



**Adelaide Brighton Cement Ltd**

an **ADBRI** company

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## QUARTERLY NOISE MANAGEMENT REPORT FOR BIRKENHEAD WORKS

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**COMPLIANCE DATE: 15/08/2022– Quarter 2 2022**  
**EPA Licence 1126: Noise Management Plan (U-787)**

**Licensed site: Adelaide Brighton Cement, Birkenhead Works**

**62 Elder Road, Birkenhead, SA 5015**

**Date of Submission: 15 August 2022**

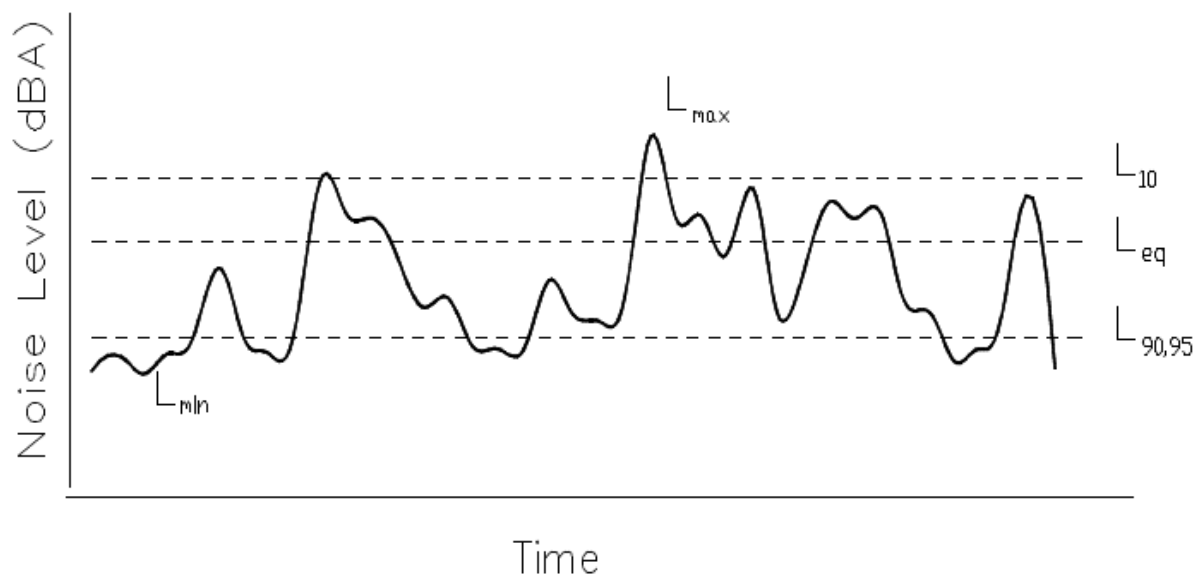
**Version Number: 1**



Report Submitted by: Advisor Environment - C&L (SA/NSW/NT)

## Glossary of acoustic terminology

- dB(A)** A unit of measurement, decibels(A), of sound pressure level which has its frequency characteristics modified by a filter ("A-weighted") so as to more closely approximate the frequency response of the human ear.
- L<sub>1</sub>** The noise level which is equalled or exceeded for 1% of the measurement period. L<sub>1</sub> is an indicator of the impulse noise level, and is used in Australia as the descriptor for intrusive noise (usually in dBA).
- L<sub>10</sub>** The noise level which is equalled or exceeded for 10% of the measurement period. L<sub>10</sub> is an indicator of the mean maximum noise level, and is used in Australia as the descriptor for intrusive noise (usually in dBA).
- L<sub>90</sub>** The noise level which is equalled or exceeded for 90% of the measurement period. L<sub>90</sub> is an indicator of the mean minimum noise level, and is used in Australia as the descriptor for background or ambient noise (usually in dBA).
- L<sub>eq</sub>** The equivalent continuous noise level for the measurement period. L<sub>eq</sub> is an indicator of the average noise level (usually in dBA).
- L<sub>max</sub>** The maximum noise level for the measurement period (usually in dBA).



**Note:** *The subjective reaction or response to changes in noise levels can be summarised as follows:*

A 3 dB(A) increase in sound pressure level is required for the average human ear to notice a change; a 5 dB(A) increase is quite noticeable and a 10 dB(A) increase is typically perceived as a doubling in loudness

<b>Monitoring Objective</b>	<p>The quarterly report will include where applicable:</p> <ul style="list-style-type: none"> <li>• Details of noise complaints (excluding complainant name and identifying address details for reasons of confidentiality), received during the quarter including the outcomes of the complaint investigation and where applicable, corrective actions implemented.</li> <li>• Details on the progress of noise attenuation projects including effectiveness.</li> <li>• Details of noise monitoring reports.</li> <li>• Details of noise minimisation activities.</li> </ul>																								
<b>Monitoring Plan</b>	<p>This monitoring report complies with the Noise Management Plan approved on 16 August 2018 by the SA EPA.</p> <p>The Plan is available on the ABC Birkenhead Community Website:  <a href="https://adelaidebrightoncommunity.com.au/">https://adelaidebrightoncommunity.com.au/</a></p>																								
<b>Noise Complaints Summary</b>	<p>The table below summarises the noise complaints for the reporting period.</p> <table border="1"> <thead> <tr> <th>Date and Time</th> <th>Location</th> <th>Description</th> <th>Action Taken</th> </tr> </thead> <tbody> <tr> <td>08/04/2022 06:45</td> <td>Alfred street Peterhead</td> <td>Squeaky noise all night</td> <td>Investigation at the time could not find the source</td> </tr> <tr> <td>10/05/2022 22:22</td> <td>Lincoln Street Largs Bay</td> <td>Droning Noise from loading area</td> <td>Investigation of accolade and cement wharf areas. Could not identify a source on Birkenhead site. Ship being loaded on the Eastern side of the Port River - may have been a possible source.</td> </tr> <tr> <td>13/05/2022 02:15</td> <td>Baker Street, Birkenhead</td> <td>High pitched and a fluttering rotating noise. Woken last night by what sounded like police helicopters but realised it was the plant.</td> <td>Site investigation/ and walk of site perimeter did not identify a source as described. Resident called back and noise had gone.</td> </tr> <tr> <td>10/06/2022 19:25</td> <td>Alfred street Peterhead</td> <td>Noise like a cement mixer</td> <td>4B transport elevator feed drag chain conveyor - squealing sound. Tension adjusted &amp; noise deadening blankets placed on drive end of conveyor</td> </tr> <tr> <td>30/06/2022 07:49</td> <td>Alfred street Peterhead</td> <td>Rumbling noise</td> <td>Investigation at the time could not find the source</td> </tr> </tbody> </table>	Date and Time	Location	Description	Action Taken	08/04/2022 06:45	Alfred street Peterhead	Squeaky noise all night	Investigation at the time could not find the source	10/05/2022 22:22	Lincoln Street Largs Bay	Droning Noise from loading area	Investigation of accolade and cement wharf areas. Could not identify a source on Birkenhead site. Ship being loaded on the Eastern side of the Port River - may have been a possible source.	13/05/2022 02:15	Baker Street, Birkenhead	High pitched and a fluttering rotating noise. Woken last night by what sounded like police helicopters but realised it was the plant.	Site investigation/ and walk of site perimeter did not identify a source as described. Resident called back and noise had gone.	10/06/2022 19:25	Alfred street Peterhead	Noise like a cement mixer	4B transport elevator feed drag chain conveyor - squealing sound. Tension adjusted & noise deadening blankets placed on drive end of conveyor	30/06/2022 07:49	Alfred street Peterhead	Rumbling noise	Investigation at the time could not find the source
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**Noise Monitoring Reports**

Attended daytime and night-time community noise monitoring survey, and an assessment of the effectiveness of recently completed projects has been undertaken by Vipac Acoustic Engineers & Scientists in this quarter. The acoustic assessments are detailed in the Vipac “Birkenhead Environmental Noise 2022- Annual Noise Survey Report”, May 2022, 50B-22-0069-TRP- 34608-3, (attached)

**Summary of the acoustic report**

ABC has commissioned Vipac to undertake regular attended and unattended noise monitoring surveys in the community to gain an understanding of how noise from the site impacts the community. Attended measurements have generally been conducted both during the daytime and night-time periods (as defined by the Noise EPP), and defined measurement positions have been established allowing for trends in noise levels at each location to be established over time.

**Attended noise measurement locations**



**Site Noise Criteria**

Noise from the activities undertaken at the ABC Birkenhead site is subject to the provisions of the Environment Protection (Noise) Policy 2007 (Noise EPP). The Noise EPP outlines Noise Goals which provide one method for demonstrating compliance with the General Environmental Duty under Section 25 of the Environment Protection Act 1993 (the Act).

The Environment Protection Authority (EPA) has advised that comparison of the  $L_{A90}$  noise level descriptor measured within 100 metres of the centre line of Victoria Road with the above Indicative Noise Levels is an acceptable method for eliminating the influence of short-term/transient noise level events (such as intermittent passing road traffic, for example) on the results. This includes measurement positions N1, R2, R10, R12, R15 and R16. At distances greater than 100 metres, the use of the  $L_{Aeq}$  descriptor is required.

As such, the following Indicative Noise Levels (INLs) apply to ABC's operations:

Zone	Indicative Noise Levels ( $L_{eq}$ , dB(A))	
	Day-time (7am to 10pm)	Night-time (10pm to 7am)
Suburban Neighbourhood Zone	57	49
General Neighbourhood Zone	57	49

**May 2022 attended noise survey results are discussed below**

### **Daytime results**

Both the  $L_{Aeq}$  and  $L_{A90}$  noise levels met the day-time criterion for all measurement locations, with the exception of the following locations listed in the day-time survey exceedances table (the descriptor used for comparison with the noise goal is indicated by bold text and shading).

Location	$L_{Aeq}$ [dB(A)]	$L_{A90}$ [dB(A)]	Criterion [dB(A)]	Exceedance [dB(A)]
R10	74	<b>61</b>	57	4
R16	78	<b>64</b>	57	7

Receivers R10 and R16 show minor exceedance, which are influenced by the road traffic noise, with frequent vehicles pass-by on Victoria Road contributing significantly to noise levels (dominant source). Since both the measurement locations are abutting Victoria Road, high traffic noise influence was expected. Victoria Road provides a major thoroughfare for trucks and other heavy vehicles and is a designated Type A Road (The Planning & Design Code).

As such, due to dominance of traffic noise, the plant was inaudible at both the measurement locations.

Similar to our previous surveys, the  $L_{A90}$  descriptor was considered to provide a more meaningful comparison between measurement surveys as it is less susceptible to the influence of extraneous transient noise sources.

The  $L_{A90}$  noise levels measured during the 2022 attended measurement survey are compared against the noise levels measured during the two most recent attended measurement surveys in the following table.

Receiver Location	Day-Time L <sub>A90</sub> Noise Level (dB(A))				
	Criterion	2020	2021	2022	Difference (2021/2022)
R2	57	53	50	54	4
R3	57	44	42	43	1
R4	57	38	37	34	-3
R5	57	49	47	48	1
R6	57	38	39	37	-2
R8	57	41	44	44	0
R9	57	37	37	34	-3
R10	57	59	59	61	2
R11	57	39	41	38	-3
R12	57	53	51	53	2
R13	57	36	38	36	-2
R14	57	36	37	32	-5
R15	57	50	48	52	4
R16	57	61	59	64	5
R17	57	42	40	37	-3
R18	57	42	42	48	6
N1	57	47	47	46	-1
N2	57	42	48	42	-6
N3	57	44	47	46	-1

### **Night-time results**

Both the  $L_{Aeq}$  and  $L_{A90}$  noise levels met the night-time criterion for all measurement locations, with the exception of the following locations listed in the night-time survey exceedances table (the descriptor used for comparison with the noise goal is indicated by bold text and shading).

**Night-time survey exceedances table**

Location	$L_{Aeq}$ [dB(A)]	$L_{A90}$ [dB(A)]	Criterion [dB(A)]	Exceedance [dB(A)]
R2	53	<b>52</b>	49	3
R5	<b>50</b>	48	49	1
R10	54	<b>50</b>	49	1
R12	54	<b>52</b>	49	3
R15	53	<b>52</b>	49	3
N2	<b>50</b>	48	49	1

The exceedance at R2, R5, R,10, R12, R15, N2 were mostly associated with traffic noise influence from nearby roads (Victoria Road and Fletcher Road). Typically (subjectively) for an average human ear, a 3 dB(A) increase in sound pressure level is just noticeable, whereas a 5 dB(A) increase is quite noticeable.

Similar to our previous surveys, the  $L_{A90}$  descriptor was considered to provide a more meaningful comparison between measurement surveys as it is less susceptible to the influence of extraneous transient noise sources.

The  $L_{A90}$  noise levels measured during the 2022 attended measurement survey are compared against the noise levels measured during the two most recent attended

Receiver Location	Night-Time L <sub>A90</sub> Noise Level (dB(A))				
	Criterion	2020	2021	2022	Difference (2021/2022)
R2	49	54	53	52	-1
R3	49	49	47	47	0
R4	49	44	43	41	-2
R5	49	52	49	48	-1
R6	49	46	43	39	-4
R8	49	47	46	47	1
R9	49	42	40	40	0
R10	49	47	47	50	3
R11	49	39	39	36	-3
R12	49	54	52	52	0
R13	49	43	44	42	-2
R14	49	42	40	39	-1
R15	49	53	52	52	0
R16	49	55	53	47	-6
R17	49	45	43	40	-3
R18	49	46	44	38	-6
N1	49	49	46	43	-3
N2	49	49	47	42	-5
N3	49	50	49	48	-1



**An onsite noise survey was also undertaken, including recent projects**

<b>Plant/Equipment</b>	<b>Development Assessment Number</b>	<b>Upgrade/Abatement Works</b>	<b>Time</b>
Tertiary Recycle (TAD) Project	DA 040/1190/20	Construction of tertiary dust and material return systems and associates structures	2020/21
Cement Mill 6 200t Fringe Silo	DA 040/0892/20	The construction of a new silo and upgrades and alterations to an existing silo, support structures and systems	2020/21
Colling Tower Project (4A)	DA 040/3617/20	Installation of replacement cooling towers and decommissioning of existing cooling tower (in association with established clinker kiln plant and cement production operations)	2020/21

<b>Plant/Equipment</b>	<b>Environment Improvement Programme (EIP) Number</b>	<b>Upgrade/Abatement Works</b>	<b>Time</b>
CM6 Clinker Gantry Air Knives	EIP 7	Installation of Cement Mill 6 clinker gantry air knives.	2021

The attended daytime and night-time offsite noise surveys confirms that these projects have not resulted in any significant changes in noise levels and overall, the noise emissions from the plant have largely remained unchanged.

This also confirms the findings of the noise studies undertaken as part of the development assessment and approval process for each project which did not predict any significant changes in noise levels.

**Overall summary**

- Noise levels met the day-time criterion for all measurement locations except for locations R10 and R16 where Victoria Road Traffic is the significant cause for these exceedances
- Noise levels met night-time criterion for all measurement locations, with the exception of the following locations R2, R5, R10, R12, R15 and N2 which are mostly associated with traffic noise influence from nearby road (Victoria Road and Fletcher Road).



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## **Adelaide Brighton Cement Ltd**

### **Birkenhead Plant – Annual Noise Survey**

#### **Noise Survey Report – May 2022**

50B-22-0069-TRP-34608-3

29 June 2022

<b>Job Title:</b> Birkenhead Plant – Annual Noise Survey			
<b>Report Title:</b> Noise Survey Report – May 2022			
<b>Document Reference:</b> 50B-22-0069-TRP-34608-3			
<b>Prepared For:</b> Adelaide Brighton Cement Ltd  <b>Contact:</b> Craig Mackenzie <b>Tel:</b> 08 8300 0512	<b>Prepared By:</b> Vipac Engineers and Scientists Limited 33 Bacon St, Hindmarsh, SA 5007, Australia  <b>Tel:</b> +61 8 8334 0900		
<b>Author:</b> Saksham Garg 29 June 2022	Senior Engineer		
<b>Reviewer:</b> Mark Ogilvie 29 Jun 2022	Senior Engineer		
<b>Issued By:</b> Saksham Garg 29 Jun 2022	Senior Engineer 		
<b>Revision History:</b>			
<i>Rev. #</i>	<i>Comments / Details of change(s) made</i>	<i>Date</i>	<i>Revised by:</i>
Rev. 00	Original issue	29 Jun 22	

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## 1 Introduction

Vipac Engineers & Scientists (Vipac) were engaged by Adelaide Brighton Cement Limited (ABC) to undertake an on-site noise measurement survey of selected plant (plant upgraded or refurbished since previous noise survey in September 2021), environmental noise survey at residential locations within proximity of the ABC Birkenhead plant during typical operations and update the computer noise model (SoundPLAN model) for the plant based on the survey results. The noise survey (off-site and on-site) was conducted during the month of May 2022.

This report provides details of the results of the on-site and off-site attended noise survey, details of the noise model update and comparison of the results of the noise survey and the updated noise model predictions against the three most recent previous surveys.

## 2 References

- [1] Vipac report 50B-18-0036-TRP-8950467-0 "Attended Noise Survey April 2019", dated 16 April 2019.
- [2] Vipac report 50B-20-0065-TRP-10950285-3 "Birkenhead Plant Noise Survey - May 2020", dated 29 May 2020.
- [3] Vipac report 50B-18-0036-TRP-6755126-2 "Birkenhead Environmental Noise-Noise Model Update and Abatement Options", dated 27 February 2019.
- [4] Environment Protection Act 1993, Government of South Australia (1995).
- [5] Licence No. 1126 Adelaide Brighton Cement Limited (issued 01 November 2017), Environment Protection Authority
- [6] Environment Protection (Noise) Policy 2007, Government of South Australia (2008).
- [7] Guidelines for the Use of the Environment Protection (Noise) Policy 2007, Environment Protection Authority (SA) (2009).
- [8] AS 1055.1-1997 Acoustics – Description and measurement of environmental noise – Part 1: General procedures, Standards Australia (1997).
- [9] Port Adelaide Enfield Council Development Plan (consolidated 30 April 2020), Department of Planning, Transport and Infrastructure (DPTI). *Revoked & replaced by The Planning & Design Code on 19 March 2021.*
- [10] Australian Standard AS IEC 61672.1-2004 Electroacoustics – Sound level meters Specifications, Standards Australia (2004).
- [11] 50B-20-0065-TRP-45950069-2, 'New Cooling Tower Noise Assessment Report', dated 11 December 2020.
- [12] 50B-20-0065-TRP-16550032-1, 'Tertiary Recycle Project Acoustics', dated 06 July 2020.
- [13] 50B-20-0065-TRP-16550045-3, 'Cement Mill 6 Upgrade Noise Assessment Report', dated 02 July 2020.
- [14] Plan SA website, <https://sappa.plan.sa.gov.au/>.
- [15] The Planning & design Code SA.
- [16] 50B-21-0078-TRP-47284453-1, 'Demolition Works Noise Report', dated 14 April 2021.
- [17] 50B-21-0078-TRP-26964-0, 'January 2022 Demolition Noise Survey Report', dated 02 February 2022.
- [18] 50B-21-0078-TRP-21553-2, 'Annual Noise Survey Report 2021', dated 11 November 2021.
- [19] 50B-22-0061-TRP-31009-1, 'ABC Birkenhead Burner Replacement – Noise Report', dated 13 April 2022.
- [20] 50B-21-0078-TRP-25617-2, 'AJ279 Blend Silo DA Acoustics Report', dated 02 February 2022.



## 3 Background

Adelaide Brighton Cement's (ABC) Birkenhead operations are licensed by the EPA for conduct of an activity identified in Schedule 1 of the *Environment Protection Act 1993* [4]. Condition U-787 of ABC's EPA License for the Birkenhead site [5] relates to noise. Specifically, ABC is required to develop and implement a noise management plan for the site. Regular attended noise monitoring surveys, development of a computer noise model for the site, and identification and implementation of noise abatement projects form part of the noise management plan.

ABC, therefore, have engaged Vipac to conduct annual attended noise monitoring surveys (day and night time) in the community surrounding the plant and within the plant for selected equipment/machinery refurbished or upgraded in the preceding year, and to annually update a computer noise model for the site (most recently updated in September 2021 [2]). This report provides details of the noise surveys, detailed computer noise model review, and provides a comparison of the predicted and measured noise levels against the historical data.

Please note that the environmental noise criterion has been updated in this report to reflect the changes in South Australian legislation, which included revoking of Council Development Plan and replacing it with a single Planning & Design Code ("The Code"). The implications of this change are discussed in the Section 4.

## 4 Assessment Criteria

### 4.1 Environment Protection (Noise) Policy 2007

Noise from industrial activities (such as those conducted at the ABC Birkenhead site) is subject to the provisions of the *Environment Protection (Noise) Policy 2007* (Noise EPP) [6]. The Noise EPP outlines Noise Goals which provide one method for demonstrating compliance with the General Environmental Duty under Section 25 of the *Environment Protection Act 1993* (the Act) [4]. Compliance with the Noise Goals may be achieved by demonstrating compliance with the Indicative Noise Levels (INLs) applicable to the site, as determined in accordance with Clause 5 of the Noise EPP and the Planning and Design Code of SA provisions.

Previously (until 19 March 2021), the INLs were derived in accordance with the land use and zoning provided by the Port Adelaide Enfield Council Development Plan. However, with the change in the SA policies, the Planning & Design Code has replaced the Council Development [15]. The change, essentially, includes incorporating all council development policies in SA into a single Code. This has resulted in slight change of zone designation/naming; however, the promoted use of the land remains same/similar.

As such, with reference to the Code, the site is located within the "Strategic Employment" (SE) zone. The nearest noise sensitive receptors (NSRs) are located within "Suburban Neighbourhood" (SN) zone and "General Neighbourhood" (GN) zone.

In accordance with the Development Plan, the "Strategic Employment" zone primarily accommodates industrial, logistical, warehouse, storage and transport land uses, and the "General Neighbourhood" and "Suburban Neighbourhood" zone promotes residential land use. With reference to the *Guidelines for the Use of the Environment Protection (Noise) Policy 2007* [7], it is therefore considered that the "Strategic Employment" zone principally promotes the "General Industry" Land Use Category, as set out in Table 2 of the Noise EPP. With reference to the relevant development plan provisions, it is considered that the "General Neighbourhood" and "Suburban Neighbourhood" zone principally promote the "Residential" land use category.

As such, the following Indicative Noise Levels (INLs) apply to ABC's operations:

- Suburban & General Neighbourhood NSR's
  - Day-time – 59 dB(A)
  - Night-time – 50 dB(A)

However, Vipac notes that the historical (annual) noise survey and assessment conducted for ABC Birkenhead has been based on the criteria (INL's) listed in Table 4-1. Even though the criteria derived in accordance with the Code is higher (slightly relaxed) than the criteria listed below, and considering that the criteria (Table 4-1) has been advised and agreed upon by EPA SA, Vipac has conducted the assessment against the Table 4-1 criteria.

Table 4-1 – Indicative Noise Levels

Zone	Indicative Noise Levels (L <sub>eq</sub> , dB(A))	
	Day-time (7am to 10pm)	Night-time (10pm to 7am)
Suburban Neighbourhood Zone	57	49
General Neighbourhood Zone	57	49

**NOTE:** The Environment Protection Authority (EPA) has advised that comparison of the L<sub>A90</sub> noise level descriptor measured within 100 metres of the centre line of Victoria Road with the above Indicative Noise Levels is an acceptable method for eliminating the influence of short-term/transient noise level events (such as intermittent passing road traffic, for example) on the results. This includes measurement positions N1, R2, R10, R12, R15 and R16. At distances greater than 100 metres, the use of the L<sub>Aeq</sub> descriptor is required.

## 4.2 Adjustment for Characteristics

For a noise containing a characteristic (tonal, impulsive, low frequency or modulating), the following adjustments are to be made to the source noise level:

- Noise containing 1 characteristic; a 5dB(A) penalty must be added to the noise level (continuous),
- Noise containing 2 characteristics; an 8dB(A) penalty must be added to the noise level (continuous),
- Noise containing 3 or 4 characteristics, a 10dB(A) penalty must be added to the noise level (continuous).

# 5 Noise Survey Details

## 5.1 Off-Site Environmental Noise Survey

### 5.1.1 Survey Methodology

All measurements were conducted in accordance with the requirements of the *Environment Protection (Noise) Policy 2007* [6], with guidance from the *Guidelines for the Use of the Environment Protection (Noise) Policy 2007* [7] and AS 1055.1-1997 [8], on the following days:

- 11 May 2022 – between 10:10PM and 01:30AM the following day,
- 12 May 2022 – between 12:30PM and 04:00PM, and

The measurements were conducted during EPA defined day-time and night-time period, to measure the noise impact to the nearest noise sensitive receivers due to the plant operation. Following methodology and equipment were used to conduct the survey:

- Measurements using the noise descriptors L<sub>Aeq</sub> and L<sub>A90</sub> were taken for a period of 15 minutes at each receiver location.
- Where possible, measurements were paused to avoid influence from the extraneous sources (such as traffic, etc.).
- Where heavy traffic was observed (near or on Victoria Road), Vipac has provided comments to reflect the noise influence.
- Where continuous noise influence from other noise sources (residential noise, construction noise, dog barking, etc.) was observed, Vipac has provided comments to reflect the possible influence.
- The sound level meters (details provided below) were mounted on approved tripods, minimum 1.5m above the ground level. The monitors were installed minimum 2m away from reflective surfaces (cars, fence, walls, etc.).

### 5.1.2 Survey Equipment

The following equipment was used to conduct the off-site noise survey. Please note that the sound level meters satisfy the requirements of AS IEC 61672.1-2004 [10].

- Equipment 1:
  - Model – Brüel & Kjær Type 2250 Class 1 sound level meter.
  - Serial number – 3012267
  - Calibration – Due for calibration on June 2023
  - Spot calibration check – The calibration of the sound level meter was checked before and after measurements and no drift in sensitivity was detected.
- Equipment 2:
  - Model – Brüel & Kjær Type 2250 Class 1 sound level meter.
  - Serial number – 3002841
  - Calibration – Due for calibration on April 2024
  - Spot calibration check – The calibration of the sound level meter was checked before and after measurements and no drift in sensitivity was detected.

### 5.1.3 Off-Site Survey Locations

Monitoring locations for both the day-time and night-time surveys were consistent with the previous attended measurement surveys, including the most recent survey conducted in September 2021 [1][2][3][18]. The monitoring locations are summarised in Table 5-1, with an overview of the monitoring locations provided in Figure 5-1.

Table 5-1: Summary of off-site attended measurement locations

Measurement Location	Location Address/ Description
<b>R2</b>	Corner of Alfred St and Hargrave St, Peterhead
<b>R3</b>	Adjacent to 145 Hargrave St, Peterhead (facing Fletcher Rd)
<b>R4</b>	Corner of Robert St and Hargrave St, Birkenhead
<b>R5</b>	Adjacent to 23 Levi St, Birkenhead
<b>R6</b>	Adjacent to 19 Craigie St, Birkenhead
<b>R8</b>	Adjacent to 39 Mary St, Peterhead
<b>R9</b>	Corner of Wills St and Whyte St, Peterhead
<b>R10</b>	Corner of Olive St and Victoria Rd, Largs Bay
<b>R11</b>	Adjacent to 158 Fletcher Rd, Largs Bay (facing east along Olive St)
<b>R12</b>	Adjacent to 33 Hilton St, Birkenhead
<b>R13</b>	Adjacent to 28 Whyte St, Peterhead (facing east down Matilda St)
<b>R14</b>	Adjacent to 15 Waverley St, Largs Bay
<b>R15</b>	Adjacent to 9 Walton St, Peterhead
<b>R16</b>	Adjacent to 77 Victoria Rd, Birkenhead
<b>R17</b>	Corner of Fletcher Rd and Rose St, Birkenhead (adjacent to 53 Fletcher Rd)
<b>R18</b>	Adjacent to 20 Fletcher Rd, Birkenhead (In the park)
<b>N1</b>	Corner of Gunn St and Well St, Birkenhead (adjacent to 39 Well St)
<b>N2</b>	Adjacent to 9 Mary St, Peterhead
<b>N3</b>	Corner of Walton St and Mary St, Peterhead (adjacent to 23 Mary St)



Figure 5-1: Overview of attended monitoring locations

## 5.2 On-Site Noise Survey

### 5.2.1 Survey Methodology

An attended noise survey of selected plant on-site was conducted to obtain updated noise measurement data for items of plant which were serviced, refurbished/upgraded since the previous noise survey or identified as the major noise source during previous noise survey and computer noise model update. The following survey methodology was followed:

- Measurements were taken at distances varying between 1-5m, depending on the access to the equipment/machinery.
- Where possible, multiple measurements were taken around an equipment/machinery to appropriately analyse the emanating sound pressure levels.
- Due to the operational conditions in the plant (typical), it is usually difficult to isolate a single source from sources directly abutting the measured source. In such case, Vipac has taken measurements at several locations around the plant area in question. This enabled Vipac to verify the combined noise levels predicted from the noise model against the measured values i.e., adjusting source noise levels to comply against the measured noise levels at the measurement location.

### 5.2.2 Survey Equipment

The following equipment were used to conduct the on-site noise survey. Please note that the sound level meters satisfy the requirements of AS IEC 61672.1-2004 [10].

- Equipment Details
  - Model – Brüel & Kjær Type 2250 Class 1 sound level meter.
  - Serial number – 3012267
  - Calibration – Due for calibration on June 2023
  - Spot calibration check – The calibration of the sound level meter was checked before and after measurements and no drift in sensitivity was detected.

### 5.2.3 On-Site Survey Locations

As identified by ABC, the plant/equipment upgraded are listed in Table 5-2.

Table 5-2: EIP Projects

Plant/Equipment	Environmental Improvement Programme (EIP) Number	Time
CM1/7 Gantry Fans	EIP 14	2020
Kiln Feed Elevator Gear Box	EIP 16	2019
BH Gas Train	EIP 15	2020

In addition to above, measurements for the recently commissioned infrastructure (refer Table 5-3) were undertaken. Please note that the listed equipment was commissioned prior to the previous noise survey (2021) and were also included in the noise model update, however, the equipment noise levels were remeasured to assess/monitor any changes in the noise emissions.

Table 5-3: DA Projects undertaken since previous noise survey

Plant/Equipment	DA Programme Number	Upgrade/Abatement Works	Time
Tertiary Recycle (TAD) Project	DA 040/1190/20	Construction of tertiary dust and material return systems and associates structures	2020/21
Cement Mill 6 200t Fringe Silo	DA 040/0892/20	The construction of a new silo and upgrades and alterations to an existing silo, support structures and systems	2020/21
Colling Tower Project (4A)	DA 040/3617/20	Installation of replacement cooling towers and decommissioning of existing cooling tower (in association with established clinker kiln plant and cement production operations)	2020/21

Noise measurements were conducted generally at a distance of 1-5 metres from the subject plant. For pre-existing plant, where possible, measurements were conducted at the same position as during previous surveys [1].

### 5.3 Survey Weather Conditions

Temperatures ranging between 10 – 21 degrees Celsius were observed throughout the survey, with wind speeds well below 5m/s observed during the noise survey. No rainfall was observed.

The meteorological data is presented in **Appendix F**.



## 6 Noise Modelling

Based on the results of the attended noise monitoring survey (on-site and off-site), and the plant data provided by ABC, the existing noise model for the Birkenhead plant was significantly updated. Noise level predictions for each of the annual off-site attended measurement survey positions were generated, along with noise contour plots for “neutral” and “worst case” weather conditions. Dominant noise sources were identified for each survey position (where possible), and the effect of significantly reducing or eliminating the noise source was then investigated. Details of the updated noise model, and the methodology followed in constructing the noise model and generating predictions are discussed below.

The purpose of the annual noise survey and the model update is to assess the existing noise conditions in the locality abutting the plant. As such, to conduct a conservative assessment, Vipac has not included the infrastructure currently under Development Application (DA) approval stage. This includes infrastructure associated with the AJ279 Blend Silo Project [20] and Burner Replacement Project [19]. Once these projects are approved, constructed and commissioned, Vipac will conduct the noise survey and update the noise model accordingly.

### 6.1 Modelling Assumptions

The following assumptions were relied upon in developing the 3D computer noise model (using SoundPLAN software) for the Birkenhead cement plant:

- The ground areas within and surrounding the ABC Birkenhead plant were assumed to be flat terrain.
- Ground absorption within the Birkenhead site was assumed to be fully reflective (based on on-site observations and Vipac’s previously validated predictive noise model of the Birkenhead cement plant).
- Ground absorption outside of the site was assumed to be partially reflective grass terrain, with the exception of roads and other reflective surfaces which were assumed to be fully reflective.
- The heights and location of buildings and other on-site structures were generally based on the information provided by ABC (plant geometry provided in dxf format on 08 November 2018) and on-site observations.
- All doors and openings closed during operations.
- Traffic noise and other noise sources not included.
- Where the on-site noise measurements indicate no apparent change in noise emissions from the specific plant/equipment, the source noise levels were not changed in the model.

### 6.2 Input Data

Sound power levels for each noise source were calibrated based on on-site survey data conducted on 26 May 2022. Please note that source noise levels for several plant/equipment were measured during the site survey. As such, computer noise model was only updated for the sources where significant change in noise emissions was observed. Whereas, for the remaining sources, the sound power level was based on previous data.

Details of all noise sources included in the model, their sound power level, and position within the plant (including measurement position) are provided in **Appendix B** and the data for the plant/equipment measured during the May 2022 on-site survey are presented in **Appendix D**.

### 6.3 Modelling Scenarios

Noise predictions were generated for “neutral” and “worst-case” meteorological conditions corresponding to the recommended conditions detailed in the *Guidelines for the Use of the Environment Protection (Noise) Policy 2007* [7] for each of the above modelling scenarios. In accordance with standard practice, noise predictions were also generated for the existing situation using weather conditions corresponding to the May 2022 attended measurement survey (average wind speed of 2m/s) for the purposes of calibration of the updated noise model against the survey results.



## 6.4 Calibration

As discussed above, noise model calibration was carried out against the results of Vipac’s most recent noise monitoring survey. Noise level predictions at each standard receiver position (R1-R18, N1-N3) were generated for the current situation using meteorological conditions corresponding to the day of night-time attended measurement survey (average wind speed of 2m/s), with the results compared against the noise levels measured at the relevant location during the survey. Meteorological conditions were based on a combination of on-site observations (for wind speed and direction), and Bureau of Meteorology (BOM) data for other parameters (temperature, pressure, and humidity).

A comparison of the predicted noise levels from the computer noise model and the attended off-site survey has been discussed in Section 7.3.2 below. The predicted results show good agreement with measured noise levels.

# 7 Assessment Results & Discussion

## 7.1 Off-Site Environmental Noise Survey

The off-site noise survey results for day-time and night-time period are presented in **Appendix A**, with results discussion and comparison against historical data discussed below. As discussed in Section 4.1 above, for measurement positions within 100 metres of the centreline of Victoria Road the  $L_{A90}$  descriptor has been used to eliminate the influence of short-term transient noise sources (such as passing road traffic) from the results. For each measurement position, the descriptor used for comparison with the noise goal is indicated by bold text and shading in the results table in **Appendix A**.

### 7.1.1 Day-Time

The day-time attended survey was conducted on 12 May 2022 (12:40PM – 03:45PM), with following conditions observed during the survey:

- Wind speeds of less than 5m/s observed during the noise survey.
- No rainfall was observed.

The results of the day-time survey are provided in Appendix A.

Both the  $L_{Aeq}$  and  $L_{A90}$  noise levels met the day-time criterion for all measurement locations, with the exception of the following (the descriptor used for comparison with the noise goal is indicated by bold text and shading).

Table 7-1: Day-time survey exceedances

Location	$L_{Aeq}$ [dB(A)]	$L_{A90}$ [dB(A)]	Criterion [dB(A)]	Exceedance [dB(A)]
R10	74	<b>61</b>	57	4
R16	78	<b>64</b>	57	7

Receivers R10 and R16 show significant exceedance, which are influenced by the road traffic noise, with frequent vehicles pass-by on Victoria Road contributing significantly to noise levels (dominant source). Since both the measurement locations are abutting Victoria Road, high traffic noise influence was expected. This has also been documented in our preceding annual noise survey reports that locations in close proximity to Victoria Road, specifically R10 and R16, are dominated by traffic noise impact. This is expected as Victoria Road provides a major thoroughfare for trucks and other heavy vehicles and is a designated Type A Road (The Planning & Design Code [15], SAPPa [14]). Additionally, it has been noted in the previous noise surveys that due to dominance of traffic noise, the plant is usually inaudible at both the measurement locations.

### 7.1.2 Night-Time

The night-time survey was conducted on 11 Amy 2022 (between 10:00PM – 04:00AM), with following conditions observed during the survey:

- Wind speeds generally below 5m/s observed over the course of the survey.
- No rainfall was observed.

The results of the night-time survey are provided in Appendix A.

Both the  $L_{Aeq}$  and  $L_{A90}$  noise levels met the night-time criterion for all measurement locations, with the exception of the following (the descriptor used for comparison with the noise goal is indicated by bold text and shading).

Table 7-2: Night-time survey exceedances

Location	$L_{Aeq}$ [dB(A)]	$L_{A90}$ [dB(A)]	Criterion [dB(A)]	Exceedance [dB(A)]
R2	53	<b>52</b>	49	3
R5	<b>50</b>	48	49	1
R10	54	<b>50</b>	49	1
R12	54	<b>52</b>	49	3
R15	53	<b>52</b>	49	3
N2	<b>50</b>	48	49	1

The exceedance at R2, R5, R10, R12, R15 and N2 were mostly associated with traffic noise influence from nearby road (Victoria Road and Fletcher Road). However, no characteristic noise was observed at any measurement location. Please note that a 'screeching noise' was also observed during Vipac's May 2020, 2021 annual noise survey. ABC had advised that the noise was an unusual occurrence and was later rectified.

Notwithstanding, the measured  $L_{A90}$  levels at R5 and N2 achieved the noise criterion.

In addition to above and as discussed in our previous survey reports [2], Vipac notes that contributions from distant traffic noise and potentially other industrial sites to the east were also noted in a number of measurements, which may have increased the measured noise levels. This is particularly relevant considering that wind conditions favourable to noise propagation were present during the night-time survey, which may have increased the contribution of these sources to measured noise levels. As such, the noise levels measured during the night-time survey are likely to be representative of worst case noise emissions from the plant, and are useful for validation of future computer noise model predictions for the plant. Weather conditions are discussed further below.

### 7.1.3 Result Comparison with Previous Surveys

The  $L_{A90}$  noise levels measured during the 2022 attended measurement survey were compared against the noise levels measured during the two most recent attended measurement surveys (2020 [1] and 2021 [2]). Similar to our previous surveys, the  $L_{A90}$  descriptor was considered to provide a more meaningful comparison between measurement surveys as it is less susceptible to the influence of extraneous transient noise sources. Table 7-3 and Table 7-4 show the comparison between the 2022 survey and preceding year results.

Table 7-3: Day-Time Survey Results Comparison

Receiver Location	Day-Time $L_{A90}$ Noise Level (dB(A))				
	Criterion	2020	2021	2022	Difference (2021/2022)
<b>R2</b>	57	53	50	54	4
<b>R3</b>	57	44	42	43	1
<b>R4</b>	57	38	37	34	-3
<b>R5</b>	57	49	47	48	1
<b>R6</b>	57	38	39	37	-2
<b>R8</b>	57	41	44	44	0
<b>R9</b>	57	37	37	34	-3
<b>R10</b>	57	59	59	61	2
<b>R11</b>	57	39	41	38	-3
<b>R12</b>	57	53	51	53	2
<b>R13</b>	57	36	38	36	-2
<b>R14</b>	57	36	37	32	-5
<b>R15</b>	57	50	48	52	4
<b>R16</b>	57	61	59	64	5
<b>R17</b>	57	42	40	37	-3
<b>R18</b>	57	42	42	48	6
<b>N1</b>	57	47	47	46	-1
<b>N2</b>	57	42	48	42	-6
<b>N3</b>	57	44	47	46	-1

Table 7-4: Night-Time Survey Results Comparison

Receiver Location	Night-Time L <sub>A90</sub> Noise Level (dB(A))				
	Criterion	2020	2021	2022	Difference (2021/2022)
R2	49	54	53	52	-1
R3	49	49	47	47	0
R4	49	44	43	41	-2
R5	49	52	49	48	-1
R6	49	46	43	39	-4
R8	49	47	46	47	1
R9	49	42	40	40	0
R10	49	47	47	50	3
R11	49	39	39	36	-3
R12	49	54	52	52	0
R13	49	43	44	42	-2
R14	49	42	40	39	-1
R15	49	53	52	52	0
R16	49	55	53	47	-6
R17	49	45	43	40	-3
R18	49	46	44	38	-6
N1	49	49	46	43	-3
N2	49	49	47	42	-5
N3	49	50	49	48	-1

Noise levels were observed to decrease at a number of locations, however; a number of increases were also observed. The discrepancies may be attributed to a number of factors, such as:

- The day of the week and time of day that the measurement was conducted,
- Extraneous noise sources present during the measurement,
- Weather conditions during the measurement (such as temperature, humidity, wind speed and wind direction); and,
- Specific site operations during the measurement.

As discussed above, in Appendix A and in our previous noise annual noise survey reports, the day-time noise measurements are heavily influenced and dominated by road traffic noise and other activities around the measurement locations (such as construction noise, resident noise, bird noise, dog barking, etc.). Hence, Vipac considers the night-time measurements provide appropriate comparison to the historical data.

The night-time survey results show an increment in noise levels at R8 and R10 in comparison to 2021 results. The increment at R8 is considered insignificant as in terms of human response to change in noise levels, a 3 dB(A) increase in sound pressure level is just perceptible to the average human ear to notice a change, a 5 dB(A) increase is quite noticeable and a 10 dB(A) increase is typically perceived as a doubling in loudness. Therefore, a 1 dB(A) increment at R8 can be considered acceptable. Also, despite an increase in noise levels compared to the 2021 survey, the measured noise level are same as the 2020 survey results.

Location R10 show an increment of 3 dB(A) in comparison to 2021 and 2020 results. It should be noted (also discussed above), location R10 is inherently affected and dominated by traffic noise on Victoria Road. This has been continually documented by ViPAC in previous years' reports.

#### **7.1.4 Influence of Extraneous Noise Sources**

With reference to the survey results and our previous surveys, the  $L_{A90}$  noise levels were found to be a better descriptor of the plant noise emissions, which is expected due to the steady-state nature of the majority of the noise emitted by the plant. However, Vipac notes that frequent traffic noise from nearby roads and noise from other industrial properties (particularly at night when weather conditions were more favourable to noise propagation from distant sources) may have also contributed to the background noise level. As such, the measured  $L_{A90}$  background noise levels during the survey may be considered to represent a slight over-estimate of the noise level contributed by the ABC plant to the measured noise levels.

Irrespective of the noise conditions during the measurement, the  $L_{A90}$  noise levels are considered to be a better estimate of noise emissions than the  $L_{Aeq}$  noise levels for ABC's operations. As discussed above, the Environment Protection Authority (EPA) has advised that the  $L_{A90}$  descriptor may be used only for locations in close proximity to Victoria Road (within 100 metres of the centreline of the road), which includes measurement positions N1, R2, R10, R12, R15 and R16.

Even though care was taken to minimise the influence of extraneous noise sources (such as passing vehicles, and traffic on nearby major roads) by pausing the sound level meter and erasing the extraneous noise influence (by using back erase function in B&K Sound Level Meter), it was not possible to entirely remove the influence of these noise sources. In particular, high volumes of road traffic on Victoria Road influenced the measurements at locations R10 and R16 to such a degree that road traffic noise is overwhelmingly the dominant noise source at these positions. As such, the results presented in Appendix A for these measurement locations provide a representation of the traffic noise impact at these locations, and are not reflective of noise emissions from the ABC site.

Due to the lower traffic volume at night, better quality measurements were obtained at R10 and R16 during the night-time survey, and the measured  $L_{A90}$  noise levels at these locations provide a reasonable estimate of worst-case noise emissions at these locations. Similarly, frequent vehicle movements on Fletcher Road made measurements at locations R3, R11, R17 and R18 difficult, particularly during the day-time survey.

To analyse the contribution of extraneous noise sources, Vipac had conducted a background noise survey (29 March 2021) with the Birkenhead Plant not operating during the survey period. The results of the background noise survey, compared against this year's annual noise survey results for night-time period, are presented below.

Table 7-5: Background Noise Survey Results Comparison Against Plant Noise Survey Results (night-time)

NSR Location	2021 Background Noise Results (Limited operation of plant)	May 2022 Survey Results (Plant under full operation)	Noise Criterion dB(A)
	L <sub>Aeq,15min</sub> dB(A)	L <sub>Aeq,15min</sub> dB(A)	
R2	53	53	49
R3	55	49	49
R4	52	45	49
R5	55	50	49
R6	45	42	49
R8	41	49	49
R9	39	43	49
R10	64	54	49
R11	43	38	49
R12	55	54	49
R13	43	46	49
R14	41	42	49
R15	49	53	49
R16	70	50	49
R17	51	43	49
R18	52	43	49
N1	49	45	49
N2	44	46	49
N3	46	50	49

Based on the results presented above, Vipac comments as follows:

**Site Notes** – Observations during survey

- No plant noise was audible at any NSR location during the survey.
- Major noise influence from traffic movements along Victoria Road and Fletcher Road was observed.
- Neighbourhood noise influence was also observed at some locations (dog barking, residents talking, etc.).
- At locations R2 and R15, noise influence from the nearby petrol station was also observed.
- The measurements were conducted for a continuous 15-minute period, without any pause.



## Environmental Noise Criterion

- The background noise levels were **exceeding** the environmental noise criterion (night-time) at locations R2, R3, R4, R5, R10, R12, R16, R17 and R18.
- The background noise levels were **within/below** the environmental noise criterion (night-time) at locations R6, R8, R9, R11, R13, R14, R15, N1, N2 and N3.

## Comparison Against Plant Noise

Based on the results presented in Table 7-5, we note the following:

- The background noise levels (with limited plant operation) exceed the noise levels measured with full plant operation (May 2022) at locations R2, R3, R4, R5, R6, R10, R11, R12, R13, R16, R17, R18 and N1. This indicates that at these locations, the major noise contributors are extraneous noise sources such as traffic noise, residential noise, etc. As such, the plant noise influence at these locations is insignificant as compared to noise influence from other sources.
- The noise levels measured with full plant operation marginally exceed (< 3dB(A)) the background noise levels (with limited plant operation) at locations R14 and N2. Typically (subjectively) for an average human ear, a 3 dB(A) increase in sound pressure level is **just** noticeable, whereas, a 5 dB(A) increase is quite noticeable and a 10 dB(A) increase is typically perceived as a doubling in loudness. As such, Vipac believes that the noise influence from the plant should not be detrimental to NSR's amenity/comfort.

In addition to above, Part 4 (General Noise Control Provisions), Clause 18, Subclause 2a of Noise EPP [6], states that the noise from a source complies with the noise goals if the source noise level does not exceed the background noise level plus 5 dB(A). Considering this, noise from the plant achieves the EPA defined noise goals at the locations highlighted above.

- The noise levels measured with full plant operation exceed the background noise levels (more than 5 dB(A)) at locations R8, R9, R15 and N3. Location R9 shows unusually high levels considering the separation between R9 and the plant boundary. Based on the site notes, it is noted that the measurement at R9 was influenced by traffic noise, train pass-by and aircraft fly-by, which may have resulted in higher levels.

Similar to 2021 survey results, noise from the ABC plant is dominant (major contributor) at locations R8, R9 and N3. This is evident considering that these receivers fall along the same line on Mary Street and Walton Street.

As such, due to the influence of extraneous noise sources in the measured levels, the results do not necessarily reflect an exceedance of the noise criteria due to ABC operations alone and essentially provide an upper limit to the noise levels that may be contributed by ABC's operations.

## **7.2 On-Site Noise Survey**

An attended noise survey of selected plant on-site was conducted to obtain updated noise measurement data for items of plant which were serviced, refurbished/upgraded since the previous noise survey or identified as the major noise source during previous noise survey and computer noise model update. The results of the survey are presented in Appendix D.

### 7.3 Computer Noise Model

#### 7.3.1 Noise Level Predictions

The computer noise model representing the current operations of the ABC Birkenhead plant predicts the incident noise levels at each noise sensitive receiver location used for the attended noise survey during day-time and night-time period, as highlighted in Figure 5-1 and Table 5-1 above. The model predicted noise levels for “neutral” and “worst case” meteorological conditions (as discussed above). The predicted noise levels are presented in Table 7-6 below.

Please note that the results from attended noise survey within the plant (Appendix D) were compared against the source noise levels used in the SoundPLAN model. Wherever the site measurements showed significant change in source noise levels for each measured equipment, the model was updated. Please note that in cases where the change in source noise levels was less than 2 dB(A), the model source levels were not changed. A 1 dB(A) change is not considered significant as it may have resulted due to wind conditions/direction and the noise from nearby extraneous sources.

Table 7-6: Computer Noise Modelling (SoundPLAN) Results

Receiver ID	Night-Time Criterion	Neutral Weather Conditions (CONCAWE Category 4) dB(A)			Worst- Case Weather Conditions (CONCAWE Category 6) dB(A)		
		2022 Model Results (Updated)	2021 Model Results (Previous)	Difference	2022 Model Results (Updated)	2021 Model Results (Previous)	Difference
R2	49	51	51	0	53	53	0
R3	49	43	43	0	45	45	0
R4	49	38	38	0	41	41	0
R5	49	50	50	0	52	52	0
R6	49	40	40	0	43	43	0
R8	49	44	44	0	46	46	0
R9	49	37	37	0	40	40	0
R10	49	46	46	0	50	50	0
R11	49	38	38	0	41	41	0
R12	49	49	49	0	53	53	0
R13	49	39	39	0	42	42	0
R14	49	37	37	0	40	40	0
R15	49	50	50	0	51	51	0
R16	49	51	51	0	53	53	0
R17	49	40	40	0	43	43	0
R18	49	38	38	0	40	40	0
N1	49	47	47	0	48	48	0
N2	49	46	46	0	48	48	0
N3	49	47	47	0	49	49	0

**Note:** Corresponding noise contour maps are provided in Appendix C.

The results show no change is noise conditions at the NSR locations. This is expected as no new infrastructure has been added to the plant since September 2021. Even with the source noise levels update (for several plant/equipment), the plant shows no overall change in noise emissions.

### 7.3.2 Calibration Results

A comparison of the computer noise model predictions against the off-site noise measurements (night-time), has been presented below:

Table 7-7: Results Comparison

Receiver	Predicted Noise Levels ( $L_{Aeq,T}$ dB(A))	Measured Noise Levels ( $L_{Aeq,T}$ dB(A))	Measured Noise Levels ( $L_{A90}$ dB(A))
R2	53	53	52
R3	45	49	47
R4	41	45	41
R5	52	50	48
R6	43	42	39
R8	46	49	47
R9	40	43	40
R10	50	54	50
R11	41	38	36
R12	53	54	52
R13	42	46	42
R14	40	42	39
R15	51	53	52
R16	53	50	47
R17	43	43	40
R18	40	43	38
N1	48	45	43
N2	48	46	42
N3	49	50	48

Predicted noise levels generated by the updated model showed good calibration with most of the NSR's, except R5, R6, R11, R16, N1 and N2. However, it should be noted that at locations where the  $L_{A90}$  descriptor does not show good calibration, the  $L_{Aeq}$  descriptor shows good agreement. This indicates that the attended survey results are influenced by extraneous noise sources (traffic noise, etc.), which may have resulted in the discrepancy. Throughout the preceding annual noise surveys, it has been noted that at several NSR locations, traffic noise is the dominant source, which is also evident from the background noise survey results presented in Table 7-5. Additionally, it should be noted that the discrepancy between the measured and predicted values change/vary every year depending on the background noise conditions, weather conditions and other factors during the survey time/day.

As such, considering the complexity of the computer noise model and the varying conditions during the attended surveys, the predicted results are considered to show good calibration with the measured noise levels.

### 7.3.3 Noise Source Contribution

Based on the predicted noise levels presented for the current operational conditions in Table 7-6 above, the noise sources predicted to contribute most significantly at each NSR were identified. For receiver locations where worst-case predicted noise levels exceed the Noise EPP night-time goals, the most significant sources and their contributions to noise levels at the receiver location were identified.

The predicted worst-case night-time noise levels at NSR locations where current noise levels exceed the night-time goal noise level, along with the most significant noise sources at each location and their relative contribution to worst-case predicted noise levels at that location are presented in Table 7-8.

Table 7-8: Most significant noise sources

Receiver	Worst-case predicted noise level	Noise Source	Contribution
R2	53	Road Bulk Station DC30	45dB(A)
		Gas Train	42dB(A)
		CS4/CS5 Dust Collector Fan	42dB(A)
		Kiln Cooling Fans	37dB(A)
R5	52	CM1&7 Clinker Gantry Fans	42dB(A)
		Gas Train	35dB(A)
		CM1&7 Clinker Gantry Fans	47dB(A)
		Road Bulk Station DC30	42dB(A)
R10	50	Kiln 4 Airslide fan	40dB(A)
		CM1 (western façade)	39dB(A)
		4B EP duct	40dB(A)
		Woodchip plant 2	40dB(A)
R12	53	CM1&7 gantry fans	48dB(A)
		CM7 (western façade)	47dB(A)
		Gas train	35dB(A)
		Limestone reclaiming shed	41dB(A)
		CSC Compressor	39dB(A)
R15	51	Ventilation Oven Fan	41dB(A)
		Kiln 4 Airslide fan	38dB(A)
		4B EP duct	39dB(A)
		Woodchip plant 1	39dB(A)
		Woodchip plant 2	37dB(A)
		Kiln Feed Elevator Gearbox	29dB(A)
R16	53	Gas train	37dB(A)
		Limestone reclaiming shed	48dB(A)
		CM7 (western façade)	41dB(A)
		Kiln Feed Elevator Gearbox	31dB(A)

Based on the results above, Vipac comments as follows:

- The noise contribution from significant sources at NSR's listed above are same as the contributors and levels mentioned in Vipac's previous annual noise survey report [2].

- This was expected as all the new sources added to the plant did not show any significant contribution during the attended noise survey.
- Overall, it should be noted that the noise emissions from the plant have largely remained unchanged even with the inclusion of new noise sources since 2020.

## 8 Additional Comments

It should be noted that there is an inherent difficulty in isolating noise emissions from the plant with the existing background noise (other sources such as traffic, etc.) during the annual noise survey in the community area (NSR's). To overcome this, Vipac had conducted a background noise survey at the NSR's in 2021, with the plant not operating. The survey indicated that at most of the NSR's, the dominant source is not the Birkenhead plant noise. However, ABC has been continuously working towards reducing noise emissions from their Birkenhead plant which is evident from the Environment Improvement Plans (EIP Projects) undertaken by ABC throughout the years. ABC has also implemented a comprehensive Noise Management Plan (NMP) and remain engaged with the community to ensure the amenity of the community members is not compromised.

With continual improvements, a significant reduction in noise levels at various NSR's has been observed (as indicated in result comparison presented in Appendix E). As such, for the next annual noise survey (2023), a noise survey for all major noise sources in the ABC plant, specifically the sources identified as major contributors in Table 7-8, should be conducted.

Overall, Adelaide Brighton Cement have implemented all practicable and reasonable measures to reduce and eliminate noise emissions from the plant operation and intends to continue to do so in future as well.

## Appendix A : Environmental Noise Survey Results



**Day-Time Noise Survey Results**

Location	Start time (hh:mm)	L <sub>Aeq</sub> [dB(A)]	L <sub>A90</sub> [dB(A)]	Criterion [dB(A)]	Exceedance [dB(A)]	Observations / Comments
R2	15:02	57	54	57	-	Plant audible, noise from petrol station, traffic noise from Victoria Rd dominant source, resident noise
R3	13:01	49	43	57	-	Traffic noise from nearby roads, street sweeping on nearby roads, plant inaudible
R4	12:40	47	34	57	-	Helicopter noise, plant inaudible, traffic noise, resident noise (gardening)
R5	14:45	52	48	57	-	Plant slightly audible, continuous road works on Levi Street (see pic), traffic noise from Victoria Rd and nearby streets, dog barking intermittent
R6	14:01	46	37	57	-	Continuous construction works in the park (see picture), plant inaudible, intermittent resident noise and dog barking, police siren, helicopter
R8	13:38	47	44	57	-	Plant slightly audible, dog barking (continuous) and traffic noise influence
R9	12:52	43	34	57	-	Construction noise, resident noise, intermittent traffic noise, plant inaudible
R10	15:41	74	61	57	4	Traffic noise dominant source, plant inaudible
R11	14:59	53	38	57	-	Plant inaudible, traffic noise dominant source
R12	15:23	58	53	57	-	Road works noise from Levi street (finishing work, clearing), traffic noise from Victoria Road dominant source (continuous noise), plant inaudible
R13	13:15	42	36	57	-	Traffic noise dominant source, plant inaudible, aircraft fly-by
R14	12:31	39	32	57	-	Intermittent bird noise and aircraft fly-by noise. Noise from nearby residents (talking), traffic noise, plant inaudible
R15	14:47	56	52	57	-	Plant audible, traffic noise from Victoria Road dominant source
R16	15:38	78	64	57	7	Continuous traffic noise from Victoria Rd (dominant source), plant inaudible
R17	13:23	48	37	57	-	Dog barking (intermittent), birds' noise, traffic on nearby roads, plant inaudible, helicopter, street sweeping on nearby roads
R18	13:44	56	48	57	-	Continuous construction works in the park (see picture), intermittent dog barking, traffic noise from Fletcher Rd, plant inaudible
N1	14:22	51	46	57	-	Helicopter noise, traffic noise from Victoria Rd (continuous), plant inaudible, continuous construction works in the park (see picture)
N2	14:23	48	42	57	-	Plant audible with traffic noise being the dominant source
N3	14:01	51	46	57	-	Plant audible with continuous traffic noise (dominant source)

**Night-Time Noise Survey Results**

Location	Start time (hh:mm)	L <sub>Aeq</sub> [dB(A)]	L <sub>A90</sub> [dB(A)]	Criterion [dB(A)]	Exceedance [dB(A)]	Observations / Comments
R2	0:42	53	52	49	3	Traffic noise from Victoria Road with plant being clearly audible
R3	22:36	49	47	49	-	Plant slightly audible with intermittent truck noise from Victoria Road
R4	22:12	45	41	49	-	Plant slightly audible, traffic noise from Victoria road and nearby streets (dominant source)
R5	0:22	50	48	49	1	Traffic noise from Victoria Road with plant being clearly audible
R6	23:43	42	39	49	-	Continuous resident noise (screaming, high pitched talking, etc.), plant inaudible with intermittent truck noise from Victoria Road
R8	23:21	49	47	49	-	Plant audible with continuous traffic noise
R9	22:31	43	40	49	-	Plant inaudible, traffic noise from nearby roads and streets, train noise and aircraft fly-by (1-off)
R10	0:54	54	50	49	1	Plant audible, traffic noise (dominant source) Victoria Road
R11	0:35	38	36	49	-	Plant barely audible, intermittent traffic noise from far away streets and roads
R12	1:06	54	52	49	3	Traffic noise (dominant source) from Victoria Road and nearby streets, plant clearly audible
R13	22:54	46	42	49	-	Plant audible with continuous dog barking and some influence from traffic and 1-off aircraft fly-by
R14	22:10	42	39	49	-	Intermittent dog barking, traffic noise (dominant), plant slightly audible
R15	0:16	53	52	49	3	Plant clearly (continuous) audible with intermittent traffic noise
R16	1:25	50	47	49	-	Plant audible with traffic noise being the dominant source
R17	23:01	43	40	49	-	Intermittent traffic noise from nearby streets. Plant inaudible with continuous noise from a nearby residential house on Fletcher Road
R18	23:24	43	38	49	-	Plant inaudible. Traffic noise from Victoria Road dominant source. The measurement was undertaken 20m away from the designated spot due to the measurement spot being fenced for upgrade works
N1	0:00	45	43	49	-	Plant clearly audible, however, traffic noise was dominant (continuous) source
N2	23:57	46	42	49	-	Plant audible with continuous traffic noise and 1 event of house alarm at a property located in nearby streets
N3	23:41	50	48	49	1	Plant audible with continuous traffic noise

## Appendix B : Noise Source Inventory

ID	Group	Noise source	Type	Source Position (UTM co-ordinates zone 54H)			Sound Power Level (dB(A) re 1pW)																											
				X	Y	Z	Overall	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k	10k
1	CM7	Dust Collector Discharge	Point	271852	6142575	20	<b>100</b>	55	65	55	68	70	75	76	80	87	87	86	91	90	89	89	91	91	89	83	79	78	76	76	71	68	65	63
2	Kiln 4	Kiln Cooling Fan 1	Point	271686	6142840	4	<b>104</b>	45	50	55	58	68	69	75	82	82	85	92	93	92	95	95	95	95	94	93	91	89	87	85	81	77	74	68
3	Kiln 4	Kiln Cooling Fan 7	Point	271668	6142835	2	<b>96</b>	41	49	54	53	59	63	63	70	71	76	81	86	81	82	86	84	86	89	87	85	83	81	79	75	75	73	70
4	Kiln 4	Kiln Cooling Fan 6	Point	271666	6142849	5	<b>91</b>	44	50	54	59	58	60	66	71	69	78	77	80	83	81	81	81	81	80	79	78	77	75	72	70	68	64	59
5	Kiln 4	Kiln Cooling Fan 4	Point	271672	6142850	5	<b>93</b>	50	52	55	61	63	65	66	67	71	76	77	79	86	81	82	83	84	85	81	80	78	75	72	68	69	67	57
6	Kiln 4	Kiln Cooling Fan 5	Point	271672	6142836	5	<b>104</b>	54	61	70	72	73	71	75	77	83	82	84	91	96	95	92	96	96	94	91	90	88	86	83	79	76	72	68
7	Kiln 4	Kiln Cooling Fan 3	Point	271678	6142838	5	<b>103</b>	53	61	69	70	71	71	72	76	81	84	83	90	94	94	92	95	96	93	91	89	87	86	83	79	77	73	66
8	Kiln 4	Kiln Cooling Fan 2	Point	271683	6142838	5	<b>101</b>	50	58	67	68	69	71	71	75	82	81	83	88	93	91	89	93	93	91	90	87	86	83	80	76	74	70	65
9	Kiln 4	Kiln 4 Primary Air Fan	Point	271671	6142837	5	<b>83</b>	37	43	50	48	51	54	54	59	62	66	66	70	71	73	72	72	72	71	68	67	69	77	66	66	67	58	60
10	Slag Dryer	Slag Dryer	Line	271780	6142824	2	<b>97</b>	63	59	61	72	86	76	74	79	77	80	82	82	83	85	86	86	91	88	84	83	82	80	78	77	76	74	68
11	Kiln 4	Ventilation Oven Fan 1	Line	271631	6142835	5	<b>115</b>	60	65	70	72	74	83	82	86	92	104	101	99	107	105	105	105	105	105	103	103	101	97	92	89	85	81	77
12	Kiln 4	Ventilation Oven Fan 2	Line	271660	6142841	5	<b>115</b>	60	65	70	72	74	83	82	86	92	104	101	99	107	105	105	105	105	103	103	101	97	92	89	85	81	77	
13	Raw mill 4B	EP Outlet Duct	Line	271611	6142876	5	<b>110</b>	66	69	72	76	80	86	88	90	101	100	98	96	98	99	100	100	98	99	98	95	92	90	87	85	83	79	76
14	Raw mill 4B	4B Air Slide Blower	Point	271598	6142880	35.5	<b>94</b>	43	50	56	71	79	74	72	75	73	78	74	74	78	82	88	77	76	81	82	83	85	83	82	81	79	75	72
15	4A/4B Tower	4A Elevator Discharge Air Slide Fan	Point	271602	6142821	37.3	<b>90</b>	38	40	43	51	58	53	59	58	68	79	80	78	79	79	85	79	77	76	76	73	72	69	69	68	65	61	59
16	Transfer Conveyors	D/C - CS1/CS2 Central Tower	Point	271662	6142805	16	<b>102</b>	43	47	55	68	65	71	73	76	84	85	84	85	92	95	95	93	92	92	89	86	86	84	81	79	75	71	67
17	Transfer Conveyors	D/C - CR1/CR2 Conveyors	Point	271610	6142802	13	<b>91</b>	46	49	50	54	59	63	63	64	69	73	75	74	81	80	81	84	83	79	76	78	80	79	76	73	69	68	65
18	Level 3 Dust Collector Area	D/C - CS 2 Conveyor	Point	271600	6142791	22	<b>91</b>	49	52	55	59	60	66	72	71	76	78	76	77	78	76	78	81	79	81	79	77	76	76	78	81	80	76	72
19	Level 3 Dust Collector Area	D/C - North Gantry Building	Point	271599	6142798	24	<b>101</b>	52	58	64	70	67	73	77	76	82	84	96	87	88	92	92	89	89	88	86	84	83	83	83	83	81	76	72
20	Level 3 Dust Collector Area	D/C - CS2/CS3A/CS4 Conveyor	Point	271596	6142790	22	<b>91</b>	51	51	55	66	62	67	67	68	75	76	81	80	80	80	80	80	80	82	78	76	75	76	75	76	74	73	71
21	Level 3 Dust Collector Area	CR4 DC	Point	271592	6142798	22.5	<b>95</b>	54	58	61	63	64	68	69	74	78	83	83	83	87	88	80	81	80	86	82	80	80	78	78	77	73	68	63
22	Transfer Conveyors	D/C - 36 Bypass Dust Disposal	Point	271585	6142821	15.5	<b>86</b>	40	43	51	56	53	58	62	68	70	71	71	69	73	73	73	75	77	80	76	75	73	70	64	61	59	55	51
23	4A/4B Tower	4A Elevator Drive	Point	271601	6142847	87	<b>100</b>	55	61	63	65	61	64	67	70	73	78	85	92	88	88	89	96	100	87	86	85	84	82	81	78	75	70	65
24	4A/4B Tower	D/C - 41 Kiln 4 Feed Surge Bin	Point	271605	6142837	87	<b>97</b>	47	50	63	63	60	73	76	77	75	80	86	86	88	86	85	88	88	86	88	83	79	78	74	72	68	65	62

ID	Group	Noise source	Type	Source Position (UTM co-ordinates zone 54H)			Sound Power Level (dB(A) re 1pW)																											
				X	Y	Z	Overall	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k	10k
25	4A/4B Tower	D/C - 38 Blending Silo Top	Point	271596	6142866	35.5	84	35	40	46	54	70	59	66	63	68	70	73	74	78	73	73	72	70	71	69	66	67	67	65	63	66	66	59
26	Woodchip Plant 1	Dust Collector	Point	271588	6142903	5	105	64	67	70	75	75	76	78	80	86	87	89	94	94	100	95	92	95	95	92	89	86	83	82	81	77	75	72
27	Slag Dryer	D/C - Slag Outfeed	Point	271769	6142823	7	87	39	45	48	53	52	56	59	60	63	69	71	72	72	81	78	78	80	79	73	72	69	68	67	65	59	55	50
28	Clinker Gantry	Cement Mill 1 & 7-Clinker Gantry 1	Point	271865	6142494	15	97	55	57	63	65	66	67	70	70	73	74	82	85	85	86	89	89	88	90	90	88	81	76	73	69	65	60	54
29	Clinker Gantry	Cement Mill 1 & 7-Clinker Gantry 2	Point	271869	6142460	15	97	55	57	63	65	66	67	70	70	73	74	82	85	85	86	89	89	88	90	90	88	81	76	73	69	65	60	54
30	Clinker Gantry	Cement Mill 1 & 7-Clinker Gantry 3	Point	271873	6142426	15	97	55	57	63	65	66	67	70	70	73	74	82	85	85	86	89	89	88	90	90	88	81	76	73	69	65	60	54
31	Clinker Gantry	Cement Mill 1 & 7-Clinker Gantry 4	Point	271888	6142427	15	97	55	57	63	65	66	67	70	70	73	74	82	85	85	86	89	89	88	90	90	88	81	76	73	69	65	60	54
32	Clinker Gantry	Cement Mill 1 & 7-Clinker Gantry	Point	271883	6142463	15	97	55	57	63	65	66	67	70	70	73	74	82	85	85	86	89	89	88	90	90	88	81	76	73	69	65	60	54
33	Clinker Gantry	Cement Mill 1 & 7-Clinker Gantry 6	Point	271877	6142496	15	97	55	57	63	65	66	67	70	70	73	74	82	85	85	86	89	89	88	90	90	88	81	76	73	69	65	60	54
34	Clinker Gantry	Clinker Blend Building CM1 Shed motor	Point	271871	6142391	1	85	42	49	52	55	57	61	62	65	71	71	71	74	74	77	77	78	75	72	73	70	68	69	65	61	56	52	47
35	Clinker Gantry	Clinker Blend Building CM1 Shed motor	Point	271877	6142392	1	84	41	49	52	55	57	61	65	66	71	70	70	76	77	76	75	73	71	69	69	68	67	65	62	58	55	52	46
36	Wharf Bulk Loading Station	D/C - CSC Bulk	Point	271910	6142540	26	91	61	65	67	70	73	75	77	79	81	77	80	79	79	79	80	81	82	79	76	73	71	71	69	69	67	66	62
37	Clinker Gantry	D/C - 23 CE1 Conveyor	Point	271868	6142535	6	105	71	77	81	86	89	91	94	95	96	95	95	93	95	92	92	94	90	87	85	83	82	82	81	78	76	74	70
38	Wharf Silos	D/C - 20 Wharf 30000T Silo #2	Point	271927	6142529	51	83	40	45	49	49	53	59	60	64	68	72	70	72	73	72	73	73	72	74	71	68	67	67	64	62	61	60	54
39	Wharf Silos	D/C - 19 Wharf 30000T Silo #1	Point	271933	6142532	51	95	41	52	55	55	61	67	70	71	72	80	82	90	81	82	85	86	84	81	83	83	80	79	75	73	69	66	62
40	Wharf Silos	D/C -18 Ship Loader	Point	271932	6142551	20	87	42	49	52	60	78	72	78	75	75	77	74	72	72	79	67	69	71	74	73	73	70	71	70	68	66	61	56
41	Wharf Silos	D/C - 16000 Silo Top (South)	Point	271928	6142566	50	95	53	59	59	79	78	71	72	69	75	83	87	84	83	84	87	83	83	83	84	80	77	75	73	71	68	65	63
42	Wharf Silos	D/C - 16000 Silo Top (North )	Point	271927	6142567	50	82	32	40	47	69	66	59	63	65	68	74	75	71	70	69	72	69	66	67	69	66	66	62	60	59	55	51	48
43	Wharf Silos	D/C - Silo Bottom 16000	Point	271929	6142576	6	91	56	64	69	74	77	77	78	78	78	77	80	79	73	77	77	75	84	83	78	76	74	74	72	72	69	65	61
44	Woodchip Plant 1	Woodchip Compressor Dryer	Point	271570	6142913	0.5	73	5	11	15	20	24	28	31	34	37	65	67	55	60	67	55	62	63	65	57	57	55	49	54	31	35	34	28
45	CM6	Cooling Tower North CM 6	Point	271610	6142760	1.9	89	-45	39	-35	57	-26	-23	60	67	-13	70	69	74	79	80	83	83	78	77	74	72	68	63	1	1	0	52	46
46		CSC Compressor	Point	271708	6142551	1	93	-45	-39	-35	-30	-26	-23	61	63	-13	70	69	82	79	78	78	79	86	88	80	77	78	77	1	1	0	69	57
47	Wharf Bulk Loading Station	Air Slide SE BDC	Point	271909	6142546	21	93	-45	-39	-35	-30	-26	-23	68	70	73	81	-9	86	83	73	82	84	85	84	83	80	79	74	69	1	0	-1	55
48		4A Stack	Point	271649	6142814	75	100	8	16	23	50	59	71	82	86	96	85	83	79	81	82	83	89	92	89	81	75	71	69	68	62	56	51	44

ID	Group	Noise source	Type	Source Position (UTM co-ordinates zone 54H)			Sound Power Level (dB(A) re 1pW)																											
				X	Y	Z	Overall	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k	10k
49	4A/4B Tower	4B Stack	Point	271604	6142847	95	103	63	62	64	69	67	74	79	88	84	85	87	91	90	91	91	94	95	91	92	90	89	89	87	85	86	83	76
50	Level 3 Dust Collector Area	Gantry Dust Collector Fan Housing	Point	271598	6142796	21	98	57	60	61	62	66	77	71	75	81	82	91	87	87	87	88	86	86	82	79	79	79	80	83	79	73	74	
51	Transfer Conveyors	T2 Dust Collector Fan	Point	271855	6142639	12	108	62	65	68	72	73	77	83	91	96	94	96	94	96	97	99	99	99	96	94	92	91	87	83	78	74	68	63
52	Level 3 Dust Collector Area	CS4/CS5 Dust Collector Fan	Point	271629	6142603	12	99	55	57	62	66	69	71	76	78	78	87	87	88	88	86	90	89	89	85	84	83	78	74	70	67	61	56	
53	Road Bulk Loading Station	Dust Collector DC 30	Point	271711	6142746	26	94	49	59	50	62	64	69	71	74	82	81	80	85	85	84	83	85	86	83	78	73	72	70	70	65	62	59	57
54	Road Bulk Loading Station	Southern Fan Discharge	Point	271711	6142744	26	86	59	67	67	69	71	72	73	73	74	74	75	76	75	77	76	72	71	71	69	67	67	66	69	65	64	62	61
55	Level 3 Dust Collector Area	CR3 Dust Collector	Point	271596	6142799	22	96	63	69	73	78	80	83	84	86	87	87	87	86	86	83	82	80	79	77	76	74	75	73	72	72	69	67	66
56	4A/4B Tower	4A Airslide East Fan	Point	271608	6142844	37	101	49	51	54	62	69	64	70	69	79	90	91	89	90	90	96	90	88	87	87	84	83	80	80	79	76	72	70
57	Raw Mill 4B	4B Elevator Drive	Point	271607	6142879	37	90	42	45	51	58	61	61	63	67	69	80	80	77	77	80	79	83	79	79	76	75	74	72	71	70	68	66	62
58	4A/4B Tower	Kiln 4 Airslide Fan	Point	271595	6142849	75	102	48	54	57	60	60	62	67	74	76	78	80	82	89	93	91	92	98	91	88	87	85	86	82	80	76	74	71
59	Kiln 4	Kiln burner	Point	271673	6142844	12	112	49	54	61	74	63	68	74	79	83	92	93	91	92	88	87	89	88	86	89	88	89	90	90	95	109	109	92
60	Gas Train	Gas Train	Point	271566	6142622	2	93	51	57	59	65	69	70	71	73	77	77	78	78	79	81	83	86	91	91	91	90	91	90	88	90	94	92	89
61	CM1	Compressor Room Exhaust & Opening	Point	271884	6142587	2.5	88	35	44	45	51	62	61	62	63	71	74	72	74	73	77	80	79	79	77	76	74	72	71	71	70	71	69	68
62		Point source 02	Point	271893	6142582	2.5	88	35	44	45	51	62	61	62	63	71	74	72	74	73	77	80	79	79	77	76	74	72	71	71	70	71	69	68
63	CM1	CM1 - South Roof	Area	271868	6142590	25	91	-	-	-	71	70	74	73	76	79	79	85	80	81	82	81	77	74	74	76	76	74	72	69	66	-	-	-
64	CM1	CM1 - North Roof	Area	271864	6142614	25	91	-	-	-	71	70	74	73	76	79	79	85	80	81	82	81	77	74	74	76	76	74	72	69	66	-	-	-
65	CM1	CM1 - South Facade	Area	271869	6142578	10	95	-	-	-	69	70	74	79	82	85	87	88	87	86	84	83	80	78	76	79	78	76	73	68	64	-	-	-
66	CM1	CM1 - West Facade	Area	271858	6142601	12.7	102	-	-	-	76	77	81	86	89	92	93	95	94	92	91	89	86	84	83	85	84	83	79	74	71	-	-	-
67	CM1	CM1 - North Facade	Area	271862	6142626	10	95	-	-	-	69	70	74	79	82	85	87	88	87	86	84	83	80	78	76	79	78	76	73	68	64	-	-	-
68	CM1	CM1 - East Facade	Area	271874	6142603	12.7	101	-	-	-	75	76	80	85	88	91	92	94	93	91	90	88	85	83	82	84	83	82	78	73	70	-	-	-
69	CM1	DC26 CM1	Point	271876	6142588	12	101	63	64	64	73	80	85	86	89	90	92	100	98	100	102	100	99	96	95	96	93	91	88	85	80	77	71	64
70	CM6	CM6 Lower - South	Area	271625	6142720	4	108	53	57	65	68	67	68	74	79	84	82	89	93	92	96	99	98	98	102	97	95	93	92	91	88	85	81	74
72	CM6	CM6 Lower - North	Area	271618	6142758	4	94	47	51	58	60	51	57	66	73	79	70	77	87	78	82	89	82	82	86	81	79	76	76	78	76	74	71	69
73	CM6	CM6 Lower - East	Area	271632	6142741	4	97	50	53	61	63	54	60	68	75	81	72	80	90	80	84	91	84	85	88	84	81	79	79	80	79	77	74	72

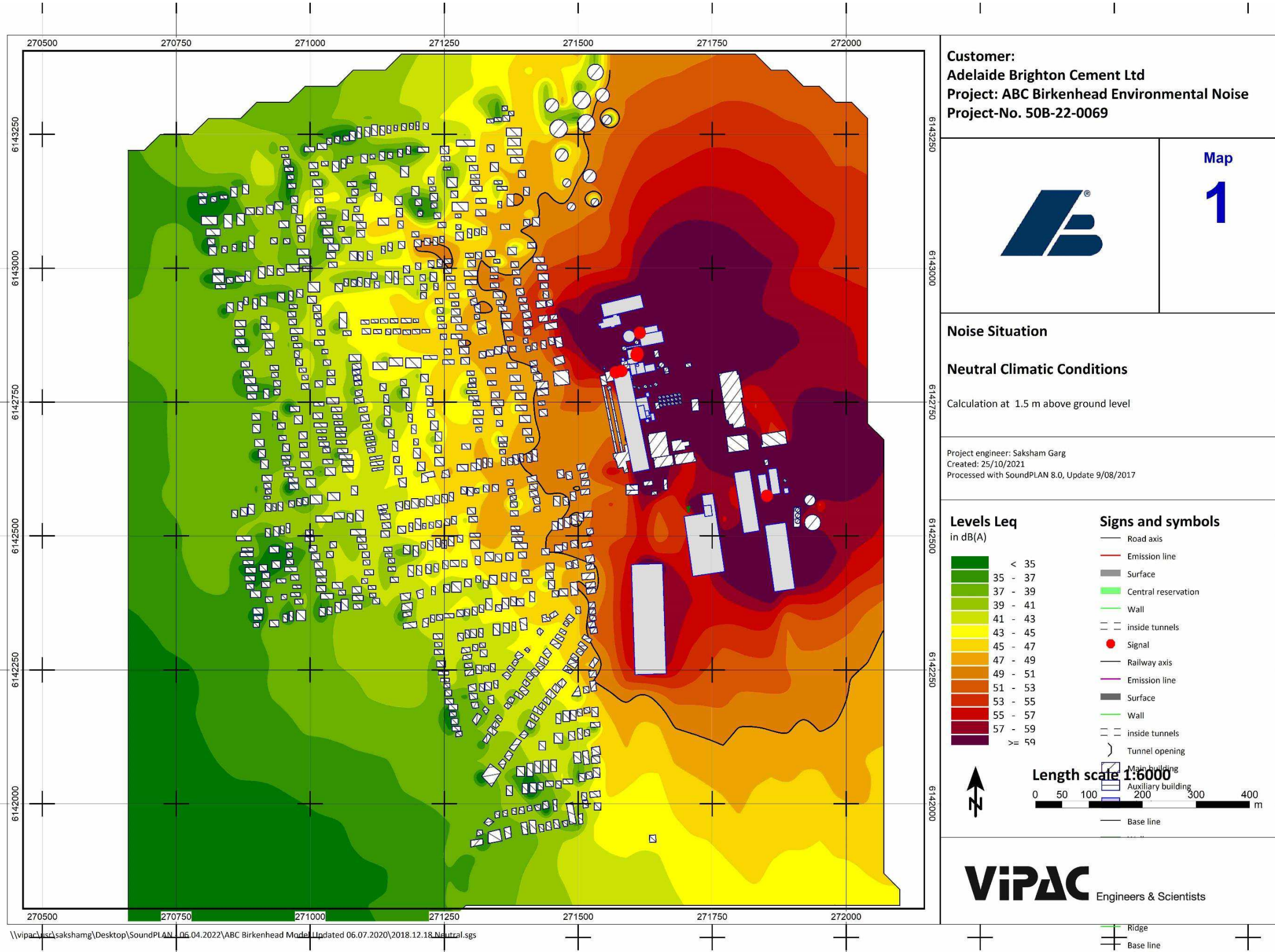
ID	Group	Noise source	Type	Source Position (UTM co-ordinates zone 54H)			Sound Power Level (dB(A) re 1pW)																											
				X	Y	Z	Overall	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k	10k
74	CM6	CM6 Upper - West Roof	Area	271616	6142730	19	91	50	52	59	65	59	60	65	69	73	69	76	86	77	79	84	79	79	82	75	72	70	69	68	66	64	59	54
75	CM6	CM6 Upper - East Roof	Area	271622	6142732	19	91	50	52	59	65	59	60	65	69	73	69	76	86	77	79	84	79	79	82	75	72	70	69	68	66	64	59	54
76	CM6	CM6 Upper - South	Area	271621	6142719	13.5	90	49	51	58	65	58	59	64	68	72	68	75	86	76	78	83	79	78	81	75	71	69	68	68	65	63	59	53
77	CM6	CM6 Upper - West	Area	271613	6142730	13	93	52	54	61	67	61	62	67	71	75	71	78	88	79	81	86	81	81	84	77	74	72	71	70	68	66	61	56
78	CM6	CM6 Upper - North	Area	271616	6142743	13.5	90	49	51	58	65	58	59	64	68	72	68	75	86	76	78	83	79	78	81	75	71	69	68	68	65	63	59	53
79	CM6	CM6 Upper - East	Area	271625	6142732	13	93	52	54	61	67	61	62	67	71	75	71	78	88	79	81	86	81	81	84	77	74	72	71	70	68	66	61	56
80	CM6	Compressor Room - South Opening	Point	271633	6142764	1	88	37	39	44	49	48	50	53	57	61	64	80	74	69	75	73	72	75	76	74	74	79	82	70	73	75	68	60
81	CM6	Compressor Room - North Opening	Point	271632	6142766	1	102	42	44	48	54	57	58	62	65	69	77	101	87	80	85	84	83	86	85	85	84	88	90	83	83	83	78	73
82	CM7	CM7 - Roof (north)	Area	271844	6142605	25	86	-	-	-	67	68	68	68	72	75	76	78	73	75	73	74	71	70	70	74	74	72	70	68	67	-	-	-
83	CM7	CM7 - Roof (south)	Area	271847	6142585	25	86	-	-	-	67	68	68	68	72	75	76	78	73	75	73	74	71	70	70	74	74	72	70	68	67	-	-	-
84	CM7	CM7 - South	Area	271848	6142575	10	93	-	-	-	57	63	69	72	73	77	84	85	87	83	84	83	80	76	74	77	75	71	68	61	57	-	-	-
85	CM7	CM7 - East	Area	271853	6142596	12.7	98	-	-	-	62	68	74	77	78	82	90	90	92	88	90	88	85	81	79	82	80	76	73	66	62	-	-	-
86	CM7	CM7 - North	Area	271842	6142615	10	93	-	-	-	57	63	69	72	73	77	84	85	87	83	84	83	80	76	74	77	75	71	68	61	57	-	-	-
87	CM7	CM7 - West	Area	271838	6142594	12.7	103	-	-	-	67	73	79	82	83	87	95	95	97	93	95	93	90	86	85	87	85	81	78	71	67	-	-	-
88	CM7	CM7 Compressor Room Opening	Area	271841	6142571	3.5	98	41	41	46	57	56	60	63	72	71	75	78	76	83	81	76	80	77	87	83	87	91	90	92	81	80	79	75
89	Kiln 4	Heat Exchanger Fan	Point	271674	6142826	16	91	41	49	61	60	60	66	67	71	71	83	77	80	83	81	80	81	81	80	77	75	74	72	69	66	66	63	54
105	Limestone Reclaimer Shed	Eastern Roof	Area	271646	6142345	19.5	93	-	-	-	69	75	78	79	81	81	79	80	79	91	79	77	77	73	72	73	73	72	69	65	63	-	-	-
106	Limestone Reclaimer Shed	Western Roof	Area	271617	6142344	19.5	93	-	-	-	69	75	78	79	81	81	79	80	79	91	79	77	77	73	72	73	73	72	69	65	63	-	-	-
107	Limestone Reclaimer Shed	West Facade	Area	271603	6142344	3.5	86	47	51	52	61	67	71	72	70	72	69	71	69	81	74	74	74	74	74	74	72	69	66	62	58	53	48	42
108	Limestone Reclaimer Shed	South Facade	Area	271635	6142242	11.1	85	46	50	51	60	66	70	71	69	70	68	70	68	80	73	73	73	73	73	73	71	68	65	61	57	52	47	40
109	Limestone Reclaimer Shed	East Facade	Area	271661	6142346	3.5	86	47	51	52	61	67	71	72	70	72	69	71	69	81	74	74	74	74	74	74	72	69	66	62	58	53	48	42
110	Limestone Reclaimer Shed	North Facade	Area	271628	6142448	11.1	85	46	50	51	60	66	70	71	69	70	68	70	68	80	73	73	73	73	73	73	71	68	65	61	57	52	47	40
111	Woodchip Plant 1	Roof	Area	271561	6142900	15	93	-	-	-	57	63	63	73	91	76	81	78	84	73	80	77	76	72	71	61	58	56	53	51	53	51	45	40
112	Woodchip Plant 1	Facade 01	Area	271552	6142889	7.5	89	-	-	-	53	59	59	69	87	73	77	74	80	69	76	73	72	68	67	57	54	52	49	48	49	47	41	36

ID	Group	Noise source	Type	Source Position (UTM co-ordinates zone 54H)			Overall	Sound Power Level (dB(A) re 1pW)																										
				X	Y	Z		25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k	10k
113	Woodchip Plant 2	Facade 02	Area	271542	6142890	7.5	84	-	-	-	48	54	54	63	82	67	72	69	74	64	70	67	66	63	61	51	48	47	43	42	44	41	36	31
114	Woodchip Plant 2	Facade 03	Area	271540	6142892	7.5	81	-	-	-	46	52	52	61	80	65	70	67	72	61	68	65	64	60	59	49	46	45	41	40	41	39	33	28
115	Woodchip Plant 1	Facade 04	Area	271538	6142894	7.5	84	-	-	-	48	54	54	63	82	67	72	69	74	64	70	67	66	62	61	51	48	47	43	42	44	41	36	31
116	Woodchip Plant 1	Facade 05	Area	271542	6142898	7.5	86	-	-	-	50	56	56	66	84	70	74	71	77	66	73	70	69	65	64	54	51	49	46	45	46	44	38	33
117	Woodchip Plant 1	Facade 06	Area	271545	6142902	7.5	84	-	-	-	48	54	55	64	82	68	73	70	75	64	71	68	67	63	62	52	49	47	44	43	44	42	36	31
118	Woodchip Plant 1	Facade 07	Area	271555	6142908	7.5	90	-	-	-	54	60	60	69	88	73	78	75	80	70	76	73	72	68	67	57	54	53	49	48	49	47	42	36
119	Woodchip Plant 1	Facade 08	Area	271564	6142911	7.5	-	-	-	-	38	32	32	22	4	18	14	17	11	22	15	18	19	23	24	34	37	39	42	44	42	44	50	55
120	Woodchip Plant 1	Facade 09	Area	271568	6142913	7.5	86	-	-	-	50	56	56	65	84	69	74	71	76	66	72	69	68	64	63	53	50	49	45	44	45	43	38	33
121	Woodchip Plant 1	Facade 10	Area	271572	6142913	7.5	81	-	-	-	45	51	51	60	79	64	69	66	72	61	67	65	63	60	58	48	46	44	41	39	41	38	33	28
122	Woodchip Plant 1	Facade 11	Area	271575	6142912	7.5	83	-	-	-	47	53	53	62	81	66	71	68	73	63	69	66	65	61	60	50	47	46	42	41	42	40	35	29
123	Woodchip Plant 1	Facade 12	Area	271579	6142904	7.5	89	-	-	-	53	59	59	68	87	72	77	74	80	69	75	73	71	68	66	56	54	52	49	47	49	46	41	36
124	Woodchip Plant 1	Facade 13	Area	271575	6142894	7.5	87	-	-	-	51	58	58	67	86	71	76	73	78	67	74	71	70	66	65	55	52	51	47	46	47	45	39	34
125	Woodchip Plant 1	Facade 14	Area	271569	6142892	7.5	79	-	-	-	43	49	49	58	77	62	67	64	69	59	65	62	61	57	56	46	43	42	38	37	38	36	31	26
126	Woodchip Plant 1	Facade 15	Area	271565	6142890	7.5	85	-	-	-	50	56	56	65	84	69	74	71	76	65	72	69	68	64	63	53	50	49	45	44	45	43	37	32
127	Woodchip Plant 1	Facade 16	Area	271561	6142890	7.5	80	-	-	-	44	50	50	60	78	63	68	65	71	60	66	64	62	59	58	47	45	43	40	38	40	38	32	27
128	Woodchip Plant 2	Roof	Area	271582	6142930	14	95	-	-	-	-	71	73	69	80	76	76	77	78	77	79	88	83	81	91	86	76	74	73	70	70	67	64	-
129	Woodchip Plant 2	South Façade	Area	271585	6142918	7	92	-	-	-	-	68	71	66	77	74	73	74	75	74	76	85	81	78	88	84	74	71	70	67	67	65	62	-
130	Woodchip Plant 2	West Facade	Area	271545	6142921	7	88	-	-	-	-	63	66	61	72	69	68	69	71	69	71	80	76	73	83	79	69	66	65	62	62	60	57	-
131	Woodchip Plant 2	North Façade	Area	271579	6142942	7	92	-	-	-	-	68	71	66	77	74	73	74	75	74	76	85	81	78	88	84	74	71	70	67	67	65	62	-
132	Woodchip Plant 2	East Facade	Area	271620	6142939	7	88	-	-	-	-	63	66	61	72	69	68	69	71	69	71	80	76	73	83	79	69	66	65	62	62	60	57	-
133	CM 6 - 200T Silo	Dust Collector	Point	271631.4	6142709	21	85	-	-	-	-	38	-	-	53	-	-	62	-	-	73	-	-	78	-	-	81	-	-	80	-	-	71	-
134	CM 6 - 200T Silo	Blower	Point	271628.5	6142712	3	91	-	-	-	-	68	-	-	77	-	-	83	-	-	85	-	-	86	-	-	83	-	-	78	-	-	73	-
135	CM 6 - 200T Silo	In-Line Screw Conveyor	Point	271632.4	6142713	4	91	-	-	-	-	69	-	-	73	-	-	80	-	-	82	-	-	84	-	-	88	-	-	79	-	-	74	-
136	CM 6 - 200T Silo	In-Line Screw Conveyor	Point	271632.8	6142715	4	91	-	-	-	-	69	-	-	73	-	-	80	-	-	82	-	-	84	-	-	88	-	-	79	-	-	74	-

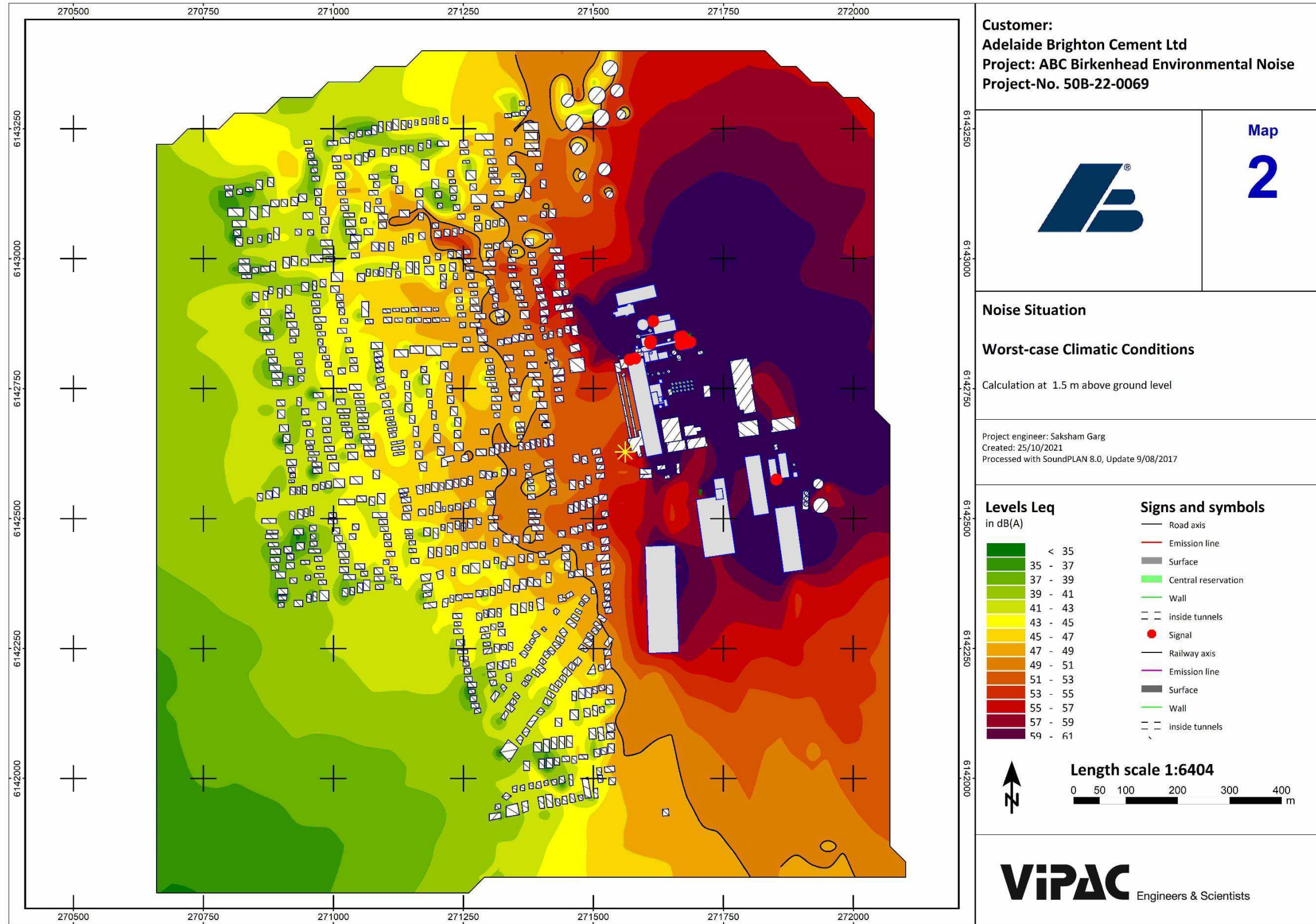


ID	Group	Noise source	Type	Source Position (UTM co-ordinates zone 54H)			Sound Power Level (dB(A) re 1pW)																											
				X	Y	Z	Overall	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k	10k
137	CM 1 - 400T Silo	In-Line Screw Conveyor	Point	271882.9	6142601	4	<b>91</b>	-	-	-	-	69	-	-	73	-	-	80	-	-	82	-	-	84	-	-	88	-	-	79	-	-	74	-
		Façade 01	Area	271584.3	6142827	7.5	<b>57</b>	57	44	48	-	58	59	63	56	61	61	66	68	69	67	64	63	62	62	62	59	53	51	-	-	47	45	-
		Façade 02	Area	271586.1	6142830	7.5	<b>56</b>	57	44	48	-	58	59	63	56	61	61	66	68	69	67	64	63	62	62	62	59	53	51	-	-	47	45	-
138	Tertiary Recycle Plant- Dust Collector	Façade 03	Area	271582.7	6142833	7.5	<b>57</b>	57	44	48	-	58	59	63	56	61	61	66	68	69	67	64	63	62	62	62	59	53	51	-	-	47	45	-
		Façade 04	Area	271580.9	6142829	7.5	<b>56</b>	57	44	48	-	58	59	63	56	61	61	66	68	69	67	64	63	62	62	62	59	53	51	-	-	47	45	-
139	Tertiary Recycle Plant	Fresh Air Blower	Point	271609	6142838	8	<b>98</b>	50	53	58	63	63	75	71	75	81	84	86	84	87	89	88	88	88	88	87	86	84	80	78	75	74	71	64
140	Tertiary Recycle Plant	Air-cooled Screw Conveyor	Point	271610.4	6142839	6	<b>96</b>	56	54	59	64	66	69	74	78	80	82	83	84	83	85	85	85	86	86	85	84	86	81	79	77	75	70	65
141	Tertiary Recycle Plant	TAD Elevator Drive (Gearbox + Motor)	Point	271610.1	6142842	35	<b>94</b>	58	57	59	64	64	72	70	75	77	79	81	81	82	83	86	85	83	86	83	83	80	76	74	71	66	62	58
142	Tertiary Recycle Plant	Roller Crusher	Point	271609.5	6142837	4	<b>96</b>	55	55	61	64	66	75	73	74	78	81	82	84	85	85	86	87	87	87	85	84	83	79	78	75	73	69	63
143	Kiln Cooling Tower Unit	4A Cooling Tower 1 & 2	Point	271615	6142880	11	<b>91</b>	44	46	49	57	64	59	65	64	74	85	86	84	85	85	91	85	83	82	82	79	78	75	75	74	71	67	65

**Appendix C : Noise Contour Plots**







## Appendix D : On-Site Survey Data

Measurements	Plant/Equipment	Distance (m)	L <sub>Aeq</sub>	L <sub>Amax</sub>	L <sub>A90</sub>	L <sub>A10</sub>	Notes
001	TAD Crusher	1	93	90	85	89	-
002	TAD Screw	1	93	91	85	89	-
003	TAD Fan	1	94	90	84	88	-
004	TAD Elevator	1	91	88	82	86	General plant noise influence/interference
005	TAD Elevator	1	88	88	82	86	General plant noise influence/interference
006	TAD Elevator	1	88	91	85	89	General plant noise influence/interference
007	Kiln Elevator	1	90	90	85	88	-
008	Kiln Elevator	1	91	89	83	86	-
009	Kiln Elevator	1	90	90	86	89	-
010	4B Conditioner Tower Water Jets	1	83	86	80	84	Normal operation
011	4B Conditioner Tower Water Jets	1	82	87	80	85	Normal operation
012	4B Conditioner Tower Water Jets	1	85	86	81	85	Normal operation
013	4B Conditioner Tower Water Jets	1	85	86	80	85	Normal operation
014	4B Conditioner Tower Water Jets	1	86	85	79	83	Normal operation
015	4B Conditioner Tower Water Jets	1	86	83	78	81	Normal operation
016	4B Conditioner Tower Water Jets	1	85	84	77	81	Normal operation
017	4B Conditioner Tower Water Jets	1	87	83	78	82	Normal operation
018	4B Conditioner Tower Water Jets	1	85	84	78	82	Normal operation
019	4B Conditioner Tower Water Jets	1	86	86	79	83	Normal operation
020	4B Conditioner Tower Water Jets	1	83	86	80	84	High flow, distinct tone
021	4B Conditioner Tower Water Jets	1	83	86	80	84	High flow, distinct tone
022	4B Conditioner Tower Water Jets	1	84	86	81	85	High flow, distinct tone
023	4B Conditioner Tower Water Jets	1	85	86	80	84	High flow, distinct tone
024	4B Conditioner Tower Water Jets	1	86	84	78	82	High flow, distinct tone
025	4B Conditioner Tower Water Jets	1	86	84	79	82	High flow
026	4B Conditioner Tower Water Jets	1	86	84	78	82	High flow
027	4B Conditioner Tower Water Jets	1	86	84	77	81	High flow
028	4B Conditioner Tower Water Jets	1	86	84	78	82	High flow, distinct tone
029	4B Conditioner Tower Water Jets	1	85	85	79	83	High flow
030	4B EP Outlet Duct	8	95	89	83	87	Directly beneath
031	4B EP Outlet Duct	12	92	88	83	87	-
032	4B CT Drag Chain	1	111	103	97	101	Resonant Cavity dominated by 4B EP, HF Intermittent Squeak
033	4B CT Drag Chain	1	111	102	96	100	Resonant Cavity dominated by 4B EP, HF Intermittent Squeak

Measurements	Plant/Equipment	Distance (m)	L <sub>Aeq</sub>	L <sub>Amax</sub>	L <sub>A90</sub>	L <sub>A10</sub>	Notes
034	4B Drag Chain 3	1	96	92	86	90	Metal rub 1.6khz
035	4B Drag Chain 3	1	94	90	84	89	Metal rub 1.6khz
036	4B EP Drag Chains 1 & 2	1	92	82	77	80	Metal rub 800hz
037	4B EP Drag Chains 1 & 2	1	88	81	75	79	Metal rub 800hz
042	North Clinker Gantry Fan East	1	84	83	77	81	-
043	North Clinker Gantry Fan West	1	83	82	74	80	-
044	4A Cooling Tower	1	91	92	87	90	-
045	4A Cooling Tower	1	87	90	84	88	-
047	4A Cooling Tower	1	88	90	84	88	-
048	CM6 Fringe Sile Dust Collector	1	85	86	80	84	-
049	CM6 Fringe Sile Dust Collector	1	84	85	79	84	-
050	Gas Train	1	69	81	68	75	Heavy traffic noise
051	Gas Train	1	72	75	68	73	Gas Train Audible /w Traffic Noise
052	Gas Train	1	71	72	66	70	Heavy traffic noise
053	CM 1 & 7 Clinker Fans	40	75	80	73	78	20m from edge of building loudest location.
054	CM 1 & 7 Clinker Fans	40	75	79	73	78	20m from edge of building loudest location.
055	CM 1 & 7 Clinker Fans	40	78	80	71	77	20m from edge of building loudest location.

**\*\*Measurements 38-41 and 46 were not considered reliable and were therefore removed from the data\*\***

## Appendix E : Annual Noise Survey Results Comparison



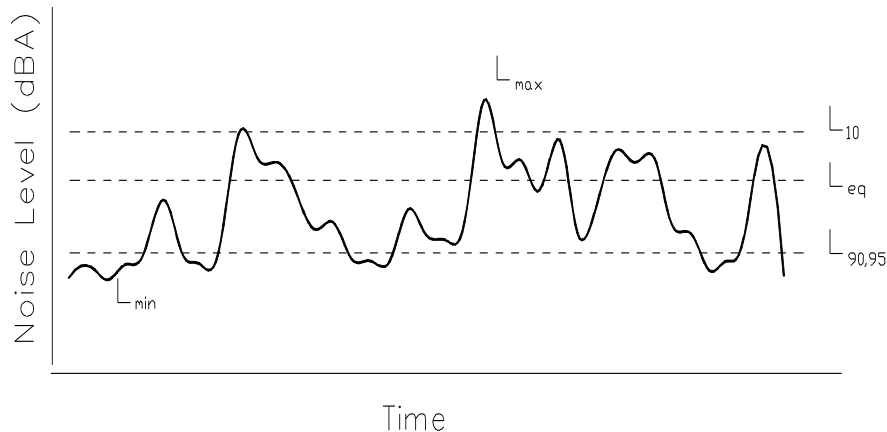
Receiver Location	Night-Time L <sub>A90</sub> Noise Level Comparison, (dB(A))					
	2017	2018	2019	2020	2021	2022
<b>R2</b>	55	55	54	54	53	52
<b>R3</b>	49	48	48	49	47	47
<b>R4</b>	44	43	41	44	43	41
<b>R5</b>	52	51	50	52	49	48
<b>R6</b>	45	44	46	46	43	39
<b>R8</b>	50	47	48	47	46	47
<b>R9</b>	43	40	41	42	40	40
<b>R10</b>	50	49	47	47	47	50
<b>R11</b>	42	39	41	39	39	36
<b>R12</b>	54	51	52	54	52	52
<b>R13</b>	46	43	43	43	44	42
<b>R14</b>	42	40	41	42	40	39
<b>R15</b>	54	53	53	53	52	52
<b>R16</b>	59	54	56	55	53	47
<b>R17</b>	47	43	43	45	43	40
<b>R18</b>	49	41	43	46	44	38
<b>N1</b>	51	48	48	49	46	43
<b>N2</b>	51	50	48	49	47	42
<b>N3</b>	52	51	50	50	49	48

## Appendix F : Meteorology Data

Time	Temperature	Dew Point	Humidity	Wind	Wind Speed	Wind Gust	Pressure
10:00 PM	50 °F	46 °F	87 %	CALM	0 mph	0 mph	30.20 in
10:30 PM	55 °F	50 °F	82 %	CALM	0 mph	0 mph	30.20 in
11:00 PM	63 °F	52 °F	68 %	W	1 mph	0 mph	30.20 in
12:30 AM	63 °F	52 °F	68 %	W	6 mph	0 mph	30.20 in
1:00 AM	64 °F	54 °F	68 %	W	5 mph	0 mph	30.20 in
1:30 AM	64 °F	54 °F	68 %	WSW	7 mph	0 mph	30.20 in
2:00 AM	64 °F	52 °F	64 %	W	7 mph	0 mph	30.17 in
2:30 AM	64 °F	54 °F	68 %	WSW	8 mph	0 mph	30.17 in
3:00 AM	64 °F	54 °F	68 %	WSW	8 mph	0 mph	30.14 in
3:30 AM	64 °F	52 °F	64 %	WSW	9 mph	0 mph	30.14 in
4:00 AM	66 °F	52 °F	60 %	SW	8 mph	0 mph	30.11 in
4:30 AM	68 °F	54 °F	60 %	SW	7 mph	0 mph	30.11 in
5:00 AM	70 °F	52 °F	53 %	E	7 mph	0 mph	30.08 in
5:30 AM	68 °F	50 °F	52 %	ESE	5 mph	0 mph	30.08 in
6:00 AM	70 °F	50 °F	49 %	ESE	6 mph	0 mph	30.05 in
6:30 AM	70 °F	46 °F	43 %	E	16 mph	0 mph	30.05 in
7:00 AM	70 °F	50 °F	49 %	SE	14 mph	0 mph	30.05 in
7:30 AM	68 °F	50 °F	52 %	ESE	13 mph	0 mph	30.05 in
8:00 AM	66 °F	50 °F	56 %	ESE	10 mph	0 mph	30.08 in
8:30 AM	64 °F	50 °F	59 %	SE	9 mph	0 mph	30.08 in
9:00 AM	64 °F	50 °F	59 %	ESE	9 mph	0 mph	30.08 in
9:30 AM	63 °F	50 °F	63 %	SE	10 mph	0 mph	30.08 in
10:00 AM	61 °F	50 °F	68 %	SSE	8 mph	0 mph	30.08 in
10:30 AM	61 °F	50 °F	68 %	S	6 mph	0 mph	30.08 in
11:00 AM	63 °F	50 °F	63 %	S	5 mph	0 mph	30.11 in
11:30 AM	63 °F	50 °F	63 %	SSW	5 mph	0 mph	30.08 in
12:00 PM	61 °F	50 °F	68 %	S	6 mph	0 mph	30.08 in
12:30 PM	61 °F	50 °F	68 %	SSE	3 mph	0 mph	30.08 in
01:00 PM	59 °F	50 °F	72 %	NE	6 mph	0 mph	30.08 in
01:30 PM	59 °F	50 °F	72 %	ENE	2 mph	0 mph	30.05 in
2:00 PM	61 °F	52 °F	72 %	ESE	10 mph	0 mph	30.05 in
2:30 PM	61 °F	52 °F	72 %	ESE	7 mph	0 mph	30.05 in

## Appendix G : Glossary of Acoustic Terminology

<b>dB(A)</b>	A-weighted decibels; a unit of measurement of sound pressure level which has its frequency characteristics modified by a filter ("A-weighted") so as to more closely approximate the frequency response of the human ear.
<b>L<sub>10</sub> or L<sub>A10</sub></b>	The noise level which is equalled or exceeded for 10% of the measurement period. L <sub>10</sub> is an indicator of the mean maximum noise level, and is used in Australia as the descriptor for intrusive noise (usually in dB(A)).
<b>L<sub>90</sub> or L<sub>A90</sub></b>	The noise level which is equalled or exceeded for 90% of the measurement period. L <sub>90</sub> is an indicator of the mean minimum noise level, and is used in Australia as the descriptor for background or ambient noise (usually in dB(A)).
<b>L<sub>eq</sub> or L<sub>Aeq</sub></b>	The equivalent continuous noise level for the measurement period. L <sub>eq</sub> is an indicator of the average noise level (usually in dB(A)).
<b>L<sub>max</sub> or L<sub>Amax</sub></b>	The maximum noise level for the measurement period (in dB(A))
<b>Broadband noise</b>	Noise comprising energy distributed across a large range of frequencies
<b>Impulsive noise</b>	A noise distinguished by a sharp rise and fall in noise level. Often characterised as thumping or banging.
<b>Low frequency noise</b>	A noise characterised as rumbling, roaring, booming or similar.
<b>Modulating noise</b>	A noise that fluctuates in either frequency (such as a wailing siren), or loudness (such as intermittent traffic). May be described as varying, fluctuating, pulsating or similar.
<b>Tonal noise</b>	A noise having a well-defined pitch or note which is clearly audible above other noise.



**Note:** *The subjective reaction or response to changes in noise levels can be summarised as follows:*

A 3 dB(A) increase in sound pressure level is required for the average human ear to notice a change; a 5 dB(A) increase is quite noticeable and a 10 dB(A) increase is typically perceived as a doubling in loudness.