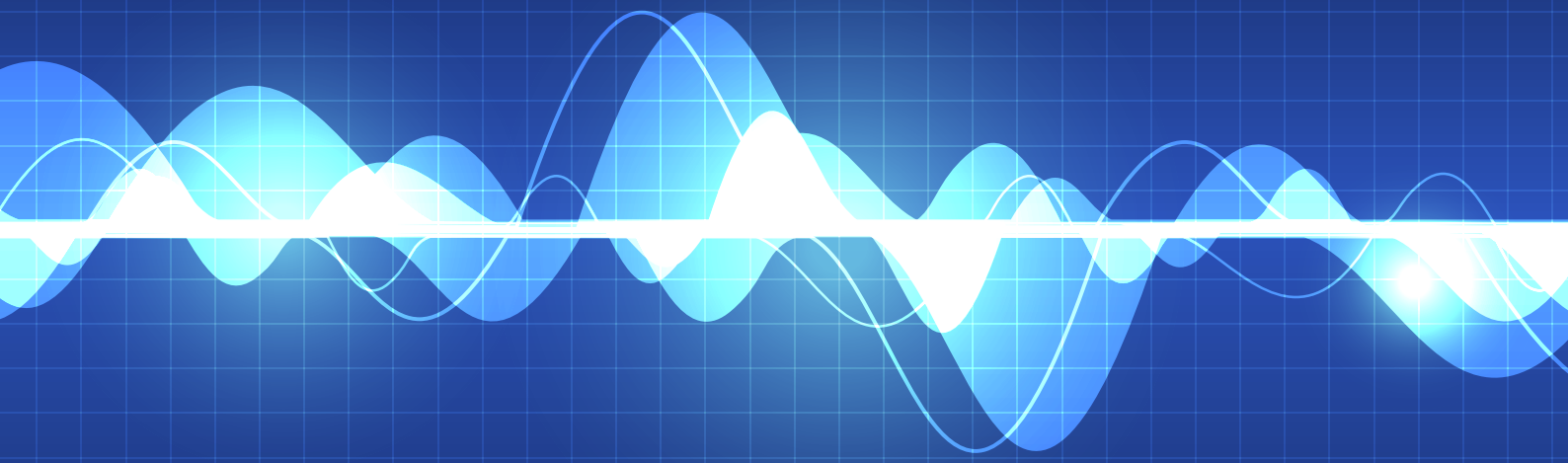
APPENDIX K -ADDENDUM NOISE AND VIBRATION ASSESSMENT

EMM
creating opportunities

Luddenham Advanced Resource Recovery Centre

Addendum Noise and Vibration Impact Assessment

Prepared for Coombes Property Group and KLF Holdings
May 2021



EMM
creating opportunities

EMM
creating opportunities

Servicing projects throughout Australia and internationally

SYDNEY
Ground Floor, 20 Chandos Street
St Leonards NSW 2065
T 02 9493 9500

NEWCASTLE
Level 3, 175 Scott Street
Newcastle NSW 2300
T 02 4907 4800

BRISBANE
Level 1, 87 Wickham Terrace
Spring Hill QLD 4000
T 07 3648 1200

ADELAIDE
Level 4, 74 Pirie Street
Adelaide SA 5000
T 08 8232 2253

MELBOURNE
Ground Floor, 188 Normanby Road
Southbank VIC 3006
T 03 9993 1905

PERTH
Suite 9.02, Level 9, 109 St Georges Terrace
Perth WA 6000
T 02 9339 3184

CANBERRA
PO Box 9148
Deakin ACT 2600

Luddenham Advanced Resource Recovery Centre

Addendum Noise and Vibration Impact Assessment

Report Number

J190749 RP58

Client

Coombes Property Group and KLF Holdings

Date

26 May 2021

Version

v1 Final

Prepared by

Carl Fokkema
Associate - Acoustics
26 May 2021

Approved by

Najah Ishac
Director - Acoustics
26 May 2021

Table of Contents

Appendices

Tables

Figures

1 Introduction

1.1 Background

In late 2019, CFT No 13 Pty Ltd, a member of Coombes Property Group (CPG), acquired the property at 275 Adams Road, Luddenham New South Wales (NSW) (Lot 3 in DP 623799, 'the subject property') within the Liverpool City Council municipality. The subject property is host to an existing shale/clay quarry.

CPG in partnership with KLF (the applicant) are seeking to construct and operate an advanced resource recovery centre (the ARRC) on the subject property (the project). The project is classed as a State Significant Development (SSD) under the State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP).

A noise and vibration impact assessment (NVIA) was prepared by EMM Consulting Pty Limited (EMM) to support the Environmental Impact Statement (EIS) for the project. The NVIA addressed the Secretary's Environmental Assessment Requirements (SEARs) and assessed the potential noise and vibration impacts associated with the project.

Since the submission of the EIS, refinements have been made to the project in response to further detailed design, submissions received on the EIS and in response to further consultation with government agencies. A Submissions Report that responds to submissions made by agencies, organisations, and the community, has been prepared by EMM. The Submissions Report also describes the additional activities undertaken relating to the project since exhibition of the EIS, including a summary of project refinements, further technical studies undertaken, and stakeholder and community engagement activities.

This Addendum NVIA forms part of the Submissions Report and has been prepared to assess the potential noise and vibration impacts of the refined project.

Separate to the ARRC project, the applicant has submitted an application to modify the existing quarry consent to allow quarry operations on the subject property to recommence (Modification 5, also referred to as MOD 5). This application was approved by Department of Planning, Industry and Environment (DPIE) on 24 May 2021. The applicant also intends to lodge a future modification application (MOD 6) to modify the quarry consent to allow infilling of the quarry void with non-recyclable construction and demolition waste from the ARRC. Assuming approval of the ARRC, quarry extraction will be carried out concurrently with ARRC construction and operation until December 2024.

Assuming approval of the MOD6 application, from January 2025 quarry infill will be carried out concurrently with the ARRC operations until such time as the quarry void is filled and rehabilitated ready for final industrial/commercial land use. Activities associated with the infilling and rehabilitation of the quarry void (MOD 6) are not considered in the Addendum NVIA and would be subject to a separate noise assessment and consideration of cumulative noise from concurrent ARRC and void rehabilitation activities.

1.2 Project overview

A detailed description of the project was provided in Chapter 2 of the EIS (EMM, 2020a). The key components of the ARRC project are as follows:

- construction and operation of an advanced construction and demolition resource recovery centre;
- accepting and processing up to 600,000 tonnes per annum (tpa) of building construction waste for recycling;
- despatch of approximately 540,000 tpa of recycled product;

- despatch of approximately 60,000 tpa of unrecyclable material either to an offsite licensed waste facility or to the adjacent quarry void (the later will be subject to separate approval);
- upgrade of the access road from the subject property to Adams Road;
- use of the access road from the subject property to Adams Road;
- the ARRC will not accept putrescibles, liquid or hazardous waste; and
- the ARRC will operate up to 24 hours a day, 7 days per week.

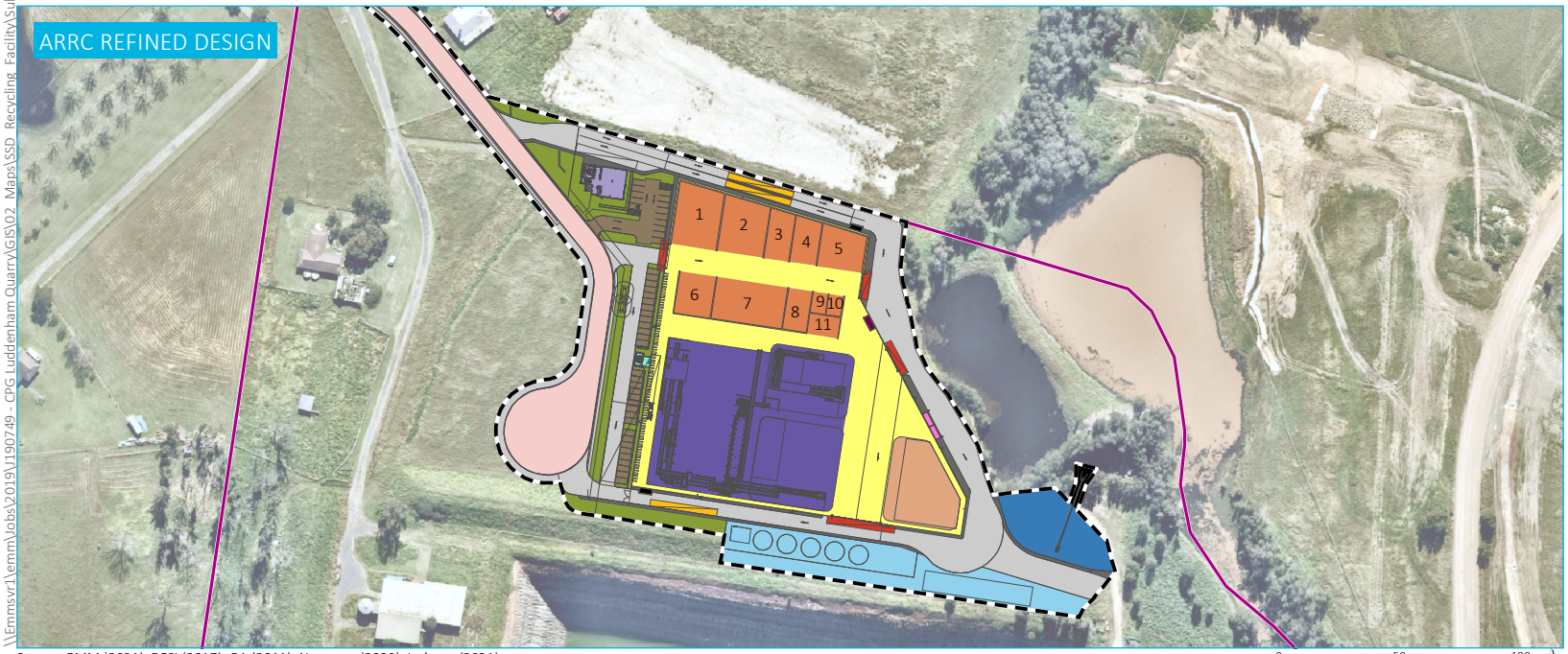
1.3 Purpose and scope of this report

This Addendum NVIA has been prepared to assess the potential noise and vibration impacts of the refined project including consideration of the revised ARRC transport strategy, revised site traffic numbers, proposed road upgrades and traffic movements within the ARRC site, as documented in the Addendum Traffic Impact Assessment (Addendum TIA), and minor amendments to site operations. The NVIA also addresses matters raised in submissions on the EIS and requests for information from DPIE.

Specifically, this Addendum NVIA includes:

- an update on project noise trigger levels (PNTL's) to be adopted for the existing residential assessment locations based on advice from DPIE and the Environment Protection Authority (EPA);
- revised operational assessment further clarifying:
  - site plant and equipment;
  - truck movements;
  - building acoustic performance;
  - cumulative ARRC and quarry operations; and
  - other operational assumptions.
- road upgrade construction noise assessment (in addition to site construction noise addressed in EIS NVIA); and
- updated road traffic noise assessment taking into account amended traffic volumes and distribution documented in the Addendum TIA.

The refined project layout is shown in Figure 1.1 with reference to the EIS ARRC design.



KEY

- Subject property
- ARRC site
- Indicative detailed layout

Proposed element

- ARRC warehouse
- Awning
- Carpark
- Drainage outlet
- Fuel store
- Hand unloading area
- Hardstand
- Internal road
- Kerb/pedestrain area
- Landscaping
- Office over ground floor
- On-site detention
- Product bay
- Site office
- Ticketbooth
- Unloading/processing
- Water treatment infrastruture
- Weighbridge
- Workshop and hazardous materials storage

Product bays

1. Concrete/rubble masonry
2. Clean timber
3. Rigid plastics
4. Paper/cardboard/film
5. Stumps/asphalt/metal
6. Heavy residual
7. Fines screened
8. Soil audit
9. Ferrous
10. Non-ferrous
11. Non-recyclables

Source: EMM (2021); DFSI (2017); GA (2011); Nearmap (2020); Indesco (2021)

0 50 100 m

GDA 1994 MGA Zone 56

N

\\Emmsvr1\emm\Jobs\2019\J190749 - CPG Luddenham Quarry\GIS\02 Maps\SSD Recycling Facility\Submissions report\SUR004 DesignChange 20210325 02.mxd 25/05/2021

Project overview

Luddenham Advanced Resource Recovery Centre
Addendum Noise and Vibration Impact Assessment
Figure 1.1

EMM
creating opportunities

2 Existing acoustic environment

2.1 Noise and vibration assessment locations

The nearest representative noise sensitive locations to the ARRC have been identified for the purpose of assessing potential noise and vibration impacts. These locations were selected to represent the range and extent of noise impacts from the ARRC. Details are provided in Table 2.1 and their locations are shown in Figure 2.1. They are referred to in this report as assessment locations.

Table 2.1 Noise assessment locations

ID	Address	Classification (currently)	Easting	Northing
R1	21612177 Elizabeth Drive, Luddenham	Residential	288775	6250213
R2	21112141 Elizabeth Drive, Luddenham	Residential	289113	6250041
R3	285 Adams Road, Luddenham (currently unoccupied)[1]	Residential	288931	6249685
R4	5 Anton Road, Luddenham	Residential	288390	6249272
R5	185 Adams Road, Luddenham	Residential	288317	6249178
R6	225 Adams Road, Luddenham	Residential	288751	6249563
R7	161 Adams Road, Luddenham	Residential	287971	6249090
R8	25102550 Elizabeth Drive, Luddenham	Residential	288373	6250229
AR1	Hubertus Club outdoor firing range	Active recreation	288643	6249324
C1	Hubertus Club restaurant including outdoor facilities	Commercial	288680	6249400

Note: 1. It is understood that the landowner intends to redevelop the property for non-residential uses but impacts at this residence have been assessed in full in this report for completeness.

2.2 Background noise survey

To establish the existing ambient noise environment of the area, unattended noise surveys and operator-attended aural observations were conducted at monitoring locations as guided by the procedures described in Australian Standard AS 1055-1997 - *Acoustics - Description and Measurement of Environmental Noise*. This has been detailed in the EIS NVIA.

A summary of existing background and ambient noise levels is given in Table 2.2.

Table 2.2 Summary of existing background and ambient noise

Monitoring location	Period[1]	Rating background level (RBL), dBA	Measured $L_{Aeq, period}$ noise level[2], dBA
NM1 (R2) – 2111-2141 Elizabeth Drive, Luddenham	Day	46	60
	Evening	40	55
	Night	39	55
NM2 (R3) – 275 Adams Road, Luddenham	Day	39	50
	Evening	38	54
	Night	35	45
NM3 (R6) – 225 Adams Road, Luddenham	Day	37	49
	Evening	38	45
	Night	33	43

Notes: 1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; Evening: 6 pm to 10 pm; Night: 10 pm to 7 am, Sunday to Friday and 10 pm to 8 am Saturday and public holidays.

2. The energy averaged noise level over the measurement period and representative of general ambient noise.

KEY

- Study area
- Cadastral boundary
- Noise measurement location

Assessment location

- Active recreation
- Commercial
- Residential

\\Emmsvr1\emm\Jobs\2019\I190749 - CPG Luddenham Quarry\GIS\02 Maps\SSD Recycling Facility\Addendum NVIA\ANV001 AssessmentLocations 20210525 01.mxd 25/05/2021

Source: EMM (2020); DFSI (2017); GA (2011); Nearmap (2020)

0 100 200 m

GDA 1994 MGA Zone 56

N

Noise monitoring and assessment locations

Luddenham Advanced Resource Recovery Centre
Addendum Noise and Vibration Impact Assessment
Figure 2.1

EMM
creating opportunities

3 Assessment criteria

3.1 Operational noise

Operational noise associated with the ARRC will be from fixed processing plant, and mobile plant and equipment including road trucks. However, the project involves the construction of a large warehouse building to contain the receipt, processing and dispatch of all materials. Containing the operations in this way is considered current best practice for the industry. Ancillary plant associated with the facility would include water treatment plant and roof ventilation fans.

Noise from development in NSW is regulated by the local council, DPIE and/or EPA. Sites generally have a licence and/or development consent conditions stipulating noise limits. These limits are typically derived from project specific trigger or operational noise levels predicted at assessment locations. They are based on EPA default criteria (eg from the *Noise Policy for Industry* (NPfI) 2017) or are specific-site noise levels that can be achieved following the application of all feasible and reasonable noise mitigation measures.

The objectives of noise trigger levels established in accordance with the NPfI are to protect the community from excessive intrusive noise and preserve amenity for specific land uses. It should be noted that the audibility of a noise source does not necessarily equate to disturbance at an assessment location.

To ensure these objectives are met, the EPA provides methods for determining project specific noise trigger levels, namely intrusiveness and amenity levels.

The application of the NPfI with consideration of the existing residential assessment locations is based on zoning and land use at the time of the development application. The zoning when the ARRC application was submitted was rural, however the land has now been rezoned with the area subject to a transitional phase as the surrounding land uses change to commercial/industrial in line with the Agribusiness Zoning and associated draft precinct plan.

The acoustic environment within the area surrounding the site will change significantly following the completion and commencement of operations at WSA, forecast for 2026. Future development of the land surrounding the site will need to consider the Australian Noise Exposure Concept/Australian Noise Exposure Forecast (ANEC/ANEF) contours for the Western Sydney Airport (WSA) to ensure there is no new residential development on land within the ANEC/ANEF 20 and above contours. The site and assessment locations R1 to R7 are within this contour and hence are expected to be impacted by future aircraft overflight noise, taxiing and ground running activities from the WSA.

3.1.1 Intrusiveness noise levels

The NPfI intrusiveness noise triggers require that $L_{Aeq,15min}$ noise levels (energy average noise level over a 15-minute period) from the site do not exceed the rated background level (RBL) by more than 5 dB during the relevant operational periods. The intrusiveness noise levels are only applicable at residential assessment locations.

Residences surrounding the site are on land currently zoned Agribusiness under the State Environmental Planning Policy (Western Sydney Aerotropolis) 2020 (Aerotropolis SEPP). A review of permitted uses within this land use zone include earthworks, freight and transport facility, electricity generating works, intensive agriculture, light industry, rural industry, service station, warehouse or distribution centre and other similar uses. These land uses are consistent with uses adopted for industrial development as defined in the NPfI.

Notwithstanding, the rezoning of the land and isolated nature of residential properties potentially impacted from the site, EPA (letter from EPA to DPIE, 8 April 2021) and DPIE have advised the applicant that project noise trigger levels (PNTLs) for residential properties in rural zoned land is to be applied to existing residences given that the application was made before the land was rezoned.

Table 3.1 presents the project intrusiveness noise levels determined for the site based on the adopted RBLs. Where assessment locations have been grouped together in the following tables, it is expected that the ambient noise environment at these assessment locations is similar.

Table 3.1 Project intrusiveness noise levels

Residential assessment location[1]	Assessment period[2]	Adopted RBL, dBA	Project intrusiveness noise level (RBL + 5 dB), $L_{Aeq,15min}$, dB
R1, R2 & R8	Day	46	51
	Evening	40	45
	Night	39	44
R3[3]	Day	39	44
	Evening	38	43
	Night	35	40
R4 – R7	Day	37	42
	Evening	37[3]	42
	Night	33	38

Notes: 1. Residential assessment locations only.

2. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; Evening: 6 pm to 10 pm; 6 am to 7 am Monday to Saturday, 6 am to 8 am Sundays and public holidays; Night: remaining periods.

3. Currently unoccupied.

3.1.2 Amenity noise levels

The assessment of amenity is based on noise levels specific to the land use. The noise levels relate only to industrial noise and exclude road or rail traffic noise. Where the measured existing industrial noise approaches recommended amenity noise levels, it needs to be demonstrated that noise levels from new developments will not contribute to existing industrial noise such that amenity noise levels are exceeded.

To ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, the project amenity noise level for a new industrial development is the recommended amenity noise level (outlined in Table 2.2 of the NPfI) minus 5 dB. It is noted that this approach is based on a receiver being impacted by multiple industrial sites (or noise sources) which currently is not the case for the subject site, hence the baseline amenity levels were adopted for cumulative noise from the ARRC and quarry.

Residential areas potentially affected by ARRC operational noise are located to the north, south and west of the ARRC site. The project amenity noise levels for the identified assessment locations are presented in Table 3.2 based on a rural noise amenity area.

Table 3.2 Project amenity noise levels (based on rural zoning)

Assessment location	Time period[1]	Indicative area	Project amenity noise level[2] dB, $L_{Aeq,period}$
R1 to R8	Day	Rural	50
	Evening		45
	Night		40
AR1	When in use	Active recreation	55
CP1	When in use	Commercial	65
Agribusiness/Enterprise	When in use	Industrial	70

Source: NPfI (EPA 2017).

Notes: 1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; Evening: 6 pm to 10 pm; Night: 10 pm to 7 am Monday to Saturday; 10 pm to 8 am Sundays and public holidays.

2. Project amenity noise level is Amenity noise level (Table 2.2 of NPfI).

3.1.3 Project noise trigger level

The PNTL is the lower of the calculated intrusiveness or amenity noise levels. Taking account of the measured background noise levels, project intrusive noise levels and project amenity levels for residential assessment locations, a summary of the PNTLs for the assessment of noise from ARRC operations is presented in Table 3.3 based on historical rural zoning and land use. The project amenity $L_{Aeq,15min}$ noise level is the recommended amenity noise level $L_{Aeq,period}$ +3 dB as per the NPfI.

Table 3.3 Project noise trigger levels (based on rural zoning)

Assessment location	Assessment period[1]	Intrusiveness noise level, $L_{Aeq,15min}$, dB	Amenity noise level[2], $L_{Aeq,15min}$, dB	PNTL[3], $L_{Aeq,15min}$, dB
R1, R2 & R8	Day	51	53	51
	Evening	45	48	45
	Night	44	43	43
R3	Day	44	53	44
	Evening	43	48	43
	Night	40	43	40
R4–R7	Day	42	53	42
	Evening	42	48	42
	Night	38	43	38
AR1	When in use	n/a	58	53
CP1	When in use	n/a	68	63
Agribusiness/Enterprise	When in use	n/a	73	73

Notes: 1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; Evening: 6 pm to 10 pm; 6 am to 7 am Monday to Saturday, 6 am to 8 am Sundays and public holidays; Night: remaining periods.

2. Project amenity $L_{Aeq,15min}$ noise level is the recommended amenity noise level $L_{Aeq,period}$ +3 dB as per the NPfI.

3. PNTL is the lower of the calculated intrusiveness or amenity noise levels.

3.2 Sleep disturbance

The NPfI suggests that a detailed maximum noise level event assessment should be undertaken where night-time noise levels at a residential location exceed:

- $L_{Aeq,15\ minute}$ 40 dB or the prevailing RBL plus 5 dB (whichever is the greater); and/or
- L_{Amax} 52 dB or the prevailing RBL plus 15 dB (whichever is the greater).

The NPfI references guidance regarding potential for sleep disturbance from the *Road Noise Policy* (RNP) (DECCW 2011). The RNP calls upon numerous studies that have been conducted into the effect of maximum noise levels on sleep. The RNP acknowledges that, at the current (2011) level of understanding, it is not possible to establish absolute noise level criteria that would correlate to an acceptable level of sleep disturbance. However, the RNP provides the following conclusions from the research on sleep disturbance:

- maximum internal noise levels (L_{Amax}) below 50 to 55 dB are unlikely to awaken people from sleep; and
- one or two noise events per night, with maximum internal noise levels (L_{Amax}) of 65 to 70 dB, are not likely to affect health and wellbeing significantly.

It is commonly accepted by acoustic practitioners and regulatory bodies (ie EPA) that a facade including a partially open window will reduce external noise levels by 10 dB. Therefore, external noise levels in the order of 60 to 65 dB calculated at the facade of a residence is unlikely to awaken people according to the RNP.

If noise levels over the screening criteria are identified, then additional analysis would consider factors such as:

- how often the events would occur;
- the time the events would occur;
- whether there are times of day when there is a clear change in the noise environment (such as during early morning shoulder periods); and
- current scientific literature available regarding the impact of maximum noise level events at night.

Table 3.4 provides the noise level event screening criteria for the residential assessment locations.

Table 3.4 Sleep disturbance screening criteria at residences

Assessment location	Adopted night RBL, dB	Night-time maximum noise level event screening criteria, dB	
		$L_{Aeq,15\ minute}$	L_{Amax}
R1, R2 & R8	39	44	54
R3	35	40	52
R4 – R7	33	40	52

3.3 Mitigating noise

Where noise levels above the PNTLs are predicted, all feasible and reasonable mitigation are to be considered for the project to reduce noise levels towards the PNTLs, before any residual impacts are determined and addressed.

The significance of the residual noise impacts is generally based around the human perception to changes in noise levels as explained in the glossary of the acoustic terms. For example, a change in noise level of 1 to 2 dB is typically indiscernible to the human ear. The characterisation of a residual noise impact of up to 2 dB above the PNTL is therefore considered negligible. The NPfI characterisation of residual noise impact is outlined further in Table 3.5.

Table 3.5 Significance of residual noise impacts

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

Source: NPfI (NSW Government, 2017).

3.4 Road traffic noise

Operational traffic require assessment for potential noise impacts. The principle guidance to assess the impact of the road traffic noise on assessment locations is in the *NSW Road Noise Policy* (RNP) (EPA 2011) Table 3.6 presents the road noise assessment criteria for residential land uses (ie assessment locations), reproduced from Table 3 of the RNP for road categories relevant to construction and use of the ARRC. Elizabeth Drive is an arterial road, whilst under the definitions of the NSW RNP, Adams Road with be a sub-arterial road.

Table 3.6 Road traffic noise assessment criteria for residential land uses

Road category	Type of project/development	Assessment criteria – dBA	
		Day (7 am to 10 pm)	Night (10 pm to 7 am)
Freeway/arterial/sub-arterial roads	Existing residences affected by additional traffic on existing freeway/arterial/sub-arterial roads generated by land use developments.	$L_{eq,15hr}$ 60 (external)	$L_{eq,9hr}$ 55 (external)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments.	$L_{eq,1hr}$ 55 (external)	$L_{eq,1hr}$ 50 (external)

Additionally, the RNP states that where existing road traffic noise criteria are already exceeded, any additional increase in total traffic noise level should be limited to an increase of up to 2 dB.

In addition to meeting the assessment criteria in Table 3.6 any significant increase in total traffic noise at the relevant residential assessment locations must be considered. Residential assessment locations experiencing increases in total traffic noise levels above those presented in Table 3.7 should be considered for mitigation.

Table 3.7 Road traffic relative increase criteria for residential land uses

Road category	Type of project/development	Total traffic noise level increase – dBA	
		Day (7 am to 10 pm)	Night (10 pm to 7 am)
Freeway/arterial/sub-arterial roads and transit ways	New road corridor/redevelopment of existing road/land use development with the potential to generate additional traffic on existing road.	Existing traffic $L_{eq(15\text{-}hr)}$+12 dB (external)	Existing traffic $L_{eq(9\text{-}hr)}$+ 12 dB (external)

Appendix B of the RNP, states that noise levels shall be rounded to the nearest integer, whilst difference between two noise levels are to be rounded to a single decimal place.

DPIE requested consideration of the Roads and Maritime's Noise Criteria Guideline (NCG) for the road traffic noise assessment, with Adams Road considered as a new road as a result of its change in functional class based on additional traffic projections from TfNSW. It is noted that the change in functional class is associated with road network changes by TfNSW and future traffic generation from the WSA and associated activities, and not a result of the proposed ARRC.

Consideration of the requirements of the NCG would result in the relevant road traffic noise criteria of 55 dB $L_{Aeq15hour}$ day and 50 dB $L_{Aeq9hour}$ night for Adams Road with the project-generated traffic. Consistent with the procedures of the RNP, the NCG states that additional increase in total traffic noise level should be limited to 2 dB or less.

4 Noise assessment approach

4.1 Overview

This section presents the methods and base parameters used to model operational and construction noise and vibration emissions from the operation of the ARRC. It also considers the cumulative impact of approved quarry operations.

Operational and construction noise levels were predicted using DGMR Software proprietary modelling software, iNoise 2021.1. The model allows prediction under the ISO9613-2 "*Acoustics – Attenuation of Sound during Propagation Outdoors – general method"* algorithm. This algorithm is accepted by the EPA. Features which affect the predicted noise level that are considered in the noise modelling include:

- equipment sound power levels and locations;
- screening from structures;
- receiver locations;
- ground topography;
- noise attenuation due to geometric spreading;
- ground absorption; and
- atmospheric absorption.

The model was populated with 3-D topography of the project and surrounding area, extending past the nearest assessment locations. Plant and equipment representing the range of proposed operation and construction scenarios was modelled at locations representing the worst-case noise levels for assessment locations.

4.2 Operational noise

The acoustic assessment of the ARRC has been based on proposed project layout (Figure 1.1), location of plant and equipment (Appendix A), and peak hour truck movements outlined in the Addendum TIA (EMM, 2021a). The assumption regarding truck noise emissions and building design are outlined in Sections .2.1 and .2.2.

4.2.1 Facility design

The assessment of noise emissions from within the building assumes the following:

- all receipt, processing and dispatch of recycling materials conducted within the proposed warehouse building on the central northern portion of the site, with the building structure comprising of:
  - 2.5 m lower portion of walls comprising 250–300 mm thick precast or in-situ concrete;
  - upper walls and roof comprising minimum 0.6 mm BMT metal cladding and minimum 150 mm medium duty thermofoil faced blanket; and
  - eight roof ventilators/fans with a sound power level of L_{Aeq} 78 dB each.

4.2.2 Truck noise

The assessment of truck noise emissions from within the subject property assumes the following:

- road truck movements on the site access road and traversing on site including through the building as outlined in Appendix A comprising during peak 15 minutes, based on peak hour movements outlined in (EMM 2021a):
  - Day/Evening: 20 movements[1] per 15 minutes;
  - Day/Evening: 16 movements per 15 minutes; and
  - Night: 8 movements per 15 minutes;
- a travel speed of 20 km/h around the site and 40 km/h on the site access road was used to determine the total sound power level for the relevant route segments (ie modelled as line sources);
- the modelling has not differentiated between a small truck (<5 t) and large truck (30 t) and rather assumed a typical sound power level for a large truck prime mover of L_{Aeq} 103 dB for all trucks on site;
- to model a worst-case impact, a 100% utilisation at 103 dB has been assumed, although during normal site operations trucks noise emission levels would be lower when waiting at a weighbridge or within the building;
- trucks were considered along the site access and driveway routes throughout the site including weighbridge locations as line sources. The total sound power of the line sources was dictated by the peak 15 minute number of trucks for the day, evening and night modelling scenarios presented above. Potential for vehicle queuing would not adversely impact noise emissions from the site, as any stationary vehicles would be at idle; and
- that the use of truck horns will be prohibited on site except where they are required to prevent an accident – a rare event so not modelled.

4.2.3 Plant and equipment

Indicative plant and equipment and associated sound power levels for the ARRC are presented in Table 4.1. The list is based on information provided by the proposed site operator (KLF) and experience at similar resource recovery centres.

The sound power levels assigned to each item have been sourced from an EMM measurement database of similar equipment, Department of Environment, Food and Rural Affairs (DEFRA) 2005, *Update of Noise Database for Prediction of Noise on Construction and Open Sites*, manufacturer data and other equivalent facilities.

[1] In keeping with the traffic impact assessment, each truck accessing the site has an inward and an outward movement (eg, 10 trucks accessing the site will have 20 movements).

Table 4.1 Operational noise sources

Noise source	No. of items	Sound power level per item (L_{Aeq}) dBA	Total sound power level (L_{Aeq}) dBA
Road trucks[1,2]	4–10[3]	103	113
Primary screen[1]	1	93	93
Secondary screen[1]	1	93	93
Tertiary screen[1]	1	93	93
Shredder[1]	1	117	117
Excavator (14 t)[1]	2	105	108
Excavator (PC300 or equivalent – 30 t)[1]	1	108	108
Front end loader (CAT972, HL970 or equivalent)[1]	2	105	108
Mobile crusher + loader[1]	1	116	116
Density separators[1]	2	93	96
Ballistic separator[1]	1	93	103
Sand screening and wash plant[1]	1	103	103
Water treatment plant	1	94	94
Pump room	1	82	82
Generator	1	94	94
Roof fans/ventilators	8	78	97

Notes: 1. Equipment located within building.
2. Trucks considered in building, traversing through site and on site access/egress.
3. Depending on time of day (see truck movements in Section .2.2).

The building will contain a range of sorting, screening, crushing and other plant to process received waste. The equipment used at any one time will be dependent on the waste received in the preceding days and may vary depending on the types of activities at customers' sites. Almost any combination of equipment could be operating simultaneously, and, at times, all plant and equipment may be operating simultaneously over a 15-minute period, processing different types of waste received (eg separating co-mingled waste; crushing and screening masonry; screening and washing fines and shredding timber). Accordingly, all plant and equipment were modelled with 100% utilisation with variations in site noise emissions of 5 dB or more is not considered likely, accordingly a correction for intermittency at night is not warranted in accordance with the procedures of Fact Sheet C in the NPfI.

Plant and equipment located within the building were considered with a space averaged reverberant level calculated for the warehouse space. Based on the sound power levels in Table 4.1, proposed construction materials and dimensions of the warehouse building, a space averaged L_{Aeq} level of 86 dB was confirmed. This level was utilised with the surface area of the relevant building components (roof, walls, doors, etc.) to develop noise emitting facades for the building.

From experience, the type of heavy machinery listed in Table 4.1 would not present tonal characteristics as defined by the NPfI. A review of the A weighted and C weighted noise levels of the cumulative plant as an unattenuated level and attenuated level through the façade/roof confirmed level differenced of 8.6 dB and 13.2 dB respectively and are less than 15 dB threshold for assessment of low frequency noise (LFN). Accordingly tonal or low frequency corrections do not need to be applied to the sources. A summary of the 1/1 octave band levels and level differences is provided in Appendix A in accordance with the procedures of Fact Sheet C in the NPfI.

All mobile plant will use level varying broad band 'quacker' reversing alarms.

4.2.4 Night-time maximum noise level events and sleep disturbance

The ARRC will operate 24 hours per day/7 days per week, hence assessment of intermittent noise and potential for sleep disturbance at residential assessment locations during the night-time hours (10 pm to 7 am) is required by the NPfI. For assessment of sleep disturbance, a sound power level of 115 dBA L_{Amax} was considered for airbrake release of site trucks. The area on the site with the greatest potential for this activity to occur is the weighbridges on the northern and southern sides of the building and within the warehouse building.

4.2.5 Noise predictions

Noise levels at the assessment locations identified in Table 2.1 were predicted based on the noise sources outlined in Table 4.1. The overall $L_{Aeq,15min}$ noise contribution was modelled for direct assessment against NPfI PNTLs.

4.2.6 Noise enhancing meteorology

The model utilised international standard ISO 9613-2:1996 'Acoustics – Attenuation of sound during propagation outdoors'. As per Section 1 of the standard:

> The method predicts the equivalent continuous A-weighted sound pressure level (as described in parts 1 to 3 of ISO 1996) under meteorological conditions favourable to propagation from sources of known sound emission.
>
> These conditions are for downwind propagation, as specified in 5.4.3.3 of ISO 1996-2:1987 or, equivalently, propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs at night.

4.3 Road upgrade construction noise and vibration assessment

4.3.1 Construction Noise

Principle construction activities for the site and new access road were addressed in the EIS NVIA and has not been considered further in this Addendum NVIA. However, additional construction work associated with any road upgrade works at Adams Road or Elizabeth Drive is anticipated and would be minor occurring over approximately four to six weeks. Typical plant and equipment associated with the works is expected to be similar to that utilised for the upgrade to the site road access as summarised in Table 4.2.

Table 4.2 Road upgrades sound power levels

Equipment/Activity	Number of items (per 15 minutes)	SWL per item, LAeq	Total SWL, LAeq	Cumulative SWL per phase, LAeq
Road upgrade works (duration = 4-6 weeks)				
Road trucks	2	103	106	114
Asphalt truck and tipper	1	112	112	
Grader	1	107	107	
Roller	1	103	103	
Water cart	1	97	97	

The upgrade works will be principally at the site entry, the intersection of Adams Road and Elizabeth Drive and on Adams Road between Elizabeth Drive and Anton Road. A review of the EIS NVIA confirmed four assessment locations are potentially most exposed to the proposed construction works. They comprise:

- R1 - 2161–2177 Elizabeth Drive, Luddenham;
- R2 - 2111–2141 Elizabeth Drive, Luddenham;
- R3 - 285 Adams Road, Luddenham (derelict dwelling – unoccupied);
- R4 - 5 Anton Road, Luddenham;
- R5 - 185 Adams Road, Luddenham; and
- R6 - 225 Adams Road, Luddenham.

4.3.2 Construction vibration

Safe working distances for typical items of vibration intensive plant are listed in Table 4.3. The safe working distances are quoted for both "Cosmetic Damage" (refer British Standard BS 7385) and "Human Comfort" (refer British Standard BS 6472-1).

Table 4.3 Recommended safe working distances for vibration intensive plant

Plant Item	Rating/Description	Safe working distance	
		Cosmetic damage (BS 7385)	Human comfort (BS 6472)
Vibratory Rollers	<50 kN (typically 12 tonnes)	5 m	15 to 20 m
	<100 kN (typically 24 tonnes)	6 m	20 m
	<200 kN (typically 46 tonnes)	12 m	40 m

Source: From Transport Infrastructure Development Corporation Construction's Construction Noise Strategy (Rail Projects), November 2007 – based on residential building.

Safe work distances relate to continuous vibration. For most construction activity, vibration emissions are intermittent in nature. The safe working distances are therefore conservative.

The safe working distances presented in Table 4.3 are indicative and will vary depending on the item of plant and local geotechnical conditions. They apply to cosmetic damage of typical buildings under typical geotechnical conditions.

The safe working distances have been used to assess the potential for construction vibration impacts based on proposed activities.

4.4 Revised road traffic noise assessment

Potential road traffic noise levels on Adams Road (classified as a sub-arterial road) and Elizabeth Drive (classified as an arterial road) were remodelled based on the changes to the proposed traffic generation from the site as described in the Addendum TIA (EMM 2021a), and a reassessment of when the traffic movements will occur (daytime versus night-time) and the updated background traffic projections provided by Transport for New South Wales (TfNSW).

Road traffic noise levels were predicted utilising the calculation procedures of US EPA Federal Highways (FHWA) Method (1996). This was considered in the assessment of road traffic noise due to low traffic flows (<200 vehicles per hour) as the calculation procedure is more sensitive to low traffic volumes compared to other methods.

Road traffic noise levels from the project have been assessed by calculating TfNSW-projected traffic and TfNSW-projected plus project traffic, including potential for 50% of truck trips south on Adams Road at representative residential assessment locations. The following assumptions have been adopted:

- a vehicle sign-posted speed for Elizabeth Drive of 80 km/h;
- a vehicle sign posted speed limit on Adams Road of 70 km/h;
- no buildings or other intervening objects that will act as a noise barrier between the road and the noise assessment point are proposed;
- a facade reflection has been added to predicted noise levels of 2.5 dB consistent with the RNP;
- ground type absorption in the calculation allows for factors of hard = 0 and soft = 0.5. Considering the ground surrounding Adams Road and Elizabeth Drive is predominantly grassland between roadway and residential facades the assessment considered ground type values:
    - 0.5 for facades greater than 40 m from edge of roadway; and
    - 0.2 for facades less than 40 m from roadway.
- with the exception of Adams Road (north) the calculation considered full field of view to the roadway for the residential facades, a 90 degree field of view was adopted for Adams Road (north) due to location of closest residential façade and segment of road; and
- Noise measurements at 2111 Elizabeth Drive were reviewed in conjunction with the classified traffic counts and FHWA predictions and confirmed levels within 1 dB.

5 Impact assessment

5.1 Operational noise

5.1.1 Single point predictions

Predicted single point operational noise levels are provided in Table 5.1 for day, evening and night operations of the proposed ARRC. The daytime noise levels from the combined ARRC and approved quarry are also provided. The levels presented for each assessment location represents the energy-average noise level over a 15-minute period and assumes all plant and activities operating concurrently in accordance with scenarios outlined in Section .2 under noise enhancing conditions (ISO9613). The predictions have also considered cumulative noise associated with concurrent ARRC and quarry operations during day hours up to 2024 (when quarry operations will cease).

Table 5.1 Predicted operational noise levels – ISO9613

Assessment location	Classification	Period	PNTL, dBL$_{Aeq,15min}$	Predicted ARRC and (ARRC + quarry) noise level[1], dB L$_{Aeq,15min}$
R1	Residential	Day	51	42 (44)
		Evening	45	41
		Night	43	41
R2	Residential	Day	51	46 (48)
		Evening	45	46
		Night	43	**46**
R3[2]	Residential	Day	44	**61 (62)**
		Evening	43	**60**
		Night	40	**60**
R4	Residential	Day	42	41 (**47**)
		Evening	42	41
		Night	38	**41**
R5	Residential	Day	42	40 (**46**)
		Evening	42	40
		Night	38	**40**
R6	Residential	Day	42	**52 (55)**
		Evening	42	**51**
		Night	38	**51**
R7	Residential	Day	42	36 (**43**)
		Evening	42	36
		Night	38	36

Table 5.1 Predicted operational noise levels – ISO9613

R8	Residential	Day	51	38 (43)
		Evening	45	38
		Night	43	38
AR1	Active recreation	When is use	58	44 (51)
C1	Commercial	When is use	68	47 (52)

Notes: 1. Exceedances of the PNTL are shown in **bold**.
2. Currently unoccupied.
3. Calculated levels from cumulative approved quarry + ARRC operations are in brackets () for day-time operations up to 2024.

The predicted noise levels at assessment locations are up to 1 dB higher than predicted in the previous NVIA (EMM 2020d) as a result of minor changes to the schedule of plant and a global update to the iNoise modelling software (iNoise 2021.1)

For the operation of the ARRC alone, it is predicted that the PNTLs at most assessment locations will be met. The predicted exceedances are at:

- Day: R3 (+17 dB) (unoccupied) and R6 (+10 dB);
- Evening: R3 (+17 dB) (unoccupied) and R6 (+9 dB); and
- Night: R2 (+3 dB), R3 (+20 dB) (unoccupied), R4 (+3 dB) and R6 (+13 dB).

Under the definitions of Section 4.2 of NPfI (see Table 3.5) the predicted noise exceedances of the PNTLs (intrusiveness noise level) are defined as **marginal** at R2 and R4, whilst for R3 the exceedances are defined as **significant** for all periods, and at R6 exceedances are defined as **moderate** during the day and **significant** during the evening and night.

Noise exceedances were predicted for a number of residential assessment locations during the day under ISO9613 noise enhancing conditions for approved quarry operations (EMM 2020).

For the operation of the combined ARRC and quarry (Table 5.1), it is predicted that the PNTLs at assessment locations will be exceeded at (daytime only):

- R3 (+18 dB) (unoccupied);
- R4 (+5 dB);
- R5 (+4 dB);
- R6 (+13 dB); and
- R7 (+1dB)

The results indicate that there will be a marginal impact based on cumulative levels for assessment locations R4 and R5, whilst significant, as defined in Section 4.2 of the NPfI (see Table 3.5), cumulative levels are predicted for R3 (unchanged from ARRC alone) and R6 (moderate with ARRC alone).

The day amenity level (53 dB) is satisfied for all assessment locations, with the exception of R3 and R6.

Residences R3 and R6 are eligible for at-receiver noise mitigation under *Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Developments* (VLAMP) procedures associated with approved quarry operations (EMM 2020) consent conditions (DA No. 315-7-2003).

The modelling predicts that the applicable amenity noise levels will be satisfied at the active recreation (AR1) and commercial (C1) components of the Hubertus Club for both ARRC and cumulative ARRC and approved quarry operations.

5.1.2 Intermittent noise events (sleep disturbance)

Modelling of intermittent maxima noise events at night considered a typical worst-case event for air brake release and a source sound power level of 115 dB L_{Amax}. Potential for these events were considered at the north and south weighbridges and predicted to the identified residential assessment locations. The results of the predictions under ISO9613 conditions are presented in Table 5.1.

Table 5.2 Predicted intermittent noise levels – ISO9613

Assessment location	Classification	Period	Screening level, dB	Predicted intermittent noise level, dB L_{Amax}
R1	Residential	Night	54	45
R2	Residential	Night	54	49
R3	Residential	Night	52	**65**
R4	Residential	Night	52	44
R5	Residential	Night	52	43
R6	Residential	Night	52	52
R7	Residential	Night	52	39
R8	Residential	Night	54	42

Results of modelling confirm compliance with the sleep disturbance screening level for most residential assessment locations with the exception of R3, which is currently unoccupied and derelict and is likely to be redeveloped for commercial or industrial use. It is noted the new zoning of the R3 land parcel would prohibit the development of a new residence.

5.1.3 Best-achievable noise levels

The applicant has selected the latest electrically powered plant and equipment that can be utilised for the sorting and processing of waste materials in combination with conventional diesel powered plant where alternatives are not currently available in order to minimise noise from the operation of the site. Furthermore receival, processing and dispatch of materials would be conducted wholly within a warehouse building to minimise noise emission and provide current best achievable noise levels.

The ARRC will implement a range of best practice noise management design and operational measures including:

- using quietest plant that can perform the required task including constant review of available technology;
- minimising number of plant and equipment operating simultaneously while still meeting processing requirements;
- switching off idle plant;

- consideration of using noisy plant (shredder and crusher) at least sensitive times of the day when incoming waste streams allow;
- implementing a regular maintenance schedule for all plant and equipment; and
- providing staff education and tool box talks on impacts of noise and best quiet work practices.

A primary operational objective will be to process waste and dispatch products as quickly as possible to minimise the size of stockpiles. As noted in Section 4.2.3, this will require the flexibility to operate different types of plant and equipment to operate simultaneously depending on the waste streams received.

5.2 Road upgrade construction noise and vibration assessment

5.2.1 Construction noise

Preliminary assessment of the construction activities, considering only distance between source and assessment location and the cumulative sound power level of 114 dB L_{Aeq} confirmed predicted noise levels of L_{Aeq} 52–64 dB. The levels exceed the standard hours NMLs established in the NVIA by 2–17 dB, however they do not approach the government's highly affected noise level.

It is not uncommon for construction projects to exceed NMLs. For this reason, they are not considered as noise criteria, but as a trigger for all feasible and reasonable noise mitigation and management to be considered, once exceeded.

There is limited opportunity due to proximity of assessment locations, construction location, duration of works and local topography to provide significant noise mitigation. The main management measure will be restricting work to daytime hours wherever possible. Residents will be notified prior to works commencing.

Should works be required to be conducted outside of the standard ICNG hours, further assessment would need to be considered, suitable justification provided and an out of hours work permit obtained.

5.2.2 Construction vibration

The nearest residence to construction activity is assessment location R2 which is approximately 100 m away from closest potential construction activities. This assessment location is outside of the safe working distances of likely plant Table 4.3, required to maintain acceptable human response and structural vibration levels. Vibration impacts from construction at any residential assessment locations are therefore highly unlikely.

5.3 Revised road traffic noise assessment

A summary of the calculated existing and predicted future daytime and night-time road traffic noise levels are presented in Table 5.3 and Table 5.4 respectively, based on the ARRC at full production (EMM 2021a) and the traffic distribution based on the revised transport strategy (refer Section 3.1 of RtS and EMM 2021a) and intersection upgrades.

Table 5.3 Road traffic noise levels – Day (7 am to 10 pm)

Road segment	Approximate distance of residential façade from nearest carriageway	Projected (non-ARRC) movements[1]	Projected (non-ARRC) plus project movements	RNP Criteria[2,3] L_{Aeq}, dB	Noise level increase due to the Project, $L_{Aeq,15hr}$, dB
		Calculated level, $L_{Aeq,15hr}$, dB	Predicted level, $L_{Aeq,15hr}$, dB		
Operation - 2024					
Adams Road (north)	205 m	45.6	46.4	60	0.8
Adams Road (south)[4]	35 m	66.8	67.3	60	0.5
Elizabeth Drive[5]	45 m	65.6	65.9	60	0.3
Operation - 2029					
Adams Road (north)	205 m	46.9	48.0	60	1.1
Adams Road (south)	35 m	67.9	68.7	60	0.8
Elizabeth Drive[4]	45 m	64.2	64.6	60	0.4

Notes: 1. Projected future traffic volumes 2024 and 2029 (EMM 2021a).
2. Adams Road is a sub-arterial road and is assessed as LAeq,15hr 60 dB.
3. Elizabeth Drive is an arterial road and assessed as LAeq,15hr 60 dB.
4. Noise measurements at 2111 Elizabeth Drive were reviewed in conjunction with the classified traffic counts and FHWA predictions and confirmed levels within 1 dB.

Daytime road traffic noise levels are predicted to comply with the RNP <2 dB allowance criterion where levels exceed the base 60 dB $L_{Aeq15hour}$ RNP target for Adams Road (north), Adams Road (south) and Elizabeth Drive.

Table 5.4 Road traffic noise levels – Night (10 pm to 7 am)

Road segment	Approximate distance of residential façade from nearest carriageway	Existing movements[1]	Existing plus project movements	RNP Criteria[2,3] L_{Aeq}, dB	Noise level increase due to the Project, $L_{Aeq,9hr}$, dB
		Calculated level, $L_{Aeq,9hr}$, dB	Predicted level, $L_{Aeq,9hr}$, dB		
Operation - 2024					
Adams Road (north)	205 m	41.8	42.6	55	0.8
Adams Road (south)	35 m	63.0	63.5	55	0.5
Elizabeth Drive[4]	45 m	66.3	66.4	55	0.1
Operation - 2029					
Adams Road (north)	205 m	43.1	44.2	55	1.1
Adams Road (south)	35 m	64.1	64.9	55	0.8
Elizabeth Drive[4]	45 m	64.9	65.2	55	0.3

Notes: 1. Projected future traffic volumes 2024 and 2029 (EMM 2021a).
2. Adams Road is a sub-arterial road and is assessed as $L_{Aeq,9hr}$ 55 dBA.
3. Elizabeth Drive is an arterial road and assessed as $L_{Aeq,9hr}$ 55 dBA.
4. Noise measurements at 2111 Elizabeth Drive were reviewed in conjunction with the classified traffic counts and FHWA predictions and confirmed levels within 1 dB.

Night-time road traffic noise levels are predicted to comply with the RNP <2 dB allowance criterion where levels exceed the base 55 dB $L_{Aeq9hour}$ RNP target for Adams Road (north), Adams Road (south) and Elizabeth Drive.

Consideration of the requirements of the NCG results in road traffic noise criteria of 55 dB $L_{Aeq15hour}$ day and 50 dB $L_{Aeq9hour}$ night for Adams Road with the project-generated traffic. Notwithstanding the baseline criteria, the ARRC would not result in traffic noise level increases of more the 2 dB and hence will satisfy the NCG and RNP.

The calculations indicate that with the exception of Adams Road (north) assessment location, the baseline noise criteria of the RNP for additional traffic on sub arterial and arterial roads or the application of the NCG for new road classification are exceeded by the existing future road traffic volumes. Therefore the relative increase of <2 dB is the determining factor for assessing potential road traffic noise impacts of the proposal.

The revised assessment of road traffic noise has demonstrated that the <2 dB criteria is satisfied for all road segments assessed as a result of traffic from the proposal.

6 Conclusion

Changes to the operational assumptions and future traffic for the site has required updates to the noise and vibration modelling predictions presented in the EIS.

Revised modelling of operational noise confirmed noise emissions typically within 1 dB of those presented in the EIS NVIA (EMM 2020c). Exceedances are predicted for a number of assessment locations consistent with the outcomes of the EIS NVIA (EMM 2020c), with the greatest impact restricted to assessment locations R3 and R6. Assessment of construction activities associated with potential road and intersection upgrades confirmed predicted noise levels of L_{Aeq} 52–64 dB. The levels exceed the standard hours NMLs established in the EIS NVIA (EMM 2020c) by 2–17 dB, however they do not approach the government's highly affected noise level. Vibration impacts from construction were considered highly unlikely as the closest residential assessment locations are well beyond the recommended safe working distances. The revised assessment of road traffic noise has demonstrated that the <2 dB criteria is satisfied for all road segments assessed as a result of traffic from the proposal.

References

Australian Standard AS 1055-1997 - *Acoustics - Description and Measurement of Environmental Noise*.

Department of Environment, Food and Rural Affairs (DEFRA) 2005, *Update of Noise Database for Prediction of Noise on Construction and Open Sites*.

EMM (2020a) *Luddenham Quarry Modification 5 - Modification Report,* prepared by EMM Consulting Pty Ltd for Coombes Property Group and KLF Holdings Pty Ltd.

EMM (2020b) *Luddenham Advanced Resource Recovery Centre – Traffic Impact Assessment* prepared by EMM Consulting Pty Ltd for Coombes Property Group and KLF Holdings Pty Ltd.

EMM (2020c) *Luddenham Advanced Resource Recovery Centre – Noise and Vibration Impact Assessment* prepared by EMM Consulting Pty Ltd for Coombes Property Group and KLF Holdings Pty Ltd.

EMM (2021a) *Luddenham Advanced Resource Recovery Centre – Addendum Traffic Impact Assessment* prepared by EMM Consulting Pty Ltd for Coombes Property Group and KLF Holdings Pty Ltd.

EMM (2021b) *Luddenham Advanced Resource Recovery Centre – Addendum Noise and Vibration Impact Assessment* prepared by EMM Consulting Pty Ltd for Coombes Property Group and KLF Holdings Pty Ltd.

NSW Environment Protection Authority (EPA) 2000, *NSW Industrial Noise Policy* (INP).

NSW Environment Protection Authority (EPA) 2017, *Noise Policy for Industry* (NPfI).

NSW Department of Environment Climate Change and Water (DECCW) 2011, *Road Noise Policy* (RNP).

NSW Roads and Maritime's (RMS) 2015, *Noise Criteria Guideline* (NCG).

Appendix A

Noise modelling – source locations and levels

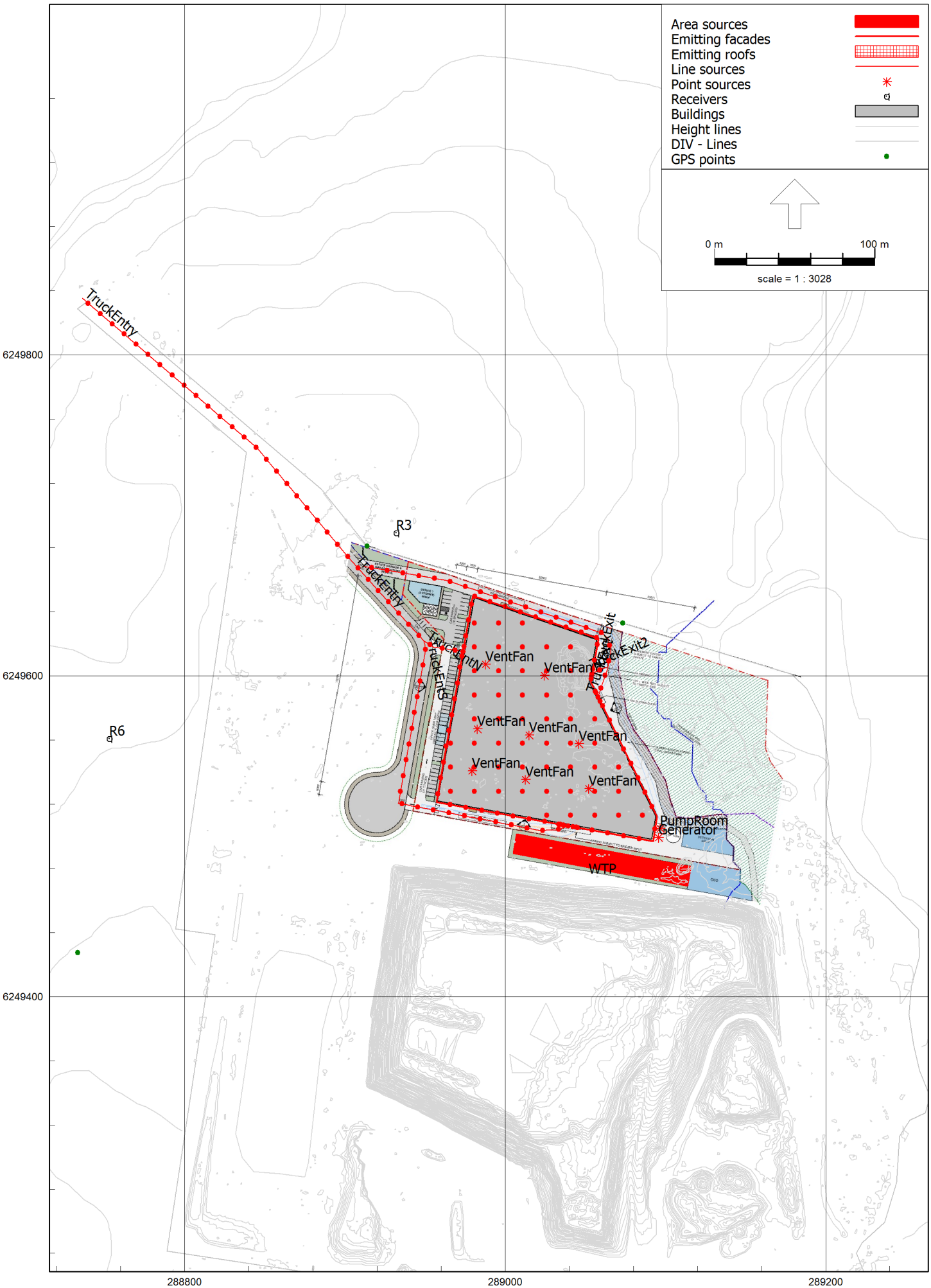

Area sources
Emitting facades
Emitting roofs
Line sources
Point sources
Receivers
Buildings
Height lines
DIV - Lines
GPS points
0 m
100 m
scale = 1 : 3028
TruckEntry
TruckEntry
TruckEntry
TruckExit
TruckExit2
R3
R6
VentFan
VentFan
VentFan
VentFan
VentFan
VentFan
VentFan
VentFan
PumpRoom
Generator
WTP
6249800
6249600
6249400
288800
289000
289200

Table A.1 ARRC source noise levels, $L_{Aeq,15min}$ dB

Description	No. of plant			Factor for no. and route / Total Lw	Lw per Item	Octave band noise level, Hz (dB)								
	Day	Evening	Night		dBA	32	63	125	250	500	1000	2000	4000	8000
Road Trucks - access road	20	-	-	13.0	115.7	-	129	125	112	106	107	110	105	100
Road Trucks - access road	-	10	-	10.0	112.6	-	126	122	109	103	104	107	102	97
Road Trucks - access road	-	-	8	9.0	111.7	-	125	121	108	102	103	106	101	96
Primary Screen	1	1	1	93.1	93.1	-	107	103	90	84	85	88	83	78
Secondary Screen	1	1	1	93.1	93.1	-	107	103	90	84	85	88	83	78
Tertiary Screen	1	1	1	93.1	93.1	-	107	103	90	84	85	88	83	78
Shredder (Eggersmann Teuton)	1	1	1	116.9	116.9	121	126	115	121	115	109	106	100	94
Excavator 14t	2	2	2	107.5	104.5	-	107	111	107	101	98	96	87	79
Excavator 30t	1	1	1	107.5	107.5	102	107	108	109	104	101	100	94	86
Front End Loader (Hyundai HL960,CAT 972 or eq)	2	2	2	108.2	105.2	99	114	110	106	100	100	98	92	85
Mobile crusher and loader	1	1	1	115.8	115.8	120	125	114	120	114	108	105	99	93
Density Separators	2	2	2	96.2	93.2	-	96	96	94	87	86	87	83	80
Ballistic separator	1	1	1	93.2	93.2	-	96	96	94	87	86	87	83	80
WTP	1	1	1	94.2	94.2	-	97	97	95	88	87	88	84	81
Pump Room	1	1	1	81.7	81.7	81	78	83	81	79	77	73	69	67

Table A.1 ARRC source noise levels, $L_{Aeq,15min}$ dB

Description	No. of plant Day	Evening	Night	Factor for no. and route / Total Lw	Lw per Item dBA	Octave band noise level, Hz (dB) 32	63	125	250	500	1000	2000	4000	8000
Generator 500 kVA* (external) SE of building	1	1	1	94.2	94.2	-	97	97	95	88	87	88	84	81
Roof fans	8	8	8	86.8	77.8	77	74	79	77	75	73	69	65	63
TOTAL - Day				120.4	120.1	123.8	129.4	121.0	123.7	118.0	112.5	110.1	104.3	98.3
TOTAL - Evening				120.3	120.1	123.8	129.2	120.5	123.7	118.0	112.5	109.9	104.1	98.0
TOTAL - Night				120.3	120.1	123.8	129.1	120.4	123.7	118.0	112.5	109.9	104.0	97.9
Internal reverberant noise level					85.8	86	90	82	89	83	79	77	73	67
						Difference Lin v A								
No LFN for source				Lin	94.4	**8.6**								
Assess LFN for breakout from building														
				Façade (TL)	31.7	13	13	16	18	18	20	24	27	27
				Resultant	66.6	73	77	66	71	65	59	53	46	40
No LFN for façade				Lin v A	79.8	**13.2**