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Woolgoolga to Glenugie Pacific Highway upgrade

Addendum to the operational noise compliance report

March 2022

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29 March 2022

W2G - Noise Monitoring – 3 properties near the section 2A alignment

1.0 Introduction

The Woolgoolga to Glenugie (W2G) Pacific Highway upgrade involved the construction of around 26 kilometres of new dual carriageway highway between Arrawarra Interchange, north of Woolgoolga and Franklins Road, south of Glenugie.

Transport for NSW (Transport), engaged AECOM Australia Pty Ltd (AECOM) to undertake an Operational Noise Compliance Assessment (ONCA) of the Woolgoolga to Glenugie upgrade and prepare the Operational Noise Compliance Report (ONCR). The assessment was completed in 2019 and is detailed in report Woolgoolga to Glenugie Pacific Highway Upgrade ONCR, dated 22 July 2019.

At the time the ONCA was undertaken, construction of the final alignment of the full M class carriageway for one section of the upgrade had not been completed. This section was the northbound carriageway between Wells Crossing Creek and approximately 3 km north of Franklins Road (section 2A). During completion of this section traffic continued to use the existing Pacific Highway in the northbound direction. The ONCR recommended that an ONCA for this section of the project be undertaken once construction was complete and open to traffic.

The final section of the northbound carriageway has now been completed and opened to traffic in December 2020. This Addendum to the W2G ONCR details the ONCA for the three residential receivers close to the competed carriageway section:

- 5521 Pacific Highway, Wells Crossing
- 5523 Pacific Highway, Wells Crossing
- 5559 Pacific Highway, Wells Crossing.

The ONCA for these properties was undertaken as described in the ONCR with some minor refinements to the modelling methodology as detailed in Section 4.0.

2.0 Operational Criteria

The ONCR detailed the road traffic noise criteria for existing residential land use developments affected by noise from the new freeway/arterial roads and redevelopments of existing freeways/arterial roads. The criteria were determined in accordance with the Minister's Conditions of Approval (SSI-4963), using the *Road Noise Policy* (RNP) with reference to the *Environmental Noise Management Manual* (ENMM), and are presented in Table 1. The external noise criteria are applied at 1 metre from the facade and at a height of 1.5 m from the floor level. The criteria include an allowance for noise reflected from the facade.

Table 1 Residential road traffic noise criteria for new and redeveloped freeways, RNP

Road category	Type of project/land use	Assessment criteria dB(A)	
		Day (7 am – 10 pm)	Night (10 pm – 7 am)
Freeway/ arterial/sub-arterial	1. Existing residences affected by noise from **new** freeways/arterial/sub-arterial road corridors[1]	$L_{Aeq(15\ hr)}$ 55 (external)	$L_{Aeq(9\ hr)}$ 50 (external)
	2. Existing residences affected by noise from **redevelopment** of existing freeway/arterial/sub-arterial roads 3. Existing residences affected by **additional traffic** on existing freeways/arterial/sub-arterial roads generated by land use developments 4. Existing residences affected by noise from existing freeway/arterial/sub-arterial roads where **no redevelopment** is taking place	$L_{Aeq(15\ hr)}$ 60 (external)	$L_{Aeq(9\ hr)}$ 55 (external)
	5. Existing residences affected by increases in traffic noise of 12 dB(A) or more from new freeway/arterial/sub-arterial roads	Between $L_{Aeq(15\ hr)}$ 42-55 (external)	Between $L_{Aeq(9\ hr)}$ 42-50 (external)

Notes:

1. *The RNP states "The contribution from the new road project refers to the noise from the new road project alone and not the total level of road traffic noise."*

The ENMM discusses what is deemed to be feasible and reasonable in terms of additional noise mitigation where the RNP base criteria are exceeded and all "feasible and reasonable" traffic management and other road design opportunities have been exhausted. Additional noise mitigation measures may include noise barriers/mounds, quieter pavement surfaces and architectural treatment of private dwellings.

It is generally not reasonable to take action to reduce noise levels to the target noise levels if the noise levels with the proposal are predicted to be:

- Within 2 dB(A) of 'No Build' noise levels (The RNP states that an increase of up to 2 dB(A) represents a minor impact that is considered barely perceptible to the average person); and
- Not 'acute' (i.e. the noise levels are predicted to be less than 65 dB(A) $L_{eq(15hr)}$ and 60 dB(A) $L_{eq(9hr)}$).
- If this situation exists then no further consideration of additional noise mitigations is required.

3.0 Operational Noise Monitoring

Road traffic noise monitoring was undertaken by AECOM at three locations within the period 19 November 2021 to 2 December 2021. Noise measurements were undertaken in accordance with AS2702 *Acoustics - Methods for the Measurement of Road Traffic Noise* and the Roads and Maritime's *Procedure - Preparing a Post Construction Noise Assessment Report*.

Simultaneous traffic counting was also undertaken by TTM from 17 November 2021 to 30 November 2021 on the main alignment during the measurement period. These traffic numbers are provided in Section 3.6.

The measured noise levels have been used in this assessment, with consideration of the monitored road traffic flows, to validate the road traffic noise model.

3.1 Noise monitoring instrumentation

All noise monitoring equipment used was of Type 1 instrumentation standard as described in Australian Standard IEC 61672.1 2004 *Electroacoustics - sound level meters* and calibrated to NATA

standards that are traceable to Australian Physical Standards held by the National Measurement Laboratory (CSIRO Division of Applied Physics). All loggers were calibrated before and after measurement periods to ensure significant drift had not occurred. All equipment has current calibration certification. The make, model and serial numbers of all equipment used in the monitoring are given below in Table 2.

3.2 Weather monitoring

Weather data recorded during the noise monitoring survey period was obtained from a weather station located at Glenugie approximately 12 km to the north. This weather station was operated as part of the Woolgoolga to Ballina Pacific Highway Upgrade. Wind speeds and rainfall at this location are considered to be representative of the Wells Crossing area.

The results of the noise monitoring have been processed in accordance with the procedures contained in the RNP. The RNP requires noise measurements affected by wind and rain to be omitted from the calculations.

3.3 Noise monitoring locations

Details of each noise logging location and the equipment are provided in Table 2. The noise logging locations are presented on a map in Appendix A.

Table 2 Noise logging locations, measurement periods and instrumentation

ID	Address	Logger type/ Serial number	Measurement period	Days of data retrieved
L1	5521 Pacific Highway, Wells Crossing	01dB Cube	19/11/21 - 02/12/21	14
L2	5523 Pacific Highway, Wells Crossing	01dB Cube	19/11/21 - 02/12/21	14
L3	5559 Pacific Highway, Wells Crossing	01dB Cube	19/11/21 - 02/12/21	14

3.4 Operational road noise monitoring results

Provided in Table 3 are the $L_{Aeq(15\ hr)}$ and $L_{Aeq(9\ hr)}$ noise levels measured at each monitoring location for the period 19 November to 2 December 2021. Logger graphs are presented in Appendix B.

Table 3 Unattended road noise monitoring results

ID	Noise logging location	Measured noise level dB(A)	
		Day: 7:00 – 22:00 $L_{Aeq(15\ hr)}$	Night: 22:00 – 7:00 $L_{Aeq(9\ hr)}$
L1	5521 Pacific Highway, Wells Crossing	50	50
L2	5523 Pacific Highway, Wells Crossing	52	52
L3	5559 Pacific Highway, Wells Crossing	50	49

3.5 Attended noise monitoring

Attended noise measurements were undertaken by AECOM on 18 November 2021 at the three logging locations. The noise measurements were conducted over a 15 minute period in order to qualify noise present at each receiver location. The results of the attended measurements, along with comments are presented in Table 4.

Table 4 Attended short-term noise monitoring results

ID	Noise monitoring location	Measurement start	Measured level noise dB(A)		Comments regarding noise sources
			$L_{Aeq\ (15\ min)}$ level	$L_{A90\ (15\ min)}$ level	
Daytime					
L1	5521 Pacific Highway, Wells Crossing	18/11/2021 12:30	51	44	Dominant noise source: traffic on the Pacific Highway. Other noise sources: birds calling at times. Insects audible the entire time. Typical truck pass-by noise level: 48-54 dB(A). Compression braking audible for southbound trucks.
L2	5523 Pacific Highway, Wells Crossing	18/11/2021 13:35	54	39	Dominant noise source: traffic on the Pacific Highway. Other noise sources: birds calling at times. Insects audible the entire time. Typical truck pass-by noise level: 46-59 dB(A). Compression braking audible for southbound trucks.
L3	5559 Pacific Highway, Wells Crossing	18/11/2021 14:21	50	42	Dominant noise source: traffic on the Pacific Highway. Other noise sources: birds calling at times. Insects audible the entire time. Typical truck pass-by noise level: 48-58 dB(A). Compression braking not as audible as other locations
Night-time					
L1	5521 Pacific Highway, Wells Crossing	18/11/2021 22:27	50	41	Dominant noise source: traffic on the Pacific Highway. Other noise sources: Insects audible the entire time. Some birds audible. Typical truck pass-by noise level: 51-56 dB(A). Some compression braking audible.
L2	5523 Pacific Highway, Wells Crossing	18/11/2021 22:58	52	42	Dominant noise source: traffic on the Pacific Highway. Other noise sources: Insects audible the entire time. Some birds audible. Typical truck pass-by noise level: 46-61 dB(A). Some compression braking audible 56 dB(A).
L3	5559 Pacific Highway, Wells Crossing	18/11/2021 14:21	51	46	Dominant noise source: traffic on the Pacific Highway. Other noise sources: Insects audible the entire time Typical truck pass-by noise level: 50-58 dB(A). Some compression braking audible 52 dB(A).

3.6 Traffic counting

Concurrent traffic counting was undertaken on the main alignment. Table 5 below presents a summary of the traffic counts. The traffic summaries are seven day averages, generally consistent with the noise logging period (17 November - 30 November 2021) and in accordance with Environment Protection Authority (EPA) requirements. The daytime period is defined as 7 am to 10 pm and night-time from 10 pm to 7 am in accordance with the RNP.

Table 5 Traffic counting results

Location	ID	Direction	Day: 7:00 –22:00			Night: 22:00 –7:00		
			Average traffic volume	Average vehicle speed, km/h	Average heavy vehicle percentage	Average traffic volume	Average vehicle speed, km/h	Average heavy vehicle percentage
Pacific Hwy South of Parker Road	1	Northbound	4,216	105	23%	778	102	61%
	2	Southbound	4,677	102	23%	740	100	49%

4.0 Operational Noise Modelling

4.1 Road traffic noise modelling methodology

The 'Work As Executed' (WAE) road design model for the project provided by Transport was reviewed and used as the basis of the road traffic noise model for the Woolgoolga to Glenugie Section 2A alignment.

The road traffic model was processed using SoundPLAN v 8.0 software, which implements the Calculation of Road Traffic Noise (CoRTN) algorithm. The UK Department of Transport devised the CoRTN algorithm and with suitable corrections, this method has been shown to give accurate predictions of road traffic noise under Australian conditions.

The modelling parameters used are generally consistent with those detailed in the operational noise management report (ONMR) and the ONCR. Some modifications to the parameters have been made to ensure consistency with the modelling that has recently been undertaken for the Glenugie Link to Maclean section of the Woolgoolga to Ballina Pacific Highway Upgrade (Sections 3 and 4). These changes are detailed below in Table 6.

Table 6 Modelling noise parameters

Parameter	Comment
Traffic volumes and mix	Existing traffic volumes were obtained from traffic count data for the model validation. 'Year of Opening' and 'Design Year' traffic volumes were obtained from the Pacific Highway Upgrade Operational Noise Compliance Review Glenugie to Pimlico (G2P ONCR Section 3 and 4). These volumes are higher than the measured volumes and those presented in the Operational Noise Management Report (W2G-0NMR-RPT-001[G] Final Draft Design – 100%, October 2015). 'Year of Opening' and 'Design Year' heavy vehicle percentages are based on the measured heavy vehicle percentages. These heavy vehicle percentages are similar to those from the Operational Noise Management Report (W2G-0NMR-RPT-001[G] Final Draft Design – 100%, October 2015) and higher than those presented in the G2P ONCR Section 3 and 4. These traffic volumes and mix were used to provide a conservative approach.
Traffic speeds	Traffic speeds for the existing road traffic noise model have been based on speeds measured during the traffic counts. Traffic speeds for the 'Year of Opening' and 'Design Year' model are based on posted speeds.
Traffic noise source heights	Four noise sources at various heights have been included in the road traffic noise model: • Light vehicles: 0.5 metres. • Heavy vehicle tyres: 0.5 metres. • Heavy vehicle engines: 1.5 metres. • Heavy vehicle exhausts: 3.6 metres. Corrections were made to the road traffic noise model to take account of the relative source contributions of the truck tyres (-5.4 dB(A)) and engines (-2.4 dB(A)) and truck exhausts (-8.5 dB(A)) compared with light vehicle sources.
Corrections	Source level corrections and propagation loss corrections have been applied to the modelled noise levels results in accordance with Road and Maritime's *Model Validation Guideline* (MVG). Refer to section 4.2.

The *Procedure – Preparing a Post Construction Noise Assessment Report* (PCNA) requires the comparison of predicted noise levels from this model with predicted noise levels from the ONMR to form the basis of the ONCA. However the MVG notes that where the traffic volumes, traffic mix or speed is significantly different to the predicted traffic volumes in the ONMR then the traffic flows should be re-evaluated and the project noise levels and mitigation reassessed. This approach has been adopted for this assessment.

4.2 Existing road traffic noise model

Road traffic noise models in NSW are regularly validated using simultaneous classified road traffic counts and noise logging. This provides confidence in the recommendations and assessment completed using noise modelling.

The MVG provides guidance and procedures for validating operational road traffic noise models. The guideline discusses error, which is the difference between measured and predicted noise levels, principles to be applied when completing monitoring and modelling to minimise error and use of calibration adjustments.

The three types of calibration adjustments that are made to the UK Calculation of Road Traffic Noise (CoRTN) by Transport include:

- source level corrections which adjust the noise level at all locations to an equal degree

- propagation loss corrections which adjust the rate of decibel change with distance or other features such as the presence of vegetation
- noise level corrections at the receiver which linearly multiply the overall calculated noise level by a constant.

A road traffic noise model is considered to be validated if the differences between the measured and predicted levels are within ± 2 dB. The MVG notes that predicted levels should generally not be lower than measured levels.

The source level correction from the Woolgoolga to Ballina Sections 3 and 4 ONCR has been adopted for this assessment. This source level correction was confirmed to be appropriate in the Stage 3 and 4 ONCR based upon noise logging results close to the road.

After confirming the source level correction, a review of the data with consideration of propagation loss was completed and demonstrated that the model validated at all locations when a suitable distance loss correction was applied.

A comparison of the predicted and measured traffic at the monitoring locations concluded that the propagation loss corrections as presented in Table 7 were appropriate.

Table 7 Wells Crossing level corrections

Correction	Daytime	Night-time
Source level correction	-1.7 dBA	+0.5 dBA
Propagation loss correction	-1 dBA	-1 dBA

Table 8 below presents a summary of the road traffic noise model validation results. The results indicate that at all locations the noise levels fall within the noise modelling accuracy of ±2 dB and on average the modelled results are slightly overpredicting compared to the measured results.

Given the good correlation of predicted and measured road traffic noise levels the road traffic noise model is considered accurate and validated.

Table 8 Road traffic noise model validation

ID	Address	Day: 7:00 –22:00			Night: 22:00 –7:00		
		Measured $L_{Aeq(15\ hr)}$, dB(A)	Predicted $L_{Aeq(15\ hr)}$, dB(A)	Difference dB	Measured $L_{Aeq(9\ hr)}$, dB(A)	Predicted $L_{Aeq\ (9hr)}$, dB(A)	Difference dB
L1	5521 Pacific Highway, Wells Crossing	50.3	51.5	1.2	49.8	50.2	0.4
L2	5523 Pacific Highway, Wells Crossing	52.4	52.8	0.4	51.6	51.5	-0.1
L3	5559 Pacific Highway, Wells Crossing	50.0	51.7	1.7	49.1	50.4	1.3
		Median difference		1.2	Median difference		0.4
		Standard deviation		0.7	Standard deviation		0.7

4.3 Traffic noise model

The 'Year of Opening' and 'Design Year' traffic flows were entered into the road traffic noise model, validated in the previous section to provide the 'Year of Opening' and 'Design Year' road traffic noise models.

4.3.1 Traffic volumes Year of Opening

The 'Year of Opening' (2020) traffic volumes which were used are presented in Table 9 below.

Table 9 Year of Opening predicted traffic flows

Location	Direction	Day: 7:00 –22:00			Night: 22:00 –7:00		
		Design Traffic Volume	Design Vehicle Speed, km/h	Design Heavy Vehicle Percentage	Design Traffic Volume.	Design Vehicle. Speed, km/h	Design Heavy Vehicle Percentage
Pacific Highway South of Parker Road	NB	4,647	110	23%	1034	110	61%
	SB	5,420	110	23%	839	110	49%

4.3.2 Traffic volumes Design Year

The 'Design Year' (2030) traffic volumes which were used are presented in Table 10 below.

Table 10 Design Year predicted traffic flows

Location	Direction	Day: 7:00 –22:00			Night: 22:00 –7:00		
		Design Traffic Volume	Design Vehicle Speed, km/h	Design Heavy Vehicle Percentage	Design Traffic Volume.	Design Vehicle. Speed, km/h	Design Heavy Vehicle Percentage
Pacific Highway South of Parker Road	NB	5,393	110	23%	1200	110	61%
	SB	6,290	110	23%	974	110	49%

4.4 Design and measured traffic volume comparison

A comparison of the design and measured traffic volumes for 2020 and 2030 are presented in Table 11 and Table 12. It can be seen that the design volumes and speeds are higher than the measured volumes and speeds and the design heavy vehicle % is the same as the measured heavy vehicle %.

Table 11 Daytime design and measured 2020 traffic volumes

Location	Direction	Day: 7:00 –22:00			Day: 7:00 –22:00		
		Design Traffic Volume	Design Vehicle Speed, km/h	Design Heavy Vehicle Percentage	Measured Traffic Volume.	Measured Vehicle. Speed, km/h	Measured Heavy Vehicle Percentage
Pacific Highway South of Parker Road	NB	4,647	110	23%	4216	105	23%
	SB	5,420	110	23%	4677	102	23%

Table 12 Night-time design and measured 2020 traffic volumes

Location	Direction	Night: 7:00 –22:00			Night: 22:00 –7:00		
		Design Traffic Volume	Design Vehicle Speed, km/h	Design Heavy Vehicle Percentage	Measured Traffic Volume.	Measured Vehicle. Speed, km/h	Measured Heavy Vehicle Percentage
Pacific Highway South of Parker Road	NB	1034	110	61%	778	102	61%
	SB	839	110	49%	740	100	49%

4.5 Predicted road traffic noise levels

The predicted noise levels are presented in Table 13 and Table 14. As the traffic volumes have increased compared with those presented in the ONMR these properties have been re-evaluated for eligibility for additional noise mitigation.

Noise contours maps have been provided in Appendix C. Detailed Noise results are provided in Appendix D.

Eligibility for consideration of additional noise mitigation is determined by noise levels at a property which exceed the RNP criteria and either:

- Exceed the 'No Build' noise levels by more than 2 dB; or
- Are 'acute' (i.e. exceed 65 dB(A) $L_{Aeq(15\ hr)}$ or 60 dB(A) $L_{Aeq(9\ hr)}$).

Table 13 Eligibility for consideration of at-property treatment for receivers in the Year of Opening

ID	Receiver address	Floor	Year of opening predicted level, dB(A)				Criteria, dB		Exceeds criteria and +2 dB increase	Acute	Eligible
			No build noise model		Operational noise compliance model						
			Day $L_{Aeq(15\ hr)}$	Night $L_{Aeq(9\ hr)}$	Day $L_{Aeq(15\ hr)}$	Night $L_{Aeq(9\ hr)}$	Day $L_{Aeq(15\ hr)}$	Night $L_{Aeq(9\ hr)}$			
645	5521 Pacific Highway, Wells Crossing	F1	62	62	59	58	60	55	No	No	No
649	5523 Pacific Highway, Wells Crossing	GF	61	60	56	56	60	55	No	No	No
651	5559 Pacific Highway, Wells Crossing	GF	62	61	57	57	60	55	No	No	No

Table 14 Eligibility for consideration of at-property treatment for receivers in the Design Year

ID	Receiver address	Floor	Design year predicted level, dB(A)				Criteria, dB		Exceeds criteria and +2 dB increase	Acute	Eligible
			No build noise model		Operational noise compliance model						
			Day $L_{Aeq(15\ hr)}$	Night $L_{Aeq(9\ hr)}$	Day $L_{Aeq(15\ hr)}$	Night $L_{Aeq(9\ hr)}$	Day $L_{Aeq(15\ hr)}$	Night $L_{Aeq(9\ hr)}$			
645	5521 Pacific Highway, Wells Crossing	F1	63	62	59	58	60	55	No	No	No
649	5523 Pacific Highway, Wells Crossing	GF	62	61	57	56	60	55	No	No	No
651	5559 Pacific Highway, Wells Crossing	GF	62	61	58	57	60	55	No	No	No

5.0 Conclusions

This report outlines the outcomes of the operational noise compliance assessment (ONCA) for the Wells Crossing to Glenugie Project (Section 2A) of the Woolgoolga to Glenugie Pacific Highway upgrade.

This is the final step in the operational noise assessment process for major projects.

This ONCA has been completed in line with the project conditions of approval to compare actual noise performance of the project against the noise performance predicted in the operational noise management review (ONMR) (2015).

The ONCA has been carried out in accordance with all relevant government policies and guidelines, and in consultation with the EPA and the Department of Planning, Industry and Environment (DPIE). The road traffic noise model developed was validated based on the noise and traffic monitoring completed following project construction.

Mitigation treatments are identified and implemented in line with the relevant guidelines and policies from the NSW Government to ensure equity for all receivers impacted by road traffic noise within NSW.

This operational noise compliance assessment (ONCA) considered operational road noise impacts upon three receivers:

- 5521 Pacific Highway, Wells Crossing
- 5523 Pacific Highway, Wells Crossing
- 5559 Pacific Highway, Wells Crossing.

It was found that the three properties are not eligible for consideration of additional noise mitigation. These properties were also not considered eligible in the ONMR.

Yours faithfully

Geoff Lucas
Senior Vibration/Acoustic Engineer

Appendix A

W2G - Wells Crossing

N

0 60 120 Meters

AECOM

Source: © 2022 Nearmap

● Loggers

Appendix B

Noise Logger Report

5521 Pacific Highway, Wells Crossing

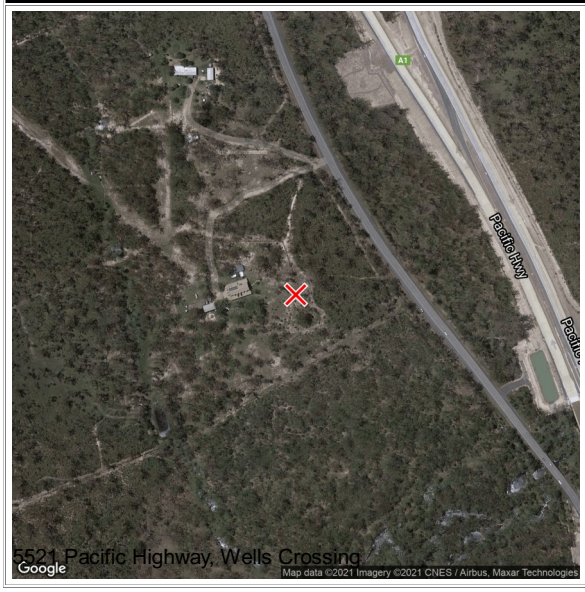
Item	Information
Logger Type	Cube
Serial number	12305
Address	5521 Pacific Highway, Wells Crossing
Location	Front Yard
Facade / Free Field	Free Field
Environment	Road traffic noise is dominant from the highway. Trucks 48-54 dBA. Insects and birds also audible.

Measured noise levels

Logging Date	$L_{Aeq,day}$ 7am-6pm	$L_{Aeq,evening}$ 6pm-10pm	$L_{Aeq,night}$ 10pm-7am	ABL Day 7am-6pm	ABL Eve 6pm-10pm	ABL Night 10pm-7am	$L_{Aeq,15hr}$ 7am-10pm	$L_{Aeq,9hr}$ 10pm-7am
Fri Nov 19 2021	50	48	51	42	-	-	49	51
Sat Nov 20 2021	48	47	48	40	-	-	48	48
Sun Nov 21 2021	47	-	45	-	-	-	47	45
Mon Nov 22 2021	51	51	49	-	43	-	51	49
Tue Nov 23 2021	51	49	49	42	42	-	50	49
Wed Nov 24 2021	50	51	50	-	-	-	50	50
Thu Nov 25 2021	50	53	51	-	-	-	51	51
Fri Nov 26 2021	52	53	52	-	45	47	52	52
Sat Nov 27 2021	50	50	52	45	45	47	50	52
Sun Nov 28 2021	50	50	48	42	44	43	50	48
Mon Nov 29 2021	50	51	47	43	45	43	50	47
Tue Nov 30 2021	48	-	49	-	-	-	48	49
Wed Dec 1 2021	51	52	51	-	44	-	51	51
Thu Dec 2 2021	52	52	50	44	47	-	52	50
Summary	**50**	**51**	**50**	**42**	**44**	**45**	**50**	**50**

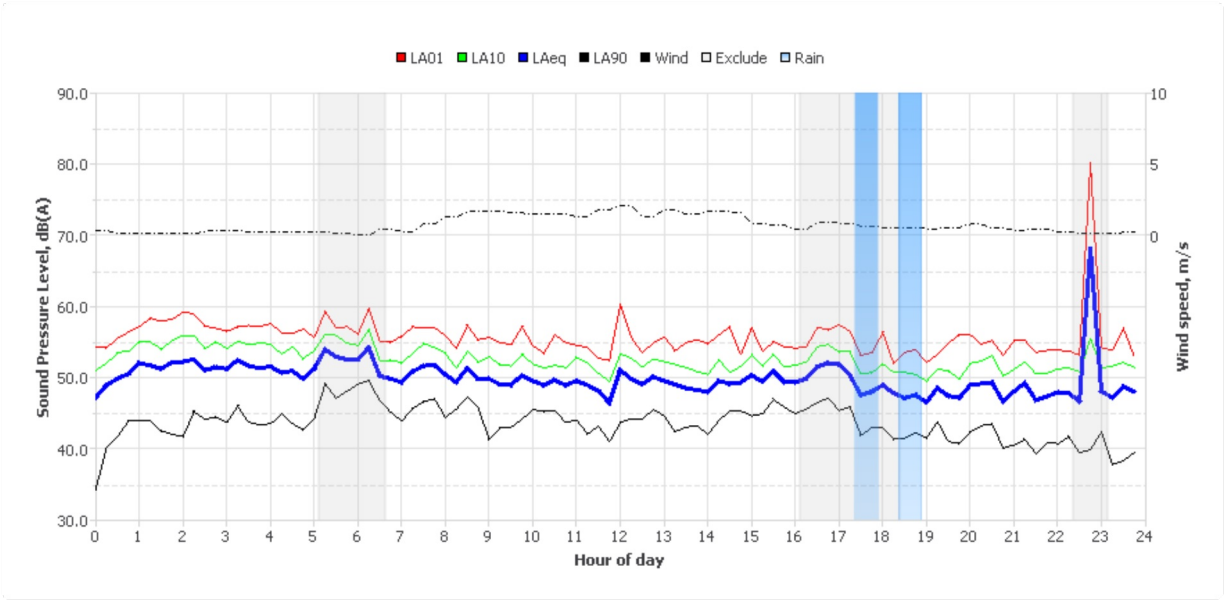
Note: Results denoted with '-' do not contain enough valid data for a value to be calculated. The data has been excluded either manually or automatically as a result of adverse weather conditions.

Logger Location



Logger Deployment Photo

Friday, 19 Nov 2021



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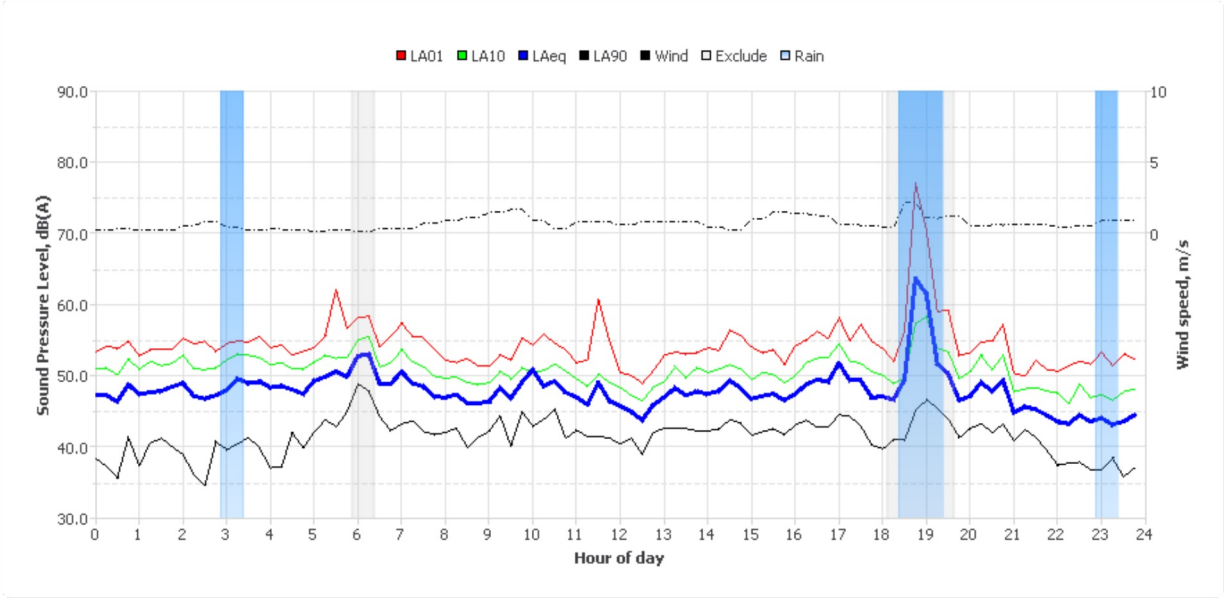

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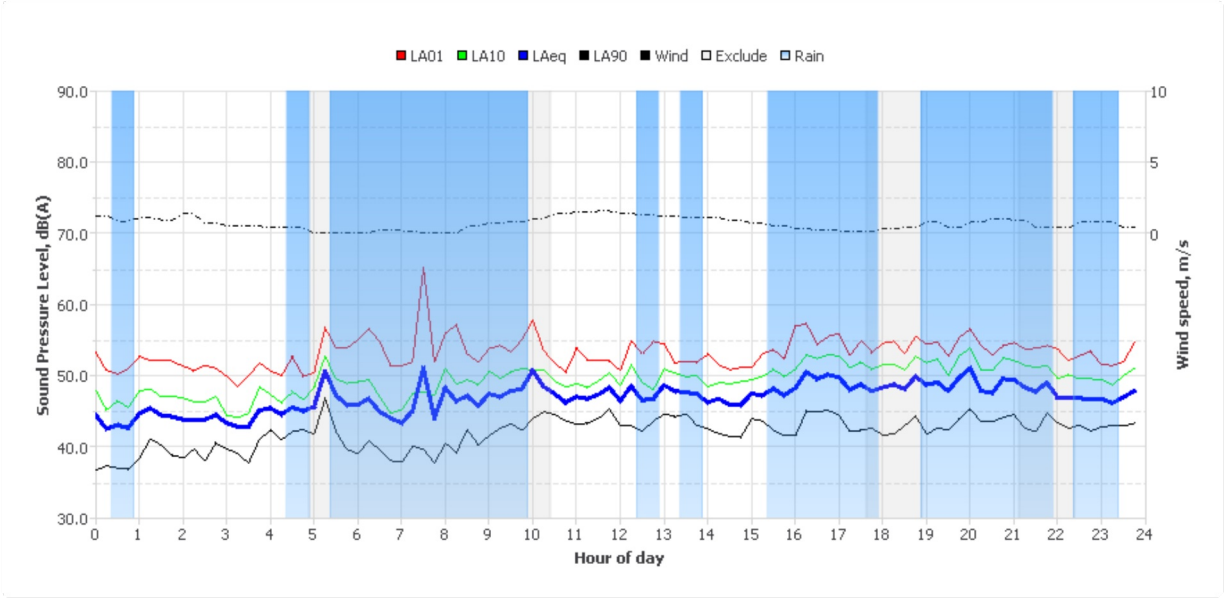

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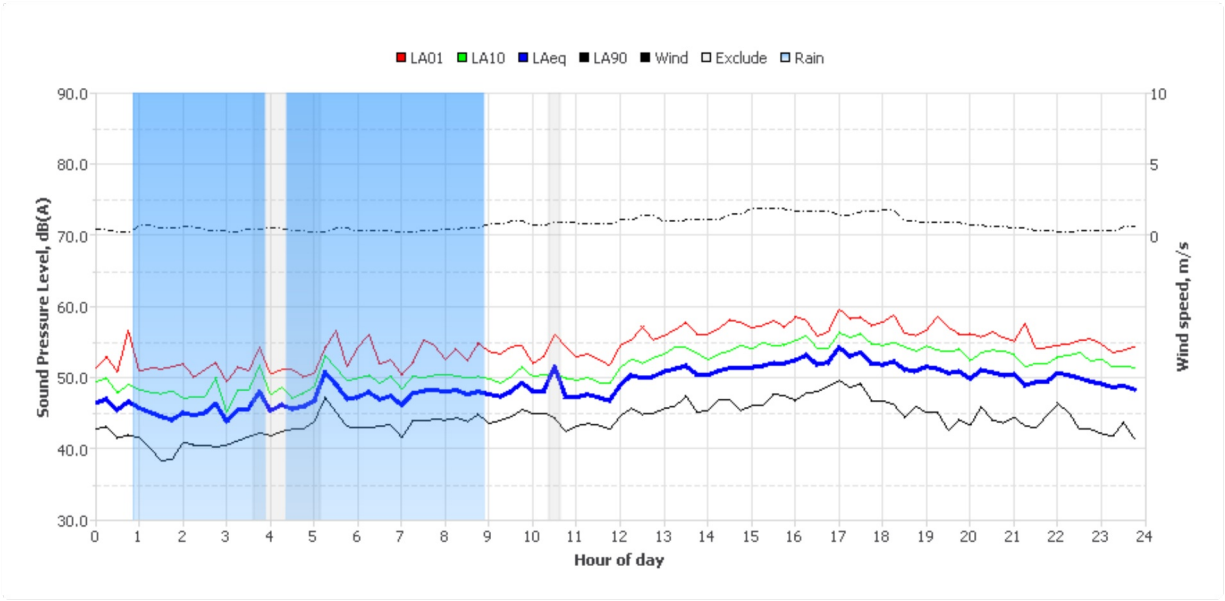

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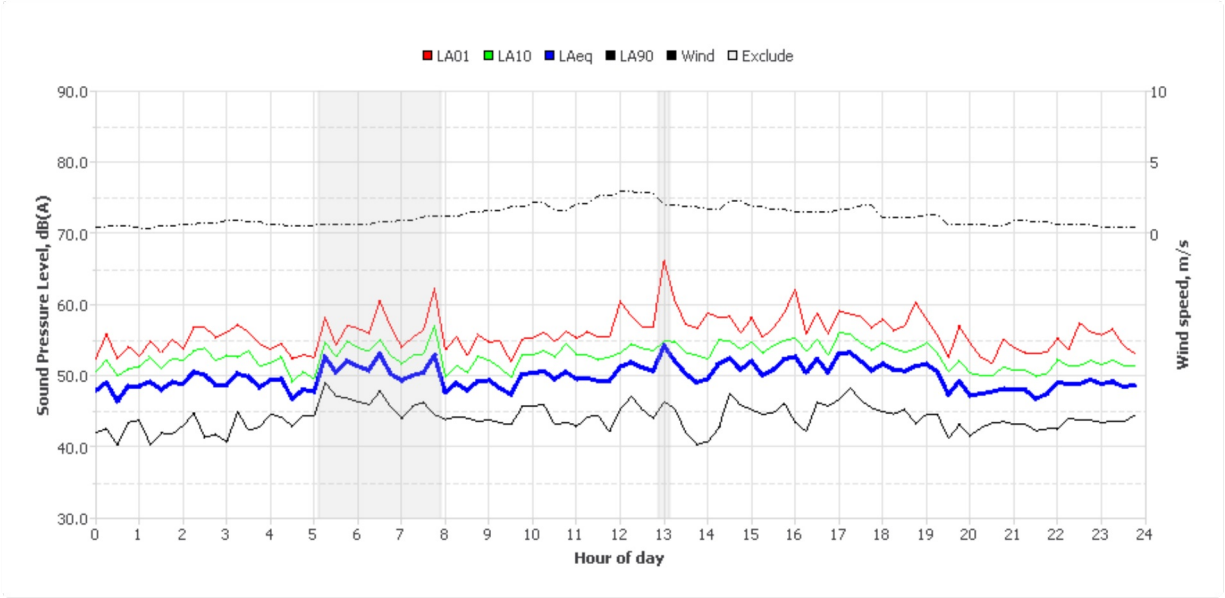

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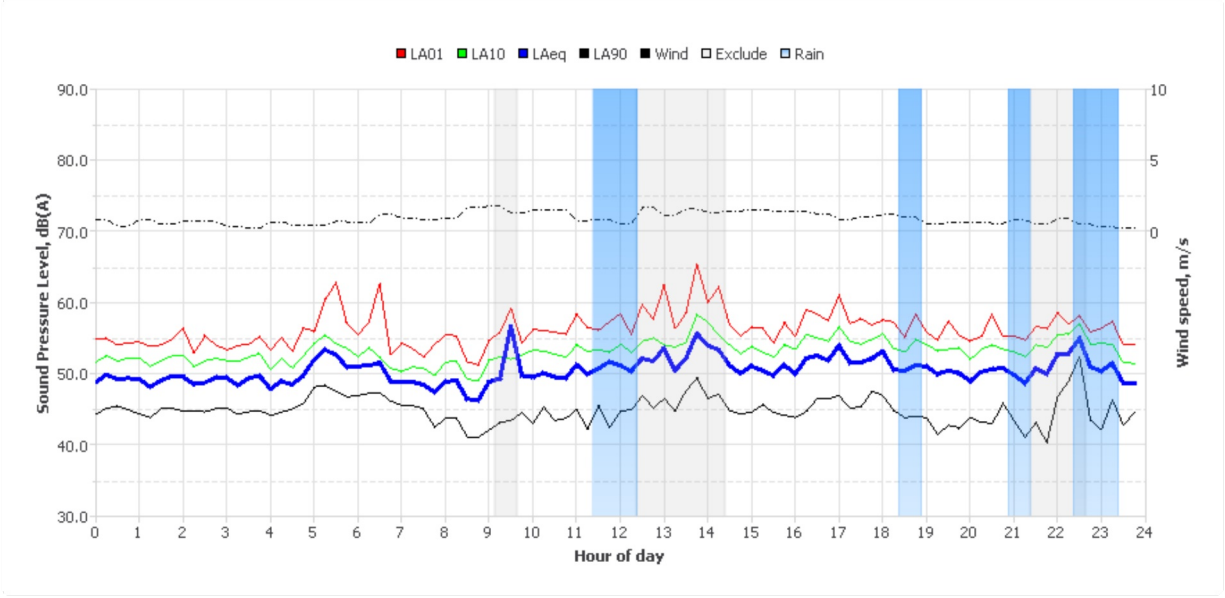

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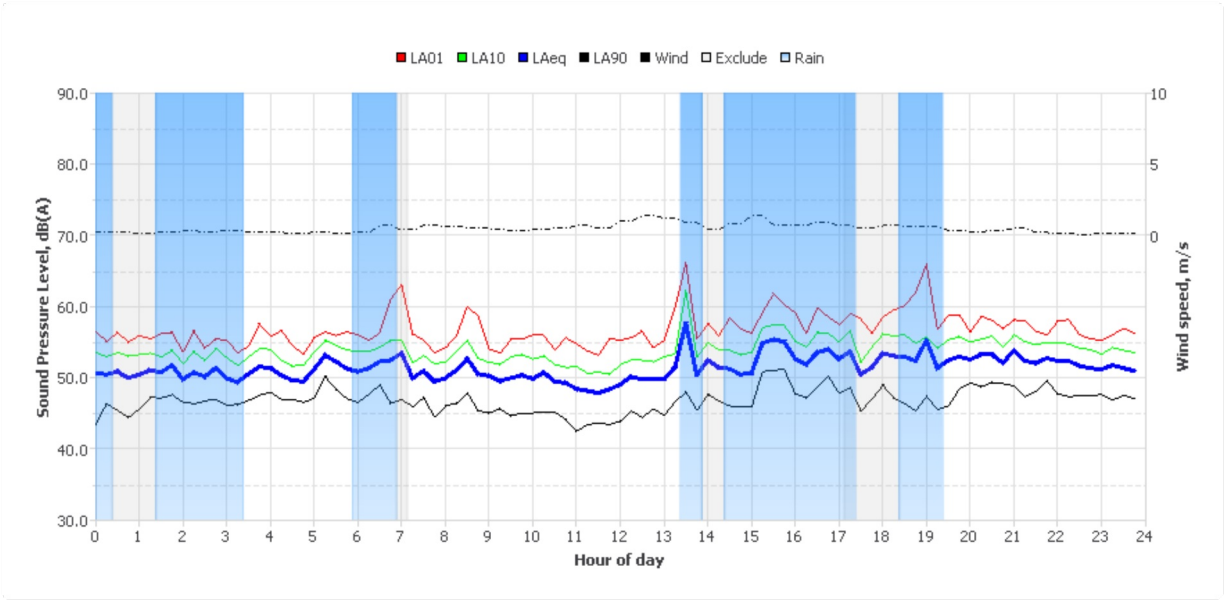

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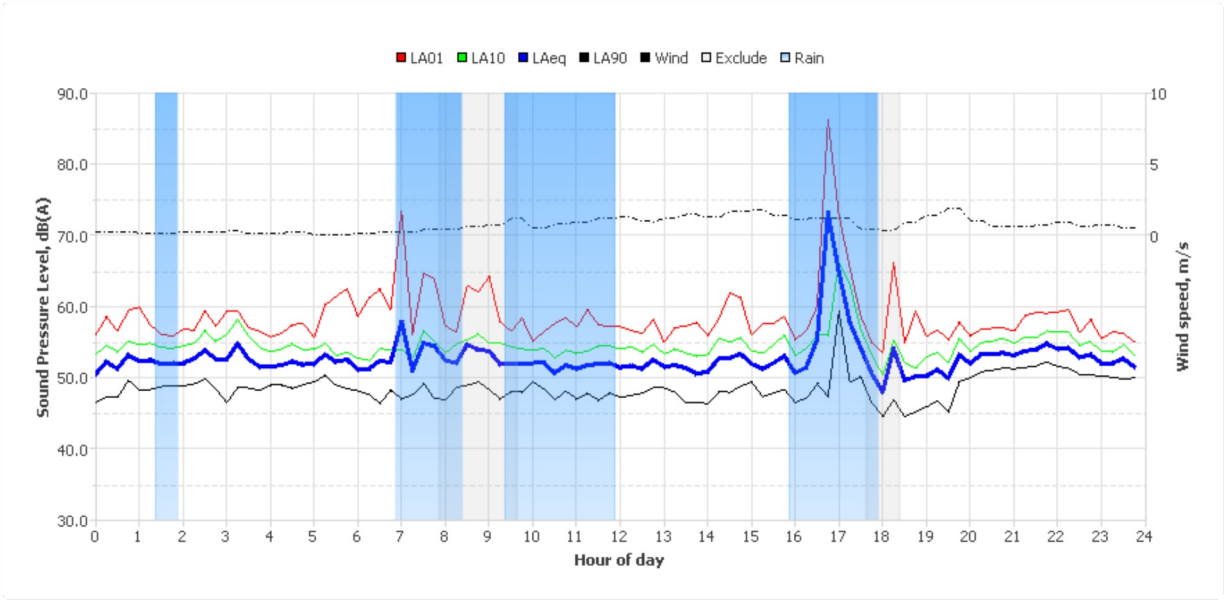

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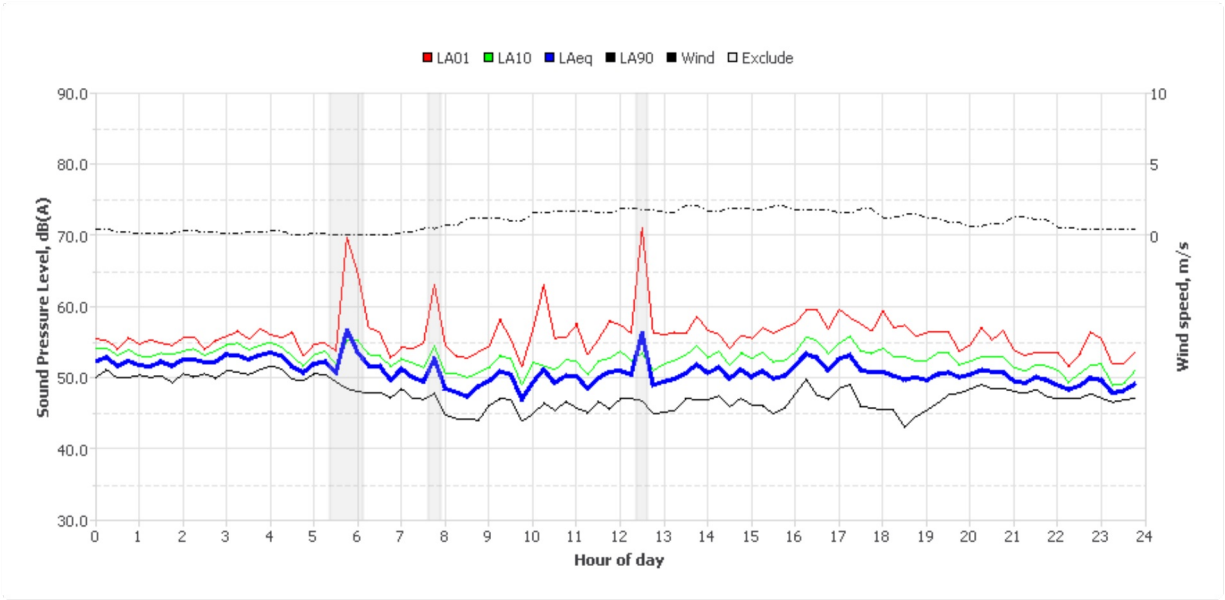

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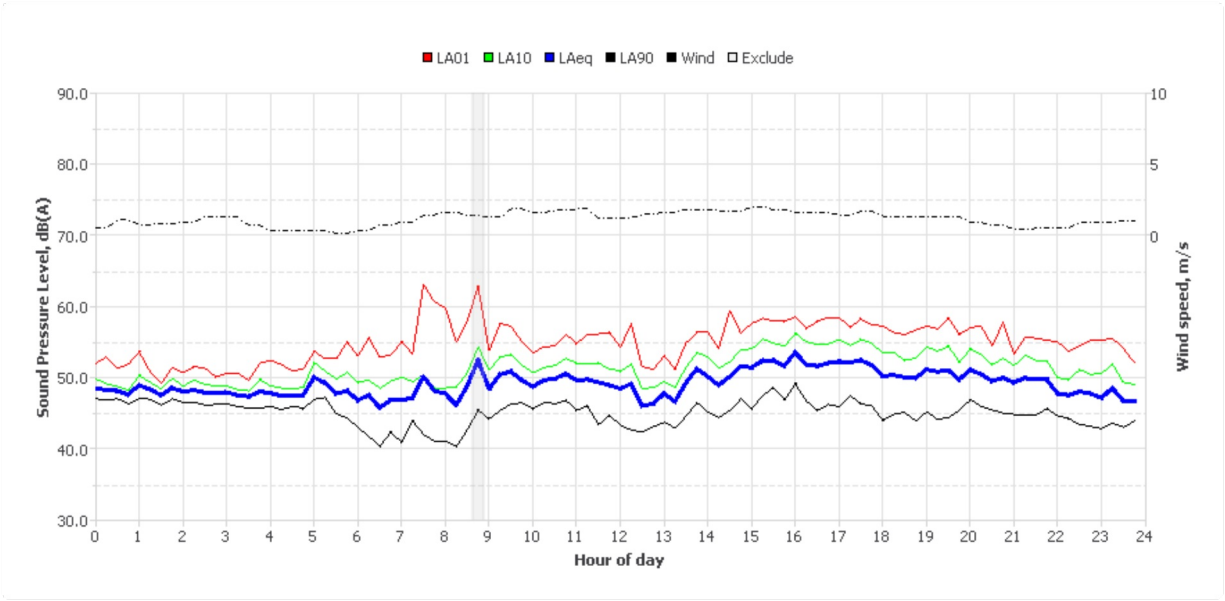
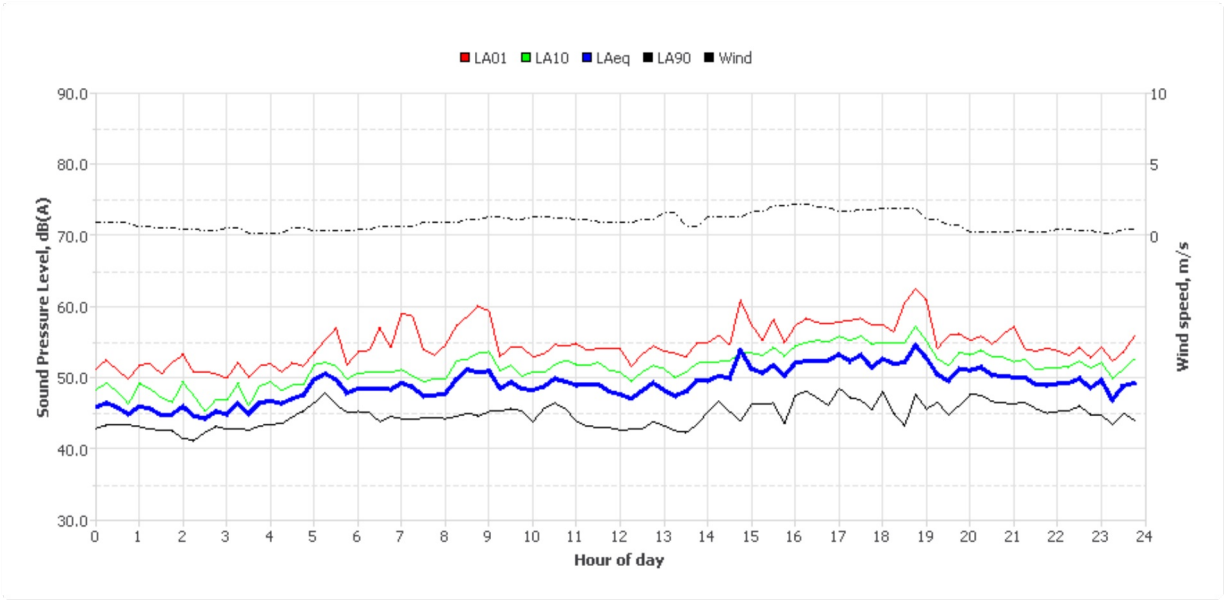
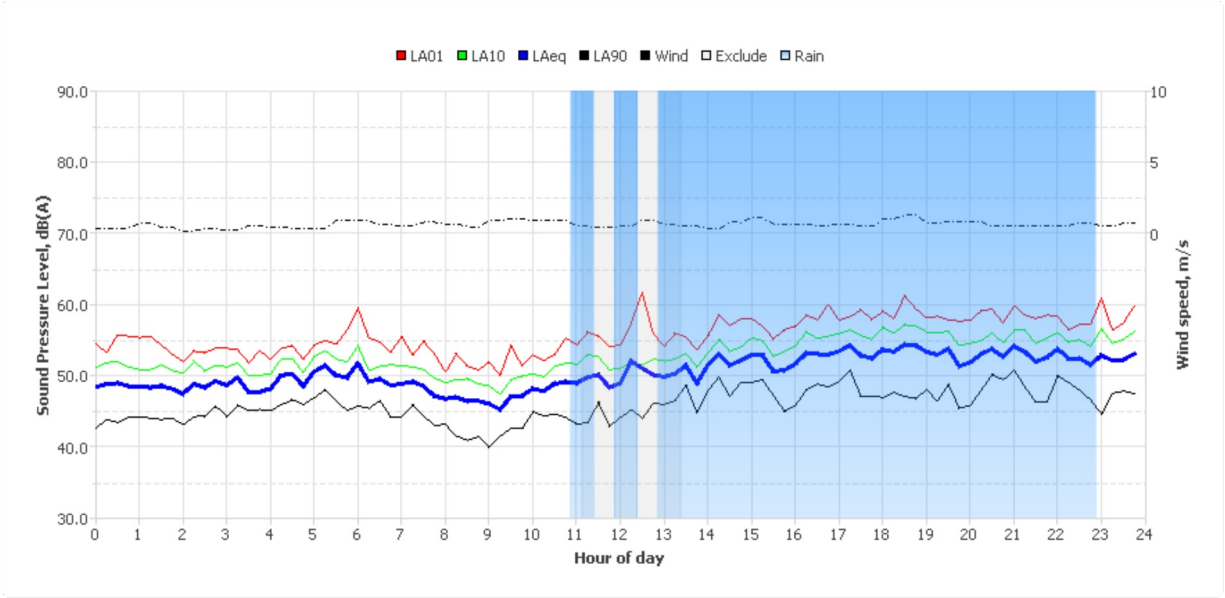


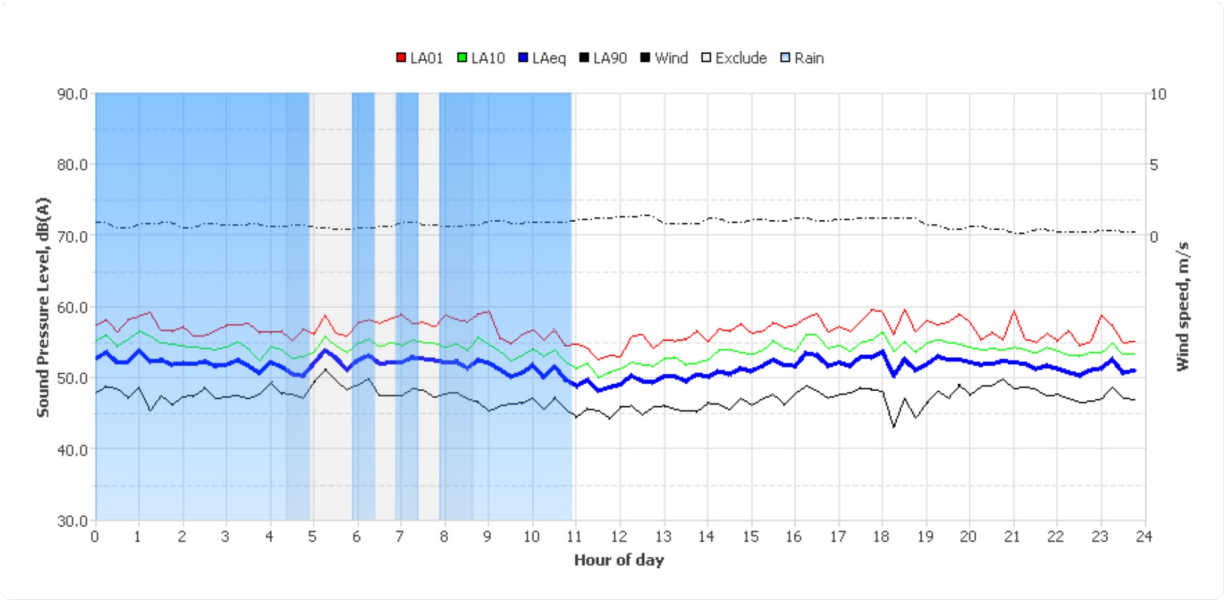
Monday, 29 Nov 2021



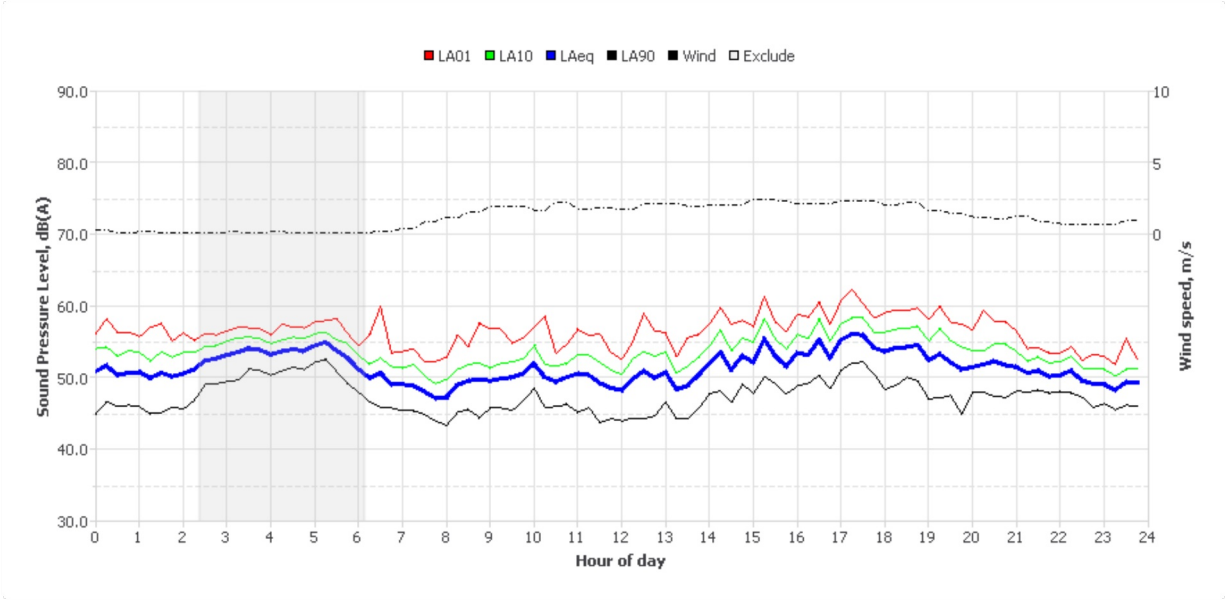
Tuesday, 30 Nov 2021



Wednesday, 01 Dec 2021



Thursday, 02 Dec 2021



Noise Logger Report

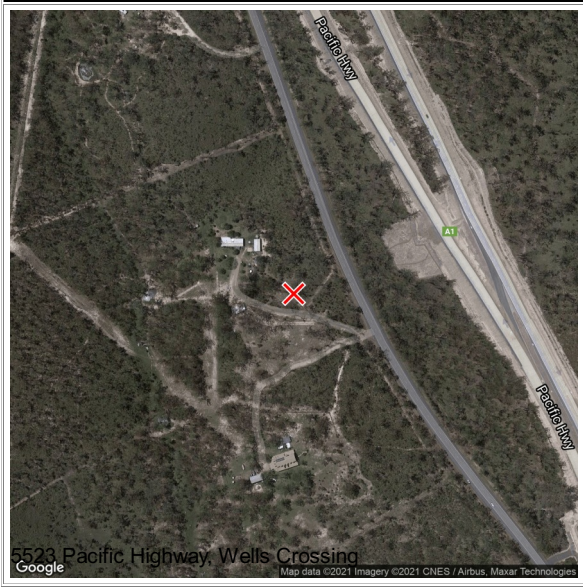
5523 Pacific Highway, Wells Crossing

Item	Information
Logger Type	Cube
Serial number	12306
Address	5523 Pacific Highway, Wells Crossing
Location	Front Yard
Facade / Free Field	Free Field
Environment	Road traffic noise is dominant from the highway. Trucks 46-69 dBA. Insects and birds also audible.

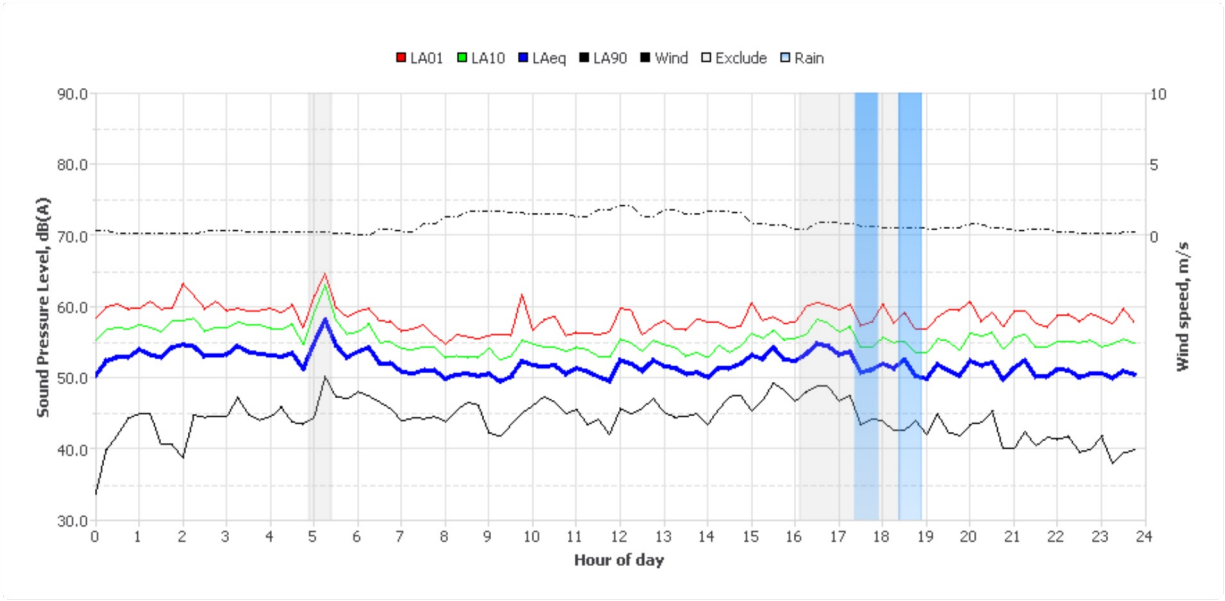
Measured noise levels

Logging Date	$L_{Aeq,day}$ 7am-6pm	$L_{Aeq,evening}$ 6pm-10pm	$L_{Aeq,night}$ 10pm-7am	ABL Day 7am-6pm	ABL Eve 6pm-10pm	ABL Night 10pm-7am	$L_{Aeq,15hr}$ 7am-10pm	$L_{Aeq,9hr}$ 10pm-7am
Fri Nov 19 2021	51	51	53	43	-	39	51	53
Sat Nov 20 2021	50	50	50	42	-	-	50	50
Sun Nov 21 2021	50	-	45	-	-	-	50	45
Mon Nov 22 2021	53	53	51	45	44	-	53	51
Tue Nov 23 2021	53	52	51	43	41	38	52	51
Wed Nov 24 2021	53	54	51	44	-	-	53	51
Thu Nov 25 2021	52	55	54	-	-	-	53	54
Fri Nov 26 2021	54	52	53	-	-	-	54	53
Sat Nov 27 2021	52	50	52	45	41	42	52	52
Sun Nov 28 2021	52	52	47	41	41	39	52	47
Mon Nov 29 2021	52	53	49	44	41	-	53	49
Tue Nov 30 2021	51	-	51	-	-	-	51	51
Wed Dec 1 2021	53	54	54	-	44	-	54	54
Thu Dec 2 2021	54	54	53	46	44	43	54	53
Summary	**52**	**53**	**52**	**44**	**41**	**39**	**52**	**52**

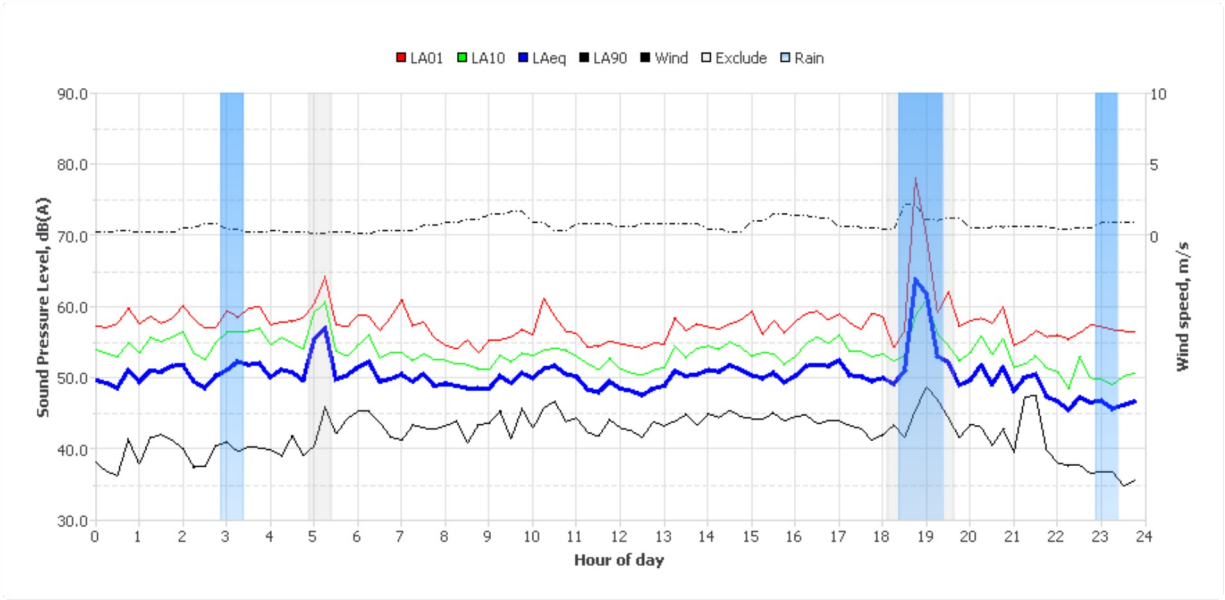
Note: Results denoted with '-' do not contain enough valid data for a value to be calculated. The data has been excluded either manually or automatically as a result of adverse weather conditions.

Logger Location	Logger Deployment Photo
	

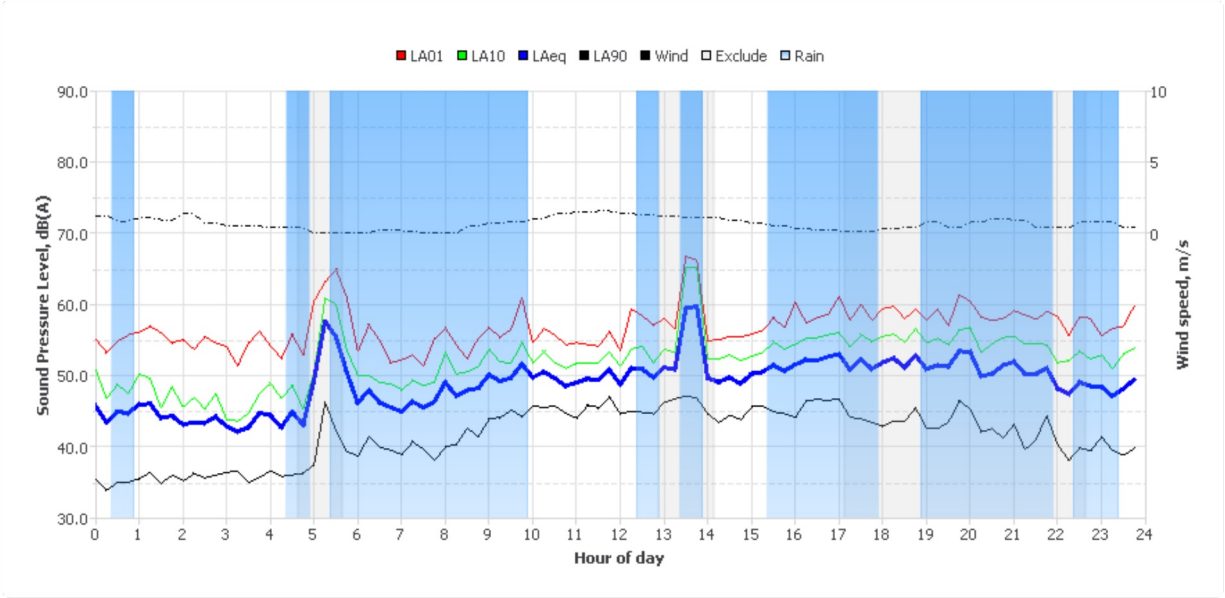
Friday, 19 Nov 2021



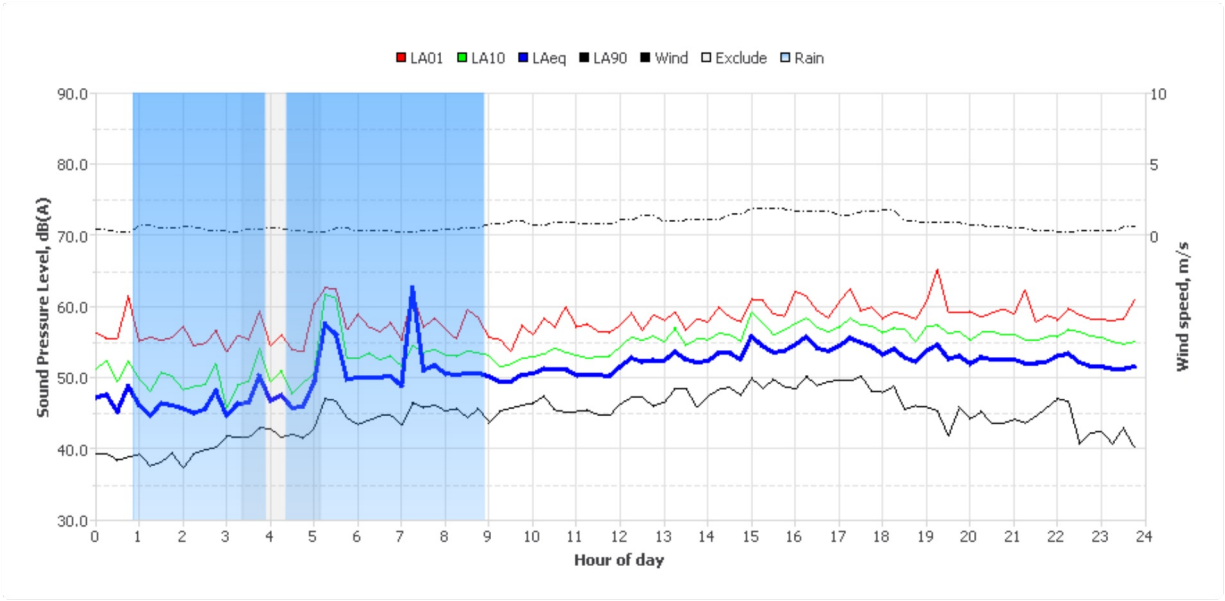
Saturday, 20 Nov 2021



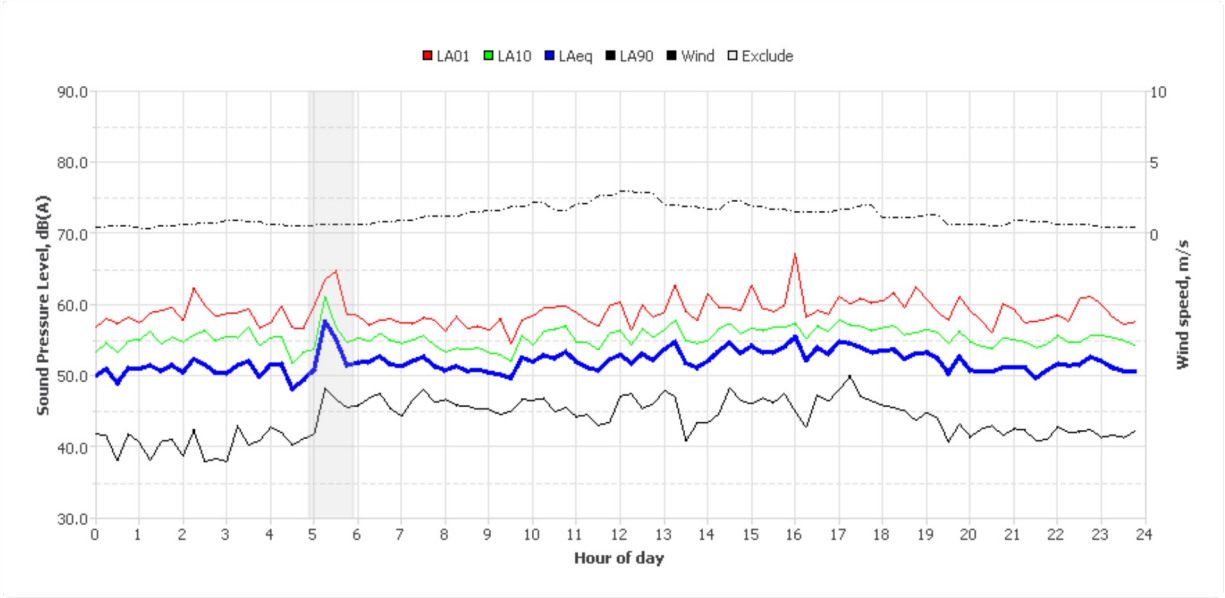
Sunday, 21 Nov 2021



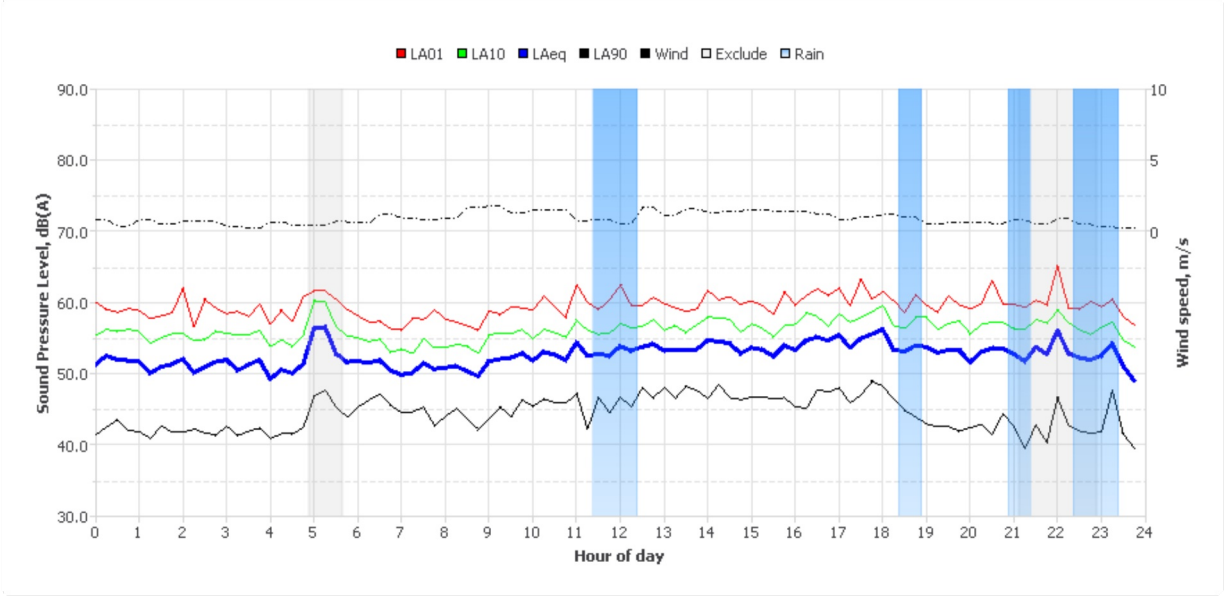
Monday, 22 Nov 2021



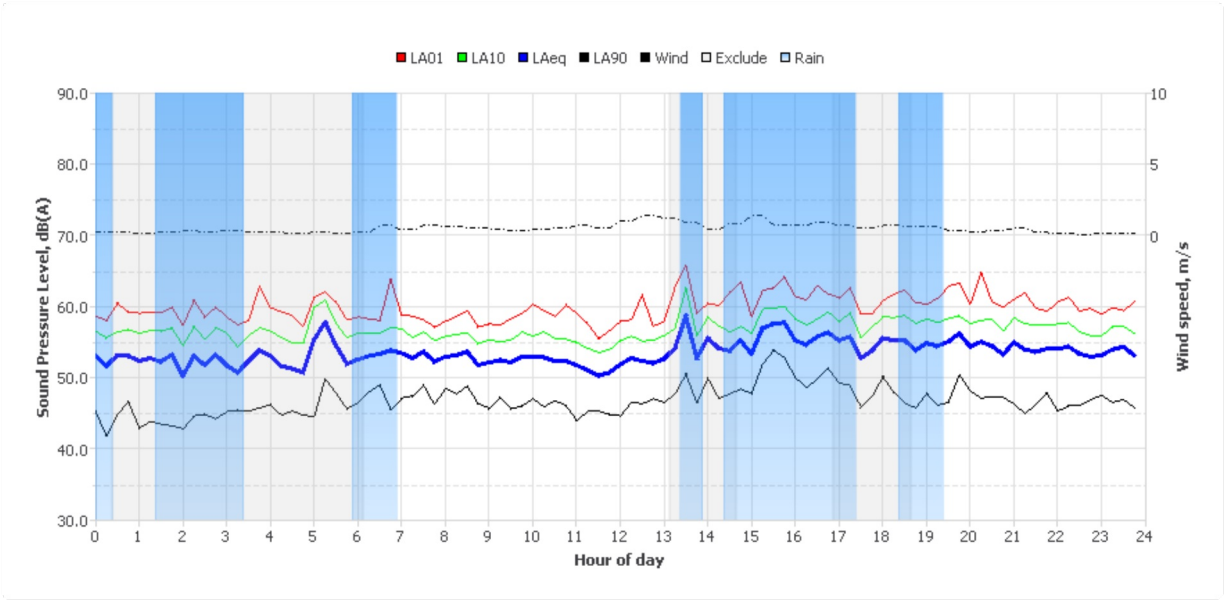
Tuesday, 23 Nov 2021



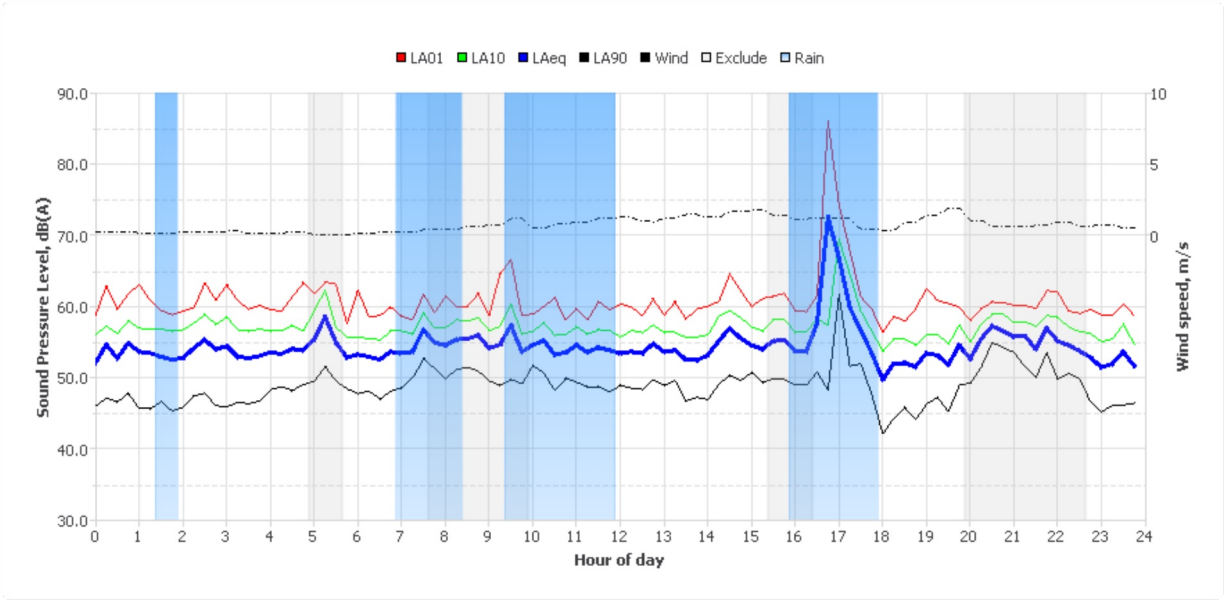
Wednesday, 24 Nov 2021



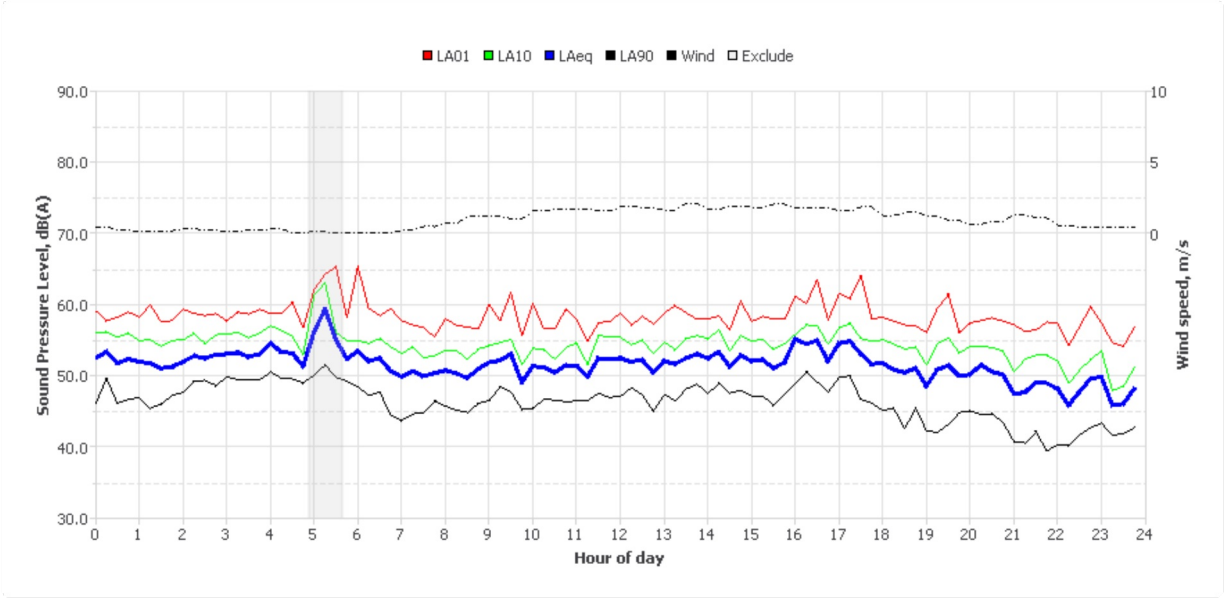
Thursday, 25 Nov 2021



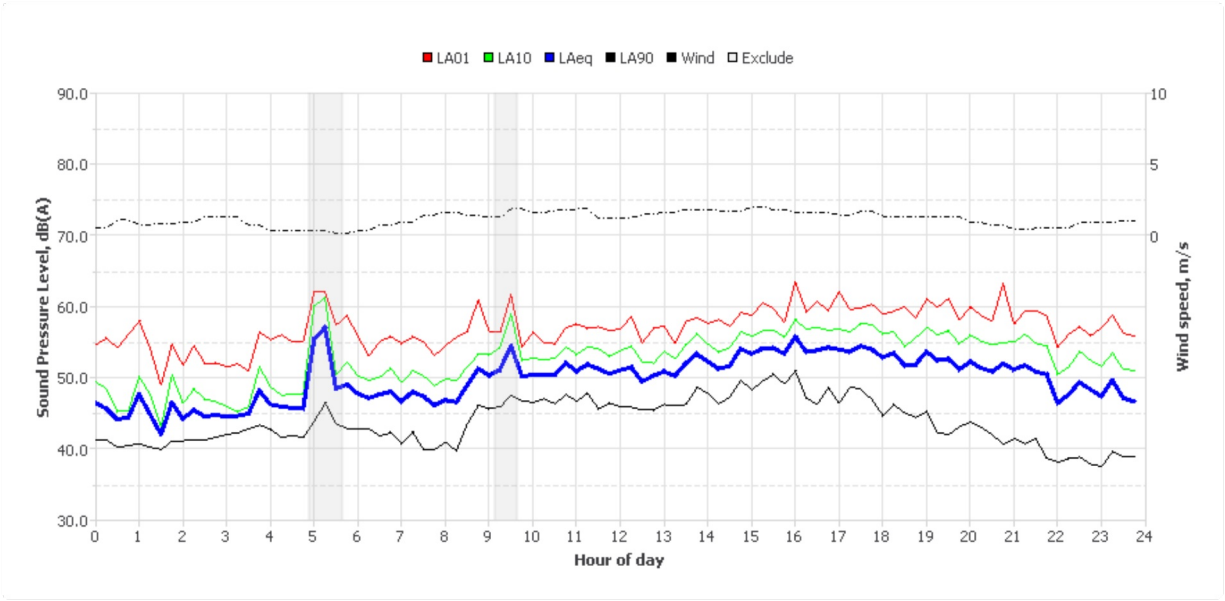
Friday, 26 Nov 2021



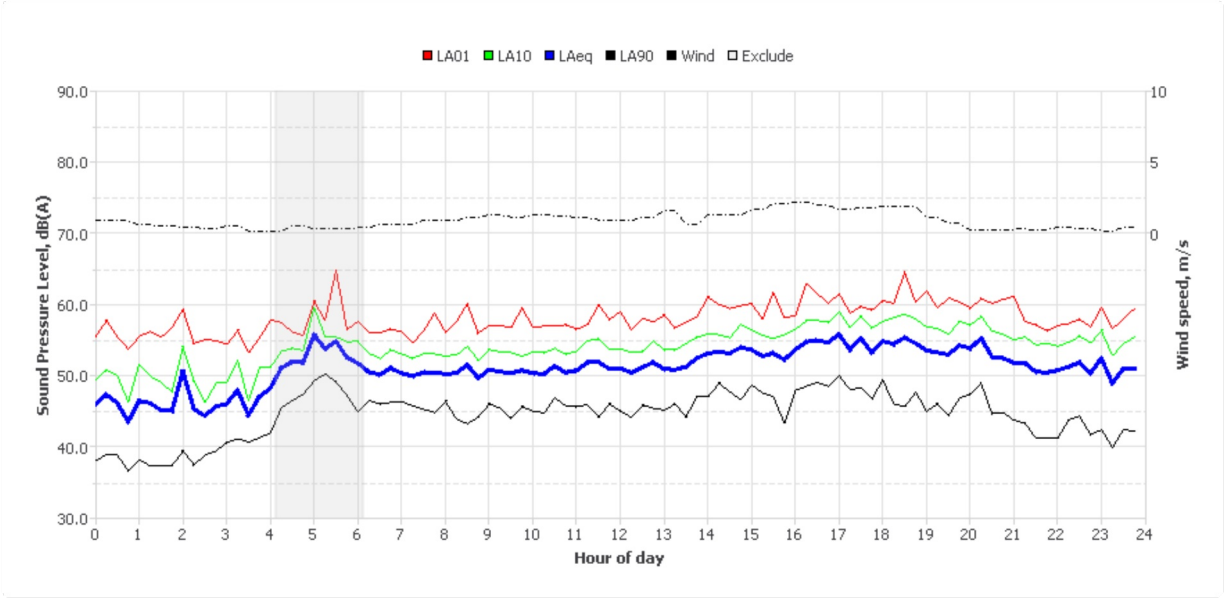
Saturday, 27 Nov 2021



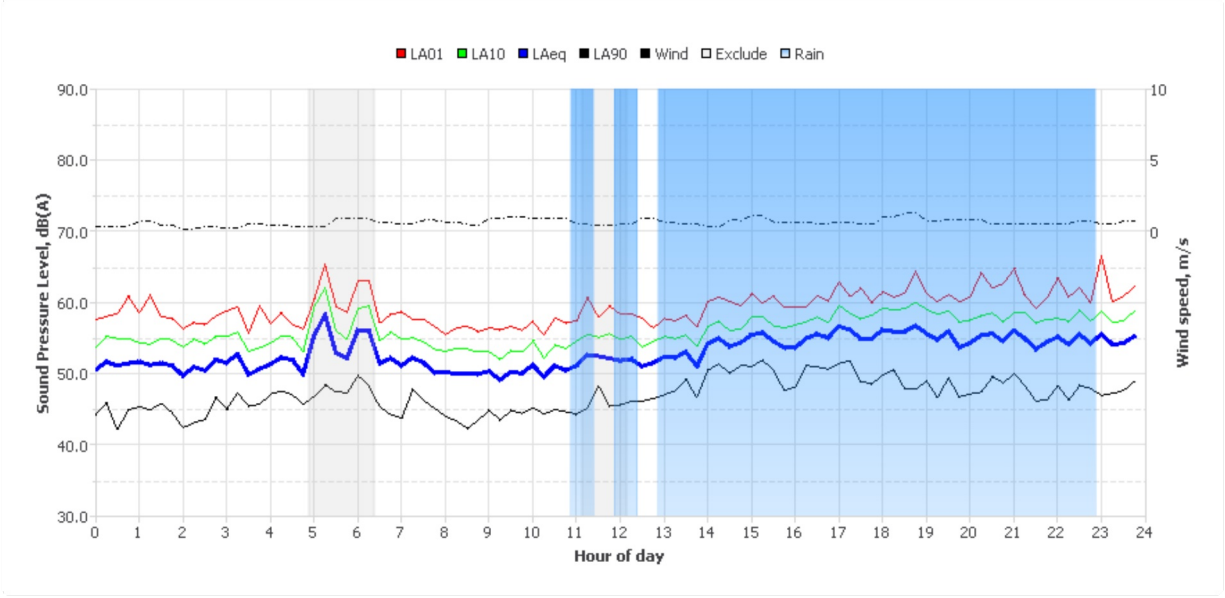
Sunday, 28 Nov 2021



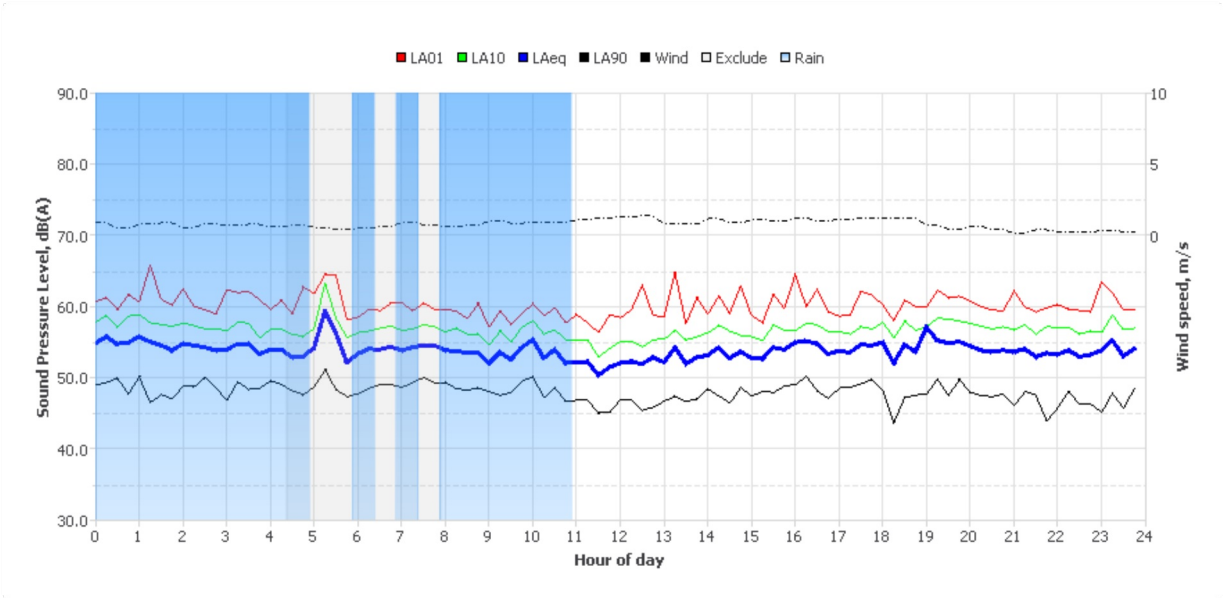
Monday, 29 Nov 2021



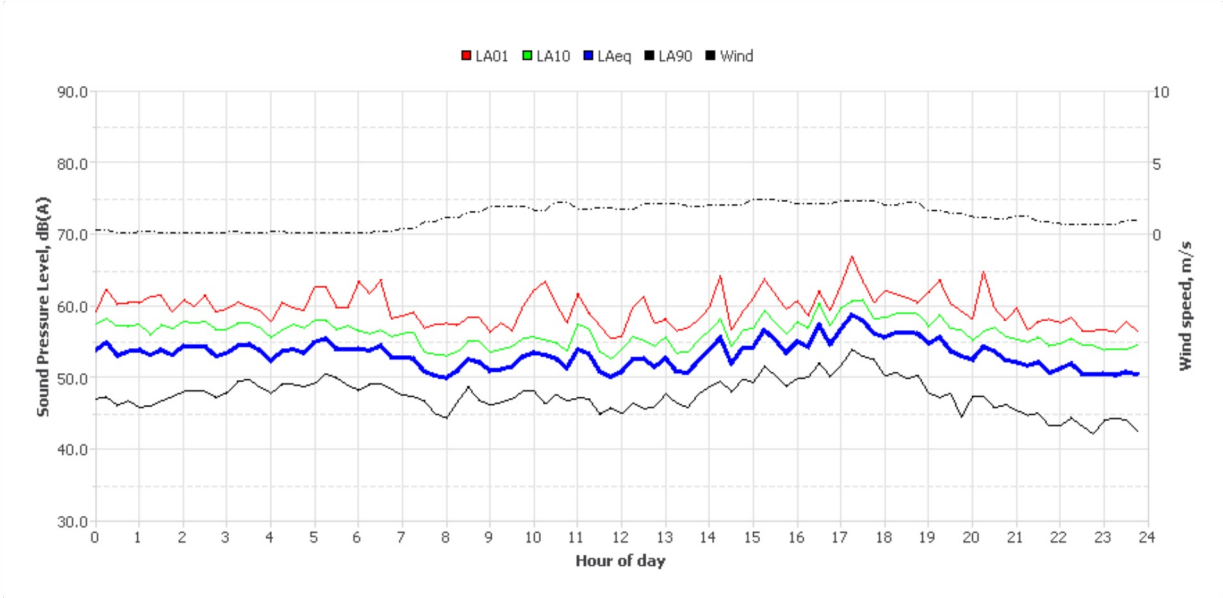
Tuesday, 30 Nov 2021



Wednesday, 01 Dec 2021



Thursday, 02 Dec 2021



Noise Logger Report

5559 Pacific Highway, Wells Crossing

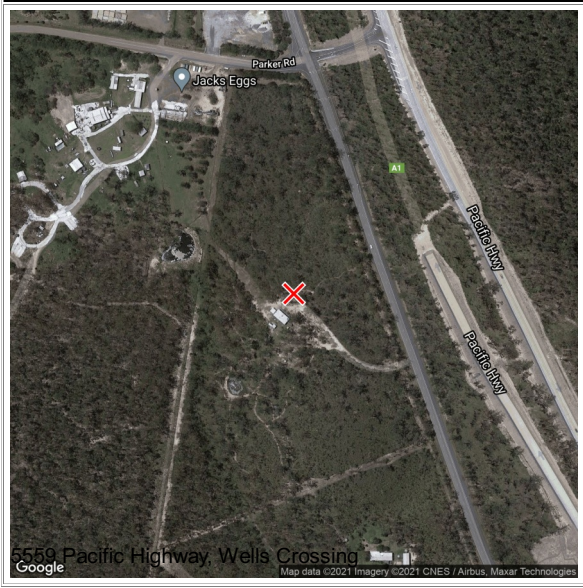
Item	Information
Logger Type	Cube
Serial number	12304
Address	5559 Pacific Highway, Wells Crossing
Location	Front Yard
Facade / Free Field	Free Field
Environment	Road traffic noise is dominant from the highway. Trucks 48-58 dBA. Insects and birds also audible.

Measured noise levels

Logging Date	$L_{Aeq,day}$ 7am-6pm	$L_{Aeq,evening}$ 6pm-10pm	$L_{Aeq,night}$ 10pm-7am	ABL Day 7am-6pm	ABL Eve 6pm-10pm	ABL Night 10pm-7am	$L_{Aeq,15hr}$ 7am-10pm	$L_{Aeq,9hr}$ 10pm-7am
Fri Nov 19 2021	50	48	51	41	-	-	49	51
Sat Nov 20 2021	48	46	47	-	-	-	48	47
Sun Nov 21 2021	48	-	43	-	-	-	48	43
Mon Nov 22 2021	51	50	49	43	42	-	51	49
Tue Nov 23 2021	50	50	49	43	41	-	50	49
Wed Nov 24 2021	50	51	49	-	-	-	50	49
Thu Nov 25 2021	51	52	51	-	-	-	51	51
Fri Nov 26 2021	51	51	51	-	43	42	51	51
Sat Nov 27 2021	50	48	49	43	40	-	49	49
Sun Nov 28 2021	50	50	46	41	40	-	50	46
Mon Nov 29 2021	49	51	46	42	41	-	50	46
Tue Nov 30 2021	48	-	49	-	-	-	48	49
Wed Dec 1 2021	51	52	51	-	45	-	51	51
Thu Dec 2 2021	51	51	50	44	-	-	51	50
Summary	**50**	**50**	**49**	**43**	**41**	**42**	**50**	**49**

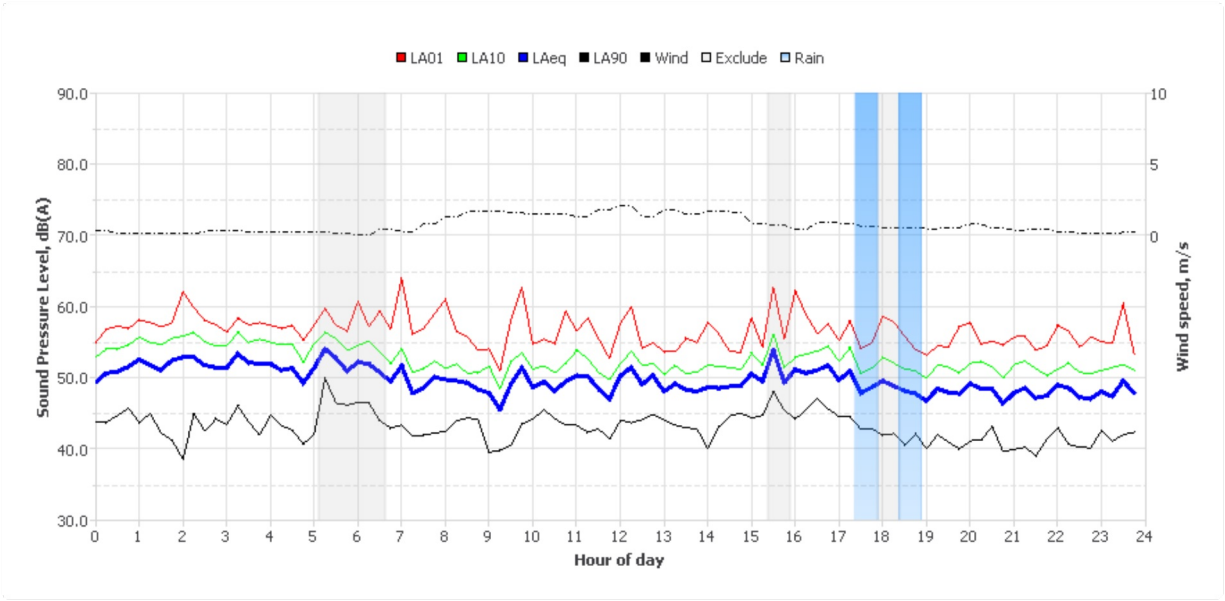
Note: Results denoted with '-' do not contain enough valid data for a value to be calculated. The data has been excluded either manually or automatically as a result of adverse weather conditions.

Logger Location

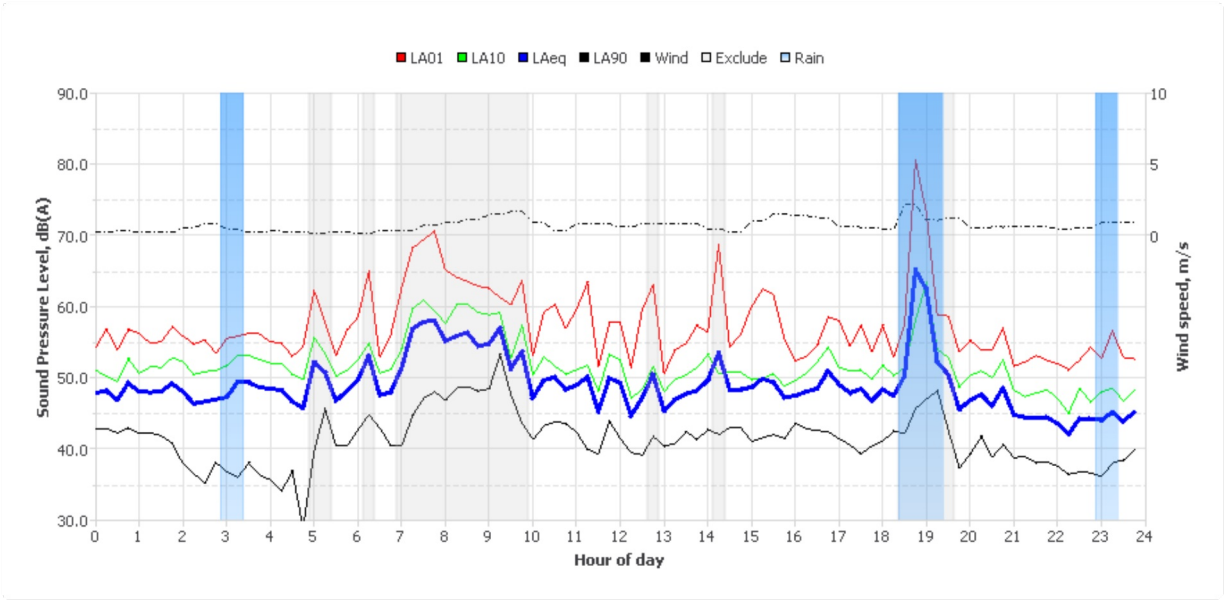


Logger Deployment Photo

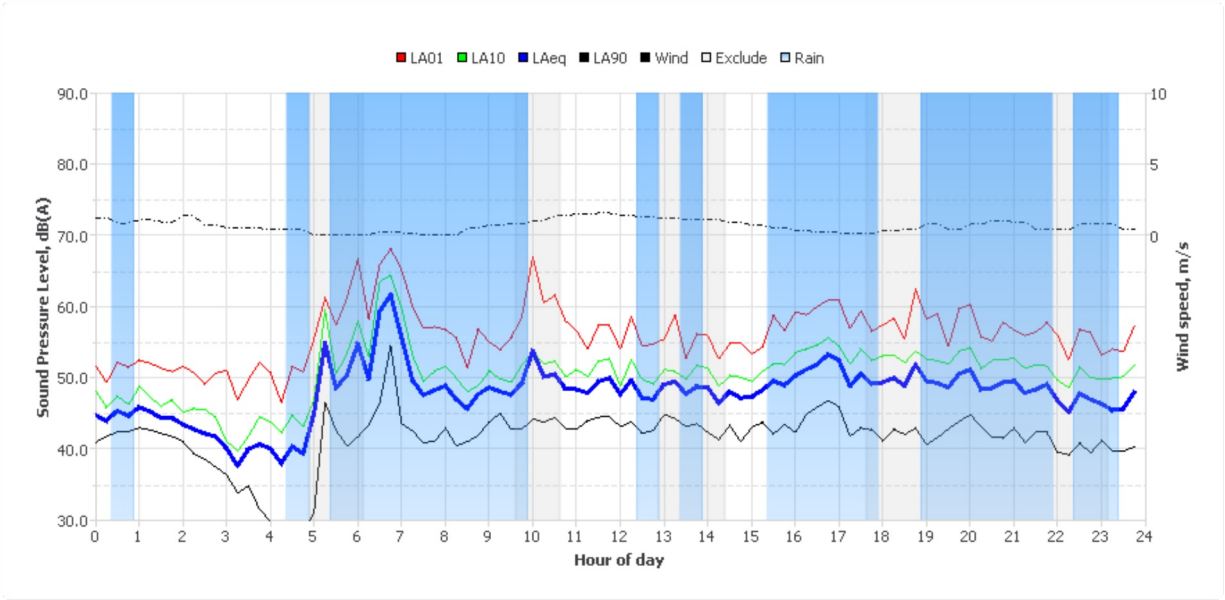
Friday, 19 Nov 2021



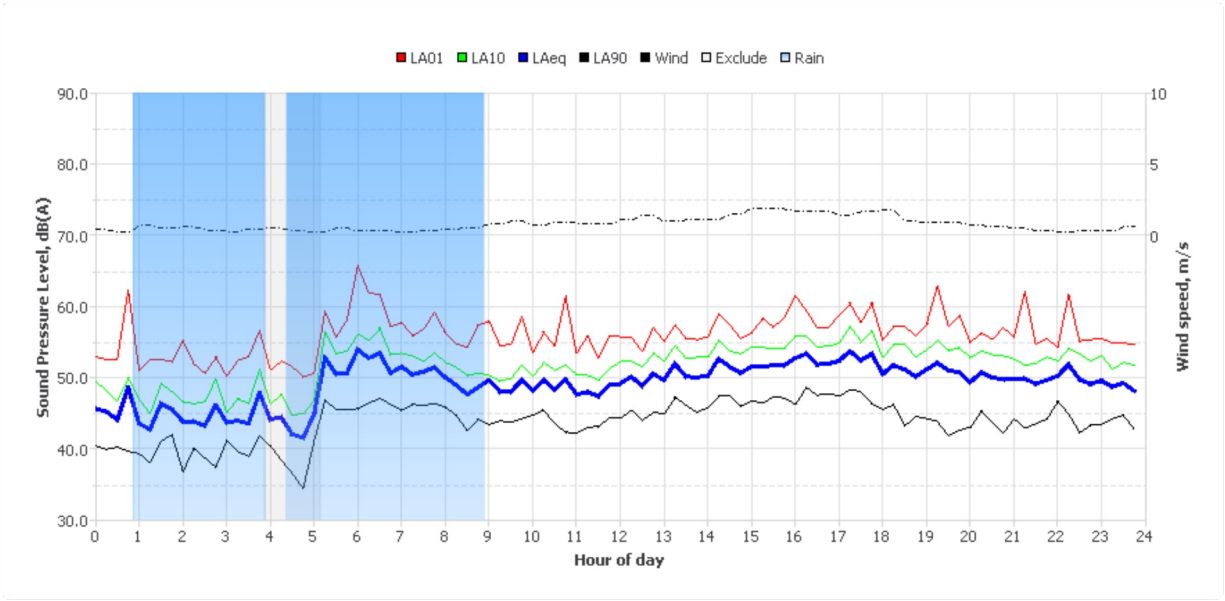
Saturday, 20 Nov 2021



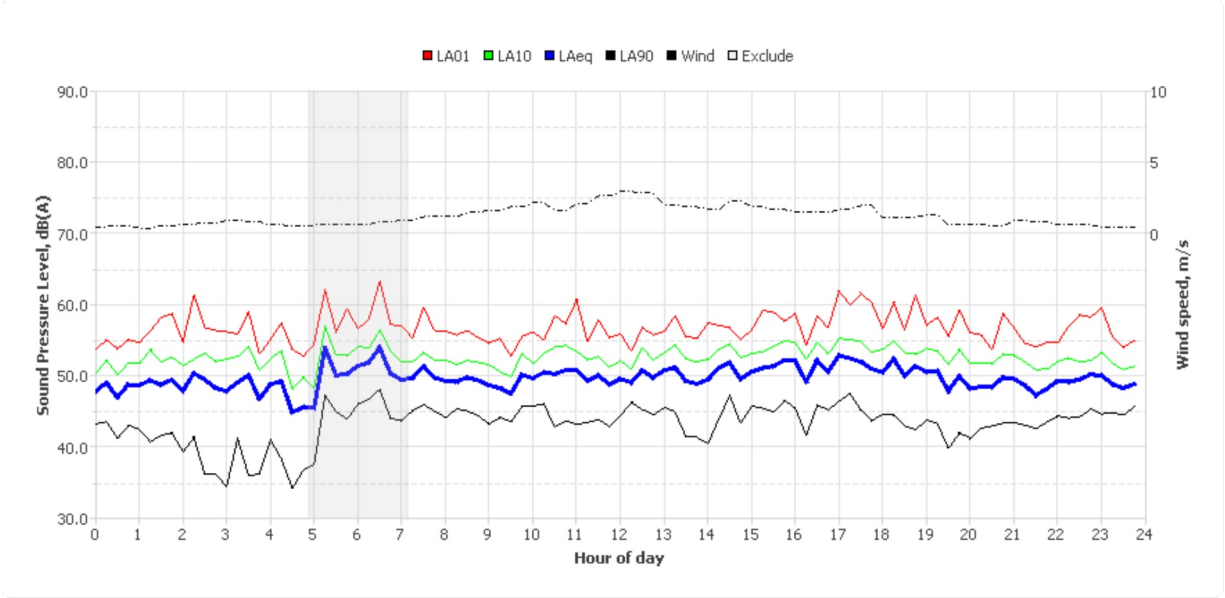
Sunday, 21 Nov 2021



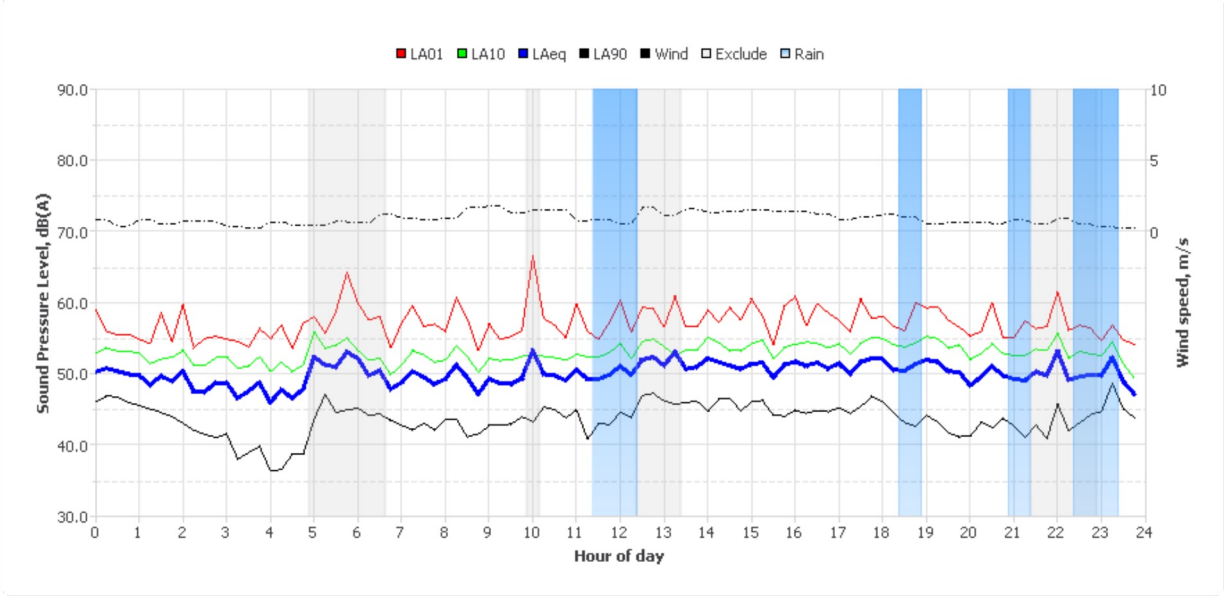
Monday, 22 Nov 2021



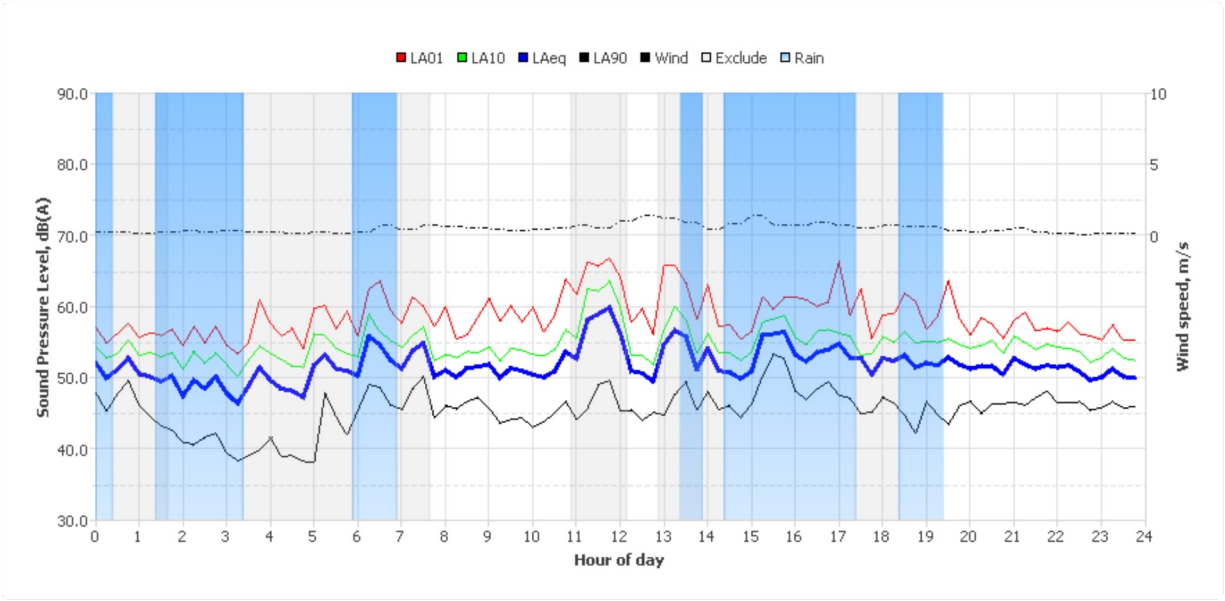
Tuesday, 23 Nov 2021



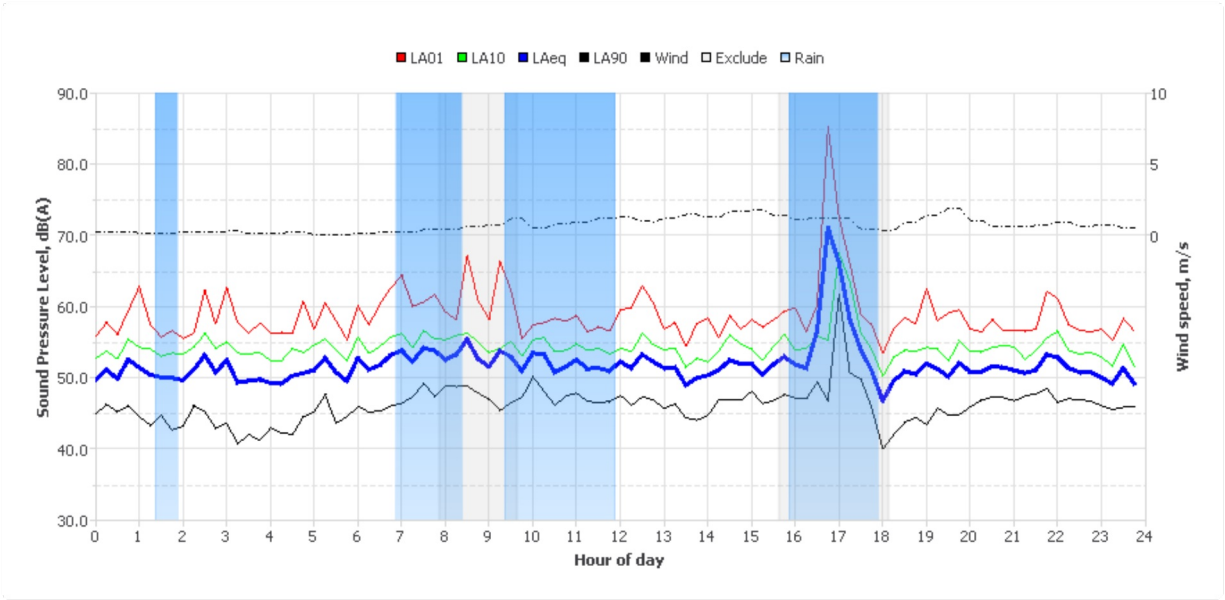
Wednesday, 24 Nov 2021



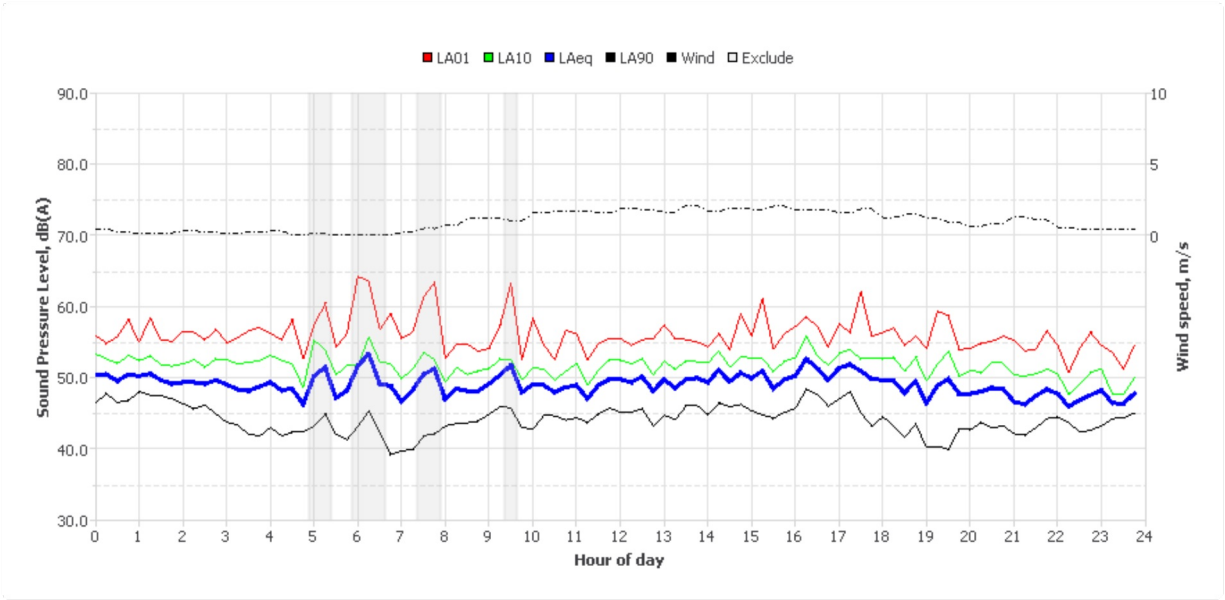
Thursday, 25 Nov 2021



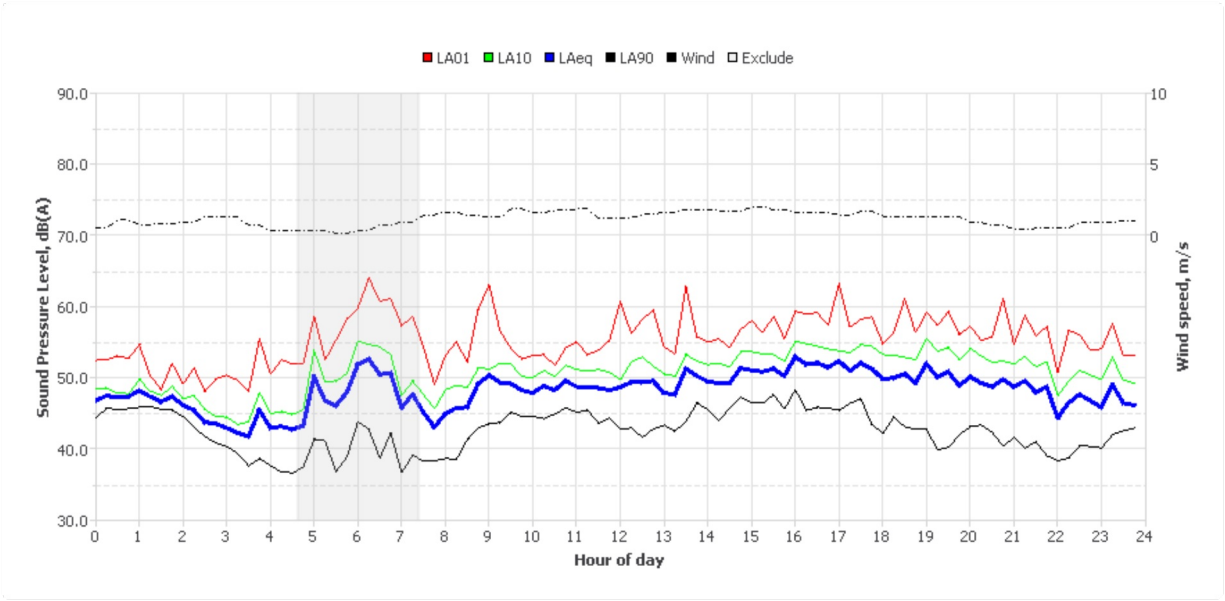
Friday, 26 Nov 2021



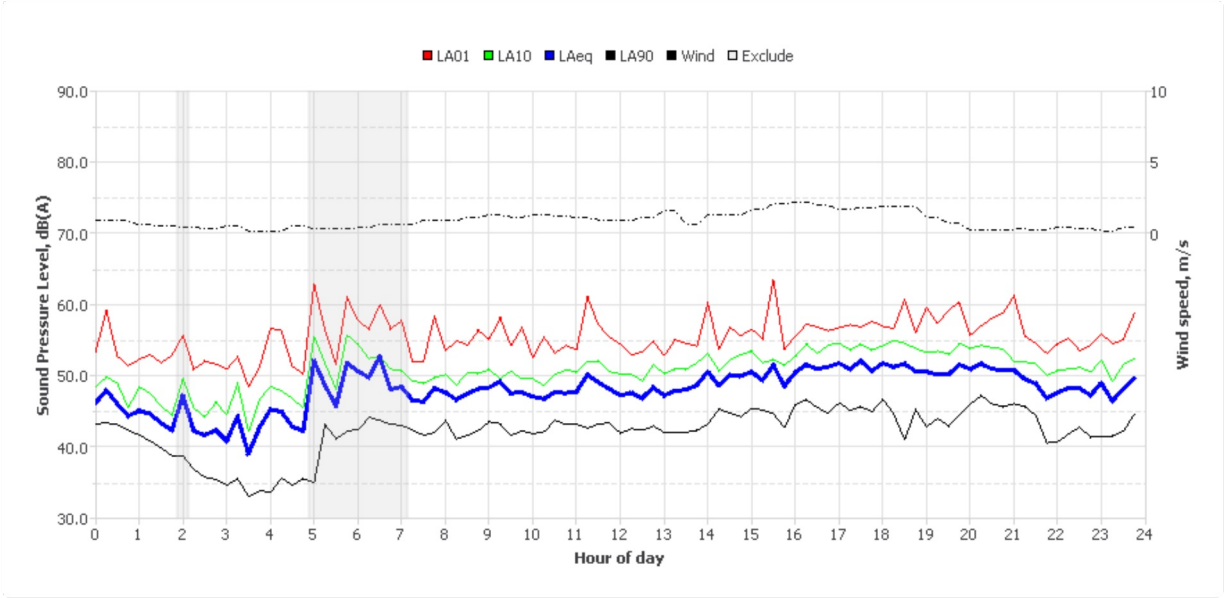
Saturday, 27 Nov 2021



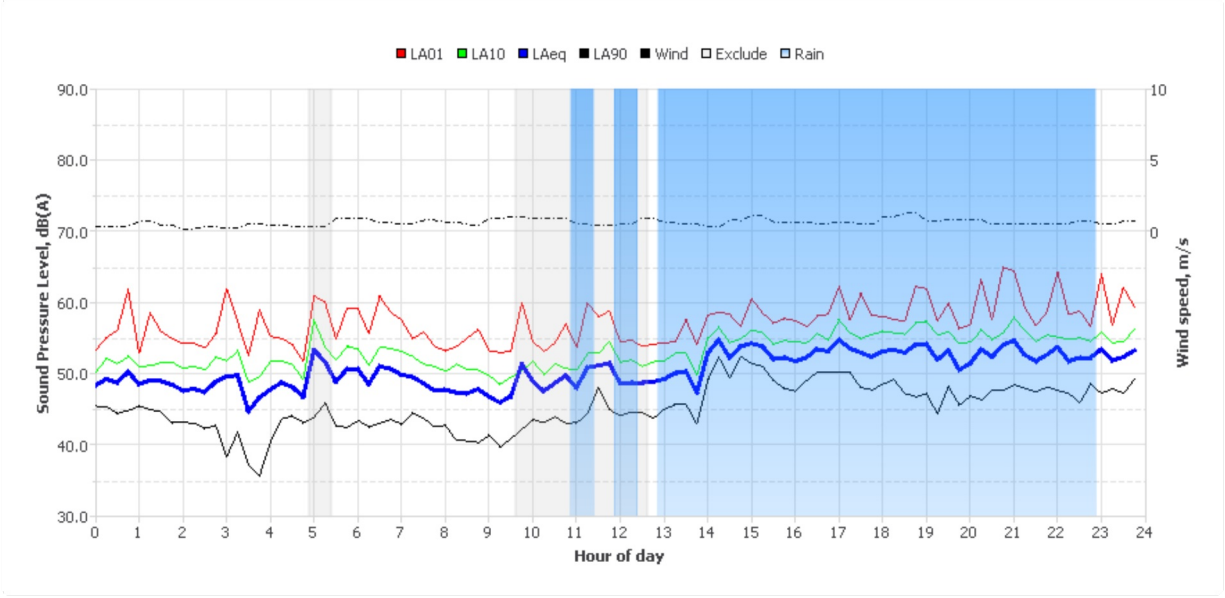
Sunday, 28 Nov 2021



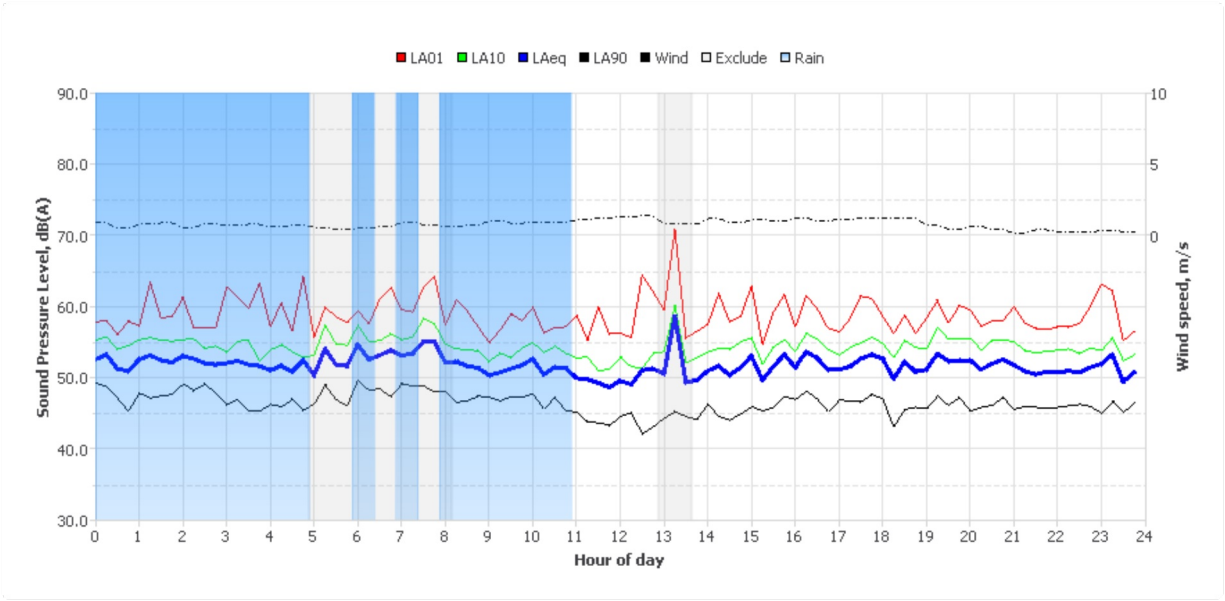
Monday, 29 Nov 2021



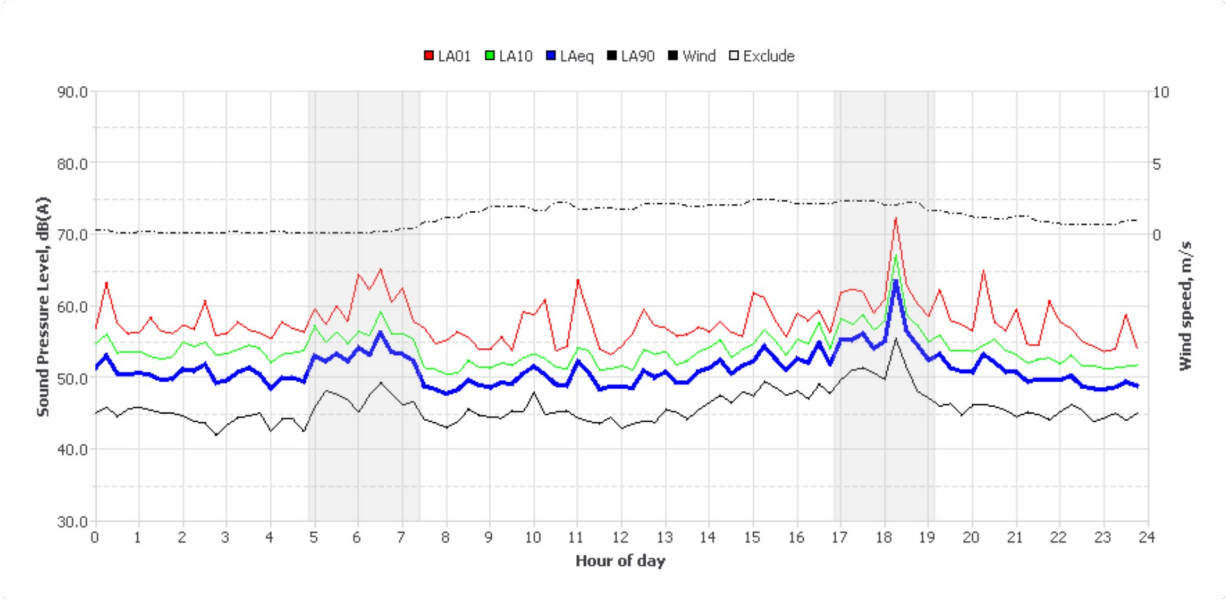
Tuesday, 30 Nov 2021



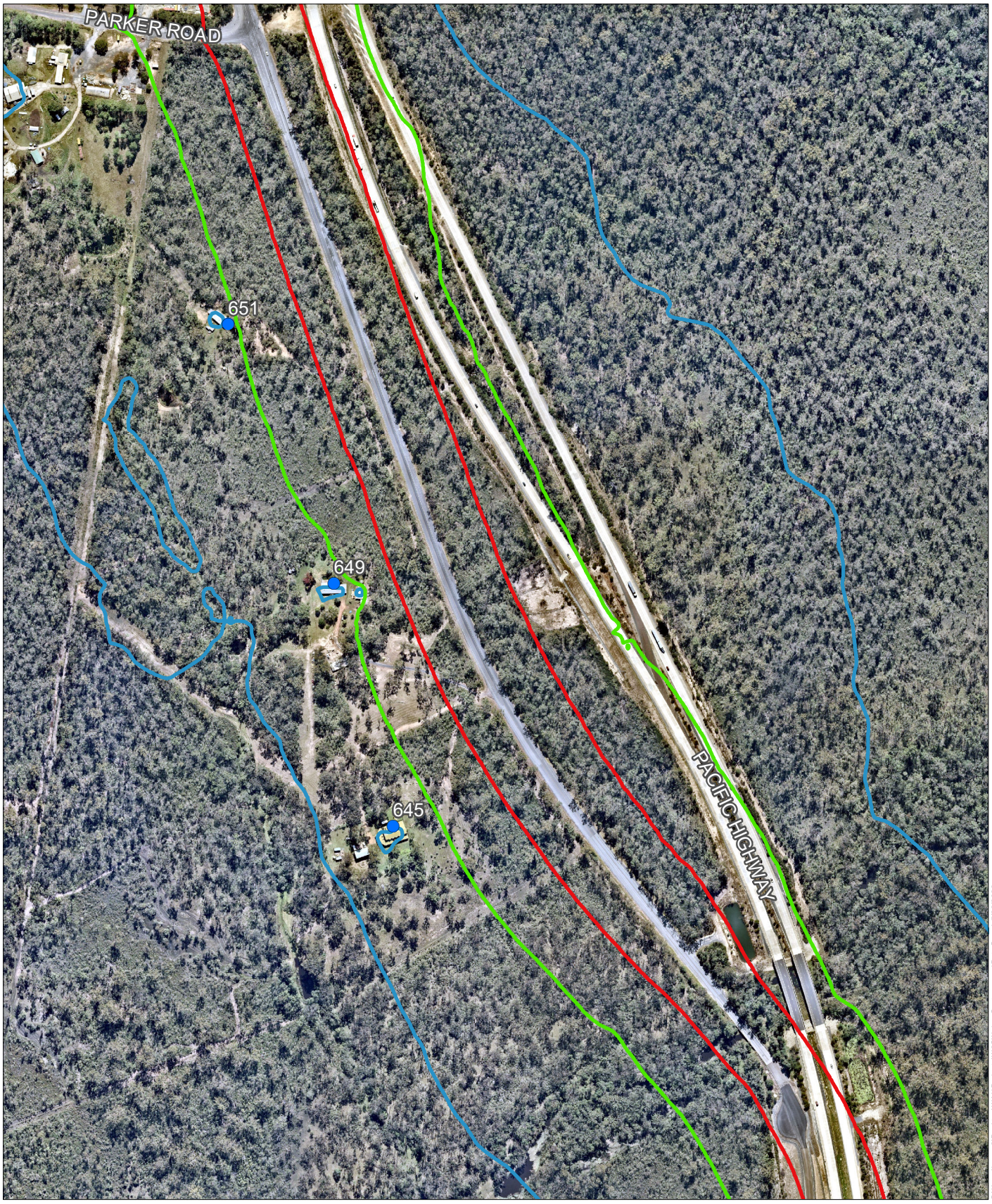
Wednesday, 01 Dec 2021



Thursday, 02 Dec 2021



Appendix C



W2G - Wells Crossing - Year of Opening - No Build - Day

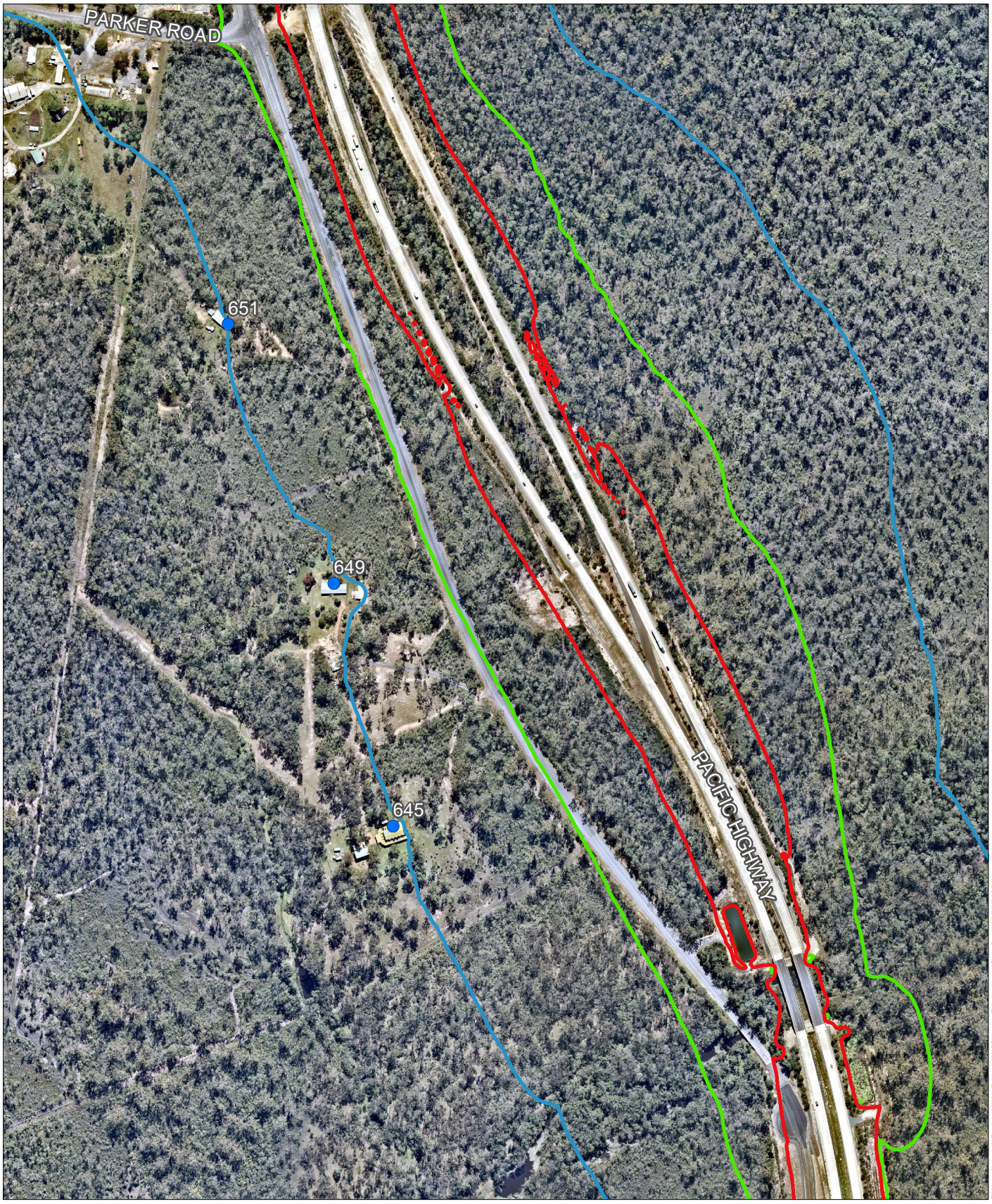
N

0 50 100 Meters

AECOM

Sound Pressure Level, $L_{Aeq\ 15hr}$ dBA

- 55
- 60
- 65



W2G - Wells Crossing - Year of Opening - Build - Day

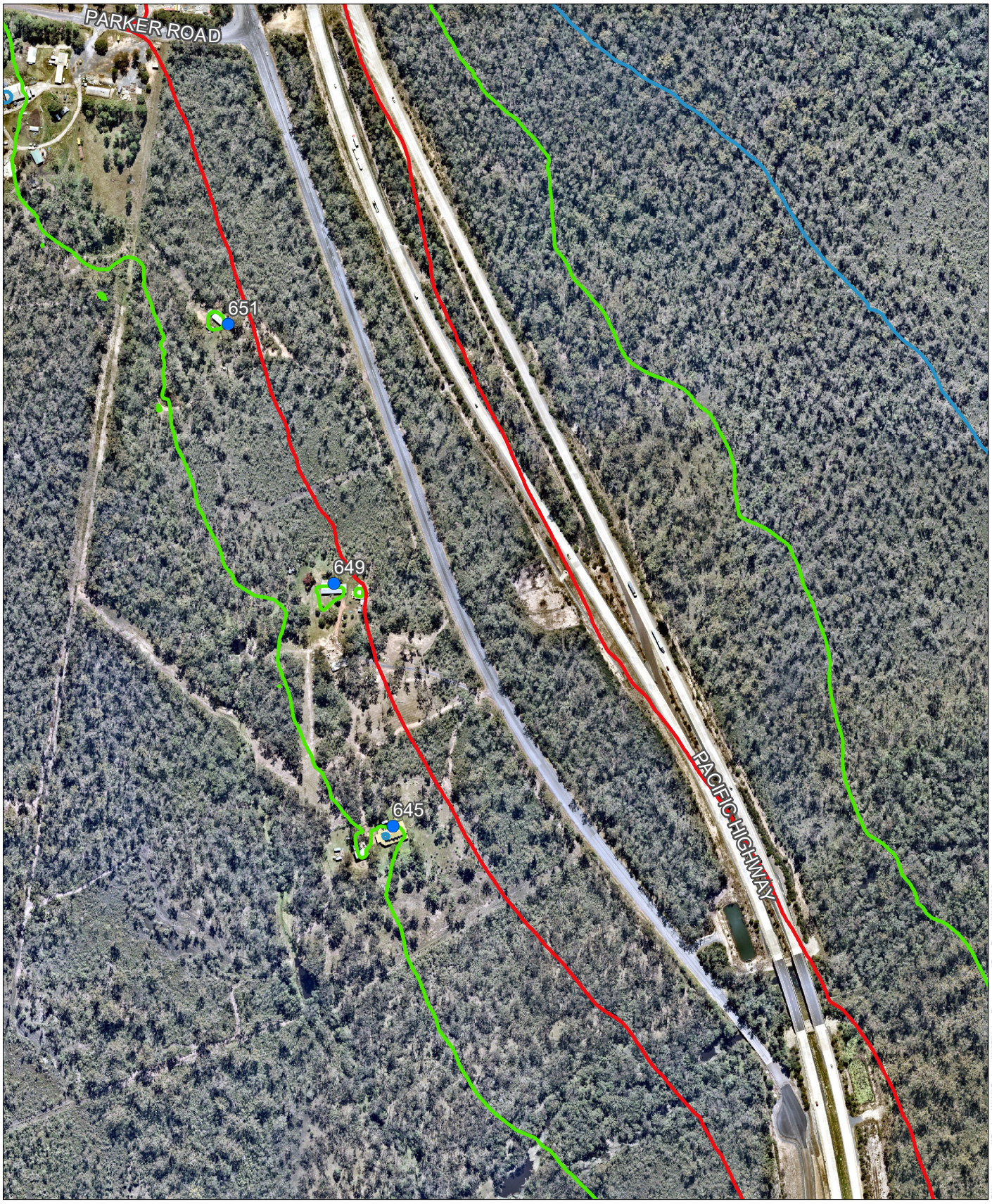
N

0 50 100 Meters

AECOM

Sound Pressure Level, $L_{Aeq\ 15hr}$ dBA

- 55
- 60
- 65



W2G - Wells Crossing - Year of Opening - No Build - Night

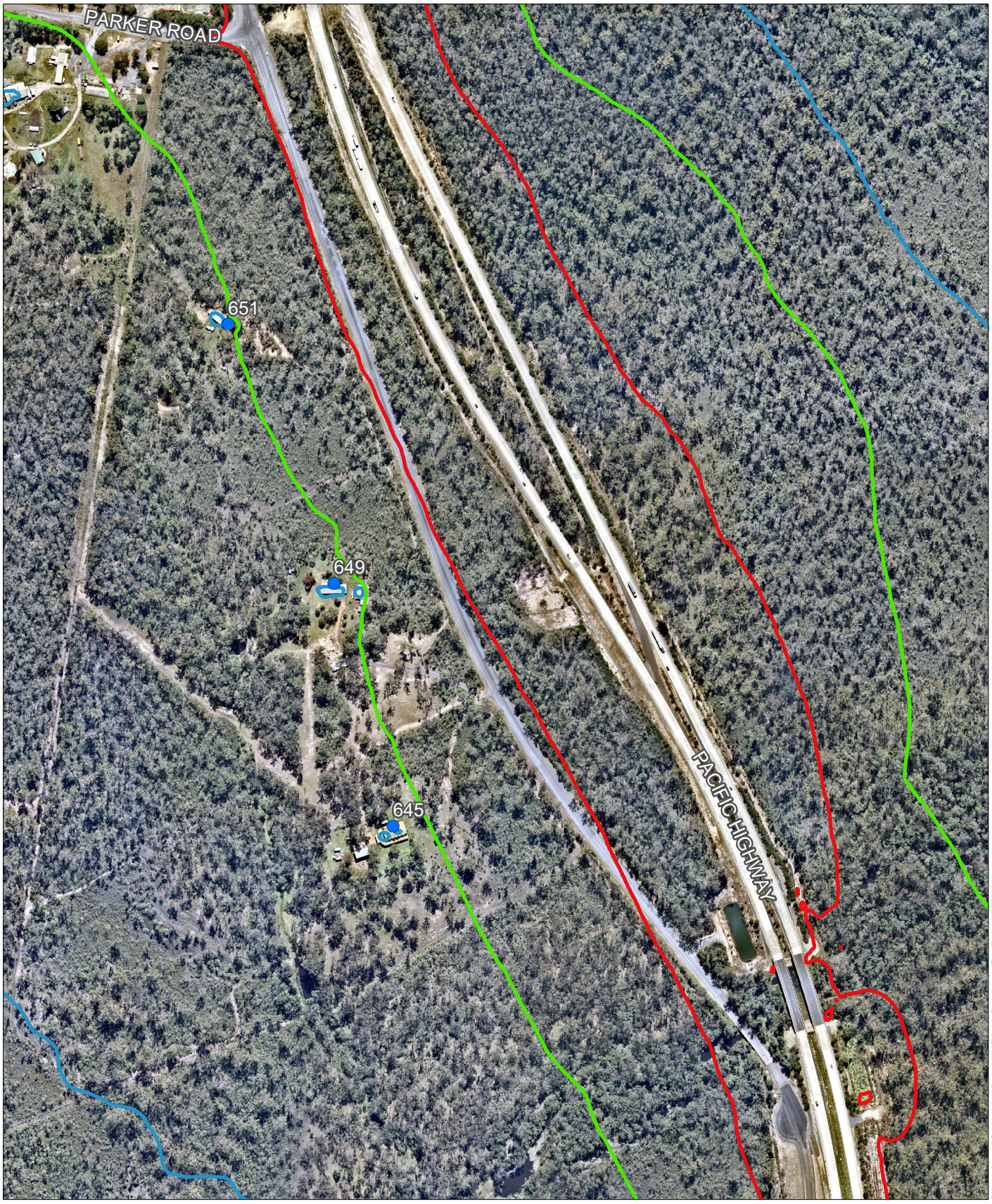
N

0 50 100 Meters

AECOM

Sound Pressure Level, $L_{Aeq\ 9hr}$ dBA

- 50
- 55
- 60



W2G - Wells Crossing - Year of Opening - Build - Night

N

0 50 100 Meters

AECOM

Sound Pressure Level, $L_{Aeq\ 9hr}$ dBA

- 50
- 55
- 60

W2G - Wells Crossing - Design Year - No Build - Day

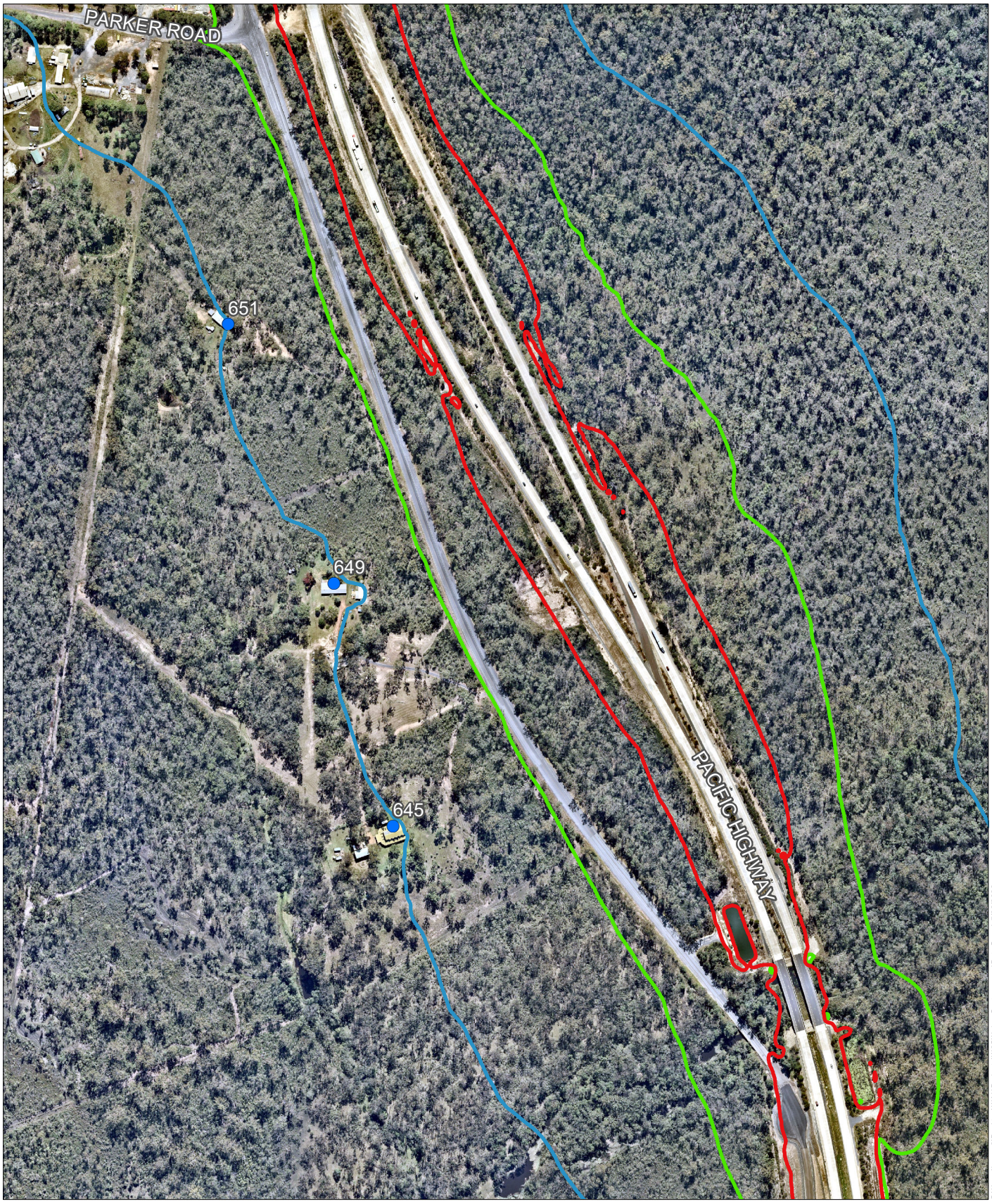
N

0 50 100 Meters

AECOM

Sound Pressure Level, $L_{Aeq\ 15hr}$ dBA

- 55
- 60
- 65



W2G - Wells Crossing - Design Year - Build - Day

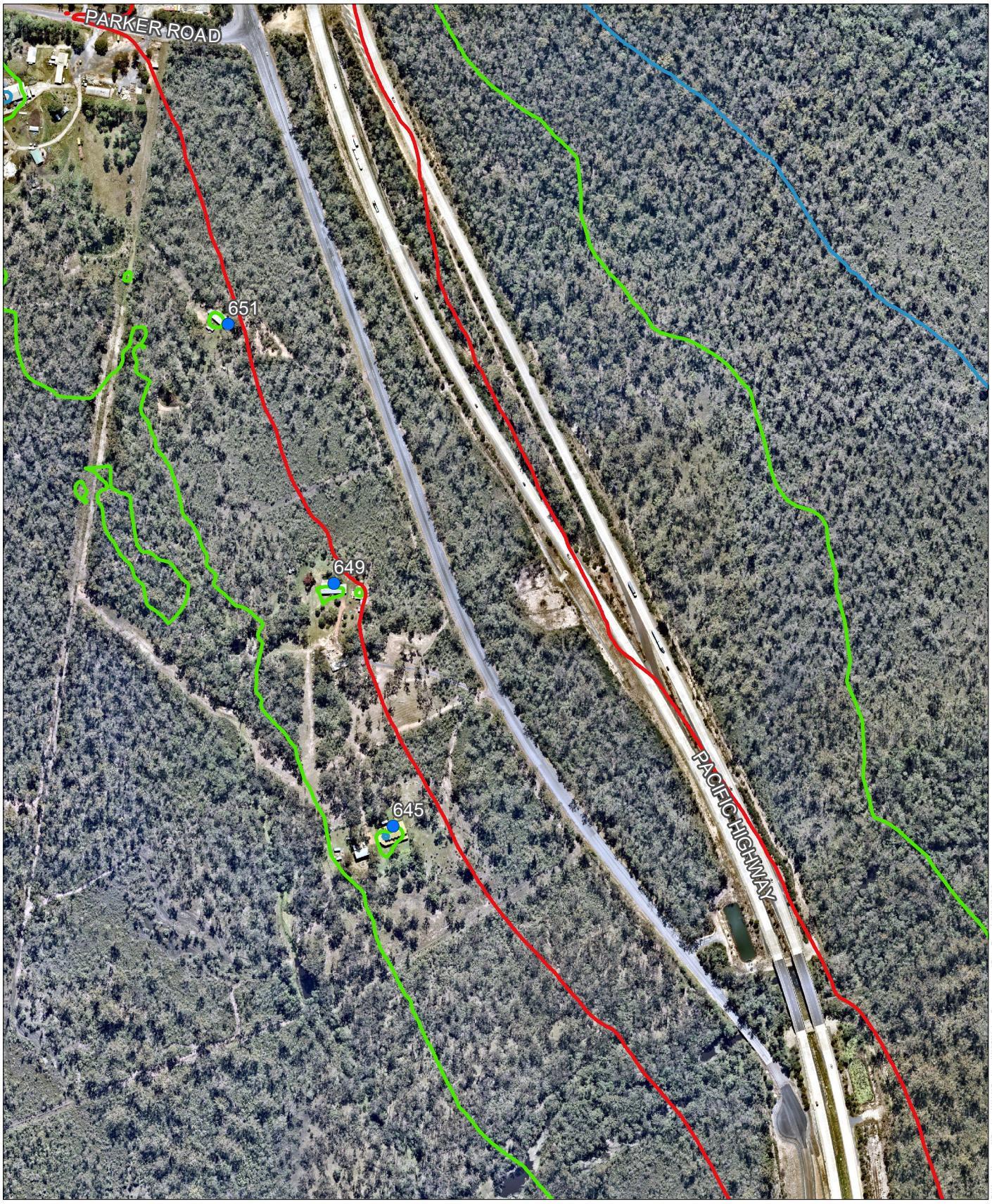
N

0 50 100 Meters

AECOM

Sound Pressure Level, $L_{Aeq\ 15hr}$ dBA

- 55
- 60
- 65



W2G - Wells Crossing - Design Year - No Build - Night

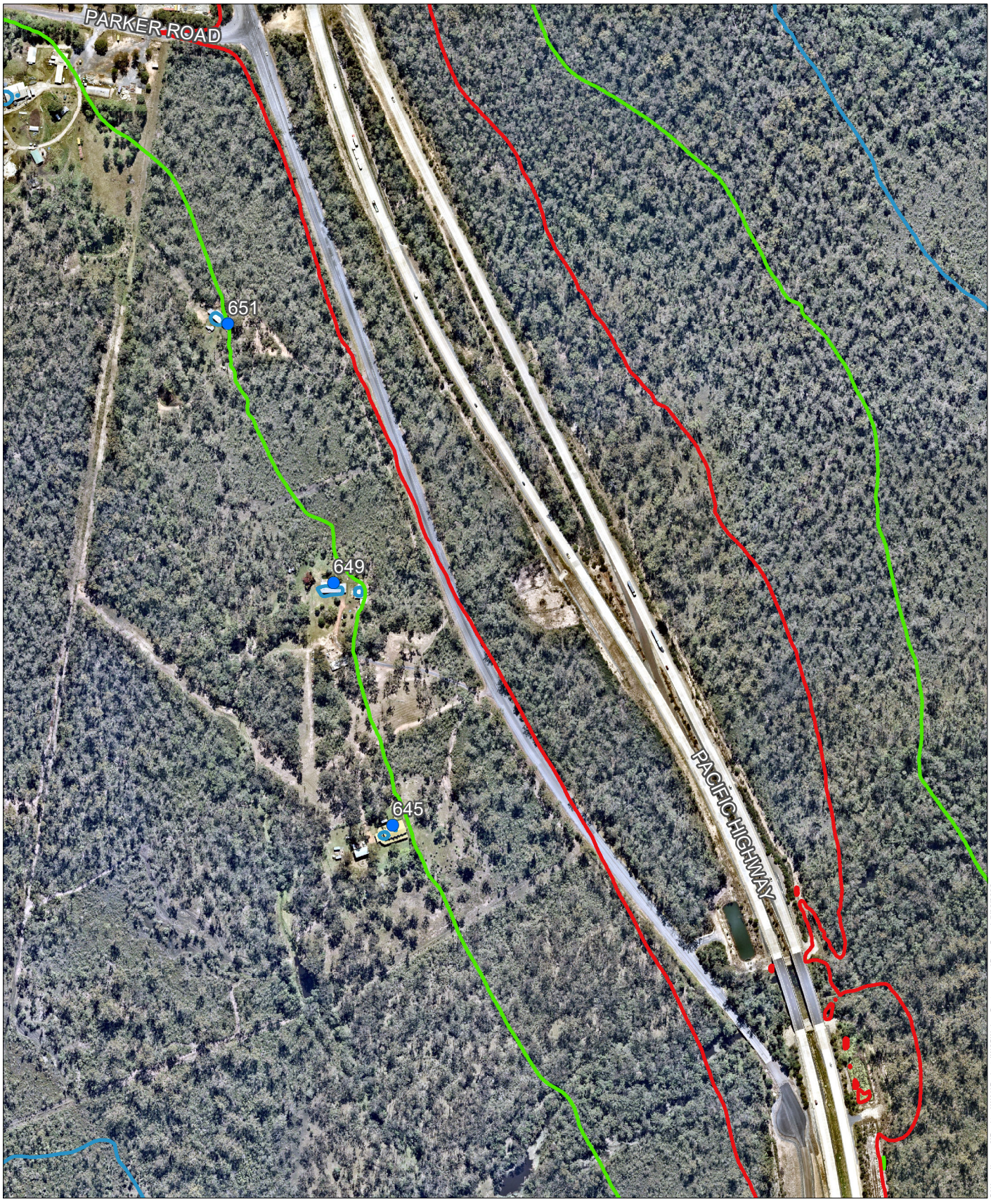
N

0 50 100 Meters

AECOM

Sound Pressure Level, $L_{Aeq\ 9hr}$ dBA

- 50
- 55
- 60



W2G - Wells Crossing - Design Year - Build - Night

N

0 50 100 Meters

AECOM

Sound Pressure Level, $L_{Aeq\ 9hr}$ dBA

- 50
- 55
- 60

Appendix D

Receiver ID	Address	Lot DP	Façade				Predicted noise level Opening Year 2020						Predicted noise level Design Year 2030						Change in noise level (Build - No Build)				NCG Project road noise criteria		NCG Project road noise criteria exceedance (dB)		Is the contribution from the road project Acute?		Is the property identified for consideration of treatment?
							No Build		Build		Project Only		No Build		Build		Project Only		Opening Year 2020		Design Year 2030								
			X	Y	Floor level	Direction	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	
645	5521 Pacific Hwy, Wells Crossing	4/DP611242	505932.5	6692320.1	GF	N	59	58	55	54	55	54	59	58	56	55	56	55	-3.5	-3.4	-3.4	-3.3	60	55	0.0	0.0	No	No	No			
645	5521 Pacific Hwy, Wells Crossing	4/DP611242	505932.5	6692320.1	F 1	N	60	59	56	55	56	55	61	60	57	56	57	56	-3.9	-3.7	-3.9	-3.7	60	55	0.0	1.0	No	No	No			
645	5521 Pacific Hwy, Wells Crossing	4/DP611242	505922.4	6692310.2	GF	W	46	45	44	43	44	43	46	46	44	44	44	44	-2.1	-2.0	-2.0	-2.0	60	55	0.0	0.0	No	No	No			
645	5521 Pacific Hwy, Wells Crossing	4/DP611242	505922.4	6692310.2	F 1	W	49	48	47	46	47	46	50	49	47	46	47	46	-2.3	-2.3	-2.3	-2.2	60	55	0.0	0.0	No	No	No			
645	5521 Pacific Hwy, Wells Crossing	4/DP611242	505936.6	6692308.2	GF	S	57	56	54	53	54	53	58	57	55	54	55	54	-2.9	-3.0	-2.9	-2.9	60	55	0.0	0.0	No	No	No			
645	5521 Pacific Hwy, Wells Crossing	4/DP611242	505936.6	6692308.2	F 1	S	59	58	55	54	55	54	59	58	56	55	56	55	-3.5	-3.4	-3.4	-3.5	60	55	0.0	0.0	No	No	No			
645	5521 Pacific Hwy, Wells Crossing	4/DP611242	505946.8	6692318.1	GF	E	61	60	58	57	58	57	62	61	58	57	58	57	-3.2	-3.2	-3.3	-3.2	60	55	0.0	2.4	No	No	No			
645	5521 Pacific Hwy, Wells Crossing	4/DP611242	505946.8	6692318.1	F 1	E	62	62	59	58	59	58	63	62	59	58	59	58	-3.9	-3.8	-3.9	-3.8	60	55	0.0	3.3	No	No	No			
649	5523 Pacific Hwy, Wells Crossing	3/DP611242	505871.4	6692571.0	GF	N	61	60	56	56	56	56	62	61	57	56	57	56	-5.1	-4.8	-5.1	-4.8	60	55	0.0	1.1	No	No	No			
649	5523 Pacific Hwy, Wells Crossing	3/DP611242	505857.4	6692565.1	GF	W	55	54	49	48	49	48	55	54	49	49	49	49	-5.8	-5.3	-5.8	-5.4	60	55	0.0	0.0	No	No	No			
649	5523 Pacific Hwy, Wells Crossing	3/DP611242	505871.6	6692559.4	GF	S	58	57	53	52	53	52	58	58	54	53	54	53	-4.5	-4.6	-4.6	-4.6	60	55	0.0	0.0	No	No	No			
649	5523 Pacific Hwy, Wells Crossing	3/DP611242	505885.5	6692565.4	GF	E	62	61	56	55	56	55	62	61	57	56	57	56	-5.5	-5.3	-5.6	-5.3	60	55	0.0	1.1	No	No	No			
651	5559 Pacific Hwy, Wells Crossing	1/DP586161	505761.9	6692838.4	GF	SE	62	61	57	57	57	57	62	61	58	57	58	57	-4.6	-4.0	-4.5	-4.1	60	55	0.0	2.2	No	No	No			
651	5559 Pacific Hwy, Wells Crossing	1/DP586161	505758.2	6692848.9	GF	NE	62	61	57	57	57	57	62	61	58	57	58	57	-4.4	-3.9	-4.4	-4.0	60	55	0.0	2.3	No	No	No			
651	5559 Pacific Hwy, Wells Crossing	1/DP586161	505747.6	6692850.7	GF	NW	57	56	52	52	52	52	58	57	53	53	53	53	-4.8	-4.3	-4.8	-4.4	60	55	0.0	0.0	No	No	No			
651	5559 Pacific Hwy, Wells Crossing	1/DP586161	505751.3	6692840.2	GF	SW	55	54	51	50	51	50	56	55	51	51	51	51	-4.5	-4.4	-4.5	-4.4	60	55	0.0	0.0	No	No	No			