DEPARTMENT OF PLANNING AND ENVIRONMENT

EXPLORER STREET, SOUTH EVELEIGH

NOISE AND VIBRATION IMPACT ASSESSMENT

Based on Explorer Street, Eveleigh Design Report
Provided by WMK Architecture, dated 30 June 2023

AUGUST 2023

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Explorer Street, South Eveleigh
Noise and Vibration Impact Assessment

Department of Planning and Environment

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1 INTRODUCTION

WSP Australia Pty Ltd (WSP) has been commissioned by the Department of Planning and Environment to undertake a Noise and Vibration Impact Assessment to support the proposed land use rezoning for the South Eveleigh Precinct (the site). The site is located on Explorer Street, to the south of Eveleigh Maintenance Facility (EMF) and approximately 3 km south west of the Sydney CBD.

1.1 PROJECT BACKGROUND

The site is known as the Explorer Street Precinct which is the central parcel of the South Eveleigh area. The site occupies an area of approximately 2.6 hectares and currently comprises 46 townhouses owned by the LAHC. WSP understands that the rezoning will allow for higher density residential apartment buildings to be constructed on the site, replacing the existing town houses.

The purpose of this assessment is to determine potential noise and vibration impacts on future development within the site from the nearby road and rail infrastructure. Mitigation measures will be recommended to ensure future residential development within the site can comply with the relevant legislation and policies, including City of Sydney Council's (CoS) Development Control Plan 2012 (DCP).

The assessment includes:

- Guidance on external building envelope sound insulation, appropriate setbacks, and any other mitigation measures required to ensure residential developments can meet relevant noise criteria from legislation and policy.
- Review of potential vibration impacts from the existing underground railway line (T4 Eastern Suburbs & Illawarra Line) beneath the site.

WSP has previously conducted a noise assessment for the site, *Explorer Street, South Eveleigh Noise and Vibration Impact Assessment* (WSP 2021) (ref: *PS120636-ACO-REP-NVIA Rev1*) and has been referenced in this document.

1.2 DESIGN STANDARDS AND REFERENCE DOCUMENTS

This assessment has been conducted in accordance with the following guidelines and legislation:

- City of Sydney Development Control Plan 2012 (CoS DCP) and Standard Conditions of Consent (CoS Conditions)
- NSW *Noise Policy for Industry 2017* (NSW NPfI)
- NSW *Road Noise Policy 2011* (NSW RNP)
- NSW EPA *Assessing vibration: a technical guideline 2006* (AVTG)
- NSW State Environmental Planning Policy (Transport and Infrastructure) 2021 and NSW *Development Near Rail Corridors and Busy Roads – Interim Guideline 2008* (DNRCBR)

The report has been written with reference to the following documentation:

- New Intercity Fleet Eveleigh Facility Project Noise and Vibration Assessment, WSP (ref: *2202522PA-170223-CXM-REPORT Noise Impact Assessment Eveleigh NIF*)
- New Intercity Fleet Eveleigh Facility Project Noise and Vibration Assessment update, WSP (ref: *PS115064-OpAssessmentUpdate Rev0*)
- Explorer Street, *South Eveleigh Noise and Vibration Impact Assessment* WSP (ref: *PS120636-ACO-REP-NVIA Rev1*)
- Explorer Street, *Eveleigh Design Report* Rev 7.0, WMK Architecture

- *Explorer Street Transport Impact Assessment*, SCT Consulting

1.3 ACOUSTIC ENGINEER ACCREDITATION

WSP staff involved with the preparation of this report are 'suitably qualified' through:

- An Engineering degree from an Australian University
- Membership of the Australian Acoustical Society (AAS)
- Working for a member firm of the Association of Australasian Acoustical Consultants (AAAC).

2 EXISTING ENVIRONMENT

This section provides a summary of relevant available baseline noise and vibration data from the site, including the location, dates, and results of measured noise and vibration levels.

To establish assessment goals for both noise ingress and noise egress, the prevailing external noise environment must be established. Similarly, any potential vibration impacts on the proposed development requires that the existing vibration levels are recorded.

A noise survey was undertaken in April and May 2023 to determine the noise environment in the vicinity of the site. The survey consisted of long-term unattended noise monitoring as well as attended short term measurements.

Vibration monitoring was undertaken in May 2023 for the purpose of assessing potential impacts of underground train movements from the tunnel running beneath the site. Supplementary vibration monitoring to assess ground borne noise was taken in July 2023.

2.1 SITE AND SURVEY LOCATION

The site is located in South Eveleigh between Redfern and Erskineville stations and covers an area of approximately 2.6 hectares. The site currently comprises 46 townhouses and a park on the southern half. Figure 2.1 presents the site and noise and vibration monitoring locations.

- The site is bounded by a major rail corridor to the north and the EMF is immediately adjacent to the site. The EMF and rail corridor are considered the most significant noise sources impacting the site and will be a focus of this assessment.
- To the east of the site are existing residential receivers and a future development precinct known as the Rowley Street Precinct. These are the identified sensitive receivers with potential to be impacted by development on the site.
- To the south is the South Sydney Rotary Park and beyond Henderson Street is a residential precinct.
- To the west is a parcel of land owned by Transport for NSW (TfNSW) currently composed of on-ground parking and single-storey industrial buildings.
- Running underneath the southern boundary of the site is a tunnel used by the T4 rail line. Trains enter and exit the tunnel approximately 50 m to the west of the site therefore the depth of the tunnel underneath the site is relatively shallow.

Table 2.1 presents the identified nearest noise-sensitive receivers to the site.

Table 2.1 Nearby noise sensitive receivers

RECEIVER	RECEIVER TYPE	APPROXIMATE DISTANCE FROM PROJECT SITE (m)
Residential along Henderson Road	Residential	15 (to site southern boundary)
Residential east of the site	Residential	10 (to site eastern boundary)
Industrial to north and west of the site	Industrial	20 (to site northern boundary)

Table 2.2 presents the identified noise sources with potential for significant impact to future residential receivers within the site.

Table 2.2 Nearby noise and vibration sources

NOISE SOURCE	TYPE OF NOISE SOURCE	APPROXIMATE NEAREST DISTANCE FROM THE SITE (m)[1]
Eveleigh Rail Maintenance Facility	Industrial noise	20
Rail Corridor	Rail noise	70
Underground Rail corridor	Rail ground borne noise and vibration	Underneath the site

(1) Noted distances are approximations and for illustrative purposes only. Noise modelling undertaken based on actual distances from noise source to receiver at detailed design stage when the location of structures is confirmed.

Figure 2.1 Aerial photograph showing site boundary and survey locations

2.1 SUMMARY OF NOISE SURVEY RESULTS

WSP completed long term unattended noise monitoring at two locations to determine the current acoustic environment at the site. Additional attended noise measurements have been undertaken to assess the existing site conditions. This section provides a summary of these results.

Table 2.3 summaries the long-term unattended noise monitoring results. The data are reported as the average equivalent continuous equivalent noise levels $L_{eq,15min}$ and Rating Background Levels (RBL) as defined in the *Noise Policy for Industry 2017* (NSW NPfI).

Table 2.3 Unattended noise measurement results

LOCATION	MEASUREMENT PERIOD	TIME PERIOD[1]	dBA $L_{eq,15\ min}$	RBL, dBA
L1 - 1 Explorer Street, Eveleigh	26/04/23 – 06/05/23	Day	52	41
		Evening	51	42
		Night	46	39
L2 - 30 Explorer Street, Eveleigh		Day	59	40
		Evening	51	41
		Night	47	36

(1) Note: Day is defined as 7.00am to 6.00pm on Monday to Saturday; 8.00am to 6.00pm on Sundays and Public Holidays, Evening is 6.00pm to 10.00pm, and Night is the remaining periods.

The typical L_{A90} octave band noise levels from the measurement at Location L2 is presented in Table 2.4.

Table 2.4 L2 octave band noise levels

SOURCE		OCTAVE BAND CENTRE FREQUENCY, Hz									OVERALL dBA
		31.5	63	125	250	500	1k	2k	4k	8k	
Typical Spectrum dB $L_{90,\ 15\ min}$	Day	46	48	47	41	36	34	32	27	19	40
	Evening	50	49	48	44	37	34	31	27	22	41
	Night	45	45	44	39	32	29	25	21	15	36

Table 2.5 presents the results of the short-term attended noise monitoring used to characterise the noise environment at the project site.

Table 2.5 Short term attended noise monitoring results

LOCATION	DATE	START TIME	$L_{EQ\ (15MIN)}$ DBA	$L_{90(15MIN)}$ DBA	MEASURED EVENT NOISE LEVELS L_{MAX}, DBA
30 Explorer Street, Eveleigh	26/04/23	10.50 am	54	49	LV passby Railway Street: 50-53 Reverse beep: up to 50 Aircraft: 55 Light aircraft: up to 70 Train horn: up to 57 Train passby: 51 Birds call: 53-67 HV WB in rail corridor: 51-52 Construction noise to southeast: up to 54 Helicopter flyover: 73 Train horn/angle grinder: 57

LOCATION	DATE	START TIME	$L_{EQ\ (15MIN)}$ DBA	$L_{90(15MIN)}$ DBA	MEASURED EVENT NOISE LEVELS L_{MAX}, DBA
4A Station Place (inside small unnamed park)	11/03/23	1.37 pm	53	46	Intermittent bird call: 71-73 Train horn from EMF: 53-54 Car passby on Station Street: 49-51 Bangs/clunks noise from EMF: 51 Train horn: 50-51 Continuous mech hum from EMF: 51-52 Power tool operating near residential: 60-61 Distant ambulance: 47-48 Van passby from Station Place: 51-52 Airplane flyby: 55 Birds call (intermittent): 49-50

A previous noise survey was undertaken by WSP in May 2021 to determine noise levels from the operation of the EMF, directly adjacent to the site. The typical highest measured L_{eq} sound pressure levels have been used to inform noise ingress requirements to the proposed development. The results of these noise measurements are presented in Table 2.6.

Table 2.6 Additional noise measurement results

LOCATION	TYPICAL HIGHEST dBA $L_{eq\ (1\ hour)}$	
	24 hours	10pm – 7am
4A Station Street, Eveleigh	63	57

2.2 SUMMARY OF VIBRATION SURVEY RESULTS

WSP carried out operator-attended vibration measurements to assess vibration impacts from the nearby underground rail corridor on the site. Measurements were conducted adjacent to the South Sydney Rotary Park on Explorer Street at four (4) different locations above the existing T4 line. Monitoring locations VM01, VM02, VM03 and VM04 are as shown in Figure 2.1.

Measurements taken on 12 May 2023 were used to determine the impacts to human comfort within the development. It was noted that the measurements at location VM03 were influenced by vehicles travelling on Station Place and therefore the measured results were not found to be a good representation of rail vibration levels. Previous vibration measurements were taken in July 2020 (as outlined in *PS120636-ACO-REP-NVIA Rev1)* at a similar location to VM01 (although closer to the rail centreline) and these results are also included to assist the assessment.

Table 2.7 summarises attended vibration monitoring results.

Table 2.7 Summary of attended vibration monitoring results

LOCATION	TIME	NUMBER OF RECORDED PASSBYS	HORIZONTAL DISTANCE FROM RAIL CENTRELINE	VDV, PERIOD ($m/s^{1.75}$) Y-AXIS
12 May 2023				
VM01	1:51pm – 3:00pm	11	~15m	0.037
VM02	3:09pm – 4:00pm	19	~6m	0.045
VM03[1]	4:09pm – 5:00pm	15	~13m	0.130
July 2020 measurements				
VM04	9:40am – 11:20am	25	~5m	0.0663 (average passby VDV)

(1) Results influenced by localised sources not related to rail vibration

Supplementary measurements were taken at two locations on 12 July 2023 to assess the impacts of ground borne noise. These results are presented in Table 2.8.

Table 2.8 Summary of supplementary attended ground borne noise monitoring

95TH PERCENTILE $L_{MAX\ SLOW}$	VIBRATION LEVELS (dBV) IN OCTAVE BANDS (Hz)								
	1	2	4	8	16	31.5	63	125	250
VM03	93	90	81	75	72	90	92	75	62
VM04	95	88	82	76	86	100	94	80	73

3 NOISE AND VIBRATION CRITERIA

Noise and vibration criteria applicable to the project have been derived from various Australian Standards, local and state policies and industry guidelines, as summarised in Table 3.1.

Table 3.1 Applicable policies and guidelines

ASSESSMENT	APPLICABLE POLICIES AND GUIDELINES	RELEVANT ASPECTS OF DEVELOPMENT
Industrial noise emissions	NSW EPA *Noise Policy for Industry* City of Sydney Development Control Plan 2012 (DCP) City of Sydney typical Conditions of Consent	— Noise from sources (such as mechanical plant) associated with the development — Noise emissions from vehicular movements on the site, including car parking
Road traffic noise emissions	NSW *Road Noise Policy*	— Noise from additional traffic on public road generated by the development
External noise intrusion	NSW State Environmental Planning Policy (Infrastructure) City of Sydney DCP	— Traffic noise intrusion to residential tenancies
Ground-borne rail noise and vibration	NSW State Environmental Planning Policy (Infrastructure) NSW DEC *Assessing vibration: a technical guideline*	— Internal ground/structure borne noise and vibration to development
Sound insulation	Building Code of Australia, Part F5 City of Sydney DCP	— Sound insulation between sole occupancy units

3.1 ENVIRONMENTAL NOISE EMISSIONS

Operational noise emissions from the site are assessed under the City of Sydney Standard Conditions of Consent and the *NSW Noise Policy for Industry 2017* (NPfI). The NPfI is designed to ensure continued amenity as developments are built and as such applies to emissions such as from fixed mechanical plant and air conditioning.

While it is the ultimate responsibility of Council to determine appropriate noise emission limits for residential developments, the following sections of this report provide a guideline on the appropriate noise limits for fixed mechanical plant (such as external air conditioner units).

The assessment procedure for noise egress from the development has three components:

— Controlling intrusive noise impacts in the short term for nearby residences

— Maintaining noise level amenity for nearby residences and other land uses

— Assessment of sleep disturbance for nearby residences

In assessing the noise impact of the site, all three components must be considered for nearby residential receivers. In most cases, one component will become the limiting criterion and form the project trigger level.

3.1.1 CITY OF SYDNEY STANDARD CONDITIONS OF CONSENT

The relevant City of Sydney Standard Conditions of Consent for the development relating to noise and vibration are reproduced below:

NOISE – GENERAL

(a) The emission of noise associated with the use of the premises including the cumulative operation of any mechanical plant and equipment, and air conditioning shall comply with the following:

> *(i) The $L_{Aeq,\ 15\ minute}$ noise level emitted from the use must not exceed the project specific noise level for that receiver as determined in accordance with the NSW EPA Industrial Noise Policy. Noise must be measured in accordance with the Industrial Noise Policy and relevant requirements of Australian Standard AS 1055-1997 Acoustics – Description and measurement of environmental noise.*
>
> *(ii) Project specific noise levels shall be determined by establishing the existing environmental noise levels, in complete accordance with the assessment $L_{A90,\ 15\ minute}$ / rating $L_{A90,\ 15\ minute}$ process to be in accordance with the requirements for noise monitoring listed in the NSW EPA Industrial Noise Policy and relevant requirements of Australian Standard AS1055-1997 Standard AS 1055-1997 Acoustics – Description and measurement of environmental noise.*
>
> *(iii) Modifying factors in Table 4.1 of the NSW EPA Industrial Noise Policy are applicable.*

(b) An $L_{Aeq,15\ minute}$ noise level emitted from the use must not exceed the $L_{A90,\ 15\ minute}$ noise level by more than 3dB in any Octave Band Centre Frequency (31.5 Hz to 8 kHz inclusive) when assessed inside any habitable room of any affected residence or noise sensitive commercial premises provided that;

> *(i) Where the $L_{A90,\ 15\ minute}$ noise level is below the threshold of hearing, Tf at any Octave Band Centre Frequency as defined in Table 1 of International Standard ISO 226 : 2003- Normal Equal-Loudness-Level Contours then the value of Tf corresponding to that Octave Band Centre Frequency shall be used instead.*
>
> *(ii) The $L_{Aeq,15\ minute}$ noise level and the $L_{A90,15\ minute}$ noise level shall both be measured with all external doors and windows of the affected residence closed;*
>
> *(iii) The relevant background noise level ($L_{A90,\ 15\ minute}$) is taken to mean the day, evening or night rating background noise level determined in complete accordance with the methodology outlined in the NSW EPA Industrial Noise Policy and Australian Standard AS1055.1997 Acoustics – Description and measurement of environmental noise.*
>
> *(iv) Background noise shall be established in the absence of all noise emitted from the use but with the ventilation equipment normally servicing the affected residence operating. Background noise measurements are to be representative of the environmental noise levels at the affected location.*
>
> *(v) Modifying factors in Table 4.1 of the NSW EPA Industrial Noise Policy are applicable. Internal Noise measurements are not to be corrected for duration.*

The *Industrial Noise Policy* as outlined in the requirements above has been superseded by the NPfI 2017. It is our understanding that the City of Sydney is accepting of the adoption of the NPfI. It is therefore assumed that compliance with the NPfI will be acceptable to meet the intent of condition a) above.

3.1.2 NSW NOISE POLICY FOR INDUSTRY

Environmental noise emissions from sources associated with the development must be assessed in accordance with the NSW NPfI.

3.1.2.1 PROJECT INTRUSIVENESS NOISE LEVEL

The project intrusiveness noise level for residential receivers prescribed in the NSW NPfI may be summarised as:

- $L_{Aeq,\ 15\text{-}minute} \leq$ *Rating Background Level* (L_{A90}) + 5 dB

Based on the RBLs as outlined in Section 2 , the project intrusiveness noise level has been established for the site in accordance with the NSW NPfI and is presented in Table 3.2. As a conservative approach the lowest RBLs of the two monitored locations has been adopted for all residences.

Project intrusiveness noise levels are used in combination with amenity noise levels to assess the potential impact of noise on nearby sensitive land uses.

Table 3.2 Established project intrusiveness noise level, residential receivers only

RECEIVER LOCATION	TIME PERIOD[1]	RBL dBA	PROJECT INTRUSIVENESS NOISE LEVEL (RBL + 5 dB) dBA $L_{eq,\ 15\ min}$
Residences east and south of the project	Day	40	**45**
	Evening	41	**45**[2]
	Night	36	**41**

(1) Note: Day is defined as 7.00am to 6.00pm on Monday to Saturday; 8.00am to 6.00pm on Sundays and Public Holidays, Evening is 6.00pm to 10.00pm, and Night is the remaining periods.

(2) As outlined in Section 2.3 of the NPfI the project intrusiveness noise level for the evening should be set no greater than the project intrusiveness noise level for the day period.

3.1.2.2 PROJECT AMENITY NOISE LEVELS

To limit continuing increases in noise levels, the maximum amenity noise level within an area from industrial noise sources should not normally exceed the amenity noise levels prescribed in the NSW NPfI. Amenity noise levels are set in conjunction with the project intrusiveness noise level to limit increases in noise levels in an area over time.

The recommended amenity noise levels represent the objective for **total** industrial noise at a receiver location, whereas the **project amenity noise level** represents the objective for noise from a **single** industrial development at a receiver location as follows:

— *Project amenity noise level = recommended amenity noise level (Table 2.2 of NSW NPfI) minus 5 dB*

The amenity criterion has been established at the identified receivers based on the results of the attended and unattended noise survey. The established amenity criteria applicable to the proposed development are presented in Table 3.3.

Table 3.3 Established Project Amenity Noise Level

LOCATION	TYPE OF RECEIVER	RECOMMENDED AMENITY NOISE LEVEL (ANL) dBA $L_{eq,\ period}$	PROJECT AMENITY NOISE LEVEL (ANL -5dB) dBA $L_{eq,\ period}$	PROJECT ADJUSTED ANL dBA $L_{eq\ period}$		
				DAY	EVENING	NIGHT
Residences east and south of the project	Residential (urban)	Day: 60 Evening: 50 Night: 45	Day: 55 Evening: 45 Night: 40	55	45	40
Industrial areas north and west of the project	Industrial Premises	70 (When in use)	65	65 (When in Use)		

3.1.2.3 MAXIMUM NOISE LEVEL EVENT ASSESSMENT

The potential for sleep disturbance from maximum noise level events from premises during the night-time period needs to be considered. Sleep disturbance is considered to be both awakenings and disturbance to sleep stages.

As outlined in the NPfI, where the development night-time noise levels at a residential location exceed the following, 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."*

Table 3.4 summarises the maximum noise level event screening criteria for the site. These criteria are recommended levels which should not be exceeded at the nearest residences to prevent sleep disturbance.

Table 3.4 Maximum noise level event – project screening criteria

	PROVIDED SCREENING CRITERIA	ADJUSTED BACKGROUND NOISE LEVEL	PROJECT SCREENING CRITERIA
Sleep disturbance screening criteria	40 dBA $L_{eq,\ 15\ min}$	*(36+5)*[1] *= 41* dBA $L_{eq,\ 15\ min}$	**41 dBA $L_{eq,\ 15\ min}$**
	52 dBA L_{Fmax}	*(36 + 15)*[2] = 51 dBA L_{Fmax}	**52 dBA L_{Fmax}**

(1) RBL + 5 as outlined in the NPfI

(2) RBL + 15 as outlined in the NPfI

3.1.2.4 PROJECT NOISE TRIGGER LEVEL

In assessing the noise impact of the proposed development on surrounding residential receivers, both the intrusiveness and amenity criteria must be considered. In most cases, only one criterion will become the limiting criterion and form the project noise trigger levels (PNTL) for the source under assessment.

It is noted that, to standardise the time periods for the intrusiveness and amenity noise levels, the following conversion between $L_{eq,\ period}$ and $L_{eq,\ 15\ minute}$ has been applied (as per Section 2.2 of the NSW NPfI):

— $L_{Aeq,\ 15\ min} = L_{Aeq,\ period} + 3\ dB$

As required in Section 2.2 of the NSW NPfI, all project noise trigger levels and limits are expressed as $L_{Aeq,15\ min}$, unless otherwise expressed. A summary of all relevant criteria is presented in Table 3.5.

Table 3.5 Summary of Project Noise Trigger Levels (PNTL)

RECEIVER LOCATION	CRITERIA TYPE	PROJECT NOISE TRIGGER LEVELS dBA $L_{eq\ 15\ min}$		
		DAY	EVENING	NIGHT
Residential Receiver				
Residences east and south of the project	Intrusiveness	45	45	41
	Amenity	58	48	43
	PNTL	**45**	**45**	**41**
Other receivers				
Industrial	All (when in use)	**68**		

3.2 ROAD TRAFFIC NOISE

The NSW *Road Noise Policy* (RNP) provides objective criteria to assess the impact of the proposed development in terms of increase of traffic noise to nearby residences.

The road policy is used in this assessment to address noise associated with potential traffic increases on the surrounding road network due to the site, considering the following elements:

— Noise generated by additional traffic on the road is to be assessed against façade-corrected noise levels when measured in front of a building façade.

— External criteria are assessed at 1 metre from the affected residential building façades and at a height of 1.5 metres from the ground.

— Internal criteria are assessed at the centre of the habitable room most exposed to traffic noise, with operable windows open to provide sufficient ventilation.

Road traffic noise criteria applicable to residential and non-residential land uses are outlined in Table 3.6 and Table 3.7 respectively.

Table 3.6 Noise assessment criteria – residential land uses (Source: NSW RNP Section 2.3.1)

ROAD CATEGORY	PROJECT TYPE/LAND USE	ASSESSMENT CRITERIA	
		DAY (7AM-10PM)	NIGHT (10PM-7AM)
Local road	Existing residences affected by additional traffic on existing local roads generated by land use developments	55 dBA $L_{eq,\ 1\ hour}$ (external)	50 dBA $L_{eq,\ 1\ hour}$ (external)

Table 3.7 Noise assessment criteria – non-residential land uses (Source: NSW RNP Section 2.3.2)

PROJECT TYPE/LAND USE	ASSESSMENT CRITERIA	
	DAY (7AM-10PM)	NIGHT (10PM-7AM)
Open Space (Passive Use)	55 dBA $L_{eq\ 15\ hour}$ (external)	-

Where existing traffic noise levels are above the noise assessment criteria, the NSW RNP aims to protect against excessive decreases in amenity as the result of a project. Where road traffic noise increases by more than 2 dB as a result of a land use development, mitigation should be considered to control excessive increase in noise level. An increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.

Therefore, a maximum 2 dB increase in traffic noise levels is considered to be the applicable assessment criterion for receivers which are already experiencing traffic noise levels greater than the criteria given in Table 3.6 and Table 3.7.

3.3 EXTERNAL NOISE INTRUSION

3.3.1 NSW STATE ENVIRONMENTAL PLANNING POLICY (TRANSPORT AND INFRASTRUCTURE) 2021

3.3.1.1 RAIL NOISE AND VIBRATION

Clause 87 of the NSW *Development Near Rail Corridors and Busy Roads – Interim Guideline 2008* states:

> (3) *This clause applies to development for any of the following purposes that is on land in or adjacent to a rail corridor and that the consent authority considers is likely to be adversely affected by rail noise or vibration:*
>
> *(a) Residential accommodation,*
>
> *(b) A place of public worship,*
>
> *(c) A hospital*
>
> *(d) An educational establishment or centre-based child care facility*
>
> *(2) Before determining a development application for development to which this clause applies, the consent authority must take into consideration any guidelines that are issued by the Secretary for the purposes of this clause and published in the Gazette.*

(3) If the development is for the purposes of residential accommodation, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following LAeq levels are not exceeded:

(a) in any bedroom in the residential accommodation—35 dB(A) at any time between 10.00 pm and 7.00 am,

(b) anywhere else in the residential accommodation (other than a garage, kitchen, bathroom or hallway)—40 dB(A) at any time.

The site is located above the underground T4 rail line and adjacent to above ground rail lines servicing western and southern Sydney. A rail noise and vibration intrusion assessment is therefore required to comply with clause 87.

3.3.1.2 ROAD NOISE

Clause 102 of the NSW *Development Near Rail Corridors and Busy Roads – Interim Guideline* 2008 states:

(3) *This clause applies to development for any of the following purposes that is on land in or adjacent to the road corridor for a freeway, a tollway or a transitway or any other road with an average daily traffic volume of more than 20,000 vehicles (based on the traffic volume data published on the website of the RMS) and that the consent authority considers is likely to be adversely affected by road noise or vibration:*

(a) Residential accommodation,

(b) A place of public worship,

(c) A hospital,

(d) An educational establishment or centre-based child care facility.

Transport for NSW has published traffic volume maps to be used in determining if assessment is required against Clause 102. These maps list every road that carries an AADT of 20,000 vehicles or more. Figure 3.1 presents the map covering the site and surrounding area.

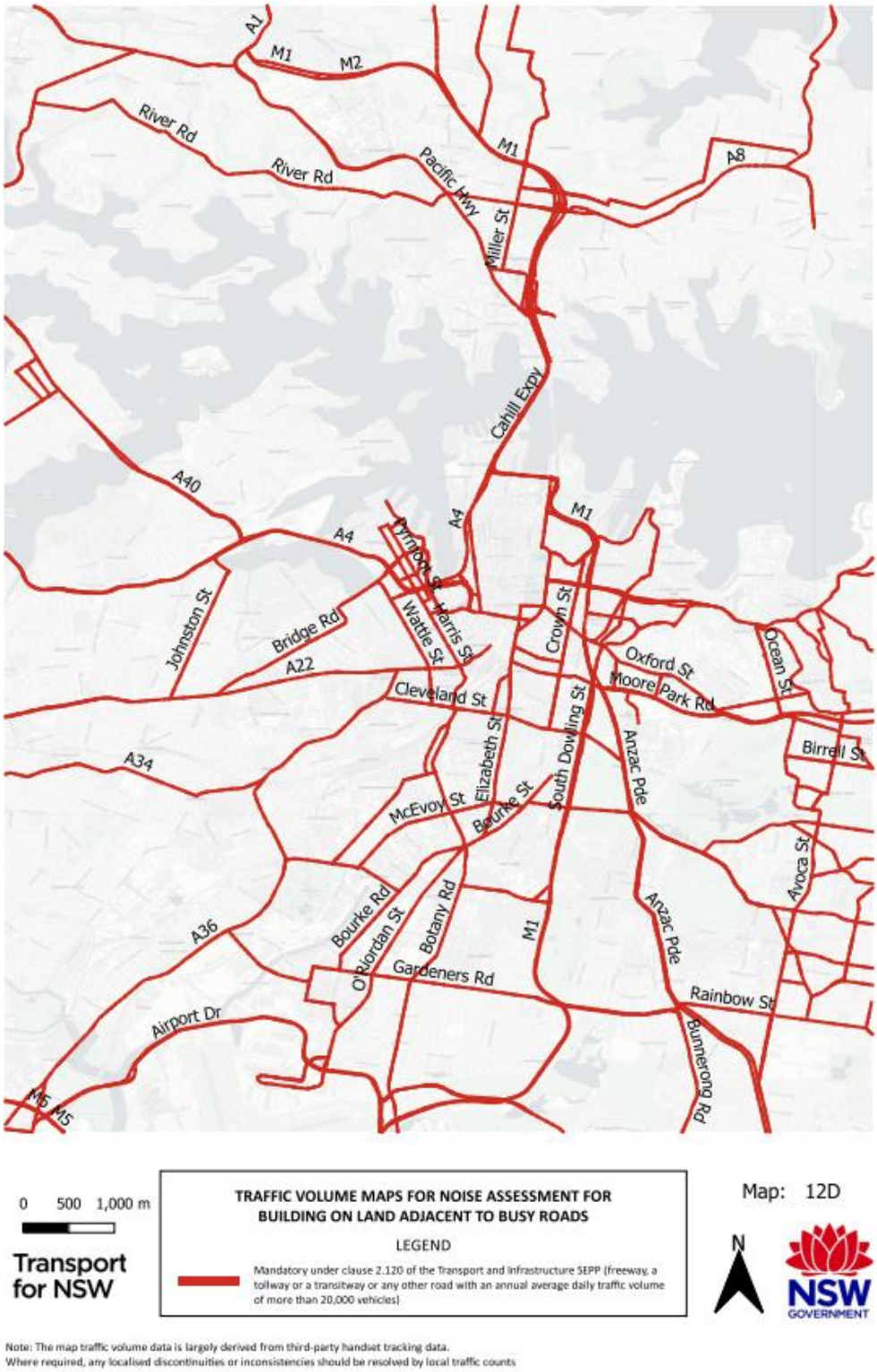


Figure 3.1 Transport for NSW *Traffic Volume Maps for Noise Assessment for Buildings on Land Adjacent to Busy Roads* – Map 12D (accessed 31 May 2023)

Henderson Road, Explorer Street and other surrounding streets to the site are not included in this map and are unlikely to carry traffic volumes greater than 20,000 per day. Therefore, Clause 102 of the DNRCBR has been determined to not apply to the site.

3.3.2 CoS DEVELOPMENT CONTROL PLAN

The requirements for internal noise levels for residential developments from the City of Sydney *Development Control Plan 2012* (DCP) are summarised in Table 3.8.

Table 3.8 City of Sydney Council DCP 2012 Noise Intrusion Criteria

DESCRIPTION	TIME	TYPE OF SPACE	INTERNAL NOISE LEVEL dBA $L_{eq,\ 1\ hour}$
Closed windows and doors	10:00pm – 7:00am	Bedrooms	**35**
	24 hours	Living Areas	**45**
Open windows and doors	10:00pm – 7:00am	Bedrooms	**45**
	24 hours	Living Areas	**55**
No natural ventilation, doors and windows shut and air conditioning in operation	10:00pm – 7:00am	Bedrooms	**38**
	24 hours	Living Areas	**48**

3.4 GROUNDBORNE RAIL NOISE AND VIBRATION

Internal ground/structure borne noise and vibration levels to residences should be controlled to within the requirements of the DNRCBR and the NSW DEC's *Assessing vibration: a technical guideline* (NSW AVTG).

The site is located near and above the following Sydney passenger and freight train lines:

- Existing above-ground railway serving western and southern Sydney, approx. 90 m (western side of site) to 150 m (eastern side of site)
- Existing underground railway serving T4 Line – under the southern end of the site

A detailed ground borne noise and vibration impact assessment of the existing underground passenger railway lines is required in accordance with the DNRCBR because the existing underground rail line is within 60 m of the site perimeter.

Table 3.9 Ground-borne noise criteria

LOCATION	NOISE LEVEL	APPLICABLE TIME PERIOD
Residential areas	40 dBA $L_{max;Slow}$	Daytime (7:00am to 10:00pm)
	35 dBA $L_{max;Slow}$	Night (10:00pm to 7:00am) – sleeping areas

Recommended vibration dose values for intermittent vibration are taken from the AVTG (Table 2.4 of the AVTG) and are summarised in Table 3.10.

Table 3.10 Acceptable vibration dose values for intermittent vibration

LOCATION	PREFERRED VALUE		MAXIMUM VALUE	
	DAY	NIGHT	DAY	NIGHT
Residential areas	0.20 $m/s^{1.75}$	0.13 $m/s^{1.75}$	0.40 $m/s^{1.75}$	0.26 $m/s^{1.75}$

3.5 INTERNAL SOUND INSULATION FOR RESIDENTIAL AREAS

The proposed residential areas of the site are classified as Class 2 under the *National Construction Code 2022* (NCC). The NCC provides performance requirements for partitions separating sole occupancy units.

City of Sydney (CoS) DCP 2012 requires additional sound insulation requirements in addition to those of the NCC, as summarised in Table 3.11.

Table 3.11 NCC and City of Sydney DCP sound insulation requirements for residential areas of the development.

BUILDING ELEMENT	DESCRIPTION	NCC		CoS DCP
		IMPACT NOISE REQUIREMENTS	AIRBORNE NOISE REQUIREMENTS	
Walls	Separating sole occupancy units	-	$R_w + C_{tr} \geq 50$	-
	Separating a habitable room of a sole occupancy unit from a bathroom, sanitary compartment, laundry or kitchen in an adjacent sole occupancy unit	Discontinuous construction	$R_w + C_{tr} \geq 50$	-
	Separating a sole occupancy unit and a stairway, public corridor, public lobby or the like	-	$R_w \geq 50$	-
	Separating a sole occupancy unit and a plant room and lift shaft	Discontinuous construction	$R_w \geq 50$	-
	A door between a sole occupancy unit and a stairway, public corridor, lobby or the like.	-	$R_w \geq 30$	-
Floors	Separating sole-occupancy units and separating sole-occupancy units and a plant room, lift shaft, stairway, public corridor, public lobby or the like.	$L_{n,w} \leq 62$	$R_w + C_{tr} \geq 50$	$L'_{nT,w} \leq 55$
Services	A duct, soil, waste, water supply pipe and stormwater pipe located in a wall or floor cavity, serves or passes through more than one sole occupancy unit if the adjacent room is a habitable room (other than a kitchen)	-	$R_w + C_{tr} \geq 40$	-
	A duct, soil, waste, water supply pipe and stormwater pipe located in a wall or floor cavity, serves or passes through more than one sole occupancy unit if the adjacent room is a kitchen or any other non-habitable room.	-	$R_w + C_{tr} \geq 25$	-
Pumps	The point of connection between the service pipes in a building and any circulating or other pump.	A flexible coupling at the connection	-	-

4 NOISE AND VIBRATION IMPACTS FROM THE SITE

The following sections outline a preliminary review of potential environmental noise emissions from the site to nearby sensitive receivers.

4.1 NOISE EMISSIONS FROM THE PROJECT SITE

All noise emissions from the site are to comply with the criteria from the City of Sydney standard conditions of consent (Section 3.1.1) and the NSW NPfI (Section 3.1.2).

4.1.1 INDUSTRIAL NOISE SOURCES – BUILDING SERVICES EQUIPMENT

As the proposed development is in the early design stages, detailed design of building services equipment has not been undertaken, and a detailed assessment of potential noise impact is not possible at this stage.

All external (mechanical) plant will be required to be assessed during the detailed design stages to ensure compliance with the applicable acoustic criteria as outlined in Section 3.1. The assessment will include typical day, evening, and night-time operation, and emergency operations. Where necessary, acoustic mitigation measures will be applied to the design. These may include:

- Selection of quieter equipment
- Selection of equipment location
- Acoustic louvres
- Acoustic attenuators
- Acoustic barriers

4.1.2 INDUSTRIAL NOISE SOURCES – BASEMENT CARPARK

It is assumed that car parking will be located within basement carparks. It is noted that the proposed carpark operations are internal to the building, therefore airborne noise emission issues associated with carpark activities are unlikely.

4.2 INCREASED ROAD TRAFFIC

Increases to road traffic noise due to the development are subject to the NSW RNP as detailed in Section 3.2. To achieve an increase of more than 2 dB in road noise at a receiver requires an increase in traffic flows of more than 60%.

Traffic volumes for the surrounding road network have been provided by SCT Consulting. Table 4.1 summarises the traffic volumes on surrounding roads with noise sensitive receivers. Existing traffic volumes as well as predicted volumes following completion of the development are presented along with the resulting percentage increase in road traffic to the nearest offsite residential receivers.

Table 4.1 Surrounding road network traffic volumes (source: SCT Consulting)

LOCATION	SCENARIO	TRAFFIC VOLUMES (TWO-WAY VPH)		INCREASE (%)	
		WEEKDAY AM PEAK HOUR	WEEKDAY PM PEAK HOUR	WEEKDAY AM PEAK HOUR	WEEKDAY PM PEAK HOUR
Henderson Road, west of Park Street	Existing	220	227	-	-
	With development	224	278	1.7	0.2
Henderson Road, east of Park Street	Existing	421	350	-	-
	With development	426	356	1.2	1.7
Henderson Road, west of Brandling Street	Existing	443	334	-	-
	With development	451	341	1.8	2.0
Progress Road, north of Henderson Road	Existing	106	77	-	-
	With development	119	90	12.2	16.7
Station Place, west of Rowley Lane	Existing	70	23	-	-
	With development	80	27	13.9	16.0

As a 60 per cent increase in traffic is required to increase traffic noise levels by more than 2 dB, it is expected that construction traffic due to the site would generally comply with the RNP criteria for receivers on Station Place.

The projected traffic increase of up to 2.0% on Henderson Street, 16.7% on Progress Road and 16.0% on Station Place will not increase traffic noise by more than 2 dB, therefore traffic impacts due to the project are not anticipated.

5 NOISE AND VIBRATION INTRUSION TO THE SITE

The following sections outline a preliminary review of noise and vibration impacts upon the site to assess impacts on sensitive receivers. This information was used to identify building construction requirements to achieve compliance with the criteria outlined in the City of Sydney DCP and NSW DNRCBR.

5.1 NOISE IMPACTS FROM ROAD NOISE

As outlined in Section 3.3.1.2 the NSW DNRCBR requires acoustic treatment for a residential property if it located on a 'busy road' that has an AADT of 20,000 vehicles or greater. Henderson Road and Explorer Street are not classified as busy roads, with traffic flows less than 20,000 AADT, as discussed in Section 3.3.1.2, therefore Clause 102 has been determined to not apply to this development. This means that acoustic treatments for the development are not required to consider road traffic noise, and standard building acoustic constructions would be suitable.

5.2 NOISE IMPACT FROM AIRBORNE RAIL NOISE

Section 3.5.1 of the DNRCBR provides guidance on the assessment of rail corridor impacts on a development. For noise impacts from above ground rail lines the typical speed of the trains, distance from the development and if the line handles freight or passenger services influence the type of noise assessment required.

Based on the provided plans, the above ground rail line to the north-west are situated approximately 90 m away from the site at its closest point. Given the proximity to stations (Macdonaldtown, Erskineville and Redfern) and curved sections of track it is assumed that speeds would be less than 80 km/h.

Figure 3.1 presents the guidance from DNRCBR indicates that for areas where the speeds are less than 80 km/h and the development is 90 m away no further assessment is required. As such, acoustic treatments of the development are not required to consider airborne rail noise, and standard building acoustic constructions would be suitable.

In accordance with DNRCBR, the site would be situated outside Zone B for passenger (and freight services). As a result, it is considered that based on the speed of trains on the above ground rail line would not necessarily necessitate the implementation of specific acoustic treatment.

However, DNRCBR states that for developments within Zone B "in locations where noise levels are higher especially next to train stabling yards, freight lines and high speed operations, it may be advisable to seek specialist acoustic advice from an acoustic consultant to confirm that the measures will achieve the desired noise criteria". This is considered in Section 5.3.

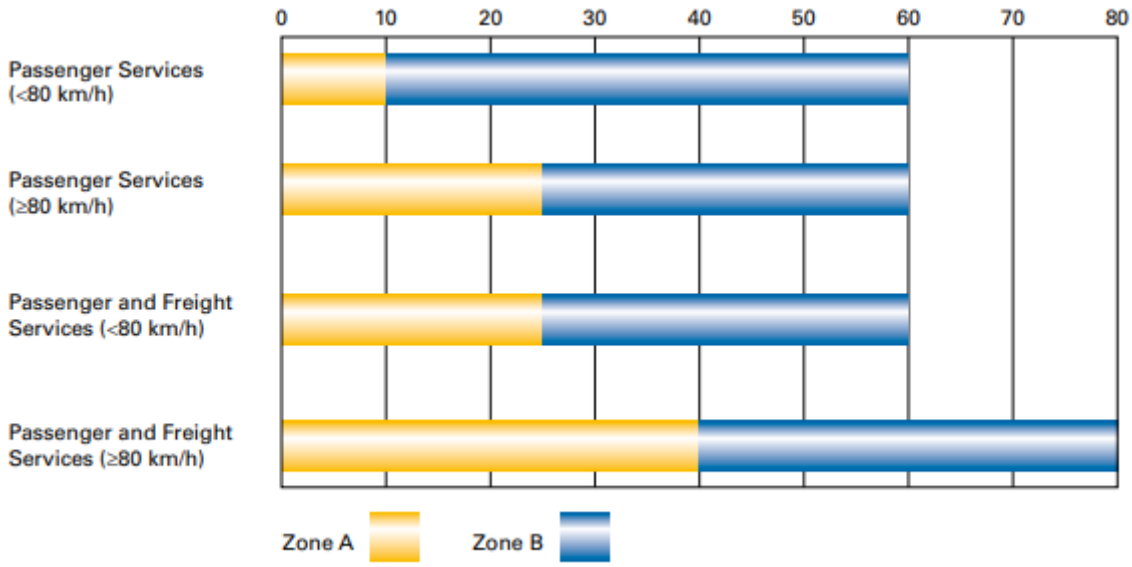


Figure 3.1: Acoustic Assessment Zones based on distance (m) of noise-sensitive development from operational track (not corridor)

Figure 5.1 *Development Near Rail Corridors and Busy Roads – Interim Guideline* - Figure 3.1

5.3 NOISE IMPACT FROM THE EVELEIGH MAINTENANCE FACILITY (EMF)

5.3.1 PREDICTED FAÇADE NOISE LEVELS

The most significant external noise source impacting on the subject site is the EMF adjoining the north boundary of the site, and the adjacent railway lines that service the EMF.

WSP has previously undertaken a noise survey to determine external noise levels from the operation of the EMF and adjacent railway lines (Report reference: *2202522PA-170223-CXM-REPORT Noise Impact Assessment Eveleigh NIF*, 2017 and updates to modelling scenarios in report reference *PS115064-OpAssessmentUpdate Rev0*, 2019). The results of these surveys have been referenced to determine noise impacts on the site from the EMF.

The EMF assessment identified that the highest noise levels that could be expected for residences on Explorer Street were 58-59 dBA. These scenarios considered up to 5 trains with all services running inside the EMF, brake testing inside the EMF and up to two trains idling outside the EMF with services running.

This generally aligns with the results from the measurements undertaken by WSP on site (Table 2.5) that measured noise from the EMF at approximately 52-57 dBA, where the maximum noise event occurred due to train horns. Previous measurements conducted in 2021 (Table 2.6) found a maximum $L_{eq,1\ hour}$ of 63 dBA during the day period and 57 dBA during the night.

The results of both rounds of attended measurements and the noise assessment for the EMF are generally consistent. As a conservative approach this assessment has adopted the highest of these noise levels to determine façade treatments that will meet the internal acoustic amenity requirements.

Figure 5.2 to Figure 5.4 present façade noise maps that show the magnitude of noise levels across the facades of the proposed buildings. The modelling used the worst case night time impacts from the EMF and indicates the worst noise impacts are on the north eastern facades of the buildings with southern facades having the least impacts. The impacts at the north eastern corner of the development are predicted to be highest due to the modelling considering trains idling just outside the EMF doorway on the eastern side.

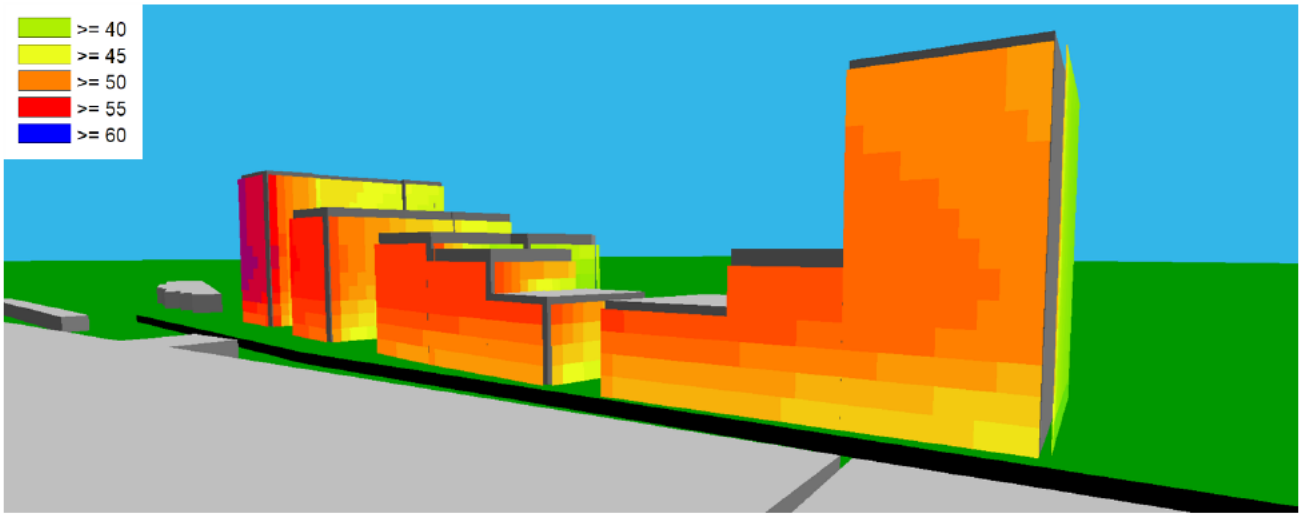


Figure 5.2 Façade noise map view from north west

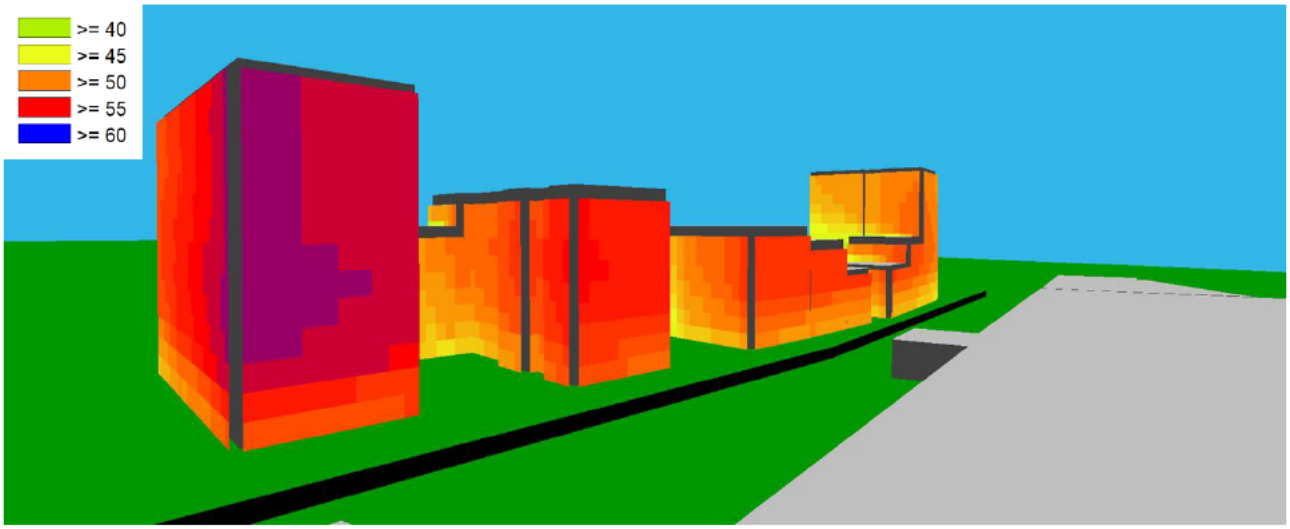


Figure 5.3 Façade noise map view from north east

Figure 5.4 Façade noise map view from south east

Detailed design of building facades including glazing will need to be conducted during the subsequent design stages on site to identify any special requirements for the internal spaces that will be located along the building perimeter. Internal acoustic amenity requirements for residential areas are as outlined in Section 3.3.

5.3.2 PRELIMINARY FAÇADE DESIGN REQUIREMENTS

5.3.2.1 GLAZING ASUMPTIONS

Preliminary acoustic calculations have been performed based on the external noise levels and approximate building siting. Building construction for bedroom areas has been assumed to include façade walls of ≥45 dB R_w for non-glazed components. Glazed components have assumed to account for up to 50% of the façade facing the EMF for bedrooms and 100% for living rooms as a preliminary conservative assessment.

The required minimum overall window sound insulation performances are outlined in Table 5.1. The overall façade sound insulation performance is the composite performance of both the glazing plus framing and non-glazing elements. No shielding from balconies have been considered in these calculations.

It is expected that these requirements indicate the worst case for apartments with facades facing the EMF. The requirements will reduce for facades that do not have direct line of sight with the EMF as shown in Figure 5.2 to Figure 5.4.

5.3.2.2 NATURAL VENTILATION ASSUMPTIONS

WSP's measured external noise levels at the site (Table 2.5 and Table 2.6) are greater than the CoS internal noise level requirements for residences with open windows.

A typical 10dB reduction for external to internal noise levels through an open window has been assumed. No allowance has been made for shielding due to orientation of the facades, balconies or wintergardens.

5.3.2.3 MINIMUM FAÇADE PERFORMANCE TO MEET CITY OF SYDNEY INTERNAL NOISE LEVELS

Further detailed acoustic modelling is recommended to confirm the suitability of these preliminary glazing requirements and whether they can be rationalised. This should be undertaken at the detailed design stage when the location of buildings is confirmed. Other factors such as aesthetic and thermal requirements will need to be considered in the final facade (glazing) design.

Natural ventilation may be adopted for this development as the noise levels reduction requirements are within the range of typical openable window with balcony or orientational shielding.

Suitability of natural ventilation should be confirmed and further investigated during the detailed design stages when the exact location and orientation of the proposed residential developments are known. This would involve review of design options to ensure maximum benefits from balcony shielding and orientation.

Table 5.1 City of Sydney Council DCP 2012 Noise Intrusion Requirements

DESCRIPTION	INTERNAL SPACE	INTERNAL NOISE LEVEL REQUIREMENT dBA $L_{eq,\ 1\ hour}$	EXTERNAL NOISE LEVEL dBA $L_{eq\ (1\ hour)}$	OVERALL PERFORMANCE REQUIREMENT	EXAMPLE ATTENUATION
Closed windows and doors	Bedroom – night time	**35**	57	33 dB $R_w + C_{tr}$	— Single glazed 10.38 mm laminated glass — Double glazed unit (DGU): 8mm monolithic / 12mm air gap / 6.38 mm laminate
	Living room – 24 hours	**45**	63	31 dB $R_w + C_{tr}$	— Single glazed 6.38 mm laminated glass — Double glazed unit (DGU): 6mm monolithic / 12mm air gap / 6mm monolithic
Open windows and doors	Bedroom – night time	**45**	57	12 dB(A) outside to inside reduction	— 10 dB(A) reduction through open windows/doors — 2 dB(A) reduction through combination of balcony shielding and orientation
	Living room – 24 hours	**55**	63	8 dB(A) outside to inside reduction	— 10 dB(A) reduction through open windows/doors
No natural ventilation, doors and windows shut and air conditioning in operation	Bedroom – night time	**38**	57	33 dB $R_w + C_{tr}$	— Assuming same façade attenuation as for 'Closed windows and doors' the internal noise level from air conditioning should not exceed 35dBA (bedrooms) or 45dBA (living rooms)
	Living room – 24 hours	**48**	63	31 dB $R_w + C_{tr}$	

5.4 RAIL VIBRATION AND GROUND-BORNE NOISE

Residential areas within the development are required to comply with ground-borne noise and vibration criteria as outlined in Section 3.3.1.

5.4.1 GROUND-BORNE NOISE

Modelling was undertaken based on the relevant method and values outlined below have been adopted:

- Vibration levels were measured at representative locations of both the closest point of the proposed buildings to the rail tunnel at both the east and west end of the development. Measurements were taken on 12 July 2023 and are presented in Table 2.8.
- The following documents describe the transfer functions for the propagation of vibration from the soil into the building foundations and then through the building to the internal floors:
  - *Nelson and Saurenman: A Prediction Procedure for Rail Transportation Groundborne Noise and Vibration, Transportation Research Record 1143*;
  - *US Dept of Transport;*
  - Nelson and Villot et al: *Procedures to Predict Exposure in Buildings and Estimate Annoyance, a report from the Railway Induced Vibration Abatement Solutions (RIVAS) Collaborative Project* (2012).
- The estimation of sound pressure levels within the room is based on the theoretical method set out in the *ANC Guidelines on the Measurement and Assessment of Ground-borne Noise and Vibration*, which is also consistent with the measurement data set out by Nelson and Villot, as detailed above.

The provided plans include two basement levels across the footprint of the development. As the vibration measurements could only be conducted at surface level it is expected that basement floors would be closer to the underground rail line and potentially experience greater impacts, however they would not be required to meet any vibration or ground borne noise targets.

The projected ground-borne noise levels are presented in Table 5.2. The predictions assume that the building would be supported on foundations without a basement. Based on this, it is predicted that compliance with the ground borne noise criteria is unlikely at lower levels, possible at mid-levels and compliant at higher levels (Floor 5/6 and above).

The results indicate that ground borne noise impacts are highest at the south western end of the development close to the rail tunnel where it is shallowest. An approximate 2 dB drop was observed from the western end to the eastern end of the site. The results do not indicate what the likely reduction of impacts are moving perpendicular to the rail tunnel.

Table 5.2 Forecasted ground-borne noise levels from a train pass-by

FLOOR LEVEL	CRITERION dBA $L_{max\ Slow}$	WEST (BLOCK A AND BLOCK B)		EAST (BLOCK C)	
		MODELLED NOISE LEVEL dBA $L_{max\ Slow}$ (1)	COMPLIES(2)	MODELLED NOISE LEVEL dBA $L_{max\ Slow}$ (1)	COMPLIES(2)
Floor 1	35	40	**Unlikely**	38	**Unlikely**
Floor 2	35	37	**Unlikely**	35	**Possibly**
Floor 3	35	35	**Possibly**	33	**Possibly**
Floor 4	35	33	**Possibly**	31	**Possibly**

FLOOR LEVEL	CRITERION dBA $L_{max\ Slow}$	WEST (BLOCK A AND BLOCK B)		EAST (BLOCK C)	
		MODELLED NOISE LEVEL dBA $L_{max\ Slow}$ (1)	COMPLIES(2)	MODELLED NOISE LEVEL dBA $L_{max\ Slow}$ (1)	COMPLIES(2)
Floor 5	35	32	**Possibly**	30	**Yes**
Floor 6	35	30	**Yes**	28	**Yes**
Floor 7	35	29	**Yes**	27	**Yes**
Floor 8	35	28	**Yes**	26	**Yes**
Floor 9	35	27	**Yes**	25	**Yes**
Floor 10	35	26	**Yes**	24	**Yes**
Floor 11	35	26	**Yes**	23	**Yes**

(1) Uncertainty associated with the predictions is estimated to be +/- 5dB

(2) Comment on compliance also takes into account prediction accuracy

Based on the results of this assessment, predicted ground-borne noise levels are likely to require additional more detailed investigations. A further detailed assessment will be necessary to ensure that appropriate ground-borne noise mitigation is provided for the future development. This would involve conducting further detailed vibration measurements across the proposed footprint of the development to produce a grid map of predicted ground-borne noise impacts. Following these additional measurements, it will be possible to propose specific building isolation that would provide the required attenuation across the footprint.

5.4.2 GROUND VIBRATION

VDV measurements were taken at 3 locations in April 2023 as part of the noise and vibration survey (Section 2.2) at locations representative of the closest points within the site to the underground rail corridor. These results were measured over a 1 hour period during the busiest time of the day and as a conservative approach to be extrapolated across the 15 hour (day) and 9 hour (night) periods. Of these 3 locations, the highest VDV was measured at Location VM02 has been adopted for the assessment.

Measurements were sourced from the previous measurements conducted by WSP in July 2020 and have been presented for completeness. The average VDV based on 25 train pass-bys was 0.0663 $m/s^{1\ 75}$. The number of typical weekday train movements based on the T4 line timetable has increased since 2020 therefore the VDV results are slightly different.

The results of this assessment are presented in Table 5.3. The typical weekday T4 line train movements based on the current timetable have also been presented.

Table 5.3 eVDV from T4 line at proposed development site

PERIOD	TYPICAL WEEKDAY T4 LINE MOVEMENTS	CALCULATED eVDV $m/s^{1.75}$	PREFERRED $m/s^{1.75}$	MAXIMUM $m/s^{1.75}$
Day	343	0.093	0.2	0.4
Night	75	0.082	0.13	0.26
	July 2020 measurements – using average pass-by VDV			
Day	343	0.285	0.2	0.4
Night	75	0.195	0.13	0.26

The results of the measurements conducted in April 2023 indicate that ground vibration is unlikely to be a significant issue, with levels below relevant preferred and maximum levels.

The results of the measurements taken in July 2020 indicated ground vibration levels at the site exceed the preferred levels but would be below the maximum allowable levels.

It should be noted that these measurements were all taken on the ground and do not factor in coupling losses between the ground and building. It is likely that vibration levels experienced within residences of the proposed development would be lower. Furthermore, the proposed design incorporates at least one basement level over the entire building envelope which will assist in providing vibration attenuation to the residential units above.

5.4.3 DISCUSSION

Preliminary modelled ground-borne noise and vibration levels exceed the screening criteria for both noise and vibration. As such the future building design will need to will need to include ground-borne noise mitigation measures. It is noted that typically, ensuring compliance with the ground-borne noise criteria would also result in compliance with the ground vibration criteria. As discussed in Section 5.4.1, a further detailed vibration assessment including measurements on site should be undertaken to determine specific building isolation measures.

6 CONCLUSION

WSP has conducted a noise and vibration impact assessment for the proposed rezoning and residential development at Explorer Street, Eveleigh NSW.

Noise design objectives were set in accordance with the criteria set out in the City of Sydney Development Control Plan, the Council's Standard Noise Conditions of Consent, NSW *Noise Policy for Industry*, NSW *Road Noise Policy* and NSW *State Environmental Planning Policy (Transport and Infrastructure)* following an assessment of existing ambient and background noise levels for the site.

As the site is in the early design stages, a detailed environmental noise emissions assessment to the nearest sensitive receivers has not been undertaken. The proposed development will need to be designed to achieve compliance with the applicable environmental noise limits as outlined in this report.

Preliminary noise and vibration impacts from the Eveleigh Maintenance Facility and adjacent railway lines onto the site were assessed based on industry guidelines. Noise from mechanical plant will be required to be assessed during the detailed design stages to ensure compliance with the applicable acoustic criteria. This assessment has demonstrated that the site will generate only a minor increase in traffic noise on local roads associated with the peak hour usage.

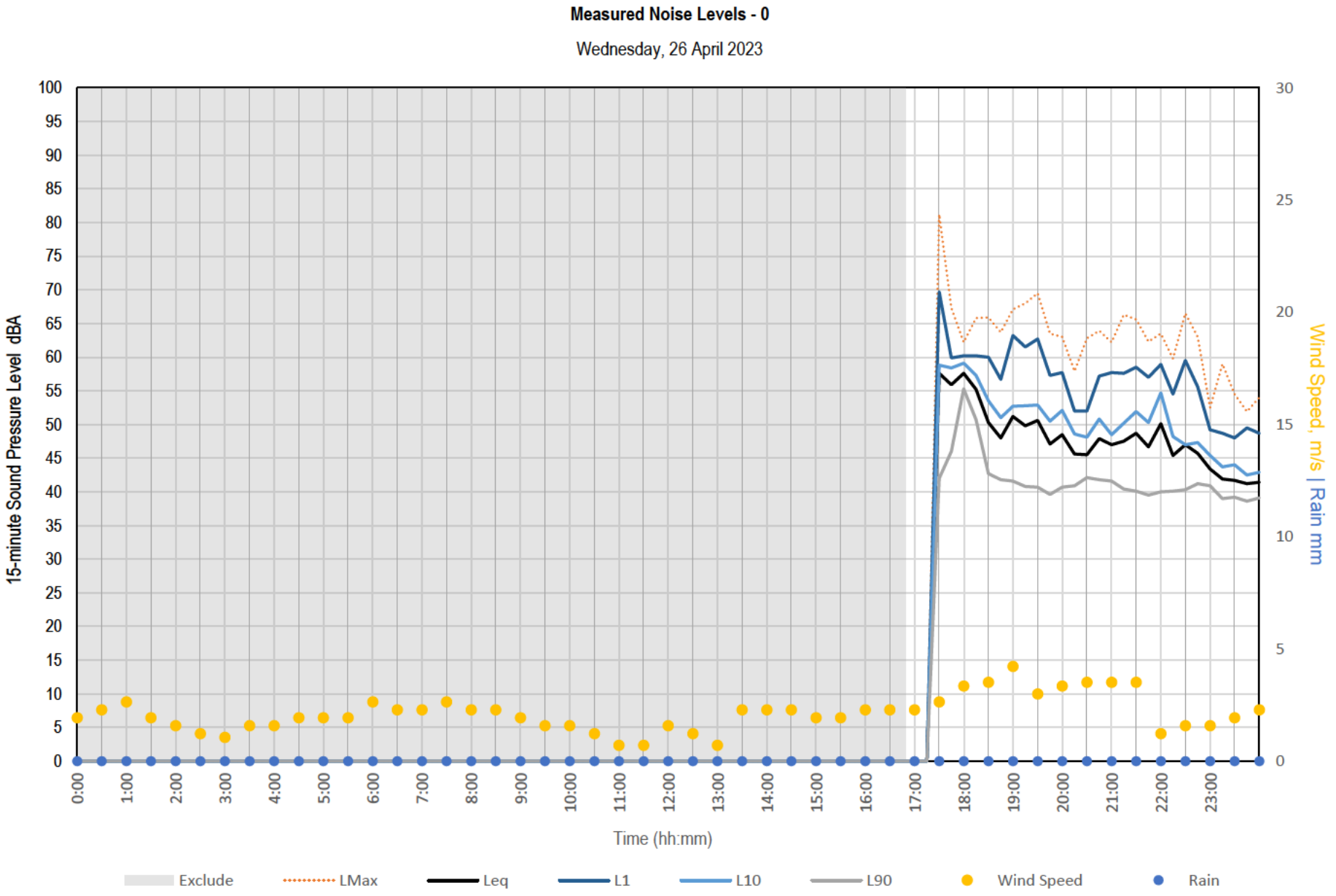
An assessment of noise and vibration intrusion from road and rail sources into the site was completed. Based on the available information at the time of writing, this assessment has found that road and rail noise intrusion into the site are likely to be readily manageable with standard building constructions. The assessment found that building isolation is likely to be required to control ground borne noise within the development due to the nearby underground rail tunnel and should be further investigated at detailed design.

Natural ventilation may be suitable for apartments with consideration from noise impacts from the Rail Maintenance facilities. This could be achieved by either balcony shielding, orientation or reduced window sizing. Further review should be undertaken during detailed design stage to inform the development façade design.

Overall, it is concluded that the site will have limited acoustic impacts on the surrounding environment and the applicable environmental noise criteria can be complied with at the nearest sensitive receivers, however ground borne noise impacts require further investigation during detailed design to ensure intrusion from the adjacent rail corridor is appropriately managed.

APPENDIX A

UNATTENDED NOISE MONITORING RESULTS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Time (hh:mm)
Exclude
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Wind Speed
Rain

Measured Noise Levels - 0

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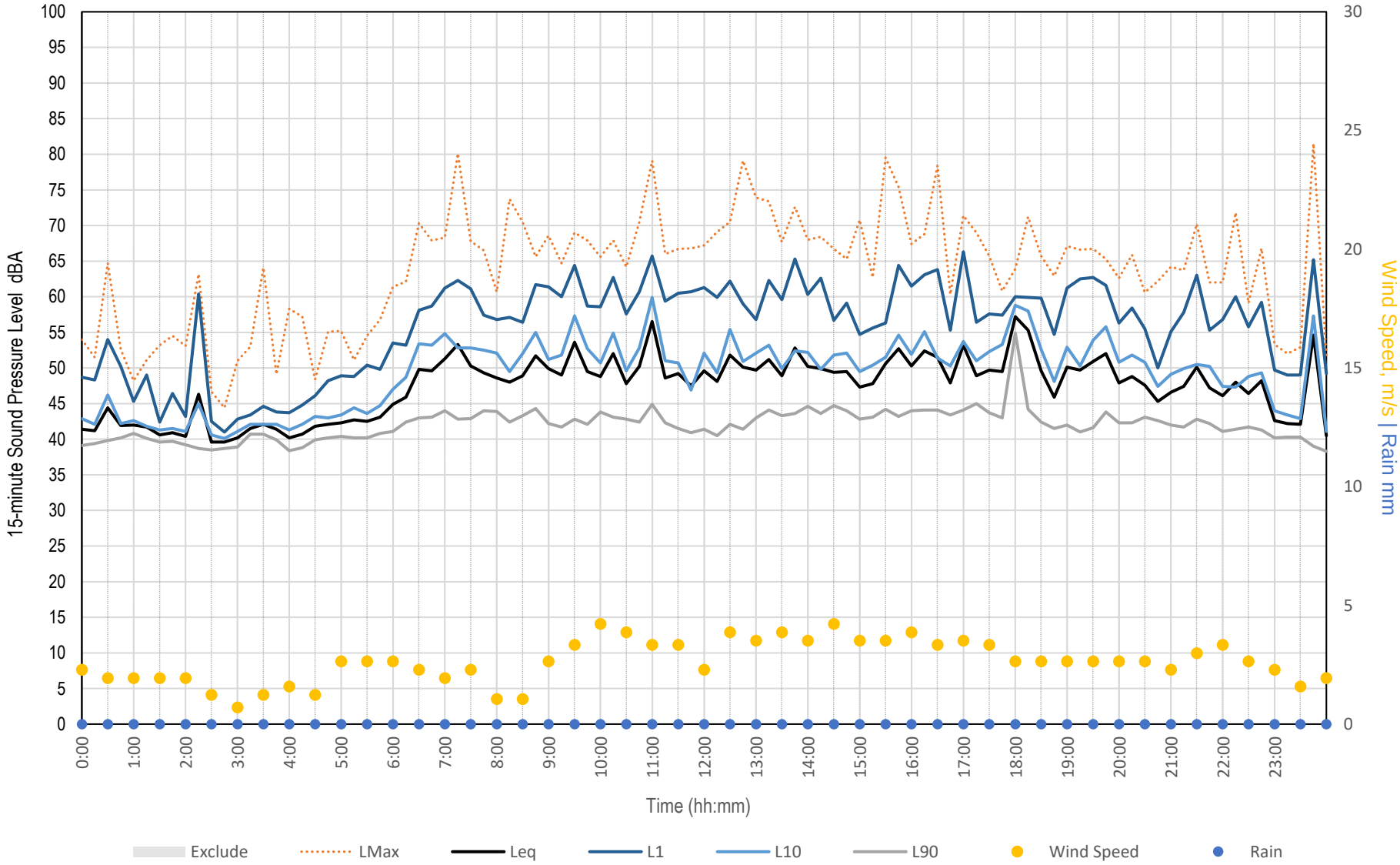

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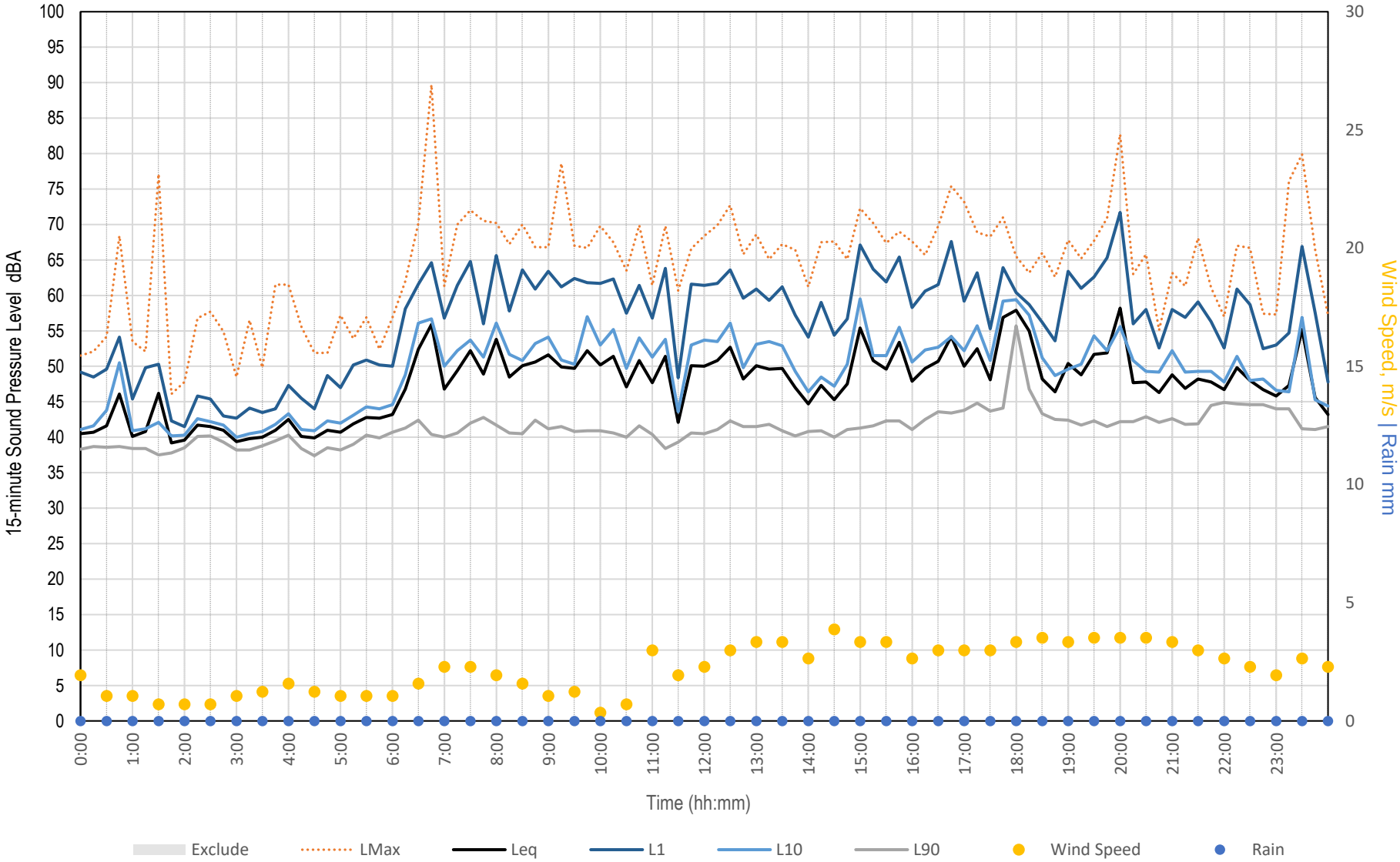

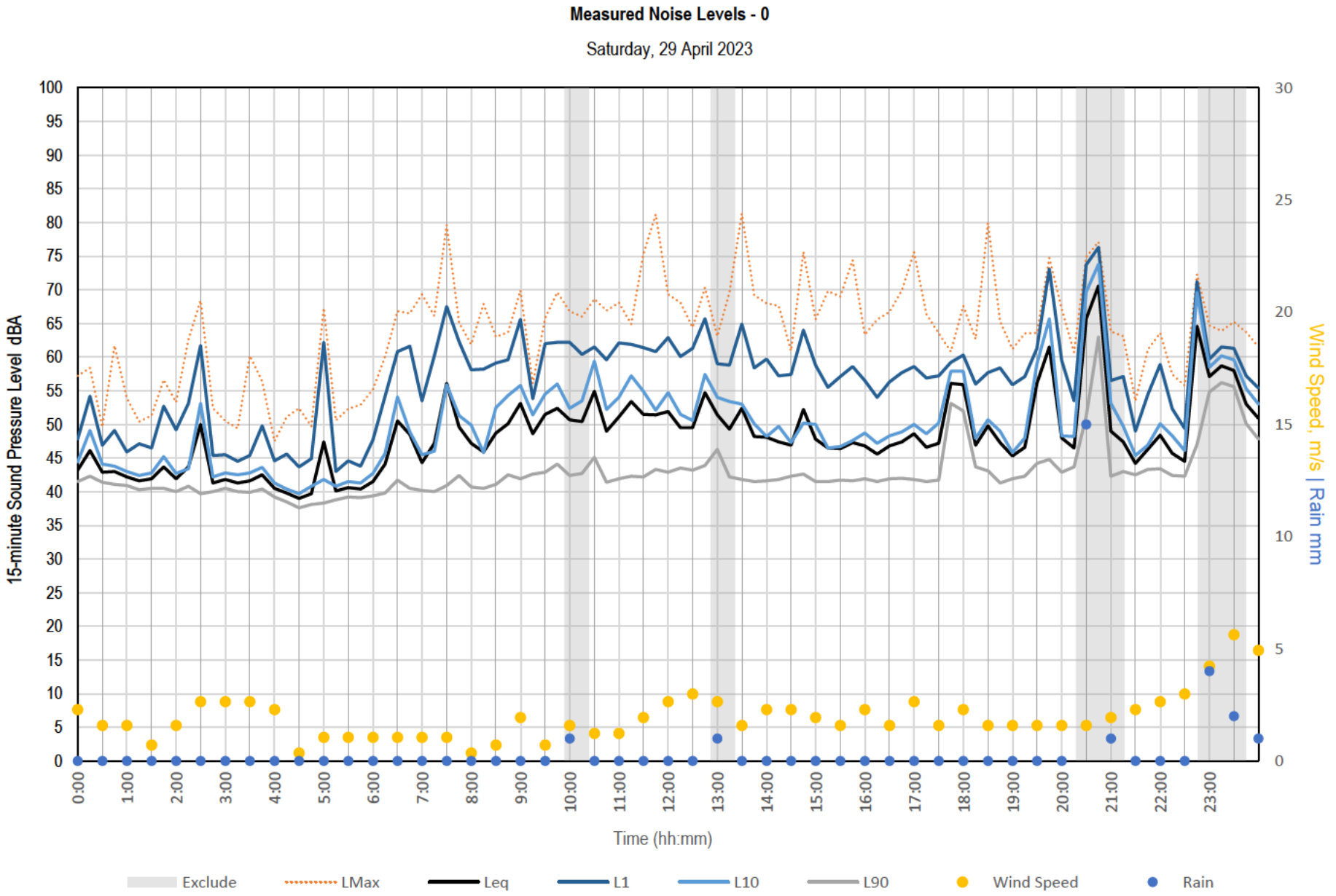
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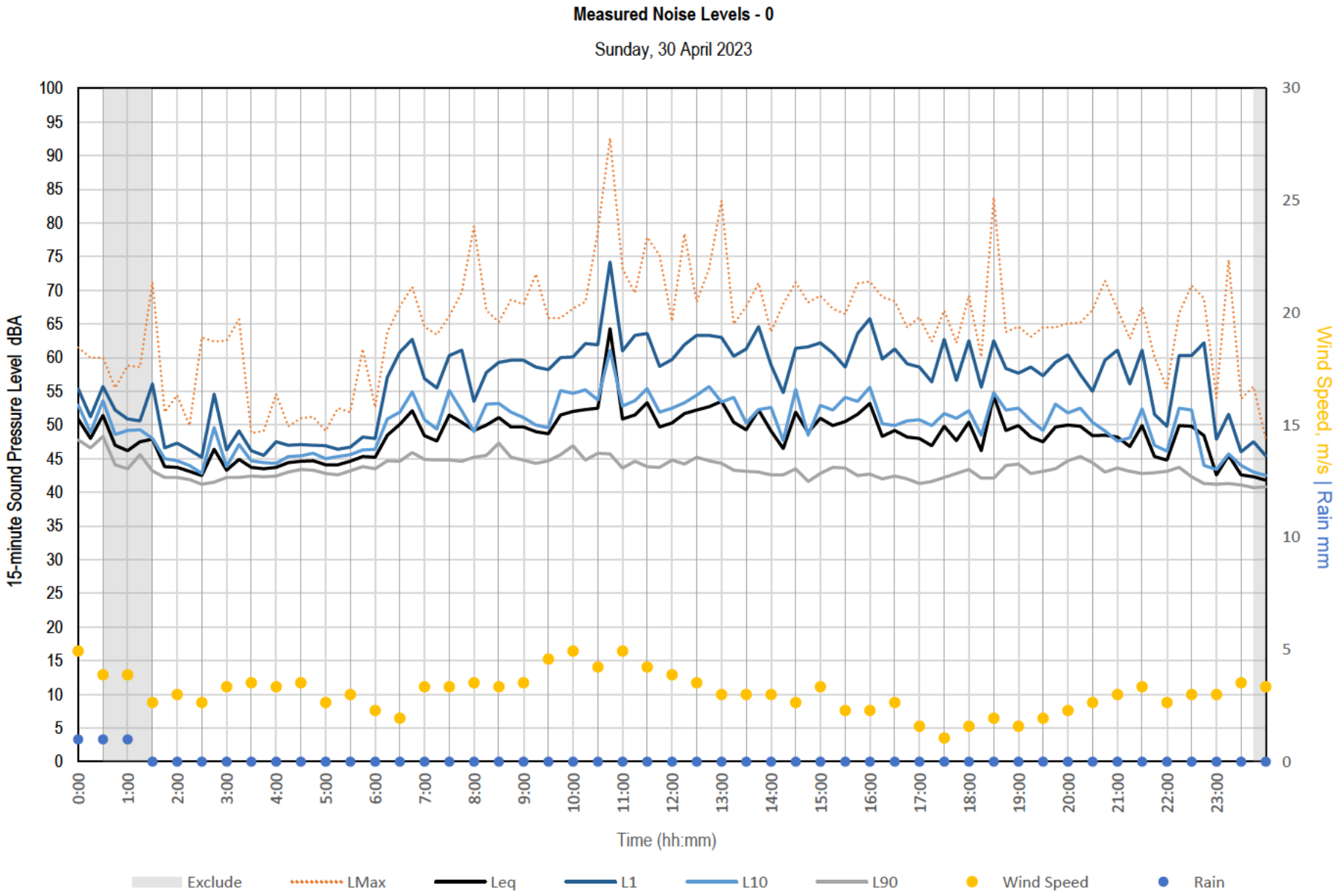
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Wind Speed
Rain

Measured Noise Levels - 0

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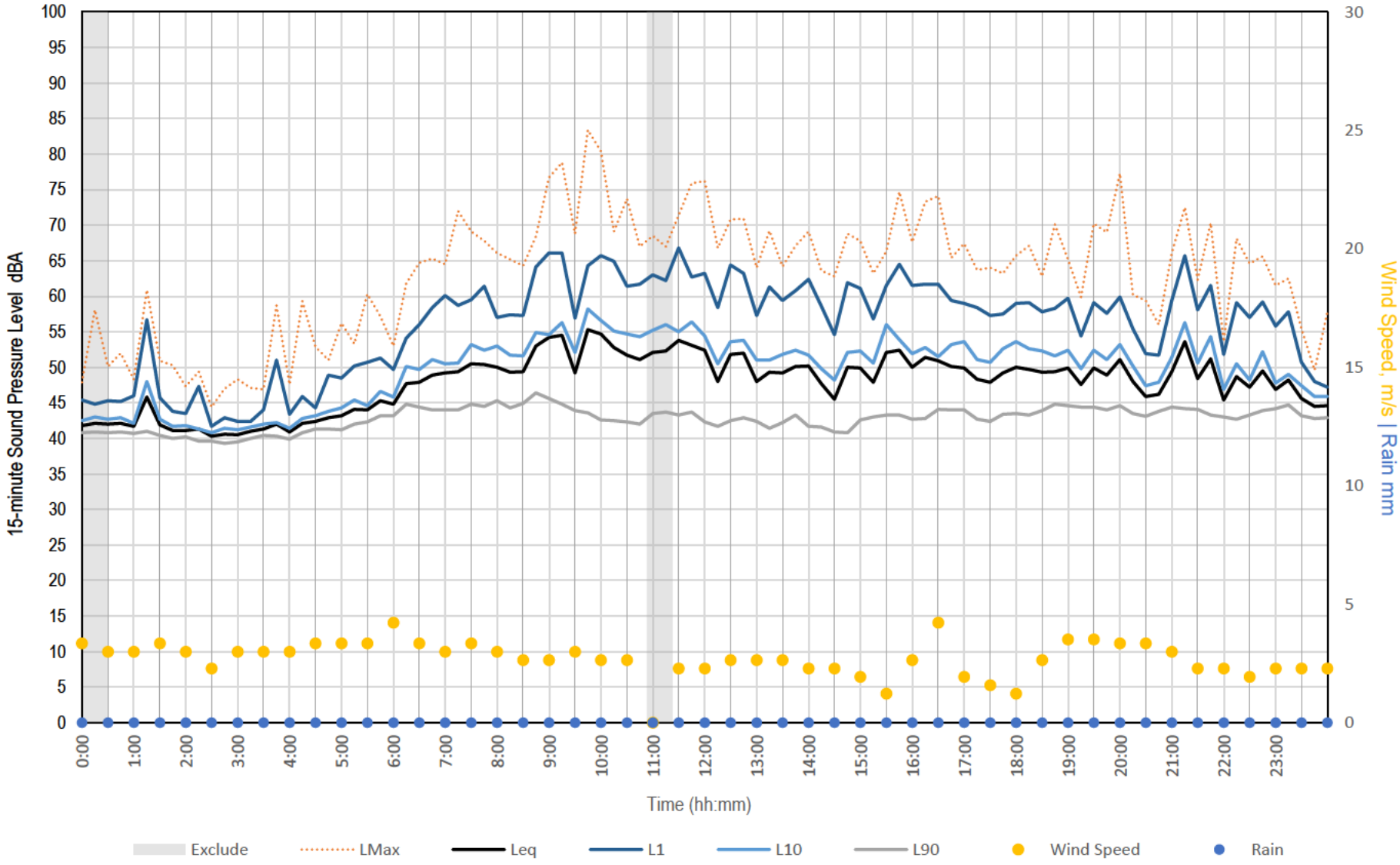

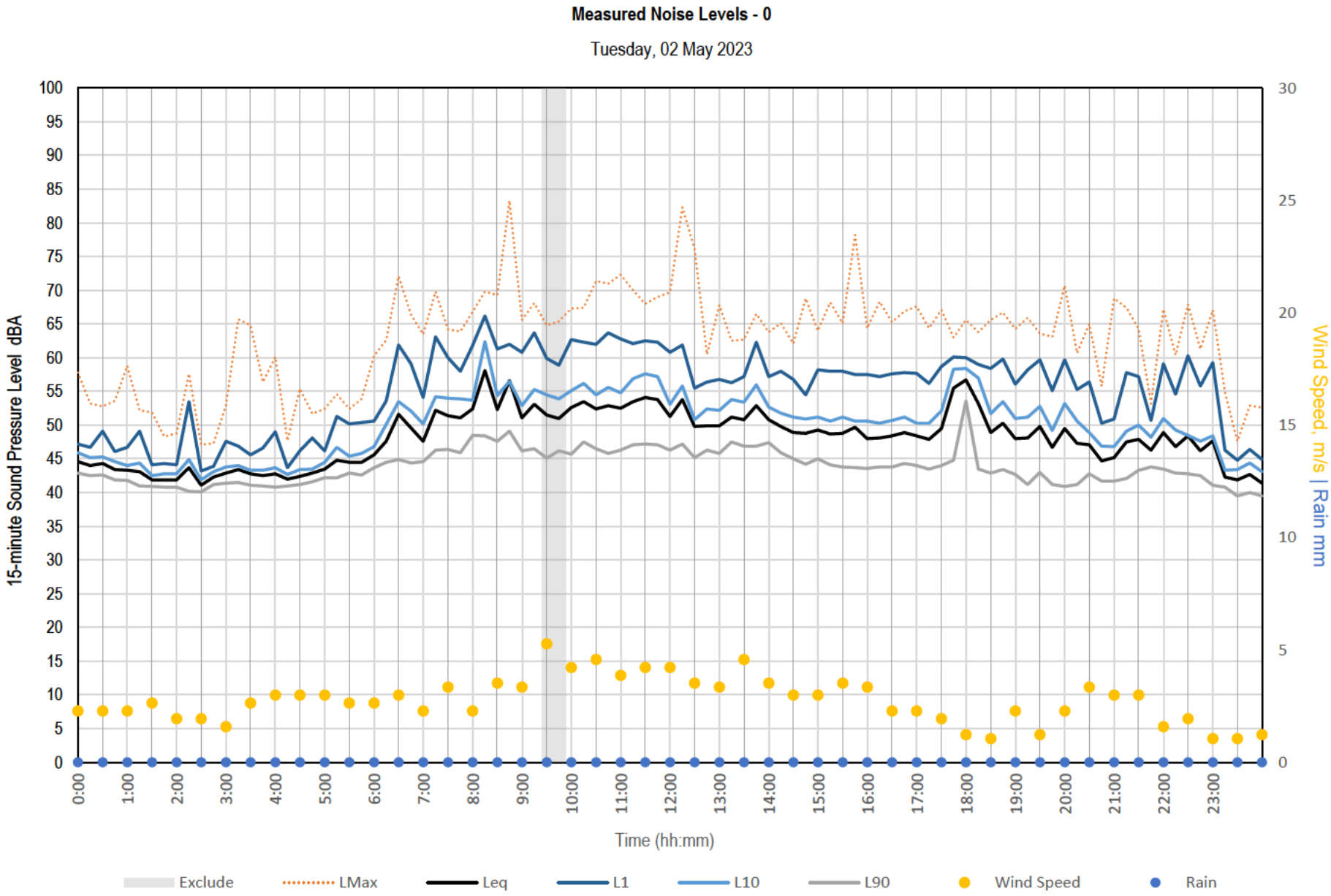
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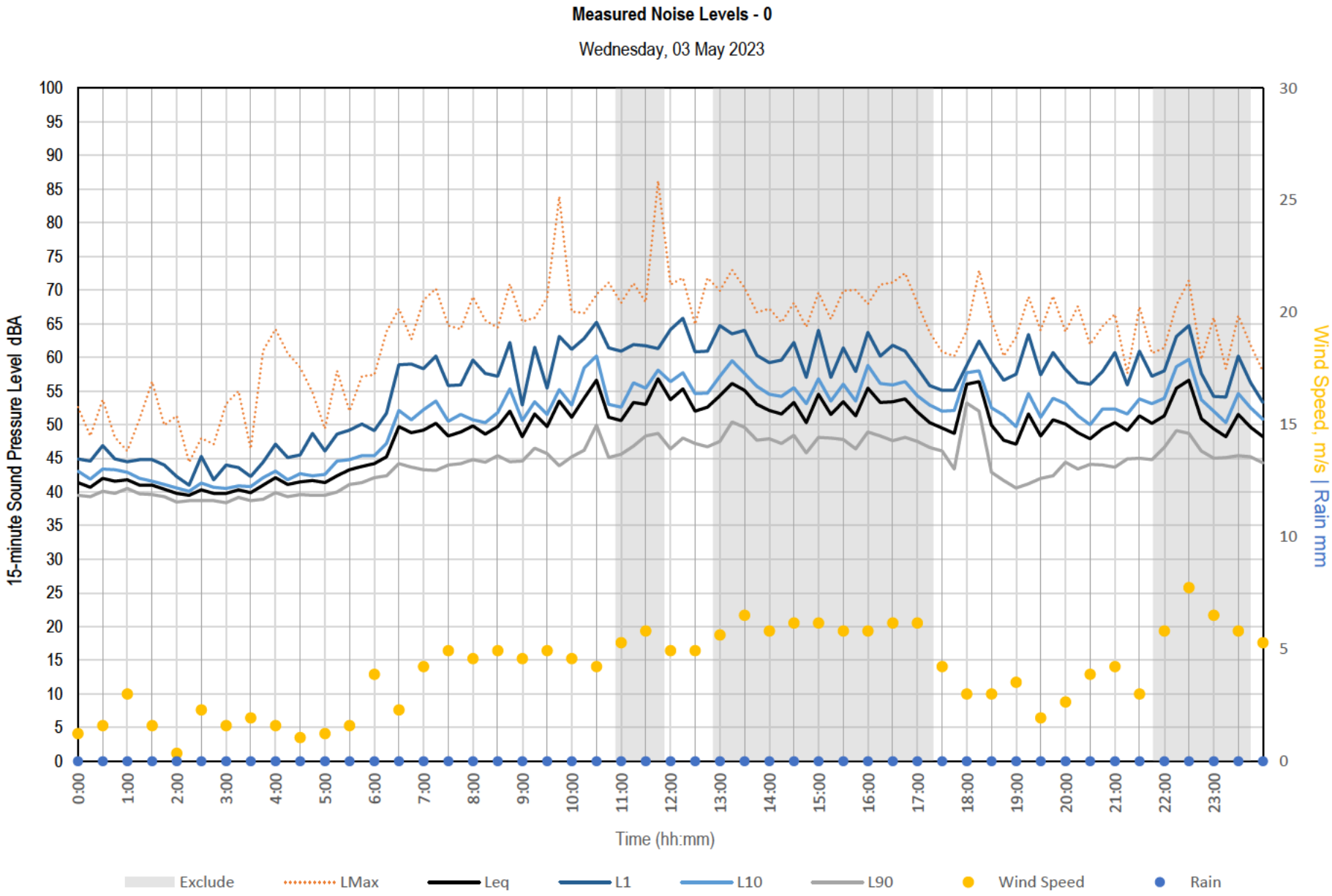
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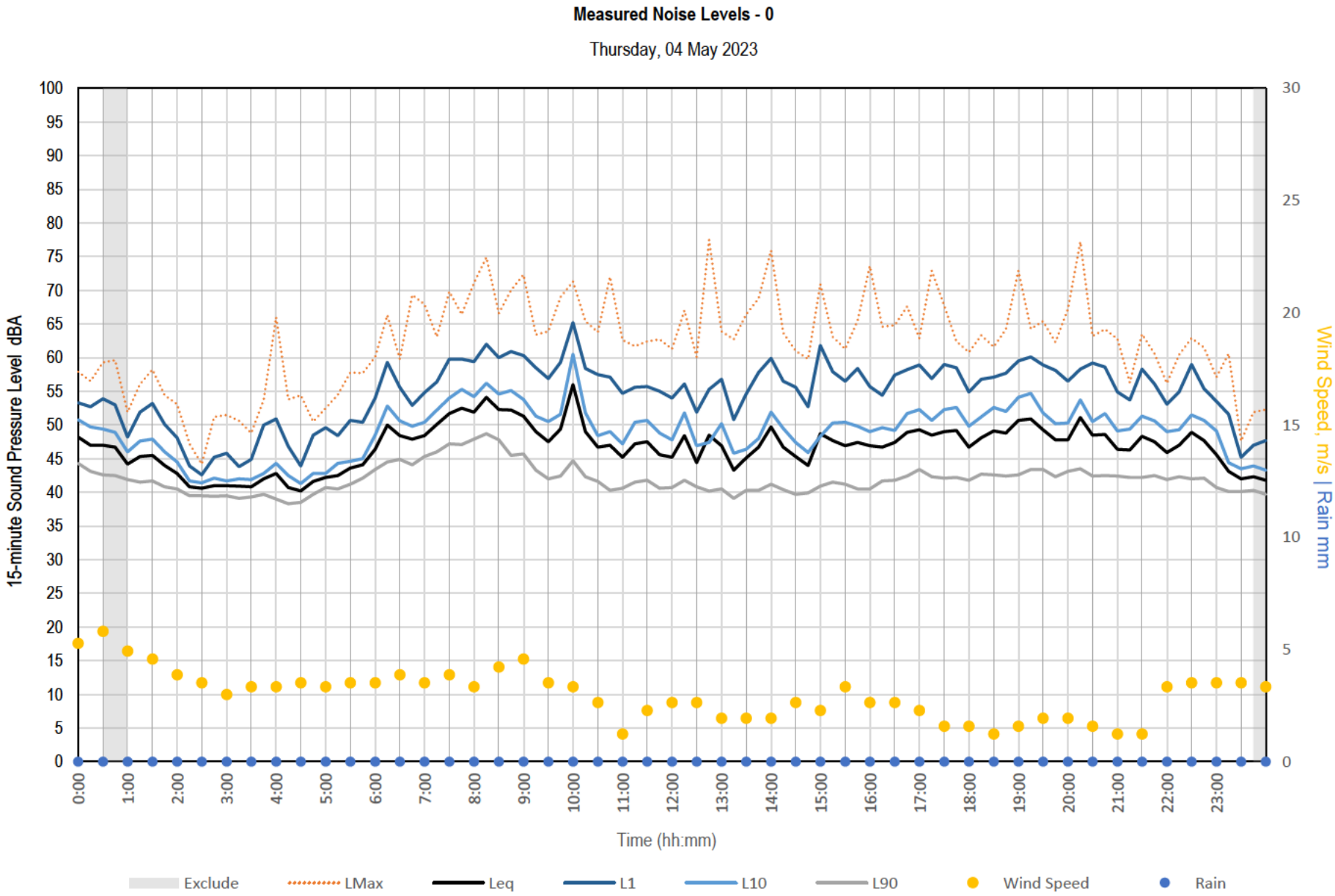
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Wind Speed
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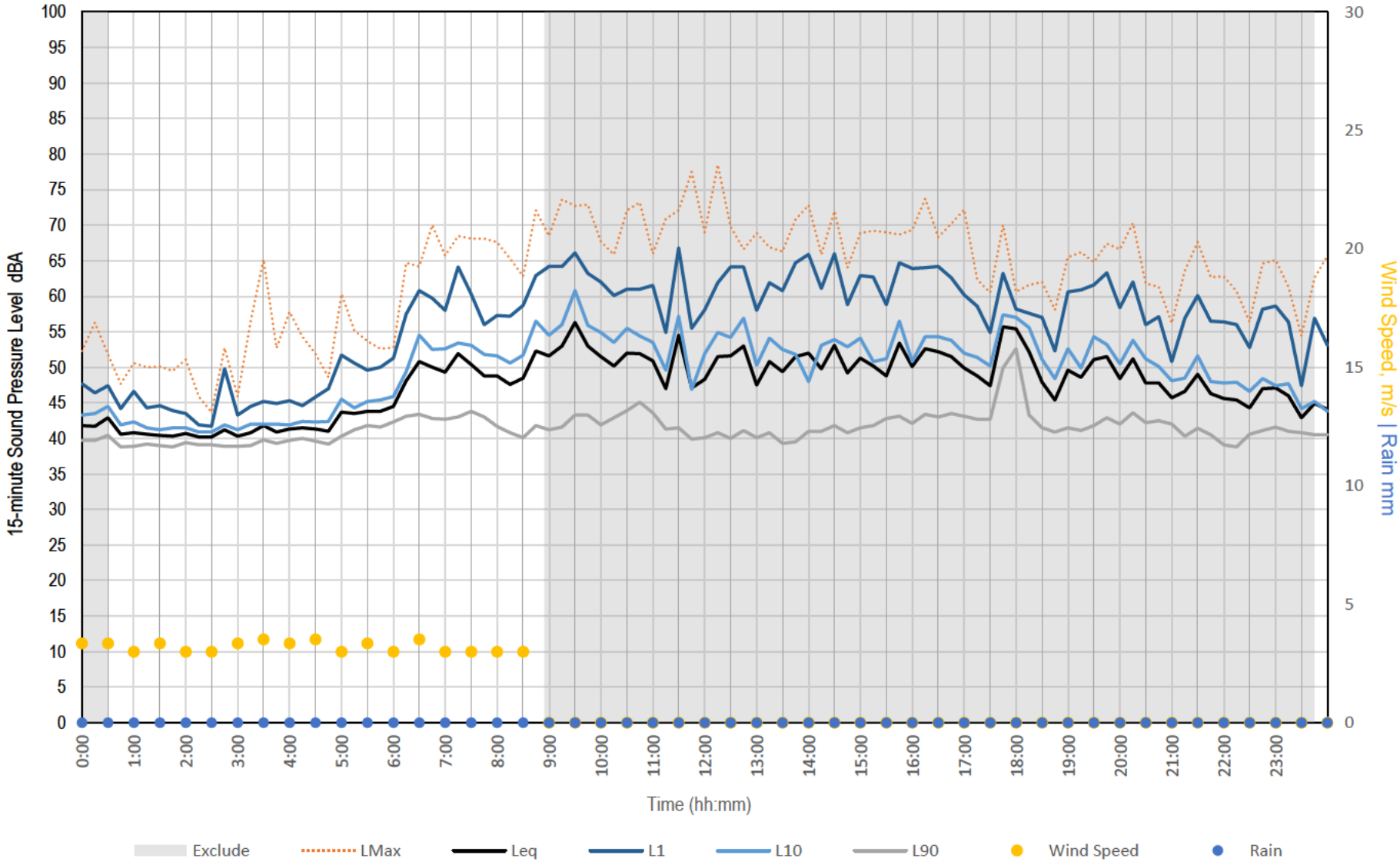
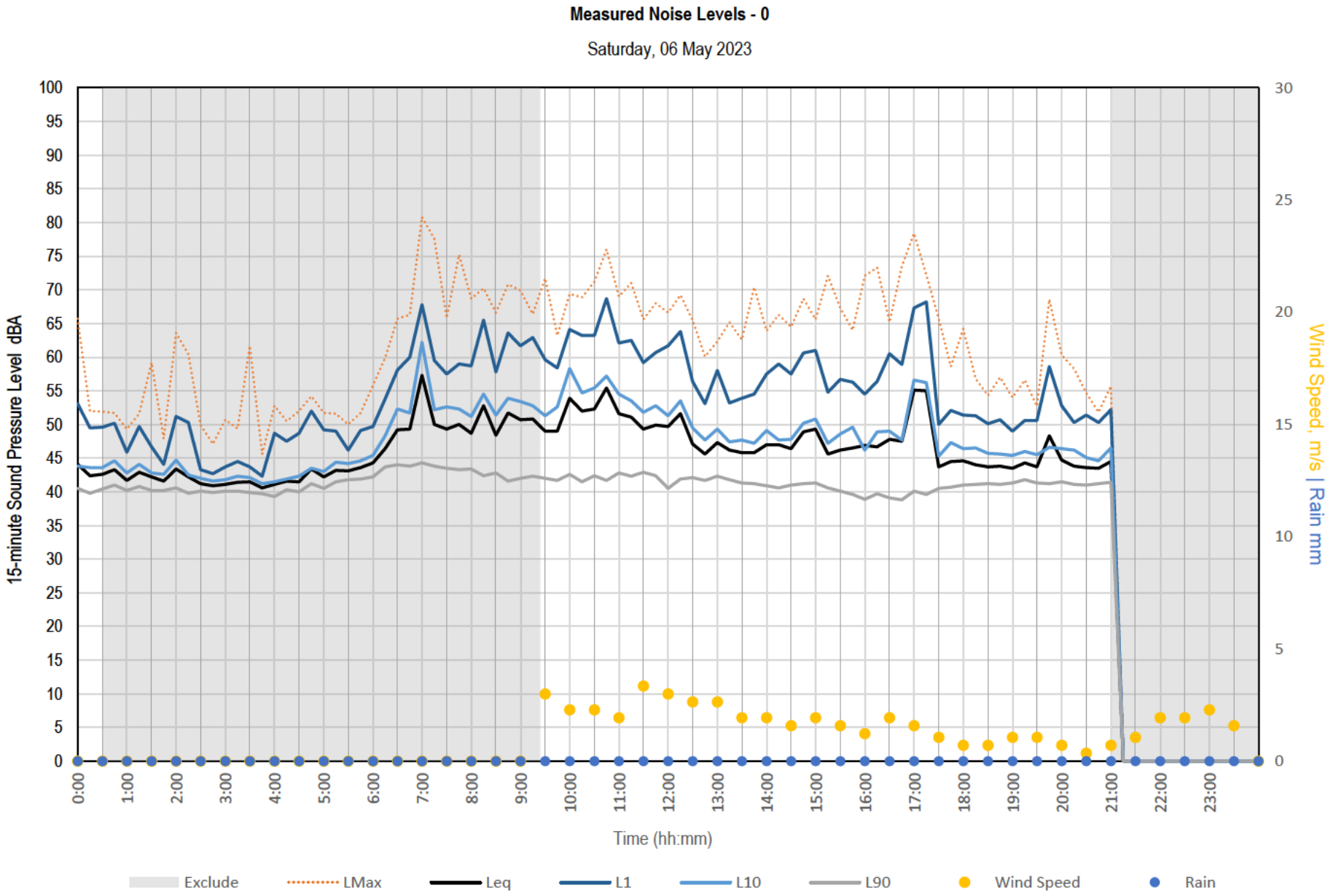
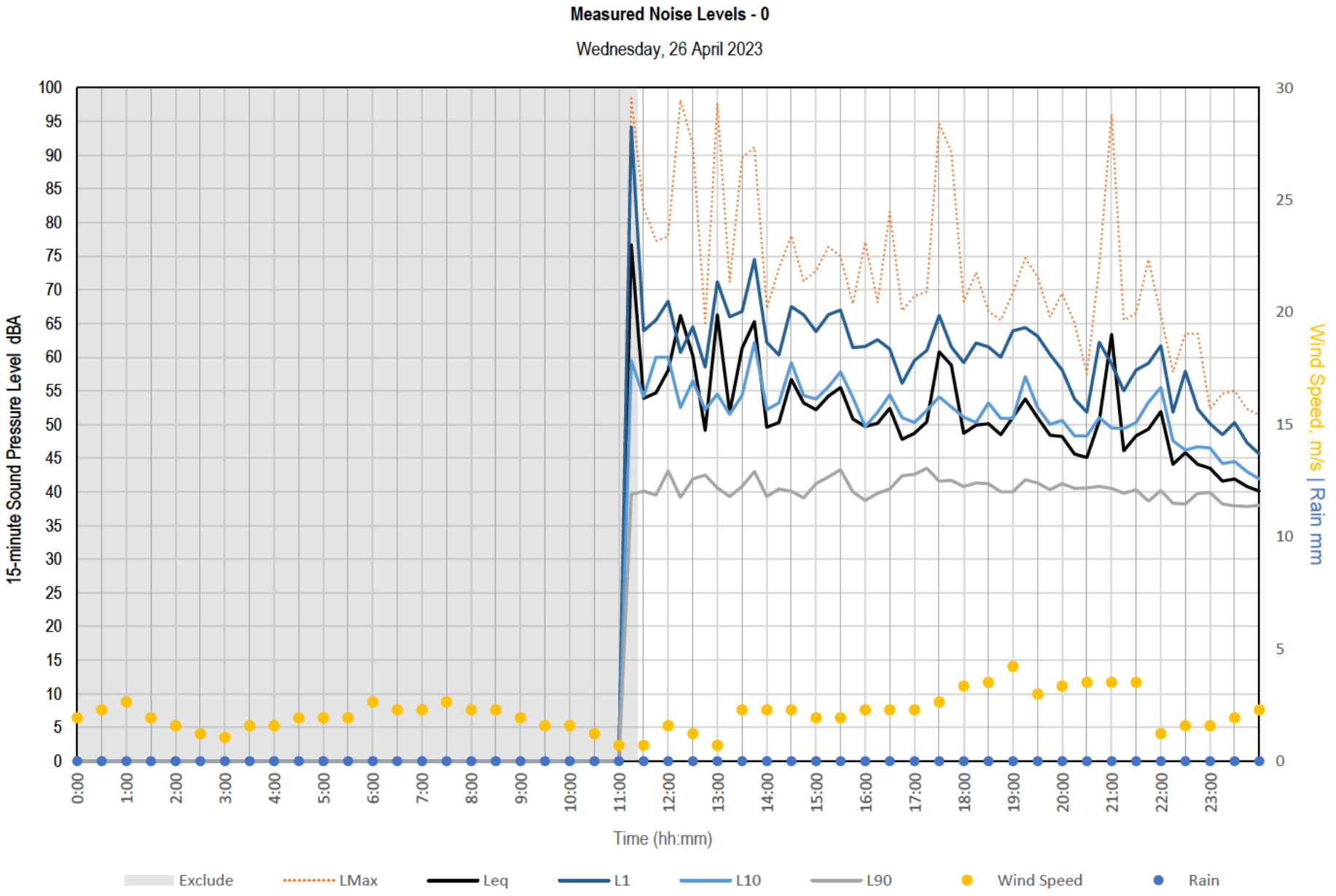
Measured Noise Levels - 0

Friday, 05 May 2023

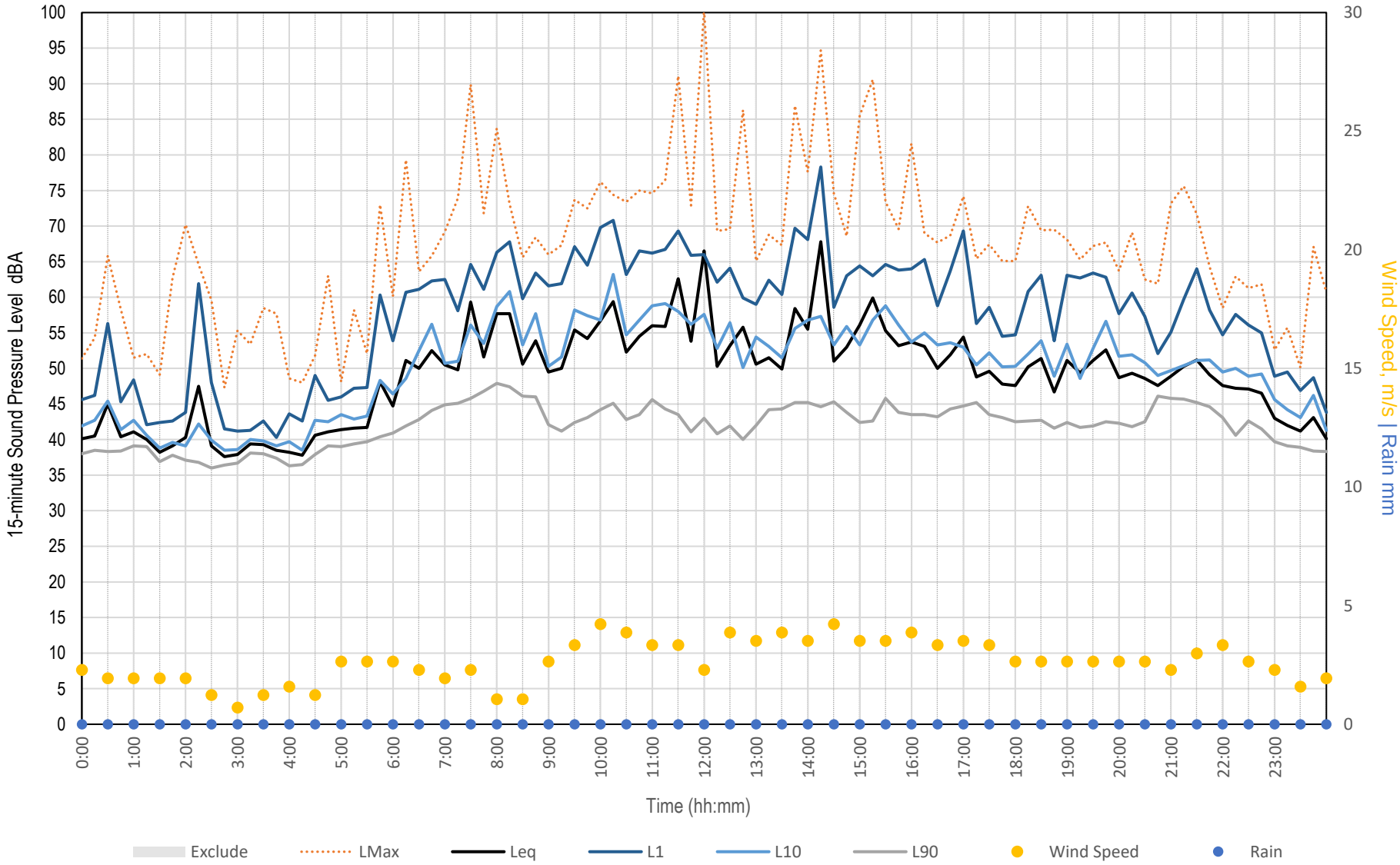


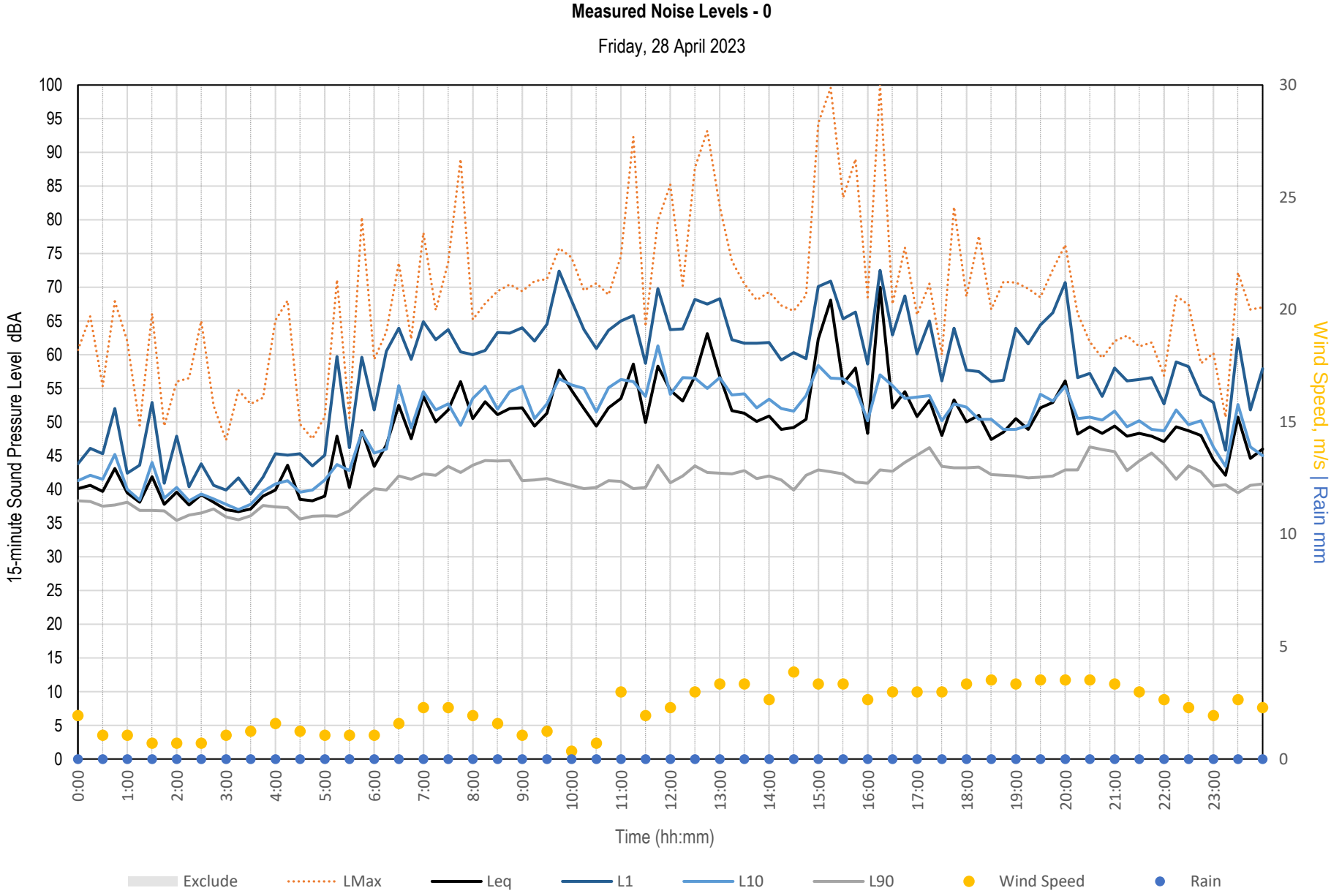

Measured Noise Levels - 0
Saturday, 06 May 2023
15-minute Sound Pressure Level dBA
Wind Speed, m/s | Rain mm
Time (hh:mm)
Exclude
LMax
Leq
L1
L10
L90
Wind Speed
Rain


Measured Noise Levels - 0
Wednesday, 26 April 2023
15-minute Sound Pressure Level dBA
Wind Speed, m/s | Rain mm
Time (hh:mm)
Exclude
LMax
Leq
L1
L10
L90
Wind Speed
Rain

Measured Noise Levels - 0

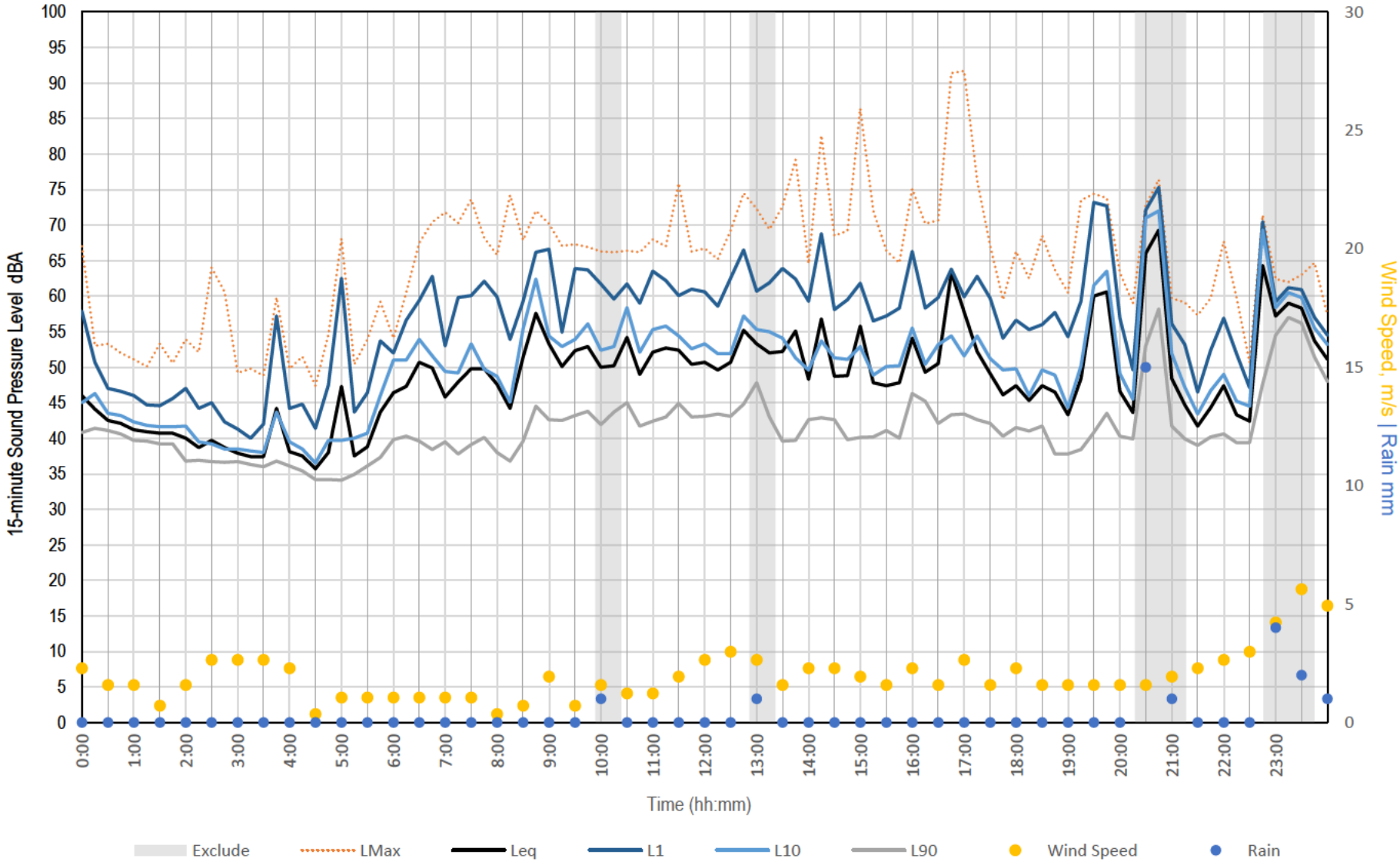
Thursday, 27 April 2023

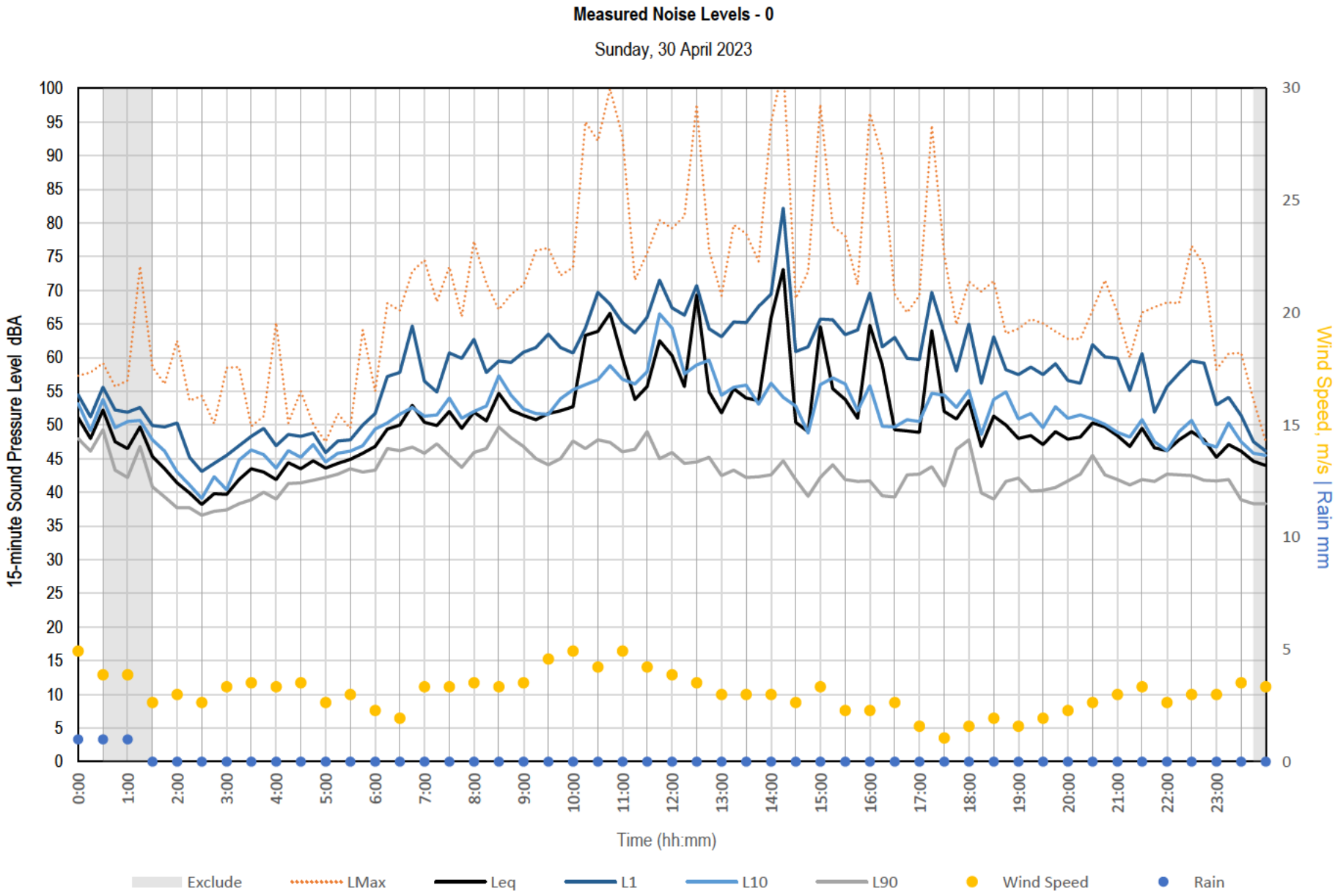


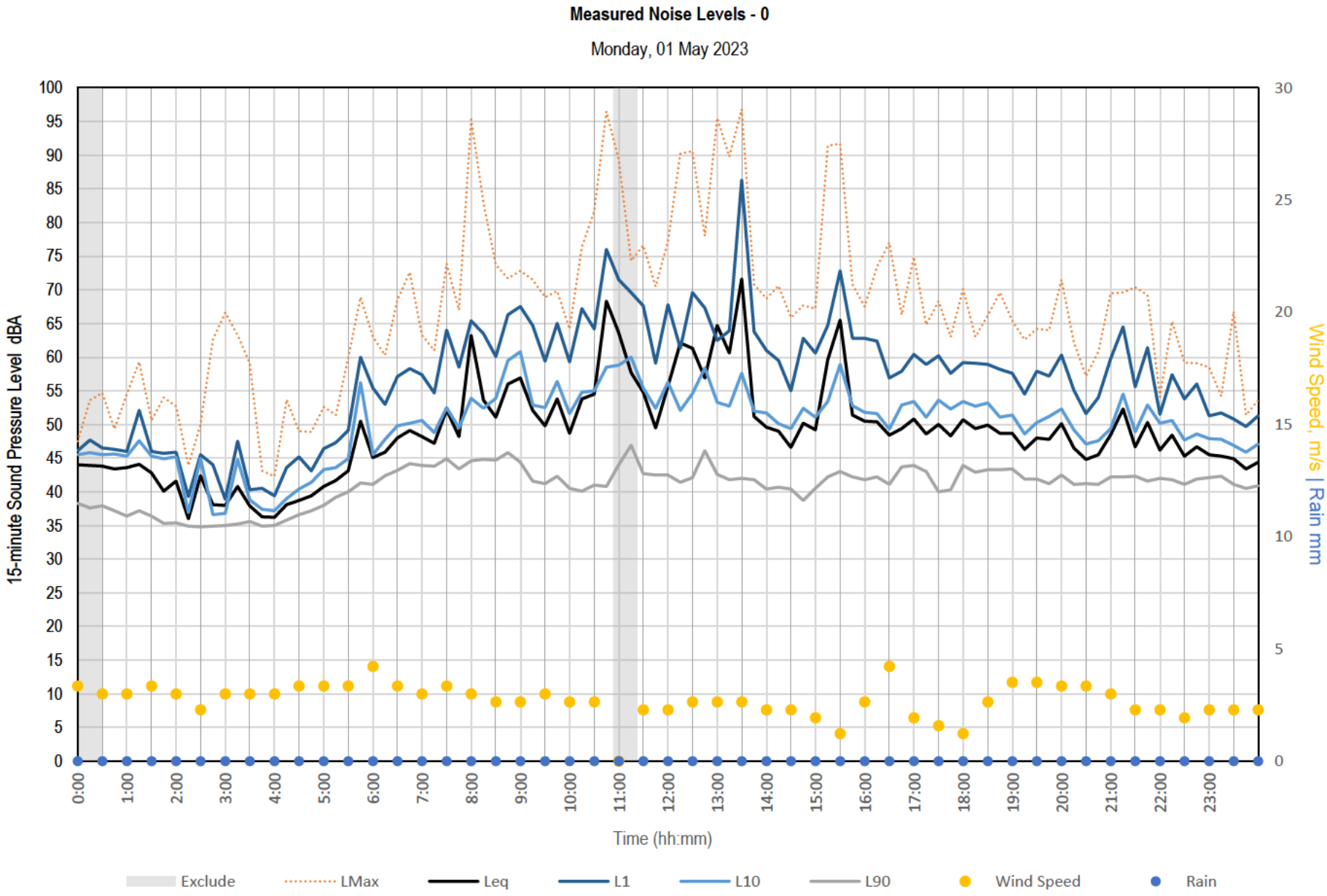

Measured Noise Levels - 0
Friday, 28 April 2023
15-minute Sound Pressure Level dBA
Wind Speed, m/s | Rain mm
Time (hh:mm)
Exclude
LMax
Leq
L1
L10
L90
Wind Speed
Rain

Measured Noise Levels - 0

Saturday, 29 April 2023

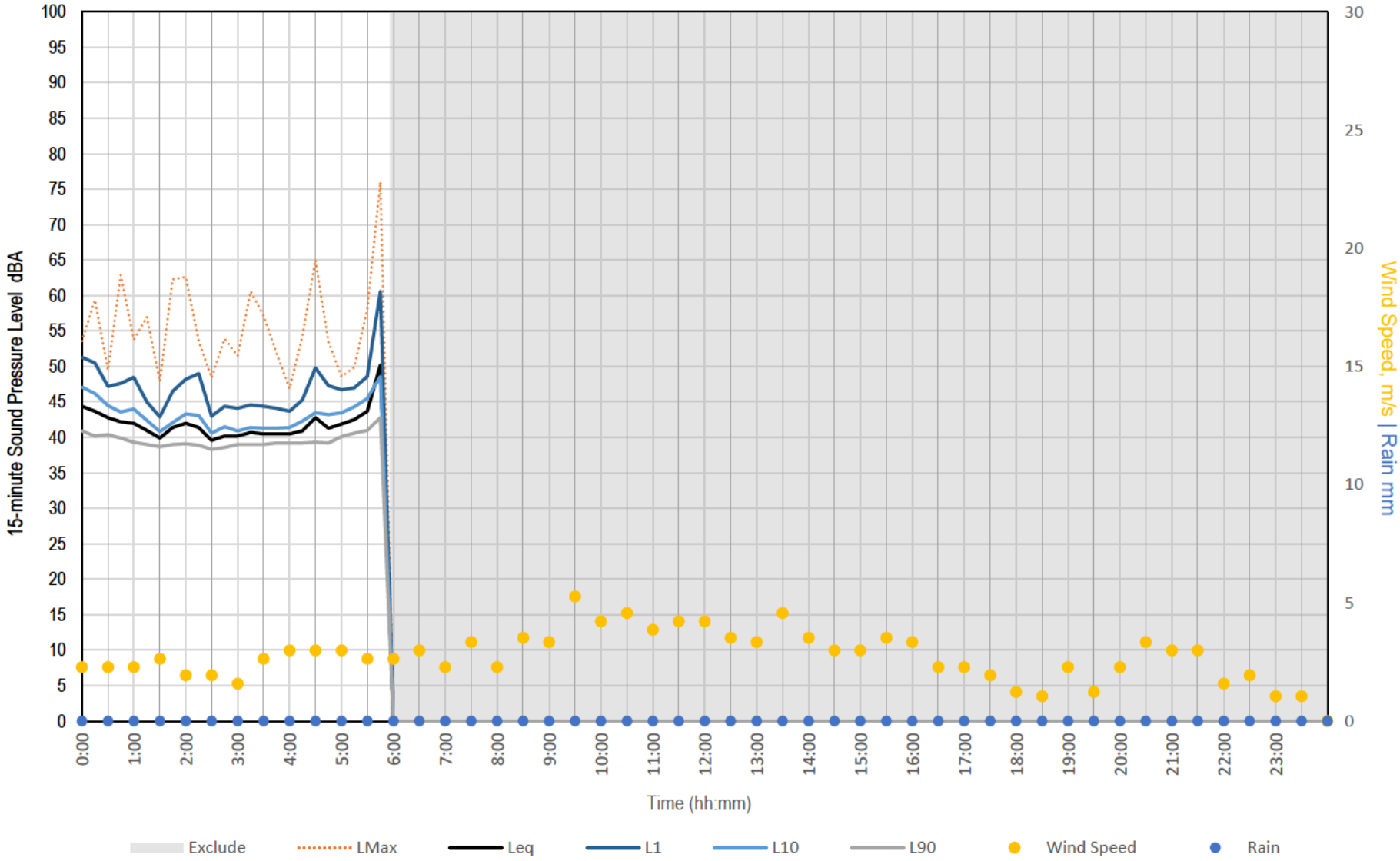



Measured Noise Levels - 0
Sunday, 30 April 2023
15-minute Sound Pressure Level dBA
Wind Speed, m/s | Rain mm
Time (hh:mm)
Exclude
LMax
Leq
L1
L10
L90
Wind Speed
Rain


Measured Noise Levels - 0
Monday, 01 May 2023
15-minute Sound Pressure Level dBA
Wind Speed, m/s | Rain mm
Time (hh:mm)
Exclude
LMax
Leq
L1
L10
L90
Wind Speed
Rain

Measured Noise Levels - 0

Tuesday, 02 May 2023



ABOUT US

WSP is one of the world's leading engineering professional services consulting firms. We are dedicated to our local communities and propelled by international brainpower. We are technical experts and strategic advisors including engineers, technicians, scientists, planners, surveyors, environmental specialists, as well as other design, program and construction management professionals. We design lasting Property & Buildings, Transportation & Infrastructure, Resources (including Mining and Industry), Water, Power and Environmental solutions, as well as provide project delivery and strategic consulting services. With approximately 50,000 talented people globally, we engineer projects that will help societies grow for lifetimes to come.