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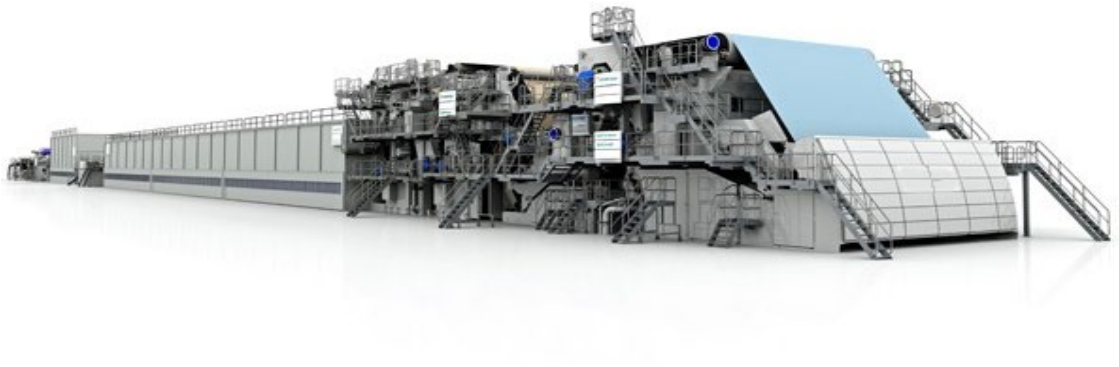
Opal Pty Ltd

Botany Paper Mill – EPL Compliance
May 2021 Quarterly noise monitoring report



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Opal Pty Ltd
Botany Paper Mill - EPL Compliance

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Hutchison Weller Pty Ltd
ABN 37 001 024 095
13/357 Military Road
Mosman NSW 2008

www.hutchisonweller.com

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Glossary

Acoustic and vibration related terms:

- **Acoustic Spectrum:** A representation of a sound sample (usually short term) of the amount of energy or sound level per frequency.
- **Ambient Noise**: Ambient noise encompasses all sound present in a given environment, being usually a composite of sounds from many sources near and far.
- **dB(A):** A unit of sound measurement which has frequency characteristics weighted so that it approximates the response of the human ear to sound waves
- **Heavy Vehicle**: A truck, transport or other vehicle with a gross vehicle weight above a specified level (for example: over 8 tonnes)
- L_{A90}: Is the noise level that is exceeded 90 per cent of the measurement time. This parameter is commonly referred to as the background noise level
- L_{Aeq}: Noise level that represents the energy average noise from the source during a specified time period, and is the equivalent continuous sound pressure level for a given period
- $L_{Aeq(15hr)}$: The Leq noise level for the period from 7 am to 10 pm.
- $L_{Aeq(9hr)}$: The Leq noise level for the period from 10 pm to 7 am.
- **NCA**: Noise Catchment Area. Grouping dwellings or receivers together in terms of similar noise environment.
- **Noise barrier**: Generally a wall or an earth mound that obstructs or restricts the passage of sounds waves from a noise source
- **Noise Logger**: A data logging (data and audio in some cases) which records noise. Usually used for unattended noise monitoring of background or ambient noise.
- **NML**: Noise Management Level as detailed in the NSW Interim Construction Noise Guideline. The NML is the noise goal for construction activities.
- **Octave Bands**: Sounds that contain energy over a wide range of frequencies are divided into sections called bands. A common standard division is in 10 octave bands identified by their center frequencies 31.5, 63, 250, 500, 1000, 2000, and 4000 Hz
- **RBL**: Rating Background Level is the overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used for determining the appropriate construction noise criteria.
- **RNP**: Road Noise Policy (OEH, 2011)
- **Sound Level Meter**: An instrument consisting of a microphone, amplifier and data analysis package for quantifying and measuring noise.
- **Sound Power Level** (Lw): Sound power level or acoustic power level is a logarithmic measure of the sound power in comparison to a specified reference level.
- **Sound Pressure Level** (SPL or Lp): The level of noise, usually expressed in dB(A), as measured by a standard sound level meter.

1. Introduction

1.1 Background

OPAL operates a paper mill at its Botany site in Sydney, NSW. The paper mill is subject to operational noise conditions set out in the Ministers Conditions of Approval (MCoA) (including subsequent modifications) and the Environment Protection Licence (EPL) No. 1594.

As part of the EPL, there is a requirement to undertake quarterly monitoring at receivers surrounding the site to show compliance with set noise limits. This report covers the May 2021 – July 2021 quarter. At the time of monitoring, the B9 paper machine was operating at typical production capacity but was shut down for routine maintenance between June 7 and June 11 2021.

1.2 Objective

This report addresses operational licence conditions relating to measurements of the quarterly monitoring of the noise environment around the Opal site, i.e. Condition M6.1 and M6.2 of EPL 1594. These require:

- M6.1 The licensee must undertake noise monitoring at least once every three months to check compliance with the noise limits specified in Condition L4.1.
- M6.2 All monitoring required by this licence must be undertaken in accordance with Australian Standard 2659.1 – 1998: Guide to the use of sound measuring equipment – Portable sound level meters, or any revisions of that standard which may be made by Australian Standards Authority, and the compliance monitoring guidance provided in the NSW Industrial Noise Policy.

1.3 Operational noise limits

Operational noise limits for the new Opal Paper Mill are detailed in condition L4.1 of EPL 1594 and Condition 10 of the MCoA. These have been replicated in **Table 1**.

Since the inception of the monitoring program dating back to as early as 2012, the same receiver locations have been used. This last noise monitoring survey only had access to 5 locations with the residence located at R3 (Murrabin Avenue) no longer available for survey access.

Table 1 Operational noise limits

ID	Location	Day $L_{Aeq,15min}$, dB(A)	Evening $L_{Aeq,15min}$, dB(A)	Night $L_{Aeq,15min}$, dB(A)	Night L_{Amax}, dB(A)
R1	Corner of McCauley Street and Australia Avenue	46	45	43	55
R2	Australia Avenue	45	45	43	55
R3*	Murrabin Avenue*	46	45	43	55
R4	Partanna Avenue	42	41	41	55
R5	Corner of Partanna Avenue and Moorina Avenue	42	42	39	55
R6	Moorina Avenue	43	43	39	55

*Receiver location no longer accessible

Regular quarterly monitoring surveys have demonstrated that direct measurement of Opal's contribution to the noise environment is not possible because noise emissions from the site are generally lower than the ambient measured L_{Aeq} noise levels, which masks the actual noise from the Opal site.

Ambient noise levels measured at the receiver locations using the L_{Aeq} noise parameter are therefore not a true representation of noise from the Opal site but a combination of influences from all local noise sources.

The influence from Opal on the local noise environment may be better described using the L_{A90} statistical parameter. This additional parameter has been presented in the results summary to be considered in conjunction with the L_{Aeq} noise level when assessing compliance of the Opal site.

During the night time periods fewer extraneous noise influences are present providing lower overall noise levels in the area. Under these conditions constant noise sources such as Opal operations are more likely to be apparent in the background noise levels noting that the emission levels from the site remain relatively constant throughout the day, evening, and night time.

Maximum noise levels from the site are also captured under the EPL requiring a cap on noise emissions of L_{Amax} 55 dB(A) at all locations during the night time period. An L_{Amax} parameter for the monitoring period simply records the loudest noise level measured during the night time assessment period and does not distinguish the source of noise.

Maximum noise events are not generally observed from the Opal site unless equipment has broken down or maintenance activities are underway and neither of these scenarios reflect normal operation of the plant.

Maximum noise levels recorded during these surveys are, therefore, more representative of the broader noise environment which makes the distinction between external sources and Opal's emissions difficult. Furthermore, maximum noise levels measured during the monitoring surveys often, if not always, exceed the maximum noise limit from the site hindering the identification of Opal's contribution.

The addition of the L_{A1} noise level statistic is proposed in conjunction with the L_{Amax} parameter to compliment the maximum noise profile and provide a better representation of environmental noise influences.

An L_{A1} noise level above the night time criteria would not necessarily indicate an exceedance of the Opal noise goals however, long term measurements of this parameter may be useful in identifying changes to the local noise profile which can then be compared to any changes in functional operation within the Opal site.

2. Existing environment

The site is located on the boundary of an industrial area around Port Botany and is bordered to the north and east of the site by residential properties as illustrated in Figure 2-1. The local noise environment beyond the Opal boundary varies throughout the day depending on the contribution of sources including trucks on Botany Road, aircraft, port noise, local business activities on McCauley Road, and local traffic movements.

Noise emissions from the paper mill do not vary significantly as the operation of the plant has been demonstrated to be consistent and reliable.

The source of maximum noise level events in the area are typically from the local road network and aircraft fly-overs. The nature of the processes within the Opal site means that there are typically no maximum noise level events associated with production activities. The exception to this may occur when equipment is not functioning properly during a breakdown or during maintenance activities, both of which are not common scenarios.

The influence of weather conditions on noise levels are apparent as seasonal variations which are forming data trends in the long-term monitoring for the local area.

2.1 Monitoring limitations

The local noise environment has been a feature of the area for many years and the total measured noise levels at monitoring locations are only partly due to Opal site operations. Direct monitoring of Opal noise emissions over time has demonstrated that specific contribution from Opal cannot be provided with any certainty due to the influence of other audible noise sources adjacent to the site.

2.2 Receiver locations

The EPL specifies six locations for quarterly monitoring. These are illustrated in Figure 2-1 and described further in **Table 2**. The receiver at R3 is not currently being monitored due to access restrictions.

Figure 2-1 Site location and compliance monitoring locations

Table 2 Description of monitoring locations

Monitoring location	Description
R1	This location has a large degree of acoustic shielding from local noise sources due to the development of a warehousing facility on the corner of McCauly Avenue and Australia Avenue. The noise environment at this location is heavily influenced by traffic on McCauley Street, Perry Street and Beauchamp Road. Local industrial noise from Raymond Avenue is also audible during the day and night time.
R2	This receiver is located opposite the bottom apex of the Purcell Park on Australia Avenue. At this location the residents have a clear line of sight to the paper mill. Noise walls have less effectiveness for the residences due to the large separation distances. Noise from port activities also has less shielding from the Opal site. Background noise levels are heavily dominated by road traffic noise from all sources.
R3*	This receiver is located adjacent to Purcell Park on Murrabin Avenue. At this location the residents have a partial line of sight to the paper mill although they are located closer to the boundary noise wall than receivers at R2. Noise from port activities are partially shielded by the Opal site. Background noise levels are heavily dominated by road traffic, aircraft and industrial noise from all surrounding sources.
R4	The receivers at Partanna Avenue are physically closest to the Opal site but have the benefit of significant shielding of operational activities from the noise barrier located on the northern boundary. Road traffic noise contributes to background noise for this receiver. Some construction work was in progress at the park adjacent to the property during the monitoring period.
R5	Furthest location from the Opal site, a higher degree of influence from Botany Road, Bunnerong Road and the port. Noise from the Opal site is generally inaudible at this location although significant noise from the Opal site has been observed here during adverse meteorological conditions.
R6	In this location receivers are well shielded from operational noise from the Opal site due to the presence of the noise barrier and No. 8 paper machine building. Noise levels at this location are heavily influenced by local bird colonies, port noise, traffic on Botany road and traffic on Bunnerong Road. Construction of industrial units on the adjacent vacant land (Hanger block) is well underway at the time of writing this report.

*Receiver location currently unavailable

3. Operational noise monitoring

3.1 Method

Operational noise monitoring for the May survey period was completed between 4 June and 15 June 2021, using automatic noise loggers deployed at five representative locations.

Monitoring was performed using Acoustic Research Laboratories brand Ngara Type 1 noise loggers and a SVAN 958 SLM, set to A-weighting, fast-response, and recording noise levels continuously over consecutive periods at each location. This survey period coincided with typical continuous operations of paper mill.

Weather conditions during the survey period were considered typical for the monitoring period. Data covering a 24 hour period has been extracted from the monitoring to provide a representative sample of noise levels for the May quarter. In Section 3.3 these data have been compared to the long term monitoring for the project to determine any variance in the local noise environment.

Weather data obtained from the Automatic Weather Station (AWS) maintained by the Bureau of Meteorology at Sydney Airport. Weather conditions for the monitoring period have been plotted showing daily trends in wind direction and speed which are presented in Figure 3-1.

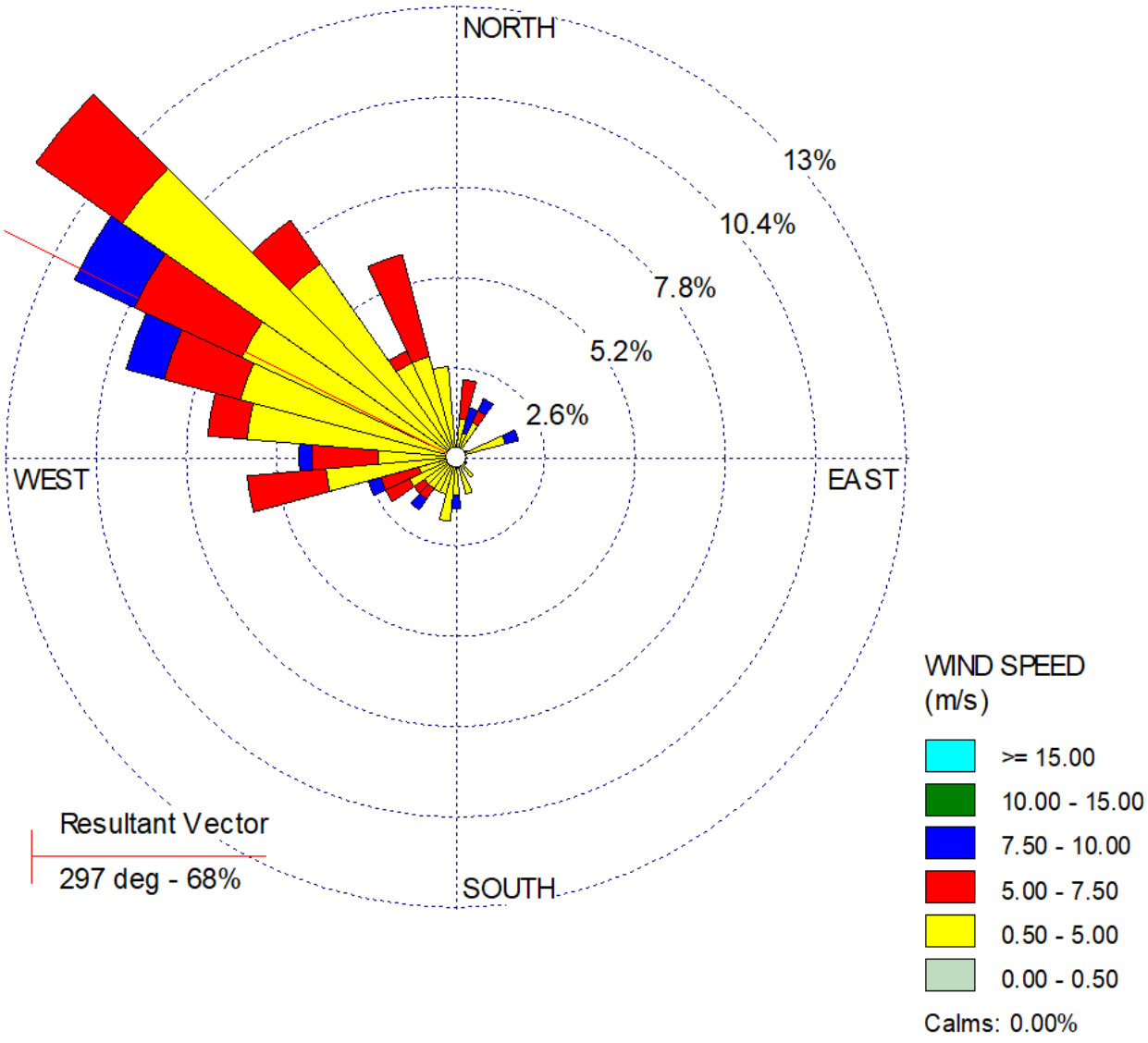


Figure 3-1 Wind speed and direction during monitoring period (4 June– 15 June 2021, source BoM 2021)

The plotted data from the wind rose indicates that wind speeds during the monitoring were below 5 m/s for about 70% of the time (see Figure 3-2) with the overall resultant wind vector for the monitoring period concentrated in the north west. Winds from this general direction are likely to minimise the influence of the Opal and Port operations on the residential locations to the north. Noise from Port operations would also be reduced at residential locations to the north and east of the Opal site. A more detailed analysis of meteorological conditions has been provided for the shut down and operational periods of the monitoring survey. in Section 3.2.

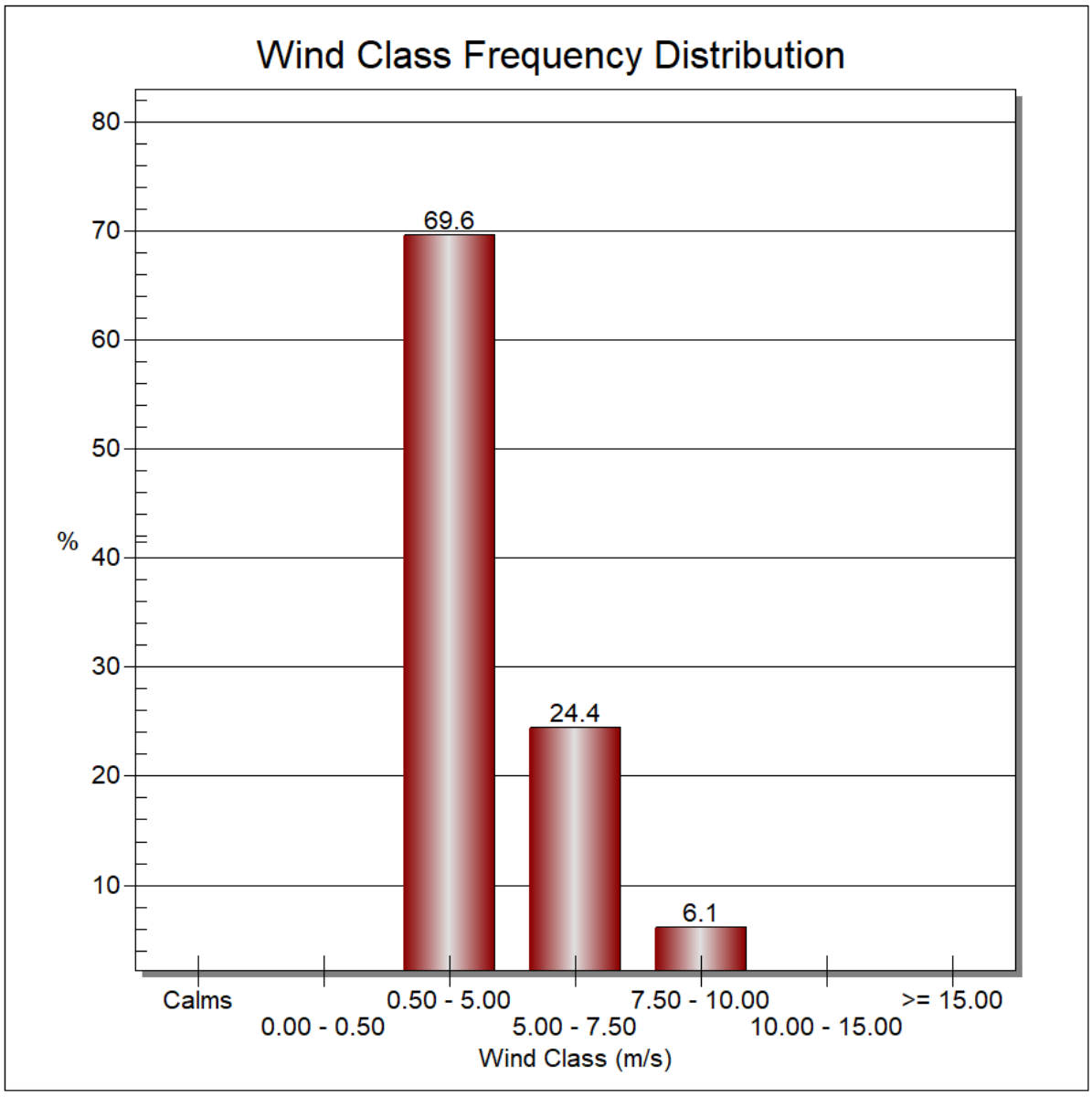


Figure 3-2 Wind speed frequency distribution

3.2 Monitoring results

The reported L_{Amax}, L_{A1}, L_{Aeq}, and L_{A90} noise levels are summarised from a 24 hour period of monitoring and are affected by all noise sources in the local area such as road traffic, loud short-term noise (birds), aircraft, and local industry and heavy vehicle movements.

During the June 2021 quarterly noise survey, the paper mill operated normally from the evening of 4 June until midnight 6 June 2021. Between 7 June until 1:00am 11 June, the mill was shut for maintenance, resuming full production at 4:30 pm 11 June until 15 June when the monitoring was completed.

A comparison of the L_{Aeq} noise levels between operating and shut down periods has been completed for each of the assessment periods. To characterise the outcomes of this assessment, where the results are positive, operational noise levels are higher than periods when the paper machine is shut.

The results for the daytime show that there is little variation of the L_{Aeq} noise levels when operating and shut periods are compared, ranging from -1.6 to +0.9dB. This level of variance is small and typically within the range of daily fluctuations in ambient noise levels.

During the evening, the spread of results widens to give a range of between -1.9 to +2. dB with most sites reporting a decrease in noise levels when the paper machine is operational versus shut. A range of $^{+}/_{-}$ 2dB for measured levels is again within the range of fluctuations in ambient noise levels for each site.

At night-time, the results between open and shut vary from -0.6 to +3 dB for the L_{Aeq} parameter with the majority of the sites less than 1 dB, while R2 reported the single highest variance at 3dB. The L_{A90} parameter showed the greatest spread during the night with receivers R2 and R4 having a +7.1dB and +3.5dB increase, respectively.

With all night time locations indicating an increase in the background noise level, a further assessment of the meteorological conditions has been undertaken to determine any possible influences on the monitoring results during the night time period.

Appendix A presents the graphs of wind speed and direction during the night time periods for both the shut operational scenarios. In general, the night time periods during the shutdown tend to have lower wind speeds and a dominant wind direction that propagates noise away from the other sources such as Port Botany container terminal.

When the paper mill was operational, wind speeds were generally higher, and the wind direction included components that were more favorable to propagation of noise from other sources such as Botany Road and the container terminal.

On balance, the L_{Aeq} noise levels did not vary significantly between the operational and shutdown states with variations typically less than 1dB, the receiver at R2 being the exception. In both states, operational and shutdown, the L_{Aeq} 15 minute noise level exceeded the project noise goals.

At locations R5 and R6, the measured levels during the latest round of noise monitoring indicate that the overall night time background environmental noise levels were higher than the noise criteria at each location regardless of the operating environment of the paper mill.

Historically, the monitoring data confirms that there is little or no variation in noise levels at the nearest receiver locations when the paper mill is either operational or shut. Given the inconsistency in increases or decreases in background noise levels between sites and in particular the significant variation in background noise levels at R2, no clear conclusion on operational noise influences should be draw from these latest results.

The L_{Amax} noise levels for the May noise monitoring period are consistent with L_{Amax} noise levels from previous surveys. The L_{A1} noise levels are consistent with other monitoring periods and are higher than the project L_{Amax} noise goals.

3.3 Comparison with previous monitoring surveys

The most recent round of compliance measurements has been added to the historical data collected during compliance noise surveys, providing about 8 years of seasonal data. This data includes measurements of the noise environment with the Opal site operational and shut down for maintenance over this period.

The results of monitoring survey for the May 2021 quarter have been graphed and are shown in Appendix B. The parameters of L_{Aeq} and L_{A90} presented in Table 3 are used to provide information for comparison against the project criteria and the background noise environment.

A separate table of L_{Amax} and L_{A1} noise levels has been generated for the recent monitoring survey and in future once sufficient data is acquired, will be graphed to demonstrate data trends for each of the monitoring locations.

The data in Figure 3-3 and Figure 3-4 provides a chronological progression of the measured noise levels during shutdown and normal operations summarised for monitoring from 2012 to present.

Historical background noise levels from Figure 3-3 and Figure 3-4 are not directly related to the L_{Aeq} criteria from the EPL; however, they provide an indication of the increase in background environmental noise levels corresponding to the regular noise surveys undertaken for the Opal site.

Table 3 Summary of noise monitoring Day

Time and date	Profile of Noise Environment - Noise Monitoring Location											
	R1		R2		R3		R4		R5		R6	
Daytime: 7:00:00 AM to 6:00:00 PM Date	**L_{90} (10th Percentile)**	**L_{Aeq}**	**L90 (10th Percentile)**	**L_{Aeq}**	**L_{90} (10th Percentile)**	**L_{Aeq}**	**L_{90} (10th Percentile)**	**L_{Aeq}**	**L_{90} (10th Percentile)**	**L_{Aeq}**	**L_{90} (10th Percentile)**	**L_{Aeq}**
Friday 4 June 2021	33.6	70.5	30.7	69.9	-	-	48.2	58.8	29.7	69.7	28.6	71.7
Saturday 5 June 2021	38.6	49.5	42.9	51.4	-	-	41.2	52.6	40.8	52.3	41.6	65.7
Sunday 6 June 2021	37.9	48.4	42.0	50.4	-	-	41.7	57.1	37.1	49.6	42.3	53.3
Monday 7 June 2021	39.5	49.2	38.7	51.3	-	-	41.6	51.8	40.6	52.4	44.6	53.4
Tuesday 8 June 2021	43.6	51.1	42.6	51.6	-	-	42.1	53.8	44.9	54.6	45.9	54.2
Wednesday 9 June 2021	45.5	51.6	48.3	53.6	-	-	44.6	52.9	47.0	54.0	48.7	57.0
Thursday 10 June 2021	41.4	51.1	42.6	51.7	-	-	42.3	52.9	43.3	53.3	44.7	58.0
Friday 11 June 2021	-	-	49.0	54.9	-	-	45.1	54.7	47.3	54.0	48.3	56.7
Saturday 12 June 2021	-	-	46.2	52.0	-	-	41.6	53.2	45.0	53.3	45.1	55.6
Sunday 13 June 2021	-	-	47.4	53.5	-	-	42.9	54.4	43.8	52.5	44.7	54.3
Monday 14 June 2021	-	-	44.7	51.7	-	-	42.3	52.2	39.1	52.5	42.2	55.6
Tuesday 15 June 2021	-	-	44.9	52.1	-	-	41.6	50.9	39.0	55.8	43.2	56.0
Median Open	**37.9**	**49.5**	**44.8**	**52.1**			**42.0**	**53.8**	**40.0**	**52.9**	**42.8**	**55.8**
Median Shut	**42.5**	**51.1**	**42.6**	**51.7**			**42.2**	**52.9**	**44.1**	**53.7**	**45.3**	**55.6**
Difference Open v Shut	**-4.6**	**-1.6**	**2.2**	**0.4**			**-0.2**	**0.9**	**-4.1**	**-0.8**	**-2.6**	**0.2**

Table 4 Summary of noise monitoring Evening

Time and date	Profile of Noise Environment - Noise Monitoring Location											
	R1		R2		R3		R4		R5		R6	
Evening: 6:00:00 PM to 10:00:00 PM Date	**L_{90} (10th Percentile)**	**L_{Aeq}**	**L90 (10th Percentile)**	**L_{Aeq}**	**L_{90} (10th Percentile)**	**L_{Aeq}**	**L_{90} (10th Percentile)**	**L_{Aeq}**	**L_{90} (10th Percentile)**	**L_{Aeq}**	**L_{90} (10th Percentile)**	**L_{Aeq}**
Friday 4 June 2021	45.6	49.9	50.8	53.6			47.2	51.6	45.0	49.3	46.3	49.8
Saturday 5 June 2021	42.4	46.6	42.8	49.2			42.1	47.6	44.3	48.1	44.5	48.9
Sunday 6 June 2021	43.0	47.9	47.1	51.0			44.1	50.8	43.8	48.3	44.6	49.1
Monday 7 June 2021	42.1	48.4	41.1	47.5			40.8	45.3	44.4	49.8	44.8	48.0
Tuesday 8 June 2021	43.3	56.4	42.9	53.8			42.4	53.6	45.4	53.6	45.2	53.8
Wednesday 9 June 2021	42.4	48.2	43.5	49.4			39.1	45.6	44.6	49.9	44.3	48.8
Thursday 10 June 2021	39.6	51.2	42.8	50.4			39.7	48.5	40.6	49.6	41.4	50.0
Friday 11 June 2021			49.0	53.9			43.6	49.1	45.9	50.8	45.9	50.2
Saturday 12 June 2021			49.0	52.6			42.7	47.7	44.0	49.3	43.7	48.2
Sunday 13 June 2021			48.0	51.9			42.9	48.1	44.2	49.0	43.7	47.8
Monday 14 June 2021			47.1	52.6			41.6	46.9	40.3	45.7	40.3	45.8
Tuesday 15 June 2021			44.3	51.4			42.6	47.1	39.0	46.9		
Median Open	**43.0**	**47.9**	**47.6**	**52.3**			**42.8**	**47.9**	**44.1**	**48.7**	**44.5**	**48.9**
Median Shut	**42.3**	**49.8**	**42.9**	**49.9**			**40.3**	**47.1**	**44.5**	**49.9**	**44.6**	**49.4**
Difference Open v Shut	**0.8**	**-1.9**	**4.7**	**2.4**			**2.6**	**0.9**	**-0.4**	**-1.2**	**0.0**	**-0.5**

Table 5 Summary of noise monitoring Night

Time and date	Profile of Noise Environment - Noise Monitoring Location											
	R1		R2		R3		R4		R5		R6	
Night 10:00:00 PM to 7:00:00 AM Date	**L_{90} (10th Percentile)**	**L_{Aeq}**	**L90 (10th Percentile)**	**L_{Aeq}**	**L_{90} (10th Percentile)**	**L_{Aeq}**	**L_{90} (10th Percentile)**	**L_{Aeq}**	**L_{90} (10th Percentile)**	**L_{Aeq}**	**L_{90} (10th Percentile)**	**L_{Aeq}**
Friday 4 June 2021	43.2	47.5	49.1	51.9			45.2	49.5	42.9	47.8	43.2	48.6
Saturday 5 June 2021	40.0	44.9	47.4	50.8			43.0	47.0	43.9	47.8	42.5	46.5
Sunday 6 June 2021	40.8	46.7	46.5	51.4			42.1	46.7	44.8	49.2	43.4	47.5
Monday 7 June 2021	39.4	45.7	38.9	46.4			37.9	44.7	42.6	49.0	42.1	47.6
Tuesday 8 June 2021	36.7	46.0	37.3	48.1			37.2	45.1	36.3	46.3	37.7	46.6
Wednesday 9 June 2021	38.9	45.2	39.1	47.1			36.8	42.7	41.7	48.6	41.2	46.4
Thursday 10 June 2021	40.8	45.8	46.2	52.0			40.4	46.3	42.2	48.5	42.0	47.4
Friday 11 June 2021			44.8	49.8			40.7	47.1	44.4	48.6	44.3	48.2
Saturday 12 June 2021			46.0	50.4			41.3	45.5	44.3	48.0	44.0	47.5
Sunday 13 June 2021			44.7	48.6			40.0	45.3	42.3	46.6	40.9	45.4
Monday 14 June 2021			45.5	50.8			40.2	45.3	42.2	46.7	40.6	45.3
Tuesday 15 June 2021			46.5	50.3			41.6	45.8	43.1	48.8		
Median Open	**40.8**	**45.8**	**46.1**	**50.6**			**41.0**	**46.1**	**43.0**	**47.9**	**42.5**	**47.4**
Median Shut	**39.2**	**45.8**	**39.0**	**47.6**			**37.6**	**44.9**	**42.0**	**48.6**	**41.6**	**47.0**
Difference Open v Shut	**1.7**	**0.0**	**7.1**	**3.0**			**3.5**	**1.1**	**1.1**	**-0.6**	**0.9**	**0.4**

Table 6 Summary of night time maximum noise levels

Time and date	Maximum Noise Environment - Noise Monitoring Location											
	R1		R2		R3		R4		R5		R6	
Date	L_{Amax}	L_{A1}	L_{Amax}	L_{A1}	L_{Amax}	L_{A1}	L_{Amax}	L_{A1}	L_{Amax}	L_{A1}	L_{Amax}	L_{A1}
Friday 4 June 2021	74.6	62.9	72.0	62.2			76.0	63.5	71.6	66.7	74.2	64.5
Saturday 5 June 2021	68.5	58.8	70.1	61.2			72.0	64.9	75.8	71.8	69.8	65.2
Sunday 6 June 2021	72.9	62.7	70.3	63.1			73.3	60.1	75.8	68.4	72.8	58.6
Monday 7 June 2021	72.8	62.3	70.7	63.9			72.7	64.4	85.1	68.5	71.3	61.1
Tuesday 8 June 2021	74.6	62.8	72.8	63.6			76.0	65.6	68.5	62.6	67.6	60.5
Wednesday 9 June 2021	73.4	62.7	79.2	68.9			75.1	64.4	85.9	69.8	69.8	63.2
Thursday 10 June 2021	72.6	59.9	81.3	71.4			73.7	67.0	72.5	66.3	68.4	58.7
Friday 11 June 2021			70.4	63.4			79.0	72.5	73.1	64.8	76.4	62.9
Saturday 12 June 2021			71.5	61.1			77.8	63.0	70.6	63.6	71.9	65.7
Sunday 13 June 2021			69.9	61.8			76.4	67.5	76.5	66.1	73.9	65.0
Monday 14 June 2021			69.6	63.7			74.2	60.4	84.8	65.4	70.3	62.7
Tuesday 15 June 2021			70.5	63.0			73.5	66.1	84.4	67.3		
Wednesday 16 June 2021												
Median Open	**72.9**	**62.7**	**70.4**	**62.2**			**76.0**	**64.9**	**75.8**	**66.1**	**72.9**	**64.8**
Median Shut	**73.1**	**62.5**	**76.0**	**66.4**			**74.4**	**65.0**	**78.8**	**67.4**	**69.1**	**60.8**
Difference Open v Shut	**-0.2**	**0.2**	**-5.6**	**-4.2**			**1.6**	**-0.1**	**-3.0**	**-1.3**	**3.8**	**4.0**

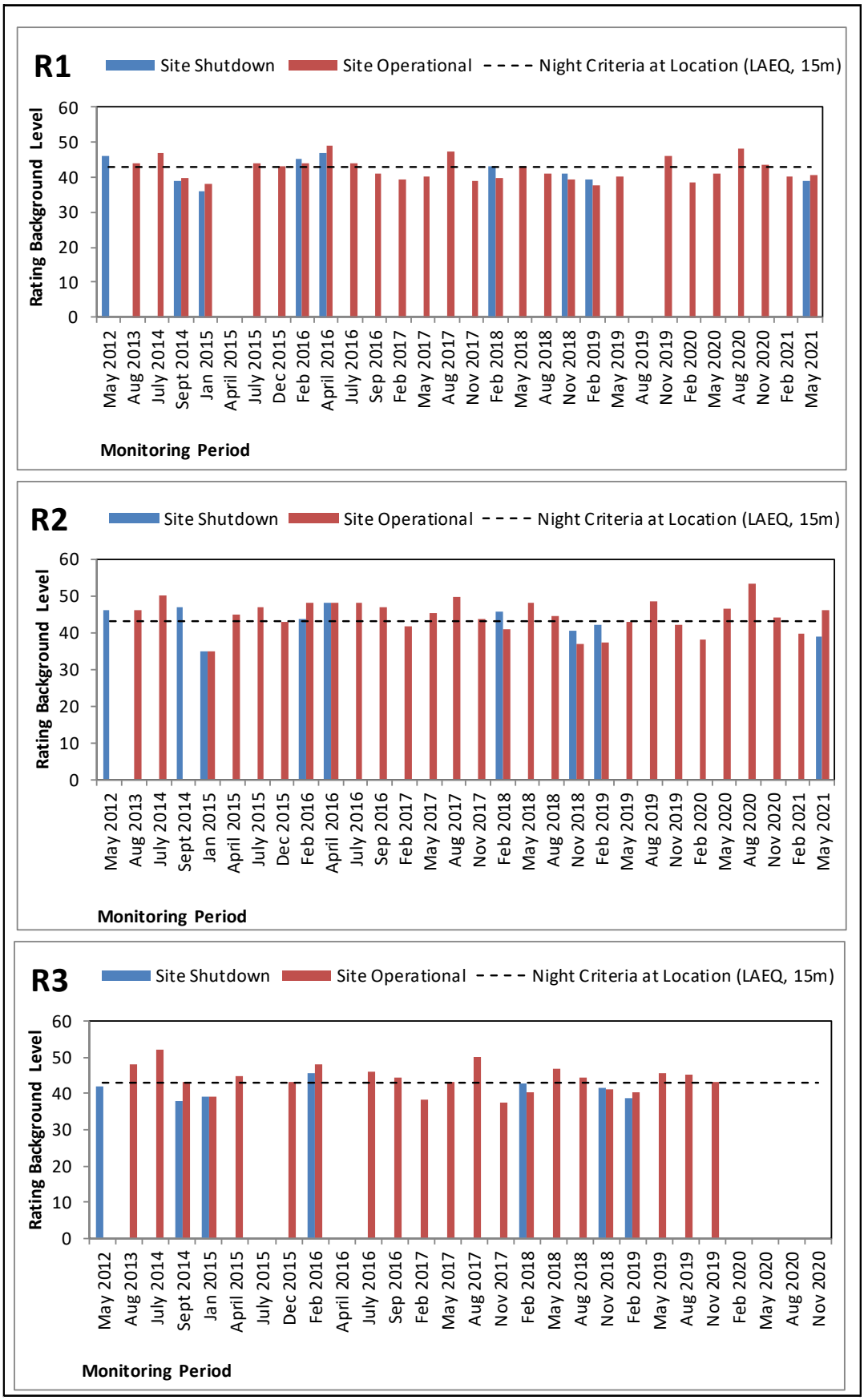


Figure 3-3: Comparison of background noise levels at R1 – R3

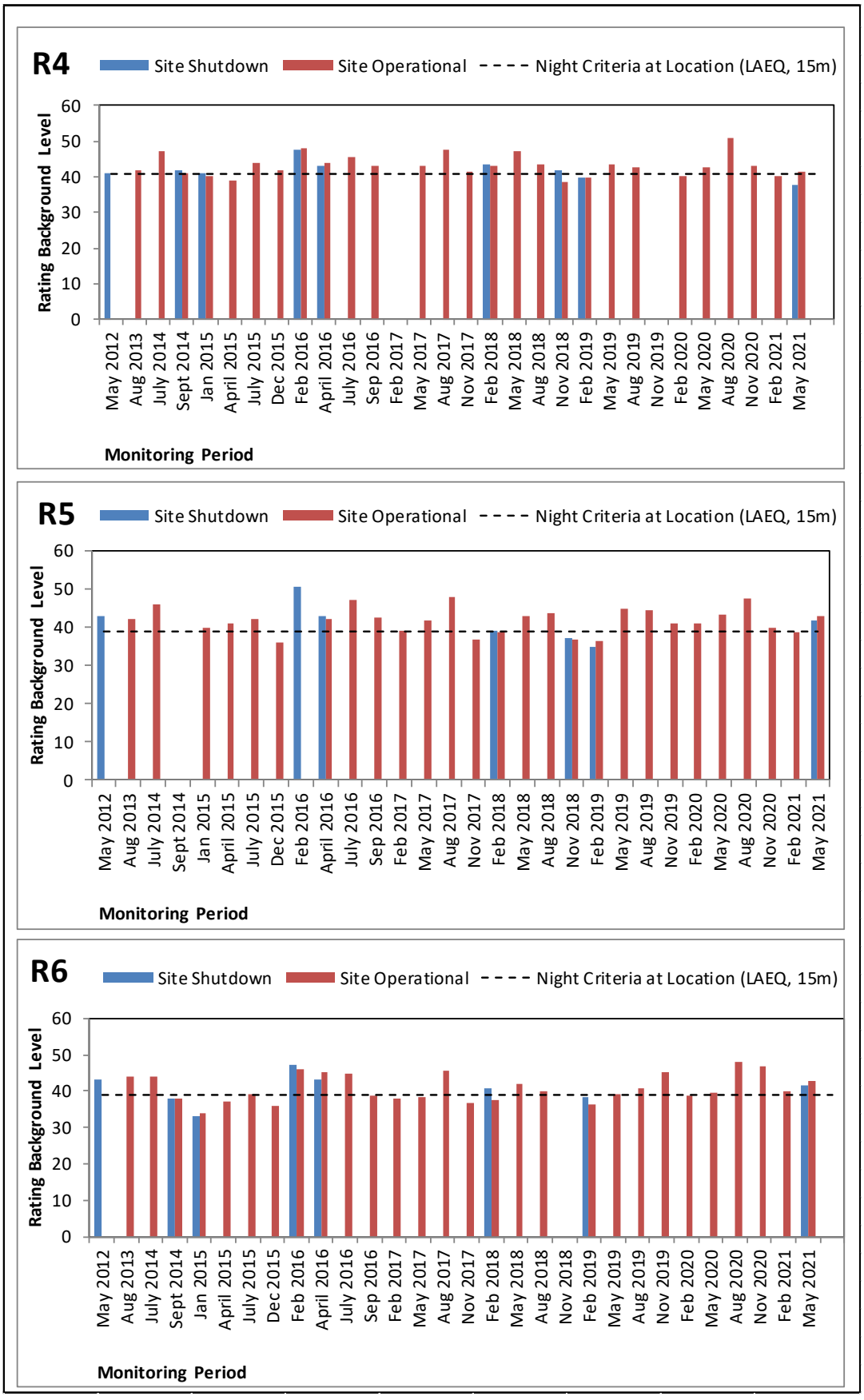


Figure 3-4: Comparison of background noise levels at R4 – R6

4. Summary

The quarterly noise survey data for the May-July 2021 period indicates that the L_{Aeq} long term measured noise levels in the vicinity of the paper mill exceeded the EPL criteria for day, evening, and night-time, regardless of whether the paper mill was operational or shut down.

The maximum (L_{A1}) recorded noise levels at each monitoring location also exceeded the EPL criteria of 55 dB(A) at all receiver locations with the paper mill operational or shut down, indicating that these exceedances are not the result of noise emissions from the Opal site.

In summary the May 2021 quarterly monitoring the following conclusions have been drawn:

- Several years of monitoring data indicate that the ambient noise environment in the local area is a product of the combined influence of all noise sources within the Port Botany area including the Opal site when operational.

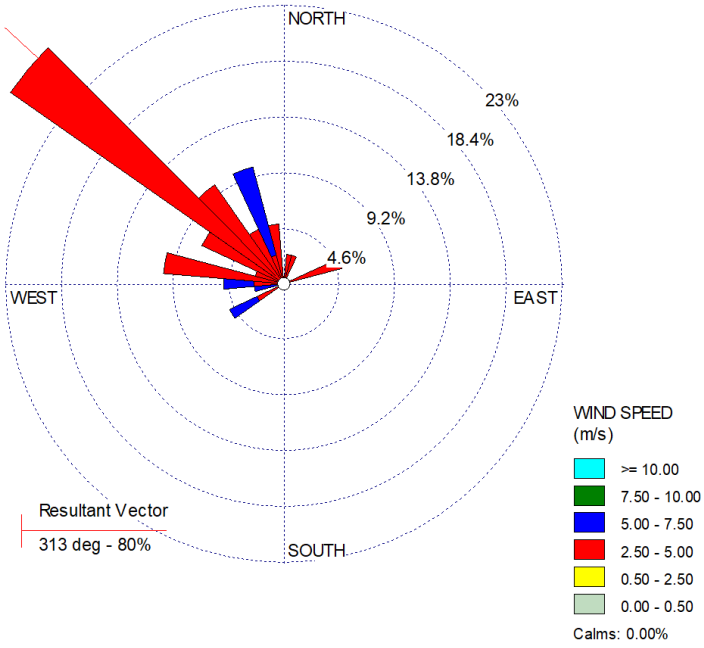
- The most recent noise monitoring results indicate that the measured L_{Aeq} noise levels are generally similar to the long-term series of data for corresponding seasonal measurement periods and the L_{A90} noise levels sit below the criteria at each location.

- The L_{Amax} noise levels for the May noise monitoring period are consistent with L_{Amax} noise levels from previous surveys. The L_{A1} noise levels are consistent with other monitoring periods.

- L_{Aeq} and maximum noise levels recorded during the survey period are not related to the normal operation of the Opal site.

- The L_{A90} noise level at two sites indicated an increase in the ambient noise environment during the periods of operational versus shutdown however, this outcome was not consistent between all measured sites and is not likely to reflect noise emissions solely from the paper mill.

Appendix A. Wind speed and direction – Night



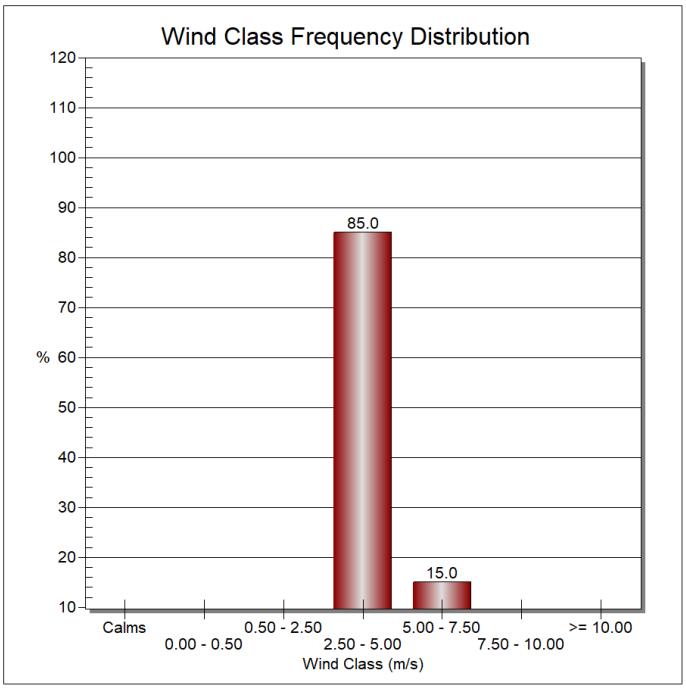
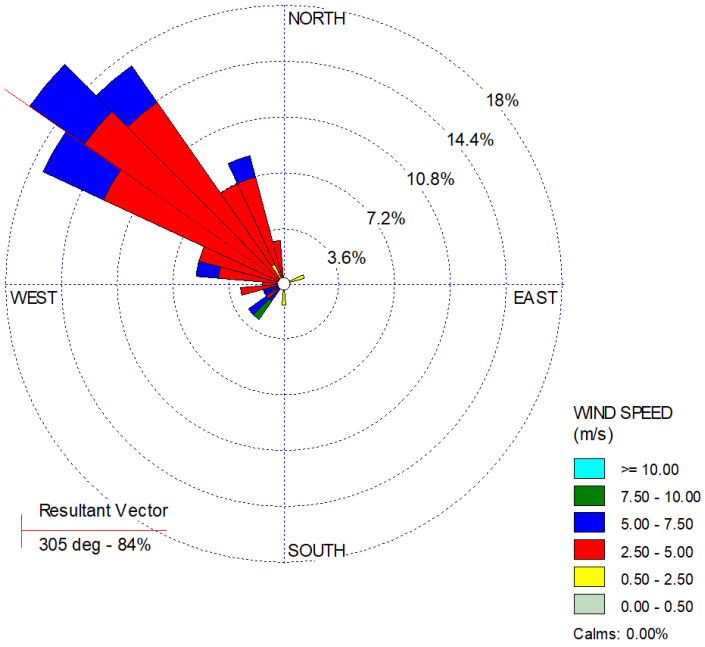


Figure 5 Wind speed and direction during shut down periods



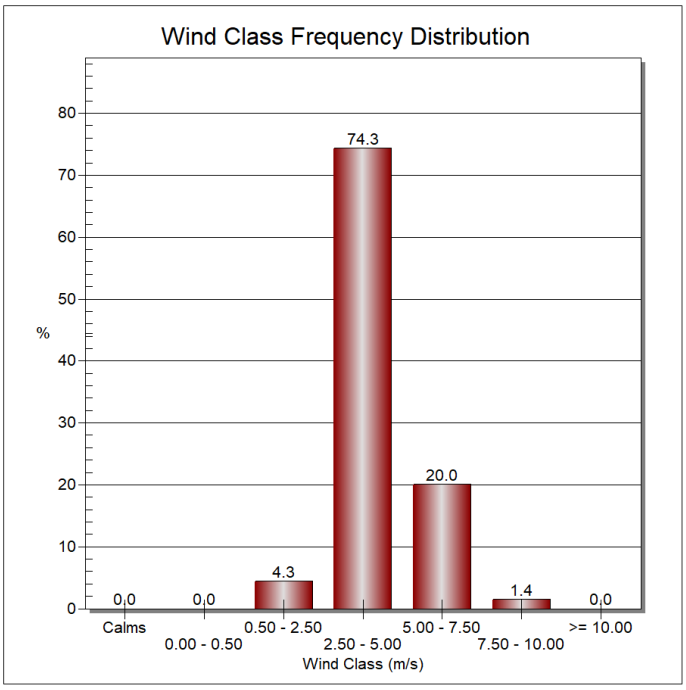
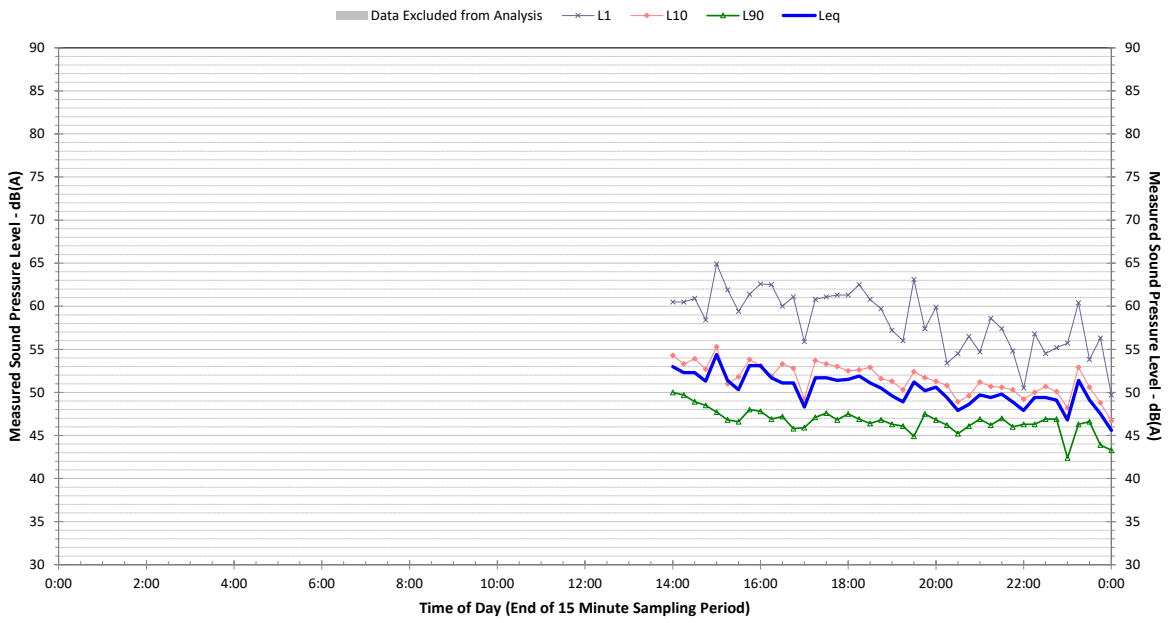


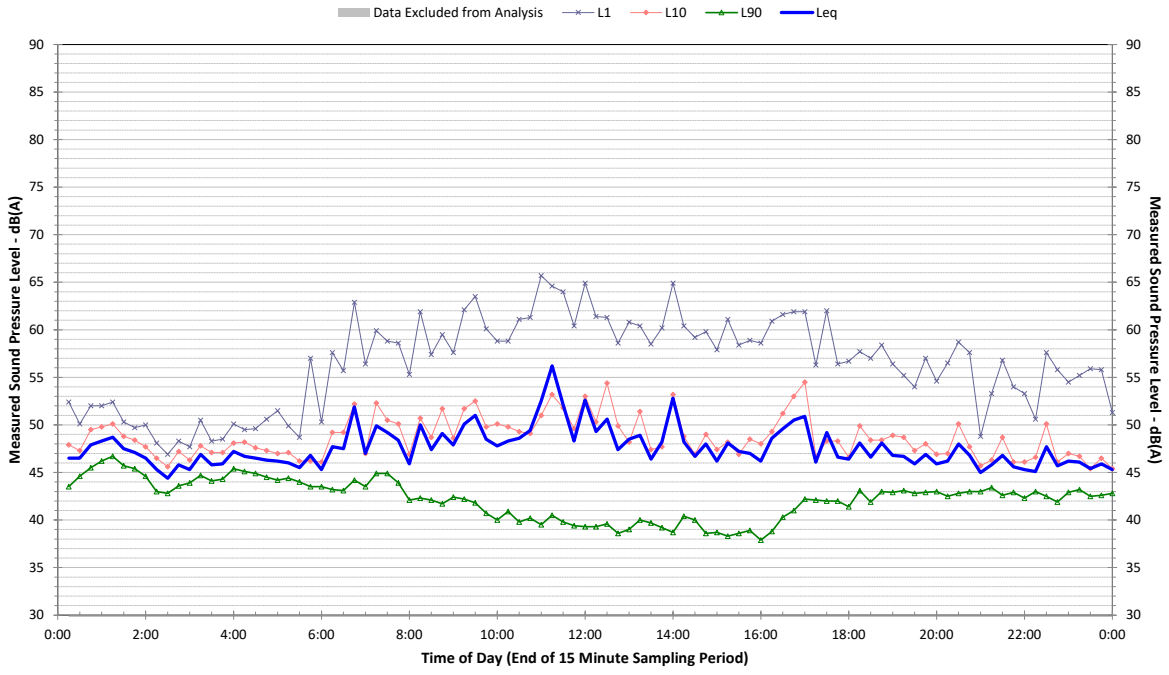
Figure 6 Wind speed and direction during operating periods

Appendix B. Noise logger graphs

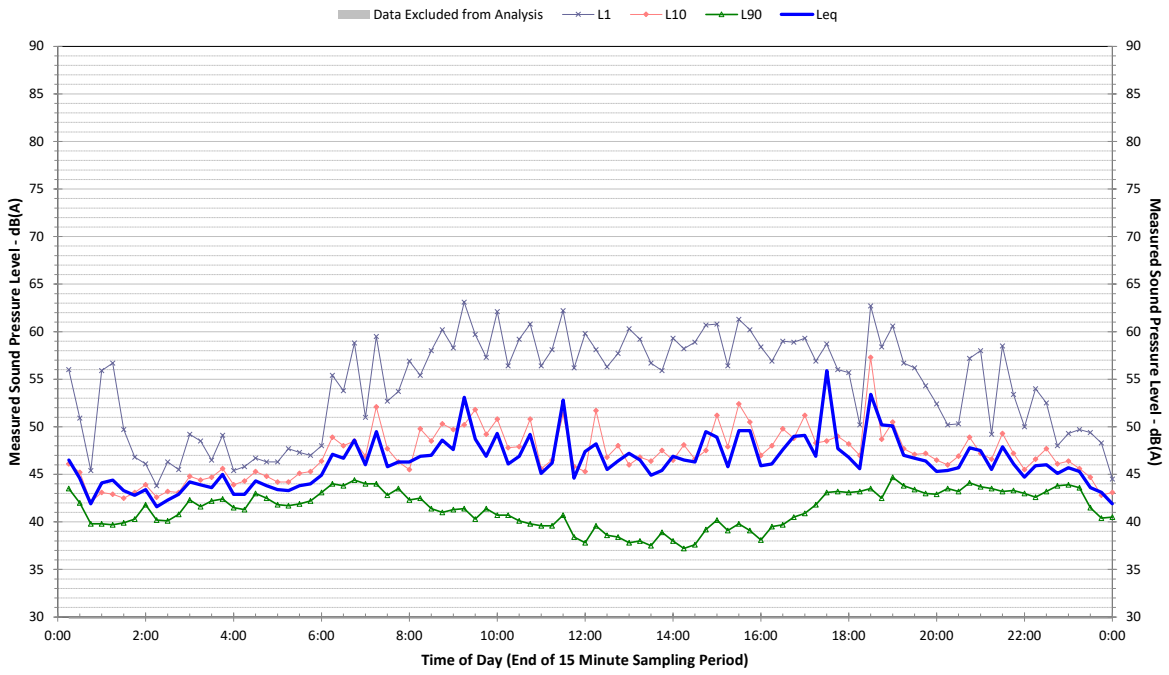
Profile of Noise Environment - Noise Monitoring Location 1
Friday 4 June 2021



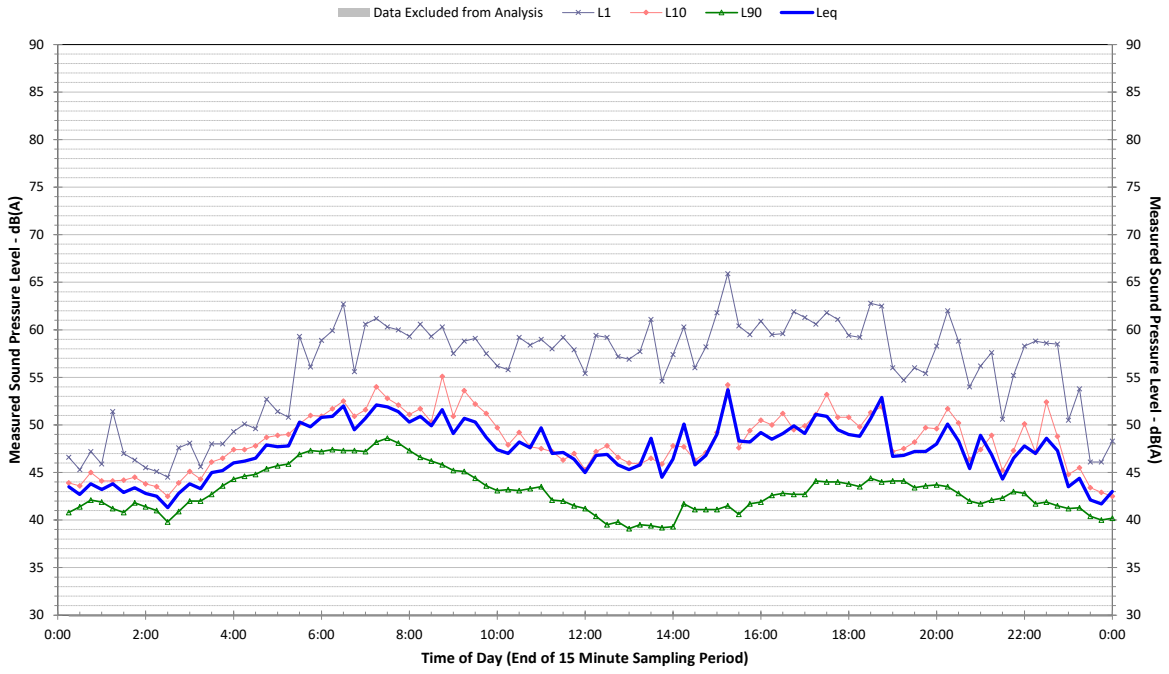
Profile of Noise Environment - Noise Monitoring Location 1
Saturday 5 June 2021



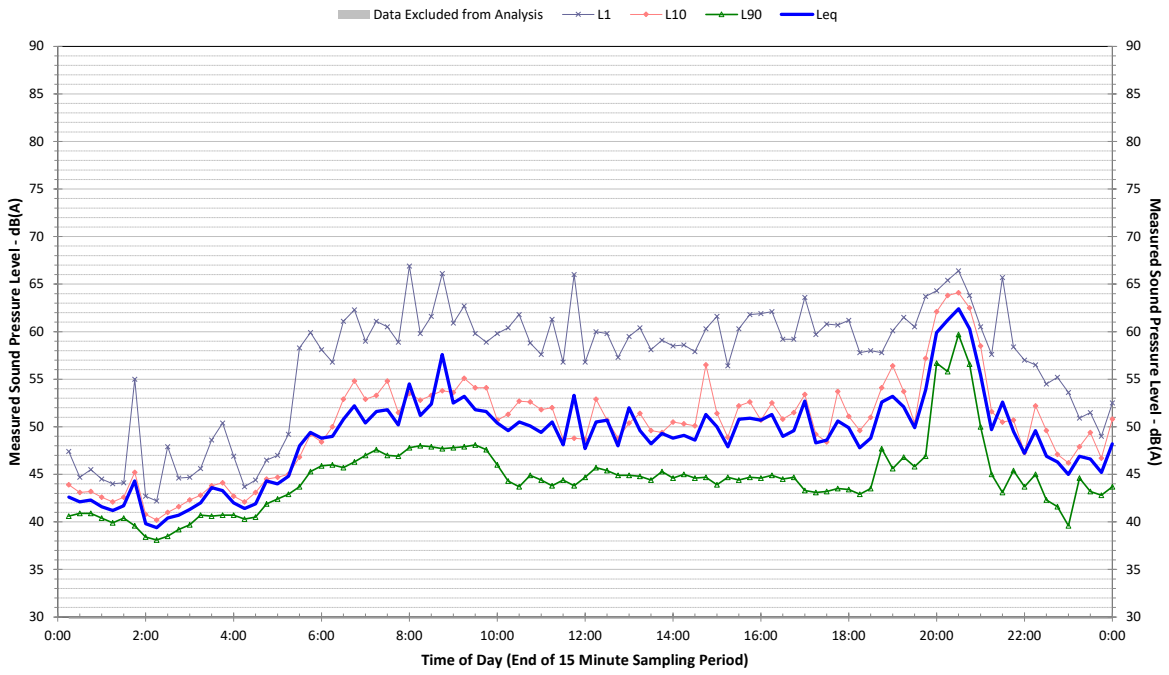
Profile of Noise Environment - Noise Monitoring Location 1
Sunday 6 June 2021



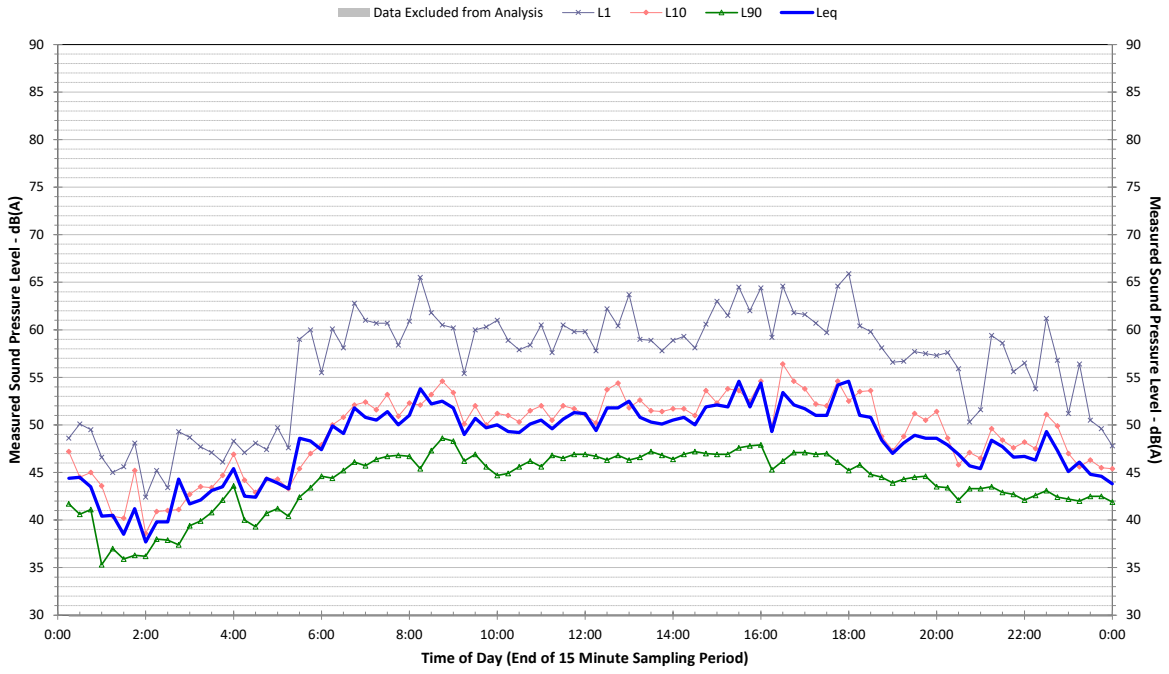
Profile of Noise Environment - Noise Monitoring Location 1
Monday 7 June 2021

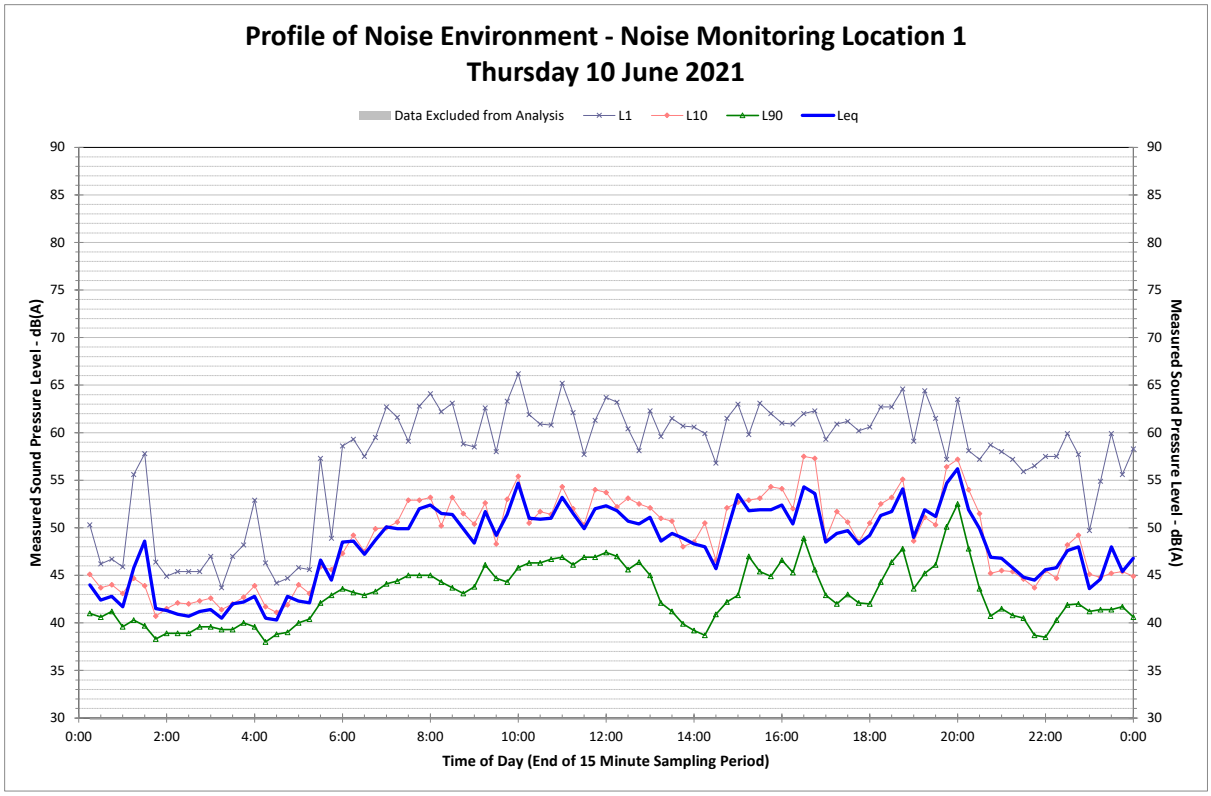


Profile of Noise Environment - Noise Monitoring Location 1
Tuesday 8 June 2021

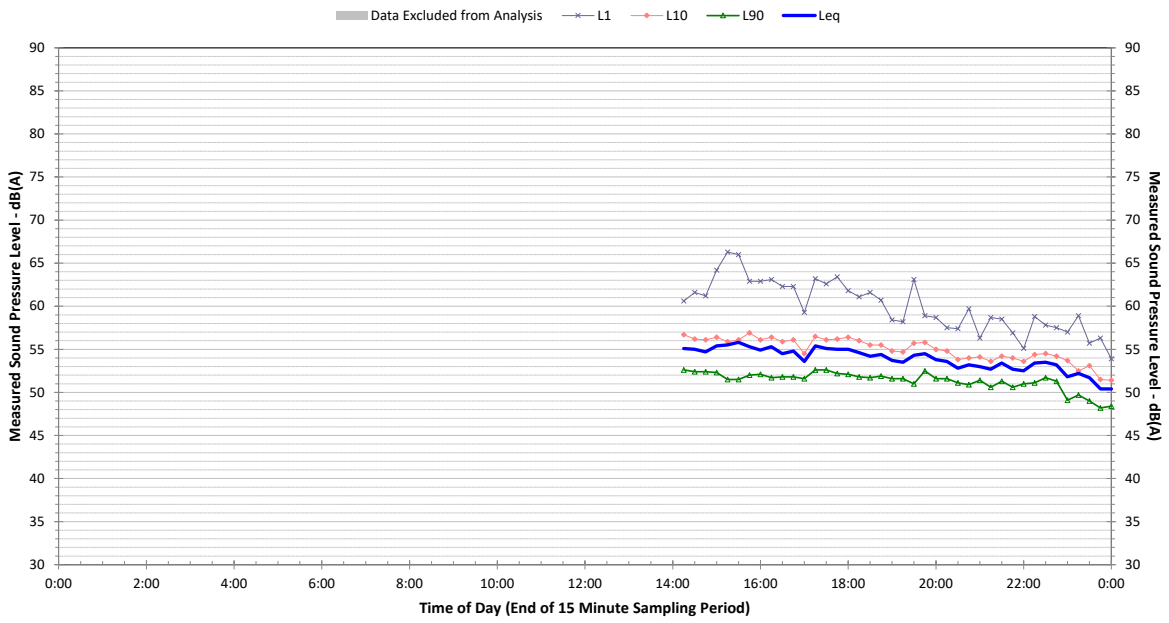


Profile of Noise Environment - Noise Monitoring Location 1
Wednesday 9 June 2021

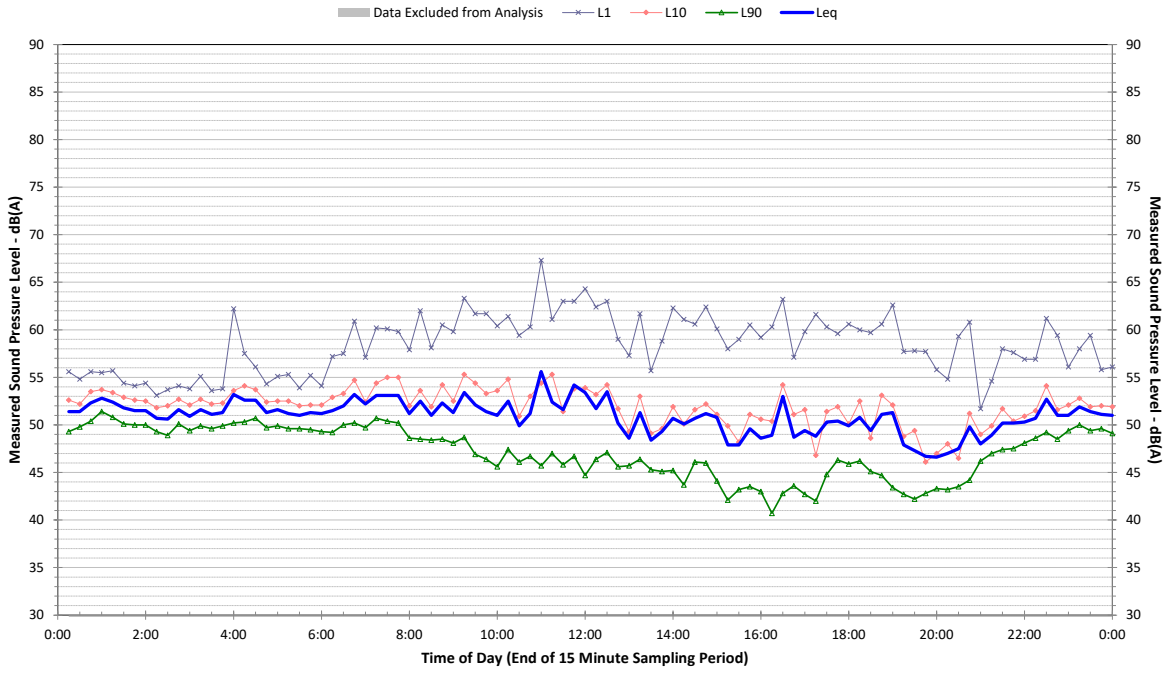



Profile of Noise Environment - Noise Monitoring Location 1
Thursday 10 June 2021
Data Excluded from Analysis
L1
L10
L90
Leq
Measured Sound Pressure Level - dB(A)
Measured Sound Pressure Level - dB(A)
90
85
80
75
70
65
60
55
50
45
40
35
30
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00
Time of Day (End of 15 Minute Sampling Period)

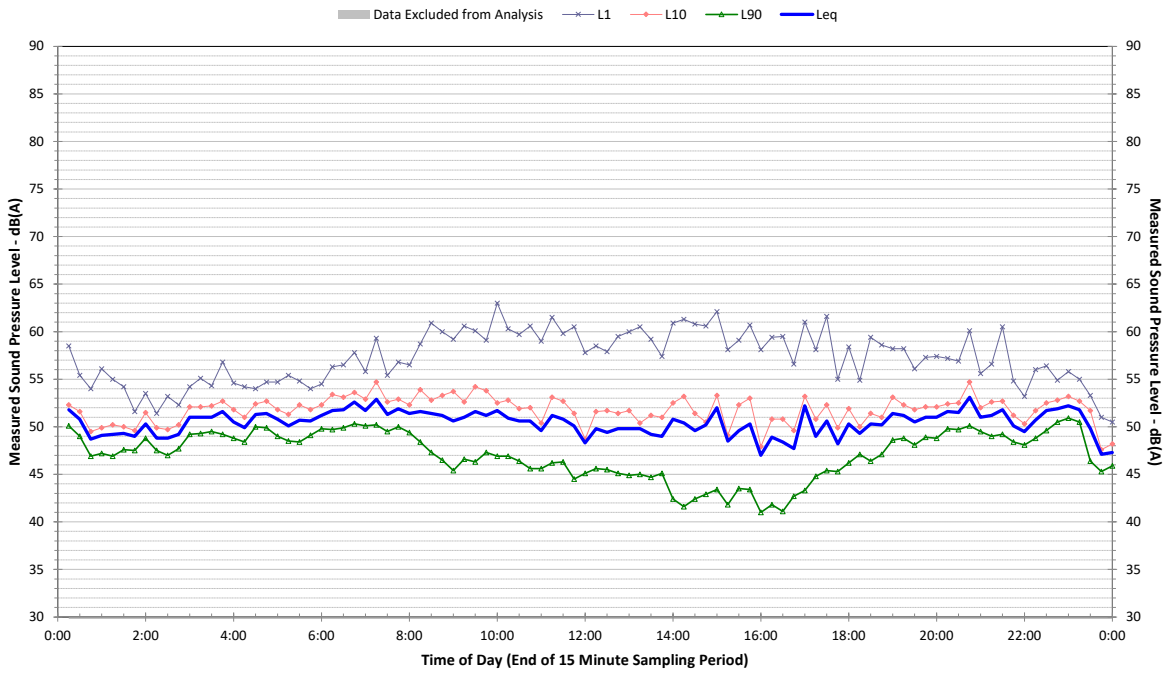
Profile of Noise Environment - Noise Monitoring Location 2
Friday 4 June 2021



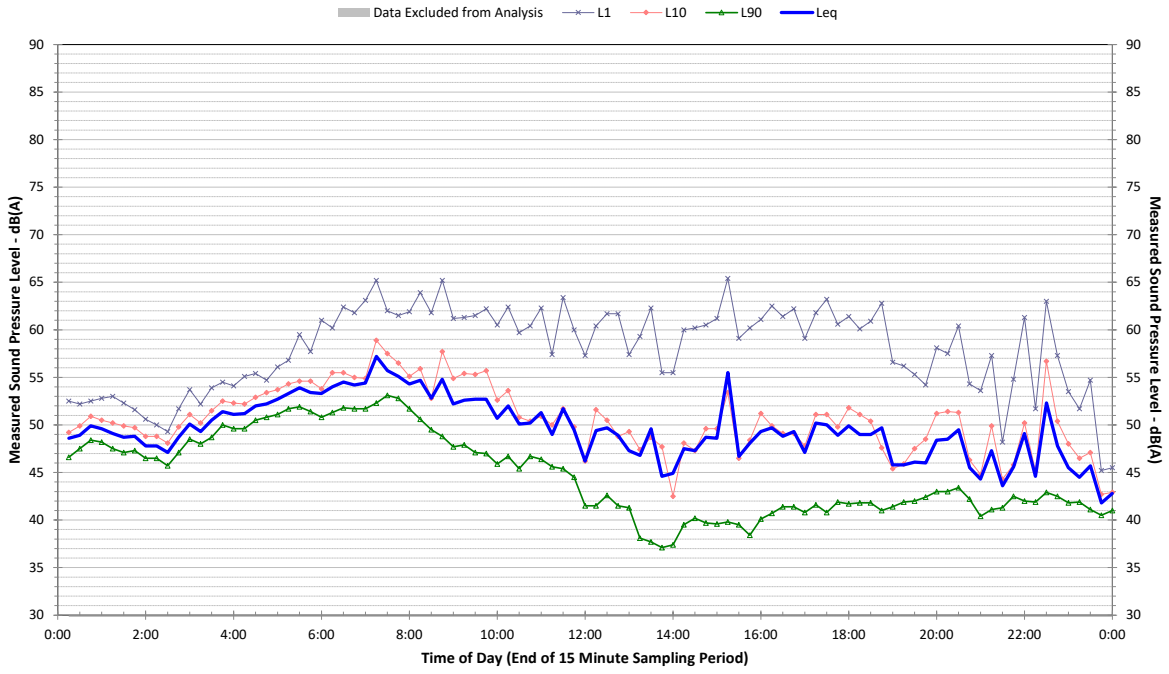
Profile of Noise Environment - Noise Monitoring Location 2
Saturday 5 June 2021



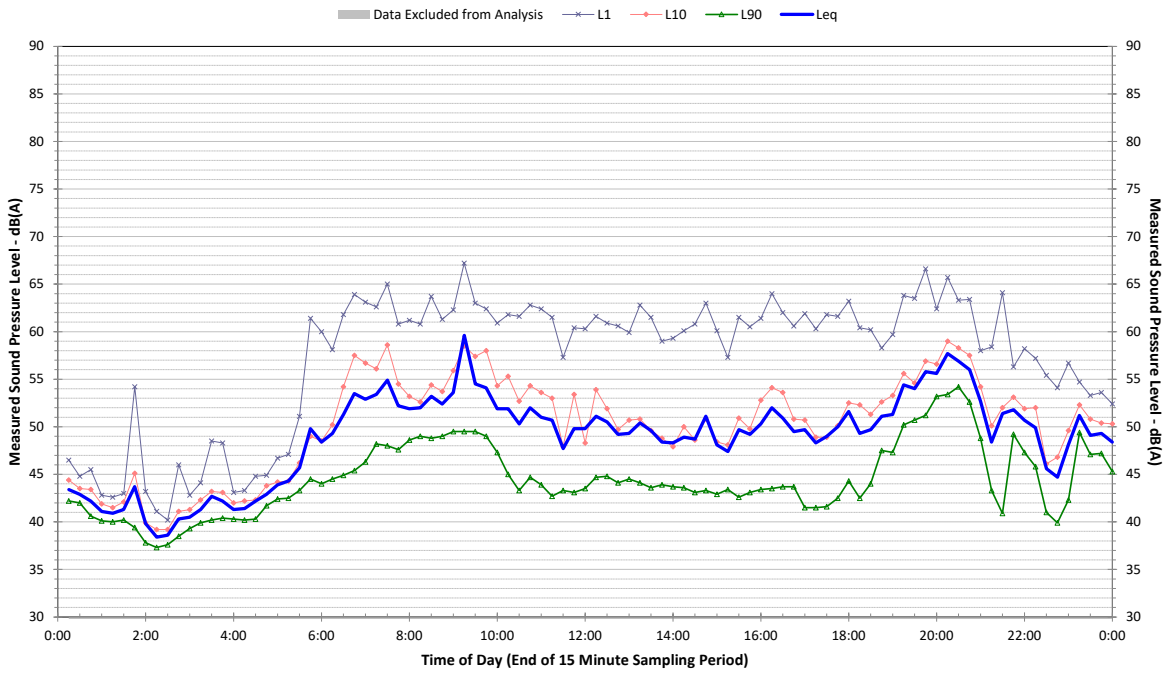
Profile of Noise Environment - Noise Monitoring Location 2
Sunday 6 June 2021



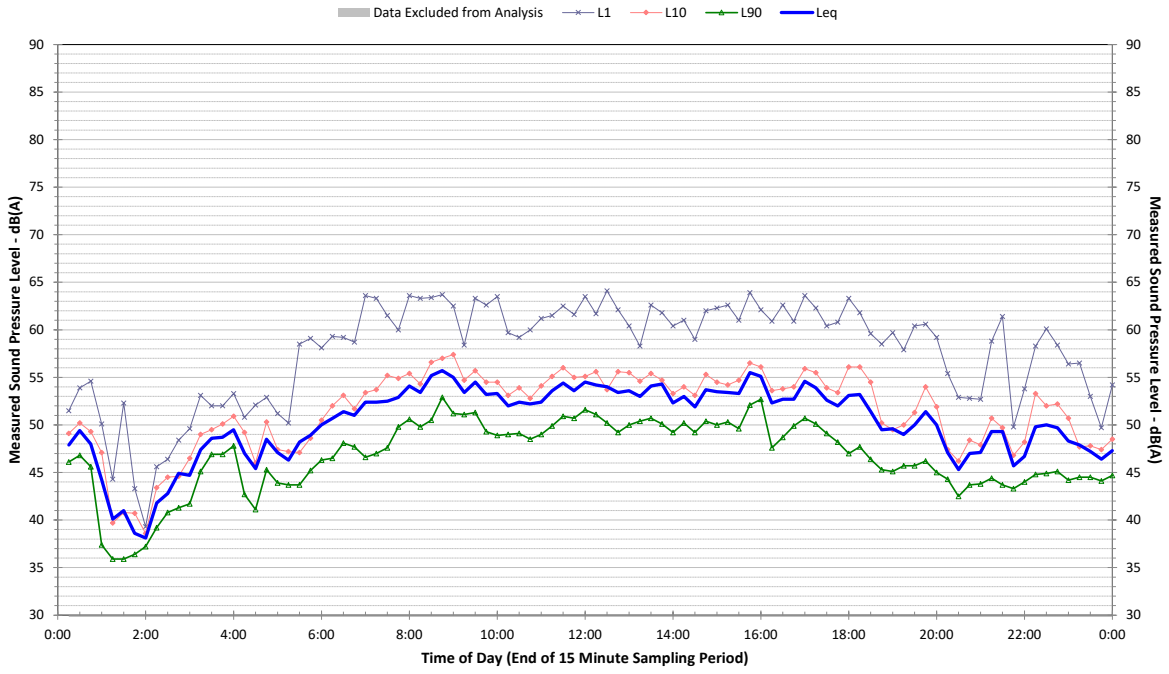
Profile of Noise Environment - Noise Monitoring Location 2
Monday 7 June 2021



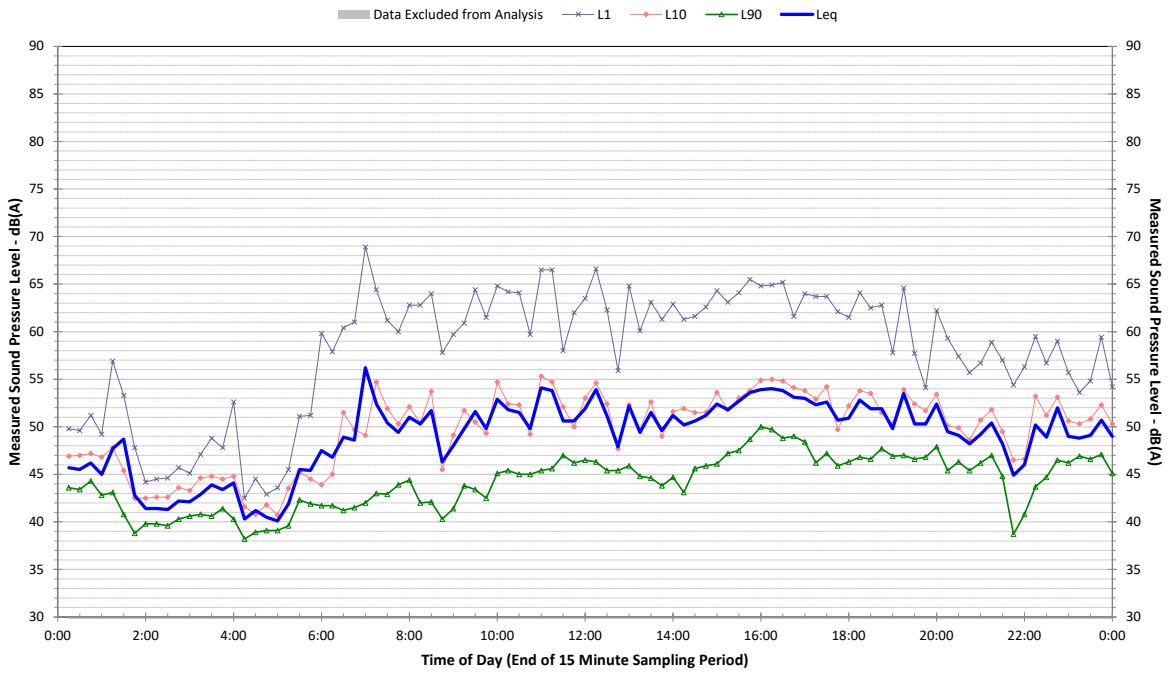
Profile of Noise Environment - Noise Monitoring Location 2
Tuesday 8 June 2021



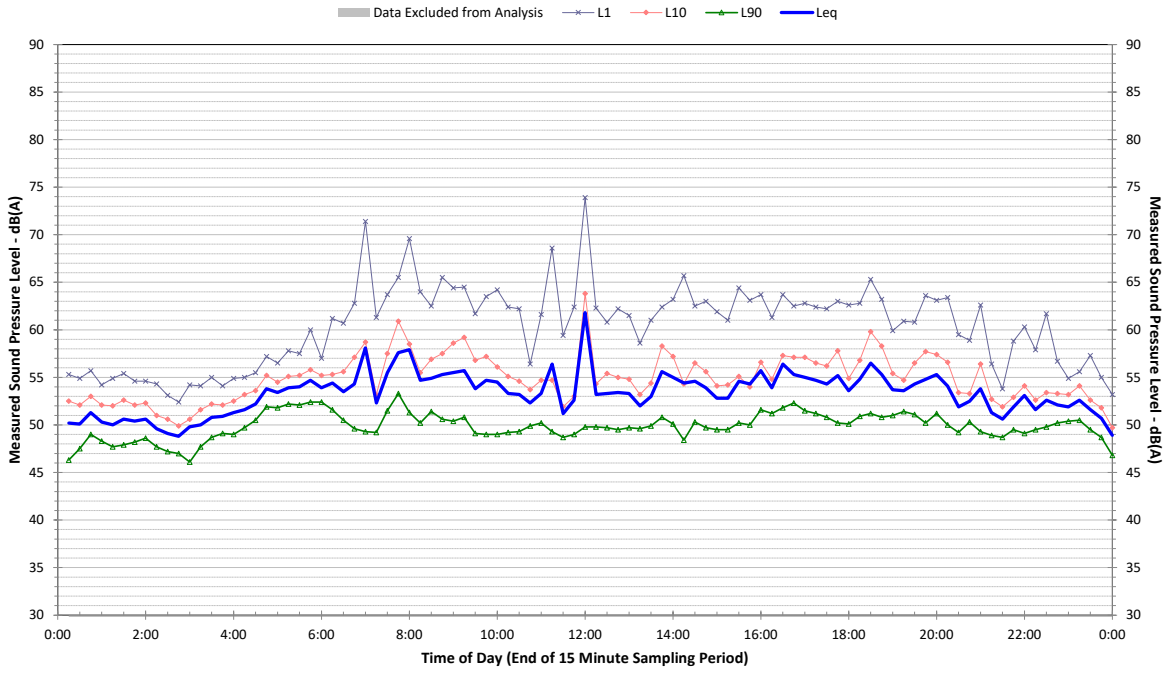
Profile of Noise Environment - Noise Monitoring Location 2
Wednesday 9 June 2021



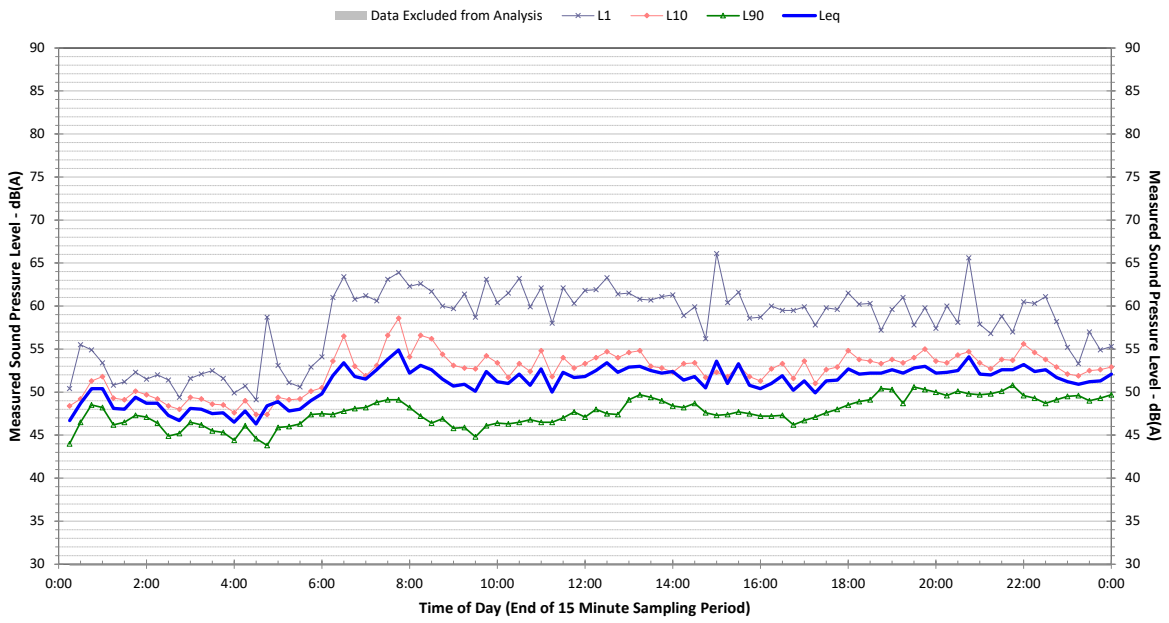
Profile of Noise Environment - Noise Monitoring Location 2
Thursday 10 June 2021



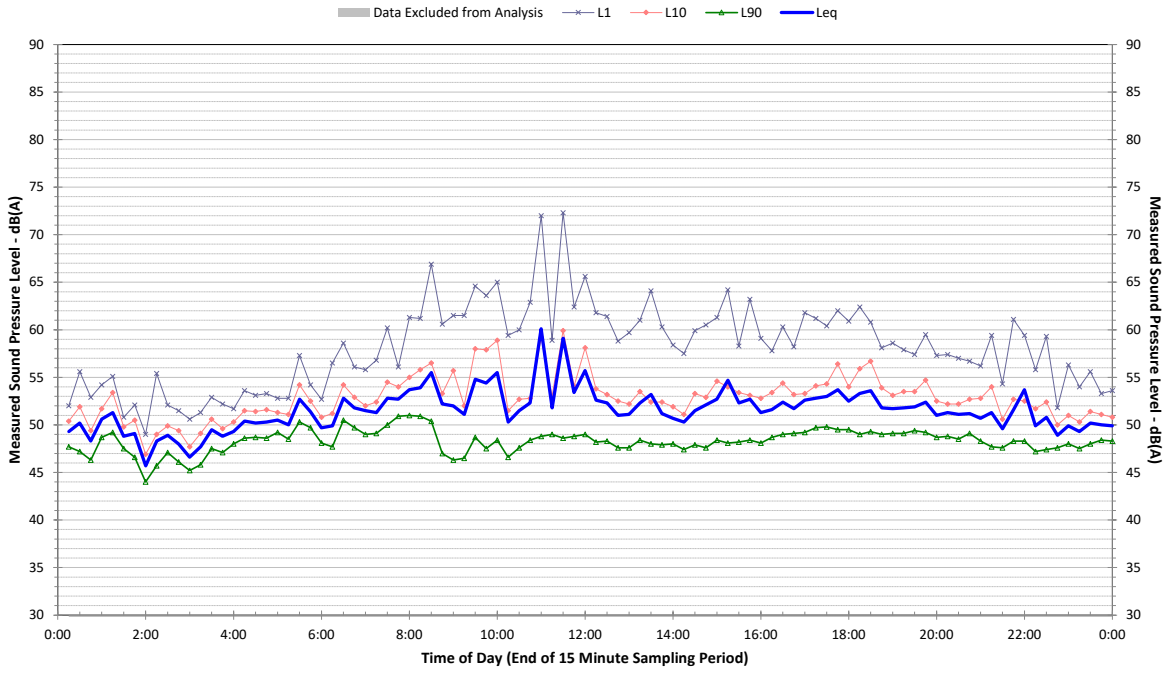
Profile of Noise Environment - Noise Monitoring Location 2
Friday 11 June 2021



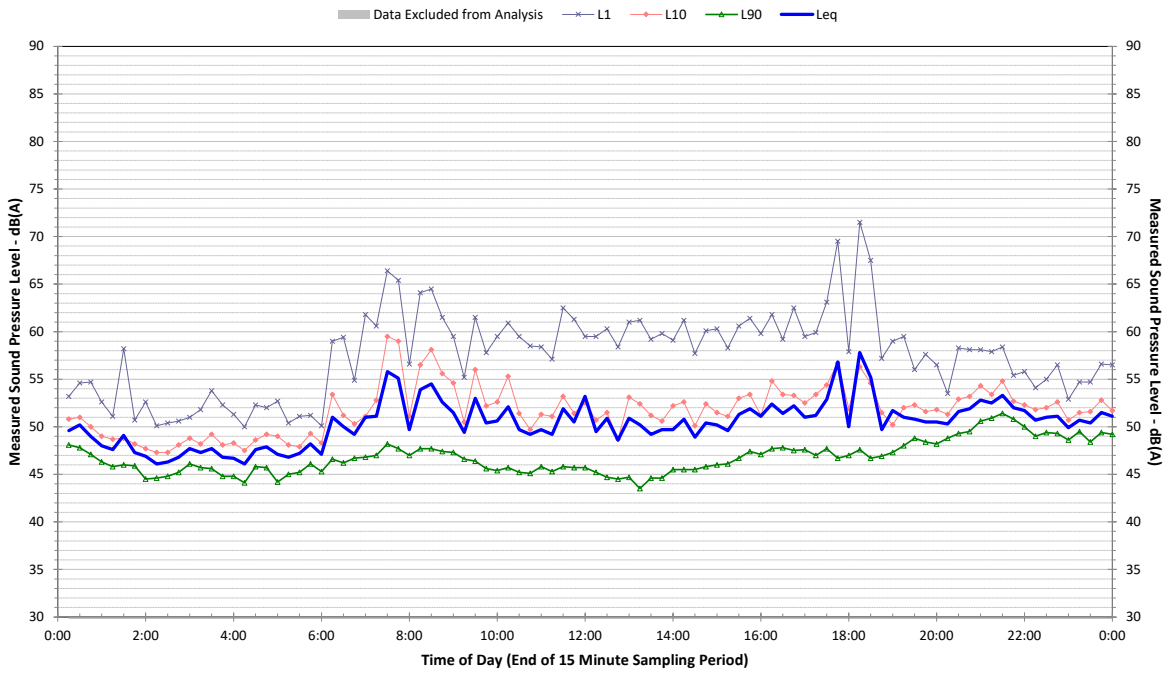
Profile of Noise Environment - Noise Monitoring Location 2
Saturday 12 June 2021



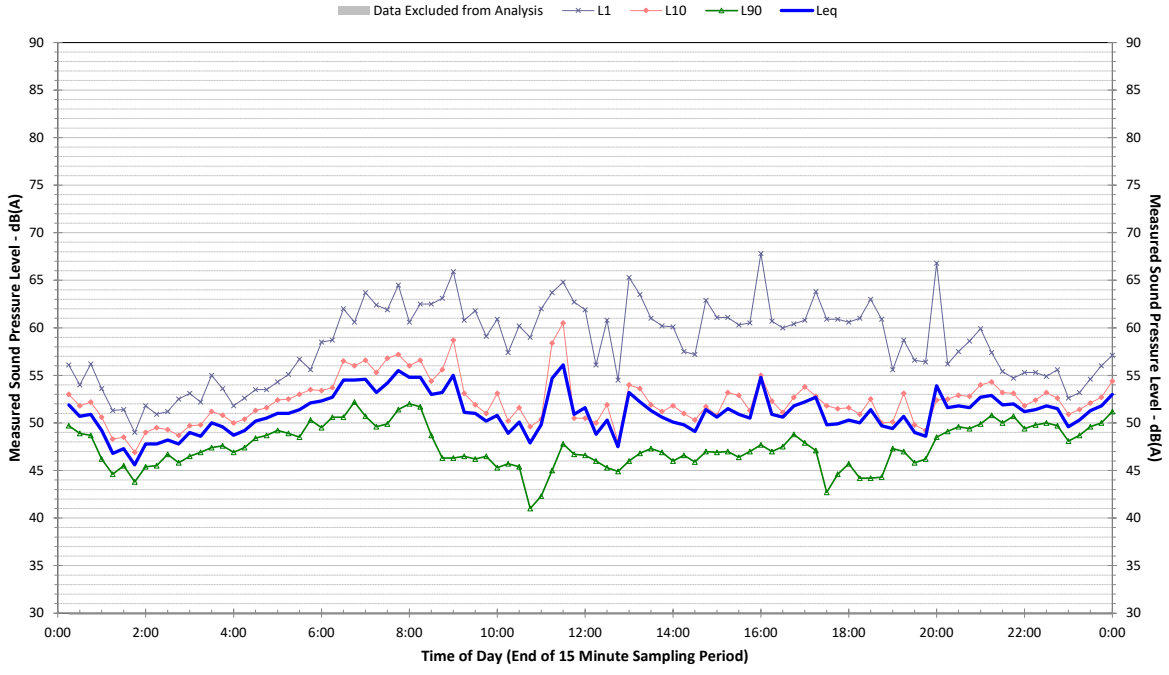
Profile of Noise Environment - Noise Monitoring Location 2
Sunday 13 June 2021



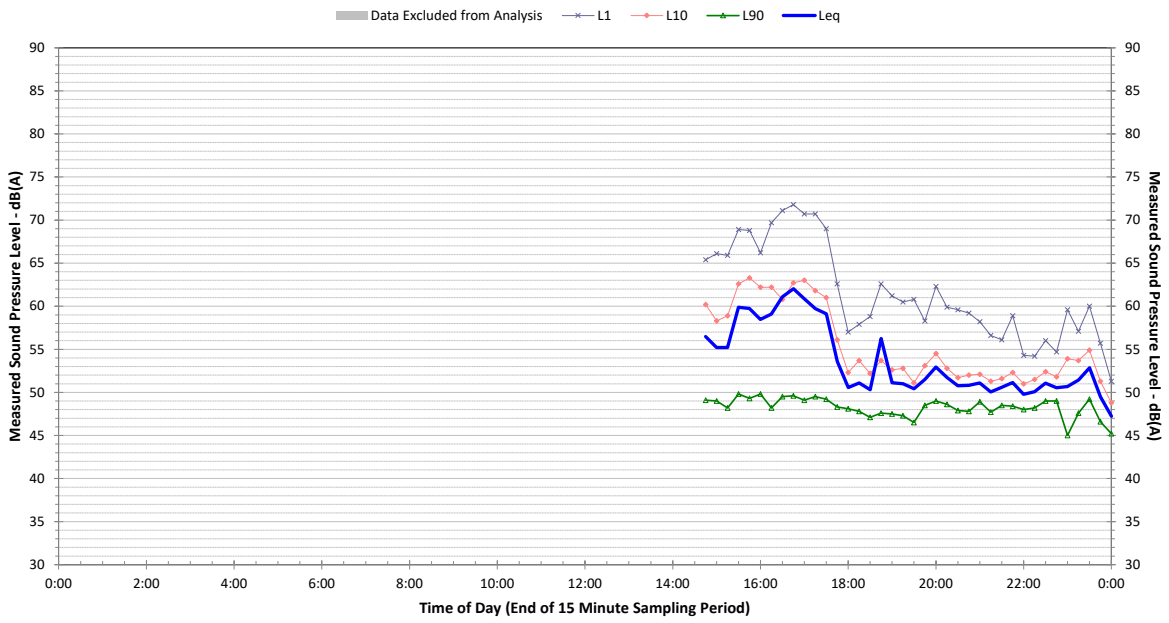
Profile of Noise Environment - Noise Monitoring Location 2
Monday 14 June 2021



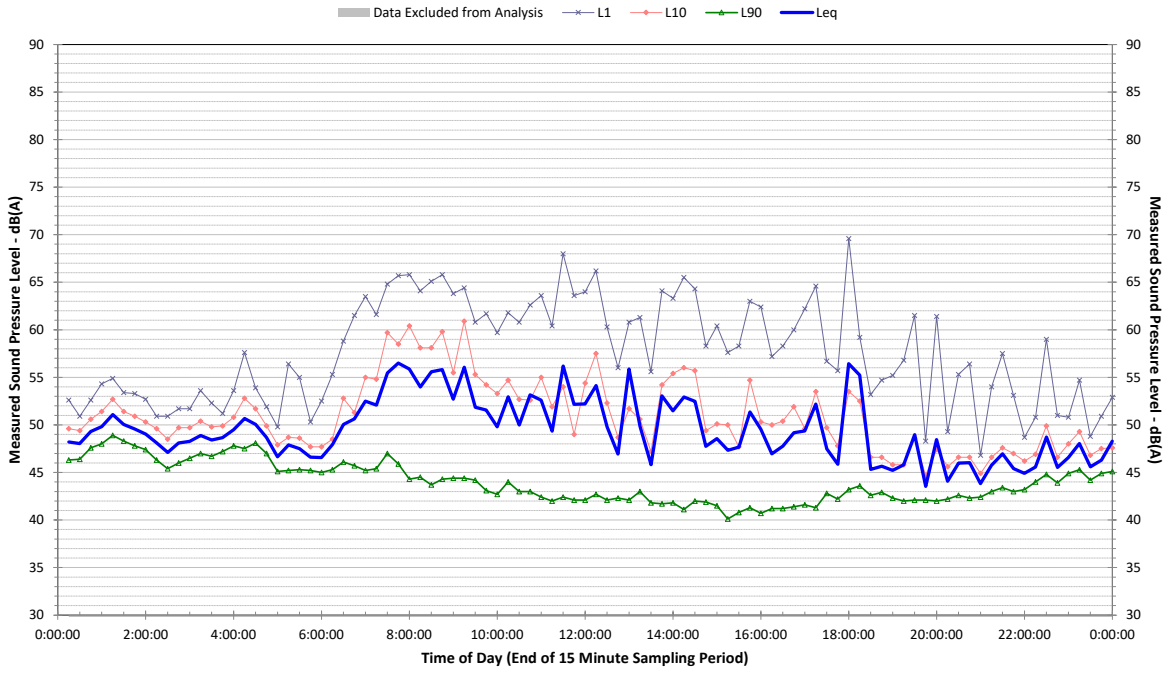
Profile of Noise Environment - Noise Monitoring Location 2
Tuesday 15 June 2021



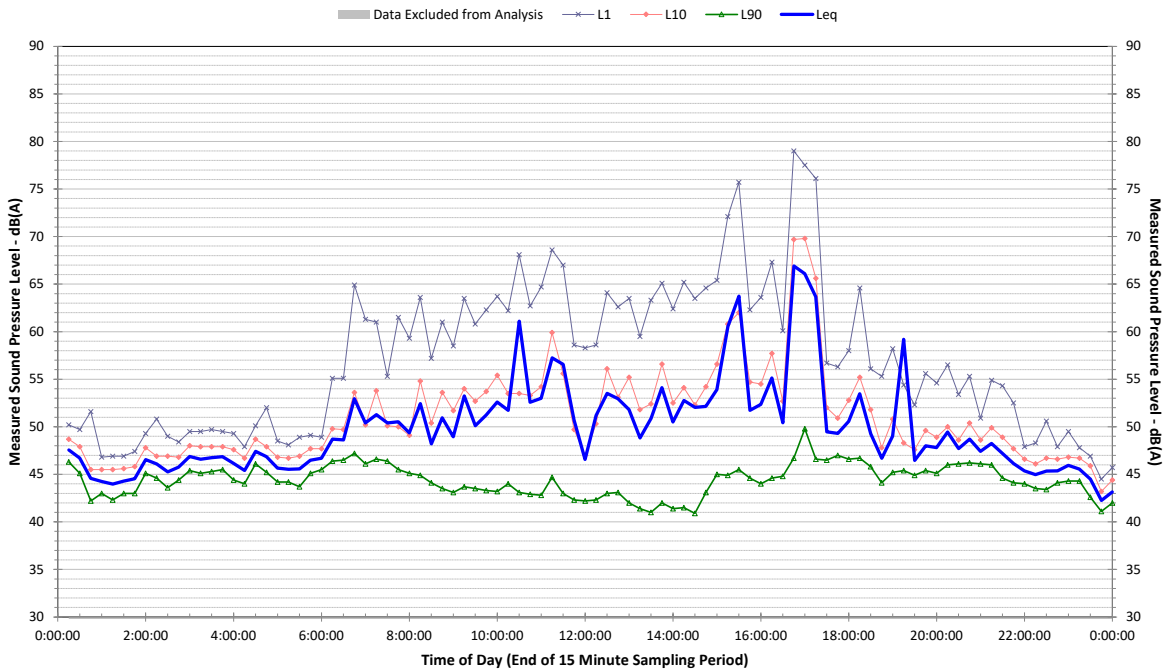
Profile of Noise Environment - Noise Monitoring Location 4
Friday 4 June 2021



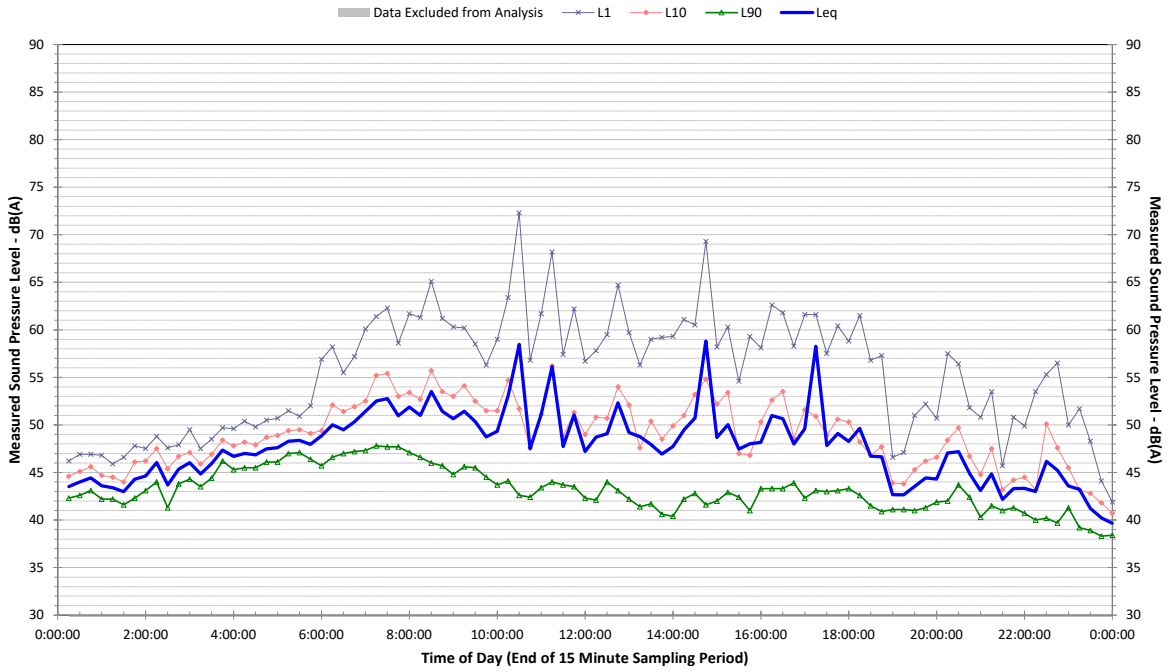
Profile of Noise Environment - Noise Monitoring Location 4
Saturday 5 June 2021



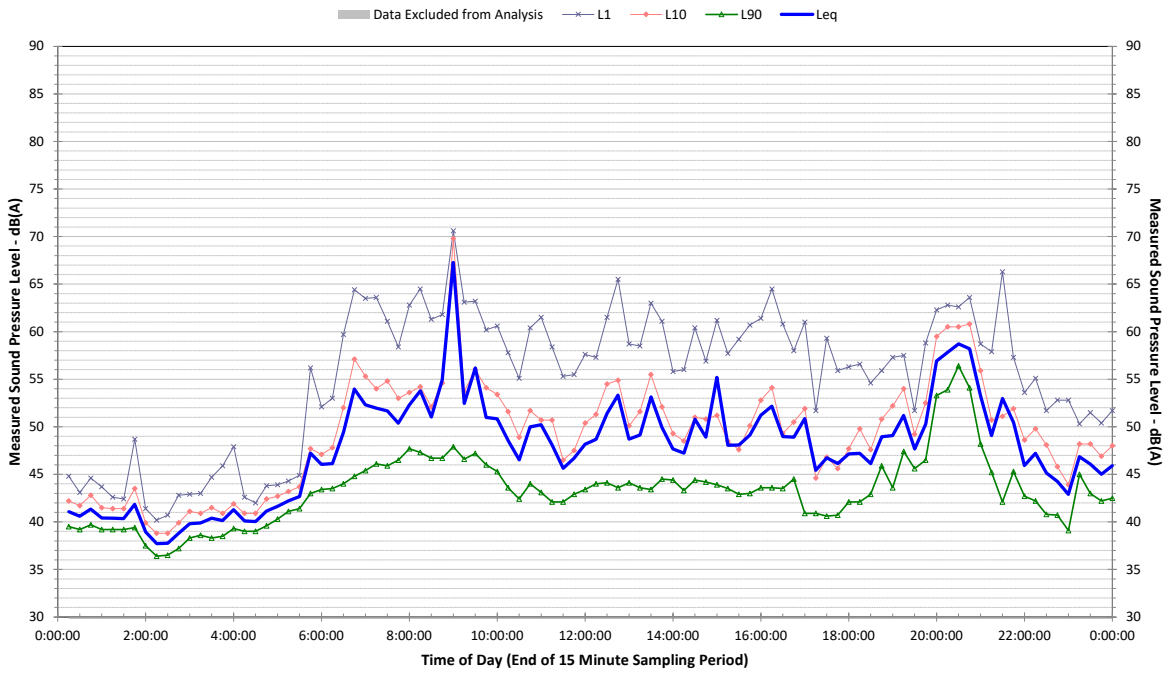
Profile of Noise Environment - Noise Monitoring Location 4
Sunday 6 June 2021



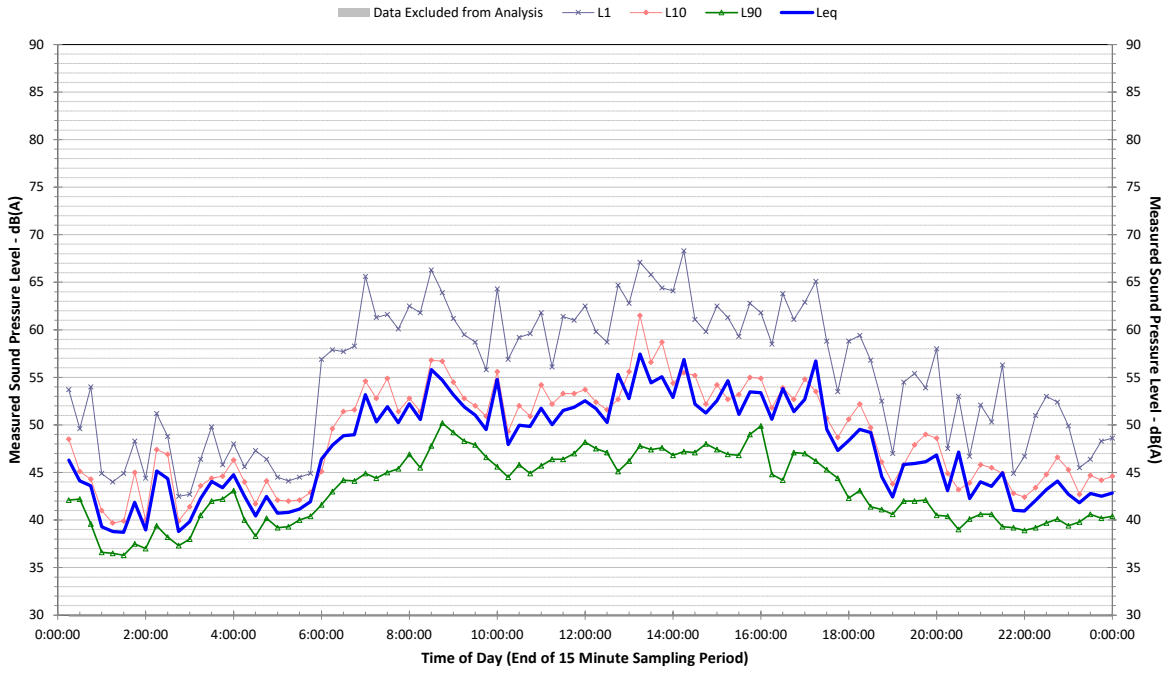
Profile of Noise Environment - Noise Monitoring Location 4
Monday 7 June 2021



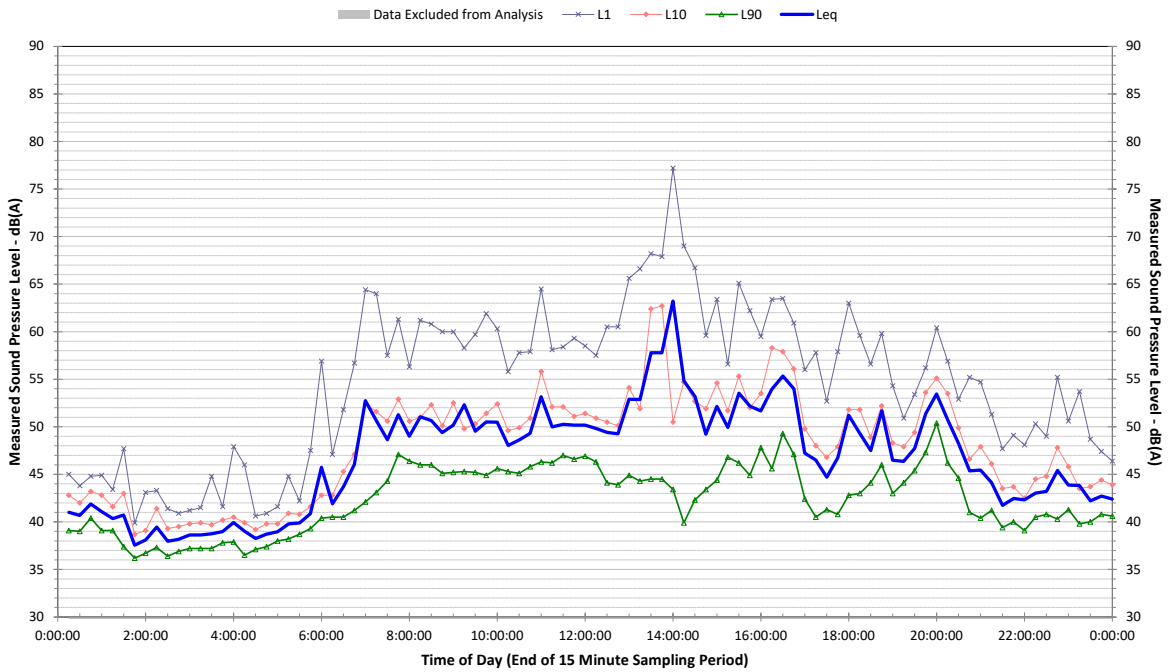
Profile of Noise Environment - Noise Monitoring Location 4
Tuesday 8 June 2021



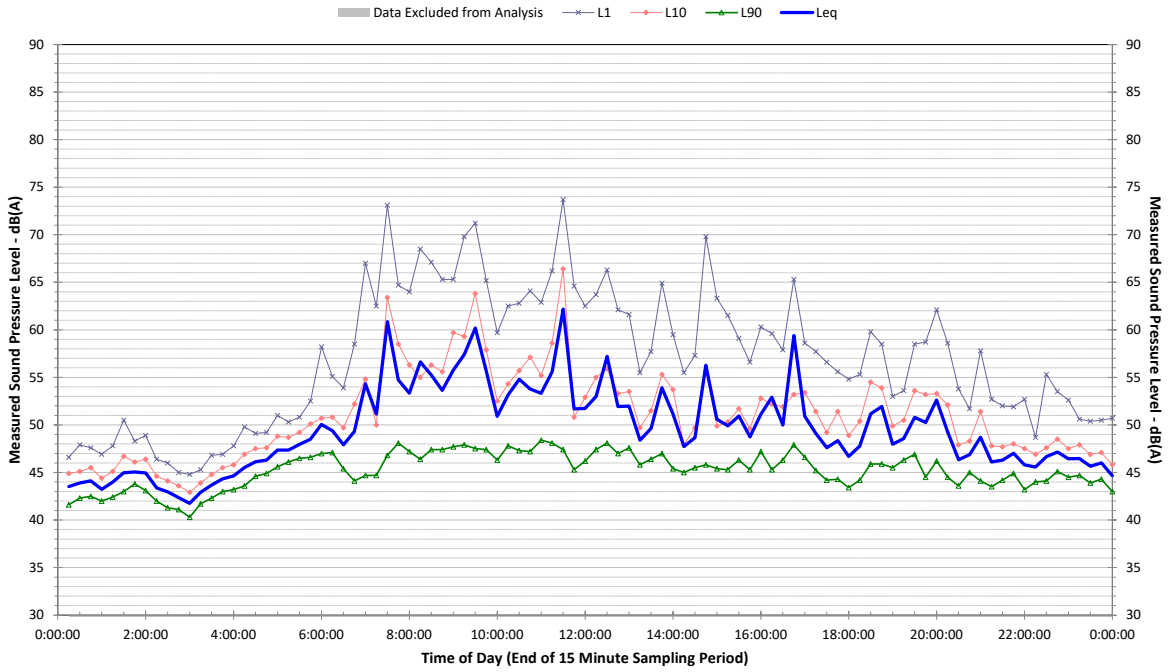
Profile of Noise Environment - Noise Monitoring Location 4
Wednesday 9 June 2021



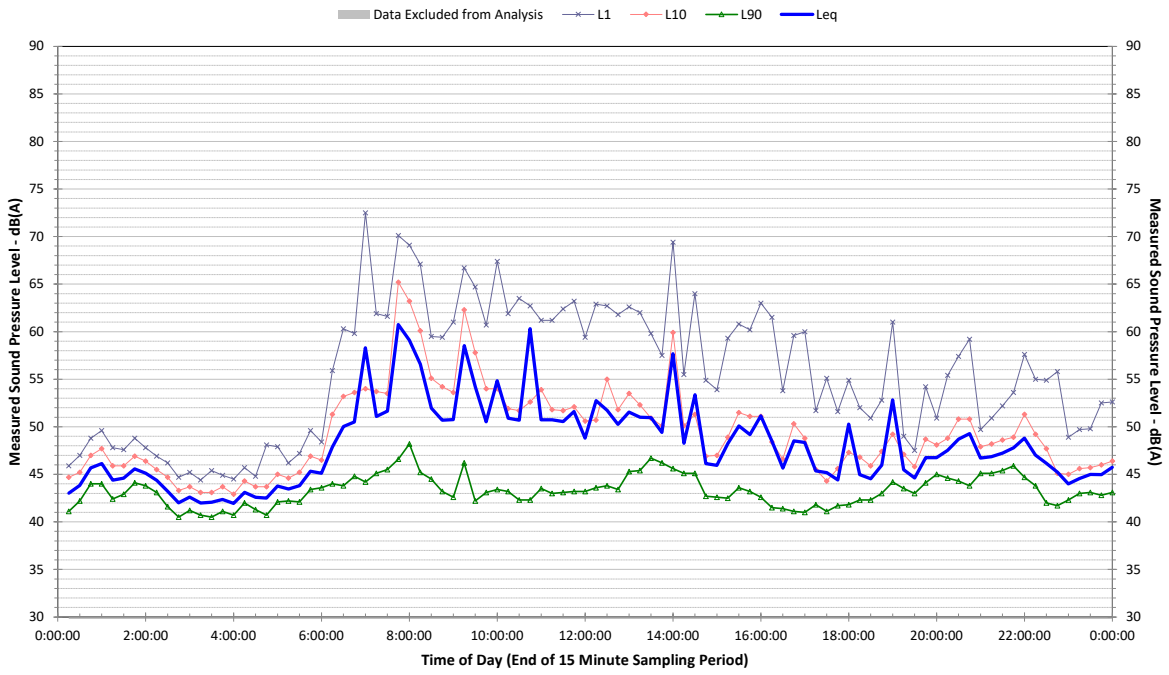
Profile of Noise Environment - Noise Monitoring Location 4
Thursday 10 June 2021



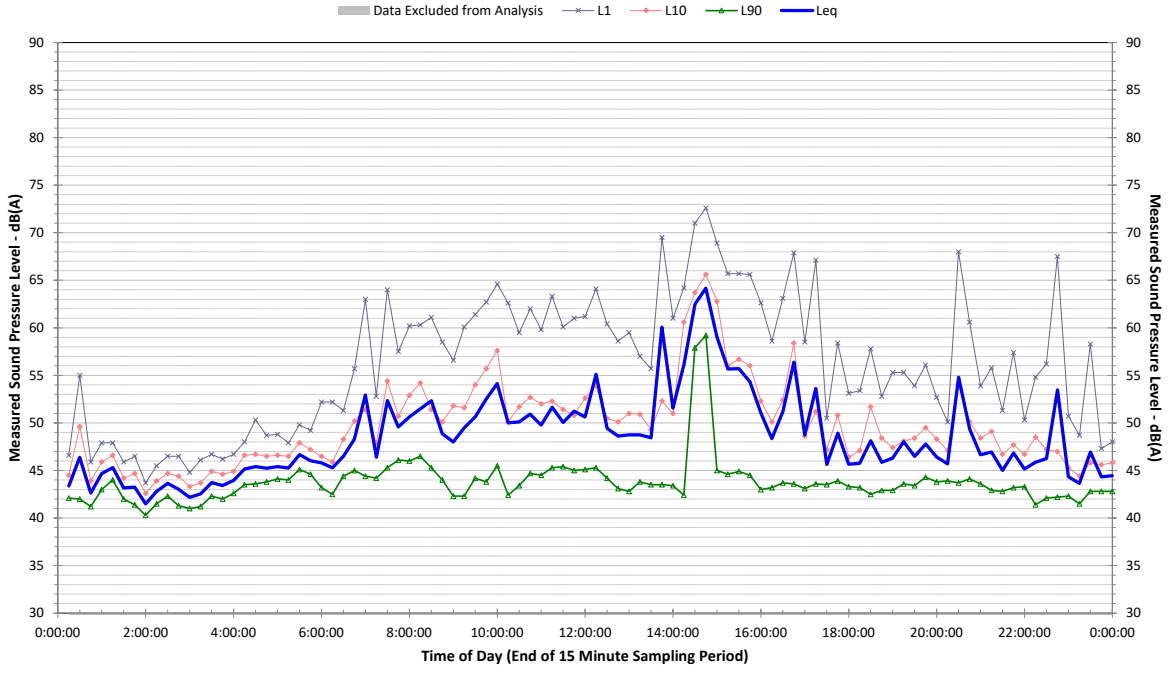
Profile of Noise Environment - Noise Monitoring Location 4
Friday 11 June 2021



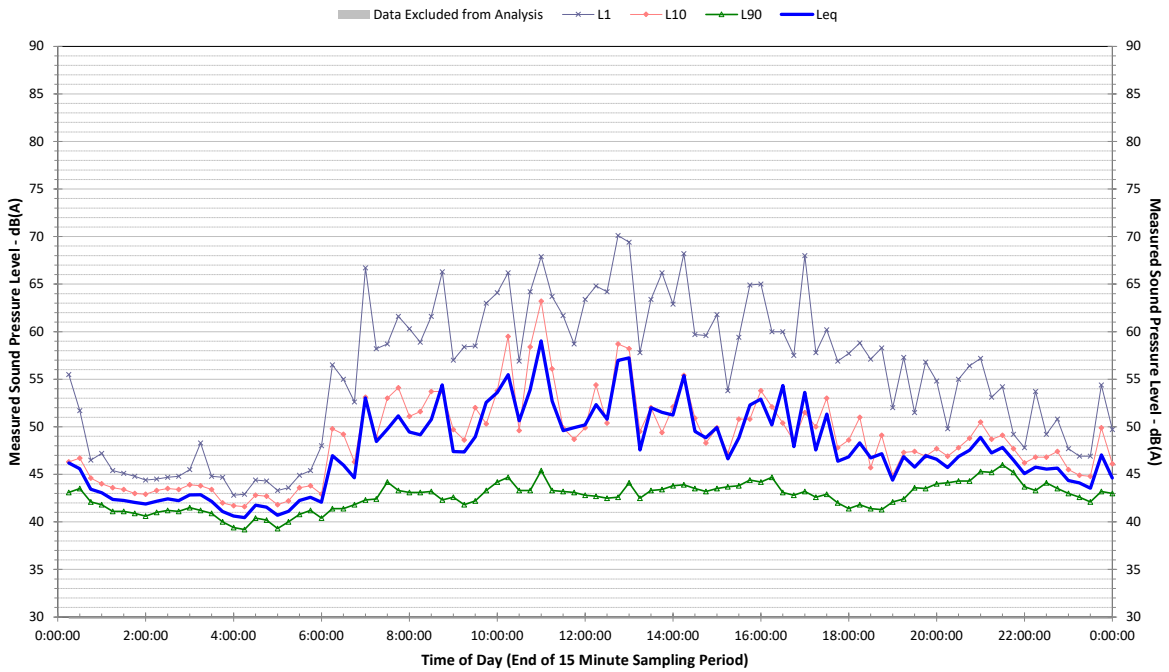
Profile of Noise Environment - Noise Monitoring Location 4
Saturday 12 June 2021



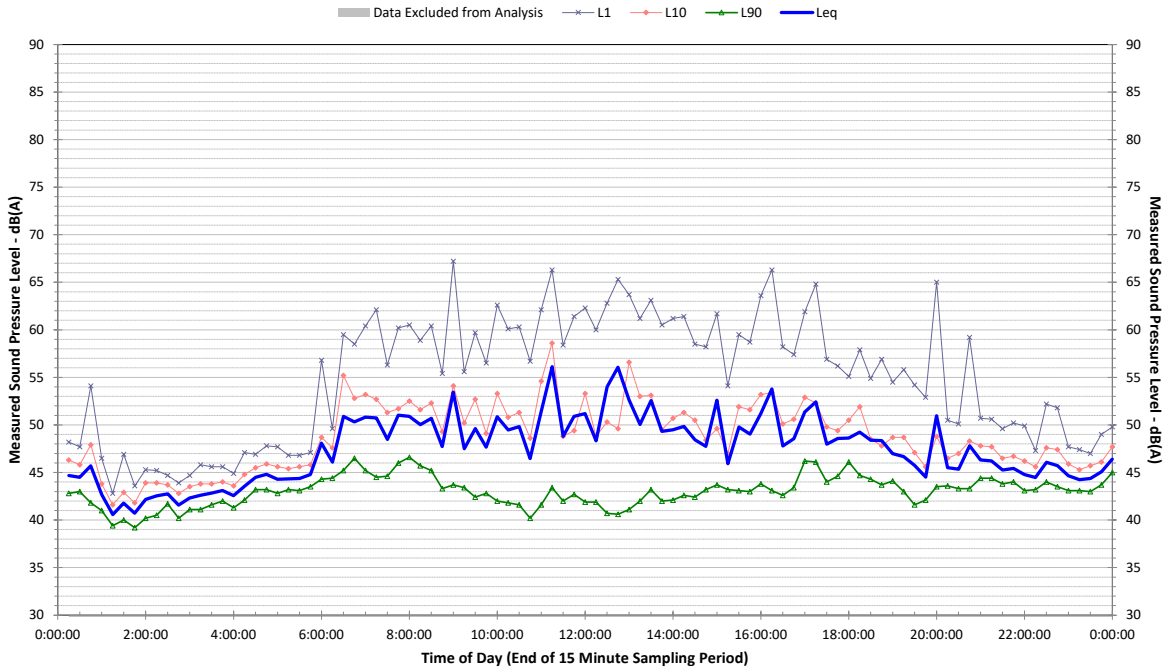
Profile of Noise Environment - Noise Monitoring Location 4
Sunday 13 June 2021



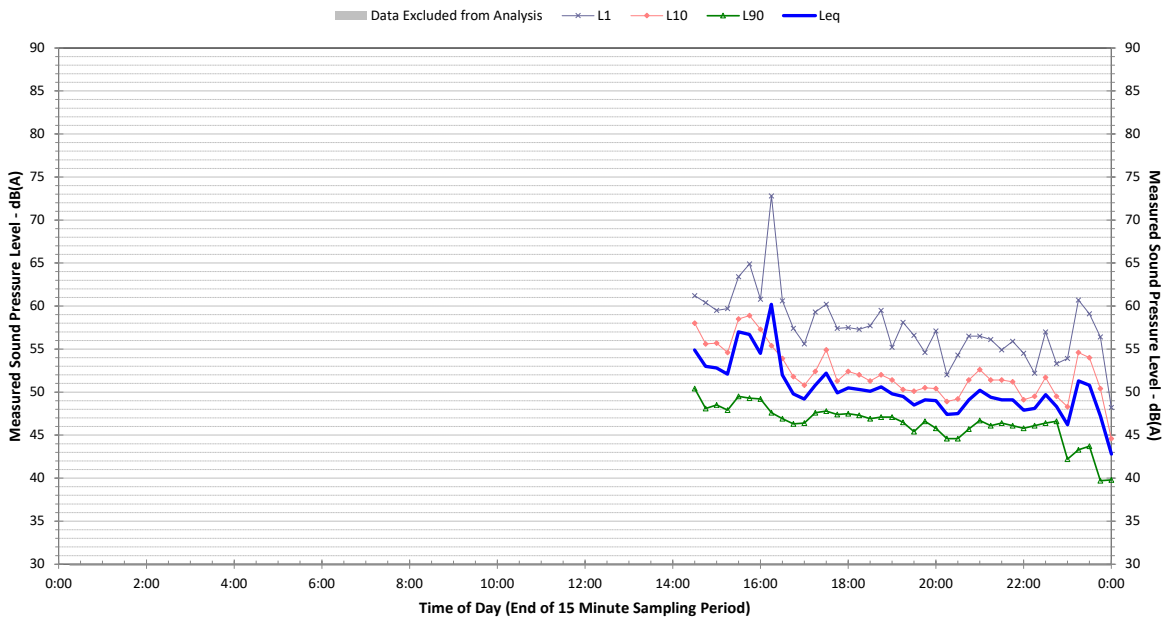
Profile of Noise Environment - Noise Monitoring Location 4
Monday 14 June 2021



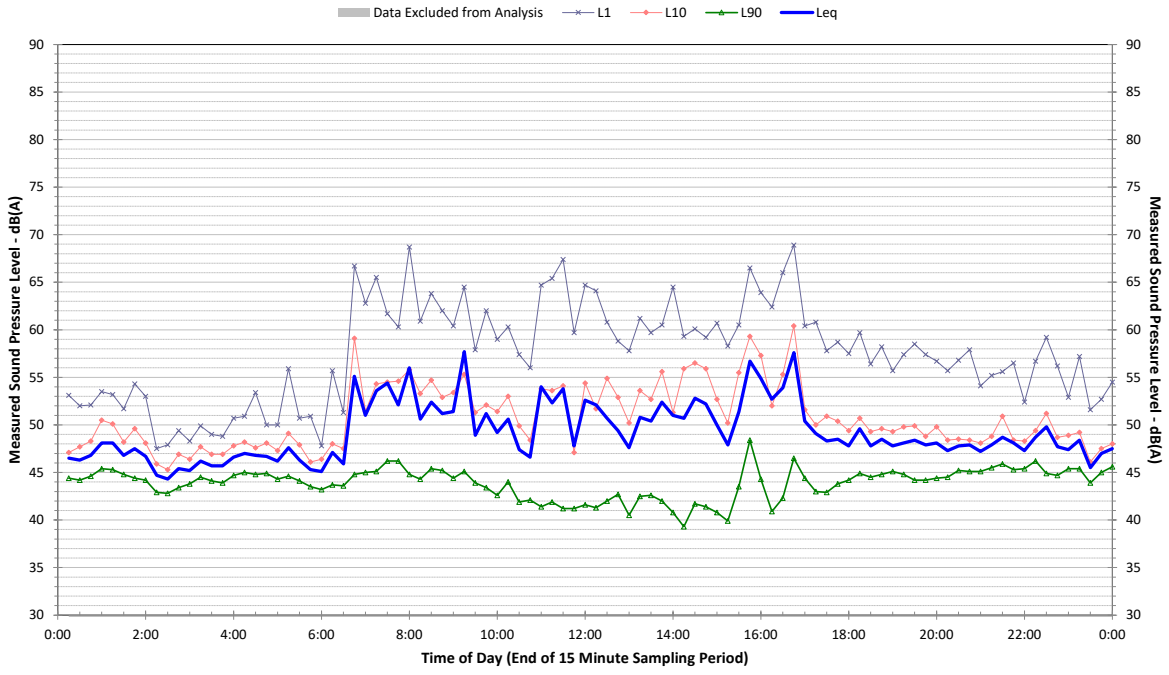
Profile of Noise Environment - Noise Monitoring Location 4
Tuesday 15 June 2021



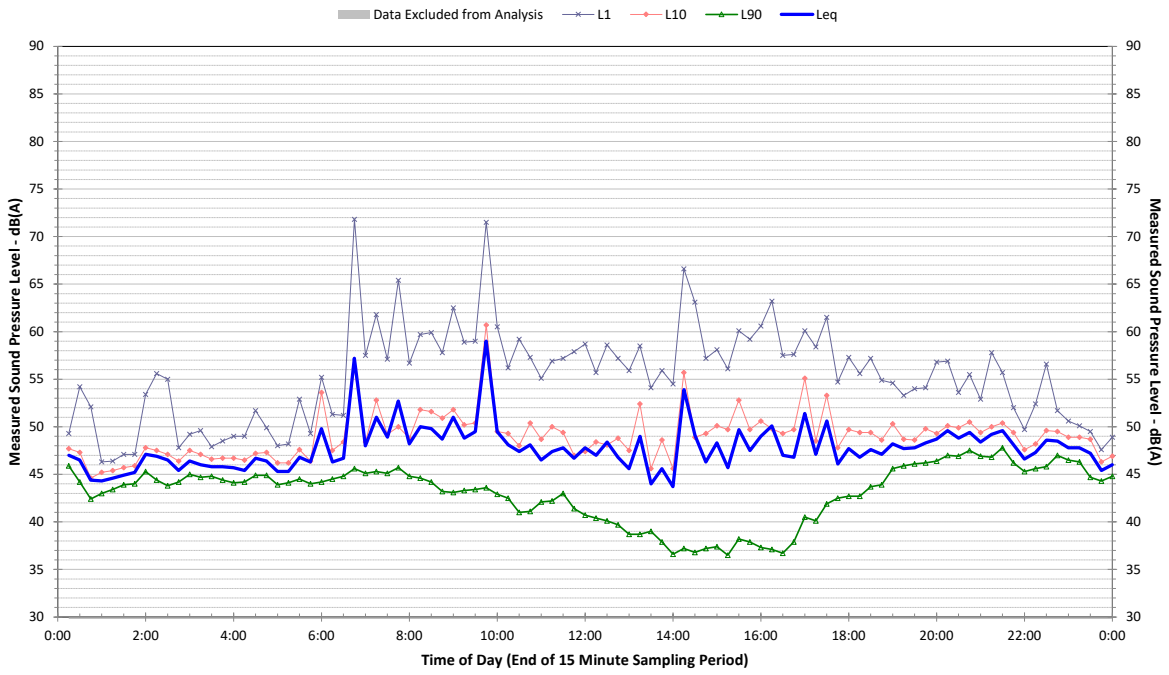
Profile of Noise Environment - Noise Monitoring Location 5
Friday 4 June 2021



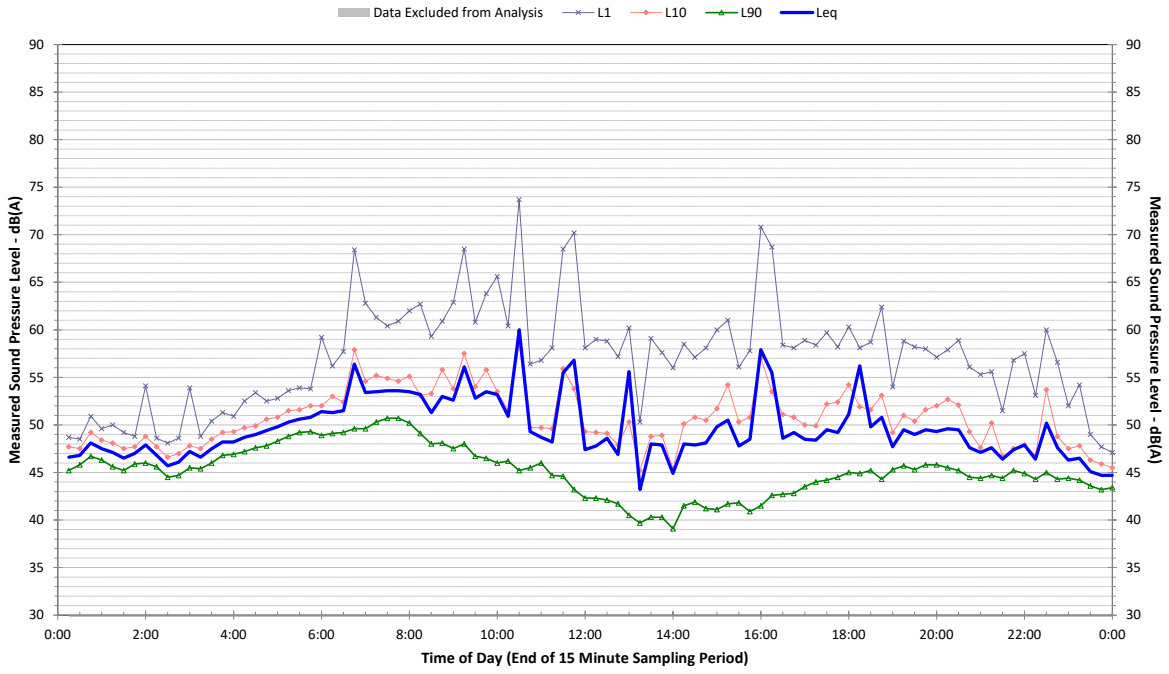
Profile of Noise Environment - Noise Monitoring Location 5
Saturday 5 June 2021



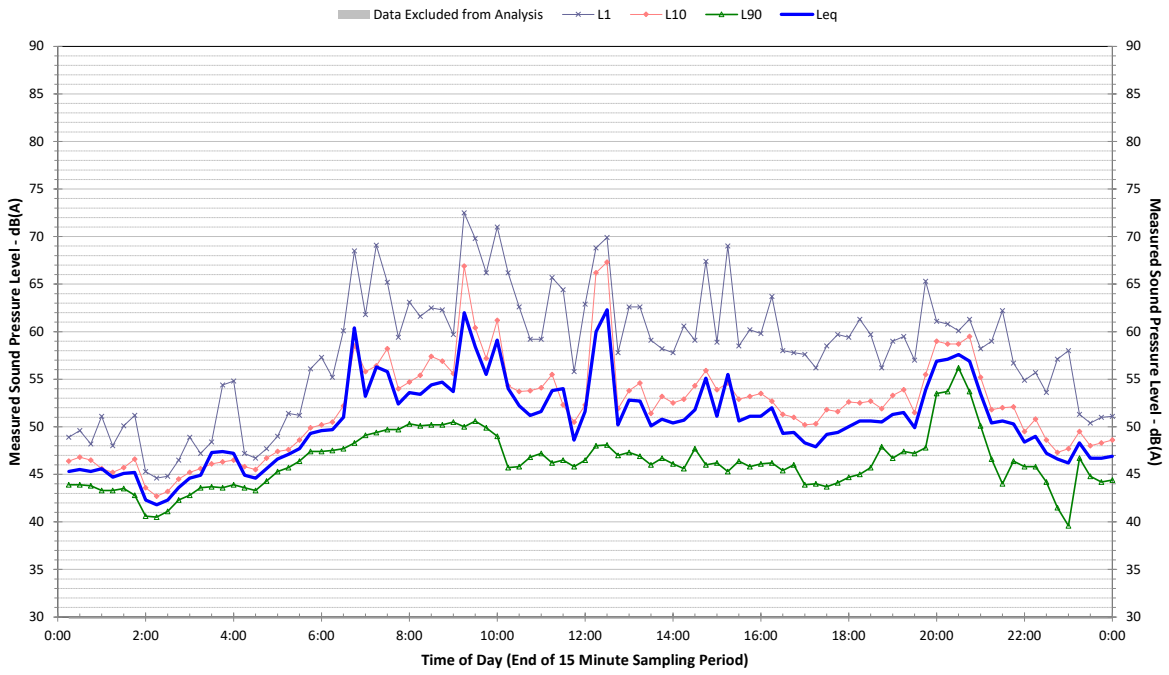
Profile of Noise Environment - Noise Monitoring Location 5
Sunday 6 June 2021



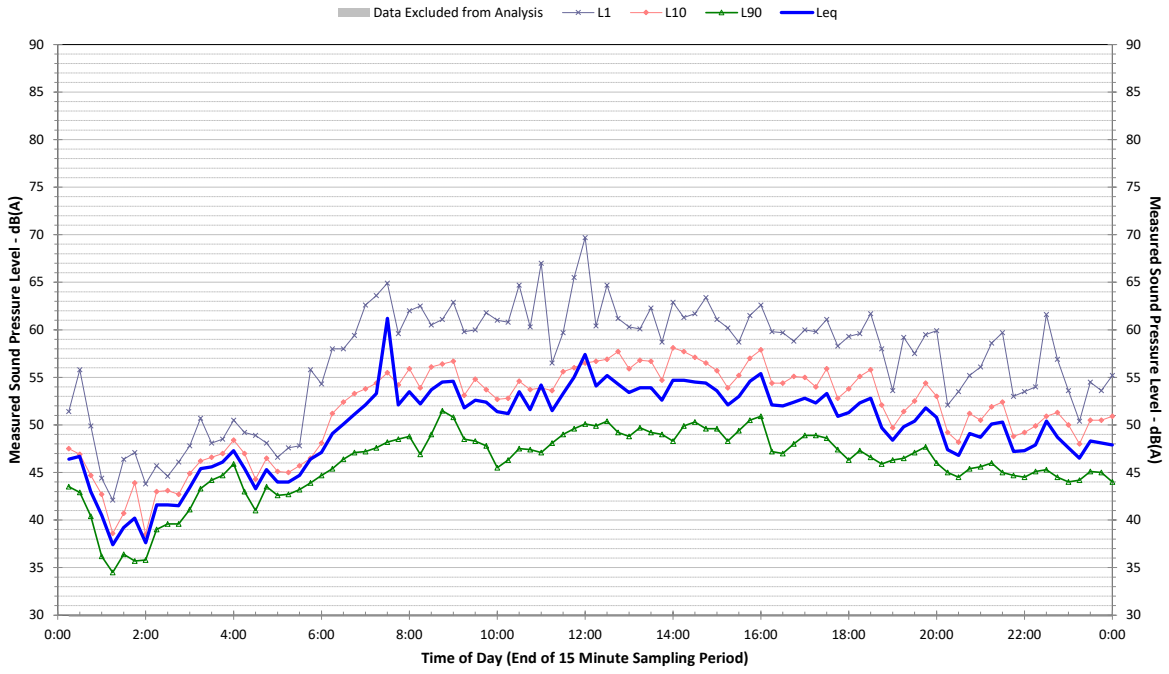
Profile of Noise Environment - Noise Monitoring Location 5
Monday 7 June 2021



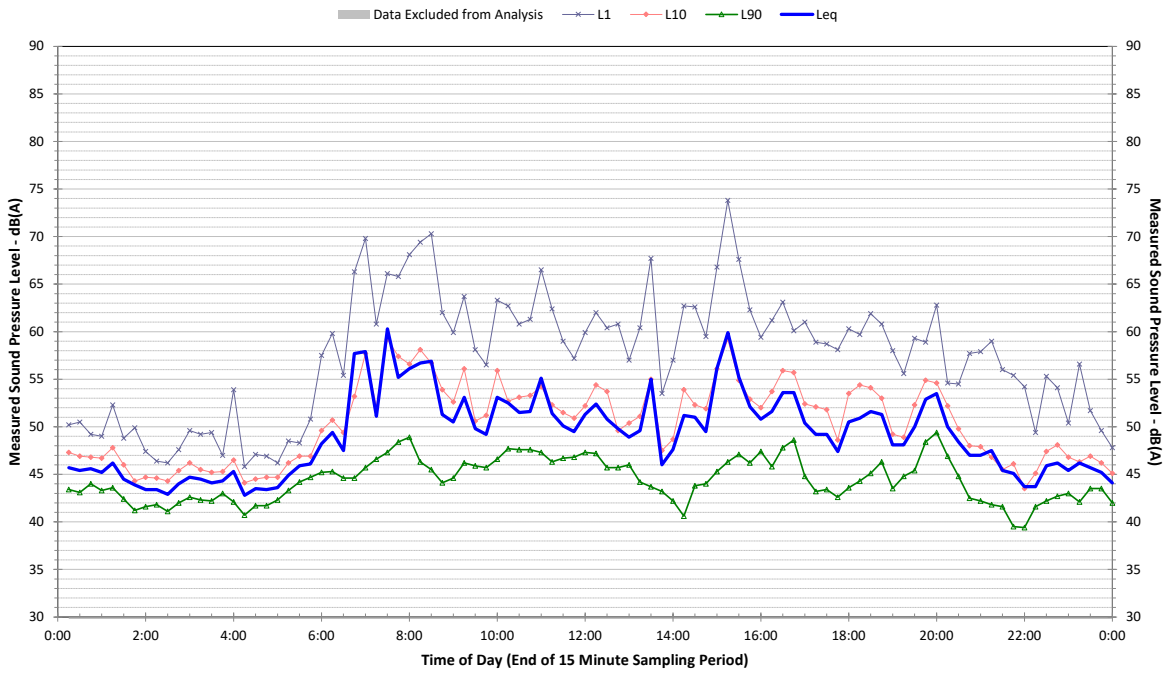
Profile of Noise Environment - Noise Monitoring Location 5
Tuesday 8 June 2021



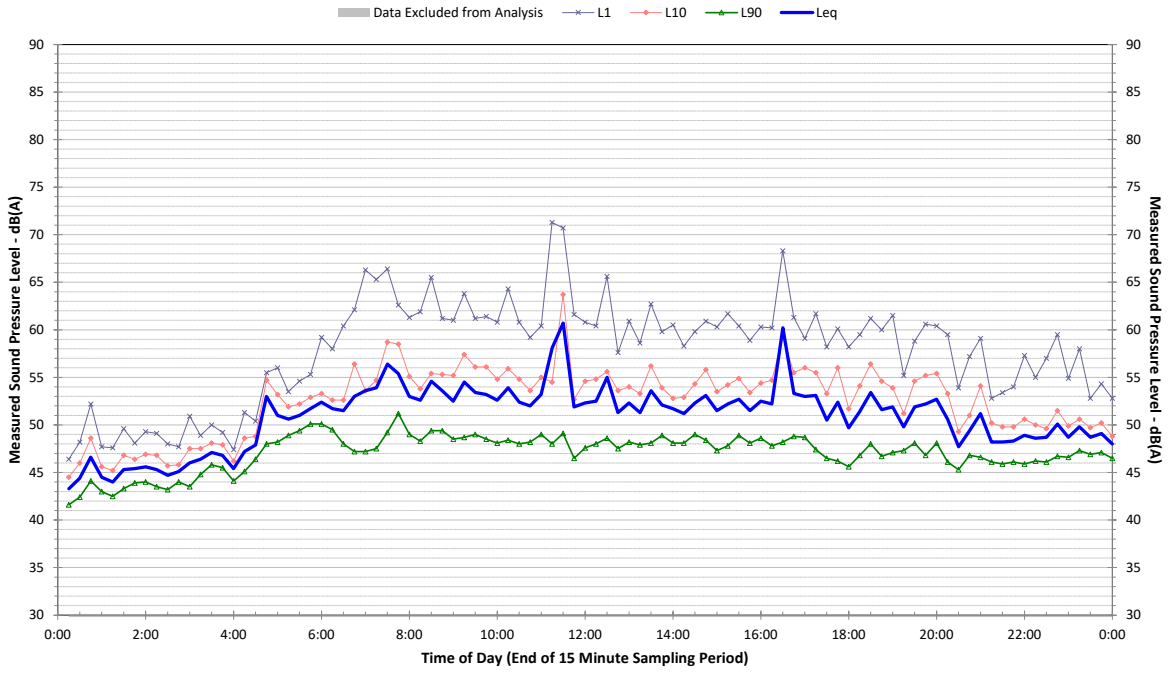
Profile of Noise Environment - Noise Monitoring Location 5
Wednesday 9 June 2021



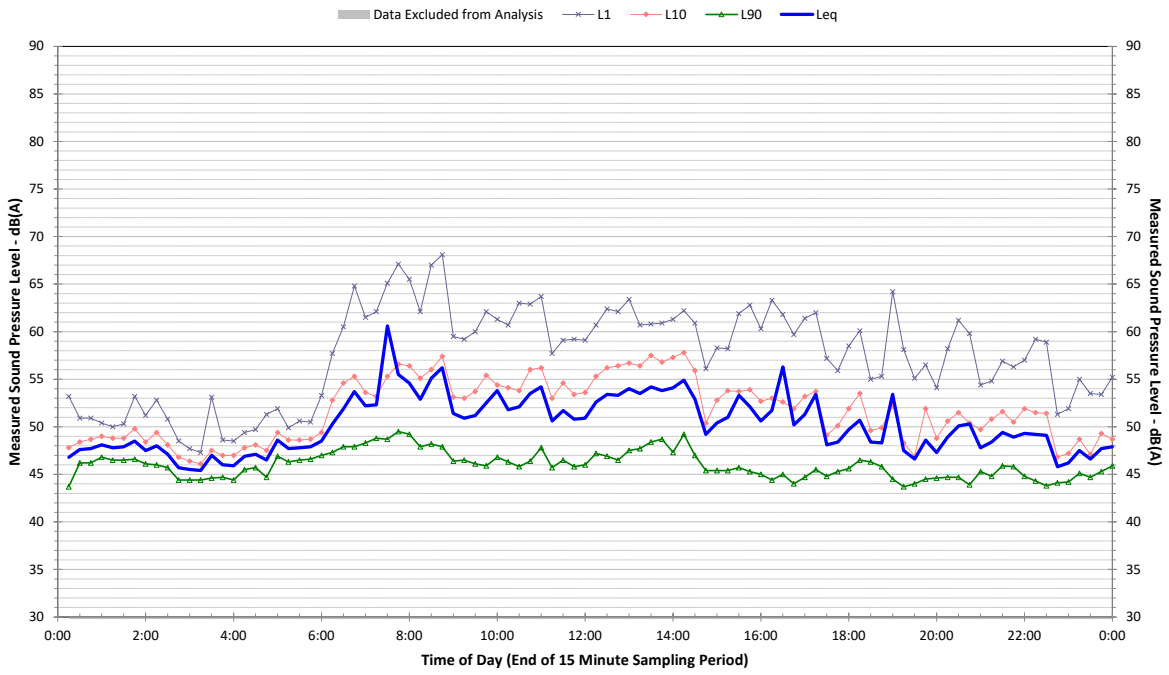
Profile of Noise Environment - Noise Monitoring Location 5
Thursday 10 June 2021



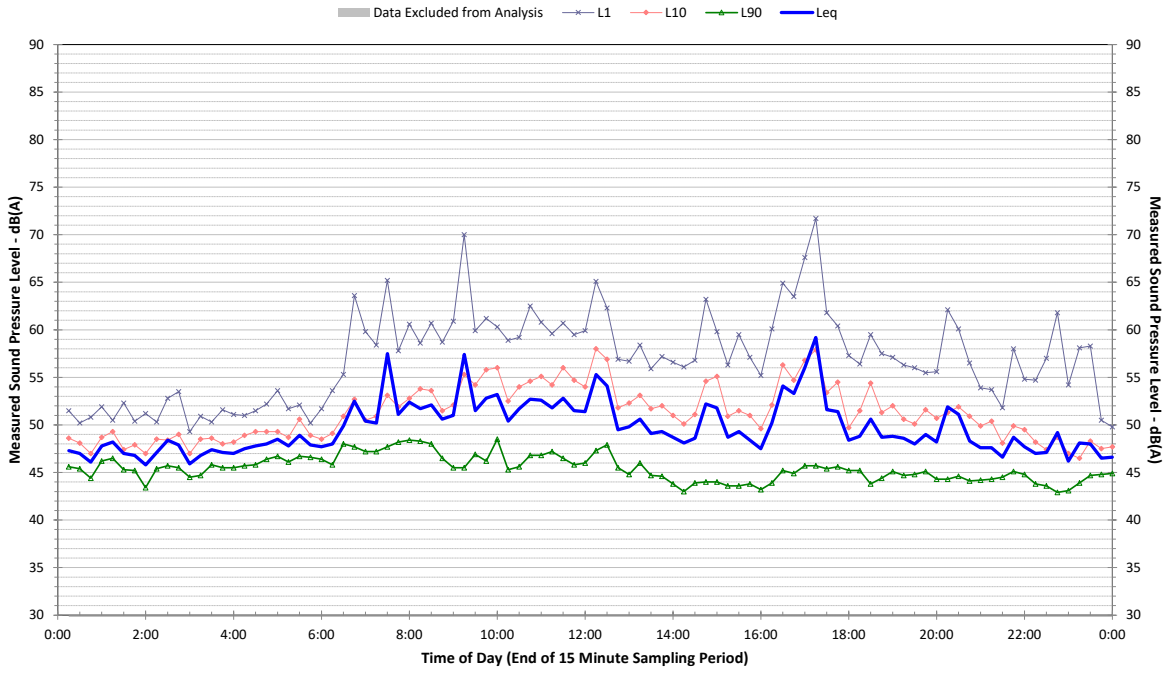
Profile of Noise Environment - Noise Monitoring Location 5
Friday 11 June 2021



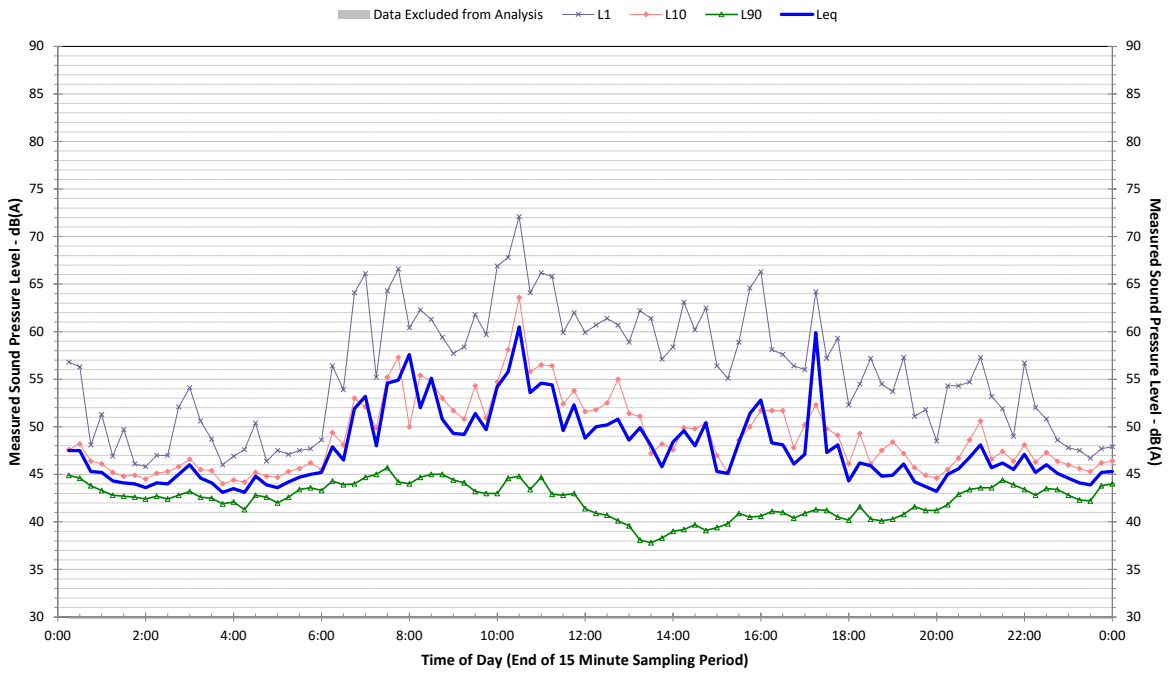
Profile of Noise Environment - Noise Monitoring Location 5
Saturday 12 June 2021



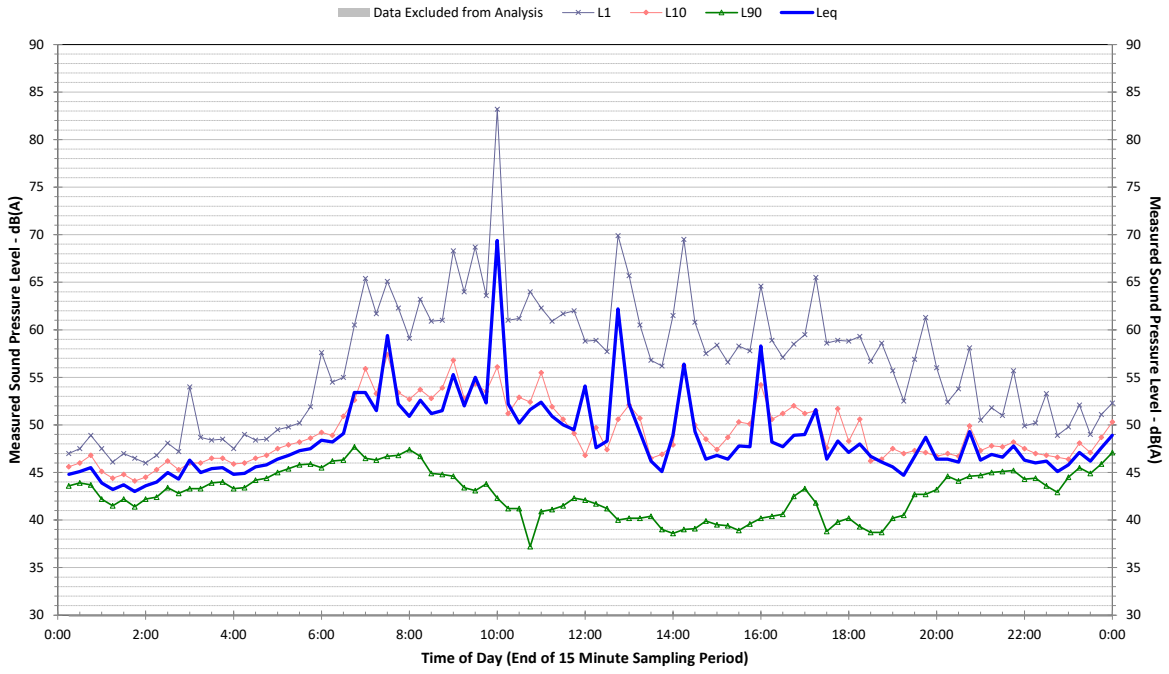
Profile of Noise Environment - Noise Monitoring Location 5
Sunday 13 June 2021



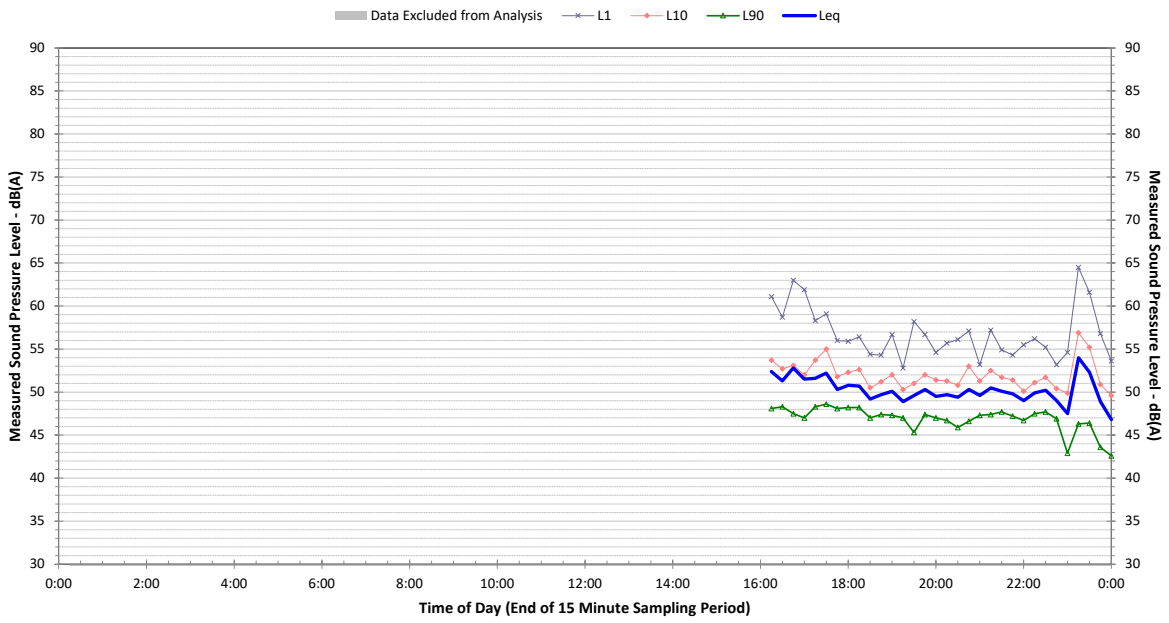
Profile of Noise Environment - Noise Monitoring Location 5
Monday 14 June 2021



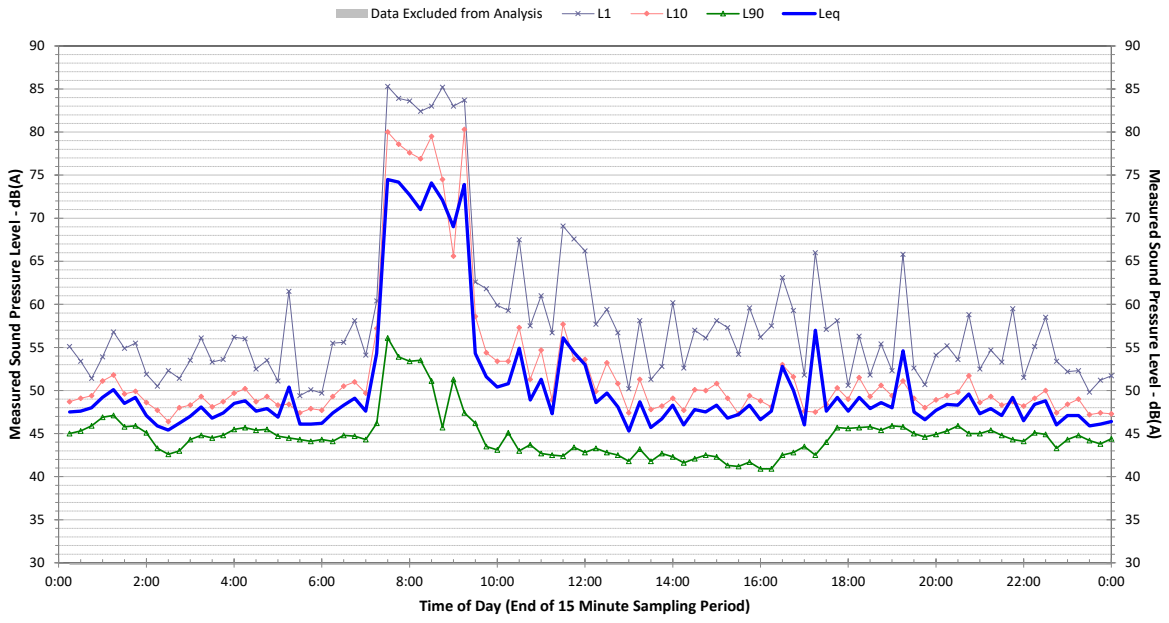
Profile of Noise Environment - Noise Monitoring Location 5
Tuesday 15 June 2021



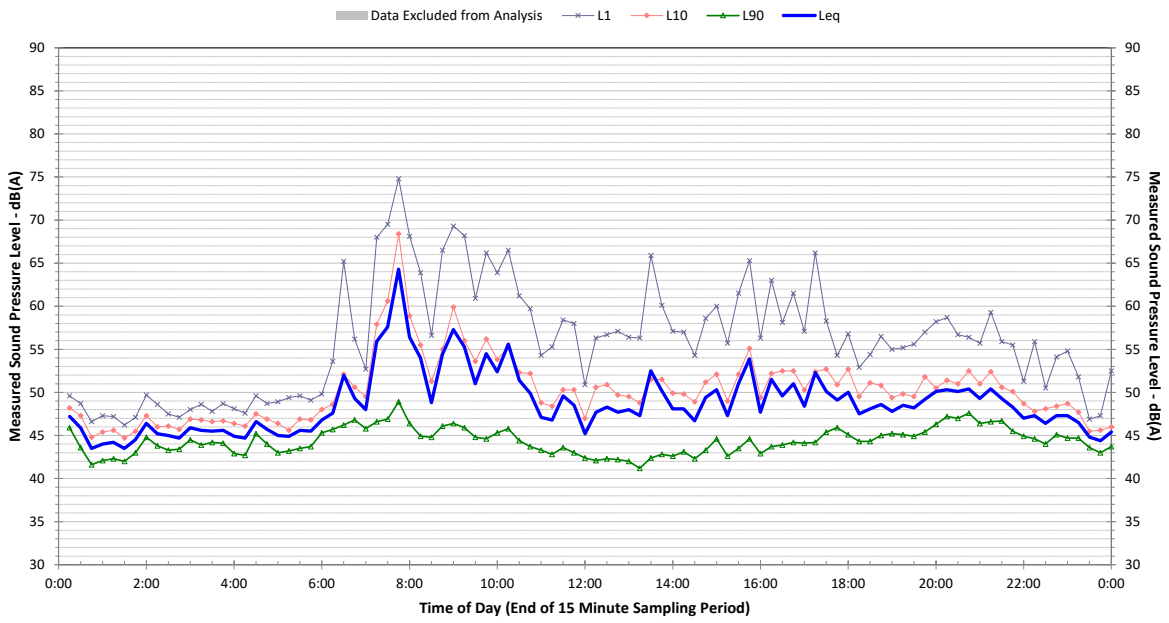
Profile of Noise Environment - Noise Monitoring Location 6
Friday 4 June 2021



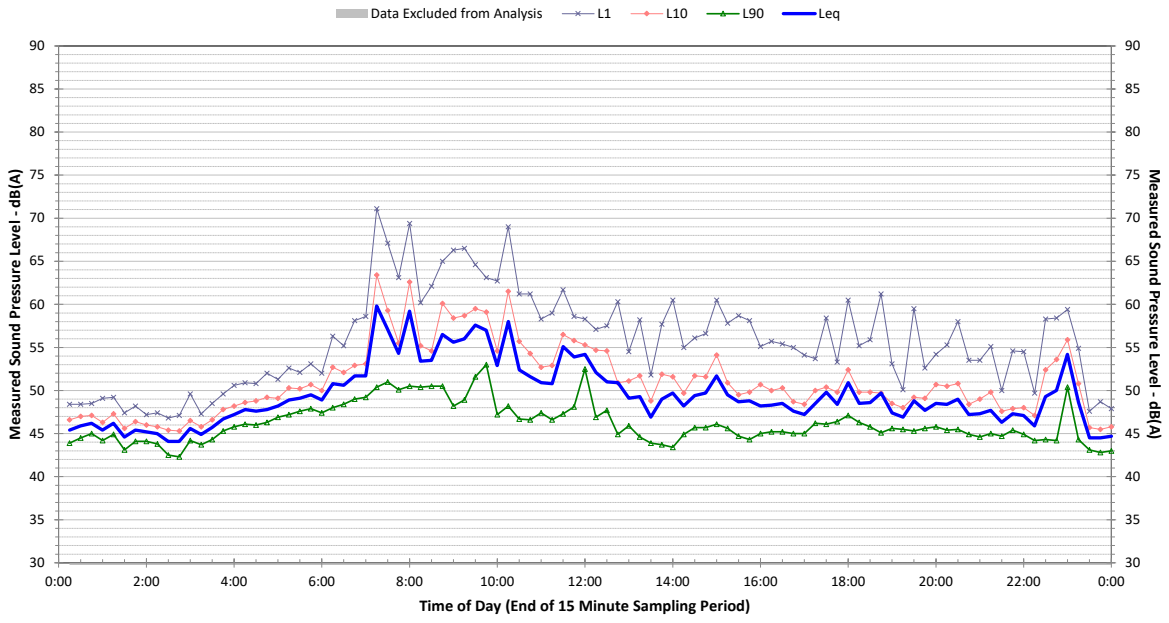
Profile of Noise Environment - Noise Monitoring Location 6
Saturday 5 June 2021



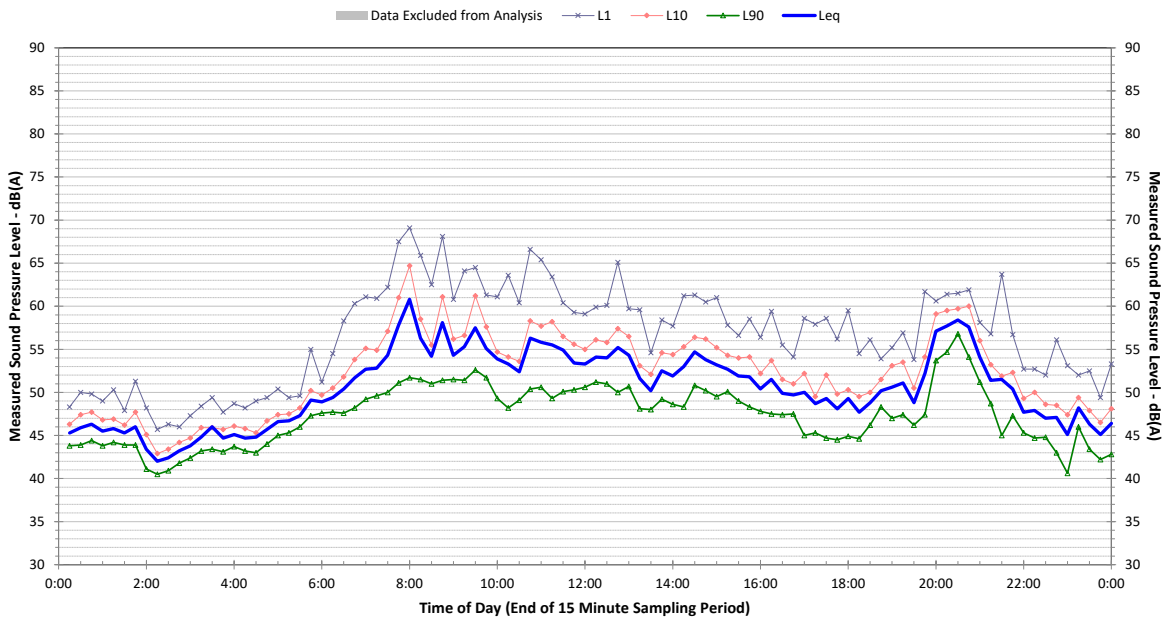
Profile of Noise Environment - Noise Monitoring Location 6
Sunday 6 June 2021



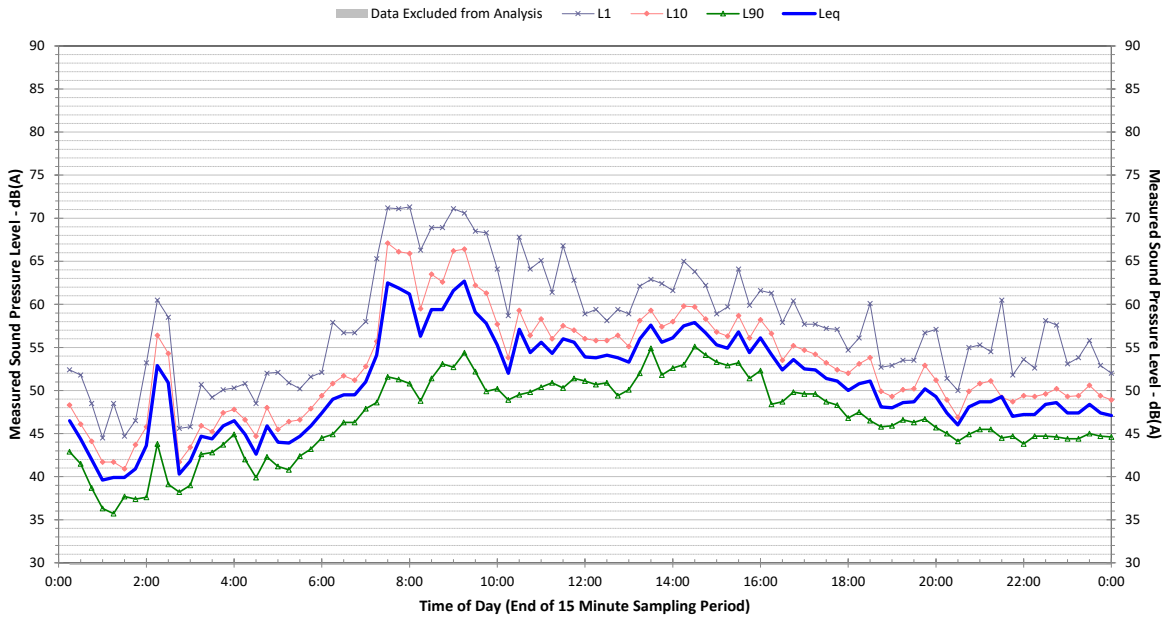
Profile of Noise Environment - Noise Monitoring Location 6
Monday 7 June 2021



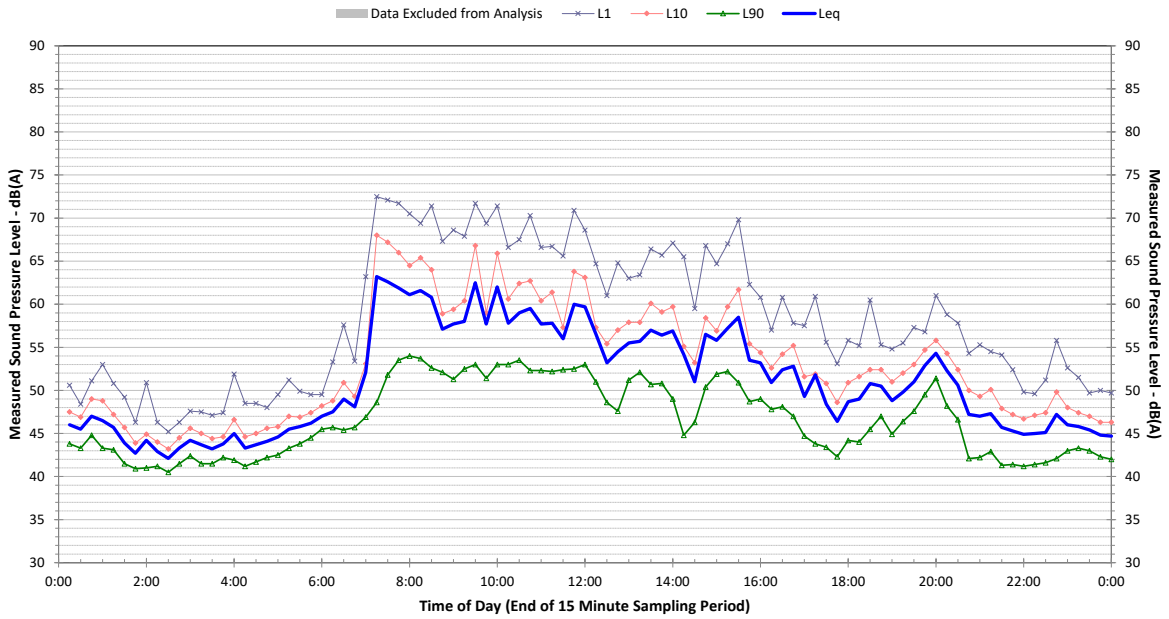
Profile of Noise Environment - Noise Monitoring Location 6
Tuesday 8 June 2021



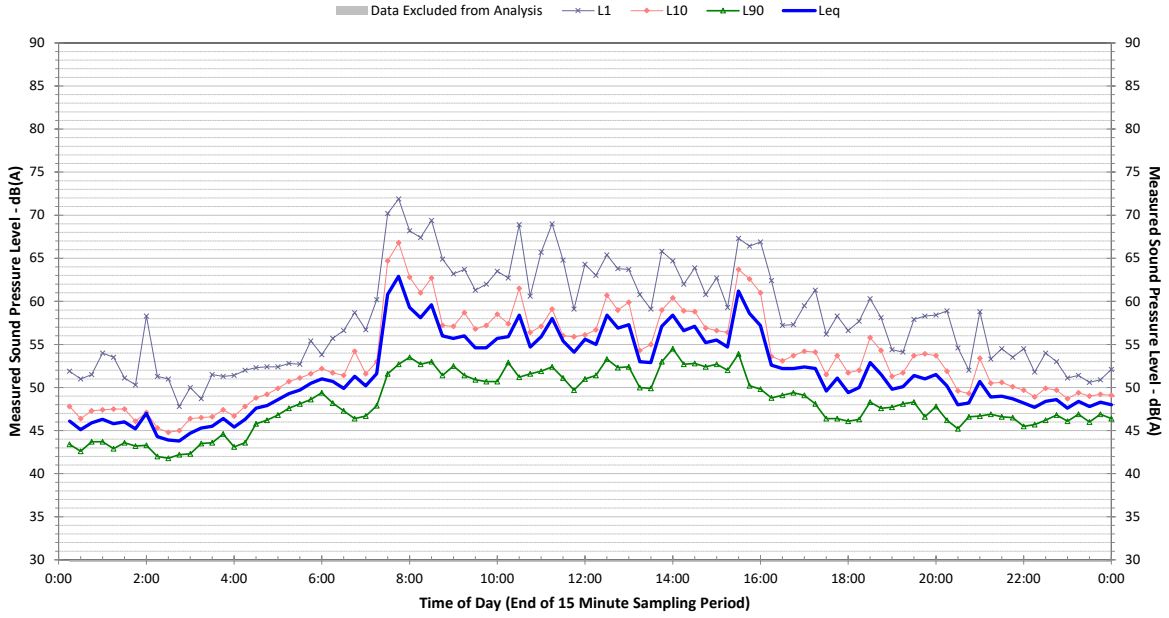
Profile of Noise Environment - Noise Monitoring Location 6
Wednesday 9 June 2021



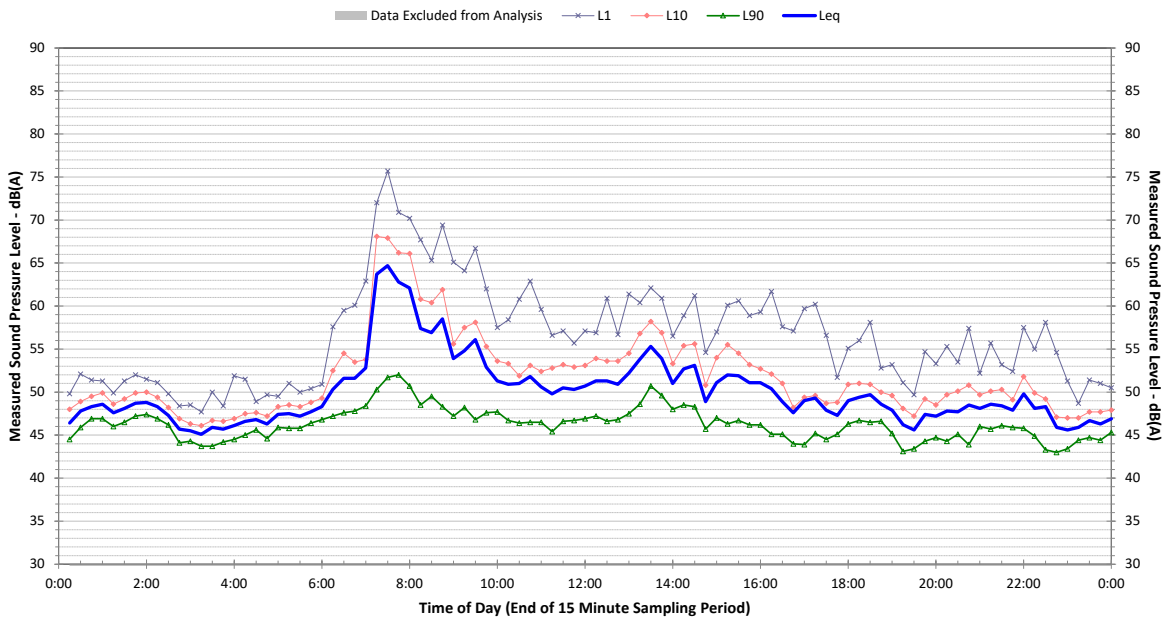
Profile of Noise Environment - Noise Monitoring Location 6
Thursday 10 June 2021



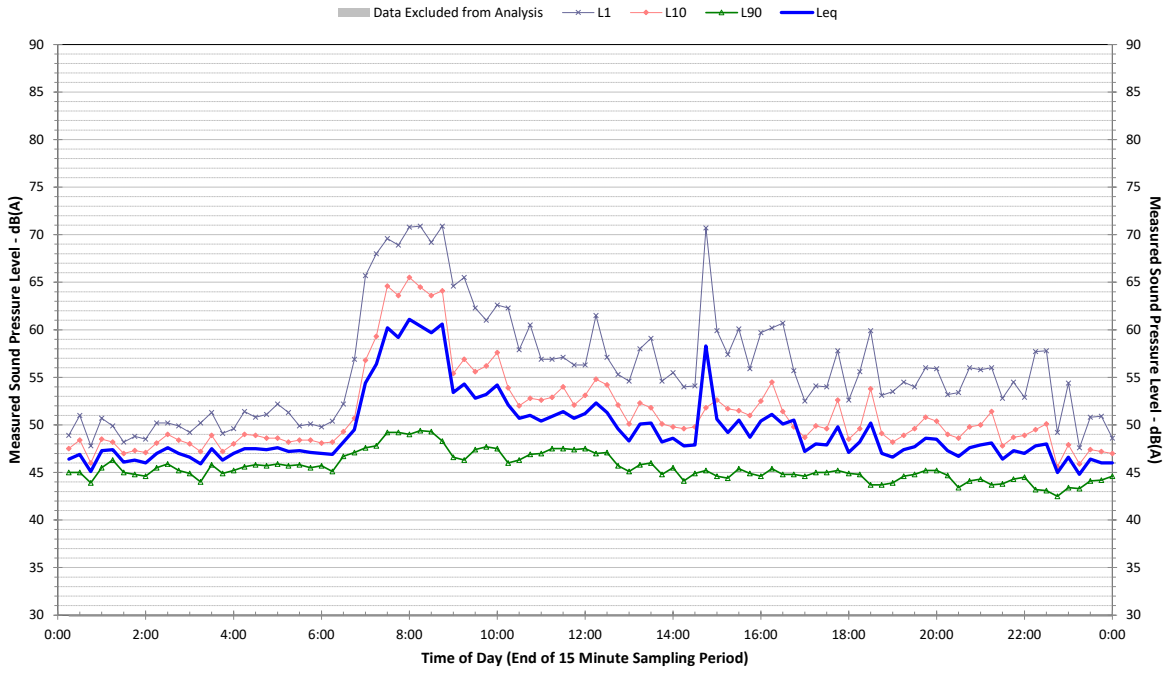
Profile of Noise Environment - Noise Monitoring Location 6
Friday 11 June 2021



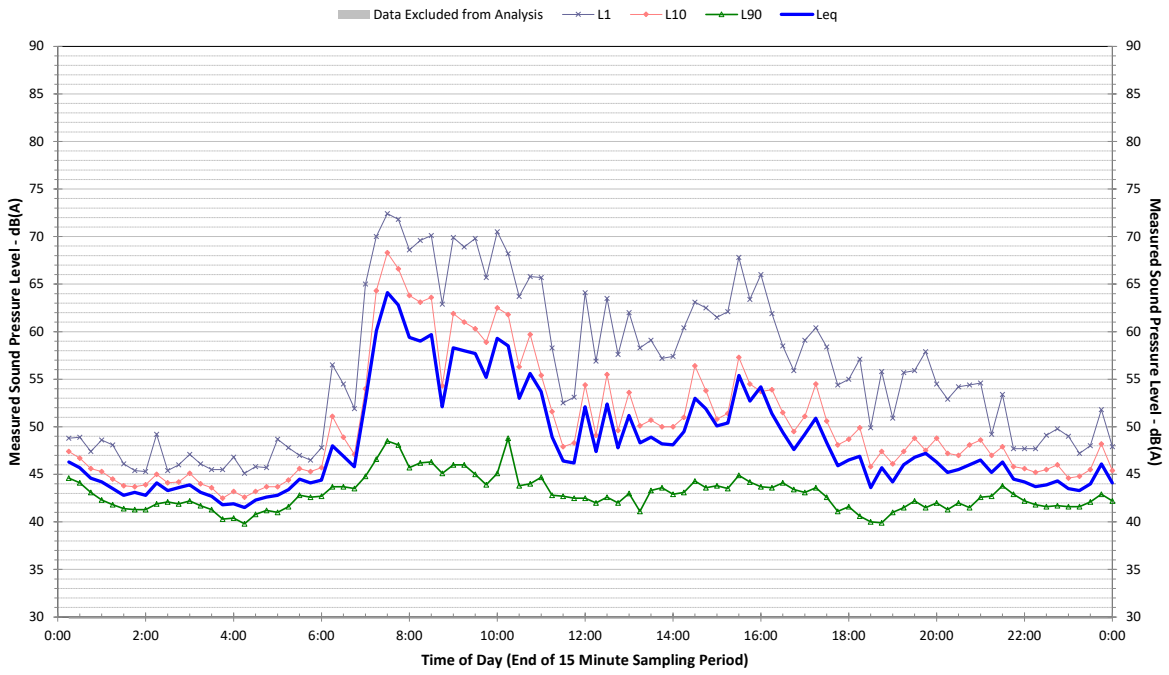
Profile of Noise Environment - Noise Monitoring Location 6
Saturday 12 June 2021



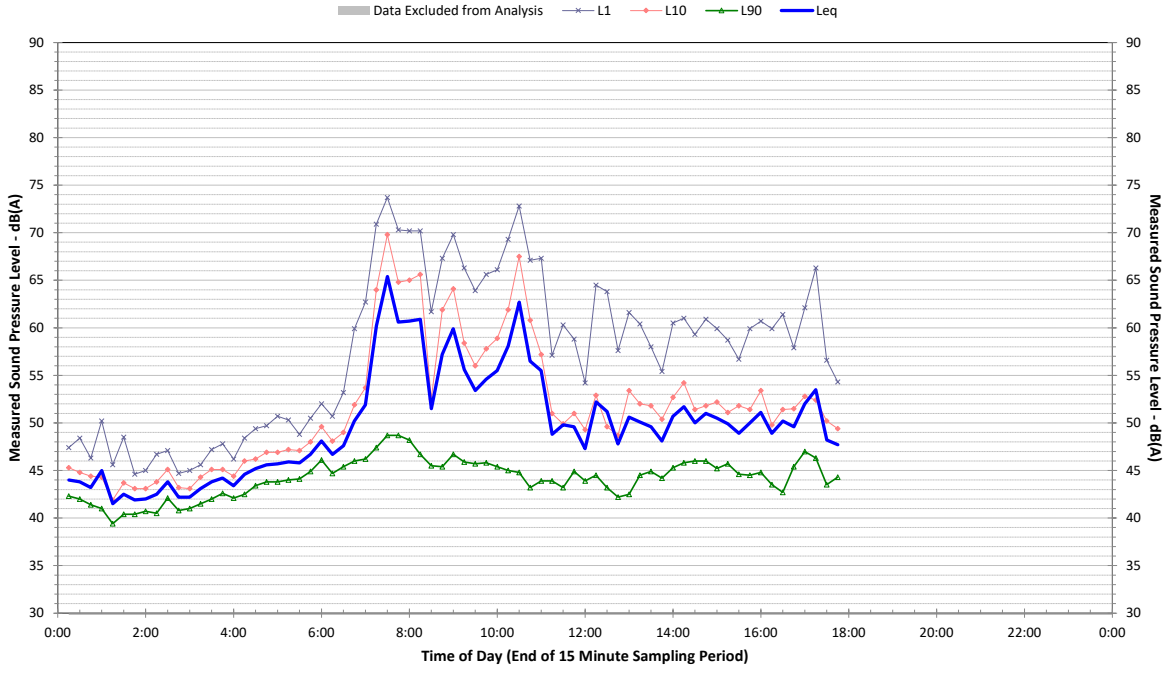
Profile of Noise Environment - Noise Monitoring Location 6
Sunday 13 June 2021



Profile of Noise Environment - Noise Monitoring Location 6
Monday 14 June 2021



Profile of Noise Environment - Noise Monitoring Location 6
Tuesday 15 June 2021



hutchison weller

Hutchison Weller Pty Ltd
ABN 34 603 174 518
Level 1, 357 Military Road, Mosman NSW 2088
www.hutchisonweller.com