



project

Environmental noise survey in vicinity of Staunton Foods pig processing facility

where

Spital Cross, Timoleague, Co. Cork

when

April 2021

why

IE licence P0947-01 compliance survey

client

Staunton Foods Ltd.

prepared by

Damian Brosnan BSc MSc MIOA MIEI

A handwritten signature in black ink, appearing to read 'Damian Brosnan', with a long horizontal flourish extending to the right.

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Profile

This report was prepared by Damian Brosnan, who has the following qualifications and experience:

- BSc (Honours) 1993 (University College Cork).
- Postgraduate diploma in Acoustics & Noise Control 2009 (Institute of Acoustics).
- MSc (Distinction) in Applied Acoustics 2015 (University of Derby).
- Certificate of competence in workplace noise risk assessment (Institute of Acoustics).
- Member of Institute of Acoustics (MIOA) & secretary of Irish IOA branch.
- Founding member of Association of Acoustic Consultants of Ireland (AACI).
- Member of Engineers Ireland (MIEI).
- Engaged with continuing professional development through IOA & EI.
- Working in noise since 1996, and has worked on several hundred noise projects.
- Lead author of *Environmental noise guidance for local authority planning & enforcement departments* (AACI, 2019).
- 1996-2001: Noise Officer with Cork County Council.
- 2001-2014: Partner with DixonBrosnan Environmental Consultants, specialising in EIA.
- 2015--: Principal at Damian Brosnan Acoustics.

Summary

On 08.04.21—09.04.21, Damian Brosnan Acoustics carried out the annual environmental noise survey in the vicinity of the Staunton Foods Ltd. pig processing facility at Timoleague, Co. Cork. The survey is a requirement of industrial emissions licence P0947-01 relevant to the facility. The survey consisted of daytime, evening and night-time monitoring at four stations specified in the licence, representing the nearest dwellings.

Throughout the daytime survey, the facility was in full production. There was limited onsite activity during the evening and night-time survey, chiefly related to internal clean-up operations. Several fixed sources were operating continuously throughout the survey.

Facility emissions complied with respective daytime, evening and night-time limits of 55, 50 and 45 dB specified by licence P0947-01. No audible tones or impulses were noted, thus complying with schedule B.4 of the licence.

Glossary

Ambient	Total noise environment at a location, including all sounds present.
Amplitude	Maximum extent of oscillation in a noise signal. Greater amplitude results in louder signal.
A-weighting	Weighting or adjustment applied to sound level to approximate non-linear frequency response of human ear. Denoted by suffix A in parameters such as $L_{Aeq T}$, $L_{AF10 T}$, etc.
Background level	A-weighted sound pressure level of residual noise exceeded for 90 % of time interval T. Denoted $L_{AF90 T}$.
Broadband	Noise which contains roughly equal energy across frequency spectrum. Does not contain tones, and is generally less annoying than tonal noise.
Decibel (dB)	Unit of noise measurement scale. Based on logarithmic scale so cannot be simply added or subtracted. 3 dB difference is smallest change perceptible to human ear. 10 dB difference is perceived as doubling or halving of sound level. Examples of decibel levels are as follows: 20 dB: very quiet room; 30-35 dB: night-time rural environment; 55-65 dB: conversation; 80 dB: busy pub; 100 dB: nightclub. Throughout this report noise levels are presented as decibels relative to 20 μPa.
Emissions	Noise originating from source under consideration, spreading spherically, hemispherically or otherwise into surrounding environment.
Extraneous	Noise emissions unrelated to source under consideration.
Fast response	0.125 seconds response time of sound level meter to changing noise levels. Denoted by suffix F in parameters such as $L_{AF10 T}$, $L_{AF90 T}$, etc.
Free field	Measurement position removed from acoustically reflective surfaces other than ground.
Frequency	Number of cycles per second of a sound or vibration wave. Low frequency noise may be perceived as hum, while whine represents higher frequency. Range of human hearing approaches 20-20,000 Hertz.
Hertz (Hz)	Unit of frequency measurement.
Impulse	Noise which is of short duration, typically less than one second, sound pressure level of which is significantly higher than background.

Interval	Time period T over which noise parameters are measured at position. Denoted by T in $L_{Aeq T}$, $L_{AF90 T}$, etc.
$L_{Aeq T}$	Equivalent continuous sound pressure level during interval T, effectively representing average A-weighted noise level of ambient noise environment.
L_{AF}	Instantaneous A-weighted sound pressure level measured every 0.125 s. Highest level measured each second is displayed and recorded. Useful indicator in fluctuating noise environment.
$L_{AF10 T}$	A-weighted sound pressure level exceeded for 10% of interval T, usually used to quantify traffic noise.
$L_{AF90 T}$	A-weighted sound pressure level exceeded for 90% of interval T, usually used to quantify background noise. May also be used to describe noise level from continuous steady or almost-steady source, particularly where local noise environment fluctuates.
$L_{AReq T}$	Rating noise level, derived from $L_{Aeq T}$ plus specified adjustments for tonal and impulsive characteristics. Equivalent to $L_{A T}$ used by EPA.
Masking	Rendering inaudible of one noise source by another source(s) which may be louder, or may contain significant acoustic energy in same part of frequency spectrum. In latter case, any tone(s) in original source emissions may become inaudible.
Noise sensitive location	Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or area of high amenity which for its proper enjoyment requires absence of noise at nuisance levels.
1/3 octave band	Frequency spectrum may be divided into octave bands. Upper limit of each octave is twice lower limit. Each octave may be subdivided into thirds, allowing greater analysis of tones.
Reflective field	Noise levels measured close to walls or other surfaces (apart from ground) will be increased due to reflections. Levels may be corrected to calculate incident level. Correction of 3 dB typically applies where distance to surface is 0.5 to 2 m. Other corrections may apply depending on location and source spectrum.
Residual level	Noise level remaining when specific source is absent or does not contribute to ambient.
Sound pressure	Deviation over ambient atmospheric pressure due to passing sound wave. Human ear is sound pressure detector, and thus acoustic parameters ultimately relate to sound pressure. Sound pressure level is ratio of measured sound pressure to reference value.
Soundscape	Acoustic environment as perceived, experienced or understood by listeners, taking context into account.
Specific level	$L_{Aeq T}$ level produced by specific noise source under consideration during interval T, measured directly or by estimation or calculation.
Tone	Character of noise caused by dominance of one or more frequencies which may result in increased noise nuisance.
Z-weighting	Standard weighting applied by sound level meters to represent linear scale. Denoted by suffix Z in parameters such as $L_{Zeq T}$, $L_{ZF90 T}$, etc. Typically used to describe spectral band levels.

In this report units are generally presented using US National Institute Of Standards & Technology guidelines.

1 Introduction

1.1 Damian Brosnan Acoustics was instructed by Staunton Foods Ltd. (SF) to carry out an environmental noise survey in the vicinity of the SF pig processing facility at Spital Cross, Timoleague, Bandon, Co. Cork. The survey is an annual requirement of industrial emissions licence P0947-01, issued 08.10.15 by the Environmental Protection Agency (EPA) in respect of the facility. The objectives of the survey were as follows:

- Undertake noise monitoring in accordance with *International Standard ISO 1996-2:2017 Acoustics – Description, measurement and assessment of environmental noise, Part 2: Determination of environmental noise levels* (2017) and EPA document *NG4 Guidance note for noise: Licence applications, surveys and assessments in relation to scheduled activities* (2016).
- Measure noise levels at one onsite station (NSL1) and three offsite stations (NSL2-NSL4) specified in licence P0947-01, shown in **appendix 1**.
- Assess measured levels in the context of noise criteria set out in the licence, reproduced in **appendix 2**. Daytime, evening and night-time $L_{Aeq,T}$ limits of 55, 50 and 45 dB are specified at offsite receptors.

1.2 The survey consisted of daytime, evening and night-time monitoring. The daytime survey was commenced Thursday 08.04.21. Evening and night-time monitoring was carried out later that night. Daytime monitoring was completed the following morning Friday 09.04.21. Weather conditions, equipment details and uncertainty factors are listed in **appendix 3**.

1.3 The SF facility was in full production during daytime monitoring. There was limited onsite activity during the evening and night-time survey, chiefly related to internal clean-up operations. Noise emissions arising from a current onsite construction zone near the main entrance are not subject to licence P0947-01, and are instead subject to local authority control. Operational SF noise sources subject to P0947-01 limits were as follows:

- Refrigeration plant, cooling condensers, compressors, etc. operating continuously throughout.
- Various plant units at the wastewater treatment plant (WWTP), operating continuously throughout.
- Intermittent lairage pig squeals throughout, more frequent during the daytime.
- Intermittent truck movements during the daytime, with a single movement during the evening.
- Truck refrigeration trailers running continuously using mains electrical power.
- Intermittent livestock trailer washout events near the lairage during the daytime.
- Sporadic vehicle movements in the carpark during the daytime and evening.

2 Results

2.1 Noise data recorded are presented in **appendix 4**, and summarised in **tables 1 & 2**. Frequency spectra are shown in **appendix 5** and tabulated in **appendix 6**. $L_{Aeq,T}$ levels specific to the SF facility were determined using guidance set out in the NG4 document. At NSL4, low audibility of SF emissions precluded their accurate determination, and it was possible only to derive a 'less than' result.

Table 1: Noise data summary – Northerly stations.

Station	NSL1	NSL1	NSL1	NSL2	NSL2	NSL2
Period	Day	Eve	Night	Day	Eve	Night
Intervals (number x minutes)	3x30	1x30	2x15	3x30	1x30	2x15
Ambient $L_{Aeq,T}$ (dB)	62-64	55	40-45	47-50	47	38-39
Facility audible	✓	✓	✓	✓	✓	✓
Facility specific $L_{Aeq,T}$ (dB)	<50	40	40-41	<45	42	38-39
Tone objectively detected	x	x	x	x	x	x
Tone attributable to facility	x	x	x	x	x	x
Facility audibly tonal	x	x	x	x	x	x
Facility audibly impulsive	x	x	x	x	x	x
Rating correction (dB)	0	0	0	0	0	0
Facility rated $L_{AReq,T}$ (dB)	<50	40	40-41	<45	42	38-39
Applicable parameter	$L_{AReq,T}$	$L_{AReq,T}$	$L_{Aeq,T}$	$L_{AReq,T}$	$L_{AReq,T}$	$L_{Aeq,T}$
Relevant result (dB)	<50	40	40-41	<45	42	38-39
Limit (dB)	55	50	45	55	50	45
Compliance	✓	✓	✓	✓	✓	✓

Table 2: Noise data summary – Southerly stations.

Station	NSL3	NSL3	NSL3	NSL4	NSL4	NSL4
Period	Day	Eve	Night	Day	Eve	Night
Intervals (number x minutes)	3x30	1x30	2x15	3x30	1x30	2x15
Ambient $L_{Aeq,T}$ (dB)	51-53	47	43-45	54-57	53	34-35
Facility audible	✓	✓	✓	x	✓	✓
Facility specific $L_{Aeq,T}$ (dB)	47-48	46	43-45	<46	<31	<31
Tone objectively detected	x	x	x	x	x	x
Tone attributable to facility	x	x	x	x	x	x
Facility audibly tonal	x	x	x	x	x	x
Facility audibly impulsive	x	x	x	x	x	x
Rating correction (dB)	0	0	0	0	0	0
Facility rated $L_{AReq,T}$ (dB)	47-48	46	43-45	<46	<31	<31
Applicable parameter	$L_{AReq,T}$	$L_{AReq,T}$	$L_{Aeq,T}$	$L_{AReq,T}$	$L_{AReq,T}$	$L_{Aeq,T}$
Relevant result (dB)	47-48	46	43-45	<46	<31	<31
Limit (dB)	55	50	45	55	50	45
Compliance	✓	✓	✓	✓	✓	✓

2.2 SF operations were clearly audible at three of the four stations. During the daytime, truck movements, WWTP operations, refrigeration plant and pig squeals were audible at NSL1 and NSL2, with carpark activity also audible at the former. Continuous plant sources and lairage squeals remained audible during the evening and night-time. At NSL3, continuously operating plant on the eastern façade of the SF facility was audible throughout. At the fourth station (NSL4), SF plant emissions were faintly discernible during the evening and night-time.

2.3 At the three stations where SF noise emissions were clearly audible, specific $L_{Aeq T}$ levels attributable to same were 49 dB or less during the daytime, 40-47 dB during the evening, and 38-45 dB during the night-time. SF noise levels did not exceed the 55 dB daytime, 50 dB evening and 45 dB night-time limits specified in licence P0947-01. No audible tones or impulses were detected in SF emissions at any of the stations.

3 Conclusions

3.1 SF noise emissions audible at the four stations did not exceed respective daytime, evening and night-time limits set out in licence P0947-01.

3.2 SF operations did not give rise to tonal or impulsive noise at any station, thus complying with schedule B.4 of the licence.

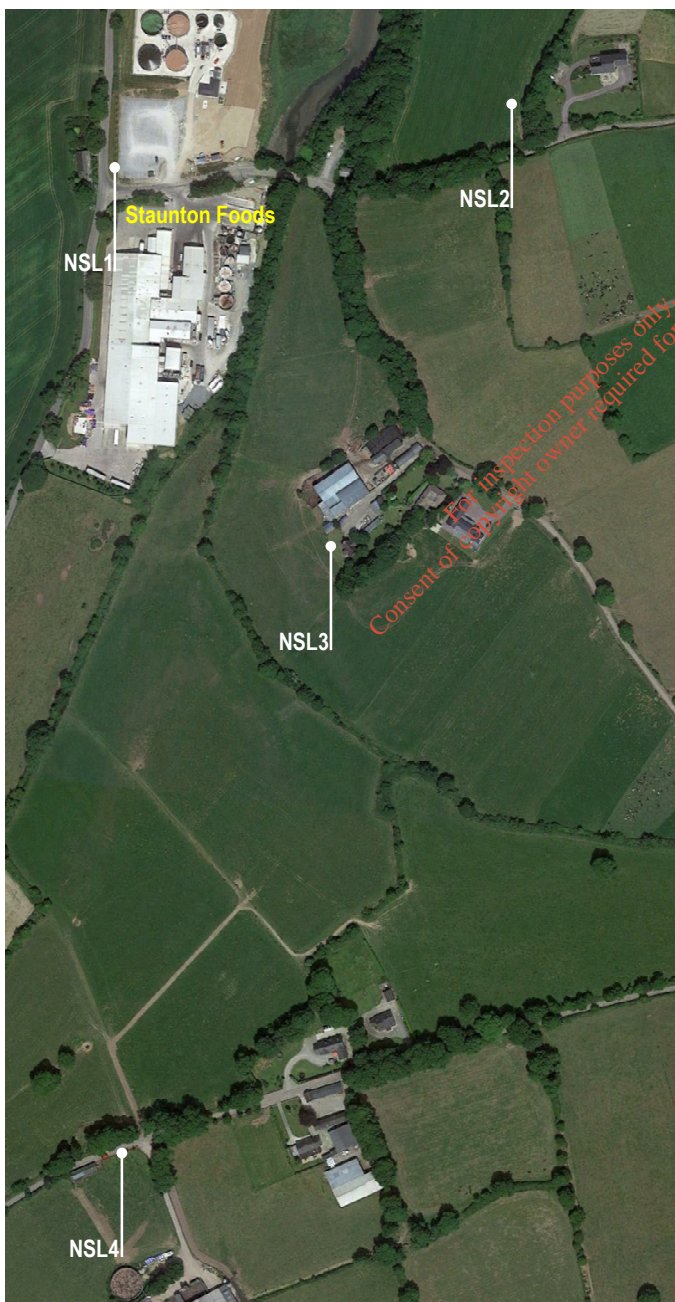
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Appendix 1: Stations

Station	ITM NGR*	Location	Propagation route
NSL1	546680 542594	SW corner of SF overflow carpark, opposite dwelling at Spital Cross	Free field; clear line of sight to N yard area; terrain level; route over hard ground
NSL2	546957 542636	Inside field gate adjacent to dwelling 230 m ENE of site	Free field; partial line of sight to N yard area through trees; terrain rising source-receiver; route over grass & trees
NSL3	546841 542352	Front lawn of farmhouse dwelling 130 m SE of site	Free field; clear line of sight to S yard area, with N half of site screened by adjacent outbuilding; terrain rising slightly source-receiver; route over grass
NSL4	546818 541961	Road verge close to dwelling cluster 380-460 m SSE of site	Free field; clear line of sight to S yard area through hedgerow; terrain level; route over grass

*Not verified in situ.

NO



Appendix 2: P0947-01 noise conditions

4.3 Noise

Noise from the installation shall not give rise to sound pressure levels ($L_{Aeq, T}$) measured at Noise Sensitive Locations of the installation which exceed the limit value(s).

6.13 Noise

6.13.1 The licensee shall carry out a noise survey of the site operations annually. The survey programme shall be undertaken in accordance with the methodology specified in the 'Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)' as published by the Agency.

B.4 Noise Emissions

Daytime dB $L_{Ar,T}$ (30 minutes)	Evening time dB $L_{Ar,T}$ (30 minutes)	Night-time dB $L_{Aeq,T}$ (15-30 minutes)
55	50	45 ^{Note 1}

Note 1: There shall be no clearly audible tonal component or impulsive component in the noise emission from the activity at any noise-sensitive location.

C.5 Noise Monitoring

Location	Measurement	Frequency
NSL1 (146718E, 042525N) - dwelling NW of site NSL2: (146995E, 042567N) - dwelling 230m NE of site NSL3: (146879E, 042283N) - dwelling 130m SE of site NSL4: (146856E, 041892N) - dwelling cluster 380-460m SSE of site	$L_{Aeq, T}$ $L_{Ar, T}$ 1/3 Octave Band Analysis	Annually
Period	Minimum Survey Duration ^{Note 1}	
Daytime	A minimum of 3 sampling periods at each noise monitoring location.	
Evening-time	A minimum of 1 sampling period at each noise monitoring location.	
Night-time ^{Note 2}	A minimum of 2 sampling periods at each noise monitoring location.	

Note 1: Sampling period is to be the time period T stated as per *Schedule B.4 Noise Emissions*, of this licence. This applies to day, evening and night time periods.

Note 2: Night-time measurements should be made between 2300hrs and 0400hrs, Sunday to Thursday, with 2300hrs being the preferred start time.

Appendix 3: Survey details

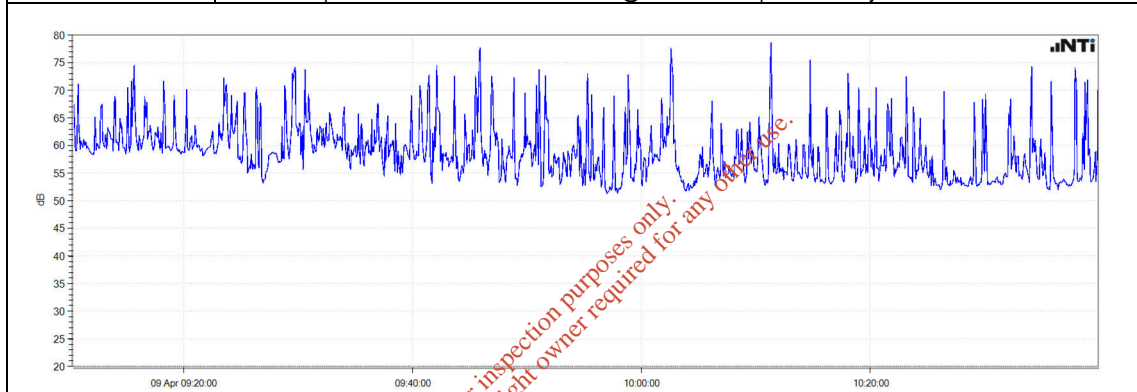
Weather	
Cloud cover	Thu afternoon: 100 % Eve+Night: 80 % Fri morning: 100 %
Precipitation	0 mm throughout
Temperature	Thu afternoon: 9 °C Eve+Night: Falling to 4 °C Fri morning: 6 °C
Wind direction	W throughout
Wind speed	Thu afternoon: 2-4 m/s, gusting to 6 m/s Eve+Night: 0-2 m/s Fri morning: 0-2 m/s
WS measurement	Anemo anemometer 2 m above ground level at each station

Instruments	
Calibrator	Bruel & Kjaer Type 4231 Serial 2326589 Verification 11.06.20
SLM DB3	NTi Audio XL2 Serial A2A-15392-E0 Microphone A16340 Pre-amp 7956 Verification 14.02.20
SLM DB4	NTi Audio XL2 Serial A2A-15429-E0 Microphone A16329 Pre-amp 7945 Verification 14.02.20
SLM DB5	NTi Audio XL2 Serial A2A-17932-E0 Microphone A18747 Pre-amp 9220 Verification 24.07.20
Certificates	Available on request

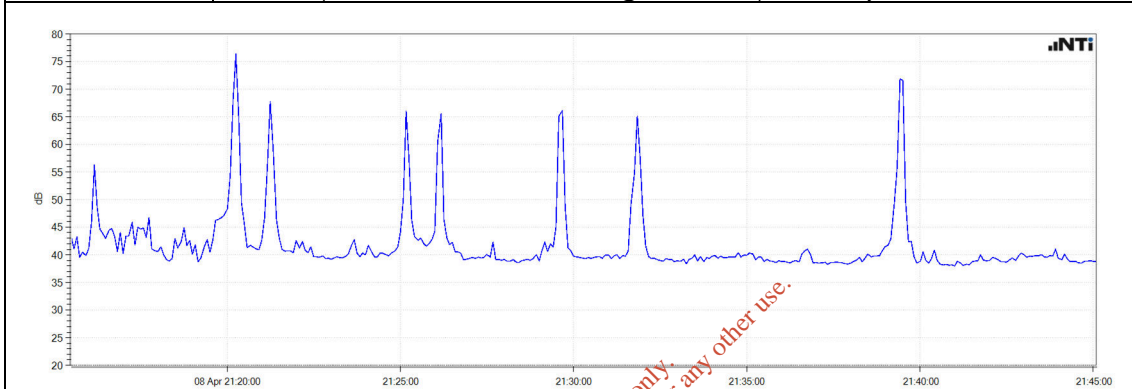
Uncertainty	
Residual noise	c_i = 1 dB where source dominates, >20 dB where source becomes masked u_i = 0.5 dB, $c_i u_i$ range = 0.5 to >10 dB
Weather	$c_i u_i$ = 2 dB in downwind & crosswind conditions, otherwise $c_i u_i$ >2 dB Levels representative of contemporaneous conditions only
Anemo height	2 m anemometer height may increase meteorological uncertainty, 10 m height impractical
Precipitation	Precipitation = 0 mm during reported intervals, $c_i u_i$ = 0 dB
Operations	Levels representative of contemporaneous operating conditions only, $c_i u_i$ <1 dB
Location	$c_i u_i$ = 0 dB at free field positions, $c_i u_i$ = 0.4 dB at near field & reflective field positions
Instrument	IEC 61672-1 class 1 specifications, u_i = 0.5 dB
Combined	3 dB to >10 dB, depending on position, variation chiefly due to meteorology & residual noise intrusion
Expanded	6 dB to >10 dB, 95 % coverage
Comment	All reasonable & practical efforts were applied to minimise uncertainty throughout survey

Appendix 4: Data

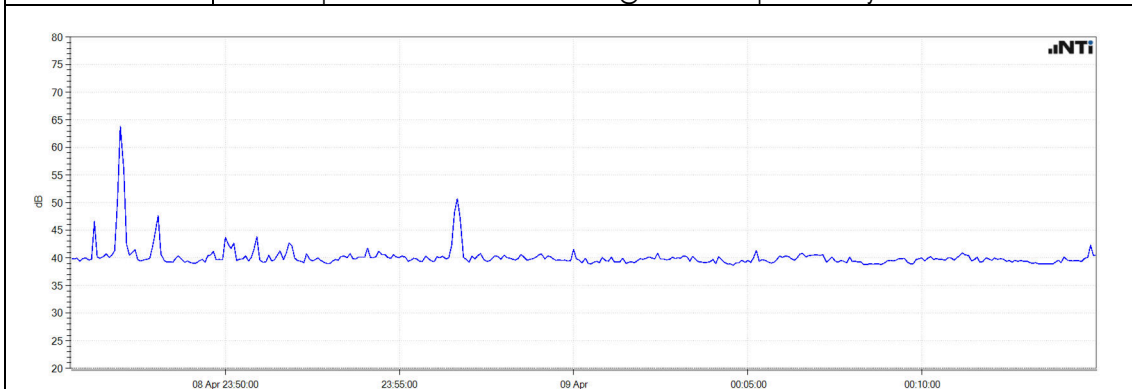
Station NSL1		Time	L _{Aeq} T	L _{AF10} T	L _{AF90} T	Specific L _{Aeq} T
Date	Fri 09.04 21	0910-0940	64	66	57	<50
Period	Daytime	0940-1010	63	65	53	<50
Survey operator	Damian Brosnan BSc MSc MIOA MIEI	1010-1040	62	62	53	<50
Acoustic field	Free field					
Microphone height	1.2 m above ground level					
Wind vector	Multiple vectors					
Extraneous noise	Intermittent traffic through adjacent junction dominant when present; Bird song/calls; Construction activities at SF site continuously dominant, particularly continuously running telescopic lift; Voices audible in adjacent carpark 0930-0950					
Facility audibility	Operational SF emissions almost entirely masked by continuous construction noise, with only carpark movements and truck activity audible					
Audible character	Broadband, no impulses					
Spectral analysis	No emergent energy of significance evident in any 1/3 bands					
Determination	Not possible to determine due to construction noise intrusion; Estimated at <50 dB using L _{AF}					
Comment	-					
Standard	ISO 1996 (2016 & 2017) + EPA NG4 (2016)					
SLM details	Unit: DB5 Field calibration: 09.04.21 0906 @ 44.0 mV/Pa Post survey drift check: 93.9 dB					



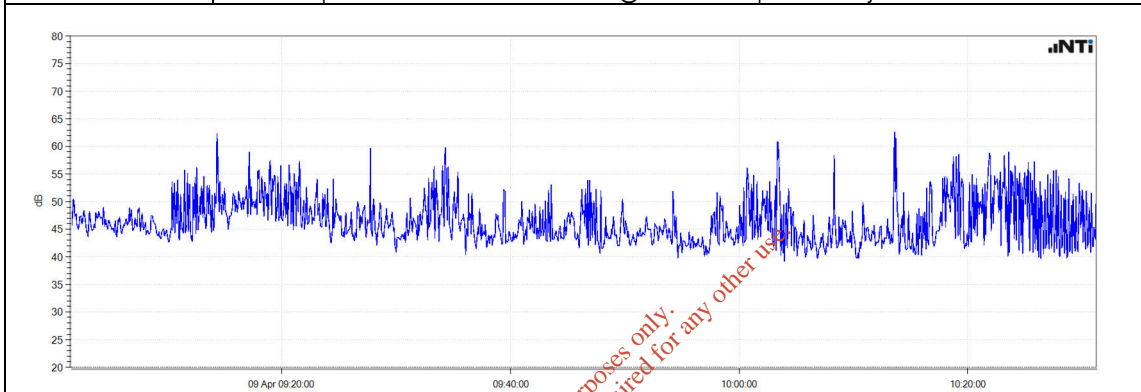
Station NSL1		Time	L _{Aeq T}	L _{AF10 T}	L _{AF90 T}	Specific L _{Aeq T}
Date	Thu 08.04.21	2115-2145	55	46	39	40
Period	Evening					
Survey operator	Damian Brosnan BSc MSc MIOA MIEI					
Acoustic field	Free field					
Microphone height	1.2 m above ground level					
Wind vector	Multiple vectors					
Extraneous noise	Occasional passing road traffic dominant when present; Distant traffic slightly audible; Tractor activity occasionally audible at 1-200 m					
Facility audibility	Continuous refrigeration emissions dominating background; WWTP blower clearly audible ramping up and down; Intermittent pig squeals in lairage clearly audible					
Audible character	Broadband, no impulses					
Spectral analysis	No emergent energy of significance evident in any 1/3 bands					
Determination	L _{eq} outside passing traffic representative					
Comment	-					
Standard	ISO 1996 (2016 & 2017) + EPA NG4 (2016)					
SLM details	Unit: DB5 Field calibration: 08.04.21 2113 @ 44.0 mV/Pa Post survey drift check: 93.9 dB					



Station NSL1		Time	L _{Aeq T}	L _{AF10 T}	L _{AF90 T}	Specific L _{Aeq T}
Date	Thu/Fri 08/09.04.21	2345-0000	45	42	39	41
Period	Night-time	0000-0015	40	40	39	40
Survey operator	Damian Brosnan BSc MSc MIOA MIEI					
Acoustic field	Free field					
Microphone height	1.2 m above ground level					
Wind vector	Multiple vectors					
Extraneous noise	Passing vehicle 2347; Distant traffic slightly audible; Continuous plant emissions at facility to W faintly audible					
Facility audibility	Continuous refrigeration emissions dominating background; WWTP blower clearly audible ramping up and down; Intermittent pig squeals in lairage clearly audible, chiefly during first interval					
Audible character	Broadband, no impulses					
Spectral analysis	Continuous non-tonal energy in 25 Hz band, not of audible significance, most likely from SF site					
Determination	L _{eq} outside passing vehicle representative					
Comment	-					
Standard	ISO 1996 (2016 & 2017) + EPA NG4 (2016)					
SLM details	Unit: DB5 Field calibration: 08.04.21 2113 @ 44.0 mV/Pa Post survey drift check: 93.9 dB					

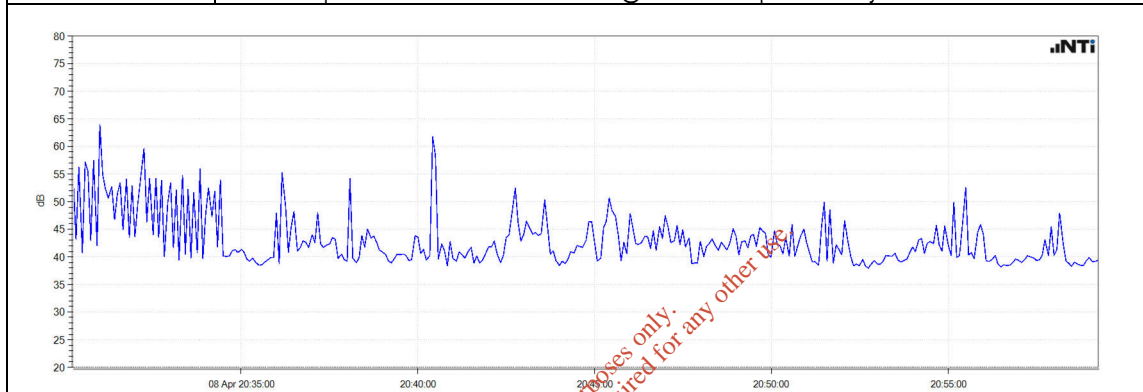


Station NSL2		Time	L _{Aeq T}	L _{AF10 T}	L _{AF90 T}	Specific L _{Aeq T}
Date	Fri 09.04.21	0901-0931	50	51	42	<45
Period	Daytime	0931-1001	47	49	43	<45
Survey operator	Damian Brosnan BSc MSc MIOA MIEI	1001-1031	50	54	40	<45
Acoustic field	Free field					
Microphone height	1.2 m above ground level					
Wind vector	Station downwind of facility					
Extraneous noise	Sporadic local traffic and loudest traffic movements in distance audible, partially masked by SF construction noise; Latter dominating soundscape continuously; Bird song/calls					
Facility audibility	Operational emissions masked by SF construction noise, apart from WWTP blower ramping up and down, and pig squeals, both slightly audible					
Audible character	Broadband, no impulses					
Spectral analysis	Non-tonal signal detected in 200 Hz band during interval 2, traced to mobile plant at SF construction zone					
Determination	Not possible to accurately determine due to construction noise intrusion; Operational noise L _{eq} estimated at <45 dB using L _{AF}					
Comment	-					
Standard	ISO 1996 (2016 & 2017) + EPA NG4 (2016)					
SLM details	Unit: DB4 Field calibration: 09.04.21 0856 @ 41.4 mV/Pa Post survey drift check: 93.9 dB					

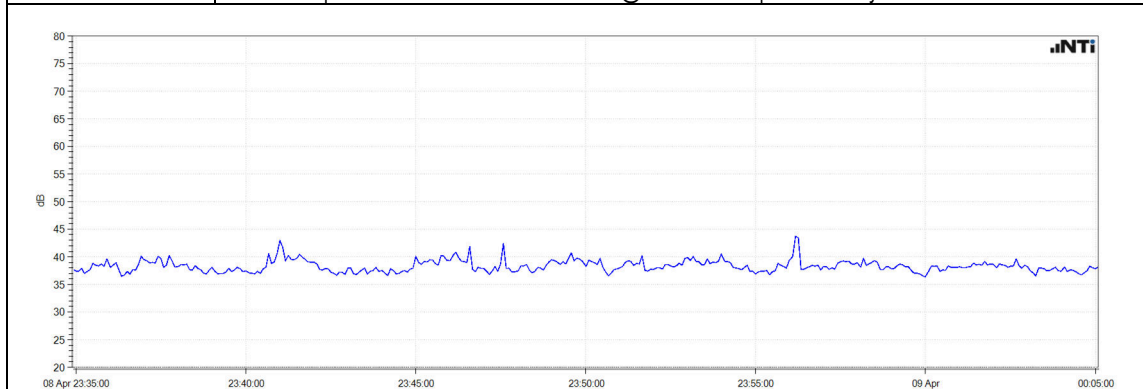


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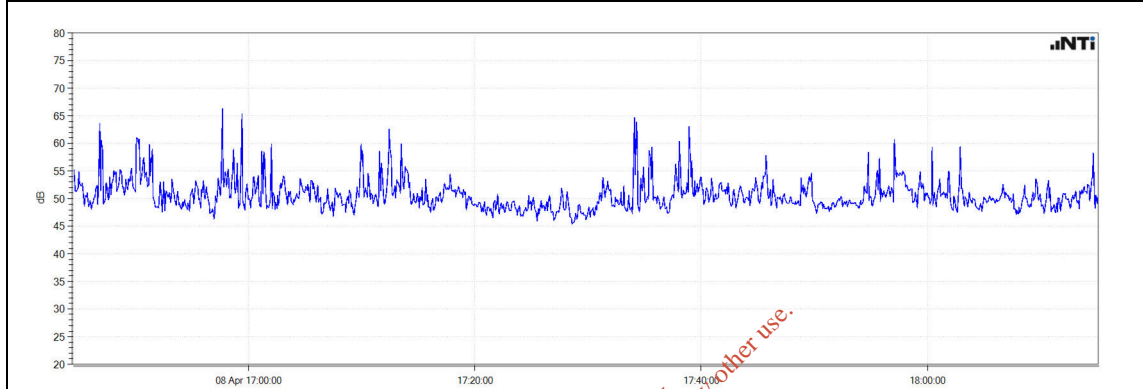
Station NSL2		Time	L _{Aeq T}	L _{AF10 T}	L _{AF90 T}	Specific L _{Aeq T}
Date	Thu 08.04.21	2030-2100	47	47	39	42
Period	Evening					
Survey operator	Damian Brosnan BSc MSc MIOA MIEI					
Acoustic field	Free field					
Microphone height	1.2 m above ground level					
Wind vector	Station downwind of facility					
Extraneous noise	Sporadic traffic on local road and intermittent traffic to W clearly audible; Occasional tractor activity at approx. 200 m clearly audible across valley					
Facility audibility	Continuous and steady SF plant emissions clearly audible, in addition to clearly audible WWTP blower at intervals, and intermittent pig squeals in lairage					
Audible character	Broadband, no impulses (squeals not considered impulsive)					
Spectral analysis	Continuous energy in 50 and 80 Hz bands, most likely due to SF site, not tonal or of audible significance					
Determination	[L ₉₀ , representative of continuous emissions] + [blower L _{eq} estimated using L _{AF} at 38 dB] Squeal occurrence insufficient to affect measured data					
Comment	-					
Standard	ISO 1996 (2016 & 2017) + EPA NG4 (2016)					
SLM details	Unit: DB4 Field calibration: 08.04.21 1654 @ 41.4 mV/Pa Post survey drift check: 93.8 dB					



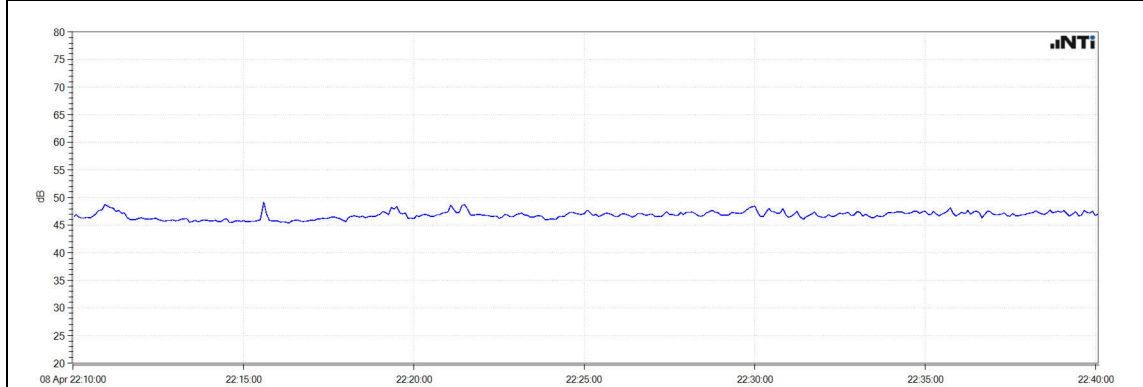
Station NSL2		Time	L _{Aeq T}	L _{AF10 T}	L _{AF90 T}	Specific L _{Aeq T}
Date	Thu/Fri 08/09.04.21	2335-2350	39	40	37	39
Period	Night-time	2350-0005	38	39	37	38
Survey operator	Damian Brosnan BSc MSc MIOA MIEI					
Acoustic field	Free field					
Microphone height	1.2 m above ground level					
Wind vector	Station downwind of facility					
Extraneous noise	No local traffic; Sporadic traffic to W clearly audible					
Facility audibility	Continuous and steady SF plant emissions clearly audible, in addition to clearly audible WWTP blower at intervals, and pig squeals in lairage					
Audible character	Broadband, no impulses					
Spectral analysis	Continuous energy in 50 and 80 Hz bands, most likely due to SF site, not tonal or of audible significance					
Determination	Distant traffic insufficient to affect L _{eq} , thus L _{eq} reasonably representative					
Comment	-					
Standard	ISO 1996 (2016 & 2017) + EPA NG4 (2016)					
SLM details	Unit: DB4 Field calibration: 08.04.21 1654 @ 41.4 mV/Pa Post survey drift check: 93.8 dB					



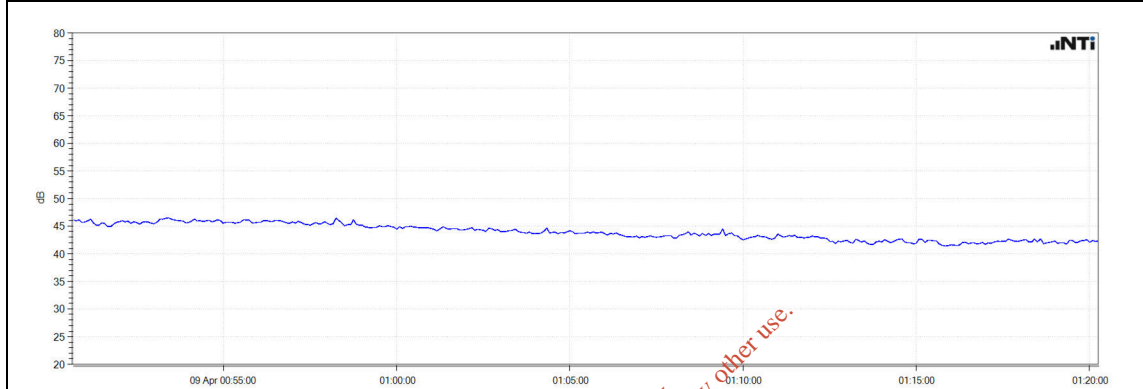
Station NSL3		Time	L _{Aeq} T	L _{AF10} T	L _{AF90} T	Specific L _{Aeq} T
Date	Thu 08.04.21	1645-1715	53	55	48	48
Period	Daytime	1715-1745	51	52	47	47
Survey operator	Damian Brosnan BSc MSc MIOA MIEI	1745-1815	51	53	48	48
Acoustic field	Free field					
Microphone height	1.2 m above ground level					
Wind vector	Crosswind					
Extraneous noise	Sporadic activity at adjacent farmyard, including tractor movements; Children playing at 100 m audible to approx. 1700; Traffic to W clearly audible intermittently; Breeze movement; Bird song/calls					
Facility audibility	Continuous and steady SF plant emissions clearly audible					
Audible character	Broadband, no impulses					
Spectral analysis	No emergent energy of significance evident in any 1/3 bands					
Determination	L90 representative					
Comment	-					
Standard	ISO 1996 (2016 & 2017) + EPA NG4 (2016)					
SLM details	Unit: DB3 Field calibration: 08.04.21 1638 @ 43.1 mV/Pa Post survey drift check: 93.9 dB					



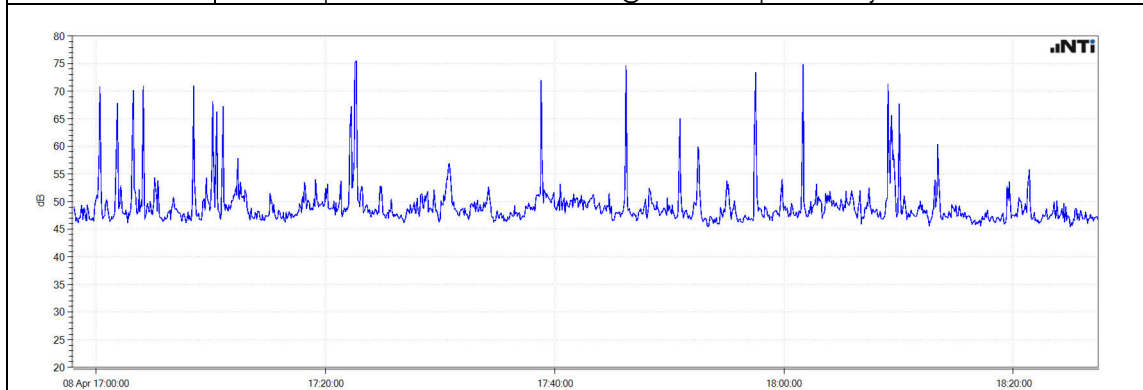
Station NSL3		Time	L _{Aeq} T	L _{AF10} T	L _{AF90} T	Specific L _{Aeq} T
Date	Thu 08.04.21	2210-2240	47	48	46	46
Period	Evening					
Survey operator	Damian Brosnan BSc MSc MIOA MIEI					
Acoustic field	Free field					
Microphone height	1.2 m above ground level					
Wind vector	Crosswind					
Extraneous noise	Occasional traffic to W clearly audible					
Facility audibility	Continuous and steady SF plant emissions dominating soundscape					
Audible character	Broadband, no impulses					
Spectral analysis	Steady energy in 50 and 160 Hz bands not tonal or audible, most likely from SF site					
Determination	L _{eq} not representative due to distant traffic; L90 representative					
Comment	-					
Standard	ISO 1996 (2016 & 2017) + EPA NG4 (2016)					
SLM details	Unit: DB3 Field calibration: 08.04.21 1638 @ 43.1 mV/Pa Post survey drift check: 93.9 dB					



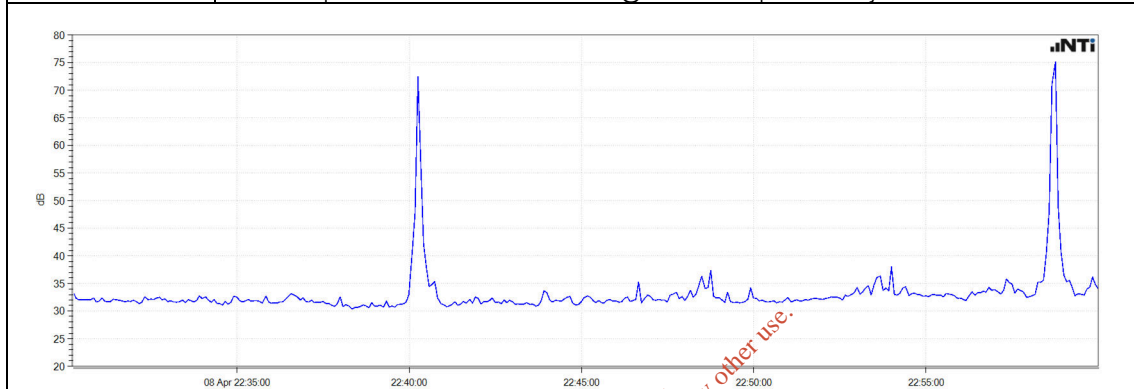
Station NSL3		Time	L _{Aeq T}	L _{AF10 T}	L _{AF90 T}	Specific L _{Aeq T}
Date	Fri 09.04.21	0050-0105	45	46	44	45
Period	Night-time	0105-0120	43	43	42	43
Survey operator	Damian Brosnan BSc MSc MIOA MIEI					
Acoustic field	Free field					
Microphone height	1.2 m above ground level					
Wind vector	Crosswind					
Extraneous noise	Traffic to W almost entirely absent					
Facility audibility	Continuous and steady SF plant emissions dominating soundscape, reducing slightly during second interval					
Audible character	Broadband, no impulses					
Spectral analysis	Minor SF energy detected in various bands, not audibly or objectively tonal					
Determination	L _{eq} representative					
Comment	-					
Standard	ISO 1996 (2016 & 2017) + EPA NG4 (2016)					
SLM details	Unit: DB3 Field calibration: 08.04.21 1638 @ 43.1 mV/Pa Post survey drift check: 93.9 dB					



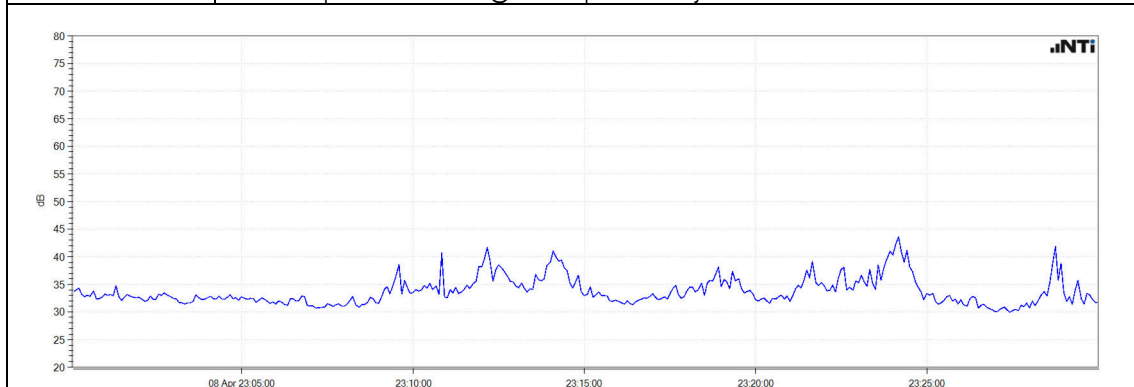
Station NSL4		Time	L _{Aeq T}	L _{AF10 T}	L _{AF90 T}	Specific L _{Aeq T}
Date	Thu 08.04.21	1657-1727	57	53	46	<46
Period	Daytime	1727-1757	55	52	47	<46
Survey operator	Damian Brosnan BSc MSc MIOA MIEI					
Acoustic field	Free field					
Microphone height	1.2 m above ground level					
Wind vector	Station upwind					
Extraneous noise	Occasional passing traffic dominant when present; Distant traffic to W audible at low level; Compressor/pump emissions at farmyard at 100 m clearly audible continuously; Breeze through nearby trees; Bird song/calls					
Facility audibility	Inaudible					
Audible character	-					
Spectral analysis	Clear signal at 125 Hz, not tonal, traced to nearby farmyard					
Determination	Inaudible, thus <L95					
Comment	-					
Standard	ISO 1996 (2016 & 2017) + EPA NG4 (2016)					
SLM details	Unit: DB4 Field calibration: 08.04.21 1654 @ 41.4 mV/Pa Post survey drift check: 93.9 dB					



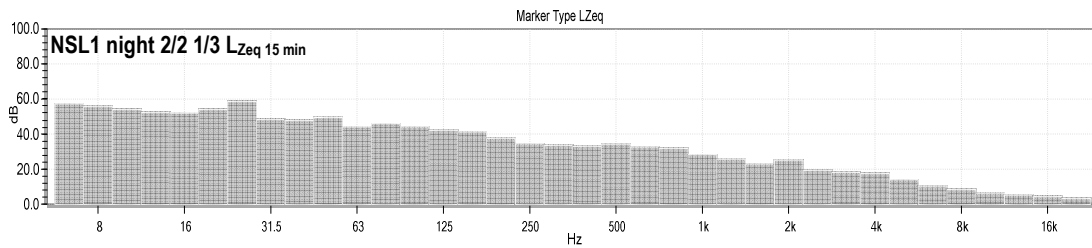
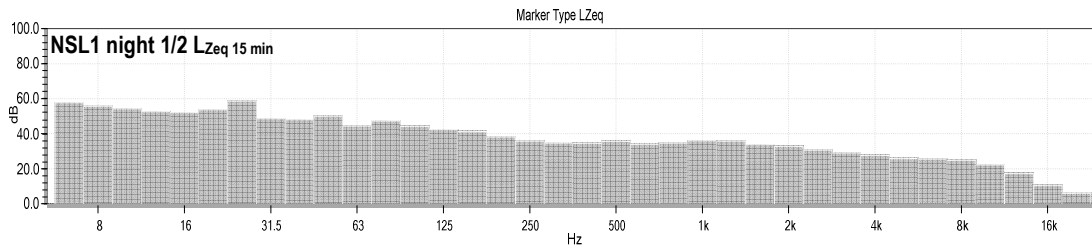
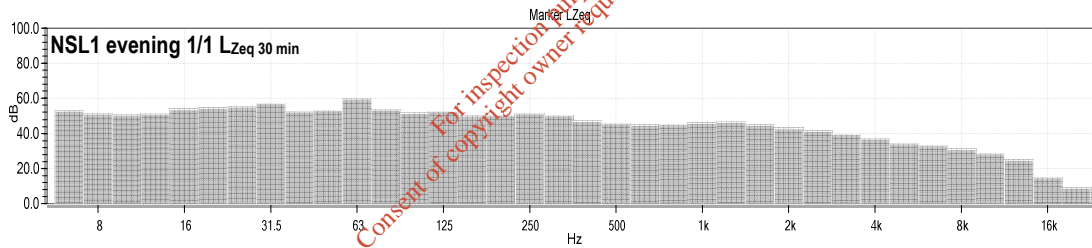
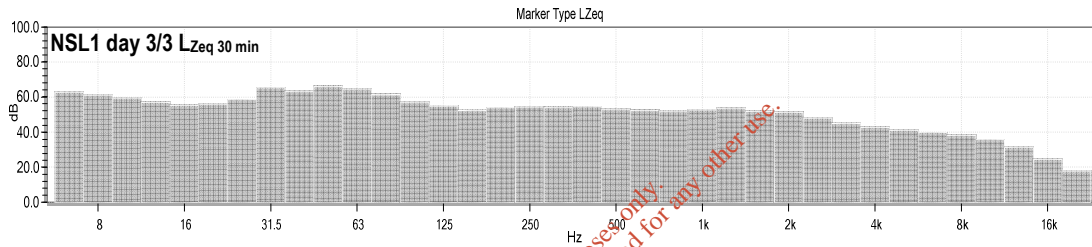
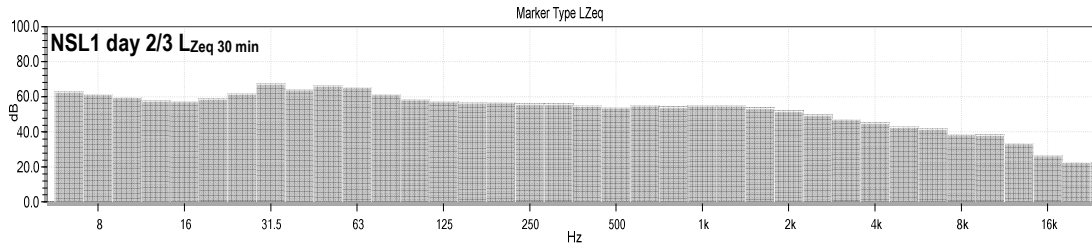
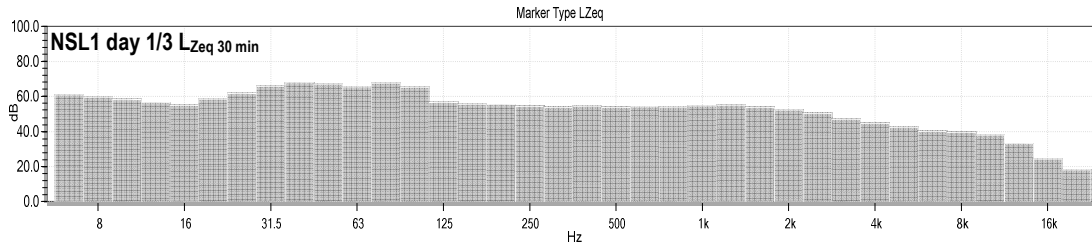
Station NSL4		Time	L _{Aeq T}	L _{AF10 T}	L _{AF90 T}	Specific L _{Aeq T}
Date	Thu 08.04.21	2230-2300	53	34	31	<31
Period	Evening					
Survey operator	Damian Brosnan BSc MSc MIOA MIEI					
Acoustic field	Free field					
Microphone height	1.2 m above ground level					
Wind vector	Station upwind of facility					
Extraneous noise	Passing cars x2 dominant when present; Distant traffic to W and NW audible at intervals; Continuous emissions from motor/pump at farmyard at 100 m audible at low level; Distant barking					
Facility audibility	Faintly discernible					
Audible character	Broadband, no impulses					
Spectral analysis	Non-tonal energy at 40 Hz traced to passing vehicle					
Determination	Amplitude insufficient to affect data, thus <L90					
Comment	-					
Standard	ISO 1996 (2016 & 2017) + EPA NG4 (2016)					
SLM details	Unit: DB5 Field calibration: 08.04.21 2113 @ 44.0 mV/Pa Post survey drift check: 93.9 dB					

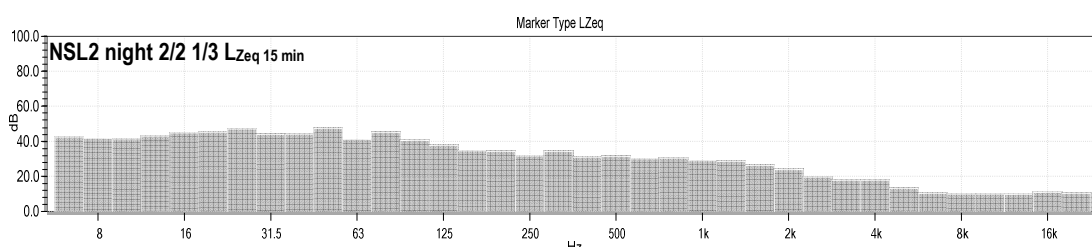
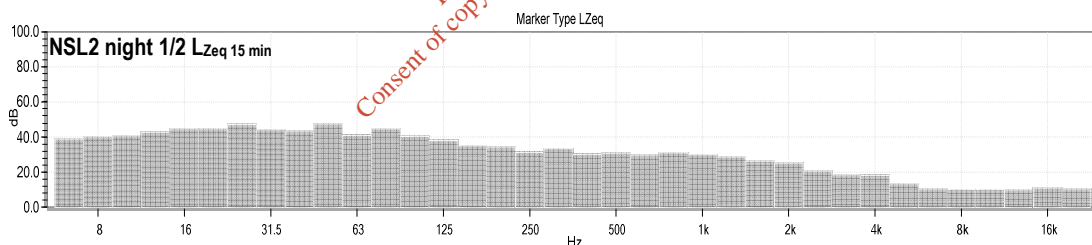
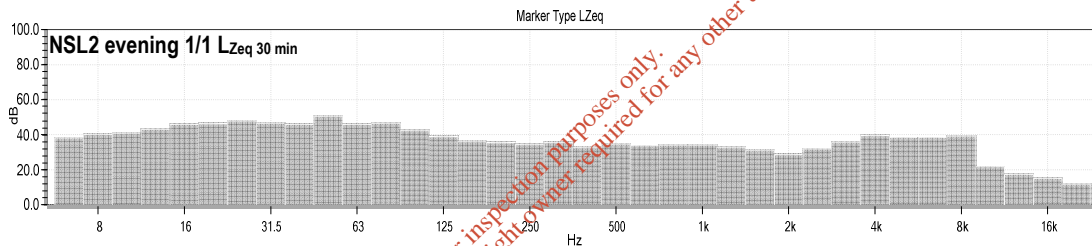
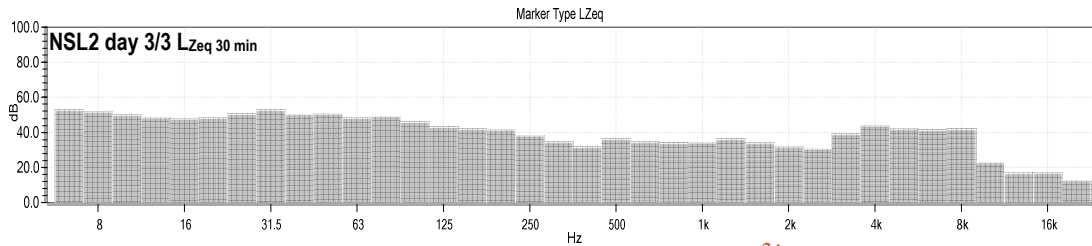
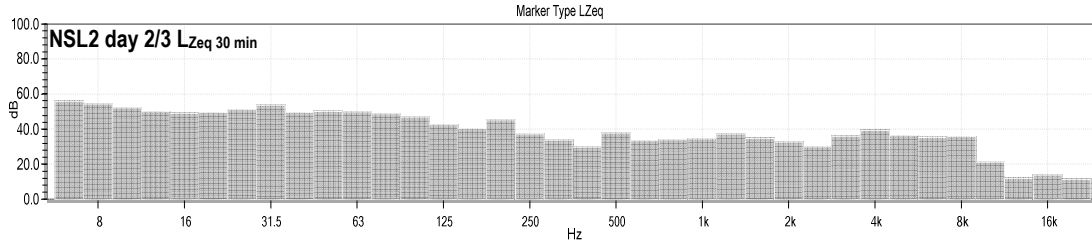
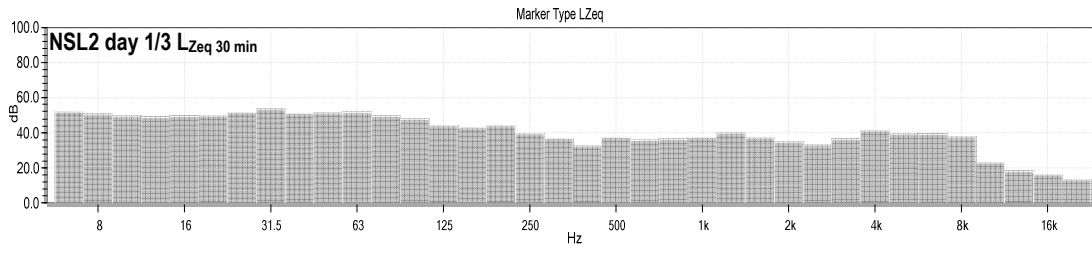


Station NSL4		Time	L _{Aeq T}	L _{AF10 T}	L _{AF90 T}	Specific L _{Aeq T}
Date	Thu 08.04.21	2300-2315	34	37	31	<31
Period	Night-time	2315-2330	35	37	31	<31
Survey operator	Damian Brosnan BSc MSc MIOA MIEI					
Acoustic field	Free field					
Microphone height	1.2 m above ground level					
Wind vector	Station upwind of facility					
Extraneous noise	No local traffic; Distant traffic to W and NW audible at intervals; Continuous emissions from motor/pump at farmyard at 100 m audible at low level, louder at intervals					
Facility audibility	Faintly discernible					
Audible character	Broadband, no impulses					
Spectral analysis	No emergent energy of significance evident in any 1/3 bands					
Determination	Amplitude insufficient to affect data, thus <L90					
Comment	-					
Standard	ISO 1996 (2016 & 2017) + EPA NG4 (2016)					
SLM details	Unit: DB5 Field calibration: @ mV/Pa Post survey drift check: 93.9 dB					

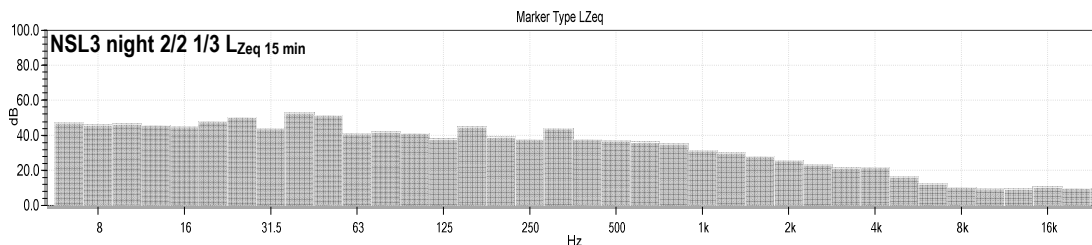
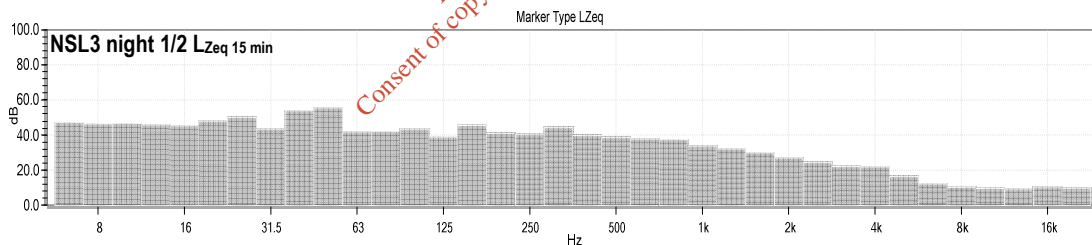
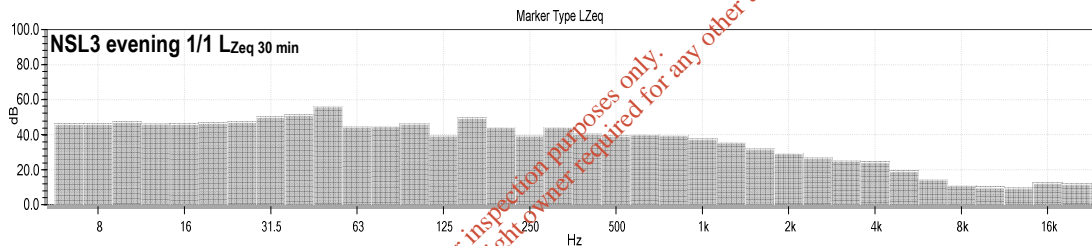
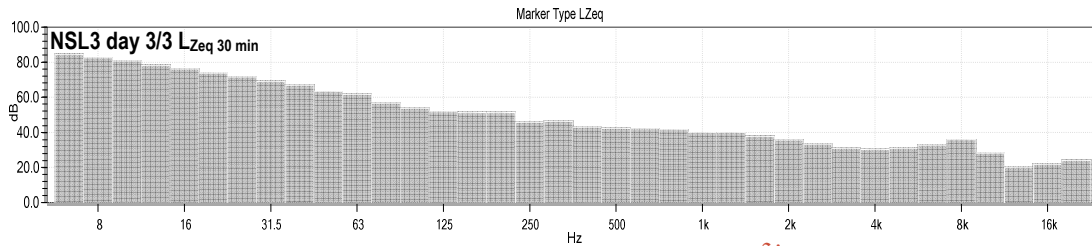
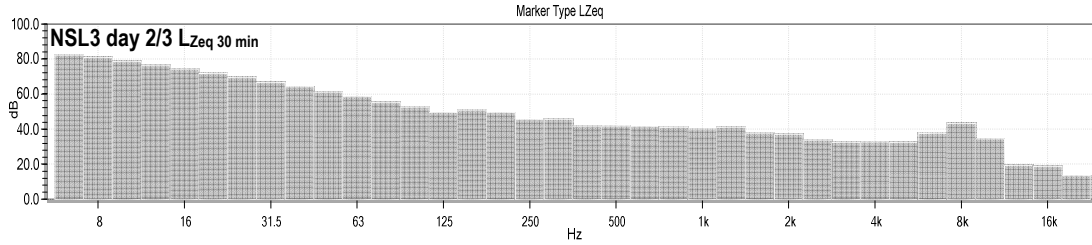
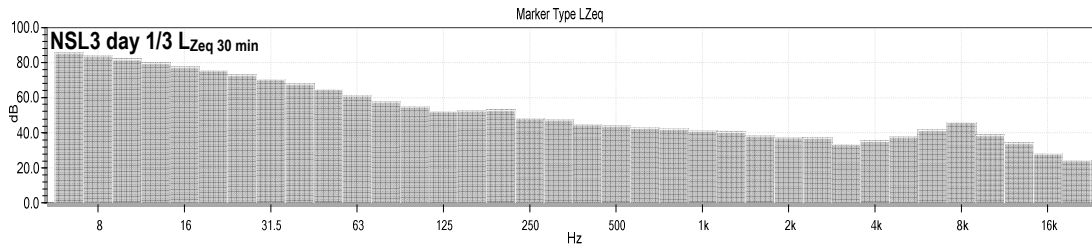


Appendix 5: Spectra

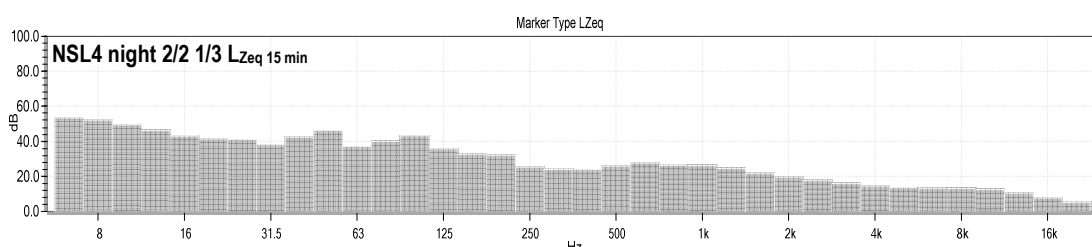
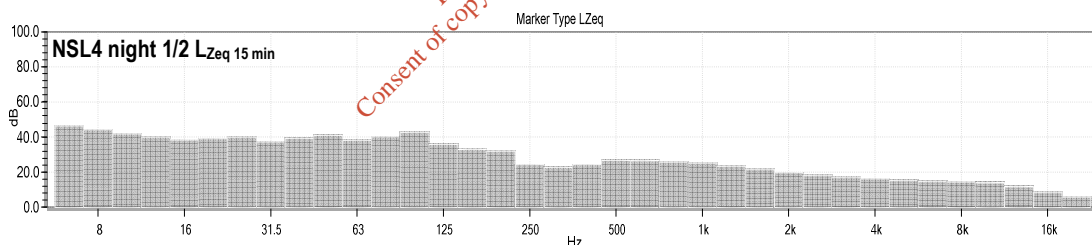
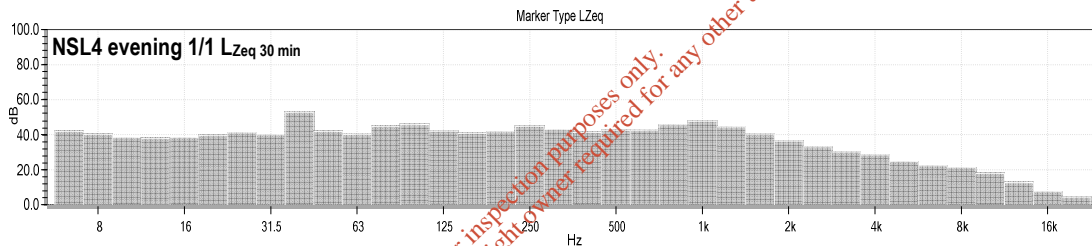
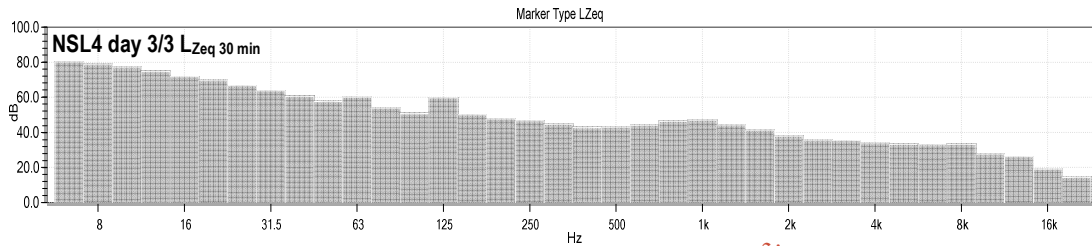
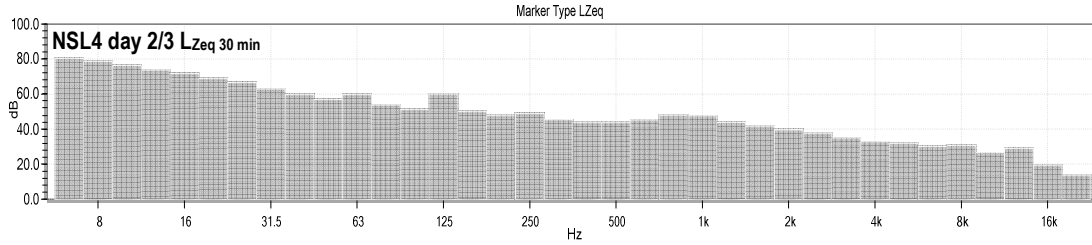
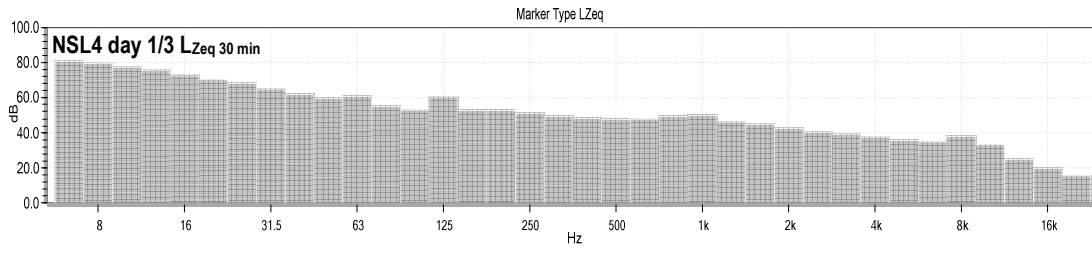




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Appendix 6: 1/3 octave band levels

Band (Hz)	NSL1 L _{Ze} q T (dB)						NSL2 L _{Ze} q T (dB)					
	Day			Eve	Night		Day			Eve	Night	
	1/3	2/3	3/3	1/1	1/2	2/2	1/3	2/3	3/3	1/1	1/2	2/2
6.3	61	63	63	53	58	57	52	56	53	38	39	43
8	60	61	61	51	56	56	51	54	52	40	40	42
10	58	60	60	50	54	54	49	52	50	41	41	41
12.5	57	58	57	51	53	52	49	50	48	43	43	43
16	55	57	55	54	52	52	49	49	48	46	45	45
20	59	59	56	54	54	54	50	49	48	46	45	45
25	62	62	59	55	59	59	52	51	50	48	47	47
31.5	66	67	65	57	49	48	53	54	53	47	44	44
40	68	64	63	52	48	48	51	49	50	46	44	44
50	67	66	66	53	50	50	51	50	51	51	48	47
63	65	65	65	60	44	44	52	50	48	46	41	41
80	68	61	61	53	47	46	49	49	49	47	45	45
100	65	58	57	52	44	44	48	47	46	43	40	41
125	57	57	55	53	42	42	44	42	43	39	38	38
160	56	56	52	50	41	41	43	40	42	36	35	35
200	55	57	54	50	38	38	44	45	41	36	34	34
250	54	56	54	51	36	34	40	37	38	35	31	32
315	54	56	54	50	35	34	37	34	34	36	33	34
400	54	55	55	47	35	33	33	30	32	33	30	31
500	54	54	53	46	36	34	37	38	36	35	31	31
630	54	55	52	45	34	33	33	36	33	34	30	30
800	54	54	52	45	35	32	32	36	34	34	31	30
1000	55	55	53	46	36	28	37	34	34	34	30	29
1250	55	55	54	46	36	26	40	37	36	33	29	29
1600	54	53	52	45	34	23	37	35	34	31	26	26
2000	52	52	51	43	33	25	35	33	32	29	25	24
2500	50	50	48	41	31	19	33	30	31	32	21	20
3150	47	47	45	39	29	18	36	36	39	36	18	18
4000	45	45	43	37	28	18	41	39	44	40	18	18
5000	42	43	41	34	26	14	39	36	42	38	13	13
6300	40	41	40	33	26	10	39	35	41	38	10	10
8000	40	38	38	31	25	8	38	36	42	39	10	10
10000	38	38	36	28	22	6	23	21	23	22	10	10
12500	33	33	31	25	17	5	18	12	17	17	10	10
16000	24	26	24	15	11	4	16	14	17	15	11	11
20000	18	23	18	9	6	3	13	11	12	12	10	10
Total A	64	63	62	55	45	40	50	47	50	47	39	38

Band (Hz)	NSL3 L _{Zeq T} (dB)						NSL4 L _{Zeq T} (dB)					
	Day			Eve	Night		Day			Eve	Night	
	1/3	2/3	3/3	1/1	1/2	2/2	1/3	2/3	3/3	1/1	1/2	2/2
6.3	85	82	84	46	47	47	81	80	80	42	46	85
8	84	81	83	46	46	46	80	79	79	40	44	84
10	82	79	81	47	47	46	78	76	77	38	42	82
12.5	80	77	78	46	46	46	76	74	75	38	40	80
16	78	74	76	46	45	45	73	72	72	38	38	78
20	75	72	74	46	48	48	70	69	70	40	39	75
25	73	70	72	47	50	50	68	67	67	41	40	73
31.5	70	67	69	50	43	44	65	63	64	40	37	70
40	68	64	67	51	54	53	62	60	61	53	39	68
50	65	61	63	56	55	51	60	57	58	42	41	65
63	61	59	62	44	42	41	61	60	60	40	38	61
80	58	55	57	45	42	42	55	54	54	45	40	58
100	55	53	54	46	43	41	53	51	51	46	43	55
125	52	49	52	39	39	38	60	60	60	42	36	52
160	52	51	51	49	46	45	53	50	50	41	33	52
200	53	49	51	44	41	39	53	48	48	42	32	53
250	48	45	46	39	41	38	51	49	47	45	24	48
315	47	46	46	44	44	44	49	45	45	43	23	47
400	44	42	43	40	40	38	48	44	43	41	24	44
500	44	42	42	39	39	37	48	44	43	43	27	44
630	43	41	42	40	38	36	48	45	44	43	27	43
800	42	41	42	40	37	35	49	48	46	46	26	42
1000	41	40	40	37	34	31	50	48	47	48	25	41
1250	40	41	40	35	32	30	46	44	44	45	23	40
1600	38	38	38	32	30	28	45	42	41	40	22	38
2000	37	37	36	29	27	25	43	40	38	36	20	37
2500	37	34	33	27	24	23	40	38	36	33	18	37
3150	33	32	31	25	22	21	39	35	35	30	17	33
4000	35	33	30	24	22	21	38	33	34	28	16	35
5000	38	32	31	19	16	16	36	32	33	25	15	38
6300	41	38	33	14	12	12	35	30	33	22	15	41
8000	46	43	36	11	10	10	38	31	33	21	14	46
10000	39	34	28	10	10	9	33	27	28	18	14	39
12500	34	19	20	10	9	9	25	29	26	13	12	34
16000	28	19	22	12	10	10	20	19	19	7	9	28
20000	24	13	24	12	10	10	16	14	14	4	6	24
Total A	53	51	51	47	45	43	57	55	54	53	34	53