Department of Planning and Environment

Our ref: SSI-7319-PA-2

Tony Gant
Project Director, M1 to Raymond Terrace
Level 7, 6 Stewert Avenue
Newcastle West, NSW, 2302

22/12/2022

Subject: M1 to Raymond Terrace – Traffic Noise Monitoring Program

Dear Mr Gant

I refer to your submission dated 28 November 2022, of the Traffic Noise Monitoring Program (Revision 1, 24 November) and Independent Review for the M1 to Raymond Terrace project (SSI 7319).

I note that the Traffic Noise Monitoring Program:

- Has been prepared by a suitably qualified acoustics expert;
- Includes the monitoring locations used to inform the EIS;
- Identifies additional monitoring locations to determine change in operation traffic noise;
- Contains additional monitoring locations as agreed with the Department of Planning and Environment;
- Includes monitoring that is representative of the range of sound propagation conditions along the corridor; and
- Has been reviewed by an Independent Expert.

Accordingly, as nominee of the Planning Secretary, I approve the Traffic Noise Monitoring Program (Revision 1, dated November 24 2022).

You are reminded that if there are any inconsistencies between the Traffic Noise Monitoring Program and the conditions of approval, the conditions prevail.

Please ensure you make the document publicly available on the project website at the earliest convenience.

If you wish to discuss the matter further, please contact Grant Brown at grant.brown@dpie.nsw.gov.au

Yours sincerely

Grant Brown

Acting Team Leader
Infrastructure Management

As nominee of the Planning Secretary

TRANSPORT

Glenn Snow
Department of Planning & Environment
320 Pitt Street
Sydney NSW 2001

A46505370

Via email: Glenn.Snow@planning.nsw.gov.au
Mary.Garland@planning.nsw.gov.au
Daniel.Gorgioski@planning.nsw.gov.au

CC: Grant.Brown@planning.nsw.gov.au

28 November 2022

Dear Mary,

M1 Pacific Motorway extension to Raymond Terrace (SSI-7319)

Traffic Noise Monitoring Program and Independent review

Further to my letter dated 30 August 2022, and review meeting on 21 November 2022 outlining the schedule to undertake additional noise monitoring for the project prior to Christmas.

Please find attached a copy of the revised Traffic Noise Monitoring Program (Attachment 1) and the updated independent review (Attachment 2).

Transport has engaged Arup to deploy the three (3) additional monitors on Monday 28th November to ensure sufficient data can be obtained before the school holidays.

Please contact Paul Galvin (0437 376 617) should any further clarification be required.

Sincerely,

Tony Gant

Project Director, M1 to Raymond Terrace

NSW GOVERNMENT

Level 7, 6 Stewart Avenue,
NEWCASTLE WEST NSW 2302

Attachment 1 – Traffic Noise Monitoring Program v2.

ARUP

Transport for New South Wales

M1 to Raymond Terrace

Traffic Noise Monitoring Program

Reference: AC02

1 | 24 November 2022

Job number 289109-00

Arup Australia Pty Ltd | ABN 76 625 912 665

Arup Australia Pty Ltd
Level 5
151 Clarence Street
Sydney
NSW 2000
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arup.com

ARUP

Document Verification

Project title	M1 to Raymond Terrace
Document title	Traffic Noise Monitoring Program
Job number	289109-00
Document ref	AC02
File reference	AC02_v2

Revision	Date		
0	1 November 2022	**Filename**	AC02-R-v1_Traffic noise monitoring program
		Description	Noise monitoring program

	Prepared by	Checked by	Approved by
Name	Daniel Jimenez	Mitchell Allen	Mitchell Allen
Signature			

1	24 November 2022	**Filename**	AC02-R-v1_Traffic noise monitoring program
		Description	

	Prepared by	Checked by	Approved by
Name	Daniel Jimenez	Mitchell Allen	Mitchell Allen
Signature			

	Filename	
	Description	

	Prepared by	Checked by	Approved by
Name			
Signature			

Issue Document Verification with Document ☑

Contents

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Appendices

1. Purpose

This document details requirements for updated noise monitoring to be undertaken for the M1 to Raymond Terrace project and is issued for review and approval by the NSW Department of Planning and Environment (DPE) with respect to satisfying Conditions of Approval for the M1 Pacific Motorway Extension to Raymond Terrace project through Detailed Design.

This Traffic Noise Monitoring Program (TNMP) has been developed:

- in response to Transport for NSW (TfNSW) revised environmental management measure (NV10) in the submissions report,
- to fulfil the requirements of Condition E87 and E88 of the draft Conditions of Approval for M1 Pacific Motorway Extension to Raymond Terrace (SSI 7319) V4, and
- to support an operational noise review (ONR), operational noise validation and operational noise monitoring report required by the Draft Conditions of Approval for M1 Pacific Motorway Extension to Raymond Terrace (SSI 7319) V4.

The noise and traffic monitoring locations and noise monitoring methodology have been developed with reference to the following documents:

- NSW Road Noise Policy (RNP) [1]
- TfNSW Road Noise Criteria Guideline (RNCG) [2]
- TfNSW Road Noise Mitigation Guideline (RNMG) [3]
- TfNSW Road Noise Model Validation Guideline (RNMVG) [4]
- EPA Approved Methods for the measurement and analysis of environmental noise in NSW [5]
- NSW Noise Policy for Industry (NPfI) [6]
- EIS noise technical report – Part 1 [7]
- EIS noise technical report – Part 2 [8]
- Submissions Report – Main body [9]
- Submissions Report – Appendix D - Noise supplementary technical report [10]

2. Methodology

2.1 Procedure

Noise monitoring shall be undertaken in general accordance with the EPA Approved Methods for the measurement and analysis of environmental noise in NSW [5] and outside of school holiday periods.

Long-term noise loggers shall be placed at each nominated noise monitoring location listed in Table 1 to continuously record ambient noise levels for a period of up to 21 consecutive days, allowing for adverse weather conditions, with the aim to collect a minimum 7 days of valid data at each location. The nominated period of noise monitoring provides a level of redundancy should there be issues with individual logging locations in the event of malfunction or unforeseen adverse weather conditions. Periodic checks of the noise loggers will be carried out 7 days and 14 days after deployment.

A one-off short-term operator attended noise monitoring will be conducted at each noise logger location and each additional attended noise monitoring location during both the daytime and night-time periods, concurrently with the 15-minute periods logged using the long-term noise loggers. The daytime attended noise monitoring will be carried out after the long-term noise logger has been installed during the period between 7am and 10pm. The nigh-time attended noise monitoring will be carried out between 10pm and 7am.

Measurements will be taken at a height of 1.5 m above the ground at each agreed location and, wherever appropriate and possible, at 1 m of the building façade with façade corrections being allowed for as applicable. Free field measurement locations used for validation are located within 30 m of the road (no closer than 10 m) and, wherever appropriate and possible, having unobstructed line of sight to approximately 150 degrees of road and tyre interface to verify representative road traffic source levels. The sample time interval will be set at 15 minutes and the meter time constant set to “Fast”.

Maximum noise level analysis will be undertaken of existing noise exposure derived from noise logger data for the project. The analysis will be restricted to locations where maximum noise level events are considered clearly attributable to road traffic noise events. The assessment of the impact of sleep disturbance on residents is made in terms of likely maximum noise levels from road traffic, the extent to which these maximum noise levels exceed the ambient level, and the expected number of noise events from road traffic during the night on an hourly basis.

2.2 Equipment

Equipment used for both unattended and attended noise surveys will be Class 1 as defined in IEC 61672-1:2019 [11] and carry current calibration certificates. Calibration of the noise monitoring equipment will be checked prior to and following all measurements with no significant drift in calibration being recorded. If the noise level recorded during the post-measurement check differs by more than 1.0 dB from the noise level recorded during the pre-measurement check, all measurements made in the intervening period will be disregarded.

2.3 Weather

Weather data will be obtained from the Bureau of Meteorology’s (BOM) from the Williamtown RAAF weather station located within 30 km of all noise monitoring locations for the monitoring period. This weather station is preferred over the Newcastle University and Newcastle Nobbys weather stations as it expected to be more representative of inland weather conditions. The data must include as a minimum rainfall (mm), wind speed (km/h) and wind direction over 15-minute periods and record the time intervals. The weather station information must include as a minimum the height at which the data has been recorded to account for the height difference between the weather station and the noise monitor microphone location. Where appropriate, correction factors will be applied based on Table C.1 of ISO 4354:2009 [12]. This data will be reviewed to identify periods of adverse weather during the unattended noise logging survey. Where appropriate, periods of high winds and/or rain will be excluded from the analysis in accordance with the NSW Noise Policy for Industry [6].

2.4 Traffic

Classified road traffic counts shall be collected at each nominated traffic count location aligning the existing road corridors (refer Appendix A for an aerial view of proposed traffic count locations). Hourly classified traffic counts must be conducted concurrently with noise logging throughout the entire noise monitoring period.

Traffic counts will not be collected at baseline noise logging locations. Table 2 lists the indicative locations where traffic counts are required as part of this TNMP.

2.5 Locations

Proposed noise monitoring and traffic count locations are provided as a markup on aerial image of the project in Appendix A.

The locations have been selected to establish the following:

- Existing road traffic noise levels for **validation** of the operational noise model ($L_{Aeq, period}$)
- Existing **baseline** noise levels to validate RBLs established in the EIS for each relevant NCA (RBL, $L_{A90, period}$)

The number of locations proposed for monitoring provides a level of redundancy for both model validation and baseline should there be issues with individual logging locations.

Proposed locations for concurrent traffic counting have also been provided for noise monitoring locations that are to be used for validation. Table 1 provides a detailed description of the reasoning behind the selection of the proposed noise monitoring locations.

All noise monitoring locations have been replicated from the EIS with exception of the following:

- Noise measurement location L01A has been removed from this TNMP. It was conducted as a short-term measurement for the EIS adjacent to a long-term unattended noise monitoring location. This TNMP requires concurrent 15-minute attended short-term measurements during both daytime and night-time to determine correlation at each long-term unattended noise monitoring location.
- Noise measurement locations L04A, L05A, L10A and L12, conducted as short-term measurements are proposed to be replaced by long-term unattended noise monitoring locations.
- Noise measurement locations L04A, L05A and L10A have been relocated relative to the location proposed in the EIS to within the operational noise study area (L04A) and construction noise study area (L05A and L10A)
- Noise measurement location L18 has been relocated further south on the New England Highway to facilitate access to the noise monitoring location. The new location is expected to be exposed to a similar traffic noise profile as the location proposed in the EIS and facilitate access to the noise logging location.
- Noise measurement locations L21, L22, L23, L24, L25, L26, L27, L28, L29 and L30 are proposed as new long-term unattended noise monitoring locations:
  - L21, L22, L29 and L30 have been proposed to determine propagation loss and accuracy of barrier design. L22 will also be used to determine RBLs for NCA04B.
  - L23 and L24 have been proposed to validate traffic noise impacts on Anderson Drive and New England Highway respectively.
  - L25, L26, L27 and L28 have been proposed as additional locations to determine RBLs at the residential areas in NCA09, NCA14A & B, NCA13 and NCA04A respectively.
- Attended short-term noise monitoring locations A01, A02, A03 and A04 are proposed to be used to supplement the understanding of propagation loss in free field and propagation loss and accuracy of barrier design relative to the nearest unattended long-term noise monitoring location. These are additional to those required at each long-term noise monitoring location.

Table 1: Proposed long-term unattended noise monitoring locations

ID	NCA	Address	Suburb	Purpose	Comments
L01	NCA01A	23 Cahill Close	Black Hill	Validation	• Propagation loss and accuracy of barrier design • Proximity to existing road (Pacific Motorway and Lenaghans Drive) • Location behind existing barrier • Validate traffic noise impacts from Pacific Motorway and Lenaghans Drive • Provides representative background noise levels for NCA01A
L02	NCA03	54 Weakleys Drive	Beresfield	Baseline	• Provides representative background noise levels for NCA03 • Proximity to existing road (Weakleys Drive)
L03	NCA07	51 New England Highway	Black Hill	Baseline	• Provides representative background noise levels for NCA07
L04	NCA04A	1/15 Quarter Sessions Road	Tarro	Validation	• Line of sight to CSSI • Proximity to existing road (New England Highway) • Propagation loss and accuracy of barrier design (future barrier) • Change in noise level post construction • Ramp connecting to CSSI • Validate traffic noise impacts from New England Highway
L04A	NCA04B	19 Enright Street	Beresfield	Baseline	• Provides representative background noise levels for NCA04A and NCA04B
L05	NCA05A	11 Anderson Drive	Tarro	Baseline	• Provides representative background noise levels for NCA05A
L05A	NCA05B	66 Beresford Avenue	Beresfield	Baseline	• Provides representative background noise levels for NCA05B
L06	NCA06	61 Redbill Drive	Woodberry	Baseline	• Provides representative background noise levels for NCA06
L07	NCA08	179 Old Maitland Road	Hexham	Baseline	• Provides representative background noise levels for NCA08
L08	NCA09	838 Tomago Road	Tomago	Validation	• Ramp connecting to CSSI • Proximity to existing road (Tomago Road) • Validate traffic noise impacts from Tomago Road • Provides representative background noise levels for NCA10
L09	NCA14A	2213 Pacific Highway	Heatherbrae	Validation	• Verification of road surface correction • Proximity to existing road (Pacific Highway) • Change in noise level post construction • Validate traffic noise impacts from Pacific Highway
L10	NCA14B	14 Elizabeth Avenue	Raymond Terrace	Baseline	• Provides representative background noise levels for NCA14B

ID	NCA	Address	Suburb	Purpose	Comments
L10A	NCA14C	10 Mirage Close	Raymond Terrace	Baseline	• Provides representative background noise levels for NCA14C
L11	NCA12	2264 Pacific Highway	Heatherbrae	Validation	• Verification of road surface correction • Proximity to existing road (Pacific Highway) • Validate traffic noise impacts from Pacific Highway • Provides representative background noise levels for NCA12
L12	NCA14C	53 Martens Avenue	Raymond Terrace	Validation	• Verification of road surface correction • Proximity to existing road (Pacific Highway) • Validate traffic noise impacts from Pacific Highway
L13	NCA01A	11 Cahill Close	Black Hill	Validation	• Propagation loss and accuracy of barrier design • Proximity to existing road (Pacific Motorway and Lenaghans Drive) • Location not behind existing barrier • Validate traffic noise impacts from Pacific Motorway and Lenaghans Drive • Provides representative background noise levels for NCA01A
L14	NCA01B	19 Walter Parade	Black Hill	Baseline	• Provides representative background noise levels for NCA01B
L15	NCA04A	70 New England Highway	Tarro	Validation	• Propagation loss and accuracy of barrier design • Proximity to existing road (New England Highway) • Validate traffic noise impacts from New England Highway
L16	NCA04A	44 Sapphire Drive	Tarro	Validation	• Propagation loss and accuracy of barrier design • Proximity to existing road (New England Highway) • Location behind existing barrier • Validate traffic noise impacts from New England Highway
L17	NCA04B	11 Central Avenue	Tarro	Baseline	• Provides representative background noise levels for NCA04B
L18	NCA08	Proposed interchange at Tarro		Validation	• Proximity to existing road (New England Highway) • Validate traffic noise impacts from New England Highway • Validate postconstruction traffic noise impacts from new road
L19	NCA14A	2207 Pacific Highway	Heatherbrae	Validation	• Verification of road surface correction • Proximity to existing road (Pacific Highway) • Change in noise level post construction • Validate traffic noise impacts from Pacific Highway

ID	NCA	Address	Suburb	Purpose	Comments
L20	NCA13	Pacific Highway (north of Raymond Terrace Interchange)		Validation	• Verification of road surface correction • Proximity to existing road (Pacific Highway) • Validate traffic noise impacts from Pacific Highway
L21	NCA04A	90 Yarrum Avenue	Beresfield	Validation	• New long-term unattended noise monitoring location • Propagation loss and accuracy of barrier design • Proximity to existing road (New England Highway) • Location not behind existing barrier • Validate traffic noise impacts from New England Highway • Location provides an additional validation point for New England Highway before John Renshaw Drive
L22	NCA04B	37 Christie Road	Tarro	Baseline	• New long-term unattended noise monitoring location • Provides representative background noise levels for NCA04B
L23	NCA04A	61 Anderson Drive	Tarro	Validation	• New long-term unattended noise monitoring location • Ramp connecting to CSSI • Proximity to existing road (Anderson Drive) • Validate traffic noise impacts from Anderson Drive to improve the accuracy of noise model
L24	NCA04A	4 Anderson Drive	Tarro	Validation	• New long-term unattended noise monitoring location • Ramp connecting to CSSI • Proximity to existing road (Anderson Drive and New England Highway) • Validate traffic noise impacts from Anderson Drive • Location provides an additional validation point for New England Highway to improve accuracy of the noise model
L25	NCA09	819 Tomago Road	Tomago	Baseline	• New long-term unattended noise monitoring location • Provides representative background noise levels for NCA09 • Additional location representative of background noise level of residents northwest of the Sweetwater Grove development
L26	NCA14A	3 Elkin Avenue	Heatherbrae	Baseline	• New long-term unattended noise monitoring location • Provides representative background noise levels for NCA14A • Additional location representative of background noise level of residents in Heatherbrae

ID	NCA	Address	Suburb	Purpose	Comments
L27	NCA13	6B Elizabeth Avenue	Raymond Terrace	Baseline	• New long-term unattended noise monitoring location • Provides representative background noise levels for NCA13 • Additional location representative of background noise level of isolated residences residents near north end of the CSSI
L28	NCA04A	29 Eastern Avenue	Tarro	Baseline	• New long-term unattended noise monitoring location • Provides representative background noise levels for NCA04A • Additional location representative of background noise level of residences near future ramps connecting to CSSI
L29	NCA04B	1 Beverly Close	Tarro	Baseline	• New long-term unattended noise monitoring location • Provides representative background noise levels for NCA04B
L30	NCA04B	54 Pasadena Crescent	Beresfield	Baseline	• New long-term unattended noise monitoring location • Provides representative background noise levels for NCA04B
A01	NCA01A	6 Cahill Close	Black Hill	Attended	• New short-term unattended noise monitoring location • Propagation loss in free field relative to L13
A02	NCA01A	23 Cahill Close	Black Hill	Attended	• New short-term unattended noise monitoring location • Propagation loss in free field relative to L01
A03	NCA04A	100 Yarrum Avenue	Beresfield	Attended	• New short-term unattended noise monitoring location • Propagation loss and accuracy of barrier design relative to L21
A04	NCA04A	3 Emerald Street	Tarro	Attended	• New short-term unattended noise monitoring location • Propagation loss and accuracy of barrier design relative to L16

Table 2: Proposed traffic count locations

ID	Address	Suburb	Comments
T01	Pacific motorway south of intersection with Lenaghans Drive	Black Hill	• To validate noise monitoring locations L01 and L13
T02	Lenaghans Drive before merging with Pacific Motorway	Black Hill	• To validate noise monitoring locations L01 and L13
T03	New England Highway near Beresfield golf course	Beresfield	• To validate noise monitoring location L21
T04	New England Highway west of Quarter Sessions Road	Tarro	• To validate noise monitoring locations L04, L15 and L16
T05	Anderson Drive between Central Avenue and Eastern Avenue	Tarro	• To validate noise monitoring location L23
T06	Woodberry Road off Anderson Drive	Tarro	• To validate noise monitoring location L05
T07	New England Highway east of Woodlands Close	Tarro	• To validate noise monitoring locations L05, L18 and L24
T08	Tomago Road near intersection with Pacific Highway	Tomago	• To validate noise monitoring location L08
T09	Pacific Highway east of intersection with Tomago Road	Tomago	• To validate noise monitoring location L08
T10	Pacific Highway south of Hank Street	Heatherbrae	• To validate noise monitoring locations L09, L11 and L19
T11	Pacific Highway near Windeyers Creek overpass	Heatherbrae	• To validate noise monitoring locations L12 and L20

3. Reporting

The following sections describe the contents of the Traffic Noise Monitoring Report (TNMR).

The requirements for measuring, analysis and reporting noise in the EPA *Approved methods for the measurement and analysis of environmental noise in NSW* [5] must be considered as part of the report of the noise survey data.

3.1 Existing noise environment

As a minimum, the TNMR would contain the following information for each of the noise monitoring locations:

1. Describe the study area.
2. Discuss the noise catchment areas defined in the EIS working paper, noise monitoring procedures and identify the monitoring locations and corresponding monitoring periods.
3. A map clearly identifying the monitoring location.
4. Outline instrumentation used, including equipment manufacturer, model and serial number. Example table to be provided is shown below:

Measurement location	Equipment/model	Serial No.	Logger / SLM Type
			Class 1

Notes:

All meters must comply with AS IEC 61672.1 2013 "Electroacoustics - Sound Level Meters" and designated Class 1 as per table, and suitable for field use.

5. Document equipment calibration before and after the noise monitoring period
6. Tabulate locations and measured noise levels, including the following as a minimum:
   a. Long-term noise levels should be tabulated on the basis of the descriptors:
      – RBL, L_{Aeq}, L_{10} and L_1 for the daytime (7am – 6pm), evening (6pm – 10pm) and nigh-time (10pm – 7am) periods.
      – Weekday, weekend and weekly L_{Aeq} for the daytime (7am – 6pm) and nigh-time (10pm – 7am) periods.
   b. Short-term noise levels are to be tabulated on the basis of the descriptors $L_{90(15min)}$, $L_{Aeq(15min)}$ and L_{max}.
   c. Graphical representation of the descriptors L_{Amax}, L_{A10}, L_{Aeq} and L_{A90}, for each 15-minute period, including excluded periods due to adverse weather or extraneous conditions and reasoning for exclusion.
7. Event sound levels and other relevant sound level data to determine and demonstrate compliance with licence conditions, including the A-weighted maximum noise level (L_{Amax}) and $L_{n1,T}$.
8. A qualitative summary of the acoustic environment at each monitoring location, including a description of identified noise sources that are not representative of the ambient noise environment and contribution to the measures noise levels.
9. Assessment against the established RBLs in the EIS to comment on the validity of RBLs for each relevant NCA.
10. Document any corrections applied to the noise monitoring data and how it was derived.

3.2 Existing traffic flow and composition

As a minimum, the TNMR will contain the following information for each of the traffic count locations:

1. A map clearly identifying the monitoring location.
2. Tabulated traffic volumes and percentages for each class of vehicle during the noise monitoring period in order to implement heavy vehicle corrections for model validation as per Peng, et.al. [13].
3. Outline average hourly number of vehicles classified in light, medium and heavy vehicles during the daytime (7am to 10pm) and night-time (10pm to 7am) periods and average speed. Example table to be provided is shown below:

Road name	Posted speed	Average speed	Direction	Daytime							Night-time						
				LV	HV1	HV2	HV3	HV4	HV5	Total	LV	HV1	HV2	HV3	HV4	HV5	Total
			NB														
			SB														

3.3 Noise monitoring summary template

Table 3 provides a template noise monitoring summary for reference. A comparable format shall be provided for each noise monitoring location.

Table 3: Template noise monitoring summary sheet

Noise Monitoring Location:					**Map of Noise Monitoring Location**
Noise Monitoring Address:					
Noise Logger Type and serial number:					
Noise Monitoring Period:	dd/mm/yyyy	To	dd/mm/yyyy		
Description of noise environment:					

Ambient Noise Logging Results – NPfI Defined Time Periods					**Photo of Noise Monitoring Location**
Time Period	Noise Level (dBA)				
	RBL	L_{Aeq}	L_{10}	L_1	
Daytime (0700 – 1800)					
Evening (1800 – 2200)					
Night-Time (2200 – 0700)					

Ambient Noise Logging Results – RNP Defined Time Periods			
Time Period	Noise Level (dBA)		
	Weekday L_{Aeq}	Weekend L_{Aeq}	Weekly L_{Aeq}
Number of valid days			
Daytime (0700 – 2200)			
Night-Time (2200 – 0700)			

Attended Noise measurement Results					
Date	Start Time	Duration	Noise Level (dBA)		
			L_{A90}	L_{Aeq}	L_{Amax}
	(daytime)				
	(night-time)				

References

[1] Department of Environment, Climate Change and Water NSW, “NSW Road Noise Policy,” NSW Government, 2012.

[2] Transport for NSW, “Road Noise Criteria Guideline,” Transport for NSW, 2022.

[3] Transport for NSW, “Road Noise Mitigation Guideline,” Transport for NSW, Sydney, 2022.

[4] Transport for NSW, “Road Noise Model Validation Guideline,” Transport for NSW, 2022.

[5] Environment Protection Authority, “Approved methods for the meausrement and analysis of environmental noise in NSW,” NSW Environment Protection Authority, 2022.

[6] State of NSW and Environment Protection Authority, “Noise Policy for Industry,” Environment Protection Authority, 2017.

[7] Transport for NSW, “M1 Pacific Motorway extension to Raymond Terrace - Noise and vibration working paper (Part 1),” NSW Government, July 2021.

[8] Transport for NSW, “M1 Pacific Motorway extension to Raymond Terrace - Noise and vibratio working paper (Part 2),” NSW Government, July 2021.

[9] Transport for NSW, “M1 Pacific Motorway extension to Raymond Terrace - Submissions report,” NSW Government, June 2022.

[10] Transport for NSW, “M1 Pacific Motorway extension to Raymond Terrace - Submissions report Appendix D,” June 2022.

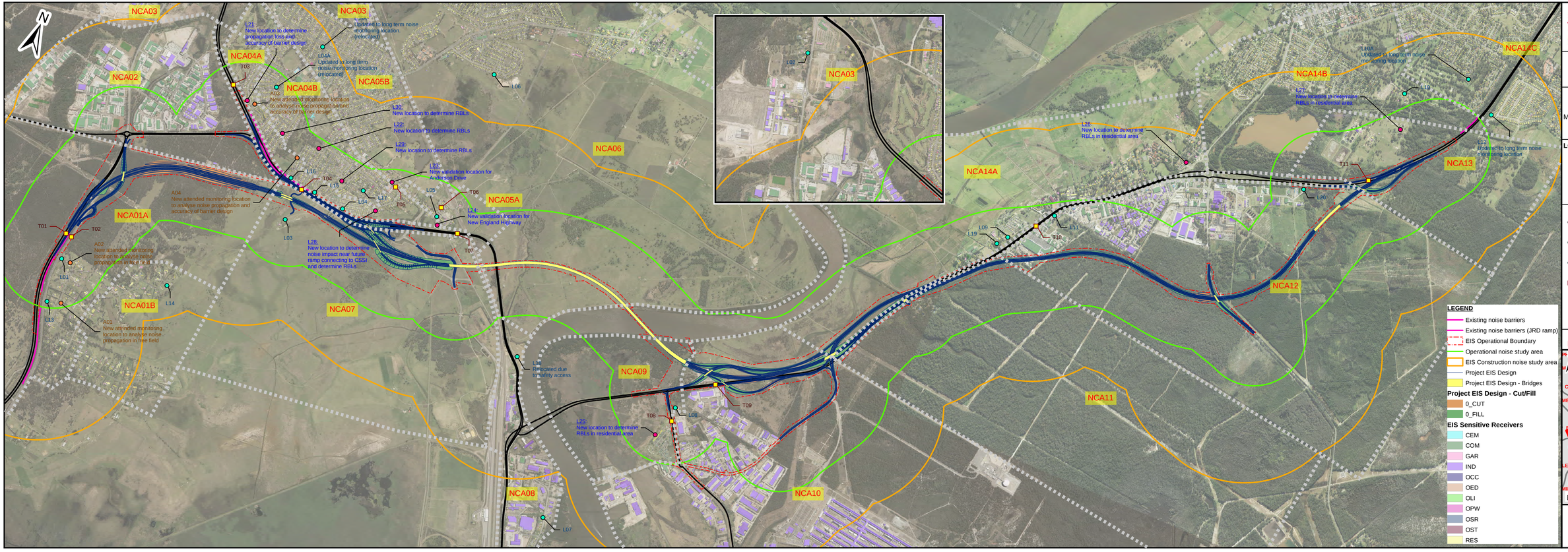
[11] Internaltional Electrotechnical Commission, “IEC 61672-1:2019 Electroacoustics - Sound level meters - Part 1: Specifications,” International Standard, 2013.

[12] International Organisation for Standardization, “ISO 4354:2009 Wind actions on structures,” 2009.

[13] J. Peng, J. Parnell and N. Kessissoglou, “A six-category heavy vehicle noise emission model in free-flowing condition,” *Applied Acoustics,* vol. 143, pp. 211-221, 2019.

Appendix A

Noise and traffic monitoring locations aerial map



NSW GOVERNMENT | Transport for NSW

PROPOSED ADDITIONAL NOISE MONITORING PRE-CONSTRUCTION

P.0057302
SH10 PACIFIC HIGHWAY

M1 PACIFIC MOTORWAY EXTENSION TO RAYMOND TERRACE
OVERVIEW PLAN (Sheet 1 of 1)

LOCALITY: BLACK HILL, TARRO, TOMAGO, HEATHERBRAE

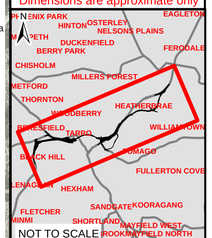
LGA: NEWCASTLE, PORT STEPHENS

FILE NO: SF2014/075219

DRAWN: 24/08/2022

- Long term noise monitoring location identified in the EIS (noise logger)
- New long term noise monitoring location (noise logger)
- New short term attended noise monitoring location (15-minute concurrent noise measurement)
- Traffic counts location (concurrent with noise logging)

Lengths are in metres
Dimensions are approximate only



Accuracy Disclaimer
Areas,Boundaries,Dimensions and positions of improvements in relation to the boundaries are subject to final survey.

Appendix B

Previous noise surveys

B.1 Noise monitoring for EIS

Various noise monitoring was undertaken as part of the EIS assessment. The following sections provide a summary of this information for reference and has been used as the starting point for derivation of this updated noise monitoring plan.

B.1.1 Unattended noise monitoring

Long-term unattended noise monitoring was conducted at 11 locations between 1 June and 15 July 2018 as part of the EIS assessment, to establish existing background and ambient noise levels.

Table 4: Long-term unattended noise monitoring locations to monitor background ambient noise levels

Logger ID	Address	Suburb
L01	23 Cahill Close	Black Hill
L02	54 Weakleys Drive	Beresfield
L03	51 New England Highway	Black Hill
L04	1/15 Quarter Sessions Road	Tarro
L05	11 Anderson Drive	Tarro
L06	61 Redbill Drive	Woodberry
L07	179 Old Maitland Road	Hexham
L08	838 Tomago Road	Tomago
L09	2213 Pacific Highway	Heatherbrae
L10	14 Elizabeth Avenue	Raymond Terrace
L11	2264 Pacific Highway	Heatherbrae

Long-term unattended noise monitoring of existing traffic noise levels was conducted at eight locations between 15 March and 24 March 2016.

Table 5: Long-term unattended noise monitoring locations to monitor existing traffic noise levels

Logger ID	Address	Suburb
L13	11 Cahill Close	Black Hill
L14	23 Walter Parade	Black Hill
L15	70 New England Highway	Tarro
L16	44 Sapphire Drive	Tarro
L17	11 Central Avenue	Tarro
L18	Proposed interchange at Tarro	Tarro
L19	2207 Pacific Highway	Heatherbrae
L20	Pacific Highway (north of Raymond Terrace Interchange)	Raymond Terrace

B.1.2 Attended noise monitoring

Short-term attended measurements were conducted during the day and night-time periods, concurrently with the long-term unattended noise monitoring in 2018 (locations listed in Table 4).

Table 6: Short-term attended measurement locations conducted during the daytime and night-time periods

Logger ID	Address	Suburb
L01A	24 Walter Parade	Black Hill
L04A	22 Lenox Street	Beresfield
L05A	49 Beresford Avenue	Beresfield
L10A	15 Brown Street	Raymond Terrace
L12	53 Martens Avenue	Raymond Terrace

B.1.3 Measured noise levels

Table 7 and Table 8 presents a summary of the background and traffic noise levels provided in the EIS and Appendix D of the Submissions Report.

Table 7: Re-analysed and re-established RBLs

Logger ID	Address	Suburb	Measured RBL, dB(A)		
			Day	Evening	Night
L01	23 Cahill Close	Black Hill	56	53	47
L01A	24 Walter Parade	Black Hill	46	43	37
L02	54 Weakleys Drive	Beresfield	40	41	37
L03	51 New England Highway	Tarro	53	49	45
L04	1/15 Quarter Sessions Road	Tarro	57	54	46
L04A	22 Lenox Street	Beresfield	46	46	44
L05	11 Anderson Drive	Tarro	50	44	37
L05A	49 Beresford Avenue	Beresfield	46	46	44
L06	61 Redbill Drive	Woodberry	40	40	38
L07	179 Old Maitland Road	Hexham	41	43	41
L08	838 Tomago Road	Tomago	53	53	46
L09	2213 Pacific Highway	Heatherbrae	52	49	41
L10	14 Elizabeth Avenue	Raymond Terrace	40	41	37
L10A	15 Brown Street	Raymond Terrace	45	45	42
L11	2264 Pacific Highway	Heatherbrae	62	52	42

Table 8: Monitored road traffic noise levels

Logger ID	Address	Suburb	Monitored traffic noise levels, dB(A)	
			$L_{Aeq(15h)}$ (7am-10pm)	$L_{Aeq(9h)}$ (10pm-7am)
L13	11 Cahill Close	Black Hill	56	53
L14	23 Walter Parade	Black Hill	50	45
L15	70 New England Highway	Tarro	74	72
L16	44 Sapphire Drive	Tarro	64	60
L17	11 Central Avenue	Tarro	57	51
L18	Proposed interchange at Tarro	Tarro	72	70
L19	2207 Pacific Highway	Heatherbrae	62	59
L20	Pacific Highway (north of Raymond Terrace Interchange)	Raymond Terrace	75	72

Attachment 2 – Independent Review.

November 24, 2022

Paul Galvin
Transport for NSW
Level 7, 6 Stewart Ave
Newcastle West, NSW 2302
Email: Paul.Galvin@Transport.nsw.gov.au

Dear Paul,

Re: M1 Pacific Motorway extension to Raymond Terrace (SSI-7319)
Proposed Additional Noise Monitoring –Peer Review

Introduction

The M1 Pacific Motorway extension to Raymond Terrace project involves 15km of new motorway between Black Hill and Raymond Terrace. RWDI Australia Pty Ltd (RWDI) has been commissioned by Transport NSW to conduct a peer review of the M1 to Raymond Terrace Traffic Noise Monitoring Program Reference: AC02, 24 November 2022 (Arups).

The monitoring review is aimed to be independent and consistent with the proposed draft planning conditions E87 and the noise commitment NV10 to provide additional noise monitoring for the project.

The relevant draft planning condition and noise commitment is presented below:

Draft Condition E87

Before the commencement of Work, a Traffic Noise Monitoring Program must be prepared to inform the calculation of operational road traffic noise impacts at sensitive land use(s). The program must:

(a) include monitoring at the noise monitoring locations used to inform the EIS; and

(b) identify additional locations at which monitoring will be undertaken to determine the change in operational traffic noise as a result of the CSSI.

NV10

Prior to construction, additional noise monitoring be carried out to validate the Rating Background Levels adopted for the project during construction.

Traffic Noise Monitoring

The M1 to Raymond Terrace Traffic Noise Monitoring Program proposes the following additional monitoring for traffic noise to support traffic noise modelling and model validation (15 monitoring locations):

ID	Location	Location considered appropriate (Yes/No)
L01	23 Cahill Close, Black Hill	Yes
L04	1/15 Quarter Sessions Road, Tarro	Yes
L08	838 Tomago Road, Tomago	Yes
L09	2213 Pacific Highway, Heatherbrae	Yes
L11	2264 Pacific Highway, Heatherbrae	Yes
L12	53 Martens Avenue, Raymond Terrace	Yes
L13	11 Cahill Close, Black Hill	Yes
L15	70 New England Highway, Tarro	Yes
L16	44 Sapphire Drive, Tarro	Yes
L18	Proposed interchange at Tarro	Yes
L19	2207 Pacific Highway, Heatherbrae	Yes
L20	Pacific Highway (north of Raymond Terrace Interchange)	Yes
L21	90 Yarrum Avenue, Beresfield	Yes
L23	52 Anderson Drive, Tarro	Yes

ID	Location	Location considered appropriate (Yes/No)
L24	4 Anderson Drive, Tarro	Yes

For traffic noise model validation, traffic counting is required to be conducted. The M1 to Raymond Terrace Traffic Noise Monitoring Program proposes the following monitoring locations:

ID	Location	Location considered appropriate (Yes/No)
T01	Pacific motorway south of intersection with Lenaghans Drive Black Hill • To validate noise monitoring locations L01 and L13	Yes
T02	Lenaghans Drive before merging with Pacific Motorway Black Hill • To validate noise monitoring locations L01 and L13	Yes
T03	New England Highway near Beresfield golf course Beresfield • To validate noise monitoring location L21	Yes
T04	New England Highway west of Quarter Sessions Road Tarro • To validate noise monitoring locations L04, L15 and L16	Yes
T05	Anderson Drive between Central Avenue and Eastern Avenue Tarro • To validate noise monitoring location L23	Yes

ID	Location	Location considered appropriate (Yes/No)
T06	Woodberry Road off Anderson Drive Tarro • To validate noise monitoring location L05	Yes
T07	New England Highway east of Woodlands Close Tarro • To validate noise monitoring locations L05, L18 and L24	Yes
T08	Tomago Road near intersection with Pacific Highway Tomago • To validate noise monitoring location L08	Yes
T09	Pacific Highway east of intersection with Tomago Road Tomago • To validate noise monitoring location L08	Yes
T10	Pacific Highway south of Hank Street Heatherbrae • To validate noise monitoring locations L09, L11 and L19	Yes
T11	Pacific Highway near Windeyers Creek overpass Heatherbrae	Yes

On review of the M1 to Raymond Terrace Traffic Noise Monitoring Program Reference: AC02, 24 November 2022 (Arup), RWDI considers that the additional post approval monitoring locations and traffic counting locations are representative of the range of sound propagation conditions along the length of the M1 Pacific Motorway extension to Raymond Terrace project corridor.

Background Noise Monitoring

The M1 to Raymond Terrace Traffic Noise Monitoring Program proposes the following additional background monitoring to support any further construction noise assessment post Approval (18 monitoring locations):

ID	Location	Location considered appropriate (Yes/No)
L02	54 Weakleys Drive, Beresfield	Yes
L03	51 New England Highway, Black Hill	Yes
L04A	19 Enright Street, Beresfield	Yes
L05	11 Anderson Drive, Tarro	Yes
L05A	66 Beresford Avenue, Beresfield	Yes
L06	61 Redbill Drive, Woodberry	Yes
L07	179 Old Maitland Road, Hexham	Yes
L10	14 Elizabeth Avenue, Raymond Terrac	Yes
L10A	10 Mirage Close, Raymond Terrac	Yes
L14	19 Walter Parade, Black Hill	Yes
L17	11 Central Avenue, Tarro	Yes
L22	37 Christie Road, Tarro	Yes
L25	819 Tomago Road, Tomago	Yes
L26	3 Elkin Avenue, Heatherbrae	Yes

ID	Location	Location considered appropriate (Yes/No)
L27	6B Elizabeth Avenue, Raymond Terrace	Yes
L28	29 Eastern Avenue, Tarro	Yes
L29	1 Beverly Close, Tarro	Yes
L30	54 Pasadena Crescent, Tarro	Yes

On review of the M1 to Raymond Terrace Traffic Noise Monitoring Program report Reference: AC02, 24 November 2022 (Arup), RWDI considers that the additional post approval background noise monitoring locations proposed are appropriate to confirm the Rating Background Levels (RBLs) for any post Approval construction noise assessment.

Conclusion

RWDI Australia Pty Ltd (RWDI) has been commissioned by Transport NSW to conduct a peer review of the M1 to Raymond Terrace Traffic Noise Monitoring Program Reference: AC02, 24 November 2022 (Arup).

On review of the Noise Monitoring Program, RWDI considers that:

- monitoring locations are consistent with those used in the EIS;
- the additional post approval monitoring locations and traffic counting locations proposed are representative of the range of sound propagation conditions along the length of the M1 Pacific Motorway extension to Raymond Terrace project corridor;
- the additional post approval background noise monitoring locations proposed are appropriate to confirm the Rating Background Levels (RBLs) for any post Approval construction noise assessment; and
- the Noise Monitoring Program is consistent with draft condition 87 and commitment NC10.

I trust this information is sufficient. Please contact us if you have any further queries.

Yours Faithfully
RWDI

John Wassermann
Senior Technical Director