Shoalhaven Starches Modification 26

Noise and Vibration Impact Assessment

Manildra Group

3 March 2026

→ The Power of Commitment

Project name		Shoalhaven Starches Noise Impact Assessment					
Document title		Shoalhaven Starches Modification 26 | Noise and Vibration Impact Assessment					
Project number		12645127					
File name		12645127-REP_0_Manildra MOD26 NVIA.docx					
Status Code	**Revision**	**Author**	**Reviewer**		**Approved for issue**		
			Name	**Signature**	**Name**	**Signature**	**Date**
S4	0	M Oosterlaken	P Pandey		E Smith		03/03/26

GHD Pty Ltd ABN 39 008 488 373
Contact: Matthijs Oosterlaken, Noise Consultant | GHD
133 Castlereagh Street , Level 15
Sydney, New South Wales 2000, Australia
T +61 2 9239 7100 | **F** +61 2 9239 7199 | **E** sydmail@ghd.com | **ghd.com**

© GHD 2026
This document is and shall remain the property of GHD. The document may only be used for the purpose for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

Executive summary

This report is subject to, and must be read in conjunction with, the limitations set out in section 1.6 and the assumptions and qualifications contained throughout the Report.

Assessment overview

GHD was engaged by Manildra to conduct a noise and vibration impact assessment for a proposed modification to the approved Shoalhaven Starches Expansion Project (SSEP). The modification seeks to increase grain storage and handling capacity, wastewater treatment plant capacity and construct additional finished product silos in addition to the approved but not yet constructed silos at the North Packing Plant.

Construction assessment findings

A construction noise assessment was undertaken to determine the potential for increase in noise levels at sensitive receivers. Construction noise management levels were established from measured background noise levels.

Four construction scenarios were modelled to predict noise levels at representative sensitive receivers. The predicted noise levels indicate exceedances of the noise management levels for the majority of construction activities at most of the sensitive receivers. Noise impacts will be managed by implementing the reasonable and feasible mitigation measures recommended in this report.

Operational assessment findings

Noise sources associated with the operation of the proposed modification were identified and modelled in the site-wide noise model developed by GHD as part of the noise pollution reduction program. The predicted noise levels from the proposed modification were assessed against design noise goals (15 dB below the Environment Protection Licence and Development Consent 06_0228 Condition 12) and show compliance at all sensitive receivers.

To ensure noise levels of MOD26 achieve the design noise goals, the sound power levels presented in this report must be achieved by selecting low noise equipment or implementing at-source mitigation measures during the detailed design.

An analysis for annoying noise characteristics was undertaken and found that the proposed modification does not contain tonal or low frequency noise characteristics.

Additionally, cumulative noise levels of the following scenarios have been predicted:

– Current operations including the proposed modification and the rail line
– Current operations including all approved but not yet constructed modifications, the proposed modification and the rail line.

Predicted cumulative noise levels were analysed for annoying noise characteristics and found low frequency noise to be present at all sensitive receivers. The cumulative noise levels were assessed against the EPL noise limits, and show exceedances at all sensitive receivers. This is consistent with Stage 1 of the Noise Pollution Reduction Program (Noise PRP) outcomes and a noise mitigation strategy has been developed as part of the PRP to address these exceedances. Nonetheless, for acoustic compliance, the bi-annual compliance measurement data should be referred to.

The proposed modification is anticipated to have no contribution to the overall noise levels from the site as the predicted noise levels are below the design noise goals.

Recommended construction mitigation measures are provided in Section 8.1 and recommendations for further detailed design of the proposed modification to minimise operational noise are provided in Section 8.2.

Key terms, acronyms and abbreviations

Term	Definition
A-weighting	The frequency weightings used in sound level measurements are often related to the response of the human ear so that the meter better responds to what you actually hear.
AWS	Automated Weather Station
Background noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is described using the L90 descriptor.
C-weighting	C-weighting is an adjustment made to sound-level measurements that takes account of low-frequency components of noise within the audibility range of humans
CNMP	Construction Noise Management Plan
CNVG	Construction Noise and Vibration Guideline (Transport for NSW, 2024)
Cumulative ANYC	Cumulative, Approved but Not Yet Constructed
dB	Decibel is the unit used for expressing the sound pressure level (SPL) or power level (SWL) in acoustics.
dBA	Decibel expressed with the frequency weighting filter used to measure 'A-weighted' sound pressure levels, which conforms approximately to the human ear response, as our hearing is less sensitive at low and high frequencies. The dBZ value is the unweighted sound pressure level.
DDG	Distiller's Dried Grain
DECC	NSW Department of Environment and Climate Change
DECCW	NSW Department of Environment, Climate Change and Water
EPA	NSW Environment Protection Authority
EPL	Environmental Protection Licence
GHD	GHD Pty Ltd
Hz	The measure of frequency of sound wave oscillations per second. 1 oscillation per second equals 1 hertz.
ICNG	Interim Construction Noise Guideline (DECC, 2009)
ID	Identification
ISO	International Organization for Standardization
$L_{Aeq,period}$	Equivalent sound pressure level: the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.
$L_{A90,\ period}$	The A-weighted sound pressure level that is exceeded for 90% of the time over which a given sound is measured. This is considered to represent the background noise e.g. $L_{A90,15min.}$
L_{Amax}	The absolute maximum noise level in a noise sample.
MOD26	Modification 26 of the Shoalhaven Starches Expansion Project
NCA	Noise Catchment Area
NML	Noise Management Level
Noise enhancing conditions	Wind and temperature inversion conditions
Noise PRP	Noise Pollution Reduction Program
NPfI	Noise Policy for Industry (EPA, 2017)
NSW	New South Wales
NVIA	Noise and Vibration Impact Assessment

Term	Definition
RAN	Royal Australian Navy
RBL	Rating Background Level
RNP	Road Noise Policy (DECCW, 2011)
RW	Sound transmission loss of a material or building element. The value is a single number rating that indicates how effective the material or building element reduces airborne sound transmission
SN	Serial Number
SSEP	Shoalhaven Starches Expansion Project
SWNM	Site-wide noise model
SWL	Sound power level
WTP	Wastewater Treatment Plant

Contents

Executive summary i

Key terms, acronyms and abbreviations ii

1. Introduction 1

1.1 Background 1

1.2 Purpose and scope of this report 1

1.3 General site overview 1

1.4 Summary of the proposed modification 3

1.5 Context of modification 4

1.6 Limitations 4

1.7 Assumptions 5

2. Existing environment 6

2.1 Sensitive receivers 6

2.2 Existing noise environment 8

2.2.1 Noise monitoring 8

2.2.2 Meteorological conditions during noise monitoring 9

2.3 Meteorological conditions 12

2.3.1 Atmospheric conditions 12

2.3.2 Noise enhancing conditions 12

3. Noise criteria 16

3.1 Development Consent 06_0228 16

3.2 Environment Protection Licence 17

3.3 Noise management plan 18

3.4 Construction noise criteria 18

3.5 Road traffic noise criteria 19

3.6 Operational noise criteria 20

3.6.1 Noise Policy for Industry 20

3.6.2 Sleep disturbance 21

3.6.3 Modifying factor corrections 21

3.6.4 Project specific noise criteria 22

4. Noise modelling methodology 24

4.1 Noise propagation algorithm 24

4.2 Noise enhancing weather 24

4.3 Noise modelling program 25

4.4 Site wide noise model validation 25

4.4.1 Near field 26

4.4.2 Far field 26

5. Construction noise impact assessment 27

5.1 Construction methodology 27

5.1.1 Construction hours 27

5.1.2 Construction equipment and materials 27

5.2 Noise modelling methodology 28

5.3 Construction noise modelling results 28

6. Operational noise impact assessment 30
6.1 Modification 26 plant and equipment 30
6.1.1 Grain storage and handling facilities 30
6.1.2 Water treatment plant upgrade 33
6.1.3 Additional finished product silos 37
6.2 Operational noise modelling results 37
6.2.1 Annoying characteristics analysis 37
6.2.2 Predicted operational noise levels 38
6.2.3 Sleep disturbance impacts 42
7. Road traffic noise impact assessment 46
7.1.1 Existing road network 46
7.1.2 Existing traffic volumes 46
7.1.3 Traffic generation 46
7.1.4 Prediction methodology 46
7.1.5 Road traffic noise impacts 46
8. Mitigation measures 48
8.1 Construction noise mitigation measures 48
8.2 Operational noise mitigation measures 49
9. Conclusion 52
10. References 53

Table index

Table 1.1 Summary of MOD26 works with respect to noise emissions 3
Table 2.1 Sensitive receivers 6
Table 2.2 Unattended noise monitoring results – GHD 2024 8
Table 2.3 Measured rating background levels during plant shutdowns 8
Table 2.4 Adopted rating background noise levels based on the Day Design noise monitoring during plant shutdown 9
Table 2.5 Assessment of significance of noise enhancing conditions at receiver locations 13
Table 2.6 Significant noise-enhancing conditions analysis – Nowra RAN Air Station AWS 2020 - 2024 15
Table 3.1 Residential construction noise management levels 19
Table 3.2 Project noise management levels 19
Table 3.3 Road traffic noise criteria 19
Table 3.4 Modifying factor corrections 21
Table 3.5 One-third octave band low frequency noise thresholds 22
Table 3.6 Operational noise criteria 23
Table 4.1 SoundPLAN noise modelling parameters 25
Table 4.2 Average difference between measured and predicted noise levels 26
Table 5.1 Construction equipment and assumed sound power levels 27
Table 5.2 Construction scenarios 28
Table 5.3 Predicted noise levels during construction activities 29
Table 6.1 Conveyors and bucket elevators noise sources 30
Table 6.2 Train and truck unloader building 31
Table 6.3 Silo grain screening building 32

Table 6.4	Silo grain sieving building	33
Table 6.5	Stage 1 screening building	33
Table 6.6	MBR tank and RO sources	34
Table 6.7	RO water recovery plant building	34
Table 6.8	Cooling towers	35
Table 6.9	Scrubber pumps	35
Table 6.10	Biogas shed expansion sources	36
Table 6.11	Biogas shed expansion and scrubber #2 blower room buildings	36
Table 6.12	Equalisation tank equipment	36
Table 6.13	BVF pumps	37
Table 6.14	Finished product silo building	37
Table 6.15	Applied low frequency noise penalty at sensitive receivers	38
Table 7.1	Existing traffic volumes Bolong Road	46
Table 7.2	Predicted increase in road traffic noise levels during construction	47
Table 8.1	Construction noise mitigation measures	48
Table 8.2	Operational noise mitigation measures	49
Table A.1	Noise monitoring equipment details	57
Table B.1	Near field noise monitoring validation	70
Table B.2	Far field monitoring locations	72
Table B.3	Measured and predicted noise level comparison, Location 1	74
Table B.4	Measured and predicted noise level comparison, Location 2	76
Table B.5	Measured and predicted noise level comparison, Location 3	78
Table B.6	Measured and predicted noise level comparison, Location 4	80
Table B.7	Measured and predicted noise level comparison, Location 5	82
Table B.8	Measured and predicted noise level comparison, Location 6	84
Table B.9	Measured and predicted noise level comparison, Location 8	85
Table E.1	Predicted cumulative noise levels of the site – neutral weather conditions	89
Table E.2	Predicted cumulative noise levels of the site – noise enhancing weather conditions	90

Figure index

Figure 2.1	Site and representative sensitive receivers	7
Figure 2.2	Assessment period wind rose during monitoring period	10
Figure 2.3	Noise monitoring locations	11
Figure 2.4	Wind roses – frequency of counts by wind direction (%) – Nowra RAN Air Station AWS 2020 – 2024	14
Figure 6.1	MOD26 noise levels – neutral weather conditions	39
Figure 6.2	MOD26 noise levels – noise enhancing weather conditions	40
Figure 6.3	Operational noise levels ($L_{Aeq,15min}$) – MOD26	41
Figure 6.4	Rail and cumulative noise levels – neutral weather conditions	42
Figure 6.5	Rail and cumulative noise levels – noise enhancing weather conditions	43
Figure 6.6	Operational noise levels ($L_{Aeq,15min}$) – Cumulative (current operation and MOD26)	44
Figure 6.7	Operational noise levels ($L_{Aeq,15min}$) – Cumulative (current operation, approved but not yet constructed modifications and MOD26)	45
Figure B.1	Near field monitoring locations	71

Figure B.2 Far field monitoring locations 73
Figure B.3 Measured and predicted noise levels and wind conditions, Location 1 75
Figure B.4 Measured and predicted noise levels and wind conditions, Location 2 77
Figure B.5 Measured and predicted noise levels and wind conditions, Location 3 79
Figure B.6 Measured and predicted noise levels and wind conditions, Location 4 81
Figure B.7 Measured and predicted noise levels and wind conditions, Location 5 83
Figure B.8 Measured and predicted noise levels and wind conditions, Location 6 84
Figure B.9 Measured and predicted noise levels and wind conditions, Location 8 85

Appendices

Appendix A Noise monitoring methodology and daily monitoring charts
Appendix B Site-wide noise model validation
Appendix C Noise model input data – MOD26
Appendix D Modifying factor analysis results
Appendix E Cumulative noise levels

1. Introduction

1.1 Background

GHD was engaged by Shoalhaven Starches Pty Ltd (Manildra) to conduct a noise and vibration impact assessment for a proposed modification to the Shoalhaven Starches Expansion Project (SSEP) (Modification 26 or MOD26).

Manildra operates the Shoalhaven Starches factory (the factory) at Bolong Road, Bomaderry, near Nowra, in NSW (the site). At the factory, flour and grains are processed to produce ethanol, starch, gluten, glucose and distiller's dried grain (DDG).

Manildra is the holder of Environment Protection Licence (EPL) number 883 issued by the New South Wales Environmental Protection Authority (NSW EPA).

1.2 Purpose and scope of this report

This report assesses the potential noise and vibration impacts associated with the project. Specifically, this report describes the background and scope of the proposed modification with respect to potential noise and vibration impacts during construction and operation of MOD26.

1.3 General site overview

Wheat flour and grains (wheat) are processed at the Manildra factory to produce ethanol, starch, gluten and glucose. Solid wastes are treated to produce DDG, with liquid wastes being transferred to the environmental farm wastewater treatment plant. Excess treated wastewater is irrigated onto pasture. The main processing and materials treatment areas (plant group areas) at Shoalhaven Starches comprise the:

– Flour mill
  - The flour mill is used to mill wheat grain into flour which is then further processed through the various site processing plants to produce starch, gluten, glucose and ethanol. All remaining mill feed and pollard (flour sieving rejects) is processed through the DDG dryers for sale as stock feed. Flours from the various grinding operations are collected and blended together before passing through final treatment and weighing operations to bulk storage bins. Flour is taken from these bins for use in existing site production processes.
– Starch & Gluten plant
  - Within the starch plant, flour is processed to separate the starch from gluten (the protein component of flour). The starch is graded, dried and packed for shipment. Different grades of starch are manufactured for food and paper making applications. Starch that is not used for these applications is used as a raw material for the ethanol plant. Gluten is dried and sold for use in the food industry.
  - Aqueous (water-based) wastes are reused within the plant or are transferred to the environmental farm wastewater treatment plant.
– Glucose plant
  - The glucose plant (contained within the starch plant area) houses two lines; the 'confectioners' glucose line and the 'brewers' glucose line. Confectioner's glucose is distinguished by having been demineralised to remove latent odours and flavours that might be carried through to the final product by the glucose.
  - Both processes use starch as the raw material. The starch is broken down to its constituent glucose molecules using enzymatic and hydrolytic processes. Water is removed from the resulting solutions using evaporation to produce glucose and brewer's solutions of desired concentration. The glucose product is shipped to customers in bulk containers.
  - The glucose manufacturing process generates aqueous wastes, mostly condensate from the evaporators, which is reused during regeneration of the ion exchangers.
– Ethanol and distillation plants

- Waste starch from the starch plant is transferred to the ethanol plant and fermented to produce ethanol. Starch, which is in suspension, is heated in jet cookers before being fermented.
- Fermentation is carried out in fermentation vessels using the treated substrate to which an ethanol-producing yeast inoculum has been added. The yeast inoculum is generated using yeast propagator vessels, these being seeded using commercial strains of yeast.
- Wastes from the fermenters are transferred to the DDG plant for processing. Fermentation liquor from the ethanol plant is transferred to the distillation plant where water and other impurities are removed to produce various grades of ethanol.

– DDG plant
  - Wastes from the ethanol and distillation plant are dewatered in decanter centrifuges and dried in steam dryers to produce granular DDG. Light phase from the DDG decanters is evaporated to recover soluble protein (syrup) and produce clear condensate (liquid line). The syrup is added to the dryer feed for recovery of the solids (solids line). DDG granular product is transferred to the DDG Pellet Plant for pelletising; the DDG pellets are stored in silos. Some of the granular DDG product is stored in a storage shed until it is loaded into trucks in the DDG load-out area.

– Packing plant
  - Dried gluten/starch will be pneumatically transferred from the existing site to the new packing plant (currently under construction) via underground pipes. This dried material is proposed to be stored in silos.
  - The packing plant will consist of seven silos that will store either gluten or starch product. The medium and large silos are to be filled 24 hours a day, seven days a week, while the small silos can be filled at any time of the day for eight hours.

– Environmental farm
  - A number of wastewater streams are produced at the factory. These consist of five clear condensate streams (distillation plant condensate, evaporator condensate, DDG condensate, a small flow from the carbon dioxide plant and boiler blowdown) and a combined ‘dirty’ stream from the factory processes. The ‘dirty’ wastewater streams are combined in the farm tank (located at the factory) and pumped to the wastewater treatment plant. Treated water is pumped back to the factory for re-use, while excess treated water is stored in dams for irrigation on the farm.

– Co-generators and boilers
  - Steam, which is used in various processes throughout the factory, is generated by using a combination of gas fired boilers (all existing boilers would be converted to operate on gas) and two gas fired co-generation turbine generators.
  - The site intends to rely primarily on the gas-fired co-generation plant to provide the baseload energy and steam production requirements for site operations. Certain boilers would operate at reduced capacity to meet any unexpected peaks in steam demands whilst other boilers would be allocated to standby duty (offline and not operating) for use during maintenance of the co-generation plant.

– Biofilters
  - Exhaust air from odorous sources at the DDG plant is captured and ducted to two existing soil-bed biofilters, each having a surface area of 100 m^2, located at the southwest corner of the factory (on the southern margin of the container storage area). An additional biofilter is currently undergoing commissioning. The biofilters comprise a bed of organic bark and compost material (the matrix), with distribution of the odorous airstream through the floor of the biofilter via a manifold. Biological oxidation of odorous compounds takes place as the foul air percolates upward through the matrix. The oxidation is achieved by a population of microorganisms in the bed.
  - While the efficiency of biofilters destroying odorous components of the waste air varies according to a range of factors including soil moisture, composition and temperature, it is very high. Any odour in the exhaust air from the biofilter is due to the inherent odour of the matrix materials and typically has an ‘earthy’ characteristic.

1.4 Summary of the proposed modification

MOD26 seeks to add infrastructure to:

- Increase grain storage and handling capacity
- Increase wastewater treatment plant (WTP) capacity
- Construct finished product silos in addition to the approved, but not yet constructed silos at the North Packing Plant
- Add rail, ethanol maintenance buildings, nitric acid storage and relocation of the approved Phosphorous Oxychloride storage area.

The increased grain storage and handling capacity will enhance raw material storage and reduce supply chain disruption risks. The expanded wastewater treatment plant (WTP) will handle larger wastewater volumes and increase the factory's reuse of treated water.

A summary of site changes proposed as part of MOD26 and anticipated changes in noise emissions is provided in Table 1.1.

Table 1.1 Summary of MOD26 works with respect to noise emissions

Facility component	Proposed MOD26 works	Anticipated changes in noise emissions
Additional grain storage and handling facilities	– The installation of three (3) wheat silos to the west of the former Dairy Farmers factory building. – Construction of a train unloading facility to the south of the former Dairy Farmers factory building. – The installation of a container inverter to be sited to the west of the propped silos. – The installation of a grain conveyor and services gantry that will connect the proposed grain storage and handling facilities along the Shoalhaven River frontage of the site to the Shoalhaven Starches factory site. – The construction of the conveyor will in part require the extension of the rock revetment wall along the Shoalhaven River embankment. – The installation of a weighbridge to the north of the former Dairy Farmers factory building. – The construction of an electricity substation control room, workshop and office building to the north of the former Dairy Farmers factory building . – The above works will necessitate the demolition of the eastern part of the former Dairy Farmers factory building (as required). – The relocation of the existing car park located between the Bolong Road frontage and the former Dairy farmers factory building.	Additional noise sources associated with grain storage and handling facility, particularly on the western end of the site.
WTP upgrade	– Construction of one in-ground treated effluent storage pond with a capacity of 150 ML. – Convert the existing Wet Weather Storage Ponds No. 1, 2 and 3 into another Anaerobic Digestor with a volume of 80 ML. – It is proposed to install an above ground enclosed steel 400 KL Equalisation Tank to the east of the existing SO Basin. – Construction of a building for biogas collection fans from the new Pond 3 digester immediately to the south of the converted Anaerobic Digestor. – Installation of Biogas scrubber units. – Interconnecting pipework, pumps and blowers. – A new wastewater collection tank (70 Kl) at the factory and new pipe to the WWTP. – Substation and maintenance shed. – Additional MBR and RO plant and associated building.	Additional noise sources associated with the proposed plant and equipment to allow for the increase in WTP capacity.

Facility component	Proposed MOD26 works	Anticipated changes in noise emissions
Additional finished product silos	– Construct up to 19 finished product silos (starch & gluten) on the main factory site instead of in conjunction with the Northern Packing Plant site.	Additional noise sources associated with the storage silos.
Other works		
Rail maintenance building	– Construct a rail maintenance building, with associated internal vehicle access, at the eastern terminus of the recently approved Mod 25 rail line extension to the east of the former Paper Mill factory site. – It is also proposed to install provision for rail fuel storage adjacent to the existing rail line within the former Paper Mill site.	No noise sources are associated with the maintenance building.
Ethanol maintenance building	– Construct an Ethanol Maintenance building within the south-eastern part of the main factory site.	No noise sources are associated with the maintenance building.
Nitric acid storage	– Construction of a Nitric Acid storage adjacent to existing cooling towers to the west of Abernethys Creek.	No noise sources are associated with the maintenance building.
Phosphorous Oxychloride storage area	– Relocate the approved Phosphorous Oxychloride storage area to the west at the recently constructed starch reactor tanks.	No noise sources are associated with the storage area.

1.5 Context of modification

It is noted that the NSW EPA has issued a Noise Pollution Reduction Program (Noise PRP) as part of an amendment to Manildra's EPL number 883. GHD has completed the first stage of the Noise PRP, which included the identification of all existing noise sources on the site and identification of mitigation measures to be implemented and reviewed for feasibility.

GHD has developed a site-wide noise model (SWNM) for the site as described in the report *Shoalhaven Starches Pollution Reduction Program – Noise Compliance Investigation* (GHD, 2025).

1.6 Limitations

This report: has been prepared by GHD for Manildra Group and may only be used and relied on by Manildra Group for the purpose agreed between GHD and Manildra Group as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Manildra Group arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section 1.7 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Manildra Group and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

1.7 Assumptions

The preparation of this report relied on the following assumptions:

- The SWNM developed by GHD as described in the report *Shoalhaven Starches Pollution Reduction Program – Noise Compliance Investigation* (GHD, 2025) was used to assess cumulative noise levels.
- The SWNM was updated to include approved, but not yet constructed modifications based on noise and vibration impact assessments (where available) and measurement data collected by GHD during the noise monitoring program for the Noise PRP. The following additions were added to the SWNM:
  - Northern packing plant (modification 9 and 21). Noise levels have been sourced from the report *Shoalhaven Starches – MOD 9 & 21 – Packing Plant Design Noise Verification* (Day Design, 2024).
  - DDG dryers 6 and 7 (modification 11). It is assumed these dryers are identical to DDG dryers 4 and 5 and have been duplicated.
  - Product dryer north of Starch Dryer 5 (modification 16 and 17). Noise levels have been based on measurements undertaken of the baghouse of Gluten Dryer 8.
  - The extension of the existing rail line and product dryer buildings 3 and 4 (modification 25) and the stillage evaporators, mechanical vapour recovery evaporators and substations (modification 29) have been approved, but are currently not part of the SWNM. Noise levels from modification 25 are included in the cumulative noise assessment separately. Noise levels from modification 29 achieve the noise design goals and would therefore not contribute to the cumulative noise levels.
- The noise modelling methodology assumptions are outlined in Section 4.
- The noise model was validated using near-field and far-field monitoring locations with consideration to the meteorological conditions during the nighttime period as described in Section 4.4.
- As rail noise was not included in the SWNM and the EPA has advised that rail noise is part of the licenced premises, rail noise levels have been sourced from Table 54 and 55 of the report *Environmental Noise Impact Assessment – Proposed Extension of Existing Rail Line and Extension to Product Dryer Building 3 & 4 (Rev E)* (Day Design, 2025). The rail noise levels have been used to determine the cumulative noise levels (current site, approved but not yet constructed modifications and the proposed modification) presented in this report.
- The SWNM was developed based on noise measurements undertaken using a sound intensity probe, which is able to account for noise directivity and allows for measurements close to the sources. However, the sound intensity probe is not able to measure frequency bands below 25 Hz.

  As the Noise Policy for Industry (EPA, 2017) requires assessment of low frequency noise characteristics to the 10 Hz one-third octave band, the sound intensity probe measurement data was supplemented with one-third octave measurement data between 10 and 25 Hz from Class 1 sound level meters at locations in the vicinity of the noise source.

2. Existing environment

2.1 Sensitive receivers

Noise and vibration sensitive receivers are defined based on the type of occupancy and the activities performed in the land use. Sensitive noise and vibration receivers could include:

– residential dwellings
– classrooms
– hospitals
– places of worship
– passive and active recreational areas such as parks, sporting fields, golf courses. Note that these recreational areas are only considered sensitive when they are in use or occupied
– hotels, motels, caretaker's quarters, holiday accommodation and permanent resident caravan parks.

To assess noise levels from the site, noise sensitive receivers within 1.5 km have been considered and representative receivers in each direction have been identified. A total of 15 receivers has been included in the noise model. Details of these receivers are outlined in Table 2.1 and are shown on Figure 2.1.

Receiver R5 is located relatively close to the site and represents Burraga/Pig Island. The noise levels at this receiver have been included in this report for informational purposes, however, this receiver is currently an uninhabited dwelling.

Table 2.1 Sensitive receivers

Receiver ID	Address	Receiver type	Land use	Direction from receiver to main site
EPL assessment locations				
R1	135 Terara Road, Terara	Residential	RU1 – Primary Production	North
R2	45 Ferry Lane, Terara	Residential	R2 – Low density residential	Northeast
R3	41A Meroo Street, Bomaderry	Residential	MU1 – Mixed use	Southeast
R4	1-3 Meroo Street, Bomaderry	Residential	R1 – General residential	Southeast
R7	19 Meroo Street, Bomaderry	Residential	MU1 – Mixed use	Southeast
R8	1 Nobblers Lane, Terara	Residential	RU1 – Primary Production	North
R9	2 Tarawara Street, Bomaderry	Residential	MU1 – Mixed use	East southeast
R10	10 Tarawara Street, Bomaderry	Residential	R3 – Medium Density Residential	Southeast
R11	17 Coomea Street, Bomaderry	Residential	R3 – Medium Density Residential	Southeast
R12	6 Birriley Street, Bomaderry	Residential	R3 – Medium Density Residential	Southeast
R13	1 Coomea Street, Bomaderry	Residential	R1 – General residential	Southeast
Additional residential locations				
R5	Burraga/Pig Island, Terara	Residential – uninhabited[1]	RU1 – Primary Production	Northwest
R6	39 Hanigans Lane, Bolong	Residential	RU1 – Primary Production	Southwest
R14	390 Bolong Road, Bolong	Residential	RU1 – Primary Production	West
R15	1 Bryant Street, Terara	Residential	RU1 – Primary Production	Northwest

Legend

- Site boundary
- Modelled buildings
- Cadastre lots

Receivers

- NCA1
- NCA2
- NCA3

Paper Size ISO A4

0 200 400 m

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 / MGA zone 56

Shoalhaven Starches
Modification 26 - Noise and vibration impact assessment

Site and representative sensitive receivers

Project No. **12645127**
Revision No. **A**
Date. **02/03/2026**

FIGURE 2.1

Whilst every care has been taken to prepare this map, GHD make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete, or unsuitable in any way and for any reason.

Data Source: Nearmap

Created By: Matthijs Oosterlaken

Document Path: \\ghdnet\ghd\AU\Sydney\Projects\21\12645127\Tech\Noise\03_GIS\MOD26_Figs.qgz

2.2 Existing noise environment

2.2.1 Noise monitoring

Noise monitoring was undertaken from 9 December 2024 until 19 December 2024 at three locations representative of residential receivers to quantify and characterise the existing ambient noise environment across the study area.

The long-term noise monitoring program was undertaken in accordance with the *Approved methods for measurement and analysis of environmental noise* (EPA, 2022) and rating background noise levels (RBLs) were calculated in accordance with the NPfI. The full noise monitoring methodology is outlined in Appendix A. The noise monitoring locations are shown on Figure 2.3 and the unattended noise monitoring results are presented in Table 2.2.

Table 2.2 Unattended noise monitoring results – GHD 2024

Location	NCA	Rating background level (dBA)			Ambient noise level $L_{Aeq,period}$ (dBA)		
		Day	Evening	Night	Day	Evening	Night
L1 – 1 Nobblers Lane, Terara	NCA01	38	32	32 (33[1])	55	51	44
L6 – 17 Dalwah Street, Bomaderry	NCA02	41	41 (44[1])	35	56	54	47
L5 – 280 Bolong Road, Bolong	NCA03	43	38	38 (42[1])	61	58	55

Notes:

1. Where the measured background level for a period exceeds the previous period, the RBL of the previous period is adopted in accordance with the NPfI to protect the more sensitive evening and night periods.

As noted in the NPfI:

> *"For the assessment of modifications to existing premises, the noise from the existing premises should be excluded from background noise measurements. The exception is where the premises have been operating for a significant period of time and is considered a normal part of the acoustic environment; it may be included in the background noise assessment under the following circumstances:*
>
> – *The development must have been operating for a period in excess of 10 years in the assessment period/s being considered and is considered a normal part of the acoustic environment; and,*
> – *The development must be operating in accordance with noise limits and requirements imposed in a consent or licence and/or be applying best practice."*

Although the existing premises has been operational for more than 10 years, it is noted that noise limits of the EPL and Development Consent 06_0228 are currently not met (as described in Section 6.2.2.2). As such, the RBLs should be established without noise from the premises.

In Table 2 of the report *Environmental Noise Impact Assessment – Proposed Extension of Existing Rail Line and Extension to Product Dryer Building 3 & 4 (Rev E)* (Day Design, 2025), Day Design established RBLs whilst the site was both online and offline during April and October 2024. Additionally, GHD undertook noise monitoring in September 2025 whilst the site was offline to establish RBLs. The RBLs based on the measurements from both Day Design and GHD are presented in Table 2.3.

Table 2.3 Measured rating background levels during plant shutdowns

NCA	Rating background level (dBA)			Year of measurements	Source
	Day	Evening	Night		
NCA01 (Terara)	35 (32)[1]	34	30[2]	2024	Day Design, monitoring location DD17
	36	36 (39)[3]	36	2025	GHD, monitoring location L1

NCA	Rating background level (dBA)			Year of measurements	Source
	Day	Evening	Night		
NCA02 (Bomaderry)	49	42	38	2024	Day Design, monitoring location DD1
	39	34	30	2025	GHD, monitoring location L6
NCA03 (Bolong)	36	36 (40)[3]	36 (37)[3]	2024	Day Design, monitoring location DD11
	35 (34)[1]	34 (38)[3]	34 (37)[3]	2025	GHD, monitoring location L5

Notes:

1. The NPfI minimum background noise level of 35 dBA was adopted for the daytime.
2. Data for nighttime during plant shutdown was unavailable due to logger power failure. As such, the NPfI minimum background noise level of 30 dBA for the nighttime was adopted.
3. Where the measured background level for a period exceeds the previous period, the RBL of the previous period is adopted in accordance with the NPfI to protect the more sensitive evening and night periods.

As the site was shut down for a few days in both years, the available monitoring data to establish RBLs is not entirely representative of the existing noise environment without the site's contribution. For the purpose of the assessment, the lowest of the established RBLs have been adopted and are summarised in Table 2.4.

It is noted that this is considered to be a conservative approach, as typically the Shoalhaven Starches site would be operational and contribute to the existing noise environment.

Table 2.4 Adopted rating background noise levels based on the Day Design noise monitoring during plant shutdown

NCA	Rating background level (dBA)		
	Day	Evening	Night
NCA01 (Terara)	35	34	30
NCA02 (Bomaderry)	39	34	30
NCA03 (Bolong)	35	34	34

2.2.2 Meteorological conditions during noise monitoring

Weather conditions, wind and rain, during monitoring period, from 9 December until 19 December 2024, were obtained from the on-site weather station. This data was used to exclude periods of rain or where wind speeds were greater than 5 m/s at the microphone height. No rain was recorded during the monitoring period and a wind rose of the wind vectors recorded is shown in Figure 2.2 for each of the assessment periods.

The wind roses show that the average windspeed is higher during the day and evening periods than the night periods and the wind direction shifts from northeast during the day to south and southwest during the evening and night periods.

The wind vector data during the night period was analysed in further detail to determine the magnitude of noise-enhancing conditions for each receiver using the calculation for the C_{met} correction term outlined in ISO9613-2:2024 for the purposes of model validation. It is noted that ISO9613-2:1996 does not provide an explicit calculation method for this term, and as such ISO9613-2:2024 was only used to calculate the C_{met} correction term. The noise model predictions were undertaken using ISO9613-2:1996, as detailed in Section 4.

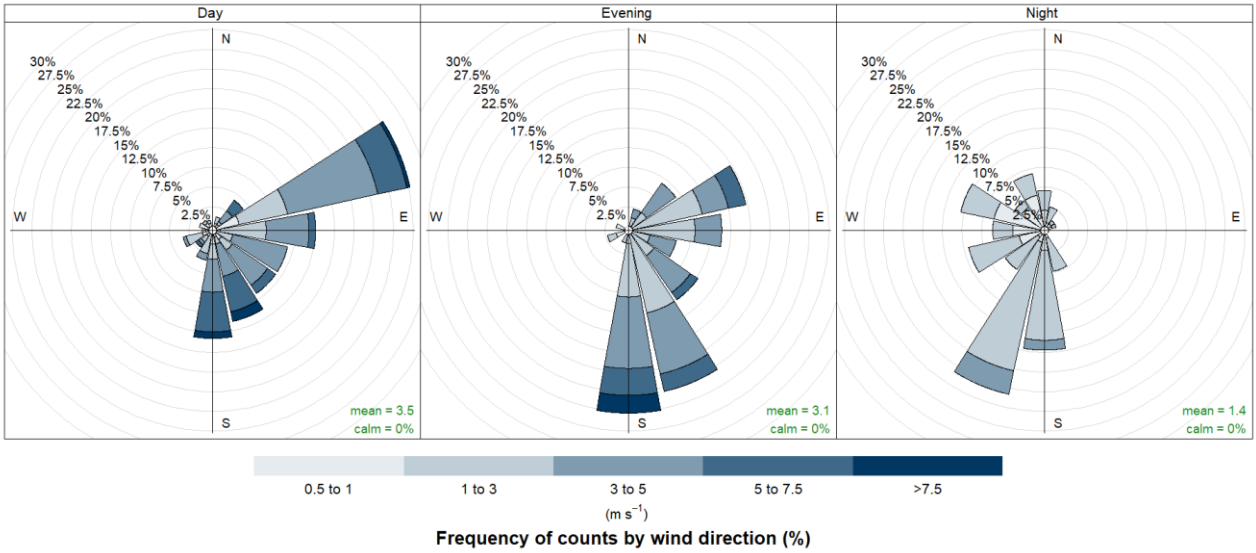


Figure 2.2 Assessment period wind rose during monitoring period

Legend

Monitoring locations

- Near field
- Far field

Paper Size ISO A4

0 200 400 m

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 / MGA zone 56

Shoalhaven Starches
Modification 26 - Noise and vibration impact assessment

Noise monitoring locations

Project No. **12645127**
Revision No. **A**
Date. **16/02/2026**

FIGURE 2.3

Whilst every care has been taken to prepare this map, GHD make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete, or unsuitable in any way and for any reason.

Data Source: Nearmap

Created By: Matthijs Oosterlaken

Document Path: \\ghdnet\ghd\AU\Sydney\Projects\21\12645127\Tech\Noise\03_GIS\MOD26_Figs.qgz

2.3 Meteorological conditions

2.3.1 Atmospheric conditions

Temperature and humidity affect how sound is absorbed by the atmosphere. With a fixed temperature at 15 ºC, a decrease in relative humidity from 80% to 20% can decrease the sound level at a listener standing 800 metres from the noise source by 3 dB (at 1000 Hz). Fixing the relative humidity at 80%, an increase in temperature from 15 ºC to 30 ºC can decrease the sound level at 800 metres from the noise source by 3 dB (at 1000 Hz).

Adopting an average temperature of 10 °C and average humidity of 70% is generally representative of the atmospheric conditions for environmental noise propagation and is considered appropriate for the purposes of this assessment.

2.3.2 Noise enhancing conditions

Certain meteorological/weather conditions can increase noise levels at a receiver by focusing wave propagation paths towards a single point. This will occur during temperature inversions (atmospheric conditions where temperature increases with height above ground level), and where there is a wind gradient (that is, wind velocities increase with height) with wind direction from the source to the receiver. These conditions are defined in the following way in the *Noise Policy for Industry* (EPA, 2017) (NPfI)*:*

– Wind gradients when the atmospheric stability is unstable or neutral (categories A – D) and the source-to-receiver wind speed is 3 m/s or less, or
– Temperature inversions, during the night-period, when the atmospheric stability is moderately to extremely stable (category F) and the source-to-receiver wind speed is 2 m/s or less.

A review of meteorological conditions at the Nowra Royal Australian Navy (RAN) Air Station Automatic Weather Station (AWS) (2020 – 2024) was undertaken to determine the significance of noise-enhancing meteorological conditions and atmospheric conditions on noise propagation in accordance with the NPfI. Although Manildra has an on-site weather station, the meteorological analysis for noise enhancing conditions was undertaken using the RAN AWS data as more historical data was available.

2.3.2.1 Atmospheric stability

The atmospheric stability is defined in the NPfI using the Pasquill-Gifford stability scheme, where stability categories A – C represent unstable atmospheric conditions, category D is representative of neutral conditions and categories E – F represent stable conditions. Stability categories have been determined using the Turner Scheme, as described in Fact Sheet D1 of the NPfI.

Temperature inversions occur during the night-time period in moderate to extreme stable atmospheric conditions (category F) and when combined with light winds (less than 2m/s) have the potential to increase noise levels from ground operations. Wind gradients can occur during unstable or neutral conditions (categories A – D) and when combined with light winds (less than 2m/s) have the potential to increase noise levels from ground operations.

2.3.2.2 Frequency of winds

To determine the significance of noise-enhancing meteorological conditions the wind speed and wind direction is required. Noise-enhancing conditions occur during light winds, up to 3 m/s, in the source to receiver direction. To determine the significance of these conditions the vector component of the wind is analysed.

A thorough review of the vector components of hourly wind data from 2020 – 2024 was undertaken for data from the Bureau of Meteorology (BoM) Nowra RAN Air Station AWS (number 068072). The BoM observations are approximately 12 km southwest of the site. Figure 2.4 shows the wind roses (2020 – 2024) for wind speeds less than 3 m/s and 2 m/s in each NPfI assessment period and for each season. The wind roses show significant portion of light winds from the northwest during autumn and winter, shifting to the east and southeast during spring and summer.

2.3.2.3 Assessment of significance

The NPfI recommends consideration of the effects of temperature inversions and wind gradients with wind direction from the source to the receiver if they are “significant”. The NPfI defines “significant” as occurring for 30% of the time in any assessment period and season in the direction of sensitive receivers. Table 2.6 provides a summary of the percentage occurrence of noise-enhancing conditions for 16 wind compass directions.

While the EPL requires, by condition L5.5, that the limits apply under noise enhancing conditions, the analysis shows that only receivers in some directions and only in some assessment periods experience significant noise enhancing conditions. Noise-enhancing conditions are significant during the day and night periods in autumn and winter for receivers located east to southeast of the site and during the day period in summer for receivers located northwest and of the site.

The significance of noise enhancing conditions at each of the sensitive receptors is outlined in Table 2.5. As the analysis identified that significant noise-enhancing effects are significant for some of the model receivers, as per the NPfI, both adverse and neutral conditions should be included in noise modelling.

Table 2.5 Assessment of significance of noise enhancing conditions at receiver locations

Receiver ID	Address	Direction from receiver to main site	Significant noise enhancing conditions?
R1	135 Terara Road, Terara	North	No
R2	45 Ferry Lane, Terara	Northeast	No
R3	41A Meroo Street, Bomaderry	Southeast	Yes (Summer day)
R4	1-3 Meroo Street, Bomaderry	Southeast	Yes (Summer day)
R5	Burraga/Pig Island, Terara	Northwest	Yes (Winter and autumn day and night)
R6	39 Hanigans Lane, Bolong	Southwest	No
R7	19 Meroo Street, Bomaderry	Southeast	Yes (Summer day)
R8	1 Nobblers Lane, Terara	North	No
R9	2 Tarawara Street, Bomaderry	East southeast	Yes (Summer day)
R10	10 Tarawara Street, Bomaderry	Southeast	Yes (Summer day)
R11	17 Coomea Street, Bomaderry	Southeast	Yes (Summer day)
R12	6 Birriley Street, Bomaderry	Southeast	Yes (Summer day)
R13	1 Coomea Street, Bomaderry	Southeast	Yes (Summer day)
R14	390 Bolong Road, Bolong	West	Yes (Winter and autumn night)
R15	1 Bryant Street, Terara	Northwest	Yes (Winter and autumn day and night)

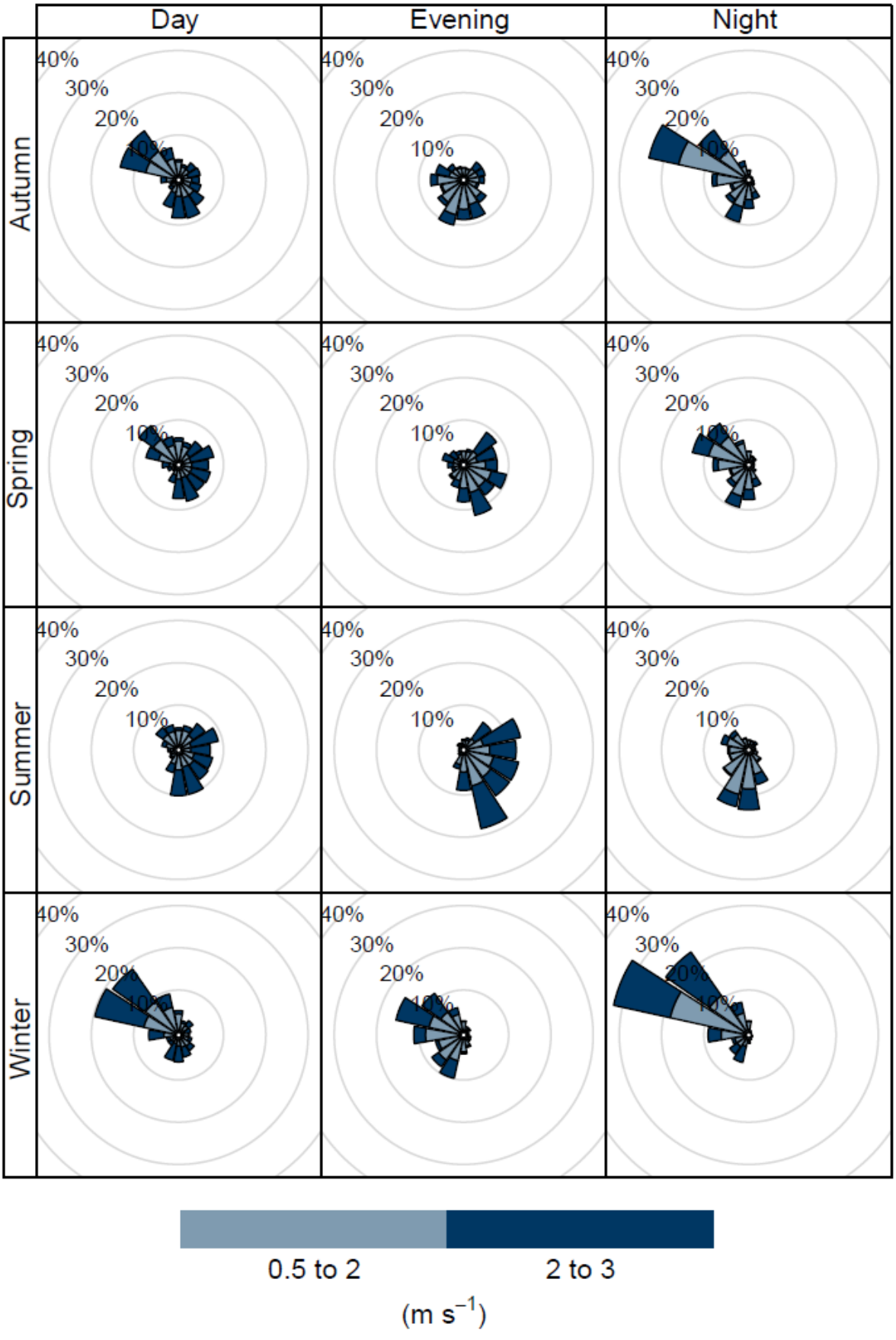


Figure 2.4 *Wind roses – frequency of counts by wind direction (%) – Nowra RAN Air Station AWS 2020 – 2024*

Table 2.6 Significant noise-enhancing conditions analysis – Nowra RAN Air Station AWS 2020 - 2024

Wind direction	Summer				Autumn				Winter				Spring			
	Day	Evening	Night		Day	Evening	Night		Day	Evening	Night		Day	Evening	Night	
	A – D	A – D	A – D	F	A – D	A – D	A – D	F	A – D	A – D	A – D	F	A – D	A – D	A – D	F
N	21%	3%	1%	8%	25%	2%	0%	11%	24%	0%	0%	14%	23%	4%	1%	15%
NNE	24%	8%	1%	6%	19%	3%	0%	4%	15%	0%	0%	6%	21%	7%	0%	9%
NE	25%	14%	0%	5%	16%	4%	0%	2%	11%	0%	0%	2%	21%	10%	0%	5%
ENE	27%	19%	0%	5%	17%	5%	0%	1%	9%	0%	0%	1%	22%	14%	0%	3%
E	29%	23%	0%	6%	20%	6%	0%	1%	10%	1%	0%	0%	23%	16%	0%	3%
ESE	**32%**	27%	1%	9%	23%	7%	0%	3%	11%	1%	0%	1%	25%	18%	0%	5%
SE	**33%**	23%	2%	15%	26%	7%	0%	6%	13%	1%	0%	1%	24%	16%	1%	8%
SSE	**32%**	18%	3%	23%	27%	5%	0%	11%	15%	1%	0%	2%	23%	13%	1%	14%
S	27%	13%	4%	27%	25%	4%	0%	15%	14%	1%	0%	4%	18%	9%	1%	17%
SSW	22%	8%	4%	28%	21%	3%	0%	18%	13%	1%	0%	6%	15%	6%	2%	19%
SW	16%	3%	4%	28%	17%	1%	0%	22%	14%	0%	0%	10%	12%	3%	2%	22%
WSW	11%	2%	4%	24%	20%	1%	0%	**33%**	21%	0%	0%	24%	12%	3%	2%	25%
W	12%	1%	3%	19%	25%	1%	0%	**35%**	29%	0%	0%	**31%**	17%	3%	2%	26%
WNW	14%	1%	3%	15%	29%	1%	0%	**33%**	**33%**	0%	0%	**32%**	20%	3%	2%	26%
NW	17%	2%	3%	13%	**31%**	1%	0%	**32%**	**35%**	0%	0%	**32%**	23%	3%	2%	26%
NNW	19%	2%	2%	11%	**31%**	1%	0%	26%	**33%**	0%	0%	28%	24%	3%	1%	21%

3. Noise criteria

3.1 Development Consent 06_0228

The site is subject to Development Consent 06_0228, last modified on 19 December 2024 under the *Environmental Planning and Assessment Act 1979* authorising Manildra to carry out development of the site in accordance with the statement of commitments and the conditions of the consent. It is noted that the Development Consent only applies to the current site and approved modifications and is not applicable to the proposed modification. Nonetheless, the Development Consent includes several conditions which are considered relevant to the noise assessment, which are reproduced below:

Hours of Operation

11. The Applicant shall comply with the restrictions in Table 1.

Table 1: Construction and Operation Hours for the Development

Activity	Day	Time
Construction	Monday – Friday	7:00 am to 6:00 pm
	Saturday	8:00 am to 1:00 pm
	Sunday and Public Holidays	Nil
Piling activities	Monday – Friday	9:00 am to 5:00 pm
Operation	All days	Any time
Use of Paper Mill site	Monday – Saturday	7:00 am to 6:00 pm
	Sunday and Public Holidays	8:00 am to 6:00 pm

Note: Construction activities may be conducted outside the hours in Table 1 provided that the activities are not audible at any residence beyond the boundary of the site.

Noise Limits

12. The Applicant shall ensure that noise from the development does not exceed the noise limits in Table 2.

Table 2: Development Noise Limits

Location	Day/Evening/Night $L_{Aeq,15minute}$ dBA	Night $L_{A1,1\ minute}$ dBA
1 – Terara on the South side of the Shoalhaven River	38	48
2, 3 & 4 – DILWra on the south side of the Shoalhaven River	38	48
5 – Meroo Street, Bomaderry	42	52
6 – Other residential locations in Bomaderry	40	50
R1 – 390 Bolong Road Bomaderry	40	-
R2 – Pig (Burraga/Pig) Island	40	-
R3 – 39 Hanigans Lane Bomaderry	40	-
R4 – 1 Bryant Street Terara	40	-

Noise Management Plan

13. During construction, the Applicant shall implement all reasonable and feasible measures to minimise the construction noise impacts of the development.

13A. The Application shall implement a Construction Noise Management Plan (CNMP) to manage the noise impacts of construction of the Development and each modification. The CNMP shall:

a. *Be prepared in accordance with the EPA's Interim Construction Noise Guideline;'*
b. *Be approved by the Secretary prior to the commencement of piling works;*
c. *Include procedures for notifying affected residences of the timing and duration of piling works, including scheduled respite periods; and*
d. *Include procedures for proactively responding to noise complaints and implementing all reasonable and feasible work practices to limit noise impacts.*

14. The Applicant shall prepare a Noise Management Plan for the development to satisfaction of the Secretary. This plan must:

a. *Be prepared by a suitably qualified and experienced expert in consultation with EPA, and be submitted to the Secretary for approval within 3 months of this consent;*
b. *Describe the measures that would be implemented to control the noise impacts of the development*
c. *Identify trigger levels for remedial action; and*
d. *Include a program to:*
    - *Investigate ways to reduce the noise impacts of the development; and*
    - *Monitor the noise impacts of the development using a combination of real-time and supplementary attended monitoring measures, which includes a protocol for evaluating compliance with the noise limits.*

3.2 Environment Protection Licence

The site is currently subject to an EPL number 883, dated 23 September 2024 under the *Protection of the Environment Operations Act 1997* ('the Act') authorising Manildra to undertake chemical production, chemical storage and agricultural processing activities at the site.

Clause L5 of the EPL provides the following noise limits at residential premises:

L5 Noise limits

L5.1 *The LAeq (15 min) sound pressure level contribution generated from the premises must not exceed the following levels when measured at or near the boundary of any residential premises:*

Location	Day (7am to 6pm) $L_{Aeq,15\ min}$	Evening (6pm to 10pm) $L_{Aeq,15\ min}$	Night (10pm to 7am) $L_{Aeq,15\ min}$	Night (10pm to 7am) $L_{A1,1\ min}$
At locations in Terrara on the south side of the Shoalhaven River	38	38	38	48
At locations in Nowra on the south side of the Shoalhaven River	38	38	38	48
At locations in Meroo Street, Bomaderry	42	42	42	52
At other residential locations in Bomaderry	40	40	40	50

L5.2 *Noise from the premises is to be measured at the most affected point or within the residential boundary, or at the most affected point within 30m of a dwelling where the dwelling is more than 30m from the boundary, to determine compliance with condition L5.1.*

The modification factors in Fact Sheet C of the Noise Policy for Industry shall also be applied to the measured noise levels where applicable.

L5.3 *Noise from the premises is to be measured at 1 metre from the dwelling facade to determine compliance with the LA1(1 minute) noise limit in condition L5.1.*

L5.4 *Where it can be demonstrated that direct measurement of noise from the premises is impractical, the EPA may accept alternative means of determining compliance (see Chapter 7 of the Noise Policy for Industry).*

L5.5 *The noise emission limits identified in condition L5.1 apply under meteorological conditions of:*
a) Wind speed up to 3 metres per second at 10 metres above ground level; or
b) Temperature inversion conditions of up to 3°C/100 metres and wind speed up to 2 metres per second at 10 metres above ground level.

3.3 Noise management plan

Previous approval for the Shoalhaven Starches Expansion Project, required the preparation of a Noise Management Plan to address and manage noise emission from the expansion project.

The Shoalhaven Starches Noise Management Plan originally prepared 31 October 2009 and revised 7 September 2010 addresses, among other things, acoustic criteria relating to the Shoalhaven Starches complex and any new developments. Section 3 of the plan lists noise limits from the EPL as shown in Section 3.2 above and states:

> *"Compliance testing conducted on a regular basis on behalf of the Mill* [Shoalhaven Starches complex] *has found noise emission from the premises satisfies the EPA criteria as a result of works on the Shoalhaven Starches site. In order to ensure that there is no increase in noise emission from the subject premises, with respect to the noise criteria nominated by the EPA in License Condition 6.3* [now 5.1]*, the design goal for such additional plant should be at least 10 dB below the criteria nominated by the EPA"*

Given the number of modifications subsequent to the original approval and locations of new noise sources, it is recommended that the noise design goals for any additional items of plant are set to a minimum 15 dB below the EPL noise limit to mitigate any increase in overall noise emission from the existing site.

3.4 Construction noise criteria

Construction noise management levels (NML) at sensitive residential receivers are provided in Table 3.1. The NML during recommended standard hours (Monday to Friday: 7 am to 6 pm, Saturday: 8 am to 1 pm and no work on Sundays or public holidays) represent a noise level that, if exceeded, would require management measures including:

– Reasonable and feasible work practices.
– Contact with the residences to inform them of the nature of works to be carried out, the expected noise levels, durations and contact details.

The management measures are aimed at reducing noise impacts at the residential receivers. However, it may not be reasonable and feasible to reduce noise levels to below the noise affected management level. The noise affected NML during recommended standard hours are not intended as a noise limit but rather a level where noise management is required

The *Interim Construction Noise Guideline* (DECC, 2009) (ICNG) acknowledges that the following activities have justification to be undertaken outside the recommended standard construction hours assuming that all reasonable and feasible mitigation measures are implemented to minimise the impacts to the surrounding sensitive land uses:

– The delivery of oversized plant or structures that police or other authorities determine to require special arrangements to transport along public roads.
– Emergency work to avoid the loss of life or damage to property, or to prevent environmental harm.
– Works where a proponent demonstrates and justifies a need to operate outside the recommended standard construction hours.
– Works which maintain noise levels at receivers to below the NML outside of the recommended standard construction hours.

Table 3.1 Residential construction noise management levels

Time of day	Noise management levels $L_{Aeq,15\ min}$	Application notes
Recommended standard hours	Noise affected RBL + 10 dBA	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq,15\ min}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected: 75 dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. Times identified by the community when they are less sensitive to noise (such as before and after school, or mid-morning or midafternoon for works near residences) 2. If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dBA	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable measures have been applied and noise is more than 5 dBA above the noise affected level, the proponent should negotiate with the community.

A summary of the NMLs is presented in Table 3.2 below. In establishing the NMLs, the RBLs whilst the Shoalhaven Starches site was offline were used (refer to Table 2.4).

Table 3.2 Project noise management levels

Receiver type	Construction noise management levels, $L_{Aeq,15\ min}$ dBA				
	Standard recommended hours		Outside recommended hours		
	Noise affected	Highly noise affected	Day	Evening	Night
Residential – NCA01 (Terara)	45	75	40	39	35
Residential – NCA02 (Bomaderry)	49	75	44	39	35
Residential – NCA03 (Bolong)	45	75	40	39	39

3.5 Road traffic noise criteria

The *NSW Road Noise Policy* (DECCW, 2011) (RNP) provides traffic noise criteria for residential receivers in the vicinity of existing arterial and local roads. The criteria (reproduced in Table 3.3) are applied to operational and construction traffic on public roads to identify potential road traffic noise impacts and the requirement for reasonable and feasible mitigation measures.

Table 3.3 Road traffic noise criteria

Road category	Type of development	Day 7 am to 10 pm	Night 10 pm to 7 am
Freeway/arterial/ sub-arterial roads	Existing residence affected by additional traffic on arterial roads generated by land use developments	60 $L_{Aeq,15hr}$	55 $L_{Aeq,9hr}$
Local roads	Existing residences affect by noise from new local road corridors	55 $L_{Aeq,1hr}$	50 $L_{Aeq,1hr}$

Road category	Type of development	Day 7 am to 10 pm	Night 10 pm to 7 am
	Existing residence affected by additional traffic on local roads generated by land use developments		

Additionally, the RNP application notes state that *"for existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level as a result of the development should be limited to 2 dB above that of the noise level without the development. This limit applies wherever the noise level without the development is within 2 dB of, or exceeds, the relevant day or night criterion."*

Therefore, if the road traffic noise increase is within 2 dBA of current levels during construction or operation of the project, then the objectives of the RNP are met and no specific mitigation measures are required, regardless of whether values presented in Table 3.3 are exceeded.

3.6 Operational noise criteria

3.6.1 Noise Policy for Industry

3.6.1.1 Applicability of the NPfI

The NPfI provides guidance on the assessment of operational noise impacts. The guideline includes both intrusiveness and project amenity noise levels that are designed to protect receivers from noise significantly louder than the background level, and to limit the total noise level from industry near a receiver.

The NPfI project noise trigger levels provide an objective for assessing a project and are not mandatory limits required by legislation. The project noise trigger levels assist the regulatory authorities to establish licensing conditions. Where project noise trigger levels are predicted to be exceeded, feasible and reasonable noise mitigation strategies should be considered. In circumstances where noise criteria cannot be achieved, residual noise impacts are used to assess noise impacts and manage noise from the site in negotiation between the regulatory authority and community. The regulatory authority then sets statutory compliance levels that reflect the achievable and agreed noise limits from the development.

The intrusiveness noise level controls the relative audibility of operational noise compared to the background level at residential receivers. The amenity noise level limit the total level of extraneous noise for all receiver types. Both levels are calculated and the lower of the two in each time period is set as the project noise trigger level. The intrusiveness noise level is assessed over a 15-minute period however the amenity noise level is assessed over the day, evening or nighttime period. For the purposes of assessment to standardise the approach the NPfI recommends that the $L_{Aeq,15min} = L_{Aeq,period} + 3$ dBA unless an alternative approach can be justified.

3.6.1.1 Intrusiveness noise level

The intrusiveness noise level is determined by a 5 dB addition to the measured or adopted background noise level with a minimum intrusiveness noise level of 35 dBA for the evening and night period and 40 dBA for the day period. The NPfI recommends that the intrusiveness noise level for the evening and night period should not exceed the daytime period. The intrusiveness noise levels are only applicable to residential receivers.

3.6.1.2 Amenity noise level and project amenity noise level

The recommended amenity noise level applies to all industrial noise in the area which when combined should remain below the recommended amenity noise level. The recommended amenity noise level represents the total industrial noise sought to be achieved at a receiver location from all new and approved sources.

Residential receiver areas are characterised into 'urban', 'suburban', 'rural' based on land uses and the existing level of noise from industry and road traffic. With consideration to the NPfI 'noise amenity area' classification, the residential receivers are located in 'RU1 – primary production', 'MU1 – mixed use', 'R1 – General residential' and 'R2 – low density residential' land use areas and have been considered as 'Rural Residential' for this assessment.

The project amenity noise level is the objective for noise from a single premises and is set at 5 dBA below the recommended amenity noise level to ensure that the industrial noise levels remain within the recommended

amenity noise level. However, where numerous industrial sites are to be redeveloped or are proposed in an area it may be relevant to divide the amenity level amongst the additional new noise generating premises. While the project site is situated amongst a number of other industrial sources, this expansion is not included in a larger development and would constitute a single premises expansion.

3.6.2 Sleep disturbance

The potential for sleep disturbance from maximum noise level events from the premises during the nighttime period requires consideration. Sleep disturbance is considered to be both awakenings and disturbance to sleep stages.

The NPfI states that where the project exceeds the following screening noise trigger levels at a residential location, a detailed maximum noise level event assessment should be undertaken:

– $L_{Aeq,15min}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or
– L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater.

The NPfI states the following regarding detailed maximum noise level event assessments:

> *The detailed assessment should cover the predicted maximum noise level, the extent to which the maximum noise level exceeds the RBL, and the number of times this happens during the night-time period.*
>
> *Other factors that may be important in assessing the extent of impacts on sleep include:*
>
> – *how often high noise events will occur*
> – *the distribution of likely events across the nighttime period and the existing ambient maximum events in the absence of the subject development*
> – *whether there are times of day when there is a clear change in the noise environment (such as during early-morning shoulder periods)*
> – *current scientific literature available at the time of the assessment regarding the impacts of maximum noise level ents at night.*
>
> *Maximum noise level event assessments should be based on the L_{AFmax} descriptor on an event basis under 'fast' time response.*
>
> *The detailed assessment should consider all feasible and reasonable noise mitigation measures with a goal of achieving the above trigger levels.*

3.6.3 Modifying factor corrections

The NPfI requires that modifying factor corrections are applied if the noise sources contain tonal, intermittent or low frequency characteristics, which have the potential to increase annoyance. The modifying factor corrections are detailed in Table 3.4.

Table 3.4 Modifying factor corrections

Factor	Assessment/ measurement	When to apply	Correction[1,2]
Tonal noise	One-third octave or narrow band analysis	Level of one-third octave band exceeds the level of the adjacent bands on both sides by: – 5 dB or more if the centre frequency of the band containing the tone is above 400 Hz – 8 dB or more if the centre frequency of the band containing the tone is 160 to 400 Hz inclusive – 15 dB or more if the centre frequency of the band containing the tone is below 160 Hz.	5 dBA[2]

Factor	Assessment/ measurement	When to apply	Correction[1,2]
Low frequency noise	Measurement of C-weighted and A-weighted level	Measure/assess C and A weighted $L_{eq,T}$ levels over same time period. Correction to be applied if the difference between the two levels is 15 dB or more and: – Where any of the one-third octave noise levels in Table C2 (reproduced in Table 3.4) are exceeded by up to and including 5 dB and cannot be mitigated, a 2 dBA positive adjustment to measured/predicted A-weighted levels for the evening/night period. – Where any of the one-third octave noise levels in Table C2 (reproduced in Table 3.4) are exceeded by more than 5 dBA and cannot be mitigated, a 5 dBA positive adjustment to measured/predicted A-weighted noise levels applies for the evening/night period and a dBA positive adjustment for the daytime period.	2 or 5 dBA[2]
Intermittent noise	Subjectively assessed	When the night-time noise level drops to that of the background noise level with a noticeable change in noise level of at least 5 dBA.	5 dBA

Notes:

1. Where two or more modifying factors are present the maximum correction is limited to 10 dBA.
2. Where a source emits a tonal and low-frequency noise, only one 5 dB correction should be applied if the tone is in the low frequency range.

Table 3.5 One-third octave band low frequency noise thresholds

Frequency (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
dB(Z)	92	89	86	77	69	61	54	50	50	48	48	46	44

3.6.4 Project specific noise criteria

The project specific noise criteria for MOD26 are shown in Table 3.6 below. At receivers R5 and R6, the EPL does not provide a noise limit. However, section 12 of Schedule 3 of Development Consent 06_0228 does provide an $L_{Aeq,15min}$ noise limit of 40 dBA during the daytime, evening and nighttime period at these receivers which was adopted for the purpose of this assessment.

The $L_{Aeq,15min}$ noise levels from the site are assessed as follows:

– noise emission from proposed plant and equipment associated with MOD26 is assessed against the design goal, which is established as 15 dB below the EPL and Development Consent 06_0228 noise limits

– cumulative noise emission from the current operation of the site, including MOD26 are assessed against the EPL noise limits

– cumulative noise emission from the current operations and all approved but not yet constructed components of the site, including MOD26 are assessed against the EPL noise limits.

The EPL includes $L_{A1,1min}$ noise limits for assessment of sleep disturbance for the EPL assessment locations. The L_{Amax} descriptor has been adopted in this report for the assessment of sleep disturbance, as this is consistent with the methodology described in the NPfI and is considered to be an equivalent descriptor to quantify maximum noise levels.

As the EPL nor the Development Consent 06_0228 provide an L_{Amax} limit for receivers R5 and R6, the L_{Amax} criteria is derived in accordance with the NPfI methodology using the established RBL from monitoring location L5.

Table 3.6 Operational noise criteria

Receiver ID	Address	Noise limit during day, evening and night $L_{Aeq,15min}$ (dBA)	Noise limit night L_{Amax}	MOD26 design noise goal $L_{Aeq,15min}$ (dBA)
EPL assessment locations – Noise limits based on the EPL				
R1	135 Terara Road, Terara	38	48	23 (38 - 15)
R2	45 Ferry Lane, Terara	38	48	23 (38 - 15)
R3	41A Meroo Street, Bomaderry	42	52	27 (42 - 15)
R4	1-3 Meroo Street, Bomaderry	42	52	27 (42 - 15)
R7	19 Meroo Street, Bomaderry	42	52	27 (42 - 15)
R8	1 Nobblers Lane, Terara	38	48	23 (38 - 15)
R9	2 Tarawara Street, Bomaderry	42	52	27 (42 - 15)
R10	10 Tarawara Street, Bomaderry	40	50	25 (40 - 15)
R11	17 Coomea Street, Bomaderry	40	50	25 (40 - 15)
R12	6 Birriley Street, Bomaderry	40	50	25 (40 - 15)
R13	1 Coomea Street, Bomaderry	40	50	25 (40 - 15)
Additional residential locations – Noise limits based on condition 12 of Development Consent 06_0228 Schedule 3				
R5[1]	Burraga/Pig Island, Terara	40[2]	53[3]	25 (40 - 15)
R6	39 Hanigans Lane, Bolong	40[2]	53[3]	25 (40 - 15)
R14	390 Bolong Road, Bolong	40[2]	53[3]	25 (40 – 15)
R15	1 Bryant Street, Terara	40[2]	53[3]	25 (40 – 15)

Notes:

1. The dwelling on Burraga/Pig Island is uninhabited. Noise levels and assessment against the noise limits in this NVIA have been included for information purposes.
2. The EPL does not provide noise limits for receivers R5 and R6, however, the Development Consent 06_0228 does include an operational noise limit of 40 dBA during all time periods for these receivers and has been included as such.
3. Based on the established RBL in Bolong (monitoring location L5) as per the NPfI.

4. Noise modelling methodology

4.1 Noise propagation algorithm

The *ISO 9613-2:1996 'Acoustics – Attenuation of sound during propagation outdoors'* (ISO, 1996) standard is an internationally recognised method for predicting environmental noise propagation in outdoor conditions. In simple terms, the ISO9613-2 method calculates the sound level at a receiver location as follows:

$Lp = Lw + D_c - (A_{div} + A_{atm} + A_{gr} + A_{bar})$

Where:

- **L_p** is the predicted octave-band sound pressure level at the receiver in decibels
- **L_w** is the octave-band sound power level (SWL) produced by the point sound source relative to a reference sound power of one picowatt (1 pW), expressed in decibels
- **D_c** is the directivity correction, in decibels, that describes the extent by which the equivalent continuous sound pressure level from the point sound source deviates in a specified direction from the level of an omnidirectional point sound source producing the sound power level, expressed in decibels
- **A_{div}** is the attenuation due to distance from the source to a receiver (geometric divergence)
- **A_{atm}** is the attenuation due to atmospheric absorption, which depends on distance, temperature, humidity, and the frequency of the sound
- **A_{gr}** is the attenuation due to the absorptive/reflective properties of the ground cover between the source and receiver (e.g., soft vs. hard ground)
- **A_{bar}** is the attenuation from screening/barriers such as ground terrain, buildings and physical structures, which reduce sound by blocking and diffracting it (depends on relative barrier height, material, and the source/receiver location)

4.2 Noise enhancing weather

A review of the significance of noise enhancing weather conditions was undertaken and is outlined in Section 2.3. It was determined that receivers in certain directions from the site may experience noise enhancing conditions more than 30% of the time and these conditions should be considered in the assessment. However, for other receivers in the study area noise enhancing conditions would not occur often and consideration of neutral conditions should be made for these receivers and as such both favourable and neutral conditions should be included in the noise modelling.

The ISO 9613-2 method assumes a light source to receiver wind which is considered to be favourable weather conditions that can enhance sound propagation, leading to higher noise levels at greater distances. To account for neutral conditions the downwind sound pressure level can be corrected to set conditions where meteorological conditions may not be favourable at all times using the C_{met} correction factor in the following equation:

$$L_{p\,(downwind)} = L_{p\,(average)} - C_{met}$$

For:

$C_{met} = 0$ if $d_p \leq 10 \cdot (h_S + h_R)$

$C_{met} = C_0[1 - \frac{10(h_S+h_R)}{d_p}]$ if $d_p > 10 \cdot (h_S + h_R)$

Where:

- **h_S** is the source height, expressed in metres
- **h_R** is the receiver height, expressed in metres

– **d_p** is the distance between the source and receiver projected to the horizontal ground plane, expressed in metres
– **C_0** is a correction factor, expressed in decibels, which depends on meteorological statistics for wind speed and direction, and temperature gradients which may depend on the angular orientation of the direction between the source and receiver

For this assessment the C_{met} correction has been used to correct modelled levels using measured wind conditions during monitoring periods for the purpose of model calibration as well as to account for neutral conditions in prediction of noise levels. To determine the C_0 coefficient for C_{met}, the equation provided in Annex C of ISO9613-2:2024 was used as ISO9613-2:1996 does not provide this explicit equation. During monitoring periods, wind vectors measured on site were utilised in this equation. To determine the correction for neutral conditions it was assumed that wind speeds are evenly distributed in all compass directions resulting in C_0 of 1.2.

4.3 Noise modelling program

Noise modelling was undertaken using SoundPLAN 9.1. SoundPLAN is a computer program for the calculation, assessment and prognosis of noise exposure. The software implements various environmental noise propagation algorithms, including the adopted ISO 9613-2:1996 algorithm. General parameters used in the SoundPLAN noise model are listed in Table 4.1.

Table 4.1 SoundPLAN noise modelling parameters

Input	Description
Model settings	
Prediction algorithm	ISO 9613-2:1996
Weather conditions	Based on an average temperature of 10°C and an average humidity of 70% (conservative).
Meteorological conditions	C_{met} adjustment to account for both neutral and noise enhancing (adverse) conditions as described in Section 4.2 Neutral: C_0 = 1.2 dB Adverse: C_0 = 0 dB
Model inputs	
Topography	5 metre intervals based on the digital elevation model 5 m Grid of Australia.
Receiver heights	1.5 metres above floor height (e.g. 1.5m for ground floor and 4.5m for first floor)
Buildings	For buildings outside of the site, footprints and heights have been sourced from the iNoise model developed by Day Design. Building footprints within the site are based on a georeferenced computer-aided design drawing where available. The building heights are based on elevation drawings provided by Manildra where available. Where no heights were available, an estimate was made based on photographs taken during the site visit and aerial imagery.
Reflections	The noise predictions consider two orders of reflection.
Ground absorption	0 for all bodies of water 0.25 for industrial premises and roads 0.75 for all other areas, which represents a mix of hard and soft ground.

4.4 Site wide noise model validation

As part of the Noise PRP, a SWNM was developed using at-source measurements as described in the report *Shoalhaven Starches Pollution Reduction Program – Noise Compliance Investigation* (GHD, 2025). The noise model results from the site-wide noise model were compared to noise monitoring undertaken in the near and far field from the site. The noise monitoring locations are shown in Figure 2.3.

A detailed description of the validation is provided in Appendix B. A summary of the validation is provided below.

4.4.1 Near field

Noise levels were measured at 14 locations near the site to validate the SWNM. These locations were selected to be close to noise sources but not directly affected by single noise sources. A comparison of measured and modelled L_{Aeq} and L_{A90} nighttime noise levels showed that most differences were within an acceptable 3 dB margin, accounting for the site's complexity and multiple noise sources. The L_{A90} was used for validation to avoid short-term noise fluctuations. The model slightly underpredicted noise levels on average by 1.1 dB, possibly due to nearby traffic or rail sources not included in the model. These findings need to be considered in conjunction with the far field monitoring described in Section 4.4.2.

4.4.2 Far field

Noise monitoring was carried out at seven locations up to 1,300 metres from the site to validate the noise model in all directions. Measurement data between midnight and 5am was used as this period is the least likely to be affected by extraneous noise providing confidence that measured levels consist of noise mainly from the site.

Meteorological conditions during the monitoring periods, presented in Section 3.2.2, have been analysed, particularly wind direction, to account for possible variability in measured levels across multiple nights. Calculation using the frequency of wind in each direction has been completed in accordance with Annex C of ISO9613.2:2024 to calculate the C_0 coefficient for the C_{met} parameter for each of 12 source to receiver directions.

For most receivers, predicted noise levels have been compared to the L_{Aeq}. The modelled level is input as an L_{Aeq} and as the time period chosen for comparison aims to exclude extraneous noise, the measured level would be closest to the L_{Aeq}. At locations L4 and L5, however, other external noise sources are still present during this nighttime period and therefore the L_{A90} level has been used for comparison at these locations.

A detailed description of the validation for each location, daily measured noise levels and predicted noise levels with consideration to the meteorological conditions are provided in Appendix B. Table 4.2 provides the average difference between the measured and predicted noise levels for the L_{Aeq} and L_{A90} noise levels.

Table 4.2 Average difference between measured and predicted noise levels

Location	Difference between average measured and predicted noise level (dBA)	
	L_{Aeq}	L_{A90}
Location 1	1.9	5.6
Location 2	-0.4	3.2
Location 3	1.3	3.2
Location 4	-5.6	-1.8
Location 5	-3.7	2.3
Location 6	-0.5	4
Location 8	-0.2	1.6

5. Construction noise impact assessment

5.1 Construction methodology

5.1.1 Construction hours

Construction of the proposed modification would occur during the recommended standard construction hours defined in the ICNG of:

– 7.00am – 6.00pm weekdays
– 8.00am – 1.00pm on Saturdays
– No construction on Sundays or public holidays

Some activities may be scheduled outside of standard construction hours, which could include:

– Work determined to comply with the relevant NMLs at the nearest sensitive receiver
– The delivery of materials by heavy vehicles outside standard construction hours as required by the NSW Police or other authorities for safety reasons. For example, oversize or over mass loads where delivery during the daytime is not possible due to impacts on daytime traffic
– Emergency situations where it is required to avoid the loss of lives and properties and/or to prevent environmental harm.

5.1.2 Construction equipment and materials

The construction works will consist of earthworks, foundation works including piling, pouring of concrete and construction of the buildings and gantries, and installation of all plant and equipment.

Plant and equipment needed for the proposed modification would be determined during the construction planning phase. Noise level data has been obtained from the Australian Standards *AS2436 – Guide to noise and vibration control on construction, demolition and maintenance sites* (Australian Standard, 2010) and the *Construction Noise and Vibration Guideline (Roads)* (Transport for NSW, 2024) (CNVG). Other equipment may be used; however, it is anticipated that they would produce similar net noise emissions when used concurrently with the equipment listed. Table 5.1 presents the construction equipment proposed for each construction scenario.

Table 5.1 Construction equipment and assumed sound power levels

Equipment	Sound power level (dBA)	Source
Bulldozer	108	AS2436
Compactor	113	AS2436
Concrete pencil vibrator	103	AS2436
Concrete pump truck	108	AS2436
Crane - Mobile	113	TfNSW CNVG
Excavator	107	AS2436
Grader	110	AS2436
Grinder	105	TfNSW CNVG
Hand tools (electric)	102	AS2436
Piling Rig (bored)	111	AS2436
Truck (> 20 tonne)	107	AS2436
Truck - concrete	109	TfNSW CNVG
Welder	105	AS2436

5.2 Noise modelling methodology

Noise modelling was undertaken using SoundPLAN 9.1 using the same modelling parameters as described in Section 4.3.

Construction scenarios for the purpose of noise modelling have been developed based on the information outlined in Section 5.1.2. These construction scenarios are presented in Table 5.2.

Noise modelling of these scenarios has been conducted to determine the potential construction noise levels at the surrounding noise sensitive receivers. The magnitude of off-site noise impacts associated with construction is dependent upon a number of factors, including:

– The intensity and location of construction activities
– The type of equipment used
– Existing background noise levels
– Intervening terrain and structures
– Weather conditions during construction works.

The noise modelling assumes that the two loudest items of equipment in the scenario are operating at maximum capacity simultaneously at the closest distance between the construction works and the sensitive receiver. This approach is considered conservative.

Table 5.2 Construction scenarios

Scenario ID	Description	Equipment	Scenario sound power level (dBA)
CS1	Earthworks or demolition works	Excavators, graders, dozer, truck	116
CS2	Foundation works and piling activities	Bored piling rig, mobile crane, trucks	115
CS3	Concrete works	Concrete truck, concrete pump, concrete vibrator, trucks	112
CS4	Mechanical and electrical installation	Welder, grinder, mobile crane, electric hand tools, trucks	114

5.3 Construction noise modelling results

Construction noise levels have been predicted at the sensitive receivers with consideration to the NML derived from the ICNG. The predicted L_{Aeq} noise levels along with the standard hours NMLs for each receiver is presented in Table 5.3.

Received noise levels shown in red indicate an exceedance of the NML. Based on the predicted noise levels, all construction scenarios are predicted to result in exceedances of the NML at several receivers. Receivers R5 and R6 are anticipated to experience the highest noise levels. During the loudest construction activities (earthworks or demolition works, CS1), receivers R5 and R6 are predicted to experience a noise level of 10 and 7 dB above the NML respectively. Other sensitive receivers are predicted to experience lower noise levels.

The exceedances would result in noticeable noise levels at the sensitive receivers. However, as the construction is temporary and during the ICNG's recommended standard construction hours, noise impacts are considered to be minor. Nevertheless, reasonable and feasible mitigation measures are recommended in Section 8.1 to be implemented to minimise noise impacts from the construction of the proposed modification.

Table 5.3 Predicted noise levels during construction activities

Receiver ID	NCA	Address	Noise Management Level (dBA)	Predicted construction noise level $L_{Aeq,15min}$ (dBA)			
				CS1	CS2	CS3	CS4
R1	NCA1	135 Terara Road, Terara	45	38	37	34	36
R2	NCA1	45 Ferry Lane, Terara	45	50	49	46	48
R3	NCA2	41A Meroo Street, Bomaderry	49	51	50	47	49
R4	NCA2	1-3 Meroo Street, Bomaderry	49	47	46	43	45
R5	NCA3	Burraga Island	45	55	54	51	53
R6	NCA3	39 Hanigans Lane, Bolong	45	52	51	48	50
R7	NCA2	19 Meroo Street, Bomaderry	49	48	47	44	46
R8	NCA1	1 Nobblers Lane, Terara	45	41	40	37	39
R9	NCA2	2 Tarawara Street, Bomaderry	49	50	49	46	48
R10	NCA2	10 Tarawara Street, Bomaderry	49	44	43	40	42
R11	NCA2	17 Coomea Street, Bomaderry	49	48	47	44	46
R12	NCA2	6 Birriley Street, Bomaderry	49	47	46	43	45
R13	NCA2	1 Coomea Street, Bomaderry	49	45	44	41	43
R14	NCA3	390 Bolong Road, Bolong	45	45	44	41	43
R15	NCA3	1 Bryant Street, Terara	45	42	41	38	40

6. Operational noise impact assessment

6.1 Modification 26 plant and equipment

MOD26 consists of the following components:

– Additional grain storage and handling facilities
– WTP upgrade
– Additional finished product silos
– Other works, including rail. ethanol maintenance buildings, nitric acid storage and relocation of the approved Phosphorous Oxychloride storage area.

The noise sources associated with the above components are described in the following sections. A detailed overview of the noise source inputs is provided in Appendix C.

Noise data for the items of equipment associated with MOD26 is based on supplier provided data where available. If no noise data was available, noise measurements undertaken of similar equipment on site were used as reference.

To ensure noise levels of MOD26 achieve the design noise goals established in Section 3.6.4, the sound power levels presented in this report must be achieved by selecting low noise equipment or implementing at-source mitigation measures.

Where at-source mitigation measures are not reasonable or feasible, noise walls can be considered. However, noise walls are less effective in reducing noise, particularly for elevated noise sources.

6.1.1 Grain storage and handling facilities

Plant and equipment associated with the additional grain storage and handling facilities consist of several components, which are discussed in the following sections.

It is noted that the silo grain screening and the stage 1 screening building are both included in the noise modelling. As one of these will be redundant, no noise would be emitted from the associated plant and equipment. However, the modelling undertaken for this assessment has considered them both to be operational simultaneously, which is conservative.

6.1.1.1 Conveyors and bucket elevators

A number of conveyors and bucket elevators will be used as part of the grain storage and handling facility. Conveyors will be operational along the riverbank, between the train and truck unloader to the silo grain screening and sieve buildings and towards the three proposed grain silos. Noise sources associated with the conveyors and bucket elevators are the motors and fans to reduce dust emissions.

Noise levels of the equipment are based on the following information provided by the supplier:

– Bucket elevator motors: SWL of 85 dBA for each bucket elevator motor
– Bucket elevator and conveyor fans: SPL of 57 dBA at 1 metre for each fan, including silencers
– Conveyor motors: SPL of 70 dBA at 1 metre for each conveyor motor.

An overview of the noise sources is provided in Table 6.1.

Table 6.1 Conveyors and bucket elevators noise sources

Conveyor / bucket elevator	Equipment	Number of items	SWL per unit (dBA)	
			Unmitigated	Mitigated
Grain storage bucket elevators	Bucket elevator motors	3	85	75
	Fans	6	66	66
	Bucket elevator motor	1	85	85

Conveyor / bucket elevator	Equipment	Number of items	SWL per unit (dBA)	
			Unmitigated	Mitigated
Stage 1 screening building bucket elevator	Fans	2	66	66
Grain storage feed conveyors	Conveyor motors	3	79	74
	Fans	6	66	66
Train and truck unloader conveyor to silo grain sieve building	Conveyor motors	1	79	79
	Fans	2	66	66
Conveyor to plant	Conveyor motors	8	79	69
	Fans	16	66	66
Bypass conveyor	Conveyor motors	1	79	79
	Fans	2	66	66

6.1.1.2 Train and truck unloader building

The train and truck unloader building allows both trains and trucks to unload grain into the grain storage and handling facilities. The building is largely closed but has openings in the east and west façade to allow trains and trucks to enter the building.

Within the building, several screw conveyors on variable speed drives (VSD) are present to transfer grain unto the conveyor belt. Additionally, several fans are housed within the building and have discharge points in the northern façade.

Noise levels of the plant and equipment are based on the following:

– A diffuse internal noise level of 70 dBA within the train and truck unloader building, representative of a truck idling within the building.
– All other noise generating equipment (including fans) are enclosed to minimise noise emissions through the openings in the western and eastern facades.
– A diffuse internal noise level of 85 dBA within any enclosed compartments of the building.
– Fan discharge outlets are designed to achieve a SWL of 70 dBA per outlet by implementing a silencer in the further design if required.

An overview of the sound power levels associated with the train and truck unloader building is shown in Table 6.2.

Table 6.2 Train and truck unloader building

Building component	Subcomponent	Total surface area (m^2)	Diffuse internal noise level (dBA)	Adopted transmission loss (R_W, dB)	Unmitigated SWL per m^2 (dBA)	Total SWL (dBA)	
						Unmitigated	Mitigated
North façade	Fan discharge outlets	4	N/A	N/A	85	91	76
	Fan room façade	201	85	32[1]	52	76	76
	Train and truck unloader façade	227	70	18[2]	47	71	73
East façade	Opening for trains/trucks	29	70	0	65	80	80
	Fan room façade	40	85	32[1]	52	68	68
	Train and truck unloader façade	113	70	18[2]	50	70	70
South façade	Train and truck unloader façade	432	70	18[2]	50	76	76

Building component	Subcomponent	Total surface area (m^2)	Diffuse internal noise level (dBA)	Adopted transmission loss (R_W, dB)	Unmitigated SWL per m^2 (dBA)	Total SWL (dBA)	
						Unmitigated	Mitigated
West façade	Opening for trains/trucks	29	80	0	65	80	80
	Fan room façade	40	85	32[1]	52	68	68
	Train and truck unloader façade	113	70	18[2]	50	70	70
Roof	Fan room roof	198	85	32[1]	52	75	75
	Train and truck unloader roof	234	70	18[2]	50	73	73

Note 1: Sandwich panel with an R_W value of 32 dB or better.

Note 2: Single corrugated steel sheet with an R_W value of 18 dB or better.

6.1.1.3 Silo grain screening and sieve buildings

The first stage silo grain screening and silo grain sieve buildings are located east of the train and truck unloader building. Within the silo grain screening building, 2 fans with discharge points in the northern façade, 1 sieve and 2 screens are present. The equipment within the silo grain sieve building consists of a single sieve.

Noise levels of the plant and equipment are based on the following:

– A diffuse internal noise level of 85 dBA within the silo grain screening building, based on internal noise measurements of the Flour Mill.
– A diffuse internal noise level of 80 dBA within the sieve building, based on internal noise measurements of the Flour Mill.
– Fan discharge outlets are designed to achieve a SWL of 75 dBA per outlet by implementing a silencer in the further design if required.

An overview of the sound power levels associated with the silo grain screening and sieve building is shown in Table 6.3 and Table 6.4.

Table 6.3 Silo grain screening building

Building component	Subcomponent	Total surface area (m^2)	Diffuse internal noise level (dBA)	Adopted transmission loss (R_W, dB)	Unmitigated SWL per m^2 (dBA)	Total SWL (dBA)	
						Unmitigated	Mitigated
North façade	Fan discharge outlets	2	N/A	N/A	85	88	78
	Silo grain screening façade	238	85	32[1]	52	76	76
East façade	Silo grain screening façade	192	85	32[1]	52	75	75
South façade	Silo grain screening façade	240	85	32[1]	52	76	76
West façade	Silo grain screening façade	192	85	32[1]	52	75	75
Roof	Silo grain screening Roof	80	85	32[1]	52	72	72

Note 1: Sandwich panel with an R_W value of 32 dB or better.

Table 6.4 Silo grain sieving building

Building component	Total surface area (m^2)	Diffuse internal noise level (dBA)	Adopted transmission loss (R_W, dB)	Unmitigated SWL per m^2 (dBA)	Total unmitigated SWL (dBA)
North façade	59	80	32[1]	47	65
East façade	50	80	32[1]	47	64
South façade	59	80	32[1]	47	65
West façade	50	80	32[1]	47	64
Roof	36	80	32[1]	47	63

Note 1: Sandwich panel with an R_W value of 32 dB or better.

6.1.1.4 Stage 1 screening building

The stage 1 screening building is located east of the Flour Mill. Within the stage 1 screening building, similar equipment is present as in the silo grain screening building (Section 6.1.1.3).

Noise levels of the plant and equipment are based on the following:

– A diffuse internal noise level of 85 dBA within the Stage 1 screening building, based on internal noise measurements of the Flour Mill.
– Fan discharge outlets are designed to achieve a SWL of 85 dBA per outlet by implementing a silencer in the further design if required.

An overview of the sound power levels associated with the stage 1 screening building is shown in Table 6.5.

Table 6.5 Stage 1 screening building

Building component	Subcomponent	Total surface area (m^2)	Diffuse internal noise level (dBA)	Adopted transmission loss (R_W, dB)	Unmitigated SWL per m^2 (dBA)	Total SWL (dBA)	
						Unmitigated	Mitigated
North façade	Fan discharge outlets	2	N/A	N/A	85	88	88
	Silo grain screening façade	177	85	32[1]	52	75	75
East façade	Silo grain screening façade	78	85	32[1]	52	71	71
South façade	Silo grain screening façade	181	85	32[1]	52	75	75
West façade	Silo grain screening façade	78	85	32[1]	52	71	71
Roof	Silo grain screening roof	85	85	32[1]	52	72	72

Note 1: Sandwich panel with an R_W value of 32 dB or better.

6.1.2 Water treatment plant upgrade

Plant and equipment associated with the water treatment plant upgrade consist of several components, which are discussed in the following sections.

6.1.2.1 Membrane Bioreactor and Reverse Osmosis

An additional membrane bioreactor (MBR) tank and reverse osmosis (RO) is proposed. Plant and equipment associated with the MBR tank and RO are similar to the existing plant and equipment, which consists of several pumps, blowers and RO rigs located within a new water recovery plant building.

Noise levels of the plant and equipment are based on the following:

– MBR and RO outdoor equipment: at source noise measurements of the outdoor MBR and RO equipment undertaken as part of the Noise PRP.
– Water recovery plant building:
  - Noise measurements of the diffuse internal noise level within the existing water recovery plant building with a single corrugated steel sheet façade.
  - Noise measurements of the closed roller doors of the existing water recovery plant building.

An overview of the sound power levels associated with the equipment of the MBR tank and RO is shown in Table 6.6 and Table 6.7.

Table 6.6 MBR tank and RO sources

Component	Equipment	Number of items	SWL per unit (dBA)		Noise PRP reference measurement
			Unmitigated	Mitigated	
MBR Tanks	MBR Blowers	6	96	81	WT017
	MBR Permeate pumps	4	77	77	WT013
RO	RO Feed pump	3	74	74	WT014
	RO Feed booster pump	1	87	87	WT004

Table 6.7 RO water recovery plant building

Building component	Subcomponent	Total surface area (m^2)	Diffuse internal noise level (dBA)	Adopted transmission loss (R_W, dB)	Unmitigated SWL per m^2 (dBA)	Total unmitigated SWL (dBA)	Noise PRP reference measurement
East façade	Closed roller doors	50	N/A	N/A	62[1]	79	WT003
	RO building façade	46	84	18[2]	59	76	WT024
South façade	RO building façade	72	84	18[2]	59	78	
West façade	RO building façade	96	84	18[2]	59	79	
Roof	RO building roof	193	84	18[2]	59	82	

Note 1: Based on measurements of a closed roller door at the existing RO water recovery plant building.

Note 2: Single corrugated steel sheet with an R_W value of 18 dB or better.

6.1.2.2 Cooling towers

Six cooling tower cells are proposed as part of the WTP upgrade, east of the existing MBR tank. As the Noise PRP found that the existing cooling towers were one of the dominant noise sources on the site, any proposed new cooling tower should have minimal noise emissions.

Noise levels of the plant and equipment are based on at-source noise measurements of the existing Eastern Evaporator cooling tower facades, louvres, fans and cooling water pumps. Implementation of mitigation measures such as ultra-low noise fans, acoustic louvres, silencers or noise walls would be required to reduce cooling tower noise to minimise cooling tower noise levels.

An overview of the sound power levels associated with the equipment of the cooling towers is shown in Table 6.15.

Table 6.8 Cooling towers

Component	Equipment	Surface area (m^2)	Number of items	Unmitigated SWL per m^2 (dBA)	SWL per item (dBA)		Noise PRP reference measurement
					Unmitigated	Mitigated	
Cooling tower	Facades louvres	60	6 (2 per two cooling cells)	84	102	82	CT003
	Façade sidewalls	48	6 (1 per cooling cell)	78	95	80	CT004
	Fan	N/A	6 (1 per cooling cell)	N/A	102	77	CT013
	Total SWL of 2 cooling tower cells				**108**	**86**	**-**
	Total SWL of 6 cooling tower cells				**113**	**91**	
Cooling tower water pumps	Pumps	N/A	5	N/A	90	80	CT008

6.1.2.3 Scrubbers

Two scrubber stations are proposed as part MOD26. Scrubber no. 1 is located north of the proposed cooling towers and consists of 8 scrubber tanks. Scrubber no. 2 is located south of the WTP ponds and consists of 3 scrubber tanks. Noise generating equipment of the scrubbers is limited to a single pump per scrubber tank with a SWL of 80 dBA per pump.

An overview of the sound power levels associated with the scrubber pumps is shown in Table 6.9.

Table 6.9 Scrubber pumps

Component	Equipment	Number of items	Unmitigated SWL per unit (dBA)
Scrubber #1	Scrubber pump	8	80
Scrubber #2	Scrubber pump	3	80

6.1.2.4 Biogas shed expansion and scrubber #2 blower room

An expansion of the biogas shed is proposed, which would approximately double the size of the biogas shed. Due to the expansion, the existing flare is moved approximately 25 metres to the north. Two additional chillers are proposed east of the biogas shed and a second flare is proposed to allow for sufficient flaring capacity if required.

The purpose of the biogas shed expansion is to allow for a better arrangement of equipment within the shed. As such, noise levels from the biogas shed expansion are anticipated to be similar to the existing biogas shed.

Noise levels of the plant and equipment are based on the following:

– At-source noise measurements of the existing biogas shed chiller, as detailed in Table 60 of the report *Site Wide Noise Model* (Day Design, 2023).
– Noise measurements at the existing flare as reported in the Noise PRP and refined with additional measurements as majority of noise emission was observed to come from the flare pipework.
– Noise measurements of the existing biogas shed, as detailed in Table 62 of the report *Site Wide Noise Model* (Day Design, 2023).

An overview of the noise sources and associated sound power levels of the biogas shed expansion is shown in Table 6.10 and Table 6.11.

Table 6.10 Biogas shed expansion sources

Component	Equipment	Number of items	SWL per unit (dBA)		Source and Noise PRP reference measurement
			Unmitigated	Mitigated	
Biogas shed expansion	Chiller	2	85	85	Table 60 of *Site Wide Noise Model* (Day Design, 2023)
	Flare	1	87	82	WT009
	Flare pipework	1	99	94	WT009

Table 6.11 Biogas shed expansion and scrubber #2 blower room buildings

Building	Building component	Surface area (m^2)	Unmitigated SWL per m^2 (dBA)	Total SWL (dBA)		Source
				Unmitigated	Mitigated	
Biogas shed expansion	North façade	34	74	89	89	Table 62 of *Site Wide Noise Model* (Day Design, 2023)
	East façade	72	74	93	88	
	West façade	72	74	93	83	
	Roof	151	74	96	86	
Scrubber #2 blower room	North façade	103	74	94	89	
	East façade	68	74	92	87	
	South façade	103	74	94	84	
	West façade	68	74	92	82	
	Roof	216	74	97	87	

6.1.2.5 Equalisation tanks

The design of the approved equalisation tank will be adjusted as part of MOD26. In addition, two pumps are proposed east of the existing equalisation tank.

Noise levels of the plant and equipment are based on the following:

– Pump noise levels of the BVF2 feed pumps are calculated based on a power rating of 14 kW using the following formula from *Engineering Noise Control* (Bies, Hansen, & Howard, 2017): $Lw = 70 + 10LOG(kW)$.

– Noise measurement of the existing agitator at the existing equalisation tank.

An overview of the noise sources and associated sound power levels is shown in Table 6.12.

Table 6.12 Equalisation tank equipment

Component	Equipment	Number of items	SWL per unit (dBA)	Source and Noise PRP reference measurement
Equalisation tank	BVF2 feed pumps	2	79	Calculated based on a power rating of 14 kW using $Lw = 70 + 10LOG(kW)$
	Agitator	1	75	WT019

6.1.2.6 BVF pumps

South of WTP ponds 1, 2 and 3, several ancillary pumps are proposed.

Noise levels of the plant and equipment are based on the following:

– Pump noise levels of the pumps are calculated based on the provided power rating using the following formula from *Engineering Noise Control* (Bies, Hansen, & Howard, 2017): $Lw = 70 + 10LOG(kW)$.

An overview of the pumps and associated sound power levels is shown in Table 6.13.

Table 6.13 BVF pumps

Component	Equipment	Number of items	Power rating (kw)	SWL per unit (dBA)	
				Unmitigated	Mitigated
BVF Pumps	BVF2 Sludge pump	1	55	87	82
	BVF2 SREC pump	1	9	80	80
	BVF2 RANS pump	1	9	80	80
	BVF2 Break Tank SO Pond pumps	3	23	84	79

6.1.3 Additional finished product silos

The additional finished product silos will be located to the southwest of the Starch Packer. The top of the finished product silos will be over capped with a structure, within which some noise generating equipment will be located.

Noise levels within the over capped structure are based on noise measurements within the over capped structure of the Flour Mill.

An overview of the sound power levels associated with the over capped structure of the finished product silo building is shown in Table 6.14.

Table 6.14 Finished product silo building

Building component	Surface area (m^2)	Diffuse internal noise level (dBA)	Adopted transmission loss (R_W, dB)	Unmitigated SWL per m^2 (dBA)	Total unmitigated SWL (dBA)	Noise PRP reference measurement
North façade	59	75	18[2]	53	71	FM023
East façade	162	75	18[2]	53	75	
South façade	59	75	18[2]	53	71	
West façade	162	75	18[2]	53	75	
Roof	318	75	18[2]	53	78	

Note 2: Single corrugated steel sheet with an R_W value of 18 dB or better.

6.2 Operational noise modelling results

6.2.1 Annoying characteristics analysis

One-third octave results have been analysed for tonal and low frequency characteristics for both the existing site and the proposed modification.

6.2.1.1 Tonal noise

The analysis for tonal frequency characteristics indicates that none of the triggers have been met for either MOD26 on its own or the existing site including MOD26. As such, no tonal noise corrections have been applied to the predicted noise levels.

6.2.1.2 Low frequency noise

The analysis for low frequency noise characteristics indicates the following:

– The noise levels of MOD26 individually do contain low frequency noise characteristics, with the difference between the C-weighted and A-weighted noise levels at sensitive receivers being more than 15 dB. However,

the low frequency noise thresholds (refer to Table 3.5) are not exceeded at the sensitive receivers due the predicted levels being minimal. Therefore, no penalty for low frequency noise has been applied to presented noise levels of MOD26 individually.

– The cumulative noise levels of the current site, including MOD26, contain low frequency noise levels with the difference between the C-weighted and A-weighted noise levels at sensitive receivers being more than 15 dB. Additionally, the low frequency noise thresholds (refer to Table 3.5) are predicted to be exceeded at the sensitive receivers by more than 5 dB in several one-third octave bands. Therefore, a 2 dB (daytime) and 5 dB (evening and nighttime) penalty for low frequency noise is applied to the predicted noise levels.

The analysis of predicted low frequency noise levels at sensitive receivers is provided in Appendix D. An overview of the applied corrections at all sensitive receivers is shown in Table 6.15 below. It is noted the low frequency noise corrections are only applied to the predicted cumulative noise levels.

Table 6.15 Applied low frequency noise penalty at sensitive receivers

Receiver ID	Address	Low frequency noise correction on cumulative noise levels (dB)	
		Day	Evening and night
R1	135 Terara Road, Terara	2	5
R2	45 Ferry Lane, Terrara	2	5
R3	41A Meroo St, Bomaderry	2	5
R4	1-3 Meroo St, Bomaderry NSW 2541	2	5
R5	Burraga Island	2	5
R6	39 Hanigans Ln, Bolong NSW 2540	2	5
R7	19 Meroo St, Bomaderry NSW 2541	2	5
R8	1 Nobblers Ln, Terara NSW 2540	2	5
R9	2 Tarawara Street, Bomaderry	2	5
R10	10 Tarawara Street, Bomaderry	2	5
R11	17 Coomea Street, Bomaderry	2	5
R12	6 Birriley Street, Bomaderry	2	5
R13	1 Coomea Street, Bomaderry	2	5
R14	390 Bolong Road, Bolong	2	5
R15	1 Bryant Street, Terara	2	5

6.2.2 Predicted operational noise levels

Predicted operational noise levels have been provided for the following scenarios:

– **MOD26**: noise from proposed plant and equipment associated with MOD26
– **Cumulative**: cumulative noise from current site operations, including MOD26 and the rail line
– **Cumulative approved not yet constructed (ANYC)**: cumulative noise from current operations plus all approved but not yet constructed components, including MOD26 and the rail line.

The predicted operational noise levels for each of the above scenarios have been assessed in the following sections.

6.2.2.1 Modification 26 noise levels

The predicted $L_{Aeq,15min}$ operational noise level from the MOD26 components and all of MOD26 are shown in Figure 6.1 (neutral meteorological conditions) and Figure 6.2 (noise enhancing meteorological conditions). Noise contours of the MOD26 noise levels are shown in Figure 6.3.

Grain storage and handling facilities are expected to be the main contributing component of MOD26 at most sensitive receivers, except at R1, R6, and R13, where the water treatment plant upgrade is predicted to contribute more. The finished product silos generally contribute minimally to the modification's noise levels.

As noise levels from MOD26 are predicted to not exceed the low frequency noise thresholds at any of the sensitive receivers, no correction for low frequency noise characteristics have been applied to the predicted noise levels.

As shown in the figures, the noise levels of the modification are predicted to comply with the design noise goal (refer to Section 3.6.4). However, it is noted that a reduced sound power level was adopted for equipment which was found to contribute significantly to the overall noise levels of the modification. The plant and equipment for MOD26 must be designed to achieve the noise emissions detailed in Section 6.1.

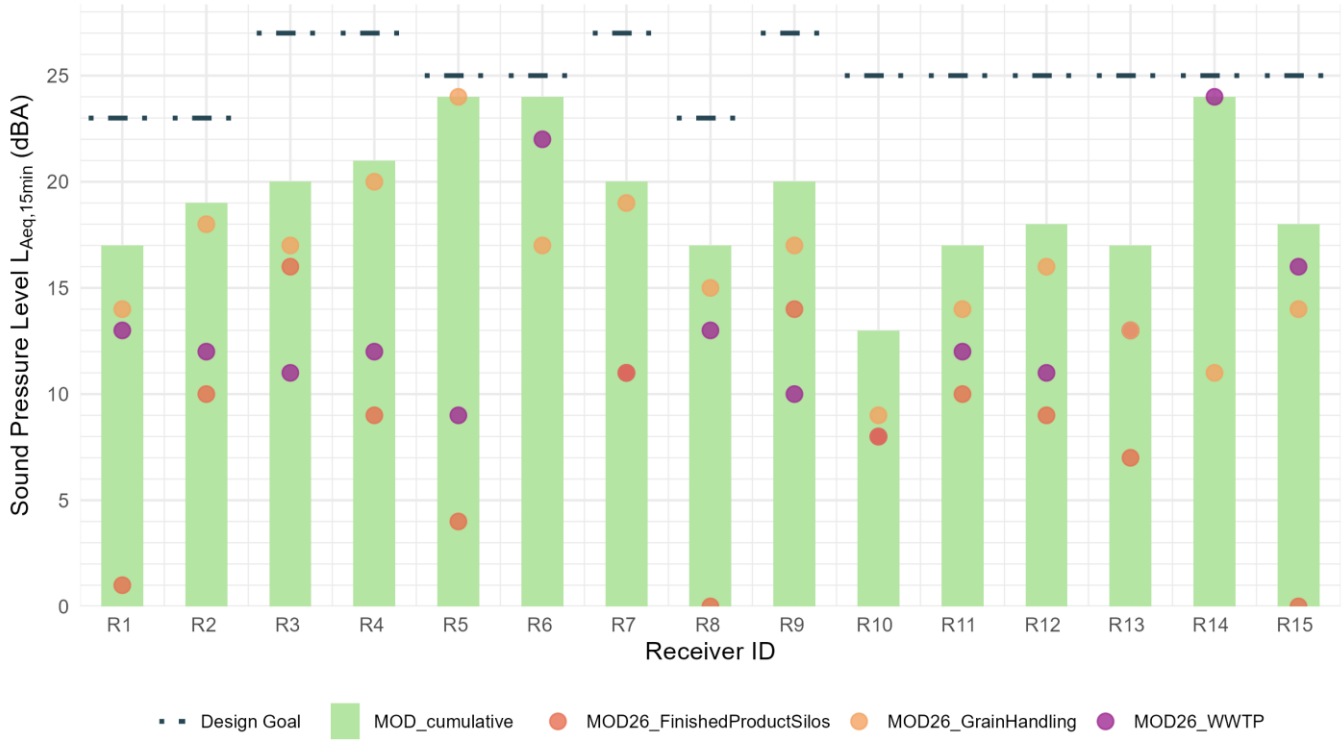


Figure 6.1 MOD26 noise levels – neutral weather conditions

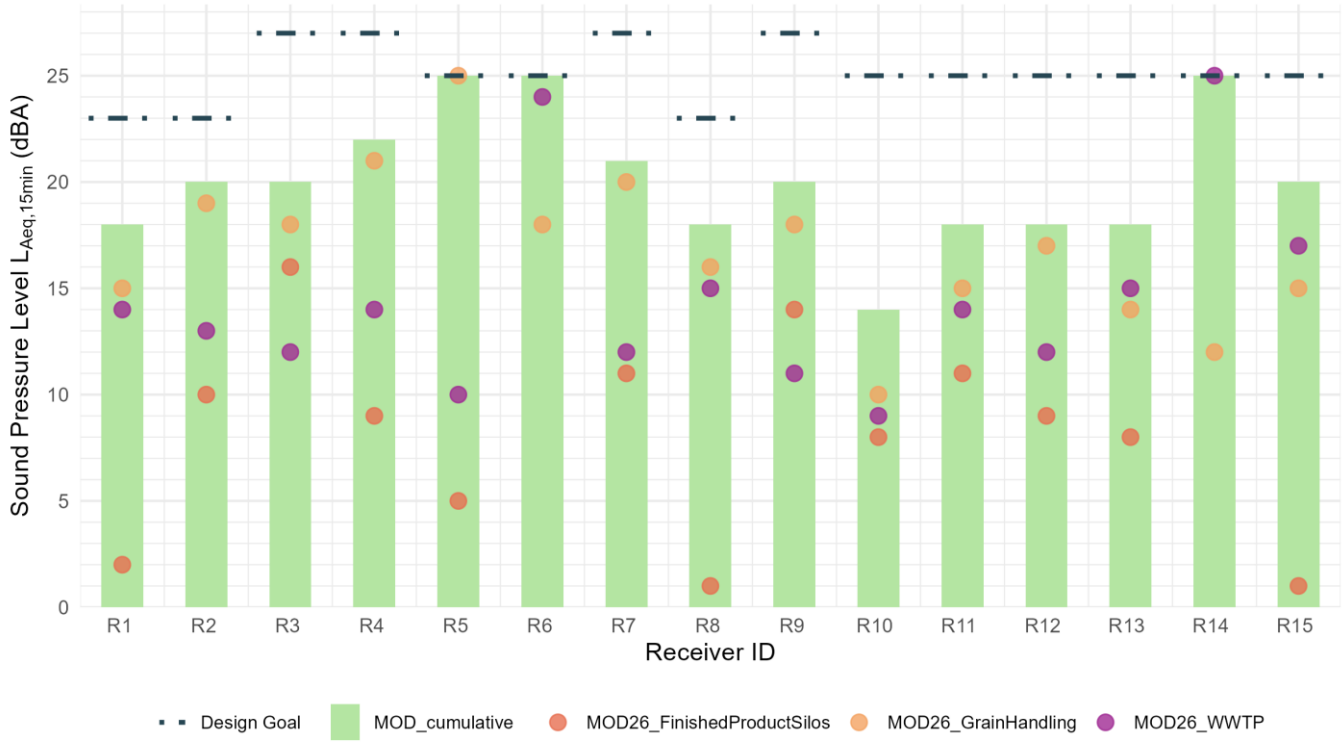
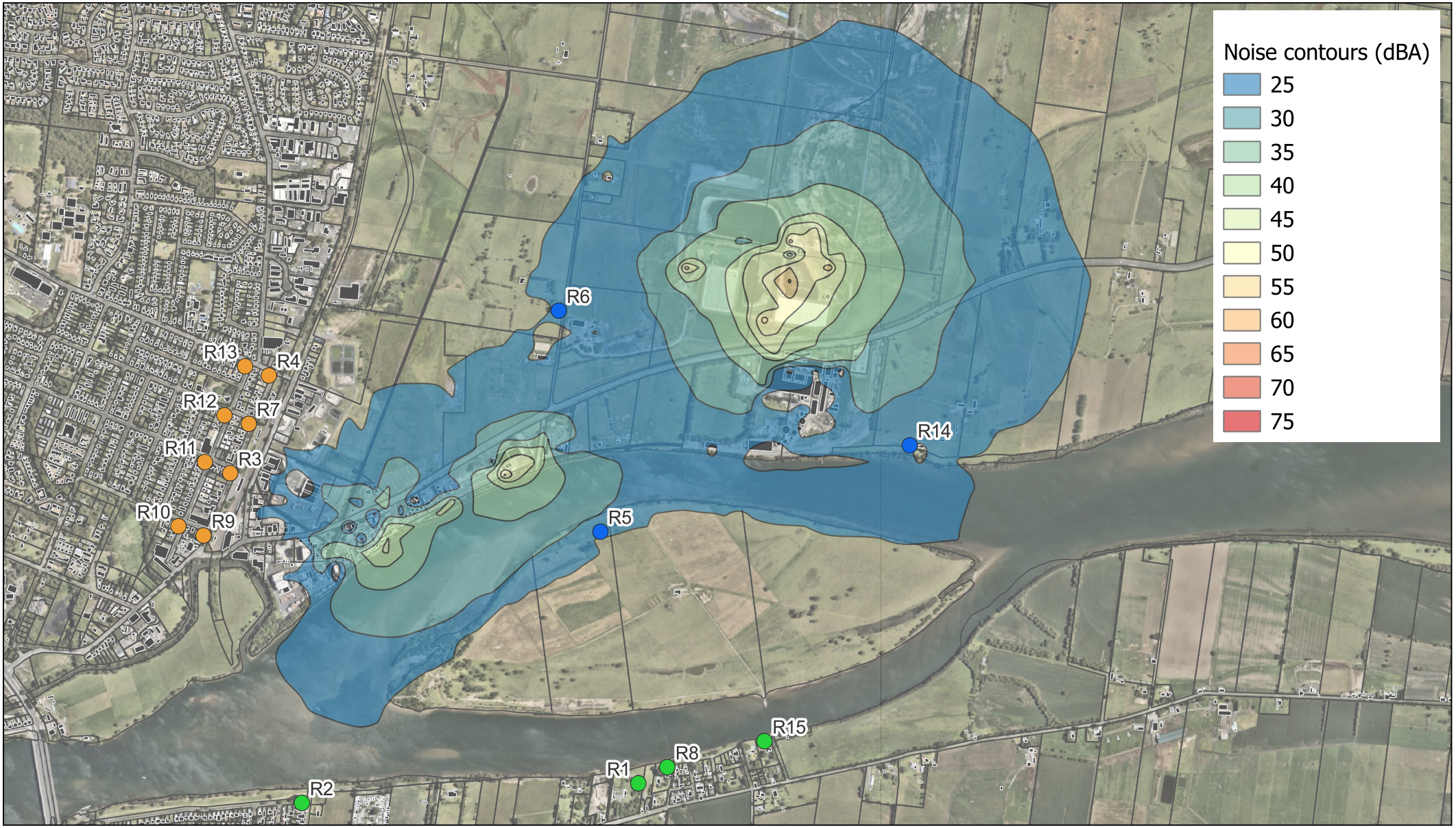


Figure 6.2 MOD26 noise levels – noise enhancing weather conditions



Legend

Modelled buildings

Cadastre lots

Receivers

NCA1

NCA2

NCA3

Paper Size ISO A4

0 400 800 m

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 / MGA zone 56

GHD

Shoalhaven Starches
Modification 26 - Noise and vibration impact assessment

Modification operational noise levels (LAeq,15min)

Project No. **12645127**
Revision No. **A**
Date. **02/03/2026**

FIGURE 6.3

Whilst every care has been taken to prepare this map, GHD make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete, or unsuitable in any way and for any reason.

Data Source: Nearmap

Created By: Matthijs Oosterlaken

Document Path: \\ghdnet\ghd\AU\Sydney\Projects\21\12645127\Tech\Noise\03_GIS\MOD26_Figs.qgz

6.2.2.2 Cumulative noise levels

The predicted $L_{Aeq,15min}$ operational noise levels from the cumulative scenarios during neutral and noise enhancing weather conditions are shown in Figure 6.4 and Figure 6.5 respectively. The cumulative operational noise levels are assessed against the EPL limits and have been corrected for low frequency noise as described in Section 6.2.1.2. Appendix E includes tables showing the predicted noise levels numerically.

The cumulative noise levels, including approved but not yet constructed modifications and MOD26, are predicted to exceed the EPL noise limits at all locations. For acoustic compliance data, the bi-annual noise compliance audits should be referred to.

However, as MOD26 is predicted to achieve the design noise goals, MOD26 would not contribute to the overall noise levels. This is also highlighted by the difference in overall noise levels and that of the modification individually.

Noise contours of the cumulative noise levels (excluding rail noise) are shown in Figure 6.6 and Figure 6.7.

6.2.3 Sleep disturbance impacts

Although the proposed modification would be operational 24 hours per day, the steady operation of the equipment associated with the proposed modification is not expected to cause significant maximum noise level events. As such, no sleep disturbance impacts are anticipated because of the proposed modification.

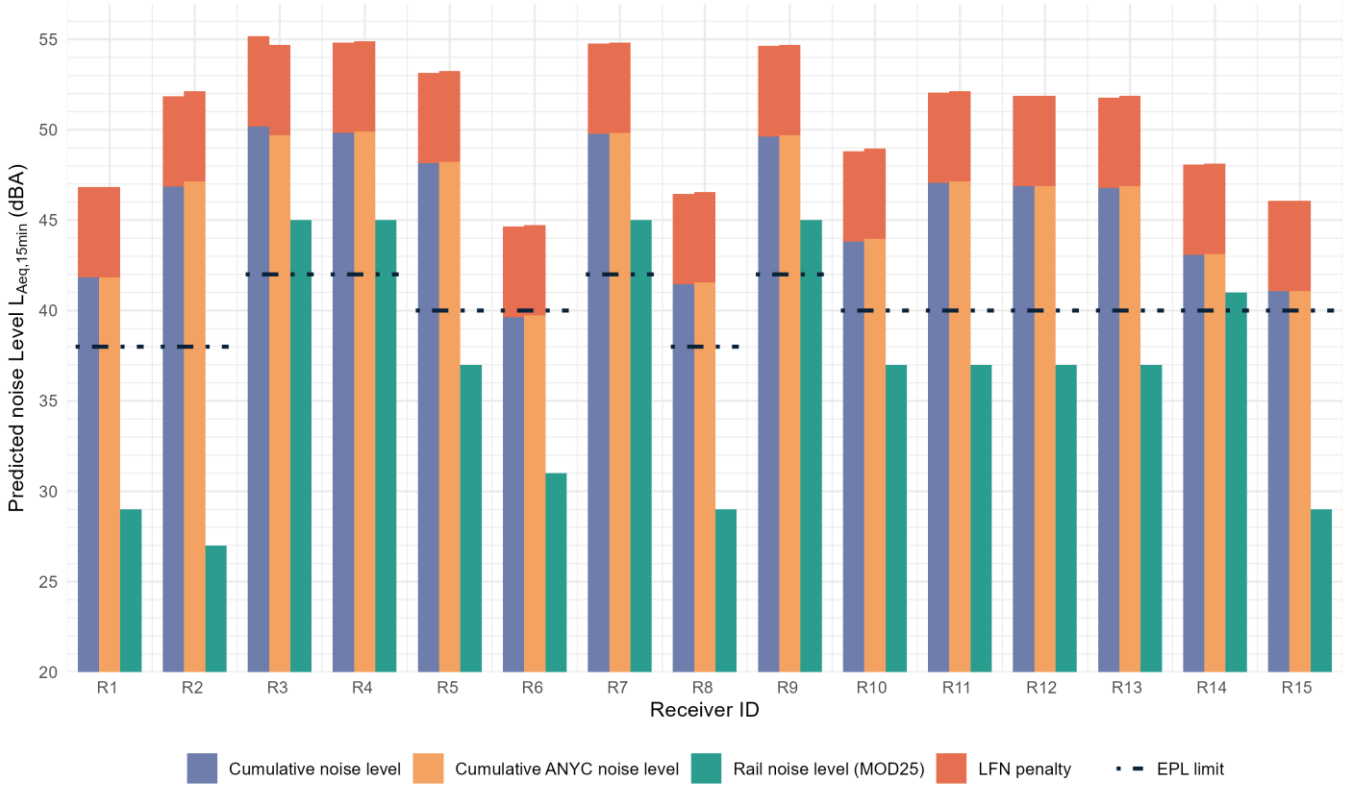


Figure 6.4 Rail and cumulative noise levels – neutral weather conditions

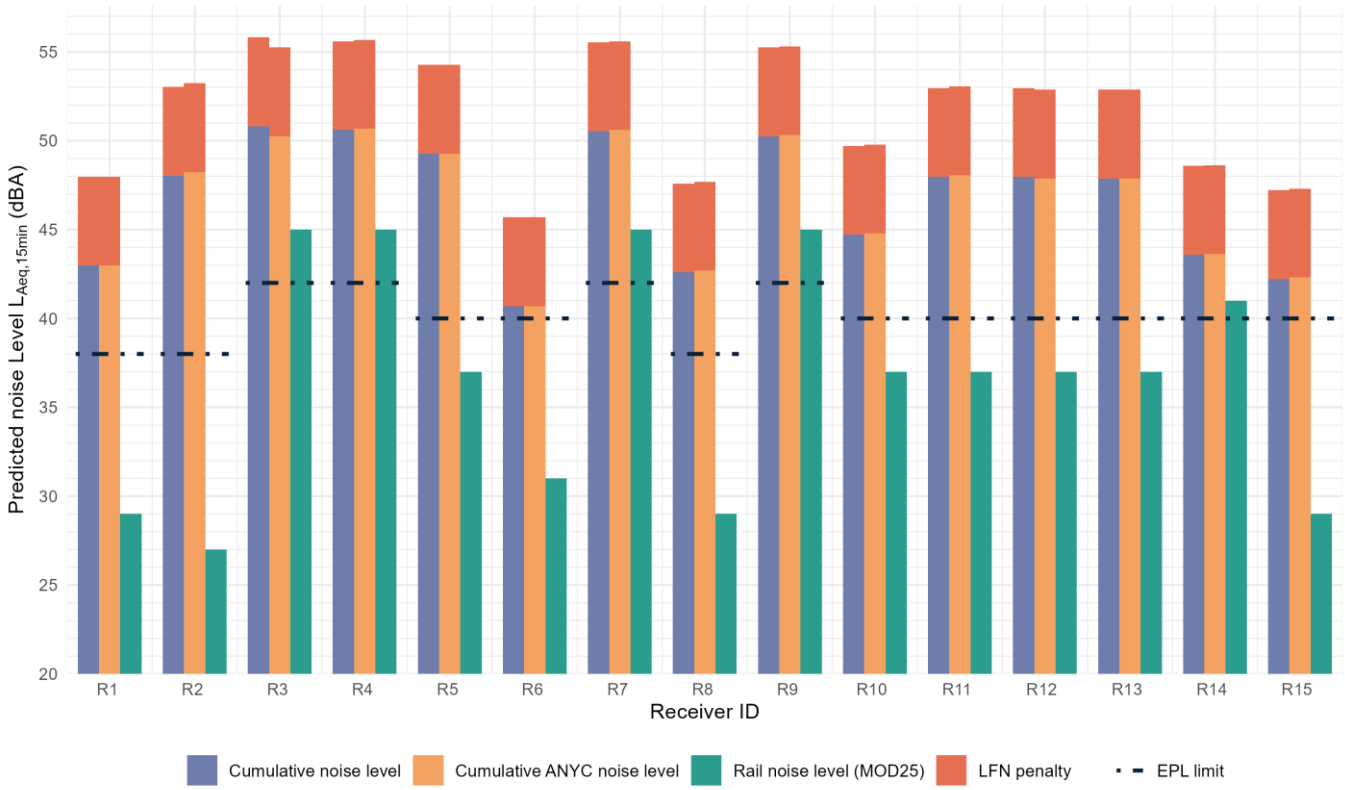
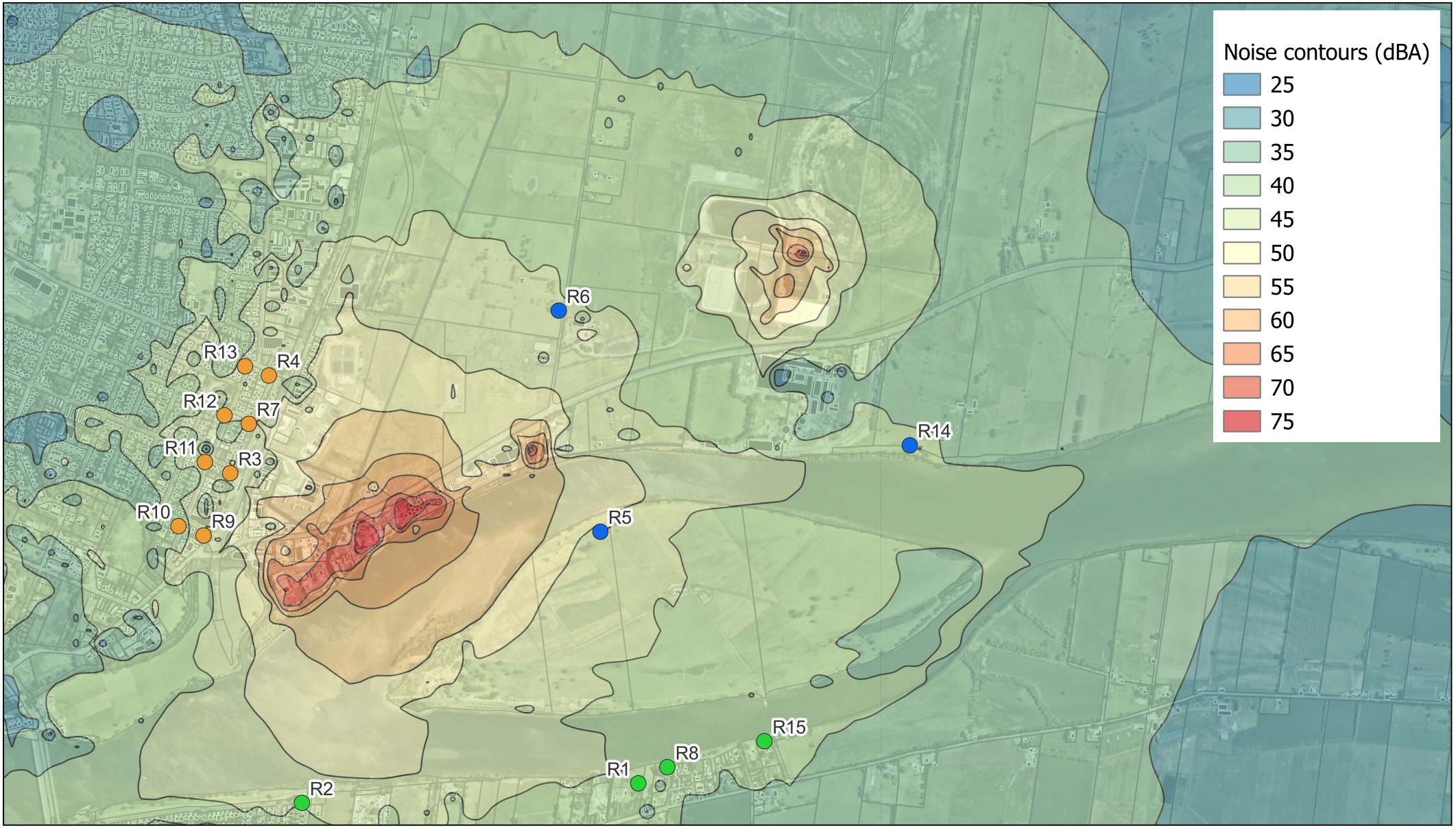


Figure 6.5 Rail and cumulative noise levels – noise enhancing weather conditions



Legend

Modelled buildings

Cadastre lots

Receivers

NCA1

NCA2

NCA3

Paper Size ISO A4

0 400 800 m

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 / MGA zone 56

GHD

Shoalhaven Starches
Modification 26 - Noise and vibration impact assessment

Cumulative operational noise levels (LAeq,15min)

Project No. **12645127**
Revision No. **A**
Date. **02/03/2026**

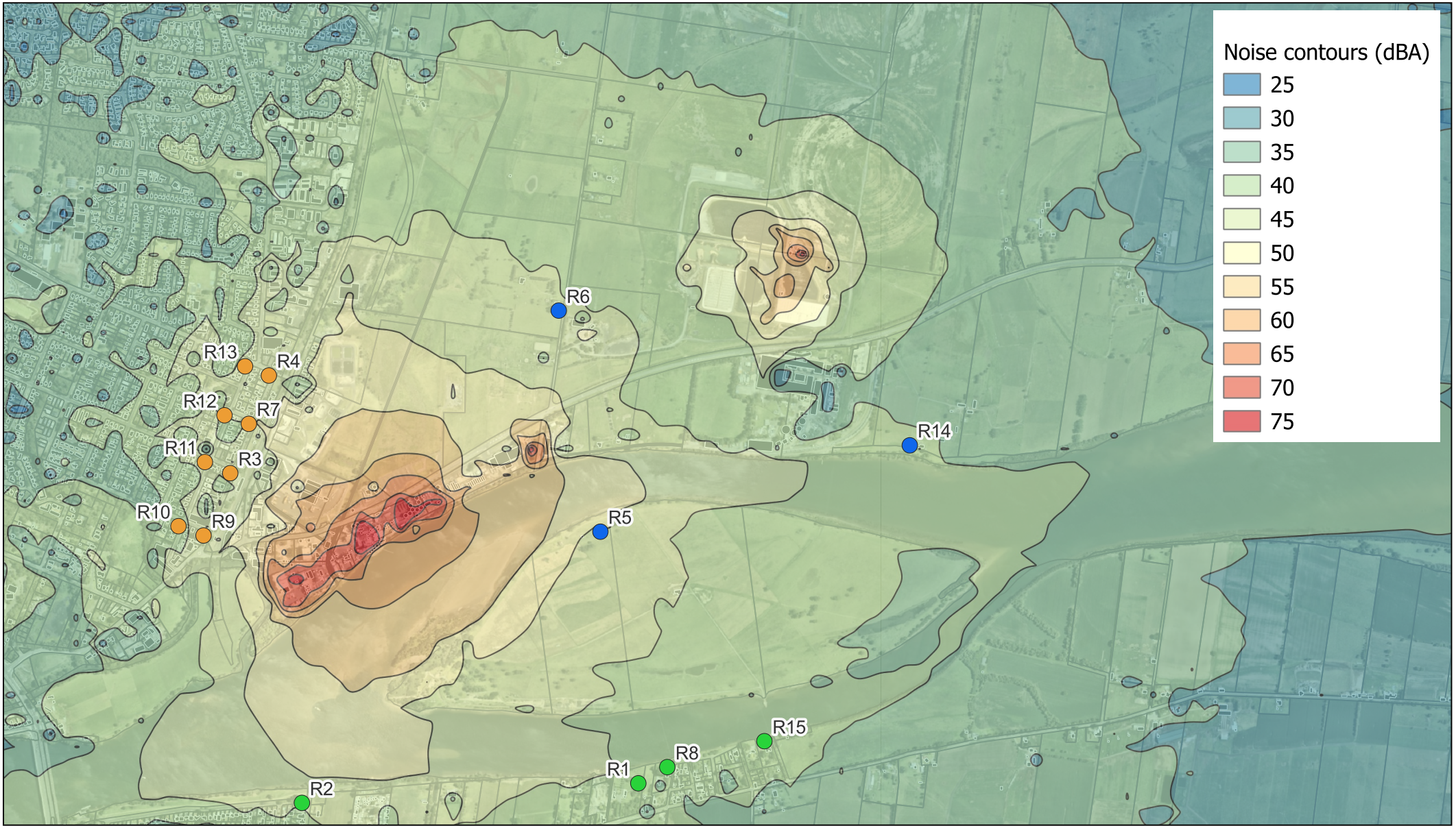
FIGURE 6.6

Whilst every care has been taken to prepare this map, GHD make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete, or unsuitable in any way and for any reason.

Data Source: Nearmap

Created By: Matthijs Oosterlaken

Document Path: \\ghdnet\ghd\AU\Sydney\Projects\21\12645127\Tech\Noise\03_GIS\MOD26_Figs.qgz



Legend

Modelled buildings

Cadastre lots

Receivers

NCA1

NCA2

NCA3

Paper Size ISO A4

0 400 800 m

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 / MGA zone 56

GHD

Shoalhaven Starches
Modification 26 - Noise and vibration impact assessment

Cumulative ANYC operational noise levels (LAeq,15min)

Project No. **12645127**
Revision No. **A**
Date. **02/03/2026**

FIGURE 6.7

Whilst every care has been taken to prepare this map, GHD make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete, or unsuitable in any way and for any reason.

Data Source: Nearmap

Created By: Matthijs Oosterlaken

Document Path: \\ghdnet\ghd\AU\Sydney\Projects\21\12645127\Tech\Noise\03_GIS\MOD26_Figs.qgz

7. Road traffic noise impact assessment

7.1.1 Existing road network

Traffic accessing and egressing the site uses Bolong Road, which runs east-west from Gerroa Road at Coolangatta and the Princess Highway at Bomaderry. Bolong Road and Jennings Lane (east of the Supagas site) is an approved restricted vehicle route providing for vehicles up to and including 26m B-Doubles and is classified as a regional road as per the NSW Road Network Classifications.[1]

As Bolong Road provides connection between the Princess Highway and local roads, it is considered to be a sub-arterial road as per the *NSW Road Noise Policy* (DECCW, 2011) (RNP).

7.1.2 Existing traffic volumes

In lieu of traffic volumes based on a weeklong traffic count, traffic counts of the existing volumes on Bolong Road were sourced from the report *Nowra Bridge Project Traffic and Transport Assessment* (ARUP, 2018). These volumes were established based on traffic counts undertaken in December 2017. It is noted that these volumes are almost 10 years old. However, it is likely that traffic volumes have grown over the last few years. The adopted volumes are considered conservative, as the increase in noise level would be greater with lower existing volumes compared to higher existing volumes.

For the purpose of assessing the nighttime traffic volumes, it is assumed that 10 percent of the existing traffic movements occur during the nighttime (10pm to 7am).

Table 7.1 Existing traffic volumes Bolong Road

Road	Period	Existing two-way weekday daily traffic volumes		
		Light vehicles	Heavy vehicles	Total
Bolong Road	Day (7am-10pm)	12,393	1,377	13,770
	Night (10pm-7am)	1,377	153	1,530

7.1.3 Traffic generation

As mentioned in Section 5.4.2 of the *Transport Assessment Shoalhaven Starches Expansion Project (Modification 26) Additional Grain Storage and Handling Facilities; Alterations and Additions to Waste Water Treatment Plant; and Other* works (arc traffic + transport, 2025), construction traffic generation is expected to comprise of no more than 4 truck trips generated per day. Construction traffic would access the site via the existing access to the site via Bolong Road or Hanigans Lane to access the WTP. Operation of the project is not anticipated to generate additional traffic to or from the site.

7.1.4 Prediction methodology

The road traffic noise assessment considers existing traffic volumes and proposed traffic generation, percentage of heavy vehicles, time periods and road surface types in the calculations. Traffic noise modelling was conducted using the *Calculation of Road Traffic Noise* (CoRTN) (Department of Transport, Welsh Office, 1988) algorithm for Bolong Road.

7.1.5 Road traffic noise impacts

The increase in road traffic noise level at the residence closest to Bolong Road during construction of the modification is presented in Table 7.2. Along Bolong Road. The table shows that along Bolong Road the road traffic noise levels do not increase by more than 2 dB and as such no impacts are anticipated at receivers.

[1] https://maps.transport.nsw.gov.au/egeomaps/road-network-classification/index.html

Table 7.2 Predicted increase in road traffic noise levels during construction

Road	Road type	Distance to nearest residence (m)	Period	Daytime controlling criteria (dBA)	Existing noise level (dBA)	Predicted noise level (dBA)	Noise level increase difference (dB)	Consideration for mitigation?
Bolong Road	Sub-arterial road	15[1]	Day	60 $L_{Aeq,15hr}$	67.7	67.7	0.0	No
			Night	55 $L_{Aeq,9hr}$	60.4	60.4	0.0	No

Note 1: The nearest residence is 66 Bolong Road.

8. Mitigation measures

8.1 Construction noise mitigation measures

As the NMLs are predicted to be exceeded at several receivers, reasonable and feasible mitigation measures must be implemented to reduce the potential for noise impacts on surrounding receivers and sensitive land uses during construction. These measures should be incorporated into the construction noise management plan (CNMP) developed for the proposed modification.

Table 8.1 Construction noise mitigation measures

Action required	Details
General controls	
Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction should include: – All relevant project specific and standard noise mitigation measures – Relevant licence and approval conditions – Permissible hours of work – Location of nearest sensitive receivers – Construction employee parking areas – Designated loading/unloading areas and procedures – Site opening/closing times (including deliveries) – Environmental incident procedures.
Behavioural practices	No swearing or unnecessary shouting or loud stereos/radios on site. No dropping of materials from height, throwing of metal items and slamming of doors.
Implement community consultation measures	Contact will be established with the local residents and the construction program and progress communicated on a regular basis, particularly when noisy activities are planned. Affected receivers will be notified of the intended work, its duration and times of occurrence. This may include a local community update letters for specific construction activities and a project info line.
Implement complaints management measures	Complaints will be managed in accordance with the procedure outlined below. Signage at each site will clearly and visibly provide a contact number and name to receive complaints and enquiries about construction. In this instance the response would be to: – Verbally respond to complainant – Provide a written response within seven calendar days if the complaint cannot be resolved verbally – Log the complaint, and any actions taken with regards to the complaint within a complaints register – Undertake monitoring at the complainant's residence(s) – Investigate the nature and reasons of the impact – Investigate and implement further mitigation measures to minimise the impact
Source controls	
Construction hours and scheduling	Comply with the recommended standard construction hours outlined by the ICNG, unless out of hours work has been approved. No truck movements before 7.00 am or after 6.00 pm. For any work that would take place outside of normal construction hours: – Undertake an assessment of the potential noise impacts associated with the proposed activities and outline specific mitigation measures. – Residents potentially affected by such activities will be notified at least five days before hand.

Action required	Details
	– Minimise consecutive night activities in the same locality and provide periods of quiet if activities occur for extended periods during the night. – Conduct activities in a manner that eliminates or minimises the need for audible warning alarms.
Equipment selection	Use quieter construction methods where reasonable and feasible (e.g. vibratory or bored piling instead of impact hammer piling).
Use and siting of plant	Simultaneous operation of noisy plant within discernible range of a sensitive receiver is to be avoided. The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently to be throttled down or shut down. Noise-emitting plant to be directed away from sensitive receivers.
Plan worksites and activities to minimise noise	Plan traffic flow, parking and loading unloading areas to minimise reversing movements within the site.
Minimise disturbance arising from delivery of goods to construction sites	Loading and unloading of materials/deliveries is to occur during standard construction hours. Contractors are to avoid dropping materials from height where practicable, during loading and unloading. Delivery vehicles to be fitted with straps rather than chains for unloading, wherever possible.

8.2 Operational noise mitigation measures

In order to achieve compliance with the design noise goal for MOD26 established in Section 3.6.4, it is recommended to implement the following mitigation measures into the detailed design of the plant.

Table 8.2 Operational noise mitigation measures

MOD26 component	Action required	Details
Further detailed design – Grain storage and handling facilities		
Conveyors and bucket elevators	Equipment selection and mitigation design	The sound power levels of the equipment should be equal or lower than those presented in Table 6.1. Where required, enclosures should be implemented to reduce noise levels of the equipment. This particularly applies to the conveyor motors of the grain storage bucket elevators, grain storage feed conveyors and conveyor to plant.
	Positioning of equipment	During detailed design, equipment should be positioned to maximise shielding by existing or proposed structures where reasonably possible
Train and truck unloader building	Detailed design of building	The detailed design of the train and truck unloader building should consider the following: – The sound power level of building features (facades and roofs) should be equal or lower than the levels presented in Table 6.2. – During detailed design, the sound power levels of building features should be estimated based on the proposed equipment within the buildings, the transmission loss and dimensions of the building features. – Noise generating equipment should be enclosed within a section of the building to minimise noise emitting through the openings in the west and eastern facades. – Fan discharge outlets should be positioned in the northern façade. – Fan discharge outlets should be fitted with silencers or acoustic louvres to minimise noise emissions and should achieve the sound power levels presented in Table 6.2.
Silo grain screening and sieve buildings	Detailed design of building	The detailed design of the silo grain screening and sieve buildings should consider the following: – The sound power level of building features (facades and roofs) should be equal or lower than the levels presented in Table 6.3 and Table 6.4.

MOD26 component	Action required	Details
		– During detailed design, the sound power levels of building features should be estimated based on the proposed equipment within the buildings, the transmission loss and dimensions of the building features. – Fan discharge outlets should be positioned in the northern façade. – Fan discharge outlets of the silo grain screening building should be fitted with silencers or acoustic louvres to minimise noise emissions and should achieve the sound power levels presented in Table 6.3.
Stage 1 screening building	Detailed design of building	The detailed design of the Stage 1 screening building should consider the following: – The sound power level of building features (facades and roofs) should be equal or lower than the levels presented in Table 6.5. – During detailed design, the sound power levels of building features should be estimated based on the proposed equipment within the buildings, the transmission loss and dimensions of the building features. – Fan discharge outlets should be positioned in the northern façade. – Fan discharge outlets of the silo grain screening building should be fitted with silencers or acoustic louvres to minimise noise emissions and should achieve the sound power levels presented in Table 6.5.
Further detailed design – Water treatment plant upgrade		
Membrane bioreactors	Equipment selection and mitigation design	The sound power levels of the equipment should be equal or lower than those presented in Table 6.6. Where required, acoustic enclosures must be designed and implemented to minimise noise emissions.
	Positioning of equipment	During detailed design, equipment should be positioned to maximise shielding by existing or proposed structures where reasonably possible
Reverse osmosis building	Detailed design of building	The detailed design of the RO building should consider the following: – The sound power level of building features (facades and roofs) should be equal or lower than the levels presented in Table 6.7. – During detailed design, the sound power levels of building features should be estimated based on the proposed equipment within the buildings, the transmission loss and dimensions of the building features.
Cooling towers	Equipment selection and mitigation design	The sound power levels of the equipment should be equal or lower than those presented in Table 6.8. Where required, mitigation measures such as operating at lower fan speeds or silencers should be implemented to minimise noise emissions.
	Detailed design of cooling towers	During detailed design, the required number and sizing of the cooling towers should be refined. Where possible, the cooling towers should be designed as small as reasonably possible while achieving the total SWLs presented in Table 6.8.
Scrubber #1 and #2	Equipment selection	The sound power levels of the equipment should be equal or lower than those presented in Table 6.9. Where required, noise generating equipment of the scrubbers must be enclosed to minimise noise emissions.
Biogas shed expansion outdoor sources	Equipment selection	The sound power levels of the equipment should be equal or lower than those presented in Table 6.10.
Biogas shed expansion and scrubber #2 blower room	Detailed design of building	The detailed design of the biogas expansion shed and scrubber #2 blower buildings should consider the following: – The sound power level of building features (facades and roofs) should be equal or lower than the levels presented in Table 6.11. – Construct both buildings with improved transmission loss values compared to the existing biogas blower shed. – During detailed design, the sound power levels of building features should be estimated based on the proposed equipment within the buildings, the transmission loss and dimensions of the building features.

MOD26 component	Action required	Details
Equalisation tanks	Equipment selection	The sound power levels of the equipment should be equal or lower than those presented in Table 6.12.
BVF pumps	Equipment selection and mitigation design	The sound power levels of the equipment should be equal or lower than those presented in Table 6.13. Where required, acoustic enclosures or noise walls must be designed and implemented to minimise noise emissions.
Further detailed design – Finished product silos		
Finished product silos	Detailed design of building	The detailed design of the over capped structure of the finished product silo should consider the following: – The sound power level of building features (facades and roofs) should be equal or lower than the levels presented in Table 6.14. – During detailed design, the sound power levels of building features should be estimated based on the proposed equipment within the buildings, the transmission loss and dimensions of the building features.
Noise validation		
All components	Noise validation report prior to construction	In accordance with Development Consent condition 14M, a noise validation report will be prepared prior to construction, to demonstrate compliance with the design noise goals can be achieved based on the detailed design. If required, mitigation measures to reduce noise levels to achieve the design noise goals should be provided in the noise validation report.
	Noise validation report during operation	Once the proposed modification is operational, a noise validation assessment would be undertaken to confirm if noise levels comply with the predictions detailed in the noise validation report.

9. Conclusion

GHD was engaged by Manildra to conduct a noise and vibration impact assessment for a proposed modification to the approved SSEP. The modification seeks to deploy a suite of heat recovery updates and enabling infrastructure to capture and transform waste heat into usable energy to drive the ethanol, starch and gluten manufacturing processes.

A construction noise assessment was undertaken to determine potential for increased noise levels at sensitive receivers. Construction noise management levels were established using background noise levels which were established using the conducted background noise monitoring. Four construction scenarios were modelled to predict noise levels at representative sensitive receivers. The predicted noise levels indicate that the noise management levels for all construction scenarios are exceeded at several sensitive receivers. As such, mitigation measures have been recommended in Section 8.1.

Noise sources associated with the operation of the proposed modification were identified and modelled in the site-wide noise model developed by GHD as part of the noise pollution reduction program. The predicted noise levels from the proposed modification were assessed against design noise goals and shows compliance with the design noise goals at all sensitive receivers.

It is noted that reduced sound power levels were adopted for equipment which was found to contribute significantly to the overall noise levels of the modification. To ensure noise levels of the proposed modification achieve the design noise goals, the further detailed design of the modification must implement mitigation measures to reduce noise emission to achieve the sound power levels presented in Section 6.1.

The analysis for annoying noise characteristics was undertaken and found that the proposed modification does not contain tonal or low frequency noise characteristics.

Additionally, cumulative noise levels of the following scenarios have been predicted:

– Current operations including the proposed modification and the rail line
– Current operations including all approved but not yet constructed modifications, the proposed modification and the rail line.

Predicted noise levels were analysed for annoying noise characteristics and found low frequency noise to be present at all sensitive receivers. The noise levels were assessed against the EPL noise limits, which shows exceedances at all sensitive receivers from existing noise sources. However, for acoustic compliance data, the bi-annual compliance data should be referred to.

Nonetheless, the proposed modification is anticipated to have no contribution to the overall noise levels from the site as the predicted noise levels are below the design noise goals.

Recommended construction mitigation measures are provided in Section 8.1 and recommendations for further detailed design of the proposed modification to minimise operational noise are provided in Section 8.2.

10. References

arc traffic + transport. (2025). *Transport Assessment Shoalhaven Starches Expansion Project (Modification 26) Additional Grain Storage and Handling Facilities; Alterations and Additions to Waste Water Treatment Plant; and Other works .*

ARUP. (2018). *Nowra Bridge Project Traffic and Transport Assessment.*

Australian Standard. (2010). *AS2436: Guide to Noise Control on Construction, Maintenance and Demolition Site.*

Bies, D., Hansen, C., & Howard, C. (2017). *Engineering Noise Control - Fifth Edition.*

Day Design. (2023). *Site Wide Noise Model.*

Day Design. (2024). *Shoalhaven Starches – MOD 9 & 21 – Packing Plant Design Noise Verification .*

Day Design. (2025). *Environmental Noise Impact Assessment, Proposed Extension of Existing Rail Line and Extension to Product Dryer Building 3 & 4 (Rev E).*

DECC. (2009). *Interim Construction Noise Guideline.*

DECCW. (2011). *NSW Road Noise Policy.*

Department of Transport, Welsh Office. (1988). *Calculation of Road Traffic Noise (CoRTN).*

EPA. (2017). *Noise Policy for Industry.*

EPA. (2022). *Approved methods for the measurement and analysis of environmental noise in NSW.*

GHD. (2025). *Shoalhaven Starches Pollution Reduction Program – Noise Compliance Investigation .*

ISO. (1996). *Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation.*

Transport for NSW. (2024). *Construction Noise and Vibration Guideline (Roads).*

Appendices

Appendix A

Noise monitoring methodology and daily monitoring charts

A-1 Noise monitoring methodology

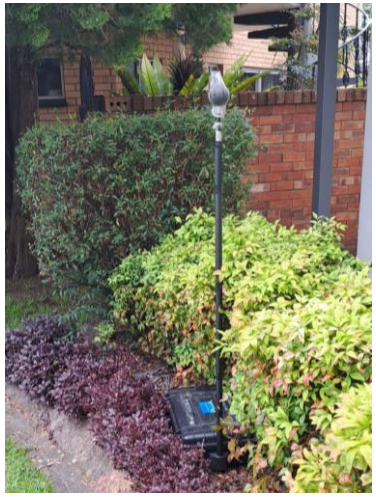
Long-term unattended noise monitoring was undertaken from 9 December 2024 until 19 December 2024 at seven far-field locations, three of which were representative of residential receivers. Throughout the noise monitoring program, at a total of 14 locations noise loggers were deployed on the site in close proximity to the plant and equipment.

The methodology for the noise monitoring program included the following:

– All monitoring activities were undertaken with consideration of the specifications outlined in the Australian Standard *AS1055 Description and measurement of environmental noise* (2018) and *Approved methods for measurement and analysis of environmental noise* (EPA, 2022).
– A calibration check was performed on the noise monitoring equipment using a sound level calibrator with a sound pressure level of 94 dBA at 1 kHz. At completion of the measurements, the meter's calibration was re-checked to ensure the sensitivity of the noise monitoring equipment had not varied. The noise loggers were found to be within the acceptable tolerance of ± 1 dBA.
– Noise monitoring was undertaken using two Svantek SVAN977 environmental noise loggers. The noise loggers were programmed to accumulate L_{A90}, L_{A10}, and L_{Aeq} noise descriptors continuously over the entire monitoring period.
– The data collected by the logger was downloaded and analysed, and any invalid data removed. Invalid data generally refers to periods of time where average wind speeds were greater than 5 m/s, or when rainfall occurred. Meteorological data was sourced from the Manildra's on-site AWS. The weather station is located on the Manildra site and is considered to be a valid distance from the site for filtering purpose in accordance with the *Noise Policy for Industry* (EPA, 2017).

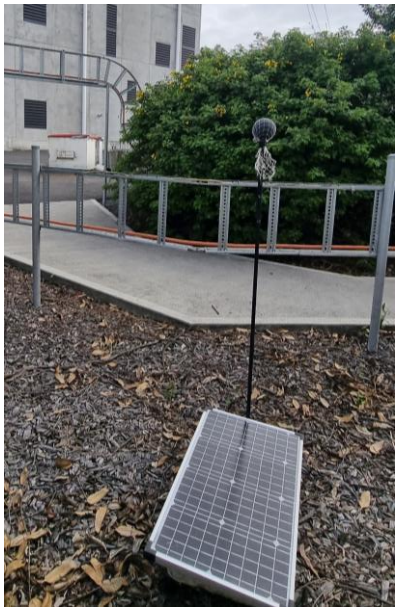
Details of the monitoring equipment and location are provided in the tables below. Additionally, daily graphs of the monitoring results are included below.

Table A.1 Noise monitoring equipment details

Logger type	Logger ID	Location description	Equipment details	Equipment settings	Logger photo
Far field	L1	1 Nobblers Lane, Terara	Sound level meter SVAN977 (SN: 45748) Class 1 sound level meter IEC 61672-3:2013-compliant Manufactured prior to 2019 Calibrator BnK type 4231 Class 1 sound level calibrator IEC 61672-3:2013-compliant Manufactured prior to 2017 SN: 3025447	Weighting: A-weighted Response type: Fast Interval period: 15 minutes Pre to post calibration variance: 0.1 dB	
Far field	L2	58 Riverview Road, Nowra	Sound level meter SVAN977 (SN: 36820) Class 1 sound level meter IEC 61672-3:2013-compliant Manufactured prior to 2019 Calibrator BnK type 4231 Class 1 sound level calibrator IEC 61672-3:2013-compliant Manufactured prior to 2017 SN: 3025447	Weighting: A-weighted Response type: Fast Interval period: 15 minutes Pre to post calibration variance: 0.6 dB	

Logger type	Logger ID	Location description	Equipment details	Equipment settings	Logger photo
Far field	L3	Shoalhaven Starches office	Sound level meter SVAN977 (SN: 69215) Class 1 sound level meter IEC 61672-3:2013-compliant Manufactured prior to 2019 Calibrator BnK type 4231 Class 1 sound level calibrator IEC 61672-3:2013-compliant Manufactured prior to 2017 SN: 3025447	Weighting: A-weighted Response type: Fast Interval period: 15 minutes Pre to post calibration variance: 0.1 dB	
Far field	L4	Shoalhaven Starches north of packer plant	Sound level meter SVAN977 (SN: 97447) Class 1 sound level meter IEC 61672-3:2013-compliant Manufactured prior to 2019 Calibrator BnK type 4231 Class 1 sound level calibrator IEC 61672-3:2013-compliant Manufactured prior to 2017 SN: 3025447	Weighting: A-weighted Response type: Fast Interval period: 15 minutes Pre to post calibration variance: 0.8 dB	

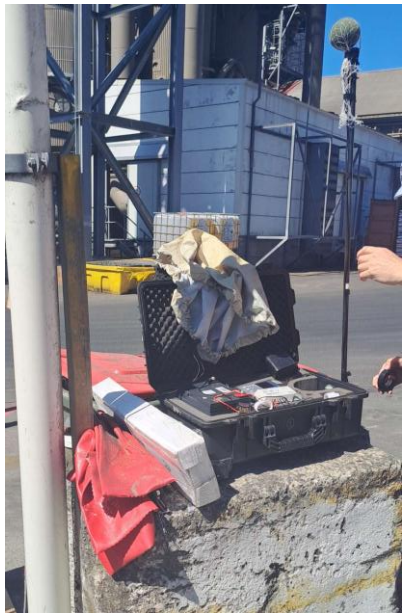
Logger type	Logger ID	Location description	Equipment details	Equipment settings	Logger photo
Far field	L5	280 Bolong Road, Bolong	Sound level meter SVAN977 (SN: 45733) Class 1 sound level meter IEC 61672-3:2013-compliant Manufactured prior to 2019 Calibrator BnK type 4231 Class 1 sound level calibrator IEC 61672-3:2013-compliant Manufactured prior to 2017 SN: 3025447	Weighting: A-weighted Response type: Fast Interval period: 15 minutes Pre to post calibration variance: 0.1 dB	
Far field	L6	17 Dalwah Street, Bomaderry	Sound level meter SVAN977 (SN: 99442) Class 1 sound level meter IEC 61672-3:2013-compliant Manufactured prior to 2019 Calibrator BnK type 4231 Class 1 sound level calibrator IEC 61672-3:2013-compliant Manufactured prior to 2017 SN: 3025447	Weighting: A-weighted Response type: Fast Interval period: 15 minutes Pre to post calibration variance: 0.3 dB	

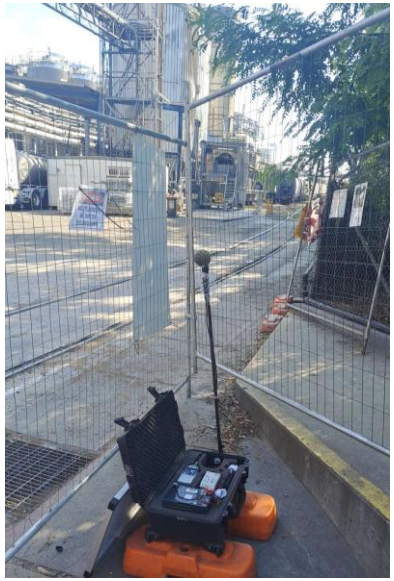
Logger type	Logger ID	Location description	Equipment details	Equipment settings	Logger photo
Far field	L8	Shoalhaven Starches Water Treatment Plant	Sound level meter SVAN977 (SN: 45744) Class 1 sound level meter IEC 61672-3:2013-compliant Manufactured prior to 2019 Calibrator BnK type 4231 Class 1 sound level calibrator IEC 61672-3:2013-compliant Manufactured prior to 2017 SN: 3025447	Weighting: A-weighted Response type: Fast Interval period: 15 minutes Pre to post calibration variance: 0.5 dB	
Near field	S1	North of Cogen plant	Sound level meter SVAN977 (SN: 36824) Class 1 sound level meter IEC 61672-3:2013-compliant Manufactured prior to 2019 Calibrator BnK type 4231 Class 1 sound level calibrator IEC 61672-3:2013-compliant Manufactured prior to 2017 SN: 3025447	Weighting: A-weighted Response type: Fast Interval period: 1 minute Pre to post calibration variance: -0.2 dB	

Logger type	Logger ID	Location description	Equipment details	Equipment settings	Logger photo
Near field	S2	North of pellet plant	Sound level meter SVAN977 (SN: 59668) Class 1 sound level meter IEC 61672-3:2013-compliant Manufactured prior to 2019 Calibrator BnK type 4231 Class 1 sound level calibrator IEC 61672-3:2013-compliant Manufactured prior to 2017 SN: 3025447	Weighting: A-weighted Response type: Fast Interval period: 1 minute Pre to post calibration variance: -0.1 dB	
Near field	S3	Biofilter corner	Sound level meter SVAN977 (SN: 36826) Class 1 sound level meter IEC 61672-3:2013-compliant Manufactured prior to 2019 Calibrator BnK type 4231 Class 1 sound level calibrator IEC 61672-3:2013-compliant Manufactured prior to 2017 SN: 3025447	Weighting: A-weighted Response type: Fast Interval period: 1 minute Pre to post calibration variance: 0.0 dB	

Logger type	Logger ID	Location description	Equipment details	Equipment settings	Logger photo
Near field	S4	South of pellet plant	Sound level meter SVAN977 (SN: 36825) Class 1 sound level meter IEC 61672-3:2013-compliant Manufactured prior to 2019 Calibrator BnK type 4231 Class 1 sound level calibrator IEC 61672-3:2013-compliant Manufactured prior to 2017 SN: 3025447	Weighting: A-weighted Response type: Fast Interval period: 1 minute Pre to post calibration variance: -0.1 dB	
Near field	S5	South of stillage corner	Sound level meter SVAN977 (SN: 36825) Class 1 sound level meter IEC 61672-3:2013-compliant Manufactured prior to 2019 Calibrator BnK type 4231 Class 1 sound level calibrator IEC 61672-3:2013-compliant Manufactured prior to 2017 SN: 3025447	Weighting: A-weighted Response type: Fast Interval period: 1 minute Pre to post calibration variance: 0.1 dB	

Logger type	Logger ID	Location description	Equipment details	Equipment settings	Logger photo
Near field	S6	North of protein plant	Sound level meter SVAN977 (SN: 36826) Class 1 sound level meter IEC 61672-3:2013-compliant Manufactured prior to 2019 Calibrator BnK type 4231 Class 1 sound level calibrator IEC 61672-3:2013-compliant Manufactured prior to 2017 SN: 3025447	Weighting: A-weighted Response type: Fast Interval period: 1 minute Pre to post calibration variance: 0.0 dB	
Near field	S7	Next to railway gate along Bolong Road	Sound level meter SVAN977 (SN: 36824) Class 1 sound level meter IEC 61672-3:2013-compliant Manufactured prior to 2019 Calibrator BnK type 4231 Class 1 sound level calibrator IEC 61672-3:2013-compliant Manufactured prior to 2017 SN: 3025447	Weighting: A-weighted Response type: Fast Interval period: 1 minute Pre to post calibration variance: 0.0 dB	

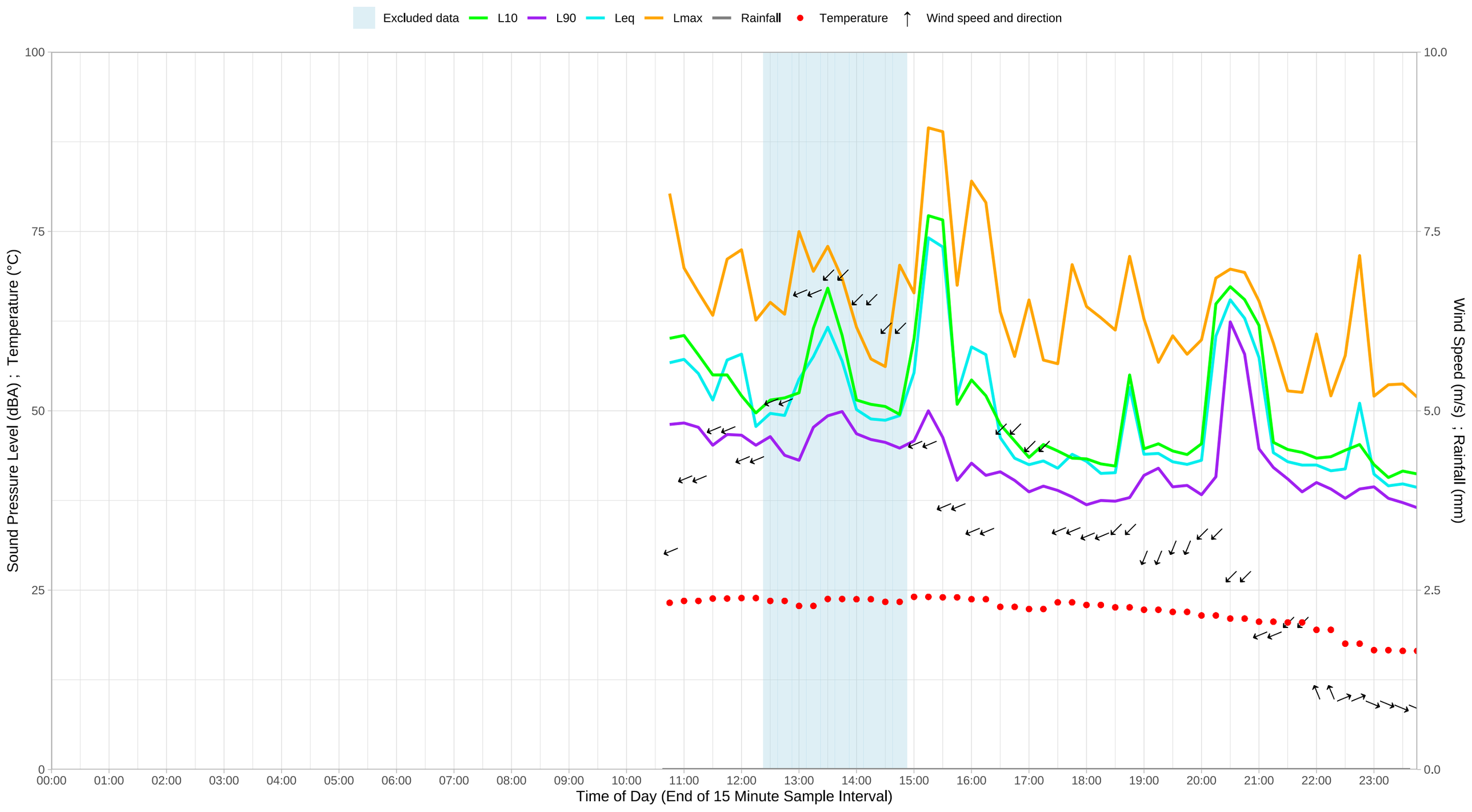
Logger type	Logger ID	Location description	Equipment details	Equipment settings	Logger photo
Near field	S8	Between GD8 and evaporators	Sound level meter SVAN977 (SN: 59668) Class 1 sound level meter IEC 61672-3:2013-compliant Manufactured prior to 2019 Calibrator BnK type 4231 Class 1 sound level calibrator IEC 61672-3:2013-compliant Manufactured prior to 2017 SN: 3025447	Weighting: A-weighted Response type: Fast Interval period: 1 minute Pre to post calibration variance: -0.2 dB	
Near field	S9	South of grain unloader	Sound level meter SVAN977 (SN: 36825) Class 1 sound level meter IEC 61672-3:2013-compliant Manufactured prior to 2019 Calibrator BnK type 4231 Class 1 sound level calibrator IEC 61672-3:2013-compliant Manufactured prior to 2017 SN: 3025447	Weighting: A-weighted Response type: Fast Interval period: 1 minute Pre to post calibration variance: -0.3 dB	

Logger type	Logger ID	Location description	Equipment details	Equipment settings	Logger photo
Near field	S10	Southwest of flour mill, near edge of railway	Sound level meter SVAN977 (SN: 59668) Class 1 sound level meter IEC 61672-3:2013-compliant Manufactured prior to 2019 Calibrator BnK type 4231 Class 1 sound level calibrator IEC 61672-3:2013-compliant Manufactured prior to 2017 SN: 3025447	Weighting: A-weighted Response type: Fast Interval period: 1 minute Pre to post calibration variance: -0.3 dB	

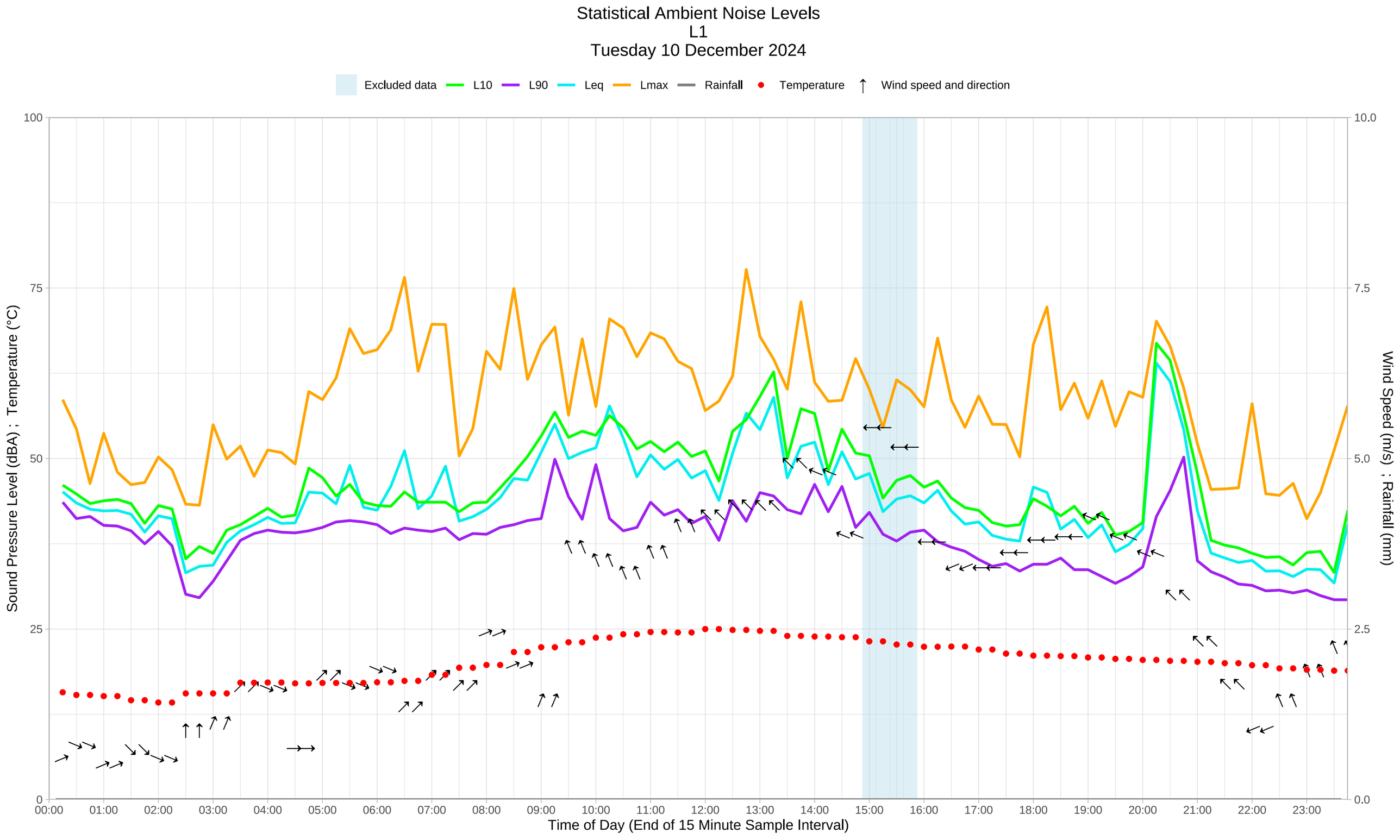
Logger type	Logger ID	Location description	Equipment details	Equipment settings	Logger photo
Near field	S11	South of firewater pipework south of ethanol control room	Sound level meter SVAN977 (SN: 36824) Class 1 sound level meter IEC 61672-3:2013-compliant Manufactured prior to 2019 Calibrator BnK type 4231 Class 1 sound level calibrator IEC 61672-3:2013-compliant Manufactured prior to 2017 SN: 3025447	Weighting: A-weighted Response type: Fast Interval period: 1 minute Pre to post calibration variance: 0.3 dB	
Near field	S12	Northeast of gluten dryer 6 dry end	Sound level meter SVAN977 (SN: 36826) Class 1 sound level meter IEC 61672-3:2013-compliant Manufactured prior to 2019 Calibrator BnK type 4231 Class 1 sound level calibrator IEC 61672-3:2013-compliant Manufactured prior to 2017 SN: 3025447	Weighting: A-weighted Response type: Fast Interval period: 1 minute Pre to post calibration variance: 0.1 dB	

Logger type	Logger ID	Location description	Equipment details	Equipment settings	Logger photo
Near field	S13	Southeast of eastern evaporators	Sound level meter SVAN977 (SN: 36825) Class 1 sound level meter IEC 61672-3:2013-compliant Manufactured prior to 2019 Calibrator BnK type 4231 Class 1 sound level calibrator IEC 61672-3:2013-compliant Manufactured prior to 2017 SN: 3025447	Weighting: A-weighted Response type: Fast Interval period: 1 minute Pre to post calibration variance: 1.0 dB	
Near field	S14	Northeast of eastern evaporators	Sound level meter SVAN977 (SN: 36826) Class 1 sound level meter IEC 61672-3:2013-compliant Manufactured prior to 2019 Calibrator BnK type 4231 Class 1 sound level calibrator IEC 61672-3:2013-compliant Manufactured prior to 2017 SN: 3025447	Weighting: A-weighted Response type: Fast Interval period: 1 minute Pre to post calibration variance: 0.0 dB	

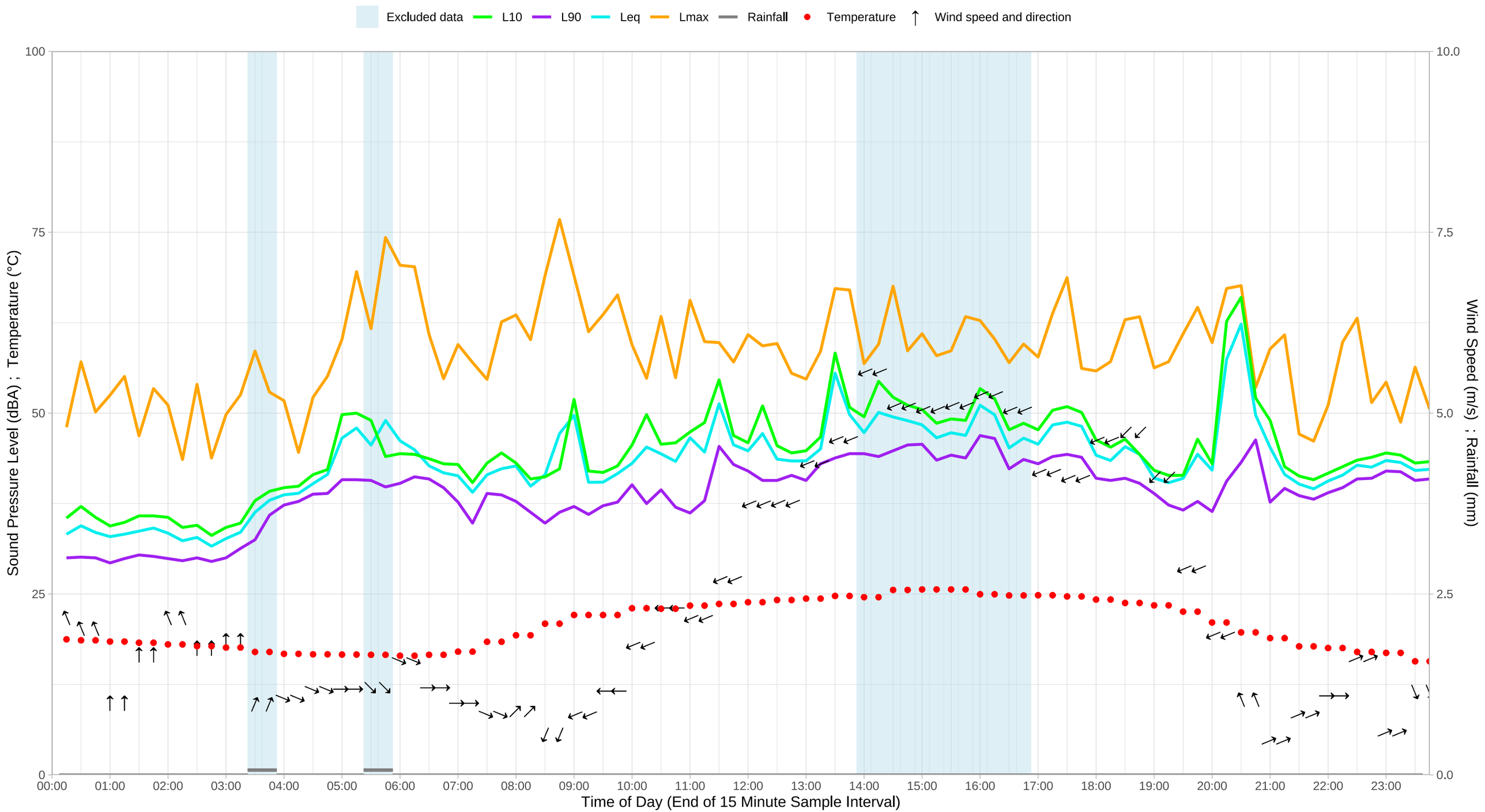
Statistical Ambient Noise Levels
L1
Monday 09 December 2024



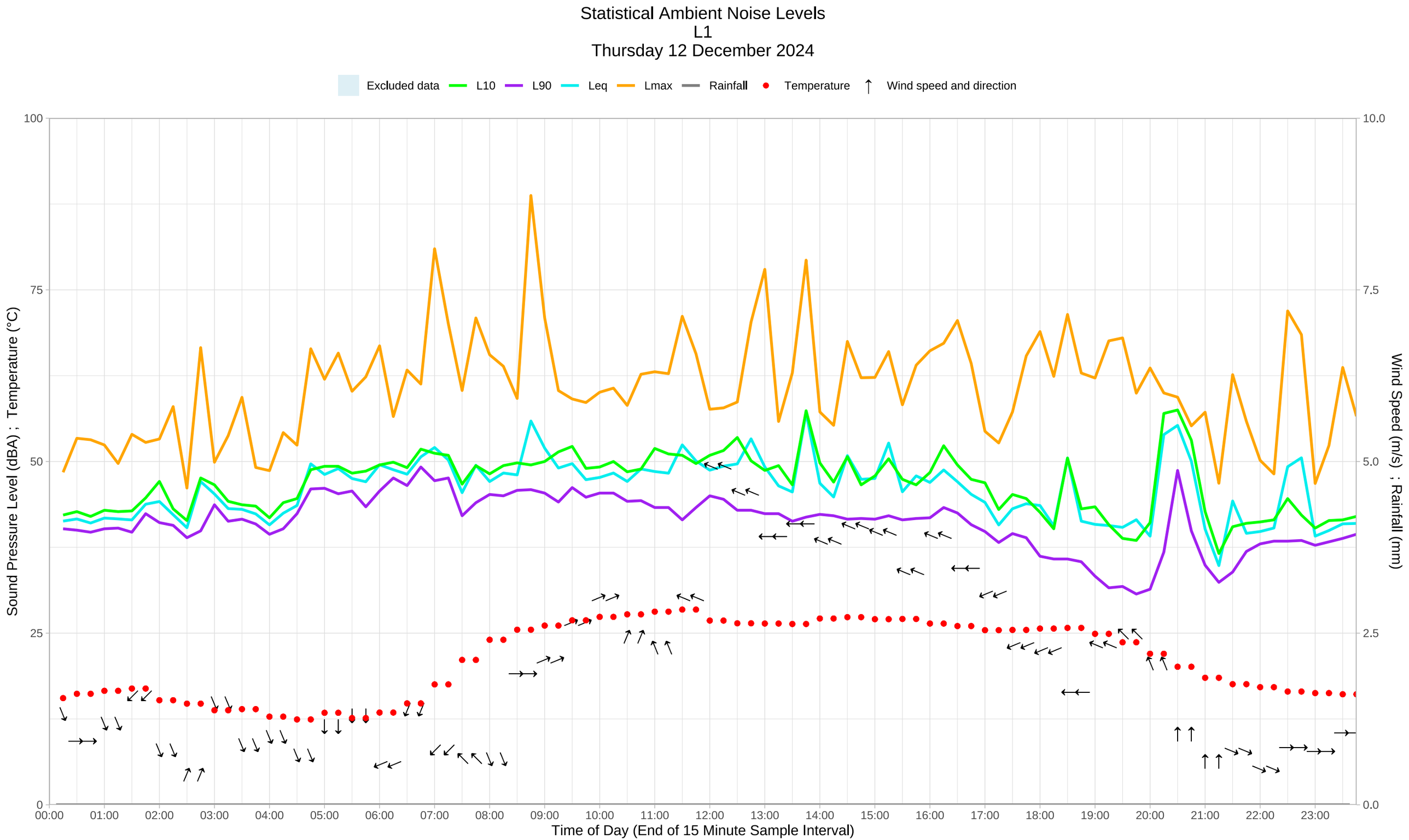
Statistical Ambient Noise Levels
L1
Tuesday 10 December 2024



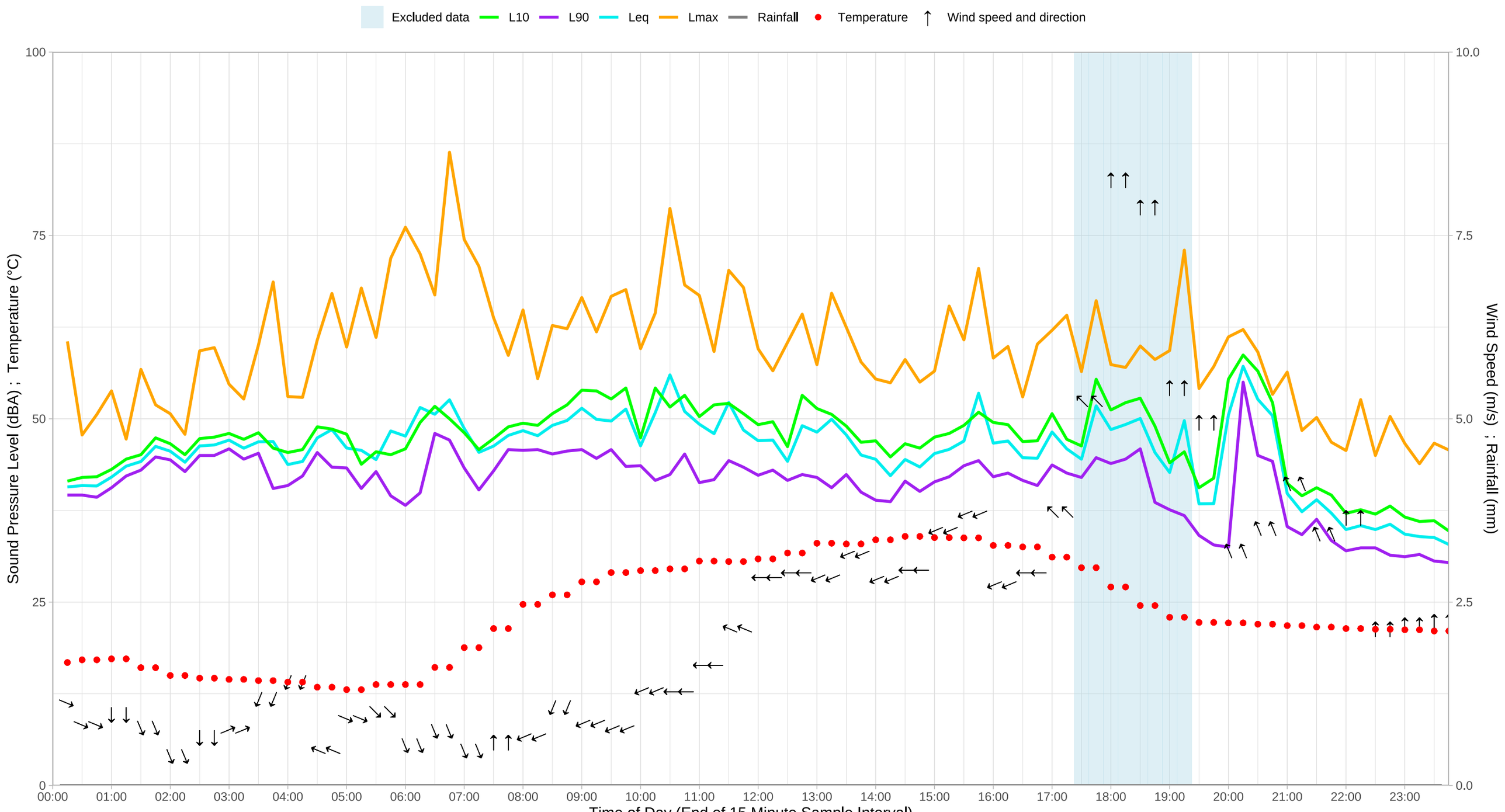
Statistical Ambient Noise Levels
L1
Wednesday 11 December 2024



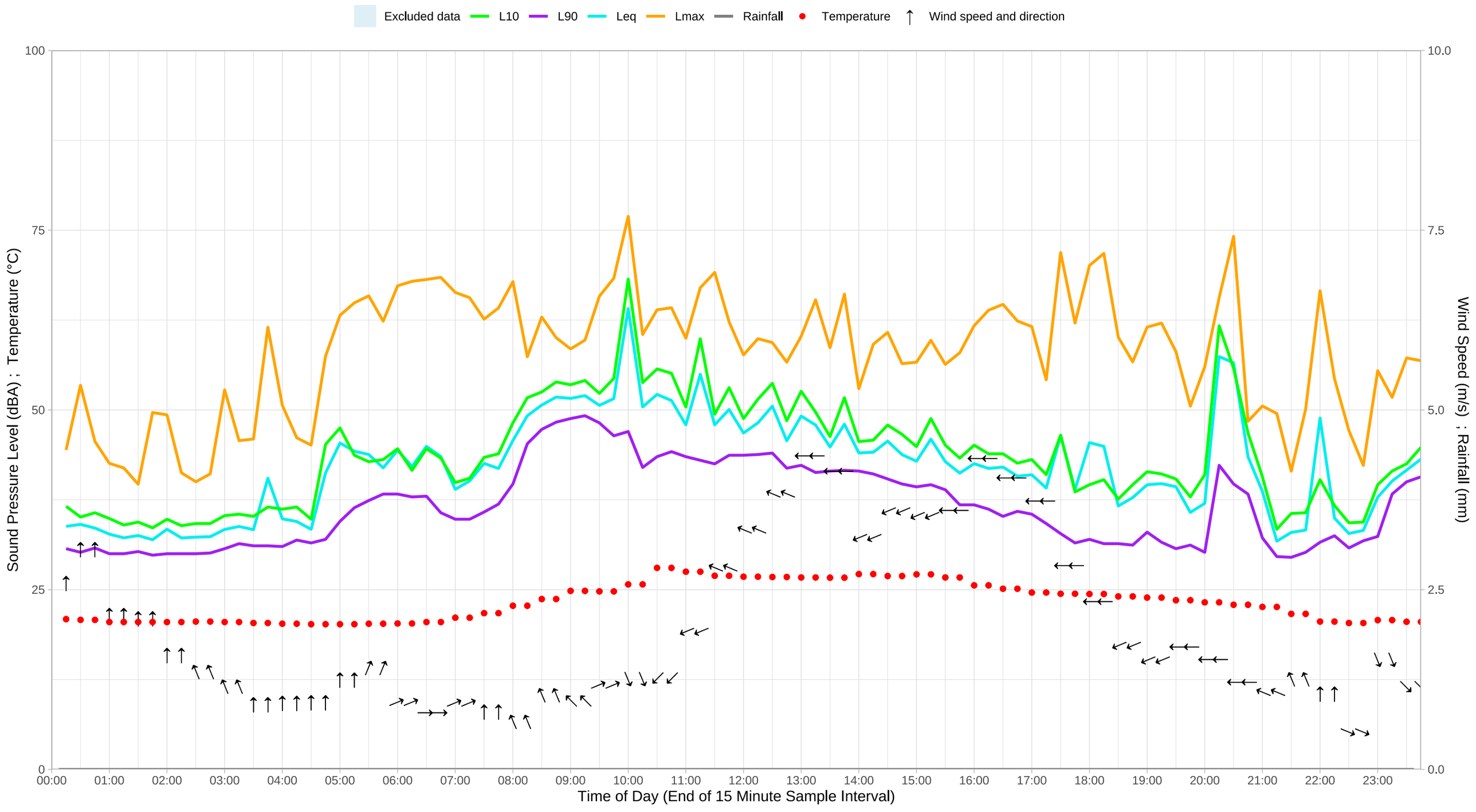
Statistical Ambient Noise Levels
L1
Thursday 12 December 2024



Statistical Ambient Noise Levels
L1
Friday 13 December 2024



Statistical Ambient Noise Levels
L1
Saturday 14 December 2024



Statistical Ambient Noise Levels
L1
Sunday 15 December 2024

Excluded data | L10 | L90 | Leq | Lmax | Rainfall | Temperature | Wind speed and direction

Sound Pressure Level (dBA) ; Temperature (°C)

Wind Speed (m/s) ; Rainfall (mm)

Time of Day (End of 15 Minute Sample Interval)

Statistical Ambient Noise Levels
L1
Monday 16 December 2024

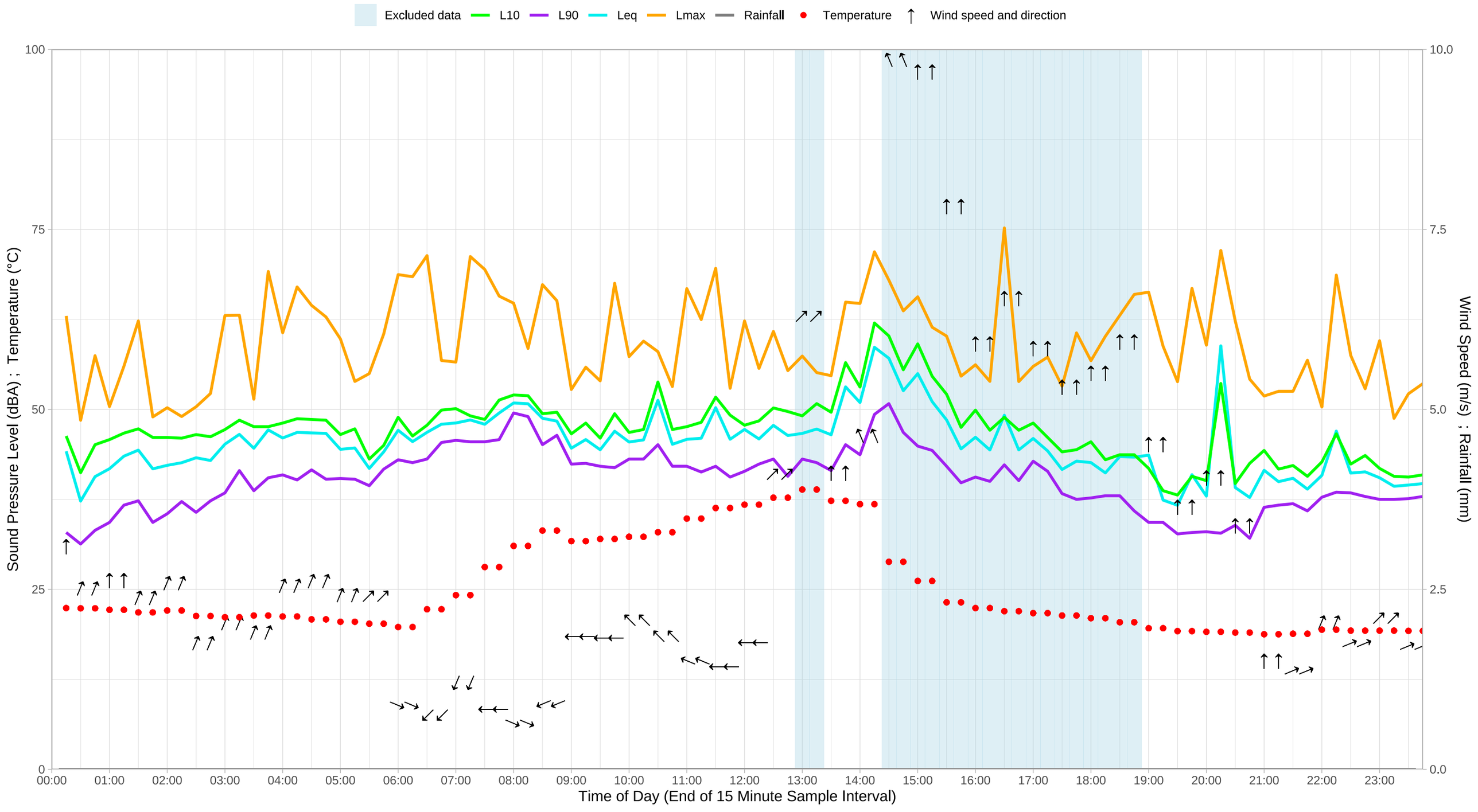
Excluded data | L10 | L90 | Leq | Lmax | Rainfall | Temperature | Wind speed and direction

Sound Pressure Level (dBA) ; Temperature (°C)

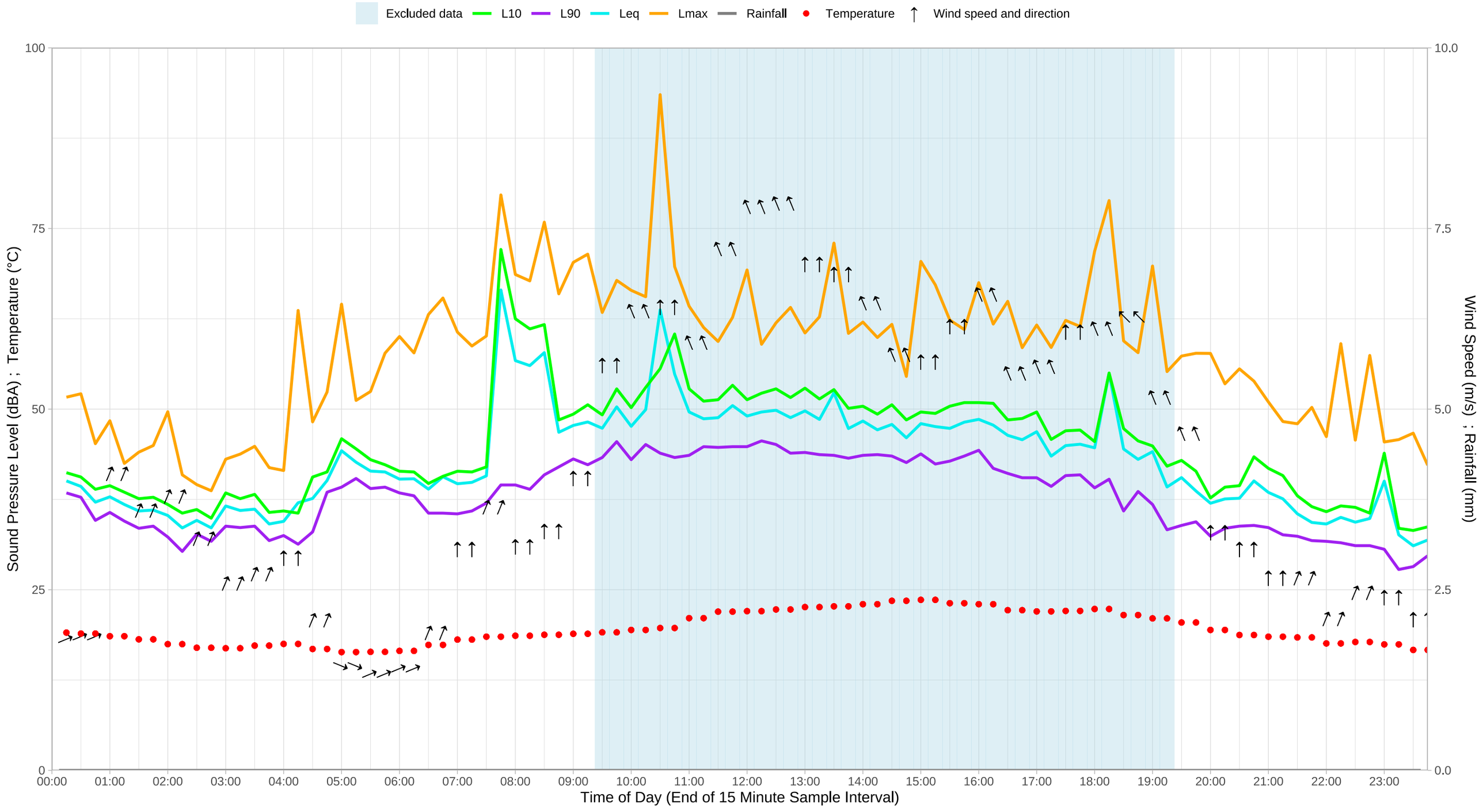
Wind Speed (m/s) ; Rainfall (mm)

Time of Day (End of 15 Minute Sample Interval)

Statistical Ambient Noise Levels
L1
Tuesday 17 December 2024



Statistical Ambient Noise Levels
L1
Wednesday 18 December 2024



Statistical Ambient Noise Levels
L1
Thursday 19 December 2024

Excluded data | L10 | L90 | Leq | Lmax | Rainfall | Temperature | Wind speed and direction

Sound Pressure Level (dBA) ; Temperature (°C)

100
75
50
25
0

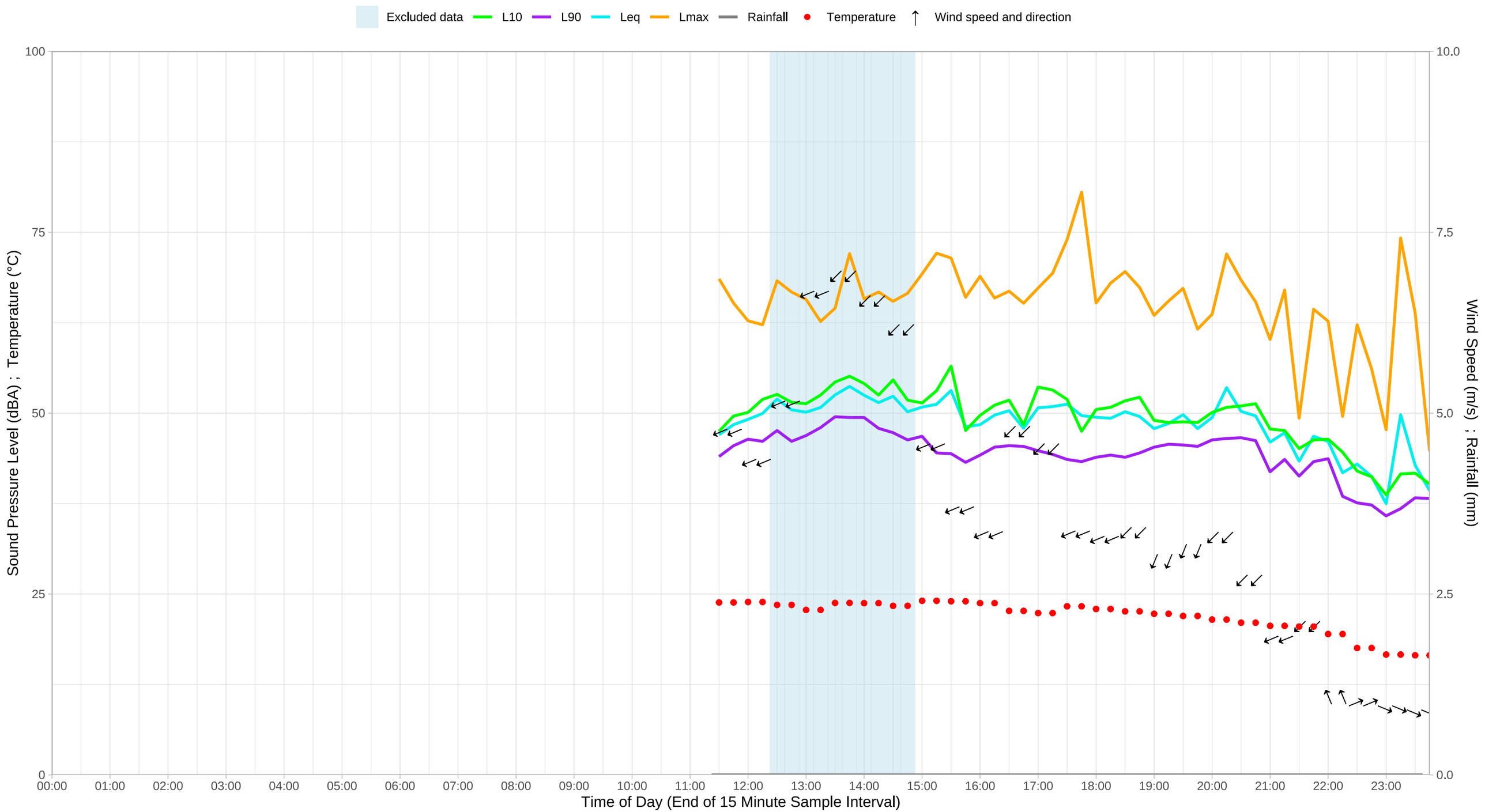
10.0
7.5
5.0
2.5
0.0

Wind Speed (m/s) ; Rainfall (mm)

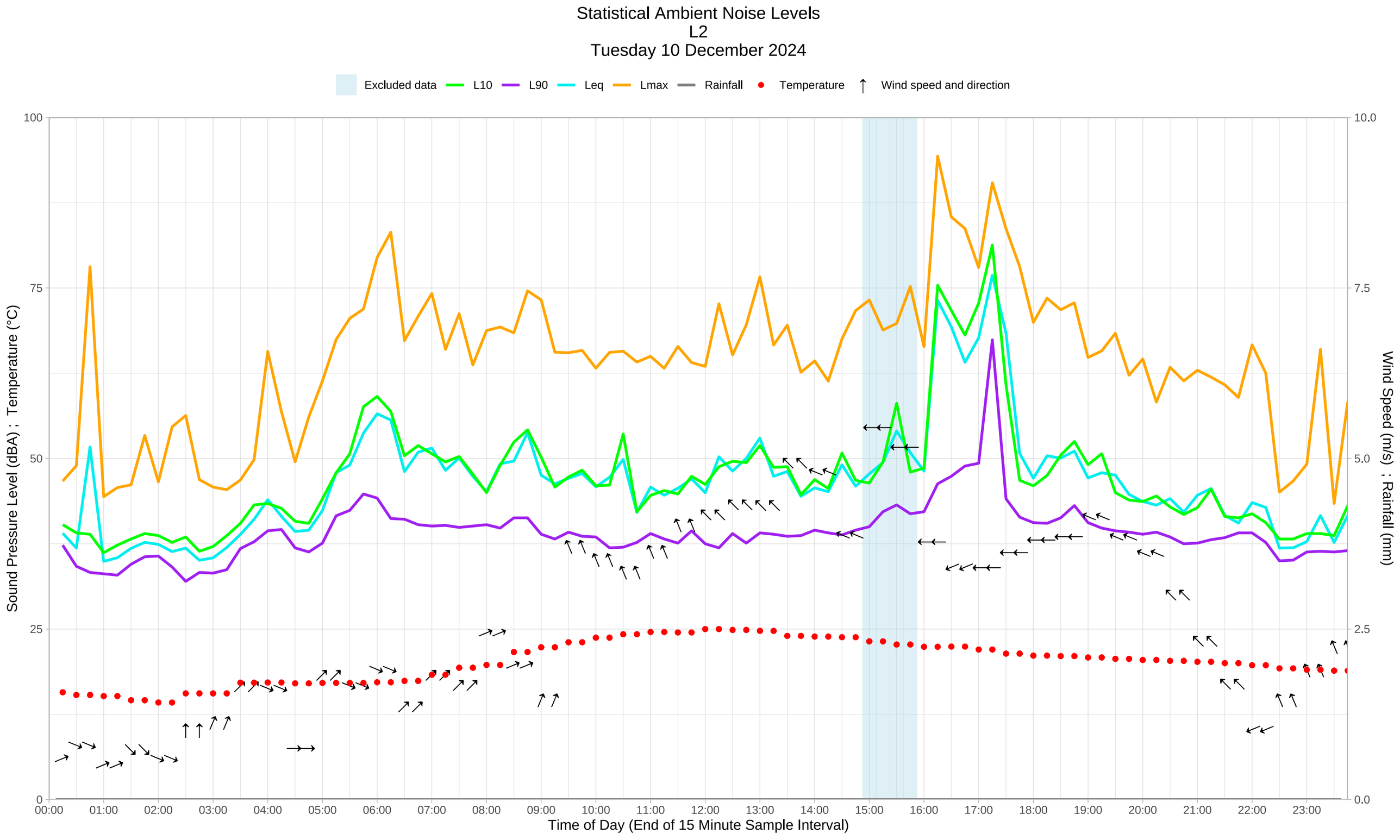
00:00 01:00 02:00 03:00 04:00 05:00 06:00 07:00 08:00 09:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00

Time of Day (End of 15 Minute Sample Interval)

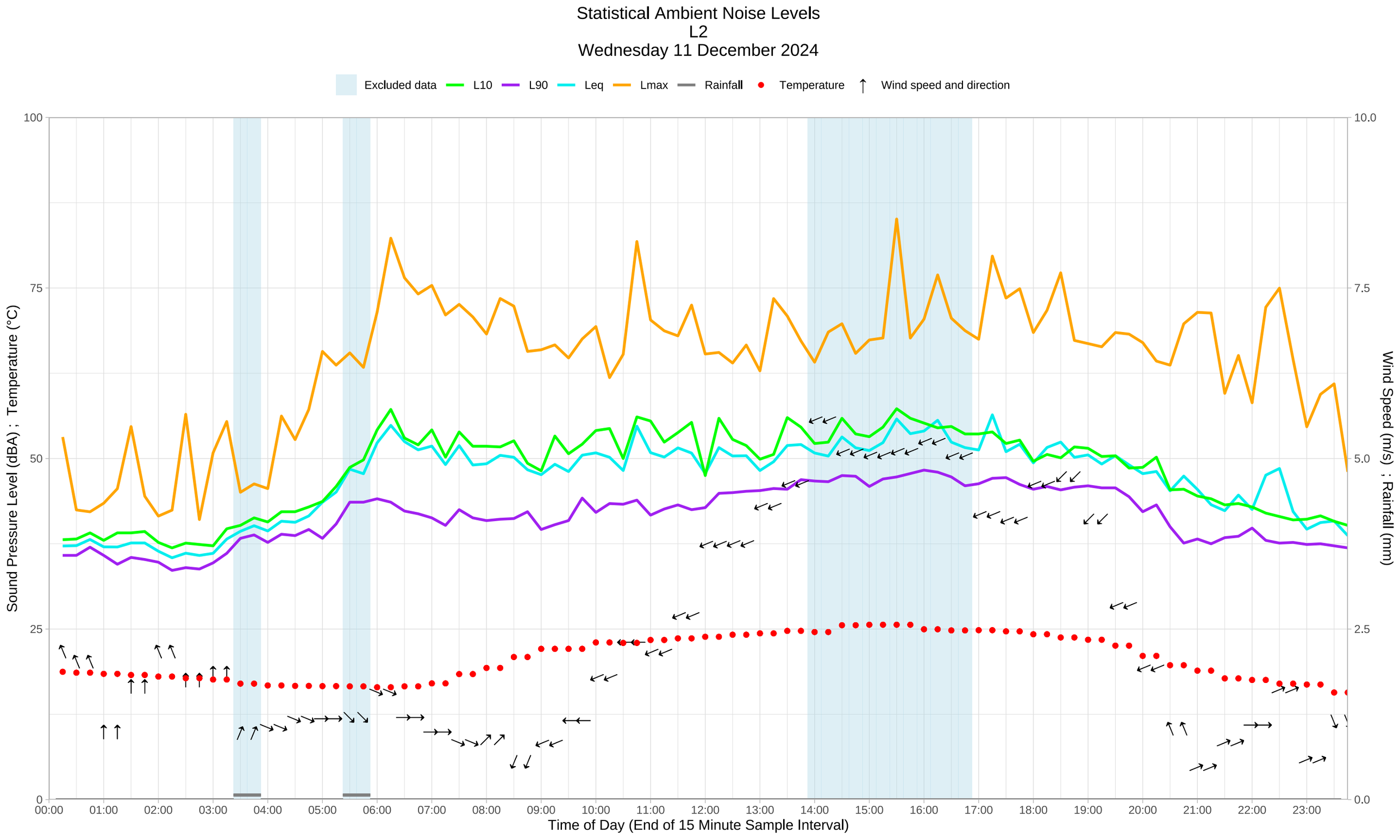
Statistical Ambient Noise Levels
L2
Monday 09 December 2024



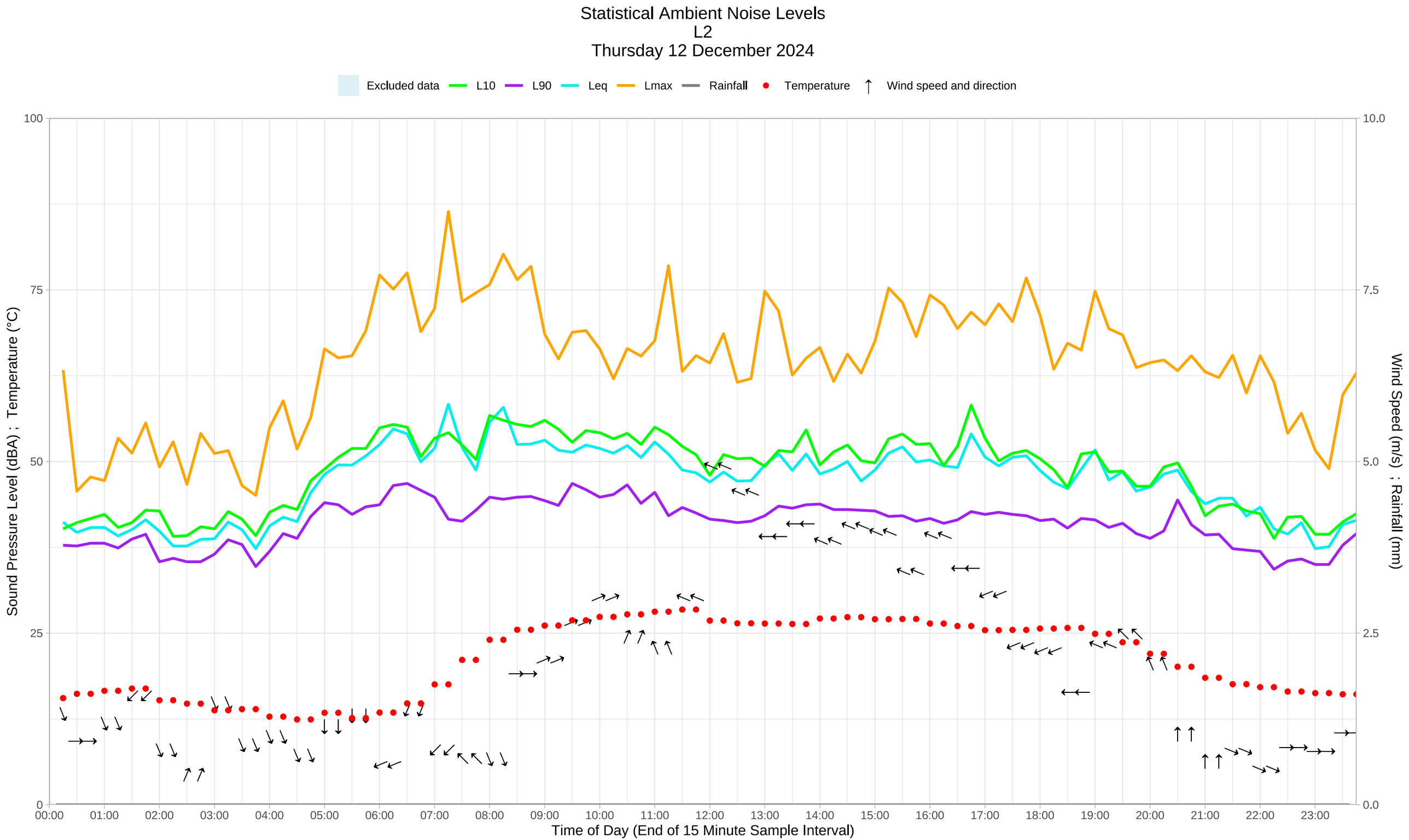
Statistical Ambient Noise Levels
L2
Tuesday 10 December 2024



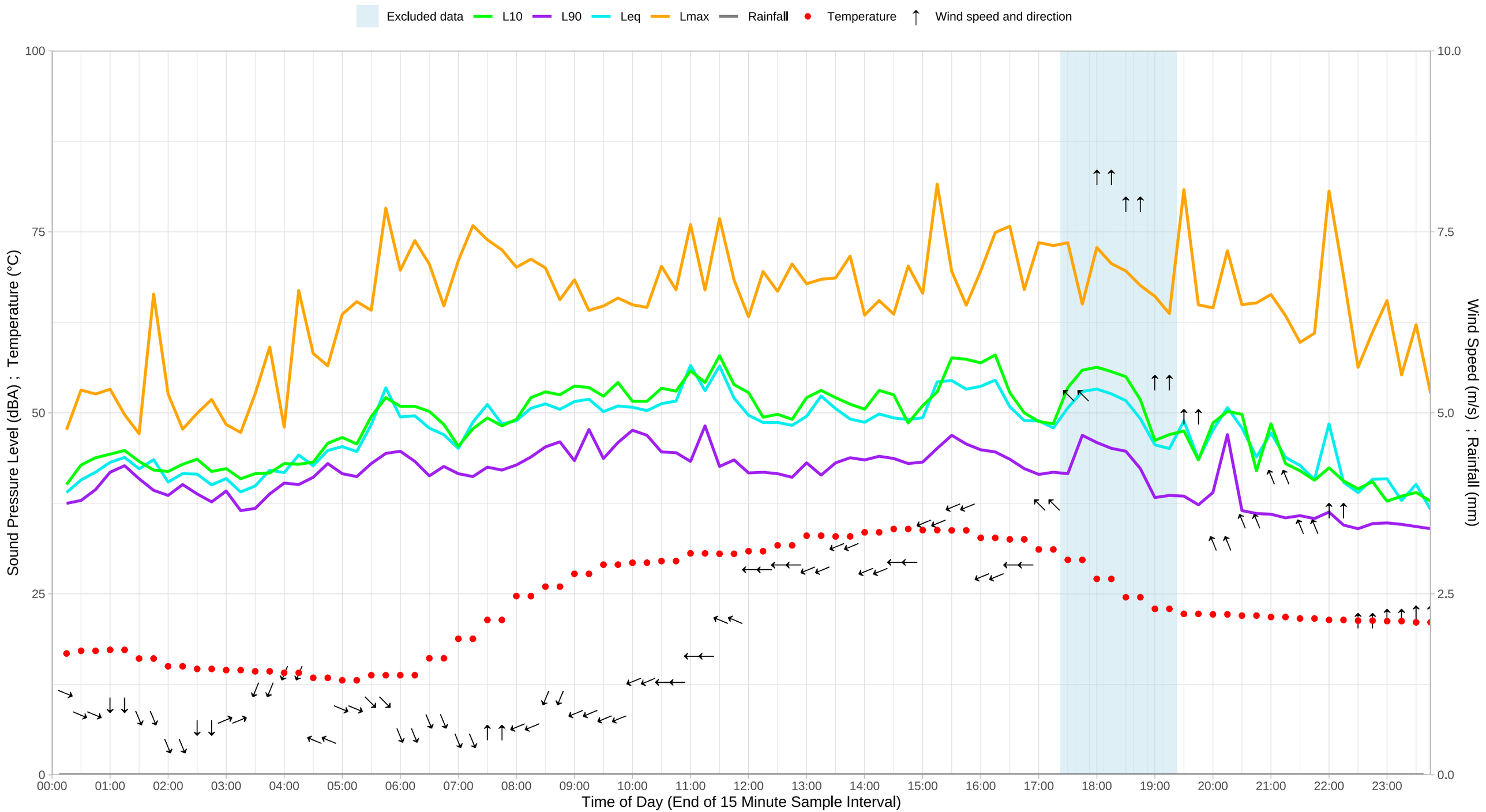
Statistical Ambient Noise Levels
L2
Wednesday 11 December 2024



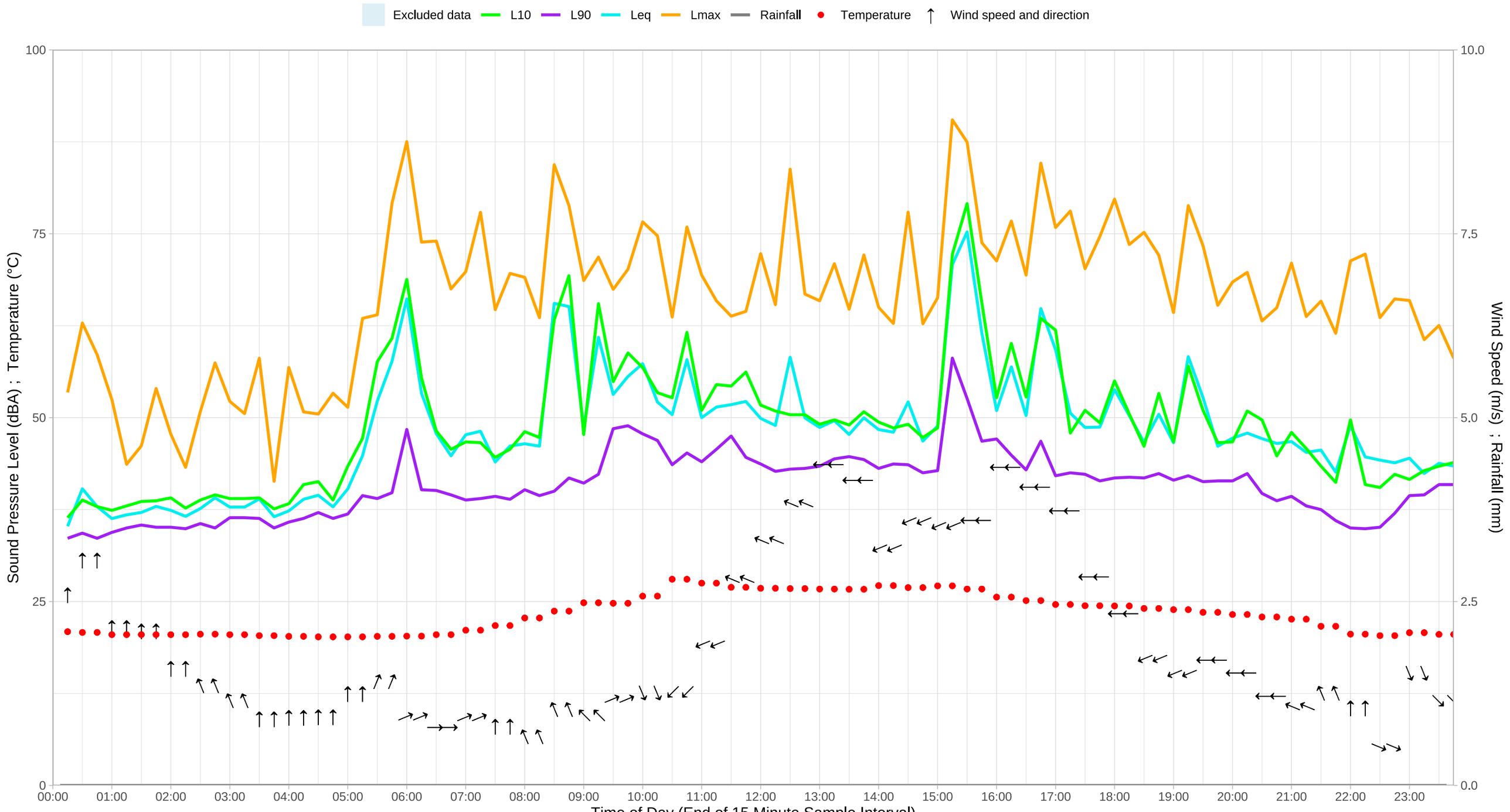
Statistical Ambient Noise Levels
L2
Thursday 12 December 2024



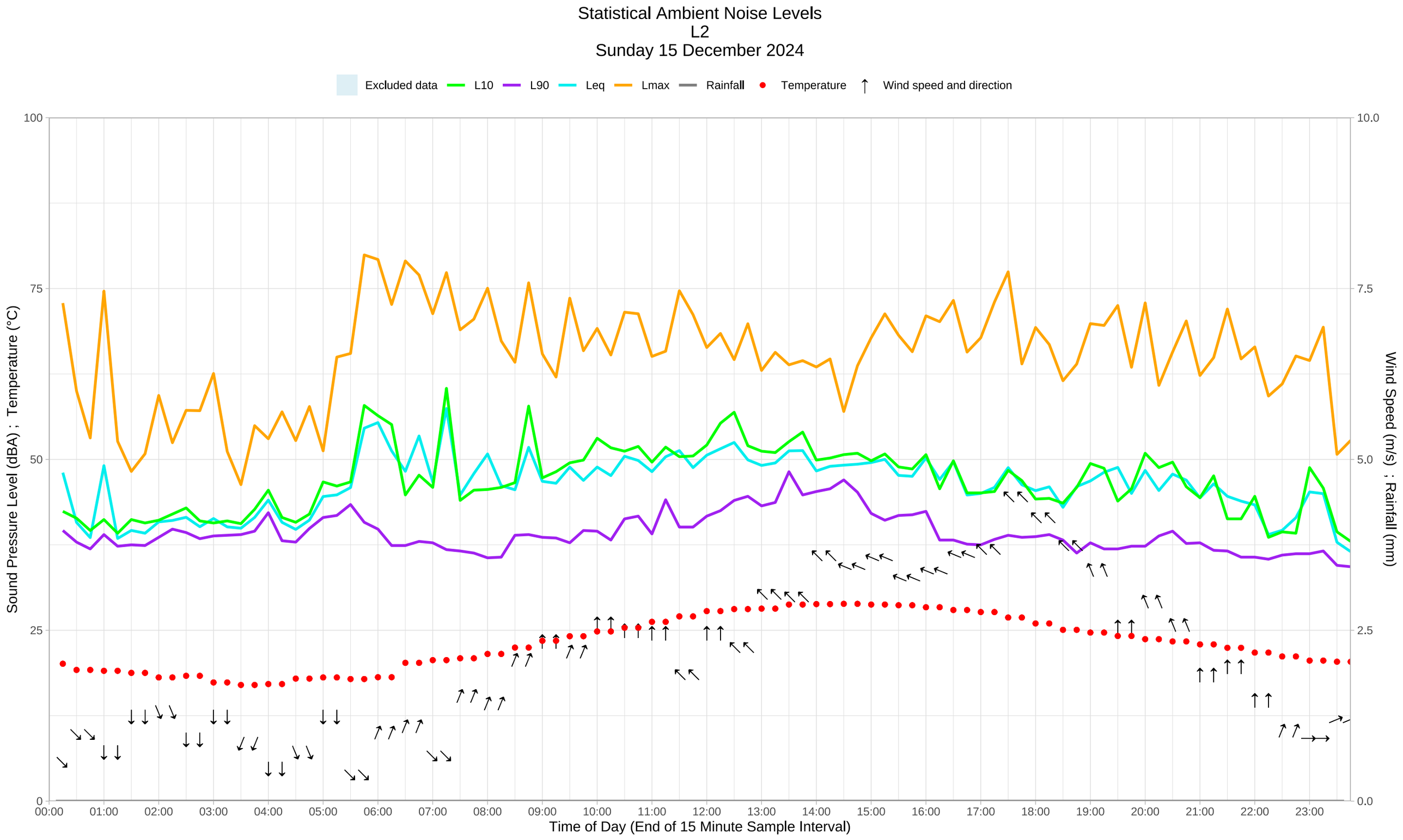
Statistical Ambient Noise Levels
L2
Friday 13 December 2024



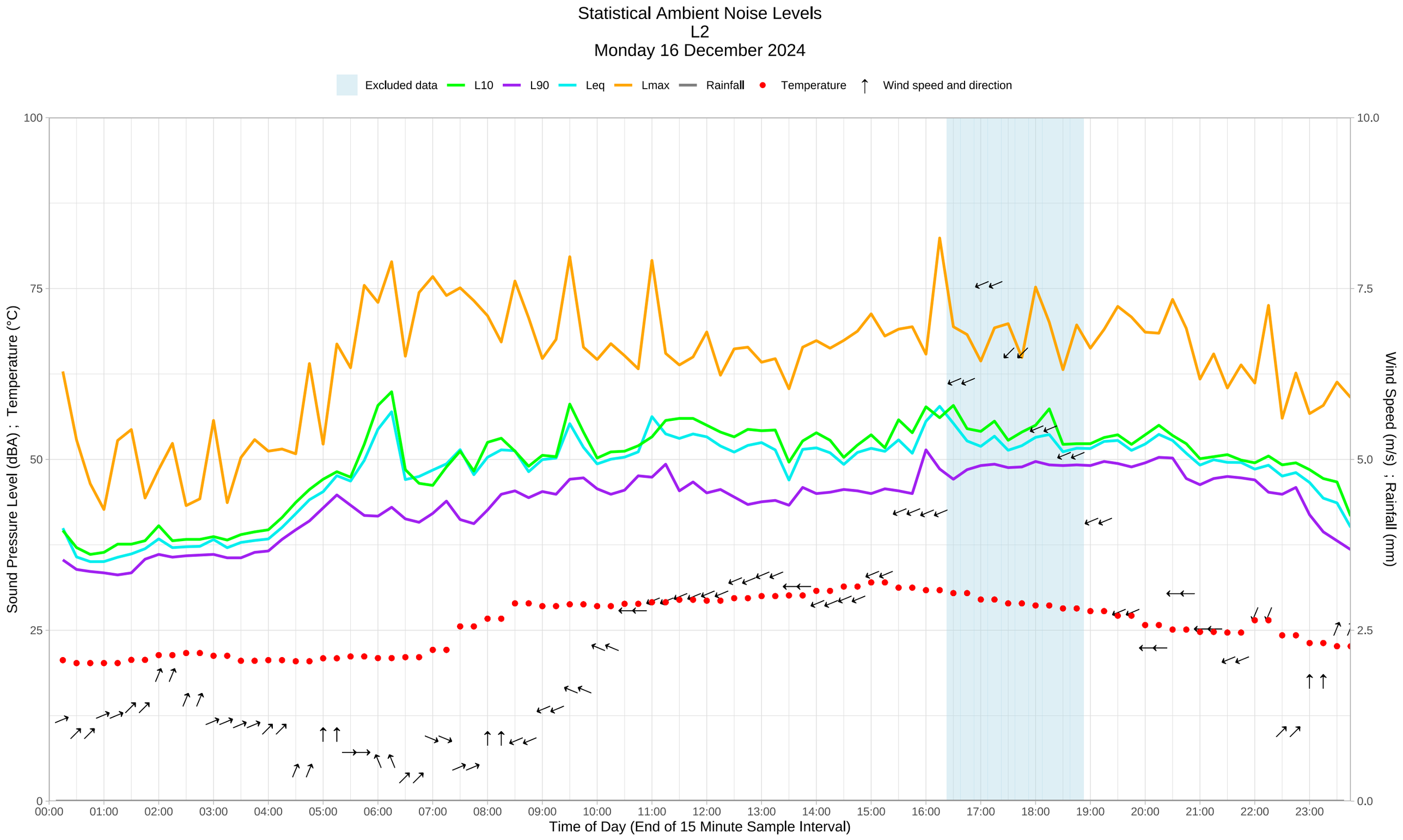
Statistical Ambient Noise Levels
L2
Saturday 14 December 2024



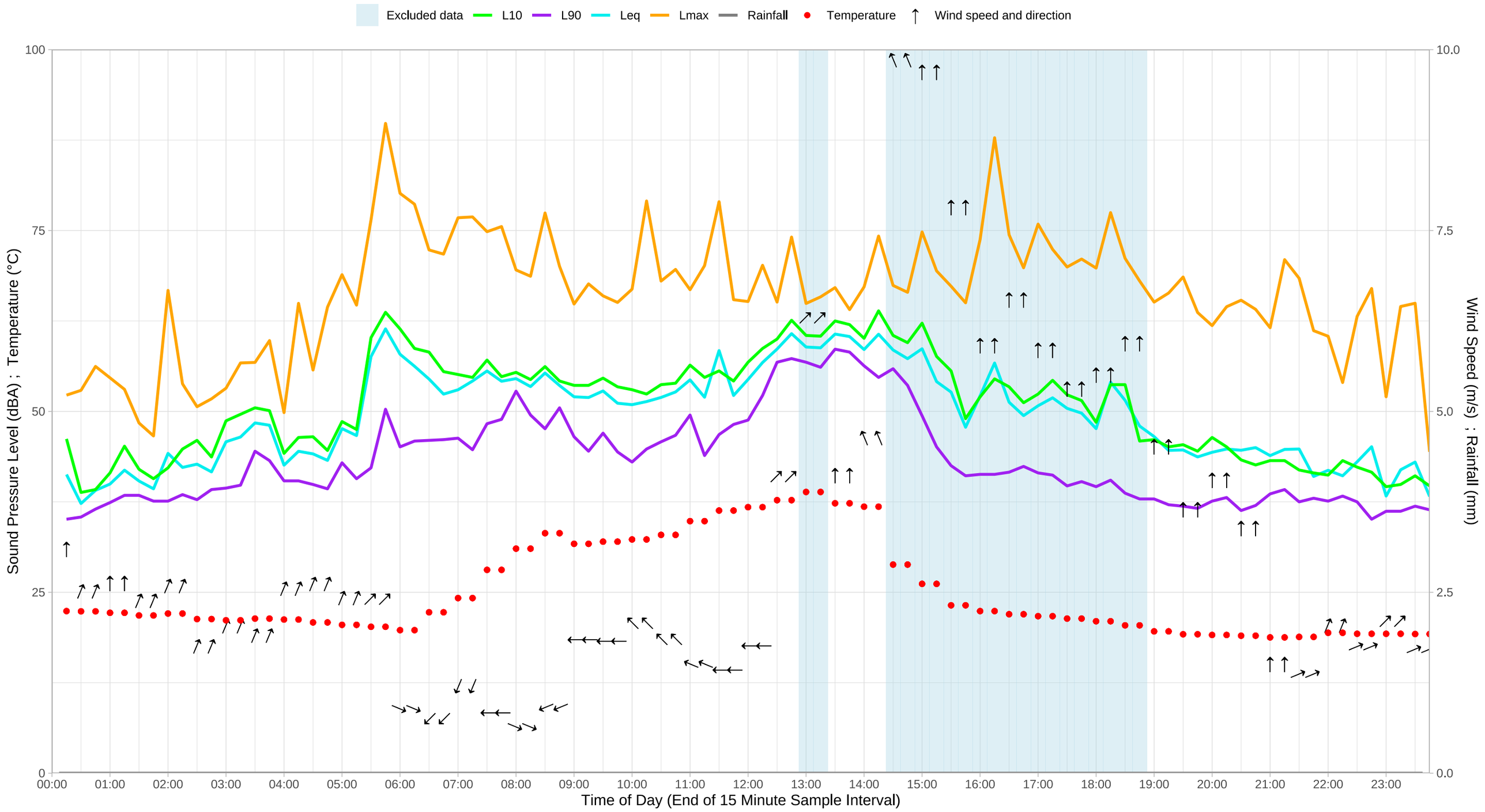
Statistical Ambient Noise Levels
L2
Sunday 15 December 2024



Statistical Ambient Noise Levels
L2
Monday 16 December 2024



Statistical Ambient Noise Levels
L2
Tuesday 17 December 2024



Statistical Ambient Noise Levels
L2
Wednesday 18 December 2024

Excluded data | L10 | L90 | Leq | Lmax | Rainfall | Temperature | Wind speed and direction

Sound Pressure Level (dBA) ; Temperature (°C)

100
75
50
25
0

10.0
7.5
5.0
2.5
0.0

Wind Speed (m/s) ; Rainfall (mm)

00:00 01:00 02:00 03:00 04:00 05:00 06:00 07:00 08:00 09:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00

Time of Day (End of 15 Minute Sample Interval)

Statistical Ambient Noise Levels
L2
Thursday 19 December 2024

Excluded data | L10 | L90 | Leq | Lmax | Rainfall | Temperature | Wind speed and direction

Sound Pressure Level (dBA) ; Temperature (°C)

100
75
50
25
0

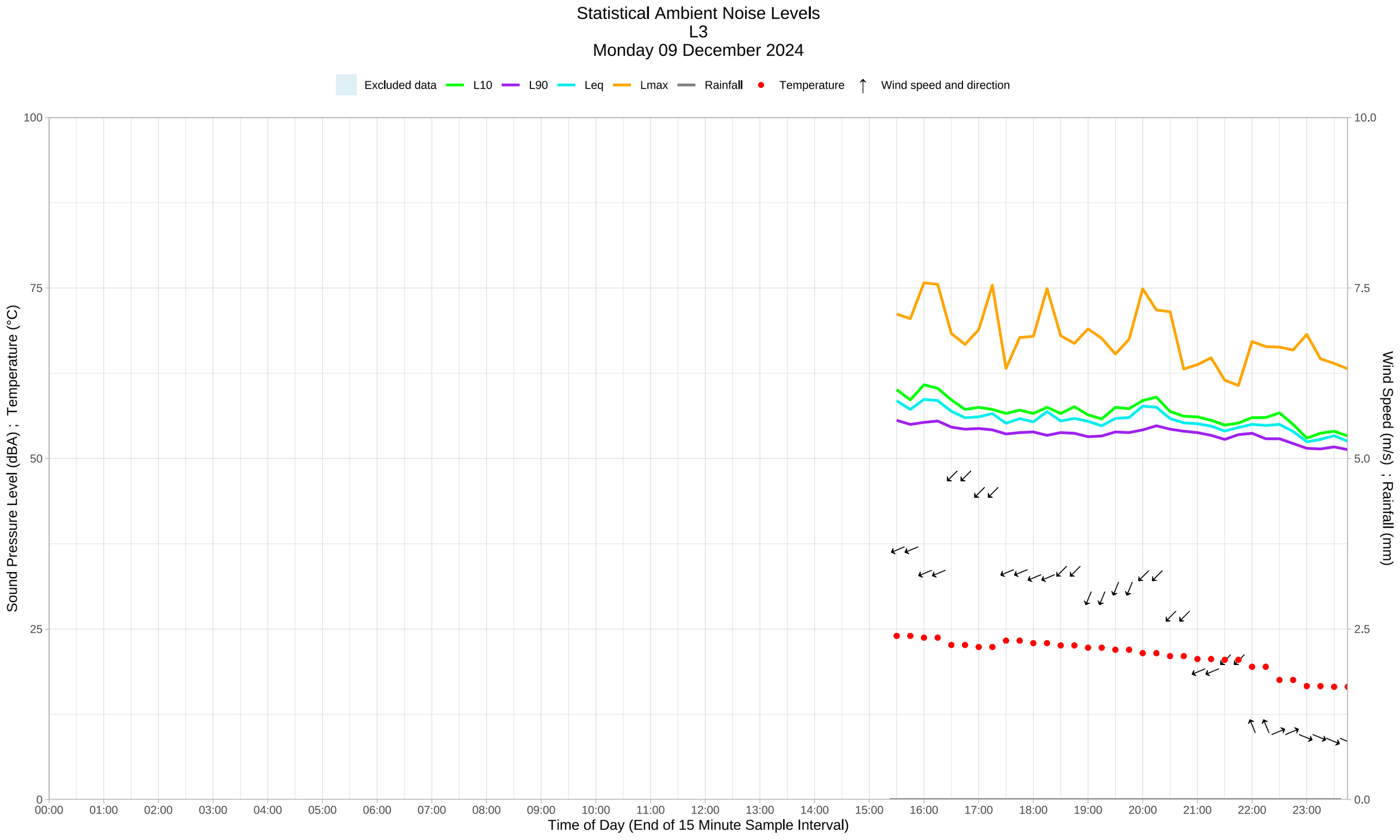
10.0
7.5
5.0
2.5
0.0

Wind Speed (m/s) ; Rainfall (mm)

00:00 01:00 02:00 03:00 04:00 05:00 06:00 07:00 08:00 09:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00

Time of Day (End of 15 Minute Sample Interval)

Statistical Ambient Noise Levels
L3
Monday 09 December 2024



Statistical Ambient Noise Levels
L3
Tuesday 10 December 2024

Excluded data | L10 | L90 | Leq | Lmax | Rainfall | Temperature | Wind speed and direction

Sound Pressure Level (dBA) ; Temperature (°C)

Wind Speed (m/s) ; Rainfall (mm)

Time of Day (End of 15 Minute Sample Interval)

Statistical Ambient Noise Levels
L3
Wednesday 11 December 2024

Excluded data | L10 | L90 | Leq | Lmax | Rainfall | Temperature | Wind speed and direction

Sound Pressure Level (dBA) ; Temperature (°C)

100
75
50
25
0

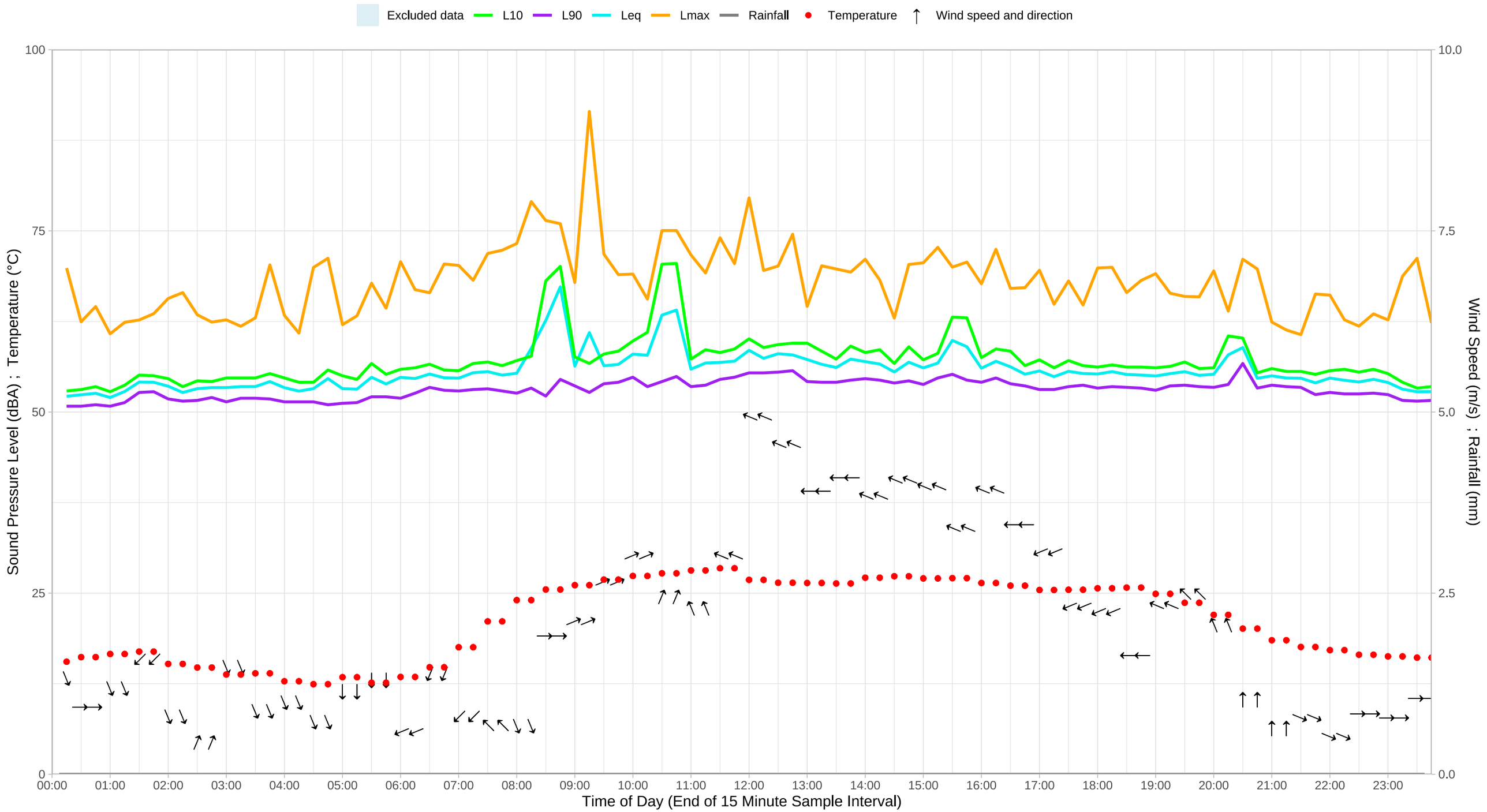
Wind Speed (m/s) ; Rainfall (mm)

10.0
7.5
5.0
2.5
0.0

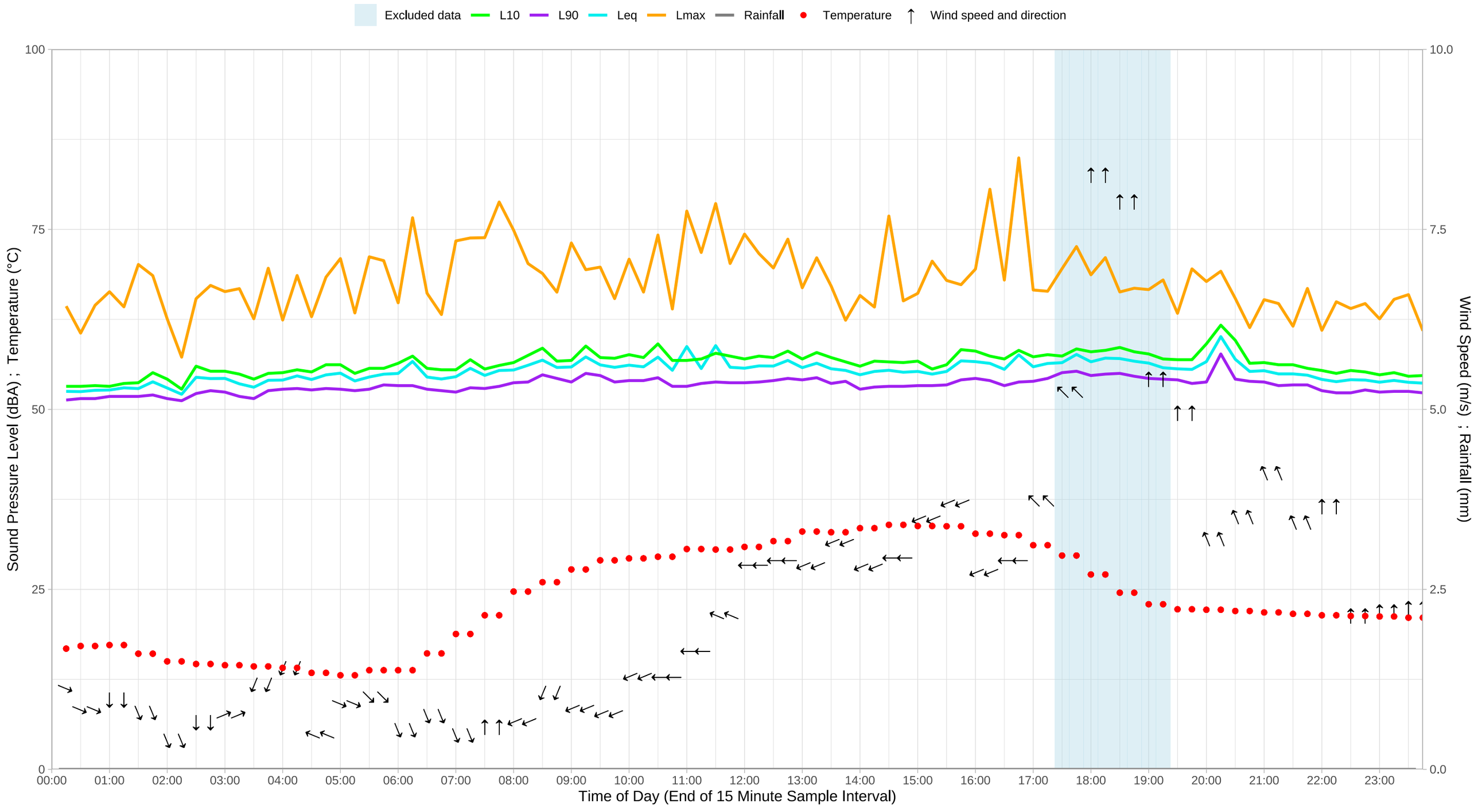
00:00 01:00 02:00 03:00 04:00 05:00 06:00 07:00 08:00 09:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00

Time of Day (End of 15 Minute Sample Interval)

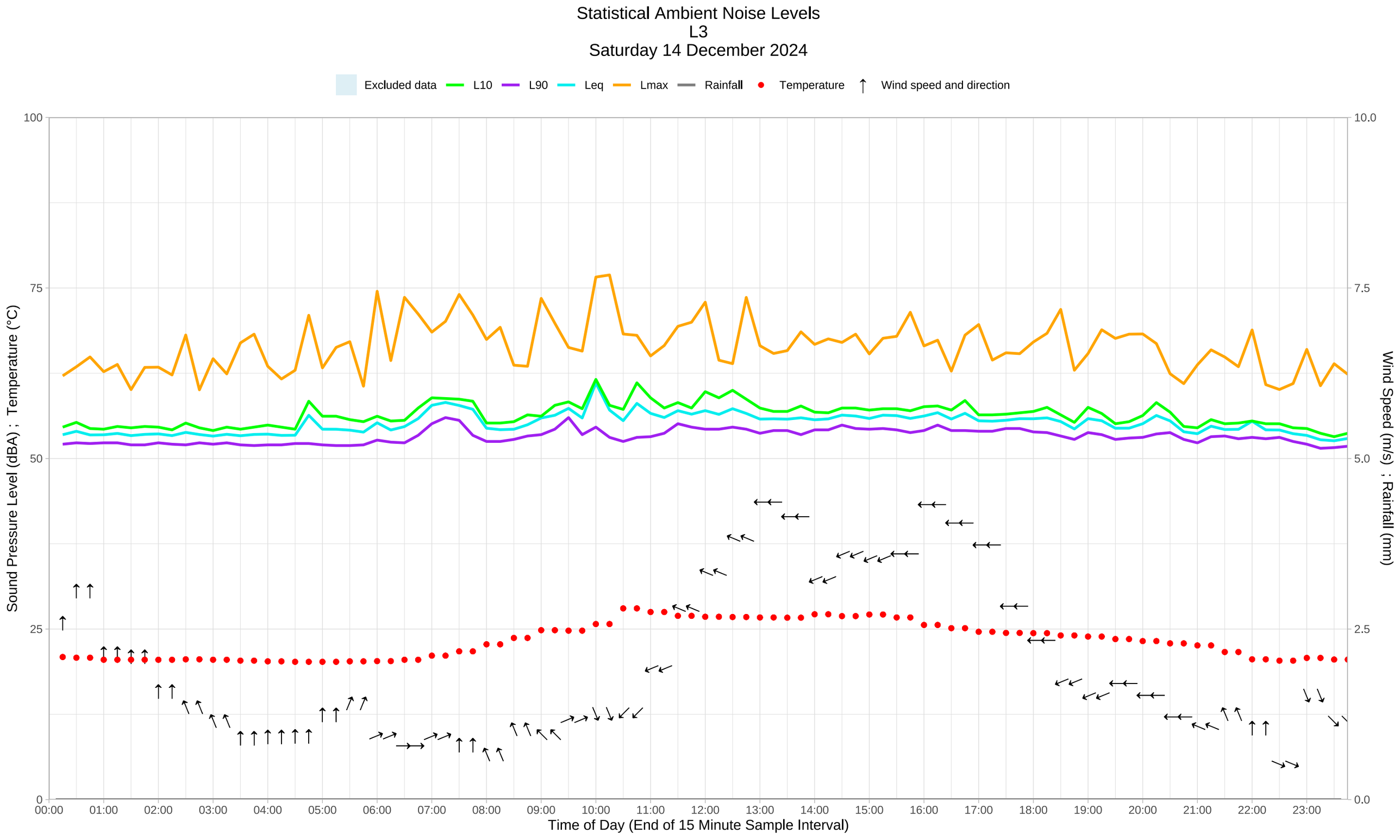
Statistical Ambient Noise Levels
L3
Thursday 12 December 2024



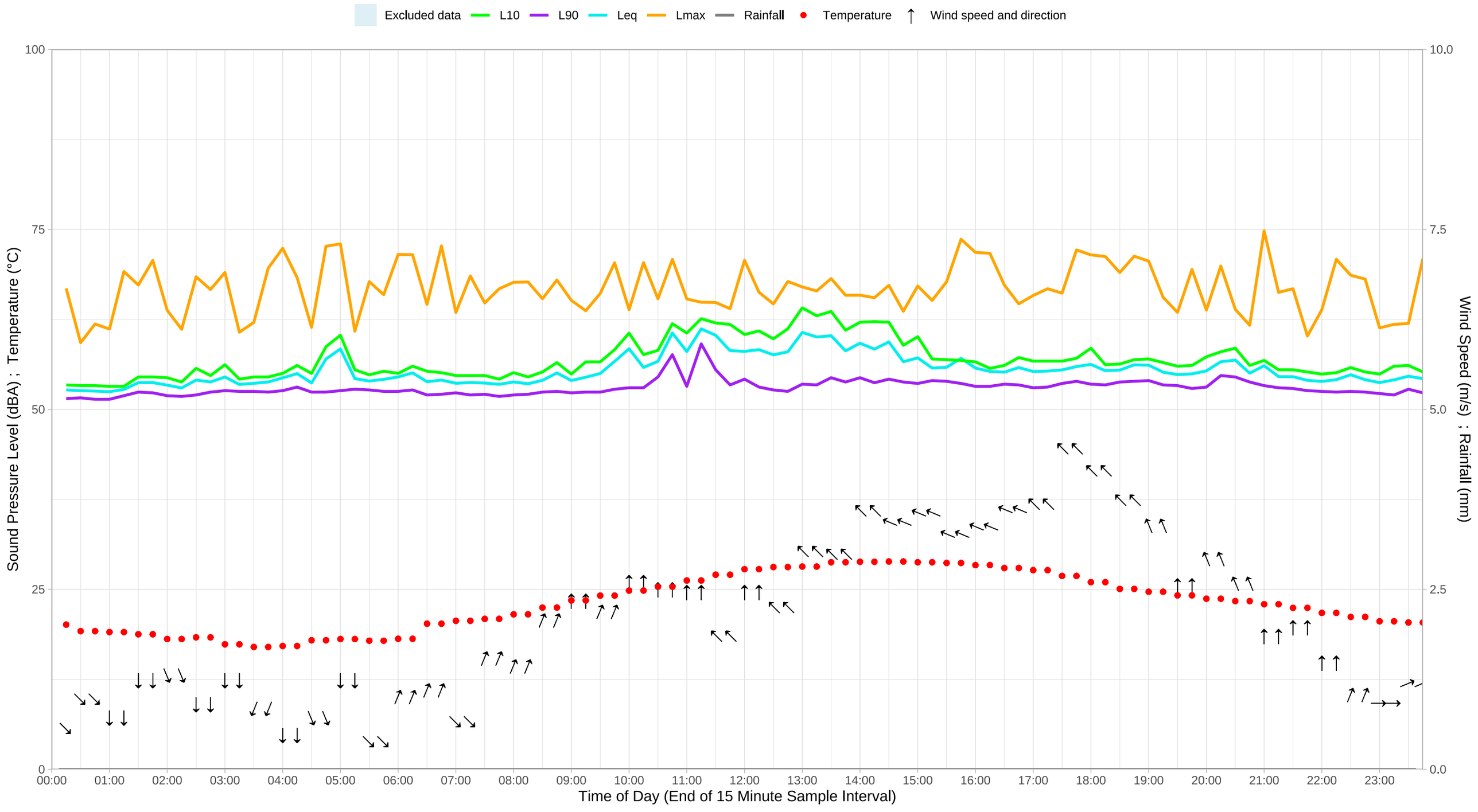
Statistical Ambient Noise Levels
L3
Friday 13 December 2024



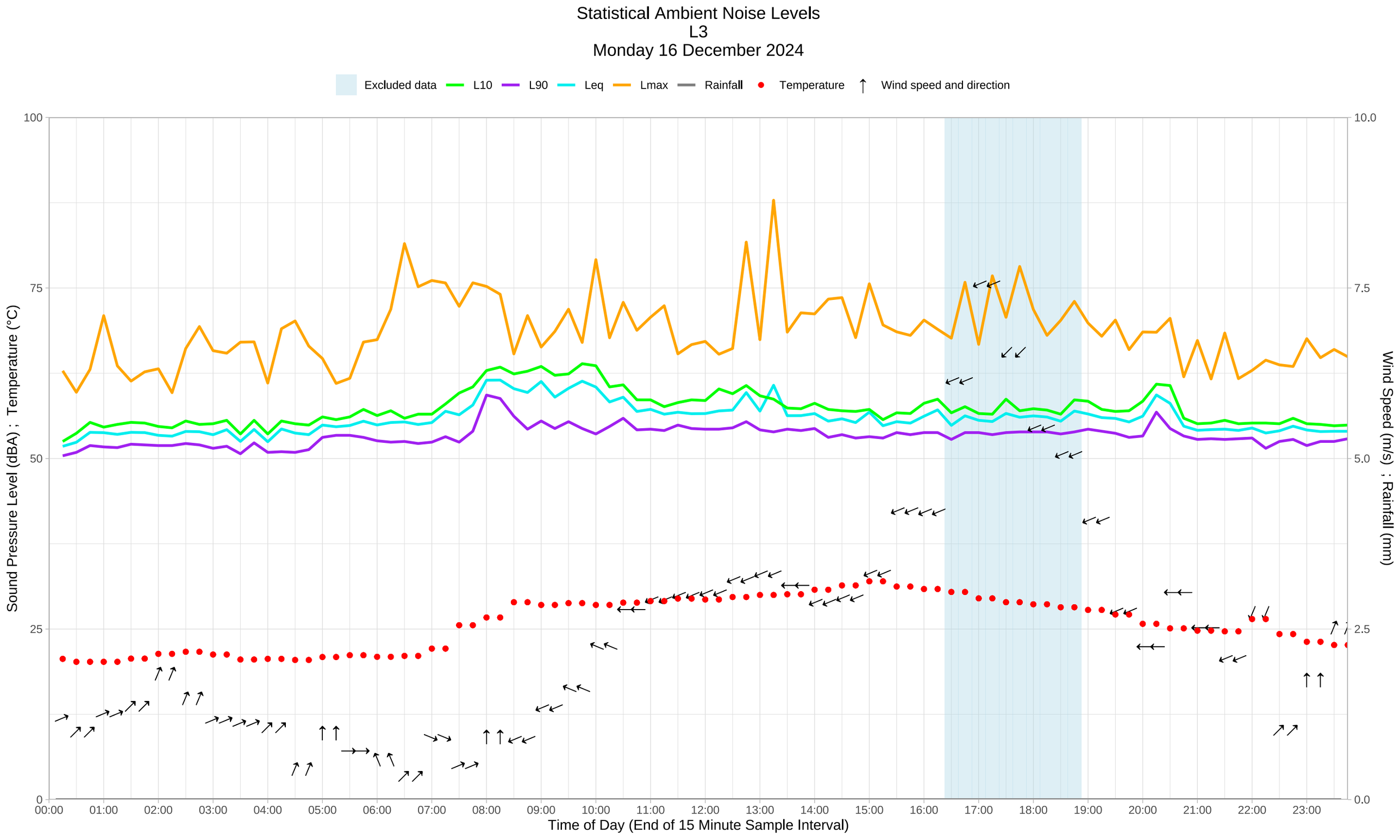
Statistical Ambient Noise Levels
L3
Saturday 14 December 2024



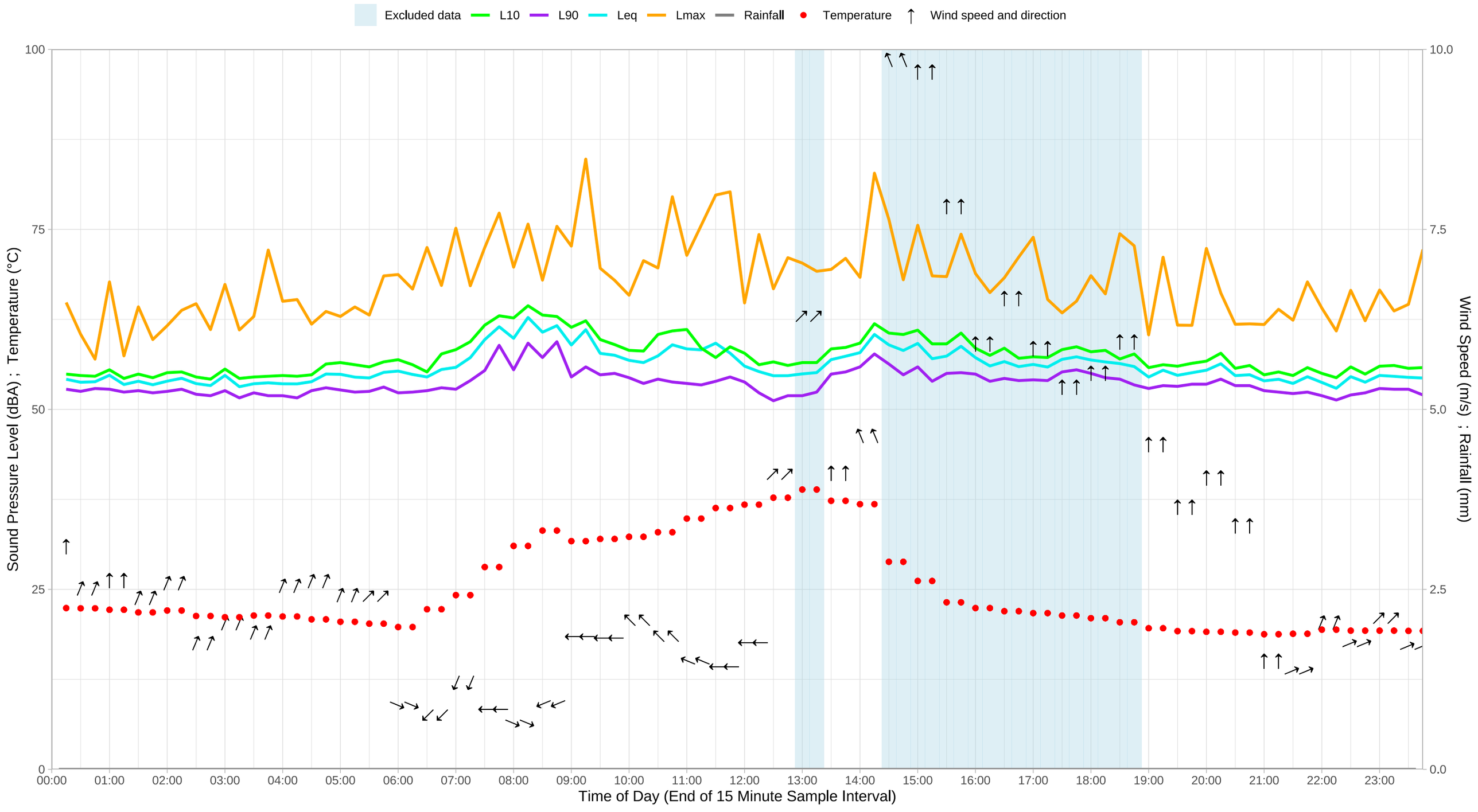
Statistical Ambient Noise Levels
L3
Sunday 15 December 2024



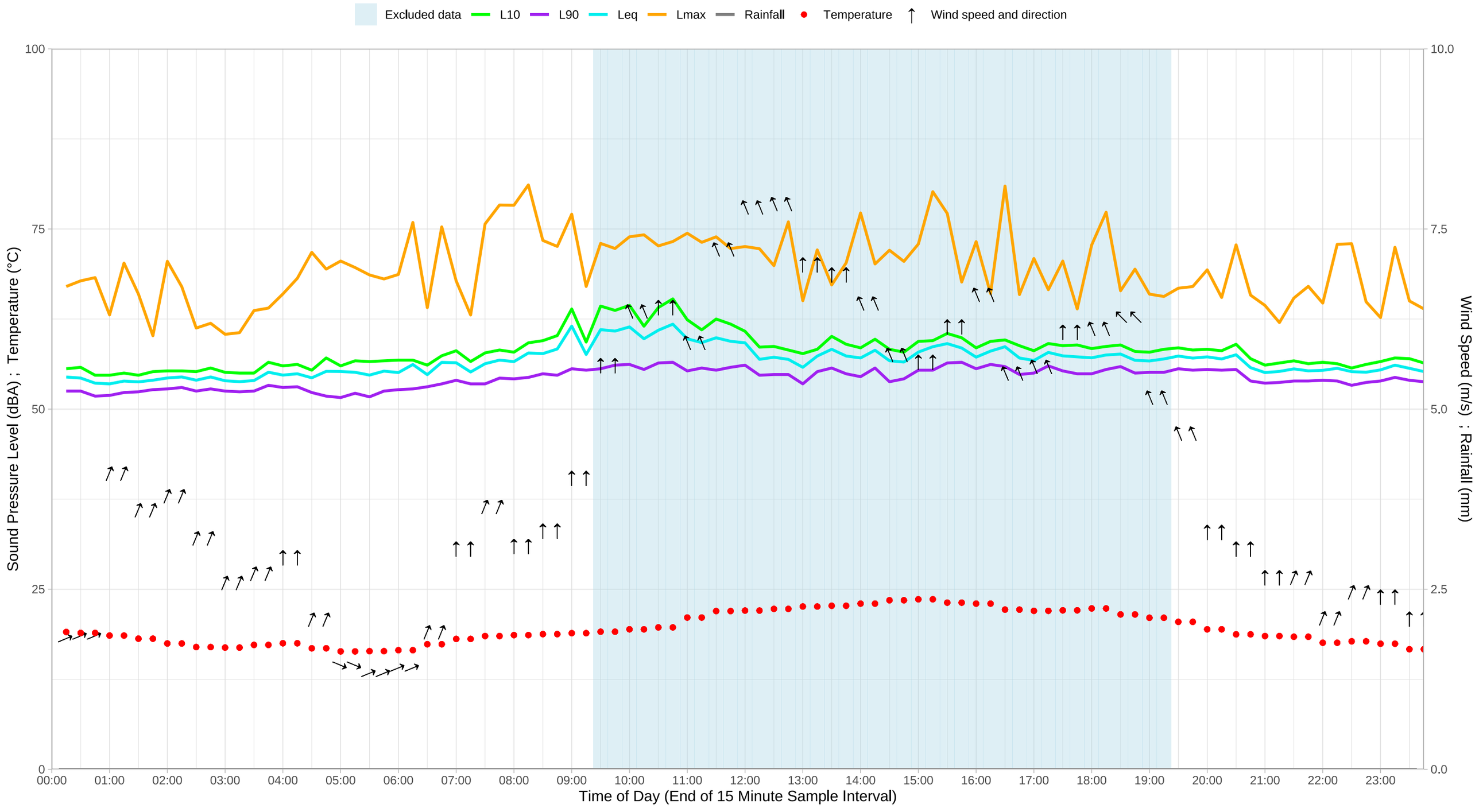
Statistical Ambient Noise Levels
L3
Monday 16 December 2024



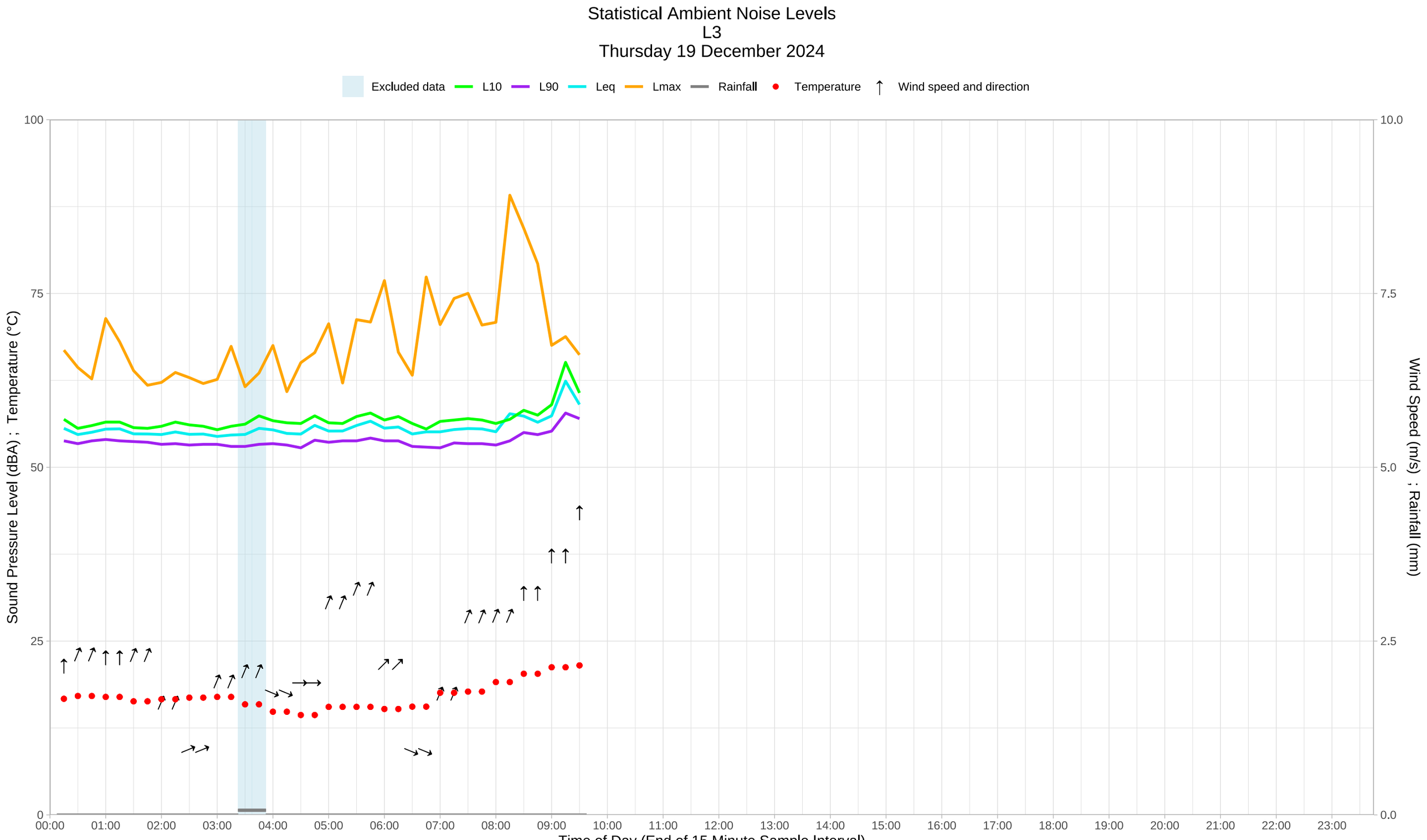
Statistical Ambient Noise Levels
L3
Tuesday 17 December 2024



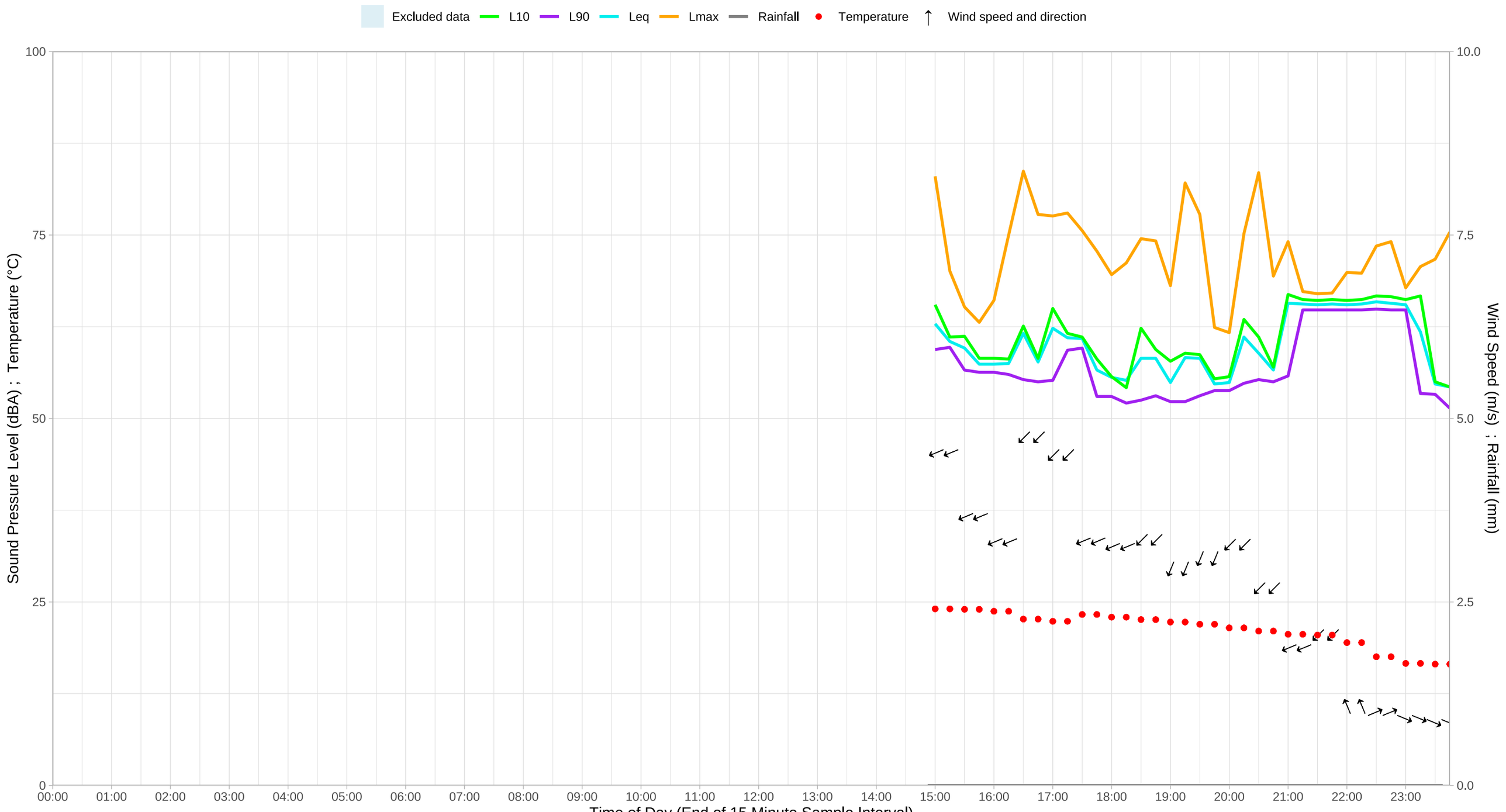
Statistical Ambient Noise Levels
L3
Wednesday 18 December 2024



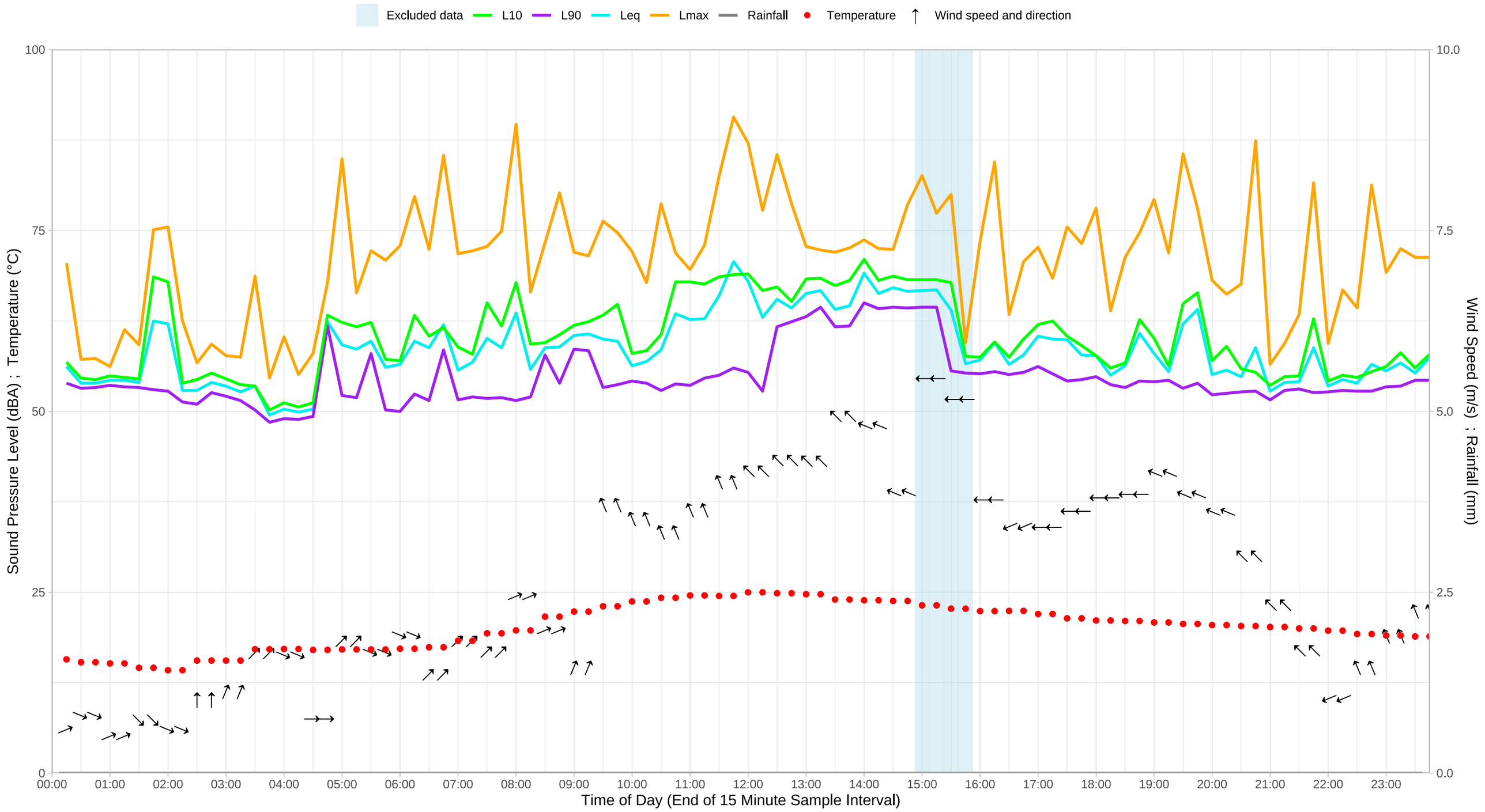
Statistical Ambient Noise Levels
L3
Thursday 19 December 2024



Statistical Ambient Noise Levels
L4
Monday 09 December 2024



Statistical Ambient Noise Levels
L4
Tuesday 10 December 2024



Statistical Ambient Noise Levels
L4
Wednesday 11 December 2024

Excluded data | L10 | L90 | Leq | Lmax | Rainfall | Temperature | Wind speed and direction

Sound Pressure Level (dBA) ; Temperature (°C)

100
75
50
25
0

Wind Speed (m/s) ; Rainfall (mm)

10.0
7.5
5.0
2.5
0.0

00:00 01:00 02:00 03:00 04:00 05:00 06:00 07:00 08:00 09:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00

Time of Day (End of 15 Minute Sample Interval)

Statistical Ambient Noise Levels
L4
Thursday 12 December 2024

Excluded data | L10 | L90 | Leq | Lmax | Rainfall | Temperature | Wind speed and direction

Sound Pressure Level (dBA) ; Temperature (°C)

100
75
50
25
0

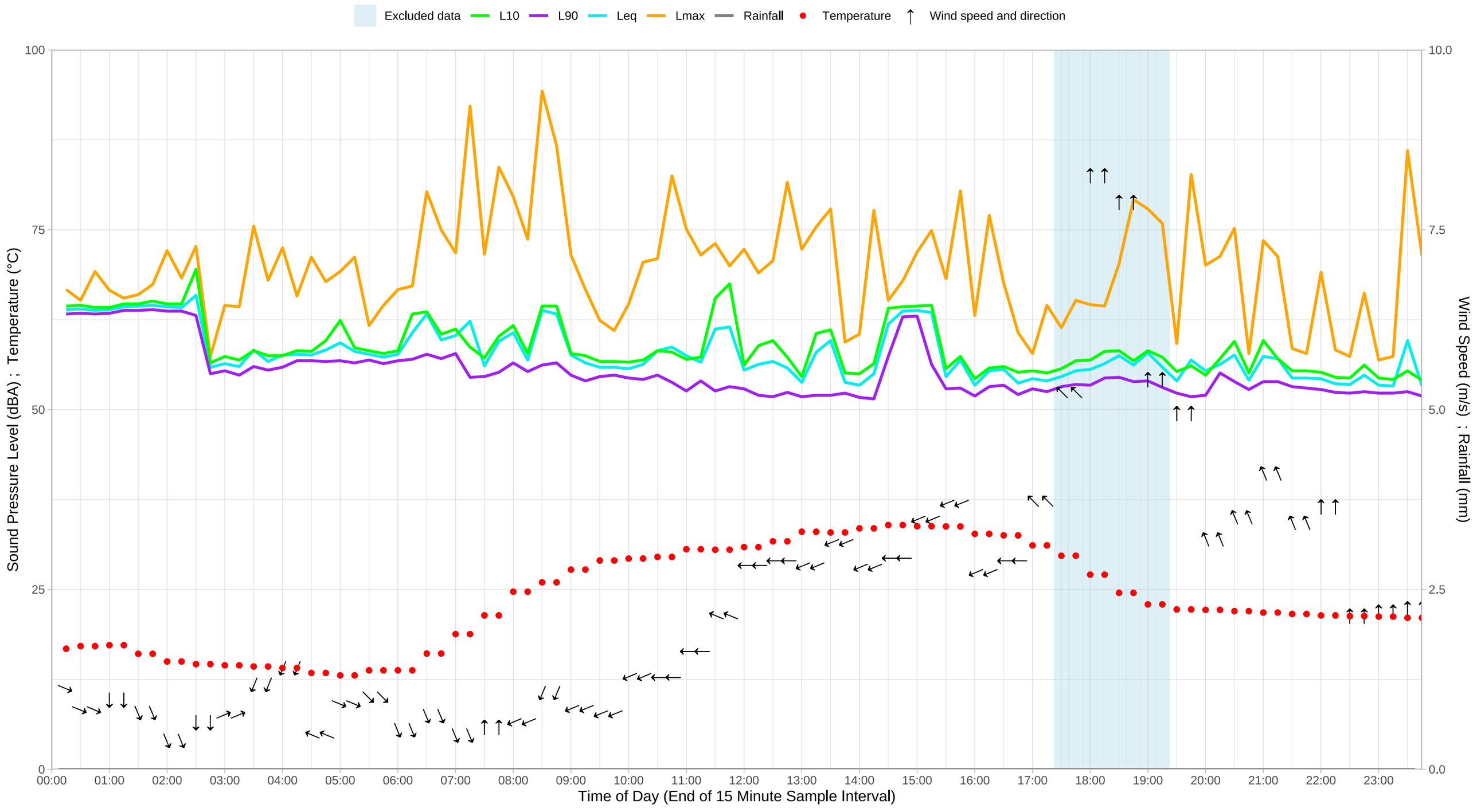
10.0
7.5
5.0
2.5
0.0

Wind Speed (m/s) ; Rainfall (mm)

00:00 01:00 02:00 03:00 04:00 05:00 06:00 07:00 08:00 09:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00

Time of Day (End of 15 Minute Sample Interval)

Statistical Ambient Noise Levels
L4
Friday 13 December 2024



Statistical Ambient Noise Levels
L4
Saturday 14 December 2024

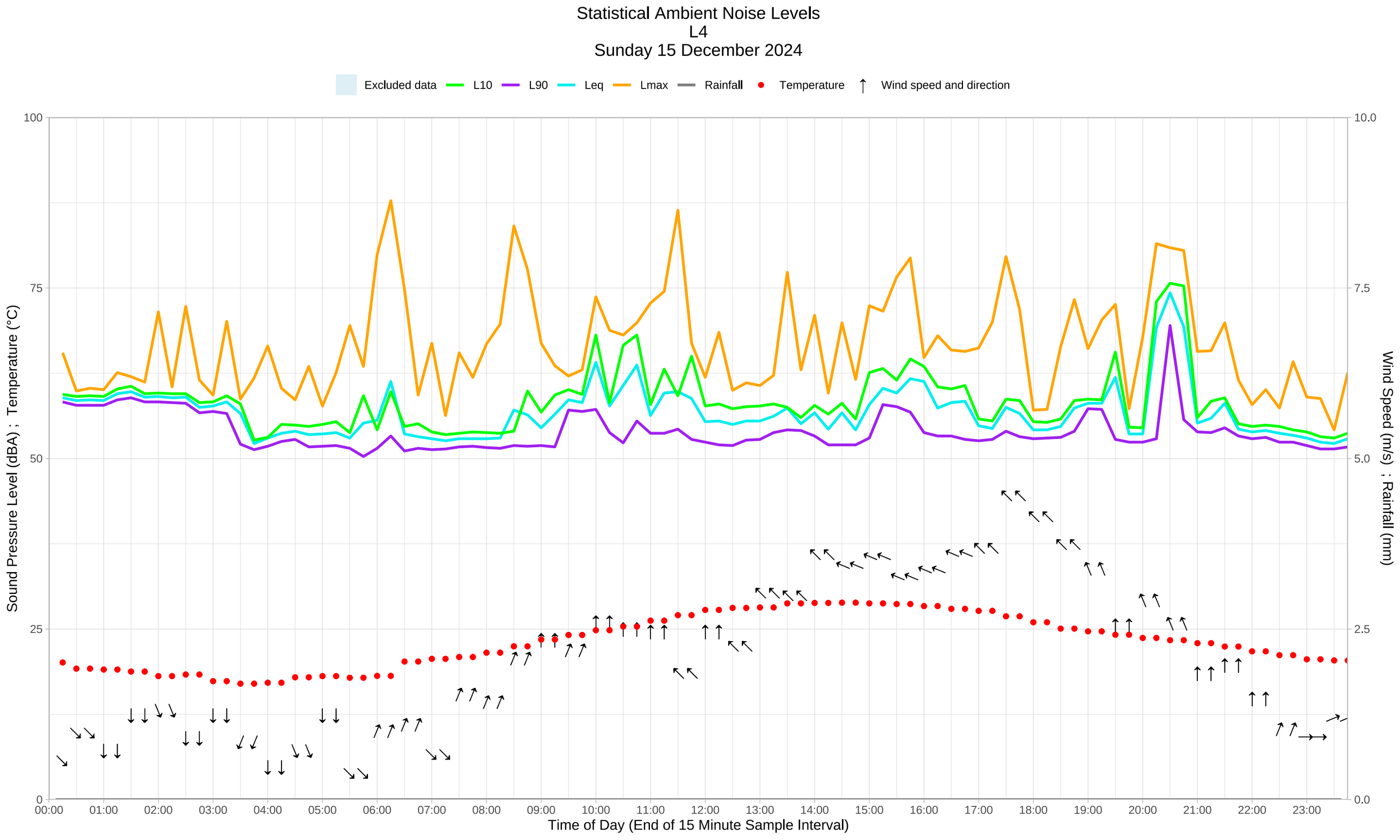
Excluded data | L10 | L90 | Leq | Lmax | Rainfall | Temperature | Wind speed and direction

Sound Pressure Level (dBA) ; Temperature (°C)

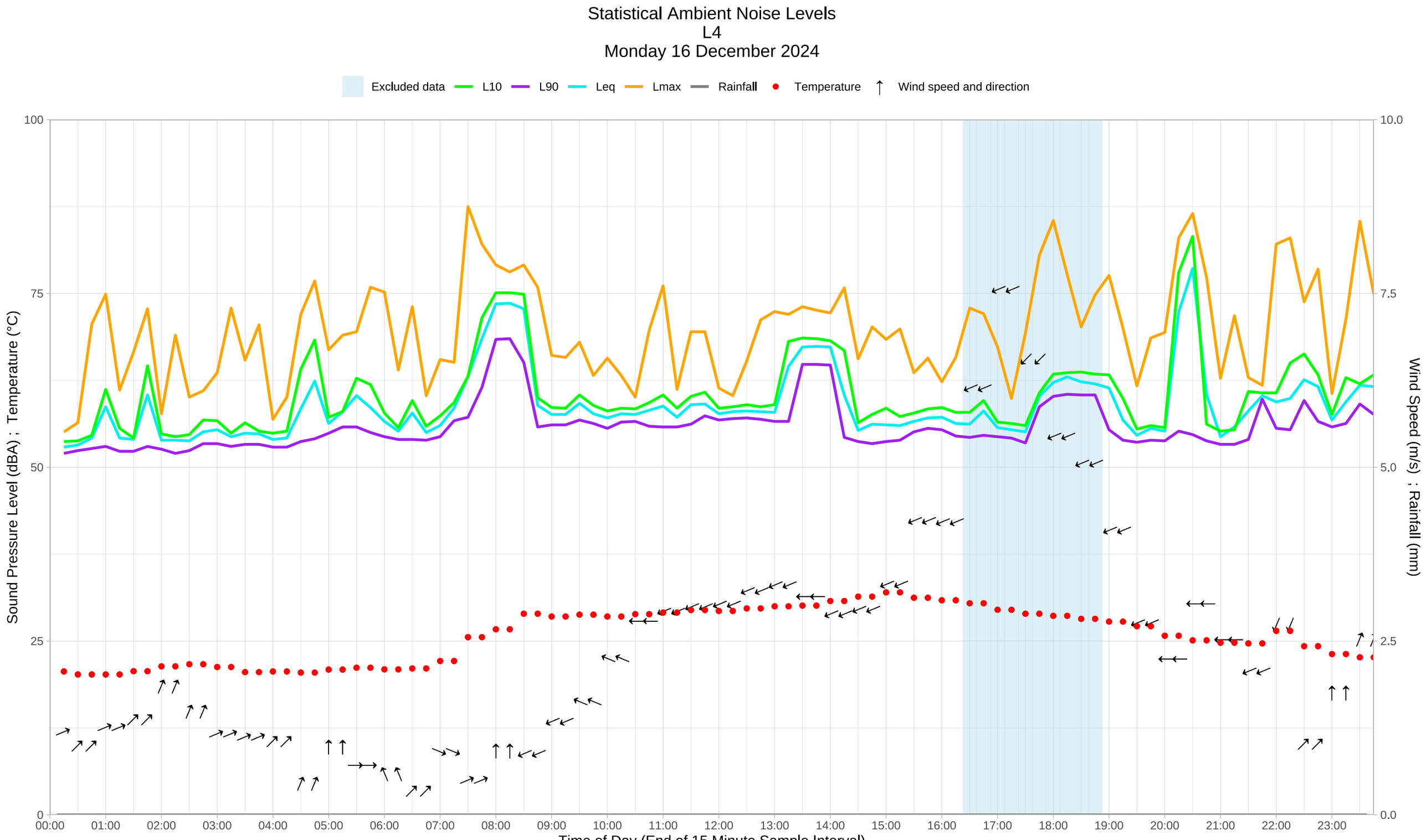
Wind Speed (m/s) ; Rainfall (mm)

Time of Day (End of 15 Minute Sample Interval)

Statistical Ambient Noise Levels
L4
Sunday 15 December 2024



Statistical Ambient Noise Levels
L4
Monday 16 December 2024



Statistical Ambient Noise Levels
L4
Tuesday 17 December 2024

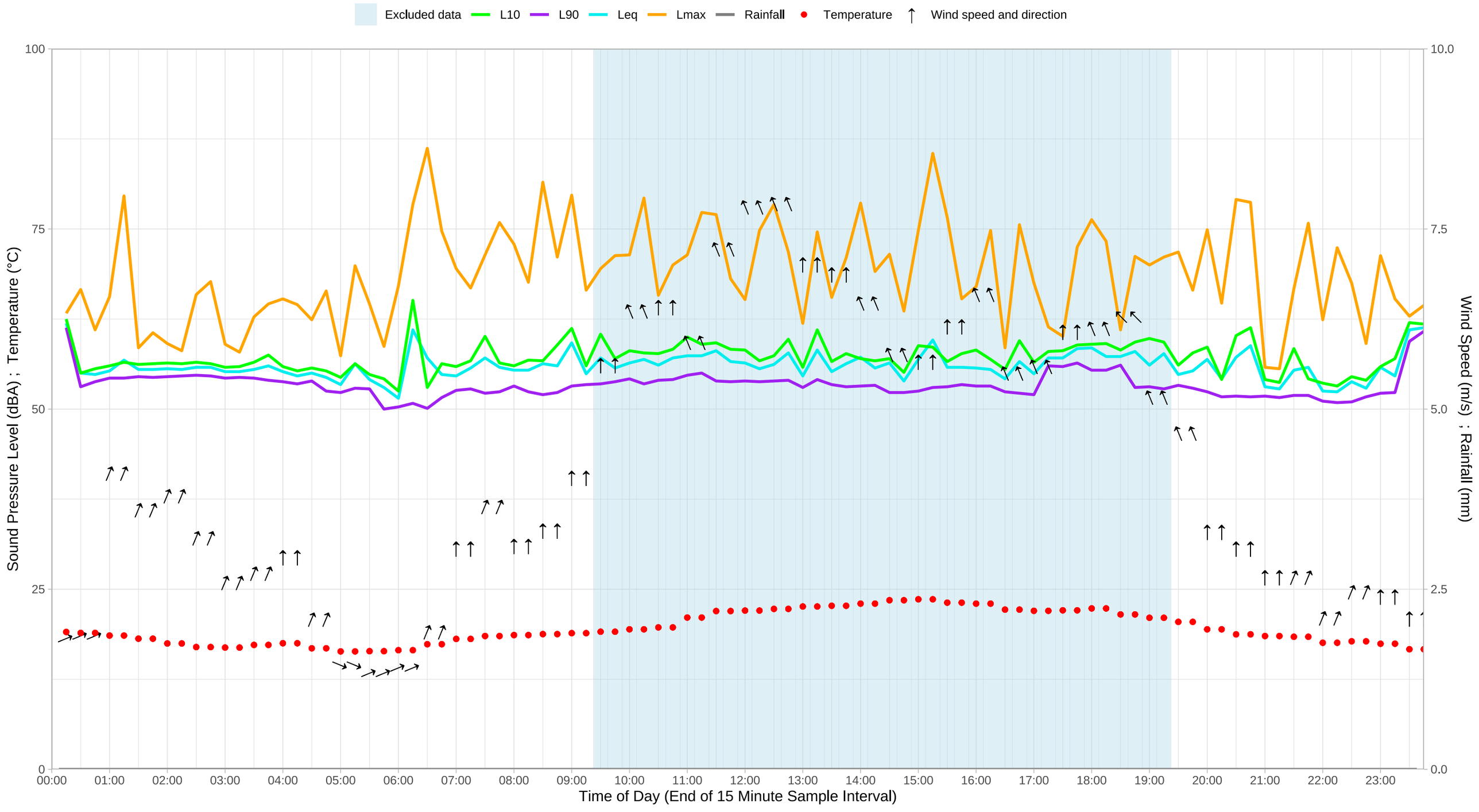
Excluded data | L10 | L90 | Leq | Lmax | Rainfall | Temperature | Wind speed and direction

Sound Pressure Level (dBA) ; Temperature (°C)

Wind Speed (m/s) ; Rainfall (mm)

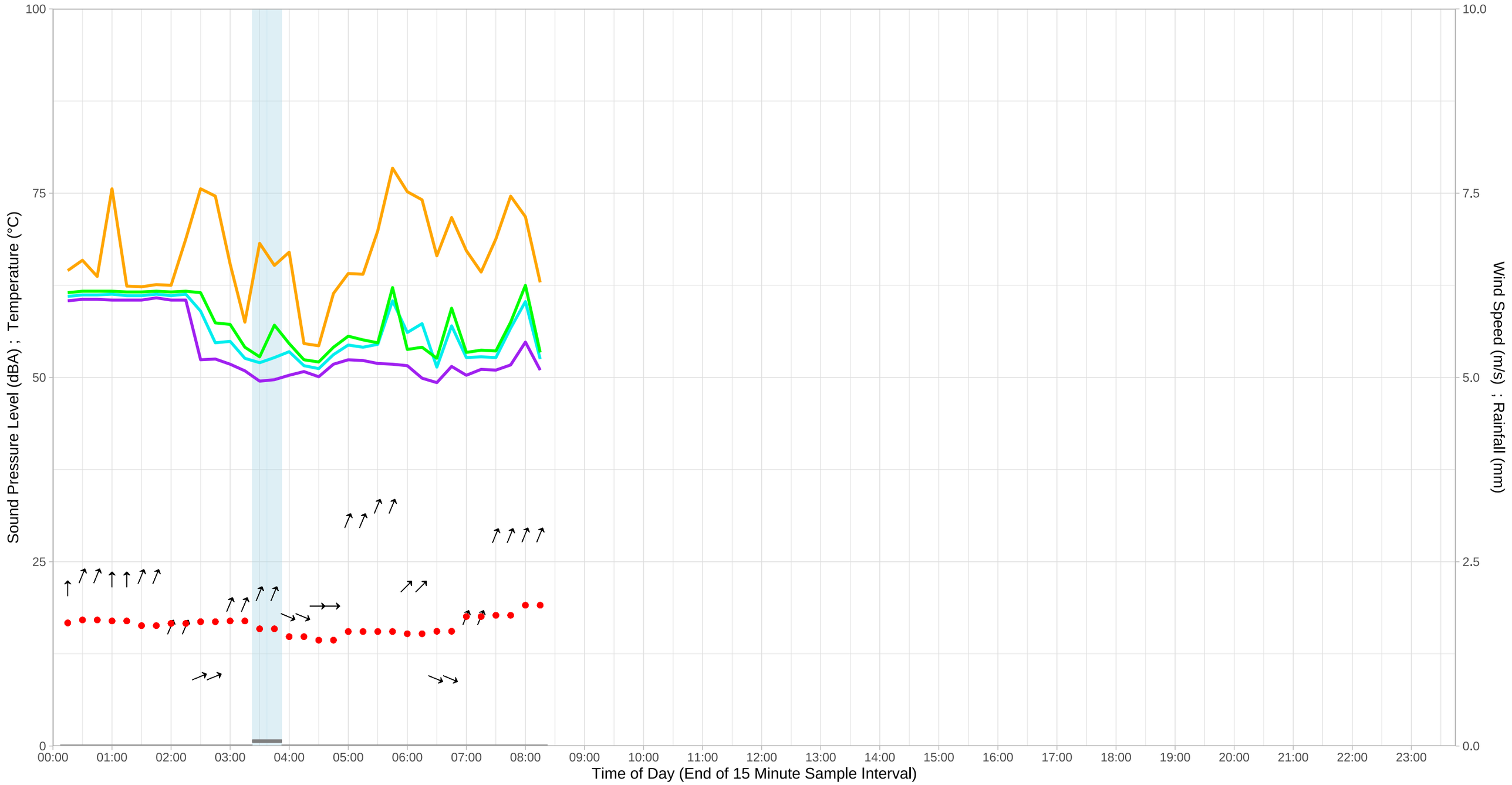
Time of Day (End of 15 Minute Sample Interval)

Statistical Ambient Noise Levels
L4
Wednesday 18 December 2024

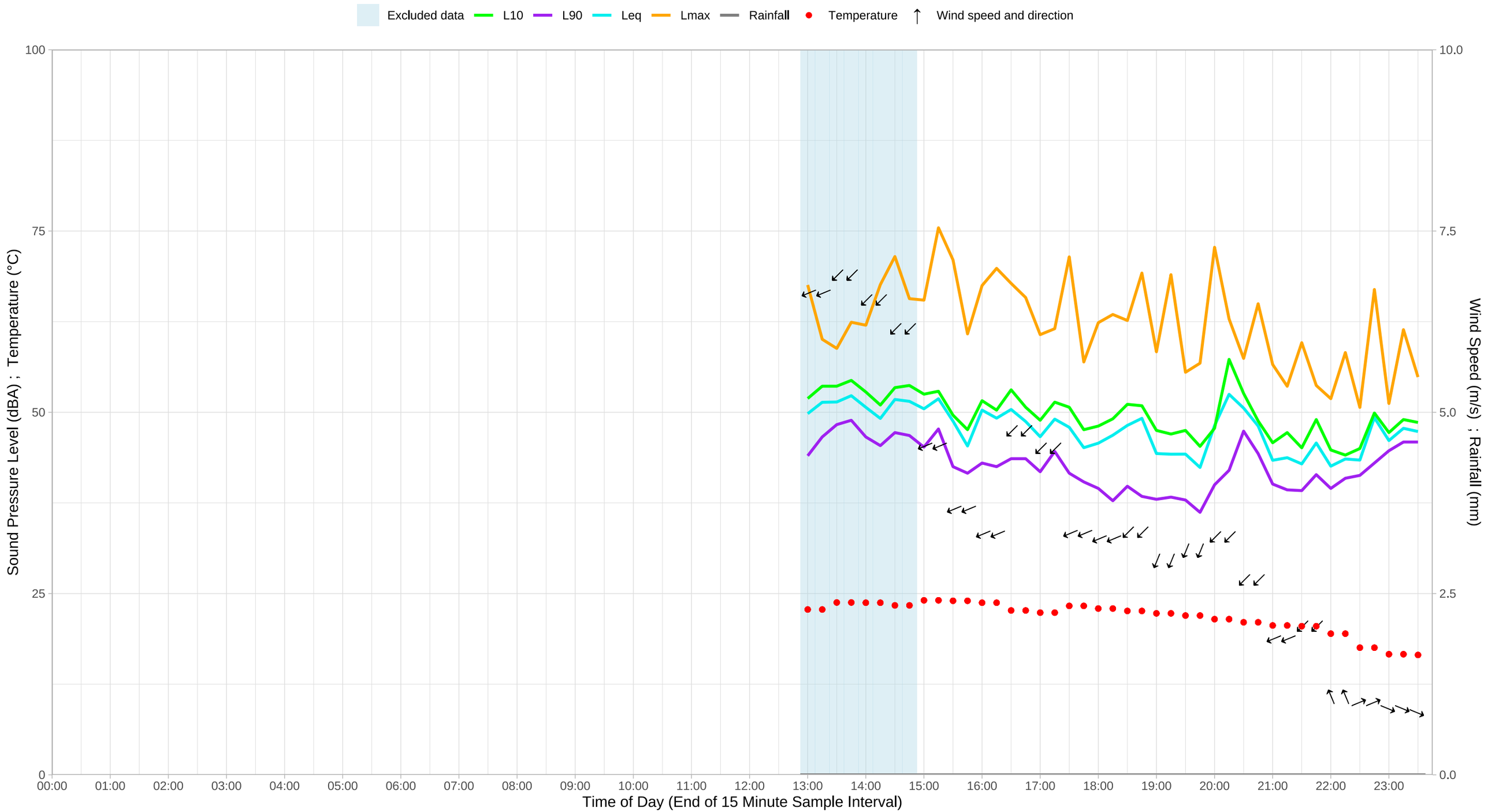


Statistical Ambient Noise Levels
L4
Thursday 19 December 2024

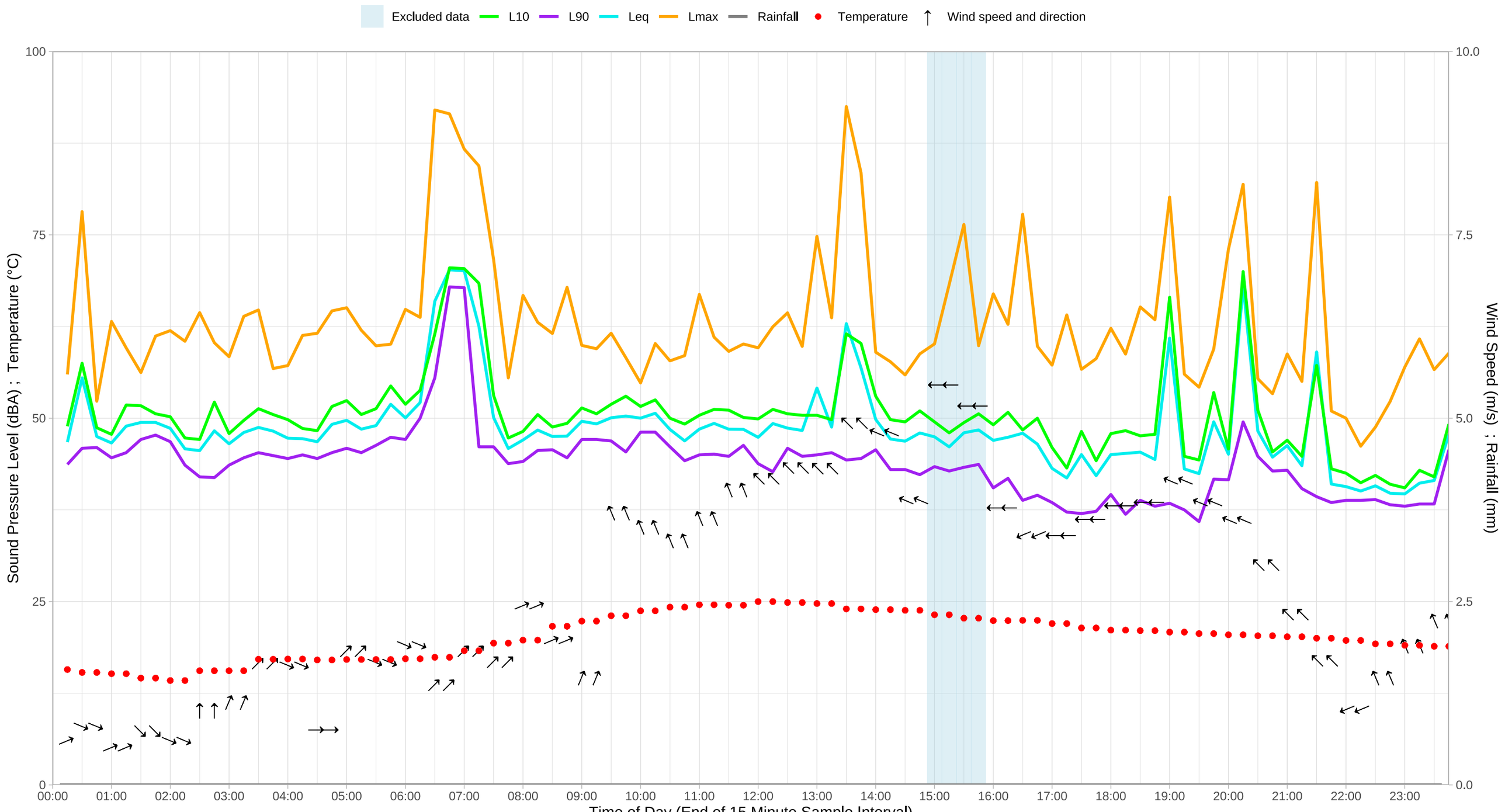
Excluded data | L10 | L90 | Leq | Lmax | Rainfall | Temperature | Wind speed and direction



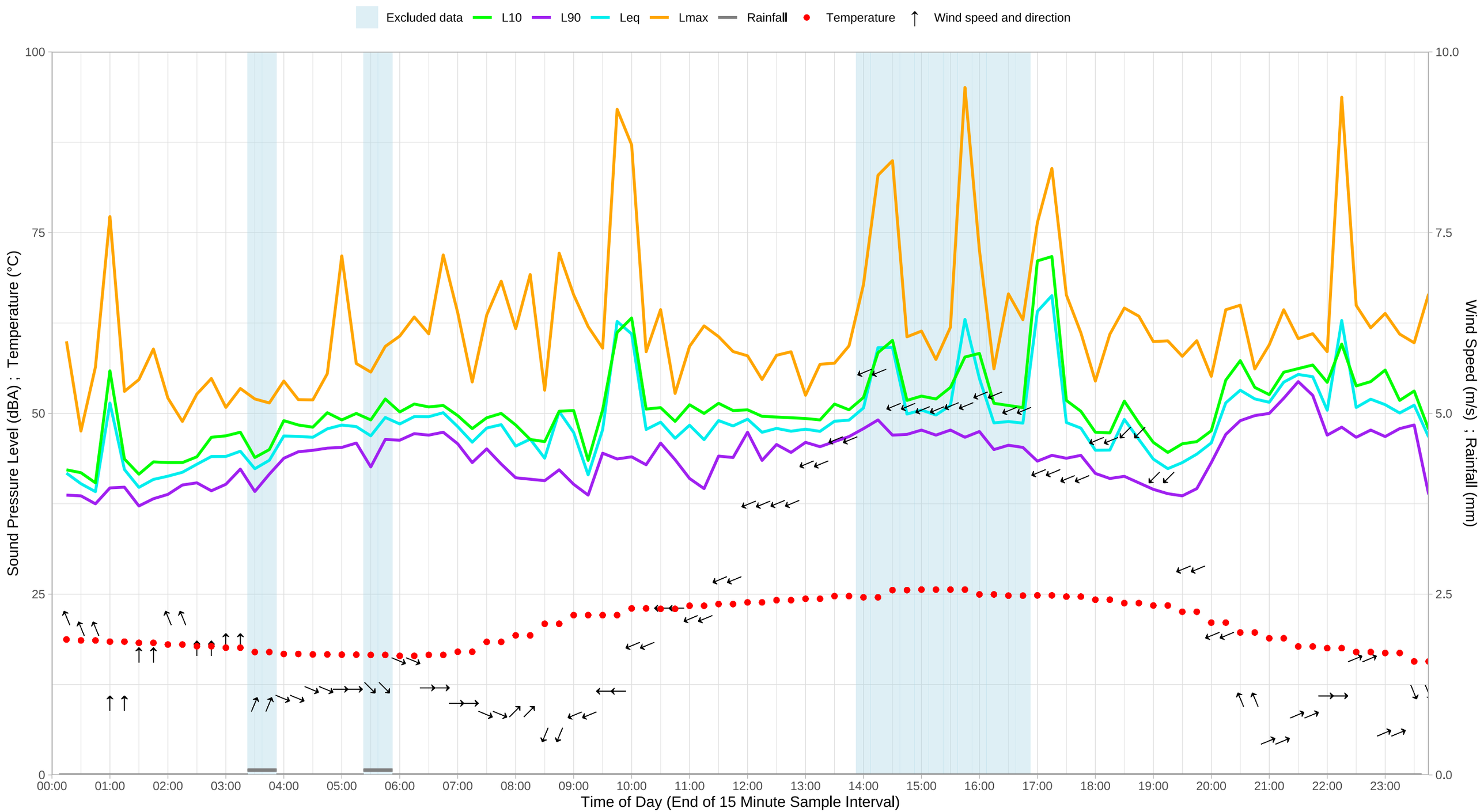
Statistical Ambient Noise Levels
L5
Monday 09 December 2024



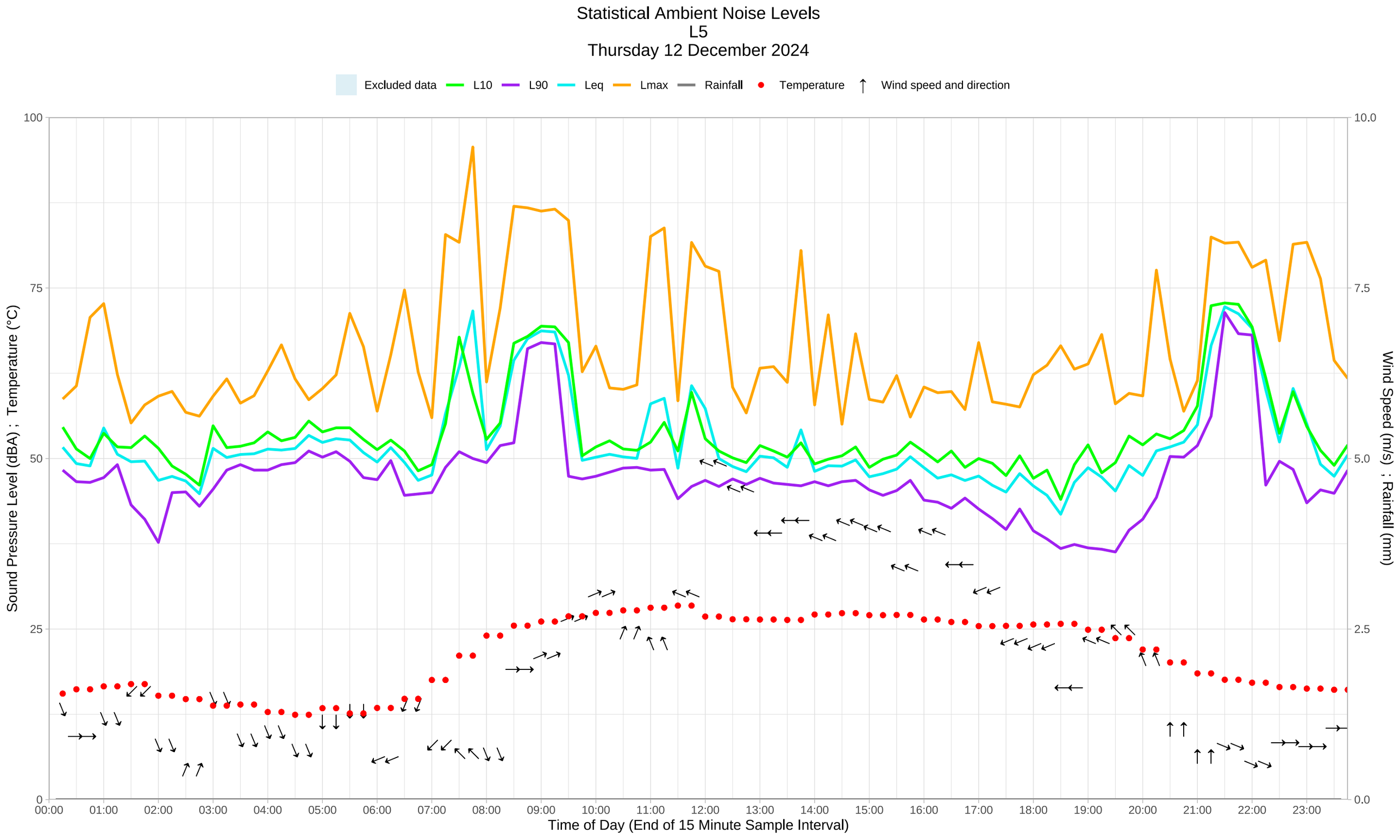
Statistical Ambient Noise Levels
L5
Tuesday 10 December 2024



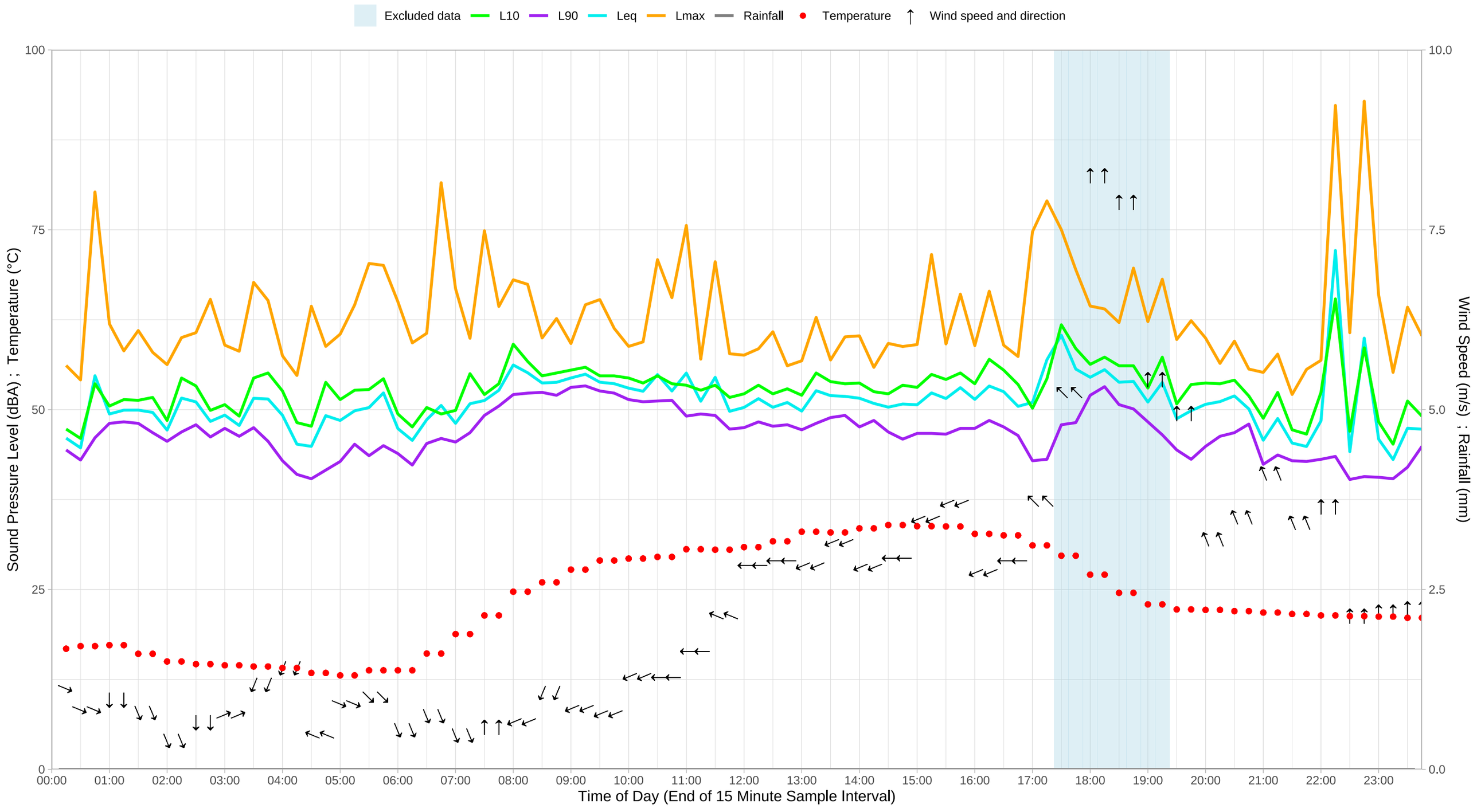
Statistical Ambient Noise Levels
L5
Wednesday 11 December 2024



Statistical Ambient Noise Levels
L5
Thursday 12 December 2024



Statistical Ambient Noise Levels
L5
Friday 13 December 2024



Statistical Ambient Noise Levels
L5
Saturday 14 December 2024

Excluded data | L10 | L90 | Leq | Lmax | Rainfall | Temperature | Wind speed and direction

Sound Pressure Level (dBA) ; Temperature (°C)

Wind Speed (m/s) ; Rainfall (mm)

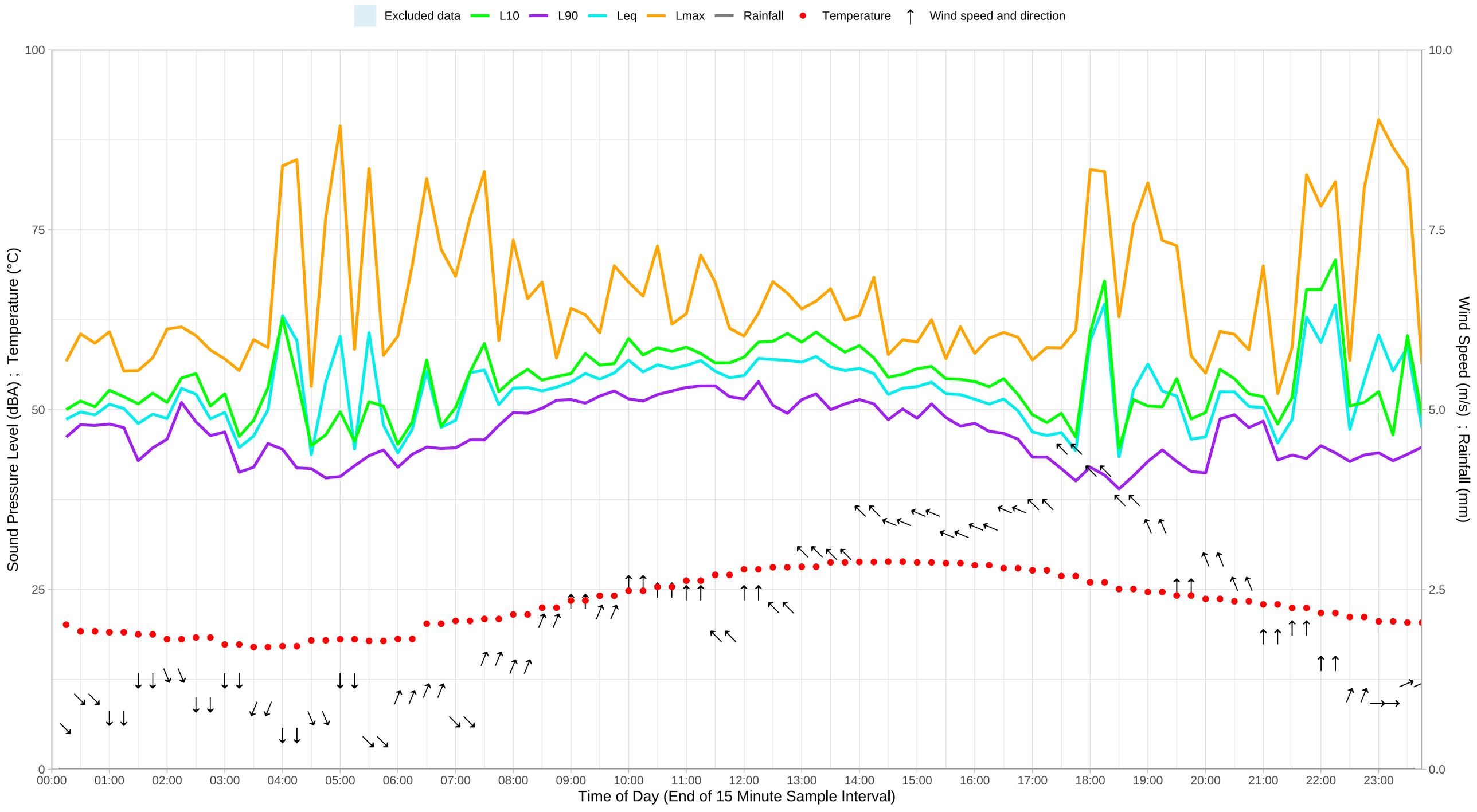
100
75
50
25
0

10.0
7.5
5.0
2.5
0.0

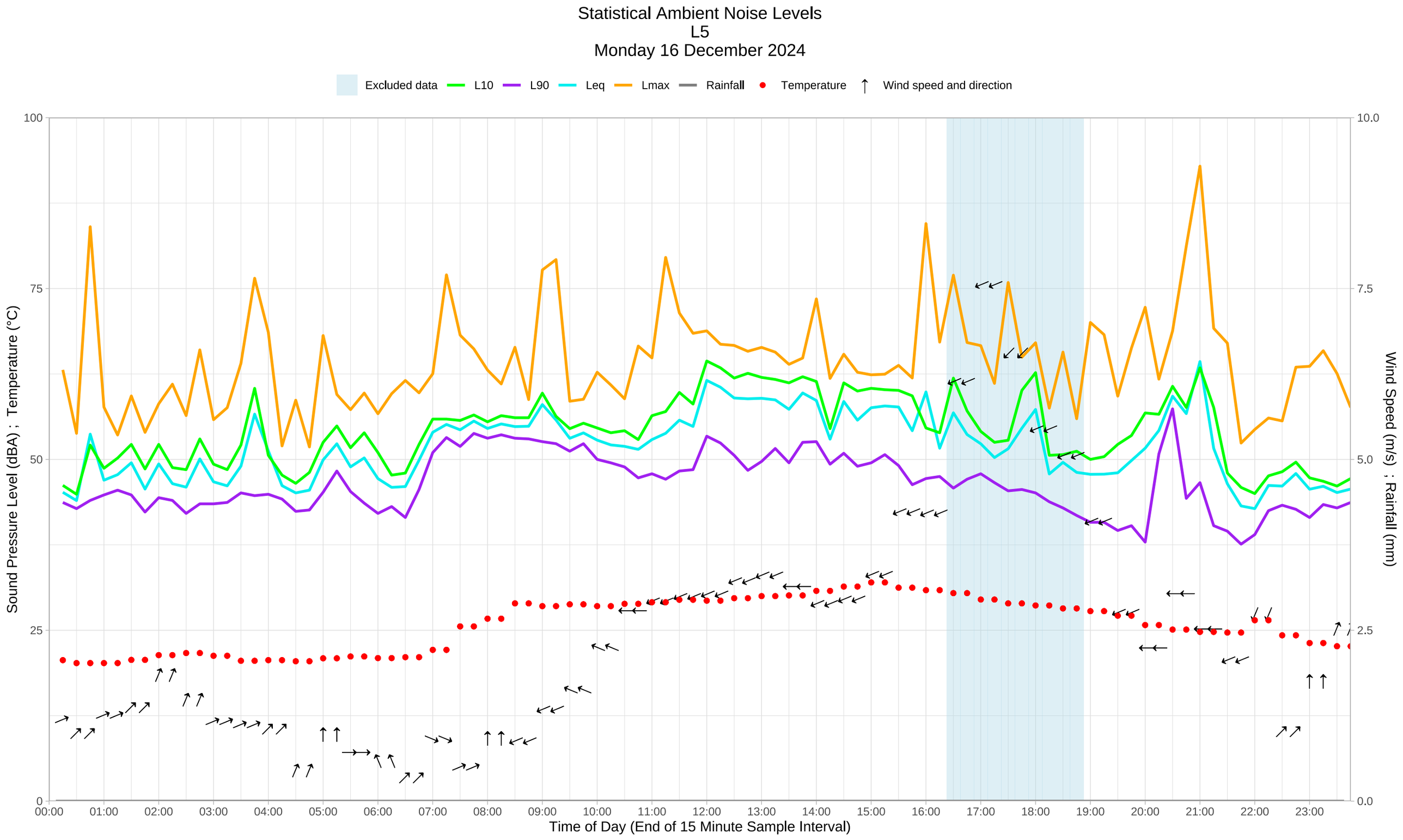
00:00 01:00 02:00 03:00 04:00 05:00 06:00 07:00 08:00 09:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00

Time of Day (End of 15 Minute Sample Interval)

Statistical Ambient Noise Levels
L5
Sunday 15 December 2024



Statistical Ambient Noise Levels
L5
Monday 16 December 2024



Statistical Ambient Noise Levels
L5
Tuesday 17 December 2024

Excluded data | L10 | L90 | Leq | Lmax | Rainfall | Temperature | Wind speed and direction

Sound Pressure Level (dBA) ; Temperature (°C)

Wind Speed (m/s) ; Rainfall (mm)

Time of Day (End of 15 Minute Sample Interval)

Statistical Ambient Noise Levels
L5
Wednesday 18 December 2024

Excluded data | L10 | L90 | Leq | Lmax | Rainfall | Temperature | Wind speed and direction

Sound Pressure Level (dBA) ; Temperature (°C)

100
75
50
25
0

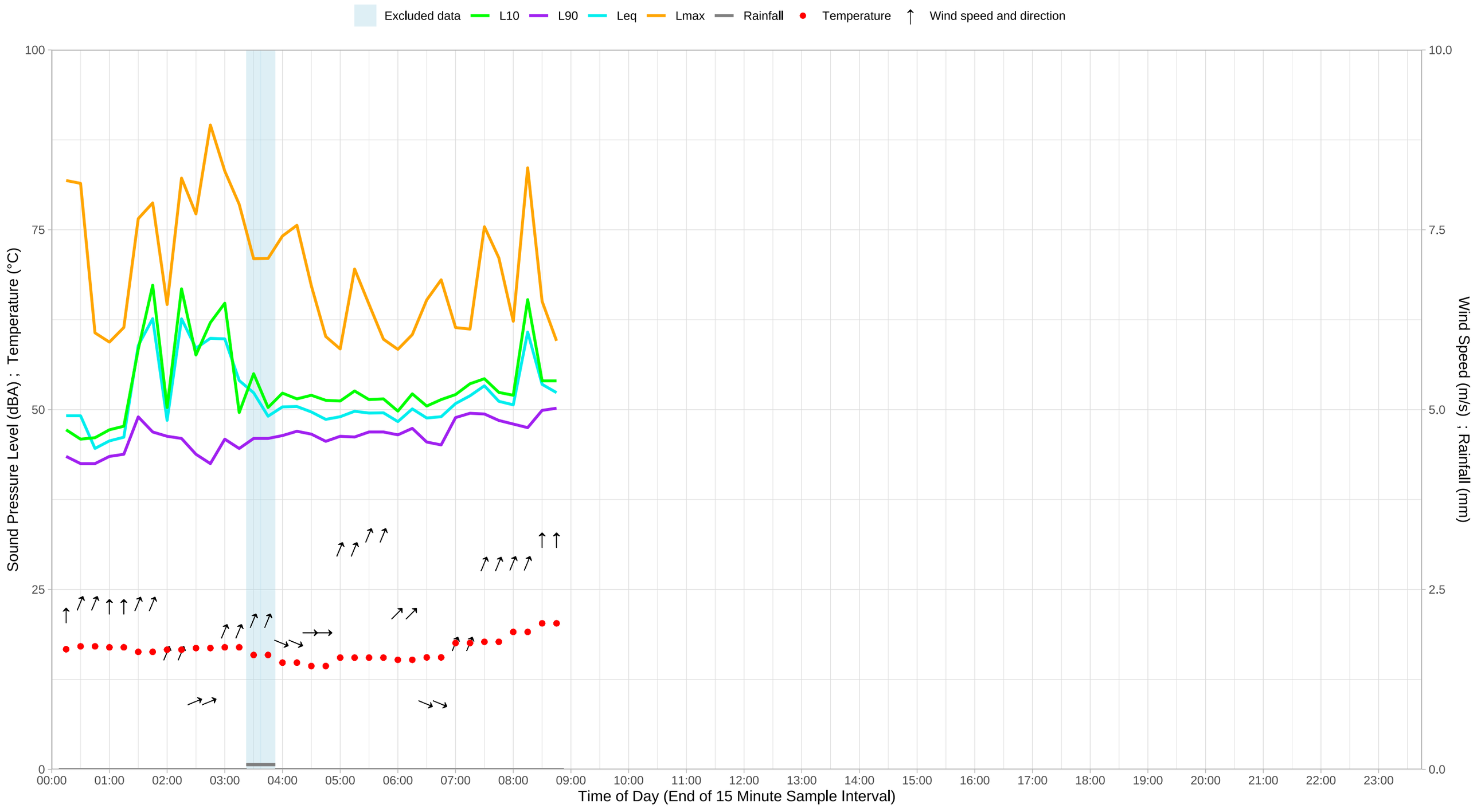
10.0
7.5
5.0
2.5
0.0

Wind Speed (m/s) ; Rainfall (mm)

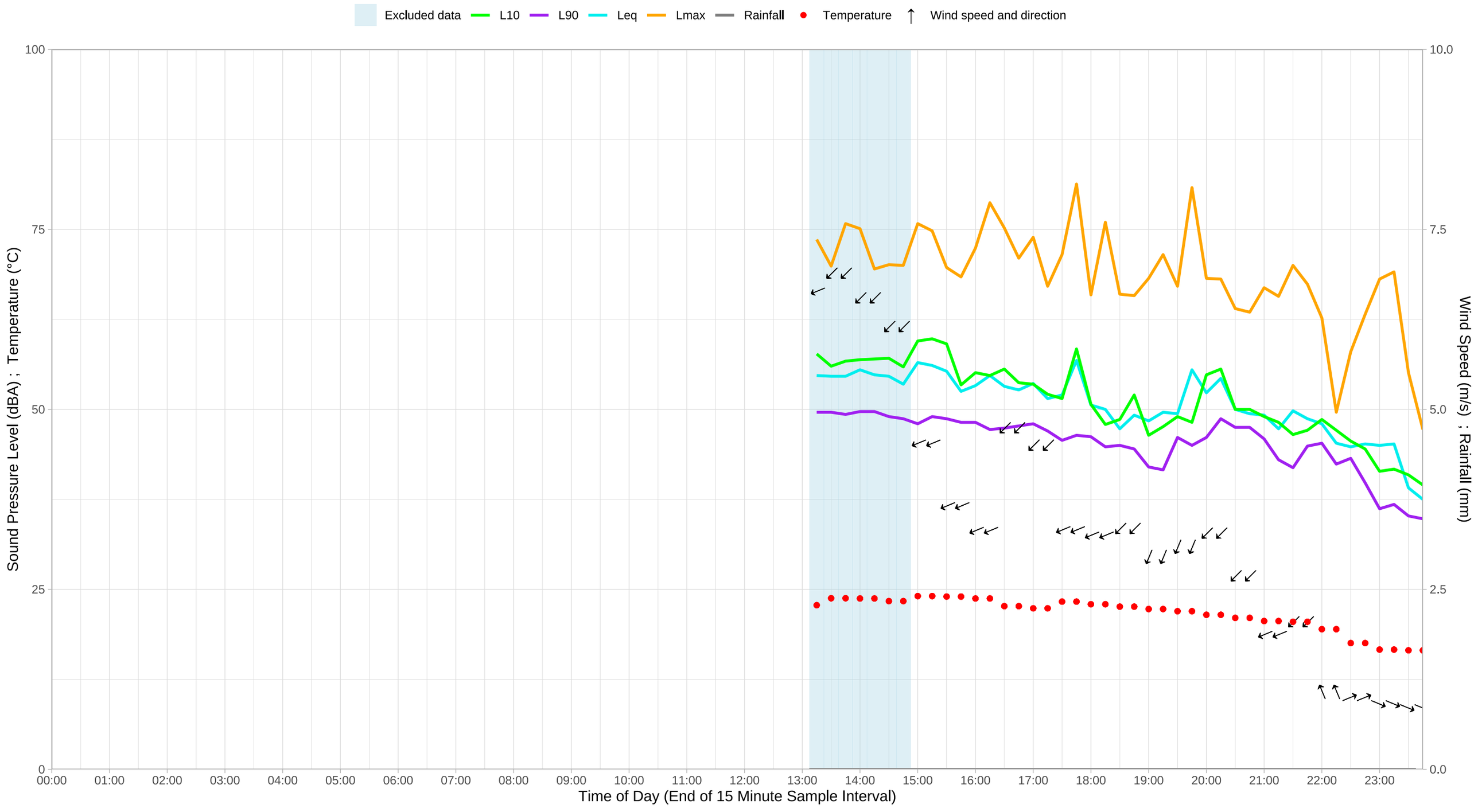
00:00 01:00 02:00 03:00 04:00 05:00 06:00 07:00 08:00 09:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00

Time of Day (End of 15 Minute Sample Interval)

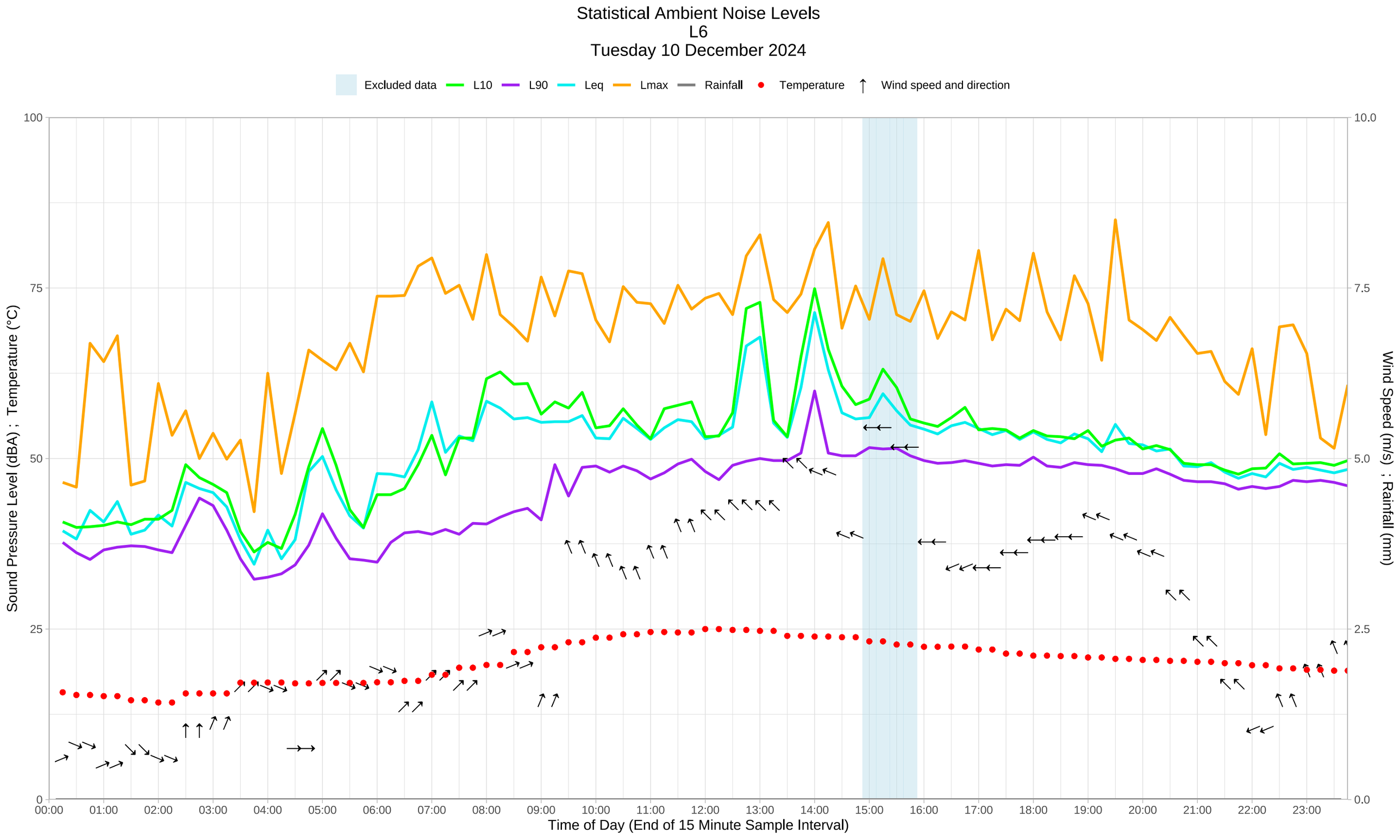
Statistical Ambient Noise Levels
L5
Thursday 19 December 2024



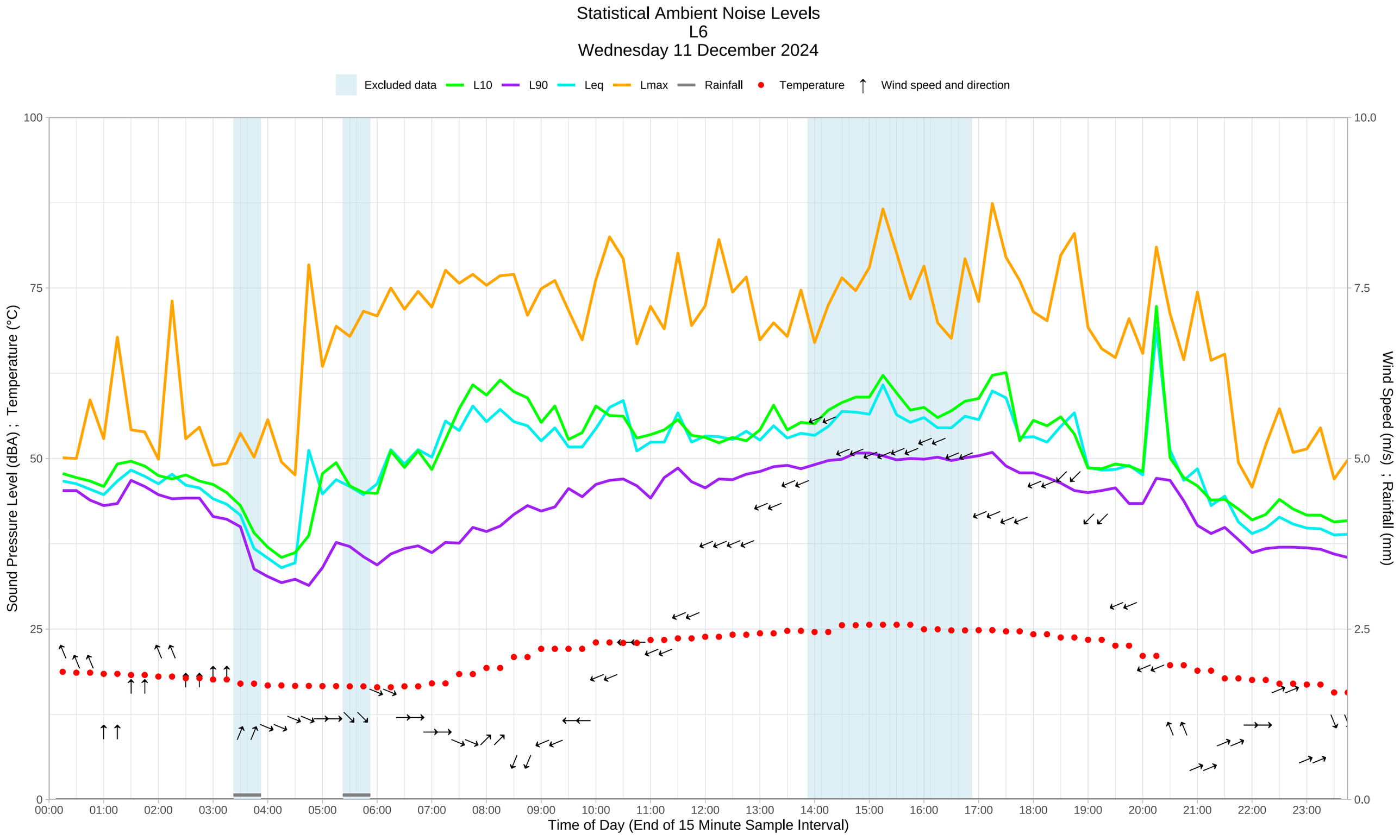
Statistical Ambient Noise Levels
L6
Monday 09 December 2024



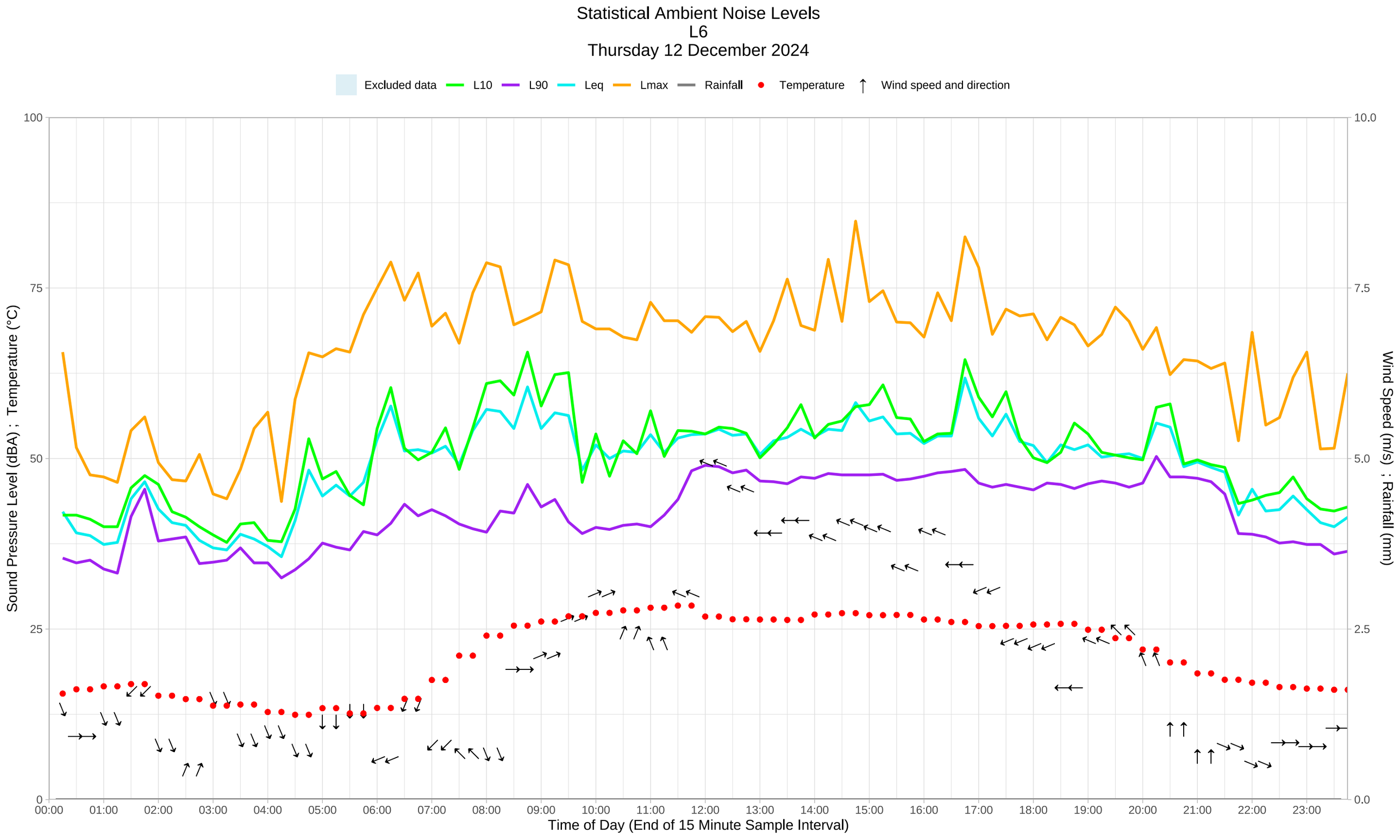
Statistical Ambient Noise Levels
L6
Tuesday 10 December 2024



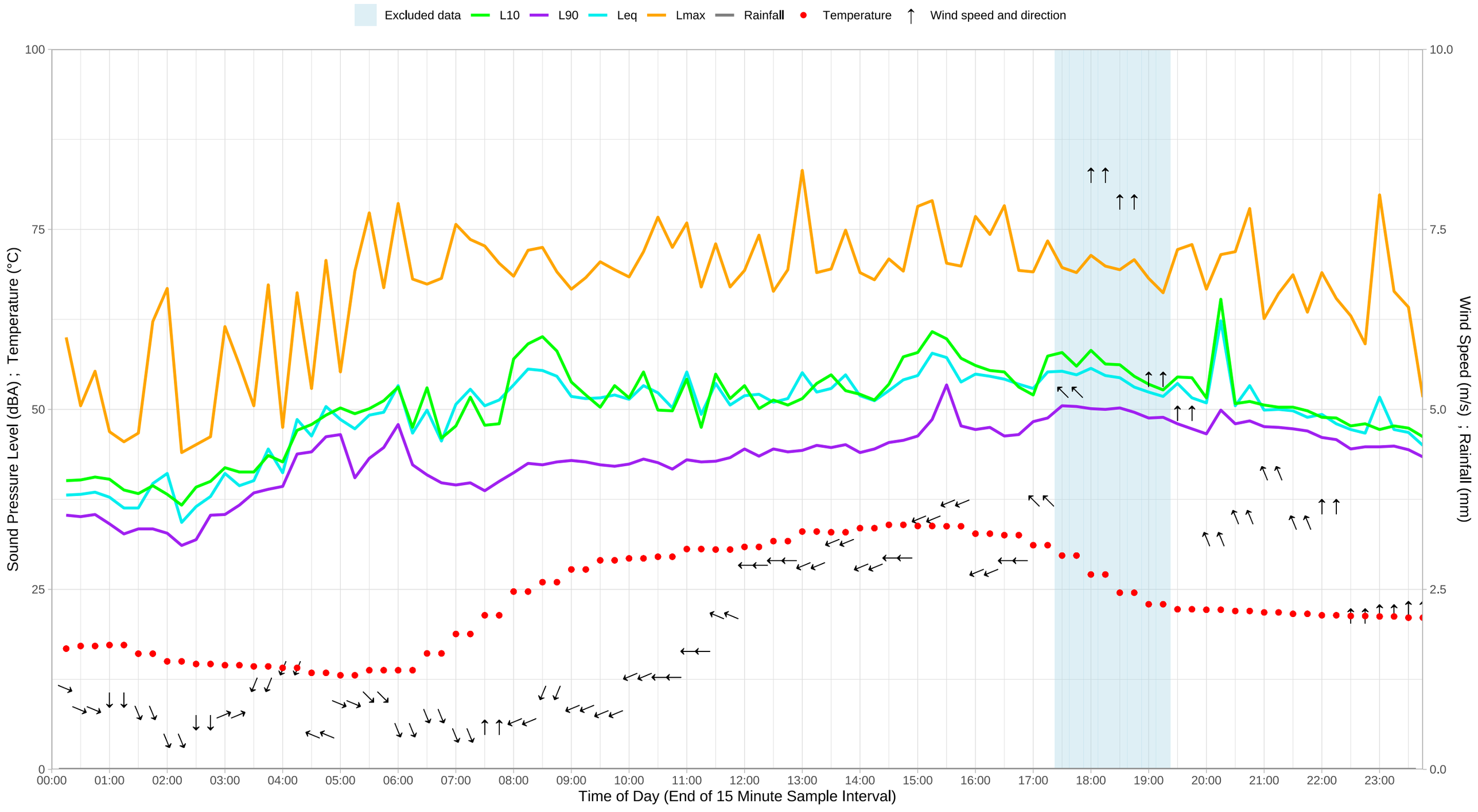
Statistical Ambient Noise Levels
L6
Wednesday 11 December 2024



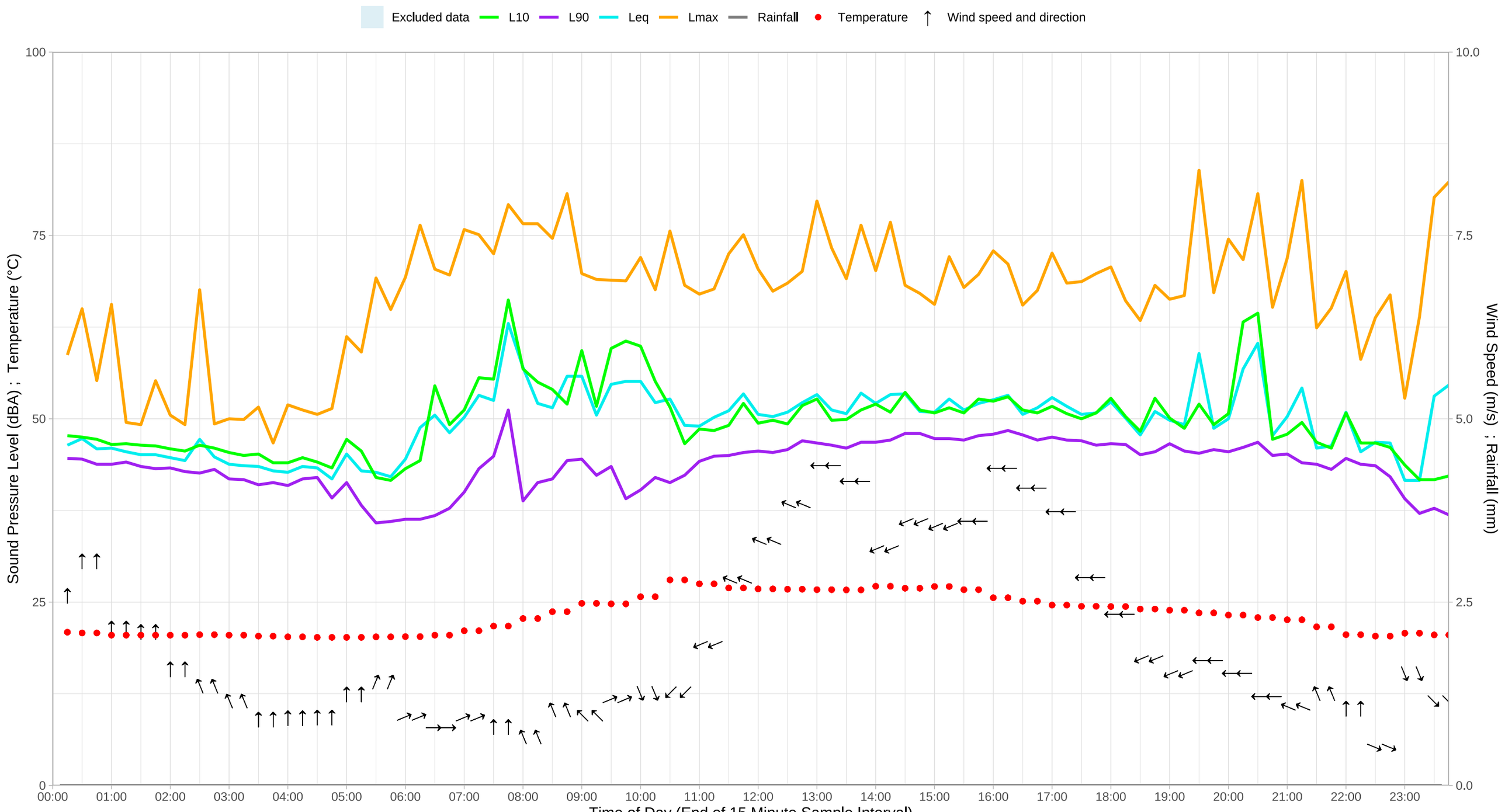
Statistical Ambient Noise Levels
L6
Thursday 12 December 2024



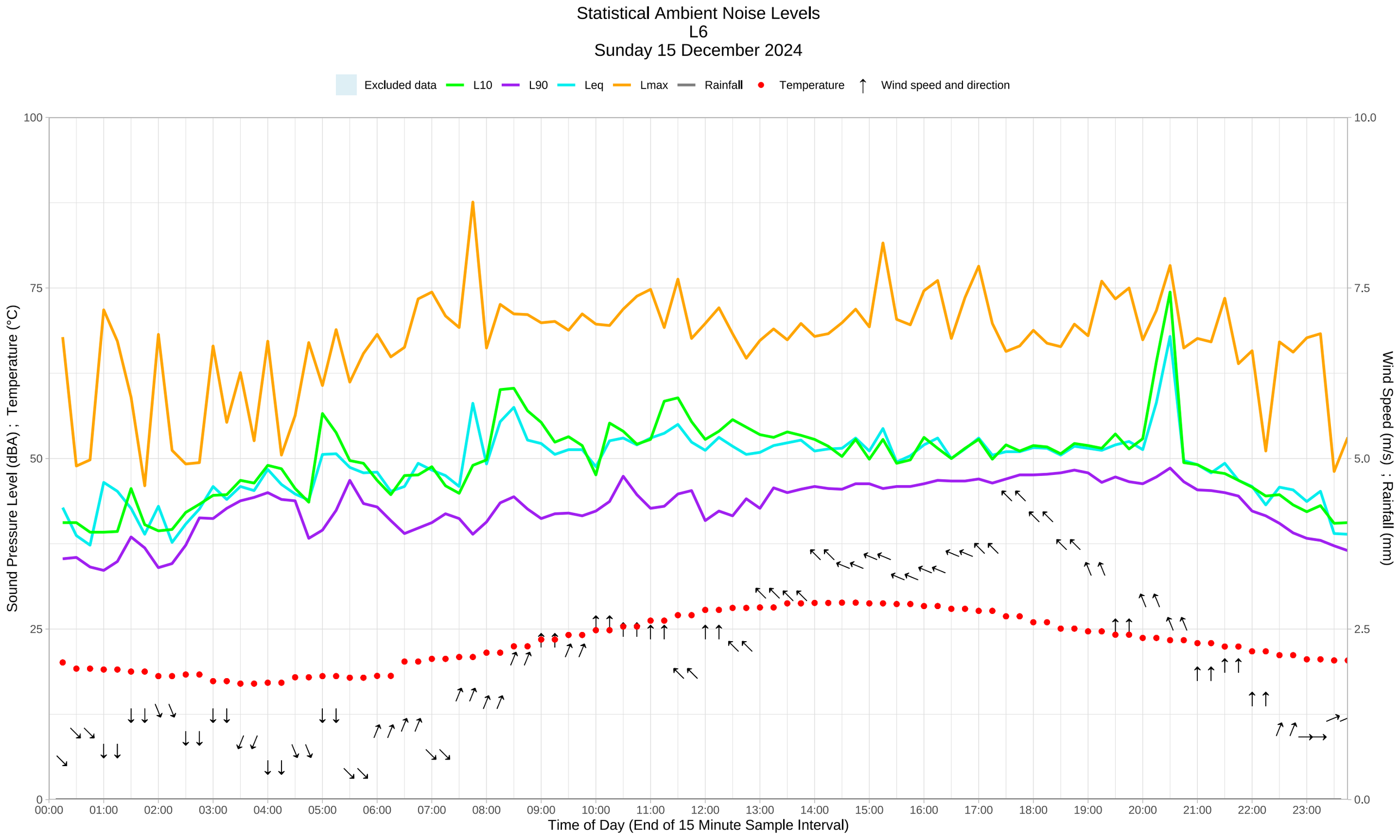
Statistical Ambient Noise Levels
L6
Friday 13 December 2024



Statistical Ambient Noise Levels
L6
Saturday 14 December 2024



Statistical Ambient Noise Levels
L6
Sunday 15 December 2024



Statistical Ambient Noise Levels
L6
Monday 16 December 2024

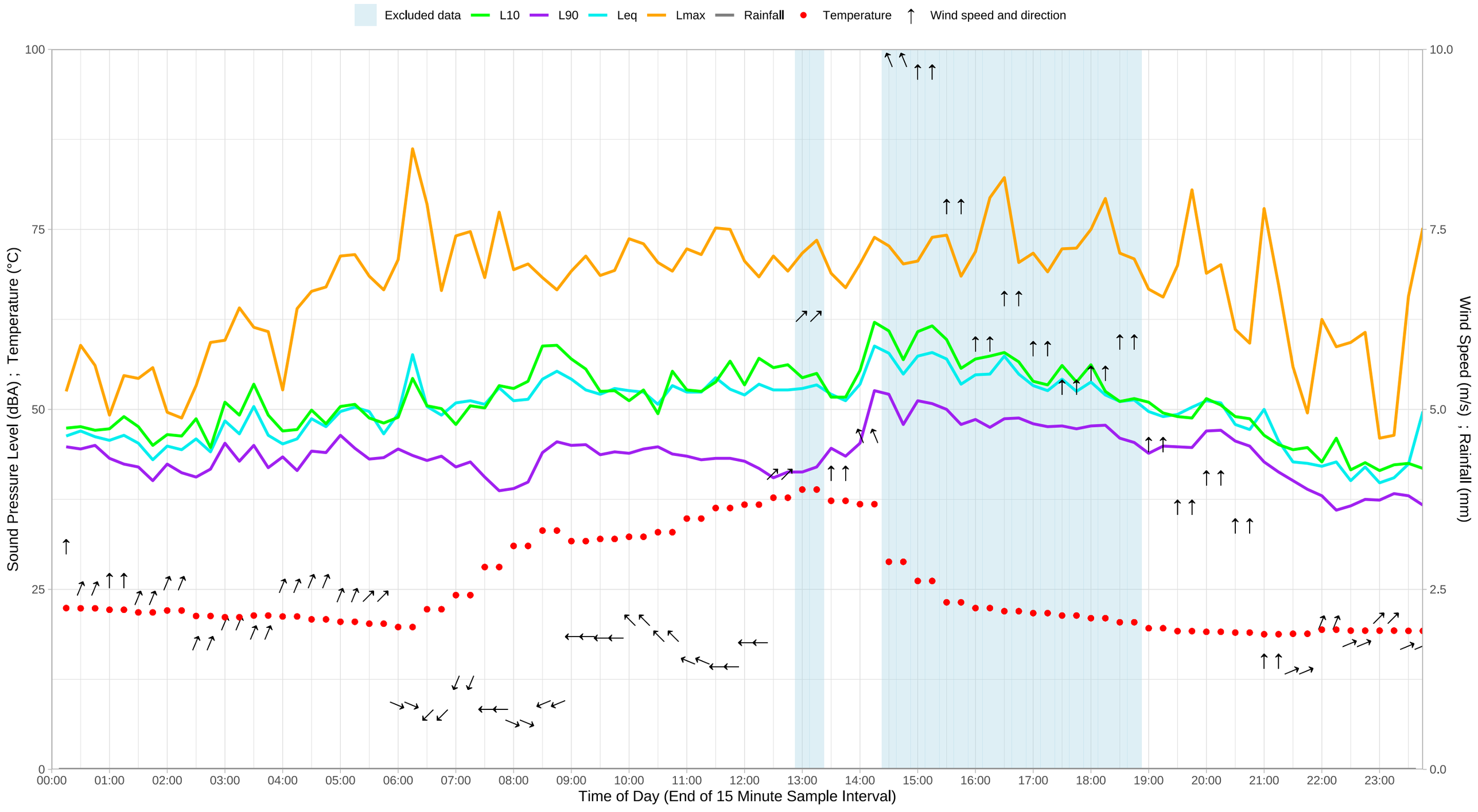
Excluded data | L10 | L90 | Leq | Lmax | Rainfall | Temperature | Wind speed and direction

Sound Pressure Level (dBA) ; Temperature (°C)

Wind Speed (m/s) ; Rainfall (mm)

Time of Day (End of 15 Minute Sample Interval)

Statistical Ambient Noise Levels
L6
Tuesday 17 December 2024



Statistical Ambient Noise Levels
L6
Wednesday 18 December 2024

Excluded data | L10 | L90 | Leq | Lmax | Rainfall | Temperature | Wind speed and direction

Sound Pressure Level (dBA) ; Temperature (°C)

100
75
50
25
0

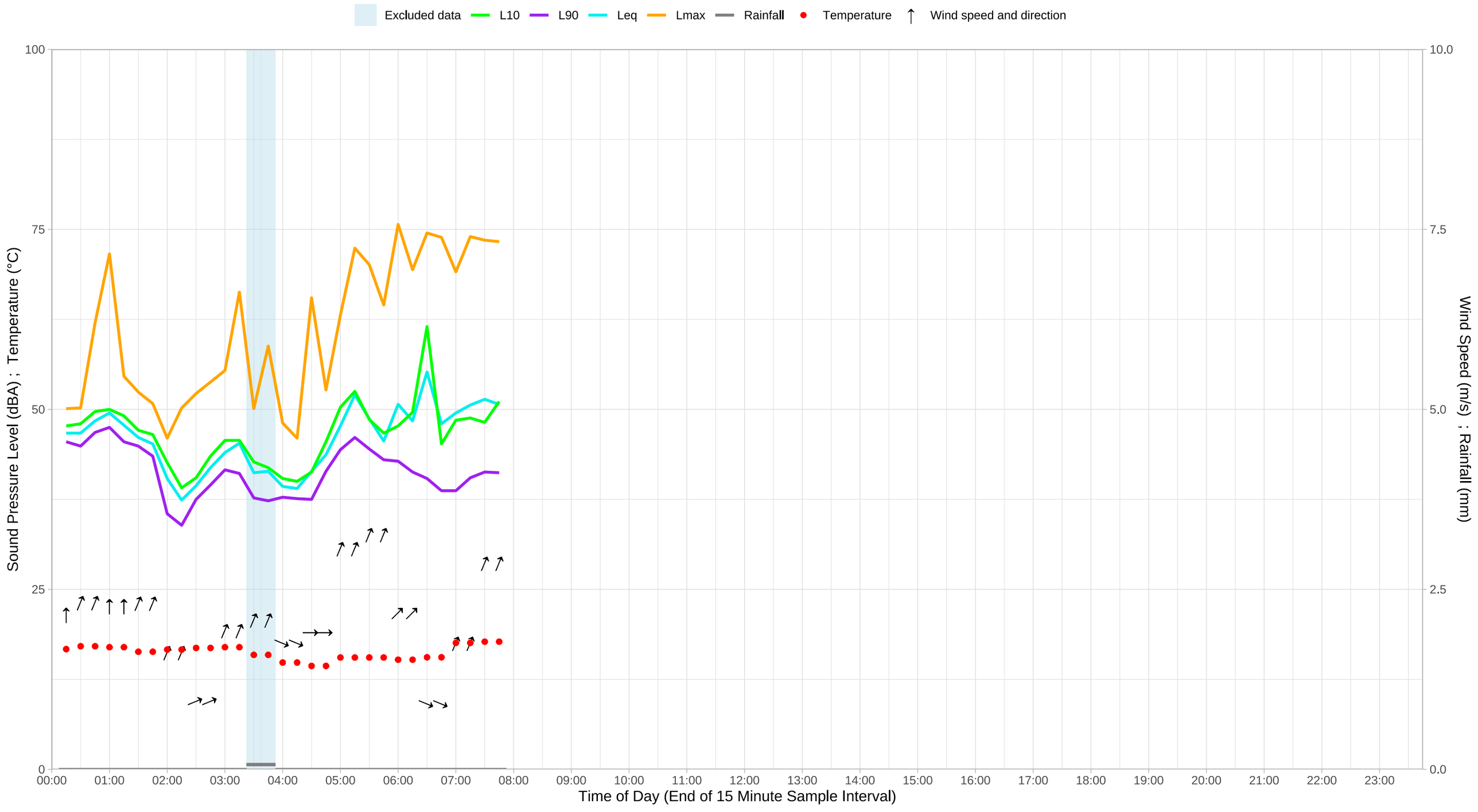
Wind Speed (m/s) ; Rainfall (mm)

10.0
7.5
5.0
2.5
0.0

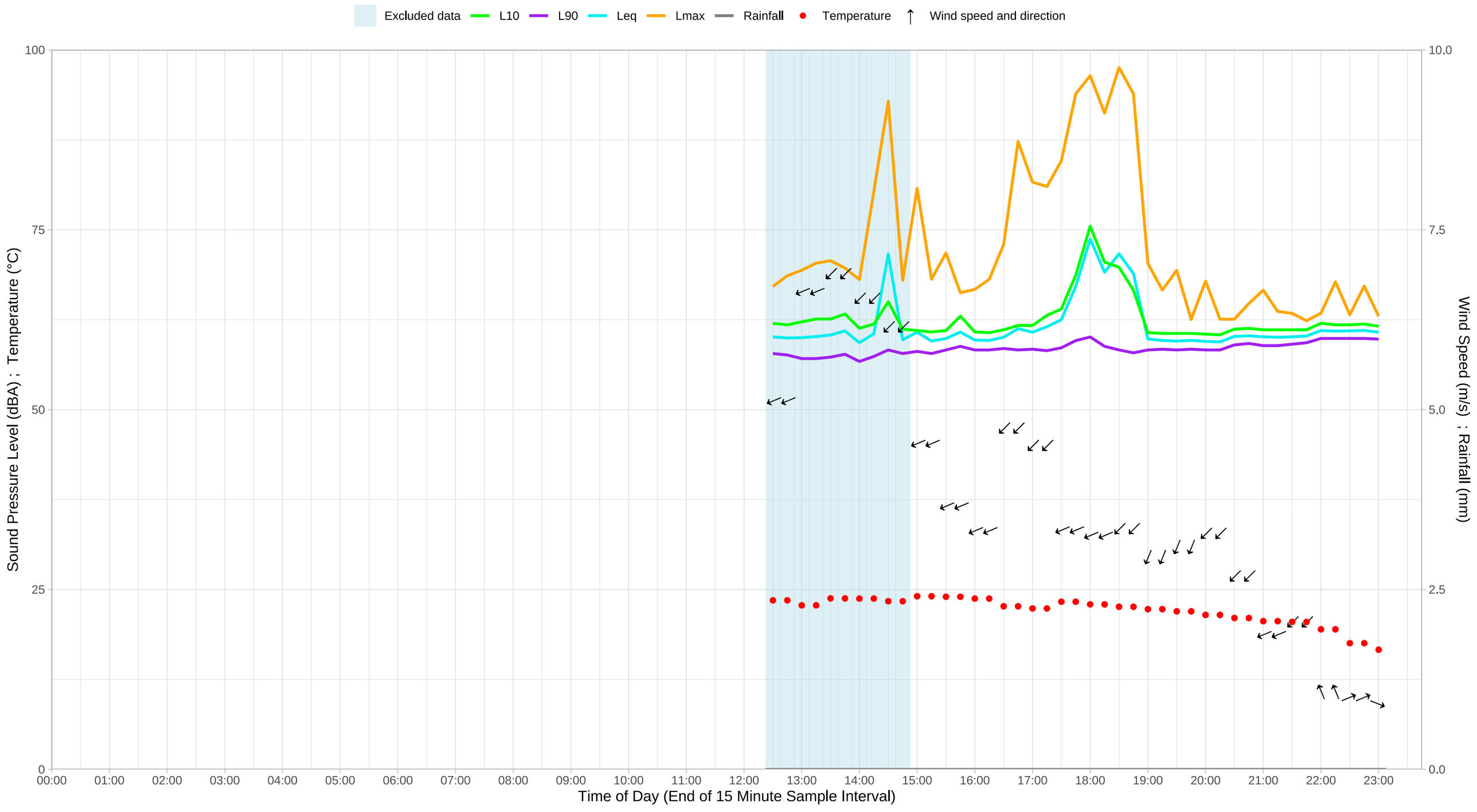
00:00 01:00 02:00 03:00 04:00 05:00 06:00 07:00 08:00 09:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00

Time of Day (End of 15 Minute Sample Interval)

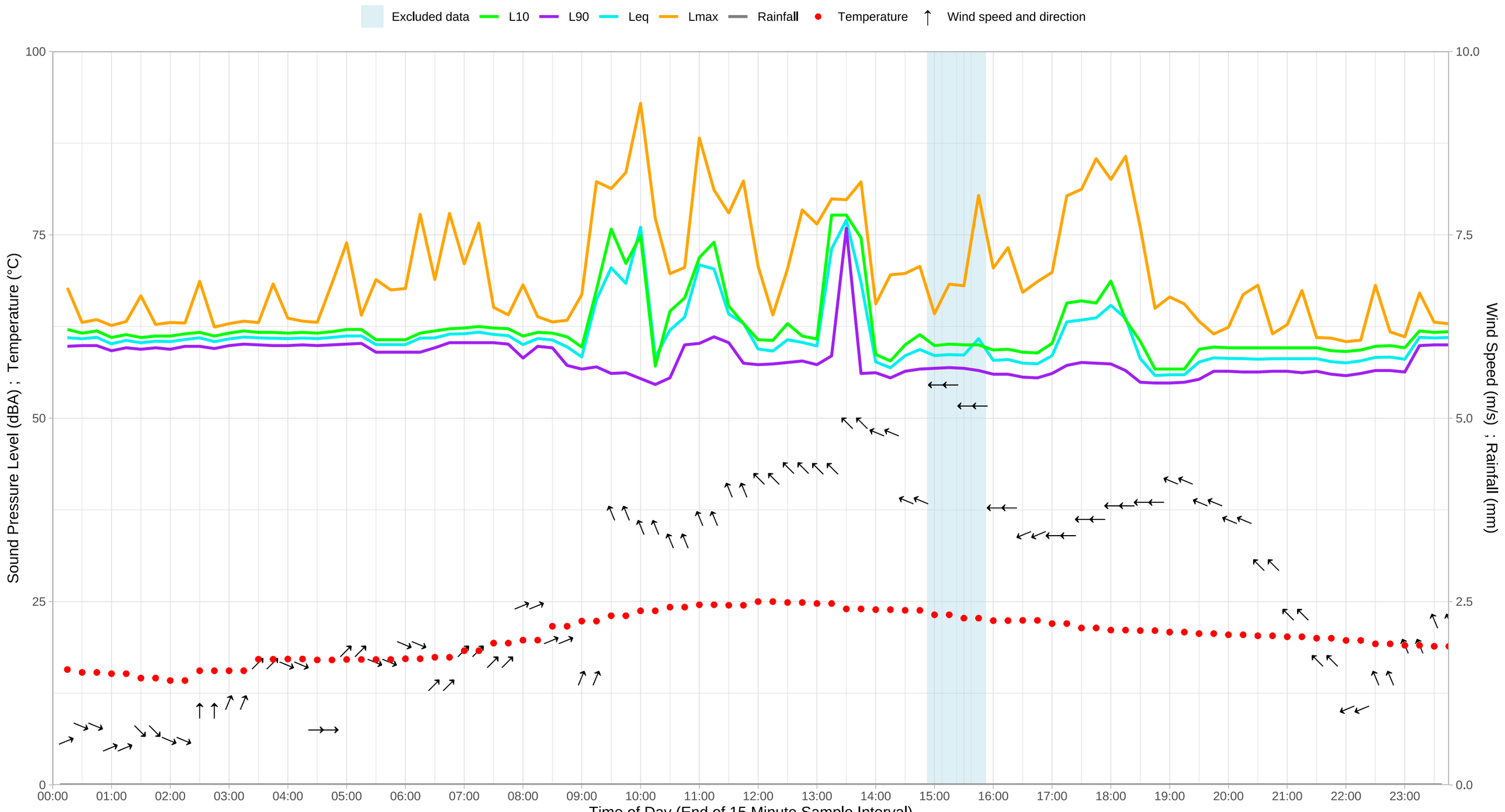
Statistical Ambient Noise Levels
L6
Thursday 19 December 2024



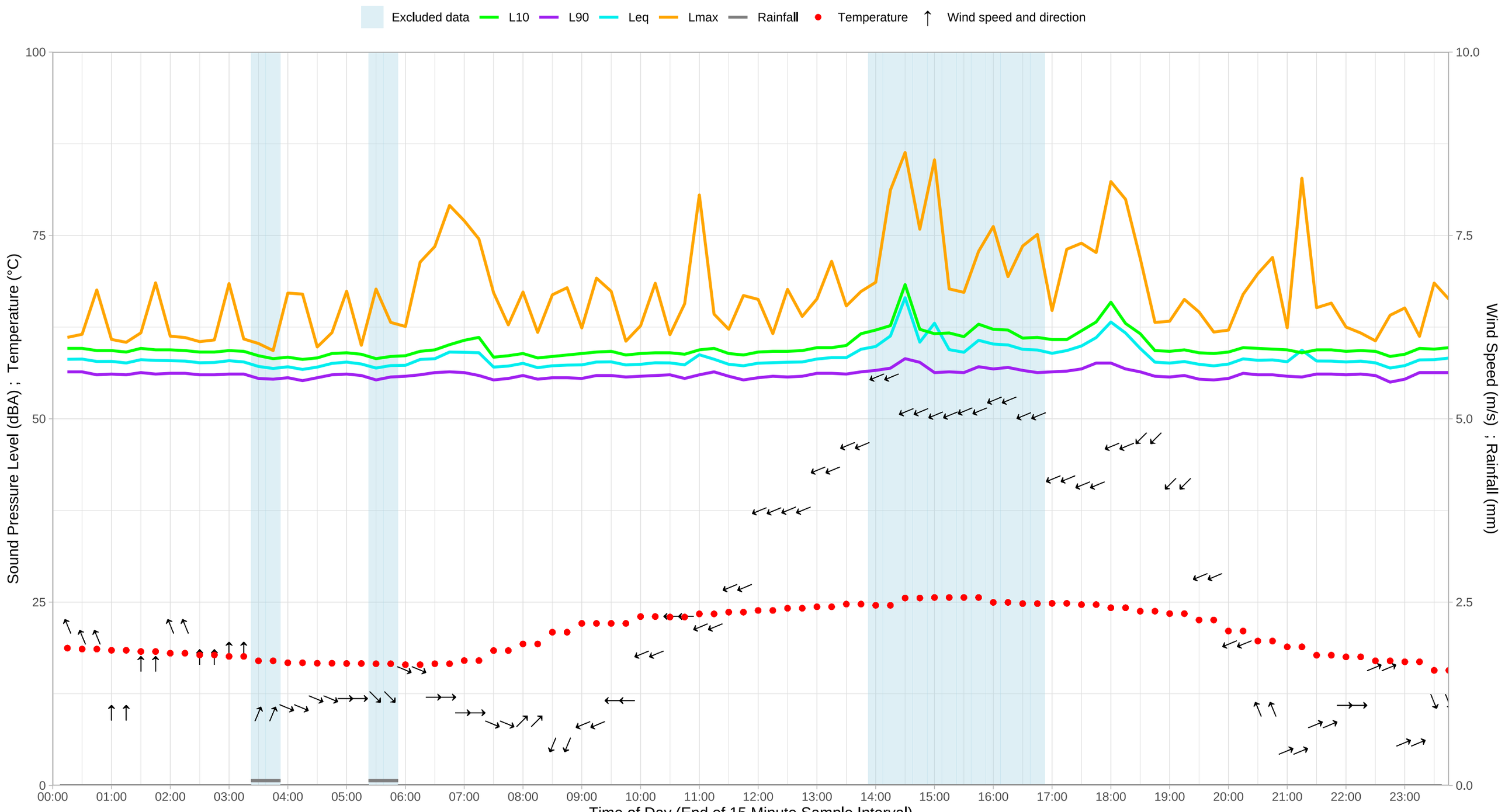
Statistical Ambient Noise Levels
L8
Monday 09 December 2024



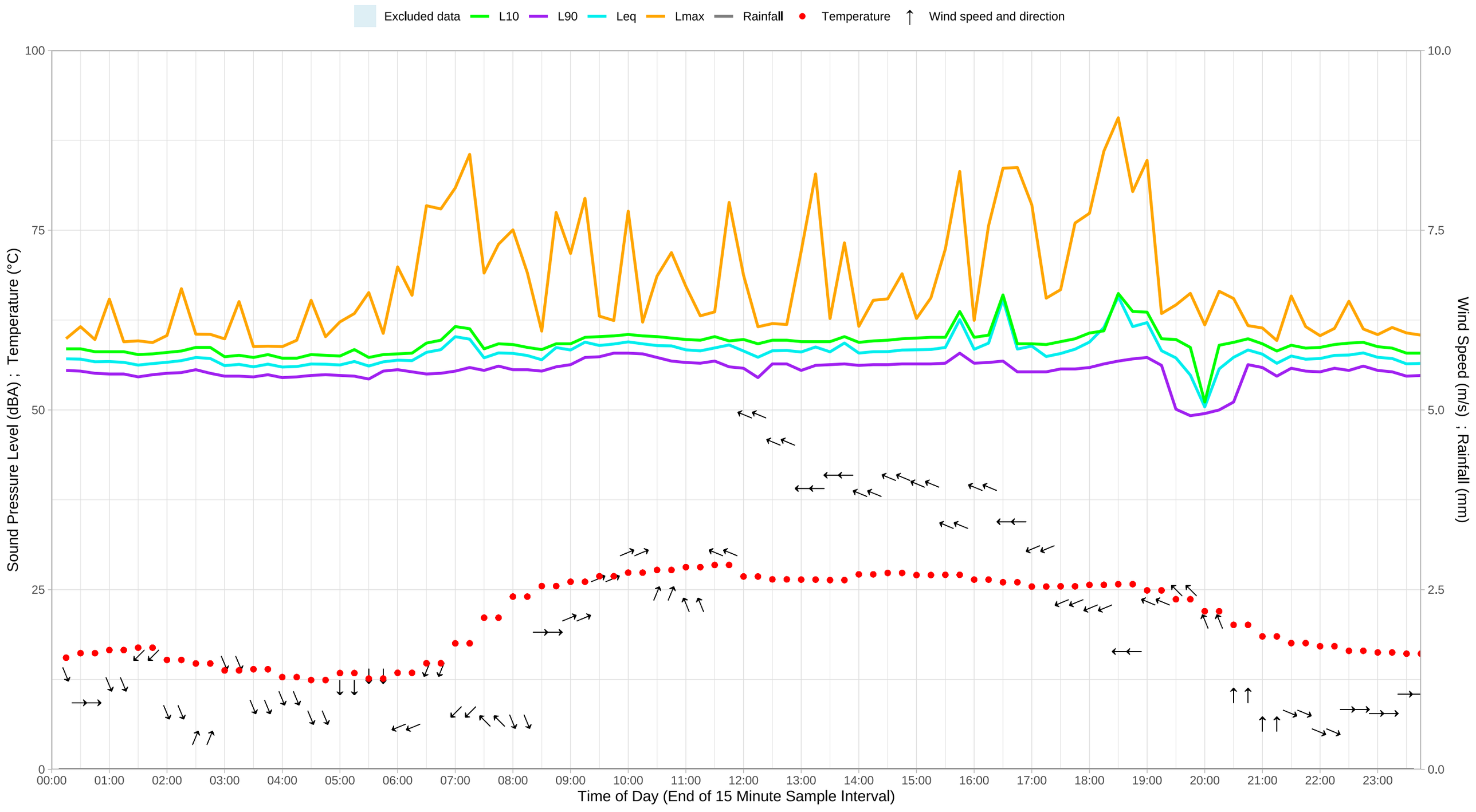
Statistical Ambient Noise Levels
L8
Tuesday 10 December 2024



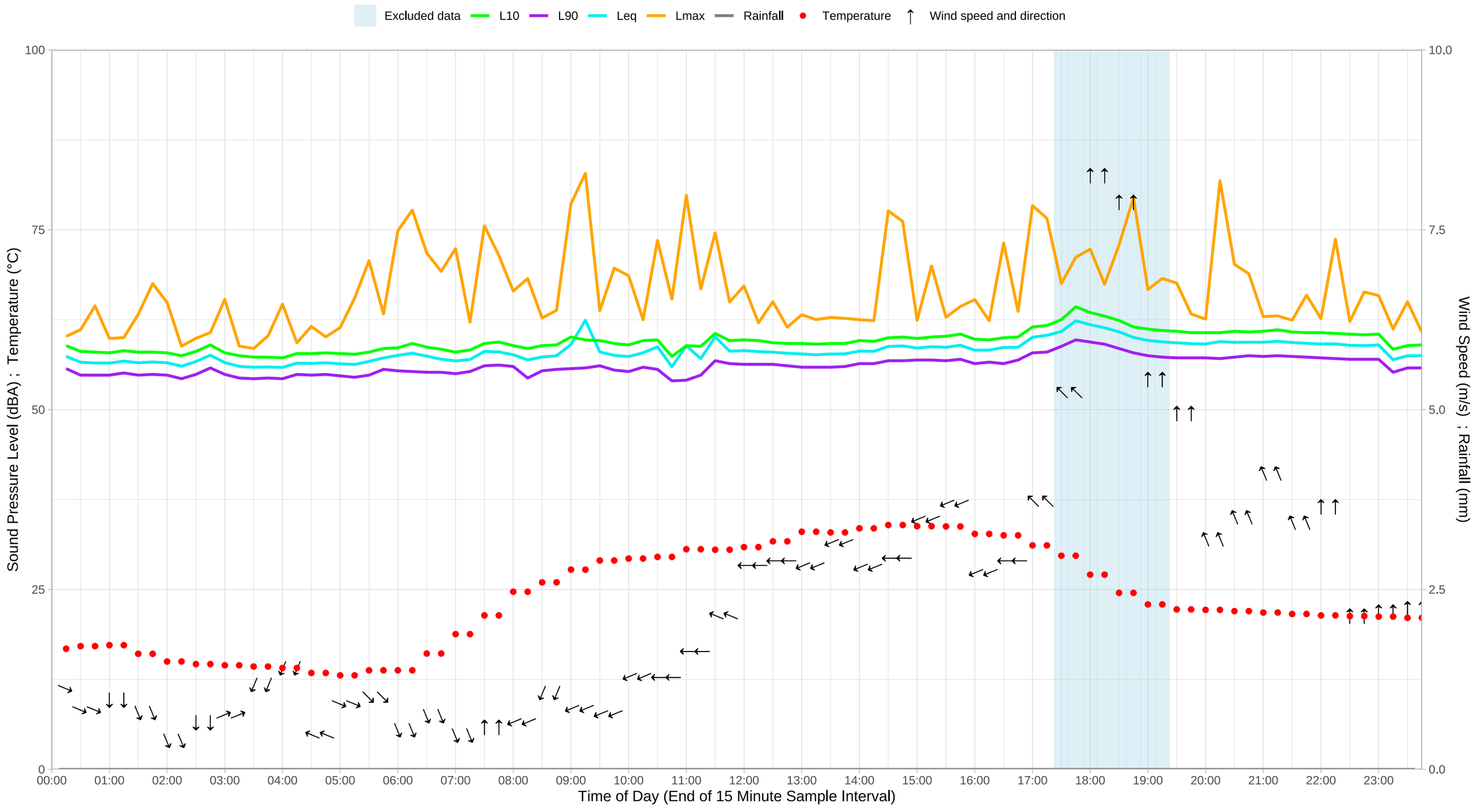
Statistical Ambient Noise Levels
L8
Wednesday 11 December 2024



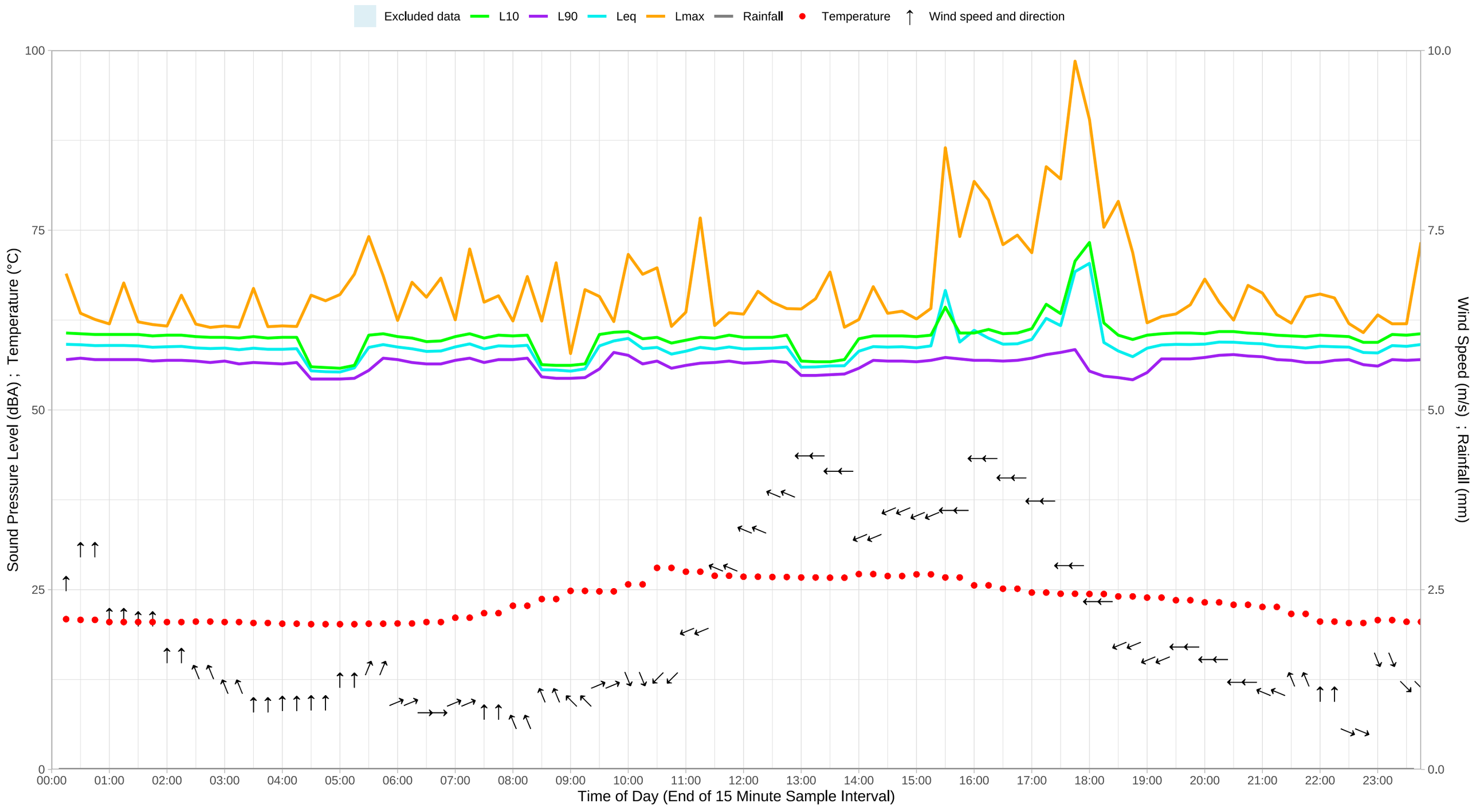
Statistical Ambient Noise Levels
L8
Thursday 12 December 2024



Statistical Ambient Noise Levels
L8
Friday 13 December 2024



Statistical Ambient Noise Levels
L8
Saturday 14 December 2024



Statistical Ambient Noise Levels
L8
Sunday 15 December 2024

Excluded data | L10 | L90 | Leq | Lmax | Rainfall | Temperature | Wind speed and direction

Sound Pressure Level (dBA) ; Temperature (°C)

Wind Speed (m/s) ; Rainfall (mm)

Time of Day (End of 15 Minute Sample Interval)

Statistical Ambient Noise Levels
L8
Monday 16 December 2024

Excluded data | L10 | L90 | Leq | Lmax | Rainfall | Temperature | Wind speed and direction

Sound Pressure Level (dBA) ; Temperature (°C)

100
75
50
25
0

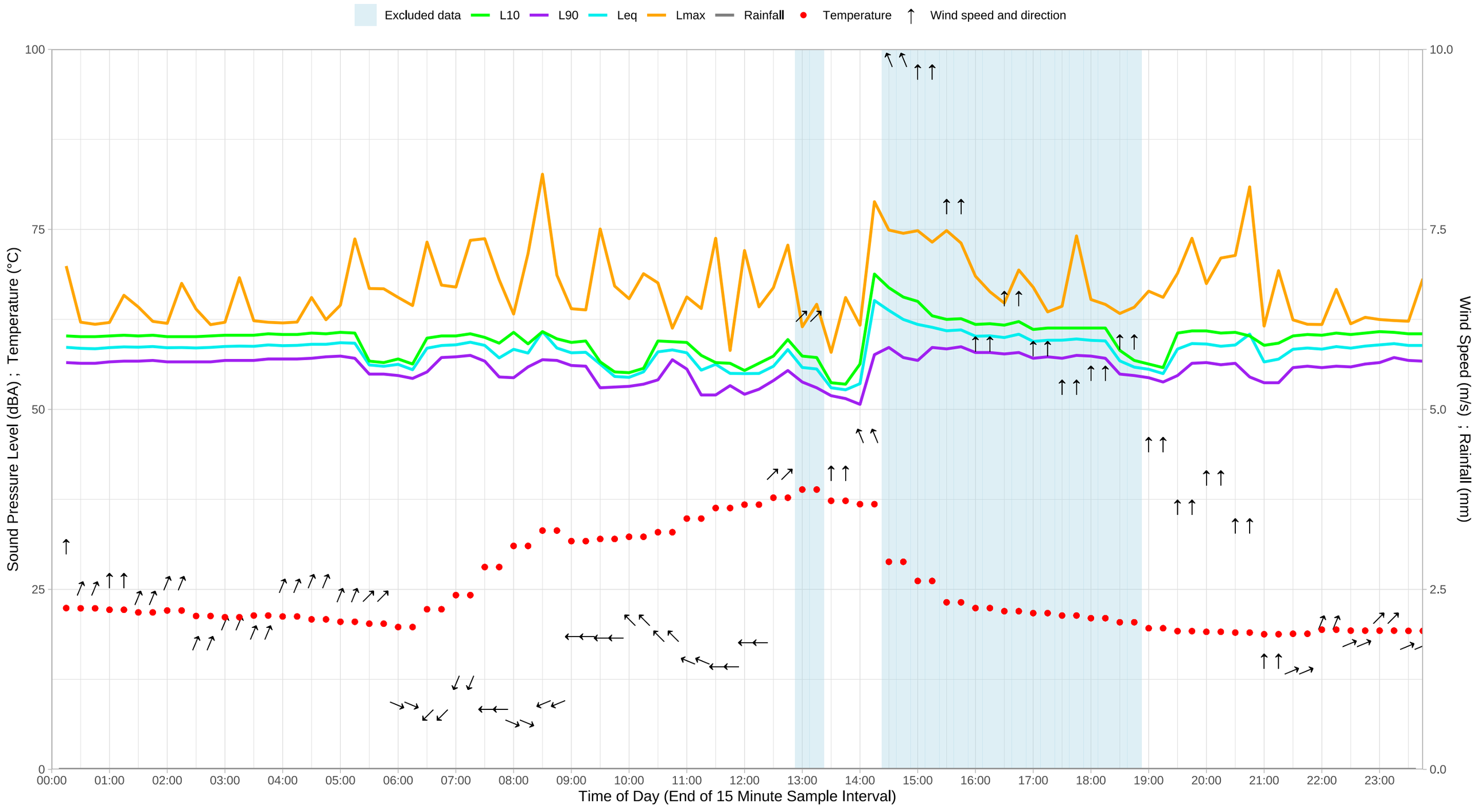
Wind Speed (m/s) ; Rainfall (mm)

10.0
7.5
5.0
2.5
0.0

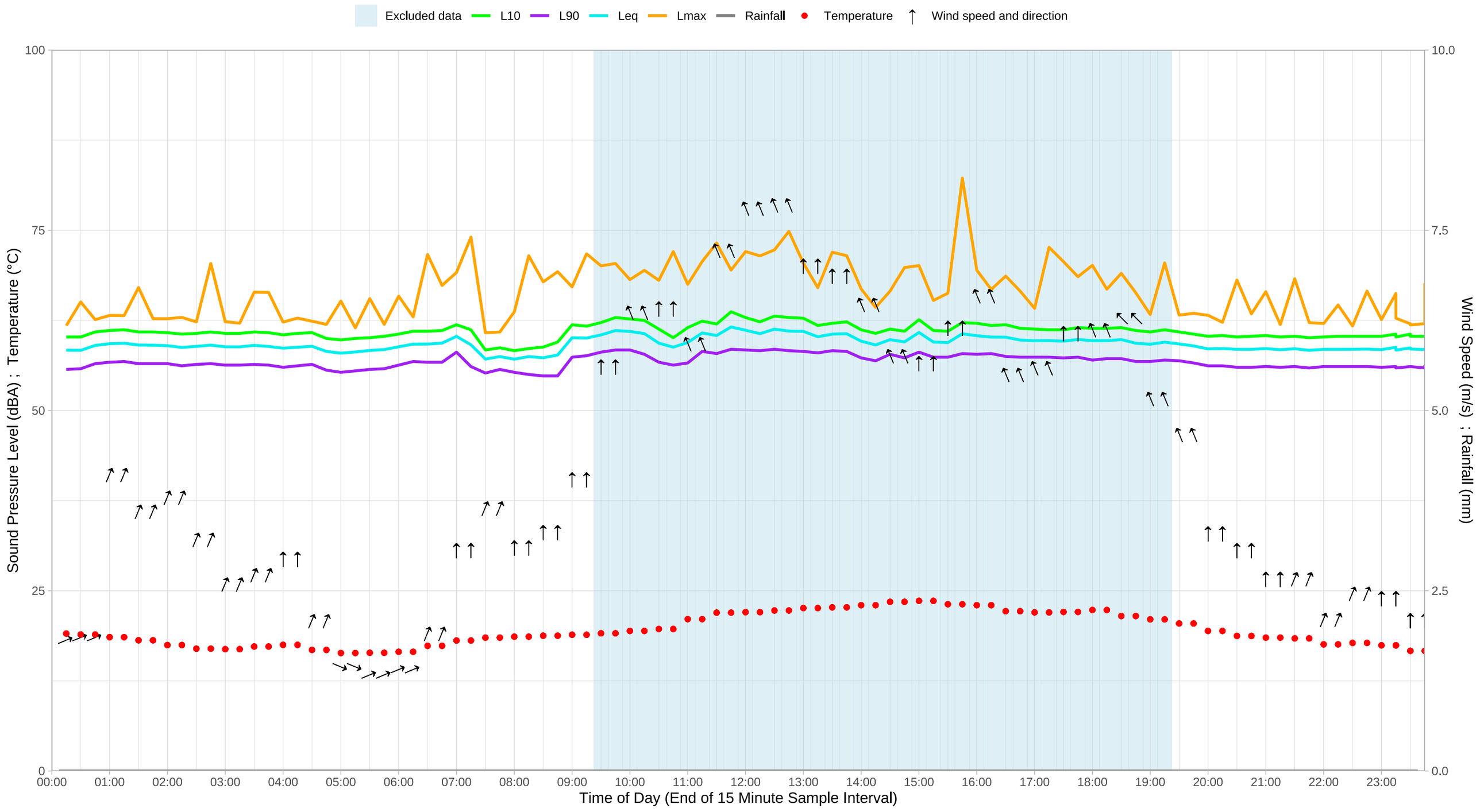
00:00 01:00 02:00 03:00 04:00 05:00 06:00 07:00 08:00 09:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00

Time of Day (End of 15 Minute Sample Interval)

Statistical Ambient Noise Levels
L8
Tuesday 17 December 2024



Statistical Ambient Noise Levels
L8
Wednesday 18 December 2024



Statistical Ambient Noise Levels
L8
Thursday 19 December 2024

Excluded data | L10 | L90 | Leq | Lmax | Rainfall | Temperature | Wind speed and direction

Sound Pressure Level (dBA) ; Temperature (°C)

100
75
50
25
0

Wind Speed (m/s) ; Rainfall (mm)

10.0
7.5
5.0
2.5
0.0

00:00 01:00 02:00 03:00 04:00 05:00 06:00 07:00 08:00 09:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00

Time of Day (End of 15 Minute Sample Interval)

Appendix B

Site-wide noise model validation

B-1 Near field

Noise levels were measured at 14 locations in close proximity to the site. These sites were chosen to be at a reasonable distance from the identifiable noise sources with the purpose of validating the source levels input to the noise model. The locations of the near field monitoring are shown on Figure B.1. Table B.1 outlines the L_{Aeq} and L_{A90} measured noise levels during the night period at the 14 near field monitoring locations and the predicted level from the noise model. The difference from the predicted level to each of the measured levels is presented and where the difference is outside 3 dB it is indicated in bold text.

Generally, a 2 dB calibration factor is regarded as an acceptable margin of uncertainty when dealing with noise modelling and predictions for a site with a limited number of noise sources and structures causing reflections, shielding and diffraction. In the case of this site, a 3 dB calibration factor is considered more appropriate due to the following contributing factors related to the scale and complexity:

– The site contains a large number of operation noise sources at varying heights.
– The site includes complex structures, including tall vertical structures (silos) and dense equipment and pipeworks which can create complex sound propagation patterns.

Noise levels from operating equipment have been modelled as continuous steady levels. Short fluctuations in noise levels near the monitoring locations from activities such as cars or pedestrians passing by would increase the L_{Aeq} noise level. However, while these activities are loud relative to the location of the noise monitoring, in the far field would be insignificant. The night period has been chosen for validation with the aim to reduce the occurrence of this as much as possible. The L_{A90} noise level has been used to validate levels at these near field locations as this level would not include these short fluctuations of noise close to the microphone.

Comparison to the measured L_{A90} noise levels shows good calibration of the noise model, with an average difference to the modelled level across the locations of -1.1 dB, indicating a slight underprediction. Underprediction may be due to the proximity of some monitoring locations to Bolong Rd or the rail sources not included in the noise modelling. These results need to be considered in conjunction with the far field monitoring, presented below.

Table B.1 Near field noise monitoring validation

Monitoring location	Measured average noise level (dBA)		Predicted $L_{Aeq,15min}$ noise level (dBA)	Difference to measured level (dBA)	
	$L_{Aeq(15\ min)}$	$L_{A90(15\ min)}$		$L_{Aeq(15\ min)}$	$L_{A90(15\ min)}$
S1	61.2	58.4	60.0	-1.2	1.6
S2	71.4	69.7	70.4	-0.9	0.8
S3	58.9	55.2	55.5	**-3.4**	0.3
S4	71.6	69.2	67.1	**-4.5**	-2.1
S5	67.8	65.1	64.2	**-3.7**	-0.9
S6	72.1	71.1	68.7	**-3.3**	-2.4
S7	70.8	65.4	61.9	**-8.9**	**-3.6**
S8	73.0	72.2	68.8	**-4.3**	**-3.5**
S9	78.4	77.2	75.9	-2.5	-1.3
S10	73.5	67.4	64.7	**-8.8**	-2.8
S11	70.6	69.6	70.1	-0.5	0.5
S12	74.2	73.3	68.4	**-5.8**	**-4.9**
S13	72.3	71.1	71.0	-1.3	-0.1
S14	67.2	65.9	68.3	1.1	2.4
Average				**-3.4**	-1.1

Legend

Monitoring locations
- Near field

Modelled buildings

Site boundary

Paper Size ANSI A

0 100 200 m

N

Map Projection: Grid Map of Australia
Horizontal Datum: GDA2020
Grid: Grid Map of Australia GDA2020 Zone 56

GHD

Manildra

Shoalhaven Starches Modification 31

Near-field noise monitoring locations

Project No. **12645127**
Revision No. **-**
Date. **2025-06-23**

FIGURE B.1

Document Path: \\ghdnet\ghd\AU\Sydney\Projects\21\12645127\Tech\Noise\03_GIS\MOD31_Figs.qgz

Data Source: Nearmap

©2025.
Whilst every care has been taken to prepare this map, GHD and make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete, or unsuitable in any way and for any reason.

Created By: Matthijs Oosterlaken

B-2 Far field

Noise monitoring was conducted at seven locations distributed around the site at various distances, up to approximately 1,300 metres. Data measured at these locations has been used to validate the noise propagation model in each direction from the site to ensure predicted noise levels at the sensitive receiver locations are accurate. The locations at which monitoring was conducted are shown on Figure B.2 and the distance and direction of each location to the site is outlined in Table B.2.

Due to the separation distance to the site of these locations, other sources of noise that are not included in the noise model (extraneous noise) may contribute at these locations, particularly during the day when roads are active. Data from the period between 12:00am midnight and 5am has been analysed for the model validation as this period is the least likely to be affected by extraneous noise providing confidence that measured levels consist of noise from the site only.

Meteorological conditions during the monitoring periods, presented in Section 2.2.2, have been analysed, particularly wind direction, to account for possible variability in measured levels across multiple nights. Calculation using the frequency of wind in each direction has been completed in accordance with Annex C of ISO9613.2:2024 to calculate the C_0 coefficient for the C_{met} parameter for each of 12 source to receiver directions.

For most receivers, predicted noise levels have been compared to the L_{Aeq}. The modelled level is input as an L_{Aeq} and as the time period chosen for comparison aims to exclude extraneous noise, the measured level would be closest to the L_{Aeq}. At locations L4 and L5, however, other external noise sources are still present during this nighttime period and therefore the L_{A90} level has been used for comparison at these locations.

The following sections detail the comparison of measured levels to model predicted levels at each of the seven monitoring locations.

Table B.2 Far field monitoring locations

Location	Address	Distance from nearest point on the site (m)	Direction to the site
L1	1 Nobblers Lane, Terara	1260	S from Wastewater Treatment Plant (WWTP) SE from main site
L2	58 Riverview Road, Terara	600	SW from all sources
L3	32 Bolong Road, Bomaderry, south of Manildra office	Within site boundary	W from most of site NW from some nearest sources
L4	36 Railway Street, Bomaderry, north boundary of Manildra site, near packing plant	250	N and NW from main site SE from WWTP
L5	280 Bolong Road, Bolong	400	E from main site SW from WWTP
L6	17 Dalwah Street, Bomaderry	380	NW from main site SW from WWTP
L8	20 Hanigans Lane, Bolong, Manildra Group wastewater treatment plant	Within site boundary	NE from all sources

Legend

Monitoring locations
- Far field

Modelled buildings

Site boundary

Paper Size ANSI A

0 250 500 m

Map Projection: Grid Map of Australia
Horizontal Datum: GDA2020
Grid: Grid Map of Australia GDA2020 Zone 56

N

GHD

Manildra

Shoalhaven Starches Modification 31

Far-field noise monitoring locations

Project No. **12645127**
Revision No. **-**
Date. **2025-06-23**

FIGURE B.2

Document Path: \\ghdnet\ghd\AU\Sydney\Projects\21\12645127\Tech\Noise\03_GIS\MOD31_Figs.qgz

Data Source: Nearmap

©2025.
Whilst every care has been taken to prepare this map, GHD and make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete, or unsuitable in any way and for any reason.

Created By: Matthijs Oosterlaken

B-2-1 Location 1

Predicted noise levels at location 1 generally agree with the measured L_{Aeq} noise levels. Measured and predicted noise levels, and the difference between are presented in Table B.3. The measured levels across the five-hour period and the predicted noise level for each night are shown on Figure B.3.

On four nights, measured noise levels are significantly lower, approximately 6 dB, than other nights. These occur on 11, 14, 18 and 19 December 2024 as illustrated in the levels presented in Table B.3. On each of these nights the predominant wind direction is southerly, blowing from the receiver location south of the site towards the site, as denoted by arrows on Figure B.3. It is commonly accepted that these conditions can reduce noise levels by up to 6 dB, however the inclusion of the C_0 parameter did not account for this phenomenon to the extent it is seen in the measurement and predicted noise levels have over predicted the measured level on these four occasions.

The average difference between predicted noise levels and measured L_{Aeq} difference is 1.9 dB, within the accepted tolerance.

Table B.3 Measured and predicted noise level comparison, Location 1

Date	Measured level (dBA)		Difference between L_{Aeq} and L_{A90} (dB)	Predicted $L_{Aeq,15min}$ noise level (dBA)	Difference, prediction – measurement (dB)	
	L_{Aeq}	L_{A90}		Modelled level	L_{Aeq}	L_{A90}
10/12/2024	41.4	37.9	3.4	43.6	2.2	**5.7**
11/12/2024	36.1	32.2	4	41.5	**5.4**	**9.3**
12/12/2024	43.7	41	2.8	44.2	0.5	**3.2**
13/12/2024	45.4	42.9	2.5	43.4	-2.0	0.5
14/12/2024	35	30.7	4.4	39.1	**4.1**	**8.4**
15/12/2024	43.3	39.2	4.1	44.1	0.8	**4.9**
16/12/2024	41.4	39.4	2.1	43.2	1.8	**3.8**
17/12/2024	44.5	37.3	7.3	40.7	**-3.8**	**3.5**
18/12/2024	36.9	33.9	3	42.1	**5.2**	**8.2**
19/12/2024	37	33.6	3.3	42.2	**5.3**	**8.6**
Average					1.9	**5.6**

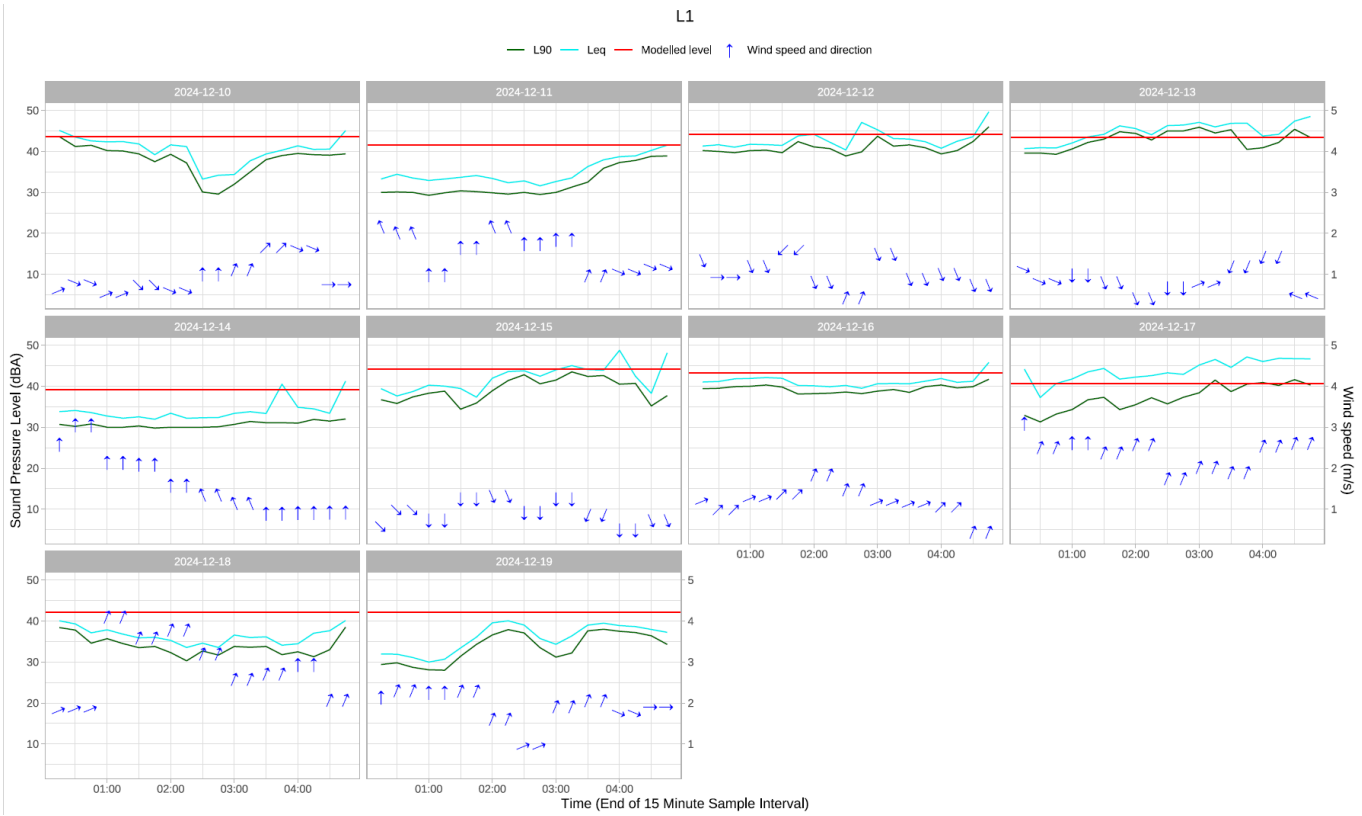


Figure B.3 Measured and predicted noise levels and wind conditions, Location 1

B-2-2 Location 2

Predicted noise levels at location 2 generally agree with the measured L_{Aeq} noise levels. Measured and predicted noise levels, and the difference between are presented in Table B.4. The measured levels across the five-hour period and the predicted noise level for each night are shown on Figure B.4.

Measured noise levels during the early morning of 17 December 2024 are significantly higher, 8.1 dB, than the predicted level for this period. The measured level is similar to the predicted level during other periods modelled and the discrepancy may be due to an over correction of the C0 parameter, or conversely extraneous noise from a source to the southwest that is enhanced by the dominant south-westerly wind on this evening.

The average difference between predicted noise levels and measured L_{Aeq} difference is -0.4 dB, and within the accepted tolerance.

Table B.4 Measured and predicted noise level comparison, Location 2

Date	Measured level (dBA)		Difference between L_{Aeq} and L_{A90} (dB)	Predicted $L_{Aeq,15min}$ noise level (dBA)	Difference, prediction – measurement (dB)	
	L_{Aeq}	L_{A90}		Modelled level	L_{Aeq}	L_{A90}
10/12/2024	41.7	35.2	6.5	40.4	-1.3	**5.2**
11/12/2024	38.4	36.2	2.1	40.1	1.7	**3.9**
12/12/2024	40.6	37.6	3.0	43.6	3.0	**6.0**
13/12/2024	42.1	39.5	2.6	43.0	0.9	**3.5**
14/12/2024	37.9	35.3	2.6	36.9	-1.0	1.6
15/12/2024	42.6	38.7	3.9	43.9	1.3	**5.2**
16/12/2024	38.6	35.8	2.8	37.5	-1.1	1.7
17/12/2024	43.8	38.9	4.9	35.7	**-8.1**	**-3.2**
18/12/2024	37.3	33.8	3.5	36.8	-0.5	**3.0**
19/12/2024	37.8	34.1	3.7	38.9	1.1	**4.8**
Average					-0.4	**3.2**

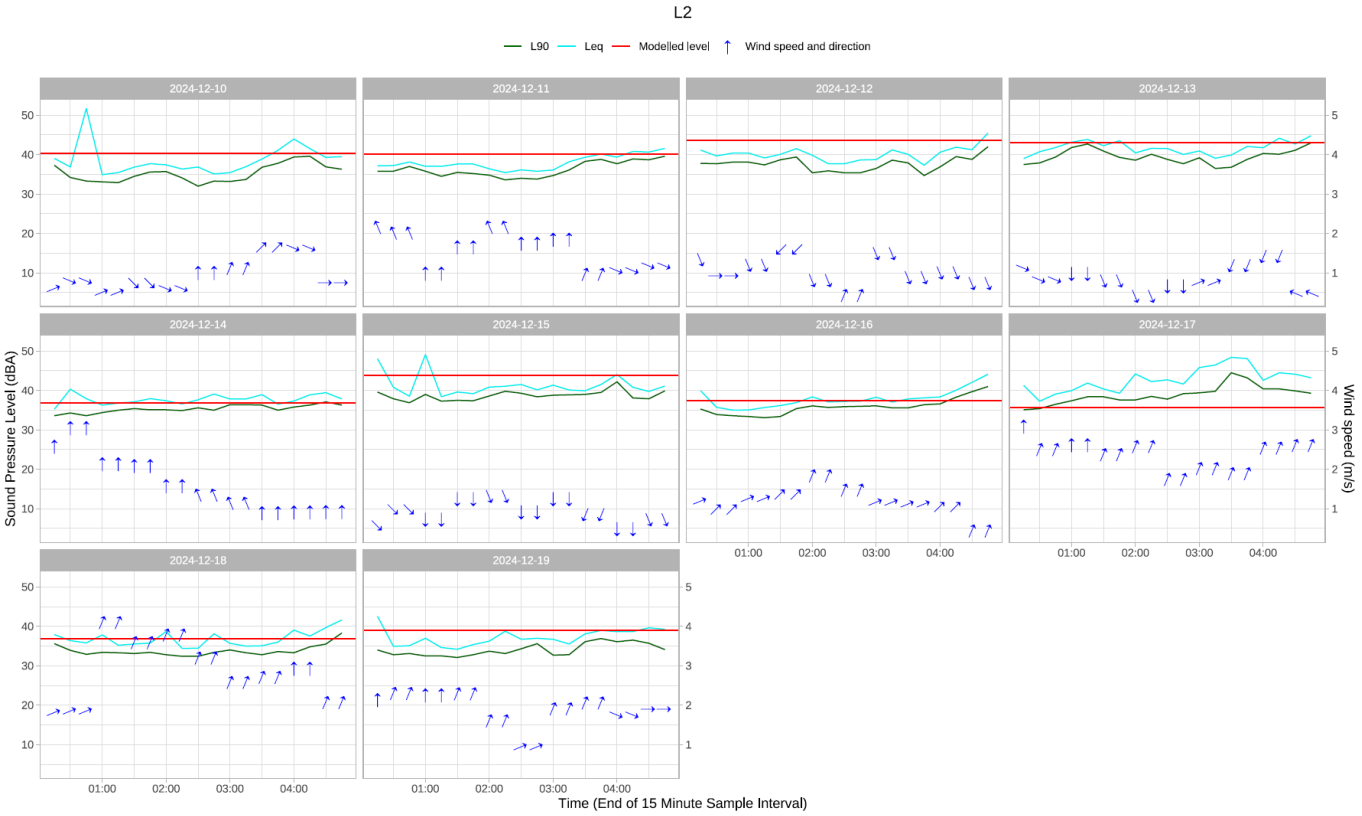


Figure B.4 Measured and predicted noise levels and wind conditions, Location 2

B-2-3 Location 3

Predicted noise levels at location 3 agree with the measured L_{Aeq} noise levels for all monitoring periods. Measured and predicted noise levels, and the difference between are presented in Table B.5. The measured levels across the five-hour period and the predicted noise level for each night are shown on Figure B.5. The average difference between predicted noise levels and measured L_{Aeq} difference is 1.3 dB, and within the accepted tolerance.

Table B.5 Measured and predicted noise level comparison, Location 3

Date	Measured level (dBA)		Difference between L_{Aeq} and L_{A90} (dB)	Predicted $L_{Aeq,15min}$ noise level (dBA)	Difference, prediction – measurement (dB)	
	L_{Aeq}	L_{A90}		Modelled level	L_{Aeq}	L_{A90}
10/12/2024	54.8	51.7	3.0	54.5	-0.3	2.8
11/12/2024	54.8	52.3	2.5	55.9	1.1	**3.6**
12/12/2024	53.3	51.5	1.8	54.3	1.0	2.8
13/12/2024	53.6	52.0	1.5	55.3	1.7	**3.3**
14/12/2024	53.7	52.1	1.6	56.5	2.8	**4.4**
15/12/2024	53.8	52.2	1.7	54.8	1.0	2.6
16/12/2024	53.5	51.5	2.0	55.0	1.5	**3.5**
17/12/2024	53.9	52.4	1.5	56.3	2.4	**3.9**
18/12/2024	54.3	52.5	1.7	55.7	1.4	**3.2**
19/12/2024	55.1	53.4	1.6	55.6	0.5	2.2
Average					1.3	**3.2**

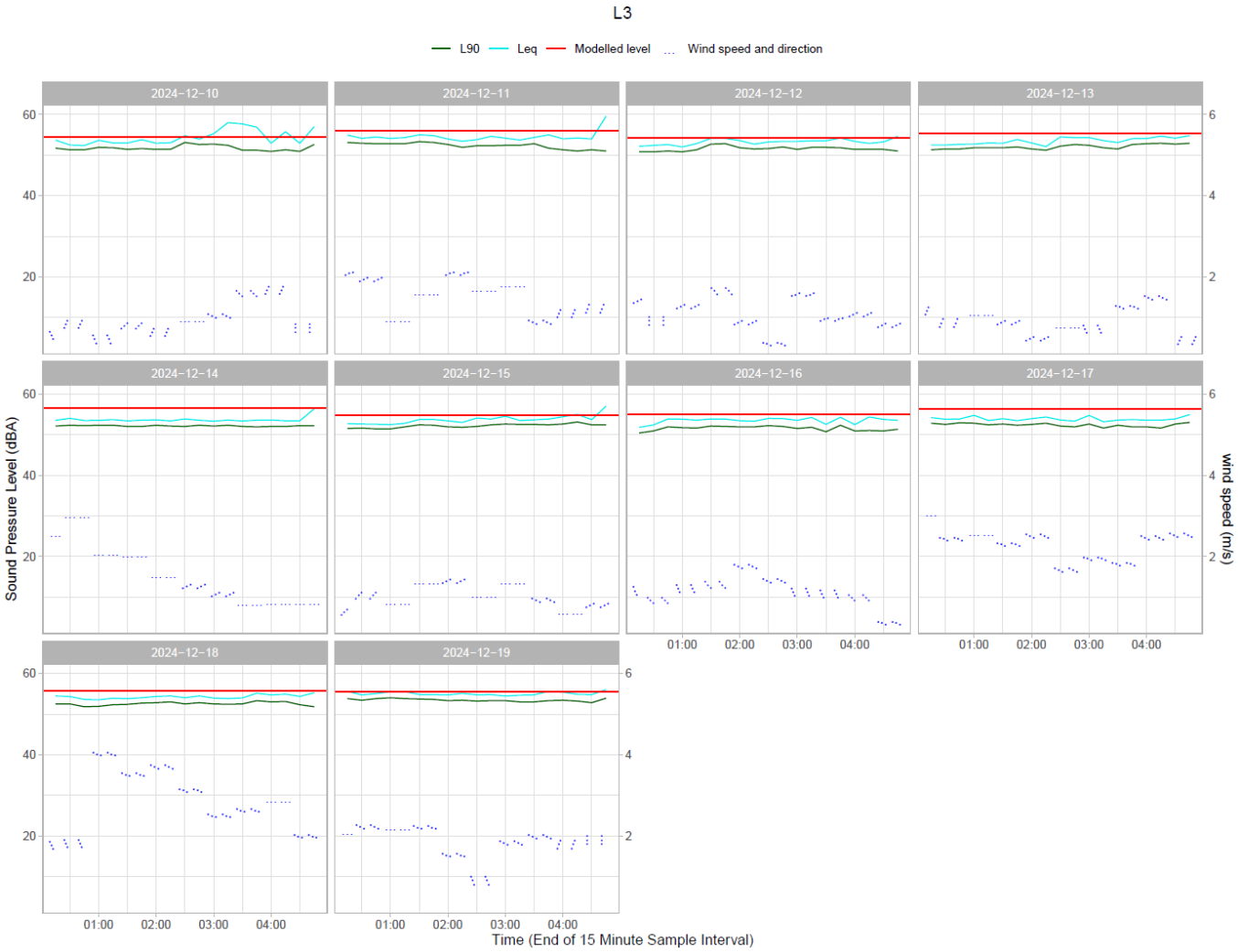


Figure B.5 Measured and predicted noise levels and wind conditions, Location 3

B-2-4 Location 4

Predicted noise levels at location 4 generally agree with the measured L_{A90} noise levels. Measured and predicted noise levels, and the difference between are presented in Table B.6. The measured levels across the five-hour period and the predicted noise level for each night are shown on Figure B.6.

At this location, as can be seen in Figure B.6, there are fluctuations in the measured L_{Aeq} independent of the L_{A90}. This typically indicates that there are short periods of noise above any continuous baseline noise and would likely be extraneous to the noise from the site. As such, for calibration of the noise levels from the site, the measured L_{A90} has been used for comparison, which excluded this extraneous noise.

On three occasions there is a sharp drop off around 3am of both the L_{Aeq} and the L_{A90} indicative of a nearby noise source turning off. It can be seen that the level prior to 3am is louder than the level measured on other nights, indicating this source is additional to the typical environment.

The average difference between predicted noise levels and measured L_{A90} difference is -1.8 dB, within the accepted tolerance. Excluding nights where the additional source was measured for part of the period, the average difference is -1.8 dB.

Table B.6 Measured and predicted noise level comparison, Location 4

Date	Measured level (dBA)		Difference between L_{Aeq} and L_{A90} (dB)	Predicted $L_{Aeq,15min}$ noise level (dBA)	Difference, prediction – measurement (dB)	
	L_{Aeq}	L_{A90}		Modelled level	L_{Aeq}	L_{A90}
10/12/2024	56.5	52.2	4.3	51.3	**-5.2**	-1.0
11/12/2024	56.9	53.5	3.4	53.1	**-3.8**	-0.4
12/12/2024	54.5	51.3	3.2	49.2	**-5.3**	-2.1
13/12/2024	62.3	59.9	2.4	51.6	**-10.7**	**-8.3**
14/12/2024	53.4	51.9	1.5	54.2	0.8	2.3
15/12/2024	57.7	56.0	1.7	50.0	**-7.7**	**-6.0**
16/12/2024	56.4	52.9	3.5	52.3	**-4.1**	-0.6
17/12/2024	64.8	52.5	12.3	53.9	**-10.9**	1.4
18/12/2024	56.1	54.5	1.7	53.3	-2.8	-1.2
19/12/2024	58.8	55.5	3.3	53.0	**-5.8**	-2.5
Average					**-5.6**	-1.8

Figure B.6 Measured and predicted noise levels and wind conditions, Location 4

B-2-5 Location 5

Predicted noise levels at location 5 generally agree with the measured L_{A90} noise levels. Measured and predicted noise levels, and the difference between are presented in Table B.7. The measured levels across the five-hour period and the predicted noise level for each night are shown on Figure B.7.

Similar to Location 4, at this location there are fluctuations in the measured L_{Aeq} independent of the L_{A90}, as can be seen in Figure B.7, for a majority of the monitoring periods. This typically indicates that there are short periods of noise above any continuous baseline noise and would likely be extraneous to the noise from the site due to the proximity of this monitoring location to other noise sources know to be operational during the night period. As such, for calibration of the noise levels from the site, the measured L_{A90} has been used for comparison, which excluded this extraneous noise.

For some monitoring periods the noise modelling is over predicting the measured L_{A90} noise level. While all effort has been made to account for continuously operating equipment, including measurements GHD has taken of the neighbouring Supagas facility, for the purpose of validation, extraneous noise cannot always be accounted for.

The average difference between predicted noise levels and measured L_{A90} difference is 2.3 dB. Using the plots in Figure B.7, it can be seen that the modelled noise level generally agrees with the measurements when taking into account fluctuations that are likely from extraneous sources of noise.

Table B.7 Measured and predicted noise level comparison, Location 5

Date	Measured level (dBA)		Difference between L_{Aeq} and L_{A90} (dB)	Predicted $L_{Aeq,15min}$ noise level (dBA)	Difference, prediction – measurement (dB)	
	L_{Aeq}	L_{A90}		Modelled level	L_{Aeq}	L_{A90}
10/12/2024	48.8	44.9	4.0	47.2	-1.7	2.3
11/12/2024	44.9	40.5	4.4	46.8	1.9	**6.3**
12/12/2024	50.6	46.4	4.2	46.0	**-4.6**	-0.4
13/12/2024	49.8	45.5	4.3	45.5	**-4.3**	0.0
14/12/2024	53.2	42.0	11.2	46.8	**-6.4**	**4.8**
15/12/2024	53.8	45.3	8.5	45.3	**-8.5**	0.0
16/12/2024	49.4	43.8	5.6	47.3	-2.1	**3.5**
17/12/2024	47.4	43.8	3.6	47.1	-0.3	**3.3**
18/12/2024	48.7	45.8	2.9	47.2	-1.5	1.4
19/12/2024	56.4	45.2	11.2	47.1	**-9.3**	1.9
Average					**-3.7**	2.3

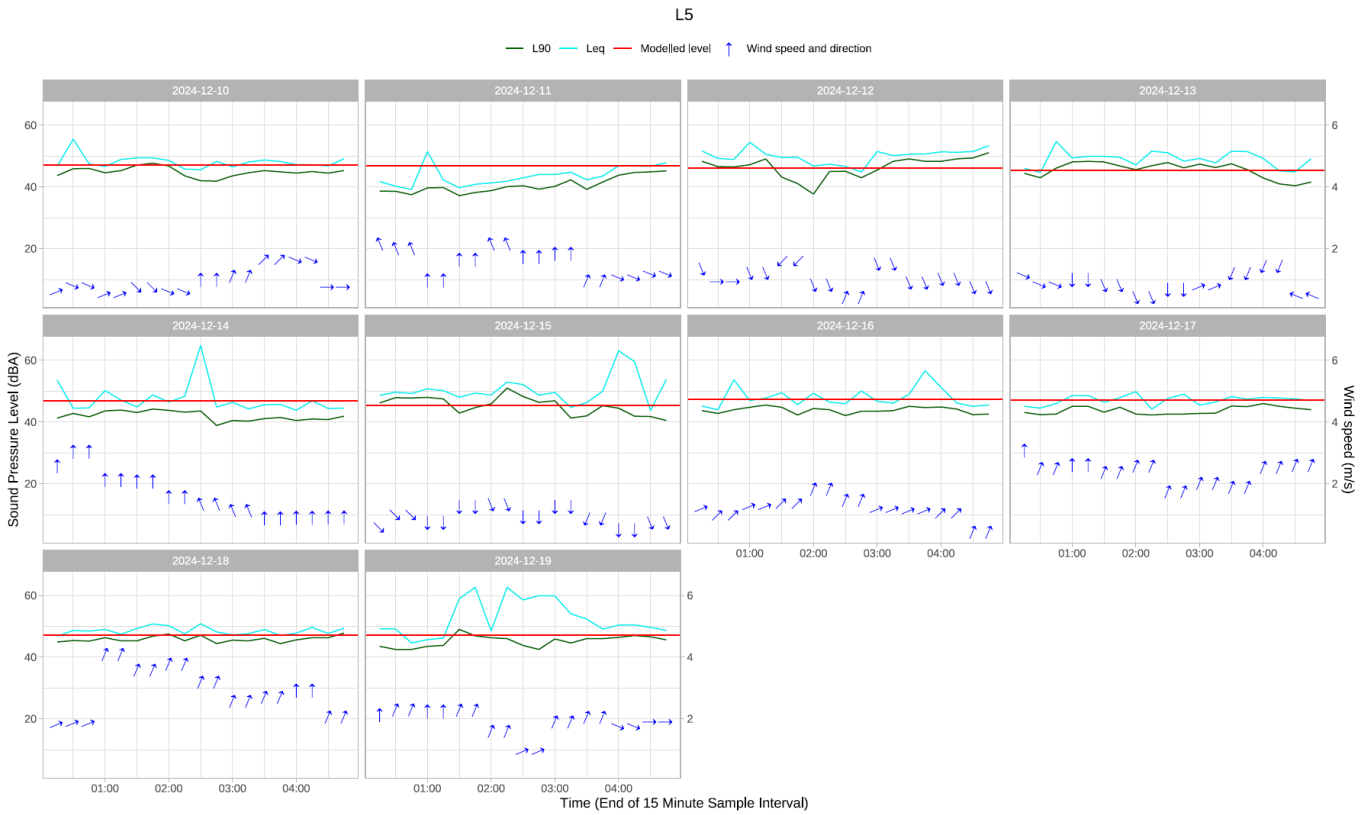


Figure B.7 Measured and predicted noise levels and wind conditions, Location 5

B-2-6 Location 6

Predicted noise levels at location 6 agree with the measured L_{Aeq} noise levels for all monitoring periods. Measured and predicted noise levels, and the difference between are presented in Table B.8. The measured levels across the five-hour period and the predicted noise level for each night are shown on Figure B.8. The average difference between predicted noise levels and measured L_{Aeq} difference is -0.5 dB, and within the accepted tolerance.

Table B.8 Measured and predicted noise level comparison, Location 6

Date	Measured level (dBA)		Difference between L_{Aeq} and L_{A90} (dB)	Predicted $L_{Aeq,15min}$ noise level (dBA)	Difference, prediction – measurement (dB)	
	L_{Aeq}	L_{A90}		Modelled level	L_{Aeq}	L_{A90}
10/12/2024	42.5	36.9	5.5	41	-1.5	**4.1**
11/12/2024	45.7	40.8	4.9	44.2	-1.5	**3.4**
12/12/2024	41.6	36.1	5.5	41.9	0.3	**5.8**
13/12/2024	42.9	36.5	6.4	43.3	0.4	**6.8**
14/12/2024	44.9	42.6	2.3	45.4	0.5	2.8
15/12/2024	44.1	38.9	5.2	42.9	-1.2	**4**
16/12/2024	40.6	36.1	4.5	41.9	1.3	**5.8**
17/12/2024	46.6	42.9	3.6	44.7	-1.9	1.8
18/12/2024	43.4	40.3	3	43.6	0.2	**3.3**
19/12/2024	44.7	40.9	3.8	43.5	-1.2	2.6
Average					-0.5	**4**

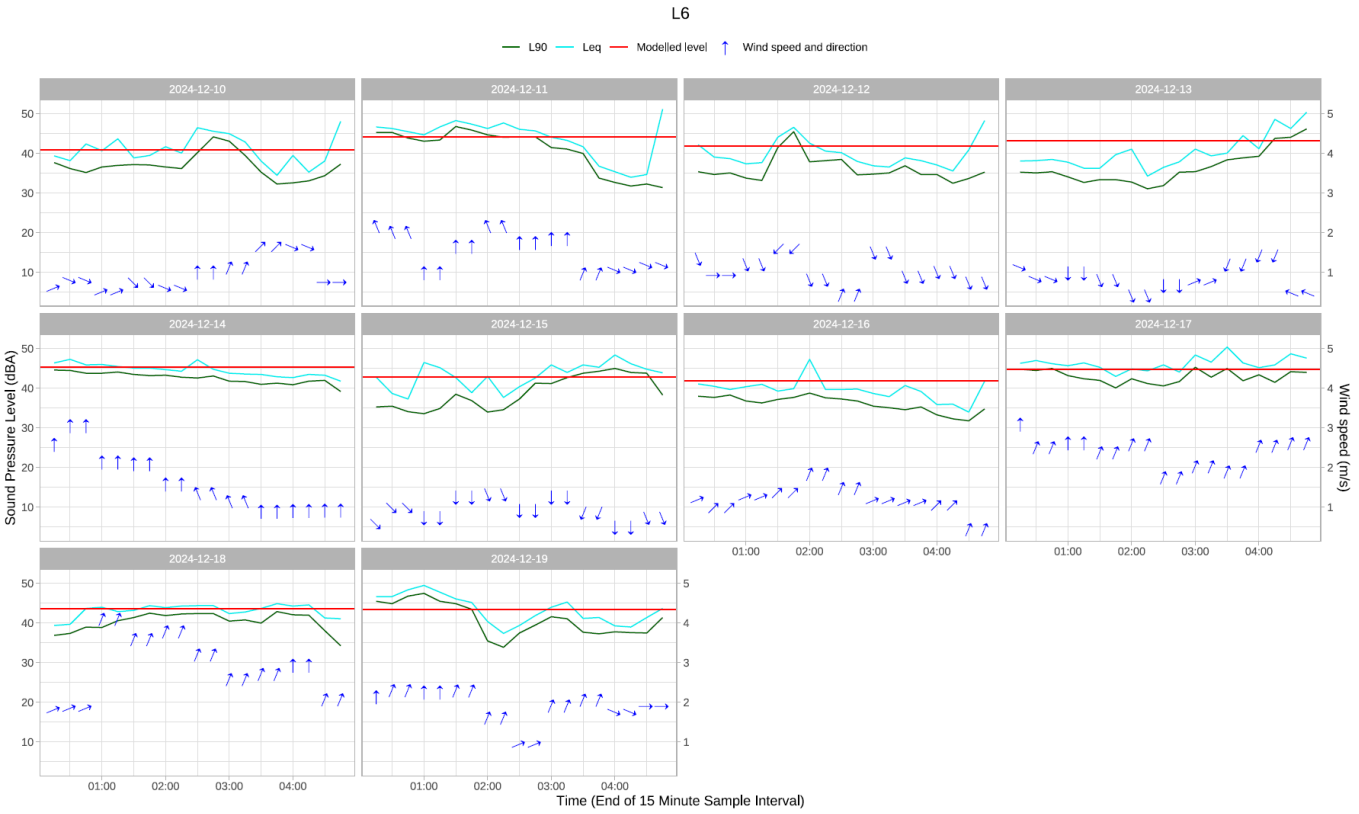


Figure B.8 Measured and predicted noise levels and wind conditions, Location 6

B-2-7 Location 8

Predicted noise levels at location 6 agree with the measured L_{Aeq} noise levels for all monitoring periods. Measured and predicted noise levels, and the difference between are presented in Table B.9. The measured levels across the five-hour period and the predicted noise level for each night are shown on Figure B.9. The average difference between predicted noise levels and measured L_{Aeq} difference is -0.2 dB, and within the accepted tolerance.

Table B.9 Measured and predicted noise level comparison, Location 8

Date	Measured level (dBA)		Difference between L_{Aeq} and L_{A90} (dB)	Predicted $L_{Aeq,15min}$ noise level (dBA)	Difference, prediction – measurement (dB)	
	L_{Aeq}	L_{A90}		Modelled level	L_{Aeq}	L_{A90}
10/12/2024	60.8	59.8	1	58.2	-2.6	-1.6
11/12/2024	57.6	56	1.7	58.3	0.7	2.3
12/12/2024	56.6	55	1.6	56.8	0.2	1.8
13/12/2024	56.5	54.8	1.7	57.6	1.1	2.8
14/12/2024	58.5	56.5	2	58.6	0.1	2.1
15/12/2024	57.7	56	1.7	56.5	-1.2	0.5
16/12/2024	58.7	56.9	1.8	58.5	-0.2	1.6
17/12/2024	58.7	56.8	2	58.6	-0.1	1.9
18/12/2024	58.9	56.3	2.6	58.5	-0.4	2.2
19/12/2024	58.1	55.7	2.4	58.4	0.3	2.7
Average					-0.2	1.6

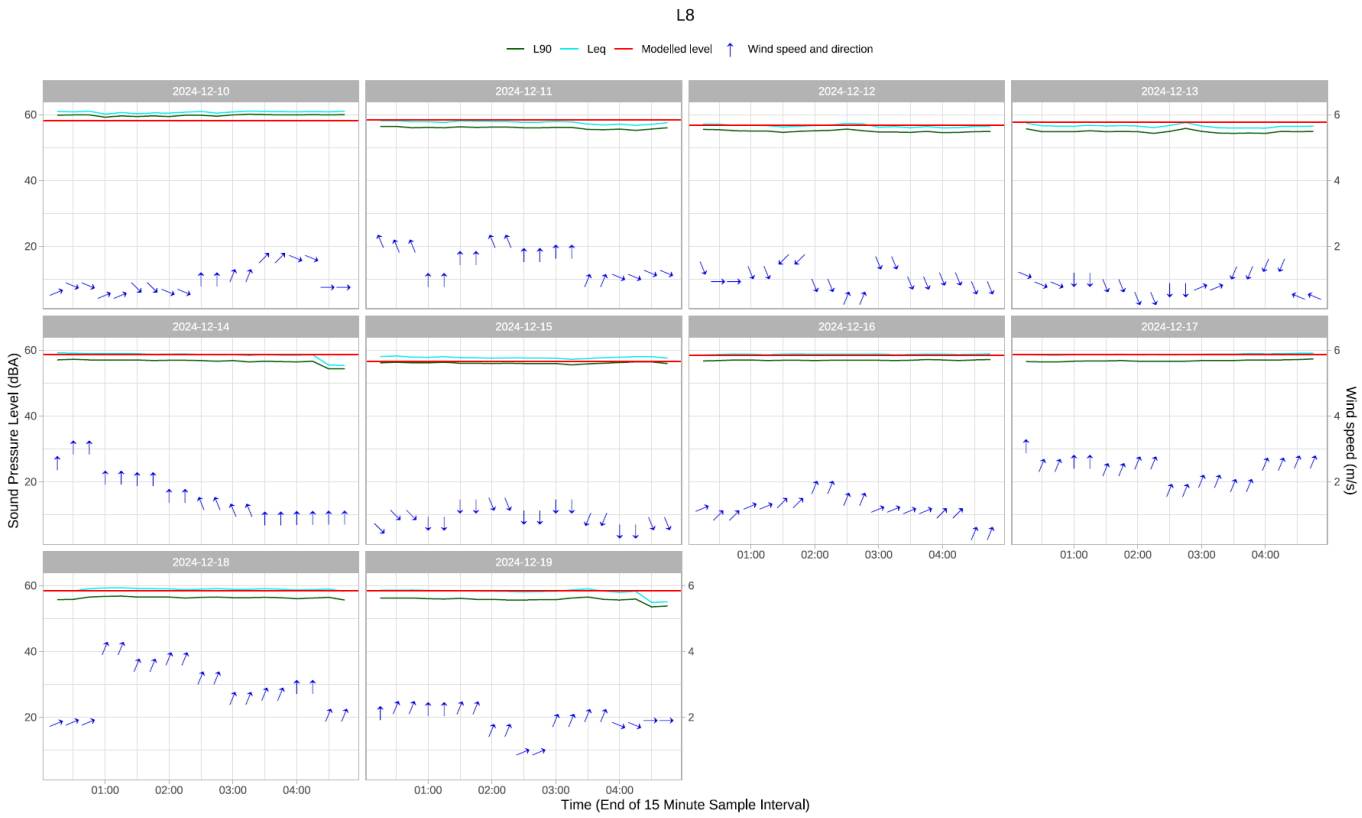


Figure B.9 Measured and predicted noise levels and wind conditions, Location 8

Appendix C

Noise model input data – MOD26

MOD Component	Component	Sub component	Equipment	Number of items	Sound power level per unit (dBA)	Sound power level per one-third octave band (dBA)																																Reference data used
						10	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	6.4k	8k	10k	
Grain storage and handling facilities	Conveyors and bucket elevators	Grain storage bucket elevators	Conveyor motors	3	75	16	21	29	32	40	43	44	43	41	42	42	44	46	48	50	53	58	58	61	60	64	67	66	66	69	63	60	59	56	53	SWL of 85 as provided by supplier on 22/12/2025
			Fans	3	66	13	24	29	35	43	42	47	54	59	50	54	54	53	57	54	53	53	53	51	49	54	49	46	42	49	47	48	48	46	41	SWL based on SPL of 57 at 1m, including silencers as provided by supplier on 22/12/2025
		Stage 1 screening building bucket elevator	Conveyor motors	1	85	26	31	39	42	50	53	54	53	51	52	52	54	56	58	60	63	68	68	71	70	74	77	76	76	79	73	70	69	66	63	SWL of 85 as provided by supplier on 22/12/2025
			Fans	1	66	13	24	29	35	43	42	47	54	59	50	54	54	53	57	54	53	53	53	51	49	54	49	46	42	49	47	48	48	46	41	SWL based on SPL of 57 at 1m, including silencers as provided by supplier on 22/12/2025
		Grain storage feed conveyors[1]	Conveyor motors	3	74	20	30	37	43	55	58	59	64	63	65	65	65	62	63	61	60	60	57	58	42	52	53	50	49	44	48	53	54	53	53	SWL based on a SPL of 70 dBA at 1m provided by supplier
			Fans	3	66	13	24	29	35	43	42	47	54	59	50	54	54	53	57	54	53	53	53	51	49	54	49	46	42	49	47	48	48	46	41	SWL based on SPL of 57 at 1m, including silencers as provided by supplier on 22/12/2025
		Train and truck unloader conveyor to silo grain sieve building	Conveyor motors	1	79	25	35	42	48	60	63	64	69	68	70	70	70	67	68	66	65	65	62	63	47	57	58	55	54	49	53	58	59	58	58	SWL based on a SPL of 70 dBA at 1m provided by supplier
			Fans	2	66	13	24	29	35	43	42	47	54	59	50	54	54	53	57	54	53	53	53	51	49	54	49	46	42	49	47	48	48	46	41	SWL based on SPL of 57 at 1m, including silencers as provided by supplier on 22/12/2025
		Conveyor to plant	Conveyor motors	9	69	15	25	32	38	50	53	54	59	58	60	60	60	57	58	56	55	55	52	53	37	47	48	45	44	39	43	48	49	48	48	SWL based on a SPL of 70 dBA at 1m provided by supplier
			Fans	16	66	13	24	29	35	43	42	47	54	59	50	54	54	53	57	54	53	53	53	51	49	54	49	46	42	49	47	48	48	46	41	SWL based on SPL of 57 at 1m, including silencers as provided by supplier on 22/12/2025
		Bypass conveyor	Conveyor motors	1	79	25	35	42	48	60	63	64	69	68	70	70	70	67	68	66	65	65	62	63	47	57	58	55	54	49	53	58	59	58	58	SWL based on a SPL of 70 dBA at 1m provided by supplier
			Fans	2	66	13	24	29	35	43	42	47	54	59	50	54	54	53	57	54	53	53	53	51	49	54	49	46	42	49	47	48	48	46	41	SWL based on SPL of 57 at 1m, including silencers as provided by supplier on 22/12/2025
WWTP Upgrade	MBR & RO	MBR tank	MBR Blowers	6	81	7	12	17	32	42	41	43	59	49	50	63	57	69	67	68	79	64	61	58	62	56	56	64	62	59	60	61	58	55	50	WT017 - existing blowers
			MBR Permeate pumps	4	77	4	9	14	29	39	41	41	53	47	55	55	55	61	60	60	61	63	58	58	63	66	67	57	52	61	67	73	58	50	56	WT013 - existing MBR permeate pumps
			Water	2	84	11	16	21	36	46	52	56	61	58	61	64	73	76	69	71	72	73	73	73	73	72	71	70	69	68	67	65	63	62	61	WT018 - existing water of MBR tank
		RO	RO Feed pump	3	74	-2	3	8	23	33	39	41	48	45	52	50	54	56	57	58	59	55	61	59	62	63	60	66	64	62	64	60	59	57	54	WT014 - exsting RO feed pump
			RO Feed booster pump	1	87	3	8	13	28	38	45	53	54	51	54	56	59	61	64	68	76	76	81	75	75	78	75	74	71	73	70	74	70	69	71	WT004 - existing RO feed booster pump
	Scrubbers	Scrubber #1	Pumps	8	80	-4	1	6	21	31	38	46	47	44	47	49	52	54	57	61	69	69	74	68	68	71	68	67	64	66	63	67	63	62	64	WT004 - RO feed booster pump used for spectral data
		Scrubber #2	Pumps	3	80	-4	1	6	21	31	38	46	47	44	47	49	52	54	57	61	69	69	74	68	68	71	68	67	64	66	63	67	63	62	64	WT004 - RO feed booster pump used for spectral data
			Chiller	1	85	0	0	0	0	31	32	35	46	62	48	59	70	63	69	70	71	77	75	64	75	75	73	73	72	72	72	72	70	69	66	WT030 - existing chiller biogas shed from DD report
	Cooling towers	Cooling tower	Cooling water pump	5	80	18	23	32	43	48	51	57	61	62	70	68	69	66	64	68	68	63	65	67	67	64	64	62	62	74	63	62	60	49	59	CT008 - existing eastern evaporator pumps
	Biogas shed expansion	Chiller	Chiller	2	85	0	0	0	0	31	32	35	46	62	48	59	70	63	69	70	71	77	75	64	75	75	73	73	72	72	72	72	70	69	66	WT030 - exsting chiller biogas shed from DD report
		Flare	Flare	1	82	-5	1	6	13	22	31	33	44	50	48	49	51	62	72	57	69	79	68	65	66	65	66	75	66	63	62	60	56	52	50	WT026 - existing flare
			Flare pipework	1	94	37	44	50	54	60	64	63	64	64	65	69	72	73	67	63	65	65	78	72	73	77	77	70	83	86	86	88	84	83	80	WT009 - existing pipeline
	Equalisation tanks	Pumps	BVF2 feed pumps	2	79	7	12	17	32	42	44	44	55	50	58	58	58	63	63	63	64	66	60	60	66	69	70	60	55	63	70	76	61	52	59	Calculated based on provided kW using 70+10*LOG(kW)
		Agitator	Agitator	1	75	7	12	17	32	42	42	42	43	45	45	45	43	45	53	54	54	57	60	68	67	65	67	65	63	60	55	54	52	50	48	WT019 - existing agitator
	BVF Pumps and tanks	BVF Pumps	BVF2 Sludge pump	1	82	-2	3	8	23	33	40	48	49	46	49	51	54	56	59	63	71	71	76	70	70	73	70	69	66	68	65	69	65	64	66	Calculated based on provided kW using 70+10*LOG(kW)
			BVF2 SREC pump	1	80	-4	1	6	21	31	38	46	47	44	47	49	52	54	57	61	69	69	74	68	68	71	68	67	64	66	63	67	63	62	64	Calculated based on provided kW using 70+10*LOG(kW)
			BVF2 RANS pump	1	80	-4	1	6	21	31	38	46	47	44	47	49	52	54	57	61	69	69	74	68	68	71	68	67	64	66	63	67	63	62	64	Calculated based on provided kW using 70+10*LOG(kW)
			BVF2 Break Tank SO Pond pump	3	79	-5	0	5	20	30	37	45	46	43	46	48	51	53	56	60	68	68	73	67	67	70	67	66	63	65	62	66	62	61	63	Calculated based on provided kW using 70+10*LOG(kW)

			l or A m,m Li dB(A)		Rw dB	L'w dB(A)	Lw dB(A)																														
Building	**Building component**	**Subcomponent**	**Surface area (m^2)**	**Diffuse internal noise level (dBA)**	**Adopted material and transmission loss**	**Sound power level per m^2 (dBA)**	**Total SWL**	**Sound power level per one-third octave band (dBA)**																														**Reference data used**
								10	**12.5**	**16**	**20**	**25**	**31.5**	**40**	**50**	**63**	**80**	**100**	**125**	**160**	**200**	**250**	**315**	**400**	**500**	**630**	**800**	**1k**	**1.25k**	**1.6k**	**2k**	**2.5k**	**3.15k**	**4k**	**6.4k**	**8k**	**10k**	
Train and truck unloader	North façade	Fan discharge outlets	4	-	0	70	76	16	28	33	39	50	58	59	61	59	57	56	57	55	53	53	51	49	48	52	55	55	55	59	57	55	54	55	57	53	50	54	FM025 - estimated SWL
		Fan room façade	201	85	32	52	76	16	28	44	38	39	45	49	50	50	54	60	61	69	71	65	67	65	61	59	51	40	37	31	26	22	18	18	9	7	5	FM025 - estimated internal level lower than Flour Mill & sandwich pannels
		Train and truck unloader façade	227	70	18	50	73	1	13	30	24	26	32	36	39	38	42	46	48	53	56	55	63	65	66	68	62	60	58	54	51	50	48	49	42	41	39	FM025 - estimated internal level based on idling truck within building & single corrugated steel sheets
	East façade	Opening for trains/trucks	29	70	0	65	80	-8	4	21	15	21	27	31	39	39	44	49	52	58	62	61	68	70	71	74	70	68	67	65	63	63	62	64	58	57	55	FM025 - estimated internal level based on idling truck within building
		Fan room façade	40	85	32	52	68	9	21	37	31	32	38	41	43	43	47	53	54	62	64	58	60	58	54	52	44	33	30	24	19	15	11	11	2	0	-2	FM025 - estimated internal level lower than Flour Mill & sandwich pannels
		Train and truck unloader façade	113	70	18	50	70	-2	10	27	21	23	29	33	36	35	39	43	45	50	53	52	60	62	63	65	59	57	55	51	48	47	45	46	39	38	36	FM025 - estimated internal level based on idling truck within building & single corrugated steel sheets
	South façade	Train and truck unloader façade	432	70	18	50	76	4	16	32	27	29	35	39	42	41	45	49	51	56	59	58	66	68	69	71	65	63	61	57	54	52	50	52	45	44	42	FM025 - estimated internal level based on idling truck within building & single corrugated steel sheets
	West façade	Opening for trains/trucks	29	70	0	65	80	-8	4	21	15	21	27	31	39	39	44	49	52	58	62	61	68	70	71	74	70	68	67	65	63	63	62	64	58	57	55	FM025 - estimated internal level based on idling truck within building
		Fan room façade	40	85	32	52	68	9	21	37	31	32	38	41	43	43	47	53	54	62	64	58	60	58	54	52	44	33	30	24	19	15	11	11	2	0	-2	FM025 - estimated internal level lower than Flour Mill & sandwich pannels
		Train and truck unloader façade	113	70	18	50	70	-2	10	27	21	23	29	33	36	35	39	43	45	50	53	52	60	62	63	65	59	57	55	51	48	47	45	46	39	38	36	FM025 - estimated internal level based on idling truck within building & single corrugated steel sheets
	Roof	Fan room roof	198	85	32	52	75	16	28	44	38	39	45	48	50	50	54	60	61	69	71	65	67	65	61	59	51	40	37	31	26	22	18	18	9	7	5	FM025 - estimated internal level lower than Flour Mill & sandwich pannels
		Train and truck unloader roof	234	70	18	50	73	1	13	30	24	26	32	36	39	38	42	46	48	53	56	55	63	65	66	68	63	60	58	55	51	50	48	49	43	41	39	FM025 - estimated internal level based on idling truck within building & single corrugated steel sheets
Silo grain screening building	North façade	Fan discharge outlets	2	80	0	75	78	-13	0	16	10	17	23	26	34	34	39	45	47	53	58	57	64	66	67	69	65	63	63	61	59	58	57	60	54	52	50	FM025 - estimated SWL
		Silo grain screening façade	238	85	32	52	76	16	29	45	39	39	45	49	51	51	55	60	62	70	71	65	67	66	61	60	52	41	37	32	26	23	19	18	10	8	6	FM025 - estimated internal level & sandwich panels
	East façade	Silo grain screening façade	192	85	32	52	75	15	28	44	38	39	44	48	50	50	54	60	61	69	70	64	66	65	61	59	51	40	36	31	25	22	18	17	9	7	5	FM025 - estimated internal level & sandwich panels
	South façade	Silo grain screening façade	240	85	32	52	76	16	29	45	39	40	45	49	51	51	55	61	62	70	71	65	67	66	61	60	52	41	37	32	26	23	19	18	10	8	6	FM025 - estimated internal level & sandwich panels
	West façade	Silo grain screening façade	192	85	32	52	75	15	28	44	38	39	44	48	50	50	54	60	61	69	70	64	66	65	61	59	51	40	36	31	25	22	18	17	9	7	5	FM025 - estimated internal level & sandwich panels
	Roof	Silo grain screening Roof	80	85	32	52	72	12	24	40	34	35	41	45	46	46	50	56	57	65	67	61	63	61	57	55	47	37	33	27	22	18	14	14	5	3	1	FM025 - estimated internal level & sandwich panels
Silo sieve building	North façade	Silo grain screening façade	59	80	32	47	65	5	17	34	28	28	34	38	40	40	44	49	51	59	60	54	56	54	50	49	41	30	26	21	15	12	8	7	-2	-3	-5	FM025 - estimated internal level & sandwich panels
	East façade	Silo grain screening façade	50	80	32	47	64	4	17	33	27	28	33	37	39	39	43	49	50	58	59	54	55	54	50	48	40	29	26	20	15	11	7	7	-2	-4	-6	FM025 - estimated internal level & sandwich panels
	South façade	Silo grain screening façade	59	80	32	47	65	5	17	34	28	28	34	38	40	40	44	49	51	59	60	54	56	54	50	49	41	30	26	21	15	12	8	7	-2	-3	-5	FM025 - estimated internal level & sandwich panels
	West façade	Silo grain screening façade	50	80	32	47	64	4	17	33	27	28	33	37	39	39	43	49	50	58	59	54	55	54	50	48	40	29	26	20	15	11	7	7	-2	-4	-6	FM025 - estimated internal level & sandwich panels
	Roof	Silo grain screening roof	36	80	32	47	63	3	15	31	26	26	32	36	38	38	42	47	49	57	58	52	54	52	48	47	38	28	24	18	13	10	6	5	-4	-5	-7	FM025 - estimated internal level & sandwich panels
RO Building	East façade	Closed roller doors	50			62	79	14	19	27	38	42	49	54	53	55	62	65	70	62	61	69	60	62	60	49	52	51	53	60	58	59	63	65	62	57	53	WT003 - existing RO building doors
		RO building façade	46	84.1	18	59	76	-3	1	10	21	21	34	39	34	35	37	41	45	51	50	63	59	64	66	63	64	65	66	66	65	66	65	63	58	55	52	WT024 - existing RO building façade/roof - considering a single corrugated steel sheet
	South façade	RO building façade	72	84.1	18	59	78	-1	3	12	23	23	35	41	36	37	39	43	47	52	52	65	61	66	68	65	66	67	68	68	67	68	67	65	60	57	54	
	West façade	RO building façade	96	84.1	18	59	79	0	5	13	24	24	37	42	37	38	40	44	48	54	53	66	62	67	69	66	67	68	69	69	69	69	68	67	62	58	55	
	Roof	RO building roof	193	84.1	18	59	82	3	8	16	27	27	40	45	40	41	43	47	51	57	56	69	65	70	72	69	70	71	72	72	72	72	71	70	65	61	58	
Cooling towers	North façade	Louvre	179			59	77	29	35	39	44	57	47	59	61	62	61	64	65	64	63	62	59	55	49	58	64	62	64	69	66	67	63	61	57	55	51	CT003 - exsisting eastern evaporator louvre
	East façade	Sidewall	144			63	80	32	38	42	47	60	51	65	67	67	69	70	70	70	68	66	63	48	57	59	62	64	67	65	66	65	63	61	58	56	52	CT004 - existing eastern evaporator sidewalls
	South façade	Louvre	180			59	77	29	35	39	44	57	47	59	61	62	61	64	65	64	63	62	59	55	49	58	64	62	64	69	66	67	63	61	57	55	51	CT003 - exsisting eastern evaporator louvre
	West façade	Sidewall	143			63	80	32	38	42	47	60	51	65	67	67	69	70	70	70	68	66	63	48	57	59	62	64	67	65	66	65	63	61	58	56	52	CT004 - existing eastern evaporator sidewalls
	Fan	Fan	81			66	77	8	14	18	23	36	32	43	55	49	55	63	64	67	66	67	68	67	67	67	65	64	63	63	62	61	58	56	51	48	45	CT013 - existing eastern evaporator fans
Biogas shed extension	North façade	Biogas shed extension façade	34			74	89	0	0	0	0	41	40	52	48	50	56	64	64	69	73	76	84	77	78	79	73	75	75	79	79	77	75	72	68	64	59	WT031 - existing biogas shed from DD report
	East façade	Biogas shed extension façade	72			69	88	0	0	0	0	40	38	50	46	48	54	62	62	67	71	74	82	76	76	77	72	73	73	77	78	76	74	70	66	62	57	WT031 - existing biogas shed from DD report
	West façade	Biogas shed extension façade	72			64	83	0	0	0	0	35	33	45	41	43	49	57	57	62	66	69	77	71	71	72	67	68	68	72	73	71	69	65	61	57	52	WT031 - existing biogas shed from DD report
	Roof	Biogas shed extension roof	151			64	86	0	0	0	0	38	36	48	44	46	52	61	61	65	70	72	80	74	74	76	70	72	71	76	76	74	72	69	64	61	56	WT031 - existing biogas shed from DD report
Scrubber #2 blower room	North façade	Scrubber #2 blower room façade	103			69	89	0	0	0	0	41	40	51	48	50	55	64	64	69	73	75	83	77	78	79	73	75	75	79	79	77	75	72	68	64	59	WT031 - existing biogas shed from DD report
	East façade	Scrubber #2 blower room façade	68			69	87	0	0	0	0	39	38	50	46	48	54	62	62	67	71	74	82	75	76	77	71	73	73	77	77	75	73	70	66	62	57	WT031 - existing biogas shed from DD report
	South façade	Scrubber #2 blower room façade	103			64	84	0	0	0	0	36	35	46	43	45	50	59	59	64	68	70	78	72	73	74	68	70	70	74	74	72	70	67	63	59	54	WT031 - existing biogas shed from DD report
	West façade	Scrubber #2 blower room façade	68			64	82	0	0	0	0	34	33	45	41	43	49	57	57	62	66	69	77	70	71	72	66	68	68	72	72	70	68	65	61	57	52	WT031 - existing biogas shed from DD report
	Roof	Scrubber #2 blower room roof	216			64	87	0	0	0	0	39	38	50	46	48	54	62	62	67	71	74	82	75	76	77	71	73	73	77	77	75	73	70	66	62	57	WT031 - existing biogas shed from DD report
Product silo storage	North façade	Product silo storage façade	59	74.6	18	53	71	15	26	28	35	37	40	45	53	46	50	51	50	53	62	58	60	62	62	63	60	59	58	57	55	53	51	49	45	42	39	FM023 - existing area at top of flour mill silos & considered single steel sheet
	East façade	Product silo storage façade	162	74.6	18	53	75	19	31	32	39	41	44	50	58	50	54	55	54	57	66	62	64	66	66	67	64	63	62	61	60	57	56	54	50	47	44	FM023 - existing area at top of flour mill silos & considered single steel sheet
	South façade	Product silo storage façade	59	74.6	18	53	71	15	26	28	35	37	40	45	53	46	50	51	50	53	62	58	60	62	62	63	60	59	58	57	55	53	51	49	45	42	39	FM023 - existing area at top of flour mill silos & considered single steel sheet
	West façade	Product silo storage façade	162	74.6	18	53	75	19	31	32	39	41	44	50	58	50	54	55	54	57	66	62	64	66	66	67	64	63	62	61	60	57	56	54	50	47	44	FM023 - existing area at top of flour mill silos & considered single steel sheet
	Roof	Product silo storage roof	318	74.6	18	53	78	22	34	35	42	44	47	52	61	53	57	58	57	60	69	65	67	69	69	70	67	66	65	64	63	60	59	56	52	50	47	FM023 - existing area at top of flour mill silos & considered single steel sheet
Silo grain screening building	North façade	Fan discharge outlets	2	-	0	85	88	-3	10	26	20	27	33	36	44	44	49	55	57	63	68	67	74	76	77	79	75	73	73	71	69	68	67	70	64	62	60	FM025 - estimated SWL
		Silo grain screening façade	177	85	32	52	75	15	27	43	38	38	44	48	50	50	54	59	61	69	70	64	66	64	60	59	50	40	36	30	25	22	18	17	8	7	5	FM025 - estimated internal level & sandwich panels for facades/roofs
	East façade	Silo grain screening façade	78	85	32	52	71	11	24	40	34	35	40	44	46	46	50	56	57	65	66	60	62	61	57	55	47	36	32	27	22	18	14	14	5	3	1	FM025 - estimated internal level & sandwich panels for facades/roofs
	South façade	Silo grain screening façade	181	85	32	52	75	15	27	44	38	38	44	48	50	50	54	59	61	69	70	64	66	64	60	59	50	40	36	30	25	22	18	17	8	7	5	FM025 - estimated internal level & sandwich panels for facades/roofs
	West façade	Silo grain screening façade	78	85	32	52	71	11	24	40	34	35	40	44	46	46	50	56	57	65	66	60	62	61	57	55	47	36	32	27	22	18	14	13	5	3	1	FM025 - estimated internal level & sandwich panels for facades/roofs
	Roof	Silo grain screening Roof	85	85	32	52	72	12	24	40	35	35	41	45	47	47	51	56	58	66	67	61	63	61	57	55	47	37	33	27	22	18	14	14	5	4	2	FM025 - estimated internal level & sandwich panels for facades/roofs

Appendix D

Modifying factor analysis results

Modification 26 individually

Receiver	Predicted noise level		Low frequency noise trigger 1
	dBA	dBC	Difference between dBC and dBA (dB)
R1	18	45	**27**
R2	20	44	**24**
R3	20	44	**24**
R4	22	45	**23**
R5	25	51	**26**
R6	25	50	**25**
R7	21	45	**24**
R8	18	45	**27**
R9	20	43	**23**
R10	14	41	**27**
R11	18	45	**26**
R12	18	45	**26**
R13	18	45	**27**
R14	25	51	**26**
R15	20	45	**25**

Low frequency noise trigger 2													
Receiver	Predicted one-third noise levels (dBZ)												
Frequencies (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
LFN Thresholds	92	89	86	77	69	61	54	50	50	48	48	46	44
R1	41	42	44	39	43	39	37	37	33	31	22	20	19
R2	40	41	43	38	42	39	37	37	33	30	25	22	22
R3	41	42	44	39	42	39	37	37	32	28	22	19	19
R4	41	42	45	40	43	40	38	37	33	29	22	20	21
R5	47	47	51	45	48	46	43	43	39	35	30	27	28
R6	47	47	48	44	49	43	43	41	37	35	28	25	24
R7	41	43	45	40	43	40	38	38	33	29	22	20	20
R8	41	42	45	39	44	40	38	38	34	31	23	21	20
R9	40	41	43	38	41	38	36	36	31	27	21	18	19
R10	38	40	41	37	40	36	35	34	29	26	18	15	15
R11	42	43	44	40	43	38	37	36	32	29	21	19	19
R12	40	42	44	39	43	40	38	37	32	29	21	19	19
R13	42	43	44	40	45	39	38	37	32	30	22	19	19
R14	51	50	48	46	51	42	45	43	39	38	28	27	25
R15	41	41	43	39	44	39	38	37	33	31	24	22	21

	Exceeds LFN threshold by up to and including 5 dB and cannot be mitigated: a 2 dB penalty must be applied during evening/night
	Exceeds LFN threshold by more than 5 dB and cannot be mitigated: a 5 dB penalty must be applied during evening/night and a +2 dB penalty during the day

Cumulative noise levels

Receiver	Predicted noise level		Low frequency noise trigger 1
	dBA	dBC	Difference between dBC and dBA (dB)
R1	43	70	**27**
R2	48	72	**24**
R3	49	75	**26**
R4	49	74	**25**
R5	49	75	**26**
R6	40	69	**28**
R7	49	74	**25**
R8	42	70	**28**
R9	49	74	**25**
R10	44	70	**26**
R11	48	72	**24**
R12	48	72	**25**
R13	48	71	**24**
R14	40	68	**28**
R15	42	69	**27**

Low frequency noise trigger 2													
Receiver	Predicted one-third noise levels (dBZ)												
Frequencies (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
LFN Thresholds	92	89	86	77	69	61	54	50	50	48	48	46	44
R1	65	65	63	65	69	66	65	62	60	57	48	45	43
R2	66	66	66	67	71	69	67	64	61	58	53	50	48
R3	70	70	69	72	75	69	67	66	61	59	53	50	49
R4	69	69	68	70	74	69	69	66	62	61	53	50	49
R5	71	70	69	70	74	71	70	67	64	61	54	52	50
R6	68	66	63	66	68	62	61	60	57	55	45	44	40
R7	71	70	69	69	73	67	67	66	62	61	53	50	49
R8	65	65	63	65	69	66	64	62	59	56	48	45	43
R9	68	69	68	71	74	70	67	64	60	59	53	49	49
R10	65	65	65	66	70	65	63	61	57	56	49	45	44
R11	69	69	66	68	71	66	65	63	59	59	52	48	48
R12	70	69	67	68	72	66	66	64	60	59	51	48	47
R13	67	67	66	67	71	65	65	63	60	59	51	48	47
R14	63	63	62	63	68	63	62	59	56	54	46	43	41
R15	64	64	62	64	68	65	63	61	58	55	48	45	43

	Exceeds LFN threshold by up to and including 5 dB and cannot be mitigated: a 2 dB penalty must be applied during evening/night
	Exceeds LFN threshold by more than 5 dB and cannot be mitigated: a 5 dB penalty must be applied during evening/night and a +2 dB penalty during the day

Appendix E

Cumulative noise levels

Table E.1 Predicted cumulative noise levels of the site – neutral weather conditions

Receiver ID	Address	EPL noise limit (dBA)	Rail noise (MOD25)[1]	Predicted noise level (dBA)[2]		Noise level is below design goal?			
				Cumulative	Cumulative ANYC	Cumulative (current, rail and MOD26)		Cumulative ANYC (current, approved but not yet constructed, rail and MOD26)	
						Without LFN[3] penalty	With LFN[3] penalty	Without LFN penalty	With LFN penalty
R1	135 Terara Road, Terara	38	29	47 (42 + 5)	47 (42 + 5)	Exceeds 4 dB	Exceeds 9 dB	Exceeds 4 dB	Exceeds 9 dB
R2	45 Ferry Lane, Terara	38	27	52 (47 + 5)	52 (47 + 5)	Exceeds 9 dB	Exceeds 14 dB	Exceeds 9 dB	Exceeds 14 dB
R3	41A Meroo Street, Bomaderry	42	45	55 (50 + 5)	55 (50 + 5)	Exceeds 8 dB	Exceeds 13 dB	Exceeds 8 dB	Exceeds 13 dB
R4	1-3 Meroo Street, Bomaderry	42	45	55 (50 + 5)	55 (50 + 5)	Exceeds 8 dB	Exceeds 13 dB	Exceeds 8 dB	Exceeds 13 dB
R5	Burraga Island	40	37	53 (48 + 5)	53 (48 + 5)	Exceeds 8 dB	Exceeds 13 dB	Exceeds 8 dB	Exceeds 13 dB
R6	39 Hanigans Lane, Bolong	40	31	45 (40 + 5)	45 (40 + 5)	Yes	Exceeds 5 dB	Yes	Exceeds 5 dB
R7	19 Meroo Street, Bomaderry	42	45	55 (50 + 5)	55 (50 + 5)	Exceeds 8 dB	Exceeds 13 dB	Exceeds 8 dB	Exceeds 13 dB
R8	1 Nobblers Lane, Terara	38	29	46 (41 + 5)	47 (42 + 5)	Exceeds 3 dB	Exceeds 8 dB	Exceeds 4 dB	Exceeds 9 dB
R9	2 Tarawara Street, Bomaderry	42	45	55 (50 + 5)	55 (50 + 5)	Exceeds 8 dB	Exceeds 13 dB	Exceeds 8 dB	Exceeds 13 dB
R10	10 Tarawara Street, Bomaderry	40	37	49 (44 + 5)	49 (44 + 5)	Exceeds 4 dB	Exceeds 9 dB	Exceeds 4 dB	Exceeds 9 dB
R11	17 Coomea Street, Bomaderry	40	37	52 (47 + 5)	52 (47 + 5)	Exceeds 7 dB	Exceeds 12 dB	Exceeds 7 dB	Exceeds 12 dB
R12	6 Birriley Street, Bomaderry	40	37	52 (47 + 5)	52 (47 + 5)	Exceeds 7 dB	Exceeds 12 dB	Exceeds 7 dB	Exceeds 12 dB
R13	1 Coomea Street, Bomaderry	40	37	52 (47 + 5)	52 (47 + 5)	Exceeds 7 dB	Exceeds 12 dB	Exceeds 7 dB	Exceeds 12 dB
R14	390 Bolong Road, Bolong	40	41	48 (43 + 5)	48 (43 + 5)	Exceeds 3 dB	Exceeds 8 dB	Exceeds 3 dB	Exceeds 8 dB
R15	1 Bryant Street, Terara	40	29	46 (41 + 5)	46 (41 + 5)	Exceeds 1 dB	Exceeds 6 dB	Exceeds 1 dB	Exceeds 6 dB

Notes:

1. Rail noise levels have been sourced from Table 54 and 55 of the report *Environmental Noise Impact Assessment – Proposed Extension of Existing Rail Line and Extension to Product Dryer Building 3 & 4 (Rev E)* (Day Design, 2025). Conservatively, noise levels for existing rolling stock have been used.
2. A 5 dB correction has been applied at all receivers as described in Section 6.2.1.2.
3. Low Frequency Noise

Table E.2 Predicted cumulative noise levels of the site – noise enhancing weather conditions

Receiver ID	Address	EPL noise limit (dBA)	Rail noise (MOD25)[1]	Predicted noise level (dBA)[2,3]		Noise level is below design goal?			
				Cumulative	Cumulative ANYC	Cumulative (current, rail and MOD26)		Cumulative ANYC (current, approved but not yet constructed, rail and MOD26)	
						Without LFN[3] penalty	With LFN[3] penalty	Without LFN penalty	With LFN penalty
R1	135 Terara Road, Terara	38	29	48 (43 + 5)	48 (43 + 5)	Exceeds 5 dB	Exceeds 10 dB	Exceeds 5 dB	Exceeds 10 dB
R2	45 Ferry Lane, Terara	38	27	53 (48 + 5)	53 (48 + 5)	Exceeds 10 dB	Exceeds 15 dB	Exceeds 10 dB	Exceeds 15 dB
R3	41A Meroo Street, Bomaderry	42	45	56 (51 + 5)	55 (50 + 5)	Exceeds 9 dB	Exceeds 14 dB	Exceeds 8 dB	Exceeds 13 dB
R4	1-3 Meroo Street, Bomaderry	42	45	56 (51 + 5)	56 (51 + 5)	Exceeds 9 dB	Exceeds 14 dB	Exceeds 9 dB	Exceeds 14 dB
R5	Burraga Island	40	37	54 (49 + 5)	54 (49 + 5)	Exceeds 9 dB	Exceeds 14 dB	Exceeds 9 dB	Exceeds 14 dB
R6	39 Hanigans Lane, Bolong	40	31	46 (41 + 5)	46 (41 + 5)	Exceeds 1 dB	Exceeds 6 dB	Exceeds 1 dB	Exceeds 6 dB
R7	19 Meroo Street, Bomaderry	42	45	56 (51 + 5)	56 (51 + 5)	Exceeds 9 dB	Exceeds 14 dB	Exceeds 9 dB	Exceeds 14 dB
R8	1 Nobblers Lane, Terara	38	29	48 (43 + 5)	48 (43 + 5)	Exceeds 5 dB	Exceeds 10 dB	Exceeds 5 dB	Exceeds 10 dB
R9	2 Tarawara Street, Bomaderry	42	45	55 (50 + 5)	55 (50 + 5)	Exceeds 8 dB	Exceeds 13 dB	Exceeds 8 dB	Exceeds 13 dB
R10	10 Tarawara Street, Bomaderry	40	37	50 (45 + 5)	50 (45 + 5)	Exceeds 5 dB	Exceeds 10 dB	Exceeds 5 dB	Exceeds 10 dB
R11	17 Coomea Street, Bomaderry	40	37	53 (48 + 5)	53 (48 + 5)	Exceeds 8 dB	Exceeds 13 dB	Exceeds 8 dB	Exceeds 13 dB
R12	6 Birriley Street, Bomaderry	40	37	53 (48 + 5)	53 (48 + 5)	Exceeds 8 dB	Exceeds 13 dB	Exceeds 8 dB	Exceeds 13 dB
R13	1 Coomea Street, Bomaderry	40	37	53 (48 + 5)	53 (48 + 5)	Exceeds 8 dB	Exceeds 13 dB	Exceeds 8 dB	Exceeds 13 dB
R14	390 Bolong Road, Bolong	40	41	49 (44 + 5)	49 (44 + 5)	Exceeds 4 dB	Exceeds 9 dB	Exceeds 4 dB	Exceeds 9 dB
R15	1 Bryant Street, Terara	40	29	47 (42 + 5)	47 (42 + 5)	Exceeds 2 dB	Exceeds 7 dB	Exceeds 2 dB	Exceeds 7 dB

Notes:

1. Rail noise levels have been sourced from Table 54 and 55 of the report *Environmental Noise Impact Assessment – Proposed Extension of Existing Rail Line and Extension to Product Dryer Building 3 & 4 (Rev E)* (Day Design, 2025). Conservatively, noise levels for existing rolling stock have been used.
2. A 5 dB correction has been applied at all receivers as described in Section 6.2.1.2.
3. Low Frequency Noise