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Tweed Valley Hospital Carpark

July Report

BRISBANE
Level 1
82 Arthur Street
FORTITUDE VALLEY QLD 4006
(07) 3211 5591

ABN 98 145 324 714
www.acousticlogic.com.au

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TABLE OF CONTENTS

1 INTRODUCTION

Acoustic Logic has been engaged to carry out noise, dust and vibration monitoring for the impacts associated with the earthworks, excavation, and construction components of the Tweed Valley Hospital Carpark.

- Vibration Monitoring: 1st of July to 31st of July 2022;
- Noise Monitoring: 1st of July to 31st of July 2022; and
- Dust Monitoring: 1st of July to 31st of July 2022.

The location of the site is shown in Figure 2-1 below. The location of the on-site monitors relative to the site has also been shown in Figure 2-1.

The following Noise, Dust and Vibration Management levels have been derived from the Construction Noise, Dust and Vibration Management Plan, document reference 20211491.1/2911A/R2/OB.

2 SITE DESCRIPTION AND SENSITIVE RECEIVERS

The subject site is located on Cudgen Rd, Kingscliff as indicated in Figure 2-1. The land uses surrounding the proposed multi-storey carpark site are existing commercial, residential and educational receivers. The nearest potentially most affected receivers are:

- **Receiver 1:** Tweed Regional Aquatic Centre – Kingscliff (east)
- **Receiver 2:** Residential dwellings located on 32-58 Cudgen Road (east)
- **Receiver 3:** Residential dwelling located at 792 Cudgen Road (south)
- **Receiver 4:** TAFE NSW – Kingscliff (south)
- **Receiver 5:** Residential dwelling located at 764 Cudgen Road (south)
- **Receiver 6:** Residential receivers at 6-30 John Robb Way (west)

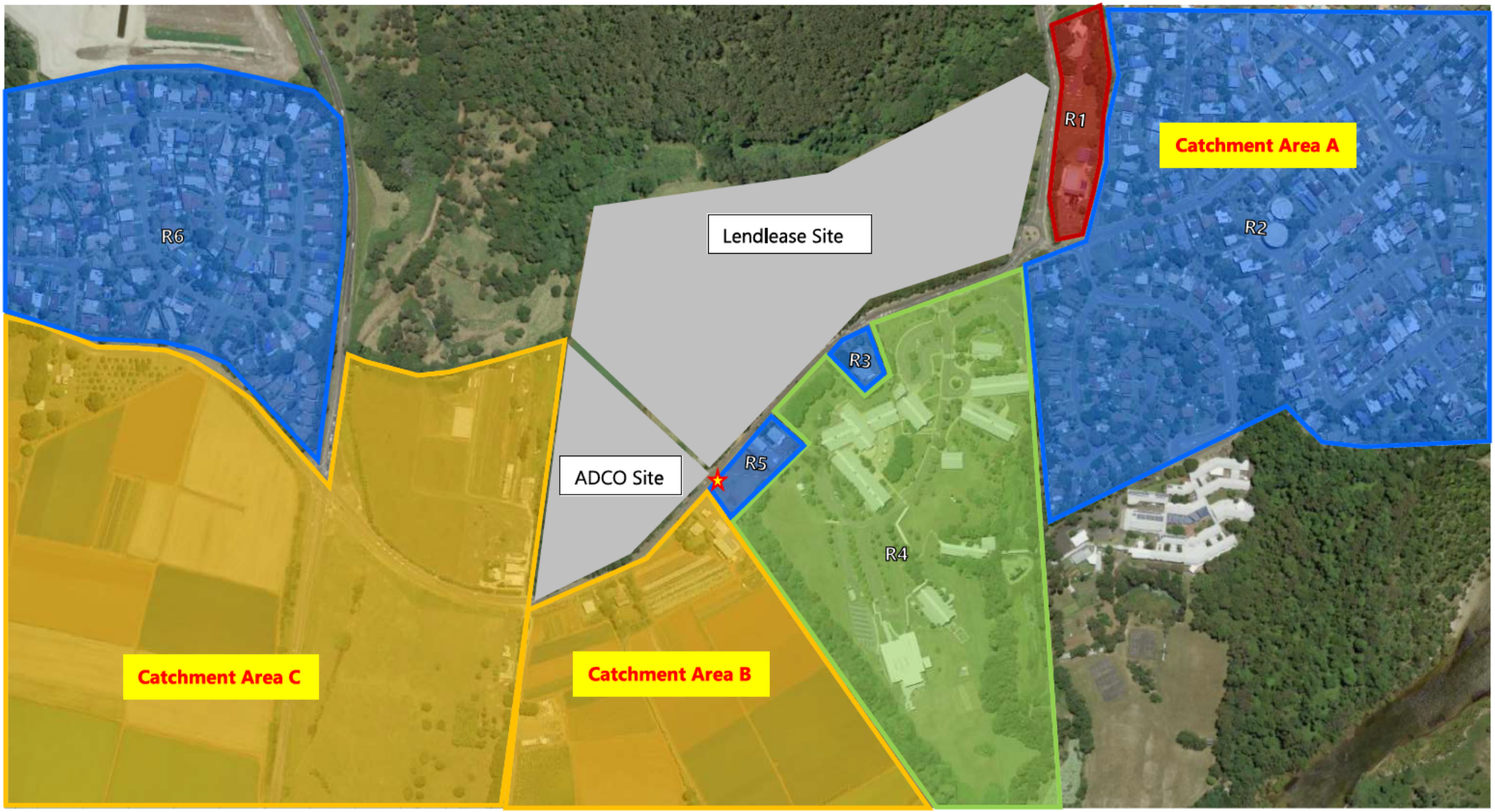


Figure 2-1 –Site and Sensitive Receiver Locations

3 VIBRATION MONITORING

3.1 VIBRATION CRITERIA

The following vibration monitoring criteria has been derived from the Construction Noise, Dust and Vibration Management Plan, document reference 20211491.1/2911A/R2/OB.

CONSTRUCTION VIBRATION CRITERIA

Vibration criteria for the nearest receivers will be based on the following documents:

- DIN 4150, *'Vibration in Buildings (2016-12)'*;
- EPA *"Assessing Vibration: A technical guideline"*; and
- ASHRAE Handbook 2007.

Summarised Recommended Vibration Limits

The summarised vibration criteria are presented in the table below.

Table 9 – Recommended Vibration Limit

Vibration Receiver	Recommended Vibration Limits PPV (mm/s)
Residential Buildings	5
Commercial/Other Buildings	20

3.2 MEASUREMENT EQUIPMENT

Vibration monitoring was conducted using one Texcel ETM vibration monitor with an external tri-axial geophone. The monitor is programmed to store statistical vibration data over every 5-minute period, along with any 'triggered' events that occur throughout the monitoring period. The following Section presents the results of vibration monitoring for the period between the 1st of July to the 31st of July 2022.

3.3 MEASUREMENT RESULTS

Table 1 – Vibration Monitoring Results

Vibration Geophone Location	Date	Maximum Measured Vibration Level mm/s	Criteria Vibration Level	Complies
Monitoring Location	2022-07-01	0.81	5mm/s PPV	Yes
	2022-07-02	0.8		Yes
	2022-07-03	0.58		Yes
	2022-07-04	0.89		Yes
	2022-07-05	0.79		Yes
	2022-07-06	0.83		Yes
	2022-07-07	1.86		Yes
	2022-07-08	1.03		Yes
	2022-07-09	0.75		Yes
	2022-07-10	1.61		Yes
	2022-07-11	0.85		Yes
	2022-07-12	1.07		Yes
	2022-07-13	0.73		Yes
	2022-07-14	1.15		Yes
	2022-07-15	0.68		Yes
	2022-07-16	0.91		Yes
	2022-07-17	0.77		Yes
	2022-07-18	1.21		Yes
	2022-07-19	0.89		Yes
	2022-07-20	0.75		Yes
	2022-07-21	0.92		Yes
	2022-07-22	0.83		Yes
	2022-07-23	0.79		Yes
	2022-07-24	0.79		Yes
	2022-07-25	0.9		Yes
	2022-07-26	0.71		Yes
	2022-07-27	0.72		Yes
	2022-07-28	0.92		Yes
	2022-07-29	0.92		Yes
	2022-07-30	0.69		Yes
	2022-07-31	0.8		Yes

4 NOISE MONITORING

4.1 DEFINITION OF TERMS

Environmental noise is complex in nature. The noise level fluctuates from moment to moment and the noise characteristic can vary depending on the particular noise source in the vicinity (for example road, railway, and factory).

For this reason, various terms and descriptors have been developed to quantify the noise environment in a way that reflects human perception. The terms used in this noise assessment are described below:

dB(A)

Unit of loudness. The higher the number, the louder the noise. A change in noise level of up to 3 dB(A) is barely perceptible. A 5 dB(A) change is noticeable. A 10 dB(A) change is subjectively a doubling of noise.

Noise Descriptors

For time varying noise sources (such as traffic noise and general environmental noise) it is not possible to assess noise impacts based on a single instantaneous measurement. It is necessary to measure noise over a discrete period until a representative sample of noise has been obtained.

The descriptors used in this assessment are defined below.

L_1

The sound pressure level that is exceeded for 1 percent of the time for which the given sound is measured.

L_{10}

The sound pressure level that is exceeded for 10 percent of the time for which the given sound is measured.

L_{90}

The sound pressure level that is exceeded for 90 percent of the time for which the given sound is measured.

L_{Aeq}

Equivalent sound pressure level – steady sound level that, over a specified period, would produce the same energy equivalence as the fluctuating sound level actually occurring.

4.2 NOISE MANAGEMENT CRITERIA

NOISE MANAGEMENT LEVEL

Establishment of criteria for construction noise requirements will be in accordance with the following documents.

- NSW Environmental Protection Authority, *'Interim Construction Noise Guideline'*;
- Australian Standard AS2107:2016; and
- Australian Standards AS2436:2010 Guide to Noise Control on Construction, Maintenance and Demolition Sites.

Location	Management level, dB(A) $L_{eq\ (15\ min)}$
Residential Receivers	**Recommended Standard Hours** *"Noise Affected* 'Level – 55 *"Highly Noise Affected'* Level - 75
Commercial Receivers	70
Educational Receivers	45 (Internal)
Office Areas	
X-Ray Areas	50(Internal)

4.3 EQUIPMENT USED

Unattended noise monitoring was conducted using a *SiteHive Hexanode 134* noise and dust monitor. The monitor was programmed to store 15-minute statistical noise levels throughout the monitoring period. Measurements were taken on A-frequency weighting and fast time weighting.

4.4 MEASURED NOISE LEVELS

The available measured noise levels have been analysed by this office and the graphed noise data presented in Appendix 1.

Please note that the presented data represents the available monitoring data for the period described in Table 2. Summarised results are also in Table 2 below.

Table 2 – Noise Monitoring Results

Date	Measured typical worst noise level dB(A) $L_{eq\ 15min}$	Noise Management Level dB(A)$L_{eq\ 15min}$ *"Highly Affected Noise"*	Exceedance
1/7/2022	70	75	No
2/7/2022	66		
3/7/2022	65		
4/7/2022	67		
5/7/2022	68		
9/7/2022	66		
10/7/2022	66		
11/7/2022	65		
12/7/2022	70		
13/7/2022	71		
14/7/2022	66		
15/7/2022	66		
16/7/2022	65		
17/7/2022	65		
18/7/2022	67		
19/7/2022	69		
20/7/2022	70		
21/7/2022	70		
22/7/2022	71		
23/7/2022	57		
24/7/2022	65		
25/7/2022	69		
26/7/2022	69		
27/7/2022	69		
28/7/2022	68		
29/7/2022	68		
30/7/2022	65		
31/7/2022	64		

Note 1: Adverse weather events caused technical failures and limited maintenance works, impacting measurements between the 5th July and 9th July and the 23rd July and 24th July.

5 DUST MONITORING

5.1 ASSESSMENT CRITERIA

Dust monitoring has been conducted to measure mechanically generated respirable $PM_{2.5}$ dust particles (< 2.5µm) and PM_{10} dust particles (< 10µm), which are generally understood to be the main health concern in airborne dust. The air quality limits are based on the standards outlined in Department of the Environment's *National Environment Protection (Ambient Air Quality) Measure* and NSW EPA's air quality categories.

It should be noted that the dust monitoring results can be influenced by events such as fires and dust storms, thus the PM_{10} limit has an allowance of 5 days per year to account for the effects of such events.

The $PM_{2.5}$ and PM_{10} goals are summarised below.

Table 3 – $PM_{2.5}$ and PM_{10} Goals (24-Hour Average)

Pollutant	Averaging Time	Maximum Concentration
$PM_{2.5}$	24 hours	25 µg/m³
PM_{10}	24 hours	50 µg/m³

The EPA has air quality categories based on particle concentration over a one hour average. As per the Construction Noise, Dust and Vibration management Plan, this project has targeted the 'Poor' category as a reference, **however, the assessment level is the 24-hour average**.

Table 4 – $PM_{2.5}$ and PM_{10} Goals (1-Hour Average)

Pollutant	Air Quality Category	Maximum Concentration
$PM_{2.5}$	Poor	62-97 µg/m³
PM_{10}		80-120 µg/m³

5.2 MEASUREMENT DETAILS

5.2.1 Equipment

The dust monitoring was conducted using a *SiteHive Hexanode 134* noise and dust monitor.

5.2.2 Period

Dust monitoring was conducted from 01/07/2022 to 31/07/2022.

5.3 MEASUREMENT RESULTS

The **daily average** $PM_{2.5}$ and PM_{10} concentration levels are presented below.

Table 5 – 24hr Average $PM_{2.5}$ and PM_{10} Concentration

Date	24hr Average $PM_{2.5}$ and PM_{10} Concentration					
	$PM_{2.5}$ Level ($\mu g/m^3$)	$PM_{2.5}$ Limit ($\mu g/m^3$)	Complies	PM_{10} Level ($\mu g/m^3$)	PM_{10} Limit ($\mu g/m^3$)	Complies
1/7/2022	3	25	Yes	13	50	Yes
2/7/2022	1		Yes	6		Yes
3/7/2022	2		Yes	10		Yes
4/7/2022	3		Yes	18		Yes
5/7/2022	1		Yes	7		Yes
9/7/2022	2		Yes	13		Yes
10/7/2022	2		Yes	7		Yes
11/7/2022	3		Yes	10		Yes
12/7/2022	5		Yes	19		Yes
13/7/2022	6		Yes	277		Note 1
14/7/2022	2		Yes	8		Yes
15/7/2022	7		Yes	22		Yes
16/7/2022	5		Yes	18		Yes
17/7/2022	4		Yes	14		Yes
18/7/2022	5		Yes	38		Yes
19/7/2022	4		Yes	14		Yes
20/7/2022	7		Yes	20		Yes
21/7/2022	15		Yes	39		Yes
22/7/2022	25		Yes	57		Note 1
23/7/2022	36		Note 1	74		Note 1
24/7/2022	8		Yes	24		Yes
25/7/2022	8		Yes	33		Yes
26/7/2022	6		Yes	30		Yes
27/7/2022	4		Yes	33		Yes
28/7/2022	6		Yes	30		Yes
29/7/2022	5		Yes	29		Yes
30/7/2022	6		Yes	18		Yes
31/7/2022	4		Yes	13		Yes

Note 1: Extreme rainfall events caused dust exceedances (not ADCO Construction works)

Note 2: Adverse weather events caused technical failures and limited maintenance works, impacting measurements between the 5th July and 9th July and the 23rd July and 24th July.

The **daily maximum 1hour** $PM_{2.5}$ and PM_{10} concentration levels are presented below.

Table 6 – 1Hr Maximum $PM_{2.5}$ and PM_{10} Concentration

Date	Maximum 1hr Average $PM_{2.5}$ and PM_{10} Concentration					
	$PM_{2.5}$ Level ($\mu g/m^3$)	$PM_{2.5}$ Limit ($\mu g/m^3$)	Complies	PM_{10} Level ($\mu g/m^3$)	PM_{10} Limit ($\mu g/m^3$)	Complies
1/7/2022	5	62-97	Yes	23	80-120	Yes
2/7/2022	4		Yes	12		Yes
3/7/2022	4		Yes	24		Yes
4/7/2022	11		Yes	61		Yes
5/7/2022	2		Yes	12		Yes
9/7/2022	4		Yes	31		Yes
10/7/2022	5		Yes	29		Yes
11/7/2022	8		Yes	22		Yes
12/7/2022	8		Yes	38		Yes
13/7/2022	37		Yes	2600		Note 1
14/7/2022	4		Yes	20		Yes
15/7/2022	11		Yes	41		Yes
16/7/2022	8		Yes	36		Yes
17/7/2022	10		Yes	51		Yes
18/7/2022	13		Yes	125		Note 2
19/7/2022	6		Yes	41		Yes
20/7/2022	10		Yes	28		Yes
21/7/2022	34		Yes	92		Yes
22/7/2022	38		Yes	88		Yes
23/7/2022	48		Yes	101		Yes
24/7/2022	14		Yes	43		Yes
25/7/2022	17		Yes	95		Yes
26/7/2022	15		Yes	66		Yes
27/7/2022	8		Yes	94		Yes
28/7/2022	13		Yes	67		Yes
29/7/2022	10		Yes	108		Yes
30/7/2022	12		Yes	37		Yes
31/7/2022	6		Yes	21		Yes

Note 1: Extraneous rainfall events caused dust exceedances (not ADCO Construction works)

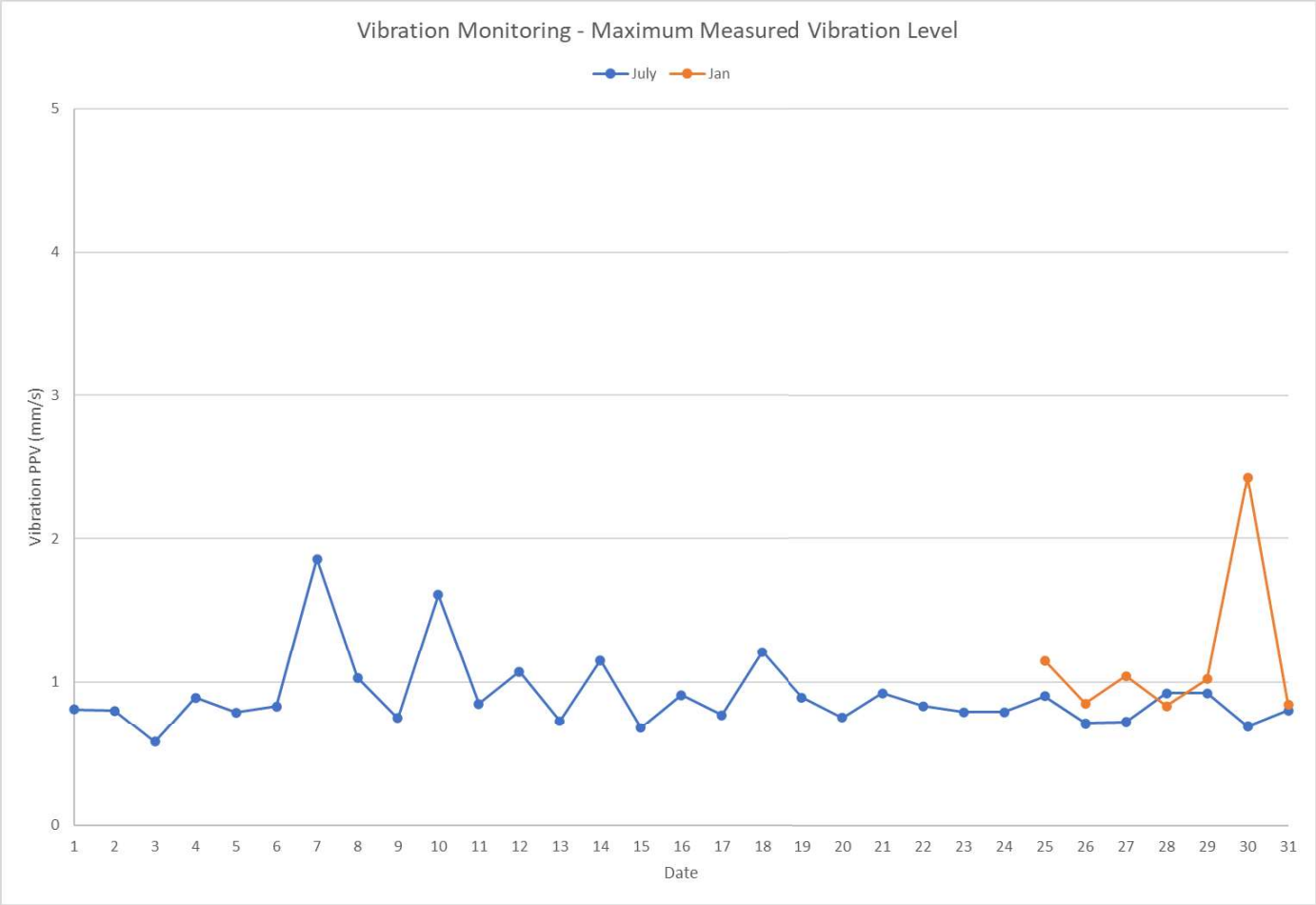
Note 2: PM10 dust level exceedance caused by a significant sudden peak. The values measured at times either side of the peak were noticeably lower than the peak and without the peak, the 1hr average values were compliant with the criteria limit. As such, this is not anticipated to be associated with ADCO works. We further note that extraneous weather was reported during the time of the exceedance.

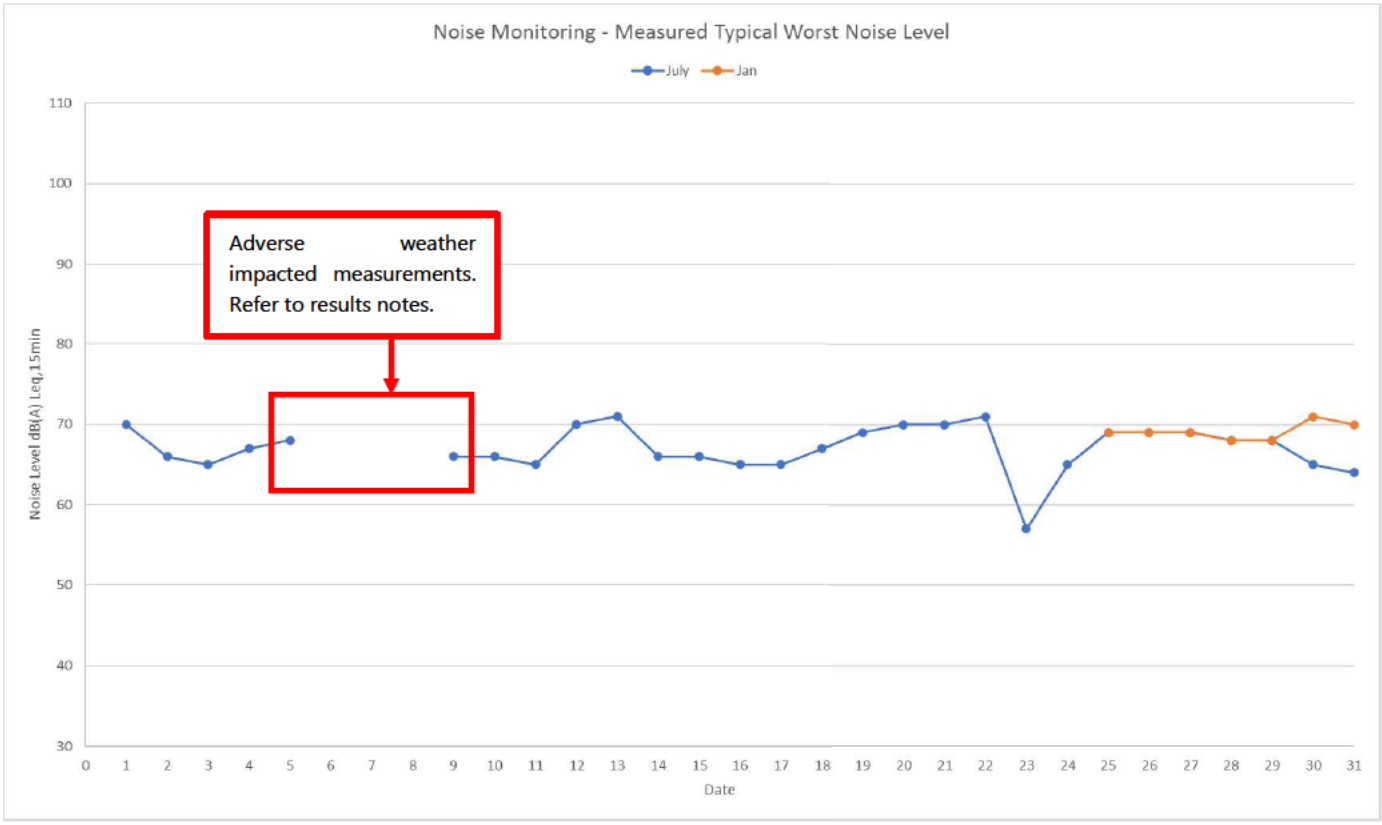
Note 3: Adverse weather events caused technical failures and limited maintenance works, impacting measurements between the 5th July and 9th July and the 23rd July and 24th July.

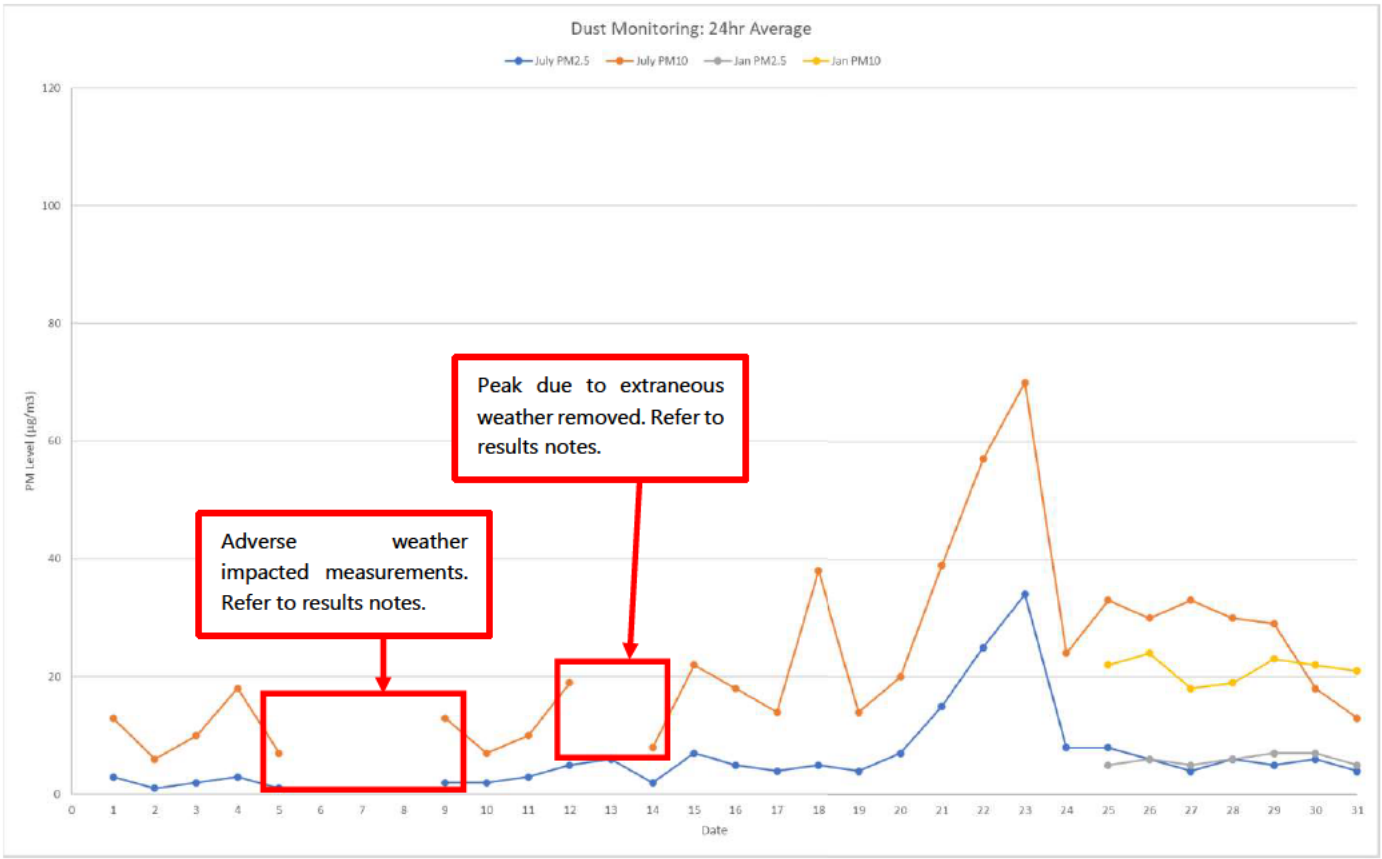
6 COMPARISON OF PRE-CONSTRUCTION EXISTING SITE CONDITIONS MEASUREMENTS TO LATEST MEASUREMENTS

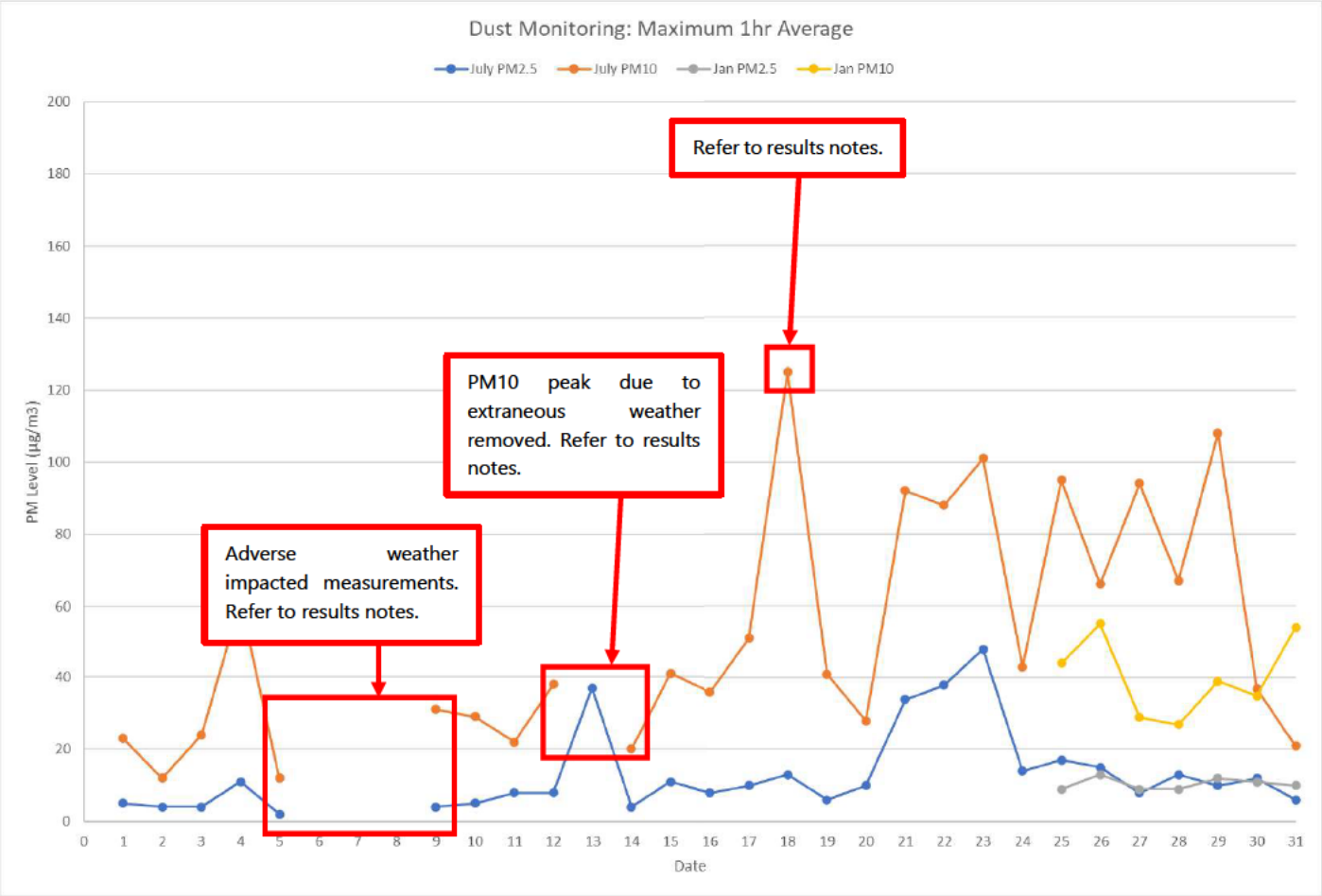
This section compares the noise, dust, and vibration measurements of the site existing conditions prior to construction works measured in January and the current site conditions based on July measurements. The site existing conditions were monitored for 7 days prior to construction works from the 25th January 2022 to the 1st February 2022 and are presented in The Existing Conditions Report (25.01.2022 – 01.02.2022) by Acoustic Logic (ref. 20211491.6/0702A/R1/JJM).

The comparative review addresses any significant difference in the measurement parameters in Table 1, Table 2, Table 5 and Table 6 measured during January and July. The measurement results during each month are shown in the following graphs.




Noise Monitoring - Measured Typical Worst Noise Level
July
Jan
Adverse weather impacted measurements. Refer to results notes.
Noise Level dB(A) Leq,15min
Date


Dust Monitoring: 24hr Average
July PM2.5
July PM10
Jan PM2.5
Jan PM10
Peak due to extraneous weather removed. Refer to results notes.
Adverse weather impacted measurements. Refer to results notes.
PM Level (µg/m3)
Date



Based on the monitoring results on equivalent days during January (existing conditions pre-construction works) and July (latest measurements) as per the graphs in this Section, we note the following:

- No significant deviation in the measured vibration, noise and PM2.5 values were observed for equivalent days during January and July.
- Measured PM10 levels on equivalent days were generally higher during July than January. This is expected as construction works are currently ongoing and nonetheless, the measured PM10 levels were below the criteria limit in July.

7 CONCLUSION

Acoustic Logic Consultancy has carried out noise, dust and vibration monitoring for the month of July at the Tweed Valley Hospital Carpark. Earthworks and excavation are noted as the major activities undertaken during this monitoring period.

This monitoring report presents the noise and vibration monitoring for the periods as follows:

- Vibration Monitoring: 1st of July to 31st of July 2022;
- Noise Monitoring: 1st of July to 31st of July 2022; and
- Dust Monitoring: 1st of July to 31st of July 2022.

The following dust concentration exceedances were measured during the monitoring period:

- 24hr average $PM_{2.5}$ level on the 23rd of July;
- 24hr average PM_{10} level on the 13th, 22nd and 23rd of July; and
- Maximum 1hr average PM_{10} level on the 13th and 18th of July.

Exceedances were not determined to be the result of construction works as per the results notes in this report.

Adverse weather events caused technical failures and limited maintenance works, impacting measurements between the 5th July and 9th July and the 23rd July and 24th July.

There were no exceedances as a result of construction works during the reporting period listed above, which demonstrates compliance with the conditions of consent.

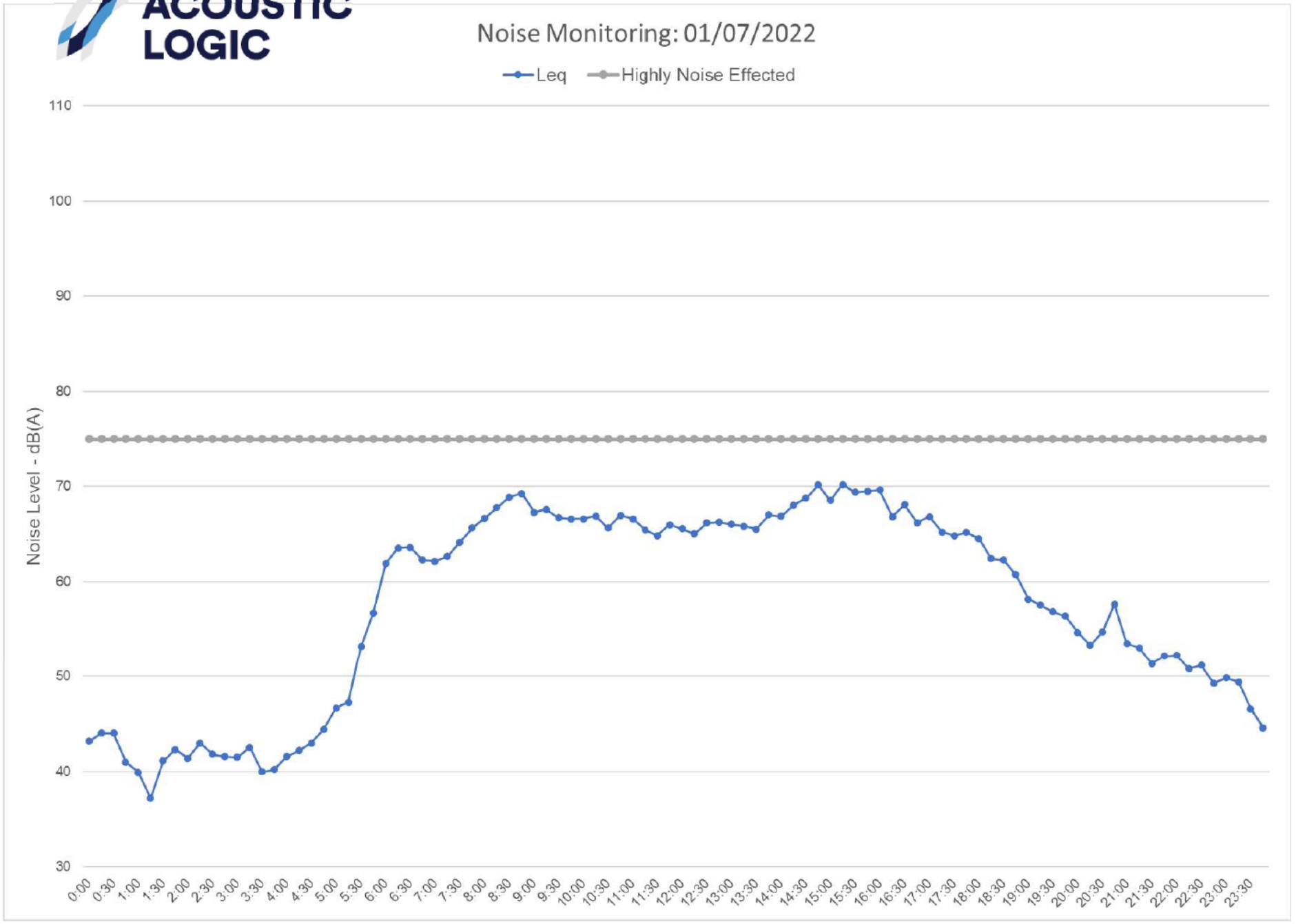
We trust this information is satisfactory. Please contact us should you have any further queries.

Yours faithfully,

Acoustic Logic Pty Ltd

APPENDIX 1 – NOISE MONITORING RESULTS

ACOUSTIC LOGIC



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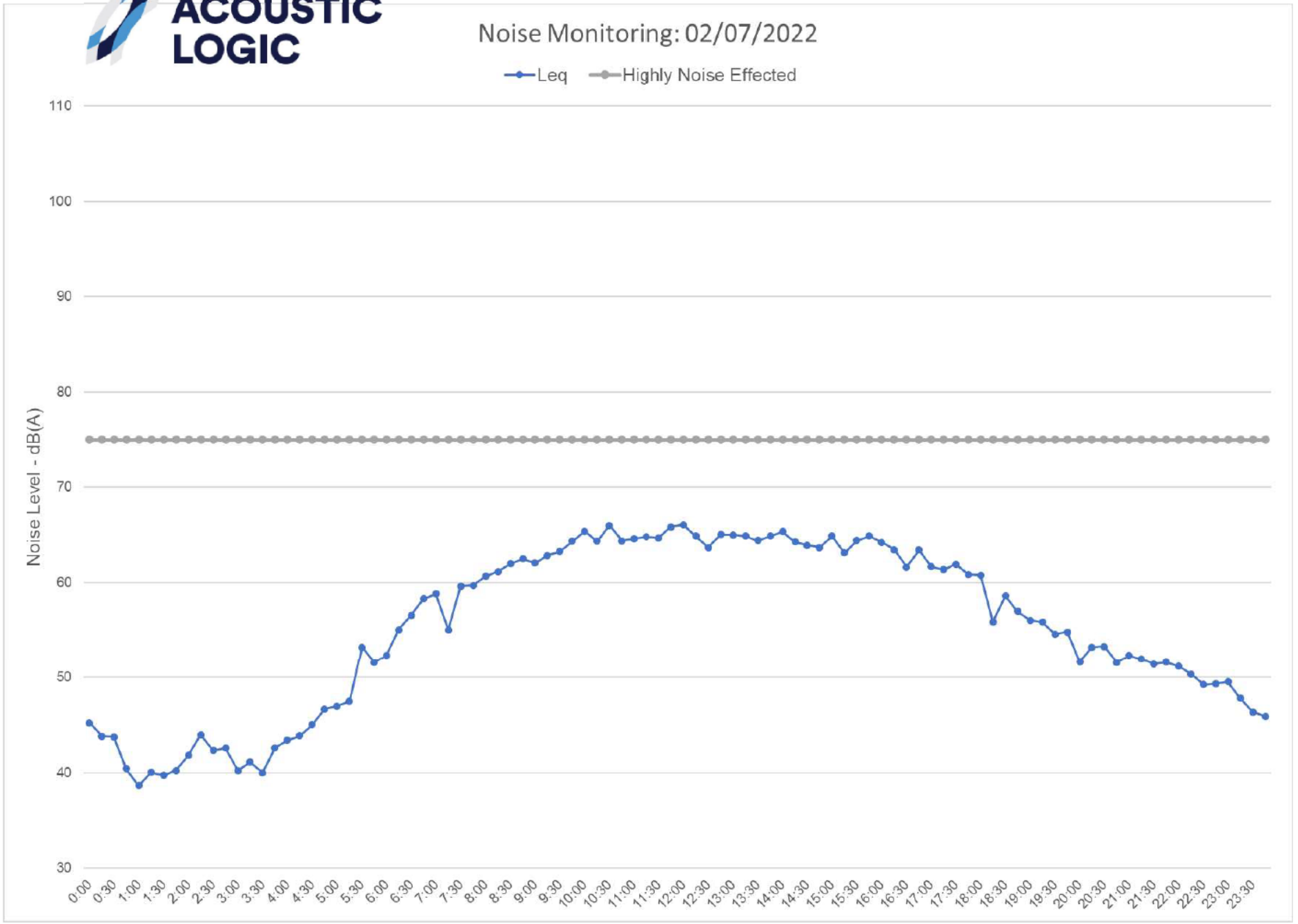

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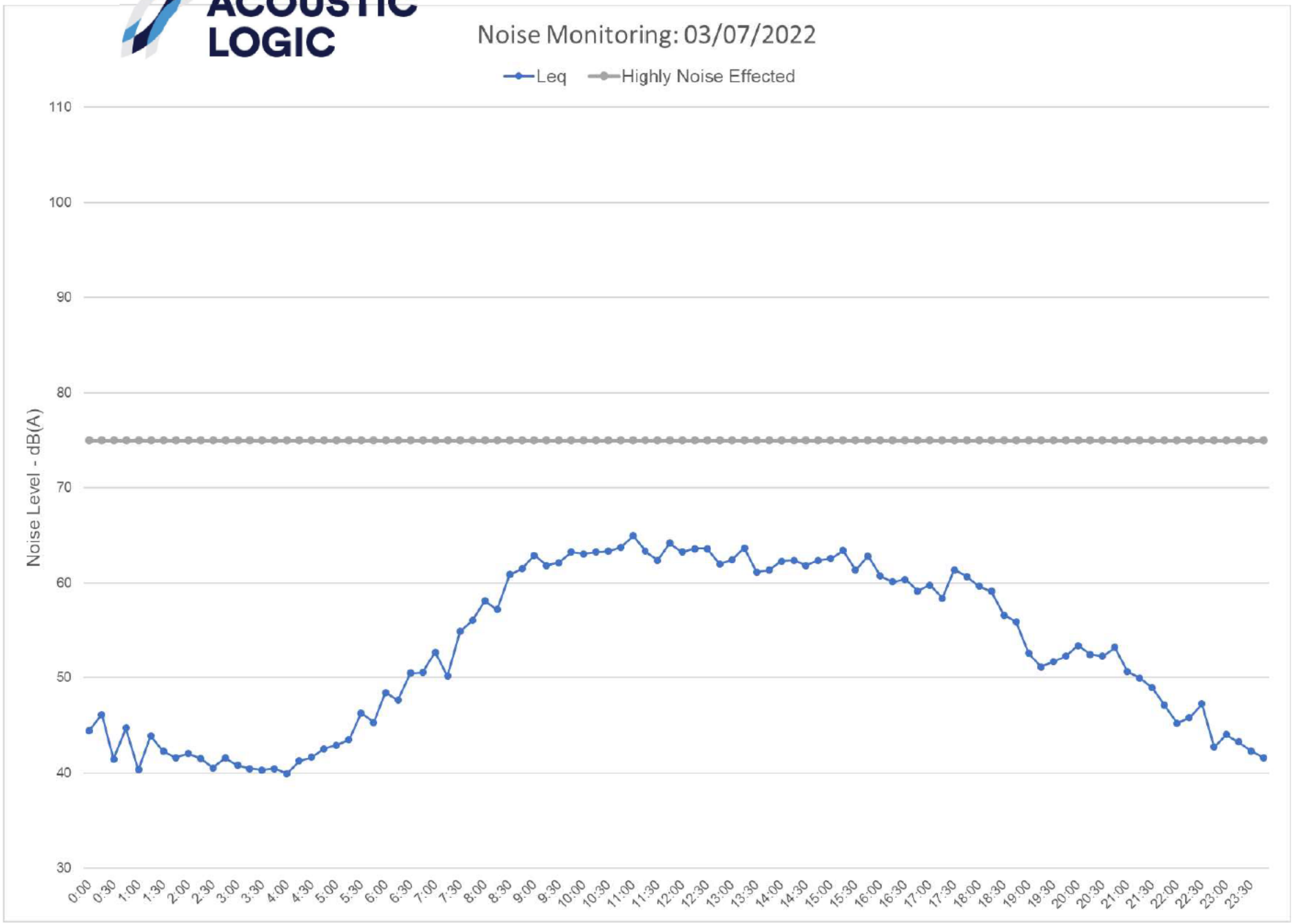

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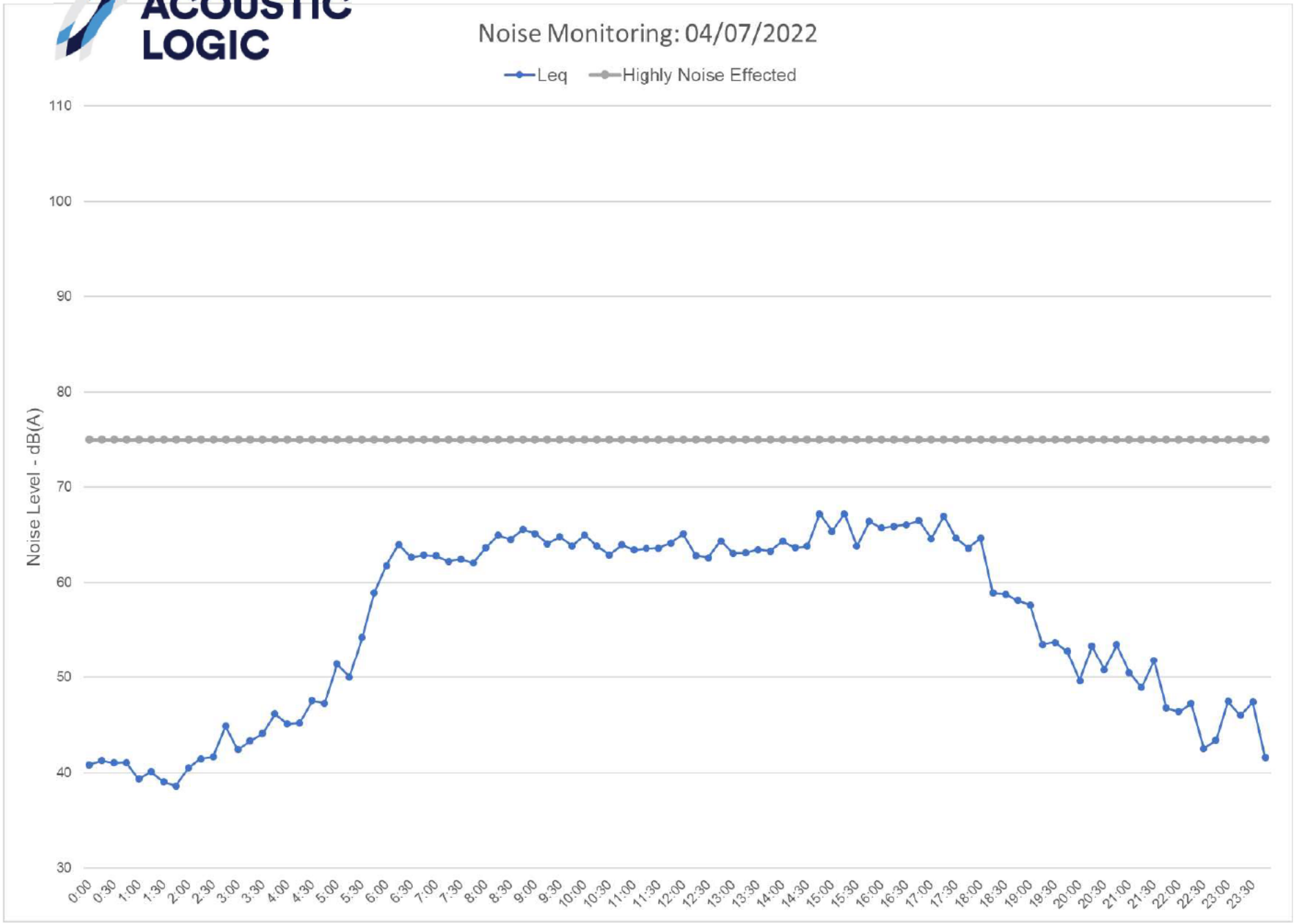

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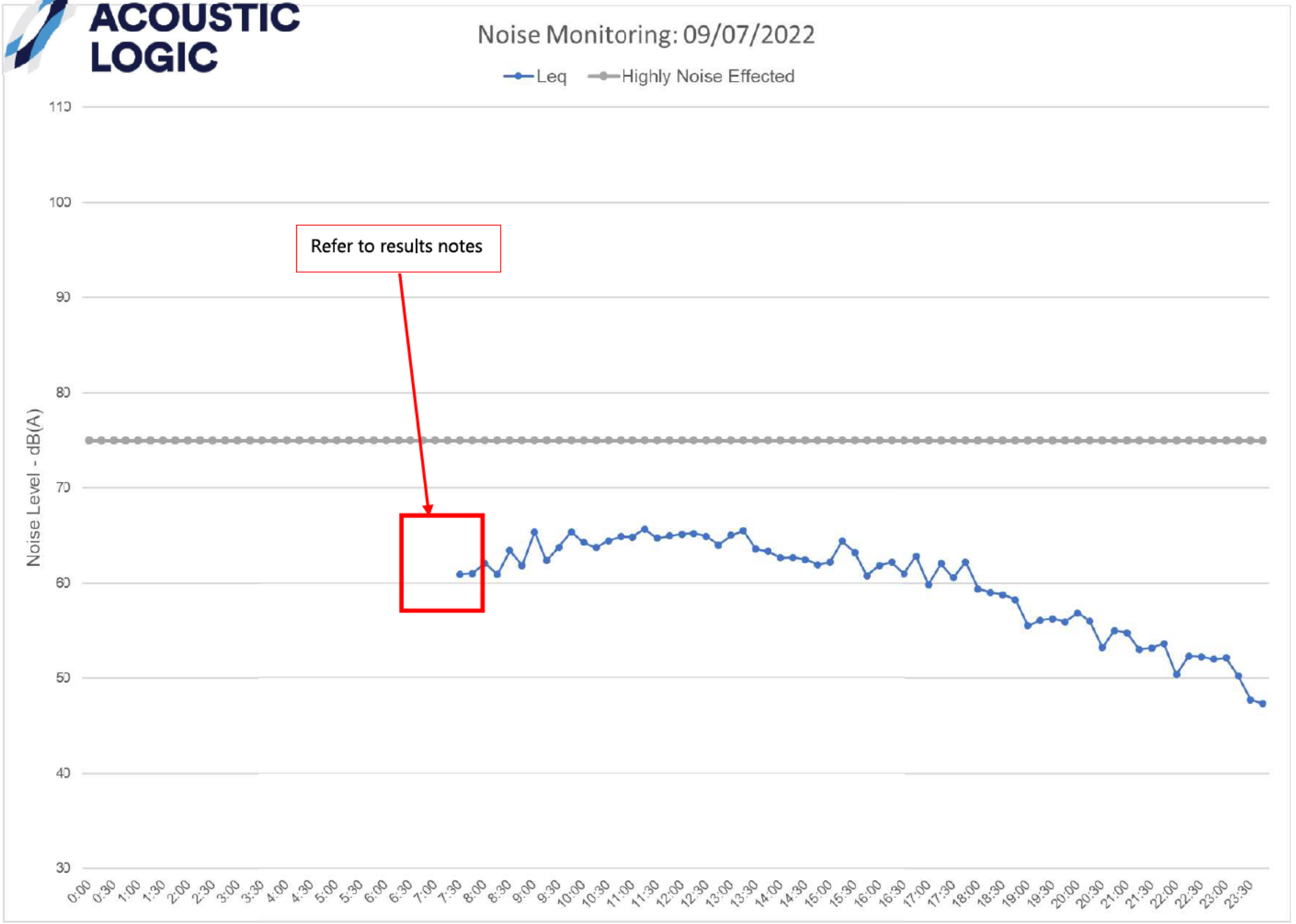

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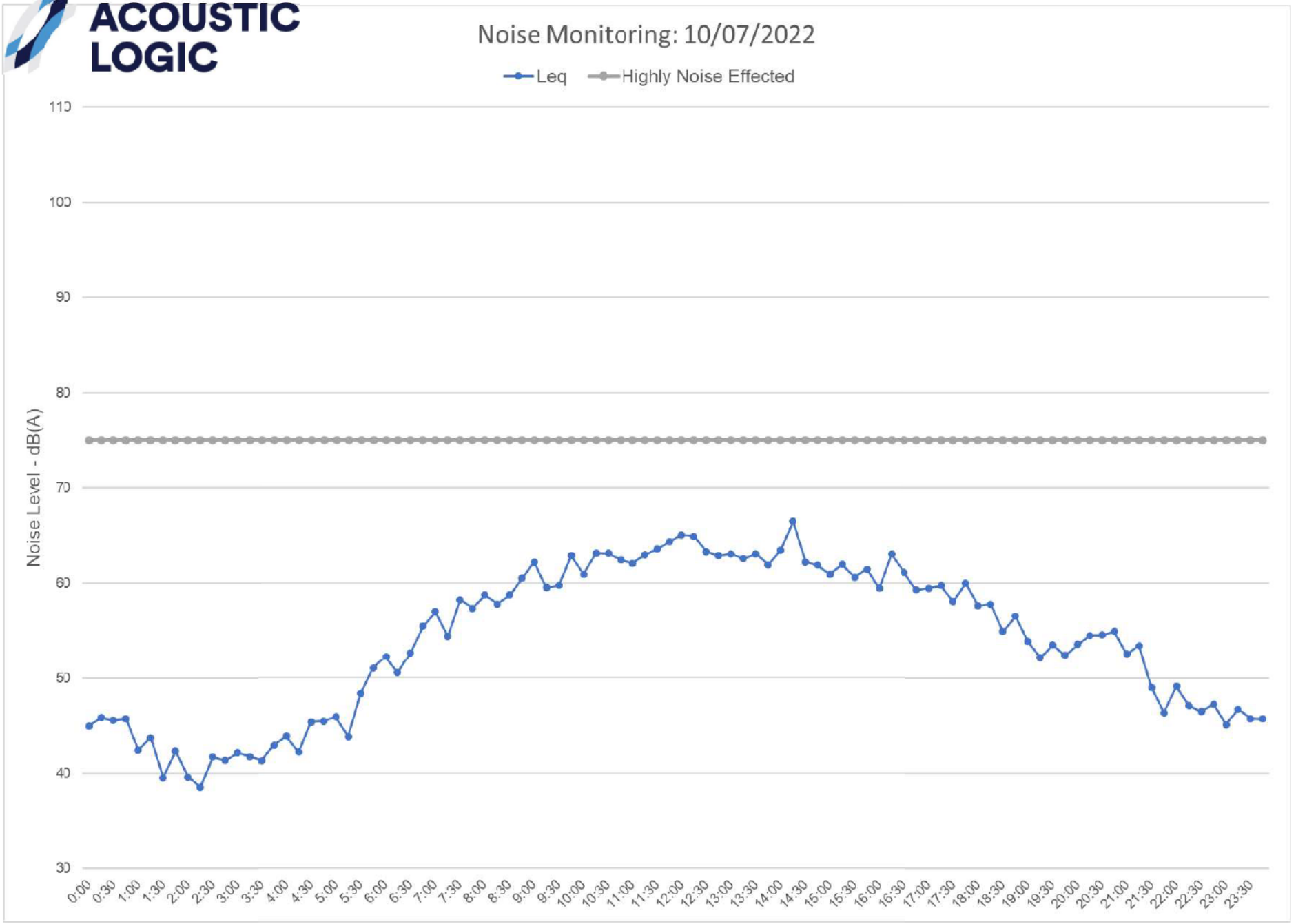

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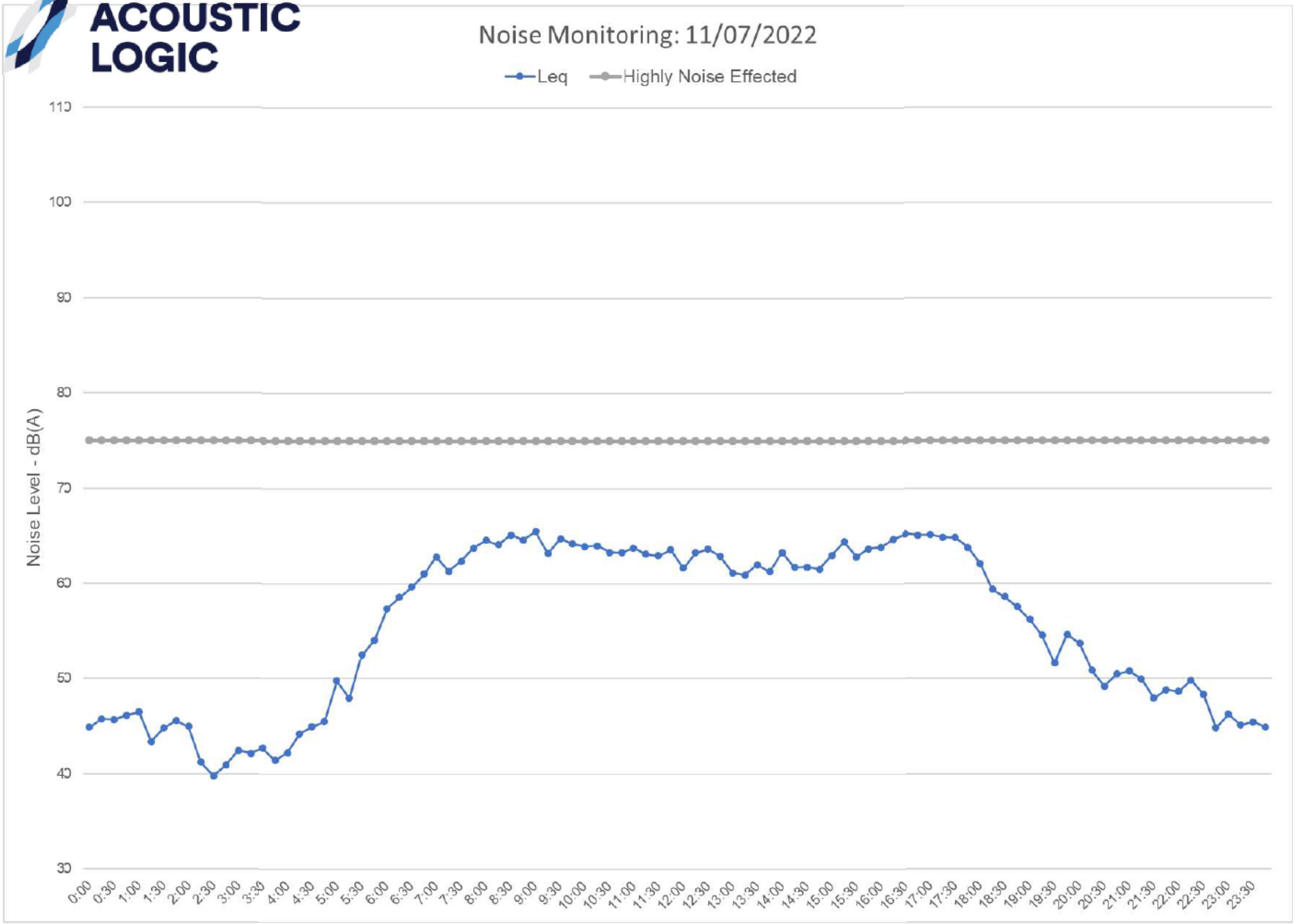

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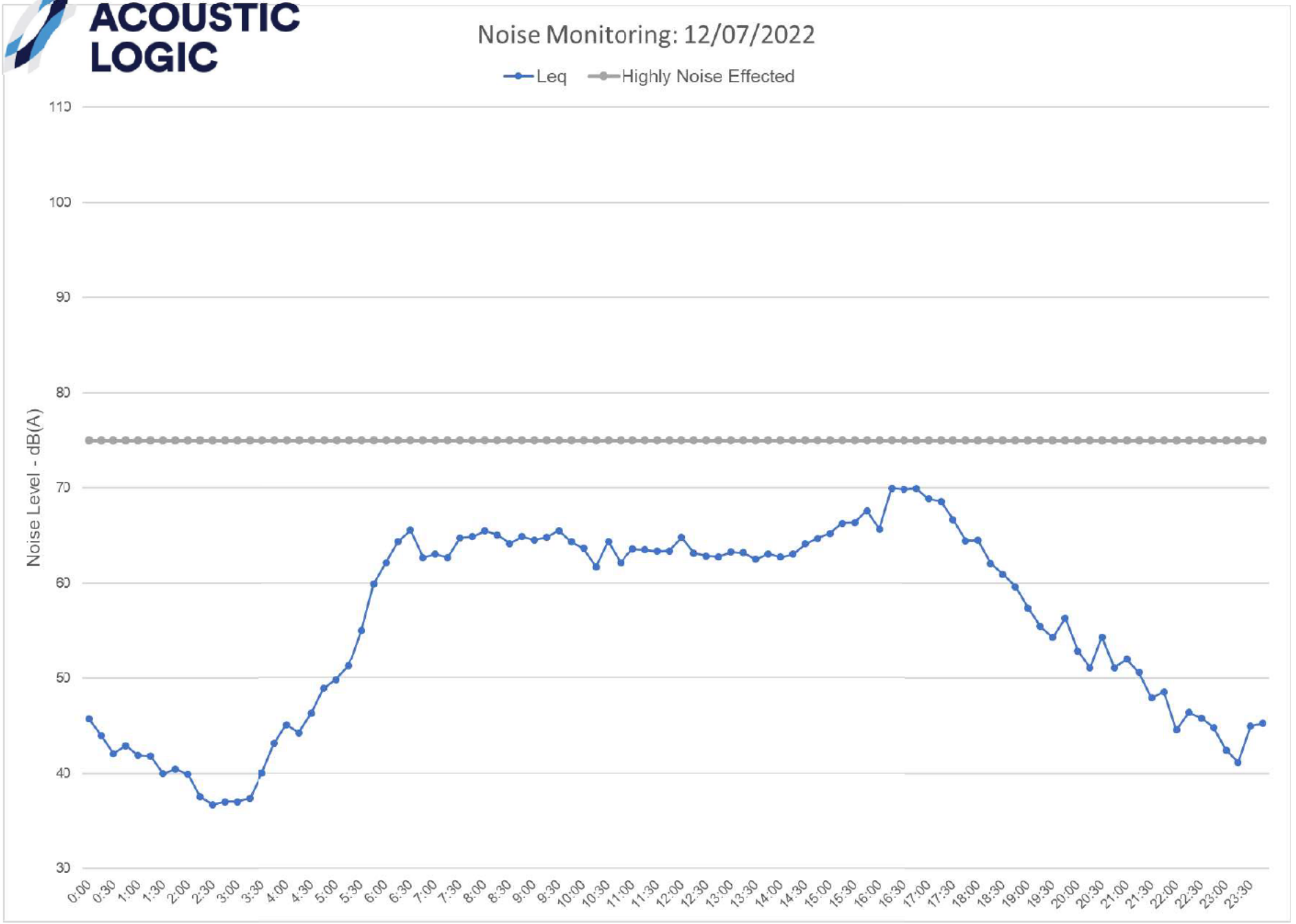

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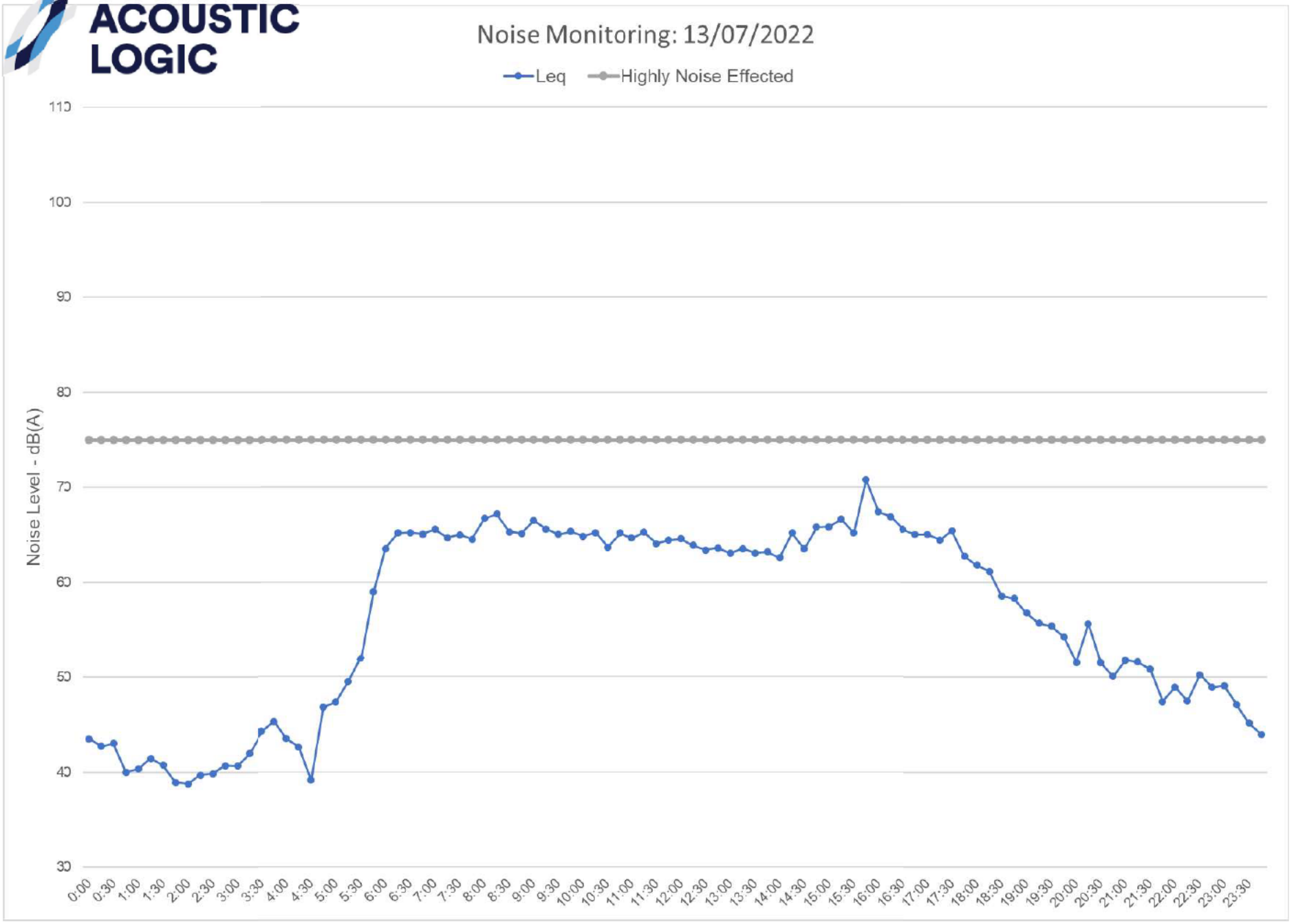

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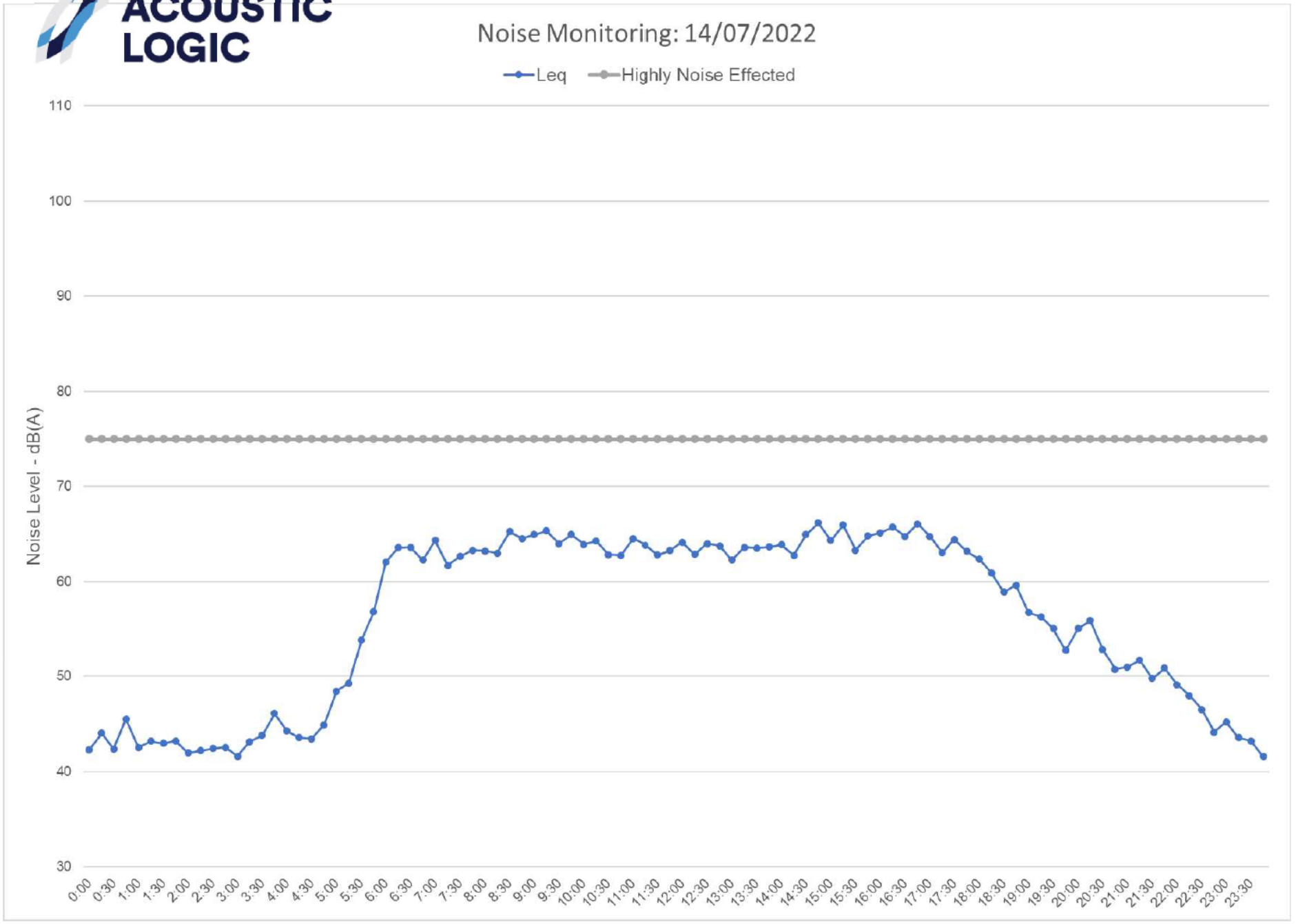

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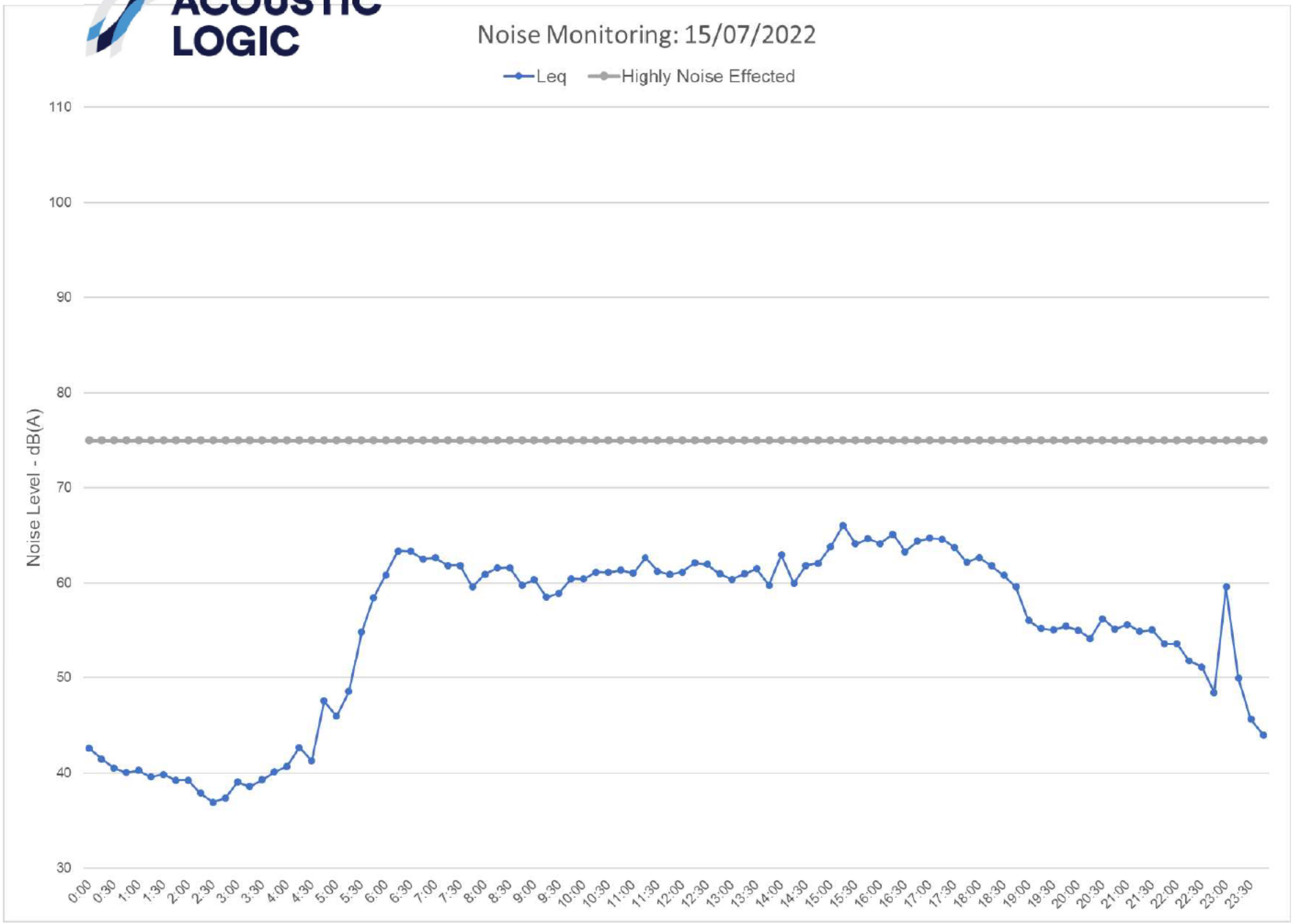

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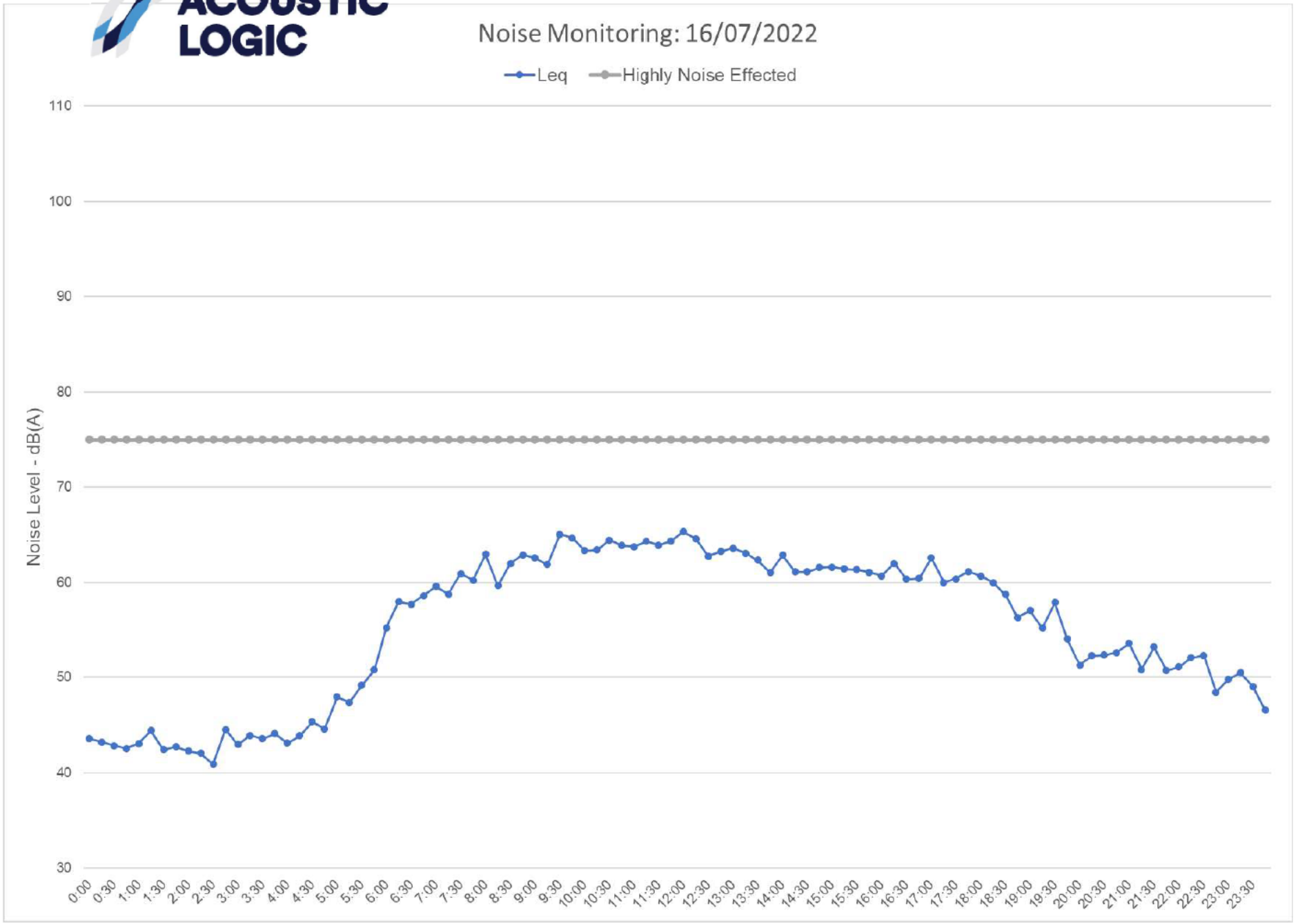

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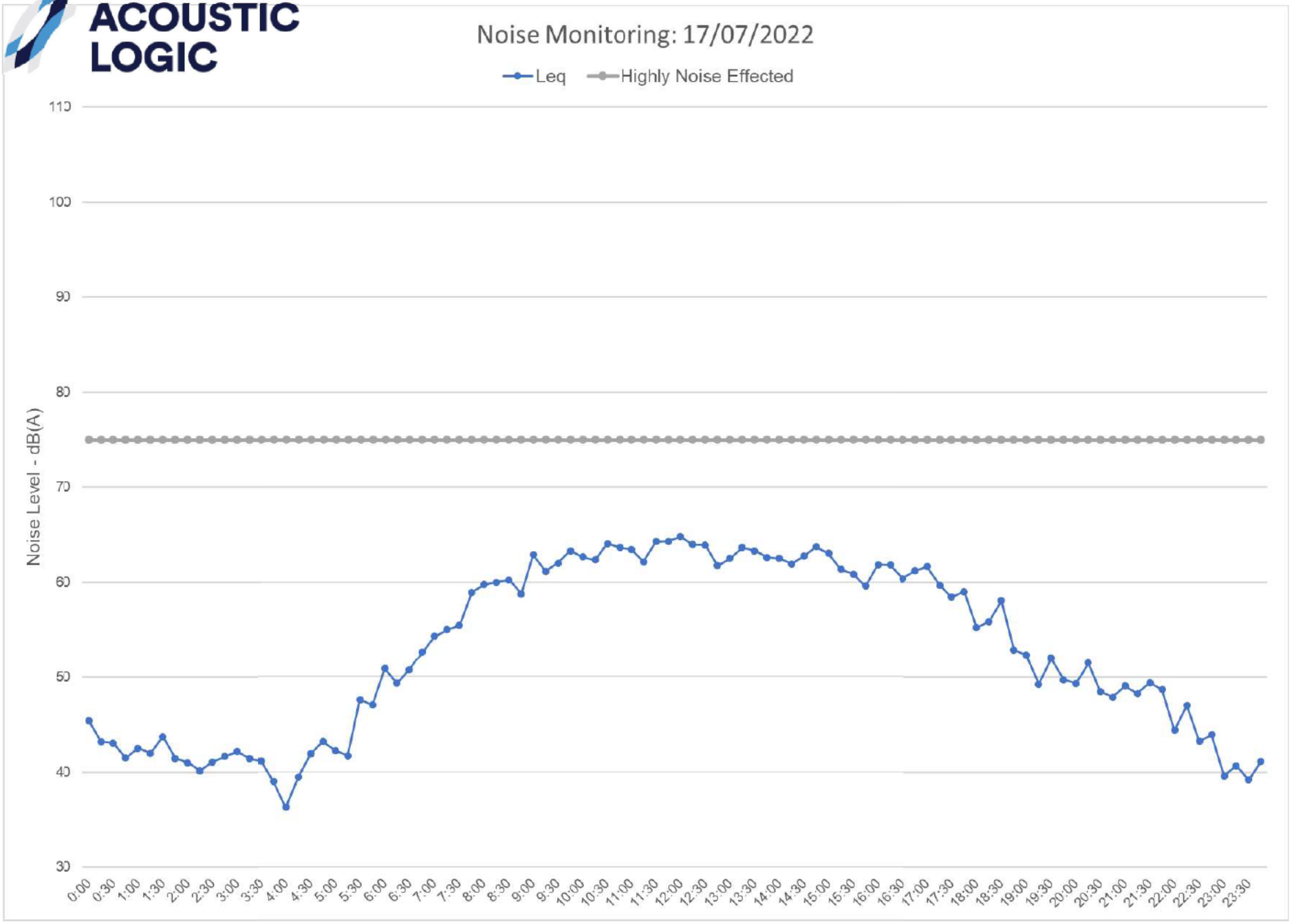

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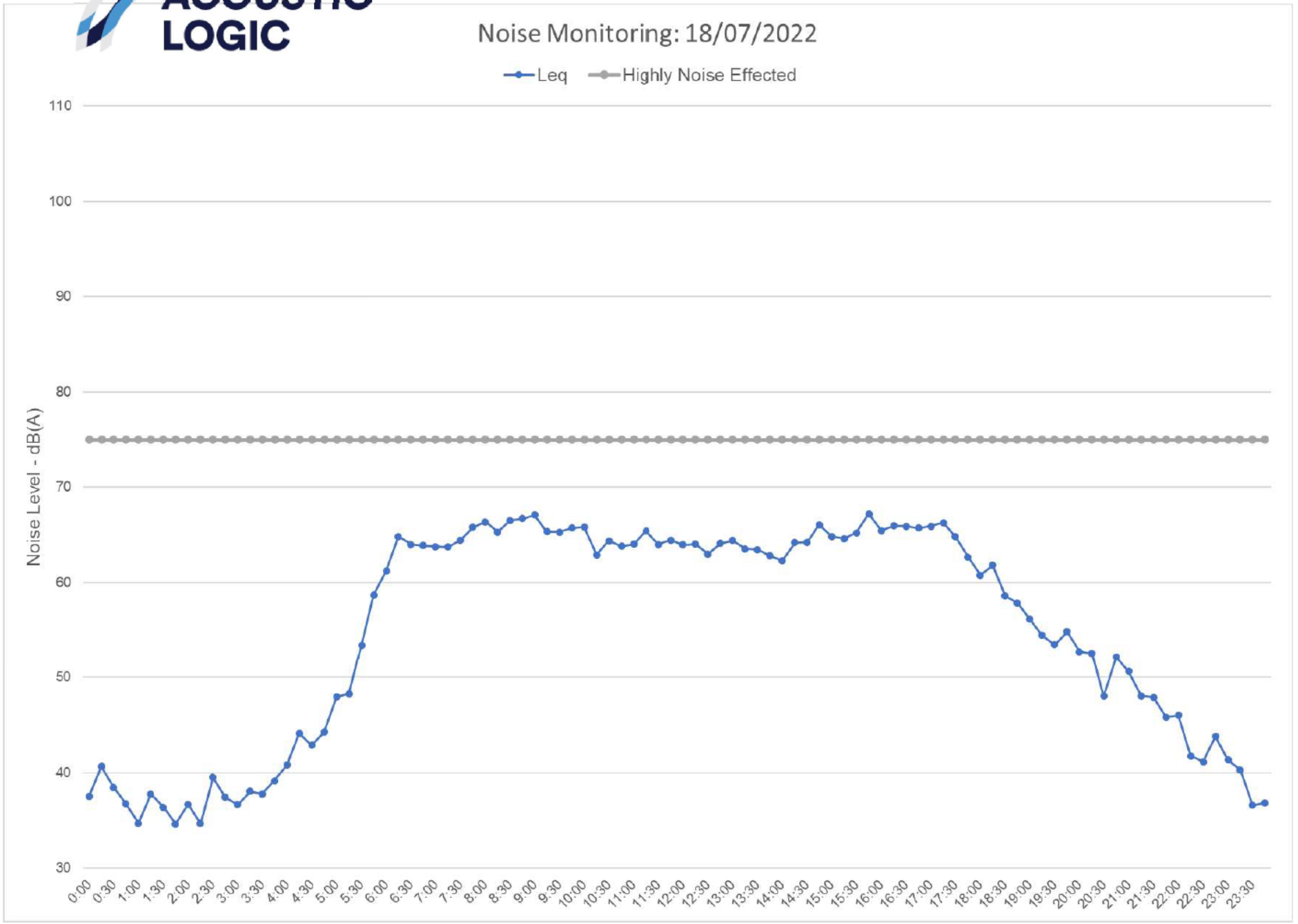

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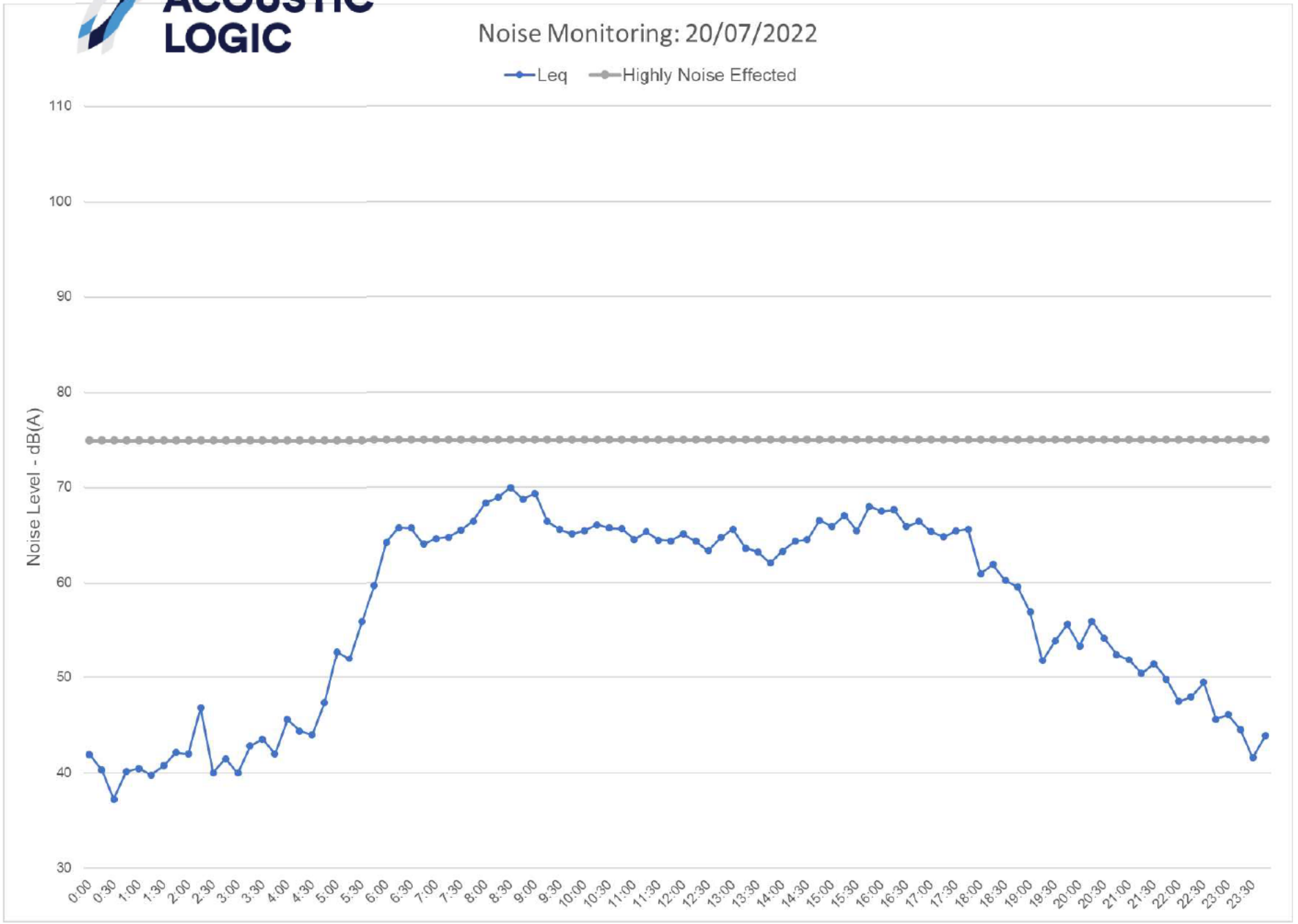
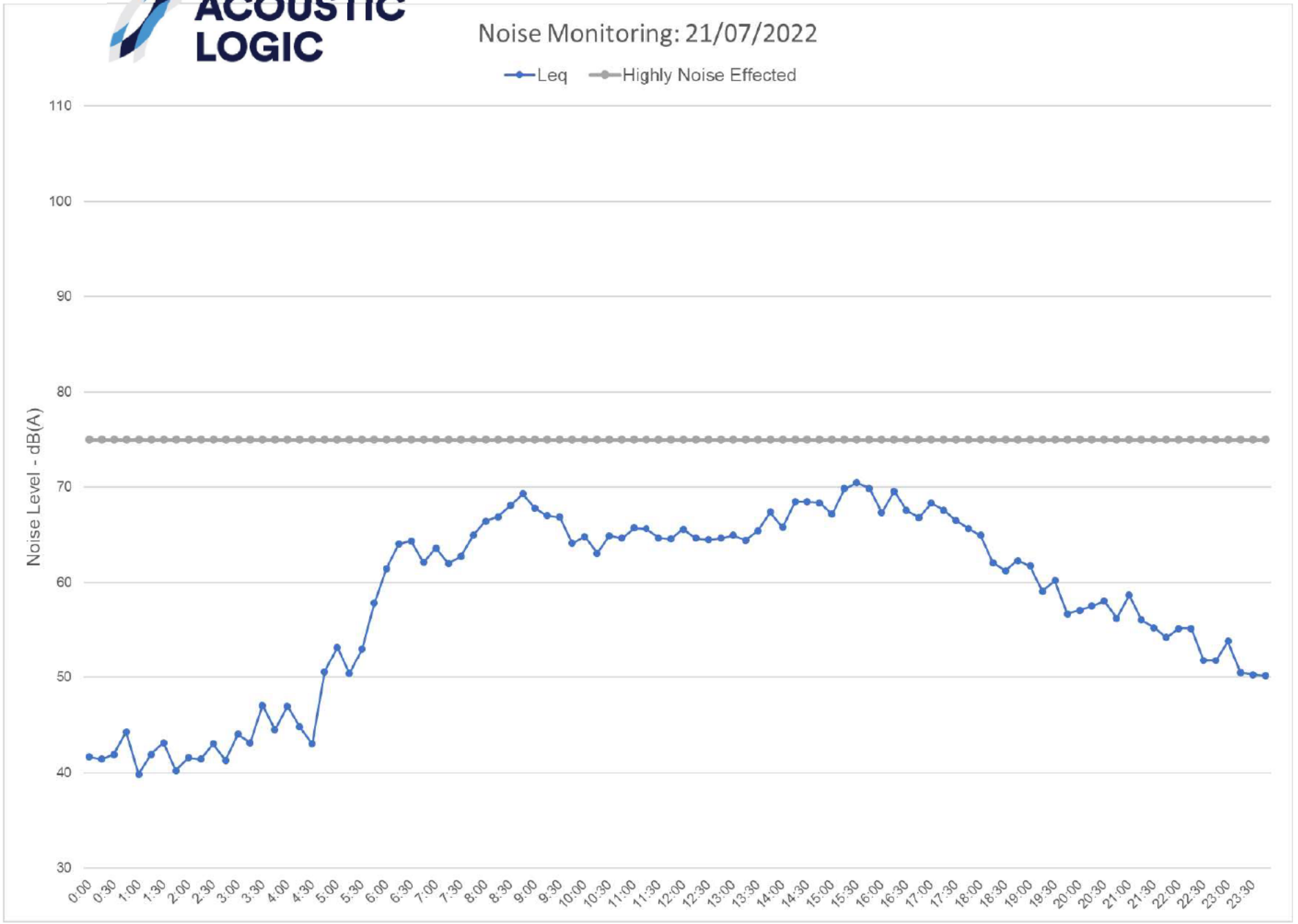


ACOUSTIC LOGIC



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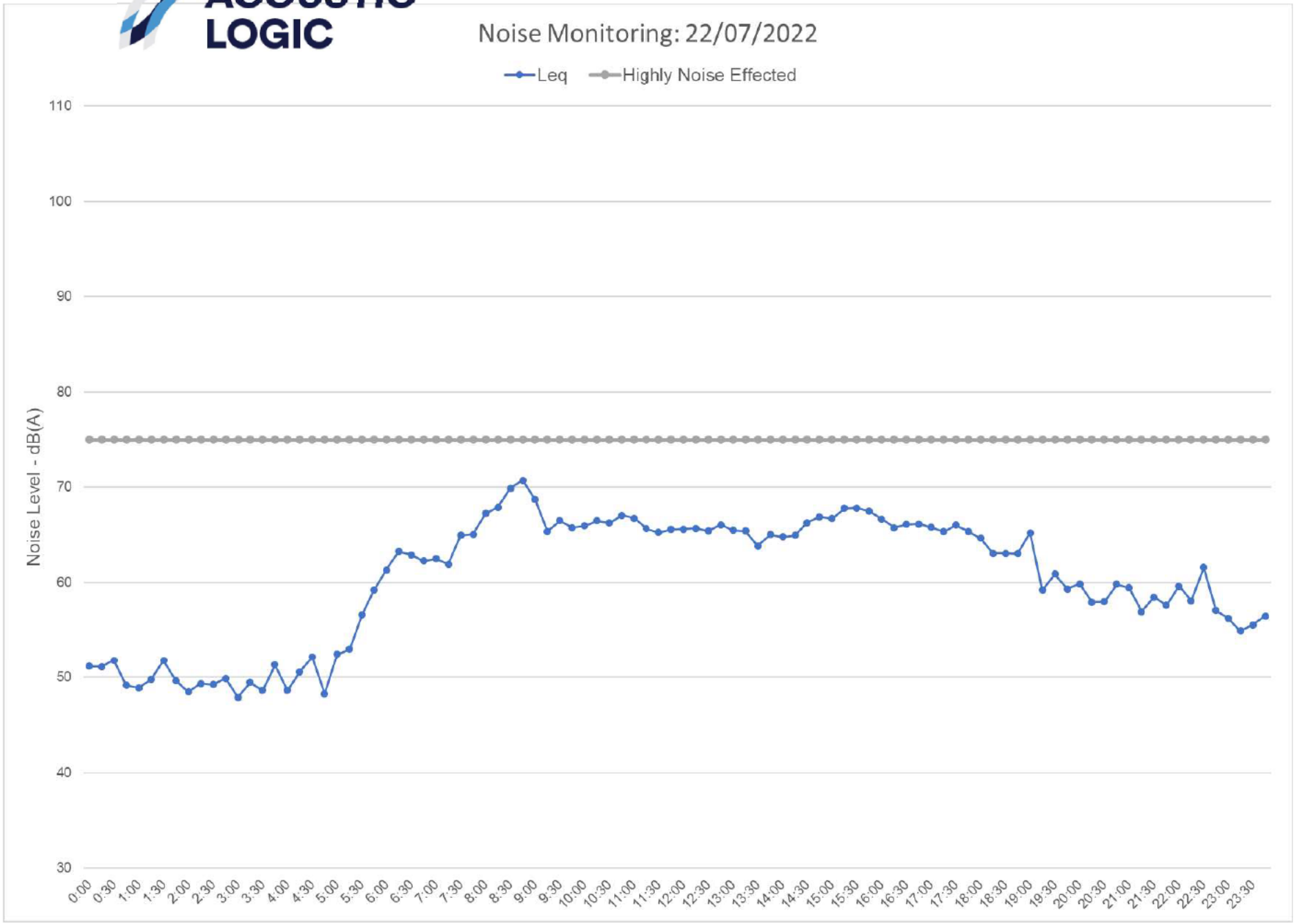

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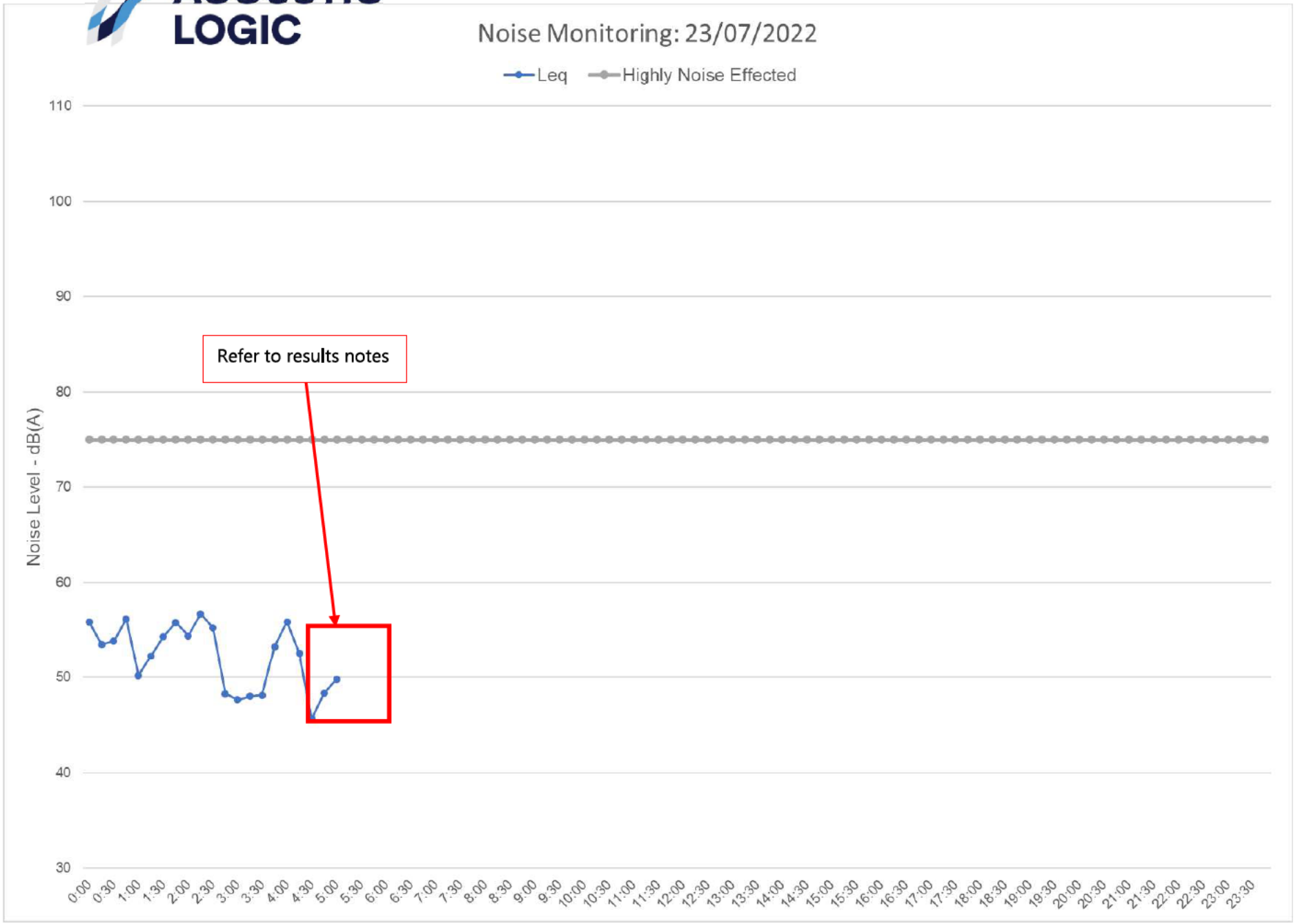

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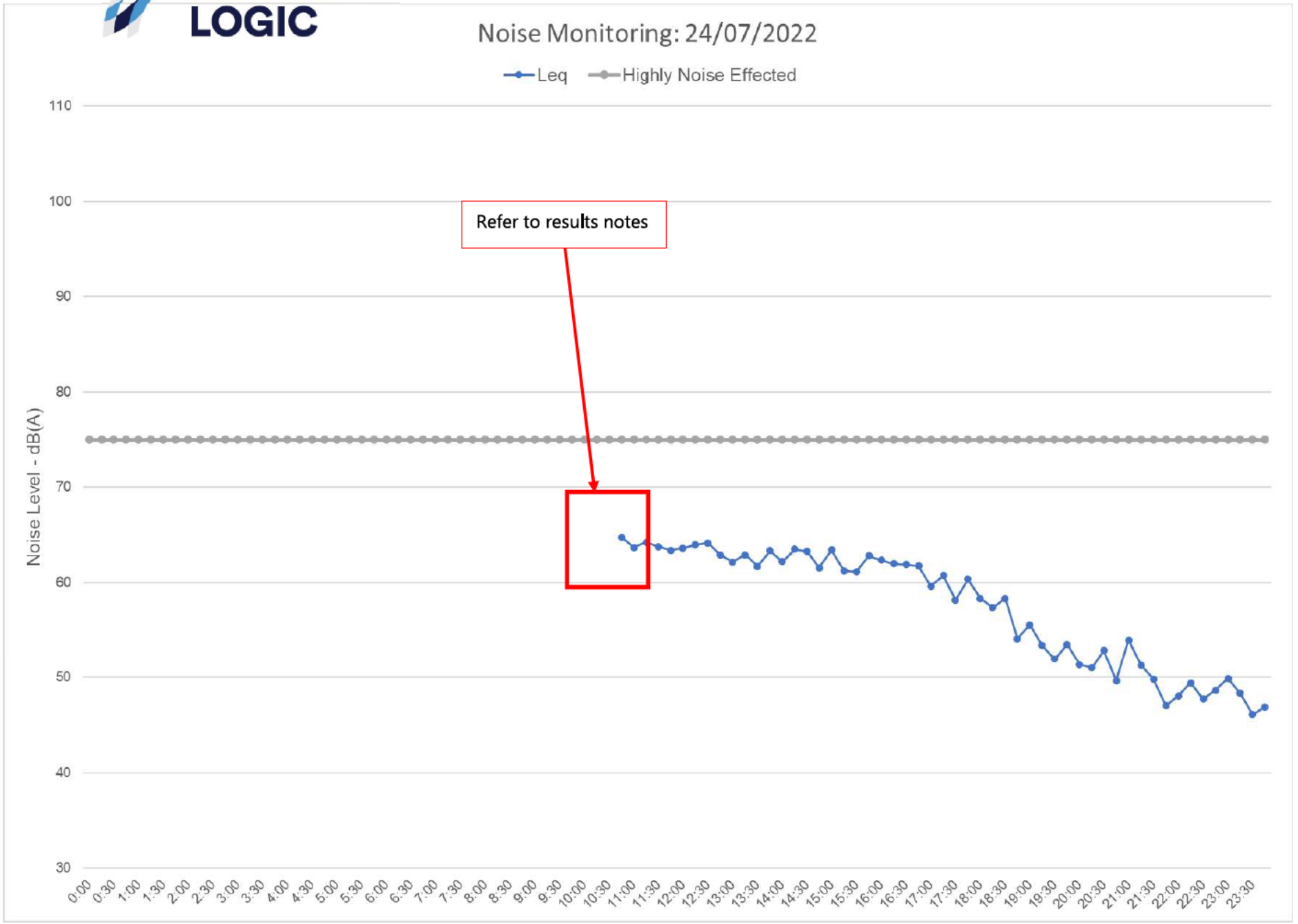

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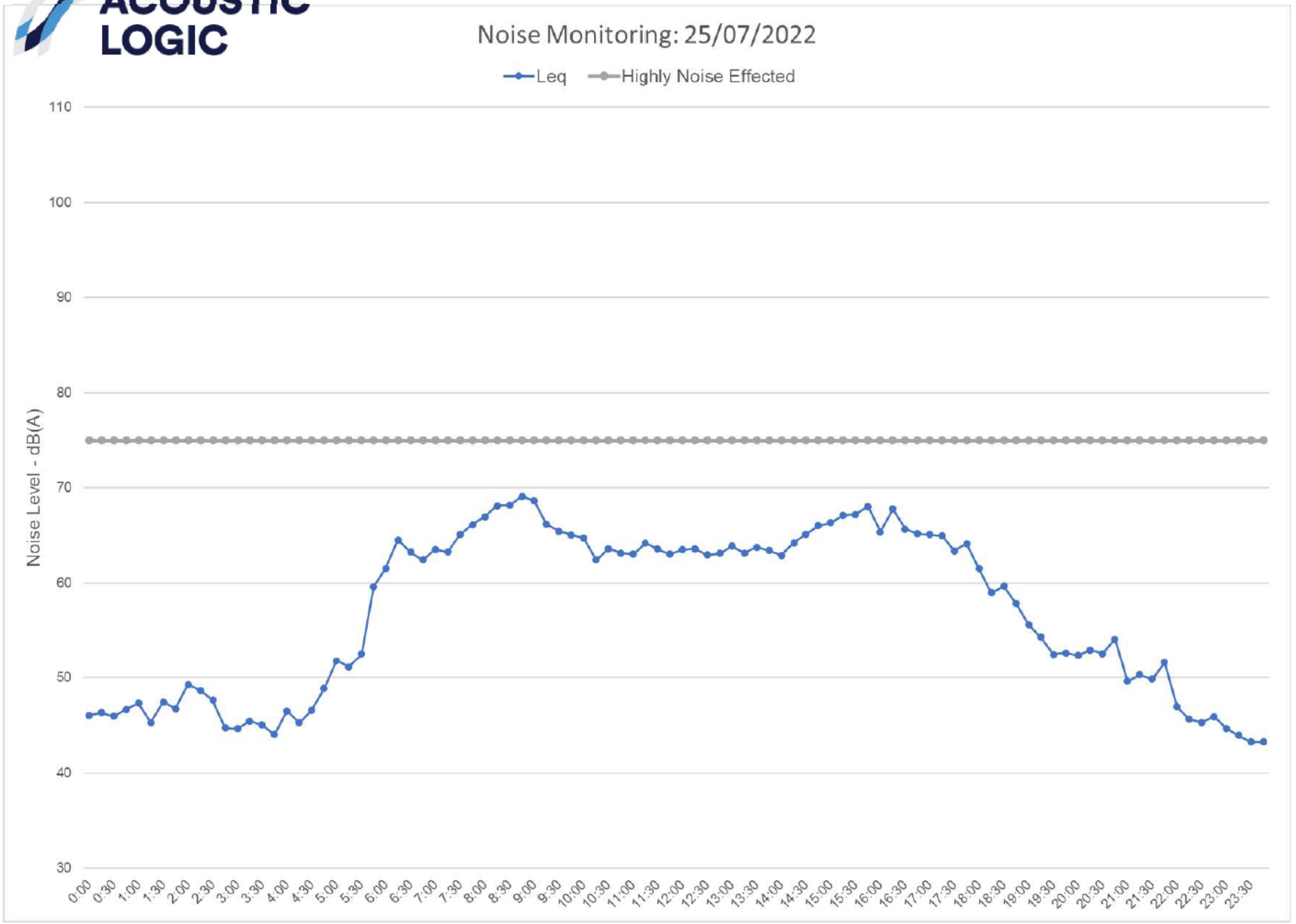

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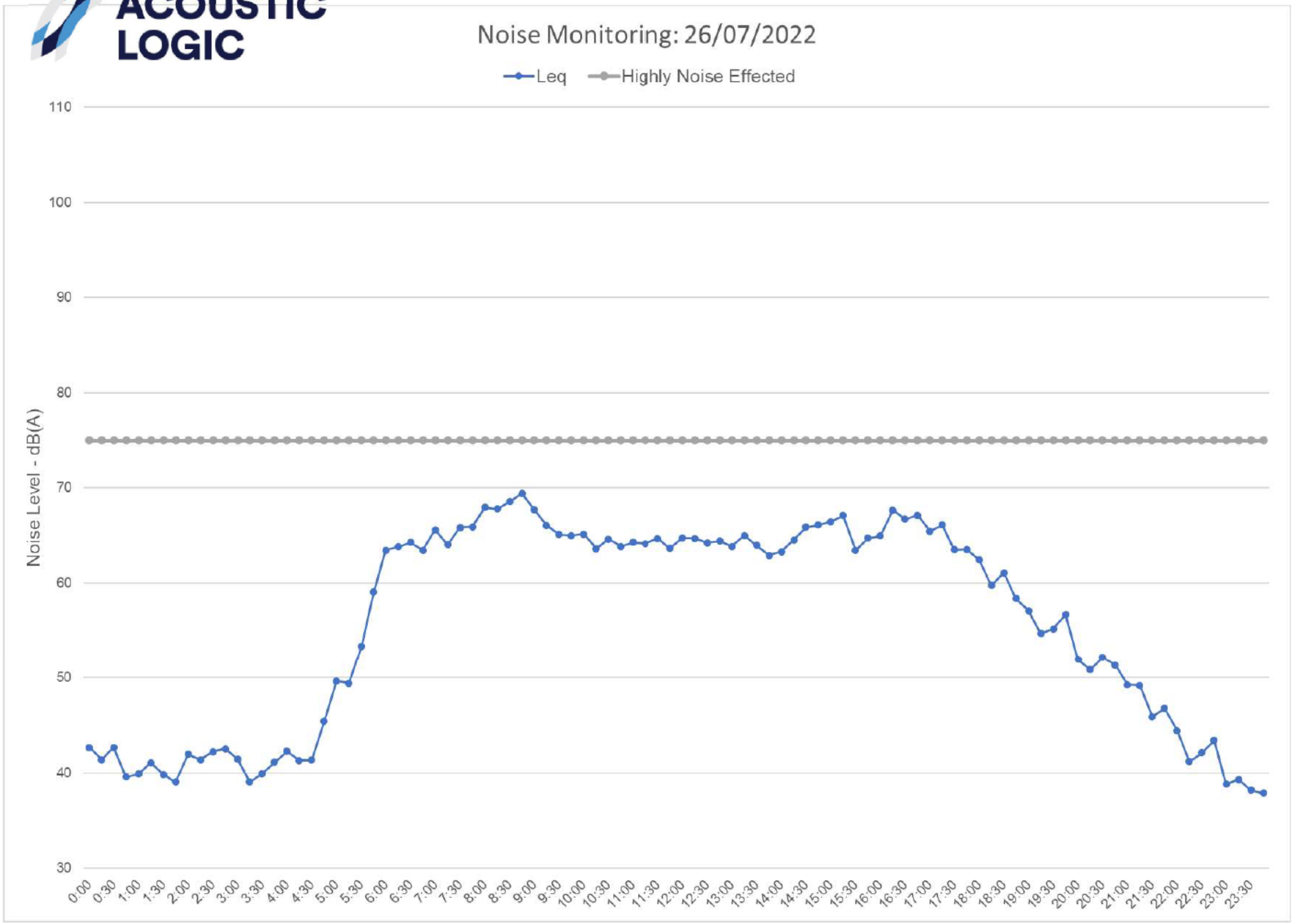

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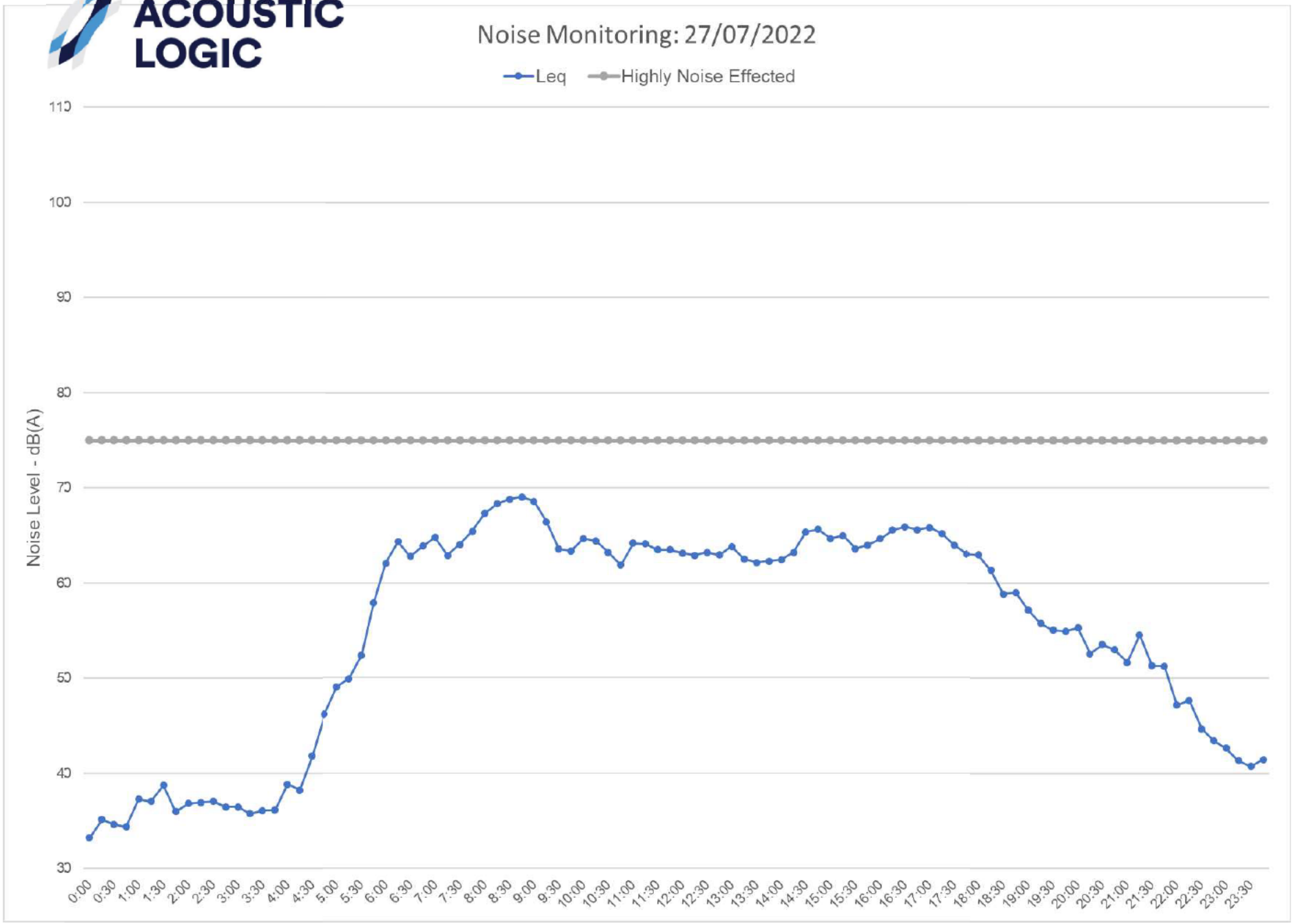

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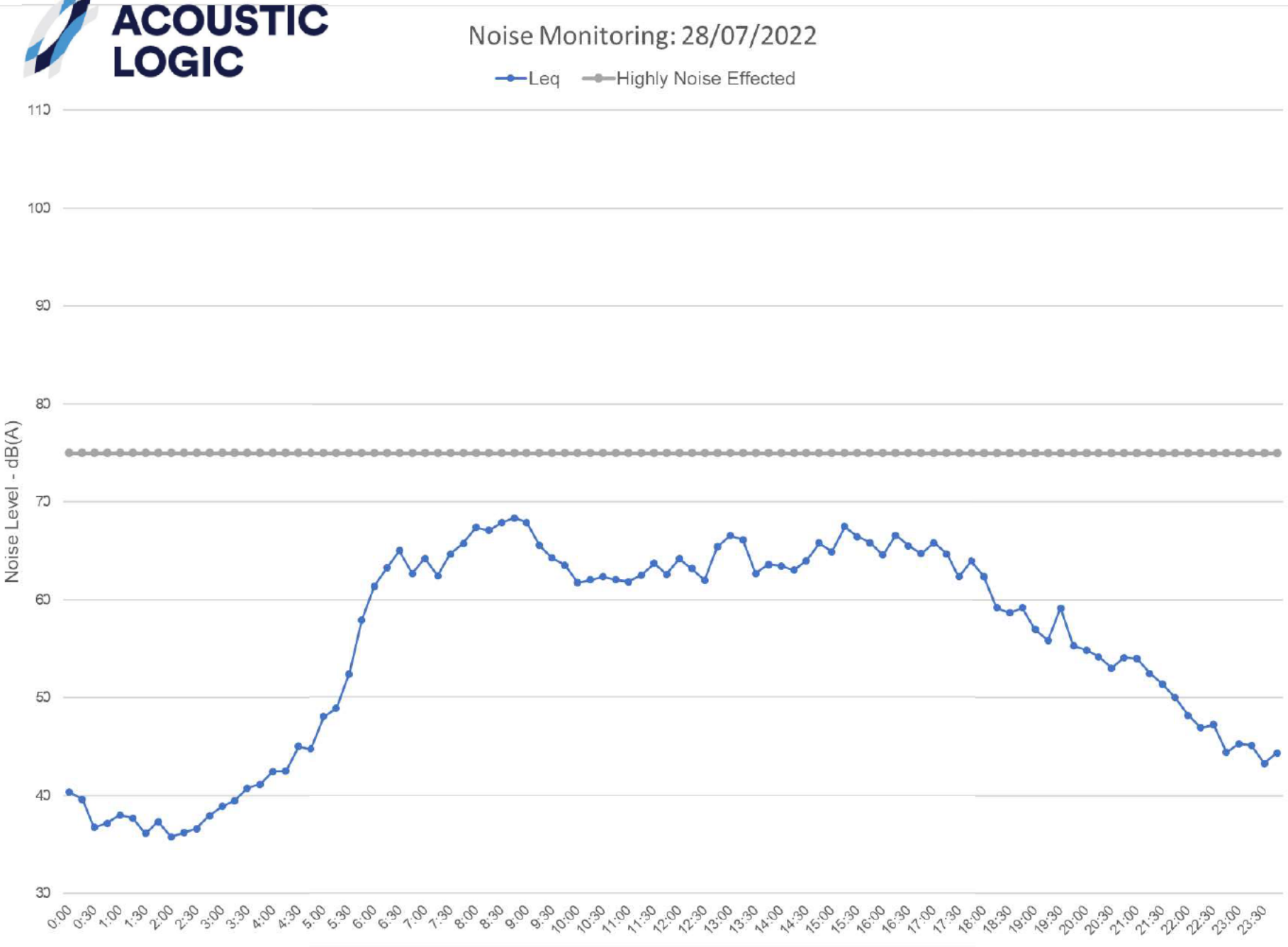

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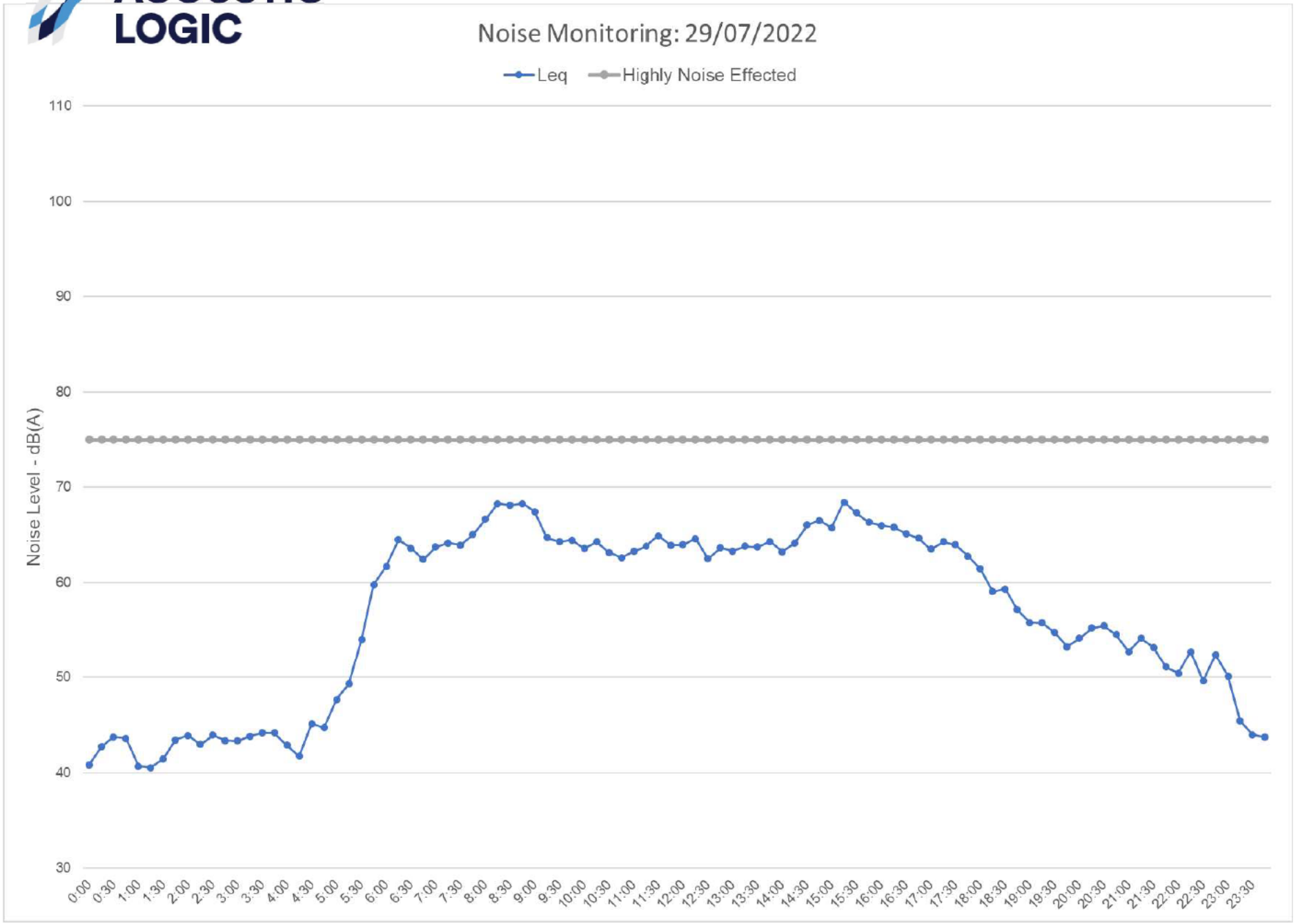

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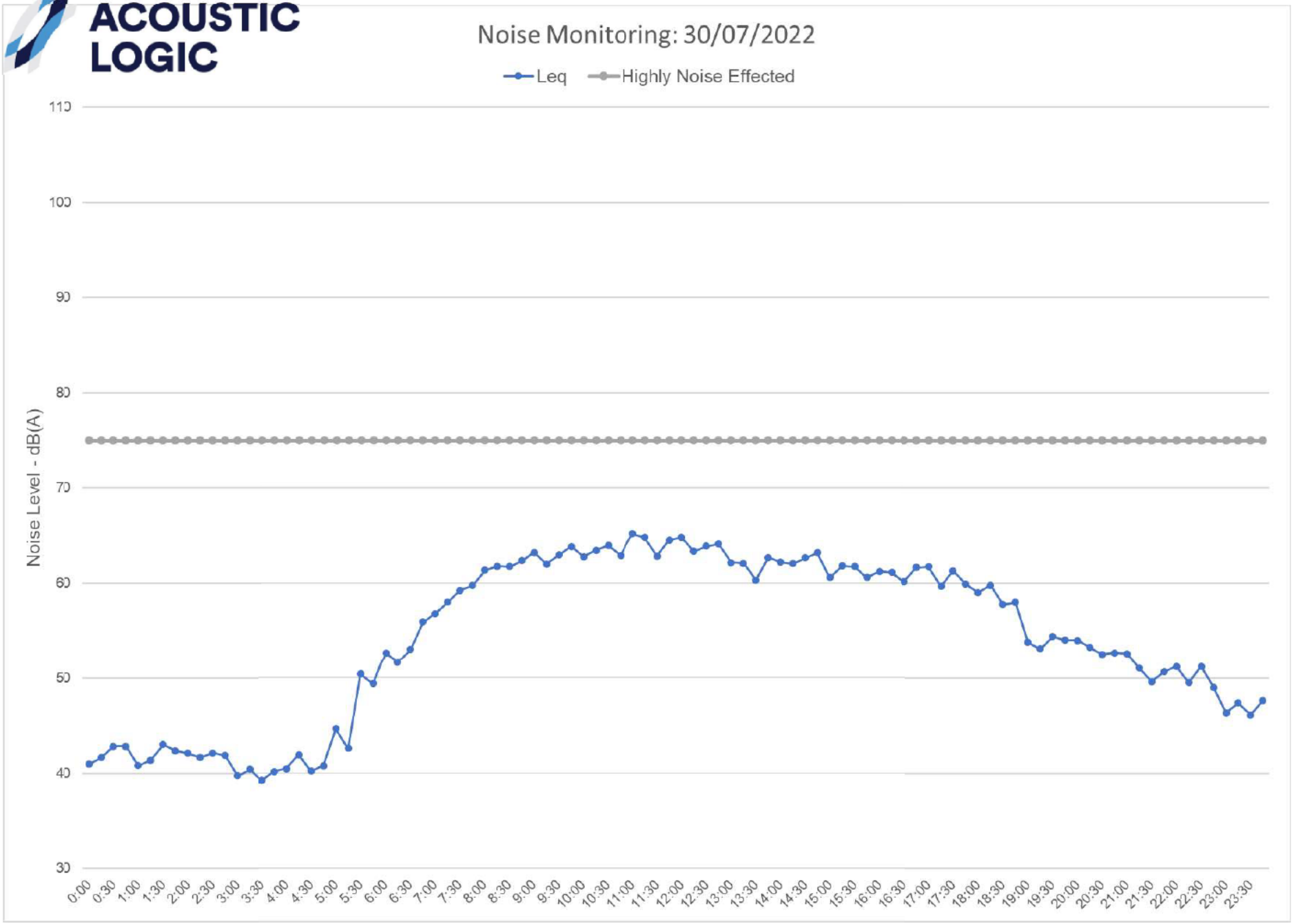

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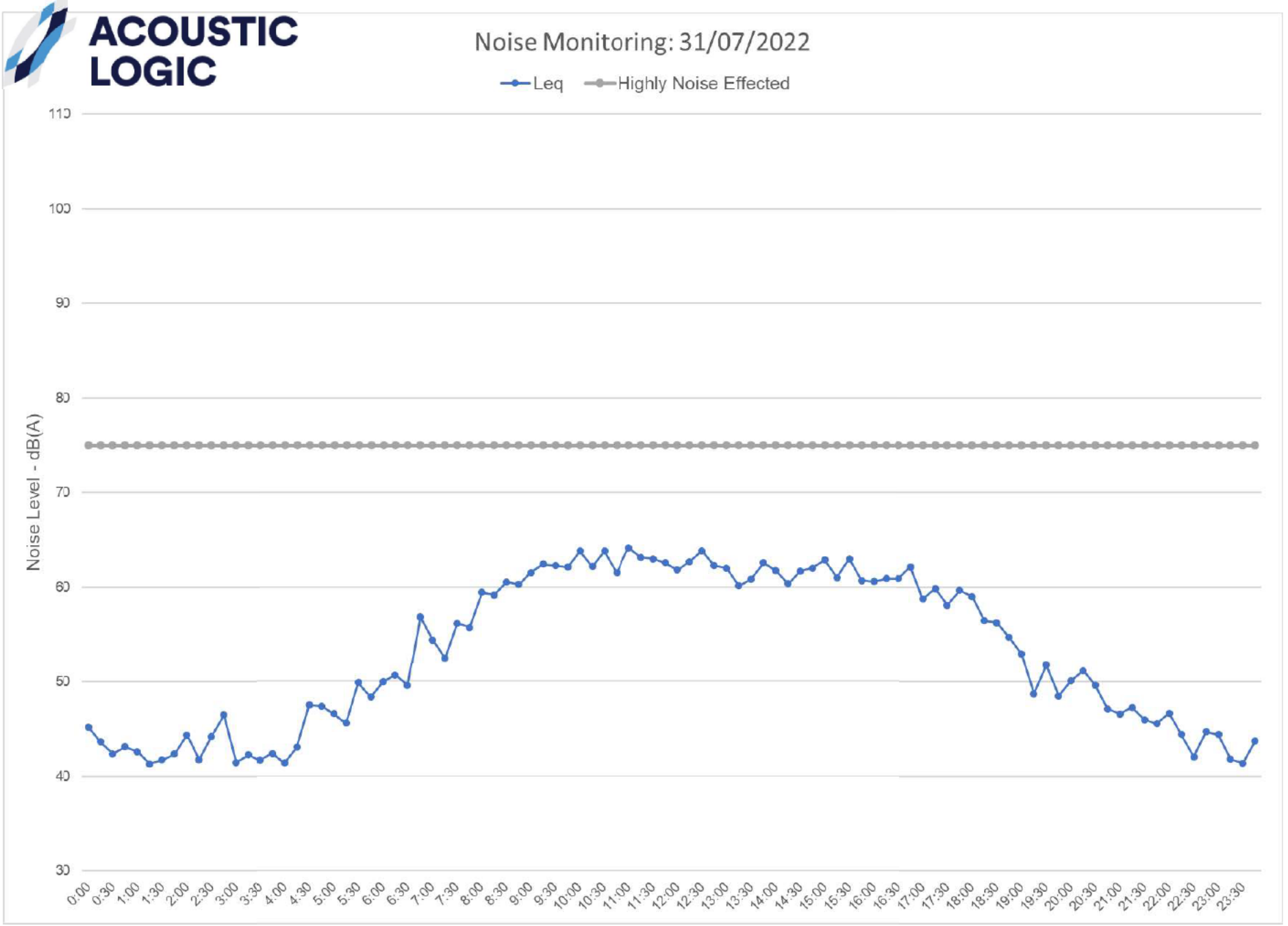
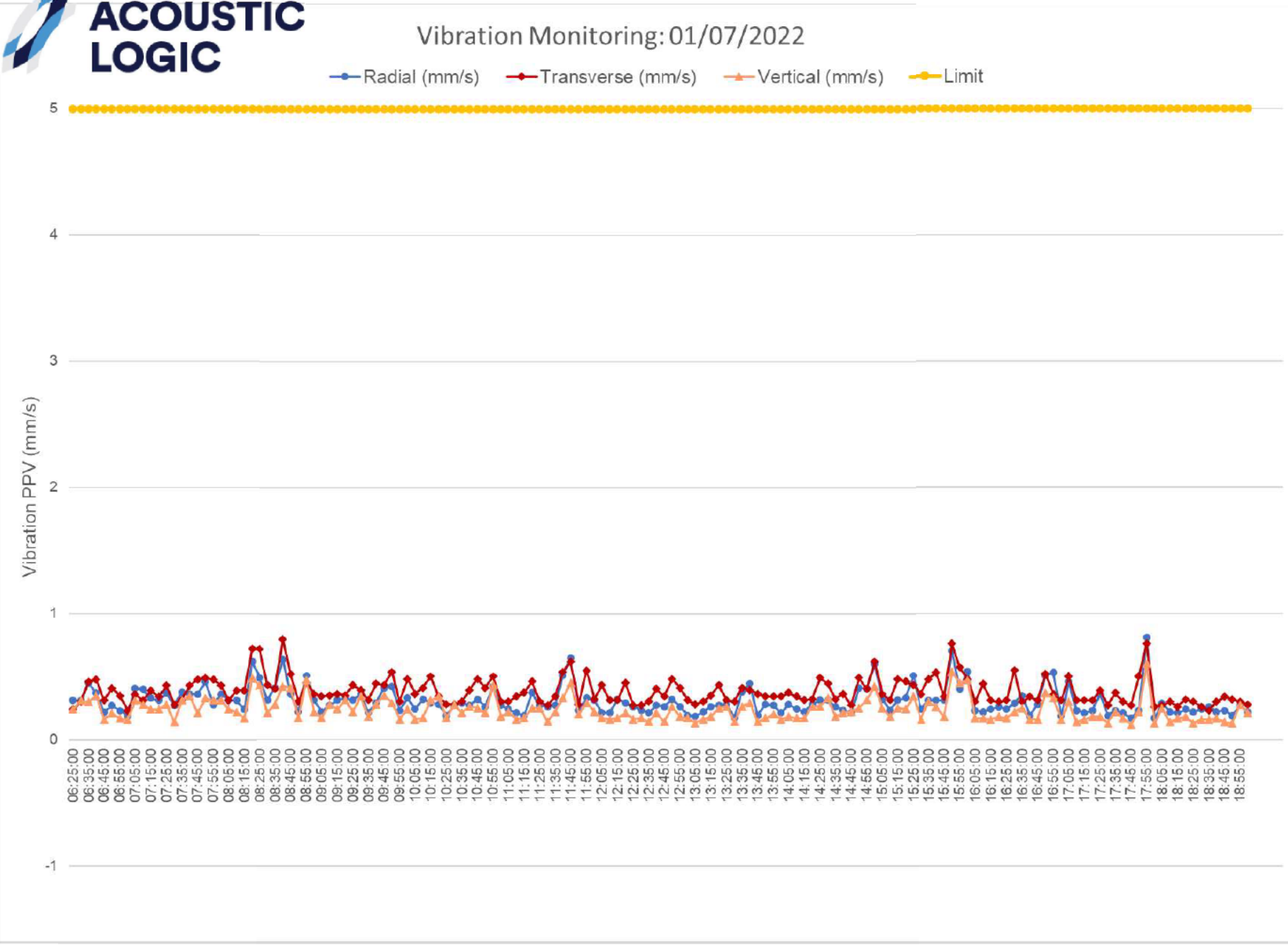


APPENDIX 2 – VIBRATION MONITORING RESULTS

ACOUSTIC LOGIC



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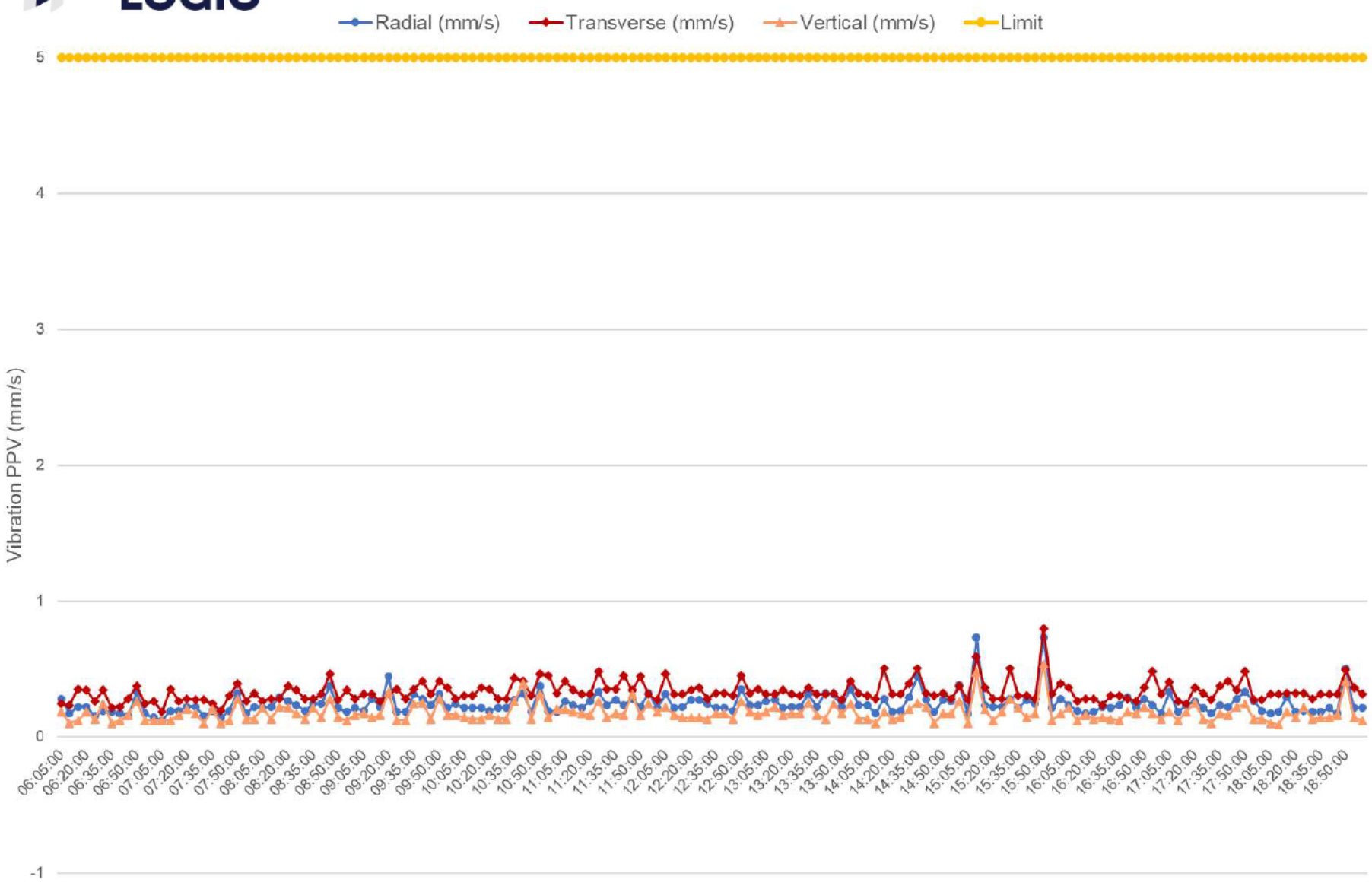

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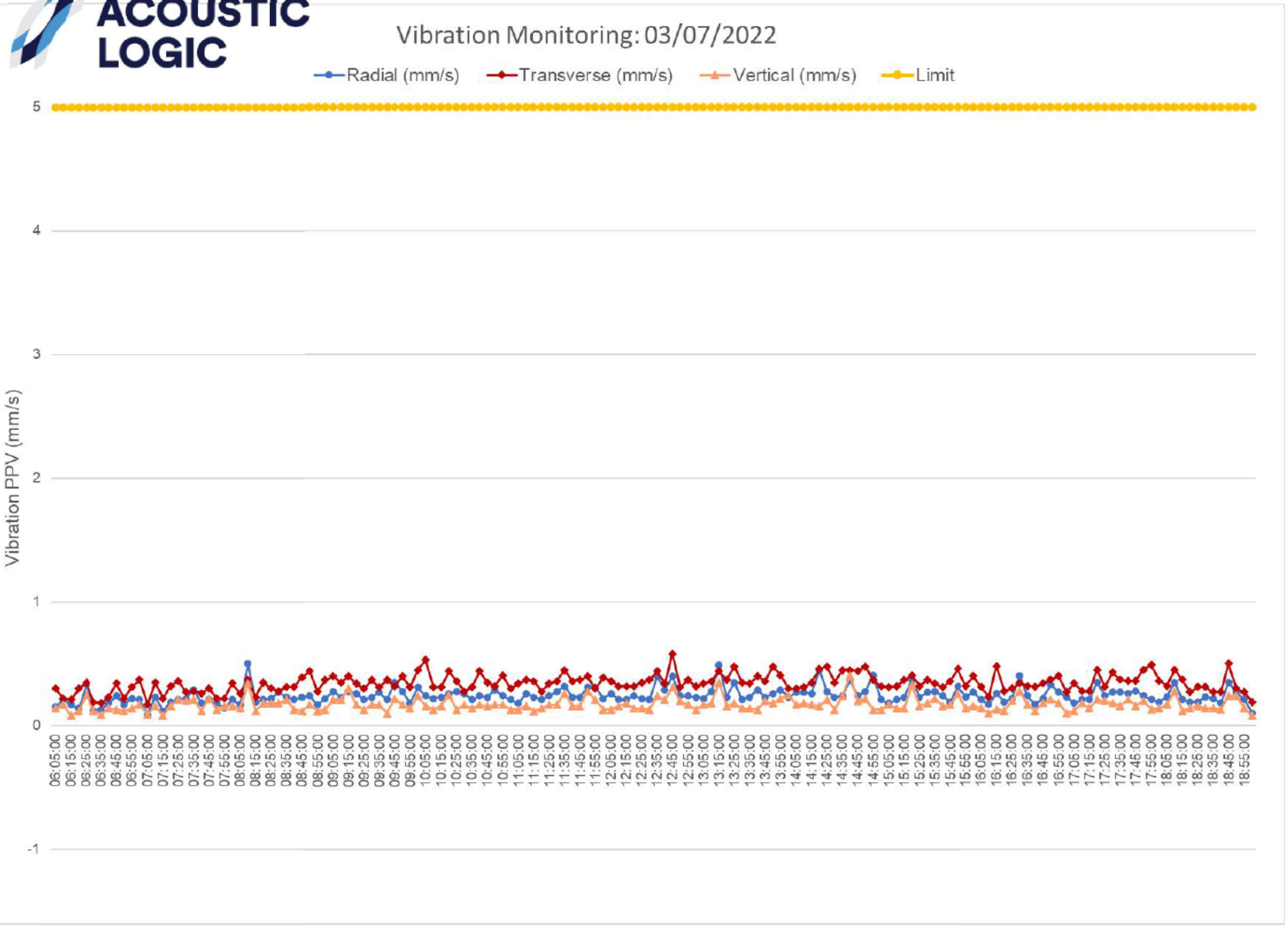

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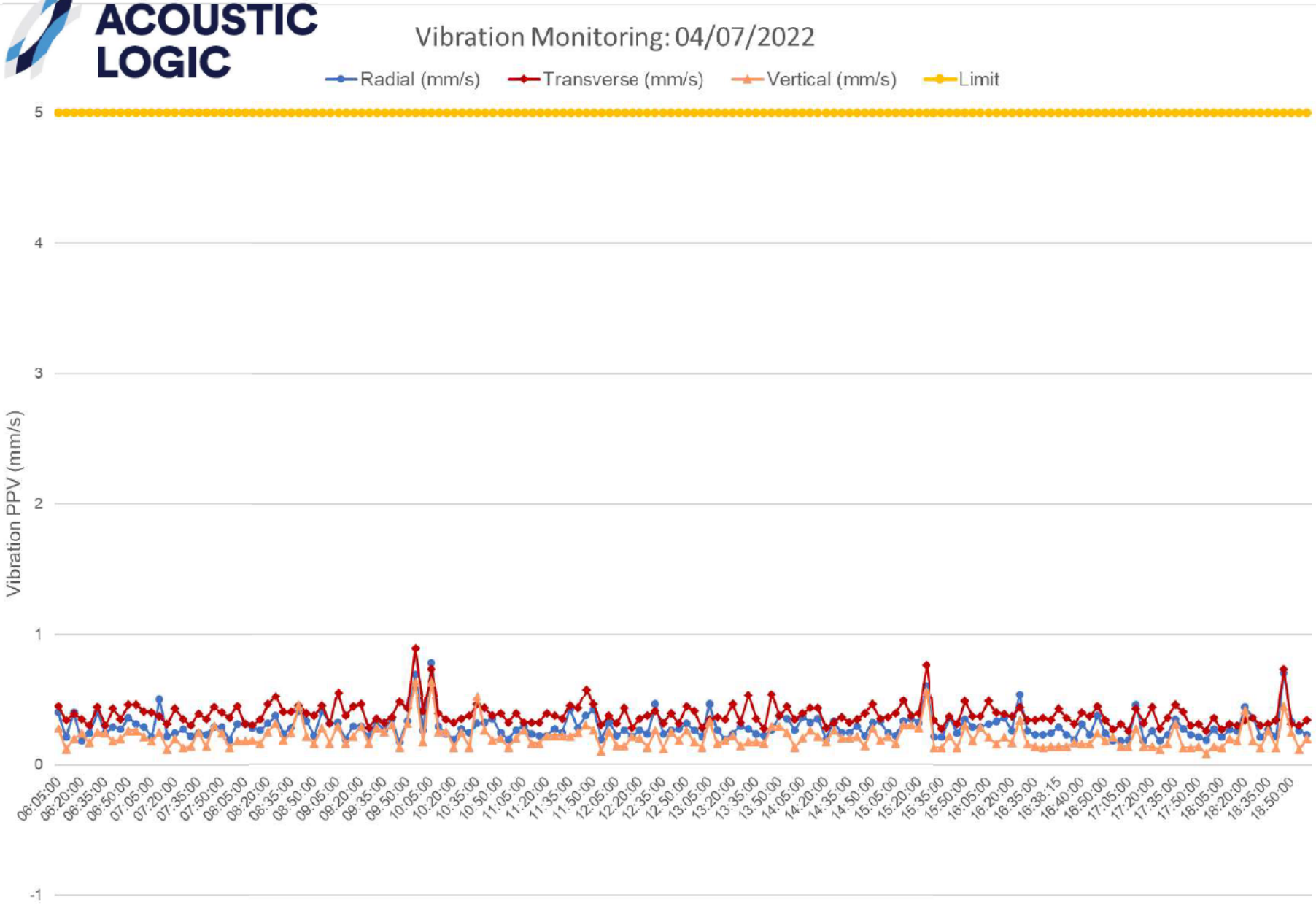

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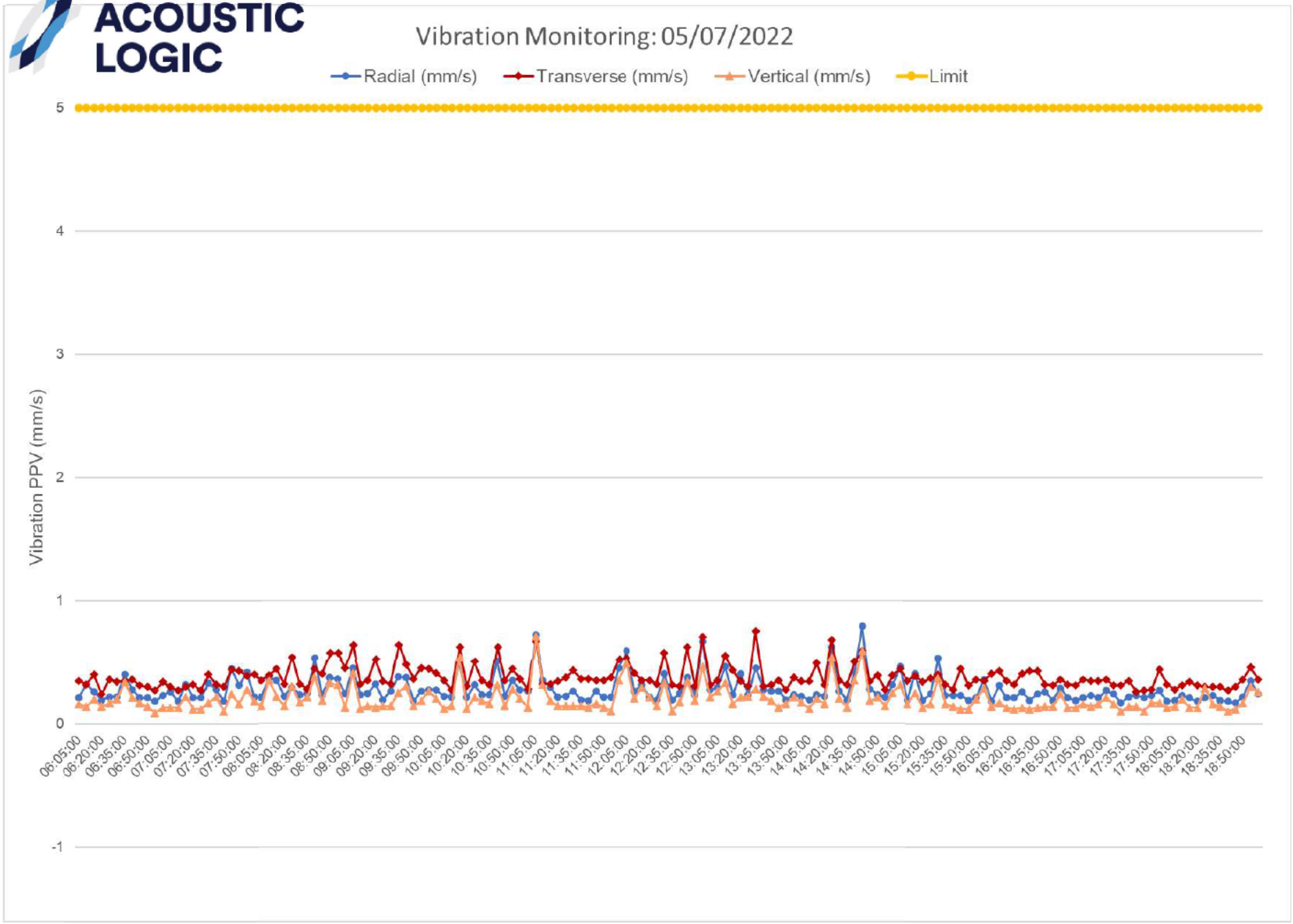

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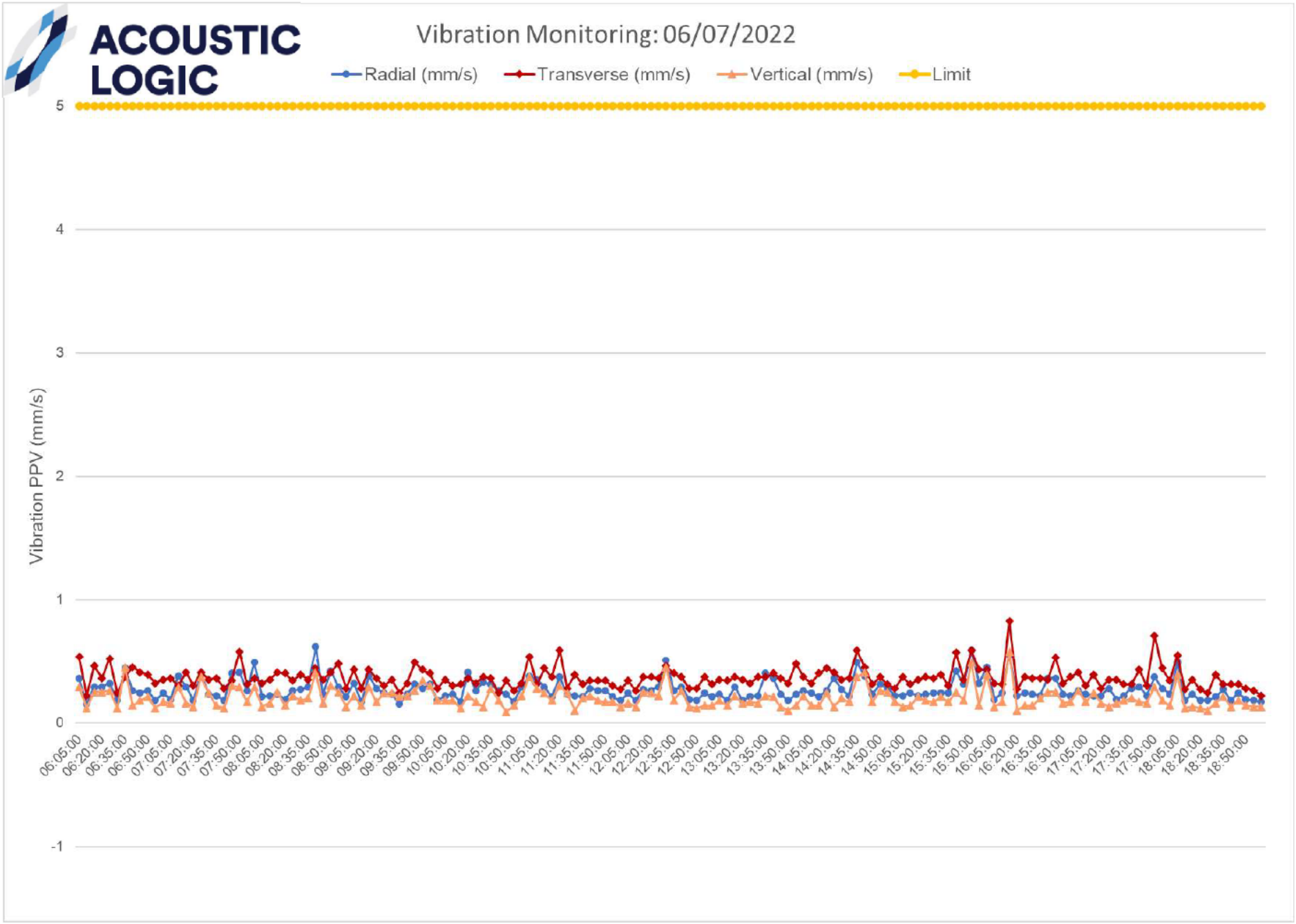

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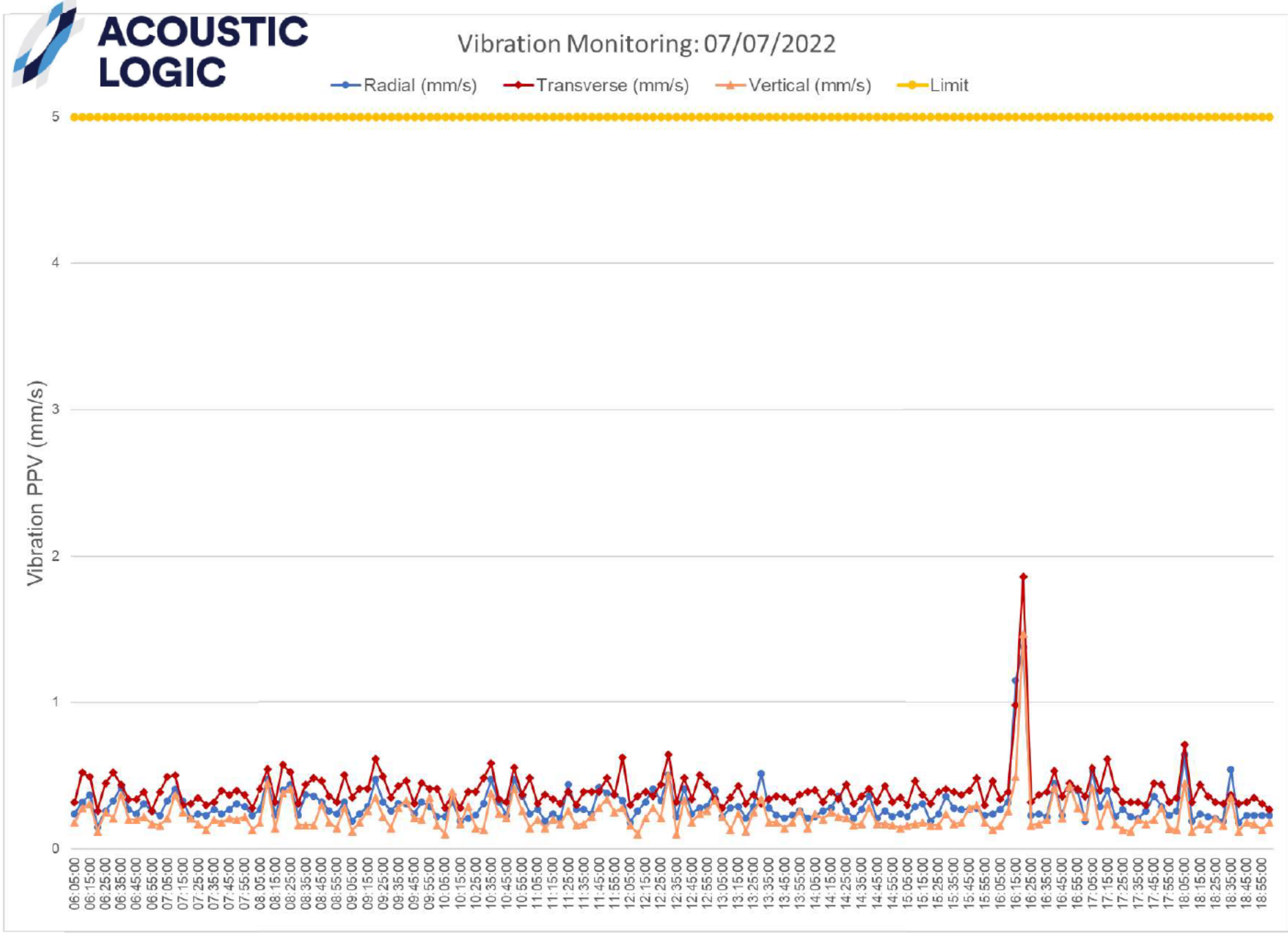

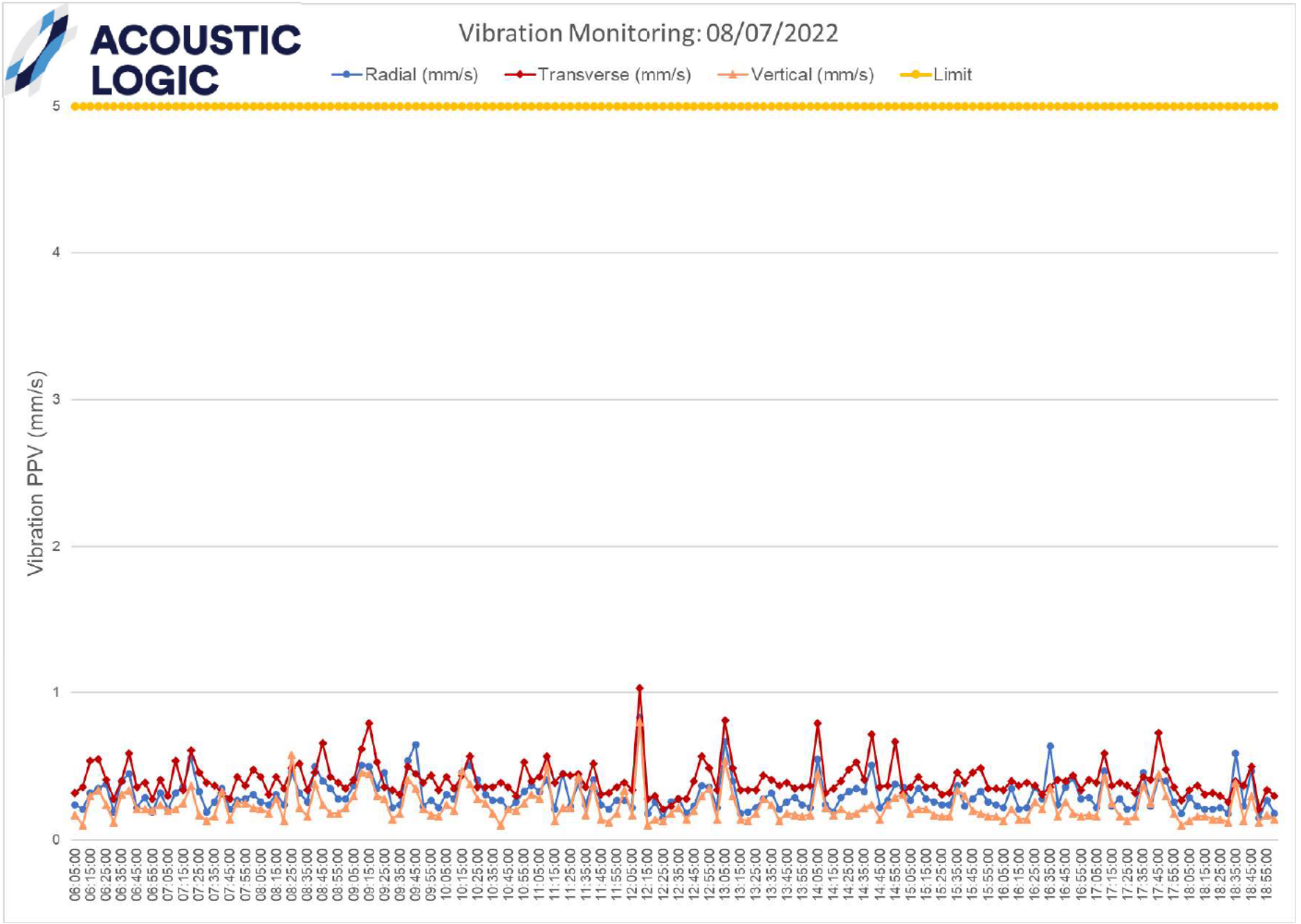
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Radial (mm/s)
Transverse (mm/s)
Vertical (mm/s)
Limit
Vibration PPV (mm/s)
0
1
2
3
4
5
06:05:00
06:15:00
06:25:00
06:35:00
06:45:00
06:55:00
07:05:00
07:15:00
07:25:00
07:35:00
07:45:00
07:55:00
08:05:00
08:15:00
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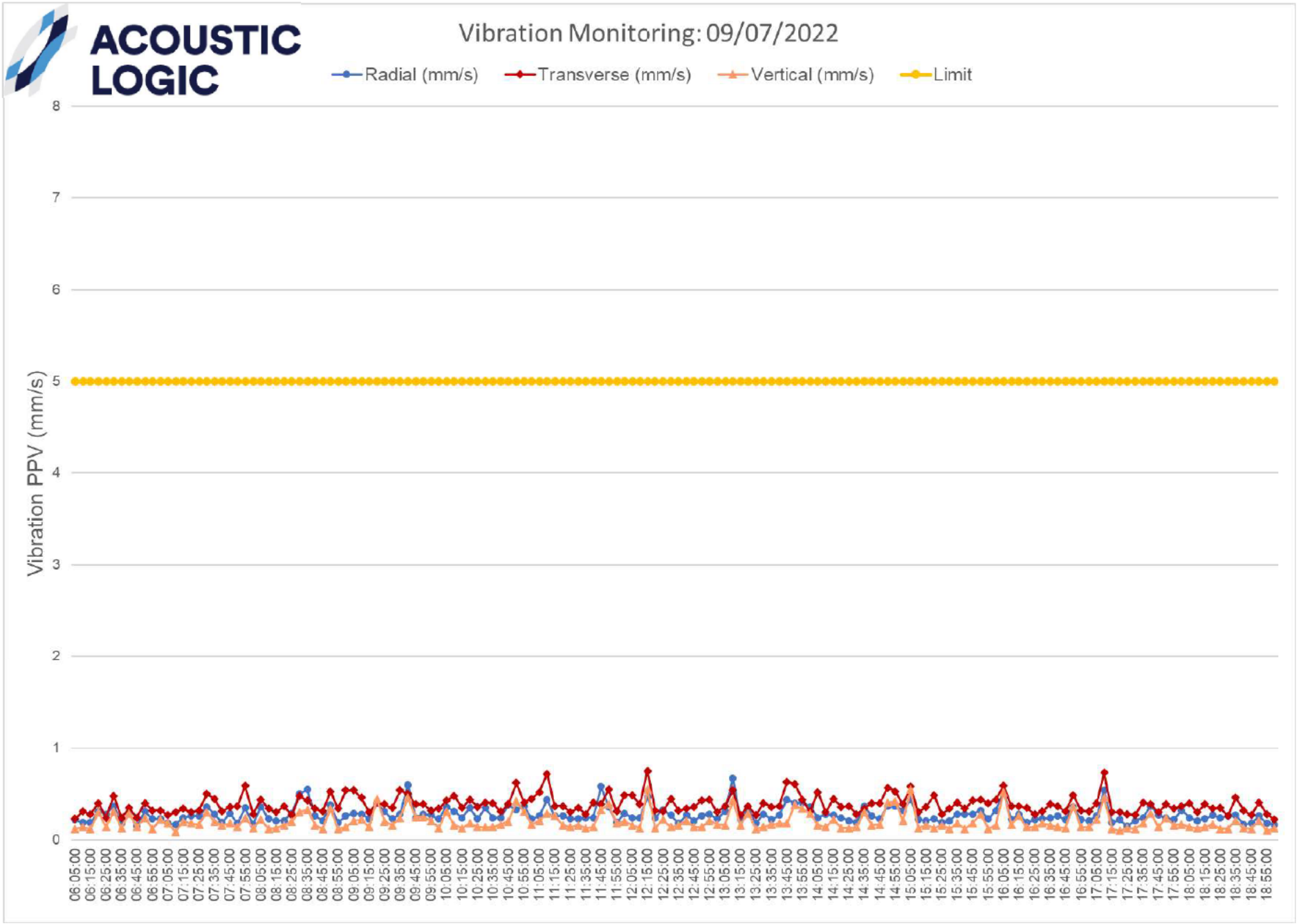
18:55:00


ACOUSTIC LOGIC
Vibration Monitoring: 09/07/2022
Radial (mm/s)
Transverse (mm/s)
Vertical (mm/s)
Limit
Vibration PPV (mm/s)
0
1
2
3
4
5
6
7
8
06:05:00
06:15:00
06:25:00
06:35:00
06:45:00
06:55:00
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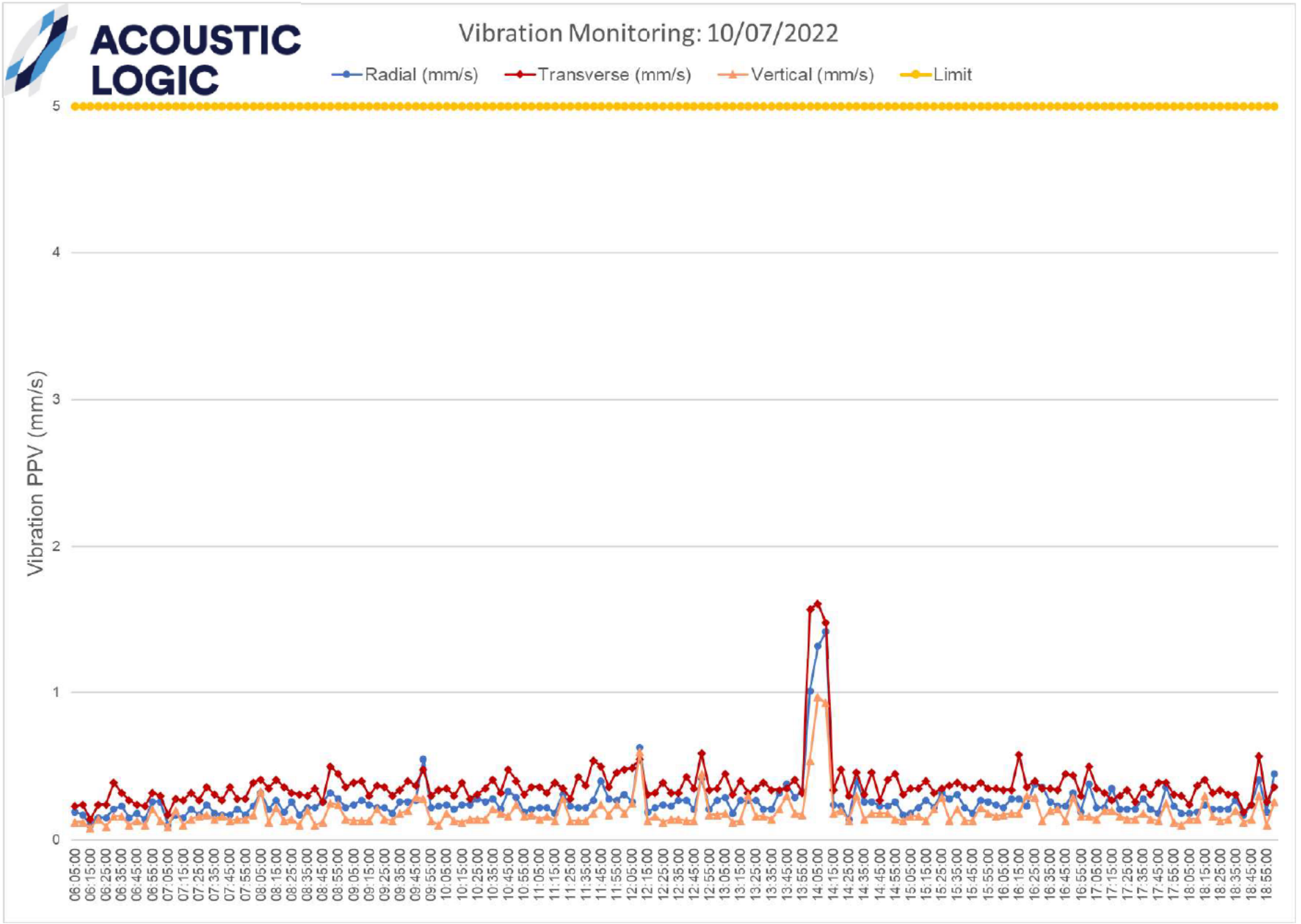

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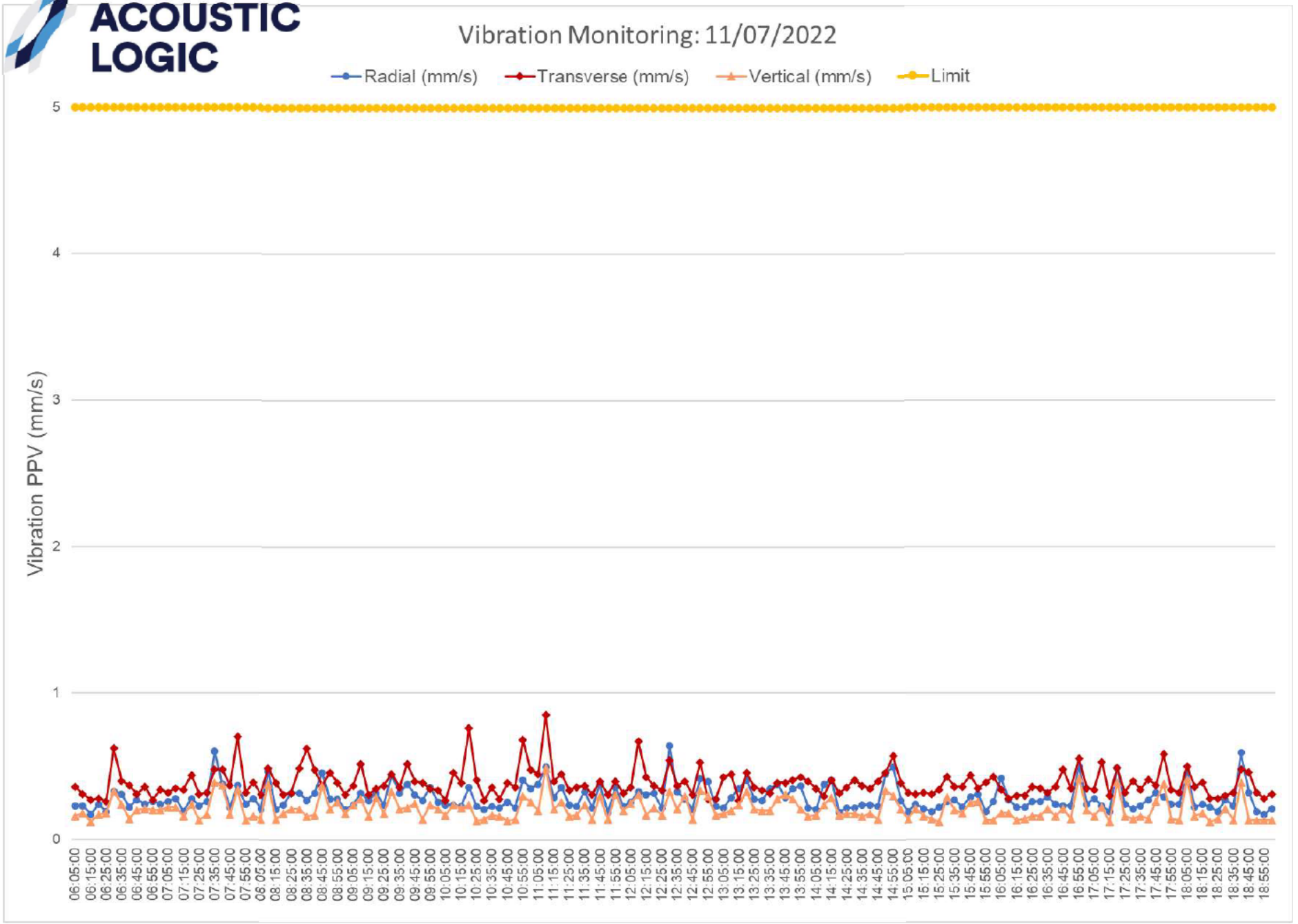

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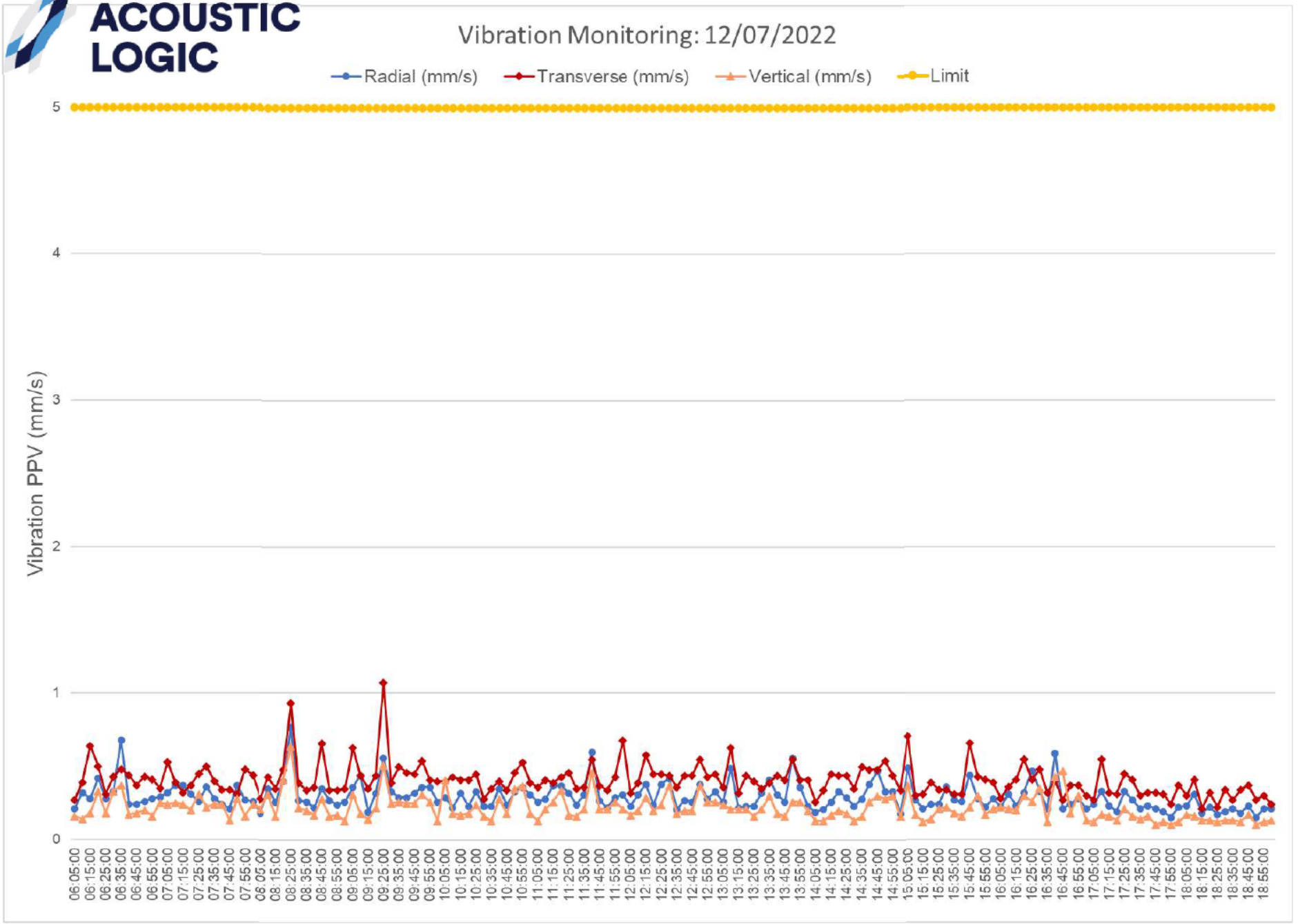

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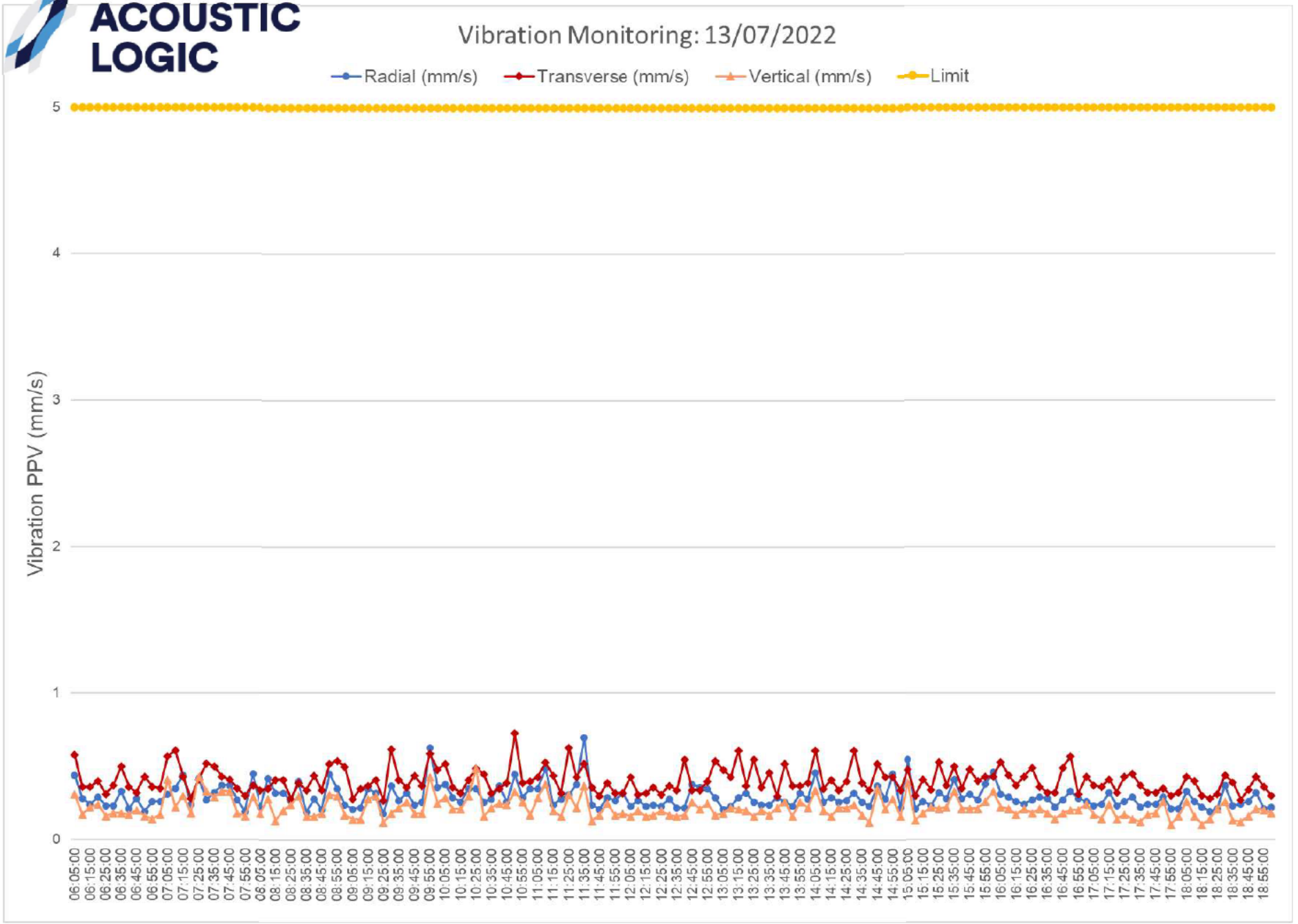

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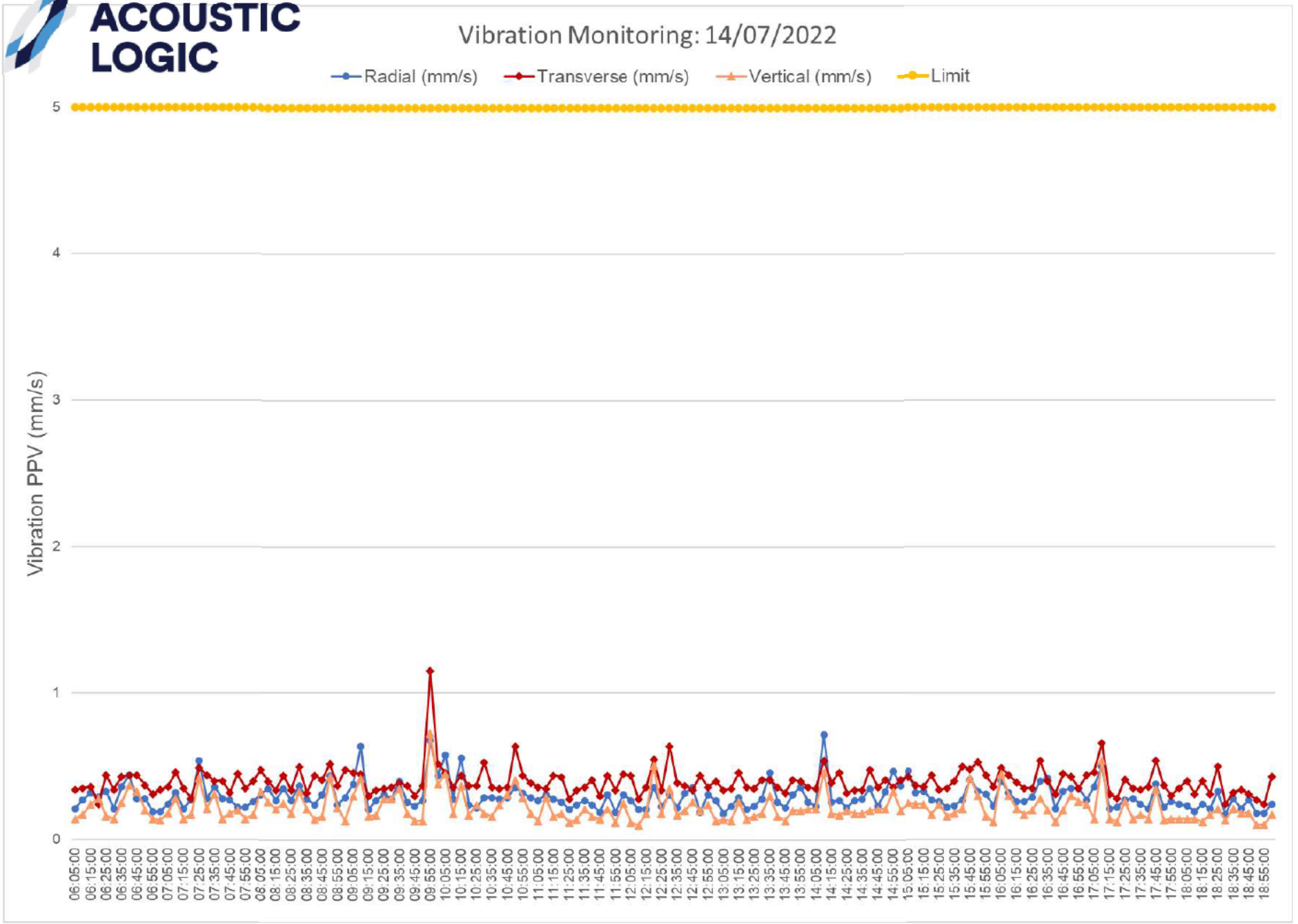

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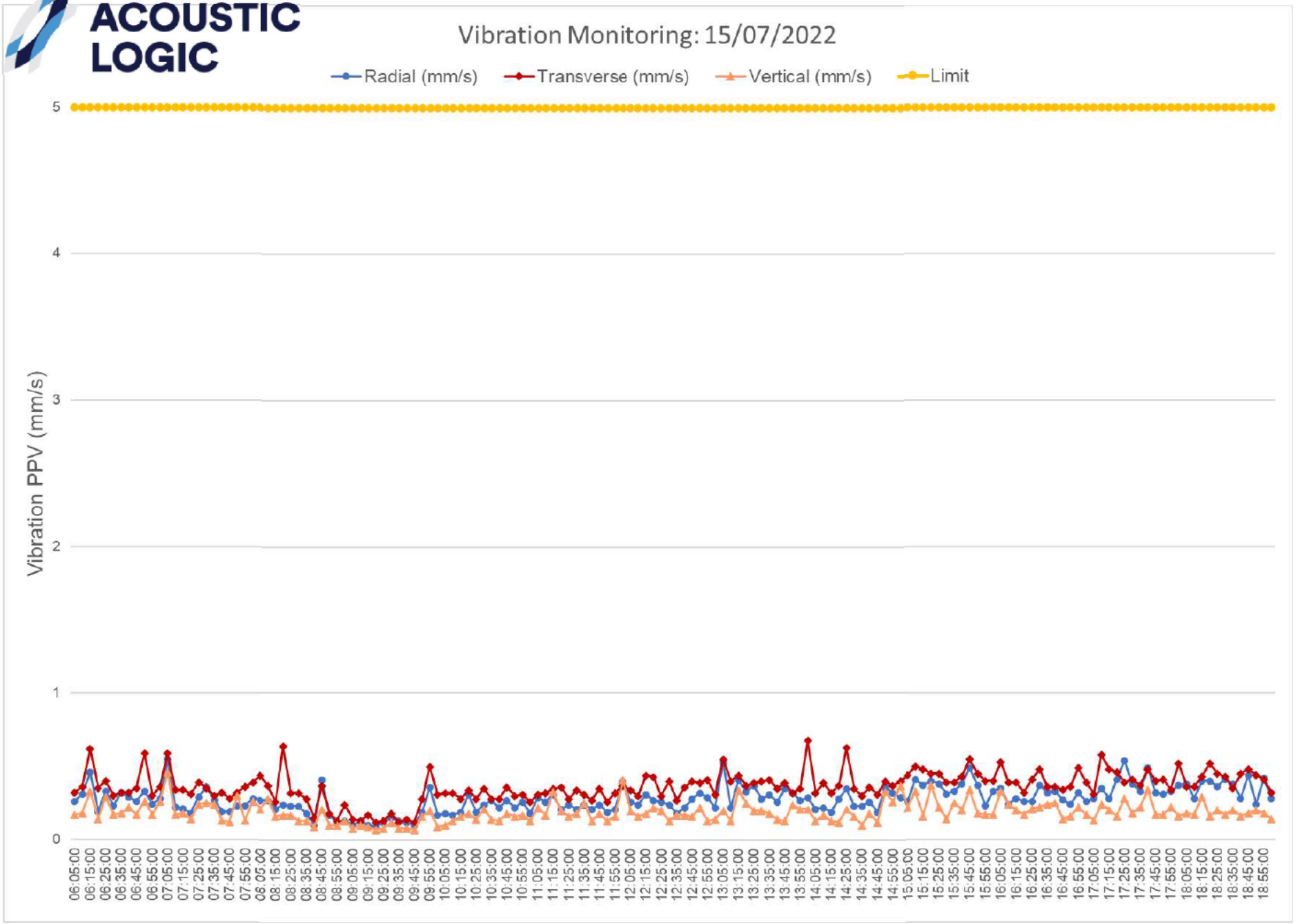

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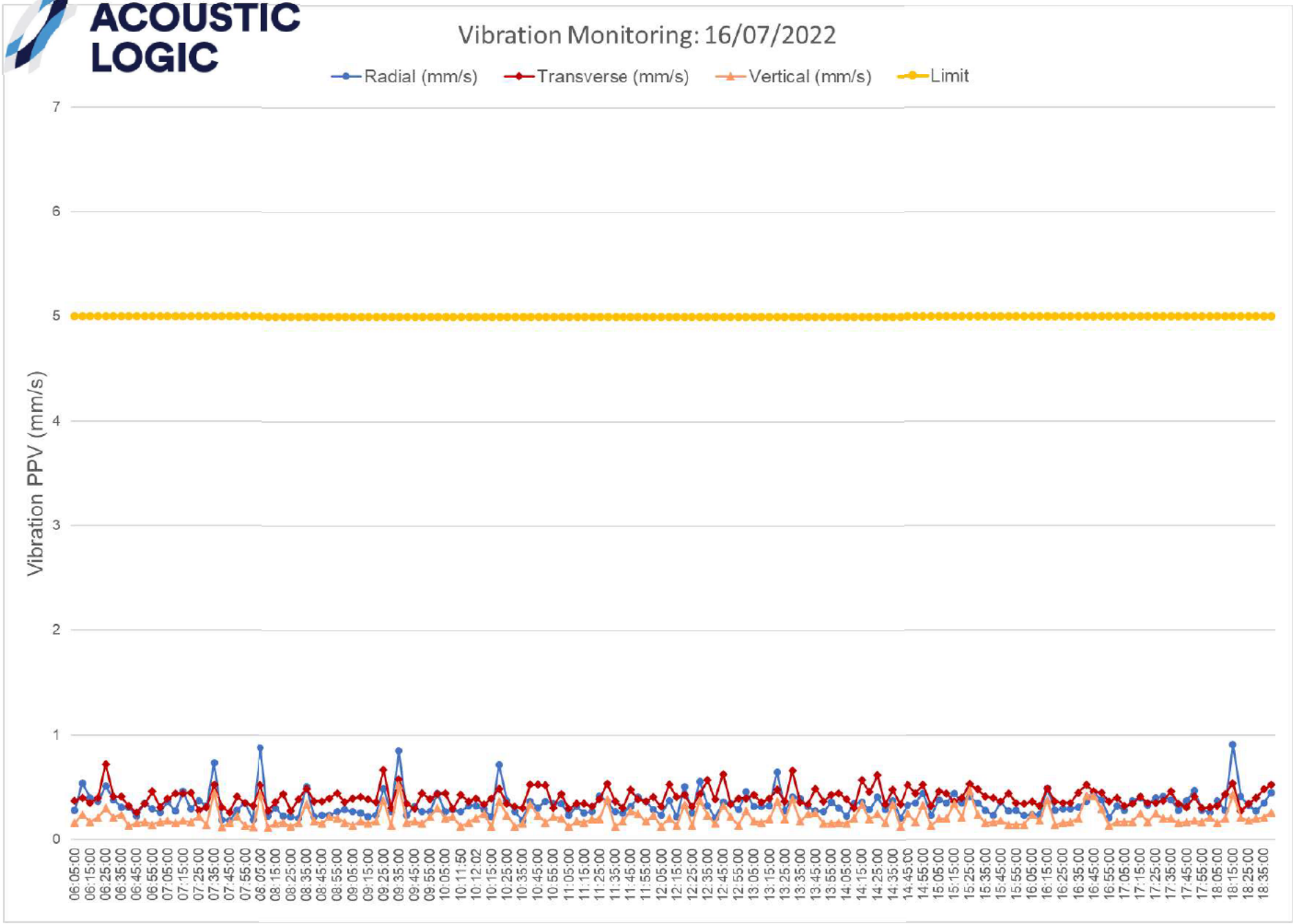

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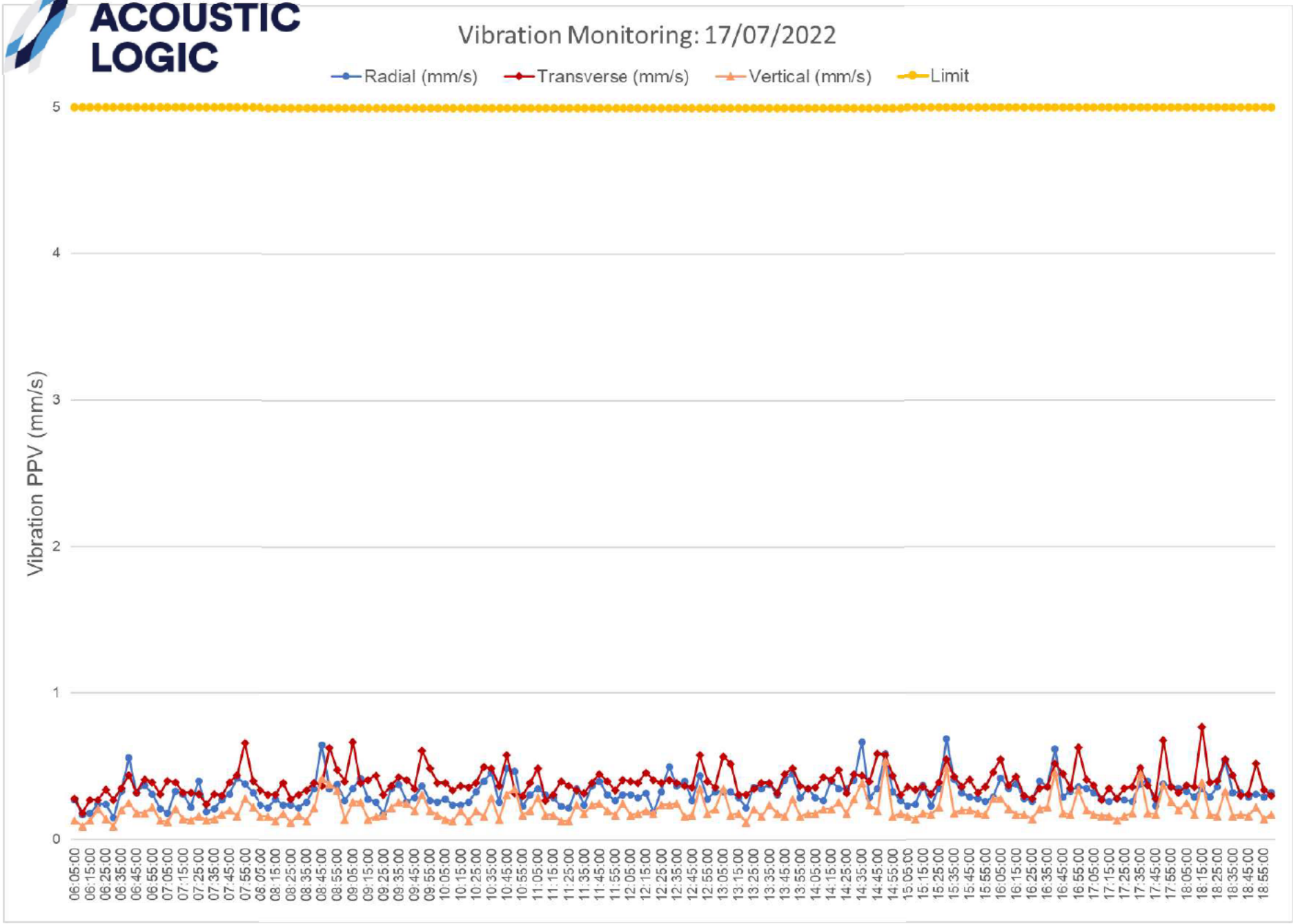

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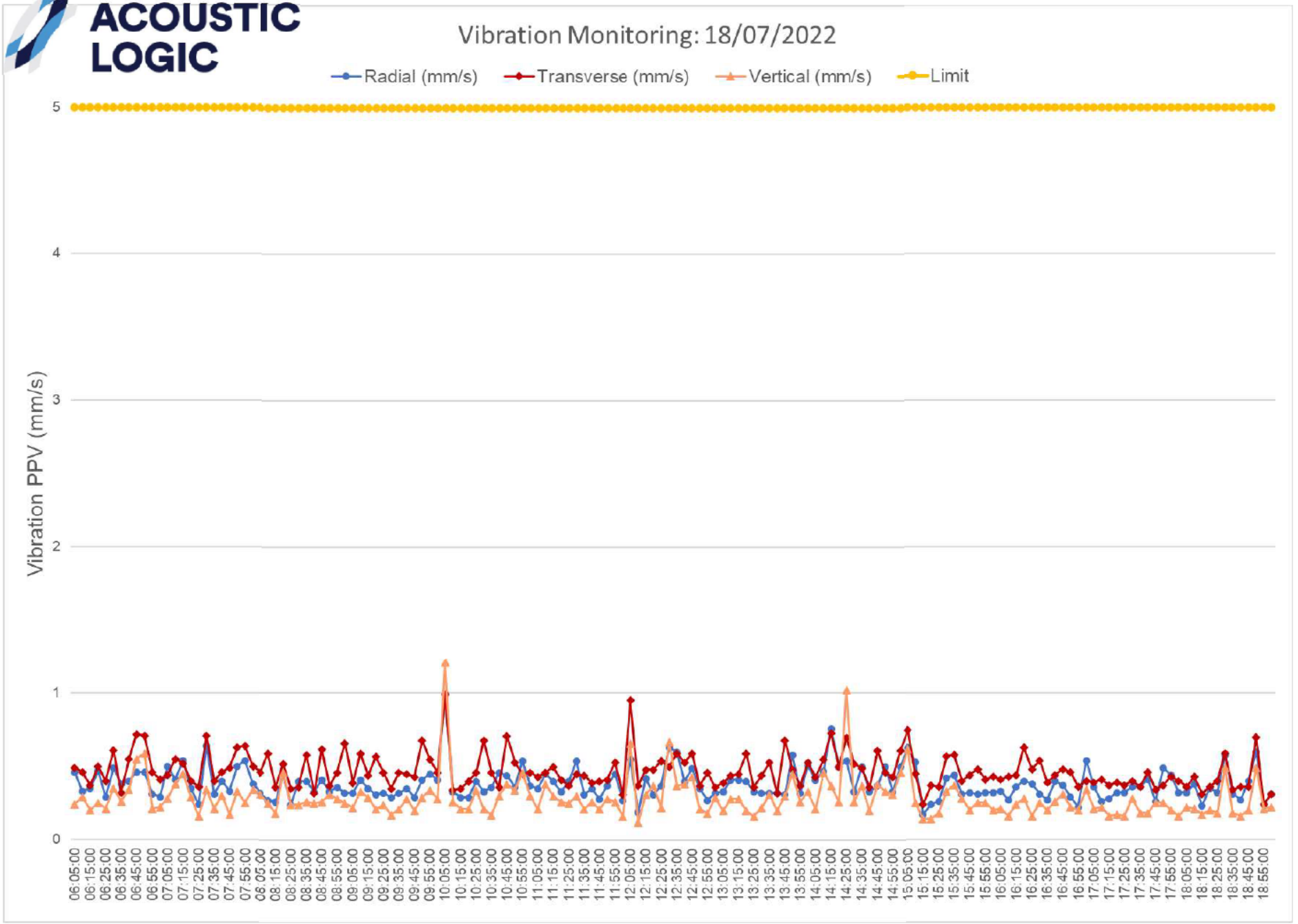

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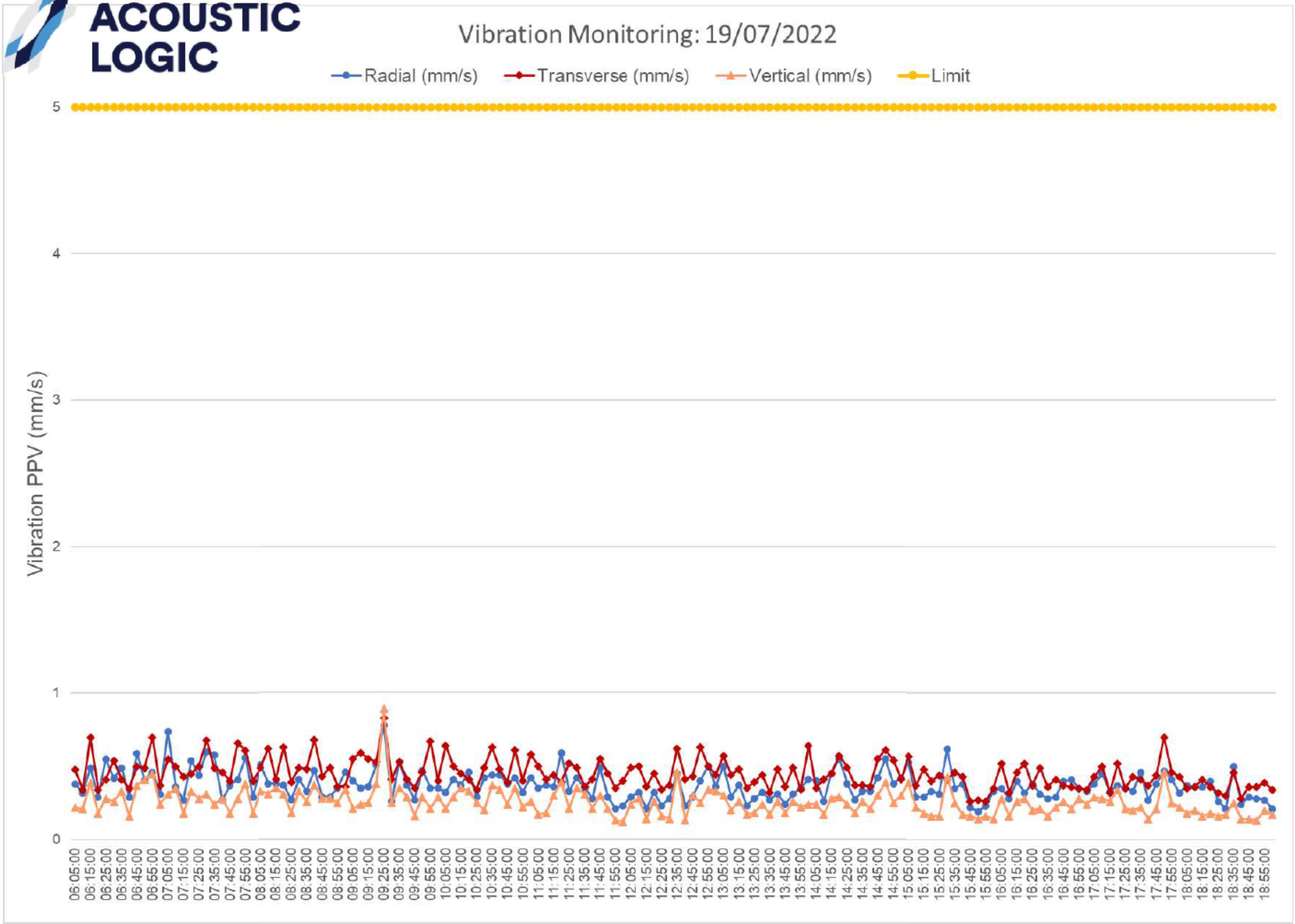
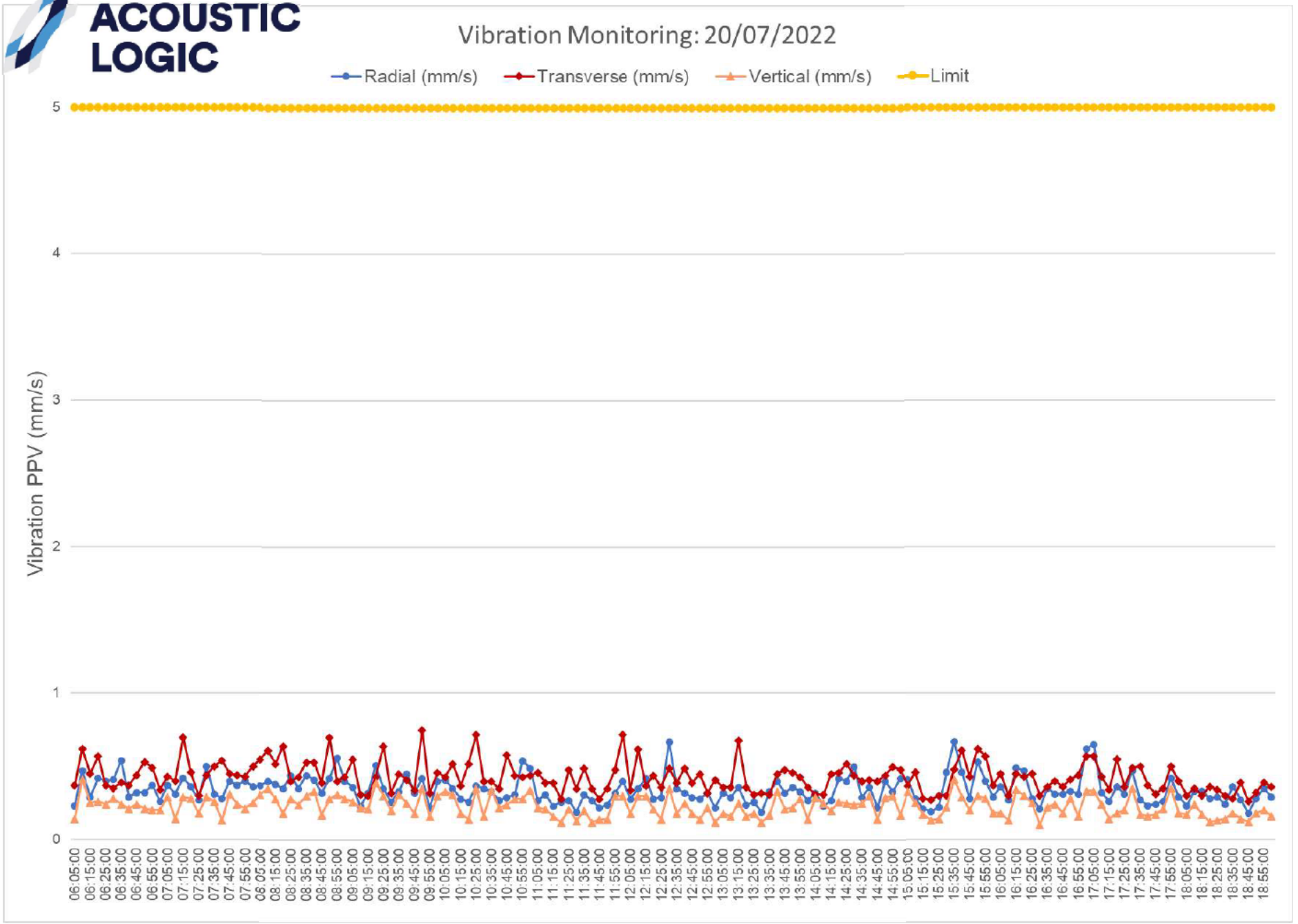


ACOUSTIC LOGIC



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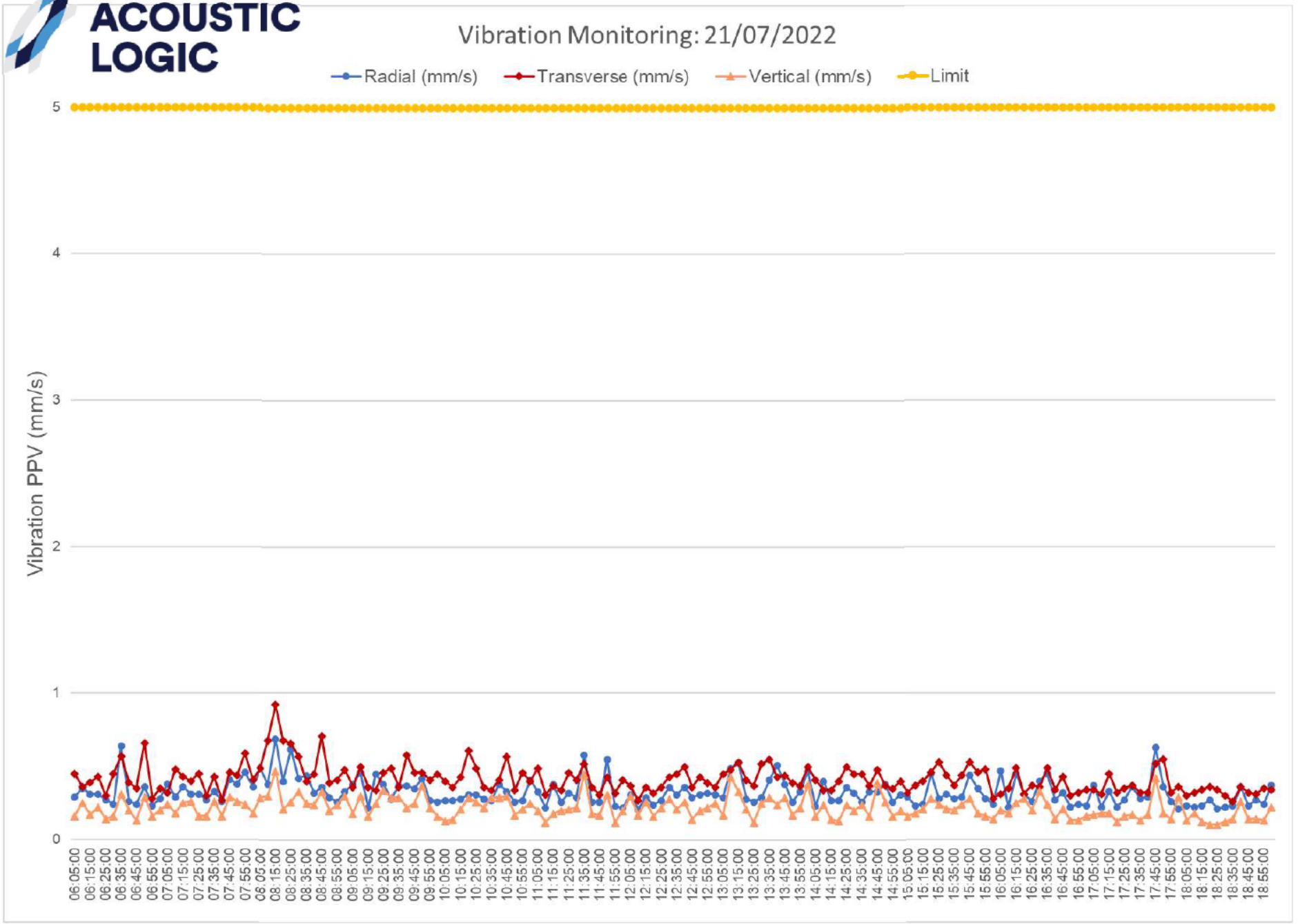

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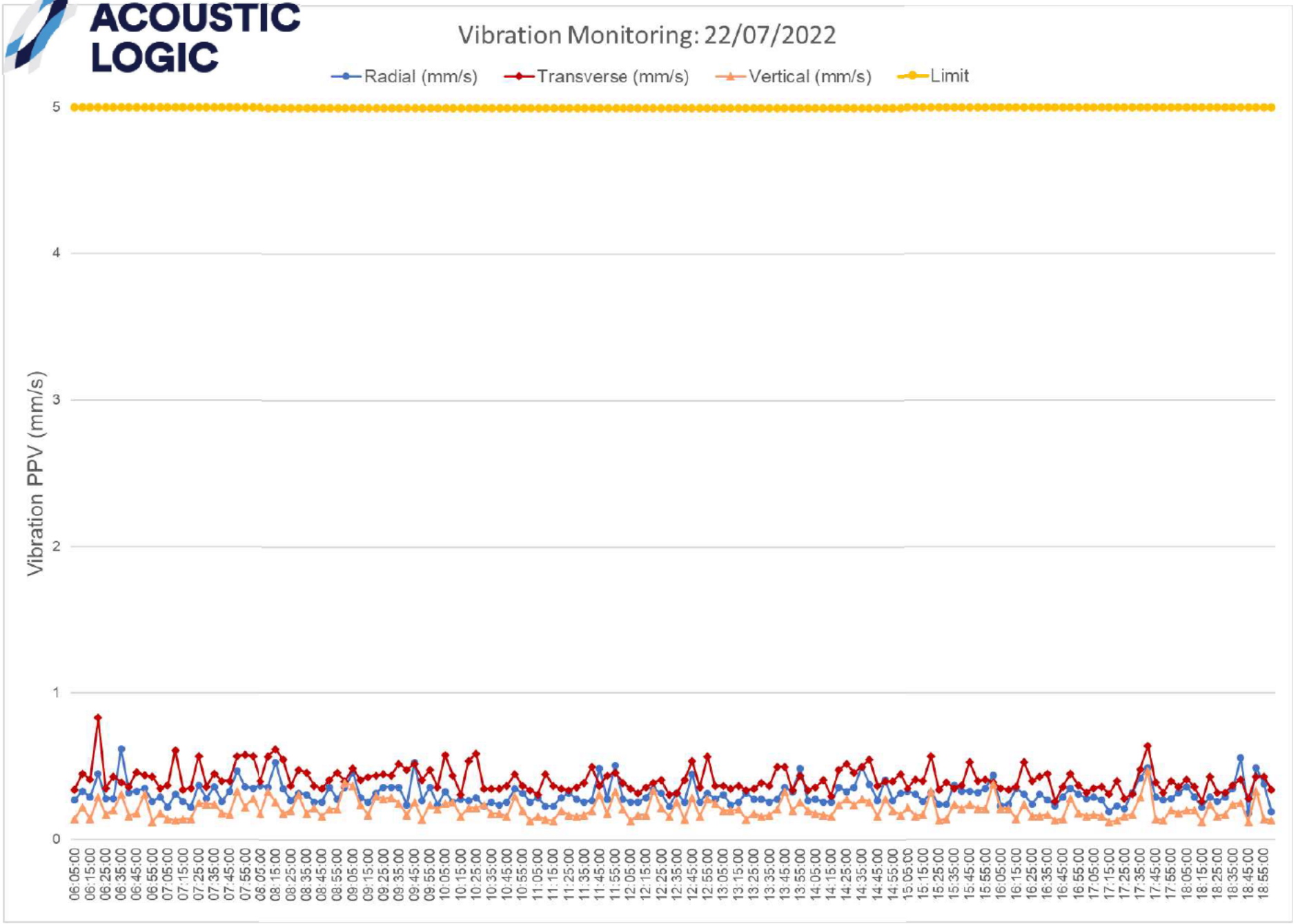

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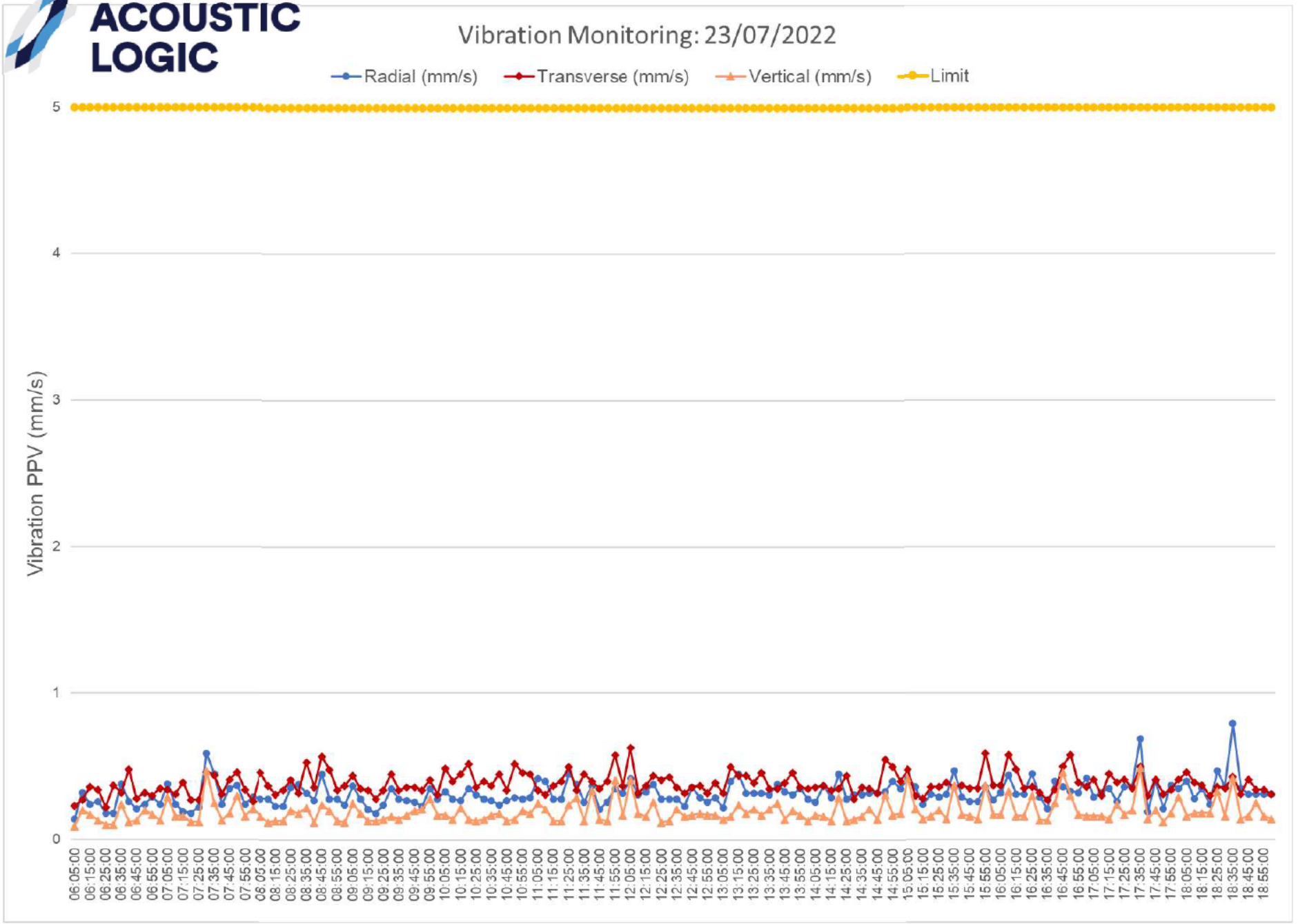

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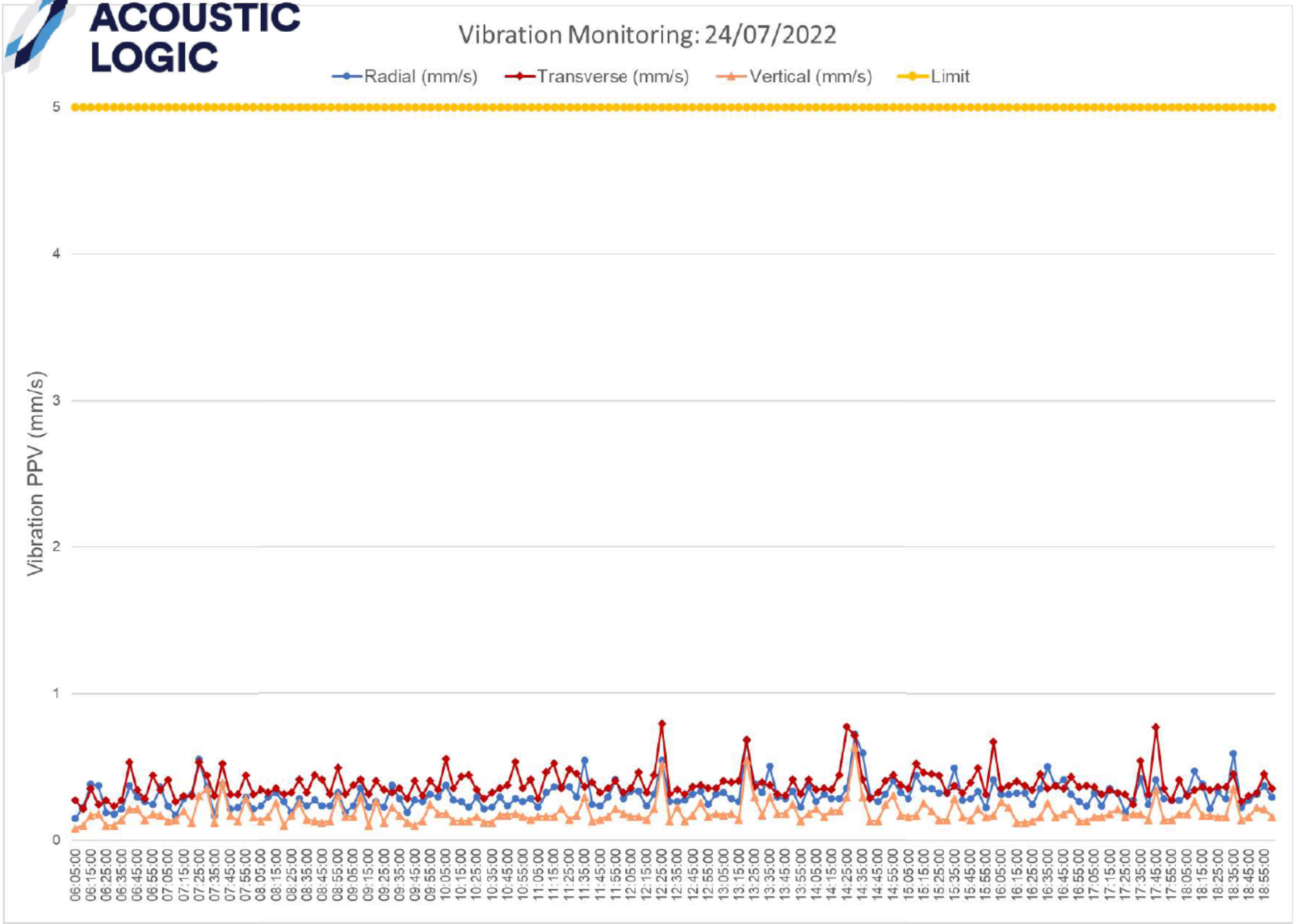

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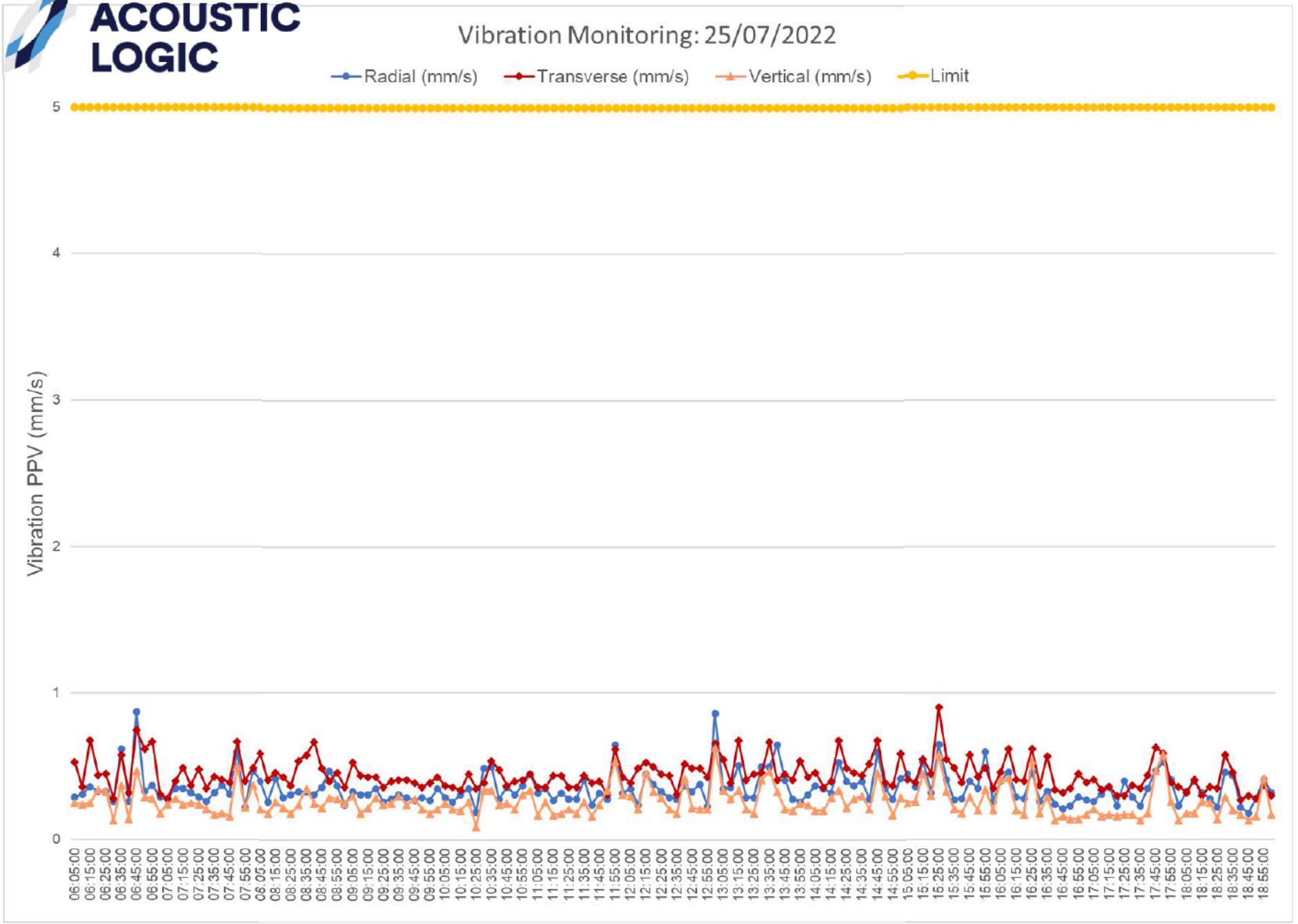

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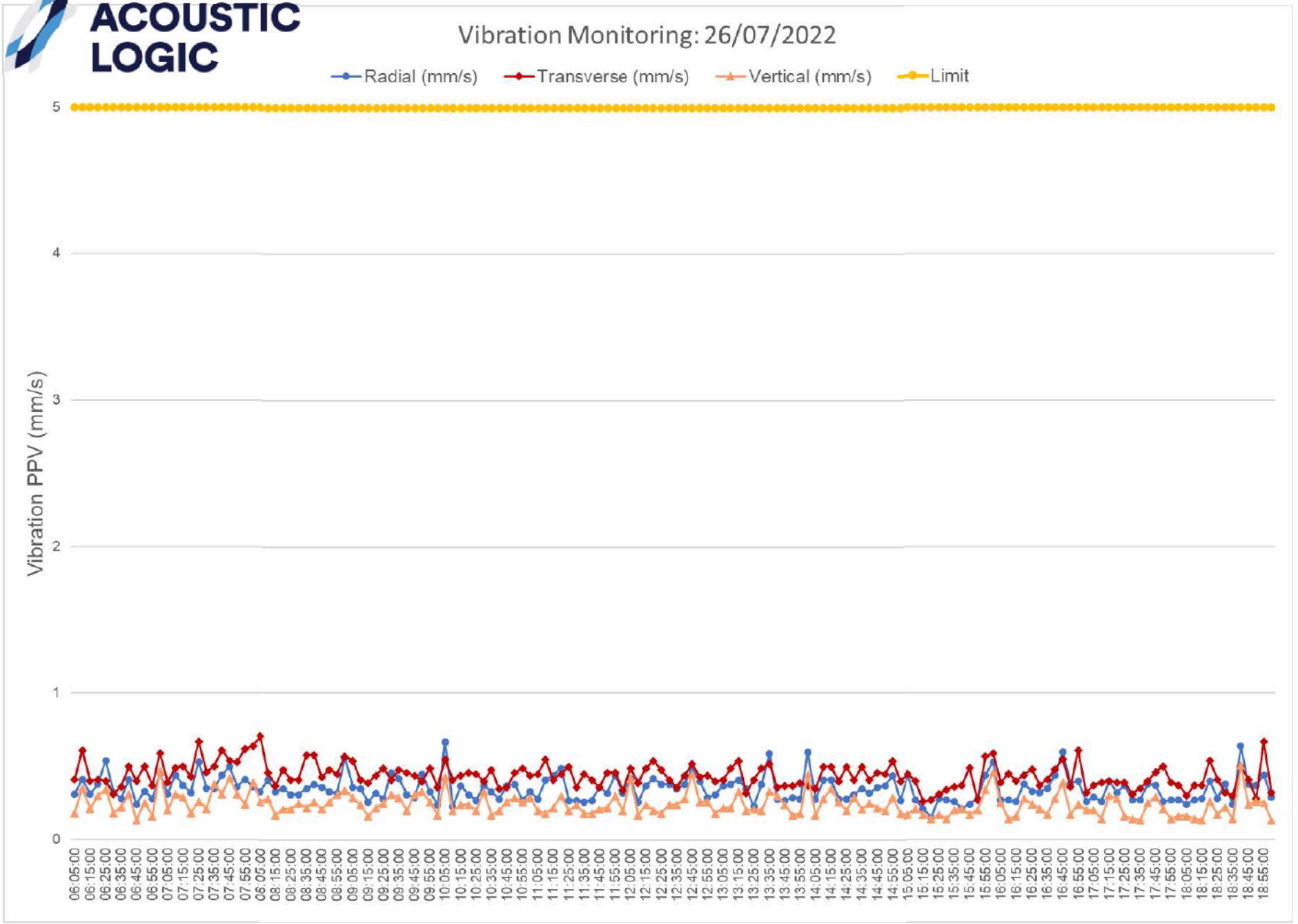

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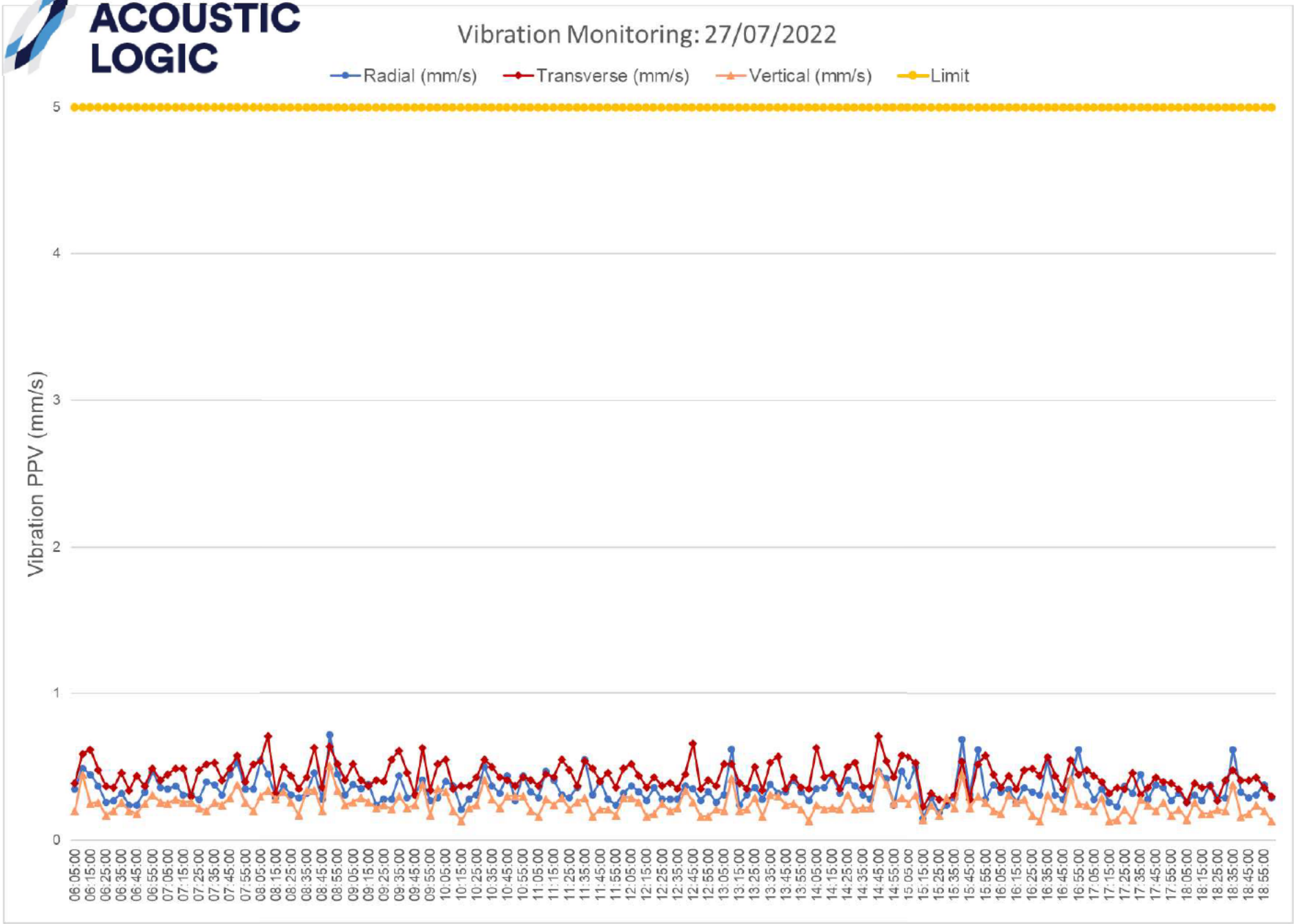

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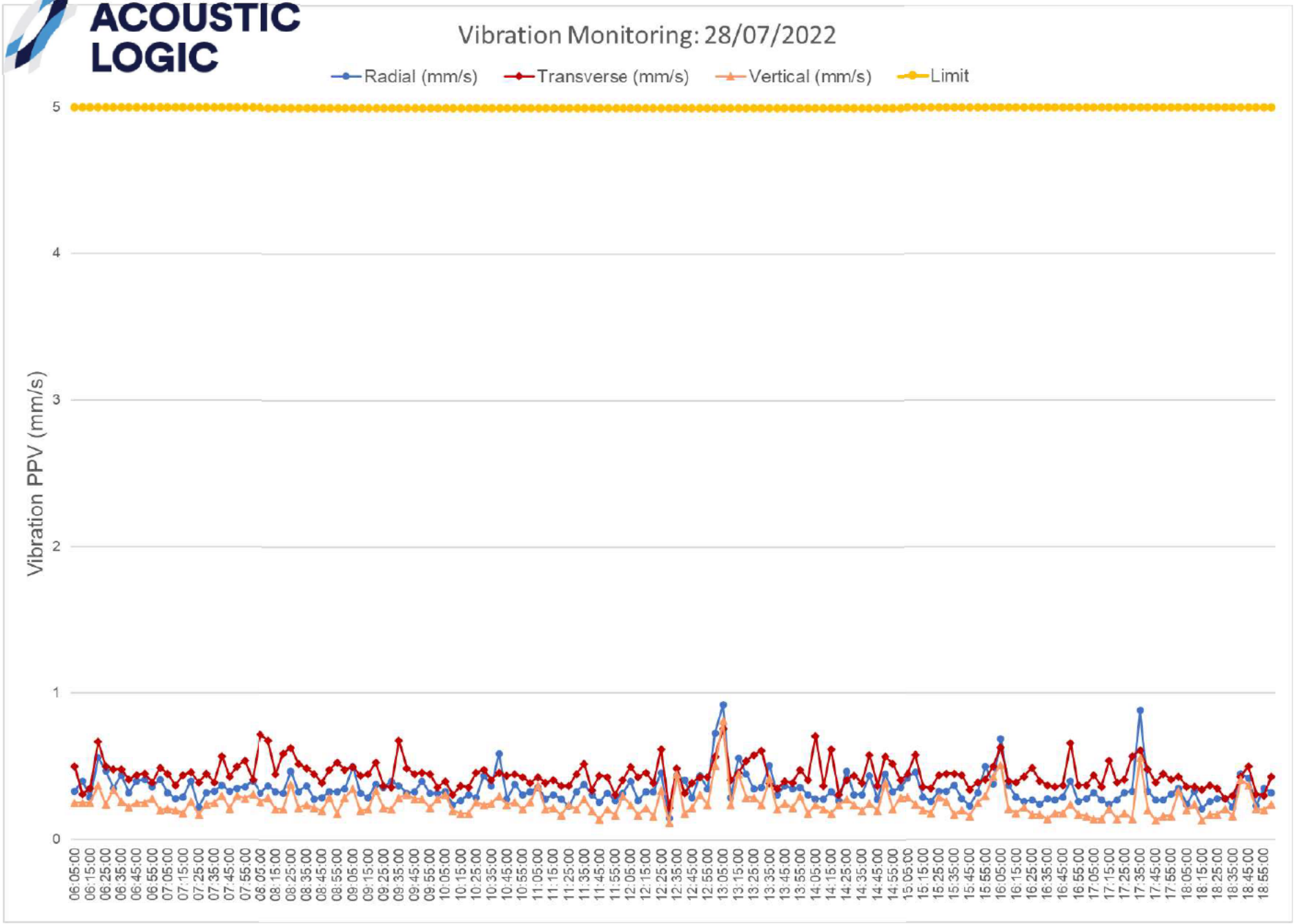

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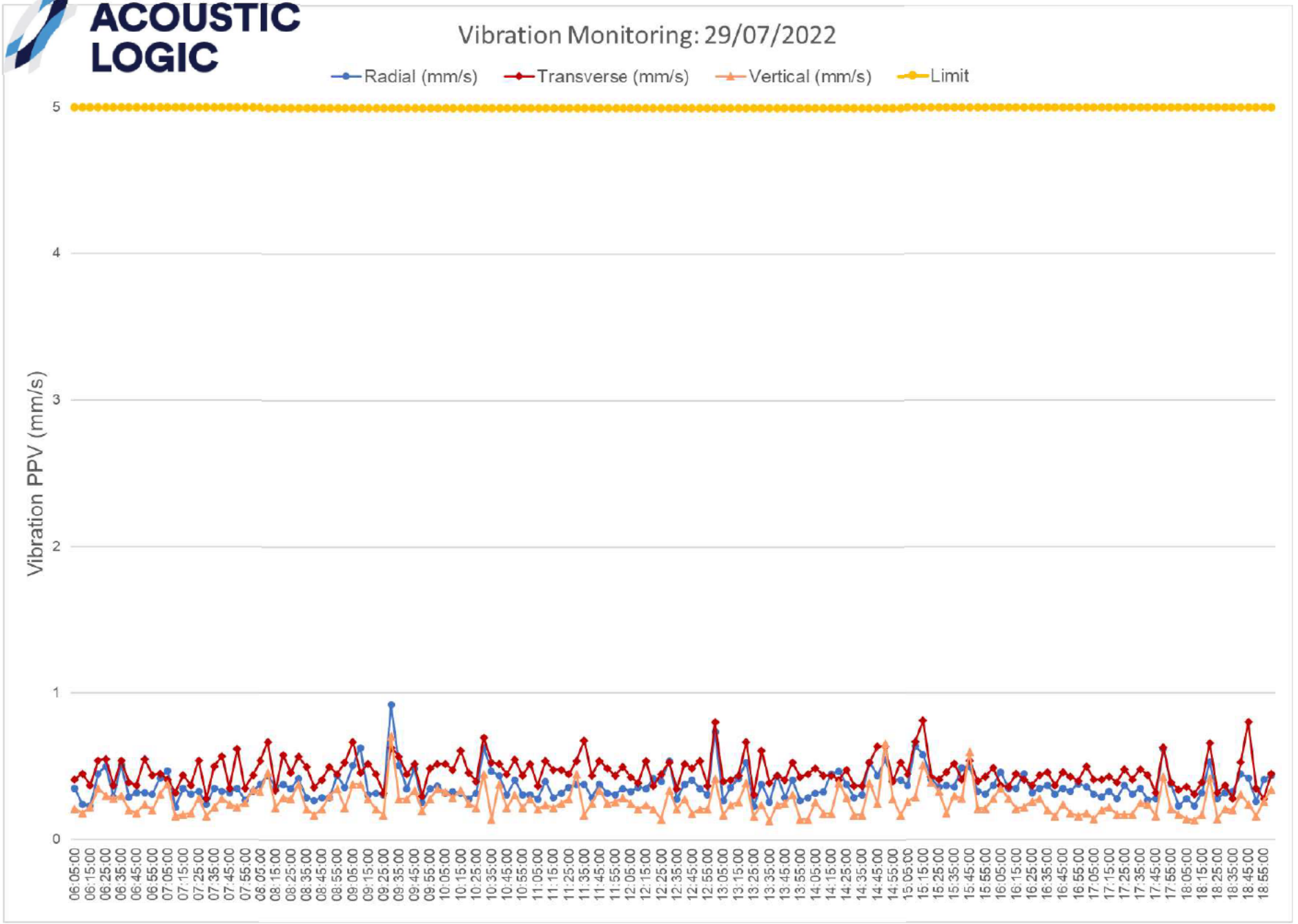

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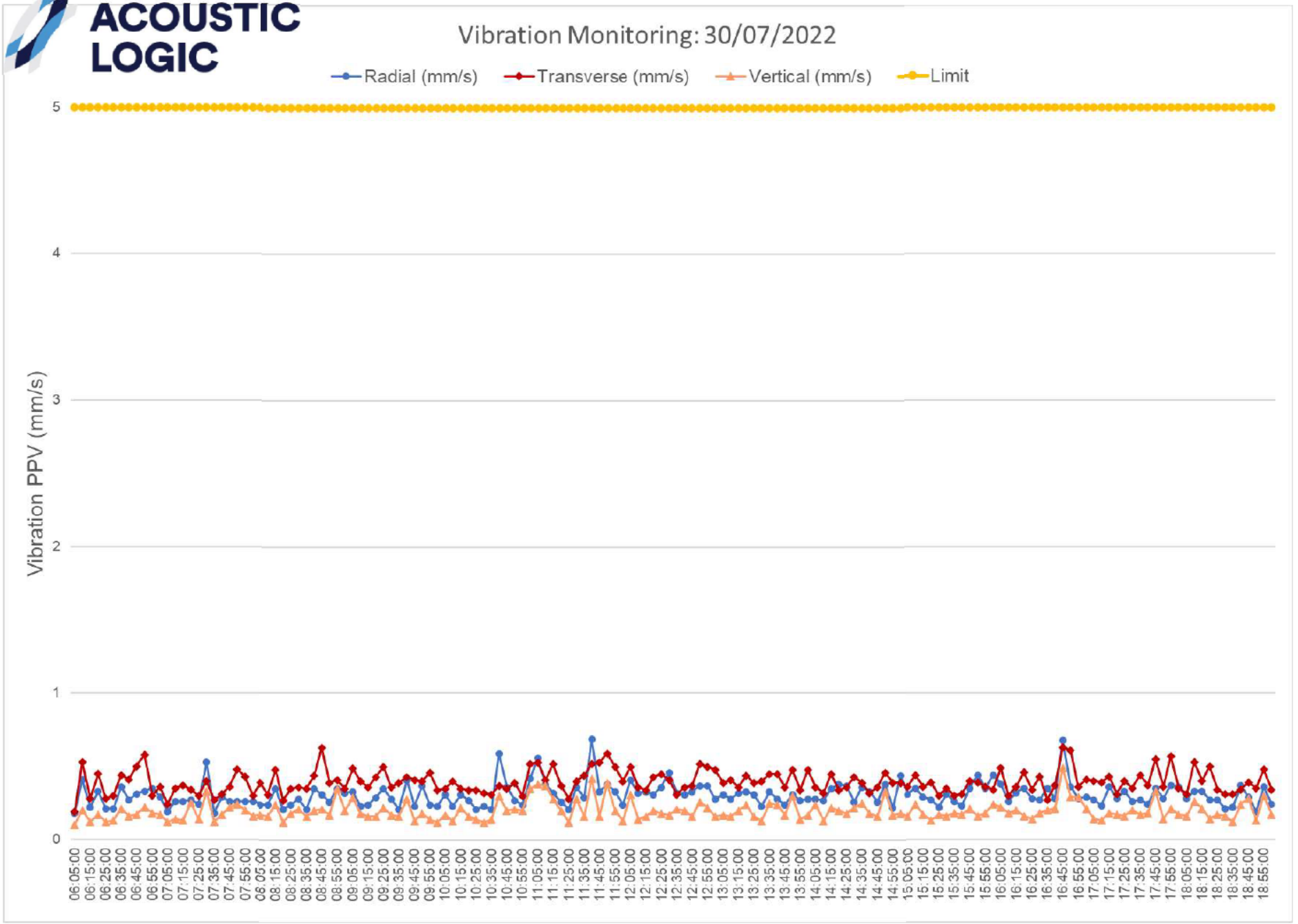

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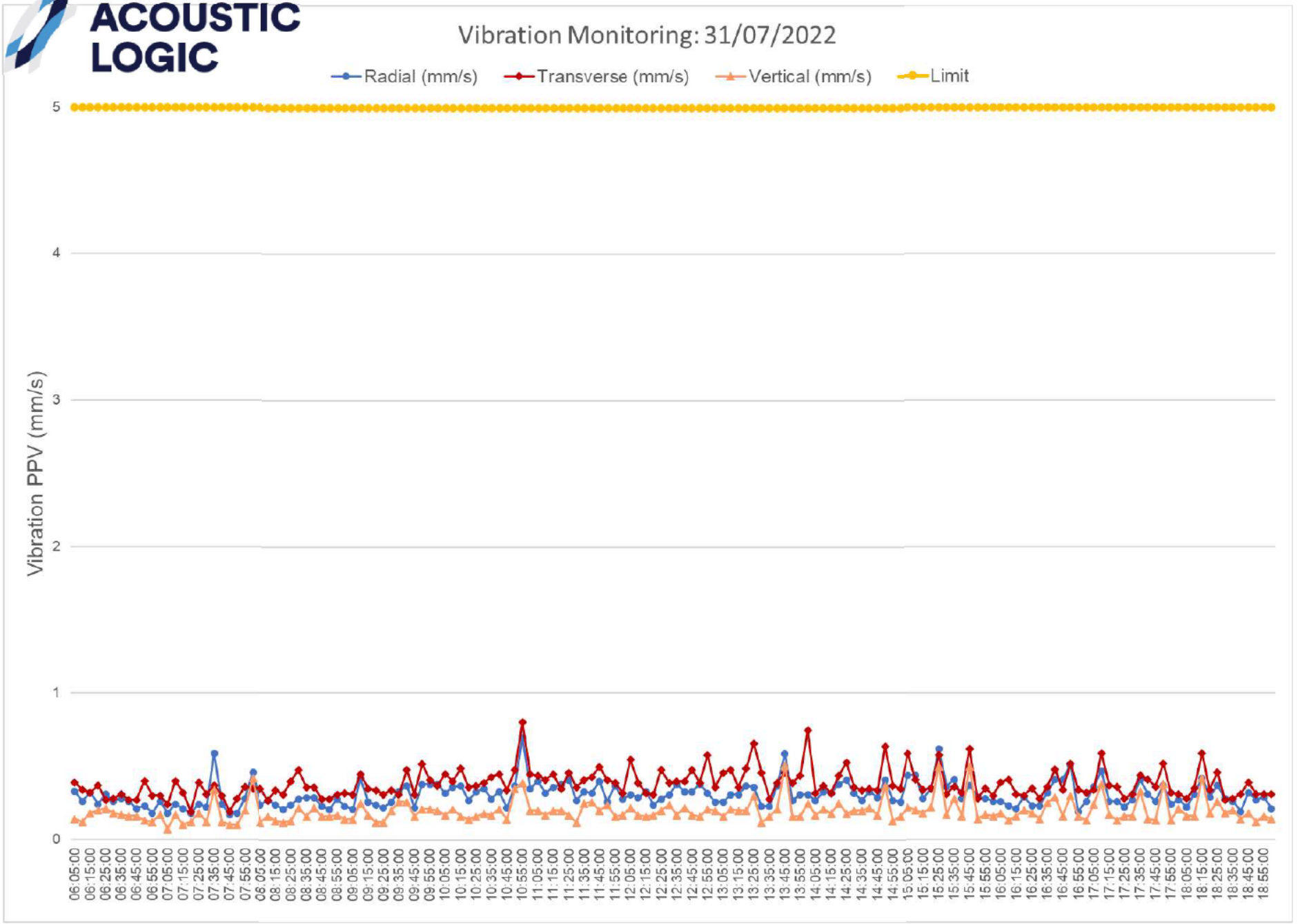
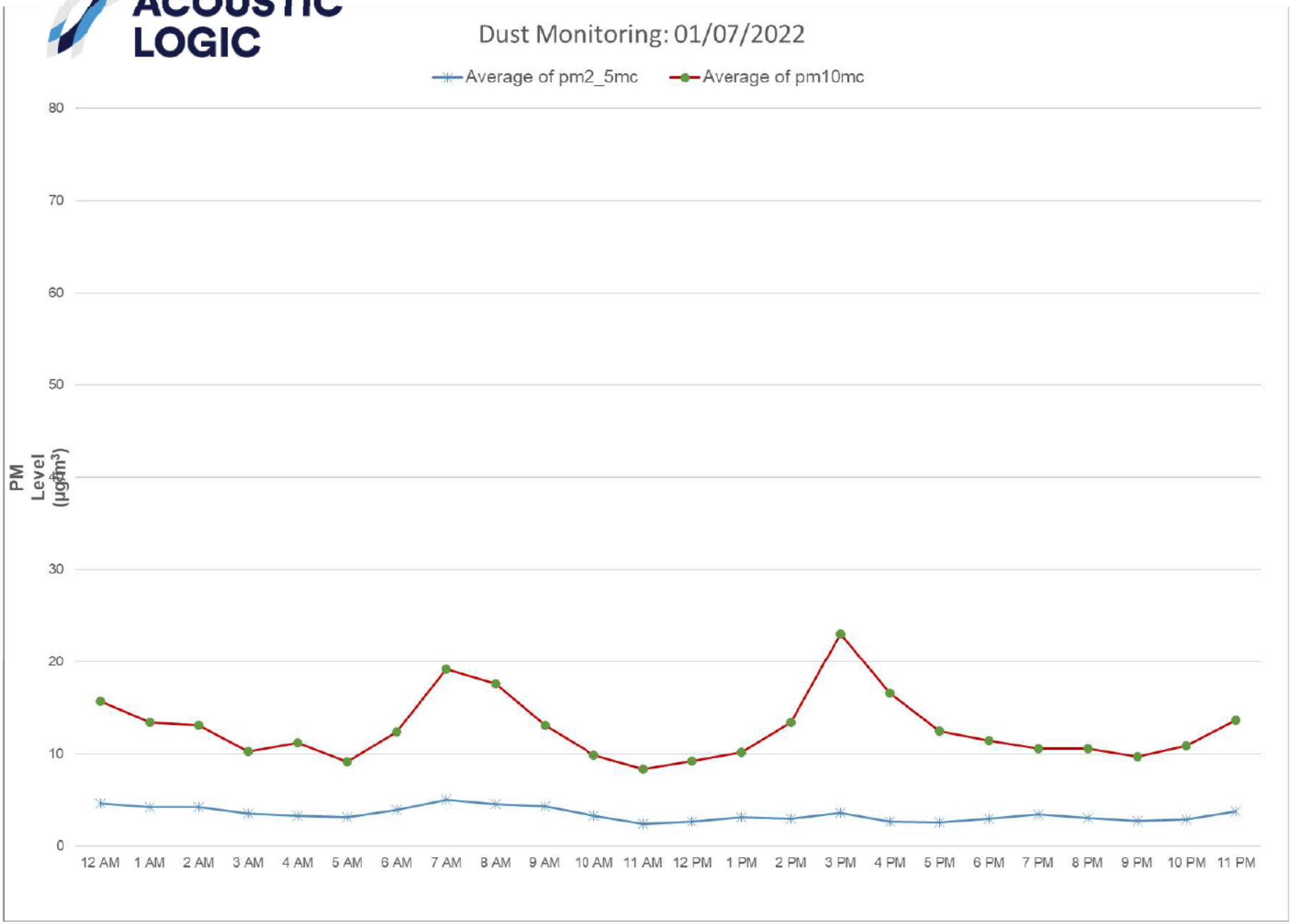
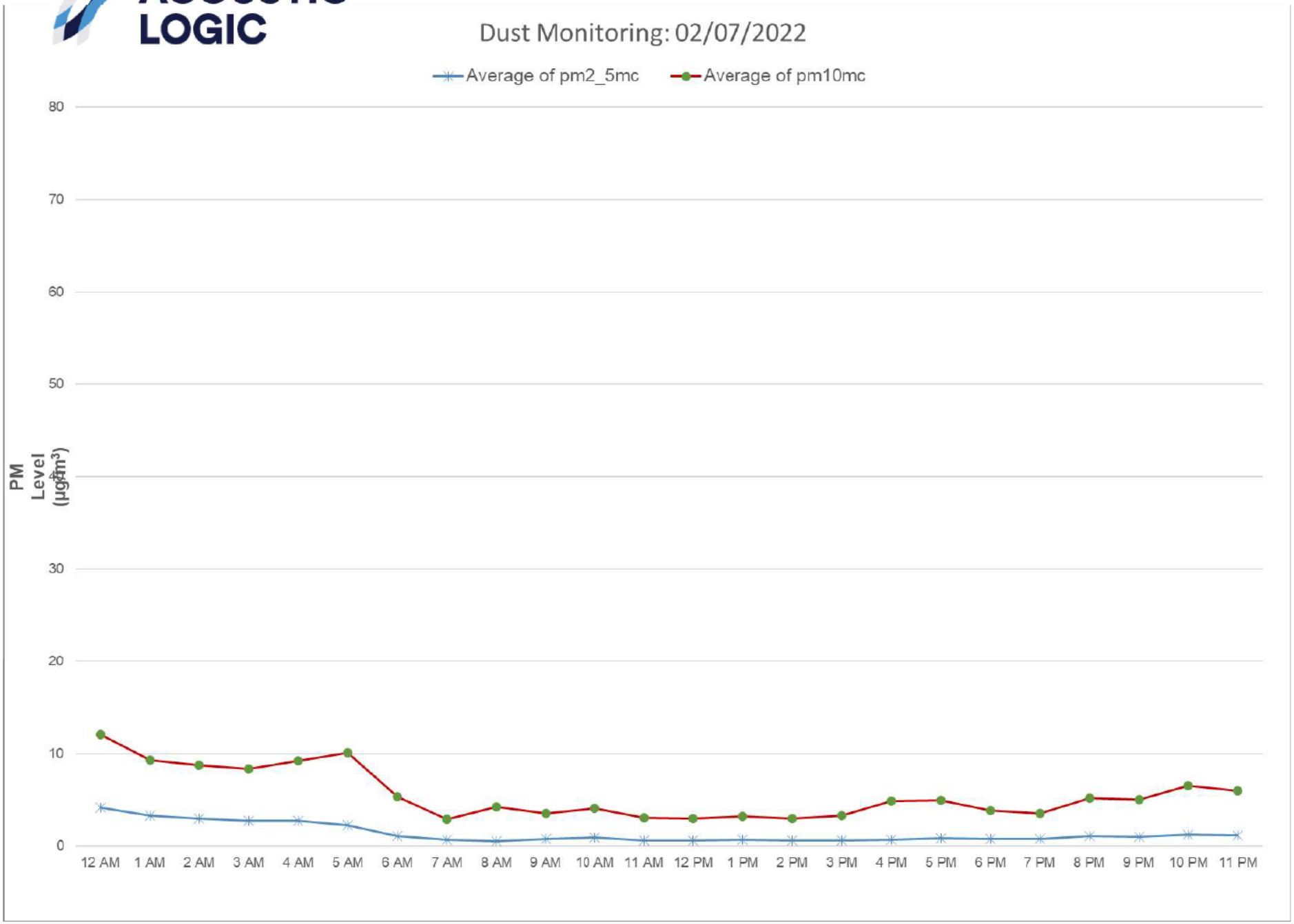


APPENDIX 3 – DUST MONITORING RESULTS

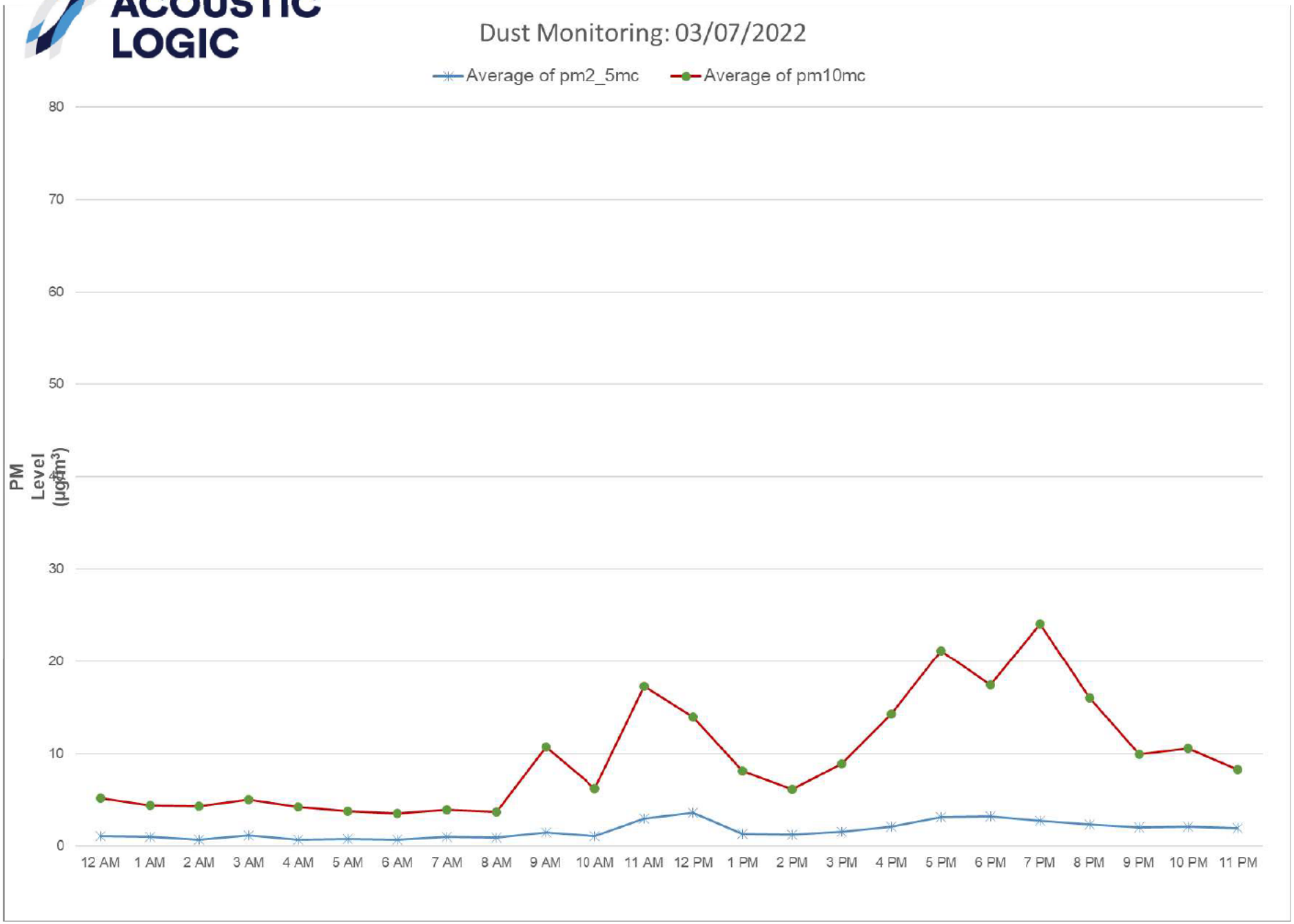
ACOUSTIC LOGIC



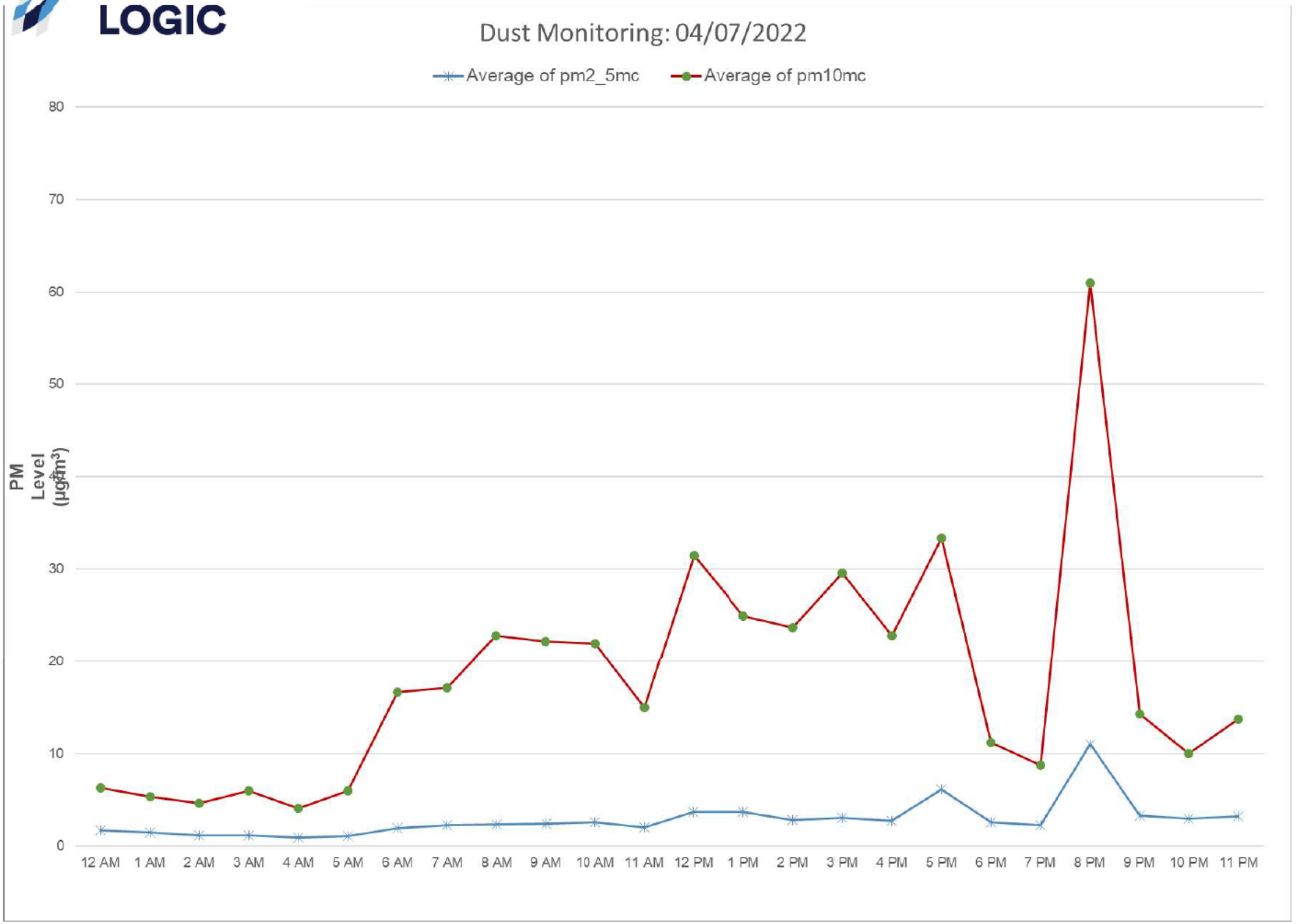
ACOUSTIC LOGIC



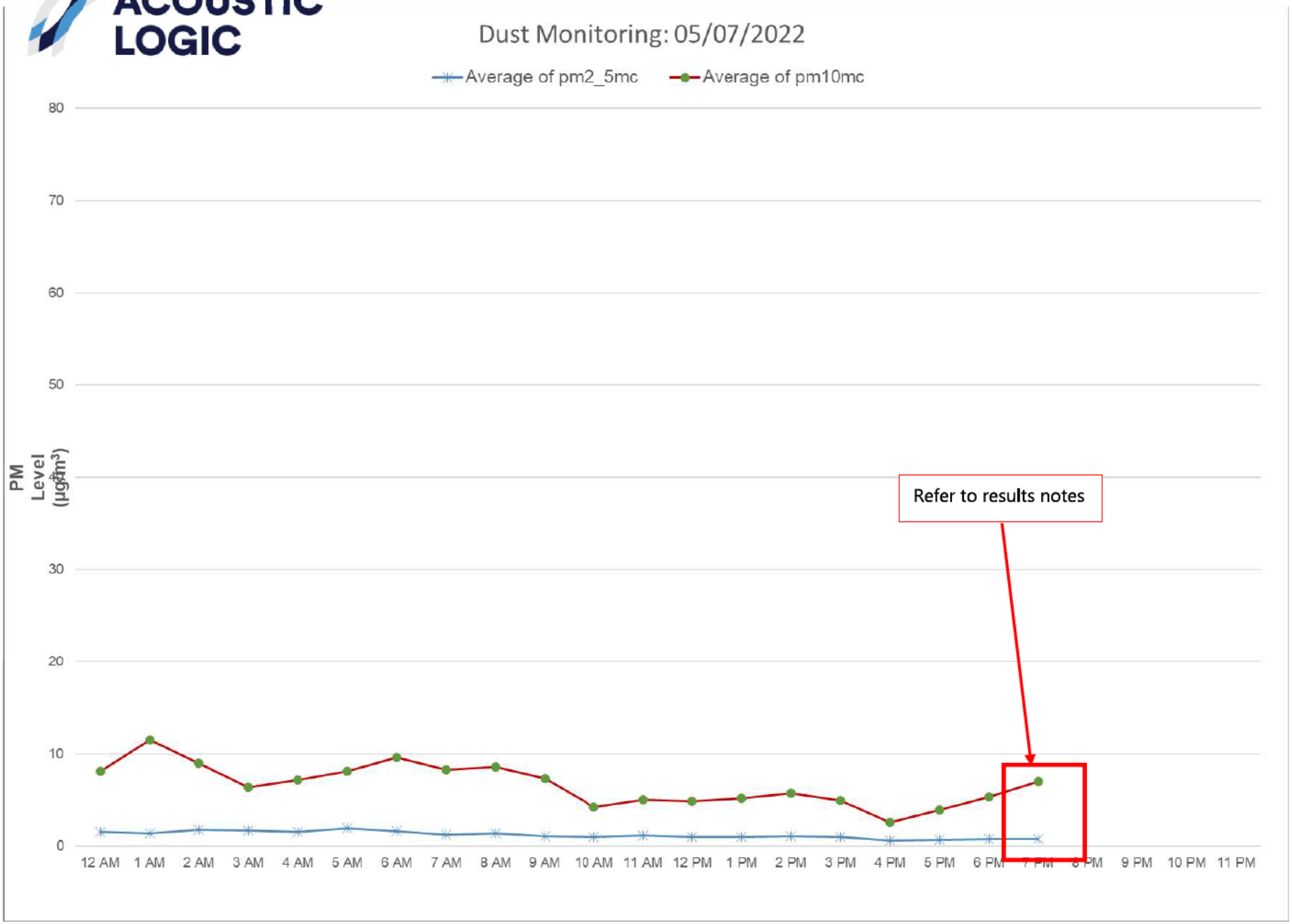
ACOUSTIC LOGIC



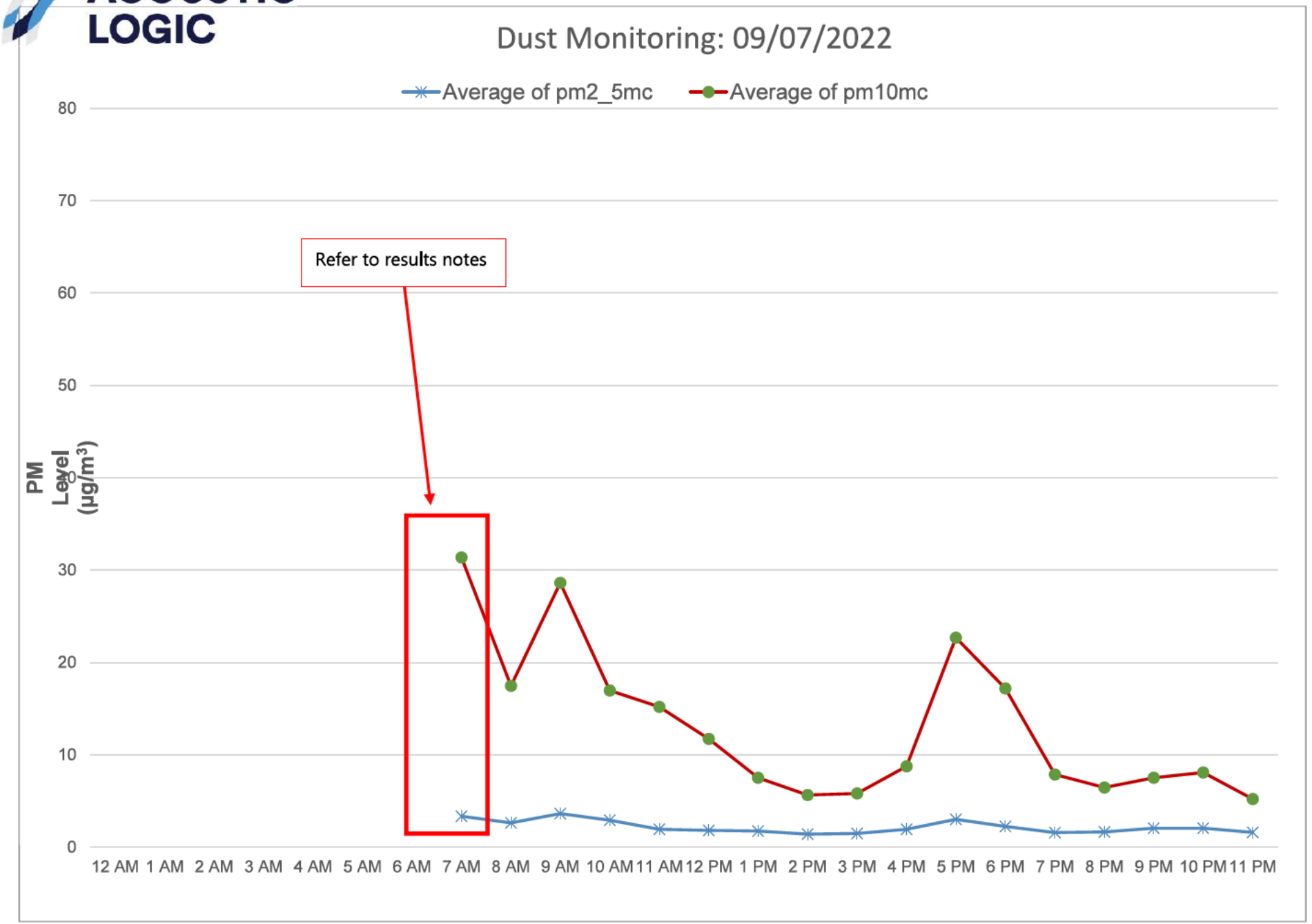
ACOUSTIC LOGIC



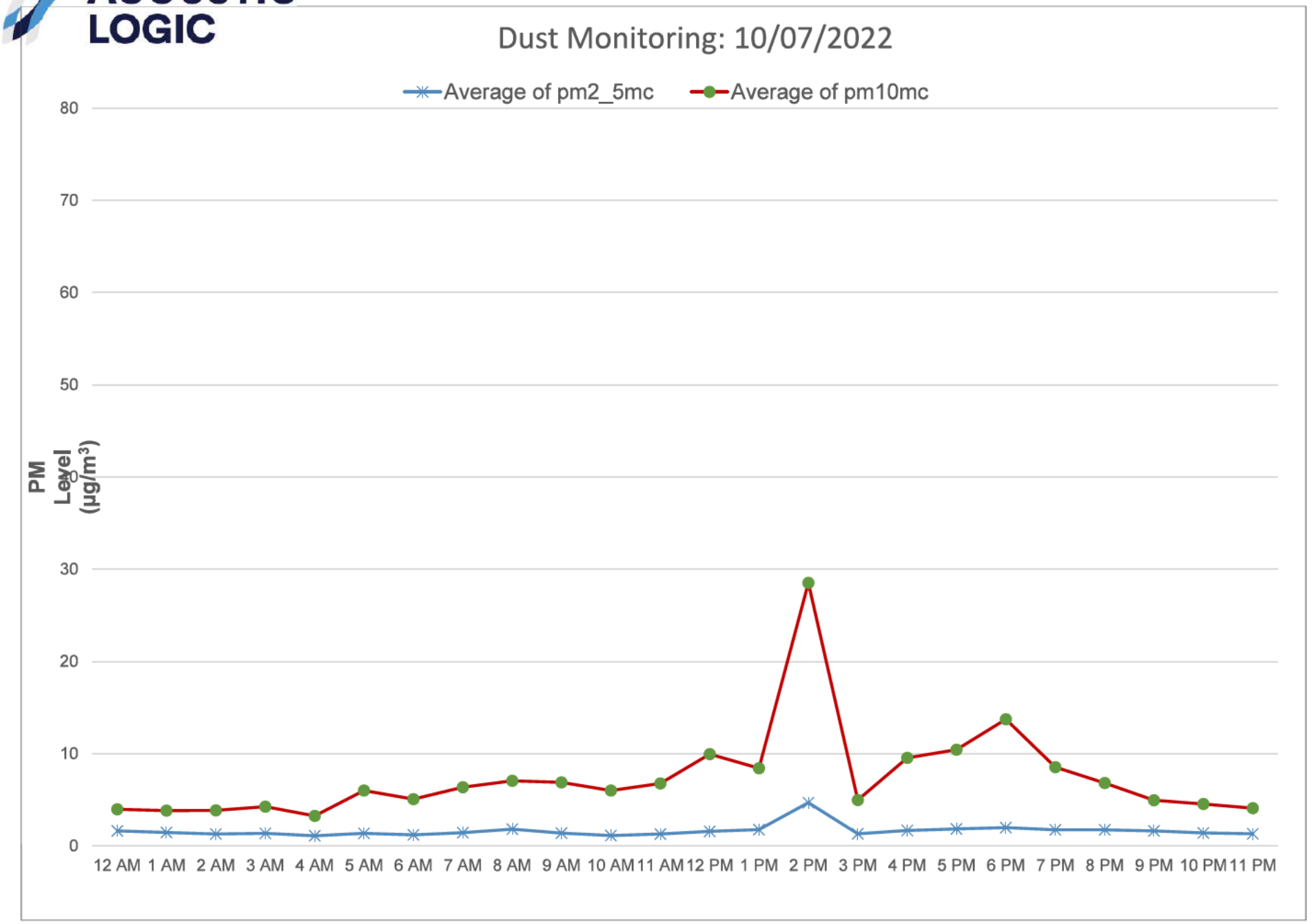
ACOUSTIC LOGIC



ACOUSTIC LOGIC



ACOUSTIC LOGIC



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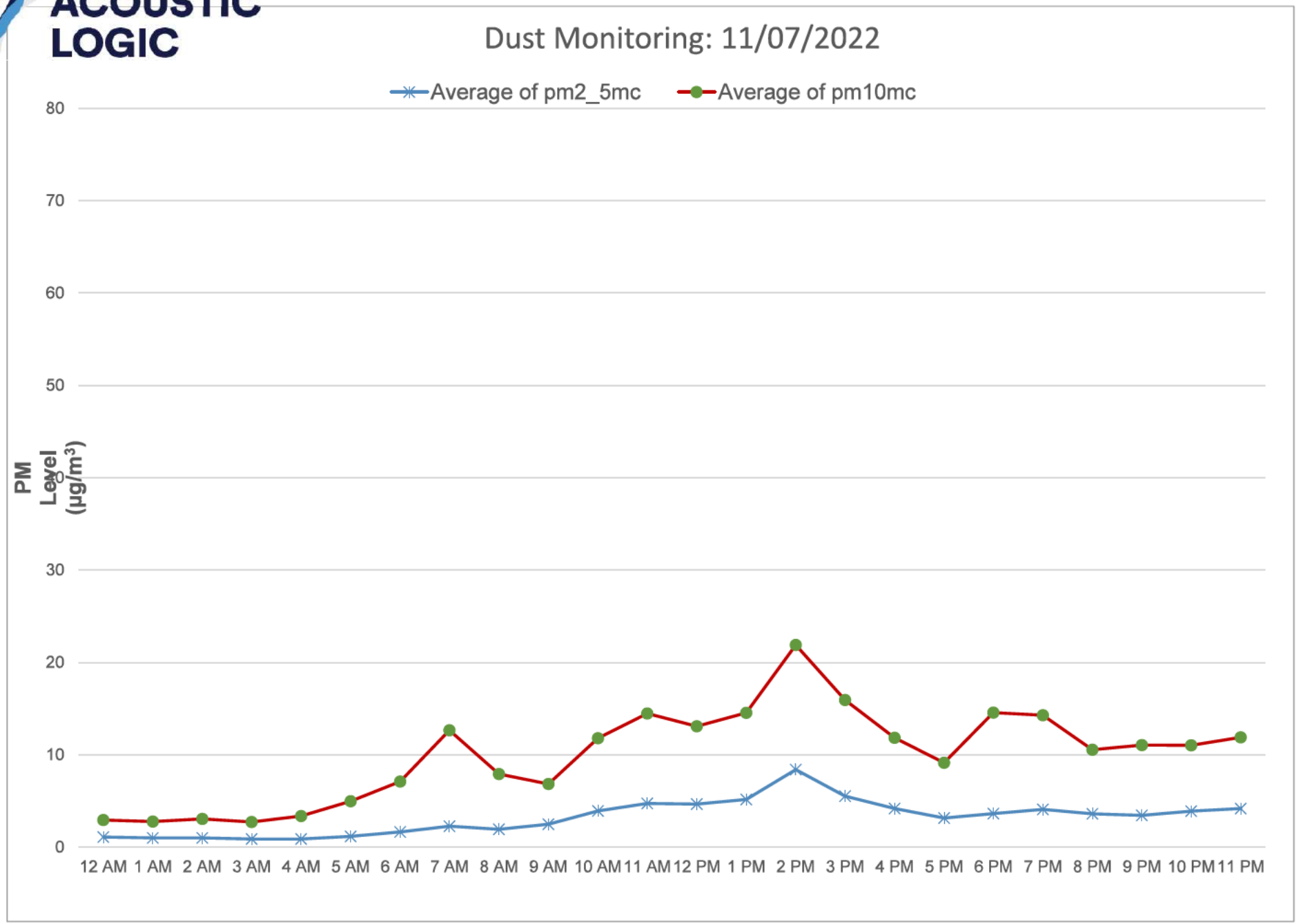

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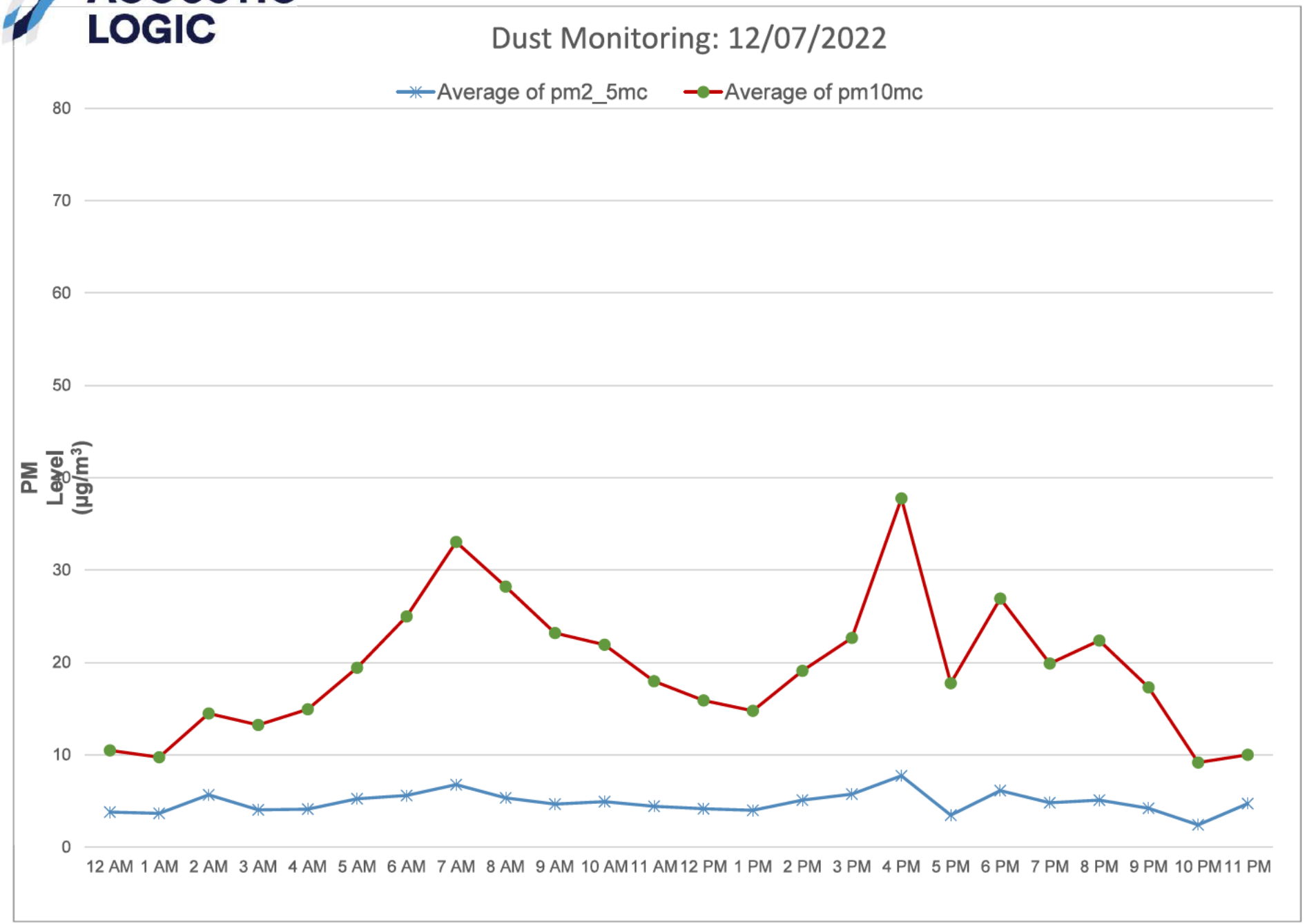

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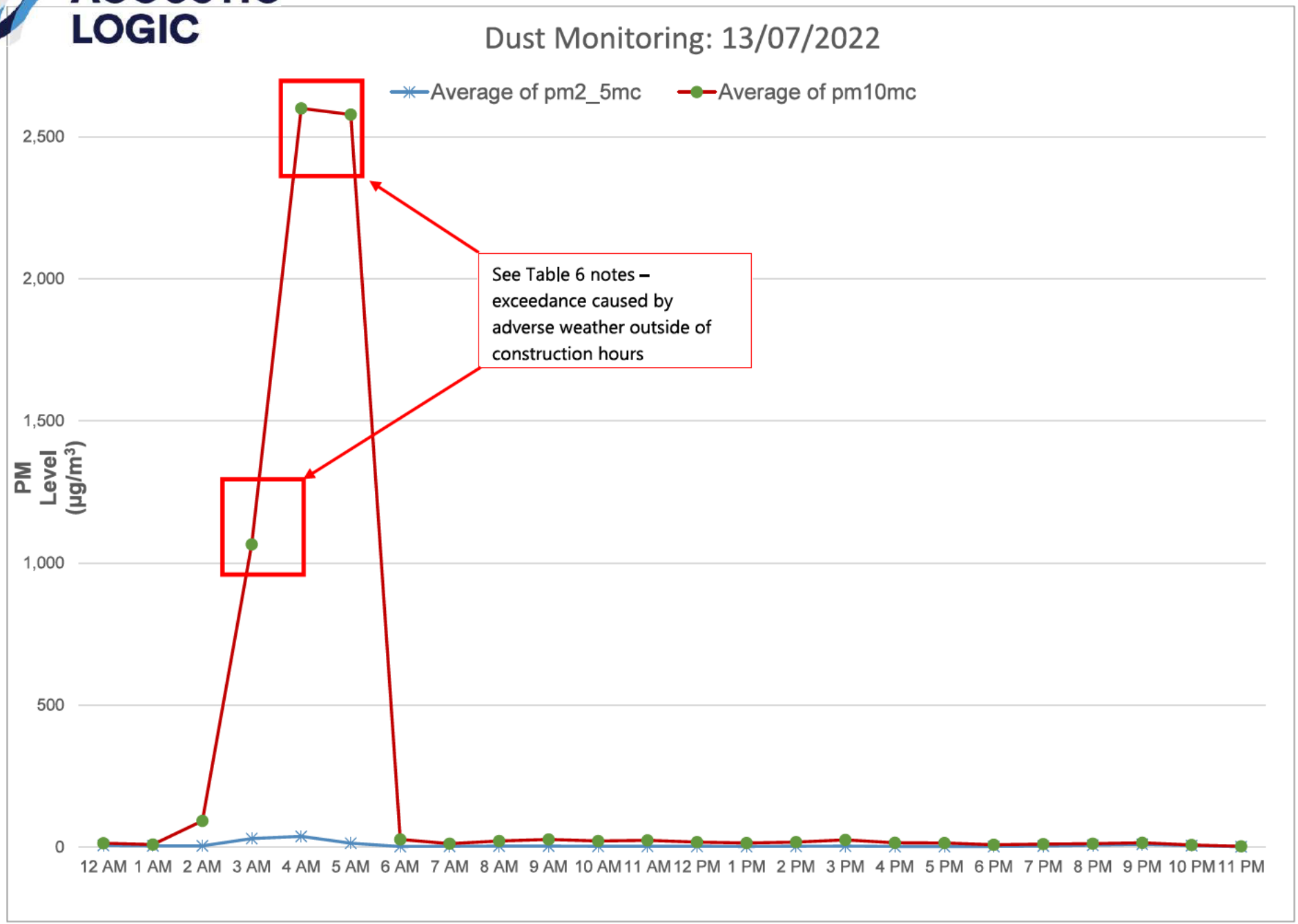

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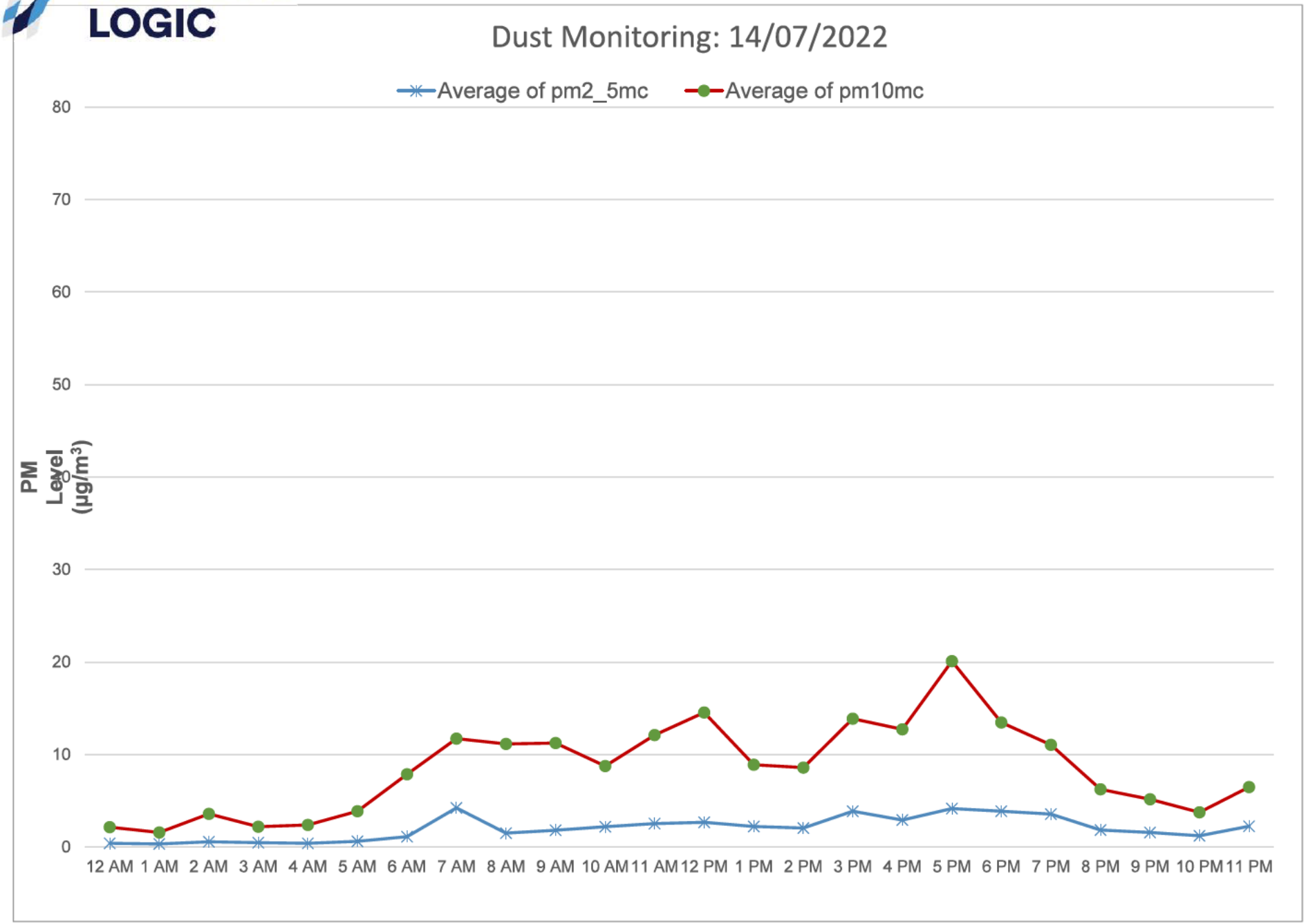

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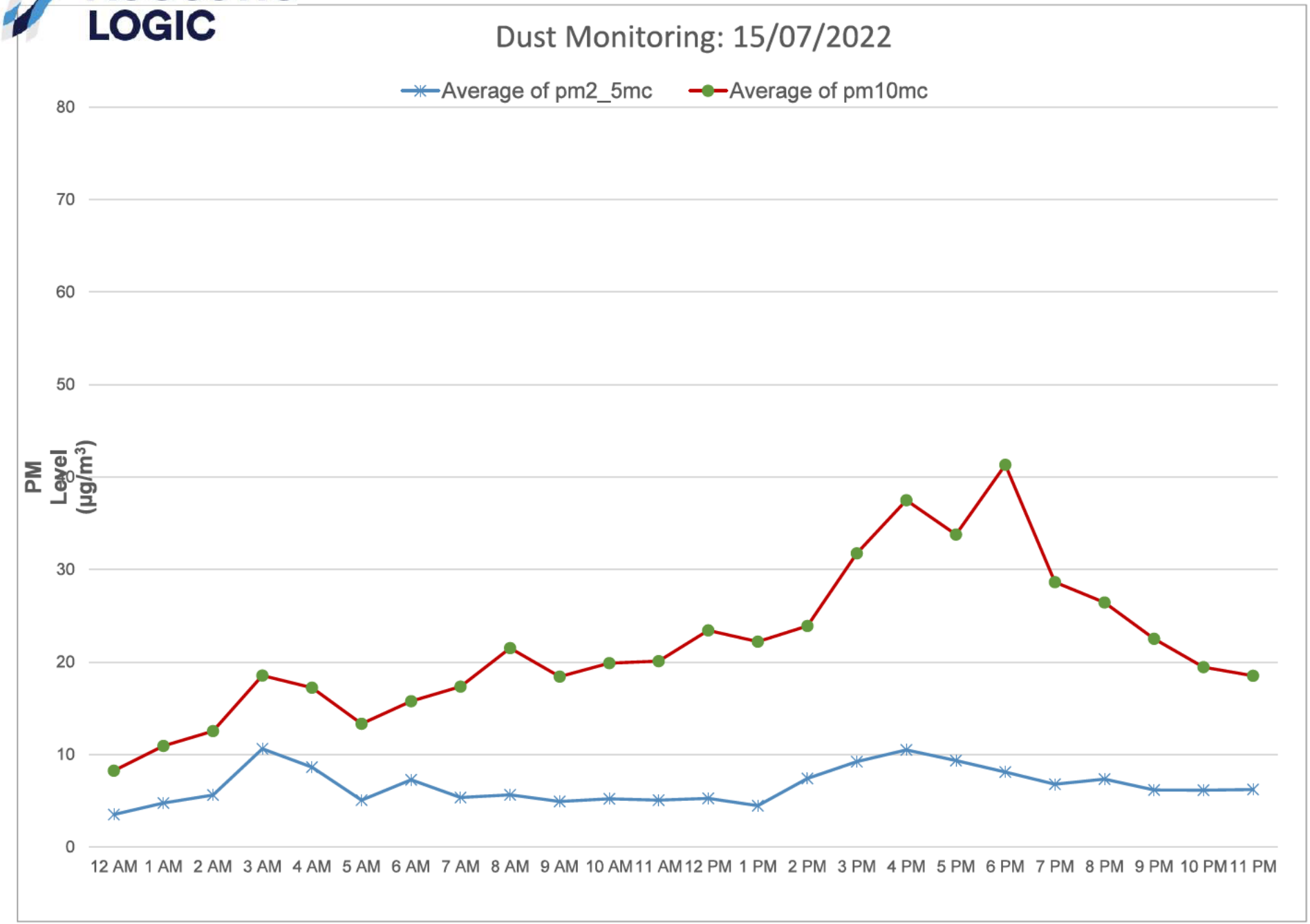

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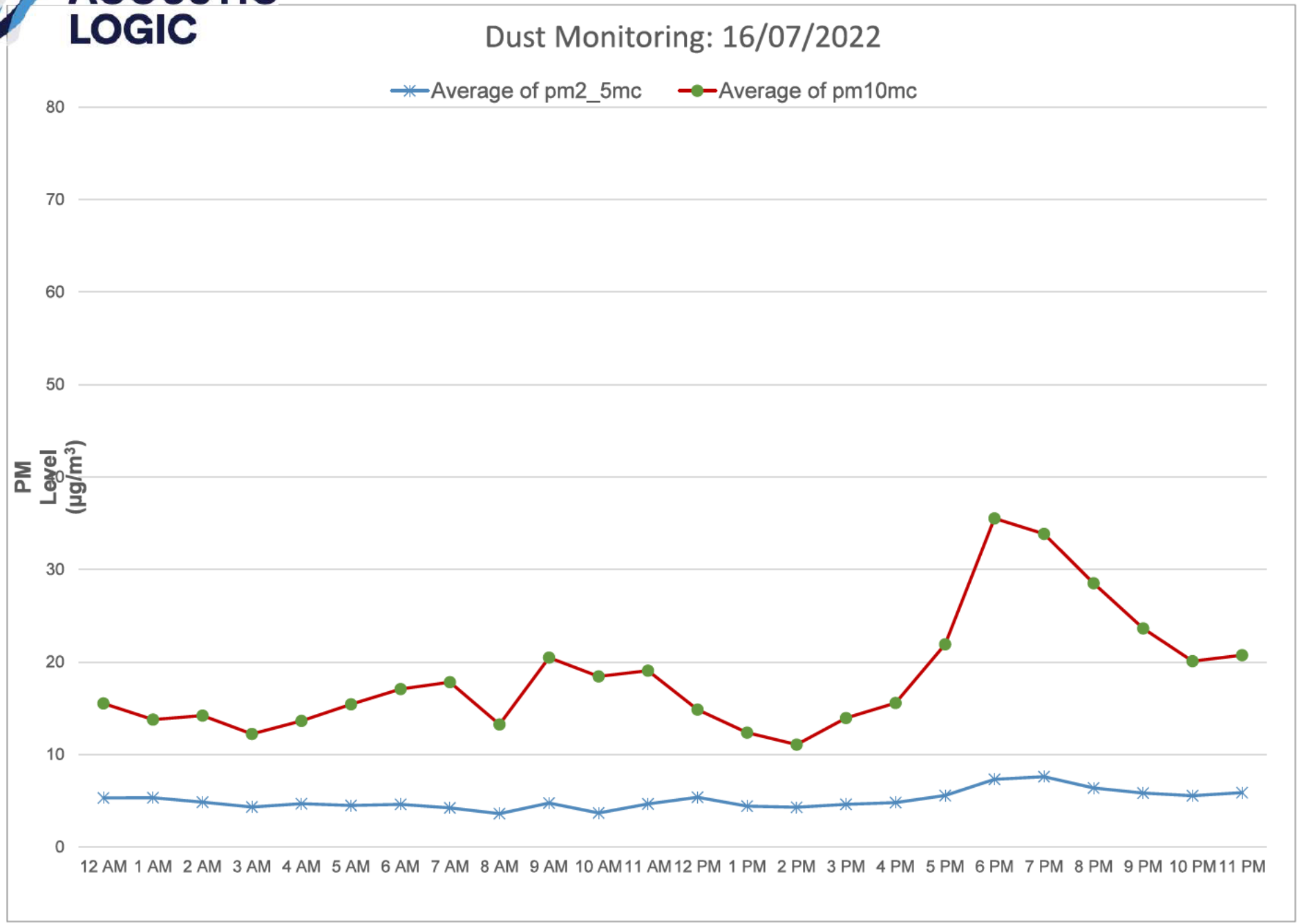

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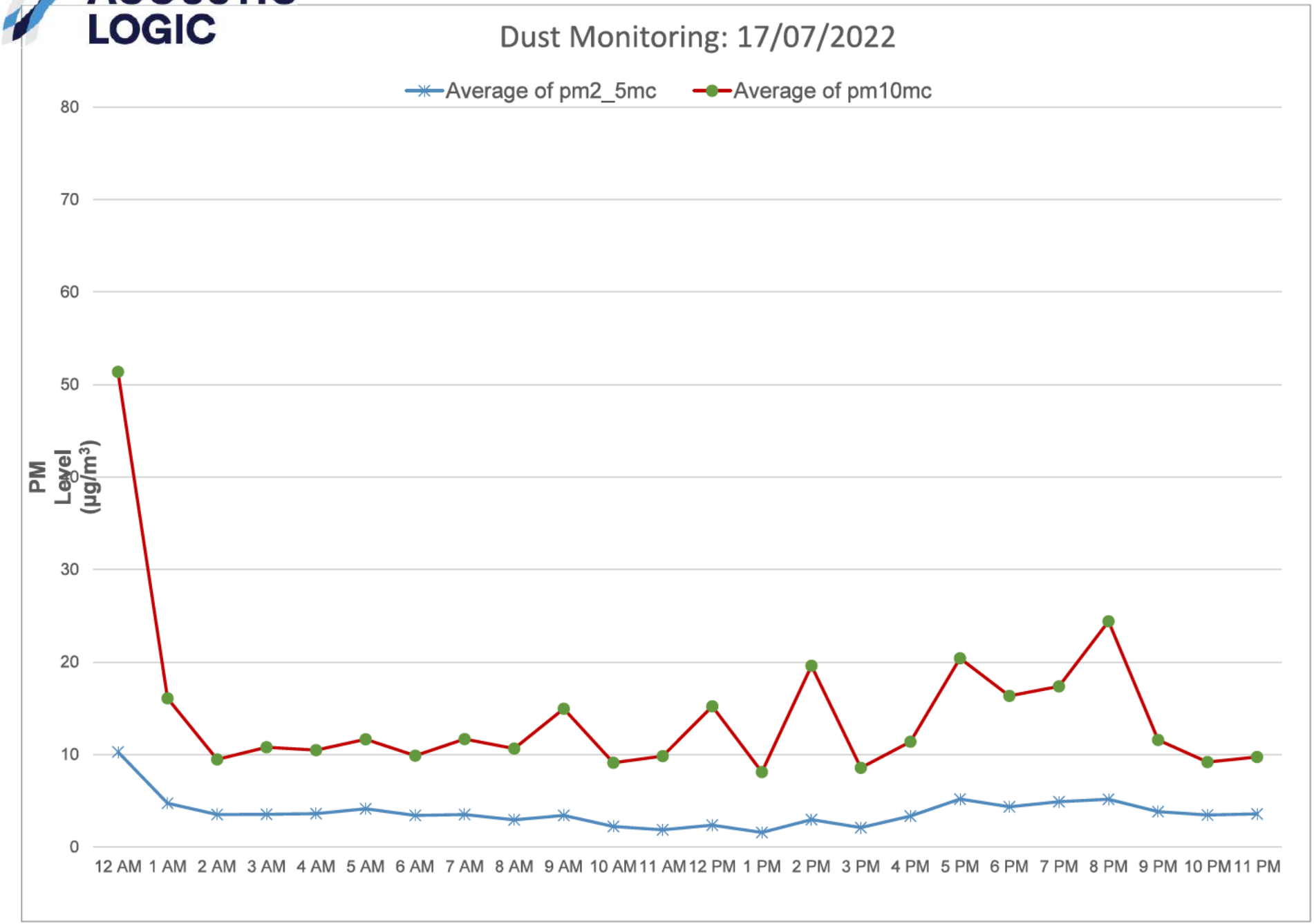

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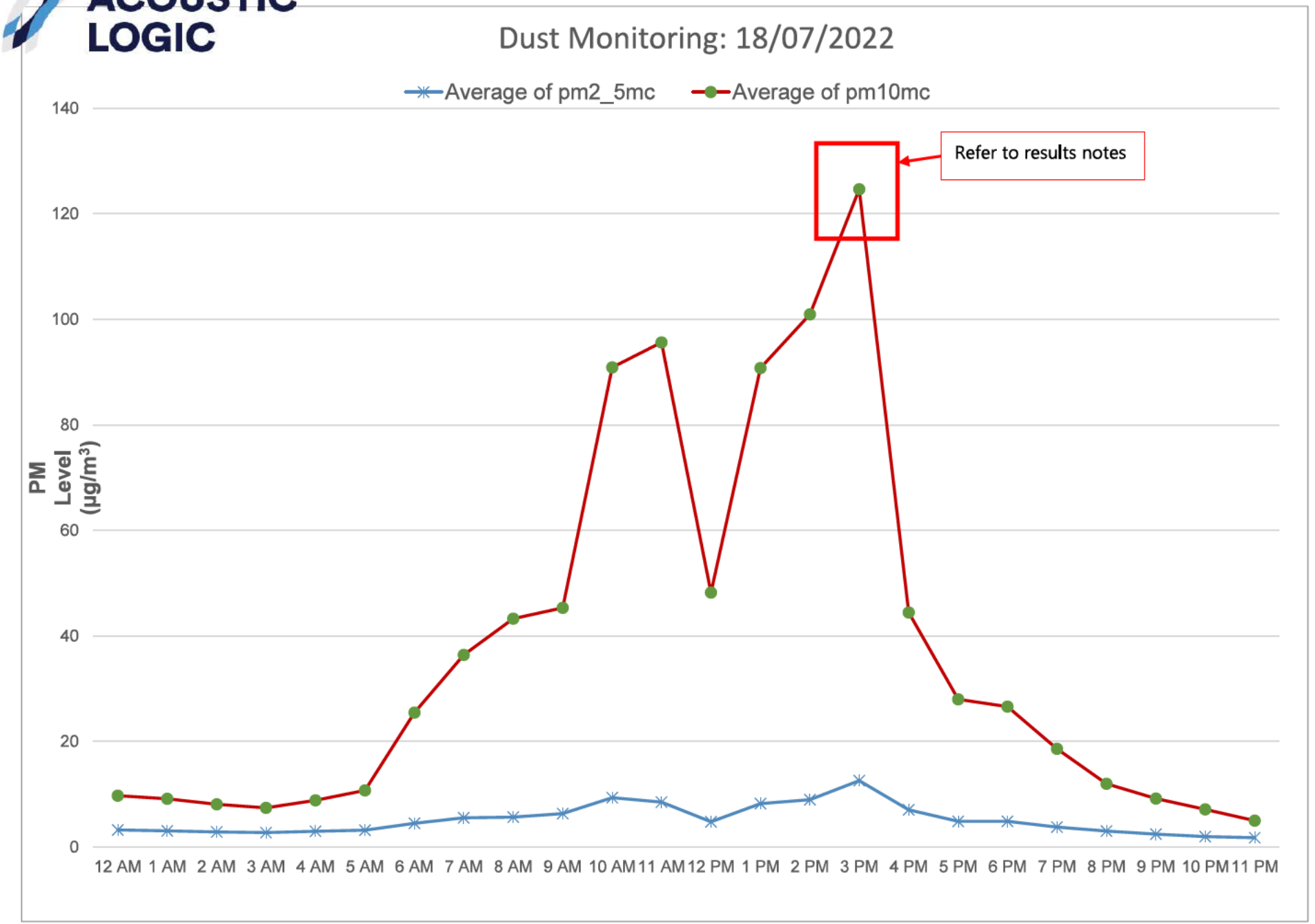

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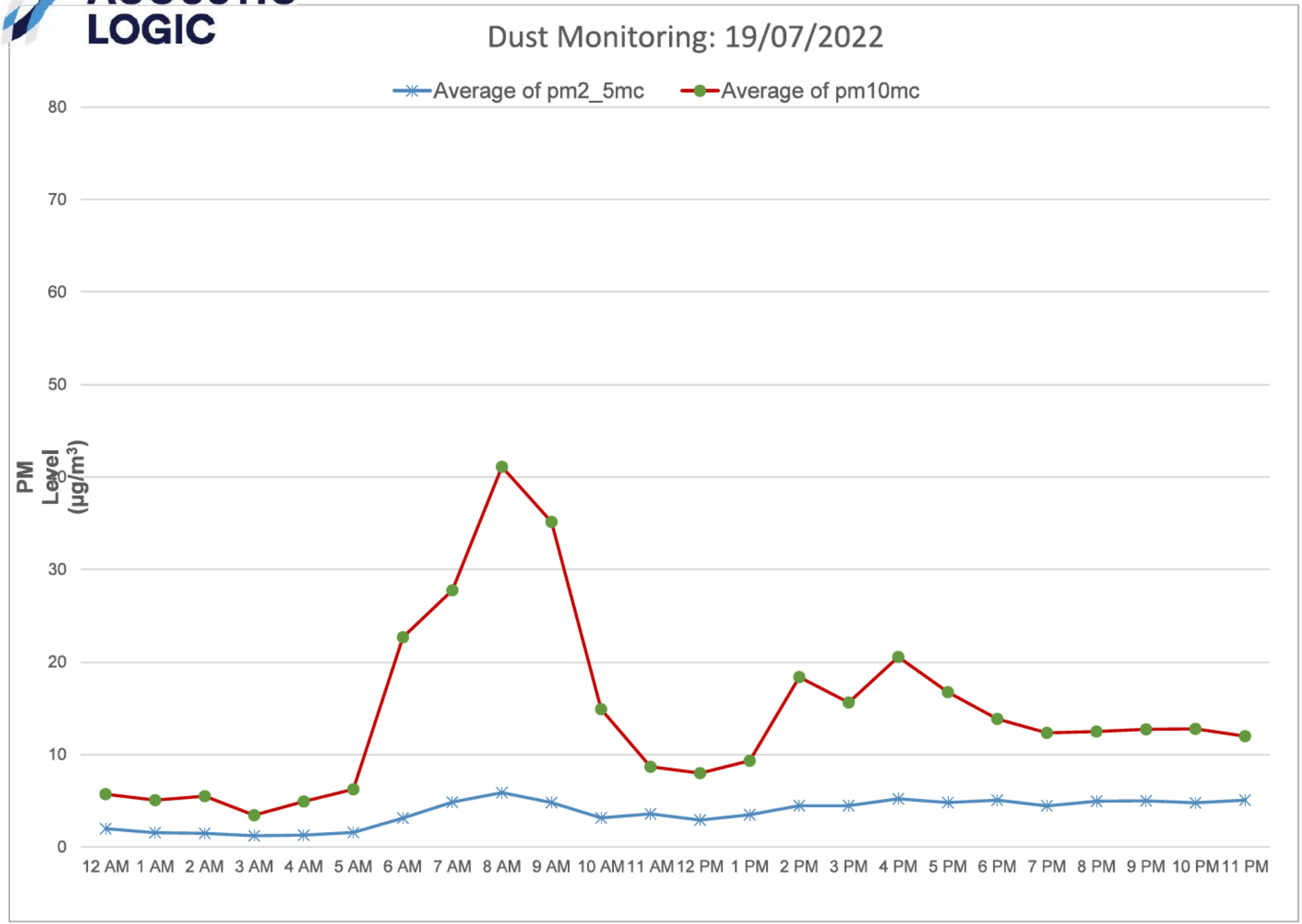

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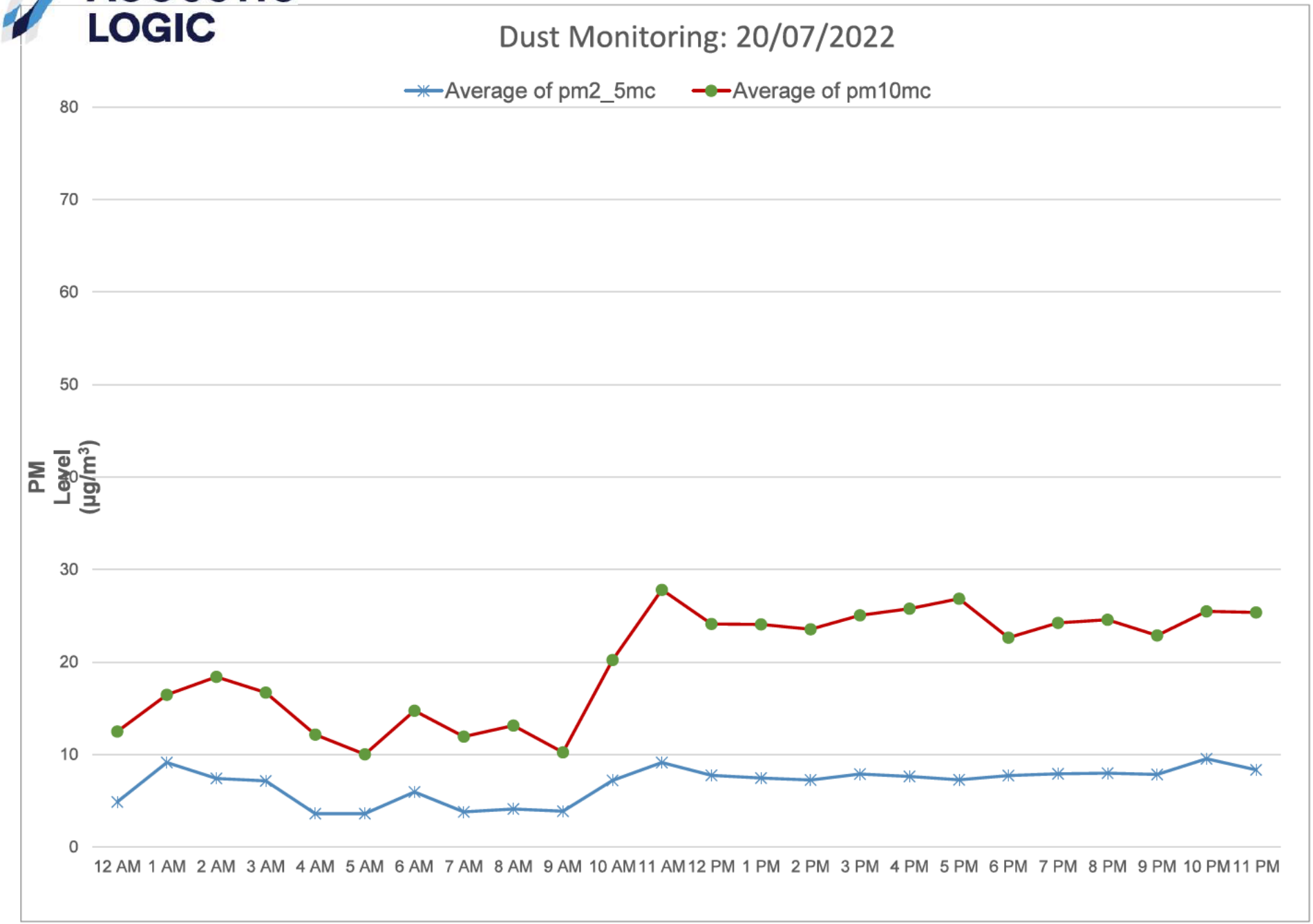

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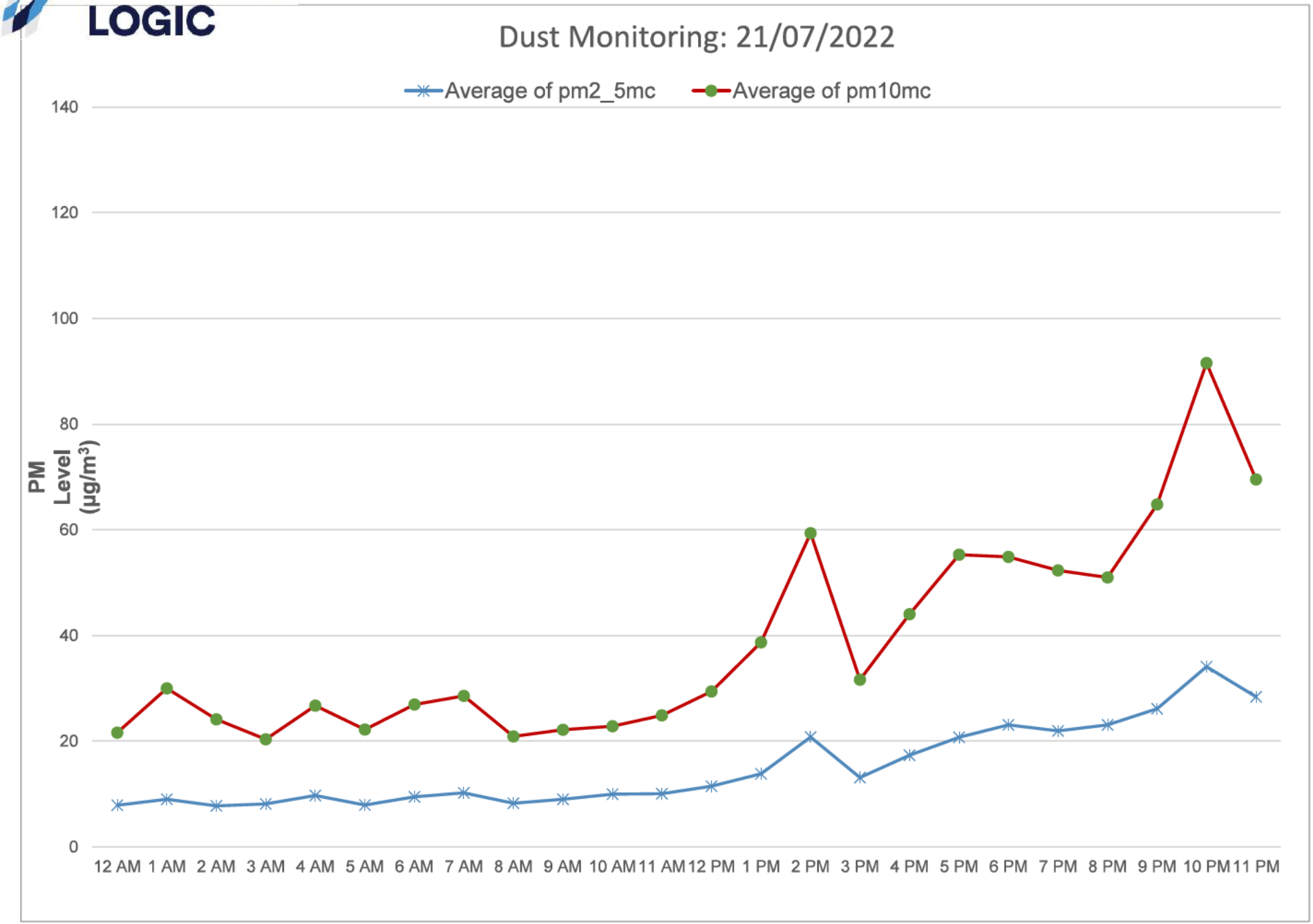

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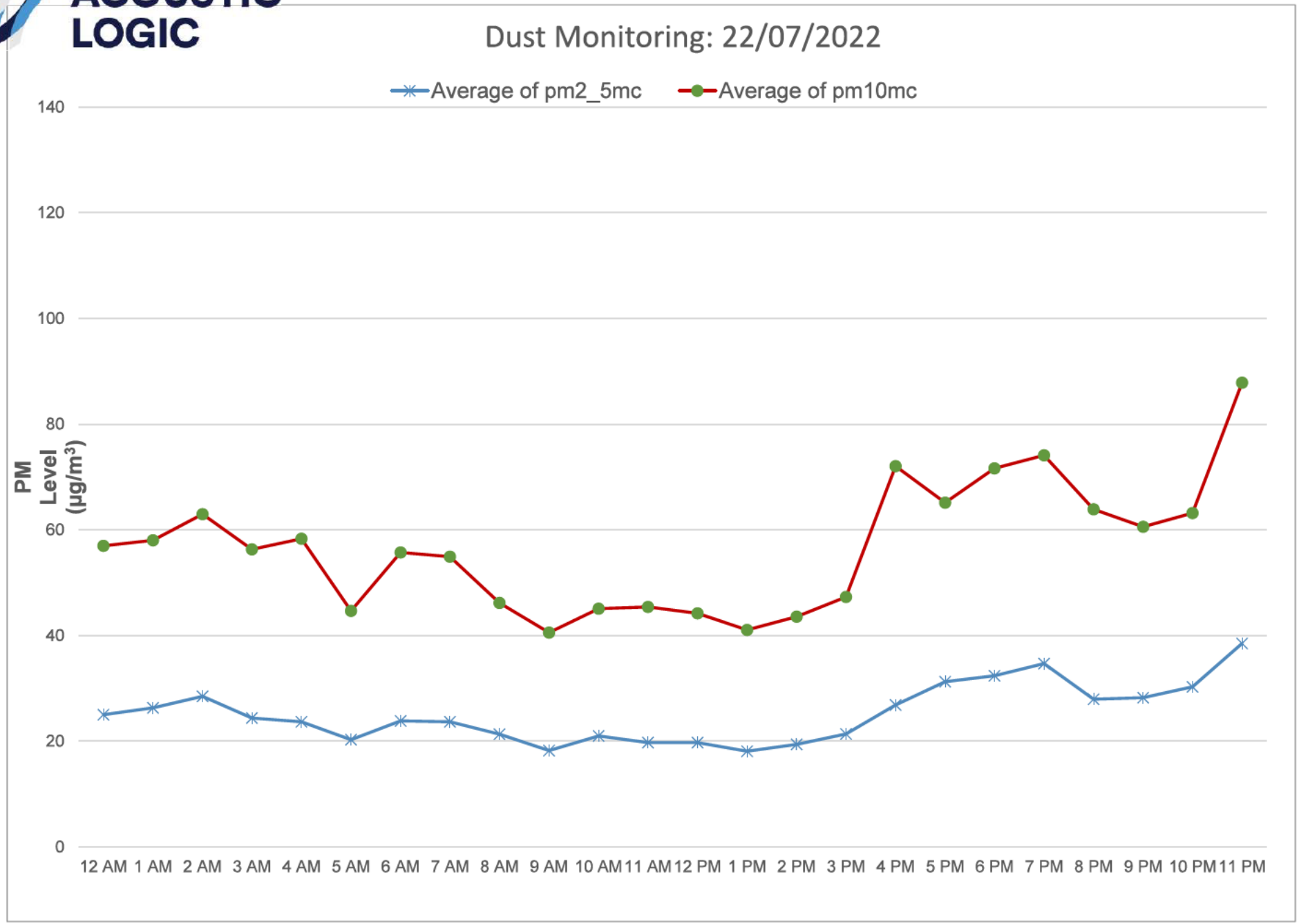

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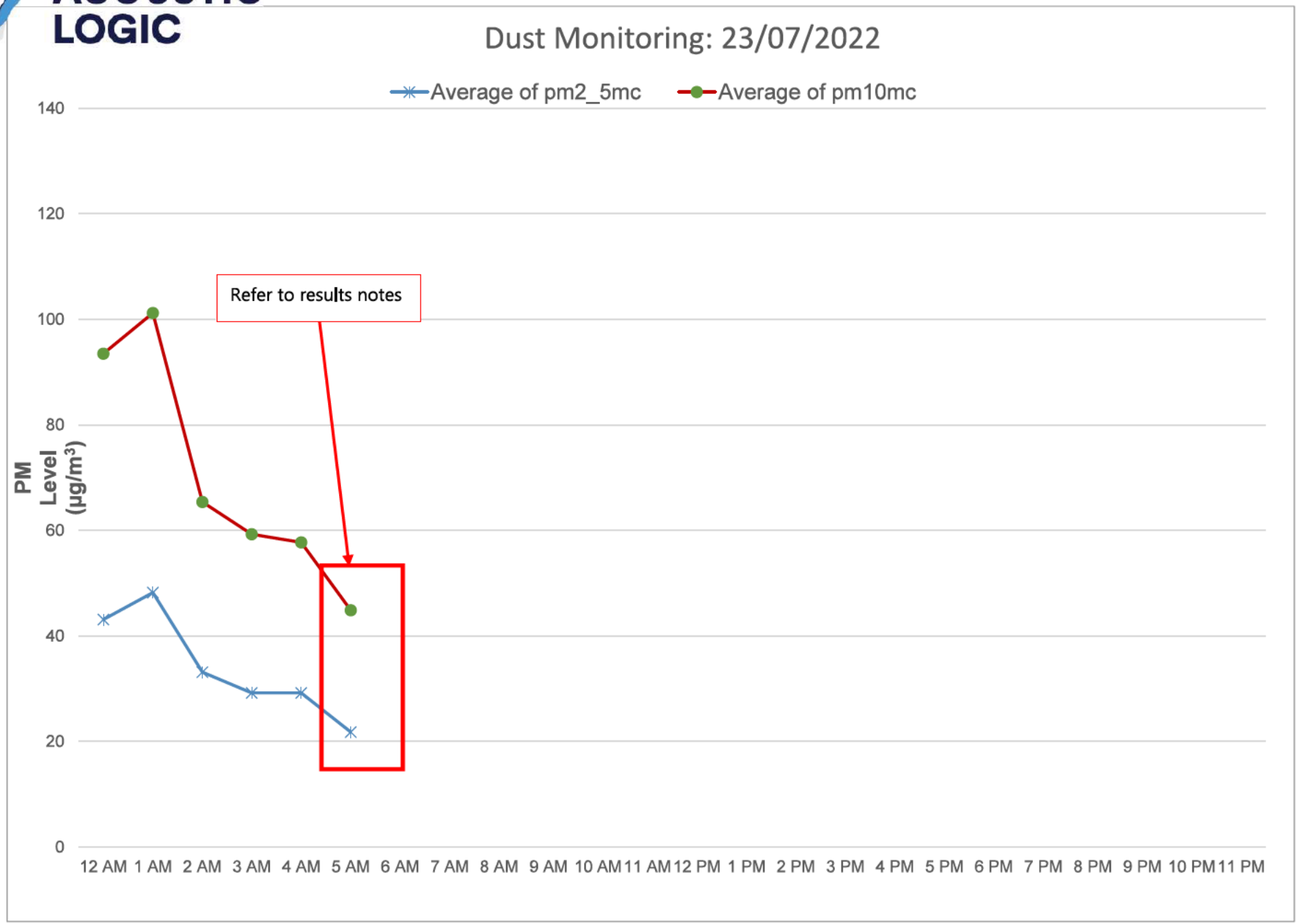

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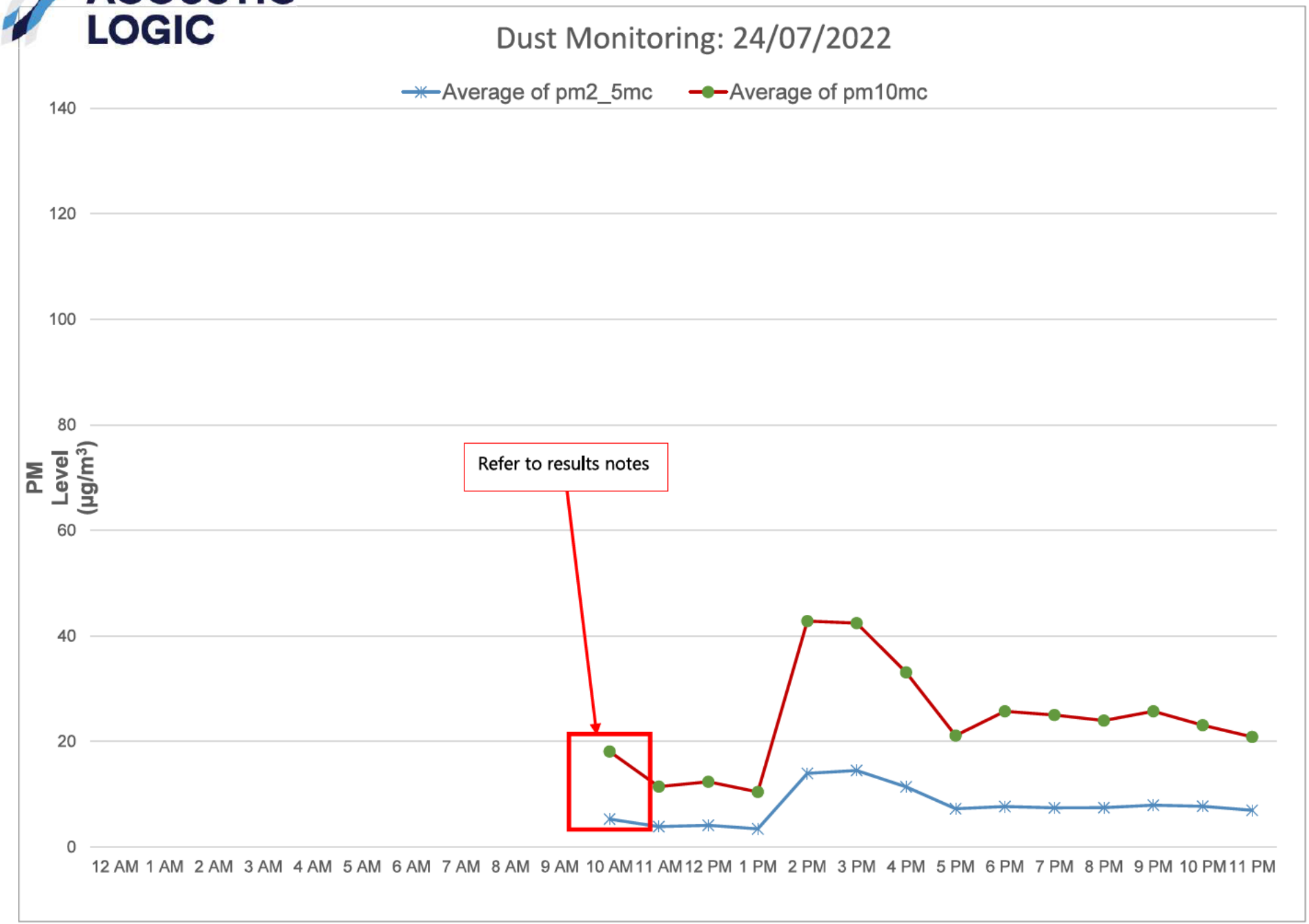

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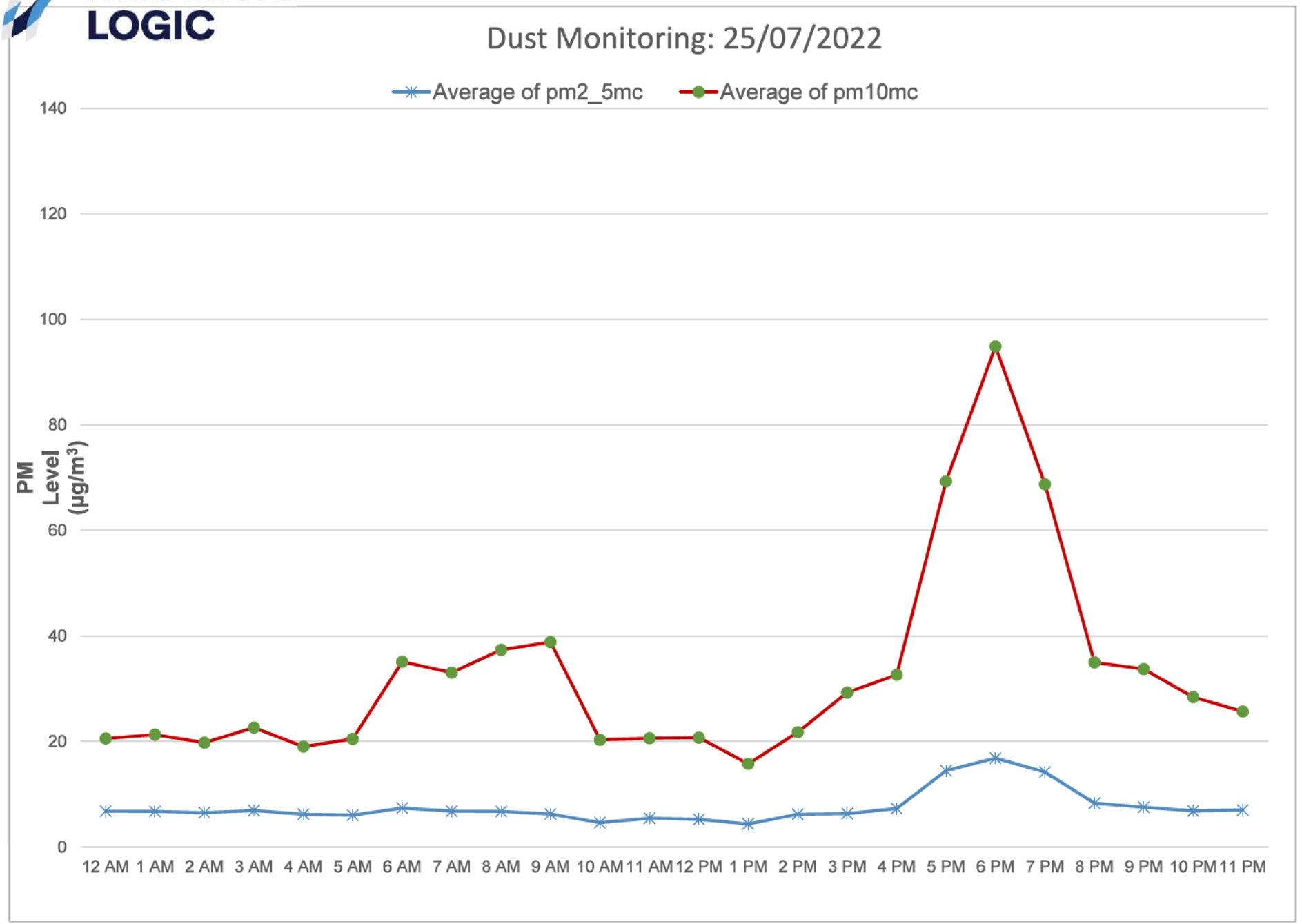

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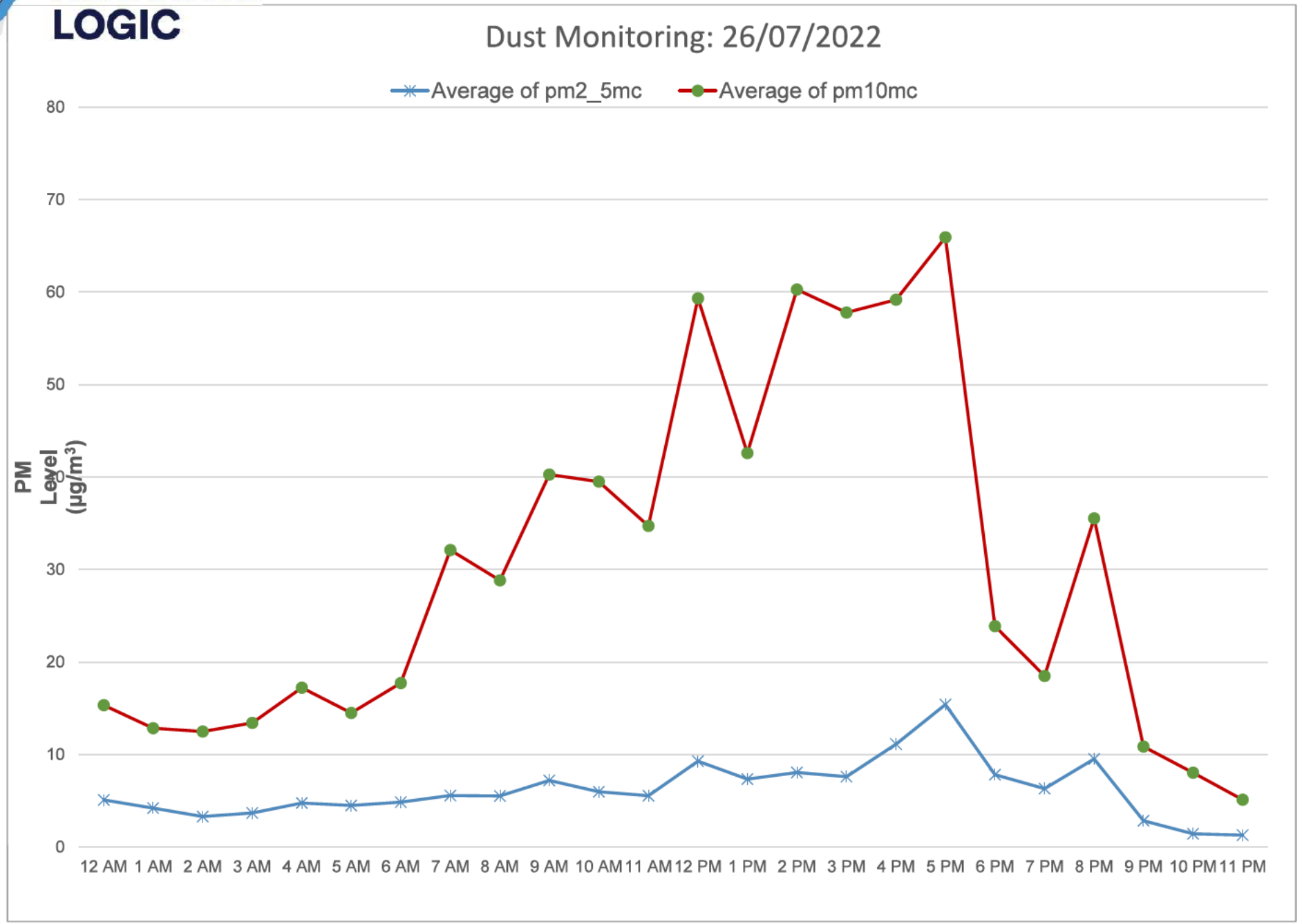

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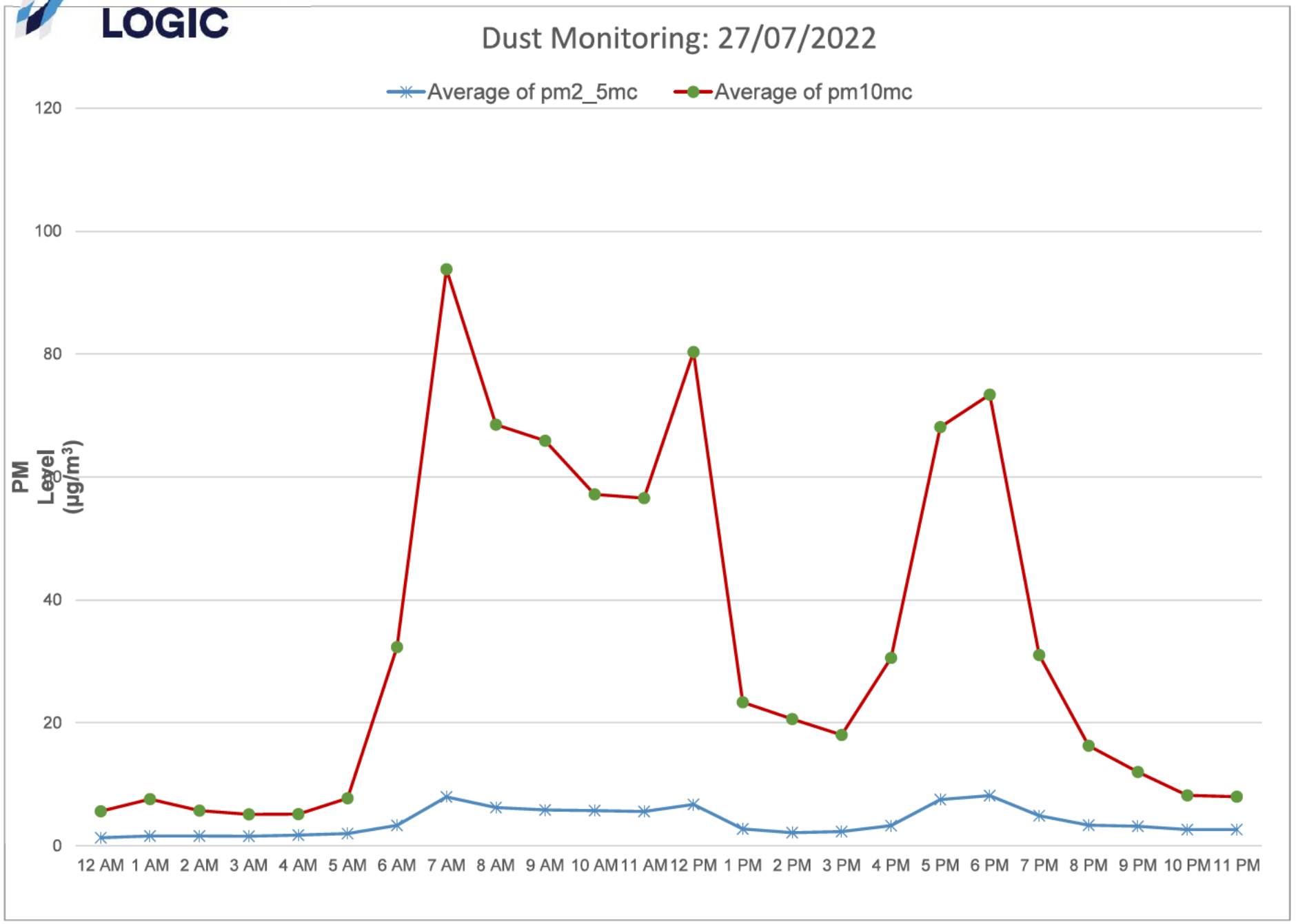

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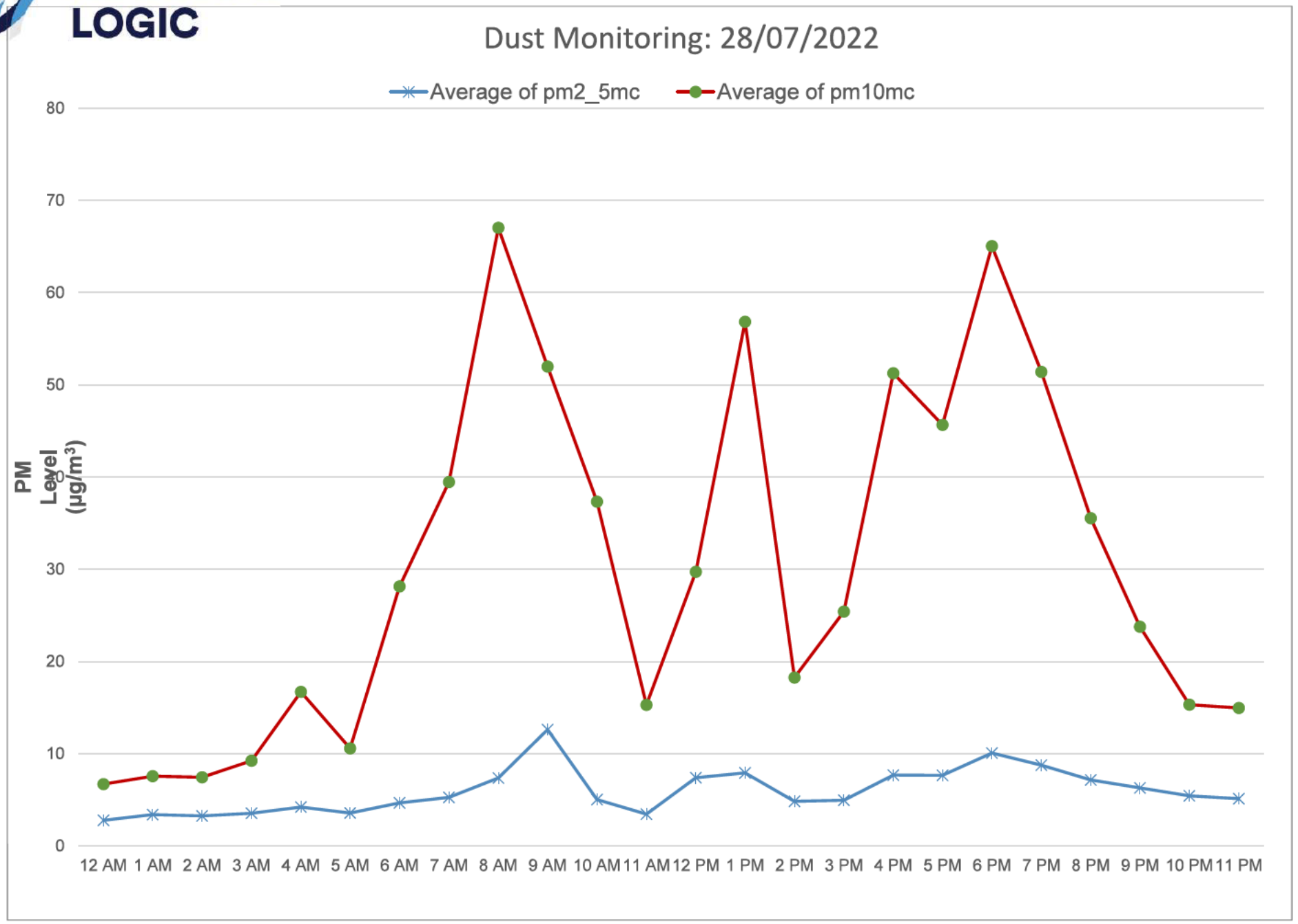

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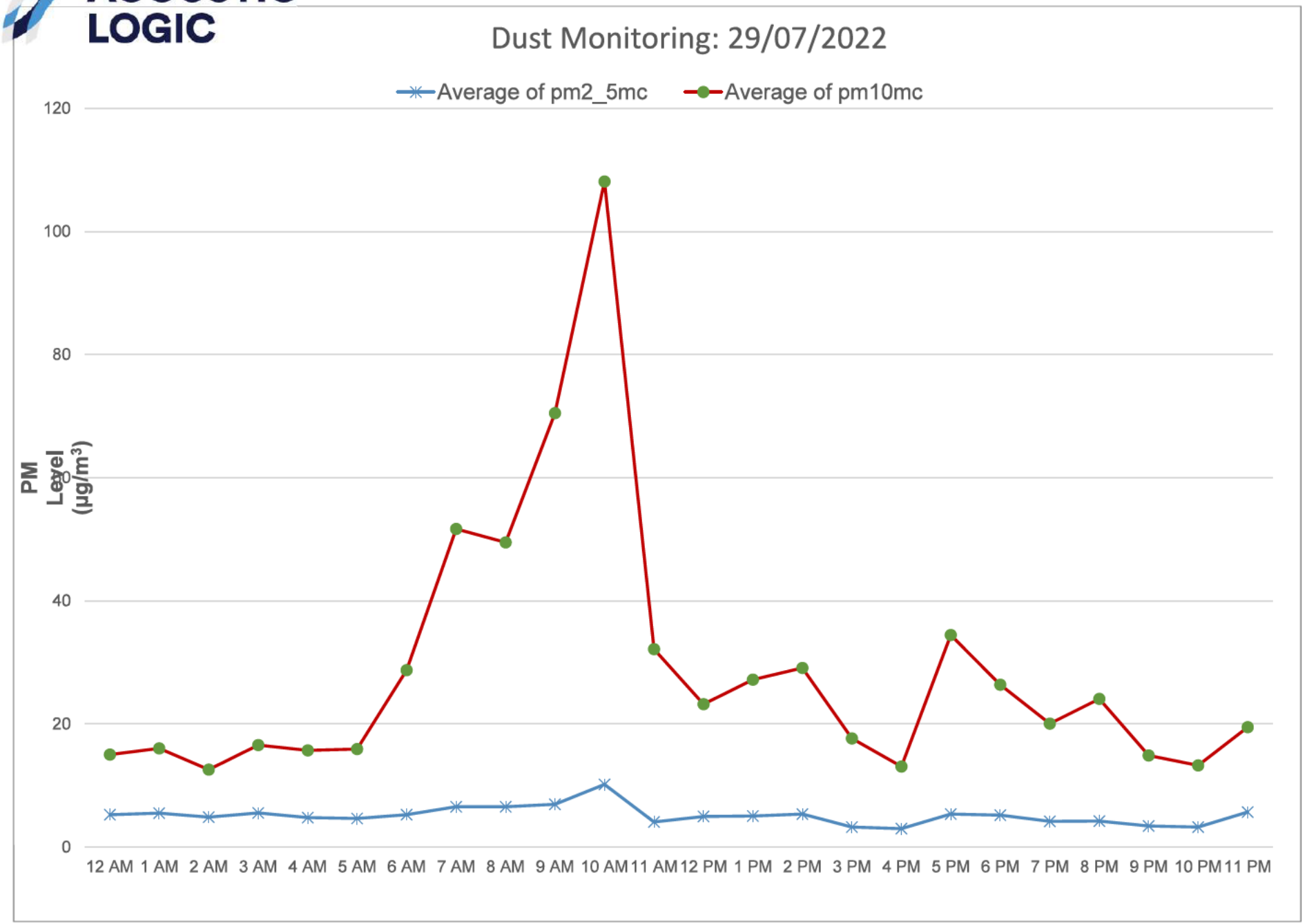

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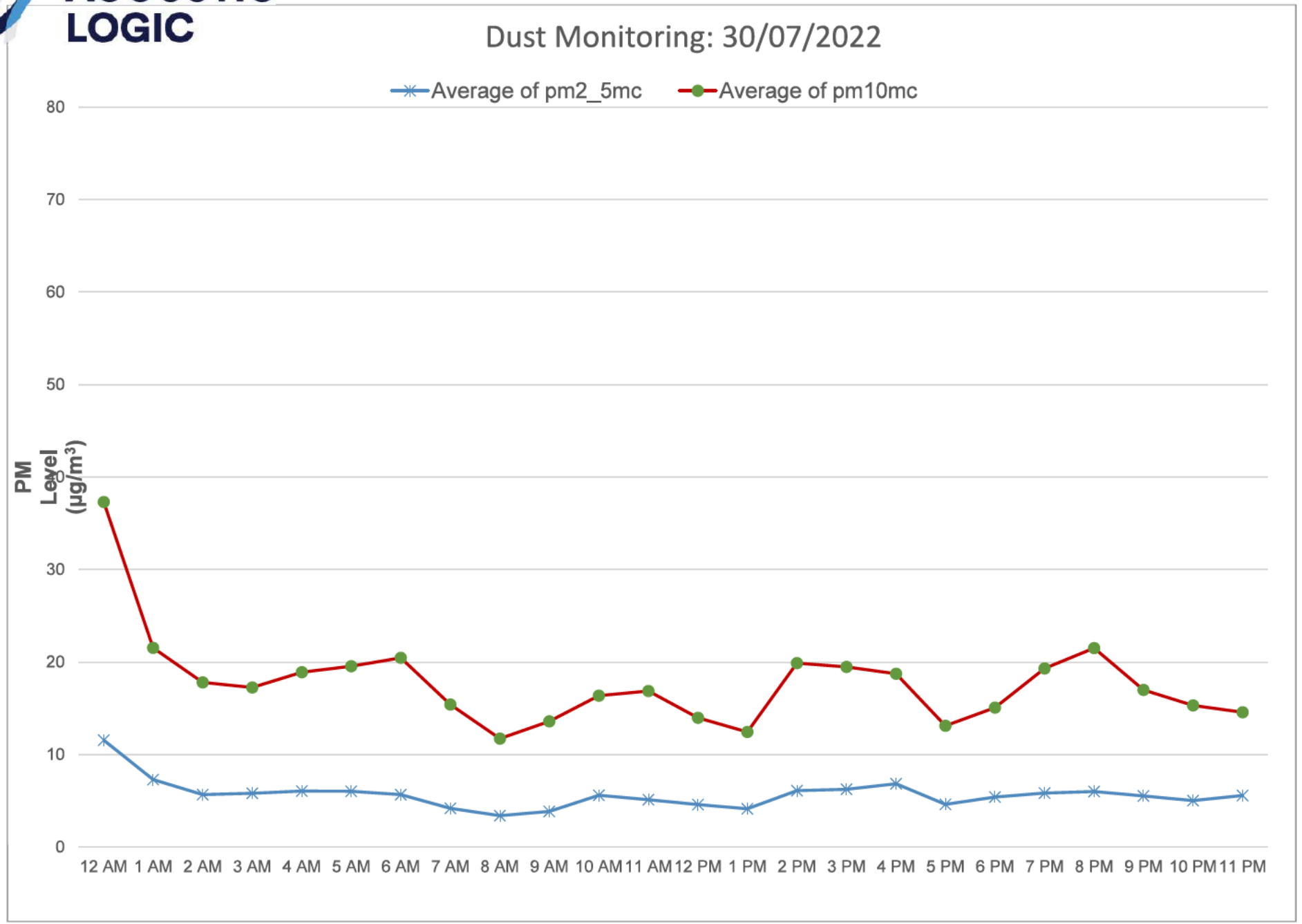

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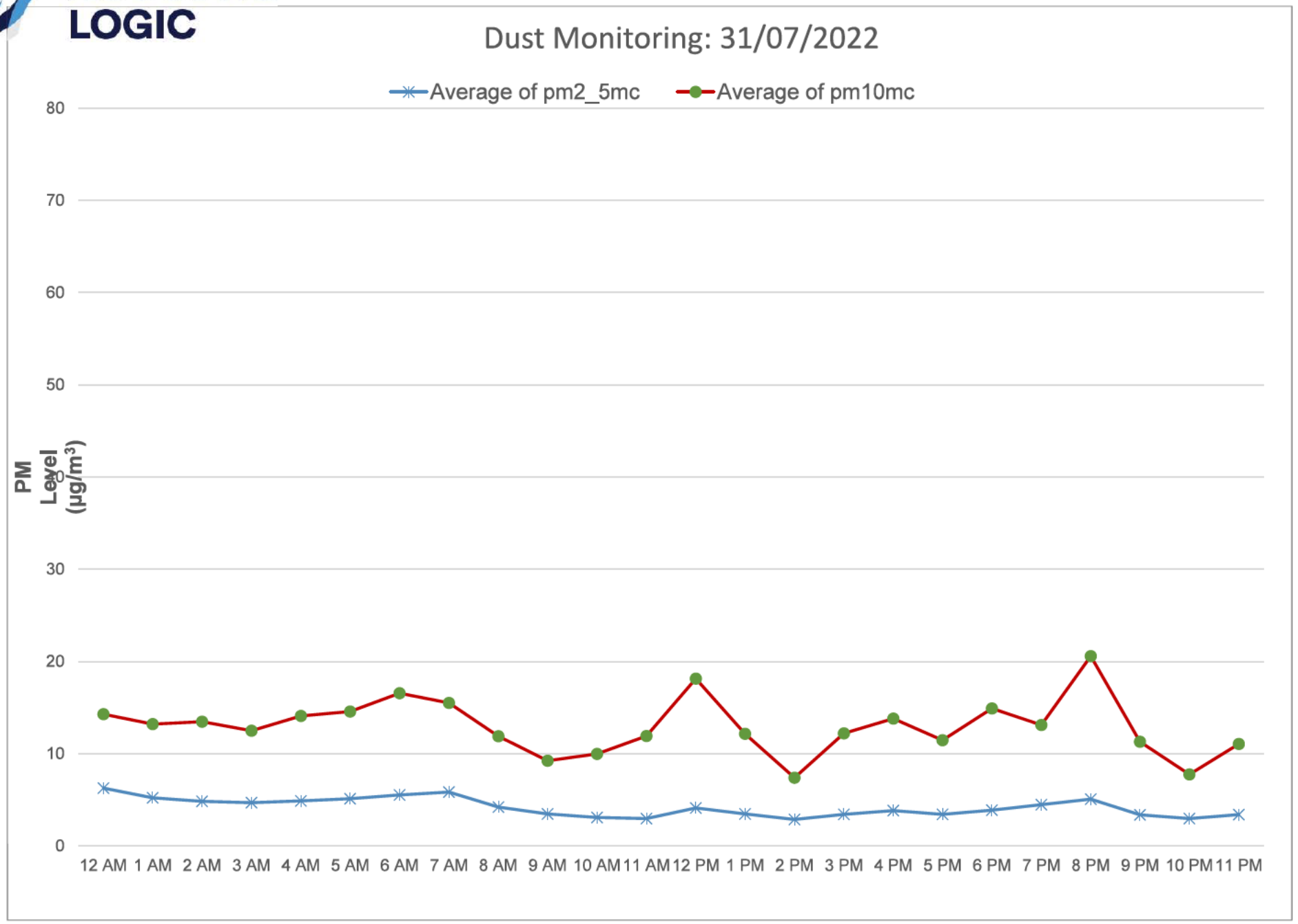

APPENDIX 4 – SITE PHOTO OF MONITORING LOCATION