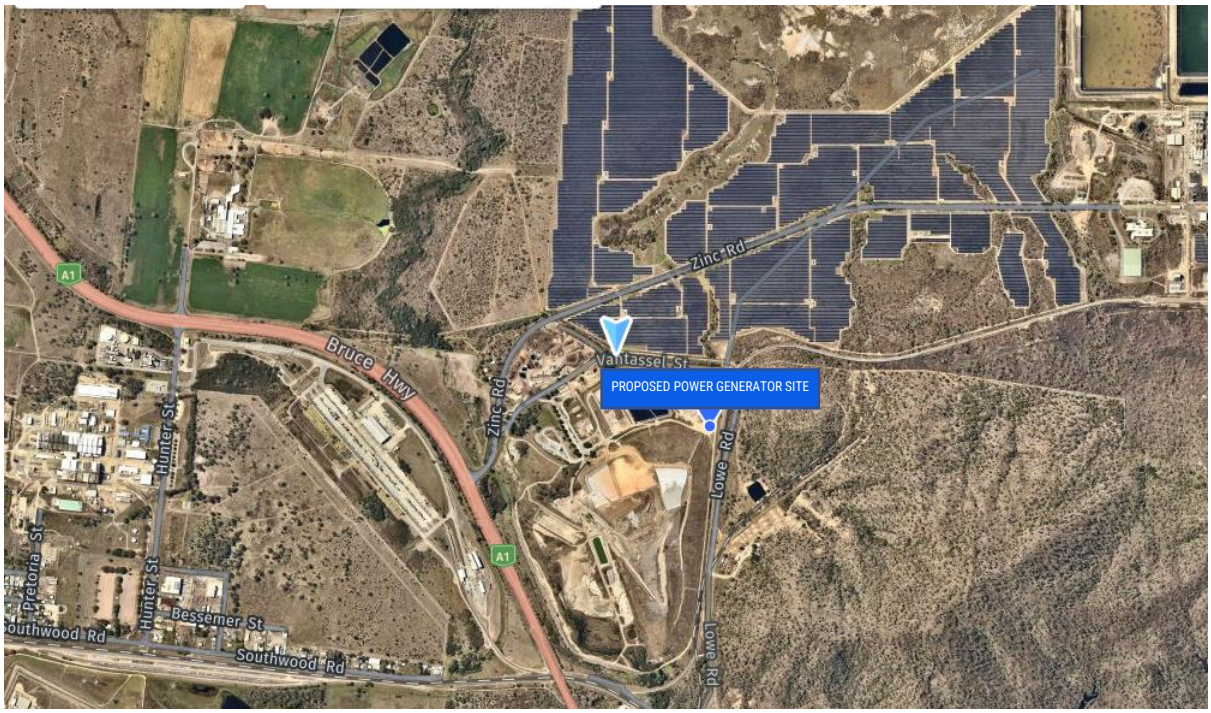
Stuart Bio-Energy Facility Townsville

Noise Impact Assessment



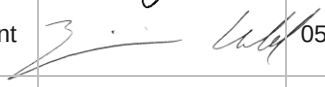
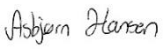
Project:	Stuart Bio-Energy Facility
Location:	Townsville, Queensland
Client:	LMS Energy Pty Ltd
Date:	9 May 2023

DOCUMENT CONTROL

REVIEW RECORD

Revision	Date	Status	Prepared	Reviewed	Approved
1	05/05/2023	Draft – for Client review	AF	BH	ARH
2	09/05/2023	Final	AF	BH	ARH

APPROVAL / SIGN OFF

ISSUE				
	Name	Position	Signature	Date
Prepared by:	Arturo Fernández	Senior Consultant		05/05/2023
Reviewed by:	Ben Hall	Principal Consultant		05/05/2023
Approved by:	Asbjorn Hansen (RPEQ: 21838)	Senior Engineer		09/05/2023
Comments:				

Release Notice

Matrix Acoustics has exercised due and customary care in preparing this report but has not, except where specifically stated, verified information provided by other parties. No other warranty, express or implied is made in relation to the conduct of Matrix Acoustics or the contents of this report. Matrix Acoustics assumes no liability for any loss resulting from errors, omissions or misrepresentations made by others.

TABLE OF CONTENTS

Executive Summary 4
1 Introduction 5
2 Sensitive Receptors 6
3 Existing Noise Environment 7
4 Noise criteria 10
4.1 Environmental Protection Act (1994) 10
4.2 Environmental Protection Regulation (2019) 10
4.3 Environmental Protection (Noise) Policy 2019 10
5 Noise Impact Assessment 12
5.1 Noise model information 12
5.2 Noise source information 12
5.3 Internal criteria 13
6 Results 14
7 Conclusion 15
Appendix A 16
Appendix B 30

TABLE OF TABLES

Table 3-1 Instrumentation used for the monitoring regime. 7
Table 3-2 Noise measurement summary 9
Table 4-1 An extract of the residential receptors noise limits from the EPP Noise 11
Table 5-1 Noise model parameters 12
Table 5-2 Sound power levels of power generator module elements 12
Table 6-1 Predicted noise levels 14

TABLE OF IMAGES

Image 1-1 Site location 5
Image 2-1 Noise sensitive receptors 6
Image 3-1 Noise monitor within the landfill site 8

EXECUTIVE SUMMARY

Noise impacts from the proposed LMS renewable energy facility at Stuart Landfill were assessed.

The noise assessment found that the noise levels from the proposed operation of a single power generator module are predicted to comply with the relevant noise criteria by a margin of more than 20 dBA.

It is therefore considered that the project has demonstrated that it will be able to operate in a manner that complies with the noise requirements of the Environmental Protection Act, Environmental Protection Regulation, and the Environmental Protection (Noise) Policy.

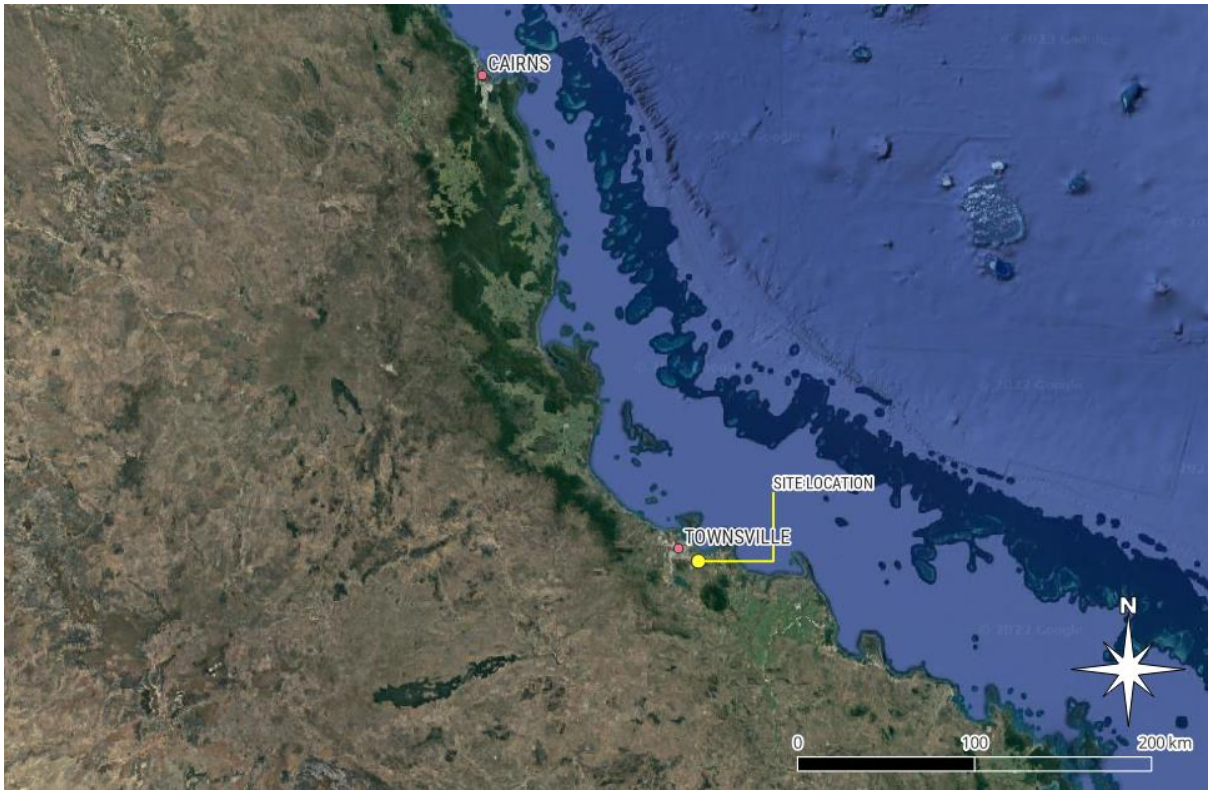
1 INTRODUCTION

Matrix Acoustics was engaged by LMS Energy Pty Ltd (LMS) to assess the noise impact from the proposed Bio-Energy facility at Stuart Landfill in Townsville, QLD. The site currently utilises one flare for the release of landfill gas. LMS is proposing to install a generator module (GM) and use the landfill gas to run the GM to generate electricity.

The objective of this study is to determine the potential noise impact from the proposed development. This will include assessment of the current ambient background noise levels, creation of a 3D noise model to predict the noise levels at the nearest noise sensitive receptors, and determination of compliance with noise criteria.

Image 1-1 shows the current flare location and the location where the GM will be positioned (the yellow circle), the location of the noise monitor, as well as the noise sensitive receptors situated around the landfill site.

Image 1-1 Site location

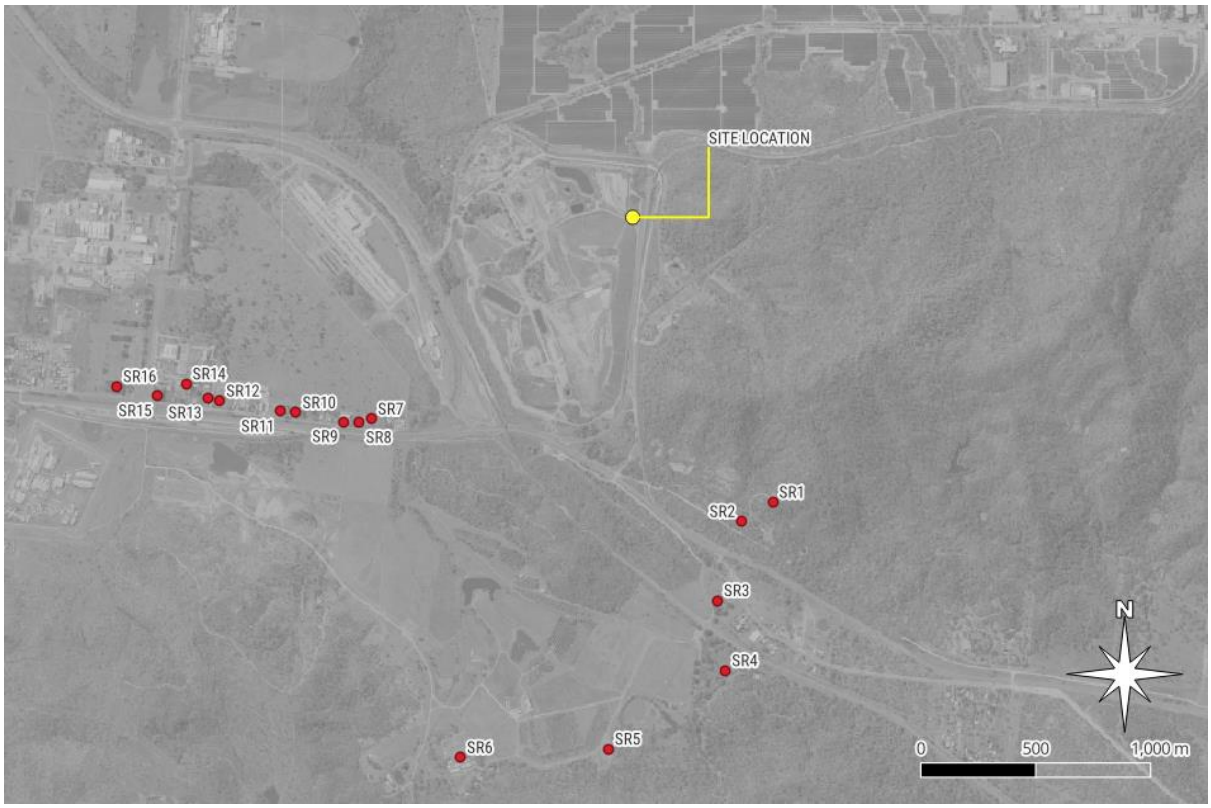


2 SENSITIVE RECEPTORS

The nearest noise sensitive receptors to the proposed GM site are situated to the south and to the southwest. Receptors in other directions are situated more than 2.5 km from the proposed site. Receptor 1 and Receptor 7 are the closest to the site and their respective distances are 1.4 km and 1.5 km from site.

Image 1-1 shows the proposed GM site and the surrounding sensitive receptors (the red circles). Note that no other sensitive receptors, such as schools, health care institutions or protected areas, have been identified in the study area.

Image 2-1 Noise sensitive receptors



3 EXISTING NOISE ENVIRONMENT

Noise monitoring was conducted 900 m south of the proposed power generator site and 900 m northwest of Receptor 1 as shown in Image 1-1. This site was selected as it is representative of the ambient noise conditions of the receptors to the east and west of the proposed project area. Noise monitoring was conducted from Thursday 20 April to Tuesday 2 May 2023.

The acoustic environment at the noise monitor location was quiet with noise from the Bruce Highway and other natural sounds driving the background noise levels. The ambient sounds included rustling leaves and wind in the trees as well as birdlife. No noise from the landfill site such as heavy machinery was audible. The landfill operators indicated that occasional work vehicles would drive past this location on working days. These have minimal impact on the ambient noise monitoring results.

Periods of adverse weather conditions were removed from the ambient noise analysis. The weather data was sourced from the Townsville Airport weather station in Townsville, Queensland.

Full noise measurements results are presented in Appendix A.

Table 3-1 Instrumentation used for the monitoring regime.

Instrument type	Type and model	Serial number
Noise monitor	NTI XL2	A2A-09856-E0
Calibrator	Pulsar 105 Type 1	72905

The equipment used for the monitoring regime was in current NATA calibration. Field calibration was undertaken before and after monitoring. Field calibration results showed no drift over the monitoring period.

Image 3-1 shows the noise monitor installed at the southern boundary of the landfill site.

Image 3-1 Noise monitor within the landfill site

The recorded noise data was analysed to determine the ambient noise levels of the area. Periods of elevated noise levels were observed during the review of the data. It is believed that these elevated noise levels are a result of rail traffic on the nearby rail track or a result of nearby activity within the

landfill site. The elevated noise levels were excluded from the analysis for the determination of the general ambient noise levels of the area.

The summary of the monitored and analysed noise levels is shown in Table 3-2.

Table 3-2 Noise measurement summary

Time period	Average values, dBA					RBL*
	L_{Amax}	L_{Aeq}	L_{A1}	L_{A10}	L_{A90}	
Day (7am – 6pm)	63.5	45.3	53.1	47.5	39.5	37.9
Evening (6pm - 10pm)	63.2	52.4	57.8	54.3	48.3	45.0
Night (10pm – 7am)	58.9	48.0	53.6	50.1	43.7	39.5

Note: The RBL it is the Rating Background Noise Level (RBL) for each assessment period, determined in accordance with Australian guidelines.

It is notable to observe that the night time RBL is 39.5 dBA and the day RBL is 37.9 dBA. The reason that the daytime RBL is lower than the evening and the night time RBLs is due to insects in the area. These are very active in the evening and some parts of the night time period.

4 NOISE CRITERIA

The licencing for this site is managed by the Department of Environment and Science (DES). The regulating instrument for environmental impacts in Queensland is the Environmental Protection Act 1994 (EP Act).

4.1 ENVIRONMENTAL PROTECTION ACT (1994)

The EP Act provides the legislative framework for the assessment and management of environmental noise emissions in the state. It has the objective of regulating activities conducted in the state of Queensland and minimising environmental harm and nuisance from such activities.

The EP Act does not directly provide any specific noise or vibration criteria other than for blasting. Most specific noise criteria are developed in the Environmental Protection Regulation and the Environmental Protection (Noise) Policy 2019 (EPP Noise).

4.2 ENVIRONMENTAL PROTECTION REGULATION (2019)

Part 3, Division 1 of the Environmental Protection Regulation (EP Reg) defines the environmental objectives and performance outcomes for operational assessments. With regard to noise, the objective is stated as:

"The activity will be operated in a way that protects the environmental values of the acoustic environment."

Two performance outcomes are defined. These are:

1) Sound from the activity is not audible at a sensitive receptor.

2) The release of sound to the environment from the activity is managed so that adverse effects on environmental values, including health and wellbeing and sensitive ecosystems, are prevented or minimised.

These objectives are achieved through the application of the Acoustic Quality Objectives contained in the Environmental Protection (Noise) Policy 2019.

4.3 ENVIRONMENTAL PROTECTION (NOISE) POLICY 2019

The purpose of the EPP Noise is to achieve the object of the Act in relation to the acoustic environment. This Policy provides specific noise levels which, if complied with, would be considered achieving the objective of the EP Act, namely, to not cause environmental nuisance or harm.

The EPP (Noise) identifies the environmental values to be enhanced or protected relating to the qualities of the acoustic environment that are conducive to:

- protecting the health and biodiversity of ecosystems
- human health and wellbeing, including an individuals' ability to have sleep, study or learn, and recreation activities (including relaxation and conversation)
- protect the amenity of the community.

The policy defines noise sensitive receptors as the following:

- dwelling
- library and educational institute (including a school, college and university)

- childcare or kindergarten
- school or playground
- hospital, surgery or medical institution
- commercial and retail activity
- protected area, or an area identified under a conservation plan under the Nature Conservation Act 1992 as a critical habitat or an area of major interest.
- marine park under the Marine Parks Act 2004
- park or garden that is open to the public (whether on payment of an amount) for use other than for sport or organised entertainment.

The acoustic quality objective is the measurement of an acoustic descriptor at a sensitive receptor. Table 4-1 shows the acoustic quality objective for each type of sensitive receptor. Time periods are defined as follows:

- Daytime – 7 am to 6 pm
- Evening – 6 pm to 10 pm
- Night-time – 10 pm to 7 am.

Table 4-1 An extract of the residential receptors noise limits from the EPP Noise

Sensitive receptor	Time of day	Acoustic quality objectives (measured at the receptor) *dB(A)*			Environmental value
		$L_{Aeq,adj,1hr}$	$L_{A10,adj,1hr}$	$L_{A1,adj,1hr}$	
residence (for outdoors)	daytime and evening	50	55	65	health and wellbeing
residence (for indoors)	daytime and evening	35	40	45	health and wellbeing
	night-time	30	35	40	health and wellbeing, in relation to the ability to sleep

The EPP Noise states that where the noise limits outlined in in Table 4-1 are achieved, then the environmental value stated in the Acoustic Quality Objectives is preserved. This ensures the objectives of the EP Act and EP Reg are both achieved.

The noise levels stated in Table 4-1 are therefore adopted as the noise criteria for this proposed development.

5 NOISE IMPACT ASSESSMENT

5.1 NOISE MODEL INFORMATION

A noise model was created to calculate the noise impacts from the operation of the proposed LMS site. The noise model was constructed in SoundPLAN 8.2. Table 5-1 presents the noise model parameters and the meteorological conditions used in the noise model.

Table 5-1 Noise model parameters

Meteorological condition	Value
Air pressure	1013 mbar
Relative humidity	70%
Temperature	10°C
Ground contours	Elevation and Depth
Ground absorption	Soft ground (α = 1)

Noise levels from the noise generating source have been predicted using the SoundPLAN in-built ISO 9613-2: 1996 prediction method. The ISO 9613 method incorporates downwind propagation or equivalently propagation under a well-developed moderate ground-based temperature inversion. The predicted noise levels are as such conservative (tendency to overpredict) noise predictions.

The elevation data for the noise model was acquired from the Elevation and Depth Foundation Spatial Data database using the 1 metre data from 2018.

5.2 NOISE SOURCE INFORMATION

Comprehensive noise measurements of LMS's power generating modules have been conducted throughout the last decade. Table 5-2 presents the noise emission of the various elements of the power generating modules.

Table 5-2 Sound power levels of power generator module elements

Element name	dBA re 10^{-12} W
3516 Exhaust	88.6
3516 Enclosure Side	85
3516 Roof	89.1
Fans-3516 Radiator	93.5
Side Gap 3516 Radiator	93.5
Transformer Roof	72.1
Transformer End	72.6
Transformer Side	72.1

The generator modules do not produce tonal or impulsive noise. Therefore, no adjustments or penalties are required.

The proponent has advised that there will be one operational GM at the site. Therefore, the noise model was constructed with a single GM operating at the proposed site.

Noise emissions from the generator modules are very constant. Typically, the L_{A10} and the L_{A1} are within 3 dBA of the L_{Aeq}. Where the project noise emissions comply with the L_{Aeq} criteria, the L_{A1} and L_{A10} criteria will be achieved. This means the L_{Aeq} are the most stringent criteria for this project and will be used to define compliance.

5.3 INTERNAL CRITERIA

The most stringent L_{Aeq} criterion is the night time criterion of 30dB(A). This is an internal noise level. The noise model predicts noise levels at the locations that are outside the buildings. A method is therefore required to determine the amount of reduction that the building façade provides.

A façade reduction of 7dB has been assumed for this assessment. This is a conservative assumption as some modern buildings can provide 20dB or greater façade reduction. The façade reduction of 7dB has been chosen to represent a building of light-weight construction with the windows open.

With the application of the 7dB façade reduction, the external night time criterion become 37dB(A). This is used as the most stringent criterion for the project. Compliance with this criterion will ensure compliance with all other project specific criteria.

6 RESULTS

The predicted noise levels are presented in

Table 6-1 below.

Table 6-1 Predicted noise levels

Receptor	Current Predicted L_{Aeq} (dBA)	External Night time Noise criterion, L_{Aeq} (dBA)	Compliance (Yes/No)
SR1	6.7	37	Yes
SR2	6.9	37	Yes
SR3	10.6	37	Yes
SR4	9.9	37	Yes
SR5	9	37	Yes
SR6	7.4	37	Yes
SR7	14.8	37	Yes
SR8	14.4	37	Yes
SR9	14.1	37	Yes
SR10	13.1	37	Yes
SR11	12.8	37	Yes
SR12	11.7	37	Yes
SR13	11.6	37	Yes
SR14	11.4	37	Yes
SR15	10.7	37	Yes
SR16	10.1	37	Yes

Table 6-1 shows that all the noise sensitive receptors comply with the most stringent noise criterion (night-time). The predicted noise levels are more than 20dB lower than the most stringent criterion.

The predicted noise levels are worst case noise predictions that only will occur during periods where the atmospheric conditions are conducive of noise propagation from the site towards the receptor. Therefore, it is considered that the project can operate in compliance with the noise criteria defined in EPP Noise.

Appendix B presents the predicted noise contour levels on an aerial map.

7 CONCLUSION

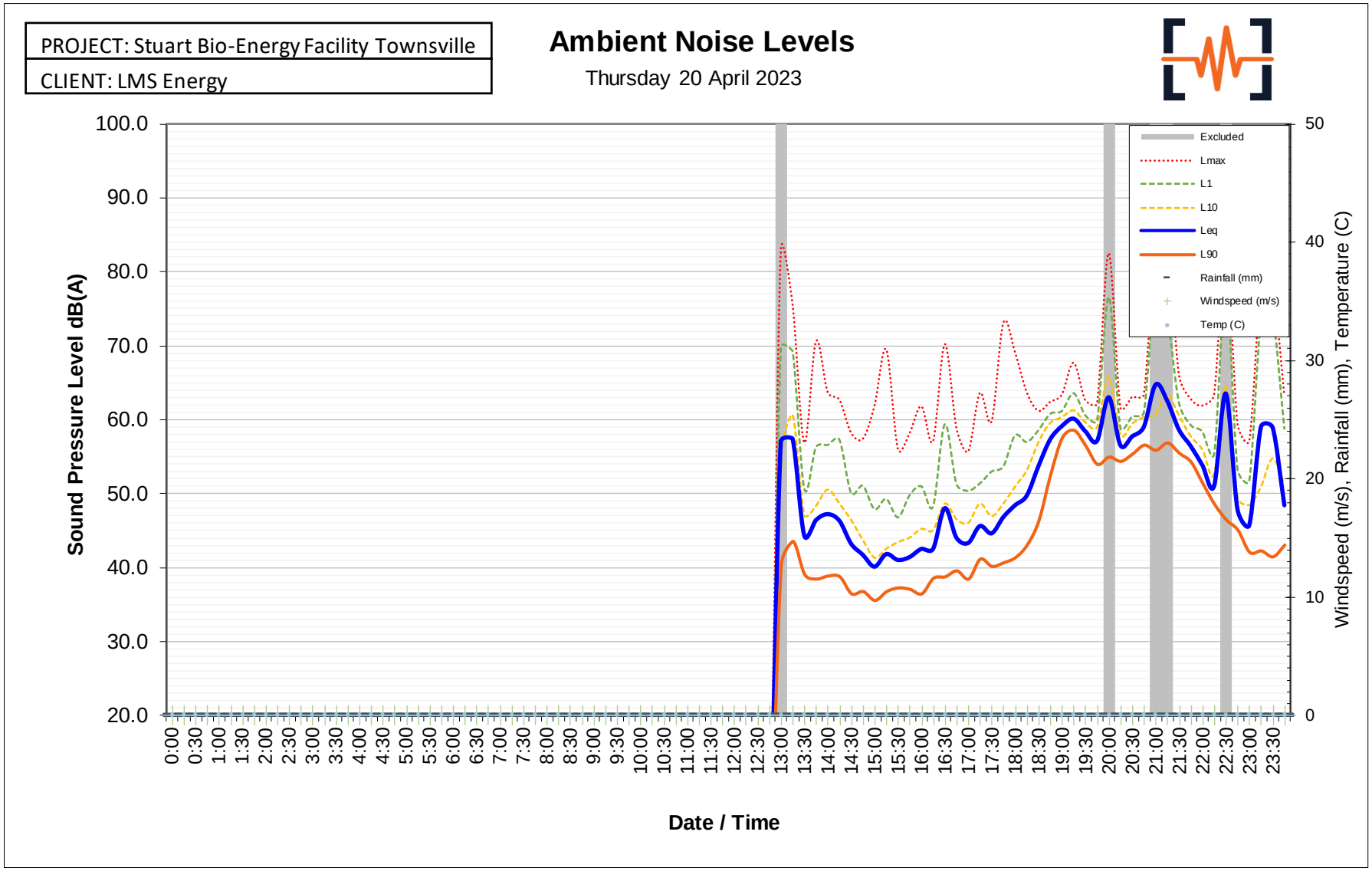
Noise impacts from the proposed LMS renewable energy facility at Stuart Landfill were assessed.

The noise assessment found that the noise levels from the proposed operation of a single power generator module are predicted to comply with the relevant noise criteria by a margin of more than 20 dBA.

It is therefore considered that the project has demonstrated that it will be able to operate in a manner that complies with the noise requirements of the Environmental Protection Act, Environmental Protection Regulation, and the Environmental Protection (Noise) Policy.

APPENDIX A

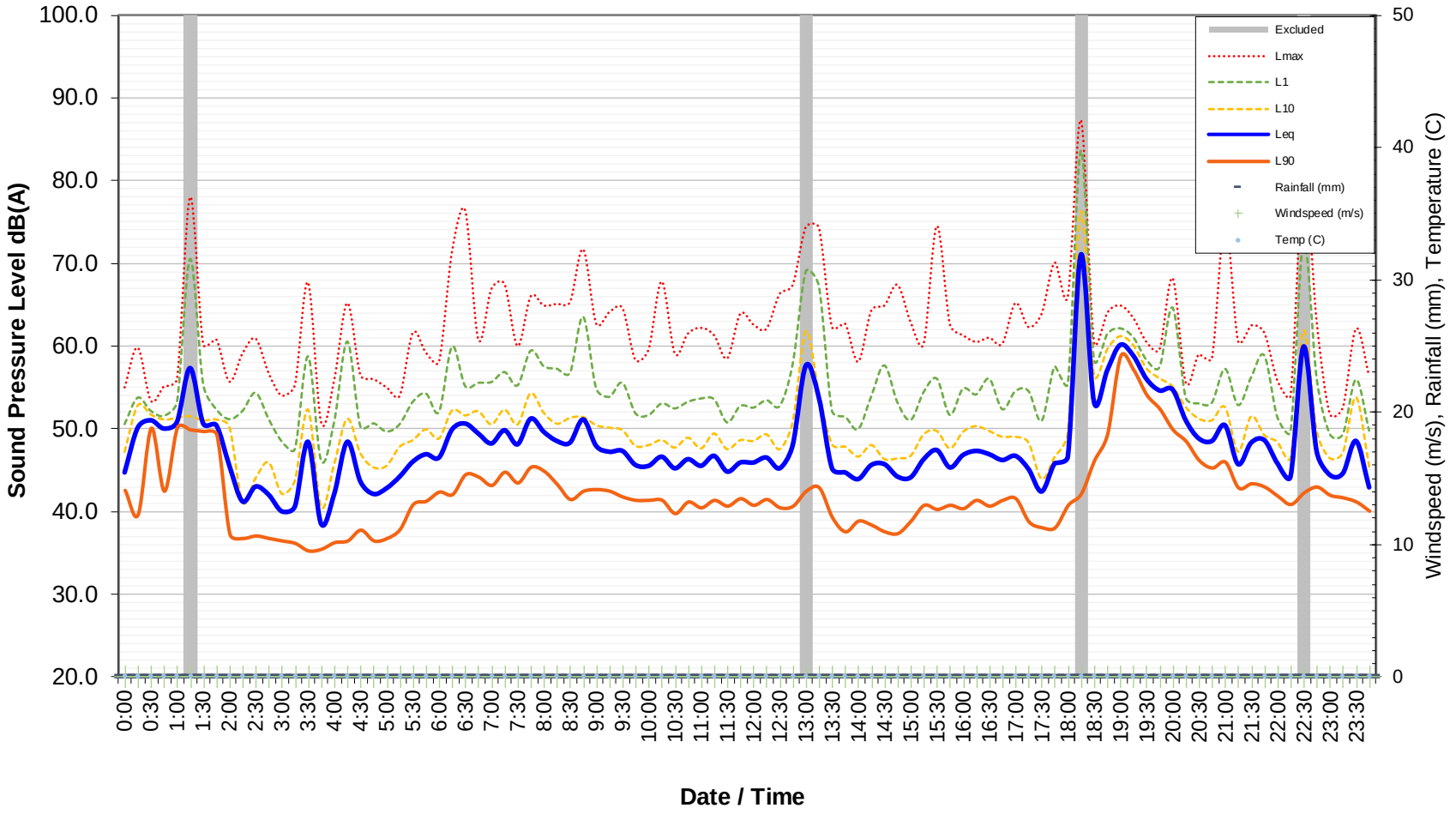
Noise Monitoring Charts

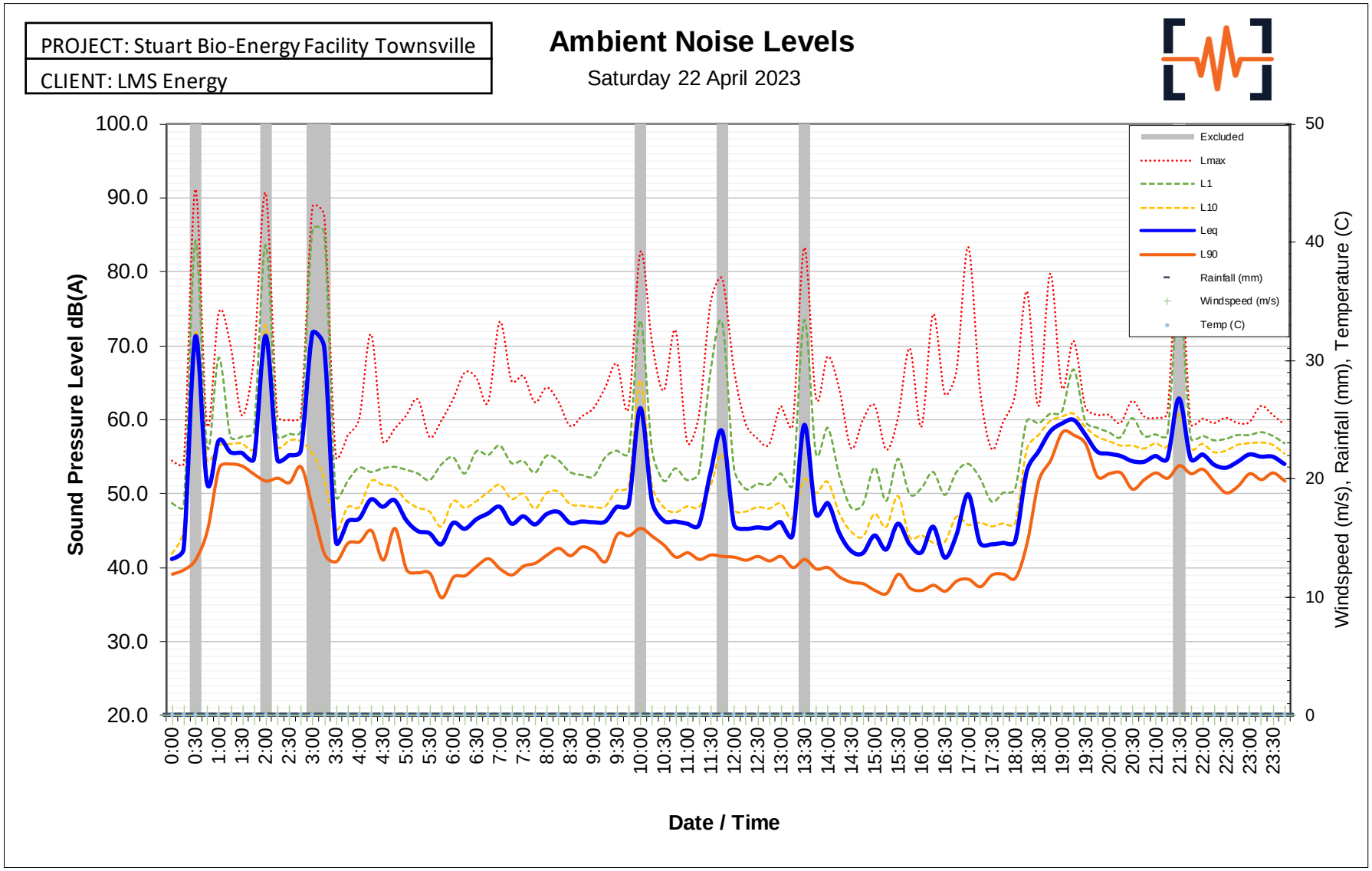

PROJECT: Stuart Bio-Energy Facility Townsville
CLIENT: LMS Energy
Ambient Noise Levels
Thursday 20 April 2023
Sound Pressure Level dB(A)
Windspeed (m/s), Rainfall (mm), Temperature (C)
Date / Time
Excluded
Lmax
L1
L10
Leq
L90
Rainfall (mm)
Windspeed (m/s)
Temp (C)

PROJECT: Stuart Bio-Energy Facility Townsville
CLIENT: LMS Energy

Ambient Noise Levels

Friday 21 April 2023

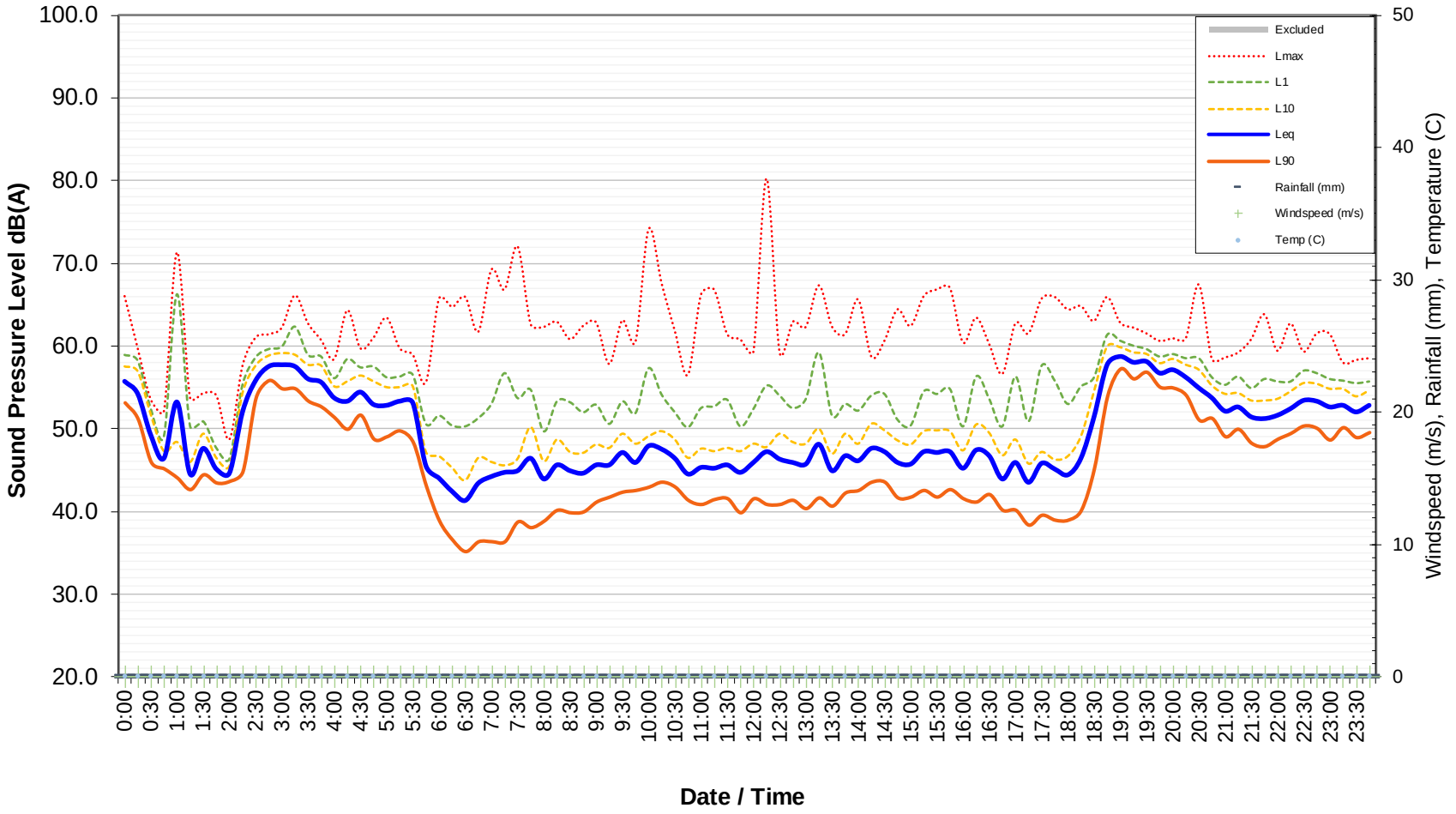


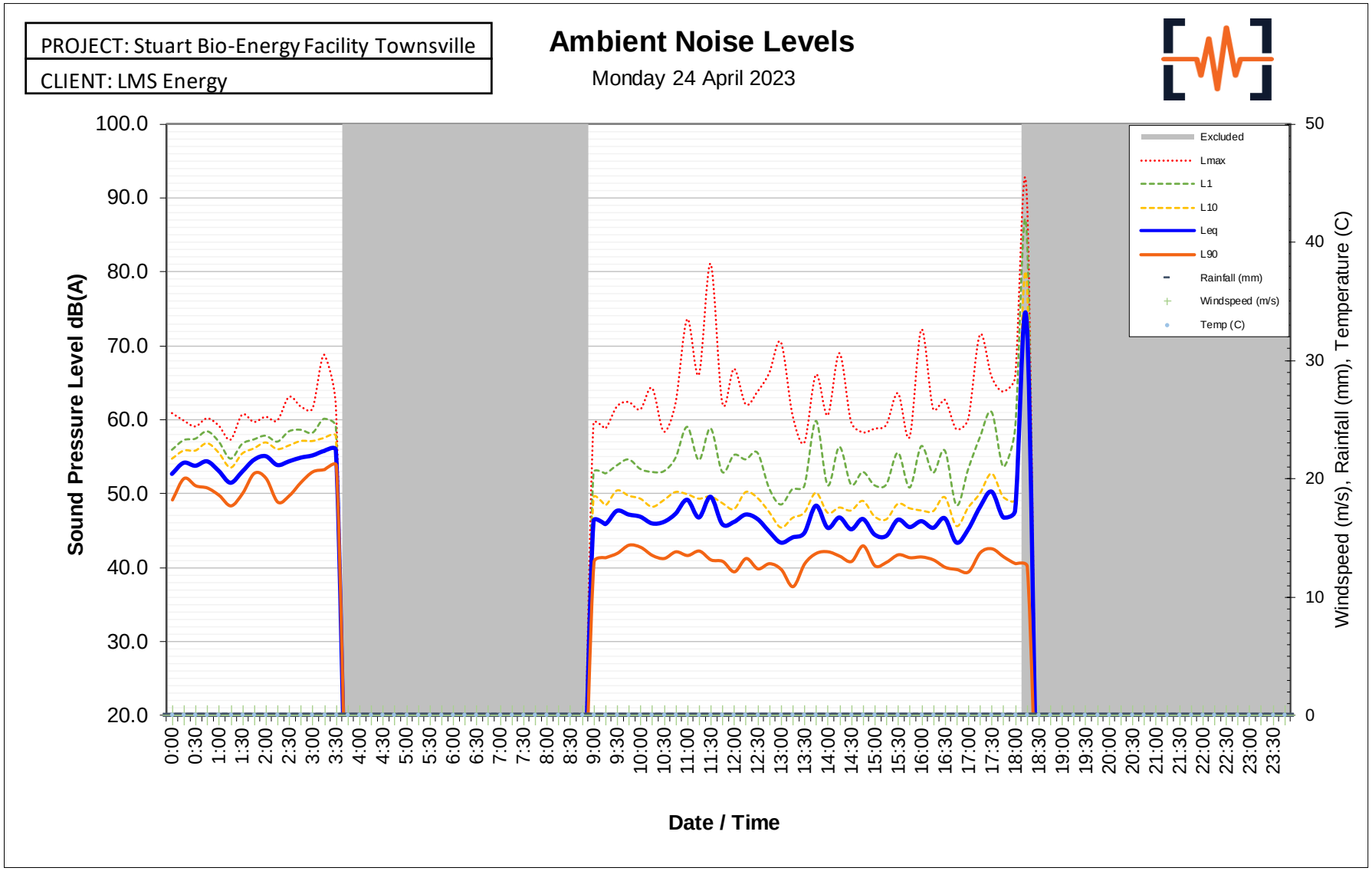

PROJECT: Stuart Bio-Energy Facility Townsville
CLIENT: LMS Energy
Ambient Noise Levels
Saturday 22 April 2023
Excluded
Lmax
L1
L10
Leq
L90
Rainfall (mm)
Windspeed (m/s)
Temp (C)
Sound Pressure Level dB(A)
Windspeed (m/s), Rainfall (mm), Temperature (C)
Date / Time

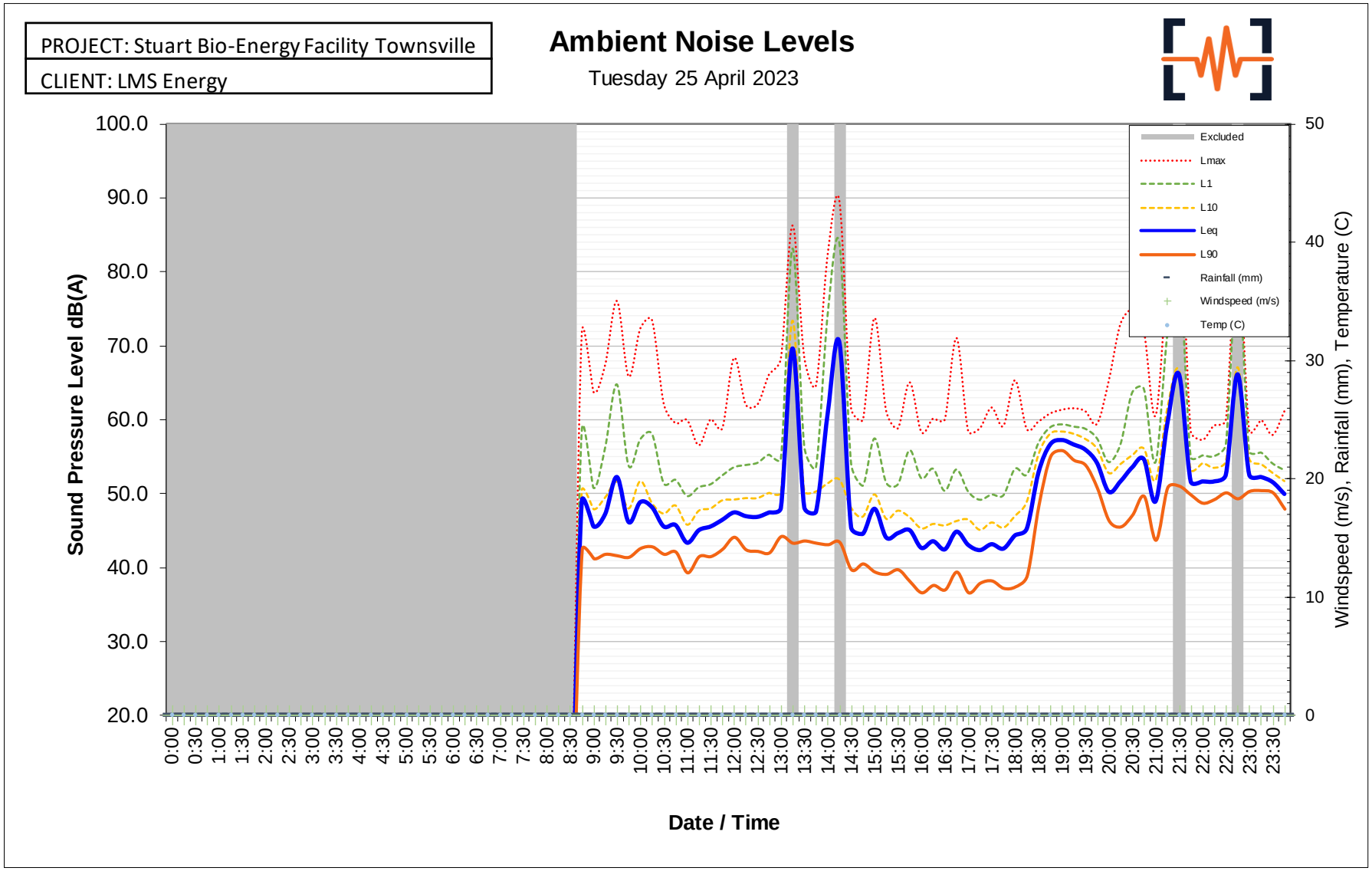
PROJECT: Stuart Bio-Energy Facility Townsville
CLIENT: LMS Energy

Ambient Noise Levels

Sunday 23 April 2023



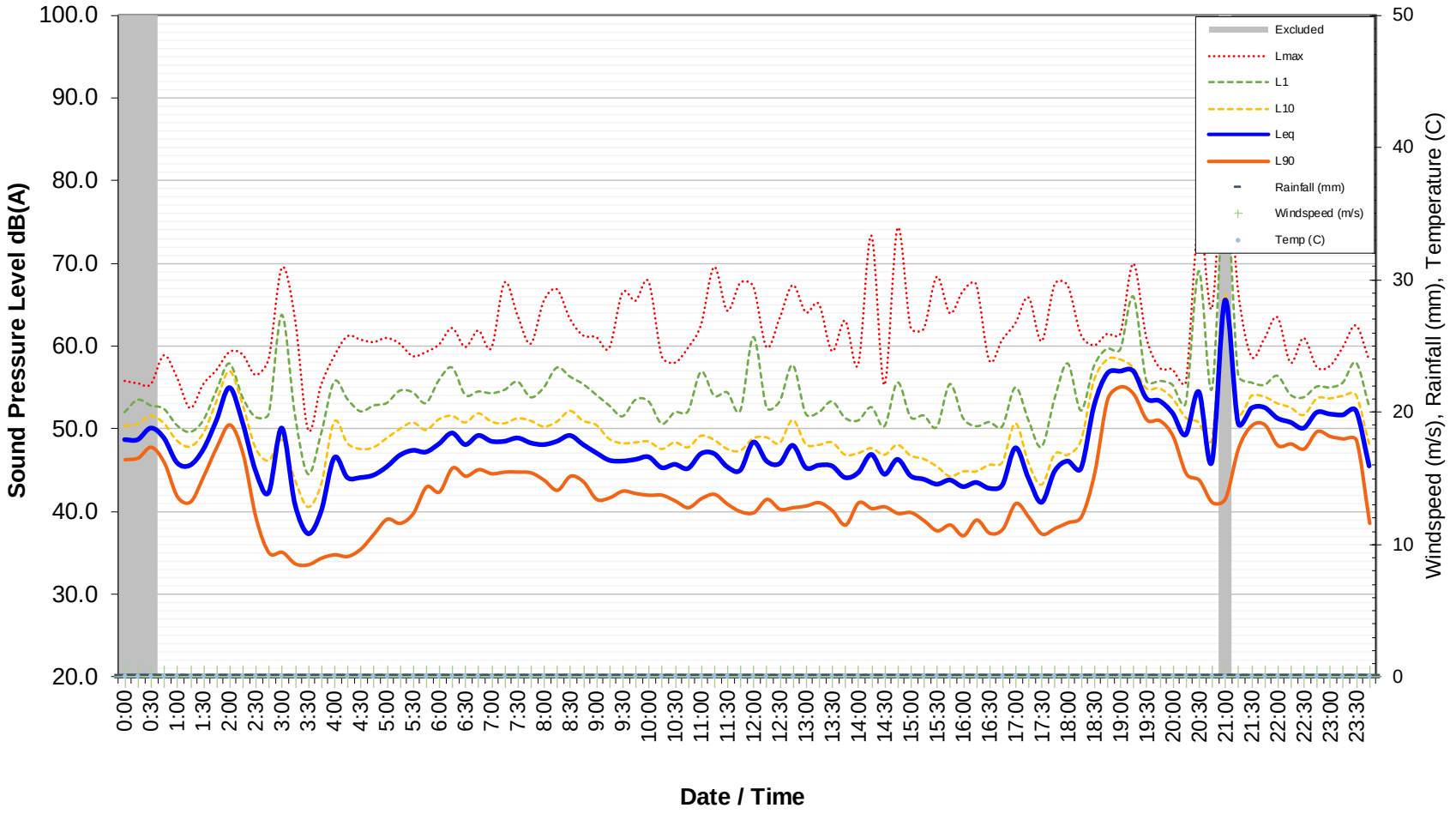

PROJECT: Stuart Bio-Energy Facility Townsville
CLIENT: LMS Energy
Ambient Noise Levels
Monday 24 April 2023
Sound Pressure Level dB(A)
Windspeed (m/s), Rainfall (mm), Temperature (C)
Date / Time
Excluded
Lmax
L1
L10
Leq
L90
Rainfall (mm)
Windspeed (m/s)
Temp (C)

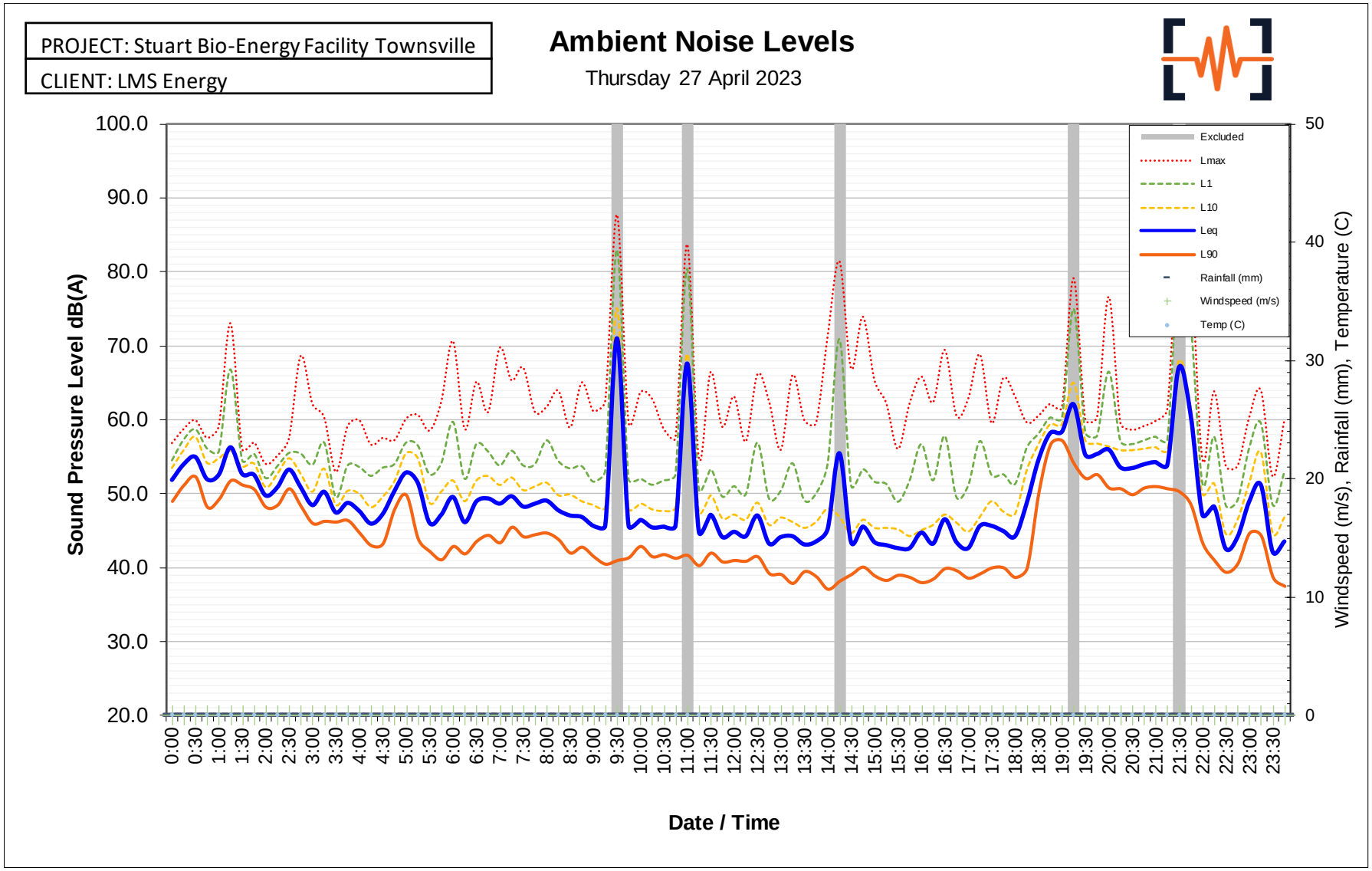

PROJECT: Stuart Bio-Energy Facility Townsville
CLIENT: LMS Energy
Ambient Noise Levels
Tuesday 25 April 2023
Excluded
Lmax
L1
L10
Leq
L90
Rainfall (mm)
Windspeed (m/s)
Temp (C)
Sound Pressure Level dB(A)
Windspeed (m/s), Rainfall (mm), Temperature (C)
Date / Time

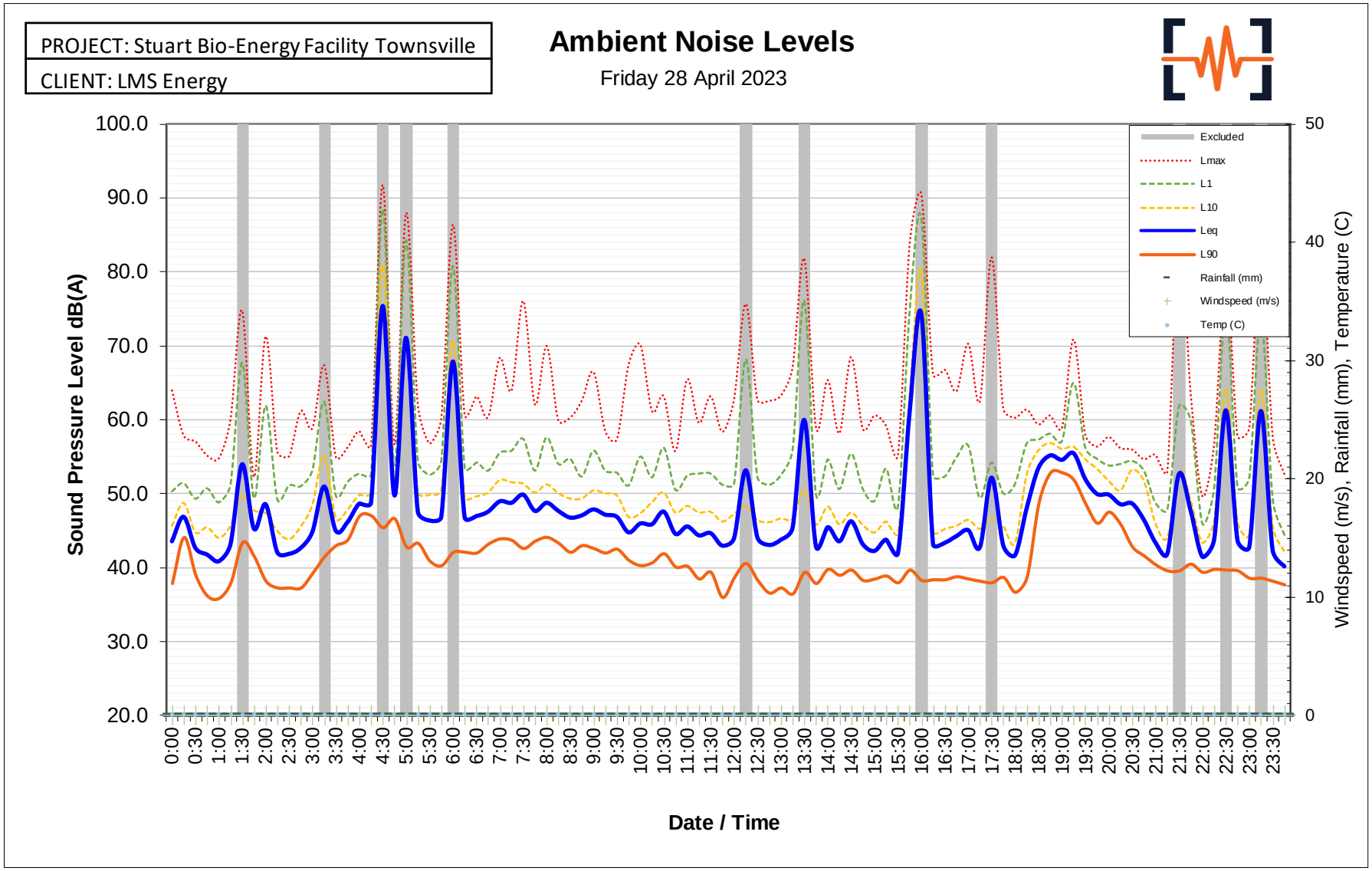
PROJECT: Stuart Bio-Energy Facility Townsville
CLIENT: LMS Energy

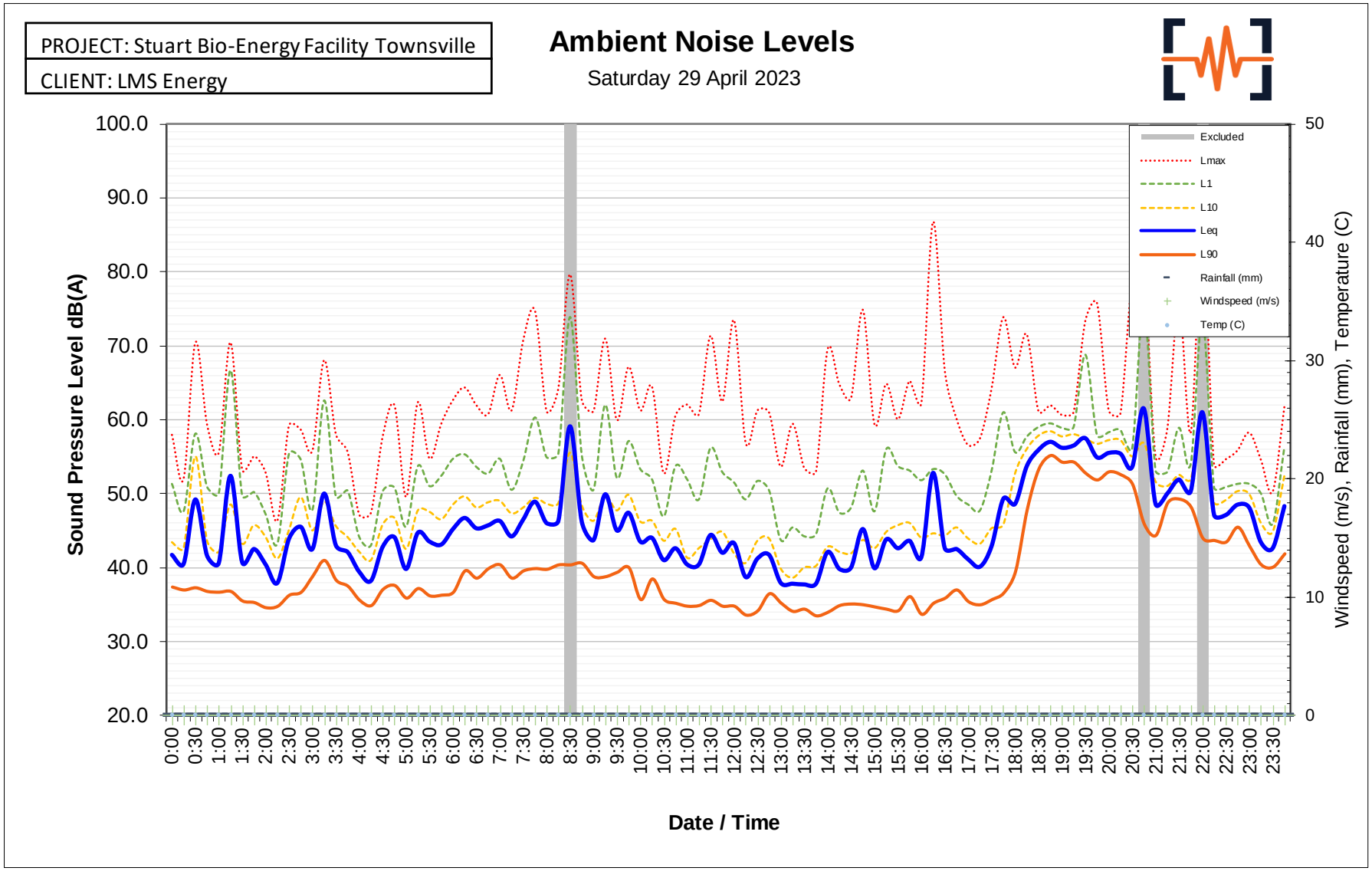
Ambient Noise Levels

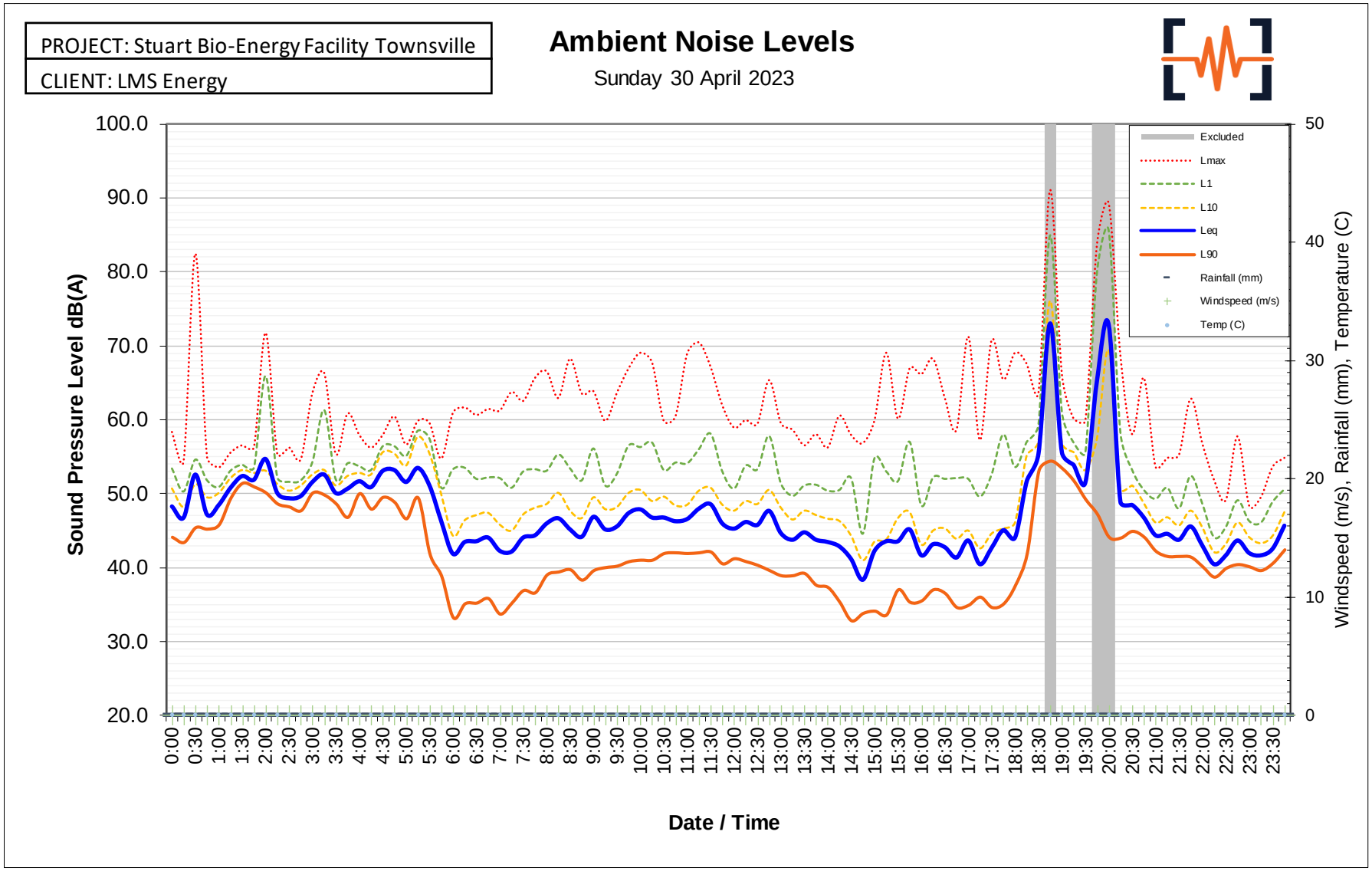
Wednesday 26 April 2023




PROJECT: Stuart Bio-Energy Facility Townsville
CLIENT: LMS Energy
Ambient Noise Levels
Thursday 27 April 2023
Excluded
Lmax
L1
L10
Leq
L90
Rainfall (mm)
Windspeed (m/s)
Temp (C)
Sound Pressure Level dB(A)
Windspeed (m/s), Rainfall (mm), Temperature (C)
Date / Time


PROJECT: Stuart Bio-Energy Facility Townsville
CLIENT: LMS Energy
Ambient Noise Levels
Friday 28 April 2023
Excluded
Lmax
L1
L10
Leq
L90
Rainfall (mm)
Windspeed (m/s)
Temp (C)
Sound Pressure Level dB(A)
Windspeed (m/s), Rainfall (mm), Temperature (C)
Date / Time


PROJECT: Stuart Bio-Energy Facility Townsville
CLIENT: LMS Energy
Ambient Noise Levels
Saturday 29 April 2023
Excluded
Lmax
L1
L10
Leq
L90
Rainfall (mm)
Windspeed (m/s)
Temp (C)
Sound Pressure Level dB(A)
Windspeed (m/s), Rainfall (mm), Temperature (C)
Date / Time

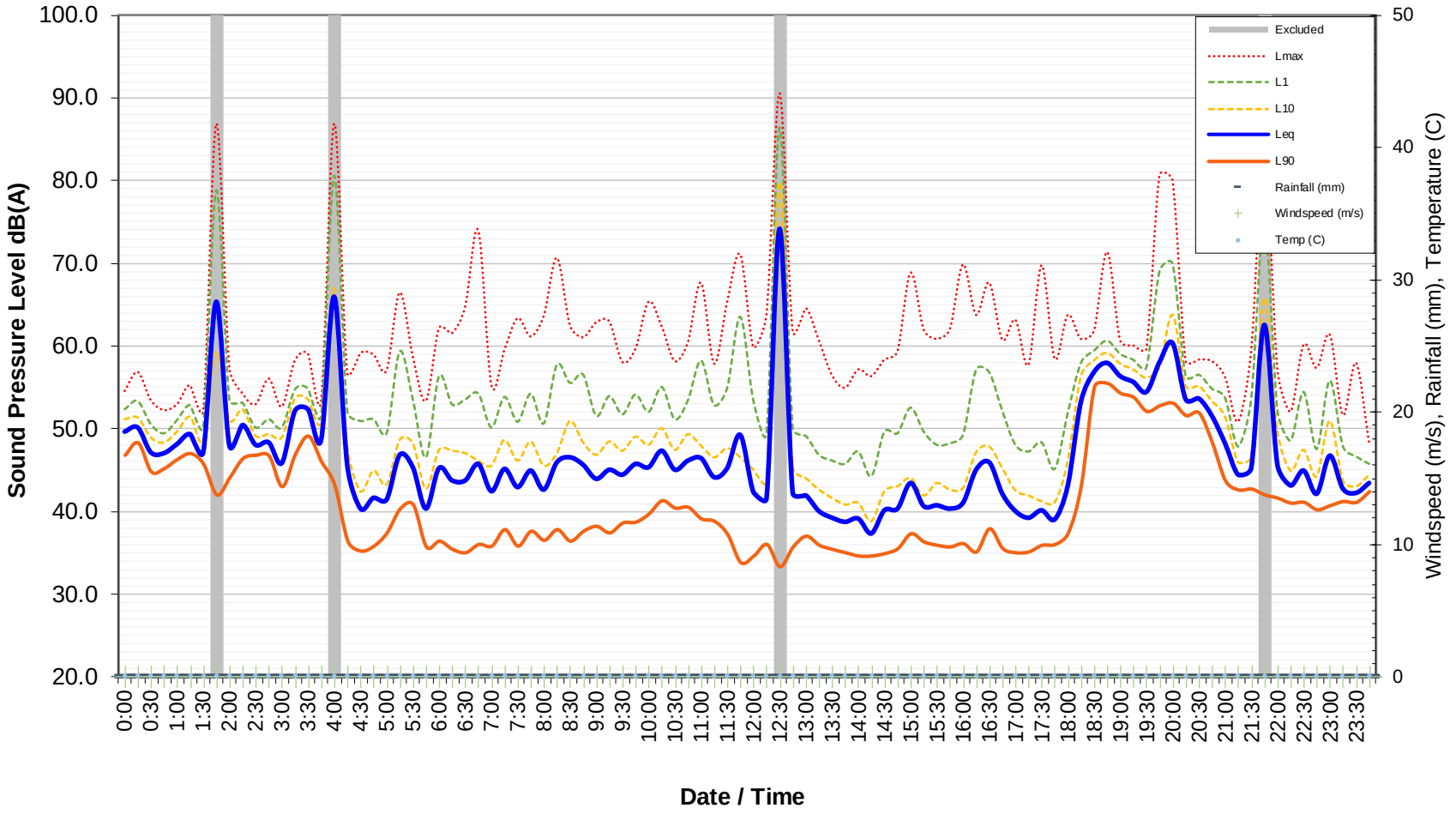

PROJECT: Stuart Bio-Energy Facility Townsville
CLIENT: LMS Energy
Ambient Noise Levels
Sunday 30 April 2023
Sound Pressure Level dB(A)
Windspeed (m/s), Rainfall (mm), Temperature (C)
Date / Time
Excluded
Lmax
L1
L10
Leq
L90
Rainfall (mm)
Windspeed (m/s)
Temp (C)
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
50
40
30
20
10
0
0:00
0:30
1:00
1:30
2:00
2:30
3:00
3:30
4:00
4:30
5:00
5:30
6:00
6:30
7:00
7:30
8:00
8:30
9:00
9:30
10:00
10:30
11:00
11:30
12:00
12:30
13:00
13:30
14:00
14:30
15:00
15:30
16:00
16:30
17:00
17:30
18:00
18:30
19:00
19:30
20:00
20:30
21:00
21:30
22:00
22:30
23:00
23:30

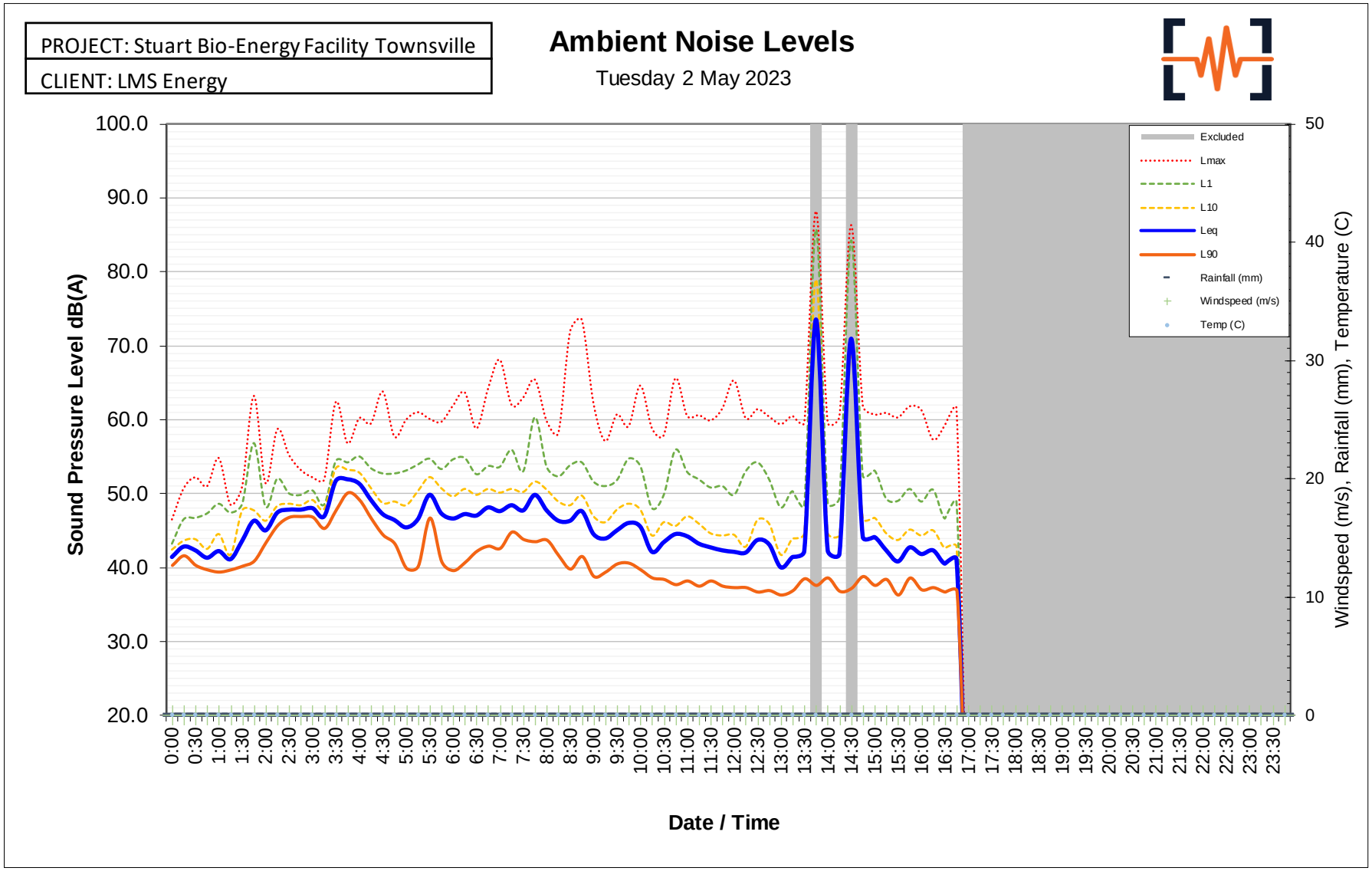
PROJECT: Stuart Bio-Energy Facility Townsville

CLIENT: LMS Energy

Ambient Noise Levels

Monday 1 May 2023




PROJECT: Stuart Bio-Energy Facility Townsville
CLIENT: LMS Energy
Ambient Noise Levels
Tuesday 2 May 2023
Sound Pressure Level dB(A)
Windspeed (m/s), Rainfall (mm), Temperature (C)
Date / Time
Excluded
Lmax
L1
L10
Leq
L90
Rainfall (mm)
Windspeed (m/s)
Temp (C)

APPENDIX B

Noise contour map - L_{Aeq}