodified trains featured brake squeal greater than 85 dB(A), compared to 41% for the modified train.

The results indicate that modified brake shoes materially decreased the occurrence and severity of brake squeal events. In addition, the overall passby noise levels were materially lower for the train with the modified brake shoes. As such, the modifications have the potential to reduce the noise impact of freight train operations perceived by residents at Kemira Valley.

H.2 Further Comments on Braking Noise

The Dendrobium Mine Noise Management Plan identifies the following rail noise impact criteria for locomotive operations on the Kemira Valley Rail Line, which is directly taken from Item 3 of Schedule 4 of the Development Consent DA 60-03-2001 conditions.

Table 4: Rail noise impact assessment criteria

Operating Conditions	Measurement Conditions	Criteria *LA1(1min)*
Locomotive at idle, with compressor radiator fans and air conditioning operating at maximum load	Stationary 15 metre contour	70 dB(A)
All other throttle settings under self-load, with compressor radiator fans and air conditioning operating at maximum load	Stationary 15 metre contour	87 dB(A) 95 dB(Lin)
All service conditions	Up to 50 km/hr, 15 metres from the centerline of rail track	87 dB(A) 95 dB(Lin) Must be non-tonal, Linear noise must not exceed A-weighted noise levels by more than 15dB

For train speeds up to 50 km/h, $L_{A1(1minute)}$ noise levels up to 87 dB(A) are permitted at 15 m from the track centreline (note that $L_{A1(1minure)}$ noise parameter is approximately equivalent to the L_{Amax} noise parameter).

From the results presented in Table H.1 and Table H.2, it is possible to estimate the L_{Amax} noise levels that would have occurred at 15 m from the track centreline. For Site A and Site B, L_{Amax} noise levels at 15 m from the track centreline would be approximately 10 dB(A) and 13 dB(A) lower than indicated in Table 11.1 and Table 11.2, respectively, based on a 20 x log (distance) relationship. The equivalent L_{Amax} noise levels for the Project's modified trains at 15 m would therefore be 82 dB(A) for Site A and Site B. These levels are 5 dB(A) lower than the 87 dB(A) noise limit identified in Development Consent DA 60-03-2001.

It is noted that L_{Amax} noise levels were 4 dB(A) to 5 dB(A) higher for the unmodified trains.

It is also noted that the Dendrobium Mine is a legacy site which is predicted to be compliant with the conditions of Development Consent DA 60-03-2001 for rail haulage impact.

H.3 Curving Noise

During FY 2015 and FY 2016, noise measurement studies were performed as part of the Dendrobium Mines' ongoing rail noise mitigation program. These measurements indicated the presence of curve squeal.

Noise mitigation measures that can reduce the incidence of curve squeal include the installation of gauge face lubricators on the approach to small radius curves and/or top-of-rail friction modifiers. The Kemira Valley Rail Line already has a permanent noise monitoring system to quantify curve squeal events and grease pots/gauge face lubricators have been installed to address curve squeal. Top-of-rail friction modifiers have also been tested, but due to the steep grade of the rail line they were found to be impractical for implementation.