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**Boral Cement Limited**

**Berrima Cement Works**

## **Annual Environmental Management Review**

<b>Development Consents Addressed:</b>	Development Consent No. 401-11-2002-i (Kiln 6) Development Consent No. 85-4-2005-i (Mill 7)
<b>Review Period:</b>	1 May 2022 - 30 April 2023
<b>Approved By:</b>	Environmental Manager - Cement

# CONTENTS

## EXECUTIVE SUMMARY

1	Annual review information	3
2	statement of compliance	4
3	introduction	6
3.1	Overview	6
3.2	Key personnel	9
3.3	Approvals	10
3.3.1	Consents	10
3.3.2	Licenses	11
3.4	Operations summary	12
3.5	Environmental management	12
4	actions required from previous aemr	14
5	environmental performance	15
5.1	Overview	15
5.2	Noise	15
5.3	Air quality	27
5.4	Soils and water quality	35
5.5	Traffic and transport	40
5.6	Waste management	44
5.7	Non-standard fuels	50
5.8	Visual amenity	64
5.9	Rehabilitation	67
5.10	Community	68
6	independent audit	73
7	incidents and non-compliances during the reporting period	74
8	activities to be completed during the next reporting period	75

## Figures


<b>Figure 1</b>	Location and monitoring points	9
<b>Figure 2</b>	Process flow diagram	9
<b>Figure 3</b>	Process flow diagram incorporating receipt of materials and dispatch of products	10
<b>Figure 4</b>	Ambient air quality monitoring January 2014 – April 2023	35
<b>Figure 5</b>	Total deposited dust (12-month rolling average) May 2014 – March 2023	35
<b>Figure 6</b>	Stack testing license comparison table	36

## Appendices

<b>Appendix 1:</b>	Annual environmental noise assessment
<b>Appendix 2:</b>	Community complaints register April 2023

# 1 ANNUAL REVIEW INFORMATION

**Table 1** AEMR authorisation

Name of operation	Berrima Cement Works
Name of operator	Boral Cement Limited
Development consent no.	Development Consent No. 401-11-2002-i (Kiln 6) Development Consent No. 85-4-2005-i (Mill 7)
Name of holder of development consents	Boral Cement Limited
AEMR start date	1 May 2022
AEMR end date	30 April 2023
<p><b>I, Greg Johnson, certify that this audit report is a true and accurate record of the compliance status of the Berrima Cement Works for the period 1 May 2022 to 30 April 2023 and that I am authorised to make this statement on behalf of Boral Cement Limited.</b></p> <p><i>Note.</i></p> <p>a) <i>The AEMR is an 'environmental audit' for the purposes of section 122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, \$1 million and for an individual \$250,000.</i></p> <p>b) <i>The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (intention to defraud by false or misleading statement – maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/ information/ documents – maximum penalty 2 years imprisonment of \$22,000, or both).</i></p>	
<b>Name of authorised reporting officer</b>	Greg Johnson
<b>Title of authorising reporting officer</b>	Environmental Sustainability Manager, Boral Cement
<b>Signature of authorised reporting officer</b>	
<b>Date: 29 June 2023</b>	

## 2 STATEMENT OF COMPLIANCE

This annual environmental management review (AEMR) summarises compliance with the following development consents applicable to the Berrima Cement Works (the Works):

- Development Consent No. DA 401-11-2002-i - approved in 2003 to upgrade and increase the capacity of Kiln 6 at the Works; and
- Development Consent No. DA 85-4-2005-i - approved in 2005 for the establishment and operation of a new cement mill (Mill 7).

It has been prepared in accordance with the *Post-approval requirements for State significant mining developments Annual Review Guideline* (NSW Government 2015) (the Guideline).

The compliance status of the Works is shown in Table 2.

**Table 2:** Statement of compliance

Were all conditions of the relevant development consents complied with?	
Development Consent No. No. 401-11-2002-i (Kiln 6)	No
Development Consent No. No. 85-4-2005-i (Mill 7)	YES

Table 3 summarises non-compliances with the development consents, based on the key in Table 4.

**Table 3** Non-compliances

Relevant approval	Condition	Condition summary	Compliance status	Comment	Where addressed in AEMR?
Air Quality Discharge	1.6	The applicant shall ensure that all necessary licences, permits & approvals are obtained & kept up to date throughout the life of the cement works. No condition of this consent removes the obligation for the Applicant to obtain, renew or comply with such licences....	Low to medium	<p>1 relating to broken dust deposition gauge bottle resulting in 1 missed sample</p> <p>1 relating to the average 24 hour particulate emission from Kiln 6 (Point 2) being 54.5mg/Nm<sup>3</sup> against the EPL licence 50mg/Nm<sup>3</sup>. This was caused by a storm creating a power dip and tripping ESP. EPA was notified.</p>	Section 7 Incidents and Non-compliances



**Table 4** Compliance status key for Table 3

Risk level	Code	Description
High	Non-compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence.
Medium	Non-compliant	Non-compliance with: <ul style="list-style-type: none"> <li>• potential for serious environmental consequences, but is unlikely to occur; or</li> <li>• potential for moderate environmental consequences, but is likely to occur.</li> </ul>
Low	Non-compliant	Non-compliance with: <ul style="list-style-type: none"> <li>• potential for moderate environmental consequences, but is unlikely to occur; or</li> <li>• potential for low environmental consequences, but is likely to occur.</li> </ul>
Administrative non-compliance	Non-compliant	Only to be applied where the non-compliance does not result in any risk of environmental harm (eg submitting a report to government later than required under approval conditions).

## 3 INTRODUCTION

### 3.1 Overview

Boral Cement Limited (Boral Cement) operates the Works off Taylor Road, New Berrima, in the Wingecarribee Local Government Area (LGA) (Figure 1). The Works was built in 1929 and has operated continuously ever since predominantly on the basis of continuing use rights and two development consents issued under the NSW Environmental Planning and Assessment Act 1979 (EP&A Act).

The Works produces cement products (cement and clinker) for sale in NSW, the ACT and for export. The Works has approval to produce up to 1.56 million tonnes per annum (tpa) of cement products. Cement products are transported to domestic customers (both internal to Boral companies, and external), by train and truck and historically to international customers through Port Kembla. Clinker is also transported to Boral Cement's Maldon Cement Works by rail which also produces cement products, including premixed dry concrete.

The Works operates 24 hours per day, 365, six days per year, including various maintenance periods.

Operational infrastructure includes one kiln (Kiln 6) and two cement mills (Mill 6 and 7), and storage and stockpiling facilities.

The main raw material inputs to the production of cement and clinker are limestone, sourced from Boral Cement's Marulan South Limestone Mine (transported via rail), and shale, sourced both on site at a shale quarry or from off-site, steel slag from BlueScope Steel in Port Kembla and granulated blast furnace slag from Bluescope Steel in Port Kembla and historically international sources.

The limestone, shale and slag are blended together, ground into a fine powder (also known as a meal) and fused at a very high temperatures (up to 1,500 degrees Celsius (°C)) in the kiln (Kiln 6). The fused material is called clinker.

Clinker is either stored ready for reclamation or distribution to customers by road and rail transport or is mixed with gypsum and mineral addition (limestone) into one of two cement mills (Mill 6 and 7), where it is crushed to produce cement. It is then fed into cement silos from where it is despatched by either road tanker or rail tanker/wagon for delivery to Boral Cement's customers (internal Boral customers or external).

Refer to the process flow diagrams in Figure 2 and Figure 3.

Cement manufacture is an energy intensive process due to the high temperatures required for the production of clinker. Prior to the introduction solid waste derived fuels, up to 225,000 tonnes per year of coal was generally used to heat the kiln. Up until 2013 coal was sourced from the nearby Medway Colliery (also known as the Berrima Colliery) but since the colliery's closure, coal has been sourced mainly from mines in the Illawarra area. As outlined in Table 5 below the Works has approval to use standard fuels such as natural gas, fuel oil, diesel and coke fines to heat the kiln along with a number of non-standard fuels.

**Table 5** Approved Kiln fuels

Fuel	Category	Tonnes Per Annum	
Natural Gas, Fuel Oil, Diesel	Standard Fuel	No Limit	
Coal	Standard Fuel	No Limit	
Coke Fines	Standard Fuel	No Limit	
HiCal50	Non-Standard Fuel	10,000	
AKF1	Non-Standard Fuel	20,000	
AKF5	Non-Standard Fuel	30,000	≤ 100,000 combined
Wood Waste	Non-Standard Fuel	50,000	
RDF	Non-Standard Fuel	80,000	
Woodchip	Standard Fuel	50,000	

SWDFs used include wood waste and refuse derived fuel (RDF) which are combustible materials recovered and processed from waste streams, such as papers, cardboards, packaging, and construction and demolition materials.

Primarily the fuel mix is made up of coal, diesel (kiln start-up), a small amount of HiCal50 (carbon anode) and SWDFs. The business will be progressively increasing its use of SWDFs and other non-standard fuels to lower its reliance on coal and to reduce the embodied carbon in its cementitious products.

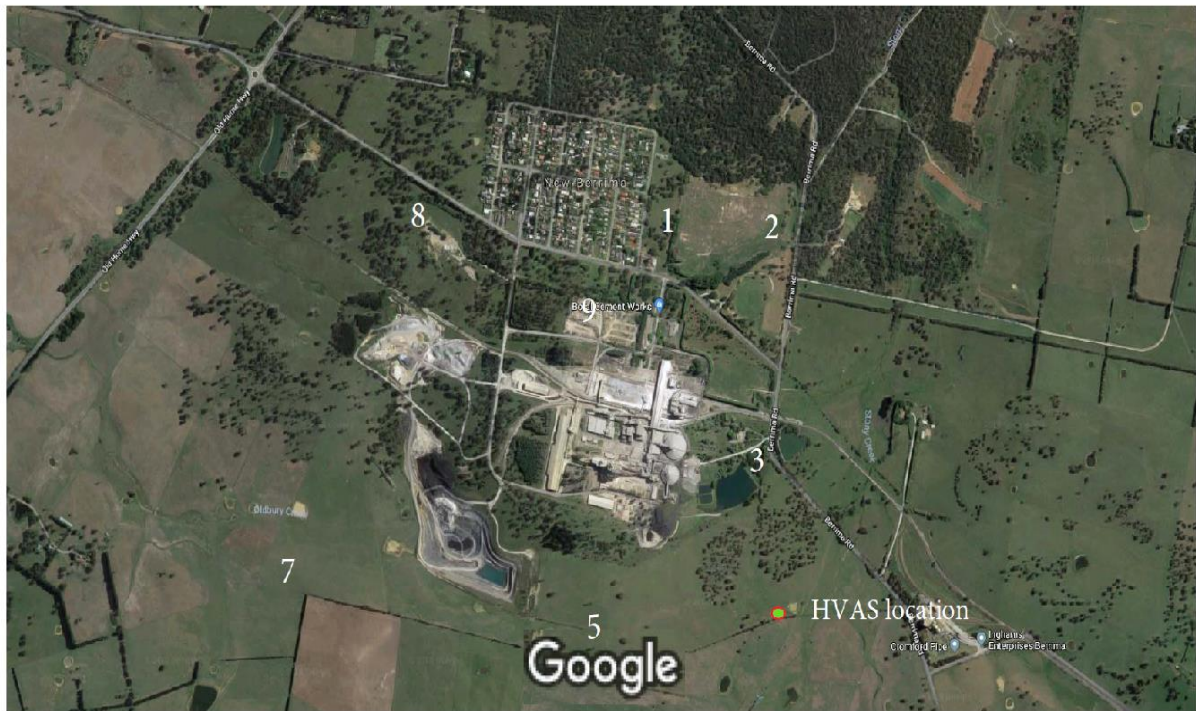
Commencing in August 2018 the Works commenced the use of SWDFs, with a Proof of Performance Trial undertaken as required as per the consent. The PoPT six monthly report was approved by both the EPA and the Secretary on 23/04/2019 which permitted the continued use of SWDFs up to 40% of total fuel. During the reporting period, Boral has continued engagement with the DPE and EPA on increasing this to the 50% approval, with approval granted on 8 December 2022.

The Works supports a direct workforce of 130 employees, a further 20 in engineering and procurement, as well as many indirect jobs in the region through logistics, contractors and suppliers.

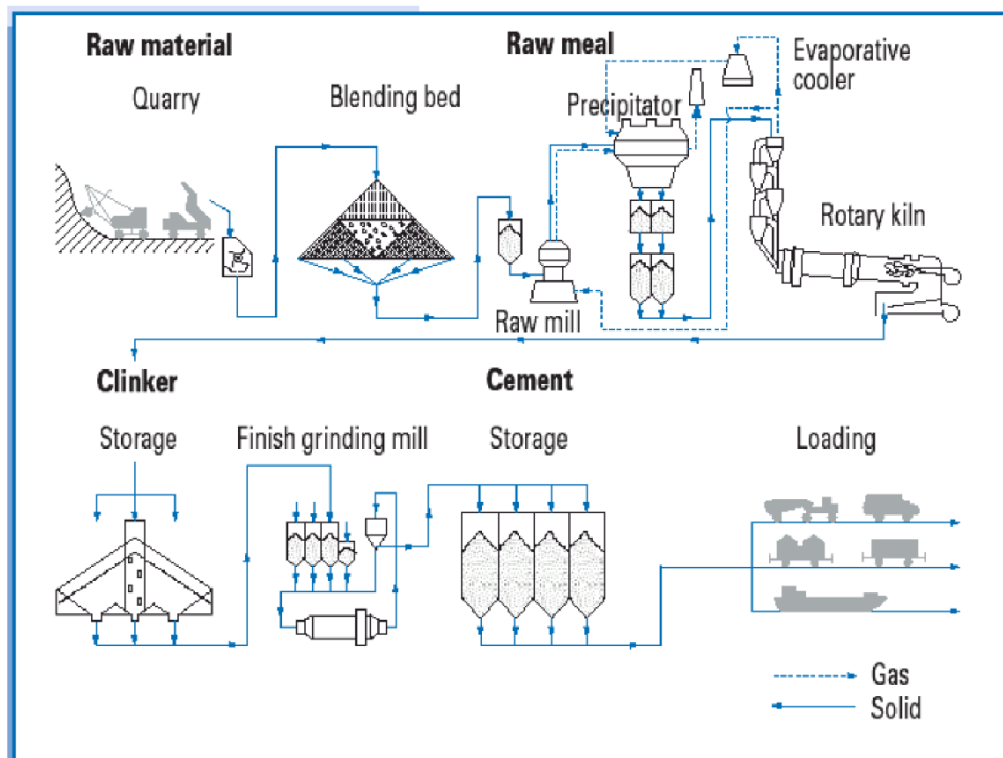
The Works is located on a 149 hectare (ha) site immediately south of the village of New Berrima and approximately 2.5 km east of the Hume Highway. The village of New Berrima was initially developed by Boral Cement's predecessors to provide housing for employees of the Works.

The Works is the most physically dominating feature of the New Berrima area, being roughly equivalent in size to the adjacent village, with the tallest structure on the site being a pre-heater tower, which is approximately 85 m high. The closest residential dwellings in the village of New Berrima are approximately 650 m north of Kiln 6.

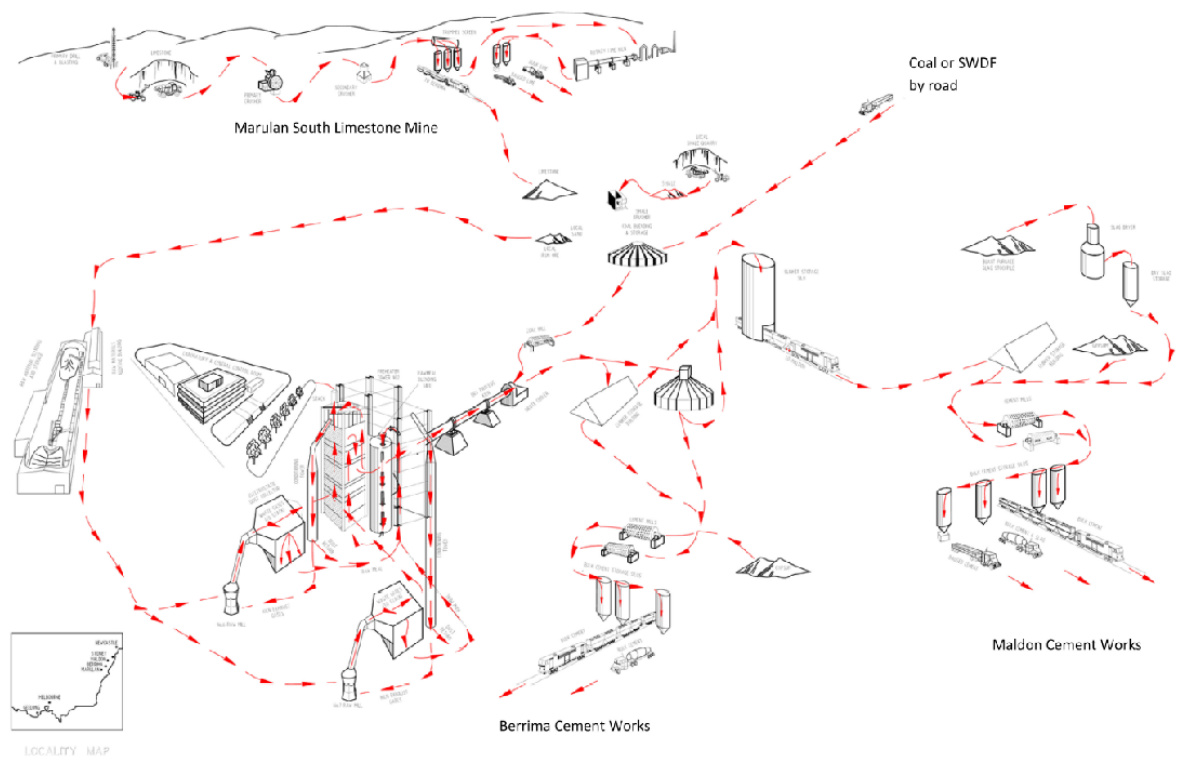
The site is zoned IN3 Heavy Industrial in the Wingecarribee Local Environmental Plan 2010.



**Figure 1** Location and monitoring points



**Figure 2** Process flow diagram



Source: Boral (2017)

**Figure 3** Process flow diagram incorporating receipt of materials and dispatch of products

## 3.2 Key personnel

Details of key personnel who are responsible for environmental management at the Works are provided in Table 6.

**Table 6** Key personnel responsible for environmental management

Name	Role	Phone number	Email address
Dean Beltrame	Operations Manager (NSW) Boral Cement	(02) 4860 2222	dean.beltrame@boral.com.au
Greg Johnson	Senior Environmental Business Partner	0401 893 420	greg.johnson@boral.com.au
Sharon Makin	Environmental Business Partner	0401 894 185	sharon.makin@boral.com.au

## 3.3 Approvals

The Works operates under a combination of continuing use rights and two development consents under the EP&A Act. It also operates under an environment protection licence (EPL) issued under the NSW *Protection of the Environment Operations Act 1997* (POEO Act).

Water used at the Works is drawn from the Wingecarribee River which is regulated by five mining purpose leases (MPLs) issued under the NSW *Mining Act 1906*. In addition, one MPL regulates the provision of power to the Works.

Shale used at the Works is extracted from a quarry on the site which is regulated under a mining lease (ML) issued under the NSW *Mining Act 1992*.

### 3.3.1 Consents

The Works operates under a combination of continuing use rights and the following two development consents approved by the NSW Minister for Planning:

- Development Consent No. DA 401-11-2002-i - approved in 2003 to upgrade and increase the capacity of Kiln 6 at the Works; and
- Development Consent No. DA 85-4-2005-i - approved in 2005 for the establishment and operation of a new cement mill (Mill 7).

Continuing existing use rights are available to the Works given it commenced operations in 1929, before any planning approvals were required.

The development consent for Mill 7 has never been modified.

Subsequent modifications to the development consent for Kiln 6, approved by delegates of the NSW Minister for Planning, have allowed the trialling and use of certain non-standard fuels, the use of alternative 'low cost' raw materials in the manufacture of clinker (such as granulated blast furnace slag), the use of rail for coal deliveries, and the stockpiling of coal on the site. Table 7 outlines the various modifications to the development consent.

**Table 7** Approvals for Kiln 6

Application	Description	Date approved
DA 401-11-2002-i	Upgrade of Kiln 6 to allow for burning of non-standard fuels, installation of continuous monitoring equipment, increase in Kiln 6 output, upgrade of coal mill capacity and intermittent use of Kiln 5.	12 May 2003
MOD 1	Use of non-standard fuels, including used tyres, liquid oil residues and spent aluminium electrode carbon.	26 September 2005
MOD 2	Removal of prohibition on the acceptance of materials classified as hazardous waste under the EPA's waste guidelines.	22 September 2006
MOD 3	Small scale trial use of tyre chips over a six month period.	13 February 2007
MOD 4	Increase in usage of coal fines from 1.5 tonnes per hour (tph) to 10 tph.	8 May 2008
MOD 5	Approval to use rail for coal deliveries.	31 August 2009
MOD 6	<del>Stockpiling of coal from Berrima Colliery for sale and transport to Port Kembla.</del>  Note: As part of MOD 9, conditions relating to MOD 6 (the stockpiling of coal from Berrima Colliery for sale and transport to Port Kembla) were deleted.	20 June 2012



MOD 7	Trial and use of granulated blast furnace slag as a raw material additive, not exceeding 150,000 tpa.	16 April 2012
MOD 8	Administrative changes to align consent and EPL conditions.	5 August 2012
MOD 9	The use of up to 100,000 tpa of SWDF as a non-standard fuel for Kiln 6, including the construction of a fuel storage and kiln feeding system, and the deletion of conditions relating to MOD 6.	5 October 2016
MOD 10	SWDF Fuel storage shed extension	11 April 2019
MOD 11	Use of HiCal 50 during start-up conditions	25 October 2019
MOD 12	Isotainer handling and whole of site noise limit.	7 April 2020
MOD 13	Chloride Bypass System and approval to consume wood chips sourced from fire impacted plantation forestry operations as a standard fuel.	31 May 2021
MOD 15	Construction and operation of AKF5 storage and feed infrastructure.	27 March 2023

### 3.3.2 Licenses

The Works operates under EPL 1968 issued by the EPA which has been subject to numerous variations. The EPL permits the following scheduled activities listed in Schedule 1 of the POEO Act:

- cement or lime works;
- extractive activities; and
- resource recovery.

The Works also operates under a ML and six MPLs as summarised in Table 8.

**Table 8** Mining leases

Mining title	Purpose	Expiry date
ML 1723	Extraction of blue shale from the quarry and rehabilitation of previously disturbed land.	18 December 2036
MPL 559	Water supply access.	20 September 2028
MPL 592	Water supply access.	20 September 2028
MPL 622	Water supply access.	20 September 2028
MPL 623	Water supply access.	20 September 2028
MPL 628	Power supply.	20 September 2028
MPL 654	Water supply access.	20 September 2028

The Annual Mining Lease Review for these licences is due annually for the previous Calendar year at the end of February. The 2022 report was submitted to the Resources Regulator on 28 February 2023.

## 3.4 Operations summary

Table 9 provides a summary of production at the Works for the 2022/23 reporting period (May 2022 and April 2023) compared to the previous 3 reporting periods.

**Table 9** Production summary

Material	Approval limit	18/19 Reporting Period	19/20 Reporting Period	20/21 Reporting Period	21/22 Reporting Period	22/23 Reporting Period
Limestone used	Nil	2,008,50	1,803,196	1,803,564	1,682,298	1,674,677
Shale used	Nil	201,990	142,586	145,521	156,944	175,651
Slag used	Nil	113,510	129,640			
Other Raw Materials			153,150		194,030	427,635
Gypsum used	Nil	81,250	70,276			
Coal used	Nil	208,610	184,446	176,070	169,388	167,540
SWDFs used	100,000 t	21,870	28,997	34,767	34,654	54,396.67
Clinker production	1,560,000 t	1,443,830	1,314,466	1,292,278	1,256,016	1,351,448
Cement production	1,560,000 t	1,209,500	1,104,195	1,043,993	1,087,963	1,104,655

Coal is predominantly used as a fuel for the kiln at the Works. However, small amounts of diesel are used during kiln start-ups.

The Works is approved to produce up to 1.56 Mtpa of cement products. In the 2022/23 reporting period the Works produced 1,351,448 tonnes of clinker. Of this clinker, 1,104,655 tonnes of cement was produced onsite. Clinker is also sent to Maldon and other customers.

Boral continued the use of SWDFs during the 2022/23 reporting period. A total of 54,396.67t of SWDF was consumed during the reporting period which is an increase to the previous reporting period.

The construction for the Chloride Bypass System (CBS) associated with MOD 13 commenced on 25 March 2022 after approval of the Construction Environmental Management Plan on 24 February 2022 with commissioning expected to commence in September 2023. Further details relating to the construction of the CBS is described in Section 3.5

MOD 15 was approved on 27 March 2023. This approved the construction and operations of AKF5 feeding infrastructure. Construction and commencement is anticipated during the 23/24 reporting period.

## 3.5 Environmental management

The Guideline requires that AEMRs focus on the environmental outcomes of a reporting period that are intended by the relevant approval. As such, this AEMR addresses the outcomes of the relevant conditions of the development consents rather than focus on management plans and monitoring data. Notwithstanding this, addressing environmental outcomes is a result of analysing monitoring data, and this has been undertaken in this AMER, particularly for key environmental areas at the Works, including air quality and noise.

*Berrima Cement Works – Operational Environmental Management Plan* (Boral 2018) (OEMP) and subordinate plans received their three yearly review and were revised in accordance with conditions 6.3A and 6.4A of DA 401-11-2002-i. The OEMP was submitted to DPE for approval on 5 April 2018 and received approval in a letter dated 21 May 2018.

Boral undertook a review of the OEMP, and the sites Air Quality Management Plan & Noise Management Plan in April 2020 to reflect the recent Mod 11 and 12 to the consent and changes to the EPL completed by the EPA on 18 December 2019. These were submitted to the Department on 5 June 2020 and approved on the 29 June 2020. A copy of the updated OEMP is available on the Boral Berrima Cement website along with the approval letter from the Department of Planning, Industry and the Environment.

<https://www.boral.com.au/locations/boral-cement-works-berrima>

The OEMP was determined to be fit for purpose for MOD 13 as operations are generally still in accordance with the associated plans. Condition 6.1, 6.1A and 6.1B required the CEMP to be updated to reflect the requirements of MOD 13. The MOD 13 CEMP was approved on 24 February 2022.

A Mod 15 CEMP was prepared and approved by DPE on the 15<sup>th</sup> May 2023.

The OEMP is currently under review to reflect requirements of MOD 15.

## 4 ACTIONS REQUIRED FROM PREVIOUS AEMR

The 2022 AEMR was submitted to the DPIE on 28<sup>th</sup> June 2022 with the DPIE completing their assessment on 11 July 2022. The Department considered that the Annual Report generally satisfied Conditions 7.3 and 6.3 of the approvals.

Note: The approval of the Annual Report by the Department is not an endorsement of the compliance status of the project.

**Table 10** Identified Actions from Previous AEMR 2022

Action required from previous AEMRs	Action taken
Continue the installation of the Chloride By-pass. Aim to commission in May 2023.	Installation progressed, with commissioning on track for September 2023
Finalise high-rate Proof of Performance Trials for Wood Waste and Refuse Derived Fuels to enable SWDF percentage usage to consented 50% of total fuel by mass.	Trials completed and DPE approval consented for 50% of total fuel by mass
Continue approval process and procurement process to install a pilot carbon capture system pilot scale carbon capture and use project to improve the quality of recycled concrete, masonry and steel slag aggregates as part of a \$2.4m grant from the Federal Government Carbon Capture, Use and Storage Development Fund.	Council DA granted for the pilot carbon capture system, with installation commencing in April 2023
Continue with MOD 14 application for a new entrance road and an increase in SWDF	Mod 14 application made to DPE and currently under assessment
Finalise the AKF5 (tyre chip trial) report.	Report has been finalized and submitted with Mod 15 approval granted for the use of AKF5 (tyre chips)
Update the OEMP to reflect recent Modifications to the consent.	OEMP updated to reflect Mod 15 conditions and operations. DPE approval pending at the time of this AEMR.

## 5 ENVIRONMENTAL PERFORMANCE

### 5.1 Overview

This section reports performance against the environmental performance conditions in Development Consent No. 401-11-2002-i (Kiln 6) and Development Consent No. 85-4-2005-i (Mill 7). It is divided into sections based on the environmental matters in the consents and comprises a conditions table and Boral's reporting against the conditions.

### 5.2 Noise

The consent requirements for noise for Kiln 6 are in conditions 3.1 to 3.6 of Development Consent No. 401-11-2002-i and for Mill 7 in conditions 2.1 to 2.6 of Development Consent No. 85-4-2005-i, which are replicated in Table 11. Noise was monitored and reported against the Kiln 6 and Mill 7 contribution criteria in October 2022 (see Appendix A – *Boral Cement Berrima - Annual Environment Noise Assessment, October 2022, Report of Assessment 31 December 2022 (Recognition Research 2022)*).

Performance against the Consent Requirements are described in Table 12.

Boral manages noise on site in accordance with the *Berrima Cement Works – Noise Management Plan* (Boral 2018, updated April 2020), which describes the monitoring points, frequency and criteria.

The Executive Summary of the Annual Noise Assessment noted the following:

*The Boral Cement Berrima works has a single noise limit condition for the total site, of LA90, 15-minute not greater than 58 dBA at Location 20 in the Store Yard. Monitoring for total site emissions at Location 20 over a 14 day period in October 2022 has again confirmed that total site emissions are in compliance with the licence condition. This is the same as in each of the 2019 to 2021 annual environmental noise assessments. The times when that sound level limit was exceeded at the site were caused by short-term extraneous noise sources not relevant to the compliance assessment.*

*Sound levels at the plant and in the residential community affected by the noise emissions from the total site have been measured regularly since 2002. Monitoring of both site source sound levels and residential receiver sound levels on an annual basis from 2008 to 2021 confirmed that sound levels of site sources did not change or increase significantly over that time.*

*The annual environmental noise assessment for 2022 has evaluated noise emission from the Cement Plant by the following methods:*

- *Monitoring of sound levels at Location 20 for compliance assessment;*
- *Monitoring of sound levels in one residential receiver location at 4 Melbourne Street, New Berrima, with unattended monitoring over a long-term period of two weeks and attended monitoring in day, and evening at three residential receiver locations. Listening monitoring was also made at three locations to compare with long-term averages from previous years and assess the audible acceptability of the received sound levels.*

***The finding of this 2022 annual environmental noise assessment is that total site noise emissions are considered to be in compliance with the licence condition.***

***It is also the finding of this assessment that the long-term average statistical sound levels have not increased significantly and this indicates that the Cement Plant is not increasing its noise emissions.***

**Table 11:** Noise conditions

Number	Condition
<b>K3.1 Noise</b>	<p>Construction activities associated with the cement works upgrade shall only be carried out:</p> <ul style="list-style-type: none"> <li>a) between 7:00 am and 6:00 pm, Monday to Friday inclusive, during periods in which the cement works is shut-down, and construction noise is audible at the boundary of the site;</li> <li>b) between 7:00 am and 1:00 pm on Saturdays, during periods in which the cement works is shut-down, and construction noise is audible at the boundary of the site;</li> <li>c) at no time on Sundays or public holidays, during periods when the cement works is shutdown, and construction noise is audible at the boundary of the site;</li> <li>d) at any time during periods in which the cement works is in operation; and</li> <li>e) at any time if construction noise is inaudible at the boundary of the site.</li> </ul>
<b>K3.1A</b>	<p>The Development shall be constructed with the aim of achieving the construction noise management levels detailed in the Interim Construction Noise Guideline (Department of Environment and Climate Change, 2009). All feasible and reasonable noise mitigation measures shall be implemented and any activities that could exceed the construction noise management levels shall be identified and managed in accordance with the CEMP.</p> <p>Note: The Interim Construction Noise Guideline identifies ‘particularly annoying’ activities that require the addition of 5dB(A) to the predicted level before comparing to the construction NML</p>
<b>K3.1B</b>	<p>Where Feasible and Reasonable, operation noise mitigation measures shall be implemented at the start of Construction (or at other times during construction) to minimise construction noise impacts.</p>
<b>M2.1 Noise Impacts</b>	<p>Construction activities associated with the cement works upgrade shall only be carried out:</p> <ul style="list-style-type: none"> <li>a) between 7:00 am and 6:00 pm, Monday to Friday inclusive, during periods in which the cement works is shut-down, and construction noise is audible at the boundary of the site;</li> <li>b) between 7:00 am and 1:00 pm on Saturdays, during periods in which the cement works is shut-down, and construction noise is audible at the boundary of the site;</li> </ul>



	<p>c) at no time on Sundays or public holidays, during periods when the cement works is shut-down, and construction noise is audible at the boundary of the site;</p> <p>d) at any time during periods in which the cement works is in operation; and</p> <p>e) at any time if construction noise is inaudible at the boundary of the site.</p>
<b>K3.2 Operationa I Noise</b>	Subject to compliance with the requirements of this consent, the cement works upgrade may be operated 24 hours per day, 7 days per week.

Noise generated at the site must not exceed the noise limits at the times and location specified in Table 2 below.

Former Limits

**Table 2 – Maximum Allowable Noise Contribution Limit (dB(A))**

Receiver Location	Day <sup>a</sup> LAeq(15 minute)	Evening <sup>b</sup> LAeq(15 minute)	Night <sup>c</sup> LAeq(15 minute)
4 Melbourne Street	37	37	37
Chelsey Park Farm	30	30	30
Candowie Farm	37	37	37

New Limits (MOD 12) 7 April 2020

**Table 2 – Maximum Allowable Noise Limit (dB(A))**

Location	Day <sup>a</sup> LA90(15 minute)	Evening <sup>b</sup> LA90(15 minute)	Night <sup>c</sup> LA90(15 minute)
The Noise Compliance Point (Point 20) – Store Yard Close	58	58	58

a. Day is defined as the period from 7:00am to 6:00pm Monday to Saturday and 8:00am to 6:00pm on Sundays and public holidays.

b. Evening is defined as the period from 6:00pm to 10:00pm.

c. Night is defined as the period from 10:00pm to 7:00am Monday to Saturday and 10:00pm to 8:00am on Sundays and public holidays.

Note: Noise contributions specified in Table 2 are to be interpreted as contributions from the new and upgraded components forming part of cement works upgrade only and not as noise limits for the site as a whole. (Footnote: 2 Incorporates EPA General Terms of Approval (L6.1 and L6.2))

**K3.3**

**K3.3A**

Any new or upgrade development projects the subject of any modification to this consent must give consideration to the Project Specific Noise Levels identified in the document titled 'PRP-7 Response – Identifying Environmental Noise Objectives For Berrima Cement Plant' dated 27 March 2018, prepared by Recognition Research.

**K3.4**

All vehicles associated with the isotainer loading operations at the site must use a broad-band type reversing alarm instead of tonal beeper reversing alarm.

<b>K3.5</b>	The locomotive of the train transporting isotainers to the site must be relocated to the eastern end of the train as soon as practically possible after arrival during daytime to avoid such movements in evening or night-time periods.
<b>K3.6</b>	The applicant must implement best practice technology with respect to the isotainer reach stacker to reduce L <sub>Amax</sub> noise events.
<b>K3.6A</b>	<p>A Noise Verification Report must be submitted to the satisfaction of the Planning Secretary at the following stages of the development:</p> <ul style="list-style-type: none"> <li>(a) prior to the commencement of construction of the chloride bypass system for Kiln 6</li> <li>(b) within three months of the commencement of operation of the chloride bypass system</li> </ul>
<b>K3.6B</b>	<p>The Noise Verification Reports required by condition 3.6A must be prepared by a suitably qualified and experienced acoustic consultant and include:</p> <ul style="list-style-type: none"> <li>(a) verification of compliance with noise limits specified in condition 3.3 in accordance with the Noise Policy for Industry (EPA, 2017)</li> <li>(b) a detailed analysis of annoying noise characteristics in accordance with Fact Sheet C of the Noise Policy for Industry (EPA, 2017) to confirm the plant and equipment associated with the chloride bypass system does not exhibit annoying noise characteristics</li> </ul>
<b>M2.1</b>	<p>Construction activities associated with the cement works upgrade shall only be carried out:</p> <ul style="list-style-type: none"> <li>a) between 7:00 am and 6:00 pm, Monday to Friday inclusive, during periods in which the cement works is shut-down, and construction noise is audible at the boundary of the site;</li> <li>b) between 7:00 am and 1:00 pm on Saturdays, during periods in which the cement works is shut-down, and construction noise is audible at the boundary of the site;</li> <li>c) at no time on Sundays or public holidays, during periods when the cement works is shut-down, and construction noise is audible at the boundary of the site;</li> <li>d) at any time during periods in which the cement works is in operation; and</li> </ul>

	e) at any time if construction noise is inaudible at the boundary of the site.																				
M2.2	Subject to compliance with the requirements of this consent, the cement works upgrade may be operated 24 hours per day, 7 days per week.																				
M2.3	<p><sup>2</sup>The Applicant shall design, construct, operate and maintain all new and upgraded components forming part of the cement works upgrade to ensure that for each receiver location listed in Table 1 below, the noise level at each receiver location does not exceed the maximum allowable noise contribution limit at the receiver location specified.</p> <table><tr><th colspan="4">Table 1 – Maximum Allowable Noise Contribution Limit (dB(A))</th></tr><tr><th>Receiver Location</th><th>Day<sup>a</sup> L<sub>Aeq</sub>(15 minute)</th><th>Evening<sup>b</sup> L<sub>Aeq</sub>(15 minute)</th><th>Night<sup>c</sup> L<sub>Aeq</sub>(15 minute)</th></tr><tr><td>Adelaide Street, near Taylor Avenue, New Berrima</td><td>43</td><td>43</td><td>40</td></tr><tr><td>Argyle Street, near Taylor Avenue, New Berrima</td><td>43</td><td>43</td><td>40</td></tr><tr><td>Candowie Farm House</td><td>43</td><td>43</td><td>40</td></tr></table> <p>a. Day is defined as the period from 7.00am to 6.00pm Monday to Saturday and 8.00am to 6.00pm on Sundays and public holidays.</p> <p>b. Evening is defined as the period from 6.00pm to 10.00pm.</p> <p>c. Night is defined as the period from 10.00pm to 7.00am Monday to Saturday and 10.00pm to 8.00am on Sundays and public holidays.</p> <p>Note: Noise contributions specified in Table 1 are to be interpreted as contributions from the new and upgraded components forming part of cement works upgrade only and not as noise limits for the site as a whole. (Footnote: 2 Incorporates EPA General Terms of Approval (L4.1 and L4.2))</p>	Table 1 – Maximum Allowable Noise Contribution Limit (dB(A))				Receiver Location	Day <sup>a</sup> L <sub>Aeq</sub> (15 minute)	Evening <sup>b</sup> L <sub>Aeq</sub> (15 minute)	Night <sup>c</sup> L <sub>Aeq</sub> (15 minute)	Adelaide Street, near Taylor Avenue, New Berrima	43	43	40	Argyle Street, near Taylor Avenue, New Berrima	43	43	40	Candowie Farm House	43	43	40
Table 1 – Maximum Allowable Noise Contribution Limit (dB(A))																					
Receiver Location	Day <sup>a</sup> L <sub>Aeq</sub> (15 minute)	Evening <sup>b</sup> L <sub>Aeq</sub> (15 minute)	Night <sup>c</sup> L <sub>Aeq</sub> (15 minute)																		
Adelaide Street, near Taylor Avenue, New Berrima	43	43	40																		
Argyle Street, near Taylor Avenue, New Berrima	43	43	40																		
Candowie Farm House	43	43	40																		
M2.4	<p><sup>3</sup>The maximum allowable noise contributions identified in condition 2.3 apply under all meteorological conditions, except:</p> <p>a) during wind speeds greater than 3ms-1 measured at 10 metres above ground level; or</p> <p>b) during temperature inversion conditions of greater than 3oC/100m and wind speeds of greater than 2ms-1 measured at 10 metres above ground.</p> <p>(Footnote: 3 Incorporates an EPA General Term of Approval (L4.4))</p>																				

<b>M2.5</b>	<p><sup>4</sup>For the purpose of assessment of noise contributions specified under condition 2.3, noise from the cement works upgrade shall be:</p> <p>a) measured at the most affected point on or within the receptor site boundary or at the most affected point within 30m of the dwelling (rural situations), where the dwelling is more than 30m from the property boundary; and</p> <p>b) where applicable, subject to the modification factors provided in Section 4 of the New South Wales Industrial Noise Policy (EPA, 2000).</p> <p>(Footnote: 4 Incorporates an EPA General Term of Approval (L4.3))</p>
<b>M2.6</b>	<p>Notwithstanding condition 2.5 of this consent, should direct measurement of noise from the site be impractical, the Applicant may employ an alternative noise assessment method deemed acceptable by the EPA (refer to Section 11 of the New South Wales Industrial Noise Policy (EPA, 2000)). Details of such an alternative noise assessment method accepted by the EPA shall be submitted to the Director-General prior to the implementation of the assessment method.</p>

**Note: (K = Kiln 6, M = Mill 7)**

**Table 12:** Response to noise conditions

Condition / EIS prediction	Performance during reporting period	Trend / management implications	Implemented / proposed management actions
<b>K3.1</b>	CBS construction commenced March 2022 and continued in the 22/23 reporting period.	Construction is a short-term activity which cannot be used to establish long-term trends. The noise verification report required under K3.6A and K3.6B was completed to provide verification of compliance prior to construction. A follow up report is due three month after commencement of operation of the CBS.	CEMP was approved by DPIE to address construction specific management controls.  The CBS construction works have been limited to daytime only within the hours nominated in the consent
<b>K3.1A</b>	CBS construction commenced March 2022 and continued in the 22/23 reporting period	As above	The CEMP was approved by DPIE to address construction specific management controls.  Section 8.4.5 of the CEMP addresses noise management and mitigation measures.
<b>K3.1B</b>	CBS construction commenced March 2022 . and continued in the 22/23 reporting period	As above	The CEMP was approved by the DPIE to address construction specific controls..  The predicted construction noise levels were well below the targets nominated for all scenarios within the construction of the CBS  <ul style="list-style-type: none"> <li>Scenario 1 - Civil works – Foundations and Concrete pads</li> </ul>



			<ul style="list-style-type: none"><li>Scenario 2 - Structure steel erection</li><li>Scenario 3 - Bag Filter / Dust Silo erection and installation</li><li>Scenario 4 - Dust transfer installation</li></ul> <table><tr><th>Receiver</th><th>Target</th><th>Scenario 1</th><th>Scenario 2</th><th>Scenario 3</th><th>Scenario 4</th></tr><tr><td>Taylor Avenue near Adelaide St</td><td>57</td><td>41</td><td>34</td><td>34</td><td>32</td></tr><tr><td>4 Melbourne Street</td><td>55</td><td>37</td><td>31</td><td>31</td><td>29</td></tr><tr><td>12 Brisbane Street</td><td>54</td><td>38</td><td>32</td><td>32</td><td>30</td></tr></table>	Receiver	Target	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Taylor Avenue near Adelaide St	57	41	34	34	32	4 Melbourne Street	55	37	31	31	29	12 Brisbane Street	54	38	32	32	30
Receiver	Target	Scenario 1	Scenario 2	Scenario 3	Scenario 4																						
Taylor Avenue near Adelaide St	57	41	34	34	32																						
4 Melbourne Street	55	37	31	31	29																						
12 Brisbane Street	54	38	32	32	30																						
K3.2	The noise assessment and annual monitoring demonstrated that Kiln 6 operated within the objectives required to achieve contribution criteria during the reporting period and should be allowed to continue operating 24 hours/day, 7 days/week.	Over all, the sound levels associated with Kiln 6 sources were calculated to be less than the objective at Location 20.They are also considered to not exceed the contribution objectives at the nearest residential receivers to the northern and southern sides of the plant.	Existing management measures effectively contain noise levels below contribution criteria.																								
K3.3	The noise assessment demonstrated that Kiln 6 operated within the objectives required to achieve contribution criteria at the residential locations during the reporting period.	As above																									
K3.3A	Any new MOD must give consideration to the PSNL in the PRP dated March 2018	Condition requirement to give consideration	The AKF5 (Tyre Chip) Storage Area noise assessment took into consideration the PSNL.																								
K3.4	All vehicles associated with the isotainer operation must use a broad-band type reversing beeper alarm.	Broadband alarms installed. Site procedure prepared and incorporated into Noise Management Plan	Implemented																								
K3.5	Locomotive must be relocate to eastern end of train as soon as practical to avoid such movements at night	Site procedure prepared and incorporated into Noise Management Plan	Implemented																								

<b>K3.6</b>	Best practice technology implemented with respect to reach stacker to reduce noise events	Site procedure prepared and incorporated into Noise Management Plan. Operators trained.	Implemented
<b>K3.6A</b>	<p>The verification report was finalised on 22 September 2021 prior to the commencement of construction of the CBS.</p> <p>There is no further reporting requirements until the commencement of operations of the CBS.</p>	<p>Operational noise targets were nominated for the modification (MOD 13) in accordance with the Consent Conditions. At the nominated Noise Compliance Point – Store Yard Close, clear compliance is achieved indicating that the noise contribution to the overall facility noise limit of 58 dB at this location will be minimal. At residences, consideration of the PSNLs of the PRP-7 Response Report is required.</p> <p>The PSNLs have been met by a minimum of 5 dB.</p>	<p>The verification report confirms that the CBS system will confirm to noise limits specified in K3.3</p> <p>Verification report required within 3 months of the commencement of operation of the CBS. This is likely to be at the end of the 23/24 reporting period.</p>
<b>K3.6B</b>	The verification was completed by John Sleeman at SLR and is a suitably qualified acoustic consultant.	Compliant	Compliant
<b>M2.1</b>	Although no construction activities are occurring in areas designated with Mill 7, the CBS construction for Kiln 6 commenced in March 2022	The CEMP controls for the CBS refer to the whole site to limit of cumulative impacts	<p>CEMP was approved by DPIE to address construction specific management controls.</p> <p>The CBS construction works have been limited to daytime only within the hours nominated in the consent</p>
<b>M2.2</b>	The noise assessment predicted and monitoring confirmed that Mill 7 operated within the contribution criteria during the	See Appendix 1 for Noise Assessment Report	Compliant

	reporting period and should be allowed to continue operating 24 hours/day, 7 days/week.		
<b>M2.3</b>	The noise assessment predicted that Mill 7 operated within the contribution criteria at the residential locations during the reporting period, including for the worst case weather scenario.	See Appendix 1 for Noise Assessment Report	Compliant
<b>M2.4</b>	Monitoring has shown compliance with limits.	See Appendix 1 for Noise Assessment Report	Compliant
<b>M2.5</b>	Noise was measured at the following locations: <ul style="list-style-type: none"> <li>• 72 Taylor Avenue (near Adelaide St);</li> <li>• 12 Brisbane Street;</li> <li>• 4 Melbourne Street;</li> <li>• Northern Boundary; and</li> <li>• Store Yard (close).</li> </ul>	See Appendix 1 for Noise Assessment Report	Compliant
<b>M2.6</b>	Section 11 of the INP provides the following alternate methods for determining compliance: <ol style="list-style-type: none"> <li>1. measuring existing noise levels with and without the premises operating;</li> <li>2. measuring the noise emissions from each of the premises at reference locations and then calculating the noise-emission levels back to the receiver; and</li> </ol>	This method has been used in previous AEMRs for the site with the results accepted by DP&E.	No management measures required.

	<p>3. using an accepted noise model calibrated for the particular locality and source.</p> <p>Method 2 was used for Mill 7.</p>		
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**Note:** (K = Kiln 6, M = Mill 7)

## 5.3 Air quality

Boral Cement is acutely aware that elevated fugitive dust emissions from the site can occur and to combat this has active dust management controls in place as set out in the *Berrima Cement Works – Dust Management Plan* (Boral 2020), which is operated across the site.

During the reporting period the site continued the use of the trial real-time dust monitor which links directly to the control room along with the site Trigger Action Response Management Plan (TARP) for dust which the site monitors current and forecast weather to manage potentially dust generating activities on site.

Table 13 sets out the relevant air quality conditions for the site within the two development consents. Table 14 sets out the site's performance during the past year relating to air quality and the key management measures that are used to minimise dust being generated and leaving the site which include:

- controlling dust from stockpiles using methods including the compaction of stockpile batters (being pushed up with a loader), wetting down with a water cart in dry weather conditions and stopping loading/unloading operations in high winds;
- controlling vehicles (ensuring they are covered and have used wheel washes for example);
- revegetating areas and planting trees to act as wind breaks;
- sealing roads or closing off unused roads;
- using a road sweeper and water carts to minimise traffic generated and windblown dust from trafficable areas; and
- modifying its activities such as loading, unloading and crushing of materials in open areas to minimise windblown dust by the use of a water carts, stopping or postponing the activities during times of high wind, modifying the process to take place under cover where possible.
- Baghouses at key transfer points within the cement mill and raw material processing areas.

In addition to controlling fugitive dust emissions by implementing the actions outlined above, Boral Cement operates its plant to ensure point source emissions meet required standards. The continuous monitoring data of particles (Kiln 6) showed compliance with agreed standards. The specialised testing of Kiln 6 and Mill 7 throughout the year showed no non-compliances with agreed standards.

Boral Cement maintains a dust deposition monitoring program, currently consisting of seven dust deposition gauges and one high volume air sampler (HVAS) located around the perimeter of the site. Samples are collected from each gauge on a monthly basis to assess compliance against the EPA's dust deposition guidelines.

Results are published , as required by the EPL, on the Boral Berrima Cement website.

As discussed in the body of this section, average dust deposition data for dust gauges for the reporting period have values well below the EPA guideline of 4g/m<sup>2</sup>/month. These results confirm that the current dust control measures on site are generally working well.

During the reporting period, the site received 14 complaints directly relating to dust concerns.

All the complainants were contacted after the complaints were received. Further details are provided in Appendix 2 Complaints Summary.

**Table 13:** Air quality conditions

Number	Condition
<b>K3.7</b>	The Applicant shall design, construct, operate and maintain the cement works upgrade in a manner that minimises dust emissions from the site and complies with the EPL.
<b>K3.7A</b>	<p>The Applicant shall apply all reasonable and feasible measures to minimise the generation of dust from coal stockpiles, including but not necessarily limited to:</p> <ul style="list-style-type: none"> <li>a) compaction of stockpile batters to minimise pick up of dust;</li> <li>b) installation of water sprays or use of a water cart to keep stockpile surfaces wet, if dust is being generated; and</li> <li>c) cessation of stockpile generation during periods of high wind, if dust generation cannot be controlled.</li> </ul>
<b>K3.8</b>	The Applicant shall take all practicable measures to ensure that all vehicles entering or leaving the site and carrying a load that may generate dust are covered at all times, except during loading and unloading. Any such vehicles shall be covered or enclosed in a manner that will prevent emissions of dust from the vehicle at all times.
<b>K3.9</b>	All trafficable areas and vehicle manoeuvring areas on the site shall be maintained in a condition that will minimise the generation or emission of wind blown or traffic generated dust from the site at all times.
<b>M2.7 Dust Emissions</b>	<sup>5</sup> The Applicant shall design, construct, operate and maintain the cement works upgrade in a manner that minimises dust emissions from the site. The raw material storage bunker associated with the cement works upgrade shall be maintained in a condition that effectively eliminates wind generated dust emissions. Dust collection systems shall be provided to all potential sources of dust production associated with the cement works upgrade. (Footnote: 5 Incorporates EPA General Terms of Approval (O2.1 and O2.2))
<b>M2.8</b>	The Applicant shall take all practicable measures to ensure that all vehicles entering or leaving the site and carrying a load that may generate dust are covered at all times, except during loading and unloading. Any such vehicles shall be covered or enclosed in a manner that will prevent emissions of dust from the vehicle at all times.
<b>M2.9</b>	All trafficable areas and vehicle manoeuvring areas associated with the cement works upgrade shall be maintained in a condition that will minimise the generation or emission of wind blown or traffic generated dust from the site at all times.
<b>K3.10 Air Quality</b>	The Applicant shall install and operate equipment in line with best practice to ensure that the Development complies with all load limits, air emission limits and air quality monitoring requirements as specified in the EPL for the site.



<b>Discharge s</b>	
<b>K3.10A</b>	Deleted
<b>M2.10 Discharge Limits</b>	<sup>6</sup> The Applicant shall design, construct, operate and maintain the cement works upgrade to ensure that total solid particle emission from the exhaust stack on Cement Mill No.7 (EPA Identification Point 10) does not exceed 20mg/m <sup>3</sup> (100% concentration limit). The concentration limit specified above is based on 101.3 kPa, 273 K, dry reference conditions and shall be determined in accordance with the monitoring requirements described under condition 3.1. To avoid any doubt, this condition does not authorise the discharge or emission of any other pollutants. (Footnote: 6 Incorporates EPA General Terms of Approval (P1.1, L2.1 and L2.2))

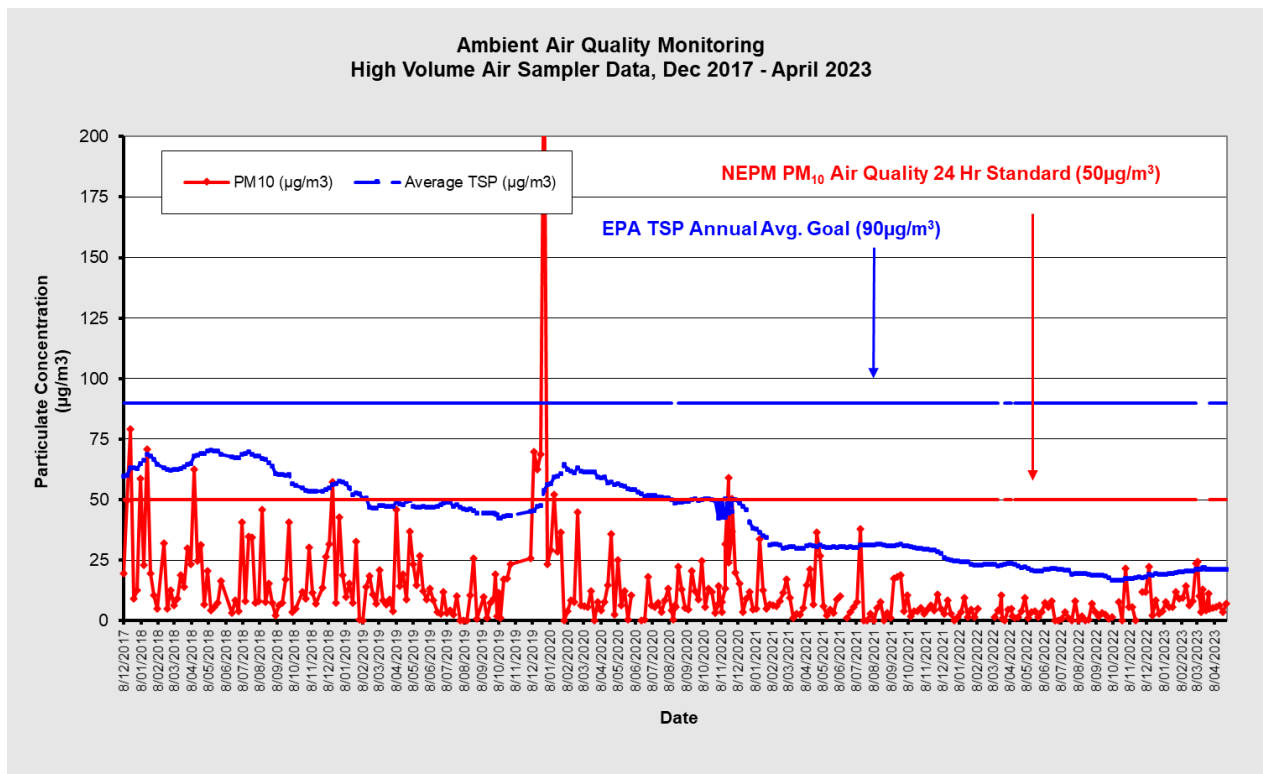
**Note: (K = Kiln 6, M = Mill 7)**

**Table 14:** Response to air quality conditions

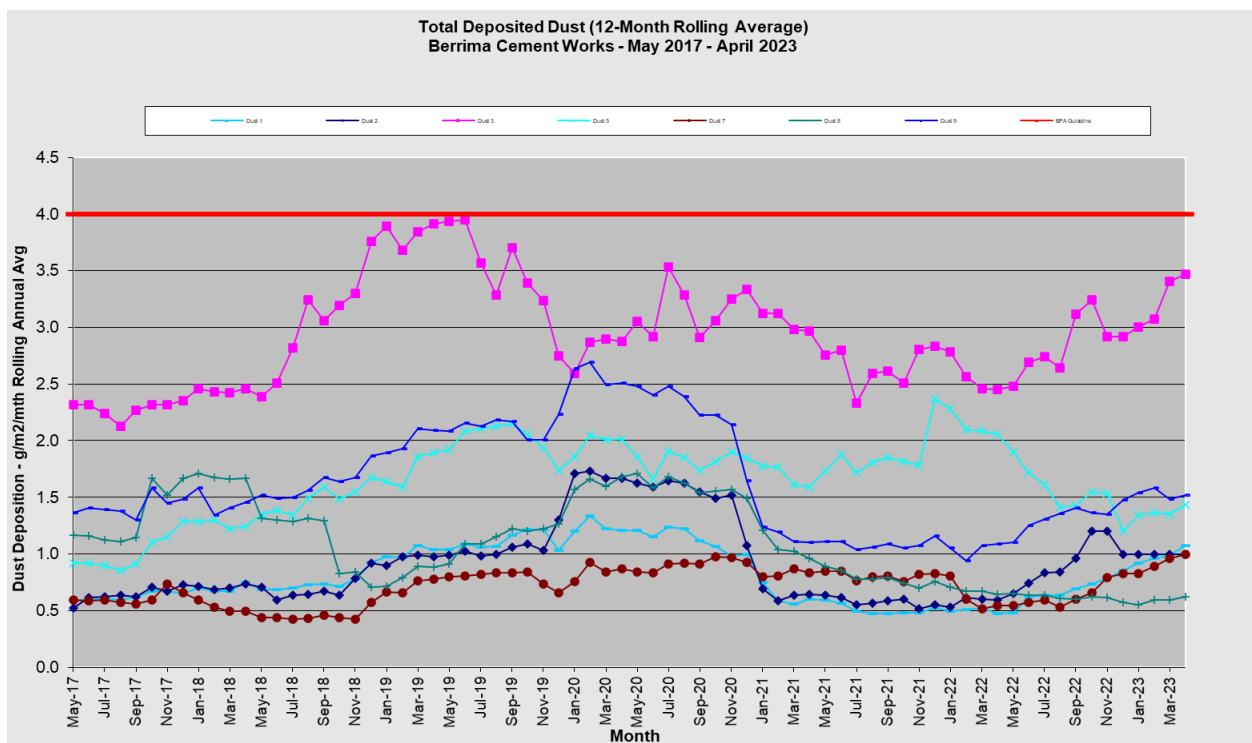
Condition / EIS prediction	Performance during reporting period	Trend / management implications	Implemented / proposed management actions
K3.7	<p><b>Dust monitoring</b></p> <p>There are seven dust monitoring gauges and one HVAS around the perimeter of the site and in New Berrima. The locations of the gauges are shown on Figure 1. Samples are collected from the dust gauges each month and each week for the HVAS. The samples are assessed for compliance against the dust deposition and total suspended particulates (TSP) guidelines in <i>Approved Methods and Guidance for Analysis for the Modelling and Assessment of Air Pollutants in NSW</i> (DEC 2005) and <i>National Environment Protection Measure for Ambient Air Quality</i> (NEPC 1998) PM<sub>10</sub> guideline.</p> <p>As there is no emission limit specified in the Licence, the following guidelines have been adopted:</p> <ul style="list-style-type: none"> <li>• EPA dust deposition guideline of 4 g/m<sub>2</sub>/month (expressed as a 12-month rolling average).</li> <li>• NEPM PM<sub>10</sub> 24 hr standard of 50 µg/m<sup>3</sup>.</li> <li>• EPA TSP annual goal of 90 µg/m<sup>3</sup>.</li> </ul> <p>As can be seen in figure 8 and 9, the dust gauges and HVAS have values below the guidelines for the reporting period.</p> <p><b>Stack emissions</b></p>	<p>Figure 8 shows the results of the analysis of the HVAS from May 2018 to April 2023. The trend during the year has been down.</p> <p>As can be seen, the current data shows that we remain below the EPA guideline of 4 g/m<sub>2</sub>/month.</p> <p>Figure 9 shows the results of the analysis of the dust gauges located around the site and the New Berrima community from May 2018 to April 2023. As can be seen, the current data shows that we remain below the EPA guideline of 4 g/m<sub>2</sub>/month.</p> <p>Boral Cement Berrima will continue to respond rapidly to, thoroughly investigate, and rectify any dust complaints received from the local community.</p>	<p>Dust control is a fundamental part of the operational management of this site. Dust is controlled through the implementation of the Dust Management Plan. As sound control measures are in place and this is supported by monitoring data, these operations will continue.</p> <p>During 2020/21 the site commissioned the real-time dust monitor and embed the use of the new site Dust Trigger Action Response Plan.</p> <p>The data from the real time monitor is used as a management tool to notify staff when TARP triggers are met to enact the corresponding management response</p>

	<p>Yearly stack emission monitoring for Kiln 6 as required by the EPL was undertaken in September 2022 and April 2023. Figure 10 shows that the Works maintained emissions well under the EPA limits.</p> <p>14 complaints were received from the community in relation to the deposition of dust on vehicles and properties. The complainants were contacted after the complaints were received. Further details are provided in Appendix 2.</p>		
<b>K3.7A</b>	See K3.7 above under Dust monitoring.	<p>Reasonable and feasible measures are being implemented to minimise fugitive dust from coal stockpiles. This includes compaction of stockpile batters (being pushed up with a loader), wetting down with a water cart in dry weather conditions and stopping loading/unloading operations in high winds.</p> <p>The site's re-vegetation program is maturing in the areas surrounding the stockpiles to create a windbreak and a dust screen.</p>	
<b>K3.8</b>	No complaints were received during this period regarding dust and vehicle movements and no related issues arose during this period.	All transport contractors are made aware of this requirement during site inductions. Section 3 of the <i>Driver Code of Conduct – Truck and Heavy Vehicles Operator</i> , which is part of the <i>Berrima Cement Works – Traffic Management Plan</i> (Boral 2017) includes requirements for all drivers of heavy vehicles on site to ensure they cover their loads and prevent spillages.	
<b>K3.9</b>	<p>See K3.7 above under Dust monitoring.</p> <p>During this reporting period Boral Cement has continued to actively work to reduce the generation of dust from vehicles and internal haul roads</p>	Some of the unsealed roads on site have been sealed in the previous years and some have been closed off and recently re-vegetated. Two wheel wash stations were installed in 2016, one at the exit of a shale pad, the other at the end of Quarry Road.	Boral Cement continues to investigate opportunities to reduce fugitive dust throughout the site. Issues are managed through

	through implementation of the Dust Management Plan.	The wheel wash stations continue to be routinely used. Boral Cement operates a road sweeper and water carts to minimise traffic generated and windblown dust from trafficable areas and vehicle manoeuvring areas. Mechanical sweepers undergo regular maintenance to ensure sweepers are working efficiently. Boral Cement modified its activities such as loading, unloading and crushing of materials in open areas to minimise windblown dust. Actions included the use of a water cart, stopping or postponing the activities until wind subsides, modifying the process to take place under cover where possible, etc.	<p>immediate corrective action and reporting through the incident management database SEquence.</p> <p>The real-time dust monitor is an extra tool to alert the site to potential fugitive dust events that could impact the New Berrima village residents.</p>
<b>M2.7</b>	Covered under KK3.7 and K3.7A		
<b>M2.8</b>	Covered under K3.8		
<b>M2.9</b>	Covered under K3.9		
<b>K3.10</b>	Stack emission monitoring for Kiln 6 was conducted by Ektimo in September 2022 and April 2023 in accordance with the sampling methods specified under EPL 1698. The reports demonstrated compliance with the emission limits for standard fuels for all monitoring parameters (see Figure 10).	No exceedances demonstrated for continuous particulate monitoring for Kiln 6 from 2 – April 2023 as demonstrated in Figure 10, with the exception of the incident in November 2022 as outlined in Section 2.	
<b>M2.10</b>	Ektimo monitored solid particle emissions from the Mill 7 stack in September 2022 in accordance with the sampling methods specified under EPL 1698. The report demonstrated compliance with the emission limit as shown in Figure 10.		



**Figure 4** Ambient air quality monitoring May 2017 – April 2023



**Figure 5** Total deposited dust (12-month rolling average) May 2017-April 2023)

Report ID	EPA 2	Kiln Stack	R013511-1	R014636-1
Pollutant	Unit of Measu	Licence Limit	Sep-2022	Apr-2023
Vol flowrate	M3/sec		230	240
Velocity	m/s		33	33
Temp	C		396	389
Nox	mg/m3	1250	1000	790
Solid Particles	mg/m3	50	30	19
Moisture	%		15	14
Molecular wgt stack gases	g per g mole		29.6	29.8
Dry das density	kg/m3		1.32	1.41
Carbon dioxide	%		20	19.6
Oxygen (O2)	%		10	9.7
Type 1 & 2 aggregate	mg/m3	0.5	<0.036	<0.034
Cadmium	mg/m3	0.05	0.0003	0.0004
Mercury	mg/m3	0.05	0.0091	0.0047
Chlorine	mg/m3	50	0.07	0.06
Carbon monoxide	%		450	310
Dioxins & Furans	nanograms/m	0.1	0.005	0.0074
Chromium (hexavalent)	mg/m3		0.00062	0.004
Hydrogen Chloride	mg/m3	10	0.14	0.15
Hydrogen fluoride	mg/m3	1	0.026	0.074
Sulphur dioxide	mg/m3	50	0.018	6.1
Sulfuric mist (SO3)	mg/m3	50	0.061	5.3
VOC	ppm	40	1.1	2.5
Thallium	mg/m3	0.05	0.0042	0.002

**Figure 6** Stack testing license comparison tables

## 5.4 Soils and water quality

The consent requirements for soils and water quality for Kiln 6 are in conditions 3.11 to 3.14 of Development Consent No. 401-11-2002-i and for Mill 7 in conditions 2.11 to 2.14 of Development Consent No. 85-4-2005-i, which are replicated in Table 14. The consents refer to EPL 1698, however, there are no water discharge limits in the EPL.

Table 16 sets out the site's performance during the past year relating to soils and water quality and the key management measures that are used at the site.

Boral manages water on site in accordance with the *Berrima Cement Works – Water Management Plan* (Boral 2020), which describes the monitoring points, frequency and parameters. Storm water and residual process water from all areas of the Works (including Kiln 6 and Mill 7) is harvested and used on site with water quality in the storages (Lake Quality and Lake Breed) tested monthly, and water quality in the receiving waterway (Wingecarribee River) tested every three months. Water is only discharged from site during very heavy rainfall, with two overflow events during the reporting period.

Three of the conditions relate to construction, with the Chloride Bypass System commencing construction on 25 March 2022 after approval of the MOD 13 CEMP on 24 February 2022. Section 8.6 of the CEMP details specific water management protocols relating to the construction of the CBS.

Approval of Modification 15 for the Tyre Chip Storage Area requires the management of Fire water and the construction of a Fire Water catchment bund. This was detailed in the CEMP prepared for this modification. The Water Management plan has been updated to reflect this requirement and is pending DPE approval.

It is demonstrated in Table 16 that the overall water management performance of the site is good. This indicates that the water management performance at Kiln 6 and Mill 7 is also good and that the conditions have been complied with during the reporting period.

Above average rainfall continued to be reported at times during the 2022/23 reporting period. The site continues to source a large portion of its daily usage requirements from waters collected within the shale pit voids. The business will continue to prioritise waters harvested onsite, however as a large consumer of water this will require the Wingecarribee River to be the main source of water. In the longer term the aim will be to source waters from the former Berrima Colliery.

**Table 15:** Soils and water quality conditions

Number	Condition
<b>K3.11 Construction Soil and Water Management</b>	Soil and water management measures consistent with Managing Urban Stormwater – Soils and Construction Vol.1 (Landcom, 2004) (the Blue Book) shall be employed during construction of the Development to minimise soil erosion and the discharge of sediment and other pollutants to land and/or waters.
<b>K3.12</b>	All construction vehicles exiting the site, having had access to unpaved areas, shall depart via a wheel-wash facility.
<b>K3.13</b>	All erosion and sedimentation controls required as part of this consent shall be maintained for the duration of the construction works, and until such time as all ground disturbed by the construction works, has been stabilised and rehabilitated so that it no longer acts as a source of sediment.
<b>K3.14 Water Discharge Limits</b>	The Applicant shall ensure that all surface water discharges from the site comply with the: a) discharge limits (both volume and quality) set for the development in any EPL; or b) relevant provisions of the POEO Act.
<b>M2.11 Water Quality Impacts</b>	<sup>7</sup> Except as may be expressly provided by a licence under the Protection of the Environment Operations Act 1997 in relation to the cement works upgrade, section 120 of that Act (pollution of waters) shall be complied with in, and in connection with, the carrying out of the cement works upgrade. (Footnote 7: 7 Incorporates an EPA General Term of Approval (L1.1))
<b>M2.12 Erosion and Sediment Control</b>	All construction vehicles exiting the site, having had access to unpaved areas, shall depart via a wheel-wash facility.
<b>M2.13</b>	All erosion and sedimentation controls required as part of this consent shall be maintained for the duration of the construction works, and until such time as all ground disturbed by the construction works, has been stabilised and rehabilitated so that it no longer acts as a source of sediment.
<b>M2.14 Site Drainage and Stormwater</b>	The Applicant shall ensure that the cement works upgrade does not lead to an increase in the volume or flow rate of stormwater leaving the site over and above pre-development flow conditions.

**Note:** (K = Kiln 6, M = Mill 7)



**Table 16:** Response to soils and water quality conditions

Condition / EIS prediction	Performance during reporting period	Trend / management implications	Implemented / proposed management actions
<b>K3.11</b>	<p>There were two overflows from Lake Quality during the reporting period (06/06/2022 and 14/11/22 ). Water was sampled at the overflow point (EPA Point 9), which had the following results:</p> <ul style="list-style-type: none"> <li>Biochemical oxygen demand (mg/L) – 3 &amp; &lt;2 (guideline:20)</li> <li>Oil and grease (mg/L) – &lt;5 for all samples (guideline: 10)</li> <li>pH – 78.2- &amp; 8.3</li> <li>Total suspended solids (mg/L) – 18 &amp; 22 (guideline: 30-50)</li> </ul> <p>The results were within guideline values and were reported as part of the site POELA monthly reports.</p>	<p>The discharge water quality is similar to previous years, with only two overflow events for the year, as a result of several periods of substantial rain in short periods of time.</p>	<p>In order to ensure sufficient capacity in Lake Quality in the event of a rain event, water for production will primarily be taken from Lake Quality prior to extracting water from Wingecarribee River.</p> <p>The approved CEMP for MOD 13 and Mod 15 details specific water management measures and specifically references <i>Managing Urban Stormwater – Soils and Construction Vol.1 (Landcom, 2004)</i> (the Blue Book)</p>
<b>K3.12</b>	Construction vehicles exited the site via a wheel wash.	NA	
<b>K3.13</b>	Refer to K3.11.	Construction is a short-term activity which cannot be used to establish trends. Two overflow events have occurred since construction of the CBS commenced	Refer to K3.11

		in March during the reporting period of the AEMR, but with no impact on water quality.	
<b>K3.14</b>	<p>No water volume and quality discharge limits are specified in EPL 1698 and water was not regarded as a project risk (SLR 2015). Notwithstanding, the EPL requires monitoring at the Lake Quality overflow point during overflows.</p> <p>There were two overflows from Lake Quality during the reporting period (06/06/2022 and 14/11/22 ). Water was sampled at the overflow point (EPA Point 9), which had the following results:</p> <ul style="list-style-type: none"> <li>Biochemical oxygen demand (mg/L) – 3 &amp; &lt;2 (guideline:20)</li> <li>Oil and grease (mg/L) – &lt;5 for all samples (guideline: 10)</li> <li>pH – 78.2- &amp; 8.3</li> <li>Total suspended solids (mg/L) – 18 &amp; 22 (guideline: 30-50)</li> </ul> <p>The results were within guideline values and were reported as part of the site POELA monthly reports.</p>	<p>The water in Lake Quality is reused in site processes and the lake only overflows during heavy rainfall. There were two overflow events during the reporting period. Sampling demonstrated that water quality met the typical NSW discharge criteria. .</p>	<p><i>Berrima Cement Works – Water Management Plan</i> (Boral 2020) is implemented at the Works, which includes the Kiln 6 area and is reviewed every three years or after an incident and is revised/improved as deficiencies become apparent.</p>
<b>M2.11</b>	<p>No water volume and quality discharge limits are specified in</p> <p>EPL 1698.</p>	Refer to K3.14.	<p><i>Berrima Cement Works – Water Management Plan</i> (Boral 2020) is implemented at the Works, which includes the Mill 7 area and is reviewed every three years or after an</p>

			incident and is revised/improved as deficiencies become apparent.
<b>M2.12</b>	Refer to K3.11.	Construction is a short-term activity which cannot be used to establish trends.	Two overflow events have occurred since construction of the CBS commenced in the previous reporting period. Construction has had no impact on water quality.
<b>M2.13</b>	Refer to K3.12.	Construction is a short-term activity which cannot be used to establish trends.	Two overflow events have occurred since construction of the CBS commenced in the previous reporting period. Construction has had no impact on water quality.
<b>M2.14</b>	Refer to K3.11.	Construction is a short-term activity which cannot be used to establish trends.	Two overflow events have occurred since construction of the CBS commenced in the previous reporting period. Construction has had no impact on water quality.

**Note:** (K = Kiln 6, M = Mill 7)

## 5.5 Traffic and transport

The requirements for traffic and transport for Kiln 6 are in conditions 3.15 to 3.16A of Development Consent No. 401-11-2002-i and for Mill 7 in conditions 2.15 to 2.17 of Development Consent No. 85-4-2005-i, which are replicated in Table 17.

Table 18 summarises the site's performance during the past year relating to traffic and transport and the key management measures that are used at the site.

Boral manages traffic on site in accordance with the Traffic Management Plan.

Four of the conditions relate to Construction, which are relevant to the construction of the Chloride Bypass Facility as part of Mod 13. The Construction Environment Management Plan – Chloride Bypass System was approved on 24 February 2022 and details specific traffic management protocols in Appendix D. The Construction traffic Management Plan aims to prevent incidents and queuing on public roads. No community complaints were received regarding construction or operational traffic.

A CEMP was prepared for Modification 15 during the reporting period, which also included a Construction Traffic Management Plan. The CEMP was approved in May 2023.

The Site Vehicle and Pedestrian Management Plan has been updated to reflect Modification 13 and 15, and is an Appendix to the OEMP.

Two of the conditions relate to parking provision and truck queuing. Sufficient car parking has historically, and continues to be, provided to accommodate employee and visitor vehicles on site without the need to park on surrounding public roads. Deliveries of fuel and ingredient materials for Kiln 6, and ingredient materials for Mill 7, have not historically, and continue to not, require queuing of trucks along Taylor Avenue. Therefore, operations at Kiln 6 and Mill 7 complied with the traffic and transport consent conditions during the reporting period.

**Table 17:** Traffic and transport conditions

Number	Condition
<b>K3.15</b>	Traffic and Transport Impacts The Applicant shall establish a bus transport system generally consistent with that identified in section 6.9 of the SEE to transport construction employees to and from the site during the construction period.
<b>K3.16</b>	The Applicant shall ensure that vehicles associated with the cement works upgrade do not stand or park on any public road or footpath adjacent to the site. Measures provided by the Applicant shall include sufficient parking for all employees and contractors during construction and operation of the cement works upgrade and management measures to ensure that heavy vehicles entering the site are not permitted to queue on Taylor Avenue at any time.
<b>K 3.16A 3.16B 3.16C 3.16D 3.16E Port Kembla Coal Haulage Campaigns Deleted.</b>	
<b>K3.16A</b>	The Applicant shall pay a road maintenance levy to Council of 4 cents/tonne/km for the transport of SWDF.
<b>M2.15 Traffic and Transport Impacts</b>	The Applicant shall establish a bus transport system generally consistent with that identified in section 6.6.7 of the SEE referred to in condition 1.2b to transport construction employees to and from the site during the construction period.
<b>M2.16</b>	The Applicant shall ensure that vehicles associated with the cement works upgrade do not stand or park on any public road or footpath adjacent to the site. Measures provided by the Applicant shall include sufficient on-site parking for all employees and contractors during construction and operation of the cement works upgrade and management measures to ensure that heavy vehicles entering the site are not permitted to queue on Taylor Avenue at any time.
<b>M2.17</b>	The Applicant shall install an advance warning signage along Taylor Avenue to advise vehicles approaching the entrance to the site of turning truck traffic in the area. This signage is to be installed prior to the commencement of operations of the cement works upgrade. Details of the design and installation of this signage are to be provided to the satisfaction of the Director-General prior to the commencement of operations at the cement works upgrade.

**Note:** (K = Kiln 6, M = Mill 7)

**Table 18:** Response to traffic and transport conditions

Condition / EIS prediction	Performance during reporting period	Trend / management implications	Implemented / proposed management actions
<b>K3.15</b>	Only a small workforce was required to construct the alternative waste facility with employees travelling to site from different directions. Therefore, a bus service was not implemented for construction during this reporting period as it was not required nor practical.	Construction timeframes are short and no performance trends can be established.	The Construction Traffic Management Plan was approved as an Appendix of the CEMP for the CBS facility on 24 February 2022 .
<b>K3.16</b>	No construction vehicles stood or parked on public roads or footpaths as there is sufficient room on roads within the site and parking areas to accommodate vehicles. Employee car parking was extended three years ago. The employee car park has unused capacity.	Construction timeframes are short and no performance trends can be established.	The Construction Traffic Management Plan was approved as an Appendix of the CEMP for the CBS facility on 24 February 2022
<b>K3.16A</b>	<p>54396 tonnes of SWDF were used in the reporting period, at the time of writing the levy has yet to be paid to Council.</p> <p>The levy payable should = (Reporting Year SWDF tonnes x 0.04) x 2.6</p> <p>Invoice cannot be issued by Council until Annual Report completed.</p>	<p>SWDF vehicles travel 2km from the highway to the site entrance and return to the highway.</p> <p>Based on 21869t in 2018/19 a levy of \$2274.31 was payable.</p> <p>Based on 28997t in 2019/20 a levy of \$3015.69 was payable.</p> <p>Based on 34767t on 2020/21 a levy of \$3615.78 is payable</p> <p>Based on 34654t on 2021/22 a levy of \$3,604.02 is payable</p> <p>Based on 54396t on 2022/23 a levy of \$5657.18 is payable</p>	<p>All prior invoices have been paid.</p> <p>A copy of this Annual Report will be made available for Council to enable the 22/23 invoice to be issued.</p>

<b>M2.15</b>	NA	NA	NA
<b>M2.16</b>	No construction vehicles stood or parked on public roads or footpaths as there is sufficient room on roads within the site and parking areas to accommodate vehicles. Employee car parking was extended three years ago. The employee car park has unused capacity.	Construction timeframes are short and no performance trends can be established.	NA
<b>M2.17</b>	As previously reported, warning signage was installed along Taylor Avenue.	This was a one-off activity with no associated trends.	Signs will be replaced if damaged or defaced.

**Note: (K = Kiln 6, M = Mill 7)**

## 5.6 Waste management

The consent requirements relating to waste management for Kiln 6 are in conditions 3.17 to 3.17C of Development Consent No. 401-11-2002-i and for Mill 7 in Condition 2.18 of Development Consent No. 85-4-2005-i, which are replicated in Table 19. The consents refer to EPL 1698, which provides waste requirements in conditions L4, O5, O6.1/2/3/4/5/6/7, E3 and E4.

Section 8.2 of the Chloride Bypass System CEMP details the Construction and Demolition Waste Management Plan. This was approved on 24 February 2022.

A similar plan was prepared as part of the Modification 15 CEMP.

Table 20 sets out the site's performance during the past year relating to waste management and the key management measures that are used at the site.

Boral manages waste on site in accordance with *Berrima Cement Works – Waste Management Plan* (Boral 2020), which describes recycling and disposal requirements for the different waste categories generated and used on site.

The waste conditions and the EPL 1698 specifically detail what wastes can be received on site for storage, treatment, processing, reprocessing or disposal such as granulated blast furnace slag (slag). These conditions exclude non-standard fuels approved for use at Kiln 6.



**Table 19:** Waste conditions

Number	Condition
<b>K3.17 Waste Management Impacts</b>	Except as otherwise permitted by this consent and a licence issued under the Protection of the Environment Operations Act 1997 the Applicant shall not cause, permit or allow any waste generated outside the site to be received at the site for storage, treatment, processing, reprocessing or disposal, or any waste generated at the site to be disposed of at the site.
<b>K3.17A</b>	<p>Condition 3.17 of this consent only applies to the storage, treatment, processing, reprocessing or disposal of waste at the premises if those activities require a licence under the Protection of the Environment Operations Act 1997 (POEO Act), and does not include:</p> <p>a) any Non-Standard Fuels approved for use at the upgraded Kiln 6 under this consent;</p> <p>b) any material normally brought to the site for the purpose of cement clinker production (as detailed in the documents listed under condition 1.2 of this consent);</p> <p>c) any material normally recycled or reused within the cement works; and</p> <p>d) any material that is subject to a specific waste recovery exemption (RRE) issued by the EPA to exempt that material from the specific clauses of the Protection of the Environment (Waste) Regulation 2005.</p>
<b>M2.18 Waste Management Impacts</b>	<sup>8</sup> The Applicant shall not cause, permit or allow any waste generated outside Cement Mill 7 to be received at Cement Mill 7 for storage, treatment, processing, reprocessing or disposal, or any waste generated at Cement Mill 7 to be disposed of at Cement Mill 7, except as expressly permitted by a licence under the Protection of the Environment Operations Act 1997. This condition only applies to the storage, treatment, processing, reprocessing or disposal of waste at the premises if it requires an environment protection licence under the Protection of the Environment Operations Act 1997. (Footnote 8: 8 Incorporates an EPA General Term of Approval (L3.1 and L3.2))
<b>K3.17AB Alternative Raw material Trial - Granulated Blast Furnace Slag (GBFS)</b>	Prior to the receipt of GBFS on-site, the Applicant must obtain a specific waste Resource Recovery Exemption (RRE) for GBFS from the EPA.
<b>K3.17AC GBFS Trial Requirements</b>	<p>Provided that the specific waste RRE is obtained for GBFS, the Applicant shall trial the use of up to 3,000 tonnes of GBFS as an alternate raw material in Kiln 6. The Applicant shall:</p> <p>a) undertake the trial over a continuous 3 day period, unless otherwise agreed in writing by the Secretary;</p>

	<p>b) conduct stack testing of all relevant air emissions and trace elements, to the satisfaction of the EPA; and</p> <p>c) use quality controlled GBFS only.</p>
<b>K3.17AD GBFS Trial Verification Report</b>	<p>Within 1 month of the completion of the GBFS trial, the Applicant shall prepare and submit a Verification Report to the Department to the satisfaction of the Director-General and the EPA.</p> <p>The Verification Report shall include:</p> <p>(a) stack emissions monitoring data measured for the duration of the trial;</p> <p>(b) copies of all analytical test reports for all substances sampled and tested;</p> <p>(c) a comparison of monitoring results from the trial with the relevant EPA standards and requirements, as determined by the EPA.</p>
<b>K3.17AE</b>	<p>Provided the results of stack testing for the GBFS trial confirm that the air pollutants emitted from the cement Kiln 6 meet the relevant EPA standards and requirements, the Applicant may commence full-scale usage of GBFS as a raw material additive in Kiln 6 at a maximum usage rate that is determined in writing by the Secretary in consultation with the EPA.</p> <p>Note: the Applicant must not commence full-scale usage of GBFS as a raw material additive in Kiln 6 until it has received written approval from the Secretary. In addition, the maximum usage rate per annum of GBFS in cement Kiln 6 must not exceed 150,000 tonnes per annum.</p>
<b>K3.17B</b>	<p>Except as provided by any condition of a licence under the Protection of the Environment Operations Act 1997, only the following 'Group A' waste may be stored at the site:</p> <p>a) AKF1.</p>
<b>K3.17C</b>	<p>Except as provided by the condition of a licence under the Protection of the Environment Operations Act 1997, the Applicant must assess, classify and dispose of all wastes generated as a result of the use of Non-Standard Fuels in a accordance with the NSW EPA's Waste Classification Guidelines.</p>

**Note:** (K = Kiln 6, M = Mill 7)

**Table 20:** Response to waste conditions

Condition / EIS prediction	Performance during reporting period	Trend / management implications	Implemented / proposed management actions
<b>K3.17</b>	Except for raw materials and SWDF non-standard fuels and HiCal 50 approved in EPL 1698 no waste generated outside the Works was received at the site during the reporting period.	The Operational Environmental Management Plan was updated in April 2018 in accordance with Condition 6.7 to incorporate measures for management of nonstandard fuels prior to their use at the site (approval letter received from DPE on 21/05/2018).	<p>Boral undertook a review of the OEMP, to reflect the recent Mod 11 and 12 to the consent and changes to the EPL completed by the EPA on 18 December 2019. These were submitted to the Department on 5 June 2020 and approved on the 29 June 2020.</p> <p>The CEMP was updated in response to MOD 13 to include the construction of the CBS and was approved on 24 February 2022, with construction occurring during the reporting period.</p> <p>The CEMP was further updated in response to Modification 15.</p>
<b>K3.17A</b>	As described above and prohibited by Condition L4.1 of the EPL, no waste generated outside the Works was received at the site during the reporting period.	The Operational Environmental Management Plan was updated in April 2018 in accordance with Condition 6.7 to incorporate measures for management of nonstandard fuels prior to their use at the site (approval letter received from DPE on 21/05/2018).	<p>Boral undertook a review of the OEMP, to reflect the recent Mod 11 and 12 to the consent and changes to the EPL completed by the EPA on 18 December 2019. These were submitted to the Department on 5 June 2020 and approved on the 29 June 2020.</p> <p>The CEMP was updated in response to MOD 13 to include the construction of the</p>

			<p>CBS and was approved on 24 February 2022, with construction occurring during the reporting period.</p> <p>The CEMP was further updated in response to Modification 15.</p>
<b>M2.18</b>	Landfilling of waste is prevented by crushing and recycling old refractory bricks through the kiln.	No waste materials are disposed on site.	
<b>K3.17AB</b>	The site-specific resource recovery exemption for full-scale GBFS use was issued by EPA on 19 September 2012.	The use of GBFS since 2012 has not resulted in an increase in stack emissions (see responses to air quality).	Current management measures for the use of GBFS are achieving desired outcomes.
<b>K3.17AC</b>	Compliance with this condition was detailed in the AEMR for 2013 – the trial was conducted between 14-16 May 2012 with stack testing on 15 May, the use of quality controlled GBFS and provision of a report on 13 July 2013.	The use of GBFS since 2012 has not resulted in an increase in stack emissions (see responses to air quality).	Current management measures for the use of GBFS are achieving desired outcomes.
<b>K3.17AD</b>	Compliance with this condition was detailed in the AEMR for 2013 – the verification report was provided on 13 July 2013 which reported that there were no stack contributions from the GBFS, coal use decreased and CO <sub>2</sub> /CO emissions decreased.	The use of GBFS since 2012 has not resulted in an increase in stack emissions (see responses to air quality).	Current management measures for the use of GBFS are achieving desired outcomes.
<b>K3.17AE</b>	Compliance with this condition was detailed in the AEMR for 2013 – the Secretary approved the ongoing use of GBFS in a letter dated 7 September 2012.	Boral has been using less GBFS than the approved rate of 150,000 tonnes per annum.	Current management measures for the use of GBFS are achieving desired outcomes.

<b>K3.17B</b>	No AKF1 or other Group A wastes were stored on site during the reporting period.	The Operational Environmental Management Plan was updated in April 2018 in accordance with Condition 6.7 to incorporate measures for management of nonstandard fuels prior to their use at the site (approval letter received from DPE on 21/05/2018).	<p>Boral undertook a review of the OEMP, to reflect the recent Mod 11 and 12 to the consent and changes to the EPL completed by the EPA on 18 December 2019. These were submitted to the Department on 5 June 2020 and approved on the 29 June 2020.</p> <p>A further review of the OEMP has commenced in relation to the approval of Modification 15 for the storage of AKF5 (tyre chips).</p>
<b>K3.17C</b>	There has been no generation of wastes from the use of the SWDF non-standard fuels. No wastes can be generated when consumed in the kiln as any ash forms part of the clinker product. Minor spillages near the shed entrance are either swept into the shed or if contaminated with other materials such as aggregates etc this material is swept up and placed into the site skip bins used for other site waste. These skip bins are sent to Resource Co who intern make SWDF to supply to site.	Wastes generated from the use of nonstandard fuels on site will be classified using the NSW EPA's Waste Classification Guidelines in accordance with EPL Condition L4.2.	Wastes generated from the use of nonstandard fuels on site will be classified using the NSW EPA's Waste Classification Guidelines in accordance with EPL Condition L4.2.

**Note: (K = Kiln 6, M = Mill 7)**

## 5.7 Non-standard fuels

The non-standard fuels consent requirements for Kiln 6 are in conditions 1.4A to 1.45 as well as 3.20 to 3.28 of Development Consent No. 401-11-2002-i, which are replicated in Table 21 and considered in Table 22. The consent refers to EPL 1698, which provides non-standard fuel requirements in conditions O5, O6.1/2/3/4/5/6/7 and E4.

In August 2018 Boral Cement commenced the use of Solid Waste Derived Fuels (SWDF) including Wood Waste (WW) and Refuse Derived Fuels (RDF). As per condition 3.25 a Proof of Performance Trial was undertaken with the six month report submitted to the Department for approval on 28 February 2018.

On the 23 April 2019 the Secretary approved the ongoing use of SWDF subject to:

- a) limiting the amount of SWDF to be fired in Kiln 6 to 40%, as a percentage of total fuel,
- b) periodic stack testing being undertaken every three months for the first 12 months of use of SWDF. The monitored pollutants must be consistent with the requirements of the Environment Protection Licence (EPL 1698)
- c) provision of a monitoring report that outlines the results of the quarterly stack testing required in (b) above and provides an assessment of compliance against the air emissions limits for the facility, to the satisfaction of the Secretary
- d) periodic measurements of hydrogen chloride (HCl) taken every three months until such time the Secretary agrees the accuracy of the HCl CEMS is confirmed through successful calibration audits undertaken in accordance with the USEPA Performance Specification 18.

The EPA updated the licence to reflect these changes in December 2019.

On the 16 November 2018 Boral sought approval from the Department to store up to 17 500t of carbon anode material (Hi Cal 50), sourced from the former Hydro Aluminium Kurri Kurri smelter for a period of 36 months. The Department reviewed the request and the additional information provided in consultation with the EPA and on 4 April 2019 confirmed approval of:

- the 'Hi Cal 50 Storage and Handling Procedure', Version 3 dated 27 March 2019 and
- the 'Hi Cal 50 (Carbon anode ex-Hydro Kurri Kurri) Recovered Resource Specification Version 3 dated 27 March 2019

During the 2019/20 reporting period (October 2019) MOD 11 was approved to permit the use of Hi Cal 50 during start up conditions. The site consumed 2951t of Hi Cal during the 2021/22 reporting period.

During the current reporting period, Modification 15 was approved for the construction and operation of AKF5 storage and feed infrastructure. Construction and operation will commence in the 2023/24 reporting period.

During the reporting period SWDF usage increased slightly going from 34 654t to 54 396t.

As per Condition 4.6, an annual audit on non-standard fuels was undertaken by Robert Byrnes of International Environmental Consultants covering the period of 30<sup>th</sup> September 21 to 1<sup>st</sup> October 2022. The audit found no non-compliances and had three recommendations relating to NSF. The report and response to the recommendations were issued to DPE, who have requested a status update on the recommendations as below...

- Boral should investigate the reason for the change in Total Suspended Particulates in the stack emissions which occurred after March 2022. – this was undertaken at the time following the audit and is complete
- Any new supplier of NSF should be subject to the same QA/QC management and reporting structure. This has been put in place and will be used as required.
- A further revision to the OEMP should be undertaken to incorporate MOD 14 when approved as this modification includes an increase in use of NSF as well as the construction of a new

road access to the site. Modification 14 has yet to be approved, however the OEMP is being reviewed in light of the Modification 15 approval.

**Table 21:** Non-standard fuels conditions

Number	Condition																																		
K1.4A Use of non standard fuels	Subject to meeting the requirements of this consent, and the requirements of a licence issued under the Protection of the Environment Operations Act 1997 for the site, the following fuels are permitted to be received at the site for use at the upgraded Kiln 6 development at the quantities, firing rates and proportions specified in Table 1.																																		
	<div><p>Table 1 – Permitted Fuels for use in upgraded Kiln 6</p><table><tr><th>Fuel</th><th>Category</th><th colspan="2">Tonnes per annum</th></tr><tr><td>Natural Gas, Fuel Oil, Diesel</td><td>Standard Fuel</td><td colspan="2">No limits</td></tr><tr><td>Coal</td><td>Standard Fuel</td><td colspan="2">No Limit</td></tr><tr><td>Coke Fines</td><td>Standard Fuel</td><td colspan="2">No Limit</td></tr><tr><td>Hi Cal 50</td><td>Non-Standard Fuel</td><td colspan="2">10,000</td></tr><tr><td>AKF1</td><td>Non-Standard Fuel</td><td colspan="2">20,000</td></tr><tr><td>AKF5</td><td>Non-Standard Fuel</td><td>30,000</td><td rowspan="3">≤100,000 combined</td></tr><tr><td>Wood Waste</td><td>Non-Standard Fuel</td><td>50,000</td></tr><tr><td>RDF</td><td>Non-Standard Fuel</td><td>80,000</td></tr></table></div>	Fuel	Category	Tonnes per annum		Natural Gas, Fuel Oil, Diesel	Standard Fuel	No limits		Coal	Standard Fuel	No Limit		Coke Fines	Standard Fuel	No Limit		Hi Cal 50	Non-Standard Fuel	10,000		AKF1	Non-Standard Fuel	20,000		AKF5	Non-Standard Fuel	30,000	≤100,000 combined	Wood Waste	Non-Standard Fuel	50,000	RDF	Non-Standard Fuel	80,000
	Fuel	Category	Tonnes per annum																																
	Natural Gas, Fuel Oil, Diesel	Standard Fuel	No limits																																
Coal	Standard Fuel	No Limit																																	
Coke Fines	Standard Fuel	No Limit																																	
Hi Cal 50	Non-Standard Fuel	10,000																																	
AKF1	Non-Standard Fuel	20,000																																	
AKF5	Non-Standard Fuel	30,000	≤100,000 combined																																
Wood Waste	Non-Standard Fuel	50,000																																	
RDF	Non-Standard Fuel	80,000																																	
	Note: The consent, as modified, permits only the use of the fuels listed above at the specified quantities. The use of any additional fuels would be the subject of appropriate assessment and determination under the Act. This consent, as modified, does NOT approve the establishment of a protocol for general use of Non-Standard Fuels.																																		
K1.4B	<p>AKF5 is approved for use at the development under this consent subject to the necessary approvals under the Act being obtained for storage facilities and kiln feeding infrastructure. No</p> <p>AKF5 is permitted to be received at the site until the necessary storage facilities and kiln feeding infrastructure have been constructed in accordance with any such approvals. Storage of AKF5 must be in accordance with Fire &amp; Rescue NSW (Fire Safety Branch) Guidelines for Bulk Storage of Rubber Tyres.</p> <p>If the Applicant proposes to exceed the stockpile sizes and heights within the above Guidelines, the Applicant must obtain written approval from Fire and Rescue NSW, to the satisfaction of the Secretary. Any AKF5 stored outside or in storage bunkers must be roofed to exclude rainwater</p>																																		
K1.4BA	<p>Notwithstanding condition 1.4B of this consent, the Applicant must undertake an air emissions stack test within three months of the commencement of use of AKF5 as a fuel in Kiln 6, or as otherwise agreed to by the Planning Secretary. The Applicant must:</p> <p>a) carry out the air emissions stack test to the satisfaction of the Planning Secretary;</p>																																		



	<p>b) undertake the air emissions stack test at a high feed rate of 4.5 tonnes per hour of AKF5, or as otherwise approved by the EPA;</p> <p>c) engage a suitably qualified and experienced person(s) to carry out the air emissions stack test;</p> <p>d) notify the Planning Secretary and EPA prior to the commencement of the air emissions stack test; and</p> <p>e) report the outcomes of the trial and stack test to the Planning Secretary and the EPA within one month of the conclusion of the test period, unless otherwise agreed by the Planning Secretary.</p>
<b>K1.4BB</b>	<p>The air emissions stack test report required by condition 1.4BA must include the following information:</p> <p>a) the dates and times when the air emissions stack test was carried out;</p> <p>b) the rates of feed of AKF5 during the air emissions stack test;</p> <p>c) the results of the air emissions stack test, including identification of any non-compliance with the conditions of this consent and the EPL; and</p> <p>d) details of additional measures to be implemented to address any non-compliance</p>
<b>K1.4C</b>	<p>Hi Cal 50 and AKF1 are approved for use at the development under this consent subject to the detailed design for any necessary storage facilities and kiln feeding infrastructure being approved to the Secretary. In particular, the detailed design shall:</p> <p>a) demonstrate that the storage facilities would be appropriately bunded in accordance with the relevant Australian Standards, especially Australian Standard AS1940-2004 (for AKF1, this would include having a minimum capacity sufficient to accommodate catastrophic failure of the tank and that adequate measures are in place to ensure a catastrophic failure of a tanker during transfer was adequately contained to ensure no off-site discharge;</p> <p>b) include appropriate measures to ensure liquids draining from the bund (and other containment areas) are kept separate and adequately treated prior to discharge to the onsite stormwater management system, and demonstrate that these measures were developed in consultation with the Sydney Catchment Authority and Wingecarribee Shire Council; and</p> <p>c) include a Fire Safety Study prepared in accordance with the Department's guideline Hazardous Industry Planning Advisory Paper No. 2: Fire Safety Study and in consultation with Fire and Rescue NSW. A construction certificate must not be issued in relation to any necessary storage facilities and kiln feeding infrastructure until the Secretary has approved the detailed design parameters. No Hi Cal 50 or AKF1 is permitted to be received at the site under this consent until any necessary storage facilities and kiln feeding infrastructure have been constructed in accordance with the detailed design parameters approved by the Secretary.</p>

<b>K1.4CA</b>	<p>Notwithstanding condition 1.4C of this consent, the Applicant is permitted to undertake a single trial of chipped tyres in the development, ahead of the construction of storage facilities and kiln feeding infrastructure for AKF5, provided that the trial meets the following requirements:</p> <p>a) no more than 205 tonnes of 2" chipped tyres is to be received at the site for the trial;</p> <p>b) the trial shall be conducted over no more than six months from the date of first receipt of the trial materials, after which any remaining trial materials shall be removed from the site to a facility lawfully permitted to accept the materials;</p> <p>c) the trial shall be undertaken for the purpose of investigating design and operational aspects of the full-scale use of AKF5;</p> <p>d) the trial shall be undertaken in full compliance with the environmental performance standards stipulated in this consent, and the requirements of the Environmental Protection Licence for the site;</p> <p>e) the Applicant shall consult with and meet the requirements of the EPA with respect to undertaking the trial, and shall not commence the trial without the prior written approval of the EPA;</p> <p>f) trial materials shall be stored in an area that is sealed, or otherwise treated to the satisfaction of the Secretary, and away from all potential ignition sources;</p> <p>g) the Applicant shall notify Fire and Rescue NSW prior to the receipt of trial materials on the site, and address any requirements with respect to the safe storage of the trial materials;</p> <p>h) the Applicant shall notify the Secretary, the EPA and the Community Liaison Group prior to the commencement of the trial; and</p> <p>i) the Applicant shall report the status and outcomes of the trial to the Secretary and the EPA on a monthly basis from the date that trial materials are first received on the site until conclusion of the trial.</p>
<b>K1.4D</b>	<p>Only Standard Fuels and the Group 1 Non-Standard Fuel, Hi Cal 50, are permitted to be used at the development during start-up and shut-down.</p>
<b>K1.4E</b>	<p>Non-Standard Fuels are not permitted to be stored at the site for longer than 3 months, except with the written permission of the Secretary.</p>

<b>K1.4F</b>	<p>No Non-Standard Fuel is permitted to be received at, or used at the development, unless it complies with:</p> <p>a) the handling, transporting, sampling, analysis and quality control requirements of this consent;</p> <p>b) any requirements of a licence issued under the Protection of the Environment Operations Act 1997 for the site; and</p> <p>c) the fuel specification for that specific fuel.</p>
<b>K1.4G</b>	<p>Prior to the receipt of the first batch of a Group 1 Non-Standard Fuel from a particular supplier, the Applicant shall certify in writing to the Secretary that the supplier has implemented appropriate quality control and quality assurance procedures to ensure the Applicant's responsibilities under this consent can be met. At the request of the Secretary, the Applicant shall forward a copy of the supplier's quality control and quality assurance procedures to the Department demonstrating how those procedures cause the Applicant to meet the requirements of this consent.</p>
<b>K1.4H</b>	<p>Prior to the receipt of the first batch of a Group 2 Non-Standard Fuel from a particular supplier, the Applicant shall certify in writing to the Secretary that the supplier has met the pre-qualification requirements set out in the approved Quality Assurance and Control Procedure for Receipt and NSW Government Department of Planning and Environment 8</p> <p>Use of Solid Waste Derived Fuels (Appendix 1 of this consent) and that the Applicant's responsibilities under this consent can be met. At the request of the Secretary, the Applicant shall forward a copy of the supplier's quality control and quality assurance procedures to the Department demonstrating how those procedures cause the Applicant to meet the requirements of this consent.</p>
<b>K1.4I</b>	<p>Prior to the receipt of the first batch of SWDF the Applicant shall develop and submit operational procedures for co-firing SWDF to ensure that the temperature of gas generated in the process is raised to a minimum temperature of 8500C for a minimum of two seconds. Operational procedures must include interlocks in the process control system.</p>
<b>K1.4J</b>	<p>Hi Cal 50 must only be used in Kiln 6 when blended with coal to create a homogenous blend. The concentration of Hi Cal 50 in the blend must not exceed 4%.</p>
<b>K3.20 Non-Standard Fuel Specifications</b>	<p>For each Group 1 or Group 2 Non-Standard Fuel approved for use at the development the Applicant shall provide a fuel specification, to be approved by the Secretary and the EPA prior to the use of that Non-Standard Fuel at the development under this consent. The Non-Standard Fuel specification shall include, but not be limited to, the minimum calorific value and the maximum quantity of all relevant pollutants, particularly the listed pollutants.</p>
<b>K3.21</b>	<p>Based on the Non-Standard Fuel specification specified in condition 3.20 the following Non-Standard Fuel specification criteria are required to be met:</p>

	<p>a) deleted MOD-109-9-2006-i;</p> <p>b) for Hi CAL 50 a mercury specification no greater than 1 mg/kg and a cadmium specification no greater than 10 mg/kg;</p> <p>c) for AKF1 a mercury specification no greater than 2 mg/kg and a cadmium specification no greater than 5 mg/kg;</p> <p>d) organohalogen compounds, expressed as chlorine, in any Non-Standard Fuel not to exceed 1% by weight; and</p> <p>e) the waste materials to be used as Non-Standard Fuels must not be diluted or blended to meet any of the fuel specification requirements.</p>
<b>K3.22 Non-Standard Fuels Pollution Tracking</b>	<p>Prior to the use of any Group 1 or Group 2 Non-Standard Fuels at the development in accordance with this consent, the Applicant shall implement a Tracking Program that meets the requirements of the Secretary. The Tracking Program shall include, but not be limited to, the identification and recording of the following information in accordance with the time periods specified in condition 3.23:</p> <p>a) batch analyses of Non-Standard Fuels received at the development as provided by the suppliers, and the results of any check analyses carried out by the Applicant as part of the quality control management procedures required under condition 6.7 and condition 6.8 of this consent;</p> <p>NSW Government Department of Planning and Environment 13</p> <p>b) a mass inventory of each listed pollutant entering the process in raw materials, conventional fuels and Non-Standard Fuels, with particular attention to, but not limited to chlorine, mercury, cadmium and chromium;</p> <p>c) emission factors for each listed pollutant calculated from inputs, outputs, and measured air emissions, variance in the emissions factors from period to period and an assessment with regards to the reasons for any such variance; and</p> <p>d) any adjustments that may be necessary to Non-Standard Fuel specifications arising from the Tracking Program analysis.</p>
<b>K3.23</b>	<p>The Applicant shall submit a Report that details and assesses the results of the Tracking Program prescribed in condition 3.22 of this consent to the Secretary. The Report shall be submitted to the Secretary:</p> <p>a) every three months in the first year of operation using Non-Standard Fuels under this consent, (to be synchronised with stack monitoring); and</p> <p>b) thereafter every six months, or as otherwise agreed to by the Secretary.</p>
<b>K3.24 Process Parameters</b>	<p>The Applicant shall cease to burn Non-Standard Fuels in Kiln 6 if:</p> <p>a) the temperature is below 8500C in the zone where Non-Standard Fuels are fired or in the vicinity of the pre-calciner; or</p>

	b) the temperature is below 3000C at the outlet of the preheater strings.
<b>K3.25</b>	<p>The Applicant must undertake PoP trials for the burning of SWDF. The maximum length of the trial will be eight months. At least one month prior to the PoP trials, the Applicant shall submit a detailed plan(s) for the PoP trials, to the satisfaction of the Secretary. The plan(s) must be prepared for the co-incineration of each permitted SWDF and be prepared in consultation with the EPA. The plan(s) must, as a minimum:</p> <p>a) verify the residence time, the minimum temperature and the oxygen content of the exhaust gas which will be achieved during normal operation and under the most unfavourable operating condition anticipated;</p> <p>b) establish all criteria for operation, control and management of the abatement equipment to ensure compliance with the emission limit values specified in the EPL;</p> <p>c) assess the performance of any monitors on the abatement system and establish a maintenance and calibration program for each monitor;</p> <p>d) establish criteria for the control of all alternative fuel input including the maximum flow and maximum calorific value;</p> <p>e) confirm that all measurement equipment of devices (including thermocouples) used for the purpose of establishing compliance with this approval have been subjected, in situ, to normal operating temperatures to prove their operation under such conditions;</p> <p>f) detail procedures for testing the performance of all major process components and emission control systems associated with the processing and burning of SWDF; and</p> <p>g) address all relevant requirements of the EPL for the project.</p>
<b>K3.24A</b>	The temperature requirement of Condition 3.24(b) does not apply to the Group 1 Non-Standard Fuel Hi Cal 50, when Hi Cal 50 is blended with coal in accordance with the requirements of condition 1.4J.
<b>K3.24B</b>	Notwithstanding Condition 3.24A, the feed rate of the Group 1 Non-Standard Fuel, Hi Cal 50, must not exceed 400kg/hr when the temperature is below 300°C at the outlet of the preheater strings.
<b>K3.26</b>	<p>The PoP trials shall:</p> <p>a) be carried out in accordance with a detailed PoP plan(s) approved by the Secretary;</p> <p>b) be undertaken by a suitably qualified and experienced person(s);</p>

	<p>c) test performance of all major process components including emission control systems using no SWDF, and representative fuels containing SWDF designed to cover the range of materials and compositions of SWDF;</p> <p>d) identify changes to the Kiln 6 emission control system that may be necessary to achieve compliance with the consent and the EPL; and</p> <p>e) demonstrate compliance with the relevant requirements of the EPL, development consent and relevant environmental and safety criteria.</p>
<b>K3.27</b>	<p>The Applicant is to report on each PoP trial to the Secretary and EPA. The reports shall be submitted at:</p> <p>a) monthly intervals during the PoP trial. The information to be contained in these reports is to be determined in consultation with the EPA as part of the PoP Trial Plan required under condition 3.25; and</p> <p>b) six months after the commencement of the PoP trial. The six month report shall contain but not be limited to the following information:</p> <ul style="list-style-type: none"> <li>i. the total quantity of SWDF used during the previous six months;</li> <li>ii. the dates and times when the trial commenced and will conclude;</li> <li>iii. the results of stack emissions testing for the analytes and properties specified in any relevant trial plan and baseline emissions for comparison, where applicable;</li> <li>iv. all monitoring data collected for the project during the previous six months;</li> <li>v. identification of any non-compliance with the conditions of this consent and the EPL;</li> <li>vi. details of additional measures to be implemented to address any non-compliance; and</li> <li>vii. an assessment of the suitability of the SWDF for ongoing use.</li> </ul> <p>Copies of the POP Trial Reports shall be made available to the public upon request.</p>
<b>K3.28</b>	<p>Use of SWDF is not permitted (outside of the approved PoP trials) until such time as the Secretary has indicated in writing that it is satisfied with the results of the six month PoP trial report specified under condition 3.27 b) for an individual SWDF.</p>

<b>K7.3A</b>	<p>In each Annual Management Report submitted after the First Year Monitoring and Modelling Assessment Report required in accordance with condition 7.6 has been submitted, the applicant shall include details of the use of all Non-Standard fuels at the development including but not limited to:</p> <ul style="list-style-type: none"> <li>a) the nature, quantity and quality of Non-Standard Fuels used at the development</li> <li>b) details of any fuels that did not meet the Fuel Specification, including the source of the fuels and how the rejected fuels were managed or disposed of;</li> <li>c) a review of the results of the Non-Standard Fuels Tracking Program and Non-Standard Fuels Quality Control Management Procedures; and</li> <li>d) the results of all monitoring undertaken in accordance with the requirements of this consent and an assessment of these monitoring results, including comparison of stack emissions against the concentration limits set in condition 3.10.</li> </ul>
<b>K7.6</b>	<p>One year after the commencement of the use of Non-Standard Fuels in accordance with this consent, the Applicant shall prepare a First-Year Monitoring and Modelling Assessment Report. The Report shall be submitted to the Secretary, the NSW Department of Health and the EPA not more than 15 months after the commencement of the use of Non-Standard Fuels in accordance with this consent.</p>

**Note:** (K = Kiln 6, M = Mill 7)

**Table 22:** Response to non-standard fuels conditions

Condition / EIS prediction	Performance during reporting period	Trend / management implications	Implemented / proposed management actions
<b>K1.4A</b>	<p>The majority of fuel consumed was coal.</p> <p>Small amounts of diesel are used during kiln start-ups.</p> <p>The site commenced the use of SWDF's in August 2018.</p>	<p>SWDF are now in use. Usage has increase from</p> <p>21 809t in 2018/19</p> <p>28 997t in 2019/20</p> <p>34 767t in 2020/21</p> <p>34 654t in 2021/22</p> <p>54 396t in 2022/23</p>	<p>Boral undertook a review of the OEMP, to reflect the recent Mod 11 and 12 to the consent and changes to the EPL completed by the EPA on 18 December 2019. These were submitted to the Department on 5 June 2020 and approved on the 29 June 2020.</p>
<b>K1.4B</b>	<p>Less than 200t of AKF 5 was received, stored or used at the site during the reporting year as part of the tyre chip trial.</p>	NA	
<b>K1.4BA</b>	<p>Tyre Chip usage has not commenced during this reporting period</p>	NA	<p>Air emission stack test will be undertaken within 3 months of AKF5 being used as a fuel</p>
<b>K1.4BB</b>	<p>Tyre Chip usage has not commenced during this reporting period</p>	NA	<p>Air emission stack test will be undertaken within 3 months of AKF5 being used as a fuel</p>
<b>K1.4C</b>	<p>Compliance was confirmed in the 2007-2008 AEMR.</p>	<p>The site will be recommenced the use of HiCal50 in 2020/21</p>	
<b>K1.4CA</b>	<p>Boral commenced tyre chip trial in January 2022.</p>	<p>Trials are one-off events that do not display reportable trends.</p>	<p>The trial completed, with Modification 15 approved for the installation and operation of a Tyre Chip Storage area..</p>



<b>K1.4D</b>	No non-standard fuels, apart from the approved HiCal 50, were used during start-up or shut-down conditions.	Apart from HiCal 50, SWDF are currently the only non-standard fuels in use. These are fed into the Calciner and are easily removed during start-up and shut down conditions	Modification 11 was approved on 25 October 2020 which permits the use of HiCal50 when blended with coal at 4% HiCal 50 to 96% coal during start-up and shut down conditions.
<b>K1.4E</b>	Written approval from the Secretary received (4/4/2019) to store up to 17 500t of HiCal 50.	NA	Manage as per approved HiCal50 Storage and Handling Procedure and Hi Cal 50 Recovered Resource Specification.
<b>K1.4F</b>	All non-standard fuels received and used at site are tested to ensure compliance with approved specifications.		
<b>K1.4G</b>	Boral provided and had approved from the Secretary their own procedures for the Group 1 HiCal 50 Specification and Storage procedures as Boral are processing and testing for supply.	NA	NA
<b>K1.4H</b>	Boral provided in writing to the Secretary on that a new Group 2 SWDF supplier had implemented appropriate quality control and quality assurance procedures with correspondence from DPIE acknowledging receipt of review.		Boral will continue to review suppliers prior to the receipt of the first batch SWDFs from a particular supplier.
<b>K1.4I</b>	Operational procedures were submitted as part of the PoPT plan process.		
<b>K1.4J</b>	HiCal will be blended within the coal blending plant when in use.		
<b>K3.20</b>	HiCal50 specification was approved on 4/4/2019. PoPT for SWDF including specification approved 28/8/2018.		

<b>K3.21</b>	All non-standard fuels have met the specified non-standard fuel specifications.	The review of results is undertaken on a routine basis.	
<b>K3.22</b>	The Non-Standard Fuels pollutant tracking procedure (SP10-01-10 Non-Standard Fuels Pollutant Tracking Procedure) was issued on 1 March 2003 and a copy was provided to DP&E by email on 2 March 2003. The procedure addresses all requirements of Condition 3.22.		
<b>K3.23</b>	The first Tracking Program report will be submitted within two weeks of the first quarterly stack test post PoPT trial approval then every six months following receipt of stack test results.	Six monthly reports have been provided as required. For the reporting period, The six-monthly report was submitted in August 22 and February 2023.	Reports will continue to be prepared as per the Conditions and supplied to the DPE.
<b>K3.24</b>	This is complied with.		
<b>K3.25</b>	PoPT plan was approved in consultation with the EPA		
<b>K3.26</b>	The PoPT was approved by the DPE 28/8/2018	PoPT originally was completed during the 2019/20 reporting period.	Further PoPT undertaken increasing to 50%.
<b>K3.27</b>	All PoPT monthly reports and the six monthly report were submitted to the Secretary and the EPA. The reports are available on request.	The PoPT six month report was accepted and approved by the DPE with continual use (with conditions limiting to 40%) of SWDF approved by the Secretary on 23/4/2019.	On 8 October 2021 Boral met with the EPA, including representatives of their air branch to discuss the POPTs. Three PoPT were completed.  The submission of the PoPTs was provided on 31 March 2022 and a response to a Rfl was provided on 12 May 2022. Further PoPT was completed in June/July 2022 to enable the finalisation of the request to

			50%. This has been approved by the DPE, with an EPL licence variation pending.
<b>K3.28</b>	The continual use of SWDF was approved by the Secretary on 23/4/2019.		
<b>K3.24B</b>	HiCal is used at the approved rate.		
<b>K7.3A</b>	<p>SWDFs were is use during the reporting period. This material came from the three approved suppliers. Two Wood Waste and one Refuse Derived Fuel. A total of 54 396t was used during the reporting period. Weekly meetings are held with suppliers to provide updates on operational demands and to review quality and the contracted specifications. All material met the consented specification during the reporting year.</p> <p>both six monthly non-standard fuel tracking program reports were submitted for the reporting period. An independent 3<sup>rd</sup> party audit was undertaken on QC management procedures of all suppliers in April 2023, with no non-compliances raised.</p> <p>Table 10 under section 5.3 summarises stack emission test results against the licence limits. All stack tests undertaken during 2022/23 were compliant with licence limits.</p>		
<b>K7.6</b>	A first year assessment report was submitted in November 2019 to the DPIE.		

**Note: (K = Kiln 6, M = Mill 7)**

## 5.8 Visual amenity

The visual amenity consent requirements for Kiln 6 are in conditions 3.18 to 3.19A of Development Consent No. 401-11-2002-i and for Mill 7 in Condition 2.19 of Development Consent No. 85-4-2005-i, which are replicated in Table 23.

Compliance with the construction requirements of the second Kiln 6 pre-heat tower was demonstrated in previous AEMRs. It is demonstrated in Table 24 that the community has not historically lodged complaints about the visual amenity of the site and this continues for the current reporting period.

**Table 23:** Visual amenity conditions

Number	Condition
<b>K3.18 Visual Amenity Impacts</b>	The Applicant shall ensure that all external lighting associated with the cement works upgrade, and including those lights already erected, is mounted, screened, and directed in such a manner so as not to create a nuisance to surrounding properties or roadways. The lighting shall be the minimum level of illumination necessary and shall comply with AS 4282(INT) 1995 – Control of Obtrusive Effects of Outdoor Lighting.
<b>K3.19</b>	<p>The second pre-heater tower shall be designed, constructed, operated and maintained in a manner that minimises the visual impact to surrounding properties and roadways.</p> <p>Note: The second pre-heater tower shall be built in a manner consistent with that described in the additional information provided (identified in condition 1.2 f)). This includes using the building materials identified and minimising the height of the pre-heater tower.</p>
<b>K3.19A</b>	Operational stockpiling of RDF in the external bale material storage area (identified on Drawing No.GE-B-2278-01 Revision DP, dated 15 January 2015) is limited to periods of extended kiln downtime for maintenance or repair only. RDF for stockpiling must be delivered in plastic wrapped 1 cubic metre bales. Stockpiles must not exceed a maximum height of five metres.
<b>M2.19 Visual Amenity</b>	Impacts The Applicant shall ensure that all external lighting associated with the cement works upgrade, and including those lights already erected, is mounted, screened, and directed in such a manner so as not to create a nuisance to surrounding properties or roadways. The lighting shall be the minimum level of illumination necessary and shall comply with AS 4282(INT) 1995 – Control of Obtrusive Effects of Outdoor Lighting.

**Note:** (K = Kiln 6, M = Mill 7)

**Table 24:** Response to visual amenity conditions

Condition / EIS prediction	Performance during reporting period	Trend / management implications	Implemented / proposed management actions
<b>K3.18 Visual Amenity Impacts</b>	Provision of lighting at the Berrima Cement Works complies with AS 4282(INT) 1995 – Control of Obtrusive Effects of Outdoor Lighting.	No community complaints regarding light spill have been received during the reporting period – the community has not previously complained about light spill from the site.	A minimum amount of lights must be on during night time for safety, however, management measures are implemented to prevent significant light spill from the site.
<b>K3.19</b>	Compliance with this condition has been confirmed previously.	No community complaints regarding light spill have been received during the reporting period – the community has not previously complained about light spill from the site.	Planting of trees for visual screening is effectively shielding the tower from sensitive receivers – this screening will become more effective as plantings mature.
<b>K3.19A</b>	Managed by the site EMP	No community complaints were received in relation to stockpiling	N/A
<b>M2.19 Visual Amenity</b>	Provision of lighting at the Berrima Cement Works complies with AS 4282(INT) 1995 – Control of Obtrusive Effects of Outdoor Lighting.	No community complaints regarding light spill have been received during the reporting period – the community has not previously complained about light spill from the site.	A minimum amount of lights must be on during night time for safety, however, management measures are implemented to prevent significant light spill from the site.

**Note:** (K = Kiln 6, M = Mill 7)

## 5.9 Rehabilitation

The Guideline requirement for reporting on rehabilitation activities focuses on mining, however, Development Consent No. 401-11-2002-i and Development Consent No. 85-4-2005-i relate to activities in a cement production facility. Areas disturbed during construction of the SWDF facility are being rehabilitated in accordance with *Construction Environmental Management Plan – Solid Waste Derived Fuels Project* (Boral 2017).

## 5.10 Community

The community relations conditions for Kiln 6 are in conditions 5.1 to 5.5 of Development Consent No. 401-11-2002-i and in conditions 4.1 to 4.3 of Development Consent No. 85-4-2005-i for Mill 7 (Table 25). Performance for both consents are reported under the conditions for Kiln 6 in Table 26 because the conditions are the largely the same in both consents.

14 community complaints were received during the reporting period, all of which were made directly through to the site.. The complaints were related to dust generation and deposition. These were addressed individually with each complainant.

The Community Liaison Group (CLG) was re-established during the 2019/20 reporting period with the members endorsed by the DPIE on 30 August 2019.

Two CLG meetings were held during the reporting period on 29 July 2022 and 1 December 2022. No whole of community meeting was held during the reporting period.

Details of these meetings are held on the ([www.boral.com.au/berrimacement](http://www.boral.com.au/berrimacement)) website.



**Table 25:** Community conditions

Number	Condition
<b>K5.1</b>	Subject to confidentiality, the Applicant shall make all documents required under this consent available for public inspection upon request. This shall include provision of all documents at the site for inspection by visitors, and in an appropriate electronic format on the Applicant's internet site, should one exist.
<b>K5.2</b>	<p>Prior to the commencement of construction for the cement works upgrade, the Applicant shall ensure that the following are available for community complaints for the life of the cement works upgrade (including construction and operation):</p> <ul style="list-style-type: none"> <li>a) a telephone number on which complaints about operations on the site may be registered;</li> <li>b) a postal address to which written complaints may be sent; and</li> <li>c) an email address to which electronic complaints may be transmitted, should the Applicant have email capabilities.</li> </ul> <p>The telephone number, the postal address and the email address shall be displayed on a sign near the entrance to the site, in a position that is clearly visible to the public. These details shall also be provided on the Applicant's internet site, should one exist.</p>
<b>K5.3</b>	<p>The Applicant shall record details of all complaints received through the means listed under condition 5.2 of this consent in an up-to-date Complaints Register. The Register shall record, but not necessarily be limited to:</p> <ul style="list-style-type: none"> <li>a) the date and time, where relevant, of the complaint;</li> <li>b) the means by which the complaint was made (telephone, mail or email);</li> <li>c) any personal details of the complainant that were provided, or if no details were provided, a note to that effect;</li> <li>d) the nature of the complaint;</li> <li>e) any action(s) taken by the Applicant in relation to the complaint, including any follow-up contact with the complainant; and</li> <li>f) if no action was taken by the Applicant in relation to the complaint, the reason(s) why no action was taken. The Complaints Register shall be made available for inspection by the EPA or the Secretary upon request.</li> </ul>
<b>K5.4</b>	Prior to the use of Non-Standard Fuels at the development the Applicant shall establish a Community Liaison Group that has access to all environmental management plans and monitoring data, environmental reporting and tracking and audit reports required by this consent. The Group shall: a) be comprised of the following, whose appointment has been approved by the Secretary: i) 1 or 2 representatives from the Applicant, including the person responsible for environmental management at the development; ii) 1 representative from Council; and

	<p>iii) 3 or 4 representatives from the local community. b) be chaired by a representative agreed to by the Group and approved by the Secretary; c) meet a minimum of once in every 6 month period; and d) review and provide advice on the environmental performance of the development, including providing comment where necessary on any environmental management plans, monitoring results, audit reports, or complaints.</p>
<b>K5.5</b>	<p>The Applicant shall at its own expense: a) ensure that 1 or 2 of its representatives attend the Group's meetings; b) provide the Group with regular information on the environmental management and performance of the development; c) provide access to independent scientific/technical support to assist member in understanding and interpreting information provided, if requested; d) provide meeting facilities for the Group, where necessary; e) arrange site inspections for the Group, if requested; f) take minutes of the Group's meetings and make these minutes available to the public for inspection within 14 days of the Group meeting, or as agreed to by the Group; g) respond to any advice or recommendations the Group may have in relation to the environmental management or performance of the development; and h) maintain a record and a copy of the minutes of each Group meeting, and any responses to the Group's recommendations, to be provided to the Secretary upon request.</p> <p>Note: The above condition's also cover all elements of conditions 4.1 to 4.3 of the conditions set out for the development on Cement Mills 7.</p>

**Note: (K = Kiln 6, M = Mill 7)**

**Table 26:** Response to community conditions

Condition / EIS prediction	Performance during reporting period	Trend / management implications	Implemented / proposed management actions
<b>K5.1</b>	<p>Development Consent No. 401-11-2002-i, Development Consent No. 85-4-2005-i and EPL 1698 are available for inspection on request at the Berrima Cement Works. Current environmental monitoring data under the EPL is available at <a href="https://www.boral.com.au/our-commitment/environmental-reporting">https://www.boral.com.au/our-commitment/environmental-reporting</a></p> <p>The site's environmental management plans and some previous AEMRs are available at (<a href="http://www.boral.com.au/berrimacement">www.boral.com.au/berrimacement</a>)</p>	Boral historically and continues to make information available on request at the site and on the site's website.	Boral will continue to make information available on request at the site and on the site's website.
<b>K5.2</b>	<p>Berrima Cement Plant's complaints procedures are documented in the operational environmental management plan and subordinate plans. Contact details for Boral Cement Berrima are included on all site entrance signage, and include a telephone number, postal address and email address. Additionally, contact details are provided on the website</p> <p>(<a href="http://www.boral.com.au/berrimacement">www.boral.com.au/berrimacement</a>)</p>	Boral historically and continues to provide contact information on signs and on the site's website.	Boral will continue to make information available on request at the site and on the site's website.
<b>K5.3</b>	<p>Berrima Cement Plant's complaints procedures are documented in the Operation Environmental Management Plan and subordinate plans. A summary of all complaints (by type) received during this reporting period of 1/05/2022 – 30/04/2023 is provided in Appendix 2. There were 14 complaints, each of which related to dust.</p>	The number of complaints has increased for this reporting period.	Boral will continue to implement the Operational Environmental Management Plan to prevent nuisance impacts on neighbouring properties and implement the real-time dust monitor.

<b>K5.4</b>	<p>The community liaison committee (CLC) was originally established in April 2004. Since 2010, the CLC was converted to public meetings, including invitations to the CLC members, as, at the time the CLC format proved unsuccessful in communicating meeting contents and outcomes to the broader community.</p> <p>In 2019/20 the Community Liaison Group was re-established.</p> <p>In 2022/23 the Community Liaison Group met twice.</p> <p>. Notes of meetings and copies of presentations made at the community meetings are sent to all meeting participants and are displayed in the community section of the Berrima website:</p> <p>(<a href="http://www.boral.com.au/berrimacement">www.boral.com.au/berrimacement</a>)</p>	<p>The aim is for the CLG to <b>meet 6 monthly</b> and there will be one whole of community meeting held annually, as required</p>	<p>The CLG met twice during the reporting period.</p>
<b>K5.5</b>	<p>The Berrima Cement Management Team is represented by the Site Operations Manager and the Environmental Sustainability Manager, together with Boral's Stakeholder Relations Manager - Southern Region (NSW/VIC/TAS/SA), and a representative from Boral Cement's Group Engineering Team.</p> <p>Minutes from the CLG meetings have been posted on the website.</p>	<p>Boral has historically, and will continue to, respond to requests from CLG members and post the meeting minutes on the website.</p>	<p>Boral will continue to respond to requests from CLG members and post the meeting minutes on the website.</p>

**Note: (K = Kiln 6, M = Mill 7)**

## 6 INDEPENDENT AUDIT

Condition 4.5 of the Kiln 6 development consent and Condition 3.3 of Cement Mill 7 development consent require Boral Cement to audit the site once every three years. Both conditions are nearly identical and the audit is undertaken as a single operation. Condition 4.5 of the Kiln 6 development consent states:

*Within three years of the commencement of operation of the cement works upgrade, and every three years thereafter or as otherwise required by the Director-General, the Applicant shall commission an independent person or team to undertake an Environmental Audit of the cement works upgrade. The independent person or team shall be approved by the Director-General, prior to the commencement of the Audit. An Environmental Audit Report shall be submitted for comment to the Director-General, the EPA and Council, within one month of the completion of the Audit. The Audit shall:*

- be carried out in accordance with ISO 14010 - Guidelines and General Principles for Environmental Auditing and ISO 14011 - Procedures for Environmental Auditing;*
- assess compliance with the requirements of this consent, and other licences and approvals that apply to the cement works upgrade;*
- assess the cement works upgrade operations against the predictions made and conclusions drawn in the SEE and other documents listed under conditions 1.2a to 1.2q inclusive; and*
- review the effectiveness of the environmental management of the cement works upgrade, including any environmental impact mitigation works.*

*The Secretary may, having considered any submission made by the EPA and/or Council in response to the Environmental Audit Report, require the Applicant to undertake works to address the findings or recommendations presented in the Report. Any such works shall be completed within such time as the Director-General may agree.*

The above wording is replicated in Condition 3.3 of the Mill 7 development consent.

The last 3 year audit was conducted in November 2020 by Robert Byrnes from International Environmental Consultants.

The DPIE accepted the audit report on 11 March 2021 and requested that an update be provided in the next AEMR and future AEMRs until actions are completed. The audit report is also available on the Berrima Cement webpage.

Boral has reviewed the audit report and believed it complied with the requirements of the audit conditions.

The next audit will be conducted in November 2023.

## 7 INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD

There were two non-compliances reported during the reporting period relating to non-compliances within sites Environmental Protection Licence 1698 conditions.

See details of non-compliance submitted to the EPA below.

### Exceedance of the average 24 hour particulate emission from Kiln 6 Non-compliance

<b>Licence condition number not complied with ▼</b>
L3.1 and L3.2
<b>Summary of particulars of the non-compliance ▼</b>
Over the 24 hour period during the 14 November 2022 the average 24 hour particulate emission from Kiln 6 (Point 2) was 54.5mg/Nm3 against the licence 50mg/Nm3. This was caused by a storm creating a power dip and tripping ESP. EPA was notified.
<b>Further details on particulars of non-compliance, if required ▼</b>
<b>Number of times occurred ▼</b>
1
<b>Date(s) when the non-compliance occurred, if applicable ▼</b>
14th November 2022
<b>Cause of non-compliance ▼</b>
Due to a storm around midday, a tree fell on power lines resulting in the site being impacted by a power dip. This appeared to impact some coal loader/feeder sensors. The electrostatic precipitator tripped 3 times within 8 hours. The resultant 24 hour particulate average was 54.4ppm, the licence limit is 50ppm.
<b>Action taken or that will be taken to mitigate any adverse effects of the non-compliance ▼</b>
EPA and DPE notified and detailed report provided. The kiln was only in operational conditions for only 6 hours during the 24 hour period of 14 November. The trips occurred during this 6 hour window which elevated the average over this period. No adverse effects noted from the non compliance.
<b>Action taken or that will be taken to prevent a recurrence of the non-compliance ▼</b>
The Moss Vale weather station daily observations recorded rain of approximately 41.2mm on Monday 14 November 2022 with a westerly wind gusts of up to 74km/hr. i.e. away from the New Berrima village. The weather conditions resulted in sodden ground and with the strong winds, the falling of the tree. Regular inspections of the power lines and management of the vegetation is in place

### Monitoring frequency (deposition dust gauge) not achieved due to broken bottle

<b>Licence condition number not complied with ▼</b>
M2.1 and M2.2
<b>Summary of particulars of the non-compliance ▼</b>
Monitoring frequency for monitoring location 15 (deposition dust bottle 7) requires 12 samples over the reporting period. Only 11 samples were obtained due to bottle breaking for the month of June.
<b>Further details on particulars of non-compliance, if required ▼</b>
<b>Number of times occurred ▼</b>
1
<b>Date(s) when the non-compliance occurred, if applicable ▼</b>
June 2022

<b>Cause of non-compliance ▼</b>
Sample was unable to be obtained due to a broken bottle
<b>Action taken or that will be taken to mitigate any adverse effects of the non-compliance ▼</b>
No action available to be taken at the time
<b>Action taken or that will be taken to prevent a recurrence of the non-compliance ▼</b>
Bottle was replaced for the next month's monitoring round. No broken bottles for the remainder of the reporting period.

## 8 ACTIVITIES TO BE COMPLETED DURING THE NEXT REPORTING PERIOD

During the 2023-24 reporting period, in addition to the annual kiln shutdowns, the following projects will be undertaken or be progressed:

- Commence commissioning of the Chloride By Pass.
- Commence pilot carbon capture system pilot and use project to improve the quality of recycled concrete, masonry and steel slag aggregates as part of a \$2.4m grant from the Federal Government Carbon Capture, Use and Storage Development Fund.
- Continue with MOD 14 application for a new entrance road and an increase in SWDF
- Commence installation of Tyre Chip Storage area infrastructure and use of Tyre Chips
- Update the OEMP to reflect recent Modifications to the consent.

## APPENDIX 1 – ANNUAL ENVIRONMENTAL NOISE ASSESSMENT (SEE ATTACHED)





Boral Cement

Annual Environmental Noise  
Assessment  
October 2022

For

Berrima Cement Plant

31 December, 2022



## **Boral Cement Berrima**

### **Annual Environmental Noise Assessment October 2022**

#### **Report of assessment**

**31 December 2022**

RRRep:057

2022.12.31	0	Final Draft	Colin Tickell	Stephen Collings		Gabriel Paicu
<b>Date</b>	<b>Rev.</b>	<b>Status</b>	<b>Prepared By</b>	<b>Checked By</b>	<b>Approved By</b>	<b>Approved By</b>
Recognition Research						Client

# Table of Contents

Disclaimer . . . . .	3
Executive Summary. . . . .	4
1 Introduction . . . . .	6
2 Contribution sound level objectives and method of measurement and assessment . . . . .	11
2.1 Modification of Development Consent. . . . .	11
2.2 Method of measurement and assessment. . . . .	11
3 Cement Plant major source operating periods . . . . .	13
4. Licence monitoring location and residential receiver sound levels review for 2022 . . . . .	17
4.1 Unattended measurement results. . . . .	17
4.2 Location 20 Store Yard (Close) location results compared to licence conditions and recommendations. . . . .	33
4.2.1 LA90,period sound Levels. . . . .	33
4.2.2 LA01.1-minute and LA01.1-minute – LA90.15-minute results for the Northern Boundary . . . . .	40
4.2.3 Low frequency noise . . . . .	52
4.3 Attended measurement results and specific receiver locations . . . . .	55
4.3.1 Comments on sound levels and results at residential 4 Melbourne St . . . . .	56
4.3.2 Taylor Avenue – Corner Adelaide St . . . . .	58
4.3.3 12 Brisbane Street . . . . .	58
4.3.4 Northern Boundary . . . . .	59
4.3.5 Location 20 Store Yard Close location . . . . .	60
5 Summary and Conclusions . . . . .	70

## Disclaimer

This report was prepared Recognition Research Pty Ltd, for the sole and exclusive benefit of Boral Cement (the “Owner”) for the purpose of assisting the Owner to assess noise at the owner’s site at Berrima Cement works, and may not be provided to, relied upon or used by any third party. Any use of this report by the Owner is subject to the terms and conditions of the agreement provided with the proposal RRPR-055 between Recognition Research and the Owner dated 28 September 2022, including the limitations on liability set out therein.

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This report contains the expression of the professional opinion of Recognition Research, based upon information available at the time of preparation. The quality of the information, conclusions and estimates contained herein is consistent with the intended level of accuracy as set out in this report, as well as the circumstances and constraints under which this report was prepared.

However, this report is a review of an existing facility and, accordingly, all estimates and projections contained herein are based on limited and incomplete data. Therefore, while the work, results, estimates and projections herein may be considered to be generally indicative of the nature and quality of the Project, they are not definitive. No representations or predictions are intended as to the results of future work, nor can there be any promises that the estimates and projections in this report will be sustained in future work.

## Executive Summary

The Boral Cement Berrima works has a single noise limit condition for the total site, of  $LA_{90,15\text{-minute}}$  not greater than 58 dBA at Location 20 in the Store Yard. Monitoring for total site emissions at Location 20 over a 14 day period in October 2022 has again confirmed that total site emissions are in compliance with the licence condition. This is the same as in each of the 2019 to 2021 annual environmental noise assessments. The times when that sound level limit was exceeded at the site were caused by short-term extraneous noise sources not relevant to the compliance assessment.

Sound levels at the plant and in the residential community affected by the noise emissions from the total site have been measured regularly since 2002. Monitoring of both site source sound levels and residential receiver sound levels on an annual basis from 2008 to 2021 confirmed that sound levels of site sources did not change or increase significantly over that time.

The annual environmental noise assessment for 2022 has evaluated noise emission from the Cement Plant by the following methods:

- Monitoring of sound levels at Location 20 for compliance assessment;
- Monitoring of sound levels in one residential receiver location at 4 Melbourne Street, New Berrima, with unattended monitoring over a long-term period of two weeks and attended monitoring in day, and evening at three residential receiver locations. Listening monitoring was also made at three locations to compare with long-term averages from previous years and assess the audible acceptability of the received sound levels.

**The finding of this 2022 annual environmental noise assessment is that total site noise emissions are considered to be in compliance with the licence condition.**

**It is also the finding of this assessment that the long-term average statistical sound levels have not increased significantly and this indicates that the Cement Plant is not increasing its noise emissions.**

Assessment of tonality of received sound levels was made at each of the monitored locations using the one-third octave band methods of the 2017 NSW Noise Policy for Industry. The assessment identified that there were no received sound level spectra having tonal qualities related to Cement Plant noise sources.

Measurements at the North Fence boundary location also assessed potential sleep disturbance and low-frequency impacts according to the 2017 release of the Noise Policy for Industry.

Calculations of sleep disturbance potential use  $LA_{01,1\text{-minute}} - LA_{90,15\text{-minute}}$  at night-time to provide comparisons with recommended maximum values for night-time of 60 dBA for  $LA_{01,1\text{-minute}}$  night-time for the Northern Boundary location and not greater than 15 dB difference for  $LA_{01,1\text{-minute}} - LA_{90,15\text{-minute}}$ . From the analyses it is considered that the number or times that the objectives of  $LA_{01,1\text{-minute}}$  greater than 60 dBA and  $LA_{01,1\text{-minute}} - LA_{90,15\text{-minute}}$  difference results greater than 15 dB related to the Cement Plant activities and noise emissions, are relatively low, especially in comparison to other noise sources such as passing trucks and vehicles and birds in the early morning. It is considered the noise emissions from the Cement Plant have a low potential for sleep disturbance. Only warning signals from train horns and occasional train operation noise were likely to cause the 60 dBA objective to be exceeded.

For low frequency assessment, an initial screening test is made of the C-weighted minus A-weighted ( $L_C - L_A$ ) period sound level exceeding more than 15 dB. If the screening value is exceeded a one-third octave band frequency analyses is then made of un-weighted (or Z-weighted  $L_z$ ) sound levels in the low-frequency bands from 10 Hz to 160 Hz, compared to a specific value.

From the assessment of this survey of Low Frequency Noise, it is considered that the main source of low-frequency noise events exceeding the policy objectives for the  $L_{eq}$  measurements is from either the new petrol station on the corner of Taylor Ave and Argyle St, road traffic noise associated with passing trucks, either from within New Berrima or on distant roads and the freeway or a combination of both. The plant can be a source at times but this is not considered to be significant.

## 1 Introduction

Boral Cement Limited operates the New Berrima cement works near Berrima and Moss Vale in the New South Wales' Southern Highlands region. In 2003, approval was granted to construct and operate an upgrade to Kiln 6 at the Site. In 2005, approval was granted to construct and operate No.7 Cement Mill at the site. Both of these developments had conditions of approval which included contribution noise objectives for different receiver areas in the adjacent residential and rural areas. Demonstration of compliance with these contribution objectives was required as a condition of approval for both projects.

Contribution noise objectives for the total Berrima cement works are included in a consolidated Pollution Control Licence for the site, issued in 2019, and revised approval conditions for the projects, issued in early 2020. The licence condition is for sound levels at just one single location. The location is known as Monitoring Location No.20 at the south-eastern corner of the western storage yard. Figure 1.1 shows an aerial view of the cement works and surrounding area, with the locations of Kiln 6 and No.7 Cement Mill and monitoring Location 20 indicated. Figure 1.2 shows an aerial view of the plant immediate locality with boundary environmental noise monitoring locations shown. A site layout plan of the works is shown in Figure 1.3.

Compliance assessment is now based on not exceeding the licence and approval condition of  $L_{A90,15-min}$  not greater than 58 dBA.

Noise monitoring of environmental noise and source noise is undertaken regularly on an annual basis in the neighbourhood of the plant and on site. Annual reporting of compliance assessments for the two projects was made from 2007 to 2019. In 2020, compliance assessment included results of monitoring at the single Location 20. Annual environmental noise assessments are provided to the NSW EPA and other statutory authorities.

Attended monitoring is made at three residential receiver locations during daytime, as has occurred in previous assessments. Unattended monitoring occurs at Location 20 (monitored since 2015), the North Fence location (monitored since 2008) and the residential receiver at 4 Melbourne Street (monitored since 2002). Sound recordings of 15-minute periods during evening and night-time at each location are also reviewed for four different days during the monitoring period to provide a pseudo attended monitoring assessment.

For this 2022 annual noise compliance assessment, measurements of sound levels in residential areas of New Berrima were obtained from 10 to 24 October 2022 and at the site until 25<sup>th</sup> October.

Measurements of continuous sound levels over the period 10 to 25 October were taken with logging sound level meters at site Location 20, Northern Boundary and residential location 4 Melbourne Street.

Measurements of attended sound levels were made during 15-minute periods in daytime, evening and night-time within the monitoring period. Locations monitored were the same as used in previous years. These were:

Residential Receivers:

- 4 Melbourne Street;
- 12 Brisbane Street

- Corner Adelaide and Taylor at 20m back from the edge of Taylor Ave to be in-line with the front of houses. This location provides the same immission as 72 Taylor Avenue used previously.

Cement Plant Site locations

- Northern Boundary
- Location 20 Store Yard (close)

This report provides an assessment of compliance of the current operation of the total Cement Plant site. Results are compared to those taken in 2005, and 2006, then the continuous annual reviews from 2010 to 2021.



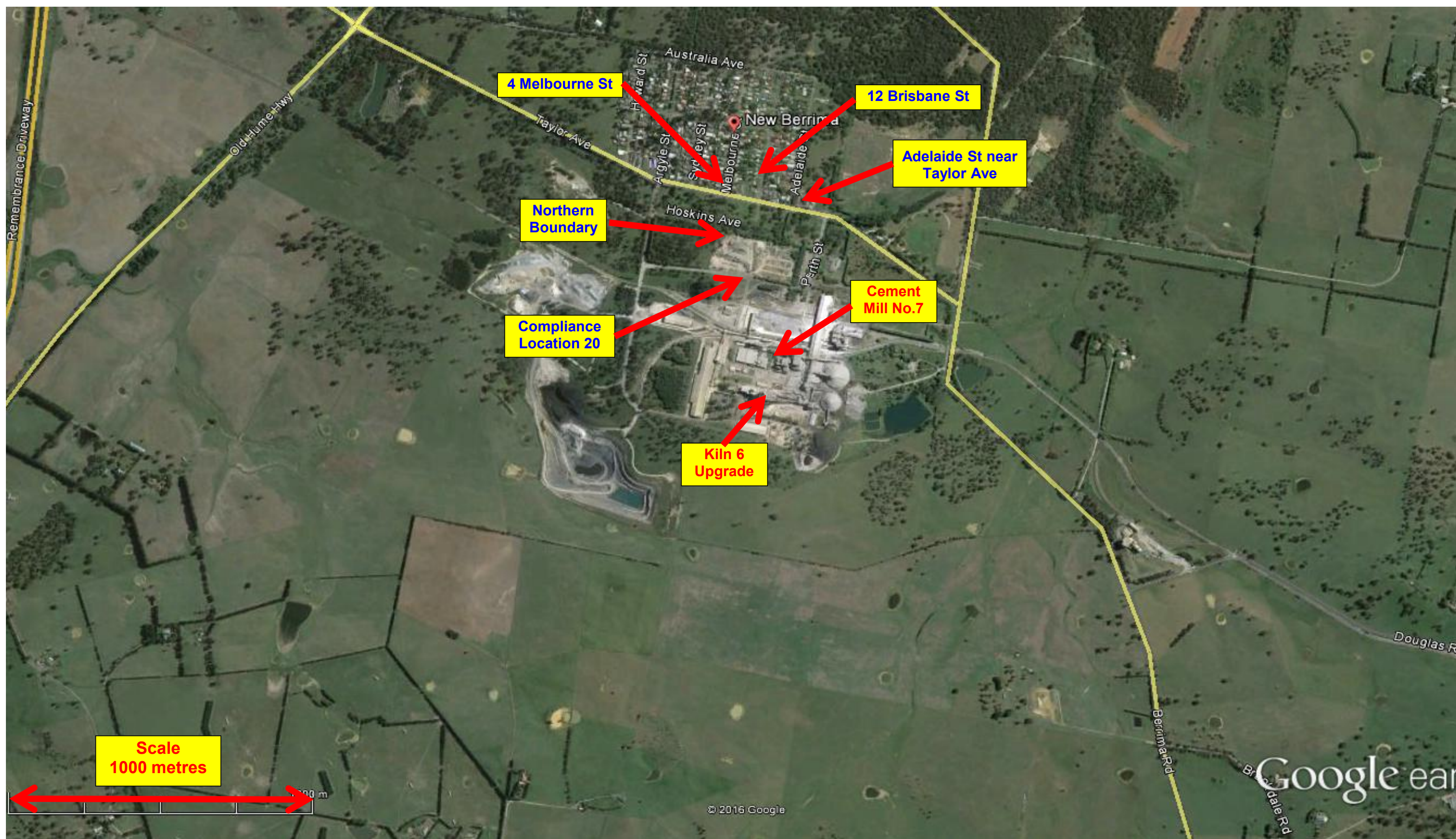
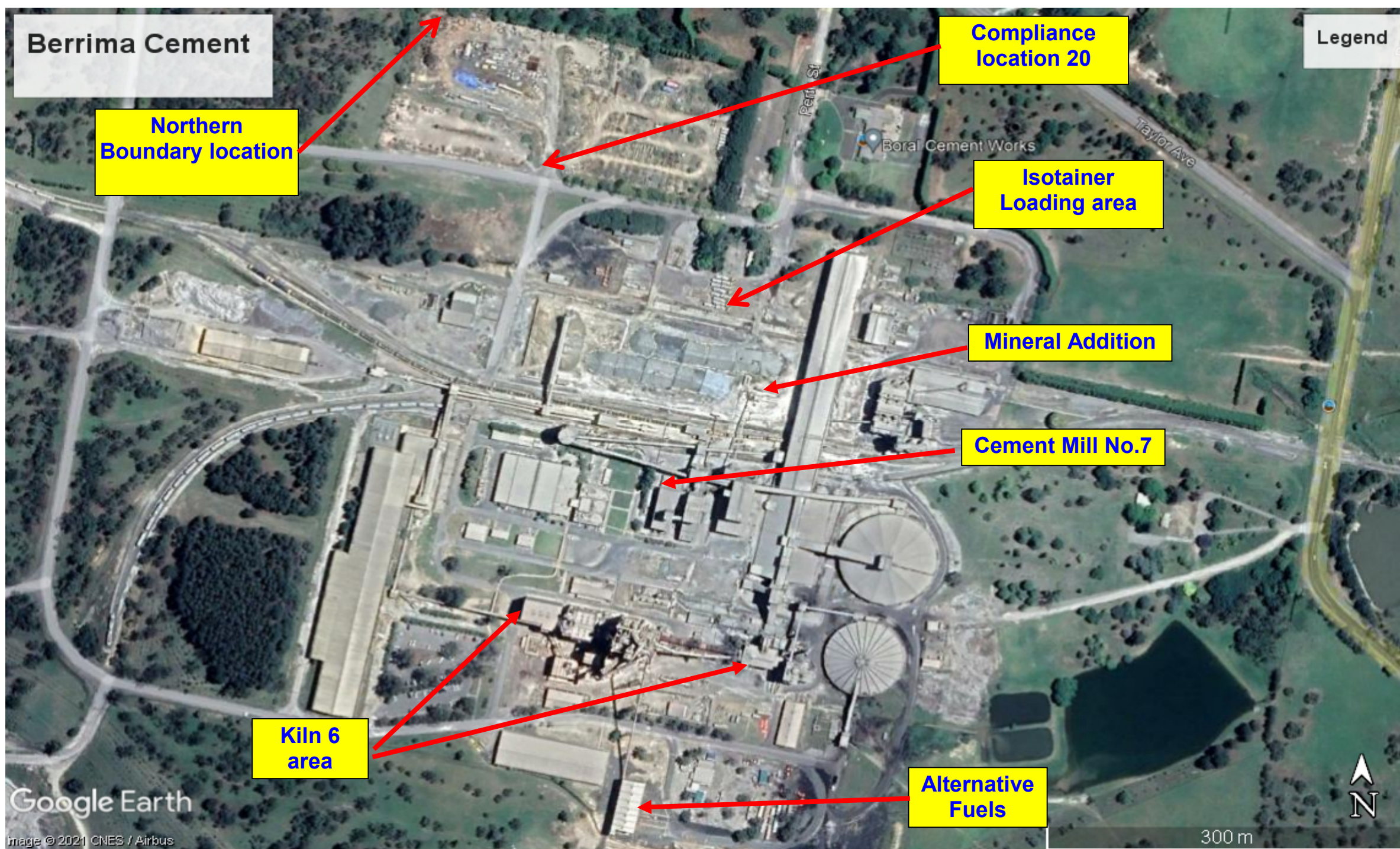


Figure 1.1: Boral Cement - Berrima Cement Works - Aerial view of site, surrounds and long-term and residential logger monitoring locations





**Figure 1.2: Boral Cement - Berrima Cement Works - Aerial view of plant area and major projects areas**





## 2 Contribution sound level objectives and method of measurement and assessment

### 2.1 Modification of Development Consent

In 2020 the Development Consent for the site was modified to allow loading of isotainers on the site and set a single site-wide noise limit. The noise limit condition is shown in Table 2.1. From the Consent Modification document. Noise generated at the site must not exceed the noise limits at the times and location specified in Table 2.1 below.

**Table 2.1 – Maximum Allowable Noise Contribution Limit (dB(A))**

Location	Day L <sub>A90</sub> (15-minute)	Evening L <sub>A90</sub> (15-minute)	Night L <sub>A90</sub> (15-minute)
The noise compliance point Location 20 Store Yard Close	58	58	58

- a. Day is defined as the period from 7:00am to 6:00pm Monday to Saturday and 8:00am to 6:00pm on Sundays and public holidays.
- b. Evening is defined as the period from 6:00pm to 10:00pm.
- c. Night is defined as the period from 10:00pm to 7:00am Monday to Saturday and 10:00pm to 8:00am on Sundays and public holidays

Note: The location of Noise Compliance Point (Point 20) – Store Yard is shown in Figure 2.1 below, along with the other monitoring locations.

### 2.2 Method of measurement and assessment

#### Total plant sound levels

Sound levels of the plant are measured by attended and unattended monitoring methods at Location 20.

Sound levels are also measured at the Northern Boundary to compare with previous measurements and also indicate potential for sleep disturbance during night periods. This is done on the assumption that if the Sleep Disturbance objectives are achieved at the boundary location, they will also be achieved at the residential receivers, which are 150m more distant from the plant. If the low-frequency spectra indicate relative compliance at the boundary, they will also indicate compliance at the residential locations.

#### 2022 receiver and boundary monitoring

As well as the site noise source monitoring, environmental receiver sound levels are measured. The set of measurements for 2022 was done between 10 and 25 October 2022, with attended measurements on the start and finish days of the survey. As the three logger monitoring locations used recording sound level meters, additional listening “attended monitoring” was done at each location for the same 15-minute periods for (daytime, evening and night-time periods). These periods were:



- |   |  |
|---|--|
| • Thursday 13 October 1:00 am to 1:15 am  | Night-time, all plant on                 |
| • Sunday 16 October – 12:45 to 01:00 am   | Night-time, CM 6 only off, all others on |
| • Sunday 16 October – 06:00 to 06:15 am   | Night-time, CM7 & Kiln 6 only on         |
| • Sunday 16 October – 08:00 to 08:15 am   | Daytime, All plant items off             |
| • Sunday 16 October – 08:45 to 09:00 am   | Daytime, all off except CM7              |
| • Wednesday 19 October – 03:30 to 03:45   | Night-time, All plant items operating    |
| • Thursday 20 October – 01:00 to 01:15 am | Night-time, All plant items operating    |

Results of long-term unattended receiver environmental noise monitoring have also been collated for monitoring undertaken at regular intervals since 2002. Comparison of these results also indicate any trends in receiver location sound levels occurring over the monitoring period since 2002.

### 3 Cement Plant major source operating periods

During the period of measurements for this annual assessment, the Kiln was operating for almost all of the monitoring period with one longer shut-down period of 3 hours 15 minutes from 8am to 11:15 on 16 October. All major plant items were off-line on that morning from 8:00 am to 8:30 am and only CM7 was operating from 8:30am to noon.

Operational outages of major plant items between midnight on 10th to midnight on 26<sup>th</sup> are shown in Table 3.1 below. Figure 3.1 shows the operating times for the whole period and Figures 3.2 to 3.4 show operations for subsequent 4-day periods. Table 3.2 shows the specific times of non-operation.

RM6 and RM7 had relatively long periods of non-operation, as did CM6.

**Table 3.1: Operating outages for major plant items 10 to 26 October 2022**

Plant item	Total Period off-line	Percent of time off-line	No. of stops	Longest off-line
Kiln 6	6 hrs 40 min	1.7%	4	3 hrs 15-min
Raw Mill 6 (RM6)	64 hrs 28 min	16.8%	44	19 hrs 25 min
Raw Mill 7 (RM7)	89 hrs 12 min	23.2%	42	19 hrs 55 min
Cement Mill 6 (CM6)	171 hrs 39 min	44.7%	40	54 hrs 17 min
Cement Mill 7 (CM7)	68 hrs 50 min	17.9%	18	21 hrs 3 min

Some of these periods may have affected measured sound levels at the residential receivers but most will not.

Figure 3.1: Boral Cement Berrima Annual Noise Assessment 2022 - Operating Times of main plant

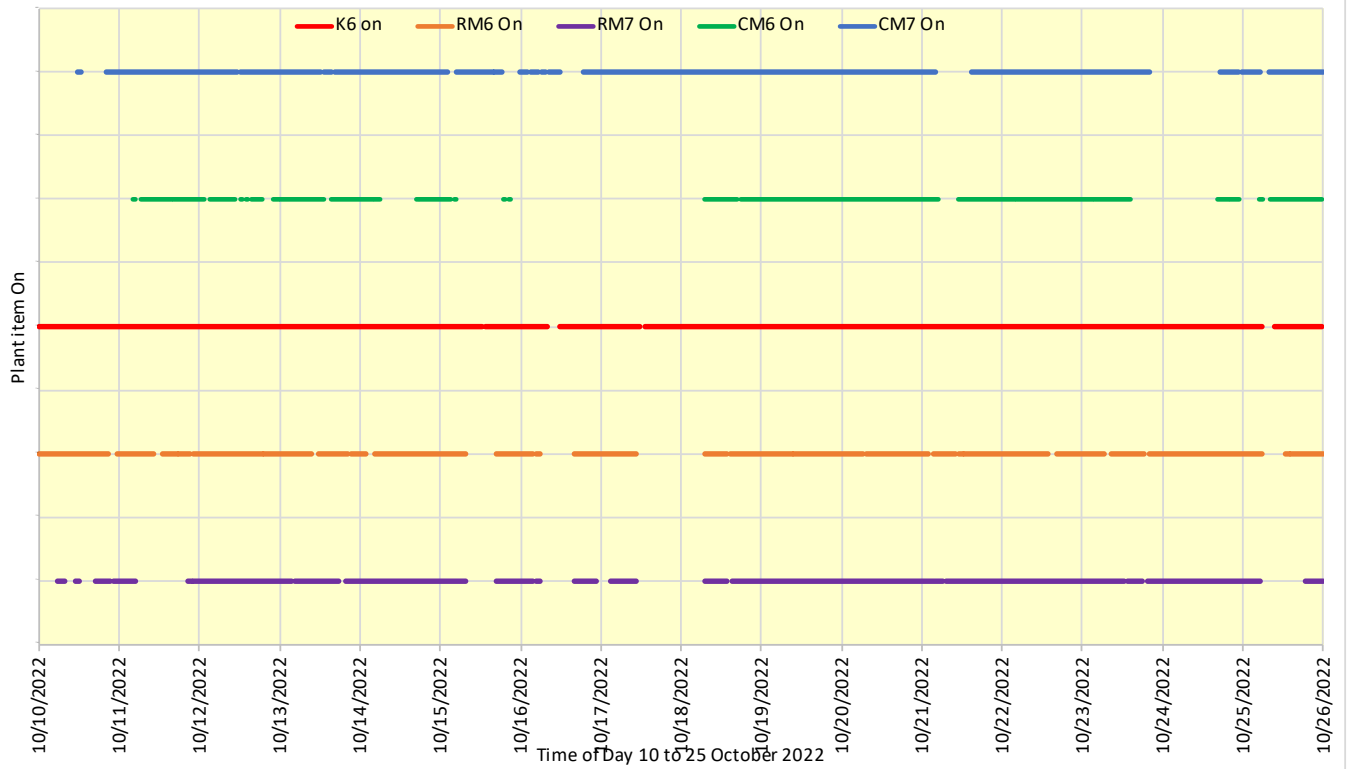


Figure 3.2: Boral Cement Berrima Annual Noise Assessment 2022 - Operating Times of main plant

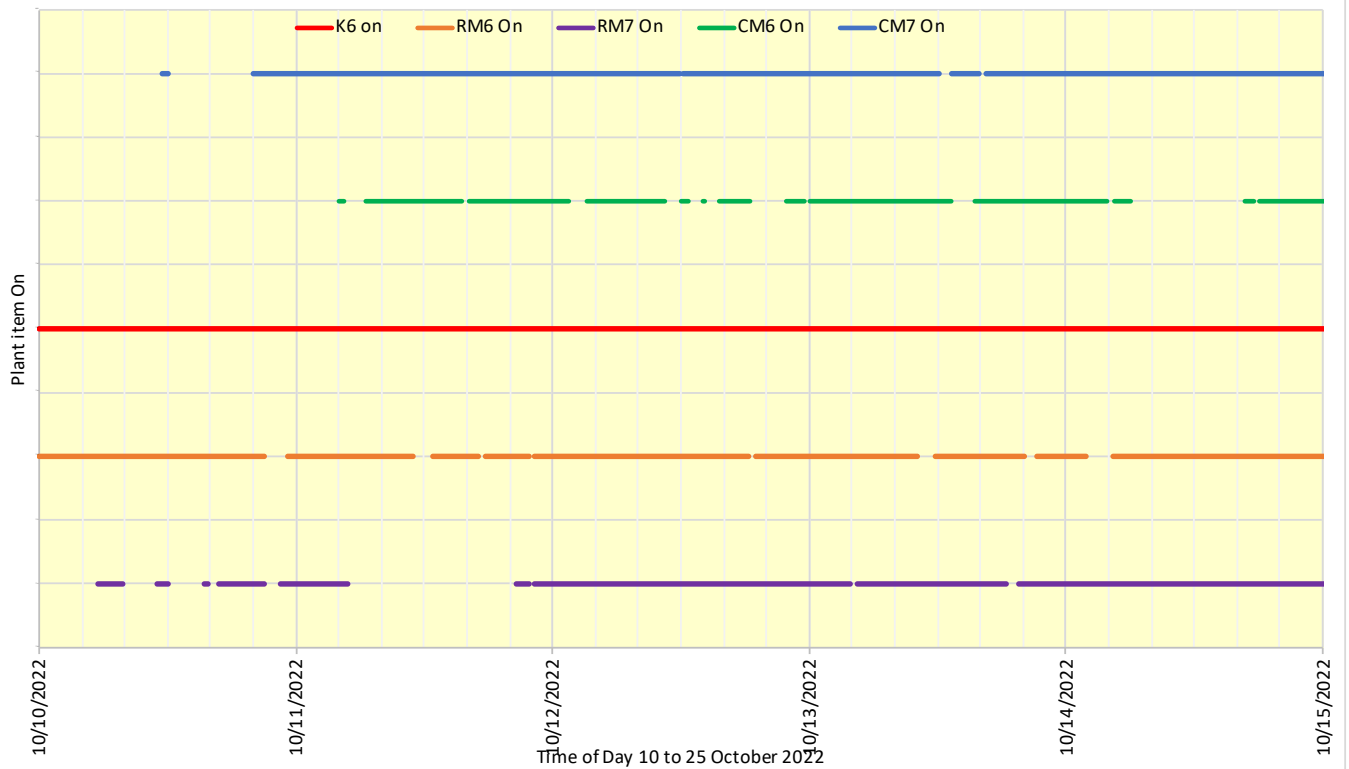


Figure 3.3: Boral Cement Berrima Annual Noise Assessment 2022 - Operating Times of main plant

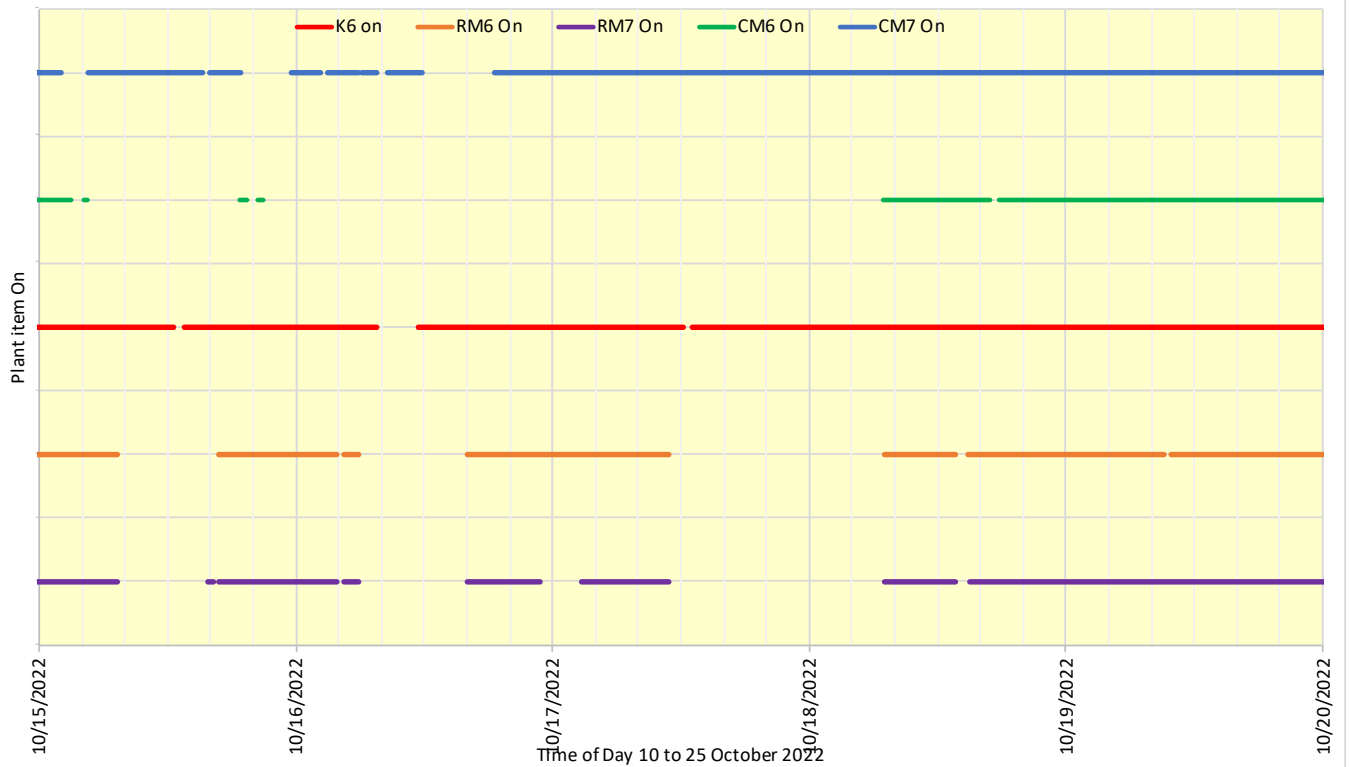


Figure 3.4: Boral Cement Berrima Annual Noise Assessment 2022 - Operating Times of main plant

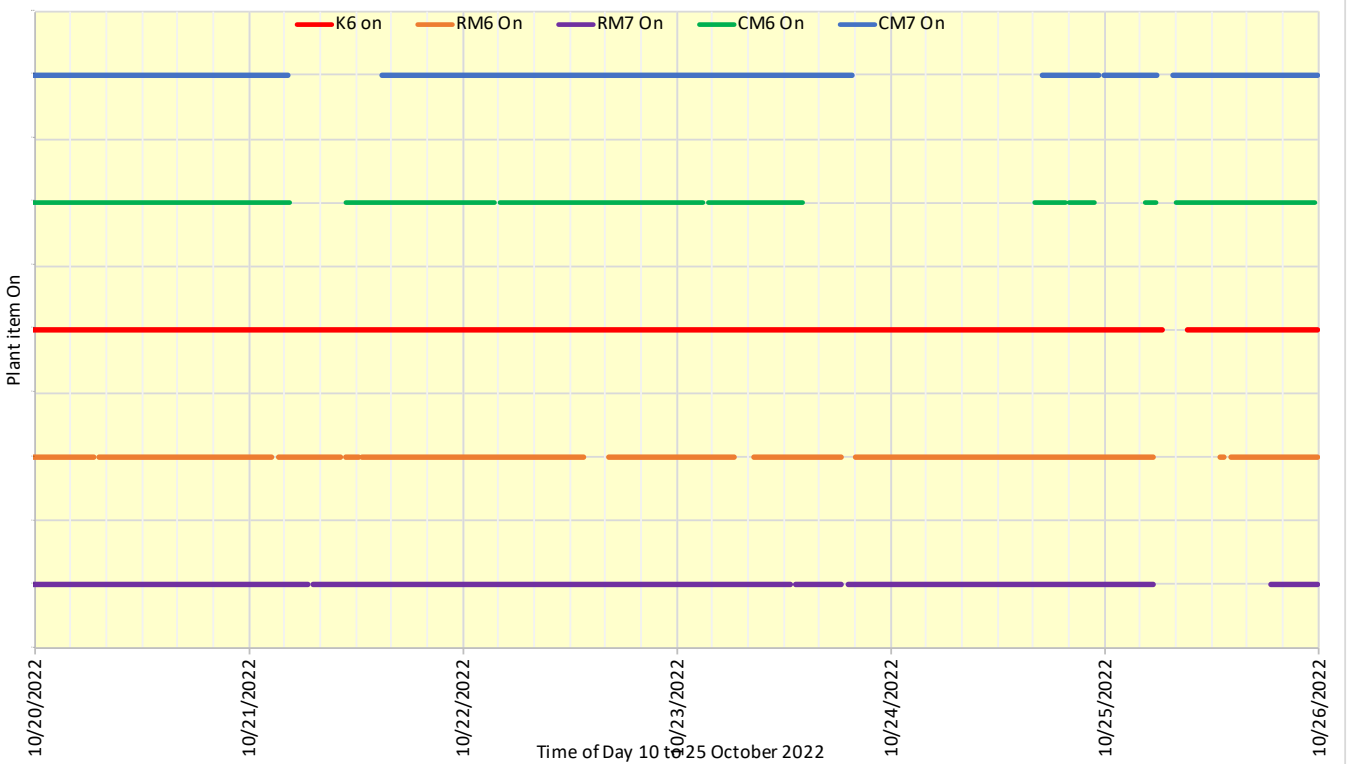




Table 3.2: Boral Cement Berrima Annual Environmental Noise Assessment October 2022 - Operating times of major plant items 10 to 25 October 2022

RM6			RM7			CM6		
Time Off	Time On	Period Off	Time Off	Time On	Period Off	Time Off	Time On	Period Off
10/10/22 9:25 PM	10/10/22 11:12 PM	47:01.0	10/10/22 12:00 AM	10/10/22 5:16 AM	5:16:11	10/10/22 12:00 AM	10/10/22 10:25 PM	22:25:19
11/10/22 10:26 AM	11/10/22 10:37 AM	11:00.0	10/10/22 5:17 AM	10/10/22 5:31 AM	0:14:00	10/10/22 10:26 PM	11/10/22 4:00 AM	5:34:02
11/10/22 11:09 AM	11/10/22 12:53 PM	44:01.0	10/10/22 8:10 AM	10/10/22 9:20 AM	1:10:00	11/10/22 4:46 AM	11/10/22 5:35 AM	0:49:00
11/10/22 5:32 PM	11/10/22 5:43 PM	11:00.0	10/10/22 9:37 AM	10/10/22 11:04 AM	1:27:01	11/10/22 5:48 AM	11/10/22 6:34 AM	0:46:01
11/10/22 10:08 PM	11/10/22 10:13 PM	04:38.0	10/10/22 12:28 PM	10/10/22 3:29 PM	3:01:02	11/10/22 3:48 PM	11/10/22 4:21 PM	0:33:00
12/10/22 6:46 PM	12/10/22 6:57 PM	11:00.0	10/10/22 4:00 PM	10/10/22 4:39 PM	0:39:00	11/10/22 4:24 PM	11/10/22 4:31 PM	0:07:00
10/13/2022 4:20:51 AM	10/13/2022 4:24:38 AM	03:47.0	10/10/22 9:26 PM	10/10/22 10:30 PM	1:04:00	11/10/22 10:08 PM	11/10/22 10:13 PM	0:04:38
10/13/2022 4:50:23 AM	10/13/2022 4:53:38 AM	03:15.0	11/10/22 5:14 AM	11/10/22 8:31 PM	15:17:06	12/10/22 1:40 AM	12/10/22 2:35 AM	0:55:00
10/13/2022 9:42:51 AM	10/13/2022 9:47:40 AM	04:49.0	11/10/22 10:08 PM	11/10/22 10:13 PM	0:04:37	12/10/22 2:43 AM	12/10/22 3:22 AM	0:39:00
10/13/2022 10:11:40 AM	10/13/2022 11:40:41 AM	29:01.0	10/13/2022 4:20:51 AM	10/13/2022 4:24:36 AM	0:03:45	12/10/22 6:58 AM	12/10/22 7:09 AM	0:11:01
10/13/2022 12:30:51 PM	10/13/2022 12:34:41 PM	03:50.0	10/13/2022 4:50:23 AM	10/13/2022 4:53:36 AM	0:03:13	12/10/22 7:42 AM	12/10/22 7:49 AM	0:07:00
10/13/2022 3:43:00 PM	10/13/2022 3:46:42 PM	03:42.0	10/13/2022 9:42:51 AM	10/13/2022 9:47:38 AM	0:04:47	12/10/22 10:41 AM	12/10/22 11:55 AM	1:14:00
10/13/2022 4:36:51 PM	10/13/2022 4:40:42 PM	03:51.0	10/13/2022 11:36:00 AM	10/13/2022 11:40:39 AM	0:04:39	12/10/22 12:53 PM	12/10/22 1:57 PM	1:04:00
10/13/2022 7:30:02 PM	10/13/2022 7:33:43 PM	03:41.0	10/13/2022 12:30:51 PM	10/13/2022 12:34:39 PM	0:03:48	12/10/22 2:27 PM	12/10/22 3:40 PM	1:13:01
10/13/2022 8:17:44 PM	10/13/2022 9:17:44 PM	00:00.0	10/13/2022 3:43:00 PM	10/13/2022 3:46:40 PM	0:03:40	12/10/22 6:45 PM	12/10/22 7:34 PM	0:49:00
10/13/2022 10:31:52 PM	10/13/2022 10:35:45 PM	03:53.0	10/13/2022 4:36:51 PM	10/13/2022 4:40:41 PM	0:03:50	12/10/22 7:43 PM	12/10/22 9:51 PM	2:08:01
10/14/2022 1:53:46 AM	10/14/2022 2:04:46 AM	11:00.0	10/13/2022 7:30:02 PM	10/13/2022 7:33:42 PM	0:03:40	12/10/22 11:43 PM	12/10/22 11:56 PM	0:13:00
10/14/2022 2:09:46 AM	10/14/2022 4:17:47 AM	08:01.0	10/13/2022 8:20:42 PM	10/13/2022 9:31:42 PM	1:11:00	10/13/2022 4:20:51 AM	10/13/2022 4:24:38 AM	0:03:47
10/14/2022 5:36:47 AM	10/14/2022 5:47:47 AM	11:00.0	10/13/2022 10:31:52 PM	10/13/2022 10:35:43 PM	0:03:51	10/13/2022 4:50:23 AM	10/13/2022 4:53:38 AM	0:03:15
10/14/2022 6:05:52 AM	10/14/2022 6:10:47 AM	04:55.0	10/14/2022 12:58:52 AM	10/14/2022 1:03:44 AM	0:04:52	10/13/2022 9:42:51 AM	10/13/2022 9:47:40 AM	0:04:49
10/14/2022 7:53:52 AM	10/14/2022 7:57:48 AM	03:56.0	10/14/2022 2:44:52 AM	10/14/2022 2:48:44 AM	0:03:52	10/13/2022 11:36:00 AM	10/13/2022 11:40:41 AM	0:04:41
10/14/2022 12:53:52 PM	10/14/2022 12:57:50 PM	03:58.0	10/14/2022 4:13:52 AM	10/14/2022 4:17:45 AM	0:03:53	10/13/2022 1:30:41 PM	10/13/2022 3:33:42 PM	2:03:01
10/14/2022 4:21:53 PM	10/14/2022 4:25:51 PM	03:58.0	10/14/2022 6:05:52 AM	10/14/2022 6:10:45 AM	0:04:53	10/13/2022 3:43:00 PM	10/13/2022 3:46:42 PM	0:03:42
10/14/2022 5:49:53 PM	10/14/2022 5:53:51 PM	03:58.0	10/14/2022 7:53:52 AM	10/14/2022 7:57:46 AM	0:03:54	10/13/2022 4:36:51 PM	10/13/2022 4:40:42 PM	0:03:51
10/14/2022 8:07:04 PM	10/14/2022 8:10:52 PM	03:48.0	10/14/2022 12:53:52 PM	10/14/2022 12:57:48 PM	0:03:56	10/13/2022 7:30:02 PM	10/13/2022 7:33:43 PM	0:03:41
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10/15/2022 3:25:59 PM	10/15/2022 4:44:00 PM	18:01.0	10/14/2022 10:39:53 PM	10/14/2022 10:43:51 PM	0:03:58	10/14/2022 2:44:52 AM	10/14/2022 2:48:46 AM	0:03:54
10/16/2022 4:07:04 AM	10/16/2022 4:33:04 AM	26:00.0	10/14/2022 11:33:53 PM	10/14/2022 11:37:52 PM	0:03:59	10/14/2022 4:06:47 AM	10/14/2022 4:32:47 AM	0:26:00
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10/17/2022 11:02:57 AM	10/18/2022 6:58:22 AM	55:25.0	10/16/2022 4:17:02 AM	10/16/2022 4:30:02 AM	0:13:00	10/14/2022 5:49:53 PM	10/14/2022 5:53:51 PM	0:03:58
10/18/2022 1:59:24 PM	10/18/2022 2:42:25 PM	43:01.0	10/16/2022 5:53:02 AM	10/16/2022 4:06:06 PM	10:13:04	10/14/2022 8:07:04 PM	10/14/2022 8:10:52 PM	0:03:48
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10/20/2022 7:00:39 AM	10/20/2022 7:22:39 AM	22:00.0	10/17/2022 11:02:57 AM	10/18/2022 6:58:20 AM	19:55:23	10/15/2022 3:11:55 AM	10/15/2022 4:15:55 AM	1:04:00
10/21/2022 2:50:46 AM	10/21/2022 3:10:46 AM	20:00.0	10/18/2022 1:59:22 PM	10/18/2022 3:02:23 PM	1:03:01	10/15/2022 4:37:55 AM	10/15/2022 6:51:00 PM	14:13:05
10/21/2022 10:22:49 AM	10/21/2022 10:48:49 AM	26:00.0	10/21/2022 2:55:44 AM	10/21/2022 3:10:44 AM	0:15:00	10/15/2022 7:48:01 PM	10/15/2022 8:37:01 PM	0:49:00
10/21/2022 12:20:49 PM	10/21/2022 12:37:49 PM	17:00.0	10/21/2022 6:46:46 AM	10/21/2022 7:13:46 AM	0:27:00	10/15/2022 9:09:01 PM	10/16/2022 12:29:02 AM	3:20:01
10/22/2022 1:47:58 PM	10/22/2022 4:08:59 PM	21:01.0	10/23/2022 12:49:05 PM	10/23/2022 1:17:05 PM	0:28:00	10/16/2022 12:41:02 AM	10/18/2022 6:58:22 AM	6:17:20
10/23/2022 6:25:04 AM	10/23/2022 8:32:05 AM	07:01.0	10/23/2022 6:36:07 PM	10/23/2022 7:22:07 PM	0:46:00	10/18/2022 5:17:25 PM	10/18/2022 5:49:26 PM	0:32:01
10/23/22 6:36 PM	10/23/2022 7:56:09 PM	20:00.0	10/25/2022 5:51:37 AM	10/25/2022 6:34:24 PM	12:42:47	10/21/2022 4:49:47 AM	10/21/2022 10:56:49 AM	6:07:02
10/24/2022 7:40:13 AM	10/24/2022 7:53:13 AM	13:00.0	CM7			10/22/2022 3:51:55 AM	10/22/2022 4:12:55 AM	0:21:00
10/25/2022 5:51:37 AM	10/25/2022 11:19:23 AM	27:46.0	Time Off	Time On	Period Off	10/23/2022 3:13:03 AM	10/23/2022 3:45:03 AM	0:32:00
10/25/2022 11:50:23 AM	10/25/2022 12:39:24 PM	49:01.0	10/10/22 12:00 AM	10/10/22 11:29 AM	11:29:13	10/23/2022 2:23:07 PM	10/24/2022 4:17:16 PM	1:54:09
10/25/2022 1:45:24 PM	10/25/2022 1:58:24 PM	13:00.0	10/10/22 12:24 PM	10/10/22 8:04 PM	7:40:03	10/24/2022 6:23:17 PM	10/24/2022 6:36:17 PM	0:13:00
Kiln 6			12/10/22 11:56 AM	12/10/22 12:12 PM	0:16:01	10/24/2022 7:56:18 PM	10/24/2022 8:20:18 PM	0:24:00
Time Off	Time On	Period Off	10/13/2022 12:22:39 PM	10/13/2022 1:15:39 PM	0:53:00	10/24/2022 11:17:19 PM	10/24/2022 11:33:19 PM	0:16:00
10/15/2022 12:52:56 PM	10/15/2022 1:27:57 PM	0:35:01	10/13/2022 3:57:40 PM	10/13/2022 4:34:05 PM	0:36:25	10/24/2022 11:40:19 PM	10/25/2022 4:48:21 AM	5:08:02
10/16/2022 7:58:03 AM	10/16/2022 11:13:04 AM	3:15:01	10/14/2022 2:44:52 AM	10/14/2022 2:48:44 AM	0:03:52	10/25/2022 6:05:21 AM	10/25/2022 8:14:22 AM	2:09:01
10/17/2022 12:41:19 PM	10/17/2022 12:41:21 PM	0:00:02	10/15/2022 2:27:53 AM	10/15/2022 4:26:53 AM	1:59:00	10/25/2022 9:15:27 PM	10/25/2022 9:22:27 PM	0:07:00
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			10/15/2022 6:51:59 PM	10/15/2022 11:30:00 PM	4:38:01			
			10/16/2022 2:48:01 AM	10/16/2022 3:03:01 AM	0:15:00			
			10/16/2022 5:53:02 AM	10/16/2022 6:18:17 AM	0:25:15			
			10/16/2022 7:59:03 AM	10/16/2022 8:31:03 AM	0:32:00			
			10/16/2022 12:11:05 PM	10/16/2022 6:26:07 PM	6:15:02			
			10/17/2022 12:41:19 PM	10/17/2022 12:41:21 PM	0:00:02			
			10/21/2022 4:46:45 AM	10/21/2022 3:03:48 PM	10:17:03			
			10/23/2022 8:04:07 PM	10/24/2022 5:07:15 PM	21:03:08			
			10/24/2022 11:20:17 PM	10/24/2022 11:49:17 PM	0:29:00			
			10/25/2022 5:51:19 AM	10/25/2022 7:34:20 AM	1:43:01			

## 4. Licence monitoring location and residential receiver sound levels - review for 2022

Environmental sound levels are measured at the Licence compliance monitoring Location 20 and at residential receiver locations in New Berrima. A combination of unattended and attended monitoring is used at three locations –

- Location 20 – the Store Yard Close – monitored since 2015
- North Fence – Monitored since 2007
- 4 Melbourne Street, New Berrima – monitored since 2002

Measurements are to assess changes at the locations, acceptability of received sound levels and compliance with the licence conditions.

Attended monitoring is also made at two other residential receiver locations to provide comparisons with previous measurements:

- 12 Brisbane St
- Adelaide St back 20m from Taylor Avenue to match the front façade of 72 Taylor Avenue, monitored previously

Attended measurements were made on 10 and 25 October 2022 in daytime and evening. As the three logger monitoring locations used recording sound level meters, additional listening “attended monitoring” was done at each location for the same 15-minute periods for (daytime, evening and night-time periods). These periods were:

- |   |  |
|---|--|
| • Thursday 13 October 1:00 am to 1:15 am  | Night-time, all plant on                   |
| • Sunday 16 October – 12:45 to 01:00 am   | Night-time, CM 6 off, all others operating |
| • Sunday 16 October – 06:00 to 06:15 am   | Night-time, CM7 & Kiln 6 only on           |
| • Sunday 16 October – 08:00 to 08:15 am   | Daytime, All plant items off               |
| • Sunday 16 October – 08:45 to 09:00 am   | Daytime, all off except CM7                |
| • Wednesday 19 October – 03:30 to 03:45   | Night-time, All plant items operating      |
| • Thursday 20 October – 01:00 to 01:15 am | Night-time, All plant items operating      |

Results of long-term unattended receiver environmental noise monitoring have also been collated for monitoring undertaken at regular intervals since 2002. Comparison of these results also indicate any trends in receiver location sound levels occurring over the monitoring period since 2002.

### 4.1 Unattended measurement results

Unattended measurements were made using logging sound level meters at 3 locations, shown in Figure 1.2:

- Residential:
  - 4 Melbourne Street, New Berrima (full results provided in Appendix B).
- Boral Cement industrial site:
  - Northern Boundary at the north-western corner of the Stores Yard (full results provided in Appendix C).

- Location 20 at the south-western corner of the Stores Yard, north of the internal cross road north of the Fettler's Shed (full results provided in Appendix D).

Monitoring instruments measured the sound levels continuously and stored the statistical results every 15-minutes. The loggers at the Northern Boundary and Location 20 also stored all of the sound levels to allow processing of other parameters, such as  $L_{A01.1\text{-minute}}$ . The logger at Location 20 also stored directional information of sound level quality from which the direction of a significant source can be identified.

During the period of measurements, major plant items were idle at different times, including the Kiln. Table 3.2 shows the times of non-operation of the major plant items and Figures 3.1 to 3.4 show the operating periods graphically. Some of these periods will have affected measured sound levels at the residential receivers and some will not. Figure 4.1 again shows the overall periods of operation of major plant items. There was one period with all plant items not operating – from 8:00am to 8:30am on 16 October. This period and that from 8:45am on the same day with only CM7 operating were reviewed by listening attended monitoring.

Statistical sound level parameters measured include the following:

<b><math>L_{Aeq.15\text{-minute}}</math></b>	The equivalent A-weighted continuous or time averaged sound level over each 15-minute period as units of dB. This single sound level represents the equivalent of the sound energy in all of the sound levels in the period, using a logarithmic average. This value is compared with objective sound levels for amenity and intrusiveness.
<b><math>L_{A90.15\text{-minute}}</math></b>	The 90% exceedance sound level over a 15-minute period. This is the sound level exceeded for 90% of the time or 13.5 minutes in each 15-minute period. It is often referred to as the background sound level and is used for comparison with objectives.
<b><math>L_{A01.1\text{-minute}}</math></b>	The 1% exceedance sound level over a 1-minute period. This is the sound level exceeded for 1% of the time or 0.6 seconds in each minute. It is used for assessment of typical maximum night-time sound levels and for comparison of the $L_{A01.1\text{-minute}}$ - $L_{A90.15\text{-minute}}$ difference with a maximum 15 dB difference objective for not causing sleep disturbance.

From these parameters, long-term averages are calculated for each period of day, evening and night in a 24-hour period, then averages or medians of these are obtained for the full length of the measurement periods of 14 days.

<b><math>L_{Aeq.\text{period average}}</math></b>	this is the energy average of the period (day, evening or night) $L_{Aeq}$ for all of the periods monitored
<b><math>L_{A90.\text{average}}</math></b>	this is the arithmetic average of the average period $L_{A90.15\text{-min}}$ for the periods monitored.
<b><math>10\%L_{A90.\text{average}}</math></b>	this is the median of the period $10\% L_{A90.15\text{-min}}$ for the monitoring period

The results for these long-term averages for each of the three sites are shown in Table 4.1

### Weather conditions

Weather is measured at the site meteorology station to the south of the Raw Materials Store.

A summary of the weather conditions for the period 10 to 25 October when the monitoring was done is shown in Figure 4.2, with those relevant to noise propagation and measurement (wind speed, wind direction and rainfall) shown in Figure 4.3.

Wind speed and rainfall are shown in Figure 4.4, wind direction is shown on Figure 4.5. Weather conditions for subsequent groups of three-day periods are shown in Figures 4.6 to Figure 4.10.

Daytime temperatures ranged from cool with maxima from a cool 13°C to mild 22°C. Night-times were cool with minimums in a range of 4 to 13°C. Nights were also very humid to rH 100% with days 40 to 90%. – see Figure 4.2.

Rain occurred on 9 days, with a maximum of 13mm on 22 October. 47mm in total fell over the two-weeks and 4 days had more than 4mm of rain in a 24-hour period.

Wind speeds were from calm to a maximum of 9.8m/s. There were 44 of the 1536 15-minute periods (or 2.9%) of calm wind and 69 periods (4.5%) of less than 0.3m/s. For day and evening periods combined, 0.5% of periods were calm, while 6.8% of night periods were calm. For wind speeds less than 0.3m/s, this occurred for 1% of day and evening periods and 10.2% of night periods. This indicates there was wind for most of the time. Wind speeds were between 3 and 5m/s for 43% of day-evening periods and 19% of night periods. Higher wind speeds of greater than 5m/s occurred for 9.5% of day-evenings and 0.3% of nights.

Wind direction was mainly northerly over the whole period with some easterly and westerly wind periods. From the morning of 10 October, the wind was easterly at 2 to 6m/s until midnight on 12<sup>th</sup> when it turned northerly at similar speeds until the morning of 14 October, when it turned westerly with higher wind speeds to 9.8m/s. The higher wind speeds lasted until the evening of 14<sup>th</sup> and then reduced to 2 to 4m/s and stayed westerly until the evening of 16<sup>th</sup> when it turned to south-easterly. From there it gradually turned from south-easterly to north easterly then northerly by midnight on 18<sup>th</sup>. It stayed northerly until the morning of 19<sup>th</sup>, then went easterly and gradually back to northerly by the morning of 21<sup>st</sup>. It stayed northerly until the morning of 23<sup>rd</sup> when it turned south-easterly until midday 25<sup>th</sup> when it turned westerly.

Normally data for high wind speed periods greater than 10m/s are discarded as it was likely wind speeds at or close to the microphones would be above 5m/s. However, there were no periods with wind speeds above 10m/s, so no periods were discarded for this. During very low wind speed periods the wind direction was variable. Westerly winds assist with enhancing noise propagation from the Hume freeway to New Berrima but are not significant for propagation from the Cement Plant towards New Berrima. A total of 61 periods were deleted for rain.

### Sound Level measurements

Table 4.1 provides a summary of the statistical data for all monitored sites over the full period of the monitoring. Results for 4 Melbourne St, the Northern Fence and Location 20 are based on the long-term average sound levels over two weeks.

The results show that for average period (daytime, evening and night-time)  $L_{Aeq}$  values, Location 20 averaged 56 to 57 dBA.  $L_{A90,period}$  average was 53 dBA for each period. This is below the long-term objective of 56 dBA. The two-day graphs of  $L_{Aeq,15-min}$  and  $L_{A90,15-min}$  are shown in Appendix D. These results are discussed in more detail in the next section.

4 Melbourne Street unattended monitoring provides residential receiver long-term sound levels. The long-term average  $L_{Aeq,period}$  sound levels 52 dBA daytime, 49 dBA evening and 48 dBA night-time. Average  $L_{A90,period}$  sound levels were 44 dBA daytime, 43 dBA evening and 42 dBA night-time. The results of the two-day graphs of  $L_{Aeq,15-min}$  and  $L_{A90,15-min}$  are shown in Appendix B. Night-time  $L_{A90,15-min}$  sound levels ranged from 36 to 50 dBA, with some nights being in the range 35 to 40 dBA and others above 44 dBA. The difference between  $L_{Aeq,15-min}$  and  $L_{A90,15-min}$  values was lowest in the night-time at 3 dB on some occasions, and highest in daytime with up to 15 or 16 dB difference most of the time, apart from event periods.

The major influence on night-time sound levels appeared to be wind speed, as noted in previous assessments. Wind direction had some influence on some occasions with northerly wind directions having lower sound levels sometimes and south-easterly winds having higher sound levels in some periods, but this was not always the case. Non-operation of major plant items did not appear to have a significant effect on sound levels.

Northern Boundary unattended measurement results are shown in Appendix C. Long-term average sound levels for  $L_{Aeq,period}$  were 54 dBA daytime, 52 dBA evening and 53 dBA night-time.  $L_{A90,period}$  average sound levels were 48 dBA for each of daytime, evening and night-time. While the differences between the averages are low, there are times when the 15-minute  $L_{Aeq,15-min}$  sound levels vary by 10 to 12 dB between measurements, either from local vehicle activities in the stores area nearby or from bird activity.

In each location, sound levels increased on most mornings from approximately 4:30am with the increase in bird activity, however this increase more often appeared to be related to wind speed.

Table 4.2 compares the long-term average results for 2020 with those measured since 2002.

For Location 20, the long-term average  $L_{Aeq,period}$  results were the same as in 2021 and less than or equal to the overall average of all results since 2015 for night-time and daytime but 1 dB higher for evening.

The  $L_{A90,period}$  average was 53 dBA for daytime and night-time periods and 54 dBA for the evening period, compared to the 15-minute licence condition of 58 dBA and the long-term period objective of 56 dBA. The maximum 15-minute  $L_{A90,15-min}$  was 64 dBA from an event near the monitor – this is discussed in the next section.

Results for the Northern Fence were a period average of 54 dBA  $L_{Aeq}$  for daytime, 52 dBA for evening and 53 dBA for night-time periods. These are 2 to 3 dB above the same results for the past 3 years and may reflect a different seasonal influence. The  $L_{A90,period}$  average for all periods was 48 dBA, equal to the long-term average of all results of 48 dBA for daytime and evening and one-dB above that for the night-time period.

For 4 Melbourne St, the long-term results of  $L_{Aeq,period}$  of 52 dBA daytime, 49 dBA evening and 48 dBA night-time were all less than the overall average since 2002. For  $L_{A90,period}$  average results of 44 dBA daytime, 43 dBA evening and 42 dBA night-time, were all equal to or 1 dB below the overall average results.

Overall there were have been no significant changes or increases in long-term average sound levels.

Figures 4.11 to 4.13 show graphs of the long-term average results as a type of time history comparison for each site. These graphs also indicate there have been no significant increases in long-term sound levels from 2018 to 2022 or since measurements commenced in 2002.

The absence of significant increases in long-term average sound levels for logger monitored locations indicates that the noise emissions from the total plant are achieving compliance with the objectives.

Figure 4.1: Boral Cement Berrima Annual Noise Assessment 2022 - Operating Times of main plant

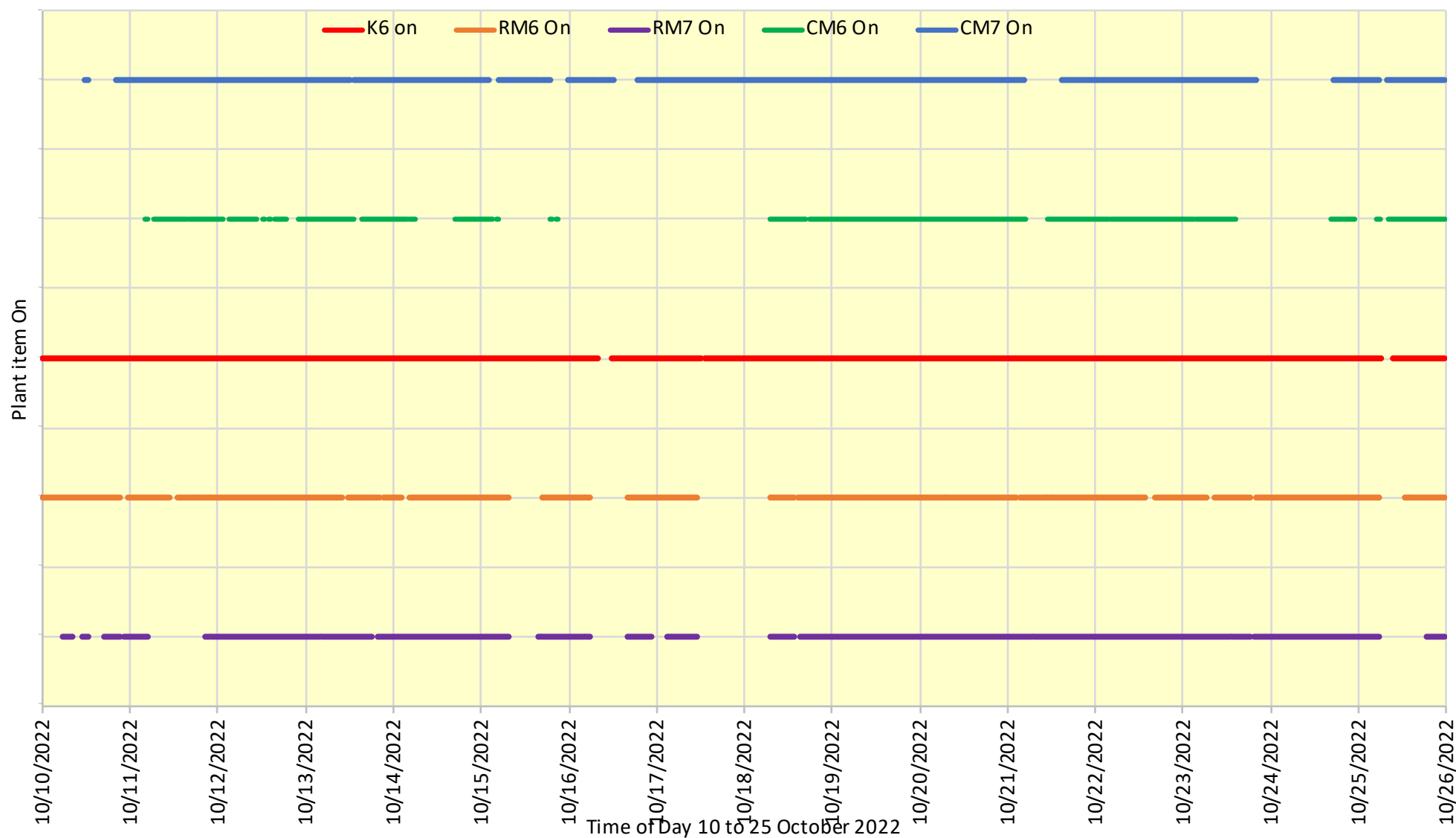


Figure 4.2: Boral Cement Berrima Annual Environmental Noise 2022 -  
Site Weather conditions 10 to 25 October 2022

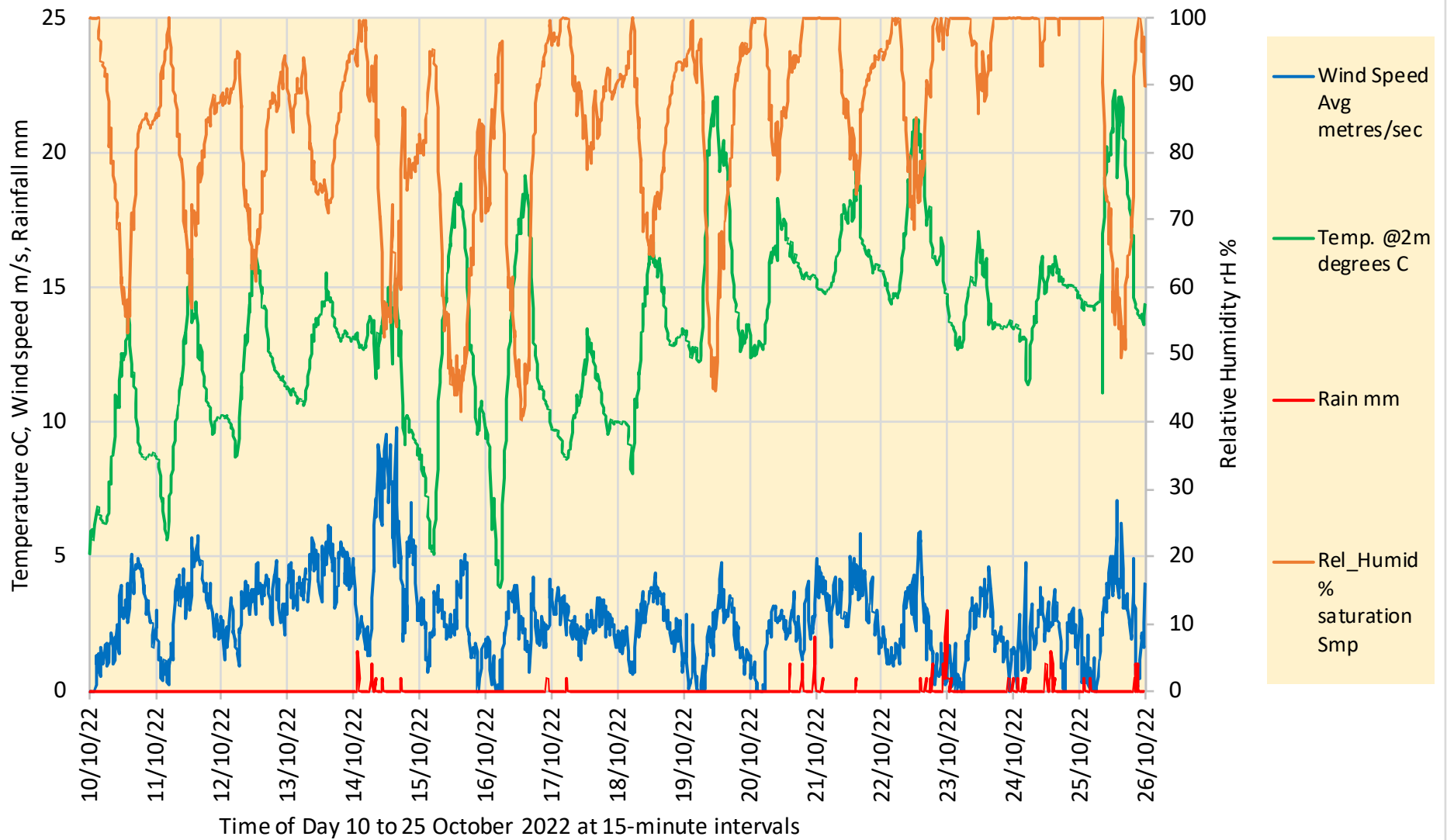




Figure 4.3: Boral Cement Berrima Annual Environmental Noise 2022 -  
Site Weather conditions 10 to 25 October 2022

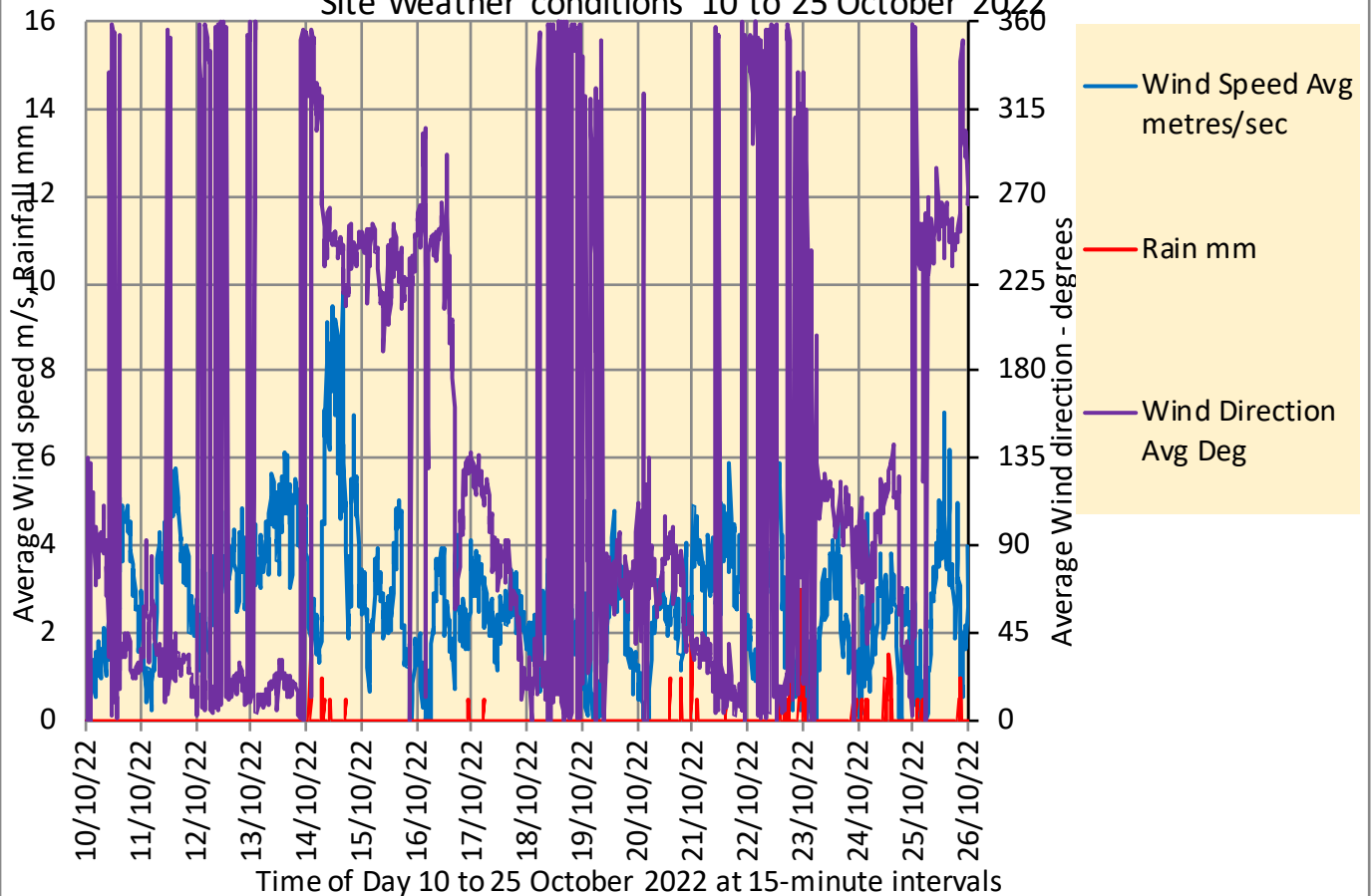
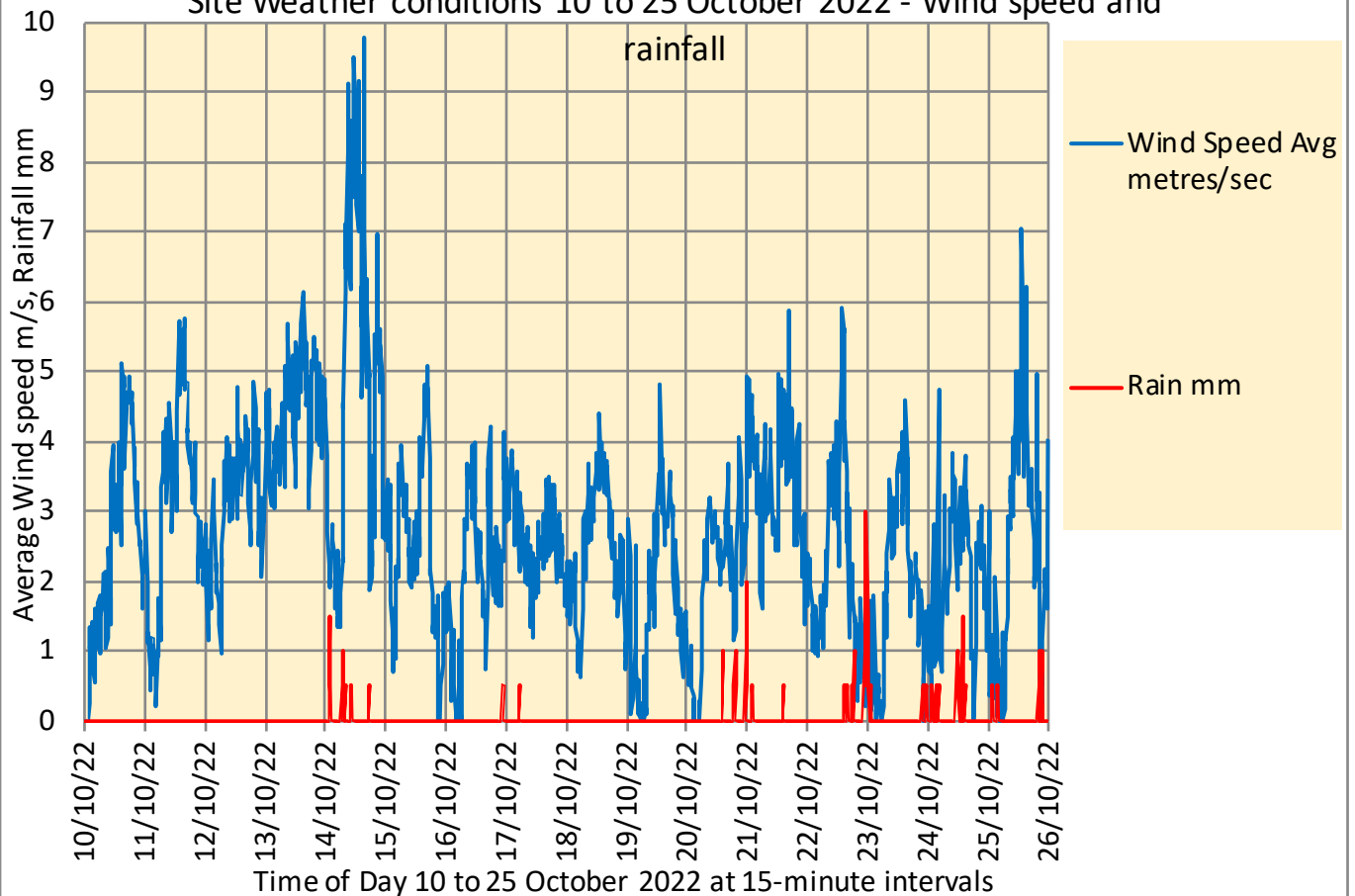


Figure 4.4: Boral Cement Berrima Annual Environmental Noise 2022 -  
Site Weather conditions 10 to 25 October 2022 - Wind speed and rainfall



Weather data 10-251022.xlsx

Figure 4.5: Boral Cement Berrima Annual Environmental Noise 2022  
-Site Weather conditions 10 to 25 October 2022 - Wind Direction

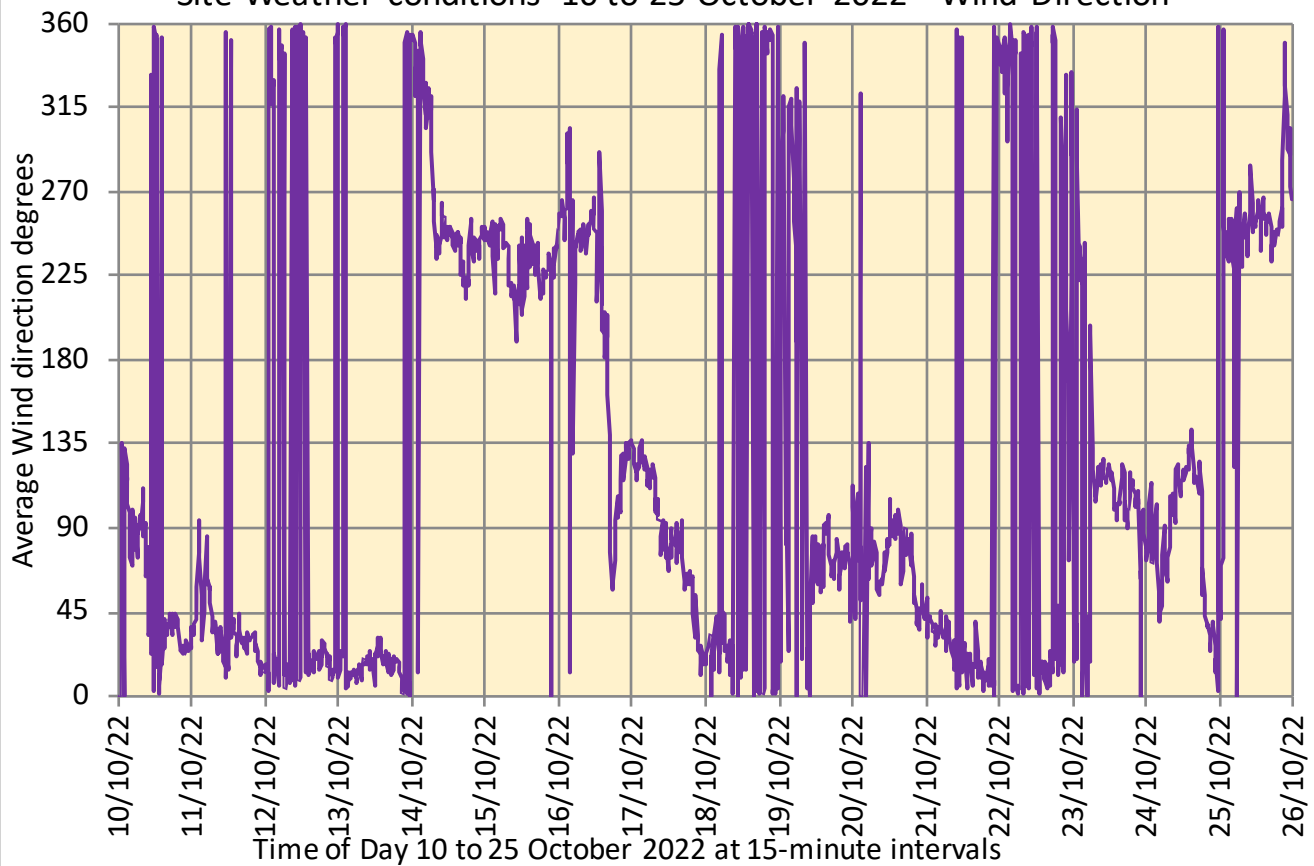
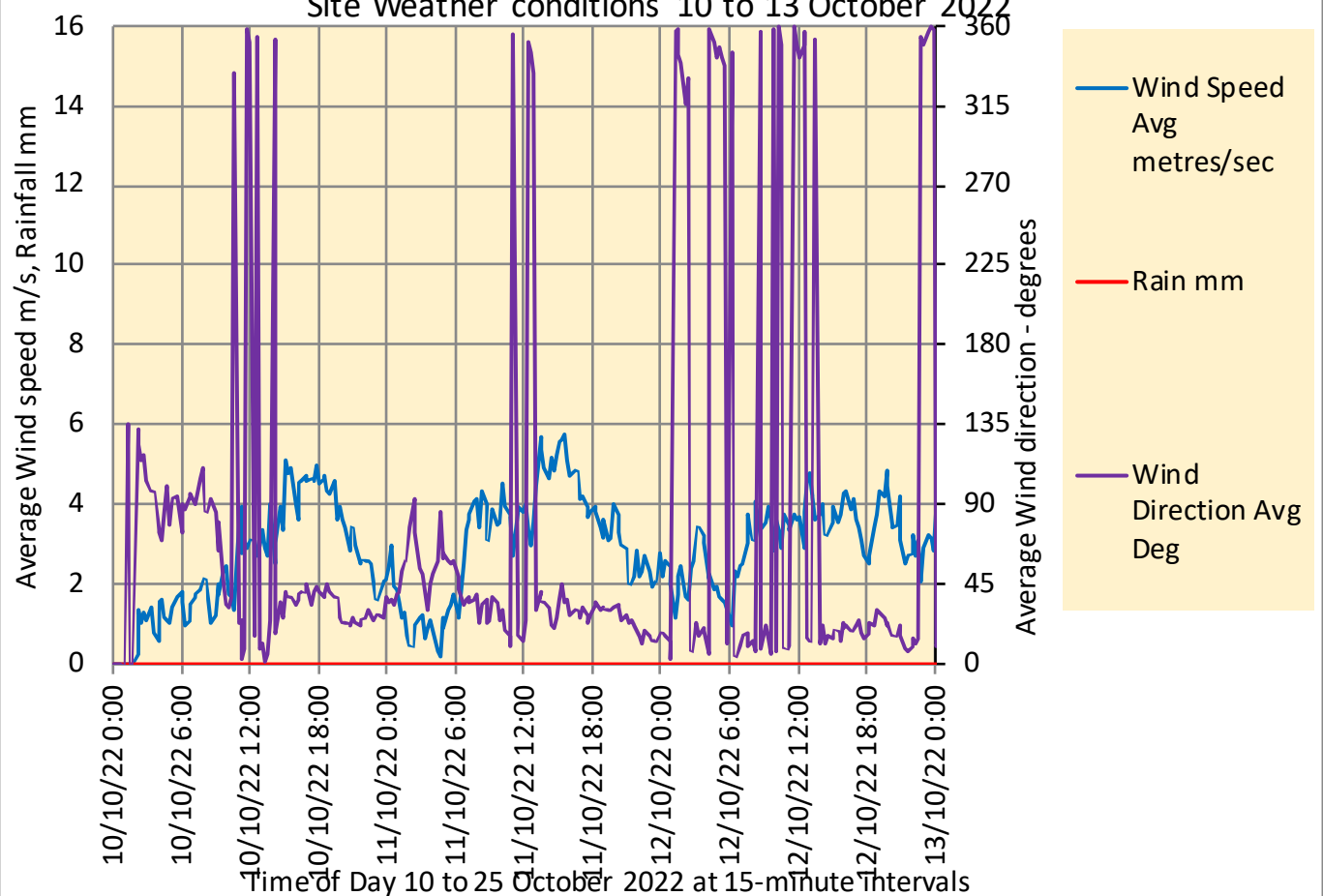


Figure 4.6: Boral Cement Berrima Annual Environmental Noise 2022 -  
Site Weather conditions 10 to 13 October 2022



Weather data 10-251022.xlsx

Figure 4.7: Boral Cement Berrima Annual Environmental Noise 2022 -

Site Weather conditions 13 to 17 October 2022

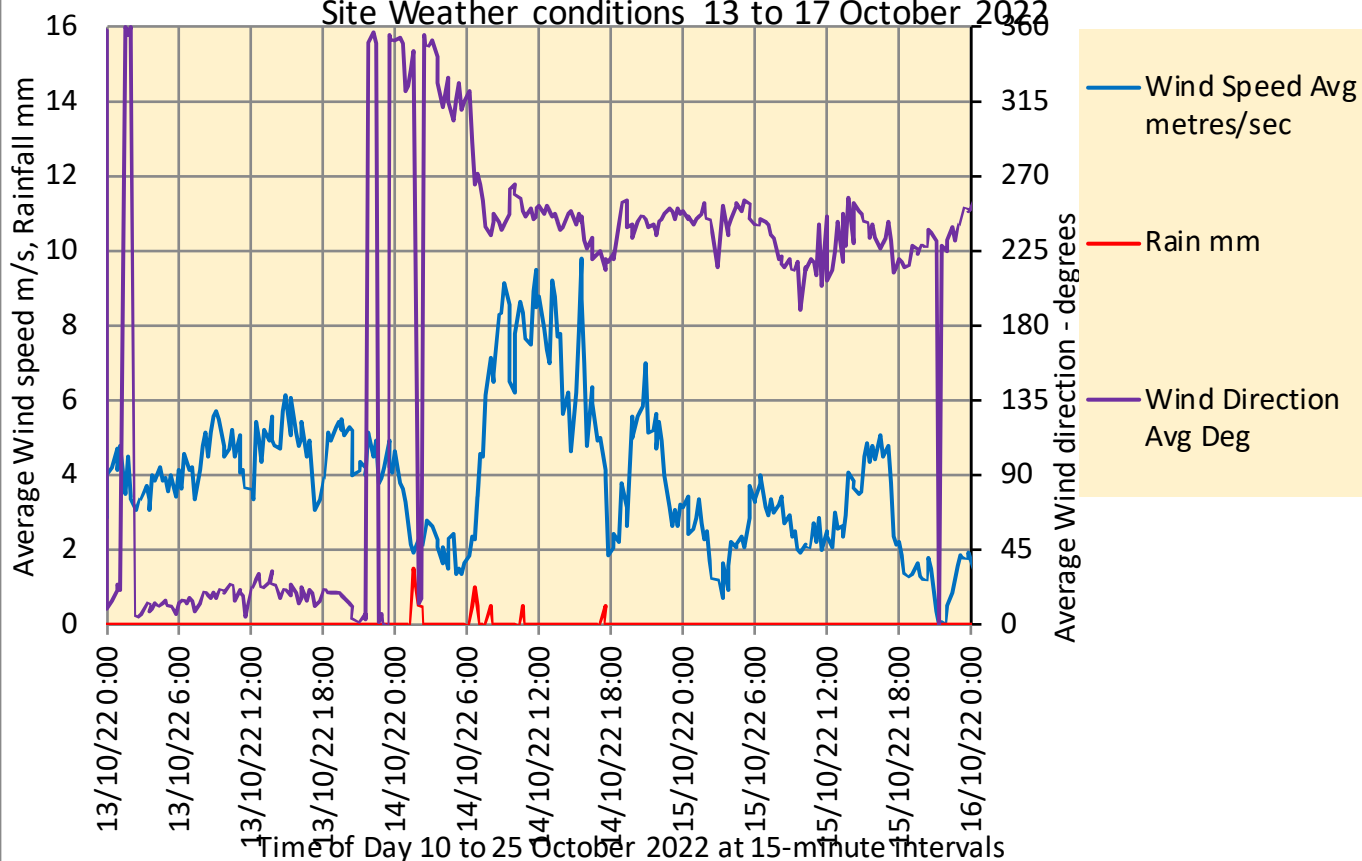


Figure 4.8: Boral Cement Berrima Annual Environmental Noise 2022 -

Site Weather conditions 17 to 19 October 2022

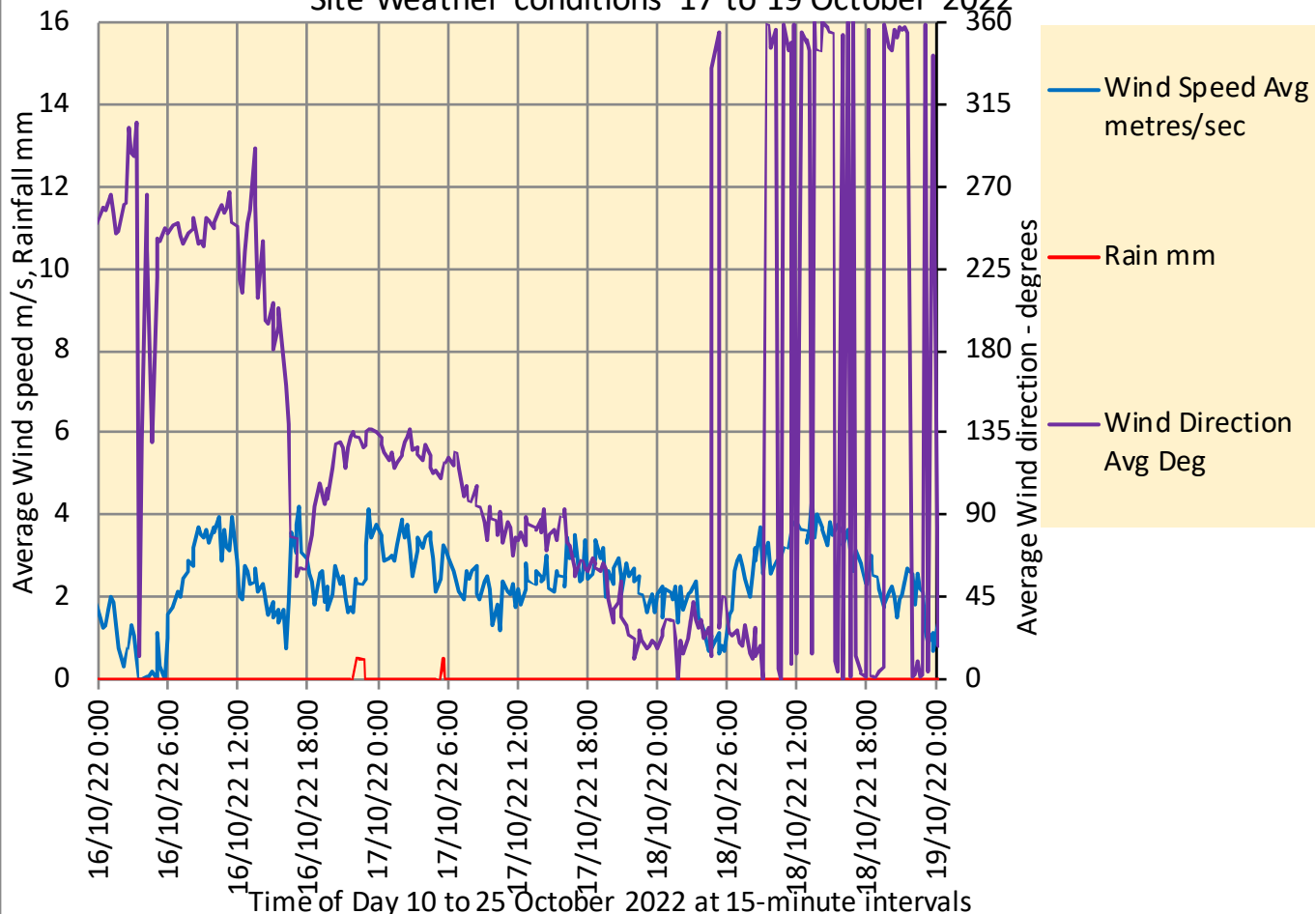


Figure 4.9: Boral Cement Berrima Annual Environmental Noise 2022

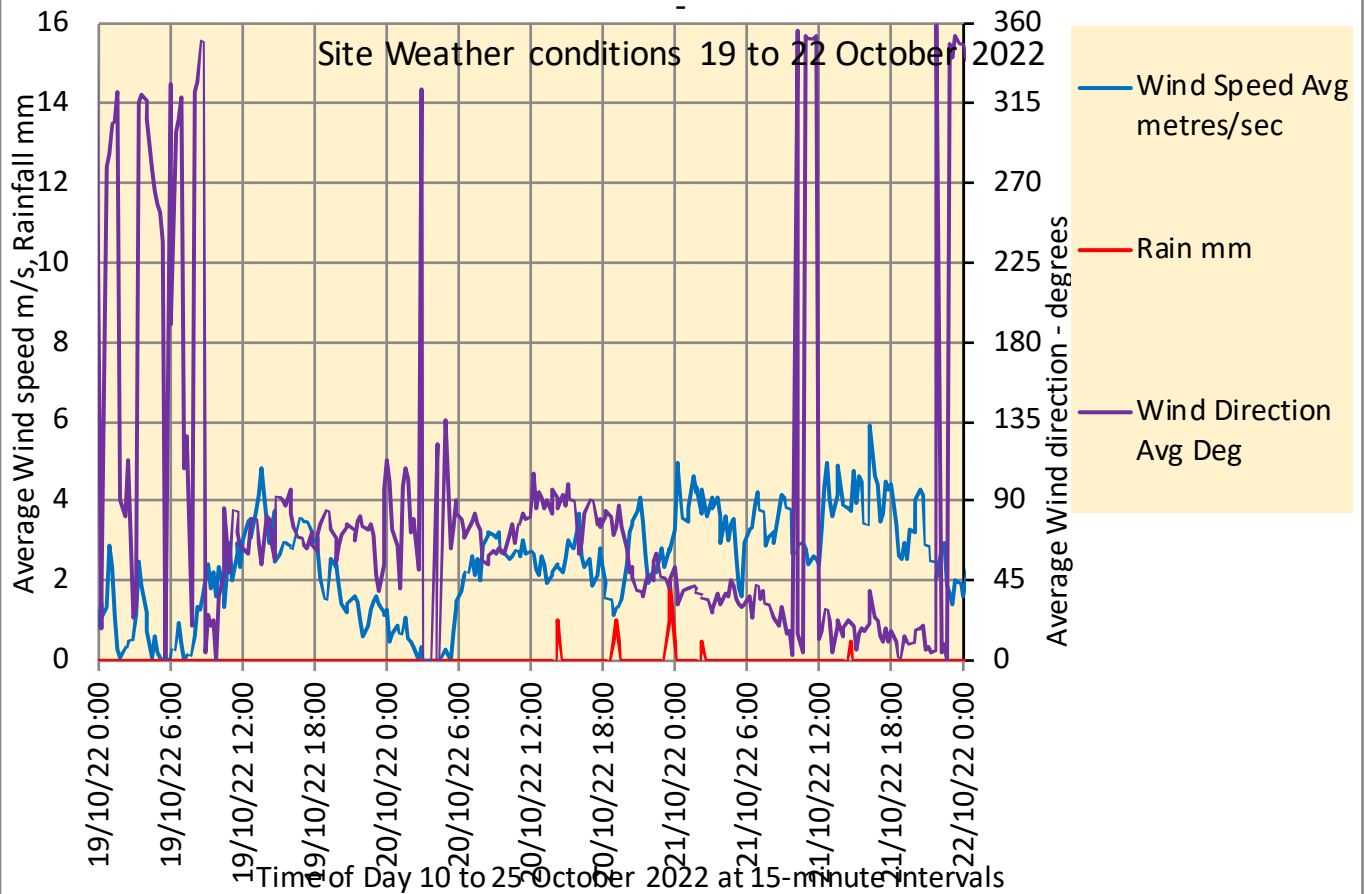
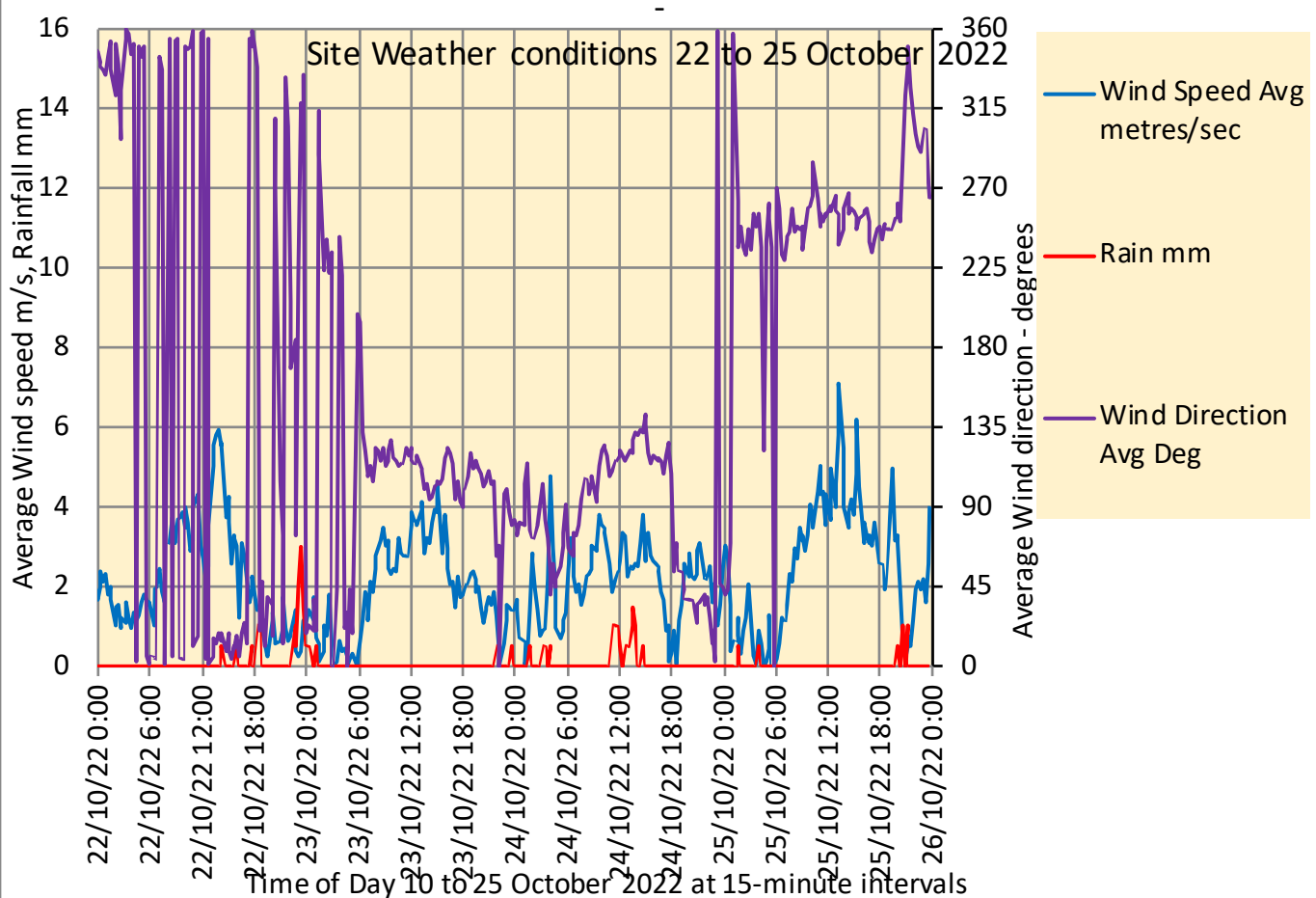


Figure 4.10: Boral Cement Berrima Annual Environmental Noise 2022



Weather data 10-251022.xlsx

**Table 4.1: Comparison of Period LAEQ, Period Average LA10 and Period 90% LA90 Results**

**Summary of Statistical Data**

LAEQ.15min	Day			Evening			Night			24 hour		
	Max L <sub>AEQ.Day</sub>	Min L <sub>AEQ.Day</sub>	Ave L <sub>AEQ.Day</sub>	Max L <sub>AEQ.Eve.</sub>	Min L <sub>AEQ.Eve.</sub>	Ave L <sub>AEQ.Eve.</sub>	Max L <sub>AEQ.Night</sub>	Min L <sub>AEQ.Night</sub>	Ave L <sub>AEQ.Night</sub>	Max L <sub>AEQ.24hr</sub>	Min L <sub>AEQ.24hr</sub>	Ave. L <sub>AEQ.24hr</sub>
Location 20 - Cement Works	59	53	57	59	54	56	59	54	56	63	53	57
4 Melbourne St., New Berrima	55	48	52	51	46	49	53	45	48	55	46	50
North Fence, New Berrima	55	50	54	55	49	52	56	51	53	53	48	50

L90.15-min 10%	Day				Evening				Night			
	Max L <sub>A90.Day</sub>	Min L <sub>A90.Day</sub>	Ave L <sub>A90.Day</sub>	Median L <sub>A90.Day</sub>	Max L <sub>A90.Eve.</sub>	Min L <sub>A90.Eve.</sub>	Ave L <sub>A90.Eve.</sub>	Median L <sub>A90.Eve.</sub>	Max L <sub>A90.Night</sub>	Min L <sub>A90.Night</sub>	Ave L <sub>A90.Night</sub>	Median L <sub>A90.Night</sub>
Location 20 - Cement Works	56	47	52	52	56	51	53	53	56	45	52	52
4 Melbourne St., New Berrima	46	36	42	41	46	38	42	42	46	37	40	41
North Fence, New Berrima	51	42	47	46	52	44	48	48	52	43	47	47

L90.15-min	Day				Evening				Night			
	Max L <sub>A90.Day</sub>	Min L <sub>A90.Day</sub>	Ave L <sub>A90.Day</sub>	Median L <sub>A90.Day</sub>	Max L <sub>A90.Eve.</sub>	Min L <sub>A90.Eve.</sub>	Ave L <sub>A90.Eve.</sub>	Median L <sub>A90.Eve.</sub>	Max L <sub>A90.Night</sub>	Min L <sub>A90.Night</sub>	Ave L <sub>A90.Night</sub>	Median L <sub>A90.Night</sub>
Location 20 - Cement Works	57	50	53	53	56	52	54	53	57	51	53	53
4 Melbourne St., New Berrima	47	39	44	43	46	39	43	42	47	38	42	42
North Fence, New Berrima	52	45	48	47	52	45	48	48	53	46	48	48

Table 4.2: Boral Cement Berrima - 2022 Annual Environmental Noise Review:  
Comparison of statistical sound levels 2002 to 2022

Receiver Location 4 Melbourne Street

Parameter	Period	Survey Dates																	
		Sep-02	Jan-03	Feb-03	Feb-04	Mar-04	Apr-04	May-04	Sep-04	Jan-06	Feb-06	Jun-06	Apr-07	Jun-08	Dec-08	Sep-10	Jun-11	Jul-11	
LAEQ.ave	Day	57	50	54	55	54	56	54	54	56	56	58	56	55	57	56	52	56	
	Evening	53	48	54	54	65	53	51	50	60	57	53	52	54	59	53	52	51	
	Night	53	44	49	47	49	50	51	49	51	51	51	52	51	56	52	50	50	
LA90.ave	Day	46	40	43	43	44	45	45	44	44	45	47	46	47	50	47	45	46	
	Evening	44	39	42	42	42	44	45	43	45	46	47	46	46	49	46	39	39	
	Night	44	37	41	39	40	44	45	43	42	46	46	46	45	50	46	38	38	
10%LA90.med	Day	44	38	41	39	41	43	43	42	43	43	45	45	45	43	45	42	44	
	Evening	42	37	40	40	39	42	44	42	43	43	45	44	45	46	43	38	41	
	Night	42	35	39	37	37	42	43	41	42	43	44	44	44	44	44	38	40	
														Most OffMost on					

Table 4.2: Boral Cement Berrima - 2022 Annual Environmental Noise Review:  
Comparison of statistical sound levels 2002 to 2022

Receiver Location 4 Melbourne Street

continued

															Statistics			
Jul-12	Oct-12	Oct-12	Sep-13	Aug-14	Jul-15	Apr-16	May-16	Jul-16	Sep-17	Jul-18	Sep-19	Oct-20	Oct-21	Oct-22	Max	Min	Ave	SD
56	55	56	53	56	57			56	53	52	53	54	53	52	58	50	55	1.9
51	50	52	50	53	52			53	49	49	48	49	48	49	68	48	52	3.8
51	49	51	51	52	52			52	48	48	47	47	47	48	56	44	50	2.4
46	43	45	43	48	48			48	44	43	43	43	43	44	50	40	45	2.1
45	40	39	42	47	46			46	42	42	42	42	42	43	49	39	43	2.7
44	36	40	42	47	45			46	42	42	42	41	41	42	50	36	43	3.3
43	40	43	41	45	46			45	42	41	40	41	40	41	46	38	42	2.1
42	33	34	41	45	44			45	41	41	40	41	39	42	46	33	41	3.1
41	29	34	40	44	43			43	40	40	39	38	39	41	44	29	40	3.5
Most Off Most on																		

Receiver Location 4 Northern Boundary

Parameter	Period	Survey Dates																
		Sep-02	Jan-03	Feb-03	Feb-04	Mar-04	Apr-04	May-04	Sep-04	Jan-06	Feb-06	Jun-06	Apr-07	Jun-08	Aug-10	Sep-10	Jun-11	Jul-11
LAEQ.ave	Day	52												63	53	50	52	55
	Evening	52												54	51	49	49	51
	Night	53												54	51	50	47	52
LA90.ave	Day	48												53	49	47	47	51
	Evening	50												53	48	47	45	49
	Night	50												53	49	47	43	49
10%LA90.ave	Day	46												51	48	46	44	49
	Evening	48												51	47	46	42	49
	Night	48												51	47	47	42	48
Most OffMost on																		

Receiver Location 4 Northern Boundary

															Statistics			
Jul-12	Oct-12	Oct-12	Sep-13	Aug-14	Jul-15	Apr-16	May-16	Jul-16	Sep-17	Jul-18	Sep-19	Oct-20	Oct-21	Oct-22	Max	Min	Ave	SD
52	49	50	51	51	52	51	54	53	51	53	51	51	51	54	63	49	52	2.8
50	45	49	50	50	51	50	51	53	49	53	51	51	51	52	59	45	51	2.9
51	44	50	49	51	52	51	52	52	49	52	51	51	51	53	54	44	51	2.2
															53	43	48	2.2
48	43	46	44	47	49	49	51	49	47	49	48	48	47	48	53	41	48	2.3
48	41	47	47	48	48	48	50	49	47	51	48	48	48	48	53	41	48	2.3
48	39	47	46	48	48	46	50	49	47	49	49	45	47	48	53	39	47	2.8
															51	41	46	2.1
46	41	45	46	46	47	47	49	47	45	47	45	45	44	46	51	41	46	2.1
46	40	46	45	47	47	46	49	47	45	50	46	47	46	48	51	40	47	2.4
46	37	45	44	47	48	48	49	47	45	48	46	45	45	47	51	37	46	2.8
Most Off Most on																		

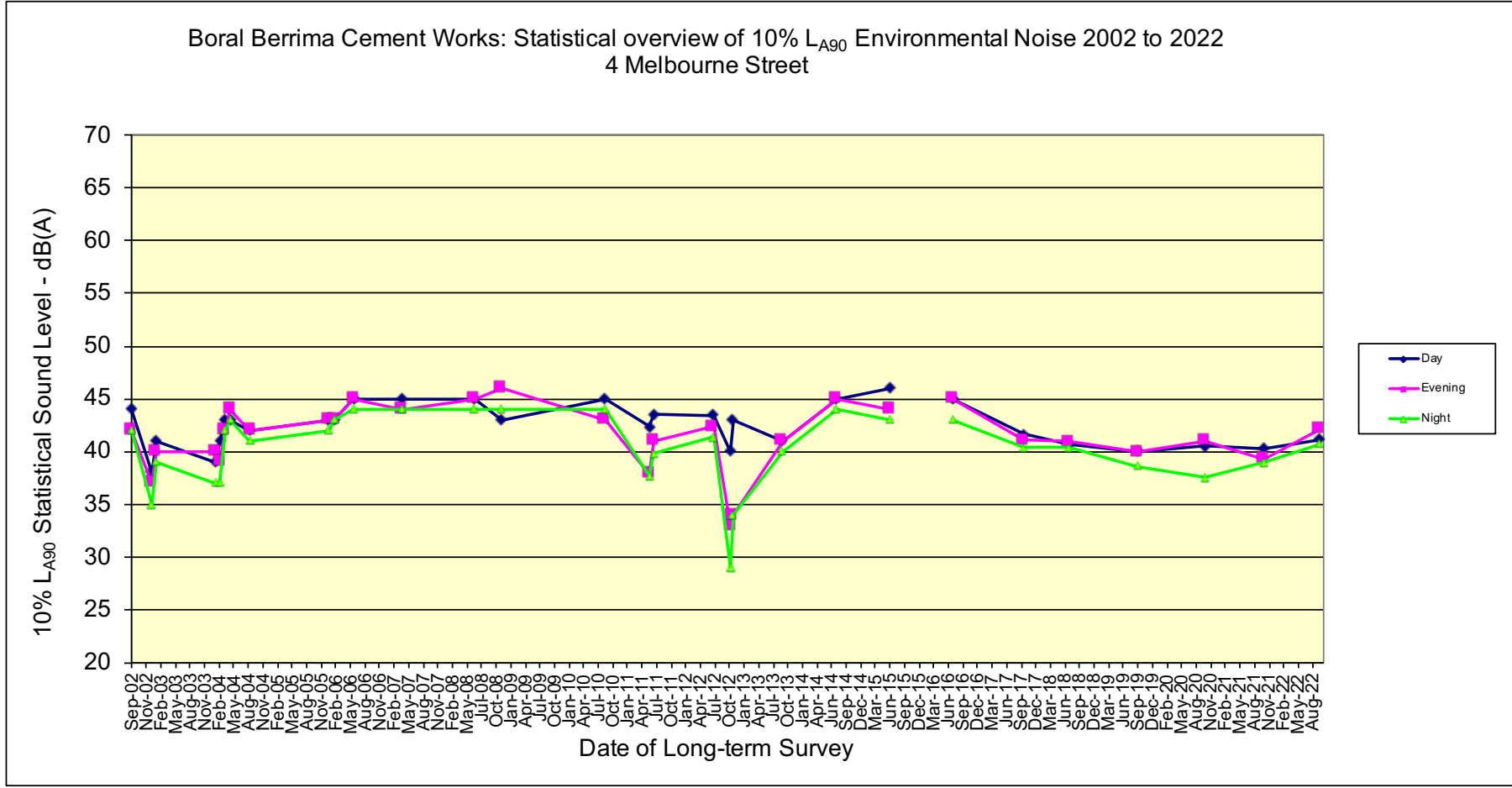
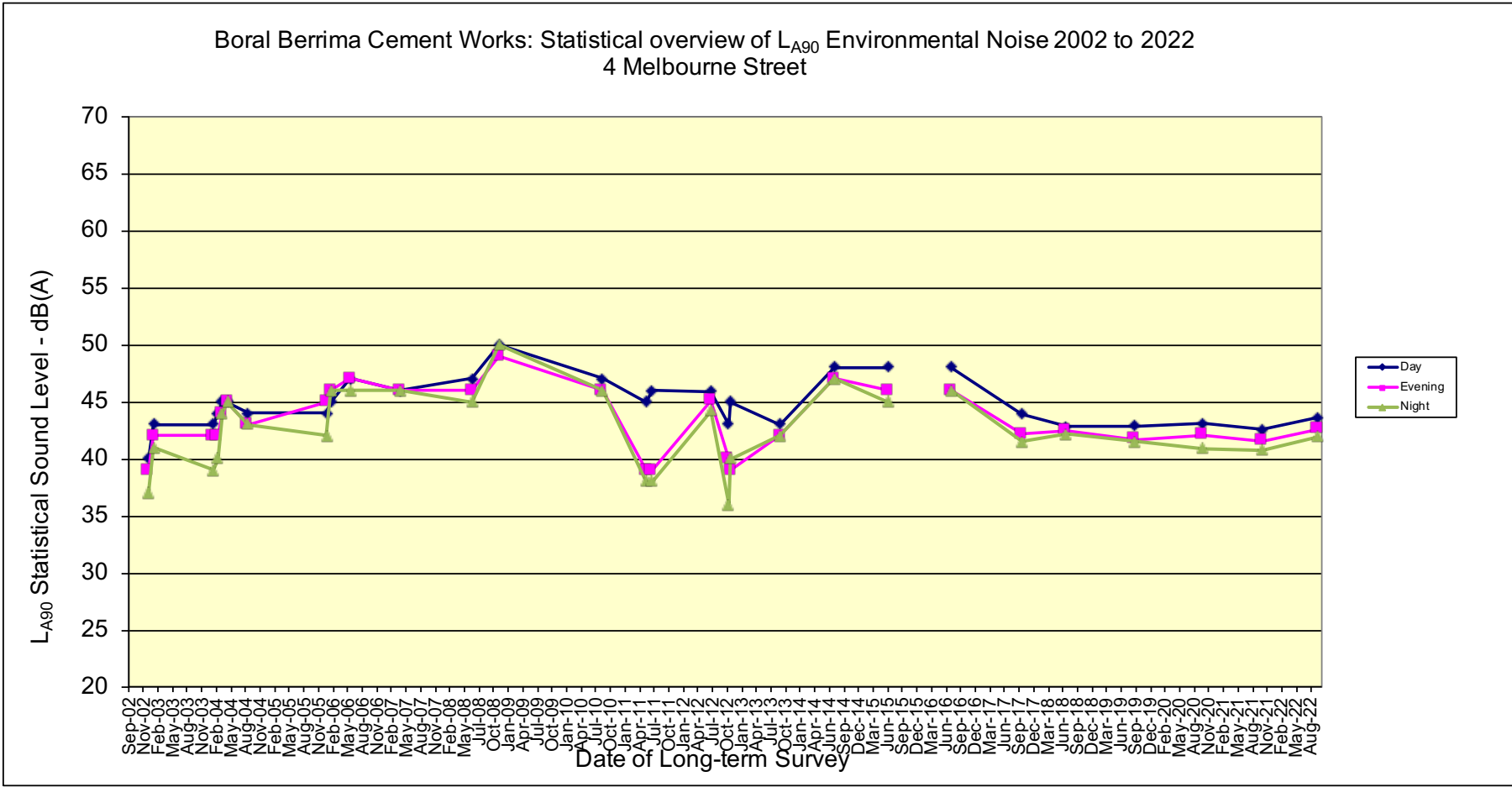
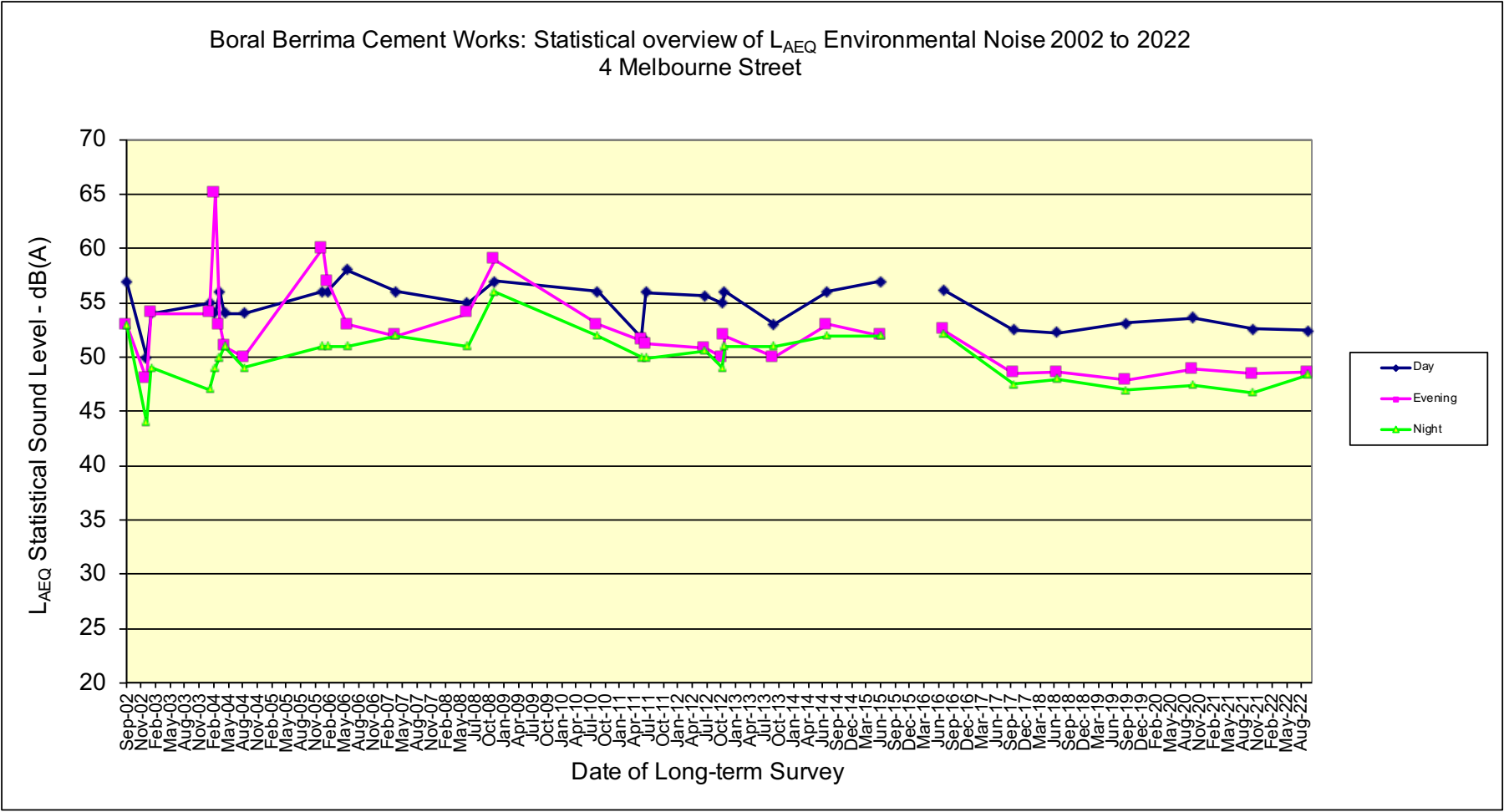


Figure 4.11: Comparison of statistical sound levels for 4 Melbourne Street location

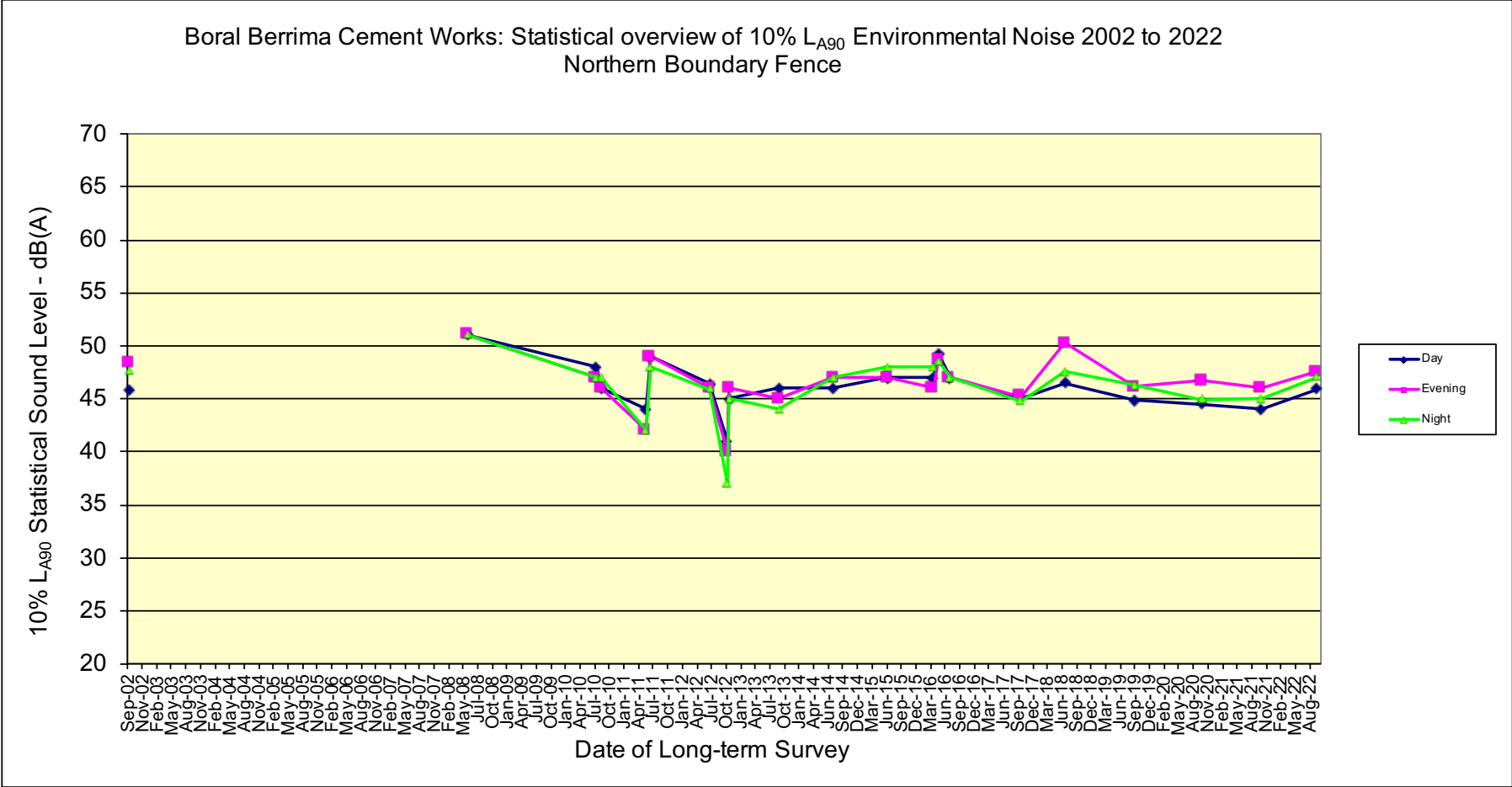
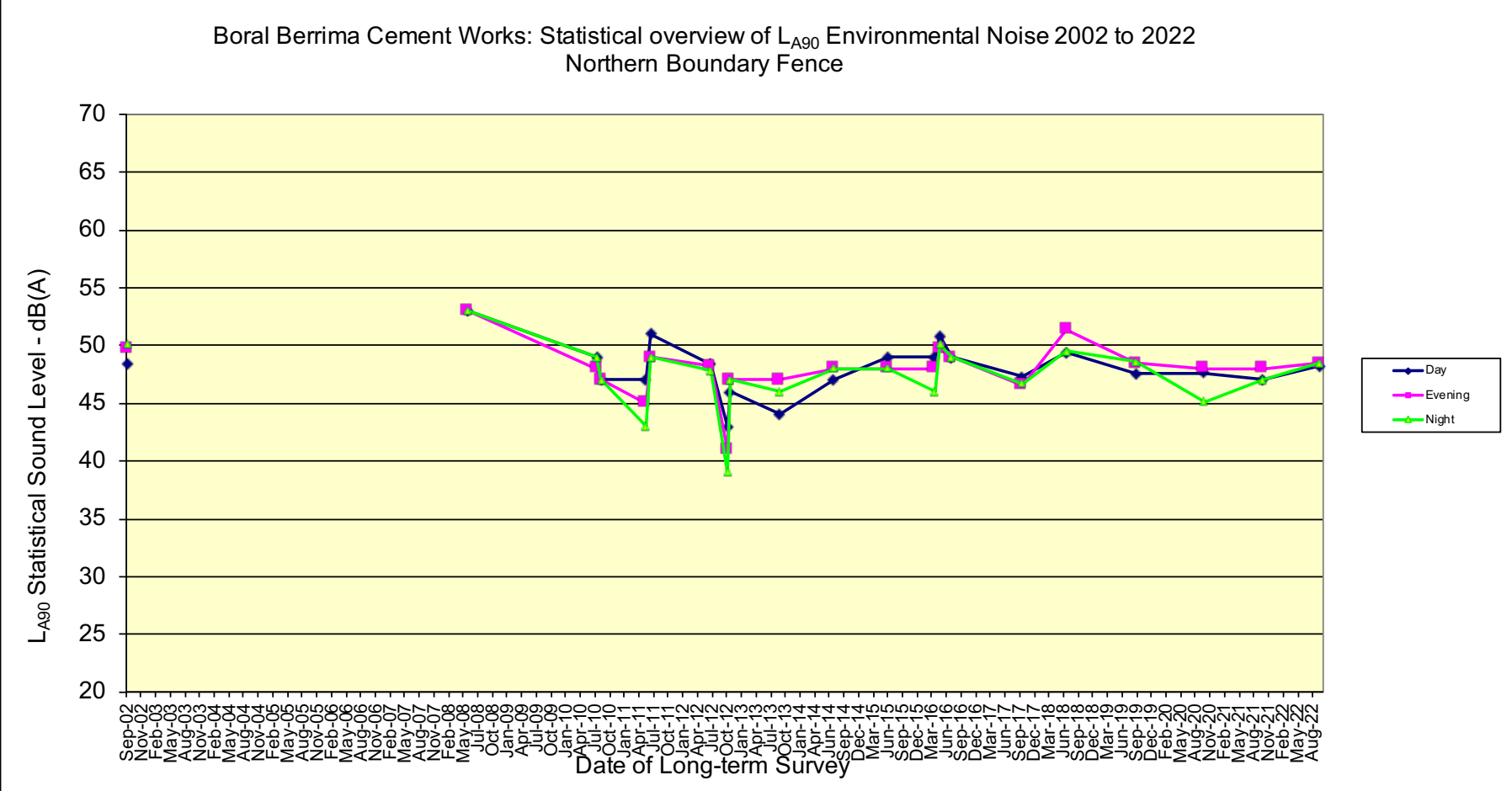
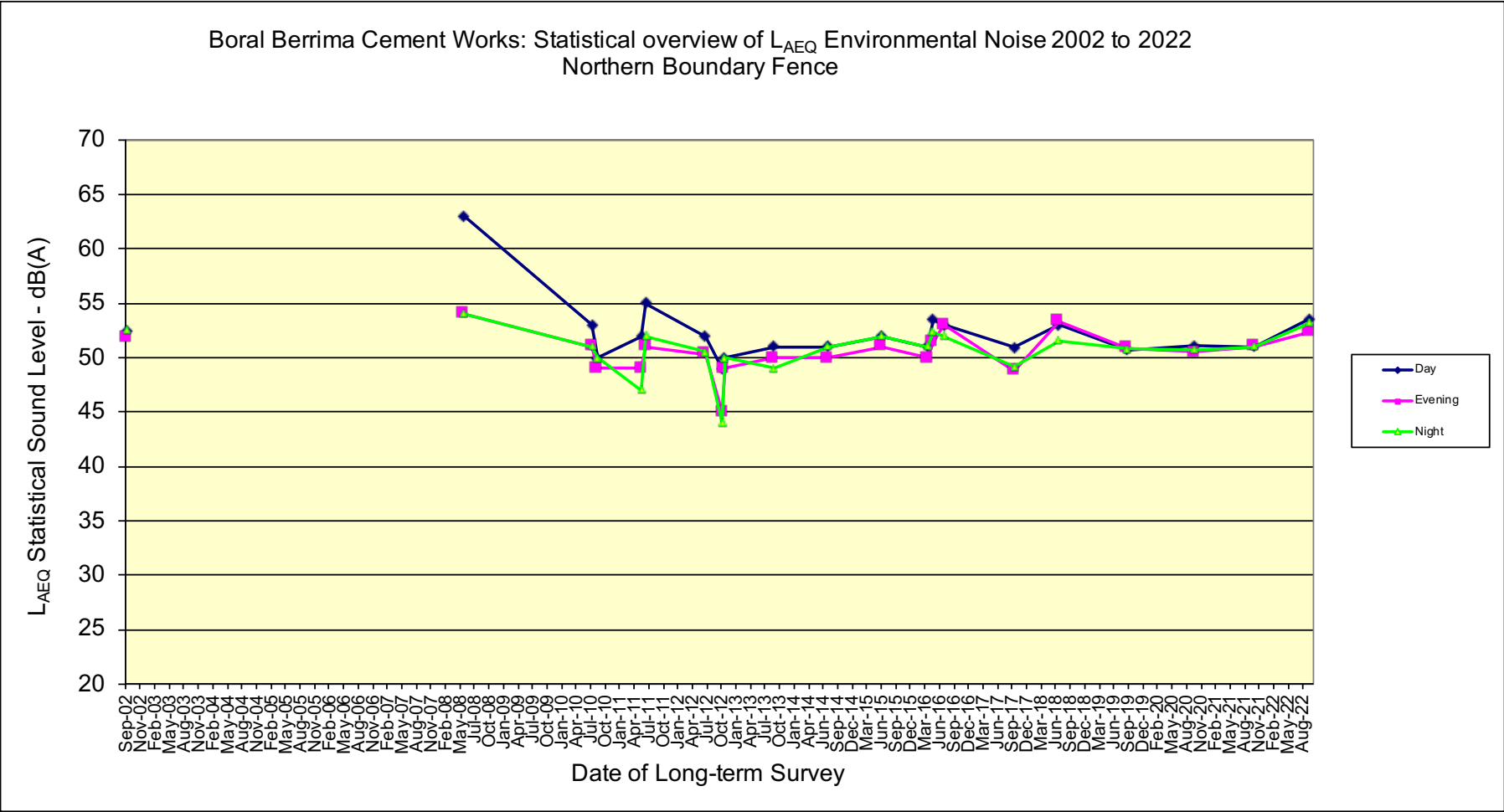


Figure 4.12: Comparison of statistical sound levels for Northern Boundary Fence location



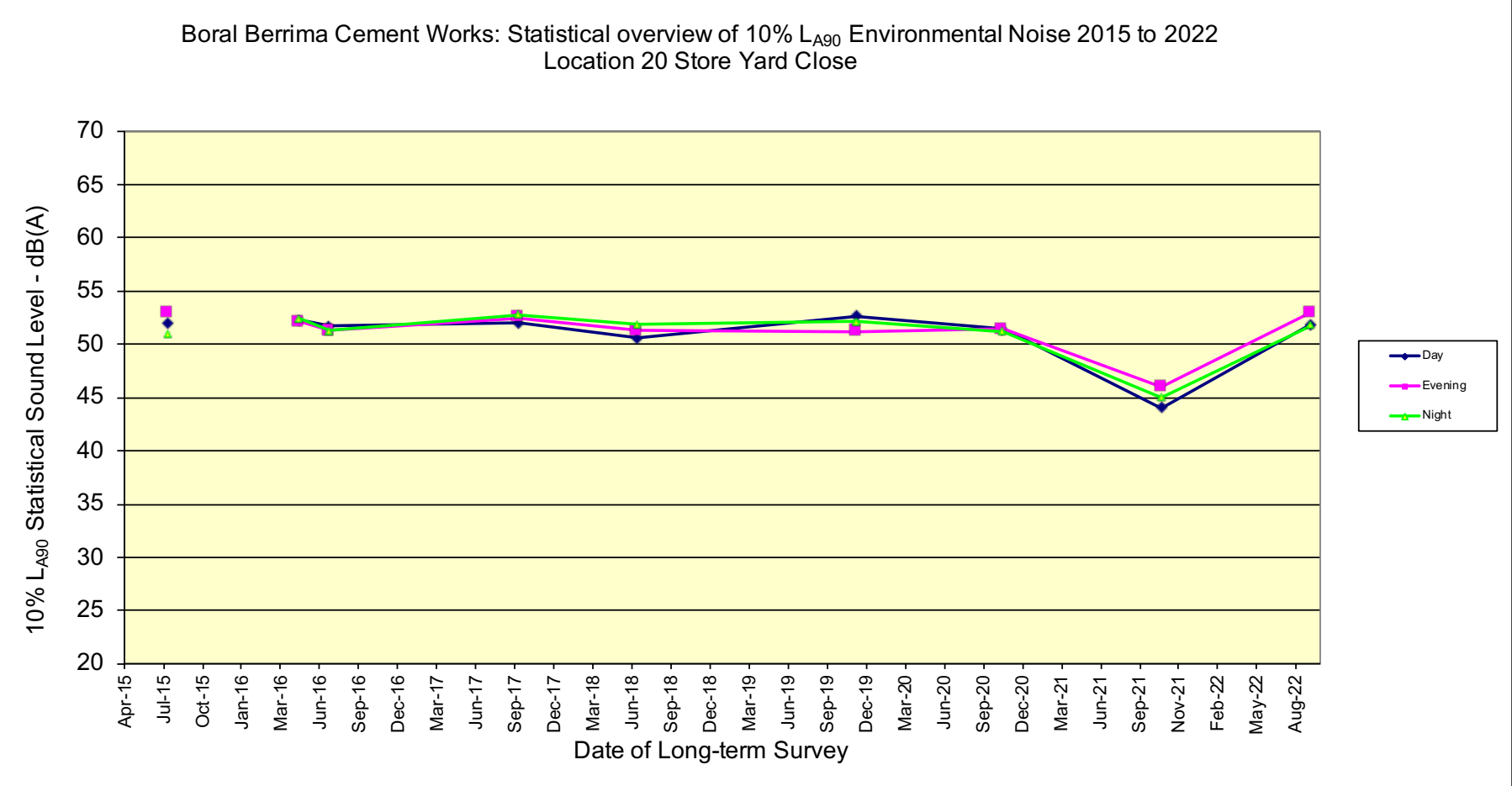
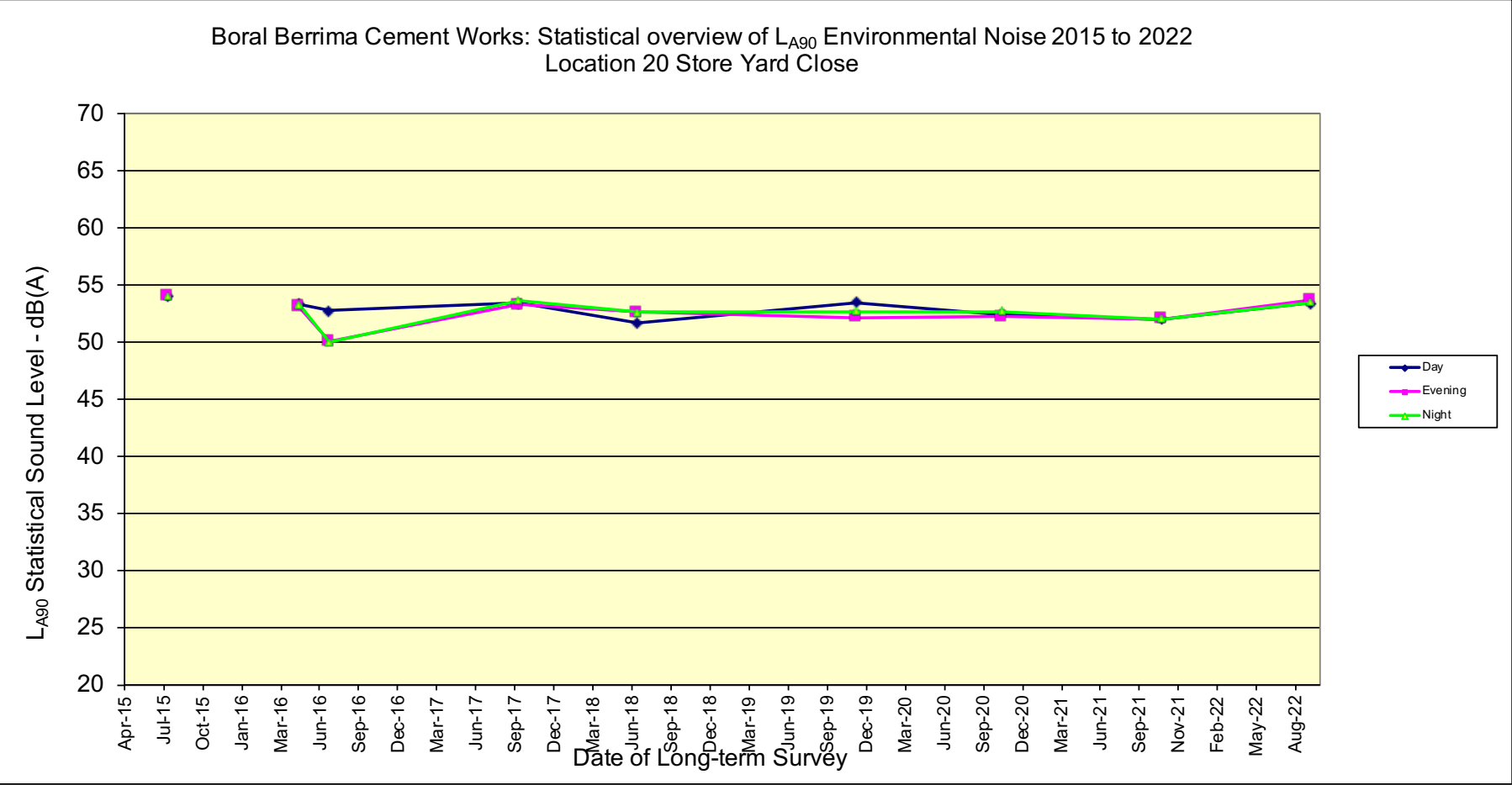
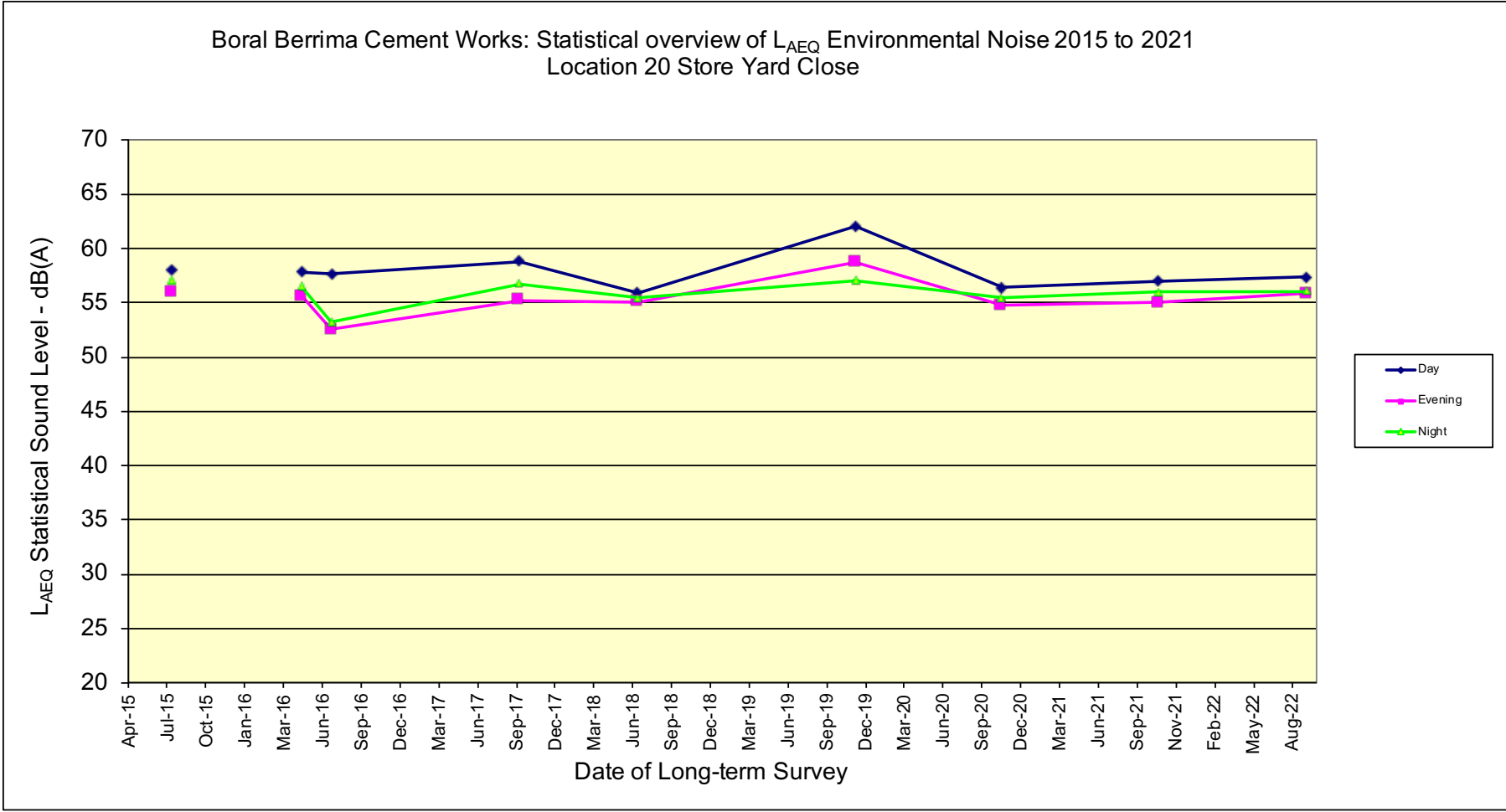


Figure 4.13: Comparison of statistical sound levels for Store Yard Close location

## 4.2 Location 20 Store Yard (Close) location results compared to licence conditions and recommendations

### 4.2.1 $L_{A90,period}$ sound levels

The licence condition for noise emissions from the site is consolidated into measurements at Location 20, with  $L_{A90,15\text{-minutes}}$  not to exceed 58 dBA. The PRP recommended objectives for the Store Yard Close location were a long-term average  $L_{A90,period}$  not greater than 56 dBA or 58 dBA for any 15-minute period. Measurement methods have to be generally as required in the NSW Noise Policy for Industry – this means omission of results during high wind speed or rainfall or from extraneous sources. Results of the measurements are provided in Appendix D.

For the 14 days of measurements the highest 15-minute period value for  $L_{A90,15\text{-min}}$  was 64 dBA, which is higher than in previous years. This occurred in the 15-minute period from 8:00 am to 8:15am on 11 October 2022, and is considered to have been caused a vehicle delivering items to the stores area and stopping close to the logger and idling during the period.

There were 5 of 1389 15-minute periods which had  $L_{A90,15\text{-minutes}}$  exceed 58 dBA. This is 0.36% of the monitored periods. Table 4.3 shows the number of  $L_{A90,15\text{-minute}}$  sound levels at specific values between 42 and 64 dBA and these are also shown graphically in Figures 4.14 to 4.17. The specific 15-minute noise objective was not exceeded for 99.6% of the measurements. The times when the  $L_{A90,15\text{-minute}}$  sound level values were above 58 dBA were caused by moving sources close to the monitor.

Four of the five exceedances were due to one event on 11 October from 7:15am to 8:15am. This is indicated in Figure 4.18. The other event on 19 October from 10:45am to 11am, is shown in Figure 4.19.

The events on 11 October from 7:15am to 8:15am can be observed in Figure 4.18, which shows on the top graph the direction of the major source of noise controlling the sound level in each 0.1 second interval over the period; the bottom graph shows the sound level for the same times. Before 7:00am, the sound level is less than the objective of not being higher than 58 dBA and from the direction of approximately 140° - this is the general direction of the major cement works noise sources. After 7:00am the direction of the major source changes to 50° to 60°, which is from the eastern Store Yard or Engineering Building area, and varies from 0 to 360° which is effectively north of the logger's position. At the same time the sound level between 7:00am and 8:00 am increases from 55 dBA to near 60 dBA. Then at 8:00 am to 8:20 am the sound level increase to 64 dBA and from the direction of approximately 35°. This indicates the source of the noise was not fixed plant but some short-term extraneous source.

The event on 19 October at 10:45am is shown in Figure 4.19 is due to a slow-moving heavy vehicle performing work possibly a Front-end loader or a Bobcat working close to the monitor. As indicated by trend line shape A, the noise source direction is moving and can be observed to have a similar shape to the sound pressure level trendline shape B. Listening to the audio in this event period, especially from the North Fence location record for the same period indicates constant, but varying heavy vehicle activity in this time. Over the full time period shown in Figure 4:19, the direction of the sound level of passing vehicles can be observed, moving from west of the microphone and then around to the eastern side of the monitor – sometimes the directions of movement change and this indicates moving vehicles close to the monitor.

Such sources are considered extraneous and are not included in the assessment level for comparison with the Licence condition. Also, the sound level caused by these events would not affect the  $L_{A90,15\text{-min}}$  sound levels received at the residential locations.

This analysis of acceptable sound level periods monitored at Location 20 for the full 14 day period are considered to be less than or not greater than the licence condition and compliance is achieved.

Table 4.3 : Boral Cement Berrima Annual Environmental Noise October 2022 - Location 20  
LA90,15-min Sound Level occurrences and percentages

LA90,15-min dBA	No. at level	% at level	Cumulative %	- Cumulative %	Cum. No.	Percentile	LA90,15-min
42	1	0.1%	0.00%	100.00%	0	0%	45.5
42.5	1	0.07%	0.07%	99.93%	1	1%	47.4
43	1	0.07%	0.14%	99.86%	2	2%	49.5
43.5	0	0.00%	0.22%	99.78%	3	3%	50.1
44	0	0.00%	0.22%	99.78%	3	4%	50.4
44.5	2	0.14%	0.22%	99.78%	3	5%	50.6
45	2	0.14%	0.36%	99.64%	5	10%	51.4
45.5	2	0.14%	0.50%	99.50%	7	15%	51.7
46	3	0.22%	0.65%	99.35%	9	20%	52.0
46.5	1	0.07%	0.86%	99.14%	12	25%	52.2
47	9	0.65%	0.94%	99.06%	13	30%	52.4
47.5	2	0.14%	1.58%	98.42%	22	40%	52.8
48	4	0.29%	1.73%	98.27%	24	50%	53.4
48.5	1	0.07%	2.02%	97.98%	28	60%	54.1
49	4	0.29%	2.09%	97.91%	29	70%	54.9
49.5	11	0.79%	2.38%	97.62%	33	75%	55.2
50	23	1.66%	3.17%	96.83%	44	80%	55.6
50.5	35	2.52%	4.82%	95.18%	67	85%	55.9
51	64	4.61%	7.34%	92.66%	102	90%	56.3
51.5	139	10.01%	11.95%	88.05%	166	95%	56.8
52	154	11.09%	21.96%	78.04%	305	96%	56.9
52.5	160	11.52%	33.05%	66.95%	459	97%	57.0
53	104	7.49%	44.56%	55.44%	619	97.5%	57.1
53.5	95	6.84%	52.05%	47.95%	723	98.0%	57.3
54	100	7.20%	58.89%	41.11%	818	98.5%	57.4
54.5	93	6.70%	66.09%	33.91%	918	99.0%	57.5
55	103	7.42%	72.79%	27.21%	1011	99.1%	57.5
55.5	89	6.41%	80.20%	19.80%	1114	99.2%	57.6
56	86	6.19%	86.61%	13.39%	1203	99.3%	57.6
56.5	58	4.18%	92.80%	7.20%	1289	99.4%	57.7
57	29	2.09%	96.98%	3.02%	1347	99.5%	57.8
57.5	8	0.58%	99.06%	0.94%	1376	99.6%	58.0
58	0	0.00%	99.64%	0.36%	1384	99.7%	58.7
58.5	1	0.07%	99.64%	0.36%	1384	99.75%	59.0
59	2	0.14%	99.71%	0.29%	1385	99.80%	59.1
59.5	1	0.07%	99.86%	0.14%	1387	99.85%	59.2
60	0	0.00%	99.93%	0.07%	1388	99.90%	59.5
60.5	0	0.00%	99.93%	0.07%	1388	99.95%	61.1
61	0	0.00%	99.93%	0.07%	1388	100%	63.8
61.5	0	0.00%	99.93%	0.07%	1388		
62	0	0.00%	99.93%	0.07%	1388		
62.5	0	0.00%	99.93%	0.07%	1388		
63	0	0.00%	99.93%	0.07%	1388		
63.5	1	0.07%	99.93%	0.07%	1388		
64	0	0.00%	100.00%	0.00%	1389		
64.5	0	0.00%	100.00%	0.00%	1389		
65	0	0	1	0.00%	1389		

Figure 4.14 : Boral Cement Berrima Annual Environmental Noise 2022 -  
Location 20 LA90,15-min sound levels occurrence

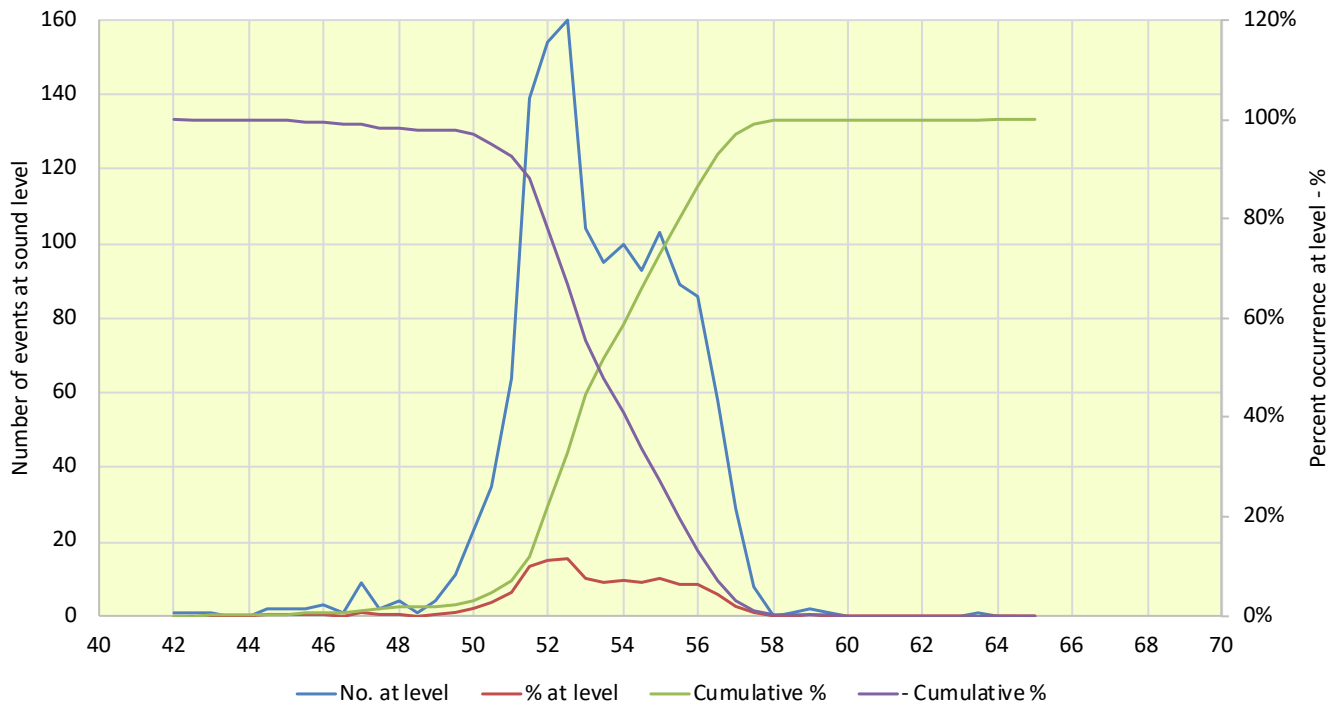


Figure 4.15 : Boral Cement Berrima Annual Environmental Noise 2022 -  
Location 20 LA90,15-min sound levels occurrence

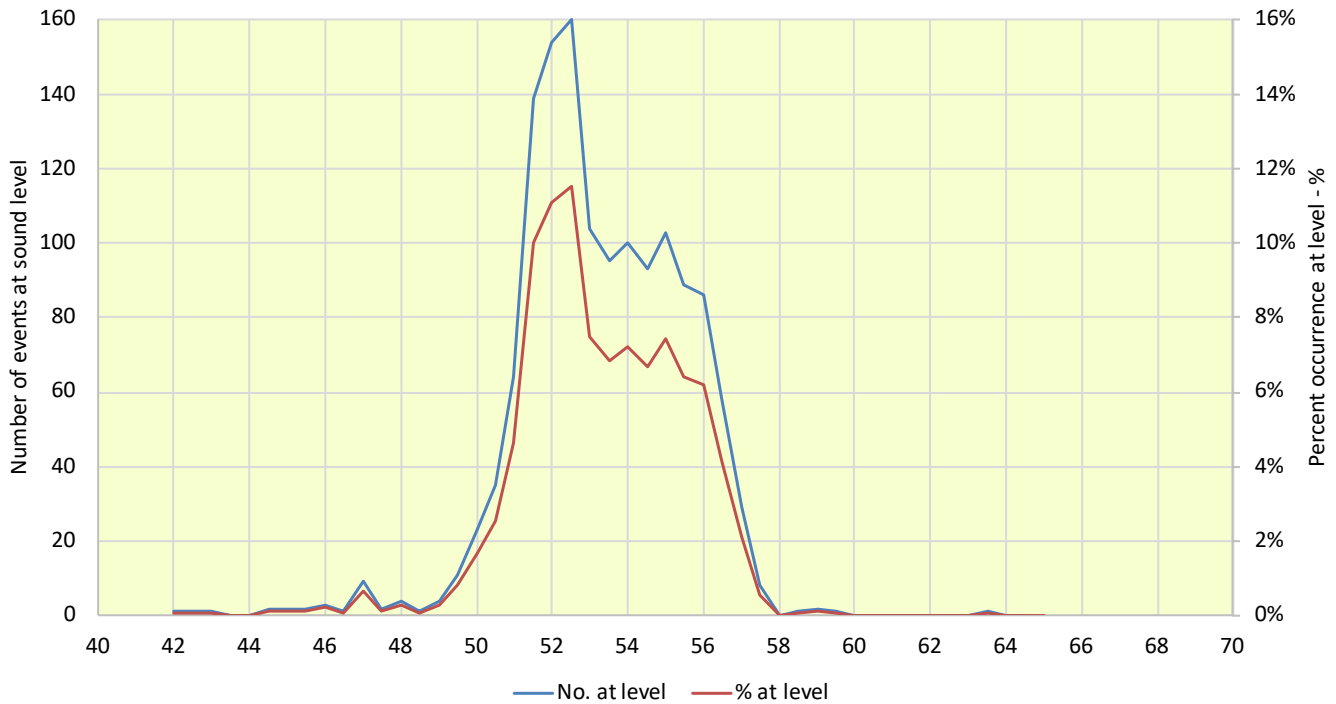


Figure 4.16: Boral Cement Berrima Annual Environmental Noise October 2022 -  
Location 20 Percentile occurrence of LA90,15-min sound levels

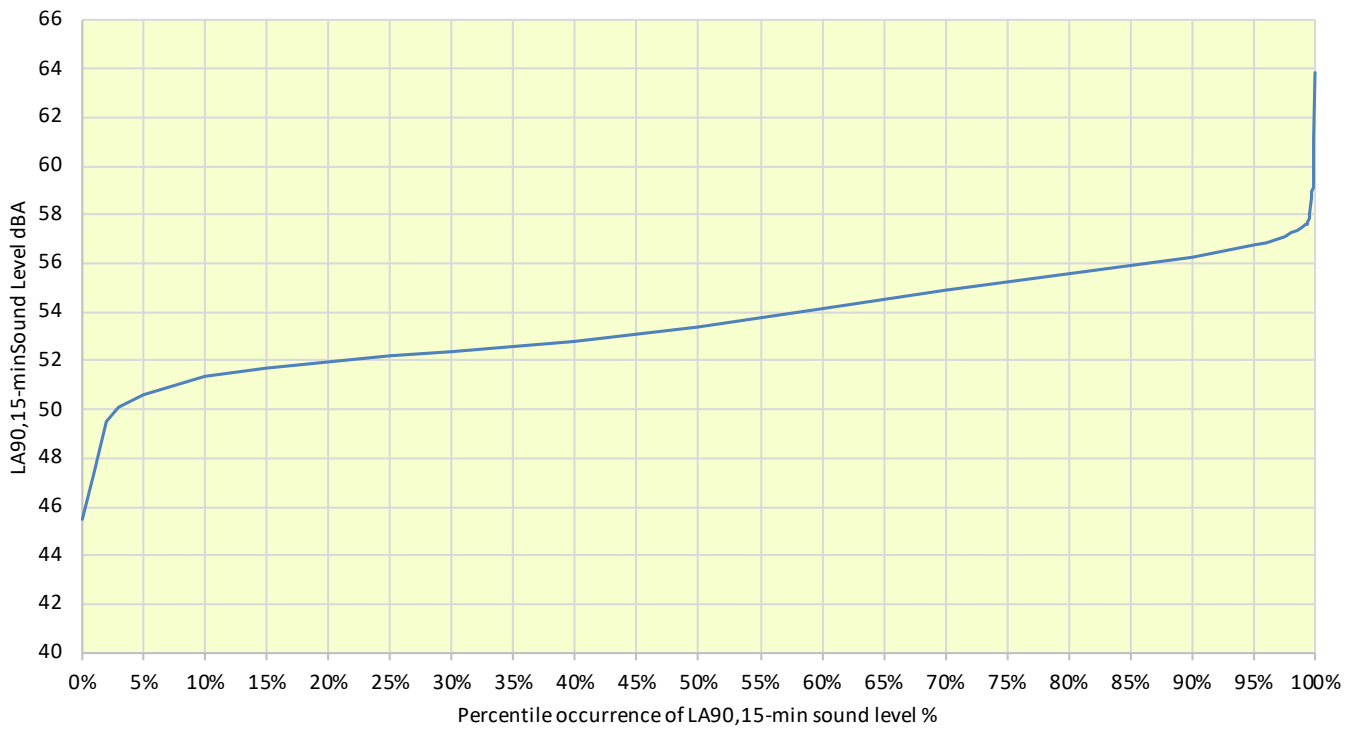


Figure 4.17 : Boral Cement Berrima Annual Environmental Noise October 2022 -  
Location 20 Percentile occurrence of LA90,15-min sound levels - detail

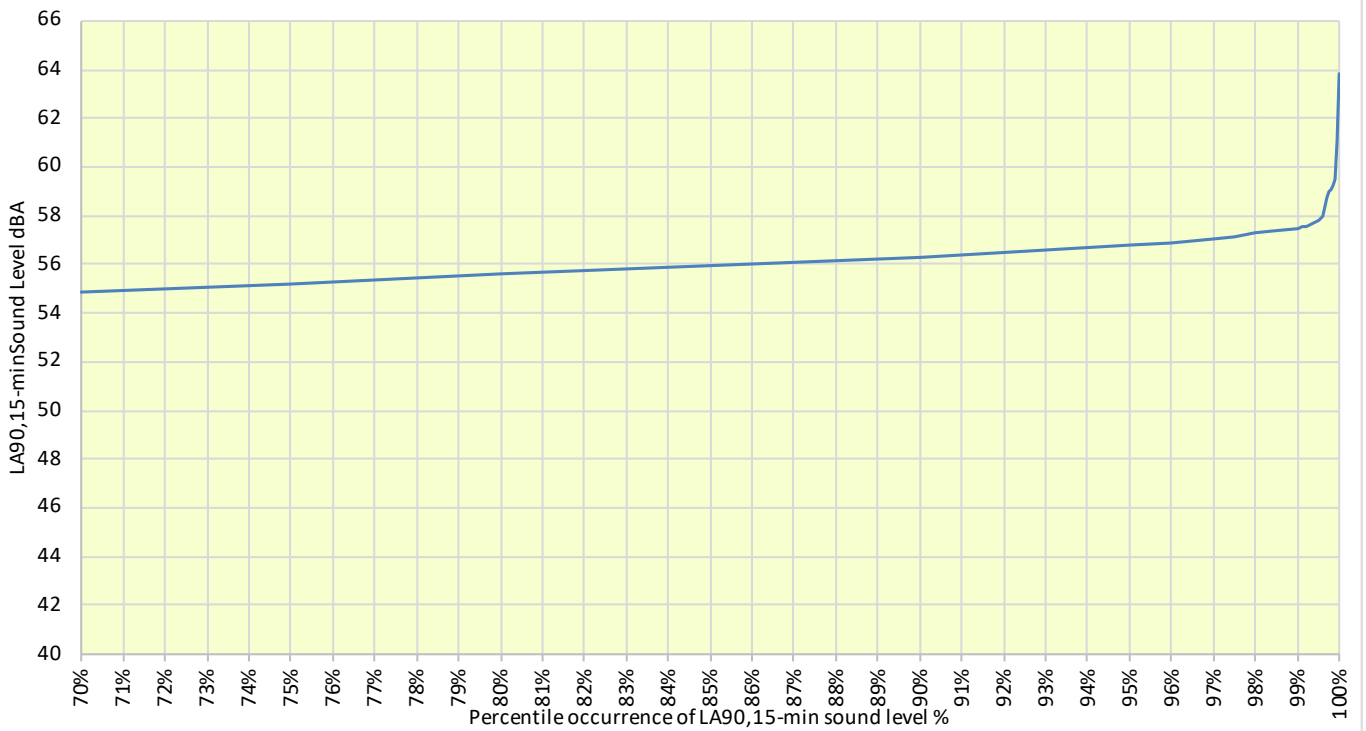
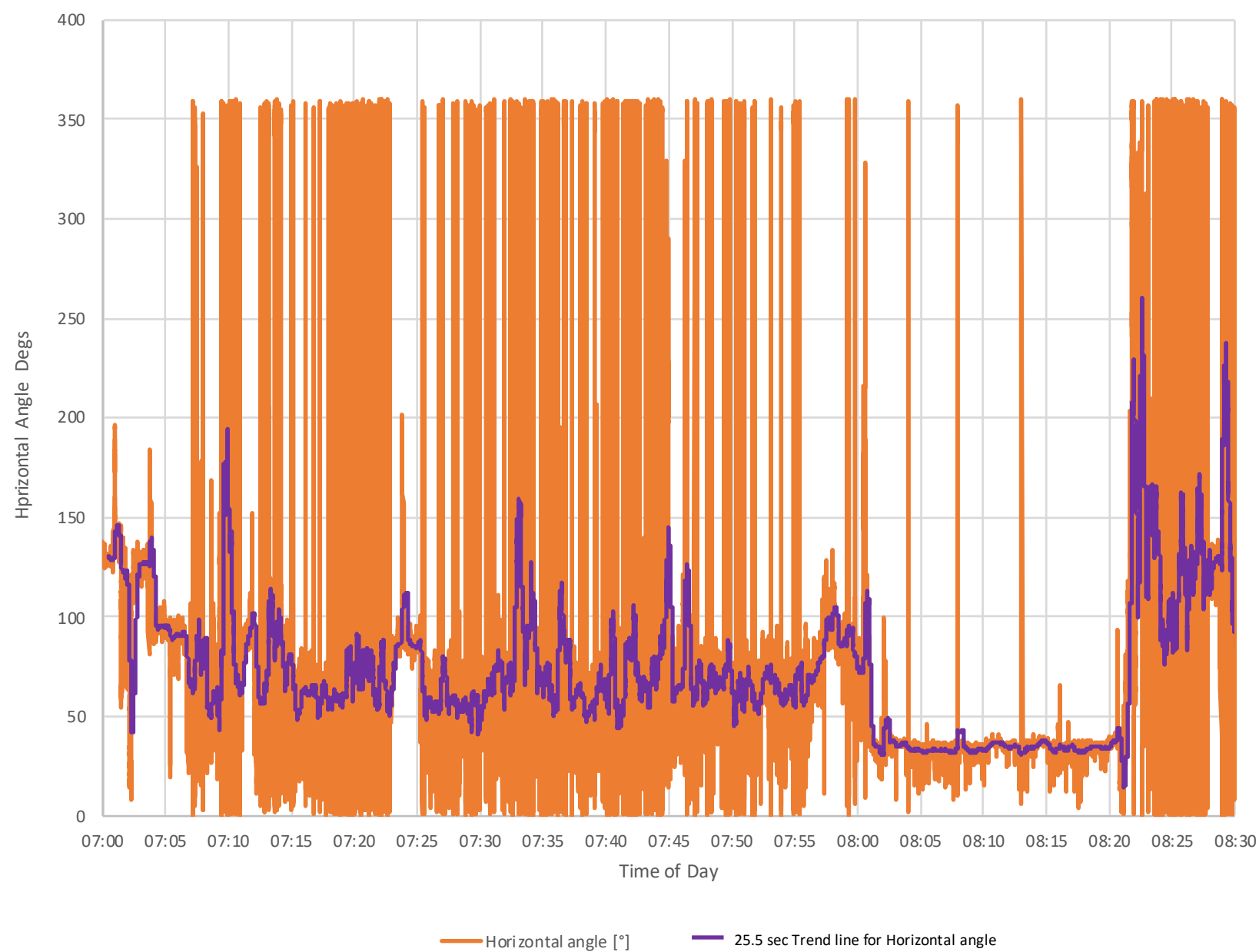


Figure 4.18 Horizontal angle [°] vs Time for the Exceedence Event 11 Oct 7:15am to 8:15 am



LAspl vs Time for the Exceedence Event 11 Oct 7:15am to 8:15 am

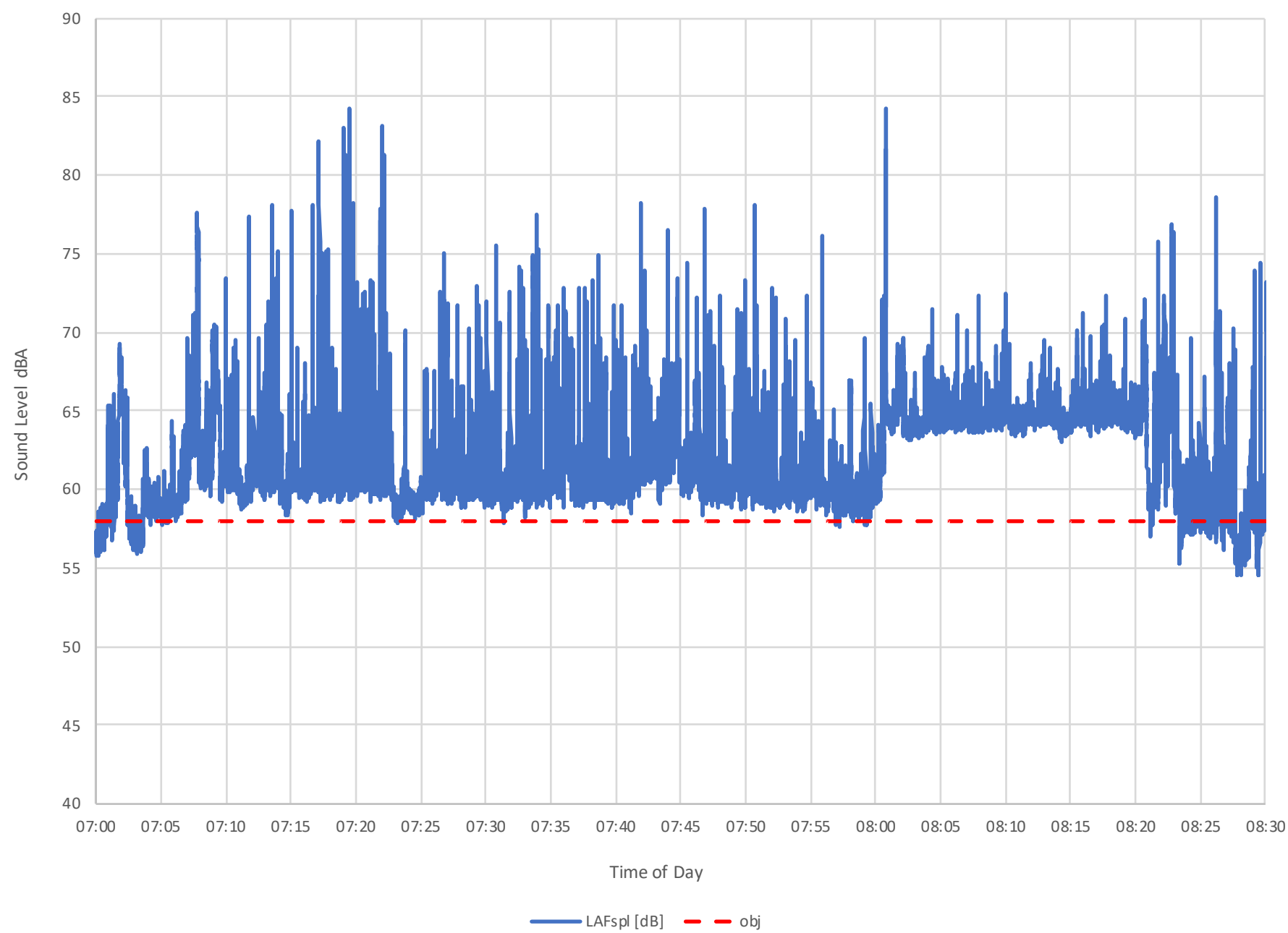
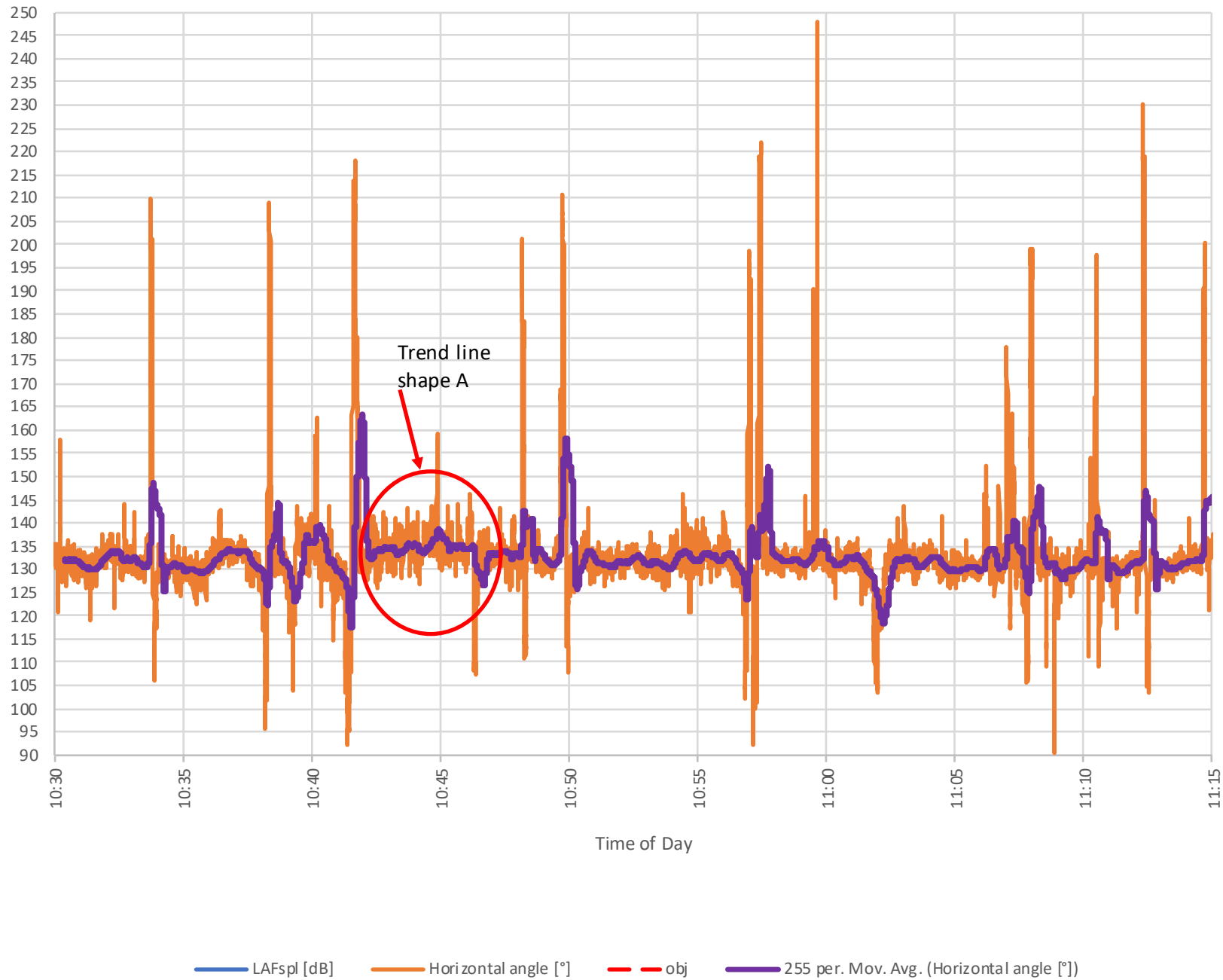
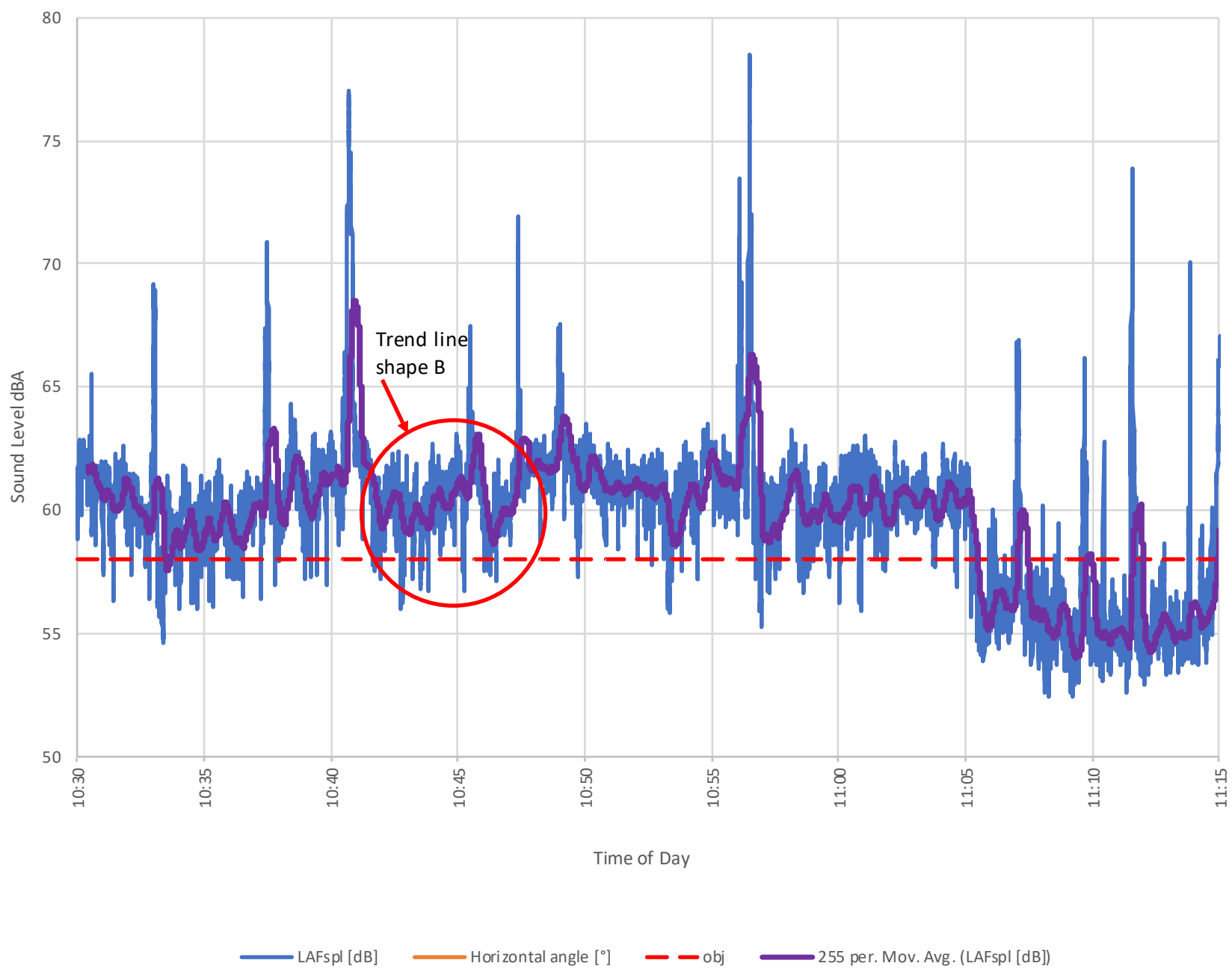


Figure 4.19 Horizontal angle [°] vs Time for the Exceedence Event 19 Oct 10:45am to 11:00 am



LA spl vs Time for the Exceedence Event 19 Oct 10:45am to 11:00 am





#### 4.2.2 $L_{A01.1\text{-minute}}$ and $L_{A01.1\text{-minute}} - L_{A90.15\text{-minute}}$ results for the Northern Boundary

Sound levels measured at the Northern Boundary locations included  $L_{A01.1\text{-minute}}$  to allow calculations of  $L_{A01.1\text{-minute}} - L_{A90.15\text{-minute}}$  at night-time to be made to provide comparisons with recommended maximum values for night-time. The recommended maximum objective of 60 dBA for  $L_{A01.1\text{-minute}}$  night-time for the Northern Boundary location and not greater than 15 dB difference for  $L_{A01.1\text{-minute}} - L_{A90.15\text{-minute}}$  are to indicate sleep disturbance potential and were provided as recommendations in the PRP report. The analysis is made at the Northern Boundary rather than 4 Melbourne St because sound levels at 4 Melbourne St are regularly affected by noise of passing vehicles in Taylor Avenue and would require significant analysis. If the North Fence results indicate acceptable conditions from Cement plant emissions, then it follows that the 4 Melbourne St location would also be acceptable for Cement Plant sound levels.

The analyses made for the Northern Boundary location showed that for this location, there were 871 night-time 1-minute events which exceeded the objective of  $L_{A01.1\text{-minute}} - L_{A90.15\text{-minute}}$  not greater than 15 dB. This is significantly more in number than the 105 events that were observed in 2021, however 8 of the 871 were observed before 4am, and considered events potentially caused by the Cement works. From the rest of the 863 events, 14% (121) were measured from 4am to 5am, 50% (436) were measured from 5am to 6am and 35% (306) were measured from 6am to 7am. In reviewing these events, it was considered that all of the events before 4am would be listened-to while a sample group of each of the 15-minute periods from 4am to 7am was to be reviewed. From the latter, 12 groups (19 groups in total) of these periods occurred and sound recordings of specific periods within those 12 groups with  $L_{A01.1\text{-minute}} - L_{A90.15\text{-minute}}$  difference results greater than 15 dB were listened to, to determine sources of noise occurring in the period. These periods were assumed to be typical of the events in adjoining or near-in-time periods.

Of the 871 events identified with a difference of greater than 15 dB at night-time, 250 had a difference of greater than 20 dB and 36 were greater than 25 dB and 2 were greater than 30. The maximum difference was 33 dB.

Figure 4.20 is a graph showing the times of events with the  $L_{A01.1\text{-minute}} - L_{A90.15\text{-minute}}$  difference results greater than 15 dB for each night of the whole survey. On most night periods, the events occurred in one particular segment of the period, such as just before and until after dawn; on other nights there were some events just after midnight and 2:30am associated with rail movements, mainly identified as rail wheel-squeal. Most of the early morning events were associated with bird noise.

The approach to listening to the events to determine the sources of noise was to listen to a representative sample for the monitoring period. The sampling was determined on the time sequence and difference level; for example, if there was a run of events in one period following directly after each other, the period with the highest difference was investigated. If the exceedances were outside the typical period, for example, 2:30 am, these were listened to as well.

Table 4.4 shows the results of the analysis performed. It should be noted that within an event, there may have been more than one noise source and the prominent noise source that caused the exceedance was noted. Table 4.5 indicates the total periods that were surveyed from the total number of exceedances. Table 4.6 summarizes those observations into the various periods. Some periods have more than one prominent noise source. From the 19 survey periods reviewed, there were a total of 90 events observed from the listening sample set. From this, birds were identified on 74 of the 90 occasions. This is main cause of exceedances in the period between 4:00am and 7am.

As observed from Figures 4.21 to Figures 4.24, these periods with bird noise are the main cause of all the total 119 periods (up from 47 periods from 2021 survey) which had differences greater than 20 dB. Other sources identified were, trucks on 8 occasions, rail squeal on five occasions and thumps on two occasions, a rail car collision on one occasion.

Figure 4.25 is a graph of the sound pressure level for the night-time of the 16/10/22 12:45am measurement for 4 Melbourne St and the North Fence. It plainly shows that the rail wheel squeal audibly identified does not significantly affect the sound level at 4 Melbourne St. It is assumed that other rail squeal events are consistent with this observation. Figure 4.26 is a graph of the sound pressure level for the night time of the 21/10/22 4:30am measurement for 4 Melbourne St. and the North Fence. It shows the amount of bird noise at North Fence, but also the trucks are actually on Taylor Ave. The rail car collision event (15/10/22 12:32am) was not audibly observed at 4 Melbourne St by listening to the audio file.

A comparison of the event sound levels received at the Northern Boundary indicated that the high levels of  $LA_{01,1\text{-minute}}$  measured were caused by birds, insects or animals, the highest being 78 dBA. Trucks on Taylor Ave were also identified at the Northern Boundary. Rail squeal was noted to have  $LA_{01,1\text{-minute}}$  sound levels of greater than 60 dBA at the Northern boundary, however the number of occurrences was less than compared to the corresponding survey reported in the 2020 Annual Noise Assessment report (8) and more than the 2021 Annual Noise Assessment report (2).

Even though the number of exceedances was a lot more than the 2021 survey (due to the amount of bird, insects and animal noise events), the results of the analyses identified to the cement work emissions for 2022 are very similar to those of the corresponding analysis from the 2021 Annual Noise Assessment report. These analyses indicate that the number or times that the objectives of  $LA_{01,1\text{-minute}}$  greater than 60 dBA and  $LA_{01,1\text{-minute}} - LA_{90,15\text{-minute}}$  difference results are greater than 15 dB and are caused by Cement Plant events, are relatively low.

On the basis of this analysis, it is considered that the noise emissions from the Cement Plant have a low potential for sleep disturbance. Site measurements and analyses indicate that the most likely cause of site sources to exceed criteria is rail associated noise, but not all rail events cause exceedances.

**Table 4.4 Berrima Cement Annual Noise Assessment 2022**

Survey of audible sources of the Sleep Disturbance parameter  $L_{A01.1min} - L_{A90.15-min} > 15$  dBA

for Night-time exceedances at the **Berrima Cement Works** North Fence monitoring location 10 to 25 October 2022

Date Time	Event Time	Time Period	Exceedance dB	L1.1min dB	Identified source comments	Prominent Identified source
15/10/22 0:30	12:32:00 AM	0	17	65	rail wagon collison	rail wagon collison
16/10/22 0:45	12:48:00 AM	0	15	63	rail squeal	rail squeal
16/10/22 0:45	12:51:00 AM	0	17	65	rail squeal ; Horn	rail squeal
16/10/22 0:45	12:52:00 AM	0	16	64	rail squeal	rail squeal
17/10/22 1:30	1:31:00 AM	1	16	69	rail squeal	rail squeal
16/10/22 2:30	2:38:00 AM	2	16	64	rail squeal	rail squeal
19/10/22 4:00	4:03:00 AM	4	16	64	truck	truck
19/10/22 4:00	4:15:00 AM	4	19	67	truck ; birds ;	truck
21/10/22 4:15	4:20:00 AM	4	16	63	truck ; birds ;	truck
21/10/22 4:15	4:28:00 AM	4	19	66	birds	birds
21/10/22 4:15	4:29:00 AM	4	18	65	birds; truck	truck
21/10/22 4:15	4:30:00 AM	4	18	65	birds	birds
21/10/22 4:30	4:31:00 AM	4	18	66	birds , truck	truck
21/10/22 4:30	4:32:00 AM	4	16	65	birds	birds
21/10/22 4:30	4:36:00 AM	4	16	64	birds;	birds
21/10/22 4:30	4:37:00 AM	4	16	64	thunp; birds; truck	truck
21/10/22 4:30	4:38:00 AM	4	15	63	birds , truck whining noise	birds
21/10/22 4:30	4:39:00 AM	4	16	64	birds;	birds
21/10/22 4:30	4:40:00 AM	4	17	65	birds ;	birds
21/10/22 4:30	4:41:00 AM	4	15	63	birds ; truck	birds
21/10/22 4:30	4:43:00 AM	4	16	65	birds	birds
21/10/22 4:30	4:44:00 AM	4	16	64	birds , truck	truck
21/10/22 4:30	4:45:00 AM	4	15	64	birds ; car ; truck	birds
25/10/22 4:45	4:46:00 AM	4	16	61	4 thumps ; truck movement ; Birds	thump
25/10/22 4:45	4:47:00 AM	4	17	62	truck ; birds ;	birds
25/10/22 4:45	4:48:00 AM	4	16	61	birds; truck	birds
25/10/22 4:45	4:49:00 AM	4	17	62	birds;	birds
25/10/22 4:45	4:50:00 AM	4	17	62	thump; birds ;	birds
25/10/22 4:45	4:51:00 AM	4	16	61	truck ; birds ;	birds
25/10/22 4:45	4:52:00 AM	4	17	62	thump; birds ;	thump
25/10/22 4:45	4:53:00 AM	4	17	62	truck ; birds ;	birds
25/10/22 4:45	4:54:00 AM	4	15	60	birds;	birds
25/10/22 4:45	4:58:00 AM	4	19	64	truck ; birds ;	truck
25/10/22 4:45	4:59:00 AM	4	19	64	truck ; birds ;	birds
25/10/22 4:45	5:00:00 AM	4	25	70	truck ; birds ;	birds
11/10/22 5:45	5:47:00 AM	5	18	70	birds , truck	birds
11/10/22 5:45	5:48:00 AM	5	20	72	birds	birds
11/10/22 5:45	5:49:00 AM	5	19	71	birds	birds
11/10/22 5:45	5:50:00 AM	5	17	69	birds	birds
11/10/22 5:45	5:51:00 AM	5	17	69	birds	birds
11/10/22 5:45	5:57:00 AM	5	18	70	birds	birds
11/10/22 5:45	5:58:00 AM	5	17	69	birds	birds
11/10/22 5:45	5:59:00 AM	5	17	69	birds	birds
11/10/22 5:45	6:00:00 AM	5	16	68	birds	birds
12/10/22 5:00	5:01:00 AM	5	20	69	birds	birds
12/10/22 5:00	5:02:00 AM	5	21	70	birds	birds
12/10/22 5:00	5:03:00 AM	5	21	70	birds; truck	birds
12/10/22 5:00	5:04:00 AM	5	20	69	birds; truck	birds
12/10/22 5:00	5:05:00 AM	5	21	70	birds;	birds
12/10/22 5:00	5:06:00 AM	5	22	71	birds;	birds
12/10/22 5:00	5:07:00 AM	5	21	70	birds;	birds
12/10/22 5:00	5:08:00 AM	5	21	70	birds;	birds
12/10/22 5:00	5:09:00 AM	5	21	70	birds;	birds
12/10/22 5:00	5:10:00 AM	5	21	70	birds; thump	birds
12/10/22 5:00	5:11:00 AM	5	20	69	birds; thump	birds
12/10/22 5:00	5:12:00 AM	5	21	70	birds	birds
12/10/22 5:00	5:13:00 AM	5	21	70	birds; motor bike (taylor)	birds
12/10/22 5:00	5:14:00 AM	5	19	68	birds; motor bike (taylor)	birds
12/10/22 5:00	5:15:00 AM	5	18	67	birds , truck	birds
13/10/22 5:15	5:16:00 AM	5	22	70	birds , truck	birds
13/10/22 5:15	5:17:00 AM	5	22	70	birds	birds
13/10/22 5:15	5:21:00 AM	5	21	70	birds , truck	birds
13/10/22 5:15	5:25:00 AM	5	22	70	birds , truck	birds
14/10/22 5:30	5:31:00 AM	5	17	67	birds	birds
14/10/22 5:30	5:32:00 AM	5	17	66	birds , truck	birds
14/10/22 5:30	5:33:00 AM	5	17	66	birds , heavy vehicle	birds
14/10/22 5:30	5:37:00 AM	5	18	68	birds , truck	birds
14/10/22 5:30	5:42:00 AM	5	18	68	birds , truck	birds
14/10/22 5:30	5:43:00 AM	5	18	67	birds; thump	birds
14/10/22 5:30	5:44:00 AM	5	18	67	birds , truck	birds
25/10/22 5:00	5:13:00 AM	5	32	75	birds , truck	birds
15/10/22 6:00	6:01:00 AM	6	25	75	birds	birds

**Table 4.4 Berrima Cement Annual Noise Assessment 2022**

Survey of audible sources of the Sleep Disturbance parameter  $L_{A01.1min} - L_{A90.15-min} > 15$  dBA

for Night-time exceedances at the **Berrima Cement Works** North Fence monitoring location 10 to 25 October 2022

15/10/22 6:00	6:02:00 AM	6	20	69	birds	birds
16/10/22 6:15	6:16:00 AM	6	28	70	birds	birds
16/10/22 6:15	6:24:00 AM	6	24	66	birds	birds
16/10/22 6:15	6:29:00 AM	6	25	68	birds;	birds
16/10/22 6:15	6:30:00 AM	6	27	69	birds;	birds
16/10/22 6:30	6:36:00 AM	6	28	71	birds	birds
16/10/22 6:45	6:52:00 AM	6	33	78	truck ; birds	birds
18/10/22 6:30	6:33:00 AM	6	15	64	Thump; birds	birds
18/10/22 6:30	6:35:00 AM	6	15	65	Thump; birds; heavy vehicle	birds
18/10/22 6:30	6:36:00 AM	6	15	64	birds; thump	birds
18/10/22 6:30	6:37:00 AM	6	15	64	birds;	birds
18/10/22 6:30	6:44:00 AM	6	19	69	birds;	birds
18/10/22 6:30	6:45:00 AM	6	18	67	birds; truck	birds
22/10/22 6:45	6:46:00 AM	6	16	62	birds;	birds
22/10/22 6:45	6:48:00 AM	6	16	62	birds; truck	birds
22/10/22 6:45	6:51:00 AM	6	15	61	birds	birds
22/10/22 6:45	6:52:00 AM	6	16	62	birds	birds
22/10/22 6:45	6:59:00 AM	6	20	66	birds	birds

**Table 4.5 Berrima Cement Annual Noise Assessment 2022**Analysis of audible sources of the Sleep Disturbance parameter  $L_{A01.1min} - L_{A90.15-min} > 15$  dBAfor Night-time exceedances at the **Berrima Cement Works** North Fence monitoring location 10 to 25 October

Date	Time	No. of events in 15-min period	Maximum Exceedance dB	Identified source comments
11/10/22 4:30	4:30:00 AM	4	19	
11/10/22 4:45	4:45:00 AM	7	18	
11/10/22 5:00	5:00:00 AM	2	18	
11/10/22 5:30	5:30:00 AM	10	25	
11/10/22 5:45	5:45:00 AM	14	20	Birds ; Truck
11/10/22 6:00	6:00:00 AM	5	17	
11/10/22 6:15	6:15:00 AM	4	20	
11/10/22 6:30	6:30:00 AM	5	21	
11/10/22 6:45	6:45:00 AM	5	18	
12/10/22 4:30	4:30:00 AM	4	16	
12/10/22 4:45	4:45:00 AM	8	22	
12/10/22 5:00	5:00:00 AM	15	22	Birds ; Truck ; Thump ; Motor Bike (taylor)
12/10/22 5:15	5:15:00 AM	12	19	
12/10/22 5:30	5:30:00 AM	6	17	
12/10/22 5:45	5:45:00 AM	12	20	
12/10/22 6:00	6:00:00 AM	14	26	
12/10/22 6:15	6:15:00 AM	14	22	
12/10/22 6:45	6:45:00 AM	7	22	
13/10/22 4:30	4:30:00 AM	5	16	
13/10/22 4:45	4:45:00 AM	7	16	
13/10/22 5:00	5:00:00 AM	10	26	
13/10/22 5:15	5:15:00 AM	14	23	Birds ; Truck
13/10/22 5:30	5:30:00 AM	15	25	
13/10/22 5:45	5:45:00 AM	10	24	
13/10/22 6:00	6:00:00 AM	12	22	
13/10/22 6:15	6:15:00 AM	7	23	
13/10/22 6:30	6:30:00 AM	6	22	
13/10/22 6:45	6:45:00 AM	1	16	
14/10/22 1:00	1:00:00 AM	2	17	
14/10/22 4:45	4:45:00 AM	6	23	
14/10/22 5:00	5:00:00 AM	7	21	
14/10/22 5:15	5:15:00 AM	8	26	
14/10/22 5:30	5:30:00 AM	15	18	Birds ; Truck ; Thump ; Heavy Vehicle
14/10/22 5:45	5:45:00 AM	11	20	
14/10/22 6:00	6:00:00 AM	11	21	Birds
15/10/22 0:30	12:30:00 AM	1	17	Rail wagon collison
15/10/22 5:00	5:00:00 AM	13	20	
15/10/22 5:15	5:15:00 AM	12	22	
15/10/22 5:30	5:30:00 AM	13	26	
15/10/22 5:45	5:45:00 AM	15	20	
15/10/22 6:00	6:00:00 AM	5	25	
15/10/22 6:15	6:15:00 AM	5	22	
15/10/22 6:45	6:45:00 AM	7	20	
16/10/22 0:45	12:45:00 AM	3	17	Rail squeal ; Train Horn
16/10/22 2:30	2:30:00 AM	1	16	
16/10/22 4:30	4:30:00 AM	4	22	Rail squeal
16/10/22 4:45	4:45:00 AM	13	25	
16/10/22 5:00	5:00:00 AM	15	25	
16/10/22 5:15	5:15:00 AM	14	27	
16/10/22 5:30	5:30:00 AM	11	26	
16/10/22 5:45	5:45:00 AM	15	27	
16/10/22 6:00	6:00:00 AM	15	24	
16/10/22 6:15	6:15:00 AM	14	28	Birds
16/10/22 6:30	6:30:00 AM	15	28	Birds
16/10/22 6:45	6:45:00 AM	14	33	Birds ; truck
17/10/22 1:30	1:30:00 AM	1	16	Rail squeal
17/10/22 5:00	5:00:00 AM	6	17	
17/10/22 5:15	5:15:00 AM	6	18	
17/10/22 5:45	5:45:00 AM	4	19	
17/10/22 6:00	6:00:00 AM	5	17	
17/10/22 6:15	6:15:00 AM	2	16	
17/10/22 6:30	6:30:00 AM	1	16	
17/10/22 6:45	6:45:00 AM	7	21	
18/10/22 4:30	4:30:00 AM	4	19	
18/10/22 4:45	4:45:00 AM	2	20	
18/10/22 5:00	5:00:00 AM	14	19	
18/10/22 5:15	5:15:00 AM	1	19	
18/10/22 5:30	5:30:00 AM	2	17	
18/10/22 5:45	5:45:00 AM	11	21	
18/10/22 6:00	6:00:00 AM	3	18	
18/10/22 6:15	6:15:00 AM	5	20	

**Table 4.5 Berrima Cement Annual Noise Assessment 2022**Analysis of audible sources of the Sleep Disturbance parameter  $L_{A01.1min} - L_{A90.15-min} > 15$  dBAfor Night-time exceedances at the **Berrima Cement Works** North Fence monitoring location 10 to 25 October

18/10/22 6:30	6:30:00 AM	6	19	Birds; Thump ; Heavy Vehicle;
18/10/22 6:45	6:45:00 AM	5	21	
19/10/22 4:00	4:00:00 AM	2	19	Truck ; Birds
19/10/22 4:15	4:15:00 AM	1	16	
19/10/22 4:30	4:30:00 AM	1	19	
19/10/22 5:00	5:00:00 AM	9	23	
19/10/22 5:15	5:15:00 AM	6	18	
19/10/22 5:30	5:30:00 AM	9	19	
19/10/22 5:45	5:45:00 AM	5	18	
19/10/22 6:00	6:00:00 AM	10	19	
19/10/22 6:15	6:15:00 AM	5	24	
19/10/22 6:30	6:30:00 AM	14	21	
19/10/22 6:45	6:45:00 AM	13	20	
20/10/22 4:45	4:45:00 AM	10	17	
20/10/22 5:15	5:15:00 AM	6	18	
20/10/22 5:30	5:30:00 AM	2	16	
20/10/22 5:45	5:45:00 AM	6	23	
20/10/22 6:00	6:00:00 AM	2	17	
20/10/22 6:15	6:15:00 AM	4	21	
20/10/22 6:30	6:30:00 AM	7	18	
21/10/22 4:15	4:15:00 AM	4	19	Truck ; Birds
21/10/22 4:30	4:30:00 AM	11	18	Truck ; Birds ; Thump ; Car
21/10/22 4:45	4:45:00 AM	6	18	
21/10/22 5:00	5:00:00 AM	15	24	
21/10/22 5:15	5:15:00 AM	12	21	
21/10/22 5:30	5:30:00 AM	2	20	
21/10/22 5:45	5:45:00 AM	5	16	
21/10/22 6:00	6:00:00 AM	2	17	
21/10/22 6:15	6:15:00 AM	4	21	
21/10/22 6:30	6:30:00 AM	7	20	
22/10/22 4:45	4:45:00 AM	6	19	
22/10/22 5:00	5:00:00 AM	15	20	
22/10/22 5:15	5:15:00 AM	11	18	
22/10/22 5:30	5:30:00 AM	5	22	
22/10/22 6:15	6:15:00 AM	9	18	
22/10/22 6:30	6:30:00 AM	7	20	
22/10/22 6:45	6:45:00 AM	5	20	Birds ; Truck
23/10/22 4:45	4:45:00 AM	2	16	
23/10/22 5:00	5:00:00 AM	1	18	
23/10/22 5:15	5:15:00 AM	3	15	
23/10/22 5:45	5:45:00 AM	1	23	
23/10/22 6:45	6:45:00 AM	1	16	
24/10/22 4:45	4:45:00 AM	2	25	
24/10/22 5:30	5:30:00 AM	1	17	
24/10/22 5:45	5:45:00 AM	1	19	
24/10/22 6:15	6:15:00 AM	2	19	
25/10/22 4:45	4:45:00 AM	12	25	Thump ; Truck ; Birds
25/10/22 5:00	5:00:00 AM	2	32	Birds ; Truck
25/10/22 5:15	5:15:00 AM	4	25	
25/10/22 5:45	5:45:00 AM	2	16	
25/10/22 6:00	6:00:00 AM	6	17	
25/10/22 6:15	6:15:00 AM	6	17	
25/10/22 6:45	6:45:00 AM	2	18	

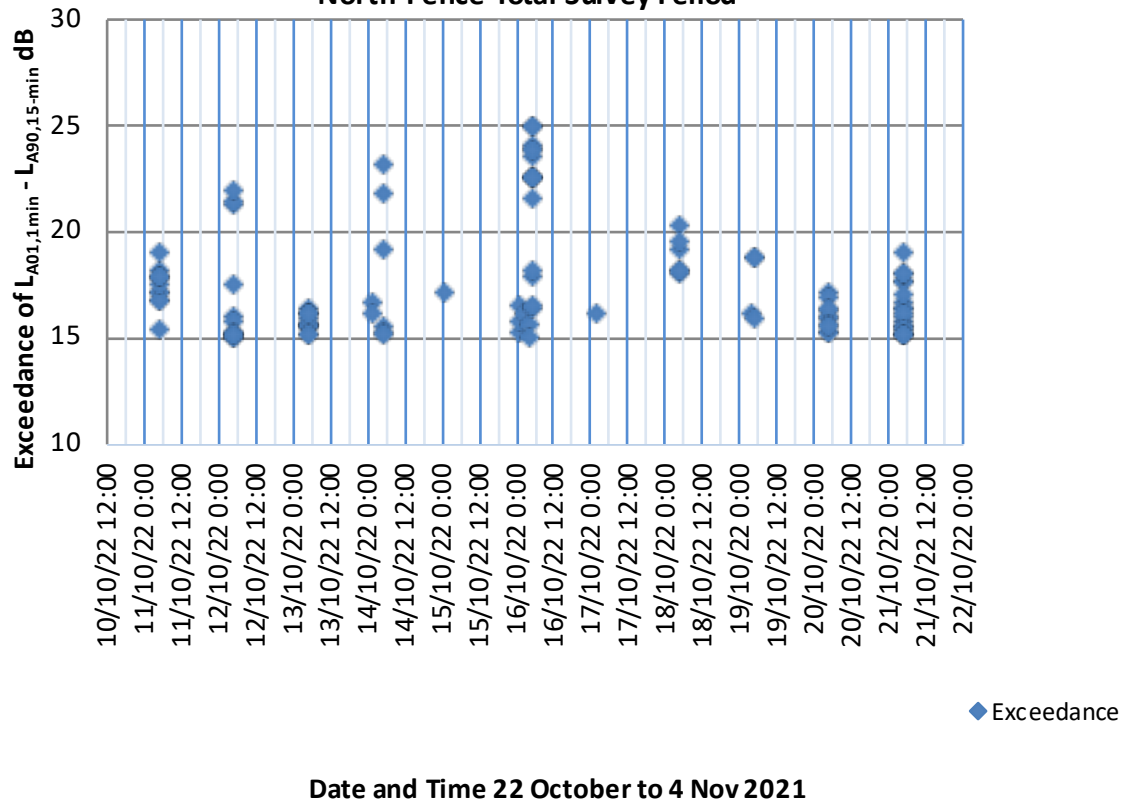
**Table 4.6 Berrima Cement Annual Noise Assessment 2022**

Statistics of audible sources of the Sleep Disturbance parameter  $L_{A01.1\text{min}} - L_{A90.15\text{-min}} > 15 \text{ dBA}$

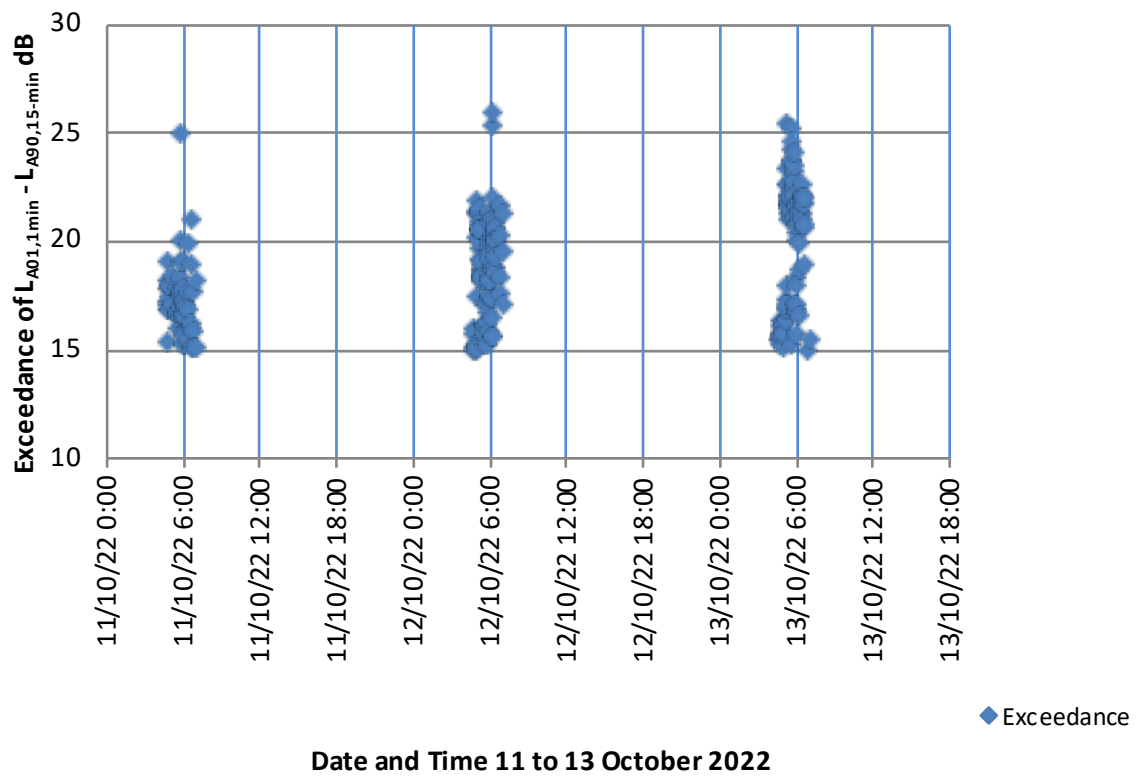
for Night-time exceedances at the **Berrima Cement Works** North Fence monitoring location 10 to 25 October 20

Date Time	Time Period	Prominent Identified Noise source	No of Occurances in the Time period
15/10/22 0:30	0	rail wagon collison	1
16/10/22 0:45	0	rail squeal	3
17/10/22 1:30	1	rail squeal	1
16/10/22 2:30	2	rail squeal	1
19/10/22 4:00	4	truck	2
21/10/22 4:15	4	birds	2
21/10/22 4:15	4	truck	2
21/10/22 4:30	4	birds	8
21/10/22 4:30	4	truck	3
25/10/22 4:45	4	birds	9
25/10/22 4:45	4	thump	2
25/10/22 4:45	4	truck	1
11/10/22 5:45	5	birds	9
12/10/22 5:00	5	birds	15
13/10/22 5:15	5	birds	4
14/10/22 5:30	5	birds	7
25/10/22 5:00	5	birds	1
15/10/22 6:00	6	birds	2
16/10/22 6:15	6	birds	4
16/10/22 6:30	6	birds	1
16/10/22 6:45	6	birds	1
18/10/22 6:30	6	birds	6
22/10/22 6:45	6	birds	5
total			90

**Figure 4.20 Boral Cement Berrima Annual Noise Assessment-Sleep Disturbance Criteria exceedances at North Fence Total Survey Period**

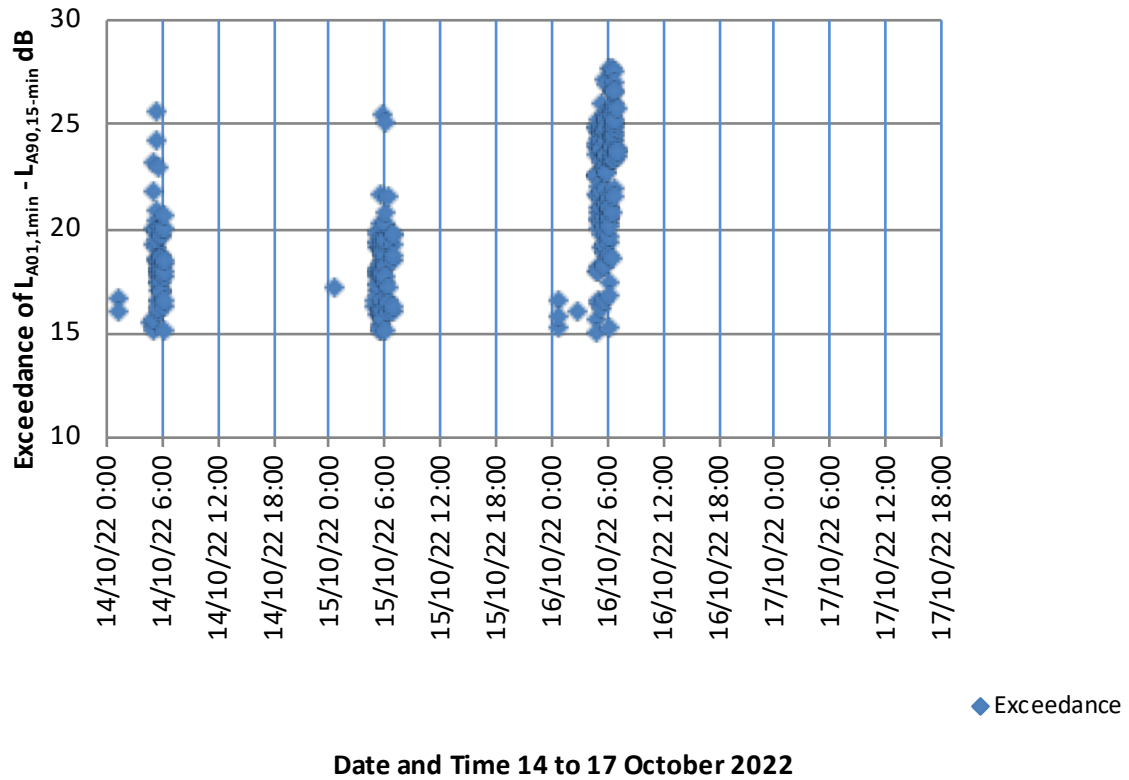


**Figure 4.21 Boral Cement Berrima Annual Noise Assessment-Sleep Disturbance Criteria exceedances at North Fence**





**Figure 4.22 Boral Cement Berrima Annual Noise Assessment-  
Sleep Disturbance Criteria exceedances at North Fence**



**Figure 4.23 Boral Cement Berrima Annual Noise Assessment  
- Sleep Disturbance Criteria exceedances at North Fence**

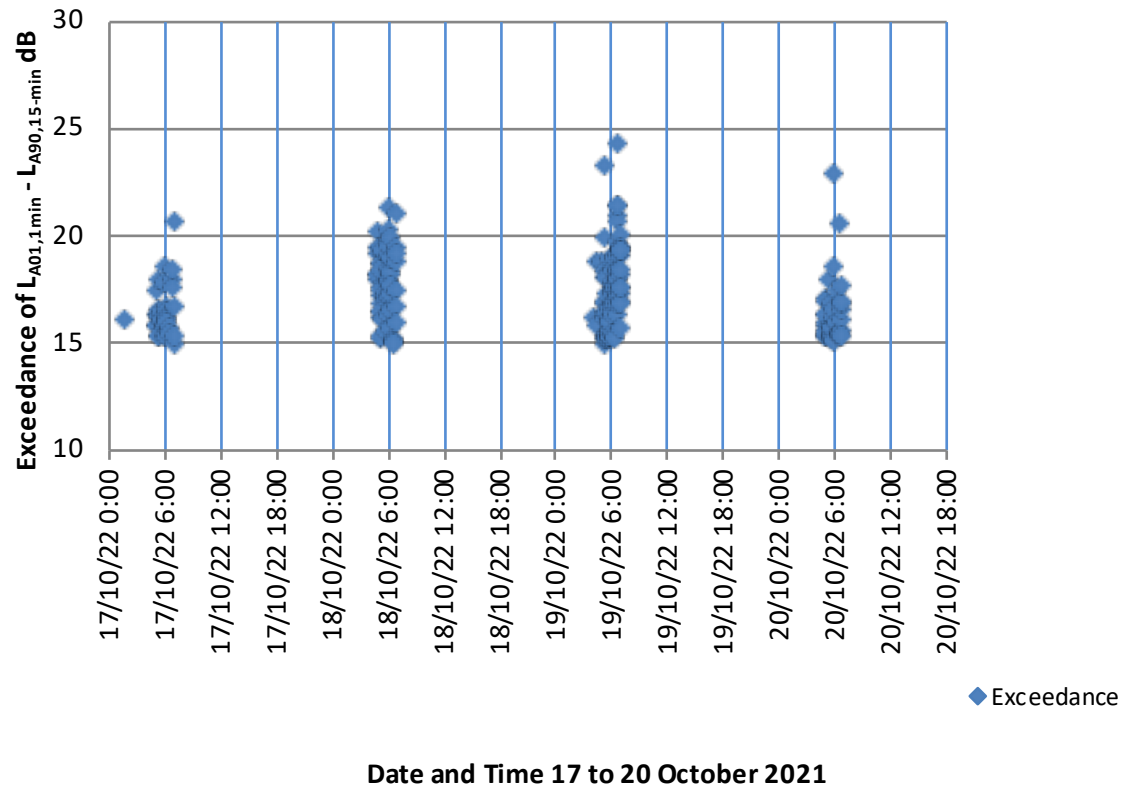


Figure 4.24 Boral Cement Berrima Annual Noise Assessment  
- Sleep Disturbance Criteria exceedances at North Fence

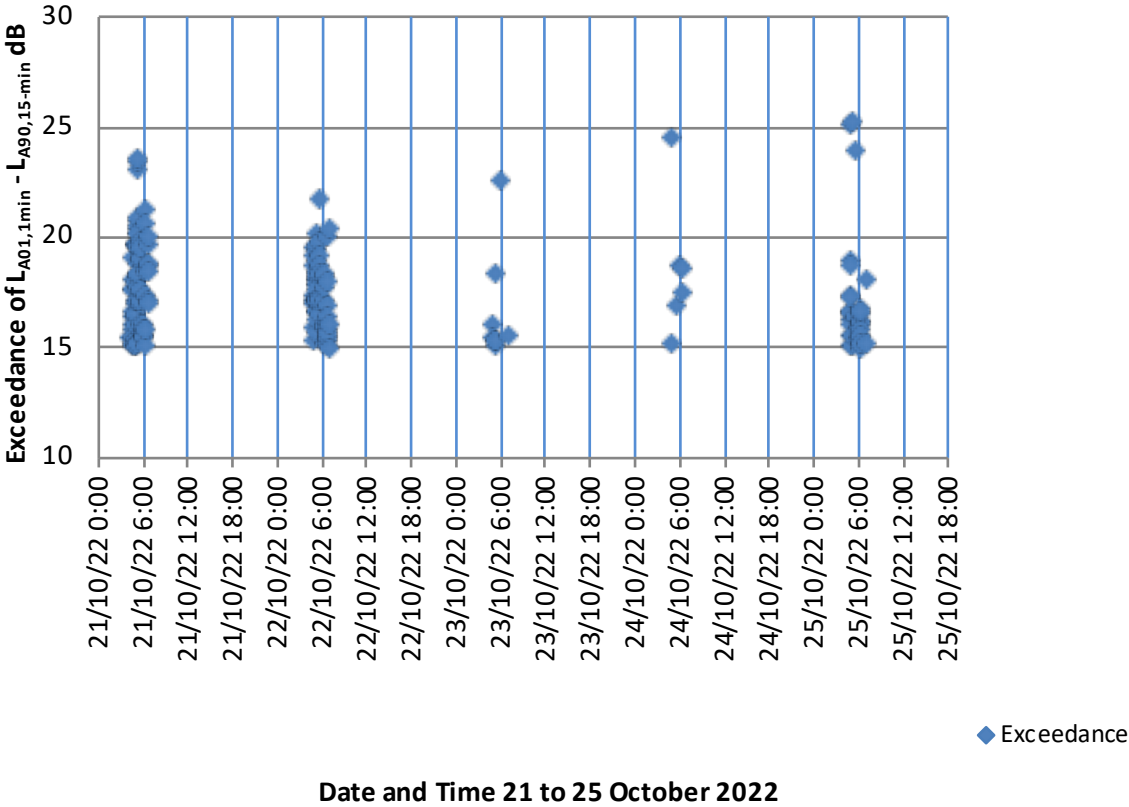


Fig 4.25 Sound Level vs Time for the 15min period 16 Oct 22 12:45am for North Fence and 4 Melbourne St

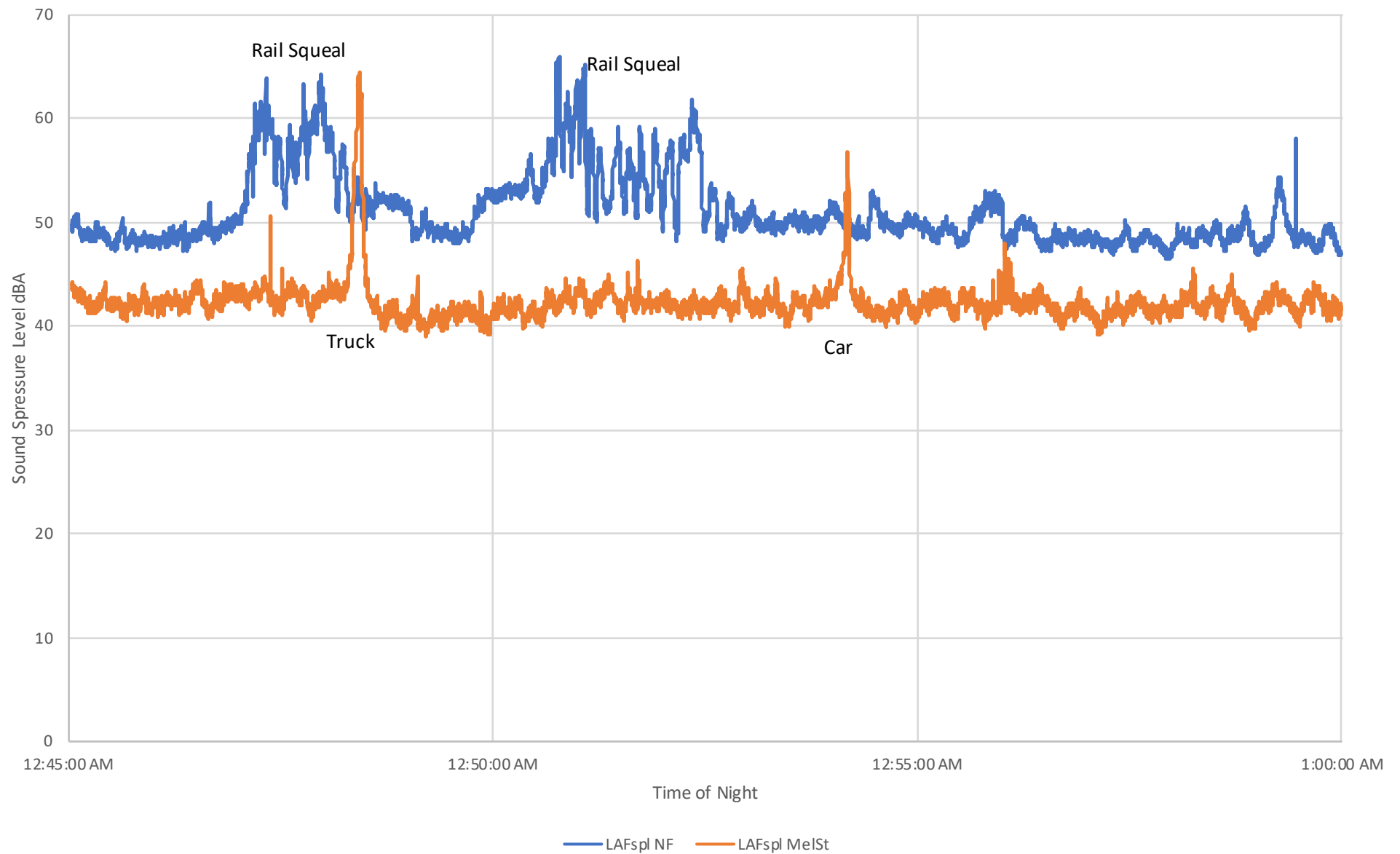
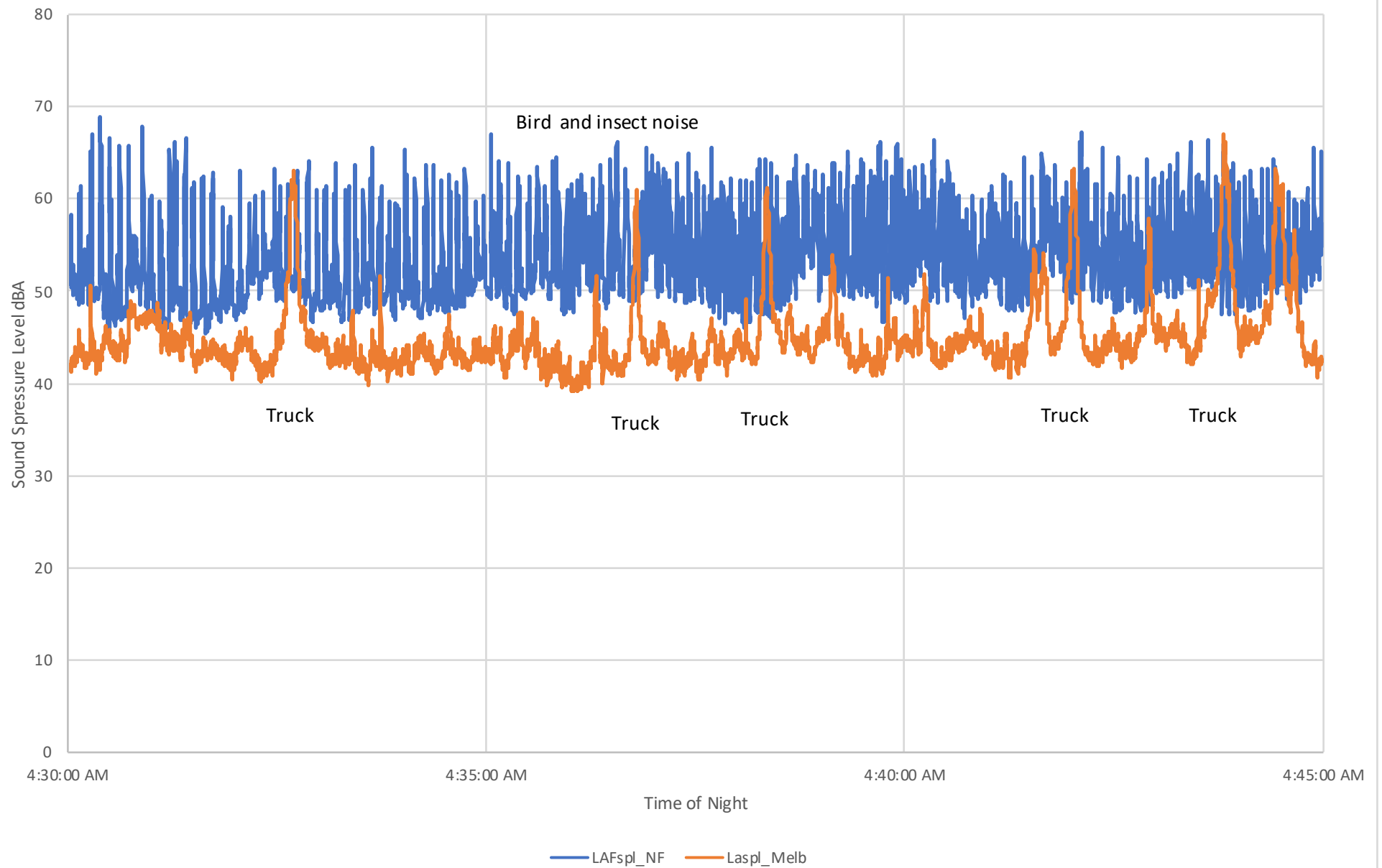


Fig 4.26

Sound Level vs Time for the 15min period 21 Oct 22 4:30am for North Fence and 4 Melbourne St



### 4.2.3 Low frequency noise

The NSW Noise Policy for Industry has a section for assessment of low frequency noise from industry as received at residential locations. This is based on an initial screening test of the C-weighted minus A-weighted  $L_{eq,15-min}$  ( $L_{Ceq}-L_{Aeq}$ ) period sound level exceeding more than 15 dB. If the screening value is exceeded a one-third octave band frequency analyses is then made of un-weighted (or Z-weighted  $L_z$ ) sound levels in the low-frequency bands from 10 Hz to 160 Hz, and compared to a specific criterion or threshold value. The values for the community attended monitoring locations are shown in Table 4.7

If the threshold levels are exceeded by up to and including 5 dB in evening or night-time, a positive adjustment of 2 dB is added to the measured sound level. If the exceedance in any band is more than 5 dB, a positive adjustment of 2 dB is added to the measured sound level for daytime and 5 dB added for evening and night-time.

The initial screening test on attended measurements indicated that exceedances were reported on eight occasions measured at 4 Melbourne Street and three occasions measured at the Northern Fence, and two occasions for 12 Brisbane St or Adelaide St near Taylor Ave (20m) in line with 72 Taylor façade (from the daytime or evening attended monitoring).

Figures of the one-third octave band spectra compared to the objectives for both  $L_{eq}$  and  $L_{90}$  spectra for Melbourne St. are shown in Appendix A figures A47 to A55 indicating the majority of the  $L_{90}$  spectra are close to or just exceeding the screening criteria of the policy.

From the measurements in the residential receiver locations, the low frequency assessment was made on the  $L_{Aeq,15-min}$  as per policy. Exceedance of the screening test were identified on three occasions out of 8 measurements for  $L_{eq,15-min}$  at 4 Melbourne St, one of the two measurements from 12 Brisbane St. and none from two from Adelaide St. For the North Fence location exceedance of the screening test occurred on all three of the measurements analysed. The North Fence analysis was used primarily to further the Low Frequency Noise propagation (LFN) investigation for the residential receiver locations, as discussed below.

Referring to Table 4.7, two of the five night-time measurements at 4 Melbourne St. had exceedances in the 40 to 160Hz bands by 7 to 15 dB, especially the 160 Hz band where both measurements had 14 and 15 dB exceedances. The North Fence data shown highlights for the same time period there was more low frequency content at 4 Melbourne St. than North Fence up to 9 dB for the 160Hz band case, consequently it can be considered that there is potentially another local LFN source other than Berrima Cement Works present in the community. It should be noted that a new petrol station has been built on the corner of Taylor Ave and Argyle St since 2020, which is about 230m from 4 Melbourne St. This establishment may have equipment working at various times throughout the night that may explain the LFN observed.

One of the other night-time measurements (16/10/22 12:45am) was identified as having 40 to 160 Hz frequency band sound levels with lower one-third octave band values at 4 Melbourne St than at the North Fence location and the exceedances are much lower. The 160Hz band level value is the same value at North Fence as 4 Melbourne St and it would be expected that the Melbourne St value would be lower than at the North Fence if that component was being emitted from the Berrima Cement Works. It should also be noted that the Adelaide St. location did not indicate any exceedances, which is closer to the works than 4 Melbourne St.

From the assessment of this survey of Low Frequency Noise, it is considered that the main source of low-frequency noise events exceeding the policy objectives for the  $L_{eq}$  measurements is from either the new petrol station on the corner of Taylor Ave and Argyle St, road traffic noise associated with passing trucks, either from within New Berrima or on distant roads and the freeway or a combination of both. The plant can be a source at times but this is not considered to be significant.

Table 4.7 Low Frequency Noise Analysis for Attended Monitoring : Community Locations

							Frequency (Hz) Criteria													Frequency (values)												
							10	13	16	20	25	32	40	50	63	80	100	125	160	10	13	16	20	25	32	40	50	63	80	100	125	160
dB(Z)							92	89	86	77	69	61	54	50	50	48	48	46	44													
							One third Octave Band Spectra													One third Octave Band Spectra Criteria values												
Description	Condition	MeasureDateTime	Laeq	Lceq	initial screening (diff >15?)	LNF	10 Hz	12_5 Hz	16 Hz	20 Hz	25 Hz	31_5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	10 Hz	12_5 Hz	16 Hz	20 Hz	25 Hz	31_5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz
4 Melbourne St	Night	16/10/2022 0:45	44	61	17.0	1	70	61	59	58	54	55	52	49	49	48	49	49	49	-22	-28	-27	-19	-15	-6	-2	-1	-1	0	1	3	5
4 Melbourne St	Night	16/10/2022 6:00	43	54	10.9	0	70	62	59	56	55	54	49	49	46	45	42	44	44	0	0	0	0	0	0	0	0	0	0	0	0	0
4 Melbourne St	Day	16/10/2022 8:00	46	58	11.8	0	70	61	60	57	58	60	55	66	56	53	53	51	55	0	0	0	0	0	0	0	0	0	0	0	0	0
4 Melbourne St	Night	19/10/2022 3:30	50	66	16.1	1	70	71	65	67	70	62	64	59	58	56	55	55	58	-22	-19	-21	-11	1	1	10	9	8	8	7	9	14
4 Melbourne St	Night	20/10/2022 1:00	48	64	16.6	1	70	71	65	66	70	60	63	57	58	56	52	53	59	-22	-18	-21	-11	1	-1	9	7	8	8	4	7	15
4 Melbourne St	Night	13/10/2022 1:00	45	59	14.0	0	70	70	65	65	64	61	63	59	59	59	56	55	59	0	0	0	0	0	0	0	0	0	0	0	0	0
12 Brisbane St	Day	10/10/2022 11:59	52	64	12.4	0	70	71	66	65	71	63	61	60	60	57	53	53	53	0	0	0	0	0	0	0	0	0	0	0	0	0
4 Melbourne St	Evening	25/10/2022 18:41	56	69	12.7	0	70	70	63	66	71	58	60	58	58	54	52	54	58	0	0	0	0	0	0	0	0	0	0	0	0	0
12 Brisbane St	Evening	25/10/2022 19:04	49	65	15.8	1	70	70	63	65	68	58	60	53	55	50	47	46	51	-22	-19	-23	-13	-1	-3	6	3	5	2	-1	0	7
Adelaide St 20m to Taylor level with front of house	Evening	25/10/2022 19:40	59	69	10.6	0	70	71	65	61	59	55	54	57	57	49	49	52	50	0	0	0	0	0	0	0	0	0	0	0	0	0
Adelaide St 20m to Taylor level with front of house	Day	10/10/2022 13:11	63	74	10.3	0	70	62	58	58	60	53	53	55	60	63	57	61	59	0	0	0	0	0	0	0	0	0	0	0	0	0
4 Melbourne St	Day	10/10/2022 11:58	56	70	13.8	0	70	61	57	57	61	52	51	47	45	45	42	42	44	0	0	0	0	0	0	0	0	0	0	0	0	0
North Fence	Night	19/10/2022 3:30	48	68	19.4	1	60	59	63	64	66	65	60	57	55	55	53	51	49	-32	-30	-24	-13	-3	4	6	7	5	7	5	5	5
North Fence	Night	20/10/2022 1:00	53	69	15.8	1	60	60	64	65	70	62	60	58	57	53	50	46	50	-32	-29	-22	-12	1	1	6	8	7	5	2	0	6
North Fence	Night	16/10/2022 0:45	53	68	15.1	1	61	60	63	64	61	61	62	61	59	60	55	53	49	-32	-29	-23	-13	-8	0	8	11	9	12	7	7	5
issues with Low freq Noise : +ve																																
exceeds 5 dB																																
Melbourne St lower than North Fence as expected for Cement Works emmissions																																
Melbourne St higher than North Fence NOT expected for Cement Works emmissions																																

### 4.3 Attended measurement results and specific receiver locations

Attended measurements were taken at the same residential locations as the unattended measurements to identify the sources of noise occurring that were audible at the time, as well as other conditions. Attended measurements were not taken on the western side of Argyle Street, because the location now adjoins a petroleum service station, which has its own noise sources. Attended monitoring was made during daytime on 10 October and daytime and evening on 25 October.

Listening attended monitoring was also done for the three logger locations for four representative night-time periods and three daytime periods using the recordings from the three logger recording sound level meters. This listening “attended monitoring” was done at each location for the same 15-minute periods. These periods were:

- Thursday 13 October 1:00 am to 1:15 am                      Night-time, all plant on
- Sunday 16 October – 12:45 to 01:00 am                      Daytime, CM 6 off, all others operating
- Sunday 16 October – 06:00 to 06:15 am                      Night-time, CM7 & Kiln 6 only on
- Sunday 16 October – 08:00 to 08:15 am                      Daytime, All plant items off
- Sunday 16 October – 08:45 to 09:00 am                      Daytime, all off except CM7
- Wednesday 19 October – 03:30 to 03:45am                      Night-time, All plant items operating
- Thursday 20 October – 01:00 to 01:15 am                      Night-time, All plant items operating

Table 4.8 provides a summary of all of the monitoring results and conditions and observations during each 15-minute period of attended or listening attended monitoring. Table 4.9 summarises these results without the comments. Figures 4.27 to 4.30 compare the statistical sound level results of  $L_{Aeq,15-min}$ ,  $L_{A90,15-min}$  and  $L_{A01,15-min}$  for each location for day, evening and night periods.

Figure 4.28 shows that Adelaide St near Taylor Avenue has the highest levels of  $L_{Aeq,15-min}$  for daytime with above 60 dBA, as well as the highest evening levels. 4 Melbourne St had the lowest daytime  $L_{Aeq,15-min}$  but the next highest evening level, although these were for one measurement close to peak-hour traffic. Night-time  $L_{Aeq,15-min}$  levels were lowest at 4 Melbourne St and highest at Location 20.

$L_{A90,15-min}$  had the same variation with the lowest at 4 Melbourne St of 35 dBA at night-time. Adelaide St had the highest  $L_{A01,15-min}$  daytime sound levels because of its proximity to Taylor Avenue and the passing vehicles. The lowest  $L_{A01,15-min}$  night-time sound level at 4 Melbourne St was 52 dBA and the highest was 60 dBA.

Figures of one-third octave band spectra and tonality spectra for all of the attended measurements are given in Appendix A the tonality figures show no measurement location had tonal criteria exceeded at frequencies below 1000 Hz. Some measurements had criteria exceeded above 1000 Hz and these were considered to be caused by birds or insects and not from the Cement Plant.

The collated results and comments for the attended measurements are also given in Appendix F.

Narrow band spectra for the attended monitoring have been prepared and are shown in Appendix E, with some major peaks in the frequency spectrum highlighted.



Attended monitoring sound recordings have been analysed for narrow-band frequency spectra, with periods of 20 seconds to 2 minutes within different parts of each recording to only include times without extraneous sources, such as vehicle passbys. These are provided in Appendix E.

#### 4.3.1 Comments on sound levels and results at residential 4 Melbourne St

Results for 4 Melbourne St attended measurements are shown in Table 4.8 and Appendices A, E and F: Environmental Noise Level Assessment Report, with unattended measurements shown in Appendix B and Table 4.1, long-term unattended results in Table 4.2. Results have been collected for this location since 2002. Attended measurements were obtained for daytime on 22 October and 4 November, and listening attended results for 23, 26, 28, 29 October and 3 November.

As reported in all previous surveys, sound levels in residential receiver areas continue to be mainly caused by road traffic noise, both on Taylor Avenue or Melbourne Street, and from the Hume Freeway at night-time. The noise emissions from the Cement Plant form the background sound levels on most occasions. Cement Plant sources audible included broad band sources such as fans and some rail operations at some times. Tonal noise was not evident on most occasions or for 15-minute sample periods. Night time  $L_{A90,15\text{-min}}$  attended sound levels ranged from 35 to 47 dBA.

One-third octave band sound levels are shown in Appendix A, with tonality graphs shown in the figures A1. The spectra are relatively broad-band with very little tonality evident in either  $L_{Aeq}$  or  $L_{A90}$  results.  $L_{Aeq}$  spectra often show higher levels at higher frequencies compared to  $L_{A90}$  results – this is caused by insect noise. None of the monitored periods for 4 Melbourne St had tonality values which exceeded the criteria.

Unattended sound levels shown on the two-day graphs of Appendix B show sound levels vary mainly diurnally with some influence from wind speed occasionally correlating with wind direction, but not all occasions, and there is little correlation of the effect from wind direction. There was also no discernible correlation of sound level with major plant source operation.

Figures 4.31 to 4.34 show the time histories of four of the listening attended monitoring periods, with annotations showing the causes of the higher sound level events. Most of the higher events were caused by passing vehicles in Taylor Avenue or birds.

For personal attended monitoring at midday on 10 October, road traffic was the main source. Major Cement Plant sources of RM7, CM6 and CM7 were not operating during the period. The  $L_{Aeq,15\text{-min}}$  was 56 dBA and the  $L_{A90,15\text{-min}}$  44 dBA. Figure A1 shows the one-third octave band spectra, with significantly higher levels for the  $L_{Aeq}$ . The  $L_{A90}$  curve is fairly flat or broadband from 160 Hz to 2000 Hz. The measurements for both parameters show the spectra were non-tonal. Narrow-band spectra in Figures E1 and E2 for a quiet period show a peaks in the spectrum at 176 Hz, related to stack fan emissions. Passing traffic was 70 to 72 dBA for trucks on Taylor Ave, 58 to 65 dBA for cars.

For the period on 13 October from 1:00am to 1:15am, major plant sources were all operating. Ambient sound levels were in the range 36-42 dBA. There was a varying oscillating noise source audible at a level of 38 to 46 dBA but the source is unknown, Trucks passing were 58 to 66 dBA. One-third octave band spectra and tonality are shown in Figure A8 and are non-tonal. Narrow-band FFT spectra are shown in figures E3.

For just after midnight on 16 October at 12:45 am to 01:00am, Cement plant source CM6 was idle but all other major sources were operating. Ambient sound levels were 40 to 42 dBA. A passing truck was 64 dBA and a car 56 dBA. A low level distant rail wheel squeal was audible for a short period at up to

44 dBA. One-third octave band spectra and tonality are shown in Figure A12 and are non-tonal. Narrow-band FFT spectra are shown in figures E4.

For the early morning of 16 October at 6:00am to 6:15am, the time history is shown in Figure 4.31. Cement plant major sources RM6, RM7, CM6 and CM7 were idle during the period. Passing road traffic noise and birds were the source of the highest sound levels, with birds being a regular source. Both were up to 60 dBA. For the 15-minute period the statistical sound levels were  $L_{Aeq,15-min}$  43 dBA and the  $L_{A90,15-min}$  35 dBA. One-third octave band spectra and tonality are shown in Figure A16 and are non-tonal. There is a much higher content of higher frequency bands in the  $L_{Aeq,15-min}$  curve from birds. Narrow-band FFT spectra are shown in figures E5 to E7. Major peaks are relatively few and at 76 Hz and 196 Hz which is related to the main stack fan emissions.

For 16 October 8:00am to 8:15am, all major cement plant sources were idle. The time history for 4 Melbourne St is shown in Figure 4.32. This shows birds, cars and trucks were the sources of the highest sound levels and the birds occurred very frequently in the period. The statistical sound levels for the period were 46  $L_{Aeq,15-min}$  and  $L_{A90,15-min}$  39 dBA. The one-third octave band spectra and tonality are shown in Figures A19, which shows highest frequencies occur in the 630 and 800 Hz bands, related to bird calls. Narrow-band FFT graphs are shown in Figures E8 to E12 for different times in the period. A range of peaks in the spectra appear with the most frequently appearing being 87 Hz, 100 Hz, 213 Hz and 694 Hz, although these do not appear at all times analysed.

For 16 October from 8:45 to 9:00am, all major cement plant sources except CM7 were idle. The time history of sound levels at 4 Melbourne St is shown in Figure 4.33. This shows a significant number of bird and car events up to 60 dBA. The statistical sound levels for the period were 47  $L_{Aeq,15-min}$  and 39 dBA  $L_{A90,15-min}$ . This is the same  $L_{A90,15-min}$  value as at 8:00am and 1 dB higher for  $L_{Aeq,15-min}$ . One-third octave band spectra and tonality graphs are shown in Figures A34, which show a high level of  $L_{Aeq,15-min}$  frequency bands above 630 Hz. Narrow-band spectra are shown for different parts of the period in Figures E13 to E16. Spectrum peaks specific to this period are shown in green text in the graphs. The main new spectral peak is at 213 Hz.

For the period on 19 October from 3:30am to 3:45 am, all major cement plant sources were operating. Figure 4.34 shows the time history of sound levels at 4 Melbourne St. Figure 4.34 shows the time history. The sound levels were very constant over the period with just variations from four truck passes and one car pass. Distant broad-band industrial noise was the background sound and there was a potential rail wheel squeal just audible at 3:43 to 3:46am. The statistical sound levels for the period were 50  $L_{Aeq,15-min}$  and 47 dBA  $L_{A90,15-min}$ . The levels had increased from 43 dBA and 38 dBA respectively from 2:00am and then dropped again after this period, but no specific sources other than the passing trucks were identified from the recorded sound. Figures E17 to E22 show the narrow band spectra for the period at different times. The major peaks identified are at 180 Hz and 694 Hz. For the section from 3:43am to 3:45am, an extended frequency range shows minor peaks in the range 3000 to 4000 Hz which could represent rail-top wheel squeal – these are at very low sound levels and would be unlikely to be audible within a residence.

For the period on 20 October from 01:00am to 01:15 am, all major cement plant sources were operating. Ambient sound levels were 46 to 48 dBA, with car pass sound levels from 53 to 58 dBA. The statistical sound levels for the period were 48  $L_{Aeq,15-min}$  and 45 dBA  $L_{A90,15-min}$ .

#### 4.3.2 Taylor Avenue – Corner Adelaide St

The location used for the attended measurements is in Adelaide Street, 20m north of Taylor Avenue which is in-line with the front façade of the residence at 72 Taylor Ave. Attended measurements were obtained for daytime on 10 October from 1:11pm and evening on 25 October from 7:40pm. Results are provided in Table 4.8. The statistical sound levels for the daytime period were 63  $L_{Aeq,15-min}$  and 47 dBA  $L_{A90,15-min}$ . For the evening period they were 59  $L_{Aeq,15-min}$  and 49 dBA  $L_{A90,15-min}$ .

One-third octave band spectra and tonality graphs are shown in Figures A3 and A40. Both sets of spectra are broadband, with the 125 and 160 Hz bands being highest in the  $L_{A90}$  spectra – this shows a combination of vehicle and plant noise.

Figures E25 to E27 show narrow band frequency analysis for the measurements. For 10 October daytime the peaks in the spectrum don't appear to match those at the North Fence or Location 20 later in the day, with the major peak from stack fan emissions at 176 to 180 Hz, noted at 4 Melbourne St, 12 Brisbane St at close to the same time, and the in-plant locations, was not evident. For the 25 October evening measurement, the peak at 179 Hz is present

As with previous assessments, road traffic noise along Taylor Avenue is the major source at this location.

$L_{Aeq}$  results for this location are controlled by motor vehicle noise passing on Taylor Avenue and whether trucks pass over bumps in the road surface.

#### 4.3.3 12 Brisbane Street

Monitoring locations used for 12 Brisbane Street were the same as in the previous measurements.  $L_{Aeq}$  results are affected by road traffic noise from Taylor Avenue and Brisbane Street. Cement Plant noise emissions also contribute at this location.

Results for attended measurements on 10 October from 11:59am and 25 October from 7:04pm are shown in Table 4.8 and Appendix F: Environmental Noise Level Assessment Report. The statistical sound levels for the daytime period were 52  $L_{Aeq,15-min}$  and 39 dBA  $L_{A90,15-min}$ . For the evening period they were 49  $L_{Aeq,15-min}$  and 45 dBA  $L_{A90,15-min}$ .

Figures A2 and A39 show graphs of the one-third octave band spectra and tonality. The daytime and evening  $L_{A90,15-min}$  spectra are highest in the 200 and 250 Hz bands and the spectra do not exceed the tonal criteria.

For the daytime on 10 October, the wind was 1 to 3m/s from the north averaging 2.5m/s. This would have reduced sound propagation from southern sources. Ambient sound levels were 35 dBA with trucks 44 to 58 dBA, cars on Taylor 44 to 55 dBA, cars local 61 to 77 dBA, a passing tractor 50 to 52 dBA, birds 43 to 52 dBA and a nearby lawn mower 50 dBA.

For the evening of 25 October, there was very light rain imminent and then commenced. Ambient sound levels were 48 dBA with a truck pass on Taylor Ave. at 58 dBA.

Narrow-band spectra are shown in figures E28 and E29 in Appendix E. For 10 October mid-day they are similar to those of 4 Melbourne St, with the highest peak at 176 Hz, but this was lower than at Melbourne St or the in-plant locations. For the evening of 25 October, the peak in the spectrum had moved to 179 Hz and was relatively higher compared to the rest of the spectrum.

#### 4.3.4 Northern Boundary

Attended sound levels at the Northern Boundary have been measured at the northern end of the store yard, adjacent to the unattended monitor.

Results for attended measurements are shown in Appendix F: Environmental Noise Level Assessment Report, and summarised in Table 4.8, with unattended measurements shown in Appendix C. Table 4.1 has long-term unattended results and the historical data in Table 4.2 and Figures 4.12. Personal attended sound levels were measured on 10 and 25 October. Listening attended monitoring was done for the same periods as for 4 Melbourne St and Location 20. Appendix A has the one-third octave band spectra and tonality assessment graphs. Both  $L_{Aeq}$  and  $L_{A90}$  spectra are non-tonal – Figures A5, A9, A13, A17, A21, A25, A29, A33 and A37. The high frequency  $L_{Aeq}$  tonal exceedances of some measurements are caused by insect noise. Statistical sound levels ranged from 48 to 56 dBA for  $L_{Aeq,15-min}$  and 43 to 52 dBA for  $L_{A90,15-min}$ .

The results are similar to those of previous years. Statistical averages are similar to the previous years and long-term averages. Long-term  $L_{Aeq}$  averages were 52 to 54 dBA for each period and within 1 dB of the overall long-term average from 2008 to 2022.  $L_{A90}$  period averages were 48 dBA for all periods. These were also the same as or 1 dB above the overall average.

Narrow band spectra are shown in Appendix E figures E30 to E52. For the attended monitoring on 10 October 174 Hz is the main peak in the spectrum, related to stack fan noise, the same as at Location 20. For the afternoon of 25 October, the main peak has moved to 180 Hz – this difference to other times would be related to fan speed variation.

For the listening attended monitoring narrow-band spectra, for some periods there are differences in the major peaks noted to those for the same period at 4 Melbourne St. For example, for 16 October from 6:00am, the major peak in the spectrum at North Fence is 75 Hz, similar to that seen at 4 Melbourne St for the same times but not evident at Location 20. The 195 Hz peak, probably from the man stack fan is seen at Location 20 and occasionally at 4 Melbourne St but not the North Fence. These differences indicate other sources may be adding peak into the narrow-band spectrum.

Taylor Avenue vehicle movement sound levels are lower at this location than for the residential locations but are still the main influence on  $L_{Aeq}$ . Site sources identified in the attended monitoring included vehicle movements, train activities and general industrial noise.

For the 13 October 1:00am period, industrial noise was the main source. An oscillating source of unknown origin was identified, along with trucks along Taylor Avenue.

For 16 October at 1:00am, as well as constant industrial noise from the plant, train movements were also audible, with a horn and occasional rail-wheel squeal noted.

For 16 October at 6:00am, birds were the major source of sound. Occasional passing truck noise from Taylor Avenue or in-plant sources were also noted.

For 8:00am on the same day when all major cement plant sources were idle, birds were the main source with occasional passing trucks.

For 8:45am on 16 October when CM7 was the only major plant item operating, birds were again the major source. The  $L_{Aeq,15-min}$  and  $L_{A90,15-min}$  were both lower than at 8:00am. There were no significant major peaks in the narrow-band spectrum that were different to those at 8:00am when all major sources were off.

For 19 October 3:30am, the major sources were industrial noise and frogs and crickets. Some rail wheel squeal observed at 4 Melbourne St during the same period were not heard. A slightly higher frequency content was noted at two occasions but the source is not known.

For 20 October at 1:00am, industrial noise and occasional rail operations noise were noted – minor rail wheel squeal, a horn and rail car shunt impact.

#### 4.3.5 Location 20 Store Yard Close location

This location has become the Environment Protection Licence noise compliance monitoring location to indicate achievement of compliance, without significant intrusion from other external noise sources (traffic) outside the plant boundary. The licence condition is for the  $L_{A90,15\text{-minutes}}$  not to exceed 58 dBA (measured according to the methods of the Noise Policy for Industry, without transient or extraneous noise sources). Objectives are also for a long-term  $L_{A90,period}$  over 7 days of 56 dBA. Earlier discussion of the results of this monitoring was provided in Section 4.2.

Results discussed in this section are for attended monitoring and associated one-third octave band and narrow-band analyses. Results of the attended monitoring are given in Table 4.8, Appendix F: Environmental Noise Level Assessment Report, and Appendix A for the one-third octave band spectra and tonality graphs. Appendix D provides the unattended sound level results and Appendix E the analysed narrow band spectra of attended sound level recordings.

Main sources were industrial noise of fans from the main parts of the plant, occasional locomotive and train movements at times (sometimes with wheel squeal) and internal traffic movements.

Figures A 6, 7, 11, 15, 19, 23, 27, 31 and 35 show the combined  $L_{Aeq,15\text{-min}}$  and  $L_{A90,15\text{-min}}$  spectra and tonality assessment. None of the spectra were found to be tonal.

Narrow-band spectra are shown in Appendix E figures E53 to E77.

Unattended sound levels shown in the two-day graphs of Appendix D show fairly constant sound levels for  $L_{Aeq,15\text{-min}}$  between 53 and 62 dBA and for  $L_{A90,15\text{-min}}$  50 to 56 dBA. Wind speed had an effect with slightly increased levels but direction less of an observable effect, on both  $L_{Aeq,15\text{-min}}$  and  $L_{A90,15\text{-min}}$  sound levels. Of more effect was operation of plant, with CM6 and CM7 idle periods giving reduced sound levels. For the occasions when the whole plant was off, sound levels were less than 50 dBA.

For the attended measurements at various times over the 14 day period, industrial noise was the major source of noise, with occasional vehicle or store yard movements.

For the period on 16 October 8:45am when only CM7 was operating, it is difficult to identify any different new narrow-band spectral peaks compared to 8:00am when all major sources were not operating. This indicates the actual relative sound levels from the major and other sources were not significant.

Attended listening monitoring is described in Table 4.8.

**Table 4.8 : Boral Cement Berrima Annual Environmental Noise Assessment 2022 - Attended Monitoring Receiver Locations 4 Melbourne St, North Fence and Location 20**

Location	Time of Day	Date	Time Start	Period	File	Statistical Sound Level - dBA								Comments
						L <sub>Aeq,t</sub>	L <sub>A01,t</sub>	L <sub>A10,t</sub>	L <sub>A90,t</sub>	L <sub>Ceq,t</sub>	L <sub>Ceq</sub> -L <sub>Aeq</sub>	L <sub>A01</sub> -L <sub>A90</sub>	L <sub>Aeq</sub> -L <sub>A90</sub>	
4 Melbourne St	Daytime	10/10/22	11:58:05 AM	15:00	1	56	68	59	44	70	14	24	12	14C, 3/8 cc, wind 1 to 3m/s N av.2.5m/s. LF noise from plant audible 160-200Hz varies on wind 8 dB over 10-15s. Quiet ambient is 43-44 ave 46-47. Distant birds, passing traffic 58-72, close bird 71
12 Brisbane St	Daytime	10/10/22	11:59:00 am	15:00	N3	52	61	50	39	64	12	22	13	Conditions: 14C, 3/8 cc, wind 1 to 3m/s N av.2.5m/s. Ambient 35 dBA. Trucks 44-58, Cars on Taylor 44 to 55, Cars local 61 to 77, Tractor 50-52, Birds 43-52, Mower 50.
Adelaide St 20m to Taylor level with front of house	Daytime	10/10/22	1:11:13 PM	15:00	4	63	75	67	47	74	10	28	16	13C, wind 0.5 to 3m/s N. Quiet 48, car passes 62-71, trucks 72-76. LF noise 160 - 200 Hz varying on wind 8 dB over 10s. Dogs 63-70, truck on road bumps 72-80
North fence	Daytime	10/10/22	3:48:13 PM	15:00	24	52	63	52	47	68	16	16	4	Quiet ambient 46 to 50. Calm, 15C, 7/8 cc. Trucks on Taylor Ave 56, distant birds, train horn to E 65. 160 Hz band varies from 30 to 40 over 10 to 15s. Hammering from shale crusher 48-51. Loco horn central crossing 61. Trucks on Taylor 66 to 68, well above plant and all at 160 Hz. TAS C80 910
Loc. 20	Daytime	10/10/22	4:47:48 PM	10:00	25	56	69	54	51	68	12	18	5	Quiet ambient 50. Passing trucks 85. Dump Station stones into hopper 60. 160 Hz varying 6 to 7, 57. Train squeal brake 56. Wind 0-1m/s E - ENE
Loc 20	Night	13/10/22	1:00:00 AM	15:00	Log	53	57	55	50	66	13	7	2	11oC, 4.8m/s NNE. Constant industrial noise Amb 50-55 (varying oscillating unknown noise)
4 Melbourne St	Night	13/10/22	1:00:00 AM	15:00	Log	45	55	44	37	59	14	18	7	Ambient 36-42, (recognize same varying oscillating noise source unknown but very low level 38 -46), Trucks passing 58 - 66
North Fence	Night	13/10/22	1:00:00 AM	15:00	Log	48	53	50	45	65	17	8	3	Constant industrial noise Amb 46-55, (varying oscillating noise source unknown), Crickets ~ 55, distant truck or heavy vehicle
North Fence	Night	16/10/22	12:45:00 AM	15:00	N4	53	62	57	48	68	15	14	5	9oC, 1.7m/s W. Cement works Ambient 47-50, insects, Train Horn, train movement, rail squeal 64 (12:52 to 12:54, Truck (Taylor) 52
Loc 20	Night	16/10/22	12:45:00 AM	15:00		56	58	57	55	68	12	4	1	Cement works Ambient 55, Train loco (145 deg - logger angle), rail car noise at 12:48 am, very stable sound level
4 Melbourne St	Night	16/10/22	12:45:00 AM	15:00		44	52	43	41	61	17	11	3	Ambient 40-42, Truck 64, Rail squeal faint and distant 44, Car 56
Loc 20	Night	16/10/22	6:00:00 AM	15:00	Log	51	62	50	47	61	11	15	4	Birds here are lower level than at North Fence and broadband industrial noise is the main source. Three trucks and one car pass. One truck pass was close at 8:56:58 to 8:57:12.
4 Melbourne St	Night	16/10/22	6:00:00 AM	15:00	Log	43	55	45	35	54	11	20	8	6oC, 1.5m/s WSW. Mostly birds and passing vehicles, with distant broad band noise.
North Fence	Night	16/10/22	6:00:00 AM	15:00	Log	55	65	59	43	61	6	22	12	Birds close by are the major sources of events. Distant trucks occasionally on 5 occasions.
Loc 20	Day	16/10/22	8:00:00 AM	15:00	Log	53	58	55	51	65	12	7	2	Birds and distant industrial noise with occasional truck noise. At 8:02:35 to 8:02:43, a vehicle stopped nearby and dropped an item. At 8:11:54 to 8:12:25 there was a car door closing nearby then restart and depart.
4 Melbourne St	Day	16/10/22	8:00:00 AM	15:00	Log	46	56	49	39	58	12	17	7	12oC, 2.8m/s WSW. All plant off. Mostly birds and passing vehicles. Distant broadband noise.
North Fence	Day	16/10/22	8:00:00 AM	15:00	Log	56	66	57	46	63	6	20	11	Mostly birds fairly close, which are responsible for all the higher event sound levels, with distant industrial broadband noise. Occasional truck pass.

**Table 4.8 : Boral Cement Berrima Annual Environmental Noise Assessment 2022 - Attended Monitoring Receiver Locations 4 Melbourne St, North Fence and Location 20**

Location	Time of Day	Date	Time Start	Period	File	Statistical Sound Level - dBA								Comments
						L <sub>Aeq,t</sub>	L <sub>A01,t</sub>	L <sub>A10,t</sub>	L <sub>A90,t</sub>	L <sub>Ceq,t</sub>	L <sub>Ceq</sub> -L <sub>Aeq</sub>	L <sub>A01</sub> -L <sub>A90</sub>	L <sub>Aeq</sub> -L <sub>A90</sub>	
Loc 20	Day	16/10/22	8:45:00 AM	15:00	Log	55	58	56	53	64	10	6	2	Birds and distant broadband industrial noise, with occasional distant vehicles audible. No significant events from other than birds.
4 Melbourne St	Day	16/10/22	8:45:00 AM	15:00	Log	47	56	51	39	58	11	17	8	130C, 3.5m/s SW. CM7 on, all else off. Birds, passing traffic and distant broad band noise.
North Fence	Day	16/10/22	8:45:00 AM	15:00	Log	52	63	54	45	62	10	19	7	Mostly birds causing the high event sound levels, as for 8:00am
Loc 20	Night	19/10/22	3:30:00 AM	15:00	Log	58	66	59	56	72	14	10	2	Not many clearly audible events. A truck pass at 3:30:54. Reversing alarm at a low level audible at 3:32:25 to 3:32:32, 3:33:18 to 3:33:35 and again at 3:44:20 to 3:44:30. Truck passing close-by from 3:43:35 to 3:43:50. Train horn at 3:34:06, then low level train movement noise from 3:44:20 to 3:44:30, with slight wheel squeal possible on two occasions.
4 Melbourne St	Night	19/10/22	3:30:00 AM	15:00	Log	50	60	50	47	66	16	12	3	12.50C, 2.5m/s NNW. Passing vehicles occasionally, mostly trucks. Distant broadband noise. Not many events and very little variation from other sources. Possibly WITN. Possible brief low level rail wheel squeal at 3:46 to 3:44am.
North Fence	Night	19/10/22	3:30:00 AM	15:00	Log	48	52	50	46	68	19	6	2	General broad-band industrial noise is the main source, with frogs and crickets. 8 vehicle passbys heard. At 3:32:02 a truck tray gate bang. At 3:34:34 a higher frequency sound heard but not identified did not change the sound level. At 3:35:32 this higher frequency sound appeared to increase slightly in level. Conveyor or Bin alarm and possible rail wheel squeal heard at 4 Melbourne St not heard from this location recording.
North Fence	Night	20/10/22	1:00:00 AM	15:00	N5	53	55	54	52	69	16	3	1	120C, 0.7m/s NE. Constant industrial noise Ambient 52-54, Train Horn 60, Rail car shunt 55-56, High frequency tone (possible Loco idle)
Loc 20	Night	20/10/22	1:00:00 AM	15:00	Log	57	60	58	56	71	14	4	1	Constant industrial noise Ambient 56-58, Train Horn 60, Rail car shunt 60-63, Rail squeal 60
4 Melbourne St	Night	20/10/22	1:00:00 AM	15:00	Log	48	51	49	45	64	17	5	2	Ambient 46-48, Car pass 53- 58
North Fence	Day	25/10/22	5:26:00 PM	15:00	N70	51	56	53	49	69	18	8	2	Conditions: Still and overcast, Cement works prominent 52, Birds 56, crickets 54, Industrial Activity: Possible Vacuum or train movement 52, Truck on Taylor 54
Location 20	Day	25/10/22	5:50:00 PM	15:00	N72	56	61	56	54	72	17	8	2	180C, 3m/s SW. Conditions: Still and overcast. Cement works prominent 54, Birds, Train loco 53 idle - 58 Accelerating, Industrial Activity: Possible Vacuum or train movement 60, Truck local 69
4 Melbourne St	Evening	25/10/22	6:41:00 PM	15:00	N74	56	68	55	47	69	13	22	9	Conditions: calm, Ambient 48, Cement works is audible, Birds 55, Highway Traffic heard, Truck on Taylor 67-71, Cars Taylor Ave 65-63, cars local 56-70, rail squeal
12 Brisbane St	Evening	25/10/22	7:04:00 PM	10:00	N76	49	55	51	45	65	16	10	4	Conditions: very light rain, Ambient 48, Truck 58
Adelaide St 20m to Taylor level with front of house	Evening	25/10/22	7:40:00 PM	15:00	N78	59	70	57	49	69	11	21	10	Conditions: very light rain, Ambient 49, Plant heard, Truck on Taylor 71, Car Local 68-77, Cars on Taylor 57-70



**Table 4.9 : Boral Cement Berrima Annual Environmental Noise Assessment 2022 - Attended Monitoring Receiver Locations, sorted for date, time and location**

Location	Time of Day	Date	Time Start	Period	File	Statistical Sound Level - dBA							
						L <sub>Aeq,t</sub>	L <sub>A01,t</sub>	L <sub>A10,t</sub>	L <sub>A90,t</sub>	L <sub>Ceq,t</sub>	L <sub>Ceq</sub> -L <sub>Aeq</sub>	L <sub>A01</sub> -L <sub>A90</sub>	L <sub>Aeq</sub> -L <sub>A90</sub>
4 Melbourne St	D	10/10/22	11:58:05 AM	15:00	1	56	68	59	44	70	14	24	12
4 Melbourne St	N	13/10/22	1:00:00 AM	15:00	Log	45	55	44	37	59	14	18	7
4 Melbourne St	N	16/10/22	12:45:00 AM	15:00		44	52	43	41	61	17	11	3
4 Melbourne St	N	16/10/22	6:00:00 AM	15:00	Log	43	55	45	35	54	11	20	8
4 Melbourne St	D	16/10/22	8:00:00 AM	15:00	Log	46	56	49	39	58	12	17	7
4 Melbourne St	D	16/10/22	8:45:00 AM	15:00	Log	47	56	51	39	58	11	17	8
4 Melbourne St	N	19/10/22	3:30:00 AM	15:00	Log	50	60	50	47	66	16	12	3
4 Melbourne St	N	20/10/22	1:00:00 AM	15:00	Log	48	51	49	45	64	17	5	2
4 Melbourne St	E	25/10/22	6:41:00 PM	15:00	N74	56	68	55	47	69	13	22	9
Loc. 20	D	10/10/22	4:47:48 PM	10:00	25	56	69	54	51	68	12	18	5
Loc 20	N	13/10/22	1:00:00 AM	15:00	Log	53	57	55	50	66	13	7	2
Loc 20	N	16/10/22	12:45:00 AM	15:00		56	58	57	55	68	12	4	1
Loc 20	N	16/10/22	6:00:00 AM	15:00	Log	51	62	50	47	61	11	15	4
Loc 20	D	16/10/22	8:00:00 AM	15:00	Log	53	58	55	51	65	12	7	2
Loc 20	D	16/10/22	8:45:00 AM	15:00	Log	55	58	56	53	64	10	6	2
Loc 20	N	19/10/22	3:30:00 AM	15:00	Log	58	66	59	56	72	14	10	2
Loc 20	N	20/10/22	1:00:00 AM	15:00	Log	57	60	58	56	71	14	4	1
Loc 20	D	25/10/22	5:50:00 PM	15:00	N72	56	61	56	54	72	17	8	2
North Fence	D	10/10/22	3:48:13 PM	15:00	24	52	63	52	47	68	16	16	4
North Fence	N	13/10/22	1:00:00 AM	15:00	Log	48	53	50	45	65	17	8	3
North Fence	N	16/10/22	12:45:00 AM	15:00	N4	53	62	57	48	68	15	14	5
North Fence	N	16/10/22	6:00:00 AM	15:00	Log	55	65	59	43	61	6	22	12
North Fence	D	16/10/22	8:00:00 AM	15:00	Log	56	66	57	46	63	6	20	11
North Fence	D	16/10/22	8:45:00 AM	15:00	Log	52	63	54	45	62	10	19	7
North Fence	N	19/10/22	3:30:00 AM	15:00	Log	48	52	50	46	68	19	6	2
North Fence	N	20/10/22	1:00:00 AM	15:00	N5	53	55	54	52	69	16	3	1
North Fence	D	25/10/22	5:26:00 PM	15:00	N70	51	56	53	49	69	18	8	2
Adelaide St 20m to Taylor	D	10/10/22	1:11:13 PM	15:00	4	63	75	67	47	74	10	28	16
Adelaide St 20m to Taylor	E	25/10/22	7:40:00 PM	15:00	N78	59	70	57	49	69	11	21	10
12 Brisbane St	D	10/10/22	11:59:00 am	15:00	N3	52	61	50	39	64	12	22	13
12 Brisbane St	E	25/10/22	7:04:00 PM	10:00	N76	49	55	51	45	65	16	10	4



Figure 4.27: Boral Cement Berrima Annual Environmental Noise October 2022 -  
Summary of Attended Monitoring Statistical Sound Levels

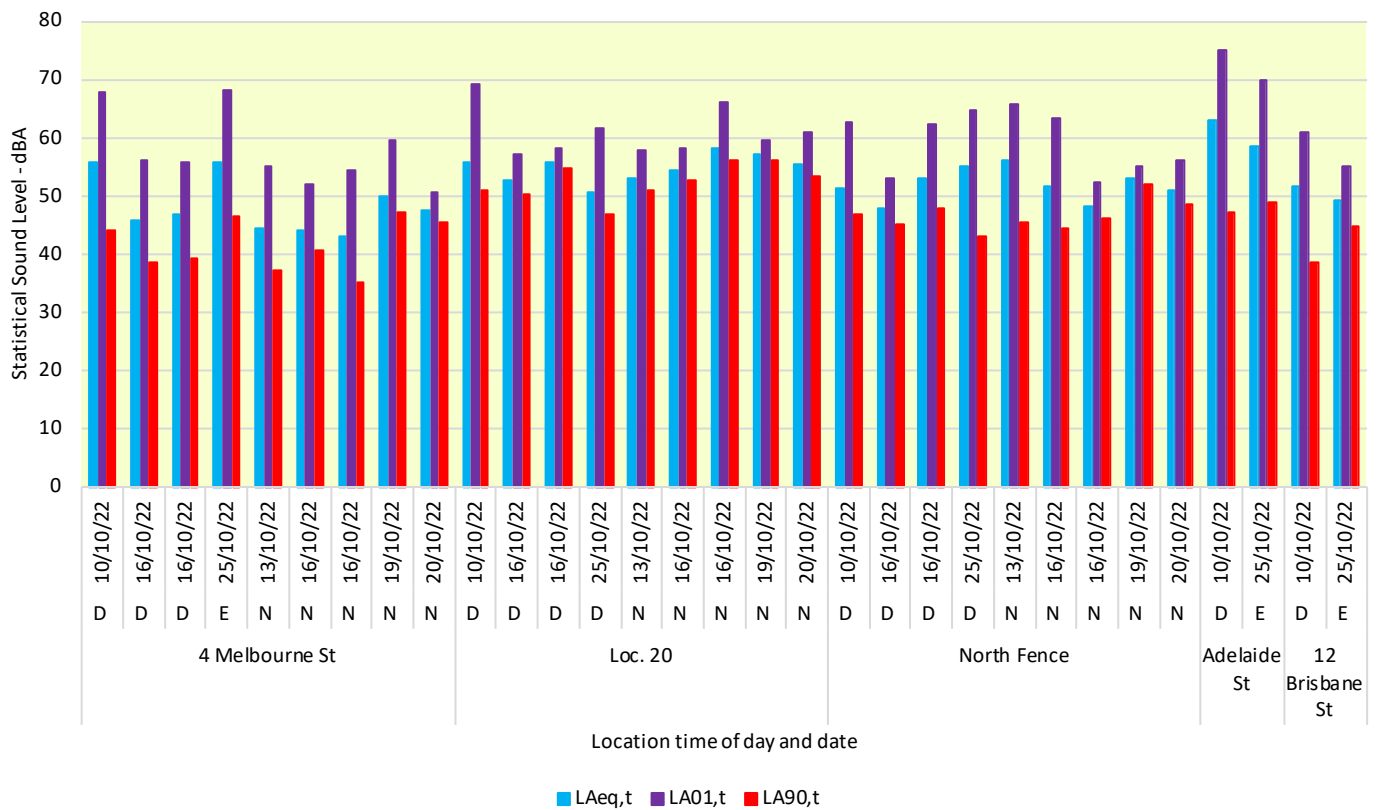


Figure 4.28: Boral Cement Berrima Annual Environmental Noise October 2022 -  
Summary of Attended Monitoring Statistical Sound Levels LAeq,15-min

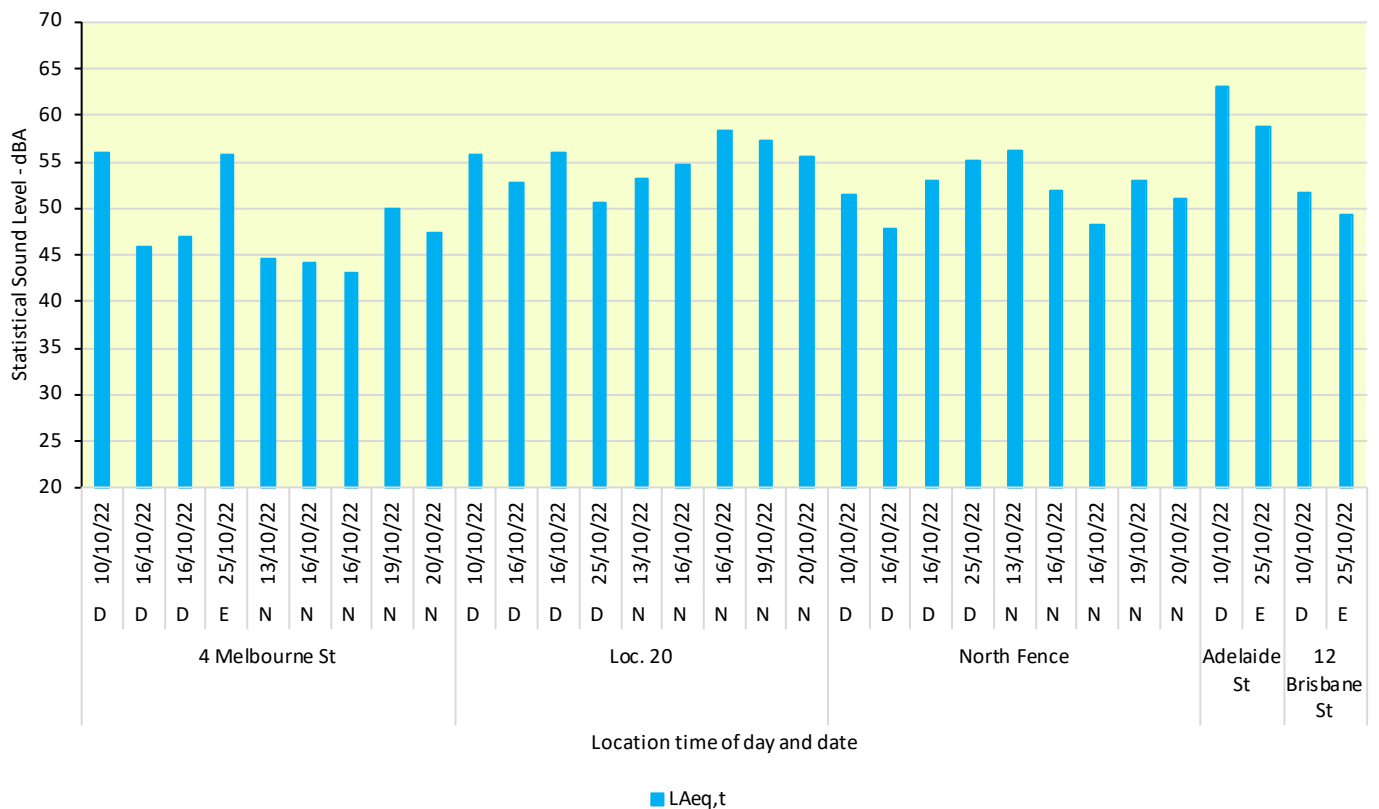


Figure 4.29: Boral Cement Berrima Annual Environmental Noise October 2022 -  
Summary of Attended Monitoring Statistical Sound Levels LA90,15-min

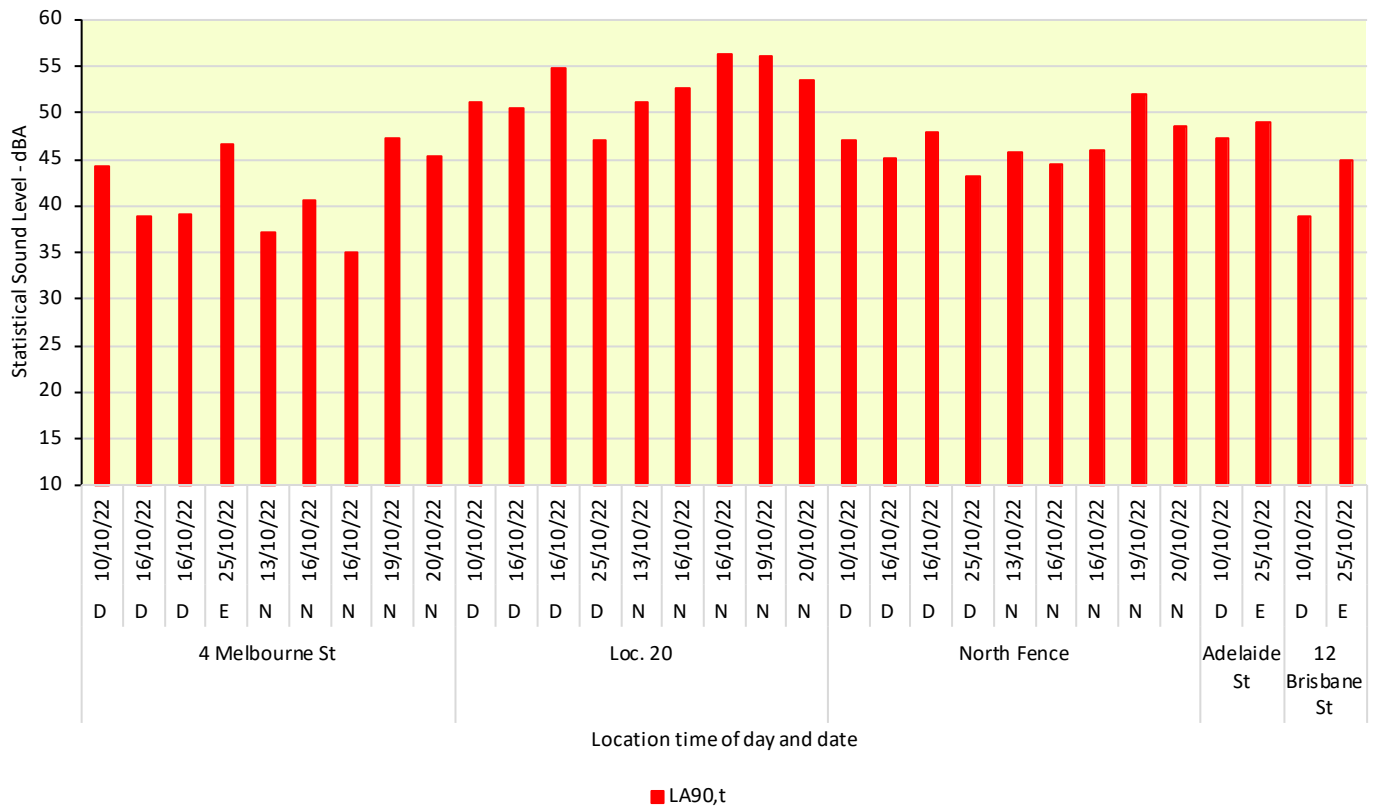


Figure 4.30 : Boral Cement Berrima Annual Environmental Noise October 2022 -  
Summary of Attended Monitoring Statistical Sound Levels LA01,15-min

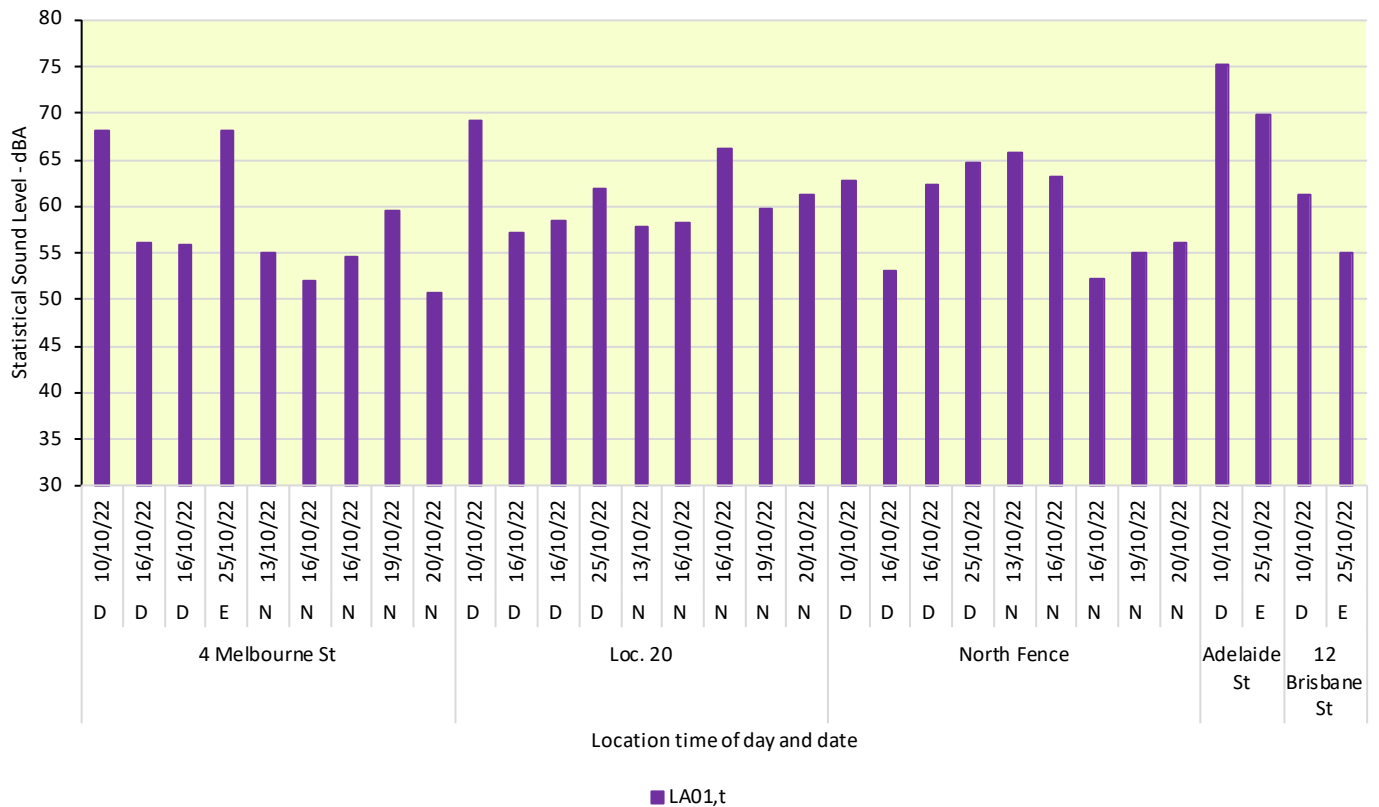


Figure 4.31: Berirma Cement 2022 Annual Environmental Noise Assessment October 2022 -  
4 Melbourne Street 6:00 to 6:15am 16 October 2022S

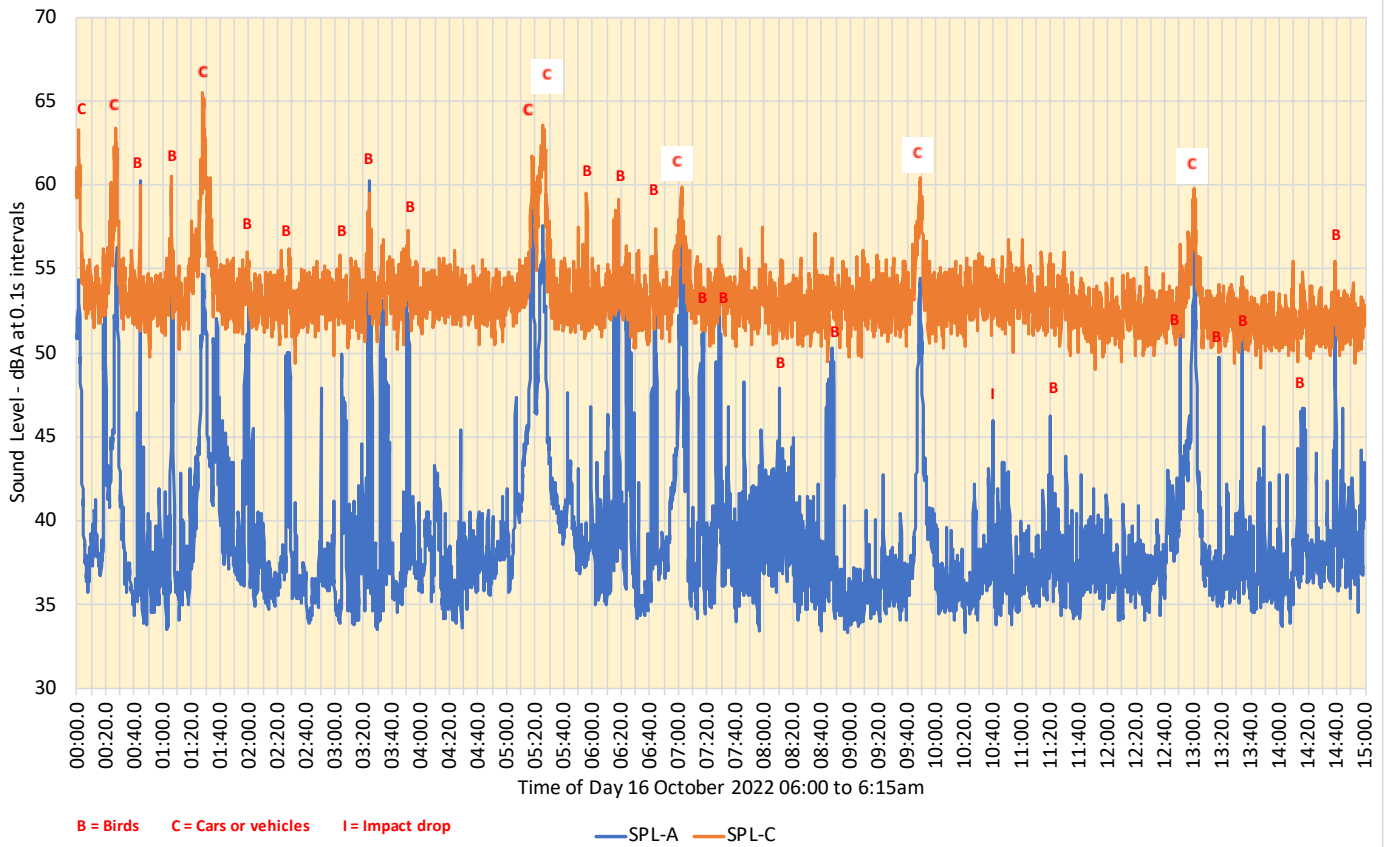


Figure 4.31A: Berirma Cement 2022 Annual Environmental Noise Assessment October 2022 -  
4 Melbourne Street 6:00 to 6:15am 16 October 2022S

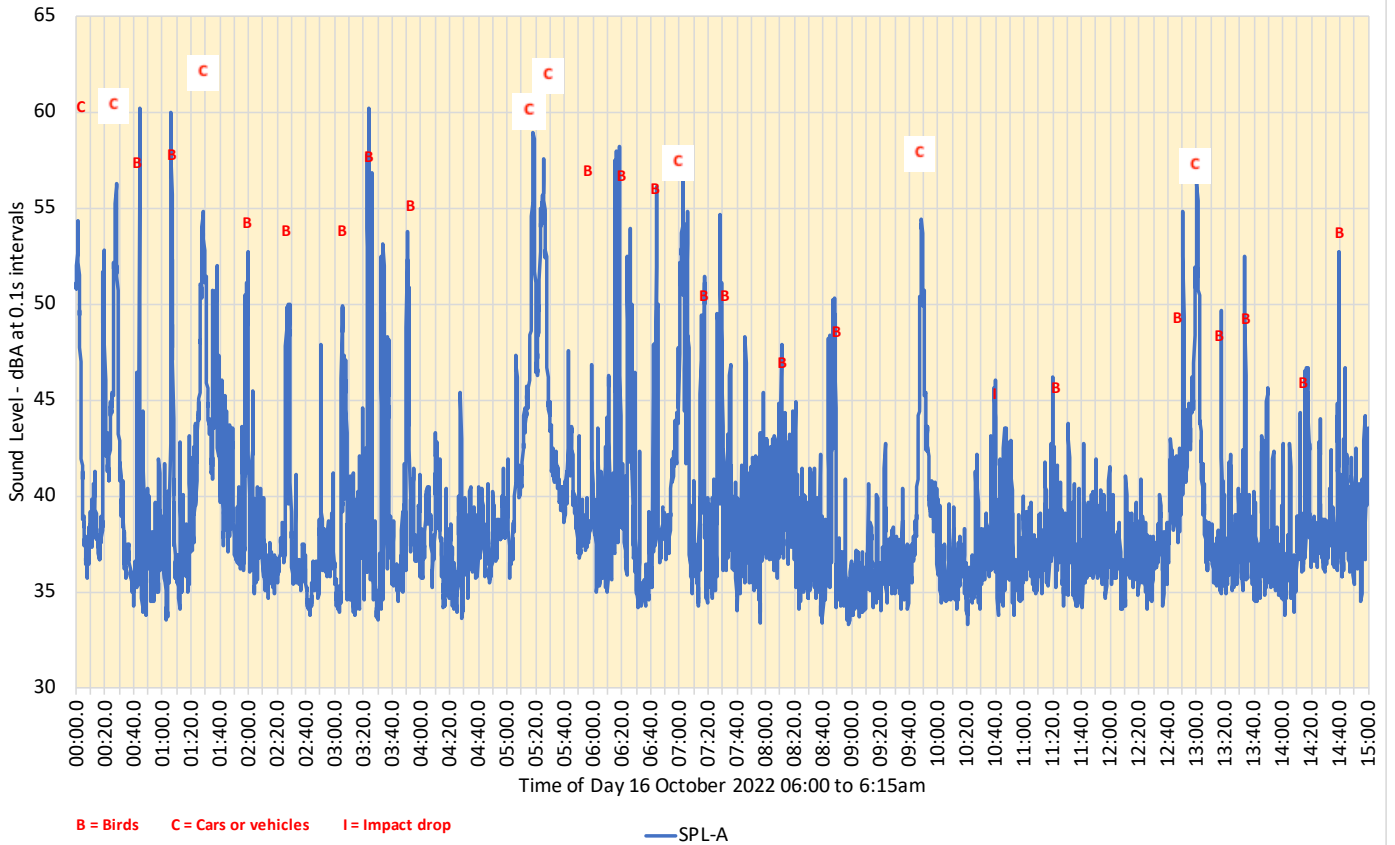


Figure 4.32: Berrima Cement 2022 Annual Environmental Noise Assessment October 2022  
4 Melbourne St 16/10/2022 8:00am to 8:15am

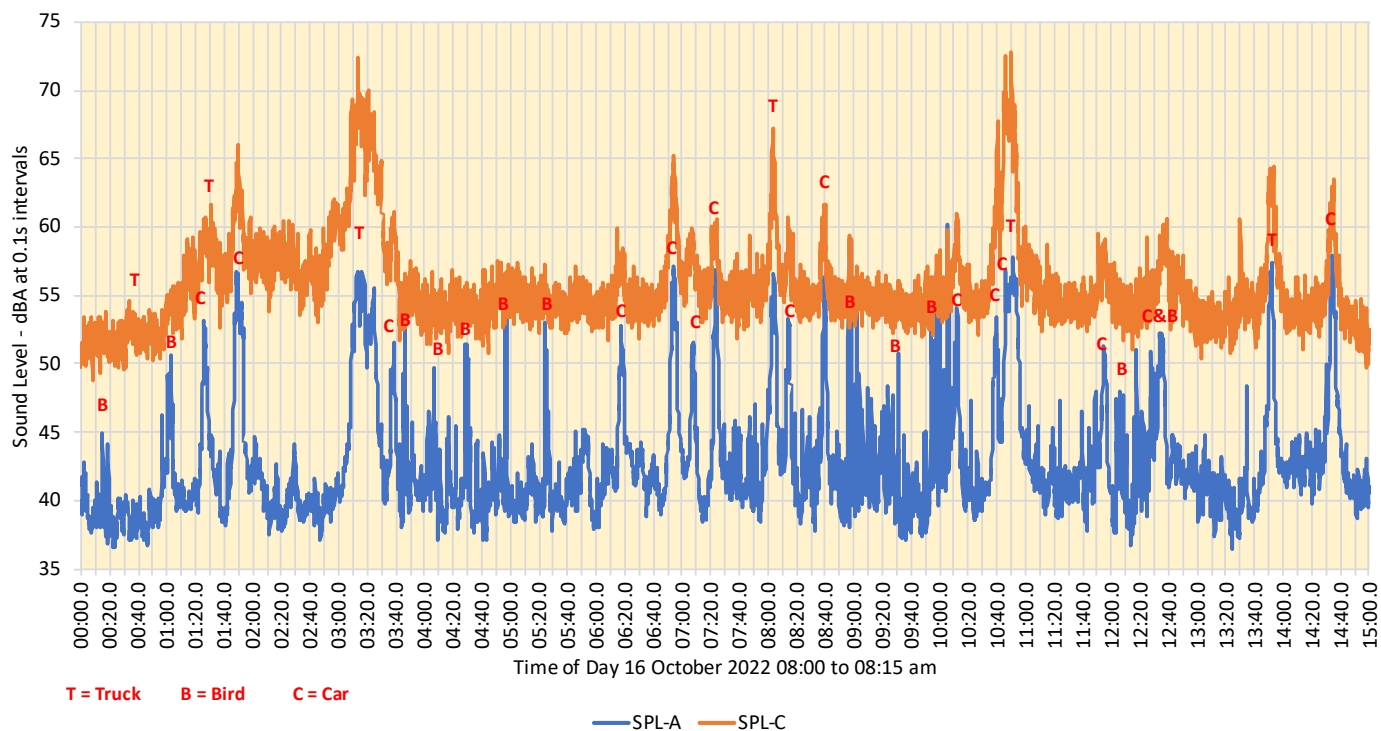
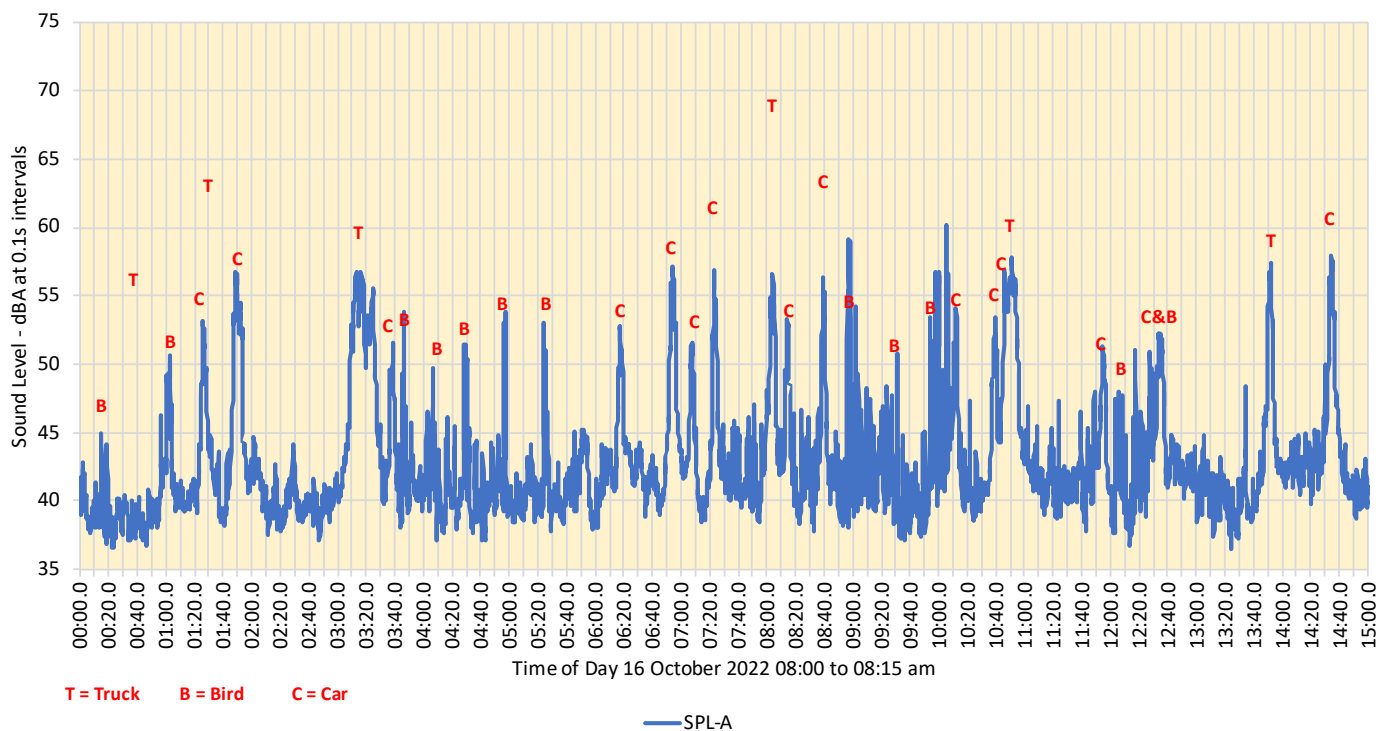
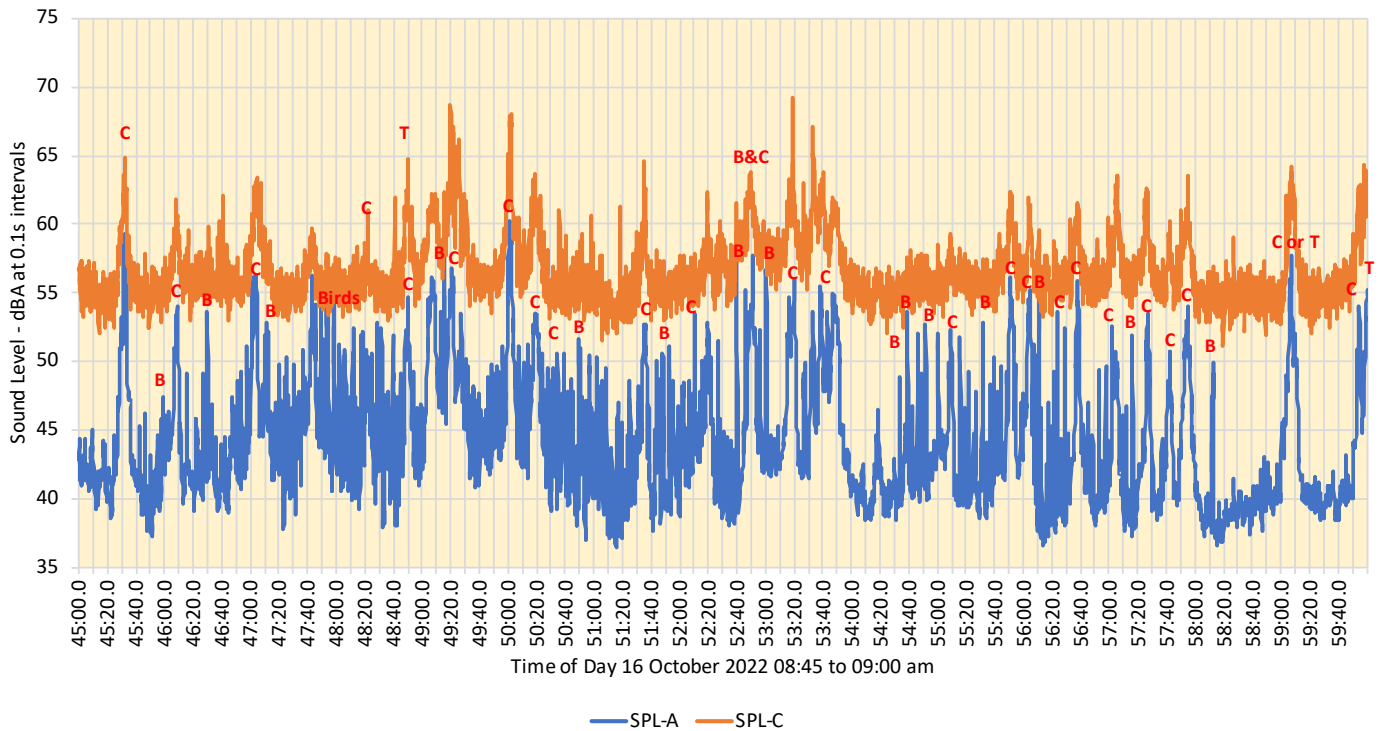


Figure 4.32A: Berrima Cement 2022 Annual Environmental Noise Assessment October 2022  
4 Melbourne St 16/10/2022 8:00am to 8:15am



4 Melbourne St 16/10/2022 8:45am to 9:00am



4 Melbourne St 16/10/2022 8:45am to 9:00am

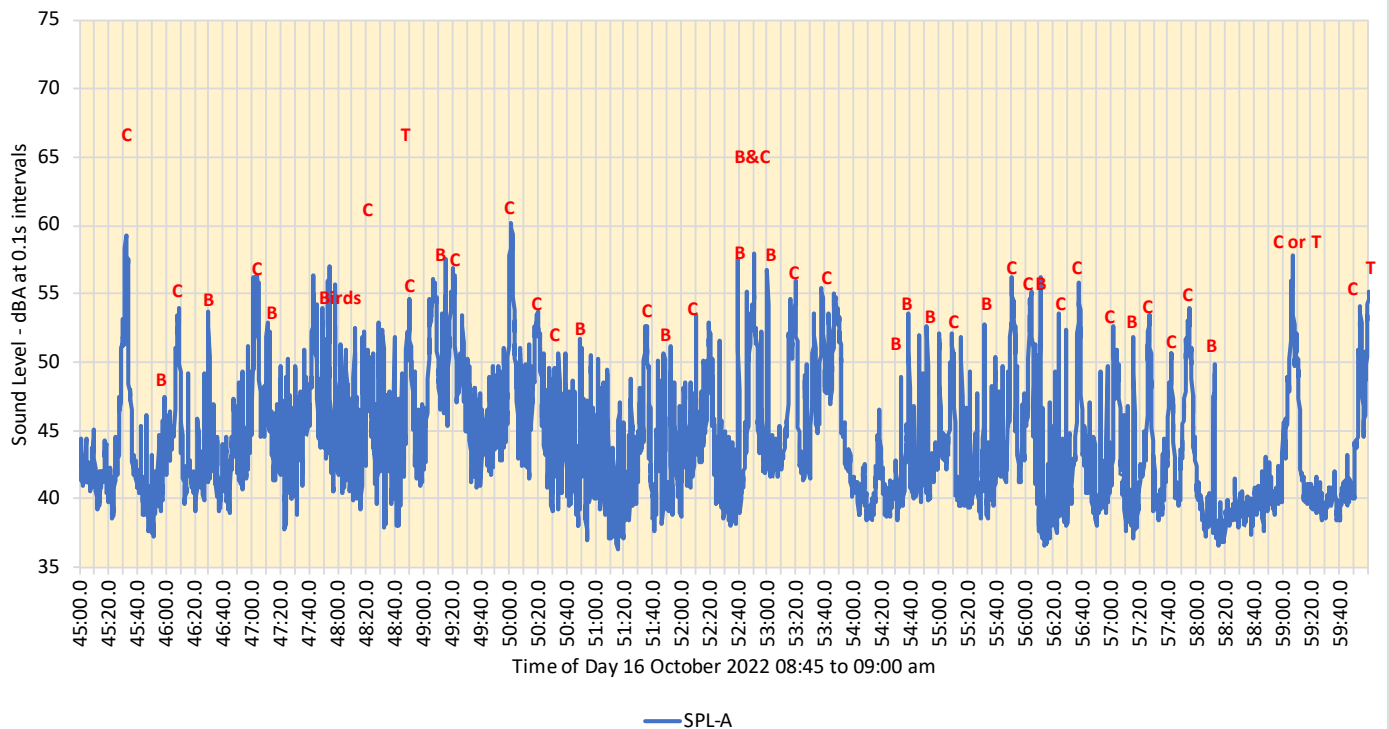


Figure 4.34: Boral Cement Berrima Annual Environmental Noise Assessment 2022 4  
Melbourne St 19 October 2022 3:30 am 3:45am

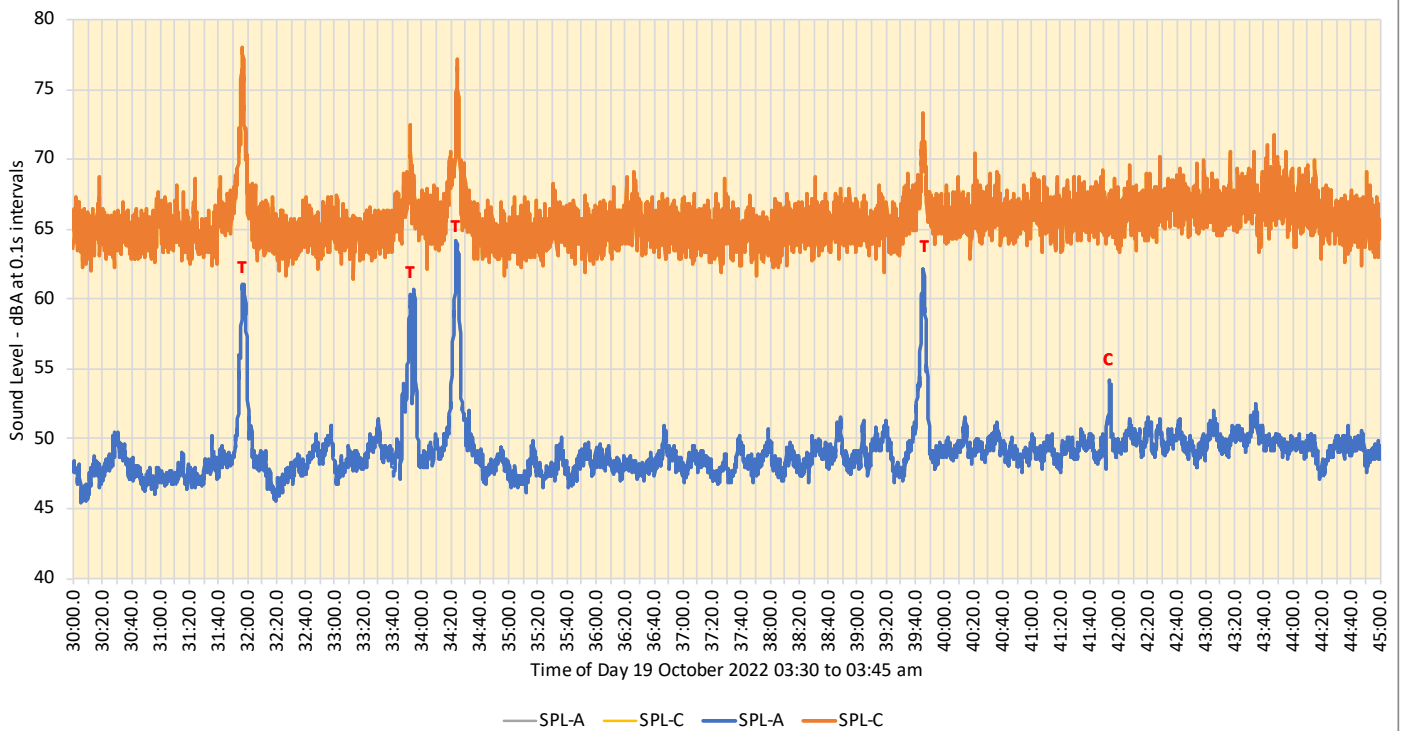
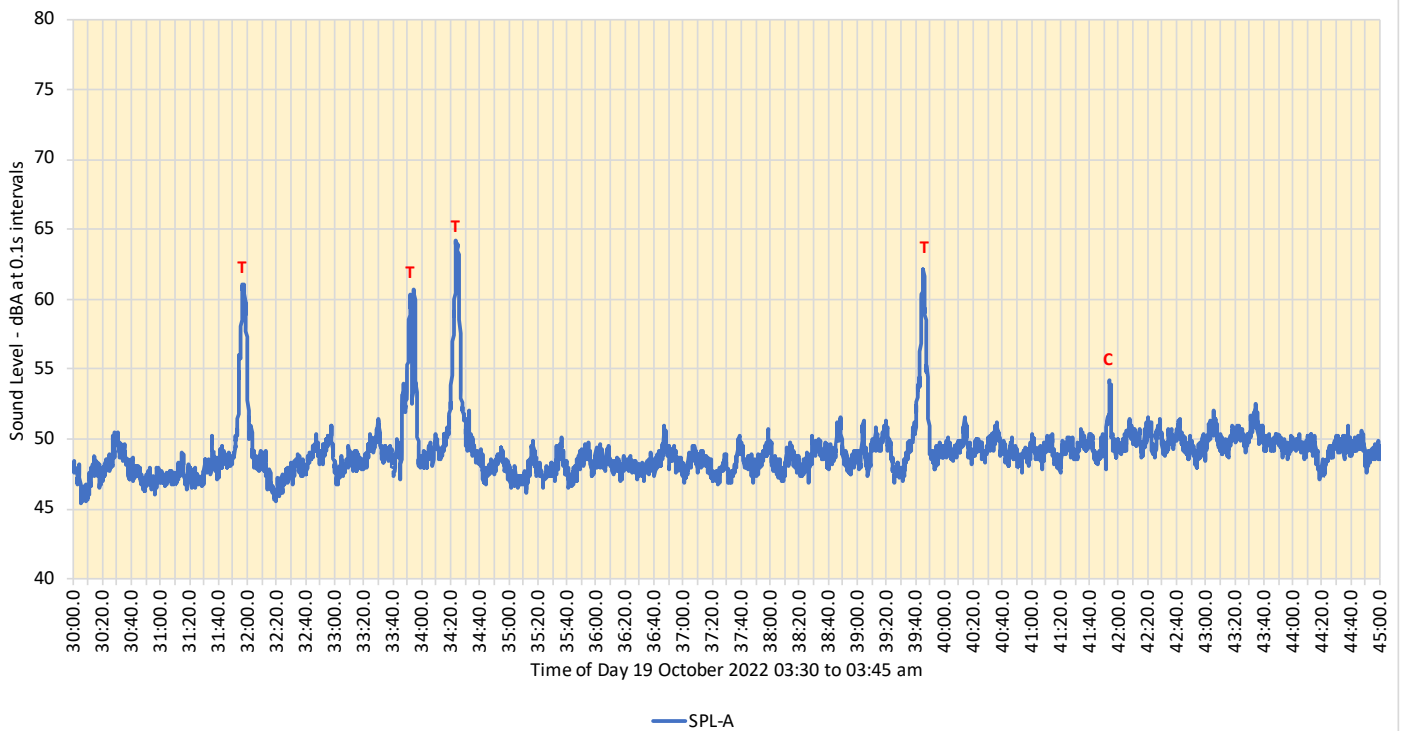


Figure 4.34A: Boral Cement Berrima Annual Environmental Noise Assessment 2022 4  
Melbourne St 19 October 2022 3:30 am 3:45am



## 5 Summary and Conclusions

The Boral Cement Berrima works has a single noise limit condition for the total site, of  $L_{A90,15\text{-minute}}$  not greater than 58 dBA at Location 20 in the Store Yard. Monitoring for total site emissions at Location 20 over a 14 day period in October 2022 has again confirmed that total site emissions are in compliance with the licence condition, as has occurred in 2019 to 2021 annual assessments. The times when that sound level limit was exceeded at the site were caused by short-term extraneous noise sources not relevant to the compliance assessment.

Sound levels at the plant and in the residential community affected by the noise emissions from the total site have been measured regularly since 2002. Monitoring of both site source sound levels and residential receiver sound levels on an annual basis from 2008 to 2021 confirmed that sound levels of site sources did not change or increase significantly over that time.

The annual environmental noise assessment has evaluated noise emission from the Cement Plant by the following methods:

- Monitoring of sound levels at Location 20 for compliance assessment;
- Monitoring of sound levels in one residential receiver location with unattended monitoring over long-term periods of two weeks and attended monitoring in day, evening and night-time at three residential receiver locations, and listening monitoring at three locations to compare with long-term averages from previous years and assess the audible acceptability of the received sound levels.

**The finding of this 2022 annual environmental noise assessment is that total site noise emissions are considered to be in compliance with the licence condition.**

**It is also the finding of this assessment that the long-term average statistical sound levels have not increased significantly and this indicates that the Cement Plant is not increasing its noise emissions.**

Assessment of tonality of received sound levels was made at each of the monitored locations using the one-third octave band methods of the 2017 NSW Noise Policy for Industry. The assessment identified that there were no received sound level spectra having tonal qualities related to Cement Plant noise sources.

Measurements at the North Fence boundary location also assessed potential sleep disturbance and low-frequency impacts according to the 2017 release of the Noise Policy for Industry.

Calculations of sleep disturbance potential use  $L_{A01,1\text{-minute}} - L_{A90,15\text{-minute}}$  at night-time to provide comparisons with recommended maximum values for night-time of 60 dBA for  $L_{A01,1\text{-minute}}$  night-time for the Northern Boundary location and not greater than 15 dB difference for  $L_{A01,1\text{-minute}} - L_{A90,15\text{-minute}}$ . From the analyses it is considered that the number or times that the objectives of  $L_{A01,1\text{-minute}}$  greater than 60 dBA and  $L_{A01,1\text{-minute}} - L_{A90,15\text{-minute}}$  difference results greater than 15 dB related to the Cement Plant activities and noise emissions, are relatively low, especially in comparison to other noise sources such as passing trucks and vehicles and birds in the early morning. It is considered the noise emissions from the Cement Plant have a low potential for sleep disturbance. Only warning signals from train horns and occasional train operation noise were likely to cause the 60 dBA objective to be exceeded.



For low frequency assessment, an initial screening test is made of the C-weighted minus A-weighted ( $L_C - L_A$ ) period sound level exceeding more than 15 dB. If the screening value is exceeded a one-third octave band frequency analyses is then made of un-weighted (or Z-weighted  $L_z$ ) sound levels in the low-frequency bands from 10 Hz to 160 Hz, compared to a specific value.

From the assessment of this survey of Low Frequency Noise, it is considered that the main source of low-frequency noise events exceeding the policy objectives for the  $L_{eq}$  measurements is from either the new petrol station on the corner of Taylor Ave and Argyle St, road traffic noise associated with passing trucks, either from within New Berrima or on distant roads and the freeway or a combination of both. The plant can be a source at times but this is not considered to be significant.

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Boral Cement

Annual Environmental Noise  
Assessment  
October 2022  
Appendix Volume

For

Berrima Cement Plant

31 December, 2022



# Table of Contents

Appendices . . . . .	1
Appendix A: One-third octave band frequency spectra of measurements and tonality graphs . . . . .	2
Appendix B: Unattended environmental sound level results for 4 Melbourne Street . . . . .	52
Appendix C: Unattended environmental sound level results for Northern Boundary . . . . .	66
Appendix D: Unattended environmental sound level results for Compliance Monitoring Location 20 Store Yard Close. . . . .	80
Appendix E: Narrow-band spectra from attended measurement recordings . . . . .	94
Appendix F: Attended monitoring results . . . . .	172

## **Appendices**

### **Appendix A: One-third octave band frequency spectra of measurements and tonality graphs**

### **Appendix B: Unattended environmental sound level results for 4 Melbourne Street**

### **Appendix C: Unattended environmental sound level results for Northern Boundary**

### **Appendix D: Unattended environmental sound level results for Compliance Monitoring Location 20 - Store Yard Close**

### **Appendix E: Narrow-band spectra from attended measurement recordings**

### **Appendix F: Attended monitoring results**

## **Appendix A: One-third octave band frequency spectra of measurements and tonality graphs**

**Table 4.8 : Boral Cement Berrima Annual Environmental Noise Assessment 2022 - Attended Monitoring Receiver Locations 4 Melbourne St, North Fence and Location 20**

Location	Time of Day	Date	Time Start	Period	File	Statistical Sound Level - dBA								Comments
						L <sub>Aeq,t</sub>	L <sub>A01,t</sub>	L <sub>A10,t</sub>	L <sub>A90,t</sub>	L <sub>Ceq,t</sub>	L <sub>Ceq</sub> -L <sub>Aeq</sub>	L <sub>A01</sub> -L <sub>A90</sub>	L <sub>Aeq</sub> -L <sub>A90</sub>	
4 Melbourne St	Daytime	10/10/22	11:58:05 AM	15:00	1	56	68	59	44	70	14	24	12	14C, 3/8 cc, wind 1 to 3m/s N av.2.5m/s. LF noise from plant audible 160-200Hz varies on wind 8 dB over 10-15s. Quiet ambient is 43-44 ave 46-47. Distant birds, passing traffic 58-72, close bird 71
12 Brisbane St	Daytime	10/10/22	11:59:00 am	15:00	N3	52	61	50	39	64	12	22	13	Conditions: 14C, 3/8 cc, wind 1 to 3m/s N av.2.5m/s. Ambient 35 dBA. Trucks 44-58, Cars on Taylor 44 to 55, Cars local 61 to 77, Tractor 50-52, Birds 43-52, Mower 50.
Adelaide St 20m to Taylor level with front of house	Daytime	10/10/22	1:11:13 PM	15:00	4	63	75	67	47	74	10	28	16	13C, wind 0.5 to 3m/s N. Quiet 48, car passes 62-71, trucks 72-76. LF noise 160 - 200 Hz varying on wind 8 dB over 10s. Dogs 63-70, truck on road bumps 72-80
North fence	Daytime	10/10/22	3:48:13 PM	15:00	24	52	63	52	47	68	16	16	4	Quiet ambient 46 to 50. Calm, 15C, 7/8 cc. Trucks on Taylor Ave 56, distant birds, train horn to E 65. 160 Hz band varies from 30 to 40 over 10 to 15s. Hammering from shale crusher 48-51. Loco horn central crossing 61. Trucks on Taylor 66 to 68, well above plant and all at 160 Hz. TAS C80 910
Loc. 20	Daytime	10/10/22	4:47:48 PM	10:00	25	56	69	54	51	68	12	18	5	Quiet ambient 50. Passing trucks 85. Dump Station stones into hopper 60. 160 Hz varying 6 to 7 , 57 . Train squeal brake 56. Wind 0-1m/s E - ENE
Loc 20	Night	13/10/22	1:00:00 AM	15:00	Log	53	57	55	50	66	13	7	2	11oC, 4.8m/s NNE. Constant industrial noise Amb 50-55 (varying oscillating unknown noise)
4 Melbourne St	Night	13/10/22	1:00:00 AM	15:00	Log	45	55	44	37	59	14	18	7	Ambient 36-42, (recognize same varying oscillating noise source unknown but very low level 38 -46), Trucks passing 58 - 66
North Fence	Night	13/10/22	1:00:00 AM	15:00	Log	48	53	50	45	65	17	8	3	Constant industrial noise Amb 46-55, (varying oscillating noise source unknown), Crickets ~ 55, distant truck or heavy vehicle
North Fence	Night	16/10/22	12:45:00 AM	15:00	N4	53	62	57	48	68	15	14	5	9oC, 1.7m/s W. Cement works Ambient 47-50, insects, Train Horn, train movement, rail squeal 64 (12:52 to 12:54, Truck (Taylor) 52
Loc 20	Night	16/10/22	12:45:00 AM	15:00		56	58	57	55	68	12	4	1	Cement works Ambient 55, Train loco (145 deg - logger angle), rail car noise at 12:48 am, very stable sound level
4 Melbourne St	Night	16/10/22	12:45:00 AM	15:00		44	52	43	41	61	17	11	3	Ambient 40-42, Truck 64, Rail squeal faint and distant 44, Car 56
Loc 20	Night	16/10/22	6:00:00 AM	15:00	Log	51	62	50	47	61	11	15	4	Birds here are lower level than at North Fence and broadband industrial noise is the main source. Three trucks and one car pass. One truck pass was close at 8:56:58 to 8:57:12.
4 Melbourne St	Night	16/10/22	6:00:00 AM	15:00	Log	43	55	45	35	54	11	20	8	6oC, 1.5m/s WSW. Mostly birds and passing vehicles, with distant broad band noise.
North Fence	Night	16/10/22	6:00:00 AM	15:00	Log	55	65	59	43	61	6	22	12	Birds close by are the major sources of events. Distant trucks occasionally on 5 occasions.
Loc 20	Day	16/10/22	8:00:00 AM	15:00	Log	53	58	55	51	65	12	7	2	Birds and distant industrial noise with occasional truck noise. At 8:02:35 to 8:02:43, a vehicle stopped nearby and dropped an item. At 8:11:54 to 8:12:25 there was a car door closing nearby then restart and depart.
4 Melbourne St	Day	16/10/22	8:00:00 AM	15:00	Log	46	56	49	39	58	12	17	7	12oC, 2.8m/s WSW. All plant off. Mostly birds and passing vehicles. Distant broadband noise.
North Fence	Day	16/10/22	8:00:00 AM	15:00	Log	56	66	57	46	63	6	20	11	Mostly birds fairly close, which are responsible for all the higher event sound levels, with distant industrial broadband noise. Occasional truck pass.

**Table 4.8 : Boral Cement Berrima Annual Environmental Noise Assessment 2022 - Attended Monitoring Receiver Locations 4 Melbourne St, North Fence and Location 20**

Location	Time of Day	Date	Time Start	Period	File	Statistical Sound Level - dBA								Comments
						L <sub>Aeq,t</sub>	L <sub>A01,t</sub>	L <sub>A10,t</sub>	L <sub>A90,t</sub>	L <sub>Ceq,t</sub>	L <sub>Ceq</sub> -L <sub>Aeq</sub>	L <sub>A01</sub> -L <sub>A90</sub>	L <sub>Aeq</sub> -L <sub>A90</sub>	
Loc 20	Day	16/10/22	8:45:00 AM	15:00	Log	55	58	56	53	64	10	6	2	Birds and distant broadband industrial noise, with occasional distant vehicles audible. No significant events from other than birds.
4 Melbourne St	Day	16/10/22	8:45:00 AM	15:00	Log	47	56	51	39	58	11	17	8	130C, 3.5m/s SW. CM7 on, all else off. Birds, passing traffic and distant broad band noise.
North Fence	Day	16/10/22	8:45:00 AM	15:00	Log	52	63	54	45	62	10	19	7	Mostly birds causing the high event sound levels, as for 8:00am
Loc 20	Night	19/10/22	3:30:00 AM	15:00	Log	58	66	59	56	72	14	10	2	Not many clearly audible events. A truck pass at 3:30:54. Reversing alarm at a low level audible at 3:32:25 to 3:32:32, 3:33:18 to 3:33:35 and again at 3:44:20 to 3:44:30. Truck passing close-by from 3:43:35 to 3:43:50. Train horn at 3:34:06, then low level train movement noise from 3:44:20 to 3:44:30, with slight wheel squeal possible on two occasions.
4 Melbourne St	Night	19/10/22	3:30:00 AM	15:00	Log	50	60	50	47	66	16	12	3	12.50C, 2.5m/s NNW. Passing vehicles occasionally, mostly trucks. Distant broadband noise. Not many events and very little variation from other sources. Possibly WITN. Possible brief low level rail wheel squeal at 3:46 to 3:44am.
North Fence	Night	19/10/22	3:30:00 AM	15:00	Log	48	52	50	46	68	19	6	2	General broad-band industrial noise is the main source, with frogs and crickets. 8 vehicle passbys heard. At 3:32:02 a truck tray gate bang. At 3:34:34 a higher frequency sound heard but not identified did not change the sound level. At 3:35:32 this higher frequency sound appeared to increase slightly in level. Conveyor or Bin alarm and possible rail wheel squeal heard at 4 Melbourne St not heard from this location recording.
North Fence	Night	20/10/22	1:00:00 AM	15:00	N5	53	55	54	52	69	16	3	1	120C, 0.7m/s NE. Constant industrial noise Ambient 52-54, Train Horn 60, Rail car shunt 55-56, High frequency tone (possible Loco idle)
Loc 20	Night	20/10/22	1:00:00 AM	15:00	Log	57	60	58	56	71	14	4	1	Constant industrial noise Ambient 56-58, Train Horn 60, Rail car shunt 60-63, Rail squeal 60
4 Melbourne St	Night	20/10/22	1:00:00 AM	15:00	Log	48	51	49	45	64	17	5	2	Ambient 46-48, Car pass 53- 58
North Fence	Day	25/10/22	5:26:00 PM	15:00	N70	51	56	53	49	69	18	8	2	Conditions: Still and overcast, Cement works prominent 52, Birds 56, crickets 54, Industrial Activity: Possible Vacuum or train movement 52, Truck on Taylor 54
Location 20	Day	25/10/22	5:50:00 PM	15:00	N72	56	61	56	54	72	17	8	2	180C, 3m/s SW. Conditions: Still and overcast. Cement works prominent 54, Birds, Train loco 53 idle - 58 Accelerating, Industrial Activity: Possible Vacuum or train movement 60, Truck local 69
4 Melbourne St	Evening	25/10/22	6:41:00 PM	15:00	N74	56	68	55	47	69	13	22	9	Conditions: calm, Ambient 48, Cement works is audible, Birds 55, Highway Traffic heard, Truck on Taylor 67-71, Cars Taylor Ave 65-63, cars local 56-70, rail squeal
12 Brisbane St	Evening	25/10/22	7:04:00 PM	10:00	N76	49	55	51	45	65	16	10	4	Conditions: very light rain, Ambient 48, Truck 58
Adelaide St 20m to Taylor level with front of house	Evening	25/10/22	7:40:00 PM	15:00	N78	59	70	57	49	69	11	21	10	Conditions: very light rain, Ambient 49, Plant heard, Truck on Taylor 71, Car Local 68-77, Cars on Taylor 57-70

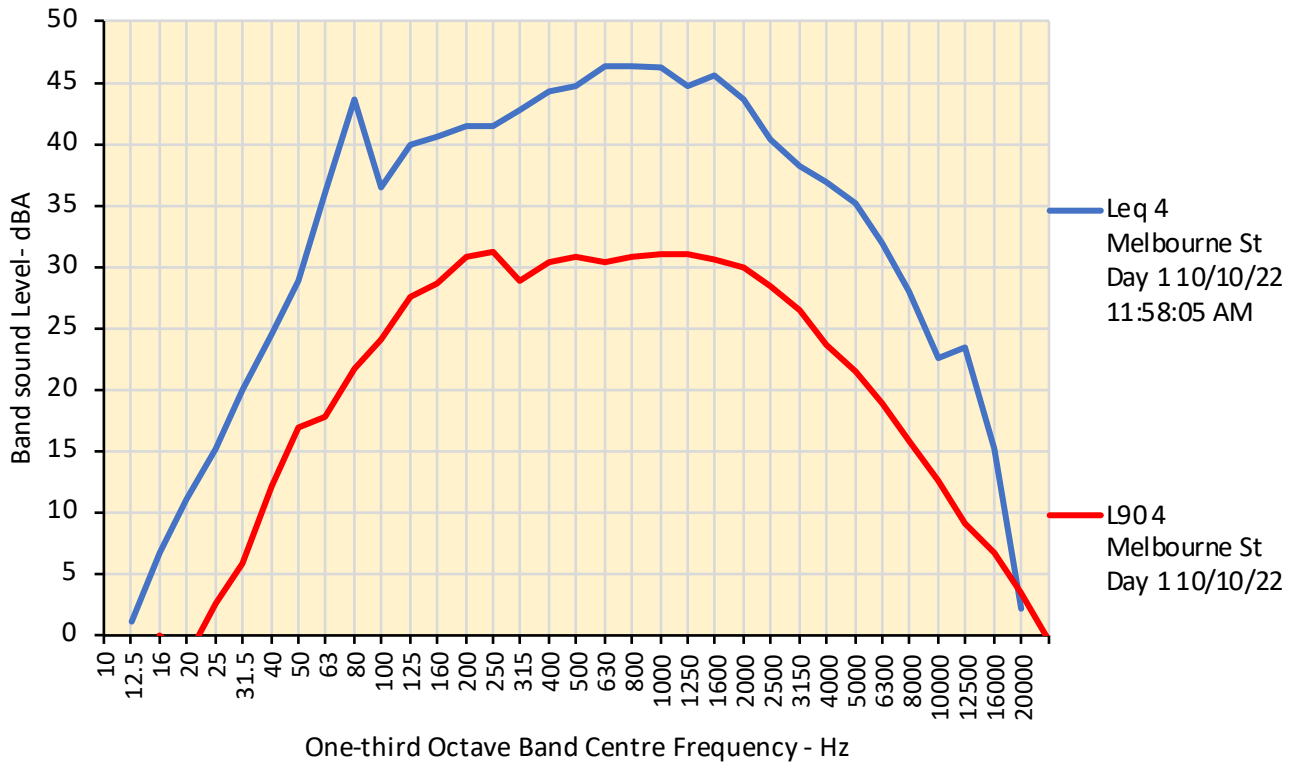


**Table 4.9 : Boral Cement Berrima Annual Environmental Noise Assessment 2022 - Attended Monitoring Receiver Locations, sorted for date, time and location**

Location	Time of Day	Date	Time Start	Period	File	Statistical Sound Level - dBA							
						L <sub>Aeq,t</sub>	L <sub>A01,t</sub>	L <sub>A10,t</sub>	L <sub>A90,t</sub>	L <sub>Ceq,t</sub>	L <sub>Ceq</sub> -L <sub>Aeq</sub>	L <sub>A01</sub> -L <sub>A90</sub>	L <sub>Aeq</sub> -L <sub>A90</sub>
4 Melbourne St	D	10/10/22	11:58:05 AM	15:00	1	56	68	59	44	70	14	24	12
4 Melbourne St	N	13/10/22	1:00:00 AM	15:00	Log	45	55	44	37	59	14	18	7
4 Melbourne St	N	16/10/22	12:45:00 AM	15:00		44	52	43	41	61	17	11	3
4 Melbourne St	N	16/10/22	6:00:00 AM	15:00	Log	43	55	45	35	54	11	20	8
4 Melbourne St	D	16/10/22	8:00:00 AM	15:00	Log	46	56	49	39	58	12	17	7
4 Melbourne St	D	16/10/22	8:45:00 AM	15:00	Log	47	56	51	39	58	11	17	8
4 Melbourne St	N	19/10/22	3:30:00 AM	15:00	Log	50	60	50	47	66	16	12	3
4 Melbourne St	N	20/10/22	1:00:00 AM	15:00	Log	48	51	49	45	64	17	5	2
4 Melbourne St	E	25/10/22	6:41:00 PM	15:00	N74	56	68	55	47	69	13	22	9
Loc. 20	D	10/10/22	4:47:48 PM	10:00	25	56	69	54	51	68	12	18	5
Loc 20	N	13/10/22	1:00:00 AM	15:00	Log	53	57	55	50	66	13	7	2
Loc 20	N	16/10/22	12:45:00 AM	15:00		56	58	57	55	68	12	4	1
Loc 20	N	16/10/22	6:00:00 AM	15:00	Log	51	62	50	47	61	11	15	4
Loc 20	D	16/10/22	8:00:00 AM	15:00	Log	53	58	55	51	65	12	7	2
Loc 20	D	16/10/22	8:45:00 AM	15:00	Log	55	58	56	53	64	10	6	2
Loc 20	N	19/10/22	3:30:00 AM	15:00	Log	58	66	59	56	72	14	10	2
Loc 20	N	20/10/22	1:00:00 AM	15:00	Log	57	60	58	56	71	14	4	1
Loc 20	D	25/10/22	5:50:00 PM	15:00	N72	56	61	56	54	72	17	8	2
North Fence	D	10/10/22	3:48:13 PM	15:00	24	52	63	52	47	68	16	16	4
North Fence	N	13/10/22	1:00:00 AM	15:00	Log	48	53	50	45	65	17	8	3
North Fence	N	16/10/22	12:45:00 AM	15:00	N4	53	62	57	48	68	15	14	5
North Fence	N	16/10/22	6:00:00 AM	15:00	Log	55	65	59	43	61	6	22	12
North Fence	D	16/10/22	8:00:00 AM	15:00	Log	56	66	57	46	63	6	20	11
North Fence	D	16/10/22	8:45:00 AM	15:00	Log	52	63	54	45	62	10	19	7
North Fence	N	19/10/22	3:30:00 AM	15:00	Log	48	52	50	46	68	19	6	2
North Fence	N	20/10/22	1:00:00 AM	15:00	N5	53	55	54	52	69	16	3	1
North Fence	D	25/10/22	5:26:00 PM	15:00	N70	51	56	53	49	69	18	8	2
Adelaide St 20m to Taylor	D	10/10/22	1:11:13 PM	15:00	4	63	75	67	47	74	10	28	16
Adelaide St 20m to Taylor	E	25/10/22	7:40:00 PM	15:00	N78	59	70	57	49	69	11	21	10
12 Brisbane St	D	10/10/22	11:59:00 am	15:00	N3	52	61	50	39	64	12	22	13
12 Brisbane St	E	25/10/22	7:04:00 PM	10:00	N76	49	55	51	45	65	16	10	4

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

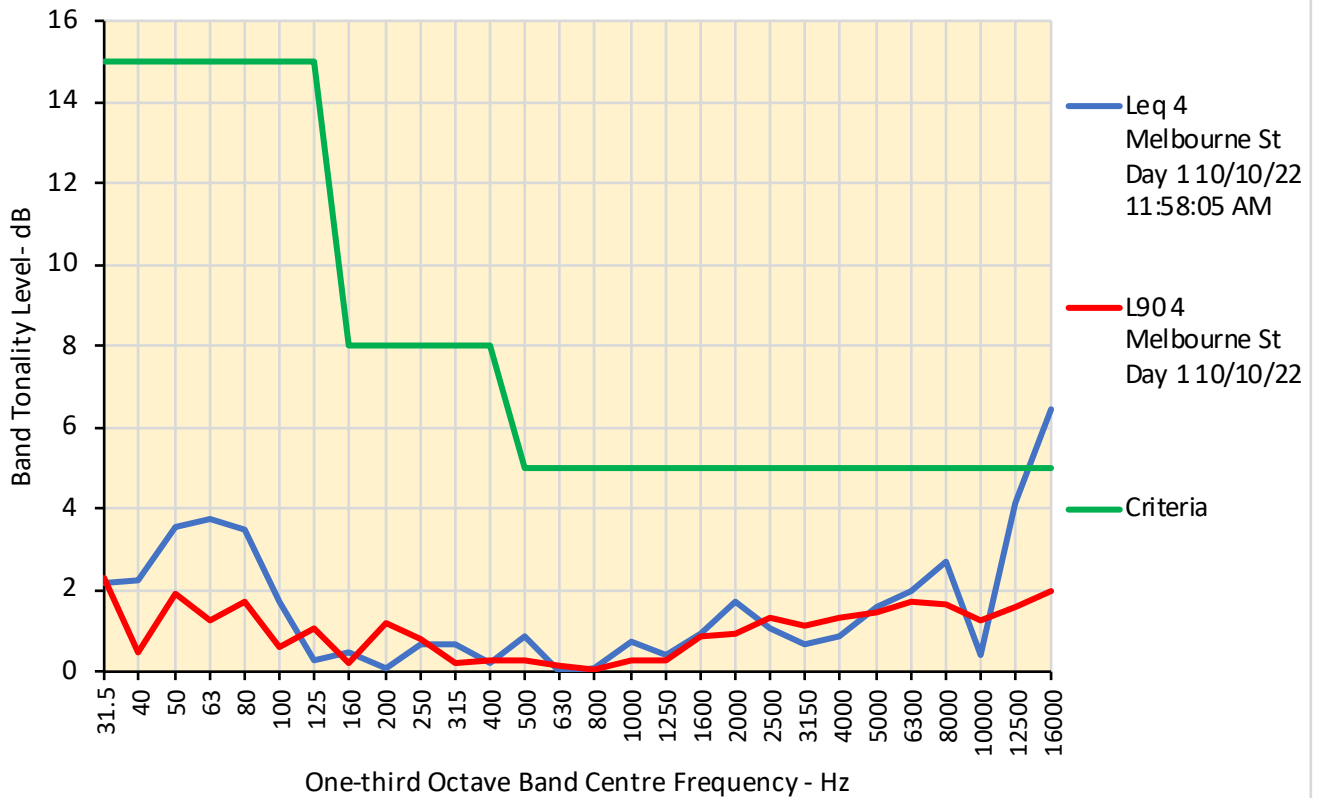
One-third Octave Band Spectra 4 Melbourne St 10/10 11:58am



Appendix A Figure A1: 4 Melbourne St 10/10/2022 11:58 am Spectra

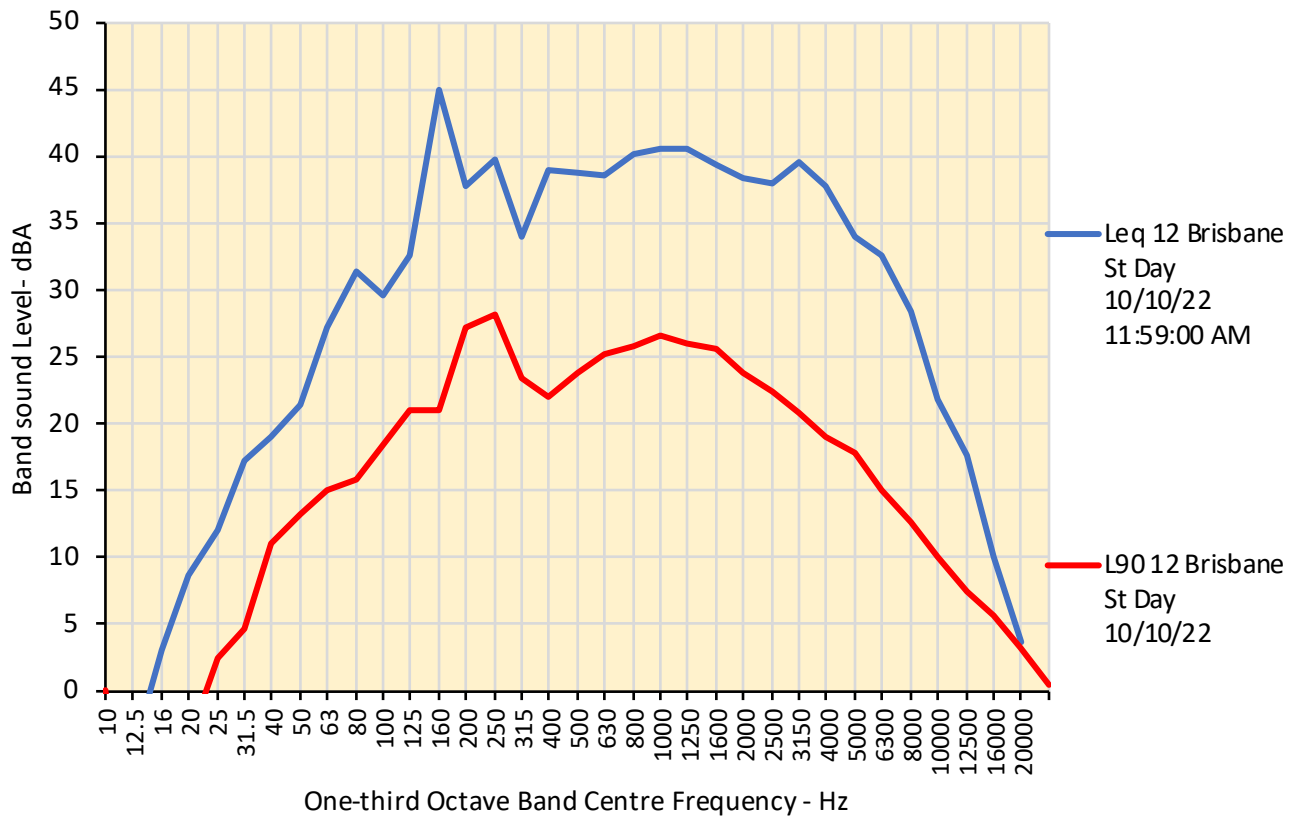
Boral Cement Berrima Annual Environmental Noise Assessment October 2022

One-third Octave Band Tonality 4 Melbourne St 10/10 11:58am



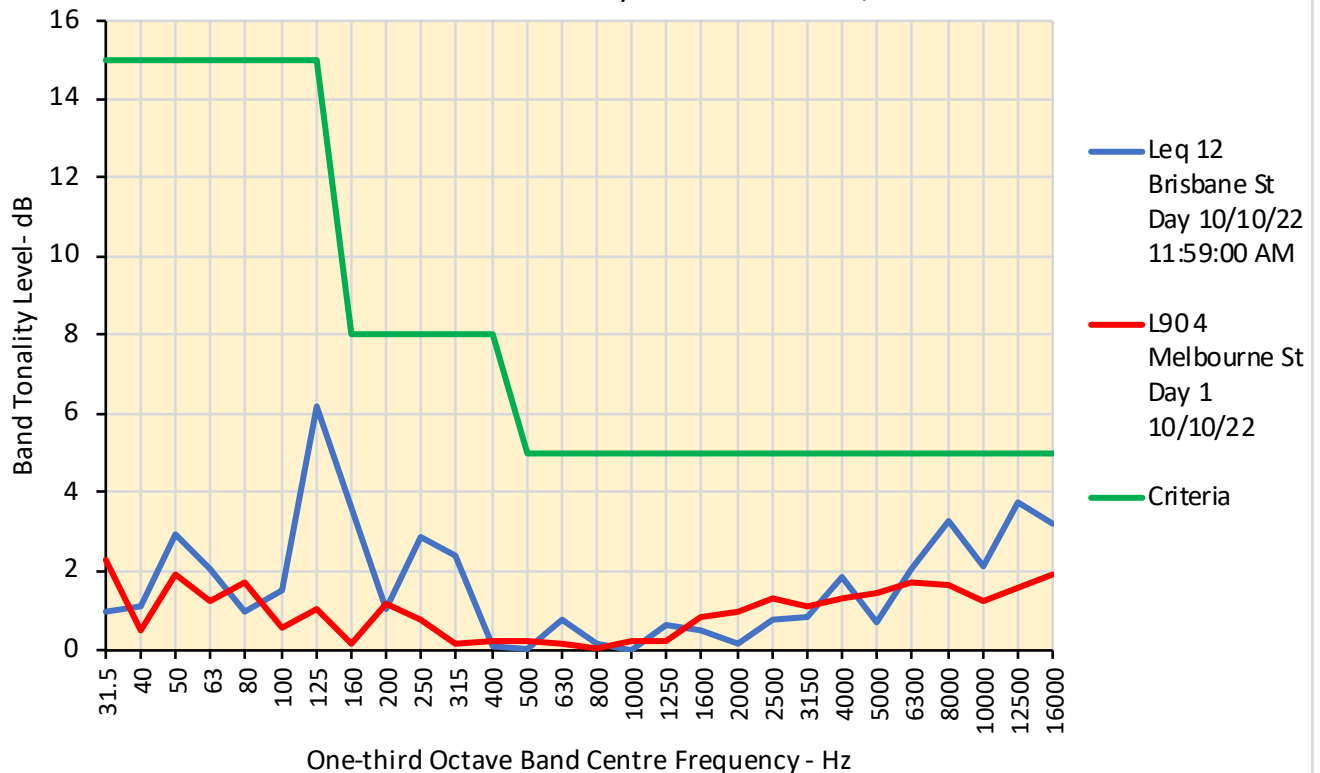
Appendix A Figure A1A: 4 Melbourne St 10/10/2022 11:58 am Tonality

Boral Cement Berrima Annual Environmental Noise Assessment October 2022  
One-third Octave Band Spectra 12 Brisbane St 10/10 11:59am



Appendix A Figure A2: 12 Brisbane St 10/10/2022 11:59 am Spectra

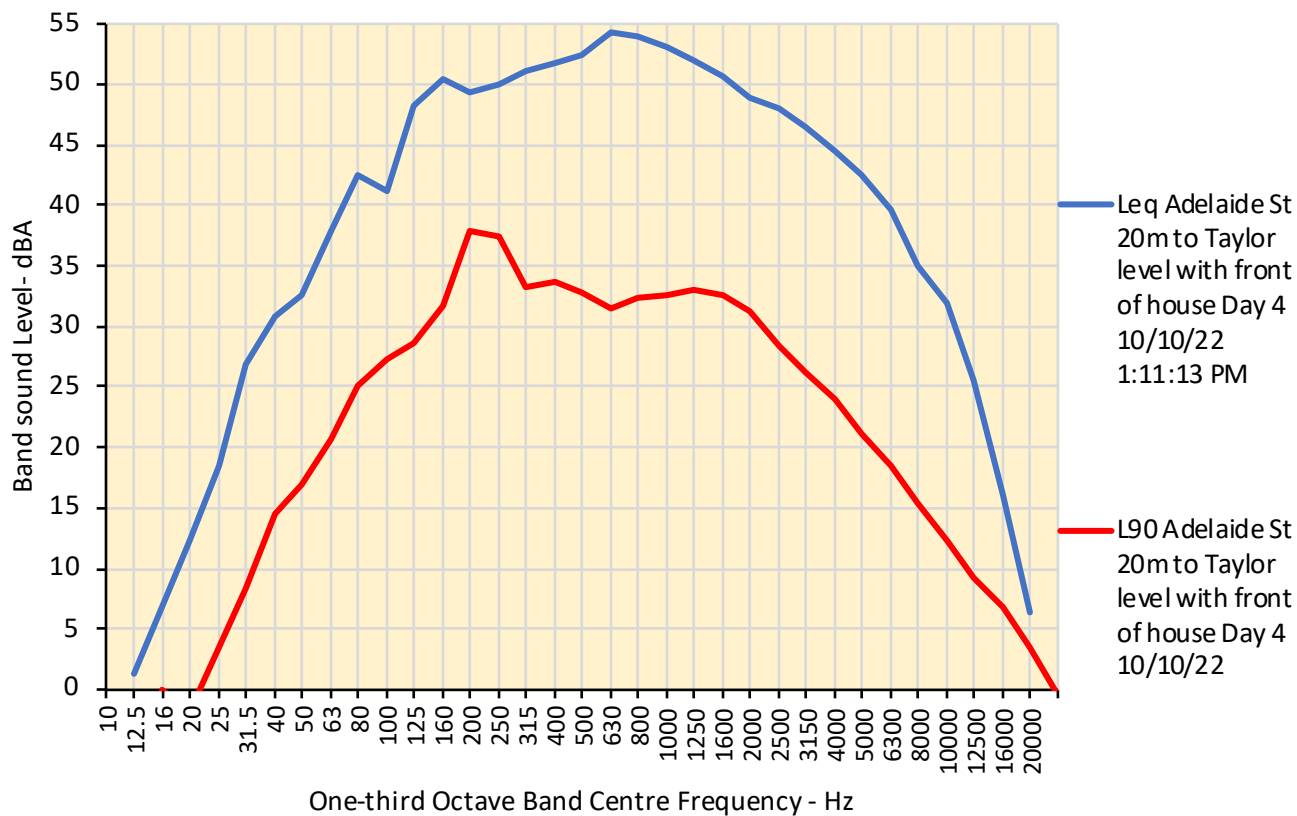
Boral Cement Berrima Annual Environmental Noise Assessment October 2022  
One-third Octave Band Tonality 12 Brisbane St 10/10 11:59 am



Appendix A Figure A2A: 12 Brisbane St 10/10/2022 11:59 am Tonality

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

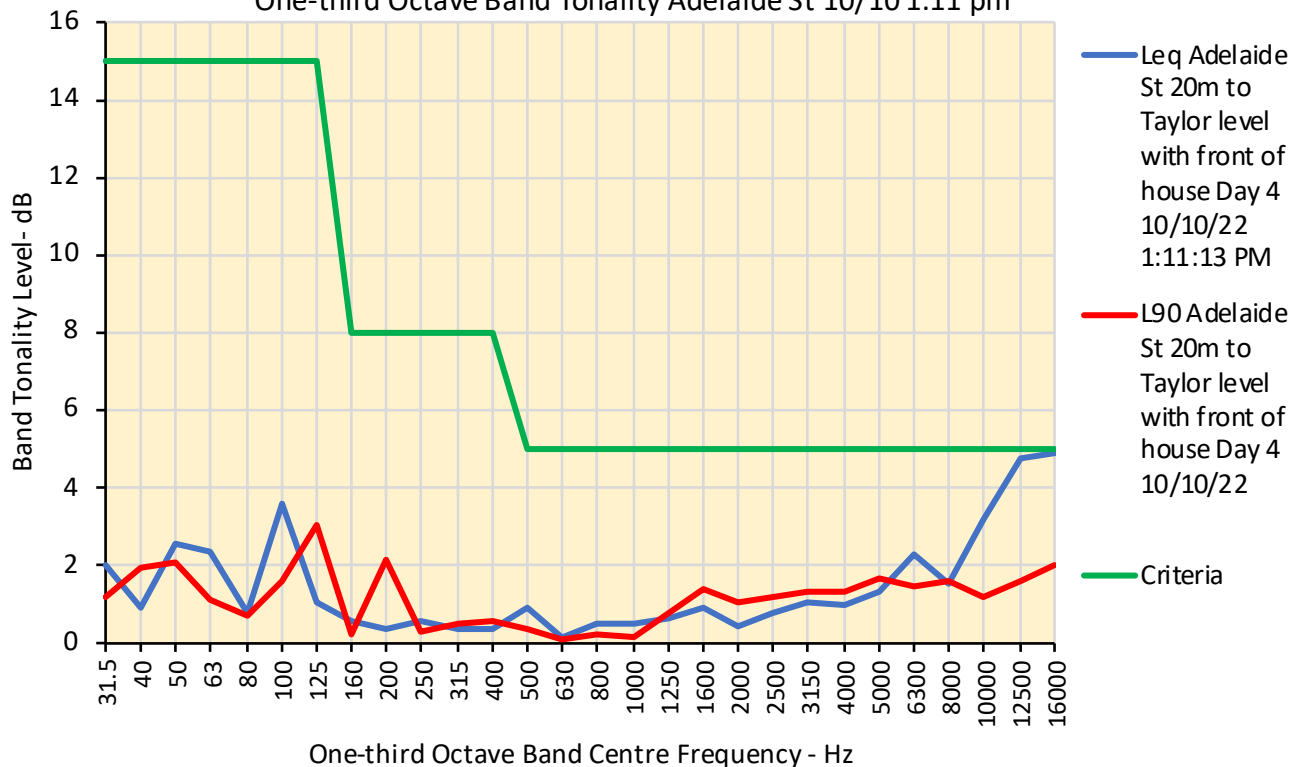
One-third Octave Band Spectra Adelaide St 10/10 1:11 pm



Appendix A Figure A3: Adelaide St 10/10/2022 1:11 pm Spectra

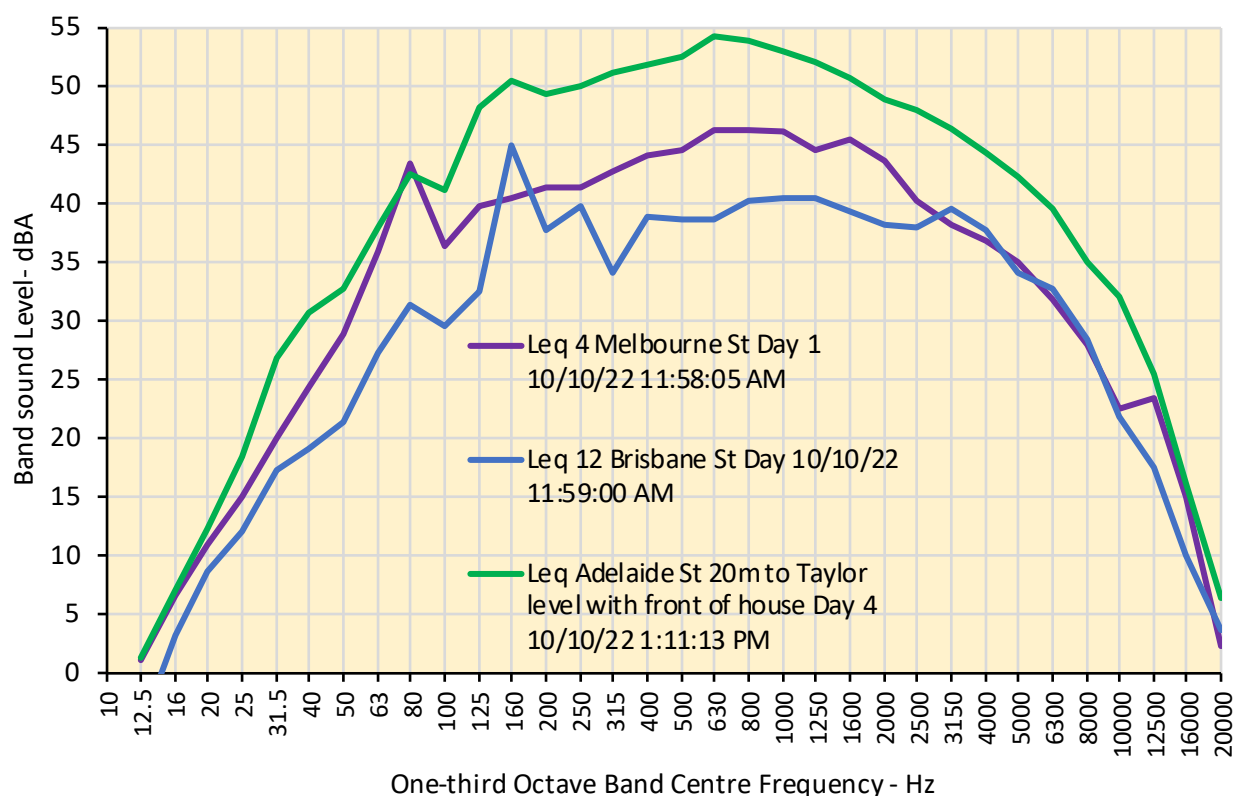
Boral Cement Berrima Annual Environmental Noise Assessment October 2022

One-third Octave Band Tonality Adelaide St 10/10 1:11 pm



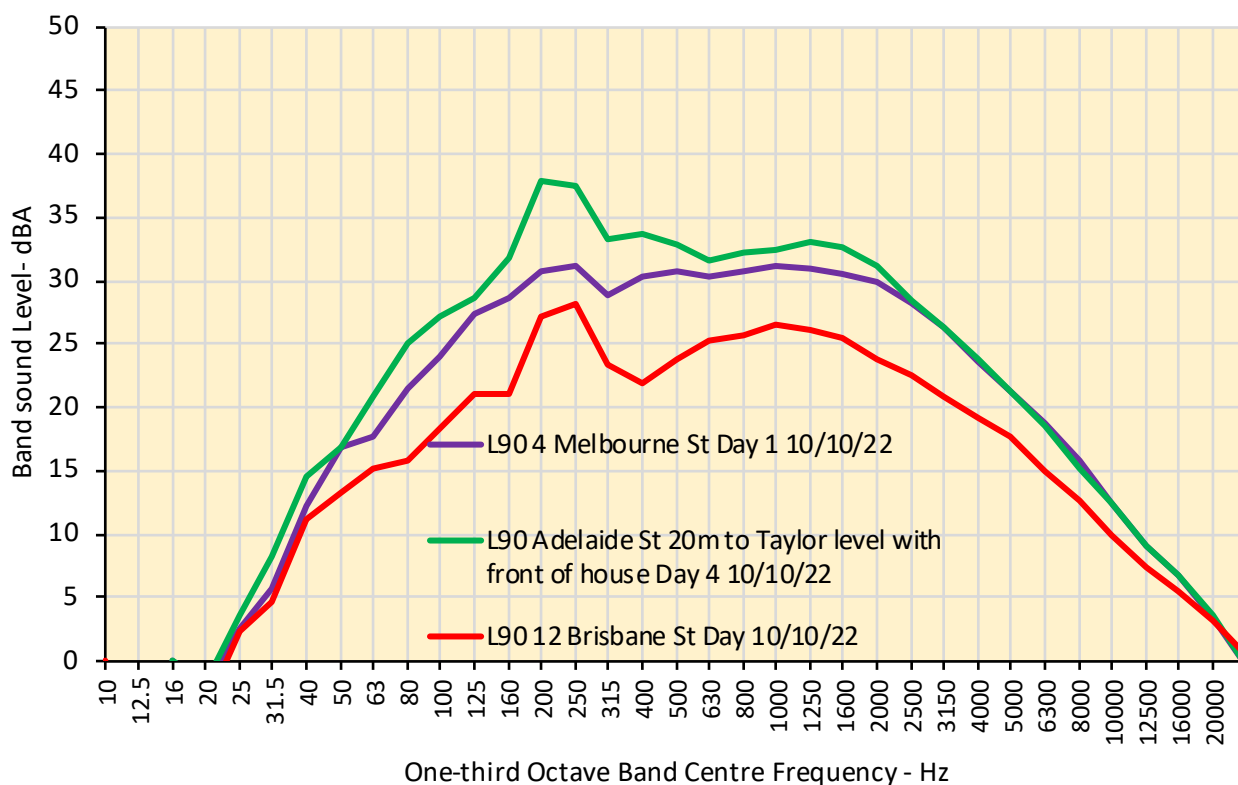
Appendix A Figure A3A: Adelaide St 10/10/2022 1:11 pm Tonality

Boral Cement Berrima Annual Environmental Noise October 2022  
One-third Octave Spectra Leq 4 Melb St, 12 Brisb St Adelaide St 10/10



Appendix A Figure A4A: Compare Leq Spectra 4 Melbourne, 12 Brisbane St & Adelaide St 10/10/2022 Daytin

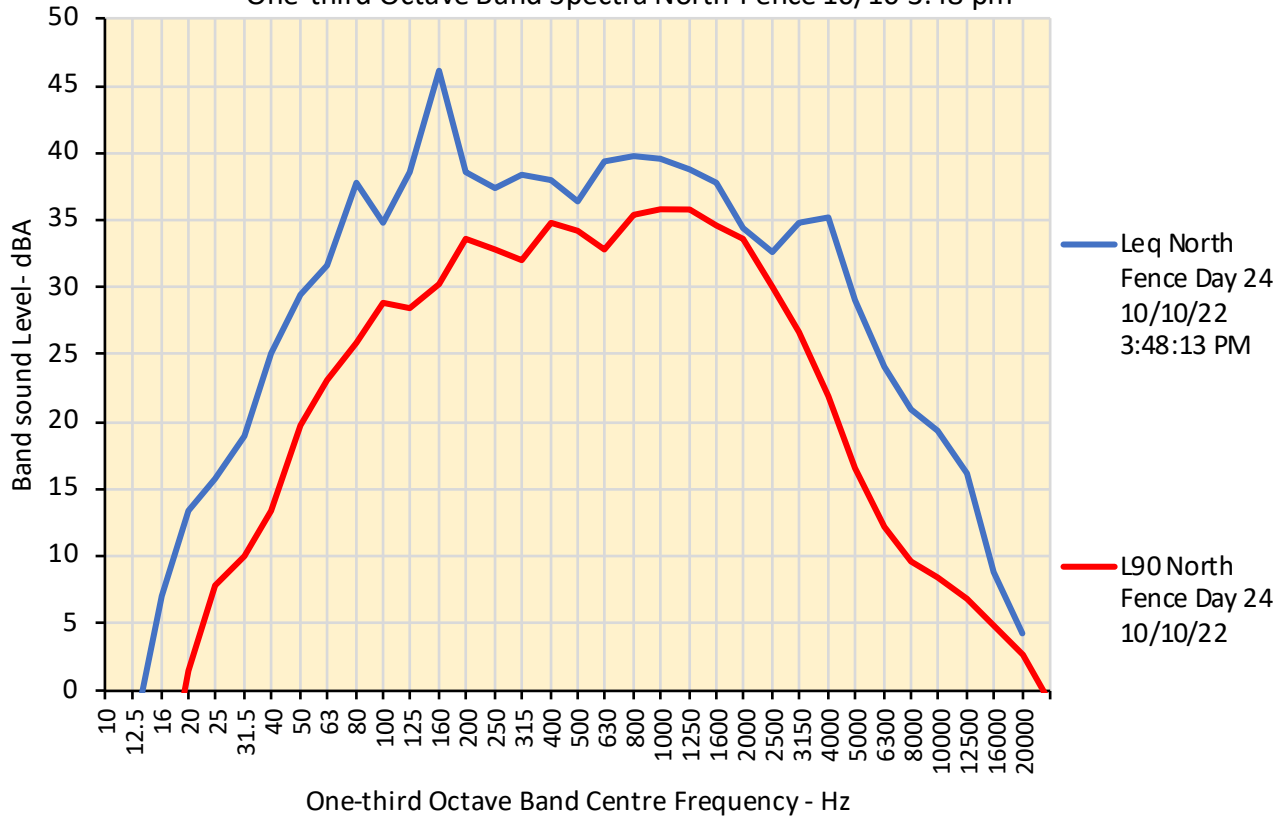
Boral Cement Berrima Annual Environmental Noise October 2022  
One-third Octave Spectra L90 4 Melb St, 12 Brisb St Adelaide St 10/10



Appendix A Figure A4B: Compare L90 Spectra 4 Melbourne, 12 Brisbane St & Adelaide St 10/10/2022 Daytin

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

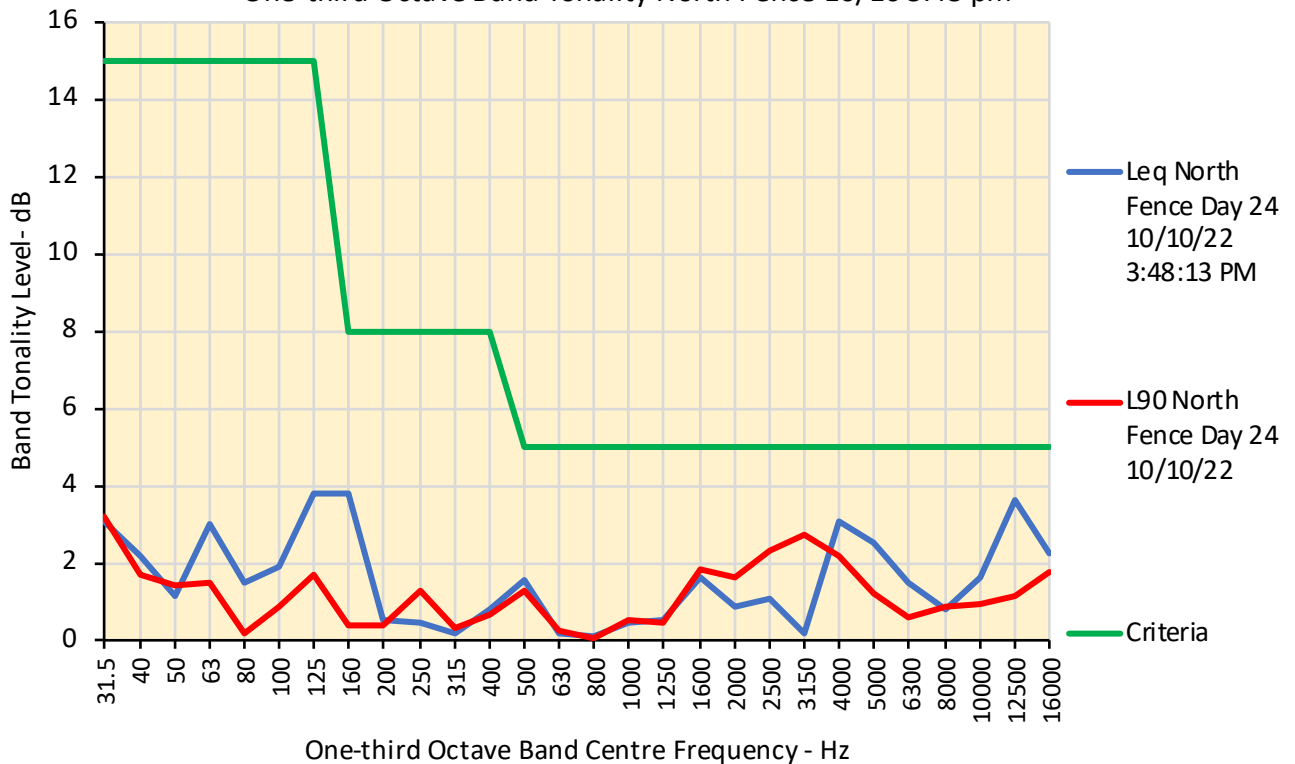
One-third Octave Band Spectra North Fence 10/10 3:48 pm



Appendix A Figure A5: North Fence 10/10/2022 3:48 pm Spectra

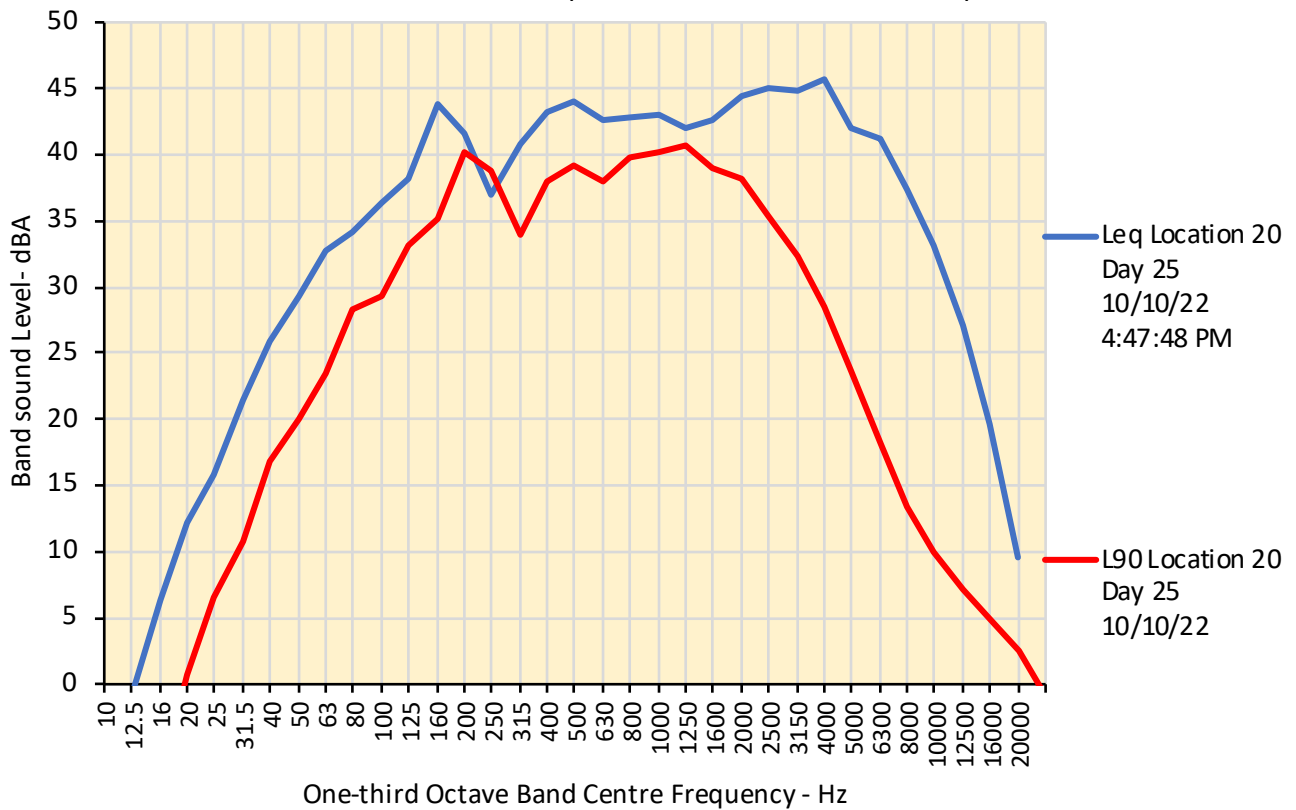
Boral Cement Berrima Annual Environmental Noise Assessment October 2022

One-third Octave Band Tonality North Fence 10/10 3:48 pm



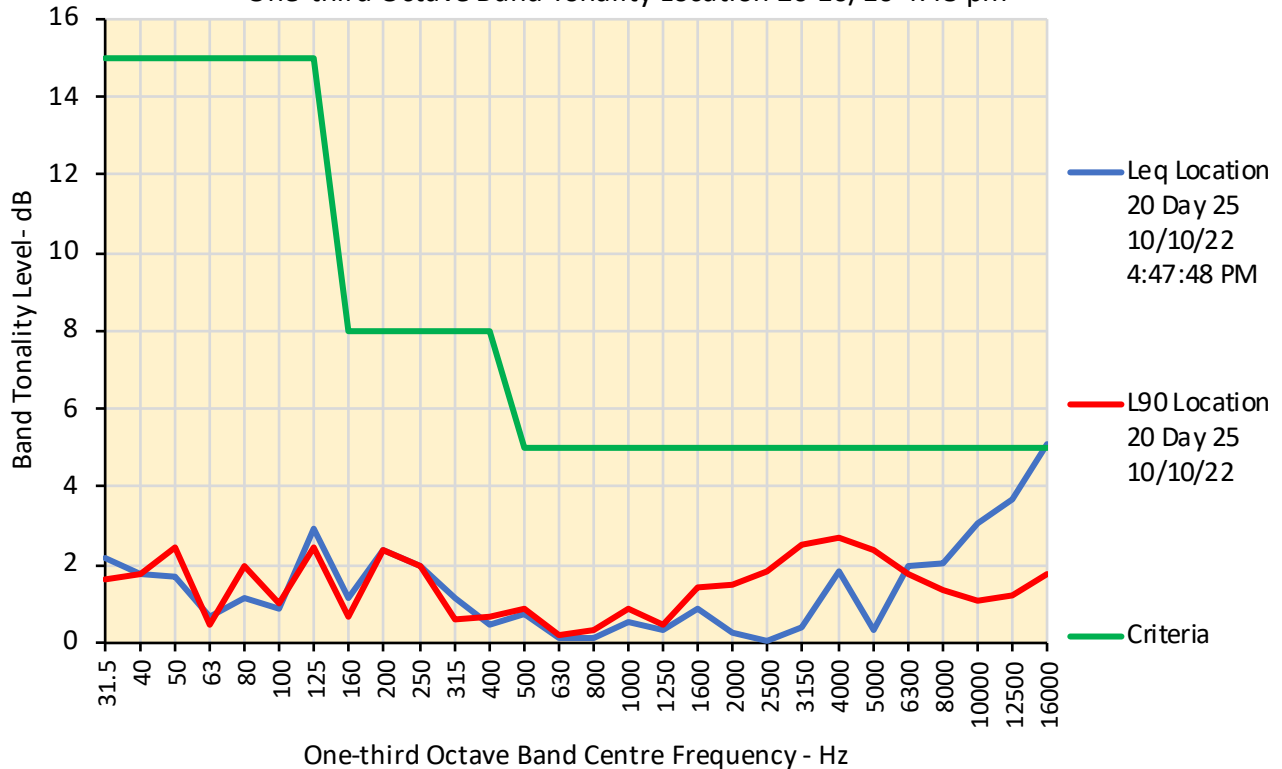
Appendix A Figure A5A: North Fence 10/10/2022 3:48 pm Tonality

Boral Cement Berrima Annual Environmental Noise Assessment October 2022  
One-third Octave Band Spectra Location 20 10/10 4:48 pm



Appendix A Figure A6: Location 20 10/10/2022 4:48 pm Spectra

Boral Cement Berrima Annual Environmental Noise Assessment October 2022  
One-third Octave Band Tonality Location 20 10/10 4:48 pm

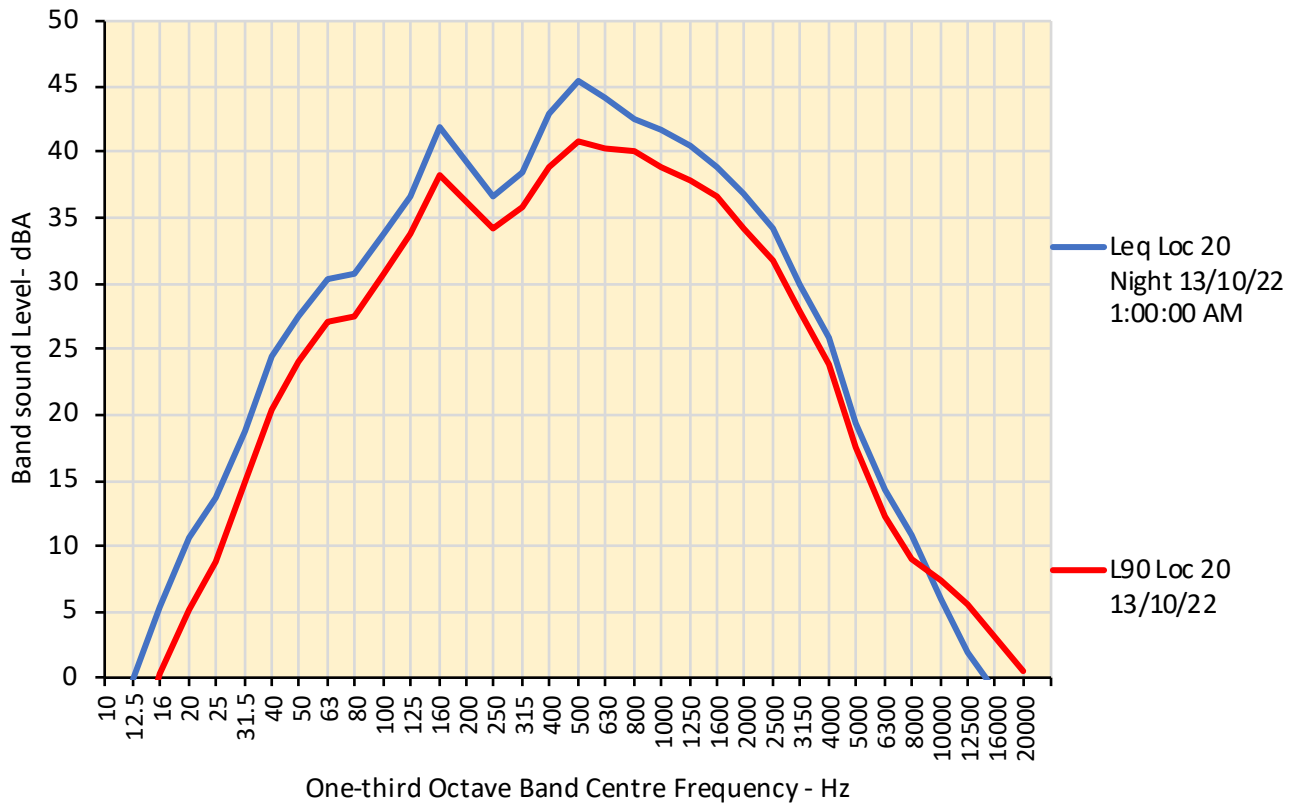


Appendix A Figure A6A: Location 20 10/10/2022 4:48 pm Tonality



Boral Cement Berrima Annual Environmental Noise Assessment October 2022

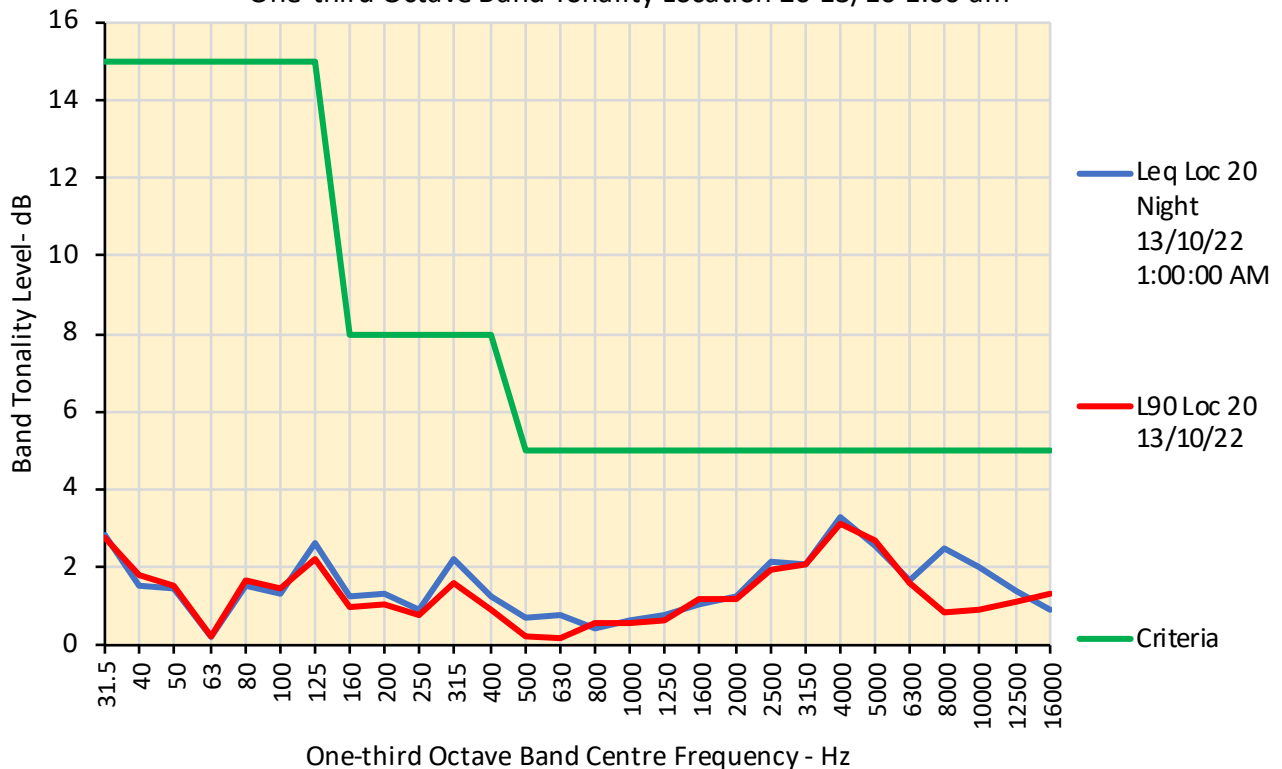
One-third Octave Band Spectra Location 20 13/10 1:00 am



Appendix A Figure A7: Location 20 13/10/2022 1:00 am Spectra

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

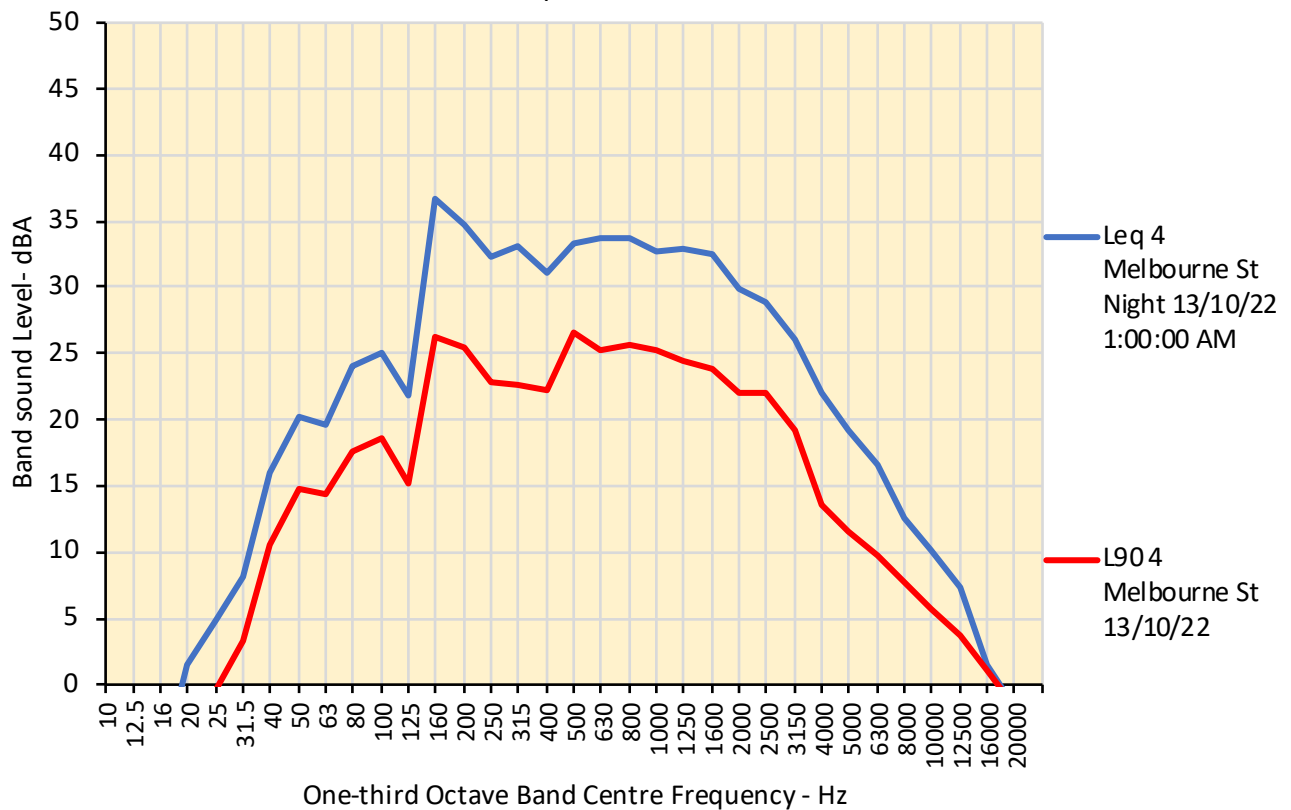
One-third Octave Band Tonality Location 20 13/10 1:00 am



Appendix A Figure A7A: Location 20 13/10/2022 1:00 am Tonality

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

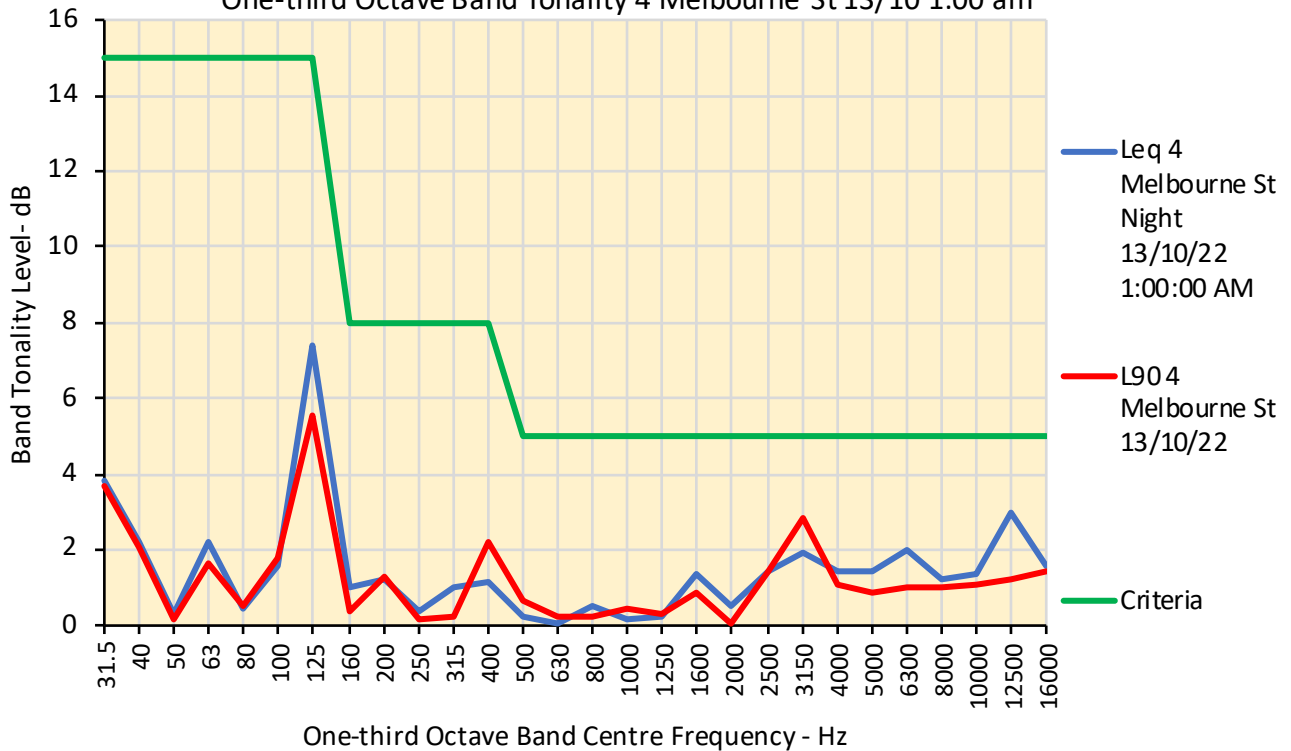
One-third Octave Band Spectra 4 Melbourne St 13/10 1:00 am



Appendix A Figure A8: 4 Melbourne St 13/10/2022 1:00 am Spectra

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

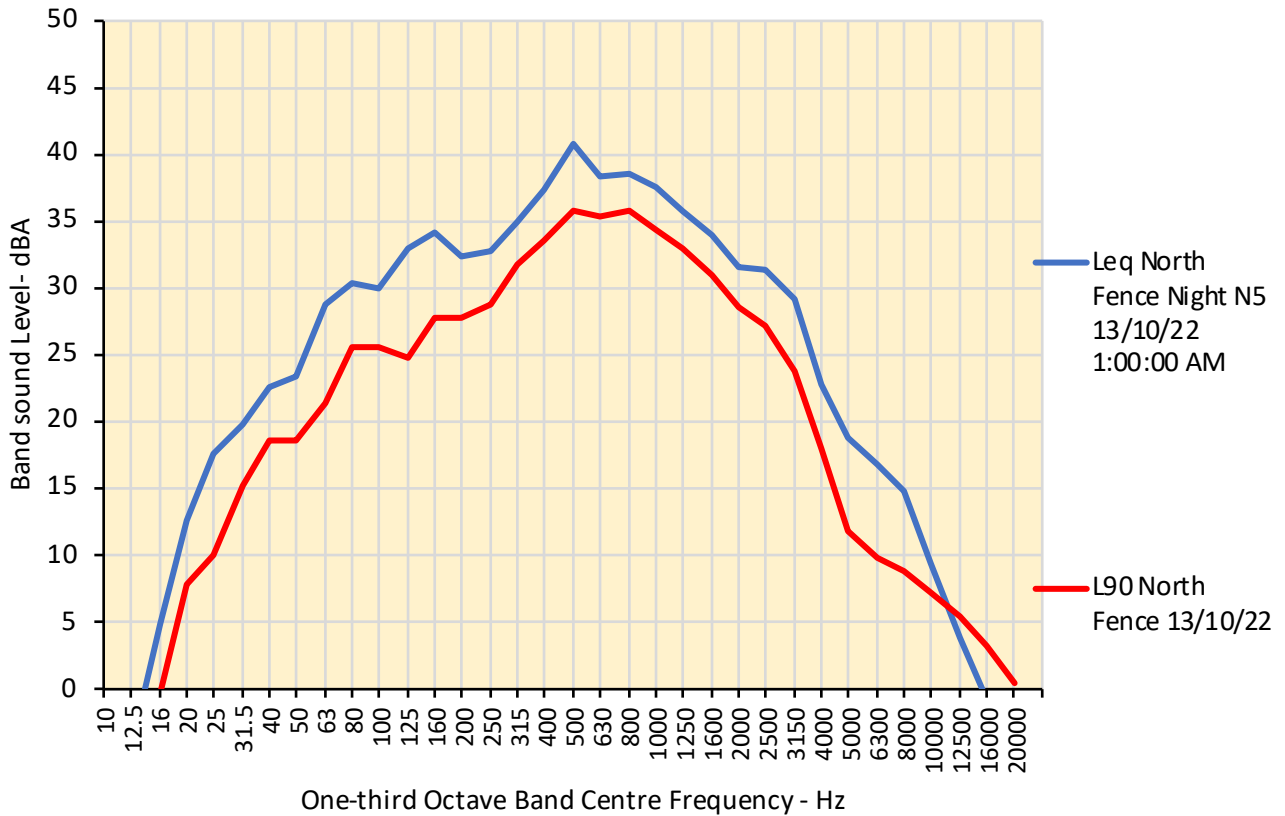
One-third Octave Band Tonality 4 Melbourne St 13/10 1:00 am



Appendix A Figure A8A: 4 Melbourne St 13/10/2022 1:00 am Tonality

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

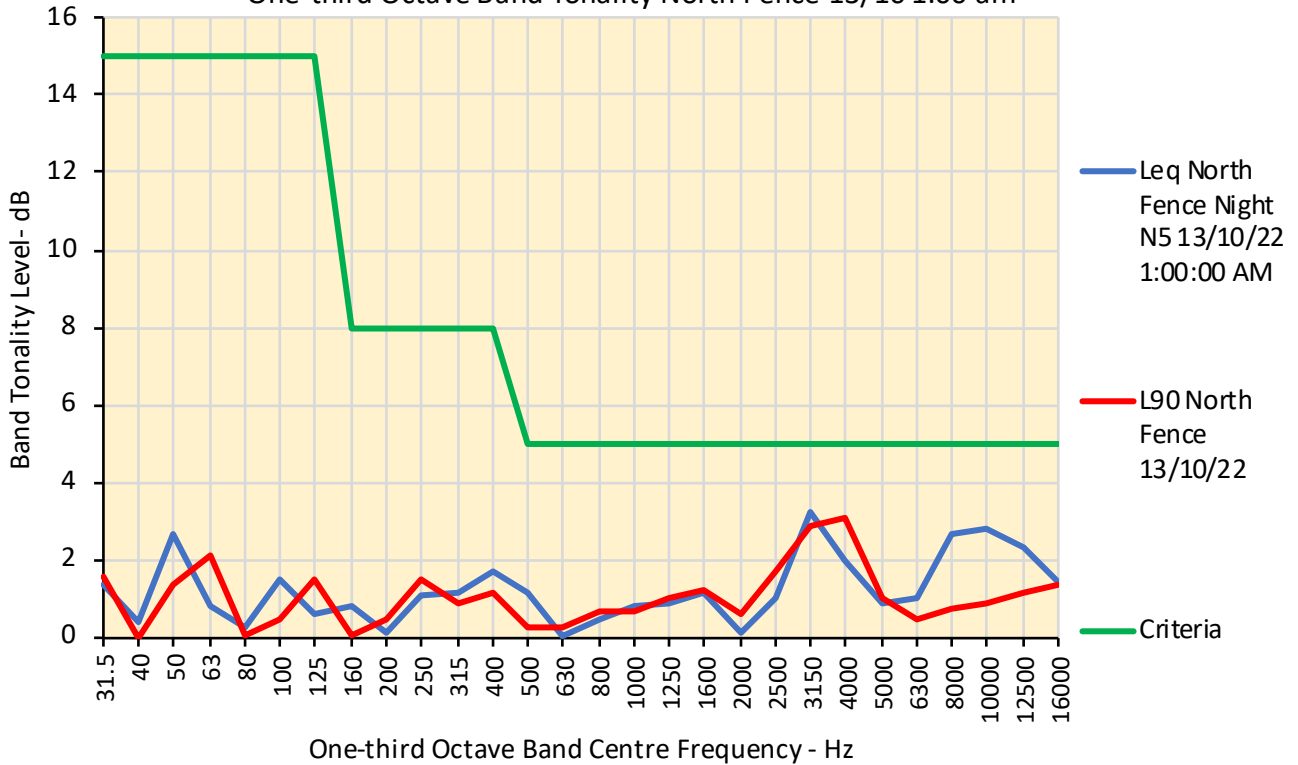
One-third Octave Band Spectra North Fence 13/10 1:00 am



Appendix A Figure A9: North Fence 13/10/2022 1:00 am Spectra

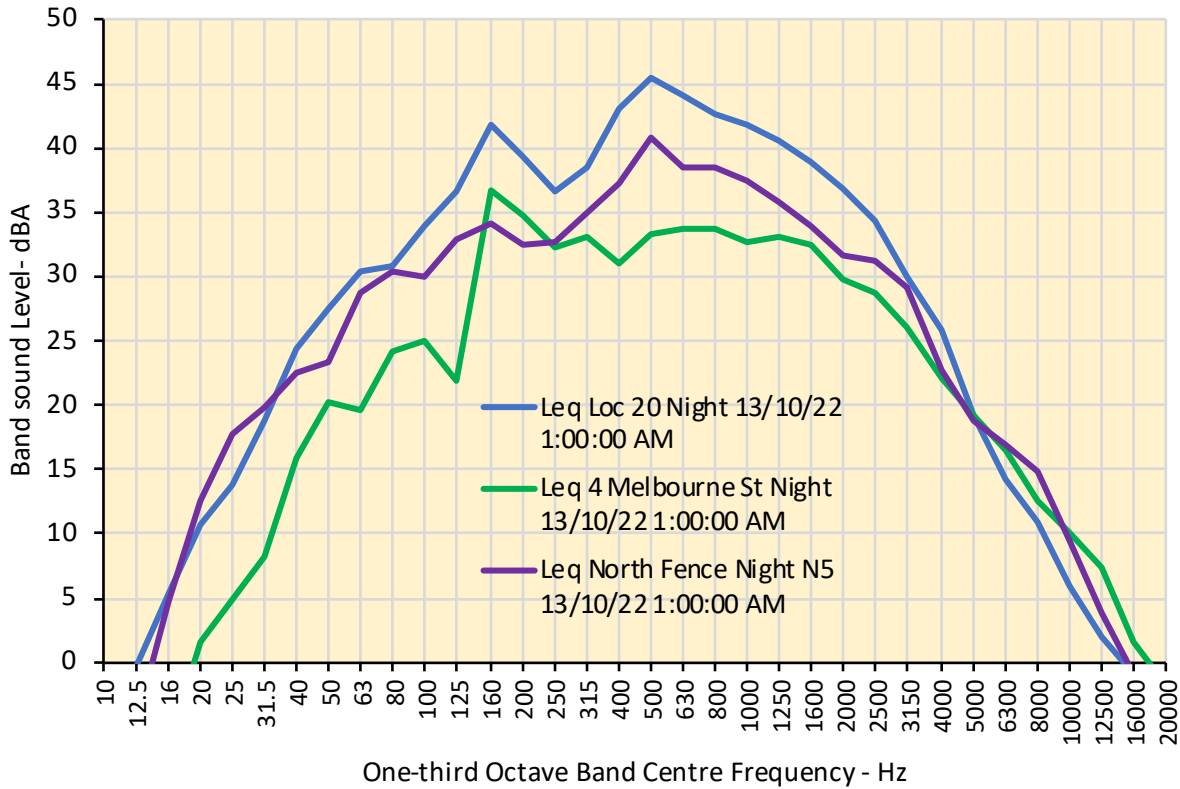
Boral Cement Berrima Annual Environmental Noise Assessment October 2022

One-third Octave Band Tonality North Fence 13/10 1:00 am



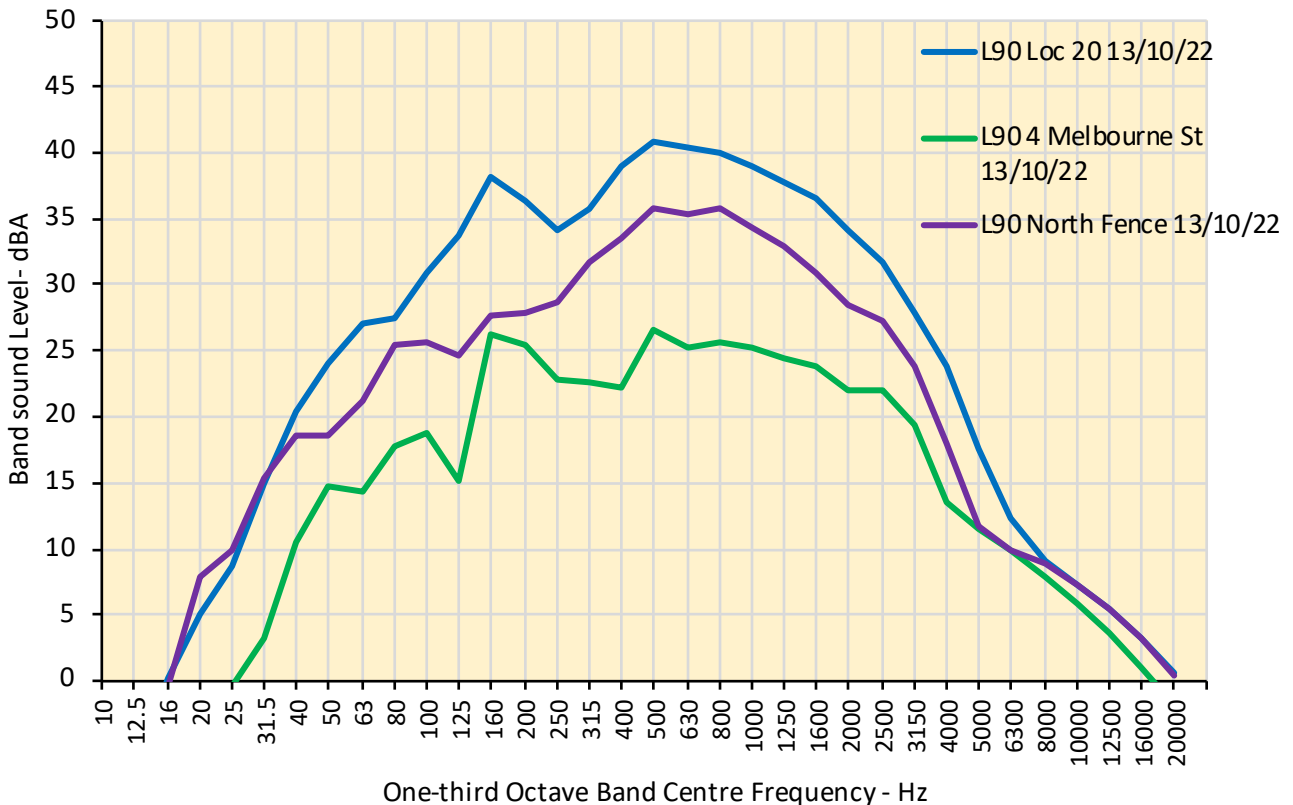
Appendix A Figure A9A: North Fence 13/10/2022 1:00 am Tonality

Boral Cement Berrima Annual Environmental Noise Assessment October 2022  
One-third Octave Spectra Loc20, North Fence & 4 Melb St Leq 13/10 1:00 am



Appendix A Figure A10A: Compare Leq spectra Loc.20, 4 Melb St & North Fence 13/10/2022 1:00 am

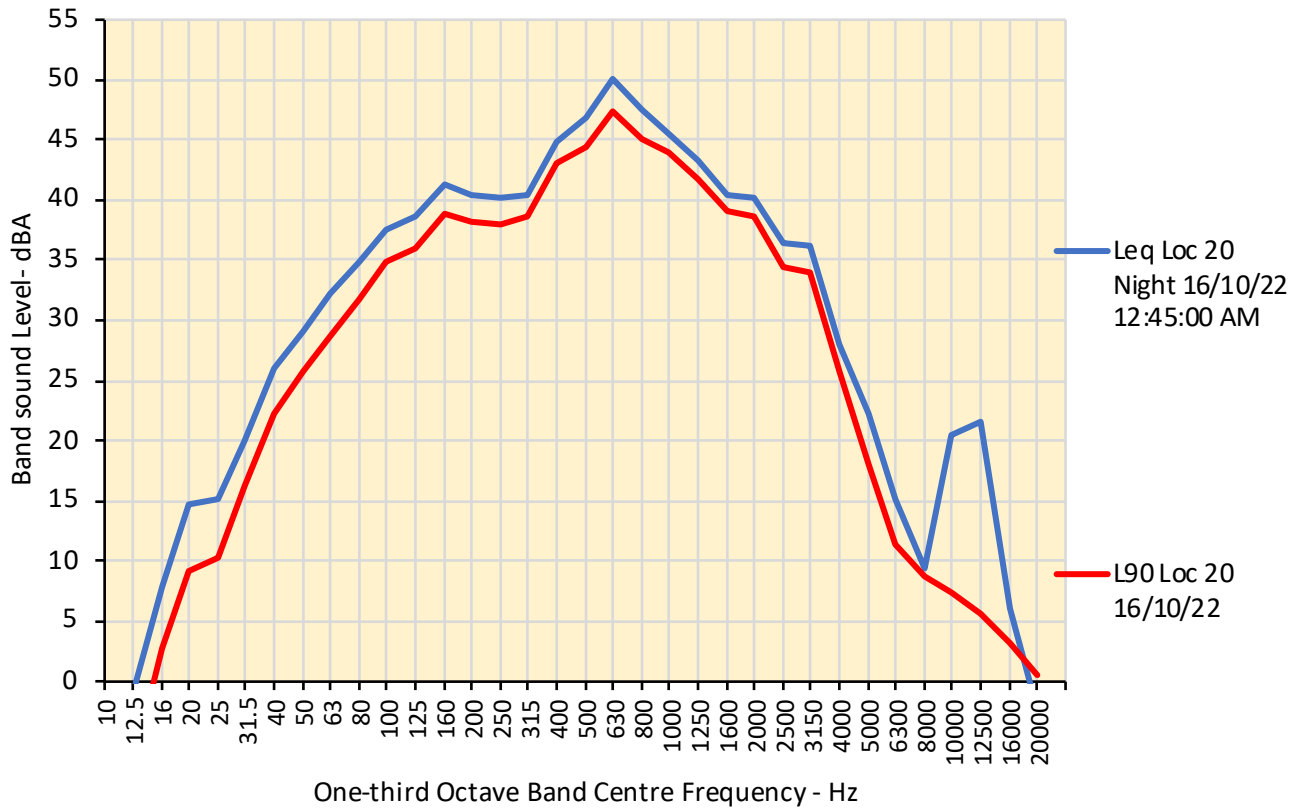
Boral Cement Berrima Annual Environmental Noise Assessment October 2022  
One-third Octave Spectra Loc20, North Fence & 4 Melb St L90 13/10 1:00 am



Appendix A Figure A10B: Compare L90 spectra Loc.20, 4 Melb St & North Fence 13/10/2022 1:00 am

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

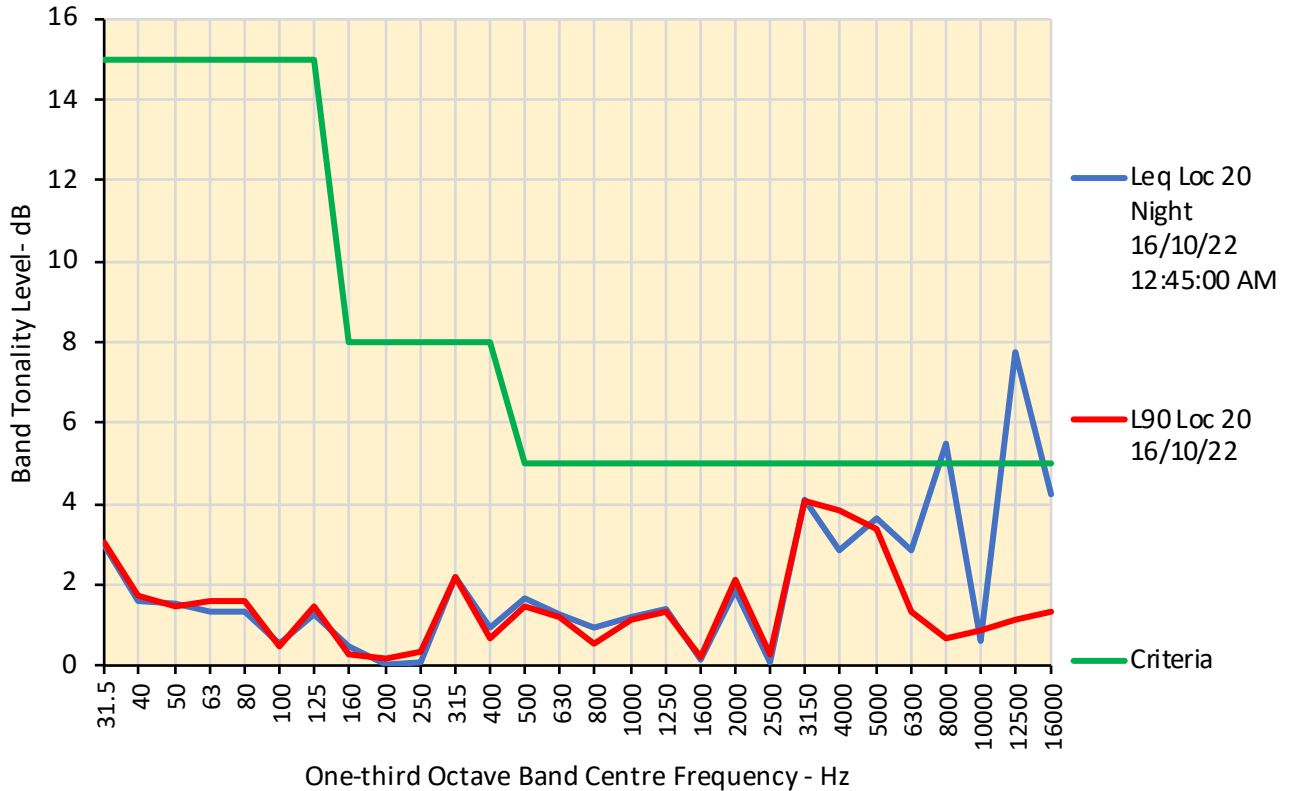
One-third Octave Band Spectra Location 20 16/10 12:45 am



Appendix A Figure A11: Location 20 16/10/2022 12:45 am Spectra

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

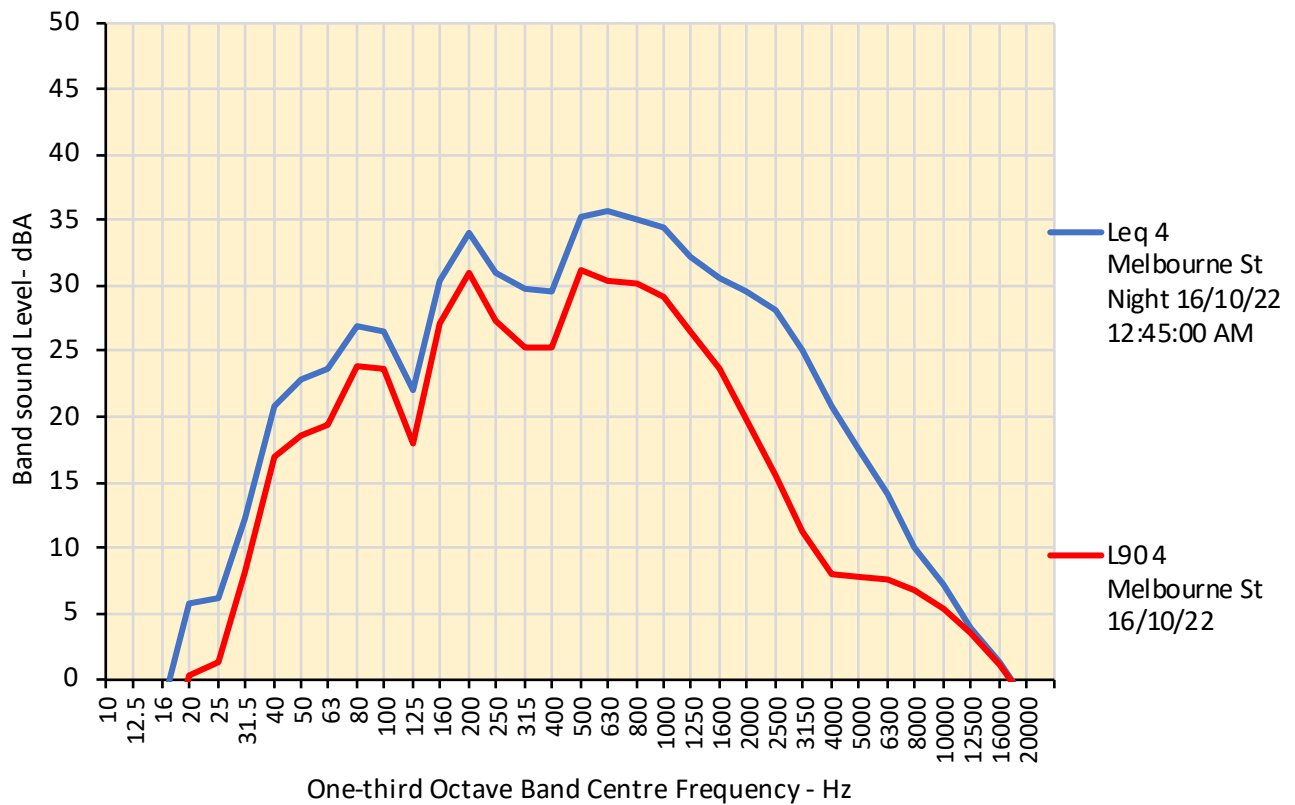
One-third Octave Band Tonality 20 16/10 12:45 am



Appendix A Figure A11A: Location 20 16/10/2022 12:45 am Tonality

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

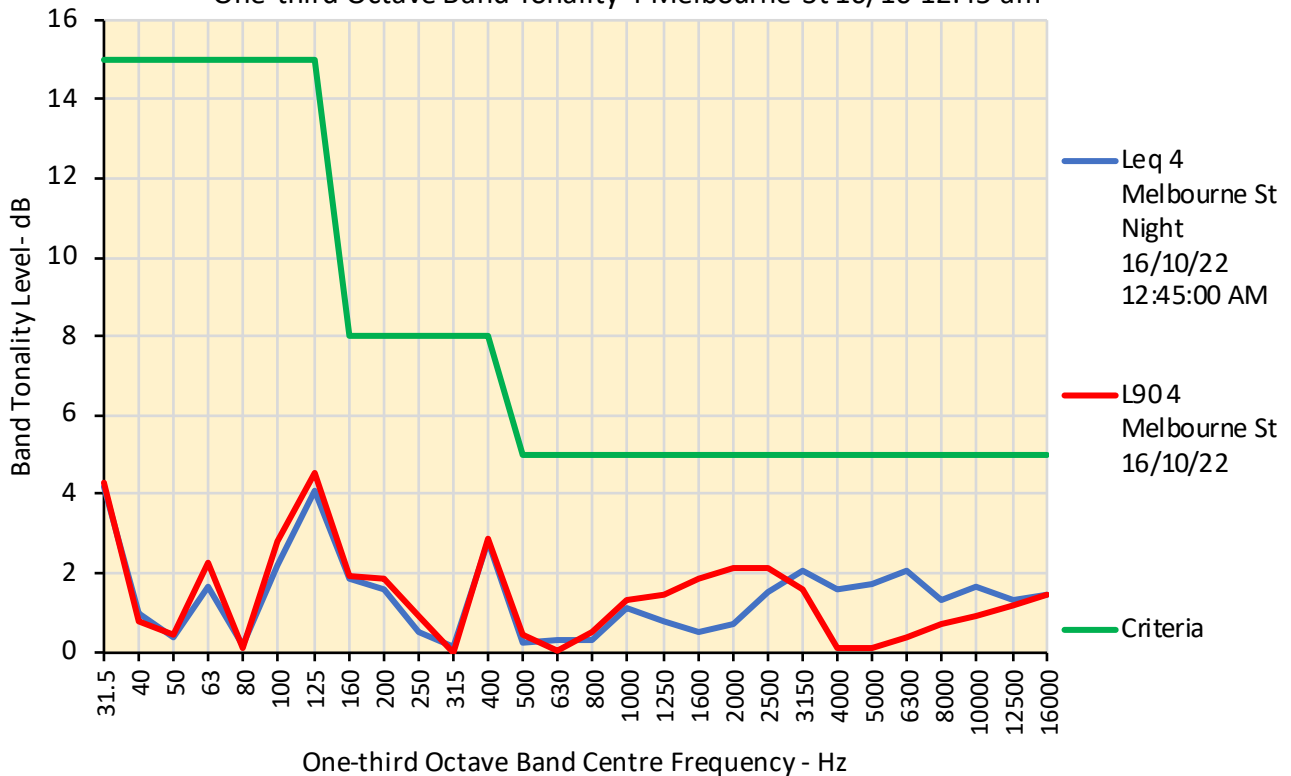
One-third Octave Band Spectra 4 Melbourne St 16/10 12:45 am



Appendix A Figure A12: 4 Melbourne St 16/10/2022 12:45 am Spectra

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

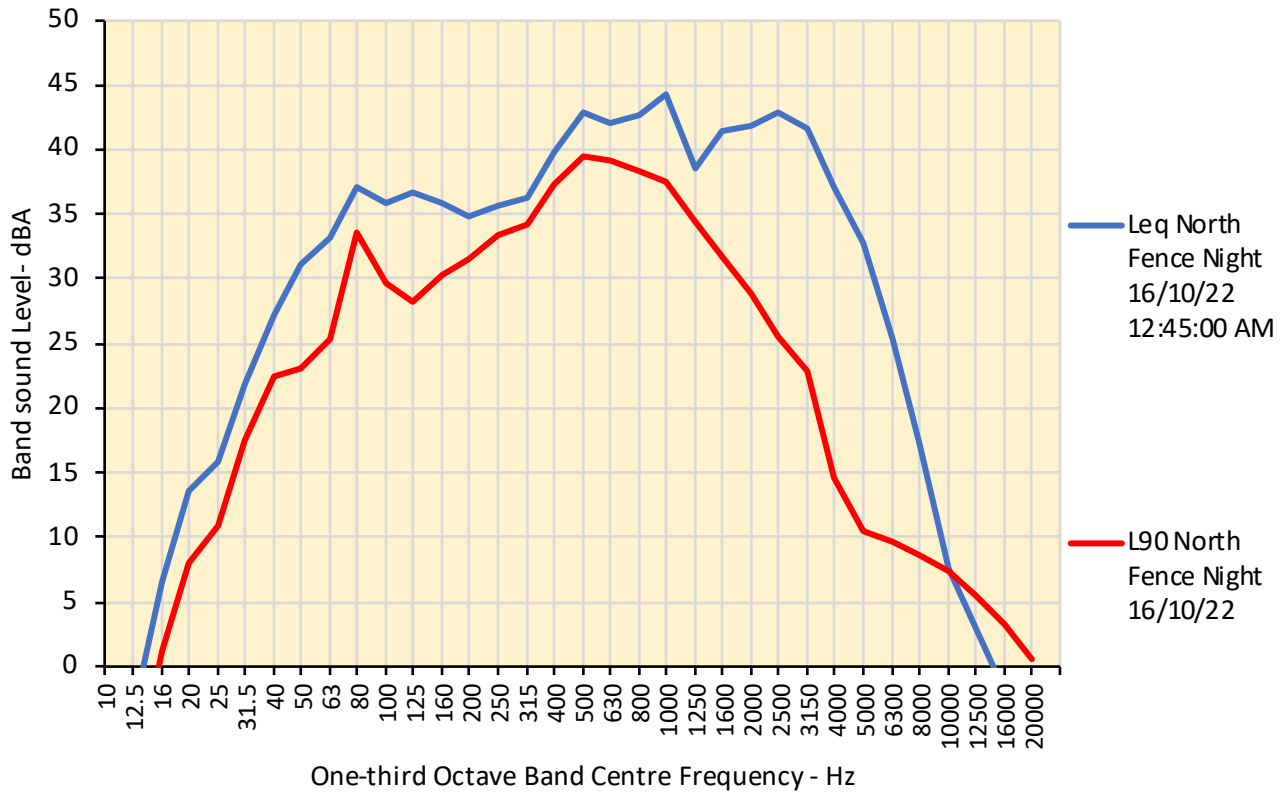
One-third Octave Band Tonality 4 Melbourne St 16/10 12:45 am



Appendix A Figure A12A: 4 Melbourne St 16/10/2022 12:45 am Tonality

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

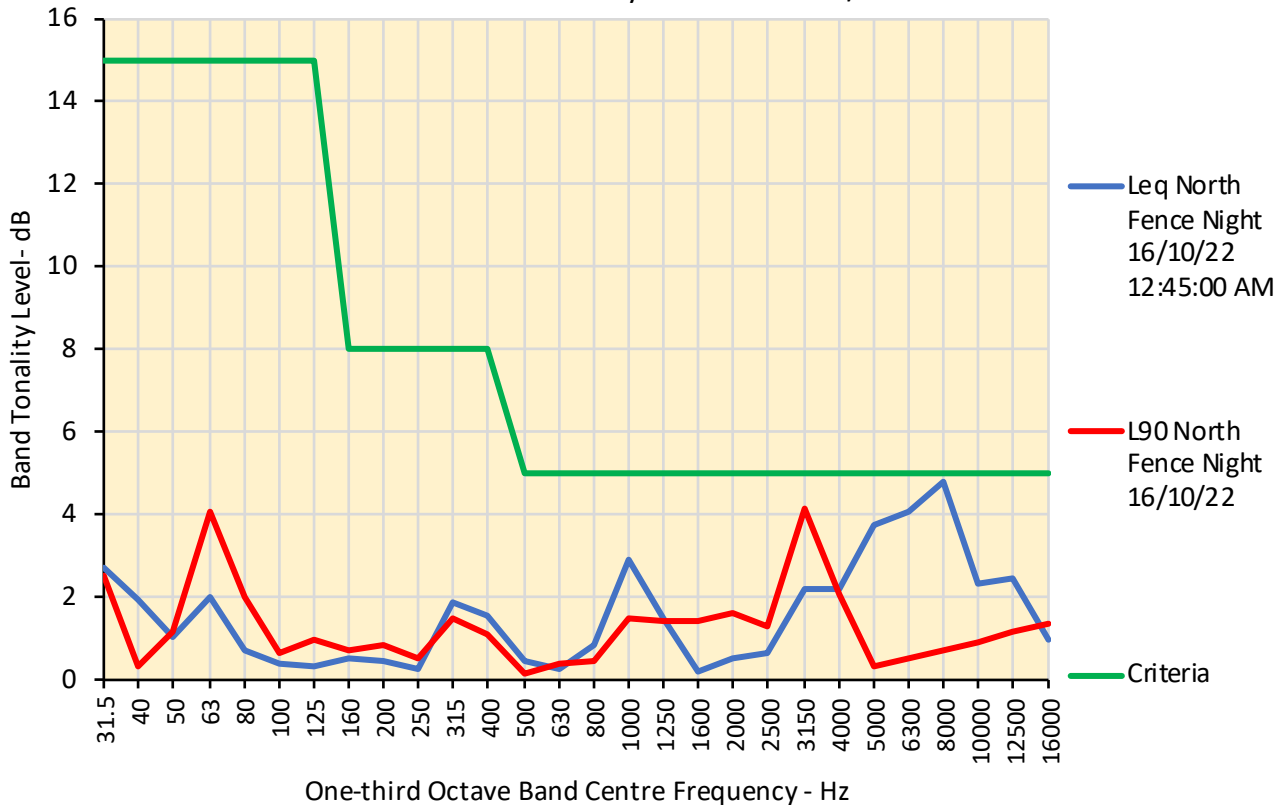
One-third Octave Band Spectra North Fence 16/10 12:45 am



Appendix A Figure A13: North Fence 16/10/2022 12:45 am Spectra

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

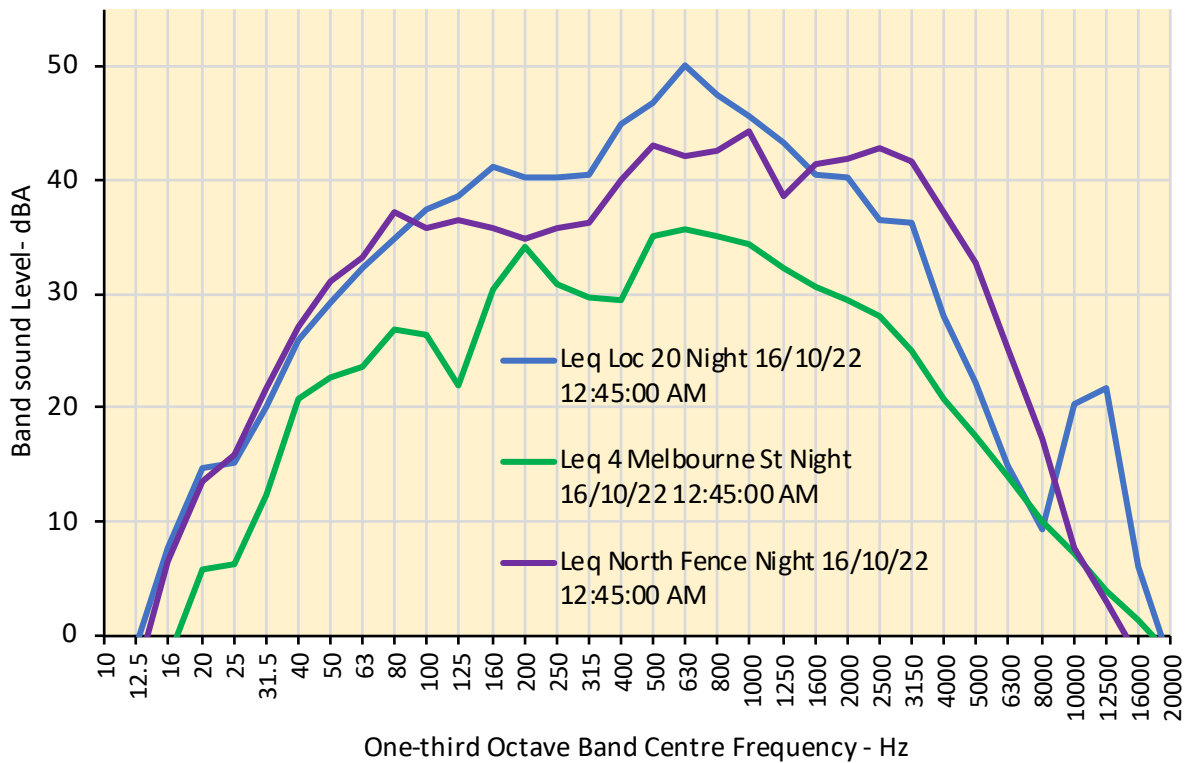
One-third Octave Band Tonality North Fence 16/10 12:45 am



Appendix A Figure A13: North Fence 16/10/2022 12:45 am Tonality

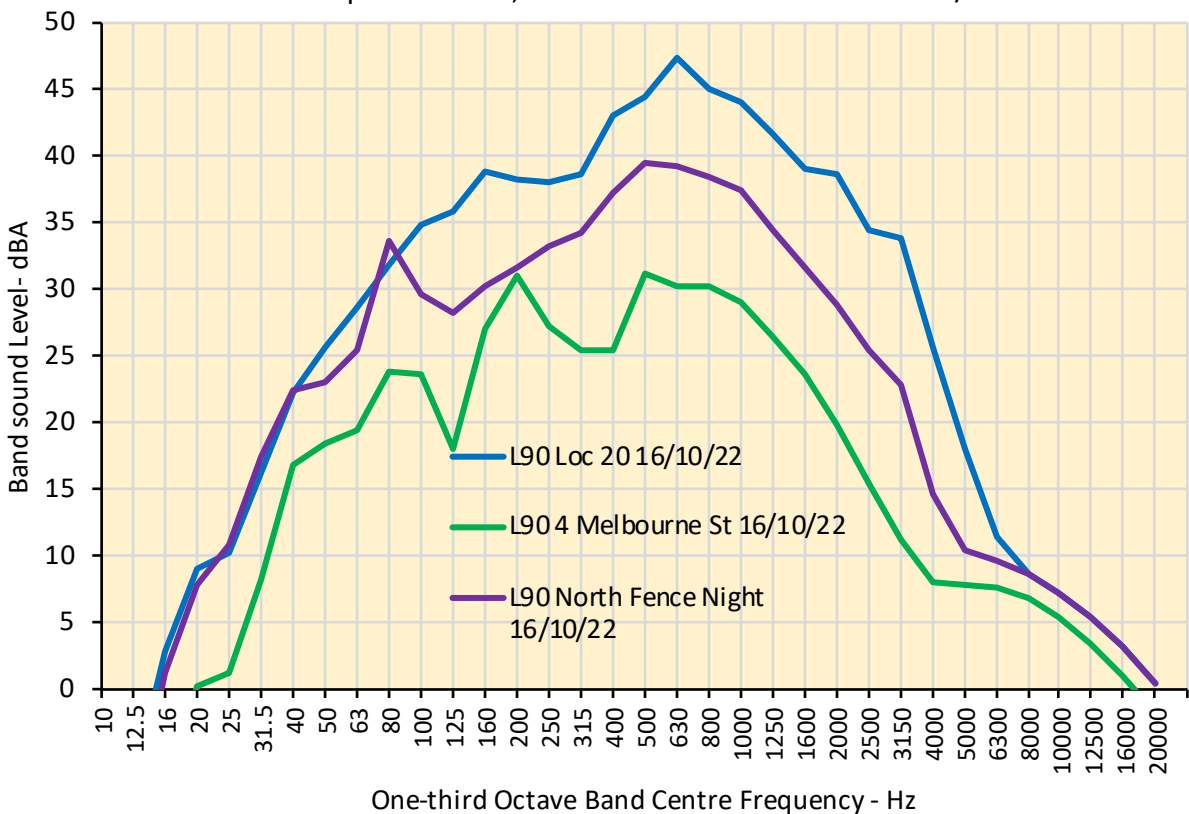


Boral Cement Berrima Annual Environmental Noise Assessment October 2022  
One-third Octave Spectra Loc20, North Fence & 4 Melb St Leq16/10 12:45 am



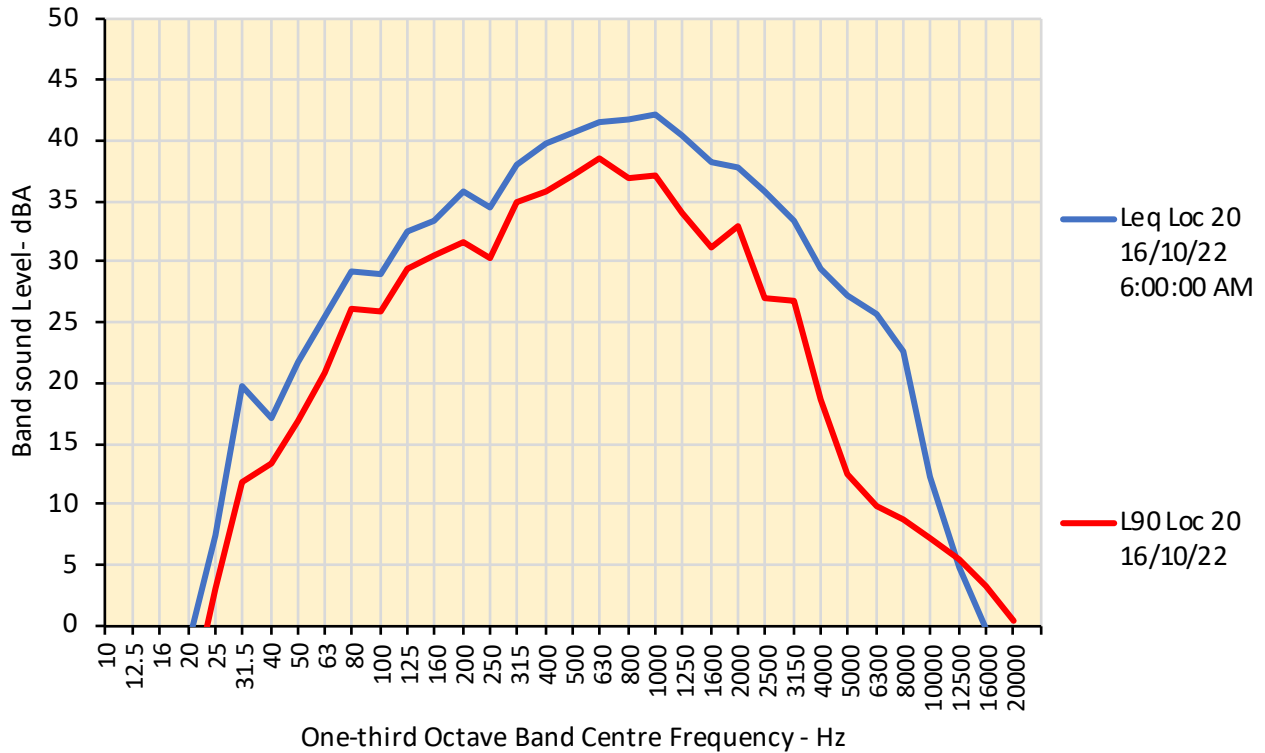
Appendix A Figure A14A: Compare Leq spectra Loc.20, 4 Melb St & North Fence 16/10/2022 12:45 am

Boral Cement Berrima Annual Environmental Noise Assessment October 2022  
One-third Octave Spectra Loc20, North Fence & 4 Melb St L90 16/10 12:45 am



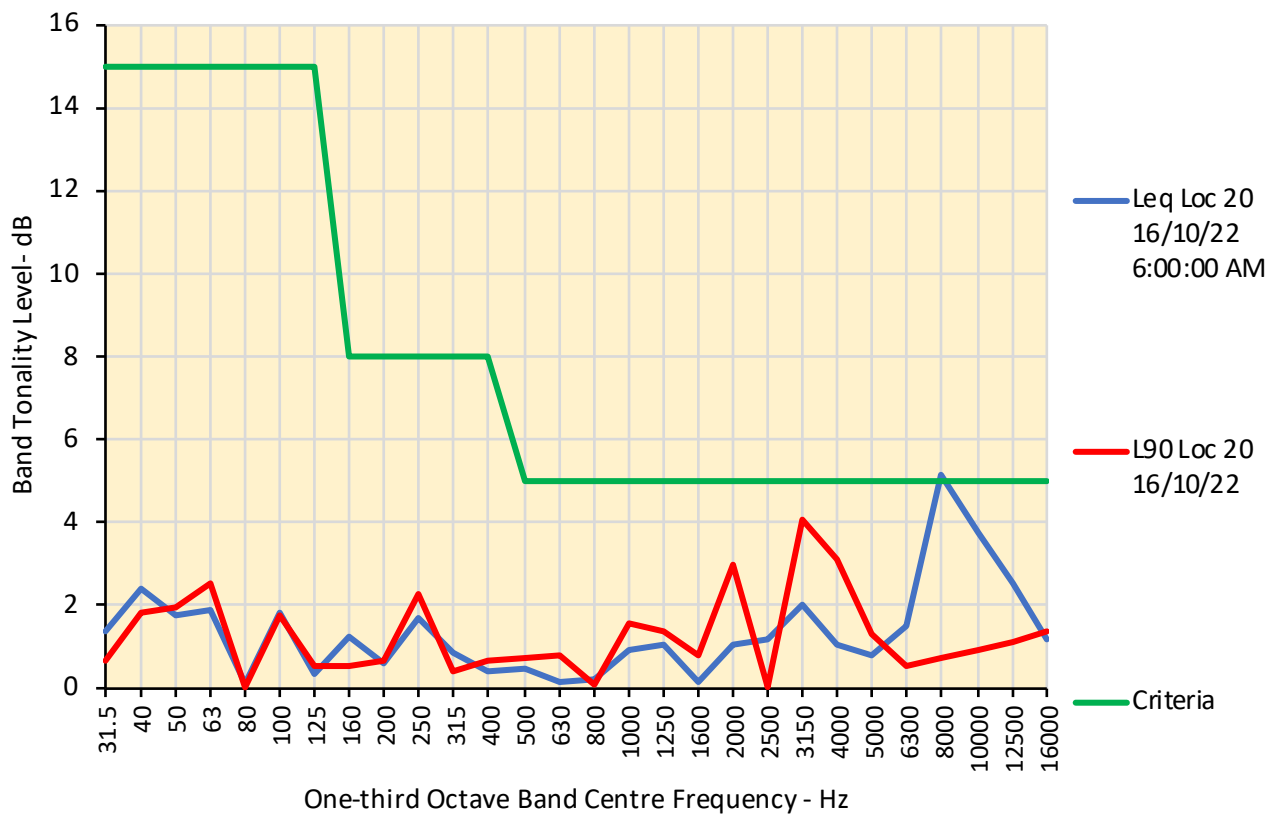
Appendix A Figure A14B: Compare L90 spectra Loc.20, 4 Melb St & North Fence 16/10/2022 12:45 am

Boral Cement Berrima Annual Environmental Noise Assessment October 2022  
One-third Octave Band Spectra Location 20 16/10 6:00 am



Appendix A Figure A15: Location 20 16/10/2022 06:00 am Spectra

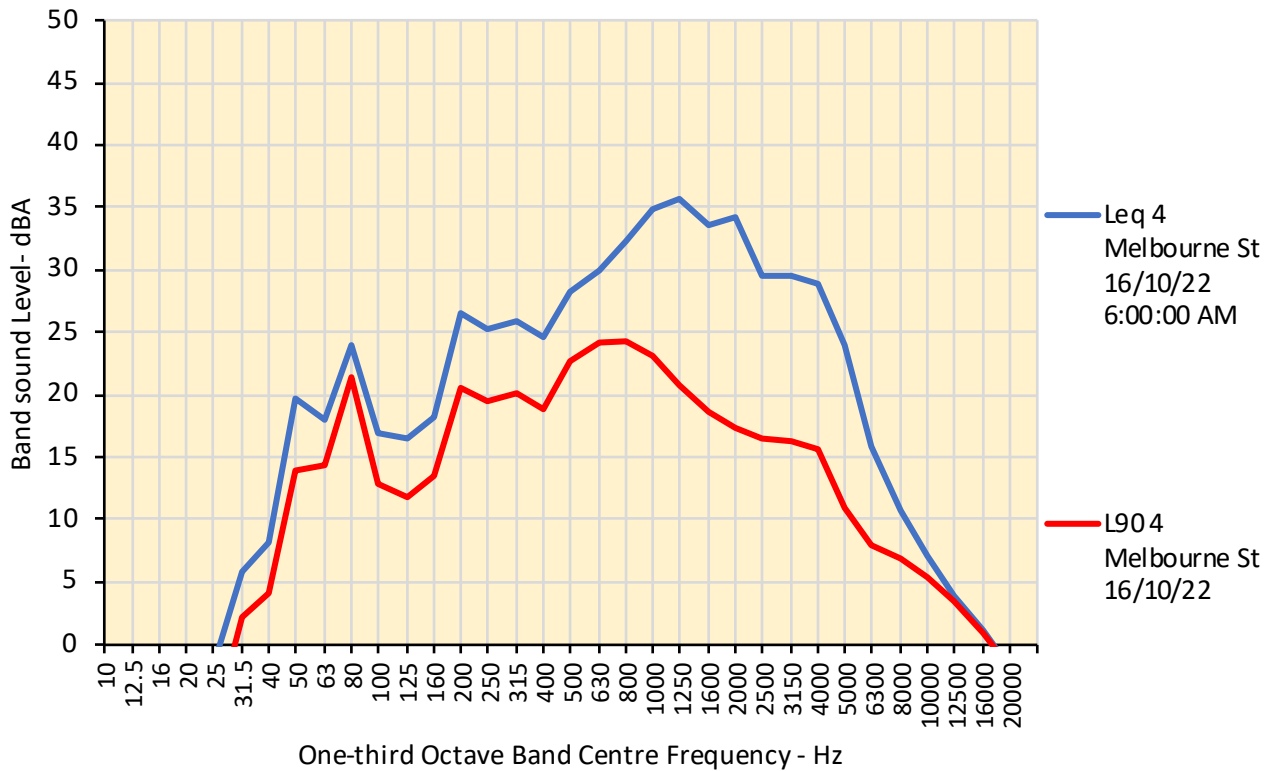
Boral Cement Berrima Annual Environmental Noise Assessment October 2022  
One-third Octave Band Tonality 20 16/10 6:00 am



Appendix A Figure A15A: Location 20 16/10/2022 06:00 am Tonality

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

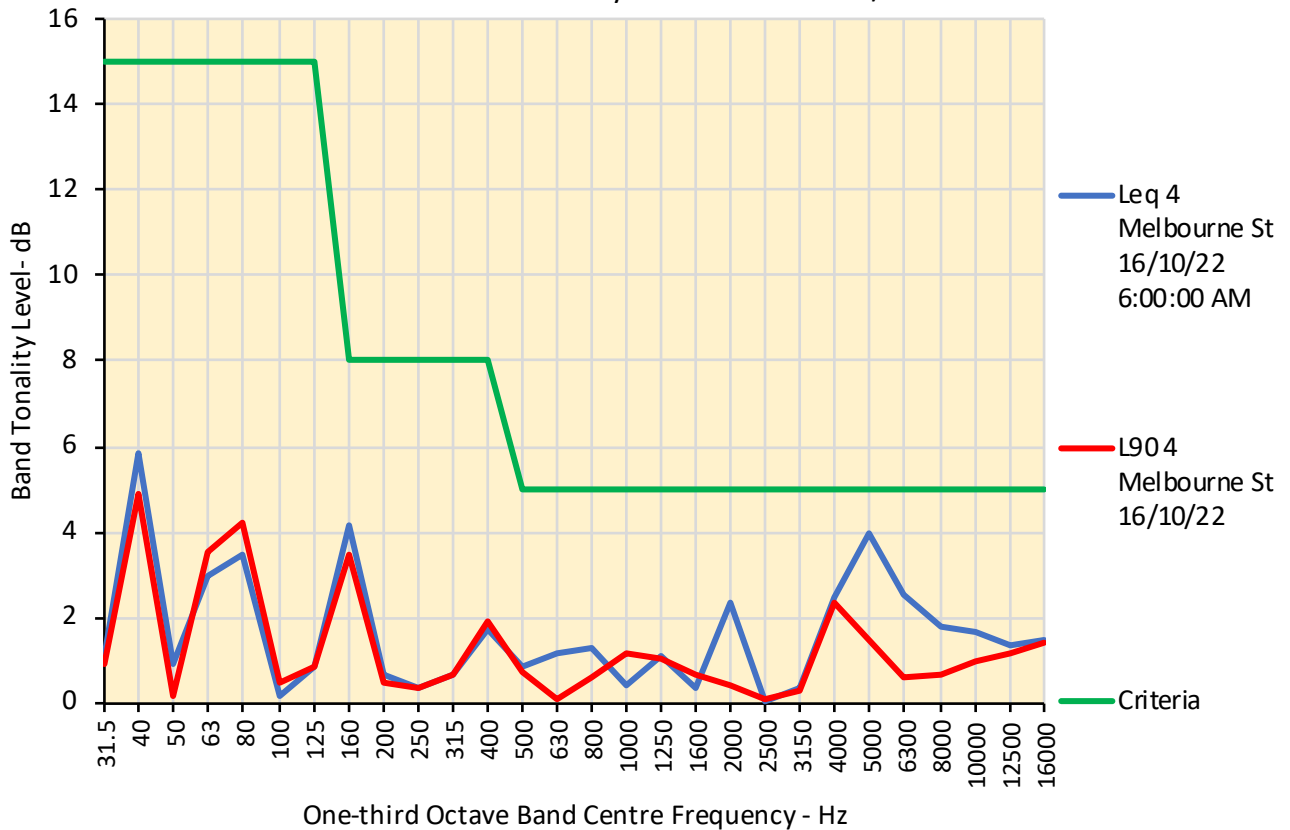
One-third Octave Band Spectra 4 Melbourne St 16/10 6:00 am



Appendix A Figure A16: 4Melbourne St 16/10/2022 06:00 am Spectra

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

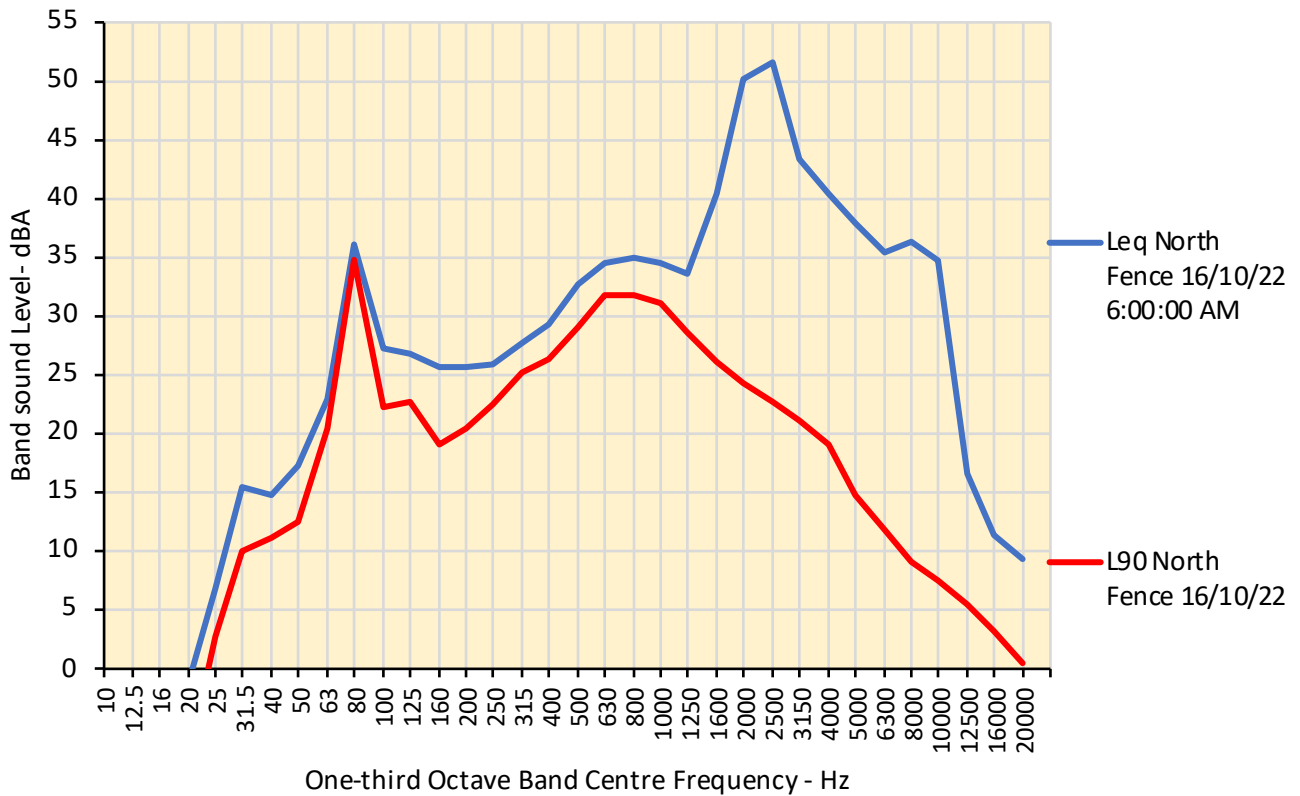
One-third Octave Band Tonality 4 Melbourne St 16/10 6:00 am



Appendix A Figure A16A: 4Melbourne St 16/10/2022 06:00 am Tonality

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

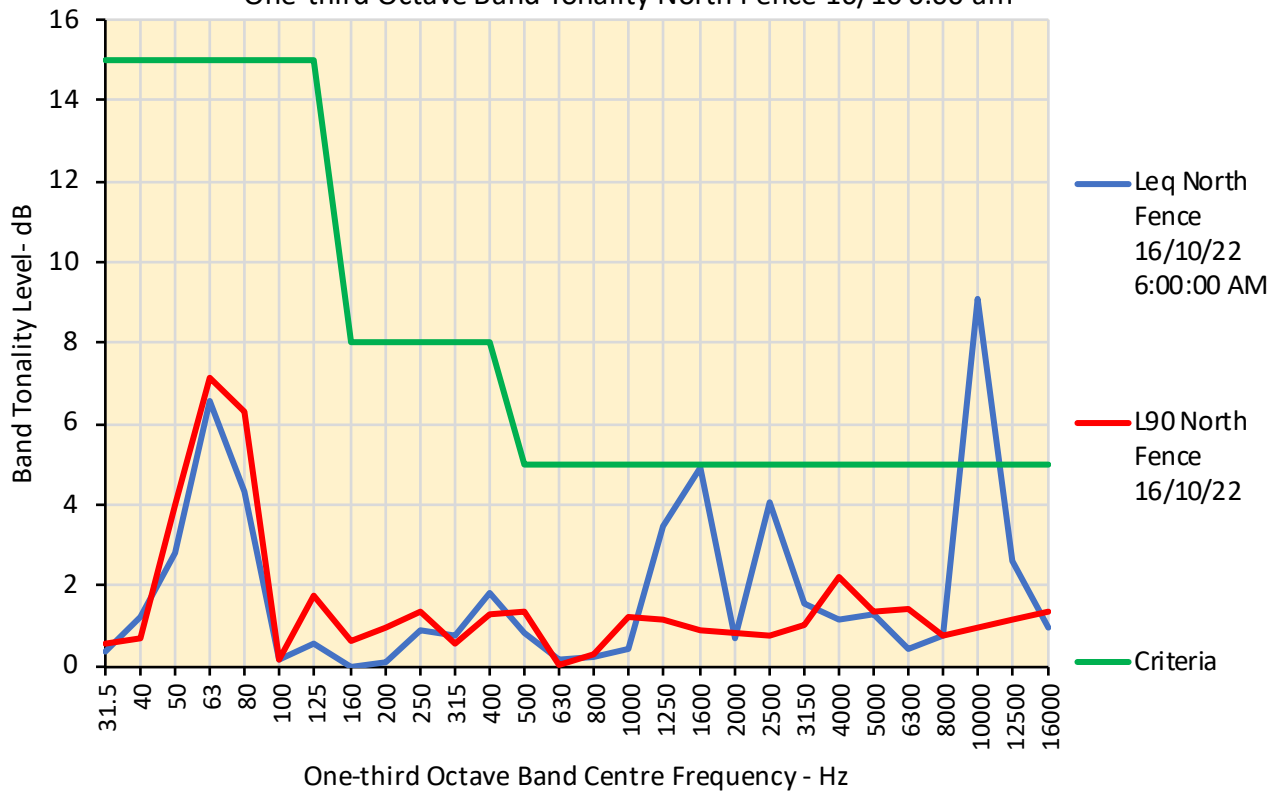
One-third Octave Band Spectra North Fence 16/10 6:00 am



Appendix A Figure A17: North Fence 16/10/2022 06:00 am Spectra

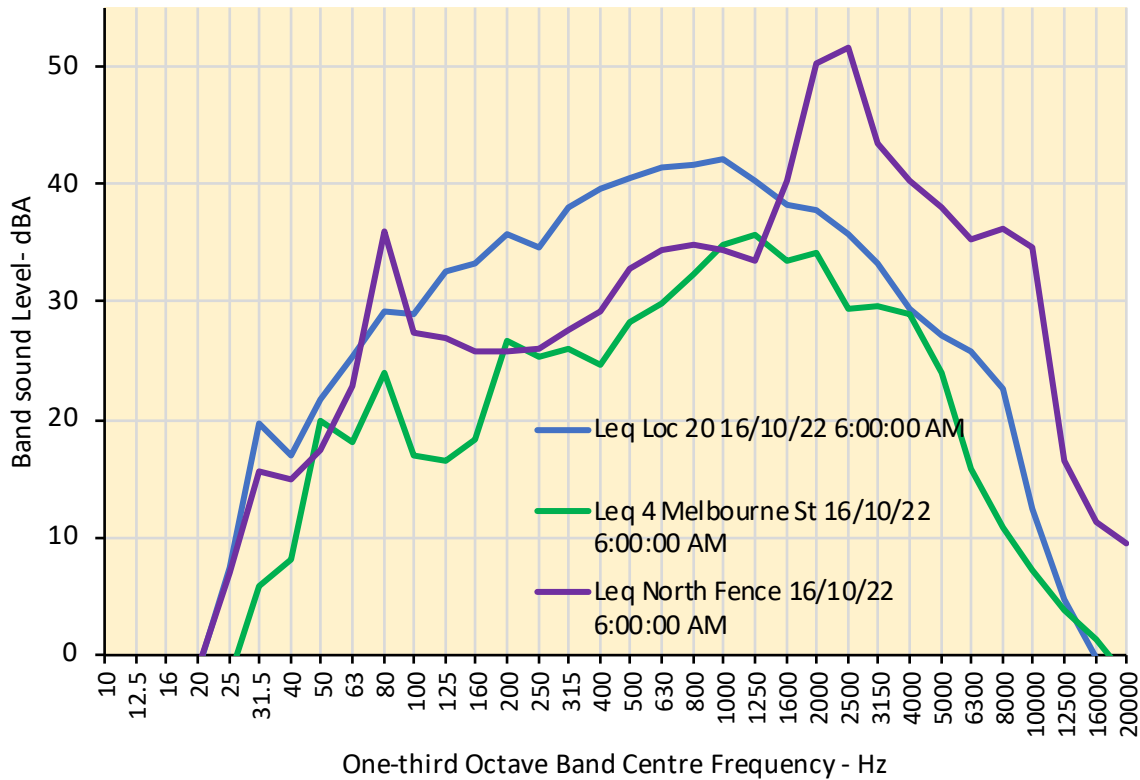
Boral Cement Berrima Annual Environmental Noise Assessment October 2022

One-third Octave Band Tonality North Fence 16/10 6:00 am



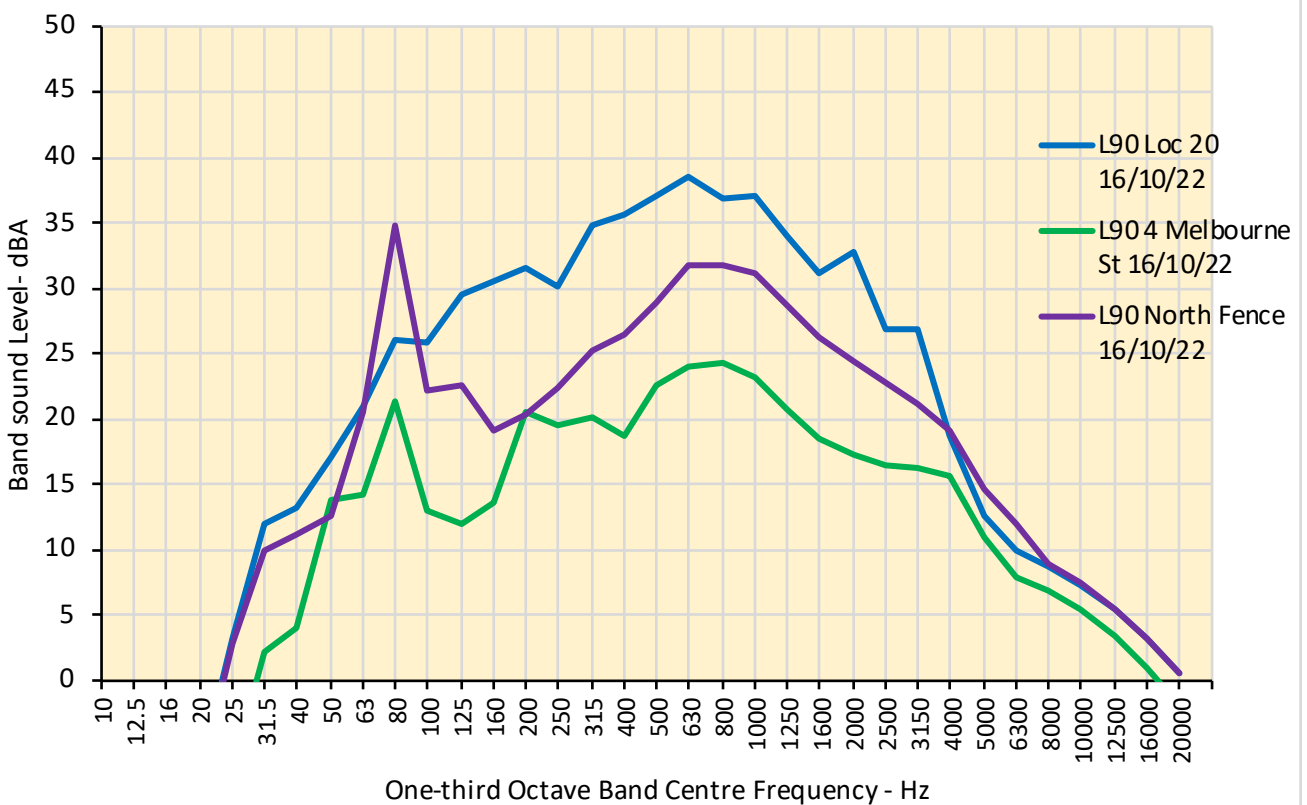
Appendix A Figure A17A: North Fence 16/10/2022 06:00 am Tonality

Boral Cement Berrima Annual Environmental Noise Assessment October 2022  
One-third Octave Spectra Loc20, North Fence & 4 Melb St Leq 16/10 6:00 am



Appendix A Figure A18A: Compare Leq spectra Loc.20, 4 Melb St & North Fence 16/10/2022 06:00 am

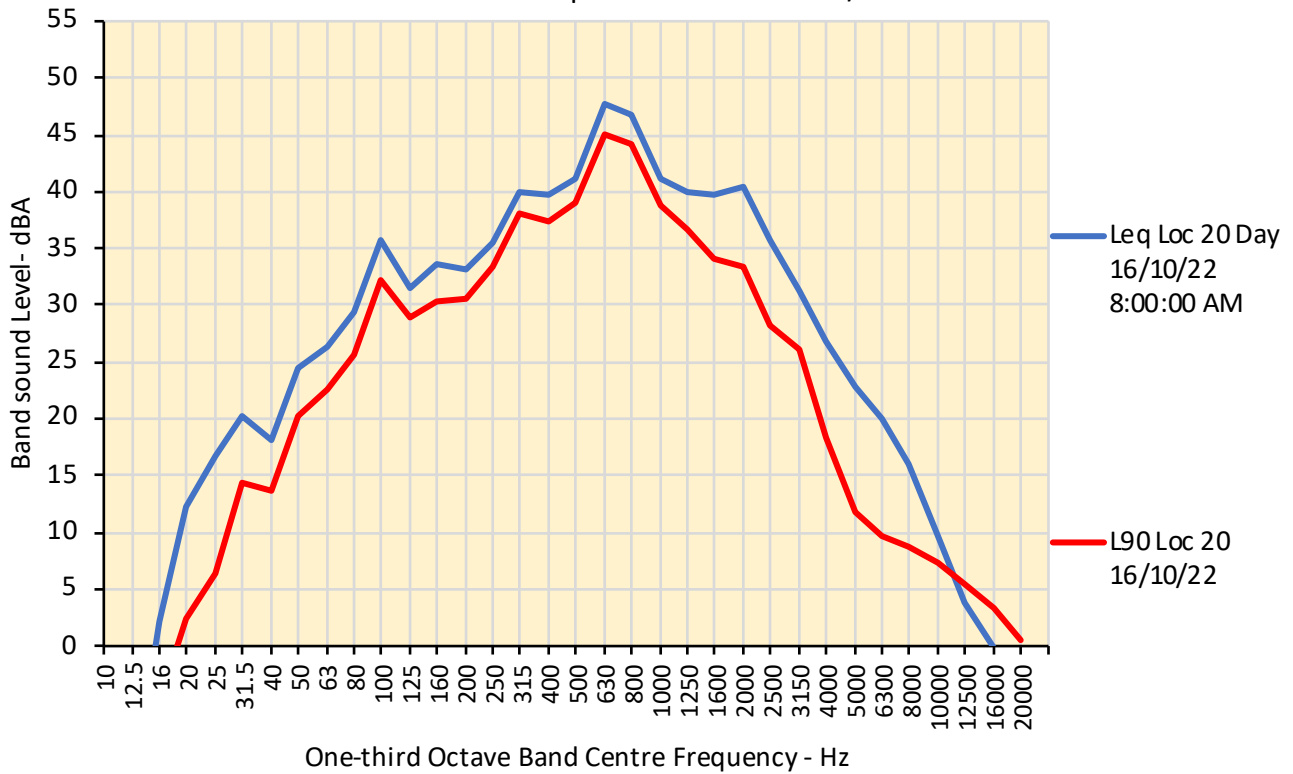
Boral Cement Berrima Annual Environmental Noise Assessment October 2022  
One-third Octave Spectra Loc20, North Fence & 4 Melb St L90 16/10 6:00 am



Appendix A Figure A18A: Compare L90 spectra Loc.20, 4 Melb St & North Fence 16/10/2022 06:00 am

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

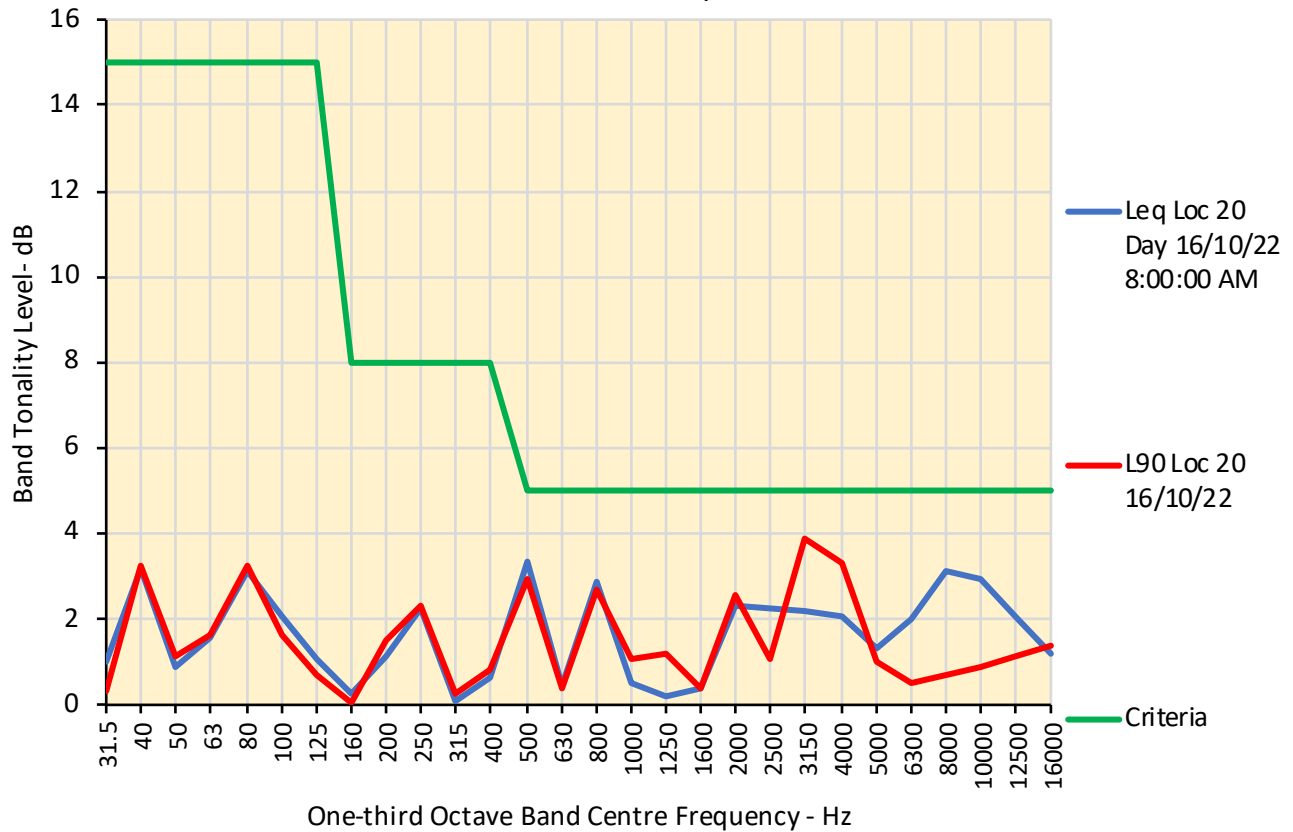
One-third Octave Band Spectra Location 20 16/10 8:00 am



Appendix A Figure A19: Location 20 16/10/2022 08:00 am Spectra

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

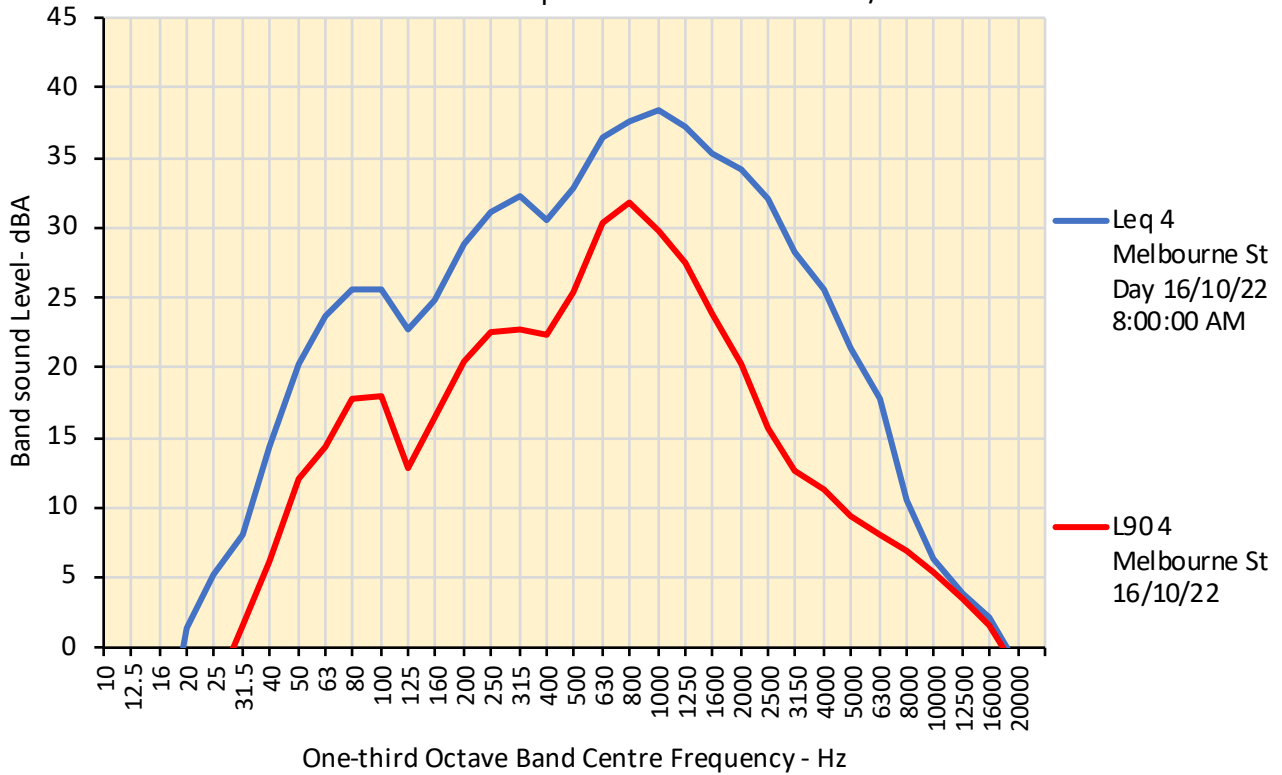
One-third Octave Band Tonality 20 16/10 8:00 am



Appendix A Figure A19A: Location 20 16/10/2022 08:00 am Tonality

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

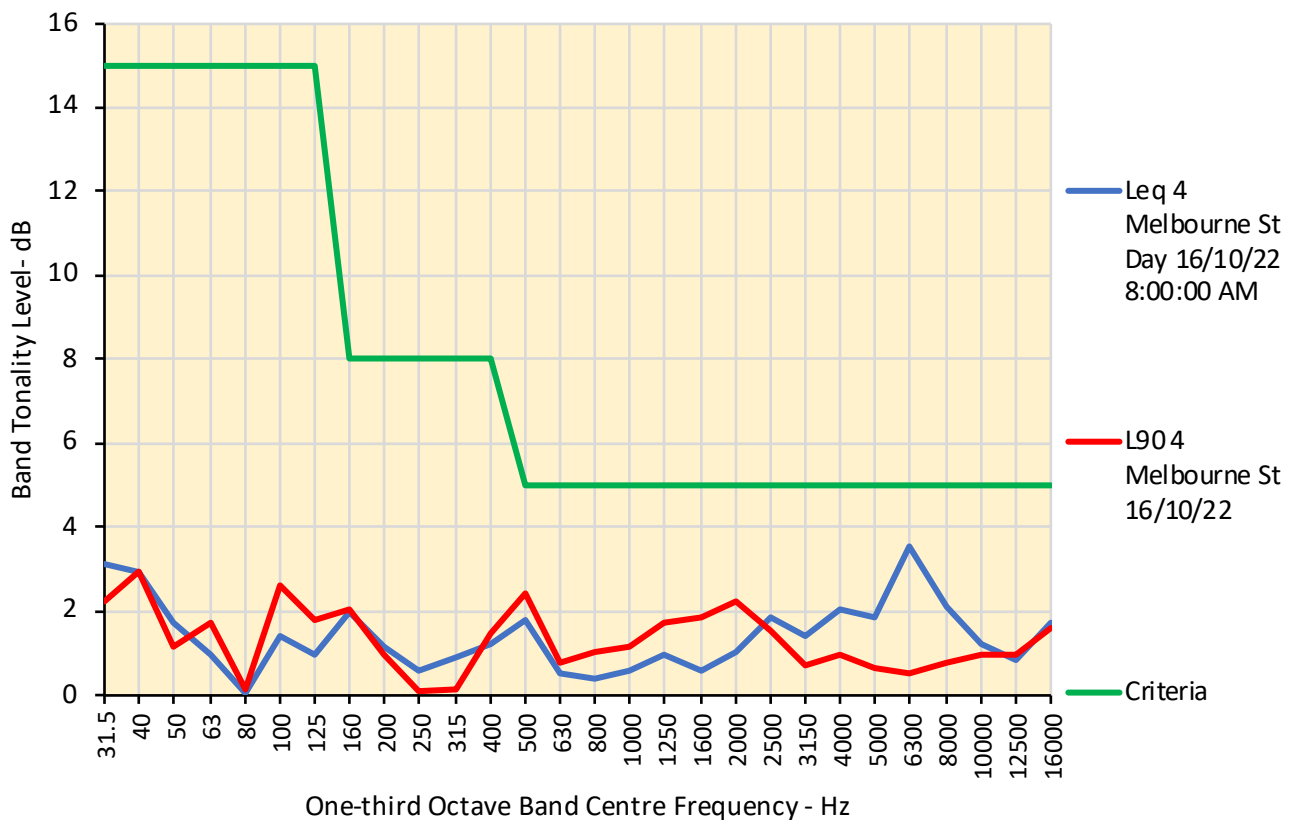
One-third Octave Band Spectra 4 Melbourne St 16/10 8:00 am



Appendix A Figure A20: 4Melbourne St 16/10/2022 08:00 am Spectra

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

One-third Octave Band Tonality 4 Melbourne St 16/10 8:00 am

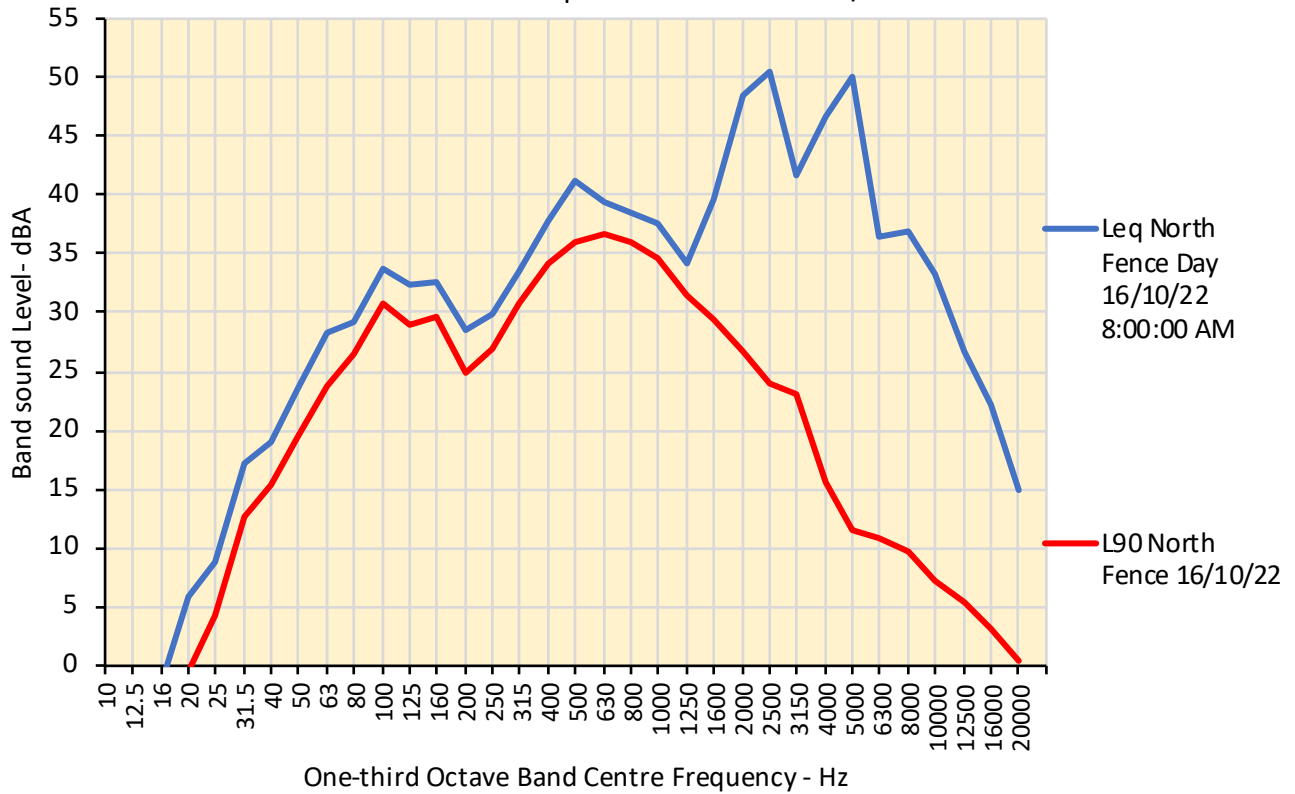


Appendix A Figure A20A: 4Melbourne St 16/10/2022 08:00 am Tonality



Boral Cement Berrima Annual Environmental Noise Assessment October 2022

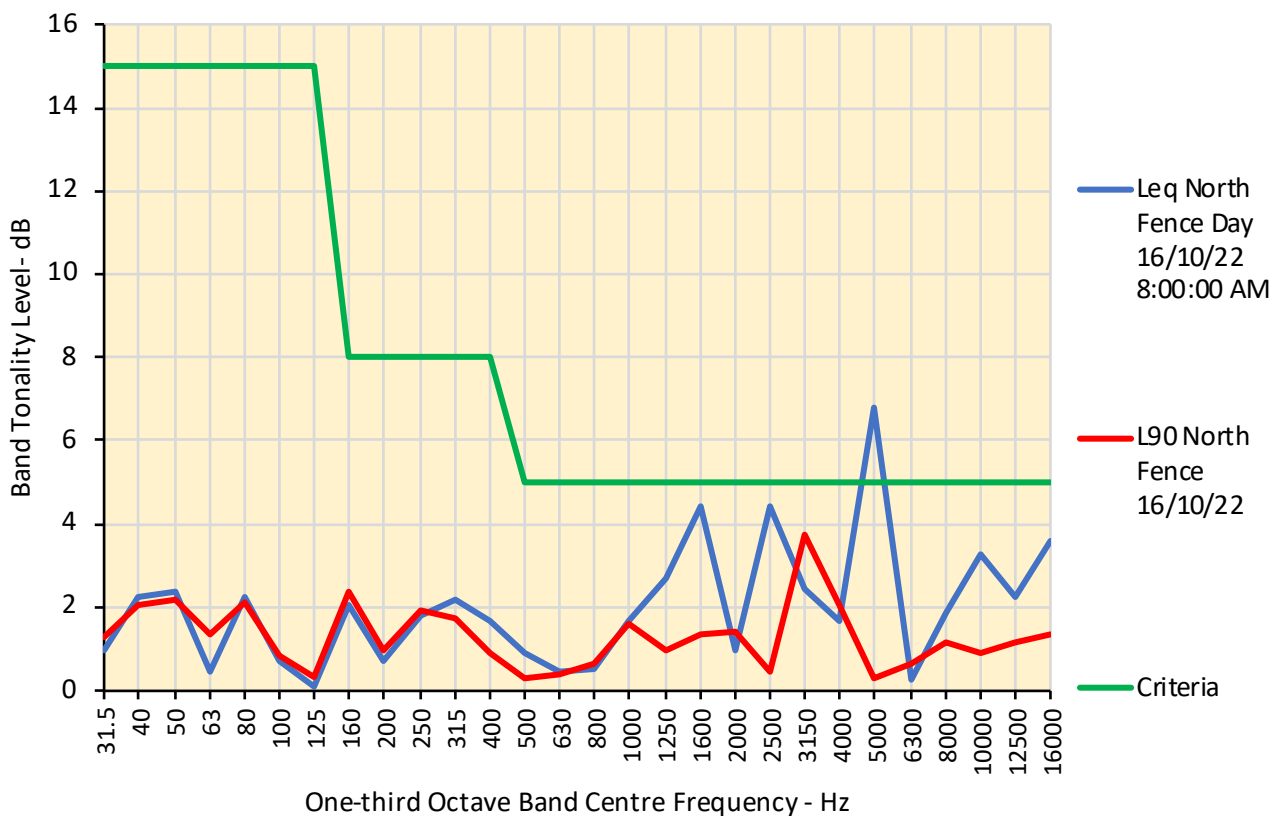
One-third Octave Band Spectra North Fence 16/10 8:00 am



Appendix A Figure A21: North Fence 16/10/2022 08:00 am Spectra

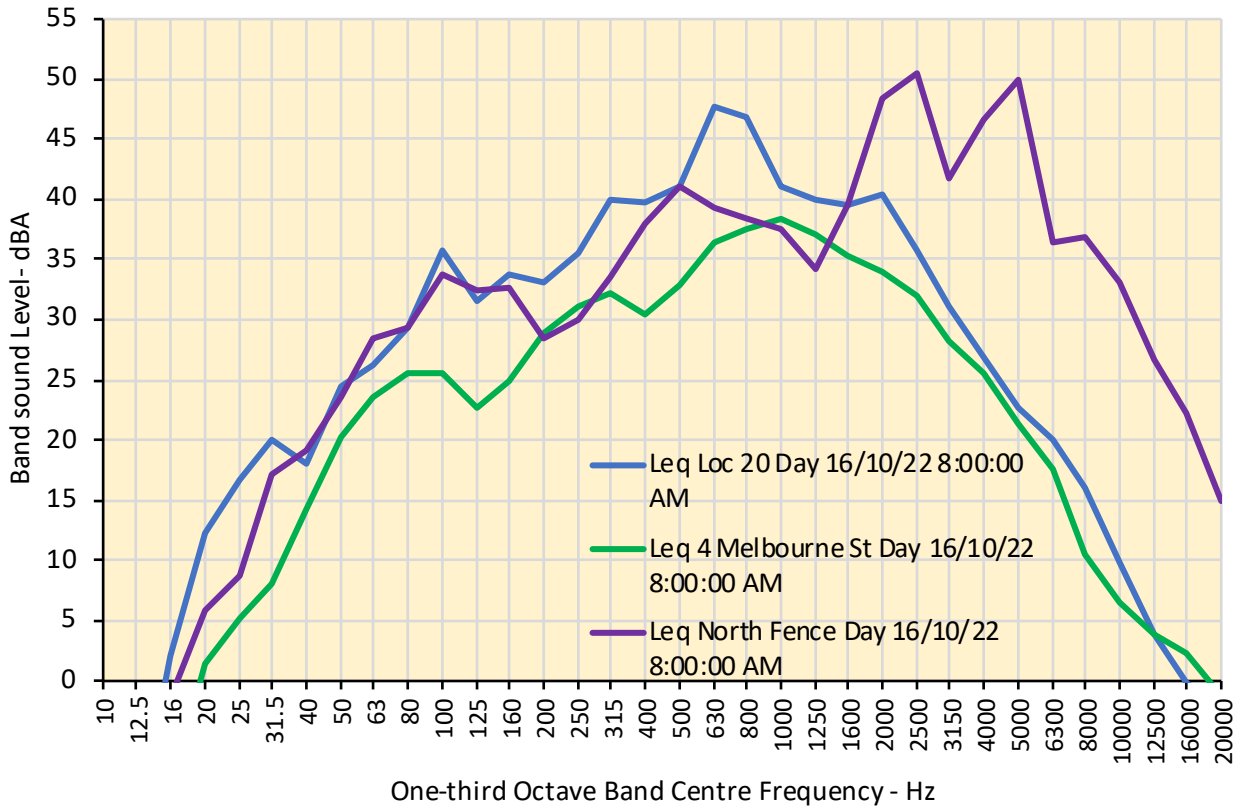
Boral Cement Berrima Annual Environmental Noise Assessment October 2022

One-third Octave Band Tonality North Fence 16/10 8:00 am



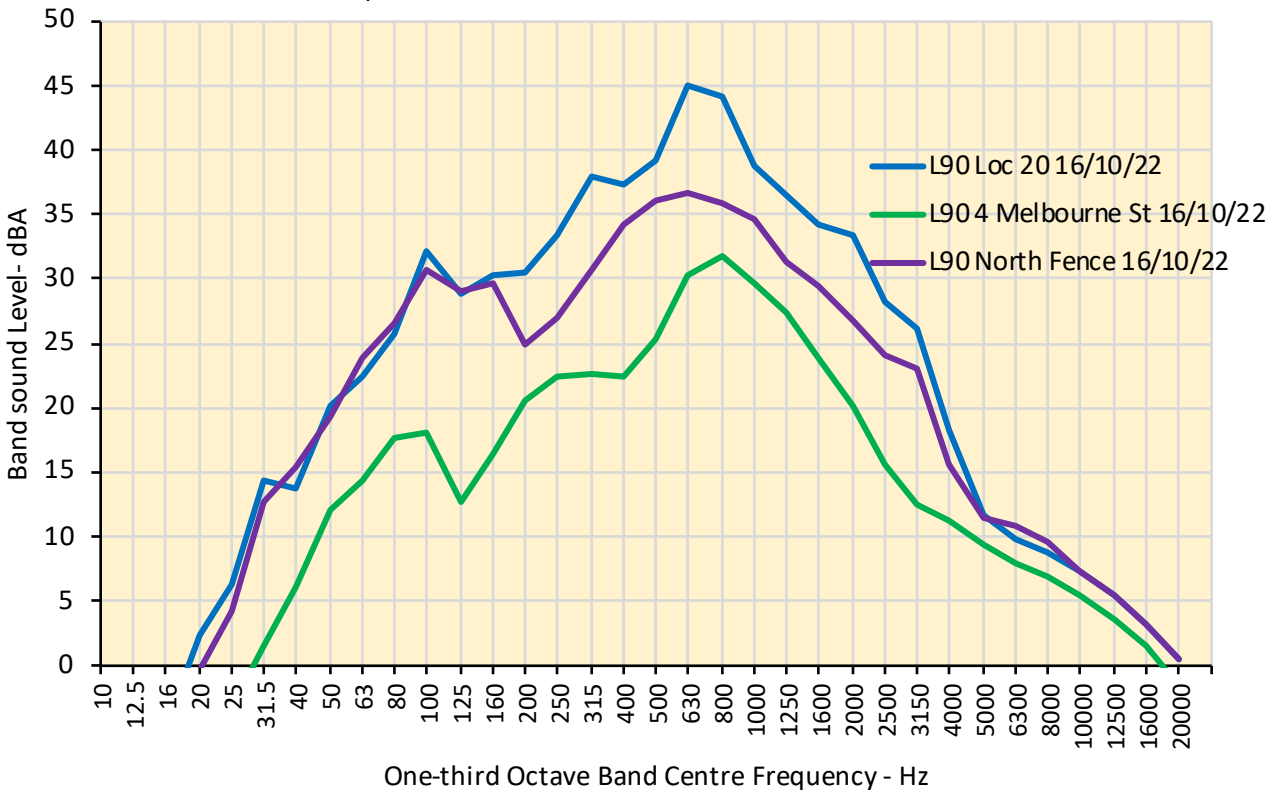
Appendix A Figure A21A: North Fence 16/10/2022 08:00 am Tonality

Boral Cement Berrima Annual Environmental Noise Assessment October 2022  
One-third Octave Spectra Loc20, North Fence & 4 Melb St Leq 16/10 8:00 am



Appendix A Figure A22A: Compare Leq spectra Loc.20, 4 Melb St & North Fence 16/10/2022 08:00 am

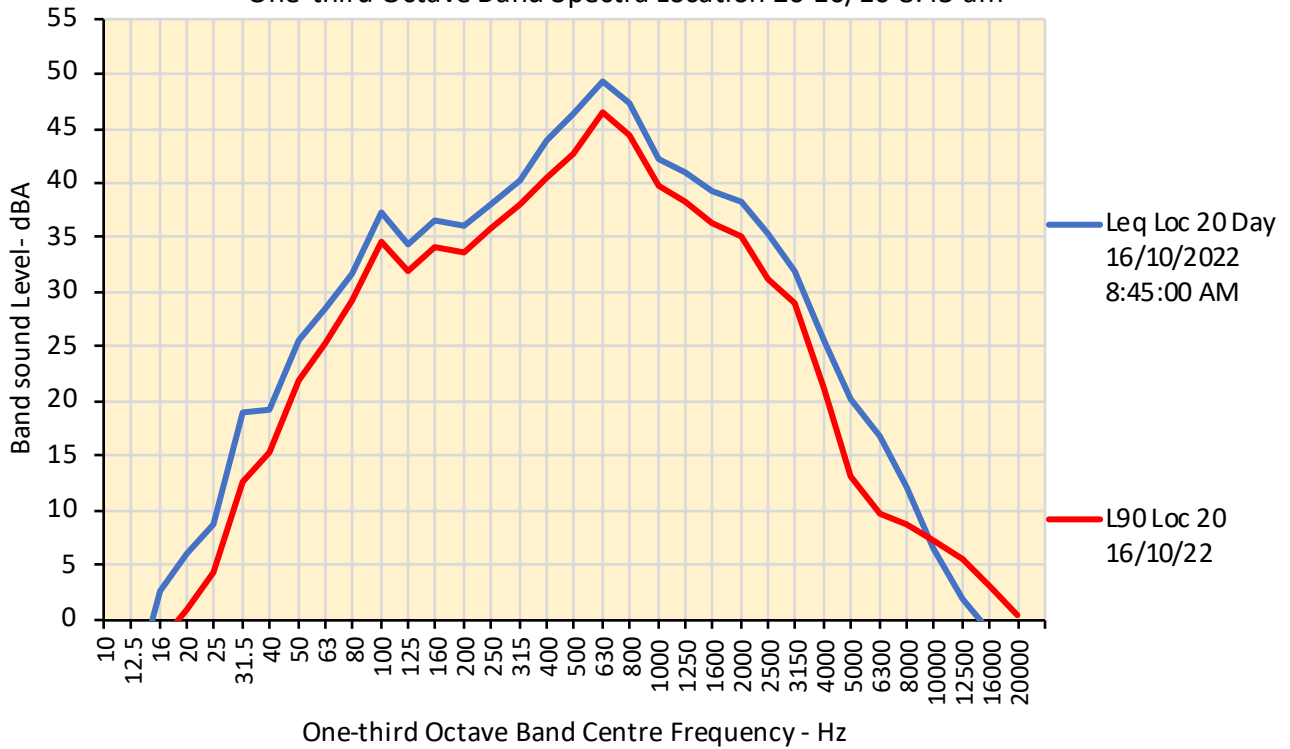
Boral Cement Berrima Annual Environmental Noise Assessment October 2022  
One-third Octave Spectra Loc20, North Fence & 4 Melb St L90 16/10 8:00 am



Appendix A Figure A22A: Compare L90 spectra Loc.20, 4 Melb St & North Fence 16/10/2022 08:00 am

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

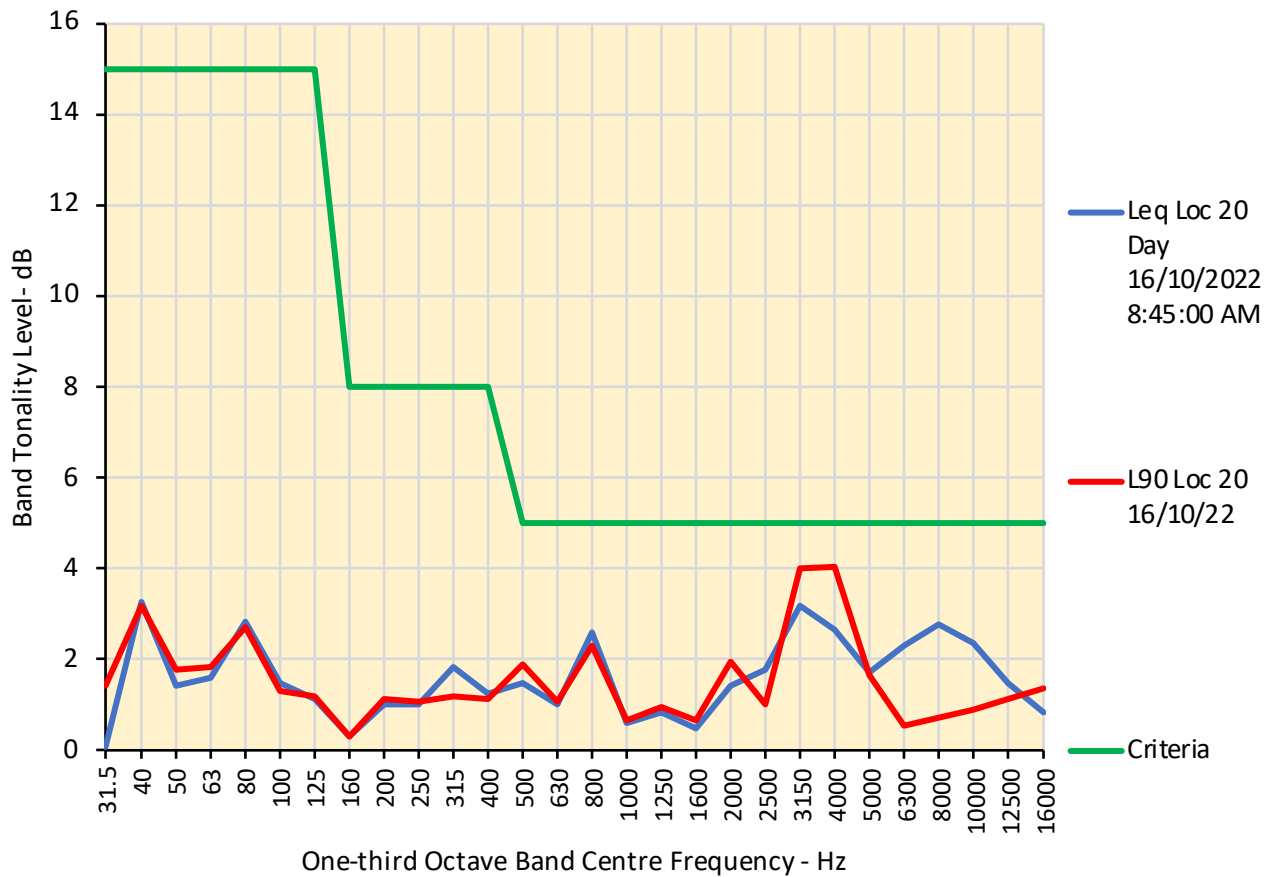
One-third Octave Band Spectra Location 20 16/10 8:45 am



Appendix A Figure A23: Location 20 16/10/2022 08:45 am Spectra

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

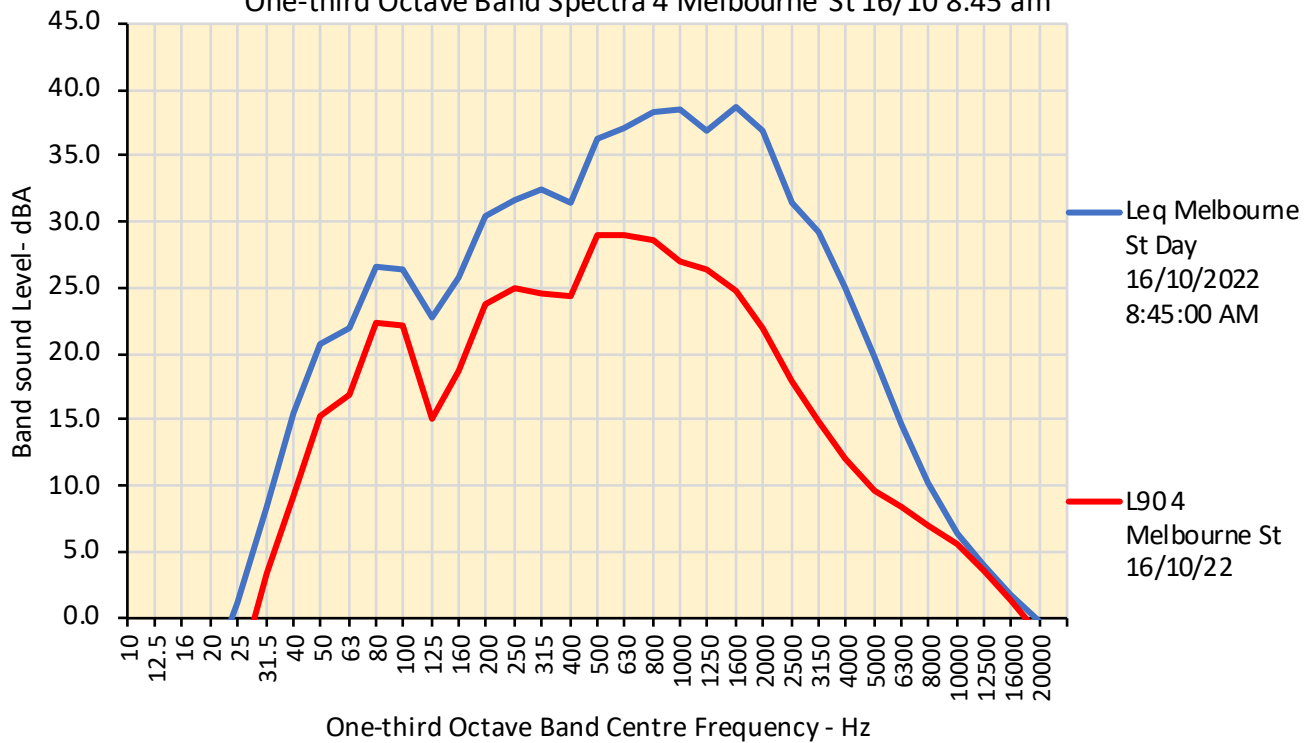
One-third Octave Band Tonality 20 16/10 8:45 am



Appendix A Figure A23A: Location 20 16/10/2022 08:45 am Tonality

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

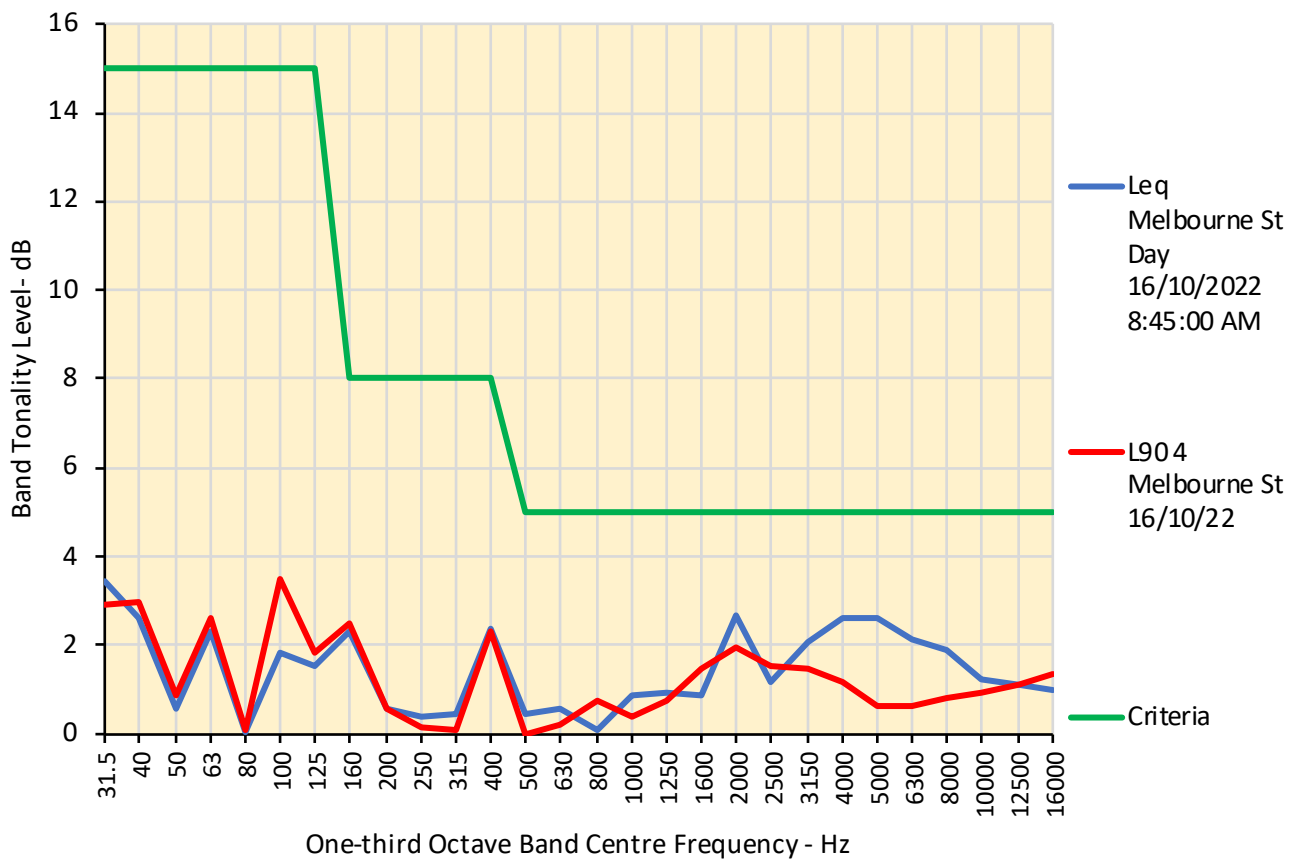
One-third Octave Band Spectra 4 Melbourne St 16/10 8:45 am



Appendix A Figure A24: 4 Melbourne St 16/10/2022 08:45 am Spectra

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

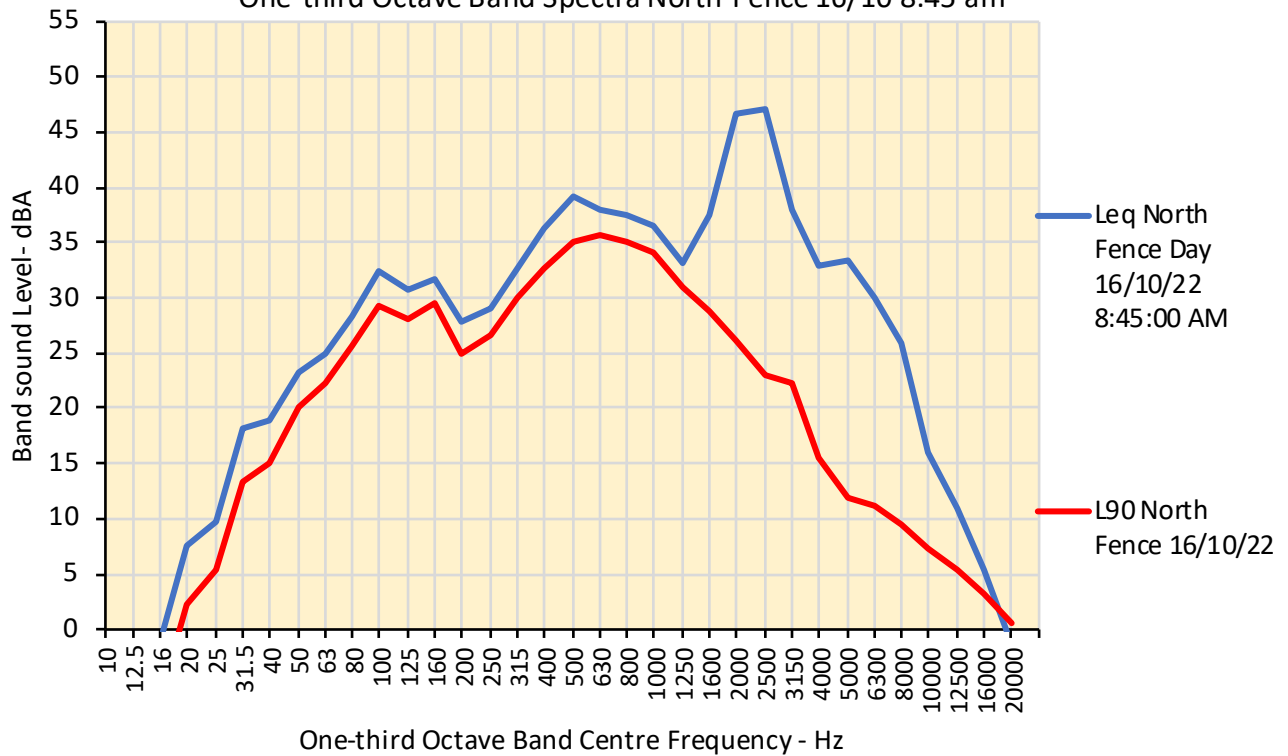
One-third Octave Band Tonality 4 Melbourne St 16/10 8:45 am



Appendix A Figure A24A: 4 Melbourne St 16/10/2022 08:45 am Tonality

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

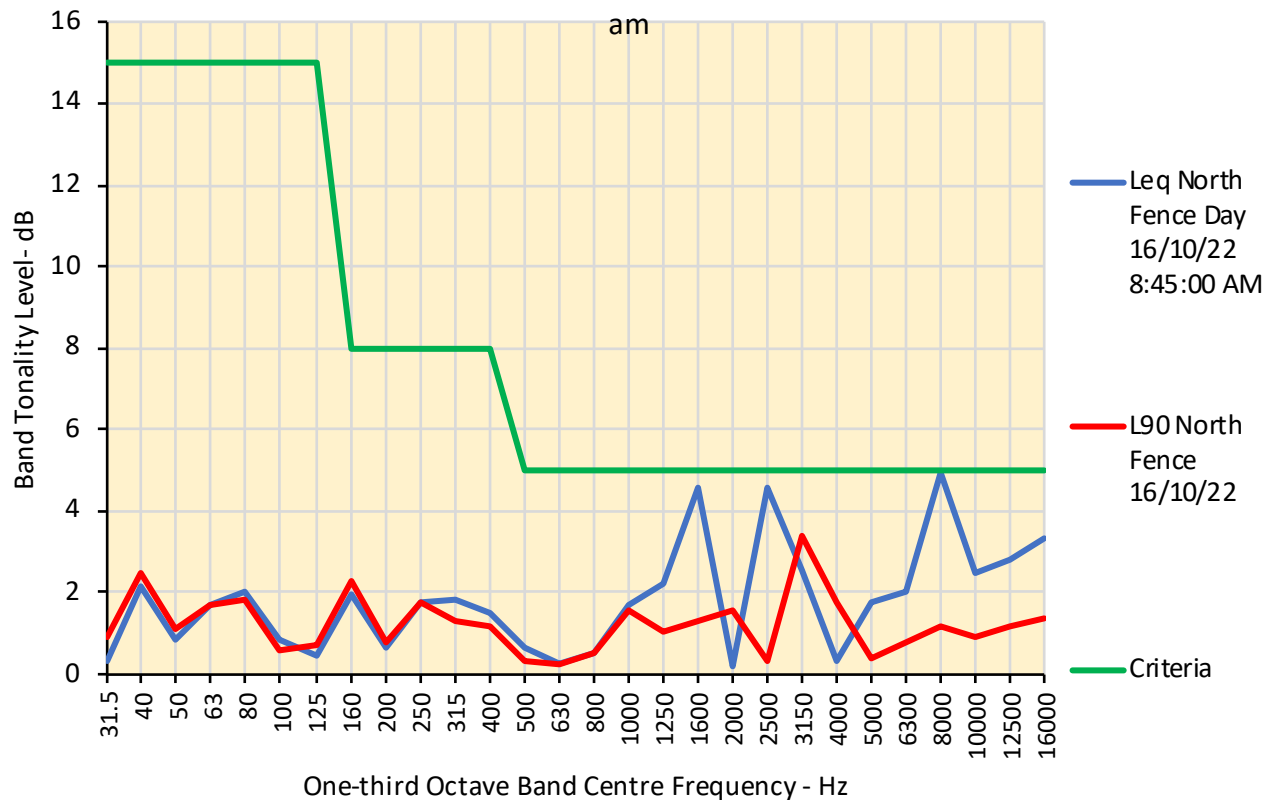
One-third Octave Band Spectra North Fence 16/10 8:45 am



Appendix A Figure A25: North Fence 16/10/2022 08:45 am Spectra

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

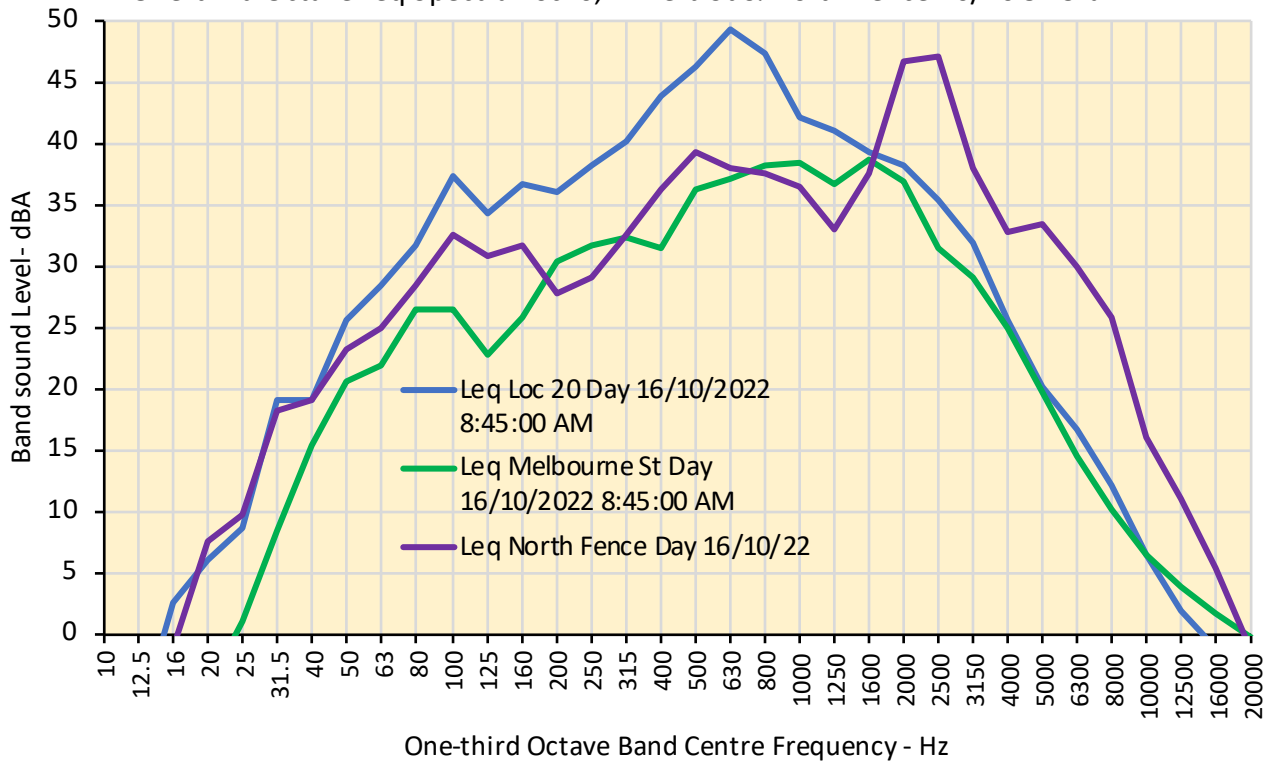
One-third Octave Band Tonality North Fence 16/10 8:45



Appendix A Figure A25A: North Fence 16/10/2022 08:45 am Tonality

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

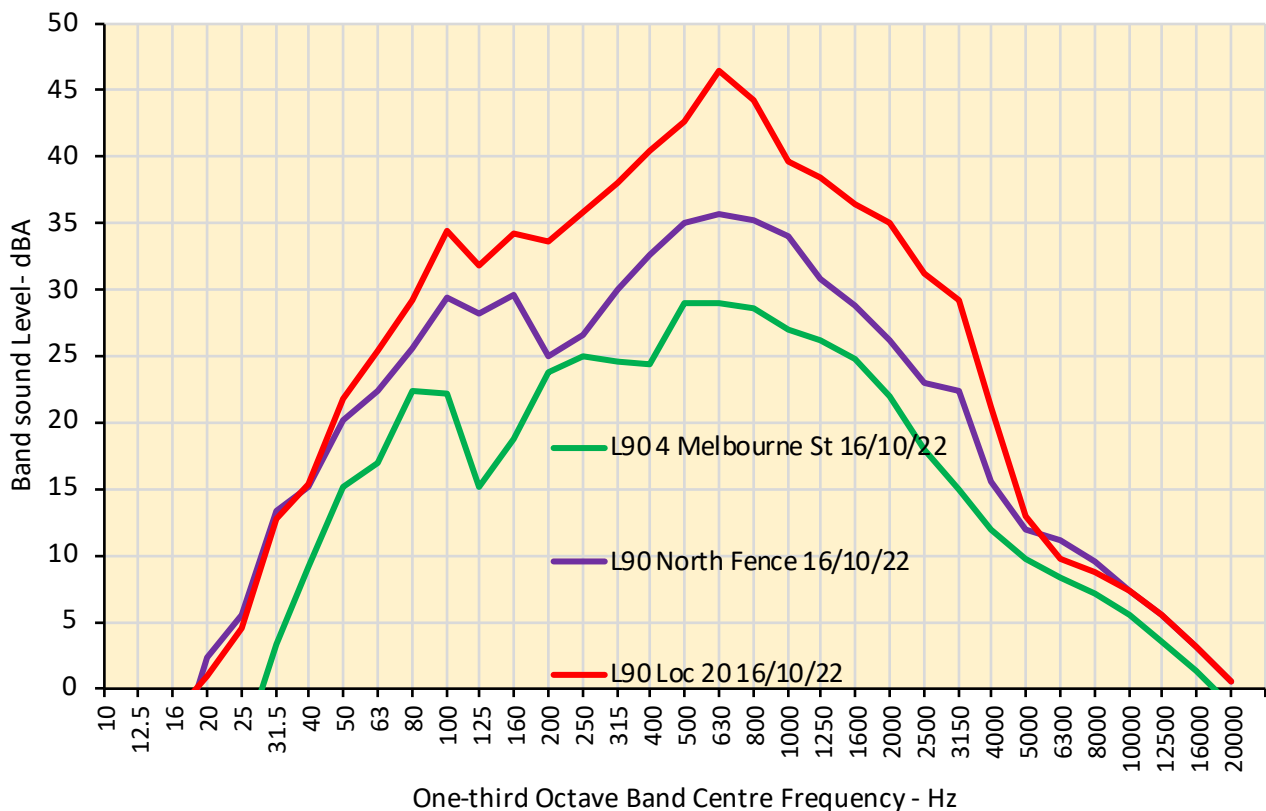
One-third Octave Leq Spectra Loc20, 4 Melb St & North Fence 16/10 8:45 am



Appendix A Figure A26A: Compare Leq spectra Loc.20, 4 Melb St & North Fence 16/10/2022 08:45 am

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

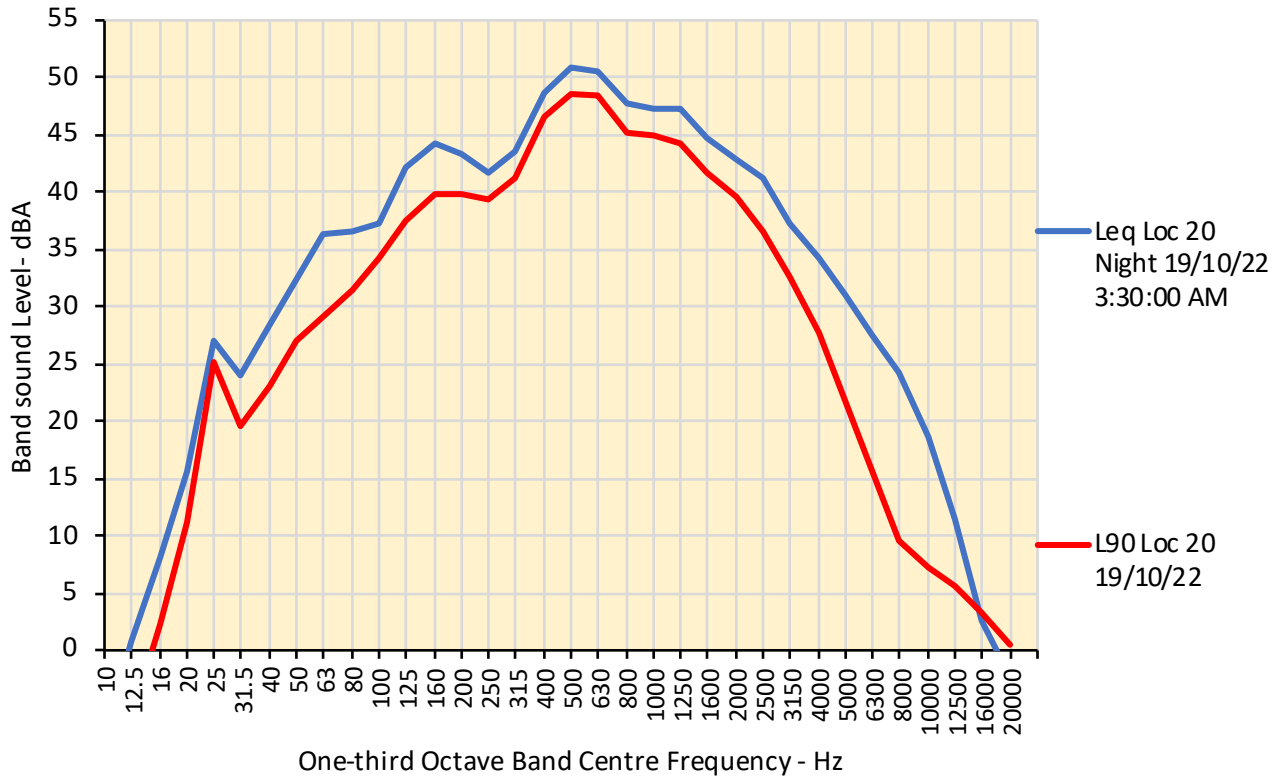
One-third Octave L90 Spectra Loc20, 4 Melb St & North Fence 16/10 8:45 am



Appendix A Figure A26B: Compare L90 spectra Loc.20, 4 Melb St & North Fence 16/10/2022 08:45 am

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

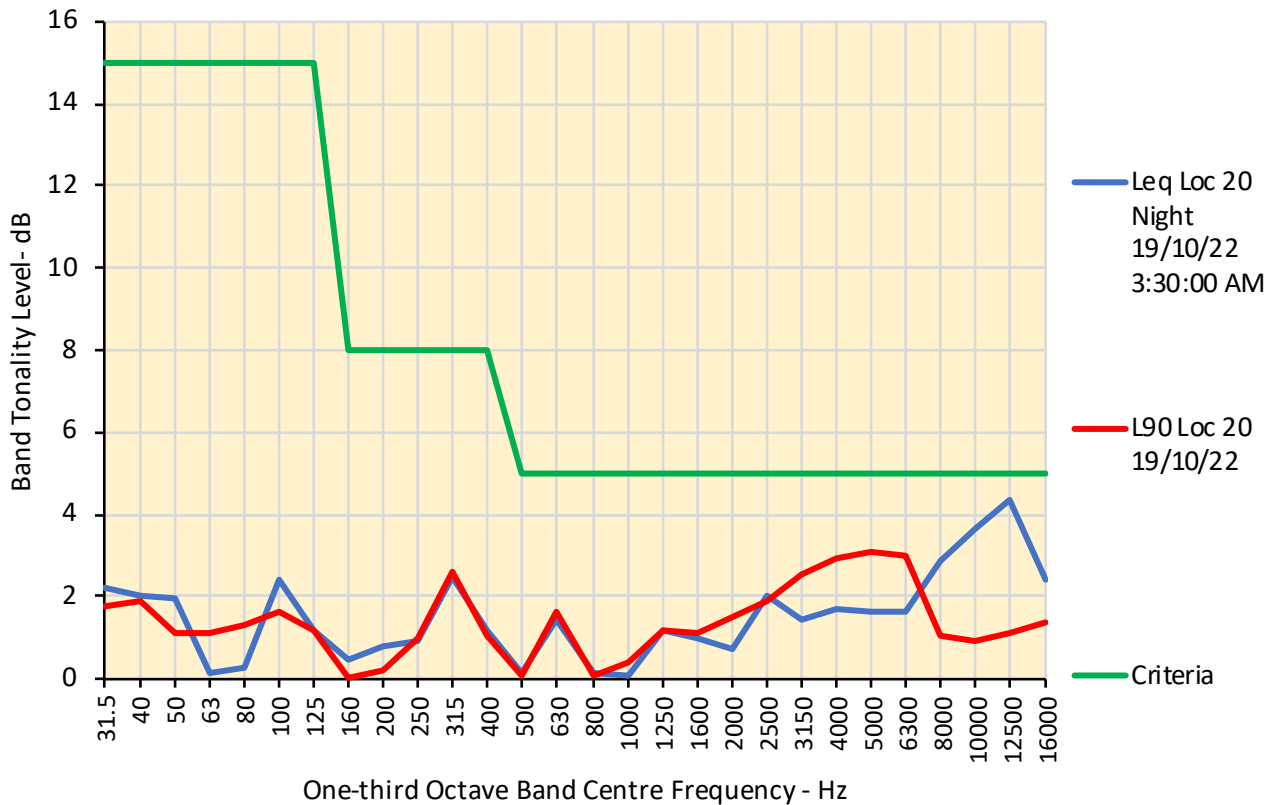
One-third Octave Band Spectra Location 20 19/10 3:30 am



Appendix A Figure A27: Location 20 19/10/2022 03:30 am Spectra

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

One-third Octave Band Tonality 20 19/10 3:30 am

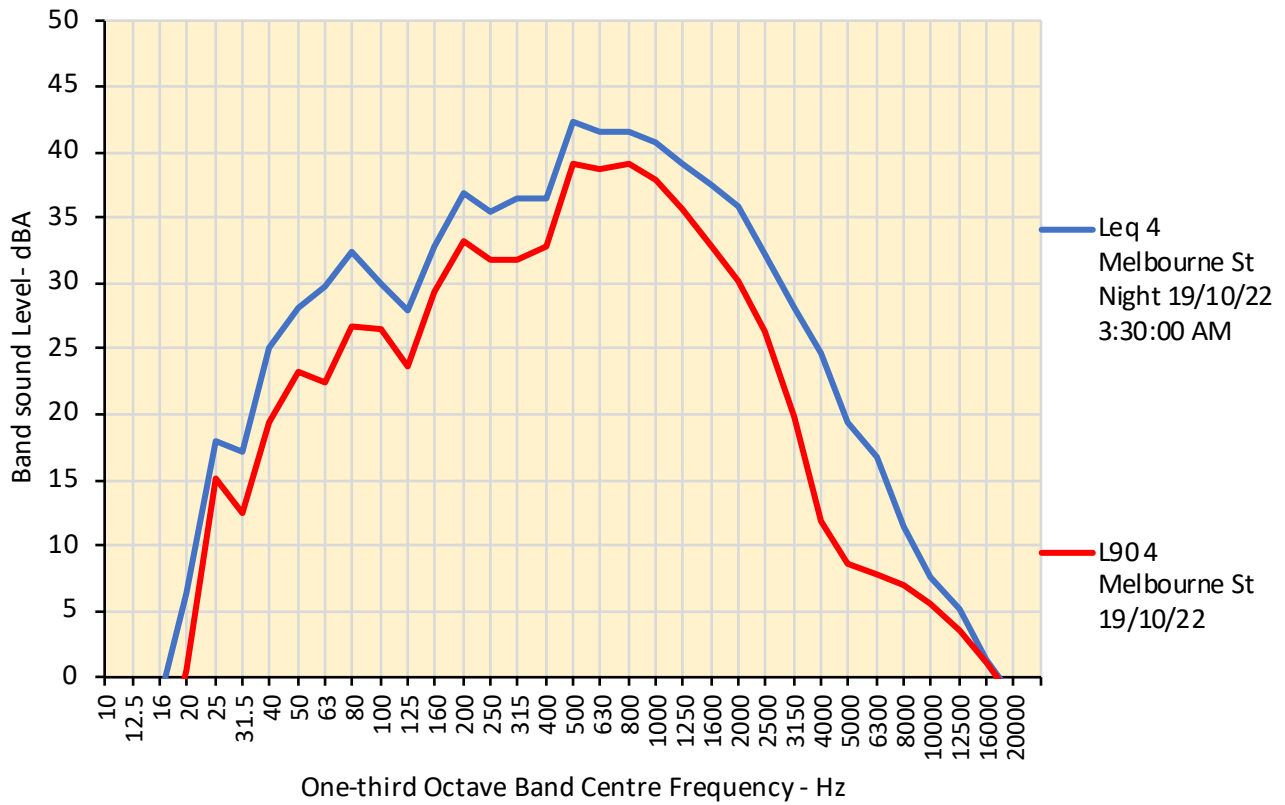


Appendix A Figure A27: Location 20 19/10/2022 03:30 am Tonality



Boral Cement Berrima Annual Environmental Noise Assessment October 2022

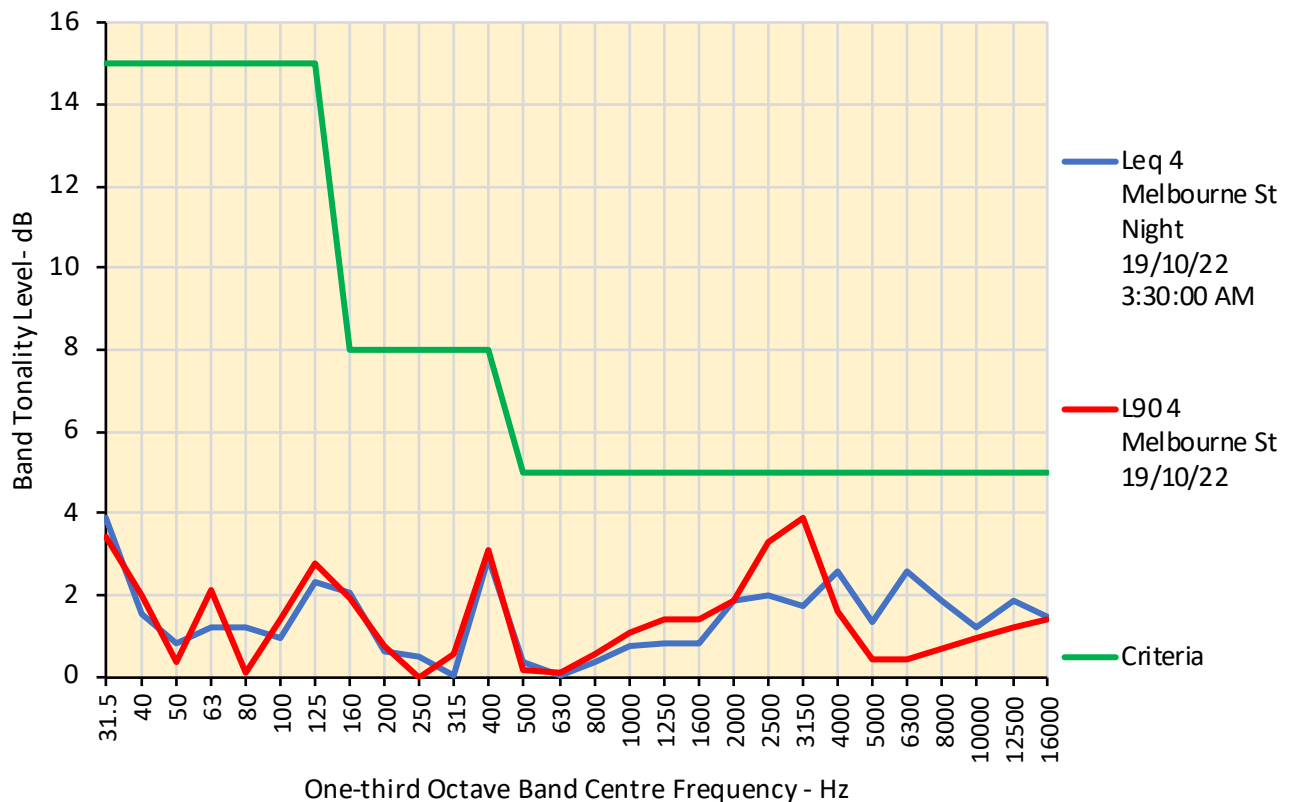
One-third Octave Band Spectra 4 Melbourne St 19/10 3:30 am



Appendix A Figure A28: 4 Melbourne St 19/10/2022 03:30 am Spectra

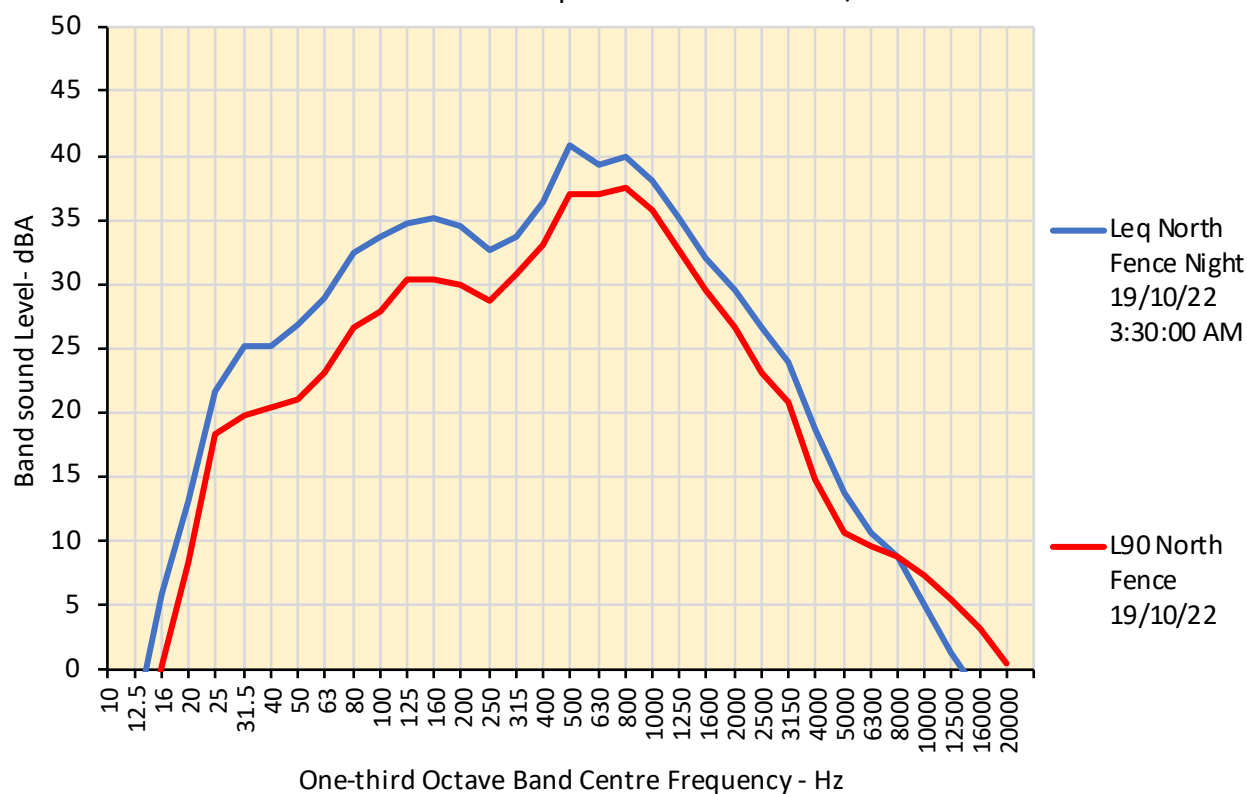
Boral Cement Berrima Annual Environmental Noise Assessment October 2022

One-third Octave Band Tonality 4 Melbourne St 19/10 3:30 am



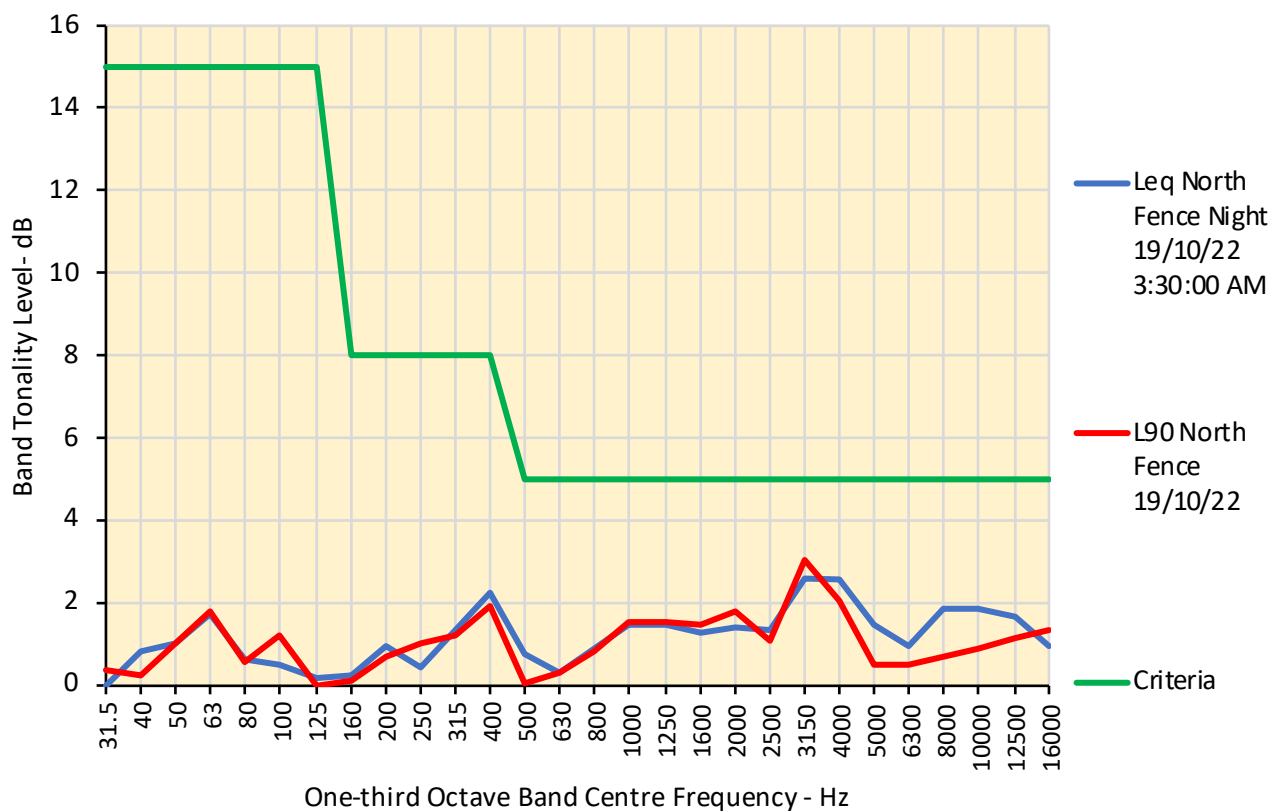
Appendix A Figure A28A: 4 Melbourne St 19/10/2022 03:30 am Tonality

Boral Cement Berrima Annual Environmental Noise Assessment October 2022  
One-third Octave Band Spectra North Fence 19/10 3:30 am



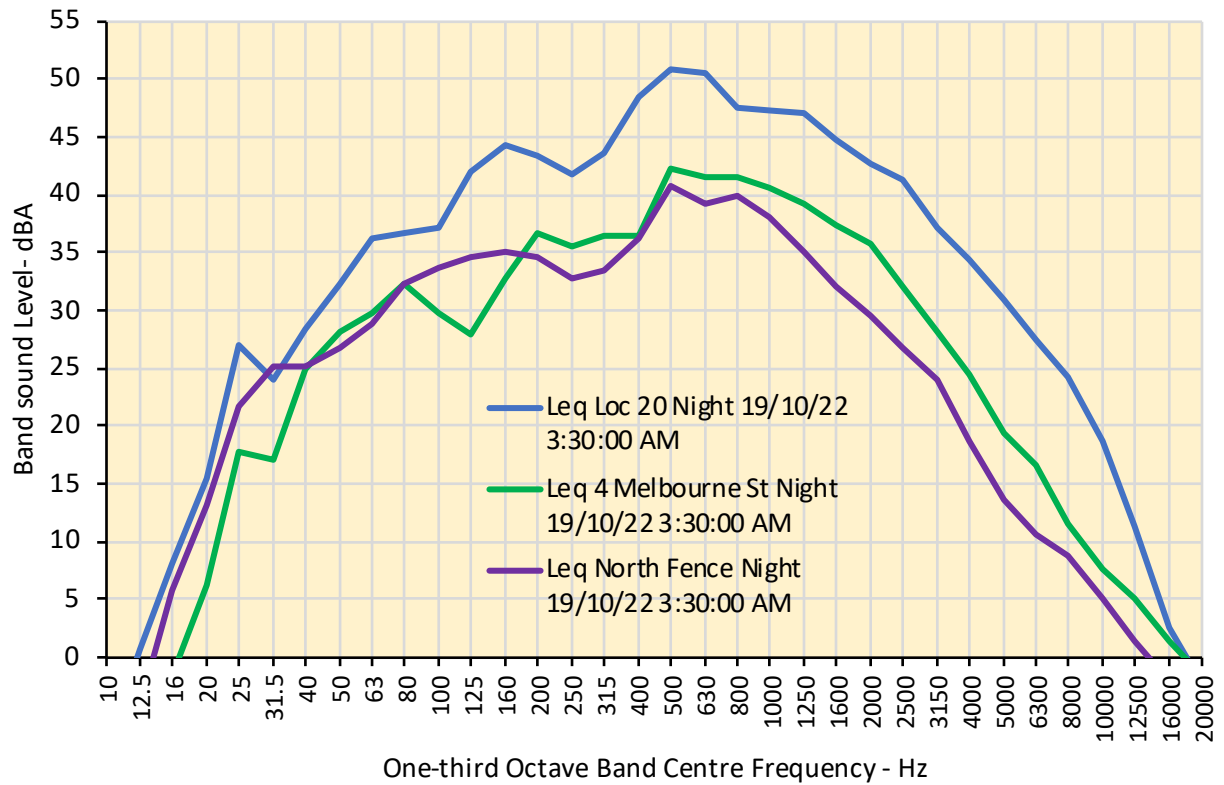
Appendix A Figure A29: North Fence 19/10/2022 03:30 am Spectra

Boral Cement Berrima Annual Environmental Noise Assessment October 2022  
One-third Octave Band Tonality North Fence 19/10 3:30 am



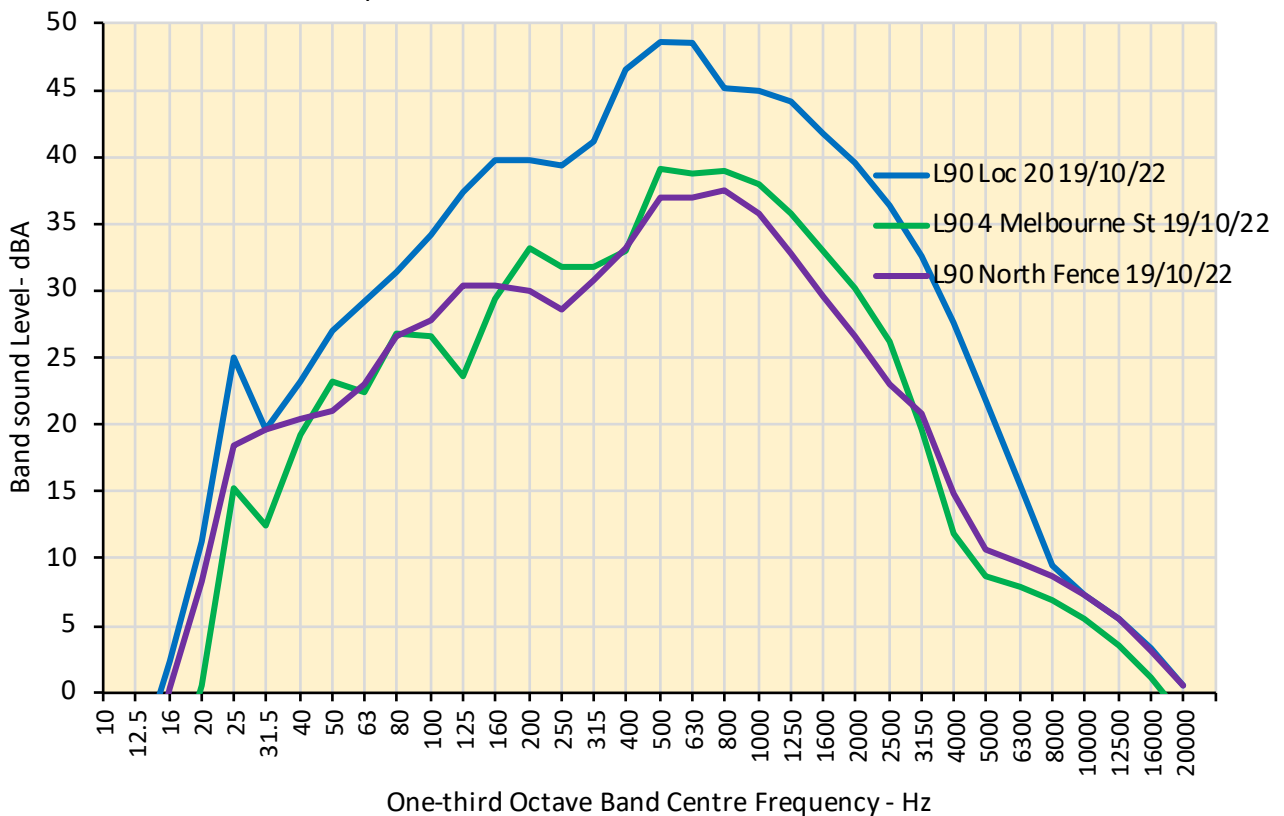
Appendix A Figure A29A: North Fence 19/10/2022 03:30 am Tonality

Boral Cement Berrima Annual Environmental Noise Assessment October 2022  
One-third Octave Spectra Loc20, North Fence & 4 Melb St Leq 19/10 3:30 am



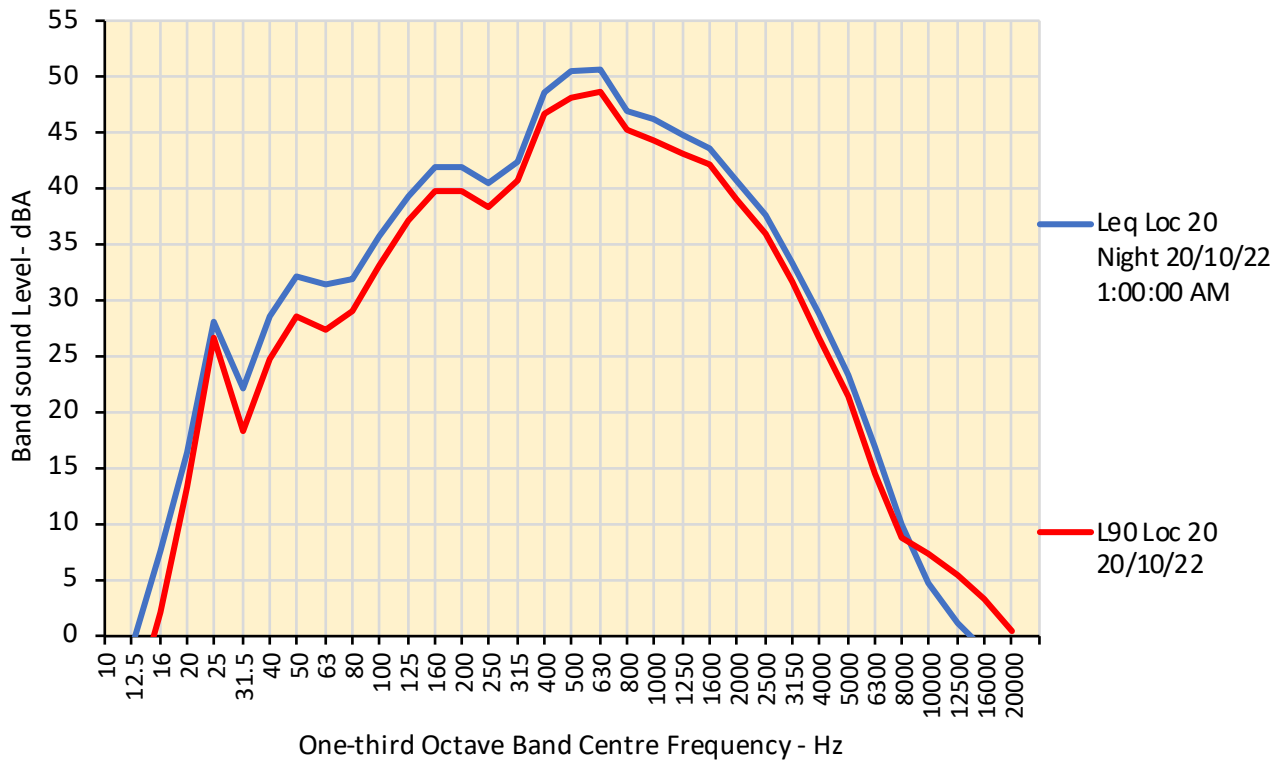
Appendix A Figure A30A: Compare Leq spectra Loc.20, 4 Melb St & North Fence 19/10/2022 03:30 am

Boral Cement Berrima Annual Environmental Noise Assessment October 2022  
One-third Octave Spectra Loc20, North Fence & 4 Melb St L90 19/10 3:30 am



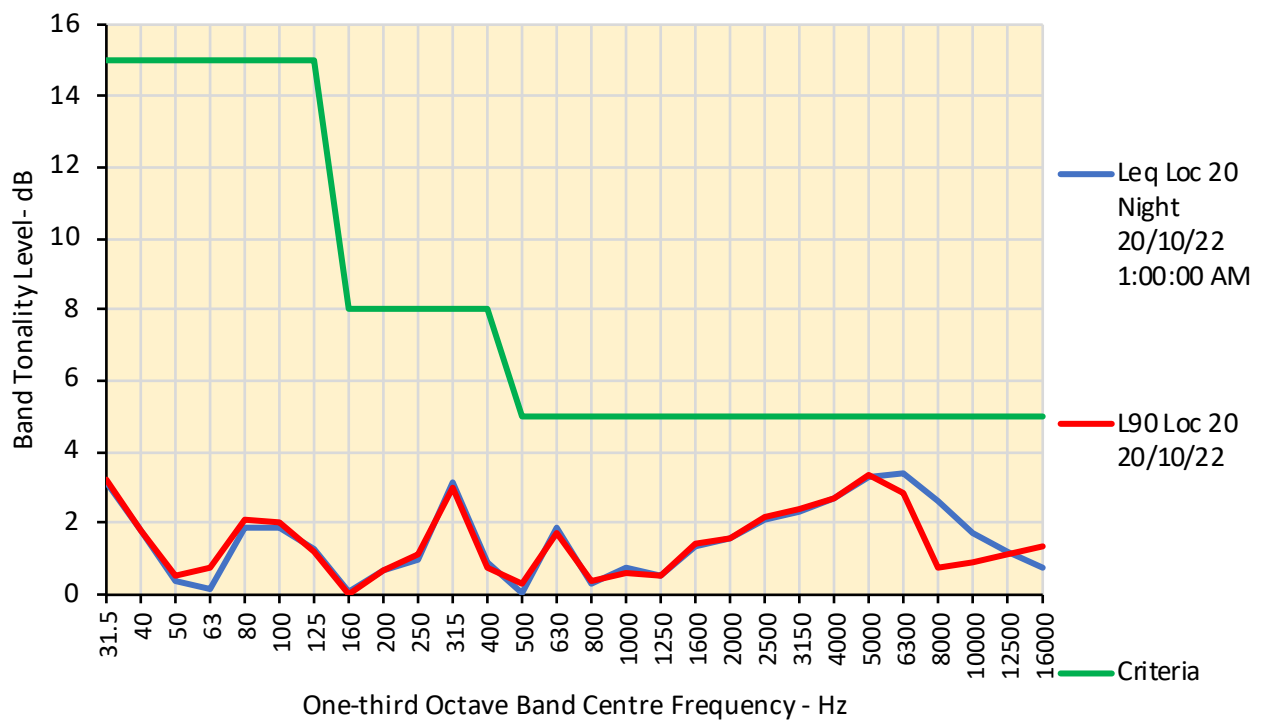
Appendix A Figure A30B: Compare L90 spectra Loc.20, 4 Melb St & North Fence 19/10/2022 03:30 am

Boral Cement Berrima Annual Environmental Noise Assessment October 2022  
One-third Octave Band Spectra Location 20 20/10 1:00 am



Appendix A Figure A31: Location 20 20/10/2022 01:00 am Spectra

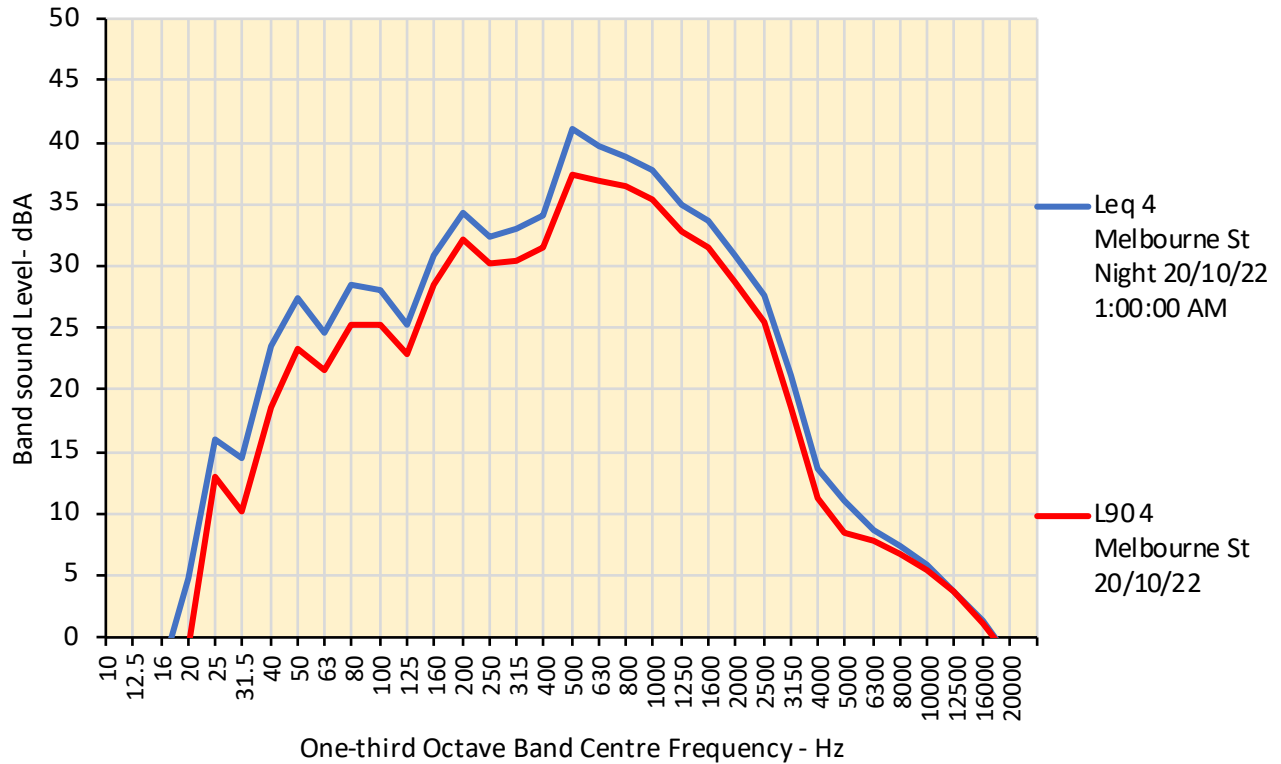
Boral Cement Berrima Annual Environmental Noise Assessment October 2022  
One-third Octave Band Tonality 20 20/10 1:00 am



Appendix A Figure A31A: Location 20 20/10/2022 01:00 am Tonality

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

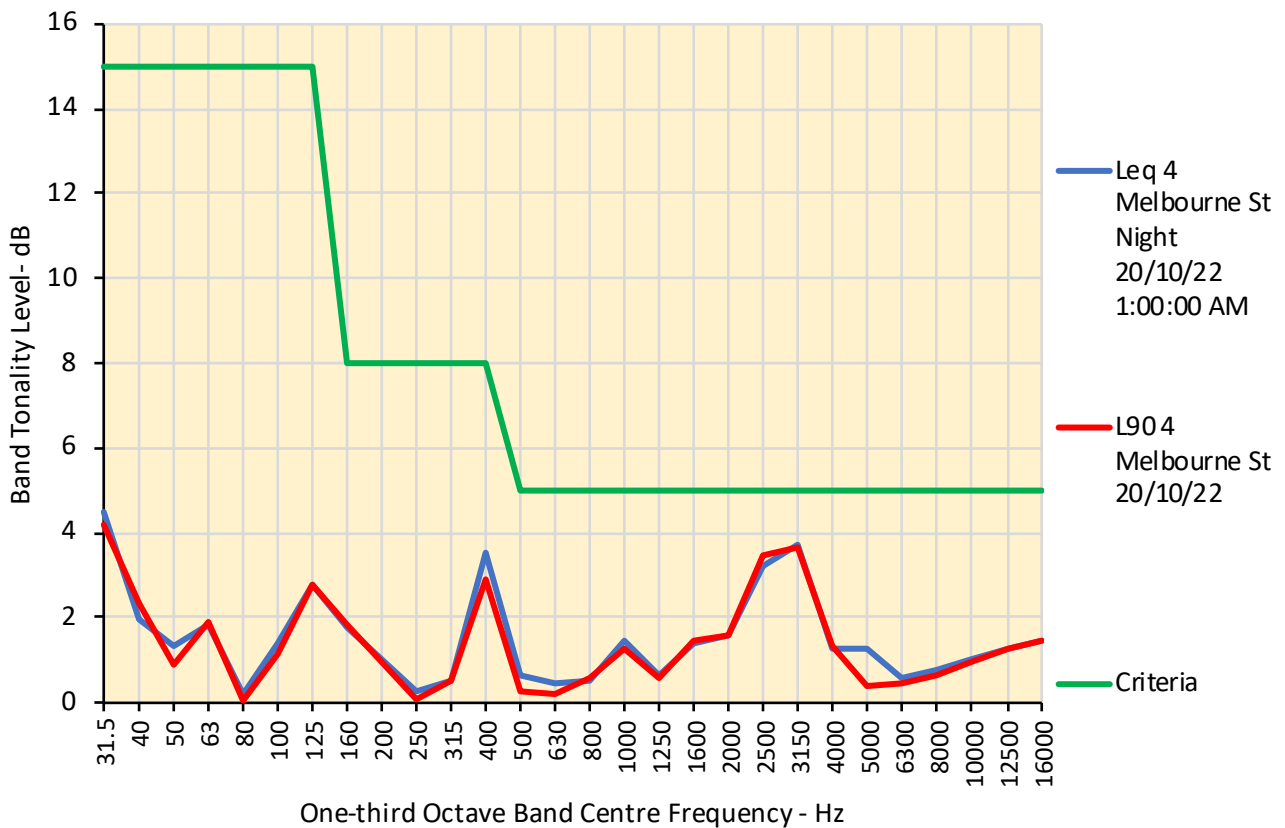
One-third Octave Band Spectra 4 Melbourne St 20/10 1:00 am



Appendix A Figure A32: 4 Melbourne St 20/10/2022 01:00 am Spectra

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

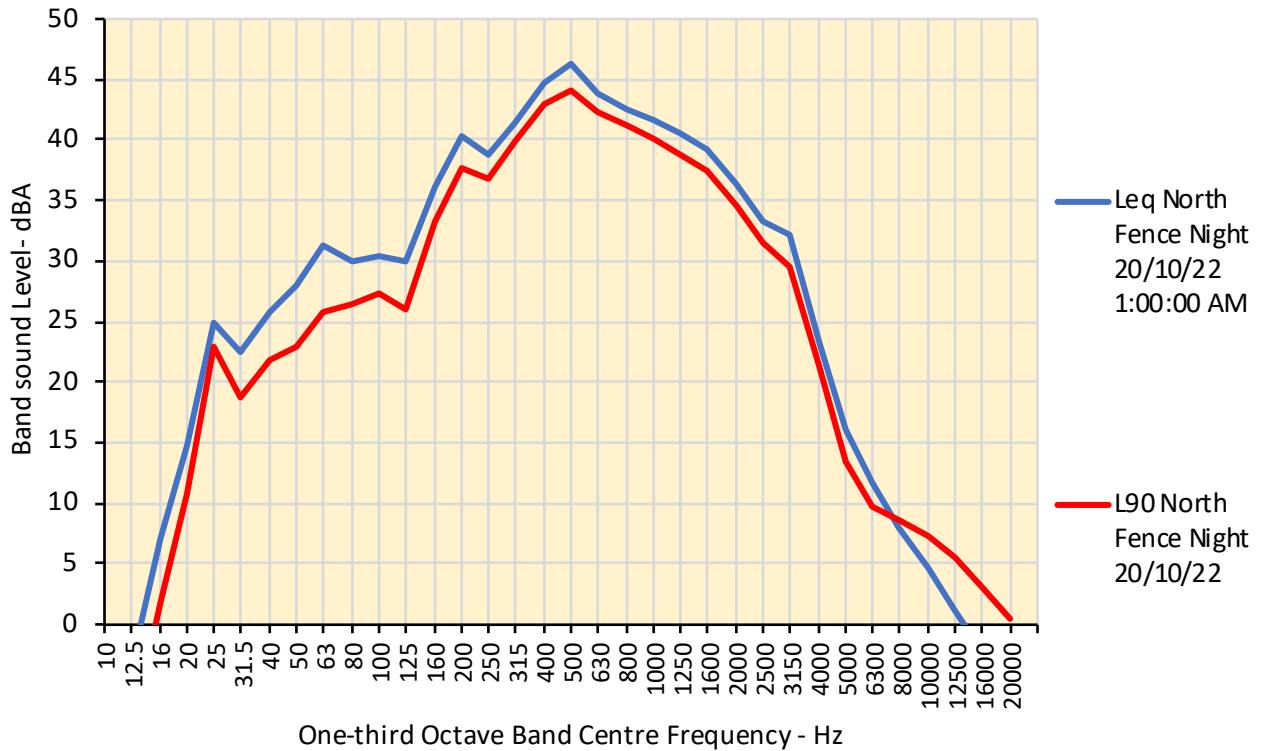
One-third Octave Band Tonality 4 Melbourne St 20/10 1:00 am



Appendix A Figure A32A: 4 Melbourne St 20/10/2022 01:00 am Tonality

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

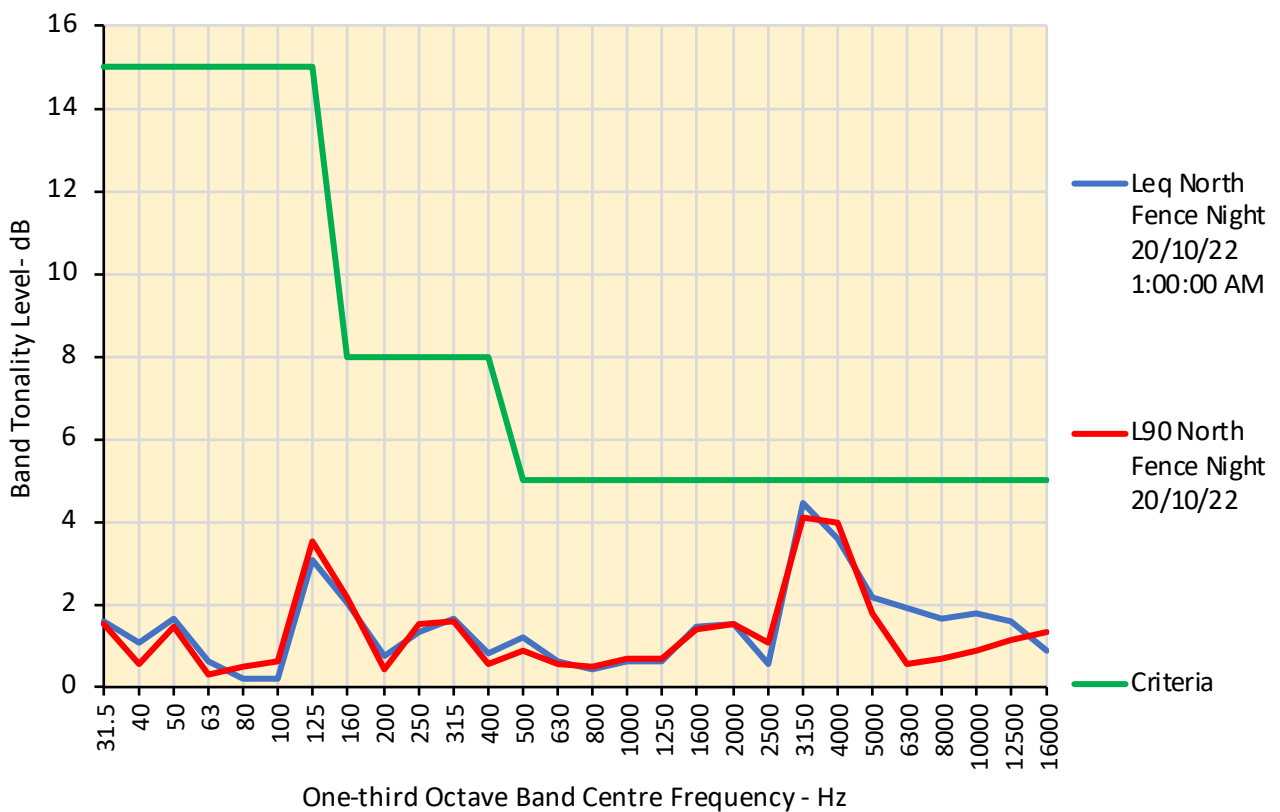
One-third Octave Band Spectra North Fence 20/10 1:00 am



Appendix A Figure A33: North Fence 20/10/2022 01:00 am Spectra

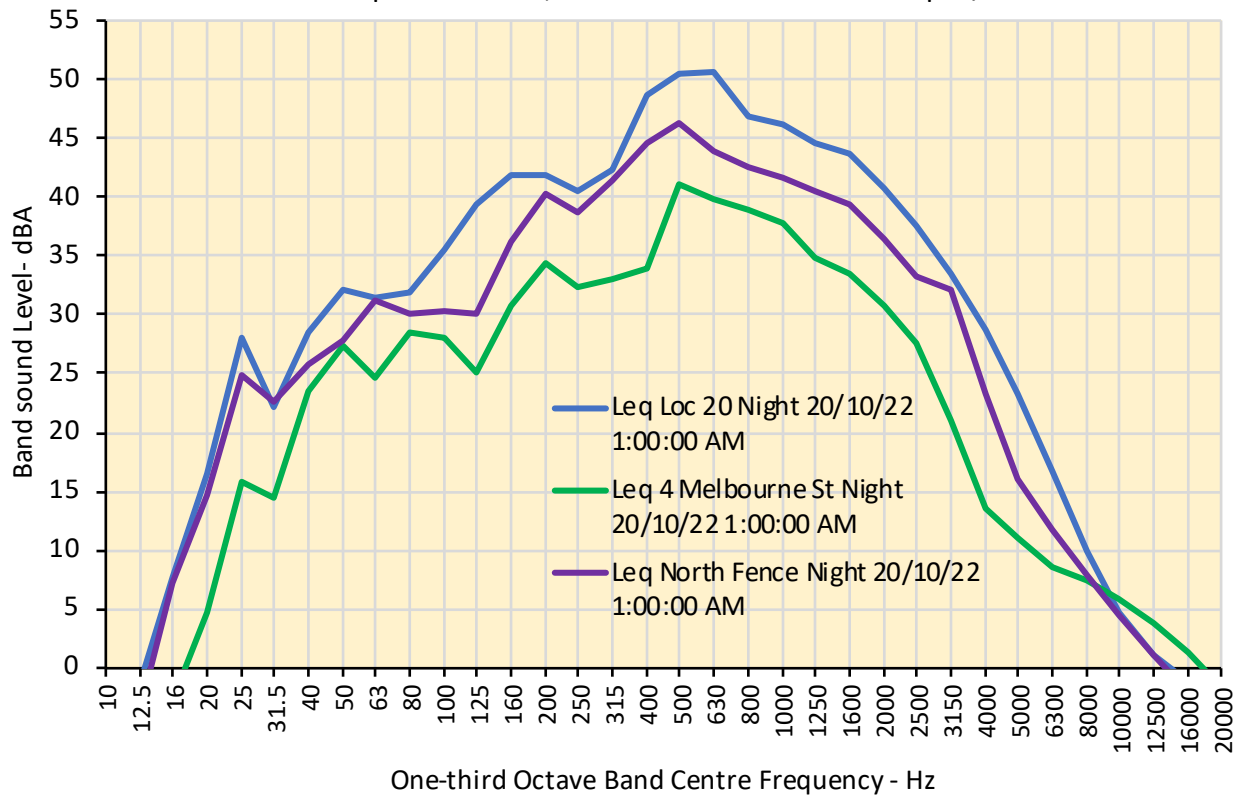
Boral Cement Berrima Annual Environmental Noise Assessment October 2022

One-third Octave Band Tonality North Fence 20/10 1:00 am



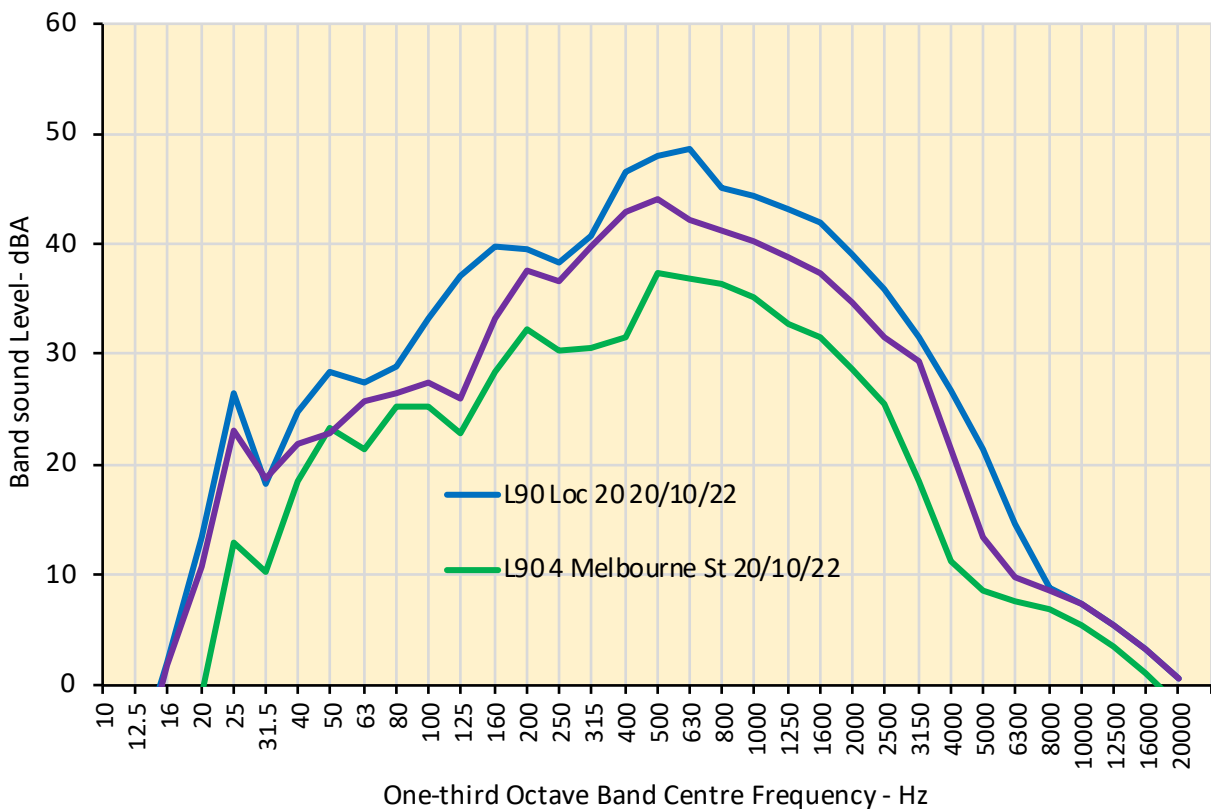
Appendix A Figure A33A: North Fence 20/10/2022 01:00 am Tonality

Boral Cement Berrima Annual Environmental Noise Assessment October 2022  
One-third Octave Spectra Loc 20, North Fence & 4 Melb St Leq 20/10 1:00 am



Appendix A Figure A34A: Compare Leq spectra Loc.20, 4 Melb St & North Fence 20/10/2022 01:00 am

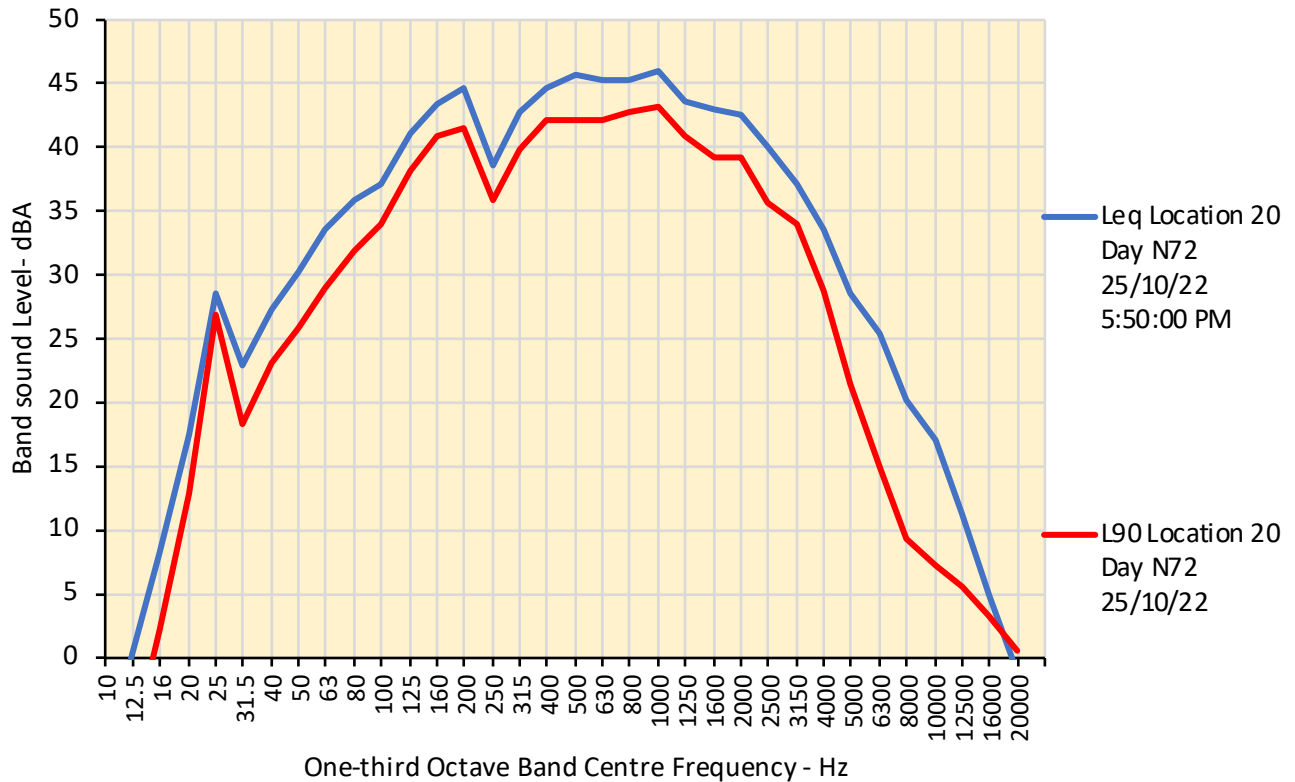
Boral Cement Berrima Annual Environmental Noise Assessment October 2022  
One-third Octave Spectra Loc 20, North Fence & 4 Melb St L90 20/10 1:00 am



Appendix A Figure A34B: Compare L90 spectra Loc.20, 4 Melb St & North Fence 20/10/2022 01:00 am

Boral Cement Berrima Annual Environmental Noise Assessment Oct. 2022

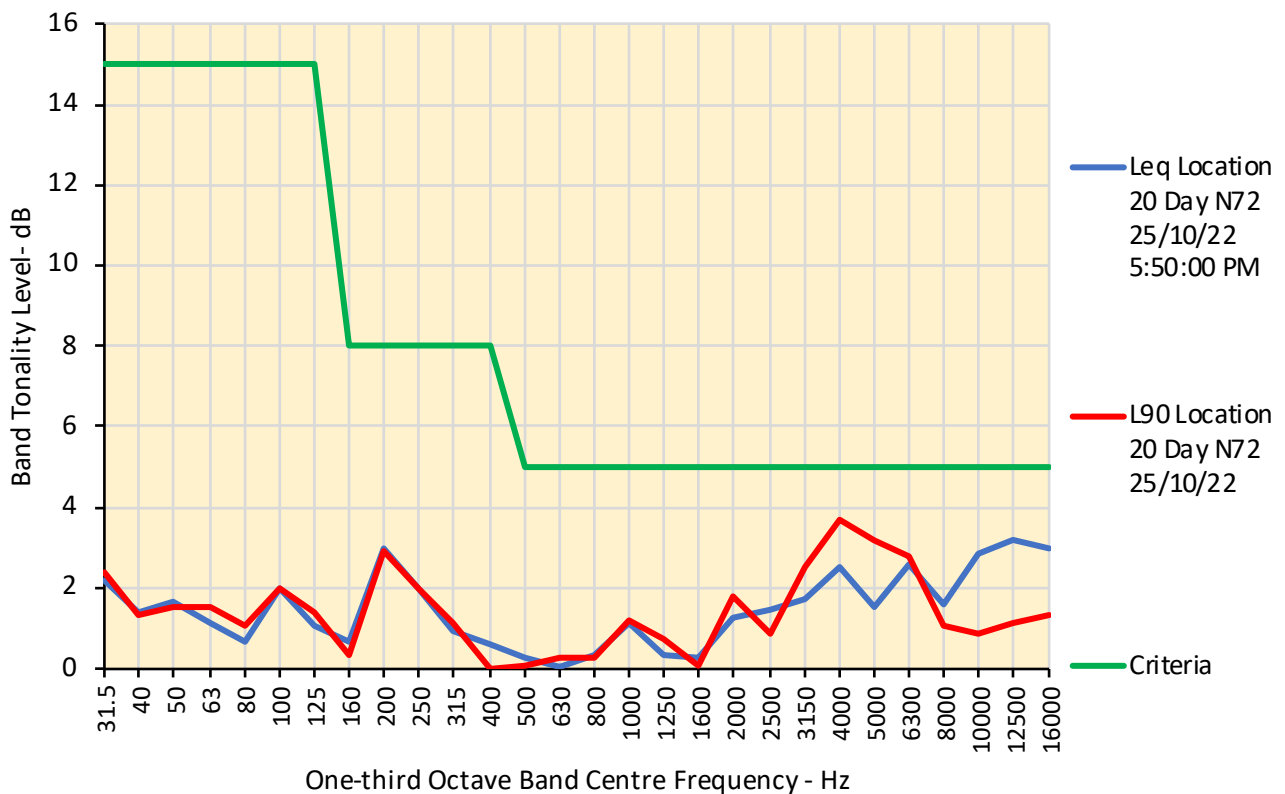
One-third Octave Band Spectra Location 20 25/10 5:50 pm



Appendix A Figure A35: Location 20 25/10/2022 05:50 pm Spectra

Boral Cement Berrima Annual Environmental Noise Assessment Oct. 2022

One-third Octave Band Tonality 20 25/10 5:50 pm

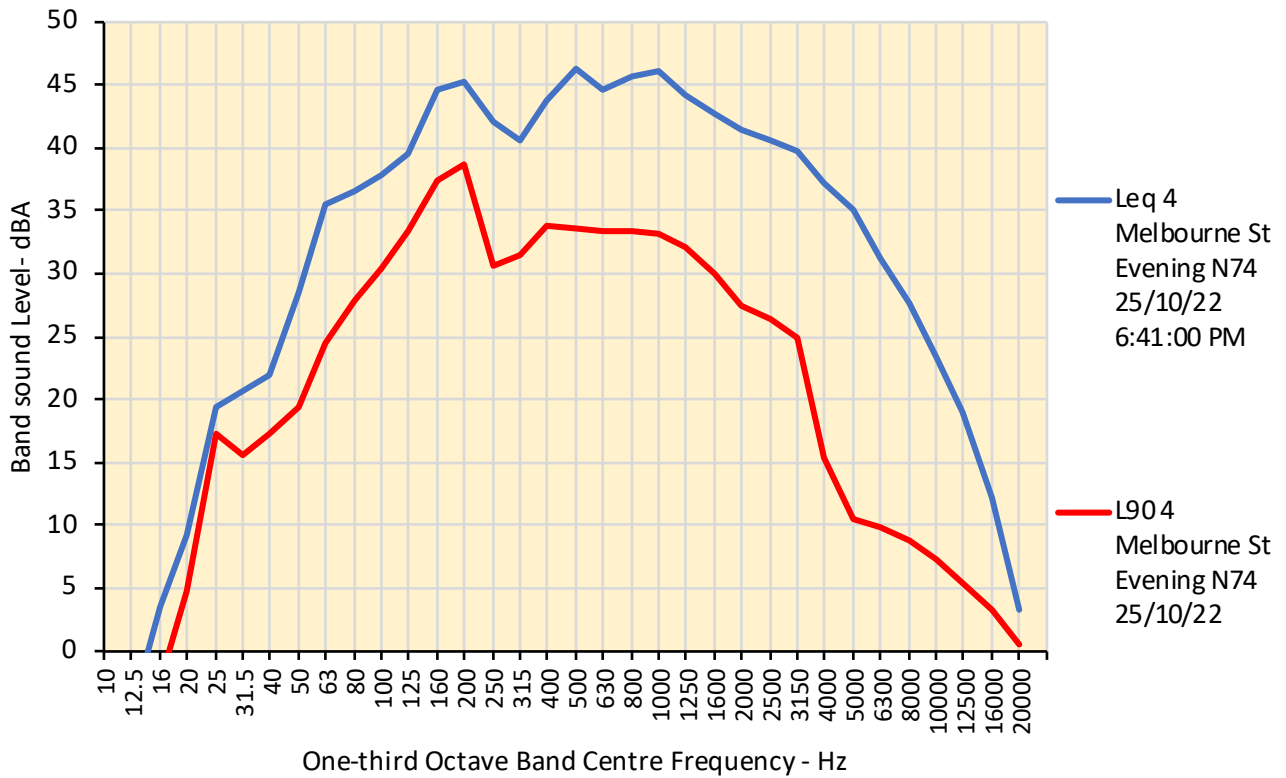


Appendix A Figure A35A: Location 20 25/10/2022 05:50 pm Tonality



Boral Cement Berrima Annual Environmental Noise Assessment October 2022

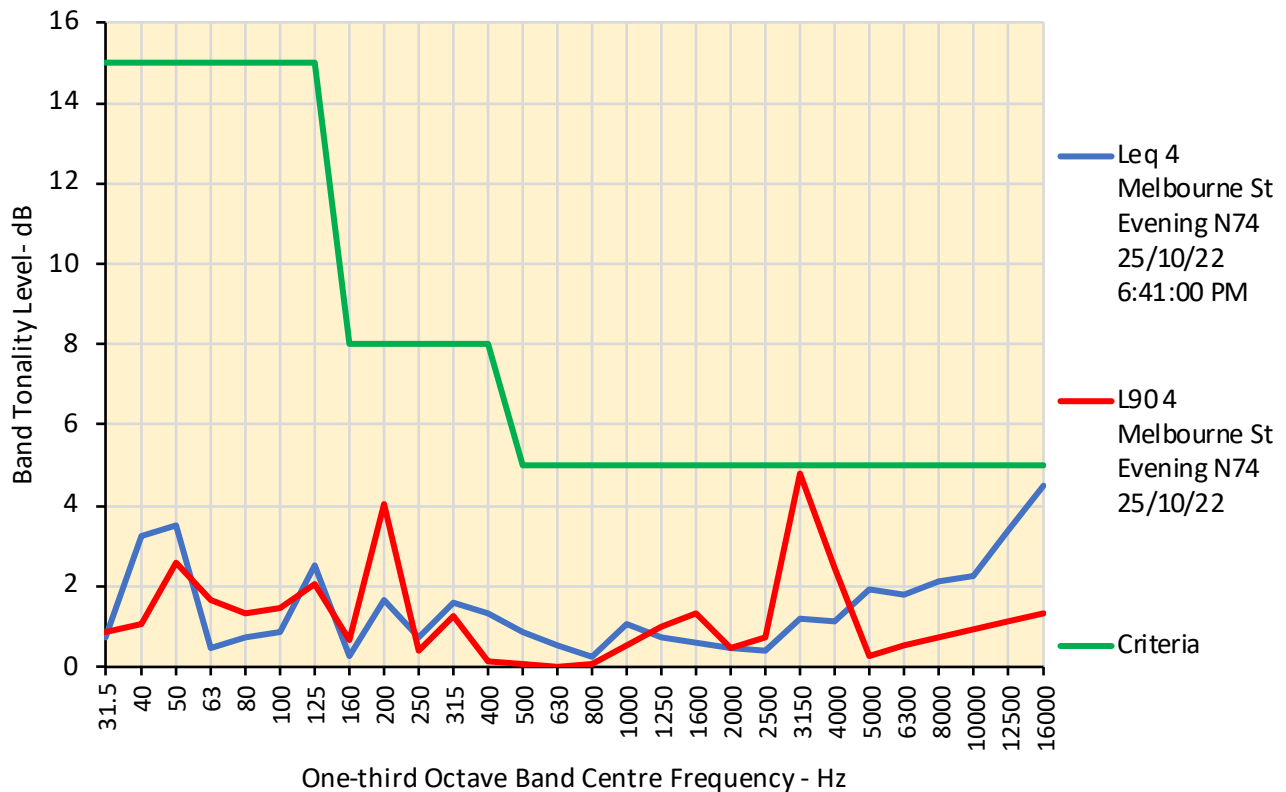
One-third Octave Band Spectra 4 Melbourne St 25/10 6:41 pm



Appendix A Figure A36: 4 Melbourne St 25/10/2022 06:41 pm Spectra

Boral Cement Berrima Annual Environmental Noise Assessment Oct. 2022

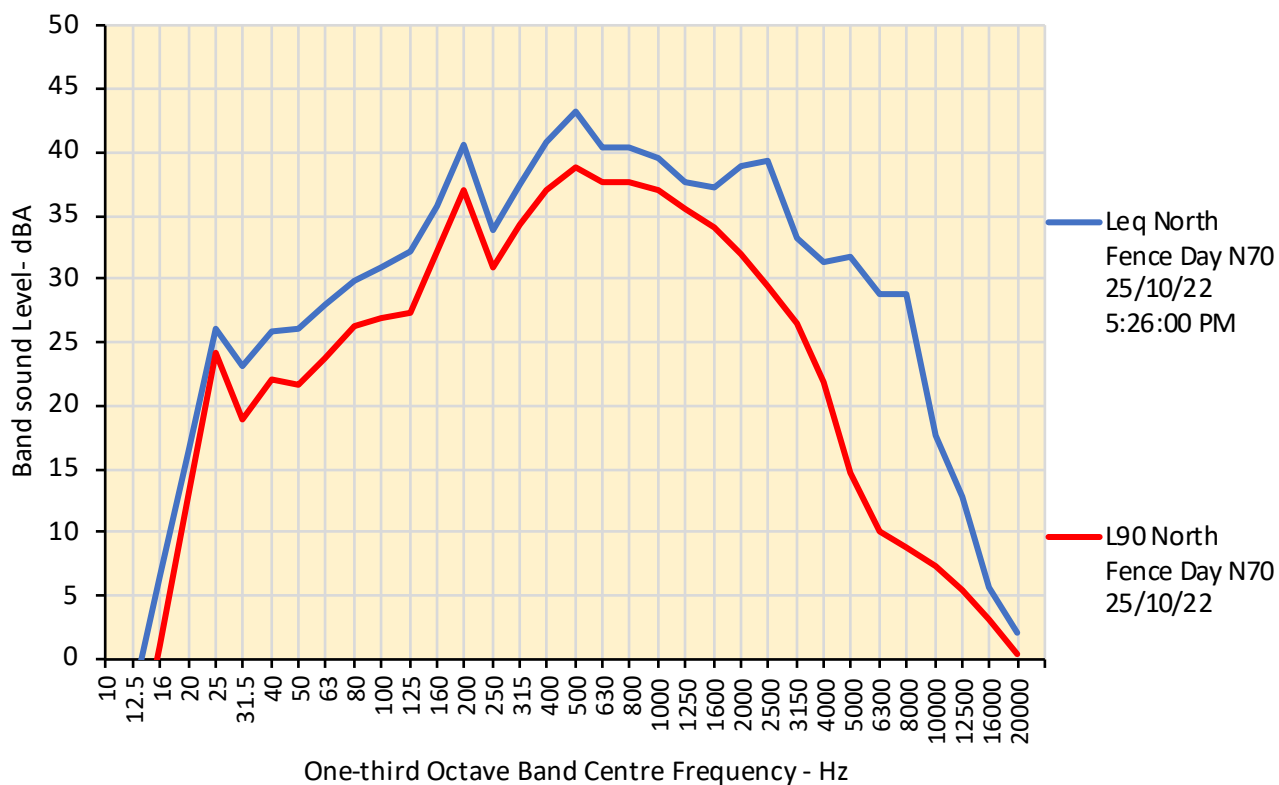
One-third Octave Band Tonality 4 Melbourne St 25/10 6:41 pm



Appendix A Figure A36A: 4 Melbourne St 25/10/2022 06:41 pm Tonality

# Boral Cement Berrima Annual Environmental Noise Assessment October 2022

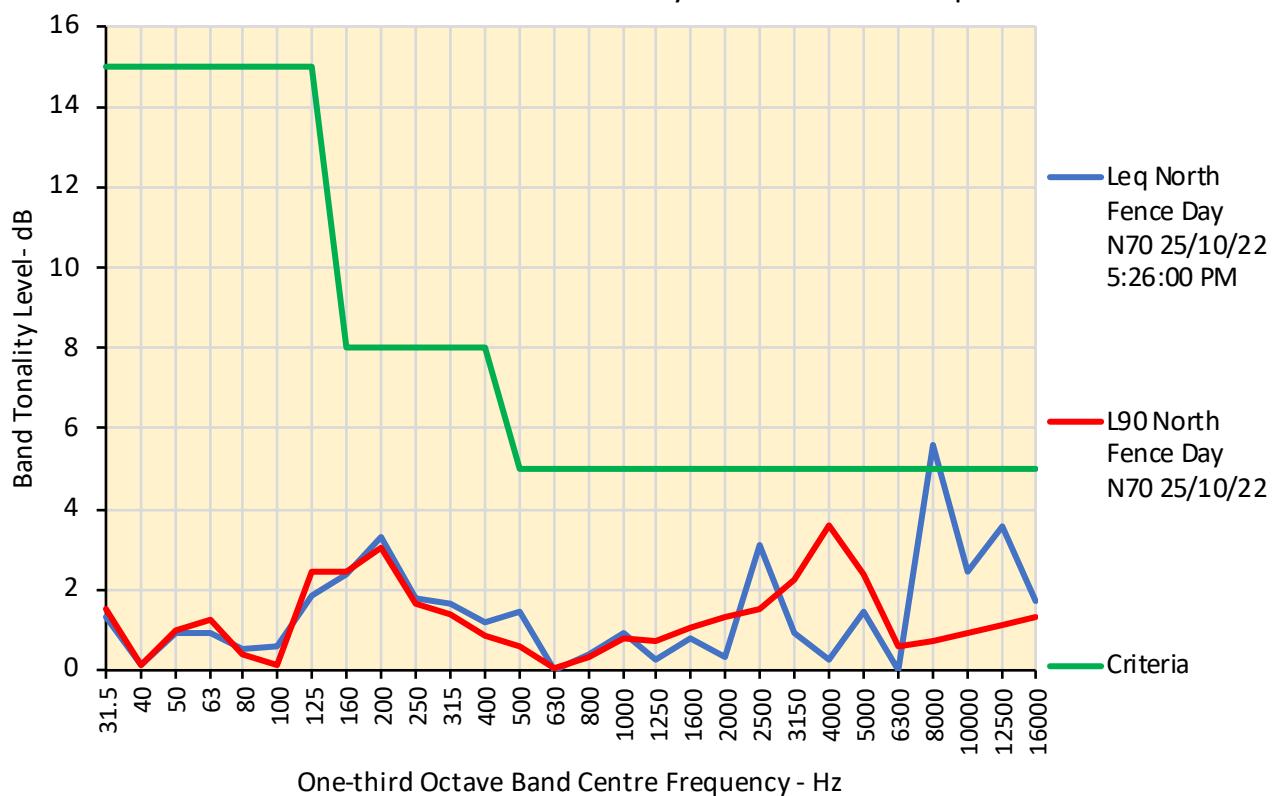
## One-third Octave Band Spectra North Fence 25/10 5:26 pm



Appendix A Figure A37: North Fence 25/10/2022 05:26 pm Spectra

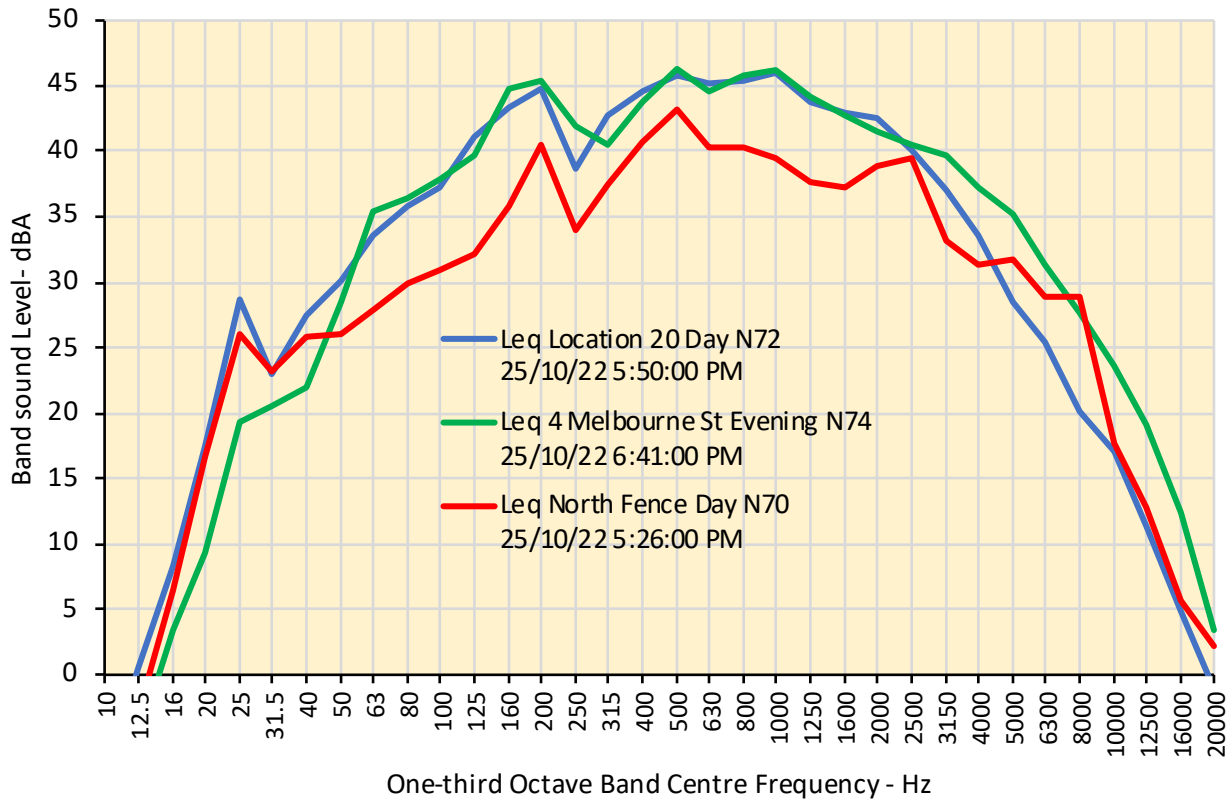
# Boral Cement Berrima Annual Environmental Noise Assessment Oct. 2022

## One-third Octave Band Tonality North Fence 5:26 pm



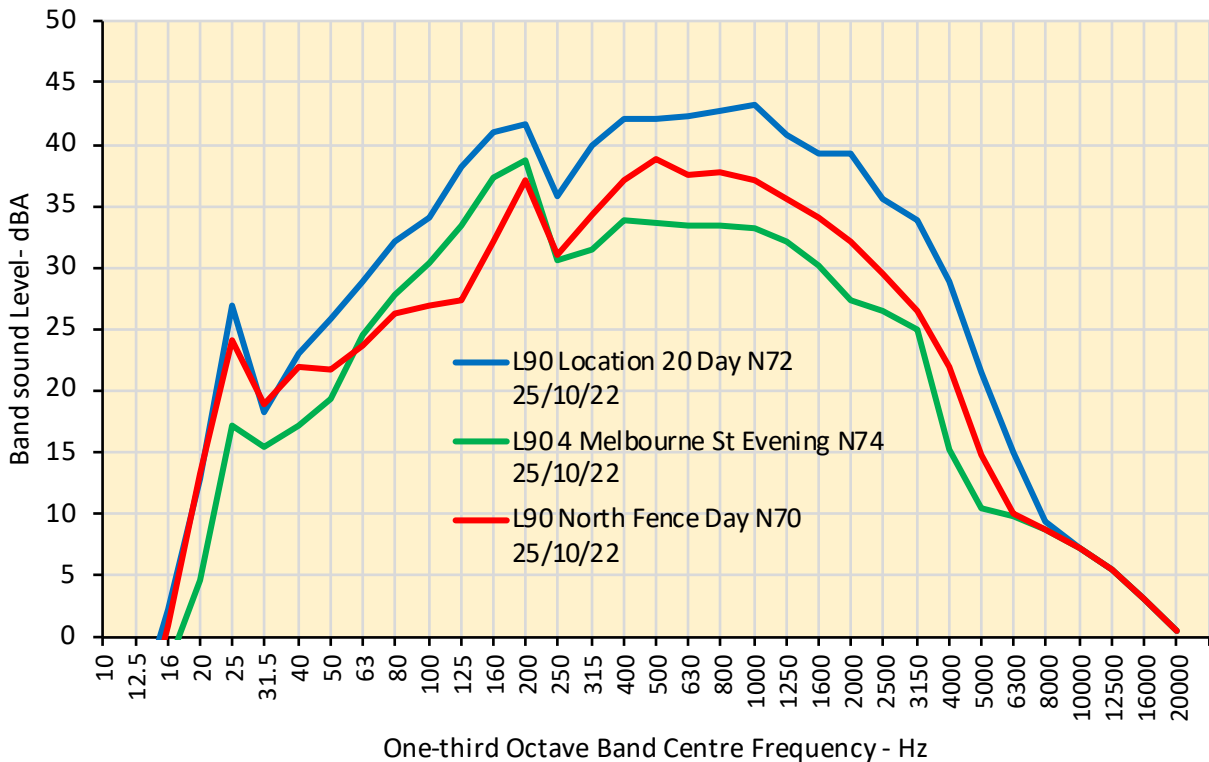
Appendix A Figure A37A: North Fence 25/10/2022 05:26 pm Tonality

Boral Cement Berrima Annual Environmental Noise Assessment Oct.2022  
One-third Octave Band Spectra Loc 20, 4 Melb St North Fence Leq 25/10



Appendix A Figure A38A: Compare Leq spectra Loc.20, 4 Melb St & North Fence 25/10/2022

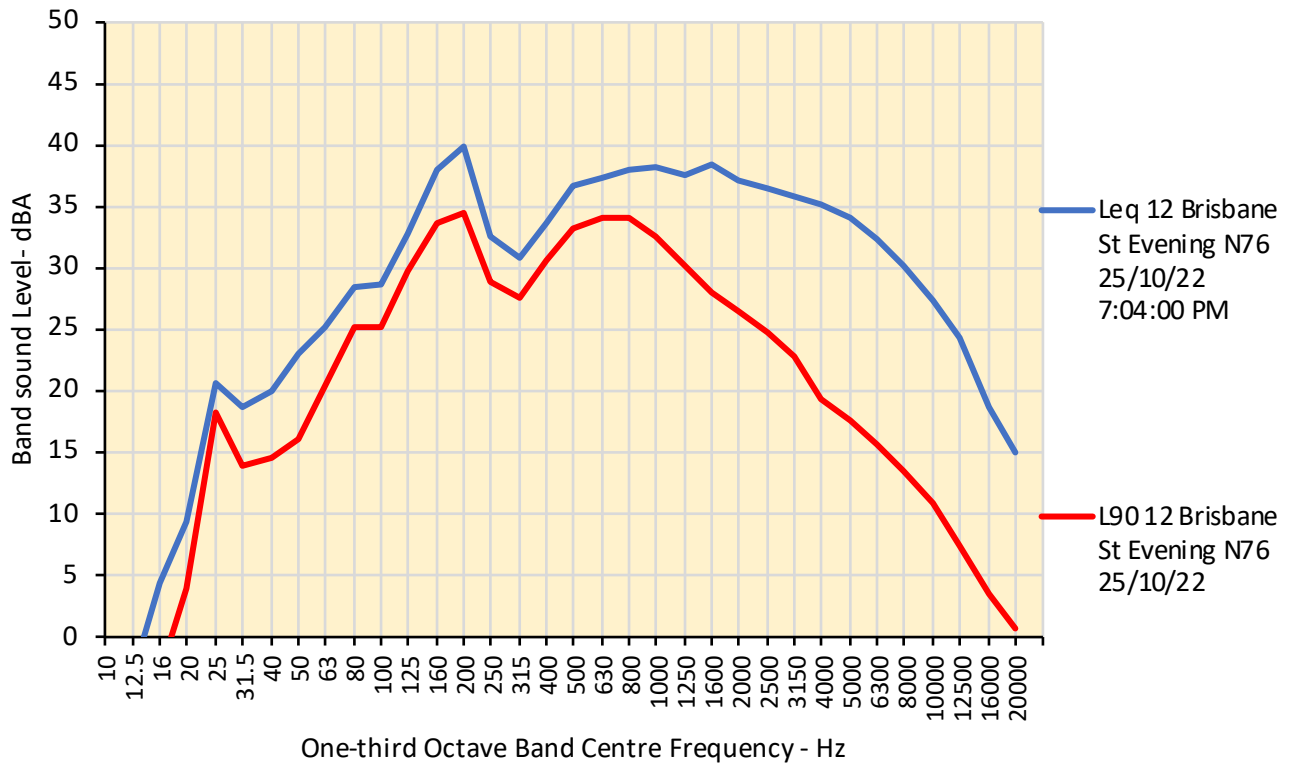
Boral Cement Berrima Annual Environmental Noise Assessment Oct.2022  
One-third Octave Band Spectra Loc 20 & 4 Melb St L90 20/10 1:00 am



Appendix A Figure A38B: Compare L90 spectra Loc.20, 4 Melb St & North Fence 25/10/2022

Boral Cement Berrima Annual Environmental Noise Assessment Oct. 2022

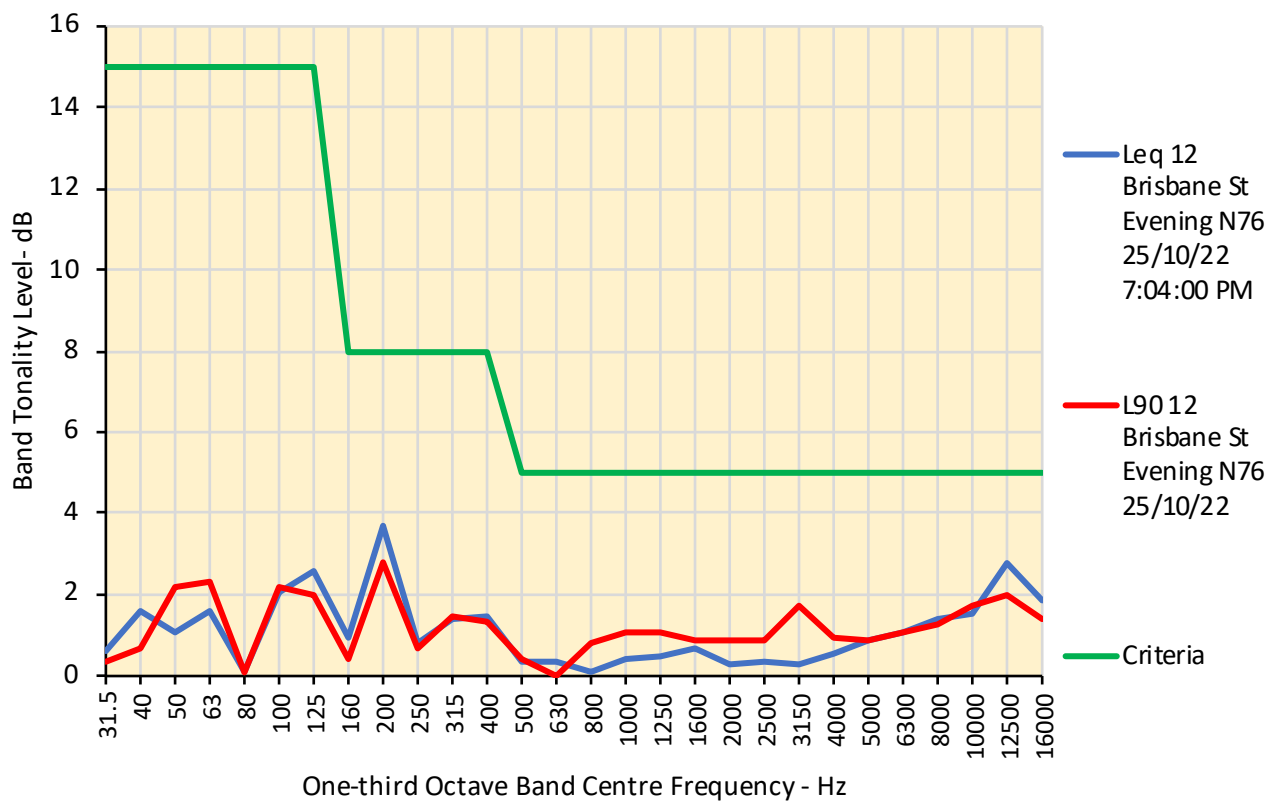
One-third Octave Band Spectra 12 Brisbane St 25/10 7:04 pm



Appendix A Figure A39: 12 Brisbane St 25/10/2022 07:04 pm Spectra

Boral Cement Berrima Annual Environmental Noise Assessment Oct. 2022

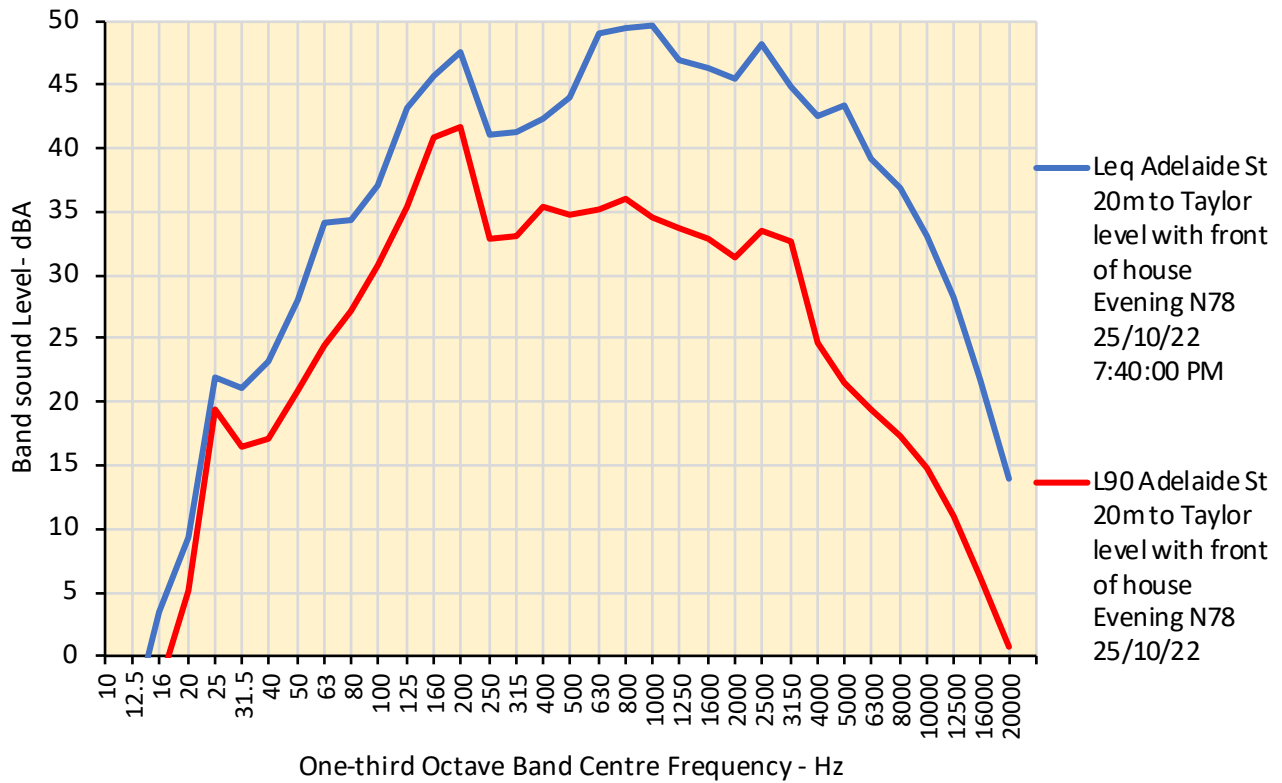
One-third Octave Band Tonality 12 Brisbane St 25/10 7:04 pm



Appendix A Figure A39A: 12 Brisbane St 25/10/2022 07:04 pm Tonality

Boral Cement Berrima Annual Environmental Noise Assessment October 2022

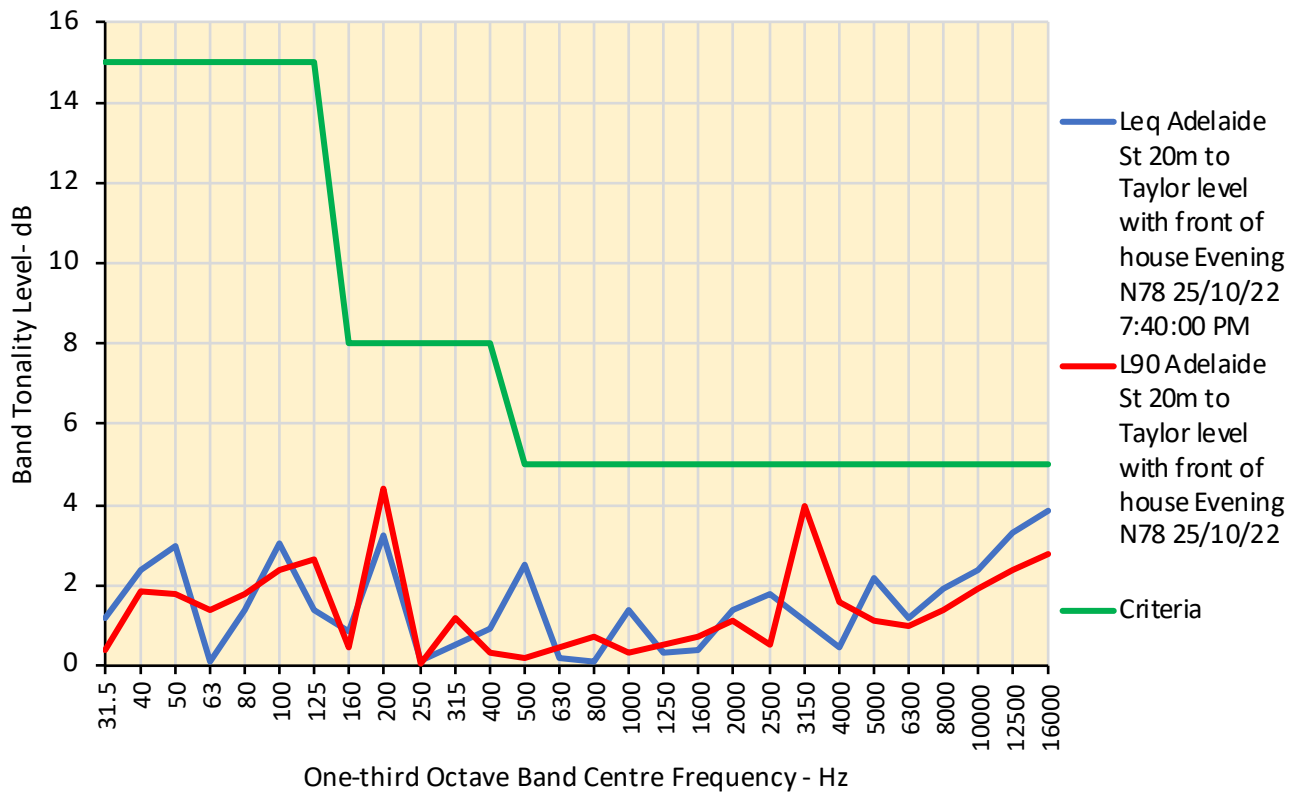
One-third Octave Band Spectra Adelaide St 25/10 7:40 pm



Appendix A Figure A40: 1Adelaide St 25/10/2022 07:40 pm Spectra

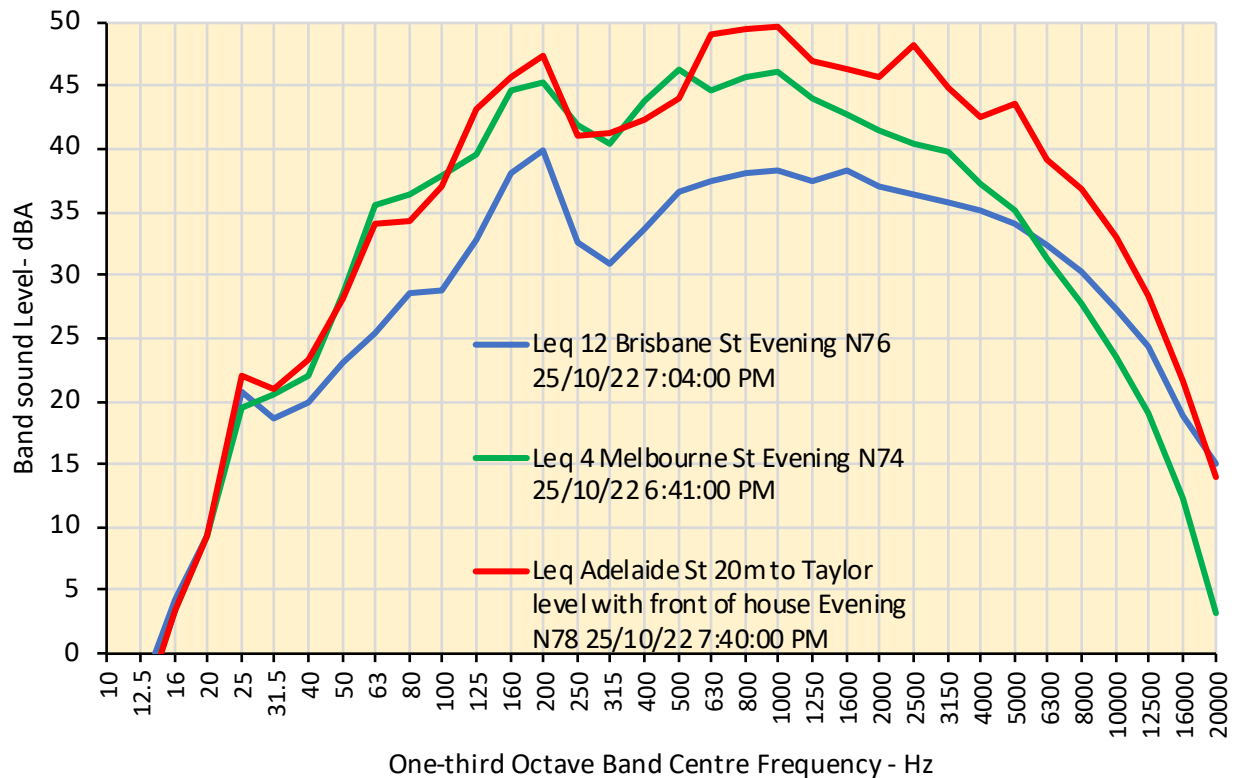
Boral Cement Berrima Annual Environmental Noise Assessment Oct. 2022

One-third Octave Band Tonality Adelaide St 25/10 7:40



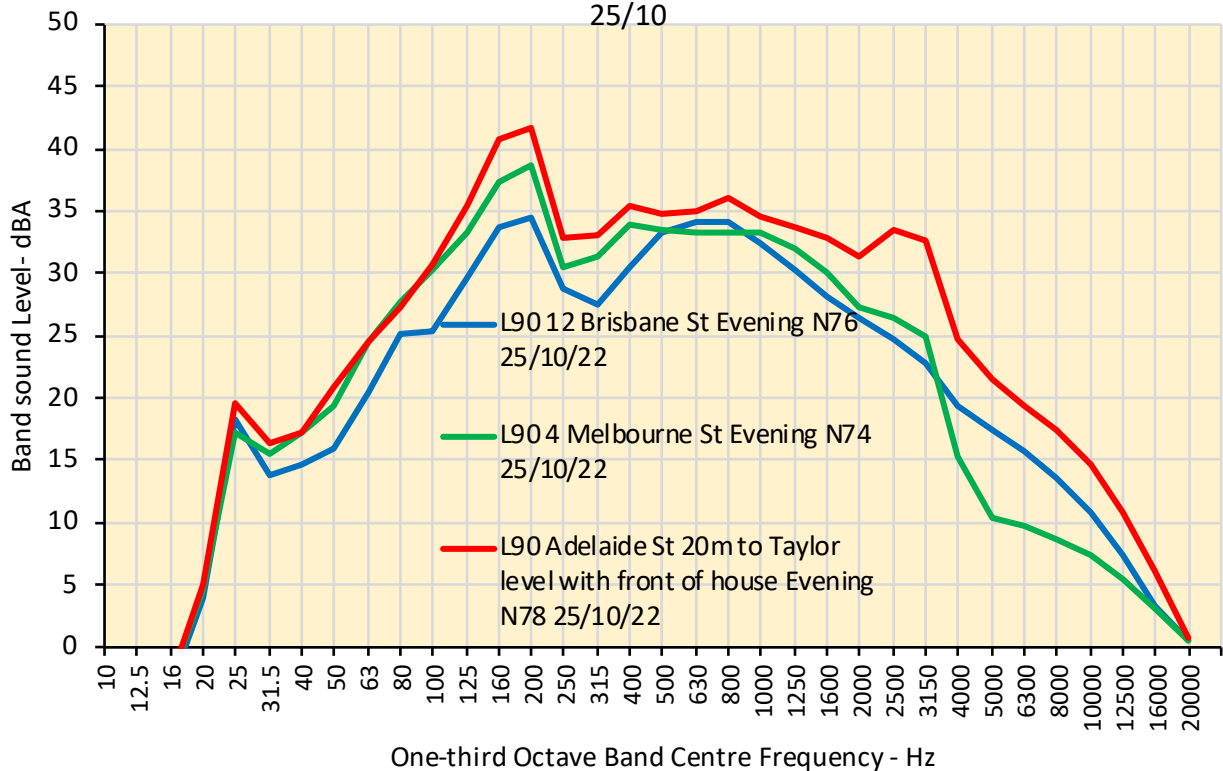
Appendix A Figure A40A: 1Adelaide St 25/10/2022 07:40 pm Tonality

Boral Cement Berrima Annual Environmental Noise Assessment Oct.2022  
One-third Octave Band Spectra 4 Melb St 12 Brisbane St Adelaide St Leq 25/10



Appendix A Figure A41A: Compare Leq spectra 4 Melb St, 12 Brisbane St & Adelaide St 25/10/2022 evening

Boral Cement Berrima Annual Environmental Noise Assessment Oct.2022  
One-third Octave Band Spectra Spectra 4 Melb St 12 Brisbane St Adelaide St L90  
25/10



Appendix A Figure A41B: Compare L90 spectra 4 Melb St, 12 Brisbane St & Adelaide St 25/10/2022 evening

Figure A42 : Boral Cement Berrima Noise Assessment 2022 - Low Frequency assessment North  
Fence 10/10/22 15:48

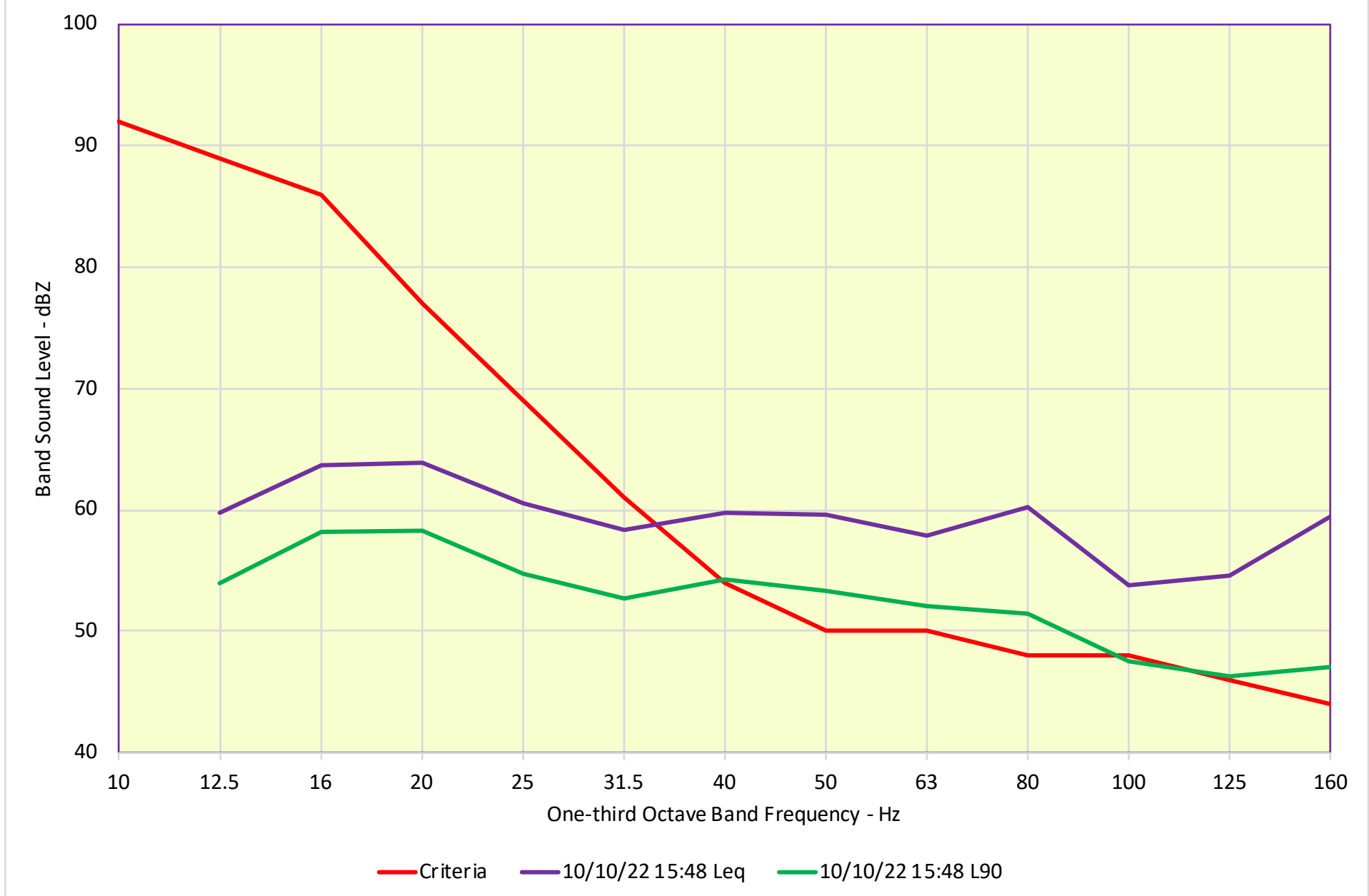


Figure A43 : Boral Cement Berrima Noise Assessment 2022 - Low Frequency assessment North  
Fence 13/10/22 01:00

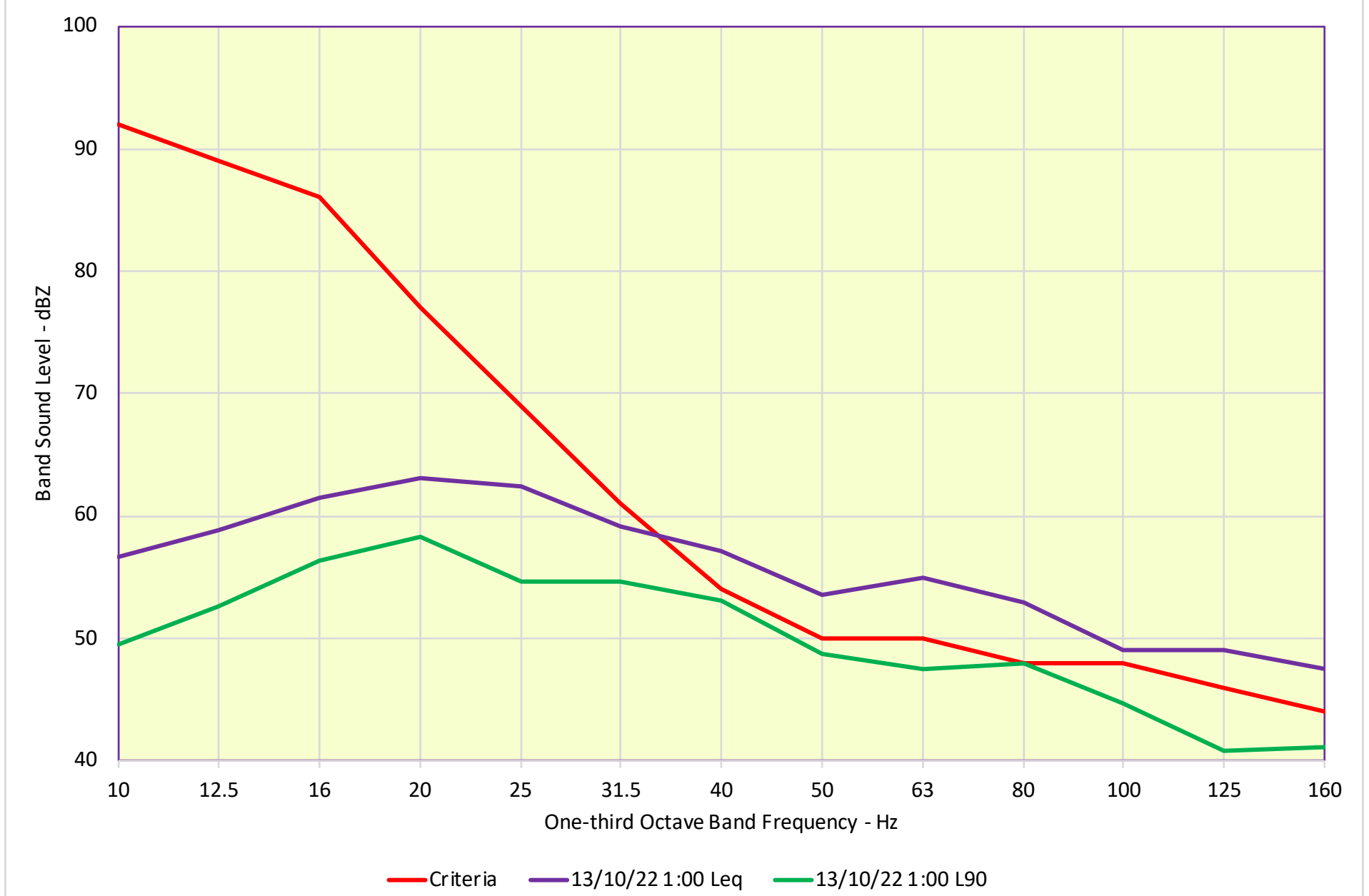


Figure A44 : Boral Cement Berrima Noise Assessment 2022 - Low Frequency assessment North  
Fence 16/10/22 0:45

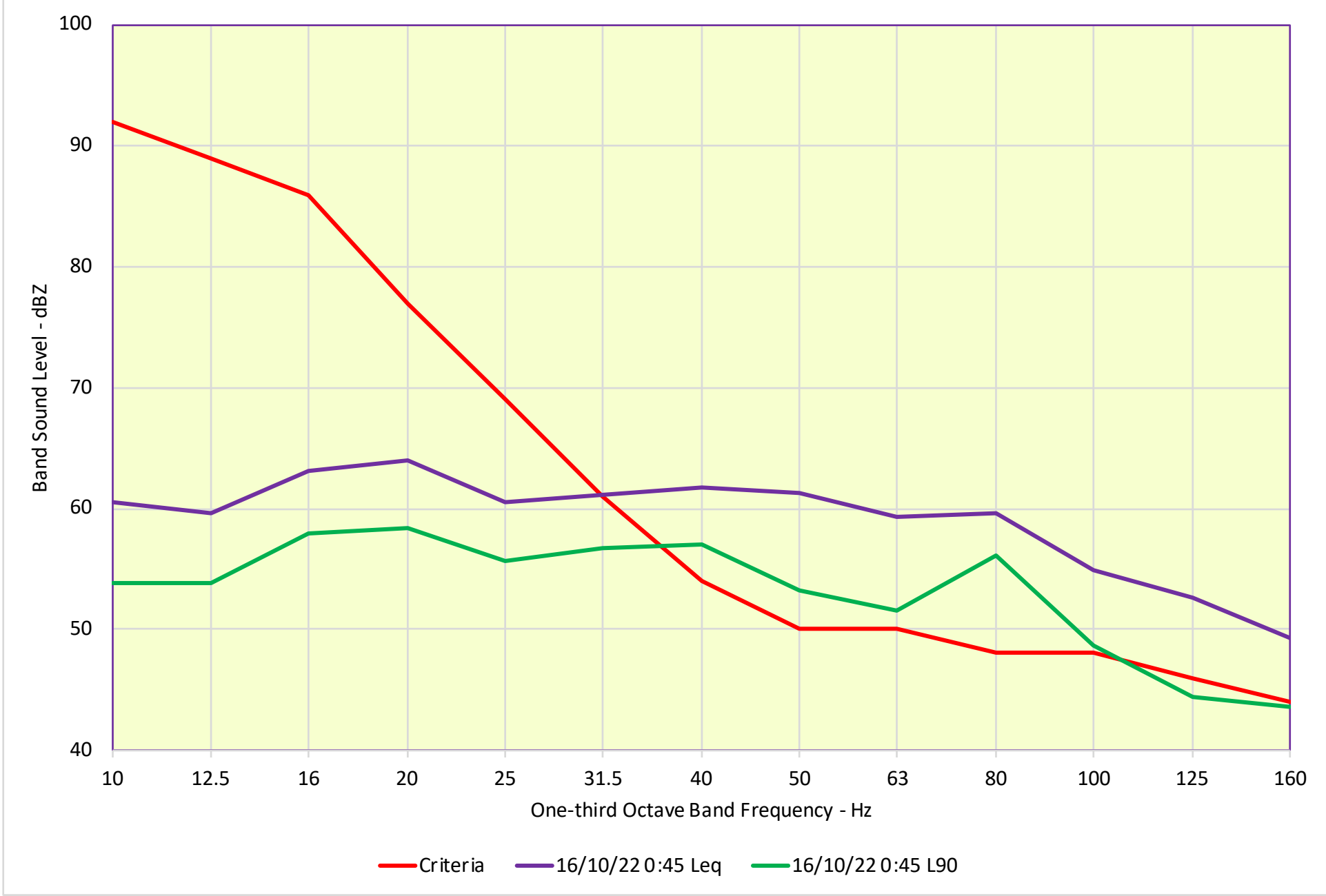


Figure A45 : Boral Cement Berrima Noise Assessment 2022 - Low Frequency assessment North  
Fence 16/10/22 06:00

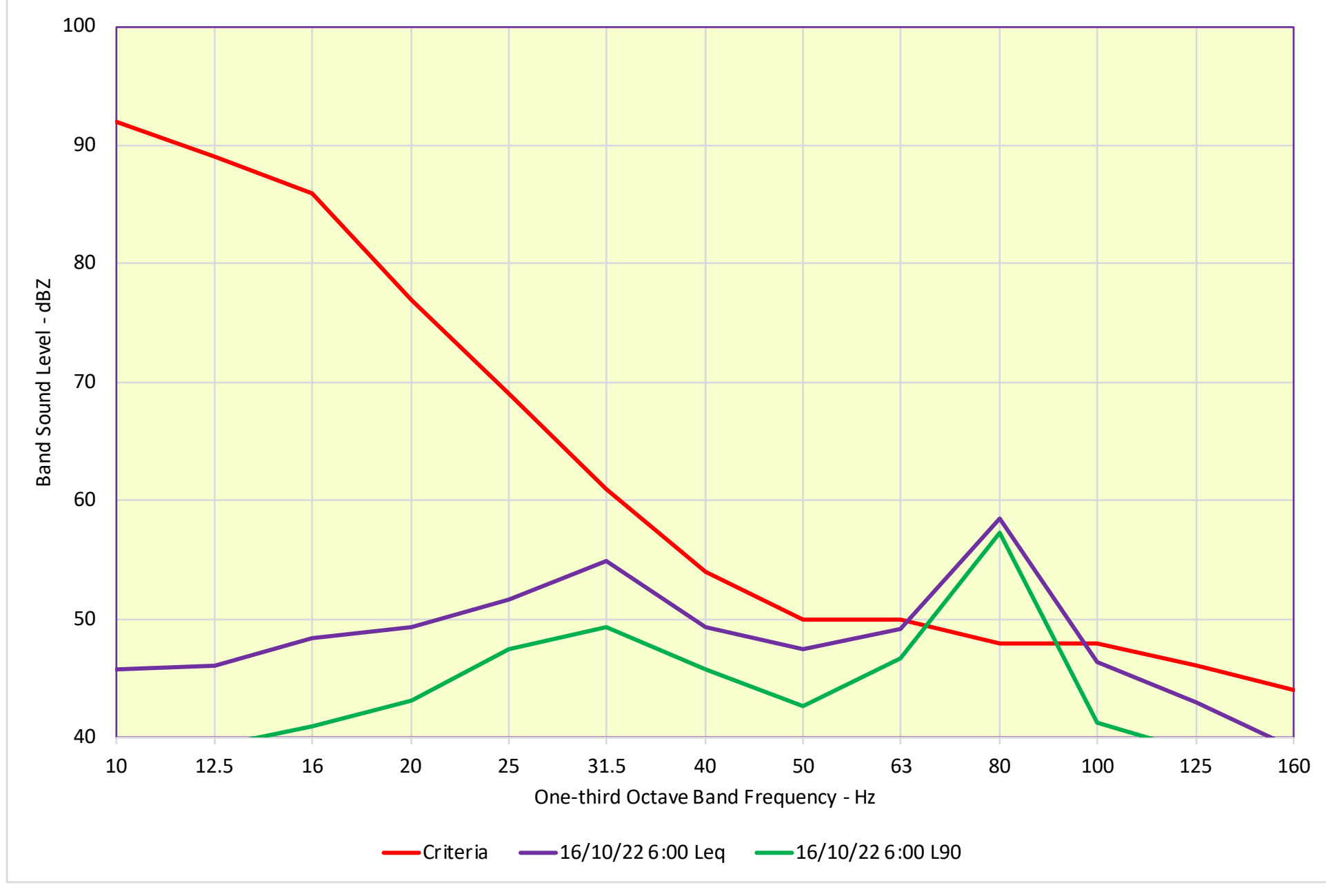




Figure A46 : Boral Cement Berrima Noise Assessment 2022 - Low Frequency assessment North  
Fence 16/6/22 8:00

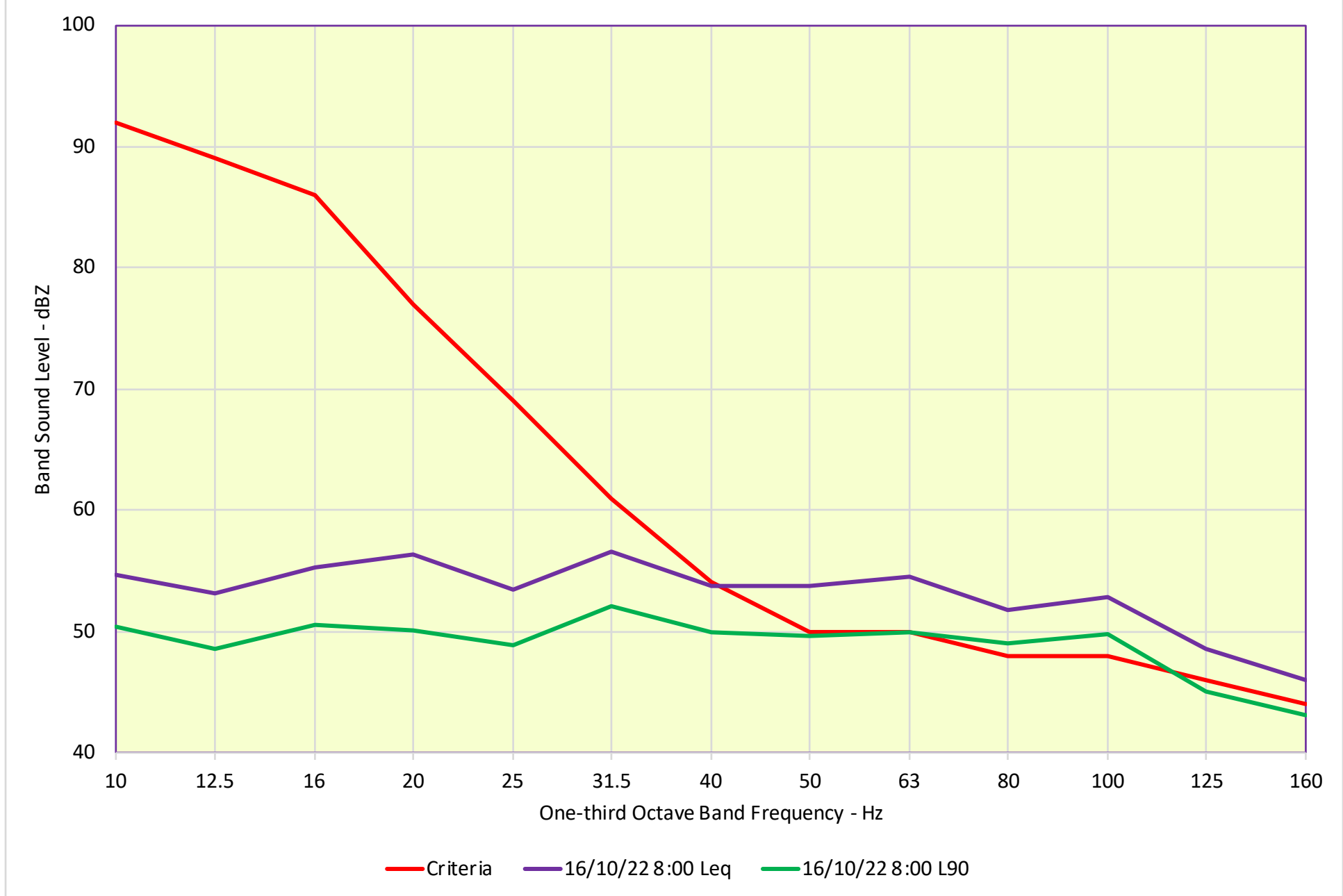


Figure A47: Boral Cement Berrima Noise Assessment 2022 - Low Frequency assessment North  
Fence 16/10/22 8:45

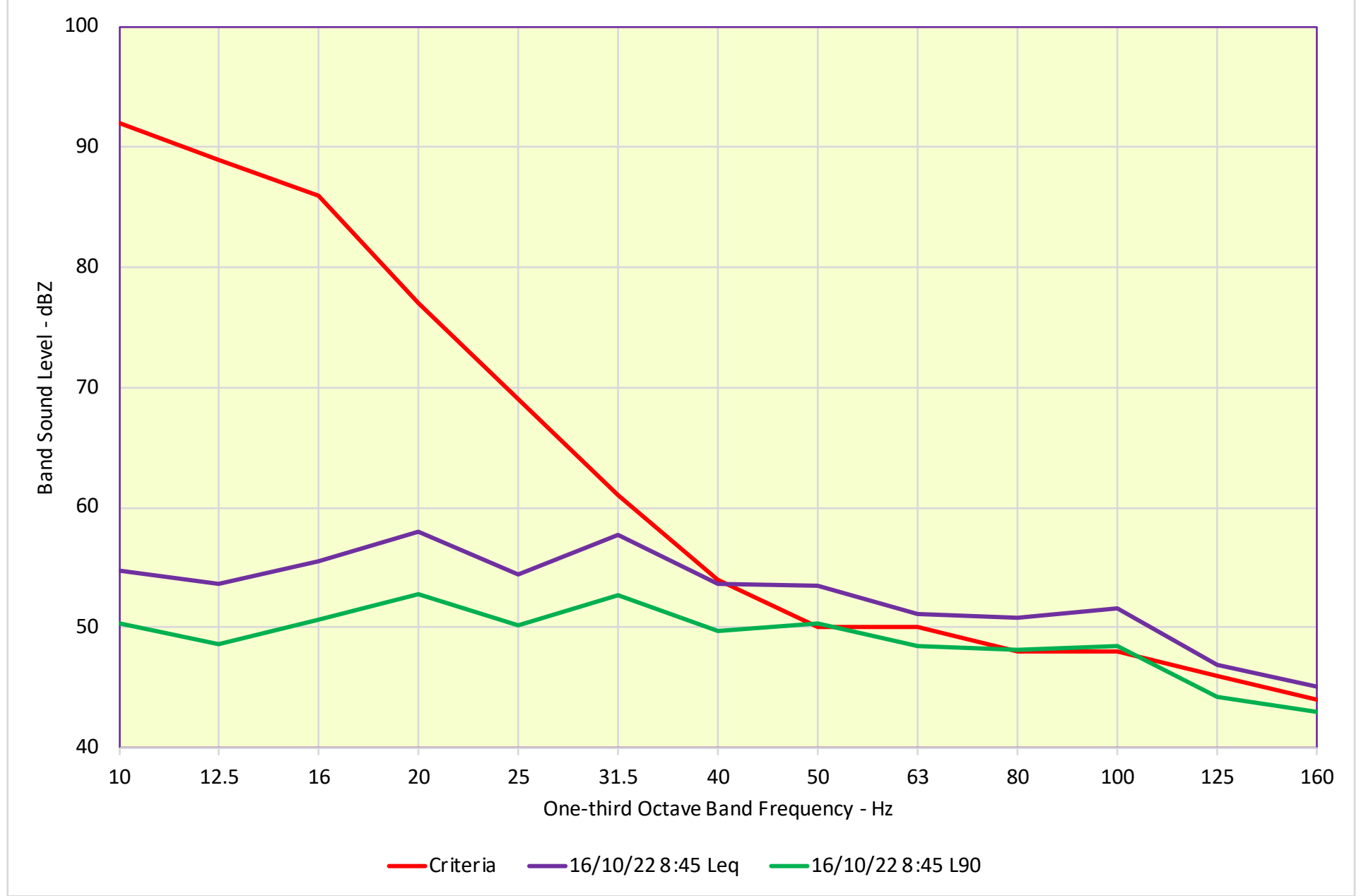


Figure A48 : Boral Cement Berrima Noise Assessment 2022 - Low Frequency assessment North Fence  
19/10/22 03:30

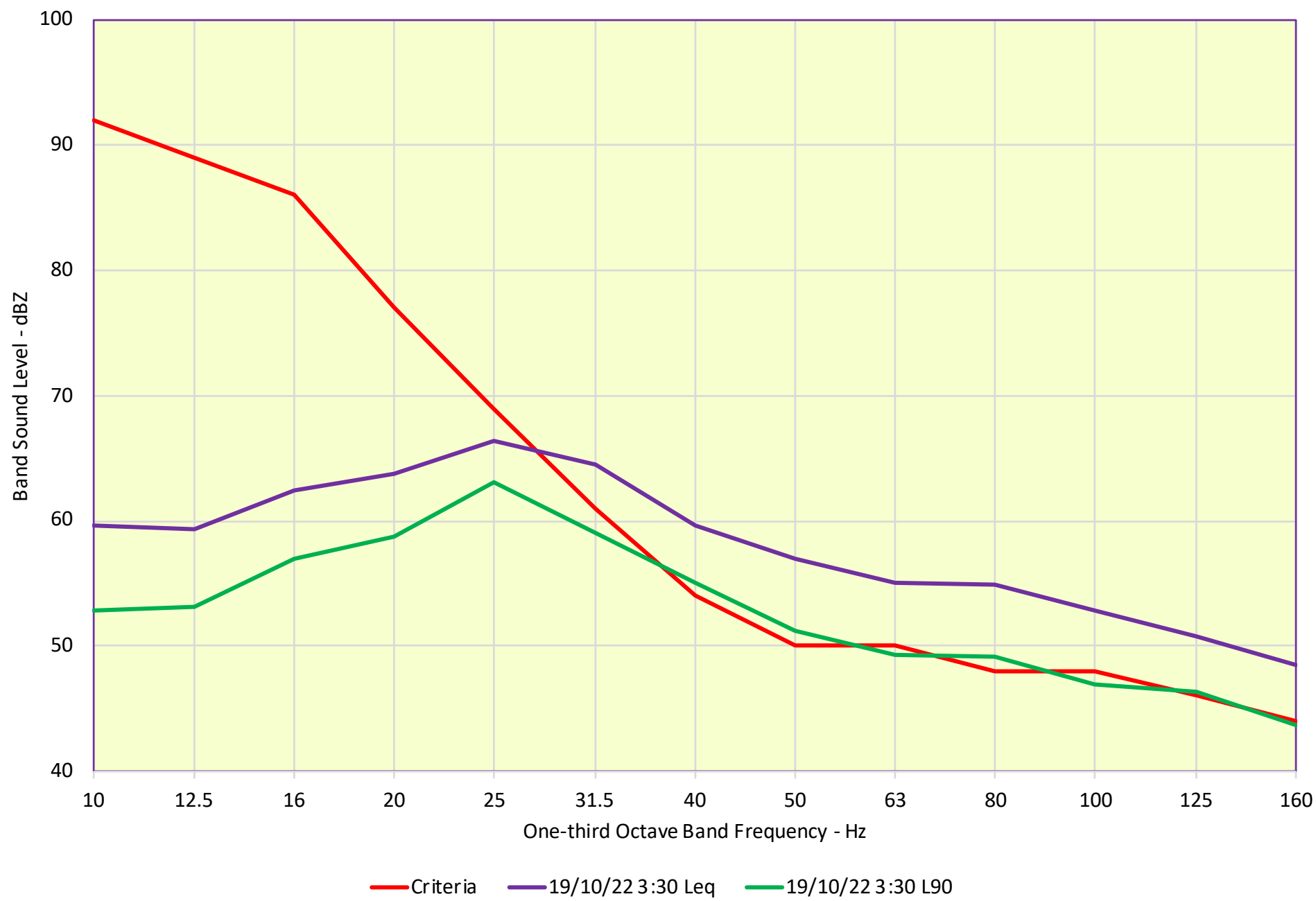


Figure A49 : Boral Cement Berrima Noise Assessment 2022 - Low Frequency assessment North Fence  
20/10/22 01:00

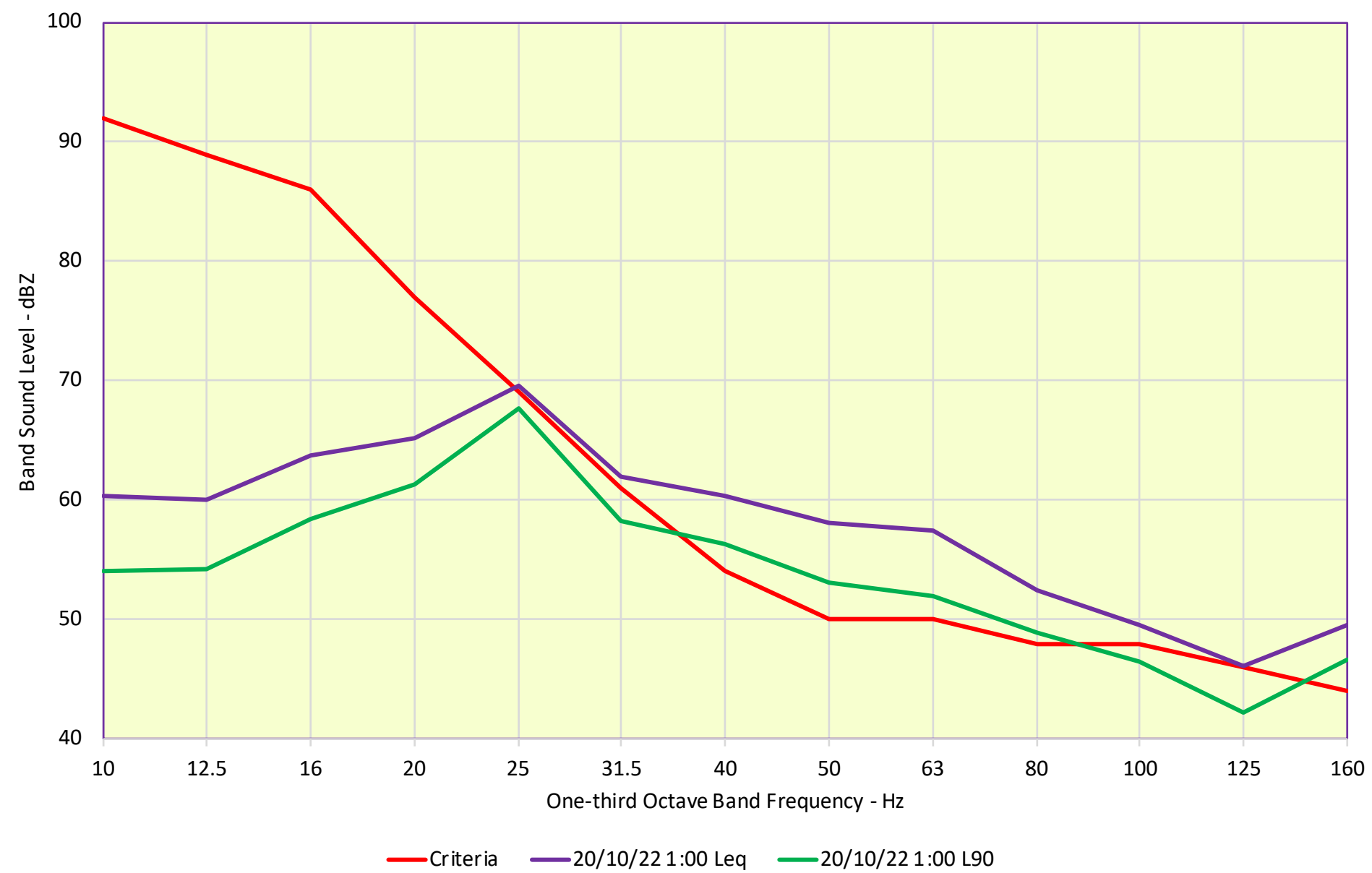
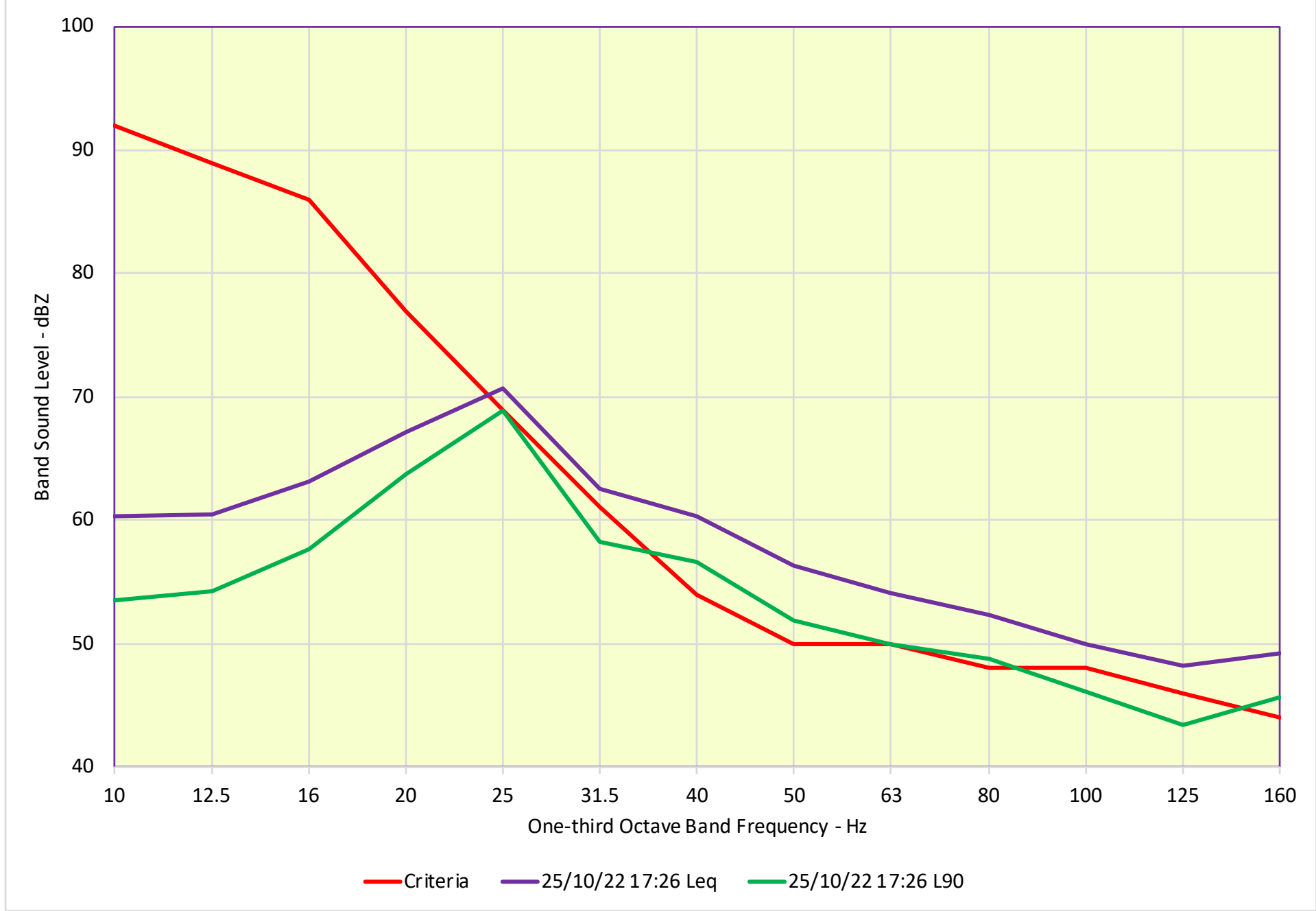


Figure A50: Boral Cement Berrima Noise Assessment 2022 - Low Frequency assessment North  
Fence 25/10/22 17:26



## **Appendix B: Unattended environmental sound level results for 4 Melbourne Street**

4 Melbourne St. New Berrima  
Daytime LAEQ 10 to 25 October 2022

Time	10/10	11/10	12/10	13/10	14/10	15/10	16/10	17/10	18/10	19/10	20/10	21/10	22/10	23/10	24/10	Maximum	Minimum	Average	SD
7:00		55	55	53	53	50	53	55	54	53	63	52	48	54	53	63	48	53	3.3
7:15		54	54	53	52	52	45	55	52	53	61	55	51	51	56	61	45	53	3.5
7:30		54	53	58	56	57	50	56	52	53	52	53	49	54	52	58	49	53	2.5
7:45		52	55	57		51	48	55	54	52	54	54	48	50	53	57	48	53	2.6
8:00		59	52	54	52	49	46	55	51	53	54	55	48	50	53	59	46	52	3.2
8:15		55	55	52	54	49	46	54	53	53	54	57	47	49	55	57	46	52	3.3
8:30		53	51	54	54	50	45	55	53	53	53	58	50	51	55	58	45	53	3.0
8:45		53	51	53	54	50	47	57	55	52	54	55	48	57	53	57	47	53	2.9
9:00		53	52	53	54	49	45	56	54	56	54	55	51	55	54	56	45	53	2.8
9:15		53	52	51	51	50	48	54	54	51	53	54	48	53	55	55	48	52	2.2
9:30		55	52	51	57	50	46	52	56	55	55	51	49	51	56	57	46	53	3.2
9:45		51	51	51	53	50	47	54	52	50	52	52	51	52	55	55	47	52	1.9
10:00		50	52	51	52	52	49	55	51	50	51	53	48	52	55	55	48	51	2.1
10:15		52	52	50	53	51	50	56	54	51	51	52	51	51	54	56	50	52	1.7
10:30		52	51	50		52	47	58	54	53	56	55	48	53	55	58	47	53	3.1
10:45		53	52	52	52	50	47	53	53	52	52	53	47	51	53	53	47	51	2.0
11:00		52	50	52	53	49	47	54	52	51	50	54	49	51		54	47	51	1.9
11:15		52	54	56	52	49	50	51	53	53	52	54	47	52		56	47	52	2.2
11:30		50	52	60	55	50	48	54	52	53	52	53	48	51		60	48	52	3.1
11:45		53	53	53	53	48	52	51	56	52	53	52	48	52		56	48	52	2.0
12:00		53	52	52	52	50	48	53	53	52	54	55	49	50		55	48	52	2.1
12:15		52	50	53	52	48	47	55	52	52	54	53	48	50		55	47	51	2.3
12:30	54	55	52	55	54	49	48	53	51	53	55	55	49	51		55	48	52	2.4
12:45	52	51	52	53	57	49	47	52	52	53	53	51	48	50		57	47	52	2.4
13:00	52	51	52	54	54	53	48	53	54	53	54	52	51	52		54	48	52	1.9
13:15	53	51	53	54	51	50	49	54	56	54	54	52	53	51		56	49	52	2.0
13:30	55	51	52	51	54	49	48	56	52	54	53	55	50	52		56	48	52	2.3
13:45	53	51	53	53	53	49	48	53	53	54	53	52	49	51		54	48	52	1.9
14:00	49	53	53	53	51	48	49	54	52	54	53	51	47	55		55	47	51	2.4
14:15	55	52	56	53	51	47	46	52	51	54		53		53		56	46	52	2.9
14:30	54	52	53	54	53	48	47	55	53	53	54		49	51		55	47	52	2.4
14:45	53	53	52	53	54	47	48	53	54	55	54	54	49	51		55	47	52	2.6
15:00	54	53	52	52	53	49	48	55	53	55	54	54	48	51		55	48	52	2.5
15:15	53	53	52	51	52	49	45	53	52	57	55	53	48	53		57	45	52	3.0
15:30	54	53	54	53	54	49	48	53	53	56	54	53	47	53		56	47	52	2.4
15:45	53	53	53	54	54	48	46	53	54	54	53	52	51	52		54	46	52	2.3
16:00	54	53	53	52	52	49	46	54	51	55	54	52		55		55	46	52	2.4
16:15	52	52	52	53	52	48	49	54	53	52	54	53	47	53		54	47	52	2.1
16:30	52	52	51	52	53	50	49	55	52	54	58	53	49	57		58	49	53	2.7
16:45	51	53	52	51	51	50	50	56	50	51	53	52	48	51		56	48	51	1.7
17:00	54	52	53	51	50	47	48	53	51	52	52	51	51	51		54	47	51	1.9
17:15	52	52	52	53		47	48	54	52	51	53	49	49	51		54	47	51	2.1
17:30	51	52	50	52	50	47	49	52	50	53	52	56		53		56	47	51	2.2
17:45	54	51	50	51	51	48	49	49	53	52	52	48	49	50		54	48	51	1.9
18:00	50	51	51	51	53	47	48	50	51	51	52	49	46	50		53	46	50	1.9
Max	55	59	56	60	57	57	53	58	56	57	63	58	53	57	56	63	53	57	2.5
Min	49	50	50	50	50	47	45	49	50	50	50	48	46	49	52	52	45	49	1.9
Ave	53	53	52	53	53	49	48	54	53	53	54	53	49	52	54	54	48	52	1.9
SD	1.5	1.5	1.3	1.9	1.6	1.8	1.7	1.7	1.4	1.6	2.3	1.9	1.5	1.7	1.3	2.3	1.3	1.6	0.3
E Ave	53	53	52	53	53	50	48	54	53	53	55	54	49	52	54	55	48	52	1.9

Evening LAEQ

Time	10/10	11/10	12/10	13/10	14/10	15/10	16/10	17/10	18/10	19/10	20/10	21/10	22/10	23/10	24/10	Maximum	Minimum	Average	SD
18:00	50	51	51	51	53	47	48	50	51	51	52	49	46	50		53	46	50	1.9
18:15	51	49	48	49	54	48	48	50	50	50	51	47		52		54	47	50	1.7
18:30	51	48	49	56	54	47	48	49	49	50	50	47		50		56	47	50	2.6
18:45	49	47	62	48	49	48	48	50	52	51		49	48	49		62	47	50	3.8
19:00	46	50	46	48	49	48	48	48	48	53		49	46	50		53	46	48	1.9
19:15	49	49	48	49	48	48	48	49	48	50		45	59	49		59	45	49	3.3
19:30	48	47	46	48	48	46	48	48	49	48	50	49	54	51		54	46	49	2.0
19:45	49	48	45	45	47	48	49	48	45	50	50	45	47	50		50	45	48	1.9
20:00	46	46	45	47	46	45	49	48	47	50	50	43	45	49		50	43	47	2.0
20:15	47	46	49	47	48	45	50	47	47	48	50	45	44	51		51	44	47	2.1
20:30	45	45	50	48	47	46	49	47	47	49	48	43	44	48		50	43	47	2.1
20:45	46	47	45	46	47	45	50	46	46	49	47	43	46	48		50	43	46	1.7
21:00	46	46	44	47	46	44	49	47	42	49	48	44	46	48		49	42	46	2.1
21:15	47	47	45	47	47	46	50	46	46	49	47	45	44	47		50	44	47	1.7
21:30	46	47	45	47	46	46	49	46	46	50	46	44	44	47		50	44	46	1.7
21:45	44	45	46	45	46	45	50	47	44	50	46	44	46			50	44	46	1.8
22:00	45	48	43	45	47	46		46	42	49	45	42	45			49	42	45	2.2
Max	51	51	62	56	54	48	50	50	52	53	52	49	59	52		62	48	53	3.8
Min	44	45	43	45	46	44	48	46	42	48	45	42	44	47		48	42	45	1.8
Ave	47	47	48	48	48	46	49	48	47	50	49	45	47	49		50	45	48	1.2
SD	2.1	1.6	4.3	2.6	2.6	1.4	0.7	1.5	2.8	1.2	2.1	2.4	4.2	1.3		4.3	0.7	2.2	1.1
E Avg	48	48	51	49	49	46	49	48	48	50	49	46	50	49		51	46	49	1.4

Night LAEQ

Time	10/10	11/10	12/10	13/10	14/10	15/10	16/10	17/10	18/10	19/10	20/10	21/10	22/10	23/10	24/10	Maximum	Minimum	Average	SD
22:00	45	48	43	45	47	46		46	42	49	45	42	45			49	42	45	2.2
22:15	46	45	46	46	46	46		43	43	49	46	44	43	47		49	43	45	1.6
22:30	44	47	43	43	47	44		45	44	48	45	43		46		48	43	45	1.7
22:45	47	45	43	51	45	45	49	43	42	49	45	44		45		51	42	45	2.6
23:00	44	44	45	43	45	45	49	45	45	53	47	44		45		53	43	46	2.6
23:15	45	46	42	42	46	43	49	44	42	49		45		44		49	42	45	2.4
23:30	45	46	43	50	44	45	50	44	44	48		43				50	43	46	2.6
23:45	46	45	44	43	45	45	50	45	41	47		42		46		50	41	45	2.4
0:00	44	45	44	45	45	43	50	45	43	47	47	41		47		50	41	45	2.2
0:15	46	44	44	41	44	43	50	43	43	45	47	40		48		50	40	45	2.7
0:30	45	46	42	44	45	42	51	43	43	45	53	42	54	46		54	42	46	4.0
0:45	46	45	42	40	47	44	50	43	43	47	48	42	54	46		54	40	46	3.7
1:00	46	44	45	41	44	45	50	44	41	48	46	42		46		50	41	45	2.7
1:15	46	44	41	43	45	43	50	44	44	49	46	40	50	47		50	40	45	3.1
1:30	45	46	43		43	43	50	47	42	48	45	40	47			50	40	45	2.8
1:45	46	46	44		47	44	49	44	43	48	48	41	45	44		49	41	45	2.3
2:00	44	45	46		43	43	49	44	46	48	46	42	44	45		49	42	45	1.9
2:15	47	48	43	46	45	42	50	48	43	49		44	45	44		50	42	46	2.6
2:30	45	45	41	55	43	44	49	43	45	50	47	41	44	44		55	41	45	3.9
2:45	47	45	41	51	46	43	50	43	45	48	47	41	44	45		51	41	45	3.1
3:00	47	45	43	46	43	44	50	45	47	48	45	40	44			50	40	45	2.5
3:15	47	46	43	43	44	43	50	42	48	48	48	45	44			50	42	45	2.5
3:30	47	43	43	47	43	43	51	44	50	49	48	40	45	47		51	40	46	3.0
3:45	47	46	42	44	44	41	49	44	50	48	48	39	45			50	39	45	3.1
4:00	46	46	44	47	45	42	50	47	49	49	46	41	46	49		50	41	46	2.8
4:15	46	46	44	44	45	42	51	49	47	47	49	42	47	50		51	42	46	2.8
4:30	48	48	48	50	46	44	50	50	47	50	49	45	46	48		50	44	48	2.1
4:45	49	48	46	50	47	43	52	50	49	52	50	46	51	51		52	43	49	2.5
5:00	49	48	47	48	48	43	52	49	49	49	50	42	48	49		52	42	48	2.7
5:15	52	53	49	51	47	42	53	52	51	52	51	49	46	52		53	42	50	3.2
5:30	52	52	51	52	48	46		54	51	53	51	48	47	52		54	46	50	2.4
5:45	51	51	50	50	51	44	52	52	53	50	53	48	48	52		53	44	50	2.5
6:00	51	51	48	49	50	43	54	51	52	53	52	47	49	52		54	43	50	2.7
6:15	52	50	53		52	44	55	53	52	55	51	49	48	53		55	44	51	3.1
6:30	57	53	53		50	51	57	53	53	60	52	49	47	55		60	47	53	3.4
6:45	57	52	53		49	53	56	53	53	61	53	51	48	54		61	48	53	3.3
7:00	55	55	53	53	50	53	55	54	53	63	52	48	54	53		63	48	53	3.3
Max	57	55	53	55	52	53	57	54	53	63	53	51	54	55		63	51	54	2.9
Min	44	43	41	40	43	41	49	42	41	45	45	39	43	44		49	39	43	2.5
Ave	48	47	45	46	46	44	51	47	46	50	48	44	47	48		51	44	47	2.1
SD	3.4	3.0	3.6	3.9	2.3	2.8	2.1	3.8	4.0	4.0	2.7	3.3	3.1	3.3		4.0	2.1	3.2	0.6
E Avg	49	48	47	48	47	46	52	48	48	53	49	45	48	49		53	45	48	2.2
24hr	51	51	51	51	51	48	48	52	51	51	53	51	48	51	52	53	48	51	1.6

# 4 Melbourne St. New Berrima

Daytime LA90

10 to 25 October 2022

Time	10/10	11/10	12/10	13/10	14/10	15/10	16/10	17/10	18/10	19/10	20/10	21/10	22/10	23/10	24/10	Maximum	Minimum	Average	SD
7:00		46	44	43	45	45	37	49	44	44	54	43	40	45	46	54	37	44	3.7
7:15		44	44	43	44	45	35	49	43	44	47	43	40	46	46	49	35	44	3.3
7:30		46	44	47	44	45	36	49	43	43	46	44	39	47	45	49	36	44	3.2
7:45		45	46	46	44	44	38	49	43	43	47	44	39	47	46	49	38	44	3.1
8:00		44	44	44	45	44	39	49	42	43	46	43	39	46	46	49	39	44	2.6
8:15		46	44	43	46	43	39	48	43	44	46	45	39	46	46	48	39	44	2.5
8:30		44	44	43	46	43	39	49	42	44	46	45	40	47	46	49	39	44	2.7
8:45		45	43	43	47	44	39	49	45	43	46	47	40	50	46	50	39	45	3.1
9:00		44	42	43	47	44	39	48	43	44	45	43	40	49	46	49	39	44	2.9
9:15		43	41	42	44	45	39	49	45	43	44	43	40	48	47	49	39	44	2.8
9:30		42	41	42	49	44	38	47	46	45	45	42	41	47	47	49	38	44	3.2
9:45		41	42	42	47	44	39	47	41	42	45	42	47	47	48	48	39	44	2.9
10:00		41	42	41	45	44	39	48	42	42	44	42	38	47	47	48	38	43	2.9
10:15		42	41	41	46	45	40	50	42	42	45	41	39	47	48	50	39	43	3.4
10:30		41	40	43	43	39	51	42	41	45	42	40	47	49	49	51	39	43	3.7
10:45		42	41	42	44	43	39	48	44	43	44	41	39	47	48	48	39	43	3.0
11:00		42	41	44	46	43	38	47	40	42	43	42	40	47	47	47	38	43	2.8
11:15		41	41	46	47	44	39	47	41	44	45	43	40	48	48	48	39	43	2.9
11:30		41	41	45	48	42	38	47	41	42	43	42	39	48	48	48	38	43	3.1
11:45		41	41	43	47	42	40	46	42	43	46	42	40	48	48	48	40	43	2.7
12:00		41	41	43	45	43	40	46	41	42	46	45	40	47	47	47	40	43	2.4
12:15		41	40	43	46	41	39	46	40	42	47	43	41	47	47	47	39	43	2.7
12:30	41	41	40	46	47	40	40	45	40	43	47	42	41	47	47	47	40	43	3.0
12:45	41	41	40	42	47	39	38	45	40	45	46	41	41	47	47	47	38	42	3.1
13:00	40	41	41	43	45	38	36	46	42	45	47	41	43	48	48	48	36	43	3.4
13:15	41	39	40	44	45	37	36	46	44	45	47	42	47	48	48	48	36	43	3.9
13:30	43	40	40	43	47	38	36	46	44	47	46	42	41	48	48	48	36	43	3.8
13:45	42	40	41	42	46	39	38	46	42	48	47	43	40	48	48	48	38	43	3.4
14:00	41	40	41	42	44	38	37	46	40	47	46	44	40	49	49	49	37	43	3.8
14:15	43	42	43	42	45	39	37	45	41	48	43	43	48	48	48	48	37	43	3.4
14:30	42	43	43	43	45	40	37	47	41	47	46	41	47	47	47	47	37	43	3.3
14:45	42	43	42	42	47	39	37	47	42	48	47	42	42	47	47	48	37	43	3.5
15:00	41	46	43	43	46	39	37	47	40	48	47	43	42	47	47	48	37	44	3.6
15:15	41	45	43	43	43	41	37	46	41	49	49	43	42	47	47	49	37	44	3.4
15:30	46	45	42	44	44	43	37	45	42	46	49	41	40	48	49	49	37	44	3.2
15:45	43	43	43	43	45	41	40	46	42	46	48	42	41	47	47	48	40	44	2.7
16:00	46	43	45	44	45	42	41	47	41	47	48	42	50	50	50	50	41	45	3.0
16:15	43	42	43	44	46	43	42	46	41	47	48	44	40	48	48	48	40	44	2.7
16:30	43	44	43	44	45	44	43	47	41	47	48	42	41	47	48	48	41	44	2.5
16:45	43	44	46	43	45	43	44	47	40	47	47	41	41	48	48	48	40	44	2.6
17:00	44	43	44	43	44	42	44	48	43	47	47	42	42	47	47	48	42	44	2.1
17:15	42	43	44	43	42	44	44	47	43	46	46	41	42	47	47	47	41	44	1.9
17:30	43	43	41	43	45	42	45	46	40	46	46	42	47	47	47	47	40	44	2.4
17:45	43	44	41	42	44	43	44	44	42	45	47	41	41	46	47	47	41	43	2.1
18:00	44	43	42	43	44	42	44	45	39	46	47	40	41	46	47	47	39	43	2.3
Max	46	46	46	47	49	45	45	51	46	49	54	47	47	50	49	54	45	48	2.5
Min	40	39	40	41	43	37	35	44	39	41	43	40	38	45	45	45	35	41	3.0
Ave	42	43	42	43	45	42	39	47	42	45	46	42	41	47	47	47	39	44	2.5
SD	1.5	1.8	1.6	1.3	1.3	2.2	2.6	1.5	1.6	2.2	1.8	1.3	1.7	1.0	1.1	2.6	1.0	1.6	0.4
90%	41	41	40	42	44	39	36	45	40	42	44	41	39	46	46	46	36	42	2.8
																	Median	41	

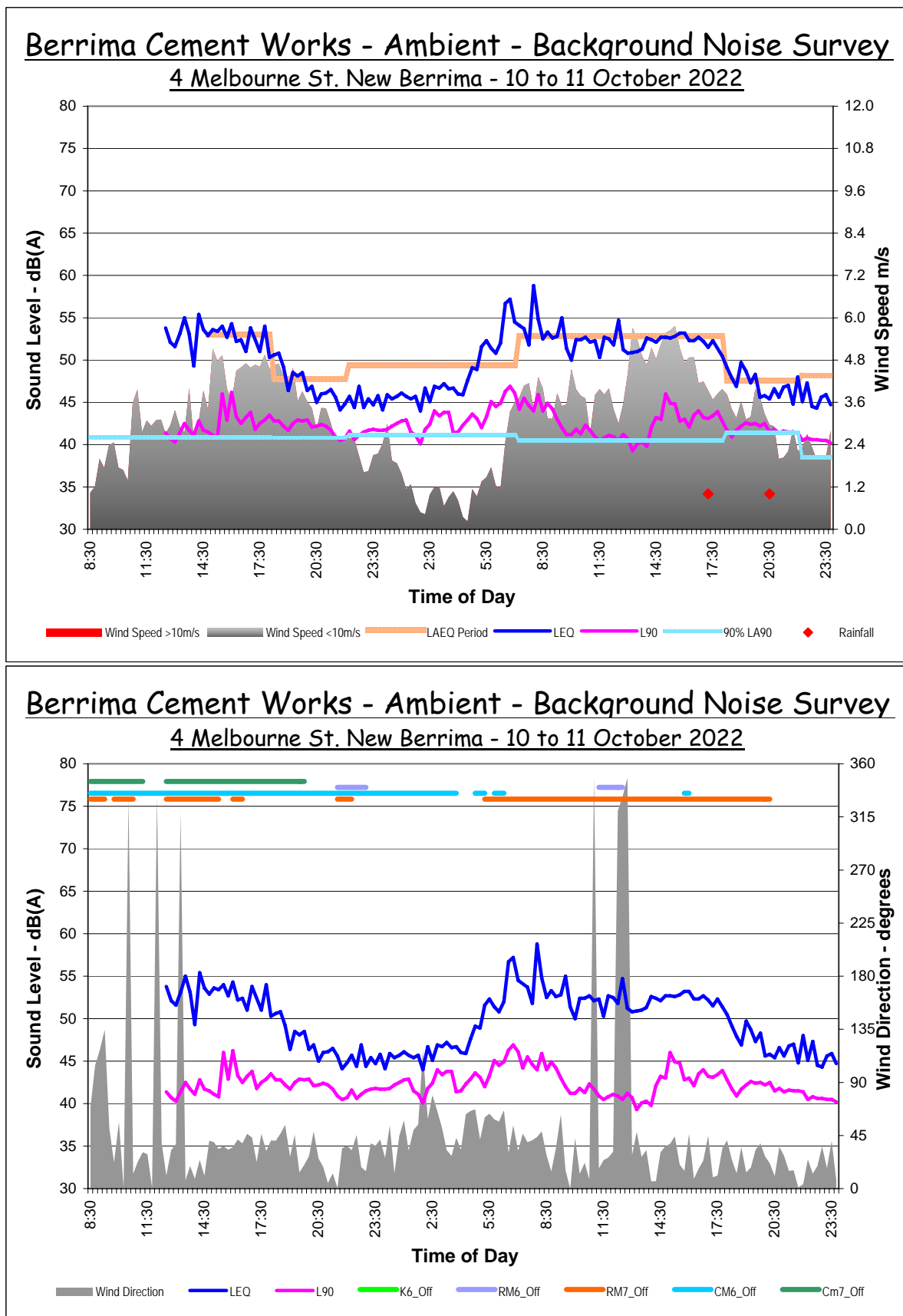
Evening LA90

Time	10/10	11/10	12/10	13/10	14/10	15/10	16/10	17/10	18/10	19/10	20/10	21/10	22/10	23/10	24/10	Maximum	Minimum	Average	SD
18:00	44	43	42	43	44	42	44	45	39	46	47	40	41	46		47	39	43	2.3
18:15	43	42	41	41	44	43	44	44	39	45	46	40	41	46		46	39	43	2.3
18:30	43	41	41	41	45	43	45	43	39	46	46	40		46		46	39	43	2.6
18:45	42	42	40	42	44	43	45	44	40	46		40	39	46		46	39	42	2.5
19:00	42	42	40	41	45	44	45	44	39	46		40	41	47		47	39	43	2.5
19:15	43	43	40	41	45	43	46	44	39	46		39	44	46		46	39	43	2.7
19:30	43	42	40	41	44	42	46	44	40	46	46	40	44	47		47	40	43	2.6
19:45	43	43	41	41	43	42	47	45	39	46	46	39	42	47		47	39	43	2.8
20:00	43	42	40	42	43	41	46	45	39	47	46	39	42	46		47	39	43	2.9
20:15	42	43	39	40	42	42	47	45	39	46	47	40	41	47		47	39	43	3.1
20:30	42	42	40	41	43	42	47	44	38	46	46	39	40	46		47	38	43	3.0
20:45	42	42	39	40	43	42	47	44	37	46	44	39	41	45		47	37	42	2.9
21:00	42	41	40	40	43	42	46	44	37	46	43	39	41	45		46	37	42	2.8
21:15	42	42	39	41	43	43	47	42	39	47	44	40	41	45		47	39	42	2.7
21:30	41	42	38	40	43	43	47	43	39	47	43	40	42	44		47	38	42	2.9
21:45	41	42	39	40	43	43	47	43	39	48	43	40	44			48	39	42	2.8
22:00	41	41	39	40	43	44	42	38	47	47	42	38	42			47	38	41	2.7
Max	44	43	42	43	45	44	47	45	40	48	47	40	44	47		48	40	44	2.6
Min	41	41	38	40	42	41	44	42	37	45	42	38	39	44		45	37	41	2.5
Ave	42	42	40	41	44	43	46	44	39	46	45	39	41	46		46	39	43	2.5
SD	0.8	0.5	0.9	0.7	0.9	0.7	1.1	0.9	0.7	0.7	1.7	0.6	1.4	0.7		1.7	0.5	0.9	0.3
90%	41	41	39	40	43	42	44	43	38	46	43	39	40	45		46	38	42	2.4
																	Median	42	

Night LA90

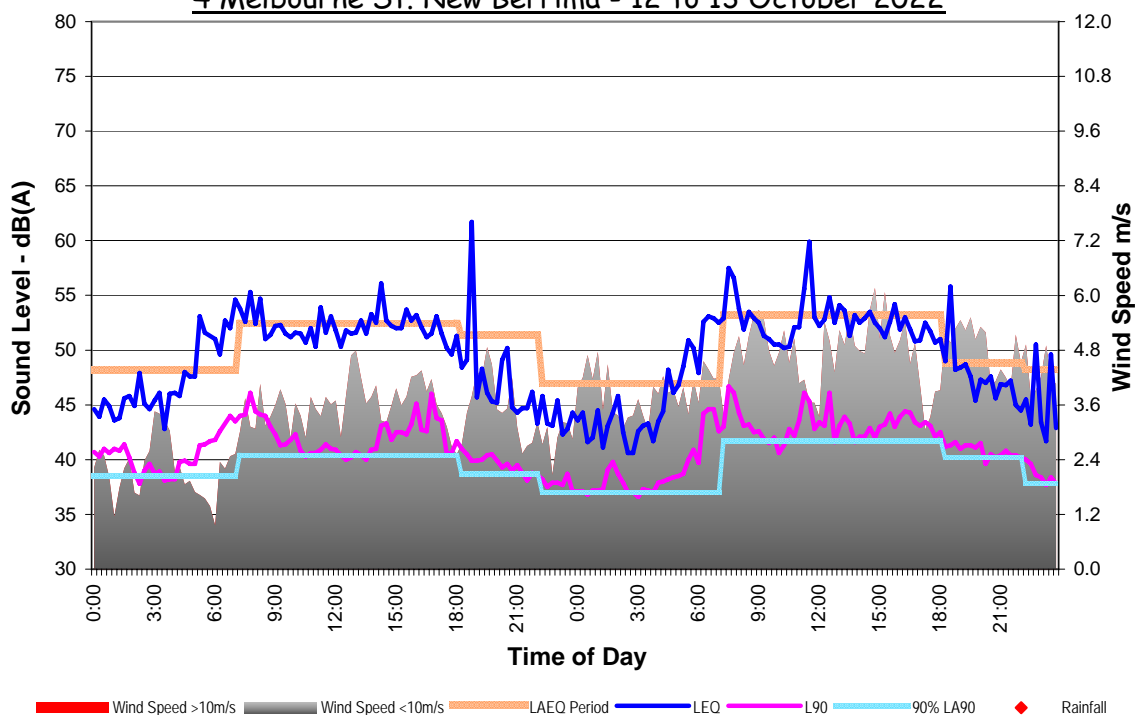
Time	10/10	11/10	12/10	13/10	14/10	15/10	16/10	17/10	18/10	19/10	20/10	21/10	22/10	23/10	24/10	Maximum	Minimum	Average	SD
22:00	41	41	39	40	43	44		42	38	47	42	38	42			47	38	41	2.7
22:15	42	41	38	40	43	44		41	37	46	42	39	39	45		46	37	41	2.7
22:30	41	41	38	40	43	43		40	37	46	42	38		44		46	37	41	2.8
22:45	41	41	38	39	43	43	47	41	37	47	43	39		43		47	37	42	3.2
23:00	42	41	38	38	42	42	47	41	37	47	43	38		43		47	37	41	3.2
23:15	42	41	38	38	42	41	47	41	38	47		39		43		47	38	41	3.2
23:30	42	41	39	38	42	43	47	41	38	46		39				47	38	41	3.3
23:45	42	40	37	38	42	43	48	40	36	45		38		44		48	36	41	3.6
0:00	42	41	37	38	42	41	47	41	37	43	43	38		45		47	37	41	3.2
0:15	42	40	37	38	42	41	47	41	39	43	43	38		45		47	37	41	3.0
0:30	42	41	37	38	42	41	48	41	39	44	47	37	42	44		48	37	42	3.5
0:45	43	41	37	38	41	41	47	40	39	45	45	38	47	44		47	37	42	3.5
1:00	43	41	37	37	41	41	47	41	39	45	43	38		44		47	37	41	3.3
1:15	43	41	37	37	41	41	47	41	39	46	42	37	43	43		47	37	41	3.2
1:30	42	41	39		41	41	47	41	40	47	42	36	44			47	36	42	3.2
1:45	41	40	40		41	41	46	42	38	46	43	37	43	42		46	37	42	2.8
2:00	40	39	39		41	40	46	42	38	46	42	37	42	43		46	37	41	2.7
2:15	42	38	38	38	42	41	46	41	39	47		35	42	43		47	35	41	3.4
2:30	42	39	37	43	41	41	46	41	40	47	42	36	41	43		47	36	41	3.0
2:45	44	40	37	41	42	41	47	40	42	46	42	38	42	43		47	37	42	2.8
3:00	43	39	37	40	41	42	47	40	44	47	43	37	43			47	37	41	3.3
3:15	44	39	37	38	42	41	46	41	45	47	43	38	43			47	37	42	3.3
3:30	44	38	37	38	41	41	48	41	47	45	42	38	43	43		48	37	42	3.4
3:45	41	38	37	38	41	40	46	41	47	45	42	38	44			47	37	41	3.4
4:00	42	38	38	39	42	40	48	41	46	45	41	37	45	45		48	37	42	3.4
4:15	42	40	38	39	42	41	47	42	40	45	43	38	45	46		47	38	42	3.1
4:30	43	40	38	40	44	41	47	43	40	45	42	38	45	44		47	38	42	2.8
4:45	44	40	38	41	44	40	47	44	40	46	42	39	43	44		47	38	42	2.6
5:00	43	40	39	42	44	39	48	42	41	45	42	38	46	42		48	38	42	2.9
5:15	42	41	39	42	44	40	47	44	41	46	41	38	44	43		47	38	42	2.6
5:30	43	41	40	42	44	41		44	42	47	42	39	45	43		47	39	42	2.1
5:45	45	42	41	42	45	36	47	42	44	46	43	39	45	43		47	36	43	3.0
6:00	45	42	40	41	43	35	47	43	44	46	42	40	45	45		47	35	42	3.1
6:15	45	43	44		44	35	46	43	44	46	42	39	44	45		46	35	43	3.0
6:30	46	43	45		44	35	49	45	45	48	42	41	45	46		49	35	44	3.5
6:45	47	44	45		44	37	50	43	45	50	43	40	46	46		50	37	44	3.5
7:00	46	44	43	45	45	37	49	44	44	54	43	40	45	46		54	37	44	3.9
Max	47	44	45	45	45	44	50	45	47	54	47	41	47	46		54	41	46	3.0
Min	40	38	37	37	41	35	46	40	36	43	41	35	39	42		46	35	39	3.1
Ave	43	40	39	40	42	40	47	42	41	46	42	38	44	44		47	38	42	2.6
SD	1.6	1.5	2.1	1.9	1.2	2.2	0.9	1.3	3.2	1.8	1.1	1.2	1.6	1.2		3.2	0.9	1.6	0.6
90%	41	39	37	38	41	37	46	40	37	45	42	37	42	43		46	37	40	3.0
																	Median	41	

## Two Day Results of Ambient Noise Monitoring



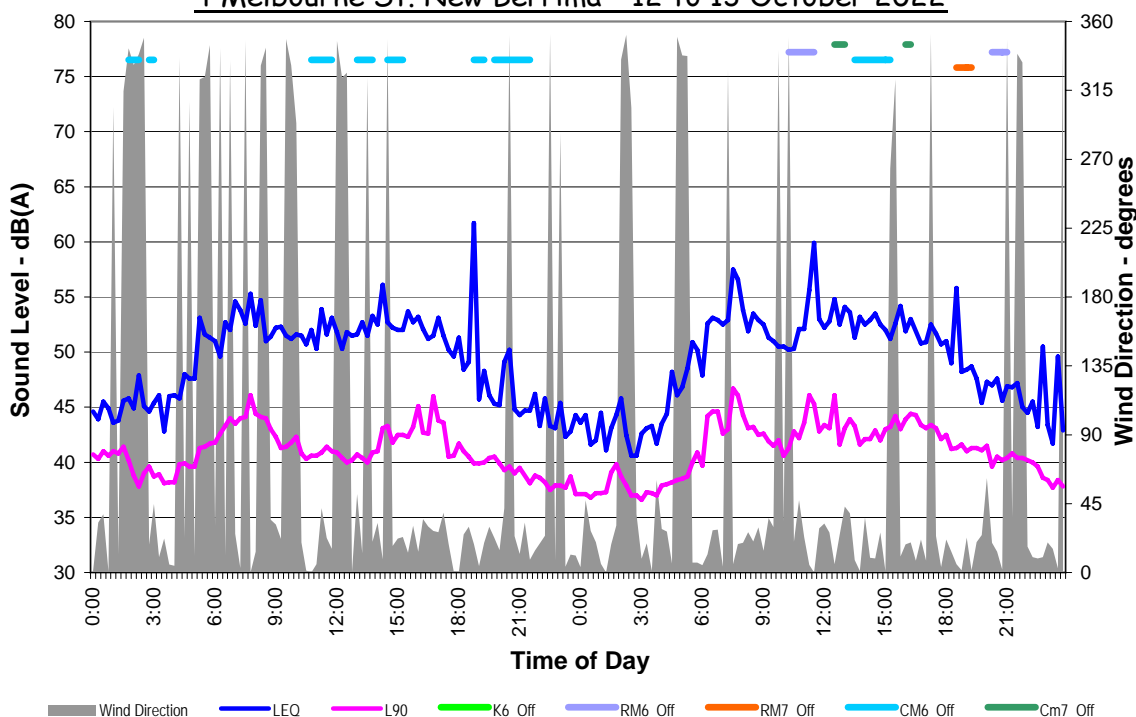
## Berrima Cement Works - Ambient - Background Noise Survey

4 Melbourne St. New Berrima - 12 to 13 October 2022



## Berrima Cement Works - Ambient - Background Noise Survey

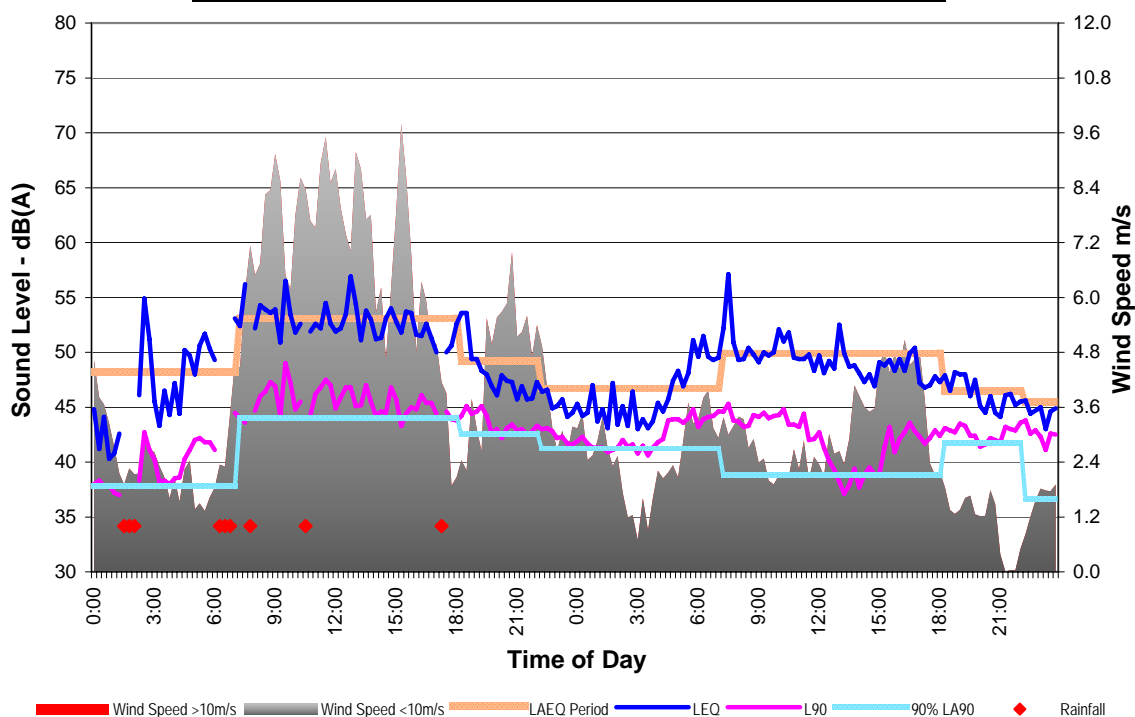
4 Melbourne St. New Berrima - 12 to 13 October 2022





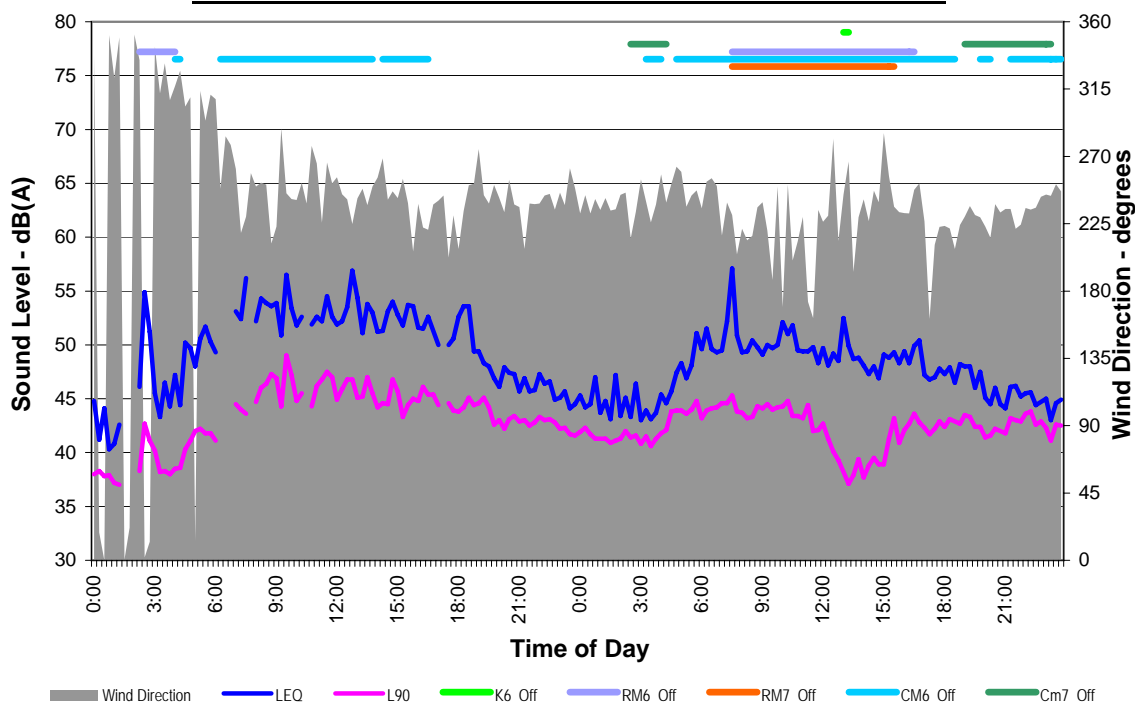
## Berrima Cement Works - Ambient - Background Noise Survey

4 Melbourne St. New Berrima - 14 to 15 October 2022



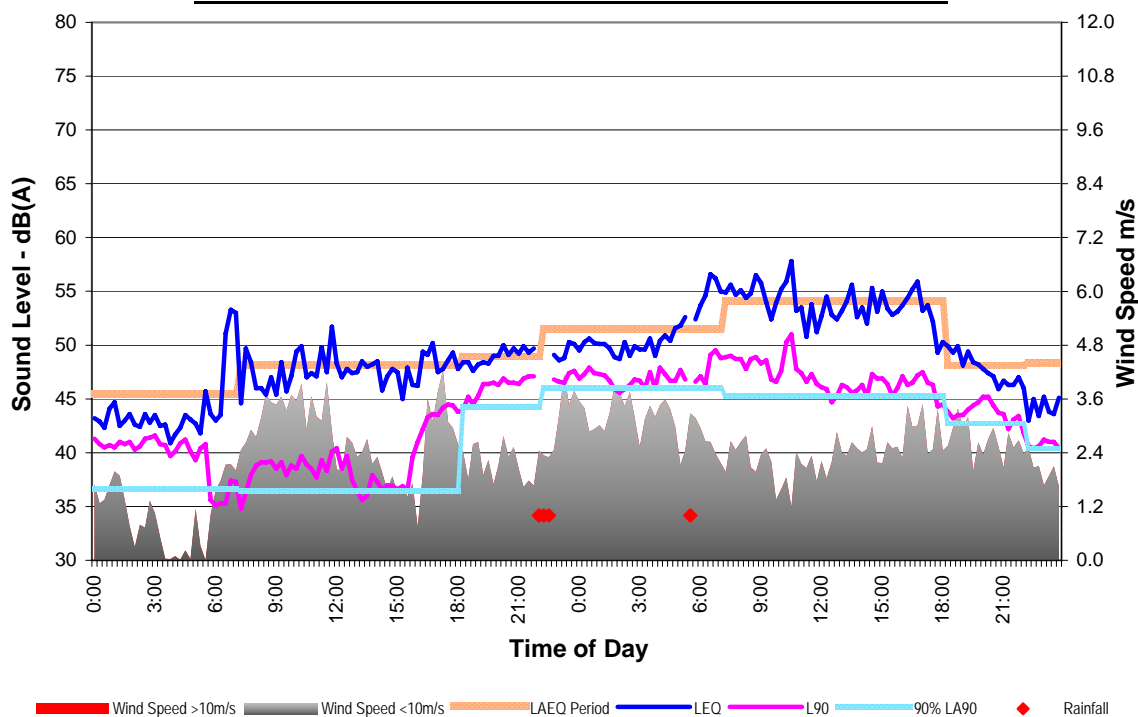
## Berrima Cement Works - Ambient - Background Noise Survey

4 Melbourne St. New Berrima - 14 to 15 October 2022



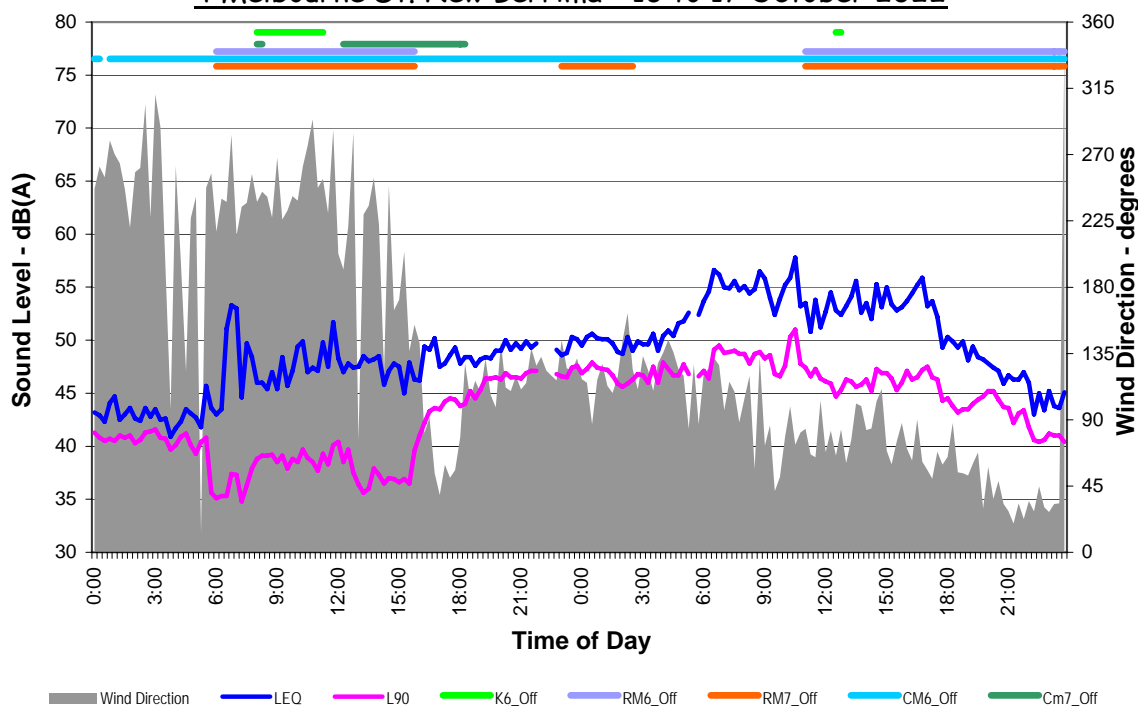
## Berrima Cement Works - Ambient - Backaround Noise Survey

### 4 Melbourne St. New Berrima - 16 to 17 October 2022



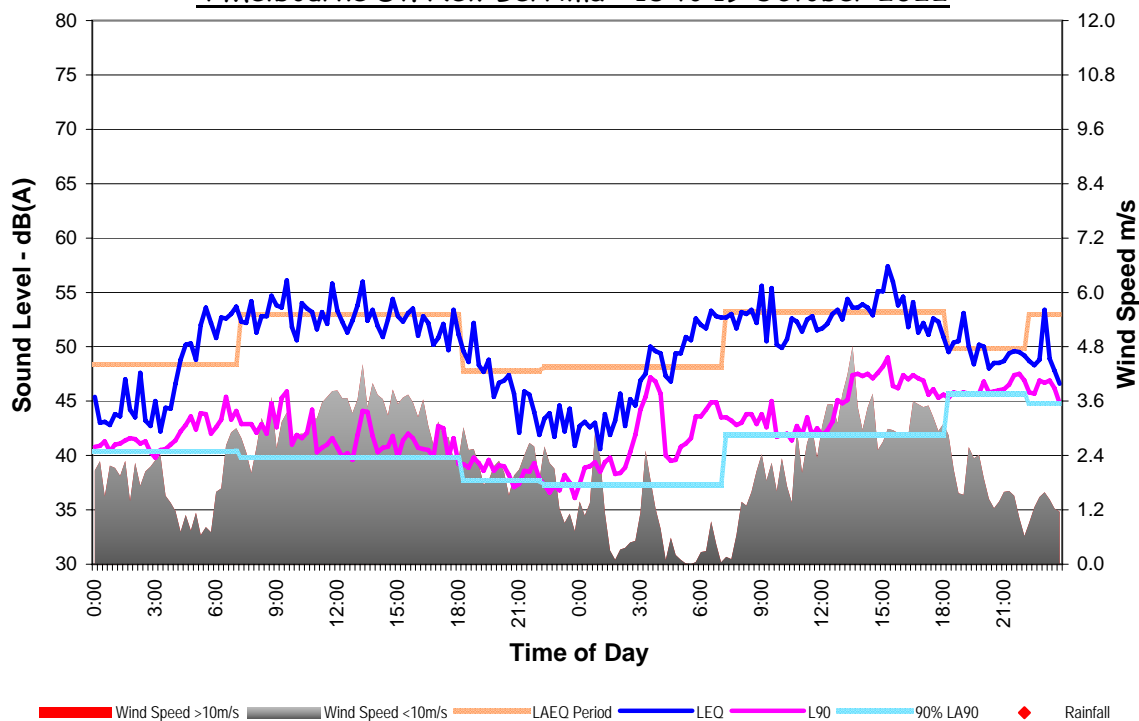
## Berrima Cement Works - Ambient - Backaround Noise Survey

### 4 Melbourne St. New Berrima - 16 to 17 October 2022



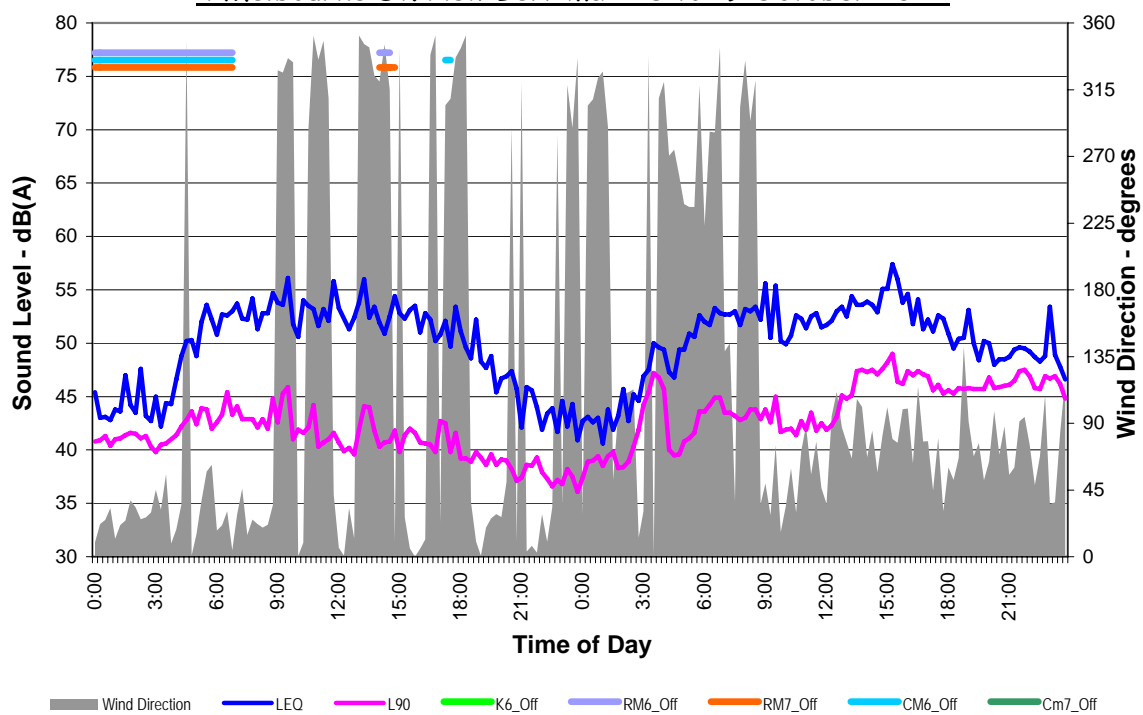
## Berrima Cement Works - Ambient - Background Noise Survey

4 Melbourne St. New Berrima - 18 to 19 October 2022



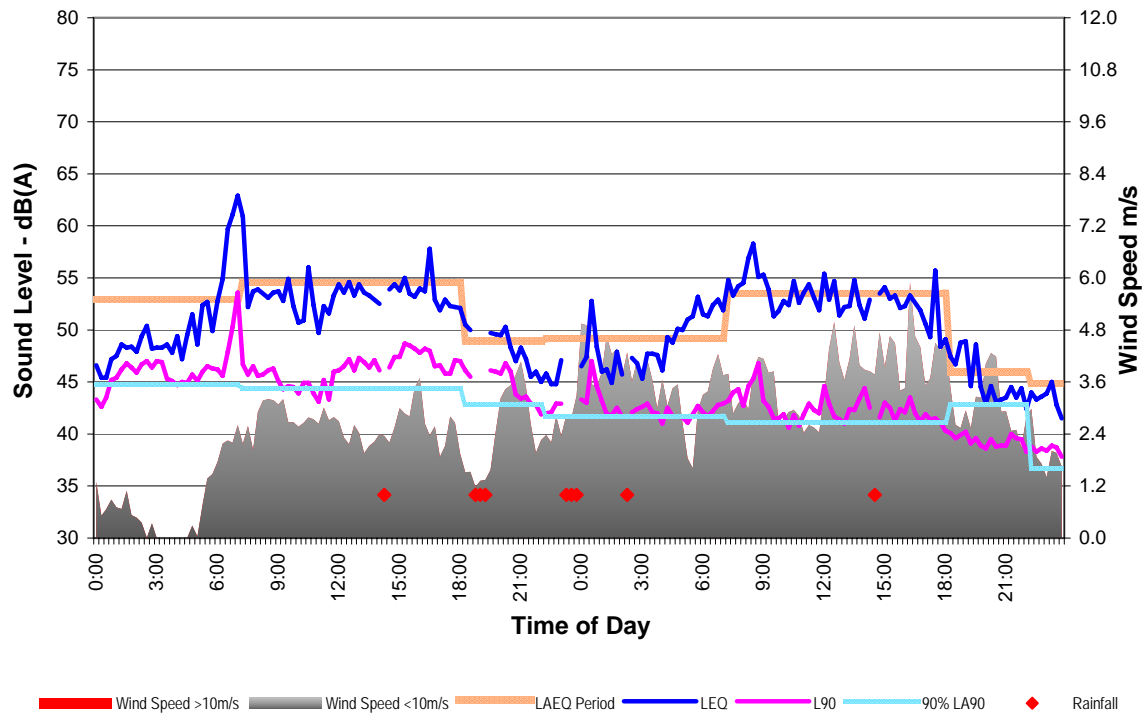
## Berrima Cement Works - Ambient - Background Noise Survey

4 Melbourne St. New Berrima - 18 to 19 October 2022



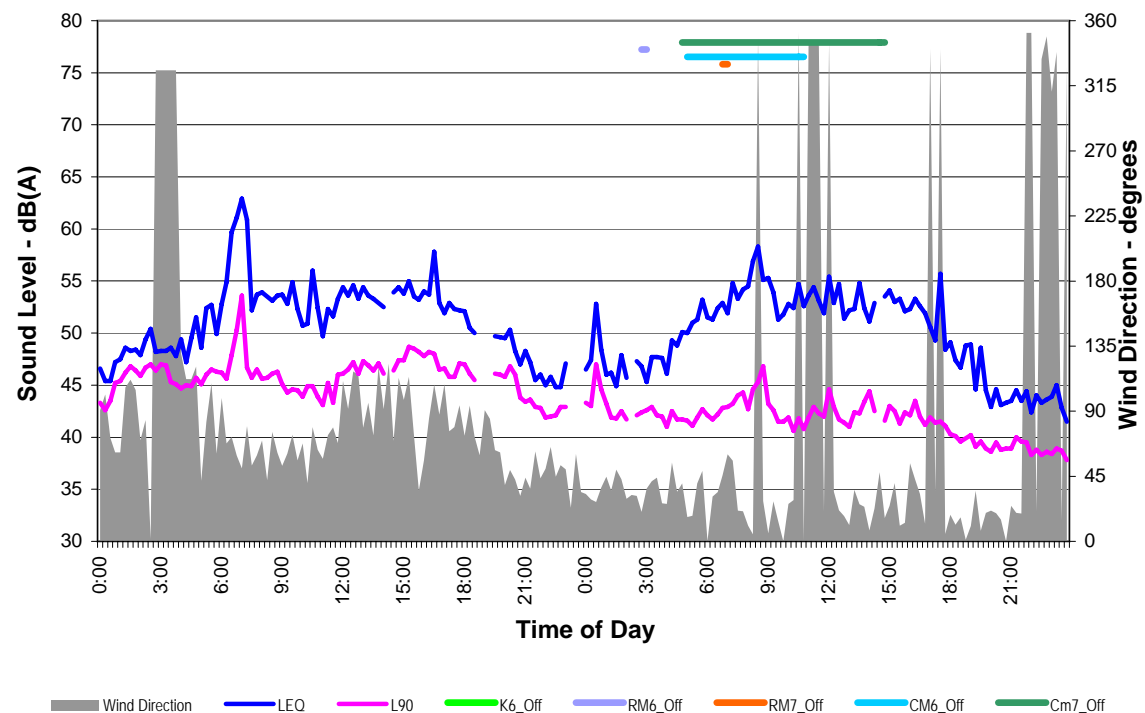
## Berrima Cement Works - Ambient - Background Noise Survey

4 Melbourne St. New Berrima - 20 to 21 October 2022



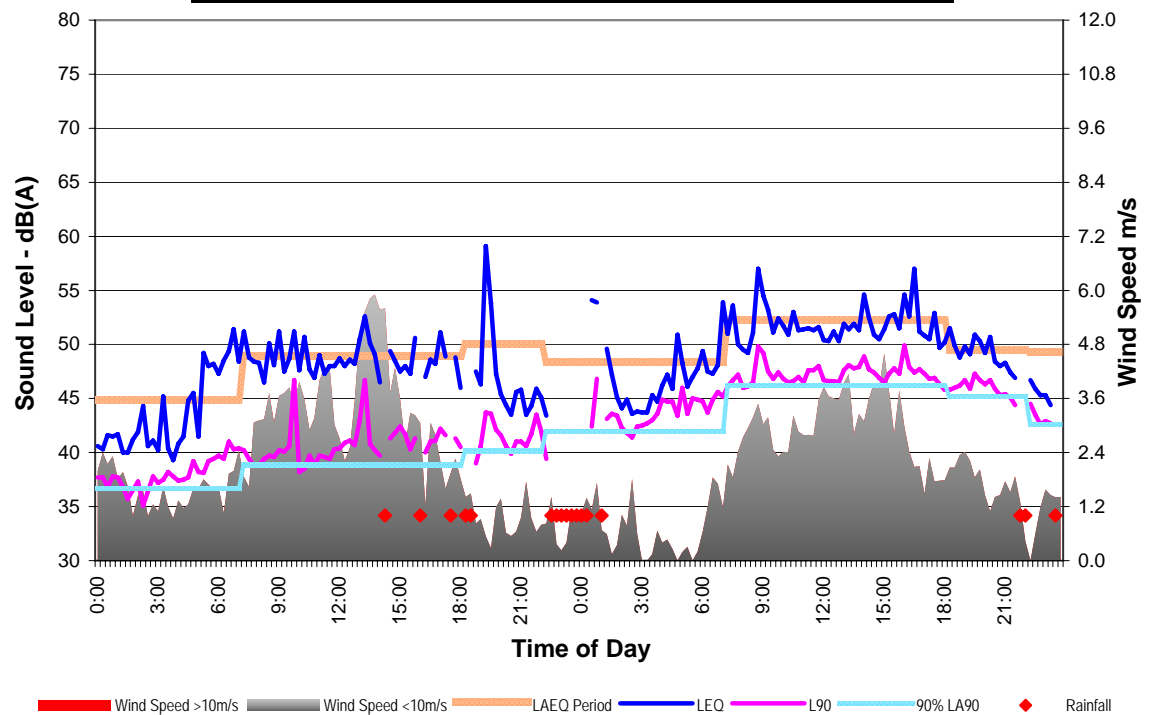
## Berrima Cement Works - Ambient - Background Noise Survey

4 Melbourne St. New Berrima - 20 to 21 October 2022



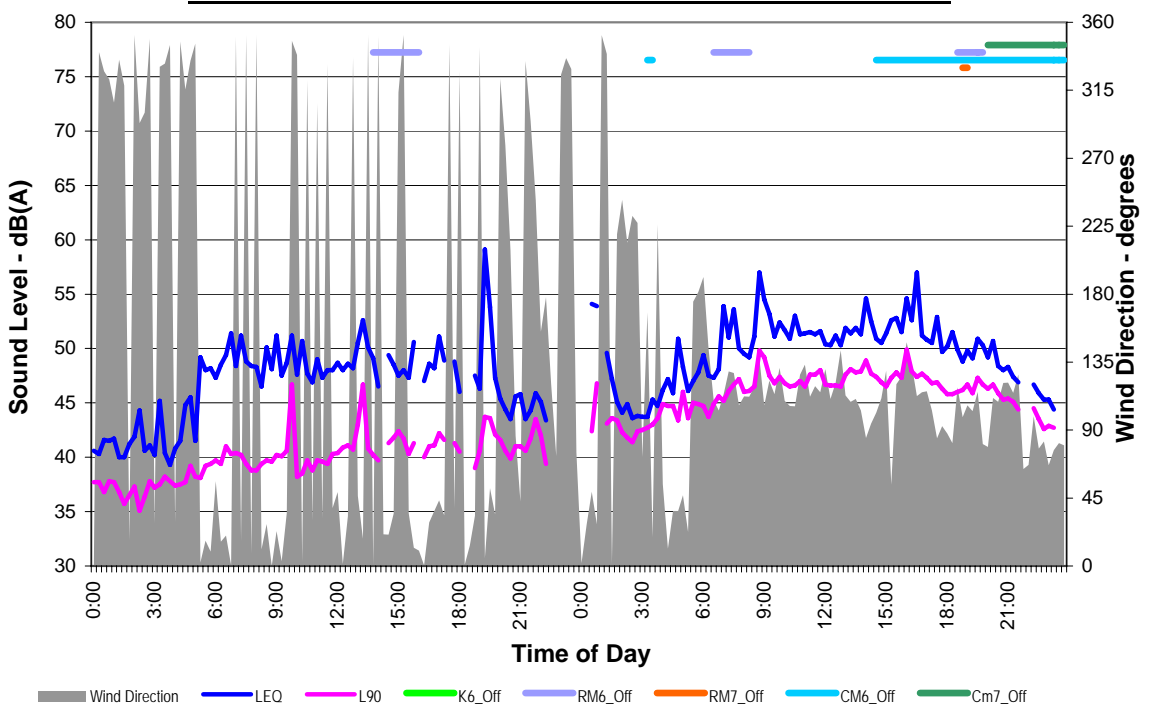
## Berrima Cement Works - Ambient - Background Noise Survey

4 Melbourne St. New Berrima - 22 to 23 October 2022



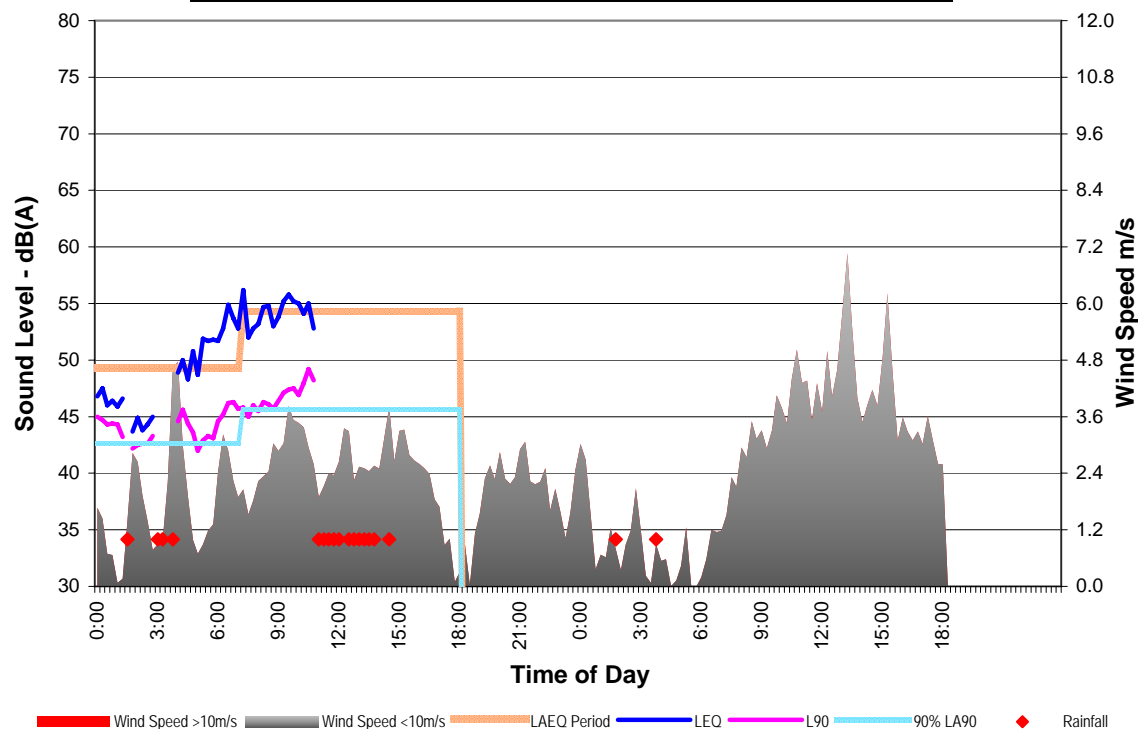
## Berrima Cement Works - Ambient - Background Noise Survey

4 Melbourne St. New Berrima - 22 to 23 October 2022



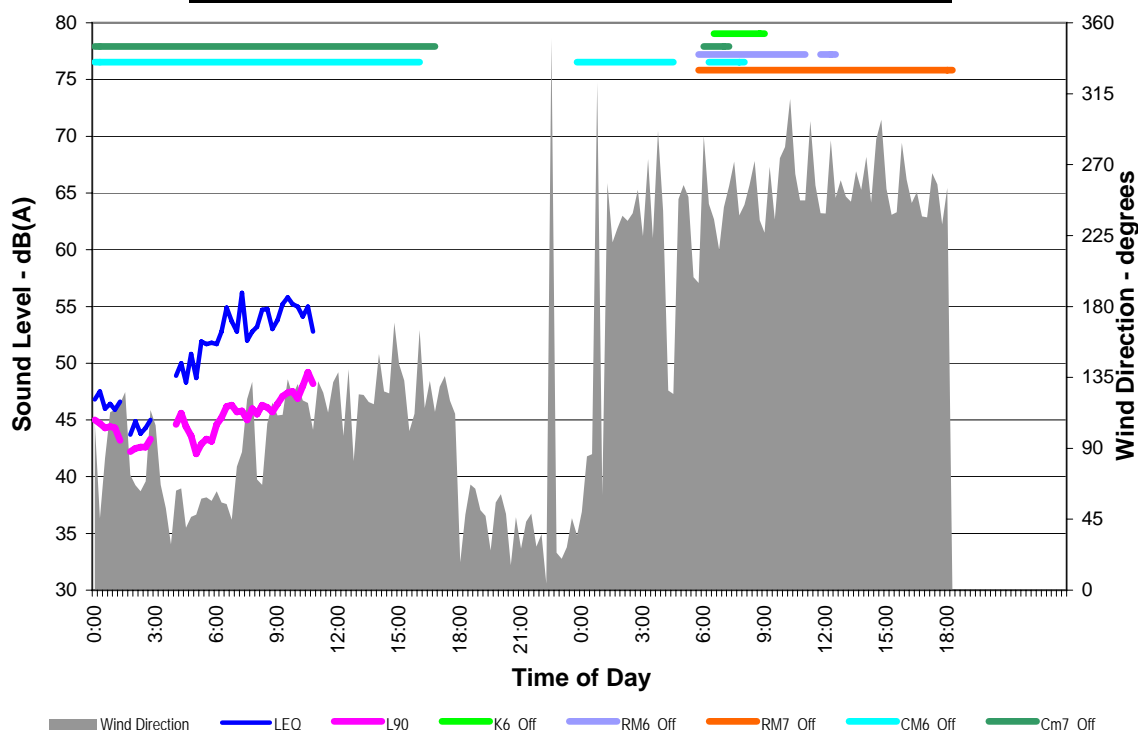
## Berrima Cement Works - Ambient - Background Noise Survey

4 Melbourne St. New Berrima - 24 to 25 October 2022



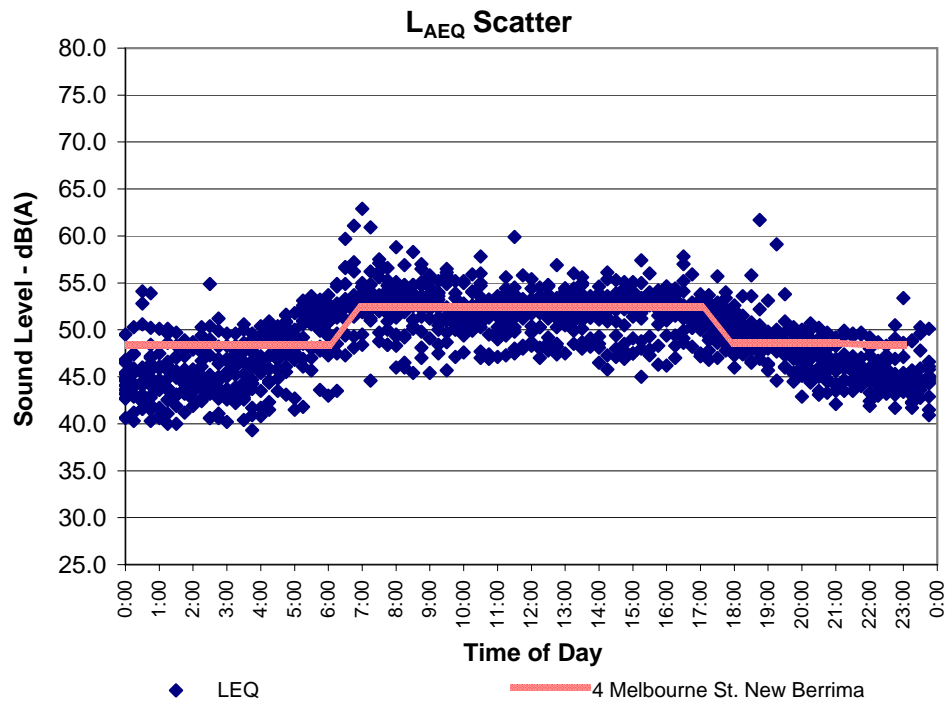
## Berrima Cement Works - Ambient - Background Noise Survey

4 Melbourne St. New Berrima - 24 to 25 October 2022



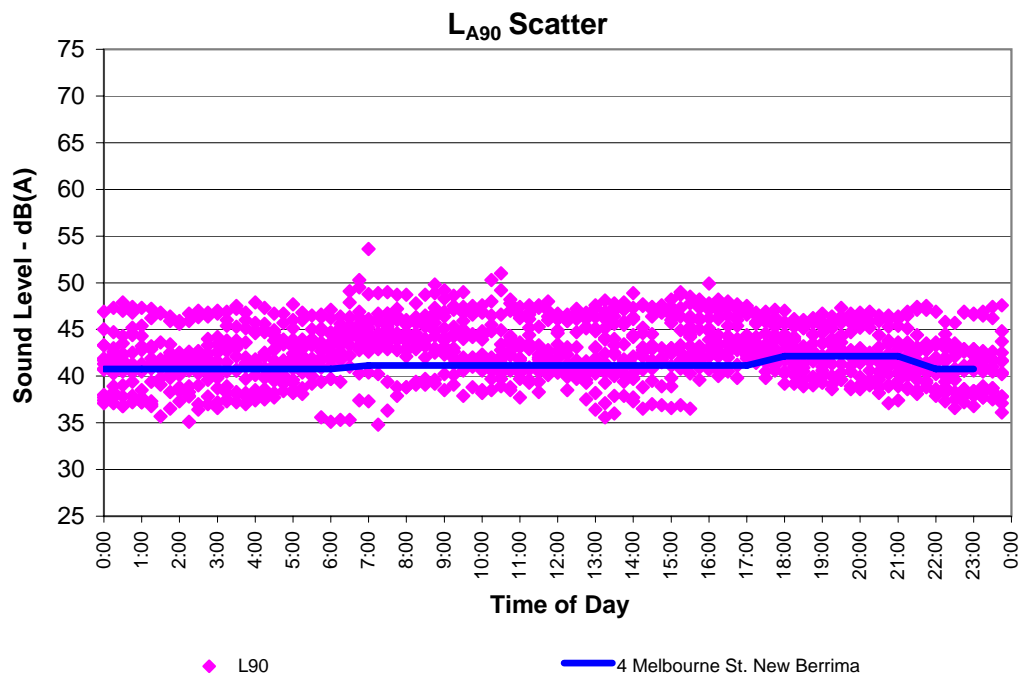
## Berrima Cement Works - Ambient - Background Noise

4 Melbourne St. New Berrima - 10 to 25 October 2022



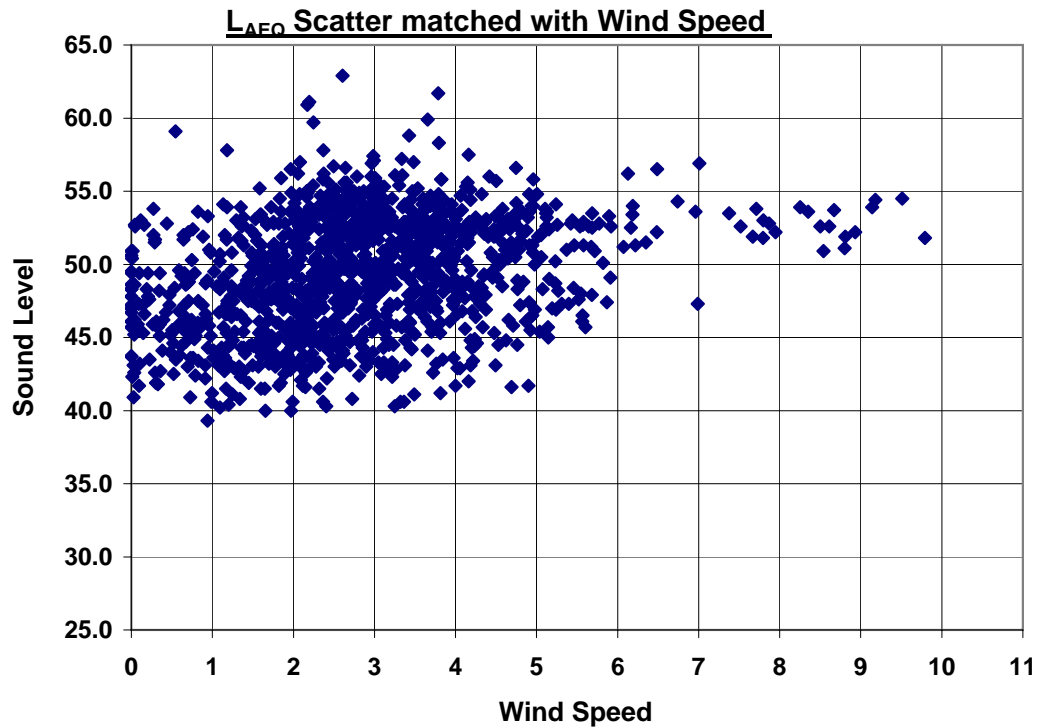
## Berrima Cement Works - Ambient - Background Noise

4 Melbourne St. New Berrima - 10 to 25 October 2022



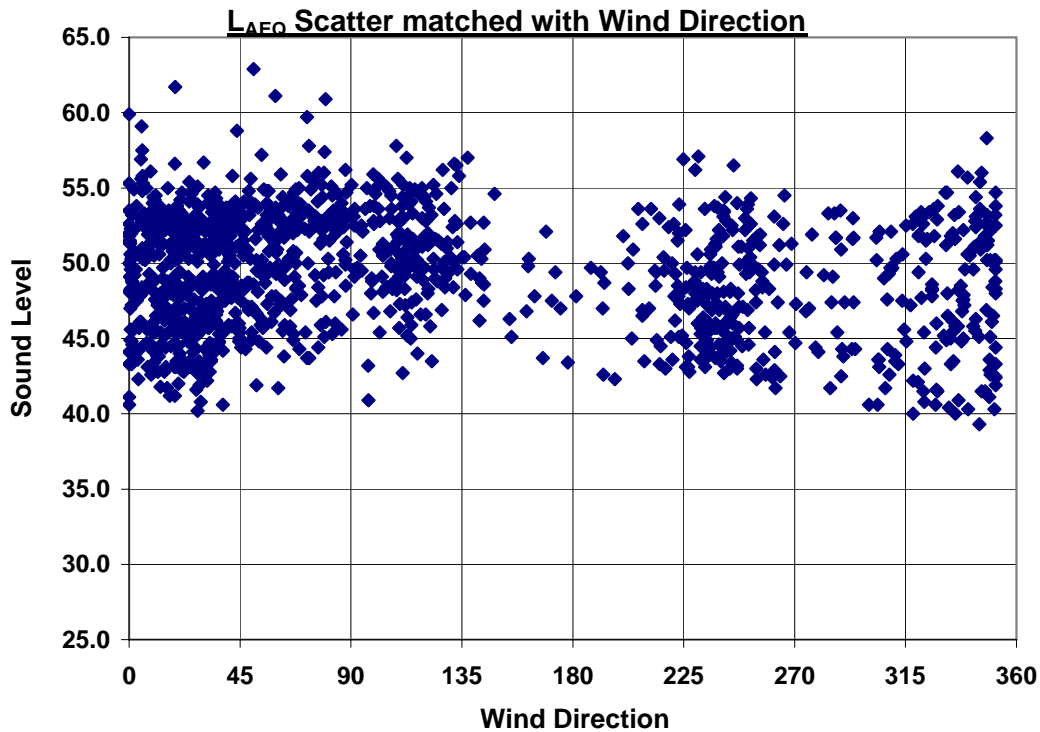
## Berrima Cement Works - Ambient - Background Noise

4 Melbourne St. New Berrima - 10 to 25 October 2022



## Berrima Cement Works - Ambient - Background Noise

4 Melbourne St. New Berrima - 10 to 25 October 2022

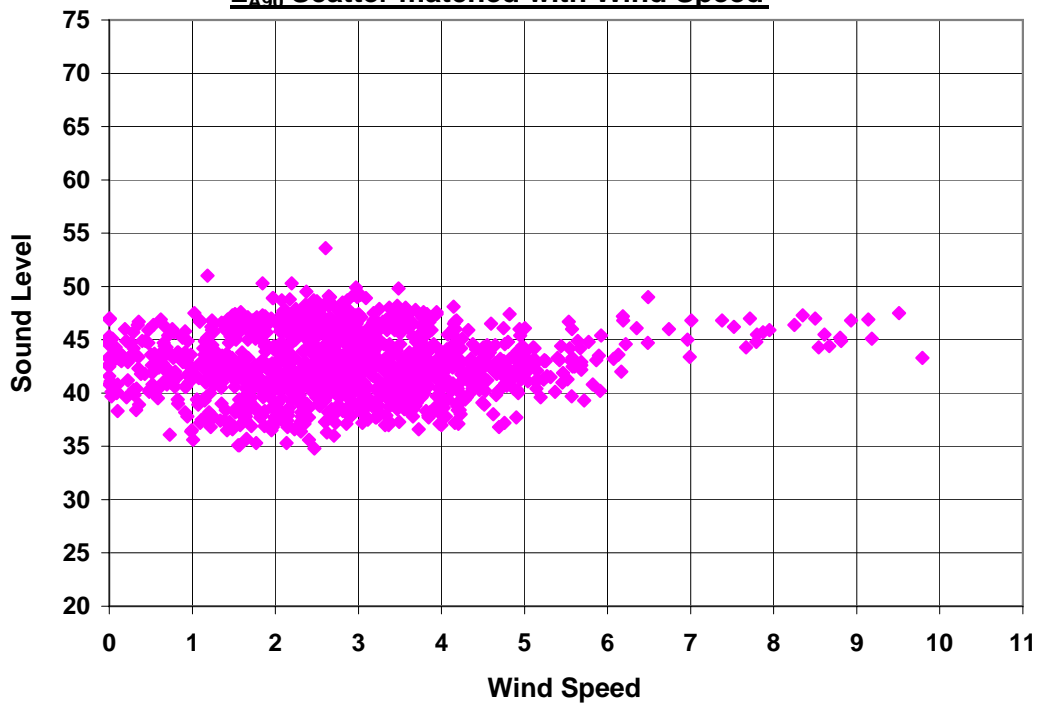




## Berrima Cement Works - Ambient - Background Noise

4 Melbourne St. New Berrima - 10 to 25 October 2022

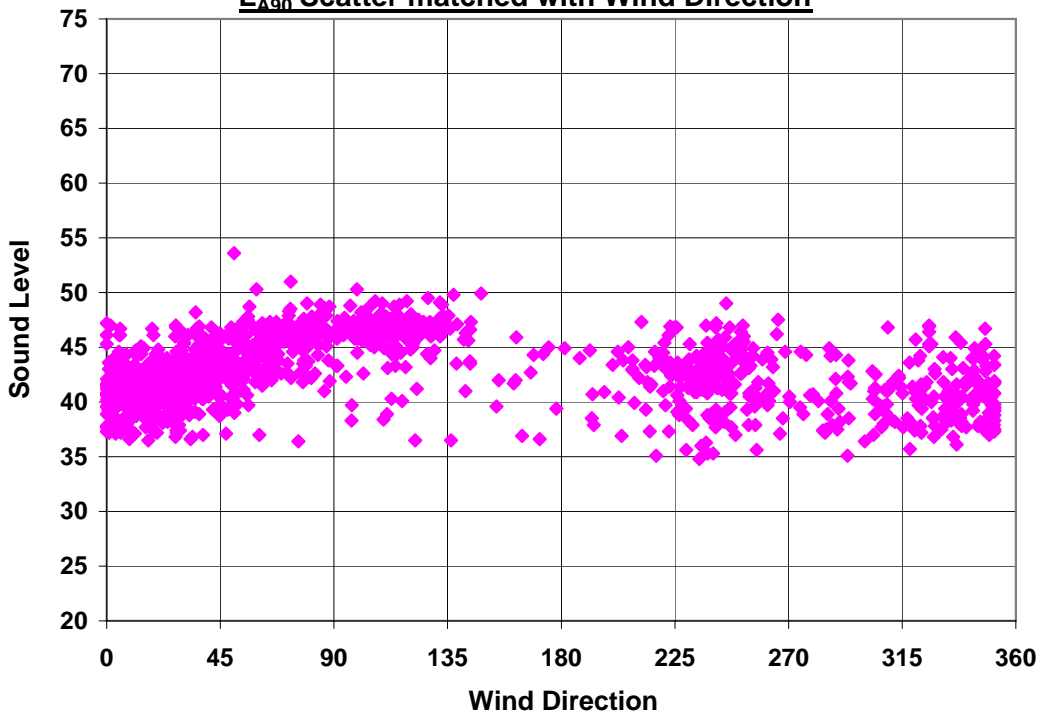
**L<sub>A90</sub> Scatter matched with Wind Speed**



## Berrima Cement Works - Ambient - Background Noise

4 Melbourne St. New Berrima - 10 to 25 October 2022

**L<sub>A90</sub> Scatter matched with Wind Direction**



## **Appendix C: Unattended environmental sound level results for Northern Boundary**

## North Fence - Cement Works

Daytime LAEQ

10 to 25 October 2022

Time	10/10	11/10	12/10	13/10	14/10	15/10	16/10	17/10	18/10	19/10	20/10	21/10	22/10	23/10	24/10	25/10	Maximum	Minimum	Average	SD
7:00		52	61	54	59	52	55	58	52	57	58	56	52	53	53	51	61	51	55	3.2
7:15		57	60	56	55	53	57	56	56	55	54	56	51	55	53	51	60	51	55	2.4
7:30		52	59	51	54	57	59	55	53	58	56	55	53	54	52	52	59	51	54	2.7
7:45		52	52	52		55	57	56	55	58	57	54	51	54	53	51	58	51	54	2.4
8:00		53	57	55	54	52	56	56	53	58	55	53	49	55	53	52	58	49	54	2.4
8:15		51	56	58	52	55	53	55	55	54	56	50	53	54	53	52	58	50	54	2.0
8:30		53	57	50	54	55	49	56	59	54	55	50	49	54	53	51	59	49	53	2.9
8:45		50	51	51	53	54	52	55	51	55	55	49	53	54	53	51	55	49	52	2.0
9:00		51	51	49	51	53	50	56	53	51	54	49	49	54	53	49	56	49	51	2.1
9:15		51	49	50	53	55	51	53	51	51	55	49	48	54	54	50	55	48	52	2.3
9:30		51	54	51	52	56	48	54	53	53	58	53	51	54	54	53	58	48	53	2.3
9:45		51	51	51	52	54	52	53	49	52	53	50	50	53	54	52	54	49	52	1.5
10:00		49	50	50	54	51	48	53	50	51	53	48	49	53	55	53	55	48	51	2.1
10:15		50	51	51	55	52	52	58	51	51	52	50	48	55	54	53	58	48	52	2.5
10:30		49	50	50		50	52	54	52	50	52	49	50	55	54	54	55	49	51	2.0
10:45		50	49	50	54	50	51	53	50	51	55	50	48	54	53	55	55	48	51	2.3
11:00		50	49	50	52	49	51	53	50	51	53	50	47	53		56	56	47	51	2.2
11:15		49	48	49	53	49	48	53	48	52	54	49	48	54		51	54	48	50	2.3
11:30		50	51	51	54	49	51	53	48	51	53	51	48	54		49	54	48	51	1.9
11:45		48	49	48	54	47	46	53	49	52	53	50	48	55		48	55	46	50	2.9
12:00		49	49	50	54	48	47	54	49	52	53	50	48	55		50	55	47	51	2.6
12:15		48	48	52	53	48	45	53	49	53	53	50	49	55	55	53	55	45	51	3.1
12:30		48	50	51	53	48	47	53	50	54	53	51	50	54		51	54	47	51	2.5
12:45		49	50	50	51	48	48	53	49	53	54	51	48	55		53	55	48	51	2.3
13:00		49	50	50	51	47	50	53	50	54	55	50	48	55		52	55	47	51	2.6
13:15		52	49	50	52	47	46	54	50	55	56	50	47	55		53	56	46	51	3.3
13:30		51	49	51	52	49	47	54	49	53	53	52	48	54		54	54	47	51	2.4
13:45		50	48	49	52	50	47	54	49	53	55	50	47	54		53	55	47	51	2.7
14:00		50	50	50	50	51	47	54	50	53	55	53	49	54	53	50	55	47	51	2.3
14:15		51	50	50	51	48	50	54	49	52		51		54	57	49	57	48	51	2.5
14:30		50	52	50	50	48	50	53	49	53	54		48	55		51	55	48	51	2.2
14:45		50	50	50	51	50	50	53	51	53	54	50	49	56	53	50	56	49	51	2.0
15:00		53	52	50	51	48	51	54	49	53	55	50	50	56	53	54	56	48	52	2.2
15:15		50	50	50	52	55	53	56	53	53	56	53	49	55	54	50	56	49	53	2.4
15:30		51	51	50	51	57	50	55	53	53	55	50	50	55	54	50	57	50	52	2.3
15:45		53	59	50	52	57	52	54	51	53	57	49	50	55	53	52	59	49	53	3.0
16:00		53	58	55	55	51	54	57	52	56	54	52		55	54	51	58	51	54	2.1
16:15	54	52	54	54	57	51	58	54	53	54	55	50	52	55	57	53	58	50	54	2.1
16:30	52	51	50	56	57	54	56	58	50	59	55	53	51	54	54	54	59	50	54	2.7
16:45	50	55	56	49	53	59	60	55	51	53	54	51	52	54	53	52	60	49	54	3.0
17:00	53	59	52	58	57	60	56	56	51	53	55	57	50	54	54	67	67	50	56	4.0
17:15	54	60	56	62		60	55	57	52	53	58	56	51	54	54		62	51	56	3.2
17:30	55	59	56	60	55	56	58	54	52	54	58	49		55	53		60	49	55	2.9
17:45	52	62	58	61	54	53	56	54	52	57	56	53	51	54	53		62	51	55	3.2
18:00	52	63	62	61	56	59	60	55	53	53	55	58	51	54	52		63	51	56	4.0
Max	55	63	62	62	59	60	60	58	59	59	58	58	53	56	57	67	67	53	59	3.3
Min	50	48	48	48	50	47	45	53	48	50	52	48	47	53	52	48	53	45	49	2.3
Ave	53	52	53	52	53	52	52	55	51	53	55	51	50	54	54	52	55	50	53	1.4
SD	1.8	3.7	4.0	3.6	2.0	3.8	4.1	1.5	2.2	2.1	1.5	2.5	1.7	0.7	1.0	2.9	4.1	0.7	2.5	1.1
E Ave	53	54	55	54	54	54	54	55	52	54	55	52	50	54	54	54	55	50	54	1.3

## Evening LAEQ

Time	10/10	11/10	12/10	13/10	14/10	15/10	16/10	17/10	18/10	19/10	20/10	21/10	22/10	23/10	24/10	25/10	Maximum	Minimum	Average	SD
18:00		63	62	61	56	59	60	55	53	53	55	58	51	54	52		63	51	56	4.0
18:15		58	56	60	61	60	59	57	59	57	55	58		54	53		61	53	57	2.3
18:30		52	53	49	49	58	54	53	57	49	54	53		55	55		58	49	53	2.9
18:45		52	51	50	49	50	50	54	52	47	53		48	50	54	52	54	47	51	2.0
19:00		52	51	49	49	50	49	54	53	48	53		48	49	53	51	54	48	51	2.1
19:15		52	51	49	48	50	48	54	53	47	52		49	48	54	51	54	47	50	2.1
19:30		51	50	49	49	50	49	54	52	47	53	52	48	48	53	51	54	47	50	2.1
19:45		51	50	48	49	50	49	54	52	46	53	52	48	49	53	51	54	46	50	2.1
20:00		51	50	48	49	49	49	54	52	47	53	52	48	49	53	50	54	47	50	2.1
20:15		50	50	48	50	49	49	55	51	48	53	51	49	48	53	50	55	48	50	2.0
20:30		50	50	48	49	48	49	54	52	48	54	51	48	49	52	50	54	48	50	1.9
20:45		50	50	48	49	49	50	54	52	48	54	51	48	51	51	50	54	48	50	1.9
21:00		50	50	48	49	50	50	53	50	47	53	50	48	50	51	51	53	47	50	1.8
21:15		50	49	48	50	50	50	53	49	47	53	50	48	48	51	51	53	47	50	1.8
21:30		50	50	47	48	51	50	53	49	47	53	51	48	48	51		53	47	50	1.9
21:45		50	49	47	49	50	50	54	49	47	54	51	48	49		50	54	47	50	2.1
22:00		50	49	48	47	50	49	50	47	54	51	48	51		50		54	47	49	1.8
Max	58	63	62	61	60	59	60	57	59	57	55	58	51	55	55		63	51	58	3.1
Min	50	49	47	47	48	48	53	49	46	52	50	48	48	51	50		53	46	49	1.9
Ave	51	51	50	50	51	51	54	52	48	53	52	50	49	53	51		54	48	51	1.6
SD	2.0	3.5	4.2	4.0	3.4	3.4	1.7	2.4	3.2	1.1	1.5	3.6	1.1	1.4	1.3		4.2	1.1	2.5	1.1
E Avg	52	54	53	53	53	52	55	53	50	54	52	52	49	53	51		55	49	52	1.4

## Night LAEQ

Time	10/10	11/10	12/10	13/10	14/10	15/10	16/10	17/10	18/10	19/10	20/10	21/10	22/10	23/10	24/10	25/10	Maximum	Minimum	Average	SD
22:00		50	49	48	47	50	49		47	54	51	48	51		50		54	47	49	1.8
22:15		50	49	47	47	51	48		50	48	54	52	48	52	49		54	47	49	2.0
22:30		50	49	48	48	50	51		50	47	53	52	48		50	50	53	47	50	1.6
22:45		50	49	47	47	51	51	54	49	46	53	51	47		51	49	54	46	50	2.

North Fence - Cement Works

Daytime LA90

10 to 25 October 2022

Time	10/10	11/10	12/10	13/10	14/10	15/10	16/10	17/10	18/10	19/10	20/10	21/10	22/10	23/10	24/10	25/10	Maximum	Minimum	Average	SD
7:00		49	48	48	49	48	45	53	48	49	52	48	45	51	51	48	53	45	49	2.2
7:15		50	48	48	49	48	45	52	49	51	51	49	46	52	51	47	52	45	49	2.1
7:30		49	47	48	50	49	47	52	48	50	51	48	46	51	50	47	52	46	49	1.8
7:45		49	47	48		49	46	53	48	48	51	49	44	52	50	47	53	44	49	2.4
8:00		49	47	47	50	50	46	52	49	50	51	48	45	53	50	48	53	45	49	2.3
8:15		49	46	47	49	49	46	52	48	48	51	47	46	52	51	48	52	46	49	2.1
8:30		48	46	46	51	49	44	51	48	47	51	46	45	52	51	46	52	44	48	2.5
8:45		47	46	47	51	48	45	51	47	47	51	46	46	52	51	45	52	45	48	2.5
9:00		48	47	46	49	49	44	52	47	47	50	46	44	52	51	45	52	44	48	2.6
9:15		48	46	47	50	49	45	52	46	48	51	46	44	52	52	46	52	44	48	2.7
9:30		48	46	47	50	47	44	52	46	48	51	46	45	51	52	50	52	44	48	2.7
9:45		48	46	46	49	47	45	52	46	49	50	46	44	51	52	49	52	44	48	2.7
10:00		47	46	47	51	46	44	51	45	48	50	46	44	51	52	49	52	44	48	2.7
10:15		46	46	47	52	49	46	52	46	49	51	46	44	52	52	49	52	44	48	2.8
10:30		46	46	47		46	45	52	46	47	49	46	45	52	52	49	52	45	48	2.6
10:45		46	46	46	51	47	45	51	46	48	51	46	44	52	51	51	52	44	48	2.8
11:00		46	46	46	49	46	45	51	45	48	51	46	45	51		49	51	45	47	2.4
11:15		46	46	47	50	46	44	51	45	48	52	46	45	52		45	52	44	47	2.7
11:30		46	46	46	51	44	46	51	45	49	51	47	45	52		46	52	44	47	2.7
11:45		46	46	45	52	43	42	51	45	50	51	47	44	52		45	52	42	47	3.4
12:00		45	46	46	51	44	41	51	46	50	51	47	45	53		45	53	41	47	3.4
12:15		45	46	49	50	44	41	51	46	51	51	47	47	53	53	46	53	41	48	3.6
12:30		45	46	48	51	44	41	51	46	52	51	48	45	52		46	52	41	47	3.4
12:45		45	46	47	49	45	42	51	46	51	51	47	45	53		48	53	42	48	3.2
13:00		45	46	47	48	43	42	51	46	52	51	47	45	53		48	53	42	47	3.2
13:15		48	46	46	49	42	42	51	46	51	51	47	45	53		49	53	42	48	3.2
13:30		48	46	47	49	44	42	52	46	51	51	48	46	52		50	52	42	48	3.0
13:45		47	46	46	50	44	43	51	46	51	52	47	45	52		50	52	43	48	3.1
14:00		48	47	47	48	44	43	51	46	51	52	48	46	51	51	46	52	43	48	2.7
14:15		48	47	47	48	45	44	51	46	50		47		52	51	46	52	44	48	2.6
14:30		47	47	47	48	45	42	50	45	51	52		45	53		47	53	42	48	3.0
14:45		47	47	47	49	46	46	51	46	51	52	47	45	53	52	47	53	45	48	2.6
15:00		47	47	47	48	46	47	51	46	51	53	47	45	54	52	48	54	45	48	2.7
15:15		46	46	48	49	48	47	51	46	51	53	47	45	53	51	47	53	45	48	2.6
15:30		48	46	47	49	49	48	51	46	51	53	47	45	53	51	47	53	45	49	2.5
15:45		48	47	47	49	49	49	51	45	50	52	46	46	53	51	47	53	45	49	2.4
16:00		48	48	48	49	47	49	52	46	51	51	47		53	52	46	53	46	49	2.3
16:15	46	47	47	48	50	47	50	51	46	50	51	47	48	53	52	46	53	46	49	2.3
16:30	46	48	46	48	49	48	49	51	45	51	52	47	47	52	52	47	52	45	49	2.2
16:45	47	49	47	46	48	48	50	51	46	51	52	46	48	52	51	47	52	46	49	2.1
17:00	48	47	47	47	49	48	49	51	45	51	52	46	47	52	51	48	52	45	49	2.2
17:15	48	47	47	47		50	50	51	46	51	51	46	46	52	51		52	46	49	2.4
17:30	48	48	46	47	51	50	51	50	46	51	51	46		52	51		52	46	49	2.3
17:45	47	48	47	48	51	50	50	51	46	51	51	46	46	52	51		52	46	49	2.3
18:00	48	49	47	47	51	51	51	51	46	51	52	47	46	52	51		52	46	49	2.3
Max	48	50	48	49	52	51	51	53	49	52	53	49	48	54	53	51	54	48	51	2.1
Min	46	45	46	45	48	42	41	50	45	47	49	46	44	51	50	45	51	41	46	3.0
Ave	47	47	46	47	50	47	45	51	46	50	51	47	45	52	51	47	52	45	48	2.3
SD	0.7	1.4	0.6	0.7	1.1	2.2	2.9	0.6	1.0	1.4	0.7	0.9	0.9	0.6	0.6	1.5	2.9	0.6	1.1	0.6
90%	46	45	46	46	48	44	42	51	45	48	51	46	44	51	51	45	51	42	47	2.8
																	Median	46		

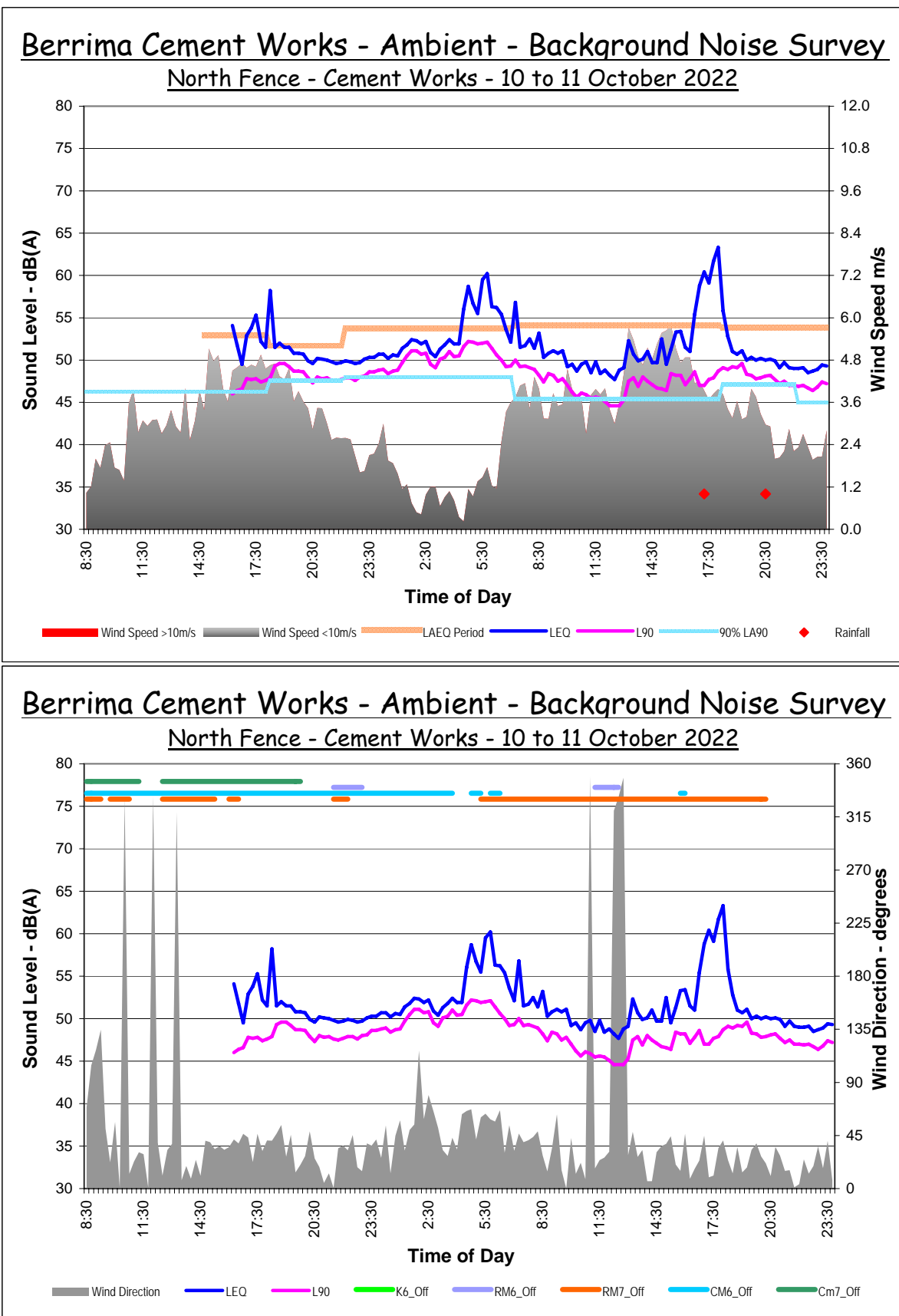
Evening LA90

Time	10/10	11/10	12/10	13/10	14/10	15/10	16/10	17/10	18/10	19/10	20/10	21/10	22/10	23/10	24/10	25/10	Maximum	Minimum	Average	SD
18:00		48	49	47	47	51	51	51	46	51	52	47	46	52	51		52	46	49	2.3
18:15		48	49	47	47	51	51	52	51	45	52	46		52	51		52	45	50	2.6
18:30		49	49	47	47	50	49	52	51	46	51	52	46	52	50		52	46	49	2.2
18:45		50	49	47	47	48	49	52	50	45	51		46	48	53	51	53	45	49	2.4
19:00		50	49	46	47	48	48	52	51	45	51		46	48	52	50	52	45	49	2.3
19:15		49	50	47	46	47	47	52	51	45	51		46	47	52	50	52	45	48	2.4
19:30		49	48	46	46	48	48	52	51	45	51	51	45	46	51	50	52	45	49	2.5
19:45		49	48	46	46	48	48	52	50	44	51	50	46	47	51	50	52	44	48	2.5
20:00		49	48	45	46	48	48	52	50	44	51	50	45	47	51	49	52	44	48	2.5
20:15		48	48	46	47	48	48	52	49	45	52	50	46	47	51	49	52	45	48	2.3
20:30		47	48	45	46	47	48	52	50	46	52	49	46	48	50	49	52	45	48	2.2
20:45		48	48	46	46	48	49	52	50	46	53	49	46	50	50	48	53	46	49	2.3
21:00		48	48	46	46	48	49	52	49	45	52	48	45	49	50	49	52	45	48	2.2
21:15		48	47	45	46	49	50	52	47	45	51	49	45	46	50	49	52	45	48	2.3
21:30		48	48	45	46	49	49	52	47	44	52	49	46	46	49	49	52	44	48	2.3
21:45		48	47	45	46	49	49	52	47	44	52	50	46	47		49	52	44	48	2.5
22:00		48	47	45	45	49	48	47	44	52	49	46	49	49	49		52	44	47	2.3
Max	50	50	47	47	51	51	52	51	46	53	52	47	50	53	51		53	46	50	2.2
Min	47	47	45	45	47	47	51	47	44	51	48	45	46	49	48		51	44	47	2.1
Ave	48	48	46	46	48	49	52	50	45	52	50	46	47	51	49		52	45	48	2.2
SD	0.8	0.8	0.8	0.6	1.2	1.0	0.3	1.5	0.7	0.5	1.1	0.4	1.1	1.1	0.8		1.5	0.3	0.9	0.3
90%	48	47	45	46	47	48	52	47	44	51	49	45	46	50	49		52	44	48	2.1
																	Median	47		

Night LA90

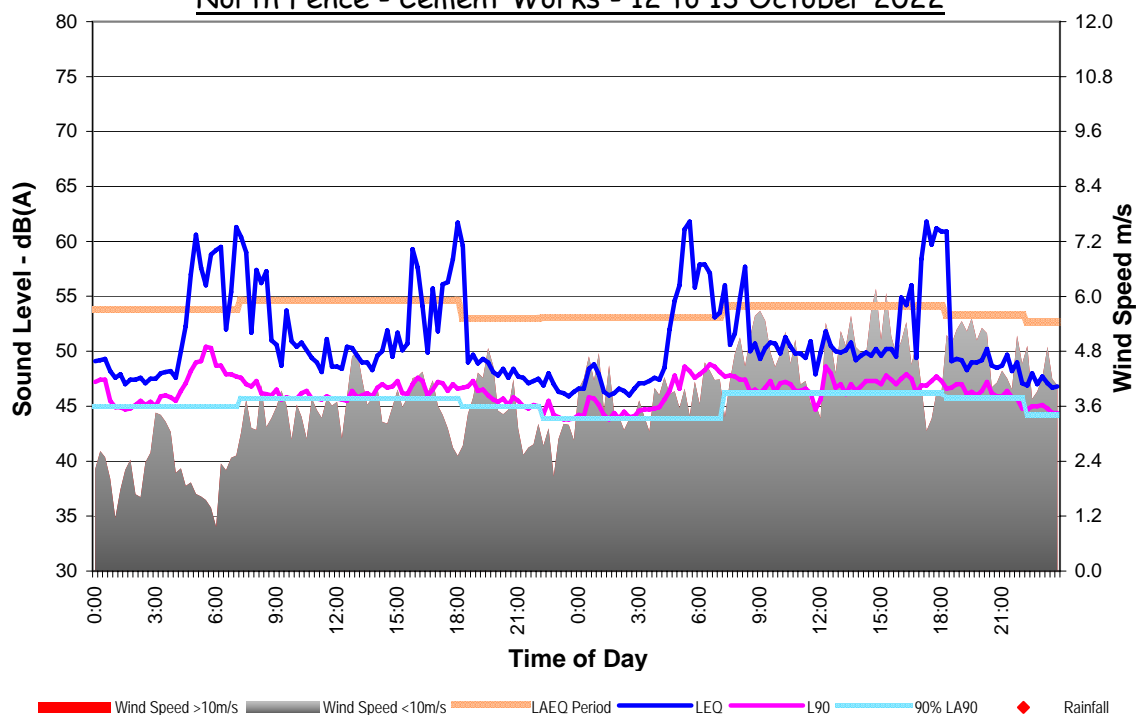
Time	10/10	11/10	12/10	13/10	14/10	15/10	16/10	17/10	18/10	19/10	20/10	21/10	22/10	23/10	24/10	25/10	Maximum	Minimum	Average	SD
22:00	48	47	45	45	49	48		47	44	52	49	46	49		49		52	44	47	2.3
22:15	48	47	44	45	49	47		48	46	52	50	46	50	48	48		52	44	48	2.3
22:30	48	47	46	45	49	50		48	45	52	50	46		49	48		52	45	48	2.2
22:45	48	47	44	45	49	50	52	47	44	52	50	45		50	47		52	44	48	2.8
23:00	48	46	44	45	49	48	52	47	45	50	50	45		50	47		52	44	47	2.5
23:15	48	47	44	45	49	47	53	48	47	50		45		50	47		53	44	48	2.5
23:30	49	47	44	44	48	47	53	48	46	50		45			48		53	44	47	2.6
23:45	49	47	44	44	48	47	53	47	47	51		45		50	49		53	44	48	2.7
0:00	49	47	44	44	48	48	53	48	46	51	49	44		50	49		53	44	48	2.8
0:15	49	47	44	44	49	48	53	48	47	52	49	44		49	49		53	44	48	2.8
0:30	48	47	46	44	48	48	53	48	46	53	49	43	48	49	50		53	43	48	2.7
0:45	49	46	46	44	48	48	53	49	45	52	49	43	50	48	50		53	43	48	2.8
1:00	49	45	45	44	47	48	52	48	46	52	48	44		48	50		52	44	48	2.7
1:15	50	45	44	45	48	48	52	48	46	53	48	43	47	48	48		53	43	47	2.7
1:30	51	45	44		47	49	52	48	47	53	49	44	48		46		53	44	48	2.8
1:45	51	45	44		47	49	54	47	50	52	49	45	49	49			54	44	48	2.7
2:00	51	45	44		46	48	53	47	51	53	49	45	50	50	49		53	44	48	2.9
2:15	51	46	45	46	46	48	53	48	52	53		45	49	49	49		53	45	48	2.8
2:30	51	45	44	46	46	48	52	48	52	52	48	46	50	49	48		52	44	48	2.7
2:45	50	45	44	45	47	47	52	49	52	52	48	45	50	50	47		52	44	48	2.6
3:00	49	45	45	46	48	46	53	49	51	51	47	45	51		49		53	45	48	2.7
3:15	50	46	45	46	48	47	53	49	45	51	48	45	51		49		53	45	48	2.7
3:30	50	46	45	48	50	48	53	50	46	52	48	46	51	50	50		53	45	49	2.4
3:45	51	46	45	48	51	47	53	50	47	52	49	47	50				53	45	49	2.5
4:00	50	46	45	48	51	47	53	49	48	52	47	46	52	47	49		53	45	49	2.5
4:15	51	46	46	48	50	47	53	51	50	51	47	47	51	49	50		53	46	49	2.2
4:30	52	47	46	48	51	48	53	51	49	53	48	48	51	50	51		53	46	50	2.1
4:45	52	48	48	49	53	46	53	50	52	54	50	49	52	50	45		54	45	50	2.6
5:00	52	49	47	50	50	43	54	50	51	52	49	48	51	50	43		54	43	49	3.1
5:15	52	49	49	49	51	43	53	50	52	52	48	47	51	51	42		53	42	49	3.1
5:30	52	50	48	50	51	43		50	52	53	48	47	51	51	43		53	43	49	3.2
5:45	52	50	48	49	51	43	53	50	50	53	48	47	52	51	43		53	43	49	3.2
6:00	51	49	48	48	50	43	54	50	50	53	48	47	52	50	44		54	43	49	3.0
6:15	51	49	48		50	42	53	50	49	53	48	47	52	50	43		53	42	49	3.3
6:30	50	48	49		50	43	54	49	50	52	48	47	52	50	47		54	43	49	2.8
6:45	49	48	49		49	45	53	49	49	52	49	46	52	51	48		53	45	49	2.5
7:00	49	48	48	49	48	45	53	48	49	52	48	45	51	51	48		53	45	49	2.2
Max	52	50	49	50	53	50	54	51	52	54	50	49	52	51	51		54	49	51	1.6
Min	48	45	44	44	46	42	52	47	44	50	47	43	47	47	42		52	42	46	2.7
Ave	50	47	46	46	49	47	53	49	48	52	48	46	50	50	47		53	46	48	2.2
SD	1.4	1.5	1.7	2.0	1.6	2.1	0.5	1.1	2.7	0.8	0.8	1.4	1.4	1.0	2.4		2.7	0.5	1.5	0.6
90%	48	45	44	44	47	43	52	47	45	51	48	44	49	48	43		52	43	47	2.9
																		Median	47	

## Two Day Results of Ambient Noise Monitoring



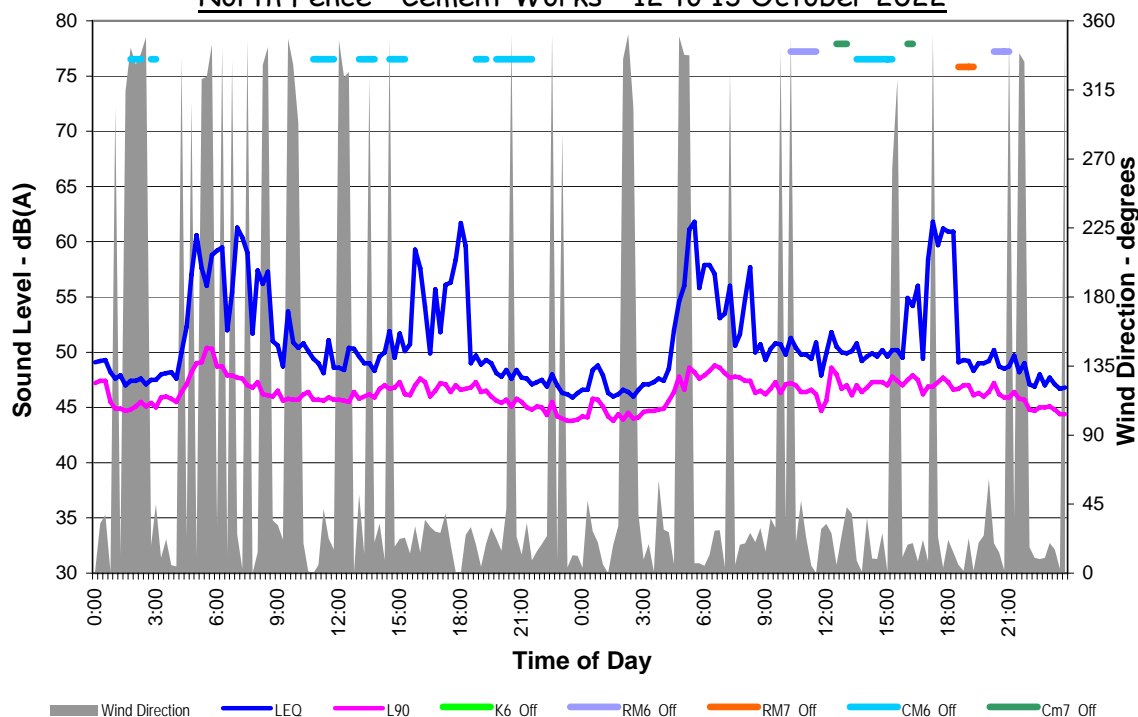
## Berrima Cement Works - Ambient - Background Noise Survey

North Fence - Cement Works - 12 to 13 October 2022



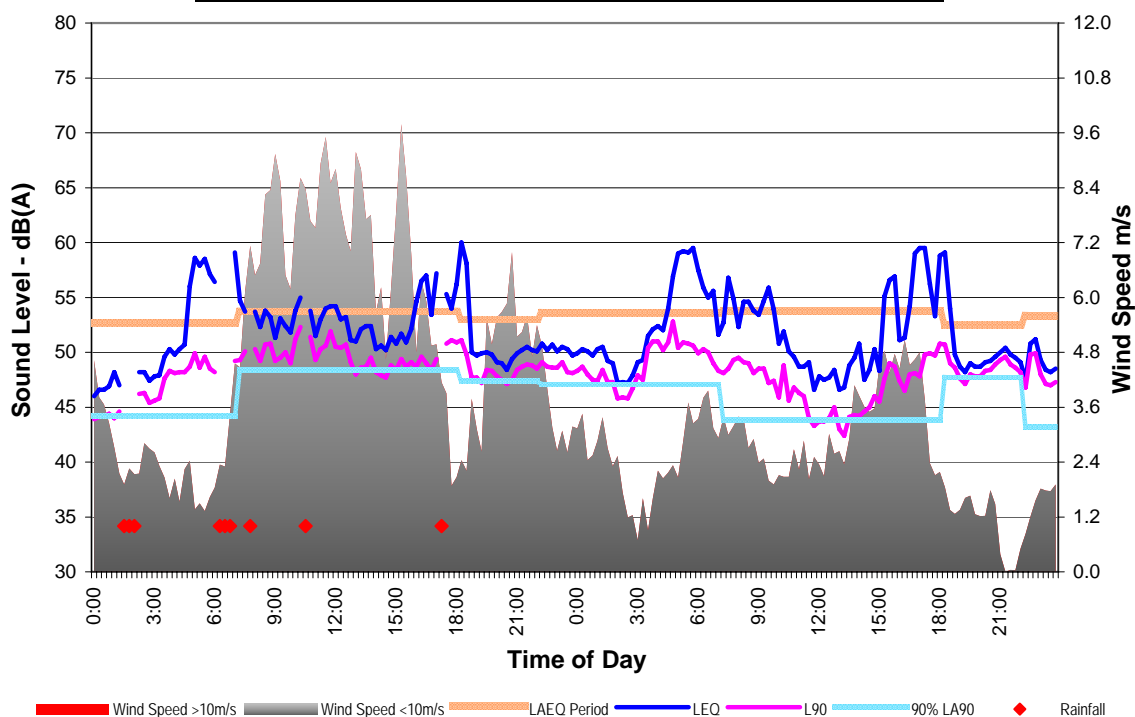
## Berrima Cement Works - Ambient - Background Noise Survey

North Fence - Cement Works - 12 to 13 October 2022



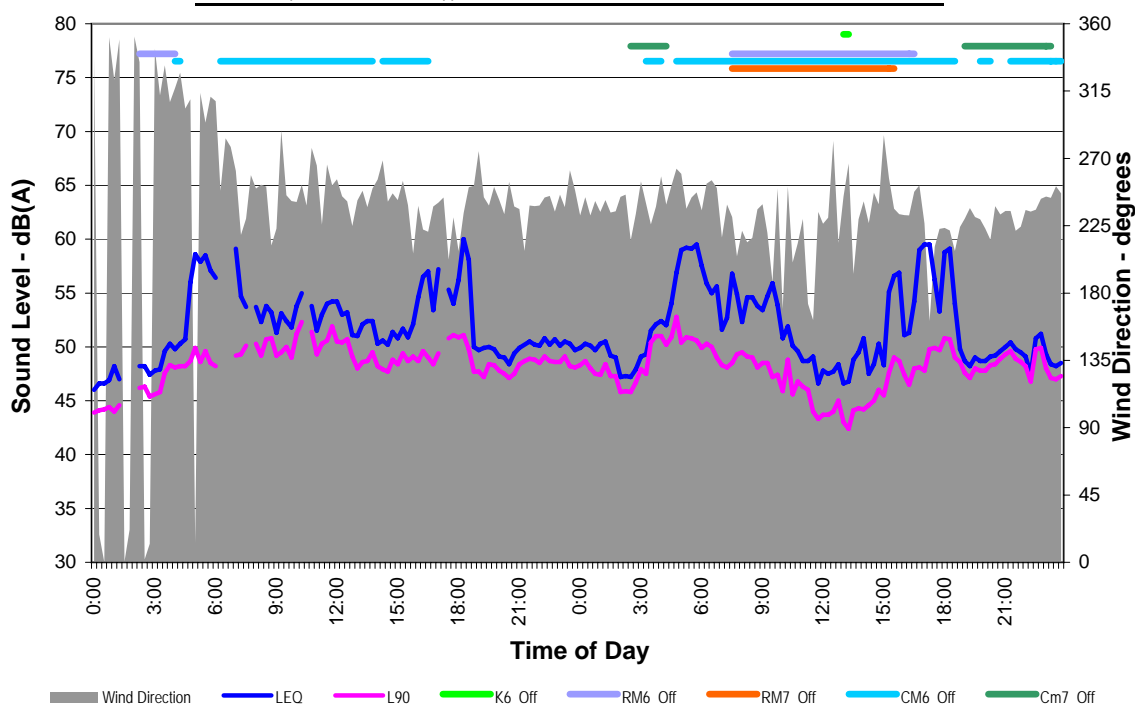
## Berrima Cement Works - Ambient - Background Noise Survey

North Fence - Cement Works - 14 to 15 October 2022



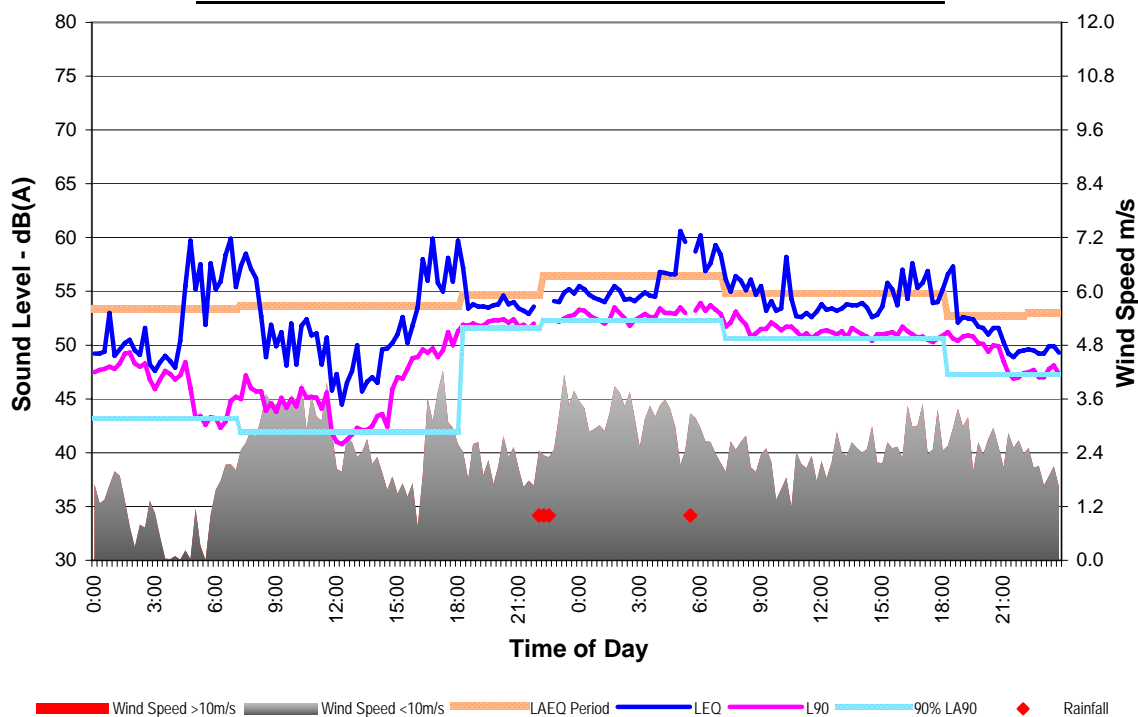
## Berrima Cement Works - Ambient - Background Noise Survey

North Fence - Cement Works - 14 to 15 October 2022



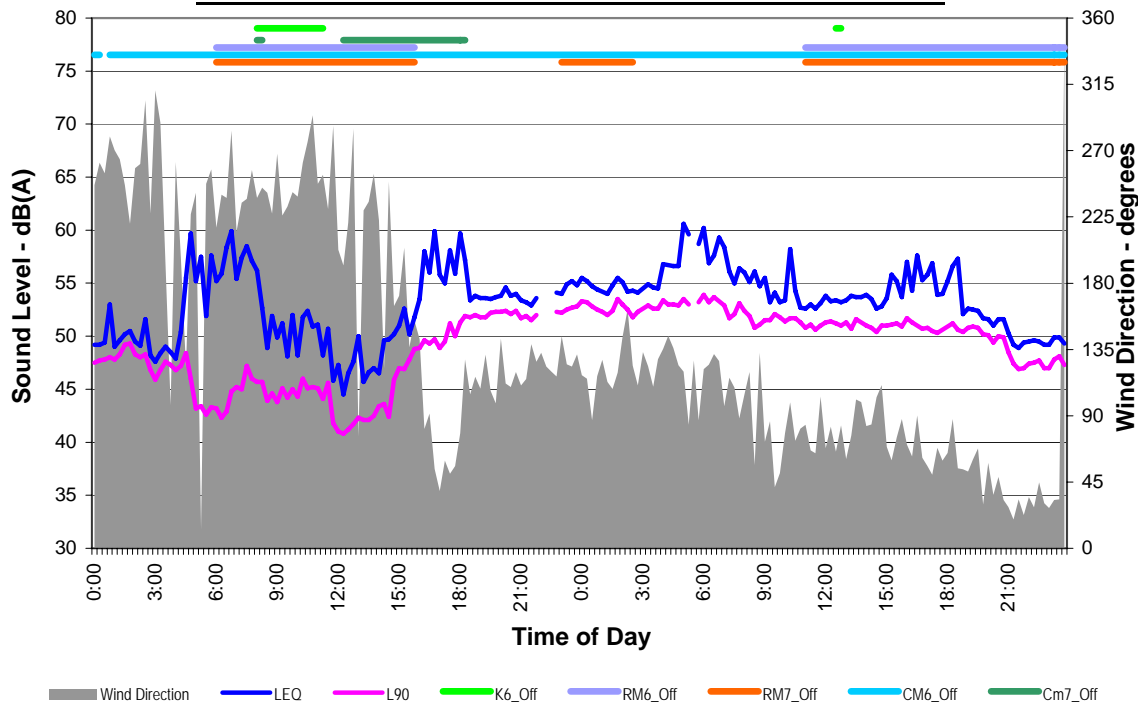
## Berrima Cement Works - Ambient - Backaround Noise Survey

North Fence - Cement Works - 16 to 17 October 2022



## Berrima Cement Works - Ambient - Backaround Noise Survey

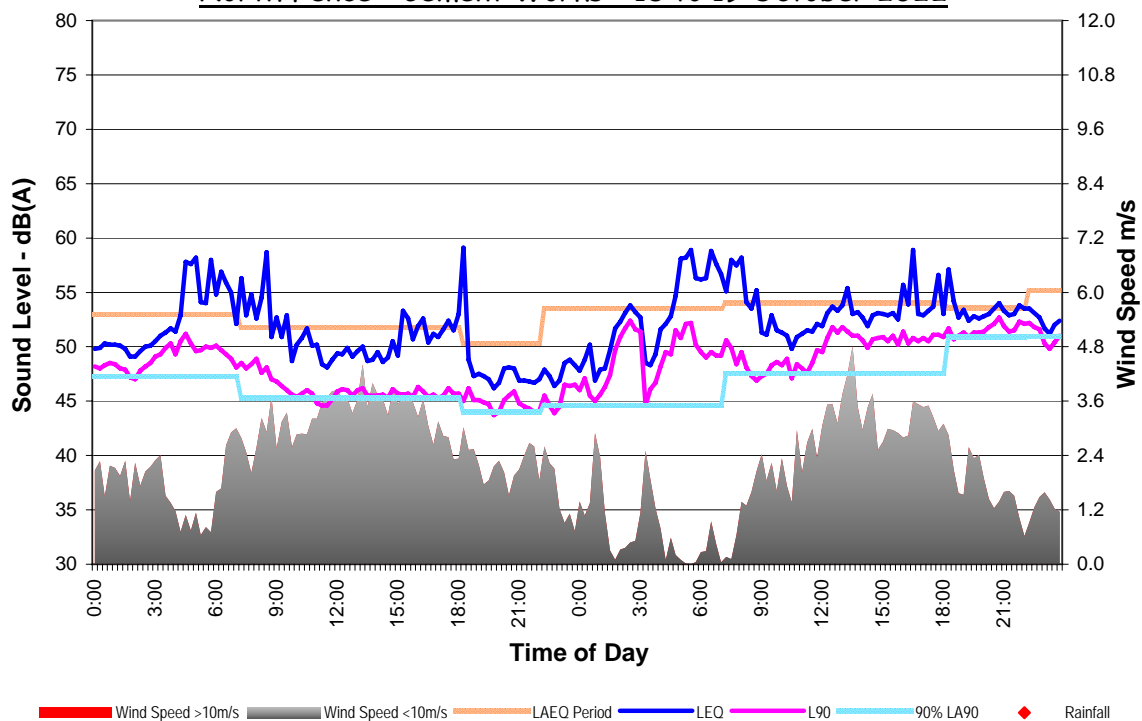
North Fence - Cement Works - 16 to 17 October 2022





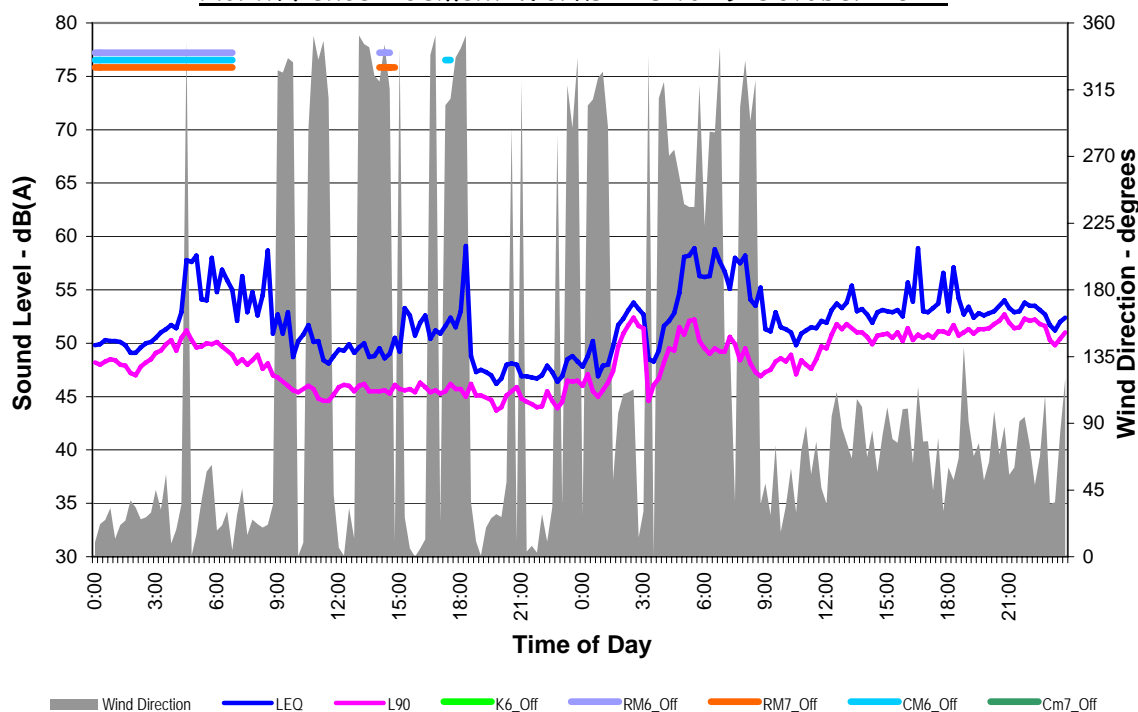
## Berrima Cement Works - Ambient - Background Noise Survey

### North Fence - Cement Works - 18 to 19 October 2022



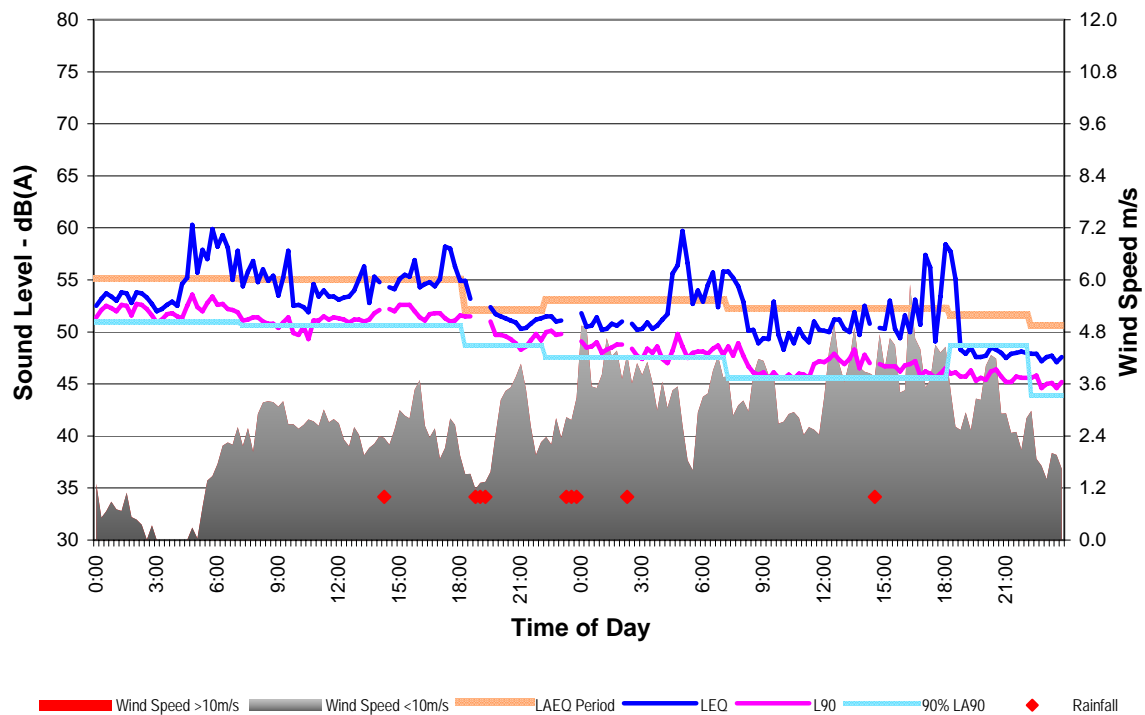
## Berrima Cement Works - Ambient - Background Noise Survey

### North Fence - Cement Works - 18 to 19 October 2022



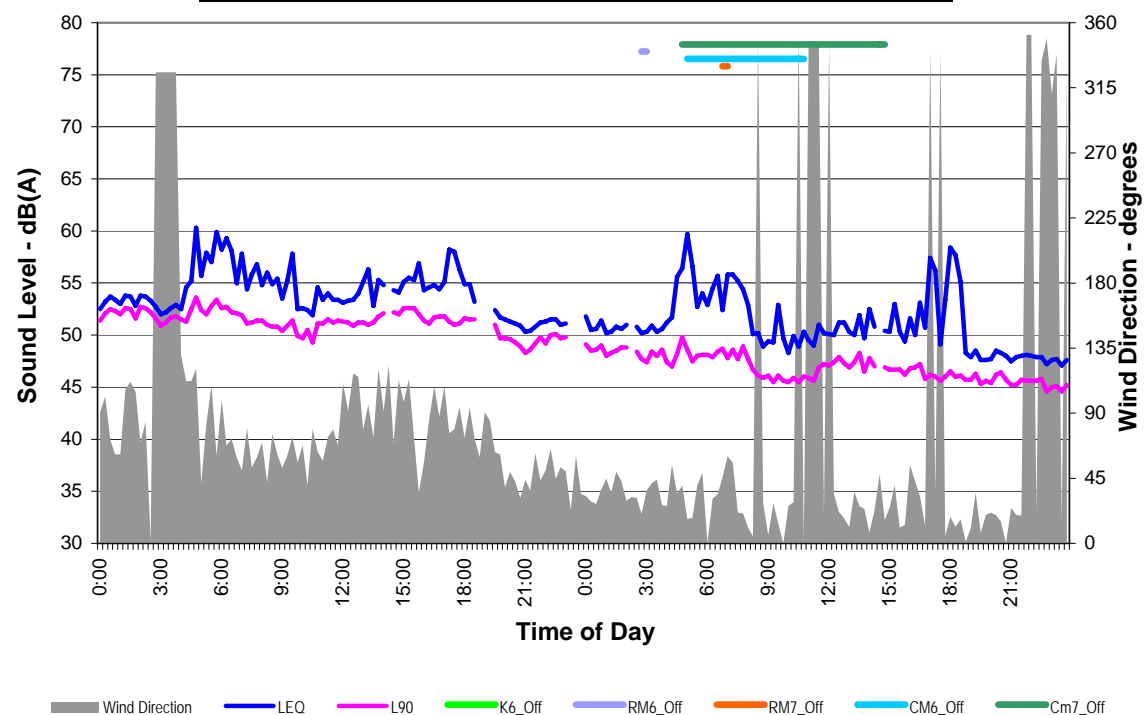
## Berrima Cement Works - Ambient - Background Noise Survey

North Fence - Cement Works - 20 to 21 October 2022



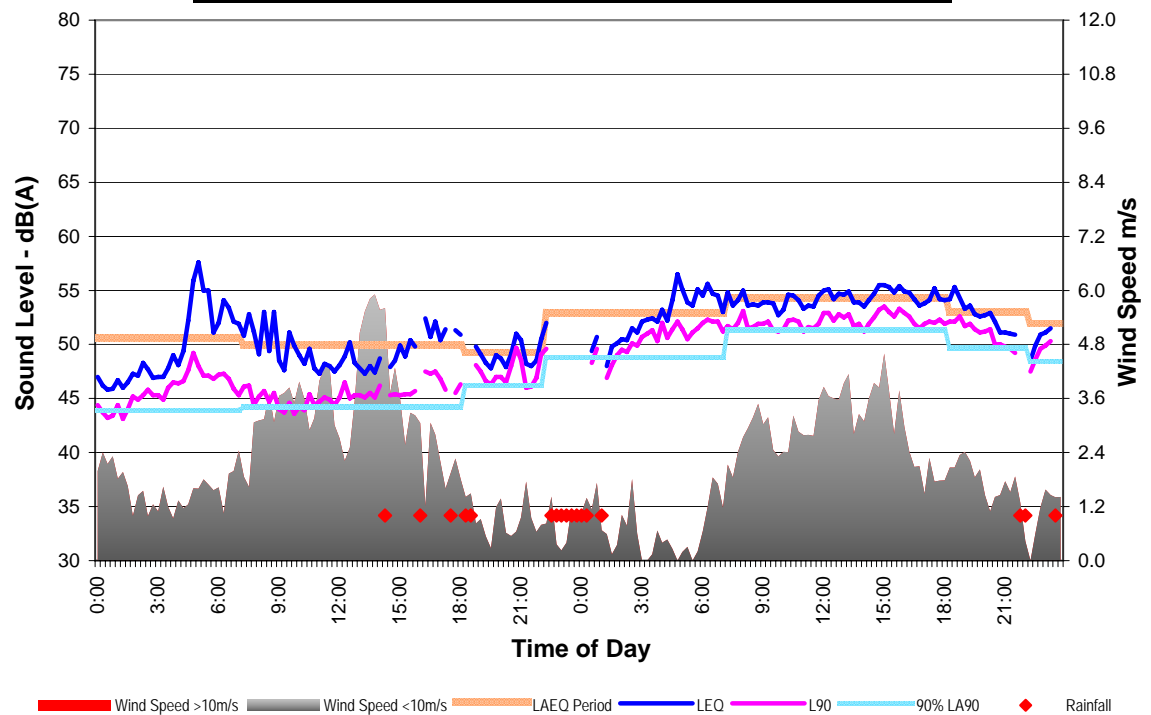
## Berrima Cement Works - Ambient - Background Noise Survey

North Fence - Cement Works - 20 to 21 October 2022



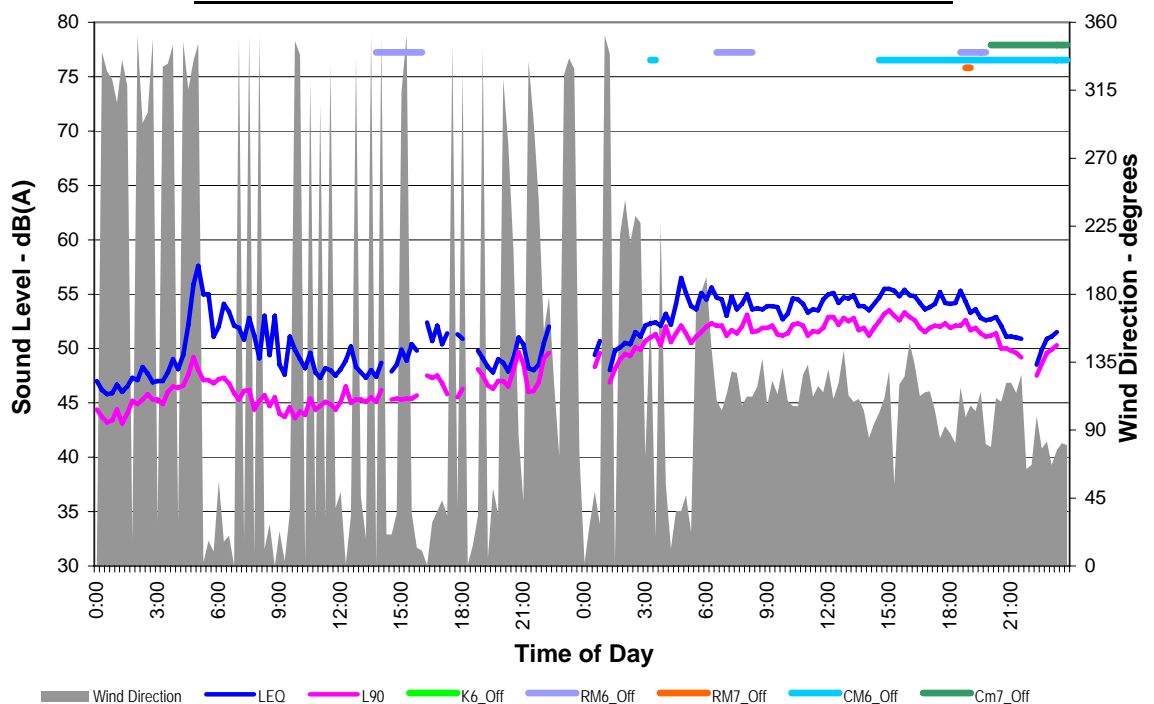
## Berrima Cement Works - Ambient - Background Noise Survey

North Fence - Cement Works - 22 to 23 October 2022



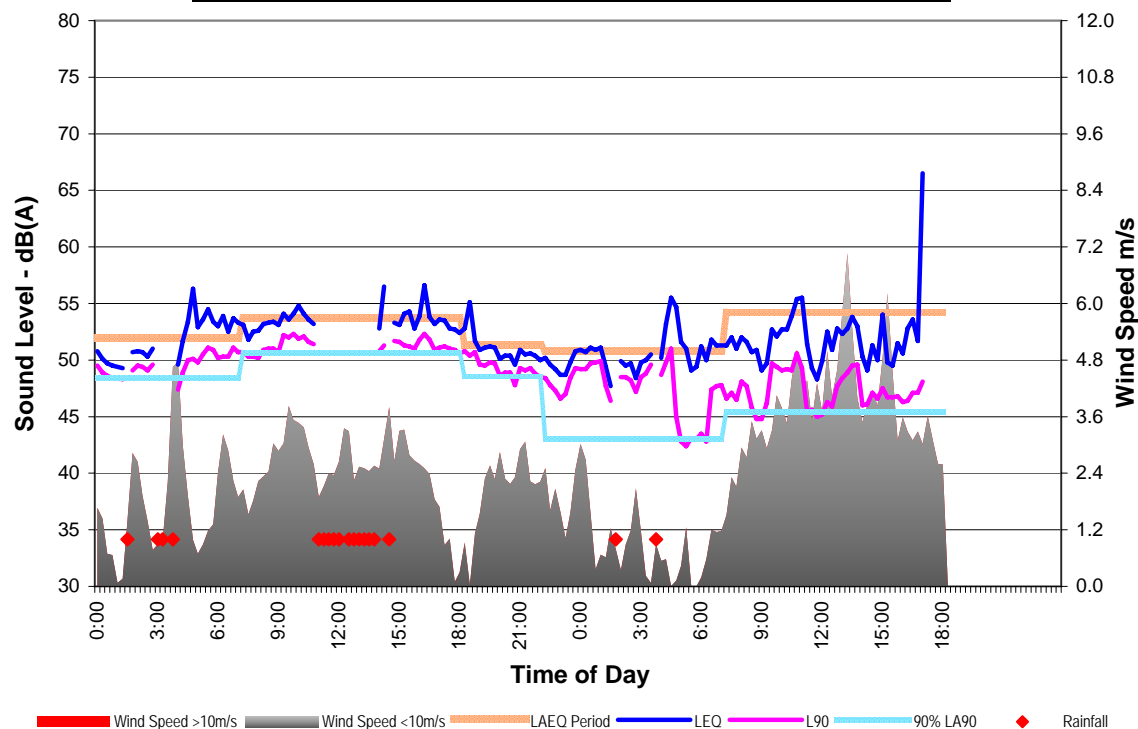
## Berrima Cement Works - Ambient - Background Noise Survey

North Fence - Cement Works - 22 to 23 October 2022



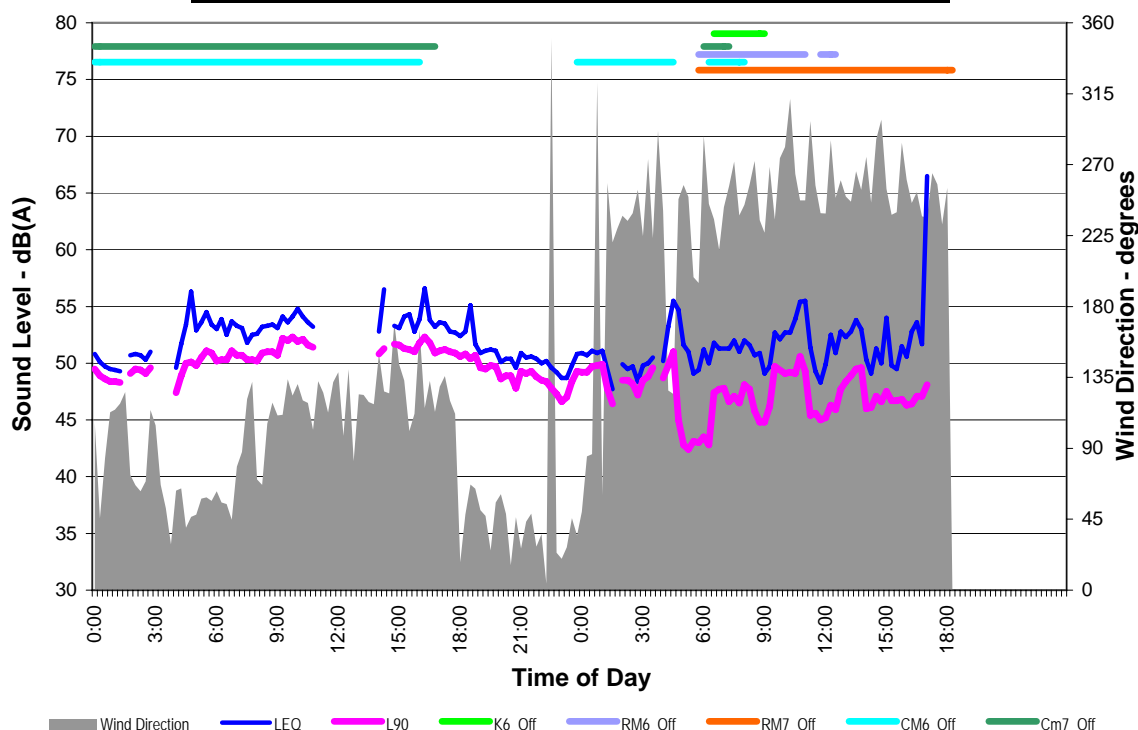
## Berrima Cement Works - Ambient - Background Noise Survey

North Fence - Cement Works - 24 to 25 October 2022



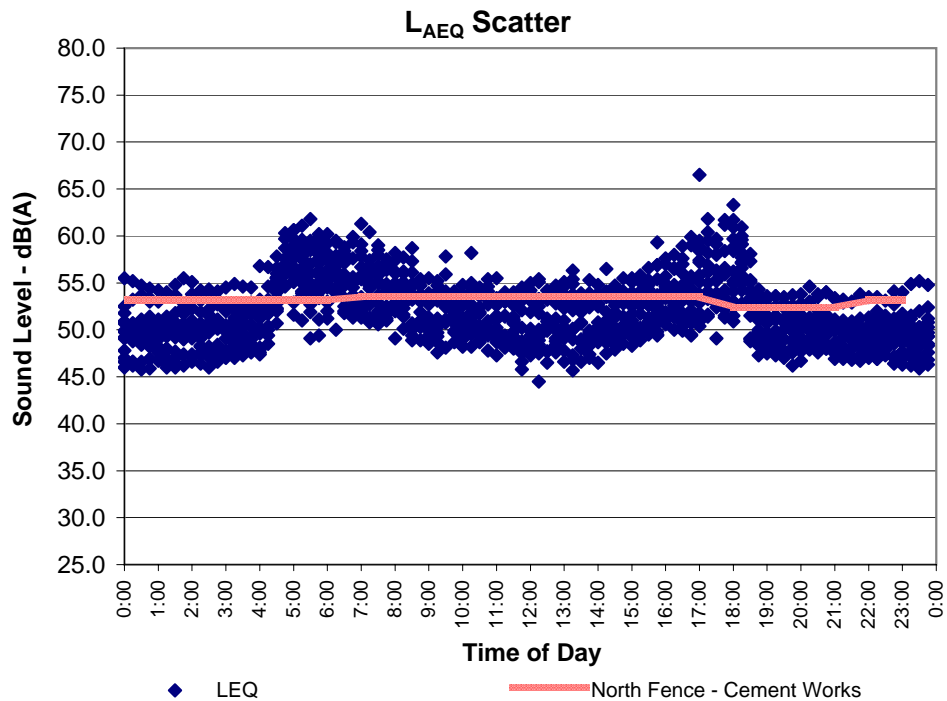
## Berrima Cement Works - Ambient - Background Noise Survey

North Fence - Cement Works - 24 to 25 October 2022



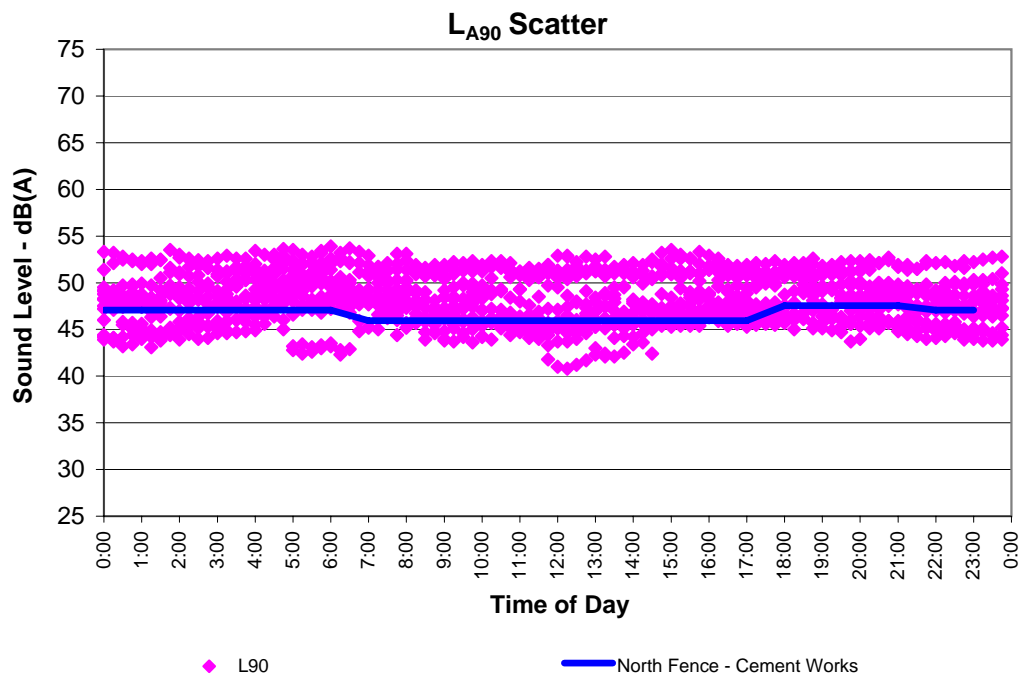
## Berrima Cement Works - Ambient - Background Noise

North Fence - Cement Works - 10 to 25 October 2022



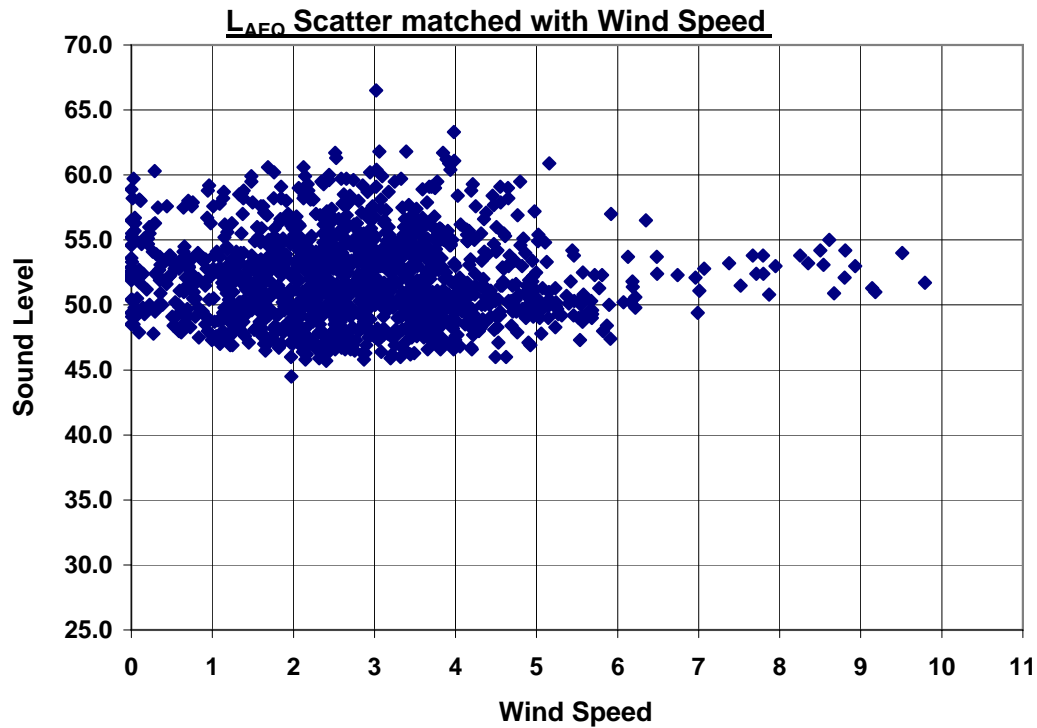
## Berrima Cement Works - Ambient - Background Noise

North Fence - Cement Works - 10 to 25 October 2022



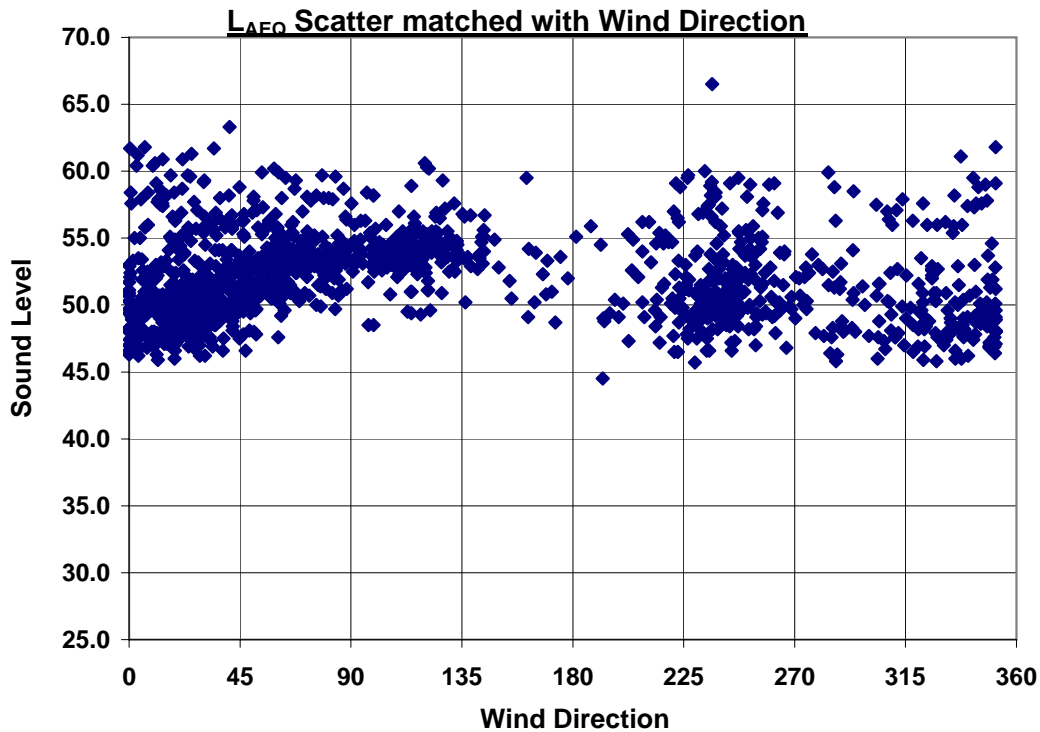
## Berrima Cement Works - Ambient - Background Noise

North Fence - Cement Works - 10 to 25 October 2022



## Berrima Cement Works - Ambient - Background Noise

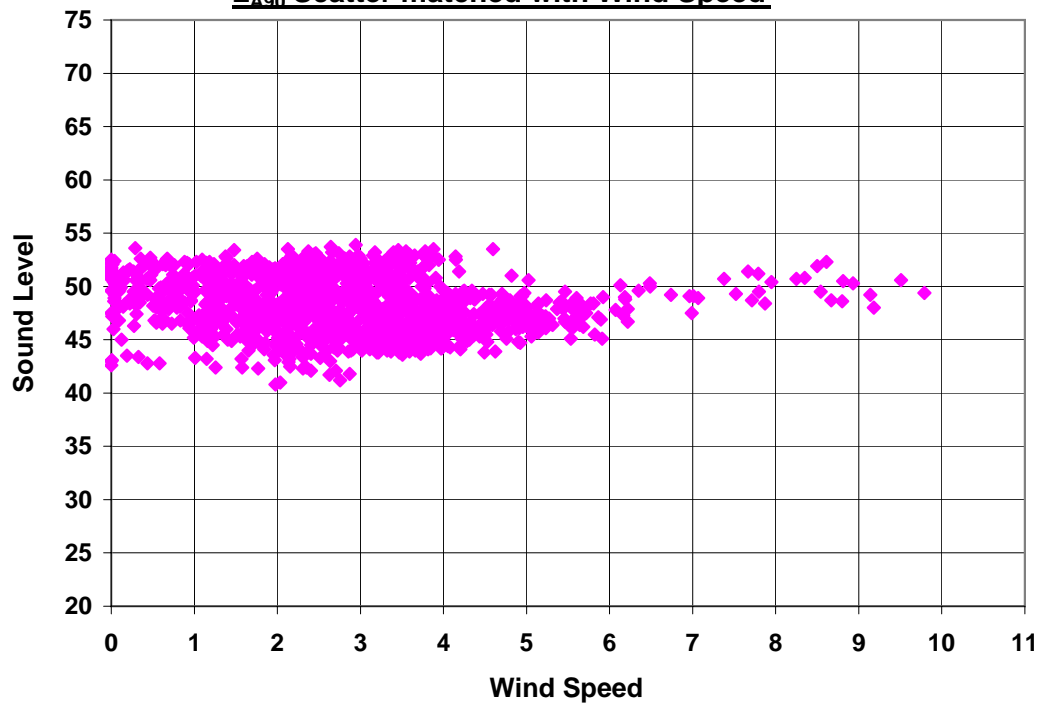
North Fence - Cement Works - 10 to 25 October 2022



## Berrima Cement Works - Ambient - Background Noise

North Fence - Cement Works - 10 to 25 October 2022

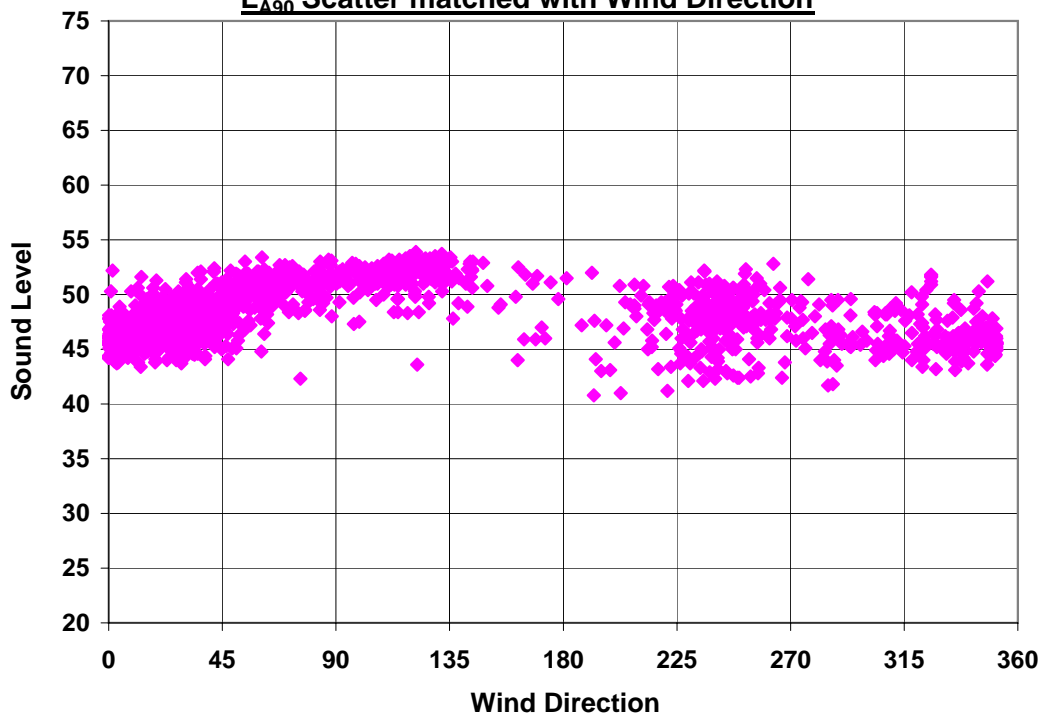
**L<sub>A90</sub> Scatter matched with Wind Speed**



## Berrima Cement Works - Ambient - Background Noise

North Fence - Cement Works - 10 to 25 October 2022

**L<sub>A90</sub> Scatter matched with Wind Direction**



## **Appendix D: Unattended environmental sound level results for Compliance Monitoring Location 20 - Store Yard Close**



Location 20 - Cement Works

Daytime LAEQ

10 to 25 October 2022

Time	10/10	11/10	12/10	13/10	14/10	15/10	16/10	17/10	18/10	19/10	20/10	21/10	22/10	23/10	24/10	25/10	Maximum	Minimum	Average	SD
7:00		63	56	56	57	56	47	61	59	59	59	56	56	58	56	57	63	47	57	3.4
7:15		63	55	59	56	56	52	60	62	57	62	58	55	58	55	56	63	52	58	3.1
7:30		63	57	59	57	56	49	61	59	57	59	60	57	59	64	56	64	49	58	3.5
7:45		61	55	61		56	54	61	58	59	60	57	54	58	62	58	62	54	58	2.7
8:00		65	55	59	58	55	53	60	56	60	58	58	55	58	60	58	65	53	58	3.0
8:15		64	55	59	56	55	56	59	60	59	60	63	58	58	58	58	64	55	58	2.5
8:30		58	55	59	59	56	55	59	60	61	58	58	55	58	56	56	61	55	57	1.9
8:45		60	55	59	60	55	55	60	58	57	61	59	57	58	56	56	61	55	58	2.0
9:00		58	55	56	67	56	56	60	60	64	62	58	56	62	57	56	67	55	59	3.4
9:15		58	56	56	63	57	54	61	59	61	59	59	58	58	60	60	63	54	59	2.2
9:30		58	55	56	57	58	54	57	57	59	59	58	55	58	61	56	61	54	57	1.8
9:45		59	59	63	60	57	55	58	56	58	59	57	55	59	59	55	63	55	58	2.2
10:00		59	64	58	60	57	54	58	57	58	59	58	55	58	59	56	64	54	58	2.5
10:15		62	57	57	58	56	54	58	60	59	60	57	55	58	60	56	62	54	58	2.1
10:30		62	55	57		55	52	62	57	62	60	56	54	57	59	59	62	52	58	3.0
10:45		60	59	57	59	55	53	58	59	62	56	62	56	58	59	56	62	53	58	2.5
11:00		60	59	57	59	54	52	60	60	59	57	58	55	58		55	60	52	57	2.4
11:15		61	58	57	59	55	53	57	60	57	57	59	54	59		55	61	53	57	2.2
11:30		57	56	54	59	54	53	57	57	55	59	58	56	60		59	60	53	57	2.0
11:45		59	56	56	58	55	54	58	57	58	59	64	55	61		58	64	54	58	2.5
12:00		61	56	55	57	54	56	60	59	58	59	58	56	59		57	61	54	58	2.1
12:15		55	55	55	58	55	54	58	55	60	61	56	55	60	60	57	61	54	57	2.3
12:30		55	55	59	56	55	57	59	58	58	59	59	54	58		59	59	54	57	1.9
12:45		57	55	58	59	53	50	59	57	58	61	59	55	59		55	61	50	57	2.9
13:00		58	55	60	59	53	49	62	59	60	60	59	56	62		55	62	49	58	3.5
13:15		58	56	59	58	55	49	60	59	59	61	59	54	61		57	61	49	58	3.1
13:30		57	60	60	58	53	49	59	62	59	59	59	55	59		56	62	49	57	3.4
13:45		56	59	61	58	54	51	59	59	58	58	57	54	59		60	61	51	57	2.8
14:00		55	59	60	56	53	50	60	59	60	58	58	54	59	64	62	64	50	58	3.7
14:15		58	60	57	56	53	49	59	60	59		59		59	59	62	62	49	58	3.4
14:30		58	60	56	56	52	49	57	56	57	57		54	59		63	63	49	56	3.4
14:45		56	59	54	56	54	50	58	55	58	59	57	55	58	58	62	62	50	57	2.7
15:00		56	58	55	54	53	51	58	58	58	59	57	55	58	55	57	59	51	56	2.3
15:15		56	55	56	54	53	49	57	56	56	60	57	53	58	61	55	61	49	56	2.9
15:30		59	55	56	55	54	50	58	55	57	60	58	53	58	56	59	60	50	56	2.5
15:45		55	54	54	54	56	51	57	57	61	59	57	54	60	59	57	61	51	56	2.6
16:00		56	56	54	54	54	51	58	57	58	58	55		60	59	59	60	51	56	2.5
16:15	55	55	54	57	56	54	52	61	55	58	60	57	54	59	57	54	61	52	56	2.6
16:30	53	57	56	61	54	55	52	58	55	58	58	56	53	58	58	53	61	52	56	2.5
16:45	54	55	54	54	55	56	53	57	54	57	57	55	54	60	56	55	60	53	55	1.8
17:00	54	55	55	55	54	54	53	57	54	57	57	55	55	59	59	57	59	53	56	1.9
17:15	53	55	54	56		55	54	58	54	57	57	55	55	58	61	53	61	53	56	2.1
17:30	52	55	54	54	54	55	54	57	54	57	58	55	55	58	58	57	58	52	55	1.8
17:45	52	55	55	54	54	55	55	56	54	58	58	55	55	58	57		58	52	55	1.6
18:00	52	55	54	54	54	55	54	56	54	57	57	54	55	58	57		58	52	55	1.5
Max	55	65	64	63	67	58	57	62	62	64	62	64	58	62	64	63	67	55	62	3.2
Min	52	55	54	54	54	52	47	56	54	55	56	54	53	57	55	53	57	47	54	2.2
Ave	53	58	56	57	57	55	52	59	57	58	59	58	55	59	59	57	59	52	57	2.0
SD	1.1	2.8	2.2	2.3	2.7	1.3	2.3	1.6	2.3	1.7	1.4	2.0	1.2	1.0	2.2	2.3	2.8	1.0	1.9	0.6
E Ave	53	59	57	58	58	55	53	59	58	59	59	58	55	59	59	58	59	53	57	2.1

Evening LAEQ

Time	10/10	11/10	12/10	13/10	14/10	15/10	16/10	17/10	18/10	19/10	20/10	21/10	22/10	23/10	24/10	25/10	Maximum	Minimum	Average	SD
18:00	52	55	54	54	54	55	54	56	54	57	57	54	55	58	57		58	52	55	1.5
18:15	54	54	54	55	56	56	56	56	54	57	57	54		58	57		58	54	56	1.4
18:30	54	55	54	55	55	55	57	55	54	58	57	54		58	57		58	54	56	1.4
18:45	54	55	56	54	55	60	57	56	56	58		54	54	58	57		60	54	56	1.8
19:00	54	55	54	54	56	55	59	56	55	56		54	54	58	57		59	54	55	1.5
19:15	55	56	54	54	56	55	58	57	54	56		54	59	58	57		59	54	56	1.7
19:30	56	56	54	54	55	52	58	57	56	56	58	55	56	58	57		58	52	56	1.6
19:45	63	56	54	54	53	52	59	56	54	56	57	56	55	58	57		63	52	56	2.6
20:00	67	56	54	54	55	52	58	58	54	57	57	55	55	58	56		67	52	56	3.5
20:15	59	56	54	54	54	52	58	58	54	57	57	55	55	58	56		59	52	56	2.0
20:30	55	56	54	54	54	52	58	57	54	57	57	55	54	58	56		58	52	55	1.7
20:45	55	55	54	54	55	52	58	57	53	57	56	54	55	58	56		58	52	55	1.7
21:00	55	55	53	54	54	53	58	57	53	57	56	56	54	58	55		58	53	55	1.6
21:15	55	55	53	56	54	53	59	56	54	57	56	55	55	58	55		59	53	55	1.5
21:30	54	55	54	53	54	53	58	56	55	58	56	55	55	57	55		58	53	55	1.5
21:45	55	55	54	54	54	54	59	57	54	58	56	54	56		55		59	54	55	1.6
22:00	55	55	53	53	55	54		56	54	58	56	55	56		55		58	53	55	1.2
Max	67	56	56	56	56	60	59	58	56	58	58	56	59	58	57		67	56	58	2.9
Min	52	54	53	53	53	52	54	55	53	56	56	54	54	57	55		57	52	54	1.4
Ave	56	55	54	54	55	54	58	56	54	57	57	55	55	58	56		58	54	56	1.3
SD	3.8	0.5	0.6	0.6	0.7	2.1	1.1	0.6	0.7	0.6	0.8	0.6	1.2	0.4	0.8		3.8	0.4	1.0	0.9
E Avg	59	55	54	54	55	54	58	56	54	57	57	55	55	58	56		59	54	56	1.5

Night LAEQ

Time	10/10	11/10	12/10	13/10	14/10	15/10	16/10	17/10	18/10	19/10	20/10	21/10	22/10	23/10	24/10	25/10	Maximum	Minimum	Average	SD
22:00	55	55	53	53	55	54		56	54	58	56	55	56		55		58	53	55	1.2
22:15	55	55	54	54	55	55		55	54	58	56	55	55	55	55		58	54	55	0.9
22:30	55	55	53	53	55	54		55	54	58	56	55		60	56		60	53	55	1.8
22:45	55	54	54	53	55	55	58	56	54	58	56	55		57	55		58	53	55	1.6
23:00	55	54	53	53	55	53	58	55	53	58	57	55		54	55		58	53	55	1.8
23:15	55	54	53	54	54	54	59	56	54	58		55		54	55		59	53	55	1.7
23:30	55	55	54	55	54	56	59	56	54	58		55			55		59	54	55	1.5
23:45	55	54	53	53	58	57	59	56	54	57		54		55	54		59	53	55	1.9
0:00	56	54	53	53	54	56	59	56	54	57	56	54		56	54		59	53	55	1.6
0:15	56	54	52	53	54	56	59	57	55	56	56	54		55	54		59	52	55	1.8
0:30	56	55	52	52	56	56	60	56	54	57	57	54	57	55	55		60	52	55	1.9
0:45	57	55	53	52	54	56	59	56	54	57	58	55	57	55	55		59	52	55	2.0
1:00	58	54	53	52	54	56	60	56	54	57	57	54		55	56		60	52	55	2.1
1:15	56	55	53	53	54	56	59	56	55	58	56	54	56	54	55		59	53	55	1.8
1:30	55	54	54		54	56	58	57	58	58	56	54	56		56		58	54	56	1.6
1:45	55	54	54		55	59	58	56	54	58	57	53	56	52			59	52	55	2.1
2:00	55	54	54		55	56	58	56	55	57	55	54	55	52	56		58	52	55	1.6
2:15	56	54	53	54	55	56	58	57	54	58		53	55	52	55		58	52	55	1.8
2:30	56	54	54	55	54	56	58	57	55	58	56	53	55	52	54		58	52	55	1.8
2:45	56	54	53	54	55	56	60	55	56	58	55	53	55	54	54		60	53	55	1.8
3:00	56	54	53	56	52	56	59	55	57	59	56	54	56		55		59	52	55	2.0
3:15	56	54	53	54	51	55	58	55	57	59	57	54	56		57		59	51	55	2.1
3:30	57	54	53	53	51	56	59	55	58	59	57	54	56	53	55		59	51	55	2.3
3:45	57	54	53	53	52	54	59	55	58	57	56	53	56				59	52	55	2.1
4:00	55	54	53	53	54	54	59	55	57	58	56	53	56	54	55		59	53	55	1.8
4:15	56	54	53	53	54	54	60	56	56	57	56	53	56	55	55		60	53	55	1.7
4:30	57	54	54	57	57	55	60	57	57	57	55	54	56	53	55		60	53	56	1.8
4:45	58	54	54	58	57	54	59	59	54	58	57	55	57	53	55		59	53	56	2.1
5:00	57	54	53	57	56	54	60	60	61	58	60	57	58	59	58		61	53	57	2.4
5:15	57	57	57	58	59	54	59	61	60	59	60	57	57	56	58		61	54	58	1.7
5:30	58	56	54	58	55	56		59	57	58	59	57	57	54	58		59	54	57	1.7
5:45	57	55	55	54	57	55	59	56	57	59	58	56	56	56	56		59	54	56	1.6
6:00	57	56	53	54	54	51	59	57	60	58	58	56	57	56	54		60	51	56	2.5
6:15	58	55	54		58	50	60	59	61	57	55	55	56	60	60		61	50	57	2.9
6:30	61	57	56		56	49	59	59	59	61	54	59	58	60	58		61	49	57	3.2
6:45	62	55	57		56	50	59	58	57	59	57	54	56	55	60		62	50	57	2.9
7:00	63	56	56	57	56	47	61	59	59	59	56	56	58	56	57		63	47	57	3.4
Max	63	57	57	58	59	59	61	61	61	61	60	59	58	60	60		61	57	59	1.2
Min	55	54	52	52	51	47	58	55	53	56	54	53	55	52	54		58	47	53	2.4
Ave	57	55	54	54	55	54	59	57	56	58	57	55	56	55	56		59	54	56	1.5
SD	1.9	0.9	1.2	1.8	1.7	2.4	0.6	1.5	2.4	0.9	1.3	1.4	0.9	2.2	1.7		2.4	0.6	1.5	0.6
E Avg	57	55	54	55	55	55	59	57	57	58	57	55	56	56	56		59	54	56	1.4
24hr	57	58	56	56	57	55	55	59	57	58	58	57	55	58	57	57	59	55	57	1.2

Location 20 - Cement Works

Daytime LA90

10 to 25 October 2022

Time	10/10	11/10	12/10	13/10	14/10	15/10	16/10	17/10	18/10	19/10	20/10	21/10	22/10	23/10	24/10	25/10	Maximum	Minimum	Average	SD
7:00		58	53	53	52	54	46	56	56	54	56	52	52	56	53	45	58	45	53	3.6
7:15		59	53	56	53	54	45	56	57	55	56	52	52	57	53	47	59	45	54	3.7
7:30		60	53	56	53	54	46	57	56	56	57	52	53	57	53	51	60	46	54	3.3
7:45		59	53	54		53	47	58	55	55	56	53	52	57	54	53	59	47	54	3.0
8:00		64	53	53	53	53	51	57	54	55	55	52	52	56	54	53	64	51	54	3.1
8:15		57	52	56	53	53	52	56	54	57	55	55	53	57	53	51	57	51	54	1.9
8:30		55	53	55	53	53	53	56	54	56	55	54	52	56	53	52	56	52	54	1.6
8:45		56	53	54	54	53	53	57	54	55	56	54	52	57	54	52	57	52	54	1.7
9:00		56	52	52	56	54	53	57	55	56	56	53	52	57	53	52	57	52	54	2.0
9:15		55	52	52	53	54	52	57	54	54	56	53	53	56	54	52	57	52	54	1.5
9:30		54	52	52	54	54	52	55	54	54	55	53	52	56	55	51	56	51	54	1.6
9:45		56	53	53	54	54	52	55	53	54	56	53	52	56	56	50	56	50	54	1.7
10:00		56	54	55	53	54	51	56	53	55	55	54	51	56	55	50	56	50	54	1.9
10:15		57	53	52	54	54	51	56	52	56	55	53	51	56	56	51	57	51	54	2.1
10:30		57	53	52		53	49	57	52	58	56	54	52	56	57	51	58	49	54	2.6
10:45		55	53	52	54	53	50	56	52	59	55	54	52	56	57	52	59	50	54	2.4
11:00		55	53	53	54	52	50	56	53	54	55	53	52	56		52	56	50	54	1.9
11:15		54	54	52	55	53	50	56	52	54	55	54	52	57		52	57	50	54	1.8
11:30		54	54	52	54	53	50	56	52	53	55	54	53	58		52	58	50	54	1.9
11:45		55	54	52	55	53	51	56	52	54	56	53	52	58		52	58	51	54	1.9
12:00		53	52	52	52	52	51	55	52	54	56	52	53	57		51	57	51	53	1.7
12:15		53	52	52	53	52	51	56	51	54	56	53	52	57	55	51	57	51	53	2.0
12:30		53	53	52	53	52	52	55	52	54	56	54	52	56		52	56	52	53	1.6
12:45		54	52	54	54	50	47	56	52	55	56	54	52	56		52	56	47	53	2.5
13:00		56	52	54	55	49	47	56	53	55	56	55	53	57		51	57	47	54	2.7
13:15		55	52	56	54	50	47	57	53	55	56	55	53	57		52	57	47	54	2.8
13:30		54	53	55	53	50	47	56	53	55	56	54	52	57		52	57	47	53	2.6
13:45		52	53	56	52	50	48	55	53	56	55	54	52	57		53	57	48	53	2.4
14:00		53	54	55	52	50	48	56	53	56	55	54	51	57	55	53	57	48	53	2.5
14:15		54	57	52	52	50	47	56	52	55		54		57	55	53	57	47	53	2.8
14:30		54	56	52	52	49	48	55	52	55	55		52	56		52	56	48	53	2.5
14:45		54	54	52	53	49	48	55	52	55	56	53	52	56	55	53	56	48	53	2.2
15:00		53	52	52	52	50	48	55	53	55	56	53	51	56	54	52	56	48	53	2.2
15:15		54	53	52	52	50	47	55	52	55	56	54	51	56	55	52	56	47	53	2.4
15:30		54	52	52	52	51	47	54	53	55	57	54	51	56	55	52	57	47	53	2.4
15:45		53	52	52	52	52	49	55	52	55	56	54	52	57	55	52	57	49	53	2.2
16:00		53	53	52	52	52	50	55	52	55	57	53		58	56	52	58	50	53	2.2
16:15	51	53	51	52	53	52	50	55	53	55	57	53	52	57	56	51	57	50	53	2.1
16:30	51	53	52	53	52	52	51	55	52	55	56	53	52	56	55	52	56	51	53	1.9
16:45	51	53	52	52	53	53	52	55	51	55	56	52	51	57	55	52	57	51	53	1.9
17:00	51	53	52	52	52	52	52	55	52	55	56	53	53	57	57	52	57	52	54	2.0
17:15	51	52	52	53	53	52	55	52	55	55	55	52	53	57	57	51	57	51	54	1.9
17:30	51	53	52	52	52	53	52	55	52	55	56	53		57	56	52	57	52	53	1.7
17:45	51	53	52	52	52	53	53	54	52	55	56	53	53	56	56		56	52	53	1.5
18:00	51	52	52	52	52	53	53	54	52	55	56	52	54	56	56		56	52	53	1.5
Max	51	64	57	56	56	54	53	58	57	59	57	55	54	58	57	53	64	51	56	2.9
Min	51	52	51	52	52	49	45	54	51	53	55	52	51	56	53	45	56	45	51	2.8
Ave	51	55	53	53	53	52	50	56	53	55	56	53	52	57	55	51	57	50	53	1.9
SD	0.2	2.4	1.0	1.4	1.1	1.6	2.3	1.0	1.3	1.0	0.6	0.8	0.6	0.5	1.3	1.4	2.4	0.2	1.2	0.6
90%	51	53	52	52	52	50	47	55	52	54	55	52	51	56	53	51	56	47	52	2.2
																		Median	52	

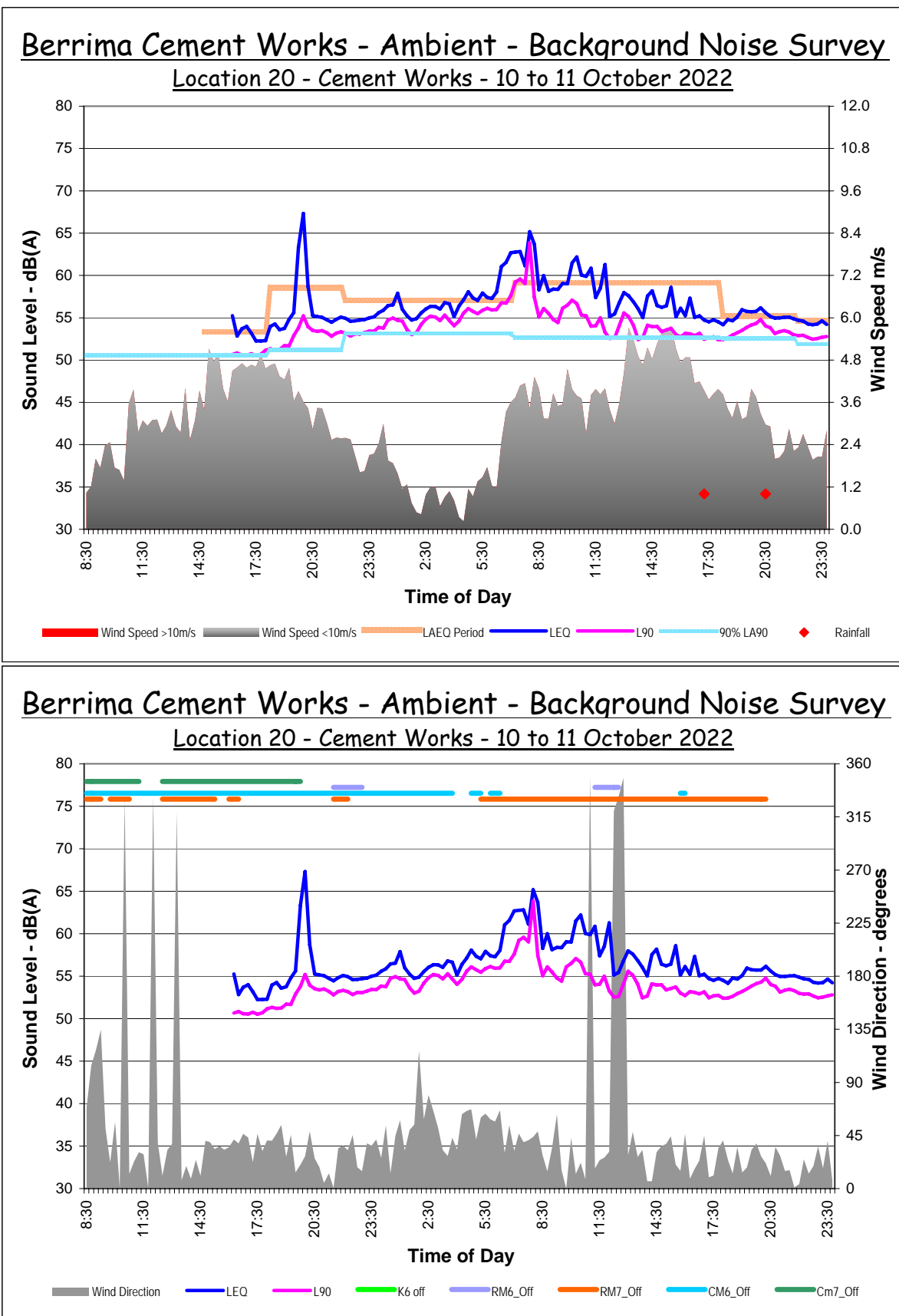
Evening LA90

Time	10/10	11/10	12/10	13/10	14/10	15/10	16/10	17/10	18/10	19/10	20/10	21/10	22/10	23/10	24/10	25/10	Maximum	Minimum	Average	SD
18:00		51	52	52	52	53	53	54	52	55	56	52	54	56	56		56	52	53	1.5
18:15	51	52	52	52	53	54	54	54	52	55	55	52		56	56		56	52	54	1.5
18:30	51	53	52	52	53	54	56	54	52	56	55	52		56	55		56	52	54	1.5
18:45	51	53	52	52	54	54	55	54	53	55		52	52	56	55		56	52	54	1.4
19:00	52	53	52	53	53	54	56	54	52	55		51	53	56	55		56	51	54	1.5
19:15	52	54	52	52	54	53	56	55	52	55		51	54	56	55		56	51	54	1.7
19:30	53	54	53	52	53	52	56	55	53	55	56	52	54	56	55		56	52	54	1.7
19:45	54	54	52	52	52	51	57	55	53	55	56	53	54	57	55		57	51	54	1.8
20:00	55	54	52	52	52	51	57	56	53	55	56	53	54	56	55		57	51	54	1.9
20:15	54	55	52	51	52	51	57	56	52	55	56	53	54	56	55		57	51	54	2.0
20:30	54	54	52	51	53	51	57	56	53	56	55	52	53	56	54		57	51	54	1.9
20:45	53	54	51	51	53	51	57	55	51	56	55	53	53	56	55		57	51	54	2.0
21:00	53	53	51	51	52	51	57	55	52	56	54	53	53	56	54		57	51	53	1.9
21:15	53	53	51	51	52	52	57	55	53	56	54	53	54	56	54		57	51	54	1.7
21:30	53	53	51	51	52	52	57	55	53	57	55	53	54	54	54		57	51	54	1.7
21:45	53	53	52	51	53	52	57	55	53	57	54	53	55		53		57	51	54	1.9
22:00	53	53	52	51	53	53		55	53	56	54	52	55	54	54		56	51	53	1.4
Max	55	55	53	53	54	54	57	56	53	57	56	53	55	57	56		57	53	55	1.5
Min	51	52	51	51	52	51	53	54	51	55	54	51	52	54	53		55	51	52	1.3
Ave	53	53	52	52	53	52	56	55	52	55	55	52	54	56	55		56	52	54	1.5
SD	1.2	0.7	0.5	0.5	0.7	1.1	1.1	0.7	0.5	0.7	0.8	0.5	0.7	0.5	0.8		1.2	0.5	0.7	0.2
90%	51	53	51	51	52	51	55	54	52	55	54	52	53	56	54		56	51	53	1.6
																		Median	53	

Night LA90

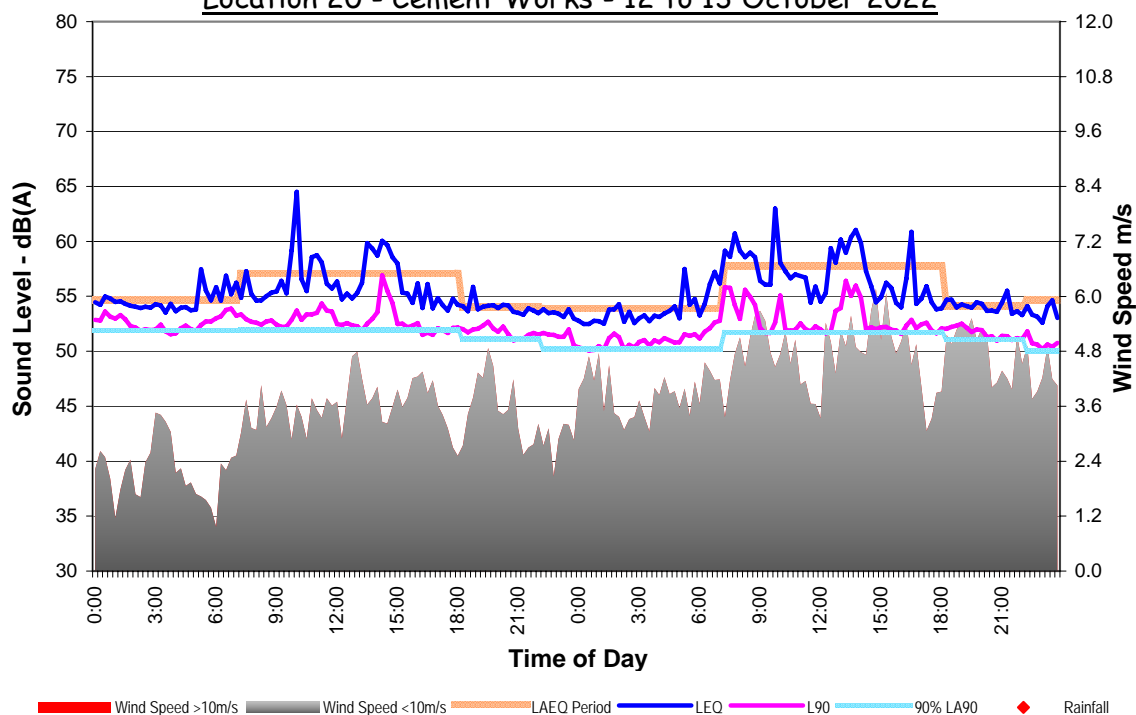
Time	10/10	11/10	12/10	13/10	14/10	15/10	16/10	17/10	18/10	19/10	20/10	21/10	22/10	23/10	24/10	25/10	Maximum	Minimum	Average	SD
22:00	53	53	52	51	53	53		55	53	56	54	52	55		54		56	51	53	1.4
22:15	53	53	52	52	53	53		54	52	56	54	53	53	54	54		56	52	53	1.1
22:30	53	53	52	51	53	53		54	52	56	54	53		54	54		56	51	53	1.4
22:45	53	53	51	51	53	53	56	54	52	57	55	53		53	54		57	51	53	1.9
23:00	53	52	51	50	53	53	57	54	51	57	54	53		53	54		57	50	53	2.0
23:15	53	53	51	51	52	53	57	54	52	57		53		53	53		57	51	53	2.0
23:30	53	53	52	50	52	55	57	54	52	56		53			53		57	50	53	2.0
23:45	53	53	51	51	52	56	57	54	51	56		52		54	53		57	51	53	2.2
0:00	54	53	50	51	52	55	57	54	52	56	55	52		54	53		57	50	53	2.0
0:15	54	53	50	50	52	55	57	54	53	55	55	52		54	53		57	50	53	2.0
0:30	55	54	50	50	52	55	58	55	53	56	55	52	55	54	53		58	50	54	2.2
0:45	55	53	50	50	52	55	57	54	53	56	55	53	55	54	54		57	50	54	2.2
1:00	55	53	50	50	52	55	58	55	52	56	54	53		53	54		58	50	53	2.1
1:15	55	53	50	50	53	55	57	54	53	57	54	52	55	52	54		57	50	54	2.1
1:30	54	53	51		53	55	56	55	53	57	54	51	54		54		57	51	54	1.7
1:45	53	52	52		53	55	56	55	52	57	54	51	55	51			57	51	54	2.0
2:00	53	52	51		53	54	56	55	53	56	53	52	55	51	55		56	51	54	1.7
2:15	54	52	50	51	53	55	56	55	53	57		51	54	51	53		57	50	53	2.1
2:30	55	52	51	52	53	55	56	55	53	57	54	51	54	51	53		57	51	53	1.9
2:45	55	52	50	52	53	55	57	53	54	56	54	52	54	52	54		57	50	53	1.8
3:00	55	52	51	52	50	55	57	53	55	57	54	52	55		54		57	50	54	2.2
3:15	55	52	51	52	50	54	56	53	56	57	54	52	55		54		57	50	54	2.0
3:30	55	52	51	52	50	54	57	53	56	57	54	52	54	52	54		57	50	53	2.1
3:45	55	52	51	51	51	53	57	54	56	55	54	52	55	52	54		57	51	53	2.1
4:00	54	52	51	51	52	52	57	54	56	55	54	52	55	52	54		57	51	53	1.9
4:15	55	52	51	51	52	53	57	54	52	55	54	52	55	53	54		57	51	53	1.8
4:30	56	52	51	52	56	54	57	56	52	55	54	52	55	52	54		57	51	54	1.8
4:45	56	52	51	53	56	53	57	56	53	55	54	53	56	52	54		57	51	54	1.9
5:00	56	52	51	53	55	53	57	55	55	55	52	52	56	51	54		57	51	54	2.0
5:15	55	52	52	53	55	53	56	56	55	55	52	53	56	52	55		56	52	54	1.7
5:30	56	53	51	53	54	54		56	55	57	53	53	56	52	55		57	51	54	1.7
5:45	56	53	52	52	54	48	56	55	55	56	52	53	56	52	43		56	43	53	3.7
6:00	56	53	51	52	53	47	56	55	55	56	52	52	56	52	42		56	42	52	3.8
6:15	56	53	52		54	46	56	55	56	56	52	52	55	52	43		56	43	52	3.8
6:30	57	54	52		54	46	56	56	56	57	52	52	55	53	45		57	45	53	3.7
6:45	57	54	53		54	46	57	56	55	56	52	52	55	53	45		57	45	53	3.6
7:00	58	53	53	52	54	46	56	56	54	56	52	52	56	53	45		56	45	53	3.5
Max Min Ave SD 90%	58	54	53	53	56	56	58	56	56	57	55	53	56	54	55		58	53	55	1.6
	53	52	50	50	50	46	56	53	51	55	52	51	53	51	42		56	42	51	3.4
	55	53	51	51	53	53	57	55	54	56	54	52	55	53	52		57	51	53	1.7
	1.2	0.6	0.7	1.0	1.4	3.0	0.5	0.8	1.7	0.6	1.0	0.6	0.7	0.9	3.9		3.9	0.5	1.2	1.0
	53	52	50	50	51	47	56	54	52	55	52	51	54	51	45		56	45	52	2.9
																		Median	52	

## Two Day Results of Ambient Noise Monitoring



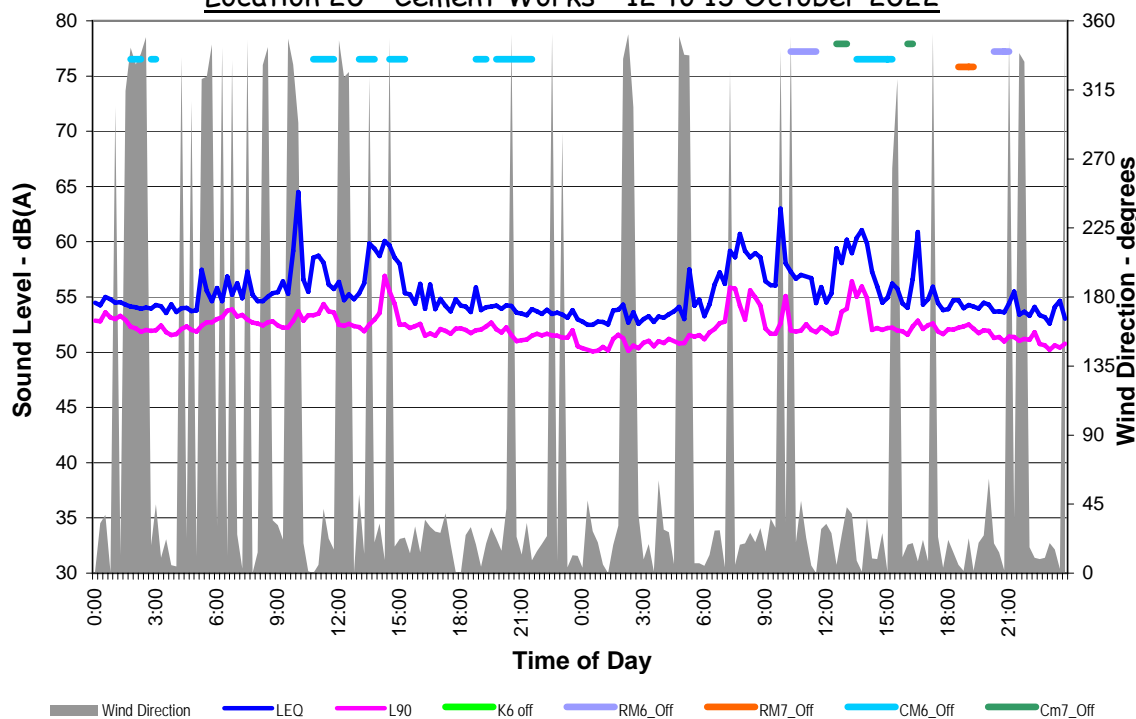
## Berrima Cement Works - Ambient - Background Noise Survey

Location 20 - Cement Works - 12 to 13 October 2022



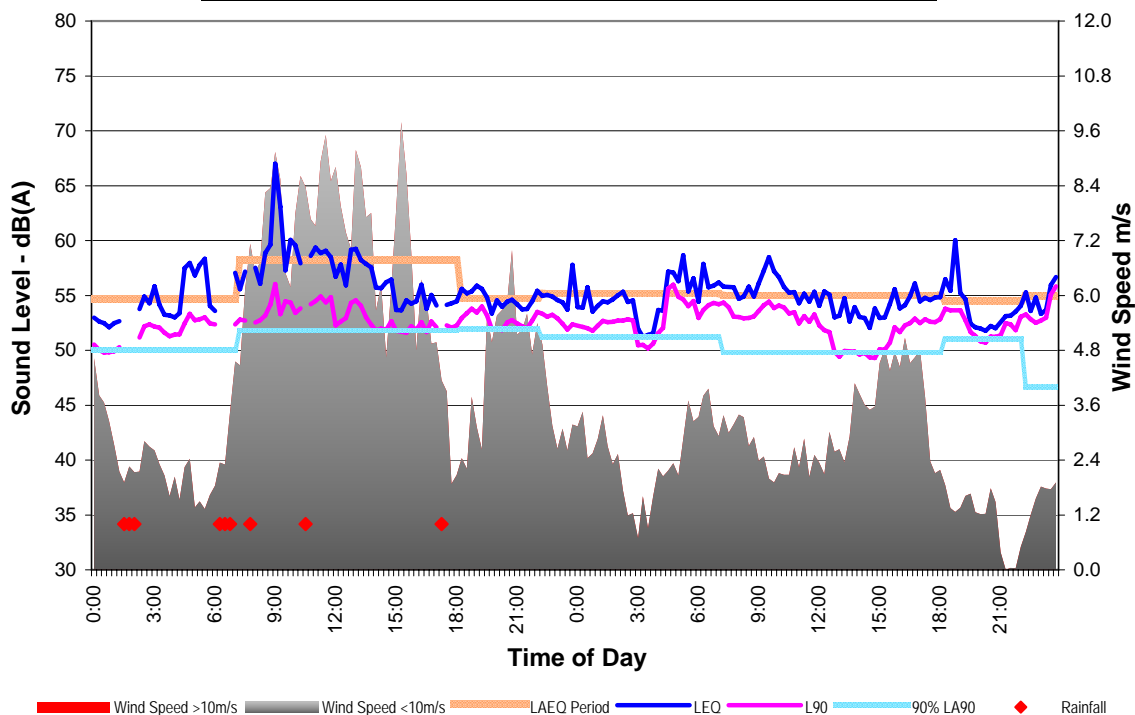
## Berrima Cement Works - Ambient - Background Noise Survey

Location 20 - Cement Works - 12 to 13 October 2022



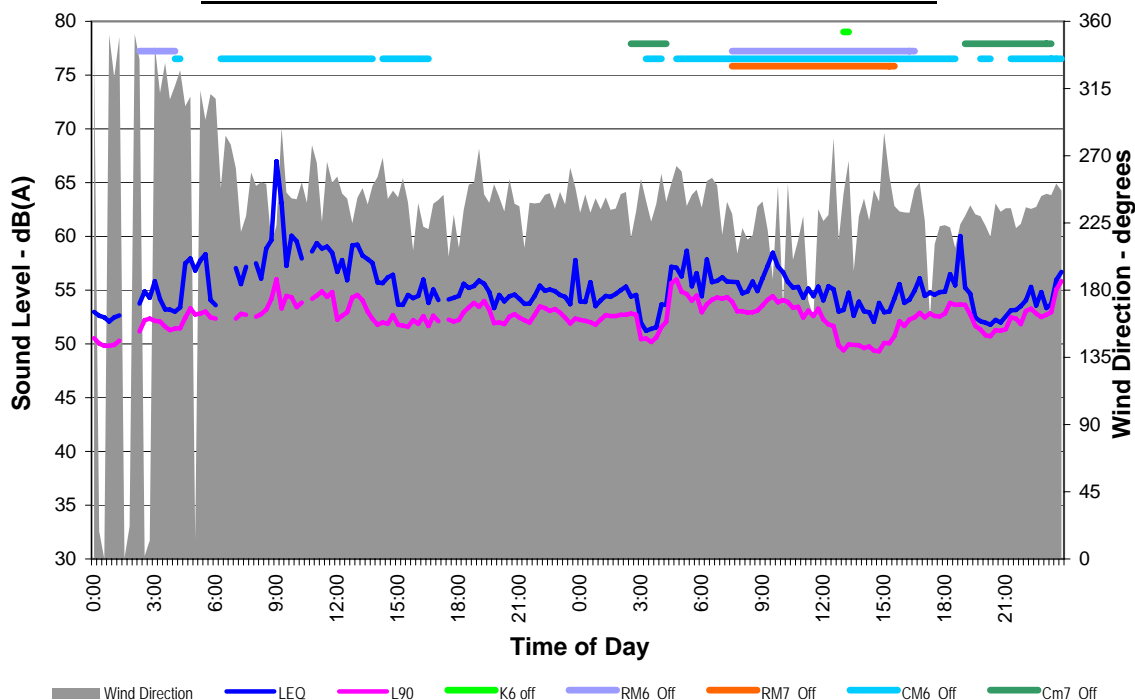
## Berrima Cement Works - Ambient - Background Noise Survey

Location 20 - Cement Works - 14 to 15 October 2022



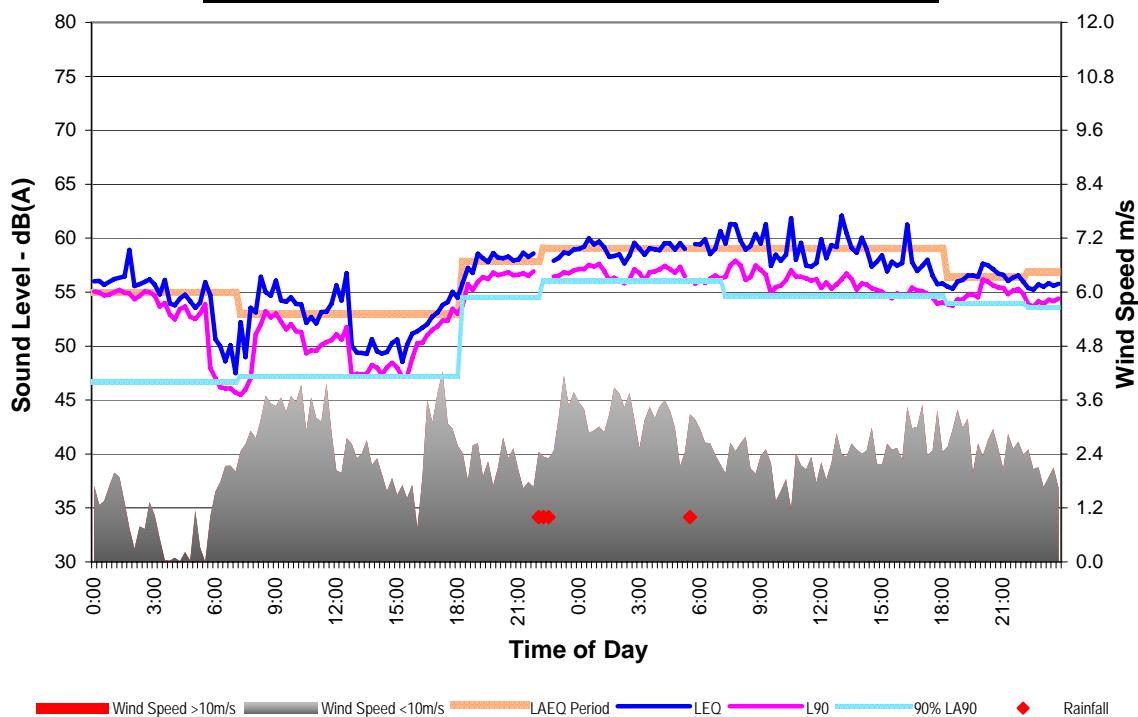
## Berrima Cement Works - Ambient - Background Noise Survey

Location 20 - Cement Works - 14 to 15 October 2022



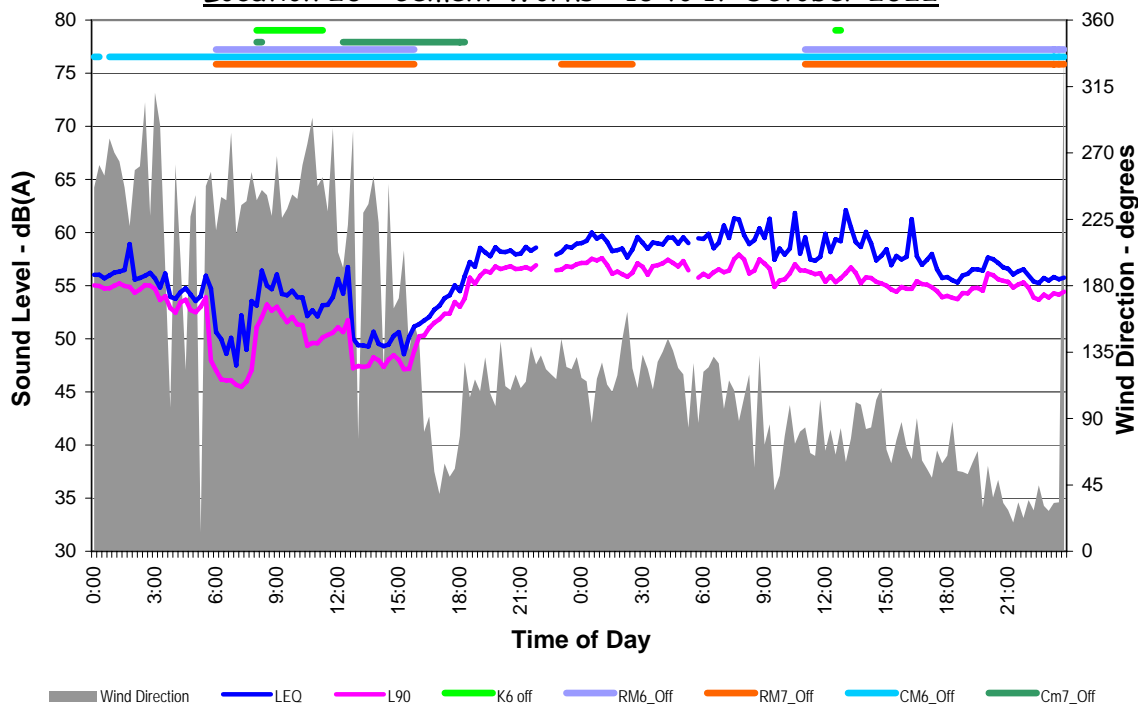
## Berrima Cement Works - Ambient - Backaround Noise Survey

### Location 20 - Cement Works - 16 to 17 October 2022



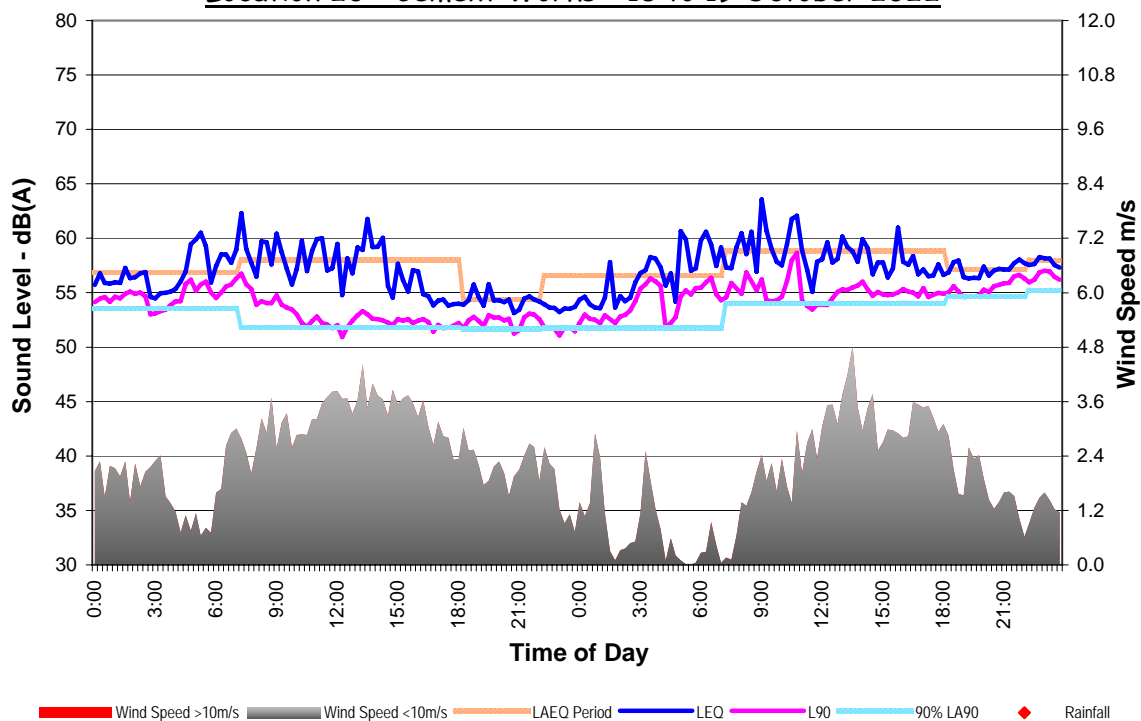
## Berrima Cement Works - Ambient - Backaround Noise Survey

### Location 20 - Cement Works - 16 to 17 October 2022



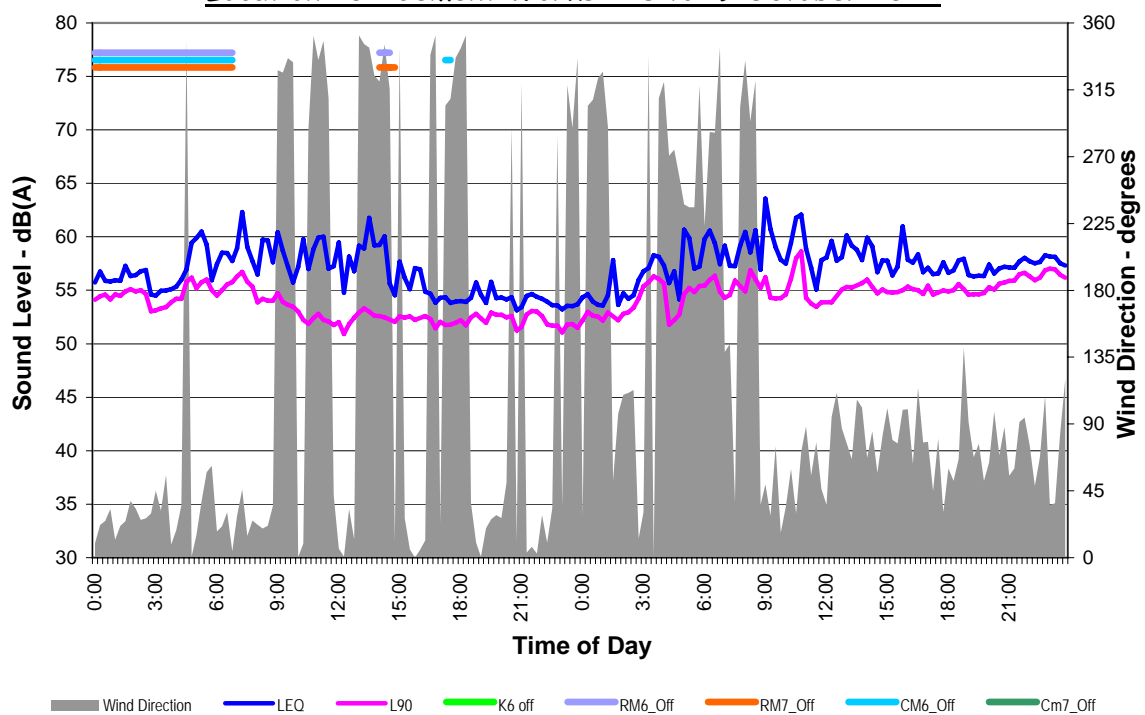
## Berrima Cement Works - Ambient - Background Noise Survey

### Location 20 - Cement Works - 18 to 19 October 2022



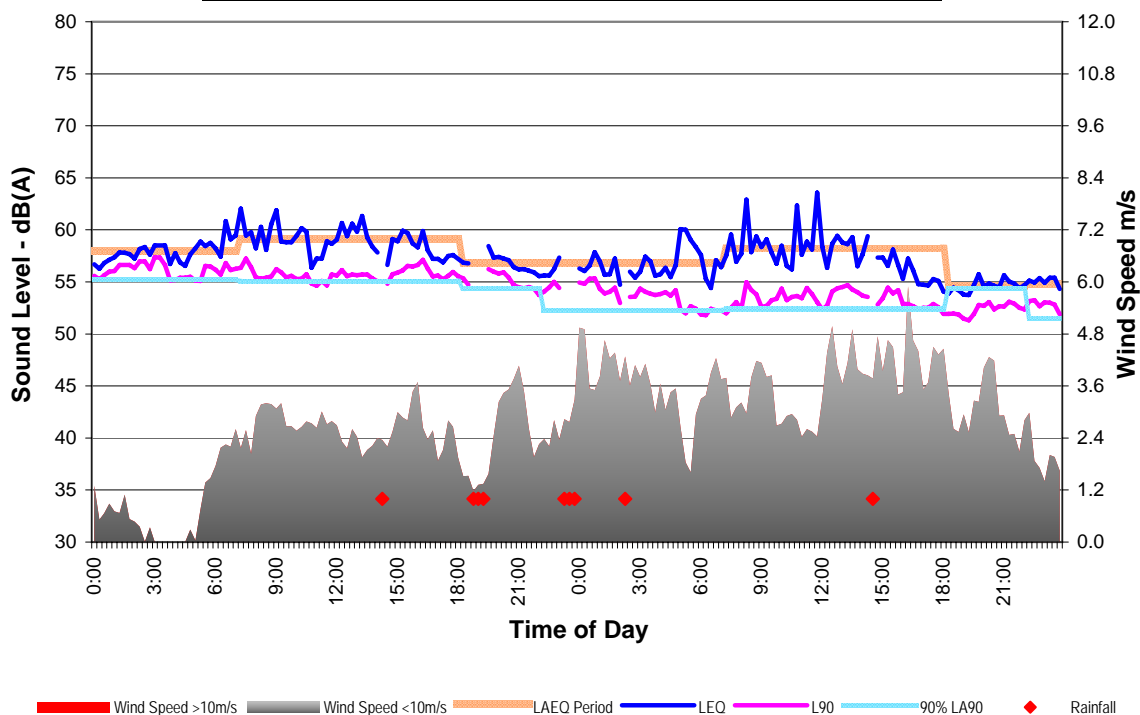
## Berrima Cement Works - Ambient - Background Noise Survey

### Location 20 - Cement Works - 18 to 19 October 2022



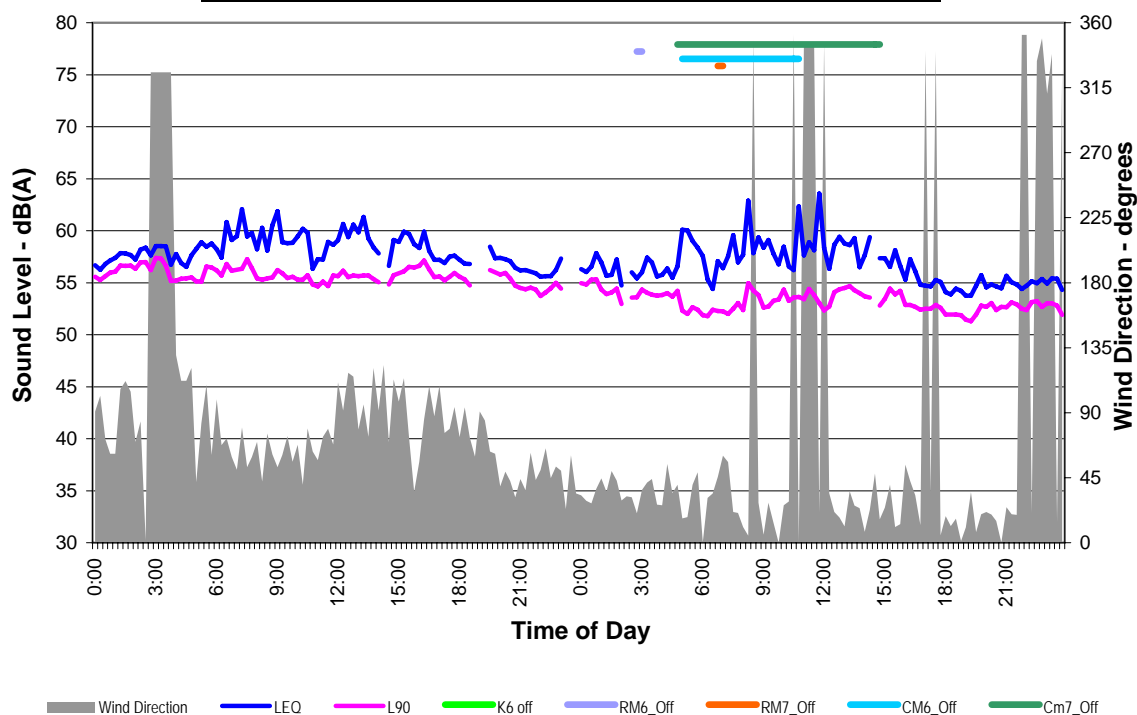
## Berrima Cement Works - Ambient - Background Noise Survey

Location 20 - Cement Works - 20 to 21 October 2022



## Berrima Cement Works - Ambient - Background Noise Survey

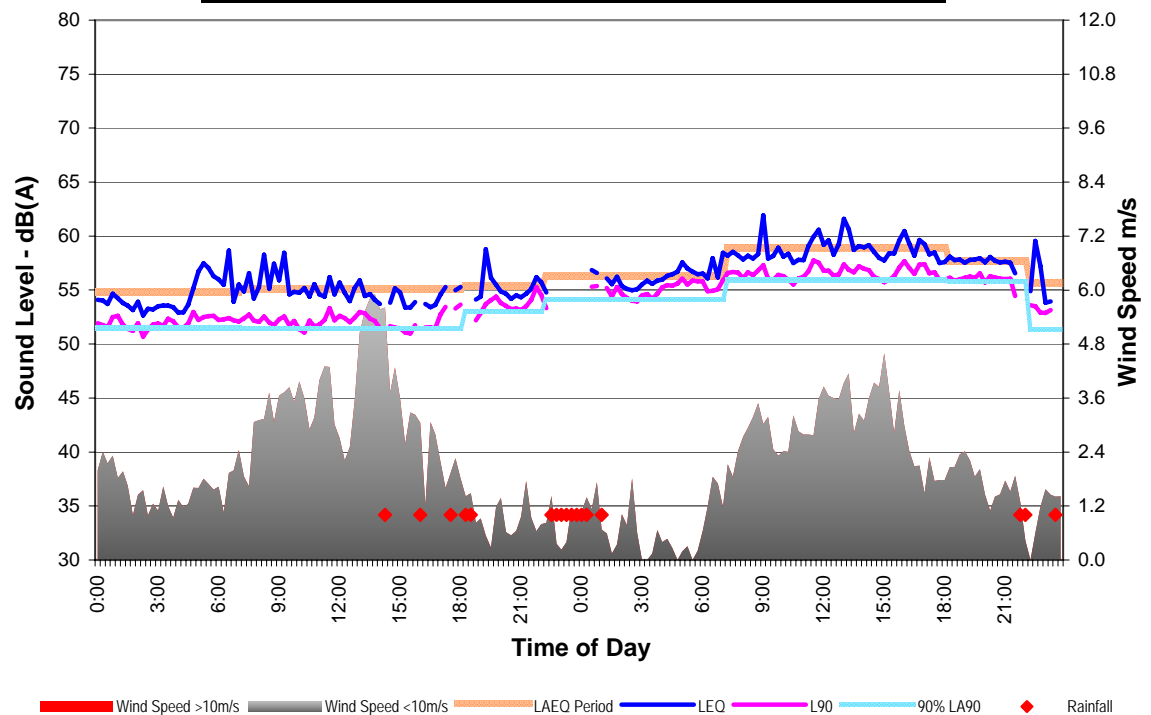
Location 20 - Cement Works - 20 to 21 October 2022





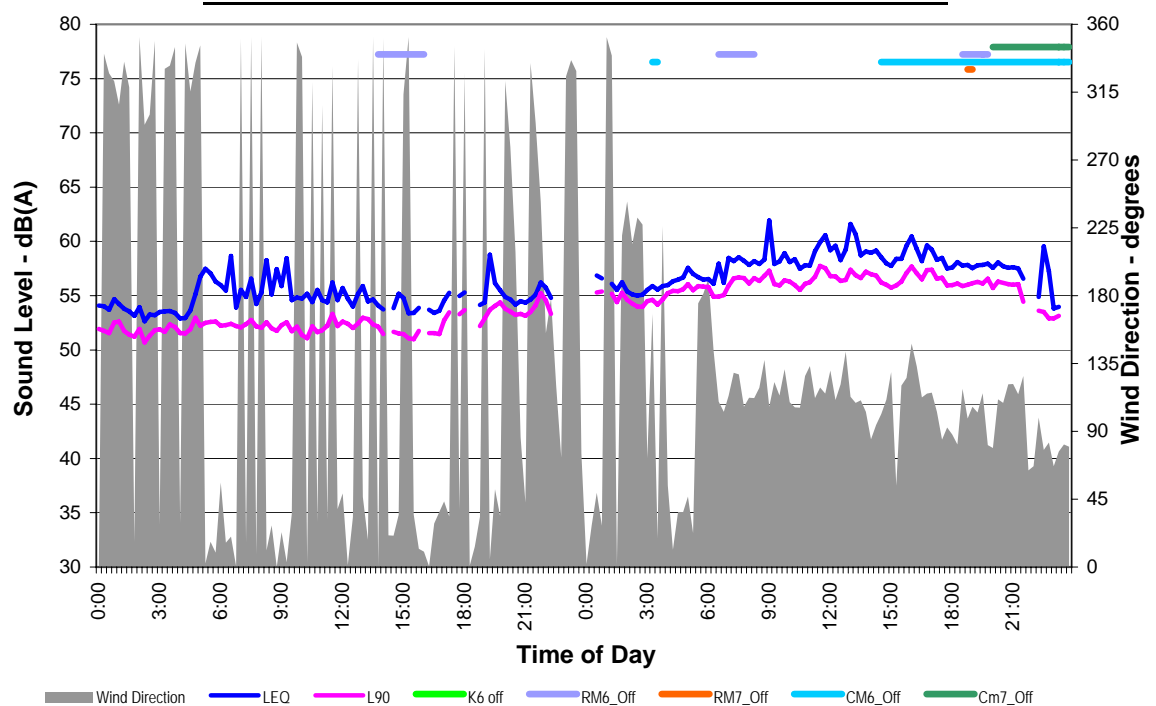
## Berrima Cement Works - Ambient - Background Noise Survey

Location 20 - Cement Works - 22 to 23 October 2022



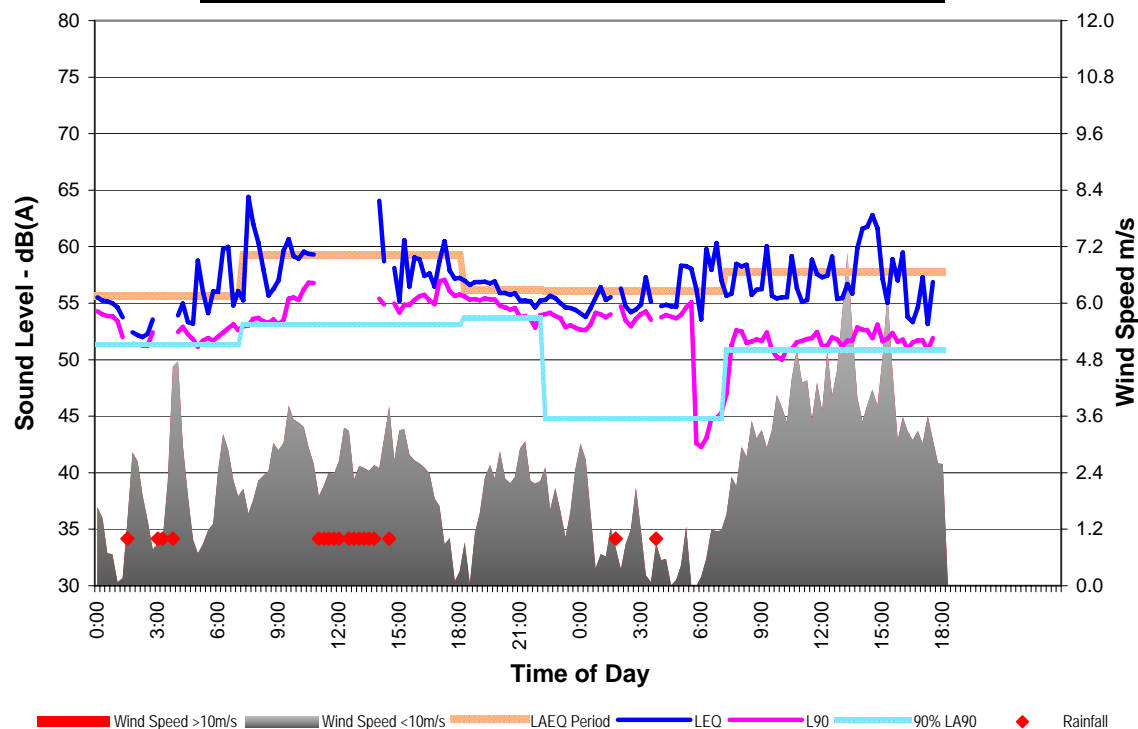
## Berrima Cement Works - Ambient - Background Noise Survey

Location 20 - Cement Works - 22 to 23 October 2022



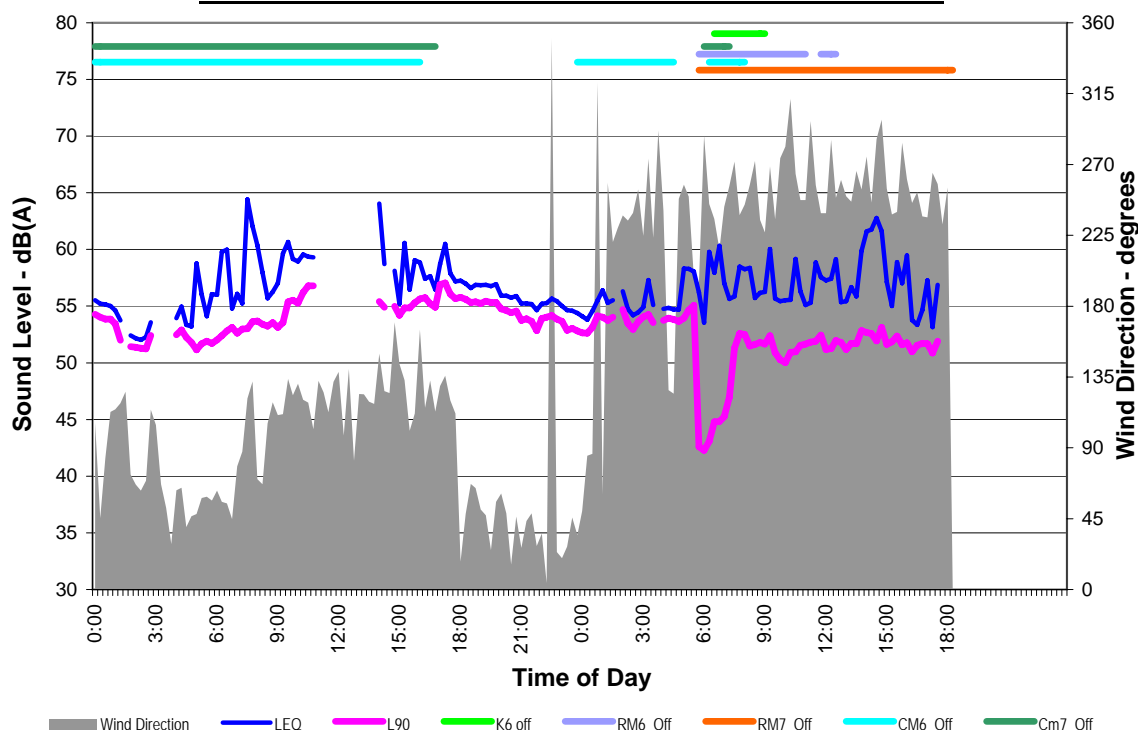
## Berrima Cement Works - Ambient - Background Noise Survey

Location 20 - Cement Works - 24 to 25 October 2022



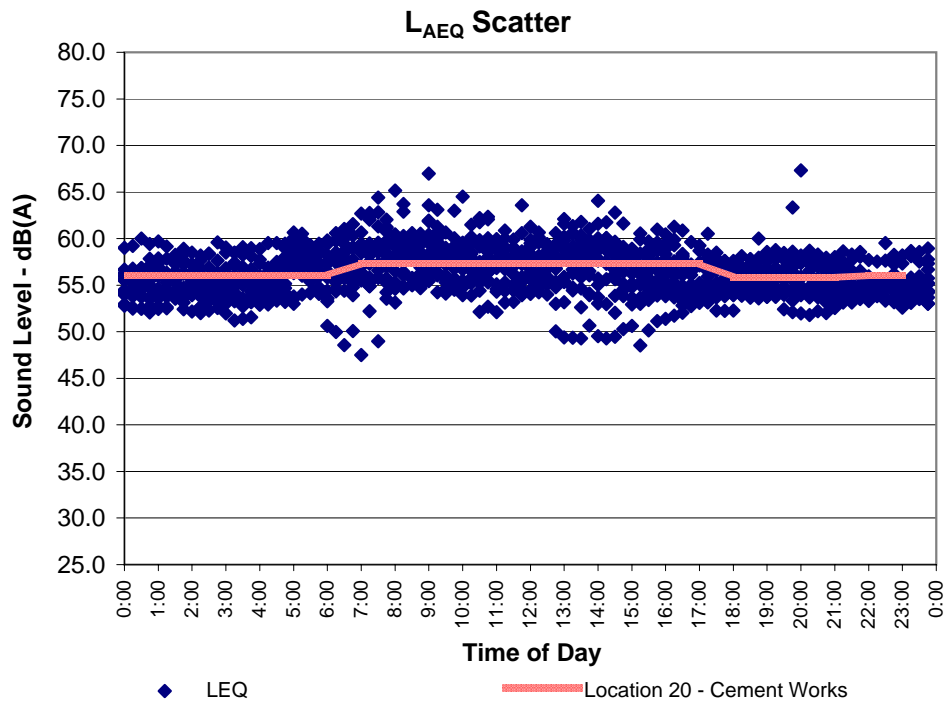
## Berrima Cement Works - Ambient - Background Noise Survey

Location 20 - Cement Works - 24 to 25 October 2022



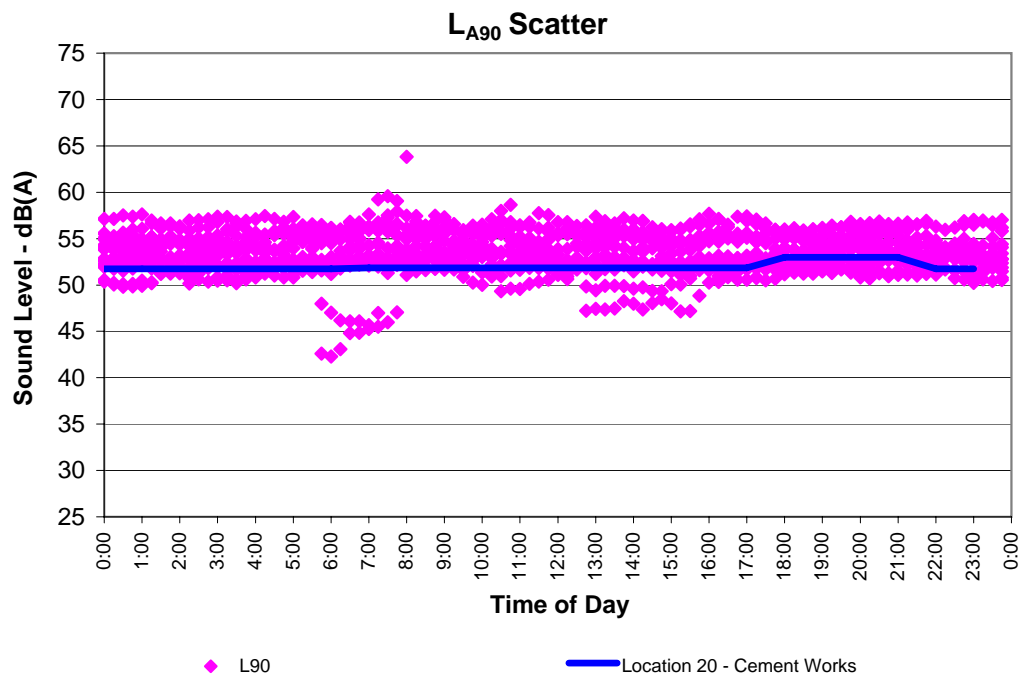
## Berrima Cement Works - Ambient - Background Noise

Location 20 - Cement Works - 10 to 25 October 2022



## Berrima Cement Works - Ambient - Background Noise

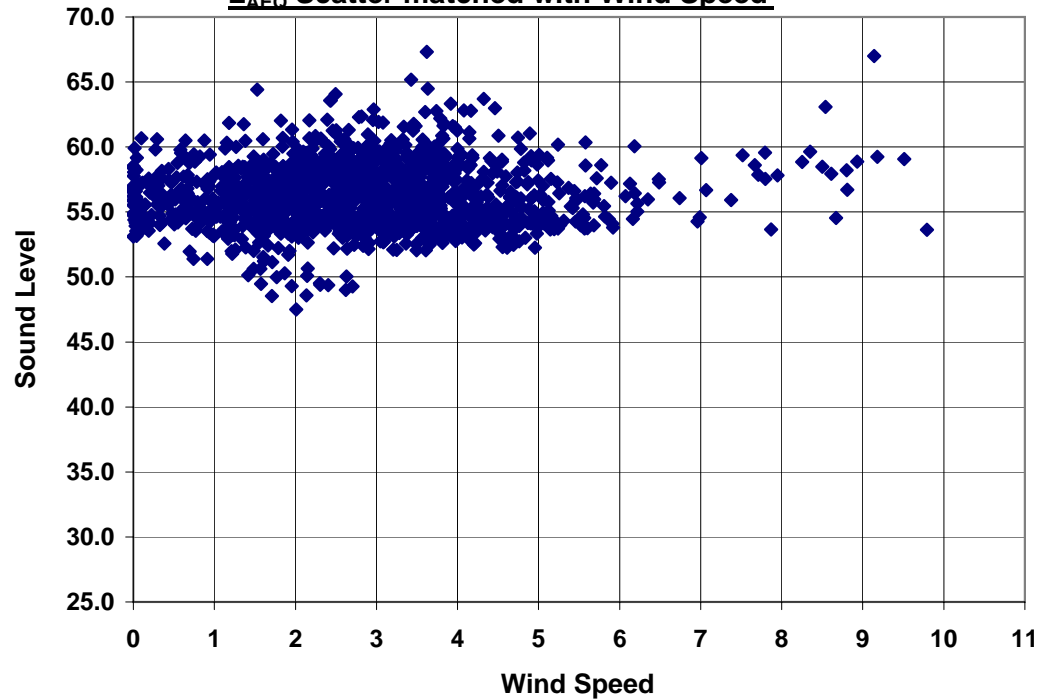
Location 20 - Cement Works - 10 to 25 October 2022



## Berrima Cement Works - Ambient - Background Noise

Location 20 - Cement Works - 10 to 25 October 2022

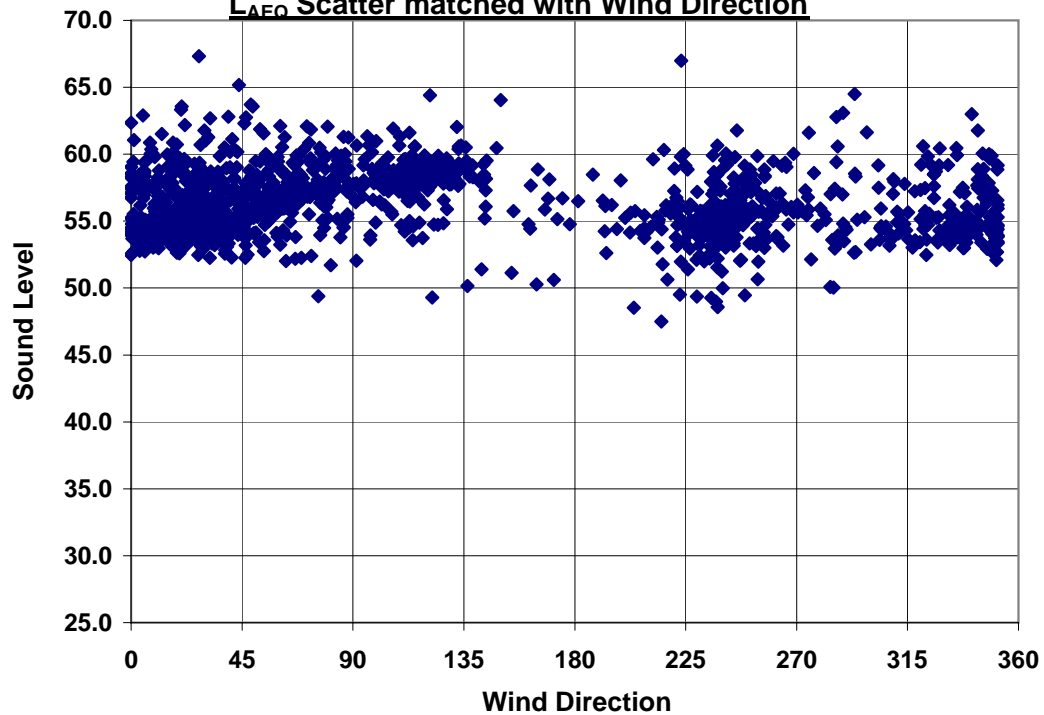
L<sub>A</sub>EQ Scatter matched with Wind Speed



## Berrima Cement Works - Ambient - Background Noise

Location 20 - Cement Works - 10 to 25 October 2022

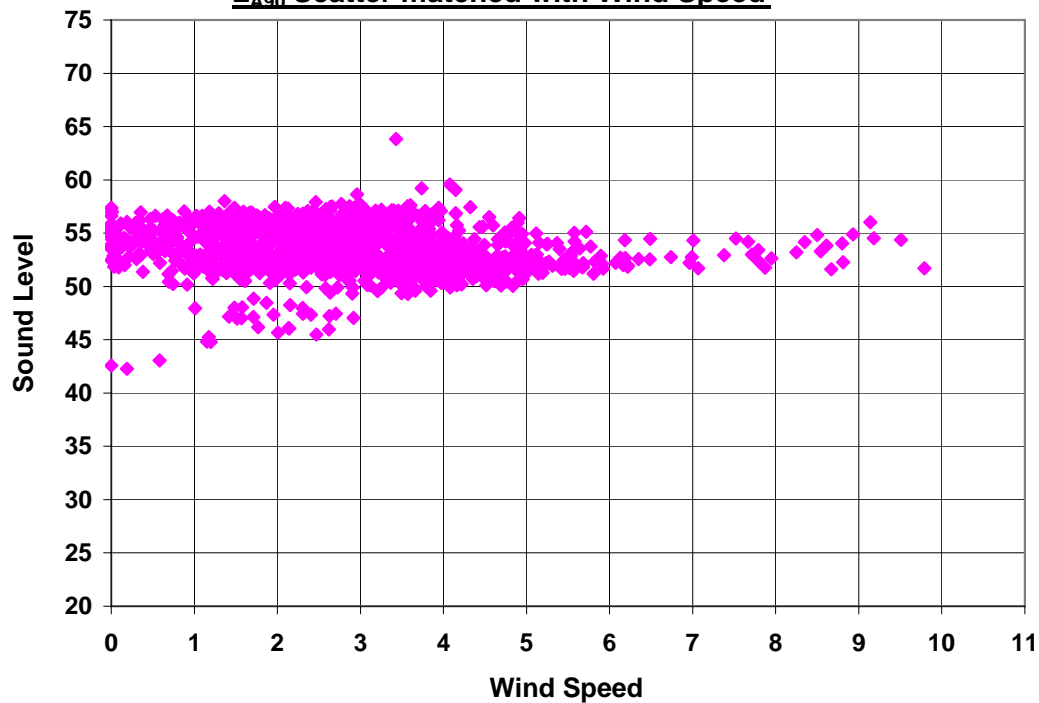
L<sub>A</sub>EQ Scatter matched with Wind Direction



## Berrima Cement Works - Ambient - Background Noise

Location 20 - Cement Works - 10 to 25 October 2022

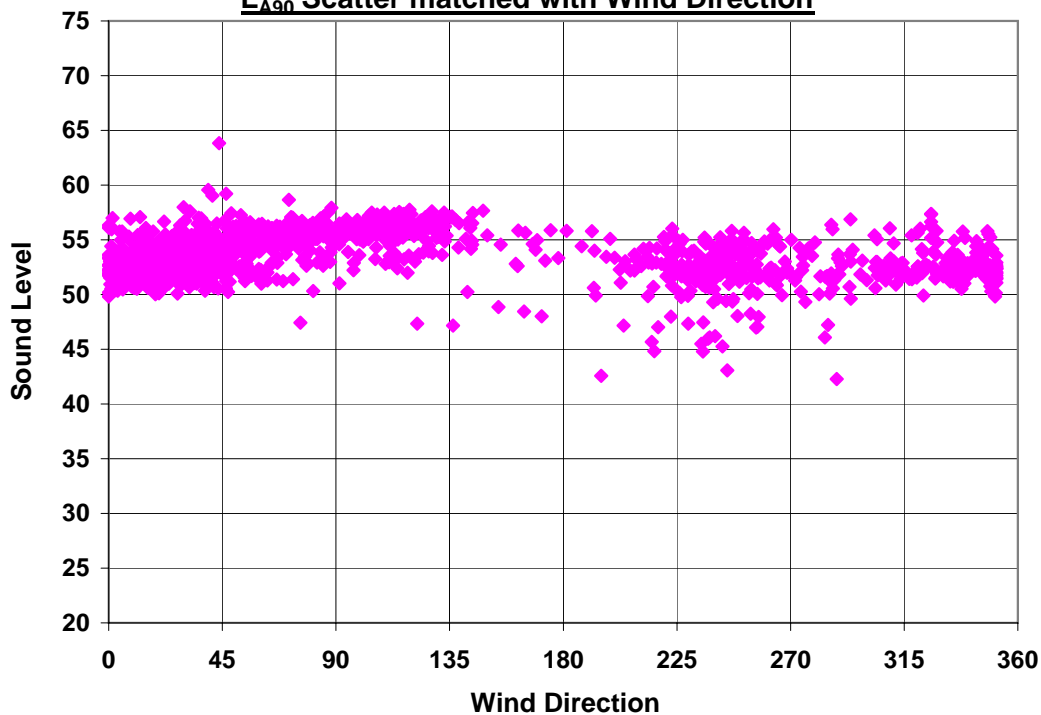
**L<sub>A90</sub> Scatter matched with Wind Speed**



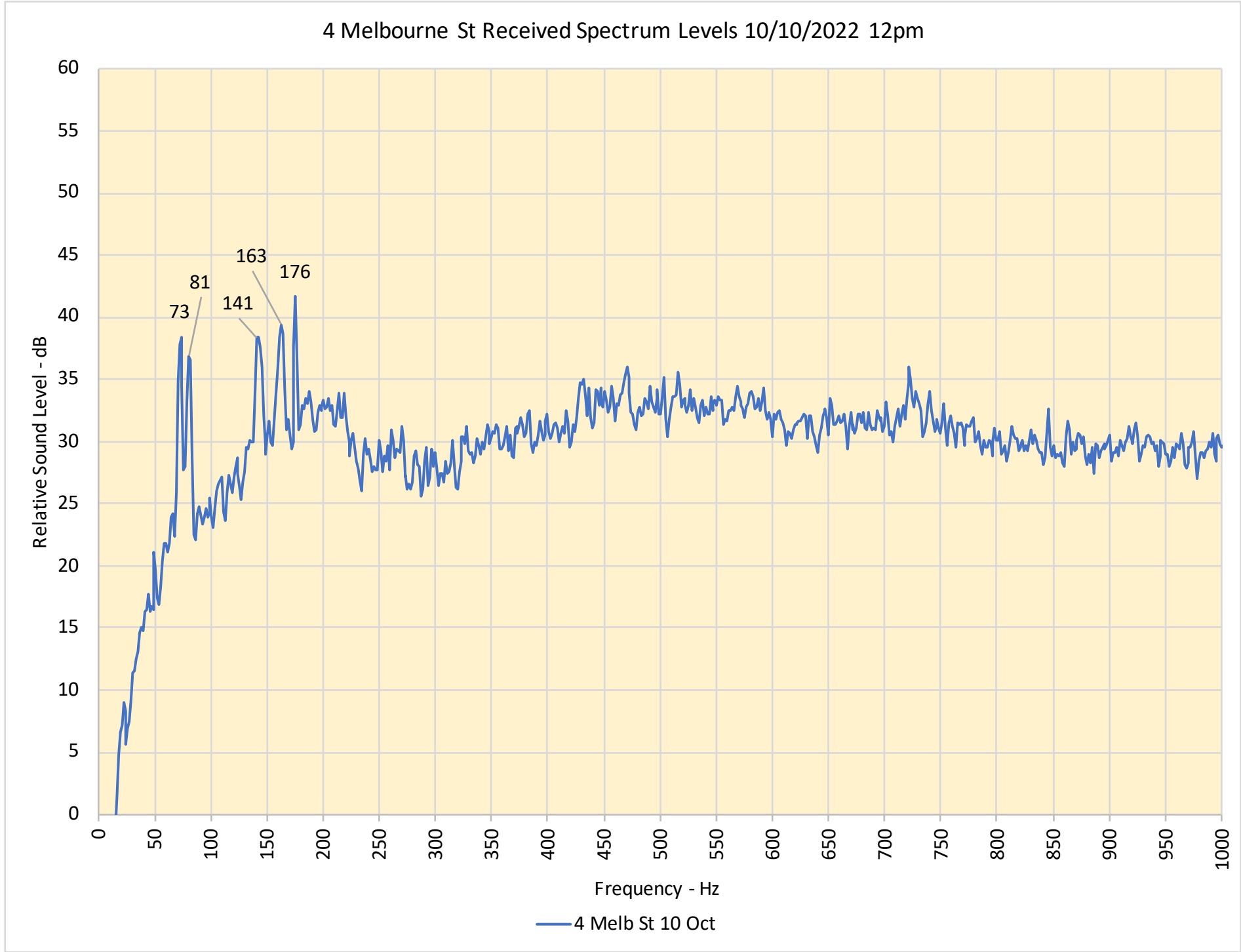
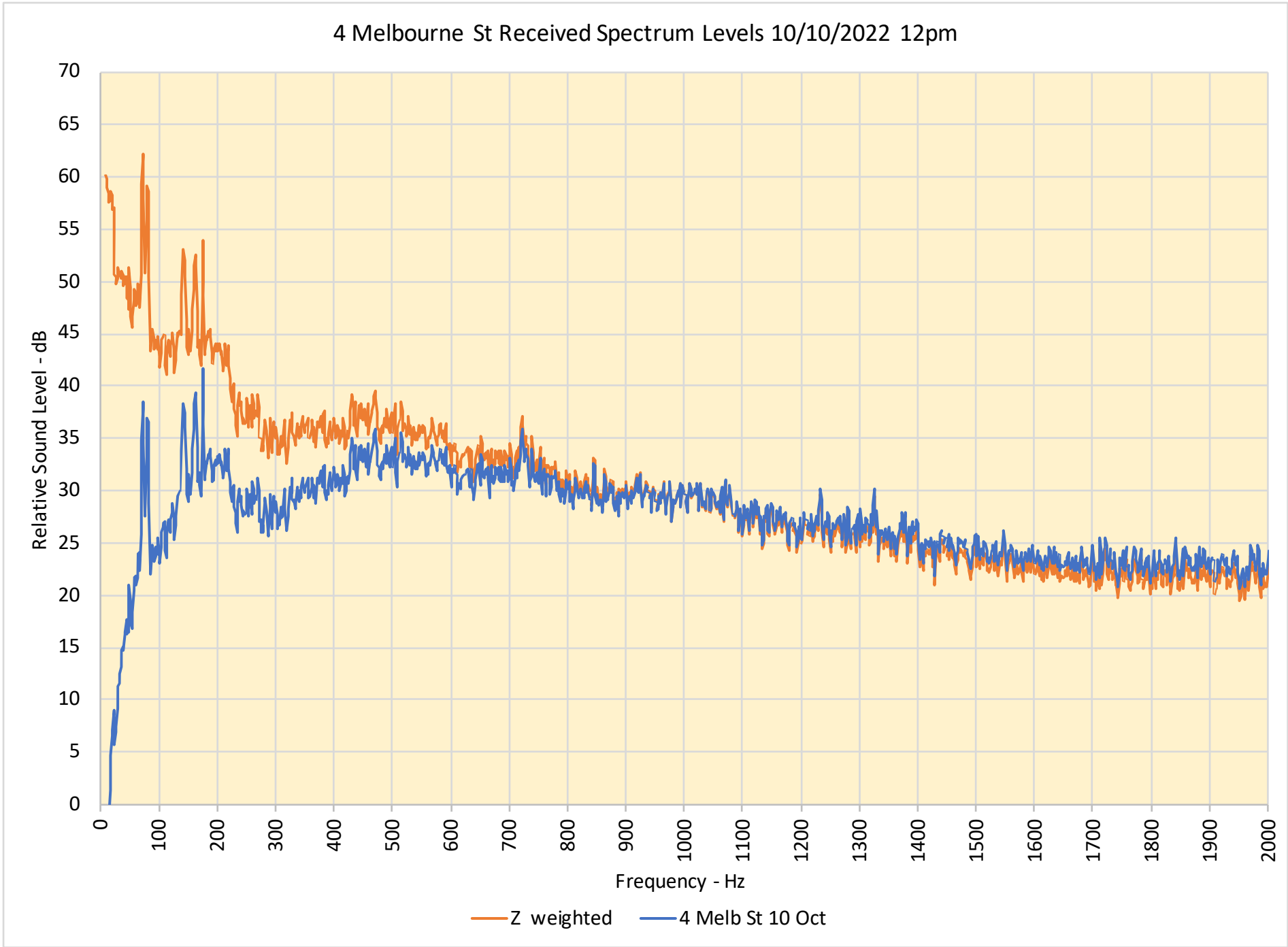
## Berrima Cement Works - Ambient - Background Noise

Location 20 - Cement Works - 10 to 25 October 2022

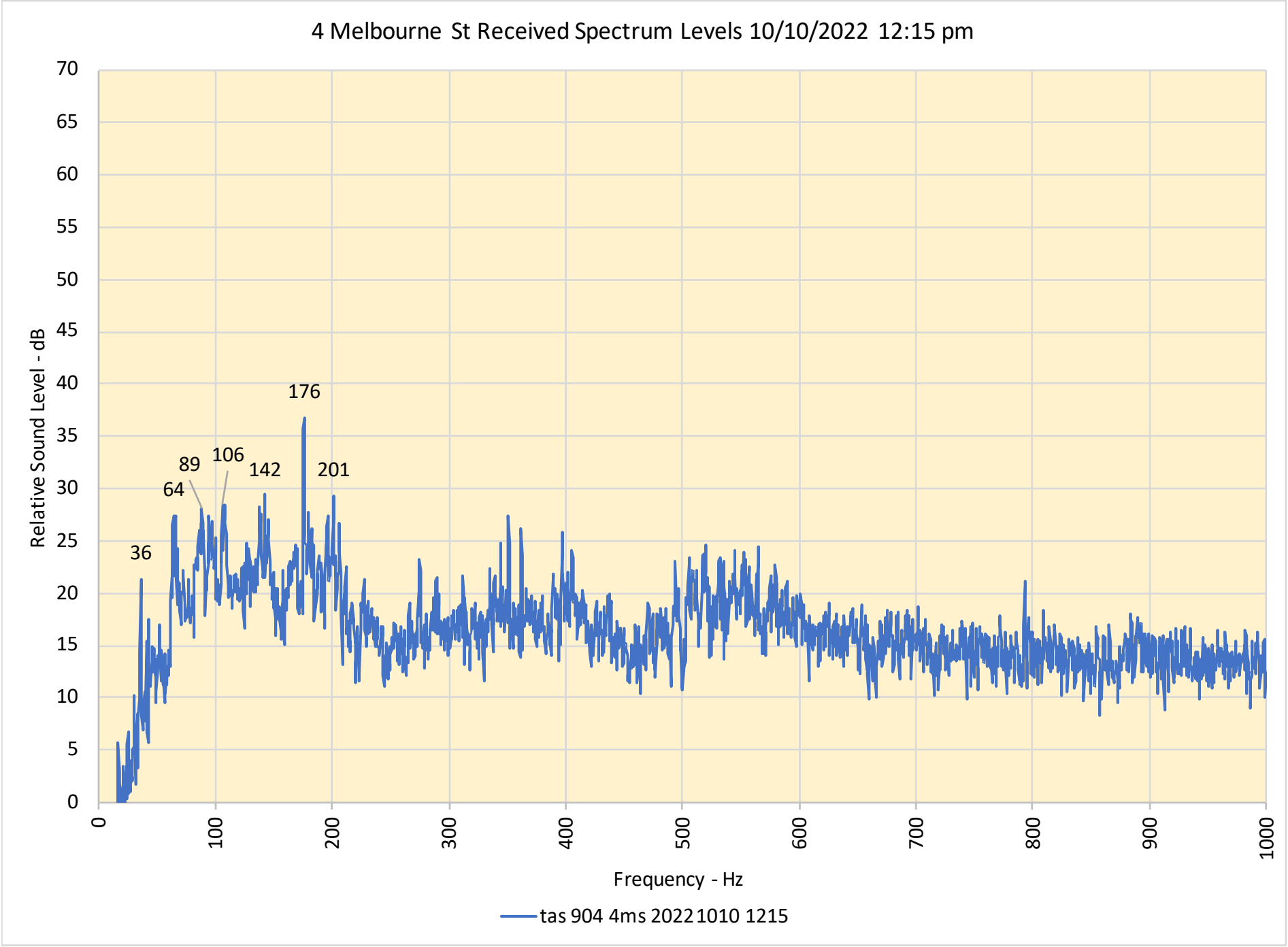
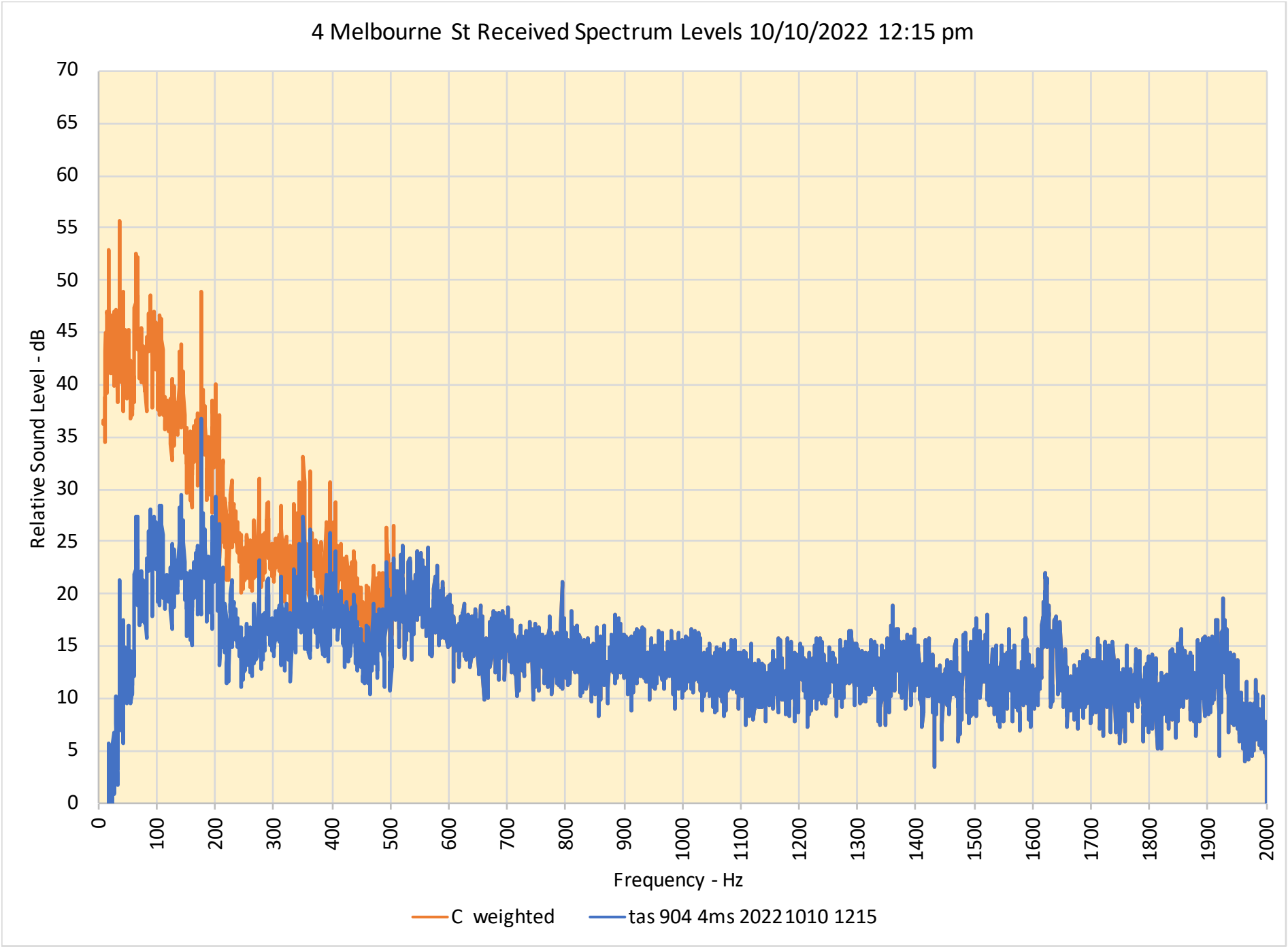
**L<sub>A90</sub> Scatter matched with Wind Direction**



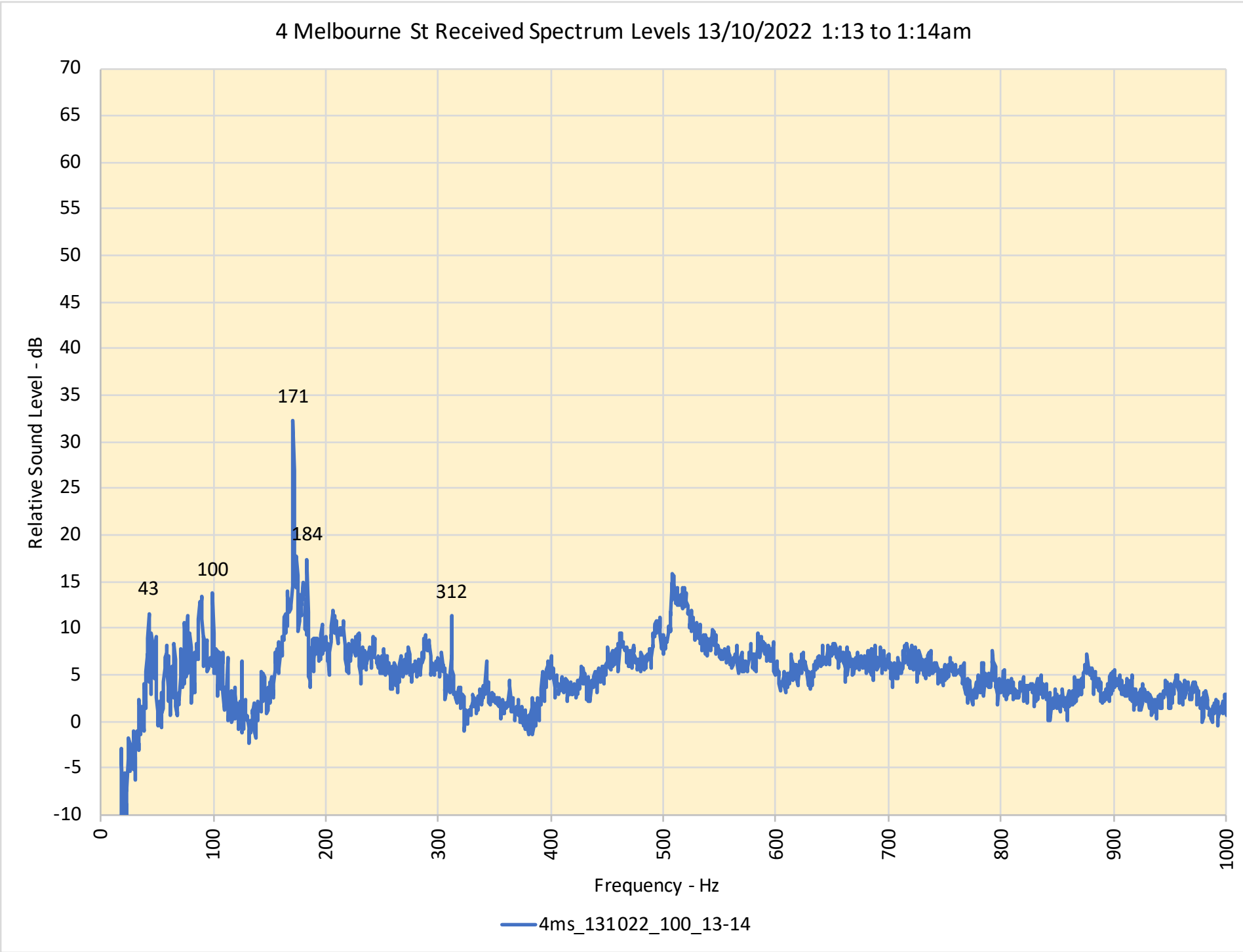
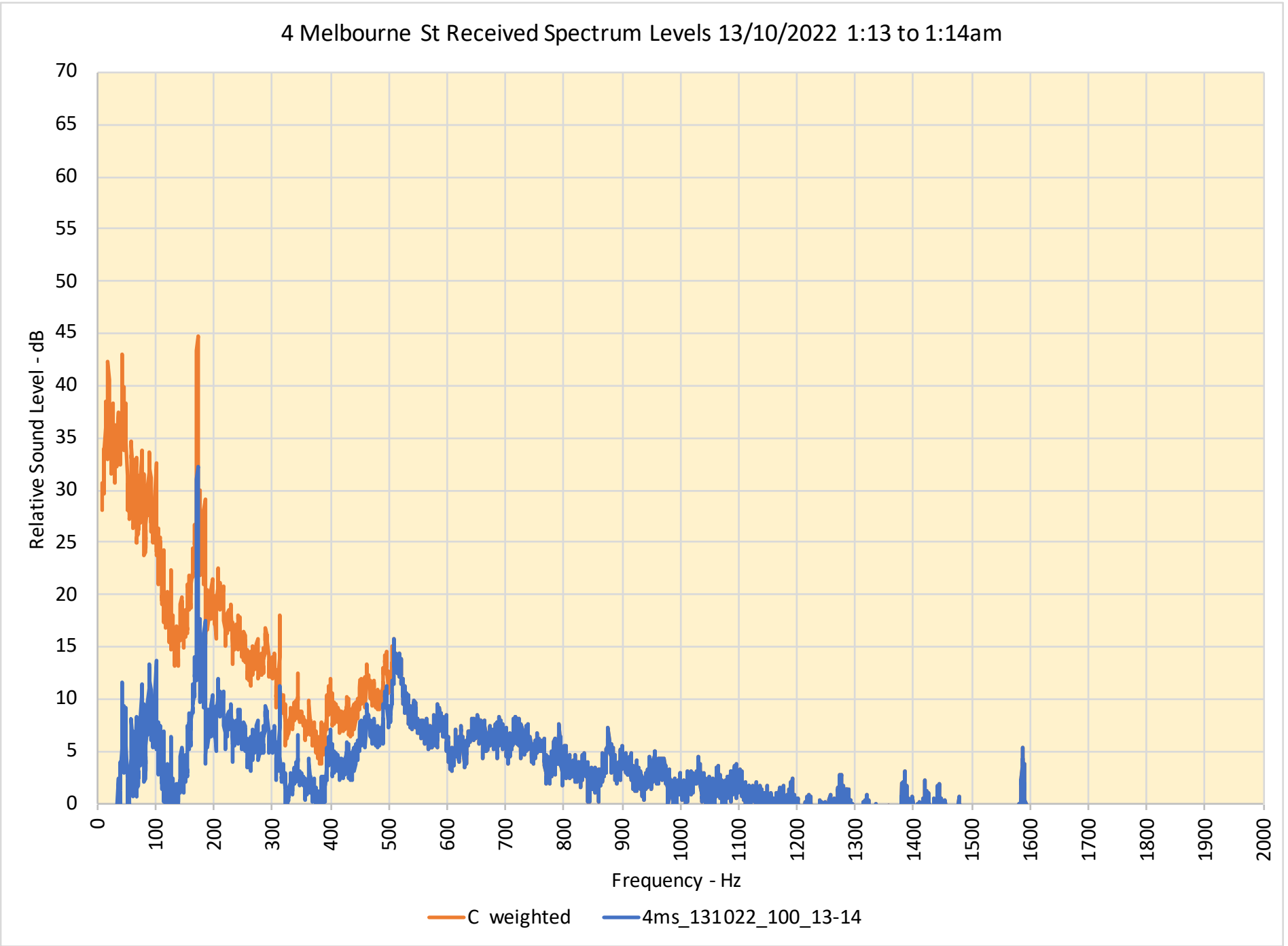
## **Appendix E: Narrow-band spectra from attended measurement recordings**

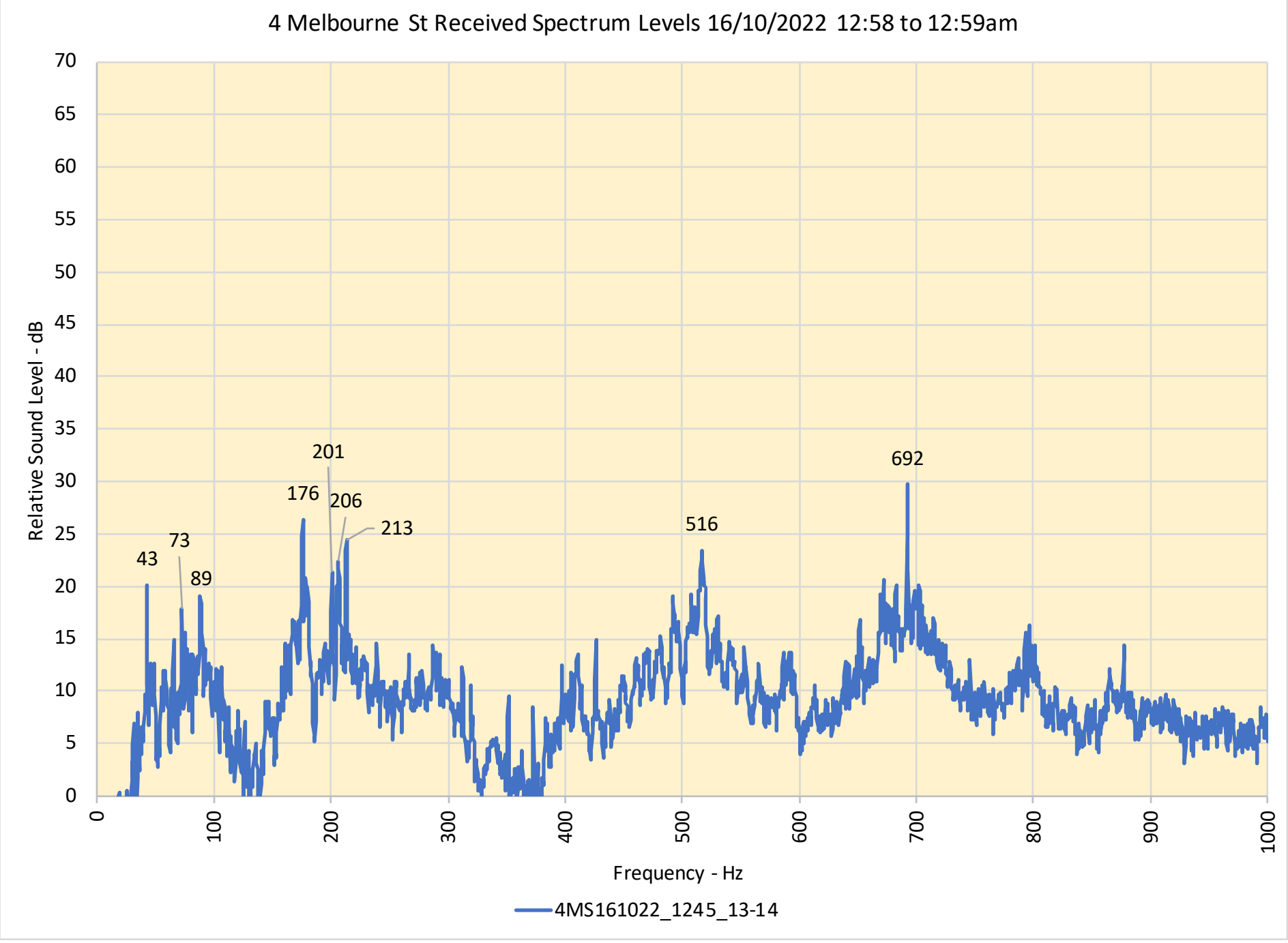
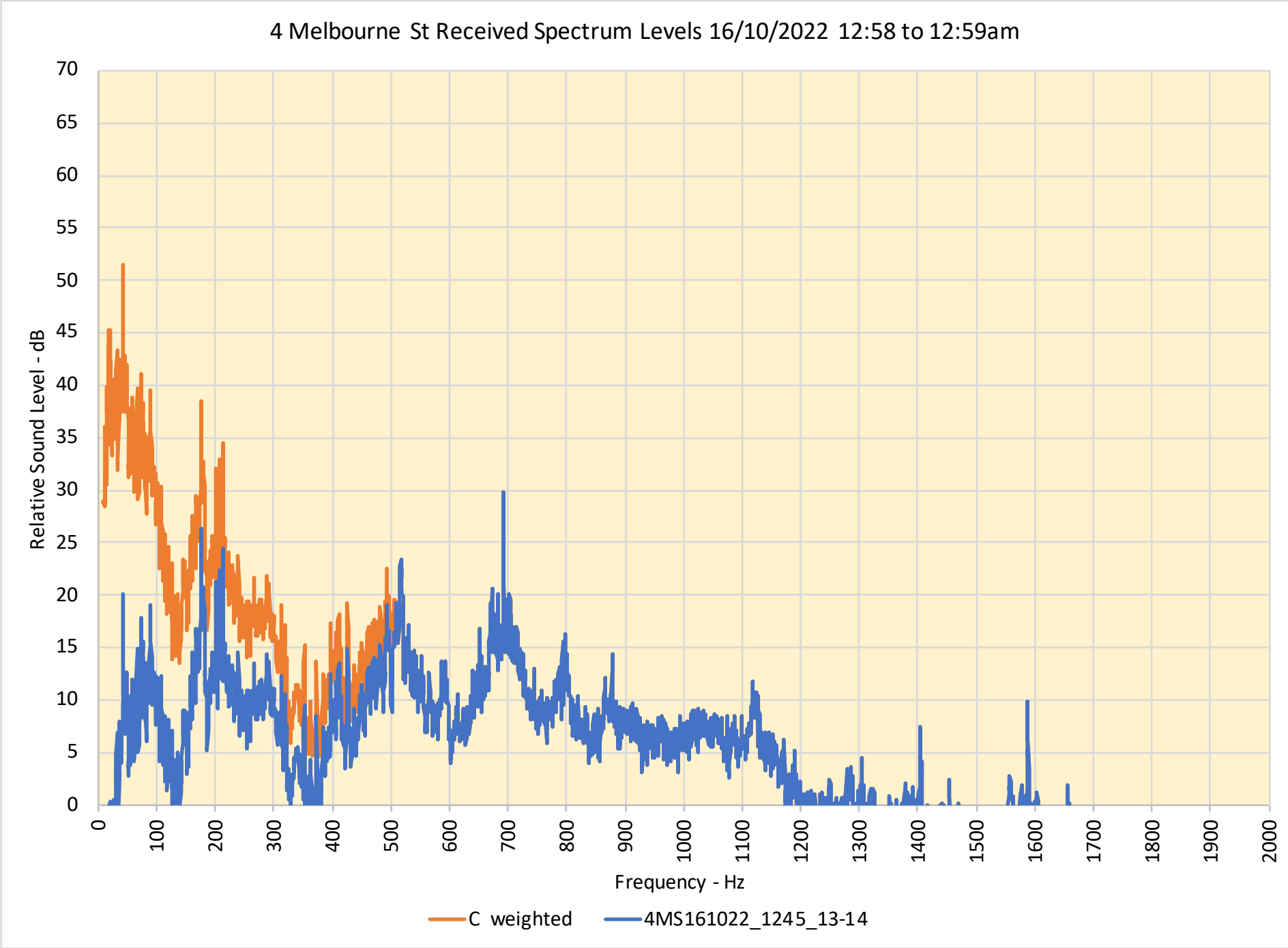


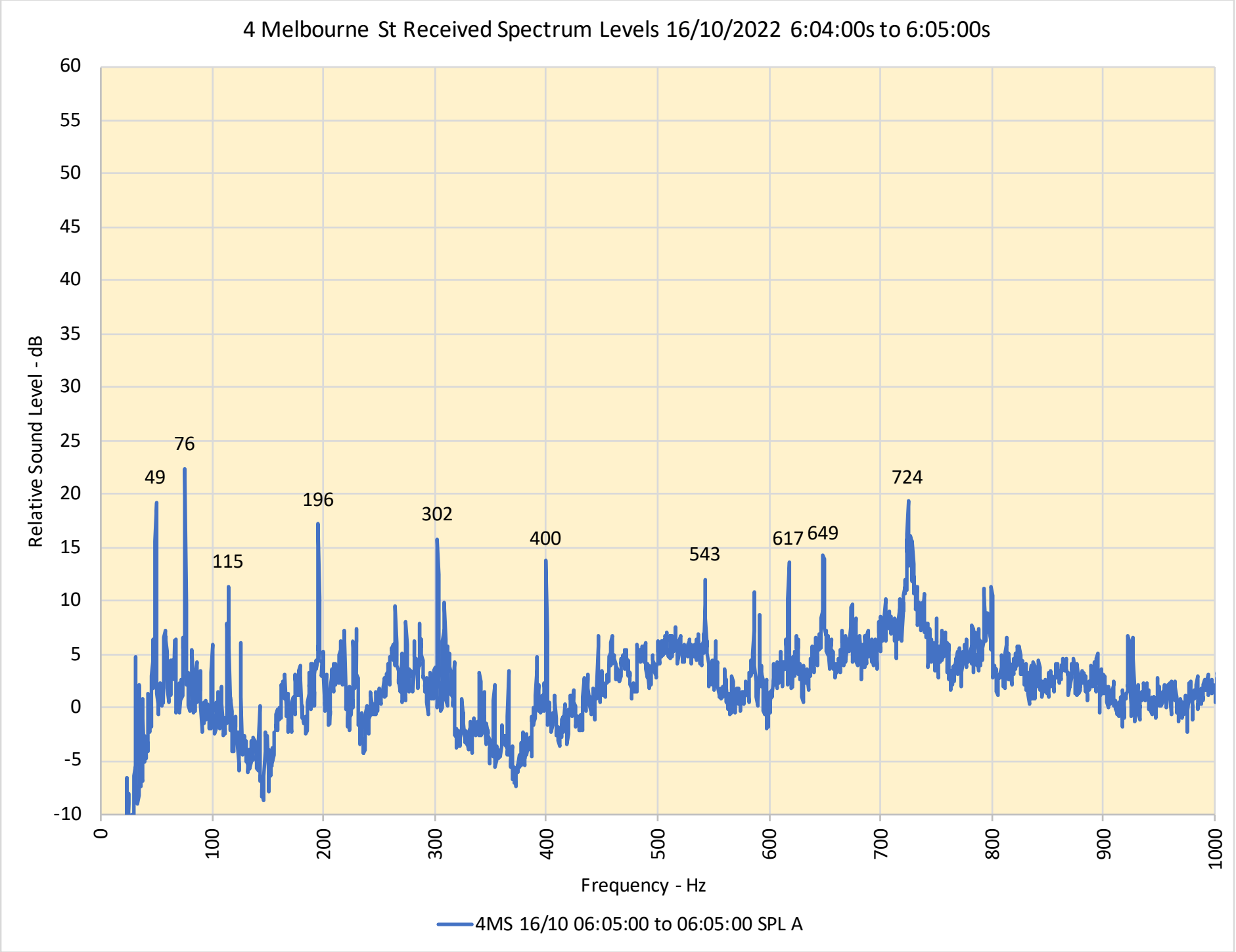
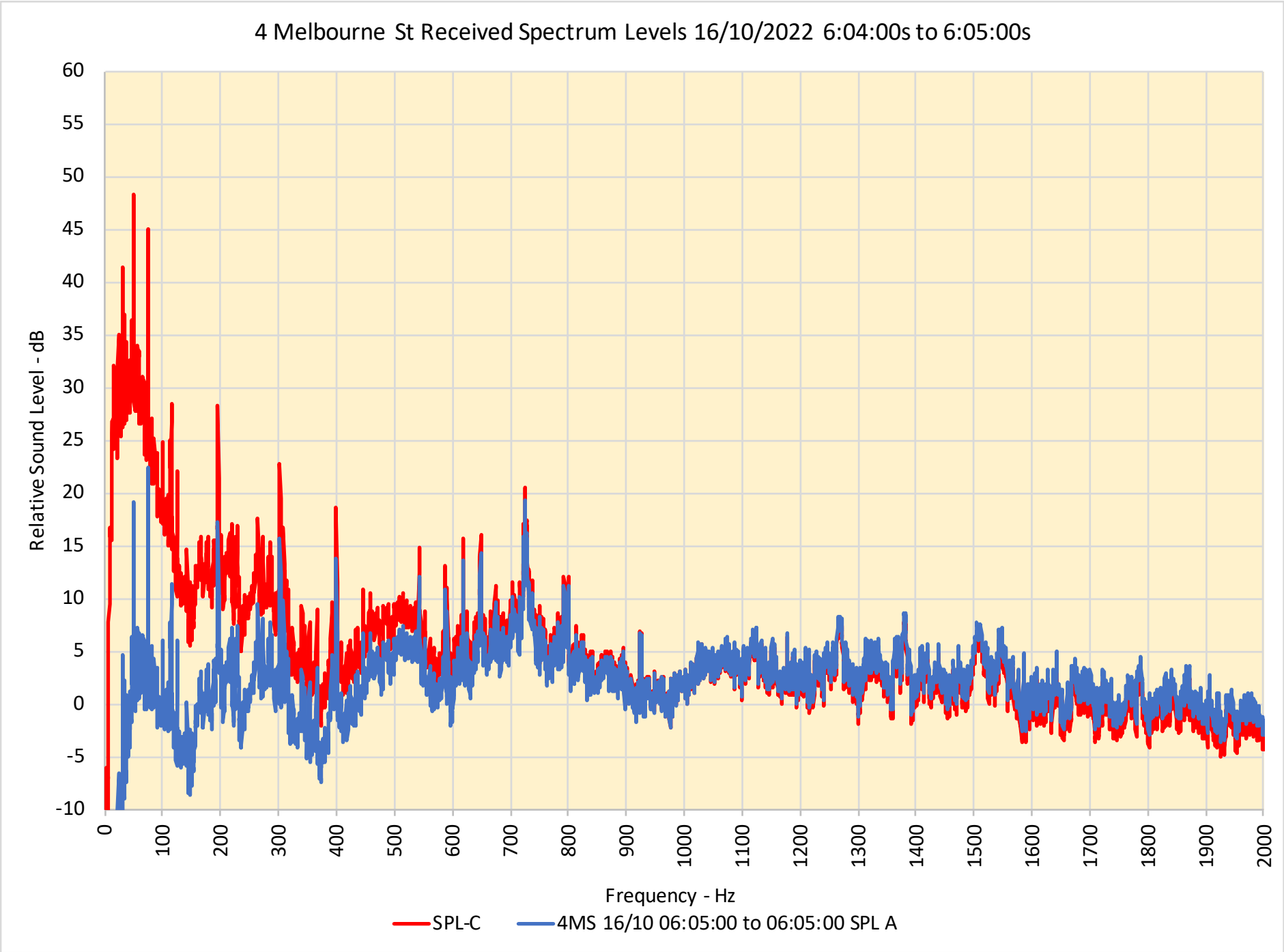
Appendix E Figure E1



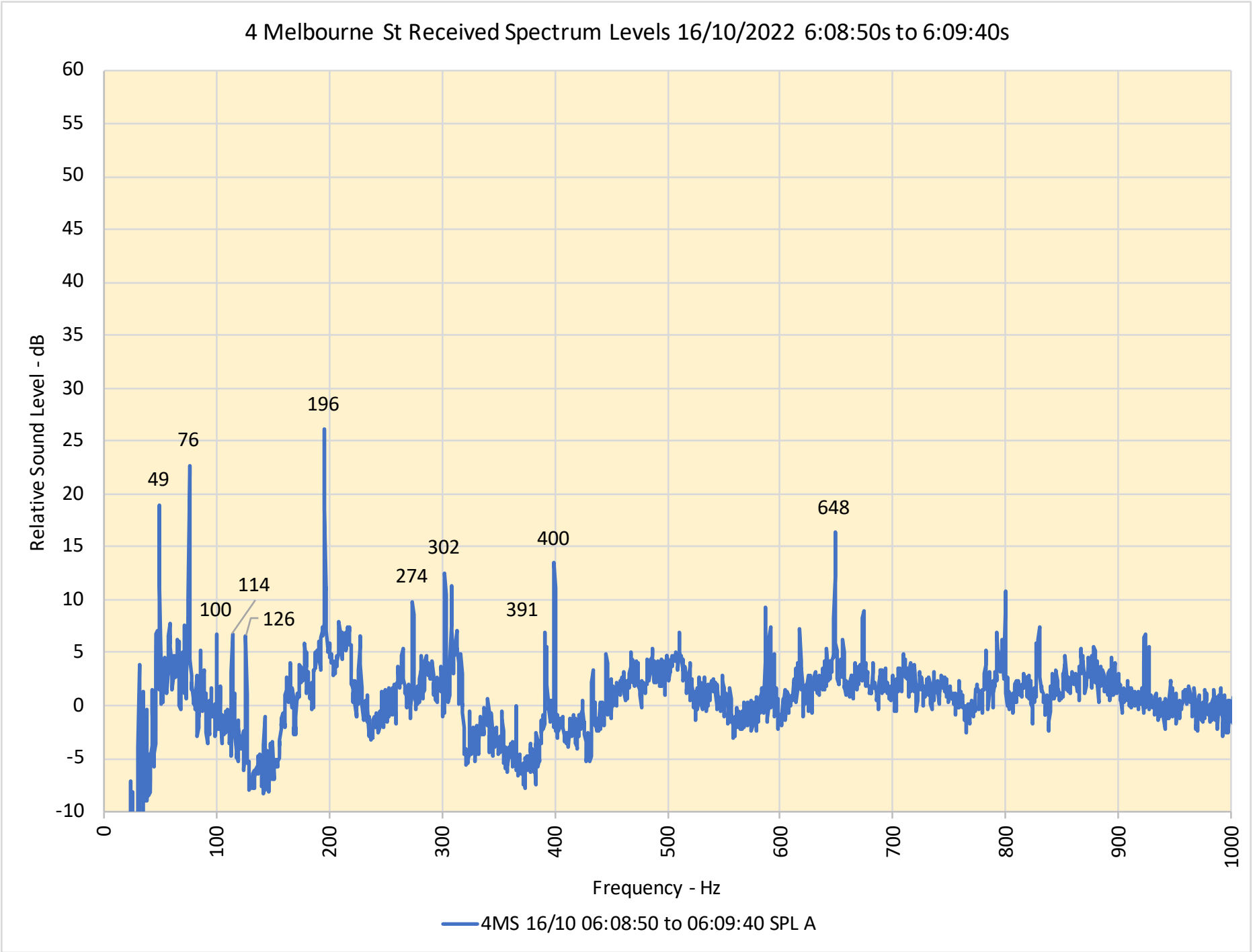
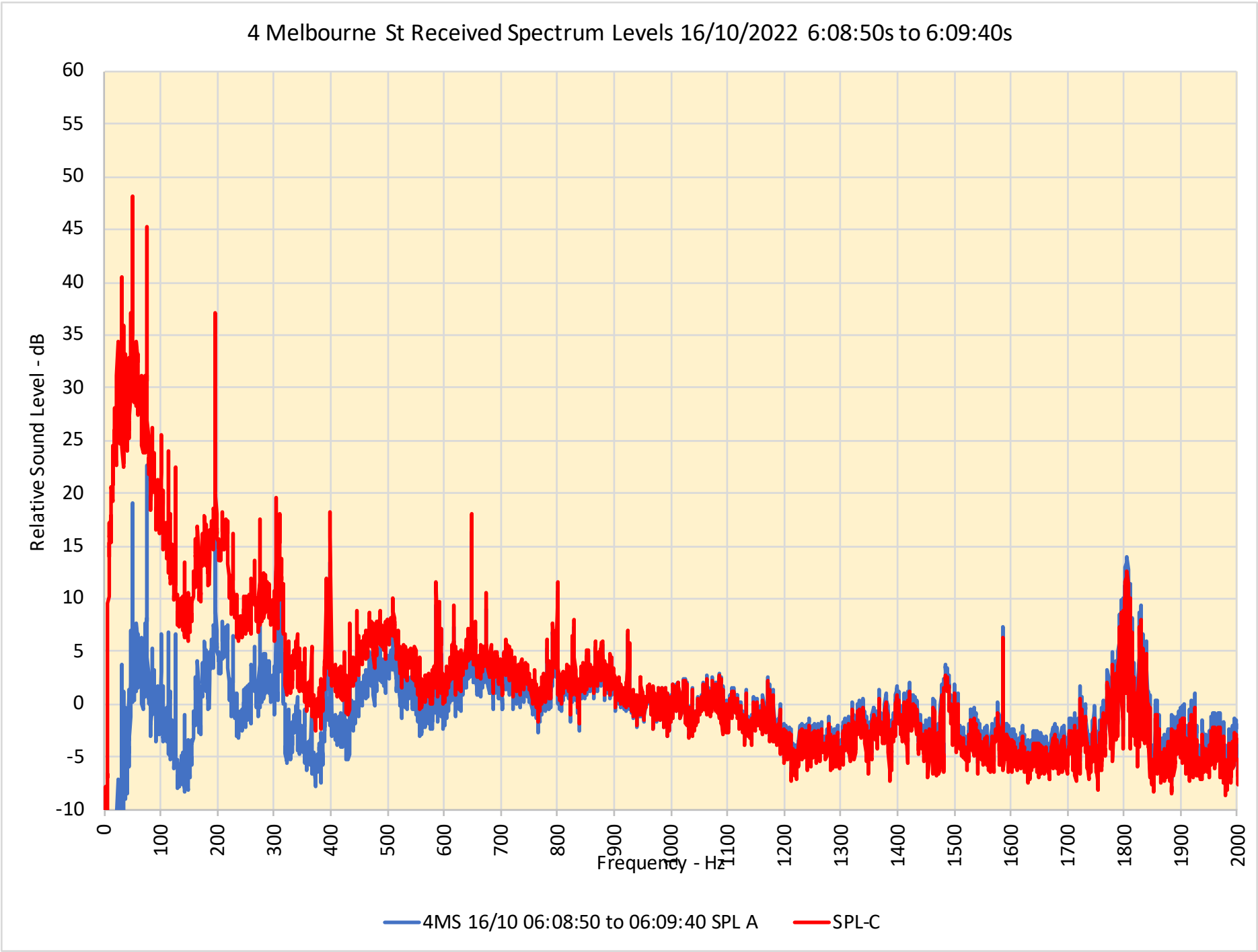




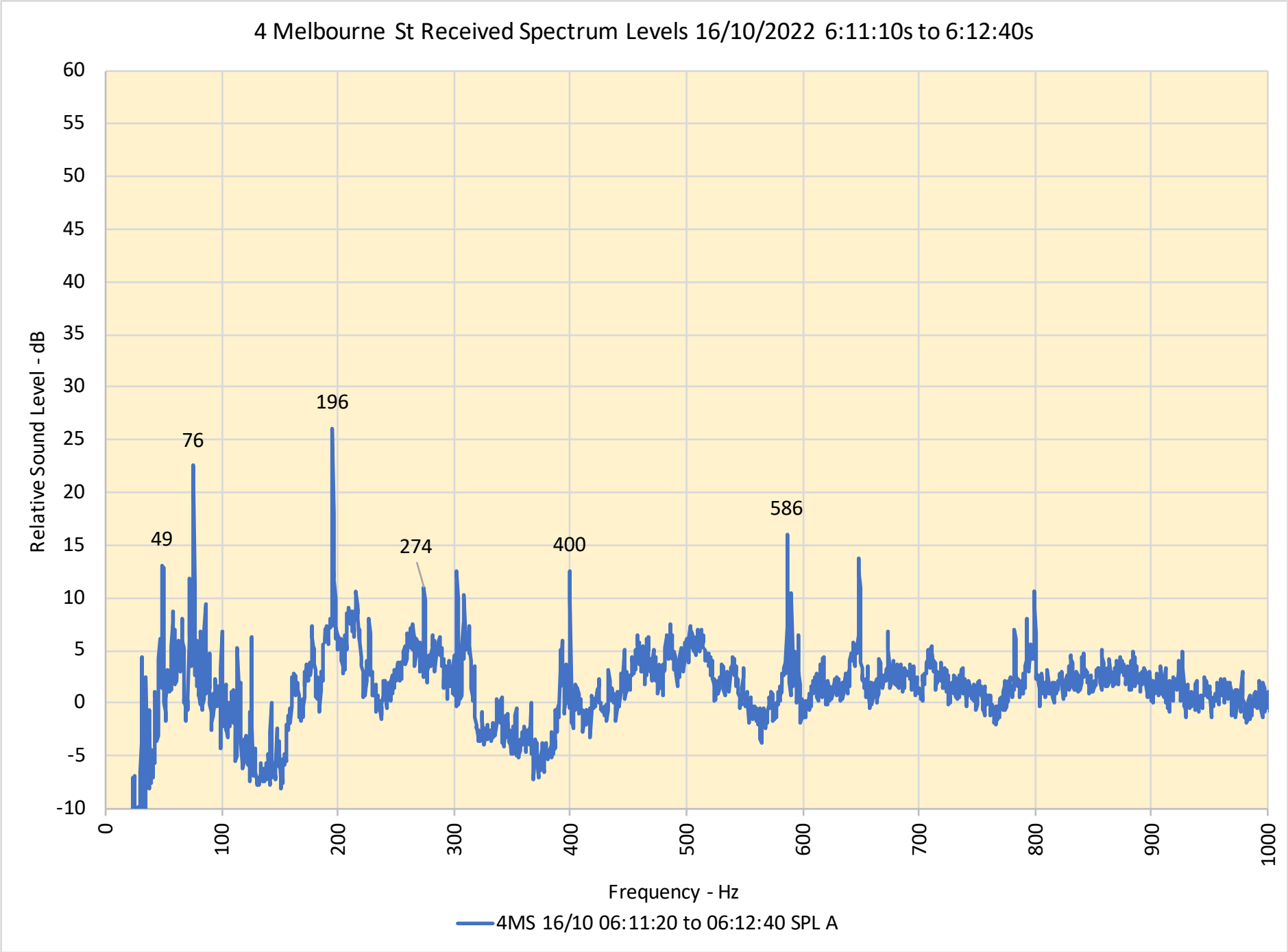
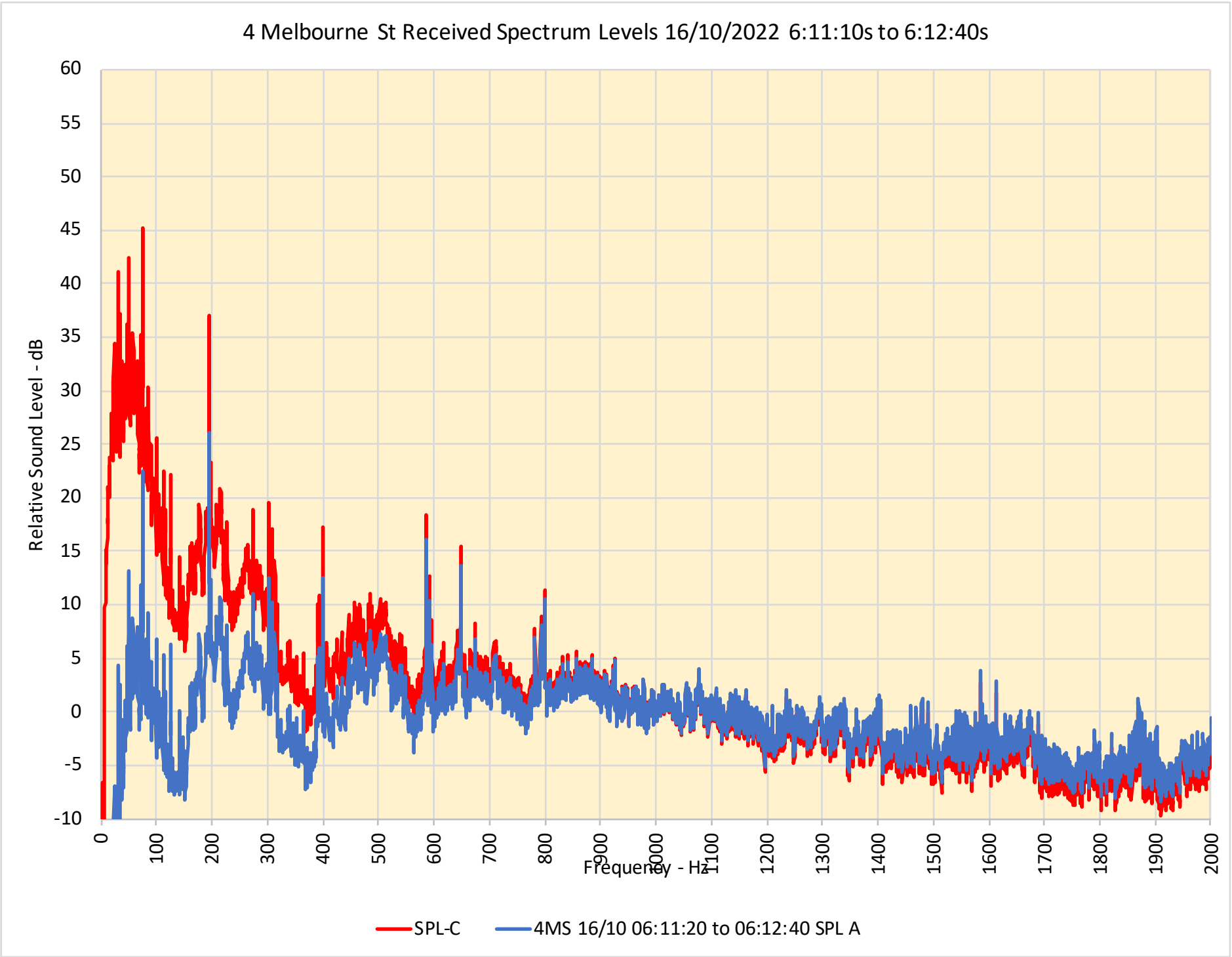




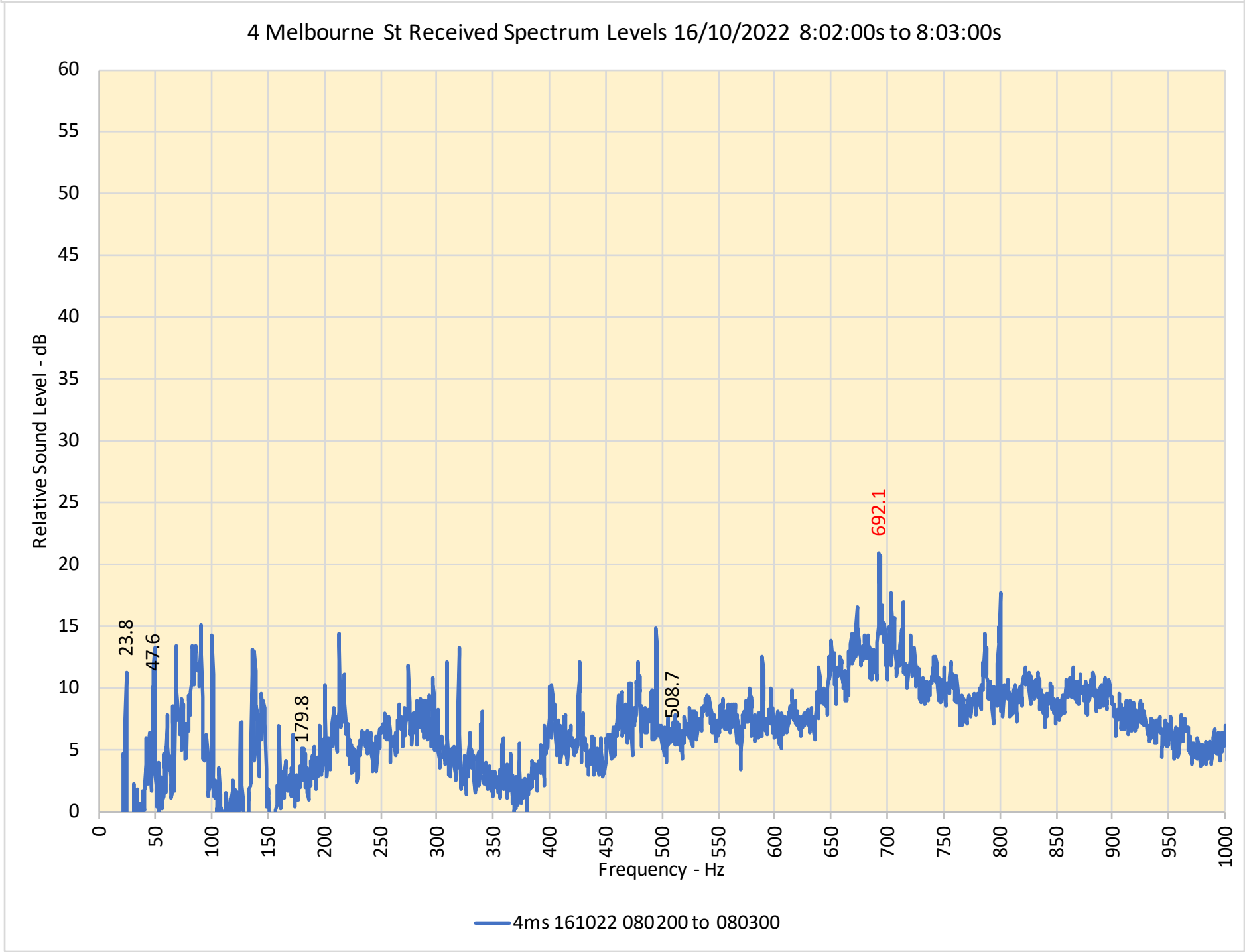
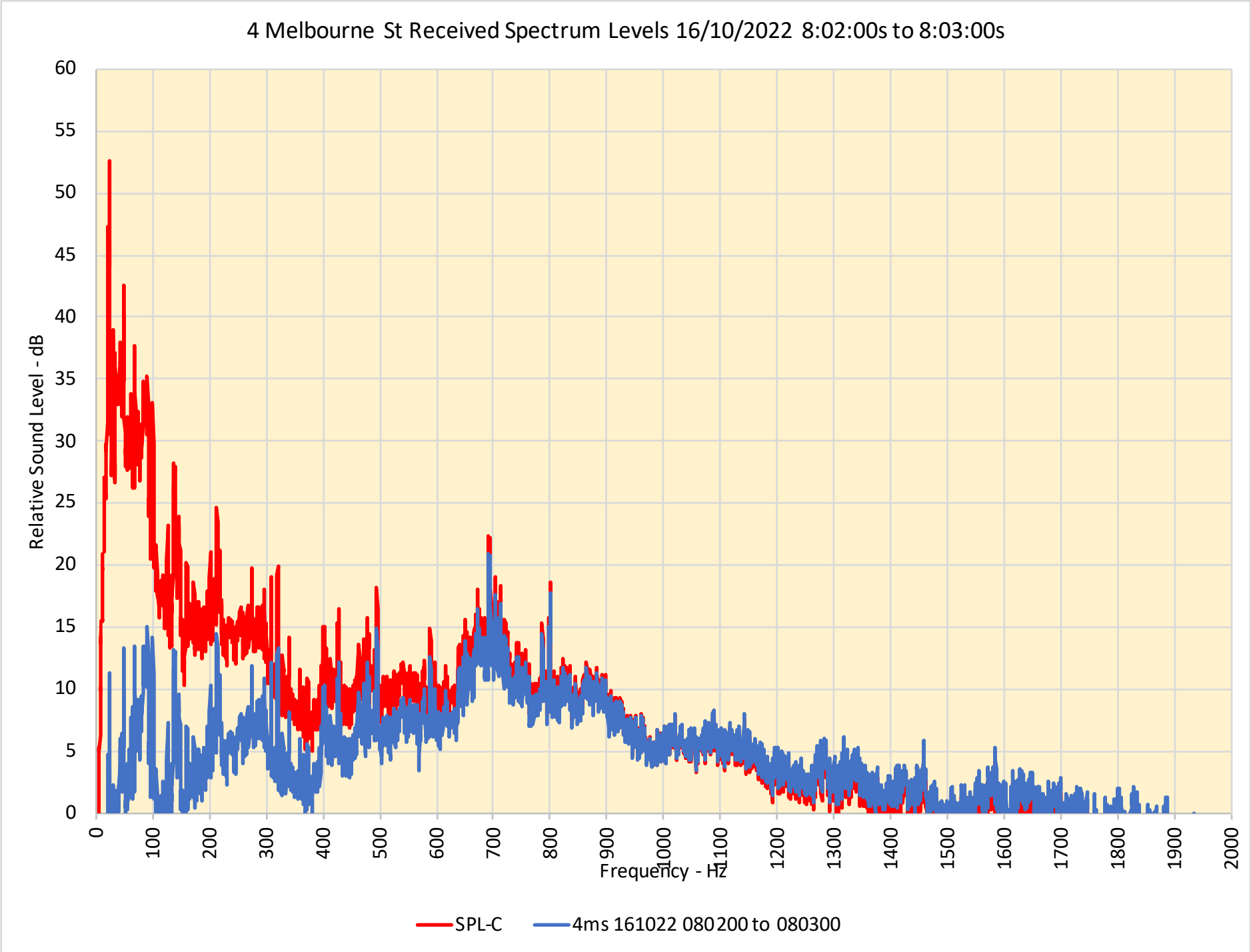
Appendix E Figure E5

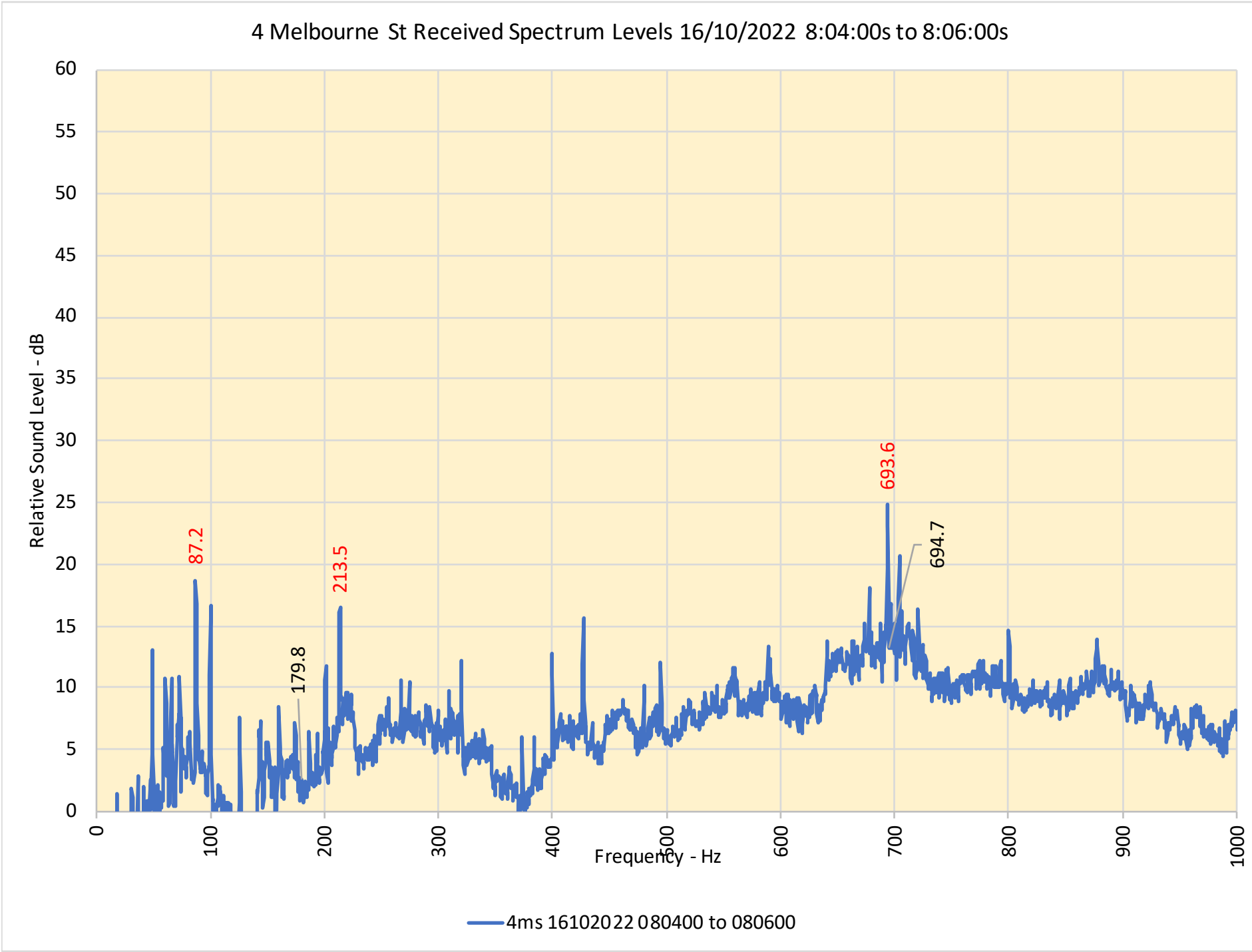
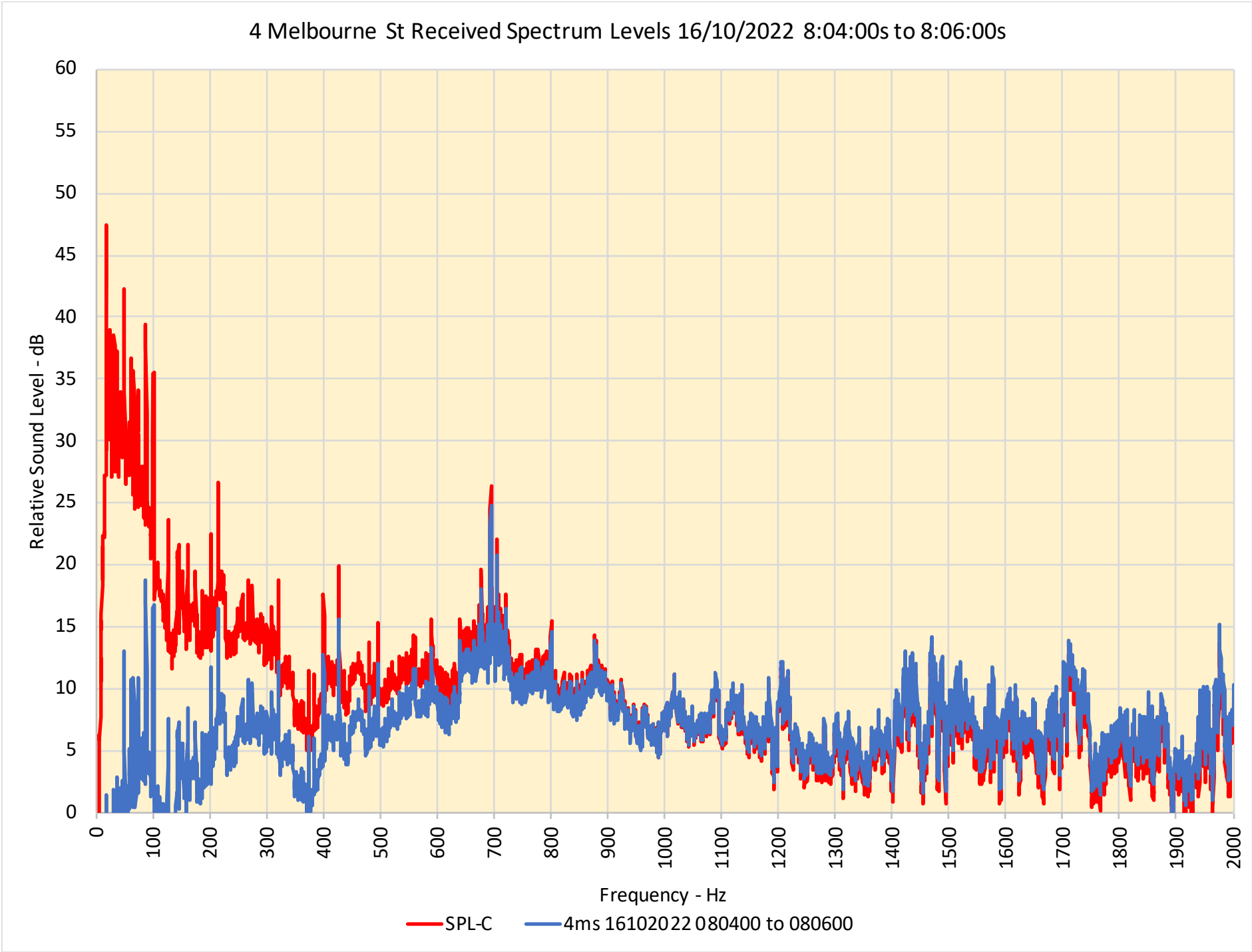


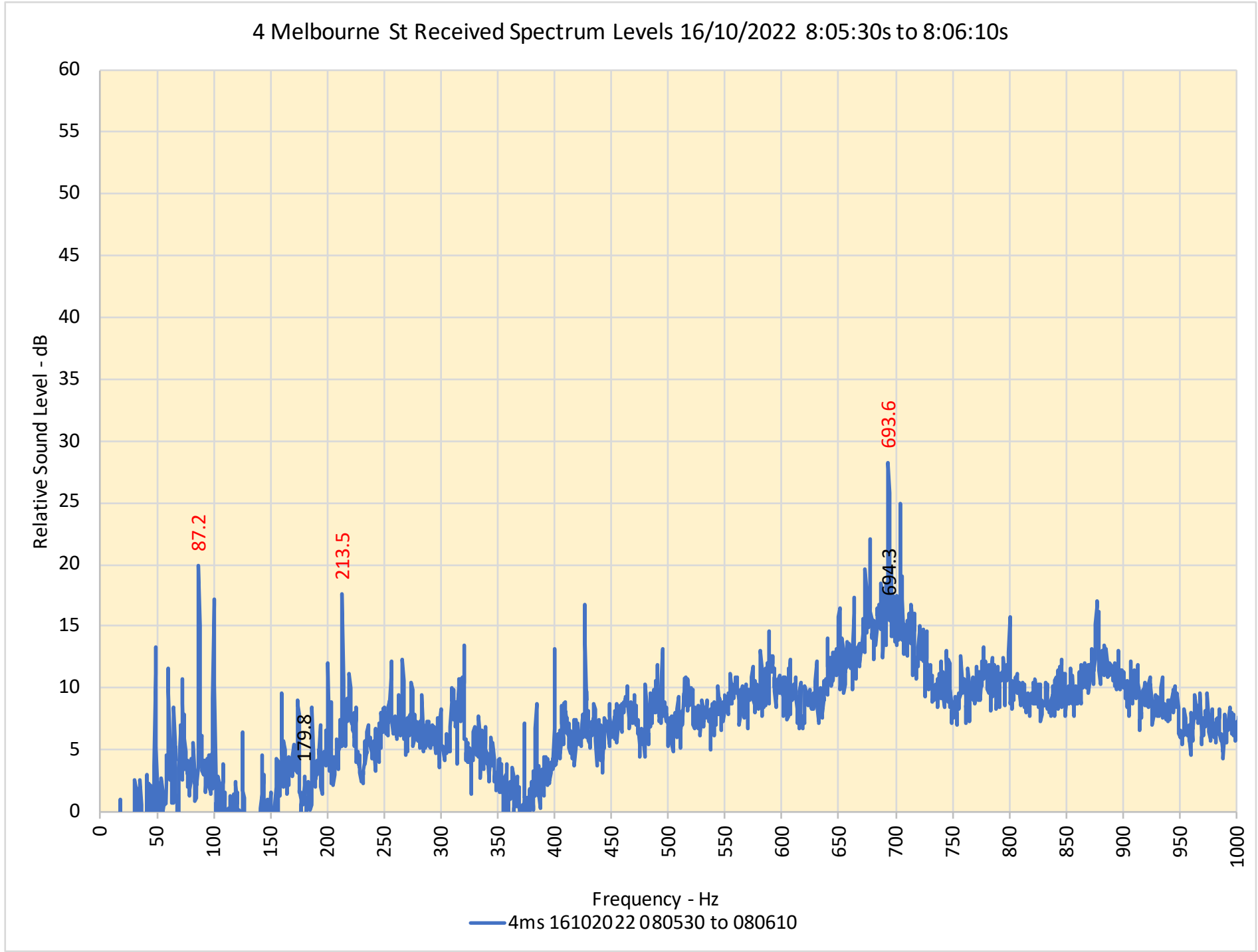
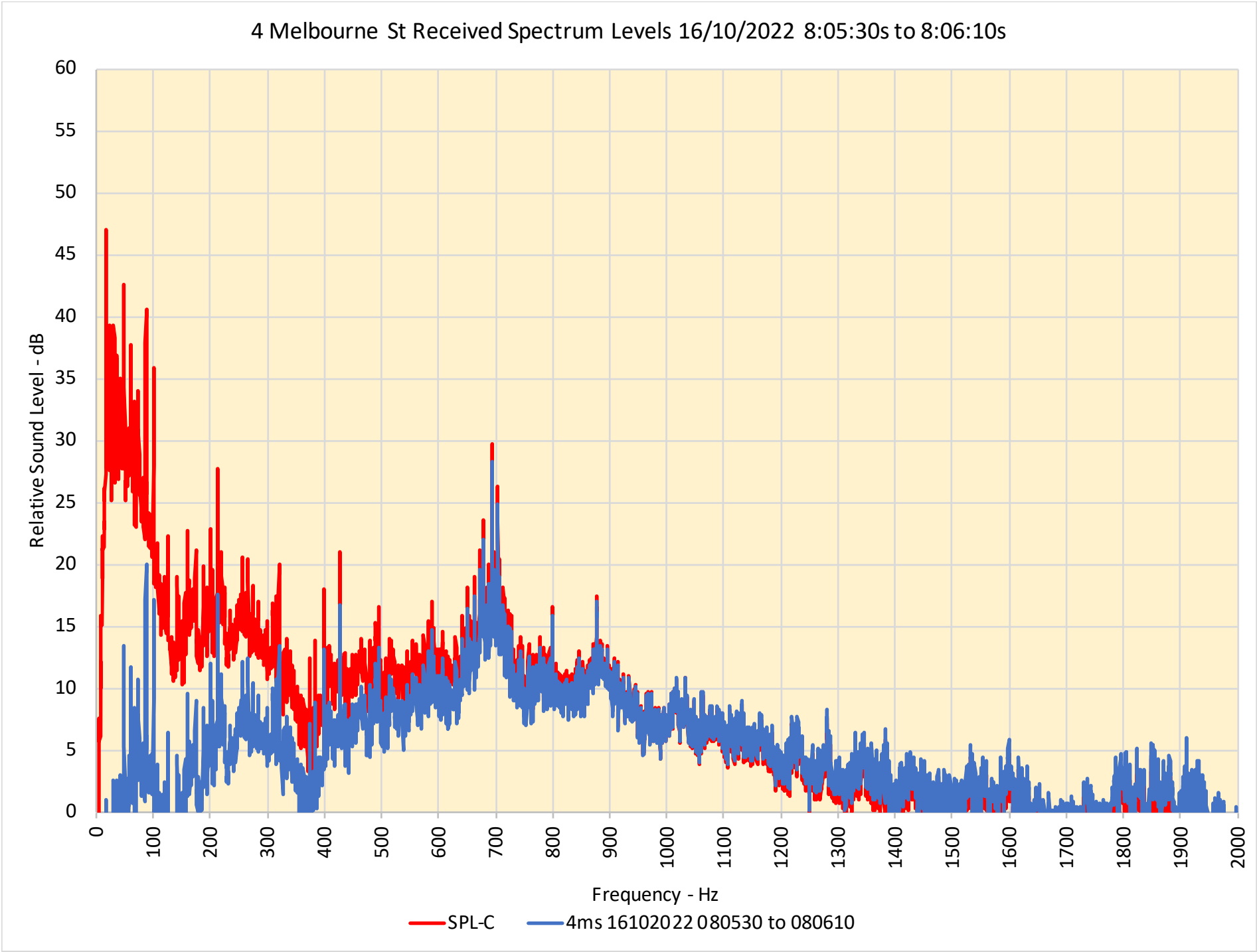
Appendix E Figure E6



Appendix E Figure E7

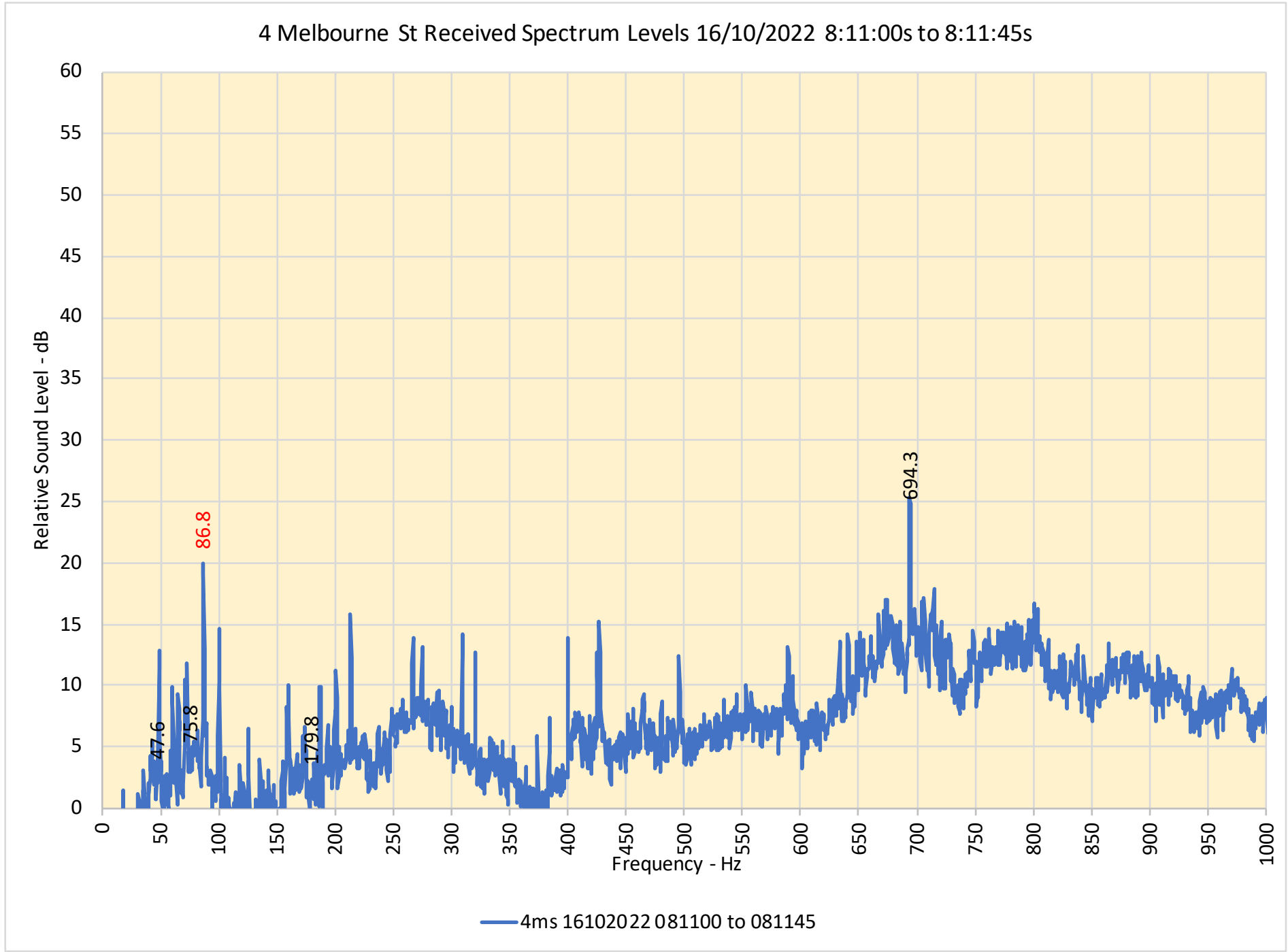
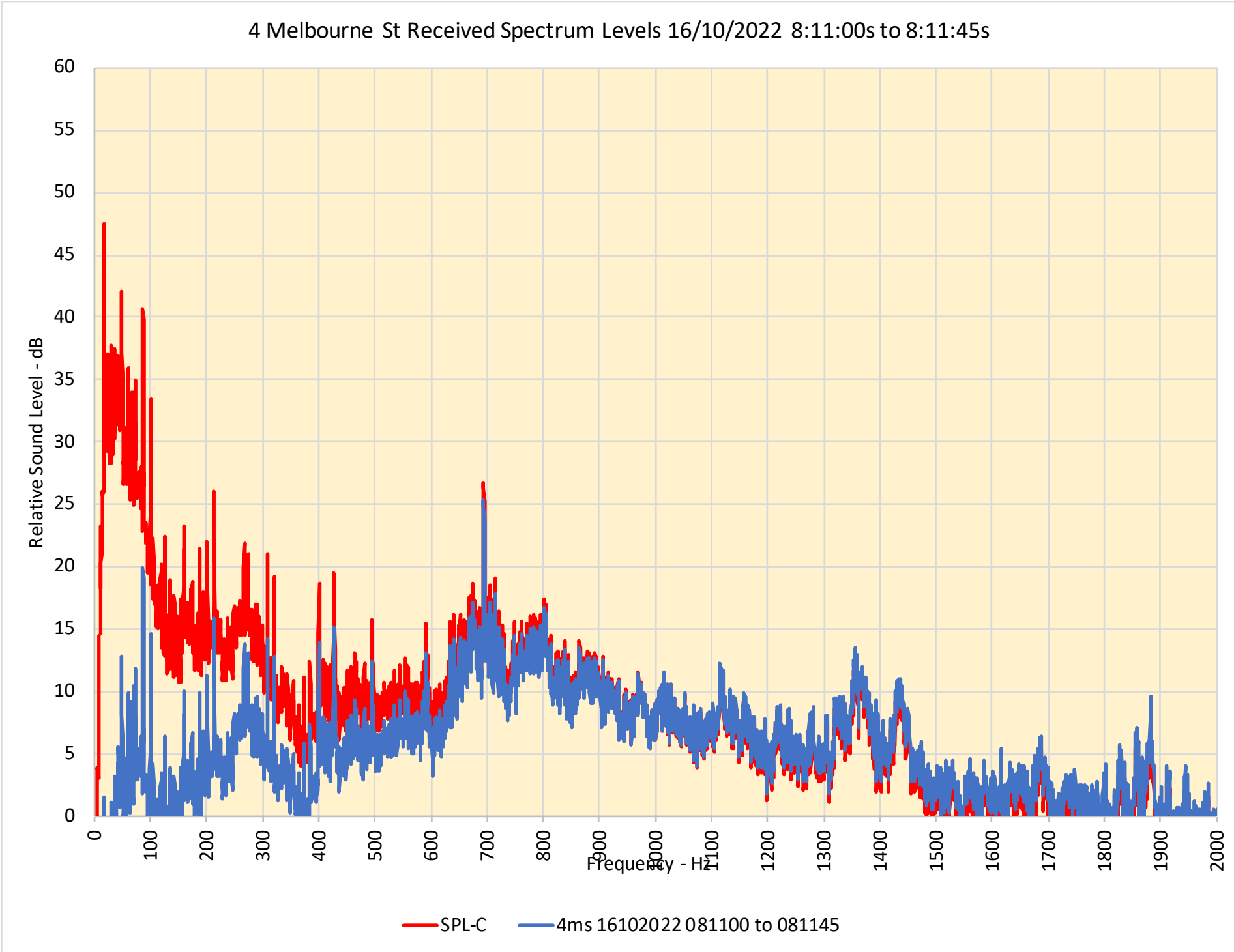




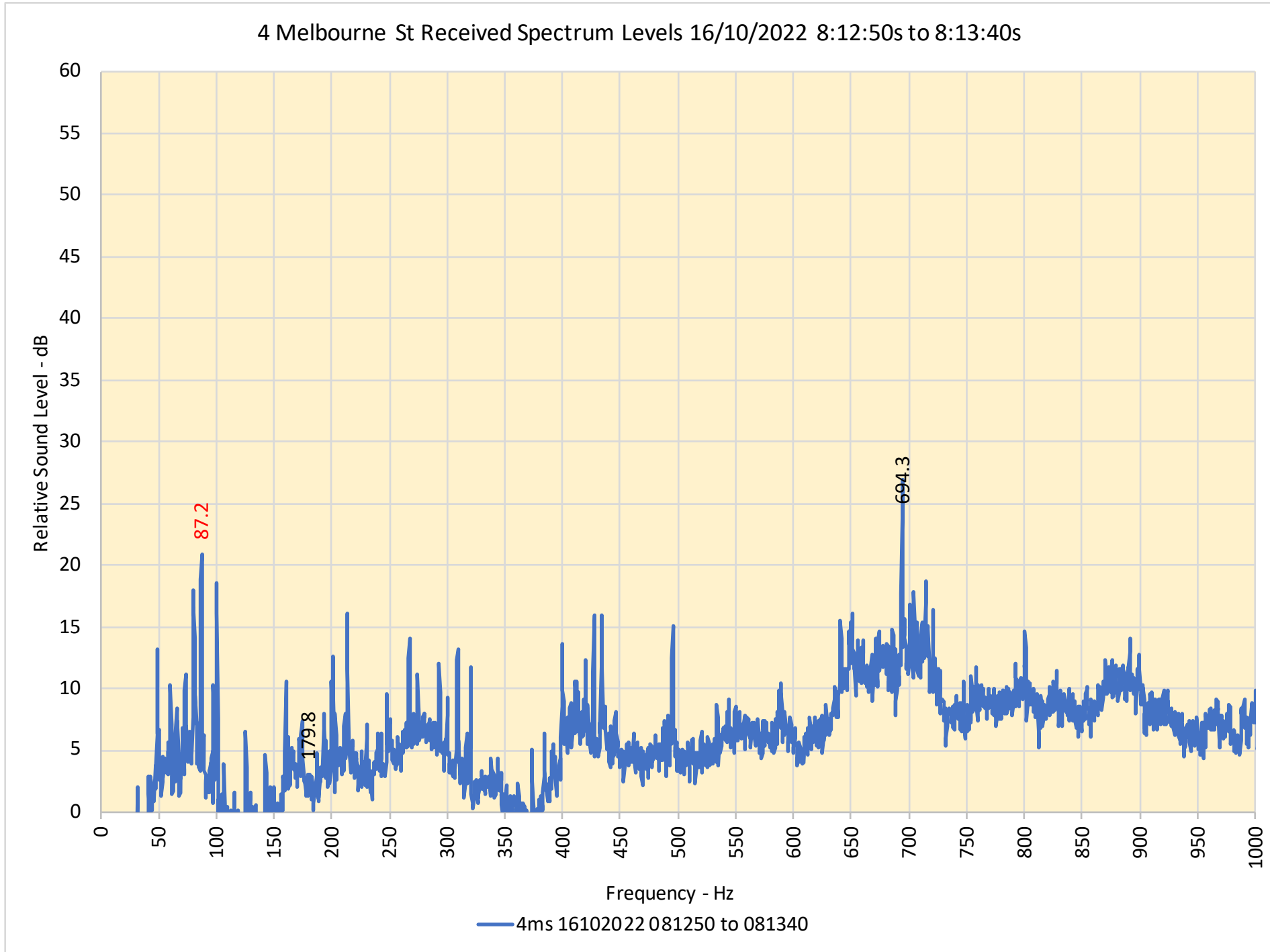
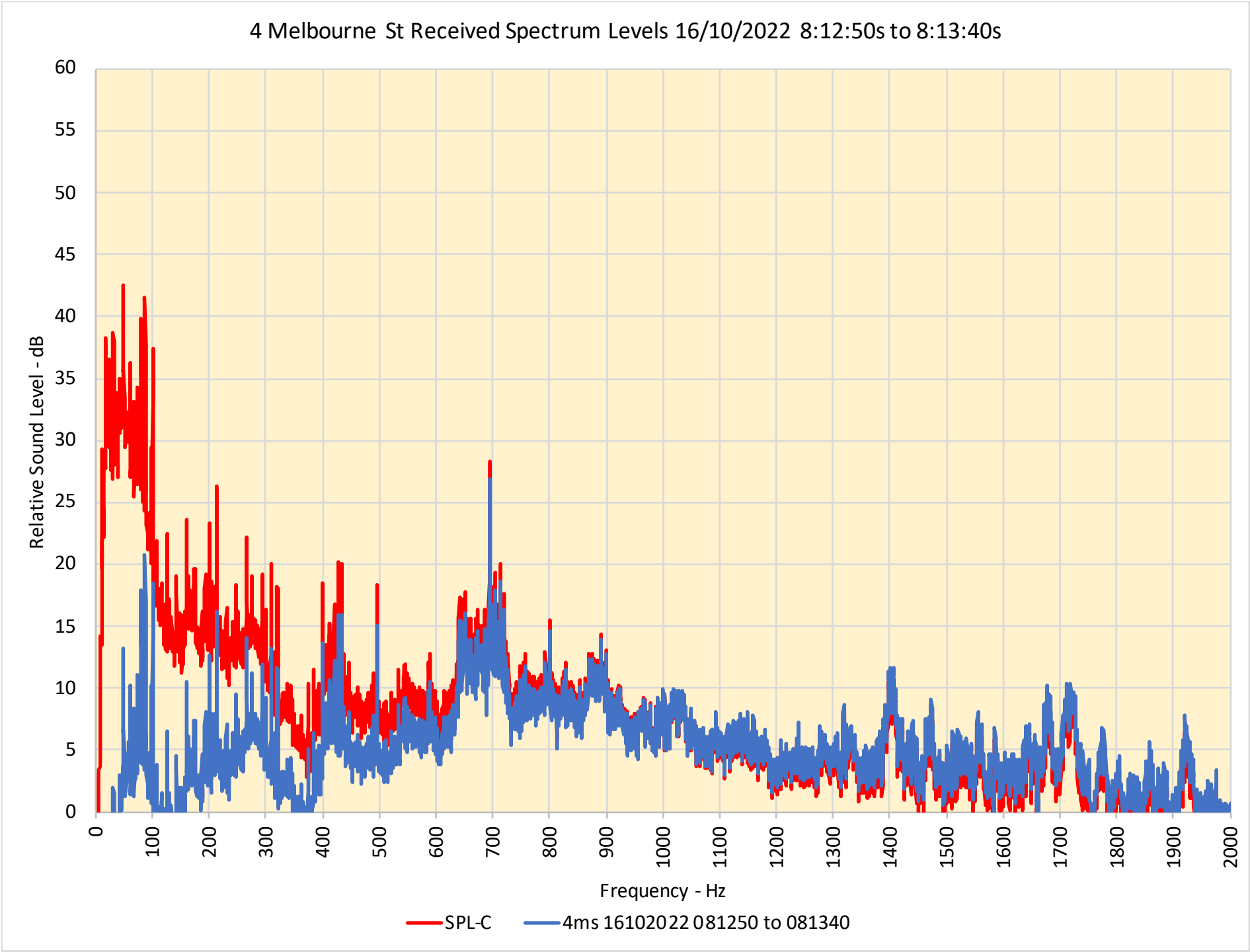


Appendix E Figure E10

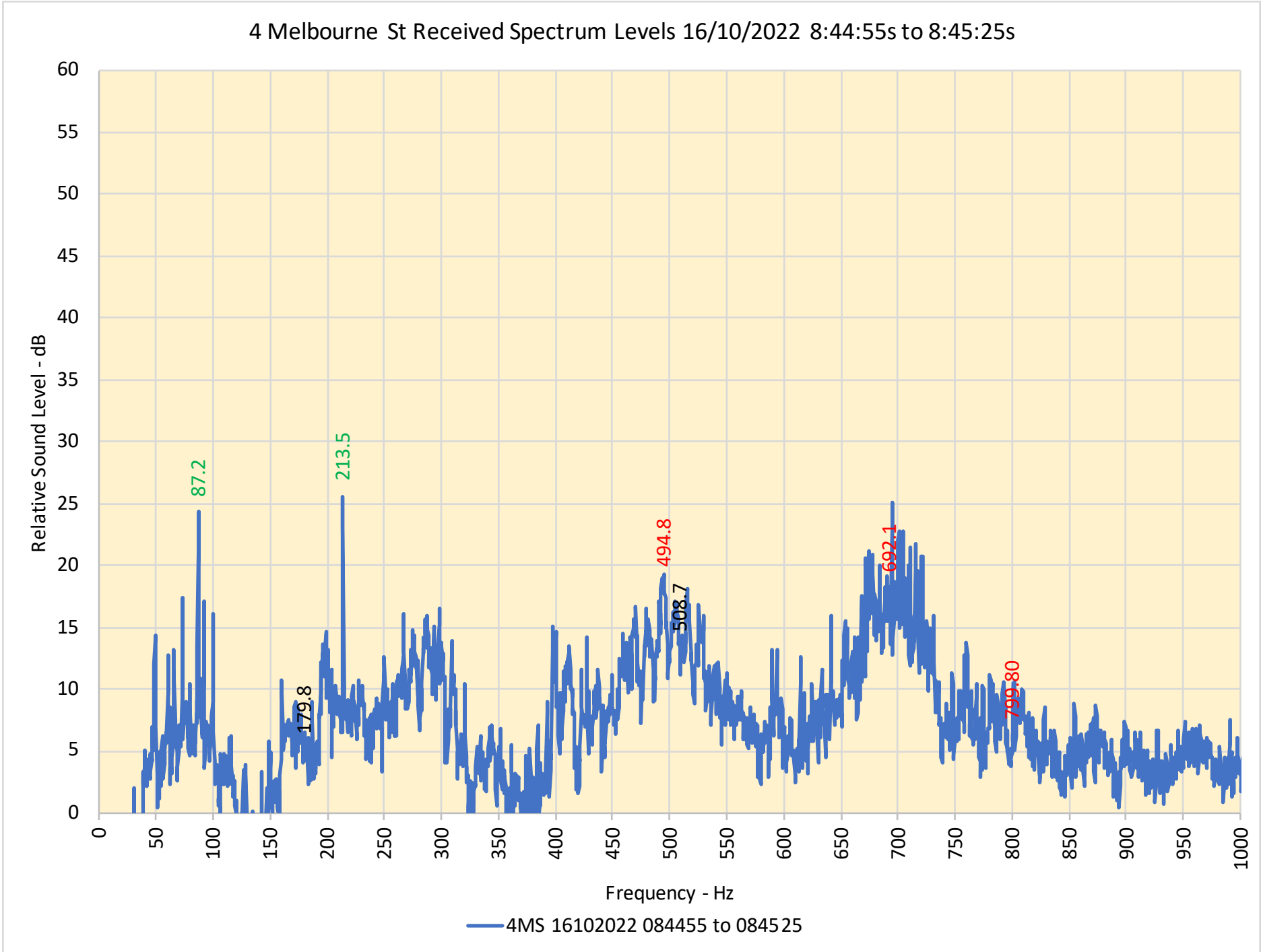
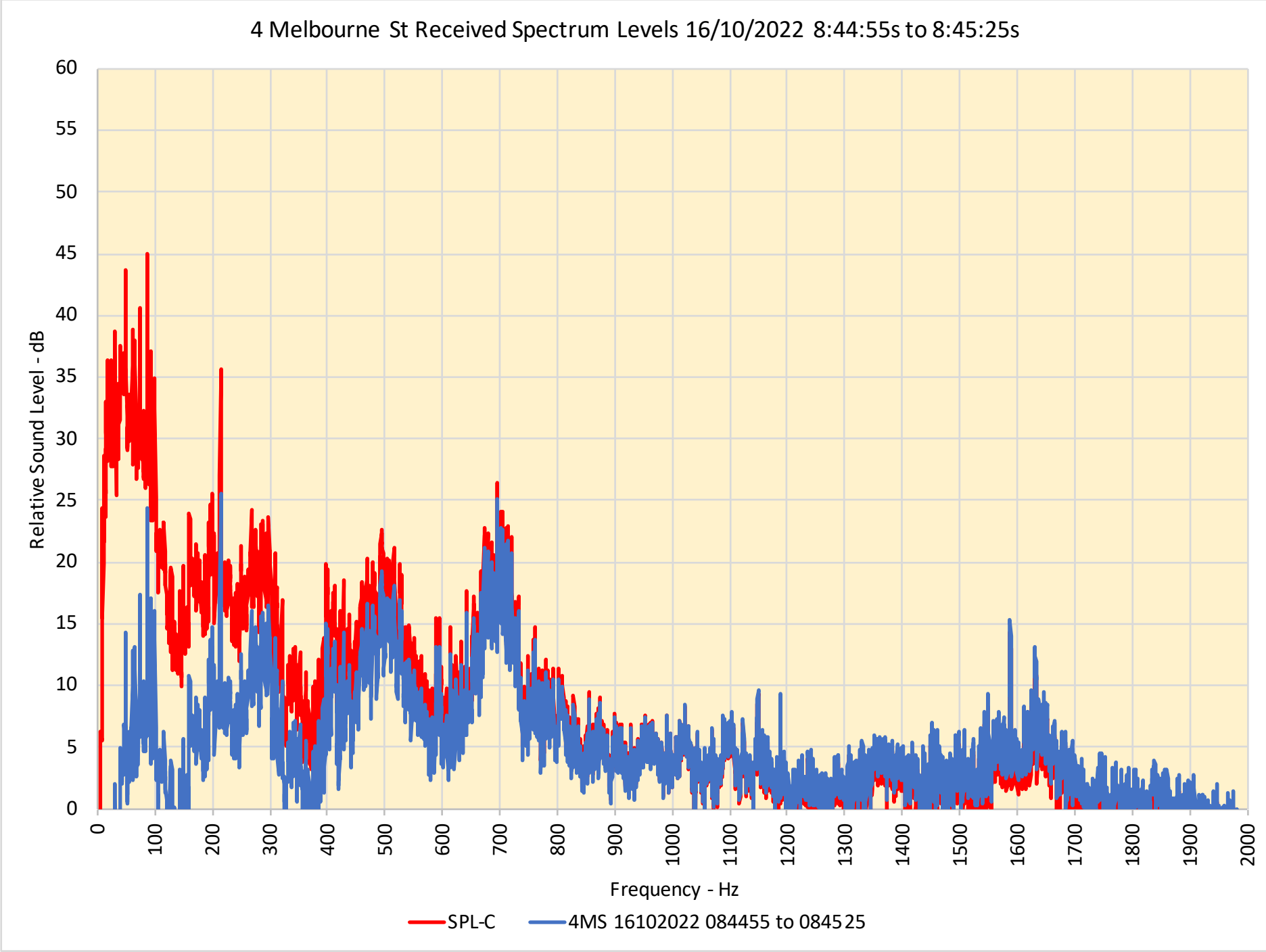




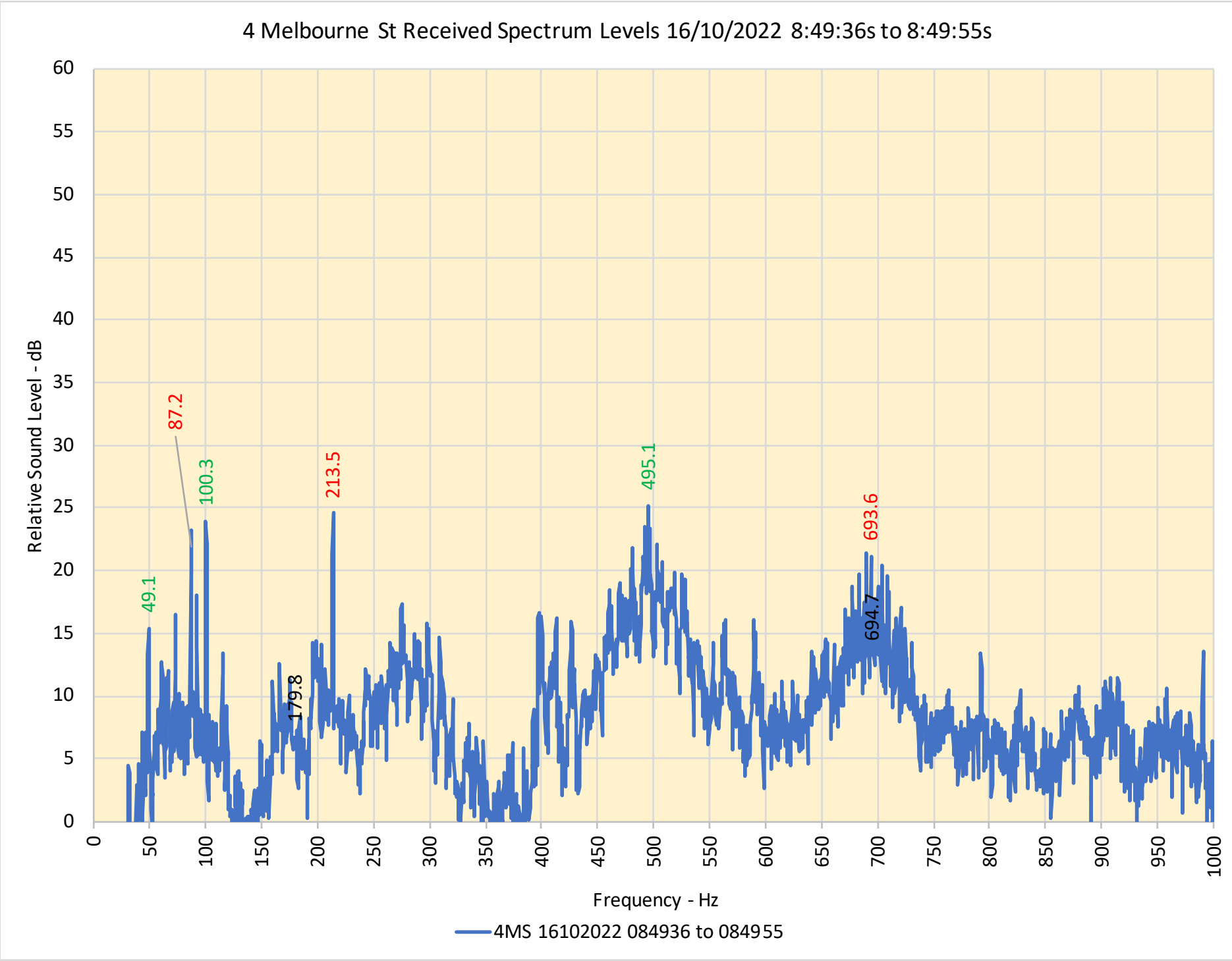
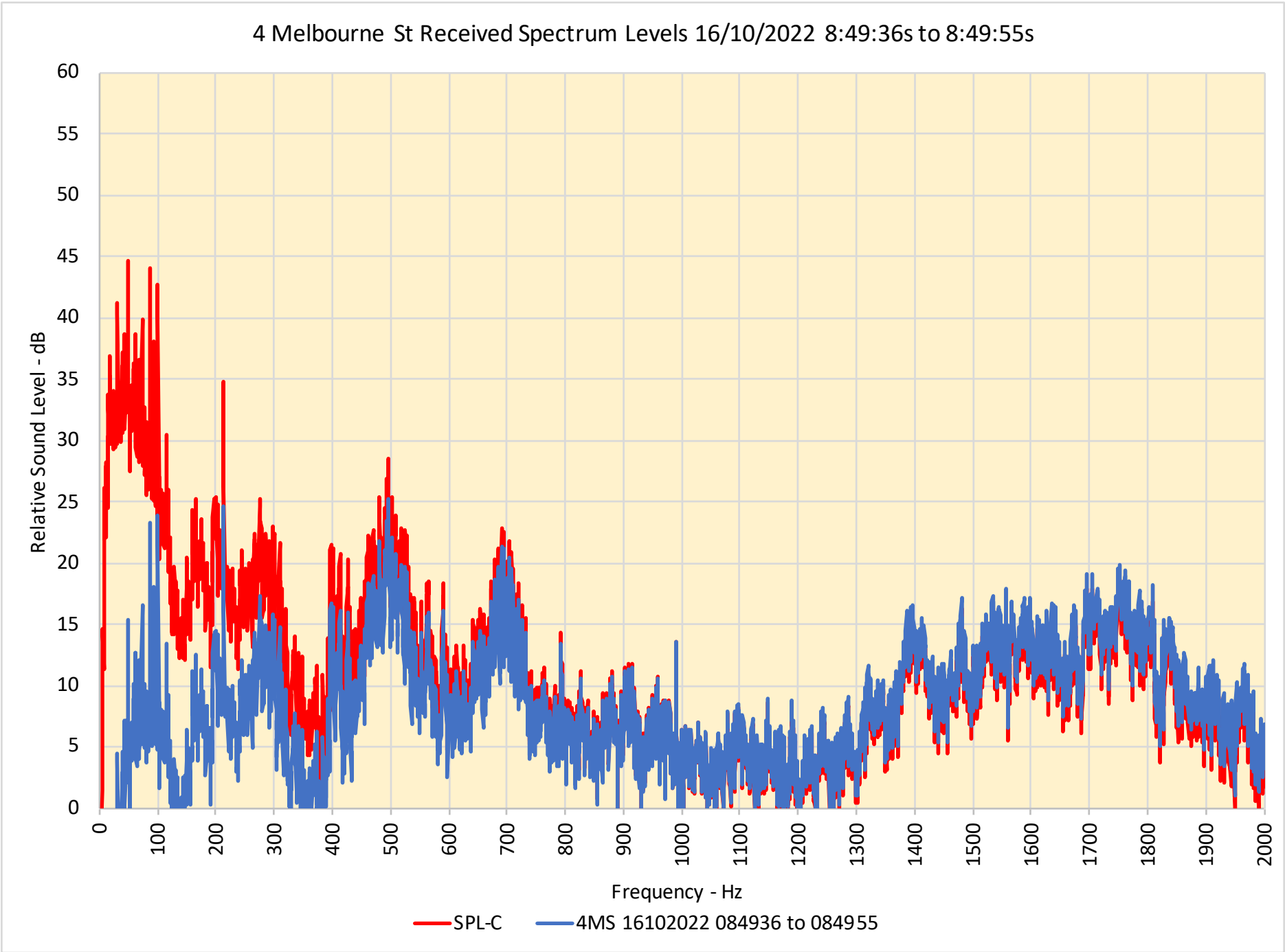
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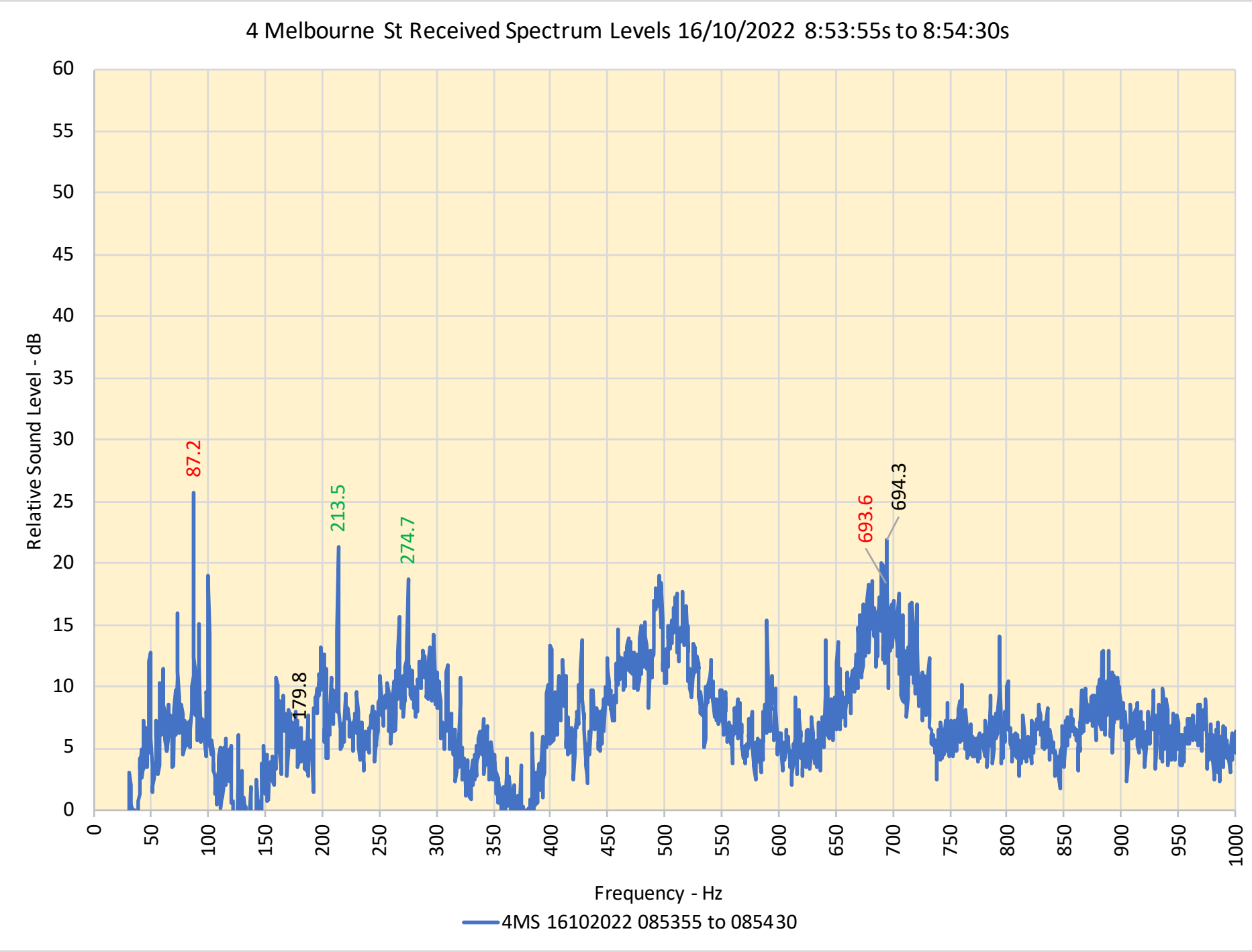
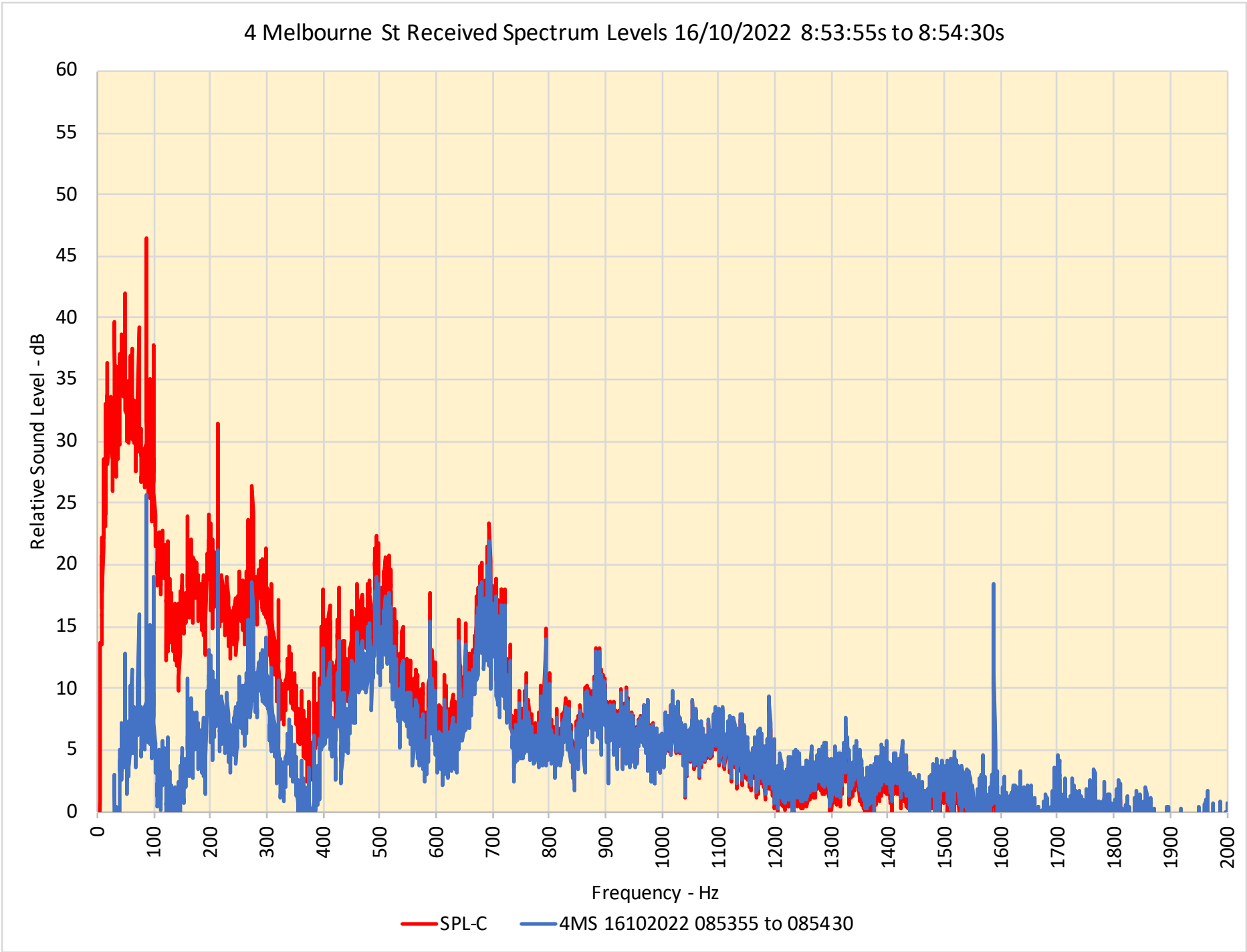
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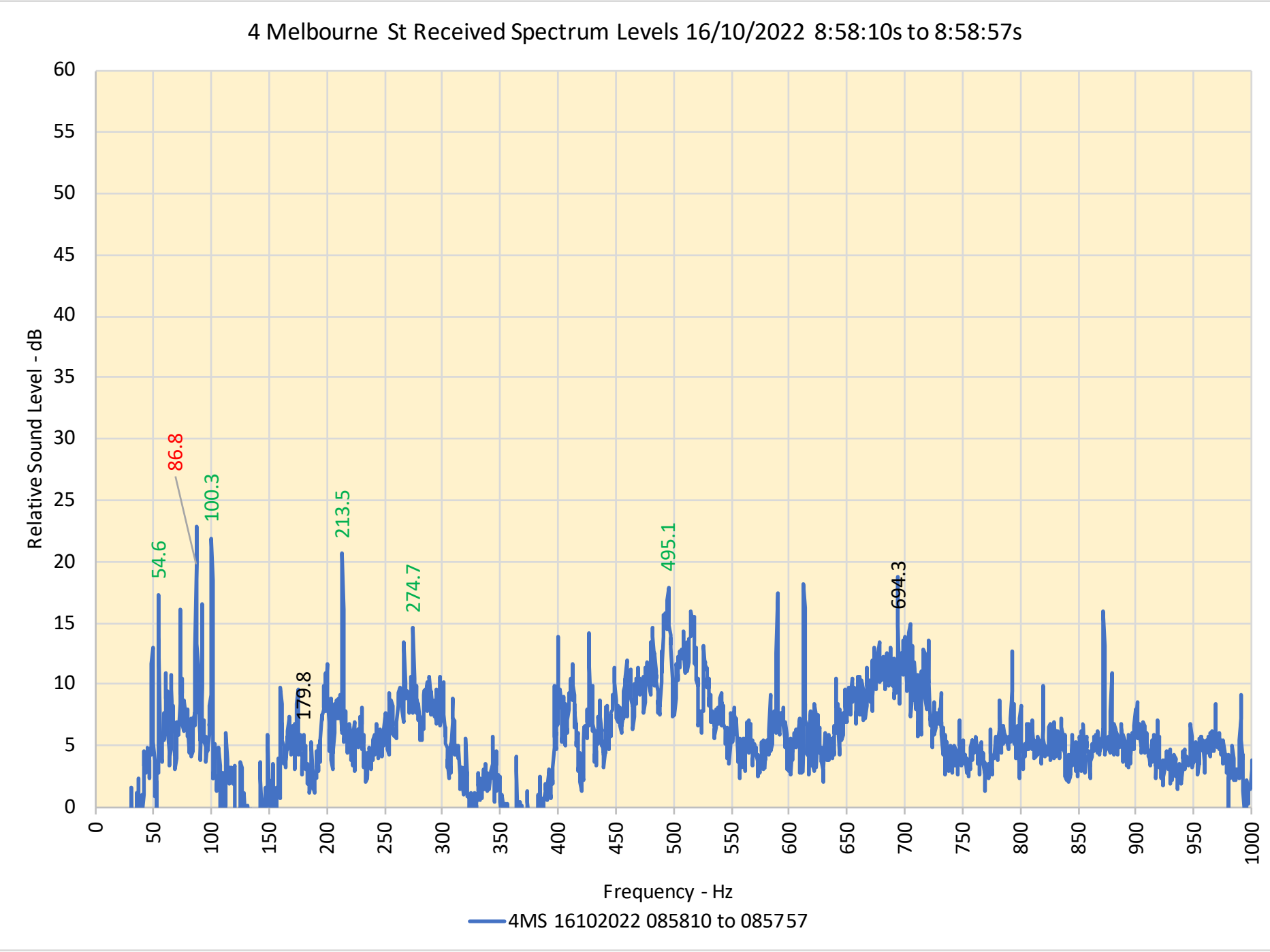
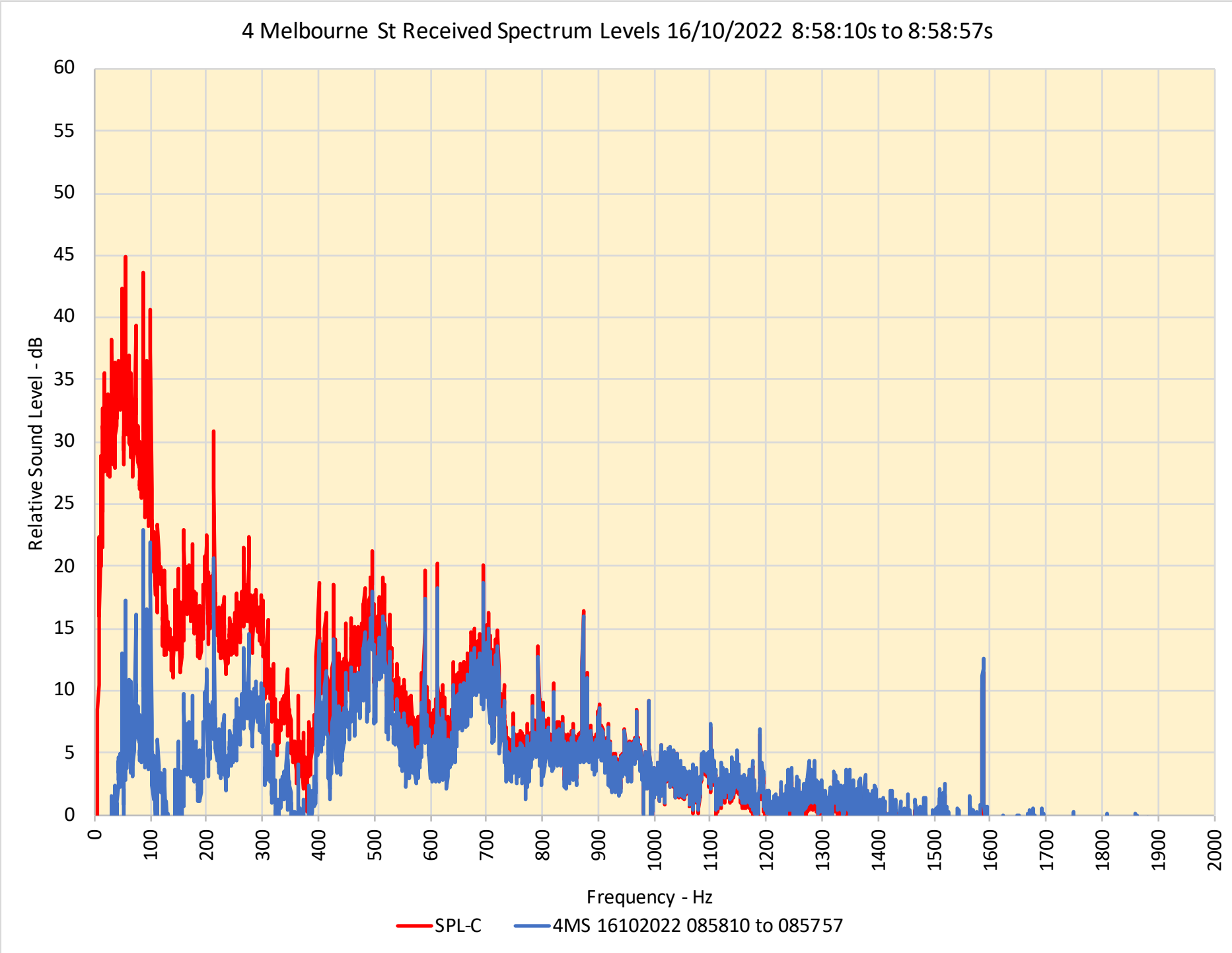
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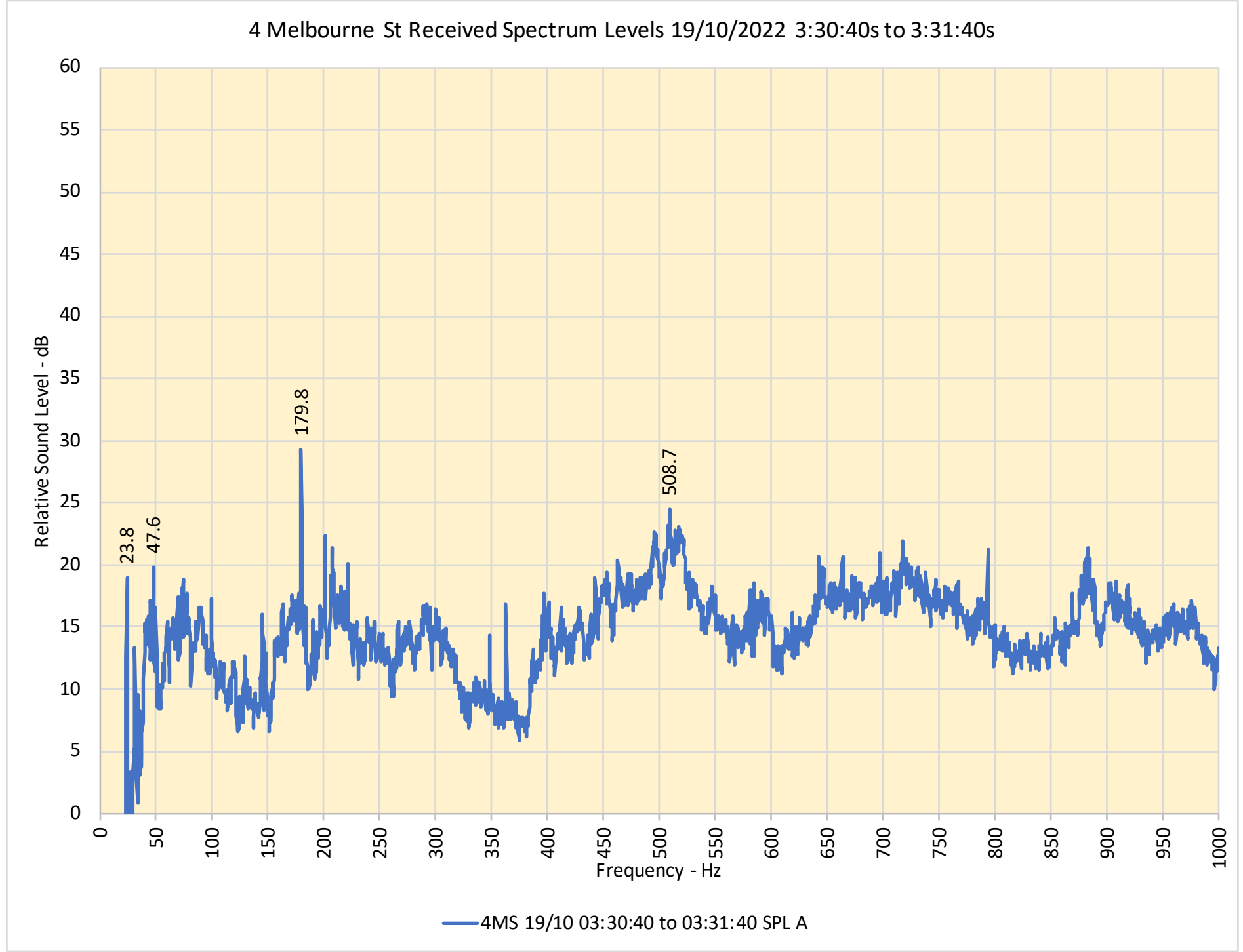
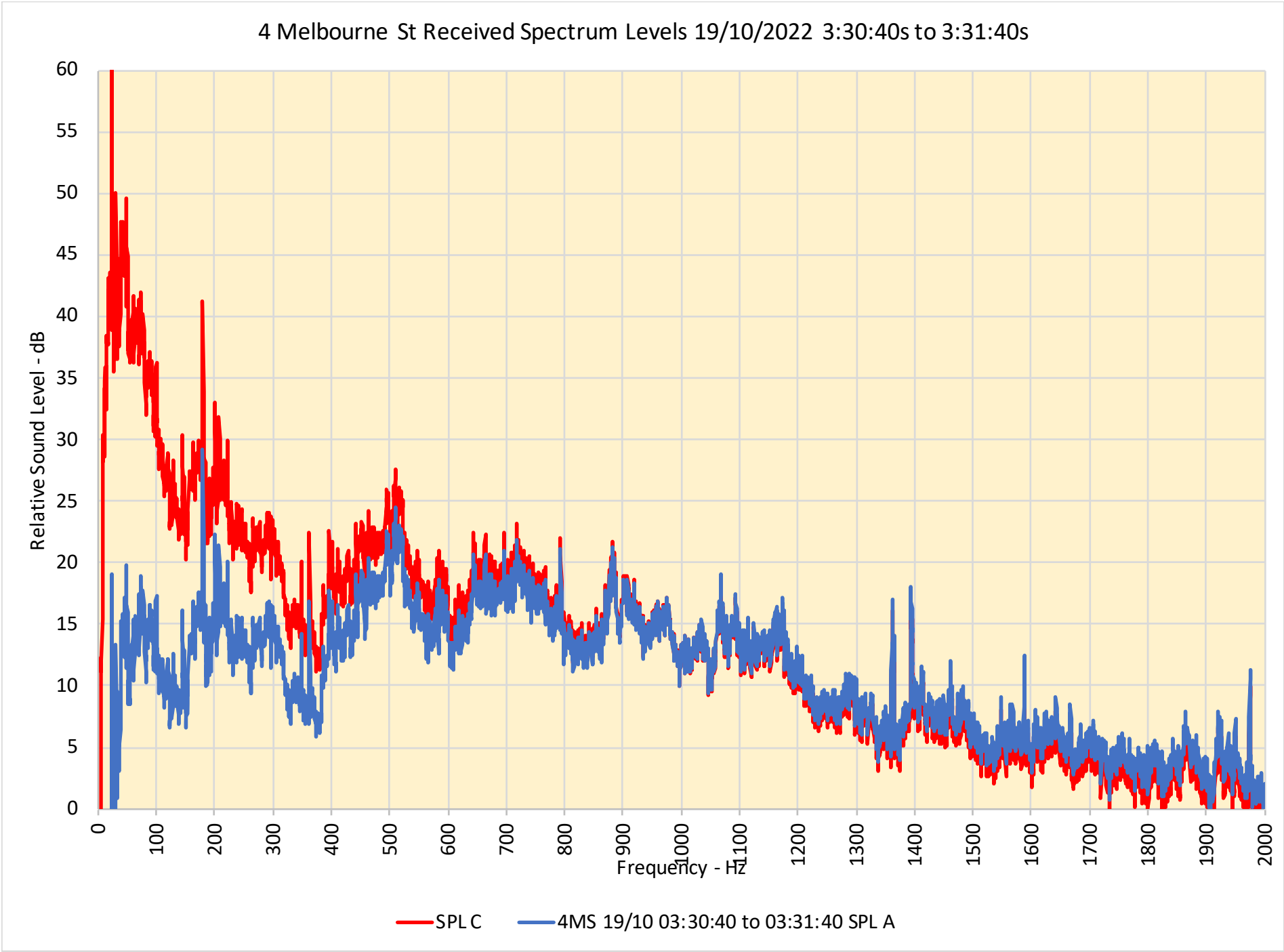
Appendix E Figure E14



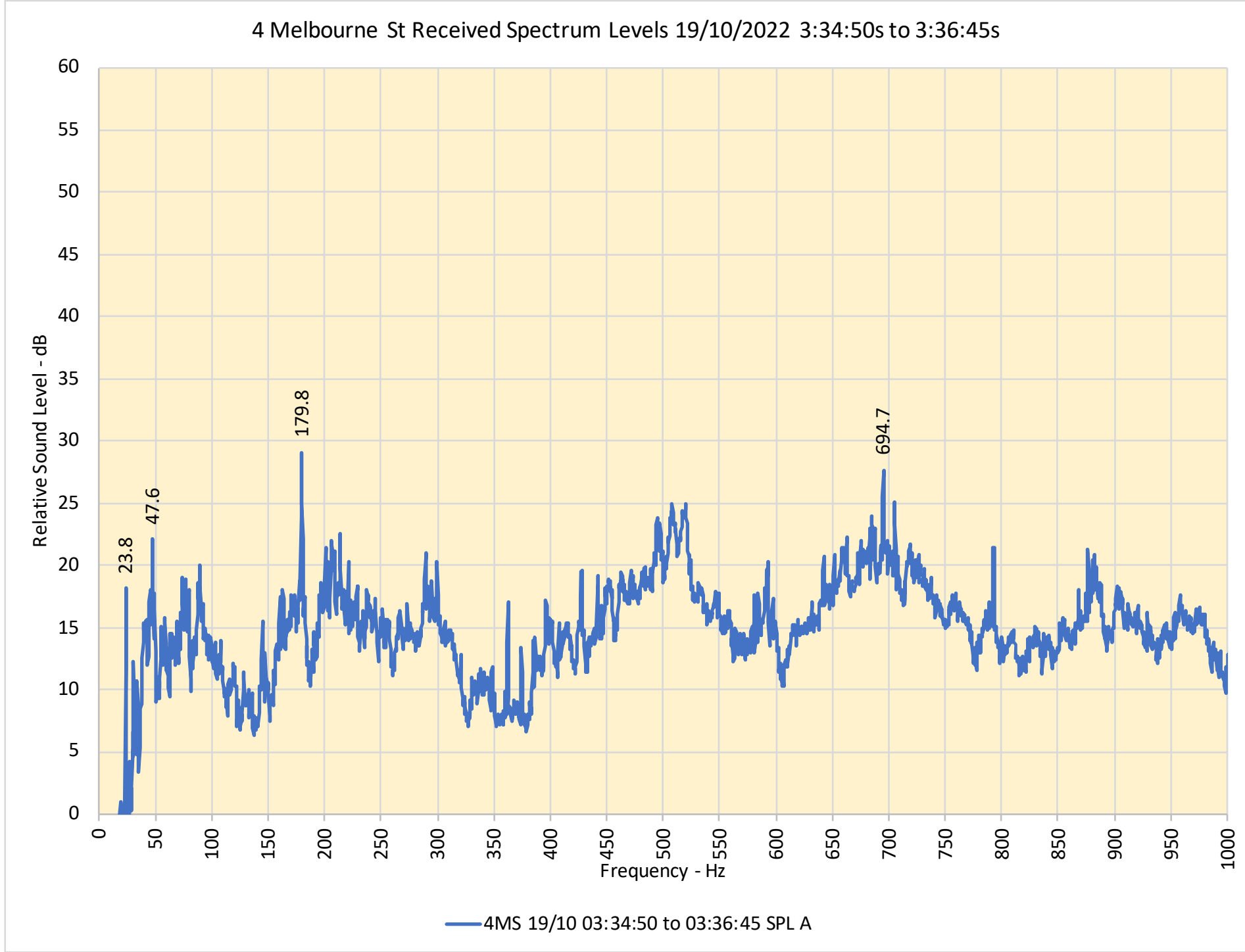
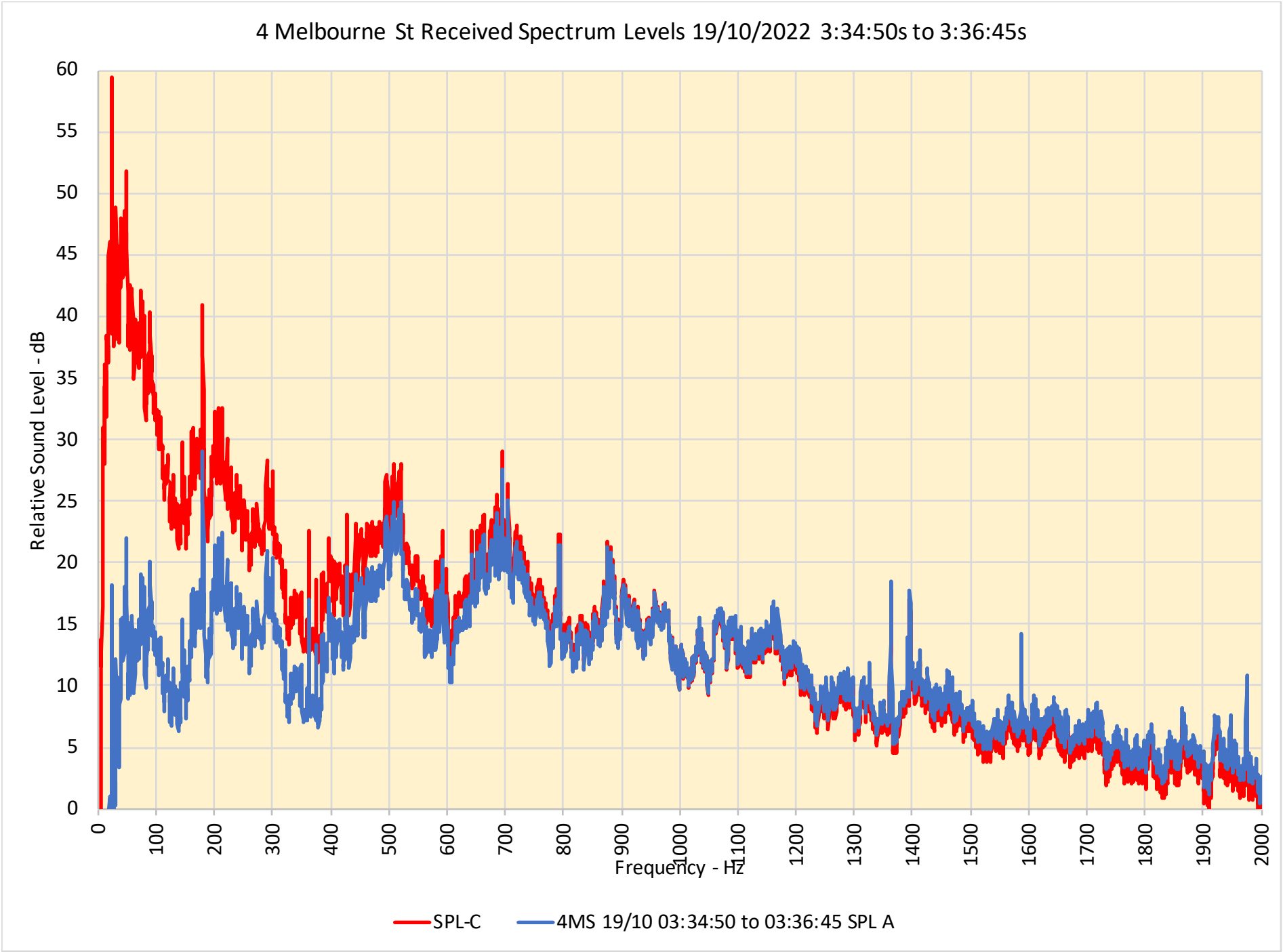
Appendix E Figure E15



Appendix E Figure E16

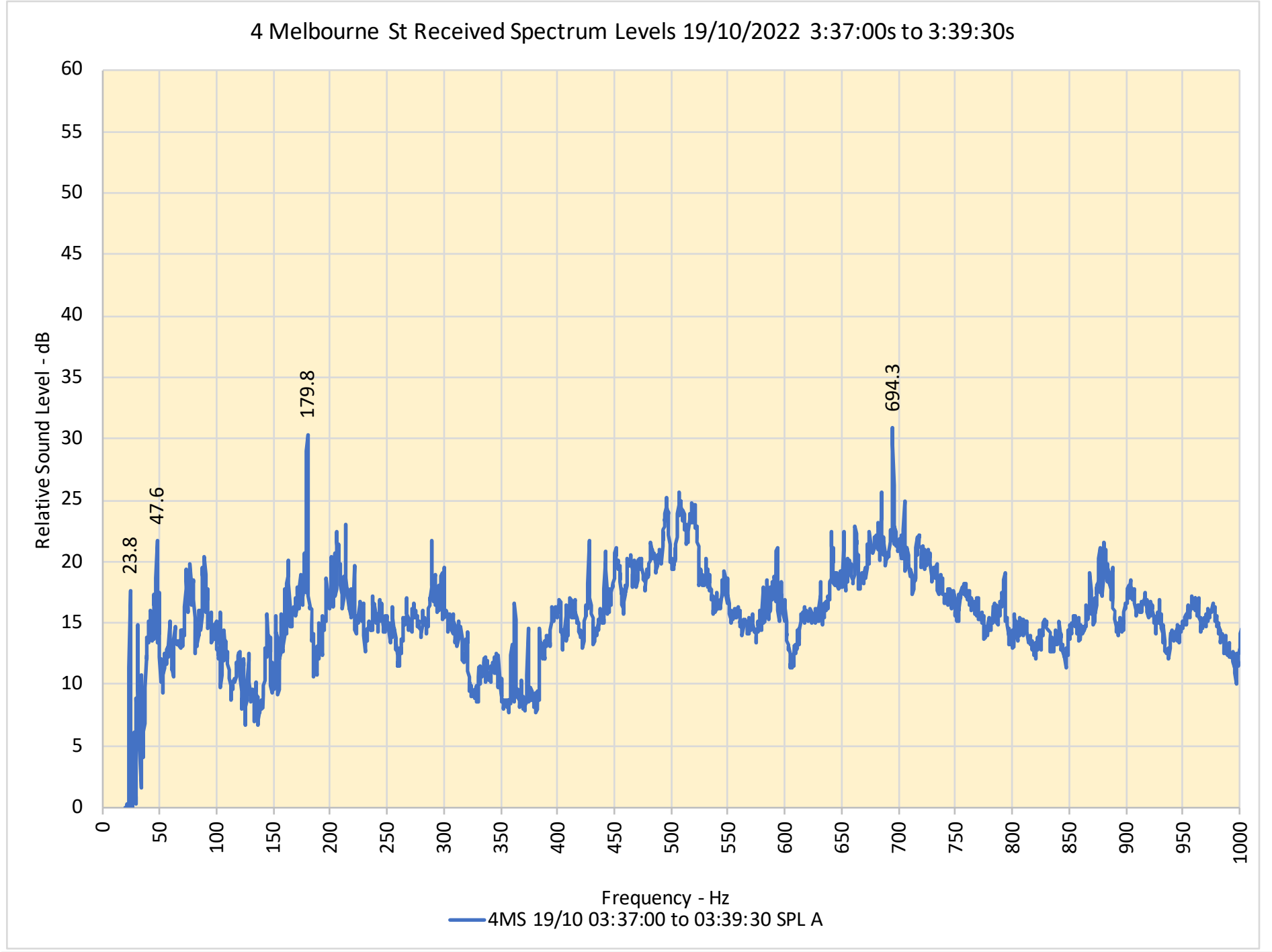
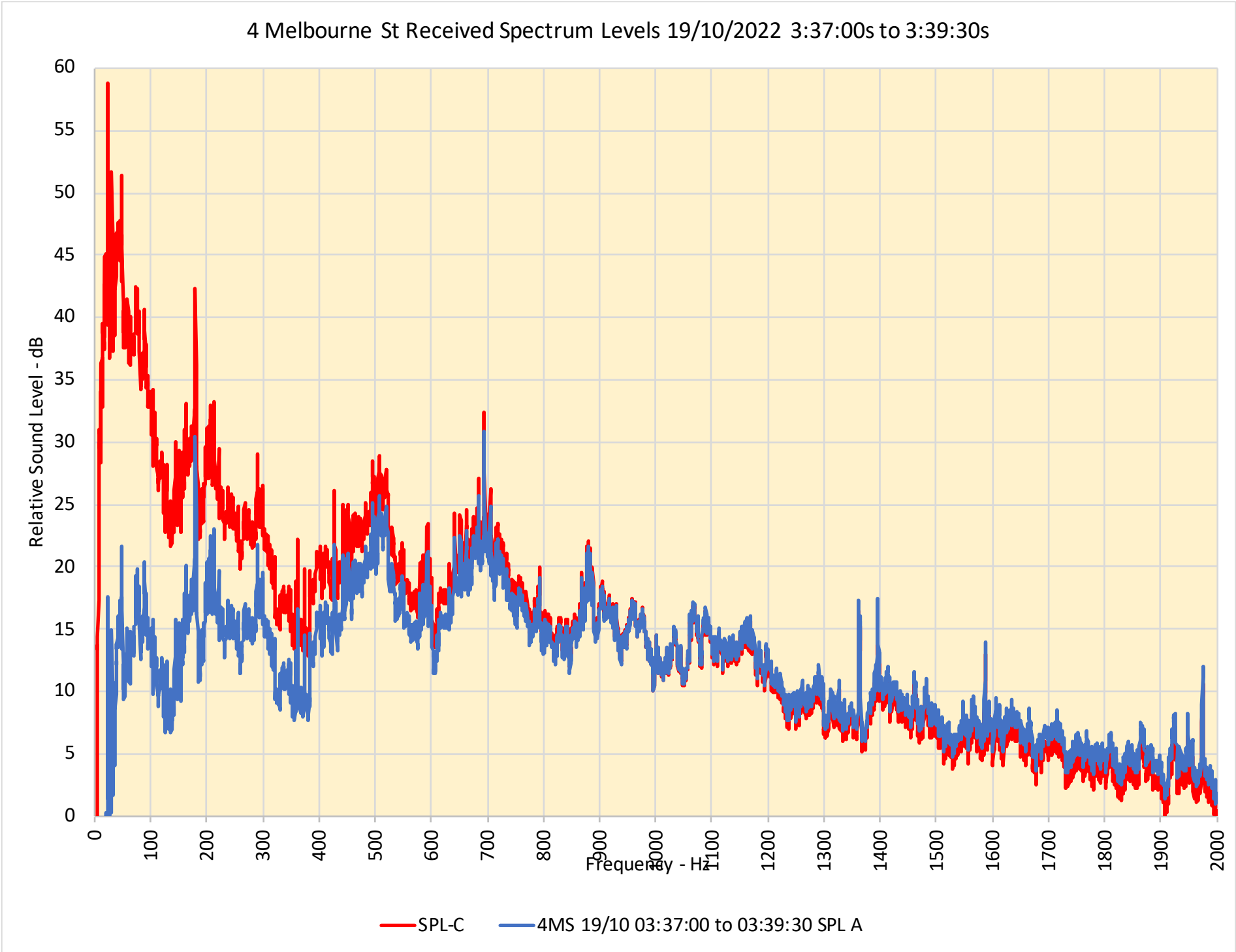


Appendix E Figure E17

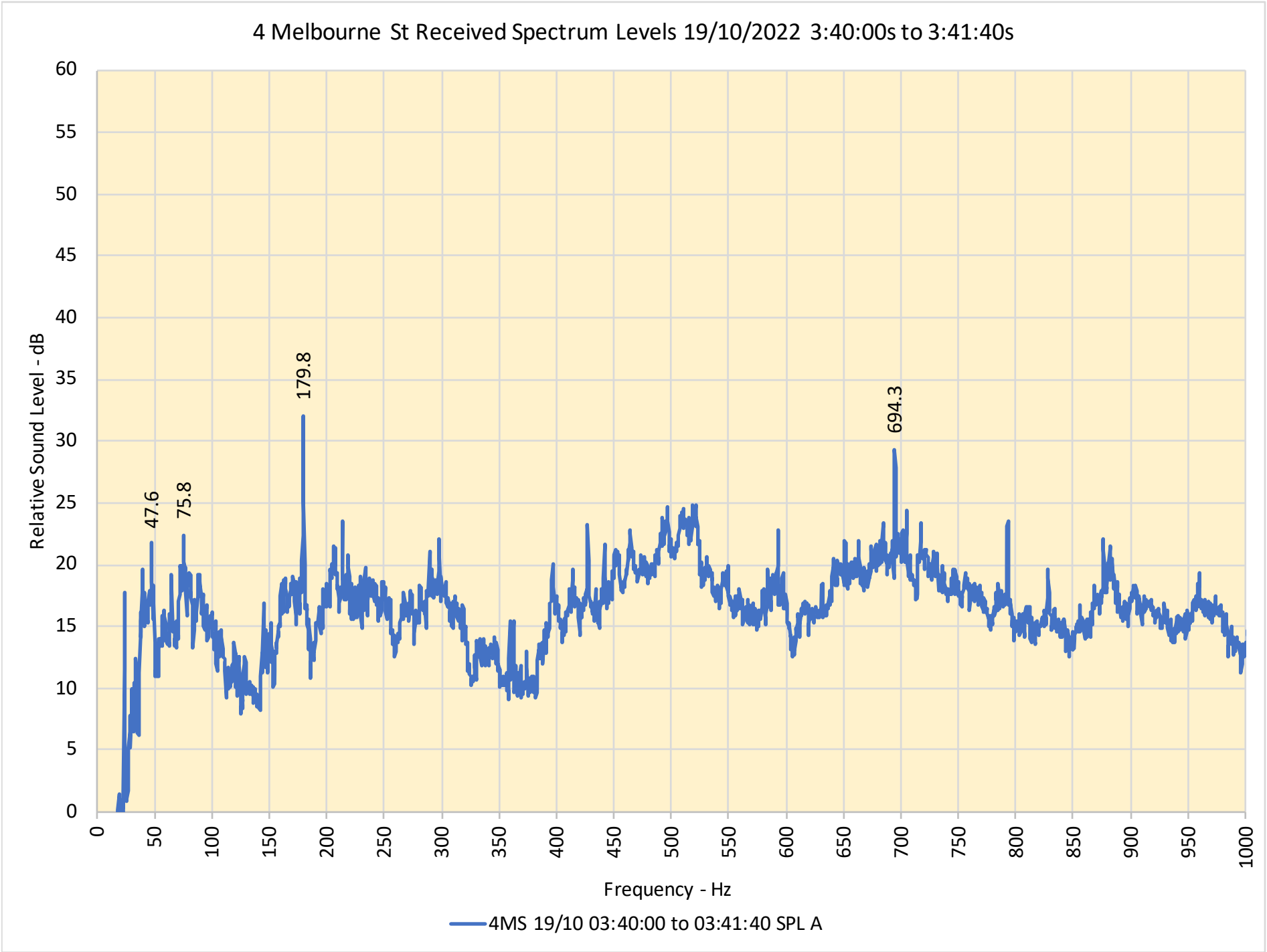
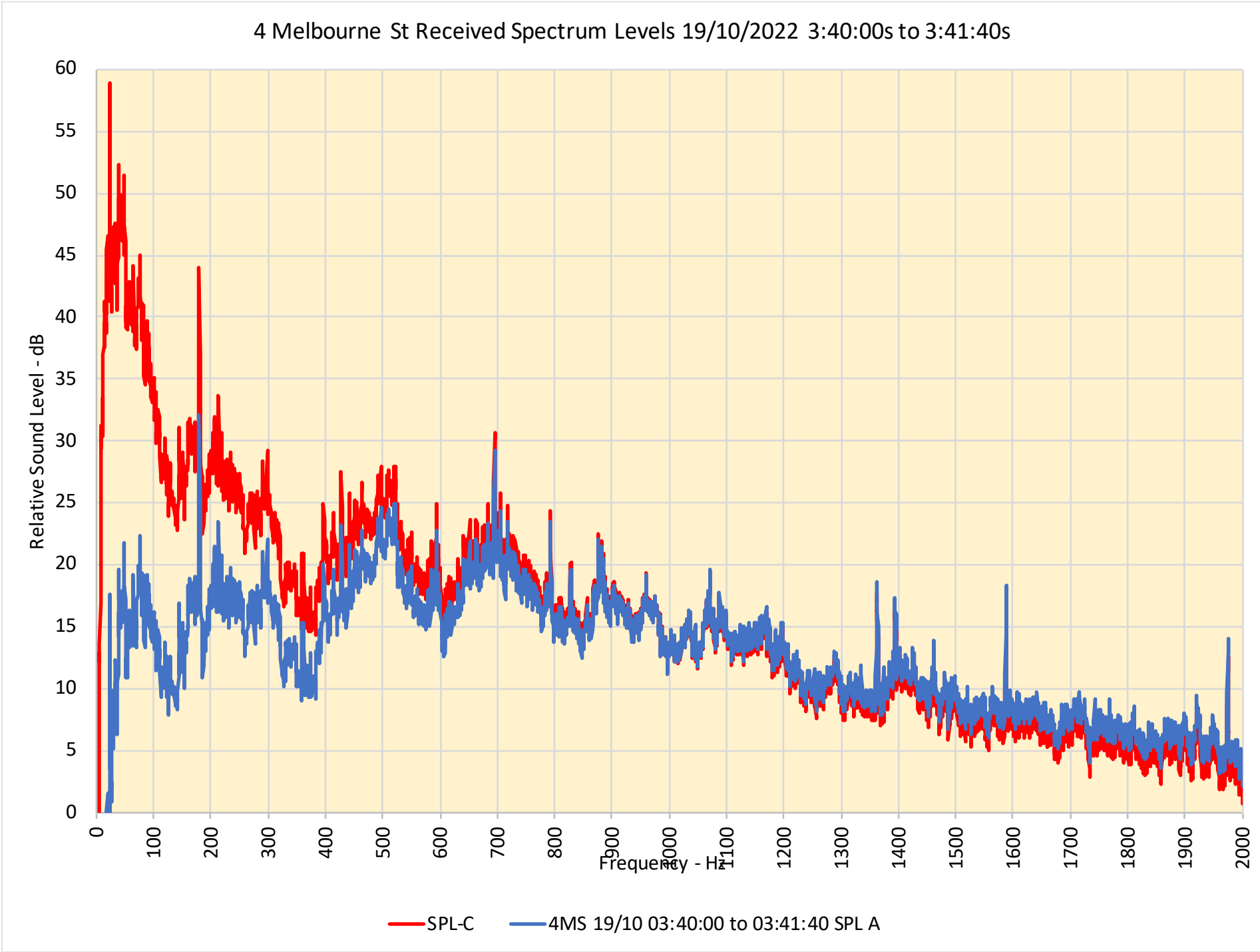


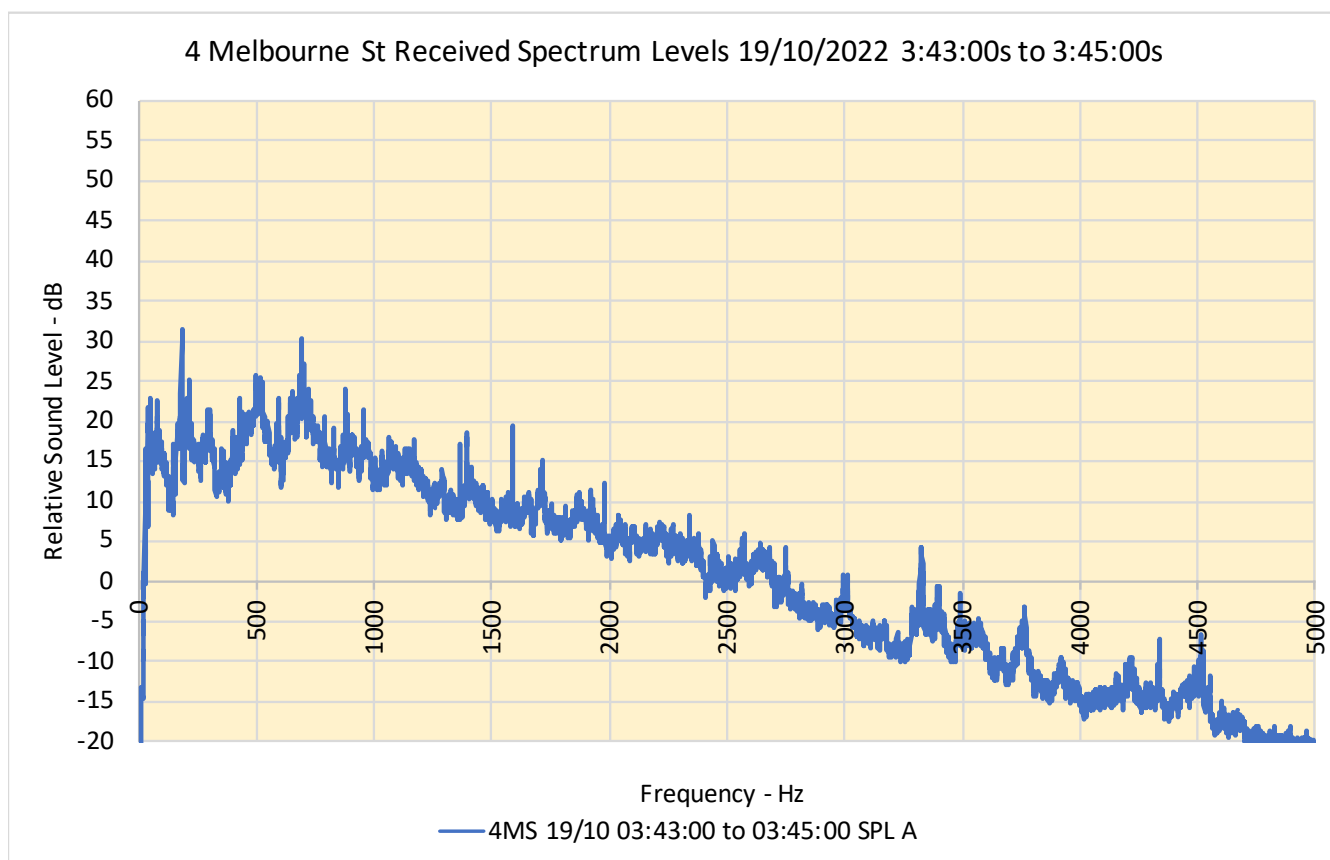
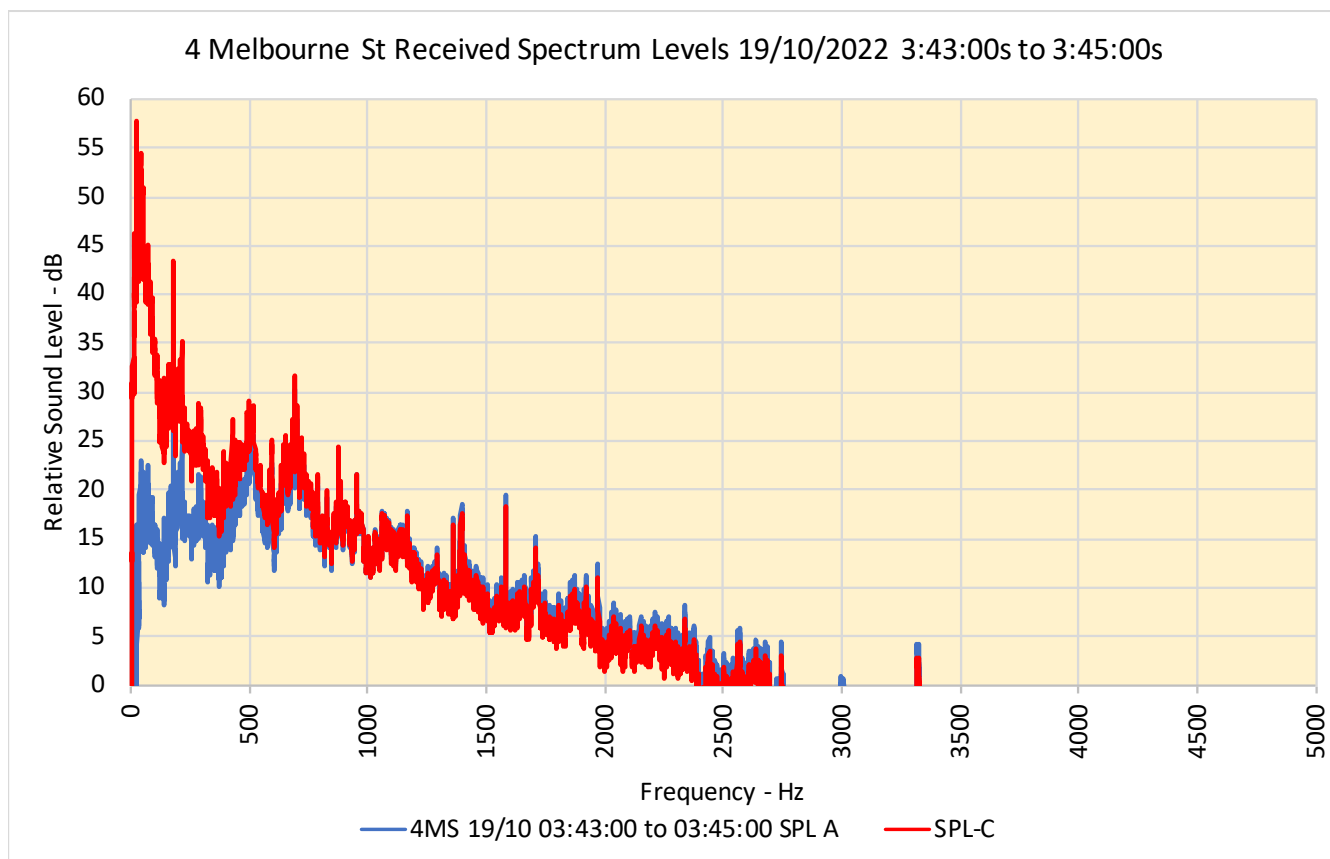
Appendix E Figure E18

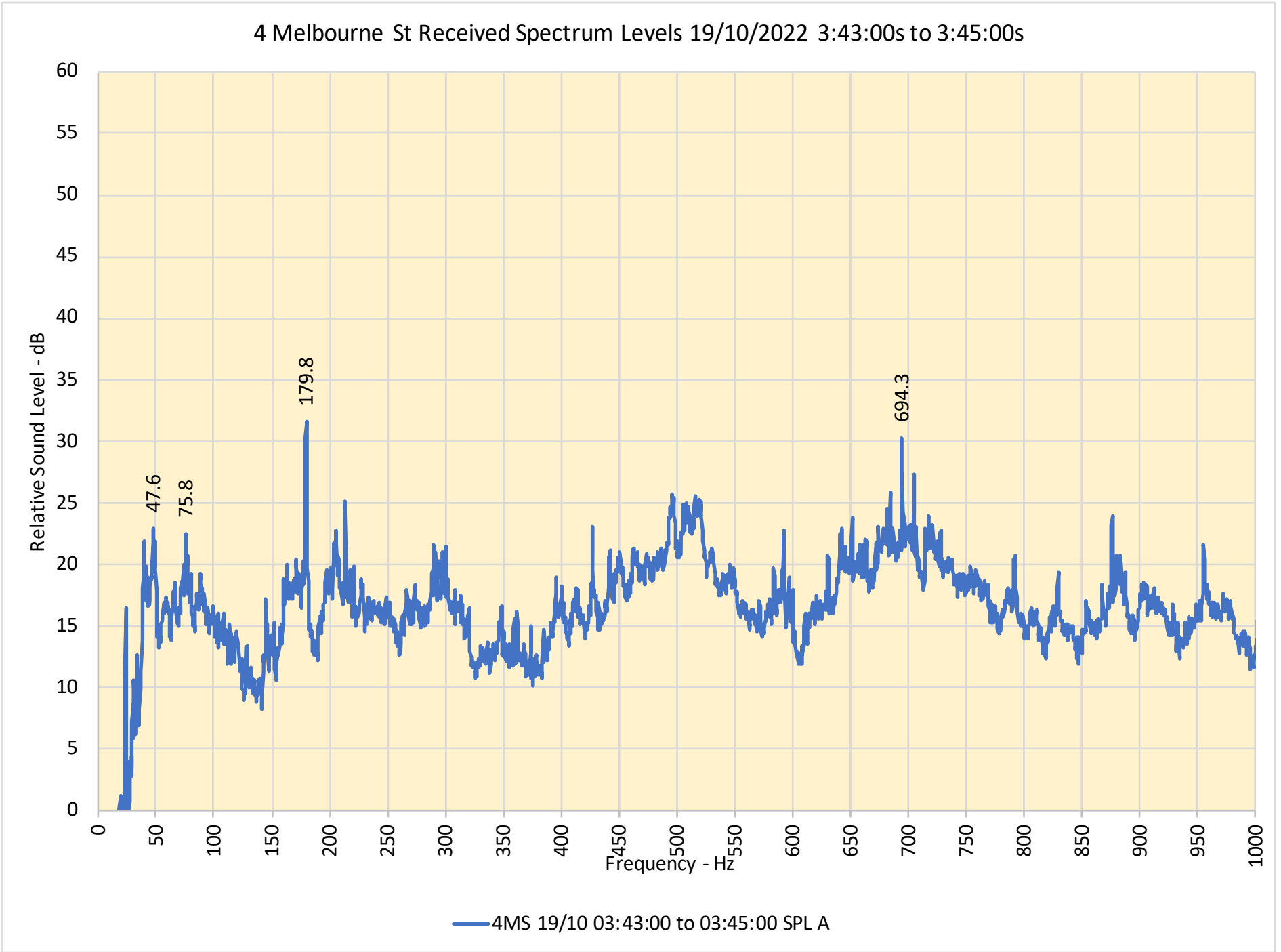
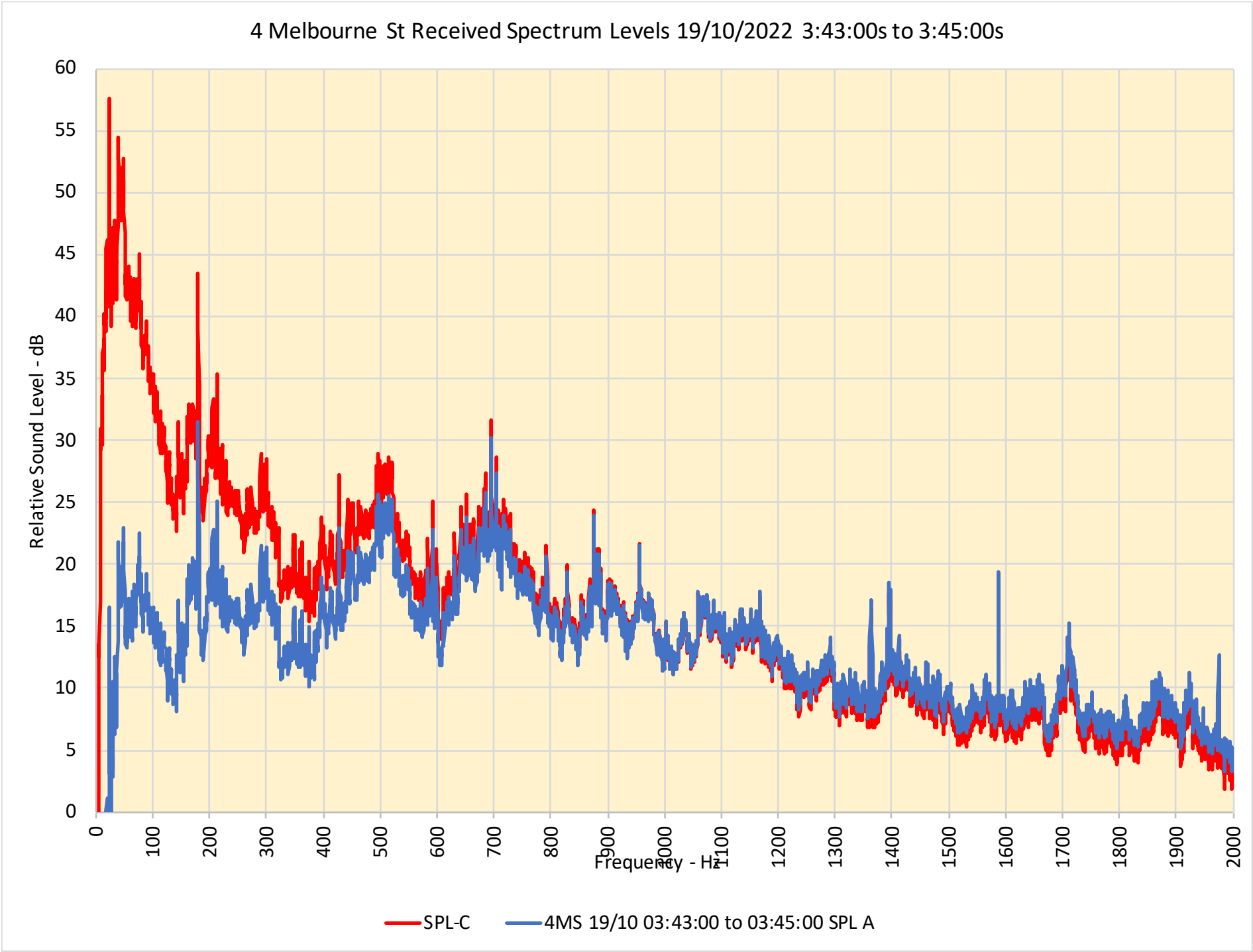




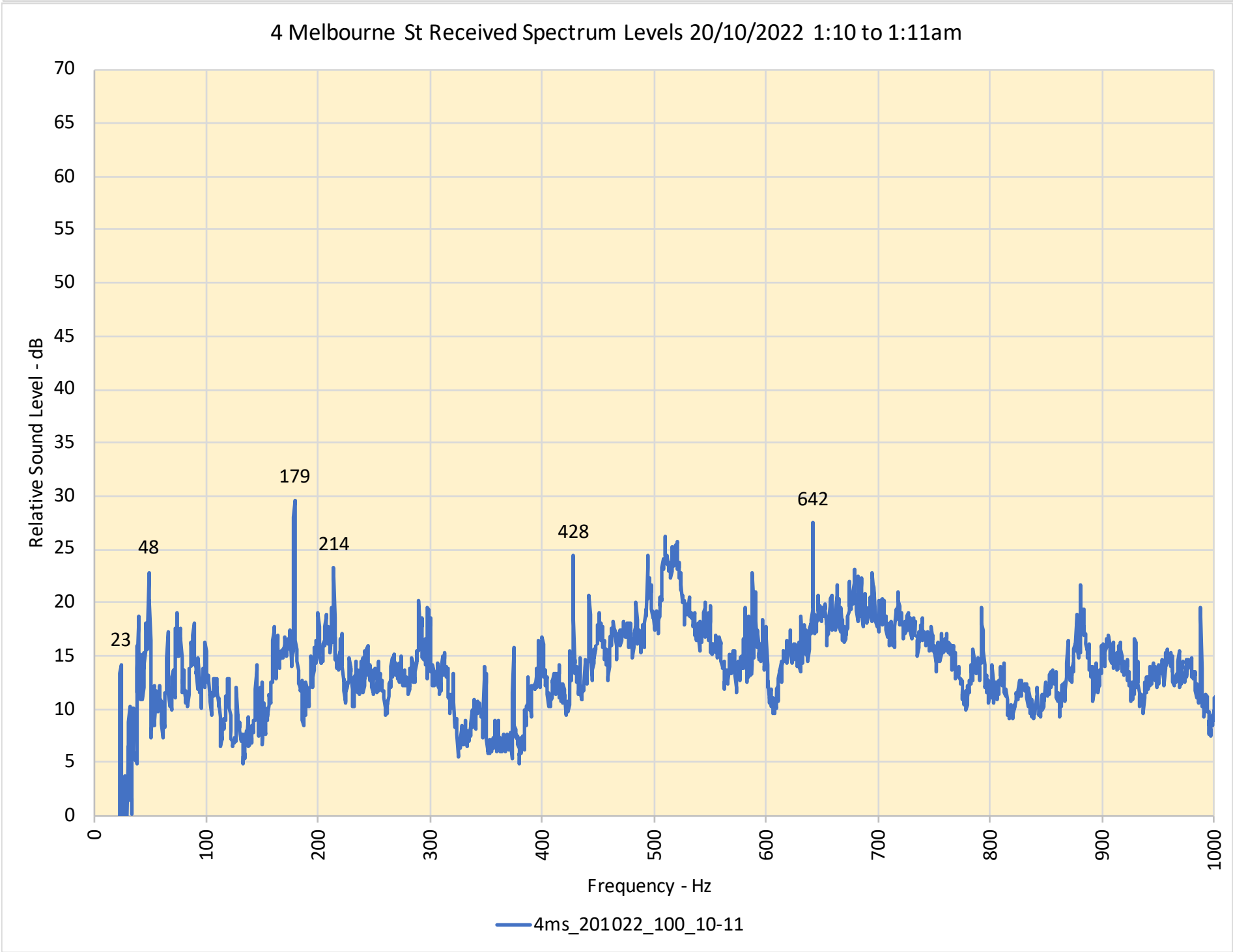
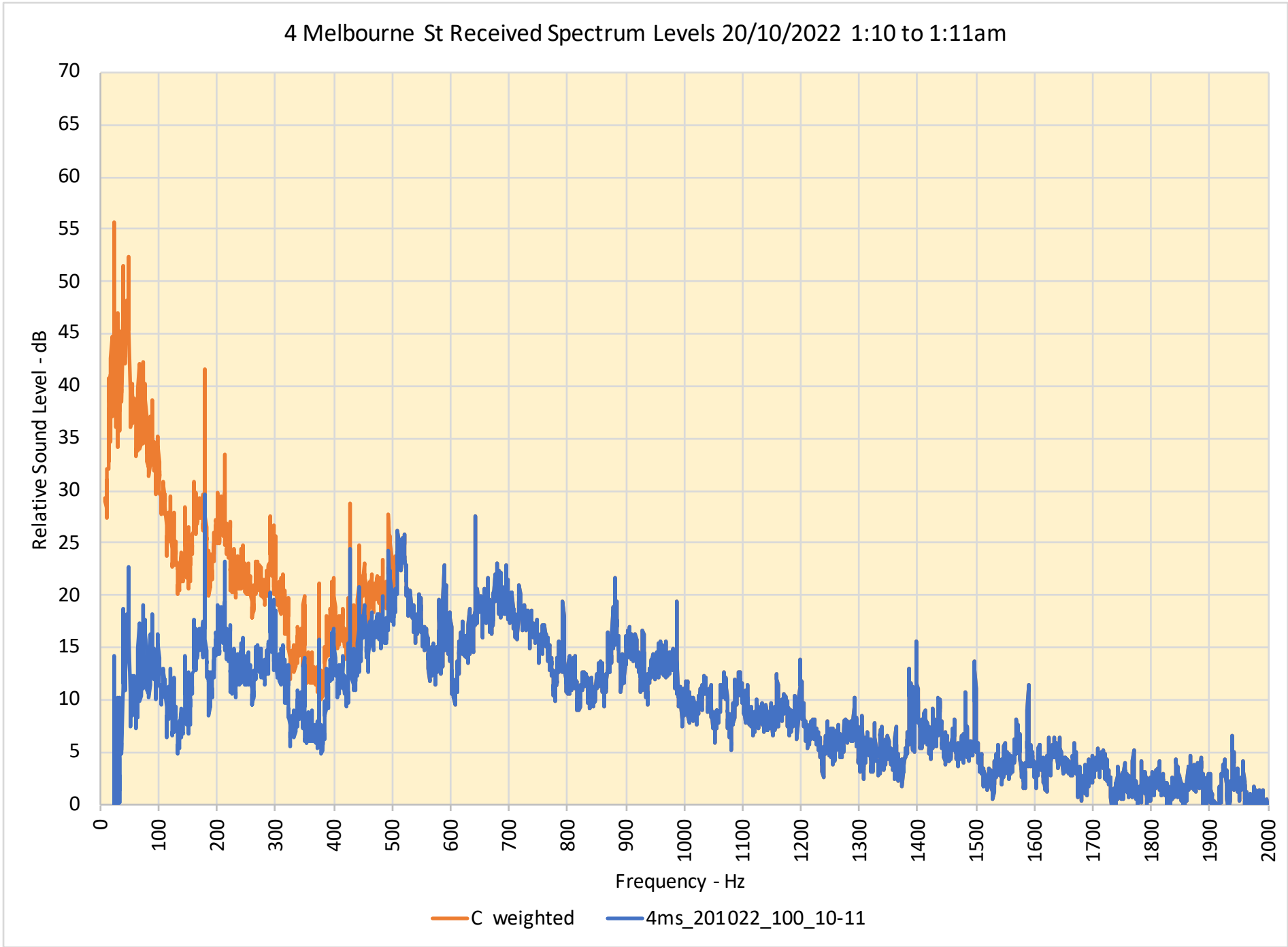
Appendix E Figure E19

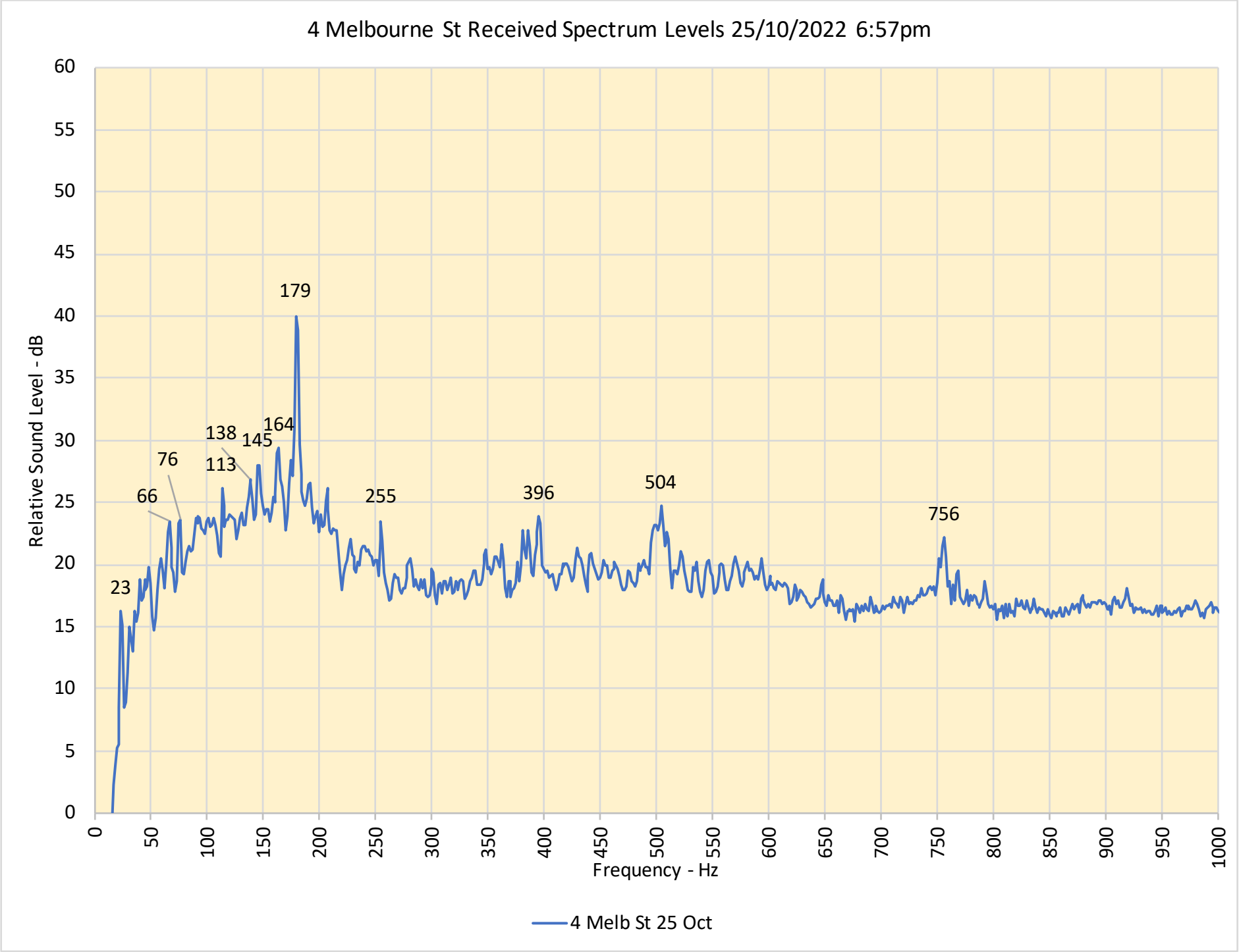
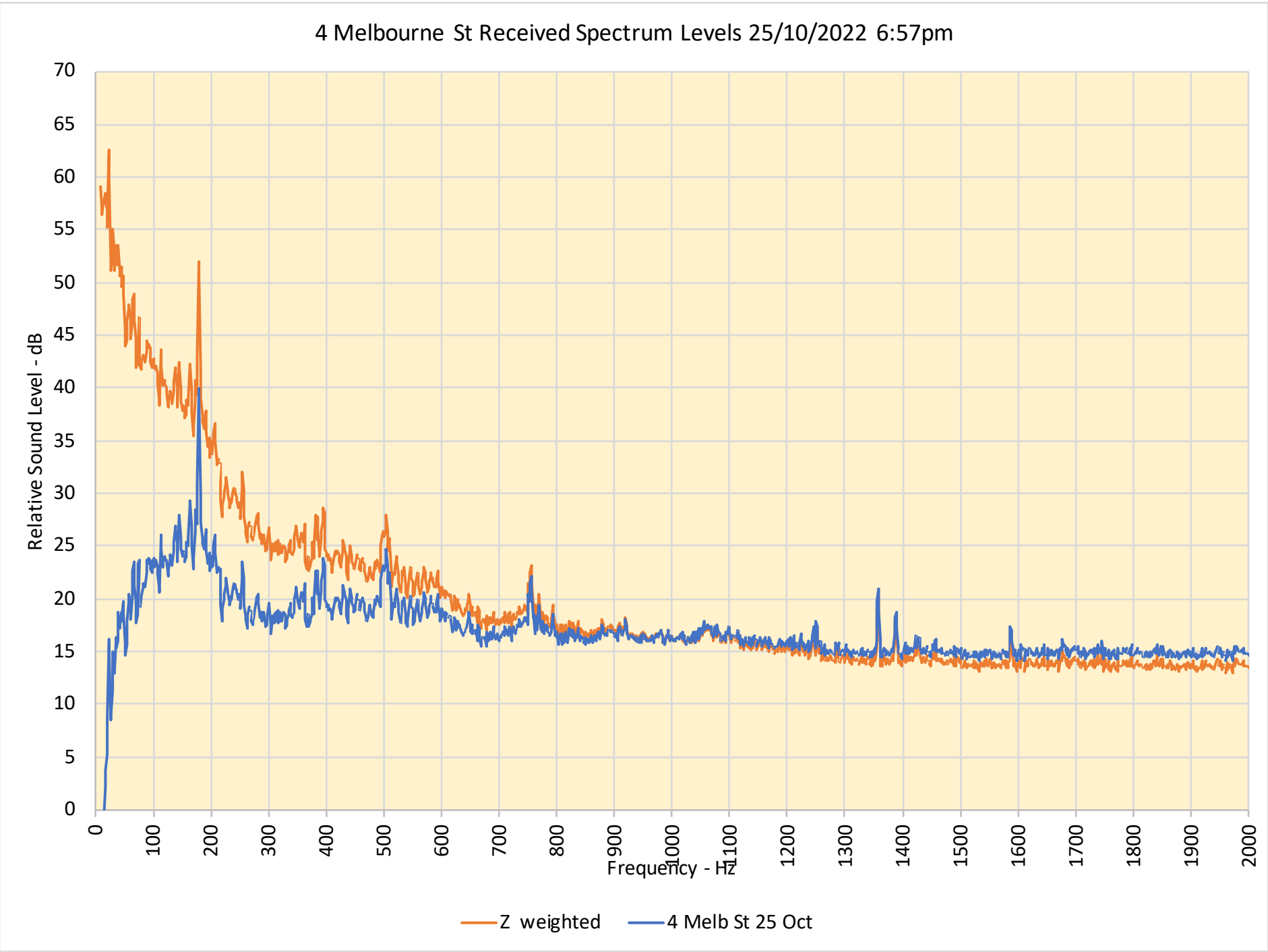




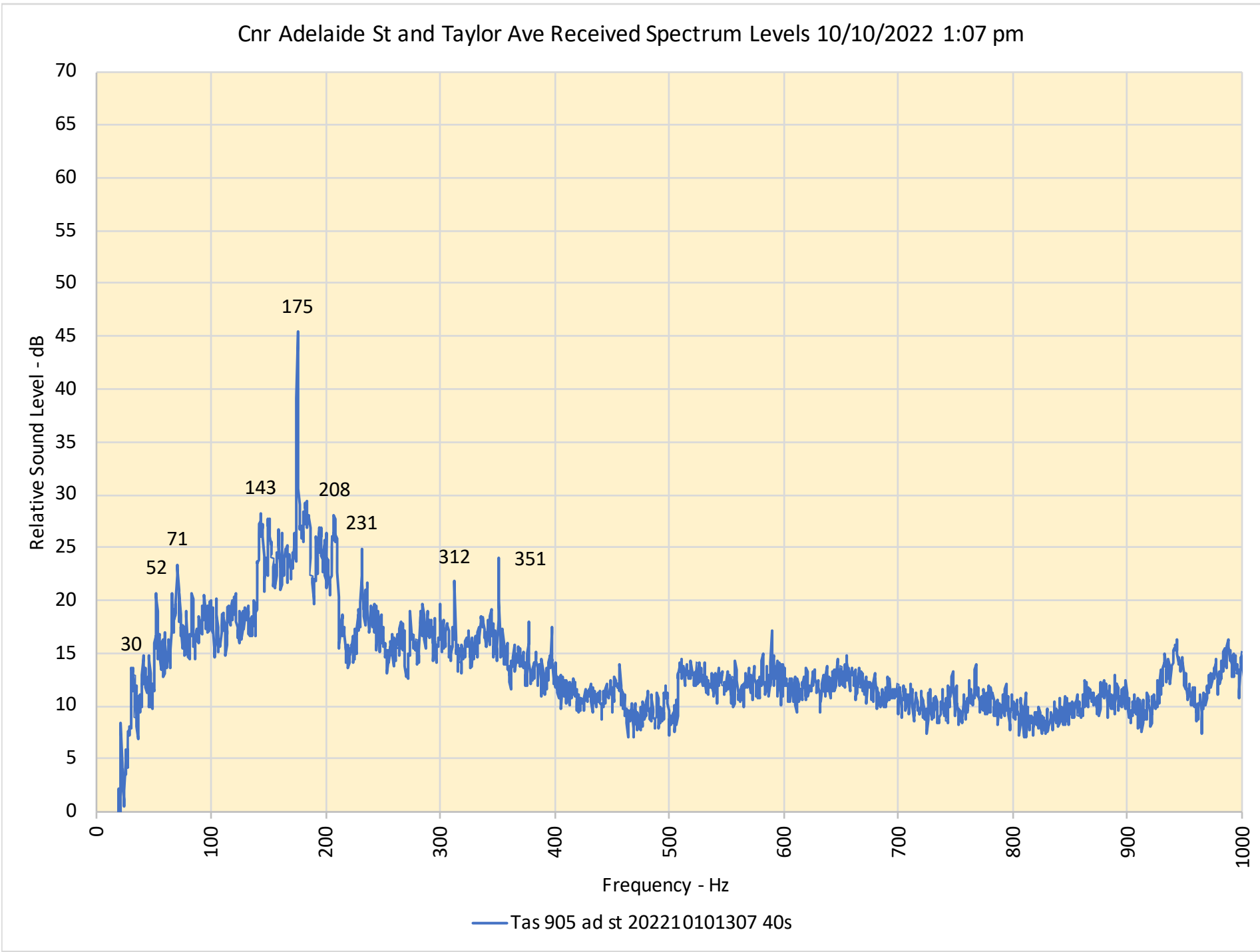
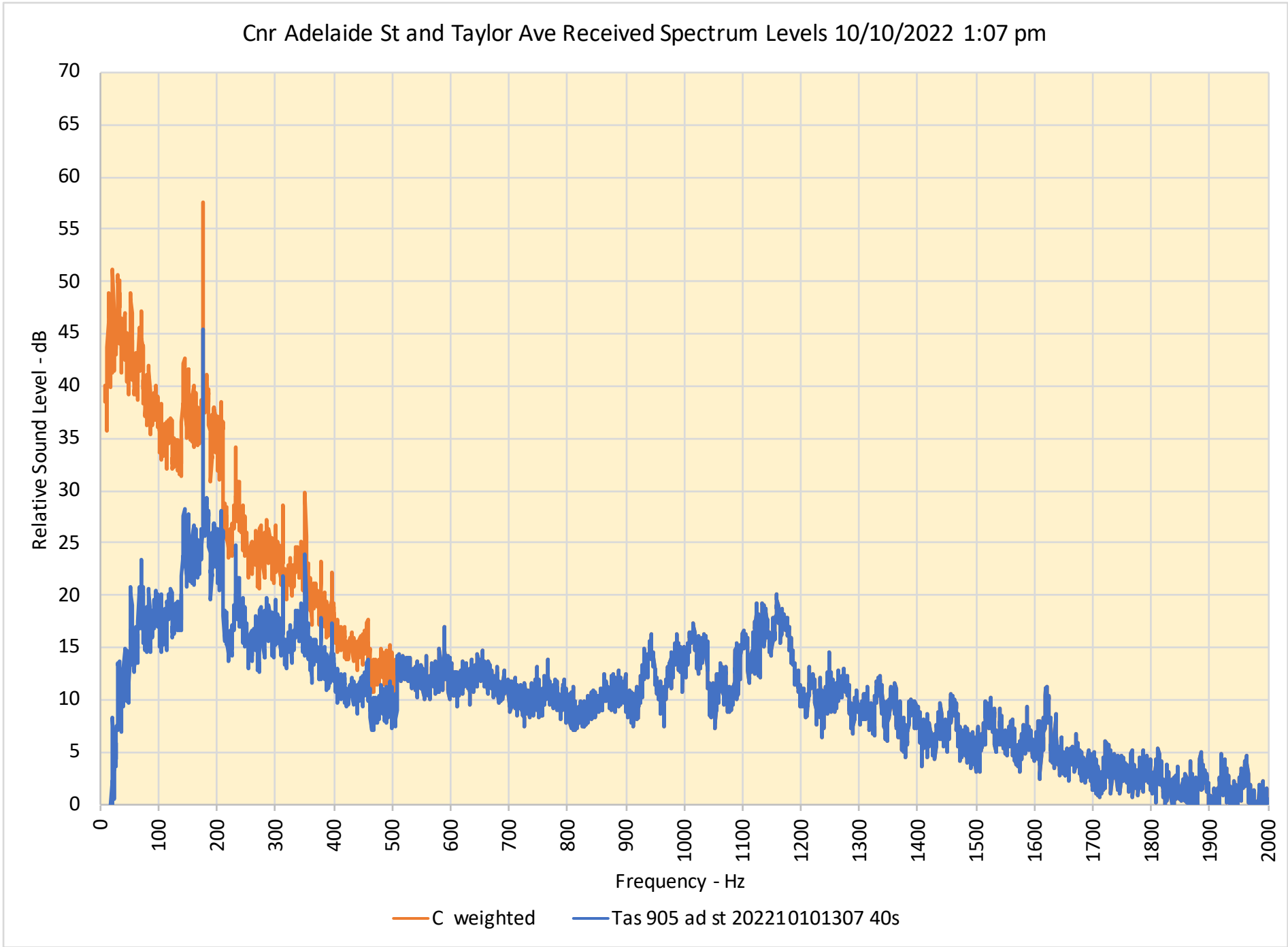


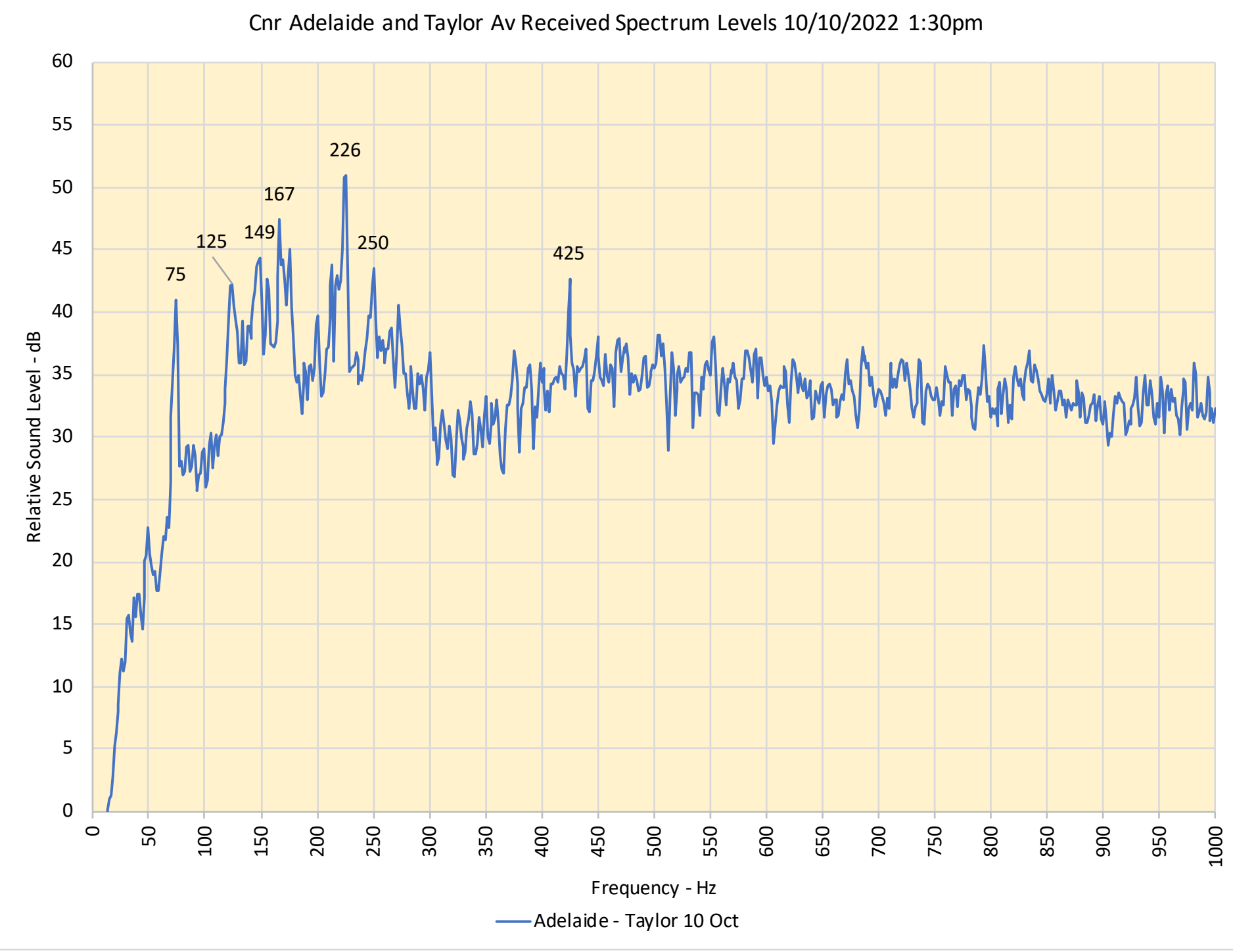
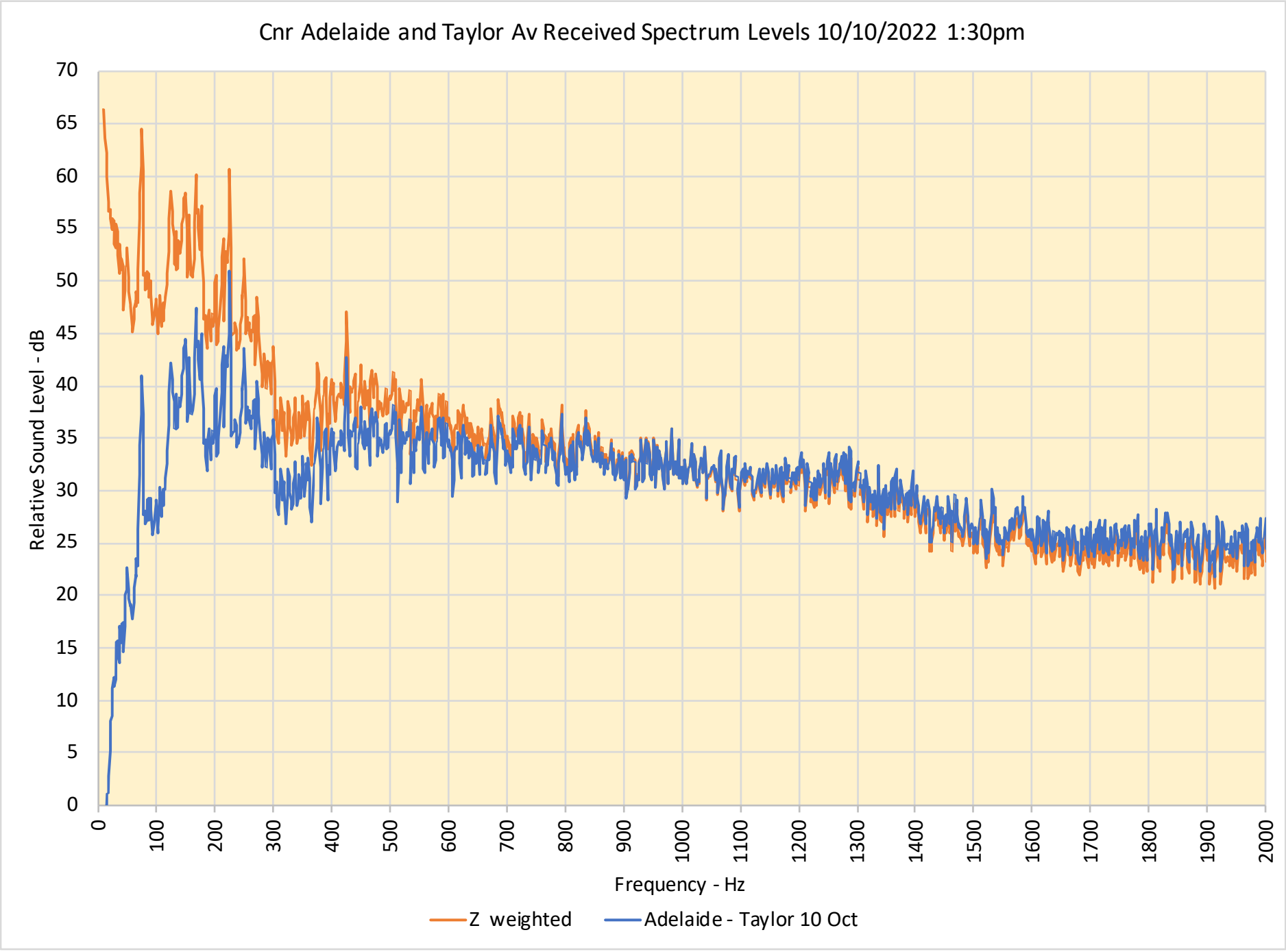
Appendix E Figure E22



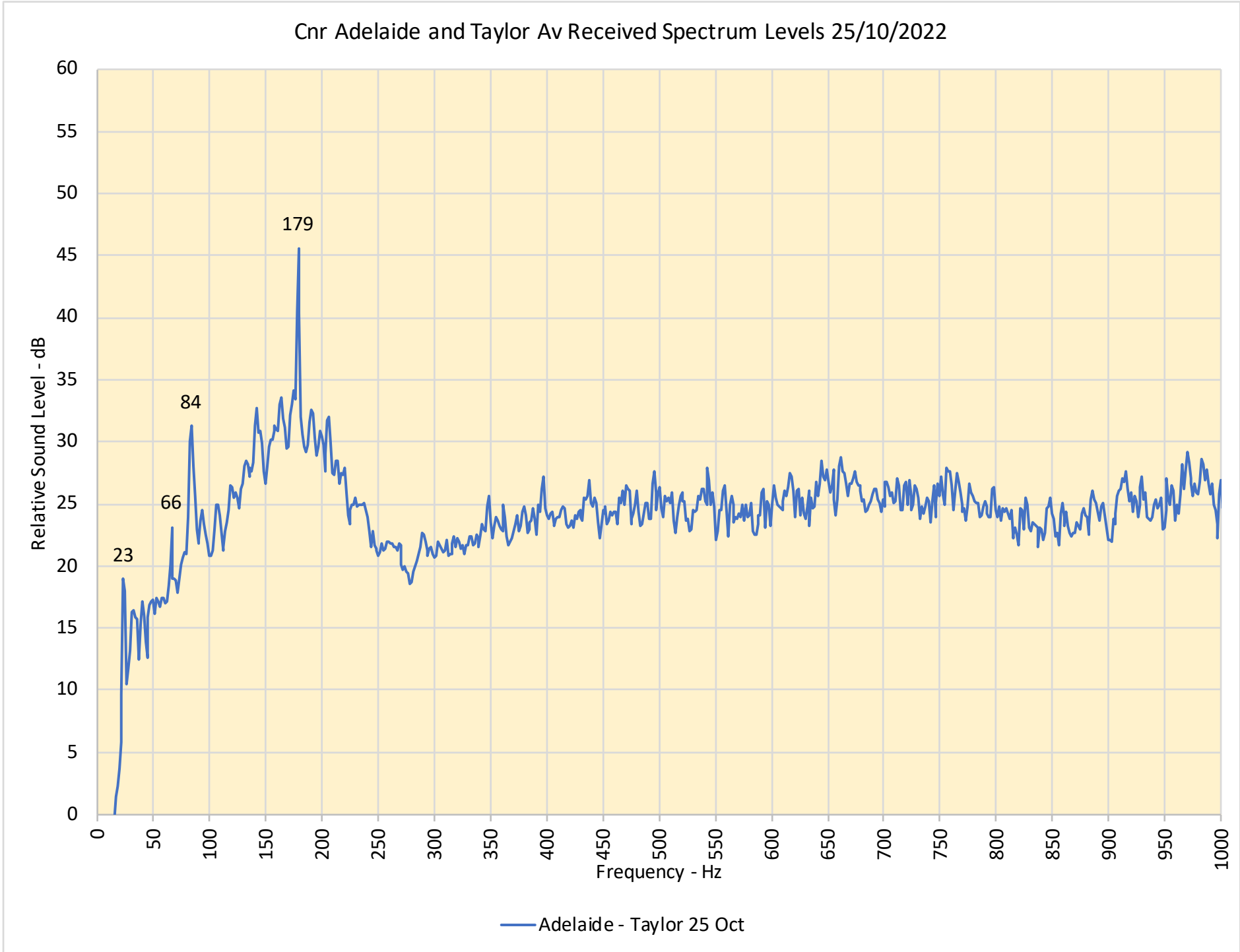
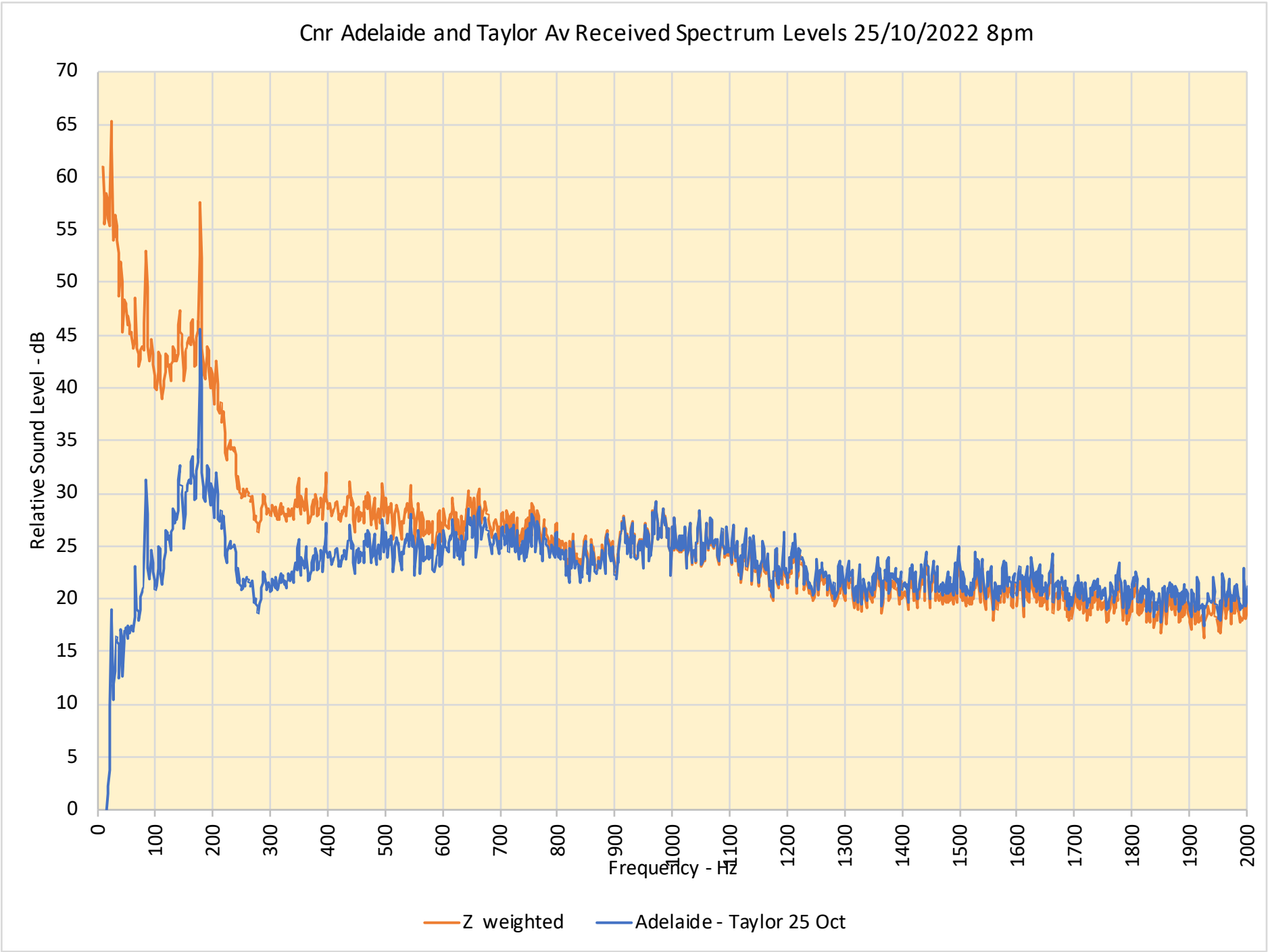


Appendix E Figure E24

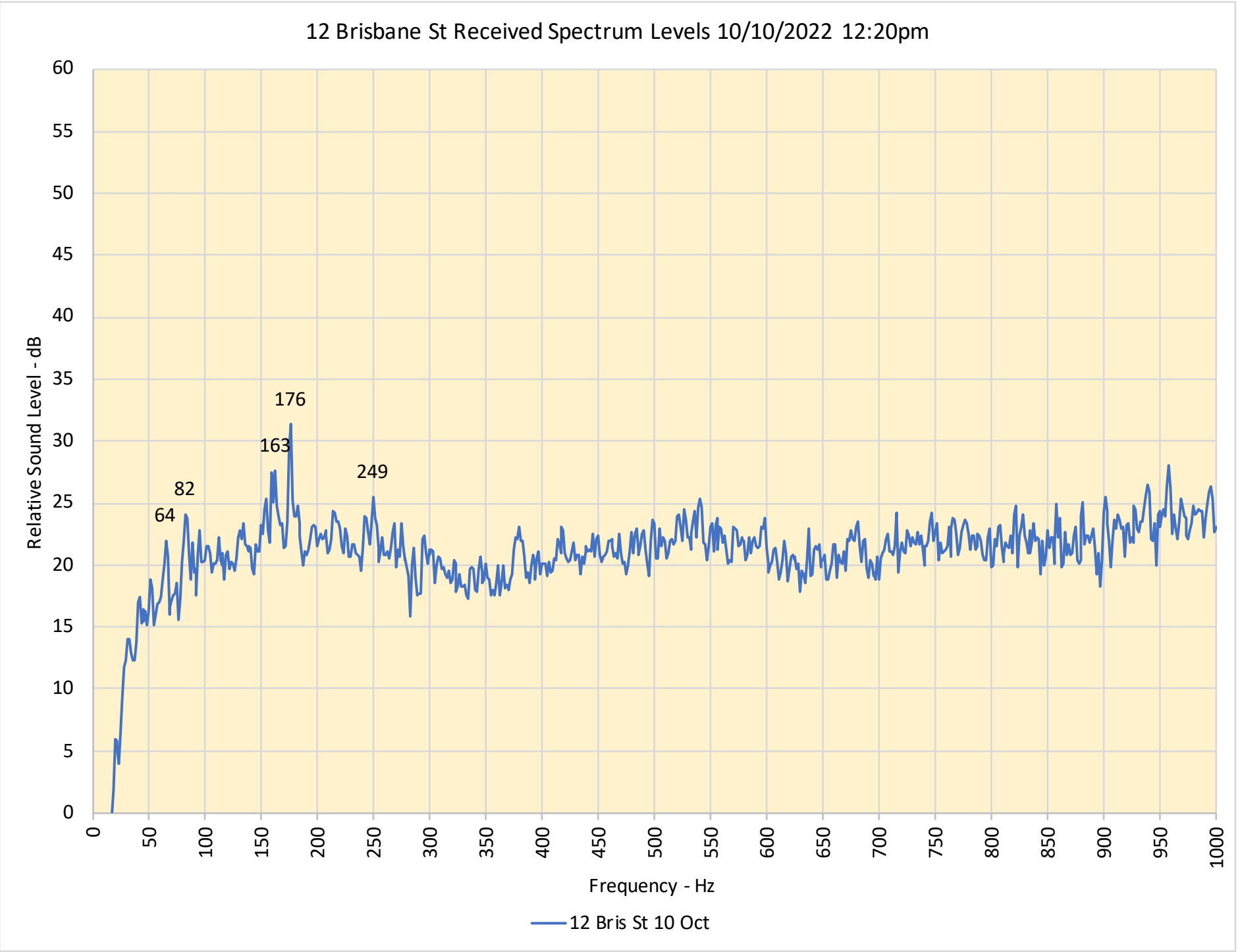
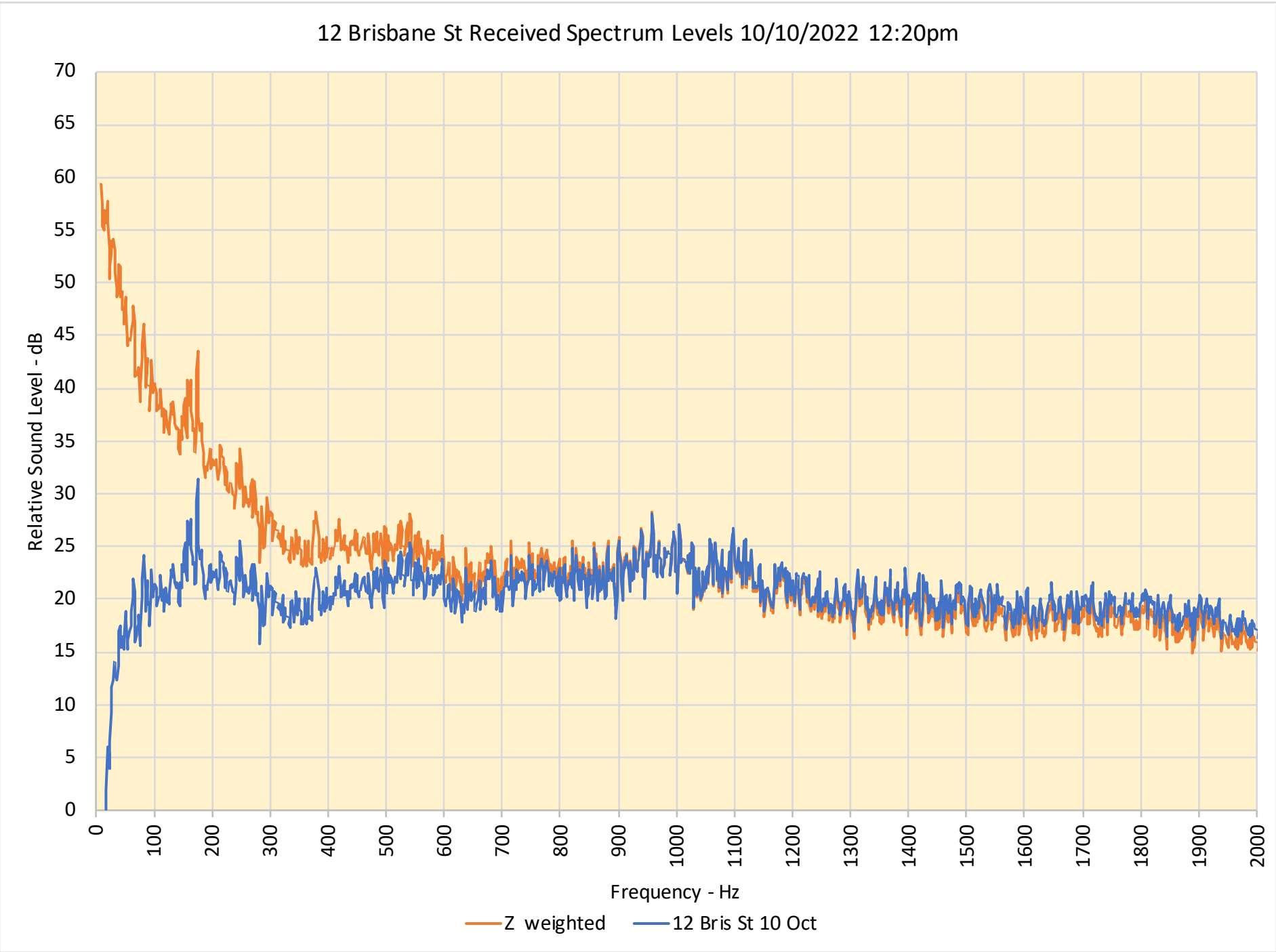




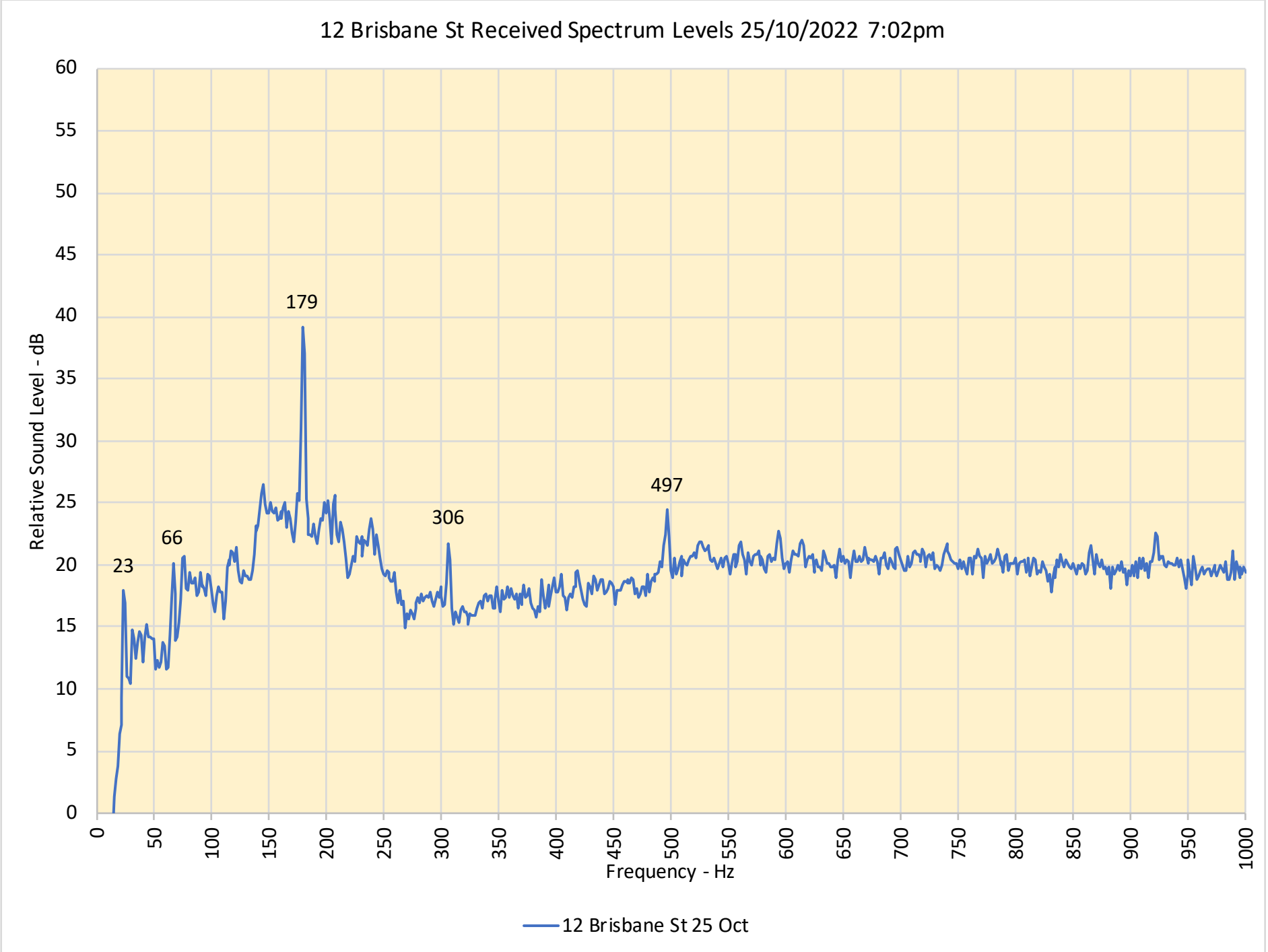
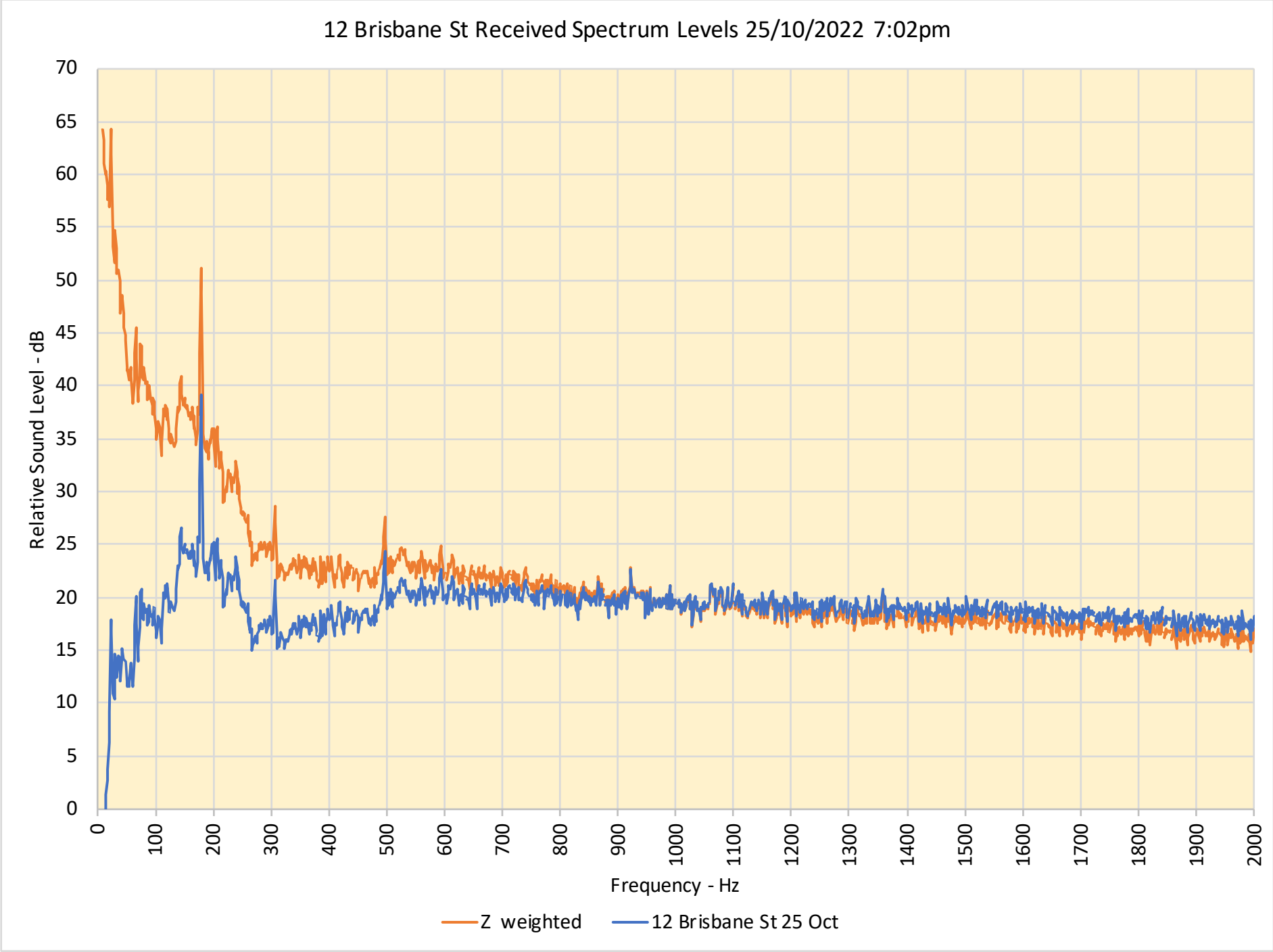




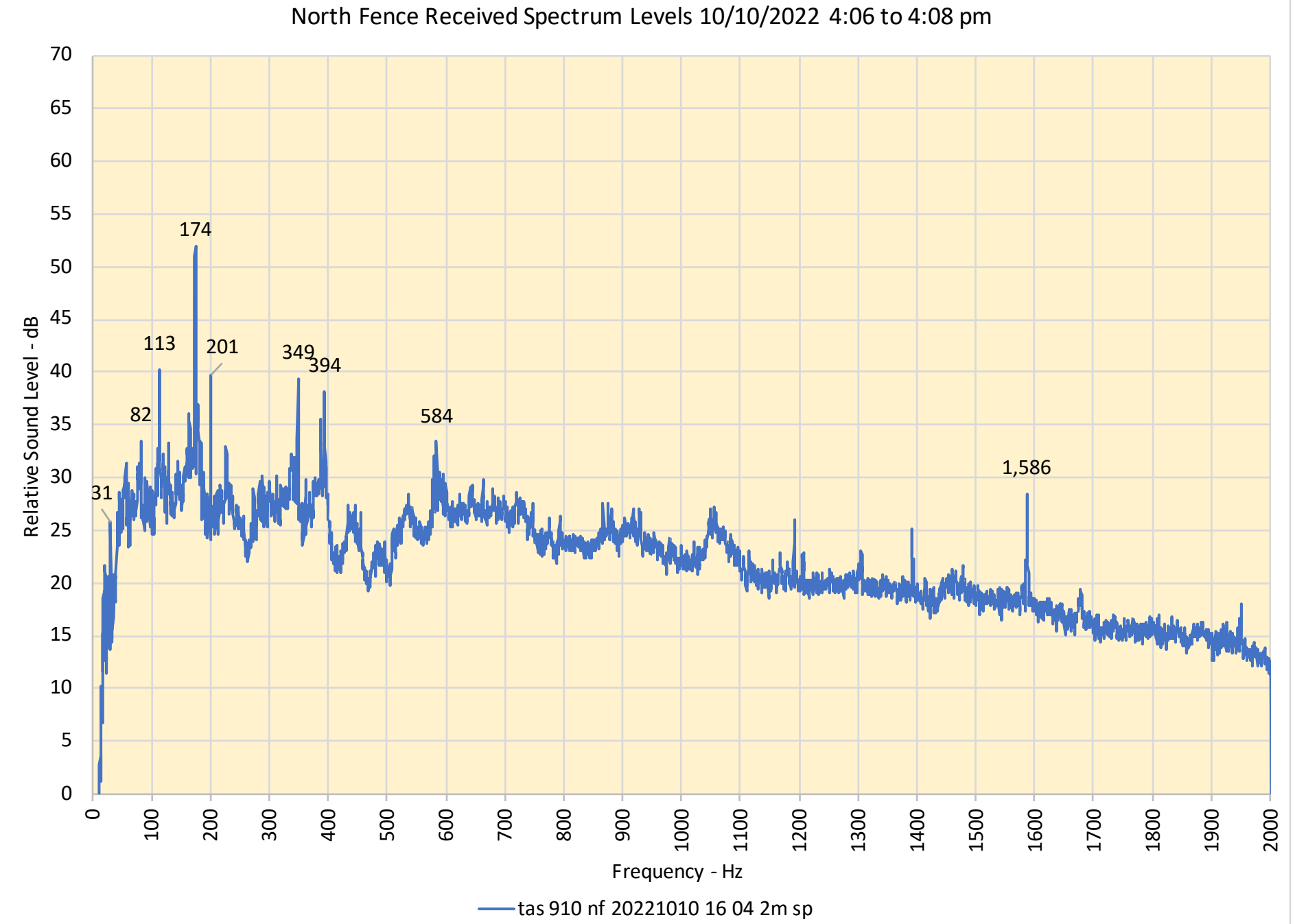
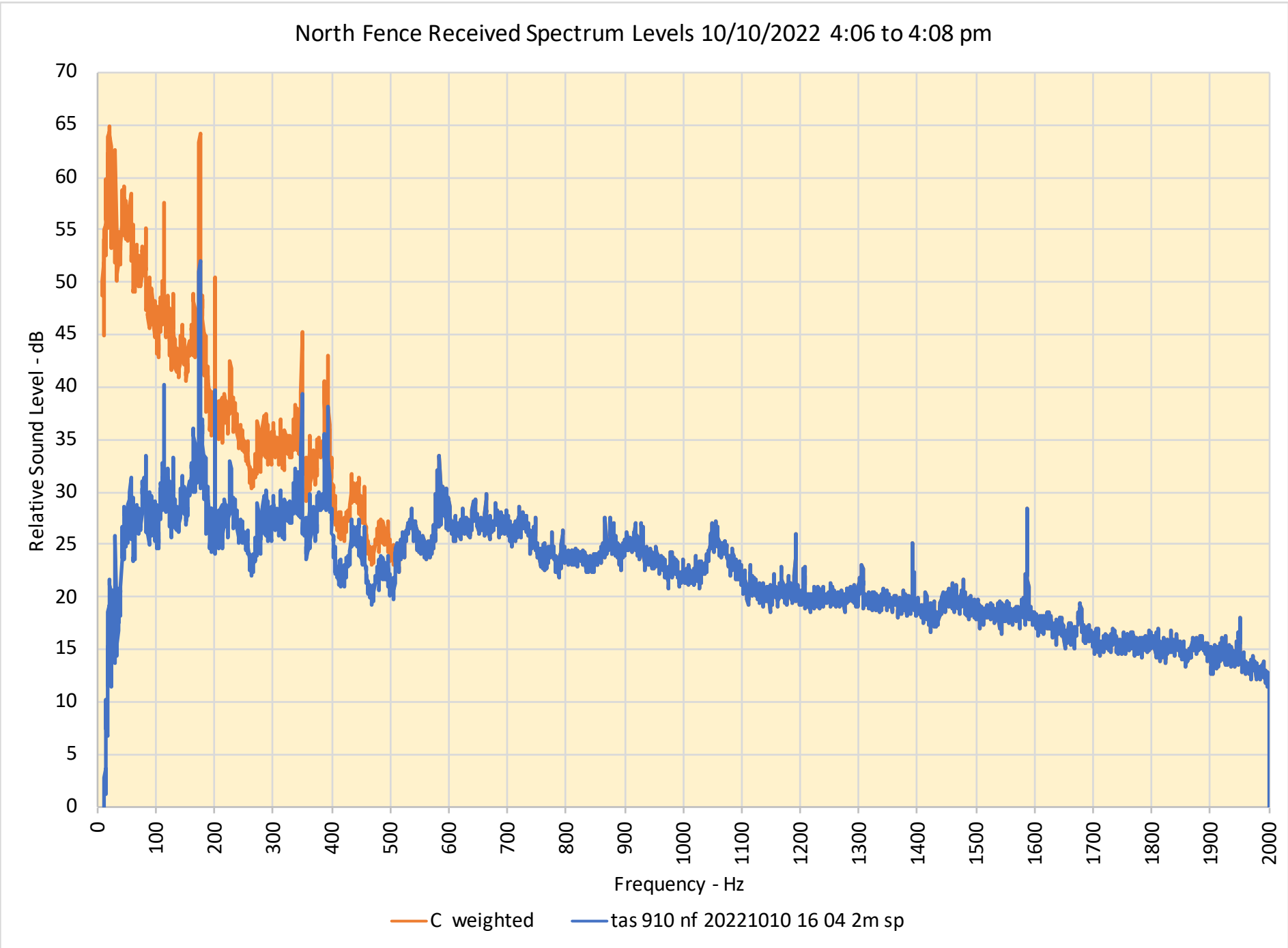
Appendix E Figure E27

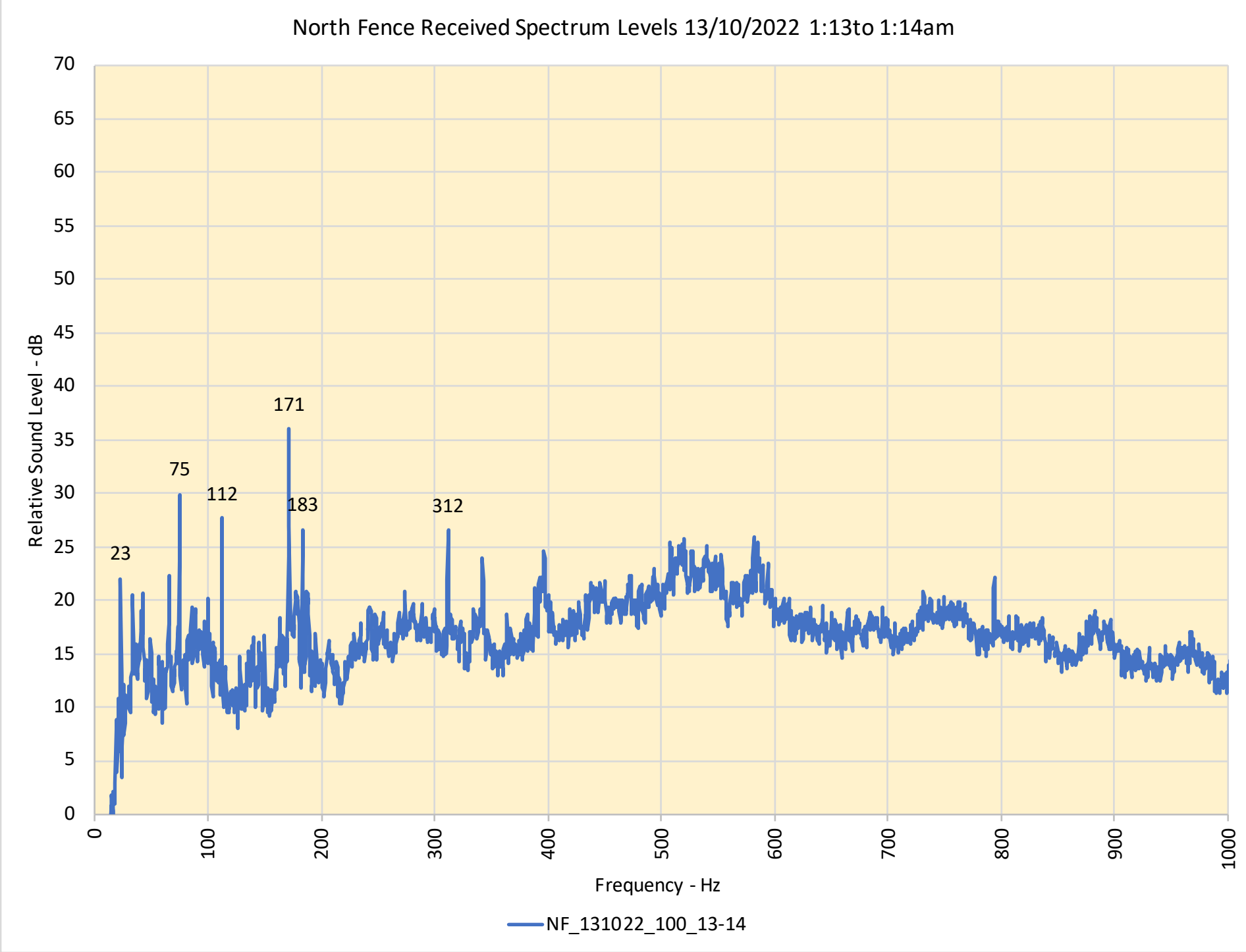
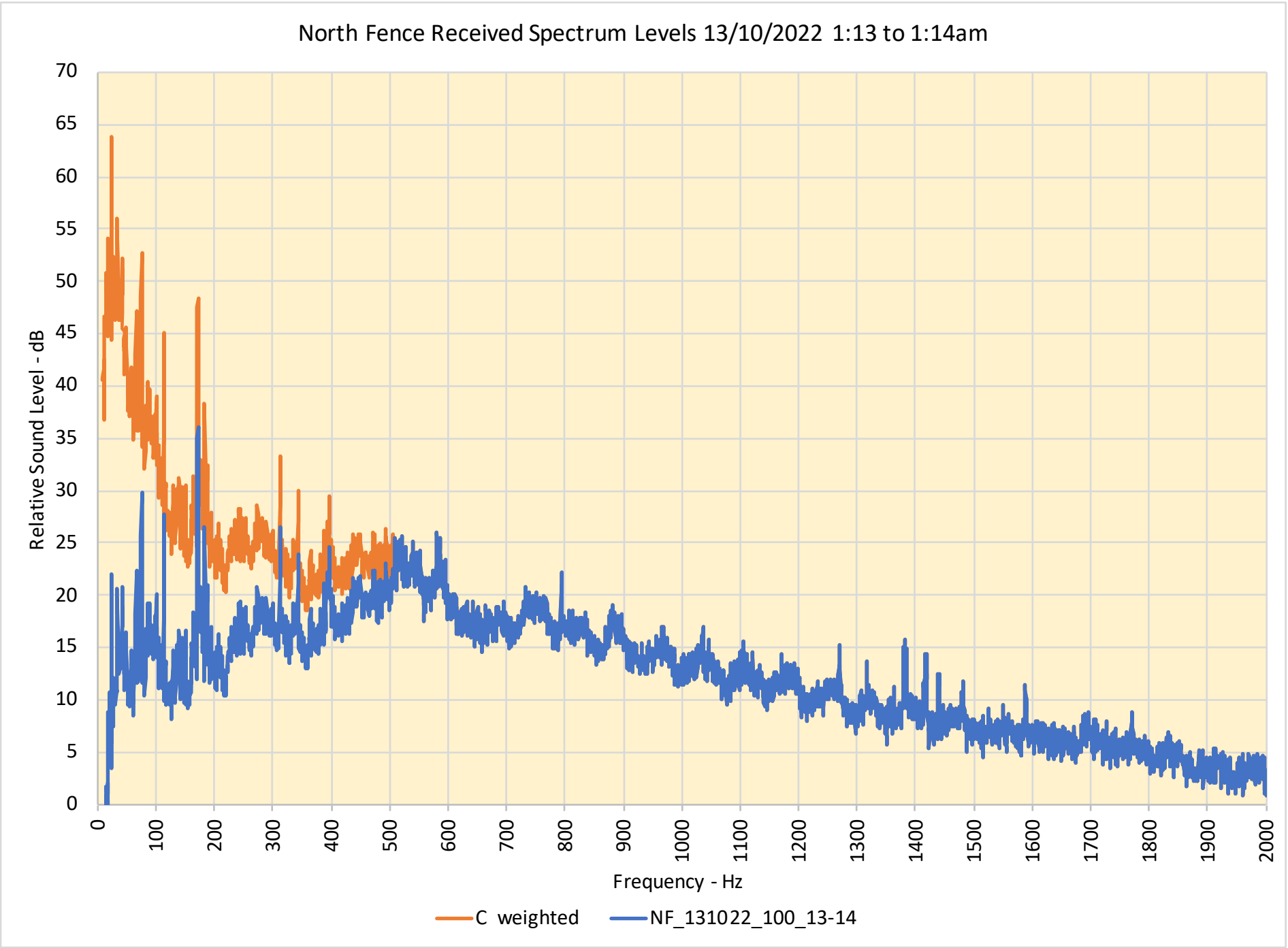


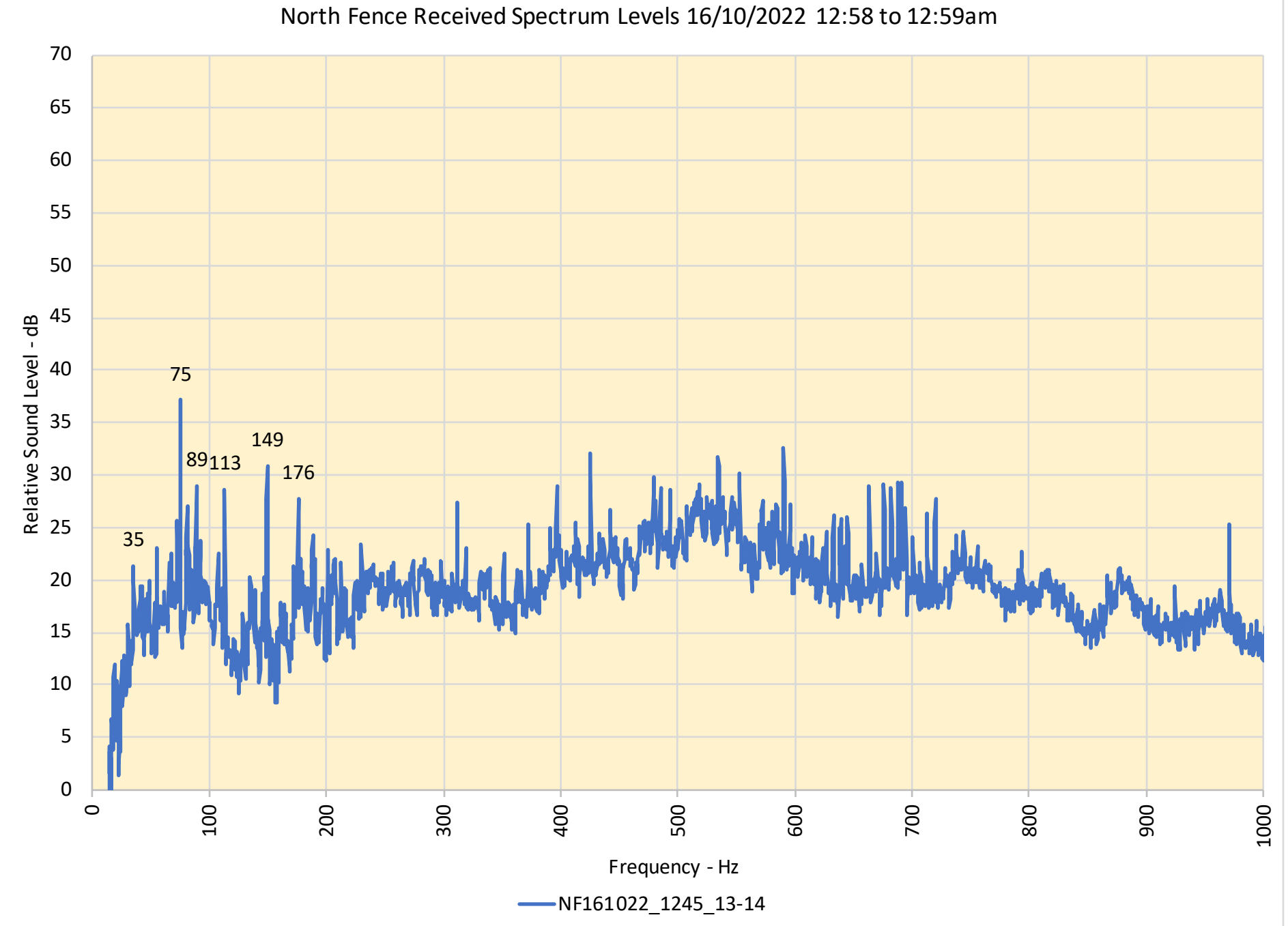
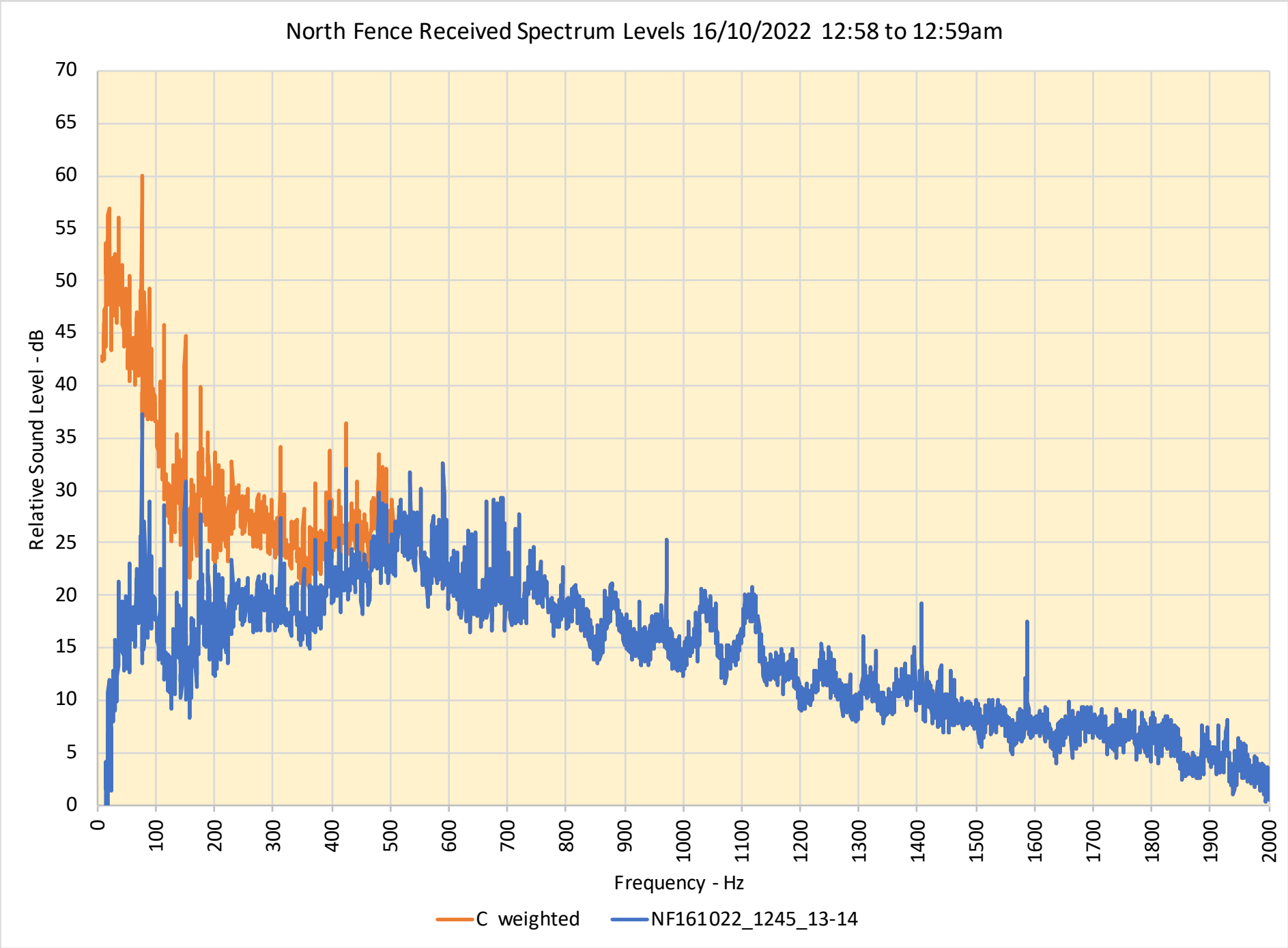
Appendix E Figure E28

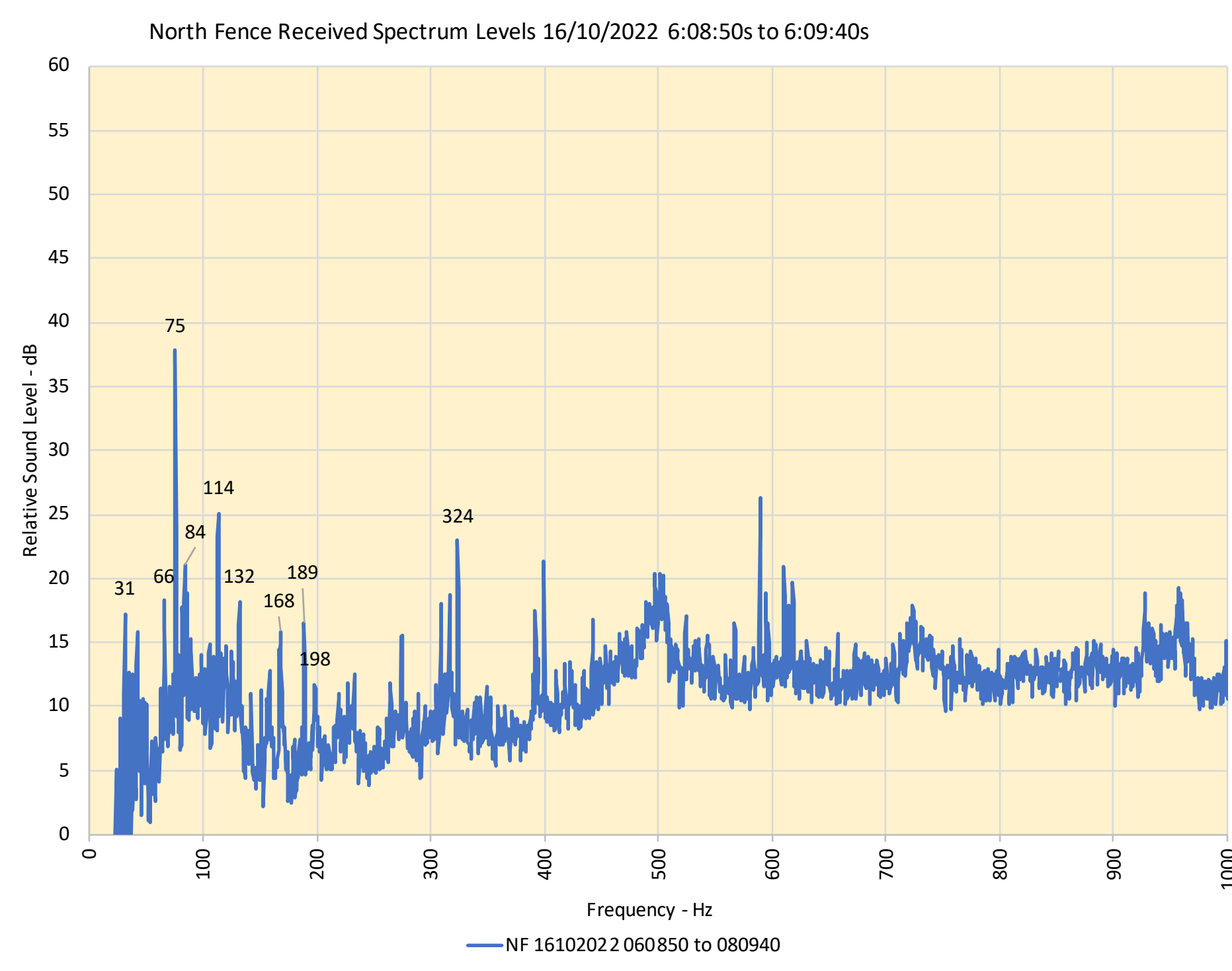
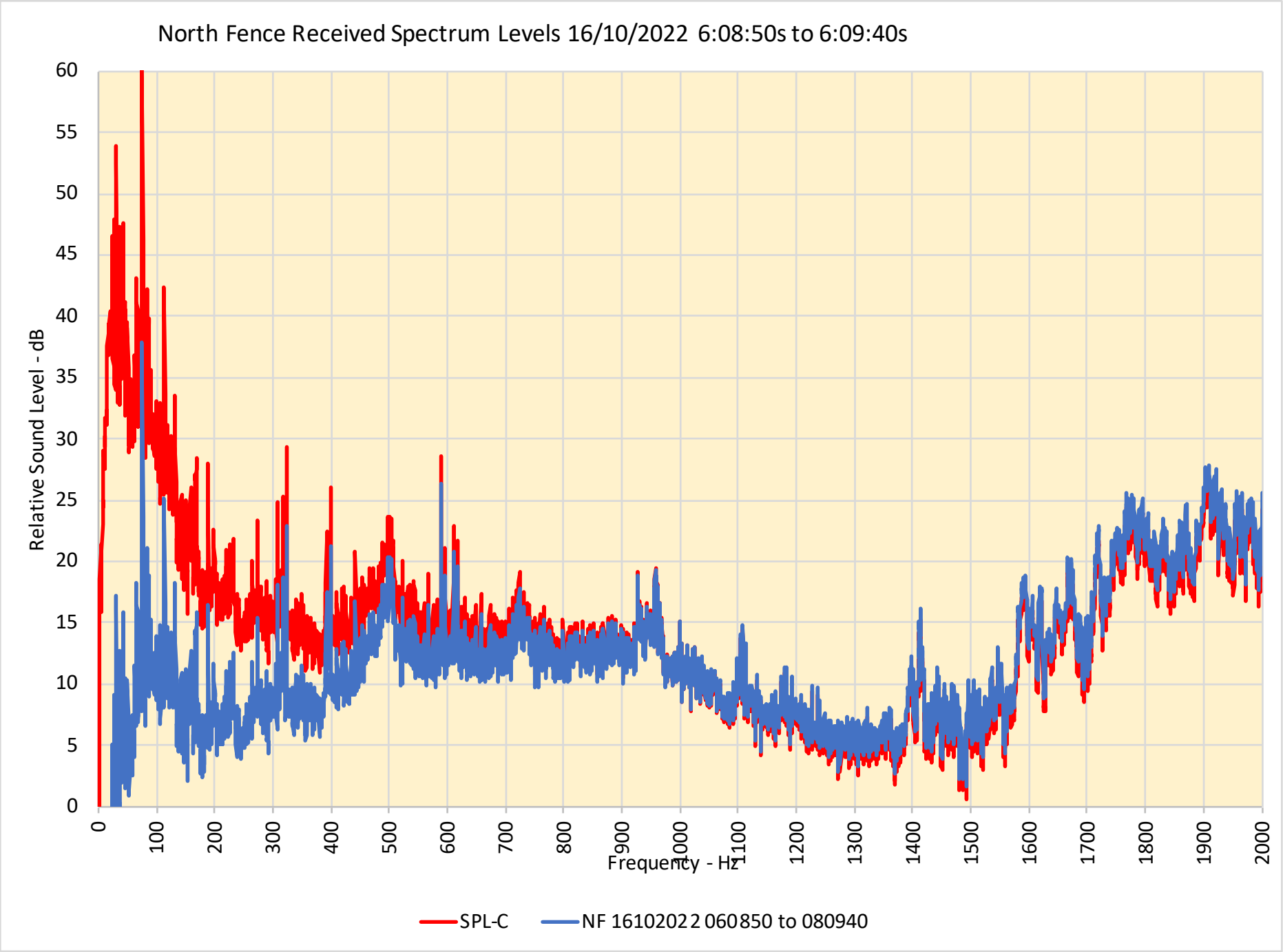


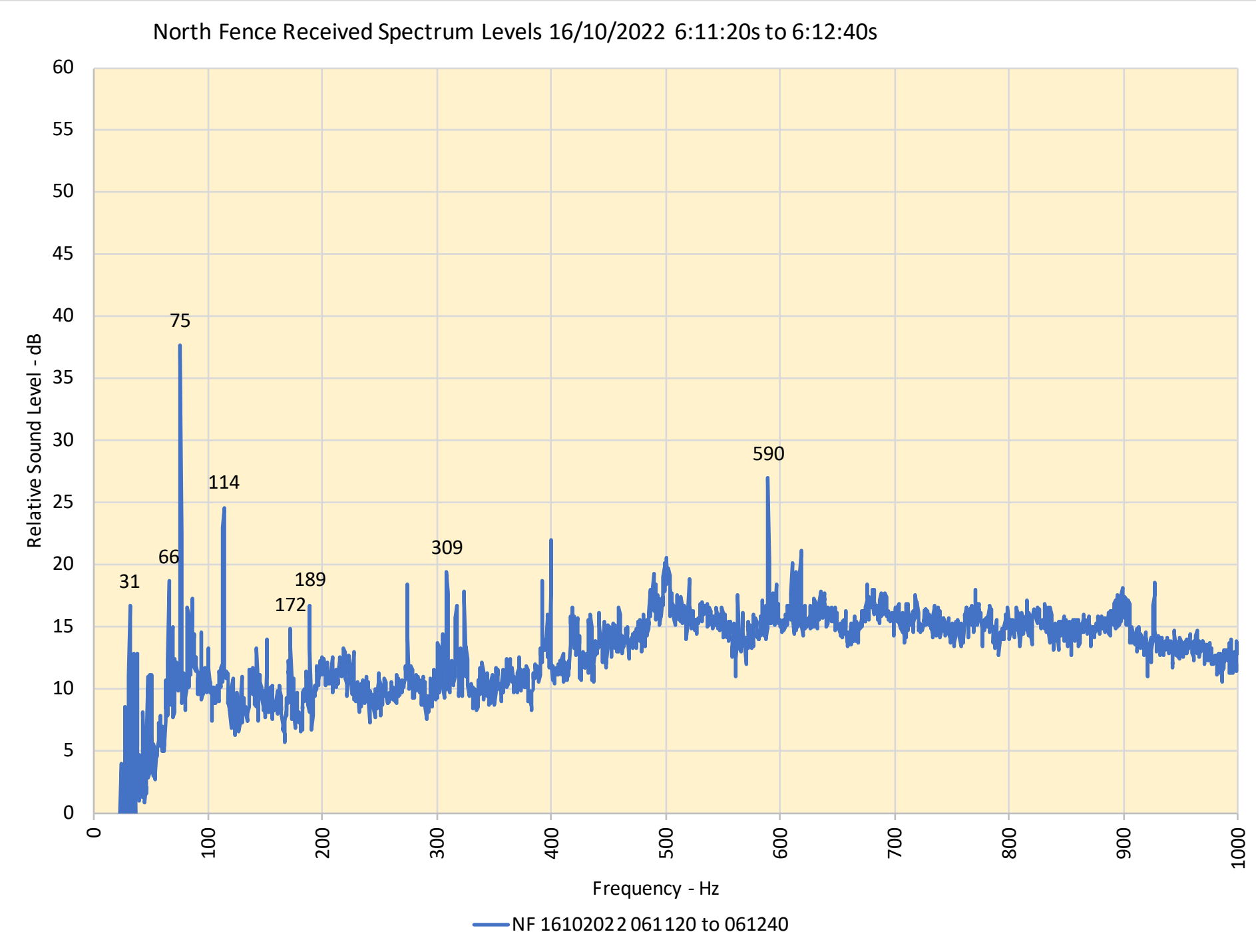
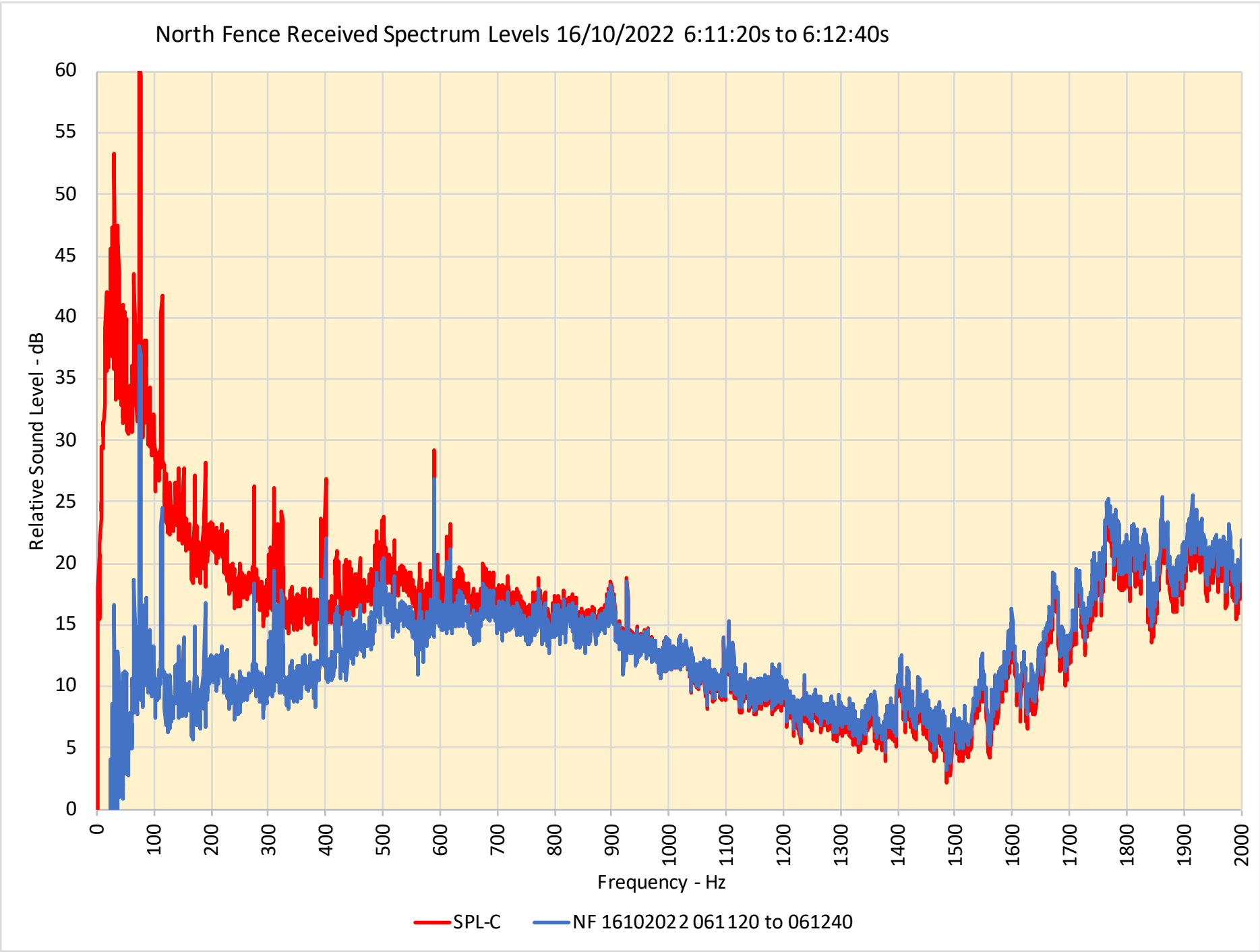
Appendix E Figure E29





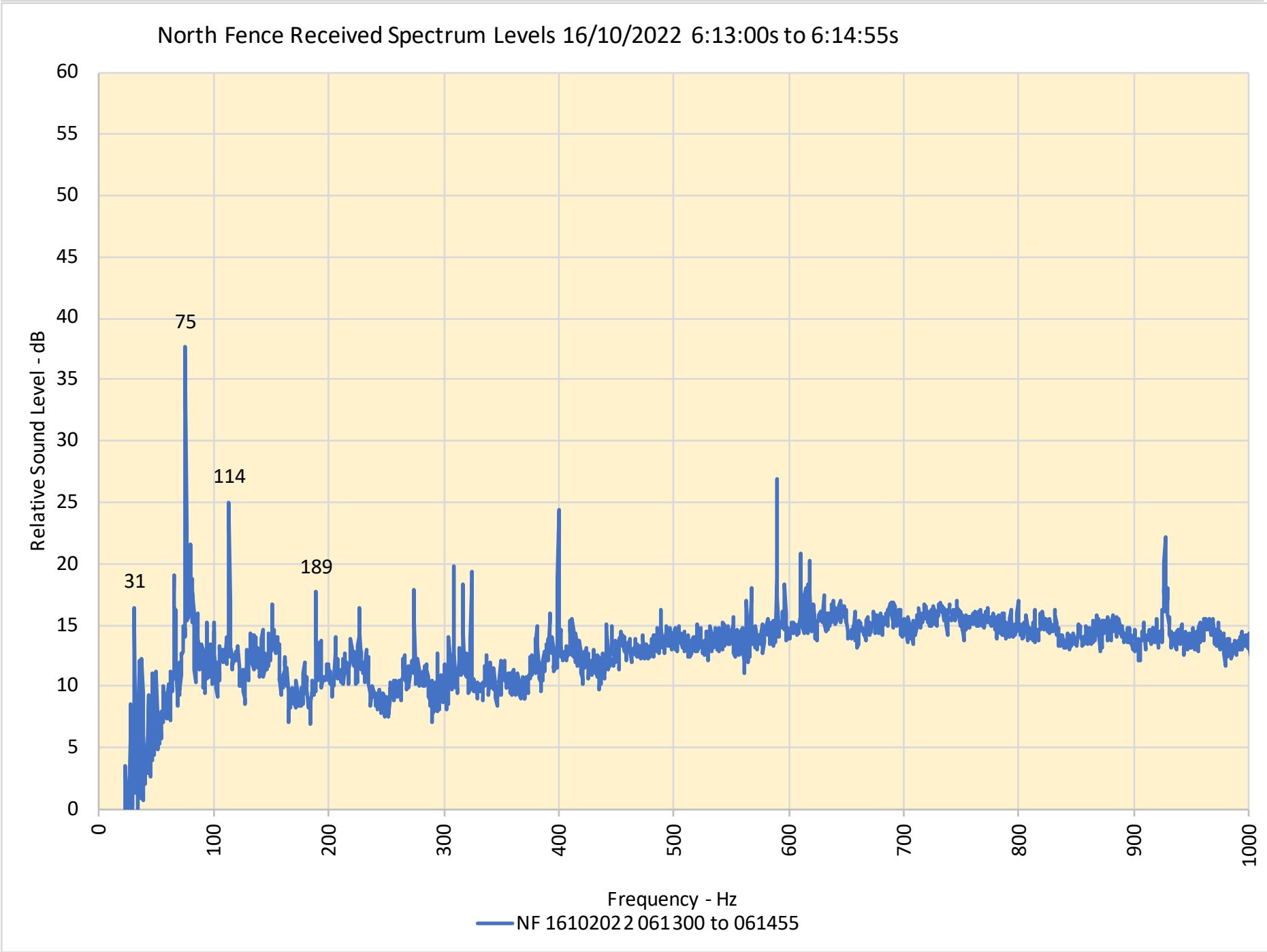
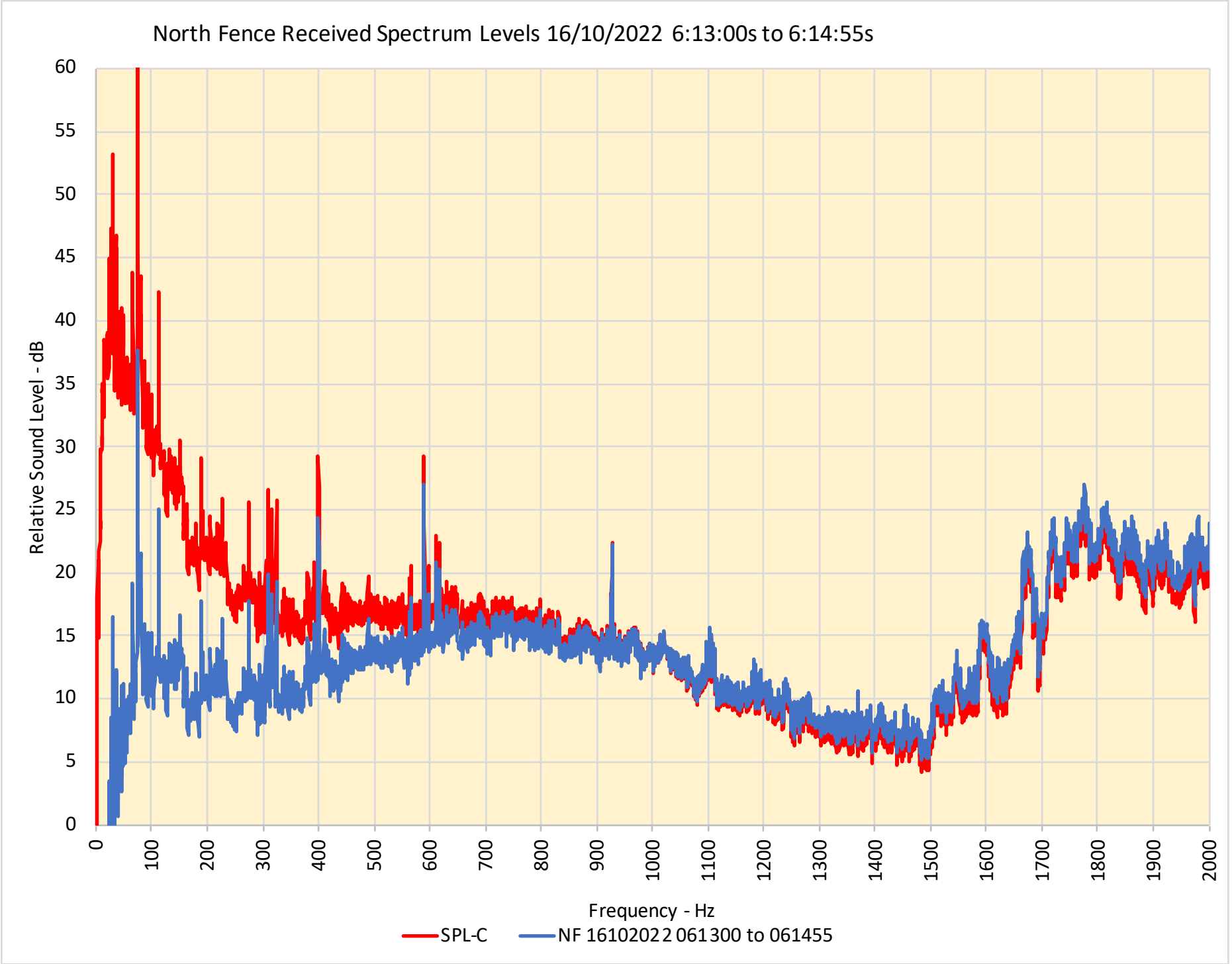




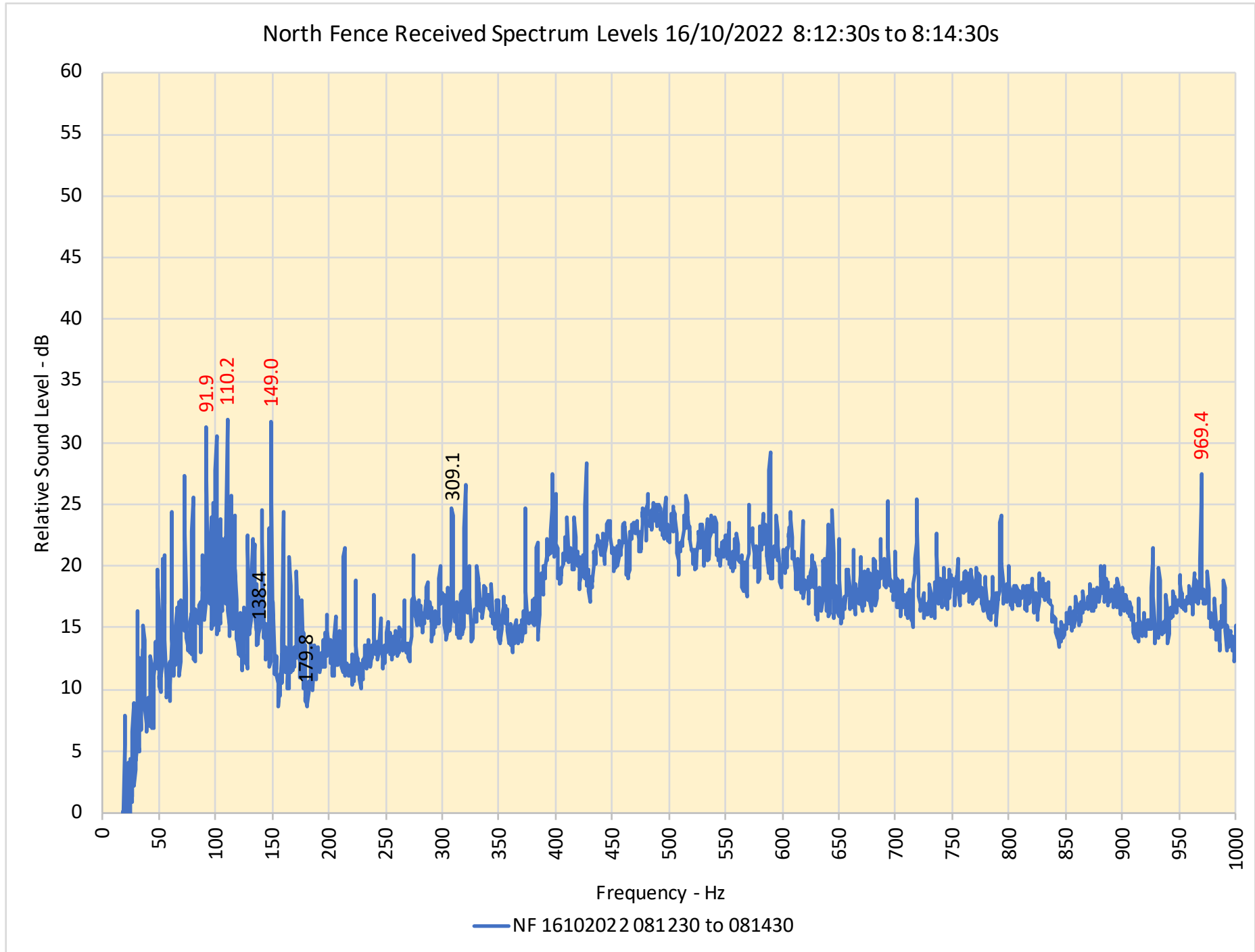
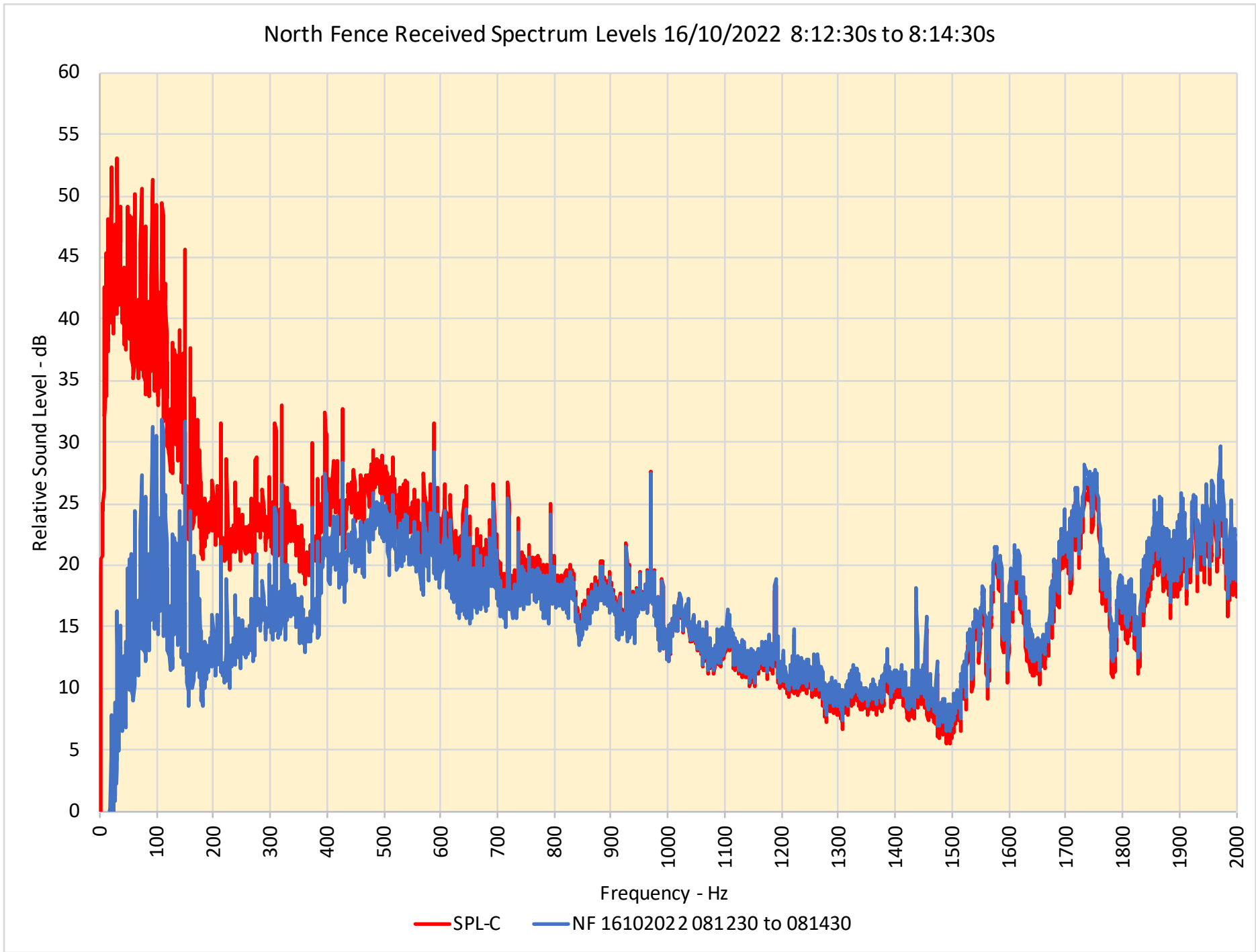


Appendix E Figure E34

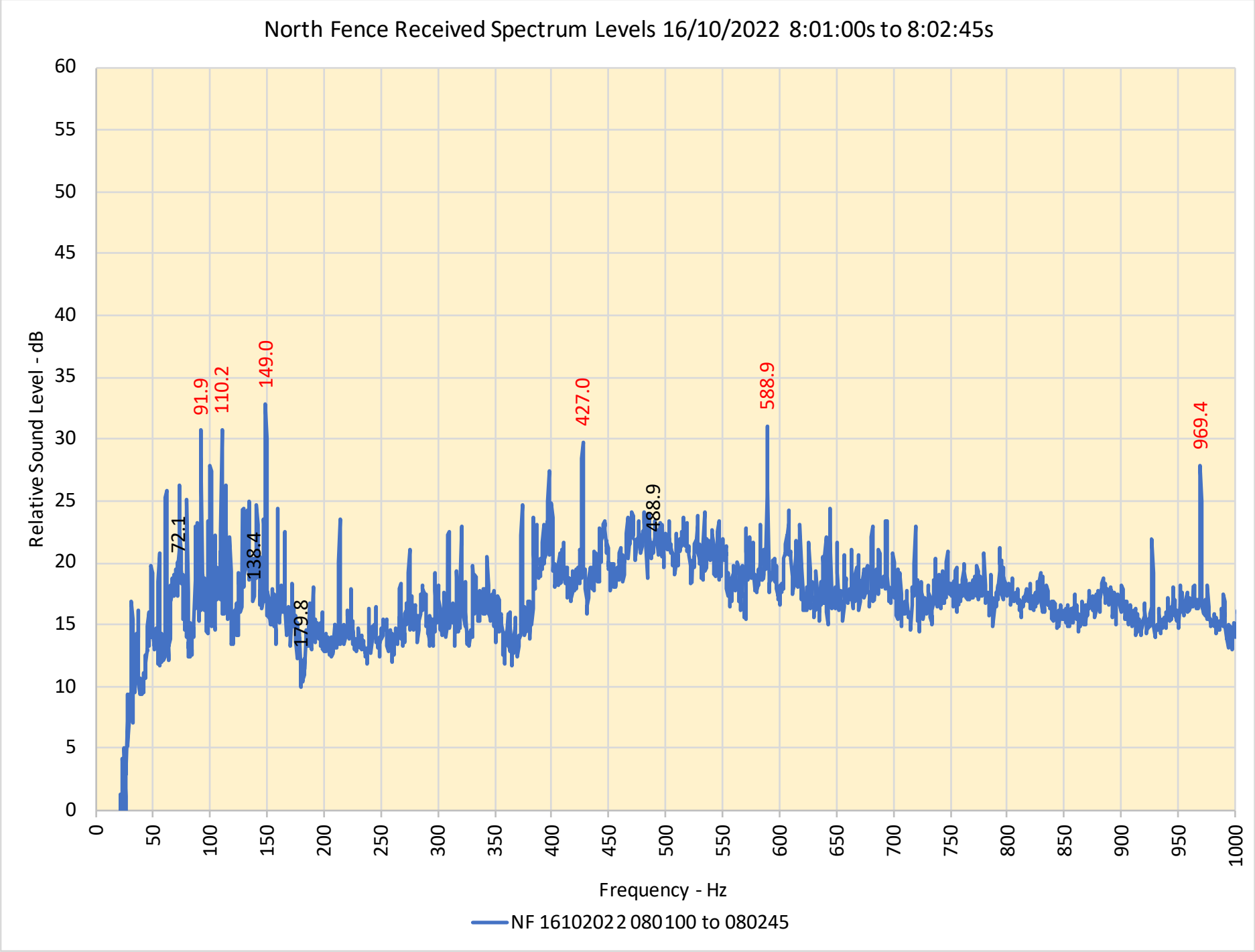
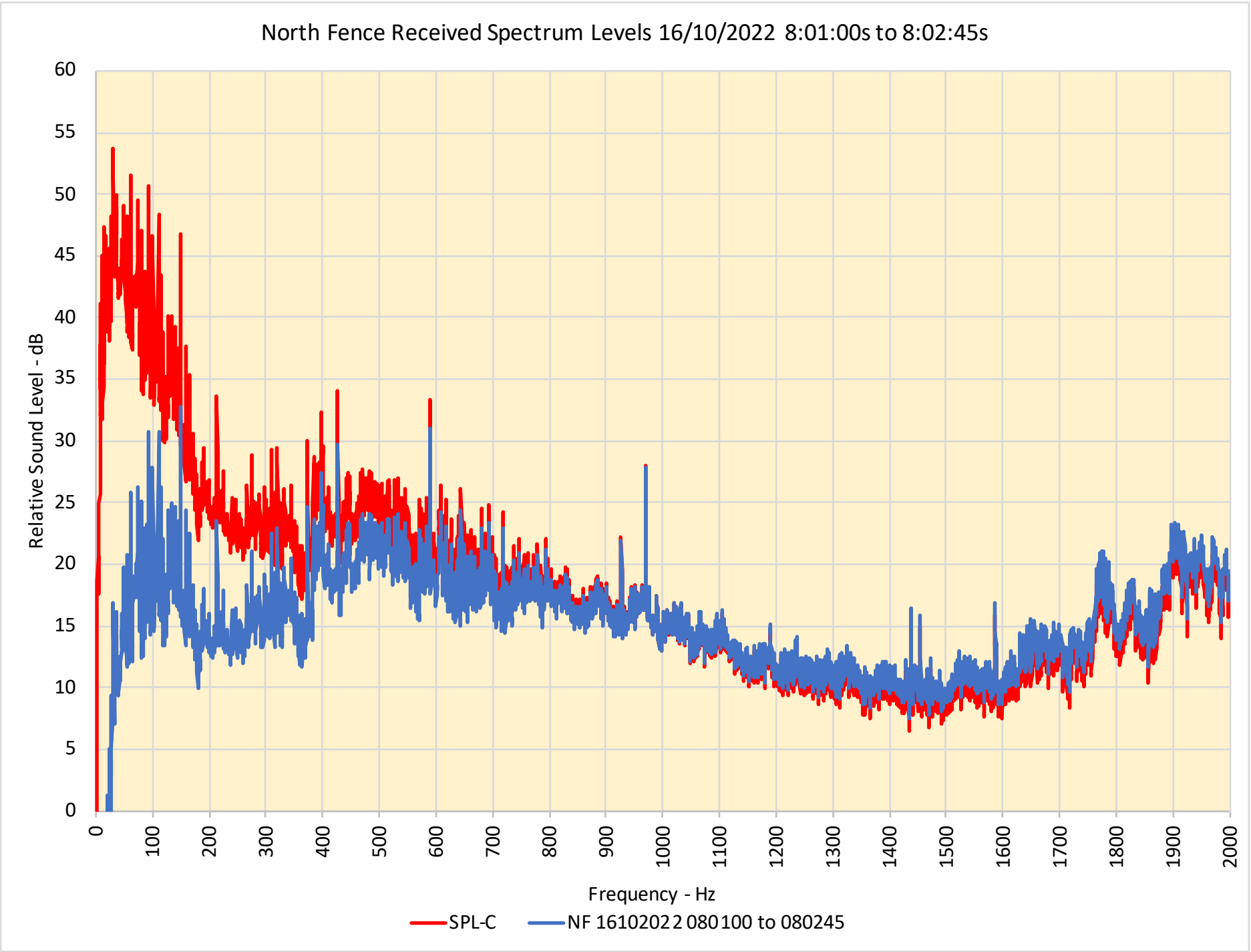




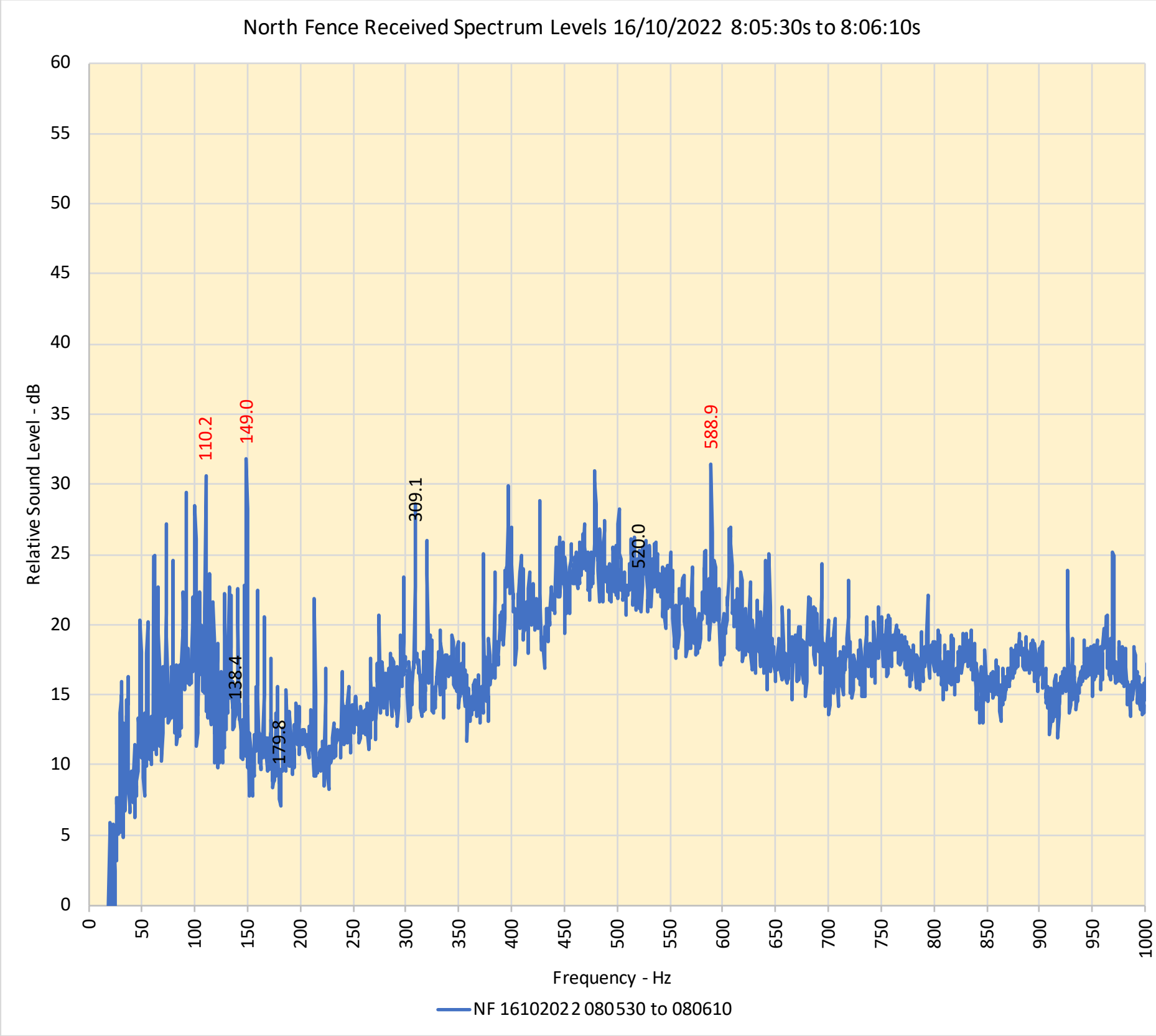
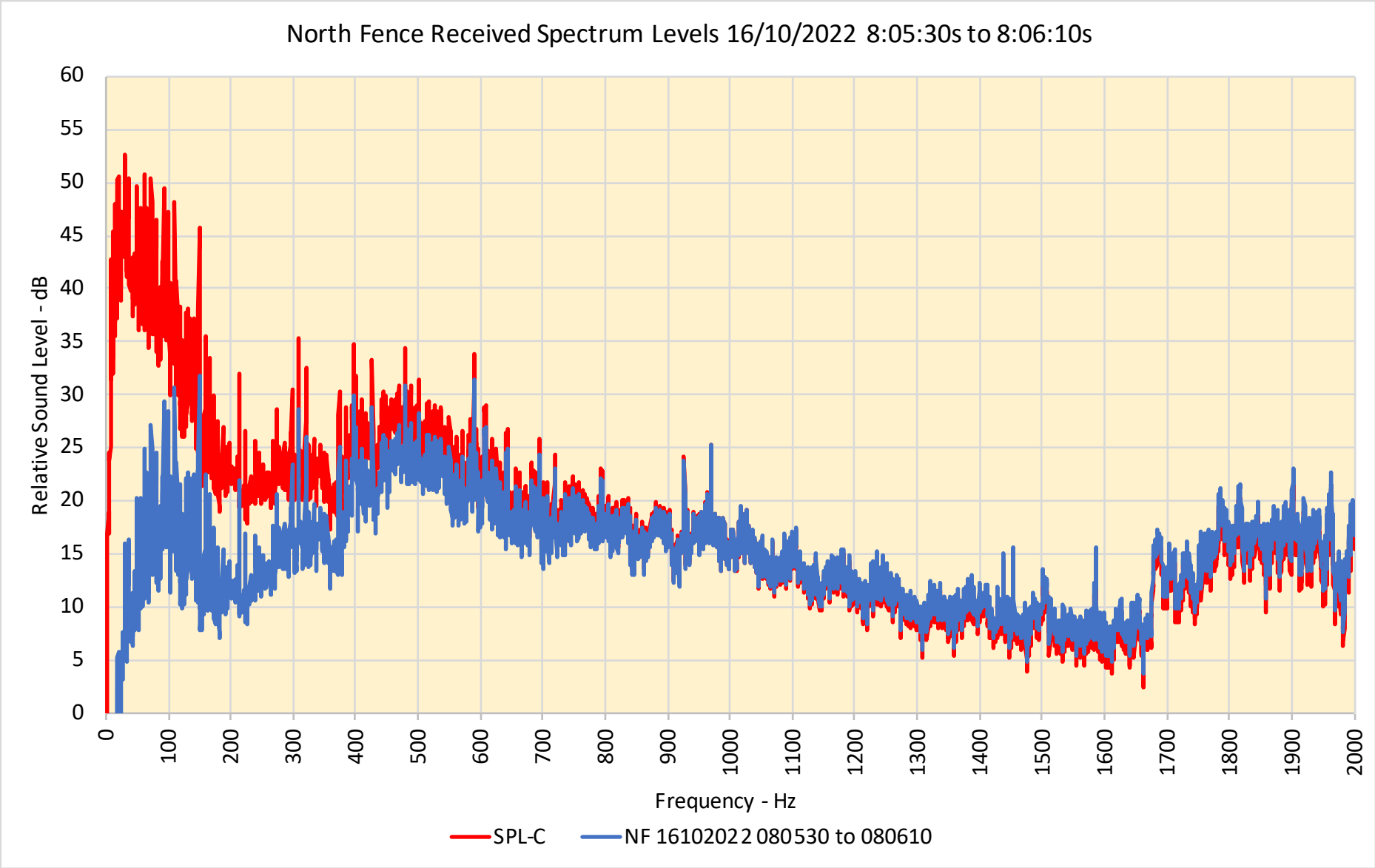
Appendix E Figure E35



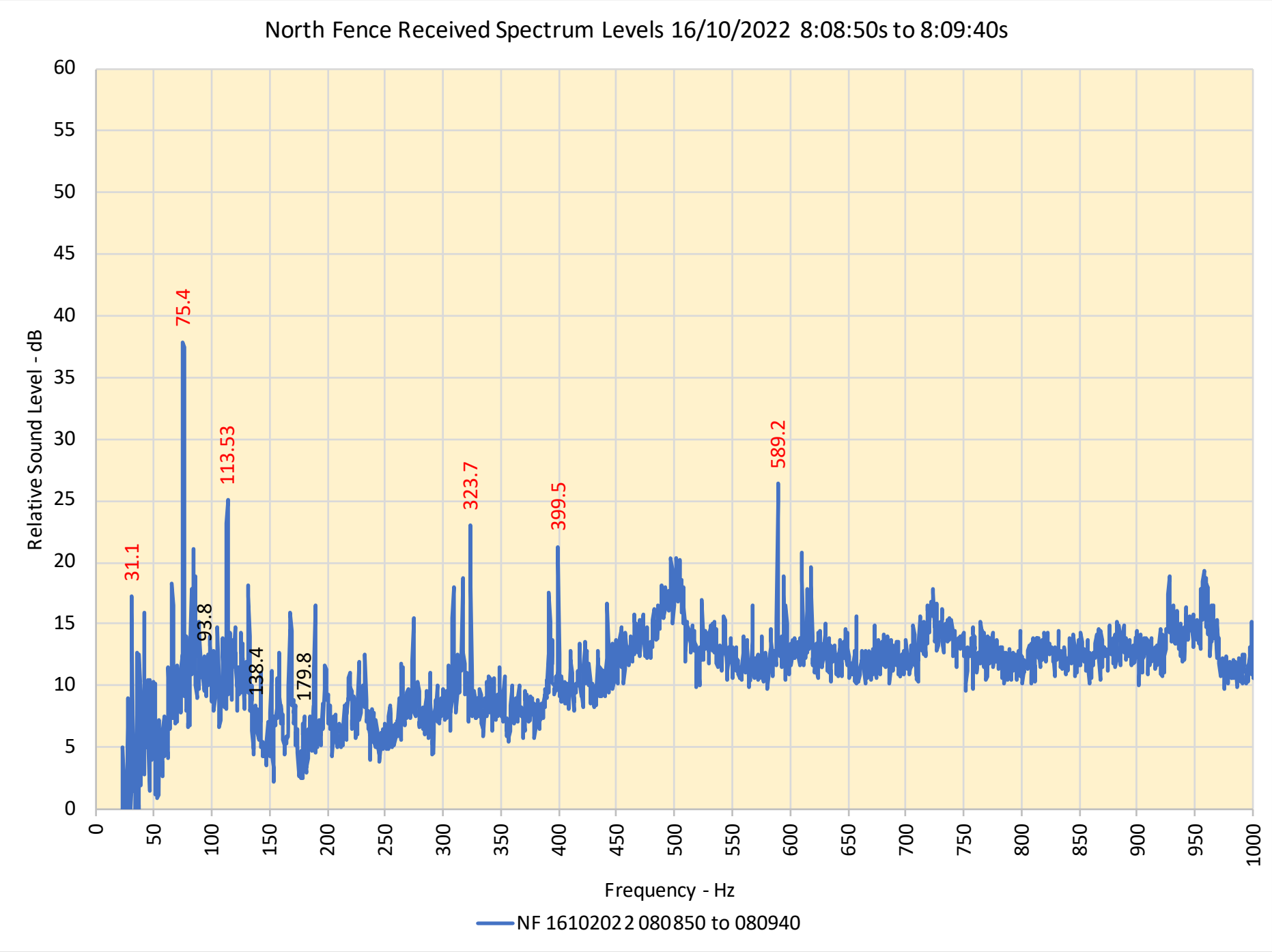
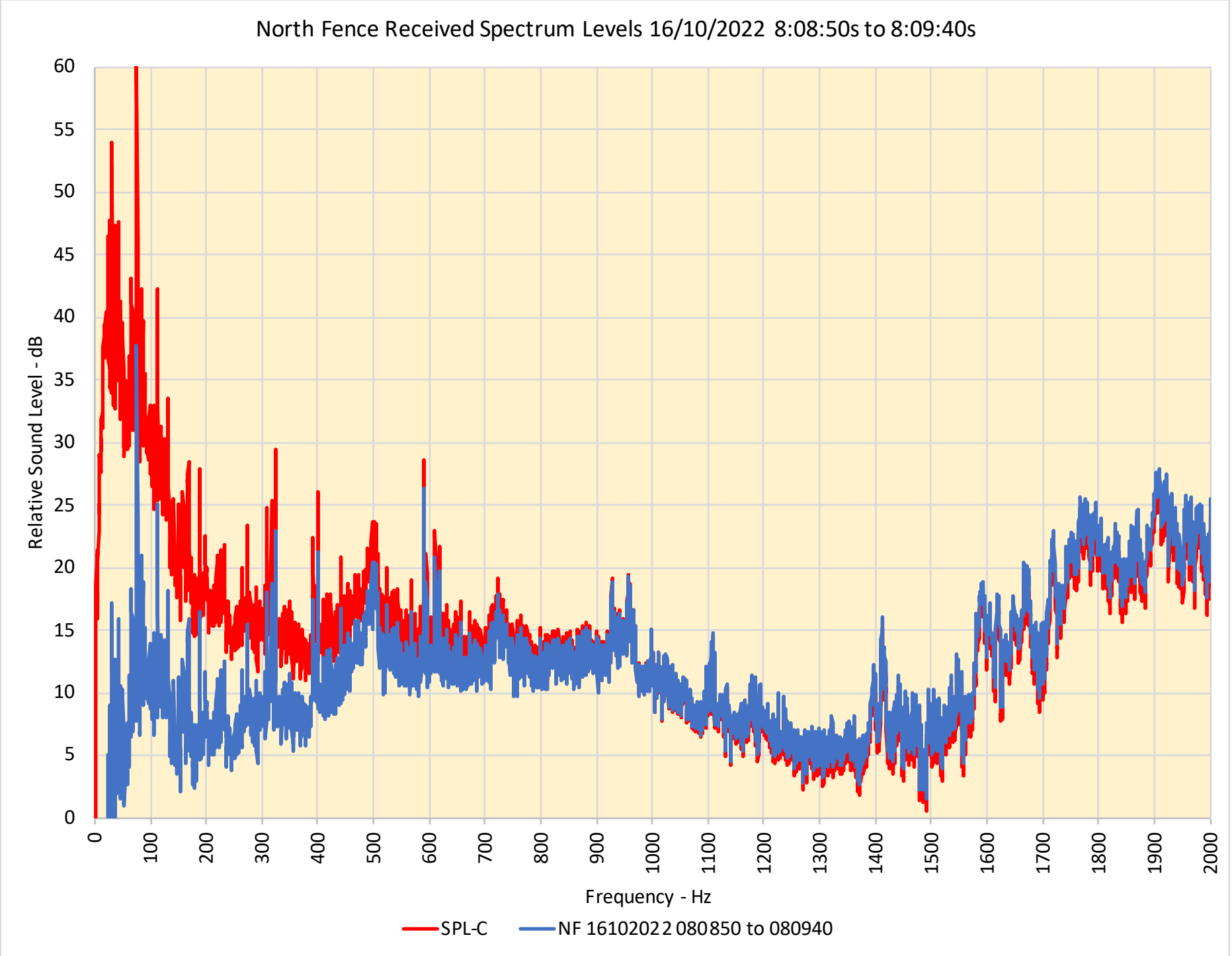
Appendix E Figure E36



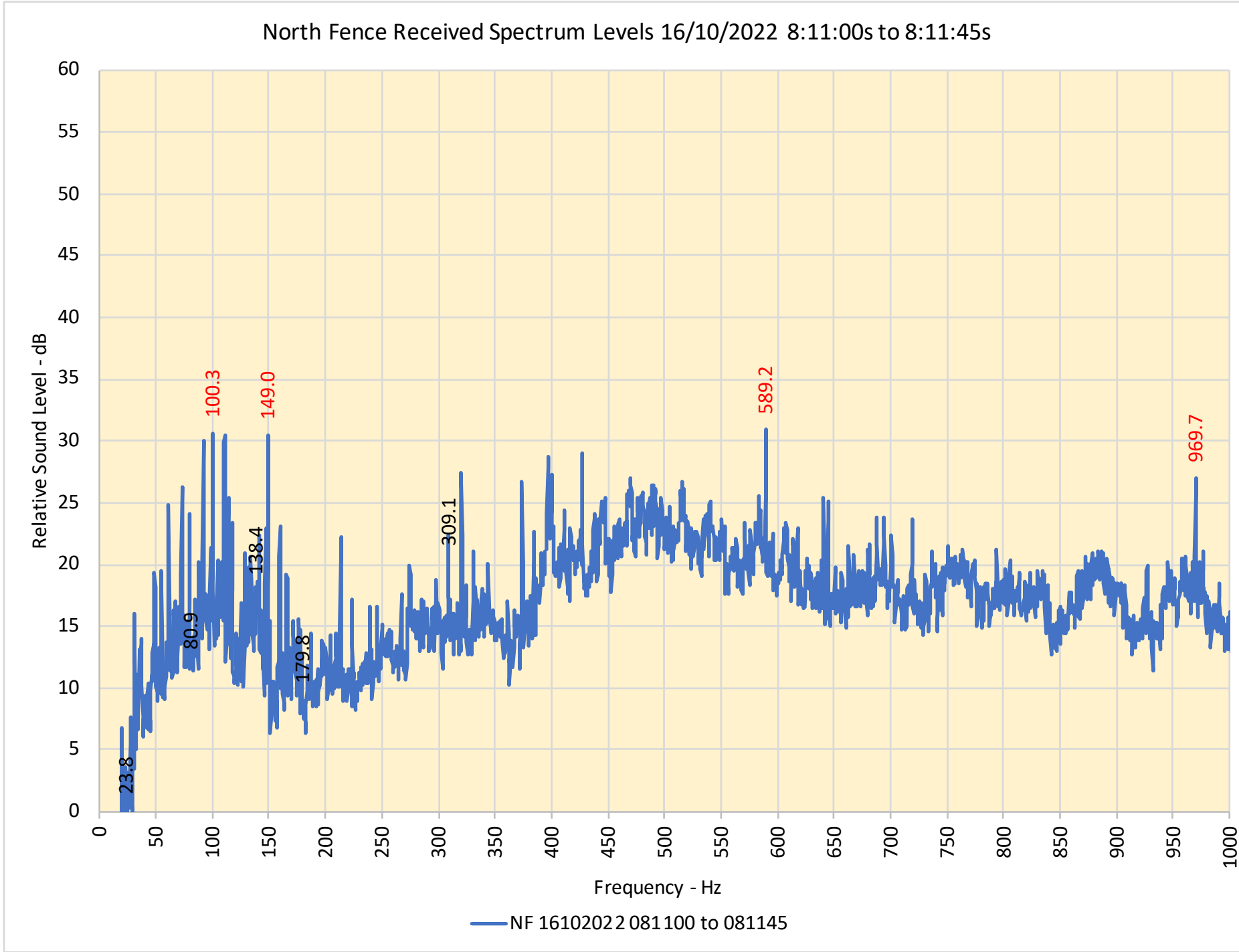
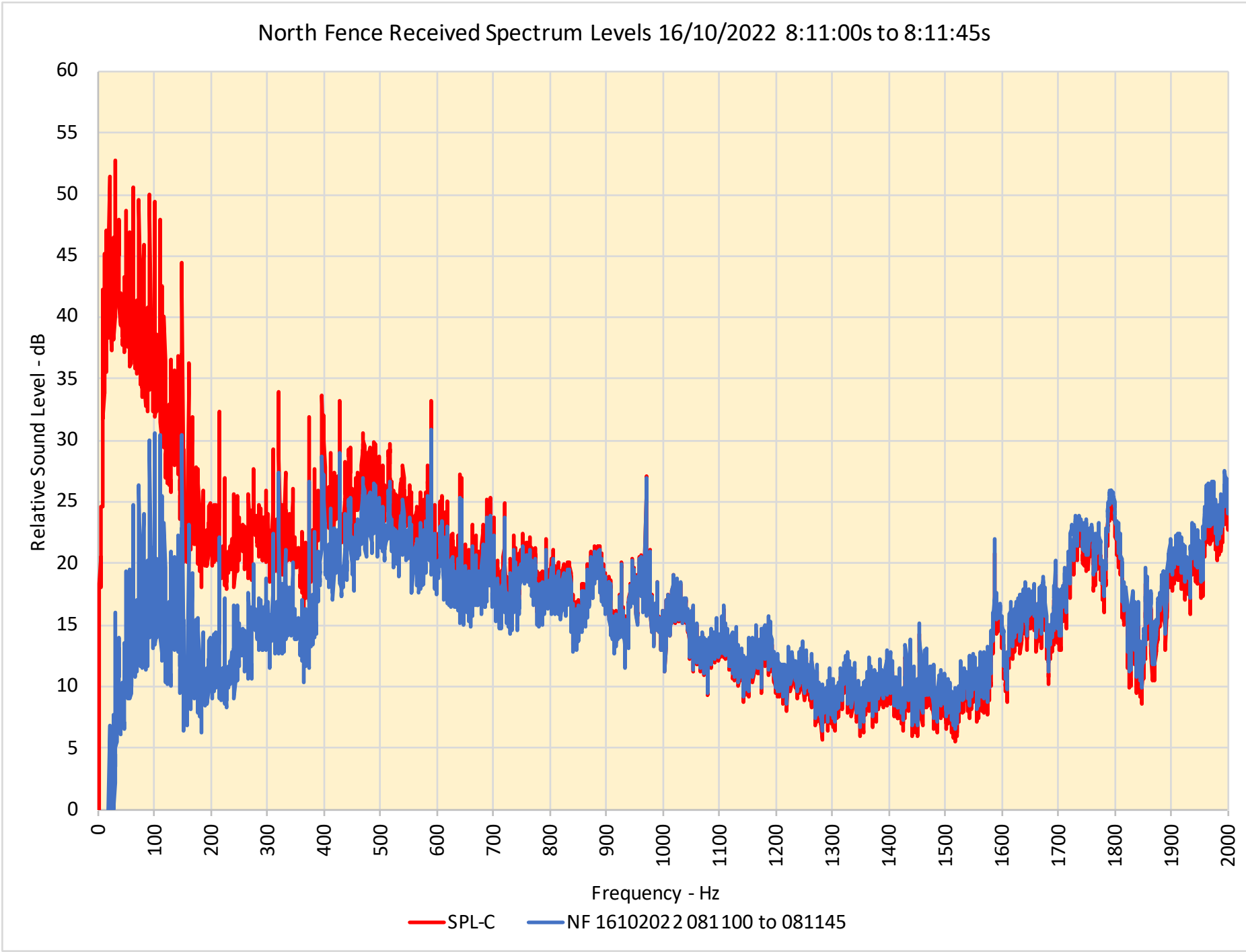
Appendix E Figure E37



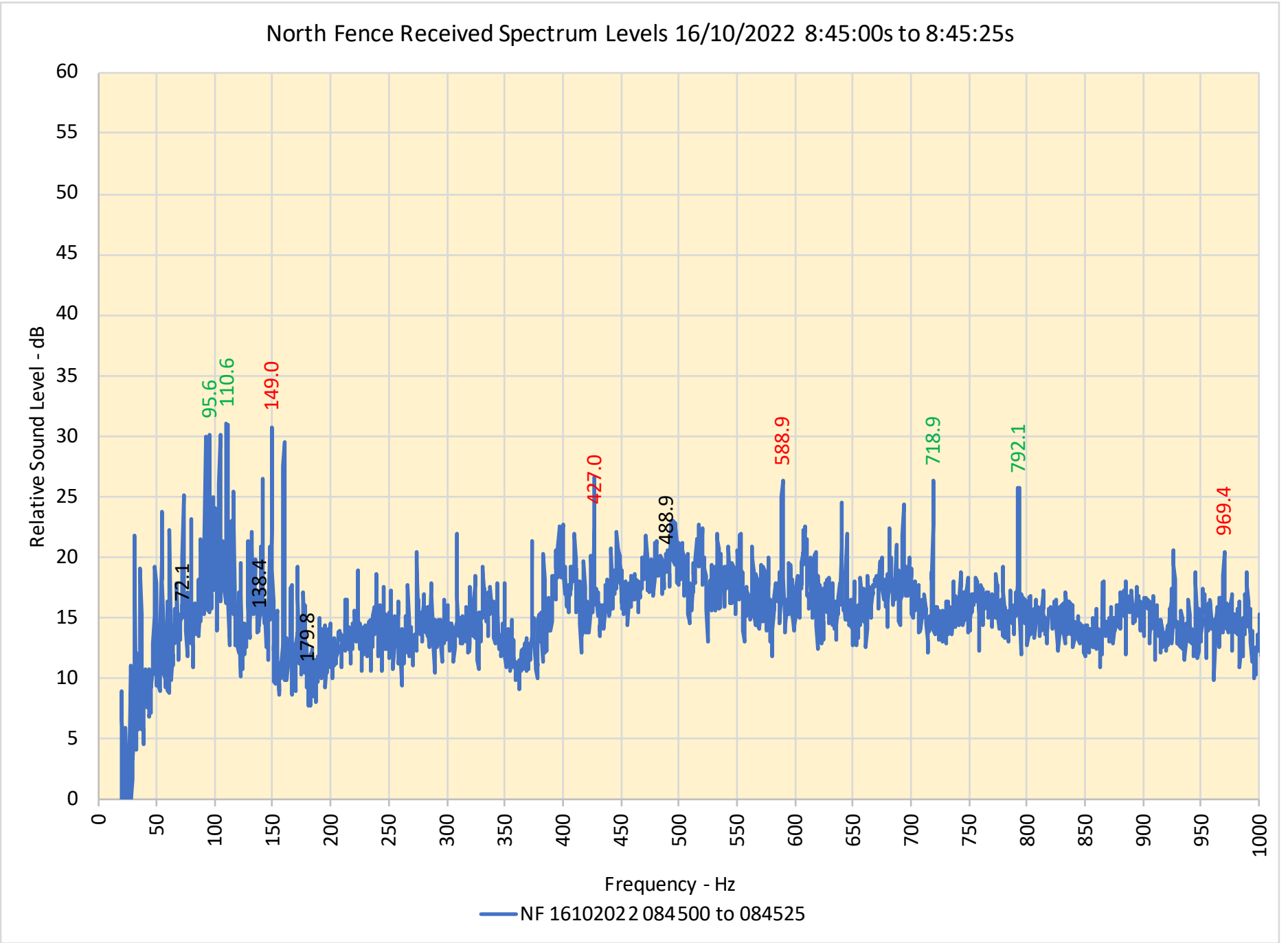
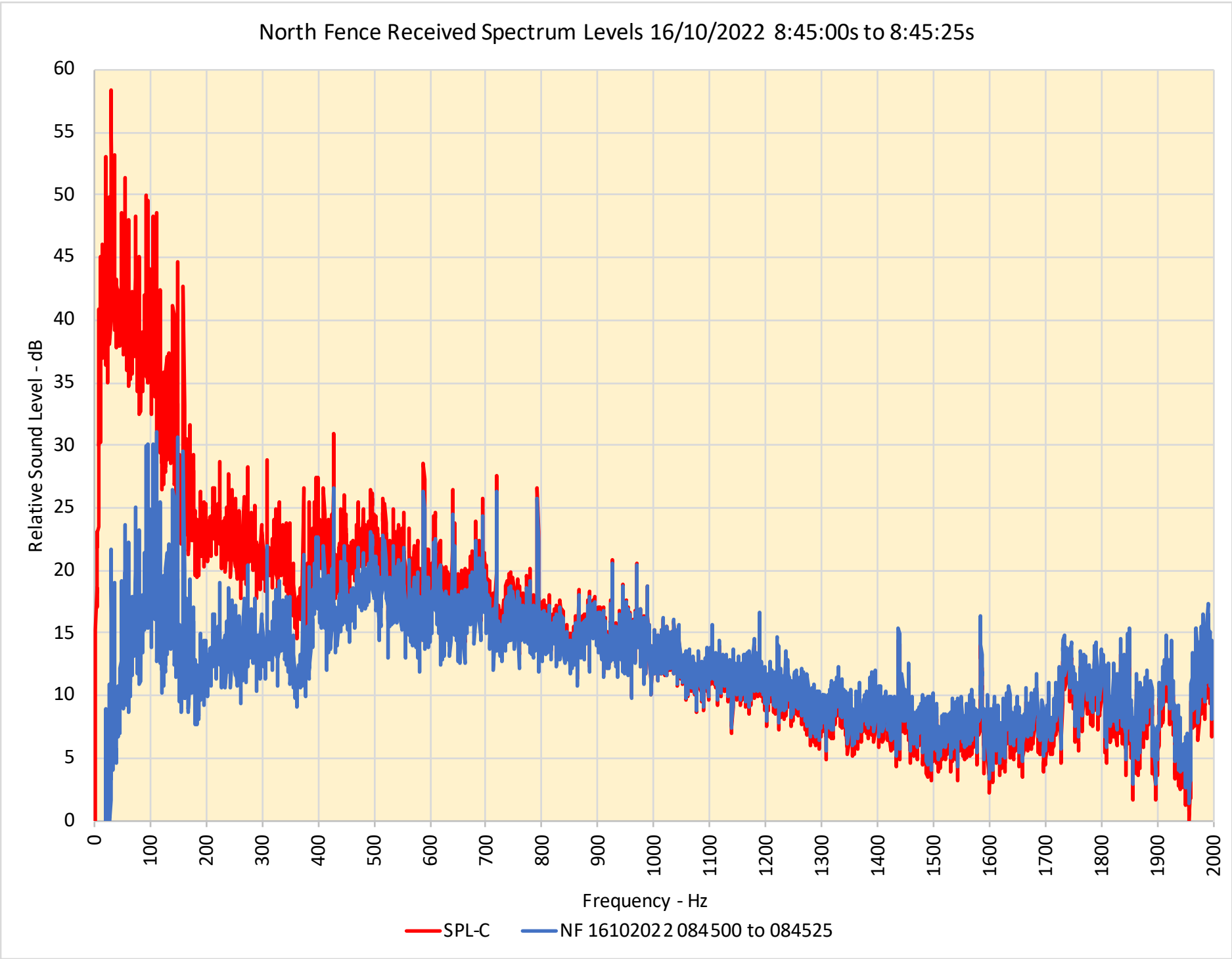
Appendix E Figure E38



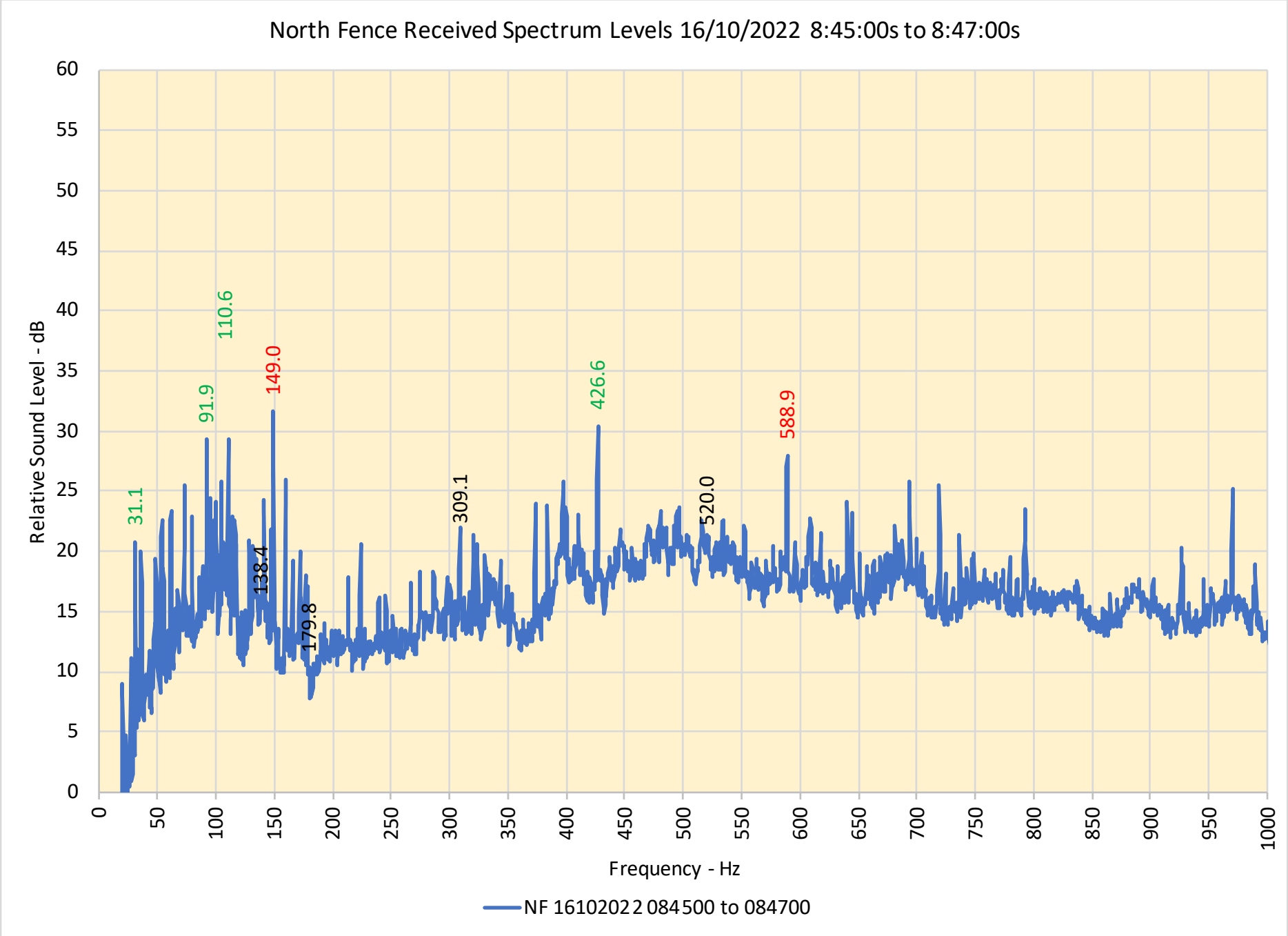
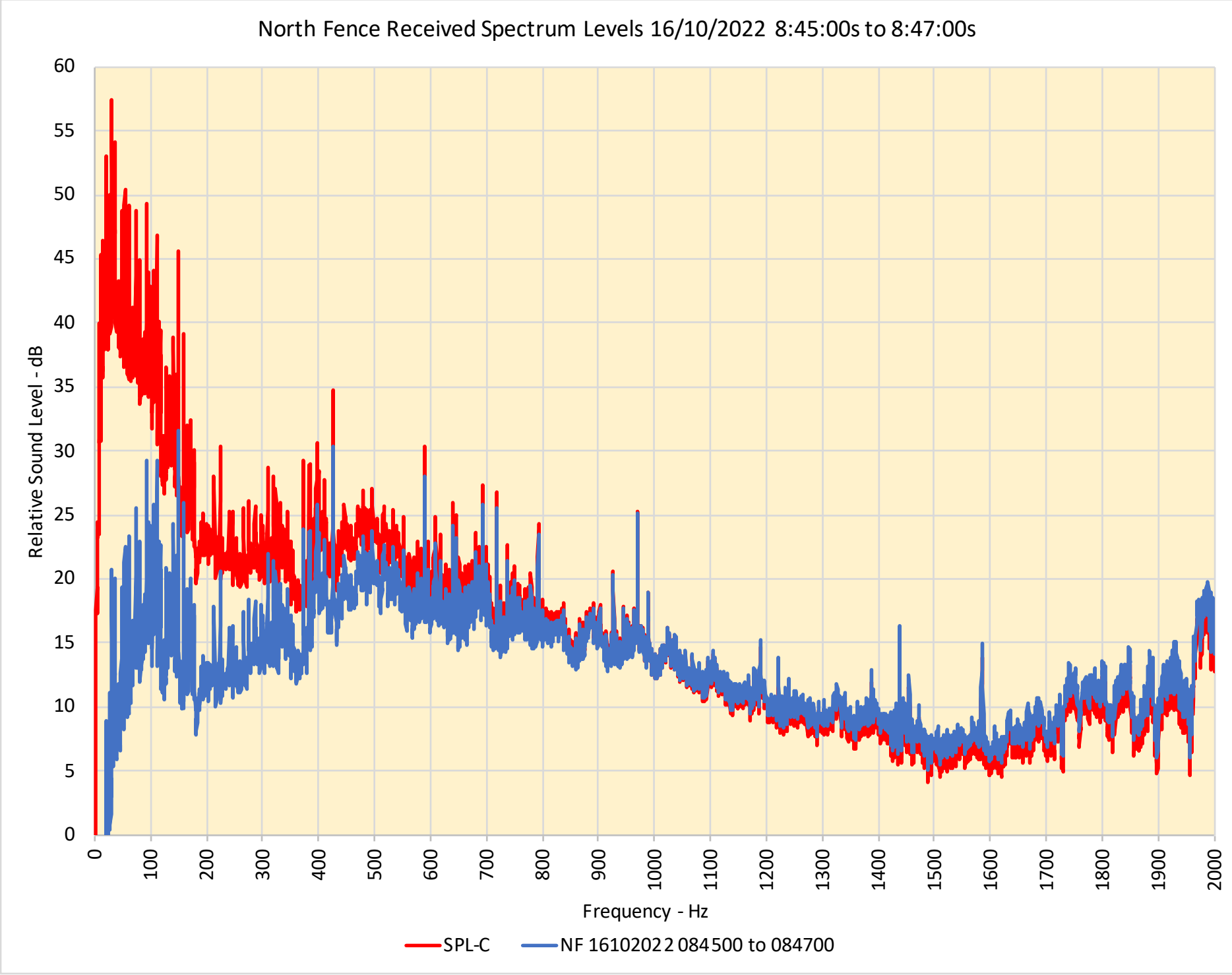
Appendix E Figure E39



Appendix E Figure E40

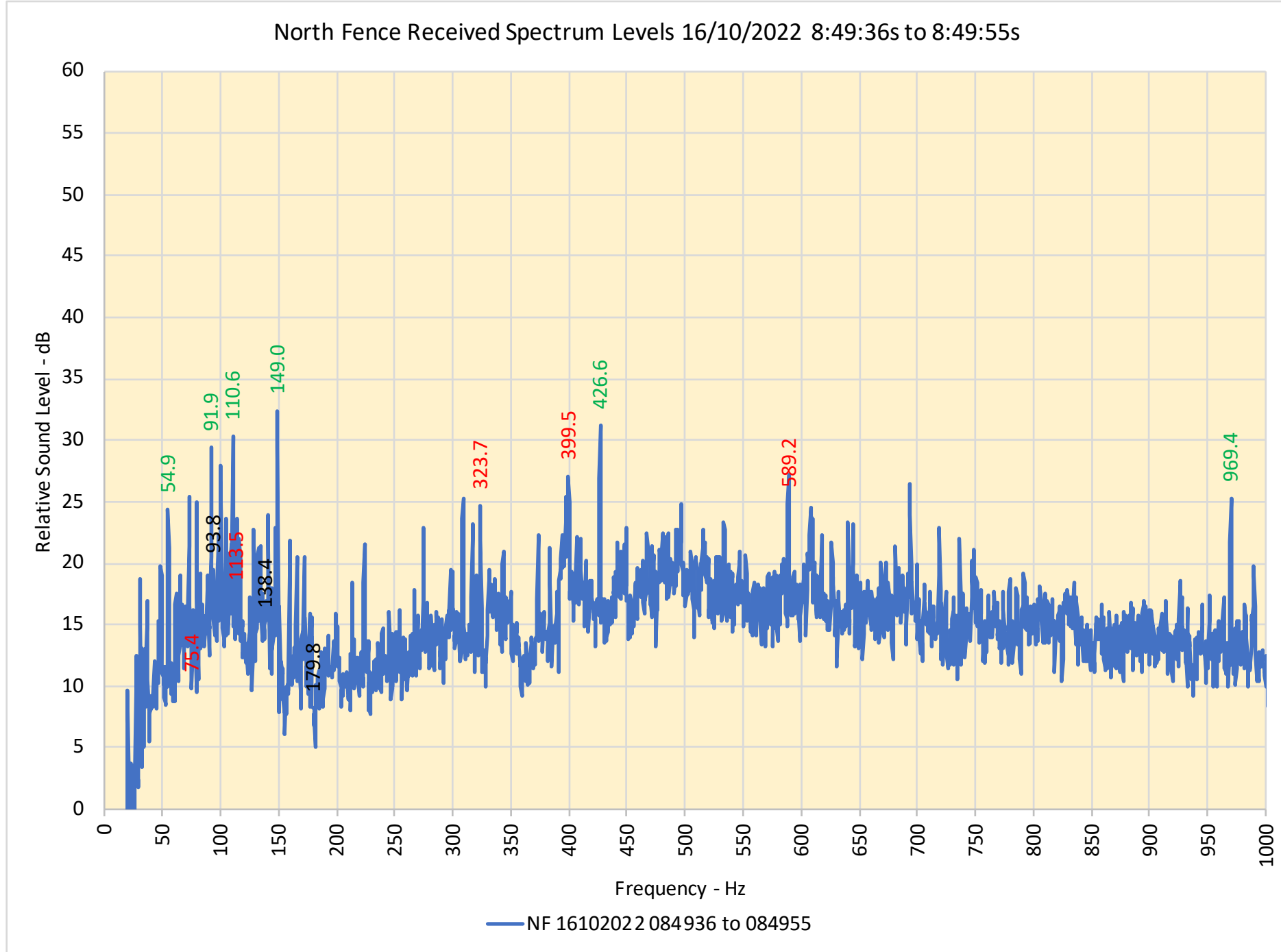
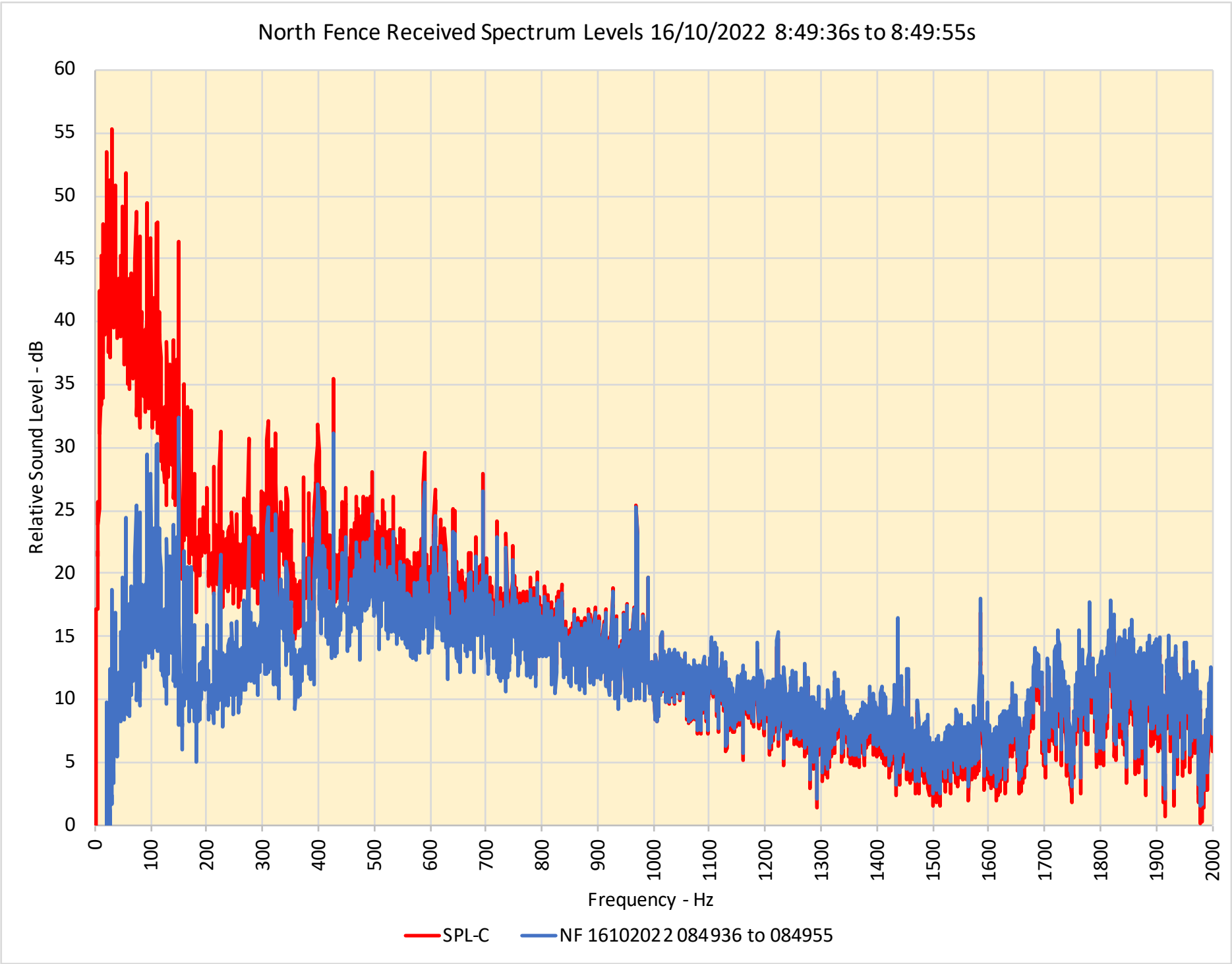


Appendix E Figure E41

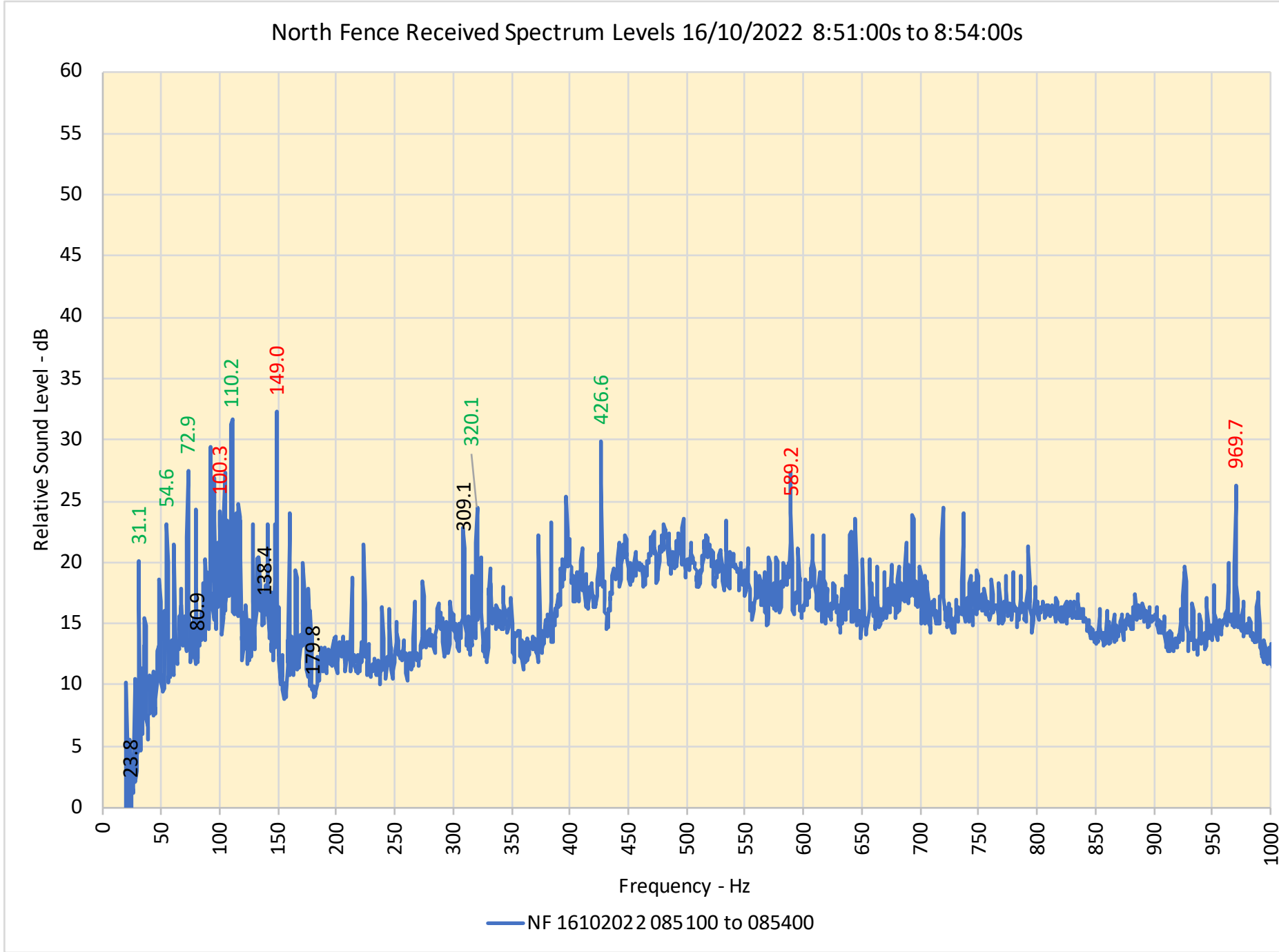
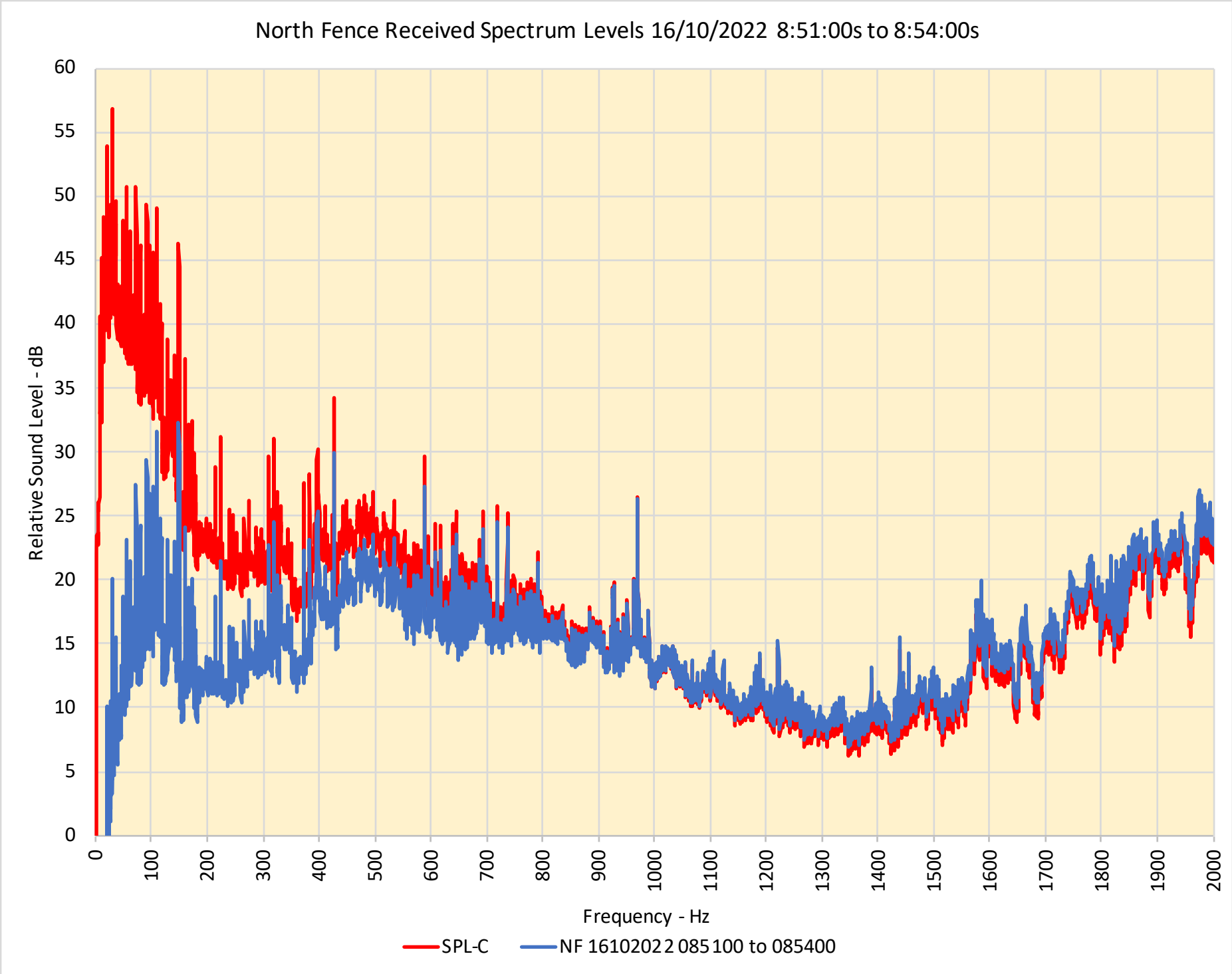


Appendix E Figure E42

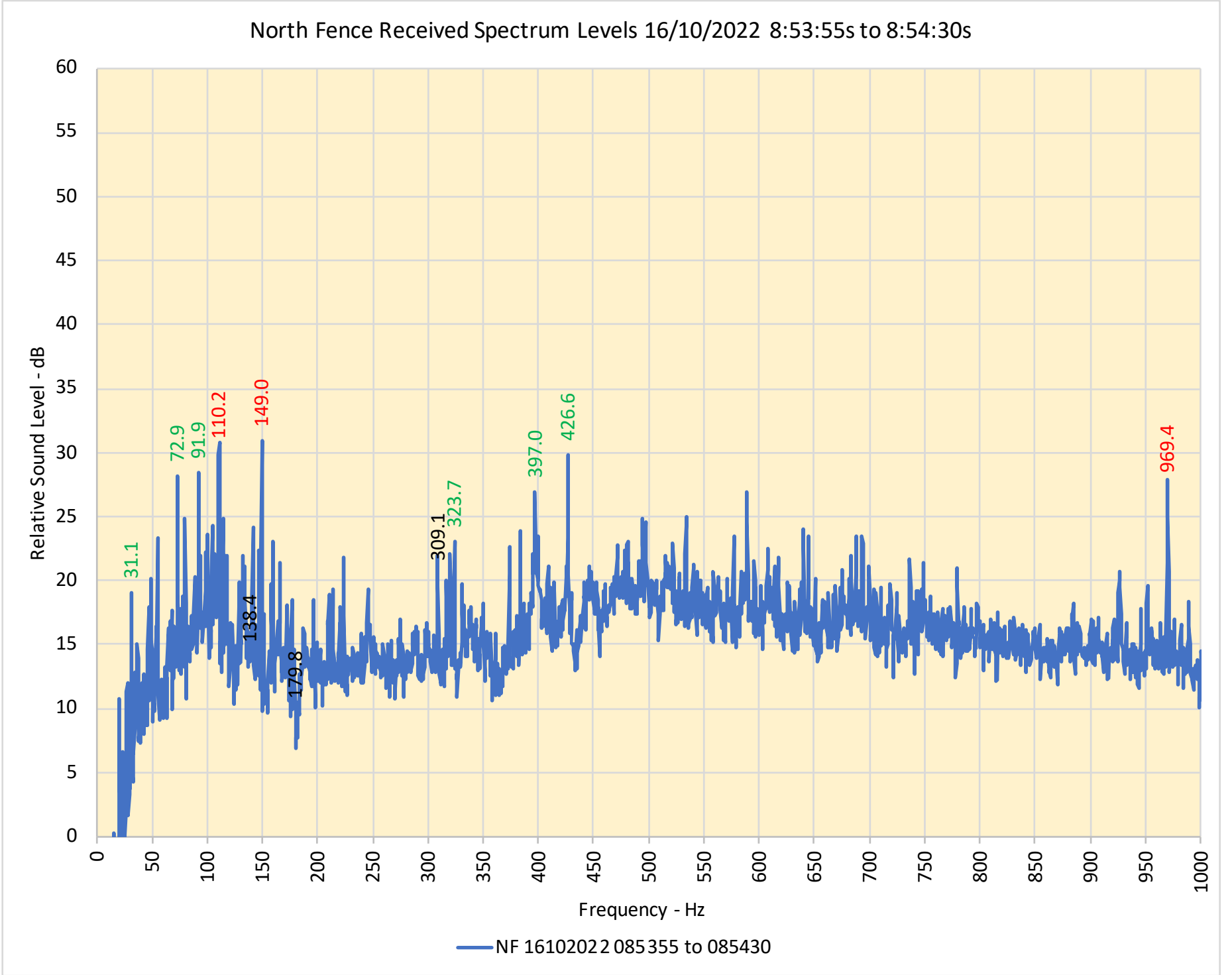
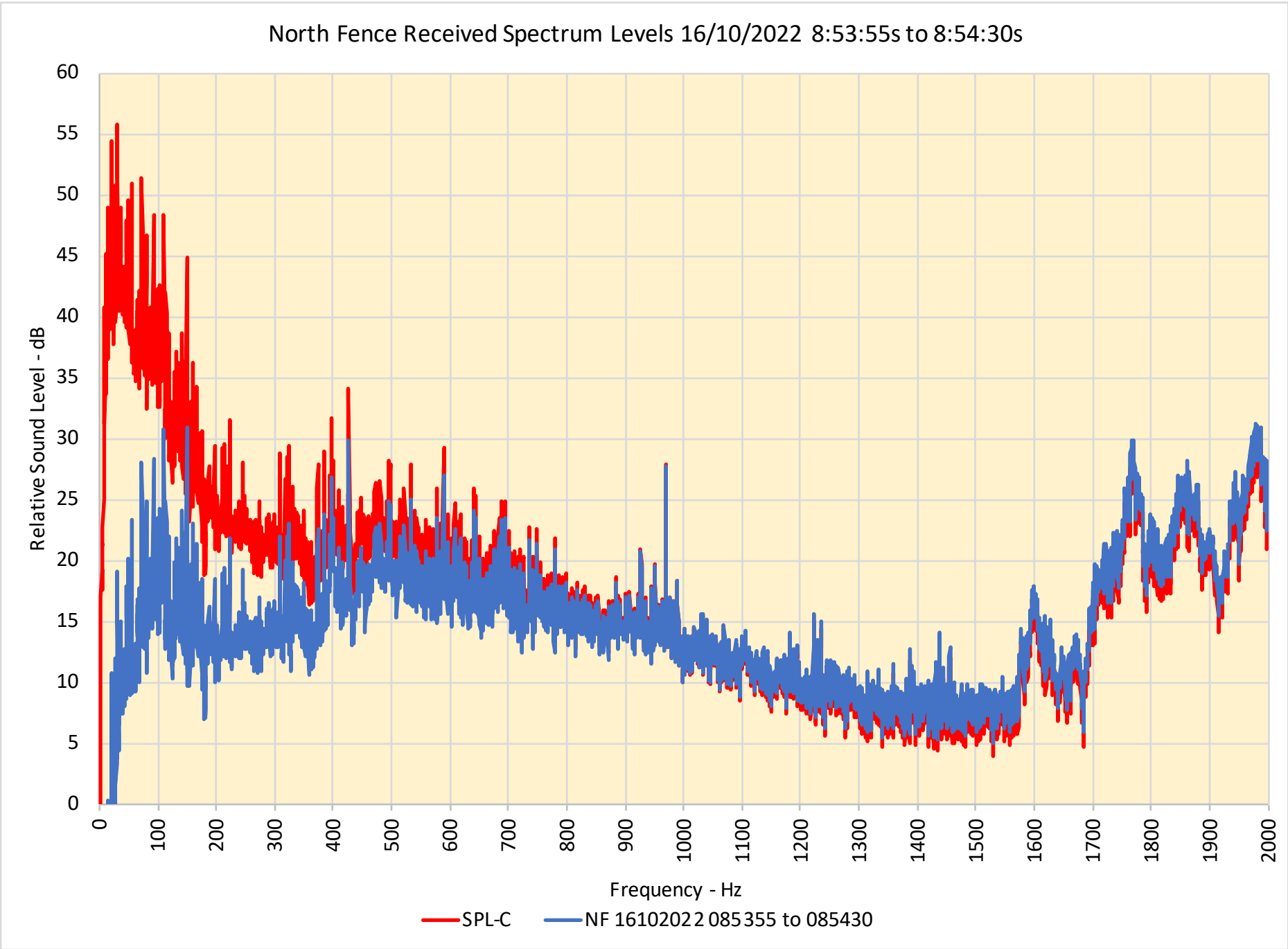


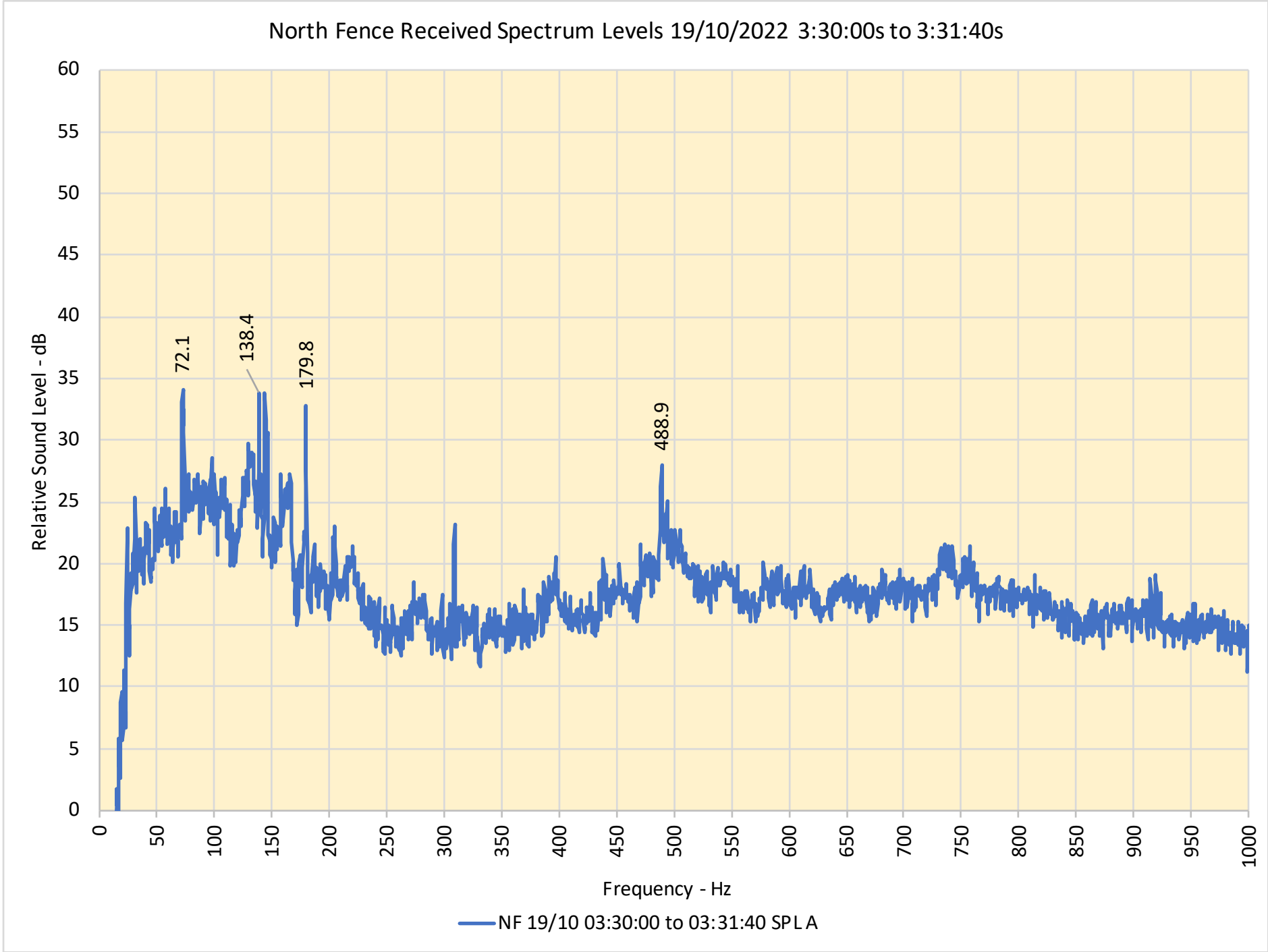
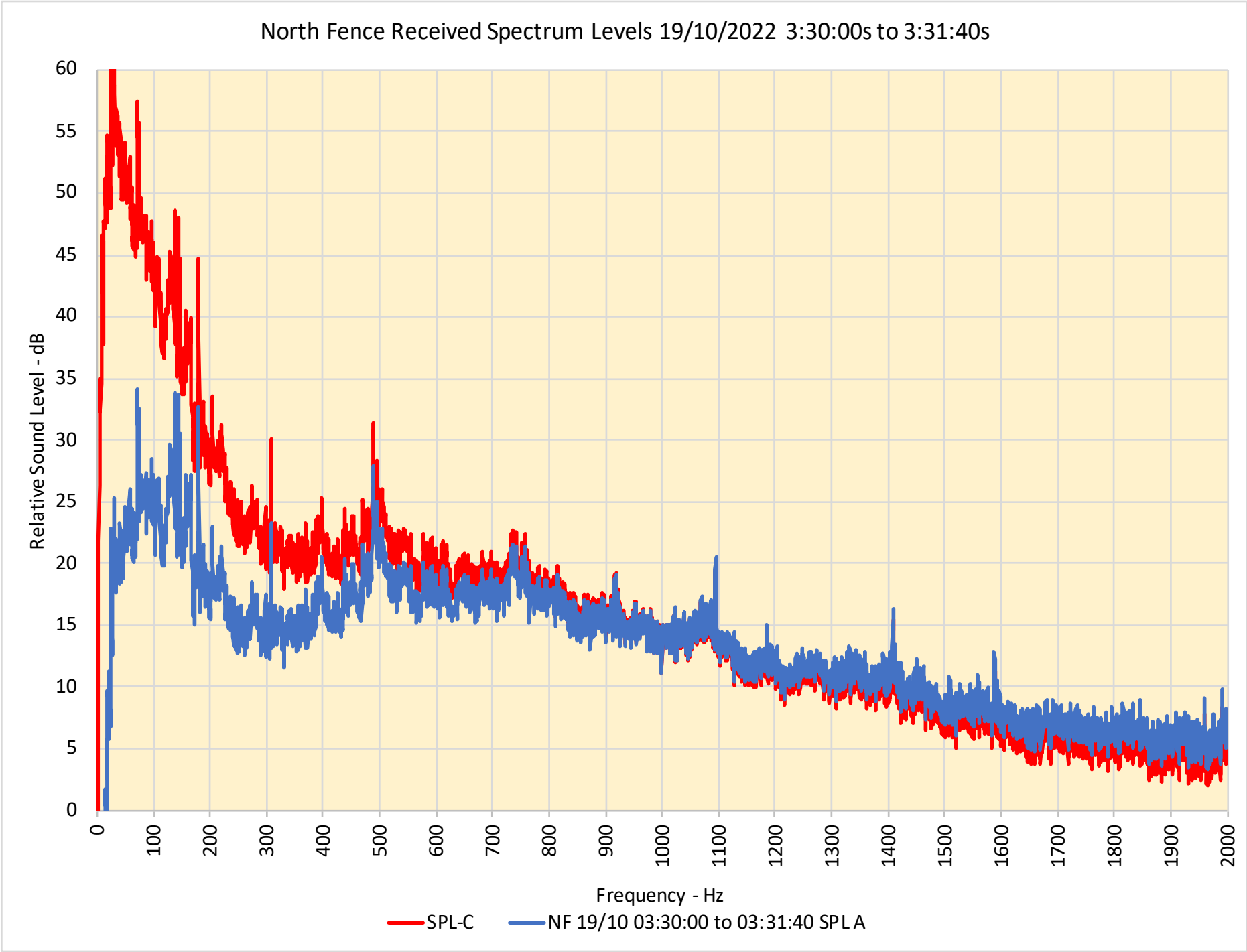


Appendix E Figure E43

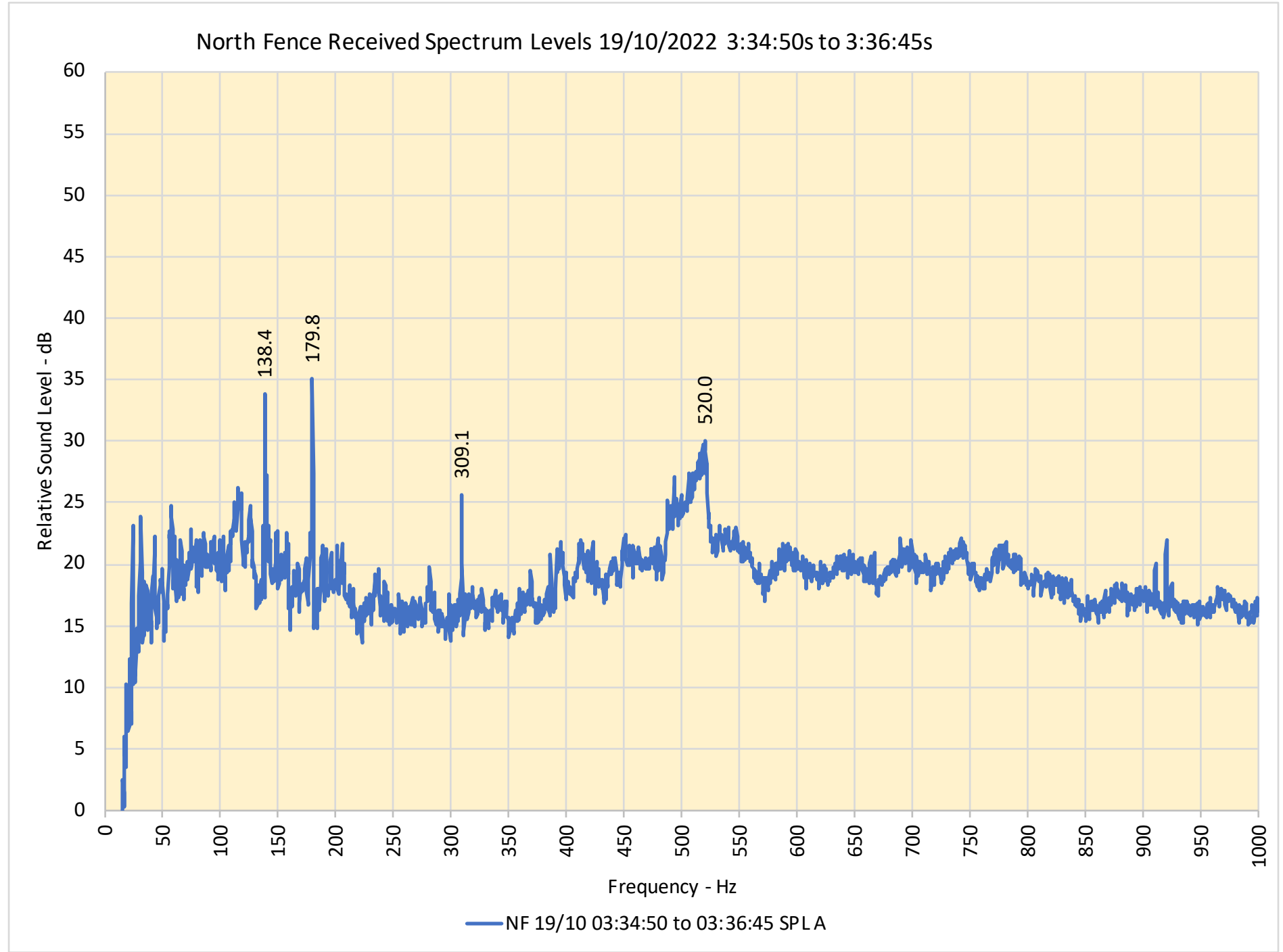
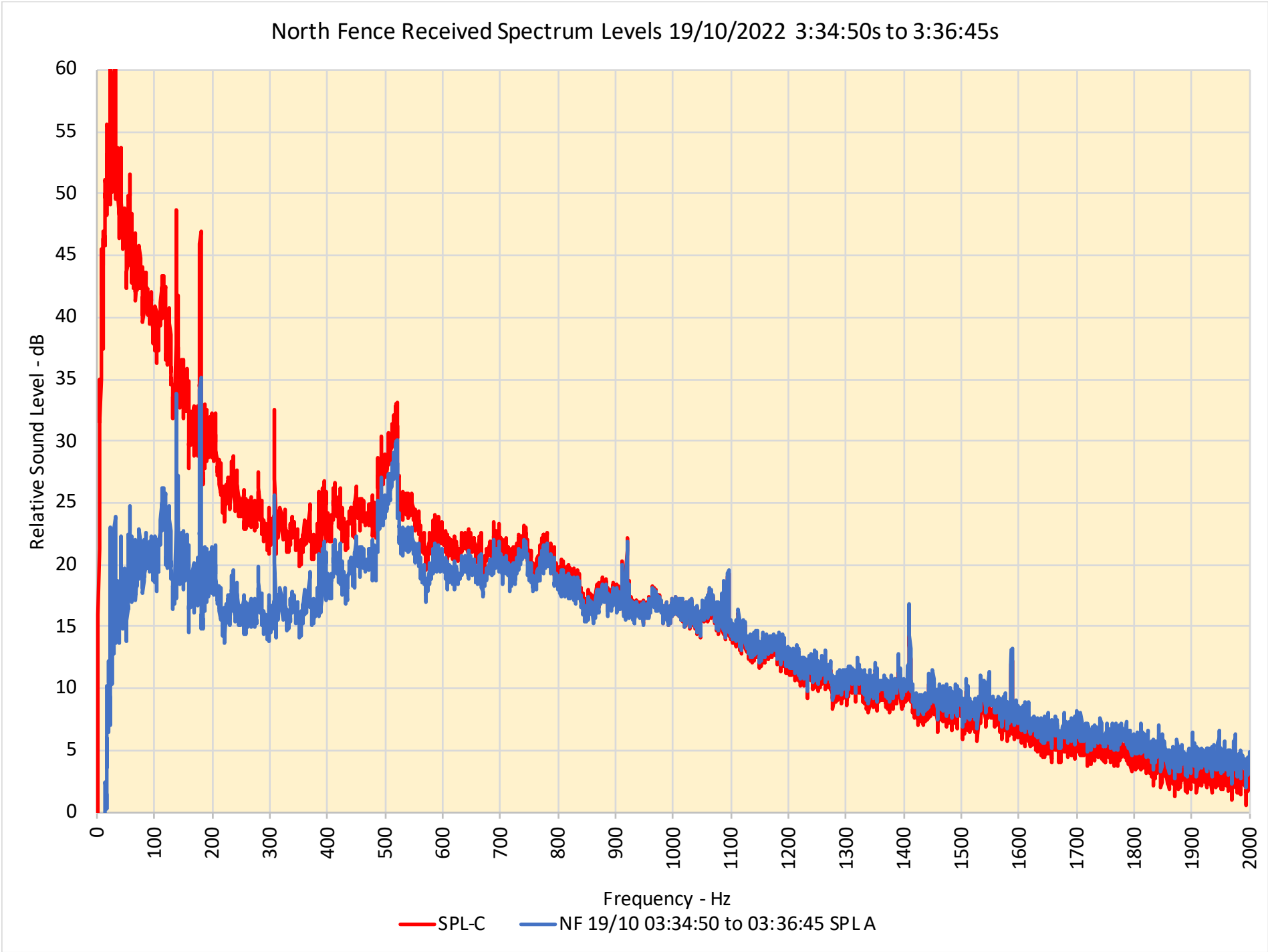


Appendix E Figure E44

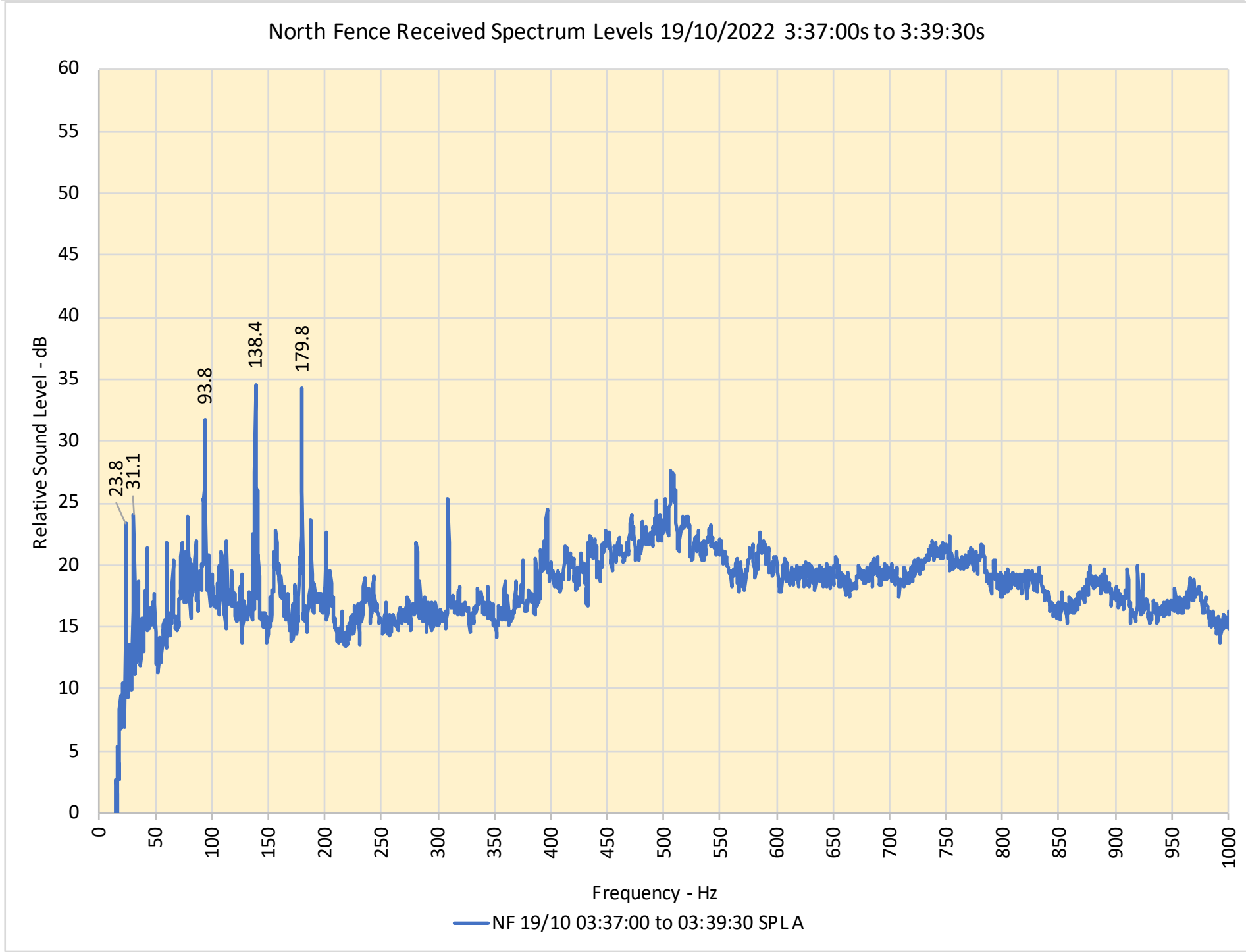
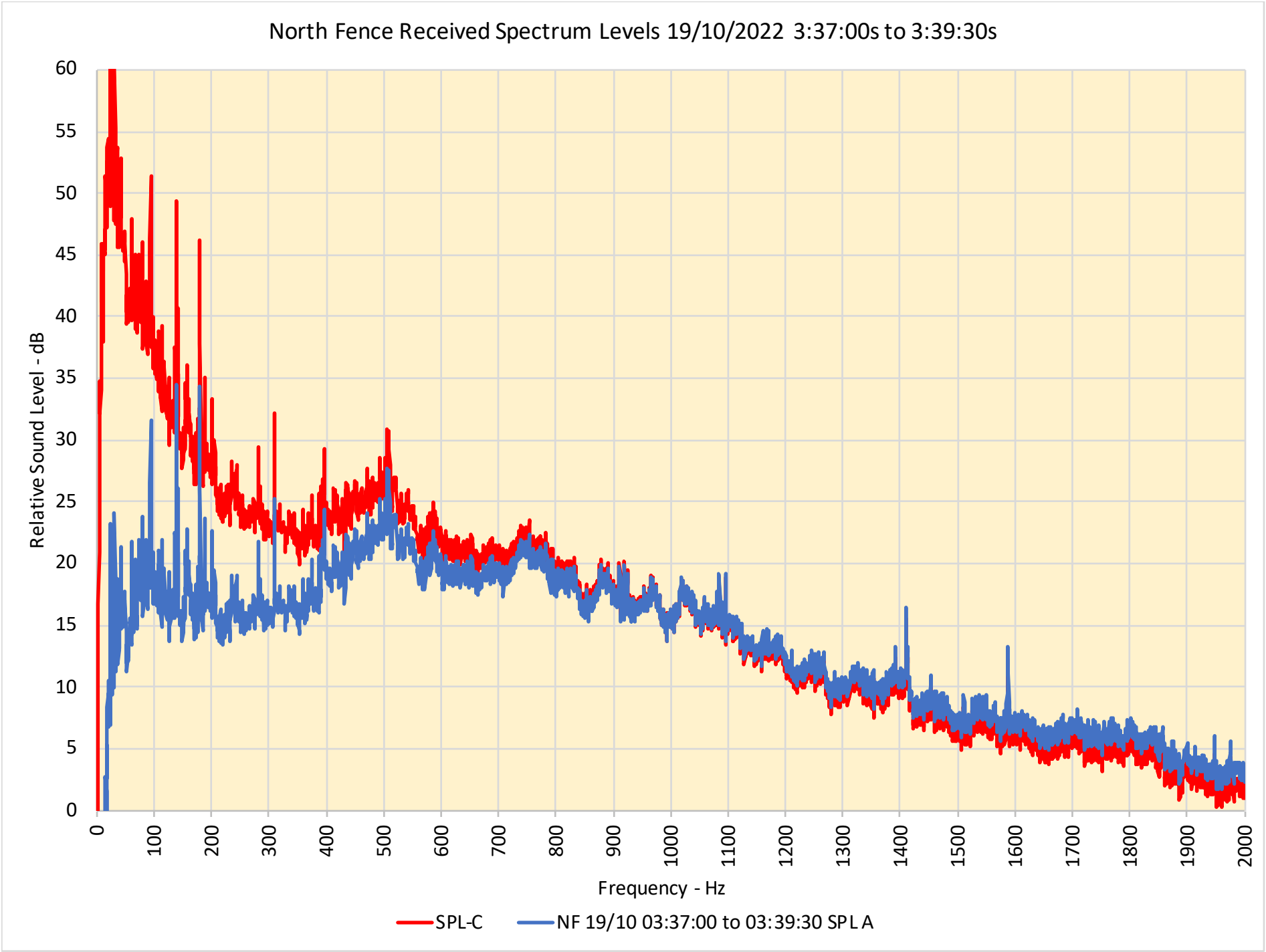




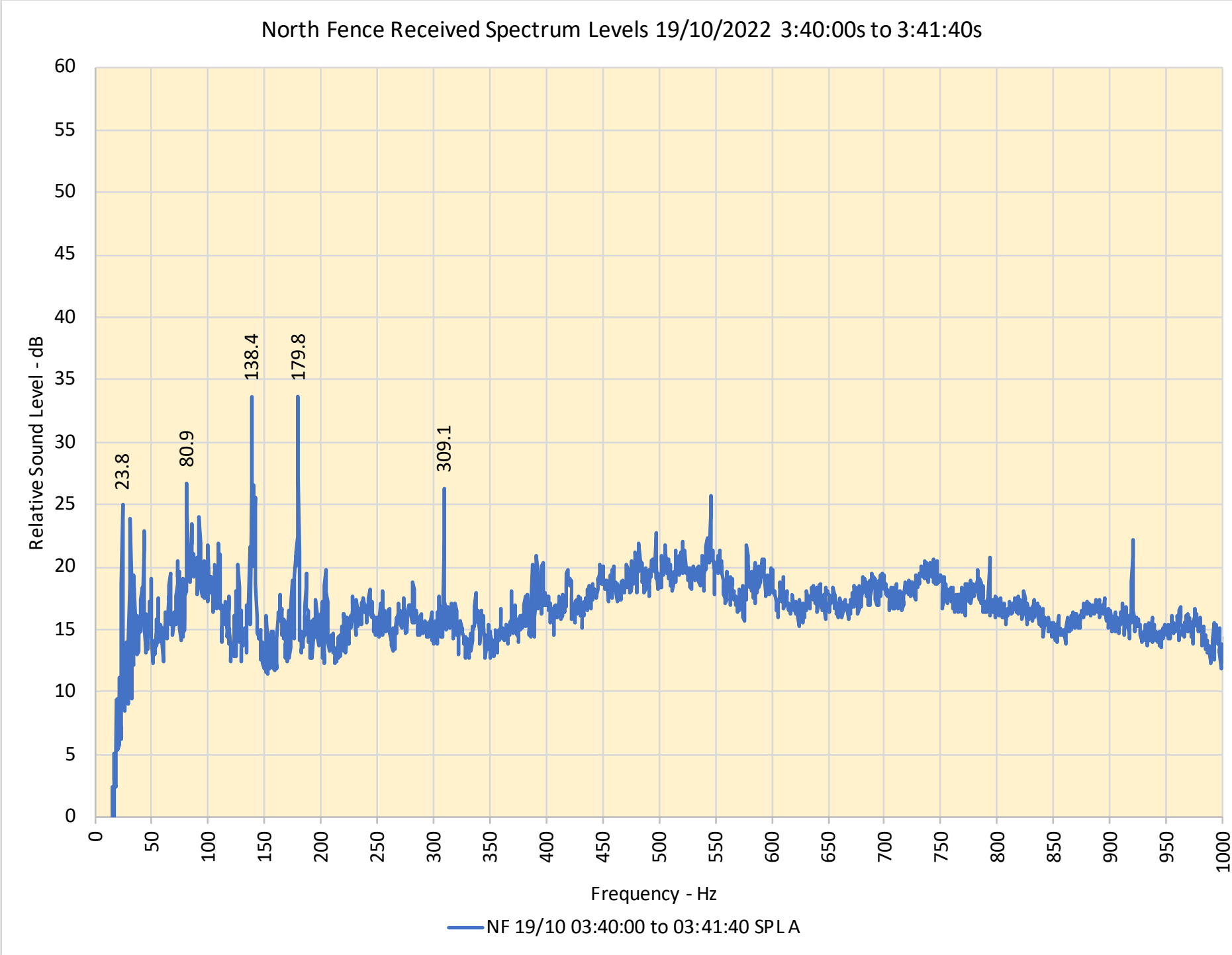
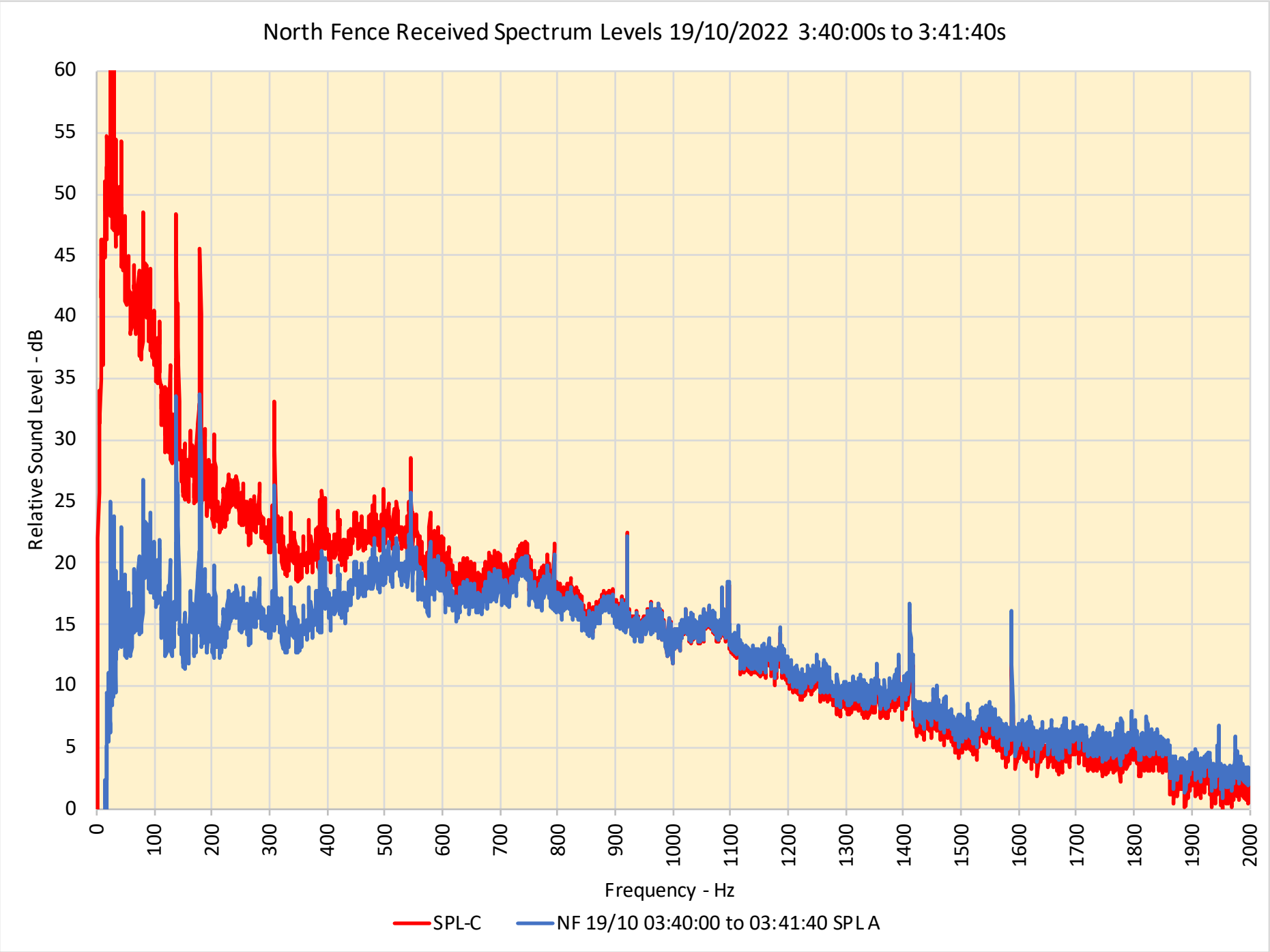
Appendix E Figure E46

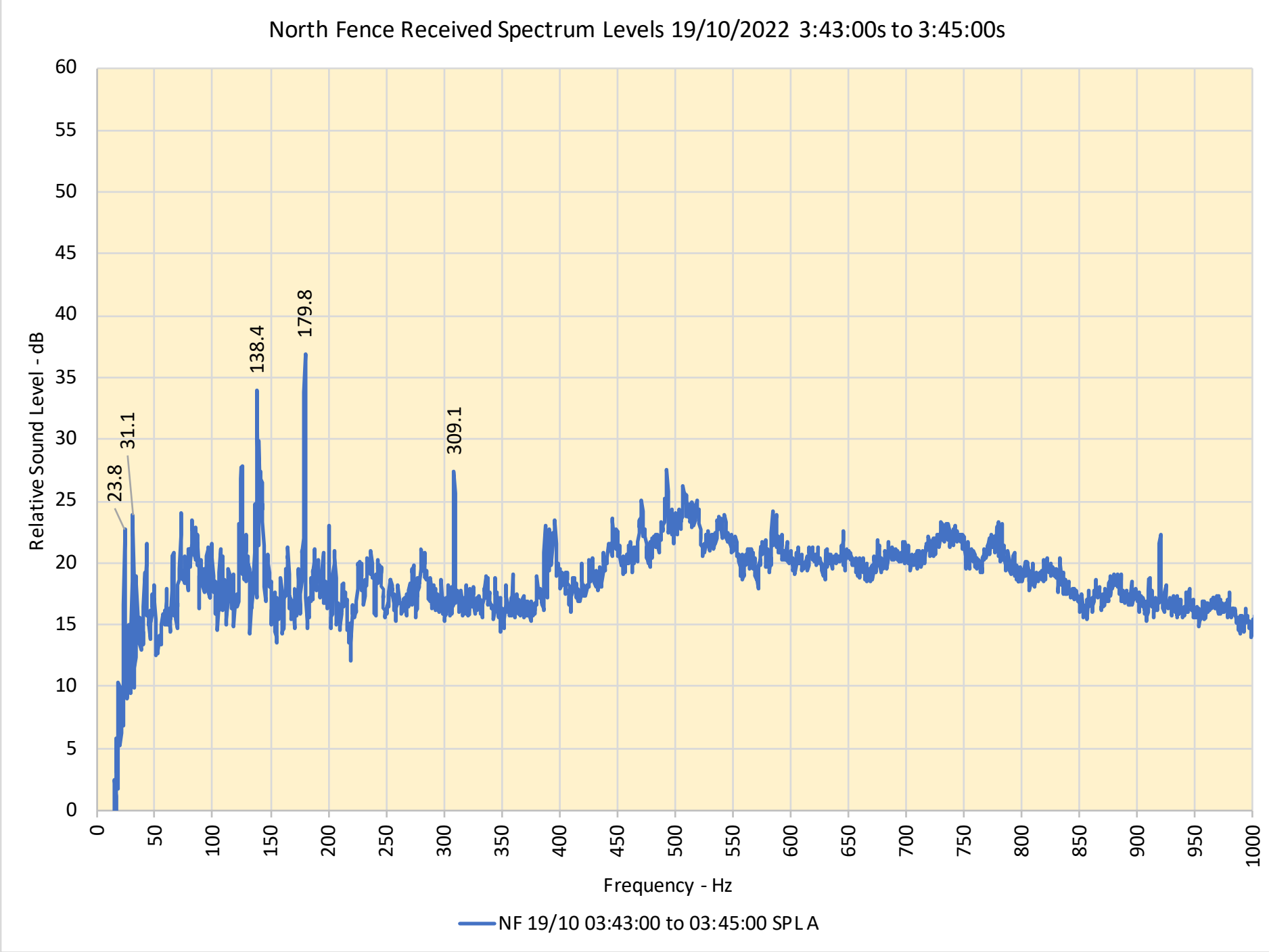
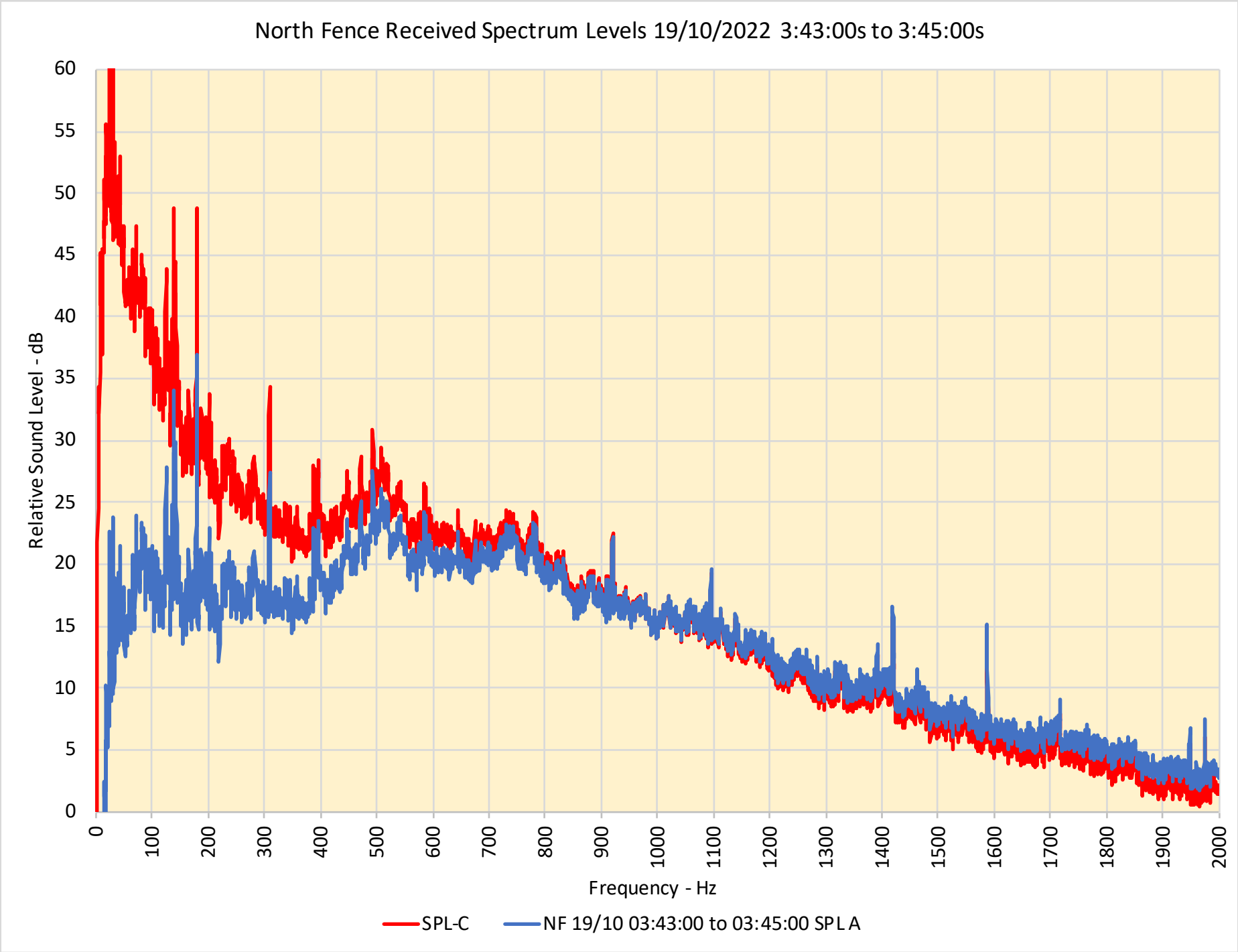


Appendix E Figure E47



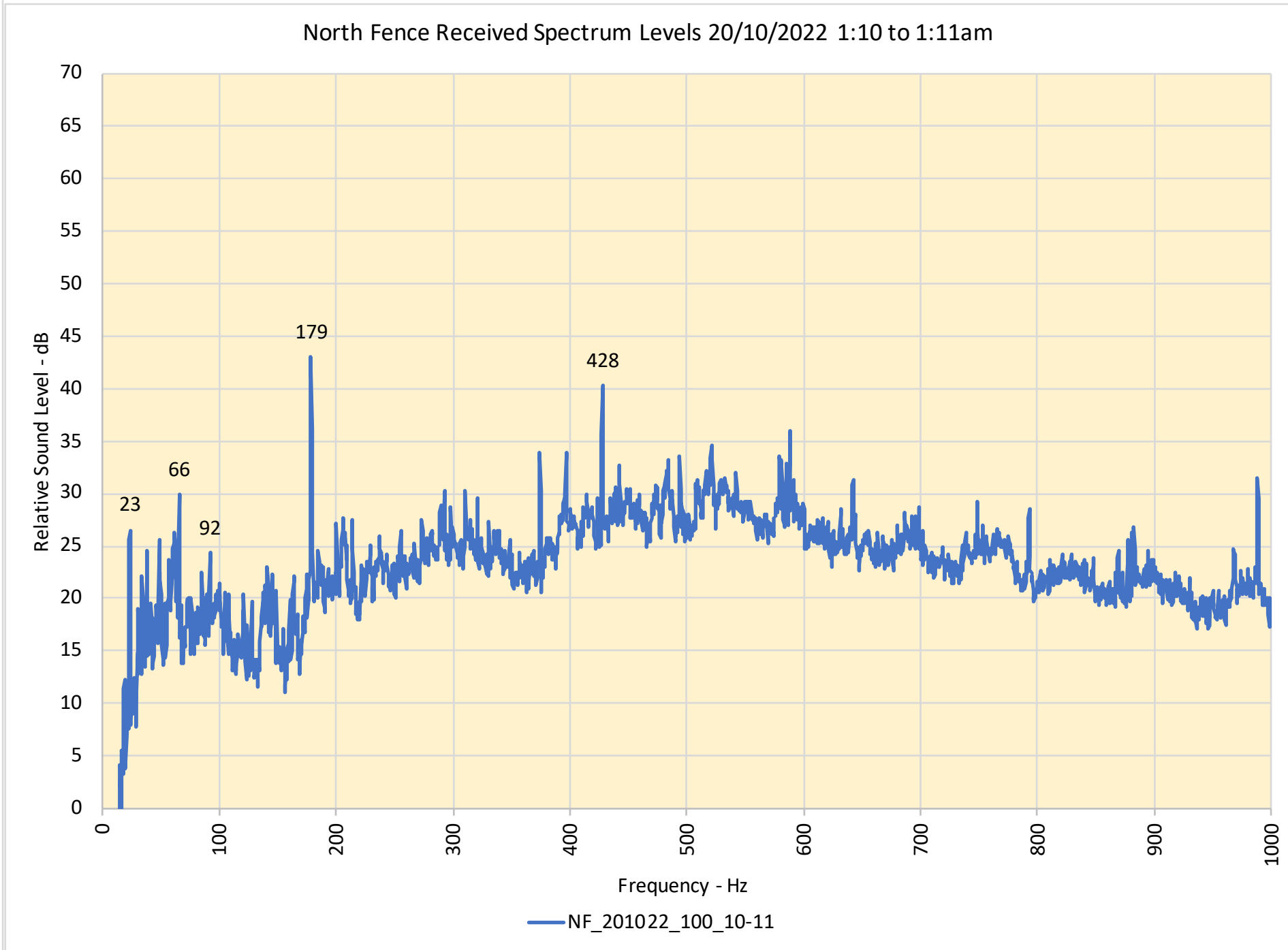
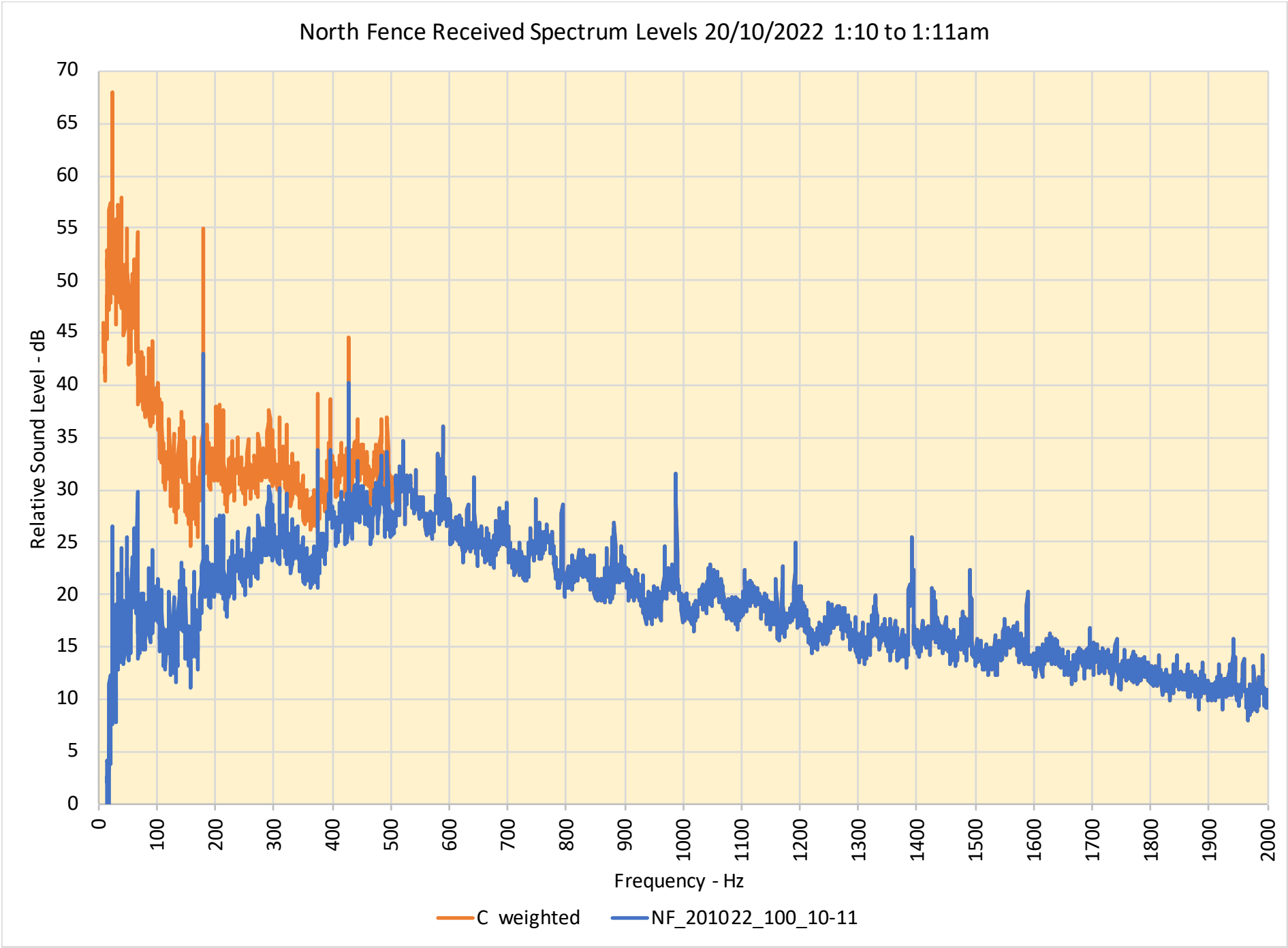
Appendix E Figure E48

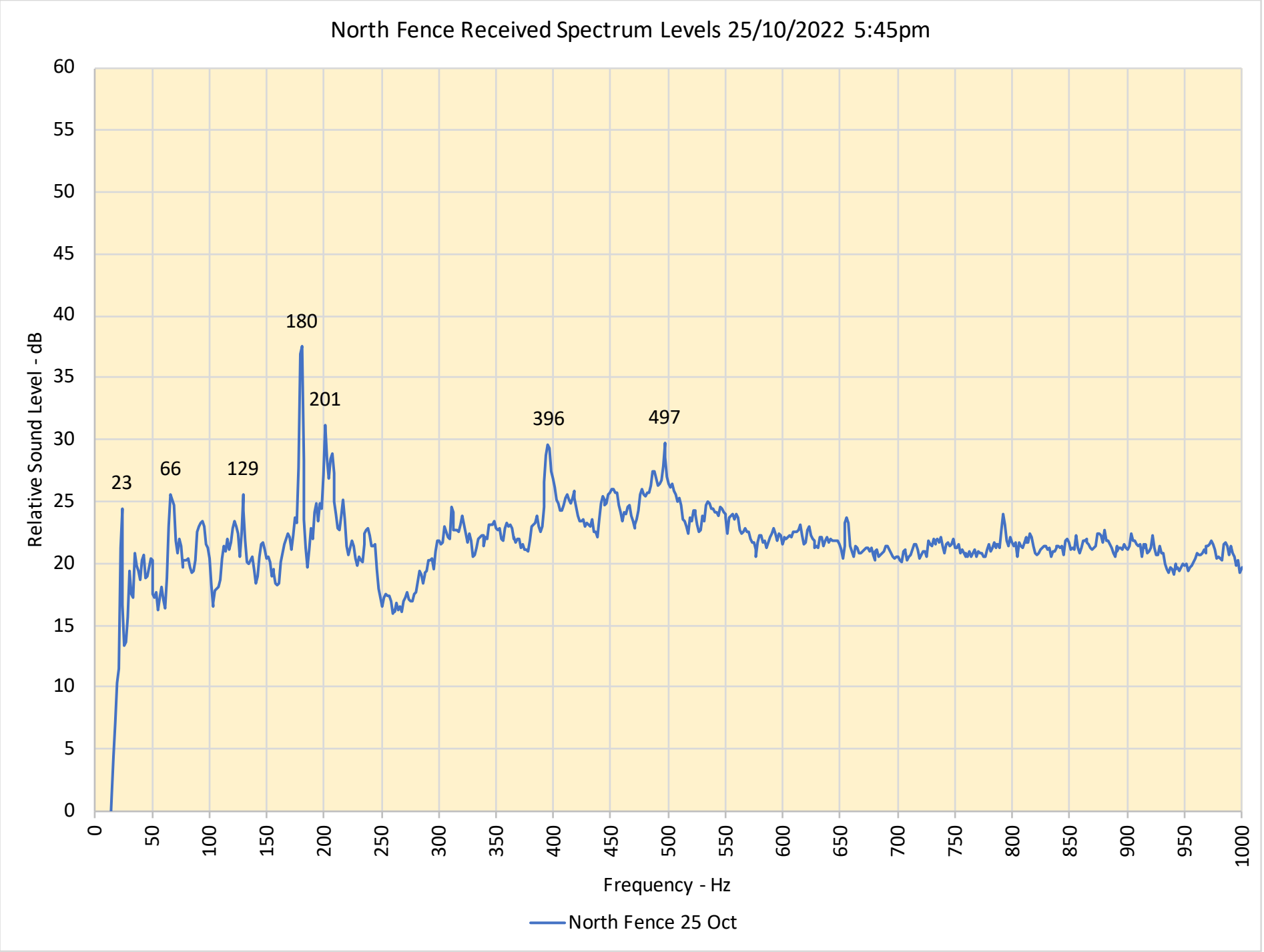
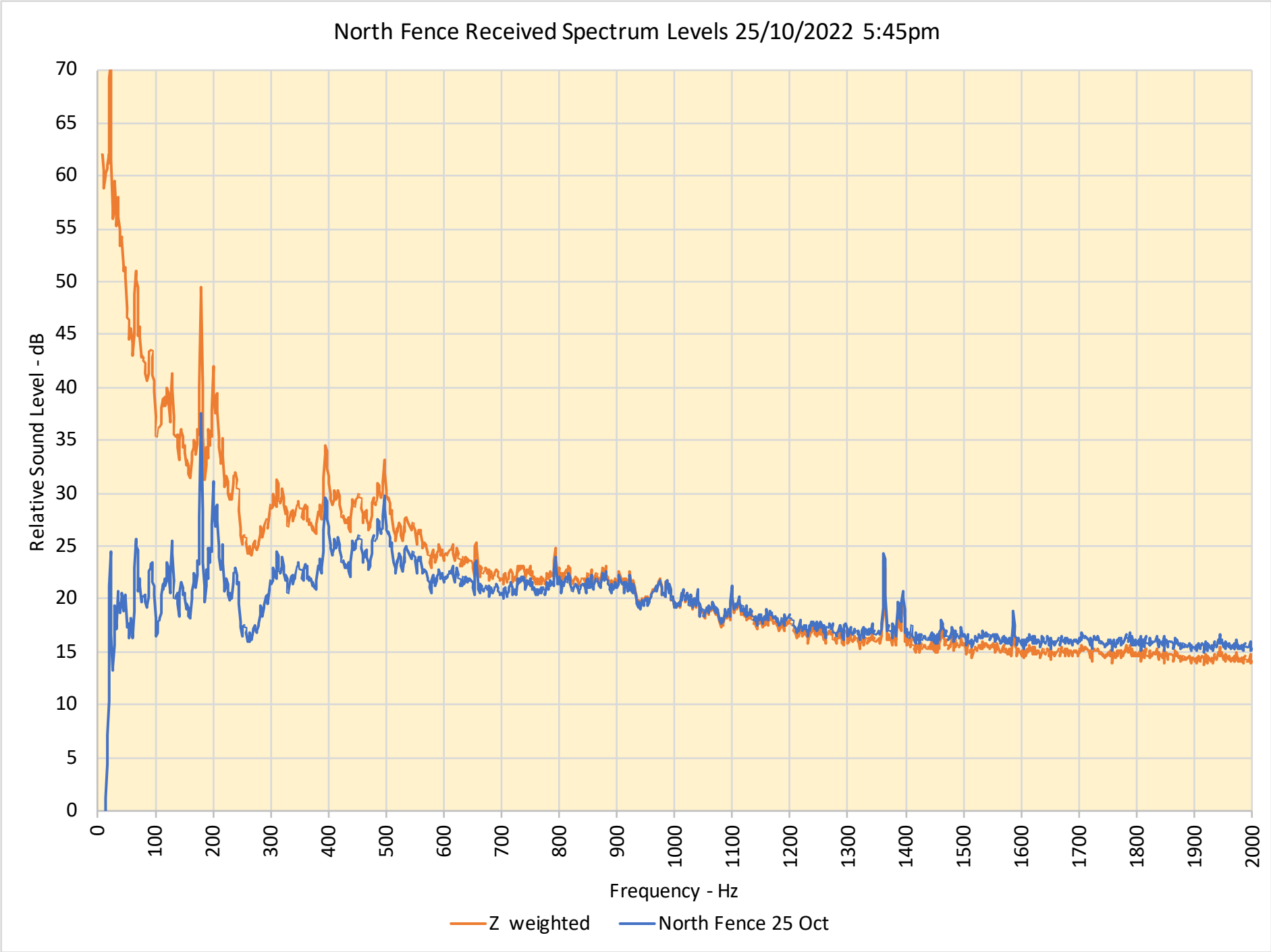




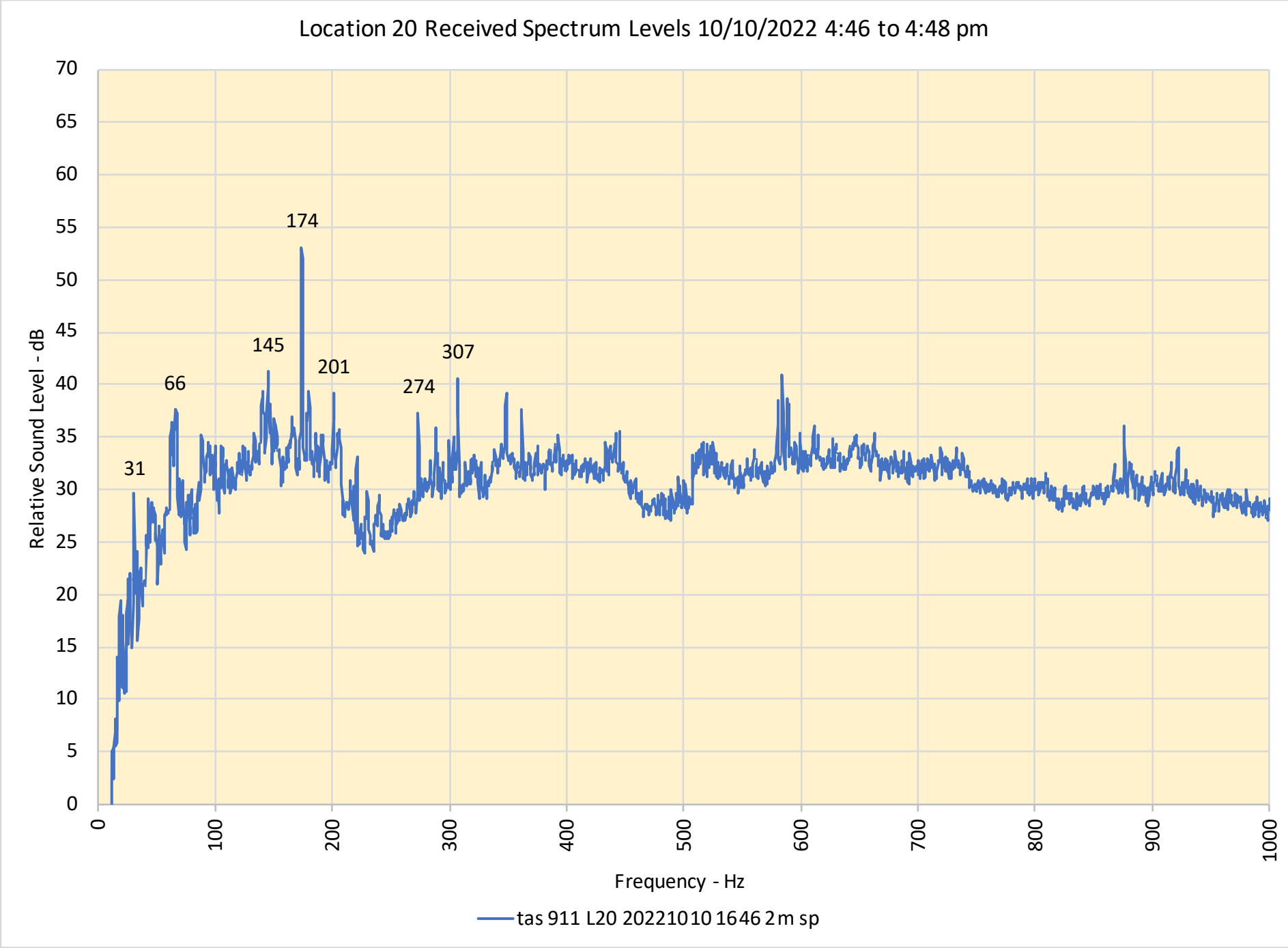
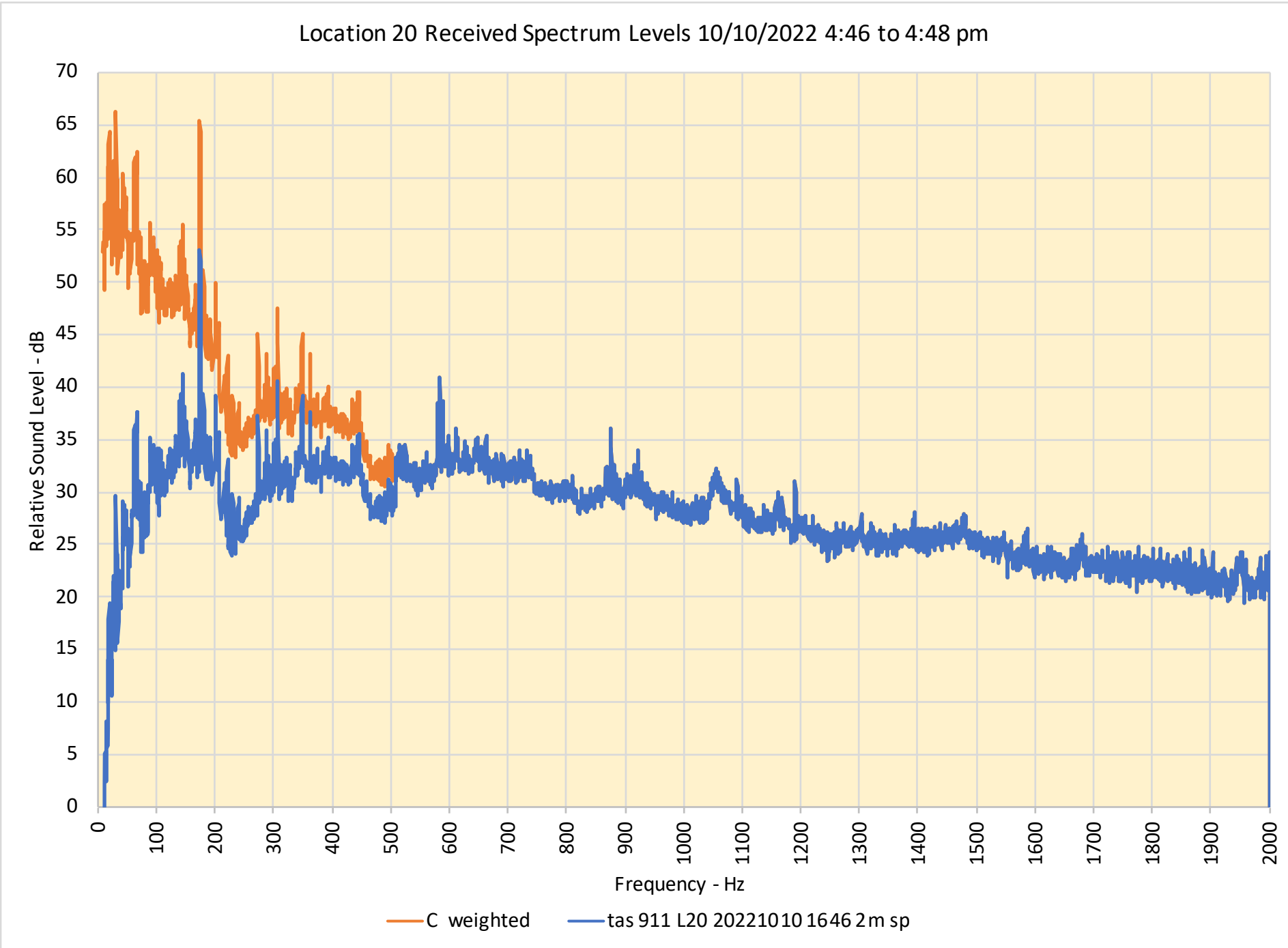
Appendix E Figure E50

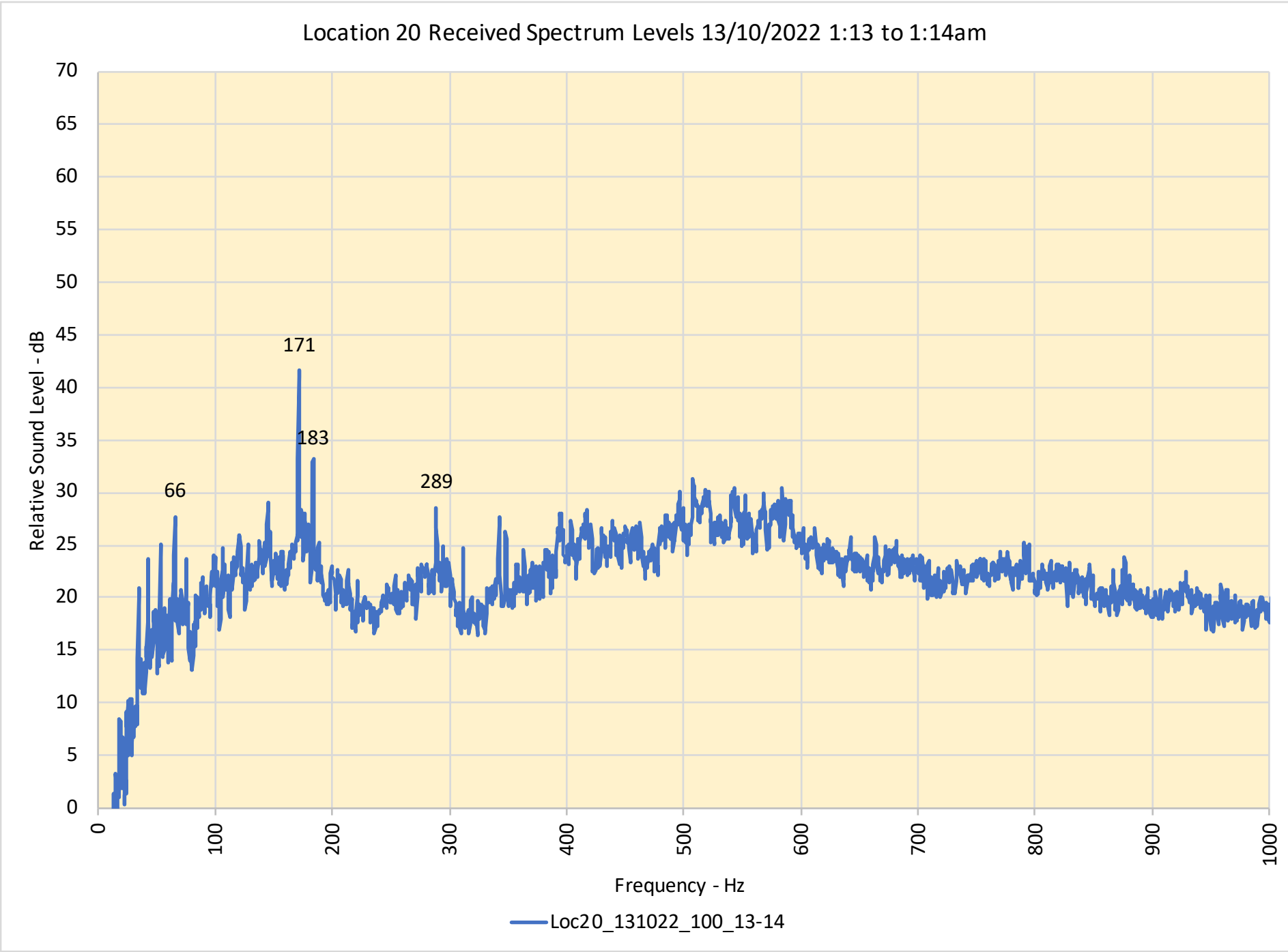
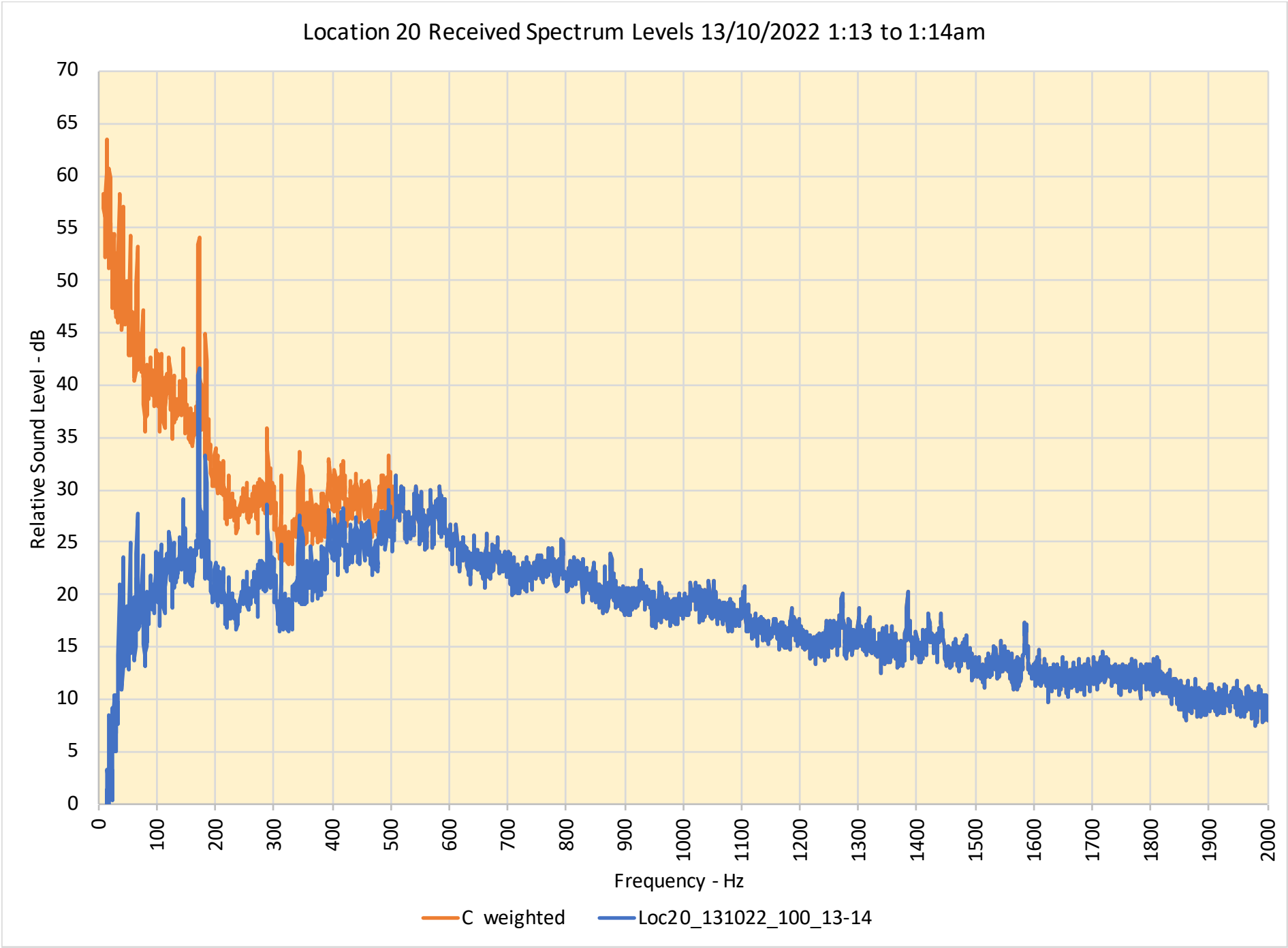




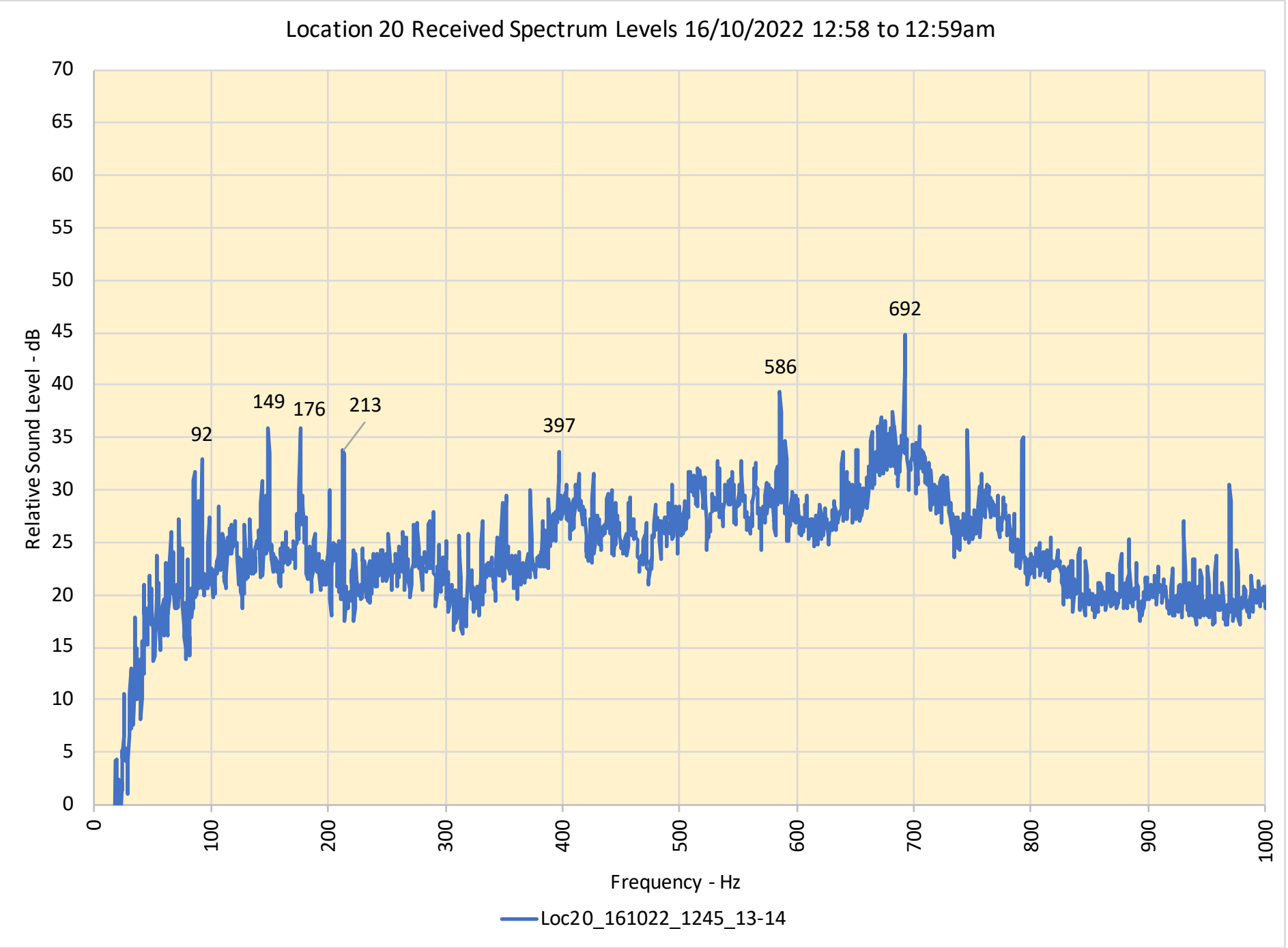
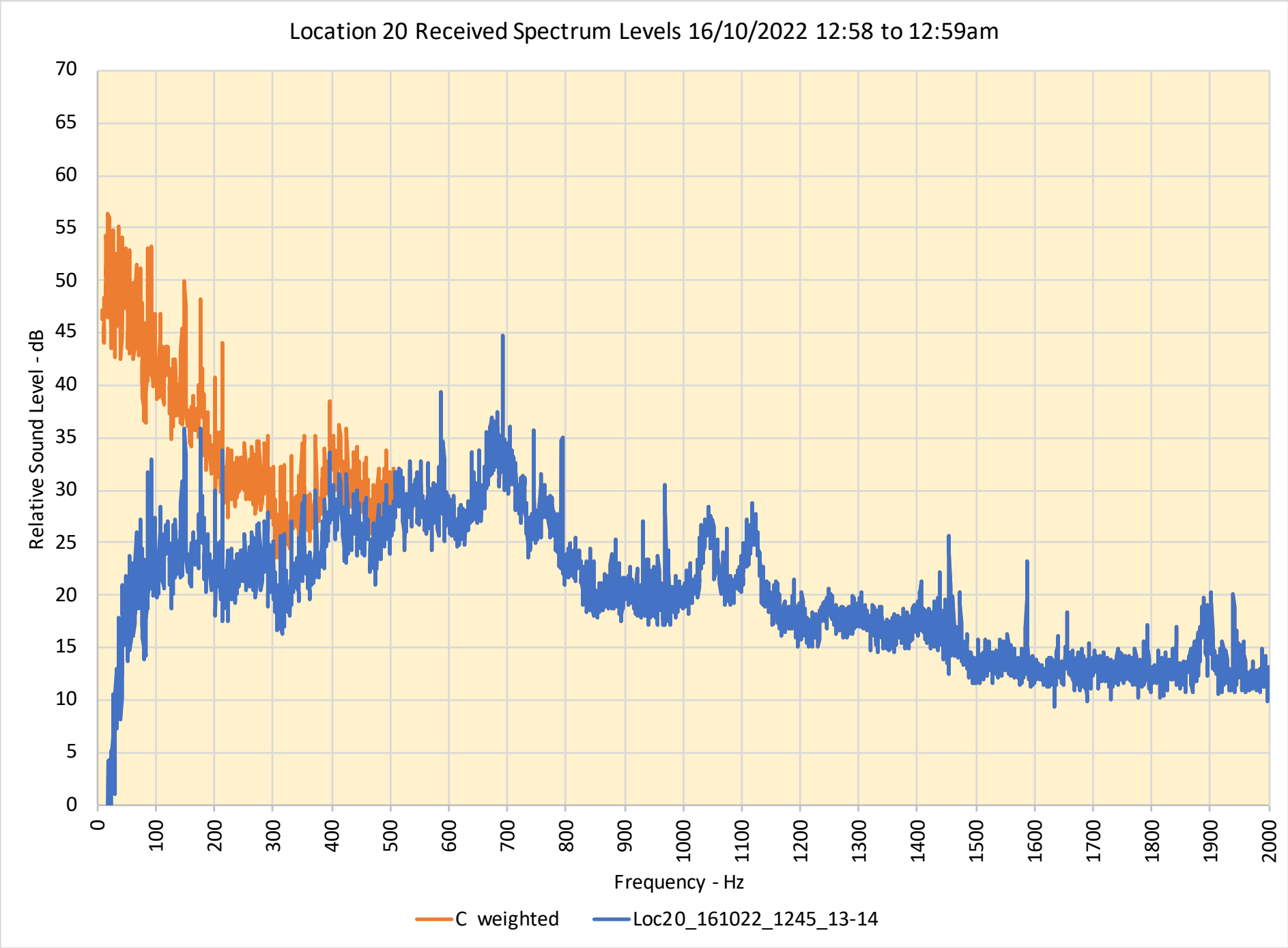


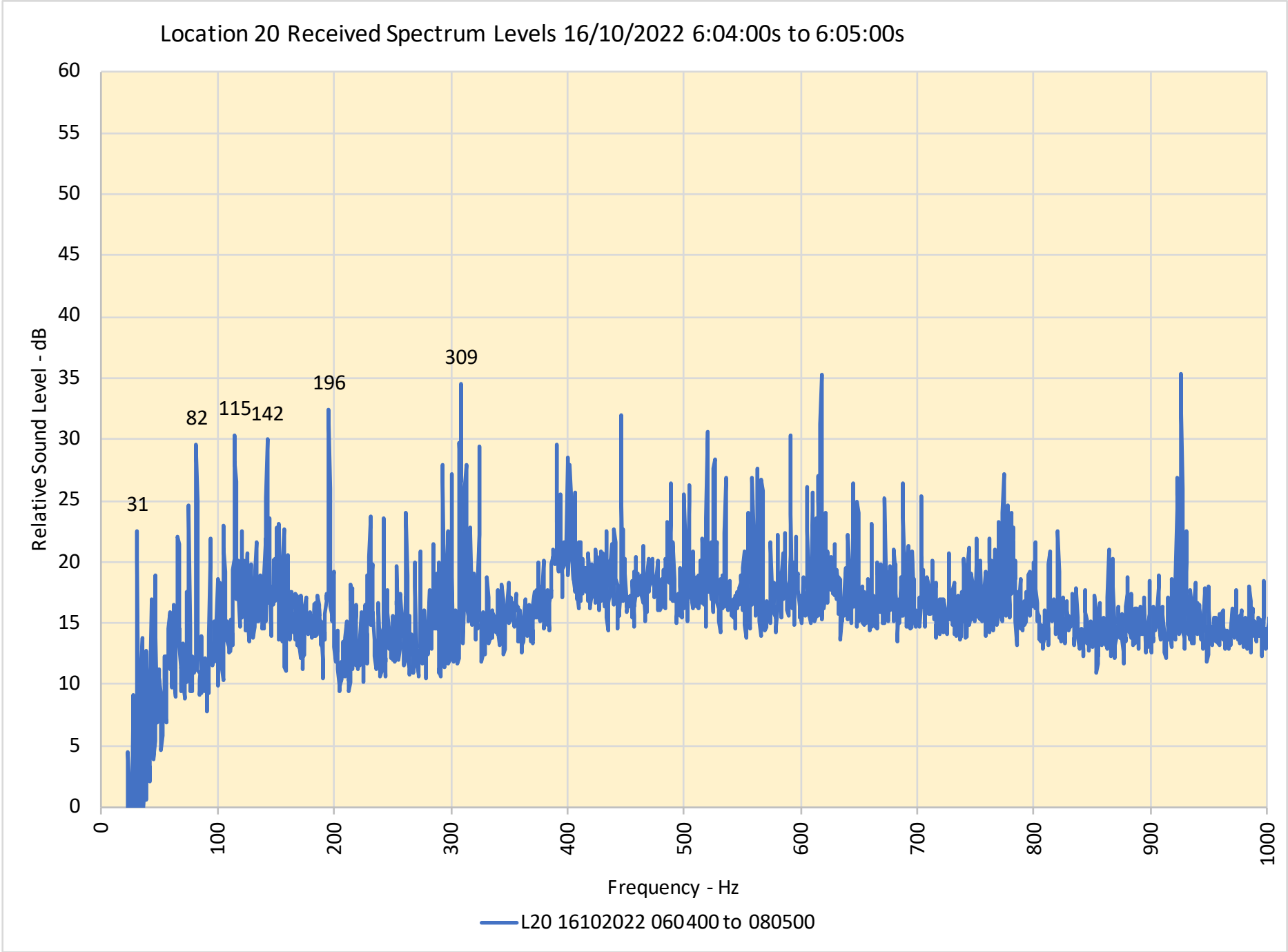
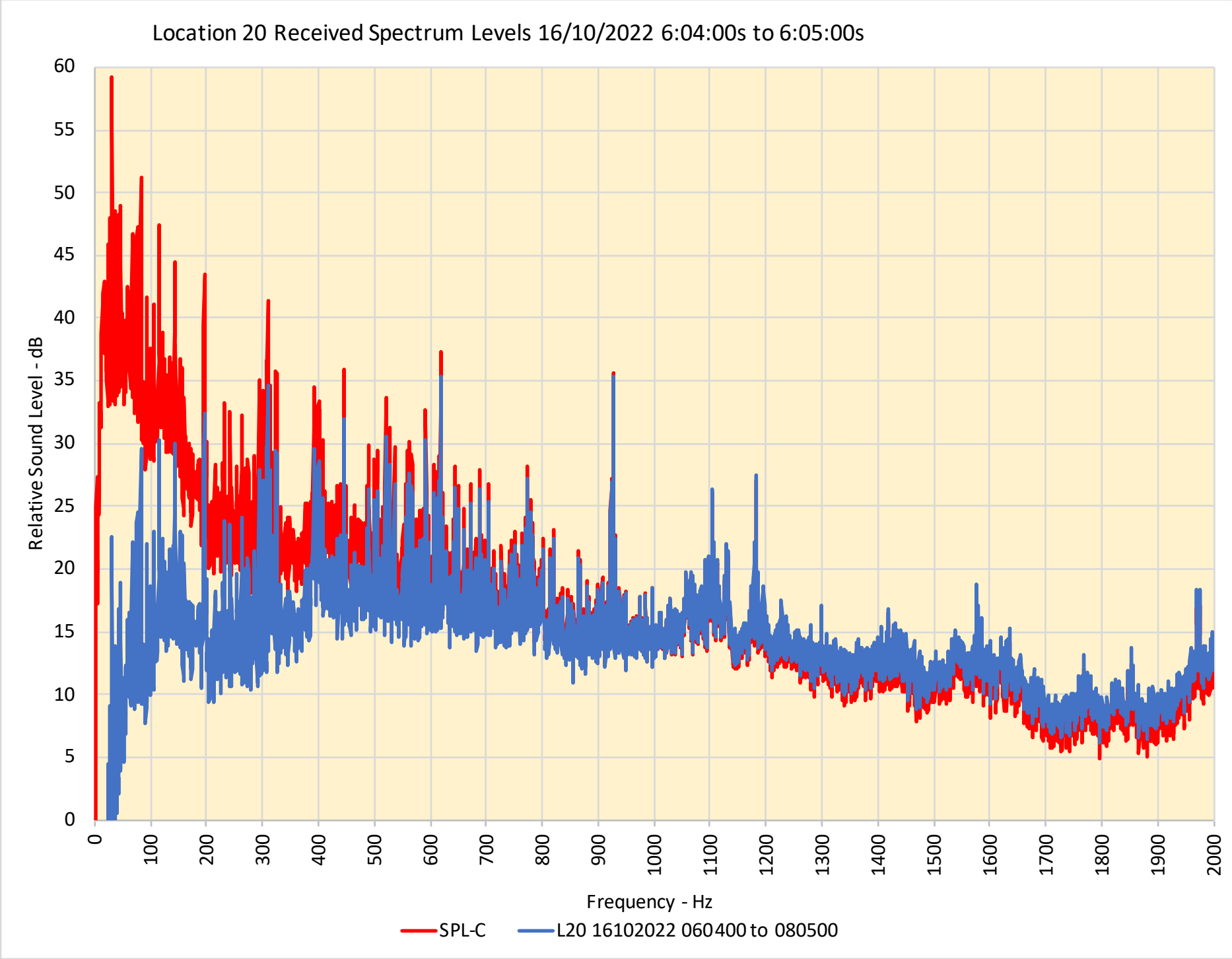
Appendix E Figure E52



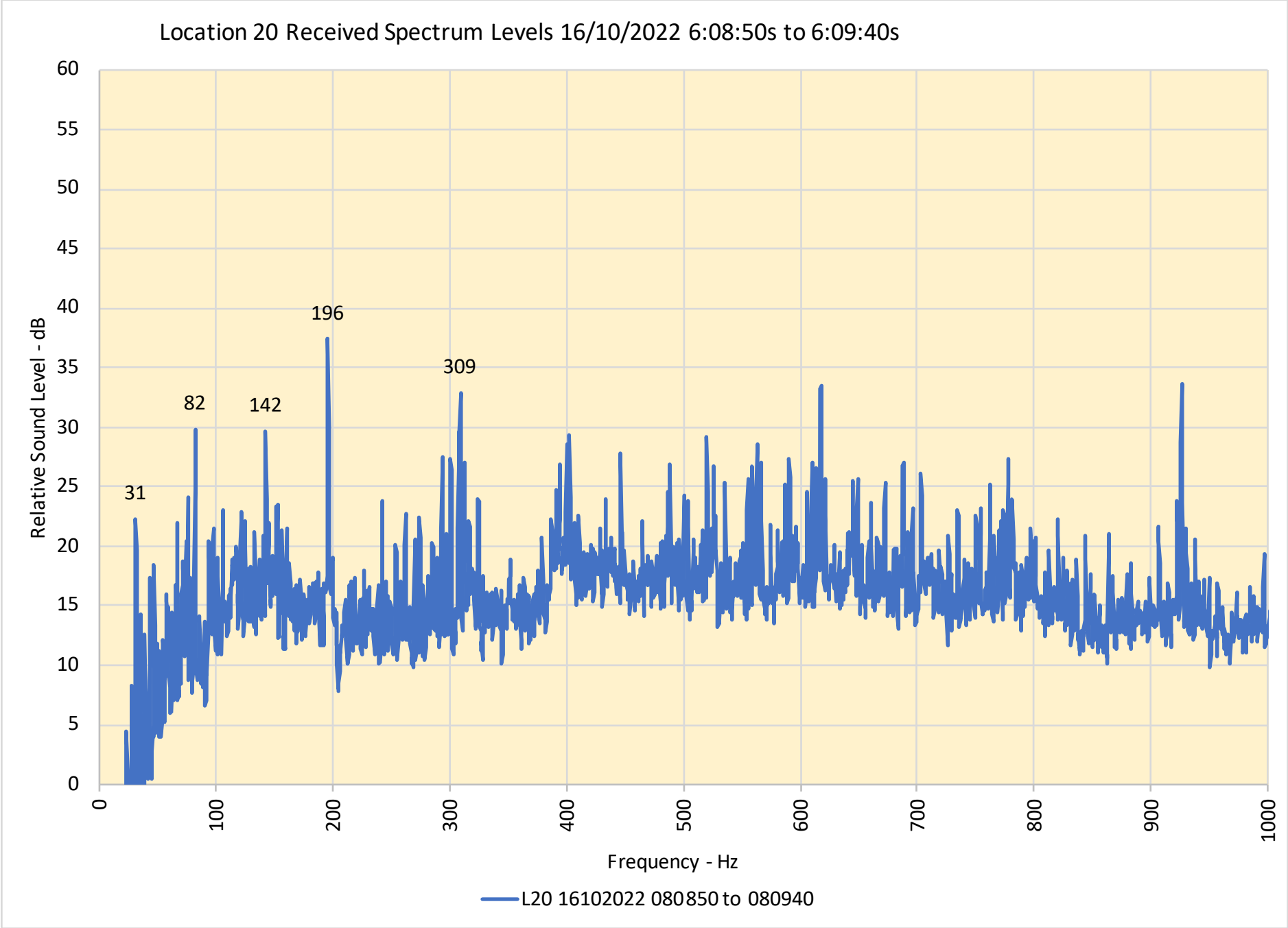
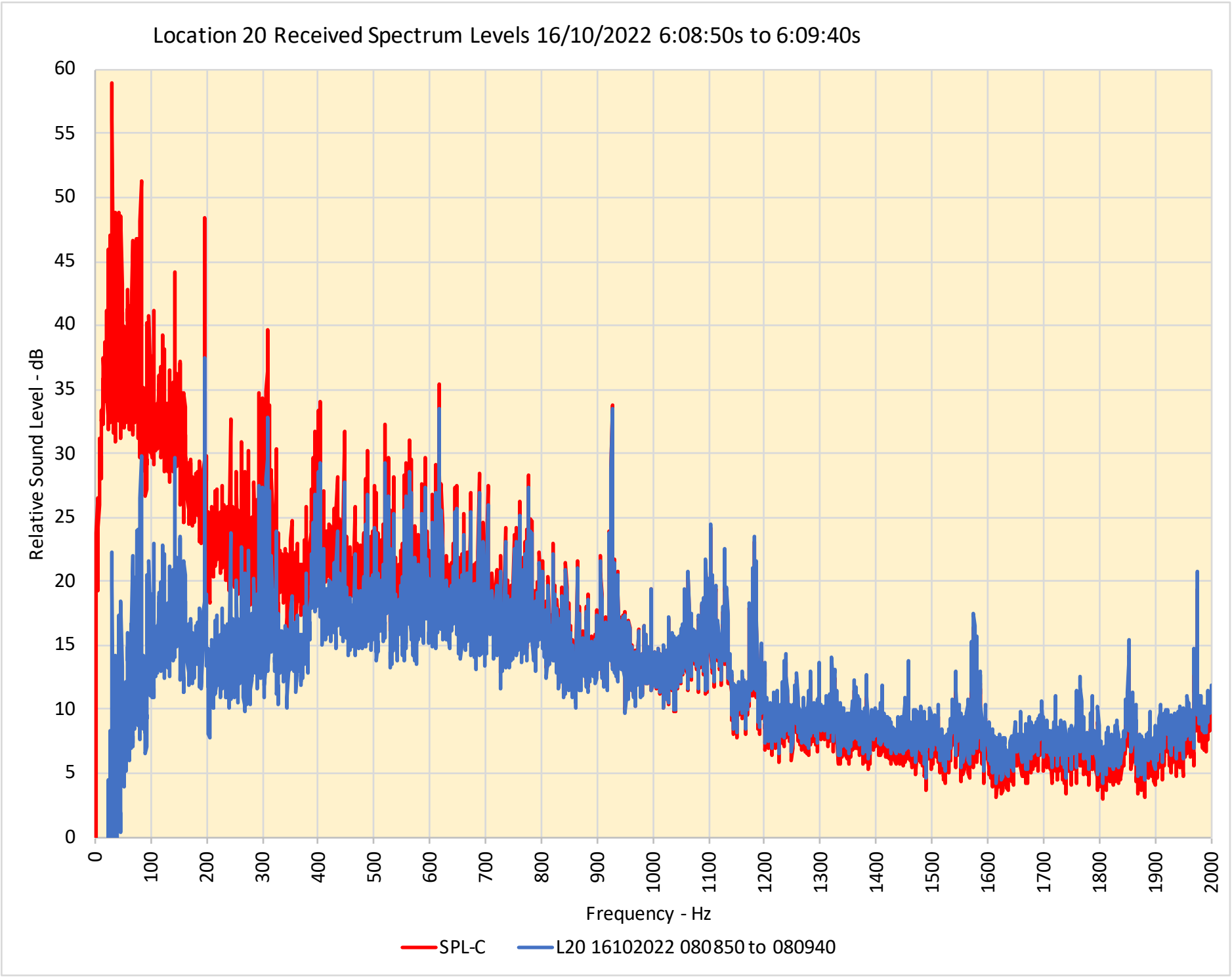


Appendix E Figure E54

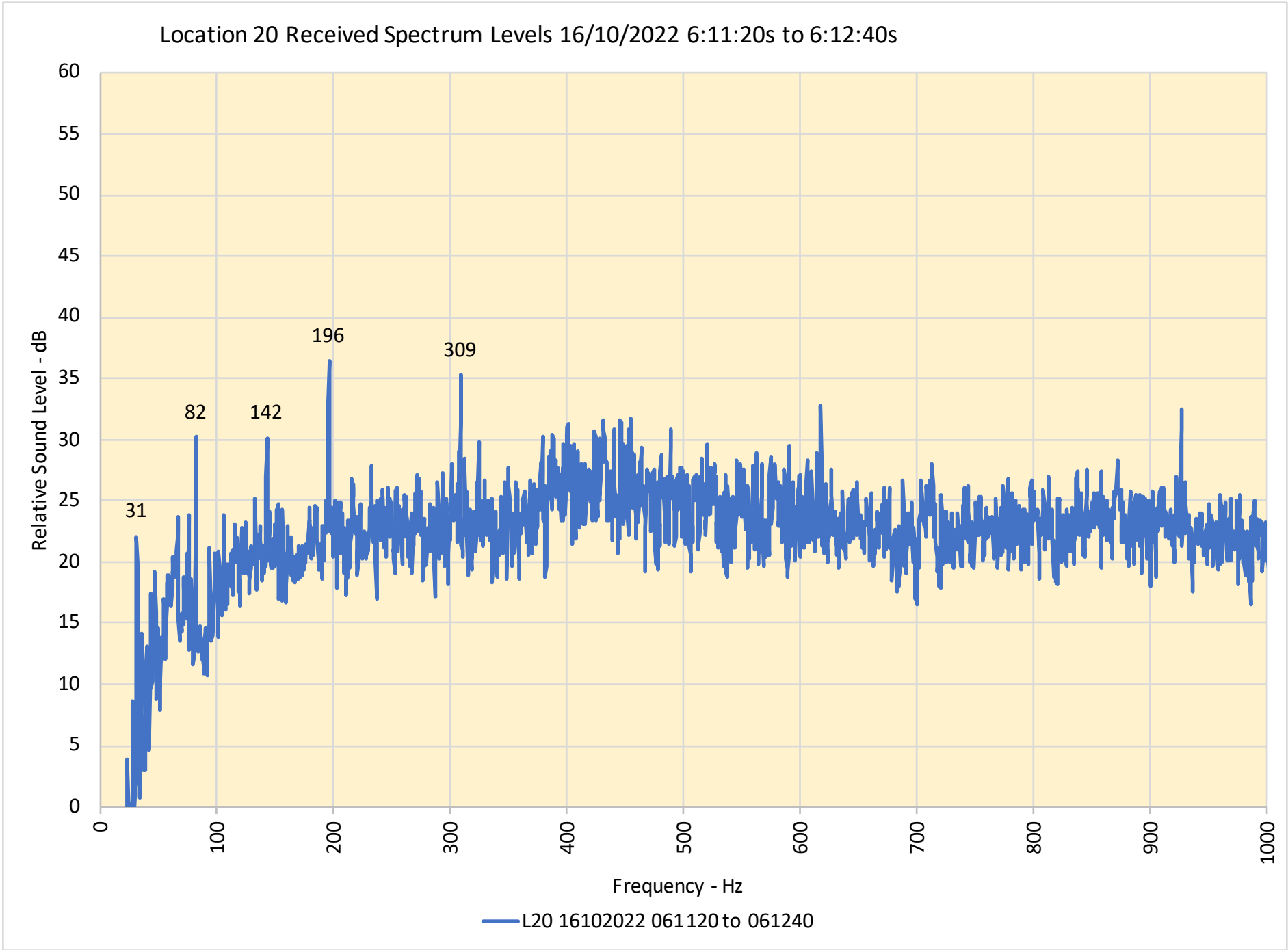
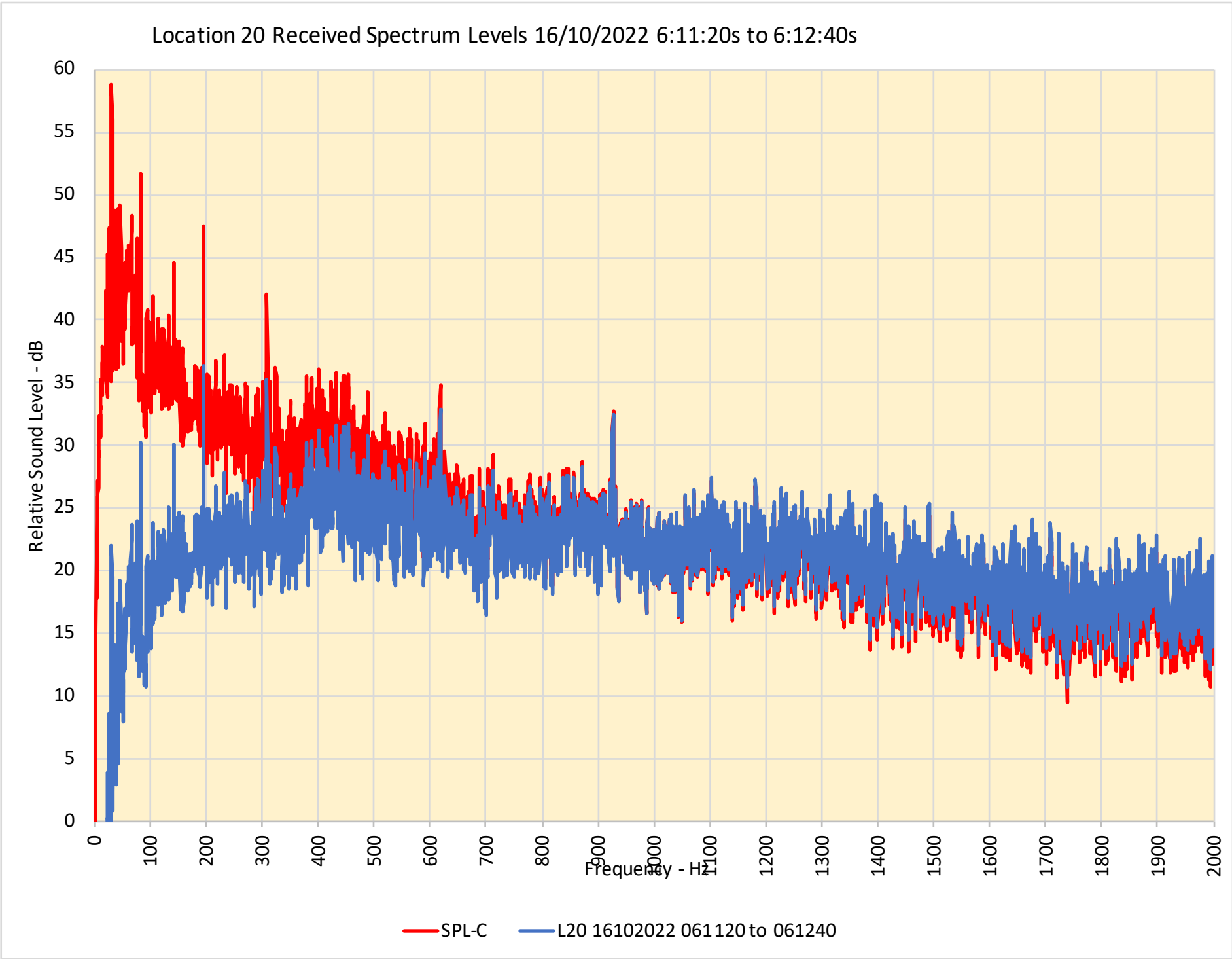




Appendix E Figure E56

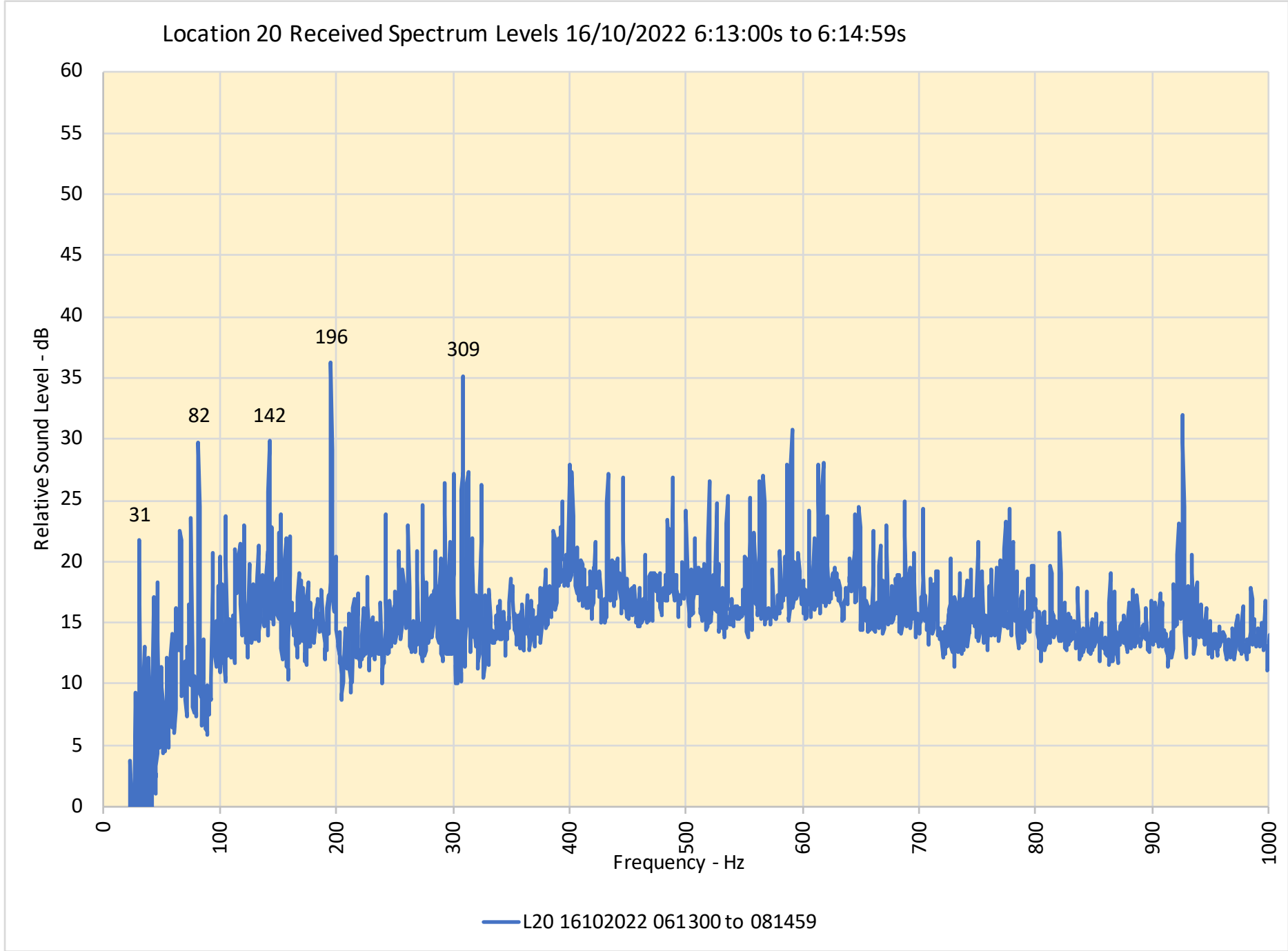
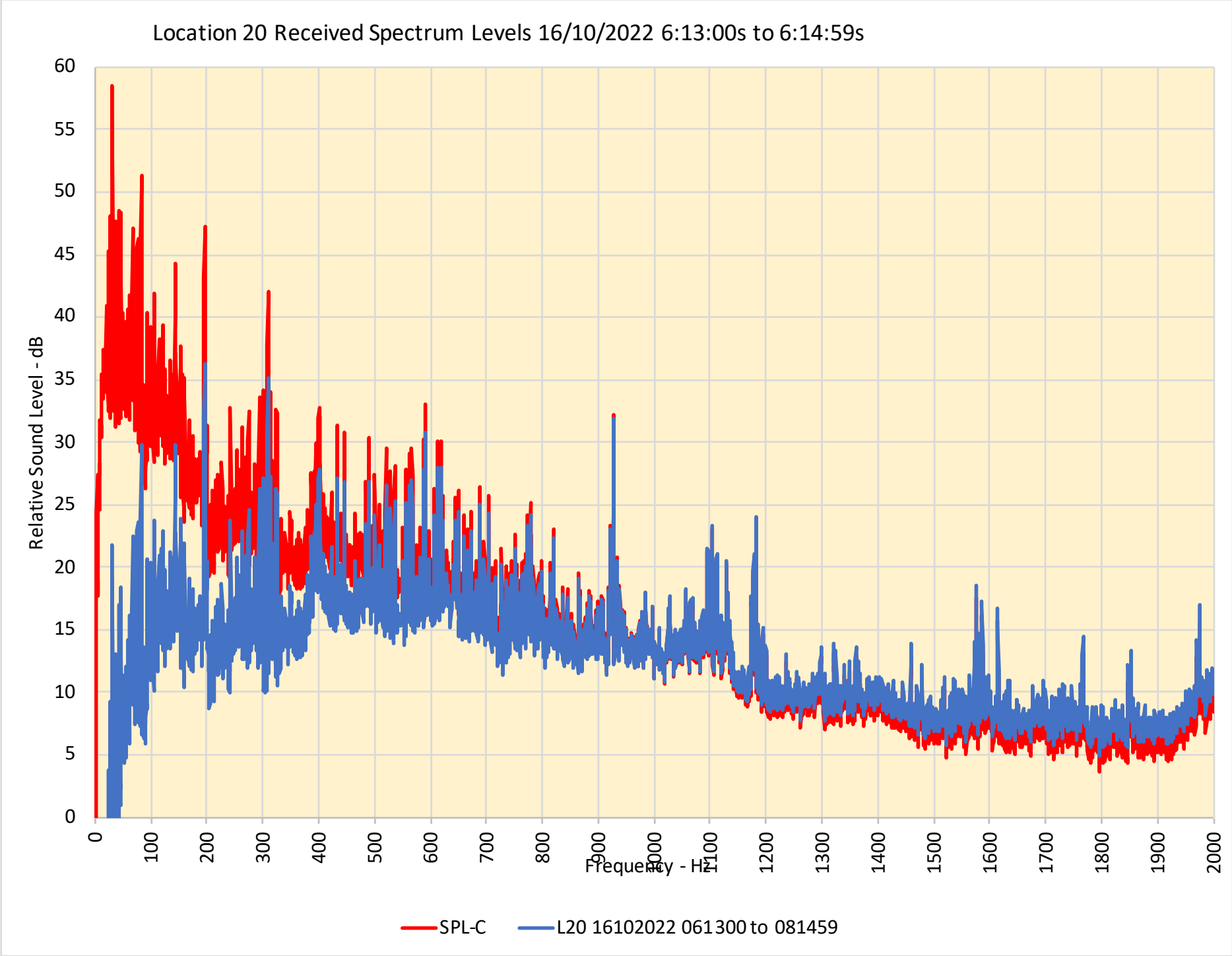


Appendix E Figure E57

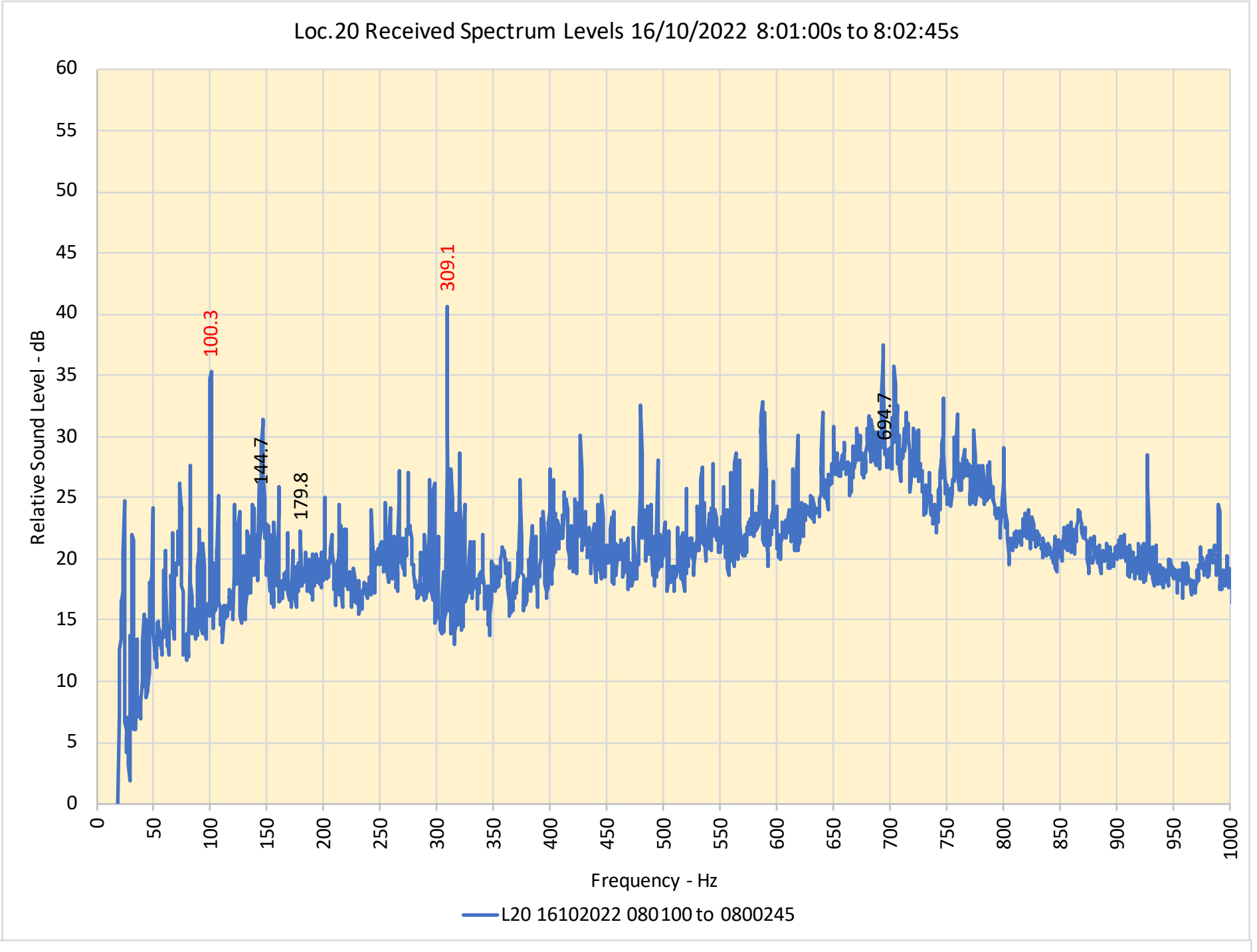
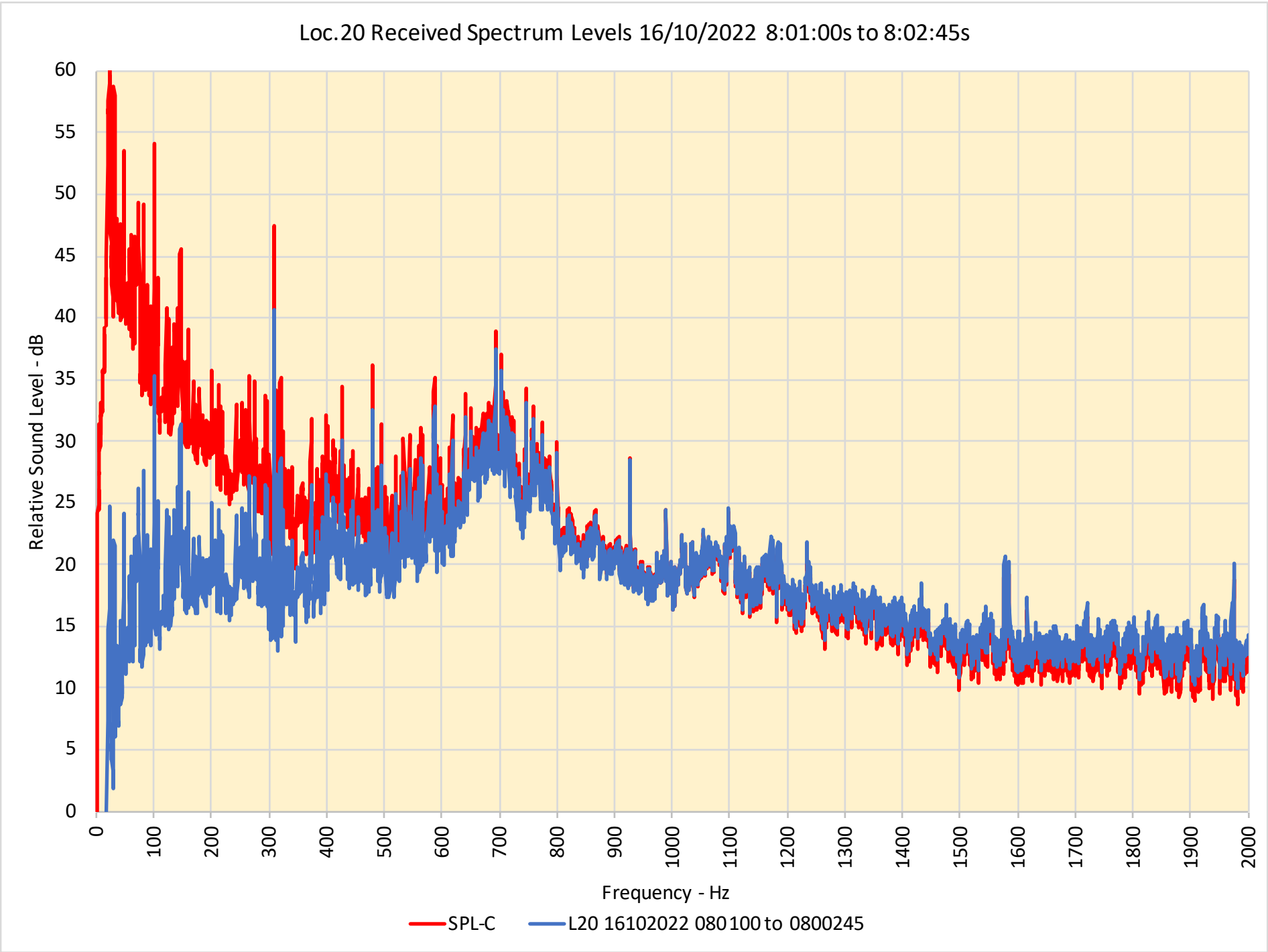


Appendix E Figure E58

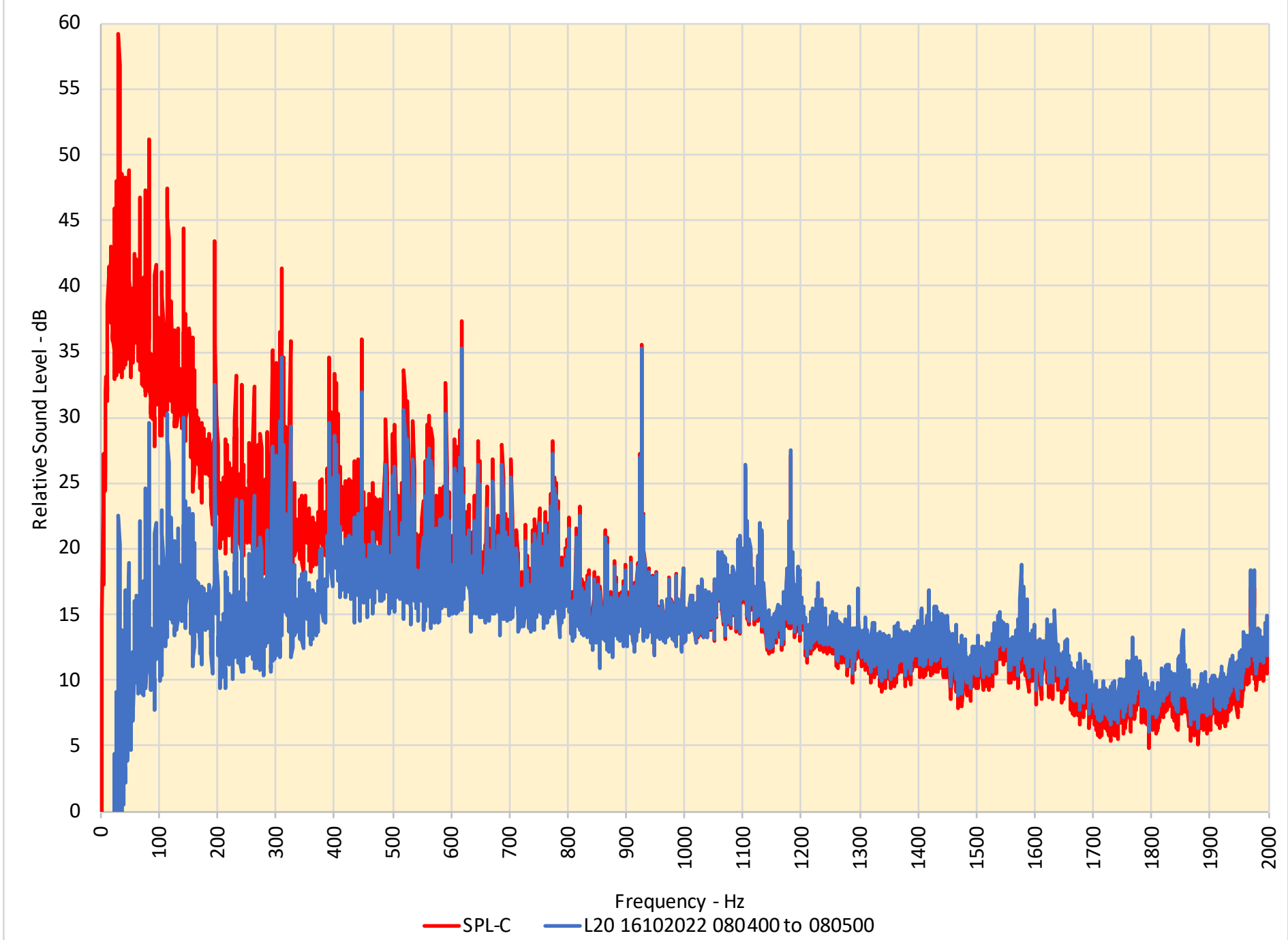




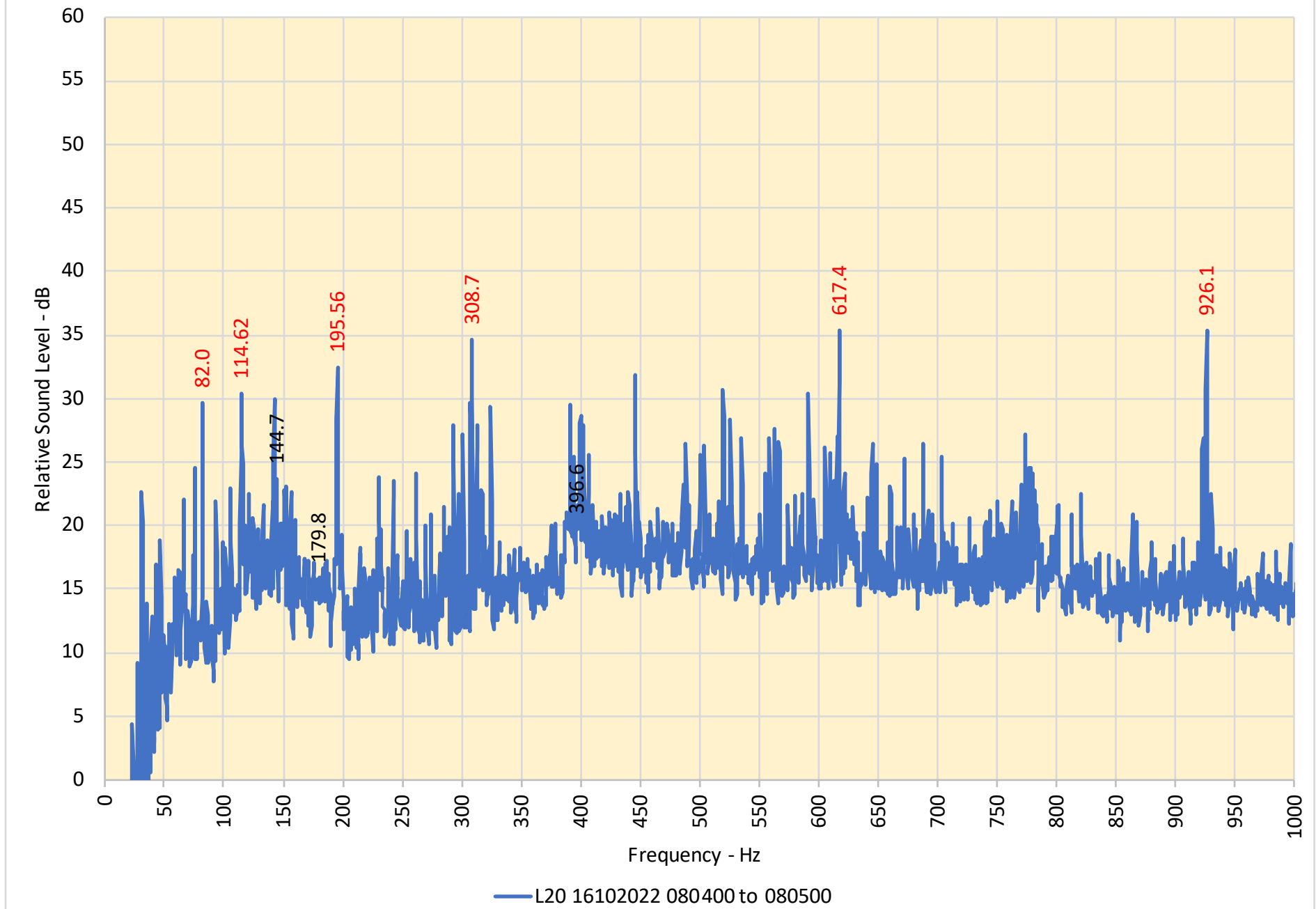
Appendix E Figure E59

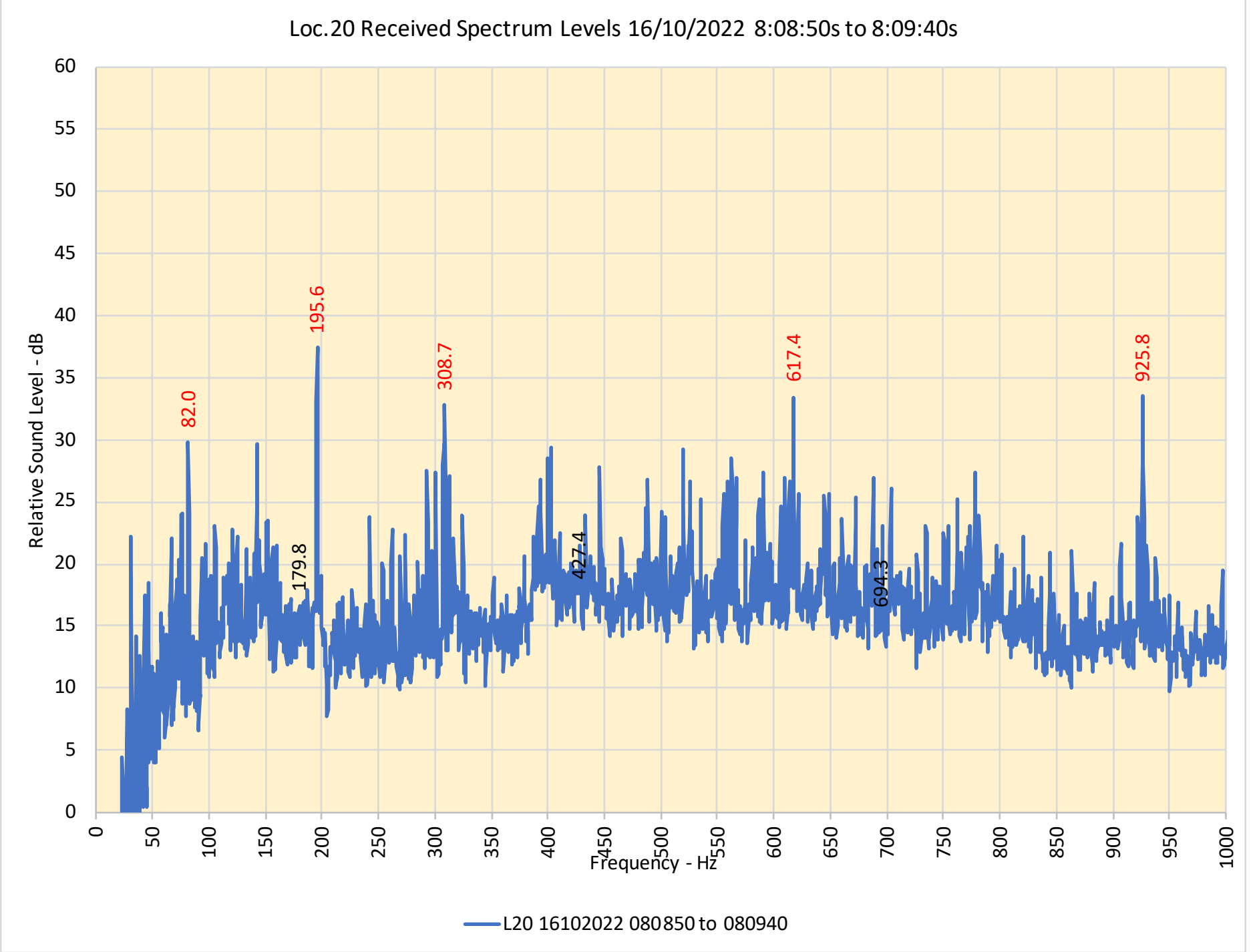
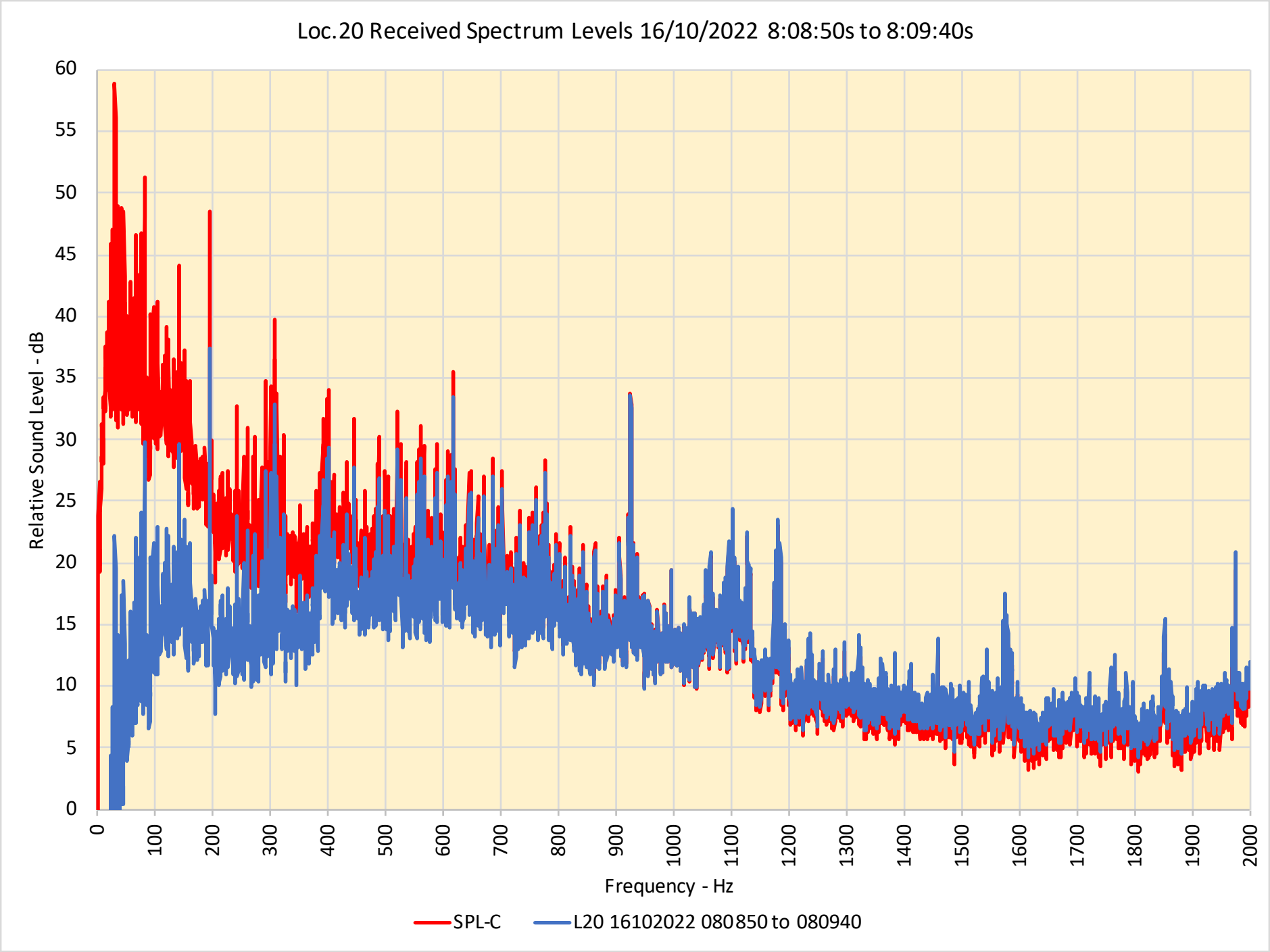


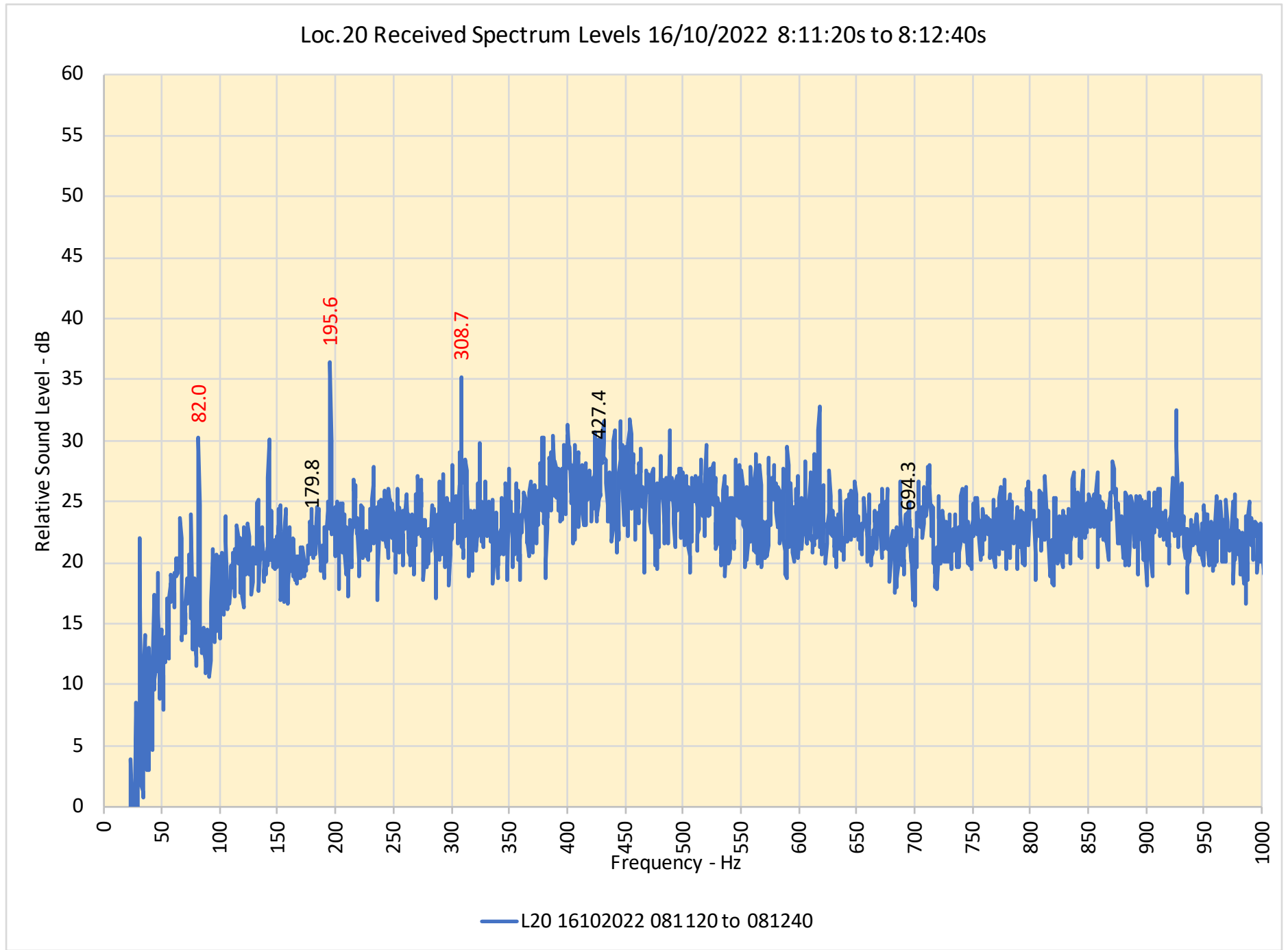
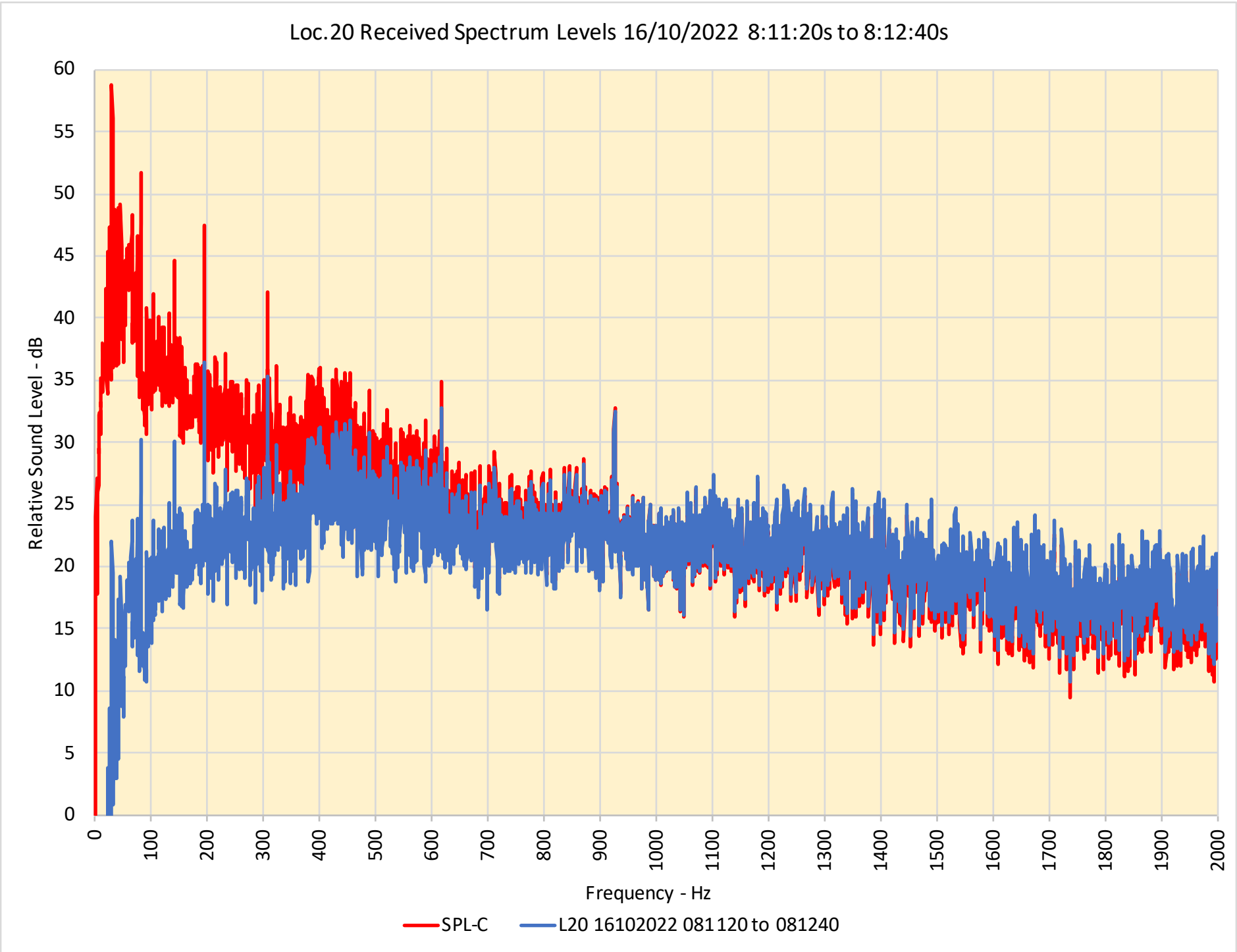
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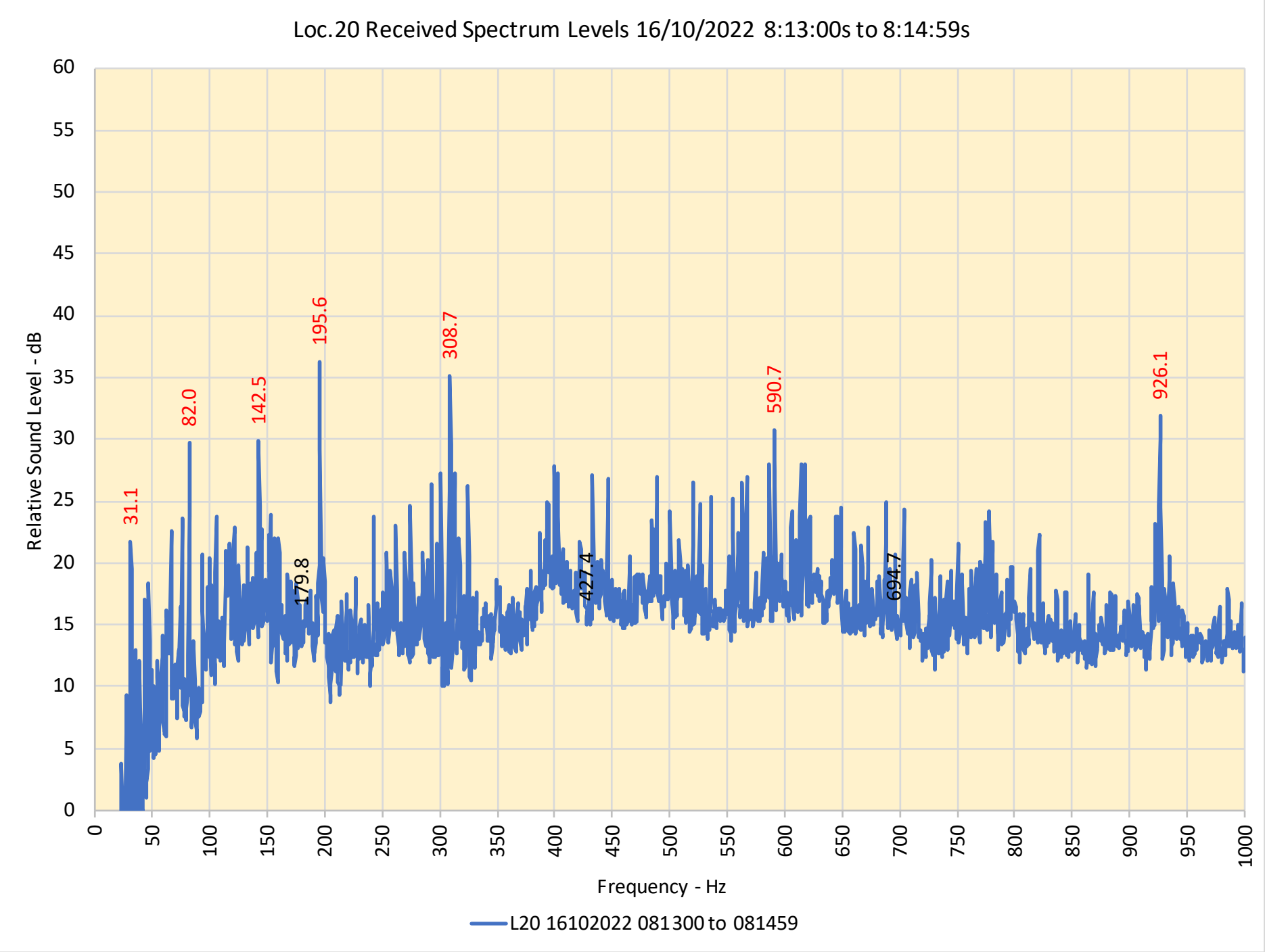
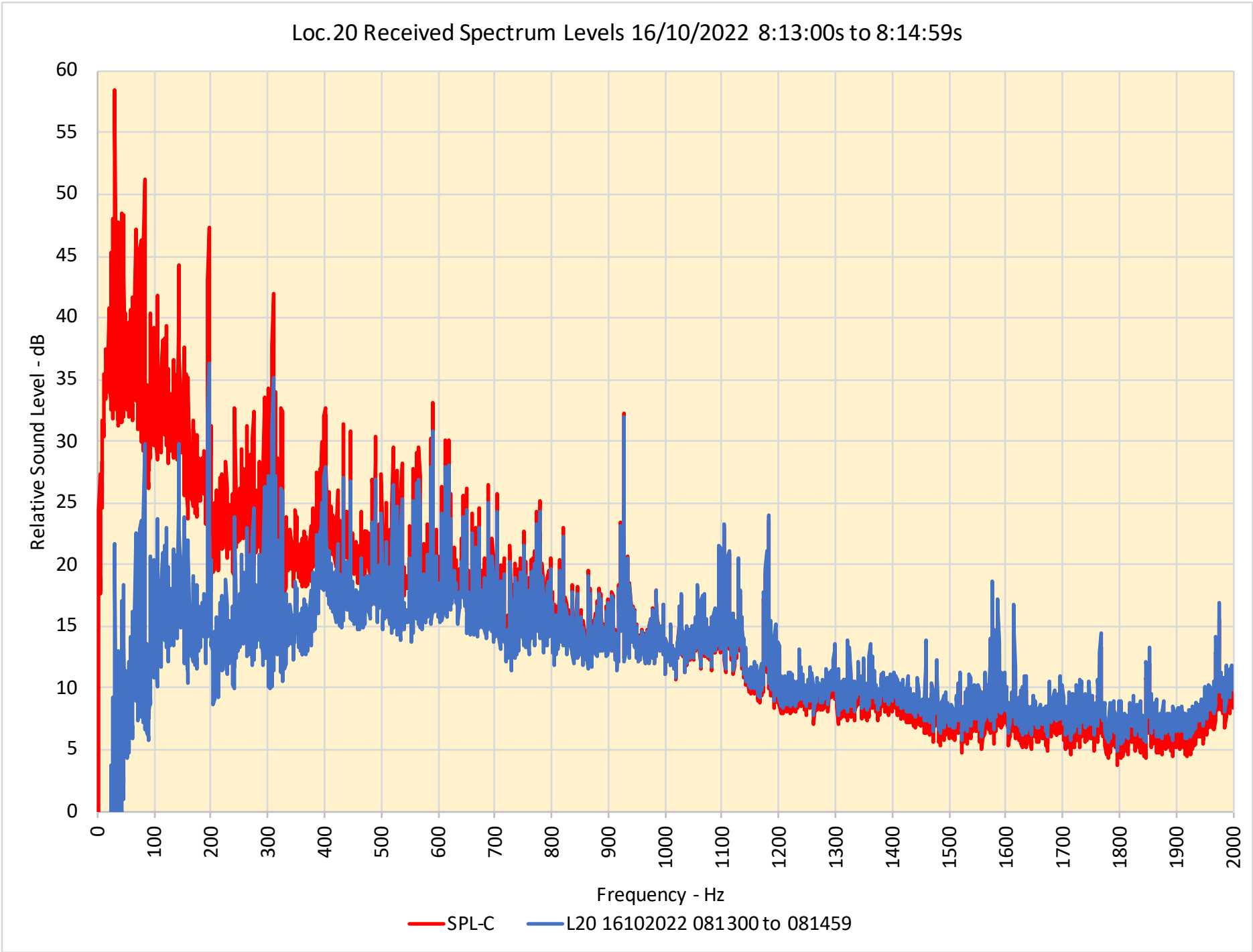
Loc.20 Received Spectrum Levels 16/10/2022 8:04:00s to 8:05:00s



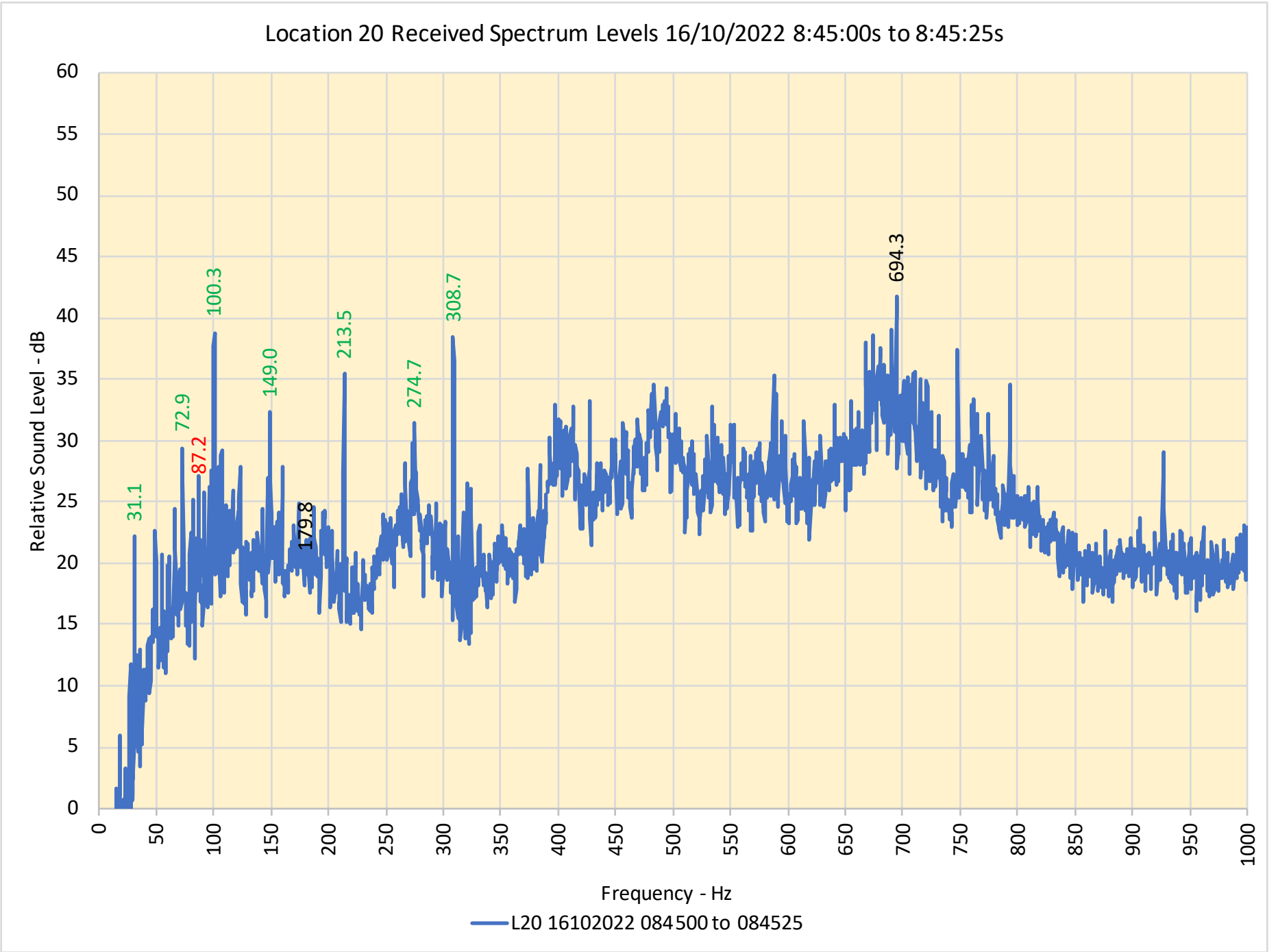
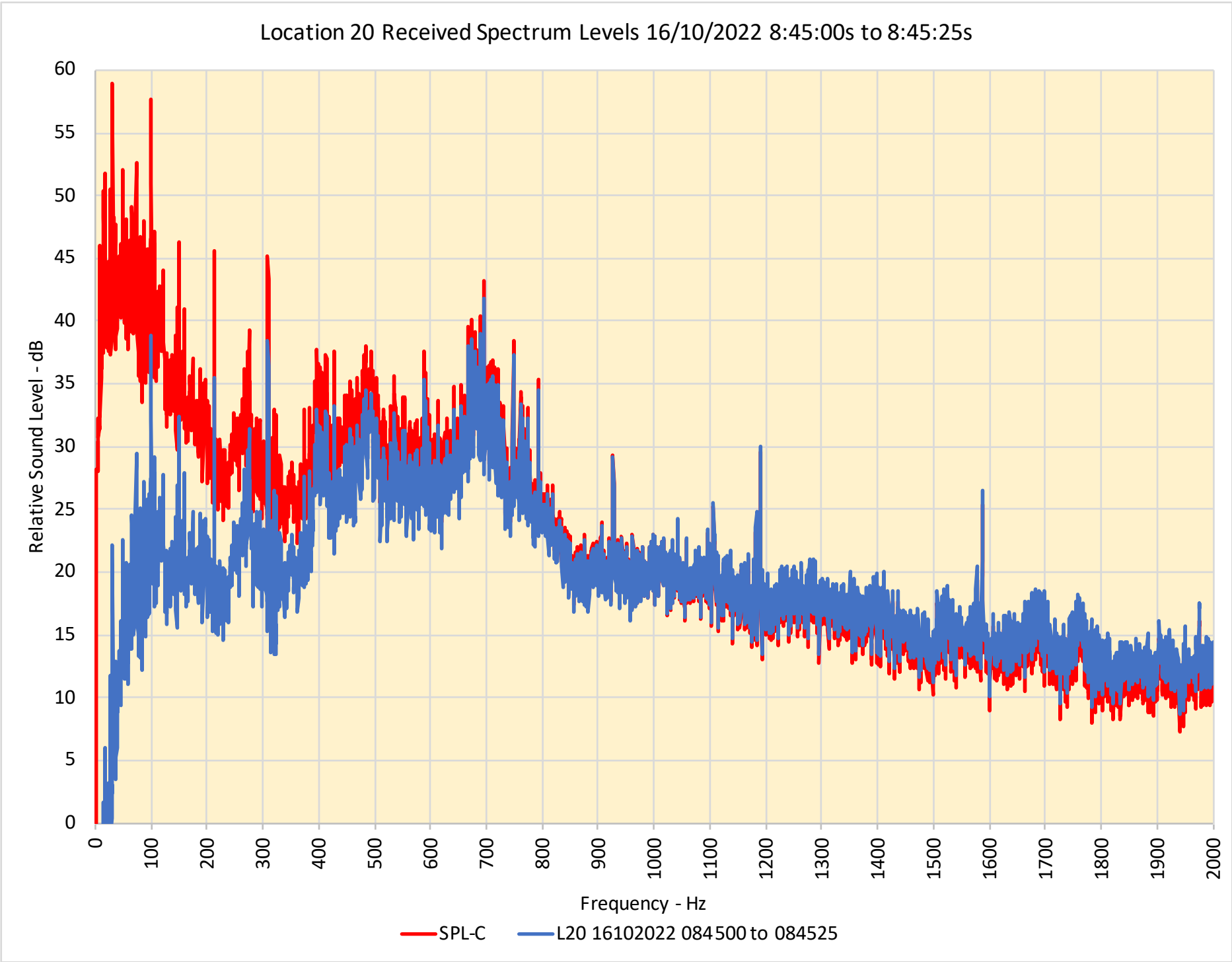




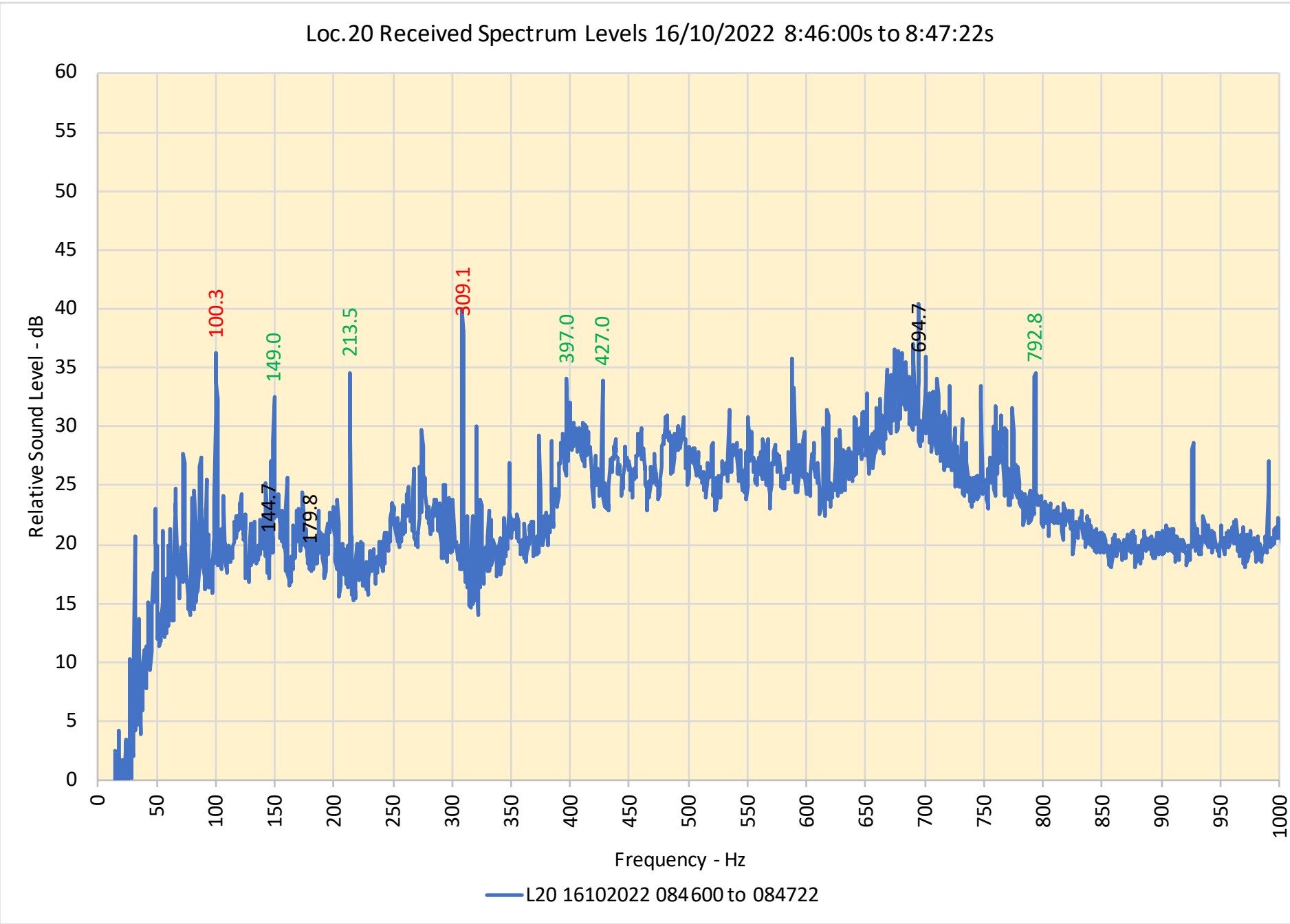
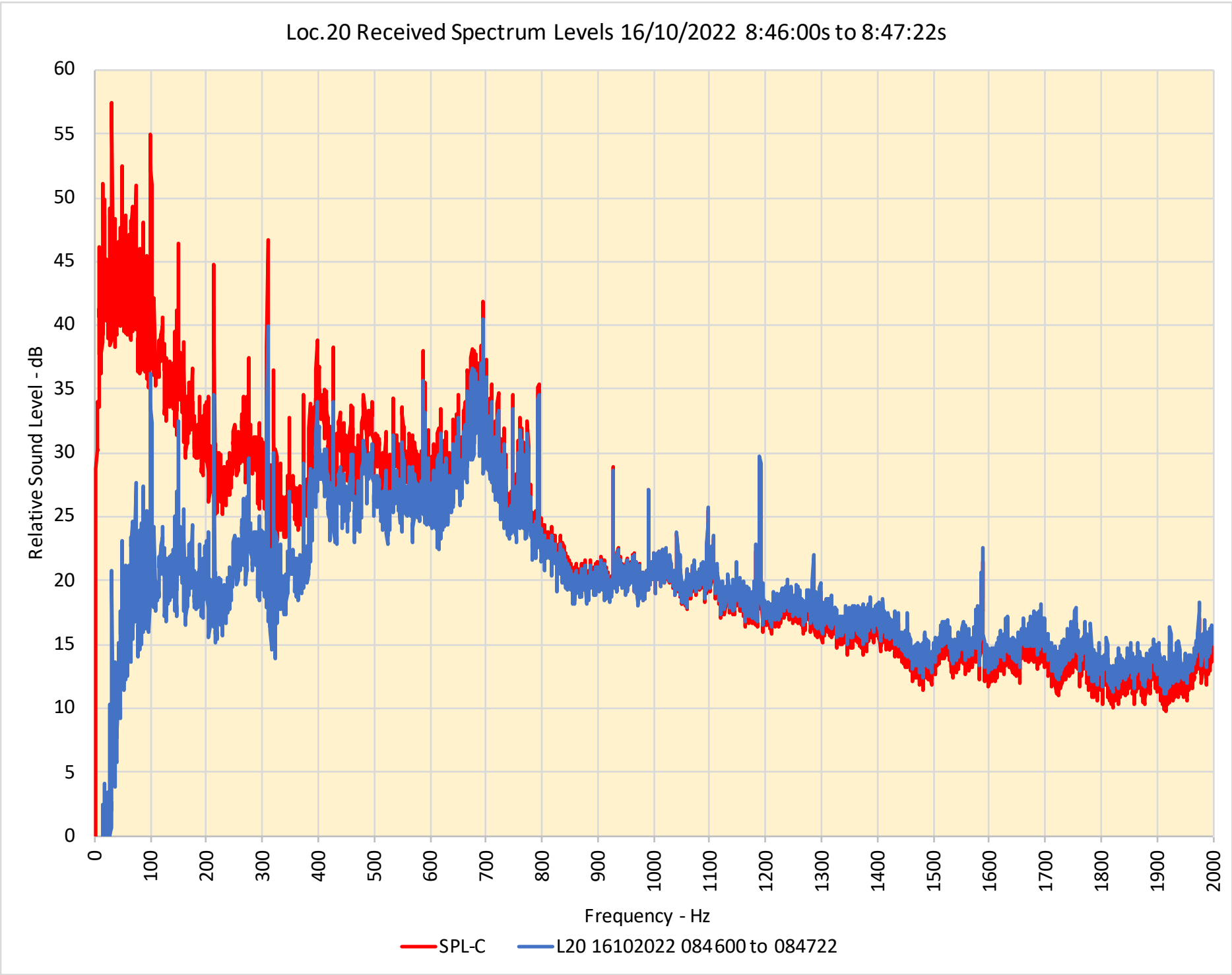
Appendix E Figure E63



Appendix E Figure E64

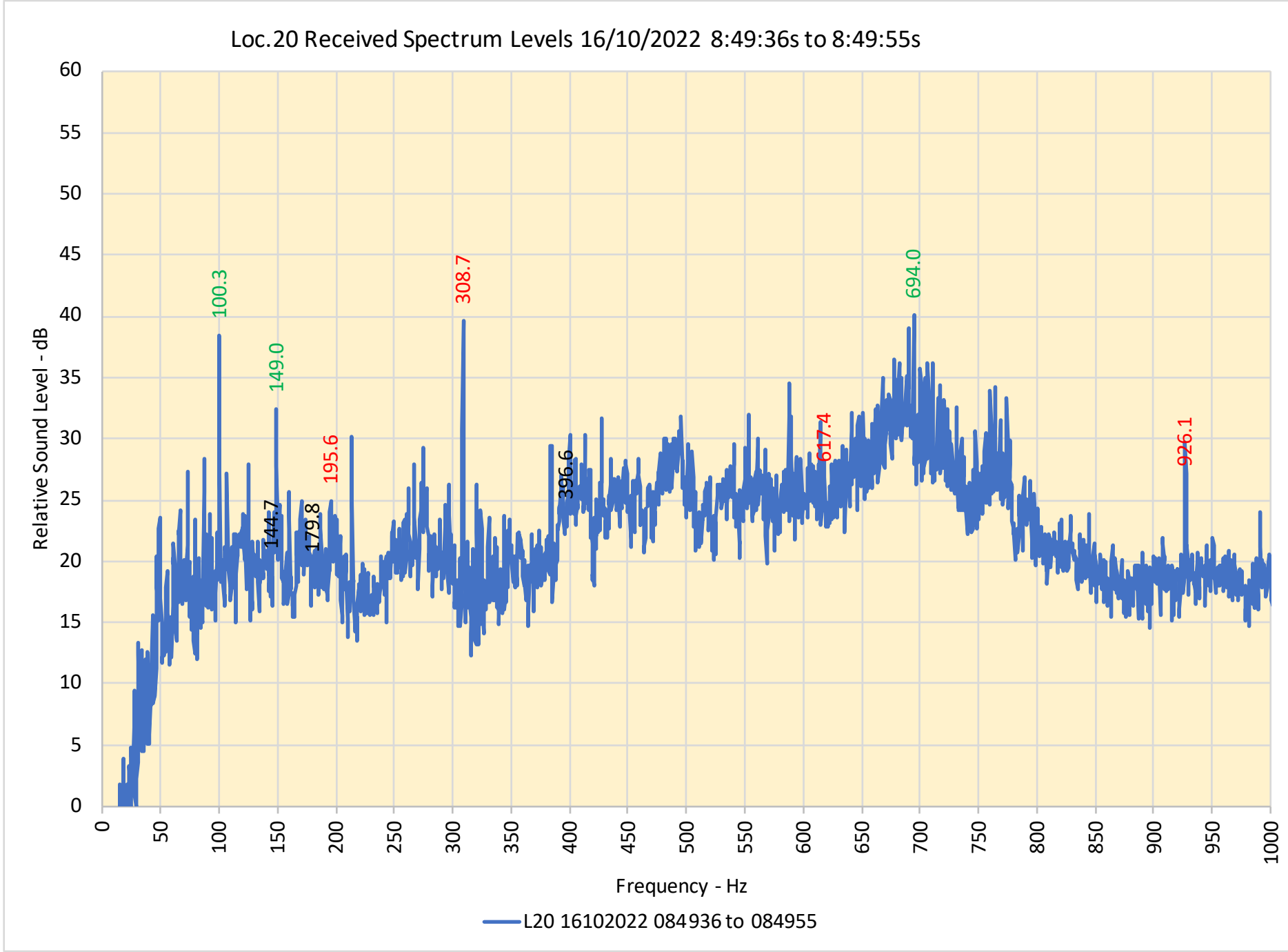
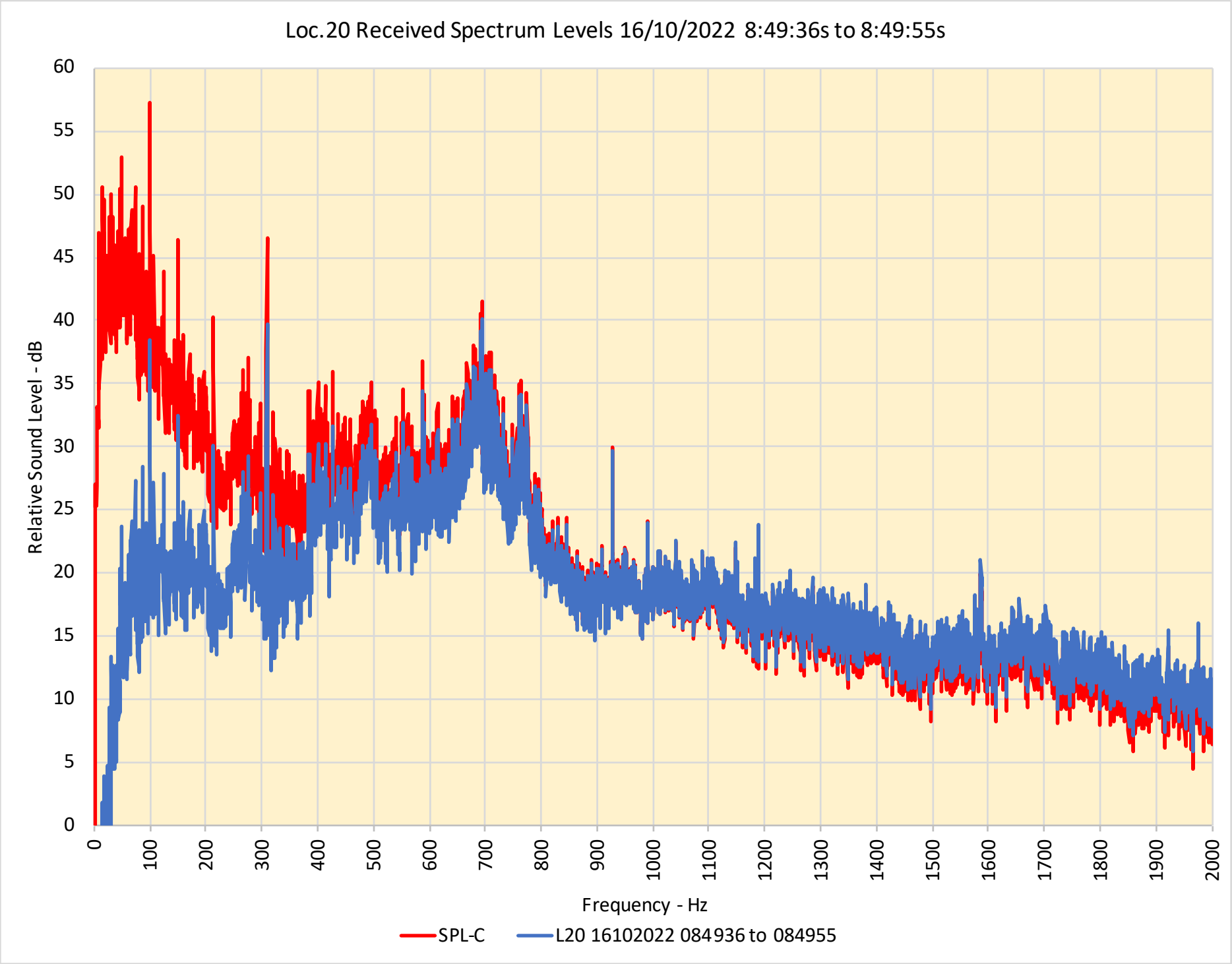


Appendix E Figure E65

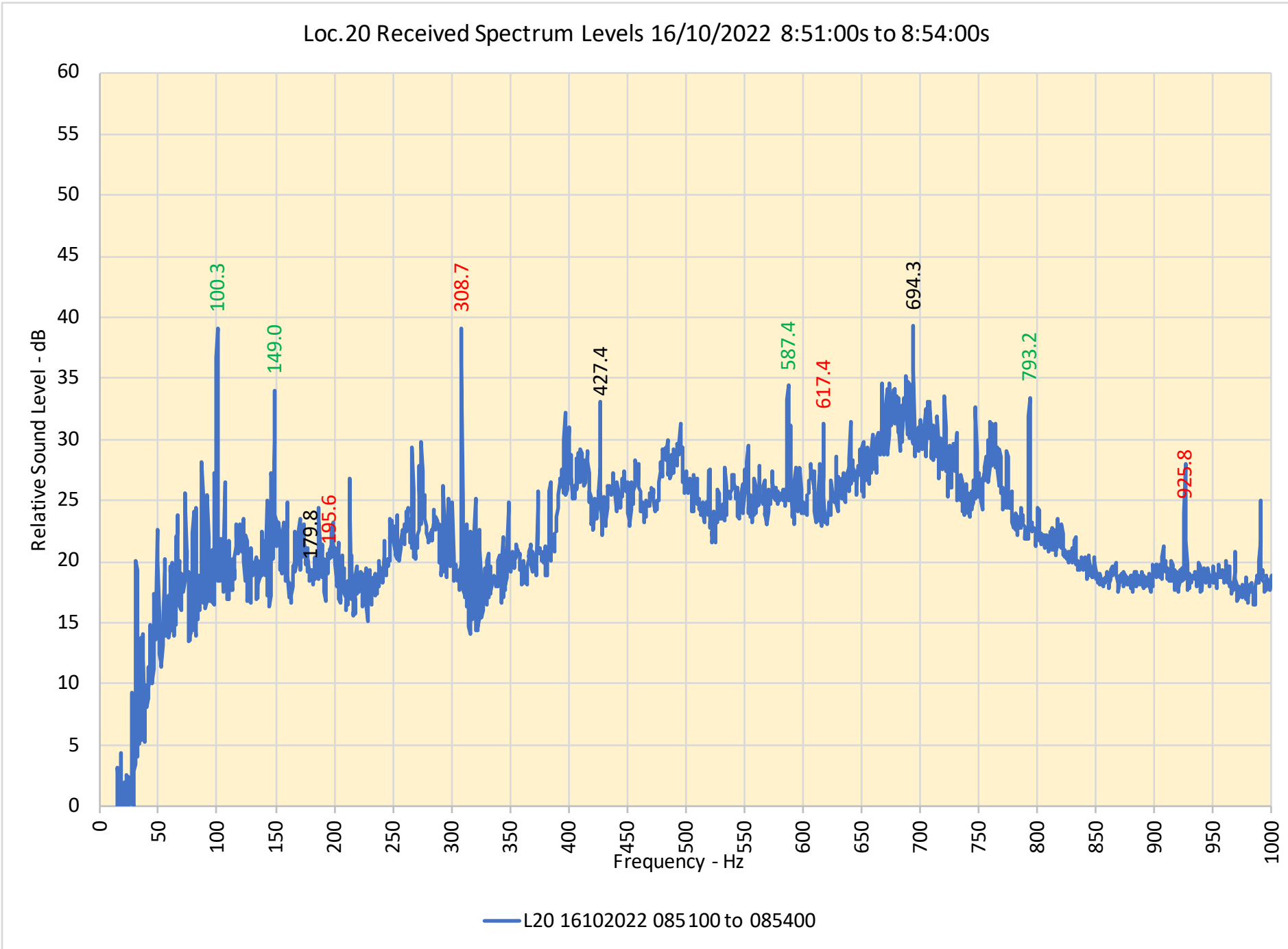
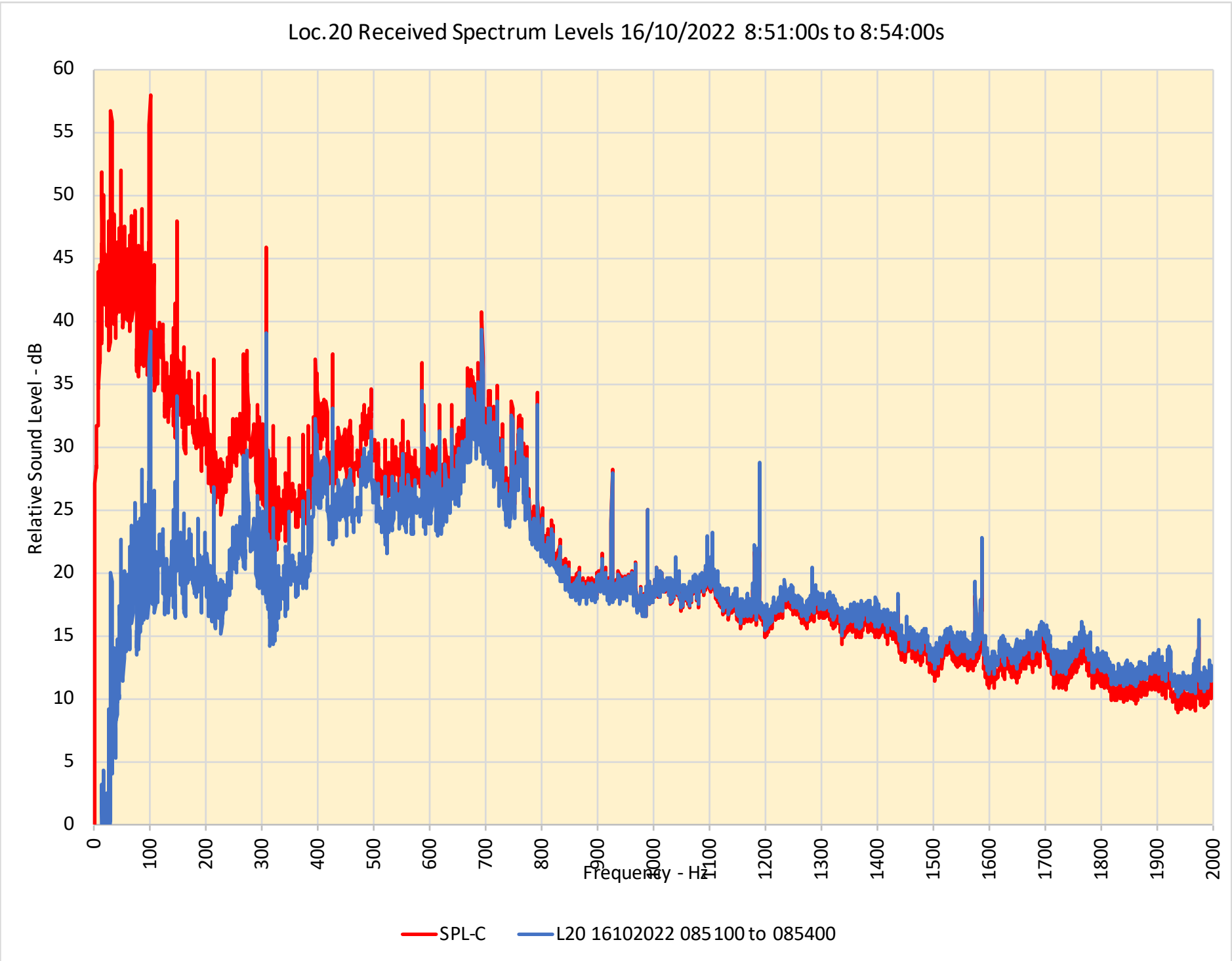


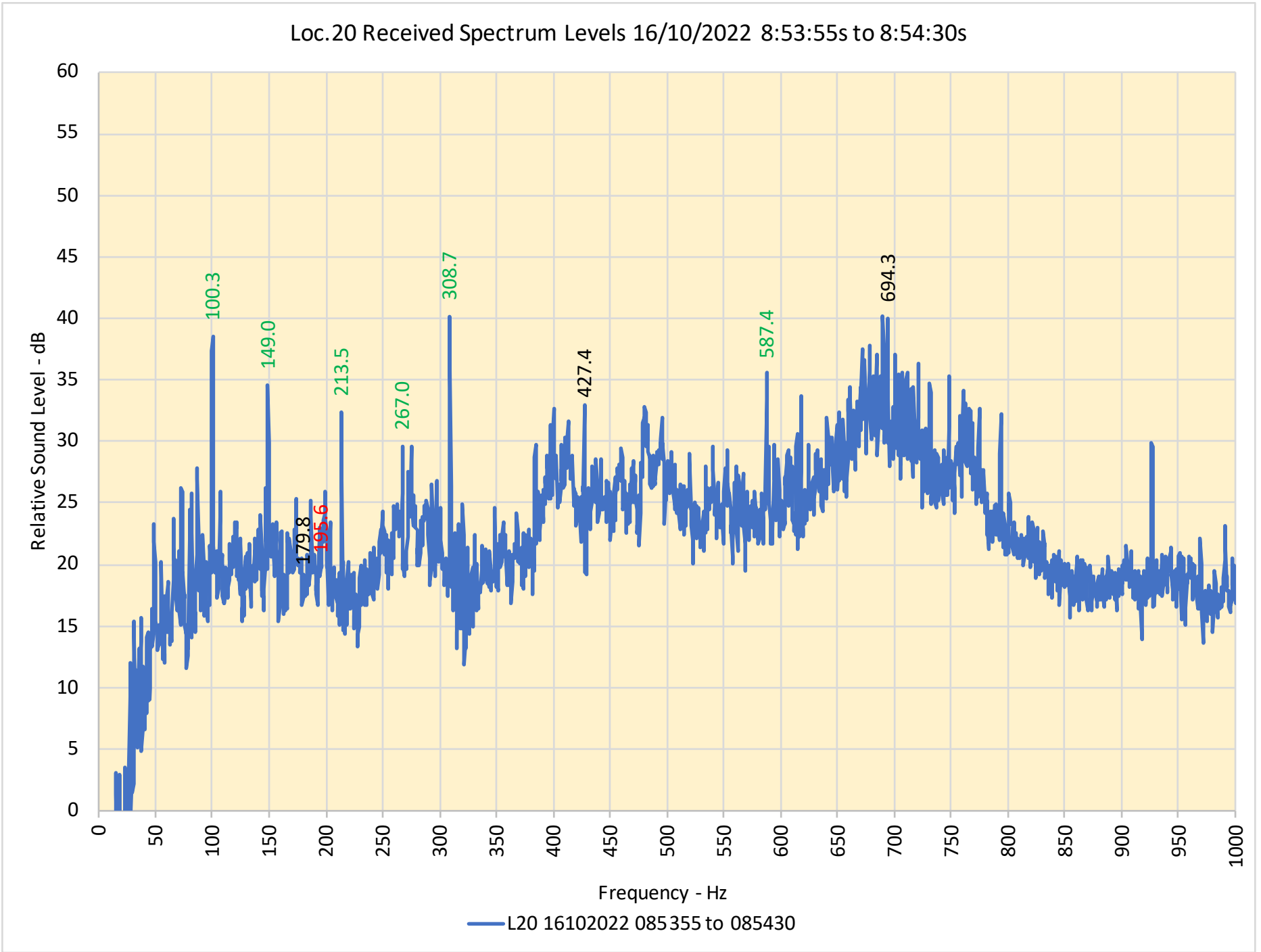
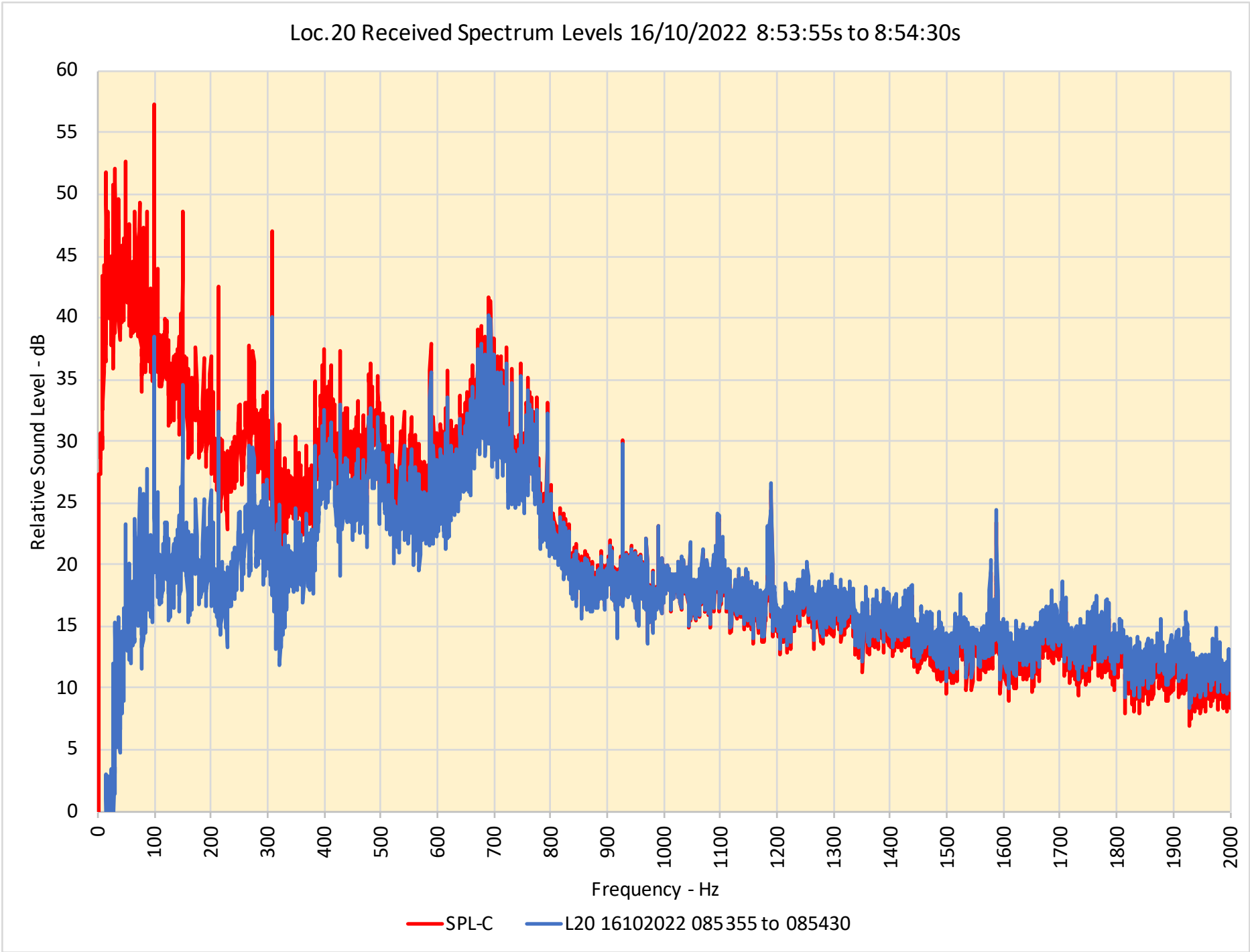
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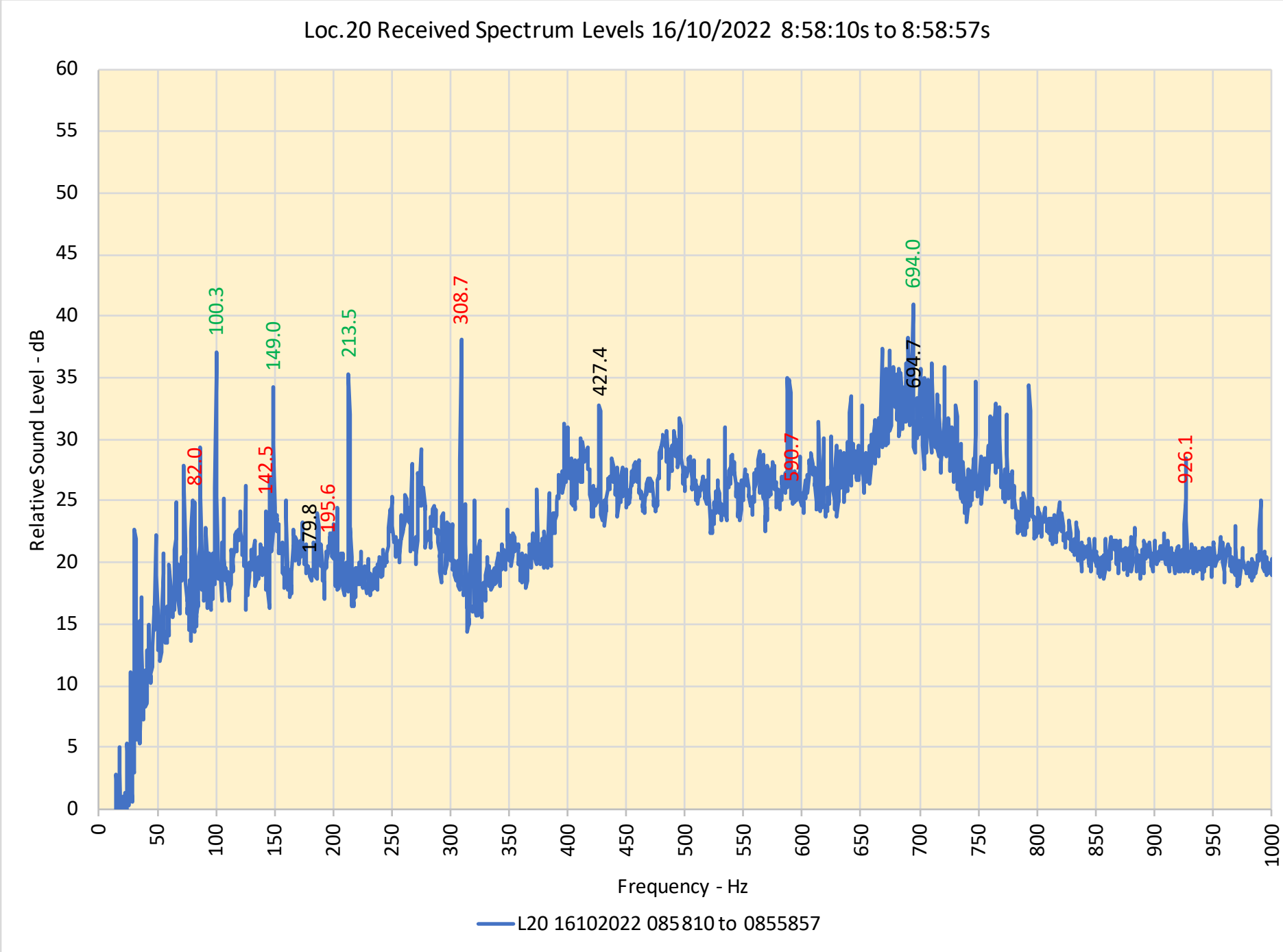
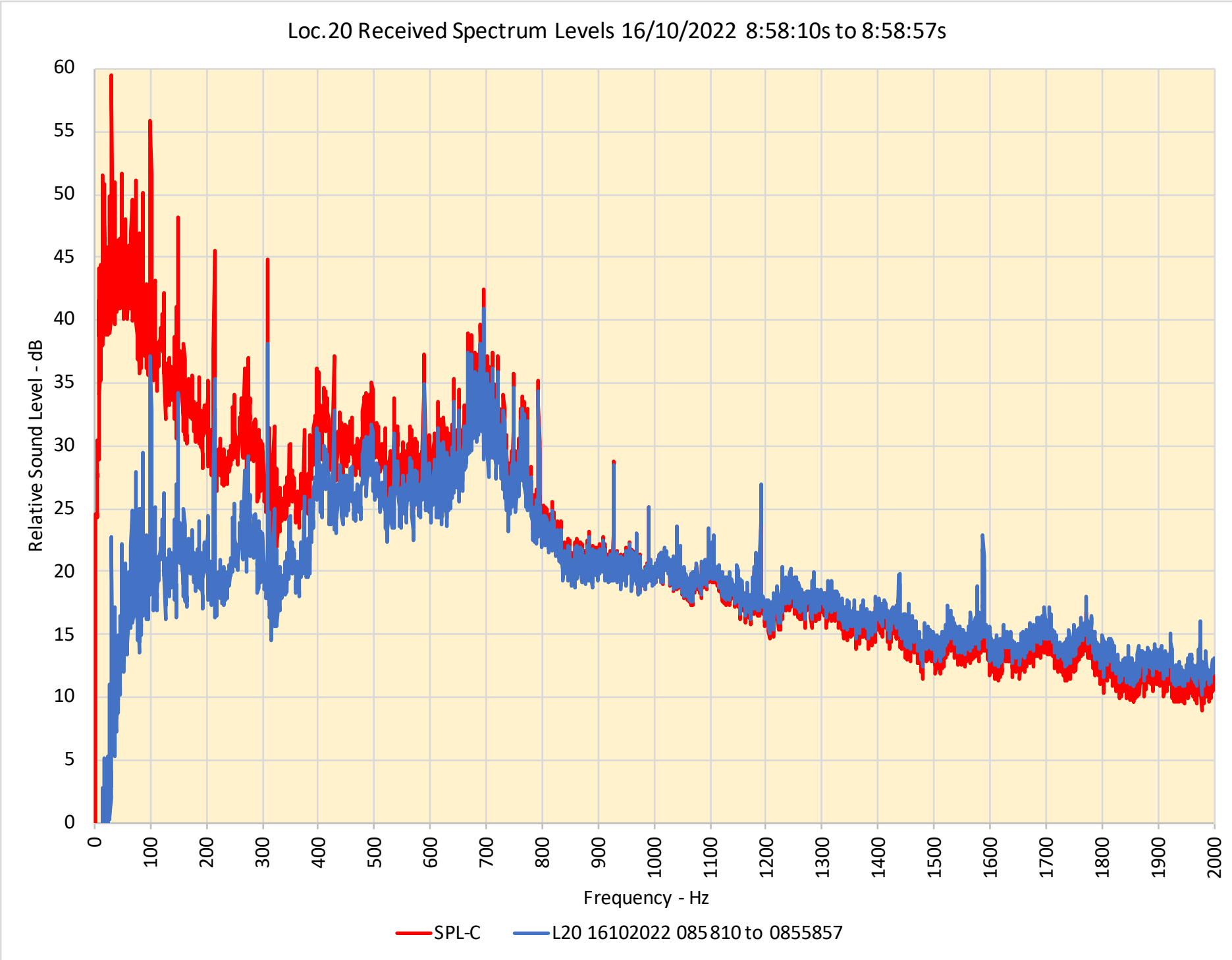


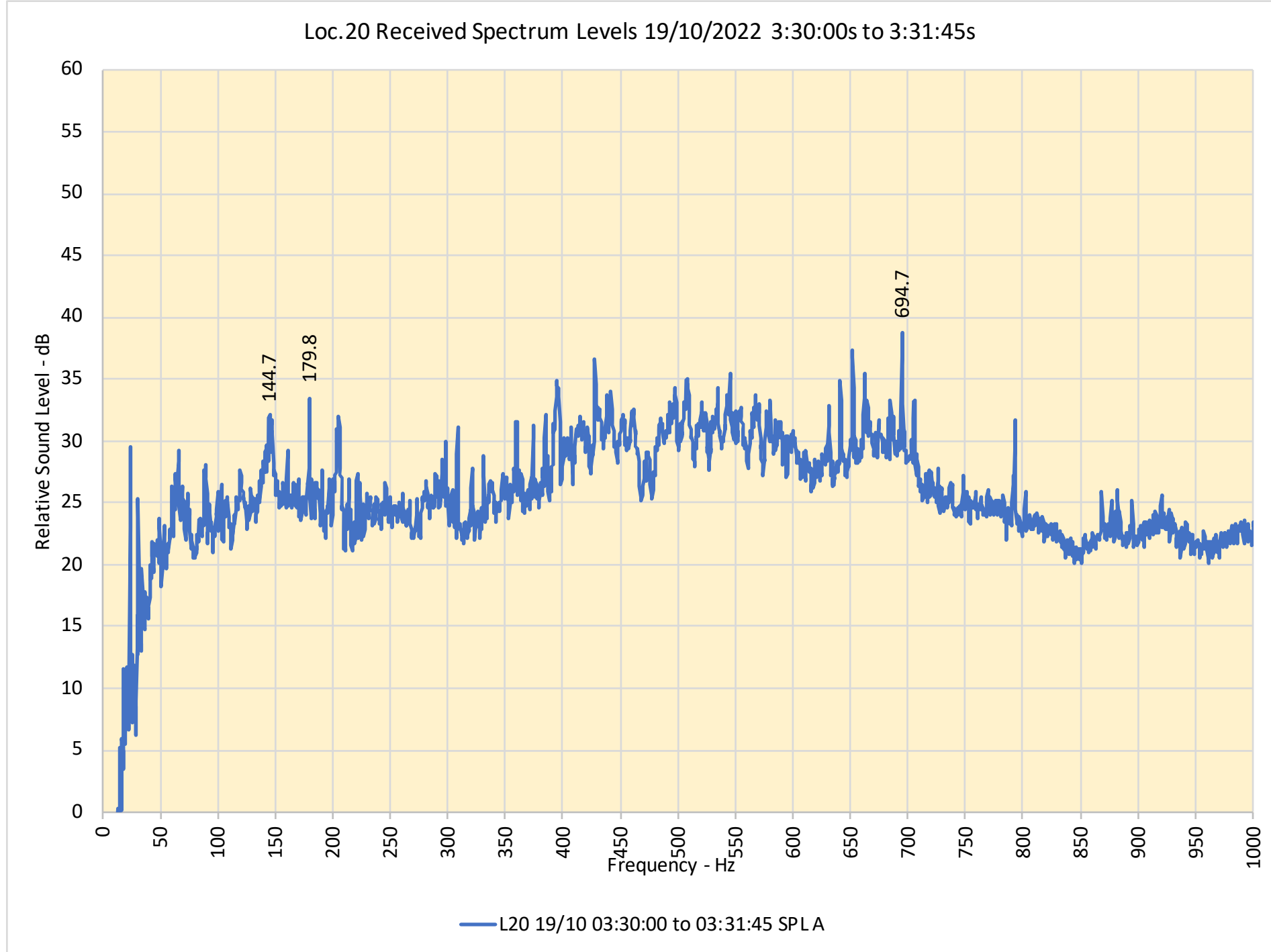
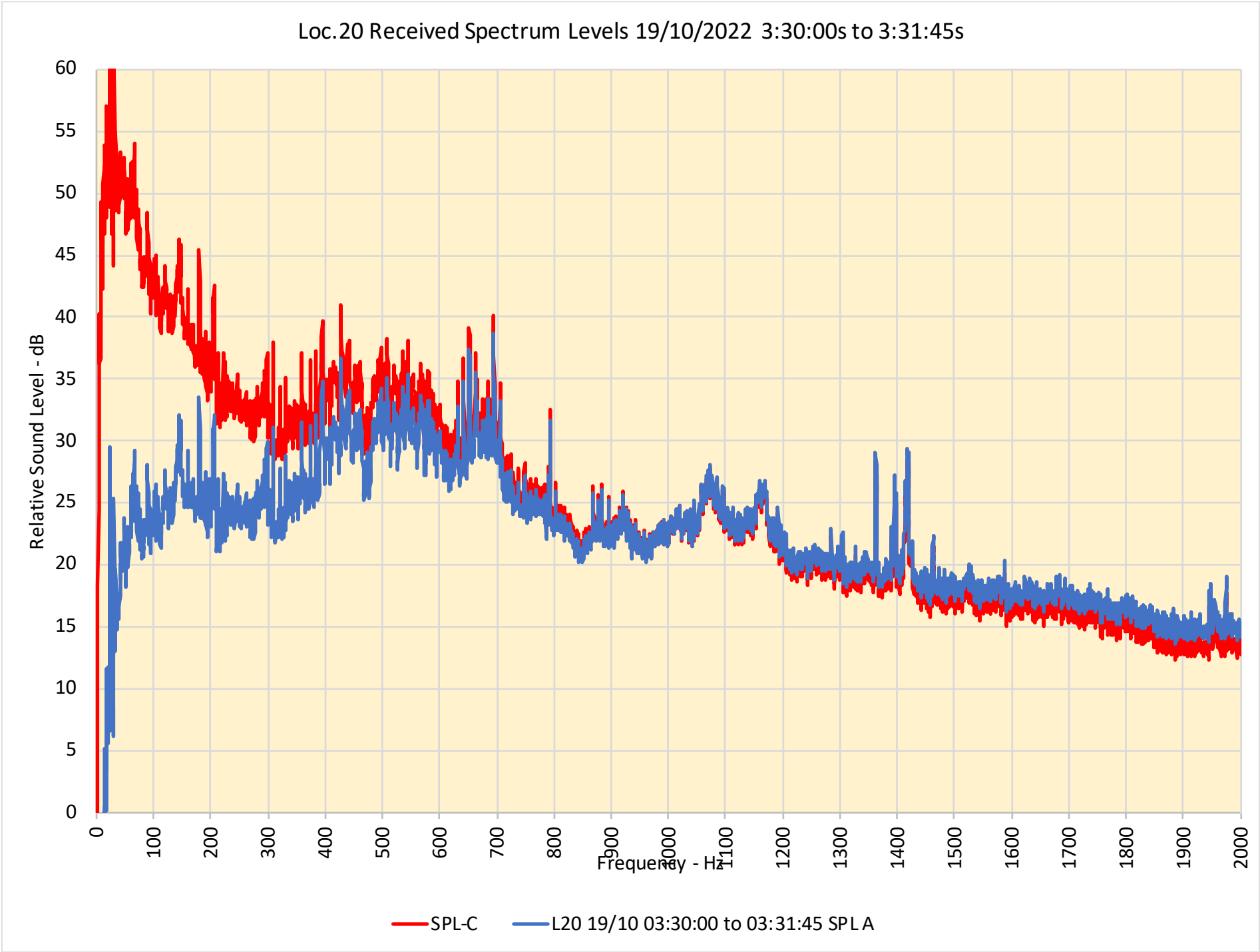


Appendix E Figure E67

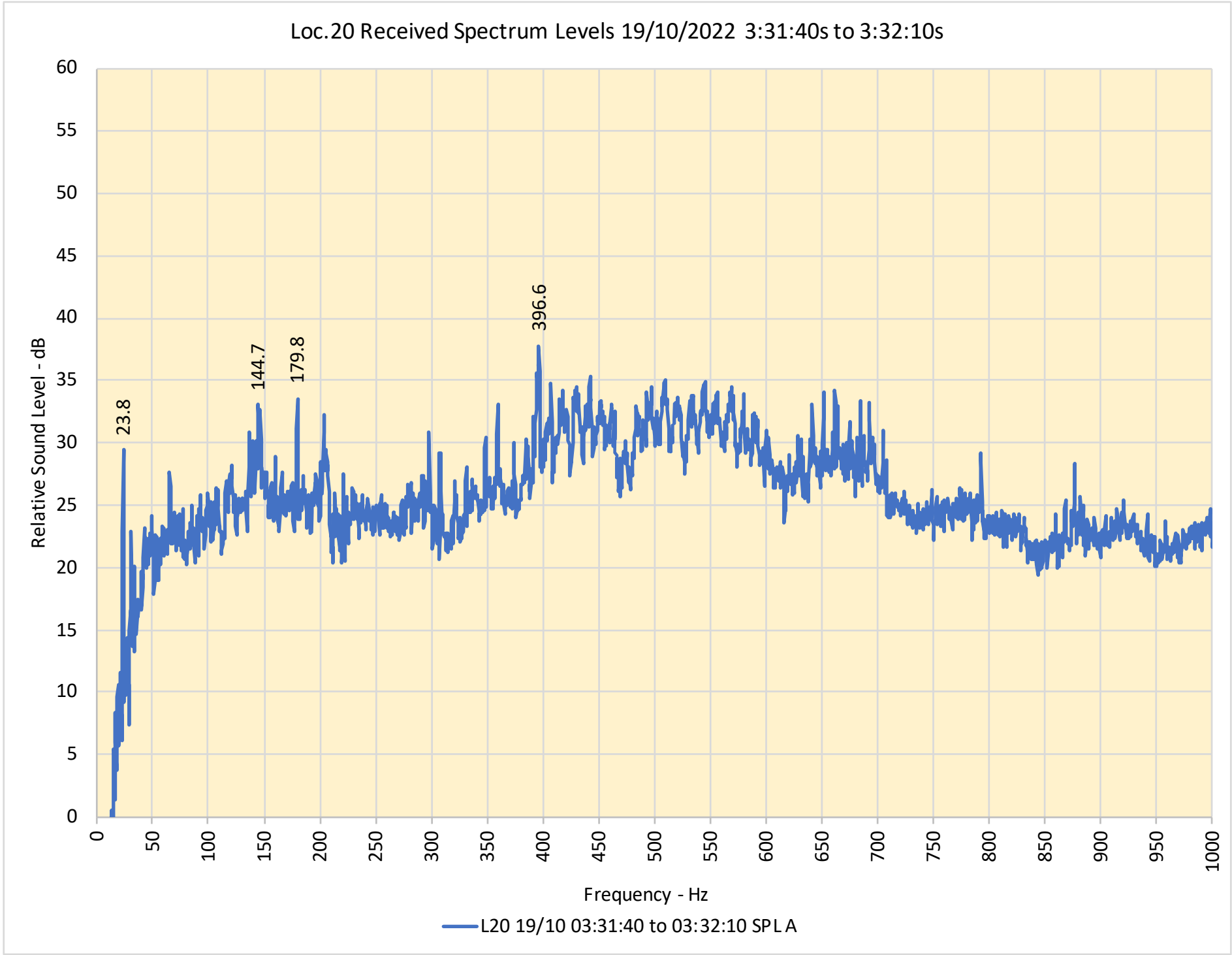
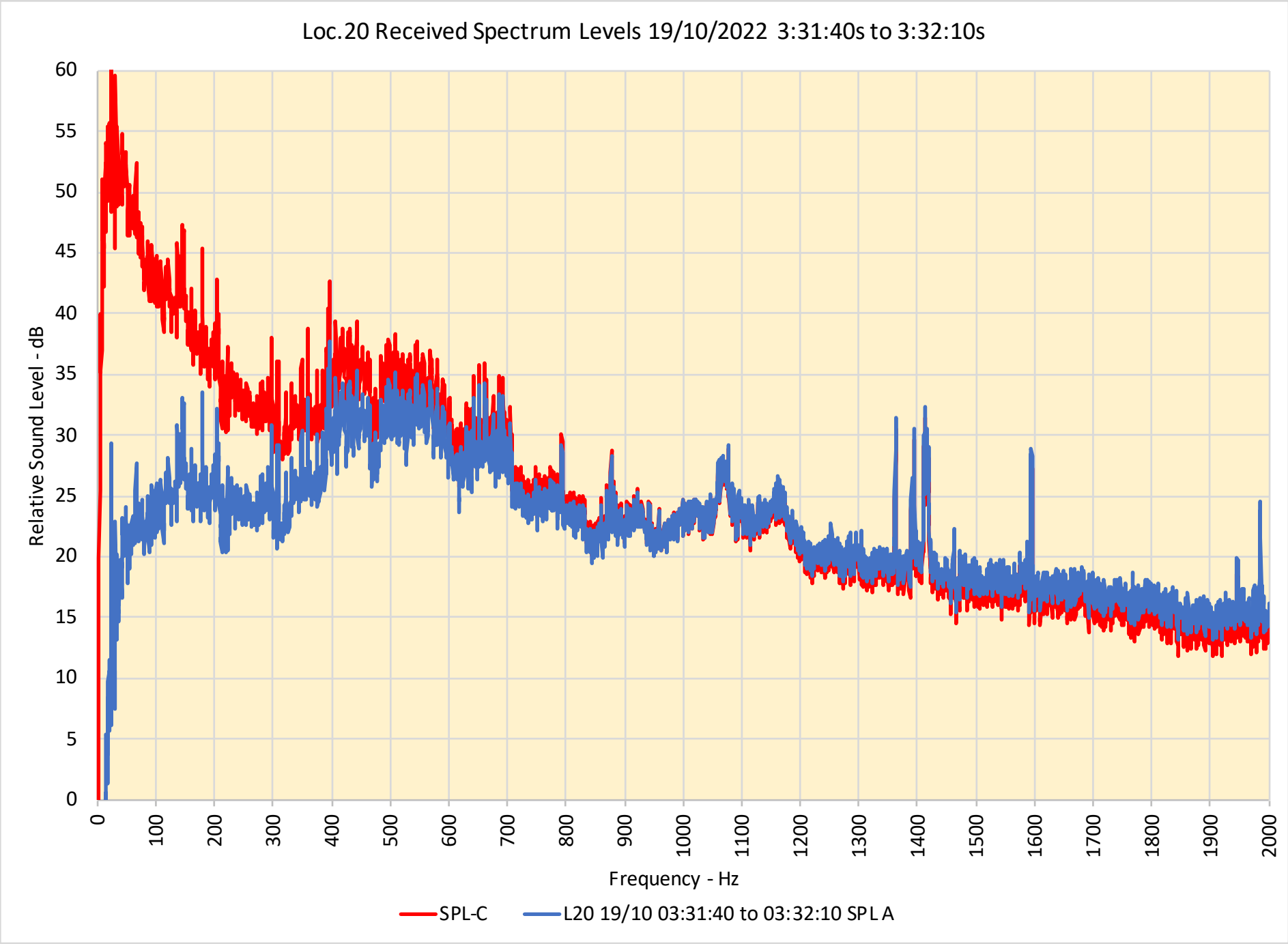


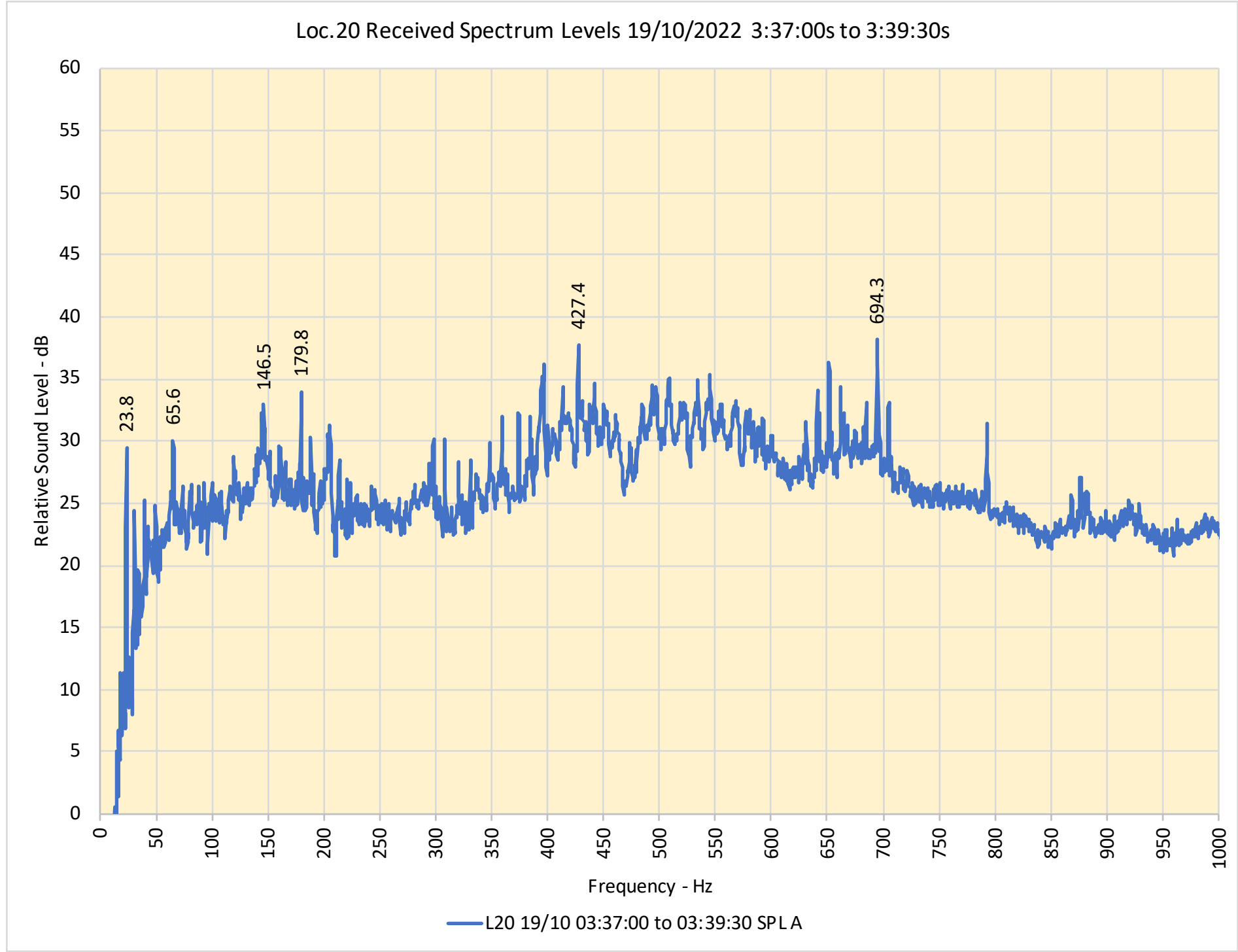
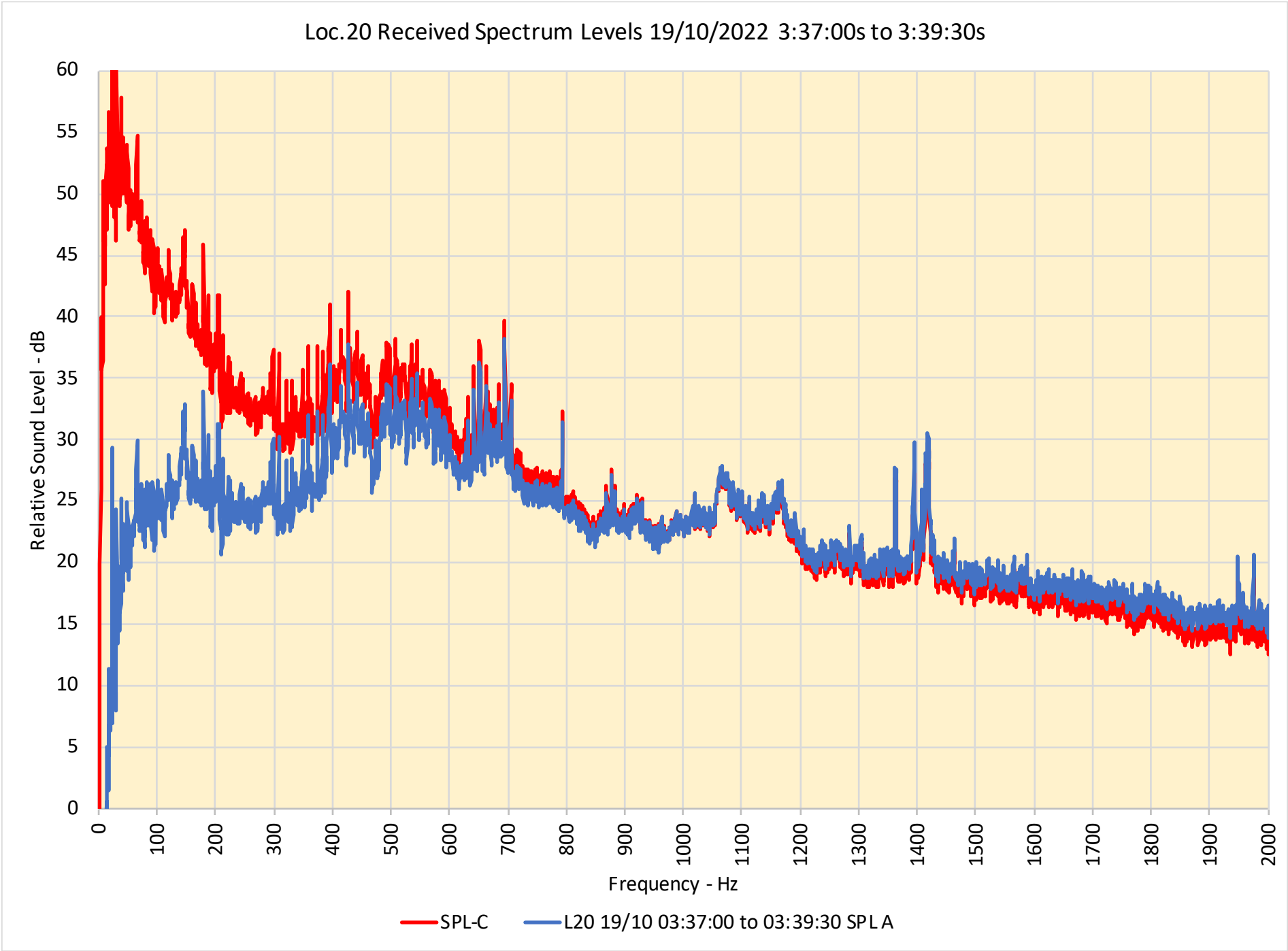




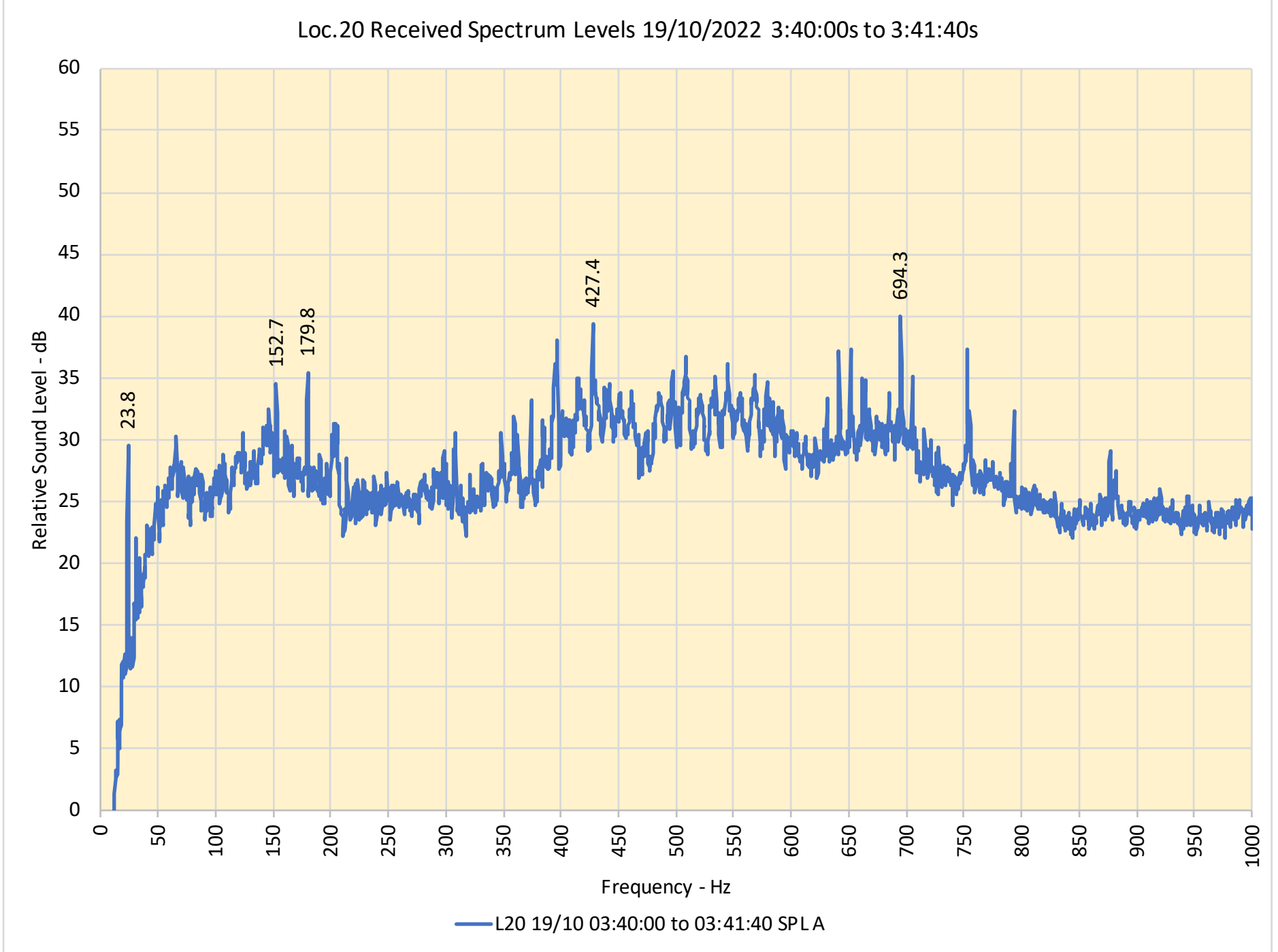
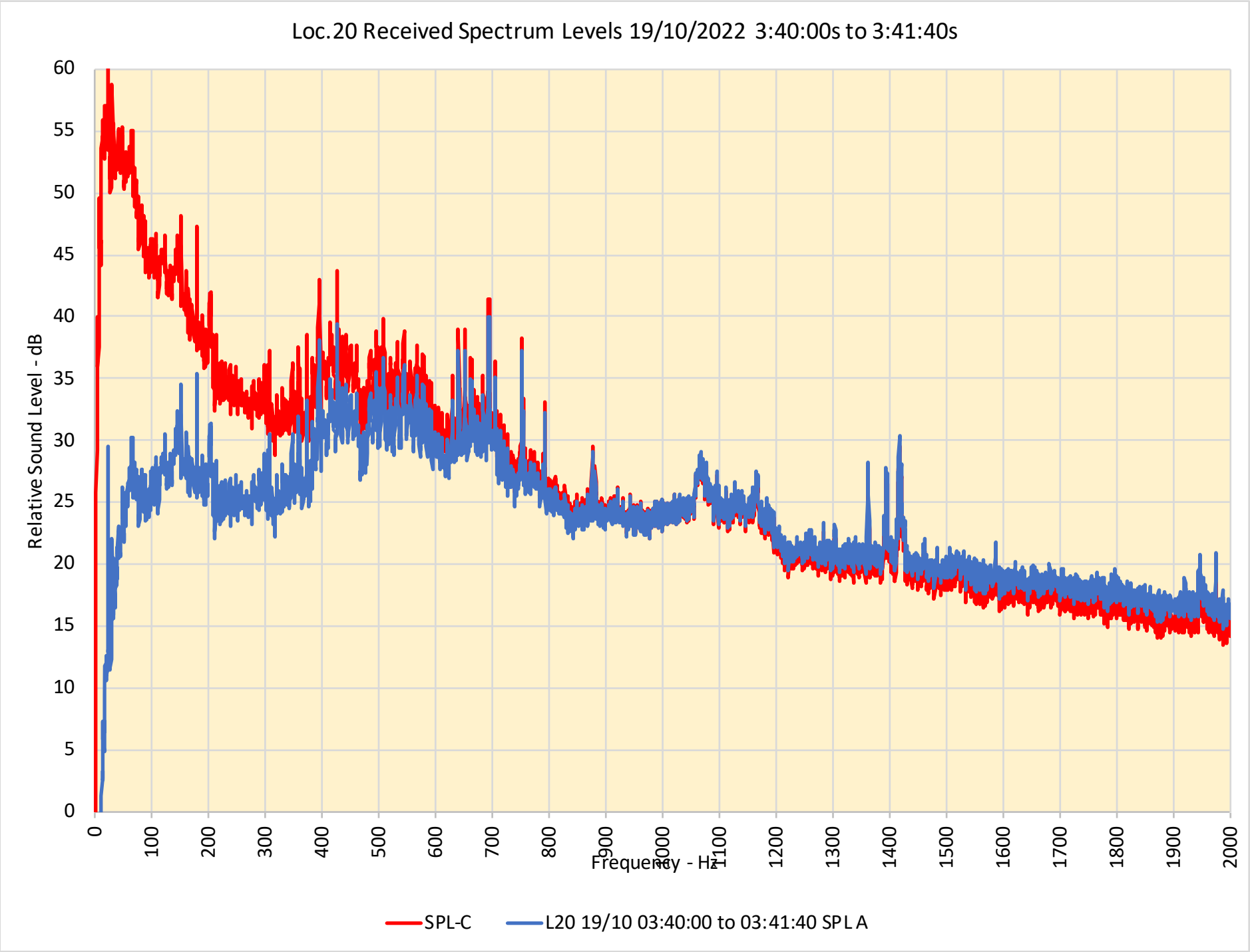


Appendix E Figure E71



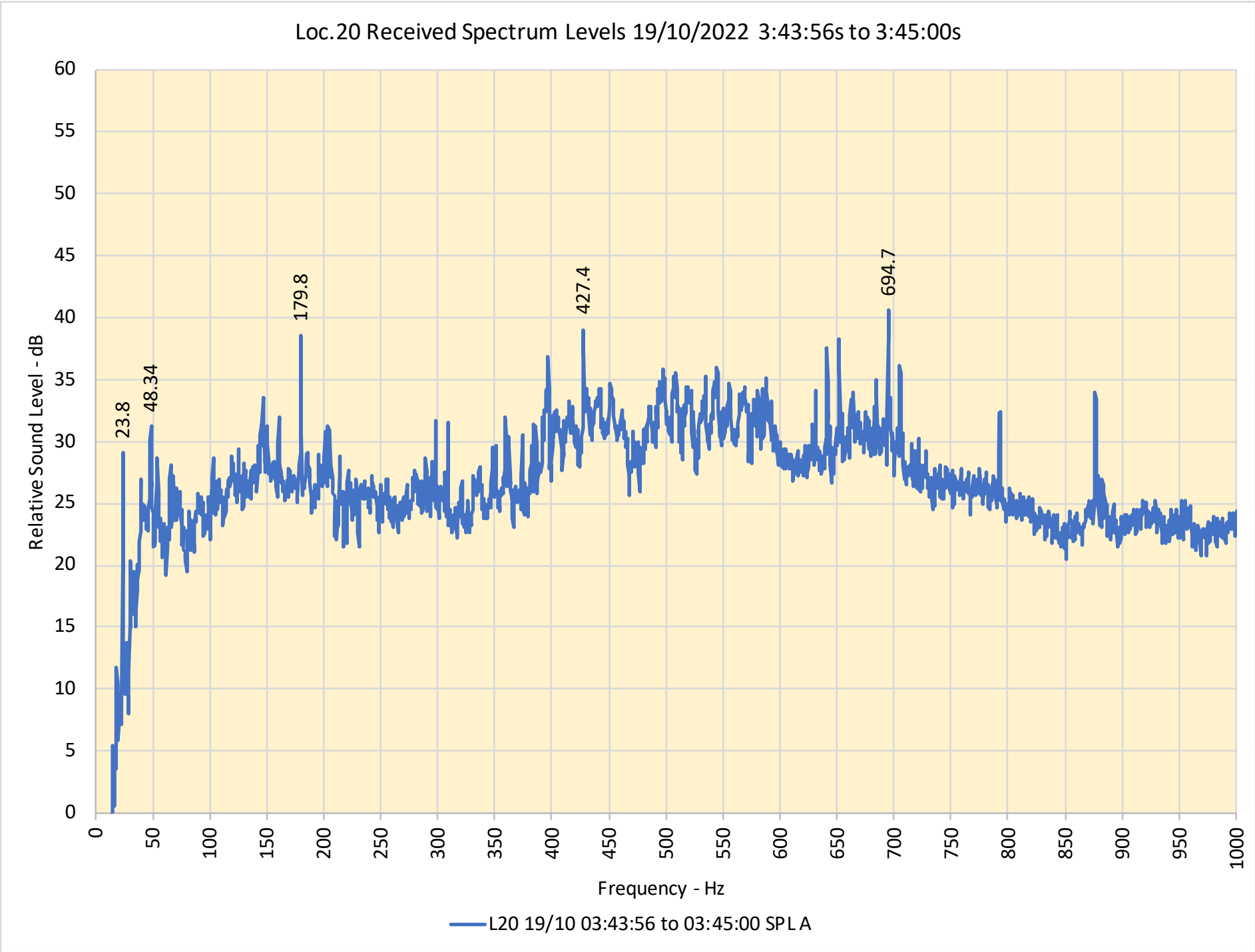
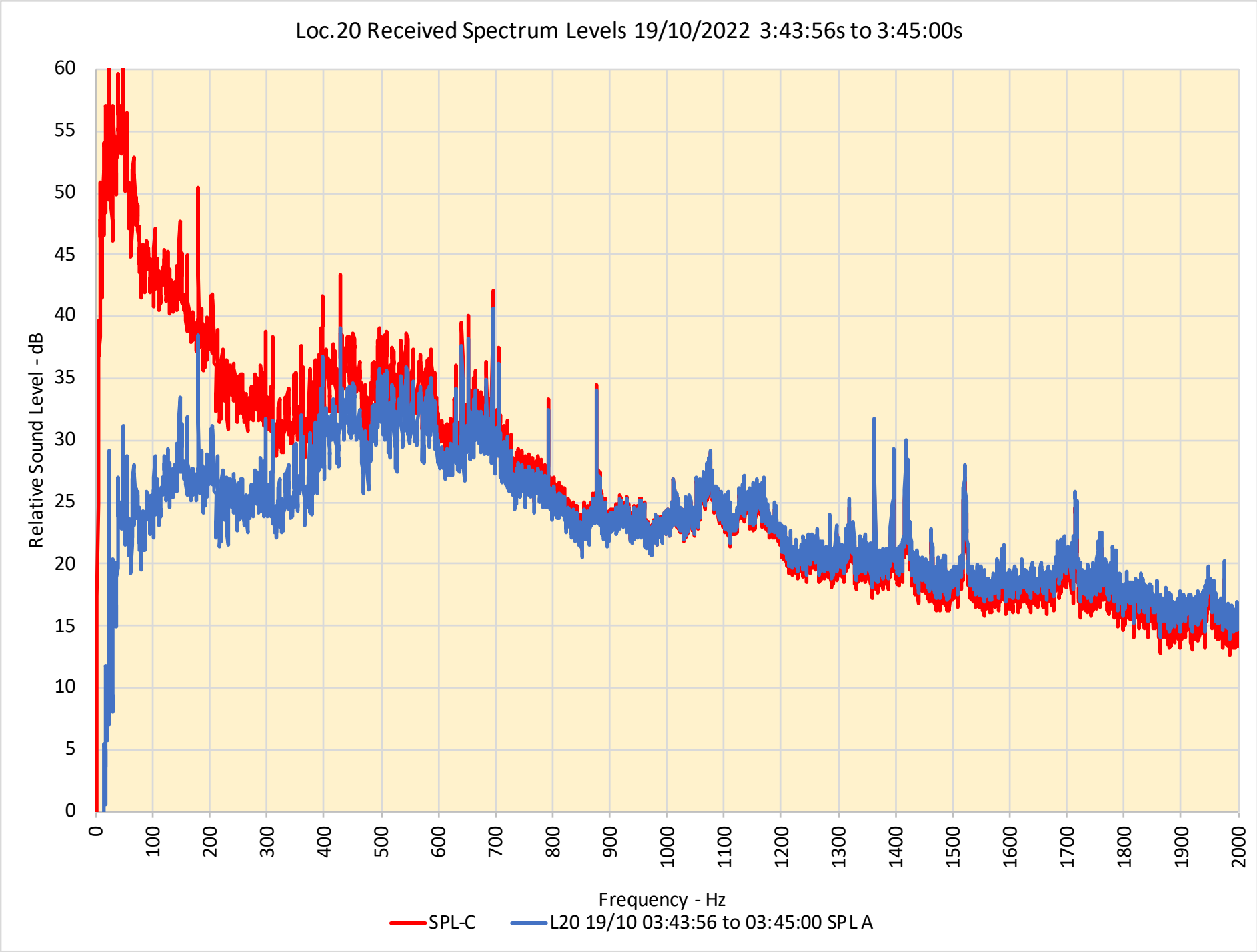


Appendix E Figure E73

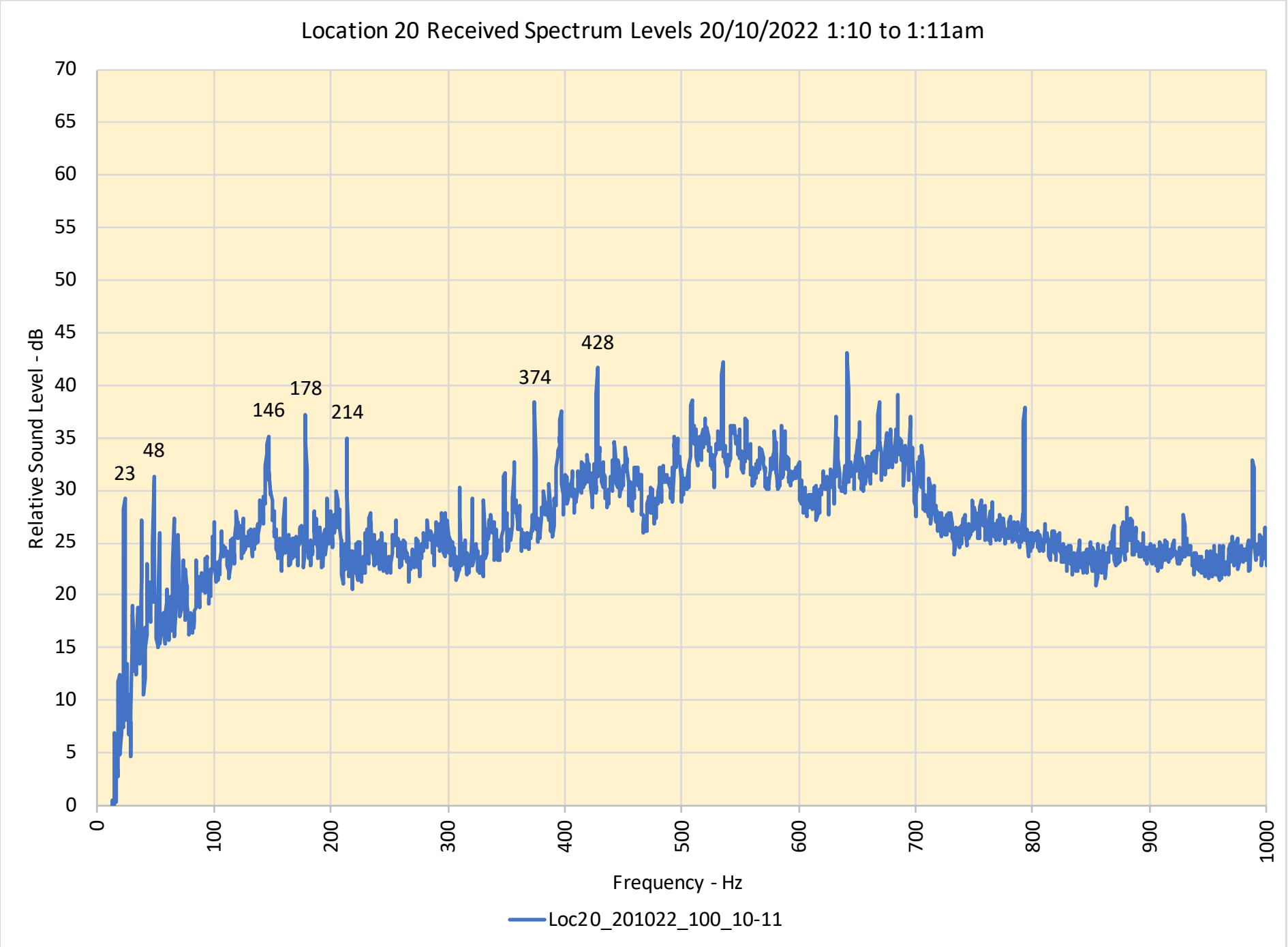
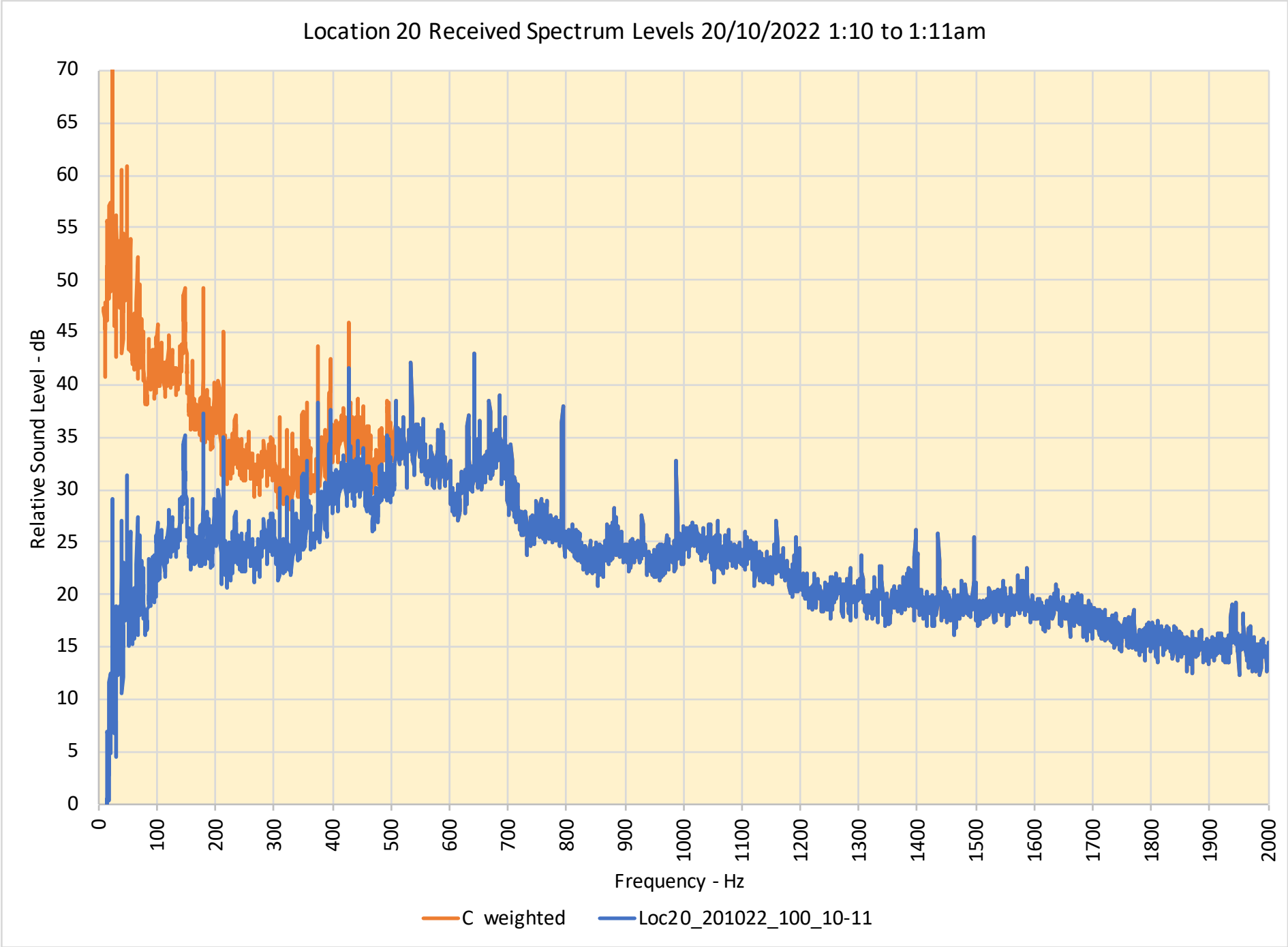


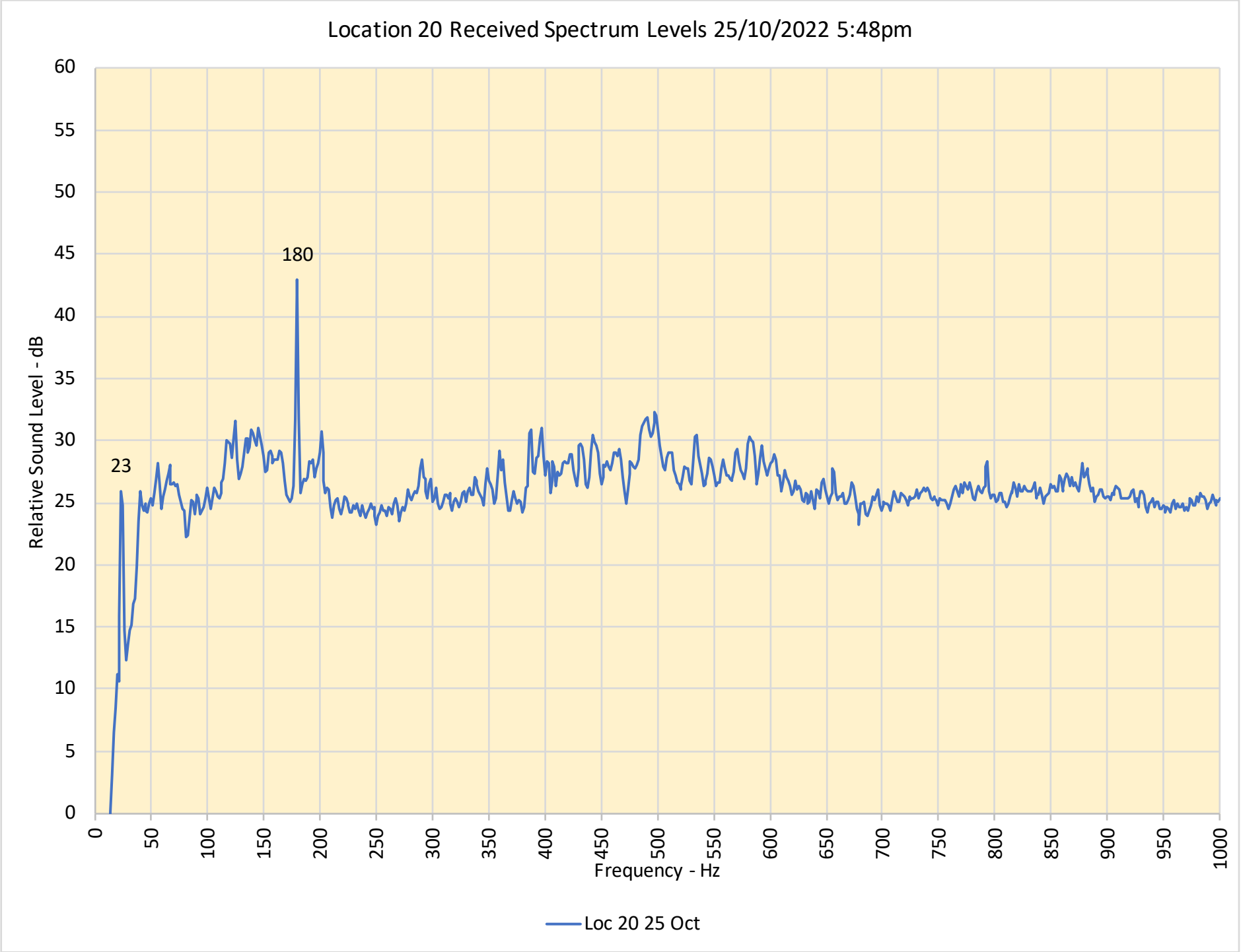
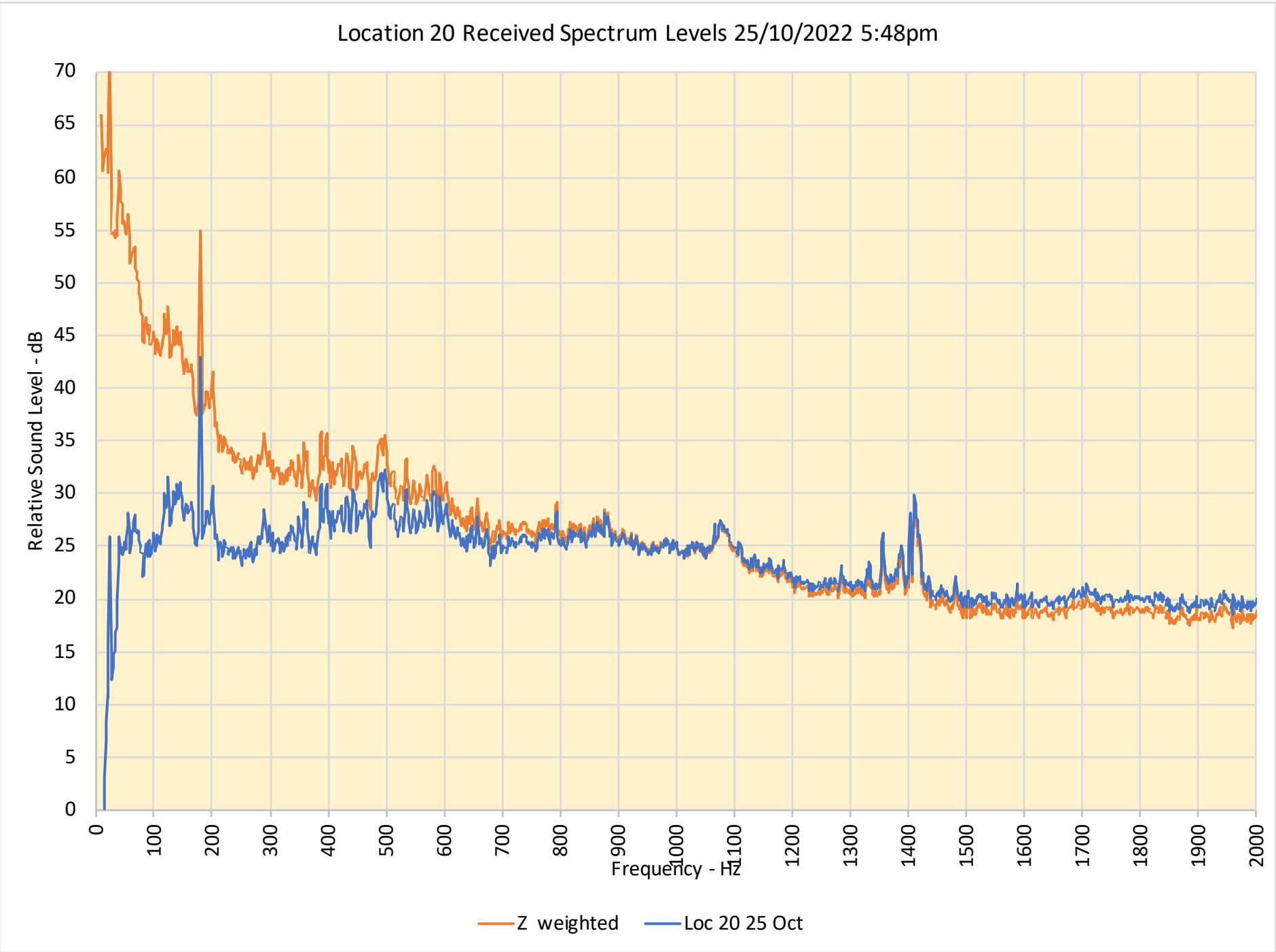
Appendix E Figure E74





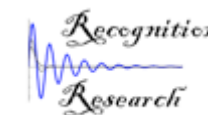
Appendix E Figure E75





## **Appendix F: Attended monitoring results**

# Enviromental Noise Level Assessment Report



for :

Commencing on:

## Berrima Cement Annual Compliance Noise Study - 2022 Monday, 10 October 2022

### Berrima Cement Annual Compliance Noise Study - 2022

Condition	Description	Meter	Ref #	weighting	Duration (secs)	Date	Time	L01	L90	Leq	Lceq	Lceq -Laeq	Comments:
Day	4 Melbourne St	Rion NA-28	1	A	900	10/10/2022	11:58 AM	68	44	56	70	13.8	14C, 3/8 cc, wind 1 to 3m/s N av.2.5m/s. LF noise fromplant audible 160-200Hz varies on wind 8 dB over 10-15s. Quiet ambient is 43-44 ave 46-47. Distant birds, passing traffic 58-72, close bird 71 ( FFT S1)
<b>Hourly Average</b>													
		Temp °C	Wind speed (Km/hr)	Direction degrees									
		12	12	24									
	12 Brisbane St	Norsonic 140	3	A	900	10/10/2022	11:59 AM	61	39	52	64	12.4	Conditions:14C, 3/8 cc, wind 1 to 3m/s N av.2.5m/s Amb 35 Trucks 44-58 Cars (Taylor) 44--55 Cars (Local) 61-77 Tractor 50-52 Birds 43-52 Mower 50 - Door bana FFT S4 C13C, wind 0.5 to 3m/s N. Quiet 48, car passes 62-71, trucks 72-76. LF noise 160 - 200 Hz varying on wind 8 dB over 10s. Dogs 63-70, truck on road bumps 72-80
<b>Hourly Average</b>													
		Temp °C	Wind speed (Km/hr)	Direction degrees									
		12	12	24									
	Adelaide St 20m to Taylor level with front of house	Rion NA-28	4	A	900	10/10/2022	1:11 PM	75	47	63	74	10.3	
<b>Hourly Average</b>													
		Temp °C	Wind speed (Km/hr)	Direction degrees									
		13	11	99									
	North Fence	Rion NA-28	24	A	900	10/10/2022	3:48 PM	63	47	52	68	16.2	Quiet ambient 46 to 50. Calm, 15C, 7/8 cc. Trucks on Taylor Ave 56, distant birds, train horn to E 65. 160 Hz band varies from 30 to 40 over 10 to 15s. Hammering from shale crusher 48-51. Loco horn centrral crossing 61. Trucks on Taylor 66 to 68, well above plant and all at 160 Hz. TAS C80 910
<b>Hourly Average</b>													
		Temp °C	Wind speed (Km/hr)	Direction degrees									
		12	16	37									

## Berrima Cement Annual Compliance Noise Study - 2022

Condition	Description	Meter	Ref #	weighting (secs)	Date	Time	L01	L90	Leq	Lceq	Lceq -Laeq	Comments:	
Day	Location 20	Rion NA-28	25	A	600	10/10/2022	4:47 PM	69	51	56	68	11.9	Quiet ambient 50. Passing trucks 85. Dump Station stones into hopper 60. 160 Hz varying 6 to 7 , 57 . Train squeal brake 56. Wind 0-1m/s E - ENE
Hourly Average													
		Temp °C	Wind speed (Km/hr)	Direction degrees									
		12	15	37									
	4 Melbourne St	Ngara	0	A	900	16/10/2022	8:45 AM	56	39	47	58	10.5	13oC, 3.5m/s SW. CM7 on, all else off. Birds, passing traffic and distant broad band noise.
Hourly Average													
		Temp °C	Wind speed (Km/hr)	Direction degrees									
		12	11	245									
	North Fence	Norsonic 140	36	A	897	16/10/2022	8:45 AM	63	45	52	62	10.0	Mostly birds causing the high event sound levels,as for 8:00am
Hourly Average													
		Temp °C	Wind speed (Km/hr)	Direction degrees									
		12	11	245									
	Location 20	Norsonic 150	1	A	900	16/10/2022	8:45 AM	58	53	55	64	9.8	Birds and distant broadband industrial noise, with occasional distant vehicles audible. No significant events fromother than birds.
Hourly Average													
		Temp °C	Wind speed (Km/hr)	Direction degrees									
		12	11	245									

## Berrima Cement Annual Compliance Noise Study - 2022

Condition	Description	Meter	Ref #	weighting (secs)	Date	Time	L01	L90	Leq	Lceq	Lceq -Laeq	Comments:	
Day	North Fence	Norsonic 140	70	A	900	25/10/2022	5:26 PM	56	49	51	69	18.4	Conditions: Still and overcast
													Cement works prominent 52
													Birds 56
													crickets 54
													Industrial Activity: Possible Vacume or
												train movement 52	
													Truck taylor 54
						</							

## Berrima Cement Annual Compliance Noise Study - 2022

Condition	Description	Meter	Ref #	weighting (secs)	Date	Time	L01	L90	Leq	Lceq	Lceq -Laeq	Comments:	
Evening	Adelaide St 20m to Taylor level with front of house	Norsonic 140	78	A	900	25/10/2022	7:40 PM	70	49	59	69	10.6	Conditions:very light rain Amb 49 Plant heard Truck 71 Car Local 68-77 Cars 57-70
Hourly Average													
		Temp °C	Wind speed (Km/hr)	Direction degrees									
		16	13	245									
Night	Location 20	Norsonic 150	1	A	900	13/10/2022	1:00 AM	57	50	53	66	13.3	Constant industrial noise Amb 50-55 (varying oscillary unkown noise)
Hourly Average													
		Temp °C	Wind speed (Km/hr)	Direction degrees									
		11	15	11									
	North Fence	Norsonic 140	5	A	897	13/10/2022	1:00 AM	53	45	48	65	17.0	Constant industrial noise Amb 46-55 (varying oscillary noise source unkown) Crickets ~ 55 distant truck or heavy vechile
Hourly Average													
		Temp °C	Wind speed (Km/hr)	Direction degrees									
		11	15	11									
	4 Melbourne St	Ngara	0	A	900	13/10/2022	1:00 AM	55	37	45	59	14.0	Amb 36-42 (recognize same varying oscillary noise source unkown but very low level 38 -46) Trucks 58 - 66
Hourly Average													
		Temp °C	Wind speed (Km/hr)	Direction degrees									
		11	15	11									



## Berrima Cement Annual Compliance Noise Study - 2022

<i>Condition</i>	<i>Description</i>	<i>Meter</i>	<i>Ref #</i>	<i>Duration weighting (secs)</i>	<i>Date</i>	<i>Time</i>	<i>L01</i>	<i>L90</i>	<i>Leq</i>	<i>Lceq</i>	<i>Lceq -Laeq</i>	<i>Comments:</i>
Night	4 Melbourne St	Ngara	2212	A	900	16/10/2022 12:45 AM	52	41	44	61	17.0	Amb 40-42 Truck - 64 Rail squeal faint and distant 44 Car 56
<b>Hourly Average</b>												
		<i>Temp °C</i>	<i>Wind speed (Km/hr)</i>	<i>Direction degrees</i>								
		10	6	252								
	Location 20	Norsonic 150	1	A	900	16/10/2022 12:45 AM	58	55	56	68	12.2	Cement works Amb 55 Train loco (145 deg - logger angle) rail car ( 3 min mark) very stable
<b>Hourly Average</b>												
		<i>Temp °C</i>	<i>Wind speed (Km/hr)</i>	<i>Direction degrees</i>								
		10	6	252								
	North Fence	Norsonic 140	4	A	897	16/10/2022 12:45 AM	62	48	53	68	15.1	Cement works Amb 47-50 insects Train Horn train movement rail squeal 64 (6-8min mark) Truck (taylor) 52
<b>Hourly Average</b>												
		<i>Temp °C</i>	<i>Wind speed (Km/hr)</i>	<i>Direction degrees</i>								
		10	6	252								
	4 Melbourne St	Ngara	0	A	900	16/10/2022 6:00 AM	55	35	43	54	10.9	6oC, 1.5m/s WSW. Mostly birds and passing vehicles, with distant broad band noise.
<b>Hourly Average</b>												
		<i>Temp °C</i>	<i>Wind speed (Km/hr)</i>	<i>Direction degrees</i>								
		7	6	238								

## Berrima Cement Annual Compliance Noise Study - 2022

Condition	Description	Meter	Ref #	weighting	Duration (secs)	Date	Time	L01	L90	Leq	Lceq	Lceq -Laeq	Comments:
Night	North Fence	Norsonic 140	25	A	897	16/10/2022	6:00 AM	65	43	55	61	6.1	Birds close by are the major sources of events. Distant trucks occasionally on 5 occasions.
Hourly Average													
		Temp °C	Wind speed (Km/hr)	Direction degrees									
		7	6	238									
	Location 20	Norsonic 150	1	A	900	16/10/2022	6:00 AM	62	47	51	61	10.7	Birds here are lower level than at North Fence and broadband industrial noise is the main source. Three trucks and one car pass. One truck pass was close at 8:56:58 to 8:57:12.
Hourly Average													
		Temp °C	Wind speed (Km/hr)	Direction degrees									
		7	6	238									
	4 Melbourne St	Ngara	0	A	900	19/10/2022	3:30 AM	60	47	50	66	16.1	12.5oC, 2.5m/s NNW. Passing vehicles occasionally, mostly trucks. Distant broadband noise. Not many events and very little variation from other sources. Possibly WITN. Possible brief low level rail wheel squeal at 3:46 to 3:44am.
Hourly Average													
		Temp °C	Wind speed (Km/hr)	Direction degrees									
		12	5	95									
	North Fence	Norsonic 140	15	A	897	19/10/2022	3:30 AM	52	46	48	68	19.4	General broad-band industrial noise is the main source, with frogs and crickets. 8 vehicle passbys heard. At 3:32:02 a truck tray gate bang. At 3:34:34 a higher frequency sound heard but not identified did not change the sound level. At 3:35:32 this higher frequency sound appeared to increase slightly in level. Conveyor or Bin alarm and possible rail wheel saueal hear at
Hourly Average													
		Temp °C	Wind speed (Km/hr)	Direction degrees									
		12	5	95									

## Berrima Cement Annual Compliance Noise Study - 2022

Condition	Description	Meter	Ref #	weighting	Duration (secs)	Date	Time	L01	L90	Leq	Lceq	Lceq -Laeq	Comments:
Night	Location 20	Norsonic 150	1	A	900	19/10/2022	3:30 AM	66	56	58	72	13.7	Not many clearly audible events. A truck pass at 3:30:54. Reversing alarm at a low level audible at 3:32:25 to 3:32:32, 3:33:18 to 3:33:35 and again at 3:44:20 to 3:44:30. Truck passing close-by from 3:43:35 to 3:43:50. Train horn at 3:34:06, then low level train movement noise from 3:44:20 to 3:44:30, with slight wheel squeal possible on two occasions.
<b>Hourly Average</b>													
		Temp °C	Wind speed (Km/hr)	Direction degrees									
		12	5	95									
	Location 20	Norsonic 150	1	A	900	20/10/2022	1:00 AM	60	56	57	71	14.1	Constant industrial noise Amb 56-58 Train Horn 60 Rail car shunt 60-63 Rail squeal 60
<b>Hourly Average</b>													
		Temp °C	Wind speed (Km/hr)	Direction degrees									
		13	3	85									
	North Fence	Norsonic 140	5	A	897	20/10/2022	1:00 AM	55	52	53	69	15.8	Constant industrial noise Amb 52-54 Train Horn 60 Rail car shunt 55-56 High freq tone ( possible Loco idle)
<b>Hourly Average</b>													
		Temp °C	Wind speed (Km/hr)	Direction degrees									
		13	3	85									
	4 Melbourne St	Ngara	0	A	900	20/10/2022	1:00 AM	51	45	48	64	16.6	Amb 46-48 Car 53- 58
<b>Hourly Average</b>													
		Temp °C	Wind speed (Km/hr)	Direction degrees									
		13	3	85									

## Berrima Cement Annual Compliance Noise Study - 2022

<i>Condition</i>	<i>Description</i>	<i>Meter</i>	<i>Ref #</i>	<i>Duration</i> <i>weighting (secs)</i>	<i>Date</i>	<i>Time</i>	<i>L01</i>	<i>L90</i>	<i>Leq</i>	<i>Lceq</i>	<i>Lceq -Laeq</i>	<i>Comments:</i>
			<i>Instrument :</i>	<i>Serial No</i>	<i>Calibrate Date</i>	<i>Measurement Date :</i>		<i>Pre Cal :</i>	<i>Post Cal :</i>			
			Ngara	878158	12/10/2021	13/10/2022		94.1		94.1		
						16/10/2022		94.1		94.1		
						19/10/2022		94.1		94.1		
						20/10/2022		94.1		94.1		
		Norsonic 140	1406081	22/04/2021		10/10/2022		94		93.7		
						13/10/2022		93.9		93.6		
						16/10/2022		93.9		93.6		
						19/10/2022		93.9		93.6		
						20/10/2022		93.9		93.6		
						25/10/2022		94		93.8		
		Norsonic 150	15030670	5/08/2021		13/10/2022		93.9		93.4		
						16/10/2022		93.9		93.4		
						19/10/2022		93.9		93.4		
						20/10/2022		93.9		93.4		
		Rion NA-28	860028	30/08/2021		10/10/2022		94		94		

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## APPENDIX 2 – COMMUNITY COMPLAINTS REGISTER APRIL 2021-MAY 2022

DATE	COMPLAINT ADDRESS	HOW REPORTED	ACTION
20/6/22	Melbourne Street, New Berrima	Rang Reception	Dust on car, voucher provided
11/11/2022	Argyle Street New Berrima	Rang Reception	Dust on car, voucher provided
15/11/22	Brisbane Street New Berrima	Rang Staff	dust on car Voucher provided
18/12/22	Brisbane Street New Berrima	Texted Staff	dust on car
19/12/22	Brisbane Street, New Berrima	Texted staff	Dust on car. Voucher provided
19/12/22	Brisbane Street New Berrima	rang staff	dust on car Voucher provided
9/01/2023	Sydney Street New Berrima	rang staff	dust on car Voucher provided
10/01/2023	Brisbane Street New Berrima	rang reception	Dust on car. Voucher provided
11/01/2023	Melbourne Street New Berrima	rang staff	dust on solar panels deposited over a number of years
12/01/2023	Melbourne Street New Berrima	rang staff	dust on solar panels deposited over a number of years
18/01/2023	Albury Street, Berrima	Rang Reception	dust on car. Discussed with resident
15/04/2023	Melbourne Street	Texted staff	dust on car Discussed with resident
17/04/2023	Melbourne Street	email	dust on car Discussed with resident
18/04/2023	Melbourne Street	Rang Reception	dust on car Voucher provided