REGIONAL ROADS VICTORIA

MAY 2021

BEAUFORT BYPASS ENVIRONMENT EFFECTS STATEMENT

NOISE AND VIBRATION IMPACT ASSESSMENT

wsp

Question today
Imagine tomorrow
Create for the future

Beaufort Bypass Environment Effects Statement
Noise and Vibration Impact Assessment

Regional Roads Victoria

WSP
Level 15, 28 Freshwater Place
Southbank VIC 3006

Tel: +61 3 9861 1111
Fax: +61 3 9861 1144
wsp.com

REV	DATE	DETAILS
00	11/05/2021	Final

	NAME	DATE	SIGNATURE
Prepared by:	Arvind Deivasigamani	11/05/2021	pp 
Reviewed by:	Tim Ryan	11/05/2021	
Approved by:	Gavin Elphinstone	11/05/2021	

TABLE OF CONTENTS

CONTENTS (Continued)

LIST OF TABLES

LIST OF TABLES (CONTINUED)

LIST OF FIGURES

LIST OF APPENDICES

GLOSSARY

A-weighting	A frequency weighting devised to attempt to take into account the fact that human response to sound is not equally sensitive to all frequencies; it consists of an electronic filter in a sound level meter, which attempts to build in this variability into the indicated noise level reading so that it will correlate, approximately, with human response.
$L_{Aeq,T}$	The A-weighted sound pressure level in decibels of a continuous steady sound that has, within a specified time interval, T, the same energy as the sound being measured.
$L_{A10,18hr}$	A common traffic noise descriptor in Australia. It is the arithmetic average of the hourly LA10 levels between 6:00 hours and 24:00 hours.
$L_{A10,12hr}$	The arithmetic average of the hourly L_{A10} levels between 6:00 hours and 18:00 hours.
$L_{Aeq,16hr}$	The L_{Aeq} noise level for the period 6:00 hours to 22:00 hours. It is the average daytime noise level over a 16 hour period.
$L_{Aeq,15hr}$	The L_{Aeq} noise level for the period 7:00 hours to 22:00 hours. It is the average daytime noise level over a 15 hour period.
$L_{Aeq,9hr}$	The L_{Aeq} noise level for the period 22:00 hours to 07:00 hours. It is the average night time noise level over a 9 hour period.
$L_{Aeq,8hr}$	The L_{Aeq} noise level for the period 22:00 hours to 06:00 hours. It is the average night time noise level over an 8 hour period.
L_{A90}	The A-weighted sound pressure level of the residual noise in decibels exceeded 90% of a given time interval, T. L_{A90} is typically taken as representative of background noise.
$L_{A\ max}$	The maximum A-weighted noise level recorded during the measurement period.
Ambient Noise	The ambient noise level at a particular location is the overall environmental noise level caused by all noise sources in the area. Ambient Noise is usually assessed as an energy average over a set time period 'T' ($L_{Aeq,\ T}$).
Attenuation	The reduction of sound energy as a function of distance travelled.
Audible	Audible refers to a sound that can be heard. There are a range of audibility grades, varying from "barely audible", "just audible" to "clearly audible" and "prominent".
Background Noise Level	Total silence does not exist in the natural or built environments, only varying degrees of noise. The Background Noise Level is the minimum repeatable level of noise measured in the absence of the noise under investigation and any other short-term noises such as those caused by all forms of traffic, industry, lawnmowers, wind in foliage, insects, animals, etc. It is quantified by the noise level that is exceeded for 90% of the measurement period 'T' ($L_{A90,\ T}$).

Decibel	The decibel (dB) is a logarithmic scale that allows a wide range of values to be compressed into a more comprehensible range, typically 0 dB to 120 db. Noise levels in decibels cannot be added arithmetically since they are logarithmic numbers. The human ear has a vast sound-sensitivity range of over a thousand billion to one, so the logarithmic decibel scale is useful for acoustical assessments.
Human Response to Noise Level Changes[1]	— Less than 3 dBA = No perceivable difference — 3 dBA = Barely perceptible difference — 5 dBA = Readily perceptible difference — 10 dBA = 'Doubling' (or 'halving') of performance
Noise	Noise is unwanted, harmful or inharmonious (discordant) sound.
Octave	An octave is the interval between two points where the frequency at the second point is twice the frequency of the first.
Sound Pressure Level (SPL)	The basic unit of sound measurement is the sound pressure level. The pressures are converted to a logarithmic scale and expressed in decibels (dB).
Sound Pressure	The rms sound pressure measured in pascals (Pa).
Time Weighting	— 'F' (Fast): Sound level meter weighting which takes 0.125 seconds to rise and fall. — 'S' (Slow): Sound level meter weighting which takes 1 second to rise and fall. — 'I' (Impulse): Sound level meter weighting which takes 0.035 seconds to rise and 1.5 to fall.

[1] [Reference; Cowan, J.P., 1994 "Handbook of Environmental Acoustics" & Bell, L.H. and D.H. Bell. 1994. "Industrial Noise Control Fundamentals and Applications"]

ABBREVIATIONS

AADT	Annual Average Daily Traffic
AS	Australian Standard
BoM	Bureau of Meteorology
CNVMP	Construction Noise and Vibration Management Plan
CoRTN	Calculation of Road Traffic Noise
dB	Decibel
dBA / dB(A)	Decibel, A-weighted
DELWP	Department of Environment, Land, Water and Planning
EE Act	*Environment Effects Act 1978*
EES	Environment Effects Statement
EMF	Environmental Management Framework
EPA	Environment Protection Authority
ERA	Environmental Risk Assessment
HV	Heavy Vehicle
LV	Light Vehicle
ORT	Off-Reservation Treatment
PONL	Project Objective Noise Limit
RRV	Regional Roads Victoria (formerly VicRoads)
SPL	Sound Pressure Level
VicRoads TNRP	VicRoads Traffic Noise Reduction Policy, 2005
VRTG	VicRoads Technical Guidelines: Noise Guidelines – Construction and Maintenance Works (2007)

EXECUTIVE SUMMARY

Regional Roads Victoria (RRV) engaged WSP Australia Pty Ltd (WSP) to undertake a noise and vibration assessment for the Beaufort Bypass project (the project). As part of the Environment Effects Statement (EES), noise and vibration impacts resulting from construction and operation of the project to all sensitive receptors are required to be assessed.

This report presents the results of noise modelling of the project for operational and construction noise and vibration against the VicRoads *Traffic Noise Reduction Policy* (TNRP) 2005 and other project considerations. The project Objective Noise Limits (PONLs) were established by the project team considering the various sections of the four proposed alignment options and their interactions with existing roads.

Noise mitigation measures have been designed to achieve the PONL as set by RRV. These measures will be incorporated into the functional road design for the project. Additionally, this report addresses the predicted influence the project will have on traffic noise within the township of Beaufort and the potential impact of sleep disturbances from heavy vehicles, once the project is operational.

WSP has undertaken baseline noise monitoring survey during the following dates:

- 8 to 18 December 2017
- 16 April to 1 May 2018
- 9 to 24 July 2018.

These results have been used to compare existing noise levels to the noise predictions, as well as validate the noise modelling undertaken for the EES.

OPERATIONAL NOISE

Operational noise impacts were assessed through noise modelling, carried out using a 3D modelling software for the proposed project alignment options. Noise levels were predicted using the Calculation of Road Traffic Noise (CoRTN) algorithm. Noise levels were predicted for the unmitigated scenarios and scenarios with noise mitigation for the four options, with further assessment undertaken for the preferred option (Option C2). Design of noise mitigation was based on a future design year of 2031.

The results show that the future traffic noise levels exceed the requirement of VicRoads TNRP and noise mitigation measures will therefore be required for the four bypass alignment options. Table ES.1 summarises the predicted number of residential properties within the alignment corridors that exceed the target PONLs.

Table ES.1 Predicted unmitigated road traffic noise levels from the project

TARGET PONL dBA $L_{10,18HR}$	PREDICTED NUMBER OF RESIDENTIAL PROPERTY EXCEEDANCES, YEAR 2031 (UNMITIGATED)			
	Option A0	Option A1	Option C0	Option C2 (preferred)
52	3	3	1	1
53	9	9	7	7
56	6	7	12	12
61	3	2	5	5
63	1	1	1	1
68	1	1	1	1
ALL	**23**	**23**	**27**	**27**

Noise mitigation options, in the form of road surface treatment, noise barriers and Off-Reservation Treatment (ORT) have been designed for Year 2031. Compliance with the PONLs is predicted to be achieved with the application of all noise mitigation options. With the implementation of mitigations, residual operational noise impacts for sensitive receptors along the alignment corridor will be low.

The preferred alignment for the project is Option C2. In addition to operational traffic noise impacts and discussion on residual impacts, the following was assessed:

- the predicted change in night-time noise levels within the township of Beaufort once the bypass is in operation
- the predicted change in night-time noise levels for sensitive receiver locations outside the town, particularly from truck engine braking.

With the implementation of mitigations, residual night-time noise impacts for sensitive receptors along the alignment corridor will be medium. The removal of trucks currently entering the town will simultaneously reduce the night-time noise impacts to sensitive receptors within the town.

CONSTRUCTION NOISE AND VIBRATION

Noise generated by construction activities would be managed in accordance with Environment Protection Authority (EPA) Victoria *Civil construction, building and demolition guide* (Publication 1834) and VicRoads *Technical Guidelines: Noise Guidelines - Construction and Maintenance Works 2007* (VRTG). Vibration will be managed in accordance with criteria based on Australian and international standards including DIN 4150.

High level predictions of construction noise and vibration have been undertaken to determine likely construction noise and vibration impacts and indicative controls for the EES. The successful construction contractor will be required to prepare a detailed Construction Noise and Vibration Management Plan (CNVMP) in order to manage the potential adverse impacts from their proposed construction equipment and methodologies. With the implementation of mitigations, construction noise and vibration impacts for sensitive receptors along the alignment corridor will range from low to medium.

1 INTRODUCTION

Regional Roads Victoria (RRV), formerly VicRoads, proposes to construct a new freeway section of the Western Highway to bypass the town of Beaufort (the project), linking completed sections of the Western Highway duplication to the east and west of Beaufort.

On 22 July 2015, the Minister for Planning determined an Environment Effects Statement (EES) would be required under the *Environment Effects Act 1978* (EE Act) to assess the potential environmental effects of the project. The EES includes consideration of four alternative alignments and selection of a preferred bypass alignment which identifies the land to be reserved for the future construction. The EES process provides for identification and analysis of the potential environment effects of the project and the means of avoiding, minimising and managing adverse effects. It includes public involvement and allows stakeholders to understand the likely environmental effects of the project and how they will be managed.

1.1 PROJECT BACKGROUND

The Western Highway is the primary road link between Melbourne and Adelaide. It serves interstate trade between Victoria and South Australia and is a key transport corridor through Victoria's west. Over 6,500 vehicles utilise the Western Highway, west of Ballarat each day. Of these 6,500 vehicles, 1,500 are classed as commercial heavy vehicles. These traffic volumes are expected to increase to approximately 7,500 by 2025 and 9,500 by 2040.

RRV have identified the need to upgrade the Western Highway from Ballarat to Stawell to:

- improve road safety at intersections
- improve safety of access to adjoining properties
- enhance road freight efficiency
- reduce travel time
- provide better access to local facilities
- improve roadside facilities.

As part of planning studies commissioned by the Commonwealth and State Governments, bypass route options around the town of Beaufort have been considered to meet the objectives identified by RRV and the National Land Transport Network's Nation Building Program.

The project would include construction of a dual carriageway, connections to major intersecting roads, interchanges to connect Beaufort to the Western Highway at the eastern and western tie-in points, several waterway crossings, an overpass of the Melbourne-Ararat rail line, and intersection upgrades at local roads and provision for service roads as required.

1.2 PROJECT OBJECTIVES

The objectives of the project are to:

- improve road safety and maintain the functionality of Beaufort's road network
- improve freight movement and efficiency across the road network
- improve Beaufort's amenity by removing heavy vehicles
- improve access to markets and the competitiveness of local industries.

2 PROJECT DESCRIPTION

The project would comprise of an 11 km freeway standard bypass to the north of the township of Beaufort, connecting the two recently duplicated sections of the Western Highway to the east and west of Beaufort. The project would be constructed under a Design and Construct or Construct only contract administered by a superintendent at RRV/Major Road Projects Victoria (MRPV), following a competitive tender process. Department of Transport would manage and maintain the asset.

2.1 FREEWAY STANDARD BYPASS

The project would connect the duplicated sections of the Western Highway to the east and west of Beaufort via the Option C2 bypass to the north of Beaufort that avoids Snowgums Bushland Reserve and cuts through Camp Hill. The bypass would include the following key components:

- designed as a freeway standard bypass
- approximately 11 km long
- designed to 120 km/hr and sign posted to 110 km/hr for its entirety
- two tie-in interchanges
- one road over rail bridge
- waterway crossings
- diamond interchange to connect with the local road network
- four overpass bridge structures over the local road network.

2.2 INTERCHANGES

The project would have interchanges at the following locations:

- tie-in points to existing Western Highway at the eastern and western ends of the bypass
- diamond interchange at existing local road network connection (Beaufort-Lexton Road).

2.3 BRIDGES AND CULVERTS

The route option would have bridge structures at the following locations:

- road over rail bridge structure for the Melbourne-Ararat rail line
- several waterway bridge structures over Yam Holes Creek
- overpass bridge structures for the existing local road network:
  - Main Lead Road
  - Beaufort-Lexton Road (diamond interchange)
  - Racecourse Road
  - Back Raglan Road.

2.4 ALIGNMENT DESCRIPTIONS

Four alignment options, referred to as Options A0, A1, C0 and C2, were assessed in order to identify a preferred bypass. Following extensive community consultation and technical assessments, Option C2 was selected as the preferred route.

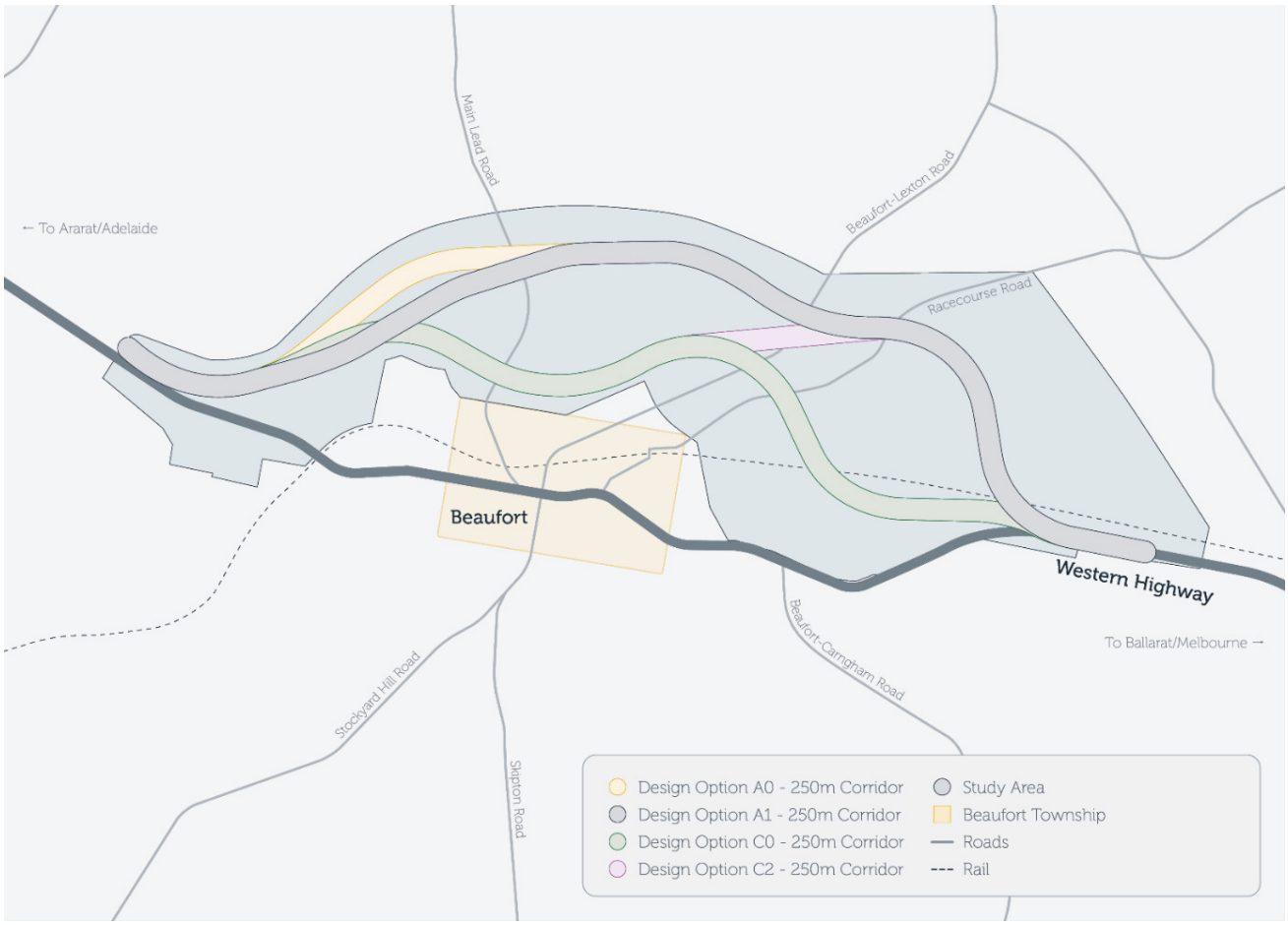


Figure 2.1 Beaufort Bypass alignment options and study area

2.4.1 OPTIONS ASSESSED

2.4.1.1 OPTION A0

The A0 bypass alignment is 11.2 km in length and is the northern most bypass option (see Figure 2.2). From the western tie-in point, approximately 3 km from the Beaufort township, this alignment curves north – north east, where there will be a west-facing, half diamond interchange to maintain access to private properties and the township via the existing Western Highway. The alignment passes over Main Lead Road then climbs through the State Forest north of Camp Hill. From here it descends to a full diamond interchange at Beaufort-Lexton Road, which will provide access to the north and south of the township, before re-joining the Western Highway at its eastern extent, approximately 4.5 km from Beaufort. An outbound exit ramp at the eastern interchange will allow for eastern access to Beaufort via the existing Western Highway. Bridges will pass over Main Lead and Racecourse Roads, as well as over the Melbourne-Ararat rail line. The main areas of fill occur at bridge and interchange locations with a large cut section north of Camp Hill.

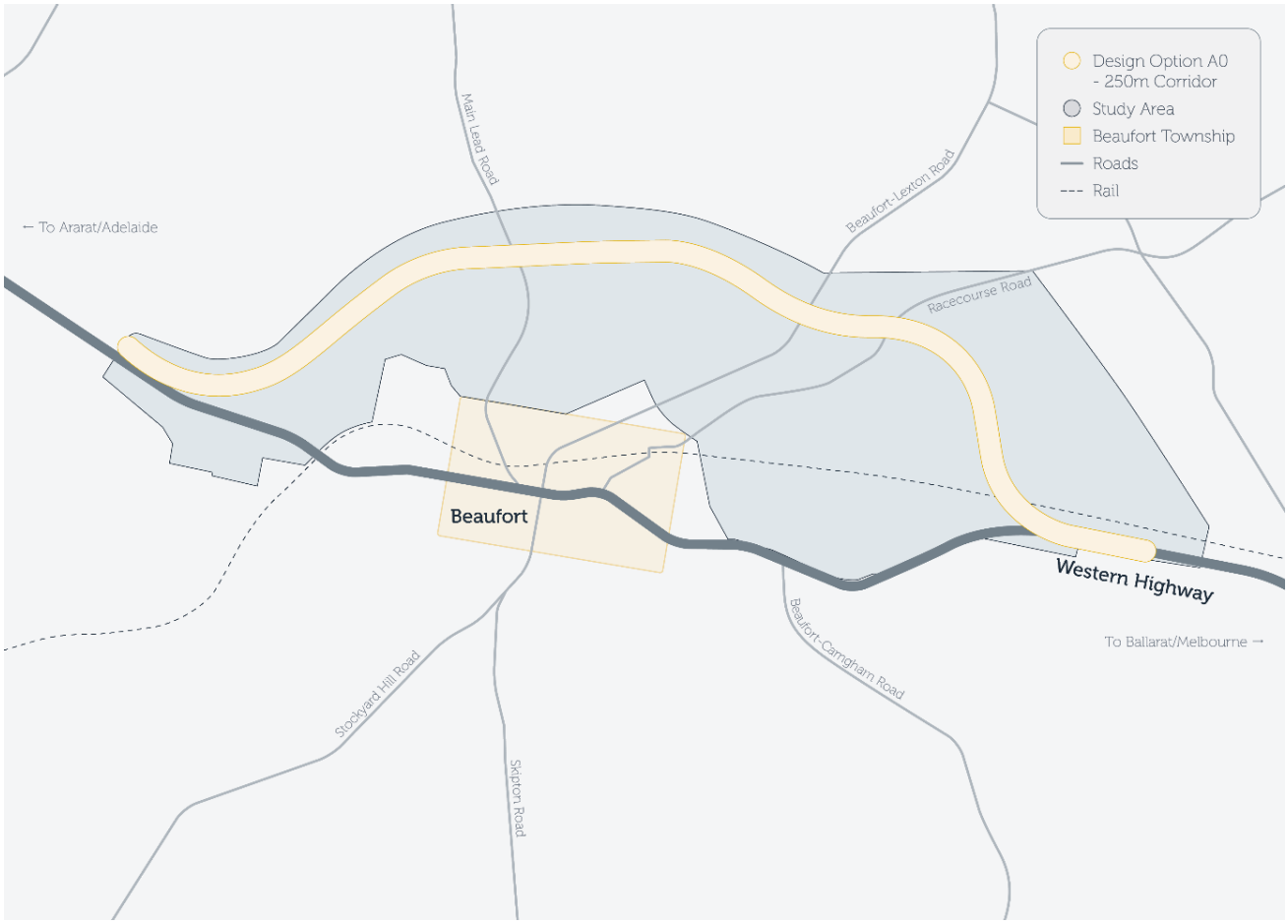


Figure 2.2 Beaufort Bypass A0 alignment option

2.4.1.2 OPTION A1

The A1 bypass alignment option is 11.1 km in length (see Figure 2.3). Approximately 3 km from the Beaufort township, this alignment deviates north-east from the Western Highway, staying slightly south of option A0 until a point east of Main Lead Road, where it re-joins the A0 alignment. There will be a west-facing, half diamond interchange at the western tie-in to maintain access to private properties and the township of Beaufort via the existing Western Highway, and a full diamond interchange at Beaufort-Lexton Road to maintain north-south access. The A1 alignment will re-join the Western Highway approximately 4.5 km to the east of the township. An outbound exit ramp at the eastern interchange will allow for eastern access to Beaufort via the existing Western Highway. Bridges will pass over Main Lead and Racecourse Roads, as well as over the Melbourne-Ararat rail line. The main areas of fill occur at bridge and interchange locations, with cuts north-east of Back Raglan Road, and north of the Camp Hill summit.

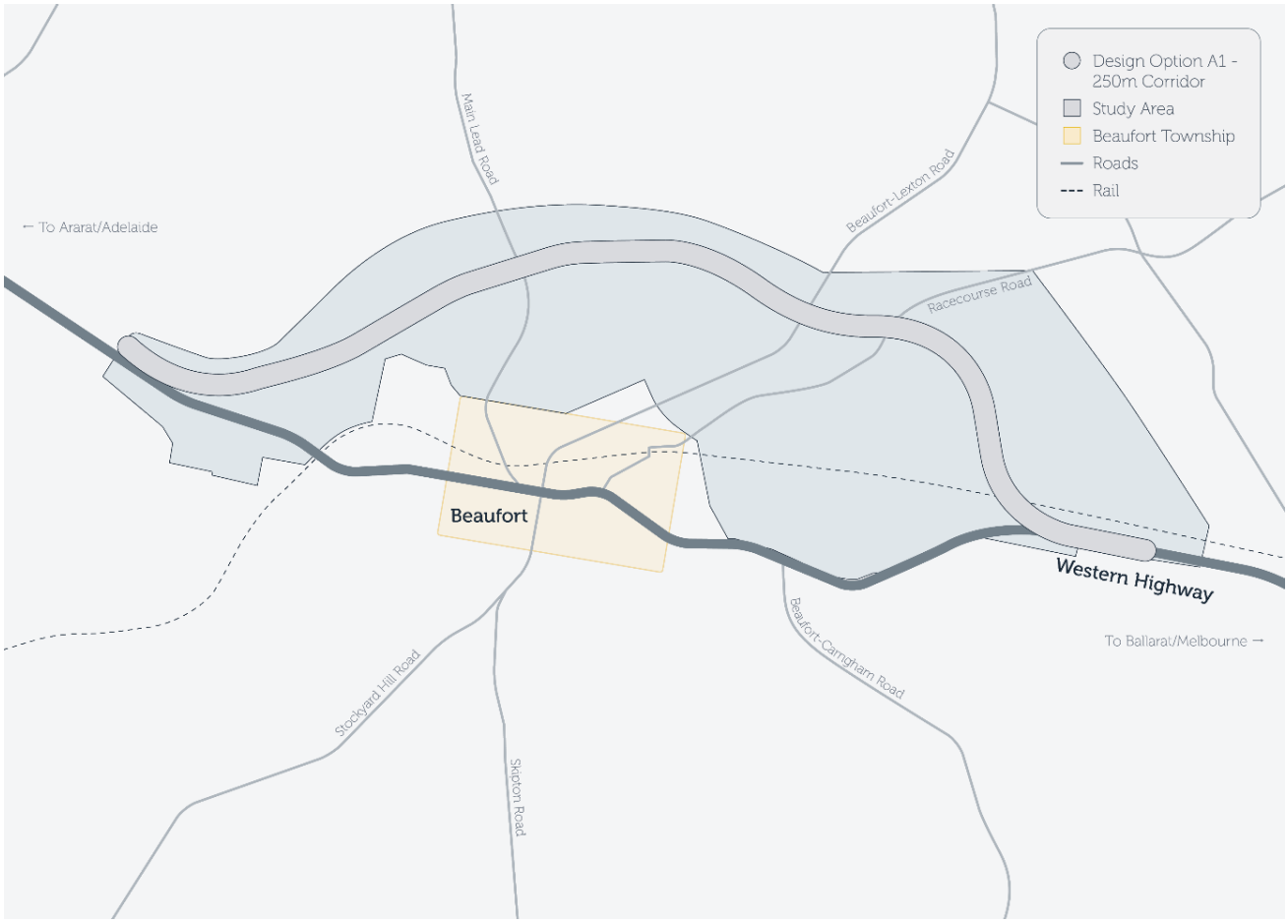


Figure 2.3 Beaufort Bypass A1 alignment option

2.4.1.3 OPTION C0

The southernmost option, C0, is approximately 10.6 km in length from the west to east tie-in points of the Western Highway (see Figure 2.4). Access to the Beaufort township via the existing Western Highway will be maintained by a west facing, half diamond interchange in the west. The C0 option follows the A0 option from the western tie-in point, approximately 3 km from the Beaufort township, before deviating at Back Raglan Road in a more easterly direction almost parallel to the existing Western Highway. This option passes close to the north of Camp Hill, with some cut and fill required in this section, before curving south-east to a full diamond interchange at Beaufort-Lexton Road, providing north-south access. The C0 alignment will re-join the Western Highway approximately 4.5 km to the east of the township. Bridges will pass over Main Lead and Racecourse Roads, as well as over the Melbourne-Ararat rail line. The main areas of fill occur at bridge and interchange locations, with the largest cut and fill areas north and north-east of Camp Hill.

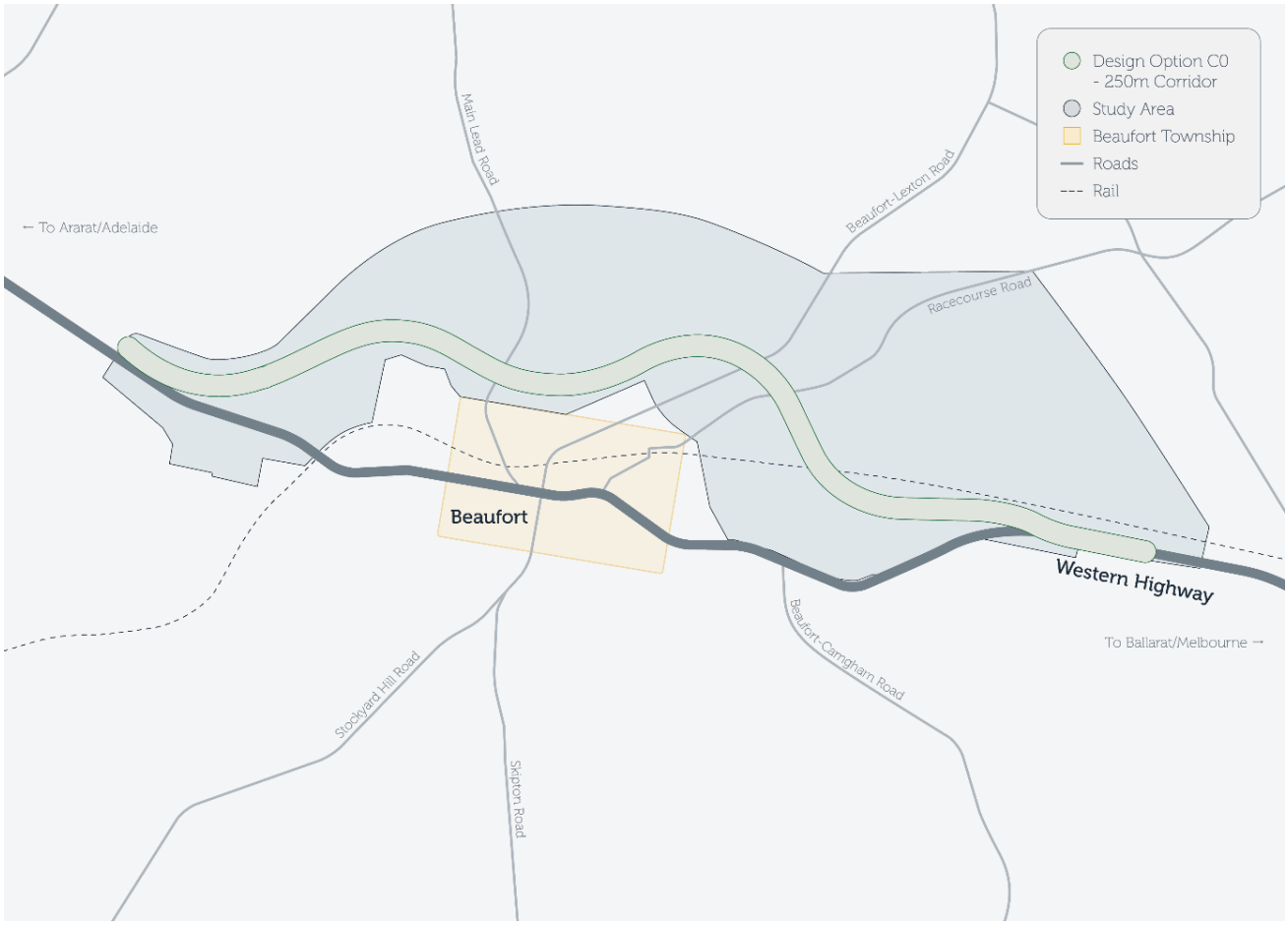


Figure 2.4 Beaufort Bypass C0 alignment option

2.4.2 PREFERRED ALIGNMENT

2.4.2.1 OPTION C2

Option C2 is 11 km in length and is a hybrid between the A0 and the C0 options (see Figure 2.5). It follows the C0 option from the western tie-in point (approximately 3 km from the Beaufort township) until Beaufort-Lexton Road, where it continues in an easterly direction and joins the A0 alignment near Racecourse Road. The C2 alignment will re-join the existing Western Highway at the eastern tie-it point, approximately 4.5 km from the township. At the western extent, access to Beaufort via the existing Western Highway will be maintained by a half diamond interchange, and there will be a full diamond interchange over Beaufort-Lexton Road. Access to Beaufort via the existing Western Highway at the eastern approach will be maintained by an outbound exit ramp at the eastern interchange. Again, bridges will pass over Main Lead and Racecourse Roads, as well as over the Melbourne-Ararat rail line. The main areas of fill occur at bridge and interchange locations, with the largest cut and fill areas north and north east of Camp Hill.

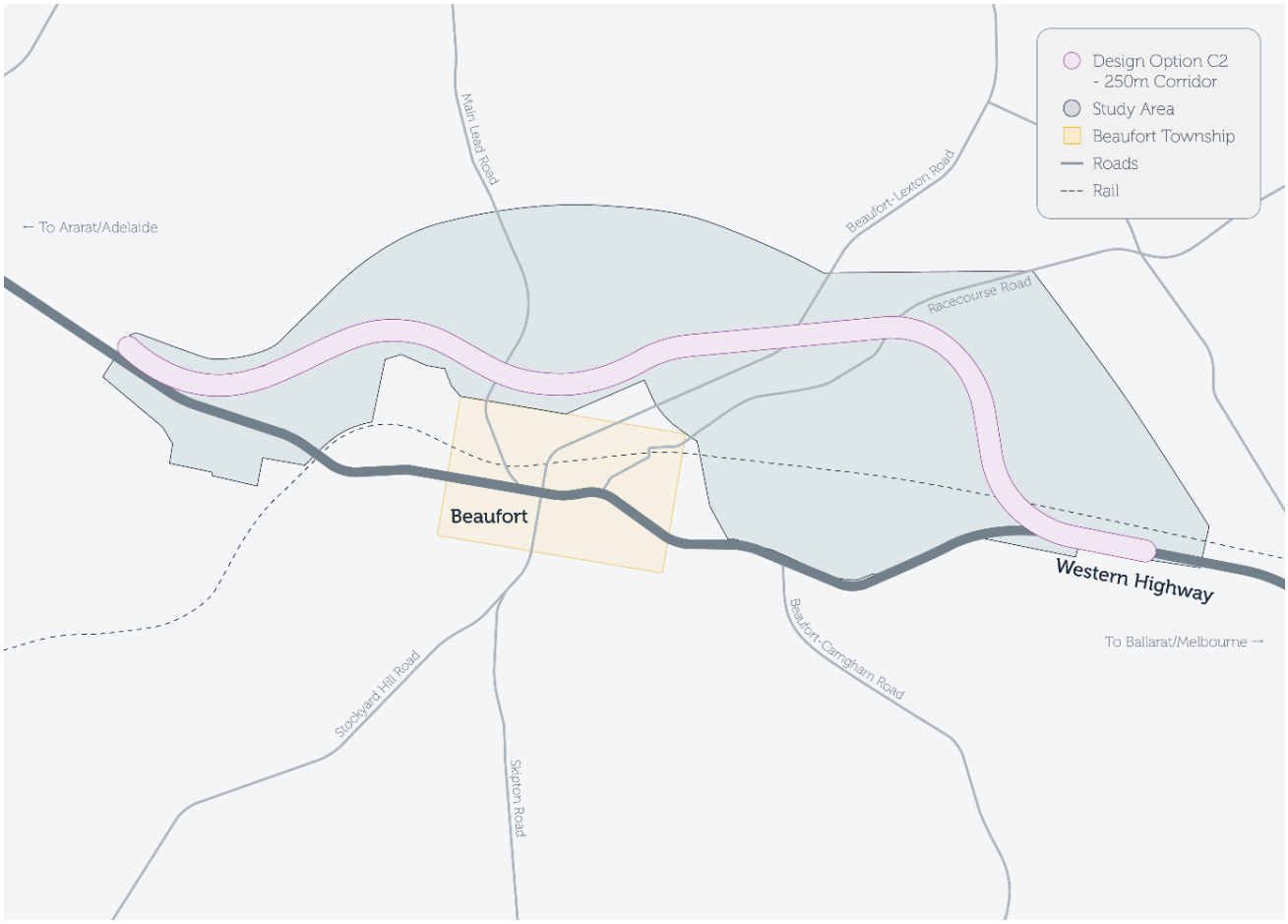


Figure 2.5 Beaufort Bypass C2 alignment option

2.5 PROJECT CONSTRUCTION

The following sub-sections describe the construction activities for the project. Construction of the bypass is expected to take two years and commence once construction funding and approvals are obtained.

2.5.1 CONSTRUCTION ACTIVITIES

Construction activities would include:

- preconstruction site delineation and compound setup, which may include (but not be limited to) tree clearance and vegetation lopping/removal, and establishment of construction site(s) and access tracks
- establishment of environmental and traffic controls
- route clearance and relocation and/or protection of utilities
- channel realignments to maintain existing flow paths
- construction drainage and sediment and erosion control mitigation
- general earthworks:
  - excavation of a cut including stripping of topsoil and placement of fill
  - import, export and stockpiling of fill
  - treatment of contaminated soil or removal of hazardous material, if required
- development of structures, interchanges, batters, drainage and pavement
- development of ancillary infrastructure:
  - noise barriers
  - lighting
  - safety barriers
  - line marking
- landscaping and site reinstatement.

2.6 OPERATIONS AND MAINTENANCE

Operations and maintenance of the project would be consistent with current practices and standards, including the VicRoads' *Roadside Management Strategy* (2011). Key objectives include:

- asset management of:
  - landscaped areas
  - stormwater drains
  - bridges and culverts
  - road pavement
  - signage
  - barriers
  - line marking
- enhancement of transport safety, efficiency and access
- protection of environmental and cultural heritage values
- management of fire risk
- preservation and enhancement of roadside amenity
- routine and life cycle maintenance activities throughout operations
- monitoring and management of areas of environmental sensitivity such as water bodies and wildlife corridors.

3 EES SCOPING REQUIREMENTS

The *Scoping Requirements for Beaufort Bypass Project Environment Effects Statement* (Department of Environment, Water, Land and Planning (DELWP) 2016) (Scoping Requirements) have been prepared by DELWP on behalf of the Minister for Planning. The Scoping Requirements set out the specific environmental matters to be investigated and documented in the EES, which informs the scope of the EES technical studies.

The following matters of the Scoping Requirements are relevant to the noise and vibration impact assessment:

EES EVALUATION OBJECTIVE

Amenity: To minimise adverse air quality, noise or vibration effects on the amenity of residents and local communities, as far as practicable during construction and operation.

Table 3.1 EES scoping requirements – Noise and vibration

SCOPING REQUIREMENTS SUB-SECTION	MATTER TO BE ADDRESSED	RELEVANT ASSESSMENT	ADDRESSED IN THIS ASSESSMENT
Key issues	Increased noise levels from the project's construction and operation could affect amenity in areas in close proximity to the road alignment alternatives.	Noise and vibration impact assessment	✓
Priorities for characterising the existing environment	Characterise the existing noise setting in adjacent established residential, rural residential, commercial and open space areas and at other sensitive land use locations.	Noise and vibration impact assessment	✓
Design and mitigation measures	Identify design responses or other mitigation measures to avoid, reduce or manage any significant noise, air quality or vibration effects at sensitive land use locations during the project construction and operation, in the context of relevant guidelines, planning policy and VicRoads TRNP 2005.	Noise and vibration impact assessment	✓
		Air quality impact assessment	EES Chapter 14: *Amenity*
Assessment of likely effects	Assess likely noise increases (due to operation) at sensitive land use locations along each alignment alternative, both with and in the absence of the proposed mitigation measures.	Noise and vibration impact assessment	✓
Approach to manage performance	Identify proposed measures to manage residual effects on amenity during project implementation, including: noise and dust emissions and the effects of vibration during and after project construction.	Air quality impact assessment	EES Chapter 14: *Amenity*
		Noise and vibration impact assessment	✓
	Include identified measures in the environmental management framework (EMF).	Noise and vibration impact assessment	✓

4 METHODOLOGY

4.1 STUDY AREA

The terminology utilised throughout the current technical assessment relating to the study area and alignment options is defined below.

Study area: The study area for the Beaufort Bypass EES project includes approximately 1,800 ha of land north of the Beaufort township, which contains the four bypass options assessed in this report. During the development stages of the alignment options, the study area was assessed to determine potential environmental impacts and constraints to individual alignment options. For the purpose of the sleep disturbance assessment, qualitative comparisons are drawn with the Beaufort township, detailed in Figure 2.1.

Alignment options: Alignment options (A0, A1, C0 and C2) refer to the four selected bypass options assessed within the study area. Each alignment option consists of a 250 m corridor in which the specific bypass option has been designed. Each alignment option, unless otherwise stipulated, is the area assessed for direct and indirect impacts resulting from the construction, operation and maintenance of the project.

Noise and vibration investigation area: The noise and vibration assessment investigation area includes the project study area and Beaufort township, and the identified sensitive receptors within Figure 4.1.

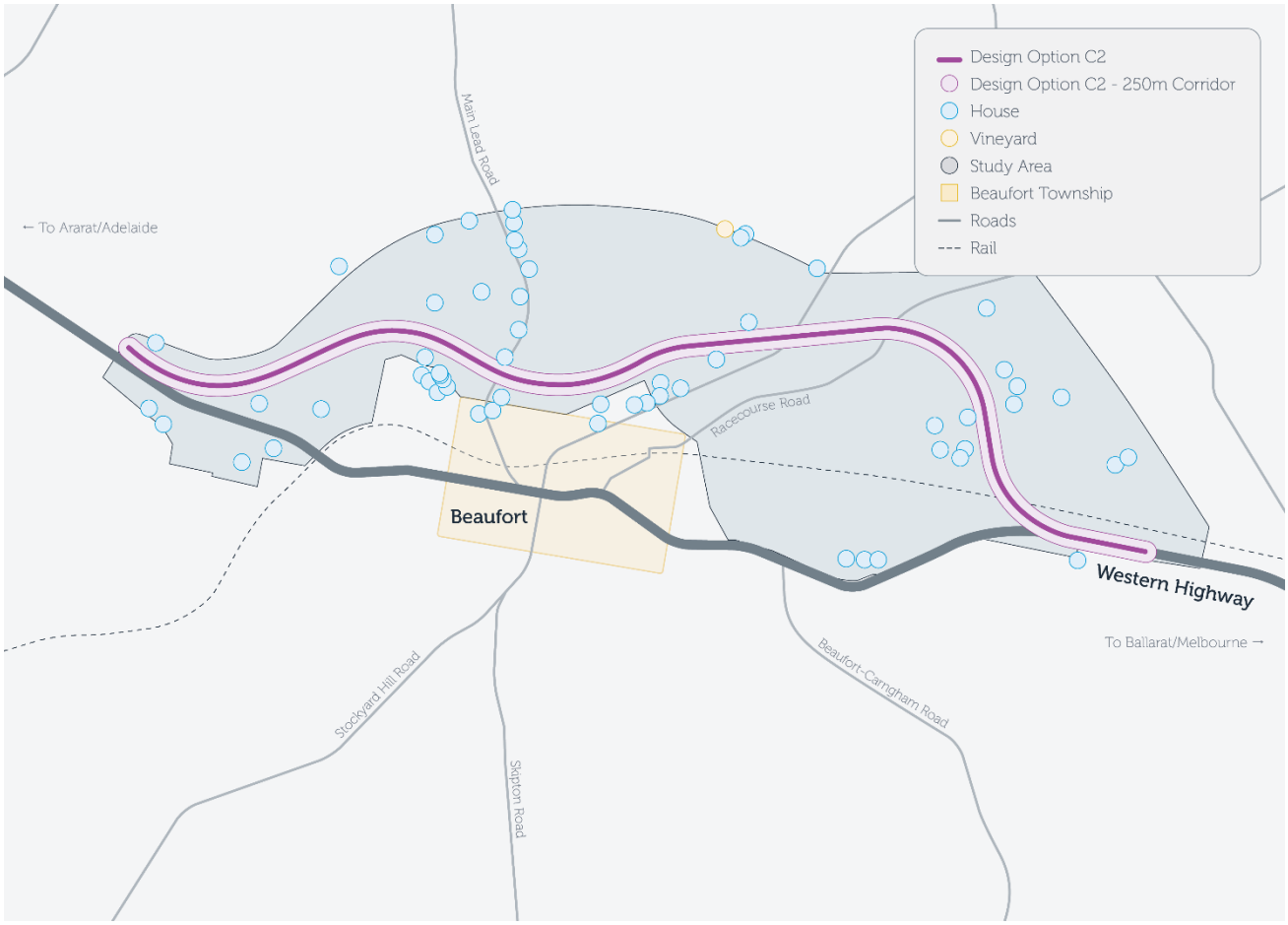


Figure 4.1 Noise and vibration investigation area

4.2 RISK ASSESSMENT

An environmental risk assessment (ERA) has been utilised in the Beaufort Bypass EES to identify environmental impacts associated with the construction and operation phases of the project. The risk assessment process is consistent with the guidance provided in Sections 3.1 and 4 of the *Scoping Requirements for the Beaufort Bypass Project EES* (DELWP 2016) and the *Ministerial guidelines for assessment of the environmental effects under the Environment Effects Act 1978* (Department of Sustainability and Environment (DSE) 2006).

The purpose of the ERA was to provide a systematic approach to the identification and further assessment of potential impacts resulting from the project, whether they be environmental, social or economic. The ERA articulates the probability of an incident with environmental, social or economic effects occurring and the consequence of that impact to the environment. Identified potential impacts with a medium or higher initial risk are subject to detailed impact assessment and mitigation treatments, detailed within each discipline impact assessment.

RRV defines risk and impact as:

- "*Environmental risk reflects the potential for negative change, injury or loss with respect to environmental assets*" (DSE 2006). This approach is consistent with ISO 31000: 2018, which defines risk as "*the effect of uncertainty of [environmental] objectives*". Both definitions reflect the fact that risk is typically expressed in terms of the likelihood of a change occurring and the consequence of that change.
- Environmental impact is described as any change to the environment as a result of project activities.

The risk assessment is a critical part of the EES process as it guides the level and range of impact assessment for the EES and facilitates a consistent approach to risk assessment across the various disciplines.

4.2.1 RISK ASSESSMENT PROCESS

The ERA has guided the environmental impact assessment for the project. The objectives of the ERA are to:

- identify primary environmental risks that relate to the construction and operation of the project
- guide the level and extent of investigation and data gathering necessary for accurately characterising the existing environment and assessing the project's environmental impact
- help identify mitigation measures to avoid, minimise and mitigate environmental risks
- inform assessment of likely residual effects that are expected to be experienced after standard controls and proposed mitigations have been implemented.

The risk assessment process for the EES adopts a risk management framework as detailed in the VicRoads Environmental Sustainability toolkit. The process includes:

- an approach to environmental management which is aligned with ISO 31000: 2018
- systems used to manage environmental risk and protect the environment, and how these are implemented at different stages of road construction, operation and maintenance
- tools and reporting requirements which provide guidance in managing environmental issues throughout the project.

The ERA identifies impact events for each relevant element of the environment, details the primary risks and has informed the level and range of technical reporting required to address predicted impacts. The ERA utilises a risk matrix approach where the likelihood and consequence of an event occurring are considered (Table 4.1, Table 4.2 and Table 4.3). All risks are reassessed at regular intervals during all phases of the project, from the development of the EES to operation and maintenance, to ensure they are still applicable, that controls are appropriate and effective, and that they reflect most recent outcomes of specialist technical studies.

Table 4.1 Risk assessment matrix

			LIKELIHOOD				
CONSEQUENCE	Risk categories		Rare (A)	Unlikely (B)	Possible (C)	Likely (D)	Almost Certain (E)
	Catastrophic	5	Medium	High	High	Extreme	Extreme
	Major	4	Medium	Medium	High	High	Extreme
	Moderate	3	Low	Medium	Medium	High	High
	Minor	2	Negligible	Low	Low	Medium	Medium
	Insignificant	1	Negligible	Negligible	Negligible	Low	Low

Based on the project objectives and context, a set of project-specific and appropriate assessment, likelihood and consequence criteria were developed.

The likelihood categories and consequence descriptions are used as a guide for evaluating risk and are shown below in Table 4.2 and Table 4.3.

Table 4.2 Likelihood categories

RARE (A)	UNLIKELY (B)	POSSIBLE (C)	LIKELY (D)	ALMOST CERTAIN (E)
Less than once in 12 months OR 5% chance of recurrence during course of the contract	About once in 6 months OR 10% chance of recurrence during course of the contract	About once in 4 months OR 30% chance of recurrence during course of the contract	About once in 2 months OR 50% chance of recurrence during course of the contract	About once in a month OR 100% chance of recurrence during course of the contract
The event may occur only in exceptional circumstances	The event could occur but is not expected	The event could occur	The event will probably occur in most circumstances	The event is expected to occur in most circumstances
It has not happened in Victoria but has occurred on other road projects in Australia	It has not happened regionally but has occurred on other road projects in Victoria	It has happened in the Beaufort region	It has happened on an adjoining section of the Western Highway	It has happened on more than one of the adjoining Western Highway projects OR It has happened multiple times on an adjoining Western Highway project

Consequence criteria have been developed for the project in consultation with technical specialists. The result is a discipline and aspect-specific set of consequence descriptors used to define what would be considered an Insignificant, Minor, Moderate, Major and Catastrophic consequence associated with a risk event (see Table 4.3).

Table 4.3 Noise and vibration environmental risk assessment consequences descriptors

ASPECTS	INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC
Construction outside normal working hours	Environment Protection Authority (EPA) Environmental Guidelines for Major Construction Sites and VicRoads Noise Guidelines – Construction and Maintenance Works criteria met at all sensitive receptors. Construction noise is negligible or just audible.	Isolated and temporary exceedances of EPA Environmental Guidelines for Major Construction Sites and VicRoads Noise Guidelines – Construction and Maintenance Works criteria at a sensitive receptor. Construction noise is audible.	Exceedance of EPA Environmental Guidelines for Major Construction Sites and VicRoads Noise Guidelines – Construction and Maintenance Works criteria in a local area. Construction noise is clearly audible for short periods of time.	Exceedance of EPA Environmental Guidelines for Major Construction Sites and VicRoads Noise Guidelines – Construction and Maintenance Works criteria in a number of local areas. Construction noise is clearly audible for extended periods of time, sleep disturbance possible.	Exceedance of EPA Environmental Guidelines for Major Construction Sites and VicRoads Noise Guidelines – Construction and Maintenance Works criteria over whole of alignment. Construction noise is clearly audible for extended periods of time, sleep disturbance likely and receiving residential complaints.

ASPECTS	INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC
Construction impacts (including construction traffic) on ambient Noise/Vibration at sensitive receptors	EPA Environmental Guidelines for Major Construction Sites and VicRoads Noise Guidelines – Construction and Maintenance Works criteria met at all sensitive receptors. Construction noise is negligible or just audible. No damage to buildings.	EPA Environmental Guidelines for Major Construction Sites and VicRoads Noise Guidelines – Construction and Maintenance Works criteria at a sensitive receptor. Construction noise is audible. Low risk for cosmetic damage but not structural damage to buildings with respect to DIN-4150-3 Structural Vibration - Effects of Vibration of Structures. Further investigation is advised.	Exceedance of EPA Environmental Guidelines for Major Construction Sites and VicRoads Noise Guidelines – Construction and Maintenance Works criteria in a local area. Construction noise is clearly audible for short periods of time. Medium risk for cosmetic damage but no structural damage to buildings with respect to DIN-4150-3 Structural Vibration - Effects of Vibration of Structures. Further investigation is recommended.	Exceedance of EPA Environmental Guidelines for Major Construction Sites and VicRoads Noise Guidelines – Construction and Maintenance Works criteria in a number of local areas. Construction noise is clearly audible for extended periods of time, amenity disturbance possible. High probability for cosmetic damage and structural damage to buildings with respect to DIN-4150-3 Structural Vibration - Effects of Vibration of Structures. Further investigation is required.	Exceedance of EPA Environmental Guidelines for Major Construction Sites and VicRoads Noise Guidelines – Construction and Maintenance Works criteria over whole of alignment. Construction noise is clearly audible for extended periods of time, ongoing amenity disturbance. Very high risk / probability for damage to buildings with respect to DIN-4150-3 Structural Vibration - Effects of Vibration of Structures. Further investigation including structural assessment is compulsory to determine potential of widespread structural damage.

ASPECTS	INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC
Maintenance activities impact on Noise / Vibration	EPA Noise Control Guidelines and VicRoads Noise Guidelines – Construction and Maintenance Works criteria and DIN-4150-3 Structural Vibration - Effects of Vibration of Structures met at all sensitive receptors. Construction noise is negligible or just audible. No damage to buildings.	Isolated and temporary exceedances of EPA Noise Control Guidelines and VicRoads Noise Guidelines – Construction and Maintenance Works criteria and DIN-4150-3 Structural Vibration - Effects of Vibration of Structures criteria at a sensitive receptor. Construction noise is audible. Low risk for cosmetic damage but no structural damage to buildings.	Exceedance of EPA Noise Control Guidelines and VicRoads Noise Guidelines – Construction and Maintenance Works criteria and DIN-4150-3 Structural Vibration - Effects of Vibration of Structures in a local area. Construction noise is clearly audible for short periods of time. Medium risk for cosmetic damage but no structural damage to buildings.	Exceedance of EPA Noise Control Guidelines and VicRoads Noise Guidelines – Construction and Maintenance Works criteria and DIN-4150-3 Structural Vibration - Effects of Vibration of Structures criteria in a number of local areas. Construction noise is clearly audible for extended periods of time, sleep disturbance possible. High probability for cosmetic damage and structural damage to buildings.	EPA Noise Control Guidelines and VicRoads Noise Guidelines – Construction and Maintenance Works criteria and DIN-4150-3 Structural Vibration - Effects of Vibration of Structures over whole of alignment. Construction noise is clearly audible for extended periods of time, sleep disturbance likely and receiving residential complaints. Very high risk / probability for damage to buildings. Further investigation including structural assessment is compulsory to determine potential of widespread structural damage.

ASPECTS	INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC
Operation impacts on Traffic noise levels	Compliance with VicRoads Traffic Noise Reduction Policy met at all sensitive receptors. Negligible increase in noise level.	Compliance with VicRoads Traffic Noise Reduction Policy met at all sensitive receptors. Airborne noise levels increase but comply with project criteria.	Minor temporary exceedance of VicRoads Traffic Noise Reduction Policy at single sensitive receptor. Airborne noise levels increase and are greater than project criteria at few sensitive receptors.	Exceedance of VicRoads Traffic Noise Reduction Policy at multiple sensitive receptors. Airborne noise levels significantly increase and are greater than project criteria at multiple sensitive receptors.	Alignment wide exceedance of VicRoads Traffic Noise Reduction Policy. Airborne noise levels well above project criteria along whole of alignment (majority to all of identified sensitive receptors within project area).
Sleep Disturbance	No sleep disturbance events from traffic noise.	Occasional sleep disturbance events at a small number of houses.	Regular sleep disturbance event at several houses.	Regular sleep disturbance events at many houses.	High number of sleep disturbance events during the night period.

The risk assessment was undertaken for each discrete alignment option as each option had a distinct profile, type and extent of environmental impacts. The assessment of these impacts is detailed within Sections 8 and 9 of this report.

4.3 IMPACT ASSESSMENT

The impact assessment for the project has utilised the ERA to inform the areas for further investigation. Impacts assessed within this assessment have typically been identified as having a medium or higher initial risk within the risk assessment when standard controls were applied. Impact assessments were prepared in two stages: initially to inform the options assessment and following the selection of the preferred alignment, where impact assessments were revised to report impacts and mitigations specifically on the preferred alignment. The technical report describes and assesses impacts in terms of the following:

- description of impact
- identification of whether impacts are direct or indirect
- prediction of the magnitude, extent and duration of impact
- overall rating of impact (without mitigation)
- residual rating of impact (with mitigation).

4.3.1 NOISE MONITORING

Noise monitoring was conducted at noise-sensitive receiver locations potentially affected by the project. The monitoring has been conducted in accordance with Australian Standard 1055.1-1997 *Acoustics-Description and measurement of environmental noise, Part 1: General procedures* (AS 1055.1) and *Traffic Noise Measurement Requirements for Acoustic Consultants* (VicRoads 2011). Two measurement location options were used for the microphone placement of the noise logger:

1. 1 m from the centre of the most exposed window of a habitable room on the lowest habitable level of the building under consideration. In most cases this is expected to be 1.2 m to 1.5 m above ground level.

   OR

2. Where the above is not achievable and free-field noise measurements are to be conducted, the microphone shall be located approximately 1.2 m above ground level and in an area free of vertical reflecting surfaces; being a circle of 5 m radius centred on the microphone.

Where measurements were located at 1 m from a reflecting surface (option 1), an adjustment of -2.5 dB was applied in accordance with EPA Guideline 1834 (*Civil construction, building and demolition guide*) to determine the background noise levels for the purposes of assessing construction noise.

Refer to Section 6.2 for all noise monitoring results.

4.3.1.1 METEOROLOGY / ANOMALOUS DATA

Meteorological conditions during the measurement period were accessed from the weather condition database for the Ballarat and Ben Nevis stations of the Bureau of Meteorology (BoM), chosen for the proximity to the study area and more detailed database over neighbouring stations (e.g. Ararat).

Noise monitoring data for a given period has been excluded for analysis if it was recorded during any amount of rainfall, or if the wind speed was derived to be greater than 3 m/s at the monitoring location. This information, in addition to subjective observations and review of the noise monitoring results, has been used to assess the impact of weather on the noise surveys at all properties. It is likely that the wind speed will be higher at the weather stations than at the noise monitoring locations, which are closer to ground, and potentially shielded by buildings and fences. In some cases, wind speeds have been adjusted to account for ground level wind speeds, according to Gowen T, Karantonis P and Rofail T (2004) *"Converting Bureau of Meteorology Wind Speed Data to Local Wind Speeds at 1.5m Above Ground Level"*. Refer to Appendix B for more details.

Where anomalous or weather affected data was identified, it has been excluded from the determination of acoustic parameters in accordance with VicRoads (2011) *Traffic Noise Measurement Requirements for Acoustic Consultants.*

4.3.2 OPERATIONAL NOISE MODELLING

An operational noise model has been prepared using SoundPLAN v7.4 noise modelling software. The model predicts road traffic noise emissions using the Calculation of Road Traffic Noise (CoRTN) algorithm.

CoRTN is the algorithm accepted by RRV to predict noise from road traffic, primarily because it predicts an $L_{10,18Hr}$ parameter. The model uses the traffic volume, speed, percentage of heavy vehicles, road geometry and terrain to predict the noise level at receiver locations along the road.

Both SoundPLAN and the CoRTN methods are accepted by RRV as suitable noise assessment tools.

The CoRTN algorithm has been used to predict road traffic noise levels at the noise sensitive receivers for the following scenarios:

- Scenario 1: Year 2017 (existing) Western Highway
- Scenario 2: Year 2031 (future), Beaufort Bypass.

The noise levels predicted for Scenario 1 have been compared with the measured noise levels. This scenario has also been modelled using the traffic data obtained by the transport team and compared with the measurements undertaken between 8 and 15 December 2017 and 16 April and 23 April 2018.

Noise mitigation options have been designed to achieve the PONLs at the residences for Scenario 2.

The CoRTN model has also been used to predict changes to noise levels within the township of Beaufort, and comparisons of scenarios with and without the project compared.

4.3.2.1 MODELLING PARAMETERS

Table 4.4 lists the parameters required for noise modelling in SoundPLAN. A comment is provided regarding the source of each piece of data.

Table 4.4 Modelling inputs

INPUT	VALUE / COMMENT
Existing road alignment	Western Freeway – Digitised from aerial imagery
Proposed road alignment	Supplied by design team
Existing road traffic speed	As sign posted
Future road traffic speed	Signposted speed 110 km/hr, all ramps are 80 km/hr, existing roads as currently sign posted
Current road traffic volumes	VicRoads published road traffic volume data (displayed in Table 4.6)
Future road traffic volumes	Supplied by the transport team (see Section 4.3.2.2)
Existing road surface types	N/A. Model will be calibrated based on noise monitoring results (in-town assessment only – refer Section 9.3).
Future road surface types	Spray seal (Size 10 mm) with dense graded asphalt at intersections and roundabouts
Terrain Data	WSP Lidar Reference Library
Proposed barrier locations	Supplied by the design team
Receiver height	1.5 m above ground level
Ground absorption	0.6 – a mixture of hard and soft ground out to 600 m, 0 – hard ground beyond 600 m from road

ROAD SURFACE TYPES AND CORRECTIONS

Table 4.5 shows the standard road surface corrections for different pavement types, as provided in Section 5.4 of *Road Design Note 06-01 – Interpretation and application of VicRoads Traffic Noise Reduction Policy 2005* (VicRoads 2010).

The project has been designed with a 10 mm spray seal surface, a typical surface type for high speed pavements in rural locations. If noise mitigation is required in the form of surface treatment, then a 7 mm spray seal will be recommended, which will provide a 2 dB overall reduction in noise emissions over the proposed 10 mm spray seal.

Table 4.5 Road surface noise corrections

SURFACE TYPE	RELATIVE NOISE LEVEL dB
Spray seals, 10 mm or larger (used to model noise impacts)	+4
Spray seals 7 mm (mitigation option)	+2
Dense graded asphalt (DGA)	0
Open graded asphalt (OGA)	-3
Stone mastic asphalt (SMA)	-1
Slurry surfacing (for lightly trafficked surfaces such as a Residential street)	0
Tyned concrete only	+1 to +4
Broomed concrete	+1 to +4
Hessian dragged concrete	+2 to +4
Exposed aggregate concrete	-1 to +1

Notes:

(1) These relative noise levels are given relative to typical dense graded asphalt. They may also depend on environmental circumstances and tyre type.

(2) Because of the nature of noise measurements and the variable levels of noise produced by the spectrum of vehicle types, it is not possible to quote absolute values.

(3) For speeds below 80 km/h tyre/road noise is less of a problem than at high speeds.

(4) It is important to ensure that there is adequate texture depth to minimise the risk of aquaplaning.

4.3.2.2 TRAFFIC VOLUMES

Table 4.6 and Table 4.7 present the traffic volumes supplied from the transport team to complete the assessment. The data has been extrapolated from EES Appendix M: *Traffic and transport impact assessment* (WSP 2021).

Traffic modelling comprised of weeklong tube counts across eight different sites within the study area, with three tube sites located along the Western Highway. Review of the results suggested anomalies with data at one of the tube sites on (Western Highway, west of Smiths lane), where volumes were lower than expected for Monday to Wednesday. As such, Monday to Wednesday data for this site only has been excluded from analysis. The impact of excluding tube data from this site was considered negligible.

A review of the weekly traffic profile data for the other tube count sites along the Western Highway showed that there were minimal differences in daily traffic volumes during the weekdays and no reason to suggest that the Thursday and Friday data could not be extrapolated for the missing three days for the one tube count site displaying anomalies (Figure 6.7 from EES Appendix M: *Traffic and transport impact assessment* (WSP 2021)). It is also noted that the weekly traffic for all sites showed that Friday was the peak traffic day, which has been considered in the assessment.

A factor of 0.95 has been used to convert the traffic volumes to 18-hour (06:00 to 24:00 hours) values.

Table 4.6 7 day average 24-hour traffic volumes – No project

SITE LOCATION	SEGMENT LOCATION	DIRECTION	2017 7 DAY AVG (VEHICLES)			2031 7 DAY AVG (VEHICLES)		
			LV	HV	Total	LV	HV	Total
Western Highway	West of Martins Lane Entrance (West of Beaufort)	East Bound	2903	871	3774	3830	1149	4979
		West Bound	2826	839	3665	3728	1107	4836
Main Lead Road	Near 125 Main Lead Road, next to Beaufort Trotting Training Track	North Bound	347	44	392	458	59	517
		South Bound	348	48	396	459	64	522
Beaufort-Lexton Road	Between Topp Lane and Action lane	East Bound	224	51	275	296	67	363
		West Bound	221	45	266	292	59	351
Western Highway	West of Smiths Lane (East of Beaufort)	East Bound	3375	841	4216	4454	1110	5563
		West Bound	3075	870	3945	4057	1148	5205
Skipton Road	Between Stockyard Hill Road and Park Road	North Bound	717	106	823	946	140	1086
		South Bound	720	120	839	950	158	1108
Back Raglan Road	North of Martins Lane and Back Raglan Road intersection	North Bound	18	7	25	24	9	33
		South Bound	20	5	24	26	6	32
Racecourse Road	Adjacent Yam Holes Creek	East Bound	52	5	56	68	6	74
		West Bound	54	5	59	71	6	77
Western Highway	Between King Street and Beaufort-Lexton Road	East Bound	5077	515	5592	6699	679	7378
		West Bound	4070	718	4788	5371	948	6318

Table 4.7 7 day average 24-hour traffic volumes – Project

SITE LOCATION	SEGMENT LOCATION	DIRECTION	2031 7 DAY AVG (VEHICLES)		
			LV	HV	Total
Western Highway	West of Martins Lane Entrance (West of Beaufort)	East Bound	1165	350	1515
		West Bound	1245	406	1651
Main Lead Road	Near 125 Main Lead Road, next to Beaufort Trotting Training Track	North Bound	458	59	517
		South Bound	459	64	522
Western Highway	West of Smiths Lane (East of Beaufort)	East Bound	1807	317	2123
		West Bound	1587	449	2036
Skipton Road	Between Stockyard Hill Road and Park Road	North Bound	946	140	1086
		South Bound	950	158	1108
Back Raglan Road	North of Martins Lane and Back Raglan Road intersection	North Bound	24	9	33
		South Bound	26	6	32
Racecourse Road	Adjacent Yam Holes Creek	East Bound	68	6	74
		West Bound	71	6	77
Beaufort Bypass	West of Beaufort-Lexton Road Interchange	East Bound	2665	800	3465
		West Bound	2484	701	3185
Beaufort Bypass	East of Beaufort-Lexton Road Interchange	East Bound	2647	793	3440
		West Bound	2470	699	3169

Traffic volumes for the night period have been modelled and provided by the transport team for the purposes of sleep disturbance assessment. The full set of data as provided in the *Beaufort Bypass Overnight Traffic Volumes* memo (WSP October 2020) is summarised in Table 4.8, Table 4.9 and presented in Appendix G.

Table 4.8 10:00 PM to 7:00 AM 'No-Project' vehicle volumes

SITE LOCATION	SEGMENT LOCATION	2017 7 DAY AVG (VEHICLES)			2031 7 DAY AVG (VEHICLES)			
		LV	HV	Total	LV	HV	Total	%HV
Western Highway	West of Martins Lane Entrance (West of Beaufort)	508	438	946	670	578	1248	46%
Western Highway	West of Smiths Lane (East of Beaufort)**	472	422	893	622	557	1179	47%
Skipton Road	Between Stockyard Hill Road and Park Road	56	20	76	74	27	100	27%

***Only Thursday to Sunday data was utilised due to possible inaccuracies with data collected for Monday to Wednesday.*

Table 4.9 10:00 PM to 7:00 AM 'Project' vehicle volumes

SITE LOCATION	SEGMENT LOCATION	2017 7 DAY AVG (VEHICLES)			2031 7 DAY AVG (VEHICLES)			
		LV	HV	Total	LV	HV	Total	%HV
Western Highway	West of Martins Lane Entrance (West of Beaufort)	162	147	309	214	194	407	48%
Western Highway	West of Smiths Lane (East of Beaufort)**	188	143	331	248	189	437	43%
Skipton Road	Between Stockyard Hill Road and Park Road	56	20	76	74	27	100	27%
Beaufort Bypass	West of Beaufort-Lexton Road Interchange	314	286	600	414	377	791	48%
Beaufort Bypass	East of Beaufort-Lexton Road Interchange	312	284	596	412	375	787	48%

***Only Thursday to Sunday data was utilised due to possible inaccuracies with data collected for Monday to Wednesday.*

4.3.2.3 ASSUMPTIONS

The following assumptions apply to the noise modelling for this project:

- The noise modelling carried out for the bypass options is based on CoRTN and has not been calibrated to existing conditions as the Bypass options are new road alignments. To remain consistent with this approach, the east and west sections of the Western Highway connections have also not been calibrated to existing conditions. This is because the new Bypass options are predicted to modify the traffic flow on the existing roads in the future. Therefore, calibration of the future model based on existing conditions may not stand valid. A non-calibrated model is considered conservative as CoRTN generally over-predicts the noise levels by 1 to 2 dB.
- The noise modelling carried out for the in-town assessment will be calibrated as the focus of the assessment is based on the existing road network and the direct comparison between measured and predicted traffic noise levels.
- CoRTN assumes a free-flowing state of traffic at a single speed. Noise levels from slowing traffic or stationary vehicles is not accounted for in the model.
- The road surface finish used for the acoustic modelling is a size 10 mm spray seal, as proposed by the civil design team. The surface correction used will be +4 dB as defined in Table 4.5.
- All residential buildings have been treated as single storey dwellings 4 m high and receivers placed at a height of 1.5 m above the ground height of the building.
- Property fences are not included in the acoustic model.

4.3.2.4 NOISE MITIGATION OPTIONS

The VicRoads TNRP aims to balance the needs of the community with a pragmatic approach to noise control. RRV is the relevant authority and determines which roads require mitigation and appropriate design noise levels.

Controlling noise from road traffic can be achieved using a variety of methods, each with their own costs and limitations. Selecting the most appropriate mitigation measure should also consider factors such as community acceptance, urban design, access and safety. Table 4.10 presents typical noise mitigation options, the approximate noise reduction and possible limitations.

Table 4.10 Noise mitigation options

MITIGATION OPTION	APPROXIMATE NOISE REDUCTION	POSSIBLE LIMITATIONS
Road alignment	3 dB per doubling of distance	Major road alignment changes are usually only suitable for greenfield roads with minimal space limitations. The effects are minimal unless the road is positioned at significantly greater distances from receivers.
Speed reduction Note 1	2 dB to 3 dB	Total traffic flow-through may be affected; safety considerations.
Surface treatments (Open Graded Asphalt etc.)	3 dB	Longevity of different surface treatments may require more regular road surface replacement.
Earth berms Note 2	3 dB to 8 dB	Space constraints limit the suitability in many cases.
Noise barriers	5 dB to 10 dB	The efficacy of noise barriers reduces as barrier heights increase. Typically, barriers above 4 m also require increased footings to withstand higher wind loads. Noise barriers must be contiguous (no gaps or holes) and have a minimum surface mass of 15 kg/m^2. Typical materials include: — Timber — Concrete — Perspex/Acrylic.
Off-Reservation Treatment (ORT) (e.g. double glazing)	5 dB to 12 dB	Only cost effective for small numbers of houses. Does not protect outdoor amenity.

Note:

(1) Speed reductions can reduce noise levels however reducing the speed of a standard freeway bypass designed to a speed of 120 km/h would undermine key project road efficiency objectives.

(2) Noise barriers are typically proposed over earth berms for mitigation treatment as they can provide an effective means of mitigating road traffic noise, by utilising less space and allowing flexibility of visual landscape design.

4.3.2.5 GENERAL MAINTENANCE

The condition of roads in future may also affect the noise associated with road traffic. Potholes, corrugations and other surface abnormalities can increase noise locally and is considered a risk with respect to maintain design operational noise levels. Maintenance of the roads will ultimately be the responsibility of the operator. The following non-exclusive tasks may form part of an appropriate maintenance procedures:

- ongoing repairs of road defects and wear from traffic over time (e.g. potholes)
- regular monitoring of noise levels (noise logging)
- established program of handling the Beaufort Bypass maintenance works.

4.3.3 CONSTRUCTION NOISE

Construction impacts are to be managed in compliance with VRTG. See Section 5.2.

Ideally, the approach to construction is to maximise construction work during Normal Working Hours (as defined in VRTG and Table 5.2). Works undertaken outside of Normal Working Hours are to comply with the guideline noise levels as defined in VRTG. The exception to this would be Unavoidable Works (works which cannot practicably meet the scheduled requirements because the work involves continuous work or would pose an unacceptable risk to life or property or risk a major traffic hazard).

4.3.3.1 APPROACH

High level predictions of construction noise have been undertaken to determine likely construction noise impacts and indicative controls for the project. As construction noise impacts are relative to all alignment options, they are resultantly addressed within Section 9.4 of this assessment.

The following approach will be used to assess construction noise for the project:

- assessment of typical construction scenarios and the times at which they are proposed to occur (e.g. during Normal Working Hours or outside of Normal Working Hours) and the locations where construction activities are likely to be carried out
- specific guideline noise levels with respect to VRTG will be based on measured background noise levels (L_{90}) at noise sensitive receptors. Note that additional noise monitoring may be required to be undertaken by the construction contractor to gain a better understanding of the background noise environment
- preparation of a detailed noise model to understand the potential noise emissions from construction activities.

Where guideline noise levels are predicted to be exceeded, options for alternative construction methodologies and / or other mitigation strategies will be considered.

Construction vibration will be assessed via a desktop study and will consider the, specific plant / activities and proximity from sensitive structures. See Section 5.2.2.

4.3.4 SLEEP DISTURBANCE

A methodology for assessment of sleep disturbance is presented in Practice Note iii of NSW ENMM[2] (Refer to Section 9.2). The ENMM states:

> *Maximum internal noise levels below 50-55 dB(A) are unlikely to cause awakening reactions*
>
> *One or two noise events per night with maximum internal noise levels of 65-70 dB(A) are not likely to significantly affect health and well-being.*
>
> *At locations where road traffic is continuous rather than intermittent, the Leq9hr(night) target noise levels should sufficiently account for sleep disturbance impacts.*
>
> *However, where the emergence of Lmax over the ambient Leq is equal to or greater than 15 dB(A), the Leq(9hr) criteria may not sufficiently account for sleep disturbance impacts.*
>
> *A maximum noise event can therefore be defined as any pass-by for which*
>
> *Lmax-Leq(1Hr)≥15dB(A)*
>
> *The assessment is used to rank and prioritise design options and noise mitigation strategies.*

Internal noise targets were set at 55 dBA in accordance with the NSW ENMM. Accounting for the reduction of sound from outside to inside a given house requires knowledge of the construction of the walls, roof, and glazing. As the construction of each property is not known and as each construction may differ, a difference of 10 dB through an open window, as is commonly used, has been assumed for this assessment. The external maximum event noise level to be used as a criterion in this case is therefore **65 dBA L_{max}**.

4.3.4.1 MODELLING

Two scenarios were prepared in the SoundPLAN model to predict maximum event noise levels from truck pass-bys. These were:

- truck under engine brakes
- heavy truck full throttle.

The model was set to implement ISO9613[3] calculation methodology, with Ground Absorption as per Table 4.4 and a source height of 4 m above ground to account for the typical height of a truck exhaust. The model assumes all the sound power is located at a single point and assumes spherical propagation, rather than a cylindrical to account for the single vehicle being the source of noise, rather than continuous flowing traffic. The assumed sound power spectrum for the truck has been taken from the WSP Reference Library, with measurements of four engine braking pass-by events averaged to determine the input.

The sleep-disturbance assessment has been prepared for the preferred alignment only and is addressed within Section 9.2 of this assessment.

4.3.5 CONSTRUCTION VIBRATION

The risk of damage to buildings and structures due to vibration arising from the construction of the project will be assessed via desktop calculations and will be largely dependent on the proximity of sensitive receptors to construction activities. Pre-construction structural condition assessments and ongoing vibration monitoring would provide the basis for managing potential structural damage to sensitive buildings/structures.

---

2 Environmental Noise Management Manual 2001

3 ISO9613-2:1996 - Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation

Vibration assessments are typically prepared during construction phases, where detailed knowledge of construction plant and equipment are understood. The vibration component of the noise and vibration impact assessment pertains to desktop calculations and mitigation only. Vibration assessments are recommended to occur during the construction phase. As construction vibration impacts are relative to all alignment options, they are resultantly addressed within Section 9.4 of this assessment.

4.4 MITIGATION

Mitigations for identified impacts were developed by discipline specialists in consultation with RRV. All identified mitigations developed for the project have been informed by specialist experience with proven feasible control measures for major civil infrastructure projects, industry best practice measures and regulatory measures defined by State, Commonwealth and International Standards and agreements.

Mitigations for the project were developed throughout the impact assessment process to inform the residual impacts of the preferred alignment defined in Section 9.

4.5 OPTIONS ASSESSMENT

The alignment refinement for the Beaufort Bypass has been undertaken in three distinct phases since project inception. These are discussed in EES Attachment IV: *Options assessment* as:

- Phase 1 – Concept alignment development
- Phase 2 – Option development and assessment
- Phase 3 – Identification of preferred alignment.

This options assessment method section considers the Phase 3 assessment and details the process for selection of the preferred alignment.

The Phase 3 assessment considered four alignment options to select the preferred alignment, utilising a customised comparative options assessment to rank each option against the following areas:

- biodiversity
- catchment values and hydrology
- cultural heritage (Aboriginal and historic)
- social and community
- amenity
- landscape and visual.

Multiple scoring scenarios and sensitivity testings were undertaken against each option to ensure the environmental, social, heritage and economic assessment criteria aligned with the EES evaluation objectives. The scoring framework developed sought to ensure a holistic decision-making process was undertaken, and that no single scoring or sensitivity scenario would be the primary determining factor in the identification and selection of the preferred alignment.

Weightings for the assessment included the application of six scenarios and sensitivity tests to eliminate bias of specific environmental constraints. These scenarios included:

- Scenario 1: Apply a score of 1 to 4 from least to highest impact
- Scenario 2: Alignment with highest number of least impact scores
- Scenario 3: Apply a score of 1 to the highest impact and the subtract the percentage difference between alignments
- Scenario 4: Apply a score of 1 to least impact and then add the percentage difference between remaining alignments
- Scenario 5: As per Scenario 3, but minus criteria that can be mitigated
- Scenario 6: As per Scenario 4, but minus criteria that can be mitigated.

The sensitivity tests included:

- Scoring sensitivity scenario 1:
  - Options with the lowest impact and other options within 5% of the lowest impact are apportioned a score of one point and a green light.
  - Options within 5–20% of the lowest impact option are apportioned a score of zero points and an amber light.
  - Options with an impact of 20% or greater than the lowest impact option are apportioned a score of minus one and a red light.
- Scoring sensitivity scenario 2:
  - Options with the lowest impact and other options within 5% of the lowest impact are apportioned a score of one point and a green light.
  - Options within 5–25% of the lowest impact option are apportioned a score of zero points and an amber light.
  - Options with an impact of 25% or greater than the lowest impact option are apportioned a score of minus one and a red light.
- Scoring sensitivity scenario 3:
  - Options with the lowest impact and other options within 5% of the lowest impact are apportioned a score of one point and a green light.
  - Options within 5–15% of the lowest impact option are apportioned a score of zero points and an amber light.
  - Options with an impact of 15% or greater than the lowest impact option are apportioned a score of minus one and a red light.

The assessment process included an iterative process with RRV, the Technical Reference Group (TRG), legal and discipline specialists to refine the assessment environmental risk workshops and develop a customised assessment matrix. The suite of assessment criteria is detailed within EES Attachment IV: *Options assessment* (RRV 2019).

5 LEGISLATION, POLICY AND GUIDELINES

This section assesses the project against the Commonwealth and State legislation, policies and guidelines relevant to the noise and vibration assessment.

5.1 OPERATIONAL FRAMEWORK

There is no legislative framework in Victoria to address road operational noise. However, RRV has determined that noise impacts are required to be assessed to the VicRoads *Traffic Noise Reduction Policy* 2005 (VicRoads TNRP).
The Policy seeks to:

- reduce noise emitted by vehicles and road surfaces
- encourage compatible land uses next to major roads
- limit traffic noise from new arterial roads and roads upgraded to carry significantly more traffic
- retrofit noise barriers on older freeways.

The Policy applies to:

- arterial roads or freeways built on new alignments, OR
- improved arterial roads and freeways, when
  - the road is widened by two or more lanes

  AND
  - buildings previously protected from traffic noise are exposed by removal of buildings required for widening.

Noise mitigation (e.g. noise barriers) should be designed to achieve the noise level objectives shown in Table 5.1 or the level that would have prevailed if the road improvements had not occurred, whichever is the greater.

Table 5.1 VicRoads TNRP noise level objectives – new roads

	BUILDING TYPES	NOISE LEVEL OBJECTIVE
Category A	Residential dwellings, aged persons homes, hospitals, motels, caravan parks and other buildings of a residential nature	63 dBA, $L_{10,18Hour}$
Category B	Schools, kindergartens, libraries and other noise-sensitive community buildings	63 dBA, $L_{10,12Hour}$

Where the noise level adjacent to Category A or B buildings prior to road improvements is less than 50 dBA $L_{10,18Hour}$, consideration will be given to limiting the noise level increase to 12 dBA. This may apply to several properties in proximity to the proposed bypass options (see Section 6.1).

5.2 CONSTRUCTION FRAMEWORK

Airborne noise generated by construction activities would be managed in accordance with VRTG, which references applicable Australian Standards and EPA Guidelines, based on protecting sensitive areas such as residential premises from 'unreasonable noise'. In some instances, the guidelines/standards referenced in VRTG have been updated and/or superseded by a replacement document. For example, *EPA Publication 1834, Civil Construction, Building and Demolition Guide (November 2020)* replaces *EPA Noise Control Guidelines, Publication 1254, October 2008* (which replaced *Environment Protection Authority 1992, Noise Control Guidelines TG 302/92*) and *EPA Publication 480, Environmental Guidelines for Major Construction Sites (1996)*.

Construction noise is expected to be audible at times near the project. However, mitigation (whether physical or behavioural) can potentially be applied to reduce unreasonable impacts on sensitive areas near the proposed alignments.

5.2.1 CONSTRUCTION NOISE

Time periods and guideline noise levels applicable to construction noise set by VRTG are defined in Table 5.2. These are referenced from the following document:

- *EPA Civil construction, building and demolition guide 1834:* November 2020 (EPA 1834).

It is expected that construction of the project will comply with EPA publication 1834 and the VRTG.

Exceptions to specified construction work hours for unavoidable works must be approved by the EPA. Unavoidable works are works that cannot practicably meet the schedule requirements because the work involves continuous work (such as a concrete pour) or would otherwise pose an unacceptable risk to life or property or risk a major traffic hazard. Affected premises should be notified of the intended work, its duration and times of occurrence. In such cases the EPA must be consulted in accordance with EPA Publication 1834 and any necessary approvals sought for works outside of applicable hours.

Table 5.2 Time periods and guideline noise levels – major infrastructure activities

TIME PERIOD	APPLICABLE HOURS	GUIDELINE NOISE LEVELS, $L_{AEQ,15MIN}$	
		Up to 18 months	18 months or more*
Normal Working Hours	— 7:00 am to 6:00 pm Monday to Friday — 7:00 am to 1:00 pm Saturdays	No specified guideline noise level – noise reduction measures apply	
Weekend / Evening Work	— 6:00 pm to 10:00 pm Monday to Friday — 1:00 pm to 10:00 pm Saturdays — 7:00 am to 10:00 pm Sundays & Public Holidays	Noise level at any residential premises not to exceed background noise by 10 dB(A) or more	Noise level at any residential premises not to exceed background noise by 5 dB(A) or more
Night	— 10:00 pm to 7:00 am Monday to Sunday	Noise should not be above background levels inside any adjacent residence	

5.2.1.1 OTHER GUIDELINES

The VRTG and EPA Guidelines set out the following key procedures to reduce noise and disruption to residents:

- schedule potentially noisier works during daylight hours, where possible
- use the lowest noise work practices and equipment to meet the requirements of the job
- move construction works progressively along the corridor to make sure works are not isolated to one location for long periods of time

- site buildings, access roads and plant should be positioned such that the minimum disturbance occurs to the locality. Barriers such as hoardings or temporary enclosures should be used. The site should be planned to minimise the need for reversing vehicles
- all mechanical plant is to be silenced by the best practical means using current technology. Mechanical plant, including noise suppression devices should be maintained to the manufacturer's specifications. Internal combustion engines are to be fitted with a suitable muffler in good repair
- fit all pneumatic tools operated near a residential area with an effective silencer on their air exhaust port
- install less noisy movement/reversing working systems for equipment and vehicles that would operate for extended periods, during sensitive times or near sensitive sites. Occupational health and safety requirements of use of working systems must be followed
- turn off plant when not in use
- all vehicular movements to and from the site to only occur during the scheduled Normal Working Hours, unless approval has been granted by the relevant authority
- where possible, no truck associated with work should be left standing with its engine operational in a street adjacent to a residential area
- relocate residents at night if works are determined to be adversely impactful.

5.2.2 CONSTRUCTION VIBRATION

There are currently no legislative requirements with regards to permissible vibration levels due to construction activities within Victoria. Vibration criteria have been established based on German Standard DIN 4150-3:1999 *Structural Vibration, Part 3: Effect of vibration on structures*.

The allowable peak velocities during short-term vibration are presented in Table 5.3 based on these criteria. Note that the established criteria are only threshold values for initiation of cosmetic damage to buildings. Structural damage limits are generally significantly higher.

If the levels from DIN 4150 are exceeded, it does not necessarily follow that damage would occur. Therefore, if exceedances were predicted then further site-specific assessment would be required to determine if construction could proceed without damage.

Table 5.3 DIN 4150-3:1999 Guideline values for vibration velocities

TYPE OF STRUCTURE	GUIDELINE VALUES FOR VELOCITY AT FOUNDATION IN MM/S			
	1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz	Vibration at horizontal plane of highest floor at all frequencies
Listed/heritage buildings	3	3 to 8	8 to 10	8
Dwellings and buildings of similar design/ occupancy	5	5 to 15	15 to 20	15
Commercial/industrial buildings	20	20 to 40	40 to 50	40

Notes:

(1) At frequencies above 100 Hz, the values given in this column may be used as minimum values.

(2) Vibration levels slightly exceeding the vibration levels in the table would not necessarily mean that damage would occur.

(3) For buildings, short-term vibration is defined as vibration which does not occur often enough to cause structural fatigue, and which does not produce resonance in the structure being evaluated.

6 EXISTING CONDITIONS

Operational and construction activities have the potential to impact on a range of sensitive receptors near the proposed alignment options. The following sections present an overview of identified key sensitive receptors near the bypass options and within the township of Beaufort.

Each receptor may be impacted by noise and vibration to a different extent by the construction/operation of the project. Noise and vibration may be perceptible at sensitive receptors near the project as:

- **airborne noise:** noise propagated through the air from source to the receptors
- **ground-borne vibration (tactile vibration):** vibration propagated through the ground and into building structures.

Operational ground-borne vibration levels will not be determined as part of the existing conditions assessment, as they are expected to have minimal to no impact at all sensitive receptors. Construction vibration has been assessed at a high level for the EES using typical road construction plant and will be assessed in more detail by the construction contractor as part of the preparation of their CNVMP.

6.1 IDENTIFIED SENSITIVE AREAS

6.1.1 CATEGORY A BUILDINGS

The investigation area (project study area and identified sensitive receptors (Category A buildings) for the operational road noise assessment are presented in Figure 6.1. The town of Beaufort is excluded from the operational road noise assessment because it is outside the study area, Category A buildings (residential dwellings) have been identified on the outskirts of the town and within the nearby rural and farming zones.

The identified Category A buildings are currently exposed to noise from the following sources:

- road traffic noise from:
  - Western Highway (A8)
  - Beaufort-Lexton Road (C172)
  - local roads
- operational rail noise from the regional V-line service between Ararat and Melbourne
- noise from commercial and community infrastructure within Beaufort
- noise from agricultural machinery operated by local residents.

Sixty-nine (69) noise sensitive receptors have been identified for the purposes of the assessment.

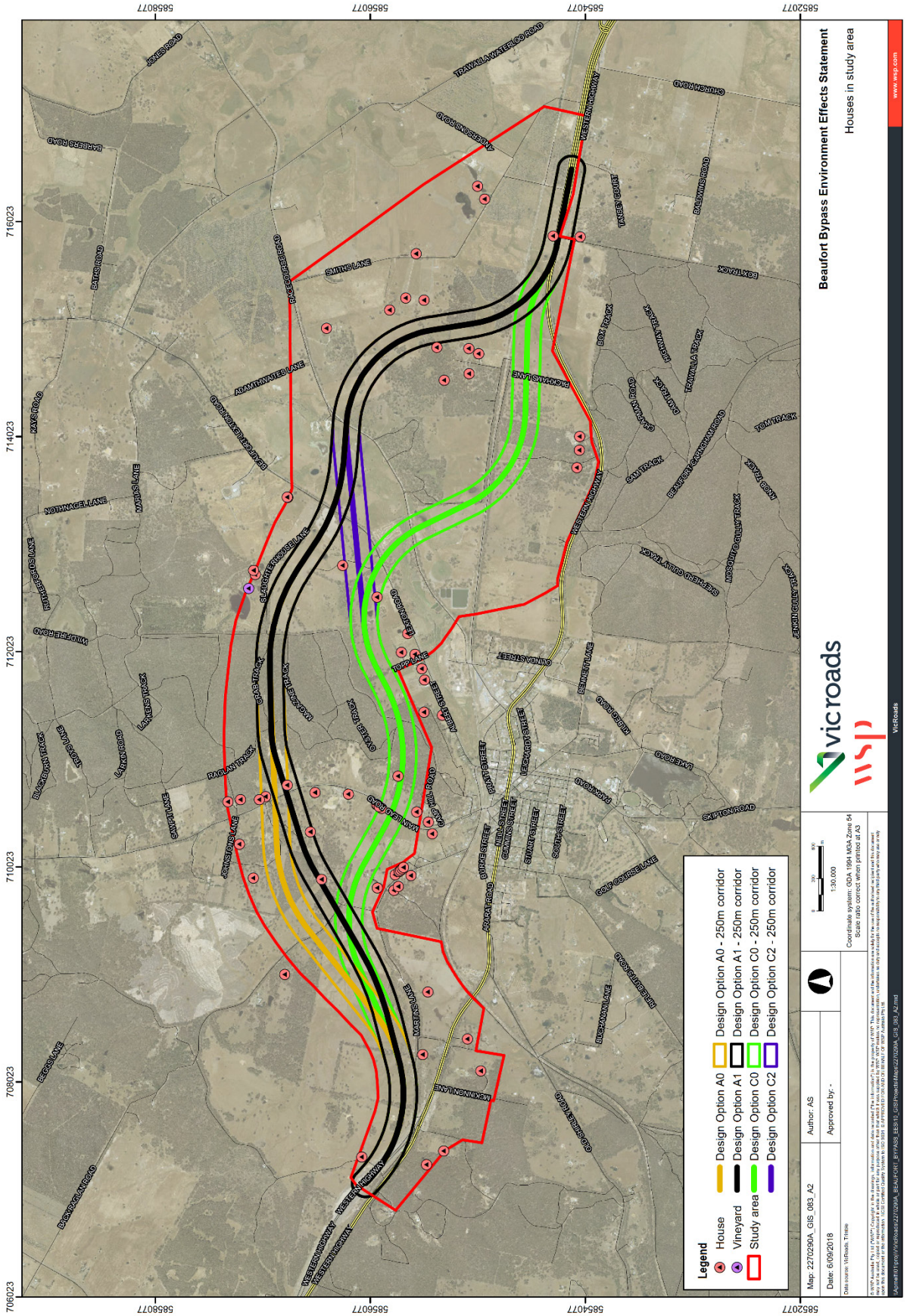


Figure 6.1 Investigation area and identified sensitive receptors for operational road noise assessment

6.1.2 CATEGORY B BUILDINGS

The following Category B buildings have been identified:

- Beaufort Primary School
- Beaufort Secondary College
- Elizabeth Watkin Kindergarten
- Beaufort Nursing Home
- Beaufort Aged Care Hostel.

The above buildings are located on the south side of the Western Highway (A8) and are within the town centre. These buildings are located outside the operational road noise assessment investigation area and are not subject to this component of the impact assessment.

6.2 NOISE MEASUREMENTS

6.2.1 RESIDENTIAL RECEPTOR MONITORING LOCATIONS

Unattended external noise measurements have been conducted at nine locations across the operational road noise assessment investigation area and are presented in Figure 6.2. The locations are identified in Table 6.1.

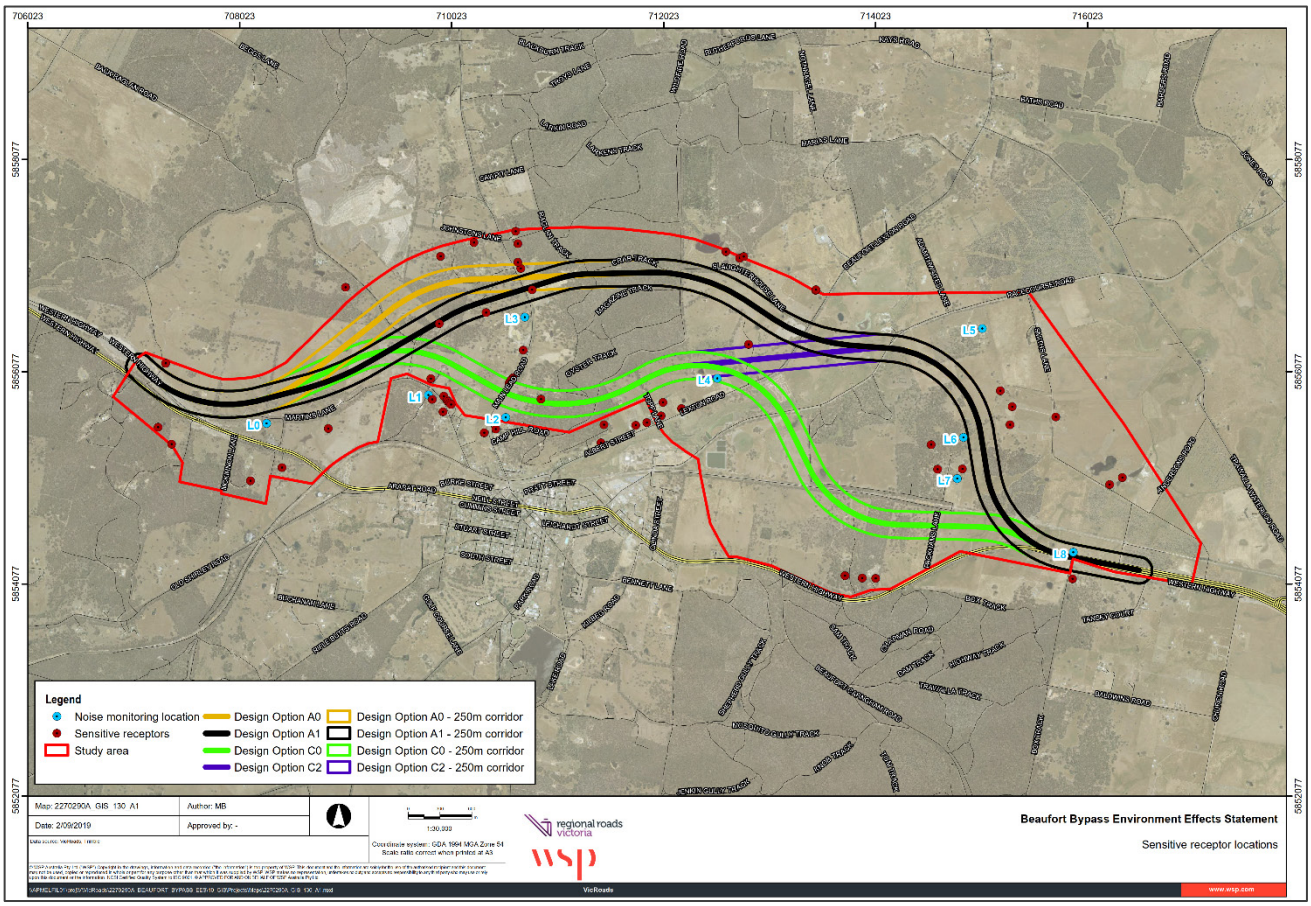


Figure 6.2 Noise monitoring locations

Table 6.1 Noise monitor IDs and locations

NOISE MONITOR ID	STREET
L0	Martins Lane
L1	Back Raglan Road
L2	Camp Hill Road
L3	Main Lead Road
L4	Beaufort-Lexton Road
L5	Racecourse Road
L6	Packhams Lane
L7	Packhams Lane
L8	Western Highway

Locations were nominally selected to represent the prevailing background conditions in that zone. The locations were strategically selected to:

- measure noise levels at sensitive receptors near the proposed alignments and determine the existing noise levels for the purposes of assessing operational road traffic noise in accordance with VicRoads TNRP. The primary parameter to be measured for these receptors was the $L_{10,18Hr}$ in accordance with VicRoads TNRP
- measure existing background noise levels (L_{90}) near proposed construction work for the alignments, to determine the guideline noise levels for construction outside of Normal Working Hours in accordance with VRTG.

Noise loggers were deployed for a period of approximately two weeks during each deployment over the following dates:

- 8 to 18 December 2017
- 16 April 2018 to 1 May 2018.

Details of the noise monitoring results including the hourly values and the $L_{Aeq,16hr}$, $L_{Aeq,15hr}$, $L_{Aeq,9hr}$ and $L_{Aeq,8hr}$ parameters are provided in Appendix A.

Appendix A shows a detailed map of each logger location, a photo of the logger in-situ and the hourly statistical values recorded by each logger. Hourly results were compared against weather data from the closest meteorological stations (Ararat and Ballarat) to determine potential influence on the results. Weather data is presented in Appendix B.

Data that have been excluded for the assessment due to non-conducive weather conditions are highlighted in Appendix A for reference. All remaining data is deemed statistically valid for assessment purposes.

6.2.1.1 IN-TOWN MONITORING LOCATIONS

Unattended external noise measurements have been conducted at four locations within the township of Beaufort and are presented in Figure 6.3. All the locations are listed in Table 6.2 and are positioned along the Western Highway.

Table 6.2 Beaufort Town centre noise monitor IDs and locations

NOISE MONITOR ID	STREET
L-A	Ararat Road
L-B	Neill Street
L-C	Neill Street
L-D	Neill Street

Figure 6.3 Noise monitoring locations in the township of Beaufort

Locations were nominally selected to represent the prevailing background conditions in that zone. The locations were strategically selected to:

- measure noise levels at sensitive receptors positioned within the township of Beaufort and determine the existing noise levels for the purposes of assessing changes in operational road traffic noise in accordance with VicRoads TNRP as a result of the project. The primary parameter to be measured for these receptors was the $L_{10,18Hr}$ in accordance with VicRoads TNRP.

Noise loggers were deployed for a period of approximately two weeks during each deployment over the following dates:

- 9 to 24 July 2018.

Details of the noise monitoring results including the hourly values, relevant traffic noise parameters and additional details are provided in Appendix A. Weather data is presented in Appendix B.

6.2.2 NOISE MEASUREMENT RESULTS

Full results of the monitoring are presented in Appendix A and summarised in Table 6.3.

Table 6.3 Existing noise levels

MONITORING LOCATION	MEASURED NOISE LEVEL, dBA			
	$L_{10,18h}$	$L_{90, Day}$	$L_{90, Evening}$	$L_{90, Night}$
L0	57	43	43	34
L1	44	34	33	27
L2	49	38	37	32
L3	49	34	33	29
L4	50	36	36	31
L5	40	30	28	24
L6*	49	38	37	32
L7	41	31	29	25
L8	66	42	42	34

Notes:

**L6 was not used for developing PONLs due to excessive extraneous noise recorded during monitoring*

The results of the measurements have been presented, and they indicate that most locations have noise levels below 50 $dBL_{A10,18hr}$. A total of two locations were measured to have existing noise levels above 50 $dBL_{A10,18hr}$, up to 66 $dBL_{A10,18hr}$.

6.2.2.1 IN-TOWN MEASUREMENT RESULTS

Full results of the monitoring are presented in Appendix A and summarised in Table 6.4.

Table 6.4 Existing noise levels – In-town measurement results

MONITORING LOCATION	MEASURED NOISE LEVEL, dBA			
	$L_{10,18H}$	$L_{90, DAY}$	$L_{90, EVENING}$	$L_{90, NIGHT}$
L-A	71	46	46	39
L-B	72	48	44	36
L-C	71	55	51	43
L-D	67	48	42	37

The results of the measurements have been presented, and they indicate that most locations have noise levels above 70 $dBL_{A10,18hr}$.

6.2.3 PROJECT OBJECTIVE NOISE LEVELS

The PONLs are summarised in Table 6.5. These PONLs are appropriately zoned along the proposed alignment options and represented graphically in Figure 6.4. Sensitive receptors near the indicated PONLs will have the same PONLs. The criteria to establish PONLs was drawn from *Appendix D* in *Road Design Note 06-01 – Interpretation and application of VicRoads Traffic Noise Reduction Policy*. Note that the PONL is set to limit the increase noise to 0 dB but in practice attenuate to +2 dB relative to the existing noise levels, where the existing levels are already above 63 dBA. Noise from the proposed bypass, including ramps, shall be considered for the assessment against the established PONLs. Existing roads are not upgraded to qualify for noise mitigation under the TNRP, and hence are not included in the assessment.

Table 6.5 Project objective noise levels

MONITORING LOCATION	MEASURED NOISE LEVEL, dBA $L_{10,18h}$	CRITERIA TO ESTABLISH PONL	PONL, dBA $L_{10,18h}$
L0	57	63 $dBL_{A10,18h}$	**63**
L1	44	Limit to +12 dB above existing	**56**
L2	49	Limit to +12 dB above existing	**61**
L3	49	Limit to +12 dB above existing	**61**
L4	50	63 $dBL_{A10,18h}$	**63**
L5	40	Limit to +12 dB above existing	**52**
L6	49	Limit to +12 dB above existing	**61**
L7	41	Limit to +12 dB above existing	**53**
L8	66	Limit to +2 dB above existing	**68***

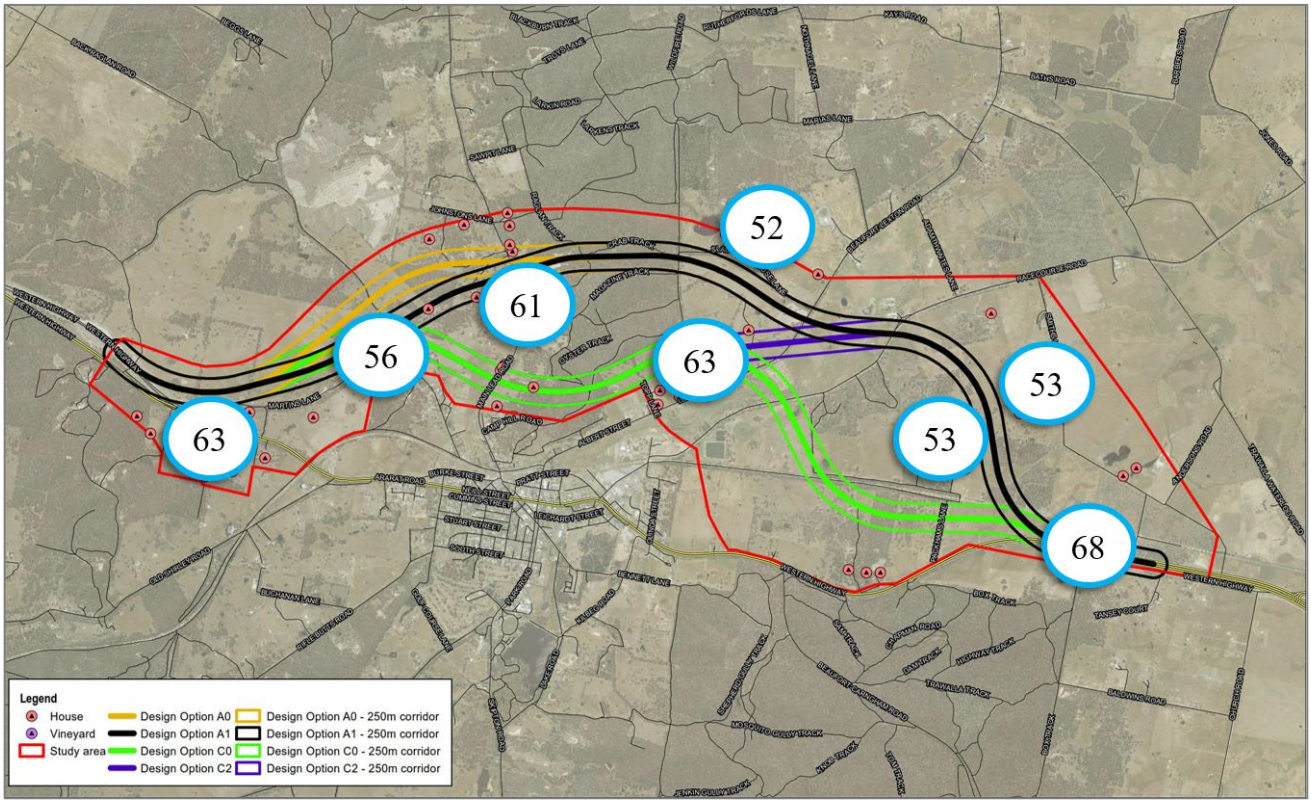


Figure 6.4 Beaufort Bypass PONLs

7 IMPACT ASSESSMENT – FOUR ALIGNMENT OPTIONS

7.1 PREDICTED NOISE LEVELS – UNMITIGATED

Modelled noise levels associated with the Beaufort Bypass alignment options **without noise mitigation** are presented in Appendix C. These results show that the noise levels exceed the requirement of VicRoads TNRP and noise mitigation measures will therefore be required. Table 7.1 summarises the predicted number of residential properties within the operational road noise investigation area (as outlined in Figure 6.1) that exceed the target PONLs.

Note that one Category A building is within the proposed alignment corridor for the C options, and hence this property is expected to be acquired should the C options be preferred. Therefore, this property is excluded from the assessment for the C0 and C2 options.

A map of the identified noise sensitive receivers is presented in Appendix E.

Table 7.1 Predicted unmitigated road traffic noise levels from the project

TARGET PONL dBA $L_{10,18HR}$	PREDICTED NUMBER OF RESIDENTIAL PROPERTY EXCEEDANCES			
	Option A0	Option A1	Option C0	Option C2
52	3	3	1	1
53	9	9	7	7
56	6	7	12	12
61	3	2	5	5
63	1	1	1	1
68	1	1	1	1
ALL	**23**	**23**	**27**	**27**

Each of the proposed alignment options will have varying impact on Category A buildings, due to their proximity to the road. The outcome of the assessment and design for potential noise mitigation may vary significantly, as efficiencies of mitigation (e.g. noise barriers vs. Off-Reservation Treatment (ORT)) will differ based on the chosen alignment. For example, if Option C0 were chosen, then the proximity of the road from Category A buildings (e.g. Beaufort-Lexton Road) can justify the requirement to construct noise barriers to mitigate noise to several properties. Conversely, if Option A0 or Option A1 were the preferred option, noise barriers may be assessed as inefficient and expensive method of reducing road traffic noise to a select few isolated properties. In these cases, ORTs (e.g. improved glazing for the most impacted habitable rooms) may be favoured, with RRV endorsement.

7.2 NOISE MITIGATION

Exceedances predicted for each of the unmitigated alignment options range between 23 and 27 sensitive receptors. A combination of the following noise mitigation solutions are recommended to meet the PONLs at all identified sensitive receptors within the investigation area (refer to Figure 6.1):

- **Lower noise road surface (surface correction):** 7 mm spray seal.

  Initial pavement treatments recommended a 10 mm spray seal, which is a typical pavement treatment for high speed rural environments. A disadvantage of the 10 mm spray seal is the higher road/tyre noise compared to smaller aggregate sizes. To reduce overall road/tyre noise impacts, a 7 mm spray seal is recommended for the road surface as this will provide a 2 dB overall reduction of noise emissions over the proposed 10 mm spray seal. Refer to Section 4.3.2.1 for information on road surface noise corrections.

- **Noise barriers:** up to 4 m in height.

  2 m high noise barriers are recommended for development as this provided an efficient option for mitigating road traffic noise prior to considering ORT at selected properties. 4 m high noise barriers were explored but were predicted to perform marginally better and if built, may add significant costs to the design and construction budget with the double of surface area worth of materials, more robust structural design for wind loading and for intensive civil works for deeper footings.

  Earth berms have not been ruled out as a mitigation measure for the final design. Noise barriers have been proposed and modelled for the assessment as they are a more effective means of mitigating road traffic noise (refer to Section 4.3.2.4). Additionally, noise barriers can be constructed immediately adjacent to the roadway and therefore can be built to break line of sight from source to receiver at shorter heights than earth berms in sections of fill. Earth berms must be built taller (and therefore use more soil) to match the relative noise barrier height in these locations.

- **Off-Reservation Treatments** (refer Section 7.2.1).

The above mitigation solutions apply to all four bypass alignments.

Predicted noise levels in the form of noise contours for the future bypass options including the proposed noise mitigations are presented in Appendix C.

Table 7.2 summarises the noise mitigation treatments required to meet the PONLs at all identified sensitive receptors for each of the four alignment options. The extent of noise barrier treatment (2 m high barriers) and residual exceedances are graphically presented in the following figures:

- Figure 7.1: Option A0
- Figure 7.2: Option A1
- Figure 7.3: Option C0
- Figure 7.4: Option C2.

Note, for completeness the ‘no barrier’, ‘2 m high barrier’ and ‘4 m high barrier’ results are also provided.

Tables of details results for all identified receptors have been provided in Appendix D. These tables provided present the predicted noise levels of each alignment option for the following scenarios:

- 2031 unmitigated traffic noise levels
- 2031 mitigated traffic noise levels (surface treatment only)
- 2031 mitigated traffic noise levels (surface treatment and 2 m noise barriers).

7.2.1 OFF-RESERVATION TREATMENT

In some situations, on-reservation traffic noise mitigation (e.g. surface treatments and noise barriers) is not considered to be reasonable or feasible to achieve PONLs at all sensitive receptors. In such instances, ORTs in the form of architectural acoustic treatments can be applied to individual noise sensitive buildings. Situations where ORT is applicable are as follows:

- noise barriers need to be unreasonably high/long to be effective, creating visual and structural design impacts
- terrain would require barriers to be unreasonably high to be effective (e.g. noise sensitive buildings are on a hill overlooking the road)
- noise sensitive buildings are a long way apart (e.g. greater than 50 m, such as in a rural or semi-rural environment), provoking noise barrier design to be excessive in length to mitigate a small number of receptors
- the combination of road surface treatments and reasonable noise barrier design are not enough to achieve the PONL at an individual sensitive receptor.

The following architectural treatments are then considered:

- acoustic seals to doors and windows on the façade where an excess to the PONL has been identified (e.g. habitable room facing the project alignment)
- closing/sealing of air vents and eaves
- alternative fresh air ventilation to meet the requirements of the Building Code of Australia (BCA) with the windows and doors shut. Air conditioning should be suitable to provide fresh air ventilation without openings which would undermine the sound insulation of the façade
- replacement of any external hollow core doors, on the façade where an excess to the PONL has been identified, with solid core doors (with threshold and perimeter door seals)
- upgrade glass doors and windows including frames, on the façade where an excess to the PONL has been identified, to incorporate laminated glazing or double-glazing units (DGUs) where applicable.

The extent of ORT is dependent on the following factors:

- the magnitude of exceedance above the PONL at the sensitive receptor
- the size and quantity of habitable rooms facing the project road alignment
- the structural/architectural condition of the property.

Specific ORT treatments can be realised once inspections have been conducted of the identified properties predicted to exceed PONLs following on-reservation mitigation.

Table 7.2 Proposed noise mitigation – four alignment options

DESIGN OPTION	NUMBER OF RECEIVERS EXCEEDING CRITERIA – NO MITIGATION	PROPOSED NOISE MITIGATION[1]					
		Roadside barriers details			Number of receivers exceeding criteria		
		Barrier ID	Length	Chainages[2] (start / end)	No barrier (surface treatment only)	2 m high barriers[3]	4 m high barriers
Option (A0)	23	A0-B1 A0-B2 A0-B3[3]	700 m 1,400 m 1,300 m	8700 / 9400 (Outbound) 2900 / 4300 (Inbound) 3100 / 4400 (Outbound)	17	9	9
Option (A1)	23	A1-B1 A1-B2 A1-B3	700 m 1,200 m 1,100 m	8700 / 9400 (Outbound) 3300 / 4500 (Outbound) 3400 / 4500 (Inbound)	13	12	11
Option (C0)	27	C0-B1 C0-B2	1,750 m 1,150 m	2650 / 4400 (Outbound) 3250 / 4400 (Inbound)	21	8	7
Option (C2)	27	C2-B1 C2-B2 C2-B3	700 m 1,750 m 1,150 m	8550 / 9250 (Outbound) 2650 / 4400 (Outbound) 3250 / 4400 (Inbound)	24	11	10

Notes:

(1) Proposed mitigation includes roadside barriers and lower noise road surface (i.e. 7 mm spray seal in lieu of 10 mm spray seal).

(2) 'Inbound' refers to traffic travelling towards Melbourne (heading East). 'Outbound' refers to traffic travelling away from Melbourne (heading West).

(3) Barrier 'A0-B3' is designed to be a 3 m high barrier under the '2 m High Barrier' Option.

As stated previously in this section, the '2 m high barrier' option has been chosen for development as this provided the most effective option for mitigating road traffic noise prior to considering ORT at selected properties.

Figure 7.1 Option A0 – Proposed mitigation and residual exceedances (2 m high barriers)

Figure 7.2 Option A1 – Proposed mitigation and residual exceedances (2 m high barriers)

Figure 7.3 Option C0 – Proposed mitigation and residual exceedances (2 m high barriers)

Figure 7.4 Option C2 – Proposed mitigation and residual exceedances (2 m high barriers)

8 OPTIONS ASSESSMENT AND PREFERRED ALIGNMENT SELECTION

The options assessment completed for the project assessed alignment options A0, A1, C0 and C2 against the customised set of criteria summarised in section 4.5. The results of the options assessment and sensitivity testing are detailed in Table 8.1. As well as the score for each alignment under each scenario, a colour coding has been applied to rank the performance of the options under each scenario as follows:

- best performing alignment option: Green
- second performing alignment option: Yellow
- third performing alignment option: Orange
- worst performing alignment option: Red.

Table 8.1 Combined alignment option scenario scoring

SCENARIO	ALIGNMENT A0	ALIGNMENT A1	ALIGNMENT C0	ALIGNMENT C2
Scenario 1	128	123	126	111
Scenario 2	18	22	20	27
Scenario 3	45.85	44.89	50.01	43.95
Scenario 4	81.03	77.59	93.98	74.12
Scenario 5	24.16	22.70	27.03	19.44
Scenario 6	47.74	42.69	56.16	35.49
Sensitivity Scenario 1	-6	-3	-5	9
Sensitivity Scenario 2	-3	2	-4	11
Sensitivity Scenario 3	-11	-6	-9	5

The alignment scoring scenarios outlined in Table 8.1 show that the best performing option is the C2 Alignment, while the worst performing options are the A0 and C0 Alignments. The primary drivers for this outcome were due to the C2 alignment having:

- the lowest amount of total native vegetation clearance
- the least impact on threatened vegetation communities identified under the *Environment Protection and Biodiversity Conservation Act 1999* and *Flora and Fauna Guarantee Act 1988*
- the least impact on wildlife corridors, particularly the core habitat areas
- the lowest amount of native vegetation with high conditions to be removed by Ecological Vegetation Class Conservation Status
- the lowest potential impacts on known or registered sites of Aboriginal and historic heritage significance
- the smallest number of dwellings within 100 m, 200 m and 300 m of the alignment corridor.

Further detail on the options assessment process is provided in the EES Attachment IV: *Options assessment*.

9 IMPACT ASSESSMENT – PREFERRED ALIGNMENT (OPTION C2)

This section provides an impact assessment specific to the preferred alignment, Option C2.

Impacts to noise and vibration that were assessed can be summarised into four categories:

- Airborne Noise: High levels of airborne operational traffic noise can adversely impact noise sensitive receivers.
- Airborne Noise: Sleep disturbance from heavy vehicles.
- Airborne Noise: High levels of airborne construction noise can adversely impact noise sensitive receivers.
- Vibration: Damage to buildings. High levels of vibration can cause damage to buildings or other property assets.

9.1 PREDICTED NOISE LEVELS – OPERATIONAL NOISE

9.1.1 UNMITIGATED AND MITIGATED RESULTS

The number of exceedances to sensitive receptors predicted for the C2 alignment without noise mitigation treatment is 27 (see Table 9.1). Without mitigations, the impact of operational noise impacts is high. Noise mitigation solutions are recommended to meet the PONLs at all identified sensitive receptors, which include:

- lower noise road surface (surface correction), 7 mm spray seal
- noise barriers, up to 4 m in height
- Off-Reservation Treatments (ORTs) (where reasonable on-reservation treatments have been explored).

Table 9.1 summarises the predicted unmitigated and mitigated noise levels for the identified houses exceeding the PONLs, demonstrating the improvements made with each iterative mitigation option. Where residual exceedances have been identified, the text is highlighted as red. A map of the identified noise sensitive receivers (House ID) is presented in Appendix E.

Table 9.1 Predicted noise levels for Option C2 (unmitigated vs. mitigated)

PREDICTED NOISE – YEAR 2031, dBA L10, 18 HR FAÇADE REFLECTED LEVELS (+2.5 dB TO FREE-FIELD LEVELS)					
House ID	**PONL**	**Unmitigated**	**Surface treatment only**	**Surface treatment + 2 m barriers**	**Surface treatment + 4 m barriers**
15	**56**	59	57	57	57
16	**56**	59	57	56	55
17	**56**	65	63	59	57
18	**56**	63	61	61	61
22	**61**	65	63	60	56
24	**61**	68	66	61	57
25	**61**	67	65	60	57
26	**61**	67	65	60	57
27	**61**	66	64	59	56
38	**63**	65	63	63	63

PREDICTED NOISE – YEAR 2031, dBA L10, 18 HR FAÇADE REFLECTED LEVELS (+2.5 dB TO FREE-FIELD LEVELS)					
House ID	**PONL**	**Unmitigated**	**Surface treatment only**	**Surface treatment + 2 m barriers**	**Surface treatment + 4 m barriers**
39	**52**	59	57	57	57
46	**53**	55	53	52	50
48	**53**	62	60	56	54
49	**53**	64	62	57	54
50	**53**	66	64	59	57
52*	**53**	69	67	67	67
53	**53**	58	56	56	56
57	**68**	72	70	70	70
58	**53**	54	52	52	52
64	**56**	63	61	56	54
65	**56**	62	60	56	53
66	**56**	62	60	56	53
67	**56**	62	60	55	52
68	**56**	62	60	55	52
69	**56**	62	60	56	54
70	**56**	60	58	54	51
78	**56**	62	60	57	55
Exceedances		**27**	**24**	**11**	**10**

**House ID 52 is the logger position of 142 Packhams Lane. This position shall not be assessed against the PONL and the there is no identified Category A or B building at this location.*

The results show the following:

- Providing a surface treatment (from 10 mm to 7 mm spray seal) with no noise barriers slightly reduces traffic noise levels but is insufficient to meet the PONLs.
- The 2 m high noise barrier option significantly reduces the number of properties exceeding the PONLs, with a small number of properties requiring further ORT to achieve compliance. Excluding House ID 52, residual noise level exceedances ranged from 1 to 6 dB. It is recommended properties with residual exceedances are considered for ORT.
- The 4 m high noise barrier option provides the greatest reduction in properties exceeding the PONLs. However, this is of marginal benefit over the 2 m high noise barrier option, with only a further reduction of 1 property for the preferred alignment. In some cases, doubling the height of the barriers does not change the resultant noise levels, implying that there is minimal benefit for pursuing this option.

  It may be possible to achieve the PONLs at a handful of remaining exceedances (House IDs 17, 48, 49), with barriers exceeding 4 m in height, however this would impact on structural, civil and visual landscaping design and is an inappropriate solution to address noise levels at 3 isolated properties.

  It can be seen from Table 9.1 that the extent of the impact is widespread along the alignment, which would be a permanent high impact without mitigation. With conventional on-reservation mitigation options considered, the number of exceedances are reduced, but permanent exceedances remain at isolated areas along the entire alignment. For these exceedances, ORT is proposed to result in a low residual impact. Associated residual impacts are described in Section 11.1.1.

9.2 SLEEP DISTURBANCE ASSESSMENT

From the current traffic volumes (refer to Section 4.3.2.2), there will be more than one or two pass-by events for sensitive receptors per night, so the internal noise target was set at 55 dBA in accordance with the NSW ENMM (refer Section 4.3.4). Accounting for the reduction of sound from outside to inside a given house requires knowledge of the construction of the walls, roof, and glazing. As the construction of each property is not known and as each construction may differ, a difference of 10 dBA through an open window, as is commonly used, has been assumed for this assessment. The external maximum event noise level to be used as a criterion in this case is therefore **65 dBA L_{max}**.

9.2.1 MODELLING

Two scenarios were prepared in the SoundPLAN model to predict maximum event noise levels from truck pass-bys as discussed in Section 4.3.4. Figure 9.1 shows the four individual measurements of engine braking events (converted to sound power) and the average spectrum (red dashed line) used in the modelling. Table 9.2 shows the assumed sound power spectra of both trucks for comparison purposes.

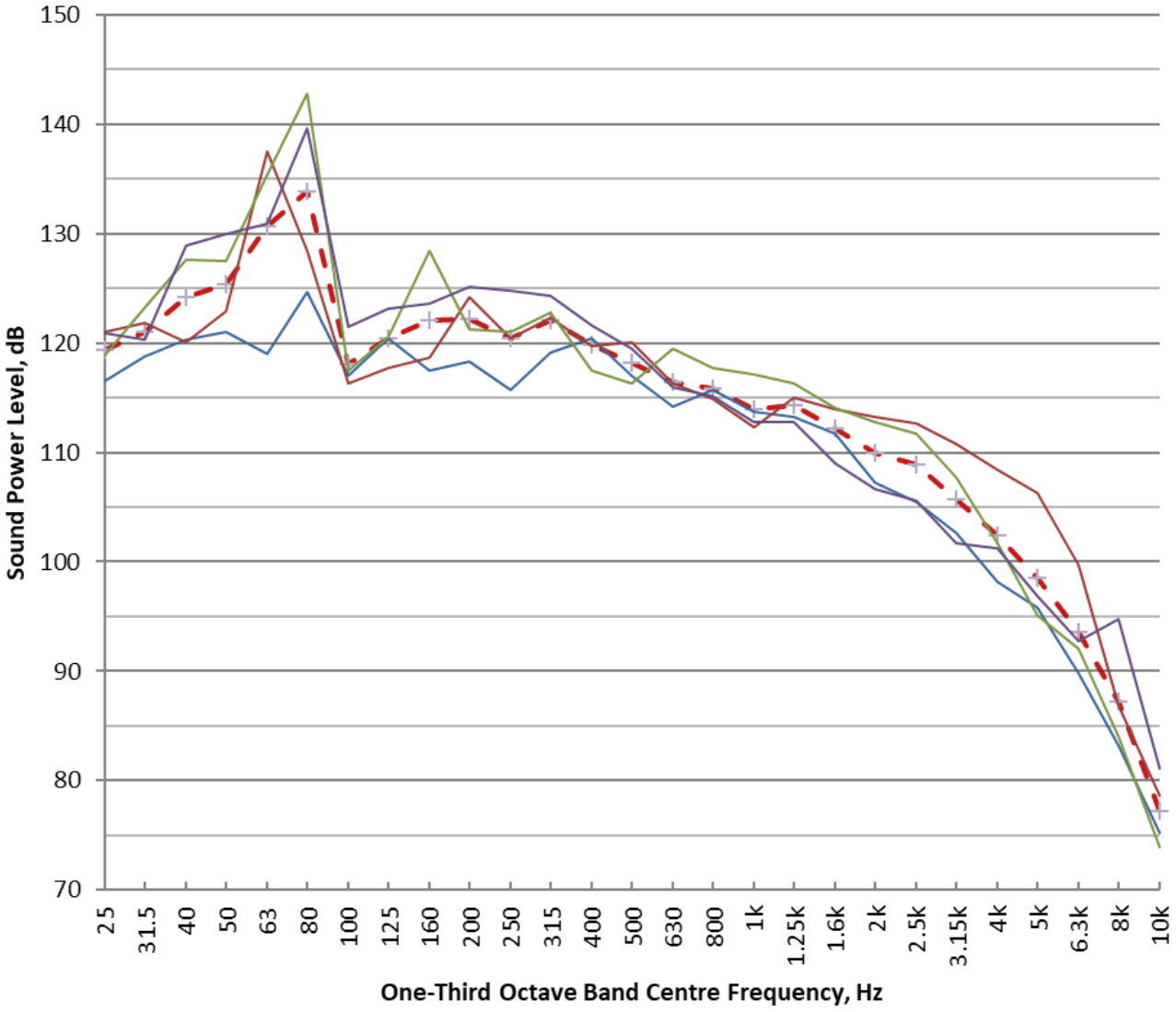


Figure 9.1 Truck noise under engine brakes – sound power spectrum

Table 9.2 Assumed sound power levels

	SOUND POWER LEVEL, dB OCTAVE BAND CENTRE FREQUENCY, HZ							
	Total (A)	**63**	**125**	**250**	**500**	**1K**	**2K**	**4K**
Truck noise under engine brakes – WSP measurement library*	125	136	125	126	123	120	115	108
Heavy Truck Full Throttle 60 mph average pavement – FHWA[4]	120	119	115	114	116	117	112	105

** Converted to octaves for comparison purposes only – model input values are in one-third octave bands*

The predicted L_{max} results for both truck scenarios are to be compared with the predicted 1-hour L_{eq} at that location. The 1-hour value has been calculated based on the CoRTN 1-hour methodology, with the traffic volumes from the lowest hour from the night-time traffic modelling (refer to Section 4.3.2.2 and Appendix G). A -3 dB correction has been applied to convert L_{10} to L_{eq} metrics, as is commonly accepted for road traffic noise sources – all other parameters are as per Section 4.3.2.

9.2.2 RESULTS AND ASSESSMENT

To account for the variability in the source, a sensitivity of +3 dB and -3 dB has been applied to the predicted results, with the resultant number of receivers above the criteria compared, a full set of results is presented in Appendix H. Table 9.3 presents a summary of the number of receivers above the criteria for surrounding sensitive receptors, including this variability. A sleep disturbance event is defined as per the ENMM, that is:

- above 65 dBA external L_{max}

  AND

- a difference of 15 dBA or more between the maximum noise levels and the one-hour L_{eq}

Table 9.3 Sleep disturbance assessment summary

SCENARIO	NUMBER OF RECEIVERS ABOVE CRITERIA	
	Engine brakes	**No engine brakes**
Reference value as modelled	9	1
Reference value +3 dB	22	7
Reference value -3 dB	1	0

The assessment indicates there is a potential impact for up to 22 sensitive receiver locations outside the town from truck engine braking. As the use of engine brakes is determined by the behaviour of the driver, the exact location of a noisy truck is subject to uncontrollable factors.

There are no cost-effective on-reservation mitigation options to control engine brake events, the predicted impacts are widespread and vary from high to low depending on the type of truck, location and associated noise levels during braking without mitigation. These are further discussed in Section 11.1.2.

[4] United States Federal Highway Administration Traffic Noise Model. Note that data at 60 mph is expected to be comparable (within 1 dB) at 110 kmph.

9.3 IN-TOWN TRAFFIC NOISE ASSESSMENT

9.3.1 MODEL CALIBRATION

The noise modelling carried out for the in-town assessment were calibrated as the focus of the assessment is based on the existing road network and the direct comparison between measured and predicted traffic noise levels.

The predicted free field traffic noise levels at the four in-town measurements locations (refer to Section 6.2.1.1) and the measured traffic noise levels are provided in Table 9.4. From these noise levels, the calibration factors have been determined which are also provided in Table 9.4.

Table 9.4 Measured vs. Predicted traffic noise levels (2018) and calibration factor

LOCATION	MEASURED $L_{10,18HR}$, dBA	PREDICTED $L_{10,18HR}$, dBA	CALIBRATION FACTOR
L-A	71	68	-3
L-B	72	72	0
L-C	71	71	0
L-D	67	67	0
Most Conservative Value (average of calibration factors)			**-1**

The most conservative calibration factor (average) has been used for the acoustic model. This is an increase to the predicted noise level of 1 dB.

9.3.2 TRAFFIC NOISE LEVEL PREDICTIONS

Table 9.5 summarises the calibrated modelled noise levels for the in-town traffic noise assessment, with comparison made to the measured results undertaken in July 2018 and the future 'project' and 'no project' scenarios for 2031.

Traffic volumes presented in Section 4.3.2 have been used in the model and based on the preferred alignment, Option C2.

Table 9.5 Predicted unmitigated road traffic noise levels for the township of Beaufort

SITE LOCATION (NO. – ADDRESS)	PREDICTED TRAFFIC NOISE LEVEL $L_{10,18HR}$, dBA				PREDICTED CHANGE IN NOISE LEVEL, dB (2018 VS 2031)	
	Measured existing (2018)	Predicted existing (2018)	Predicted future (2031 – project)	Predicted future (2031 – no project)	Project	No project
L-A	71	68	64	69	-4	1
L-B	72	72	66	73	-6	1
L-C	71	71	65	72	-6	1
L-D	67	67	64	68	-3	1

The results show the following:

- Should the project go ahead, the in-town noise levels are predicted to decrease by 3 to 6 dB from the 'Predicted (2018)' traffic noise levels once traffic is diverted onto the new bypass. This is a noticeable to significant perceived reduction in noise level and would be a positive outcome for the township.
- Should the project not proceed, the in-town noise levels are predicted to increase by approximately 1 dB from the 'Predicted (2018)' traffic noise levels. This is a low perceived increase in noise level and therefore would be considered a negligible to low impact on the township.

No mitigation is proposed to address the noise levels within the township of Beaufort.

Calibrated modelled noise levels associated with the new bypass and the predicted change in traffic noise **without noise mitigation** are presented on maps in Appendix C.

9.4 CONSTRUCTION NOISE AND VIBRATION

High-level predictions of construction noise and vibration have been undertaken to determine likely impacts and indicative controls for the project. The specific magnitude, extent and duration of impacts at the identified receptors can be quantified once a contractor is appointed and the formal construction programmed is developed.

9.4.1 NOISE LEVEL PREDICTIONS

Noise levels from construction activities are highly variable in character, duration and location. To determine the likelihood of adverse noise impacts from construction noise, calculations have been undertaken to determine typical levels from indicative construction scenarios. The scenarios and sound power levels assumed for the calculations are presented in Table 9.6. Sound power data have been gathered from *Construction Noise and Vibration Guideline – NSW Roads and Maritime Services* and *AS 2436: 2010 – Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites.*

Table 9.6 Construction scenarios and sound power levels

CONSTRUCTION SCENARIO	EQUIPMENT	SOUND POWER LEVEL L_W, dBA
Bulk earthworks	Bulldozer	116
	Scraper	110
	Excavator 35t	110
	Excavator + hydraulic hammer	122
	Grader	113
	Dump Truck	110
	Compactor	106
	Roller	109
	Water Cart	107
	Scenario Total	**124**

CONSTRUCTION SCENARIO	EQUIPMENT	SOUND POWER LEVEL L_W, dBA
Corridor clearing	Bulldozer	116
	Excavator	110
	Chainsaw	114
	Dump truck	110
	Scenario Total	**119**
Bridge Works (with driven piles)	Franna crane	98
	Piling rig driven	116
	Power gen	100
	Concrete pump	102
	Concrete truck	109
	Compressor	109
	Pneumatic hammer	115
	Welding	105
	Scenario Total	**120**
Paving	Pavement laying machine	114
	Dump truck	110
	Asphalt truck & sprayer	103
	Concrete truck	109
	Smooth drum roller	107
	Concrete saw	118
	Scenario Total	**121**

The total sound pressure level for each scenario was predicted at varying distances to produce Figure 9.2. The results provided are conservative as they do not account for local shielding, ground or atmospheric absorption.

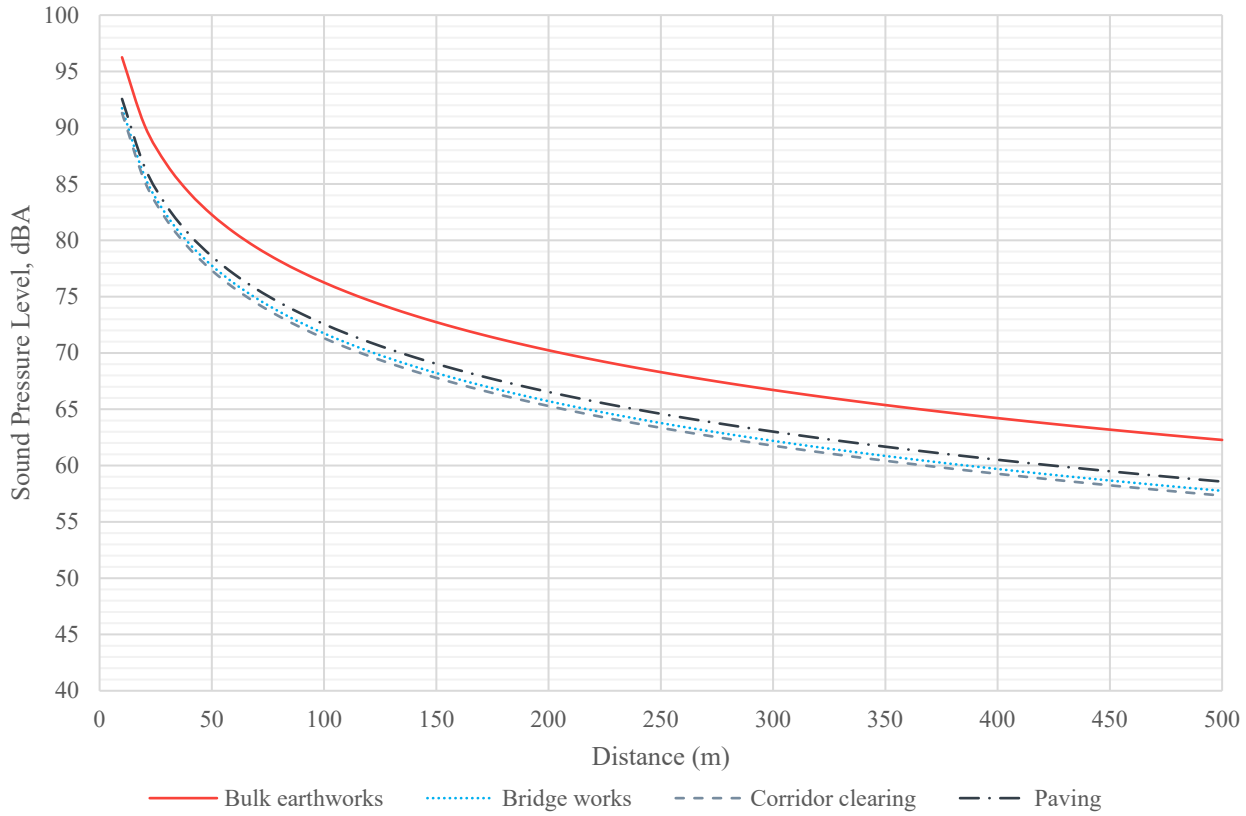


Figure 9.2 Construction noise per scenario over distance

Table 9.7 presents the predicted unmitigated noise levels at the closest identified receivers to the preferred alignment.

Table 9.7 Predicted unmitigated construction noise levels at nearest receivers to alignment C2

PREDICTED UNMITIGATED CONSTRUCTION NOISE – FREE FIELD SOUND PRESSURE LEVELS, dBA					
House ID	Distance from alignment C2, m	Construction scenario			
		Bulk earthworks	Bridge works	Corridor clearing	Paving
14	200	70	66	66	67
17	200	70	66	66	67
24	100	77	72	72	73
36	220	69	65	65	66
38	100	77	72	72	73
49	180	72	67	67	68
50	130	75	69	69	70
52	240	68	64	64	65
57	25	89	85	85	86
61	150	73	68	68	69
63	180	72	67	67	68

The results indicate that significant levels of noise may be encountered near construction activities (without mitigation). House ID 57 located 25 m from the alignment is predicted to experience the highest noise levels should these activities take place outside this location. Noise impacts without mitigation from construction will be high.

It is expected that some works during night-time periods may occur, where deemed 'unavoidable'. This may include continuous work that cannot be completed in regular working hours (e.g. concrete pour) or would otherwise pose an unacceptable risk to life or property or risk a major traffic hazard. In such cases, management actions should occur to manage impact and the relevant authority must be contacted and any necessary approvals sought in accordance with EPA Publication 1834. These unavoidable works are recommended to be indicated in the CNVMP to seek approval from relevant stakeholders.

Major infrastructure construction works have the potential to create widespread noise impacts for all sensitive areas across the alignment yet will be temporary and last only for the duration of the construction programme within each construction section. At times, these impacts will be localised to specific portions of the alignment where works are occurring. Without mitigation, noise impacts from construction will be high. With appropriate management and mitigation controls in place, the residual impact would be low to medium when works are nearby to sensitive areas. The specific extent would be known once a detailed construction programme is developed.

9.4.2 VIBRATION EFFECTS

The potential vibration impacts are expected to be predominantly associated with driven piling works, and vibratory compaction of ground surfaces. Vibration levels depend on several factors such as:

- source levels (based on equipment specs and operation mode)
- soil of properties in the investigation area
- coupling losses at soil-foundation interface
- internal building fabric and building type.

As general guidance, Table 9.8 provides guidance on safe working distances from dwellings for typical plant items (extracted from *NSW RMS Construction Noise and Vibration Guideline – August 2016*).

Table 9.8 Recommended minimum working distances from sensitive receivers for vibration intensive plant

PLANT ITEM	RATING/DESCRIPTION	MINIMUM WORKING DISTANCE (m)	
		Cosmetic damage	Human comfort
Vibratory roller	< 50 kN (Typically 1-2 tonnes)	5	15 to 20
	< 100 kN (Typically 2-4 tonnes)	6	20
	< 200 kN (Typically 4-6 tonnes)	12	40
	< 300 kN (Typically 7-13 tonnes)	15	100
	> 300 kN (Typically 13-18 tonnes)	20	100
	> 300 kN (> 18 tonnes)	25	100
Small hydraulic hammer	(300 kg - 5 to 12t excavator)	2	7
Medium hydraulic hammer	(900 kg – 12 to 18t excavator)	7	23
Large hydraulic hammer	(1600 kg – 18 to 34t excavator)	22	73
Vibratory pile driver	Sheet piles	2 to 20	20
Pile boring	≤ 800 mm	2 (nominal)	4
Jackhammer	Handheld	1 (nominal)	2

Note: More stringent safe working distances may apply to any heritage structures

Most of the receivers nearest to the C2 alignment are at minimum, located 100 m away and are therefore considered low risk for experience adverse vibration levels with respect to human comfort. It is anticipated that airborne noise levels from construction activities will be the dominant source of any intrusion caused (pre-mitigation efforts).

The extent of vibration impacts is considered localised to receivers that are close to the alignment (e.g. House ID 57). without mitigation, vibration impacts will be medium. However, these impacts will generally be short-term in nature and with the management and mitigation measures discussed in this section, the residual impacts are predicted to be low with respect to vibration. Further control options are provided in Section 11.2.

10 MITIGATIONS

10.1 OPERATIONAL NOISE

The number of exceedances predicted for the C2 alignment without noise mitigation treatment is 27. Noise mitigation solutions are recommended to meet the PONLs at all identified sensitive receptors, which include:

- lower noise road surface (surface correction), 7 mm spray seal
- noise barriers, up to 4 m in height
- Off-Reservation Treatments (ORTs) (where reasonable on-reservation treatments have been explored).

Section 9.1.1 presented the predicted unmitigated and mitigated noise levels for the identified houses exceeding the PONLs for the preferred Option C2, demonstrating the improvements made with each iterative mitigation option. The results showed the following:

- Providing a surface treatment (from 10 mm to 7 mm spray seal) with no noise barriers slightly reduces traffic noise levels but is insufficient to meet the PONLs without additional mitigation.
- The 2 m high noise barrier option significantly reduces the number of properties exceeding the PONLs, with a small number of properties requiring further ORT to achieve compliance. Excluding House ID 52, residual noise level exceedances ranged from 1 to 6 dB. It is recommended properties with residual exceedances are provided ORT.
- The 4 m high noise barrier option provides the greatest reduction in properties exceeding the PONLs. However, this is of marginal benefit over the 2 m high noise barrier option, with only a further reduction of 1 property for the preferred alignment. In some cases, doubling the height of the barriers does not change the resultant noise levels, implying that there is minimal benefit for pursuing this option. It may be possible to achieve the PONLs at a handful of remaining exceedances (House IDs 17 48, 49), with barriers exceeding 4m in height, however this would impact on structural, civil and visual landscaping design and is an inappropriate solution to address noise levels at 3 isolated properties.

Table 10.1 summarises the extent of noise barriers required to meet the PONLs at the identified sensitive receptors for the preferred alignment and demonstrates the extent of residual exceedances with each iterative mitigation option, as outlined above. The extent of the recommended noise barrier treatment (2 m high barriers with surface treatment) and residual exceedances are graphically presented in Figure 10.1.

Table 10.1 Proposed noise mitigation – Preferred Alignment (Option C2)

DESIGN OPTION	NUMBER OF RECEIVERS EXCEEDING CRITERIA – NO MITIGATION	PROPOSED NOISE MITIGATION[1]					
		Roadside barriers details			Number of receivers exceeding criteria		
		Barrier ID	Length	Chainages[2] (start / end)	No barrier (surface treatment only)	2 m high barriers	4 m high barriers
Option (C2)	27	C2-B1 C2-B2 C2-B3	700 m 1,750 m 1,150 m	8550 / 9250 (Outbound) 2650 / 4400 (Outbound) 3250 / 4400 (Inbound)	24	11	10

Notes:

(1) Proposed mitigation includes roadside barriers and lower noise road surface (i.e. 7 mm spray seal in lieu of 10 mm spray seal).

(2) 'Inbound' refers to traffic travelling towards Melbourne (heading East). 'Outbound' refers to traffic travelling away from Melbourne (heading West).

Figure 10.1 Option C2 – Proposed Mitigation and residual exceedances (2 m high barriers)

10.1.1 OFF-RESERVATION TREATMENT

In some situations, on-reservation traffic noise mitigation (e.g. surface treatments and noise barriers) is not considered to be reasonable or feasible to achieve PONLs at all sensitive receptors. In such instances, ORTs in the form of architectural acoustic treatments can be applied to individual noise sensitive buildings. Situations where ORT is applicable are as follows:

- noise barriers need to be unreasonably high/long to be effective, creating visual and structural design impacts
- terrain would require barriers to be unreasonably high to be effective (e.g. noise sensitive buildings are on a hill overlooking the road)
- noise sensitive buildings are a long way apart (e.g. greater than 50 m, such as in a rural or semi-rural environment), causing noise barrier design to be excessive in length to mitigate a small number of receptors
- the combination of road surface treatments and reasonable noise barrier design are not enough to achieve the PONL at an individual sensitive receptor.

The following architectural treatments are then considered:

- acoustic seals to doors and windows on the façade where an excess to the PONL has been identified (e.g. habitable room facing the project alignment)
- closing/sealing of air vents and eaves
- alternative fresh air ventilation to meet the requirements of the Building Code of Australia (BCA) with the windows and doors shut. Air conditioning should be suitable to provide fresh air ventilation without openings which would undermine the sound insulation of the façade
- replacement of any external hollow core doors, on the façade where an excess to the PONL has been identified, with solid core doors (with threshold and perimeter door seals)
- upgrade glass doors and windows including frames, on the façade where an excess to the PONL has been identified, to incorporate laminated glazing or double-glazing units (DGUs) where applicable.

The extent of ORT is dependent on the following factors:

- the magnitude of exceedance above the PONL at the sensitive receptor
- the size and quantity of habitable rooms facing the project road alignment
- the structural/architectural condition of the property.

Where ORT is installed for the control of average traffic noise levels, this will have a beneficial outcome for sleep disturbance, by increasing the noise level difference through the building envelope. However, ORT's may not be cost-effective to implement on all properties, especially when considering the uncertainties associated with the source noise levels during engine braking.

10.2 CONSTRUCTION NOISE AND VIBRATION

High-level predictions of construction noise and vibration have been undertaken to determine likely impacts and indicative controls for the project. The specific magnitude, extent and duration of impacts at the identified receptors can be quantified once a contractor is appointed and the formal construction programmed is developed. The following sections summarise the expected mitigation measures required to control construction impacts.

10.2.1 CONSTRUCTION NOISE CONTROL

Noise reduction at the source is the most effective way of controlling noise levels. Such measures include:

- selection of less noisy plant and equipment
- maximising offset distances between sources and sensitive receptors, where feasible
- regular maintenance of all plant and machinery
- localised shielding of stationary plant and equipment
- using site buildings as shielding, where possible
- ensuring all mufflers/silencers are in good repair
- use of non-tonal (broadband) reversing beepers
- during normal working hours
  - scheduling noisy activities for less sensitive times of the day
  - provide respite periods for noisier works
- scheduling quieter activities for evening/weekend periods
- minimising out of hours work, as far as practicable.

It is expected that some works during night-time periods may occur, where deemed 'unavoidable'. This may include continuous work that cannot be completed in regular working hours (e.g. concrete pour) or would otherwise pose an unacceptable risk to life or property or risk a major traffic hazard. In such cases, management actions should occur to manage impact and the relevant authority must be contacted and any necessary approvals sought. These unavoidable works are recommended to be indicated in the CNVMP to seek approval from relevant stakeholders.

The CNVMP shall be approved by RRV and relevant stakeholders, and would typically be expected to contain the following information:

- establishment of project-specific noise targets for construction
- a prediction of noise from each construction scenario
- an assessment of each scenario to the established targets
- mitigation measures to be implemented to control noise levels as far as practicable
- requirements for a noise monitoring regime whereby noise levels are measured and recorded
- highlight potential unavoidable evening and night works for seeking prior approval from relevant stakeholders including RRV and EPA.

Works not listed under CNVMP are recommended to be reviewed by the relevant stakeholders and authorities to approve prior to construction to ensure noise effects are adequately managed. Ongoing stakeholder management will be required for the project. The following actions will be implemented to minimise impact to the community:

- giving notice as early as possible for periods of noisier works and describing the activities and how long they are expected to take
- keep affected residents informed of progress
- appoint a principal contact person for community queries
- provide 24-hour contact details through letters and site signage
- record complaints and follow a complaint response procedure suitable for the scale of works
- ongoing monitoring during construction at sensitive receptors during critical periods to identify and assist in managing high risk noise events.

10.2.2 VIBRATION EFFECTS

Most of the receivers nearest to the C2 alignment are at minimum, located 100m away and are therefore considered low risk for experience adverse vibration levels with respect to human comfort. It is anticipated that airborne noise levels from construction activities will be the dominant source of any intrusion caused (pre-mitigation efforts).

It is recommended that active vibration monitoring occurs during major construction activities in the corridor that are in close proximity to sensitive receptors (e.g. within 25 m). House ID 57 is located 25 m away from the alignment and is recommended to have active monitoring during vibration intensive works.

A CNVMP will be developed to ensure that the impacts of construction vibration are minimised as far as practicable. These plans shall be approved by RRV and relevant stakeholders prior to construction works.

To manage risks of vibration impacts, the following additional controls should be implemented:

- dilapidation surveys
- vibration monitoring
- alternative methods and/or equipment
- specific consultation with residents/asset owners.

10.3 SUMMARY OF MITIGATIONS

A summary of mitigations is provided in Table 10.2 and will require incorporation into the EMF for the management of residual impacts. Detailed mitigation measures proposed for the project are summarised in the sections below.

Table 10.2 Summary of mitigations

NO.	MITIGATION	PROJECT PHASE
NV1d	Noise and vibration management according to EPA Guidelines	Pre-construction
NV2d	Noise and vibration management according to EPA Guidelines	Pre-construction
NV3d	Noise and vibration management according to EPA Guidelines	Earthworks
NV4d	Noise and vibration management according to EPA Guidelines	Earthworks
NV5d	Dilapidation surveys Consideration of additional protection for assets and buildings should be considered through external structural analysis, if required	Earthworks
NV6d	Noise and vibration management according to EPA Guidelines	Construction
NV7d	Noise and vibration management according to EPA Guidelines	Construction

NO.	MITIGATION	PROJECT PHASE
NV8d	Dilapidation surveys Consideration of additional protection for assets and buildings should be considered through external structural analysis, if required	Construction
NV9d	— Alternative Road Surface (7 mm spray seal) — Noise barriers — Off-Reservation Treatments (ORT) to individual buildings such as: — fresh air ventilation treatments — upgraded windows/doors — upgrade window and door seals — sealing of wall vents.	Operation
NV10d	Noise and vibration management according to EPA Guidelines	Operation/Maintenance
NV11d	Noise and vibration management according to EPA Guidelines	Operation/Maintenance
NV12d	ORT to individual buildings such as: — fresh air ventilation treatments — upgraded windows/doors — upgrade window and door seals — sealing of wall vents.	Operation

11 RESIDUAL IMPACTS

The residual impacts following implementation of post-mitigation measures for the operational and construction phases are discussed below.

11.1 OPERATIONAL IMPACTS

11.1.1 OPERATIONAL NOISE

ORTs are recommended to be applied to the properties with residual exceedances, following reasonable on-reservation mitigation measures such as surface corrections and noise barriers. As presented in Table 4.10, typical architectural improvements made to houses can achieve 5 to 12 dB internal noise level reductions, which is appropriate given the residual exceedances ranges from 1 to 6 dB above the PONL.

The extent of ORT is dependent on the following factors:

- the magnitude of exceedance above the PONL at the sensitive receptor
- the size and quantity of habitable rooms facing the project road alignment
- the structural/architectural condition of the property.

Mitigation measures associated with ORT are summarised in Section 10.1.1.

For properties with ORT, there may still be a residual impact on outdoor amenity. VicRoads Policy recognises that ORT does not protect against this impact.

Specific ORT treatments can be realised once inspections have been conducted of the identified properties predicted to exceed PONLs following on-reservation mitigation. The project should implement ORT to these properties prior to any construction work so that the residences would benefit from the internal noise reduction measures.

As discussed in Section 9.1.1, permanent exceedances remain at isolated areas along the entire alignment following the implementation of reasonable on-reservation mitigations such as noise barriers. For these remaining exceedances, with ORT, the residual impacts are negligible to low.

11.1.2 SLEEP DISTURBANCE AND IN-TOWN NOISE LEVELS

Noise from heavy vehicles may have effects on the sleep or residents, however determining this for any individual property or resident is difficult when the following elements are unknown:

- location of an engine braking event (road conditions, driver behaviour, etc)
- house/façade construction
- individual's response to noise.

Where ORT is installed for the control of average traffic noise levels, this will have a beneficial outcome for sleep disturbance, by increasing the noise level difference through the building envelope. However, ORTs may not be cost-effective to implement on all properties, especially when considering the uncertainties associated with the source noise levels during engine braking. The residual impact for these impacts is therefore considered moderate and would be widespread for the majority of properties along the alignment.

11.1.2.1 DISCUSSION AND IMPLICATIONS FOR TOWNSHIP

Engine brakes are a type of secondary braking system fitted to a heavy vehicle, designed to slow the vehicle on open roads, predominantly on downhill sections of road. Engine braking is a known cause of annoyance from trucks on highways, particularly as their use is intended for longer drives, to prevent overheating or excessive wear of the brake pads. Annoyance is due to the level of sound, spectrum shape (low frequency dominant) and character of noise (highly impulsive).

An assessment of the sleep disturbance for sensitive receptors around the township must also be balanced with the reduction in sleep disturbance for sensitive receptors within the township. From the modelled traffic volumes (refer to Appendix G), a difference in night-time traffic volumes in the town has been calculated and is presented in Table 11.1.

Table 11.1 Heavy vehicle traffic movements – Beaufort Township

	MODELLED NIGHT-TIME HEAVY VEHICLE MOVEMENTS		
	2017 (current)	**2031 (with project)**	**Difference**
West of Martins Lane Entrance (West of Beaufort)	438	194	-244
West of Smiths Lane (East of Beaufort)	422	189	-233

For the sensitive receptors within the Beaufort township, there is predicted to be a reduction of more than 230 vehicles per night passing through the town, compared to current night-time traffic volumes, assuming the project is built. This would likely reduce the number of sleep disturbance events per night for residents within the town. Furthermore, the lower speed limit within the town may currently be a cause of engine braking events as trucks slow before entering the town. This behaviour would also likely reduce due to construction of the project.

In relation to the in-town traffic noise assessment presented in Section 9.3, the township is predicted to experience a noticeable to significant perceived reduction in noise level and would be a positive outcome for the township.

11.2 CONSTRUCTION IMPACTS

Residual noise and vibration from construction activities may impact sensitive receivers. It is recognised that construction impacts are typically short term in nature. Where factors necessitate out-of-hours construction work, the residual impacts could be further controlled by the provision of alternative accommodation. Such a measure would require a detailed study to show that the predicted impacts from construction activity could not be controlled through other measures. This can be assessed and managed once a contractor is appointed and a detailed construction programme is developed.

A summary of residual impacts for both airborne noise and vibration associated with construction are provided below.

11.2.1 AIRBORNE NOISE

Major infrastructure construction works have the potential to create widespread noise impacts for all sensitive areas across the alignment yet will be temporary and lasts only for the relevant noise producing activities in the construction programme. At times, these impacts will be localised to specific portions of the alignment where works are occurring. With appropriate management and mitigation controls in place, the residual impact would be low to medium when works are nearby to sensitive areas.

11.2.2 VIBRATION

The extent of vibration impacts is considered localised to receivers that are close to the alignment (e.g. within 25 m such as House ID 57). However, the impacts generally short-term in nature and with the management and mitigation measures discussed in Section 9.4.2, the residual impacts are predicted to be low with respect to vibration.

12 CONCLUSION

A noise and vibration impact assessment has been carried out for the construction and operation of the project. The purpose of the impact assessment is to address the scoping requirements for the development of an EES.

Noise levels have been predicted for the future design year (2031) for four proposed alignments. The predicted noise levels indicate that noise levels are likely to exceed the project objectives, thereby requiring noise mitigation.

PONLs have been established in accordance with the VicRoads TNRP and Road Design Note 06-01 (RDN 06-01) for the proposed bypass alignment options. The following noise mitigation solutions have been considered to achieve the PONLs at all areas:

- lower noise road surface (surface correction), 7 mm spray seal
- noise barriers, up to 4 m in height. 2 m high barriers were chosen for the assessment
- Off-Reservation Treatments (ORTs).

The assessment indicates that the road design can achieve the PONLs through the design and implementation of noise mitigation along each of the four alignments, inclusive of ORT at a small number of properties. The extent of noise barrier treatment (2 m high barriers) and residual exceedances requiring ORT are graphically presented in the following figures in Section 7:

- Figure 7.1: Option A0
- Figure 7.2: Option A1
- Figure 7.3: Option C0
- Figure 7.4: Option C2.

The preferred alignment for the project is Option C2. Further details and assessment are presented in Section 9. In addition to operational traffic noise impacts and discussion on residual impacts, the following was assessed:

- Noise generated by construction activities would be managed in accordance with *VicRoads Technical Guidelines: Noise Guidelines - Construction and Maintenance Works 2007* (VRTG). Vibration will be managed in accordance with criteria based on Australian and international standards. At this stage, a high-level noise and vibration impact assessment from construction activities has been undertaken, however, it will be the responsibility of the successful construction contractor to prepare a CNVMP to address these potential impacts in detail.
- The assessment has also considered the predicted change in traffic noise levels within the township of Beaufort once the bypass is in operation. The results show that:
  - should the project go ahead, the in-town noise levels are predicted to decrease by 3 to 6 dB from the 'Predicted (2018)' traffic noise levels once traffic is diverted onto the new Bypass. This is a noticeable to significant perceived reduction in noise level
  - should the project not proceed, the in-town noise levels are predicted to increase by approximately 1 dB from the 'Predicted (2018)' traffic noise levels.
- An assessment of impacts from sleep disturbance has been undertaken and indicates there is a potential impact for up to 22 sensitive receiver locations outside the town from truck engine braking. As the use of engine brakes is determined by the behaviour of the driver, the exact location of a noisy truck is subject to many uncontrollable factors. Furthermore, it should be considered that trucks currently entering the town would likely use engine brakes to slow down. If the project were to proceed, the sleep disturbance impacts from trucks to sensitive receivers within the town would likely reduce.

13 LIMITATIONS

This Report is provided by WSP Australia Pty Limited (*WSP*) for Regional Roads Victoria (*Client*) in response to specific instructions from the Client and in accordance with WSP's proposal dated 2 September 2020 and agreement with the Client dated 10 September 2020 (Contract number 9383) (*Agreement*).

13.1 QUALIFICATIONS AND ASSUMPTIONS

The services undertaken by WSP in preparing this Report were limited to those specifically detailed in the Report and are subject to the scope, qualifications, assumptions and limitations set out in the Report or otherwise communicated to the Client.

Except as otherwise stated in the Report and to the extent that statements, opinions, facts, conclusion and/or recommendations in the Report (*Conclusions*) are based in whole or in part on information provided by the Client and other parties identified in the report (*Information)*, those Conclusions are based on assumptions by WSP of the reliability, adequacy, accuracy and completeness of the Information and have not been verified. WSP accepts no responsibility for the Information.

WSP has prepared the Report without regard to any special interest of any person other than the Client when undertaking the services described in the Agreement or in preparing the Report.

13.2 USE AND RELIANCE

This Report should be read in its entirety and must not be copied, distributed or referred to in part only. The Report must not be reproduced without the written approval of WSP. WSP will not be responsible for interpretations or conclusions drawn by the reader. This Report (or sections of the Report) should not be used as part of a specification for a project or for incorporation into any other document without the prior agreement of WSP.

WSP is not (and will not be) obliged to provide an update of this Report to include any event, circumstance, revised Information or any matter coming to WSP's attention after the date of this Report. Data reported and Conclusions drawn are based solely on information made available to WSP at the time of preparing the Report. The passage of time; unexpected variations in ground conditions; manifestations of latent conditions; or the impact of future events (including (without limitation) changes in policy, legislation, guidelines, scientific knowledge; and changes in interpretation of policy by statutory authorities); may require further investigation or subsequent re-evaluation of the Conclusions.

The Report does not purport to recommend or induce a decision to make (or not make) any purchase, disposal, investment, divestment, financial commitment or otherwise. It is the responsibility of the Client to accept (if the Client so chooses) any Conclusions contained within the Report and implement them in an appropriate, suitable and timely manner.

In the absence of express written consent of WSP, no responsibility is accepted by WSP for the use of the Report in whole or in part by any party other than the Client for any purpose whatsoever. Without the express written consent of WSP, any use which a third party makes of this Report or any reliance on (or decisions to be made) based on this Report is at the sole risk of those third parties without recourse to WSP. Third parties should make their own enquiries and obtain independent advice in relation to any matter dealt with or Conclusions expressed in the Report.

13.3 DISCLAIMER

No warranty, undertaking or guarantee whether expressed or implied, is made with respect to the data reported or the Conclusions drawn. To the fullest extent permitted at law, WSP, its related bodies corporate and its officers, employees and agents assumes no responsibility and will not be liable to any third party for, or in relation to any losses, damages or expenses (including any indirect, consequential or punitive losses or damages or any amounts for loss of profit, loss of revenue, loss of opportunity to earn profit, loss of production, loss of contract, increased operational costs, loss of business opportunity, site depredation costs, business interruption or economic loss) of any kind whatsoever, suffered or incurred by a third party.

APPENDIX A

NOISE MONITORING

A1 NOISE MONITORING

Noise loggers were deployed for a period of approximately two weeks during each deployment over the following dates:

- 08/12/17 to 18/12/17
- 16/04/18 to 01/05/18
- 09/07/18 to 24/07/18.

Measurements were in the free field and the microphone was located at 1.5 m above ground level in accordance with VicRoads' *Requirements for Acoustic Consultants*[2].

Details of the acoustic equipment used to conduct these measurements are provided in Table A.1 below. All acoustic equipment has current calibration certificates. Equipment was checked for calibration before and after each set of measurements.

Table A.1 Equipment details

MANUFACTURER	TYPE OF INSTRUMENT	SERIAL NUMBER
Acoustic Research Labs	EL-316	16-207-038
Acoustic Research Labs	EL-316	16-306-030
Acoustic Research Labs	EL-316	16-207-009
Acoustic Research Labs	El-316	16-207-008
Acoustic Research Labs	NGARA	8780CB
Acoustic Research Labs	El-316	16-207-014
Acoustic Research Labs	EL-316	16-707-006
Acoustic Research Labs	NGARA	8780D7
Acoustic Research Labs	EL-316	16-306-037
Acoustic Research Labs	NGARA	878005

Meteorological conditions during the measurement period have been extracted from the Ballarat, Pyrenees and Westmore Weather Stations for the assessment. The recorded meteorological conditions are presented in Appendix B. This information, in addition to subjective observations and the noise monitoring results, has been used to assess the impact of weather at all properties. As such, each of the hourly noise measurements has been assessed and judgement used to determine if it is affected by a weather event.

Where anomalous data is identified (i.e. where data is significantly different compared to adjacent times on the same day, or corresponding times on an adjacent day) and this does not appear to be due to road traffic noise, the measurements have been adjusted by one of the following averaging methods:

- averaging measurements taken at the same location on the previous and/or following days at the corresponding time or
- averaging measurements taken at the same location during the previous and following hourly measurements, on the same day.

It can be assumed that anomalous data (marked by an asterisk adjacent) is a result of poor weather as well as unverified noise sources. Field staff did note the following potential noise sources within the project boundary which may have caused the anomalous results:

- agricultural plant
- motor track (located at 250 Beaufort-Lexton Road)
- rail noise sources (e.g. train horns).

In compliance with VicRoads' *Requirements for Acoustic Consultants*[2] noise monitoring results have been presented at follows:

Where noise levels change as a result of an extraneous uncontrolled source, then measurements for the period (24 hour or 48 hour) shall be rejected if the extraneous noise lasts for more than 3 hours.

Where the extraneous source lasts for 3 hours or less, then the affected hourly measurements are to be rejected and derived descriptors presented. These shall be referred to, for example as $L_{10\ (18hr)\ adj}$ *or* $L_{eq\ (15hr)\ adj}$*. Reasons for rejection of any measurements shall be given.*

Site Details	171 Beaufort Lexton (712225.00,	**Microphone Position**	Open field condition
Start Date	Fri 08 December 2017		
End Date	Fri 15 December 2017		

Measurement Summary

Date	08/12	09/12	10/12	11/12	12/12	13/12	14/12	15/12
$L_{10,18Hr}$, dBA	52.5	52.1	56.7	57.7	56.9	50.6	56.6	57.9

Date	16/12	17/12	18/12	19/12	20/12	21/12	22/12	23/12
$L_{10,18Hr}$, dBA	53.8	52.0	58.6					

Site Map

Site Photo

Project No.		Date	18 December 2017	Sheet	2
Project Title	Beaufort Bypass	Engineer	MB / NI	Rev	1
Description	171 Beaufort Lexton			Type	LG

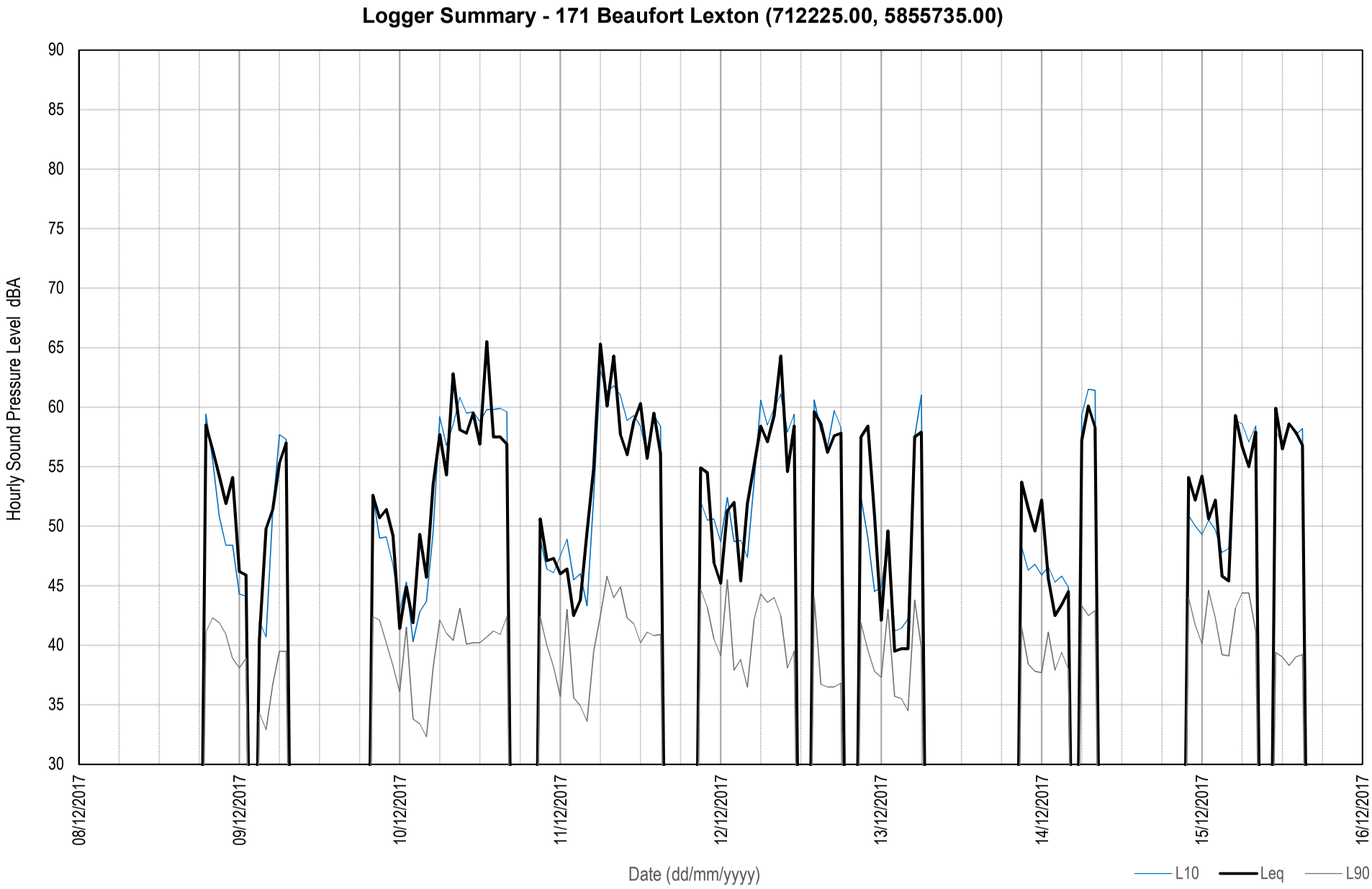
Logger Location	171 Beaufort Lexton (712225.00, 5855735.00)
Microphone Position	Open field condition

		Fri, 08 Dec 2017			Sat, 09 Dec 2017			Sun, 10 Dec 2017			Mon, 11 Dec 2017			Tue, 12 Dec 2017			Wed, 13 Dec 2017			Thu, 14 Dec 2017			Fri, 15 Dec 2017		
		L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}		L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}
Daily Averages	LA10,18h	52.5			52.1			56.7			57.7			56.9			50.6			56.6			57.9		
	LAeq,24h		52.2			48.5			56.7			57.3			56.7			48.7			50.8			54.1	
	LAeq,16h		52.0			48.5			58.2			58.7			57.7			47.3			51.4			54.6	
	LAeq,8h		49.6			48.9			49.0			51.7			52.8			48.0			53.7			52.5	
	LA90 Day						39.5						42.4			40.2						42.7			40.1
	LA90 Evening			41.8			42.3			41.1			44.7			39.4			41.5						
	LA90 Night			37.5			37.3			38.1			40.9			38.6			39.2			42.1			41.0
Hourly Values	00:00 to 01:00				44.3	46.2	38.1	42.9	41.4	36.1	47.5	46.0	35.7	48.7	45.2	39.1	44.9	42.1	37.3	45.9	52.2	37.7	49.3	54.2	40.1
	01:00 to 02:00				44.1	45.9	38.9	45.3	44.9	41.5	48.9	46.4	43.0	52.4	51.3	45.5	48.7	49.6	43.0	46.6	45.6	41.1	50.5	50.6	44.6
	02:00 to 03:00				44.1*	41.4*	35.2*	40.3	41.9	33.8	45.5	42.5	35.6	48.7	52.0	37.9	41.2	39.5	35.7	45.3	42.5	37.9	49.7	52.2	42.3
	03:00 to 04:00				42.0	40.5	34.3	42.8	49.3	33.4	46.0	43.8	34.9	48.8	45.4	38.8	41.4	39.7	35.5	45.8	43.4	39.4	47.8	45.8	39.2
	04:00 to 05:00				40.7	49.8	32.9	43.7	45.7	32.3	43.3	49.5	33.6	47.4	51.9	36.5	42.2	39.7	34.5	44.9	44.5	38.0	48.1	45.4	39.1
	05:00 to 06:00				51.3	51.4	36.7	49.5	53.5	38.1	52.5	54.9	39.5	53.7	55.1	42.1	57.5	57.5	43.8	52.8*	54.6*	40.2*	58.9	59.3	43.1
	06:00 to 07:00				57.7	55.3	39.5	59.2	57.7	42.1	63.1	65.3	42.5	60.6	58.4	44.3	61.0	57.9	39.8	59.3	57.2	43.3	58.6	56.7	44.4
	07:00 to 08:00				57.3	57.0	39.5	56.8	54.3	41.0	61.3	60.1	45.8	58.5	57.1	43.6	63.4*	59.7*	40.1*	61.5	60.1	42.5	57.1	55.0	44.4
	08:00 to 09:00				58.4*	57.5*	40.6*	58.5	62.8	40.4	61.8	64.3	44.0	59.9	59.3	44.0	64.5*	61.1*	50.3*	61.4	58.3	42.9	58.4	57.9	41.2
	09:00 to 10:00				63.8*	61.4*	44*	60.8	58.1	43.1	61.0	57.7	44.9	61.1	64.3	42.5	59.1*	57.2*	46*	62.1*	59.5*	43.3*	68*	69.9*	42.7*
	10:00 to 11:00				66.5*	62.9*	47.3*	59.5	57.8	40.1	58.9	56.0	42.3	57.9	54.6	38.1	60.7*	60.4*	44.2*	60*	58.1*	43.2*	64.2*	70.4*	39.4*
	11:00 to 12:00				66.4*	62.8*	47.3*	59.6	59.5	40.2	59.3	58.8	41.8	59.4	58.4	39.5	60.9*	62.6*	40.4*	71.2*	69.4*	43.7*	58.0	59.9	39.4
	12:00 to 13:00				65.8*	61.7*	46.6*	58.8	56.9	40.2	58.4	60.3	40.2	70.5*	69.3*	43*	61*	61.8*	42.3*	60.1*	58.3*	42.1*	56.9	56.5	39.0
	13:00 to 14:00	68.1*	78*	45.1*	64.9*	62*	45.5*	59.8	65.5	40.7	56.0	55.7	41.1	67.5*	63.3*	45.5*	54.1*	56.4*	39.8*	57*	55.8*	42.3*	58.6	58.6	38.3
	14:00 to 15:00	65.4*	64.8*	44.5*	64.8*	61.6*	45.3*	59.8	57.5	41.2	59.3	59.5	40.8	60.6	59.6	44.0	54.8*	54.8*	39.7*	58.2*	57.6*	43*	57.7	57.9	39.0
	15:00 to 16:00	66.4*	65.5*	45.1*	62.9*	59.9*	43.2*	59.9	57.5	40.9	58.4	56.1	40.9	58.0	58.6	36.7	57.9*	56.5*	37*	60.8*	58.1*	43.6*	58.2	56.8	39.2
	16:00 to 17:00	65.6*	62.6*	45.2*	62.4*	59*	43.4*	59.6	56.9	42.4	56.7*	57.9*	42.4*	56.7	56.2	36.5	57.1*	58.8*	39*	58.1*	57.5*	42.5*	57.9*	56.2*	38.3*
	17:00 to 18:00	66.5*	66.6*	45.9*	62.4*	62.4*	44.4*	60*	63.1*	44.3*	59.6*	57.5*	44.5*	59.7	57.6	36.5	56.6*	55.3*	36.8*	58.8*	56.7*	44.4*	57.8*	56.3*	38.1*
	18:00 to 19:00	62.4*	60.1*	43.7*	61.4*	62.7*	42.2*	57.3*	57*	41.6*	58.2*	55.4*	43.3*	58.3	57.8	36.8	51.8*	52.4*	36.1*	58.5*	59.3*	42.6*	64.4*	67.1*	40.5*
	19:00 to 20:00	59.4	58.5	41.1	57.2*	55.7*	41.2*	60.1*	59*	43.1*	56.6*	55.6*	43.7*	59.3*	57.3*	41.3*	55.8*	54.8*	38.7*	55.7*	57.8*	43.2*	65.8*	68.9*	44.6*
	20:00 to 21:00	55.6	56.5	42.3	52.5	52.6	42.4	53.6*	55.1*	44.3*	55.9*	57.9*	44.3*	60.2*	58.3*	44*	51.6*	56.5*	43*	54.4*	55.5*	44.2*	61.4*	63.9*	47.3*
	21:00 to 22:00	50.8	54.2	41.9	49.0	50.7	42.1	48.9	50.6	42.4	52.1	54.9	44.7	52.4	57.5	41.9	48.3	53.7	41.5	53.5*	58.2*	44.3*	61.6*	66.3*	44.9*
	22:00 to 23:00	48.4	51.9	40.9	49.1	51.4	40.2	46.4	47.1	40.0	50.5	54.5	43.2	49.0	58.4	39.6	46.3	51.5	38.4	50.9	54.1	44.0	67.1*	69.4*	45.2*
	23:00 to 0:00	48.4	54.1	38.9	46.8	49.2	38.3	46.1	47.3	38.2	50.6	46.9	40.5	44.5	50.8	37.8	46.8	49.6	37.8	50.0	52.2	41.7	65.5*	67.7*	42.6*

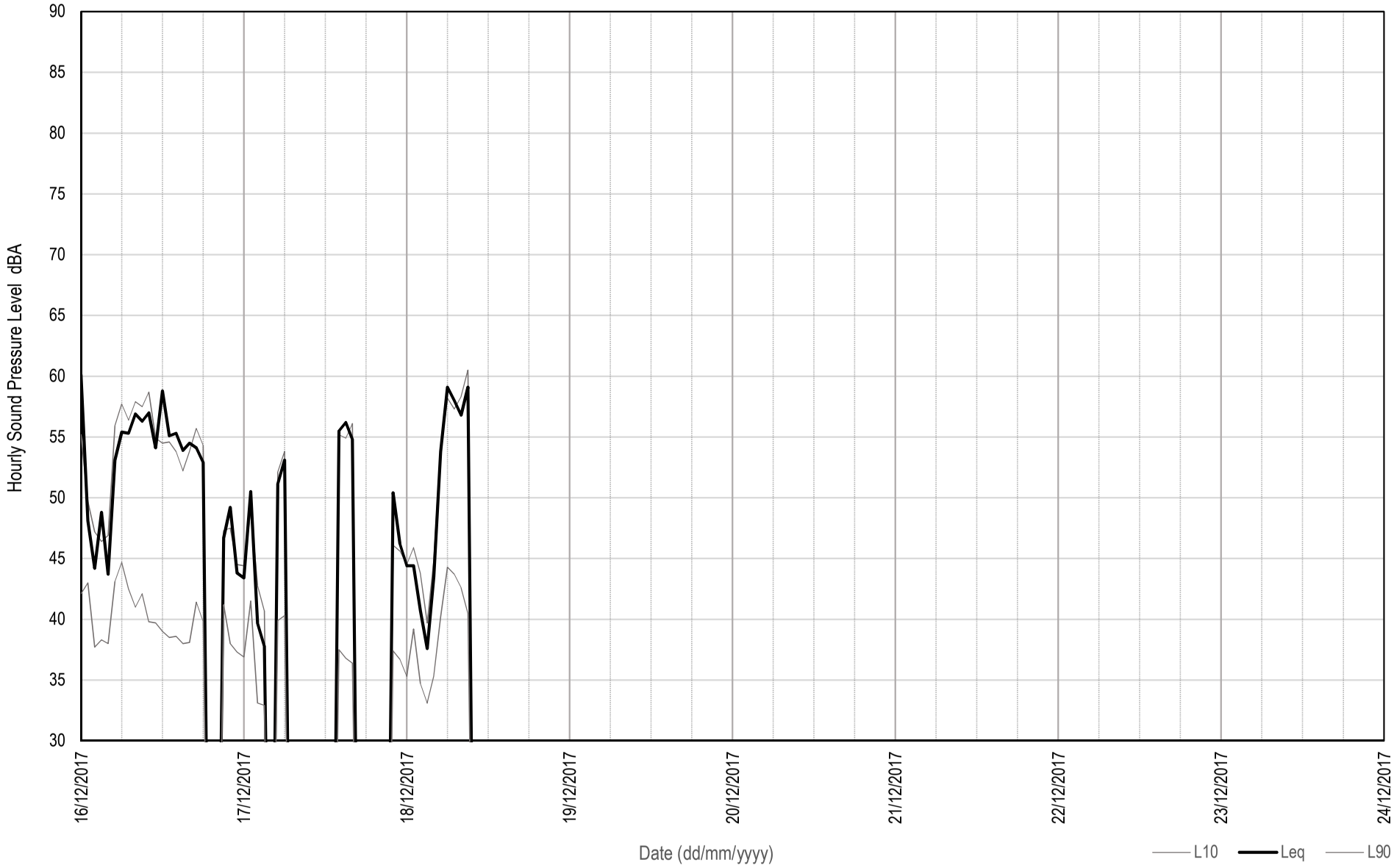
Project No.		**Date**	18 December 2017	**Shee**	3
Project Title	Beaufort Bypass	**Engineer**	MB / NI	**Rev**	1
Description	171 Beaufort Lexton			**Type**	LG

Logger Location	171 Beaufort Lexton (712225.00, 5855735.00)
Microphone Position	Open field condition

		Sat, 16 Dec 2017			Sun, 17 Dec 2017			Mon, 18 Dec 2017			Tue, 19 Dec 2017			Wed, 20 Dec 2017			Thu, 21 Dec 2017			Fri, 22 Dec 2017			Sat, 23 Dec 2017		
		L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}
Daily Averages	LA10,18h	53.8			52.0			58.6																	
	LAeq,24h		54.2			48.5			54.5																
	LAeq,16h		54.8			49.0			57.4																
	LAeq,8h		46.8			47.8																			
	LA90 Day			40.7						42.3															
	LA90 Evening			39.4			36.9																		
	LA90 Night			37.5			37.4																		
Hourly Values	00:00 to 01:00	55.2	60.1	42.1	44.4	43.4	36.9	44.5	44.4	35.3															
	01:00 to 02:00	49.7	48.1	43.0	49.0	50.5	41.5	45.9	44.4	39.2															
	02:00 to 03:00	47.2	44.2	37.7	42.8	39.7	33.1	43.8	40.7	34.7															
	03:00 to 04:00	46.4	48.8	38.3	40.7	37.8	32.9	39.7	37.6	33.1															
	04:00 to 05:00	46.9	43.7	38.0	41.2*	38.7*	33.4*	44.8	43.5	35.3															
	05:00 to 06:00	55.9	53.1	43.1	52.1	51.1	39.9	54.1	53.8	40.2															
	06:00 to 07:00	57.7	55.4	44.7	53.8	53.1	40.3	58.2	59.1	44.3															
	07:00 to 08:00	56.4	55.3	42.5	57.3*	57.2*	42.7*	57.3	58.0	43.7															
	08:00 to 09:00	57.9	56.9	41.0	56.3*	54.4*	40.4*	58.3	56.8	42.6															
	09:00 to 10:00	57.5	56.3	42.1	58*	56.1*	45.1*	60.5	59.1	40.5															
	10:00 to 11:00	58.7	57.0	39.8	56.9*	54.6*	41.2*	56.7*	84.3*	37.4*															
	11:00 to 12:00	54.9	54.1	39.7	56.4*	54.6*	40.3*																		
	12:00 to 13:00	54.5	58.8	39.0	56.2*	54.8*	39.7*																		
	13:00 to 14:00	54.6	55.1	38.5	55.1*	53.5*	40.5*																		
	14:00 to 15:00	53.8	55.3	38.6	55.2	55.5	37.5																		
	15:00 to 16:00	52.2	53.9	38.0	54.9	56.2	36.8																		
	16:00 to 17:00	53.8	54.5	38.1	56.1	54.8	36.4																		
	17:00 to 18:00	55.7	54.1	41.4	57.2*	58.2*	39.8*																		
	18:00 to 19:00	54.3	52.9	39.8	55.4*	54.4*	38.7*																		
	19:00 to 20:00	52.9*	54.5*	40.3*	52.8*	53.6*	39.4*																		
	20:00 to 21:00	52.9*	52.6*	42.9*	54.6*	55.8*	40.3*																		
	21:00 to 22:00	47.3	46.7	41.2	48.9*	54.2*	40.5*																		
	22:00 to 23:00	47.5	49.2	38.0	46.1	50.4	37.4																		
	23:00 to 0:00	44.5	43.8	37.3	45.6	46.2	36.7																		


Logger Summary - 171 Beaufort Lexton (712225.00, 5855735.00)
Hourly Sound Pressure Level dBA
90
85
80
75
70
65
60
55
50
45
40
35
30
08/12/2017
09/12/2017
10/12/2017
11/12/2017
12/12/2017
13/12/2017
14/12/2017
15/12/2017
16/12/2017
Date (dd/mm/yyyy)
L10
Leq
L90

Logger Summary - 171 Beaufort Lexton (712225.00, 5855735.00)



Site Details	195 Main Lead Road (710708.00,	**Microphone Position**	1m away from façade leading to a noise sensitive room
Start Date	Fri 08 December 2017		
End Date	Fri 15 December 2017		

Measurement Summary

Date	08/12	09/12	10/12	11/12	12/12	13/12	14/12	15/12
$L_{10,18Hr}$, dBA	46.6	46.8	50.1	51.6	50.7	44.2	49.1	50.8

Date	16/12	17/12	18/12	19/12	20/12	21/12	22/12	23/12
$L_{10,18Hr}$, dBA	50.9	46.0	54.6					

Site Map

Site Photo

Project No.		**Date**	18 December 2017
Project Title	Beaufort Bypass	**Engineer**	MB / NI
Description	195 Main Lead Road		

Sheet	2		
Rev	1		
Type	LG		

Logger Location	195 Main Lead Road (710708.00, 5856599.00)
Microphone Position	1m away from façade leading to a noise sensitive room

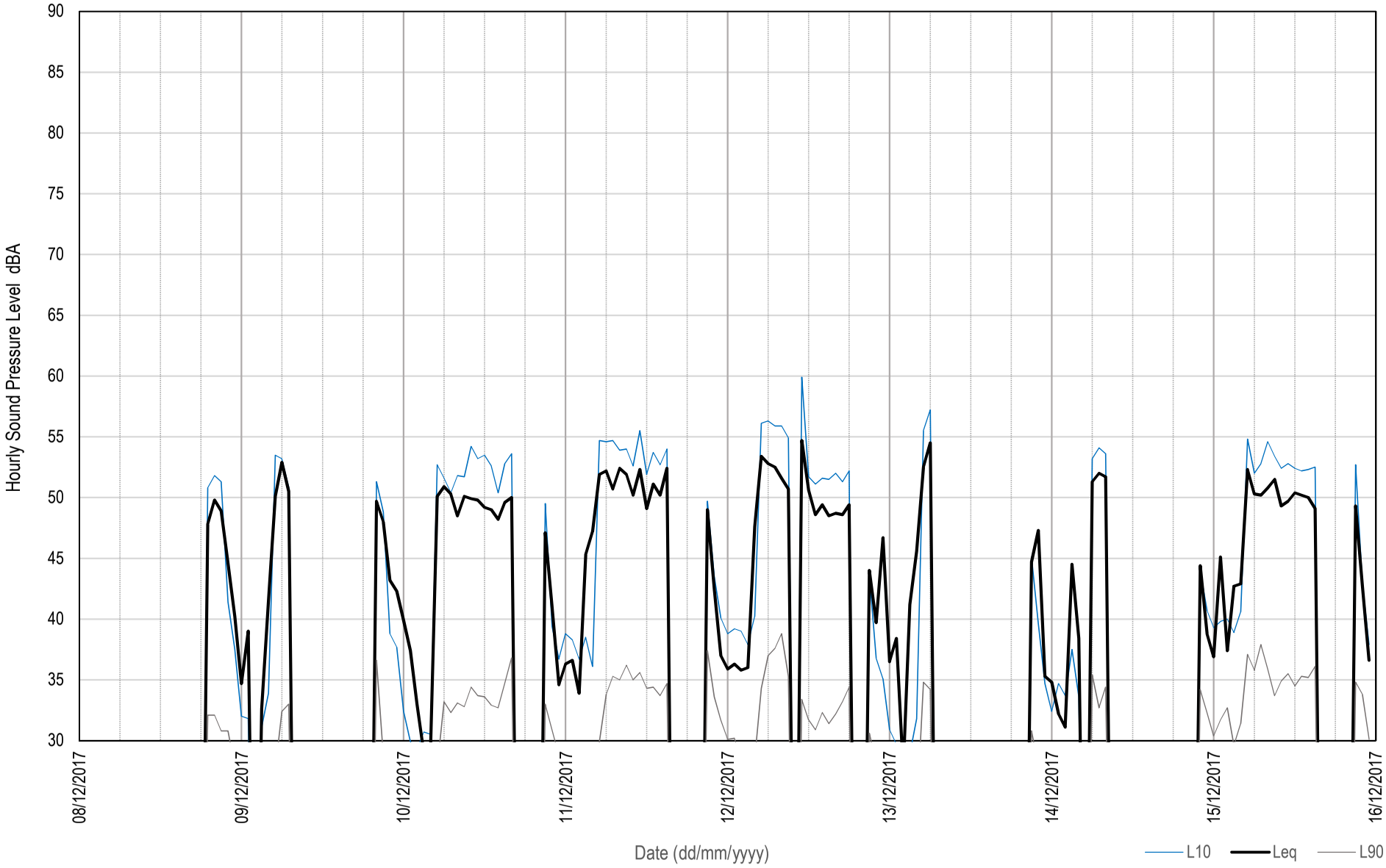
		Fri, 08 Dec 2017			Sat, 09 Dec 2017			Sun, 10 Dec 2017			Mon, 11 Dec 2017			Tue, 12 Dec 2017			Wed, 13 Dec 2017			Thu, 14 Dec 2017			Fri, 15 Dec 2017		
		L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}
Daily Averages	LA10,18h	46.6			46.8			50.1			51.6			50.7			44.2			49.1			50.8		
	LAeq,24h		43.6			44.2			47.0			48.6			48.9			44.0			43.3			47.7	
	LAeq,16h		43.7			44.6			48.2			49.6			49.8			42.9			44.4			48.5	
	LAeq,8h		43.2			43.0			45.3			46.0			45.7			40.9			45.5			42.6	
	LA90 Day						33.0						34.9			33.7						33.6			35.4
	LA90 Evening			31.7			32.7			33.6			37.4			32.5			30.8			32.8			34.8
	LA90 Night			27.8			26.5			29.1			31.5			27.8			28.3			32.8			29.6
Hourly Values	00:00 to 01:00				32.0	34.7	26.4	32.4	39.9	25.2	38.8	36.3	27.2	38.8	35.9	30.1	30.9	36.5	26.4	32.4	34.8	27.1	39.3	36.9	30.4
	01:00 to 02:00				31.8	39.0	25.8	29.9	37.4	24.2	38.3	36.6	29.3	39.2	36.3	30.2	29.7	38.4	25.7	34.7	32.2	27.6	39.8	45.1	31.7
	02:00 to 03:00				31.5*	35.4*	25.3*	29.3	33.0	24.1	36.7	33.9	28.2	39.0	35.8	28.5	28.9	27.5	24.9	33.7	31.1	26.9	40.0	37.4	32.7
	03:00 to 04:00				31.1	32.6	25.4	30.7	29.0	24.4	38.5	45.3	28.3	37.9	36.0	29.5	28.9	41.2	24.4	37.5	44.5	27.7	38.9	42.7	29.6
	04:00 to 05:00				33.9	41.5	25.8	30.5	29.6	24.0	36.1	47.2	25.9	40.2	47.6	28.5	31.8	45.6	23.8	33.6	38.4	27.0	40.6	42.9	31.4
	05:00 to 06:00				53.5	50.1	27.6	52.7	50.1	27.8	54.7	51.9	29.9	56.1	53.4	34.3	55.5	52.5	34.8	54.8*	52*	29.8*	54.8	52.3	37.1
	06:00 to 07:00				53.2	52.9	32.4	51.6	50.9	33.2	54.6	52.2	33.8	56.3	52.8	37.0	57.2	54.5	34.2	53.2	51.3	35.4	52.0	50.3	35.8
	07:00 to 08:00				50.9	50.5	33.0	50.4	50.3	32.3	54.7	50.7	35.3	55.9	52.5	37.6	54.6*	52.5*	38.7*	54.1	52.0	32.7	52.8	50.2	37.9
	08:00 to 09:00				50.6*	48.3*	33*	51.8	48.5	33.1	53.9	52.4	35.0	55.9	51.6	38.8	56.9*	53.2*	40.2*	53.6	51.7	34.4	54.6	50.8	35.9
	09:00 to 10:00				53.4*	50*	35.5*	51.7	50.1	32.8	54.0	51.9	36.2	54.9	50.7	35.3	55.6*	51.9*	40.6*	52.7*	49.6*	37.1*	53.4	51.5	33.7
	10:00 to 11:00				55.9*	51.9*	39.1*	54.2	49.9	34.4	52.6	50.2	35.0	64.6*	59.9*	36.4*	72*	68.2*	42.7*	52.9*	50.7*	35.9*	52.4	49.3	34.9
	11:00 to 12:00				55.4*	51.9*	40.1*	53.2	49.8	33.7	55.5	52.3	35.6	59.9	54.7	33.4	61.6*	57.1*	41.7*	53.2*	49.7*	34.6*	52.8	49.7	35.5
	12:00 to 13:00	65.6*	75.4*	40.5*	54.6*	50.6*	39.1*	53.5	49.2	33.6	51.9	49.1	34.3	51.7	50.6	31.7	58.7*	55.2*	38.2*	52.6*	49.7*	35.6*	52.4	50.4	34.5
	13:00 to 14:00	52.6*	50.2*	36.4*	53.2*	49.6*	38.8*	52.6	49.0	32.9	53.7	51.1	34.4	51.1	48.6	30.9	58.1*	55.1*	43.8*	52*	48.4*	37.2*	52.2	50.2	35.3
	14:00 to 15:00	66.4*	68*	37.8*	54.2*	51.9*	38.4*	50.4	48.2	32.7	52.7	50.2	33.7	51.6	49.4	32.3	55.6*	52.3*	39.8*	53.4*	49.9*	38.1*	52.3	50.0	35.2
	15:00 to 16:00	53.2*	49.2*	35.5*	54.8*	51.4*	39.2*	52.8	49.6	34.7	54.0	52.4	34.7	51.5	48.5	31.4	56.3*	53.1*	38.9*	53.4*	49.5*	37*	52.5	49.1	36.1
	16:00 to 17:00	53.9*	50.6*	36.4*	52.8*	49.2*	36.2*	53.6	50.0	36.8	53.4*	50.1*	35.3*	52.0	48.7	32.2	54*	50.8*	37.1*	52.9*	49.1*	36.2*	52.1*	48.4*	33.6*
	17:00 to 18:00	54.6*	50.4*	36.3*	52.7*	48.9*	36.3*	54.5*	51.9*	37.5*	54*	50.4*	37.2*	51.3	48.6	33.2	70.3*	65.8*	38.6*	54.3*	50.7*	38.1*	51.6*	49.7*	33.2*
	18:00 to 19:00	52.8*	49*	33.8*	52.3*	49.1*	35.3*	53.7*	55.6*	36.2*	54.2*	51.6*	38.7*	52.2	49.4	34.4	54*	50.4*	36.6*	53.6*	51.9*	37.3*	52.5*	51.7*	33.6*
	19:00 to 20:00	50.8	47.8	32.1	48.4*	55.7*	34.7*	52.5*	49.9*	37.5*	53*	50*	38.1*	48*	48.4*	35.5*	52.1*	49.4*	35.8*	51.5*	48*	35.9*	50.4*	48.2*	33.9*
	20:00 to 21:00	51.8	49.8	32.1	51.3	49.7	36.6	52.1*	51.1*	37.3*	52.3*	50.8*	37.4*	51.7*	49.8*	36.2*	47.6*	47.7*	36.8*	51.3*	51*	36.3*	53.8*	50.6*	35.1*
	21:00 to 22:00	51.3	48.9	30.8	48.8	48.0	28.7	49.5	47.1	33.0	49.7	49.0	37.4	43.6	44.0	30.6	45.1	44.7	30.8	48.2*	48.5*	34.4*	52.7	49.3	34.8
	22:00 to 23:00	41.4	44.6	30.8	38.8	43.2	28.2	39.4	41.0	30.9	43.5	42.5	33.6	36.8	39.7	28.1	39.6	47.3	27.9	43.9	44.4	34.2	42.8	42.7	33.8
	23:00 to 0:00	37.5	40.2	27.8	37.7	42.3	27.7	36.7	34.6	28.8	40.1	37.0	31.7	35.1	46.7	27.5	34.7	35.3	26.4	40.7	38.8	32.3	37.9	36.6	30.1

Project No.		Date	18 December 2017	Sheet	3
Project Title	Beaufort Bypass	Engineer	MB / NI	Rev	1
Description	195 Main Lead Road			Type	LG

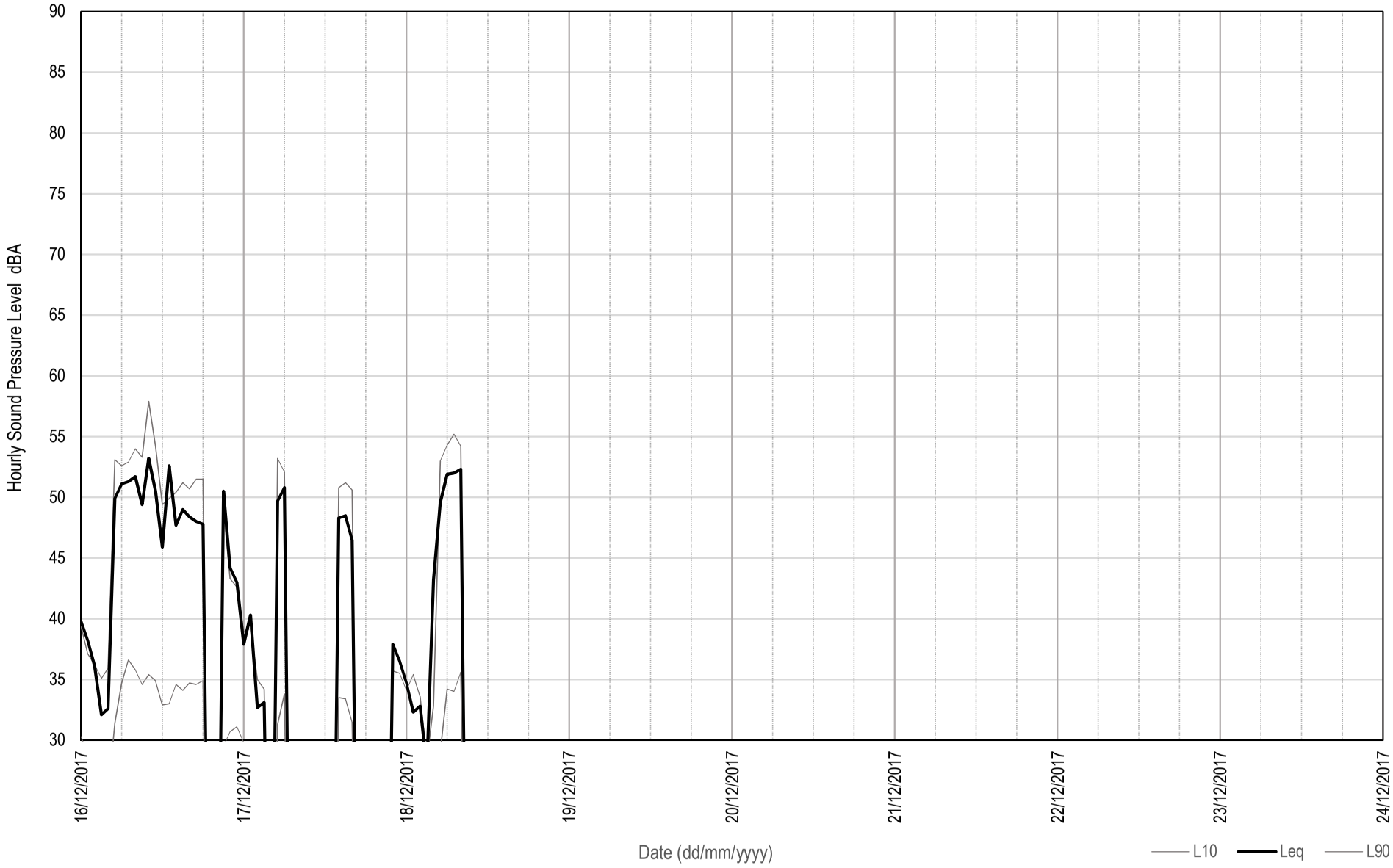
Logger Location	195 Main Lead Road (710708.00, 5856599.00)
Microphone Position	1m away from façade leading to a noise sensitive room

		Sat, 16 Dec 2017			Sun, 17 Dec 2017			Mon, 18 Dec 2017			Tue, 19 Dec 2017			Wed, 20 Dec 2017			Thu, 21 Dec 2017			Fri, 22 Dec 2017			Sat, 23 Dec 2017		
		L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}
Daily Averages	LA10,18h	50.9			46.0			54.6																	
	LAeq,24h		48.4			42.5			47.8																
	LAeq,16h		49.7			42.8			50.8																
	LAeq,8h		43.0			42.1																			
	LA90 Day			35.0						34.8															
	LA90 Evening			33.6			32.8																		
	LA90 Night			29.7			27.2																		
Hourly Values	00:00 to 01:00	39.4	39.8	30.3	38.9	37.9	29.8	34.1	34.7	26.5															
	01:00 to 02:00	37.1	38.2	28.9	39.2	40.3	29.5	35.4	32.3	26.6															
	02:00 to 03:00	36.2	36.1	25.6	35.0	32.7	25.9	33.6	32.8	25.3															
	03:00 to 04:00	35.1	32.1	25.8	34.2	33.1	25.6	28.4	27.7	23.6															
	04:00 to 05:00	35.9	32.6	25.4	34.6*	38.6*	26.1*	32.8	43.2	24.4															
	05:00 to 06:00	53.1	49.9	31.4	53.2	49.7	31.3	53.0	49.6	29.1															
	06:00 to 07:00	52.6	51.1	34.7	52.1	50.8	33.8	54.3	51.9	34.2															
	07:00 to 08:00	52.9	51.3	36.6	48.2*	47.2*	35.1*	55.2	52.0	34.0															
	08:00 to 09:00	54.0	51.7	35.8	51.9*	50.4*	36.3*	54.2	52.3	35.6															
	09:00 to 10:00	53.3	49.4	34.6	52.3*	48.5*	36.1*	54.7*	71.1*	35.6*															
	10:00 to 11:00	57.9	53.2	35.4	53*	49.2*	37.4*																		
	11:00 to 12:00	54.2	50.5	34.9	56*	53.5*	37.2*																		
	12:00 to 13:00	49.4	45.9	32.9	51.7*	48.1*	34.9*																		
	13:00 to 14:00	49.9	52.6	33.0	50*	47.5*	33.1*																		
	14:00 to 15:00	50.4	47.7	34.6	50.8	48.3	33.5																		
	15:00 to 16:00	51.2	49.0	34.1	51.2	48.5	33.4																		
	16:00 to 17:00	50.7	48.4	34.7	50.6	46.5	31.5																		
	17:00 to 18:00	51.5	48.0	34.6	51.4*	47.8*	33.2*																		
	18:00 to 19:00	51.5	47.8	34.9	51.8*	47.8*	33.6*																		
	19:00 to 20:00	51.7*	48.2*	34.7*	48.1*	46.6*	34.2*																		
	20:00 to 21:00	52.1*	49.6*	36.1*	52.6*	51.5*	34.9*																		
	21:00 to 22:00	49.0	50.5	29.5	43.7*	43.2*	30.4*																		
	22:00 to 23:00	43.3	44.2	30.7	35.7	37.9	27.8																		
	23:00 to 0:00	42.6	43.0	31.1	35.5	36.5	27.6																		

Logger Summary - 195 Main Lead Road (710708.00, 5856599.00)



Logger Summary - 195 Main Lead Road (710708.00, 5856599.00)



Site Details	4126 Western Highway (715801.00,	**Microphone Position**	Open field condition
Start Date	Fri 08 December 2017		
End Date	Fri 15 December 2017		

Measurement Summary

Date	08/12	09/12	10/12	11/12	12/12	13/12	14/12	15/12
$L_{10,18Hr}$, dBA	65.6	60.7	64.5	67.3	66.7			

Date	16/12	17/12	18/12	19/12	20/12	21/12	22/12	23/12
$L_{10,18Hr}$, dBA								

Site Map

Site Photo

Project No.		Date	18 December 2017	Sheet	2
Project Title	Beaufort Bypass	Engineer	MB / NI	Rev	1
Description	4126 Western Highway			Type	LG

Logger Location	4126 Western Highway (715801.00, 5854385.00)
Microphone Position	Open field condition

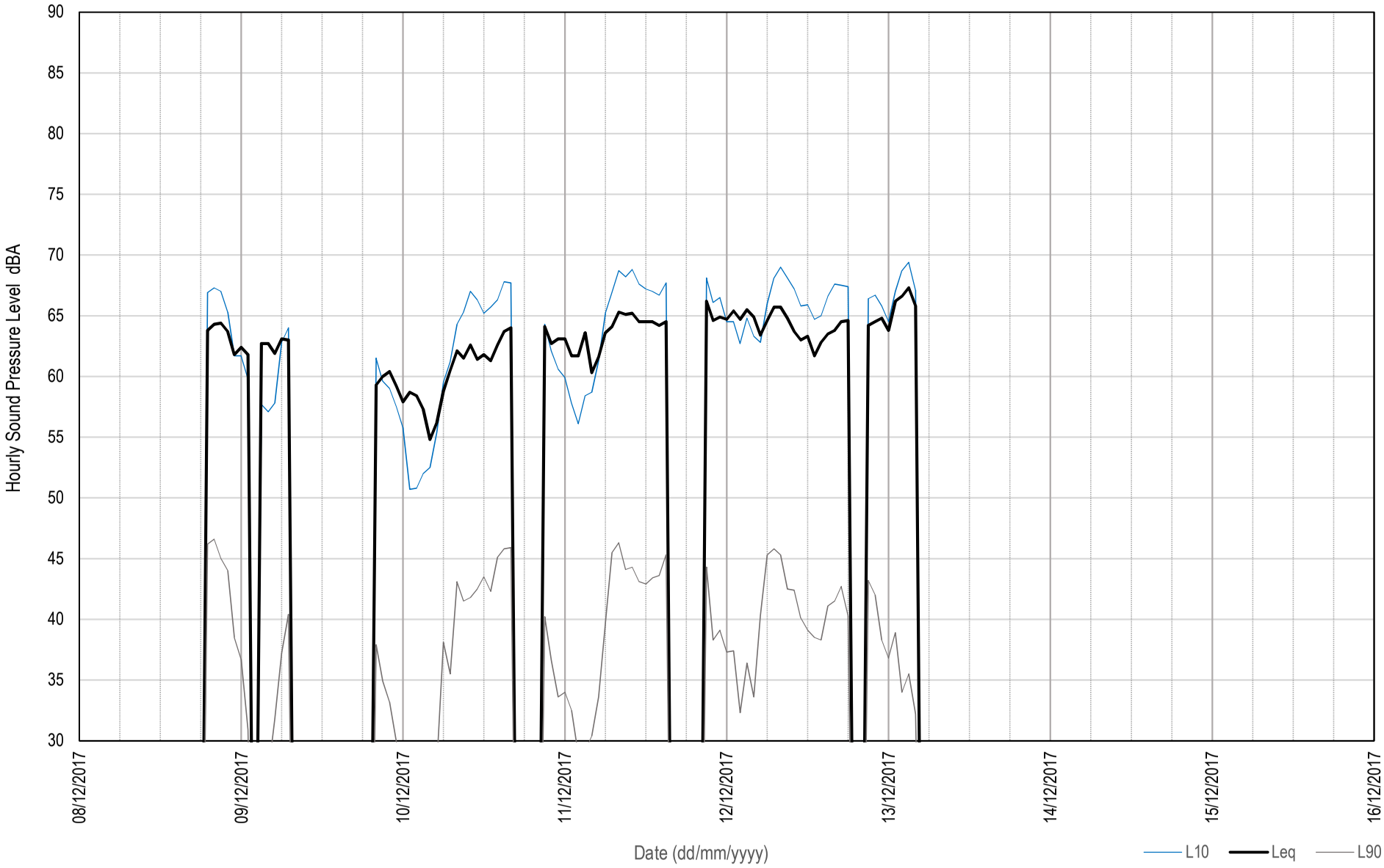
		Fri, 08 Dec 2017			Sat, 09 Dec 2017			Sun, 10 Dec 2017			Mon, 11 Dec 2017			Tue, 12 Dec 2017			Wed, 13 Dec 2017			Thu, 14 Dec 2017			Fri, 15 Dec 2017		
		L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}
Daily Averages	LA10,18h	65.6			60.7			64.5			67.3			66.7											
	LAeq,24h		60.7			58.3			60.6			63.1			64.0			66.1							
	LAeq,16h		59.9			55.7			61.0			63.1			63.5										
	LAeq,8h		61.9			58.2			62.3			64.8			65.7										
	LA90 Day						40.4						44.3			41.6										
	LA90 Evening			45.9			36.4			42.5			44.3			41.8										
	LA90 Night			34.5			28.2			33.2			37.8			36.8										
Hourly Values	00:00 to 01:00				61.7	62.4	36.7	55.8	57.9	28.5	59.9	63.1	34.0	64.5	64.7	37.3	64.5	63.8	36.8						
	01:00 to 02:00				59.8	61.8	30.9	50.7	58.7	25.9	57.8	61.7	32.5	64.5	65.4	37.4	67.0	66.2	38.9						
	02:00 to 03:00				60.5*	63.8*	31.8*	50.8	58.4	23.2	56.1	61.7	28.8	62.7	64.7	32.3	68.7	66.6	34.0						
	03:00 to 04:00				57.7	62.7	29.7	52.0	57.3	23.9	58.4	63.6	29.2	64.8	65.5	36.4	69.4	67.3	35.5						
	04:00 to 05:00				57.1	62.7	27.3	52.5	54.8	23.0	58.7	60.3	30.4	63.3	64.9	33.6	67.1	65.8	32.2						
	05:00 to 06:00				57.8	61.9	31.8	55.4	56.2	28.0	61.3	61.6	33.6	62.8	63.4	40.3									
	06:00 to 07:00				62.8	63.1	37.2	59.5	58.8	38.1	65.2	63.6	39.7	66.0	64.6	45.3									
	07:00 to 08:00				64.0	63.0	40.4	61.2	60.5	35.5	66.9	64.1	45.5	68.1	65.7	45.8									
	08:00 to 09:00				67*	64.5*	47.2*	64.3	62.1	43.1	68.7	65.3	46.3	69.0	65.7	45.3									
	09:00 to 10:00				68.9*	64.6*	49.6*	65.3	61.5	41.5	68.2	65.1	44.1	68.1	64.8	42.5									
	10:00 to 11:00				69.1*	64.9*	51.1*	67.0	62.6	41.8	68.8	65.2	44.3	67.2	63.7	42.4									
	11:00 to 12:00				69.2*	65.2*	50.4*	66.3	61.4	42.5	67.6	64.5	43.1	65.8	63.0	40.1									
	12:00 to 13:00				67.8*	63.9*	47.9*	65.2	61.8	43.5	67.2	64.5	42.9	65.9	63.3	39.1									
	13:00 to 14:00				66.6*	63.1*	47.9*	65.7	61.3	42.3	67.0	64.5	43.4	64.7	61.7	38.5									
	14:00 to 15:00	75.4*	76.4*	48.3*	65.8*	62.1*	47.6*	66.3	62.6	45.1	66.7	64.2	43.6	65.0	62.8	38.3									
	15:00 to 16:00	69.7*	66.4*	46.8*	65.5*	61.7*	46.3*	67.8	63.7	45.8	67.7	64.5	45.3	66.6	63.5	41.1									
	16:00 to 17:00	69.9*	66.1*	48.9*	66.5*	62.4*	46.3*	67.7	64.0	45.9	67.8*	64.4*	45.3*	67.6	63.8	41.5									
	17:00 to 18:00	68.9*	65.1*	50.4*	65.6*	61.6*	45.6*	68.3*	64.2*	46.4*	68.7*	65.7*	47.7*	67.5	64.5	42.7									
	18:00 to 19:00	68.7*	64.8*	48.8*	64.1*	61*	42.2*	66.7*	63*	43.9*	68.4*	65.1*	45.4*	67.4	64.6	40.3									
	19:00 to 20:00	66.9	63.8	46.2	63.3*	60.7*	40*	66.7*	63.6*	44.4*	66.7*	64.8*	43.2*	66.6*	64.4*	41.9*									
	20:00 to 21:00	67.3	64.3	46.6	61.5	59.3	37.9	67.2*	64.8*	44.4*	66.6*	65.1*	44.1*	68*	65.9*	43.5*									
	21:00 to 22:00	67.0	64.4	45.0	59.6	60.0	34.9	64.3	64.1	40.2	68.1	66.2	44.3	66.4	64.2	43.2									
	22:00 to 23:00	65.3	63.7	44.0	59.0	60.4	33.2	62.1	62.7	36.6	66.1	64.6	38.3	66.7	64.5	42.0									
	23:00 to 0:00	61.7	61.8	38.5	57.5	59.2	29.9	60.6	63.1	33.6	66.5	64.9	39.1	65.8	64.8	38.3									

Project No.		**Date**	18 December 2017	**Sheet**	3
Project Title	Beaufort Bypass	**Engineer**	MB / NI	**Rev**	1
Description	4126 Western Highway			**Type**	LG

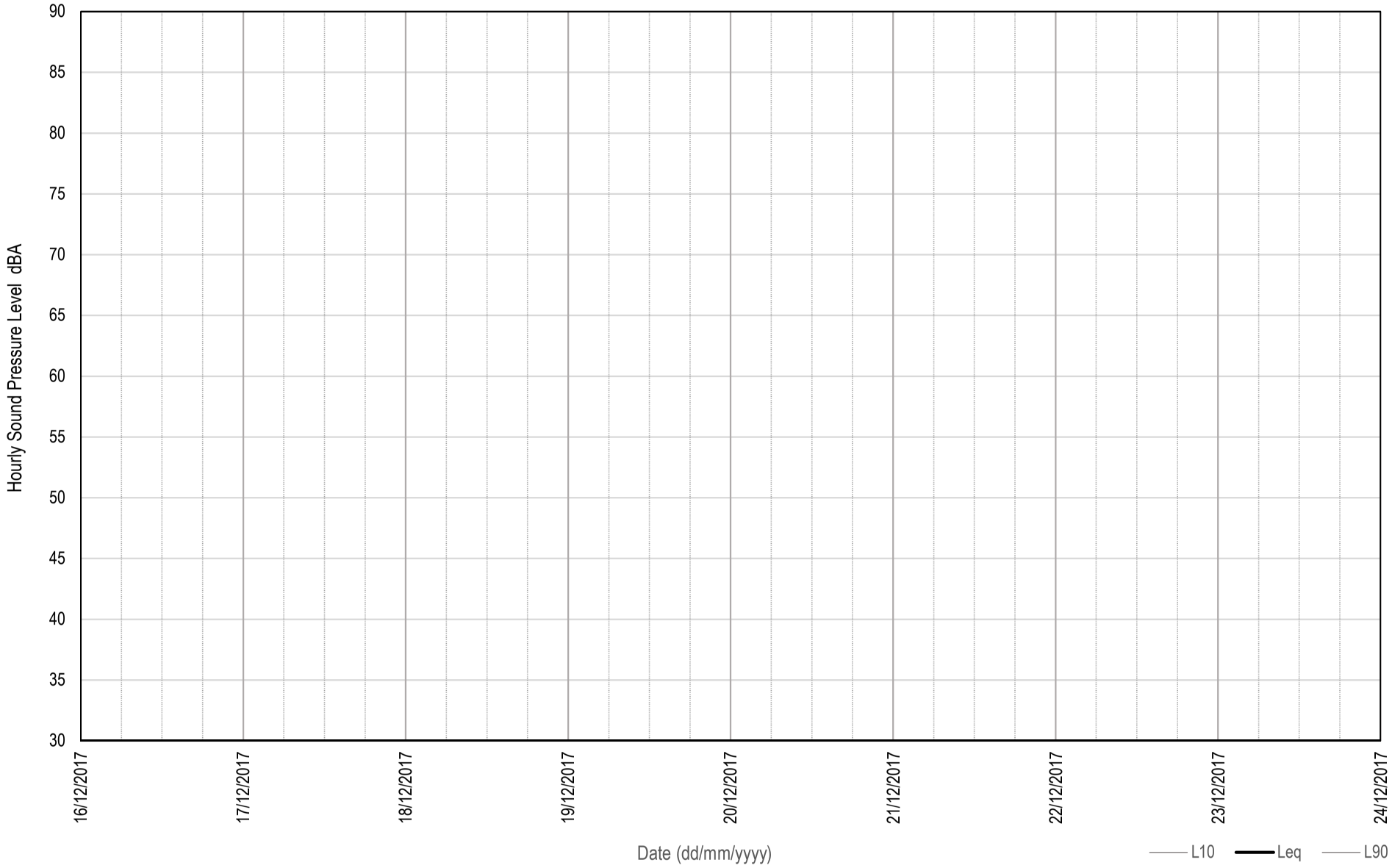
Logger Location	4126 Western Highway (715801.00, 5854385.00)
Microphone Position	Open field condition

		Sat, 16 Dec 2017			Sun, 17 Dec 2017			Mon, 18 Dec 2017			Tue, 19 Dec 2017			Wed, 20 Dec 2017			Thu, 21 Dec 2017			Fri, 22 Dec 2017			Sat, 23 Dec 2017		
		L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}
Daily Averages	LA10,18h																								
	LAeq,24h																								
	LAeq,16h																								
	LAeq,8h																								
	LA90 Day																								
	LA90 Evening																								
	LA90 Night																								
Hourly Values	00:00 to 01:00																								
	01:00 to 02:00																								
	02:00 to 03:00																								
	03:00 to 04:00																								
	04:00 to 05:00																								
	05:00 to 06:00																								
	06:00 to 07:00																								
	07:00 to 08:00																								
	08:00 to 09:00																								
	09:00 to 10:00																								
	10:00 to 11:00																								
	11:00 to 12:00																								
	12:00 to 13:00																								
	13:00 to 14:00																								
	14:00 to 15:00																								
	15:00 to 16:00																								
	16:00 to 17:00																								
	17:00 to 18:00																								
	18:00 to 19:00																								
	19:00 to 20:00																								
	20:00 to 21:00																								
	21:00 to 22:00																								
	22:00 to 23:00																								
	23:00 to 0:00																								

Logger Summary - 4126 Western Highway (715801.00, 5854385.00)



Logger Summary - 4126 Western Highway (715801.00, 5854385.00)



Site Details	66 Martins Lane (708286.00,	**Microphone Position**	1m away from façade leading to noise sensitive room
Start Date	Fri 08 December 2017		
End Date	Fri 15 December 2017		

Measurement Summary

Date	08/12	09/12	10/12	11/12	12/12	13/12	14/12	15/12
$L_{10,18Hr}$, dBA	60.2	54.9	55.6	58.6	56.4	58.9	59.6	56.6

Date	16/12	17/12	18/12	19/12	20/12	21/12	22/12	23/12
$L_{10,18Hr}$, dBA	55.3	54.2						

Site Map

Site Photo

Project No.		**Date**	19 December 2017	**Shee**	2
Project Title	Beaufort Bypass	**Engineer**	MB / NI	**Rev**	1
Description	66 Martins Lane			**Type**	LG

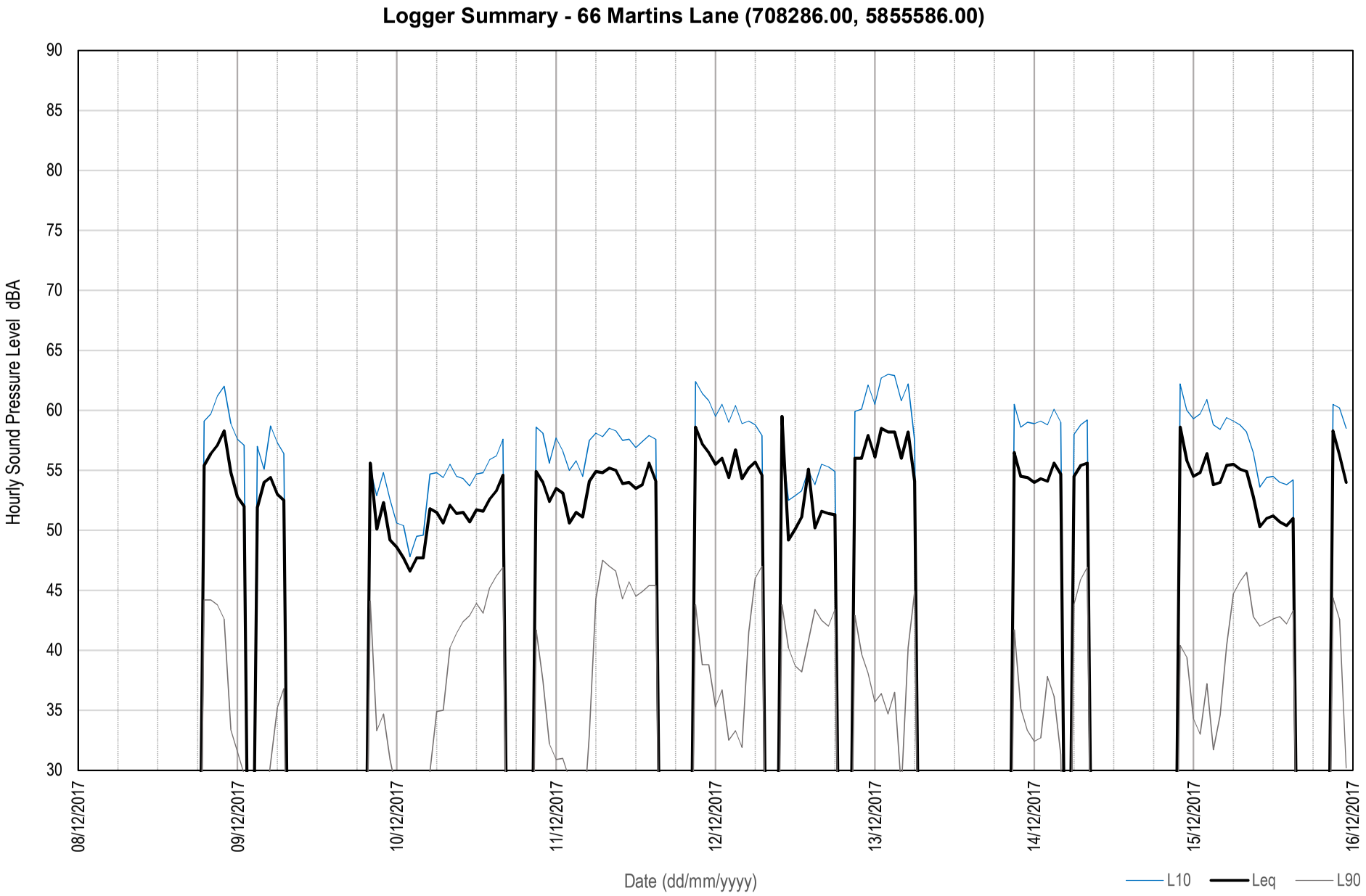
Logger Location	66 Martins Lane (708286.00, 5855586.00)
Microphone Position	1m away from façade leading to noise sensitive room

		Fri, 08 Dec 2017			Sat, 09 Dec 2017			Sun, 10 Dec 2017			Mon, 11 Dec 2017			Tue, 12 Dec 2017			Wed, 13 Dec 2017			Thu, 14 Dec 2017			Fri, 15 Dec 2017		
		L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}
Daily Averages	LA10,18h	60.2			54.9			55.6			58.6			56.4			58.9			59.6			56.6		
	LAeq,24h		52.4			49.5			50.9			53.7			54.1			53.0			51.7			53.3	
	LAeq,16h		50.7			47.2			51.2			53.5			52.9			46.4			47.9			52.1	
	LAeq,8h		54.0			49.4			52.7			55.8			57.5			54.0			55.7			54.6	
	LA90 Day						36.8						45.7			41.8						46.4			43.4
	LA90 Evening			44.1			38.7			42.6			43.8			43.2			41.7						44.4
	LA90 Night			32.0			28.8			32.3			37.2			37.2			35.3			37.3			35.6
Hourly Values	Kri				57.6	52.8	31.6	50.6	48.6	28.2	57.7	53.5	30.9	59.5	55.5	35.3	60.5	56.1	35.7	58.9	54.0	32.4	59.3	54.5	34.3
	01:00 to 02:00				57.1	52.0	29.7	50.4	47.7	26.1	56.6	53.1	31.0	60.5	56.0	36.7	62.7	58.5	36.4	59.1	54.3	32.7	59.7	54.8	33.0
	02:00 to 03:00				57.3*	51.9*	27.4*	47.8	46.6	25.7	55.0	50.6	29.3	59.0	54.4	32.5	63.0	58.2	34.7	58.8	54.1	37.8	60.9	56.4	37.2
	03:00 to 04:00				57.0	51.9	26.8	49.5	47.7	25.7	55.8	51.5	27.8	60.4	56.7	33.3	62.9	58.2	36.5	60.1	55.6	36.2	58.8	53.8	31.7
	04:00 to 05:00				55.1	54.0	25.9	49.6	47.7	23.4	54.5	51.1	24.7	58.9	54.3	31.9	60.8	56.0	28.4	59.0	54.7	31.3	58.4	54.0	34.6
	05:00 to 06:00				58.7	54.4	30.6	54.7	51.8	29.9	57.5	54.1	33.0	59.1	55.2	41.5	62.2	58.2	40.2	58.8*	54.4*	38.1*	59.4	55.4	40.4
	06:00 to 07:00				57.3	53.0	35.2	54.8	51.5	34.9	58.1	54.9	44.3	58.8	55.7	46.0	57.5	54.1	44.9	58.0	54.5	43.8	59.1	55.5	44.7
	07:00 to 08:00				56.4	52.5	36.8	54.4	50.6	35.0	57.8	54.8	47.5	57.9	54.6	47.0	54.7*	51.3*	41.5*	58.8	55.4	45.9	58.8	55.1	45.7
	08:00 to 09:00				56*	52.8*	41.7*	55.5	52.1	40.2	58.5	55.2	47.0	61.8*	64.6*	47.5*	52.9*	50.6*	41.1*	59.2	55.6	46.9	58.2	54.9	46.5
	09:00 to 10:00				57.6*	54.4*	46.1*	54.5	51.4	41.4	58.3	55.0	46.6	63.3*	63.9*	46.7*	51.7*	48.2*	40.4*	58.4*	55.1*	46.3*	56.5	52.8	42.8
	10:00 to 11:00				58.1*	55.1*	48.9*	54.3	51.5	42.4	57.5	53.9	44.3	57.3	59.5	43.8	52*	49.5*	41.6*	59.4*	55.8*	47.2*	53.6	50.3	42.0
	11:00 to 12:00	64*	77.1*	47.2*	59.1*	56.2*	48.4*	53.7	50.7	42.9	57.6	54.0	45.7	52.5	49.2	40.2	51.1*	48.2*	42.5*	59.2*	55.8*	46.7*	54.4	51.0	42.3
	12:00 to 13:00	59.4*	56.2*	48.3*	57.6*	54.5*	46.7*	54.7	51.7	43.9	56.9	53.5	44.5	52.9	50.1	38.7	53.4*	50.2*	43.6*	59.2*	55.5*	46.9*	54.5	51.2	42.6
	13:00 to 14:00	58.8*	55.3*	46.7*	57.9*	54.8*	45.4*	54.8	51.6	43.1	57.4	53.8	44.9	53.3	51.1	38.2	52.7*	50.8*	44.5*	58.1*	54.7*	44.8*	54.0	50.7	42.8
	14:00 to 15:00	59*	55.6*	47.1*	56.8*	53.6*	45.4*	55.9	52.6	45.2	57.9	55.6	45.4	55.0	55.1	40.8	52*	49.5*	45*	59.1*	55.8*	48.4*	53.8	50.4	42.2
	15:00 to 16:00	59.6*	56.5*	48.7*	57.3*	53.7*	43.5*	56.2	53.3	46.2	57.6	54.1	45.4	53.8	50.2	43.4	52.4*	49.9*	44.9*	59*	55.7*	46.6*	54.2	51.0	43.3
	16:00 to 17:00	59.3*	56.5*	49.4*	57*	54.1*	44.9*	57.6	54.6	46.9	58.2*	54.8*	46.8*	55.5	51.6	42.5	54.1*	51.3*	45.8*	59.9*	56.4*	47.5*	53.7*	50.7*	43*
	17:00 to 18:00	60.1*	56.9*	48.8*	56.8*	53.5*	43.6*	57.5*	54.5*	46.6*	60.3*	57.3*	48.7*	55.3	51.4	42.0	54.5*	51.5*	45.6*	59.6*	56.3*	48.4*	55.1*	51.9*	44*
	18:00 to 19:00	59.7*	57.9*	49*	55.9*	53*	43.2*	58.5*	55.3*	47*	59.4*	55.9*	48.3*	54.9	51.3	43.4	56.7*	53.9*	44.6*	60*	56.4*	47.6*	56.5*	53.2*	44*
	19:00 to 20:00	59.1	55.4	44.2	55.7*	52.4*	40.3*	59.1*	56.5*	47.4*	60.8*	56.9*	44.7*	59.7*	55.5*	45.8*	60.1*	56.1*	44.9*	59.9*	56.3*	45.9*	58.8*	55.2*	44.3*
	20:00 to 21:00	59.7	56.4	44.2	55.2	55.6	44.1	60.4*	59.6*	49.1*	61.2*	58.2*	45.8*	60.5*	56.7*	46*	58.6*	54.8*	42*	61.9*	60.4*	46.4*	60.2*	60.2*	45.8*
	21:00 to 22:00	61.2	57.1	43.8	52.9	50.1	33.3	58.6	54.9	41.7	62.4	58.6	43.8	59.9	56.0	42.9	60.5	56.5	41.7	61.6*	58*	46.8*	60.5	58.3	44.4
	22:00 to 23:00	62.0	58.3	42.6	54.8	52.3	34.7	58.1	54.0	37.5	61.4	57.2	38.8	60.1	56.0	39.7	58.6	54.5	35.2	62.2	58.6	40.4	60.2	56.3	42.6
	23:00 to 0:00	58.9	54.8	33.4	52.6	49.2	30.9	55.6	52.4	32.2	60.8	56.5	38.8	62.1	57.9	38.1	59.0	54.4	33.3	60.0	55.8	39.4	58.5	54.0	30.2

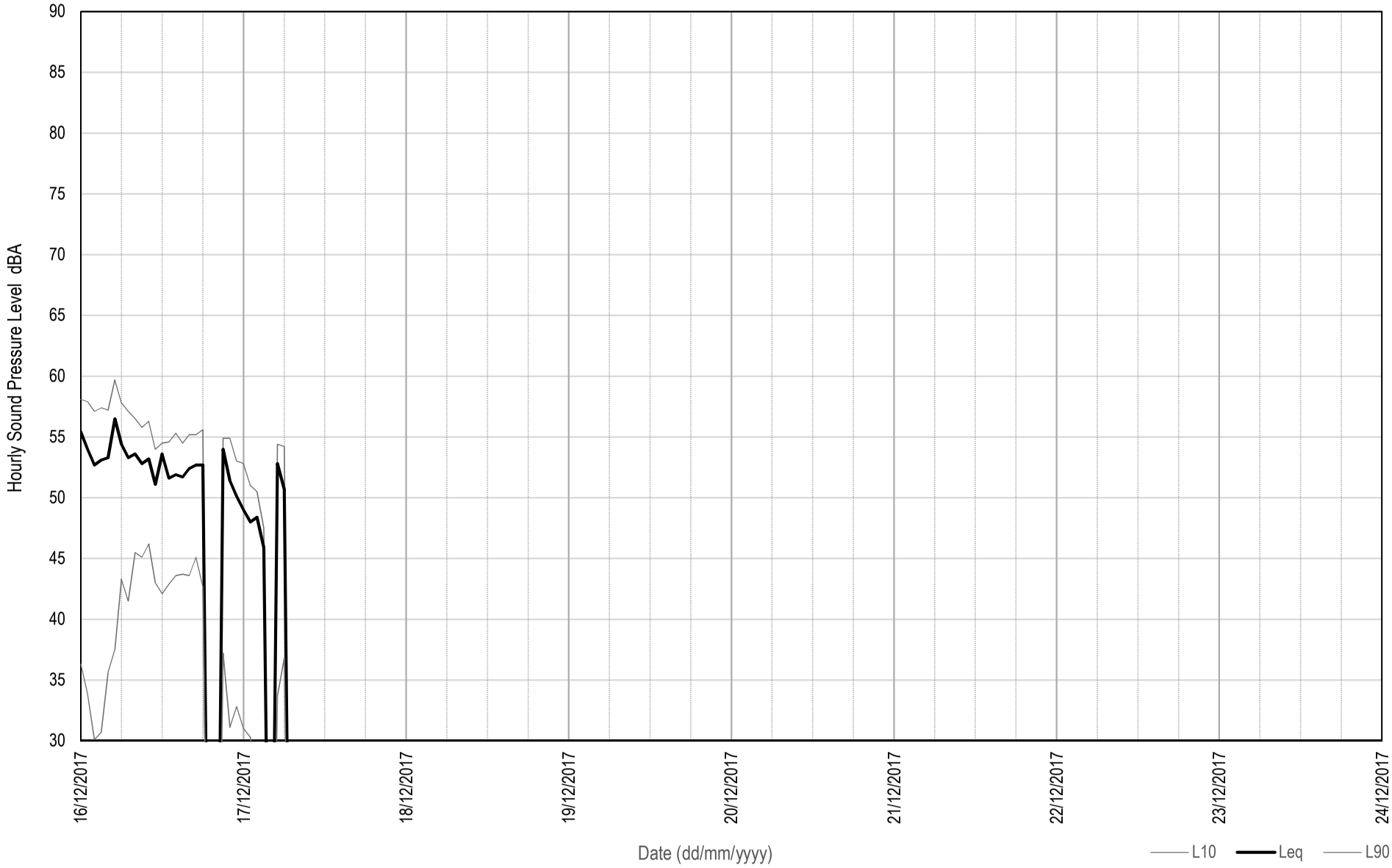
Project No.		Date	19 December 2017	Sheet	3
Project Title	Beaufort Bypass	Engineer	MB / NI	Rev	1
Description	66 Martins Lane			Type	LG

Logger Location	66 Martins Lane (708286.00, 5855586.00)
Microphone Position	1m away from façade leading to noise sensitive room

		Sat, 16 Dec 2017			Sun, 17 Dec 2017			Mon, 18 Dec 2017			Tue, 19 Dec 2017			Wed, 20 Dec 2017			Thu, 21 Dec 2017			Fri, 22 Dec 2017			Sat, 23 Dec 2017		
		L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}
Daily Averages	LA10,18h	55.3			54.2																				
	LAeq,24h		52.8			46.7																			
	LAeq,16h		52.3			42.9																			
	LAeq,8h		49.3																						
	LA90 Day			43.9																					
	LA90 Evening			42.7																					
	LA90 Night			30.8																					
Hourly Values	00:00 to 01:00	58.1	55.4	36.3	52.8	49.0	31.0																		
	01:00 to 02:00	57.9	54.0	33.9	51.0	48.0	30.3																		
	02:00 to 03:00	57.1	52.7	30.1	50.5	48.4	25.5																		
	03:00 to 04:00	57.4	53.1	30.7	47.5	45.9	25.3																		
	04:00 to 05:00	57.2	53.3	35.6	46.1*	43.7*	24.9*																		
	05:00 to 06:00	59.7	56.5	37.5	54.4	52.8	33.7																		
	06:00 to 07:00	57.8	54.4	43.3	54.2	50.7	36.8																		
	07:00 to 08:00	57.1	53.3	41.5	55*	51.9*	40.2*																		
	08:00 to 09:00	56.5	53.6	45.5	55.5*	53.7*	43.4*																		
	09:00 to 10:00	55.8	52.8	45.1	54*	51.2*	44.9*																		
	10:00 to 11:00	56.3	53.2	46.2	54.5*	51.8*	46.1*																		
	11:00 to 12:00	54.0	51.1	43.0	53.8*	51.1*	45*																		
	12:00 to 13:00	54.5	53.6	42.1																					
	13:00 to 14:00	54.6	51.6	42.9																					
	14:00 to 15:00	55.3	51.9	43.6																					
	15:00 to 16:00	54.5	51.7	43.7																					
	16:00 to 17:00	55.2	52.4	43.6																					
	17:00 to 18:00	55.2	52.7	45.1																					
	18:00 to 19:00	55.6	52.7	42.7																					
	19:00 to 20:00	55.5*	52.6*	42.5*																					
	20:00 to 21:00	55.8*	56.7*	41.2*																					
	21:00 to 22:00	54.9	54.0	37.2																					
	22:00 to 23:00	54.9	51.4	31.1																					
	23:00 to 0:00	53.0	50.1	32.8																					


Logger Summary - 66 Martins Lane (708286.00, 5855586.00)
Hourly Sound Pressure Level dBA
90
85
80
75
70
65
60
55
50
45
40
35
30
08/12/2017
09/12/2017
10/12/2017
11/12/2017
12/12/2017
13/12/2017
14/12/2017
15/12/2017
16/12/2017
Date (dd/mm/yyyy)
L10
Leq
L90

Logger Summary - 66 Martins Lane (708286.00, 5855586.00)



Site Details	23 Camp Hill Road (710525.00,	**Microphone Position**	1m away from façade leading to noise sensitive room
Start Date	Fri 08 December 2017		
End Date	Fri 15 December 2017		

Measurement Summary

Date	08/12	09/12	10/12	11/12	12/12	13/12	14/12	15/12
$L_{10,18Hr}$, dBA	49.9	47.2	49.6	48.5	48.7	47.5	49.9	52.0

Site Map

Site Photo

Project No.		**Date**	19th December 2017	**Sheet**	2
Project Title	Beaufort Bypass	**Engineer**	MB / NI	**Rev**	1
Description	23 Camp Hill Road			**Type**	LG

Logger Location	23 Camp Hill Road (710525.00, 5855653.00)
Microphone Position	1m away from façade leading to noise sensitive room

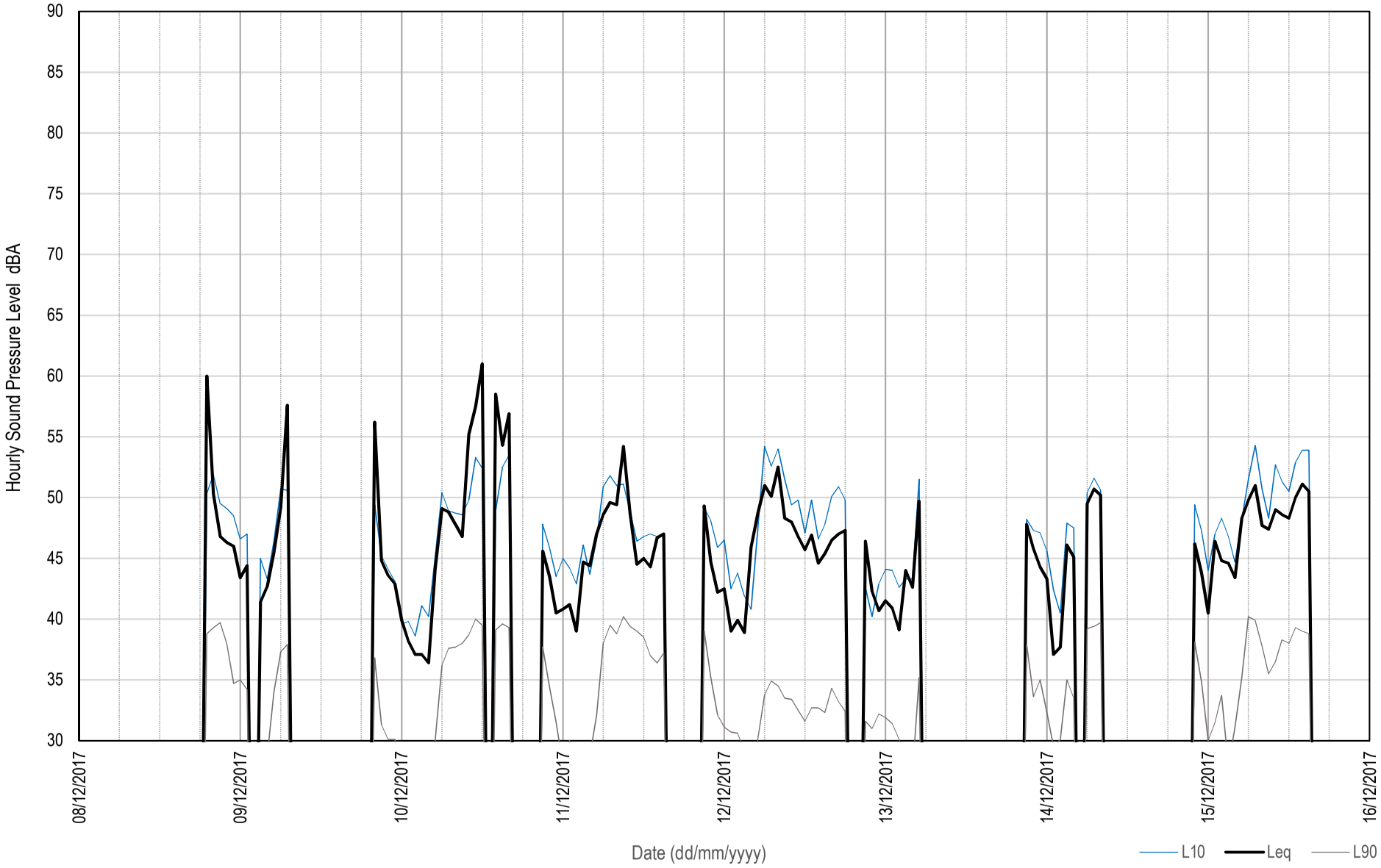
		Fri, 08 Dec 2017			Sat, 09 Dec 2017			Sun, 10 Dec 2017			Mon, 11 Dec 2017			Tue, 12 Dec 2017			Wed, 13 Dec 2017			Thu, 14 Dec 2017			Fri, 15 Dec 2017		
		L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}
Daily Averages	LA10,18h	49.9			47.2			49.6			48.5			48.7			47.5			49.9			52.0		
	LAeq,24h		50.1			47.2			52.2			46.4			46.7			40.9			43.0			46.6	
	LAeq,16h		50.6			48.4			53.9			47.3			47.6			35.8			42.9			47.5	
	LAeq,8h		44.0			40.9			43.4			44.0			44.0			43.3			45.3			-108.0	
	LA90 Day						37.9						38.4			33.2						39.6			38.1
	LA90 Evening			39.3			34.1			38.7			39.0			32.0			37.9						
	LA90 Night			34.0			28.4			31.2			31.2			31.0			33.5			33.6			
Hourly Values	00:00 to 01:00				46.6	43.4	35.0	39.6	39.9	26.6	45.0	40.8	27.9	46.5	42.5	31.1	44.1	41.5	31.9	45.6	43.3	32.3	44.0	40.5	30.0
	01:00 to 02:00				47.0	44.4	34.2	39.8	38.2	26.2	44.2	41.2	30.0	42.5	39.0	30.7	44.0	40.9	31.4	42.4	37.1	29.5	47.0	46.4	31.5
	02:00 to 03:00				45.8*	42.7*	30.1*	38.6	37.1	24.9	42.9	39.0	29.0	43.8	39.9	30.6	42.6	39.1	30.1	40.5	37.7	30.1	48.3	44.8	33.7
	03:00 to 04:00				45.0	41.4	29.6	41.1	37.1	26.6	46.1	44.7	28.9	41.9	38.9	29.1	43.3	44.0	28.6	47.9	46.1	35.0	46.8	44.6	27.9
	04:00 to 05:00				43.3	42.7	28.8	40.2	36.4	24.8	43.7	44.4	28.7	40.8	45.9	27.7	43.3	42.6	27.3	47.5	45.1	33.5	44.7	43.4	31.1
	05:00 to 06:00				46.4	45.5	34.0	45.1	44.1	30.0	46.6	47.0	32.1	47.5	48.7	30.1	51.5	49.7	35.2	48.2*	47*	34.2*	48.2	48.3	35.2
	06:00 to 07:00				50.7	49.2	37.3	50.4	49.1	36.2	50.9	48.6	38.0	54.2	51.0	33.8	53.5*	52.2*	36.6*	50.4	49.5	39.2	51.5	49.8	40.2
	07:00 to 08:00				50.6	57.6	37.9	48.9	48.8	37.6	51.8	49.6	39.5	52.6	50.1	34.9	52.2*	50*	38.3*	51.6	50.7	39.4	54.3	51.0	39.9
	08:00 to 09:00				52.4*	51.4*	38.8*	48.7	47.8	37.7	51.0	49.4	38.8	54.0	52.5	34.5	54.6*	50.7*	38.4*	50.6	50.2	39.7	50.7	47.7	37.8
	09:00 to 10:00				54.2*	50.7*	41.3*	48.6	46.8	38.0	51.1	54.2	40.2	51.5	48.3	33.5	53.5*	49.9*	37.7*	49.9*	47.8*	40.2*	48.3	47.4	35.5
	10:00 to 11:00				54.8*	51.3*	43.1*	49.8	55.2	38.7	48.9	48.7	39.4	49.4	48.0	33.4	54.9*	51.6*	38.5*	49.5*	47.9*	39.9*	52.7	49.0	36.5
	11:00 to 12:00				55.2*	51.9*	44.2*	53.3	57.5	40.0	46.4	44.5	39.0	49.8	46.8	32.5	56.3*	53.1*	41.2*	50.7*	48.2*	39.6*	51.3	48.6	38.3
	12:00 to 13:00	56.6*	66.1*	42.8*	53.2*	50.2*	42.8*	52.4	61.0	39.5	46.8	45.0	38.5	47.1	45.7	31.6	57*	53.8*	41.7*	48.9*	46.4*	40.4*	50.5	48.3	38.0
	13:00 to 14:00	53.8*	52.2*	42.2*	51.8*	49.3*	43.4*	60.8*	74.9*	38.8*	47.0	44.3	37.0	49.8	46.9	32.7	62.6*	59*	46.8*	48.9*	46.4*	40.5*	52.9	50.0	39.3
	14:00 to 15:00	60.6*	59.5*	45.6*	53.3*	50.7*	42.7*	48.9	58.5	39.1	46.8	46.7	36.4	46.6	44.6	32.7	60.2*	57*	44.5*	49.5*	47.2*	41.6*	53.9	51.1	39.0
	15:00 to 16:00	74.4*	69.8*	42.5*	53*	51.7*	42.8*	52.5	54.3	39.6	47.0	47.0	37.2	47.8	45.4	32.3	58.3*	55.5*	41.4*	49.8*	47.5*	41.3*	53.9	50.5	38.8
	16:00 to 17:00	57.3*	57.7*	44.7*	49.7*	48*	40.1*	53.5	56.9	39.3	47.4*	44.7*	36.8*	50.1	46.5	34.3	58.2*	55.1*	43*	48.9*	46.1*	41*	50.9*	48.5*	37.2*
	17:00 to 18:00	62.1*	62.8*	43.7*	50.9*	68.7*	40.6*	48.7*	75.9*	39*	48*	46.3*	38.7*	50.9	47.0	33.2	55.5*	52.9*	37*	47.7*	45.4*	39.8*	51.2*	93.2*	37.3*
	18:00 to 19:00	64.3*	58.5*	41.7*	49.1*	56.1*	39*	48.9*	48.4*	38.1*	48*	46*	38.9*	49.8	47.3	32.4	54*	50.7*	37.4*	49*	48.4*	39.7*	58.9*	57.4*	46.7*
	19:00 to 20:00	50.3	60.0	38.8	48.4*	49.5*	38*	50.8*	53.7*	39.3*	50.8*	50.5*	39.5*	51.5*	52.7*	35.6*	49.9*	47.6*	37.7*	47.6*	45.9*	38*	59*	56.4*	47*
	20:00 to 21:00	51.9	50.3	39.3	49.4	56.2	36.8	51.2*	61.4*	40.9*	49.5*	54.1*	39.1*	45.7*	48.9*	32.4*	47.9*	49.1*	38.2*	48.9*	47.6*	39.9*	143.5*	117.7*	114.5*
	21:00 to 22:00	49.5	46.8	39.7	45.2	44.8	31.3	47.8	45.6	37.7	49.2	49.3	39.0	42.6	46.4	31.6	48.2	47.8	37.9	48.7*	46.1*	38.6*	131.5*	122.4*	3.7*
	22:00 to 23:00	49.1	46.3	38.0	44.1	43.6	30.1	45.9	43.5	34.4	48.1	44.7	35.2	40.2	42.3	31.0	47.3	45.8	33.6	49.4	46.2	38.1	48.9*	113.7*	23.1*
	23:00 to 0:00	48.5	46.0	34.7	43.1	42.9	30.1	43.5	40.5	31.5	45.9	42.2	32.1	42.9	40.7	32.2	47.1	44.3	35.0	47.3	43.8	34.8	131.5*	123*	80*

Project No.		Date	19th December 2017	Sheet	3
Project Title	Beaufort Bypass	Engineer	MB / NI	Rev	1
Description	23 Camp Hill Road			Type	LG

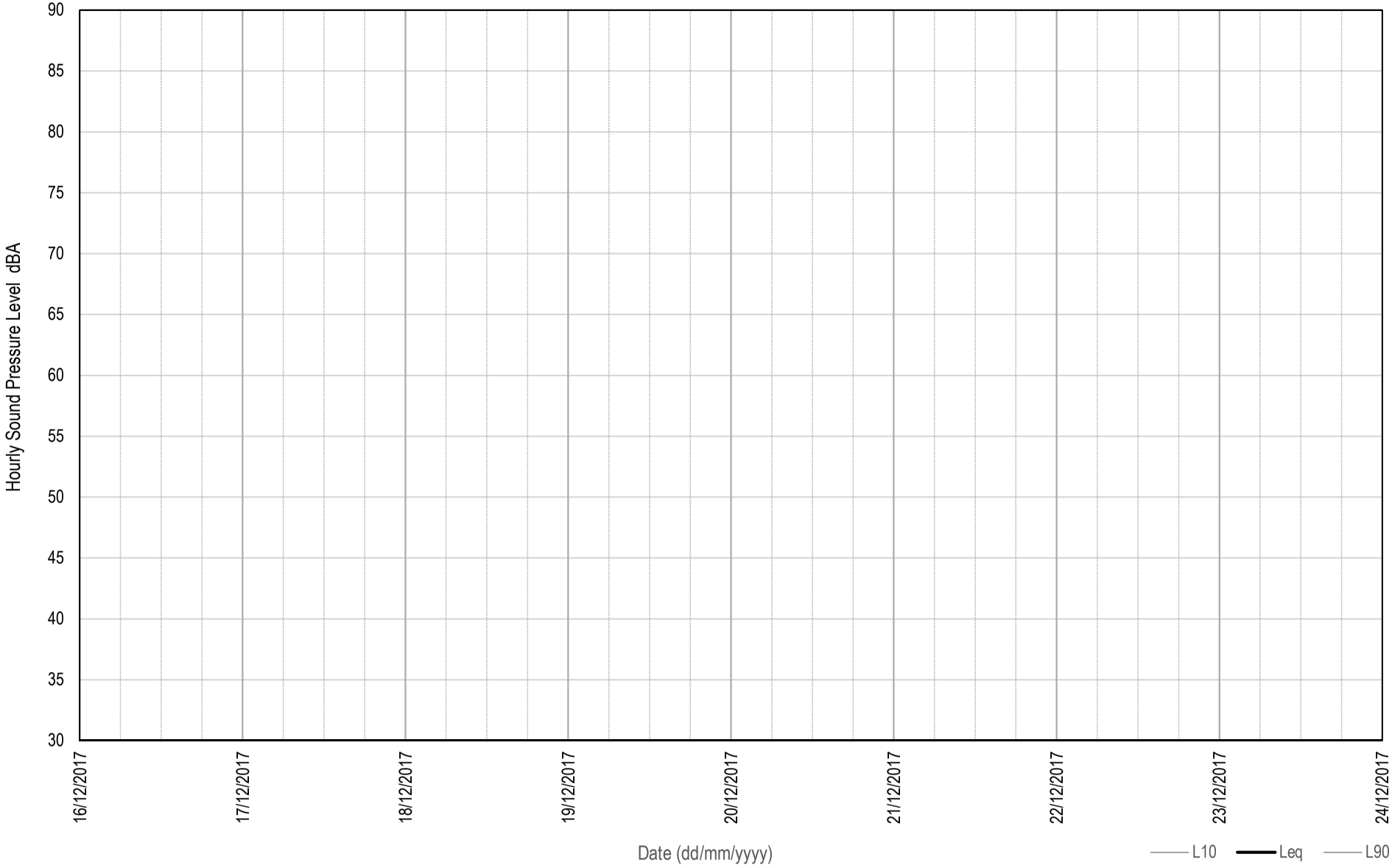
Logger Location	23 Camp Hill Road (710525.00, 5855653.00)
Microphone Position	1m away from façade leading to noise sensitive room

		Sat, 16 Dec 2017			Sun, 17 Dec 2017			Mon, 18 Dec 2017			Tue, 19 Dec 2017			Wed, 20 Dec 2017			Thu, 21 Dec 2017			Fri, 22 Dec 2017			Sat, 23 Dec 2017		
		L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}
Daily Averages	LA10,18h																								
	LAeq,24h		-112.8			-112.8			-109.4																
	LAeq,16h		-111.0			-111.0			-106.0																
	LAeq,8h		-108.0			-108.0																			
	LA90 Day																								
	LA90 Evening																								
	LA90 Night																								
Hourly Values	00:00 to 01:00	48.9*	110.7*	23.1*	50.9*	48.5*	43.3*	51.9*	49.8*	41.8*															
	01:00 to 02:00	131.5*	123.9*	80*	50.4*	48.6*	42.9*	50.8*	47.4*	40.6*															
	02:00 to 03:00	48.9*	116.8*	23.1*	48.9*	46.9*	41.8*	51.8*	48.2*	41.3*															
	03:00 to 04:00	131.5*	124*	80*	48.6*	46.3*	41.6*	50*	46.1*	35.3*															
	04:00 to 05:00	73.9*	123.5*	23.1*	48.6*	46.7*	42.8*	55.9*	52.3*	41.9*															
	05:00 to 06:00	131.5*	122.4*	80*	49.4*	46.9*	41.4*	57.7*	54.5*	46.6*															
	06:00 to 07:00	48.9*	119.4*	48.5*	53.4*	50.6*	42.3*	62.5*	59.4*	49.3*															
	07:00 to 08:00	131.5*	101.3*	80*	53.6*	51.7*	44.1*	61.4*	61.8*	50.5*															
	08:00 to 09:00	48.9*	114.3*	23.1*	54.6*	51.9*	45.3*	61.3*	59.4*	51.3*															
	09:00 to 10:00	131.5*	123.6*	80*	55.2*	52.5*	47.1*	59.4*	56.6*	49.7*															
	10:00 to 11:00	74.1*	119.5*	23.1*	56.4*	53.4*	47.1*	61.2*	84.8*	47.8*															
	11:00 to 12:00	131.5*	120.6*	80*	57.8*	59.7*	46.8*																		
	12:00 to 13:00	48.9*	116.4*	23.1*	55.7*	55.3*	45.9*																		
	13:00 to 14:00	131.5*	123.6*	80*	56.1*	53.3*	45*																		
	14:00 to 15:00	48.9*	121.5*	23.1*	56.3*	53.9*	44.8*																		
	15:00 to 16:00	54.6*	52.3*	48.9*	56.4*	55.6*	45.1*																		
	16:00 to 17:00	55.9*	53.2*	46.2*	56.9*	53.9*	43.1*																		
	17:00 to 18:00	55.5*	52.9*	45.4*	56.3*	54*	44*																		
	18:00 to 19:00	65.8*	60.6*	46.6*	55.5*	52.6*	45.3*																		
	19:00 to 20:00	55.2*	52*	44*	55.2*	53.3*	45.4*																		
	20:00 to 21:00	55.8*	53.2*	45.1*	56.4*	53.9*	45.4*																		
	21:00 to 22:00	54.3*	51.6*	43.5*	56.7*	54.2*	45.5*																		
	22:00 to 23:00	53.7*	51.8*	44.9*	52.6*	50*	44.7*																		
	23:00 to 0:00	53.6*	50.3*	45.1*	50.3*	47.9*	43*																		

Logger Summary - 23 Camp Hill Road (710525.00, 5855653.00)



Logger Summary - 23 Camp Hill Road (710525.00, 5855653.00)



Site Details	142 Packhams Lane	**Microphone Position**	On the boundary fence with adequate microphone height clearance
Start Date	Fri 08 December 2017		
End Date	Fri 15 December 2017		

Measurement Summary

Date	08/12	09/12	10/12	11/12	12/12	13/12	14/12	15/12
$L_{10,18Hr}$, dBA	46.6	43.3	48.2					

Date	16/12	17/12	18/12	19/12	20/12	21/12	22/12	23/12
$L_{10,18Hr}$, dBA								

Site Map

Site Photo

Project No.	PS102347_2270290A	**Date**	08 February 2018
Project Title	Beaufort Bypass	**Engineer**	MB/NI
Description	Background noise monitoring Beaufort Bypass		

Shee	2		
Rev	1		
Type	LG		

Logger Location	142 Packhams Lane
Microphone Position	On the boundary fence with adequate microphone height clearance

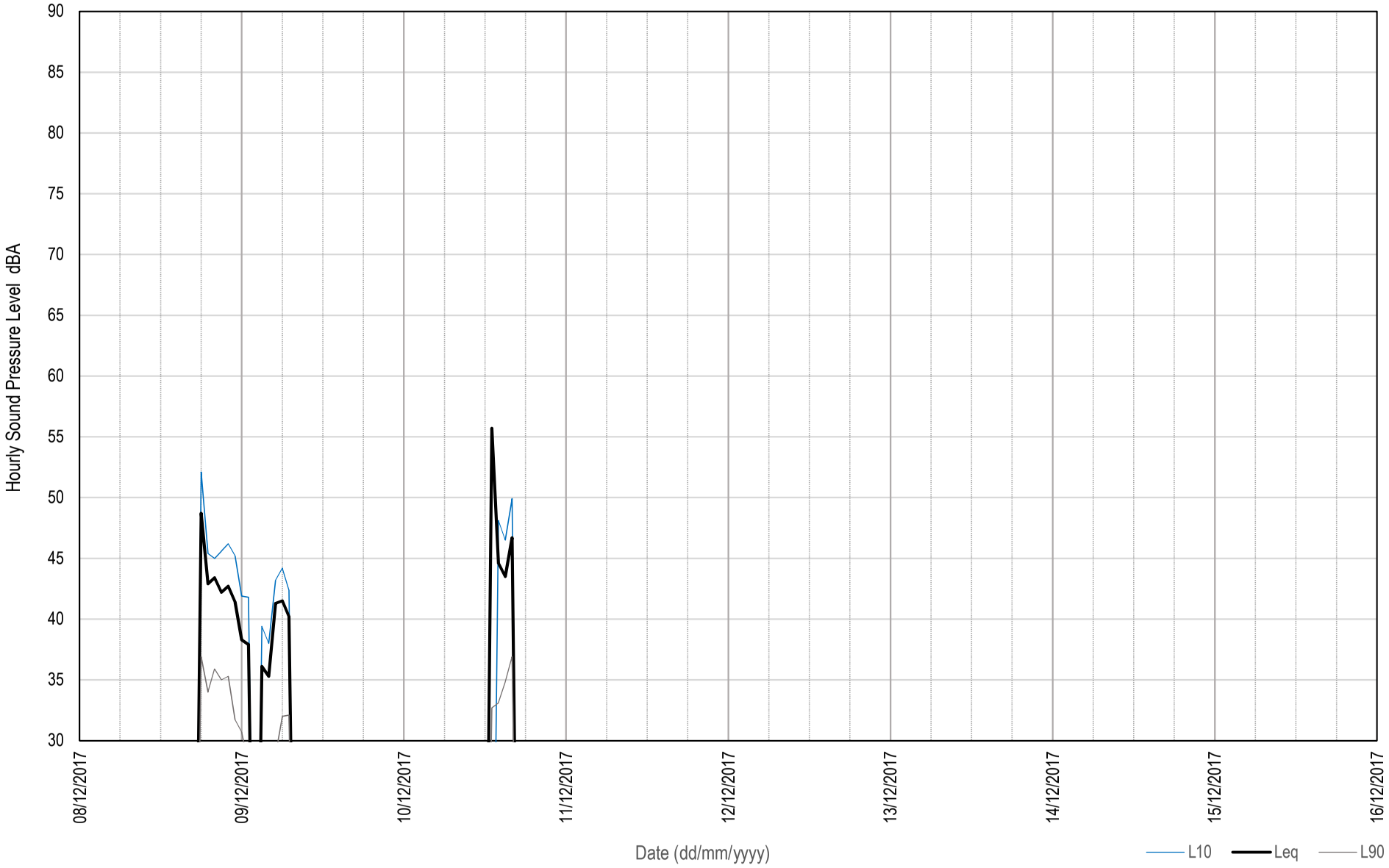
		Fri, 08 Dec 2017			Sat, 09 Dec 2017			Sun, 10 Dec 2017			Mon, 11 Dec 2017			Tue, 12 Dec 2017			Wed, 13 Dec 2017			Thu, 14 Dec 2017			Fri, 15 Dec 2017		
		L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}		L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}
Daily Averages	LA10,18h	46.6			43.3			48.2																	
	LAeq,24h		40.7			33.9			42.9			-112.8			-112.8			-112.8			-112.8			-112.8	
	LAeq,16h		40.4			31.9			44.7			-111.0			-111.0			-111.0			-111.0			-111.0	
	LAeq,8h		39.2			-108.0			-108.0			-108.0			-108.0			-108.0			-108.0			-108.0	
	LA90 Day						32.1																		
	LA90 Evening			35.5						34.4															
	LA90 Night			30.0																					
Hourly Values	00:00 to 01:00				41.9	38.3	30.7	47.4*	46.4*	45.6*	49.9*	47.9*	46.1*	51.1*	49.7*	48.2*	48.2*	47.4*	46.7*	52.7*	51.1*	48.9*	53.3*	52.2*	51.2*
	01:00 to 02:00				41.8	37.9	28.0	46.9*	46.2*	45.6*	49.5*	47.9*	46.5*	52*	50.3*	48.6*	47.6*	46.9*	46.2*	51.5*	50.6*	49.4*	52.8*	51.8*	51*
	02:00 to 03:00				41*	37.4*	28.9*	46.3*	45.5*	44.6*	49.5*	48.1*	46.9*	51*	49.4*	47.5*	48.9*	48*	47*	50.8*	50*	49.1*	53*	51.8*	50.6*
	03:00 to 04:00				39.4	36.1	27.6	48.7*	47.3*	45.4*	48.8*	47.3*	46*	51.6*	49.9*	48.2*	48.6*	48.1*	47.5*	51.9*	51.6*	49.6*	52.4*	51.5*	50.4*
	04:00 to 05:00				38.0	35.3	25.8	49.1*	48.2*	47.2*	47.6*	46.4*	45.4*	51*	49.3*	47.8*	48.1*	47.4*	46.6*	51.7*	50.9*	49.7*	52.8*	51.5*	49.9*
	05:00 to 06:00				43.2	41.3	28.8	50.4*	49.2*	46.5*	49.9*	48.4*	45.9*	51.2*	49.8*	47.5*	49*	48.9*	46.8*	51.9*	51.1*	49.3*	53*	51.8*	49.9*
	06:00 to 07:00				44.2	41.5	32.0	51*	49.9*	47.9*	49*	47.7*	45.2*	50.7*	49.4*	47.2*	47.7*	47.1*	45.9*	50.9*	50.3*	49.4*	53.1*	51.9*	49.5*
	07:00 to 08:00				42.4	40.2	32.1	48.3*	46.8*	44.8*	48.7*	47.1*	44.9*	50*	48.5*	45.7*	46.6*	46.3*	43.4*	52.4*	52.3*	50.3*	53.7*	51.1*	47.6*
	08:00 to 09:00				45.4*	42.7*	32.4*	48.7*	47.1*	44.8*	50.5*	48.9*	46.2*	47.4*	46*	44.1*	49.7*	48.6*	44.8*	52.6*	51.7*	50.8*	48.9*	47.7*	46.3*
	09:00 to 10:00				48.7*	45.8*	35.4*	63.8*	58.9*	45.7*	60.5*	56.1*	47.2*	68.7*	63.9*	43.7*	60.2*	58.5*	50*	63.3*	60.9*	51.4*	51.2*	53.1*	46.5*
	10:00 to 11:00	64.7*	71*	39.8*	55.4*	52.3*	38.9*	60.2*	59.6*	59*	60.4*	59.8*	58.9*	69.5*	68.9*	68.4*	61.3*	60.9*	60.4*	63.7*	59.8*	53.3*	61.2*	60.8*	60.3*
	11:00 to 12:00	52.9*	49.8*	38.2*	54.9*	51.3*	39.1*	61.7*	60.9*	60*	61.8*	61.1*	60.2*	64.9*	61.9*	59.5*	63.2*	62.6*	61.6*	64.2*	62.7*	53.6*	63.6*	62.8*	61.6*
	12:00 to 13:00	55.3*	51.6*	40.1*	54.4*	50.5*	38.8*	62.6*	61.3*	56.1*	62.7*	62.5*	62.1*	60.7*	52.8*	30.7*	63.2*	63*	62.6*	64*	63*	53.9*	64.6*	64.3*	63.8*
	13:00 to 14:00	55.3*	51.4*	38.8*	56.5*	52.6*	38.3*	62.5*	55.7	32.7	62.8*	62.6*	62.4*	62.1*	61.8*	61.4*	63.5*	63.2*	62.6*	64.6*	64.2*	63.6*	65*	64.8*	64.4*
	14:00 to 15:00	54*	50.7*	38.6*	54.9*	51.1*	37.5*	48.1	44.6	33.1	62.9*	62.7*	62.4*	62.7*	62.3*	62*	63.3*	63.2*	62.8*	65.1*	64.6*	63.9*	65.3*	65*	64.8*
	15:00 to 16:00	55*	51.1*	38.9*	55.8*	51.9*	36.8*	46.5	43.5	34.8	62.9*	60.3*	49.5*	62.8*	62.6*	62.4*	63.8*	63.6*	63.2*	65.9*	65.1*	64.4*	65.3*	65.1*	64.9*
	16:00 to 17:00	53.1*	49.5*	37.8*	55*	51.3*	37.7*	49.9	46.7	36.9	63.2*	62.6*	60.1*	62.7*	57*	31.1*	64*	63.8*	63.3*	65.6*	65.1*	64.6*	65.3*	65.1*	64.9*
	17:00 to 18:00	55.9*	53.1*	39.4*	55.3*	51.8*	38*	48.5*	45.5*	36.8*	63.4*	63.3*	63*	63.2*	62.3*	35.3*	64.1*	64.1*	63.8*	65.5*	65*	64.6*	65.6*	65.4*	65.1*
	18:00 to 19:00	52.1	48.7	36.9	49.7*	45.9*	34.9*	47.8*	44.6*	36*	63.4*	63.3*	63*	63.2*	63.2*	63*	64.1*	64*	63.8*	65.8*	65.3*	64.8*	65.8*	65.5*	65.4*
	19:00 to 20:00	45.4	42.9	34.0	49.1*	45.7*	34.8*	47.1*	44.2*	36.6*	63.2*	63*	62.6*	63.4*	63.3*	63*	67.3*	65.7*	63.6*	65.3*	65.1*	64.9*	66.3*	65.9*	65.7*
	20:00 to 21:00	45.0	43.4	35.9	50.4*	49.2*	41.4*	47.8*	44.9*	38.9*	62.5*	57.1*	49.7*	62.9*	59.4*	49.2*	66*	65*	64.1*	55.6*	55.6*	53.9*	66.2*	62.1*	56.1*
	21:00 to 22:00	45.6	42.2	35.0	48.6*	47.4*	46.1*	49.4*	48.1*	46.6*	52.1*	50.5*	48.5*	50.3*	48.9*	47.1*	64.1*	60.5*	52.2*	55.3*	54.2*	52.7*	56.4*	55.9*	55*
	22:00 to 23:00	46.2	42.7	35.3	49*	47.9*	46.8*	48.7*	47.4*	46.2*	51.2*	49.5*	47.9*	48.3*	47*	45.6*	53.2*	52.4*	51.5*	53.1*	52*	50.8*	55.5*	54.7*	54*
	23:00 to 0:00	45.2	41.4	31.7	48.5*	47.6*	46.7*	49.3*	47.9*	46.6*	51.7*	50.1*	48.6*	49.5*	47.8*	45.9*	52.8*	52.2*	51.6*	53*	52.3*	51.2*	53.5*	51.9*	49.7*

Project No.	PS102347_2270290A	**Date**	08 February 2018	**Sheet**	3
Project Title	Beaufort Bypass	**Engineer**	MB/NI	**Rev**	1
Description	Background noise monitoring Beaufort Bypass			**Type**	LG

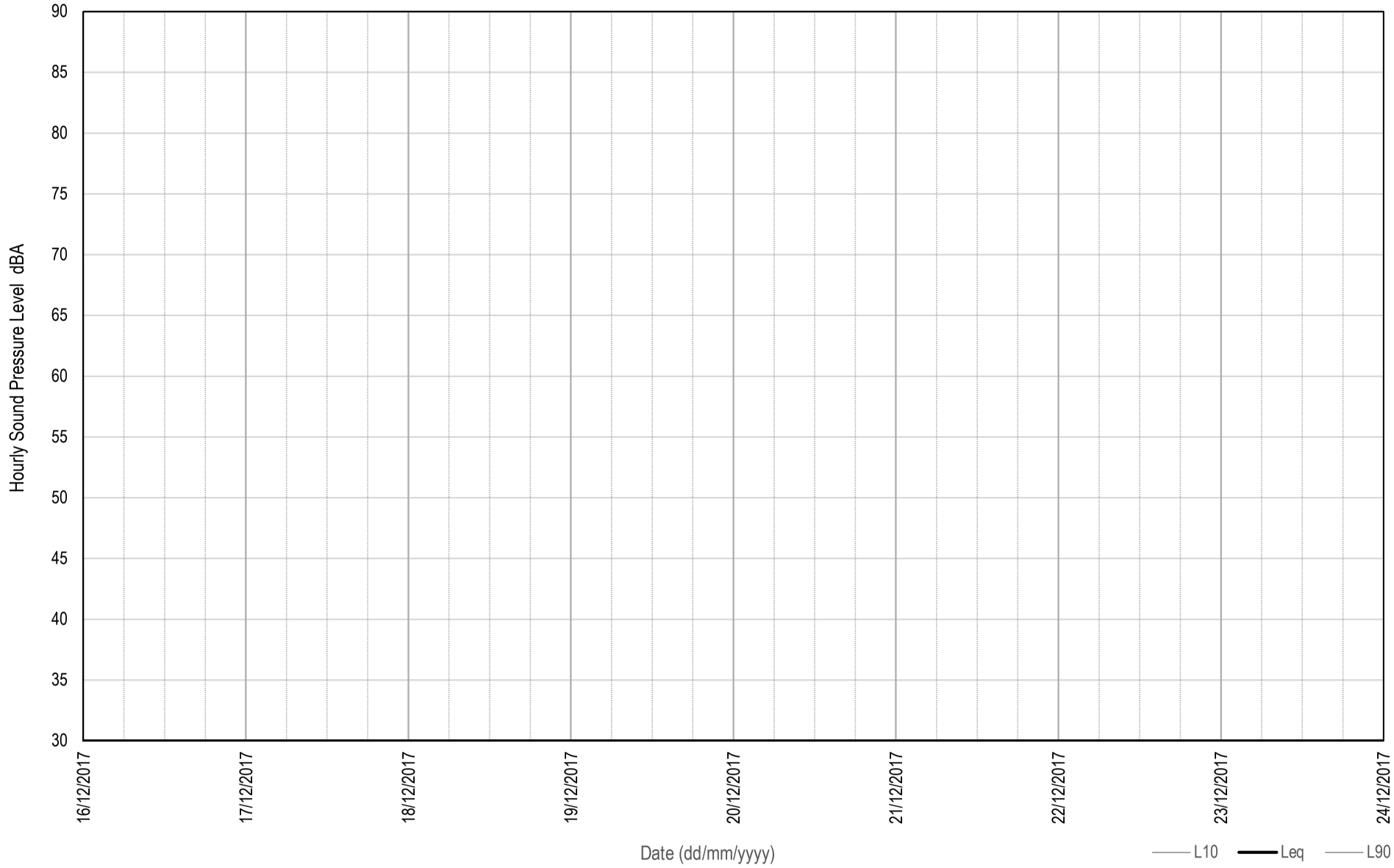
Logger Location	142 Packhams Lane
Microphone Position	On the boundary fence with adequate microphone height clearance

		Sat, 16 Dec 2017			Sun, 17 Dec 2017			Mon, 18 Dec 2017			Tue, 19 Dec 2017			Wed, 20 Dec 2017			Thu, 21 Dec 2017			Fri, 22 Dec 2017			Sat, 23 Dec 2017		
		L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}
Daily Averages	LA10,18h																								
	LAeq,24h		-112.8			-112.8			-109.8																
	LAeq,16h		-111.0			-111.0			-106.8																
	LAeq,8h		-108.0			-108.0																			
	LA90 Day																								
	LA90 Evening																								
	LA90 Night																								
Hourly Values	00:00 to 01:00	51.5*	50.3*	49*	51.6*	51.1*	50.4*	50.6*	49.8*	49.1*															
	01:00 to 02:00	52.2*	51.2*	50.1*	52.2*	51.6*	50.8*	50.8*	50*	48.7*															
	02:00 to 03:00	52.7*	51.8*	51*	52.2*	51.5*	50.7*	51*	50.4*	49.7*															
	03:00 to 04:00	52.9*	51.9*	51.1*	51.6*	51*	50*	50.3*	49.8*	49.3*															
	04:00 to 05:00	52.6*	51.9*	51*	51*	50.7*	50.3*	50.7*	49.5*	48.3*															
	05:00 to 06:00	52.5*	51.7*	50.5*	51.3*	50.7*	49.7*	50.6*	49.4*	48.1*															
	06:00 to 07:00	52.1*	51.2*	50.1*	50.7*	56.9*	48.5*	51.5*	50.2*	48.4*															
	07:00 to 08:00	51.4*	50*	47.4*	49.7*	48.4*	45.8*	51*	49.8*	48.4*															
	08:00 to 09:00	49.5*	61.7*	45.5*	49.8*	48*	45.8*	52*	51.8*	49.8*															
	09:00 to 10:00	61.3*	56.5*	50.2*	64.1*	60.4*	48.5*	62.4*	59.2*	51*															
	10:00 to 11:00	62.6*	62.3*	61.6*	63.7*	63.3*	62.7*	63.4*	63*	62.5*															
	11:00 to 12:00	64.5*	63.7*	63*	64.9*	64.5*	63.8*	64.2*	79.5*	28.1*															
	12:00 to 13:00	65.2*	64.9*	64.5*	65.6*	65.2*	64.7*																		
	13:00 to 14:00	66*	65.6*	65.3*	65.6*	65*	64.9*																		
	14:00 to 15:00	66*	65.7*	65.6*	42.8*	41.8*	31.6*																		
	15:00 to 16:00	65.7*	58.4*	34*	39.4*	37*	30.9*																		
	16:00 to 17:00	44.4*	41.7*	33*	38.2*	36.5*	30.6*																		
	17:00 to 18:00	42*	39.5*	33.5*	66*	64*	32.8*																		
	18:00 to 19:00	66.3*	65.8*	66*	66.3*	66.1*	66*																		
	19:00 to 20:00	66.4*	66.3*	66.1*	66.1*	65.9*	65.8*																		
	20:00 to 21:00	66.4*	61.7*	55*	55.2*	57.3*	52.8*																		
	21:00 to 22:00	55.6*	54.7*	53.7*	54*	53.2*	52.5*																		
	22:00 to 23:00	53.4*	52.5*	51.3*	51.6*	49.9*	48.1*																		
	23:00 to 0:00	52.5*	52*	51.4*	51.2*	50*	44.9*																		

Logger Summary - 142 Packhams Lane



Logger Summary - 142 Packhams Lane



Site Details	171 Beaufort Lexton Road	**Microphone Position**	Open Field, No reflective surfaces.
Start Date	Mon 16 April 2018		
End Date	Mon 23 April 2018		

Measurement Summary

Date	16/04	17/04	18/04	19/04	20/04	21/04	22/04	23/04
$L_{10,18Hr}$, dBA	50.6	50.2	50.0	51.0	54.1	50.2	50.4	52.1

Date	24/04	25/04	26/04	27/04	28/04	29/04	30/04	01/05
$L_{10,18Hr}$, dBA	49.7	47.9	51.9	51.6	47.3	48.3	48.3	48.2

Site Map

Site Photo

Project No.	2270290A	**Date**	03 May 2018	**Sheet**	2
Project Title	Beaufort Bypass	**Engineer**	NI	**Rev**	1
Description	Background Noise Monitoring			**Type**	LG

Logger Location	171 Beaufort Lexton Road
Microphone Position	Open Field, No reflective surfaces.

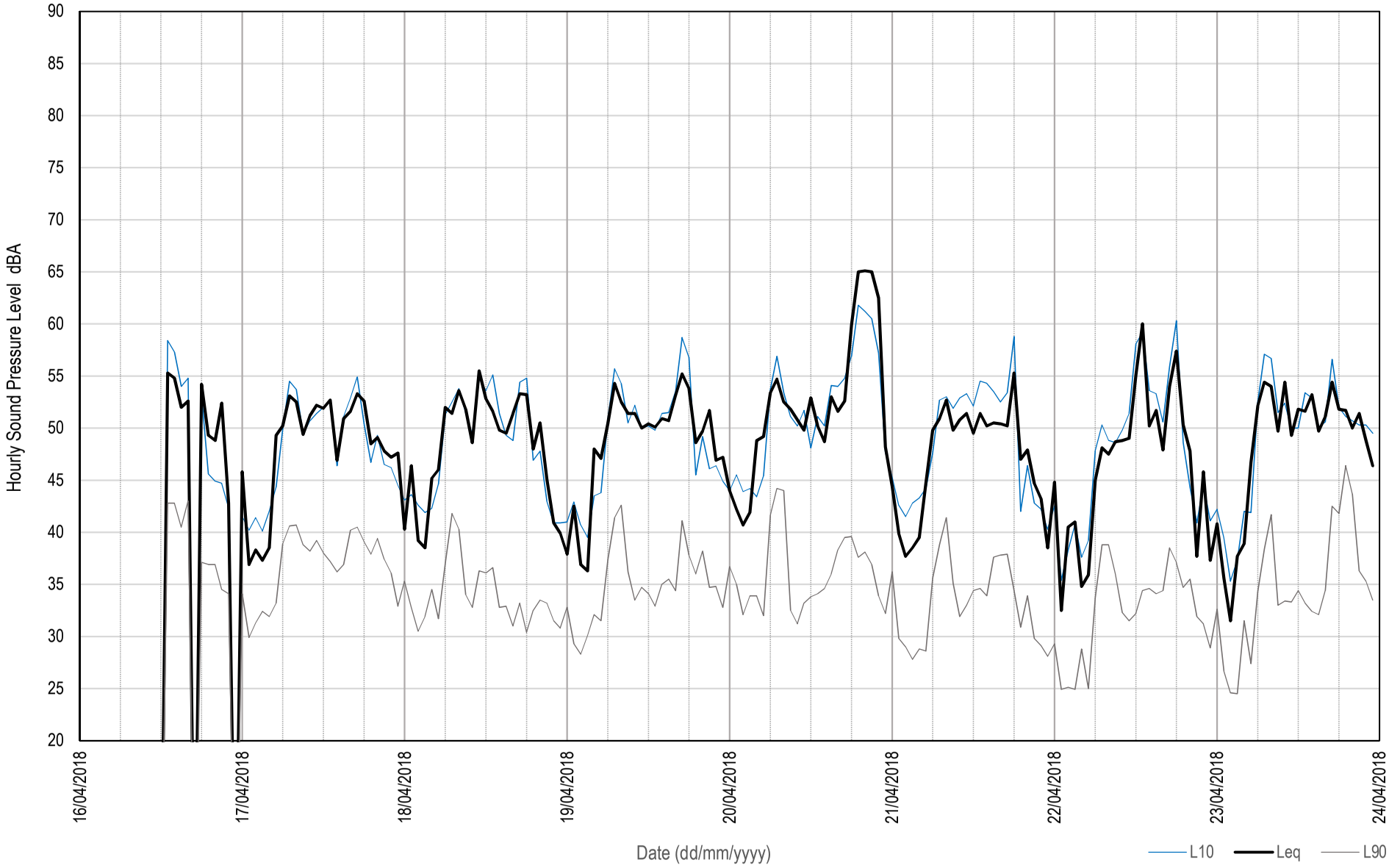
		Mon, 16 Apr 2018			Tue, 17 Apr 2018			Wed, 18 Apr 2018			Thu, 19 Apr 2018			Fri, 20 Apr 2018			Sat, 21 Apr 2018			Sun, 22 Apr 2018			Mon, 23 Apr 2018		
		L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	42.3	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}
Daily Averages	LA10,18h	50.6			50.2			50.0			51.0			54.1			50.2			50.4			52.1		
	LAeq,24h		51.2			50.0			50.3			50.5			57.8			49.2			51.1			50.8	
	LAeq,16h		52.0			51.3			51.7			51.9			58.9			50.7			52.7			52.2	
	LAeq,8h		43.2			45.0			43.3			46.1			53.8			40.5			41.8			44.8	
	LA90 Day			42.3			38.8			35.3			36.5			36.5			35.8						35.3
	LA90 Evening			36.4			38.5			32.4			36.7			38.1			34.5			35.0			42.1
	LA90 Night			33.2			33.6			31.5			34.8			31.3			27.7			29.1			29.8
Hourly Values	00:00 to 01:00				41.5	45.8	34.1	43.1	40.3	35.3	41.0	37.9	32.8	44.0	44.0	36.7	45.3	44.4	36.2	42.5	44.8	29.3	42.2	40.8	32.6
	01:00 to 02:00				40.2	36.9	29.9	43.6	46.4	32.8	42.9	42.5	29.3	45.5	42.2	35.0	42.6	39.9	29.8	35.4	32.5	24.9	39.5	35.6	26.7
	02:00 to 03:00				41.4	38.3	31.3	42.6	39.2	30.5	40.7	36.9	28.3	43.9	40.7	32.1	41.5	37.7	29.0	38.3	40.5	25.1	35.3	31.5	24.6
	03:00 to 04:00				40.1	37.3	32.4	41.9	38.5	31.9	39.5	36.3	30.1	44.2	41.9	33.9	42.8	38.5	27.8	40.7	41.0	24.9	37.3	37.7	24.5
	04:00 to 05:00				42.0	38.5	31.9	42.3	45.2	34.5	43.5	48.0	32.1	43.4	48.8	33.9	43.3	39.5	28.8	37.6	34.8	28.8	42.0	38.9	31.5
	05:00 to 06:00				44.3	49.3	33.2	44.6	46.0	31.7	43.8	47.1	31.5	45.4	49.2	32.0	44.2	44.7	28.6	39.2	35.9	25.0	41.9	46.7	27.4
	06:00 to 07:00				49.9	50.2	38.9	51.3	52.0	37.0	50.8	50.4	37.3	53.7	53.4	41.6	47.6	49.8	35.6	47.8	45.0	33.7	52.5	52.1	34.3
	07:00 to 08:00				54.5	53.1	40.6	52.5	51.4	41.8	55.7	54.3	41.4	56.9	54.7	44.2	52.7	50.9	38.8	50.3	48.1	38.8	57.1	54.4	38.4
	08:00 to 09:00				53.7	52.5	40.7	53.8	53.6	40.3	54.3	52.5	42.6	53.4	52.5	44.0	53.0	52.7	41.4	48.8	47.5	38.8	56.7	54.0	41.7
	09:00 to 10:00				49.4	49.4	38.8	51.5	51.8	34.0	50.5	51.4	36.2	51.1	51.8	32.5	51.9	49.8	35.1	48.6	48.7	36.0	51.5	49.7	33.0
	10:00 to 11:00				50.7	51.2	38.2	49.4	48.6	32.8	52.2	51.4	33.5	50.2	50.8	31.2	52.9	50.8	31.9	49.8	48.8	32.3	52.4	54.4	33.4
	11:00 to 12:00				51.4	52.2	39.2	54.8	55.5	36.3	50.0	50.0	34.7	51.7	49.8	33.2	53.3	51.4	33.0	51.4	49.0	31.5	50.0	49.3	33.3
	12:00 to 13:00	61.4*	74.5*	47.1*	52.0	51.9	38.0	53.6	52.8	36.1	50.2	50.4	34.1	48.1	52.9	33.8	52.1	49.5	34.4	58.1	55.1	32.2	50.0	51.8	34.4
	13:00 to 14:00	58.4	55.3	42.8	52.5	52.7	37.2	55.1	51.6	36.6	49.8	50.1	32.9	51.1	50.2	34.1	54.5	51.4	34.6	59.2	60.0	34.4	53.4	51.6	33.2
	14:00 to 15:00	57.3	54.8	42.8	46.4	46.9	36.2	51.4	49.8	32.8	51.4	50.9	35.0	50.2	48.7	34.6	54.3	50.2	33.9	53.6	50.2	34.6	52.9	53.2	32.4
	15:00 to 16:00	54.0	52.0	40.5	51.1	50.9	36.9	49.3	49.5	32.9	51.5	50.7	35.5	54.1	53.0	36.0	53.5	50.5	37.6	53.3	51.7	34.1	50.1	49.7	32.1
	16:00 to 17:00	54.8	52.6	43.0	52.9	51.6	40.2	48.8	51.4	31.0	53.5	53.1	34.4	54.0	51.6	38.3	52.5	50.4	37.8	50.6	47.9	34.4	50.6	51.1	34.4
	17:00 to 18:00	53.1*	53*	42.4*	54.9	53.3	40.5	54.4	53.3	33.2	58.7	55.2	41.1	54.8	52.6	39.5	53.4	50.2	37.9	55.9	54.0	38.5	56.6	54.4	42.5
	18:00 to 19:00	53.2	54.2	37.1	50.4	52.6	39.1	54.8	53.2	30.4	56.8	53.8	37.8	56.9	59.9	39.6	58.8	55.3	34.4	60.3	57.4	37.1	52.0	51.8	41.8
	19:00 to 20:00	45.6	49.3	36.9	46.7	48.5	37.9	46.9	48.0	32.5	45.5	48.6	36.0	61.8	65.0	37.6	42.0	47.0	30.9	48.6	50.3	34.7	51.1	51.7	46.4
	20:00 to 21:00	44.9	48.8	36.9	49.3	49.1	39.4	47.8	50.5	33.5	49.2	49.7	38.2	61.2	65.1	38.1	46.4	47.9	33.9	44.3	47.8	35.5	50.7	50.0	43.7
	21:00 to 22:00	44.7	52.4	34.5	46.5	47.8	37.4	43.0	45.1	33.2	46.1	51.7	34.7	60.5	65.0	36.9	42.8	44.7	29.8	40.9	37.7	31.9	50.3	51.4	36.3
	22:00 to 23:00	42.4	42.8	34.1	46.2	47.2	36.1	40.9	40.9	31.5	46.4	46.9	34.8	57.2	62.5	33.9	42.2	43.2	29.1	44.5	45.8	31.2	50.3	48.8	35.3
	23:00 to 0:00	41.8*	45.3*	33.7*	44.5	47.6	32.9	40.9	39.9	30.8	44.9	47.2	32.8	47.7	48.2	32.2	40.3	38.5	28.1	41.1	37.3	28.9	49.5	46.4	33.5

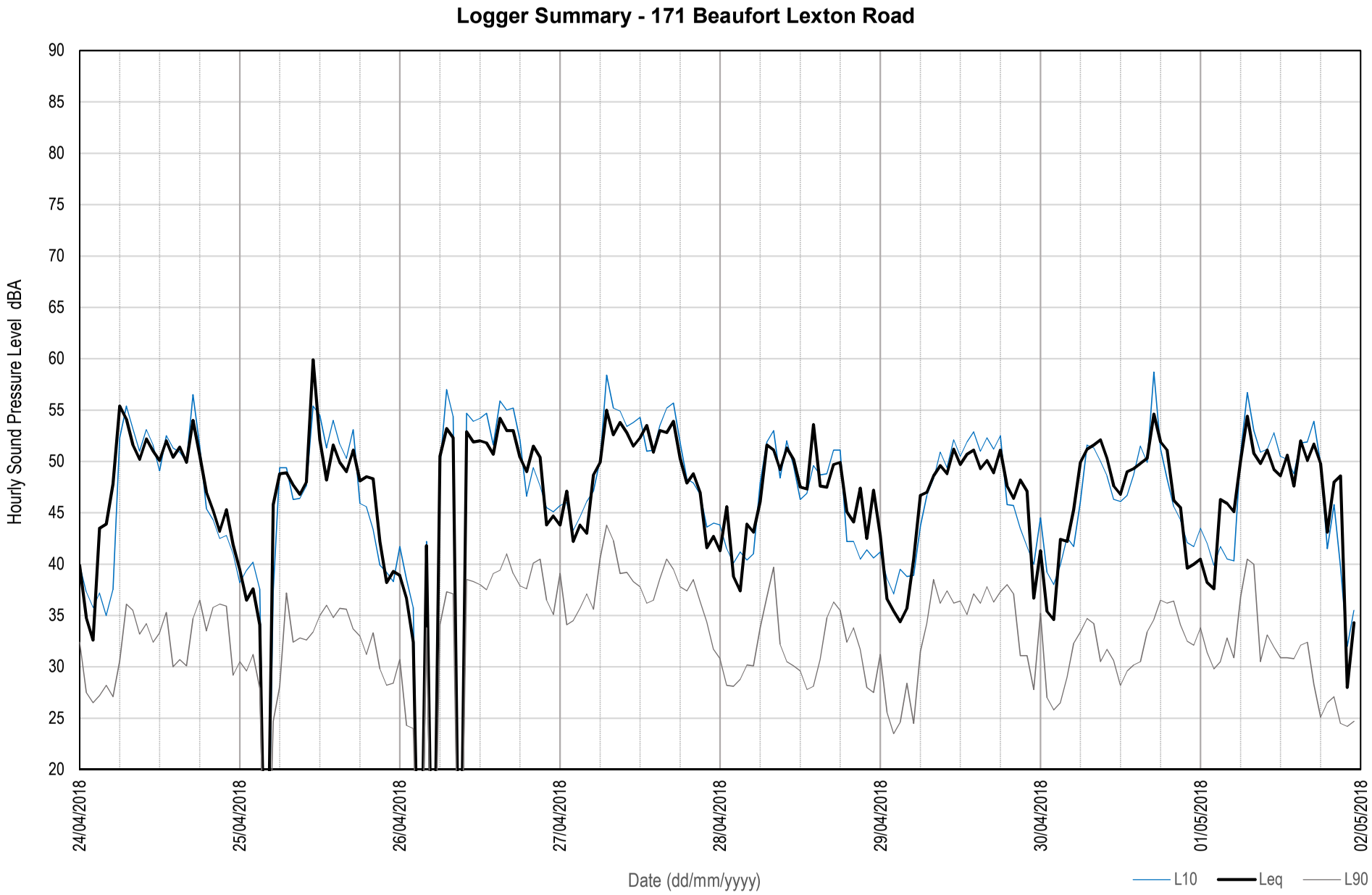
Project No.	2270290A	**Date**	03 May 2018	**Sheet**	3
Project Title	Beaufort Bypass	**Engineer**	NI	**Rev**	1
Description	Background Noise Monitoring			**Type**	LG

Logger Location	171 Beaufort Lexton Road
Microphone Position	Open Field, No reflective surfaces.

		Tue, 24 Apr 2018			Wed, 25 Apr 2018			Thu, 26 Apr 2018			Fri, 27 Apr 2018			Sat, 28 Apr 2018			Sun, 29 Apr 2018			Mon, 30 Apr 2018			Tue, 01 May 2018		
		L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}
Daily Averages	LA10,18h	49.7			47.9			51.9			51.6			47.3			48.3			48.3			48.2		
	LAeq,24h		50.0			49.8			50.1			50.8			48.2			47.9			48.9			48.9	
	LAeq,16h		51.4			51.4			51.7			52.1			49.4			49.3			50.4			50.3	
	LAeq,8h		41.3			37.4			45.2			42.5			41.6			42.5			42.9			32.2	
	LA90 Day			33.2			34.5			38.5			39.3			33.2						31.7			32.9
	LA90 Evening			35.5			31.8			39.0			37.5			32.3			36.3			35.8			25.8
	LA90 Night			29.6			29.1			36.5			30.7			27.2			29.8			32.3			24.5
Hourly Values	00:00 to 01:00	39.9	39.9	32.4	38.2	39.5	30.5	41.7	38.9	30.7	45.7	43.8	39.1	43.8	41.3	30.8	41.2	42.8	31.2	44.5	41.3	35.2	43.5	40.5	33.8
	01:00 to 02:00	37.3	34.8	27.5	39.4	36.5	29.6	38.5	36.7	24.3	46.0	47.1	34.1	41.5	45.6	28.2	38.6	36.6	25.6	39.2	35.4	27.0	42.0	38.2	31.4
	02:00 to 03:00	35.8	32.6	26.5	40.2	37.6	31.2	35.8	32.4	24.0	43.3	42.2	34.5	40.1	38.8	28.1	37.1	35.4	23.5	38.0	34.6	25.8	39.9	37.6	29.8
	03:00 to 04:00	37.2	43.5	27.2	37.6	34.1	27.9	39.4*	44.6*	25.1*	44.6	43.8	35.7	41.2	37.4	28.8	39.5	34.4	24.6	39.9	42.4	26.5	41.7	46.3	30.5
	04:00 to 05:00	35.0	43.9	28.2	34.4*	31.8*	27.7*	42.2	41.8	33.8	46.1	43.0	37.1	40.4	43.9	30.2	38.8	35.7	28.4	42.6	42.2	29.0	40.5	45.9	32.8
	05:00 to 06:00	37.5	47.8	27.1	37.3	45.8	24.7	44.5*	49.4*	30*	47.1	48.7	35.6	41.0	43.1	30.1	38.9	40.5	24.5	41.7	45.3	32.3	40.3	45.1	30.9
	06:00 to 07:00	52.3	55.4	30.6	49.4	48.8	28.1	49.5	50.5	34.1	50.2	49.9	40.6	47.9	46.1	33.8	43.7	46.7	31.5	46.1	49.9	33.4	50.8	50.1	36.8
	07:00 to 08:00	55.4	54.1	36.1	49.4	48.9	37.2	57.0	53.2	37.3	58.4	55.0	43.8	51.9	51.6	36.8	46.7	47.0	34.2	51.6	51.2	34.7	56.7	54.4	40.5
	08:00 to 09:00	53.2	51.6	35.5	46.3	47.7	32.4	54.4	52.3	37.1	55.2	52.6	42.3	53.0	51.1	39.7	48.3	48.6	38.5	51.3	51.6	34.2	53.0	50.8	40.0
	09:00 to 10:00	51.0	50.2	33.2	46.4	46.8	32.8	52.4*	52.3*	38.7*	54.9	53.8	39.1	48.4	49.2	32.2	50.9	49.6	36.2	50.0	52.1	30.5	50.9	49.8	30.5
	10:00 to 11:00	53.1	52.2	34.2	47.6	48.0	32.6	54.7	52.9	38.5	53.4	52.8	39.2	52.0	51.3	30.5	49.4	48.8	37.4	48.6	50.3	31.7	51.2	51.1	33.1
	11:00 to 12:00	51.6	51.0	32.4	55.4	59.9	33.4	53.9	51.9	38.3	53.8	51.5	38.3	49.6	50.2	30.1	52.1	51.2	36.2	46.3	47.6	30.6	52.8	49.2	31.9
	12:00 to 13:00	49.1	50.1	33.3	54.5	52.1	35.0	54.2	52.0	38.0	54.3	52.3	37.8	46.3	47.5	29.6	50.5	49.7	36.4	46.1	46.8	28.2	50.5	48.6	30.9
	13:00 to 14:00	52.5	52.0	35.3	51.3	48.2	36.0	54.7	51.8	37.5	51.0	53.5	36.2	46.9	47.3	27.8	51.9	50.7	35.1	46.7	49.0	29.6	50.2	50.6	30.9
	14:00 to 15:00	51.3	50.4	30.0	54.0	51.6	34.8	51.6	50.7	39.1	51.1	50.9	36.5	49.6	53.6	28.1	52.9	51.1	37.1	48.7	49.3	30.2	48.8	47.6	30.8
	15:00 to 16:00	50.9	51.4	30.7	51.7	49.9	35.7	55.9	54.2	39.4	53.5	53.0	38.6	48.7	47.6	30.7	51.0	49.3	36.2	51.5	49.8	30.5	51.8	52.0	32.1
	16:00 to 17:00	50.0	49.9	30.1	50.3	49.0	35.6	55.0	53.0	41.0	55.2	52.8	40.5	48.8	47.5	34.8	52.3	50.1	37.8	49.9	50.3	33.4	51.9	50.1	32.4
	17:00 to 18:00	56.5	54.0	34.7	53.1	51.1	33.7	55.2	53.0	39.1	55.7	53.9	39.5	51.1	49.7	36.3	51.2	48.9	36.3	58.7	54.6	34.6	53.9	51.7	28.3
	18:00 to 19:00	51.5	50.6	36.5	45.9	48.1	33.0	52.1	50.4	37.9	51.8	50.3	37.8	51.1	49.9	35.5	52.5	51.1	37.3	51.2	51.9	36.5	49.8	49.8	25.1
	19:00 to 20:00	45.4	47.0	33.5	45.6	48.5	31.2	46.6	49.0	37.6	48.3	47.9	37.4	42.2	45.1	32.4	45.8	47.6	38.0	48.3	51.1	36.2	41.5	43.1	26.5
	20:00 to 21:00	44.3	45.2	35.8	43.4	48.3	33.3	49.4	51.5	40.1	47.9	48.8	38.5	42.2	44.1	33.8	45.7	46.4	37.1	45.6	46.2	36.4	45.8	48.0	27.1
	21:00 to 22:00	42.5	43.2	36.1	39.9	42.2	29.8	47.6	50.4	40.5	46.8	47.0	36.4	40.5	47.4	31.7	43.5	48.2	31.1	44.3	45.5	34.1	39.7	48.6	24.5
	22:00 to 23:00	42.8	45.3	35.9	39.2	38.2	28.2	45.5	43.8	36.5	43.6	41.6	34.4	41.4	42.5	28.0	41.7	47.1	31.1	42.1	39.6	32.5	32.0	28.0	24.2
	23:00 to 0:00	41.0	41.9	29.2	38.3	39.3	28.4	45.1	44.7	35.1	44.0	42.7	31.7	40.6	47.2	27.5	40.0	36.7	27.8	41.7	40.0	32.1	35.5	34.3	24.7

Logger Summary - 171 Beaufort Lexton Road




Logger Summary - 171 Beaufort Lexton Road
Hourly Sound Pressure Level dBA
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
24/04/2018
25/04/2018
26/04/2018
27/04/2018
28/04/2018
29/04/2018
30/04/2018
01/05/2018
02/05/2018
Date (dd/mm/yyyy)
L10
Leq
L90

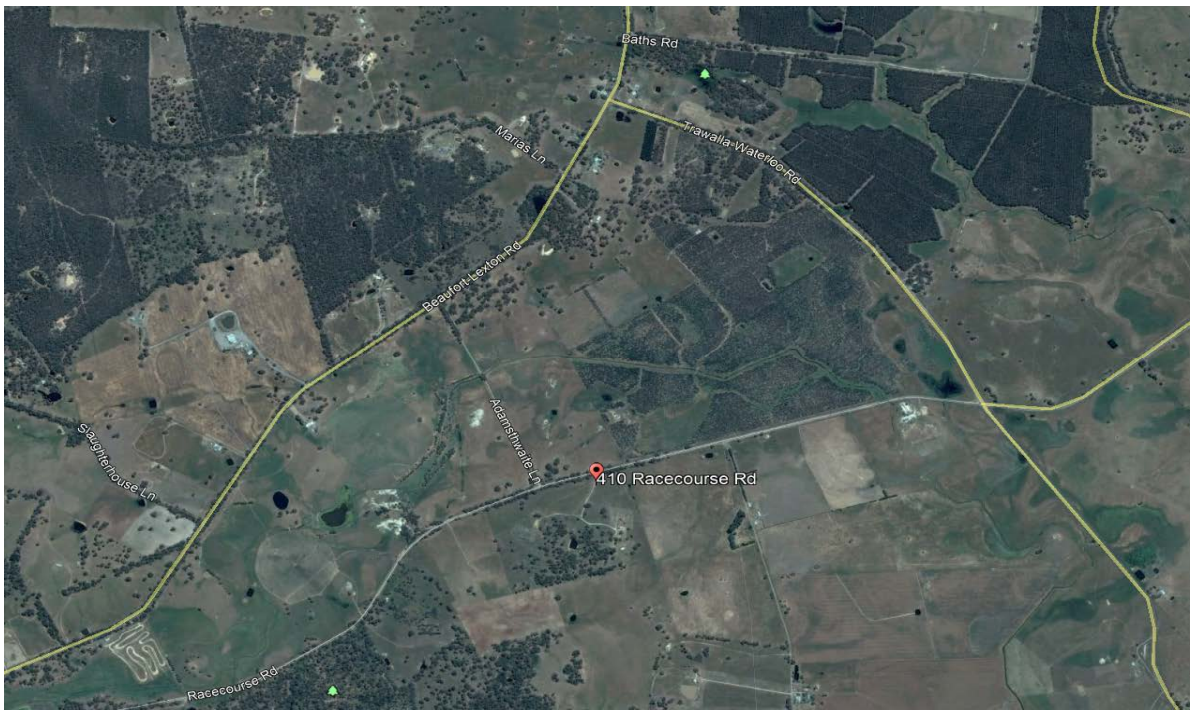
Site Details	410 Race Course Road, Beaufort	**Microphone Position**	1m from Bedroom window
Start Date	Mon 16 April 2018		
End Date	Mon 23 April 2018		

Measurement Summary

Date	16/04	17/04	18/04	19/04	20/04	21/04	22/04	23/04
$L_{10,18Hr}$, dBA	42.6	41.0	41.1	40.3	40.5	39.3	39.2	38.9

Date	24/04	25/04	26/04	27/04	28/04	29/04	30/04	01/05
$L_{10,18Hr}$, dBA	39.0	36.1						

Site Map



Site Photo

Project No.	2270290A	**Date**	03 May 2018	**Sheet**	2
Project Title	Beaufort Bypass	**Engineer**	NI	**Rev**	1
Description	2270290A			**Type**	LG

Logger Location	410 Race Course Road, Beaufort
Microphone Position	1m from Bedroom window

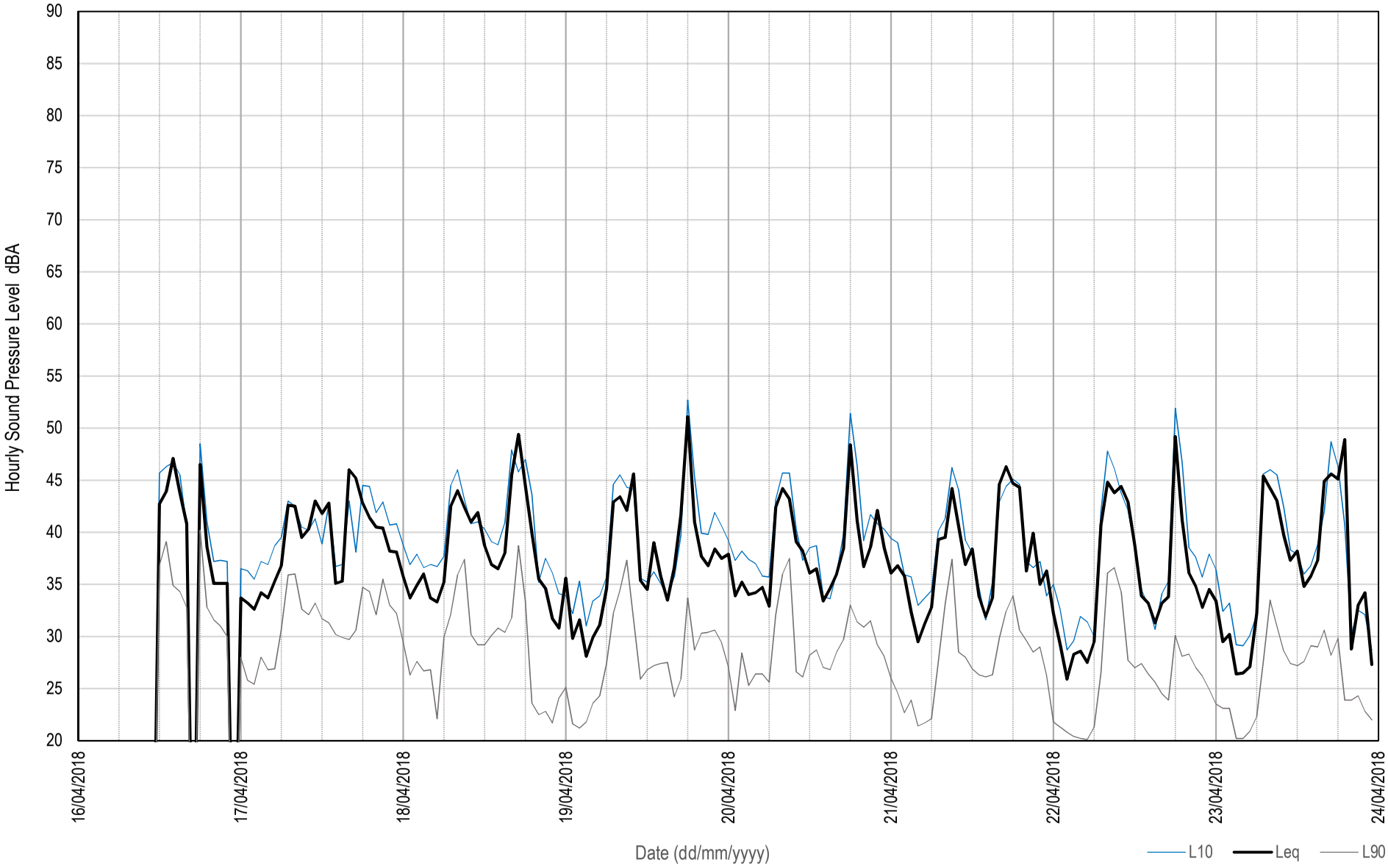
		Mon, 16 Apr 2018			Tue, 17 Apr 2018			Wed, 18 Apr 2018			Thu, 19 Apr 2018			Fri, 20 Apr 2018			Sat, 21 Apr 2018			Sun, 22 Apr 2018			Mon, 23 Apr 2018		
		L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	35.6	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}
Daily Averages	LA10,18h	42.6			41.0			41.1			40.3			40.5			39.3			39.2			38.9		
	LAeq,24h		41.7			40.6			41.0			41.1			40.1			40.0			40.1			41.0	
	LAeq,16h		42.3			41.9			42.5			42.6			41.0			41.3			41.7			42.7	
	LAeq,8h		33.5			35.8			31.6			36.1			37.0			31.9			31.1			28.5	
	LA90 Day			35.6			32.1			32.3			29.1			29.7			30.3						29.1
	LA90 Evening			33.9			34.2			25.6			30.8			31.7			29.3			28.6			25.5
	LA90 Night			27.7			28.2			23.4			26.9			24.4			22.4			22.7			22.5
Hourly Values	00:00 to 01:00				36.5	33.7	28.0	38.8	35.8	29.5	33.9	35.6	25.1	39.2	37.9	27.1	39.4	36.1	26.0	35.0	32.2	21.8	36.4	33.4	23.5
	01:00 to 02:00				36.3	33.2	25.8	36.9	33.7	26.3	32.2	29.8	21.6	37.3	33.9	22.9	39.0	36.8	24.6	32.6	29.2	21.3	32.4	29.5	23.1
	02:00 to 03:00				35.5	32.6	25.4	37.9	34.9	27.6	35.3	31.6	21.2	38.2	35.2	28.4	35.9	35.8	22.7	28.7	25.9	20.8	33.2	30.2	23.1
	03:00 to 04:00				37.2	34.2	28.0	36.6	36.0	26.7	31.0	28.1	21.8	37.4	34.0	25.3	35.7	32.3	23.9	29.6	28.3	20.4	29.2	26.4	20.2
	04:00 to 05:00				36.9	33.7	26.8	36.9	33.7	26.8	33.4	29.9	23.6	37.0	34.2	26.4	33.0	29.5	21.4	31.9	28.6	20.2	29.1	26.5	20.2
	05:00 to 06:00				38.7	35.3	26.9	36.7	33.3	22.1	33.9	31.1	24.3	35.8	34.7	26.4	33.7	31.2	21.7	31.4	27.5	20.1	30.1	27.1	20.9
	06:00 to 07:00				39.5	36.8	30.7	37.7	35.2	29.9	35.7	34.6	27.4	35.7	32.9	25.6	34.4	32.8	22.1	30.0	29.5	21.3	32.1	32.2	22.3
	07:00 to 08:00				43.0	42.6	35.9	44.5	42.5	32.1	44.6	42.9	32.2	43.1	42.4	32.1	40.1	39.3	27.6	42.0	40.7	26.5	45.6	45.4	27.6
	08:00 to 09:00				42.5	42.5	36.0	46.0	44.0	35.9	45.5	43.4	34.4	45.7	44.2	36.0	41.3	39.5	33.1	47.8	44.8	36.1	46.0	44.2	33.5
	09:00 to 10:00				40.5	39.5	32.6	43.2	42.4	37.4	44.3	42.1	37.3	45.7	43.2	37.5	46.2	44.2	37.4	46.1	43.8	36.6	45.5	43.0	31.0
	10:00 to 11:00				40.2	40.3	32.1	40.8	41.0	30.2	44.1	45.6	31.6	40.3	39.1	26.6	44.1	40.6	28.5	43.8	44.4	34.3	42.4	39.7	28.6
	11:00 to 12:00	67.8*	78*	34.5*	41.3	43.0	33.2	41.0	41.9	29.2	35.6	35.4	25.9	37.3	38.2	26.1	39.2	36.9	28.0	42.1	42.9	27.7	38.3	37.3	27.4
	12:00 to 13:00	45.7	42.7	36.8	38.9	41.8	31.7	40.3	38.7	29.2	35.2	34.5	26.8	38.5	36.1	28.2	38.0	38.4	26.9	38.7	38.7	27.0	37.9	38.2	27.2
	13:00 to 14:00	46.3	43.9	39.1	42.7	42.8	31.3	39.1	36.9	30.1	36.2	39.0	27.2	38.7	36.5	28.7	34.6	33.8	26.3	34.5	33.9	27.4	36.0	34.8	27.6
	14:00 to 15:00	46.7	47.1	34.9	36.7	35.1	30.2	38.8	36.5	30.8	35.1	35.8	27.4	33.8	33.4	27.0	31.6	31.9	26.1	33.0	33.2	26.4	36.8	35.8	29.1
	15:00 to 16:00	45.5	43.8	34.3	36.9	35.3	29.9	40.9	38.0	30.4	33.8	33.5	27.5	33.6	34.6	26.8	35.2	33.7	26.3	30.7	31.3	25.6	38.8	37.3	29.0
	16:00 to 17:00	40.4	40.8	32.8	43.0	46.0	29.7	47.9	45.5	31.8	35.7	36.6	24.2	36.1	36.0	28.5	42.9	44.6	29.8	34.1	33.2	24.5	42.0	44.9	30.6
	17:00 to 18:00	44.3*	42.4*	33.8*	38.1	45.2	30.6	45.8	49.4	38.7	39.7	41.7	25.9	39.8	38.4	29.7	44.4	46.3	32.4	35.3	33.8	23.9	48.7	45.6	28.2
	18:00 to 19:00	48.5	46.5	40.2	44.5	42.8	34.7	47.0	44.5	33.4	52.7	51.1	33.7	51.4	48.4	33.0	45.1	44.7	33.9	51.9	49.2	30.1	46.4	45.1	29.8
	19:00 to 20:00	41.0	38.6	32.8	44.4	41.4	34.3	43.6	39.9	23.6	45.3	41.0	28.7	46.4	41.1	31.4	44.6	44.3	30.6	46.7	41.2	28.1	40.7	48.9	23.9
	20:00 to 21:00	37.2	35.1	31.6	41.9	40.5	32.1	35.2	35.5	22.5	39.9	37.7	30.3	39.2	36.7	30.9	37.2	36.3	29.6	38.5	36.1	28.3	30.2	28.8	23.9
	21:00 to 22:00	37.3	35.1	31.0	42.9	40.4	35.5	37.5	34.6	22.8	39.8	36.8	30.4	41.7	38.6	31.5	36.6	39.9	28.5	37.6	34.8	27.0	32.5	33.0	24.3
	22:00 to 23:00	37.2	35.1	30.0	40.7	38.2	33.0	36.1	31.7	21.7	41.9	38.4	30.6	40.8	42.1	29.2	37.2	35.0	29.0	35.7	32.8	26.2	32.1	34.2	22.8
	23:00 to 0:00	37.5*	35.2*	30.6*	40.8	38.1	32.2	34.1	30.8	24.1	40.6	37.5	29.4	40.3	38.5	28.1	33.9	36.3	26.3	37.9	34.5	24.9	28.7	27.3	22.0

Project No.	2270290A	**Date**	03 May 2018	**Sheet**	3
Project Title	Beaufort Bypass	**Engineer**	NI	**Rev**	1
Description	2270290A			**Type**	LG

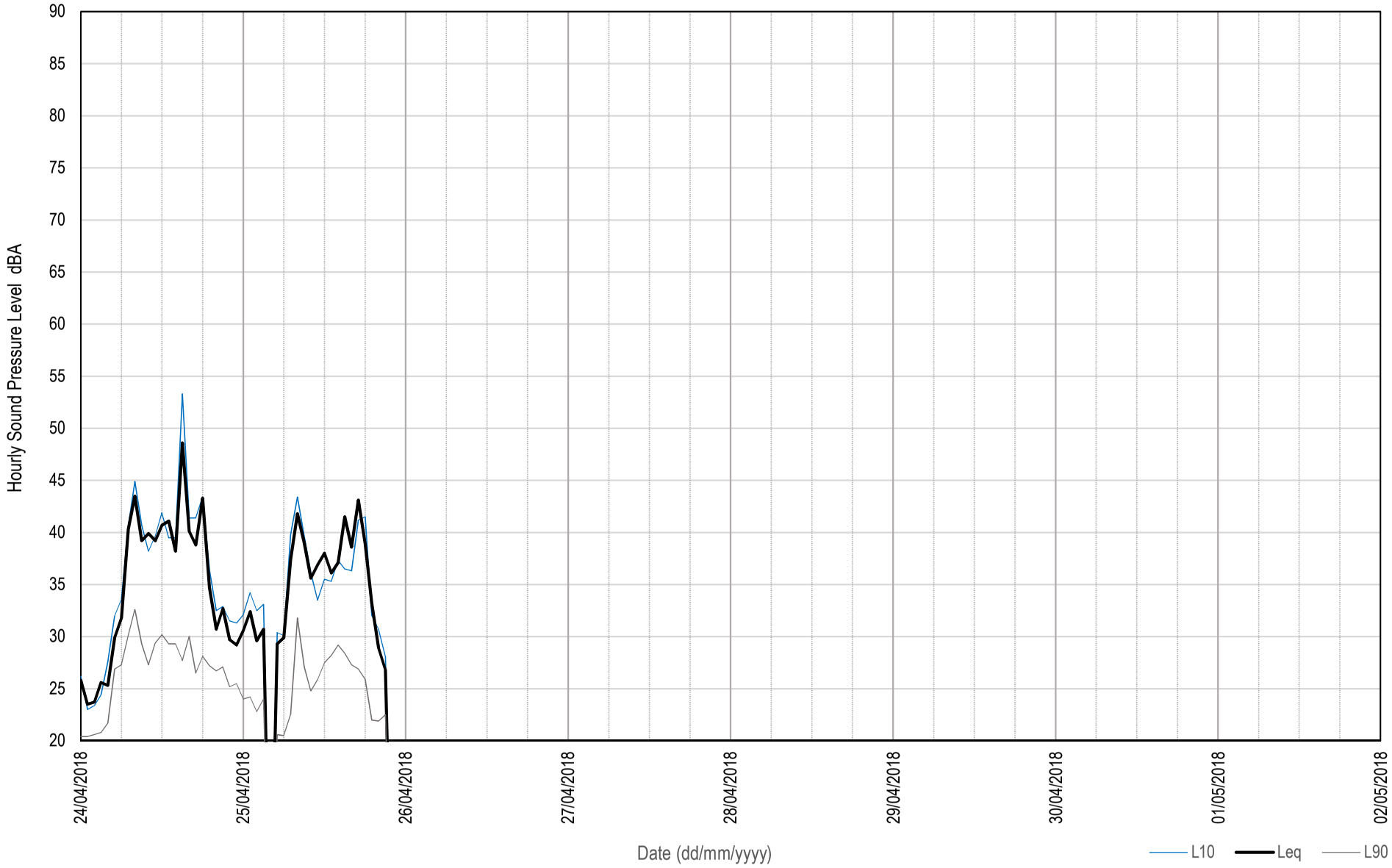
Logger Location	410 Race Course Road, Beaufort
Microphone Position	1m from Bedroom window

		Tue, 24 Apr 2018			Wed, 25 Apr 2018			Thu, 26 Apr 2018			Fri, 27 Apr 2018			Sat, 28 Apr 2018			Sun, 29 Apr 2018			Mon, 30 Apr 2018			Tue, 01 May 2018		
		L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}
Daily Averages	LA10,18h	39.0			36.1																				
	LAeq,24h		39.5			37.1																			
	LAeq,16h		41.2			38.2																			
	LAeq,8h		29.8																						
	LA90 Day			29.2			27.2																		
	LA90 Evening			27.3			23.1																		
	LA90 Night			23.4																					
Hourly Values	00:00 to 01:00	26.2	25.8	20.4	32.1	30.6	24.0																		
	01:00 to 02:00	23.0	23.5	20.4	34.2	32.4	24.2																		
	02:00 to 03:00	23.4	23.7	20.6	32.5	29.6	22.8																		
	03:00 to 04:00	24.4	25.6	20.8	33.1	30.7	24.0																		
	04:00 to 05:00	27.6	25.3	21.7	29.4*	27.9*	20.3*																		
	05:00 to 06:00	32.0	29.9	26.9	30.4	29.3	20.6																		
	06:00 to 07:00	33.6	31.8	27.3	30.1	29.9	20.5																		
	07:00 to 08:00	40.6	40.3	30.1	39.8	37.4	22.5																		
	08:00 to 09:00	44.9	43.5	32.6	43.4	41.8	31.8																		
	09:00 to 10:00	40.7	39.2	29.3	39.6	39.0	27.1																		
	10:00 to 11:00	38.2	39.9	27.3	36.1	35.6	24.8																		
	11:00 to 12:00	39.7	39.2	29.4	33.5	36.9	25.9																		
	12:00 to 13:00	41.9	40.7	30.2	35.5	38.0	27.5																		
	13:00 to 14:00	39.5	41.1	29.3	35.3	36.1	28.2																		
	14:00 to 15:00	39.5	38.2	29.3	37.3	37.1	29.2																		
	15:00 to 16:00	53.3	48.6	27.7	36.5	41.5	28.4																		
	16:00 to 17:00	41.4	40.1	30.0	36.3	38.6	27.3																		
	17:00 to 18:00	41.4	38.8	26.5	41.2	43.1	26.9																		
	18:00 to 19:00	43.4	43.3	28.1	41.5	38.9	25.9																		
	19:00 to 20:00	36.4	34.7	27.2	32.0	33.2	22.0																		
	20:00 to 21:00	32.5	30.7	26.7	30.7	28.9	21.9																		
	21:00 to 22:00	32.9	32.7	27.1	28.1	26.8	22.5																		
	22:00 to 23:00	31.5	29.7	25.2																					
	23:00 to 0:00	31.3	29.2	25.5																					

Logger Summary - 410 Race Course Road, Beaufort



Logger Summary - 410 Race Course Road, Beaufort



Site Details	122 Packhams Lane, Beaufort	**Microphone Position**	1m from dining room window
Start Date	Mon 16 April 2018		
End Date	Mon 23 April 2018		

Measurement Summary

Date	16/04	17/04	18/04	19/04	20/04	21/04	22/04	23/04
$L_{10,18Hr}$, dBA	41.4	41.9	42.6	42.1	41.0	40.8	40.5	38.5

Date	24/04	25/04	26/04	27/04	28/04	29/04	30/04	01/05
$L_{10,18Hr}$, dBA	40.2	39.2	41.7					

Site Map

Site Photo

Project No.	2270290A	**Date**	03 May 2018	**Sheet**	2
Project Title	Beaufort Bypass	**Engineer**	NI	**Rev**	1
Description	Background Noise Monitoring			**Type**	LG

Logger Location	122 Packhams Lane, Beaufort
Microphone Position	1m from dining room window

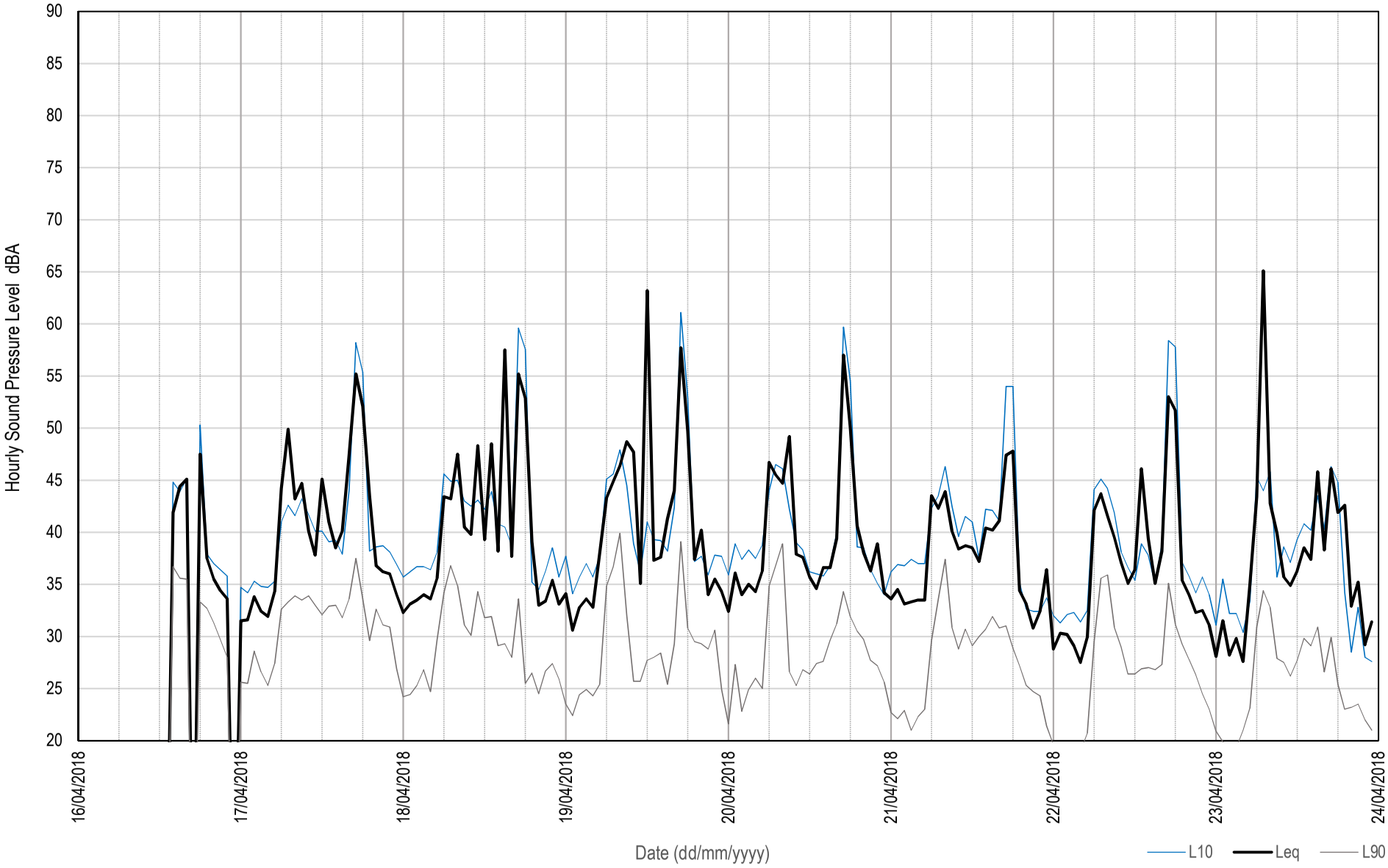
		Mon, 16 Apr 2018			Tue, 17 Apr 2018			Wed, 18 Apr 2018			Thu, 19 Apr 2018			Fri, 20 Apr 2018			Sat, 21 Apr 2018			Sun, 22 Apr 2018			Mon, 23 Apr 2018		
		L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	35.9	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}
Daily Averages	LA10,18h	41.4			41.9			42.6			42.1			41.0			40.8			40.5			38.5		
	LAeq,24h		41.2			45.5			47.7			51.1			45.7			40.6			43.2			51.6	
	LAeq,16h		42.0			47.2			49.4			52.8			47.3			42.0			44.9			53.3	
	LAeq,8h		32.3			34.2			34.3			34.9			34.8			31.5			31.2			30.2	
	LA90 Day			35.9			33.5			31.9			30.7			30.1			31.8						29.3
	LA90 Evening			31.8			31.7			25.8			29.6			30.0			28.9			29.5			23.8
	LA90 Night			27.5			27.5			25.9			26.4			24.0			21.4			22.4			23.0
Hourly Values	00:00 to 01:00				34.7	31.5	25.6	35.7	32.3	24.2	37.7	34.1	23.5	35.9	32.4	21.6	36.2	33.6	22.7	32.0	28.8	19.6	31.1	28.1	20.9
	01:00 to 02:00				34.2	31.6	25.5	36.2	33.1	24.4	34.1	30.6	22.4	38.9	36.1	27.3	36.9	34.5	22.1	31.3	30.3	19.3	35.5	31.5	19.9
	02:00 to 03:00				35.3	33.8	28.6	36.7	33.5	25.3	35.7	32.8	24.4	37.4	34.0	22.8	36.8	33.1	22.9	32.1	30.2	19.1	32.2	28.2	19.1
	03:00 to 04:00				34.8	32.4	26.6	36.7	34.0	26.8	37.0	33.6	24.9	38.3	35.0	24.9	37.4	33.3	21.0	32.3	29.1	19.4	32.2	29.8	19.3
	04:00 to 05:00				34.7	31.9	25.3	36.4	33.6	24.7	35.7	32.8	24.3	37.5	34.3	26.0	37.0	33.5	22.3	31.4	27.5	19.0	30.4	27.6	21.0
	05:00 to 06:00				35.3	34.3	27.4	38.1	35.6	29.7	37.6	38.0	25.4	38.8	36.3	25.0	37.0	33.5	23.0	32.5	29.9	20.7	33.4	35.0	23.1
	06:00 to 07:00				41.0	44.2	32.6	45.6	43.4	34.2	45.1	43.3	34.8	44.0	46.7	34.8	42.3	43.5	29.6	44.1	42.1	29.5	45.3	43.4	30.9
	07:00 to 08:00				42.6	49.9	33.3	44.9	43.2	36.8	45.6	44.9	36.7	46.5	45.5	36.8	43.5	42.3	33.6	45.1	43.7	35.6	44.0	65.1	34.4
	08:00 to 09:00				41.6	43.2	33.9	45.0	47.5	34.9	47.9	46.4	39.9	46.1	44.7	38.9	46.3	43.9	37.4	44.2	41.6	35.9	45.8	42.8	32.8
	09:00 to 10:00				43.2	44.7	33.5	43.0	40.5	31.1	44.5	48.7	32.0	42.2	49.2	26.6	42.5	40.1	30.9	41.9	39.5	30.9	35.7	39.9	27.9
	10:00 to 11:00				41.7	40.1	33.9	42.5	39.8	30.1	38.9	47.7	25.7	39.0	37.9	25.3	39.6	38.4	28.8	38.1	37.1	29.0	38.6	35.7	27.5
	11:00 to 12:00				40.1	37.8	33.0	43.1	48.3	34.3	36.2	35.1	25.7	38.3	37.6	26.8	41.5	38.7	30.7	36.6	35.1	26.4	37.1	34.9	26.2
	12:00 to 13:00				40.1	45.1	32.1	42.2	39.3	31.8	41.0	63.2	27.7	36.2	35.7	26.4	41.0	38.5	29.1	35.4	36.4	26.4	39.3	36.3	27.7
	13:00 to 14:00	62.7*	76.3*	38*	39.1	41.0	32.9	43.9	48.5	31.9	39.3	37.3	28.0	36.0	34.6	27.4	37.5	37.2	30.0	38.9	46.1	26.9	40.8	38.5	29.8
	14:00 to 15:00	44.8	41.9	36.7	39.2	38.5	33.0	40.8	38.2	29.1	39.2	37.6	28.4	35.8	36.6	27.6	42.2	40.4	30.7	37.8	39.4	27.0	40.2	37.4	29.1
	15:00 to 16:00	43.9	44.4	35.6	37.9	40.1	31.8	40.5	57.5	29.3	38.2	41.3	25.4	36.8	36.6	29.6	42.1	40.2	31.9	35.1	35.1	26.8	43.5	45.8	30.9
	16:00 to 17:00	45.1	45.1	35.5	44.0	47.4	33.6	38.7	37.7	28.0	42.4	44.0	29.3	39.9	39.4	31.2	41.1	41.1	30.8	38.8	38.2	27.3	40.3	38.3	26.6
	17:00 to 18:00	60.1*	57.3*	37.5*	58.2	55.2	37.5	59.6	55.2	33.6	61.1	57.7	39.1	59.7	57.0	34.3	54.0	47.4	31.0	58.4	53.0	35.1	46.3	46.1	29.9
	18:00 to 19:00	50.3	47.5	33.3	55.4	52.1	33.6	57.6	52.9	25.5	52.9	49.7	30.8	54.5	50.0	31.9	54.0	47.8	28.9	57.8	51.7	31.2	44.8	41.9	25.4
	19:00 to 20:00	37.9	37.5	32.7	38.2	43.5	29.6	35.2	39.1	26.5	37.2	37.4	29.5	38.6	40.6	30.5	35.2	34.4	27.2	37.1	35.4	29.3	34.2	42.6	23.0
	20:00 to 21:00	37.0	35.5	31.3	38.6	36.8	32.6	34.5	33.0	24.5	37.7	40.2	29.3	38.5	38.0	29.7	32.6	33.1	25.3	35.8	34.0	27.8	28.5	32.9	23.2
	21:00 to 22:00	36.4	34.4	29.7	38.7	36.2	31.1	36.3	33.4	26.7	35.9	34.0	28.8	36.4	36.3	27.7	32.4	30.8	24.7	34.2	32.3	26.3	32.8	35.2	23.5
	22:00 to 23:00	35.8	33.6	28.0	38.1	36.0	30.9	38.5	35.4	27.4	37.8	35.5	30.6	35.1	38.9	27.2	32.4	32.4	24.3	35.7	32.5	24.5	28.0	29.2	22.0
	23:00 to 0:00	35.2*	32.7*	28*	36.9	34.0	26.9	35.7	33.1	25.9	37.7	34.3	24.9	34.0	34.2	25.6	33.7	36.4	21.4	34.0	31.1	23.0	27.6	31.4	21.0

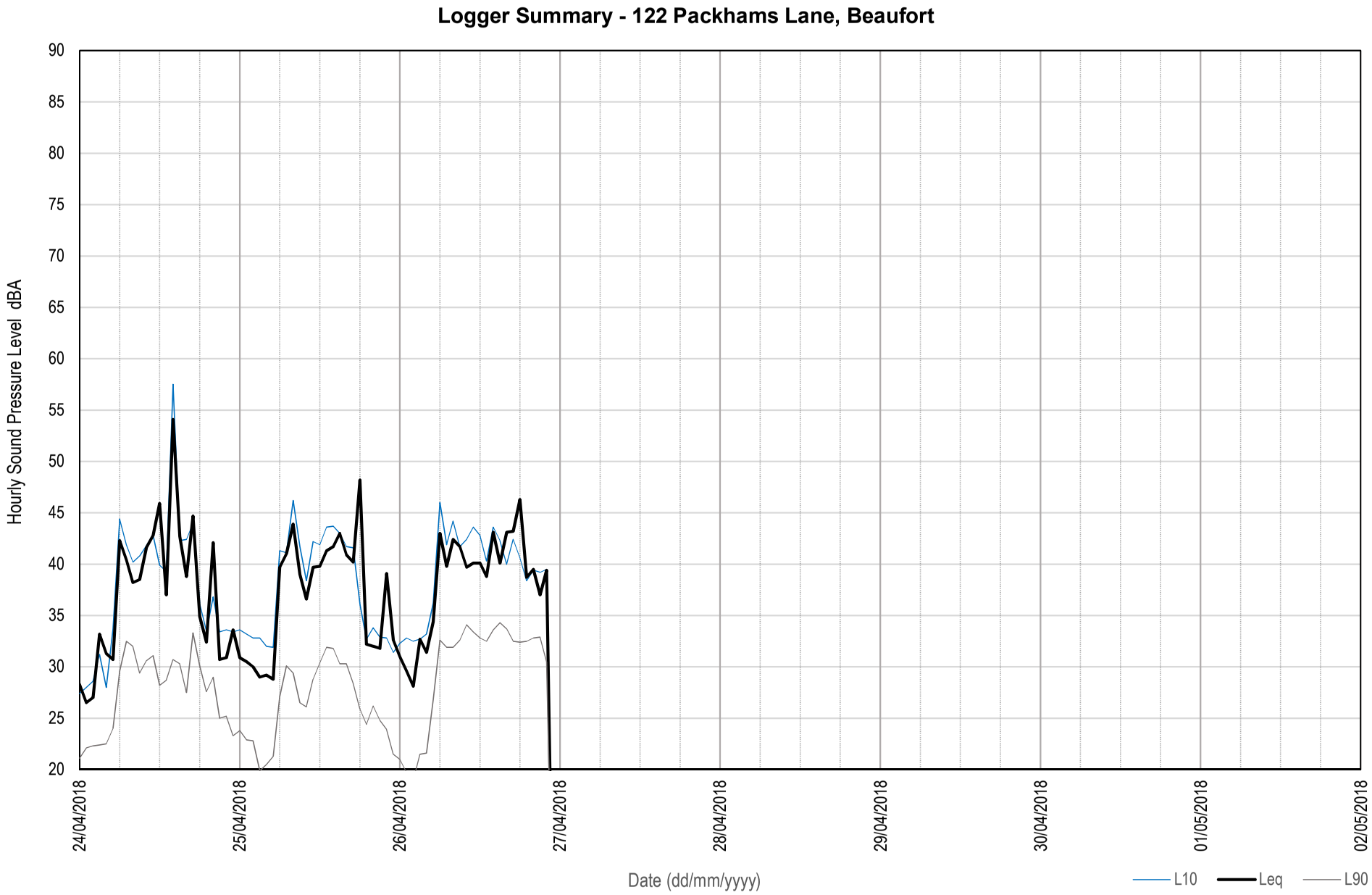
Project No.	2270290A	**Date**	03 May 2018	**Sheet**	3
Project Title	Beaufort Bypass	**Engineer**	NI	**Rev**	1
Description	Background Noise Monitoring			**Type**	LG

Logger Location	122 Packhams Lane, Beaufort
Microphone Position	1m from dining room window

		Tue, 24 Apr 2018			Wed, 25 Apr 2018			Thu, 26 Apr 2018			Fri, 27 Apr 2018			Sat, 28 Apr 2018			Sun, 29 Apr 2018			Mon, 30 Apr 2018			Tue, 01 May 2018		
		L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}
Daily Averages	LA10,18h	40.2			39.2			41.7																	
	LAeq,24h		42.9			39.9			40.4																
	LAeq,16h		44.5			41.4			41.7																
	LAeq,8h		30.6			33.7			39.4																
	LA90 Day			30.4			29.5			33.0															
	LA90 Evening			27.9			25.3			32.7															
	LA90 Night			23.0			23.1			30.5															
Hourly Values	00:00 to 01:00	27.4	28.3	21.1	33.6	30.9	23.8	32.3	31.0	21.0															
	01:00 to 02:00	28.0	26.5	22.1	33.2	30.5	22.9	32.8	29.6	19.7															
	02:00 to 03:00	28.6	27.0	22.3	32.8	30.0	22.8	32.5	28.1	18.9															
	03:00 to 04:00	31.2	33.2	22.4	32.8	29.0	19.9	32.7	32.7	21.5															
	04:00 to 05:00	28.0	31.3	22.5	32.0	29.2	20.5	33.2	31.4	21.6															
	05:00 to 06:00	33.7	30.7	24.0	31.9	28.8	21.3	36.2	34.4	26.8															
	06:00 to 07:00	44.4	42.3	29.6	41.3	39.7	27.1	46.0	43.0	32.6															
	07:00 to 08:00	41.9	40.4	32.5	41.1	41.0	30.1	41.9	39.8	31.9															
	08:00 to 09:00	40.2	38.2	32.0	46.2	43.9	29.4	44.2	42.4	31.9															
	09:00 to 10:00	40.8	38.5	29.4	41.7	39.0	26.5	41.7	41.7	32.6															
	10:00 to 11:00	41.8	41.6	30.6	38.4	36.6	26.1	42.4	39.7	34.1															
	11:00 to 12:00	42.8	42.8	31.1	42.2	39.7	28.8	43.6	40.1	33.4															
	12:00 to 13:00	39.9	45.9	28.2	41.9	39.8	30.4	42.8	40.1	32.8															
	13:00 to 14:00	39.3	37.0	28.7	43.6	41.3	31.9	40.3	38.8	32.5															
	14:00 to 15:00	57.5	54.1	30.7	43.7	41.7	31.8	43.6	43.1	33.6															
	15:00 to 16:00	42.3	42.7	30.3	43.0	43.0	30.3	42.3	40.1	34.3															
	16:00 to 17:00	42.4	38.8	27.5	41.7	40.9	30.3	40.0	43.1	33.7															
	17:00 to 18:00	44.0	44.7	33.3	41.6	40.2	28.4	42.4	43.2	32.5															
	18:00 to 19:00	36.2	34.9	30.1	36.1	48.2	25.9	40.6	46.3	32.4															
	19:00 to 20:00	33.5	32.4	27.6	32.7	32.2	24.4	38.4	38.7	32.5															
	20:00 to 21:00	36.8	42.1	29.0	33.8	32.0	26.2	39.4	39.5	32.8															
	21:00 to 22:00	33.4	30.7	25.0	32.9	31.8	24.8	39.2	37.0	32.9															
	22:00 to 23:00	33.6	30.9	25.2	32.8	39.1	23.9	39.5	39.4	30.5															
	23:00 to 0:00	33.4	33.6	23.3	31.4	32.6	21.5																		

Logger Summary - 122 Packhams Lane, Beaufort




Logger Summary - 122 Packhams Lane, Beaufort
Hourly Sound Pressure Level dBA
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
24/04/2018
25/04/2018
26/04/2018
27/04/2018
28/04/2018
29/04/2018
30/04/2018
01/05/2018
02/05/2018
Date (dd/mm/yyyy)
L10
Leq
L90

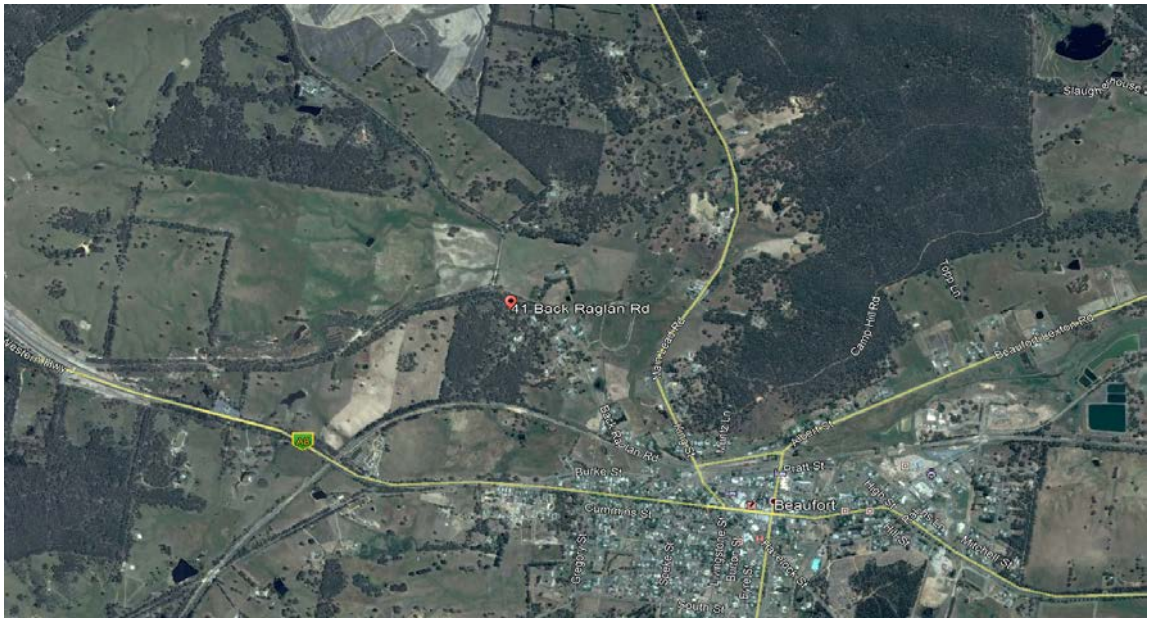
Site Details	41 Back Raglan Rd	**Microphone Position**	1m from the living room window
Start Date	Mon 16 April 2018		
End Date	Mon 23 April 2018		

Measurement Summary

Date	16/04	17/04	18/04	19/04	20/04	21/04	22/04	23/04
$L_{10,18Hr}$, dBA	44.8	43.3	44.3	45.1	44.0	45.8	45.2	41.8

Date	24/04	25/04	26/04	27/04	28/04	29/04	30/04	01/05
$L_{10,18Hr}$, dBA	42.5	45.2	44.4	41.1	43.1			

Site Map



Site Photo

Project No.	2270290A	**Date**	03 April 2018	**Sheet**	2
Project Title	Beaufort Bypass	**Engineer**	NI	**Rev**	1
Description	Background Noise Monitoring			**Type**	LG

Logger Location	41 Back Raglan Rd
Microphone Position	1m from the living room window

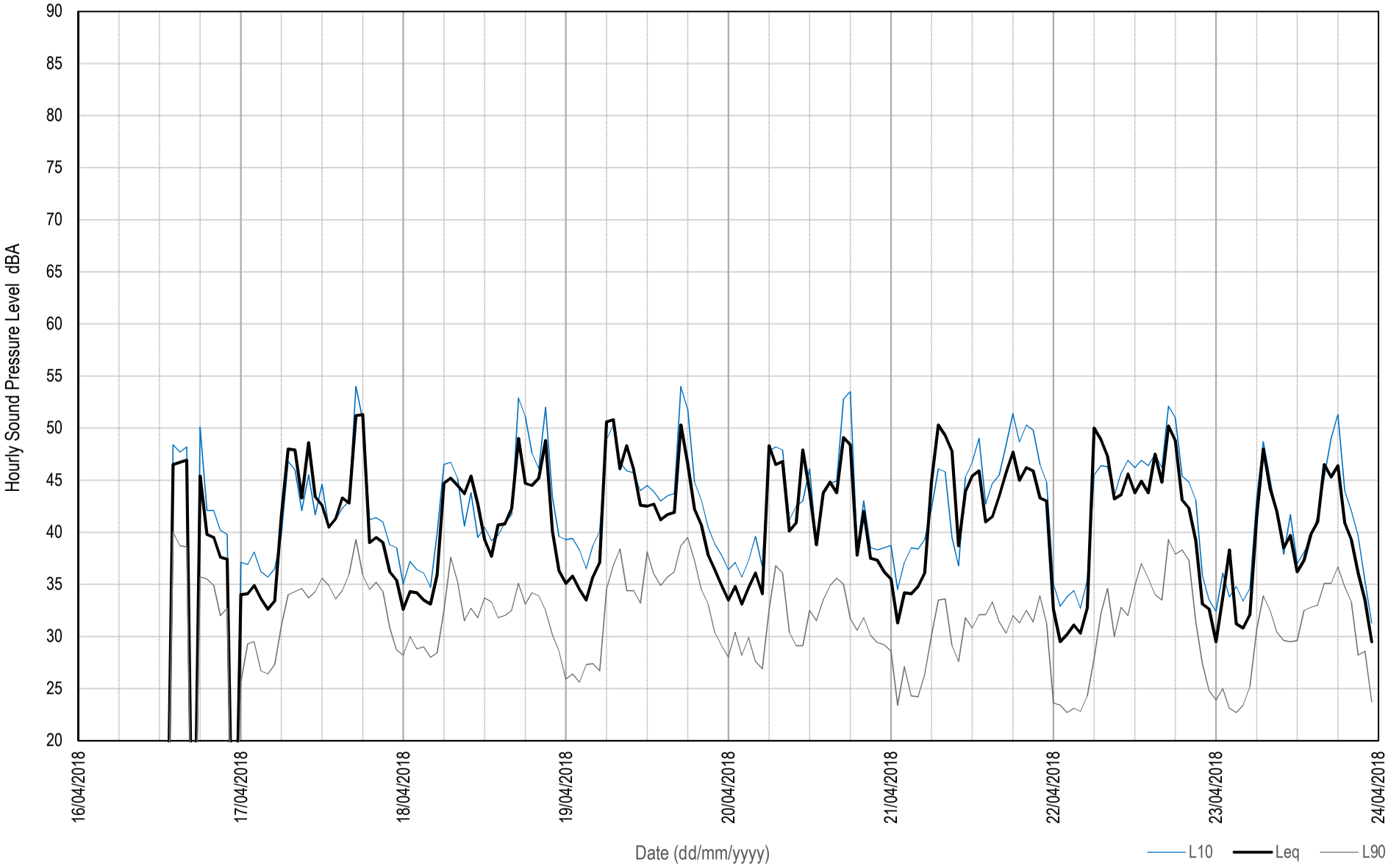
		Mon, 16 Apr 2018			Tue, 17 Apr 2018			Wed, 18 Apr 2018			Thu, 19 Apr 2018			Fri, 20 Apr 2018			Sat, 21 Apr 2018			Sun, 22 Apr 2018			Mon, 23 Apr 2018		
		L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	39.1	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}
Daily Averages	LA10,18h	44.8			43.3			44.3			45.1			44.0			45.8			45.2			41.8		
	LAeq,24h		42.7			44.3			43.2			44.6			43.7			44.7			44.7			41.4	
	LAeq,16h		43.5			45.9			44.7			46.2			45.2			46.1			46.4			42.9	
	LAeq,8h		34.0			34.6			36.5			34.8			35.2			37.9			33.5			32.8	
	LA90 Day			39.1			35.0			33.4			36.1			33.1			31.1						32.2
	LA90 Evening			34.5			35.0			33.4			36.1			31.1			31.8			34.7			33.3
	LA90 Night			28.6			29.4			28.1			29.2			27.0			25.9			25.1			25.7
Hourly Values	00:00 to 01:00				37.1	34.0	25.6	35.0	32.6	28.2	39.3	35.1	25.9	36.4	33.5	28.0	38.7	35.5	28.6	35.1	32.6	23.6	32.4	29.5	23.9
	01:00 to 02:00				36.9	34.1	29.3	37.2	34.3	30.0	39.4	35.8	26.4	37.1	34.8	30.4	34.5	31.3	23.4	32.9	29.5	23.4	36.1	33.8	25.0
	02:00 to 03:00				38.1	34.9	29.5	36.4	34.2	28.8	38.3	34.5	25.6	35.7	33.1	28.2	37.1	34.2	27.1	33.8	30.2	22.7	33.8	38.3	23.1
	03:00 to 04:00				36.2	33.6	26.7	36.1	33.5	29.0	36.5	33.5	27.3	37.3	34.7	29.9	38.5	34.1	24.3	34.4	31.1	23.1	34.8	31.2	22.7
	04:00 to 05:00				35.7	32.6	26.4	34.7	33.1	28.0	38.7	35.7	27.4	39.6	36.1	27.6	38.4	34.8	24.2	32.7	30.3	22.8	33.4	30.8	23.4
	05:00 to 06:00				36.5	33.4	27.3	39.9	35.9	28.4	40.1	37.1	26.7	36.7	34.1	26.9	39.3	36.1	26.3	35.4	32.7	24.3	34.6	32.1	25.2
	06:00 to 07:00				39.7	41.5	31.0	46.5	44.7	32.5	48.9	50.6	34.5	47.8	48.3	32.6	42.3	44.9	30.1	45.5	50.0	27.9	43.3	41.5	30.7
	07:00 to 08:00				46.8	48.0	34.0	46.7	45.2	37.6	50.3	50.8	36.8	48.2	46.5	36.8	46.1	50.3	33.5	46.4	48.9	32.2	48.7	48.0	33.9
	08:00 to 09:00				46.0	47.9	34.3	45.2	44.5	35.3	46.7	46.1	38.4	47.9	46.8	36.1	45.8	49.3	33.6	46.3	47.3	34.6	45.0	44.2	32.5
	09:00 to 10:00				42.1	43.3	34.6	40.6	43.7	31.5	45.9	48.3	34.4	41.2	40.1	30.4	39.5	47.8	29.1	43.5	43.2	30.0	41.5	42.0	30.4
	10:00 to 11:00				45.5	48.6	33.7	43.8	45.4	32.7	45.7	46.1	34.4	42.5	40.9	29.1	36.8	38.7	27.6	45.7	43.6	32.8	37.9	38.5	29.6
	11:00 to 12:00				41.7	43.4	34.3	39.5	42.7	31.8	44.0	42.6	33.2	43.0	47.9	29.1	45.3	43.9	31.8	46.9	45.6	32.0	41.7	39.7	29.5
	12:00 to 13:00				44.6	42.6	35.6	40.5	39.3	33.7	44.5	42.5	38.1	46.1	43.9	32.5	46.7	45.4	30.8	46.2	43.8	34.8	37.0	36.2	29.6
	13:00 to 14:00	52.3*	67.1*	18.6*	40.5	40.5	34.9	39.2	37.7	33.3	43.9	42.7	36.0	38.8	38.8	31.5	49.0	45.9	32.1	46.9	44.9	37.0	38.1	37.3	32.5
	14:00 to 15:00	48.4	46.5	40.0	41.2	41.3	33.6	39.7	40.7	31.8	43.0	41.2	34.9	43.6	43.8	33.5	42.7	41.0	32.1	46.4	43.8	35.6	39.4	39.8	32.8
	15:00 to 16:00	47.7	46.7	38.7	42.3	43.3	34.4	40.9	40.8	32.0	43.5	41.7	35.7	44.7	44.8	34.9	44.7	41.5	33.3	47.5	47.5	34.0	41.5	41.0	33.0
	16:00 to 17:00	48.2	46.9	38.6	43.0	42.8	36.0	41.7	42.3	32.5	43.7	41.9	36.2	44.9	43.8	35.6	45.5	43.5	31.4	46.2	44.8	33.5	45.3	46.5	35.1
	17:00 to 18:00	55*	52.6*	42.1*	54.0	51.2	39.3	52.9	49.0	35.1	54.0	50.3	38.7	52.8	49.1	35.0	48.4	45.7	30.3	52.1	50.2	39.3	49.0	45.3	35.1
	18:00 to 19:00	50.1	45.4	35.7	50.8	51.3	35.9	51.1	44.7	33.1	51.8	46.6	39.5	53.5	48.4	31.7	51.4	47.7	32.0	51.0	48.8	37.9	51.3	46.4	36.7
	19:00 to 20:00	42.1	39.8	35.5	41.2	39.0	34.5	47.6	44.5	34.2	44.8	42.2	37.3	38.4	37.8	30.6	48.7	45.0	31.3	45.4	43.1	38.3	44.0	40.9	34.8
	20:00 to 21:00	42.1	39.5	34.9	41.4	39.5	35.2	46.1	45.2	33.9	43.1	40.7	34.5	43.0	42.0	31.8	50.3	46.2	32.5	44.8	42.3	37.3	42.1	39.3	33.3
	21:00 to 22:00	40.2	37.6	32.0	41.0	39.0	34.3	52.0	48.8	32.5	40.5	37.8	33.1	38.5	37.5	30.1	49.8	45.9	31.4	43.1	39.2	31.4	39.7	36.1	28.2
	22:00 to 23:00	39.8	37.4	32.7	38.8	36.2	30.8	43.4	40.1	30.2	38.9	36.4	30.4	38.3	37.3	29.4	46.5	43.3	33.9	35.9	33.1	27.4	35.3	33.5	28.6
	23:00 to 0:00	39*	36.3*	30.1*	38.5	35.4	28.7	39.6	36.3	28.6	37.8	34.9	29.1	38.5	36.2	29.2	44.8	43.0	31.3	33.5	32.6	24.8	31.3	29.5	23.7

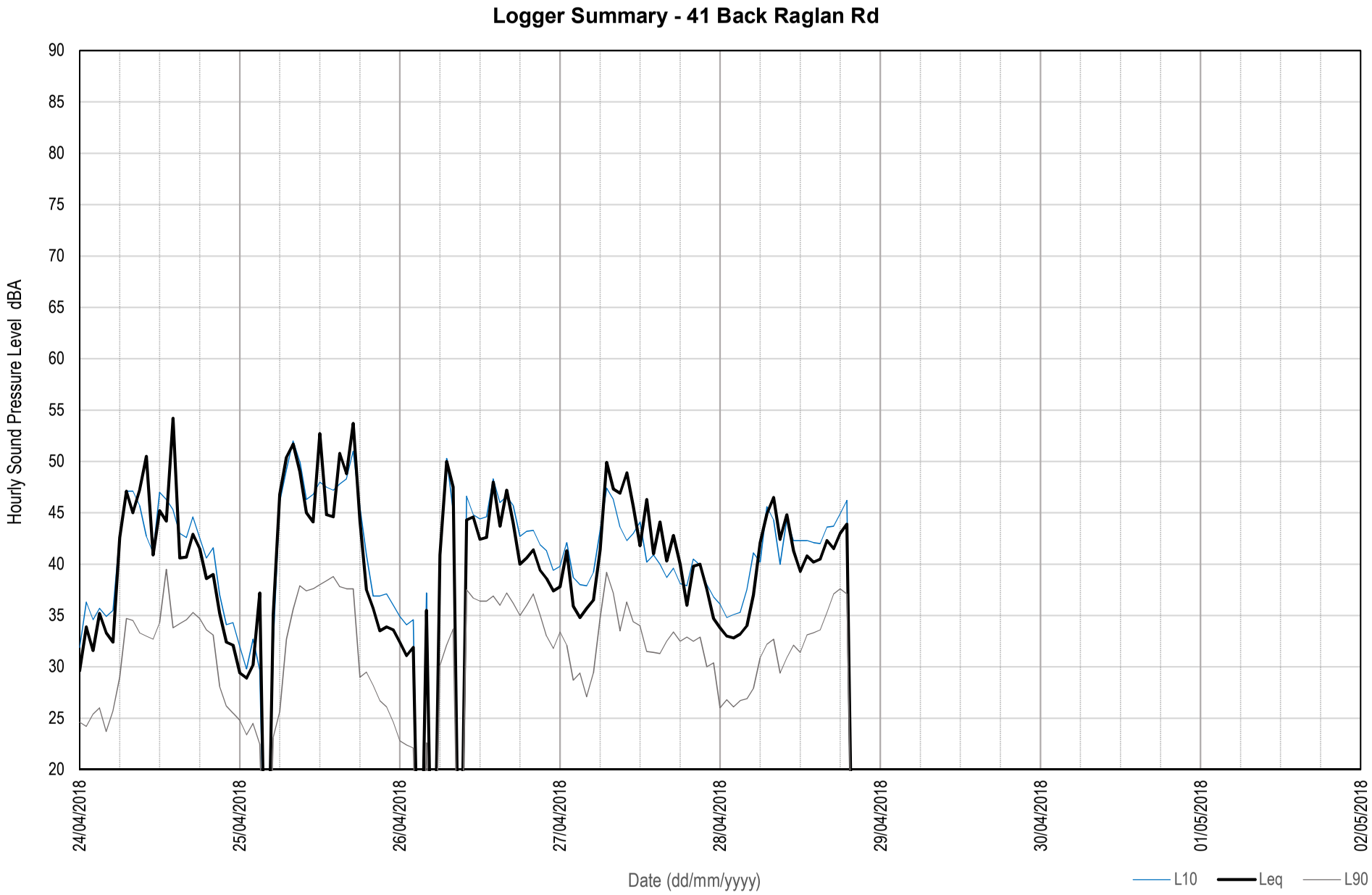
Project No.	2270290A	**Date**	03 April 2018	**Sheet**	3
Project Title	Beaufort Bypass	**Engineer**	NI	**Rev**	1
Description	Background Noise Monitoring			**Type**	LG

Logger Location	41 Back Raglan Rd
Microphone Position	1m from the living room window

		Tue, 24 Apr 2018			Wed, 25 Apr 2018			Thu, 26 Apr 2018			Fri, 27 Apr 2018			Sat, 28 Apr 2018			Sun, 29 Apr 2018			Mon, 30 Apr 2018			Tue, 01 May 2018		
		L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}
Daily Averages	LA10,18h	42.5			45.2			44.4			41.1			43.1											
	LAeq,24h		44.6			46.9			43.1			43.4			41.6										
	LAeq,16h		46.3			48.6			44.7			44.8			42.9										
	LAeq,8h		32.6			32.1			37.7			34.9													
	LA90 Day			34.5			37.2			35.9			34.1			31.5									
	LA90 Evening			32.4			28.4			35.8			32.7			35.3									
	LA90 Night			24.5			24.4			31.1			28.0												
Hourly Values	00:00 to 01:00	31.9	29.6	24.6	32.0	29.4	24.8	34.9	32.4	22.8	39.8	37.8	33.4	36.1	33.8	26.0									
	01:00 to 02:00	36.3	33.9	24.2	29.8	28.9	23.4	34.1	31.1	22.4	42.1	41.3	32.1	34.8	33.0	26.8									
	02:00 to 03:00	34.6	31.6	25.4	32.7	30.2	24.5	34.6	31.9	22.1	38.7	35.9	28.7	35.1	32.8	26.1									
	03:00 to 04:00	35.7	35.2	26.0	29.7	37.2	22.5	35.3*	31.7*	22.6*	38.0	34.8	29.4	35.3	33.2	26.7									
	04:00 to 05:00	34.9	33.3	23.7	27.8*	25.7*	22.2*	37.2	35.5	22.6	37.9	35.7	27.1	37.5	34.0	26.9									
	05:00 to 06:00	35.5	32.4	25.7	32.3	35.1	23.1	37.4*	33.6*	26.3*	39.2	36.5	29.4	41.1	37.0	27.9									
	06:00 to 07:00	42.8	42.6	29.0	46.1	46.8	25.6	40.2	40.9	30.1	43.3	41.4	34.8	40.2	42.1	30.9									
	07:00 to 08:00	47.1	47.1	34.7	49.2	50.4	32.7	50.3	50.0	32.1	47.4	49.9	39.2	45.6	44.9	32.2									
	08:00 to 09:00	47.1	45.0	34.5	52.0	51.7	35.6	45.2	47.5	33.7	46.3	47.3	37.2	44.3	46.5	32.7									
	09:00 to 10:00	45.7	47.2	33.3	50.0	49.0	37.9	45*	44.3*	35.7*	43.6	46.9	33.5	40.0	42.4	29.4									
	10:00 to 11:00	42.7	50.5	33.0	46.3	45.0	37.4	46.6	44.3	37.5	42.3	48.9	36.3	44.4	44.8	30.9									
	11:00 to 12:00	41.1	40.9	32.7	46.8	44.1	37.6	44.8	44.6	36.7	43.0	45.6	34.4	42.3	41.3	32.1									
	12:00 to 13:00	47.0	45.2	34.3	48.0	52.7	38.0	44.4	42.4	36.4	44.1	41.8	34.0	42.3	39.3	31.4									
	13:00 to 14:00	46.3	44.2	39.5	47.5	44.8	38.4	44.6	42.6	36.4	40.2	46.3	31.5	42.3	40.8	33.1									
	14:00 to 15:00	45.3	54.2	33.8	47.2	44.6	38.8	48.3	48.0	36.9	40.9	41.0	31.4	42.1	40.2	33.3									
	15:00 to 16:00	43.0	40.6	34.2	47.8	50.8	37.8	46.0	43.7	36.0	40.0	44.1	31.3	42.0	40.5	33.6									
	16:00 to 17:00	42.6	40.7	34.6	48.3	48.8	37.6	46.6	47.2	37.2	38.7	40.3	32.5	43.6	42.3	35.3									
	17:00 to 18:00	44.6	42.9	35.3	51.0	53.7	37.6	45.7	44.0	36.2	39.6	42.8	33.4	43.7	41.5	37.1									
	18:00 to 19:00	42.6	41.5	34.7	45.5	44.2	29.0	42.7	40.0	35.0	38.1	40.0	32.5	44.9	43.0	37.6									
	19:00 to 20:00	40.6	38.6	33.6	40.9	37.5	29.5	43.2	40.6	36.0	37.9	36.0	32.9	46.2	43.9	37.1									
	20:00 to 21:00	41.6	39.0	33.1	36.9	35.7	28.2	43.3	41.4	37.1	40.5	39.8	32.5												
	21:00 to 22:00	37.0	35.2	28.1	36.9	33.5	26.7	41.9	39.4	35.1	39.9	40.0	32.9												
	22:00 to 23:00	34.1	32.4	26.2	37.1	33.9	26.1	41.3	38.6	33.0	38.0	37.6	30.0												
	23:00 to 0:00	34.3	32.1	25.5	36.0	33.6	24.6	39.4	37.4	31.8	36.8	34.7	30.4												

Logger Summary - 41 Back Raglan Rd




Logger Summary - 41 Back Raglan Rd
Hourly Sound Pressure Level dBA
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
24/04/2018
25/04/2018
26/04/2018
27/04/2018
28/04/2018
29/04/2018
30/04/2018
01/05/2018
02/05/2018
Date (dd/mm/yyyy)
L10
Leq
L90

APPENDIX B

METEOROLOGICAL CONDITIONS

DATE	8/12/17			9/12/17			10/12/17			11/12/17			12/12/17		
Time	Temperature (ºc)	Wind Speed (m/s)	Rain fall since 9am (mm)	Temperature (ºc)	Wind Speed (m/s)	Rain fall since 9am (mm)	Temperature (oc)	Wind Speed (m/s)	Rain fall since 9am (mm)	Temperature (oc)	Wind Speed (m/s)	Rain fall since 9am (mm)	Temperature (oc)	Wind Speed (m/s)	Rain fall since 9am (mm)
0:00	8.9	4	0	9.7	1.3	0	11	3.5	0	11.4	6.1	0	11.5	7	0
1:00	8.2	3.6	0	10.9	1.9	0	11	2.2	0	11.2	6.3	0	11.1	7.4	0
2:00	7.8	3.2	0	11.3	2.5	0	11.8	2.2	0	11.2	6.2	0	11.1	6.7	0
3:00	7.1	2.9	0	12.1	3.9	0	10.6	2.4	0	11	5.3	0	10.6	7.5	0
4:00	6.3	2.5	0	12	4.9	0	9.5	2.3	0	11.1	5.6	0	10.2	6.8	0
5:00	5.6	2.4	0	11.2	3.9	0	9.4	2.2	0	10.8	5.5	0	9.9	5.8	0
6:00	6.8	2.5	0	11.2	3.5	0	10.3	1.6	0	10.8	5	0	11.1	5.4	0
7:00	8.8	3.3	0	12.2	3.9	0.2	11.6	3.2	0	11.6	6.2	0	13.3	5.3	0
8:00	10.5	4.2	0	13.4	5.1	0	12.5	4	0	13.5	6.1	0	16.5	5	0
9:00	10.9	4.8	0	14.7	6.6	0	14.3	3.9	0	14.3	5.7	0	20.1	3	0
10:00	12.5	5.1	0	15.4	7.6	0	17.1	3.4	0	16.3	5.5	0	21.7	3.6	0
11:00	14.6	5.1	0	15.8	7.1	0	18.5	3.4	0	18.5	5	0	24.3	3.1	0
12:00	14.2	5.6	0.2	17.3	6.8	0	20	3	0	19.8	4.9	0	25.9	2.3	0
13:00	15.2	5.5	0	18.2	6.8	0	21.3	3.5	0	21.4	4.9	0	26.6	1.8	0
14:00	15	5.5	0	19.2	6.6	0	23.1	3.7	0	22.2	4.6	0	28	2.3	0
15:00	16.8	4.6	0	19.3	6	0	22.9	4.2	0	22.7	4.3	0	28	3.2	0
16:00	16.3	5.1	0	20.8	5.1	0	23.3	4	0	22.8	4.6	0	28.8	2.3	0
17:00	15.9	5.7	0	19.5	5.7	0	22.7	4.2	0	22.5	5.2	0	28.6	2.5	0
18:00	16.3	5.4	0	18.9	5	0	20.9	5.4	0	21.3	5.8	0	25.6	3.3	0
19:00	15.1	4	0	17.5	4	0	18.2	5.9	0	17.7	6.4	0	22.4	6.3	0
20:00	13.2	2.6	0	14.8	4.5	0	15.6	5.5	0	14.6	6.6	0	19.9	5.2	0
21:00	11.5	1.9	0	13.1	3.6	0	13.5	5.6	0	12.9	6.7	0	18.4	4.2	0
22:00	11.2	2.1	0	12.1	2.5	0	12.2	6.1	0	11.8	6.3	0	16.6	2.8	0
23:00	9.1	0.2	0	11.9	3.4	0	11.5	5	0	11.6	6.4	0	14.1	1.7	0

DATE	13/12/17			14/12/17			15/12/17		
Time	Temperature (°c)	Wind Speed (m/s)	Rain fall since 9am (mm)	Temperature (°c)	Wind Speed (m/s)	Rain fall since 9am (mm)	Temperature (oc)	Wind Speed (m/s)	Rain fall since 9am (mm)
0:00	13.5	1.9	0	18.8	2.2	0	11.6	4.9	0
1:00	14.6	1.3	0	18.8	2.9	0	11.3	4.3	0
2:00	15.3	3.1	0	19.9	2.1	0	10.8	4.4	0
3:00	13.7	2.3	0	18.5	1.5	0	10.4	4.5	0
4:00	16.2	3.2	0	17.7	1.7	0	10	4.6	0
5:00	16.9	4.7	0	16.4	3.6	0	9	3.6	0
6:00	19	5.2	0	15.5	2.1	0	10.2	3.8	0
7:00	22.1	6.1	0	15.3	3.3	0	12.9	3.8	0
8:00	24.2	7.8	0	15.9	4	0	15.7	3.5	0
9:00	26.5	9	0	17.8	4.7	0	17.6	2.5	0
10:00	28.5	9.6	0	17	5.9	0	19	2.4	0
11:00	30.4	9.3	0	17.7	5.1	0	20.4	4.3	0
12:00	31.5	8.6	0	18.2	5.2	0	21.8	4.4	0
13:00	33	8.6	0	22	5.2	0	23.2	3.6	0
14:00	34	8.1	0	22.3	5.6	0	25.4	5.7	0
15:00	34.1	8.1	0	23.4	5.8	0	25.3	5	0
16:00	32.6	8	0	23.3	5.1	0	25.5	4.6	0
17:00	34.6	7.4	0	21.7	6.1	0	25.3	4.4	0
18:00	30.6	6.9	0	20.1	5.9	0	25	3.7	0
19:00	27.7	4.3	0	18.6	4.9	0	23.2	3.7	0
20:00	24.7	5.2	0	15.9	5.9	0	17.9	4.4	0
21:00	23	4.5	0	14.3	5.9	0	15.8	4.8	0
22:00	22.5	3.3	0	13.4	5.9	0	13.8	4.7	0
23:00	20.2	2.2	0	12	5.8	0	12.4	4	0

DATE	16/04/18			17/04/18			18/04/18			19/04/18			20/04/18		
Time	Temperature (°c)	Wind Speed (m/s)	Rain fall since 9am (mm)	Temperature (°c)	Wind Speed (m/s)	Rain fall since 9am (mm)	Temperature (oc)	Wind Speed (m/s)	Rain fall since 9am (mm)	Temperature (oc)	Wind Speed (m/s)	Rain fall since 9am (mm)	Temperature (oc)	Wind Speed (m/s)	Rain fall since 9am (mm)
0:00	10.2	3.3	0	5.2	8.2	0	7.3	6.5	0	11.3	3.1	0	14.4	1.8	0
1:00	10.0	3.6	0	4.9	6.7	0	9.1	5.0	0	11.1	3.9	0	14.8	2.4	3.8
2:00	10.0	3.1	0	4.8	7.9	0	12.1	3.9	0	10.9	3.3	0	15.0	1.8	6.6
3:00	10.0	2.8	0	4.9	6.5	0	11.3	4.2	0	11.5	2.8	0	14.8	0.7	0.8
4:00	10.1	1.8	0	4.8	6.3	0	12.4	5.8	0	11.4	1.9	0	14.3	1.3	2.8
5:00	10.3	2.5	0	4.6	5.7	0	11.3	4.6	0	10.8	1.3	0	13.5	1.8	0.2
6:00	10.5	2.2	0	4.9	6.7	0	7.9	4.4	0	11.2	2.2	0	13.4	1.8	5.8
7:00	10.6	3.3	0.2	5.4	5.0	0	7.9	4.2	0	10.6	2.8	0	12.7	2.2	2
8:00	10.9	3.6	0	5.9	4.9	0	9.1	3.6	0	11.4	3.1	0	14.5	2.4	0.2
9:00	11.2	4.7	0	6.8	2.9	0	10.8	3.6	0	13.3	2.5	0	16.4	2.2	0
10:00	11.5	5.4	0.4	8.2	2.5	0	12.1	3.9	0	14.9	2.8	0	17.8	2.4	0
11:00	12.4	5.4	0.6	9.1	3.6	0	13.5	3.6	0	16.1	2.4	0	19.1	2.2	0
12:00	12.8	9.3	0	10.4	2.5	0	15.1	2.8	0	17.1	2.8	0	19.5	1.9	0
13:00	13.1	8.5	0	11.1	3.9	0	17.2	3.1		17.8	2.4	0	20.5	2.8	0
14:00	12.5	6.8	0	11.8	3.3	0	17.2	3.3	0	18.7	3.3	0	21.1	3.3	0
15:00	12.8	6.9	0	11.5	3.1	0	16.9	3.1	0	18.5	2.4	0	21.2	1.8	0
16:00	11.0	7.4	0	10.5	3.3	0	15.1	3.1	0	17.7	2.6	0	20.4	3.3	0
17:00	10.0	9.4	0	9.0	4.9	0	13.9	3.1	0	16.7	2.6	0	18.8	3.9	0
18:00	8.2	7.5	0	7.5	3.6	0	12.7	3.6	0	15.4	2.5	0	17.0	3.6	0
19:00	7.4	8.1	0	7.1	4.6	0	12.2	4.4	0	15.4	0.6	0	16.5	2.6	0
20:00	7.1	7.8	0	6.4	4.2	0	12.1	3.6	0	15.3	3.6	0	17.0	3.1	0
21:00	6.5	7.2	0	5.6	5.3	0	11.9	3.3	0	14.9	3.3	0	16.9	2.8	0
22:00	6.1	8.2	0	5.2	4.9	0	11.7	3.3	0	14.7	2.9	0	16.6	4.2	0
23:00	5.8	7.5	0	5.1	8.2	0	11.5	3.6	0	14.9	2.2	0	16.6	4.9	0

DATE	21/04/18			22/04/18			23/04/18			24/04/18			25/04/18		
Time	Temperature (°c)	Wind Speed (m/s)	Rain fall since 9am (mm)	Temperature (°c)	Wind Speed (m/s)	Rain fall since 9am (mm)	Temperature (oc)	Wind Speed (m/s)	Rain fall since 9am (mm)	Temperature (oc)	Wind Speed (m/s)	Rain fall since 9am (mm)	Temperature (oc)	Wind Speed (m/s)	Rain fall since 9am (mm)
0:00	16.6	5.4	0	15.4	3.6	0	15.0	5.0	0	18.4	4.4	0	11.3	3.1	0
1:00	16.5	4.7	0	15.7	0.0	0	15.6	4.6	0	17.8	4.2	0	10.6	3.6	0
2:00	16.6	4.4	0	14.4	1.1	0	14.8	3.3	0	17.0	4.4	0	9.7	3.1	0
3:00	16.6	4.4	0	14.0	2.2	0	14.7	3.3	0	16.9	4.4	0.2	9.3	1.1	0
4:00	16.6	2.6	0	13.5	2.8	0	14.7	4.4	0	17.0	4.9	0	9.3	2.6	0.4
5:00	14.7	2.8	0	13.3	2.4	0	15.3	5.3	0	17.0	4.6	0	8.9	3.6	0
6:00	14.4	5.8	0	13.2	3.1	0	15.2	5.3	0	17.0	3.9	0	8.2	3.6	0
7:00	13.7	6.3	0	13.5	3.6	0	15.0	3.6	0	16.6	3.9	0	7.8	3.3	0
8:00	15.3	3.9	0	14.7	3.1	0	17.0	2.8	0	17.0	3.1	0	8.5	2.8	0
9:00	17.3	4.6	0	16.5	2.4	0	18.8	2.8	0	17.4	3.1	0	10.1	0.7	0
10:00	19.8	3.9	0	18.5	2.5	0	19.8	3.1	0	17.3	3.9	0	12.2	1.3	0
11:00	21.2	4.7	0	19.1	1.8	0	22.0	2.4	0	19.4	4.7	0	13.5	2.8	0
12:00	19.8	4.7	0	20.4	2.4	0	23.0	3.9	0	19.4	4.6	0	15.3	3.9	0
13:00	20.3	5.8	0	21.3	3.3	0	24.4	4.2	0	18.7	2.2	0	15.7	4.4	0
14:00	19.4	4.0	0	21.2	3.3	0	24.5	4.0	0	16.1	2.6	0	15.8	4.6	0
15:00	18.3	5.4	0	20.7	2.4	0	23.4	3.9	0	17.7	3.6	0	15.3	4.4	0
16:00	17.9	3.9	0	19.5	1.0	0	22.4	4.4	0	17.8	1.8	0	14.4	4.2	0
17:00	17.3	3.6	0	18.3	1.8	0	21.3	4.4	0	16.5	1.8	0	12.5	3.6	0
18:00	16.0	5.1	0	16.3	1.8	0	20.5	5.3	0	15.3	0.6	0	12.4	1.8	0
19:00	16.2	4.7	0	16.2	1.4	0	19.7	3.1	0	15.2	1.8	0	12.2	4.4	0
20:00	16.1	4.2	0	16.4	1.1	0	18.4	3.3	2.6	14.4	2.6	0	11.3	5.0	0
21:00	16.0	4.9	0	16.5	0.0	0	19.1	3.9	0	13.0	3.3	0	10.2	5.4	0
22:00	15.9	4.9	0	16.4	2.2	0	19.8	5.4	0	12.4	2.2	0	9.8	4.9	0
23:00	15.7	5.3	0	15.2	4.4	0	19.6	4.4	0	12.0	2.6	0	9.1	4.2	0

DATE	26/04/18			27/04/18			28/04/18		
Time	Temperature (°c)	Wind Speed (m/s)	Rain fall since 9am (mm)	Temperature (°c)	Wind Speed (m/s)	Rain fall since 9am (mm)	Temperature (oc)	Wind Speed (m/s)	Rain fall since 9am (mm)
0:00	8.7	4.4	0	6.6	5.3	0	11.2	6.1	0
1:00	8.5	5.3	0	6.4	5.3	0	12.1	4.7	0
2:00	8.3	7.2	0	6.1	4.7	0	12.3	3.1	0
3:00	8.1	8.5	0	5.9	3.1	0	11.8	2.5	0
4:00	7.8	8.1	0	5.6	3.1	0	11.2	2.5	0
5:00	7.7	7.5	0	5.7	3.9	0	11.6	2.5	0
6:00	7.9	6.9	0	6.1	5.8	0	11.0	2.4	0
7:00	7.8	7.8	0	6.3	4.4	0	10.9	2.5	0
8:00	8.1	7.2	0	7.1	2.4	0	11.6	3.6	0
9:00	8.7	7.1	0	8.6	1.9	0	12.4	3.3	0
10:00	9.9	5.8	0.2	10.1	0.6	0	13.9	1.7	0
11:00	10.5	5.4	0	11.7	1.9	0	14.5	1.9	0
12:00	12.5	3.9	0	13.0	1.3	0	16.4	2.4	0
13:00	12.5	5.4	0	13.0	1.9	0	16.8	2.4	0
14:00	12.7	5.8	0	13.4	2.8	0	16.7	1.4	0
15:00	11.3	6.1	0	13.7	2.5	0	16.1	2.4	0
16:00	10.1	5.8	0	12.7	2.4	0	15.0	4.2	0
17:00	9.2	6.3	0	11.5	2.8	0	13.5	5.1	0
18:00	8.3	6.7	0	10.2	3.6	0	12.0	6.3	0
19:00	7.8	4.6	0	9.2	5.6	0	10.5	5.3	0
20:00	7.3	4.9	0	8.1	5.4	0	10.5	2.8	0
21:00	6.8	6.3	0	8.9	6.0	0	10.6	3.1	0
22:00	6.5	5.8	0	9.0	4.4	0	9.2	4.6	0
23:00	6.9	6.4	0	12.0	5.4	0	9.9	3.9	0

APPENDIX C

NOISE CONTOUR MAPS

NOISE CONTOUR MAPS

FUTURE NOISE LEVELS (2031) – UNMITIGATED

Option A0: Maps 1 to 6

Option A1: Maps 13 to 18

Option C0: Maps 25 to 30

Option C2: Maps 37 to 42

FUTURE NOISE LEVELS (2031) – MITIGATED

Option A0: Maps 7 to 12

Option A1: Maps 19 to 24

Option C0: Maps 31 to 36

Option C2: Maps 43 to 48

IN-TOWN NOISE LEVELS

Maps 49 to 51

Note: All contours (except the in-town contours) are presented as façade reflected levels (+2.5 dB to free-field levels).

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

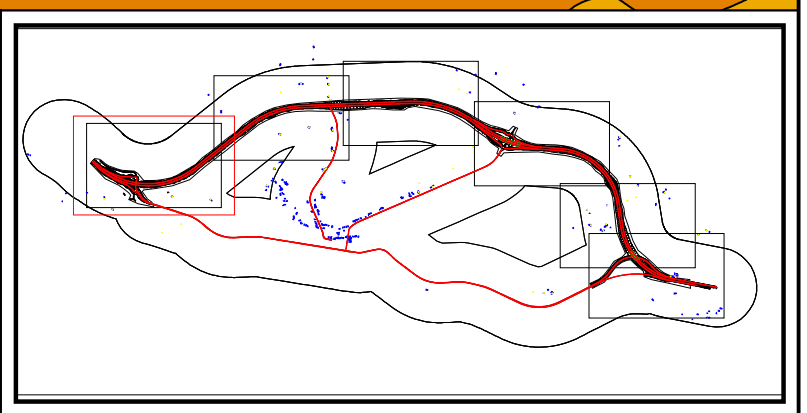
10/10

11/11

14/66 Martins Lane

SCALE

0 50 100 200 300 400 500 600 m



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 1	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

wsp

2270290A - Beaufort Bypass EES

Future Year 2031, Option A0 - Section 1

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)

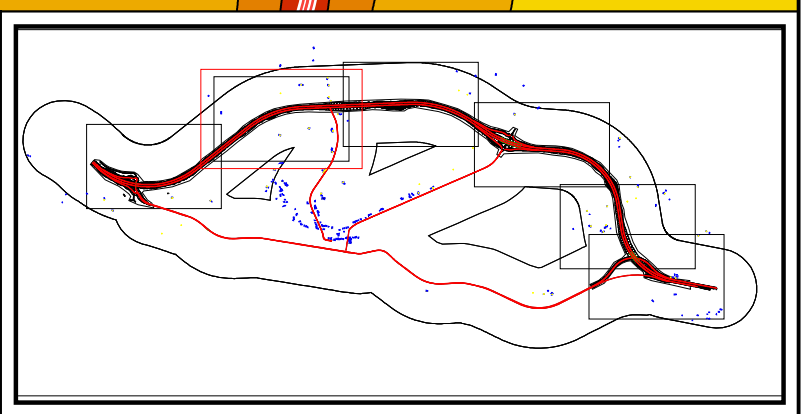
34/34
21/21
33/33
20/20
32/32
31/31
30/30
19/19
29/195 Main Lead Way
18/18

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 2	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

wsp

2270290A - Beaufort Bypass EES

Future Year 2031, Option A0 - Section 2

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)

40/Vineyard

41/41

31/31

30/30

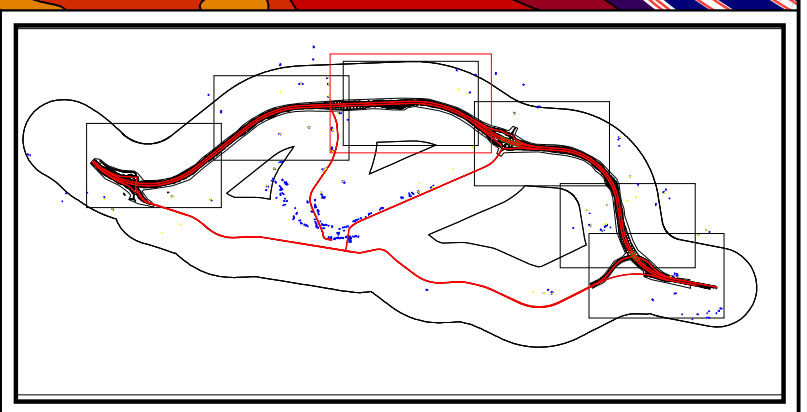
.ead Way

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 3	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

2270290A - Beaufort Bypass EES

Future Year 2031, Option A0 - Section 3

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)

42/42

39/39

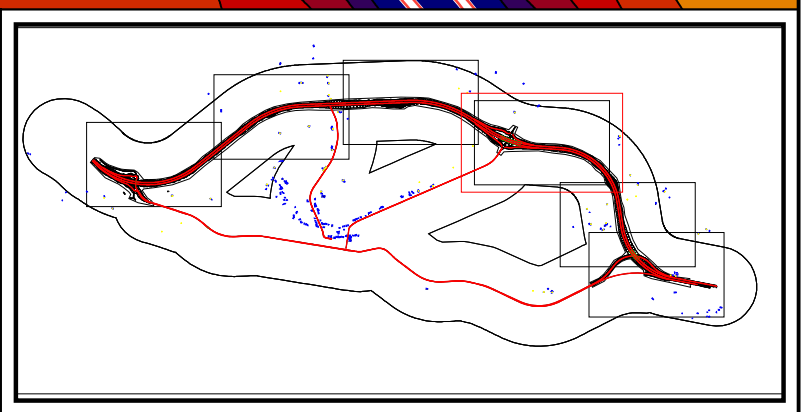
51/

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 4	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

wsp

2270290A - Beaufort Bypass EES

Future Year 2031, Option A0 - Section 4

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)

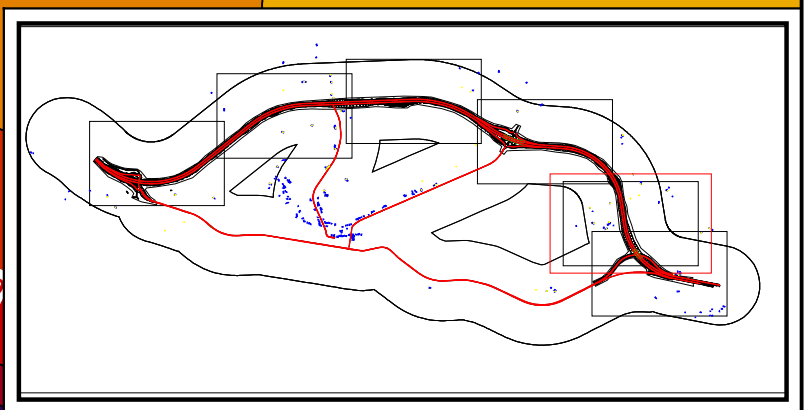
CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m

55/55
54/54
56/56
53/53
52/142 Packhams Lane - Logger Pos
50/50
46/46
49/122 Packhams Lane
47/47
48/48
58/58



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 5	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

wsp

2270290A - Beaufort Bypass EES

Future Year 2031, Option A0 - Section 5

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)

48/48

59/59

58/58

2/4126 We[illegible] Highway (logger)

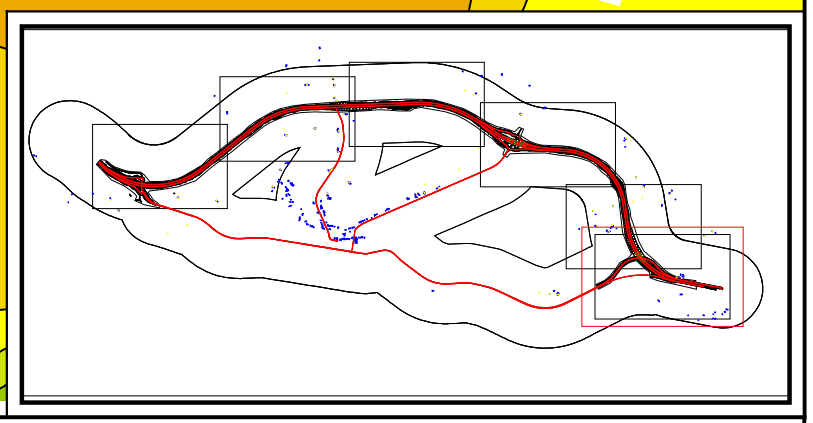
57/57

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 6	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

2270290A - Beaufort Bypass EES

Future Year 2031, Option A0 - Section 6

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

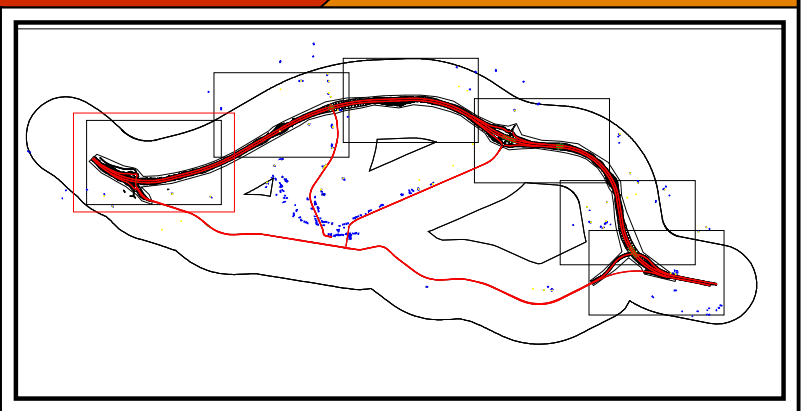
10/10

14/66 Martins Lane

11/11

SCALE

0 50 100 200 300 400 500 600 m



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 7	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

wsp

2270290A - Beaufort Bypass EES

Future Year 2031, Option A1 - Section 1

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)

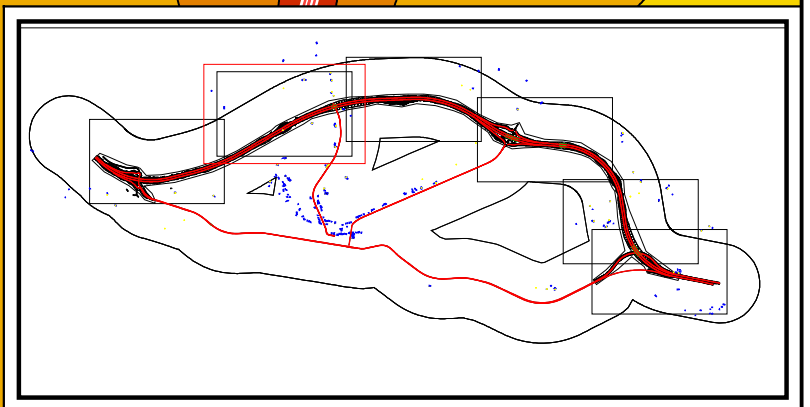
CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m

34/34
21/21
33/33
20/20
32/32
31/31
30/30
19/19
29/195 Main Lead Way
18/18



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 8	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

2270290A - Beaufort Bypass EES

Future Year 2031, Option A1 - Section 2

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m

40/Vineyard

41/41

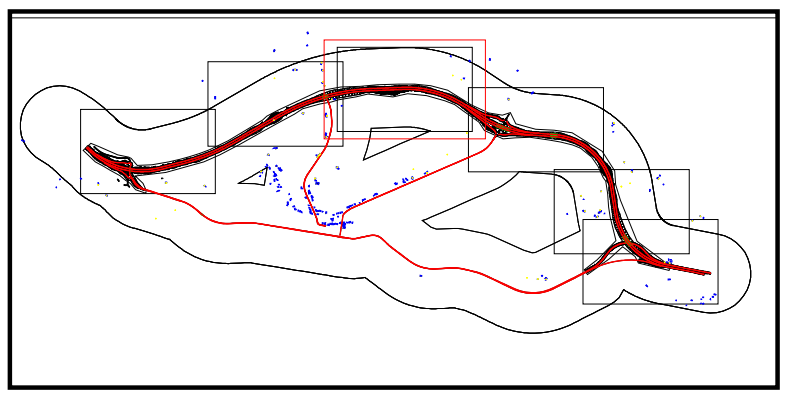
31/31

30/30

32/32

33/33

.ead Way



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 9	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

2270290A - Beaufort Bypass EES

Future Year 2031, Option A1 - Section 3

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)

42/42

39/39

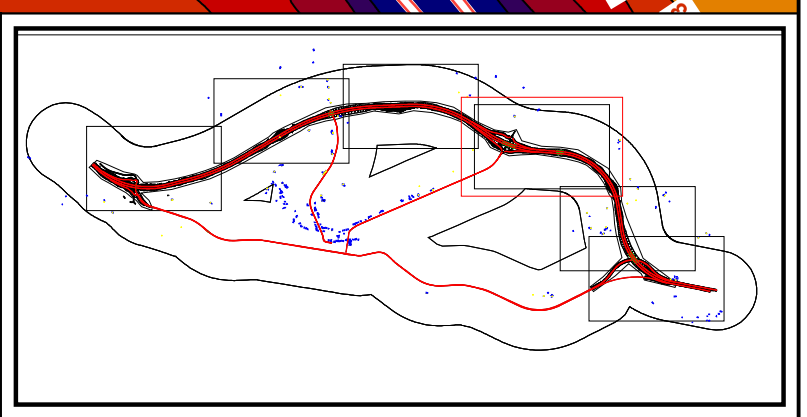
51/

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 10	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

wsp

2270290A - Beaufort Bypass EES

Future Year 2031, Option A1 - Section 4

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m

54/54

56/56

53/53

52/142 Packhams Lane - Logger Pos

50/50

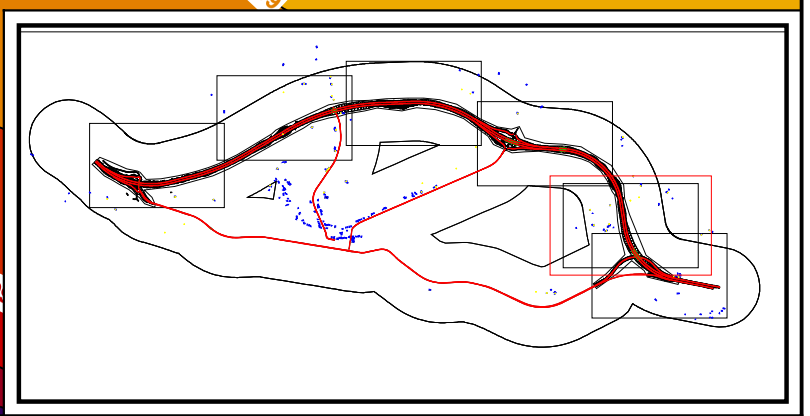
46/46

49/122 Packhams Lane

47/47

48/48

58/58



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 11	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

wsp

2270290A - Beaufort Bypass EES

Future Year 2031, Option A1 - Section 5

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)

48/48

59/59

58/58

57/57

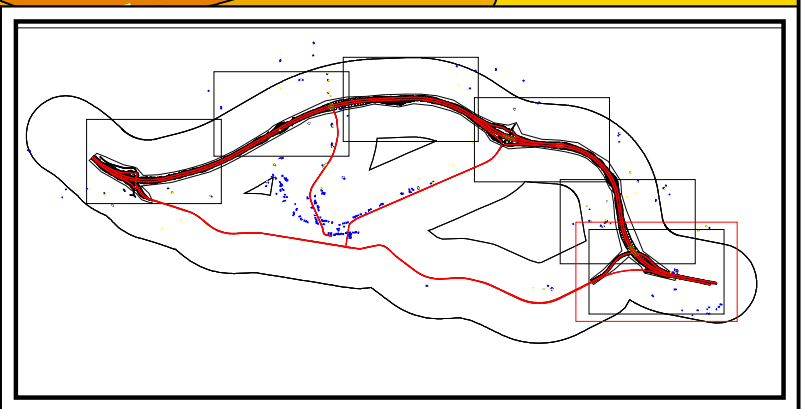
2/4126 We[illegible] Highway (logger)

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 12	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

wsp

2270290A - Beaufort Bypass EES

Future Year 2031, Option A1 - Section 6

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)

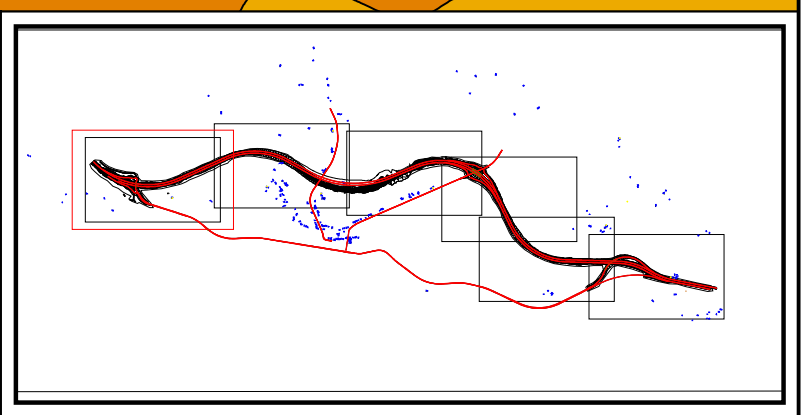
1/66 Martins Lane

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number:13	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

wsp

2270290A - Beaufort Bypass EES

Future Year 2031, Option C0 - Section 1

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)

8/195 Main Lead Way

11/41 Back Raglan Rd

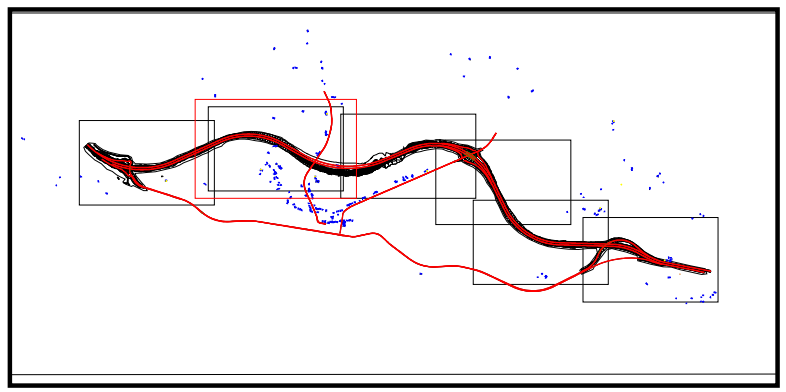
5/23 Camp Hill Rd

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number:14	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

2270290A - Beaufort Bypass EES

Future Year 2031, Option C0 - Section 2

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)

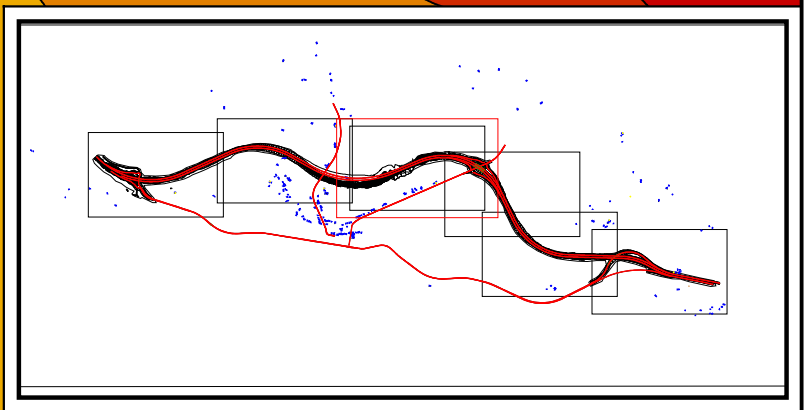
3/171 Beaufort Lexton Road - Logger

CONTOURS dBA, L10(18h)

39
42
45
48
51
54
57
60
63
66
69
72
75

SCALE

0 50 100 200 300 400 500 600 m



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number:15	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

2270290A - Beaufort Bypass EES

Future Year 2031, Option C0 - Section 3

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)

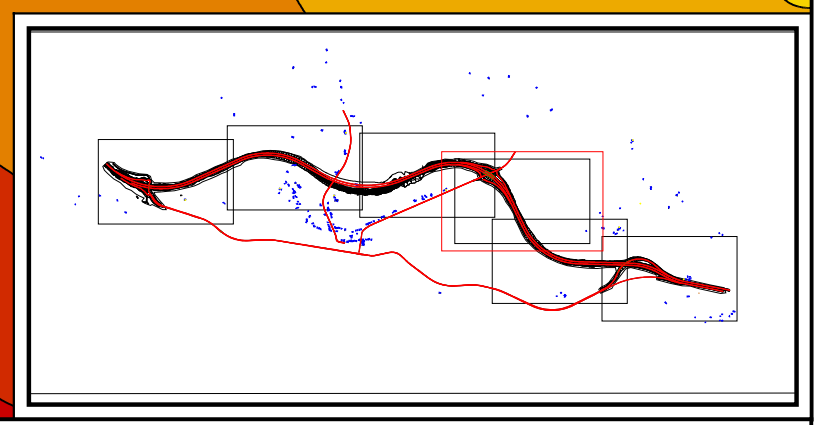
3/171 Beaufort Lexton Road - Logger

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number:16	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

2270290A - Beaufort Bypass EES

Future Year 2031, Option C0 - Section 4

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)

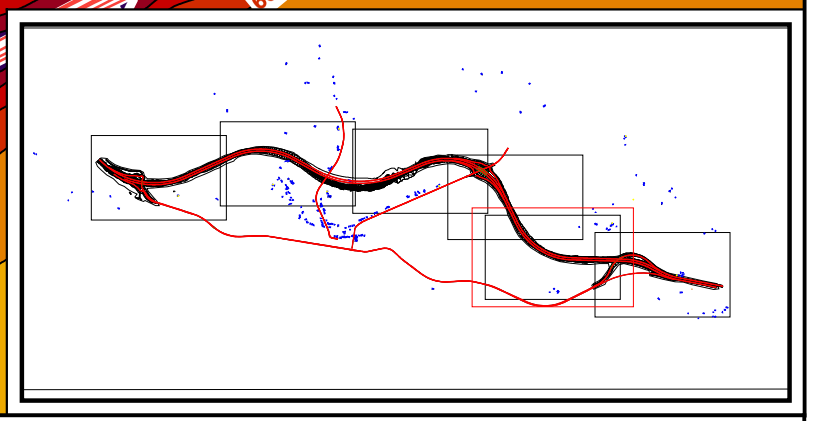
13/122 Packhams Lane

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number:17	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

2270290A - Beaufort Bypass EES

Future Year 2031, Option C0 - Section 5

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)

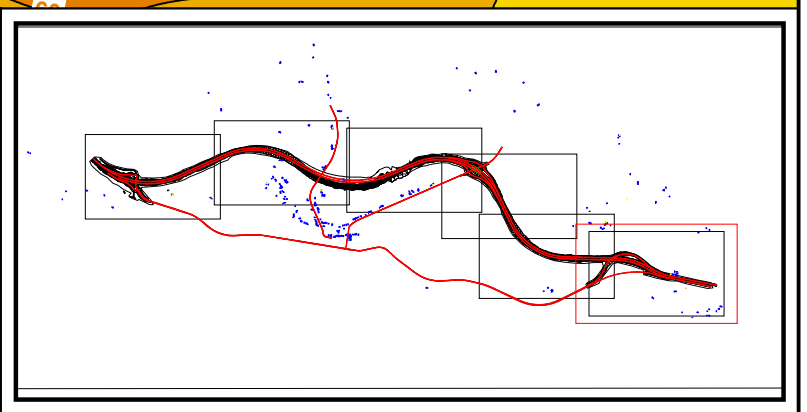
2/4126 Western Highway (logger)

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number:18	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

wsp

2270290A - Beaufort Bypass EES

Future Year 2031, Option C0 - Section 6

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)

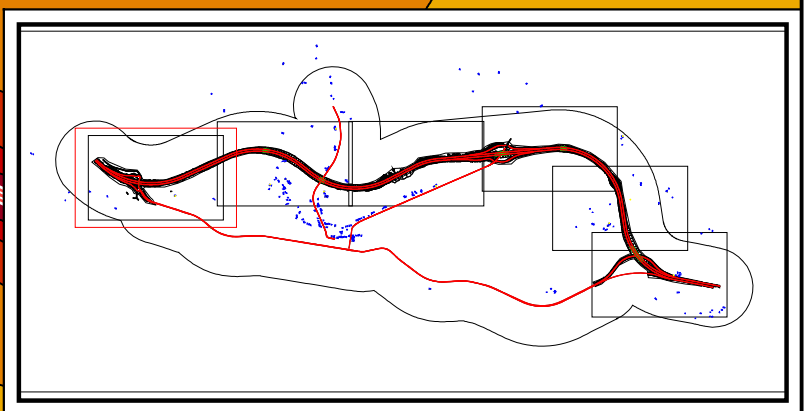
CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

1/66 Martins Lane

SCALE

0 50 100 200 300 400 500 600 m



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 19	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

2270290A - Beaufort Bypass EES

Future Year 2031, Option C2 - Section 1

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)

8/195 Main Lead Way

11/41 Back Raglan Rd

5/23 Camp Hill Rd

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m

Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 20	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

wsp

2270290A - Beaufort Bypass EES

Future Year 2031, Option C2 - Section 2

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)

8/195 Main Lead Way

3/171 Beaufort Lexton Road - Logger

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m

Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 21	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

2270290A - Beaufort Bypass EES

Future Year 2031, Option C2 - Section 3

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)

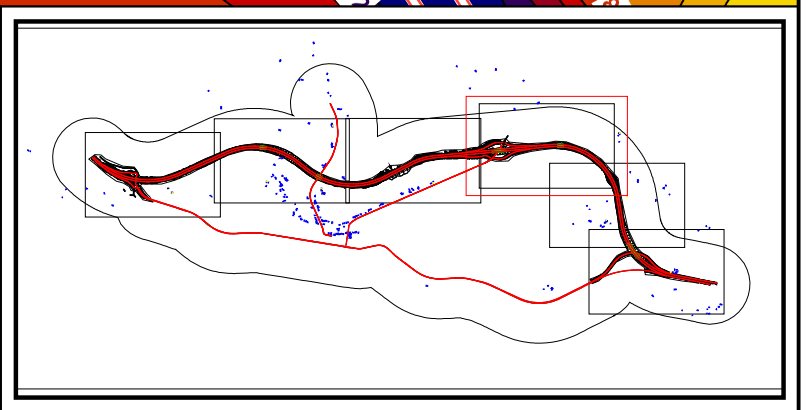
12/410 Race

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 22	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

wsp

2270290A - Beaufort Bypass EES

Future Year 2031, Option C2 - Section 4

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)

9/142 Packhams Lane - Logger Pos

13/122 Packhams Lane

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m

Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 23	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

wsp

2270290A - Beaufort Bypass EES

Future Year 2031, Option C2 - Section 5

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)

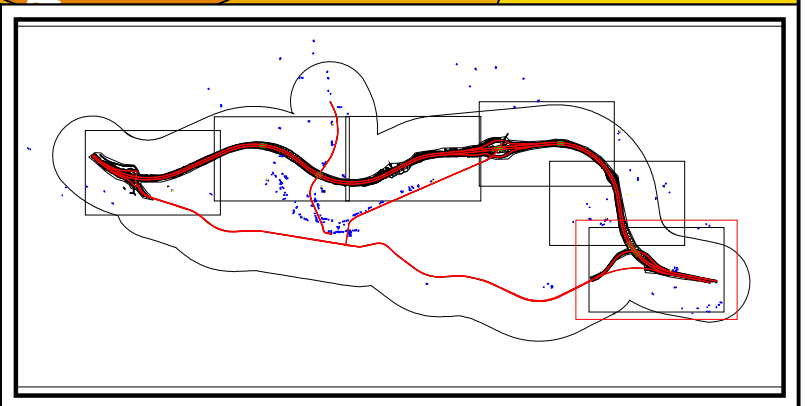
2/4126 Western Highway (logger)

CONTOURS
dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 24	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

wsp

2270290A - Beaufort Bypass EES

Future Year 2031, Option C2 - Section 6

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)
- Proposed Noise Wall

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m

10/10

14/66 Martins Lane

Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 25	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

2270290A - Beaufort Bypass EES

Proposed Mitigation Future Year 2031, Option A0 - Section 1

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)
- Proposed Noise Wall

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m

Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 26	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

2270290A - Beaufort Bypass EES

Proposed Mitigation Future Year 2031, Option A0 - Section 2

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)
- Proposed Noise Wall

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m

40/Vineyard

41/41

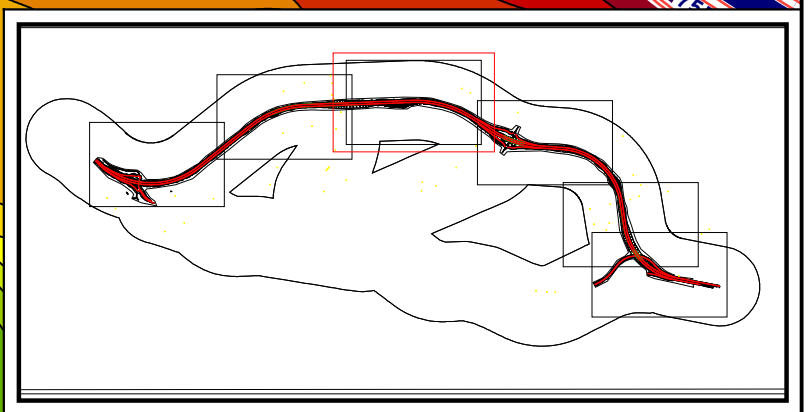
31/31

32/32

33/33

30/30

Lead Way



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 27	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

2270290A - Beaufort Bypass EES

Proposed Mitigation Future Year 2031, Option A0 - Section 3

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)
- Proposed Noise Wall

42/42

39/39

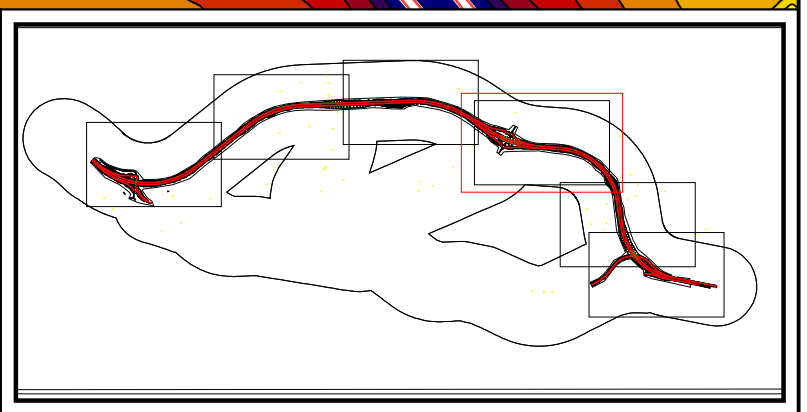
51/

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 28	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

2270290A - Beaufort Bypass EES

Proposed Mitigation Future Year 2031, Option A0 - Section 4

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)
- Proposed Noise Wall

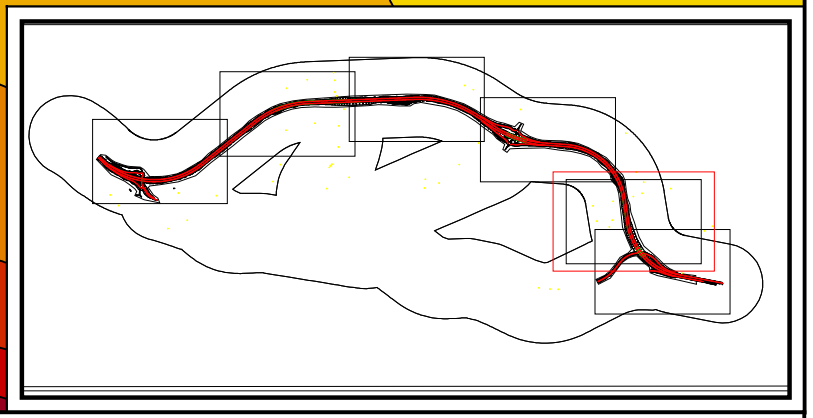
CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m

55/55
54/54
56/56
53/53
52/142 Packhams Lane - Logger Pos
50/50
46/46
49/122 Packhams Lane
47/47
48/48
58/58



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 29	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

2270290A - Beaufort Bypass EES

Proposed Mitigation Future Year 2031, Option A0 - Section 5

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)
- Proposed Noise Wall

48/48

59/59

58/58

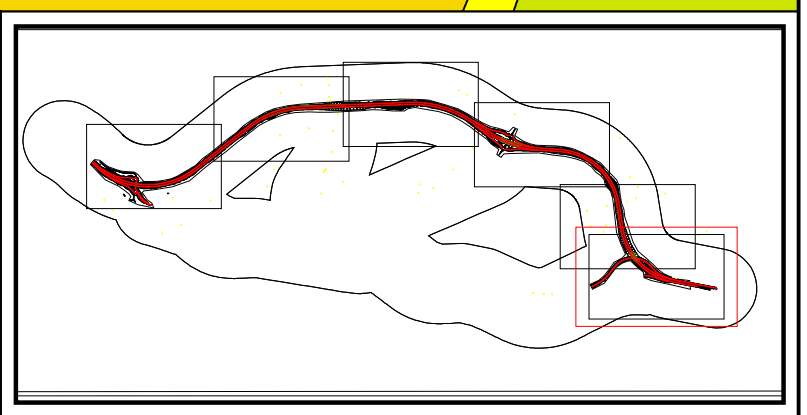
57/57

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 30	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

2270290A - Beaufort Bypass EES

Proposed Mitigation Future Year 2031, Option A0 - Section 6

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)
- Proposed Noise Wall

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

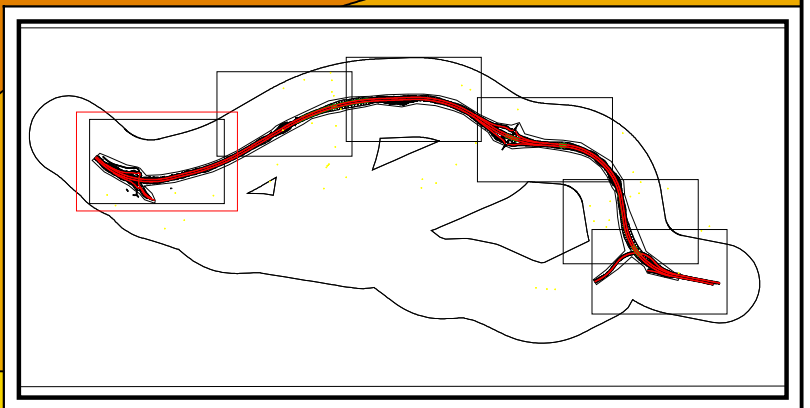
SCALE

0 50 100 200 300 400 500 600 m

10/10

14/66 Martins Lane

11/11



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 31	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

2270290A - Beaufort Bypass EES

Proposed Mitigation Future Year 2031, Option A1 - Section 1

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)
- Proposed Noise Wall

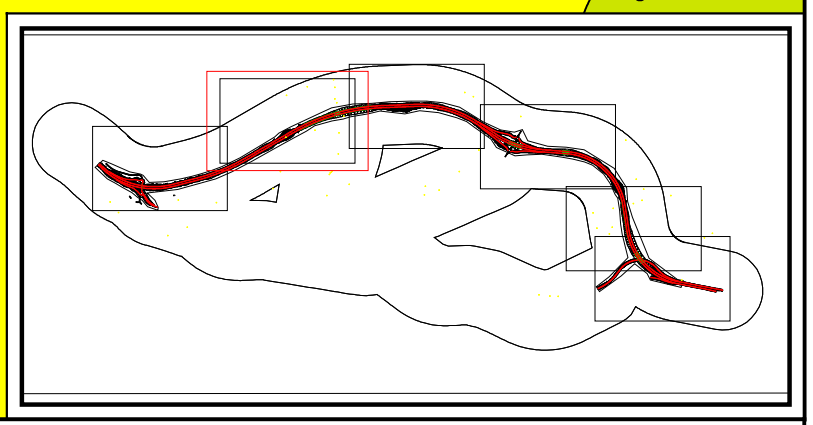
CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m

34/34
21/21
33/33
20/20
32/32
31/31
30/30
19/19
29/195 Main Lead Way
18/18



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 32	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

wsp

2270290A - Beaufort Bypass EES

Proposed Mitigation Future Year 2031, Option A1 - Section 2

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)
- Proposed Noise Wall

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m

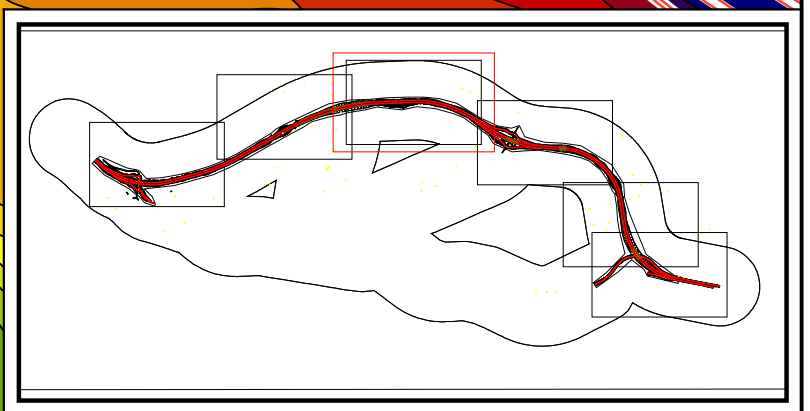
40/Vineyard

41/41

31/31

30/30

Lead Way



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 33	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

wsp

2270290A - Beaufort Bypass EES

Proposed Mitigation Future Year 2031, Option A1 - Section 3

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)
- Proposed Noise Wall

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

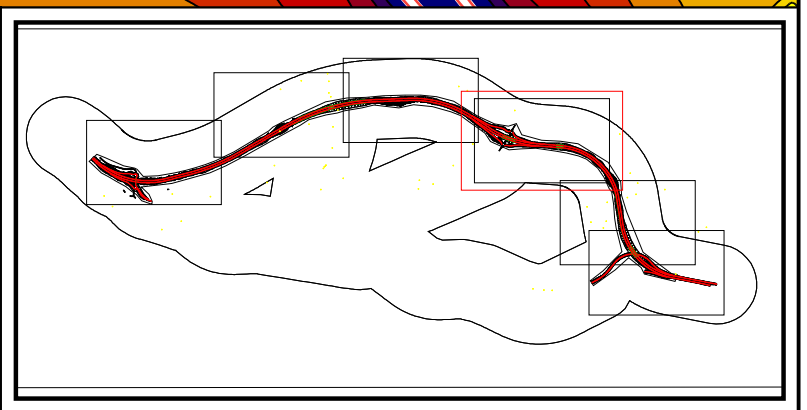
SCALE

0 50 100 200 300 400 500 600 m

42/42

39/39

51/



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 34	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

wsp

2270290A - Beaufort Bypass EES

Proposed Mitigation Future Year 2031, Option A1 - Section 4

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)
- Proposed Noise Wall

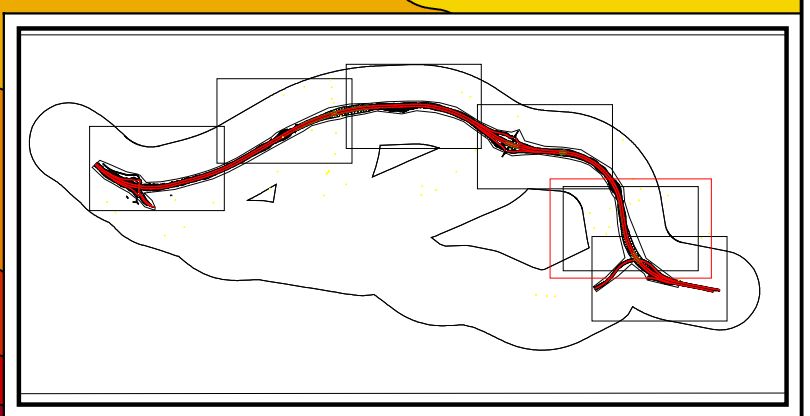
CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m

55/55
54/54
56/56
53/53
52/142 Packhams Lane - Logger Pos
50/50
46/46
49/122 Packhams Lane
47/47
48/48
58/58



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 35	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

2270290A - Beaufort Bypass EES

Proposed Mitigation Future Year 2031, Option A1 - Section 5

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)
- Proposed Noise Wall

48/48

59/59

58/58

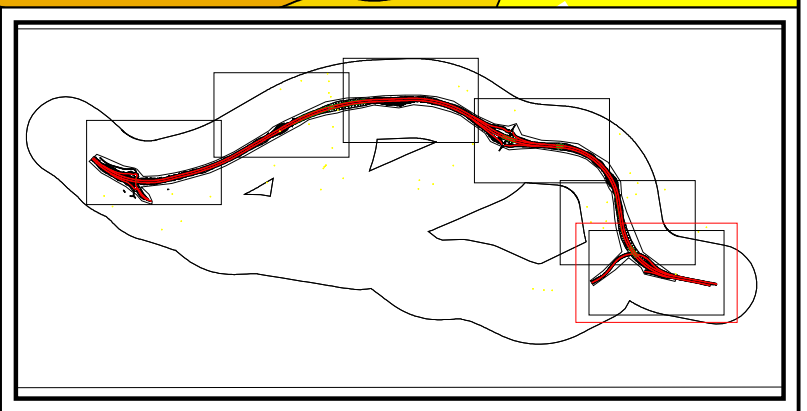
57/57

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 36	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

2270290A - Beaufort Bypass EES

Proposed Mitigation Future Year 2031, Option A1 - Section 6

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)
- Proposed Noise Wall

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

10/10

11/11

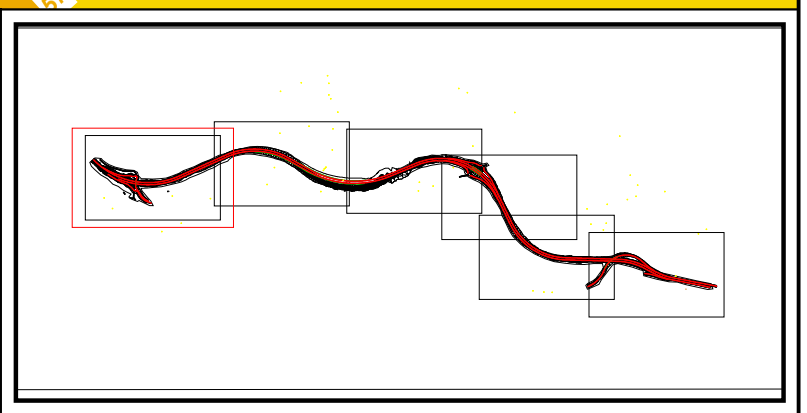
13/13

14/66 Martins Lane

15/15

SCALE

0 50 100 200 300 400 500 600 m



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number:37	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

2270290A - Beaufort Bypass EES

Proposed Mitigation Future Year 2031, Option C0 - Section 1

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)
- Proposed Noise Wall

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m

19/19

29/195 Main Lead Way

18/18

28/28

17/17

27/27

26/26

25/25

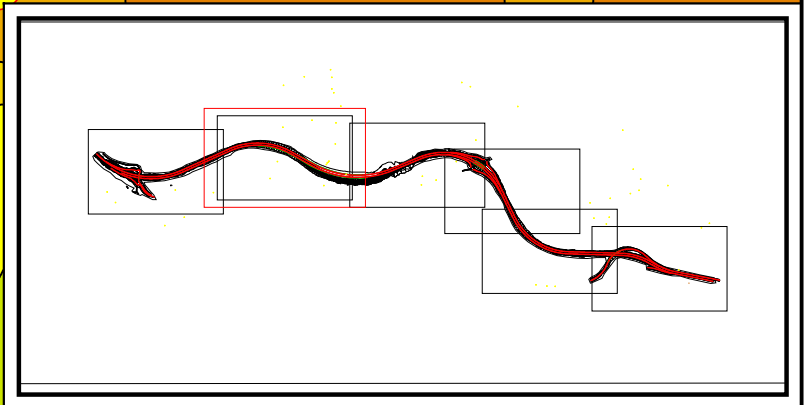
24/24

23/23

16/41 Back Raglan Rd

22/23 Camp Hill Rd

5/15



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number:38	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

2270290A - Beaufort Bypass EES

Proposed Mitigation Future Year 2031, Option C0 - Section 2

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)
- Proposed Noise Wall

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m

28/28

23/23

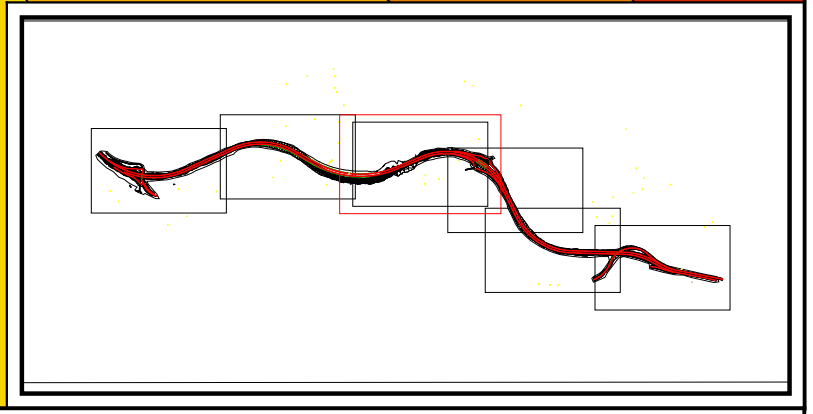
39/39

38/38

36/36

37/171 Beaufort Lexton Road - Logger

35/35



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number:39	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

wsp

2270290A - Beaufort Bypass EES

Proposed Mitigation Future Year 2031, Option C0 - Section 3

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)
- Proposed Noise Wall

38/38

37/171 Beaufort Lexton Road - Logger

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m

Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number:40	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

2270290A - Beaufort Bypass EES

Proposed Mitigation Future Year 2031, Option C0 - Section 4

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)
- Proposed Noise Wall

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m

46/46

47/47

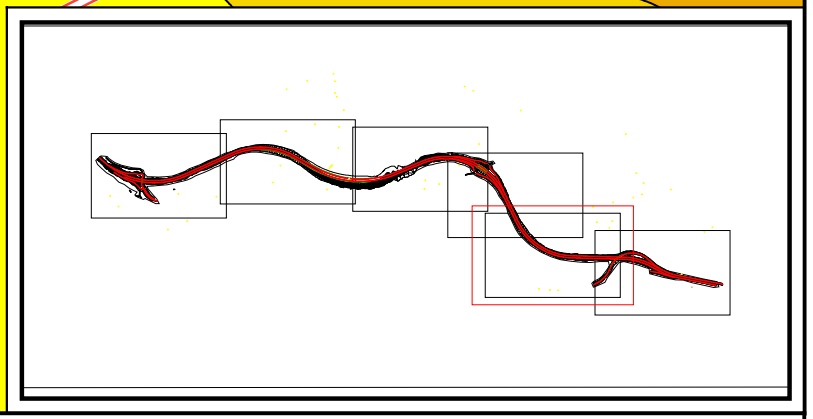
49/122 Packhams Lane

48/48

43/43

44/44

45/45



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number:41	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

wsp

2270290A - Beaufort Bypass EES

Proposed Mitigation Future Year 2031, Option C0 - Section 5

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)
- Proposed Noise Wall

48/48

59/59

58/58

57/57

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m

Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number:42	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

2270290A - Beaufort Bypass EES

Proposed Mitigation Future Year 2031, Option C0 - Section 6

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)
- Proposed Noise Wall

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m

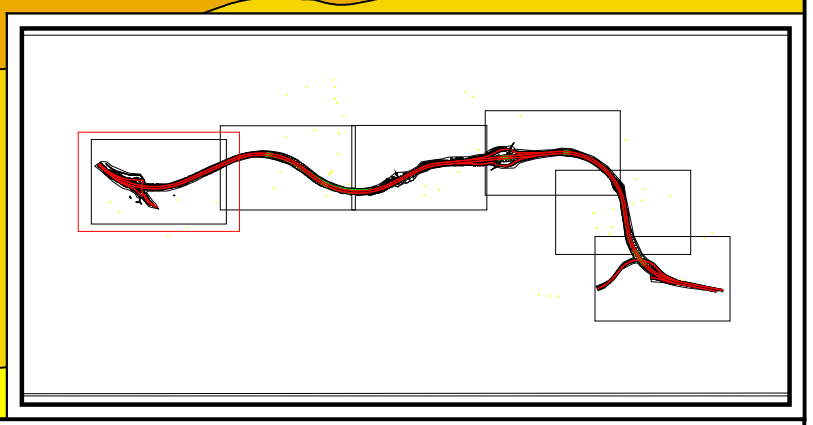
10/10

11/11

14/66 Martins Lane

15/15

13/13



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 43	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

2270290A - Beaufort Bypass EES

Proposed Mitigation Future Year 2031, Option C2 - Section 1

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)
- Proposed Noise Wall

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

19/19

29/195 Main Lead Way

18/18

28/28

17/17

27/27

26/26

25/25

24/24

23/23

16/41 Back Raglan Rd

22/23 Camp Hill Rd

5/15

SCALE

0 50 100 200 300 400 500 600 m

Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 44	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

2270290A - Beaufort Bypass EES

Proposed Mitigation Future Year 2031, Option C2 - Section 2

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)
- Proposed Noise Wall

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m

28/28

39/39

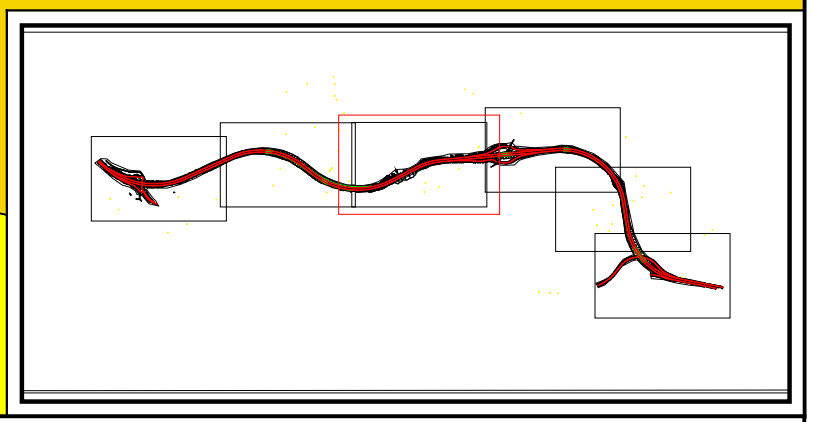
38/38

23/23

36/36

37/171 Beaufort Lexton Road - Logger

35/35



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 45	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

2270290A - Beaufort Bypass EES

Proposed Mitigation Future Year 2031, Option C2 - Section 3

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)
- Proposed Noise Wall

42/42

39/39

51/410 Race

CONTOURS dBA, L10(18h)

39
42
45
48
51
54
57
60
63
66
69
72
75

SCALE

0 50 100 200 300 400 500 600 m

Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 46	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

wsp

2270290A - Beaufort Bypass EES

Proposed Mitigation Future Year 2031, Option C2 - Section 4

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)
- Proposed Noise Wall

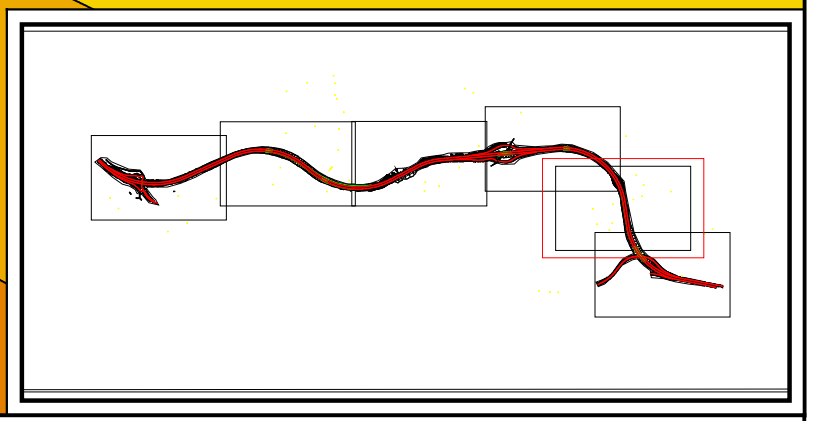
55/55
54/54
56/56
53/53
52/142 Packhams Lane - Logger Pos
50/50
46/46
47/47
49/122 Packhams Lane
48/48

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m



Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 47	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

wsp

2270290A - Beaufort Bypass EES

Proposed Mitigation Future Year 2031, Option C2 - Section 5

LEGEND

- Sensitive Receiver
- Main building
- 63 dBA, L10(18h)
- Proposed Noise Wall

48/48

59/59

58/58

57/57

CONTOURS dBA, L10(18h)

- 39
- 42
- 45
- 48
- 51
- 54
- 57
- 60
- 63
- 66
- 69
- 72
- 75

SCALE

0 50 100 200 300 400 500 600 m

Date: 8/08/2018	Prediction Algorithm: CoRTN
Map Number: 48	Prediction Height: 1.5m
Client: VicRoads	Coordinate System: UTM Zone 55 WGS84
	Author: Tim Ryan

N

2270290A - Beaufort Bypass EES

Proposed Mitigation Future Year 2031, Option C2 - Section 6

APPENDIX D

PREDICTED NOISE LEVELS (DETAILED RESULTS)

UNMITIGATED RESULTS – YEAR 2031, DBA L10, 18 HR FAÇADE REFLECTED LEVELS (+2.5dB TO FREE-FIELD LEVELS)					
House ID	**PONL**	**Option A0**	**Option A1**	**Option C0**	**Option C2**
10	**63**	57	56	53	54
11	**63**	54	54	53	53
12	**63**	56	56	56	54
13	**63**	56	56	56	54
14	**63**	64	64	63	62
15	**56**	60	61	60	59
16	**56**	55	58	60	59
17	**56**	55	59	65	65
18	**56**	59	78	60	63
19	**56**	61	66	56	56
20	**56**	62	56	45	39
21	**56**	61	57	46	-
22	**61**	52	54	65	65
23	**61**	48	50	-	-
24	**61**	53	55	68	68
25	**61**	53	55	67	67
26	**61**	53	55	67	67
27	**61**	53	55	67	66
28	**61**	55	57	60	60
29	**61**	60	61	56	56
30	**61**	66	60	53	50
31	**61**	68	64	51	-
32	**61**	67	64	52	-
33	**61**	61	59	50	-
34	**61**	57	54	45	-
35	**63**	38	38	56	55
36	**63**	40	39	58	56
37	**63**	43	43	57	54
38	**63**	47	47	68	65
39	**52**	58	58	57	59
40 (Vineyard)		62	62	38	-
41	**52**	61	61	39	38
42	**63**	60	60	47	56
43	**63**	-	-	44	-
44	**63**	36	36	44	-

UNMITIGATED RESULTS – YEAR 2031, DBA L10, 18 HR FAÇADE REFLECTED LEVELS (+2.5dB TO FREE-FIELD LEVELS)					
House ID	**PONL**	**Option A0**	**Option A1**	**Option C0**	**Option C2**
45	**63**	44	44	46	-
46	**53**	56	55	56	55
47	**53**	53	53	55	52
48	**53**	62	62	58	62
49	**53**	64	64	56	64
50	**53**	66	65	54	66
51	**52**	51	51	-	50
52	**53**	65	64	54	65
53	**53**	59	59	53	58
54	**53**	54	54	50	52
55	**53**	51	52	46	49
56	**53**	53	53	51	50
57	**68**	72	72	72	72
58	**53**	56	56	55	54
59	**53**	54	55	53	52
60	**63**	59	60	3	56
61	**68**	63	63	63	63
62	**63**	-	-	51	51
63	**63**	57	59	54	57
64	**56**	51	55	63	63
65	**56**	45	53	62	62
66	**56**	44	53	62	62
67	**56**	-	53	62	62
68	**56**	-	52	62	62
69	**56**	52	56	62	62
70	**56**	-	52	60	60
71	**61**	-	-	57	57
72	**61**	-	-	57	57
73	**63**	-	-	52	51
74	**63**	-	-	55	55
75	**63**	-	-	55	55
76	**52**	62	61	-	38
77	**56**	59	55	55	55
78	**56**	53	57	62	62
Exceedances		**23**	**23**	**27**	**27**

MITIGATED RESULTS – YEAR 2031, dBA L10, 18 HR (SURFACE ONLY) FAÇADE REFLECTED LEVELS (+2.5dB TO FREE-FIELD LEVELS)					
House ID	**PONL**	**Option A0**	**Option A1**	**Option C0**	**Option C2**
10	**63**	54	54	51	52
11	**63**	52	52	50	51
12	**63**	52	52	53	52
13	**63**	52	53	52	52
14	**63**	62	62	61	60
15	**56**	57	58	57	57
16	**56**	51	55	57	57
17	**56**	51	56	63	63
18	**56**	56	76	57	61
19	**56**	59	64	54	54
20	**56**	60	53	37	37
21	**56**	59	55	-	-
22	**61**	-	-	63	63
23	**61**	-	-	-	-
24	**61**	43	51	66	66
25	**61**	47	51	65	65
26	**61**	48	51	65	65
27	**61**	49	51	65	64
28	**61**	53	55	58	58
29	**61**	58	59	53	54
30	**61**	64	58	48	48
31	**61**	66	62	-	-
32	**61**	65	61	-	-
33	**61**	59	57	-	-
34	**61**	55	52	-	-
35	**63**	-	-	54	53
36	**63**	-	-	55	54
37	**63**	-	-	54	52
38	**63**	41	41	66	63
39	**52**	56	56	55	57
40 (Vineyard)		60	60	-	-
41	**52**	59	59	-	36
42	**63**	58	58	-	54
43	**63**	-	-	41	-
44	**63**	-	-	40	-

MITIGATED RESULTS – YEAR 2031, dBA L10, 18 HR (SURFACE ONLY) FAÇADE REFLECTED LEVELS (+2.5dB TO FREE-FIELD LEVELS)					
House ID	**PONL**	**Option A0**	**Option A1**	**Option C0**	**Option C2**
45	**63**	-	-	41	-
46	**53**	53	53	52	53
47	**53**	50	50	51	50
48	**53**	60	60	55	60
49	**53**	62	62	53	62
50	**53**	64	63	50	64
51	**52**	48	48	-	48
52	**53**	63	62	47	63
53	**53**	56	56	41	56
54	**53**	51	51	-	50
55	**53**	48	48	-	47
56	**53**	48	48	-	48
57	**68**	70	70	70	70
58	**53**	52	52	52	52
59	**53**	49	50	51	50
60	**63**	57	58	-	54
61	**68**	61	61	61	61
62	**63**	-	-	49	49
63	**63**	55	57	52	55
64	**56**	49	53	61	61
65	**56**	43	51	60	60
66	**56**	42	51	60	60
67	**56**	-	51	60	60
68	**56**	-	50	60	60
69	**56**	50	54	60	60
70	**56**	-	50	58	58
71	**61**	-	-	55	55
72	**61**	-	-	55	55
73	**63**	-	-	50	49
74	**63**	-	-	53	53
75	**63**	-	-	53	53
76	**52**	60	59	-	36
77	**56**	57	53	53	53
78	**56**	51	55	60	60
Exceedances		**17**	**14**	**19**	**24**

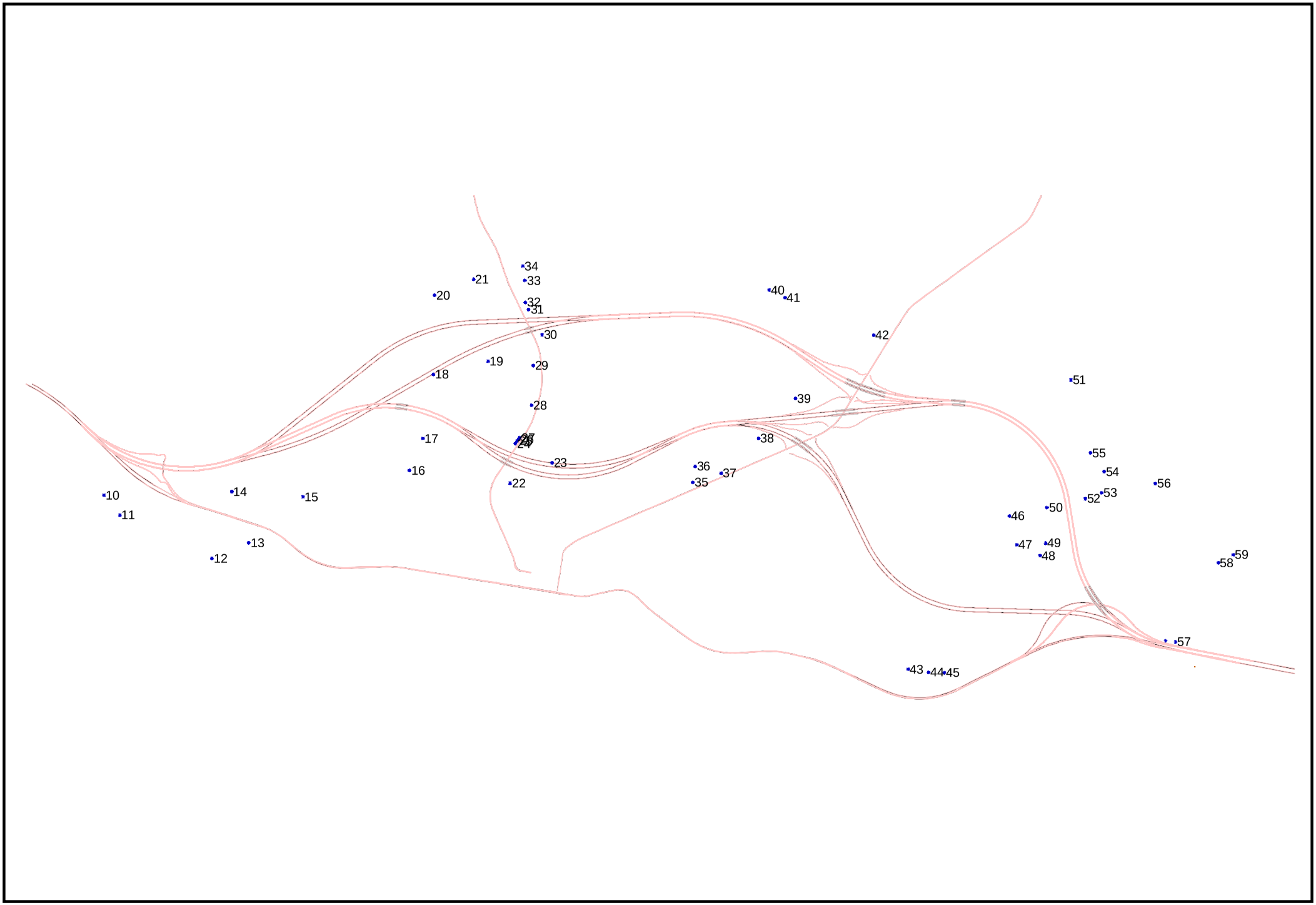
MITIGATED RESULTS – YEAR 2031, dBA L10, 18 HR (SURFACE + 2M BARRIERS) FAÇADE REFLECTED LEVELS (+2.5dB TO FREE-FIELD LEVELS)					
House ID	**PONL**	**Option A0**	**Option A1**	**Option C0**	**Option C2**
10	**63**	54	54	51	52
11	**63**	52	52	50	51
12	**63**	52	52	53	52
13	**63**	52	53	53	53
14	**63**	62	62	61	-
15	**56**	56	58	57	57
16	**56**	51	55	56	-
17	**56**	51	56	59	59
18	**56**	56	76	61	61
19	**56**	53	60	51	51
20	**56**	56	50	37	37
21	**56**	55	51	-	-
22	**61**	-	-	60	-
23	**61**	-	-	-	-
24	**61**	36	48	60	61
25	**61**	41	49	60	60
26	**61**	42	48	60	60
27	**61**	43	49	59	59
28	**61**	48	51	55	55
29	**61**	53	56	51	3
30	**61**	57	56	44	44
31	**61**	60	58	-	-
32	**61**	60	58	-	-
33	**61**	56	55	-	-
34	**61**	52	50	-	-
35	**63**	-	-	53	53
36	**63**	-	-	55	54
37	**63**	-	-	54	-
38	**63**	41	41	67	63
39	**52**	56	56	55	57
40 (Vineyard)		60	60	-	-
41	**52**	59	59	-	36
42	**63**	58	58	-	55
43	**63**	-	-	41	-
44	**63**	-	-	40	-
45	**63**	-	-	41	-
46	**53**	52	52	52	52

MITIGATED RESULTS – YEAR 2031, dBA L10, 18 HR (SURFACE + 2M BARRIERS) FAÇADE REFLECTED LEVELS (+2.5dB TO FREE-FIELD LEVELS)					
House ID	**PONL**	**Option A0**	**Option A1**	**Option C0**	**Option C2**
47	**53**	49	49	52	49
48	**53**	57	56	55	56
49	**53**	57	57	53	57
50	**53**	59	59	50	59
51	**52**	48	48	-	48
52	**53**	67	67	47	67
53	**53**	57	56	40	56
54	**53**	51	51	-	50
55	**53**	48	48	-	47
56	**53**	48	48	-	48
57	**68**	70	70	70	70
58	**53**	52	52	52	52
59	**53**	49	50	51	50
60	**63**	57	58	3	54
61	**68**	61	61	61	61
62	**63**	-	-	49	49
63	**63**	55	57	52	55
64	**56**	49	52	57[1]	56
65	**56**	43	51	56	56
66	**56**	42	51	56	56
67	**56**	-	51	55	55
68	**56**	-	50	55	55
69	**56**	50	54	56	56
70	**56**	-	50	55	54
71	**61**	-	-	51	51
72	**61**	-	-	52	52
73	**63**	-	-	49	49
74	**63**	-	-	53	53
75	**63**	-	-	53	53
76	**52**	59	59	-	36
77	**56**	*57[1]*	53	53	53
78	**56**	51	55	57	57
Exceedances		**9**	**12**	**8**	**11**

1. Noise level exceed by 0.1 dB which is generally within the model tolerance.

APPENDIX E

NOISE SENSITIVE RECEIVER MAP


34
21
33
20
40
41
32
31
30
42
19
29
18
51
39
28
17
38
23
55
16
36
37
54
56
22
35
10
14
15
53
52
11
46
50
13
47
49
48
59
12
58
57
43
44
45

APPENDIX F

RISK REGISTER

Table F.1 Noise and vibration environmental risk assessment register – A0 alignment

RISK ID	IMPACT PATHWAY	RISK DESCRIPTION	STANDARD CONTROLS	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	RESIDUAL RISK		
				Consequence	Likelihood	Rating		Consequence	Likelihood	Rating
NV1a	Increases noise and vibration during pre-construction activities	Airborne Noise: High levels of airborne construction noise can adversely impact on noise sensitive receivers	Implement EPA Guideline 1834, Best Practise construction noise controls. Provide engineering controls, such as noise mitigation in the form of noise barriers, attenuated plant. Provide management controls such as restricted hours of operation (daytime only), community notification of works.	Minor	Possible	Low	Not required	Minor	Possible	Low
NV2a	Increases noise and vibration during clearing	Airborne Noise: High levels of airborne construction noise can adversely impact on noise sensitive receivers	Implement EPA Guideline 1834, Best Practise construction noise controls. Provide engineering controls, such as noise mitigation in the form of noise barriers, attenuated plant. Provide management controls such as restricted hours of operation (daytime only), community notification of works. Controls as per Section 177.	Minor	Possible	Low	Not required	Minor	Possible	Low

RISK ID	IMPACT PATHWAY	RISK DESCRIPTION	STANDARD CONTROLS	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	RESIDUAL RISK		
				Consequence	Likelihood	Rating		Consequence	Likelihood	Rating
NV3a	Increases noise and vibration during earthworks	Airborne Noise: High levels of airborne construction noise can adversely impact on noise sensitive receivers	Implement EPA Guideline 1834, Best Practise construction noise controls. Provide engineering controls, such as noise mitigation in the form of noise barriers, attenuated plant. Provide management controls such as restricted hours of operation (daytime only), community notification of works. Controls as per Section 177.	Minor	Possible	Low	Not required	Minor	Possible	Low
NV4a	Increases noise and vibration during earthworks	Ground-borne noise: Construction activity can result in ground-borne noise inside noise sensitive buildings that can cause disturbance	Implement EPA Guideline 1834, Best Practise construction noise controls with reference to alternative guidance documents such as NSW EPA Interim Construction Noise Guideline. Provide engineering controls, such as introduction of less impactful works (e.g. smaller plant), less vibration intensive methods (e.g. rock saws vs. rock-breaking). Provide management controls such as restricted hours of operation (daytime only), community notification of works. Controls as per Section 177.	Minor	Rare	Negligible	Not required	Minor	Rare	Negligible

RISK ID	IMPACT PATHWAY	RISK DESCRIPTION	STANDARD CONTROLS	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	RESIDUAL RISK		
				Consequence	Likelihood	Rating		Consequence	Likelihood	Rating
NV5a	Increases noise and vibration during earthworks	Vibration: Damage to buildings. High levels of vibration can cause damage to heritage or other property assets	Implement EPA Guideline 1834, Best Practise construction noise controls with reference to alternative guidance documents such as DIN 4150-3 to set and implement vibration limits. Provide engineering controls, such as introduction of less impactful works (e.g. smaller plant), less vibration intensive methods (e.g. rock saws vs. rock-breaking).	Minor	Unlikely	Low	Consideration of additional protection for assets and buildings should be considered through external structural analysis	Minor	Rare	Negligible
NV6a	Increases noise and vibration during construction	Airborne Noise: High levels of airborne construction noise can adversely impact on noise sensitive receivers	Implement EPA Guideline 1834, Best Practise construction noise controls. Provide engineering controls, such as noise mitigation in the form of noise barriers, attenuated plant. Provide management controls such as restricted hours of operation (daytime only), community notification of works.	Minor	Possible	Low	Not required	Minor	Possible	Low

RISK ID	IMPACT PATHWAY	RISK DESCRIPTION	STANDARD CONTROLS	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	RESIDUAL RISK		
				Consequence	Likelihood	Rating		Consequence	Likelihood	Rating
NV7a	Increases noise and vibration during construction	Ground-borne noise: Construction activity can result in ground-borne noise inside noise sensitive buildings that can cause disturbance	Implement EPA Guideline 1834, Best Practise construction noise controls with reference to alternative guidance documents such as NSW EPA Interim Construction Noise Guideline. Provide engineering controls, such as introduction of less impactful works (e.g. smaller plant), less vibration intensive methods (e.g. rock saws vs. rock-breaking). Provide management controls such as restricted hours of operation (daytime only), community notification of works.	Minor	Rare	Negligible	Not required	Minor	Rare	Negligible
NV8a	Increases noise and vibration during construction	Vibration: Damage to buildings. High levels of vibration can cause damage to heritage or other property assets	Implement EPA Guideline 1834, Best Practise construction noise controls with reference to alternative guidance documents such as DIN 4150-3 to set and implement vibration limits. Provide engineering controls, such as introduction of less impactful works (e.g. smaller plant), less vibration intensive methods (e.g. rock saws vs. rock-breaking).	Moderate	Unlikely	Medium	Dilapidation surveys Consideration of additional protection for assets and buildings should be considered through external structural analysis, if required	Moderate	Rare	Low

RISK ID	IMPACT PATHWAY	RISK DESCRIPTION	STANDARD CONTROLS	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	RESIDUAL RISK		
				Consequence	Likelihood	Rating		Consequence	Likelihood	Rating
NV9a	Increases noise and vibration during operation	Airborne Noise: High levels of airborne operational traffic noise can adversely impact on noise sensitive receivers	Compliance with VicRoads Traffic Noise Reduction Policy. Noise mitigation measures, such as noise barriers, noise mounds and road surface treatment.	Moderate	Unlikely	Medium	Off-Reservation Treatments (ORT) to individual buildings such as: — fresh air ventilation treatments — upgraded windows / doors — upgrade window and door seals — sealing of wall vents	Minor	Rare	Negligible

RISK ID	IMPACT PATHWAY	RISK DESCRIPTION	STANDARD CONTROLS	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	RESIDUAL RISK		
				Consequence	Likelihood	Rating		Consequence	Likelihood	Rating
NV10a	Increases noise and vibration during maintenance	Airborne Noise: High levels of airborne construction noise can adversely impact on noise sensitive receivers	Maintenance in the form of road works would fall under EPA guidelines 1834 for minor works (resurfacing road sections). Provide engineering controls, such as noise mitigation in the form of noise barriers, attenuated plant. Provide management controls such as restricted hours of operation (daytime only), community notification of works.	Minor	Rare	Negligible	Not required	Minor	Rare	Negligible
NV11a	Increases noise and vibration during maintenance	Vibration: Damage to buildings. High levels of vibration can cause damage to heritage or other property assets	Monitor and manage vibration levels by implementing DIN 4150-3 to set vibration 'limits' to reduce risk of structural damage. Provide engineering controls, such as introduction of less impactful works (e.g. smaller plant), less vibration intensive methods (e.g. rock saws vs. rock-breaking).	Minor	Rare	Negligible	Not required	Minor	Rare	Negligible

Table F.2 Noise and Vibration environmental risk assessment register – A1 alignment

RISK ID	IMPACT PATHWAY	RISK DESCRIPTION	STANDARD CONTROLS	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	RESIDUAL RISK		
				Consequence	Likelihood	Rating		Consequence	Likelihood	Rating
NV1b	Increases noise and vibration during pre-construction activities	Airborne Noise: High levels of airborne construction noise can adversely impact on noise sensitive receivers	Implement EPA Guideline 1834, Best Practise construction noise controls. Provide engineering controls, such as noise mitigation in the form of noise barriers, attenuated plant. Provide management controls such as restricted hours of operation (daytime only), community notification of works.	Minor	Possible	Low	Not required	Minor	Possible	Low
NV2b	Increases noise and vibration during clearing	Airborne Noise: High levels of airborne construction noise can adversely impact on noise sensitive receivers	Implement EPA Guideline 1834, Best Practise construction noise controls. Provide engineering controls, such as noise mitigation in the form of noise barriers, attenuated plant. Provide management controls such as restricted hours of operation (daytime only), community notification of works. Controls as per Section 177.	Minor	Possible	Low	Not required	Minor	Possible	Low

RISK ID	IMPACT PATHWAY	RISK DESCRIPTION	STANDARD CONTROLS	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	RESIDUAL RISK		
				Consequence	Likelihood	Rating		Consequence	Likelihood	Rating
NV3b	Increases noise and vibration during earthworks	Airborne Noise: High levels of airborne construction noise can adversely impact on noise sensitive receivers	Implement EPA Guideline 1834, Best Practise construction noise controls. Provide engineering controls, such as noise mitigation in the form of noise barriers, attenuated plant. Provide management controls such as restricted hours of operation (daytime only), community notification of works. Controls as per Section 177.	Minor	Possible	Low	Not required	Minor	Possible	Low

RISK ID	IMPACT PATHWAY	RISK DESCRIPTION	STANDARD CONTROLS	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	RESIDUAL RISK		
				Consequence	Likelihood	Rating		Consequence	Likelihood	Rating
NV4b	Increases noise and vibration during earthworks	Ground-borne noise: Construction activity can result in ground-borne noise inside noise sensitive buildings that can cause disturbance	Implement EPA Guideline 1834, Best Practise construction noise controls with reference to alternative guidance documents such as NSW EPA Interim Construction Noise Guideline. Provide engineering controls, such as introduction of less impactful works (e.g. smaller plant), less vibration intensive methods (e.g. rock saws vs. rock-breaking). Provide management controls such as restricted hours of operation (daytime only), community notification of works. Controls as per Section 177.	Minor	Rare	Negligible	Not required	Minor	Rare	Negligible
NV5b	Increases noise and vibration during earthworks	Vibration: Damage to buildings. High levels of vibration can cause damage to heritage or other property assets	Implement EPA Guideline 1834, Best Practise construction noise controls with reference to alternative guidance documents such as DIN 4150-3 to set and implement vibration limits. Provide engineering controls, such as introduction of less impactful works (e.g. smaller plant), less vibration intensive methods (e.g. rock saws vs. rock-breaking).	Minor	Unlikely	Low	Consideration of additional protection for assets and buildings should be considered through external structural analysis	Minor	Rare	Negligible

RISK ID	IMPACT PATHWAY	RISK DESCRIPTION	STANDARD CONTROLS	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	RESIDUAL RISK		
				Consequence	Likelihood	Rating		Consequence	Likelihood	Rating
NV6b	Increases noise and vibration during construction	Airborne Noise: High levels of airborne construction noise can adversely impact on noise sensitive receivers	Implement EPA Guideline 1834, Best Practise construction noise controls. Provide engineering controls, such as noise mitigation in the form of noise barriers, attenuated plant. Provide management controls such as restricted hours of operation (daytime only), community notification of works.	Minor	Possible	Low	Not required	Minor	Possible	Low
NV7b	Increases noise and vibration during construction	Ground-borne noise: Construction activity can result in ground-borne noise inside noise sensitive buildings that can cause disturbance	Implement EPA Guideline 1834, Best Practise construction noise controls with reference to alternative guidance documents such as NSW EPA Interim Construction Noise Guideline. Provide engineering controls, such as introduction of less impactful works (e.g. smaller plant), less vibration intensive methods (e.g. rock saws vs. rock-breaking). Provide management controls such as restricted hours of operation (daytime only), community notification of works.	Minor	Rare	Negligible	Not required	Minor	Rare	Negligible

RISK ID	IMPACT PATHWAY	RISK DESCRIPTION	STANDARD CONTROLS	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	RESIDUAL RISK		
				Consequence	Likelihood	Rating		Consequence	Likelihood	Rating
NV8b	Increases noise and vibration during construction	Vibration: Damage to buildings. High levels of vibration can cause damage to heritage or other property assets	Implement EPA Guideline 1834, Best Practise construction noise controls with reference to alternative guidance documents such as DIN 4150-3 to set and implement vibration limits. Provide engineering controls, such as introduction of less impactful works (e.g. smaller plant), less vibration intensive methods (e.g. rock saws vs. rock-breaking).	Moderate	Unlikely	Medium	Dilapidation surveys Consideration of additional protection for assets and buildings should be considered through external structural analysis, if required	Moderate	Rare	Low

RISK ID	IMPACT PATHWAY	RISK DESCRIPTION	STANDARD CONTROLS	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	RESIDUAL RISK		
				Consequence	Likelihood	Rating		Consequence	Likelihood	Rating
NV9b	Increases noise and vibration during operation	Airborne Noise: High levels of airborne operational traffic noise can adversely impact on noise sensitive receivers	Compliance with VicRoads Traffic Noise Reduction Policy. Noise mitigation measures, such as noise barriers, noise mounds and road surface treatment.	Moderate	Unlikely	Medium	Off-Reservation Treatments (ORT) to individual buildings such as: — fresh air ventilation treatments — upgraded windows/ doors — upgrade window and door seals — sealing of wall vents	Minor	Rare	Negligible

RISK ID	IMPACT PATHWAY	RISK DESCRIPTION	STANDARD CONTROLS	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	RESIDUAL RISK		
				Consequence	Likelihood	Rating		Consequence	Likelihood	Rating
NV10b	Increases noise and vibration during maintenance	Airborne Noise: High levels of airborne construction noise can adversely impact on noise sensitive receivers	Maintenance in the form of road works would fall under EPA guidelines 1834 for minor works (resurfacing road sections). Provide engineering controls, such as noise mitigation in the form of noise barriers, attenuated plant. Provide management controls such as restricted hours of operation (daytime only), community notification of works.	Minor	Rare	Negligible	Not required	Minor	Rare	Negligible
NV11b	Increases noise and vibration during maintenance	Vibration: Damage to buildings. High levels of vibration can cause damage to heritage or other property assets	Monitor and manage vibration levels by implementing DIN 4150-3 to set vibration 'limits' to reduce risk of structural damage. Provide engineering controls, such as introduction of less impactful works (e.g. smaller plant), less vibration intensive methods (e.g. rock saws vs. rock-breaking).	Minor	Rare	Negligible	Not required	Minor	Rare	Negligible

Table F.3 Noise and vibration environmental risk assessment register – C0 alignment

RISK ID	IMPACT PATHWAY	RISK DESCRIPTION	STANDARD CONTROLS	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	RESIDUAL RISK		
				Consequence	Likelihood	Rating		Consequence	Likelihood	Rating
NV1c	Increases noise and vibration during pre-construction activities	Airborne Noise: High levels of airborne construction noise can adversely impact on noise sensitive receivers	Implement EPA Guideline 1834, Best Practise construction noise controls. Provide engineering controls, such as noise mitigation in the form of noise barriers, attenuated plant. Provide management controls such as restricted hours of operation (daytime only), community notification of works.	Minor	Possible	Low	Not required	Minor	Possible	Low
NV2c	Increases noise and vibration during clearing	Airborne Noise: High levels of airborne construction noise can adversely impact on noise sensitive receivers	Implement EPA Guideline 1834, Best Practise construction noise controls. Provide engineering controls, such as noise mitigation in the form of noise barriers, attenuated plant. Provide management controls such as restricted hours of operation (daytime only), community notification of works. Controls as per Section 177.	Minor	Possible	Low	Not required	Minor	Possible	Low

RISK ID	IMPACT PATHWAY	RISK DESCRIPTION	STANDARD CONTROLS	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	RESIDUAL RISK		
				Consequence	Likelihood	Rating		Consequence	Likelihood	Rating
NV3c	Increases noise and vibration during earthworks	Airborne Noise: High levels of airborne construction noise can adversely impact on noise sensitive receivers	Implement EPA Guideline 1834, Best Practise construction noise controls Provide engineering controls, such as noise mitigation in the form of noise barriers, attenuated plant. Provide management controls such as restricted hours of operation (daytime only), community notification of works. Controls as per Section 177. Hoarding (erection of temporary fencing) in selected locations, in consultation with receivers.	Minor	Likely	Medium	None identified	Minor	Likely	Medium

RISK ID	IMPACT PATHWAY	RISK DESCRIPTION	STANDARD CONTROLS	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	RESIDUAL RISK		
				Consequence	Likelihood	Rating		Consequence	Likelihood	Rating
NV4c	Increases noise and vibration during earthworks	Ground-borne noise: Construction activity can result in ground-borne noise inside noise sensitive buildings that can cause disturbance.	Implement EPA Guideline 1834, Best Practise construction noise controls with reference to alternative guidance documents such as NSW EPA Interim Construction Noise Guideline. Provide engineering controls, such as introduction of less impactful works (e.g. smaller plant), less vibration intensive methods (e.g. rock saws vs. rock-breaking). Provide management controls such as restricted hours of operation (daytime only), community notification of works. Controls as per Section 177.	Minor	Rare	Negligible	Not required	Minor	Rare	Negligible

RISK ID	IMPACT PATHWAY	RISK DESCRIPTION	STANDARD CONTROLS	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	RESIDUAL RISK		
				Consequence	Likelihood	Rating		Consequence	Likelihood	Rating
NV5c	Increases noise and vibration during earthworks	Vibration: Damage to buildings. High levels of vibration can cause damage to heritage or other property assets.	Implement EPA Guideline 1834, Best Practise construction noise controls with reference to alternative guidance documents such as DIN 4150-3 to set and implement vibration limits. Provide engineering controls, such as introduction of less impactful works (e.g. smaller plant), less vibration intensive methods (e.g. rock saws vs. rock-breaking).	Moderate	Unlikely	Medium	Dilapidation surveys Consideration of additional protection for assets and buildings should be considered through external structural analysis, if required	Moderate	Rare	Low
NV6c	Increases noise and vibration during construction	Airborne Noise: High levels of airborne construction noise can adversely impact on noise sensitive receivers	Implement EPA Guideline 1834, Best Practise construction noise controls. Provide engineering controls, such as noise mitigation in the form of noise barriers, attenuated plant. Provide management controls such as restricted hours of operation (daytime only), community notification of works. Hoarding (erection of temporary fencing) in selected locations, in consultation with receivers.	Minor	Likely	Medium	None identified	Minor	Likely	Medium

RISK ID	IMPACT PATHWAY	RISK DESCRIPTION	STANDARD CONTROLS	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	RESIDUAL RISK		
				Consequence	Likelihood	Rating		Consequence	Likelihood	Rating
NV7c	Increases noise and vibration during construction	Ground-borne noise: Construction activity can result in ground-borne noise inside noise sensitive buildings that can cause disturbance	Implement EPA Guideline 1834, Best Practise construction noise controls with reference to alternative guidance documents such as NSW EPA Interim Construction Noise Guideline. Provide engineering controls, such as introduction of less impactful works (e.g. smaller plant), less vibration intensive methods (e.g. rock saws vs. rock-breaking). Provide management controls such as restricted hours of operation (daytime only), community notification of works.	Minor	Rare	Negligible	Not required	Minor	Rare	Negligible

RISK ID	IMPACT PATHWAY	RISK DESCRIPTION	STANDARD CONTROLS	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	RESIDUAL RISK		
				Consequence	Likelihood	Rating		Consequence	Likelihood	Rating
NV8c	Increases noise and vibration during construction	Vibration: Damage to buildings. High levels of vibration can cause damage to heritage or other property assets	Implement EPA Guideline 1834, Best Practise construction noise controls with reference to alternative guidance documents such as DIN 4150-3 to set and implement vibration limits. Provide engineering controls, such as introduction of less impactful works (e.g. smaller plant), less vibration intensive methods (e.g. rock saws vs. rock-breaking).	Moderate	Unlikely	Medium	Dilapidation surveys Consideration of additional protection for assets and buildings should be considered through external structural analysis, if required	Moderate	Rare	Low

RISK ID	IMPACT PATHWAY	RISK DESCRIPTION	STANDARD CONTROLS	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	RESIDUAL RISK		
				Consequence	Likelihood	Rating		Consequence	Likelihood	Rating
NV9c	Increases noise and vibration during operation	Airborne Noise: High levels of airborne operational traffic noise can adversely impact on noise sensitive receivers	Compliance with VicRoads Traffic Noise Reduction Policy. Noise mitigation measures, such as noise barriers, noise mounds and road surface treatment.	Major	Possible	High	Off-Reservation Treatments (ORT) to individual buildings such as: — fresh air ventilation treatments — upgraded windows/ doors — upgrade window and door seals — sealing of wall vents	Minor	Possible	Low

RISK ID	IMPACT PATHWAY	RISK DESCRIPTION	STANDARD CONTROLS	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	RESIDUAL RISK		
				Consequence	Likelihood	Rating		Consequence	Likelihood	Rating
NV10c	Increases noise and vibration during maintenance	Airborne Noise: High levels of airborne construction noise can adversely impact on noise sensitive receivers	Maintenance in the form of road works would fall under EPA guidelines 1834 for minor works (resurfacing road sections). Provide engineering controls, such as noise mitigation in the form of noise barriers, attenuated plant. Provide management controls such as restricted hours of operation (daytime only), community notification of works.	Minor	Possible	Low	Not required	Minor	Possible	Low
NV11c	Increases noise and vibration during maintenance	Vibration: Damage to buildings. High levels of vibration can cause damage to heritage or other property assets	Monitor and manage vibration levels by implementing DIN 4150-3 to set vibration 'limits' to reduce risk of structural damage. Provide engineering controls, such as introduction of less impactful works (e.g. smaller plant), less vibration intensive methods (e.g. rock saws vs. rock-breaking).	Moderate	Rare	Low	Not required	Moderate	Rare	Low

Table F.4 Noise and Vibration environmental risk assessment register – C2 alignment

RISK ID	IMPACT PATHWAY	RISK DESCRIPTION	STANDARD CONTROLS	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	RESIDUAL RISK		
				Consequence	Likelihood	Rating		Consequence	Likelihood	Rating
NV1d	Increases noise and vibration during pre-construction activities	Airborne Noise: High levels of airborne construction noise can adversely impact on noise sensitive receivers	Implement EPA Guideline 1834, Best Practise construction noise controls Provide engineering controls, such as noise mitigation in the form of noise barriers, attenuated plant. Provide management controls such as restricted hours of operation (daytime only), community notification of works. Controls as per Section 177.	Minor	Possible	Low	Not required	Minor	Possible	Low
NV2d	Increases noise and vibration during clearing	Airborne Noise: High levels of airborne construction noise can adversely impact on noise sensitive receivers	Implement EPA Guideline 1834, Best Practise construction noise controls. Provide engineering controls, such as noise mitigation in the form of noise barriers, attenuated plant. Provide management controls such as restricted hours of operation (daytime only), community notification of works. Controls as per Section 177.	Minor	Possible	Low	Not required	Minor	Possible	Low

RISK ID	IMPACT PATHWAY	RISK DESCRIPTION	STANDARD CONTROLS	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	RESIDUAL RISK		
				Consequence	Likelihood	Rating		Consequence	Likelihood	Rating
NV3d	Increases noise and vibration during earthworks	Airborne Noise: High levels of airborne construction noise can adversely impact on noise sensitive receivers	Implement EPA Guideline 1834, Best Practise construction noise controls Provide engineering controls, such as noise mitigation in the form of noise barriers, attenuated plant. Provide management controls such as restricted hours of operation (daytime only), community notification of works. Controls as per Section 177. Hoarding (erection of temporary fencing) in selected locations, in consultation with receivers.	Minor	Likely	Medium	None Identified	Minor	Likely	Medium

RISK ID	IMPACT PATHWAY	RISK DESCRIPTION	STANDARD CONTROLS	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	RESIDUAL RISK		
				Consequence	Likelihood	Rating		Consequence	Likelihood	Rating
NV4d	Increases noise and vibration during earthworks	Ground-borne noise: Construction activity can result in ground-borne noise inside noise sensitive buildings that can cause disturbance	Implement EPA Guideline 1834, Best Practise construction noise controls with reference to alternative guidance documents such as NSW EPA Interim Construction Noise Guideline. Provide engineering controls, such as introduction of less impactful works (e.g. smaller plant), less vibration intensive methods (e.g. rock saws vs. rock-breaking). Provide management controls such as restricted hours of operation (daytime only), community notification of works. Controls as per Section 177.	Minor	Rare	Negligible	Not required	Minor	Rare	Negligible

RISK ID	IMPACT PATHWAY	RISK DESCRIPTION	STANDARD CONTROLS	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	RESIDUAL RISK		
				Consequence	Likelihood	Rating		Consequence	Likelihood	Rating
NV5d	Increases noise and vibration during earthworks	Vibration: Damage to buildings. High levels of vibration can cause damage to heritage or other property assets	Implement EPA Guideline 1834, Best Practise construction noise controls with reference to alternative guidance documents such as DIN 4150-3 to set and implement vibration limits. Provide engineering controls, such as introduction of less impactful works (e.g. smaller plant), less vibration intensive methods (e.g. rock saws vs. rock-breaking).	Moderate	Unlikely	Medium	Dilapidation surveys Consideration of additional protection for assets and buildings should be considered through external structural analysis, if required	Moderate	Rare	Low
NV6d	Increases noise and vibration during construction	Airborne Noise: High levels of airborne construction noise can adversely impact on noise sensitive receivers	Implement EPA Guideline 1834, Best Practise construction noise controls Provide engineering controls, such as noise mitigation in the form of noise barriers, attenuated plant. Provide management controls such as restricted hours of operation (daytime only), community notification of works Hoarding (erection of temporary fencing) in selected locations, in consultation with receivers	Minor	Likely	Medium	None Identified	Minor	Likely	Medium

RISK ID	IMPACT PATHWAY	RISK DESCRIPTION	STANDARD CONTROLS	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	RESIDUAL RISK		
				Consequence	Likelihood	Rating		Consequence	Likelihood	Rating
NV7d	Increases noise and vibration during construction	Ground-borne noise: Construction activity can result in ground-borne noise inside noise sensitive buildings that can cause disturbance	Implement EPA Guideline 1834, Best Practise construction noise controls with reference to alternative guidance documents such as NSW EPA Interim Construction Noise Guideline. Provide engineering controls, such as introduction of less impactful works (e.g. smaller plant), less vibration intensive methods (e.g. rock saws vs. rock-breaking). Provide management controls such as restricted hours of operation (daytime only), community notification of works.	Minor	Rare	Negligible	Not required	Minor	Rare	Negligible

RISK ID	IMPACT PATHWAY	RISK DESCRIPTION	STANDARD CONTROLS	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	RESIDUAL RISK		
				Consequence	Likelihood	Rating		Consequence	Likelihood	Rating
NV8d	Increases noise and vibration during construction	Vibration: Damage to buildings. High levels of vibration can cause damage to heritage or other property assets	Implement EPA Guideline 1834, Best Practise construction noise controls with reference to alternative guidance documents such as DIN 4150-3 to set and implement vibration limits. Provide engineering controls, such as introduction of less impactful works (e.g. smaller plant), less vibration intensive methods (e.g. rock saws vs. rock-breaking).	Moderate	Unlikely	Medium	Dilapidation surveys Consideration of additional protection for assets and buildings should be considered through external structural analysis, if required	Moderate	Rare	Low

RISK ID	IMPACT PATHWAY	RISK DESCRIPTION	STANDARD CONTROLS	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	RESIDUAL RISK		
				Consequence	Likelihood	Rating		Consequence	Likelihood	Rating
NV9d	Increases noise and vibration during operation	Airborne Noise: High levels of airborne operational traffic noise can adversely impact on noise sensitive receivers	Compliance with VicRoads Traffic Noise Reduction Policy. Noise mitigation measures, such as noise barriers, noise mounds and road surface treatment.	Major	Possible	High	Off-Reservation Treatments (ORT) to individual buildings such as: — fresh air ventilation treatments — upgraded windows/ doors — upgrade window and door seals — sealing of wall vents	Minor	Possible	Low

RISK ID	IMPACT PATHWAY	RISK DESCRIPTION	STANDARD CONTROLS	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	RESIDUAL RISK		
				Consequence	Likelihood	Rating		Consequence	Likelihood	Rating
NV10d	Increases noise and vibration during maintenance	Airborne Noise: High levels of airborne construction noise can adversely impact on noise sensitive receivers	Maintenance in the form of road works would fall under EPA guidelines 1834 for minor works (resurfacing road sections). Provide engineering controls, such as noise mitigation in the form of noise barriers, attenuated plant. Provide management controls such as restricted hours of operation (daytime only), community notification of works.	Minor	Possible	Low	Not required	Minor	Possible	Low
NV11d	Increases noise and vibration during maintenance	Vibration: Damage to buildings. High levels of vibration can cause damage to heritage or other property assets	Monitor and manage vibration levels by implementing DIN 4150-3 to set vibration 'limits' to reduce risk of structural damage. Provide engineering controls, such as introduction of less impactful works (e.g. smaller plant), less vibration intensive methods (e.g. rock saws vs. rock-breaking).	Moderate	Rare	Low	Not required	Moderate	Rare	Low

APPENDIX G

NIGHT-TIME TRAFFIC VOLUMES

MEMO

TO:	Philip Setton (WSP)
FROM:	Wilson Foo (WSP)
SUBJECT:	**Beaufort Bypass Overnight Traffic Volumes**
OUR REF:	PS120870-TPL-MEM-0001 RevA.docx
DATE:	**5 October 2020**

INTRODUCTION

As part Traffic and Transport Assessment for the Beaufort Bypass Environmental Effects Statement (Report PS120870-ENV-REP-0014 RevK), traffic models were built to forecast future traffic volumes at key locations within the study area.

As part of additional commentary from TRG review on the Beaufort Bypass Noise Assessment, additional analysis has been requested to develop forecast volumes for the overnight period of 10:00 PM to 7:00 AM based on the 7-day average traffic volume. The following memorandum details the methodology and results.

METHODOLOGY

The detailed methodology and assumptions for the following areas are detailed in the below sections of the Traffic and Transport Assessment report PS120870-ENV-REP-0014 RevK:

- Model development - Section 4.4
- Model results - Section 9.1
- Survey methodology and results – Section 6.1

In line with the methodology and approach of the original transport modelling, volumes for a 'project' and 'no-project' scenario have been developed, where the forecast volumes results are option agnostic (i.e. the preferred Beaufort Bypass alignment option has no impact on the forecast volumes).

Three locations were assessed as shown below in Figure 1.1, which were based on the Automatic Traffic Counter (ATC) surveyed locations:

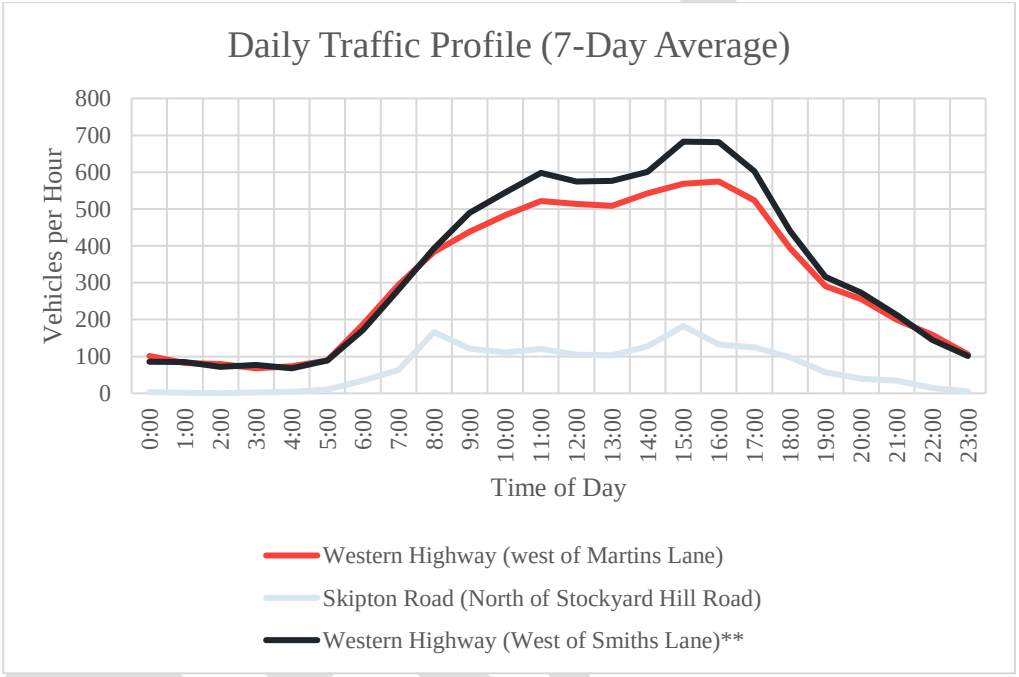
1. Western Highway, west of Martins Lane;
2. Western Highway, west of Smiths Lane;
3. Skipton Road, north of Stockyard Hill Road.

Level 15, 28 Freshwater Place
Southbank VIC 3006

Tel: +61 3 9861 1111
Fax: +61 3 9861 1144
www.wsp.com

Figure 1 Survey Locations

To extract the 10:00 PM to 7:00 AM volumes, the 7-day average traffic profile was reviewed for each of these sites, as shown below in Figure 1.2.



**Only Thursday to Sunday data was summarised due to possible inaccuracies with data collected for Monday to Wednesday.

Figure 2 7-Day Average Traffic Profile

The percentage proportion of traffic travelling in the 10:00 PM to 7:00 AM time period was calculated for each site broken into vehicle classifications of Light Vehicles (LVs) and Heavy Vehicles (HVs) where LVs were defined as either Category 1 or 2 vehicles based on Austroads classifications. An assumption was made that the overnight vehicle proportions from the 2017 surveys would apply in the future model years of 2021 and 2031 for both proportion of vehicles travelling overnight and proportion of LVs/HVs travelling in the overnight period. Factors were then calculated to apply for each location.

For the 'project' scenario of traffic travelling on the Beaufort Bypass, the calculated proportions used were an average of the two Western Highway locations.

RESULTS

The calculated overnight vehicle proportions for light vehicles, heavy vehicles and total vehicles are stated below in Table 1.1 to 1.4 for each location based on the 7-day average (i.e. the total daily percentage of each vehicle classification from 10:00 PM to 7:00 AM):

Table 1 7-Day Average Overnight Vehicle Percentage - Western Highway, west of Martins Lane

OVERNIGHT VEHICLE CLASSIFICATION	PROPORTIONAL PERCENTAGE
Light Vehicles	9%
Heavy Vehicles	26%
Total Vehicles	13%

Table 2 7-Day Average Overnight Vehicle Percentage - Western Highway, west of Smiths Lane

OVERNIGHT VEHICLE CLASSIFICATION	PROPORTIONAL PERCENTAGE**
Light Vehicles	7%
Heavy Vehicles	25%
Total Vehicles	11%

**Only Thursday to Sunday data was utilised due to possible inaccuracies with data collected for Monday to Wednesday.

Table 3 7-Day Average Overnight Vehicle Percentage - Skipton Road, north of Stockyard Hill Road

OVERNIGHT VEHICLE CLASSIFICATION	PROPORTIONAL PERCENTAGE
Light Vehicles	4%
Heavy Vehicles	9%
Total Vehicles	5%

Table 4 7-Day Average Overnight Vehicle Percentage - Beaufort Bypass

OVERNIGHT VEHICLE CLASSIFICATION	PROPORTIONAL PERCENTAGE
Light Vehicles	8%
Heavy Vehicles	25%
Total Vehicles	12%

The results were applied to the original outputs for the 'no-project' and 'project' scenarios as summarised below in Table 1.5 and 1.6 for the overnight time period. The 2017 volumes for 'no-project' were surveyed existing volumes and the 2017 'project' volumes are redistributed volumes based on spreadsheet modelling. The 2021 and 2031 volumes are based on 2017 volumes and an applied growth factor.

Table 5 10:00 PM to 7:00 AM 'NoProject' Vehicle Volumes

SITE LOCATION	SEGMENT LOCATION	2017 7 DAY AVG (VEHICLES)			2021 7 DAY AVG (VEHICLES)			2031 7 DAY AVG (VEHICLES)		
		LV	HV	Total	LV	HV	Total	LV	HV	Total
Western Highway	West of Martins Lane Entrance (West of Beaufort)	508	438	946	550	474	1024	670	578	1248
Western Highway	West of Smiths Lane (East of Beaufort)**	472	422	893	510	456	967	622	557	1179
Skipton Road	Between Stockyard Hill Road and Park Road	56	20	76	60	22	82	74	27	100

**Only Thursday to Sunday data was utilised due to possible inaccuracies with data collected for Monday to Wednesday.

Table 6 10:00 PM to 7:00 AM 'Project' Vehicle Volumes

SITE LOCATION	SEGMENT LOCATION	2017 7 DAY AVG (VEHICLES)			2021 7 DAY AVG (VEHICLES)			2031 7 DAY AVG (VEHICLES)		
		LV	HV	Total	LV	HV	Total	LV	HV	Total
Western Highway	West of Martins Lane Entrance (West of Beaufort)	162	147	309	175	159	334	214	194	407
Western Highway	West of Smiths Lane (East of Beaufort)**	188	143	331	204	155	358	248	189	437
Skipton Road	Between Stockyard Hill Road and Park Road	56	20	76	60	22	82	74	27	100

Beaufort Bypass	West of Beaufort-Lexton Road Interchange	314	286	600	340	309	649	414	377	791
Beaufort Bypass	East of Beaufort-Lexton Road Interchange	312	284	596	338	307	645	412	375	787

**Only Thursday to Sunday data was utilised due to possible inaccuracies with data collected for Monday to Wednesday.

Wilson Foo
Senior Transport Engineer

APPENDIX H

SLEEP DISTURBANCE MODELLING RESULTS

PREDICTED LMAX AND LEQ NOISE LEVELS – SLEEP DISTURBANCE ASSESSMENT

RECEIVER	PREDICTED L_{MAX} dBA		PREDICTED 1 HOUR L_{EQ}	CRITERIA	EXCEEDS?	
	Engine braking	Normal truck			Engine braking	Normal truck
10	59.1	53.5	46	57	-	-
11	57.8	51.9	45.5	56.5	-	-
12	51.6	44.5	47.9	58.9	-	-
13	56.4	49.6	48.1	59.1	-	-
15	59.5	53	52.6	63.6	-	-
17	67.3	61.9	54.5	65.5	YES	-
18	60.9	55	56.1	67.1	-	-
19	57.5	50.8	47	58	-	-
20	48.3	40.6	31.5	42.5	-	-
21	0	0	0	11	-	-
23	104.8	98.9	74.8	85.8	N/A	N/A
24	75.4	70.1	56.8	67.8	YES	YES
25	72.7	67.4	56.4	67.4	YES	YES
26	71.4	66	56.1	67.1	YES	YES
27	70.2	64.8	55.7	66.7	YES	YES
28	60.4	54.4	50.9	61.9	-	-
30	52.4	45	39.5	50.5	-	-
31	0	0	0	11	-	-
32	0	0	0	11	-	-
33	0	0	0	11	-	-
34	0	0	0	11	-	-
35	61.7	55.5	48.7	59.7	-	-
36	63.6	58.2	50.2	61.2	YES	-
38	73.6	68.1	59	70	YES	YES
39	64.8	58.4	52.6	63.6	YES	-
40	0	0	0	11	-	-

RECEIVER	PREDICTED L_{MAX} dBA		PREDICTED 1 HOUR L_{EQ}	CRITERIA	EXCEEDS?	
	Engine braking	Normal truck			Engine braking	Normal truck
10	59.1	53.5	46	57	-	-
41	48.2	40.4	31.5	42.5	-	-
42	58.5	52	50.8	61.8	-	-
43	0	0	0	11	-	-
44	0	0	0	11	-	-
45	0	0	0	11	-	-
46	56.5	49.7	48.7	59.7	-	-
47	54.5	46.5	45.9	56.9	-	-
48	66	60.1	56.4	67.4	YES	-
50	72.1	66.5	61.1	72.1	YES	-
53	60.3	54.1	50.2	61.2	-	-
54	57.2	50.2	45.9	56.9	-	-
55	54.9	47.6	42.8	53.8	-	-
56	51.2	43.8	42.5	53.5	-	-
58	55.3	48.4	47.6	58.6	-	-
59	54.2	47.1	45.3	56.3	-	-
60	58.3	51.8	50.7	61.7	-	-
61	65.5	60.1	56.7	67.7	YES	-
62	58.7	52.4	44.8	55.8	-	-
63	64.5	58.2	47.7	58.7	YES	-
64	63.8	58.1	51.7	62.7	YES	-
65	63.2	57.5	50.8	61.8	YES	-
66	63	57.3	50.5	61.5	YES	-
67	62.8	57	50.4	61.4	YES	-
68	62.7	56.9	50.2	61.2	YES	-
69	61.5	55.7	51.4	62.4	-	-
70	60.3	54.3	49.3	60.3	-	-
71	60.1	54.4	45.9	56.9	-	-
72	58.2	51.6	46.6	57.6	-	-
73	58.5	51.8	45.3	56.3	-	-
74	62.1	55.9	48.9	59.9	YES	-
75	61.6	55.3	49.3	60.3	-	-

RECEIVER	PREDICTED L_{MAX} dBA		PREDICTED 1 HOUR L_{EQ}	CRITERIA	EXCEEDS?	
	Engine braking	Normal truck			Engine braking	Normal truck
10	59.1	53.5	46	57	-	-
76	48.1	40.4	31.1	42.1	-	-
77	55	48.1	48.6	59.6	-	-
78	59.9	54.4	52	63	-	-
Location L0	66.5	60.6	56.6	67.6	YES	-
Location L1	58.1	52.1	50.8	61.8	-	-
Location L2	66.6	61.2	53.7	64.7	YES	-
Location L3	55.1	48.5	46.8	57.8	-	-
Location L4	58.8	52.3	47.7	58.7	-	-
Location L5	53.7	46.6	43.5	54.5	-	-
Location L6	72.9	67.6	55.9	66.9	YES	YES
Location L7	68.7	63	58.3	69.3	YES	-
Location L8	82	76.4	65	76	YES	YES

ABOUT US

WSP is one of the world's leading engineering professional services consulting firms. We are dedicated to our local communities and propelled by international brainpower. We are technical experts and strategic advisors including engineers, technicians, scientists, planners, surveyors, environmental specialists, as well as other design, program and construction management professionals. We design lasting Property & Buildings, Transportation & Infrastructure, Resources (including Mining and Industry), Water, Power and Environmental solutions, as well as provide project delivery and strategic consulting services. With 43,600 talented people in more than 550 offices across 40 countries, we engineer projects that will help societies grow for lifetimes to come.

wsp