

Health Infrastructure NSW
Westmead PSB and MSCP
Construction Noise Monitoring

Noise monitoring report
2023-04-01 to 2023-04-30

AC17

v1 | 2 May 2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 271985

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Job title		Westmead PSB and MSCP Construction Noise Monitoring		Job number		271985	
Document title		Noise monitoring report 2023-04-01 to 2023-04-30		File reference		v1	
Document ref		AC17					
Revision	Date	Filename	271985-AC17v1 PSB and MSCP Noise monitoring -Apr 2023.pdf				
v1	02/05/23	Description	Issue				
			Prepared by	Checked by	Approved by		
		Name	Cynthia Nguyen	Clemence Terraz	Clemence Terraz		
		Signature					
		Filename					
		Description					
			Prepared by	Checked by	Approved by		
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			Prepared by	Checked by	Approved by		
		Name					
		Signature					
Issue Document Verification with Document							<input checked="" type="checkbox"/>

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Noise Monitoring Daily Results

1 Introduction

Arup has been commissioned by PricewaterhouseCoopers (PwC) on behalf of Health Infrastructure NSW to install noise monitors within the Central Acute Services Building (CASB), Children's Hospital Westmead (CHW) and Kids Research (KR) and Ronald McDonald House (RMH) buildings to monitor construction noise from the Paediatric Service Building (PSB) and Multi Storey Car Park (MSCP) development sites in the Westmead Precinct.

The noise loggers have been setup to send email and SMS notifications to stakeholders when construction Noise Management Levels (NMLs) are exceeded.

This report details noise measurement results from **1 April 2023 to 30 April 2023** inclusive.

2 Noise logger locations

Acoustic Research Labs Ngara noise loggers have been installed in the locations shown in Figure 1 and Figure 2 below.

The noise loggers were calibrated by Acoustic Research Labs (NATA-accredited calibration) in November 2021.

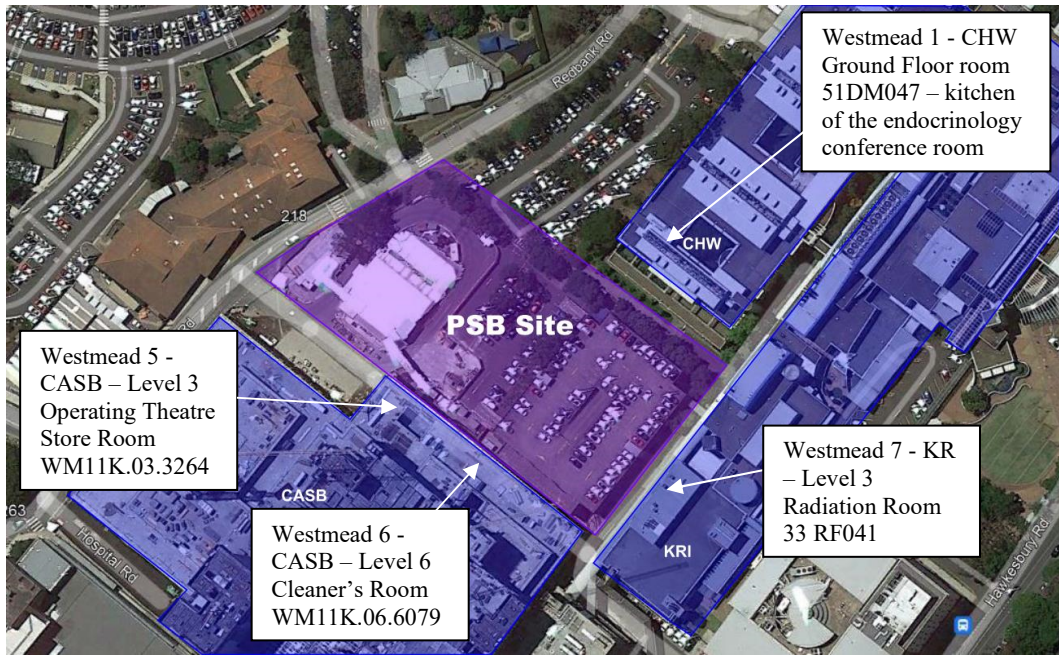


Figure 1: PSB noise monitoring locations.



Figure 2: MSCP noise monitoring locations.

2.1 Noise Logger relocation

The following table provides a record of the noise loggers which have been relocated during the project.

Table 1: Noise logger relocation records

Logger ID	Original location	Current location	
	Location	Date moved	Location
Westmead 2	CHW Level 2 Consult Room 92BW025	14/04/22	CHW Level 2 Parent Kitchen 92BW028

3 Noise Management Levels

The current construction Noise Management Levels for each internal monitoring location are set out in Table 2.

Measurement data taken from ‘standard’ construction work hours for the project only are assessed against the Noise Management Level criteria, being:

- 7am-6pm Mon-Fri
- 8am-1pm Sat
- No work on Sundays and Public Holidays.

As part of the previous installation works a baseline noise study was conducted to determine appropriate noise management level. Refer to Arup’s *Baseline noise measurements* report¹ for details regarding how these Management Levels were nominated.

Table 2: Baseline noise measurement results.

Logger ID	Location	Noise Management Level (upper limit), dB L _{Aeq,15min}
Westmead 1	CHW Ground Floor room 51DM047 – kitchen of the endocrinology conference room (facing PSB site)	60
Westmead 5	CASB Level 3 Operating Theatre Store Room WM11K.03.3264 (facing PSB site)	50
Westmead 6	CASB Level 6 Cleaner’s Room WM11K.06.6079 (facing PSB site)	52
Westmead 7	KR Level 3 Radiation Room 33 RF041 (facing PSB site)	58
Westmead 2	CHW Level 2 Parent Kitchen 92BW025 (facing MSCP site)	64
Westmead 3	RMH Level 1 Store Room 101 (facing MSCP site)	47

3.1 Management Level updates

The following provides a progressive record of management level updates:

- None to-date.

¹ Arup report reference 271985-AC02.

4 Noise monitoring results

4.1 Outages

Noise monitoring outages are shown below. This excludes outages related to logger data collection and calibration.

Table 3: Noise logger outages during monitoring period.

Logger Id	Noise logger location	Outages
Westmead 1	CHW Ground Floor room 51DM047 – kitchen of the endocrinology conference room (facing PSB site)	-
Westmead 5	CASB Level 3 Operating Theatre Store Room WM11K.03.3264 (facing PSB site)	-
Westmead 6	CASB Level 6 Cleaner's Room WM11K.06.6079 (facing PSB site)	
Westmead 7	KR Level 3 Radiation Room 33 RF041 (facing PSB site)	01/04/23-28/04/23 ¹
Westmead 2	CHW Level 2 Parent Kitchen 92BW025 (facing MSCP site)	-
Westmead 3	RMH Level 1 Store Room 101 (facing MSCP site)	-

Note:

1_ Westmead 7 underwent repairs from the 1/4/23 to 27/4/23 and was deployed on site on the 28/4/23, the data during the repair period has been excluded from this report.

4.2 Exceedances

The number of Management Level exceedances recorded at each noise monitoring location during the assessment period are shown below.

Table 4: Recorded Management Level exceedances.

Logger Id	Noise logger location	Noise Management Level exceedance instances
Westmead 1	CHW Ground Floor room 51DM047 – kitchen of the endocrinology conference room (facing PSB site)	2
Westmead 5	CASB Level 3 Operating Theatre Store Room WM11K.03.3264 (facing PSB site)	63
Westmead 6	CASB Level 6 Cleaner's Room WM11K.06.6079 (facing PSB site)	9
Westmead 7	KR Level 3 Radiation Room 33 RF041 (facing PSB site)	-
Westmead 2	CHW Level 2 Parent Kitchen 92BW025 (facing MSCP site)	5
Westmead 3	RMH Level 1 Store Room 101 (facing MSCP site)	17

It is the responsibility of Ford Civils (the Head Contractor) to respond to each Noise Management Level exceedance when it occurs and record the outcome of

the exceedance investigation (cause of NML exceedance, any noise mitigation measures implemented to address the exceedance, etc.).

4.3 Daily noise monitoring results

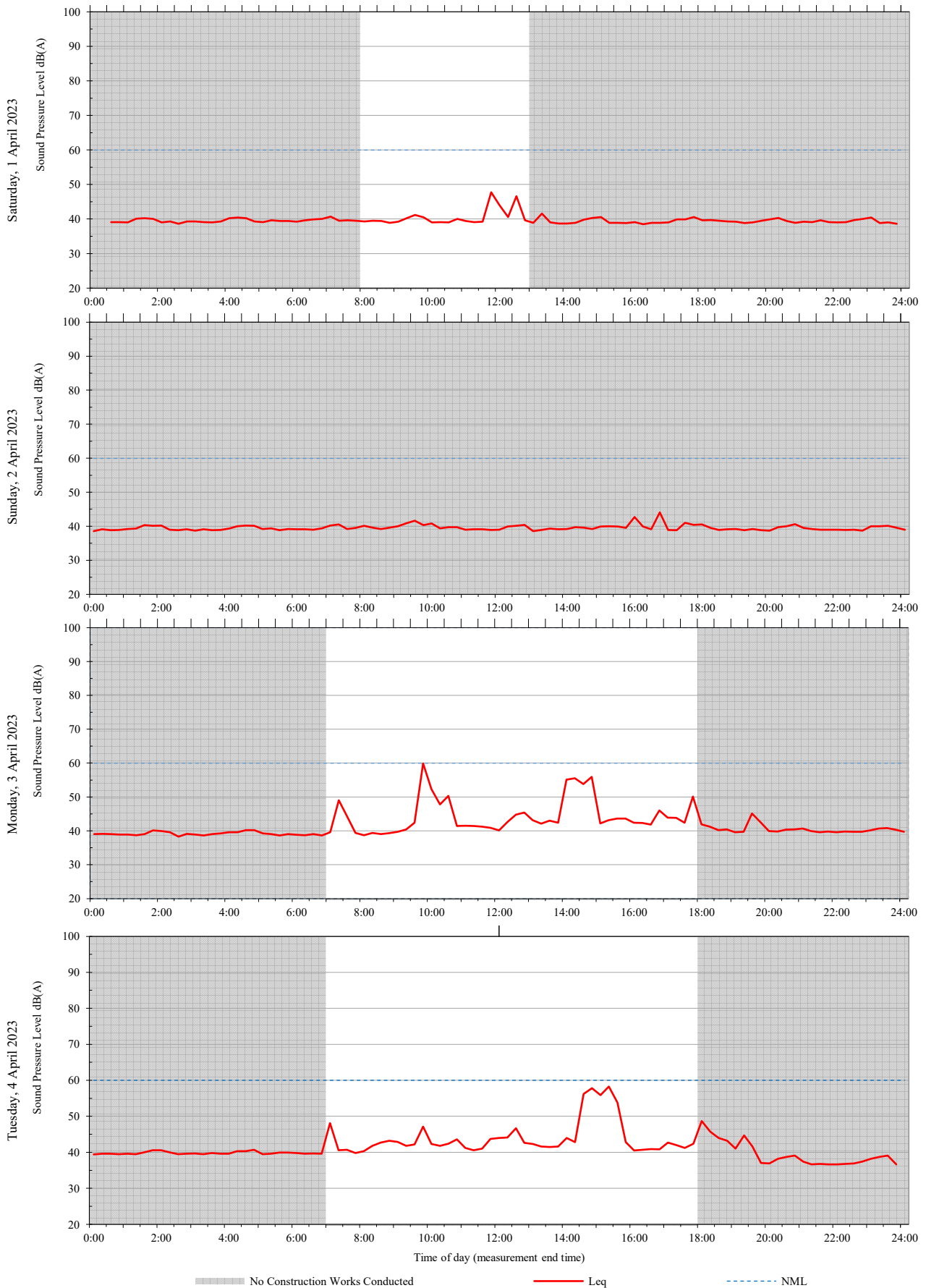
Daily noise monitoring results are showing for each location in Appendix A.

Appendix A

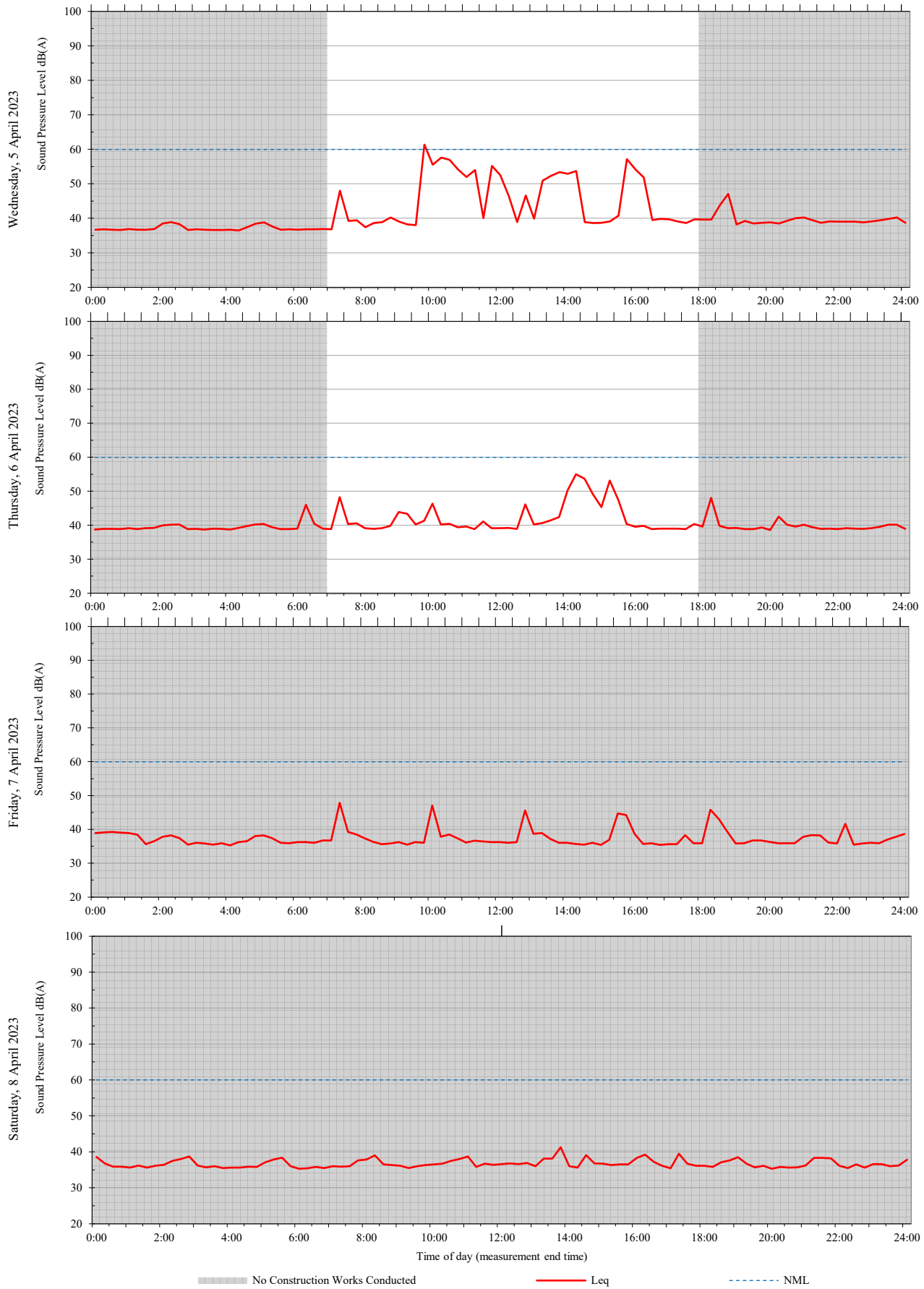
Noise Monitoring Daily Results

A1 CHW Ground Floor room 51DM047 (Westmead 1)

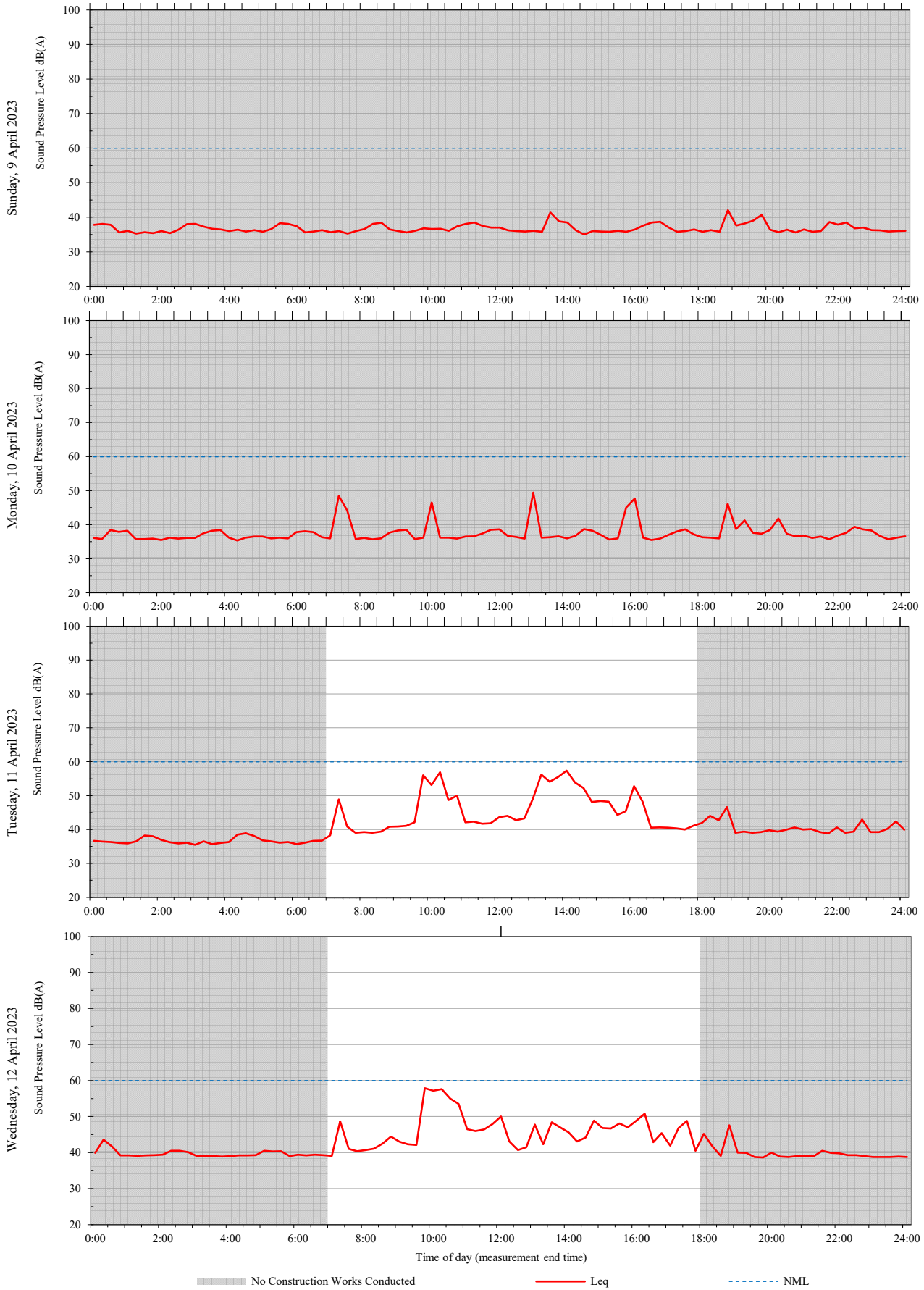
Unattended monitoring: CHW Ground Floor room 51DM047 (Internal)



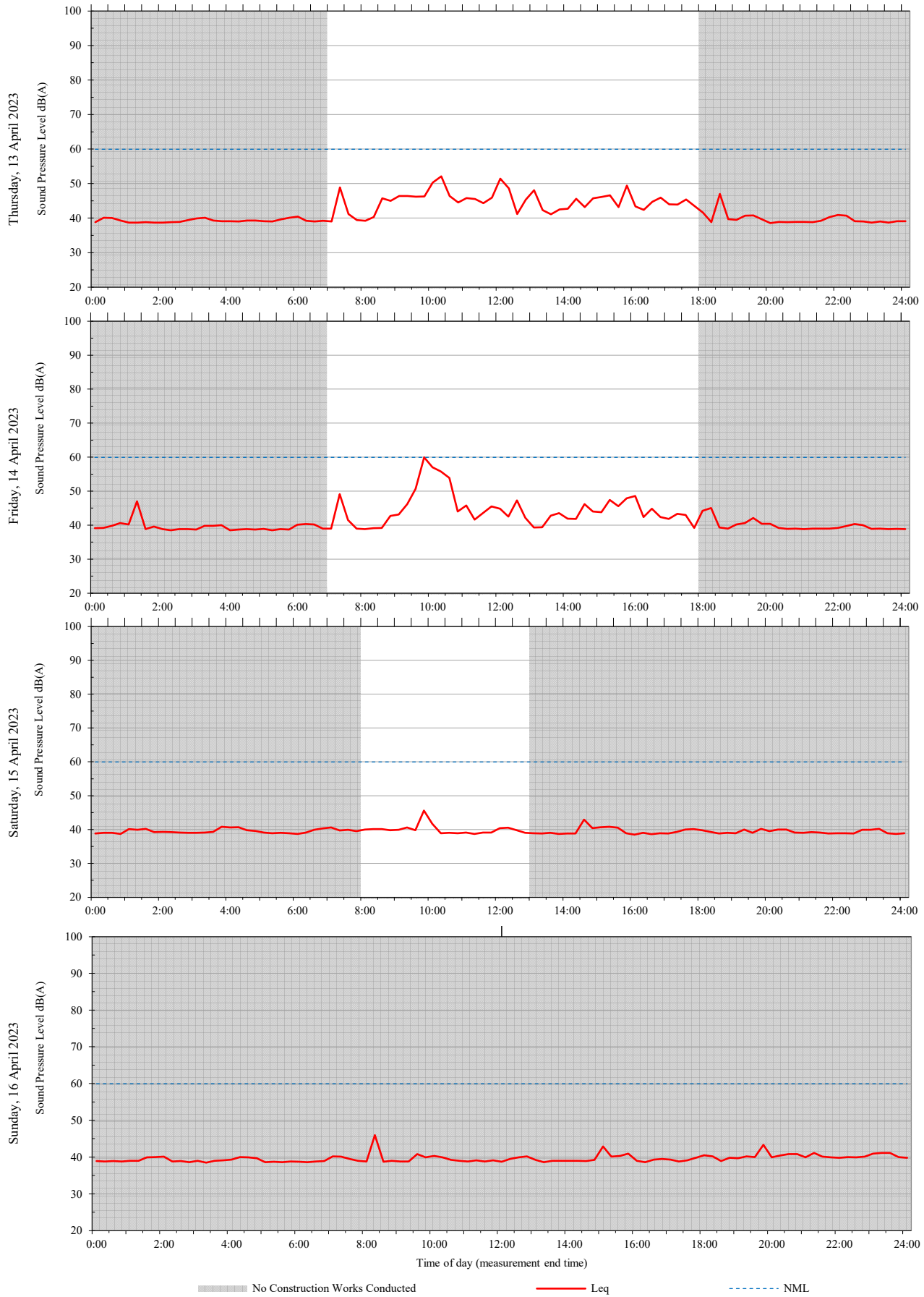
Unattended monitoring: CHW Ground Floor room 51DM047 (Internal)



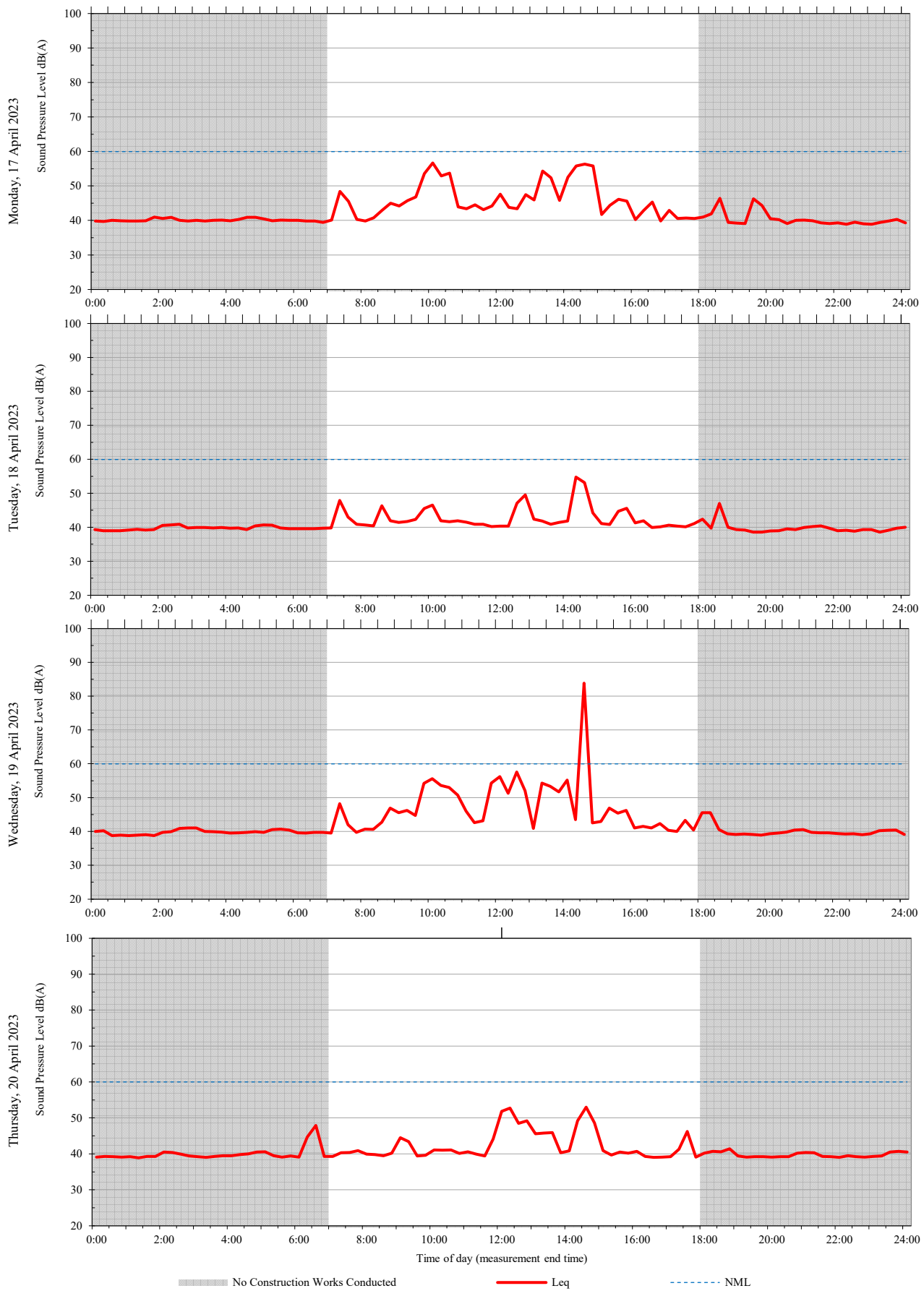
Unattended monitoring: CHW Ground Floor room 51DM047 (Internal)



Unattended monitoring: CHW Ground Floor room 51DM047 (Internal)

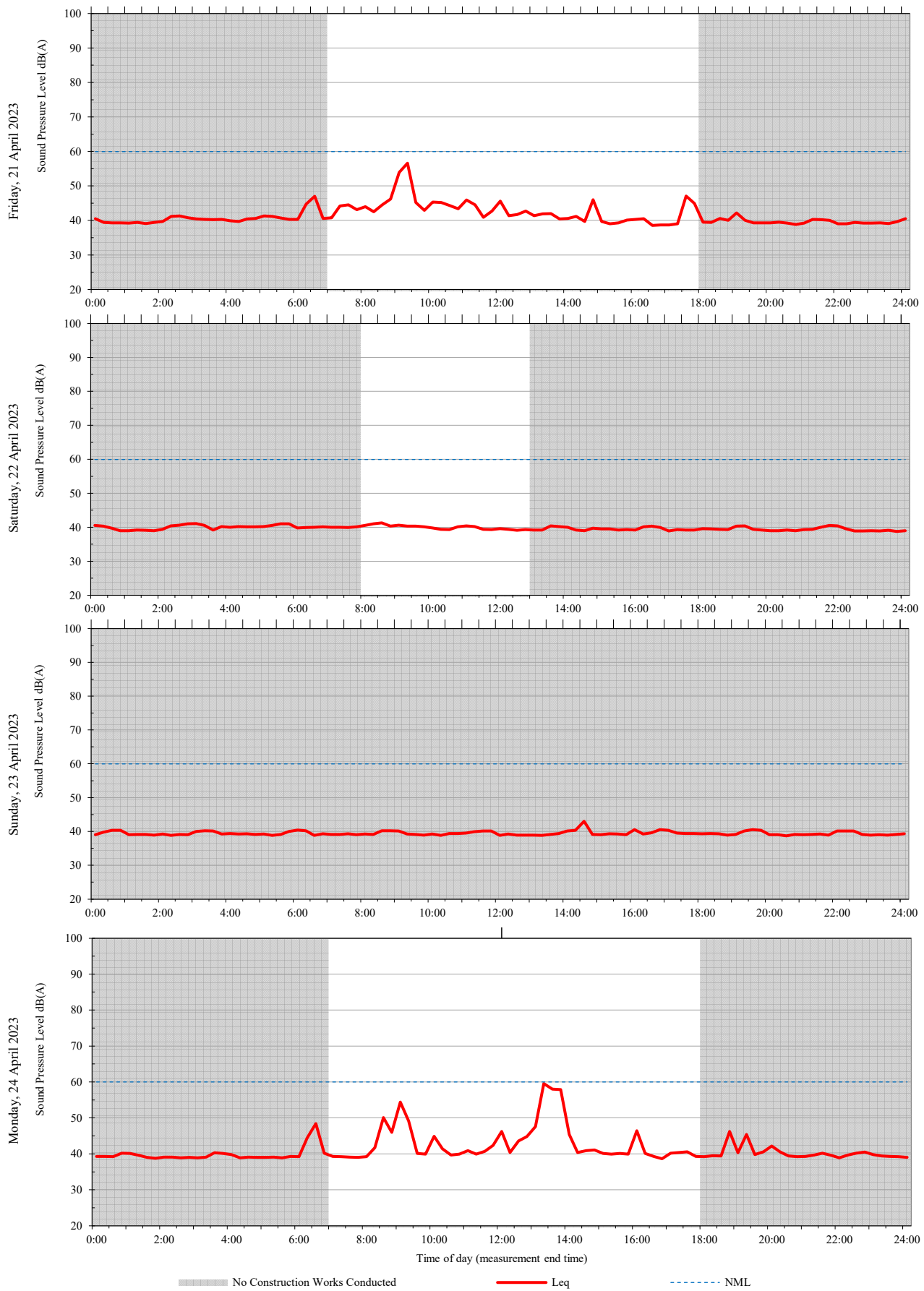


Unattended monitoring: CHW Ground Floor room 51DM047 (Internal)

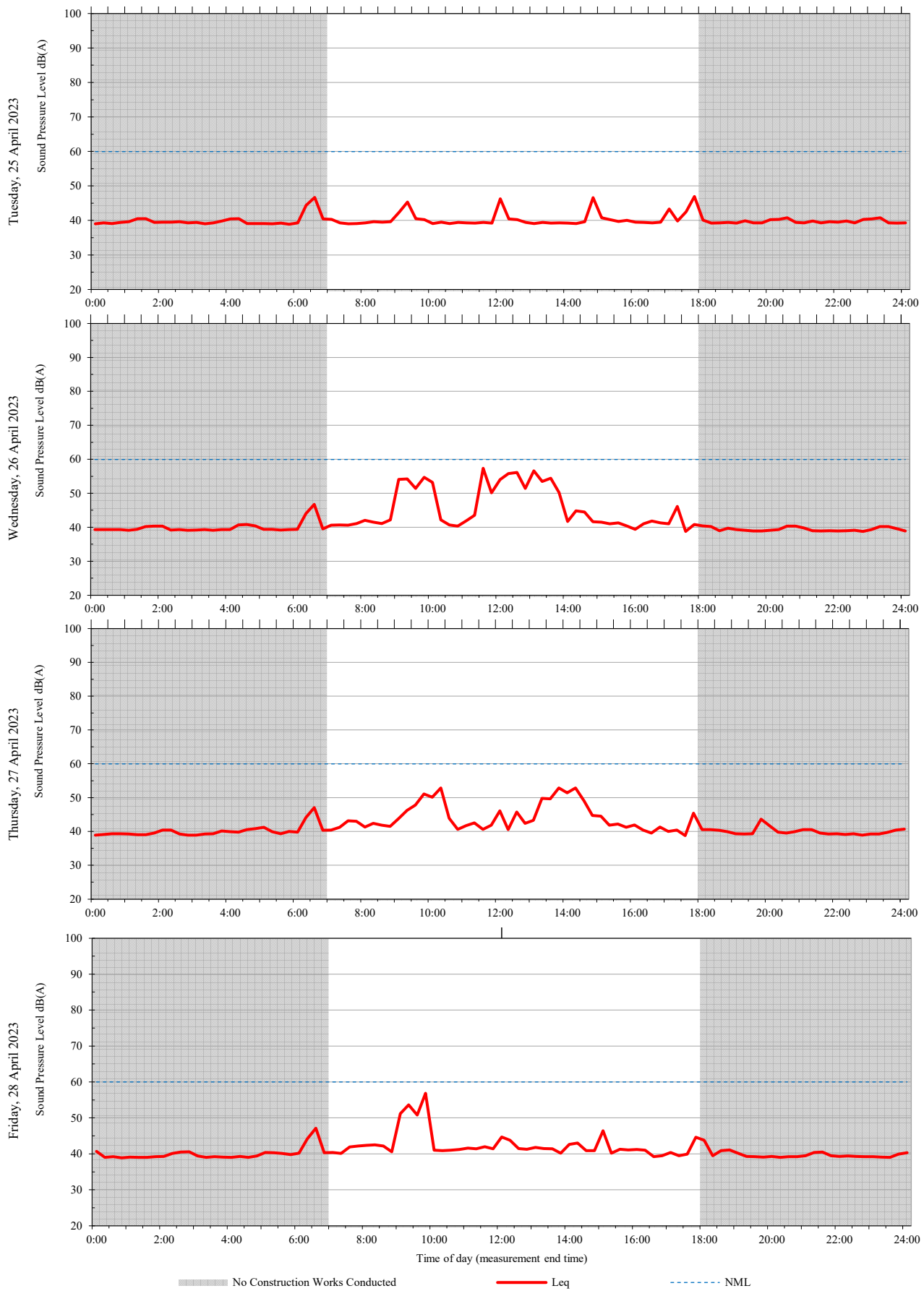


Unattended monitoring: CHW Ground Floor room 51DM047 (Internal)

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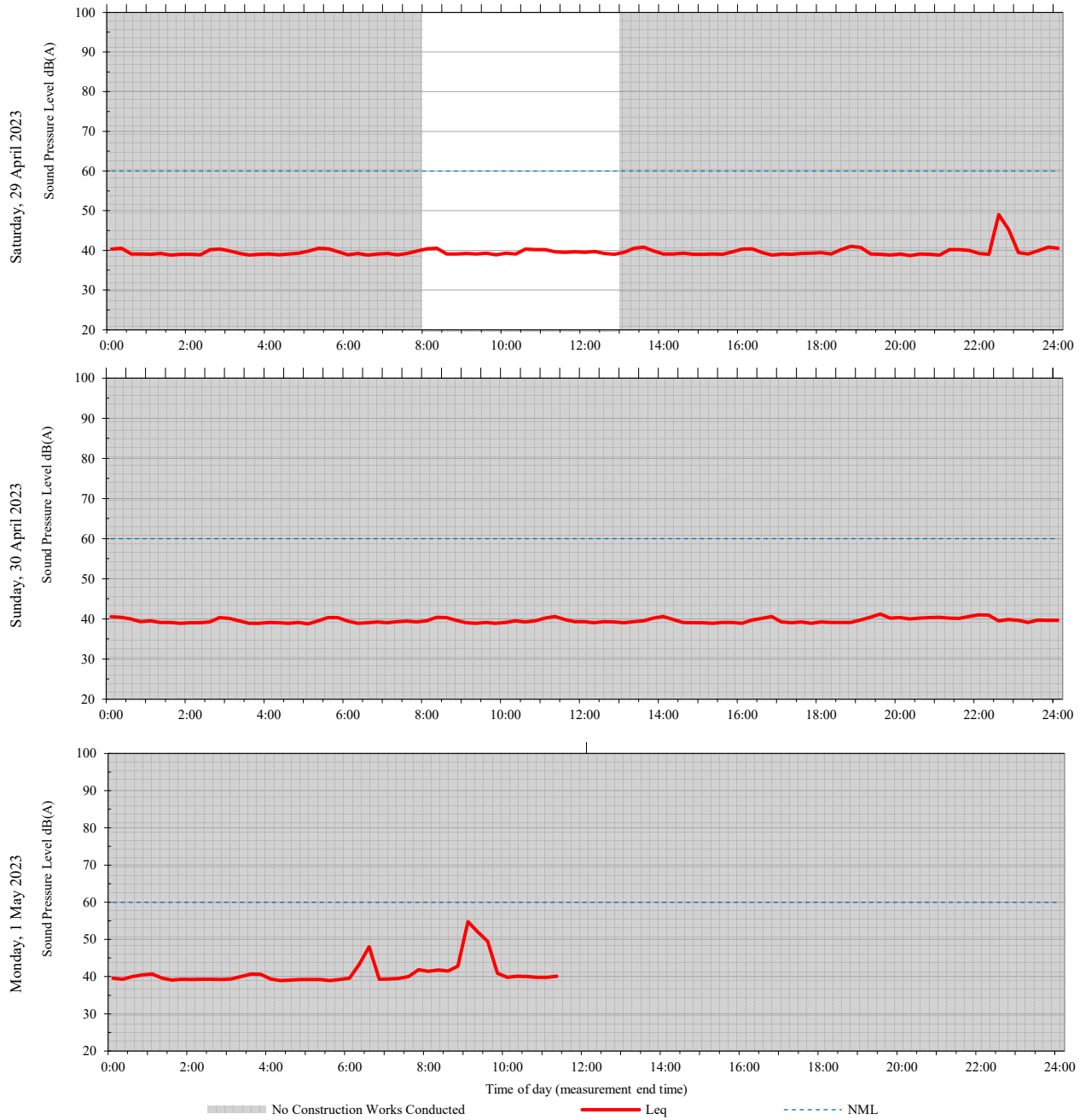


Unattended monitoring: CHW Ground Floor room 51DM047 (Internal)



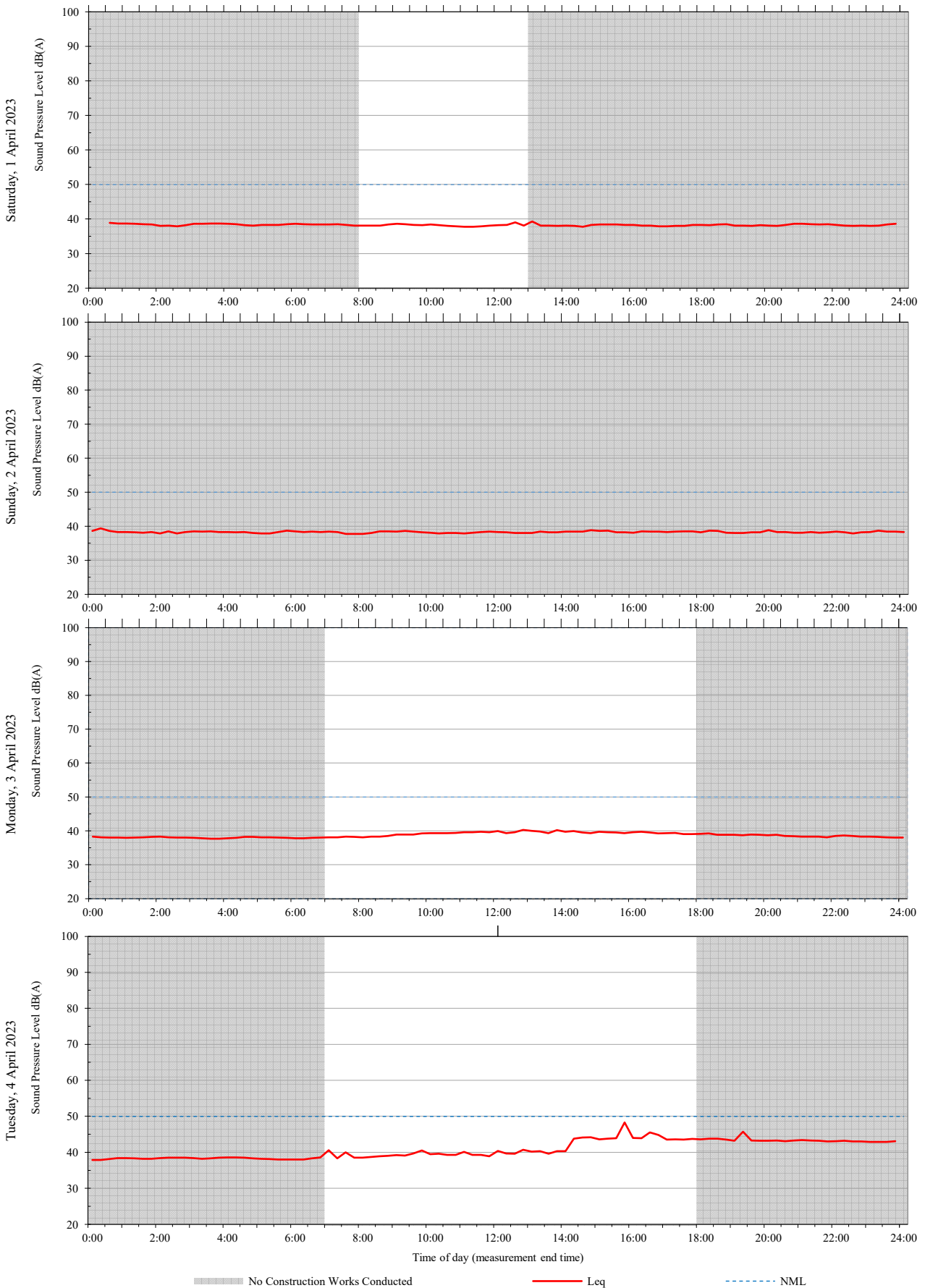
Unattended monitoring: CHW Ground Floor room 51DM047 (Internal)

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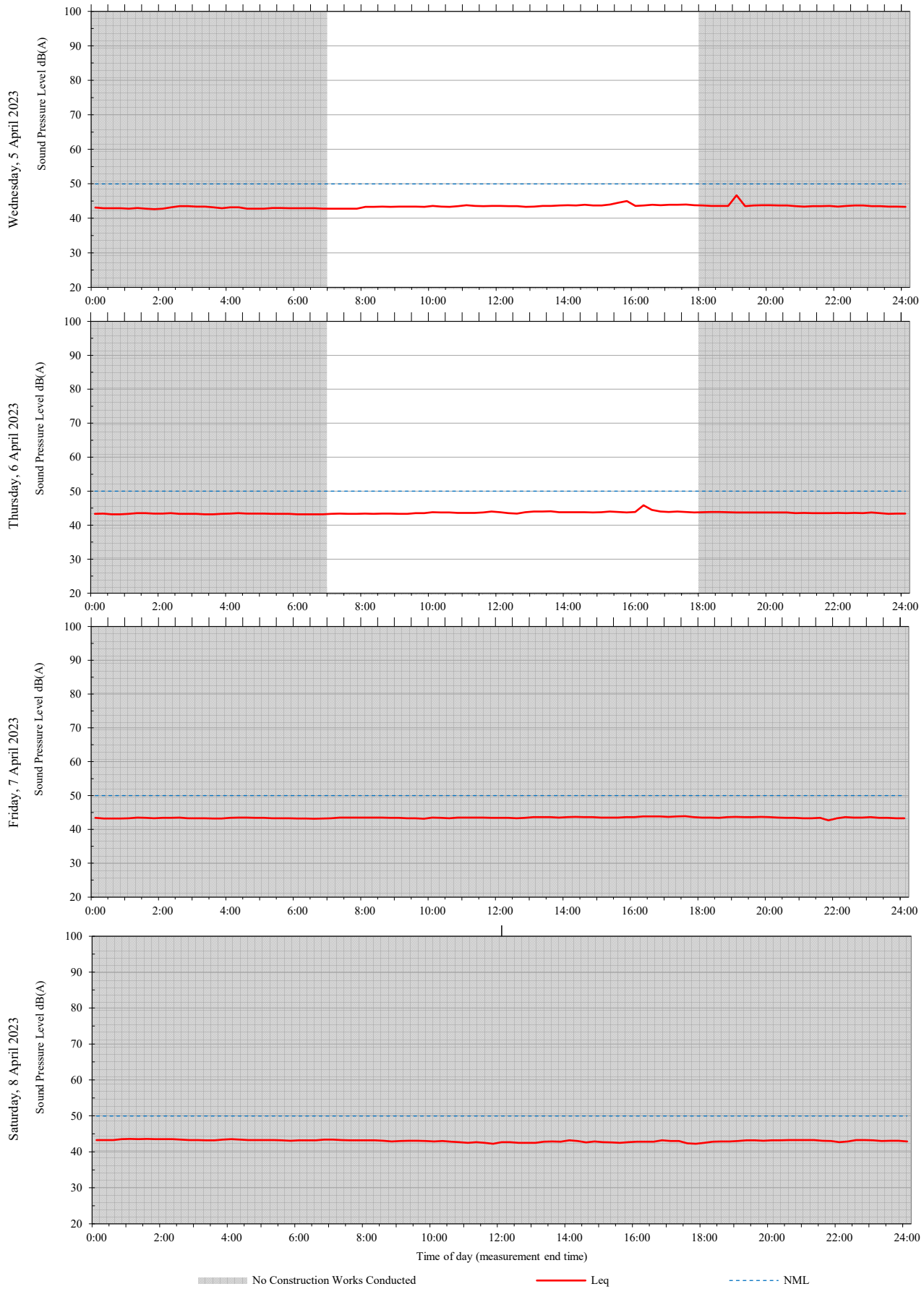


A2 CASB Level 3 Operating Theatre Store Room WM11K.03.3264 (Westmead 5)

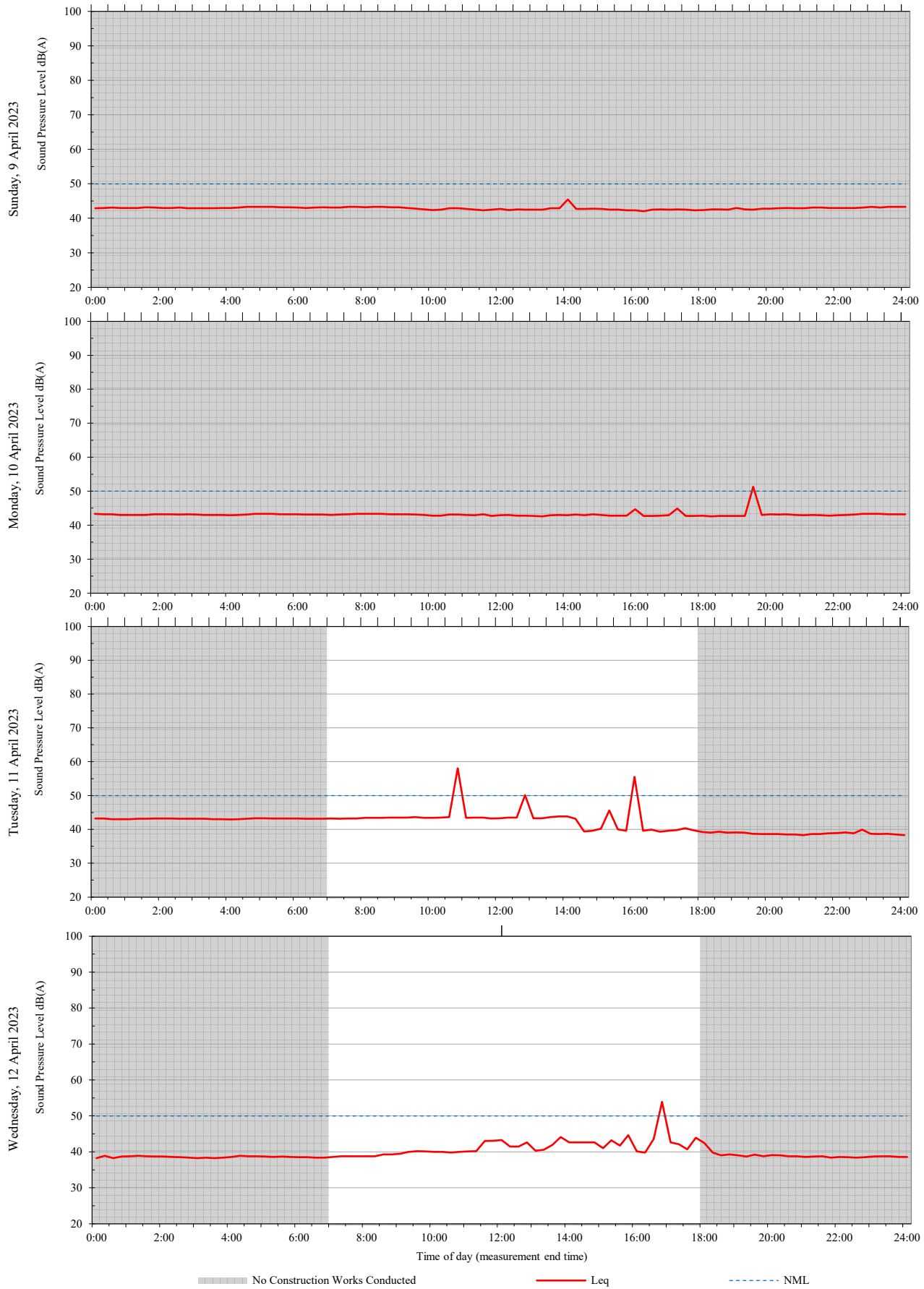
Unattended monitoring: CASB Level 3 Operating Theatre Store Room (Internal)



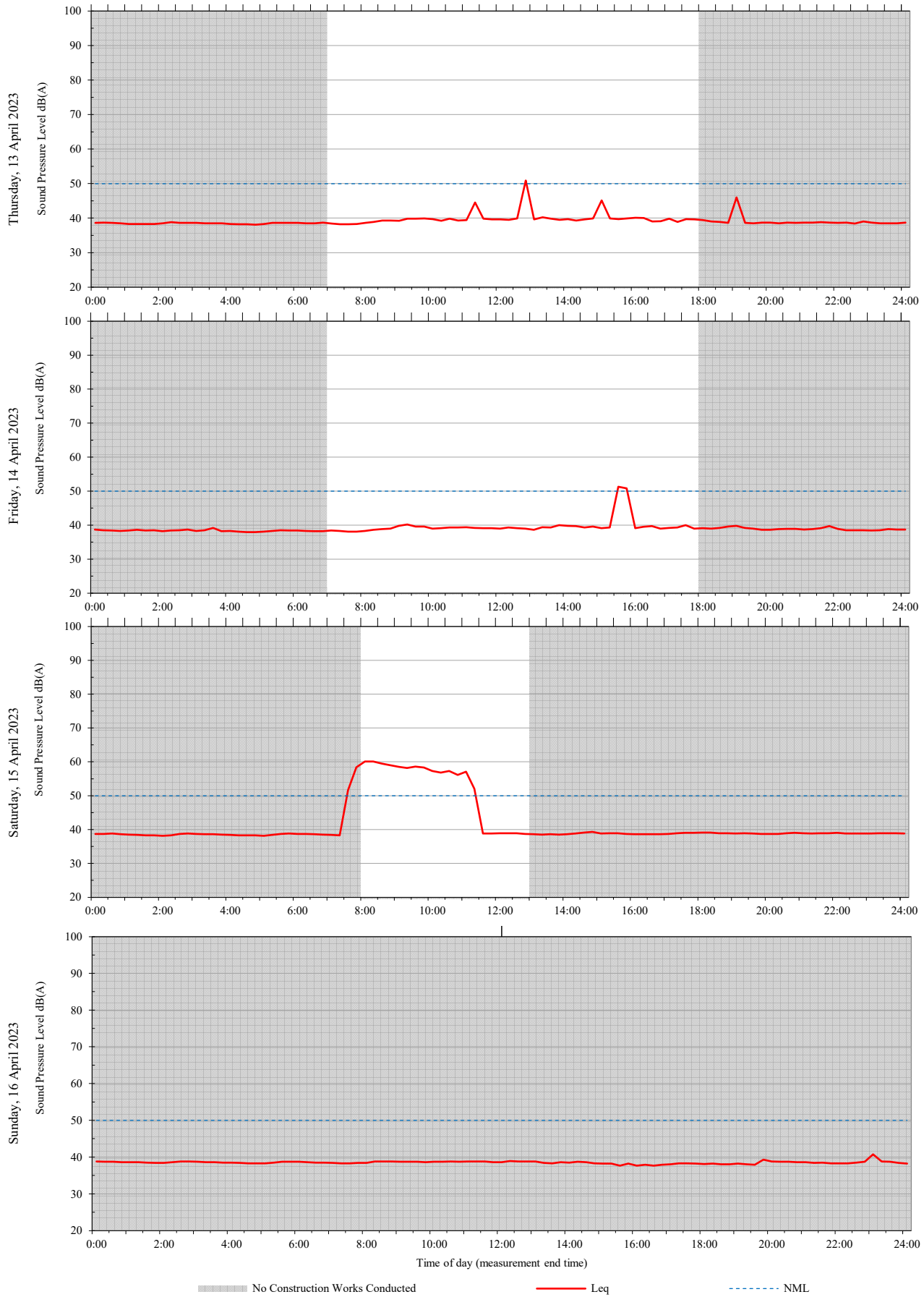
Unattended monitoring: CASB Level 3 Operating Theatre Store Room (Internal)



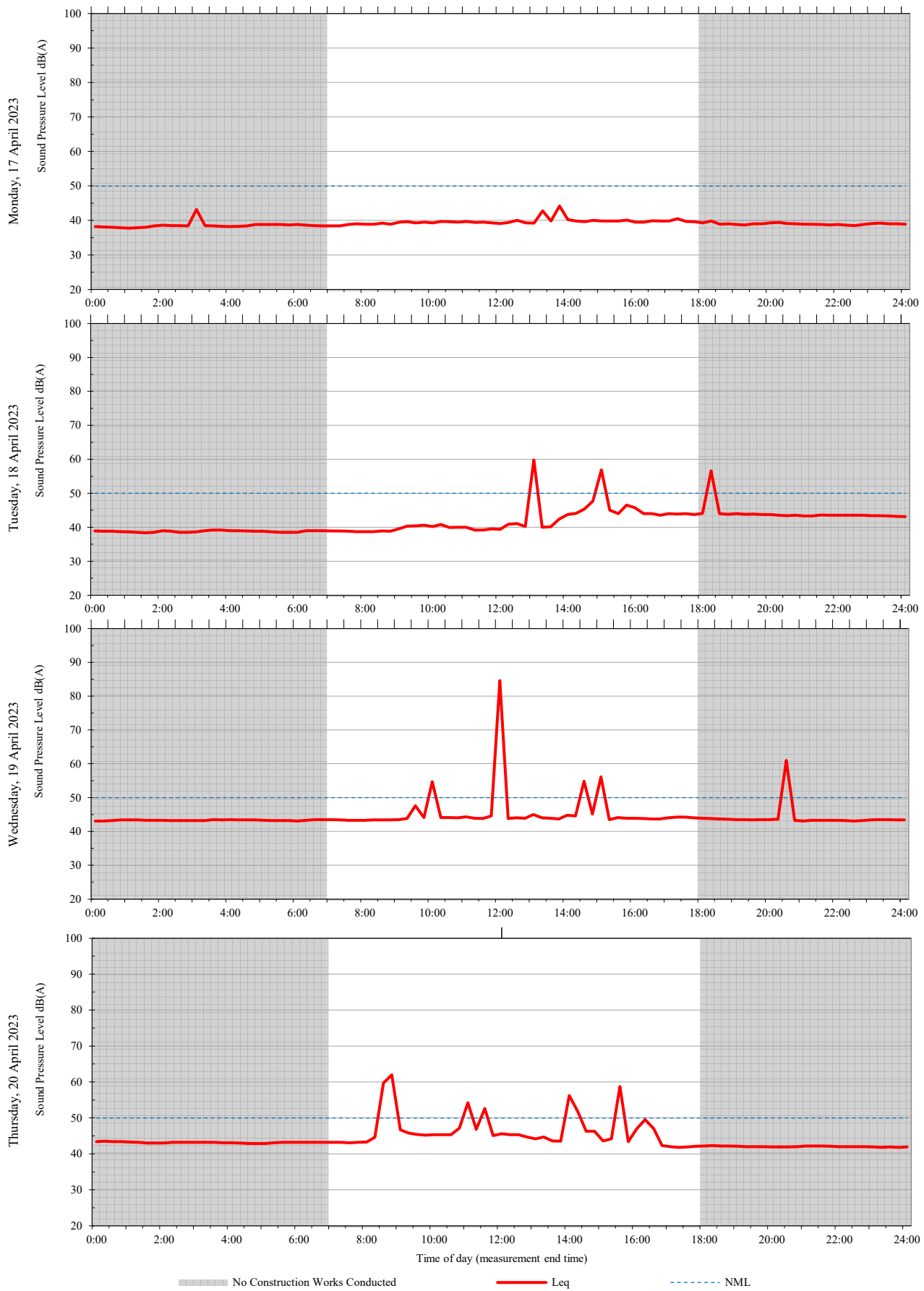
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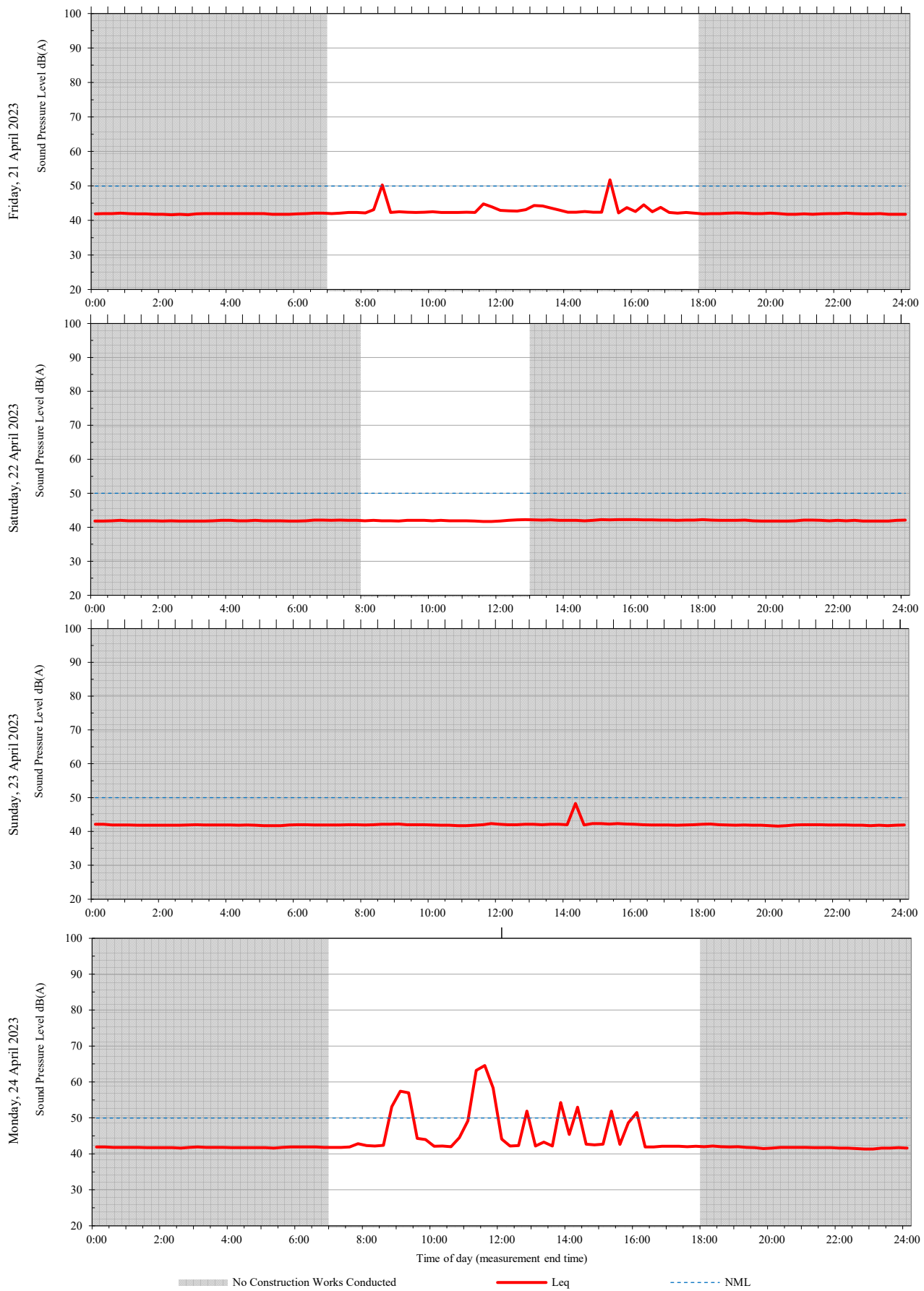
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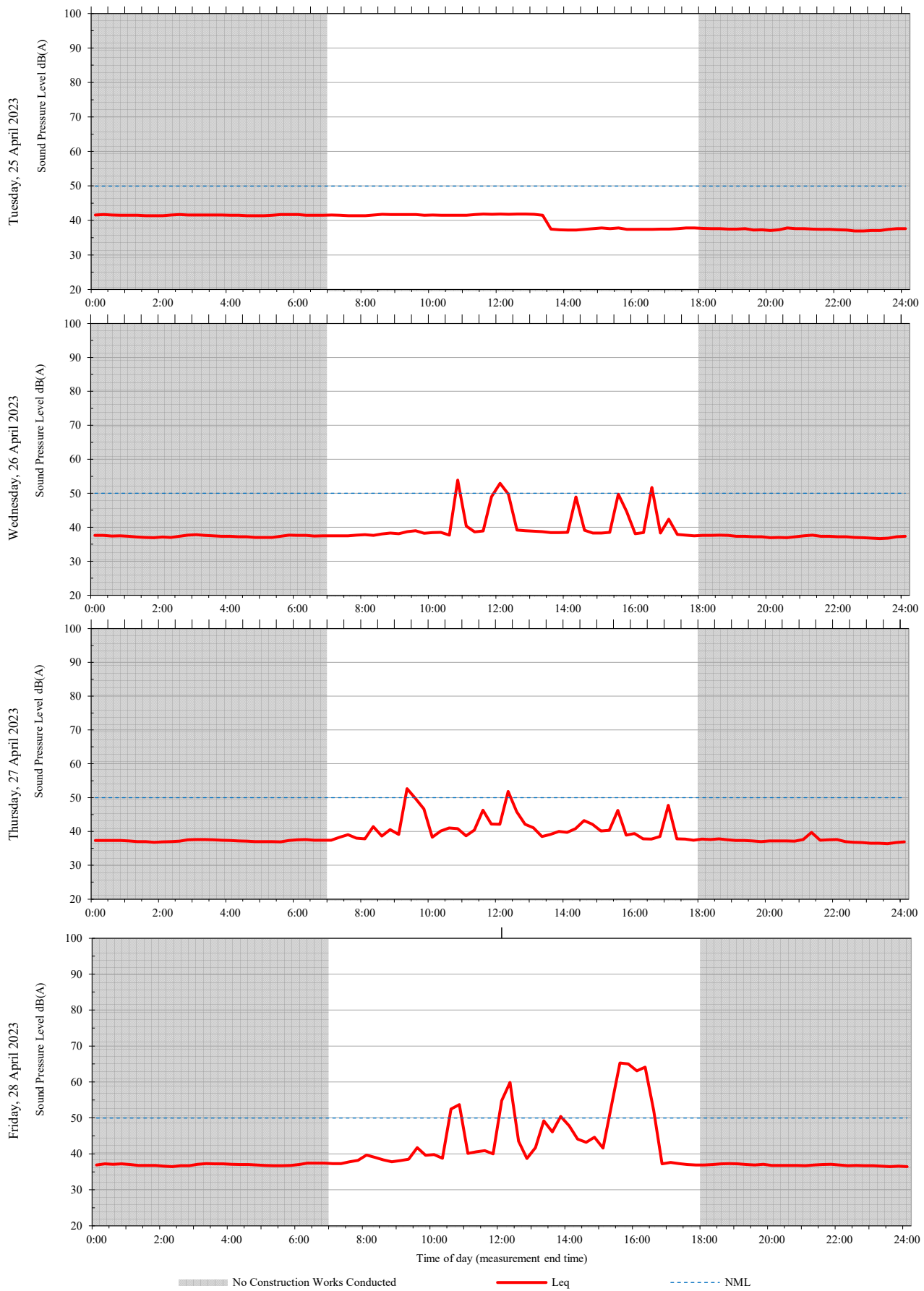
Unattended monitoring: CASB Level 3 Operating Theatre Store Room (Internal)



Unattended monitoring: CASB Level 3 Operating Theatre Store Room (Internal)

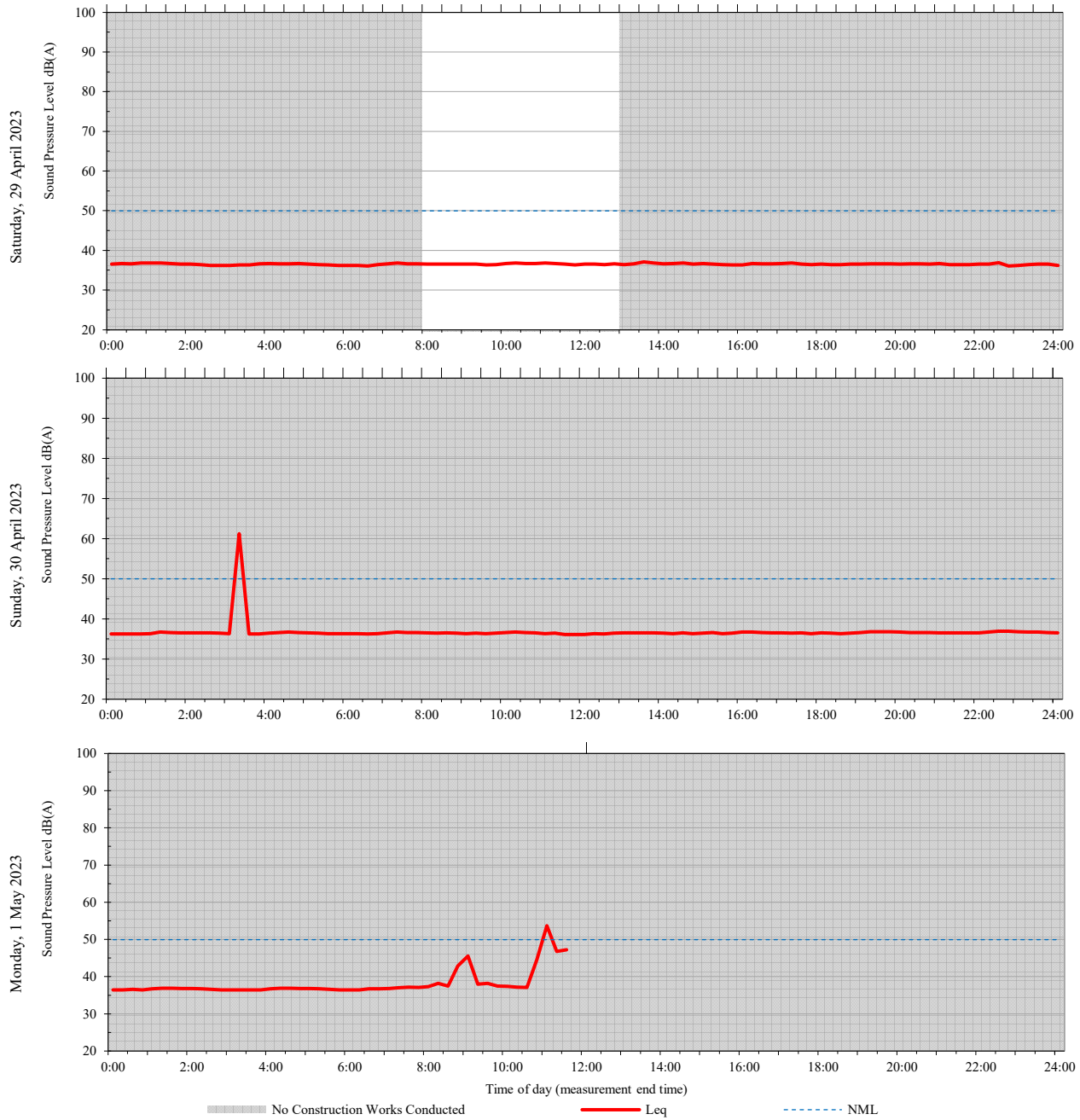


Unattended monitoring: CASB Level 3 Operating Theatre Store Room (Internal)



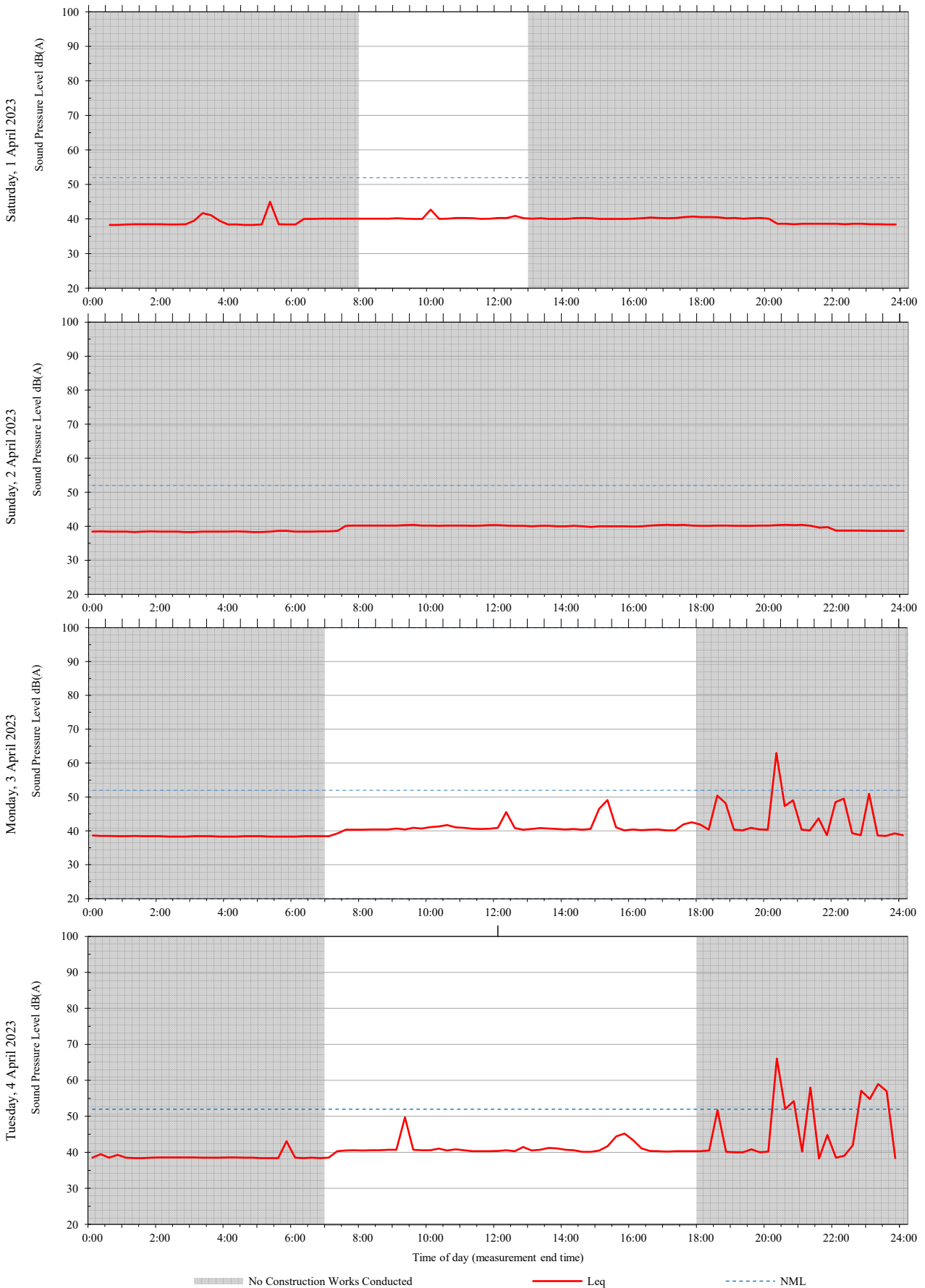
Unattended monitoring: CASB Level 3 Operating Theatre Store Room (Internal)

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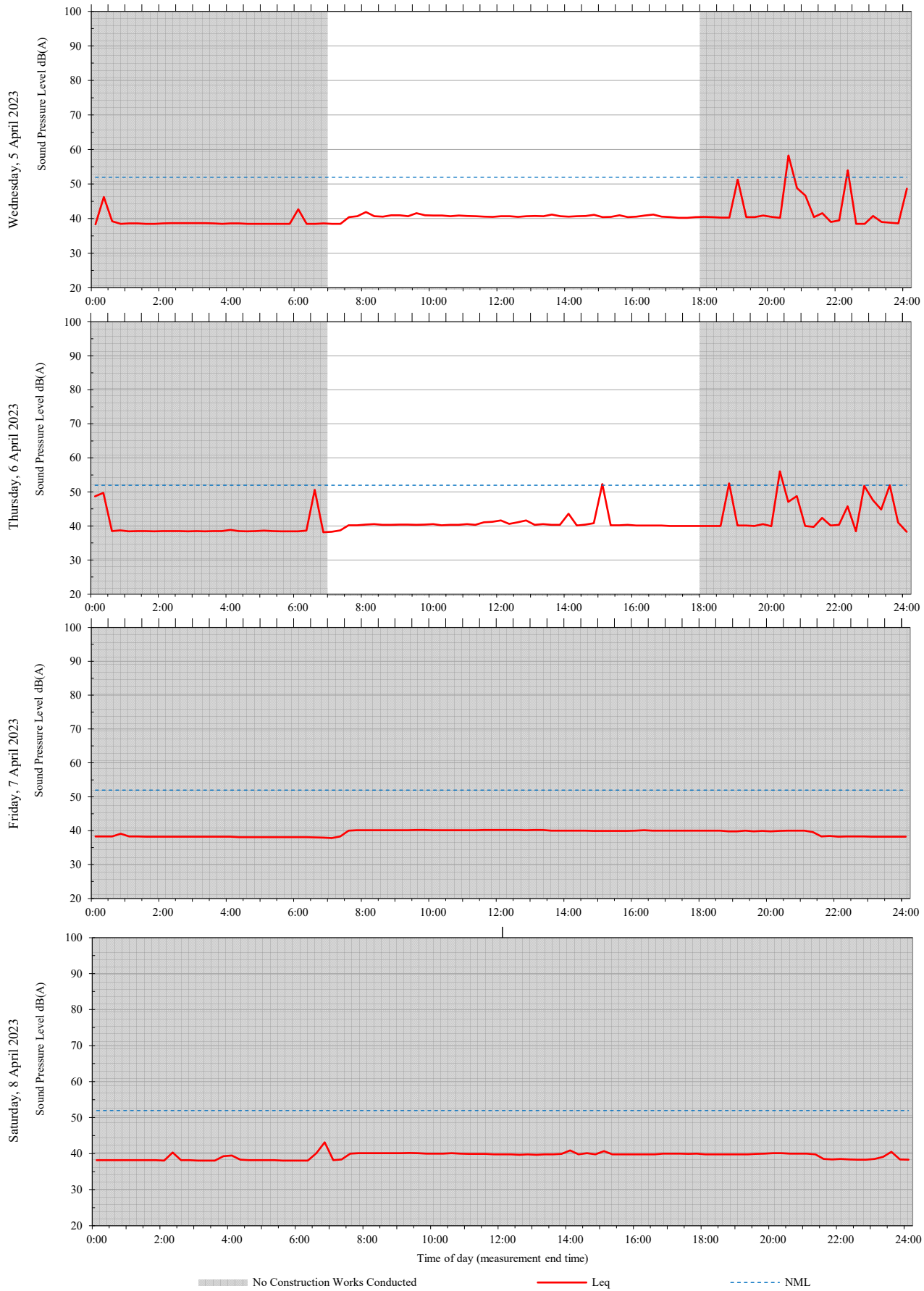


A3 CASB Level 6 Cleaner's Room WM11K.06.6079 (Westmead 6)

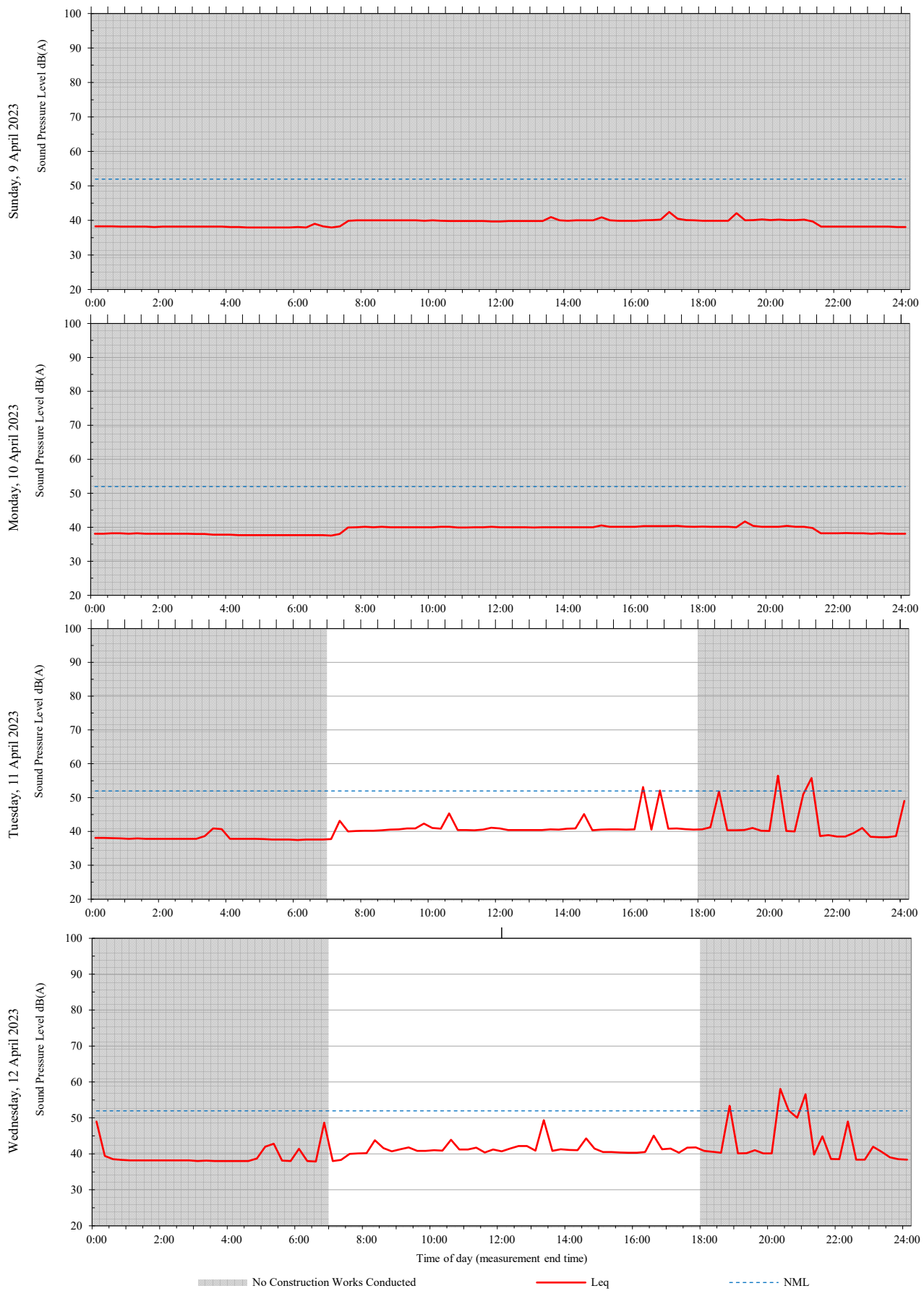
Unattended monitoring: CASB Level 6 Cleaner's Room (Internal)



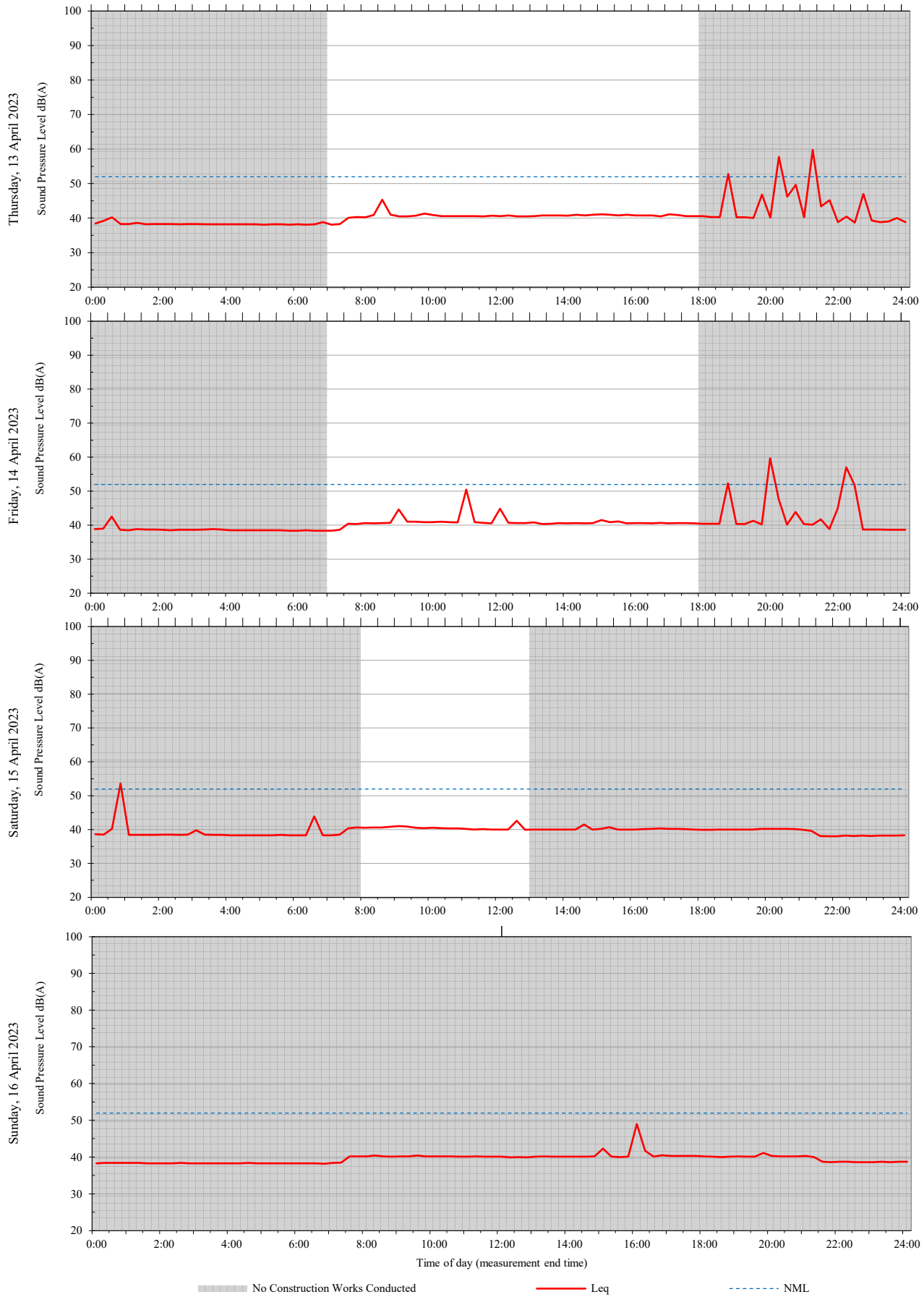
Unattended monitoring: CASB Level 6 Cleaner's Room (Internal)



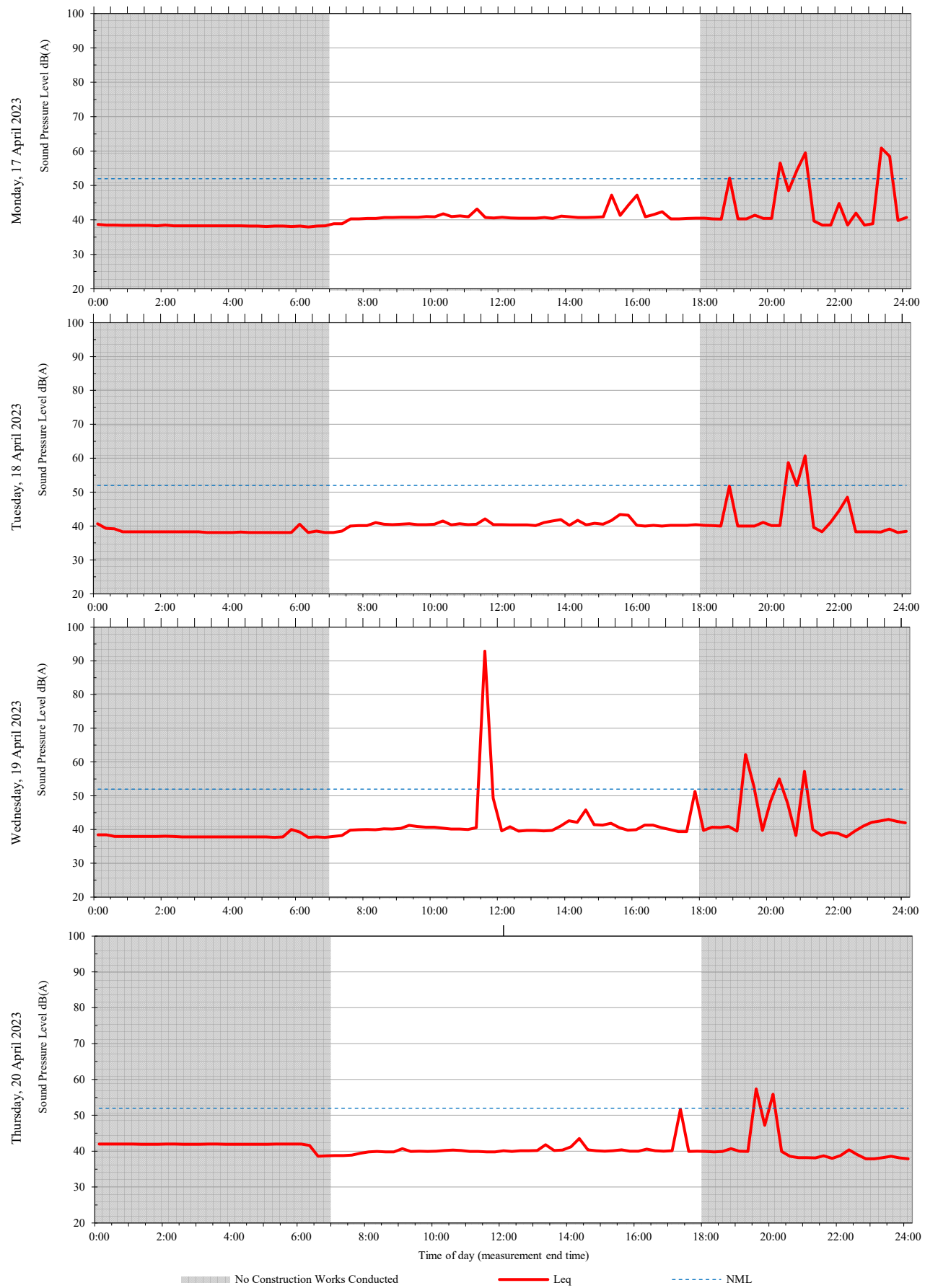
Unattended monitoring: CASB Level 6 Cleaner's Room (Internal)



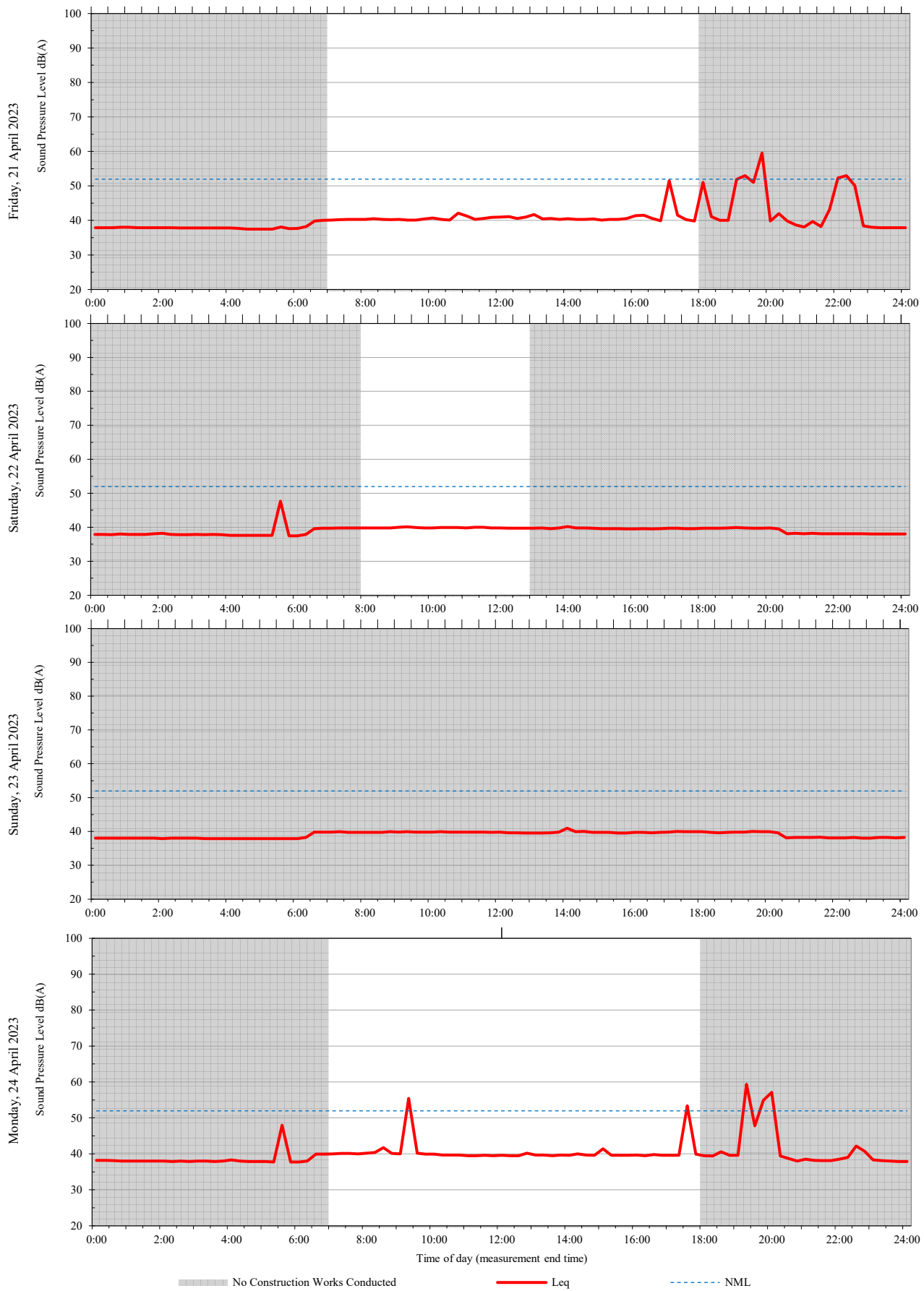
Unattended monitoring: CASB Level 6 Cleaner's Room (Internal)



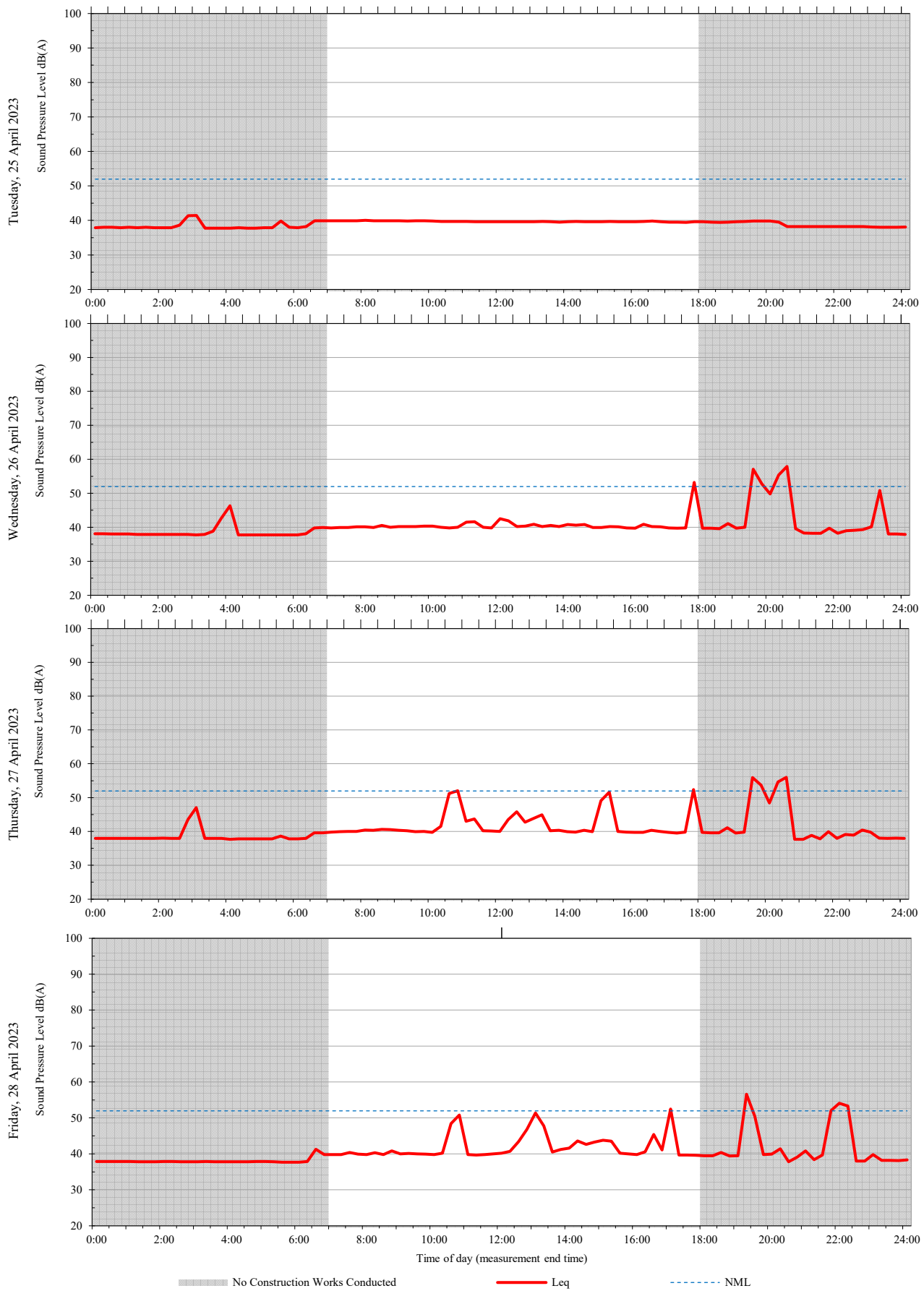
Unattended monitoring: CASB Level 6 Cleaner's Room (Internal)



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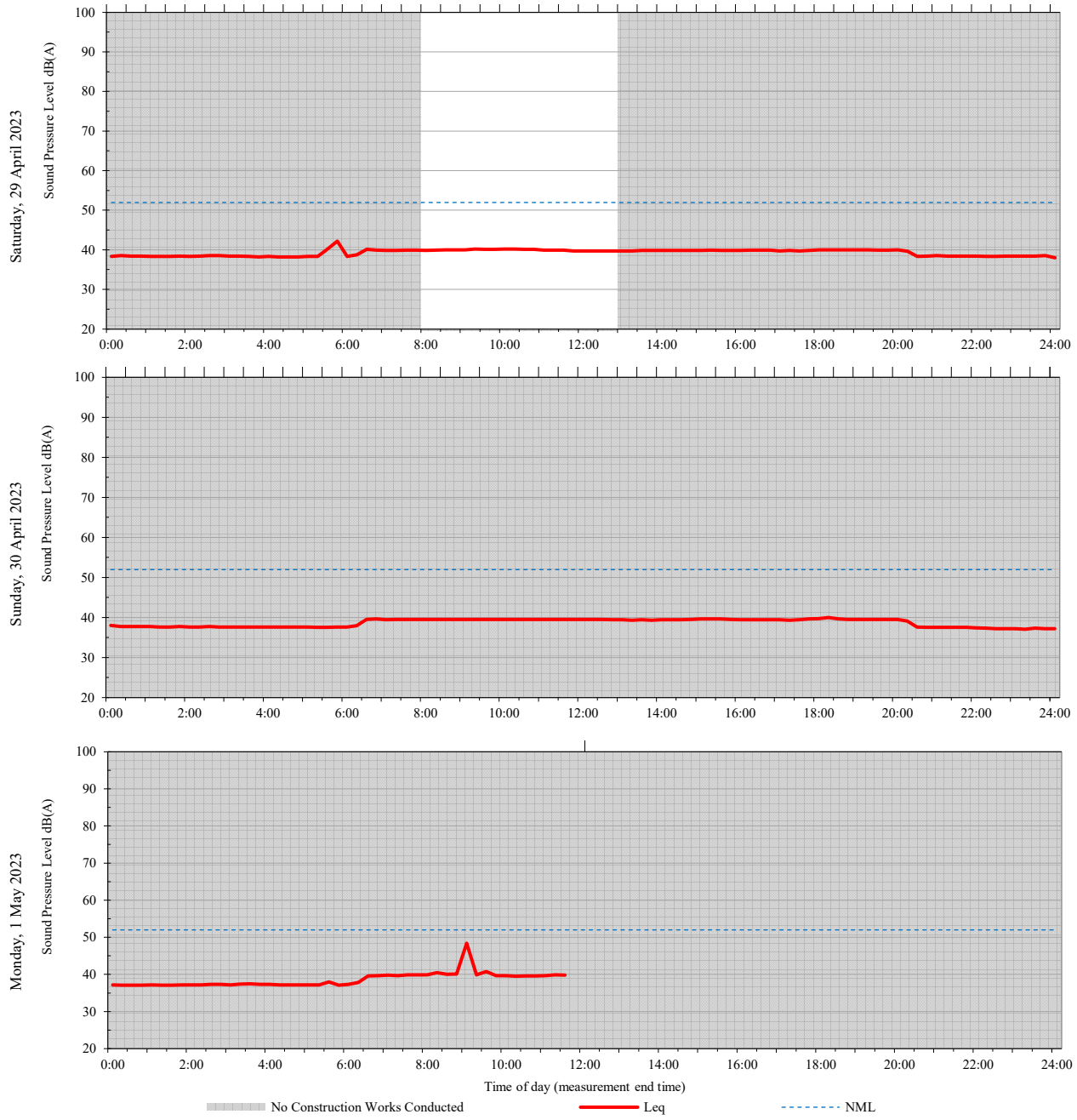


Unattended monitoring: CASB Level 6 Cleaner's Room (Internal)



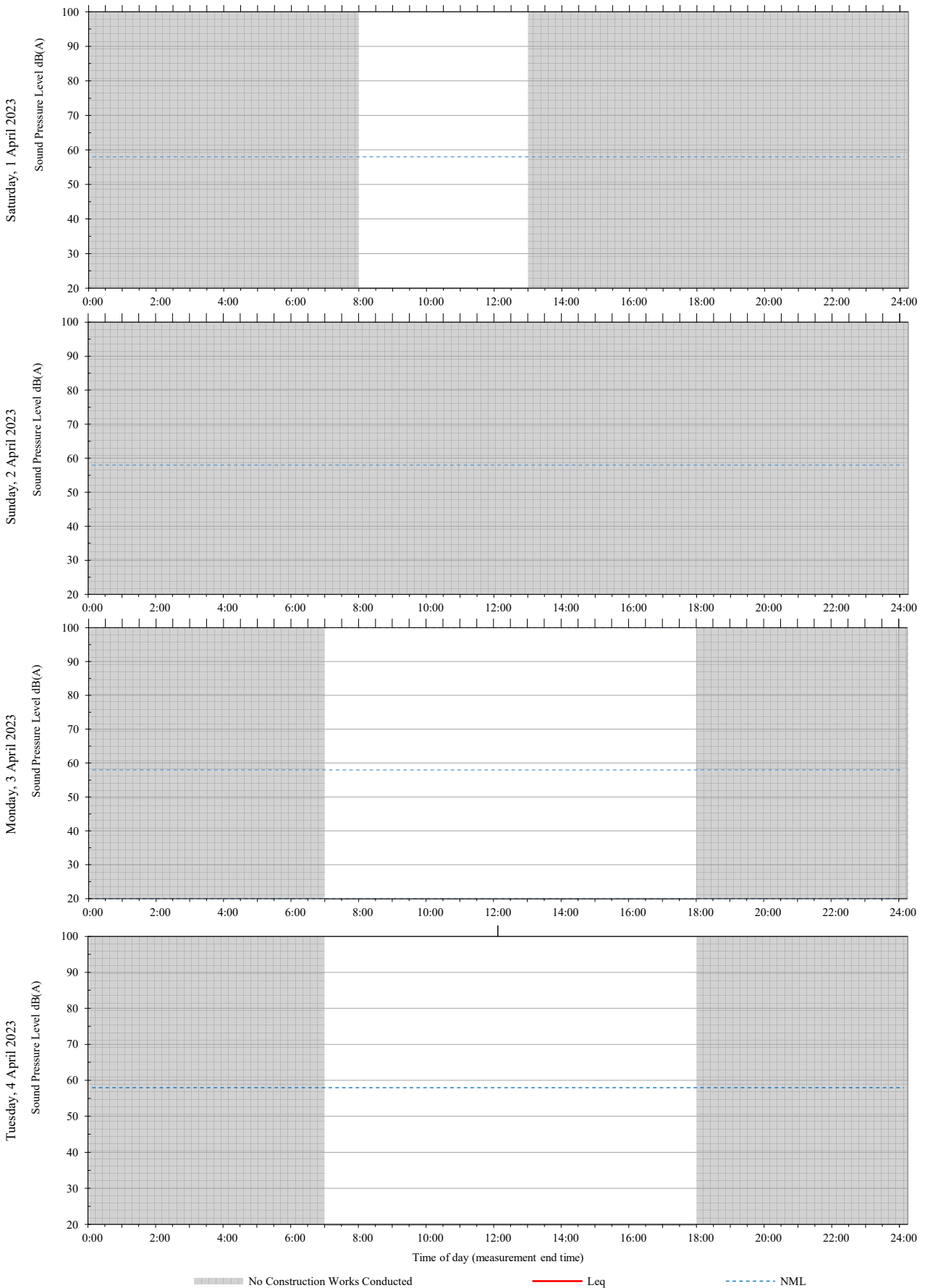
Unattended monitoring: CASB Level 6 Cleaner's Room (Internal)

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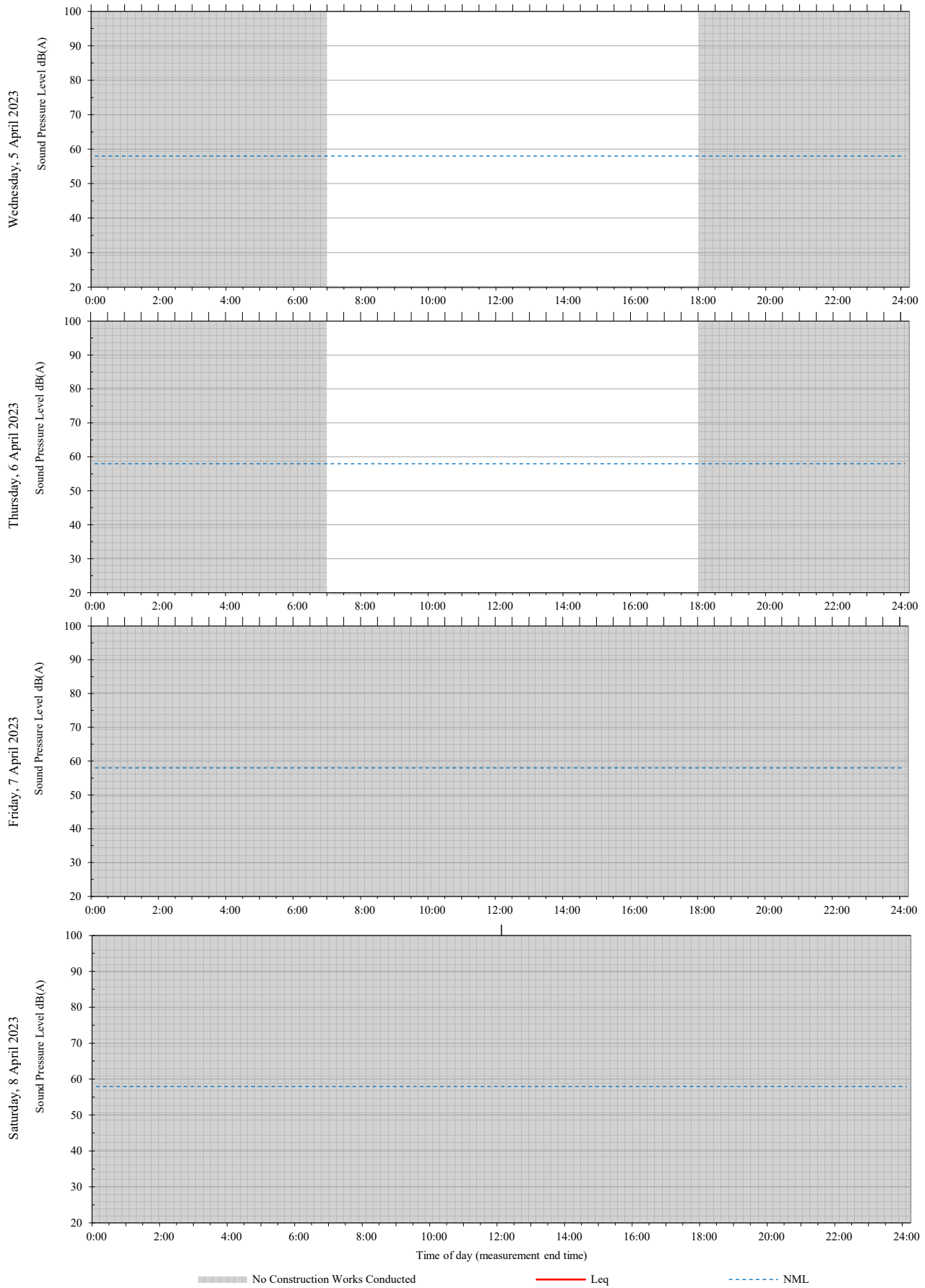
A4 KR Level 3 Radiation Room 33 RF041 (Westmead 7)

Unattended monitoring: KR Level 3 Radiation Room 33 RF041 (Internal)



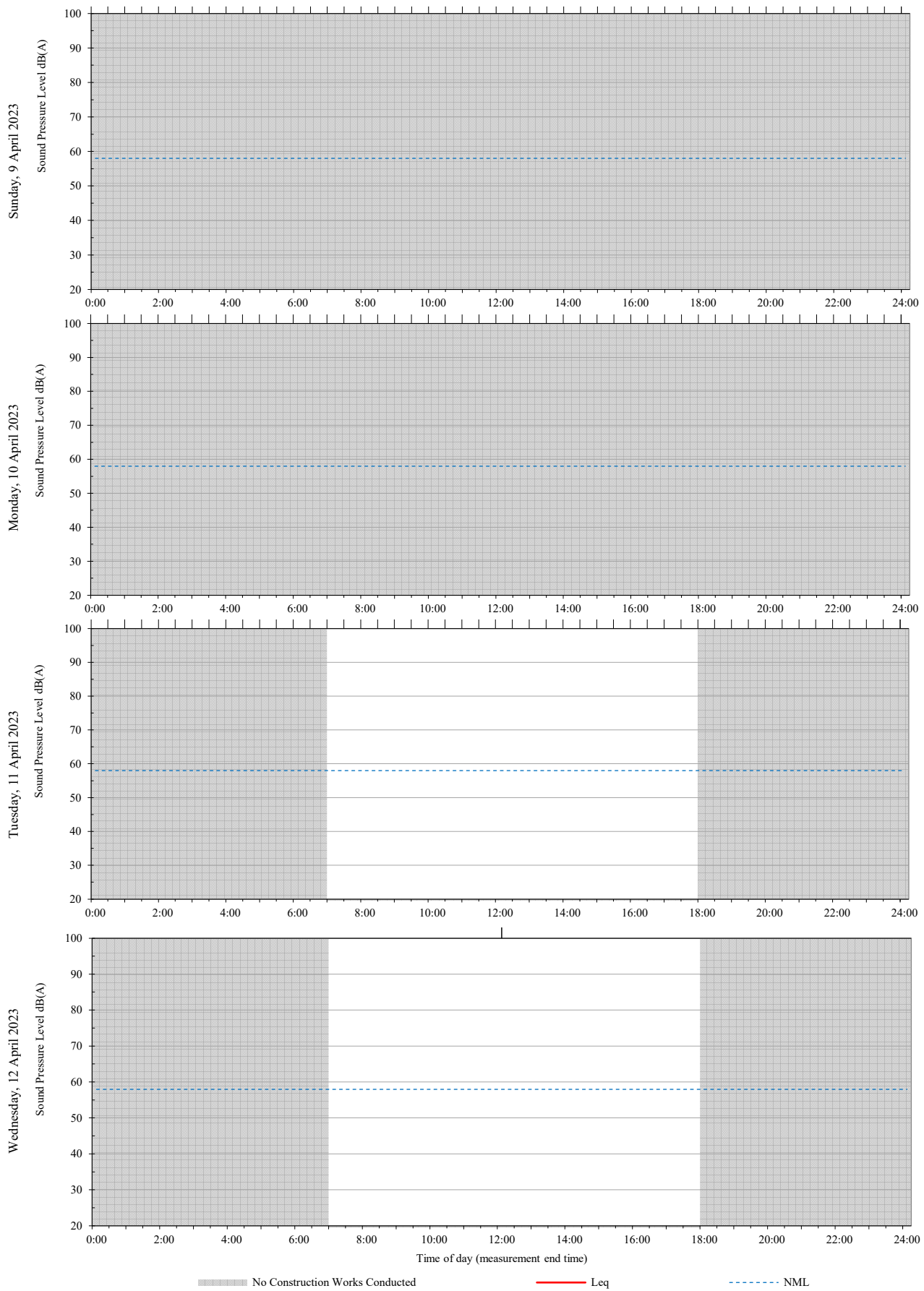
Unattended monitoring: KR Level 3 Radiation Room 33 RF041 (Internal)

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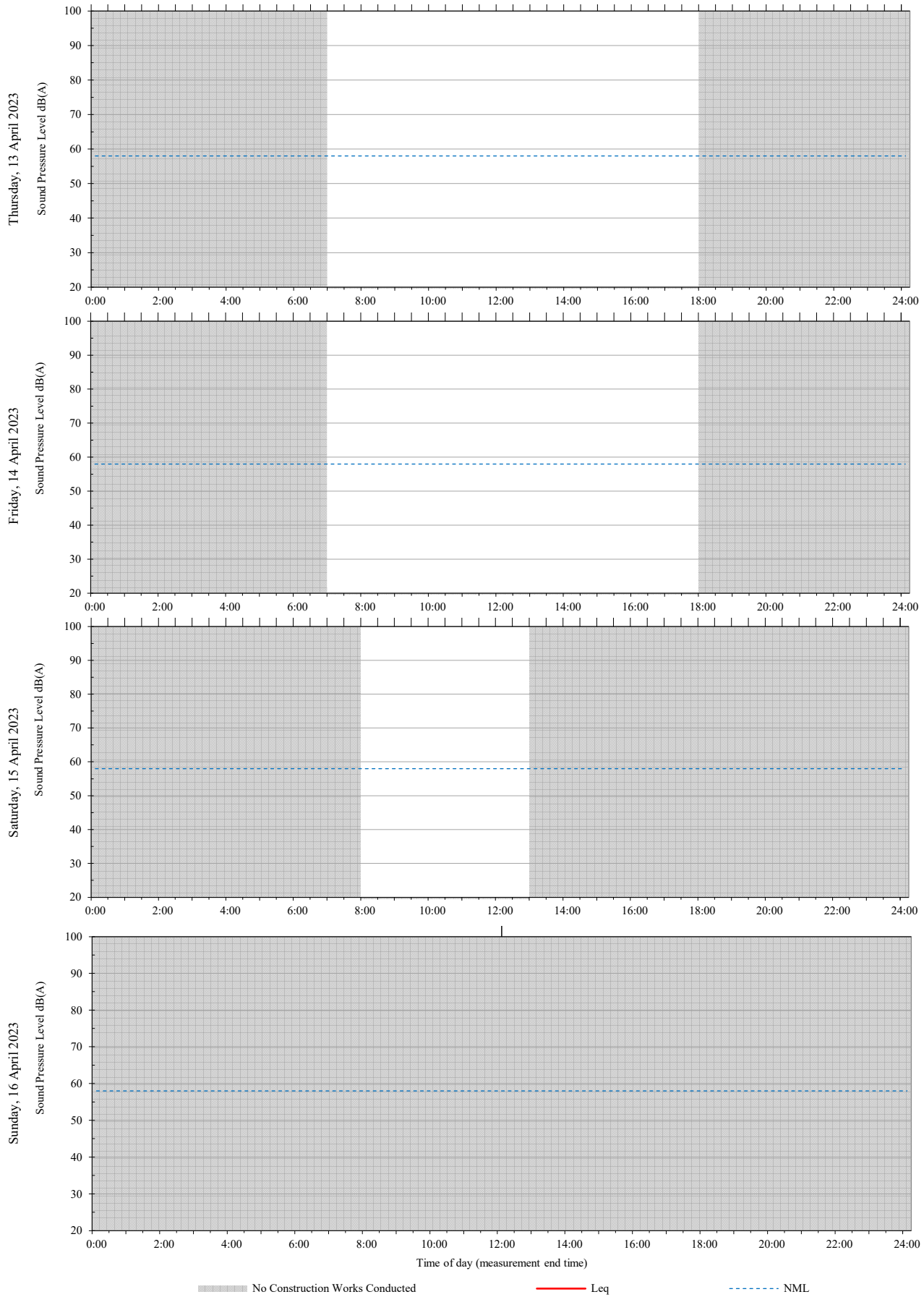


Unattended monitoring: KR Level 3 Radiation Room 33 RF041 (Internal)

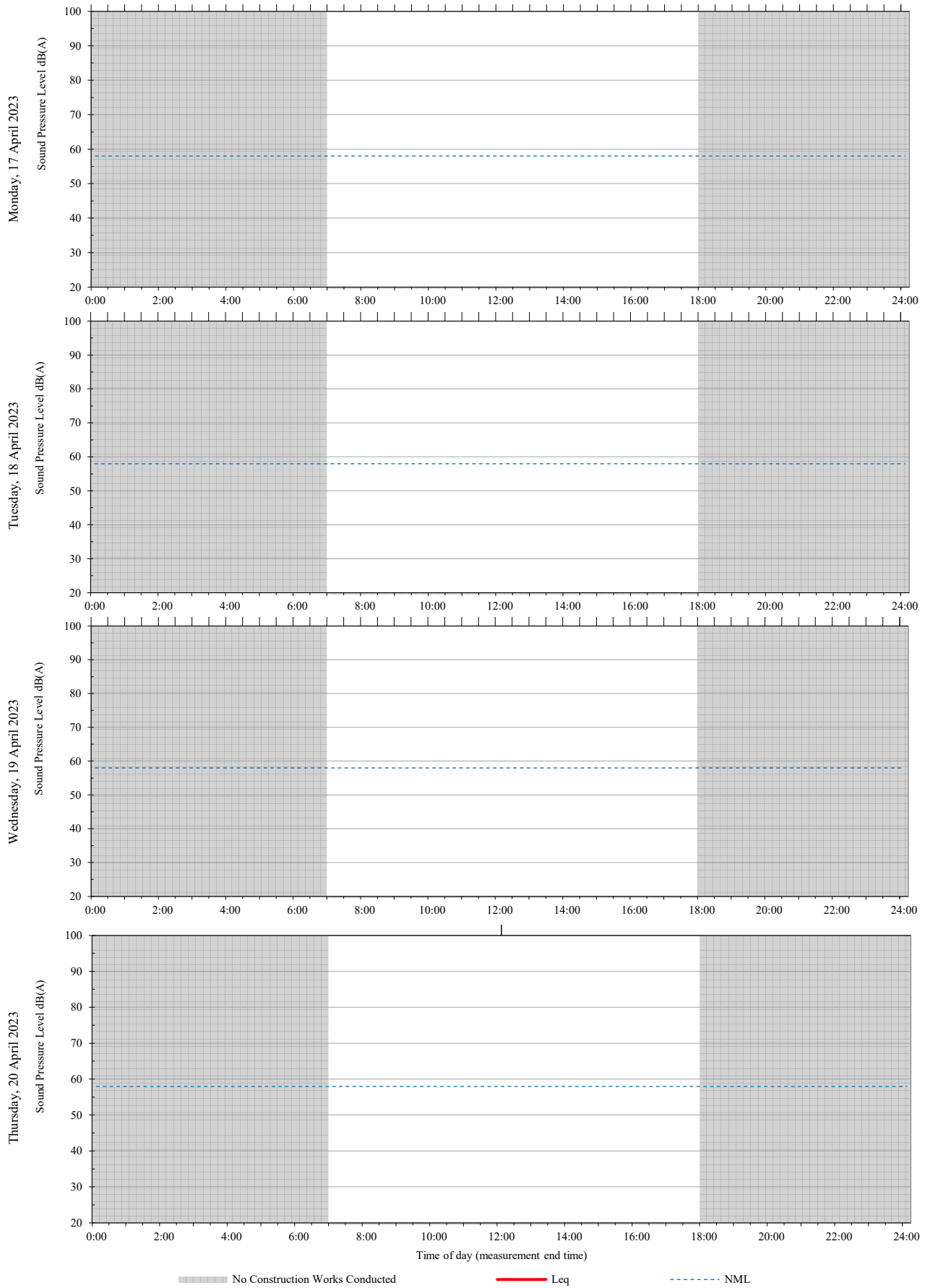
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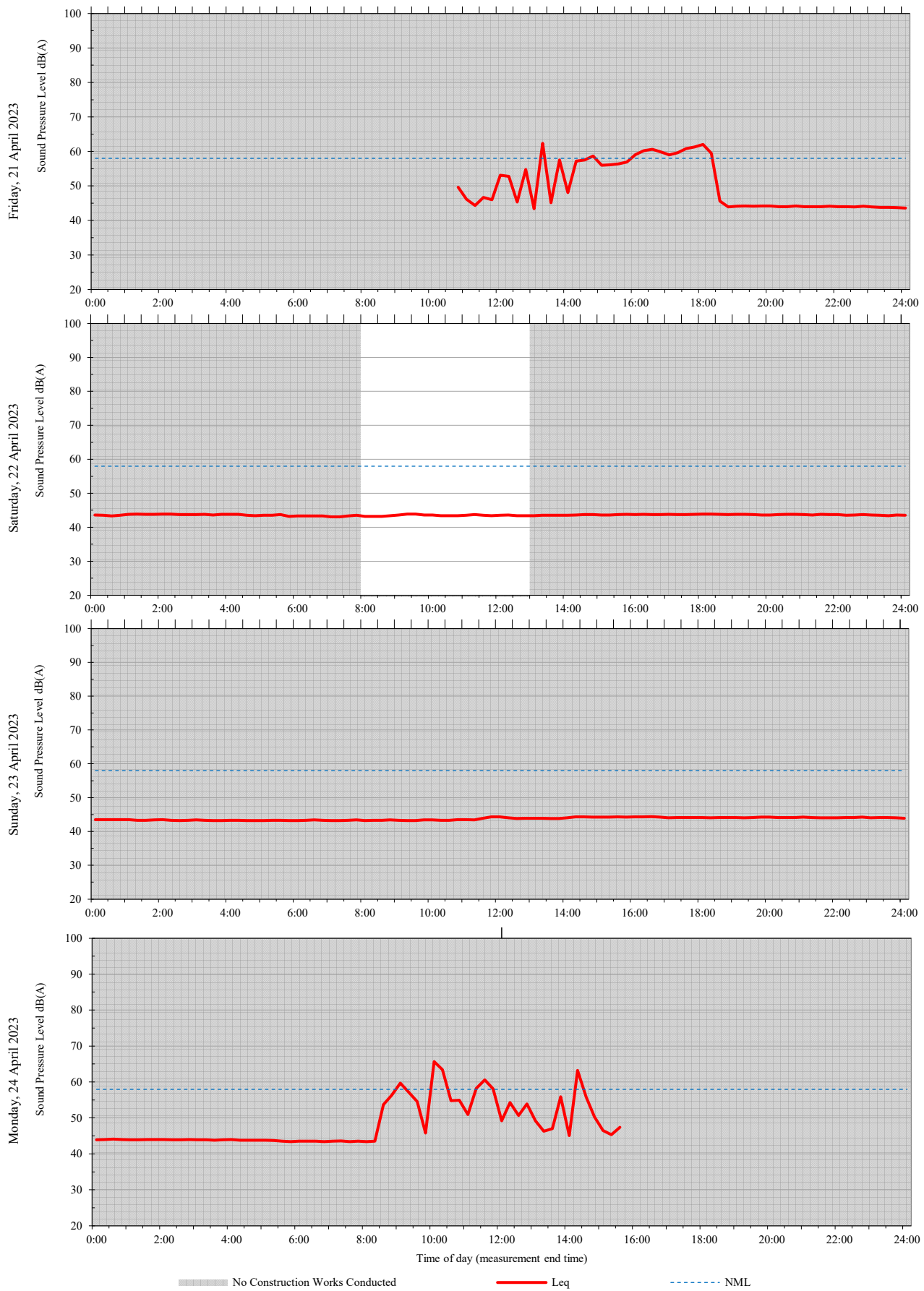
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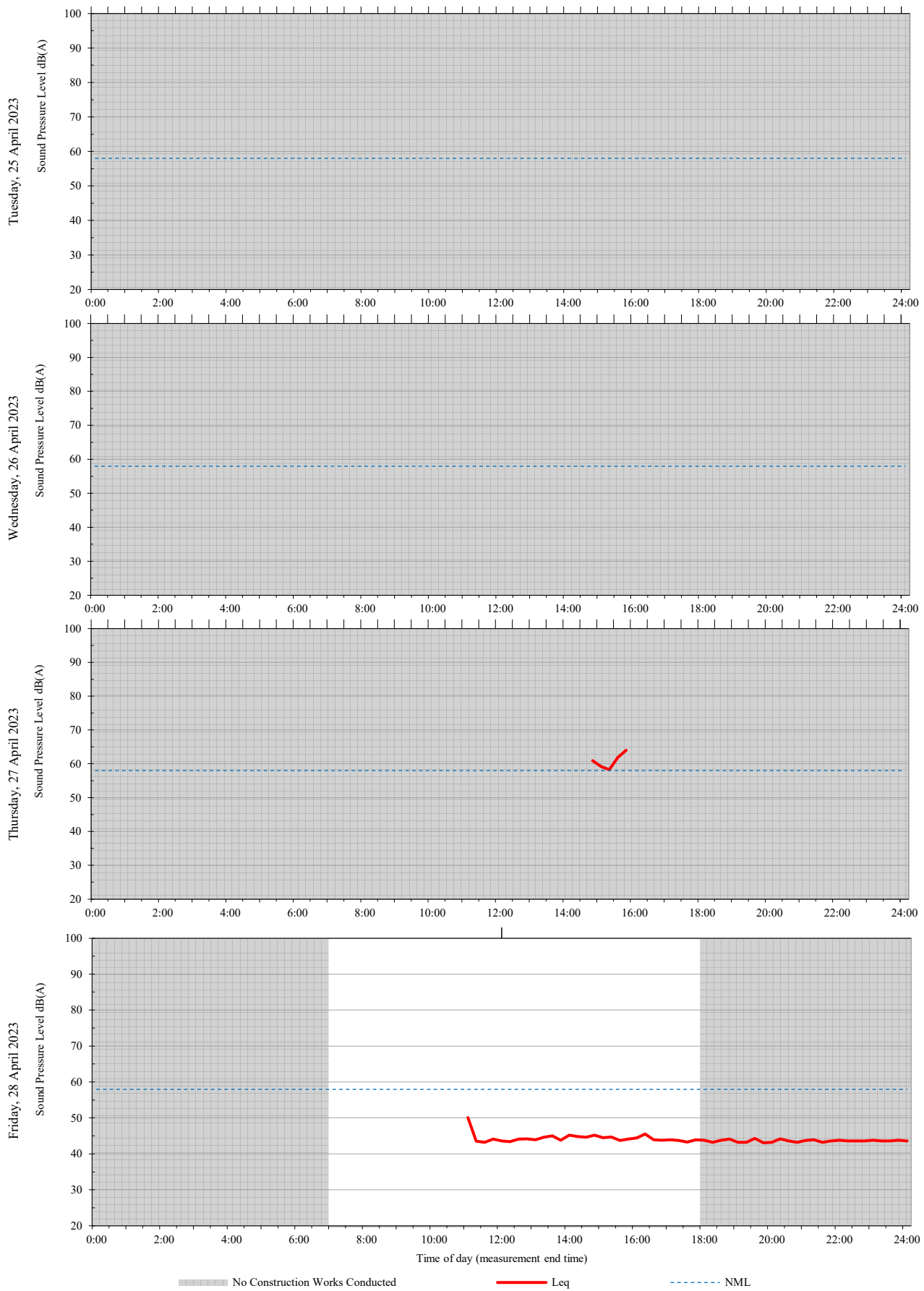
Unattended monitoring: KR Level 3 Radiation Room 33 RF041 (Internal)



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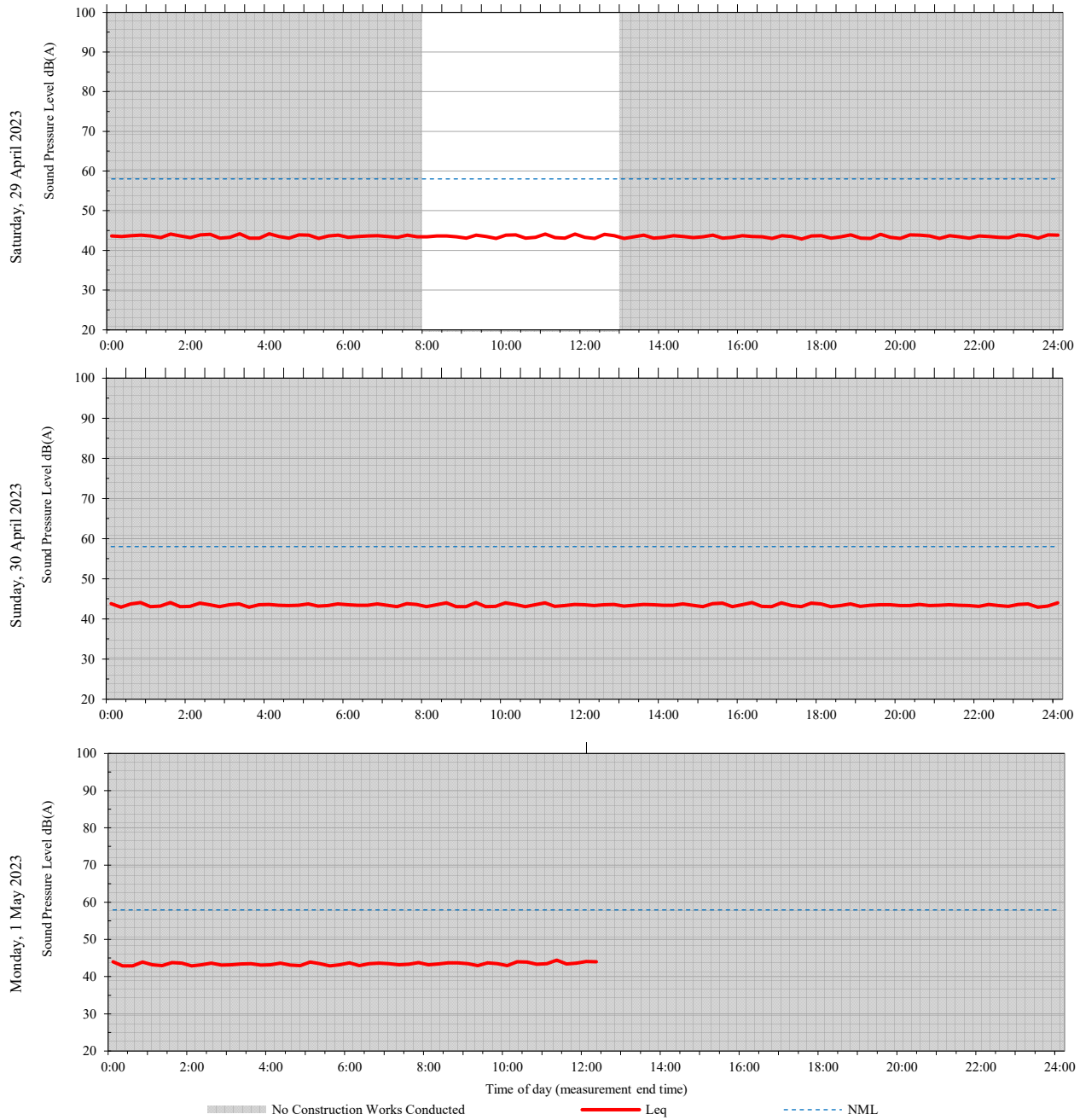


Unattended monitoring: KR Level 3 Radiation Room 33 RF041 (Internal)



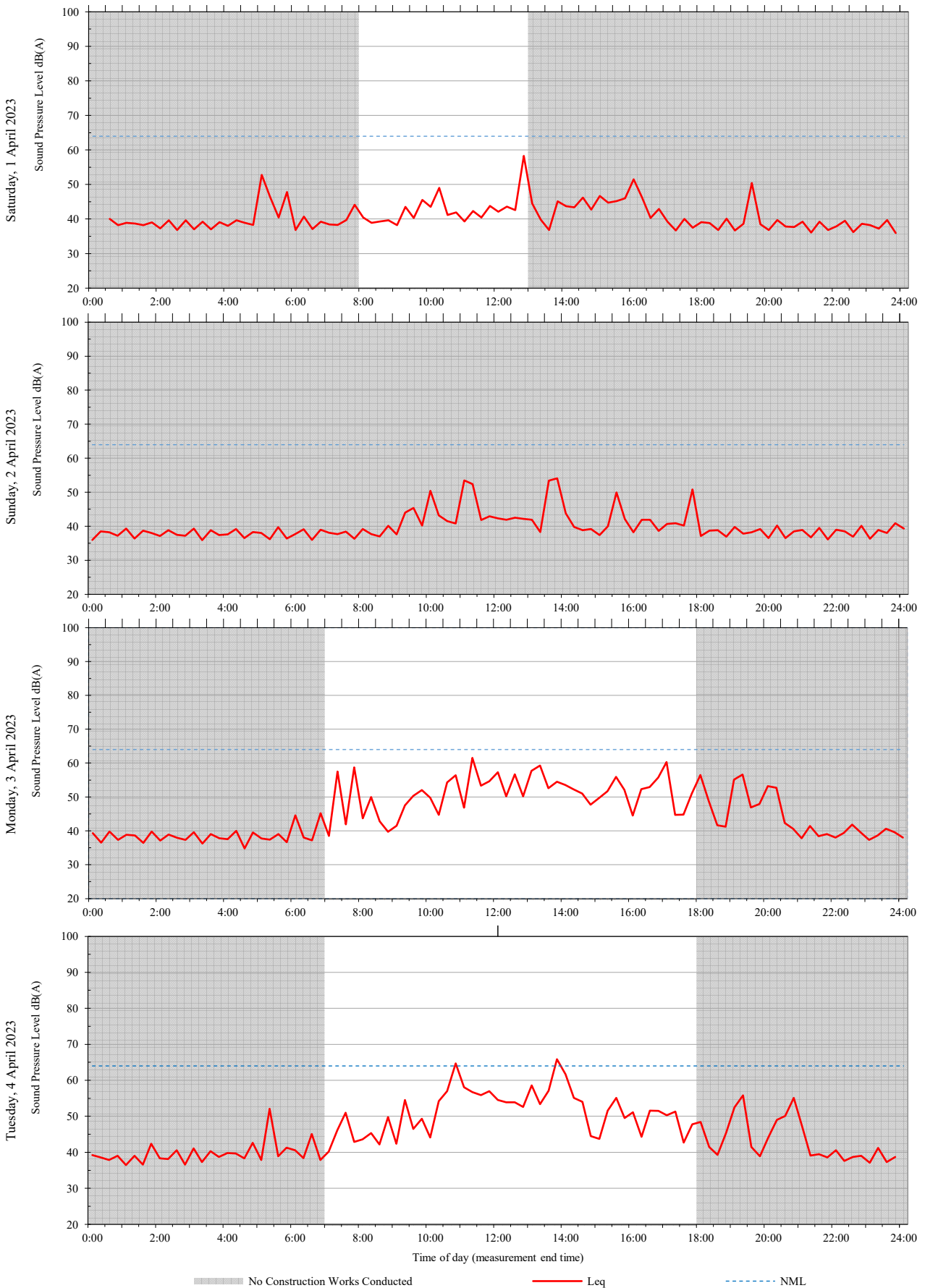
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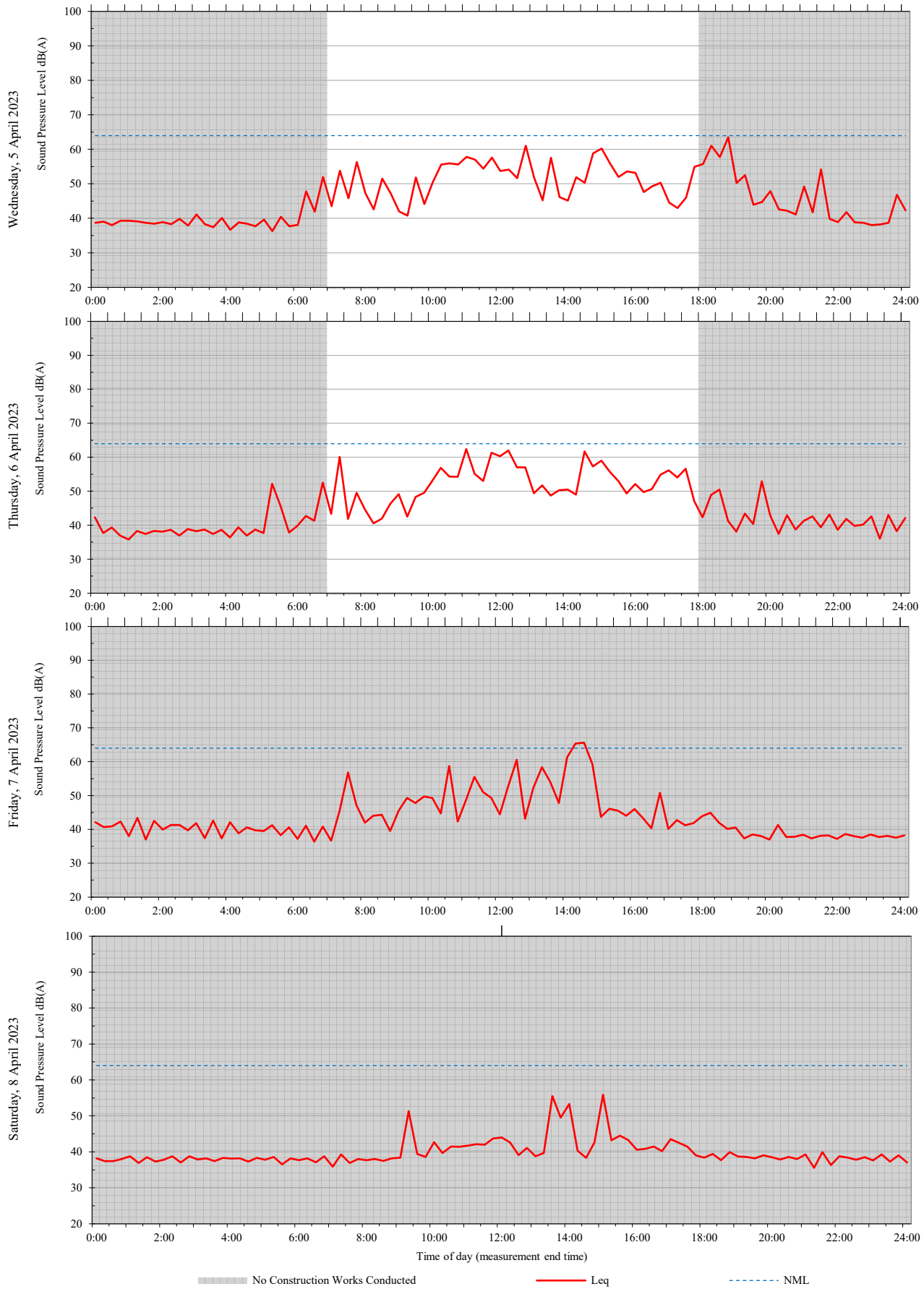
A5 CHW Level 2 Parent Kitchen 92BW025 (facing MSCP site) (Westmead 2)

Unattended monitoring: CHW Level 2 Parent Kitchen 92BW025 (Internal)

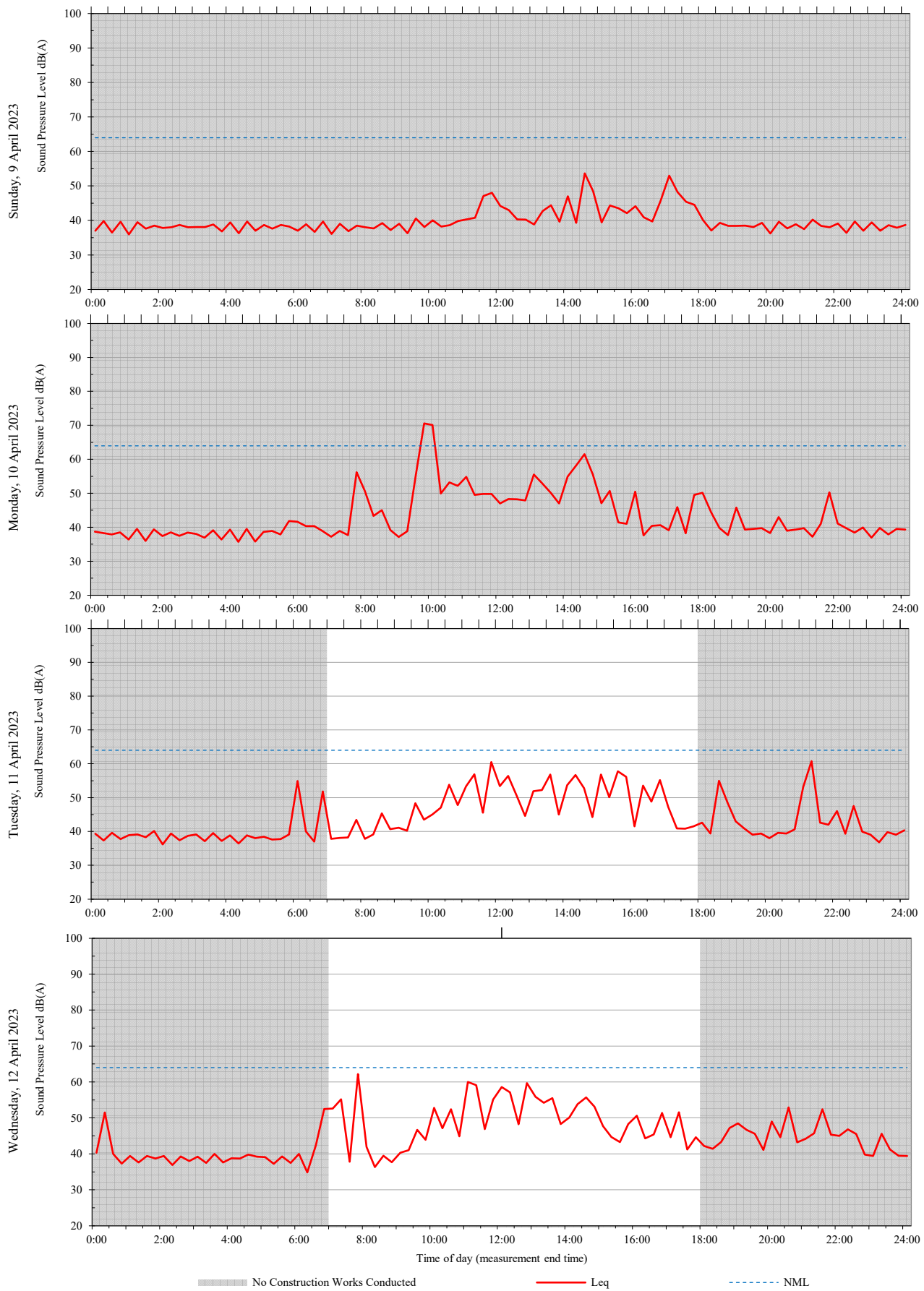


Unattended monitoring: CHW Level 2 Parent Kitchen 92BW025 (Internal)

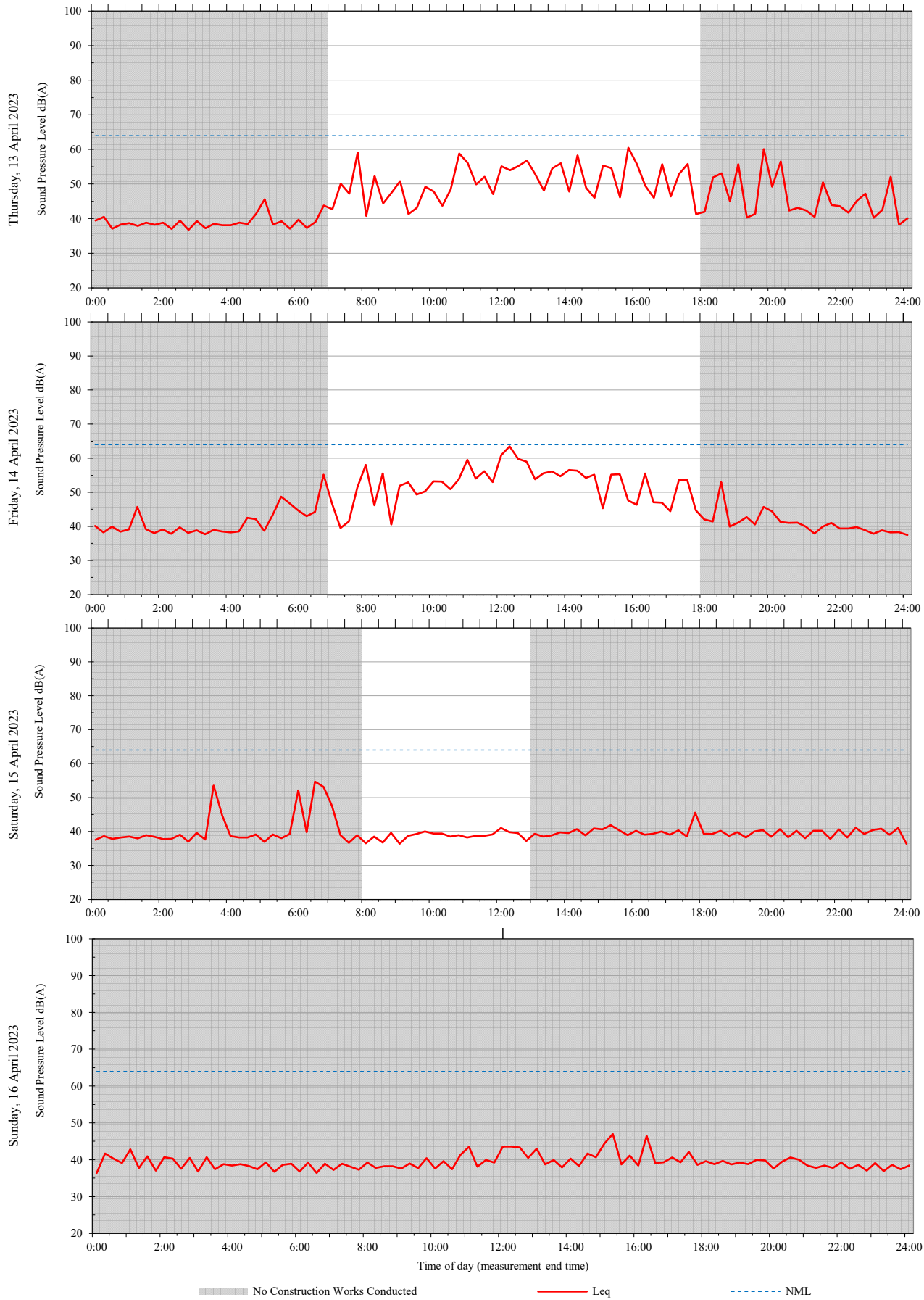
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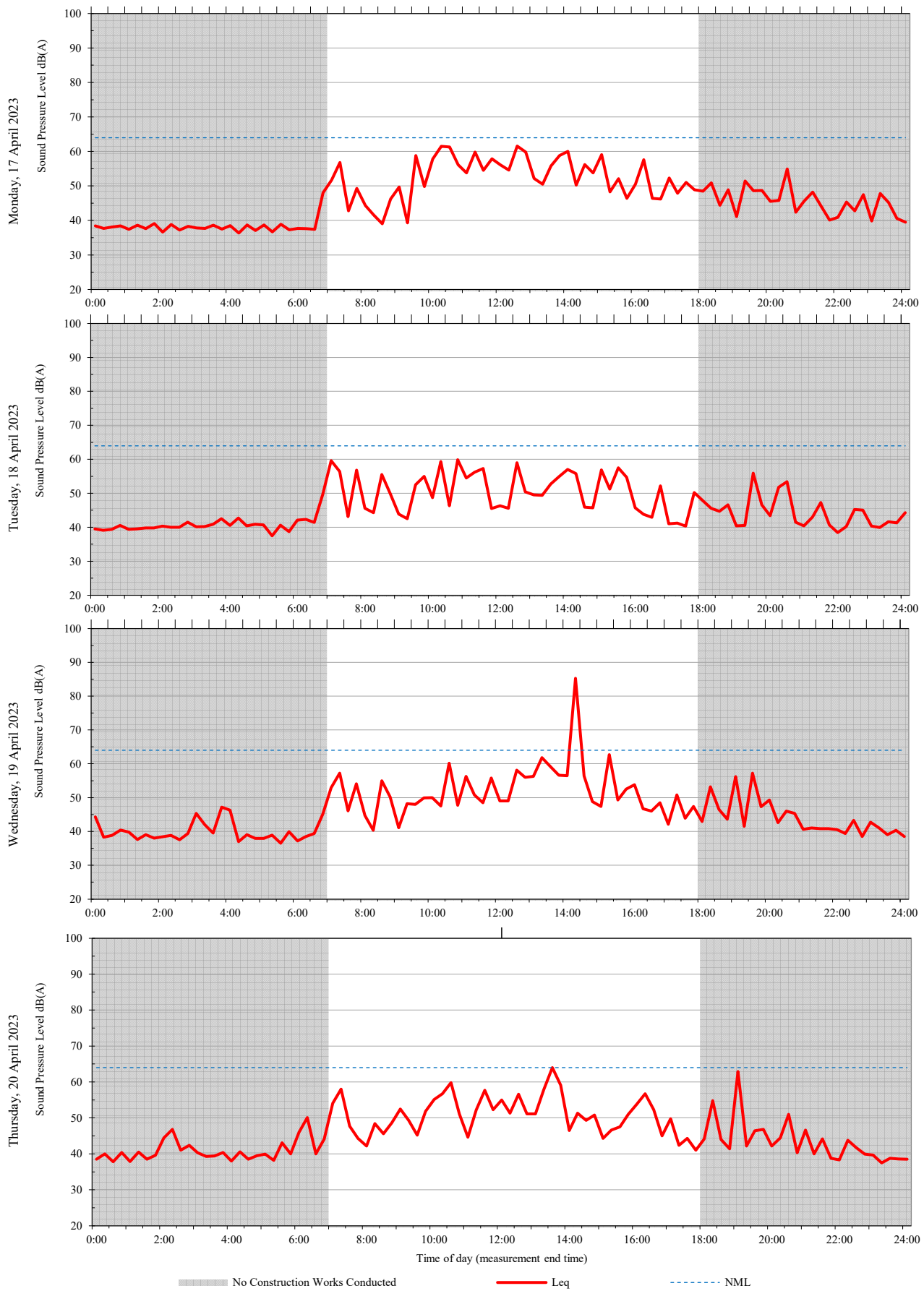
Unattended monitoring: CHW Level 2 Parent Kitchen 92BW025 (Internal)



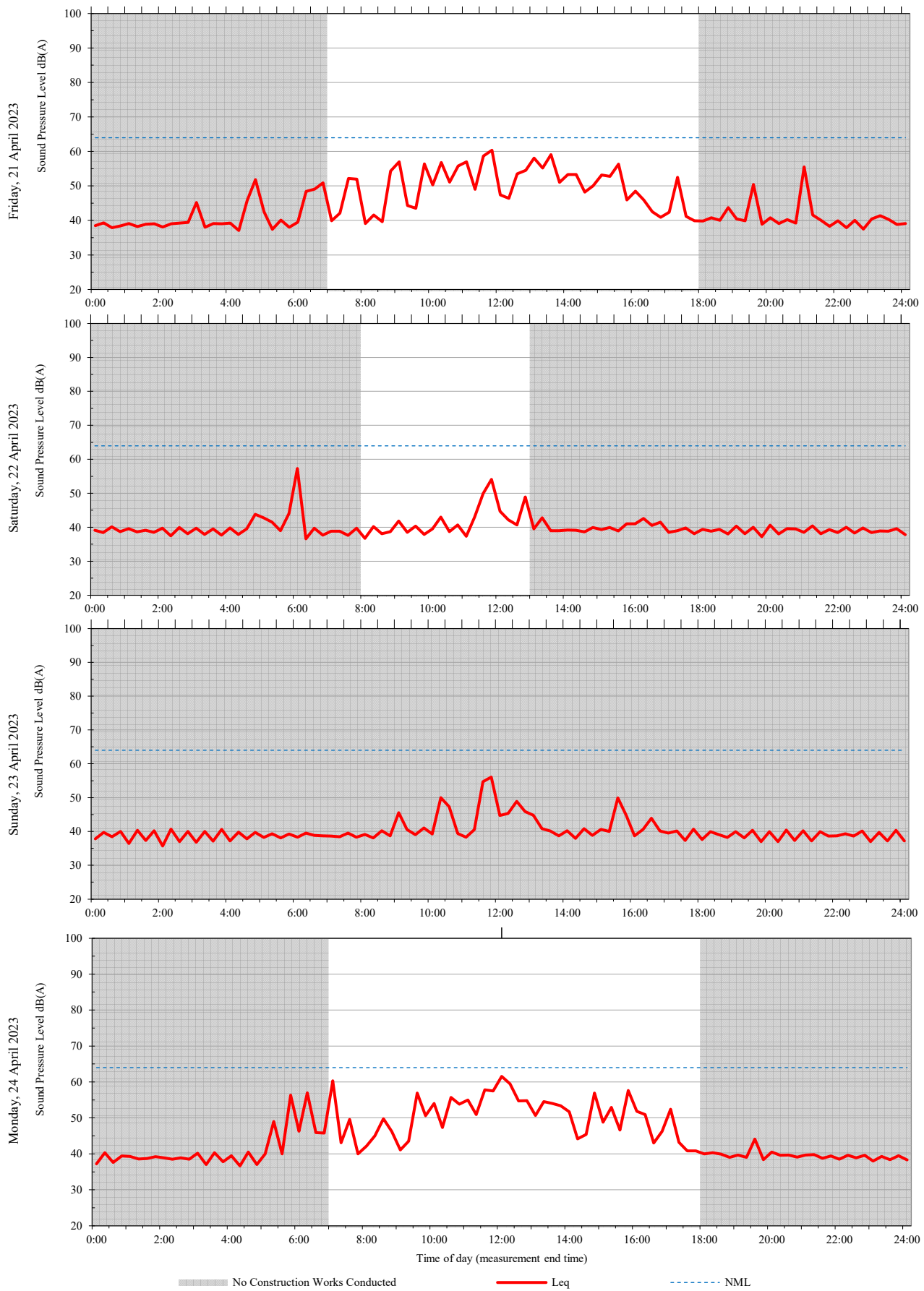
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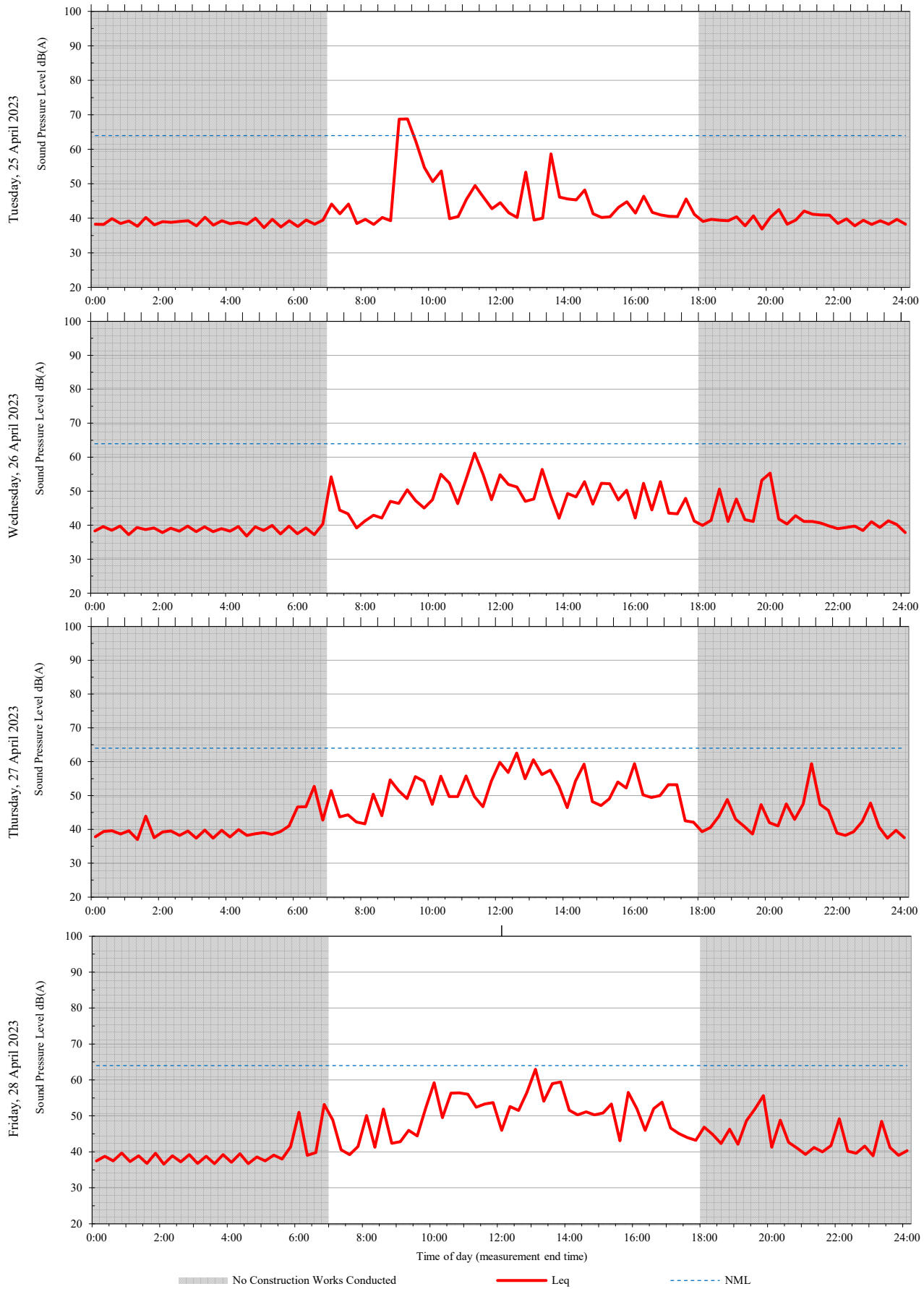


Unattended monitoring: CHW Level 2 Parent Kitchen 92BW025 (Internal)



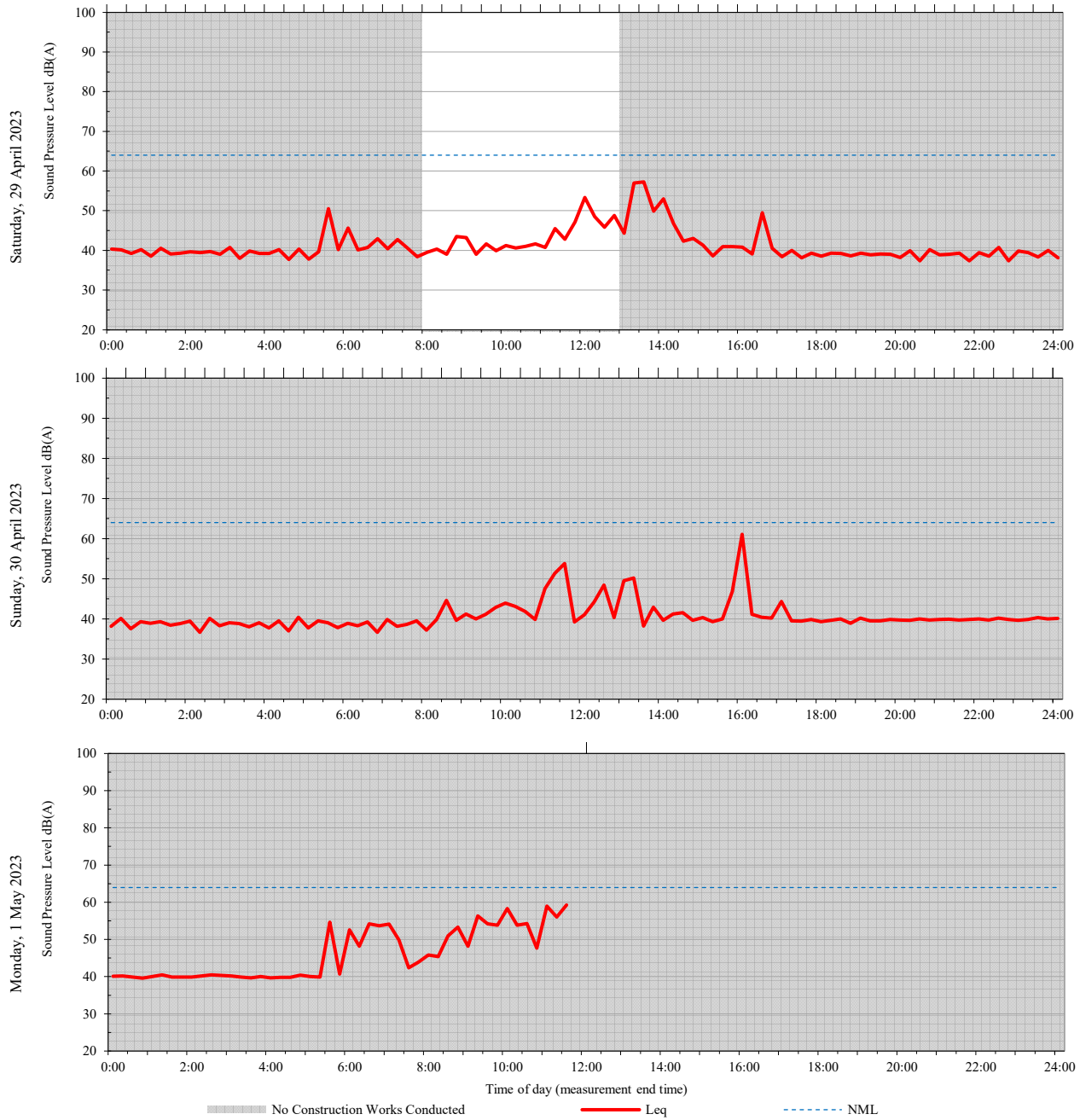
Unattended monitoring: CHW Level 2 Parent Kitchen 92BW025 (Internal)

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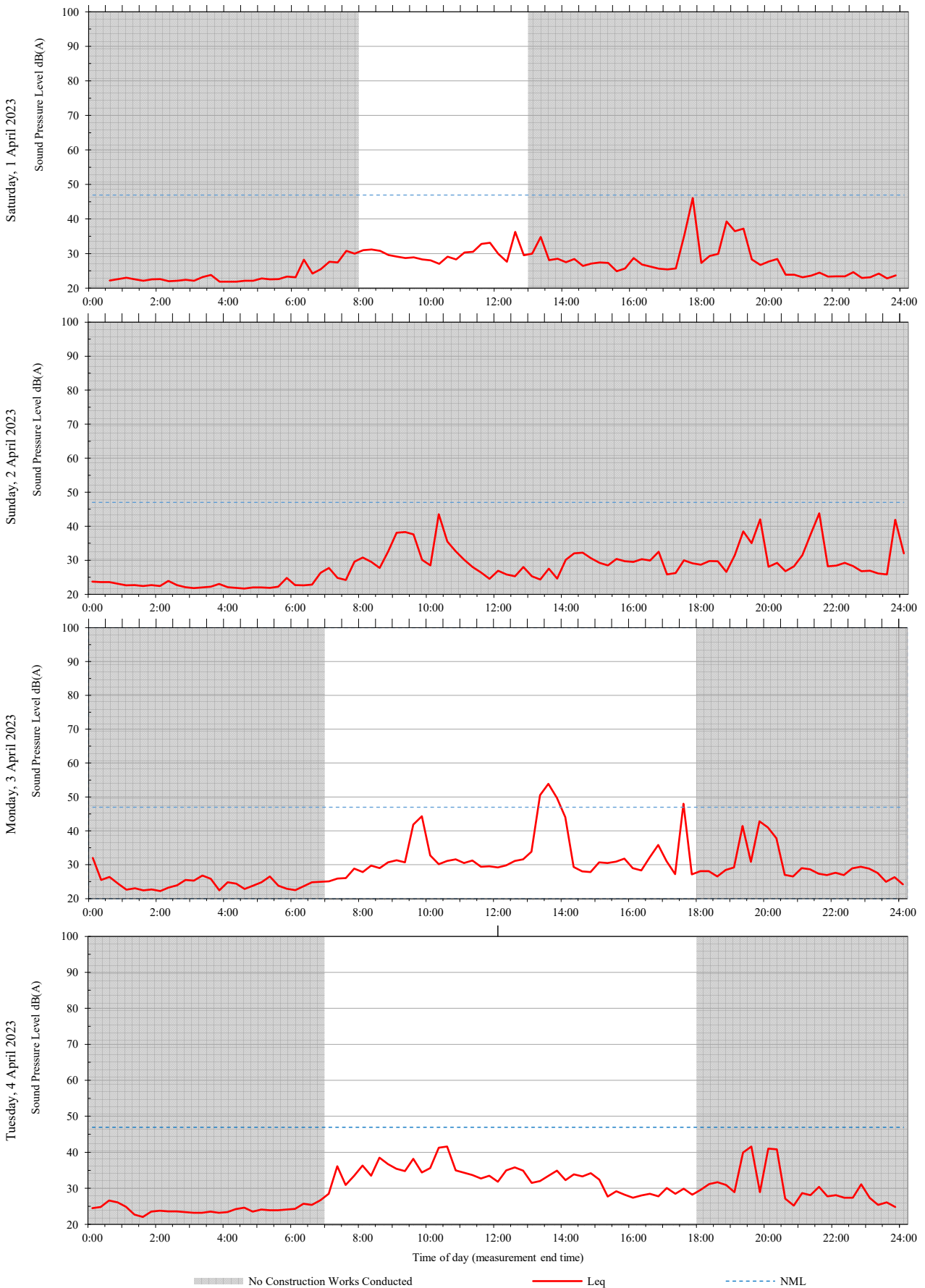
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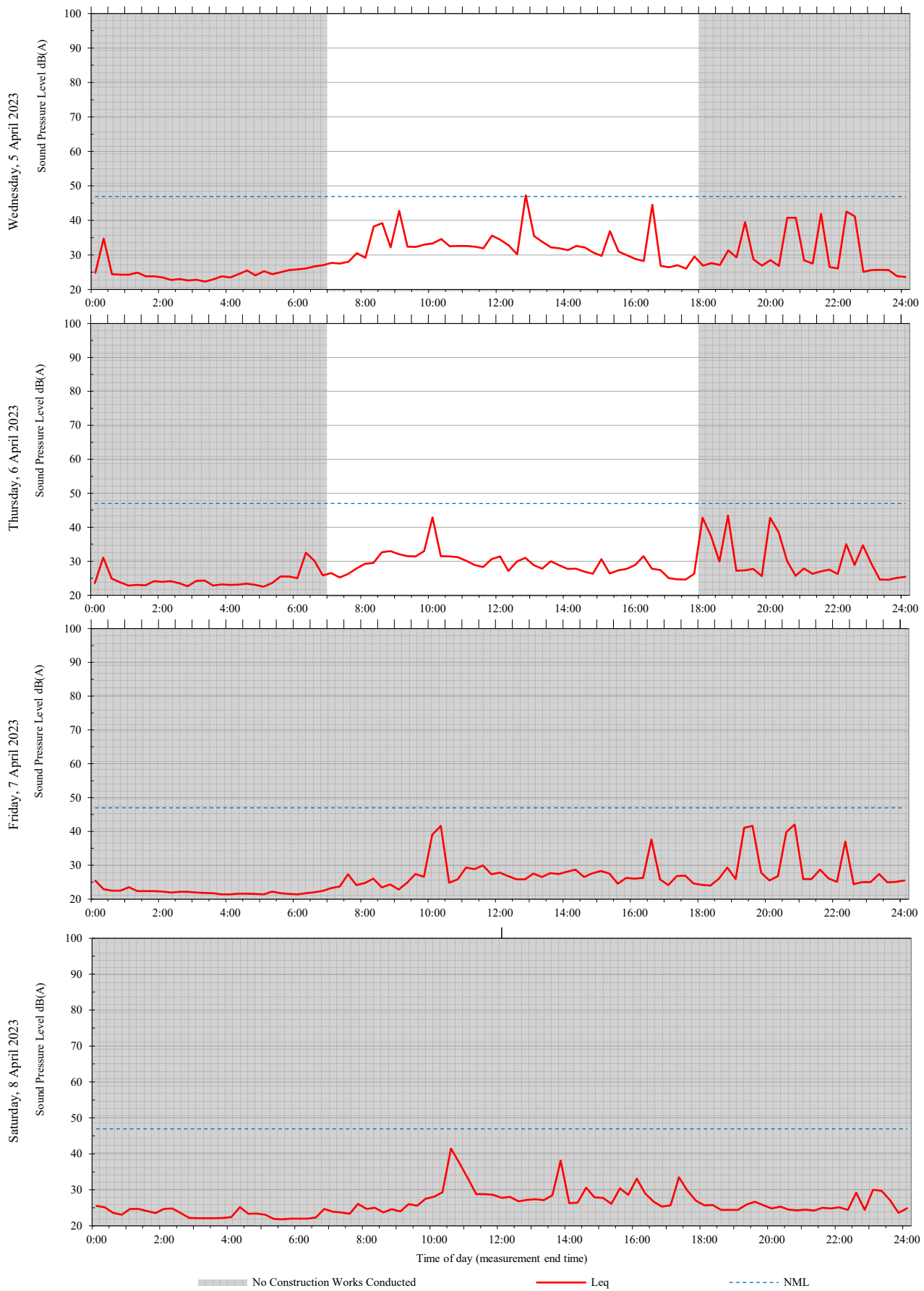


A6 RMH Level 1 Store Room 101 (Westmead 3)

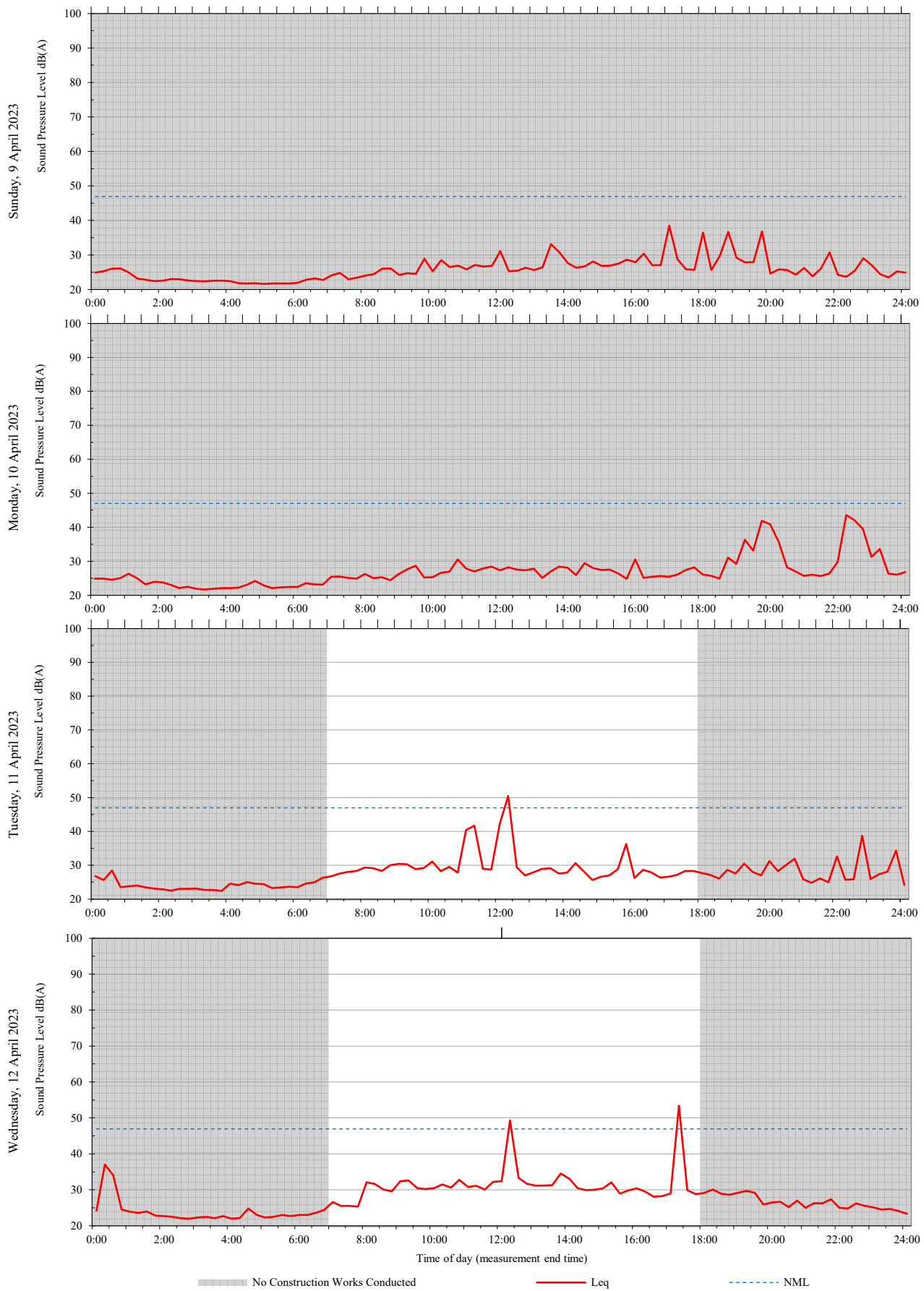
Unattended monitoring: RMH Level 1 Store Room 101 (Internal)



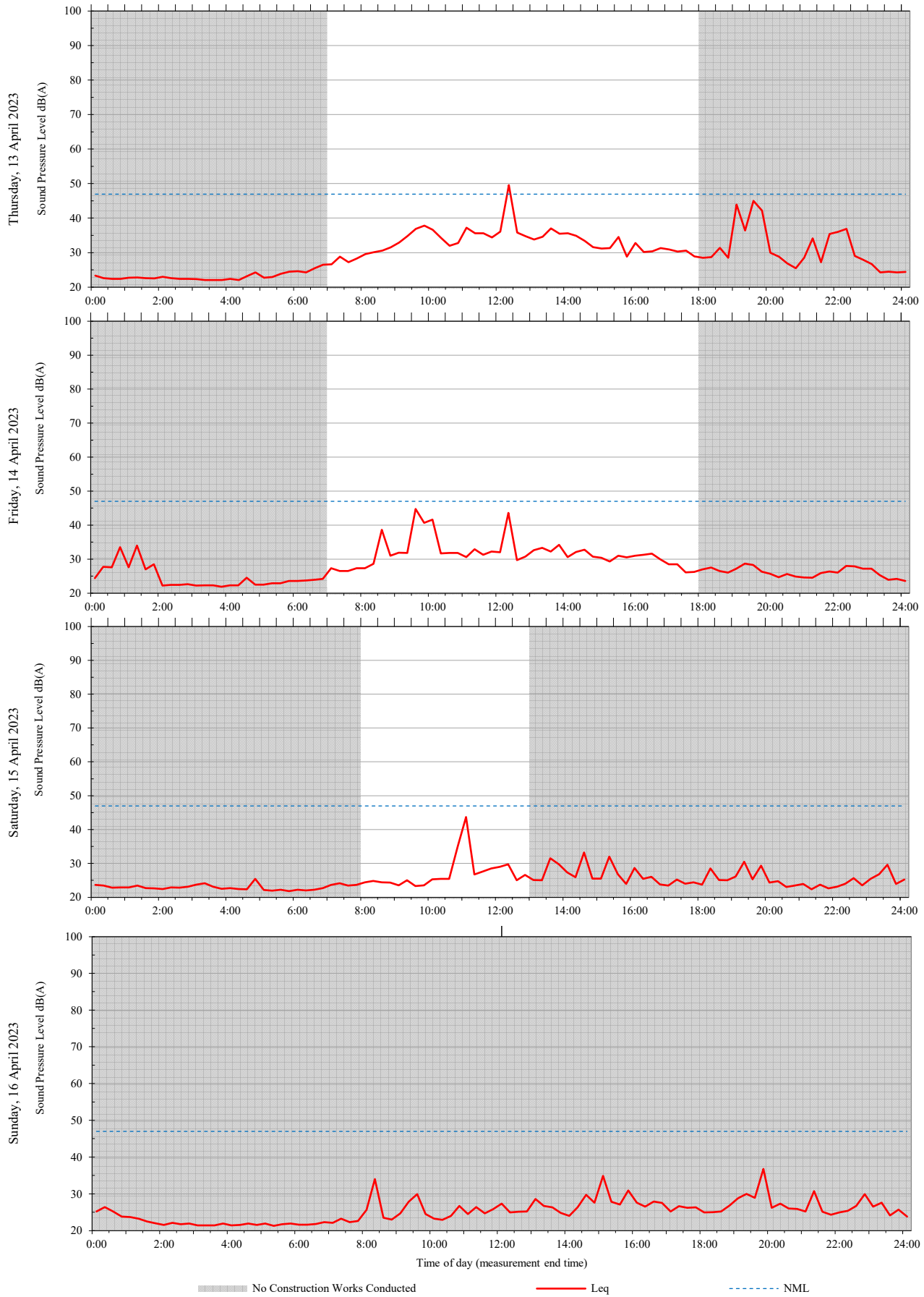
Unattended monitoring: RMH Level 1 Store Room 101 (Internal)



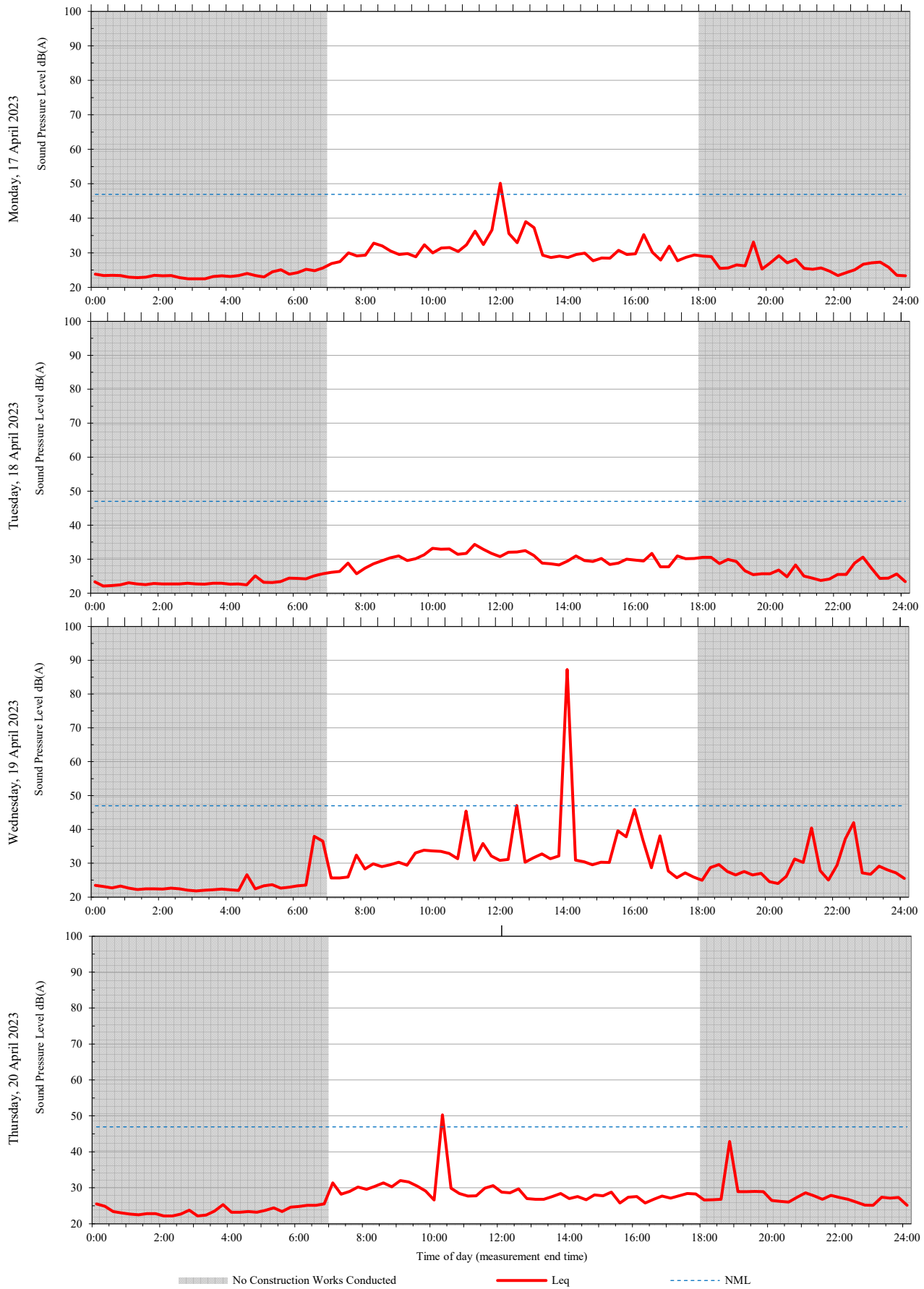
Unattended monitoring: RMH Level 1 Store Room 101 (Internal)



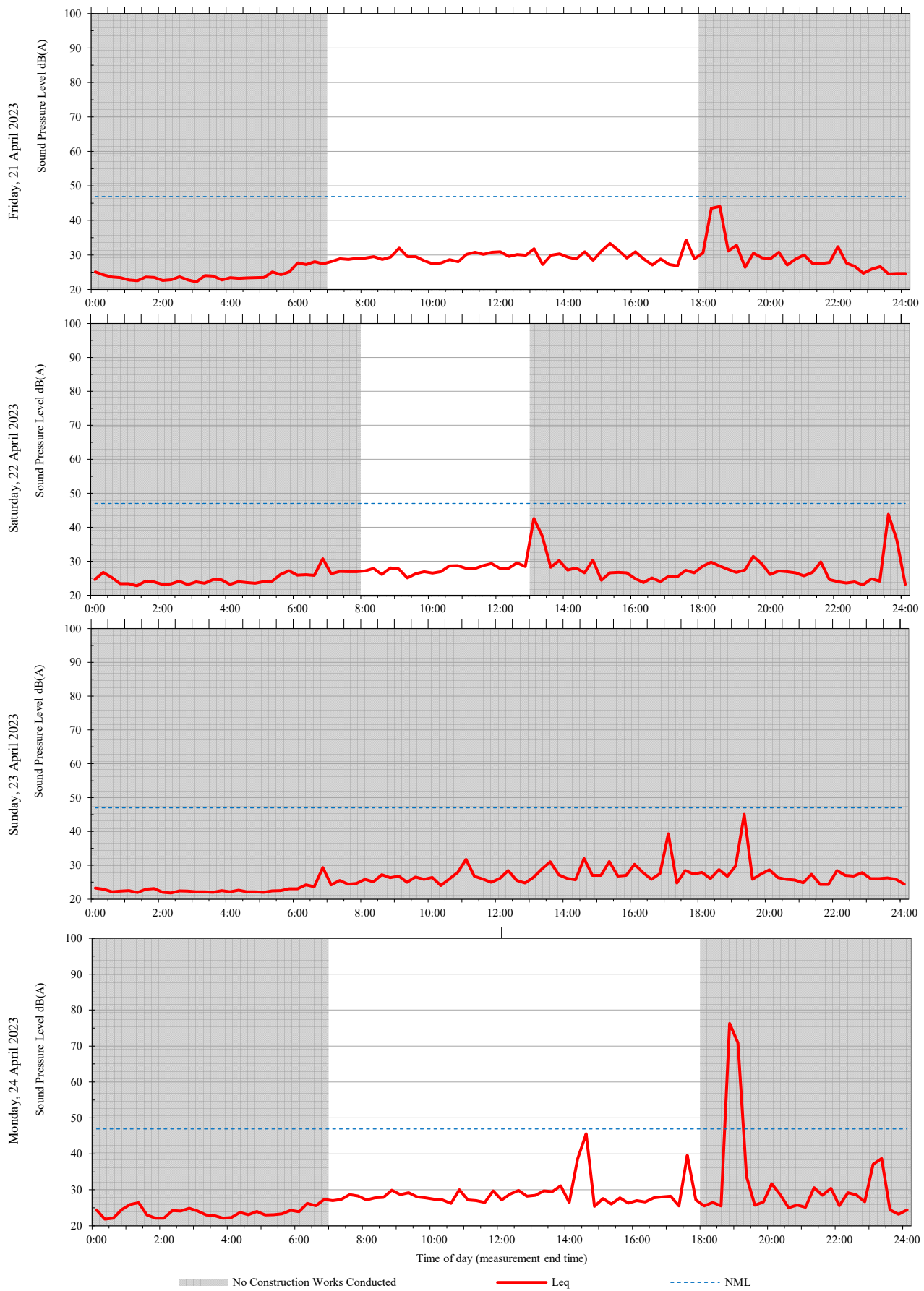
Unattended monitoring: RMH Level 1 Store Room 101 (Internal)



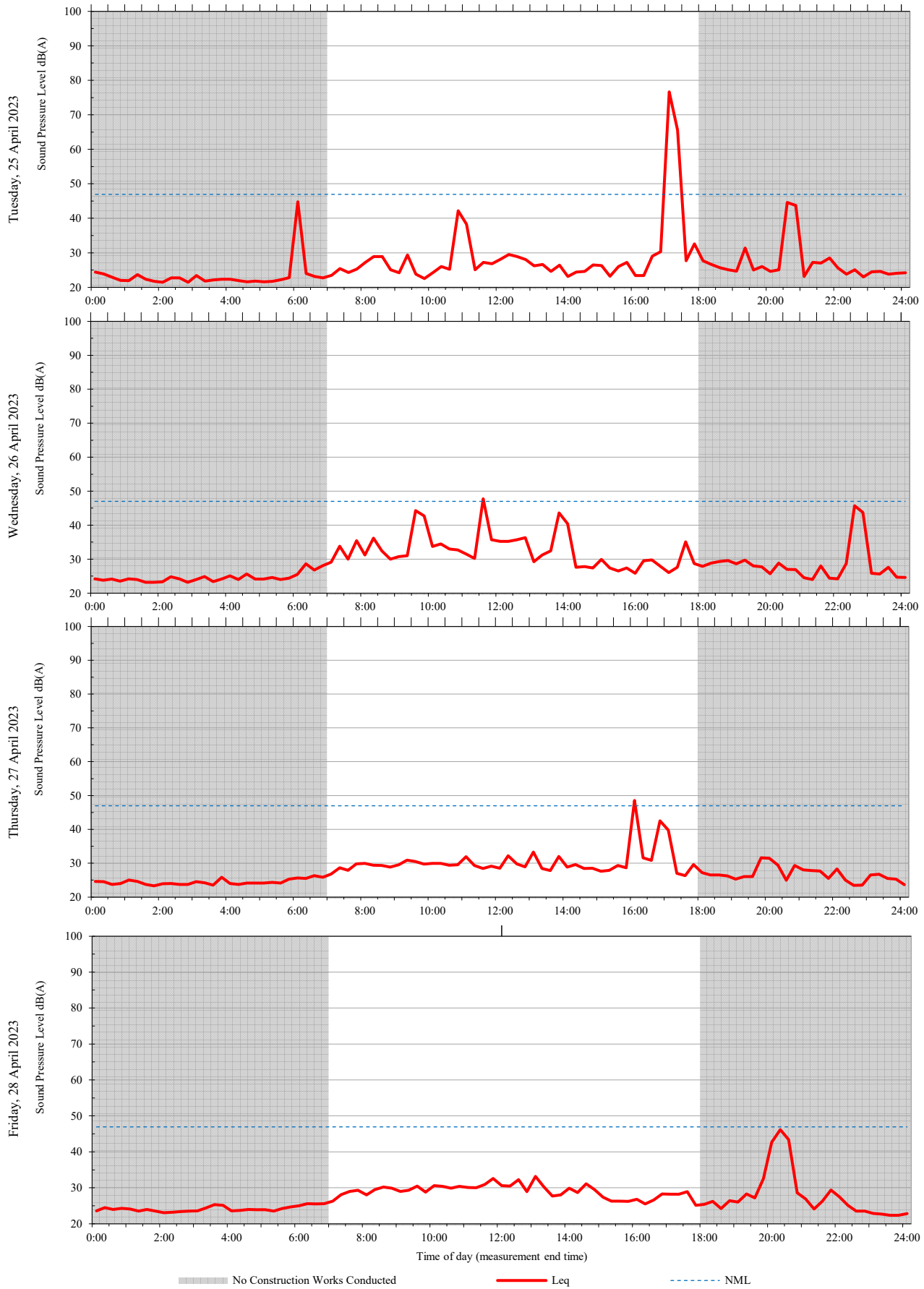
Unattended monitoring: RMH Level 1 Store Room 101 (Internal)



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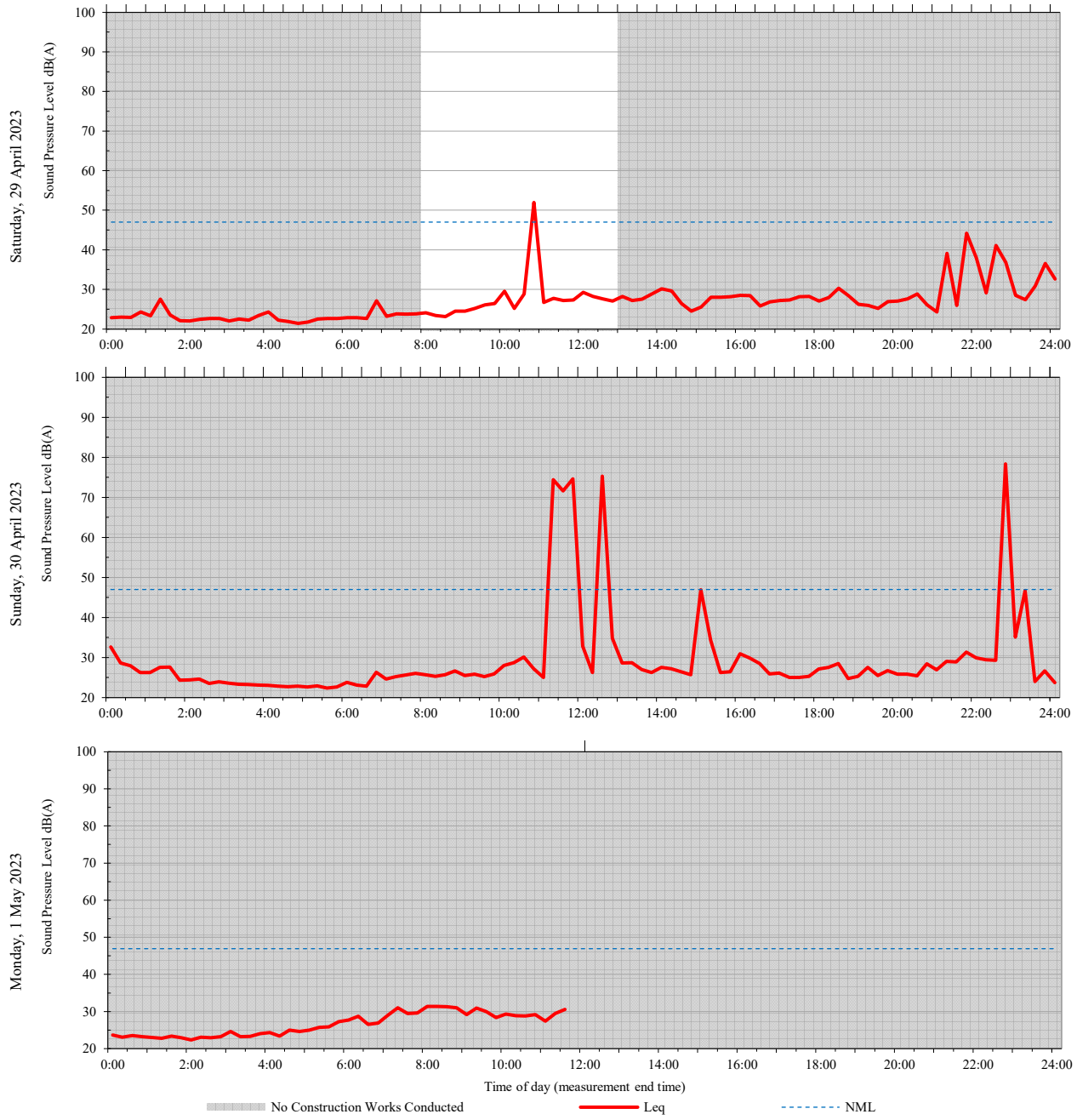


Unattended monitoring: RMH Level 1 Store Room 101 (Internal)



Unattended monitoring: RMH Level 1 Store Room 101 (Internal)

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Health Infrastructure

Children's Hospital Westmead

**Vibration Monitoring - KR L4 44-4873 -
April 2023**

CVM/ KRL4/202304

Issue 1 | 19/06/2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 271985

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Document Verification

Project title Children's Hospital Westmead
Document title Monthly Vibration Monitoring Report
Job number 271985
Document ref CVM/KRL4/202304
File reference -

Revision	Date	Filename	Description
		Westmead Hospital – SVAN958 KR – L4 Rm 44-4873 - Summary of Recent Vibration Measurements (01-04 to 30-04).docx	
Issue 1	19/06/2023		Issue

	Prepared by	Checked by	Approved by
Name	PR	MJW	MJW
Signature			

Filename
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	Prepared by	Checked by	Approved by
Name			
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Filename
Description

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Executive Summary

This report summarises the vibration monitoring data recorded at KR Level 4 in Room 44-4873, over one month – from 01/04/2023 to 30/04/2023. Graphs in this report show the recorded data in blue, and exceedance trigger levels in red.

RMS Acceleration Levels

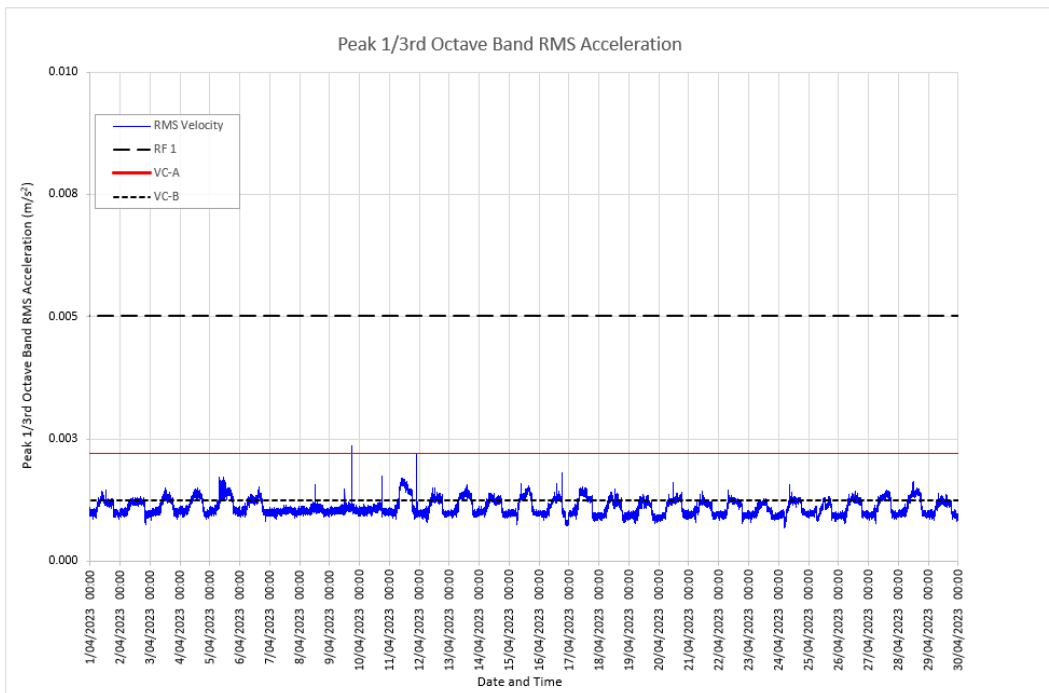


Figure 1: Measured RMS acceleration vibration levels for 01/04/2023 to 30/04/2023 at the KR L4.

The table below summarises the number of Root-Mean-Square Acceleration limit exceedances recorded during and outside of construction hours at KR L4 Lab.

During Construction Hours	Outside of Construction Hours
0	2

1. Introduction

Arup has been commissioned by PricewaterhouseCoopers (PwC) on behalf of NSW Health Infrastructure to monitor vibration levels in facilities adjacent to the Paediatric Services Building and Forecourt development sites to ensure facility operations are not excessively impacted by the construction works. This report summarises the vibration monitoring data recorded at KR – L4 Room 44-4873 during the period of the 01/04/2023 to 30/04/2023.

For the purposes of reporting, construction works are considered to be occurring at the following times:

Day	Construction Hours
Monday to Friday	7:00am to 6:00pm
Saturday	8:00am to 1:00pm
Sunday	No works
Public Holidays	No works

2. Monitor Location

The location of this monitor is shown below in Figure 2.

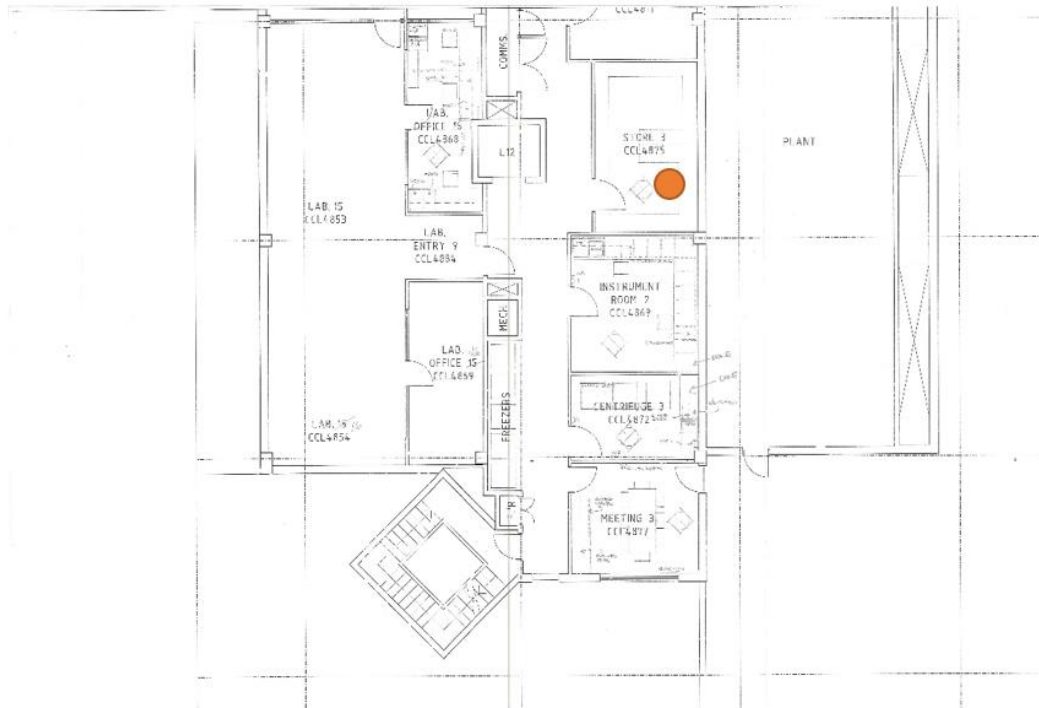


Figure 2: KR – L4 vibration monitor location

Monitoring at this location utilises a SVAN 958AG (SN 59827) with a triaxial accelerometer (SA207B).

3. Recorded Data

Figure 3 below shows the vibration levels (RMS acceleration) recorded between 01/04/2023 and 30/04/2023. The recorded data is shown in blue, while the limit of 0.002 m/s^2 (VC-A) is shown in red.

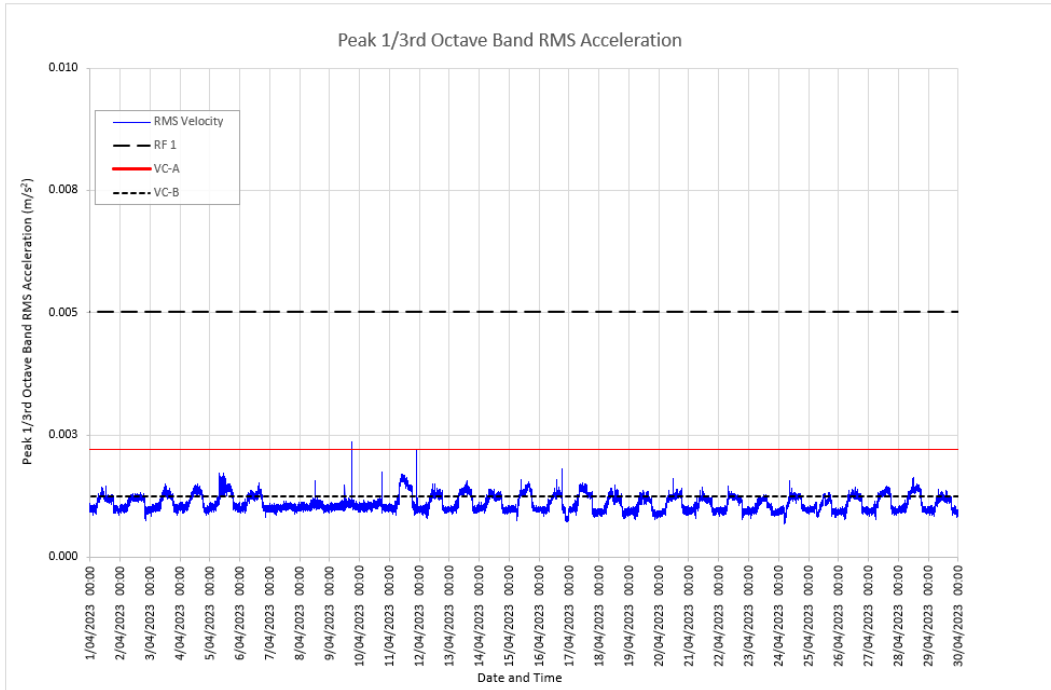


Figure 3: Measured RMS acceleration vibration levels for 01/04/2023 to 30/04/2023 at KR – L4.

The table below summarises the number of Root-Mean-Square Acceleration limit exceedances recorded during and outside of construction hours at KR L4 Lab.

During Construction Hours	Outside of Construction Hours
0	2



Health Infrastructure

Children's Hospital Westmead

**Vibration Monitoring - SCHN - 1.5t MRI
- April 2023**

CVM/ SCHN/202304

Issue 1 | 16/05/2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 271985

Arup Pty Ltd ABN 18 000 966 165

Arup Pty Ltd

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Document Verification

Project title Children's Hospital Westmead
Document title Monthly Vibration Monitoring Report
Job number 271985
Document ref CVM/SCHN/202304
File reference -

Revision	Date	Filename
		Westmead Hospital – 103677 SCHN - 1.5t MRI - Summary of Recent Vibration Measurements (01-04 to 30-04).docx
Issue 1	16/05/2023	Description Issue

	Prepared by	Checked by	Approved by
Name	PR	MJW	MJW
Signature			

Filename	Description	Prepared by	Checked by	Approved by
Name				
Signature				

Filename	Description	Prepared by	Checked by	Approved by
Name				
Signature				

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Executive Summary

This report summarises the vibration monitoring data recorded at SCHN - 1.5t MRI, over one month – from 01/04/2023 to 30/04/2023. Graphs in this report show the recorded data in blue, and exceedance trigger levels in red.

RMSV Vibration Levels

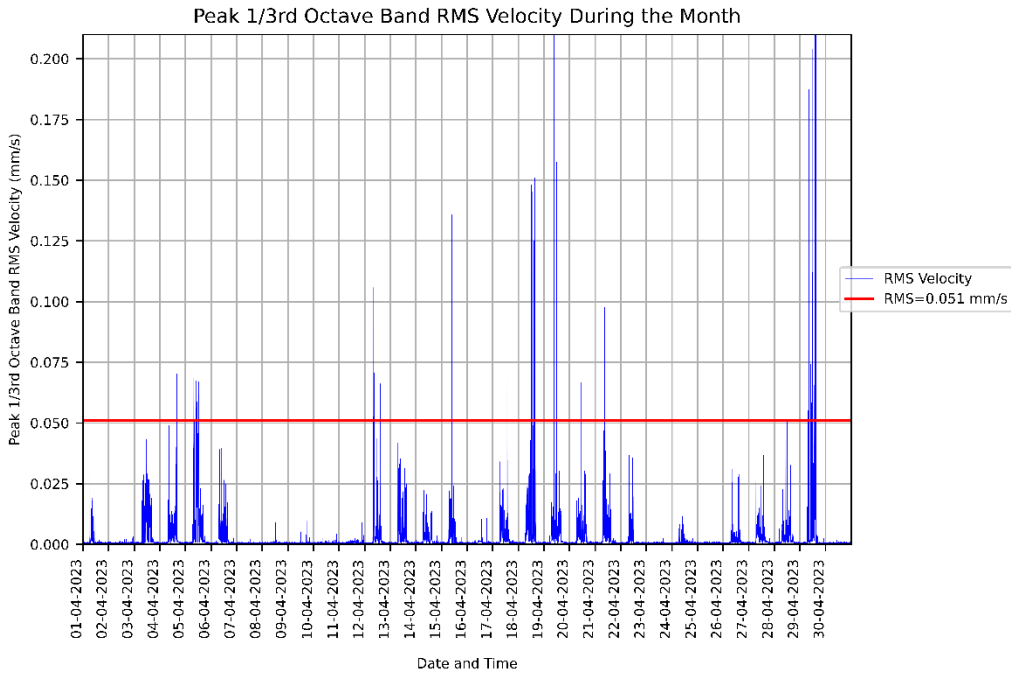


Figure 1: Measured RMSV vibration levels for 01/04/2023 to 30/04/2023 at the SCHN - 1.5t MRI.

The table below summarises the number of Root-Mean-Square Velocity (RMSV) limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
90	26

1. Introduction

Arup has been commissioned by PricewaterhouseCoopers (PwC) on behalf of NSW Health Infrastructure to monitor vibration levels in facilities adjacent to the Forecourt development sites to ensure facility operations are not excessively impacted by the construction works. This report summarises the vibration monitoring data recorded at SCHN - 1.5t MRI during the period of the 01/04/2023 to 30/04/2023.

For the purposes of reporting, construction works are considered to be occurring at the following times:

Day	Construction Hours
Monday to Friday	7:00am to 6:00pm
Saturday	8:00am to 1:00pm
Sunday	No works
Public Holidays	No works

2. Monitor Location

The location of this monitor is shown below in Figure 3Figure .



Figure 3: SCHN - 1.5t MRI vibration monitor location

Monitoring at this location utilises a GeoSIG GMSplus with a GeoSIG VE-11 geophone. The calibration certificate for the geophone is included in Appendix A.

3. Recorded Data

Figure 4 below shows the vibration levels (RMS velocity) recorded between 01/04/2023 and 30/04/2023. The recorded data is shown in blue, while the limit of 0.051mm/s (V_{RMS}) is shown in red.

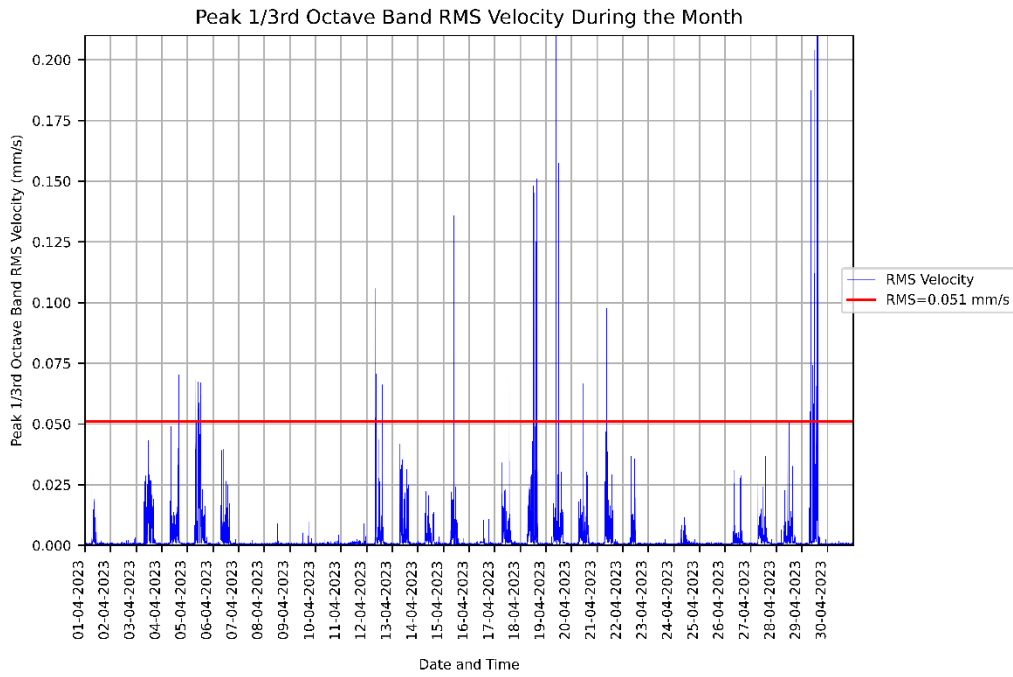


Figure 4: Measured RMSV vibration levels for 01/04/2023 to 30/04/2023 at the SCHN - 1.5t MRI.

The table below summarises the number of RMS Velocity limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
90	26

Appendix A: Calibration Certificates

GeoSIG

103677_GS_Test_Record_GMSplus.docx

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Test Record GMSplus

Test Record	1	Job	31057
S/N	103677	Test Procedure	GS_GMSplus_TestProcedure_V01

Customer	AU_ARUP_Riddet	Date	01.02.2018
		Tested by	Ross Baradoy

Model	GMSplus	103677	Option 1		
Type	3Ch		Option 2		
Description	Recorder		Option 3		
Main board	GS_IA18_S-MN.V06.H2	160281	Option 4		
Conn. board	GS_IA18_S-MN.V06.H2	160305	Option 5		
Input range	± 10 V DIFF		Option 6		
Sensor 1	VE-11	56865	Ext. Option 1	GXX-3GUE	17738
Sensor 2	0		Ext. Option 2		
Power	15 VDC		Ext. Option 3		
Armdas/Predas	21.12.16		MAC	8C:8E:76:00:C2:01	
Linux	gms-linux-firmware-r121_20170321.gsfw		DSP	51.03.05	
			RTC	80.02.03	

Remarks:

1. Test Equipment

1.1. Test equipment is as per list and ready	<input checked="" type="checkbox"/> Ok
--	--

2. Visual Check

2.1. No defects found during visual check	<input checked="" type="checkbox"/> Ok
---	--

3. Configuration

3.1. Description	GMSplus GeoSIG Ltd
3.2. Memory	8 GB
3.3. Station	GSGMS
3.4. Location	Australia
3.5. Sampling rate	200 SPS
3.6. Units	mm/s
3.7. LSB value	0.0000132500000mm/s /count
3.8. Pre event	5 s
3.9. Post event	10 s
3.10. Trigger level	2 and 3 mm/s
3.11. Alarms Trigger level	n/a

4. Sensor input test

4.1. AC input test	<input checked="" type="checkbox"/> Ok
4.2. DC input test	<input checked="" type="checkbox"/> Ok
4.3. Noise test	<input checked="" type="checkbox"/> Ok

5. Real sensor test

5.1. Test pulse	<input checked="" type="checkbox"/> Ok	<input type="checkbox"/> n/a
5.2. Event X-Y-Z	<input checked="" type="checkbox"/> Ok	<input type="checkbox"/> n/a
5.3. Tilt	<input checked="" type="checkbox"/> Ok	<input type="checkbox"/> n/a
5.4. Over range	<input checked="" type="checkbox"/> Ok	<input type="checkbox"/> n/a

6. Options testing

6.1. GMS-Wi-Fi	<input type="checkbox"/> Ok	<input checked="" type="checkbox"/> n/a
6.2. GMS-GPS	<input type="checkbox"/> Ok	<input checked="" type="checkbox"/> n/a
6.3. GXX-3GUM	<input checked="" type="checkbox"/> Ok	<input type="checkbox"/> n/a
6.4. ALC, Config:	<input type="checkbox"/> Ok	<input checked="" type="checkbox"/> n/a
6.5. GMS-Interconnection	<input type="checkbox"/> Ok	<input checked="" type="checkbox"/> n/a
6.6. Serial modem	<input type="checkbox"/> Ok	<input checked="" type="checkbox"/> n/a
6.7. Ethernet modem	<input type="checkbox"/> Ok	<input checked="" type="checkbox"/> n/a
6.8. Sensor junction box	<input type="checkbox"/> Ok	<input checked="" type="checkbox"/> n/a

7. Physical inspection

7.1. Housing	<input checked="" type="checkbox"/> Ok
7.2. Fixation and screws	<input checked="" type="checkbox"/> Ok
7.3. Cables and connectors	<input checked="" type="checkbox"/> Ok
7.4. Labels	<input checked="" type="checkbox"/> Ok
7.5. Cleanness	<input checked="" type="checkbox"/> Ok

8. Configuration backup

8.1. Instrument configuration (*.xml)	<input checked="" type="checkbox"/> Ok
8.2. Software configuration (*.gsc)	<input checked="" type="checkbox"/> Ok
8.3. Test files archived	<input checked="" type="checkbox"/> Ok

Final Acceptance

All tests were executed according to the test procedure and all results were checked and are according to the specifications.

Tested by Ross Baradoy  on 26.02.2018

Approved by Tobias Liesching  on 02.03.2018



Health Infrastructure

Children's Hospital Westmead

**Vibration Monitoring - WIMR - BSF
Mice Holding Room - Floor - April 2023**

CVM/ WIMR/202304

Issue 1 | 16/05/2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 271985

Arup Pty Ltd ABN 18 000 966 165

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Document Verification

Project title Children's Hospital Westmead
Document title Monthly Vibration Monitoring Report
Job number 271985
Document ref CVM/WIMR/202304
File reference -

Revision	Date	Filename
		Westmead Hospital – 103678 WIMR - BSF Mice Holding Room - Floor - Summary of Recent Vibration Measurements (01-04 to 30-04).docx

Issue	Date	Description
Issue 1	16/05/2023	Issue

	Prepared by	Checked by	Approved by
Name	PR	MJW	MJW
Signature			

Filename	Description	Prepared by	Checked by	Approved by
Name				
Signature				

Filename	Description	Prepared by	Checked by	Approved by
Name				
Signature				

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Executive Summary

This report summarises the vibration monitoring data recorded at WIMR - BSF Mice Holding Room - Floor, over one month – from 01/04/2023 to 30/04/2023. Graphs in this report show the recorded data in blue, and exceedance trigger levels in red.

RMSV Vibration Levels

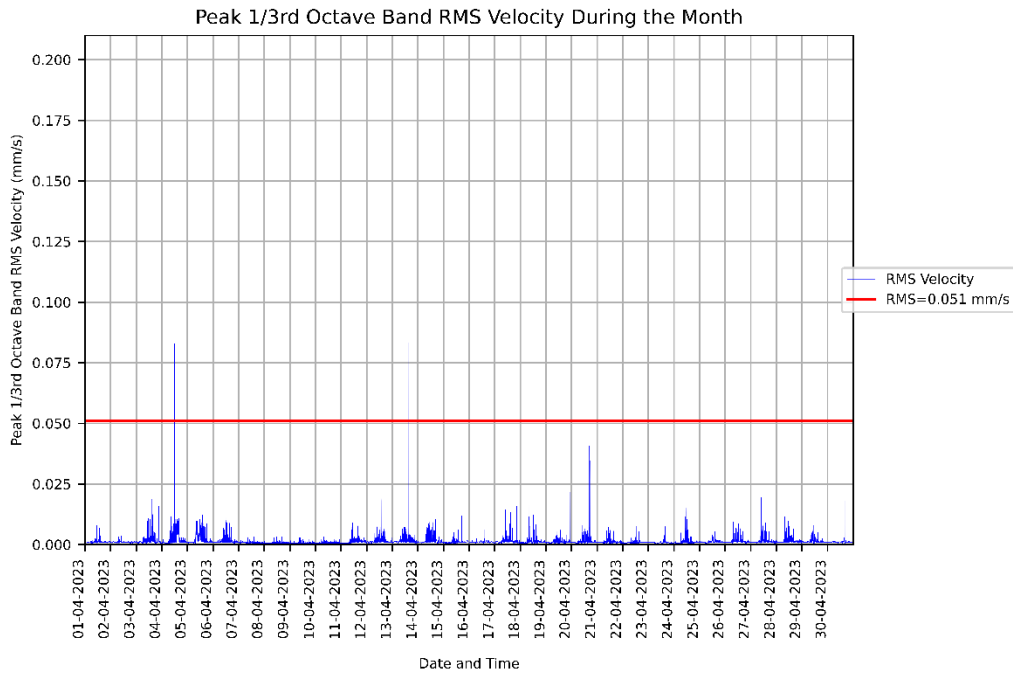


Figure 1: Measured RMSV vibration levels for 01/04/2023 to 30/04/2023 at the WIMR - BSF Mice Holding Room - Floor.

The table below summarises the number of Root-Mean-Square Velocity (RMSV) limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
2	0

PPV Vibration Levels

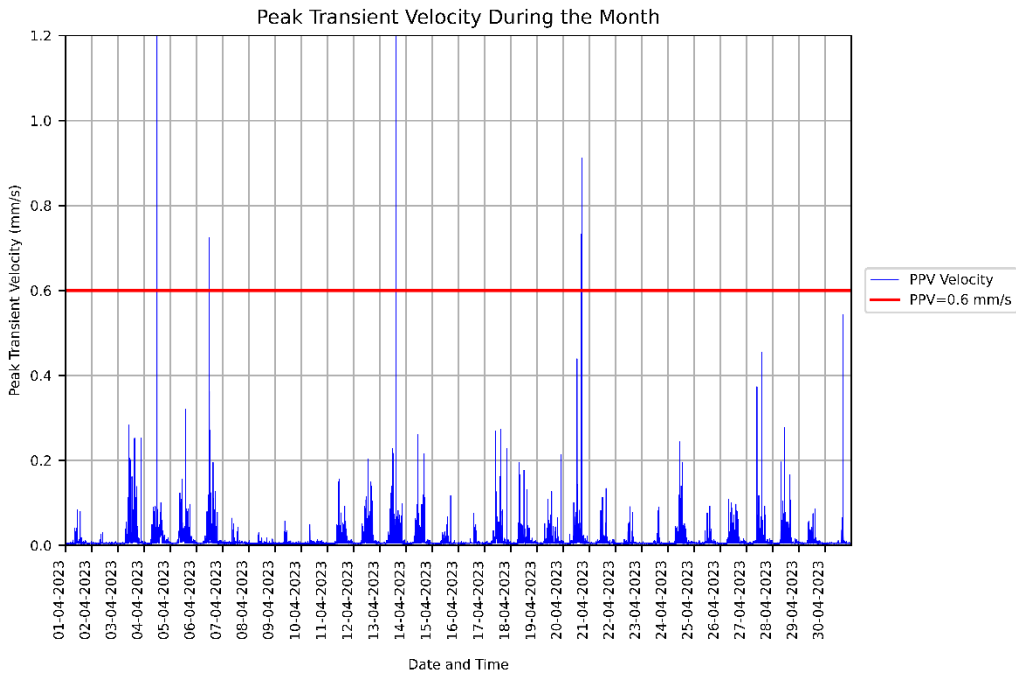


Figure 2: Measured vibration levels for 01/04/2023 to 30/04/2023 at the WIMR - BSF Mice Holding Room - Floor.

The table below summarises the number of Peak Particle Velocity (PPV) limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
3	4

1. Introduction

Arup has been commissioned by PricewaterhouseCoopers (PwC) on behalf of NSW Health Infrastructure to monitor vibration levels in facilities adjacent to the Paediatric Services Building and Multi-storey Car Park development sites to ensure facility operations are not excessively impacted by the construction works. This report summarises the vibration monitoring data recorded at WIMR - BSF Mice Holding Room - Floor during the period of the 01/04/2023 to 30/04/2023.

For the purposes of reporting, construction works are considered to be occurring at the following times:

Day	Construction Hours
Monday to Friday	7:00am to 6:00pm
Saturday	8:00am to 1:00pm
Sunday	No works
Public Holidays	No works

2. Monitor Location

The location of this monitor is shown below in Figure 3.

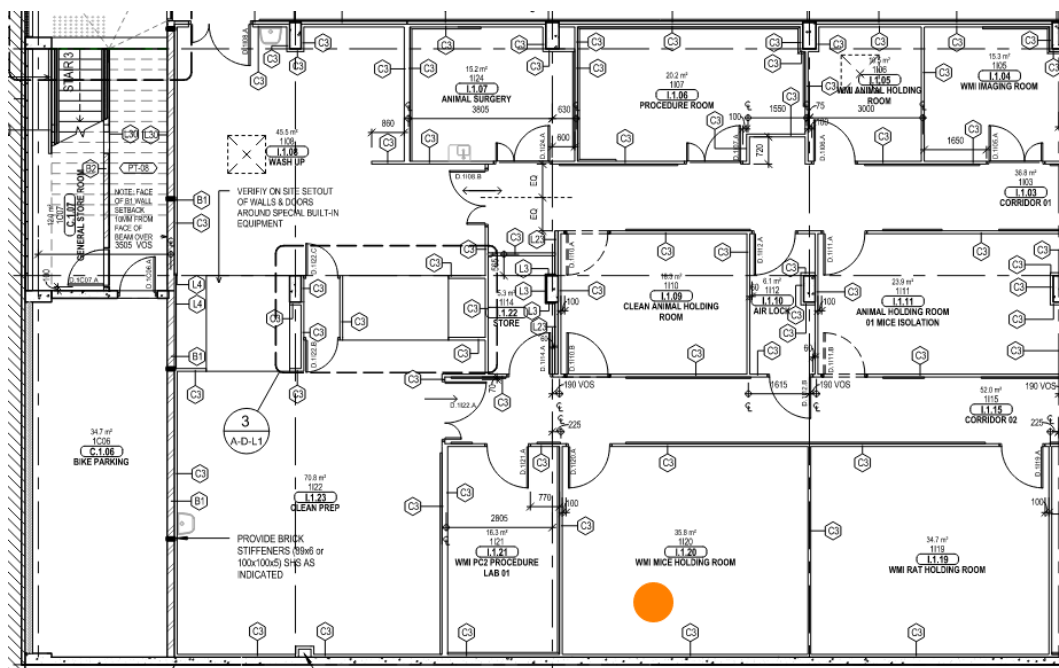


Figure 3: WIMR - BSF Mice Holding Room - Floor vibration monitor location

Monitoring at this location utilises a GeoSIG GMSplus with a GeoSIG VE-11 geophone. The calibration certificate for the geophone is included in Appendix A.

3. Recorded Data

Figure 4 below shows the vibration levels (RMS velocity) recorded between 01/04/2023 and 30/04/2023. The recorded data is shown in blue, while the limit of 0.18mm/s (V_{RMS}) is shown in red.

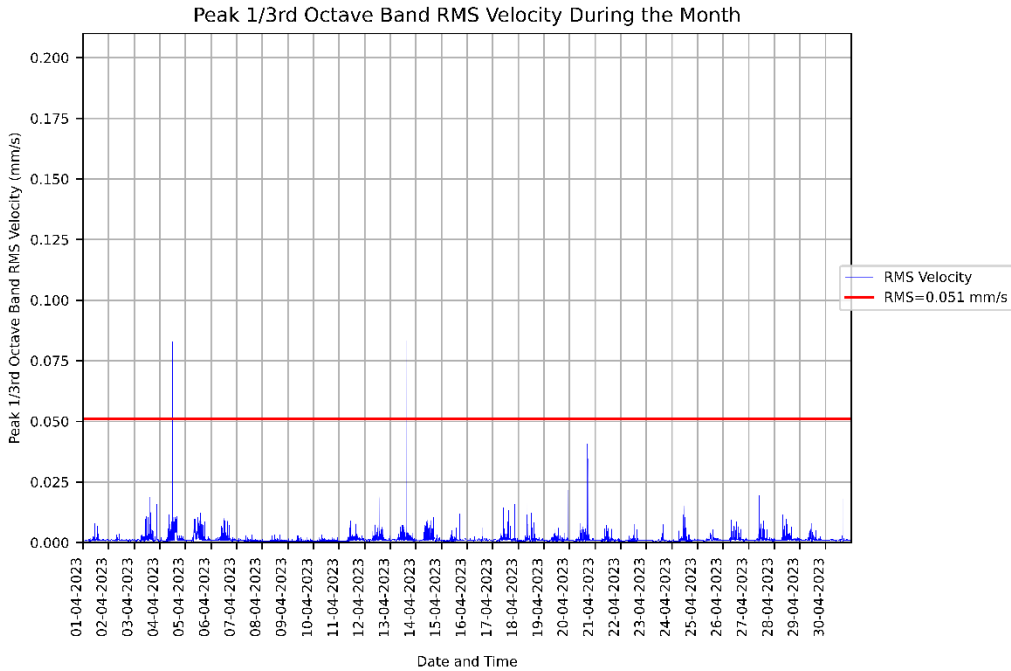


Figure 4: Measured RMSV vibration levels for 01/04/2023 to 30/04/2023 at the WIMR - BSF Mice Holding Room - Floor.

The table below summarises the number of RMS Velocity limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
2	0

Figure 5 below shows the peak particle vibration levels (PPV velocity) recorded between 01/04/2023 and 30/04/2023. The recorded data is shown in blue, while the limit of 0.6mm/s (V_{PPV}) is shown in red.

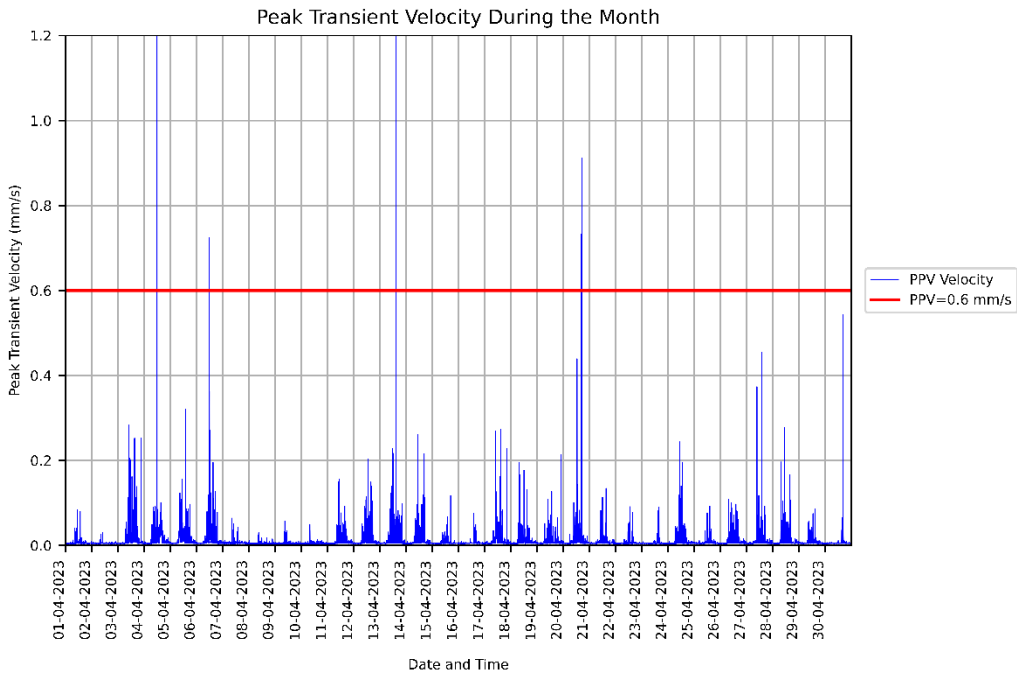


Figure 5: Measured PPV vibration levels for 01/04/2023 to 30/04/2023 at the WIMR - BSF Mice Holding Room - Floor.

The table below summarises the number of PPV limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
3	4

Appendix A: Calibration Certificates



Test Record GMSplus

Test Record	1	Job	31057
S/N	103677	Test Procedure	GS_GMSplus_TestProcedure_V01

Customer	AU_ARUP_Riddet	Date	01.02.2018
		Tested by	Ross Baradoy

Model	GMSplus	103677	Option 1		
Type	3Ch		Option 2		
Description	Recorder		Option 3		
Main board	GS_IA18_S-MN.V06.H2	160281	Option 4		
Conn. board	GS_IA18_S-MN.V06.H2	160305	Option 5		
Input range	± 10 V DIFF		Option 6		
Sensor 1	VE-11	56865	Ext. Option 1	GXX-3GUE	17738
Sensor 2	0		Ext. Option 2		
Power	15 VDC		Ext. Option 3		
Armdas/Predas	21.12.16		MAC	8C:8E:76:00:C2:01	
Linux	gms-linux-firmware-r121_20170321.gsfw		DSP	51.03.05	
			RTC	80.02.03	

Remarks:

1. Test Equipment

1.1. Test equipment is as per list and ready	<input checked="" type="checkbox"/> Ok
--	--

2. Visual Check

2.1. No defects found during visual check	<input checked="" type="checkbox"/> Ok
---	--

3. Configuration

3.1. Description	GMSplus GeoSIG Ltd
3.2. Memory	8 GB
3.3. Station	GSGMS
3.4. Location	Australia
3.5. Sampling rate	200 SPS
3.6. Units	mm/s
3.7. LSB value	0.0000132500000mm/s /count
3.8. Pre event	5 s
3.9. Post event	10 s
3.10. Trigger level	2 and 3 mm/s
3.11. Alarms Trigger level	n/a

4. Sensor input test

4.1. AC input test	<input checked="" type="checkbox"/> Ok
4.2. DC input test	<input checked="" type="checkbox"/> Ok
4.3. Noise test	<input checked="" type="checkbox"/> Ok

5. Real sensor test

5.1. Test pulse	<input checked="" type="checkbox"/> Ok	<input type="checkbox"/> n/a
5.2. Event X-Y-Z	<input checked="" type="checkbox"/> Ok	<input type="checkbox"/> n/a
5.3. Tilt	<input checked="" type="checkbox"/> Ok	<input type="checkbox"/> n/a
5.4. Over range	<input checked="" type="checkbox"/> Ok	<input type="checkbox"/> n/a

6. Options testing

6.1. GMS-Wi-Fi	<input type="checkbox"/> Ok	<input checked="" type="checkbox"/> n/a
6.2. GMS-GPS	<input type="checkbox"/> Ok	<input checked="" type="checkbox"/> n/a
6.3. GXX-3GUM	<input checked="" type="checkbox"/> Ok	<input type="checkbox"/> n/a
6.4. ALC, Config:	<input type="checkbox"/> Ok	<input checked="" type="checkbox"/> n/a
6.5. GMS-Interconnection	<input type="checkbox"/> Ok	<input checked="" type="checkbox"/> n/a
6.6. Serial modem	<input type="checkbox"/> Ok	<input checked="" type="checkbox"/> n/a
6.7. Ethernet modem	<input type="checkbox"/> Ok	<input checked="" type="checkbox"/> n/a
6.8. Sensor junction box	<input type="checkbox"/> Ok	<input checked="" type="checkbox"/> n/a

7. Physical inspection

7.1. Housing	<input checked="" type="checkbox"/> Ok
7.2. Fixation and screws	<input checked="" type="checkbox"/> Ok
7.3. Cables and connectors	<input checked="" type="checkbox"/> Ok
7.4. Labels	<input checked="" type="checkbox"/> Ok
7.5. Cleanness	<input checked="" type="checkbox"/> Ok

8. Configuration backup

8.1. Instrument configuration (*.xml)	<input checked="" type="checkbox"/> Ok
8.2. Software configuration (*.gsc)	<input checked="" type="checkbox"/> Ok
8.3. Test files archived	<input checked="" type="checkbox"/> Ok

Final Acceptance

All tests were executed according to the test procedure and all results were checked and are according to the specifications.

Tested by Ross Baradoy  on 26.02.2018

Approved by Tobias Liesching  on 02.03.2018



Health Infrastructure

Children's Hospital Westmead

**Vibration Monitoring - KR - Gait Lab -
April 2023**

CVM/ KR/202304

Issue 1 | 16/05/2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 271985

Arup Pty Ltd ABN 18 000 966 165

Arup Pty Ltd

Level 5

151 Clarence Street

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Document Verification

Project title Children's Hospital Westmead
Document title Monthly Vibration Monitoring Report
Job number 271985
Document ref CVM/KR/202304
File reference -

Revision	Date	Filename	
		Westmead Hospital – 103156 KR - Gait Lab - Summary of Recent Vibration Measurements (01-04 to 30-04).docx	
Issue 1	16/05/2023	Description	Issue

	Prepared by	Checked by	Approved by
Name	PR	MJW	MJW
Signature			

Filename			
Description	Prepared by	Checked by	Approved by
Name			
Signature			

Filename			
Description	Prepared by	Checked by	Approved by
Name			
Signature			

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Executive Summary

This report summarises the vibration monitoring data recorded at KR - Gait Lab, over one month – from 01/04/2023 to 30/04/2023. Graphs in this report show the recorded data in blue, and exceedance trigger levels in red.

RMSV Vibration Levels

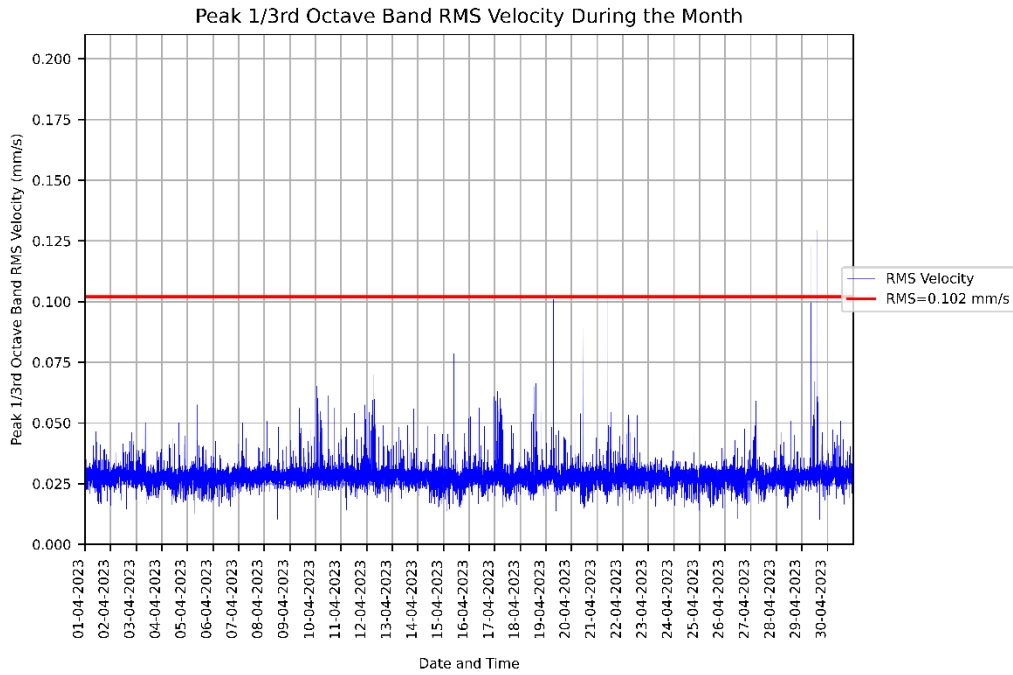


Figure 1: Measured RMSV vibration levels for 01/04/2023 to 30/04/2023 at the KR - Gait Lab.

The table below summarises the number of Root-Mean-Square Velocity (RMSV) limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
2	1

PPV Vibration Levels

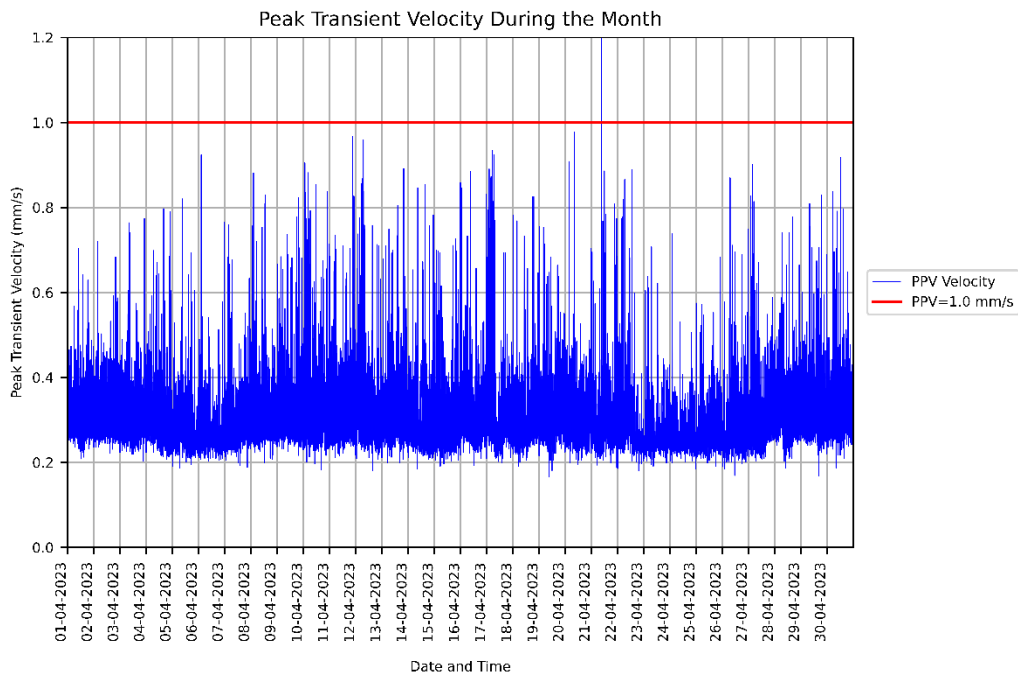


Figure 2: Measured vibration levels for 01/04/2023 to 30/04/2023 at the KR - Gait Lab.

The table below summarises the number of Peak Particle Velocity (PPV) limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
0	1

1. Introduction

Arup has been commissioned by PricewaterhouseCoopers (PwC) on behalf of NSW Health Infrastructure to monitor vibration levels in facilities adjacent to the Paediatric Services Building and Multi-storey Car Park development sites to ensure facility operations are not excessively impacted by the construction works. This report summarises the vibration monitoring data recorded at KR - Gait Lab during the period of the 01/04/2023 to 30/04/2023.

For the purposes of reporting, construction works are considered to be occurring at the following times:

Day	Construction Hours
Monday to Friday	7:00am to 6:00pm
Saturday	8:00am to 1:00pm
Sunday	No works
Public Holidays	No works

2. Monitor Location

The location of this monitor is shown below in Figure 3Figure .

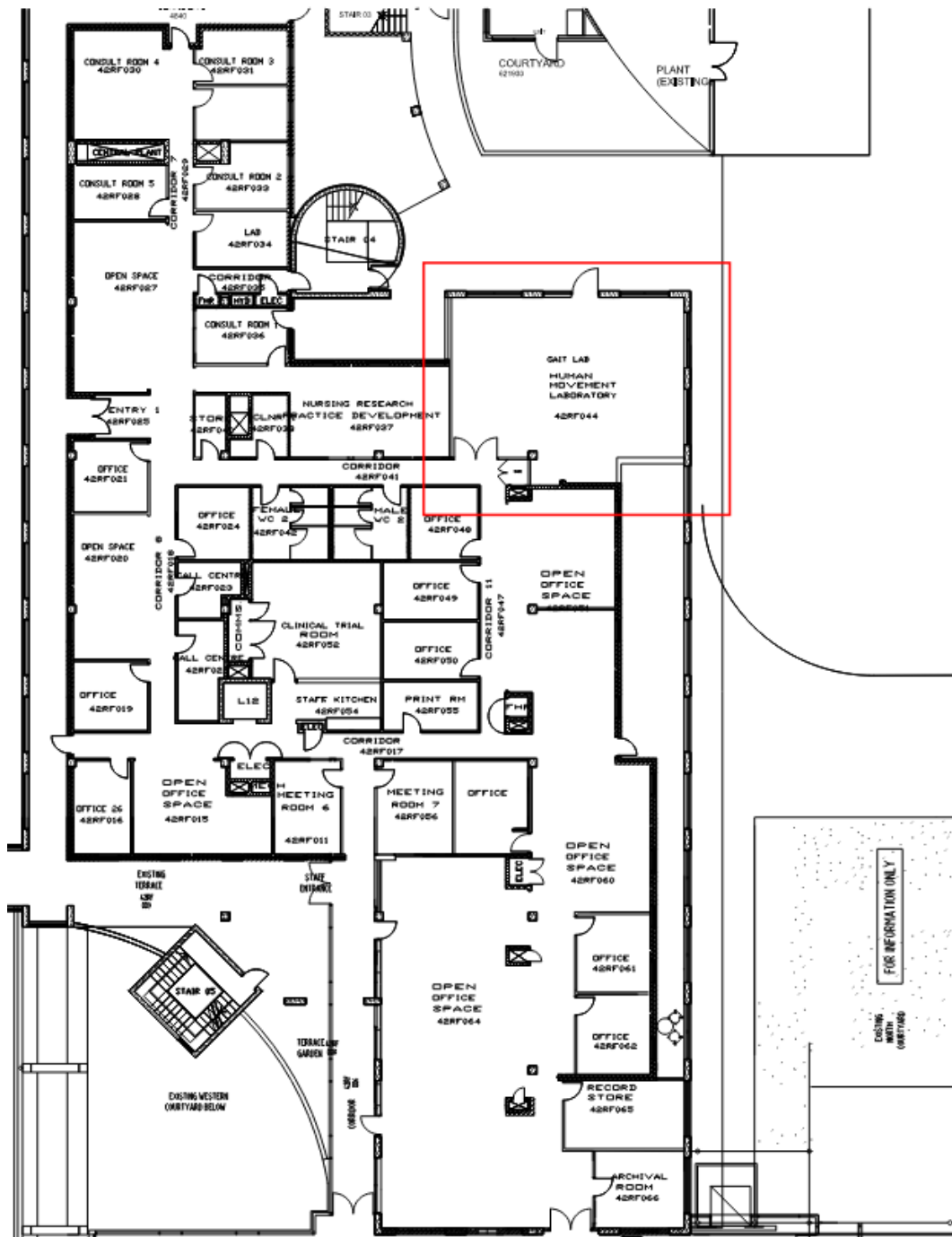


Figure 3: KR - Gait Lab vibration monitor location

Monitoring at this location utilises a GeoSIG GMSplus with a GeoSIG VE-11 geophone. The calibration certificate for the geophone is included in Appendix A.

3. Recorded Data

Figure 4 below shows the vibration levels (RMS velocity) recorded between 01/04/2023 and 30/04/2023. The recorded data is shown in blue, while the limit of 0.102mm/s (V_{RMS}) is shown in red.

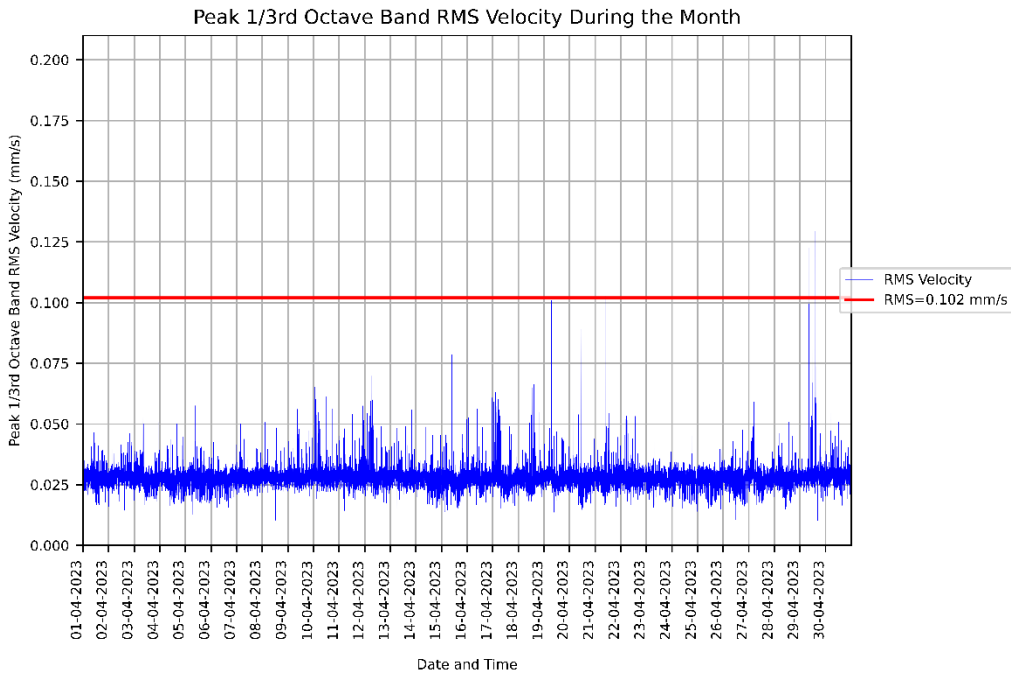


Figure 4: Measured RMSV vibration levels for 01/04/2023 to 30/04/2023 at the KR - Gait Lab.

The table below summarises the number of RMS Velocity limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
2	1

Figure 5 below shows the peak particle vibration levels (PPV velocity) recorded between 01/04/2023 and 30/04/2023. The recorded data is shown in blue, while the limit of 1.0mm/s (V_{PPV}) is shown in red.

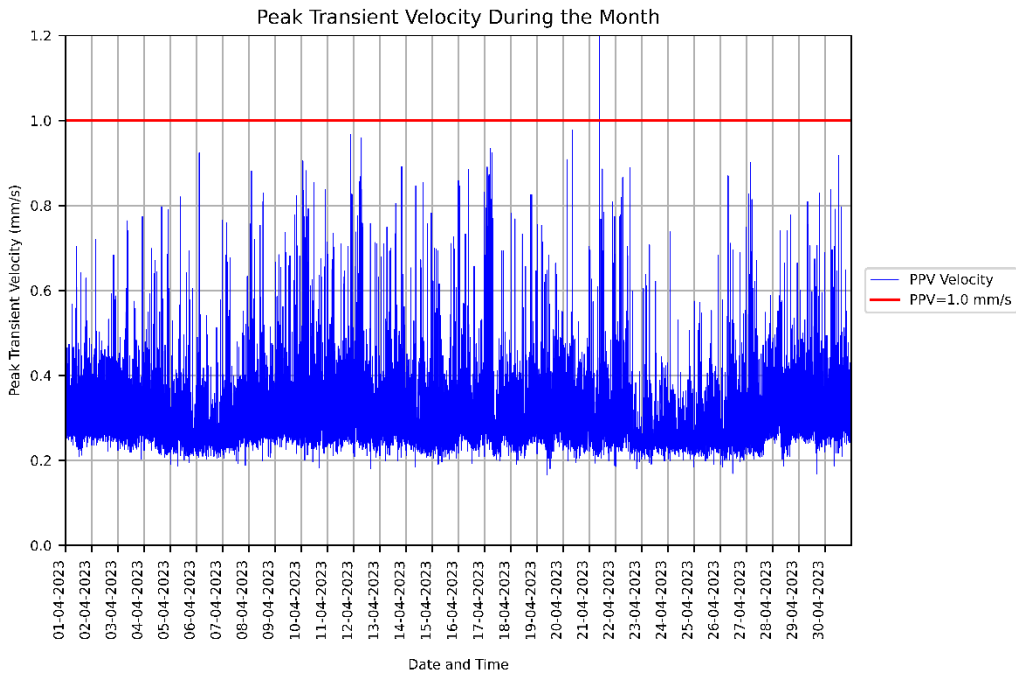


Figure 5: Measured PPV vibration levels for 01/04/2023 to 30/04/2023 at the KR - Gait Lab.

The table below summarises the number of PPV limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
0	1

Frequency response and linearity characteristics for
GeoSIG Velocity Geophone **VE-11** Serial No. **55908**
Constant velocity of 10 mm/sec Peak applied for response
(Except at 200.0 Hz where applied level limited to 1.0 mm/s peak)
For amplitude linearity applied level varied at 15.92 Hz

12VDC Power Supply

Geophone Orientation.: Vertical

Frequency		Velocity mm/sec Peak	Indicated Sensitivity $\text{mV}/\text{mm}\cdot\text{s}^{-1}$	Expanded uncertainty
Hz	Radians/sec		Vertical Sensitivity	$U_{95} \%$
3.00	18.85	10.0	110.73	1.00%
4.00	25.13	10.0	110.65	0.90%
6.00	37.70	10.0	107.04	0.90%
10.00	62.83	10.0	101.63	0.90%
15.00	94.25	10.0	99.12	0.90%
15.92	94.25	1.0	N/A	0.90%
15.92	94.25	5.0	93.34	0.90%
15.92	94.25	10.0	93.15	0.90%
15.92	94.25	50.0	93.10	0.90%
15.92	94.25	100	N/A	0.50%
30.00	188.50	10.0	97.57	0.50%
60.00	376.99	10.0	98.58	0.50%
120.00	753.98	10.0	110.55	0.50%
150.00	942.48	10.0	125.20	0.50%
Hz	Radians/sec	Velocity mm/sec Peak	Vertical Sensitivity	$U_{95} \%$

Note1:

The laboratory has accreditation under ISO/IEC 17025 from NATA for calibration to ISO 16063-21 at frequencies from 0.5 Hz. Measurements at all frequencies and levels shown in the table above are made using reference equipment traceably calibrated to Australian National Standards.

Note2:

The uncertainties quoted are estimated at a confidence level of 95% and a coverage factor of $k=2$ applies unless otherwise stated.



Health Infrastructure

Children's Hospital Westmead

**Vibration Monitoring - SCHN - L1
Endocrinology Lab - April 2023**

CVM/ SCHN/202304

Issue 1 | 16/05/2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 271985

Arup Pty Ltd ABN 18 000 966 165

Arup Pty Ltd

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Document Verification

Project title Children's Hospital Westmead
Document title Monthly Vibration Monitoring Report
Job number 271985
Document ref CVM/SCHN/202304
File reference -

Revision	Date	Filename
		Westmead Hospital – 103157 SCHN - L1 Endocrinology Lab - Summary of Recent Vibration Measurements (01-04 to 30-04).docx

Issue	Date	Description
Issue 1	16/05/2023	Issue

	Prepared by	Checked by	Approved by
Name	PR	MJW	MJW
Signature			

Filename

	Prepared by	Checked by	Approved by
Name			
Signature			

Filename

	Prepared by	Checked by	Approved by
Name			
Signature			

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Executive Summary

This report summarises the vibration monitoring data recorded at SCHN - L1 Endocrinology Lab, over one month – from 01/04/2023 to 30/04/2023. Graphs in this report show the recorded data in blue, and exceedance trigger levels in red.

RMSV Vibration Levels

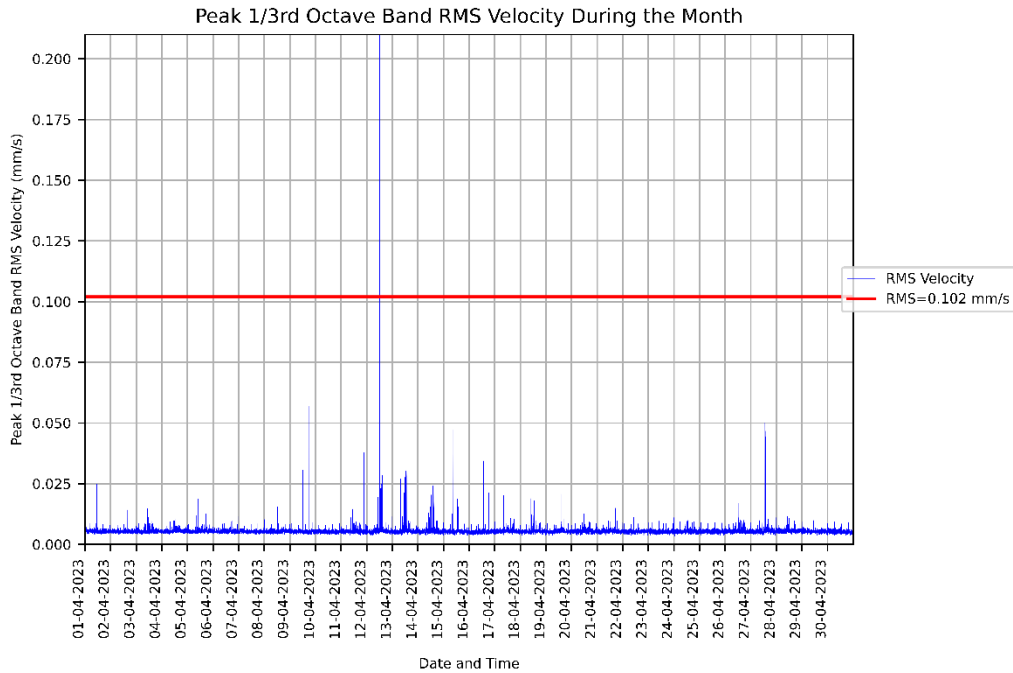


Figure 1: Measured RMSV vibration levels for 01/04/2023 to 30/04/2023 at the SCHN - L1 Endocrinology Lab.

The table below summarises the number of Root-Mean-Square Velocity (RMSV) limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
1	0

1. Introduction

Arup has been commissioned by PricewaterhouseCoopers (PwC) on behalf of NSW Health Infrastructure to monitor vibration levels in facilities adjacent to the Paediatric Services Building and Multi-storey Car Park development sites to ensure facility operations are not excessively impacted by the construction works. This report summarises the vibration monitoring data recorded at SCHN - L1 Endocrinology Lab during the period of the 01/04/2023 to 30/04/2023.

For the purposes of reporting, construction works are considered to be occurring at the following times:

Day	Construction Hours
Monday to Friday	7:00am to 6:00pm
Saturday	8:00am to 1:00pm
Sunday	No works
Public Holidays	No works

2. Monitor Location

The location of this monitor is shown below in Figure 3Figure .

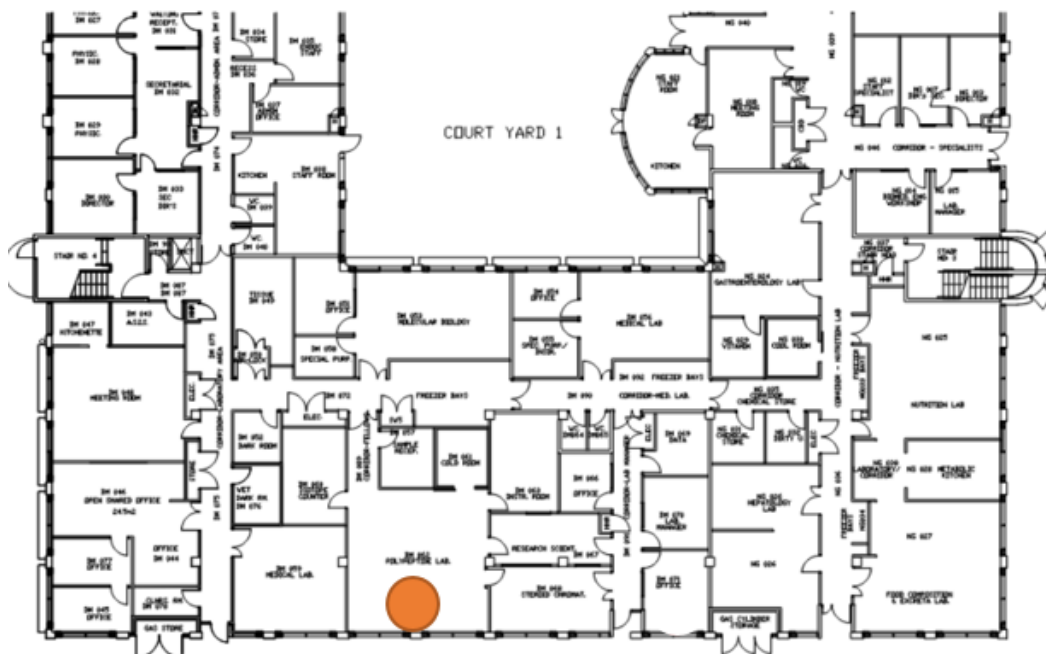


Figure 3: SCHN - L1 Endocrinology Lab vibration monitor location shown in orange

Monitoring at this location utilises a GeoSIG GMSplus with a GeoSIG VE-11 geophone. The calibration certificate for the geophone is included in Appendix A.

3. Recorded Data

Figure 4 below shows the vibration levels (RMS velocity) recorded between 01/04/2023 and 30/04/2023. The recorded data is shown in blue, while the limit of 0.102mm/s (V_{RMS}) is shown in red.

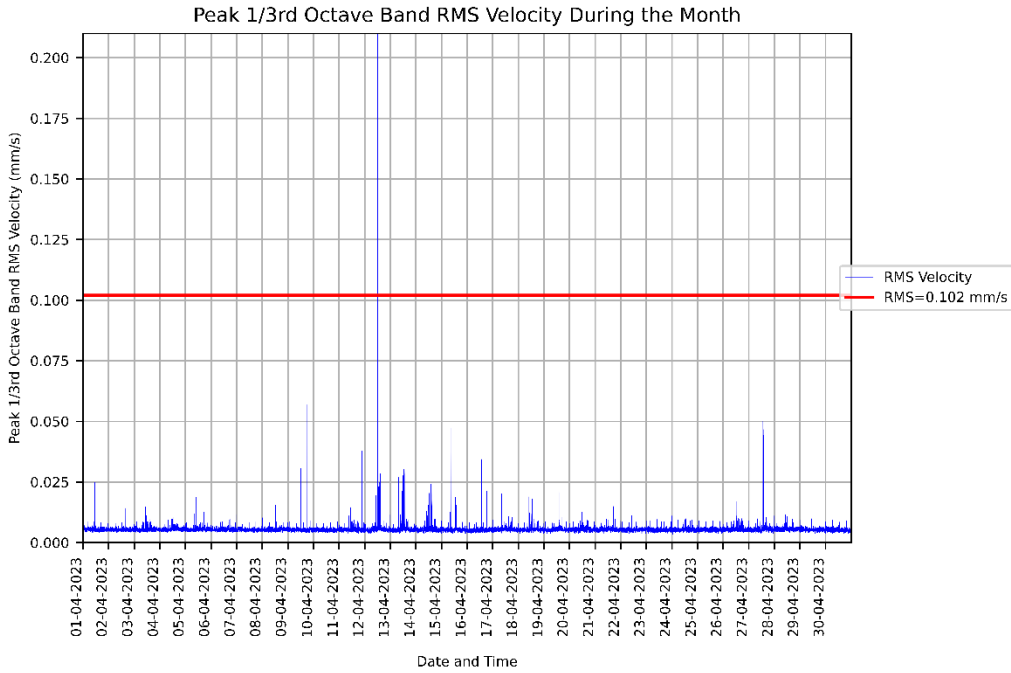


Figure 4: Measured RMSV vibration levels for 01/04/2023 to 30/04/2023 at the SCHN - L1 Endocrinology Lab.

The table below summarises the number of RMS Velocity limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
1	0

Frequency response and linearity characteristics for
GeoSIG Velocity Geophone **VE-11** Serial No. **55910**
Constant velocity of 10 mm/sec Peak applied for response
(Except at 200.0 Hz where applied level limited to 1.0 mm/s peak)
For amplitude linearity applied level varied at 15.92 Hz

12VDC Power Supply

Geophone Orientation.: Vertical

Frequency		Velocity mm/sec Peak	Indicated Sensitivity mV/mms ⁻¹	Expanded uncertainty
Hz	Radians/sec		Vertical Sensitivity	U ₉₅ %
3.00	18.85	10.0	109.76	1.00%
4.00	25.13	10.0	111.50	0.90%
6.00	37.70	10.0	108.98	0.90%
10.00	62.83	10.0	103.80	0.90%
15.00	94.25	10.0	101.12	0.90%
15.92	94.25	1.0	N/A	0.90%
15.92	94.25	5.0	95.09	0.90%
15.92	94.25	10.0	94.96	0.90%
15.92	94.25	50.0	94.83	0.90%
15.92	94.25	100	N/A	0.50%
30.00	188.50	10.0	99.03	0.50%
60.00	376.99	10.0	100.56	0.50%
120.00	753.98	10.0	113.91	0.50%
150.00	942.48	10.0	119.09	0.50%
Hz	Radians/sec	Velocity mm/sec Peak	Vertical Sensitivity	U ₉₅ %

Note1:

The laboratory has accreditation under ISO/IEC 17025 from NATA for calibration to ISO 16063-21 at frequencies from 0.5 Hz. Measurements at all frequencies and levels shown in the table above are made using reference equipment traceably calibrated to Australian National Standards.

Note2:

The uncertainties quoted are estimated at a confidence level of 95% and a coverage factor of k=2 applies unless otherwise stated.



Health Infrastructure

Children's Hospital Westmead

**Vibration Monitoring - CASB level 3
Surgical Suite - April 2023**

CVM/ CASB/202304

Issue 1 | 16/05/2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 271985

Arup Pty Ltd ABN 18 000 966 165

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Document Verification

Project title Children's Hospital Westmead
Document title Monthly Vibration Monitoring Report
Job number 271985
Document ref CVM/CASB/202304
File reference -

Revision	Date	Filename
		Westmead Hospital – 103160 CASB level 3 Surgical Suite - Summary of Recent Vibration Measurements (01-04 to 30-04).docx

Issue	Date	Description
Issue 1	16/05/2023	Issue

	Prepared by	Checked by	Approved by
Name	PR	MJW	MJW
Signature			

Filename

Description

	Prepared by	Checked by	Approved by
Name			
Signature			

Filename

Description

	Prepared by	Checked by	Approved by
Name			
Signature			

Issue Document Verification with Document

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Executive Summary

This report summarises the vibration monitoring data recorded at CASB level 3 Surgical Suite, over one month – from 01/04/2023 to 30/04/2023. Graphs in this report show the recorded data in blue, and exceedance trigger levels in red.

RMSV Vibration Levels

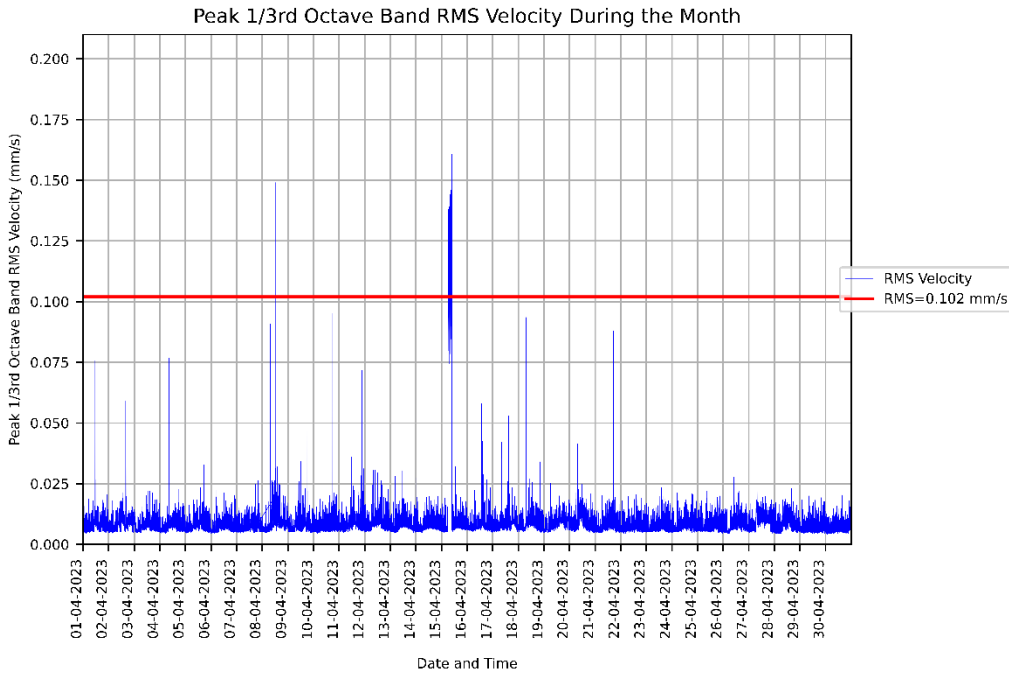


Figure 1: Measured RMSV vibration levels for 01/04/2023 to 30/04/2023 at the CASB level 3 Surgical Suite.

The table below summarises the number of Root-Mean-Square Velocity (RMSV) limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
46	31

1. Introduction

Arup has been commissioned by PricewaterhouseCoopers (PwC) on behalf of NSW Health Infrastructure to monitor vibration levels in facilities adjacent to the Paediatric Services Building and Multi-storey Car Park development sites to ensure facility operations are not excessively impacted by the construction works. This report summarises the vibration monitoring data recorded at CASB level 3 Surgical Suite during the period of the 01/04/2023 to 30/04/2023.

For the purposes of reporting, construction works are considered to be occurring at the following times:

Day	Construction Hours
Monday to Friday	7:00am to 6:00pm
Saturday	8:00am to 1:00pm
Sunday	No works
Public Holidays	No works

2. Monitor Location

The location of this monitor is shown below in Figure 3Figure .

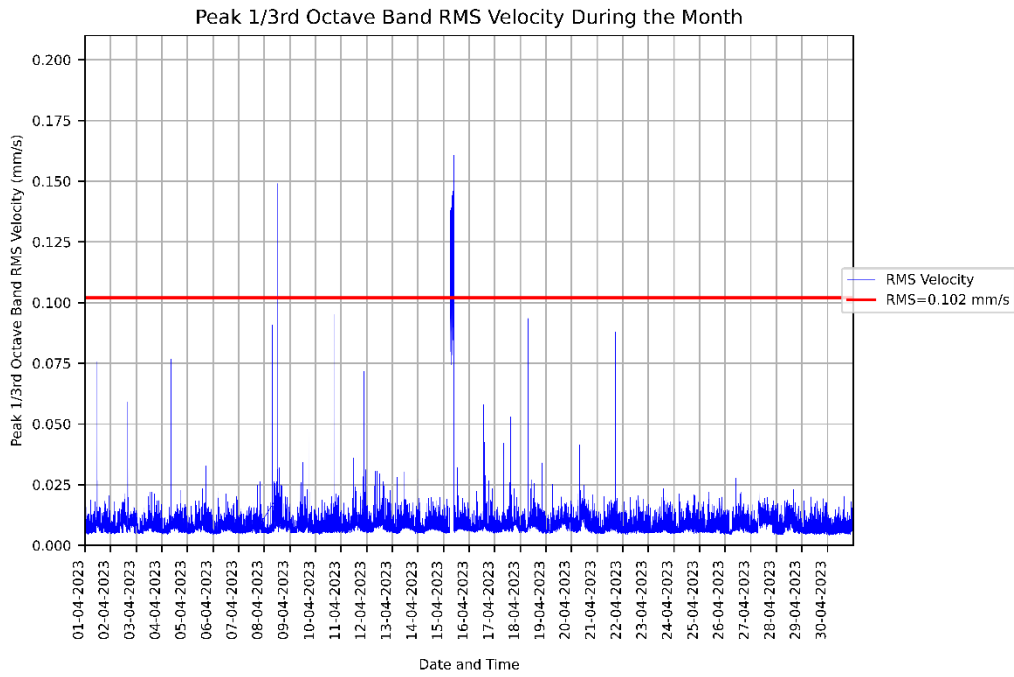


Figure 4: Measured RMSV vibration levels for 01/04/2023 to 30/04/2023 at the CASB level 3 Surgical Suite.

The table below summarises the number of RMS Velocity limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
46	31

Appendix A: Calibration Certificates

Frequency response and linearity characteristics for
GeoSIG Velocity Geophone **VE-11** Serial No. **55912**
Constant velocity of 10 mm/sec Peak applied for response
(Except at 200.0 Hz where applied level limited to 1.0 mm/s peak)
For amplitude linearity applied level varied at 15.92 Hz

12VDC Power Supply

Geophone Orientation.: Vertical

Frequency		Velocity mm/sec Peak	Indicated Sensitivity $\text{mV}/\text{mms}^{-1}$	Expanded uncertainty
Hz	Radians/sec		Vertical Sensitivity	U_{95} %
3.00	18.85	10.0	112.74	1.00%
4.00	25.13	10.0	113.82	0.90%
6.00	37.70	10.0	109.59	0.90%
10.00	62.83	10.0	100.79	0.90%
15.00	94.25	10.0	96.12	0.90%
15.92	94.25	1.0	N/A	0.90%
15.92	94.25	5.0	90.09	0.90%
15.92	94.25	10.0	89.99	0.90%
15.92	94.25	50.0	89.89	0.90%
15.92	94.25	100	N/A	0.50%
30.00	188.50	10.0	92.45	0.50%
60.00	376.99	10.0	92.89	0.50%
120.00	753.98	10.0	100.92	0.50%
150.00	942.48	10.0	117.80	0.50%
Hz	Radians/sec	Velocity mm/sec Peak	Vertical Sensitivity	U_{95} %

Note1:

The laboratory has accreditation under ISO/IEC 17025 from NATA for calibration to ISO 16063-21 at frequencies from 0.5 Hz. Measurements at all frequencies and levels shown in the table above are made using reference equipment traceably calibrated to Australian National Standards.

Note2:

The uncertainties quoted are estimated at a confidence level of 95% and a coverage factor of $k=2$ applies unless otherwise stated.



Health Infrastructure

Children's Hospital Westmead

**Vibration Monitoring - CMRI Animal
Holding Facility - April 2023**

CVM/ CMRI/202304

Issue 1 | 16/05/2023

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 271985

Arup Pty Ltd ABN 18 000 966 165

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Document Verification

Project title Children's Hospital Westmead
Document title Monthly Vibration Monitoring Report
Job number 271985
Document ref CVM/CMRI/202304
File reference -

Revision	Date	Filename	
		Westmead Hospital – 103161 CMRI Animal Holding Facility - Summary of Recent Vibration Measurements (01-04 to 30-04).docx	

Issue	Date	Description	
Issue 1	16/05/2023	Issue	

	Prepared by	Checked by	Approved by
Name	PR	MJW	MJW
Signature			

Filename	

	Prepared by	Checked by	Approved by
Name			
Signature			

Filename	

	Prepared by	Checked by	Approved by
Name			
Signature			

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Executive Summary

This report summarises the vibration monitoring data recorded at CMRI Animal Holding Facility, over one month – from 01/04/2023 to 30/04/2023. Graphs in this report show the recorded data in blue, and exceedance trigger levels in red.

RMSV Vibration Levels

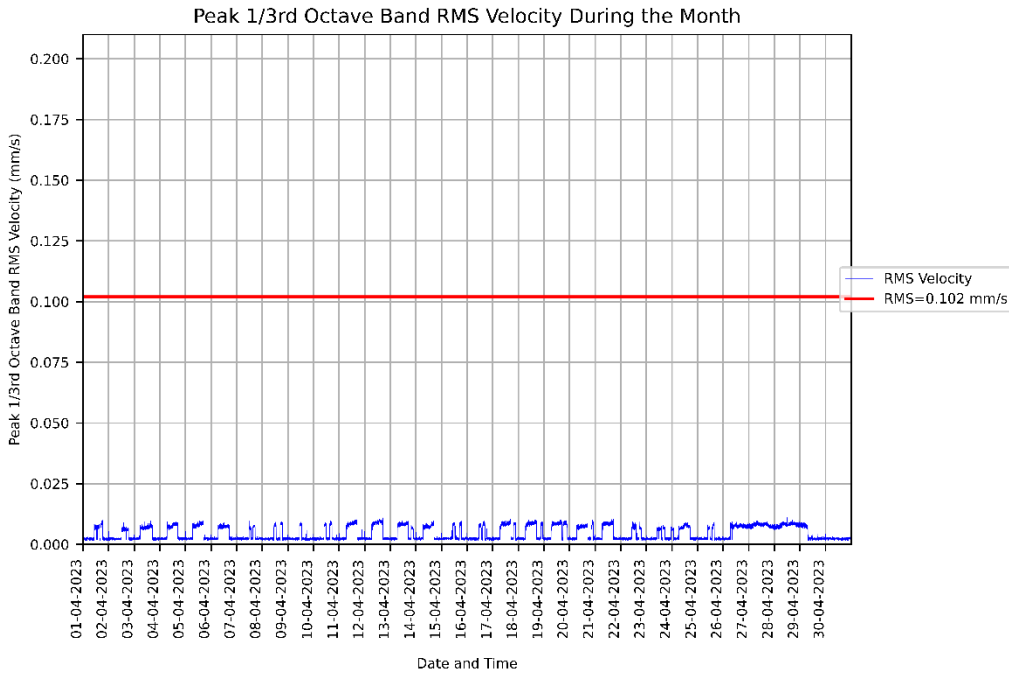


Figure 1: Measured RMSV vibration levels for 01/04/2023 to 30/04/2023 at the CMRI Animal Holding Facility.

The table below summarises the number of Root-Mean-Square Velocity (RMSV) limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
0	0

PPV Vibration Levels

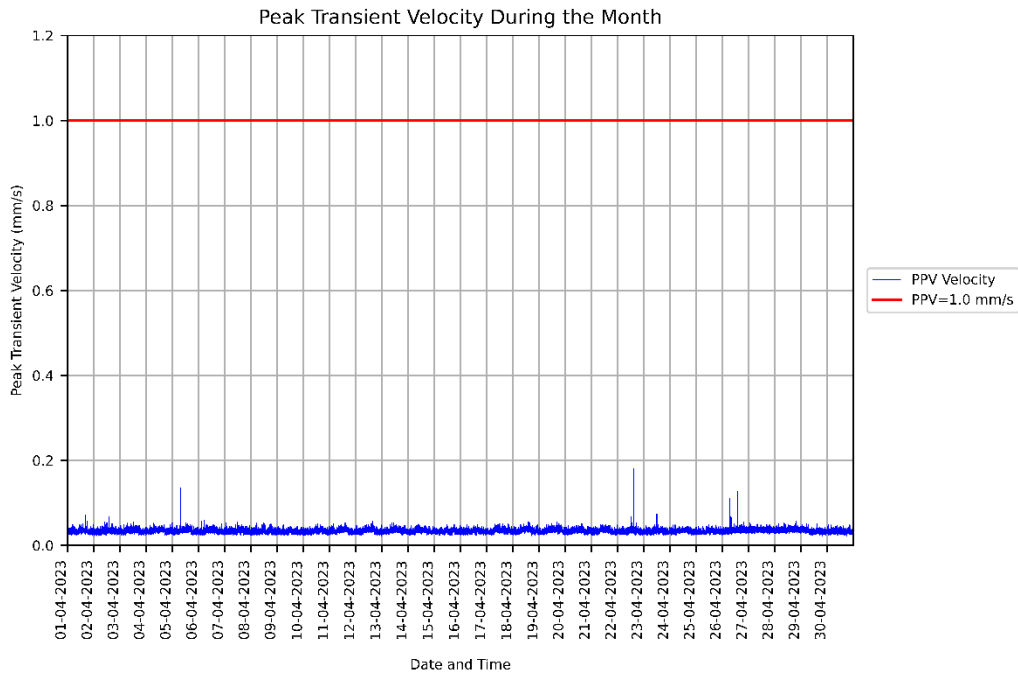


Figure 2: Measured vibration levels for 01/04/2023 to 30/04/2023 at the CMRI Animal Holding Facility.

The table below summarises the number of Peak Particle Velocity (PPV) limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
0	0

1. Introduction

Arup has been commissioned by PricewaterhouseCoopers (PwC) on behalf of NSW Health Infrastructure to monitor vibration levels in facilities adjacent to the Forecourt development sites to ensure facility operations are not excessively impacted by the construction works. This report summarises the vibration monitoring data recorded at CMRI Animal Holding Facility during the period of the 01/04/2023 to 30/04/2023.

For the purposes of reporting, construction works are considered to be occurring at the following times:

Day	Construction Hours
Monday to Friday	7:00am to 6:00pm
Saturday	8:00am to 1:00pm
Sunday	No works
Public Holidays	No works

2. Monitor Location

The location of this monitor is shown below in Figure 3Figure .



Figure 3: CMRI Animal Holding Facility vibration monitor location

Monitoring at this location utilises a GeoSIG GMSplus with a GeoSIG VE-11 geophone. The calibration certificate for the geophone is included in Appendix A.

3. Recorded Data

Figure 4 below shows the vibration levels (RMS velocity) recorded between 01/04/2023 and 30/04/2023. The recorded data is shown in blue, while the limit of 0.102mm/s (V_{RMS}) is shown in red.

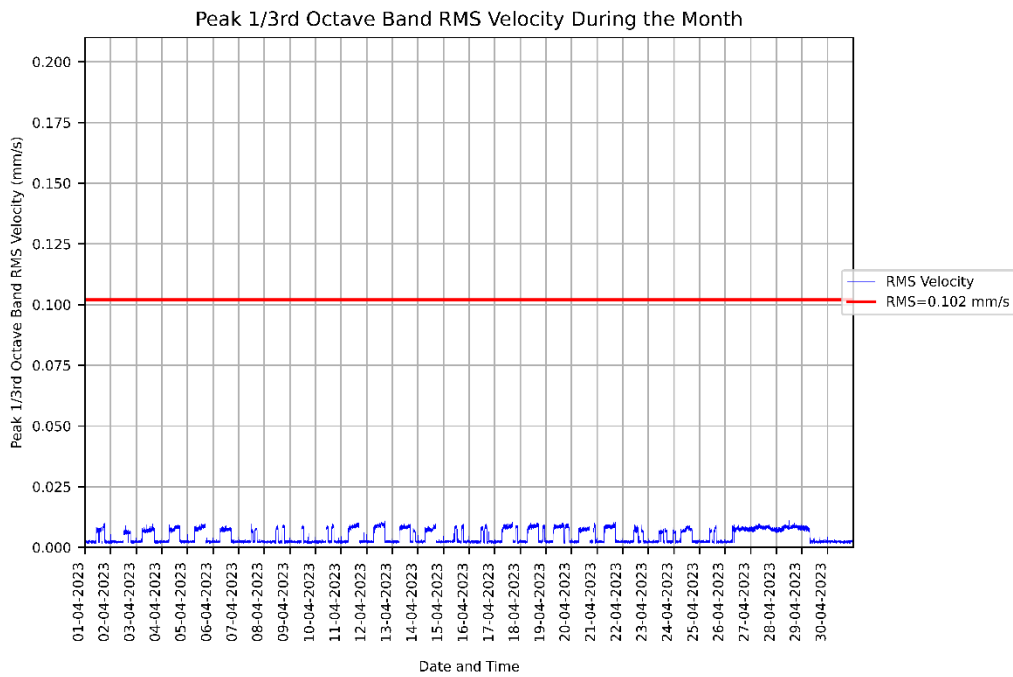


Figure 4: Measured RMSV vibration levels for 01/04/2023 to 30/04/2023 at the CMRI Animal Holding Facility.

The table below summarises the number of RMS Velocity limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
0	0

Figure 5 below shows the peak particle vibration levels (PPV velocity) recorded between 01/04/2023 and 30/04/2023. The recorded data is shown in blue, while the limit of 1.0mm/s (V_{PPV}) is shown in red.

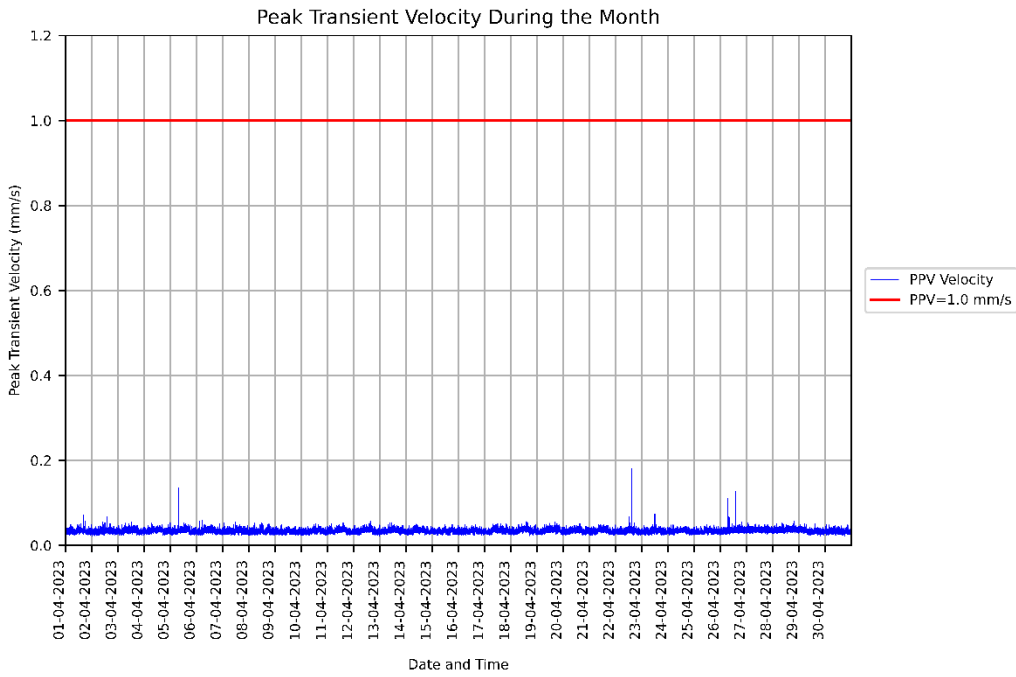


Figure 5: Measured PPV vibration levels for 01/04/2023 to 30/04/2023 at the CMRI Animal Holding Facility.

The table below summarises the number of PPV limit exceedances recorded during and outside of construction hours.

During Construction Hours	Outside of Construction Hours
0	0

Frequency response and linearity characteristics for
GeoSIG Velocity Geophone **VE-11** Serial No. **55913**
Constant velocity of 10 mm/sec Peak applied for response
(Except at 200.0 Hz where applied level limited to 1.0 mm/s peak)
For amplitude linearity applied level varied at 15.92 Hz

12VDC Power Supply

Geophone Orientation.: Vertical

Frequency		Velocity mm/sec Peak	Indicated Sensitivity mV/mms ⁻¹ Vertical Sensitivity	Expanded uncertainty U ₉₅ %
Hz	Radians/sec			
3.00	18.85	10.0	106.24	1.00%
4.00	25.13	10.0	105.59	0.90%
6.00	37.70	10.0	100.69	0.90%
10.00	62.83	10.0	94.25	0.90%
15.00	94.25	10.0	91.31	0.90%
15.92	94.25	1.0	N/A	0.90%
15.92	94.25	5.0	85.93	0.90%
15.92	94.25	10.0	85.77	0.90%
15.92	94.25	50.0	85.76	0.90%
15.92	94.25	100	N/A	0.50%
30.00	188.50	10.0	89.27	0.50%
60.00	376.99	10.0	90.17	0.50%
120.00	753.98	10.0	100.67	0.50%
150.00	942.48	10.0	115.82	0.50%
Hz	Radians/sec	Velocity mm/sec Peak	Vertical Sensitivity	U ₉₅ %

Note1:

The laboratory has accreditation under ISO/IEC 17025 from NATA for calibration to ISO 16063-21 at frequencies from 0.5 Hz. Measurements at all frequencies and levels shown in the table above are made using reference equipment traceably calibrated to Australian National Standards.

Note2:

The uncertainties quoted are estimated at a confidence level of 95% and a coverage factor of k=2 applies unless otherwise stated.