TECHNICAL APPENDIX 11.1: LEGISLATION, POLICY AND GUIDANCE

APPENDIX 11.1 LEGISLATION, POLICY AND GUIDANCE

11.1.1 Legislation

11.1.1.1 The following legislation, policy and guidance documents of relevance have been considered in undertaken the assessment of effects of noise from the Proposed Development:

The Control of Pollution Act, 1974 (COPA) (UK Government, 1974)

11.1.1.2 Section 60 of the Control of Pollution Act enables Local Authority officers to serve a notice in respect of noise nuisance from construction works, instructing the contractor to minimise nuisance to neighbouring properties through specific conditions. Section 61 of the Control of Pollution Act provides a method by which a contractor can apply to the Local Authority for prior consent to undertake construction works in advance of their commencement. If consent is given, the application is exempt from any enforcement action under Section 60 of the same act.

The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017

11.1.1.3 The current requirement for EIA in Scotland comes from The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017, which came into force on 16 May 2017.

11.1.2 Policy

11.1.2.1 The following policies of relevance to the assessment have been considered:

Planning Advice Note (PAN) 1/2011: 'Planning and Noise[1]

11.1.2.2 Published in March 2011, PAN 1/2011 provides advice on the role of the planning system in helping to prevent and limit adverse effects of noise (Scottish Government, 2011). Information and advice on noise assessment methods are provided in the accompanying Technical Advice Note (TAN 2011): Assessment of Noise. Included within the PAN document and the accompanying TAN are details of the legislation, technical standards, and codes of practice for specific noise issues.

11.1.2.3 Neither PAN 1/2011 nor the associated TAN provides specific guidance on the assessment of noise from fixed plant, but the TAN includes an example assessment scenario for 'New noisy development (incl. commercial and recreation) affecting a noise sensitive building', which is based on British Standard (BS) 4142:1997: Method for rating industrial noise affecting mixed residential and industrial areas. In 2014, BS4142: 1997 was replaced with BS4142:2014: Methods for rating and assessing industrial and commercial sound.

11.1.3 Standards and Guidance

11.1.3.1 This assessment is carried out in accordance with the principles contained within the following documents:

British Standard 5228:2009 +A1:2014 (BS5228), Code of Practice for Noise and Vibration Control on Construction and Open Sites[2]

11.1.3.2 Guidance on the prediction and assessment of noise and vibration from construction sites is provided in British Standard (BS) 5228:2009 +A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise. BS5228-1 provides recommended limits for noise from construction sites.

11.1.3.3 The construction noise impact assessment (CNIA) will be carried out according to the ABC method specified in Table E.1 of BS5228-1, in which noise sensitive receptors (NSRs) are classified in categories A, B or C according to their measured or estimated background noise level.

1 Planning Advice Note: Planning and noise (PAN 1/2011, The Scottish Government, 2011

2 British Standard 5228: Code of practice for noise and vibration control on construction and open sites (BS 5228), BSI, 2009, amended 2014

11.1.3.4 In line with best practice (BS 5228-1), a Construction Noise Management Plan (CNMP) will be developed by the principal contractor prior to starting construction works. The details of the CNMP will be agreed with Comhairle Nan Eilean Siar and is expected to be secured by an appropriately worded planning condition.

11.1.3.5 Part 2: Vibration. BS5228-2 provides recommended limits for vibration from construction sites. The construction vibration impact assessment (CVIA) will be carried out against the guidance on effects of vibration levels specified in Table B.1 of BS5228-2. The level of vibration ranging from 0.14 $mm.s^{-1}$ to 10 $mm.s^{-1}$ indicates where vibration may be perceptible however acceptable, or intolerable.

Design Manual for Roads and Bridges LA 111 Noise and Vibration[3]

11.1.3.6 The Design Manual for Roads and Bridges (DMRB) LA 111 Noise and Vibration document provides guidelines for the assessment and management of noise and vibration impacts associated with road projects. The guidance sets out the requirements for assessing noise and vibration impacts from road schemes, ensuring that these impacts are identified, quantified, and managed appropriately.

11.1.3.7 During any time period, the significance of the effect is defined by the lowest observable adverse effect level (LOAEL) and significant observable adverse effect level (SOAEL).

British Standard 4142:2014+A1:2019: Methods for rating and assessing industrial and commercial sound (BS 4142)[4]

11.1.3.8 British Standard 4142 describes methods for rating and assessing the following:

- Sound from industrial and manufacturing processes.
- Sound from fixed installations which comprise mechanical and electrical plant and equipment.
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises.
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train movements on or around an industrial and/or commercial site.

11.1.3.9 The methods use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

11.1.3.10 In accordance with the assessment methodology, the specific sound level (LAeq,T) of the noise source being assessed is corrected, by the application corrections for acoustic features, such as tonal qualities and/or distinct impulses, to give a "rating level" (LAr,Tr).The British Standard effectively compares and rates the difference between the rating level and the typical background sound level (LA90,T) in the absence of the noise source being assessed.

11.1.3.11 BS 4142 advises that the time interval ('T') of the background sound measurement should be sufficient to obtain a representative or typical value of the background sound level at the time(s) when the noise source in question is likely to operate or is proposed to operate in the future.

11.1.3.12 Comparing the rating level with the background sound level, BS 4142 states:

- "*Typically, the greater this difference, the greater the magnitude of impact.*
- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
- *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.*"

3 Design Manual for Roads and Bridges (DMRB), LA 111 Noise and Vibration, Transport Scotland, 2019
4 British Standard 4142: Methods for rating and assessing industrial and commercial sound (BS 4142), BSI, 2014, Amended 2019

11.1.3.13 BS 4142 states for low noise conditions (which this Proposed Development applies):

- *"For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.*
- *Where background sound levels and rating levels are low, absolute levels might be as, or more relevant than the margin by which the rating level exceeds the background. This is especially true at night."*

11.1.3.14 The second statement will be relevant when background noise levels are very low, which is likely to be appropriate for the assessment of this site. Absolute levels, which is the sum of the background sound level and the specific sound source of the Proposed Development, will be assessed as the more relevant metric if background levels are deemed very low.

ISO 9613-2:2024, Acoustics — Attenuation of sound during propagation outdoors, Part 2: Engineering method for the prediction of sound pressure levels outdoors

11.1.3.15 This document specifies an engineering method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources. The method predicts the equivalent continuous A-weighted sound pressure level (as described in ISO 1996-series) under meteorological conditions favourable to propagation from sources of known sound emission.

11.1.3.16 The operational noise impact assessment is be based on a 3D digital model of the Proposed Development and Study Area to industry standard in in accordance with ISO 9613-2.

qNANR116 – Open/closed window research: sound Insulation Through ventilated Domestic Windows

11.1.3.17 The insulation of an open window has been generally accepted as being 10-15 dBA although its precision and effect on opening style, open area and window size, are not readily available. A programme of laboratory measurements have been undertaken by the Building Performance Centre at Napier University on behalf of the Department for Environment, Food and Rural Affairs, in order to quantify the sound insulation provided by a variety of window types, opening styles, areas of opening and ventilator devices.

TECHNICAL APPENDIX 11.2: CALIBRATION CERTIFICATES

A.1 CALIBRATION CERTIFICATE NL52 01265434

ANV MEASUREMENT SYSTEMS

CERTIFICATE OF CALIBRATION

ilac-MRA UKAS CALIBRATION 0653

Date of Issue: 21 April 2022

Certificate Number: UCRT22/1548

Calibrated at & Certificate issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Page 1 of 2 Pages

Approved Signatory

K. Mistry

Customer	Wood Group UK Ltd St Vincent Plaza St Vincent Street Glasgow G2 5LD
Order No.	26010406
Description	Sound Level Meter / Pre-amp / Microphone / Associated Calibrator

Identification

Manufacturer	*Instrument*	*Type*	*Serial No. / Version*
Rion	Sound Level Meter	NL-52	01265434
Rion	Firmware		2.0
Rion	Pre Amplifier	NH-25	65436
Rion	Microphone	UC-59	13122
Brüel & Kjær	Calibrator	4231	2052327
	Calibrator adaptor type if applicable		UC 0210

Performance Class 1

Test Procedure TP 10. SLM 61672-3:2013

Procedures from IEC 61672-3:2013 were used to perform the periodic tests.

Type Approved to IEC 61672-1:2013 Yes

If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2013

Date Received 19 April 2022 ANV Job No. UKAS22/04276

Date Calibrated 21 April 2022

The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organisation responsible for approving the results of pattern-evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 specifications of IEC 61672-1:2013.

Previous Certificate	*Dated*	*Certificate No.*	*Laboratory*
	27 May 2020	UCRT20/1451	0653

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

CERTIFICATE OF CALIBRATION

UKAS Accredited Calibration Laboratory No. 0653

Certificate Number UCRT22/1548

Page 2 of 2 Pages

Sound Level Meter Instruction manual and data used to adjust the sound levels indicated.

SLM instruction manual title	NL-52/NL-42 Description for IEC 61672-1		
SLM instruction manual ref / issue	No. 56034 21-03	Source	Rion
Date provided or internet download date	19 March 2021		

	Case Corrections	Wind Shield Corrections	Mic Pressure to Free Field Corrections
Uncertainties provided	Yes	Yes	Yes

Total expanded uncertainties within the requirements of IEC 61672-1:2013	YES		
Specified or equivalent Calibrator	Equivalent		
Customer or Lab Calibrator	Customers Calibrator		
Calibrator adaptor type if applicable	UC 0210		
Calibrator cal. date	20 April 2022		
Calibrator cert. number	UCRT22/1540		
Calibrator cal cert issued by Lab	0653		
Calibrator SPL @ STP	94.11	dB	Calibration reference sound pressure level
Calibrator frequency	999.79	Hz	Calibration check frequency
Reference level range	Single	dB	

Accessories used or corrected for during calibration - Extension Cable & Wind Shield WS-15

Note - The Extension Cable was used between the SLM and the pre-amp for this calibration.

Environmental conditions during tests	Start	End	
Temperature	23.68	24.32	± 0.30 °C
Humidity	41.1	39.9	± 3.00 %RH
Ambient Pressure	100.33	100.28	± 0.03 kPa

Indication at the Calibration Check Frequency					
Initial indicated level	94.1	dB	Adjusted indicated level	94.1	dB
Uncertainty of calibrator used for Indication at the Calibration Check Frequency ±				0.10	dB

Self Generated Noise

Microphone installed - Less Than 17.9 dB A Weighting

Microphone replaced with electrical input device - UR = Under Range indicated

Weighting	A			C			Z		
	13.1	dB	UR	17.4	dB	UR	22.8	dB	UR

Self Generated Noise reported for information only and not used to assess conformance to a requirement

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

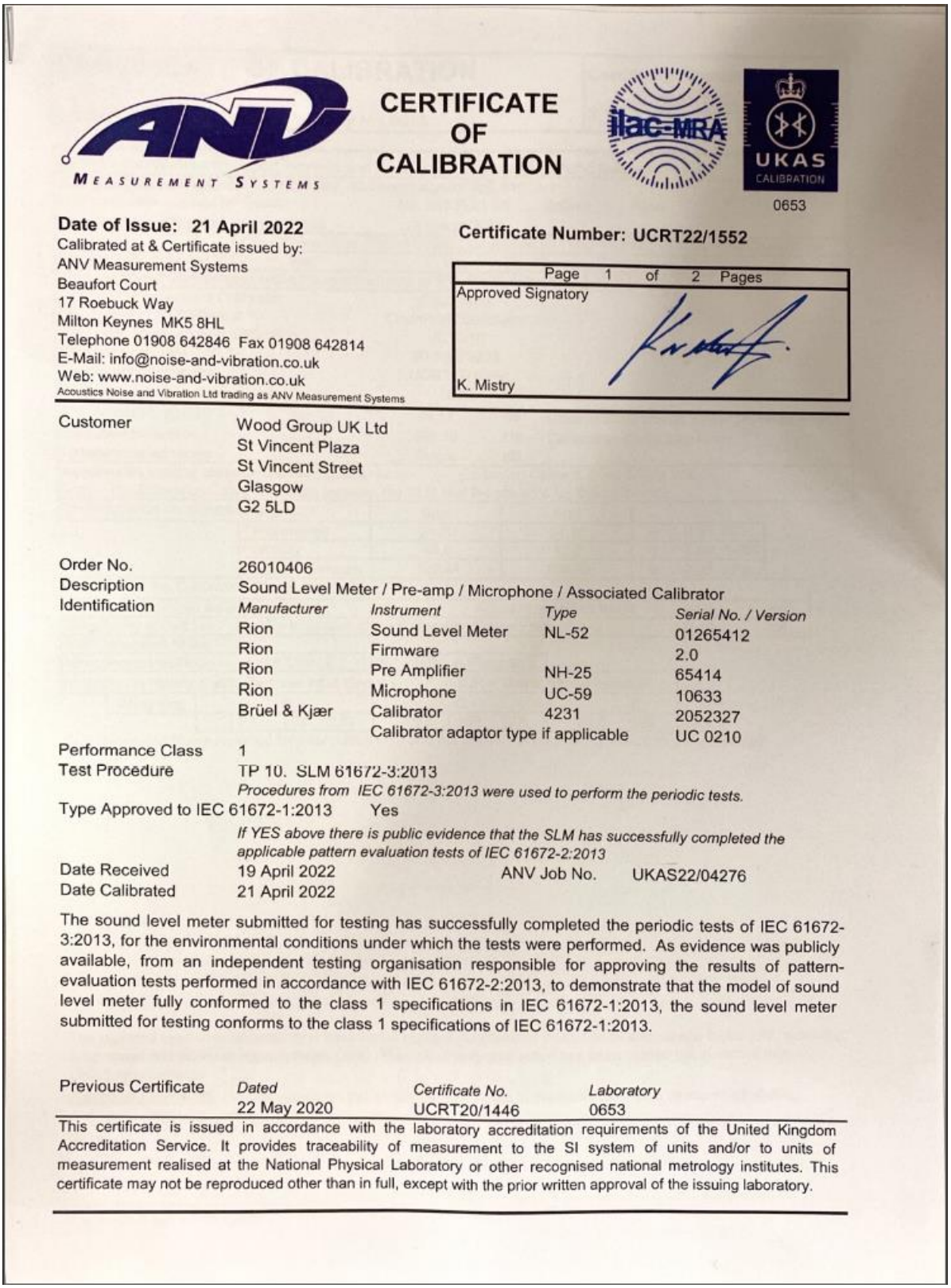
Additional Comments The results on this certificate only relate to the items calibrated as identified above.

None

..... END .....

Calibrated by: B. Giles R 3

A.2 CALIBRATION CERTIFICATE NL52 01265412



ANV MEASUREMENT SYSTEMS

CERTIFICATE OF CALIBRATION

ilac-MRA UKAS CALIBRATION 0653

Date of Issue: 21 April 2022

Certificate Number: UCRT22/1552

Calibrated at & Certificate issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Page 1 of 2 Pages

Approved Signatory

K. Mistry

Customer	Wood Group UK Ltd St Vincent Plaza St Vincent Street Glasgow G2 5LD
Order No.	26010406
Description	Sound Level Meter / Pre-amp / Microphone / Associated Calibrator

Identification	*Manufacturer*	*Instrument*	*Type*	*Serial No. / Version*
	Rion	Sound Level Meter	NL-52	01265412
	Rion	Firmware		2.0
	Rion	Pre Amplifier	NH-25	65414
	Rion	Microphone	UC-59	10633
	Brüel & Kjær	Calibrator	4231	2052327
		Calibrator adaptor type if applicable		UC 0210

Performance Class	1
Test Procedure	TP 10. SLM 61672-3:2013
	Procedures from IEC 61672-3:2013 were used to perform the periodic tests.
Type Approved to IEC 61672-1:2013	Yes
	If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2013
Date Received	19 April 2022 ANV Job No. UKAS22/04276
Date Calibrated	21 April 2022

The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organisation responsible for approving the results of pattern-evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 specifications of IEC 61672-1:2013.

Previous Certificate	*Dated*	*Certificate No.*	*Laboratory*
	22 May 2020	UCRT20/1446	0653

CERTIFICATE OF CALIBRATION

UKAS Accredited Calibration Laboratory No. 0653

Certificate Number
UCRT22/1552

Page 2 of 2 Pages

Sound Level Meter Instruction manual and data used to adjust the sound levels indicated.

SLM instruction manual title	NL-52/NL-42 Description for IEC 61672-1		
SLM instruction manual ref / issue	No. 56034 21-03	Source	Rion
Date provided or internet download date	19 March 2021		

	Case Corrections	Wind Shield Corrections	Mic Pressure to Free Field Corrections
Uncertainties provided	Yes	Yes	Yes

Total expanded uncertainties within the requirements of IEC 61672-1:2013	YES		
Specified or equivalent Calibrator	Equivalent		
Customer or Lab Calibrator	Customers Calibrator		
Calibrator adaptor type if applicable	UC 0210		
Calibrator cal. date	20 April 2022		
Calibrator cert. number	UCRT22/1540		
Calibrator cal cert issued by Lab	0653		
Calibrator SPL @ STP	94.11	dB	Calibration reference sound pressure level
Calibrator frequency	999.79	Hz	Calibration check frequency
Reference level range	Single	dB	

Accessories used or corrected for during calibration - Extension Cable & Wind Shield WS-15
Note - The Extension Cable was used between the SLM and the pre-amp for this calibration.

Environmental conditions during tests	Start	End	
Temperature	24.50	24.30	± 0.30 °C
Humidity	40.6	42.2	± 3.00 %RH
Ambient Pressure	100.24	100.20	± 0.03 kPa

Indication at the Calibration Check Frequency

Initial indicated level	94.2	dB	Adjusted indicated level	94.1 dB
Uncertainty of calibrator used for Indication at the Calibration Check Frequency ±				0.10 dB

Self Generated Noise

Microphone installed - Less Than 17.9 dB A Weighting

Microphone replaced with electrical input device - UR = Under Range indicated

Weighting	A			C			Z		
	11.7	dB	UR	15.5	dB	UR	20.8	dB	UR

Self Generated Noise reported for information only and not used to assess conformance to a requirement

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

Additional Comments The results on this certificate only relate to the items calibrated as identified above.

None

..... END .....

Calibrated by: B. Giles

R 3

A.3 CALIBRATION CERTIFICATE NL52 01265413

MEASUREMENT SYSTEMS

CERTIFICATE OF CALIBRATION

0653

Date of Issue: 25 May 2022

Certificate Number: UCRT22/1693

Calibrated at & Certificate issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Approved Signatory

K. Mistry

Customer	Wood Group St. Vincent Plaza (Floor 2) 319 St. Vincent Street Glasgow G2 5LP
Order No.	26010406
Description	Sound Level Meter / Pre-amp / Microphone / Associated Calibrator

Identification	*Manufacturer*	*Instrument*	*Type*	*Serial No. / Version*
	Rion	Sound Level Meter	NL-52	01265413
	Rion	Firmware		2.0
	Rion	Pre Amplifier	NH-25	65414
	Rion	Microphone	UC-59	10633
	Rion	Calibrator	NC-74	34178103
		Calibrator adaptor type if applicable		NC-74-002

Performance Class	1
Test Procedure	TP 10. SLM 61672-3:2013 *Procedures from IEC 61672-3:2013 were used to perform the periodic tests.*
Type Approved to IEC 61672-1:2013	Yes *If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2013*
Date Received	23 May 2022 ANV Job No. UKAS22/05346
Date Calibrated	25 May 2022

The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organisation responsible for approving the results of pattern-evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 specifications of IEC 61672-1:2013.

Previous Certificate	*Dated*	*Certificate No.*	*Laboratory*
	22 May 2020	UCRT20/1448	0653

CERTIFICATE OF CALIBRATION

UKAS Accredited Calibration Laboratory No. 0653	**Certificate Number** UCRT22/1693
	Page 2 of 2 Pages

Sound Level Meter Instruction manual and data used to adjust the sound levels indicated.

SLM instruction manual title	NL-52/NL-42 Description for IEC 61672-1			
SLM instruction manual ref / issue	No. 56034 21-03	Source	Rion	
Date provided or internet download date	19 March 2021			

	Case Corrections	Wind Shield Corrections	Mic Pressure to Free Field Corrections
Uncertainties provided	Yes	Yes	Yes

Total expanded uncertainties within the requirements of IEC 61672-1:2013 — YES

Specified or equivalent Calibrator	Specified		
Customer or Lab Calibrator	Customers Calibrator		
Calibrator adaptor type if applicable	NC-74-002		
Calibrator cal. date	24 May 2022		
Calibrator cert. number	UCRT22/1682		
Calibrator cal cert issued by Lab	0653		
Calibrator SPL @ STP	94.02	dB	Calibration reference sound pressure level
Calibrator frequency	1001.97	Hz	Calibration check frequency
Reference level range	Single	dB	

Accessories used or corrected for during calibration - Extension Cable & Wind Shield WS-15
Note - The Extension Cable was used between the SLM and the pre-amp for this calibration.

Environmental conditions during tests	Start	End	
Temperature	24.15	24.31	± 0.30 °C
Humidity	48.3	48.3	± 3.00 %RH
Ambient Pressure	100.06	100.05	± 0.03 kPa

Indication at the Calibration Check Frequency

Initial indicated level	94.0	dB	Adjusted indicated level	94.0 dB

Uncertainty of calibrator used for Indication at the Calibration Check Frequency ± 0.10 dB

Self Generated Noise

Microphone installed - Less Than 18.8 dB A Weighting

Microphone replaced with electrical input device - UR = Under Range indicated

Weighting	A			C			Z		
	12.5	dB	UR	16.9	dB	UR	23.5	dB	UR

Self Generated Noise reported for information only and not used to assess conformance to a requirement

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

Additional Comments The results on this certificate only relate to the items calibrated as identified above.

Prior to calibration the instrument was re-aligned.

..... END .....

Calibrated by: B. Bogdan R 2

A.4 CALIBRATION CERTIFICATE NL52 00175536

ANV MEASUREMENT SYSTEMS

CERTIFICATE OF CALIBRATION

ilac-MRA UKAS CALIBRATION 0653

Date of Issue: 25 May 2022 **Certificate Number: UCRT22/1695**

Calibrated at & Certificate issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Approved Signatory

K. Mistry

Customer	Wood Group St. Vincent Plaza (Floor 2) 319 St. Vincent Street Glasgow G2 5LP
Order No.	26010406
Description	Sound Level Meter / Pre-amp / Microphone / Associated Calibrator

Identification

Manufacturer	*Instrument*	*Type*	*Serial No. / Version*
Rion	Sound Level Meter	NL-52	00175536
Rion	Firmware		2.0
Rion	Pre Amplifier	NH-25	65638
Rion	Microphone	UC-59	13128
Rion	Calibrator	NC-74	34178103
	Calibrator adaptor type if applicable		NC-74-002

Performance Class	1
Test Procedure	TP 10. SLM 61672-3:2013
	Procedures from IEC 61672-3:2013 were used to perform the periodic tests.
Type Approved to IEC 61672-1:2013	Yes
	If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2013
Date Received	23 May 2022 ANV Job No. UKAS22/05346
Date Calibrated	25 May 2022

The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organisation responsible for approving the results of pattern-evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 specifications of IEC 61672-1:2013.

Previous Certificate	*Dated*	*Certificate No.*	*Laboratory*
	26 May 2020	UCRT20/1449	0653

CERTIFICATE OF CALIBRATION

Certificate Number
UCRT22/1695

UKAS Accredited Calibration Laboratory No. 0653

Page 2 of 2 Pages

Sound Level Meter Instruction manual and data used to adjust the sound levels indicated.

SLM instruction manual title	NL-52/NL-42 Description for IEC 61672-1			
SLM instruction manual ref / issue	No. 56034 21-03	Source	Rion	
Date provided or internet download date	19 March 2021			

	Case Corrections	Wind Shield Corrections	Mic Pressure to Free Field Corrections
Uncertainties provided	Yes	Yes	Yes

Total expanded uncertainties within the requirements of IEC 61672-1:2013	YES		
Specified or equivalent Calibrator	Specified		
Customer or Lab Calibrator	Customers Calibrator		
Calibrator adaptor type if applicable	NC-74-002		
Calibrator cal. date	24 May 2022		
Calibrator cert. number	UCRT22/1682		
Calibrator cal cert issued by Lab	0653		
Calibrator SPL @ STP	94.02	dB	Calibration reference sound pressure level
Calibrator frequency	1001.97	Hz	Calibration check frequency
Reference level range	Single	dB	

Accessories used or corrected for during calibration - Extension Cable & Wind Shield WS-15

Note - The Extension Cable was used between the SLM and the pre-amp for this calibration.

Environmental conditions during tests	Start	End	
Temperature	24.65	24.37	± 0.30 °C
Humidity	48.5	48.7	± 3.00 %RH
Ambient Pressure	100.05	100.05	± 0.03 kPa

Indication at the Calibration Check Frequency				
Initial indicated level	94.3	dB	Adjusted indicated level	94.0 dB
Uncertainty of calibrator used for Indication at the Calibration Check Frequency ±				0.10 dB

Self Generated Noise

Microphone installed - Less Than 19.1 dB A Weighting

Microphone replaced with electrical input device - UR = Under Range indicated

Weighting	A			C			Z		
	13.1	dB	UR	16.9	dB	UR	23.1	dB	UR

Self Generated Noise reported for information only and not used to assess conformance to a requirement

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

Additional Comments The results on this certificate only relate to the items calibrated as identified above.

None

..... END .....

Calibrated by: B. Bogdan R 2

A.5 CALIBRATION CERTIFICATE NC74 34178103

MEASUREMENT SYSTEMS

CERTIFICATE OF CALIBRATION

ilac-MRA UKAS CALIBRATION 0653

Date of Issue: 24 May 2022

Certificate Number: UCRT22/1682

Calibrated at & Certificate issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Approved Signatory

K. Mistry

Customer	Wood Group St. Vincent Plaza (Floor 2) 319 St. Vincent Street Glasgow G2 5LP			
Order No.	26010406			
Test Procedure	Procedure TP 1 Calibration of Sound Calibrators			
Description	Acoustic Calibrator			
Identification	*Manufacturer* Rion	*Instrument* Calibrator	*Model* NC-74	*Serial No.* 34178103

The calibrator has been tested as specified in Annex B of IEC 60942:2003. As public evidence was available from a testing organisation (PTB) responsible for approving the results of pattern evaluation tests, to demonstrate that the model of sound calibrator fully conformed to the requirements for pattern evaluation described in Annex A of IEC 60942:2003, the sound calibrator tested is considered to conform to all the class 1 requirements of IEC 60942:2003.

ANV Job No.	UKAS22/05346	
Date Received	23 May 2022	
Date Calibrated	24 May 2022	
Previous Certificate	*Dated* *Certificate No.* *Laboratory*	22 May 2020 UCRT20/1440 0653

CERTIFICATE OF CALIBRATION	Certificate Number UCRT22/1682
UKAS Accredited Calibration Laboratory No. 0653	Page 2 of 2 Pages

Measurements

The sound pressure level generated by the calibrator in its WS2 configuration was measured five times by the Insert Voltage Method using a microphone as detailed below. The mean of the results obtained is shown below. It is corrected to the standard atmospheric pressure of 101.3 kPa (1013 mBar) using original manufacturers information.

Test Microphone	*Manufacturer*	*Type*
	Brüel & Kjær	4134

Results

The level of the calibrator output under the conditions outlined above was

94.02 ± 0.10 dB rel 20 µPa

Functional Tests and Observations

The frequency of the sound produced was	1001.97	±	0.12 Hz
The total distortion was	1.61	±	0.11 % Distortion

During the measurements environmental conditions were

Temperature	23	to	24	°C
Relative Humidity	44	to	51	%
Barometric Pressure	99.4	to	99.5	kPa

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

The uncertainties refer to the measured values only with no account being taken of the ability of the instrument to maintain its calibration.

A small correction factor may need to be applied to the sound pressure level quoted above if the device is used to calibrate a sound level meter which is fitted with a free-field response microphone. See manufacturers handbook for details.

..... END .....

Note:

Calibrator adjusted prior to calibration?	NO	
Initial Level	N/A	dB
Initial Frequency	N/A	Hz

Additional Comments: The results on this certificate only relate to the items calibrated as identified above.

None

Calibrated by: B. Bogdan R 2

TECHNICAL APPENDIX 11.3: METEOROLOGICAL DATA

APPENDIX 11.3 METEOROLOCIAL DATA

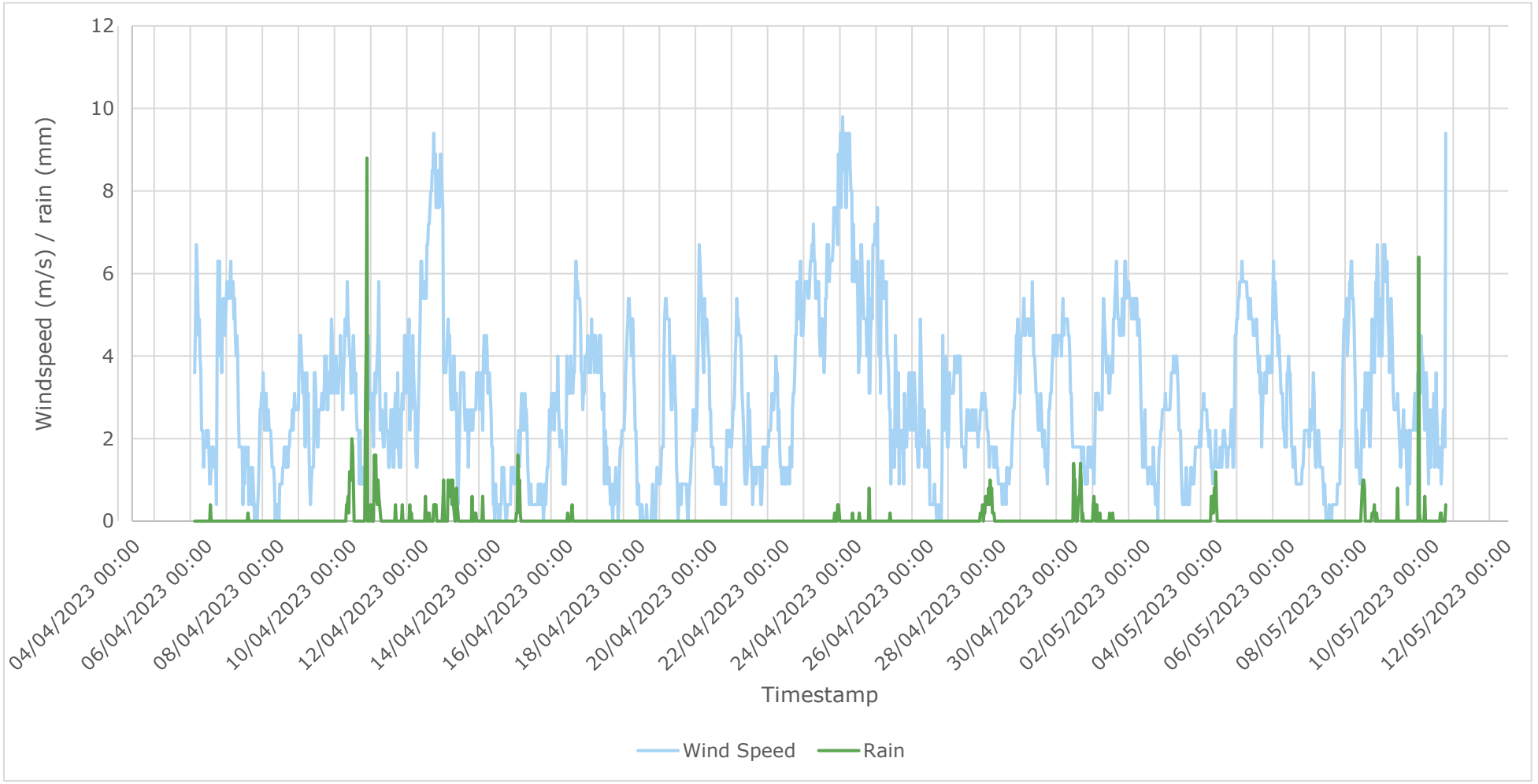


Figure 0-1: Meteorological Data

TECHNICAL APPENDIX 11.4: HISTOGRAMS OF SOUND LEVEL METER DATA LA90

1. APPENDIX 11.4 HISTOGRAMS OF SOUND LEVEL METER DATA LA902

APPENDIX 11.4 HISTOGRAMS OF SOUND LEVEL METER DATA LA90

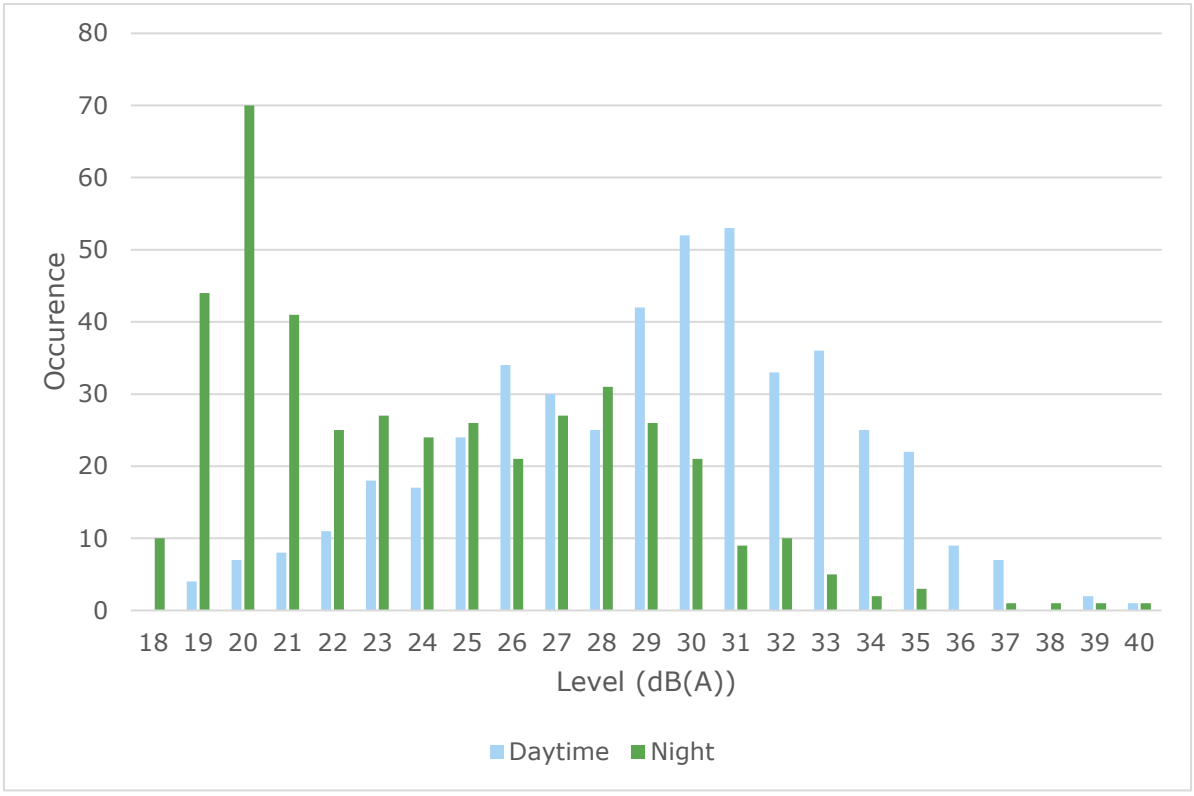


Figure 0-1: Measured Background L_{A90} Noise Levels for Sound Level Meter (SLM) 1

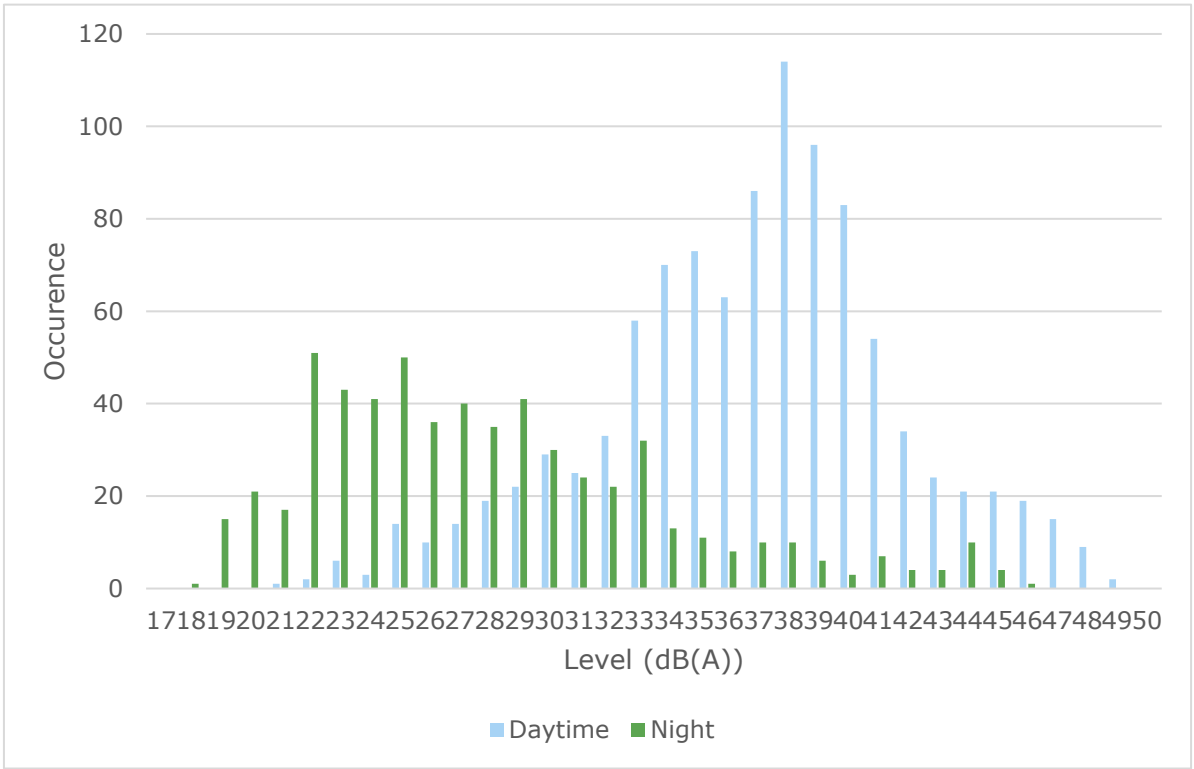


Figure 0-2: Measured Background L_{A90} Noise Levels for SLM 2

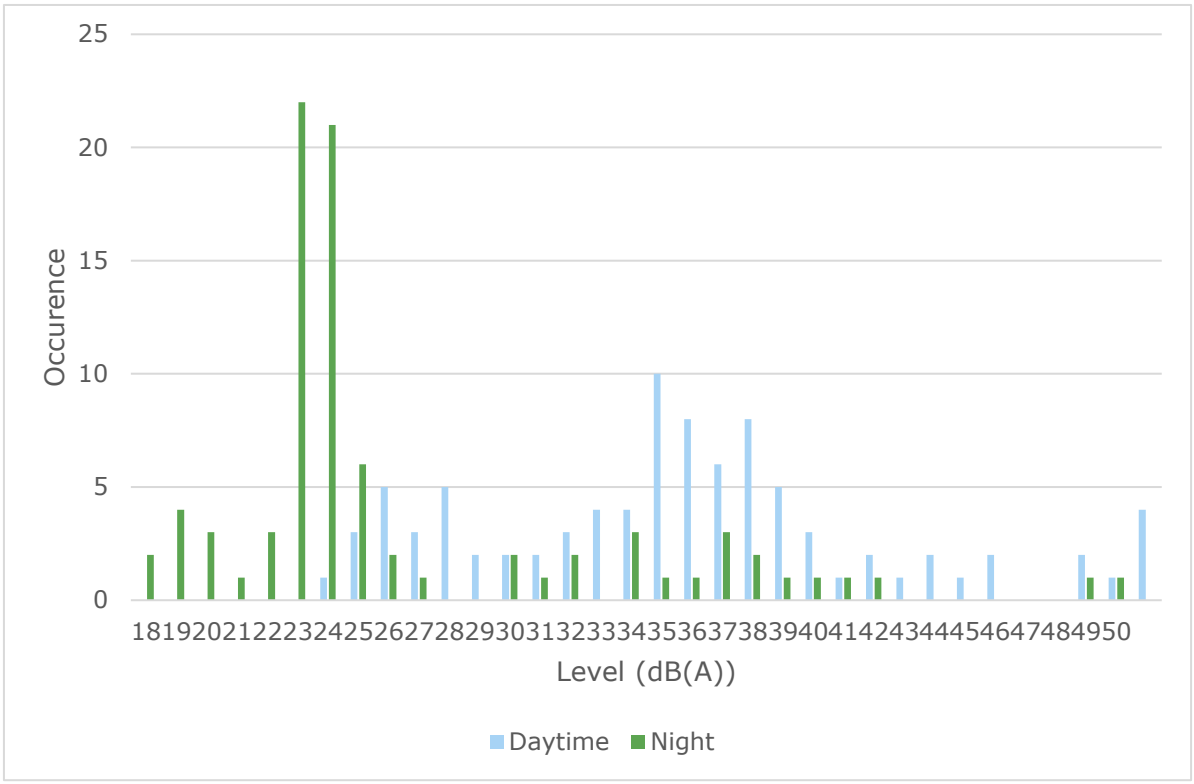


Figure 0-3: Measured Background L_{A90} Noise Levels for SLM 3

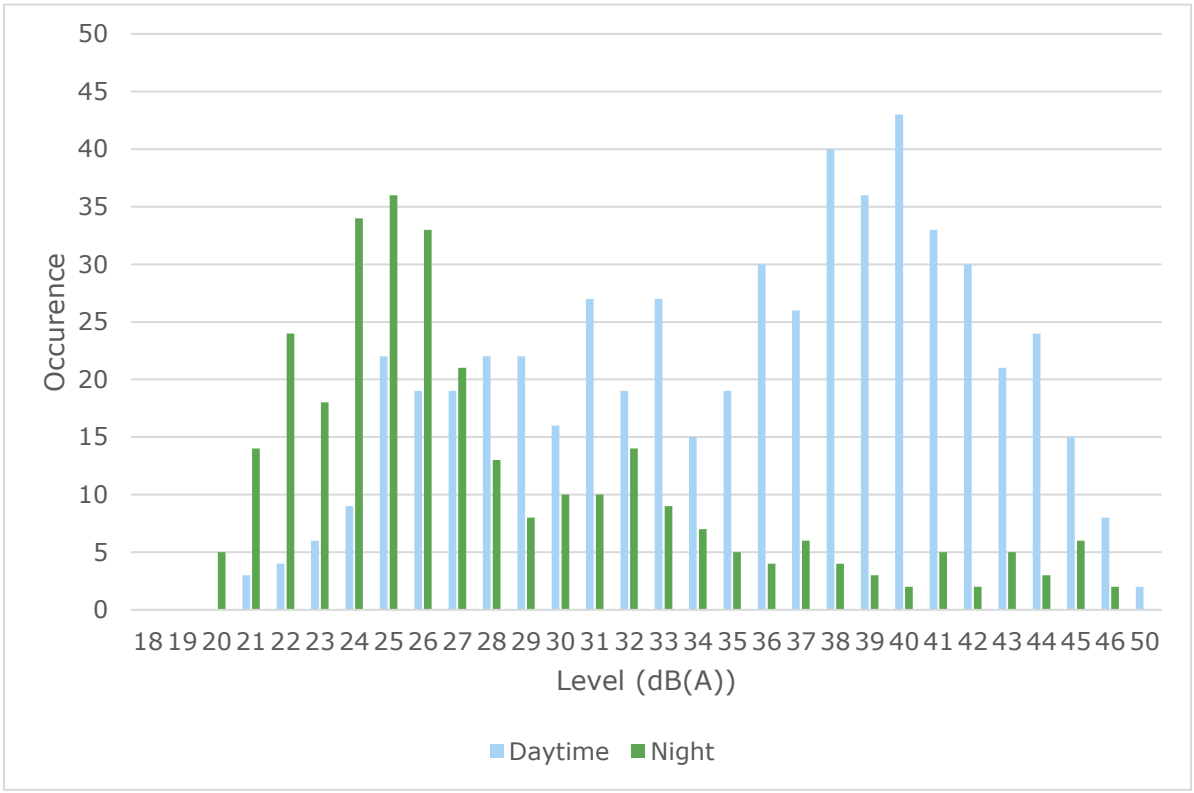


Figure 0-4: Measured Background L_{A90} Noise Levels for SLM 4

TECHNICAL APPENDIX 11.5: METHOD OF ASSESSMENT

APPENDIX 11.5 METHOD OF ASSESSMENT

11.5.1.1 Determining Magnitude of Change and Sensitivity of Receptors

11.5.1.1.1 The sensitivity of the NSR is estimated in its current state prior to any change implied by the Proposed Development. The level of sensitivity is determined according to existing regulations and guidance, societal value, and vulnerability for the change. By the combination of the assessed value of these three components, the NSRs' sensitivity can be classified as Low, Medium or High, as recommended by TAN 2011. Table 0.1 presents the definitions of receptor sensitivity.

Table 0.1: Evaluation of Receptor Sensitivity

Level of Sensitivity	Definition
Low	Receptors where distraction or disturbance from noise is minimal.
	Buildings not occupied during working hours. Factories and working environments with existing high noise levels. Sports grounds when spectator noise is a normal part of the event. Night Clubs.
Medium	Receptors moderately sensitive to noise, where it may cause some distraction or disturbance.
	Offices. Bars/Cafes/Restaurants where external noise may be intrusive. Sports grounds when spectator noise is not a normal part of the event and where quiet conditions are necessary (e.g. tennis, golf, bowls).
High	Receptors where people or operations are particularly susceptible to noise.
	Residential, including private gardens where appropriate. Quiet outdoor areas used for recreation. Conference facilities. Theatres/Auditoria/Studios. Schools during the daytime. Hospitals/residential care homes. Places of worship.

11.5.1.1.2 With the exception of the Creed Recycling Centre which is Medium sensitivity, all other NSRs considered in this assessment are residential in nature, with a semi-rural baseline noise environment. Therefore, the sensitivity of all NSRs is High.

Magnitude of Impact

11.5.1.1.3 The magnitude of an impact at a given receptor can be interpreted as the degree of alteration that is undergone by the receptor as a consequence of the impact. Magnitude criteria can be quantitative using specified standards. As reported in Table 0.2, the impact magnitude is worked out on a case-by-case basis for each NSR and classified as Negligible, Low, Medium, or High.

Construction Noise and Vibration

11.5.1.1.4 The noise criteria provided for the ABC method are detailed in BS 5228-1 are shown Table 0.2.

Table 0.2: Construction Noise Impact Assessment Criteria

Assessment category and threshold value period	Threshold value, LAeq (dB)		
	Category A	Category B	Category C
Night-time	45	50	55
Evenings and weekends	55	60	65
Daytime and Saturdays	65	70	75

11.5.1.1.17 Night-time is defined as between 23:00 and 07:00. Evenings and weekends are defined as 19:00 – 23:00 on weekdays, 13:00 – 23:00 on Saturdays and 07:00 – 23:00 on Sundays. Daytime is defined to be 07:00 – 19:00 on weekdays and 07:00 – 13:00 on Saturdays.

11.5.1.1.18 The NSR is defined as Category A if the ambient noise levels (rounded to the nearest 5 dB) are less than those stated for Category A. This is true for the Study Area and therefore the Proposed Development will be assessed to Category A thresholds.

11.5.1.1.19 The detailed construction schedule was not available at the time of writing, therefore an assumed schedule is outlined in Table 0.3, with likely construction equipment identified in Annex C of BS 5228-1. This is subject to further development. The activity is analysed to determine the percentage of the construction time each piece of equipment is being used and how many are in use. Using this information, a total equivalent noise level is calculated. The dispersion of this total noise level is then modelled, accounting for distance and ground absorption.

Table 0.3: Estimated Construction Schedule

Contract Works	Description	Start	Duration (months)	End	Proposed Working Hours
Enabling Works	Soil strip, peat removal, processing of site won rock, formation of platforms, drainage, temporary compounds, temporary and permanent access.	Feb 2026	22	Nov 2027	(March to September) Monday to Saturday 07:00 to 19:00 (October to February) Monday to Saturday 07:30 to 19:00
HVDC and AC Building Works	Construction of HVDC and AC building and equipment foundations, drainage, electrical cable trenches/troughs, HVDC and AC building structures, internal access roads and fencing.	Feb 2027	27	April 2029	
HVDC and AC Equipment Fit Out	Installation of HVDC and AC electrical equipment and building ancillary supplies.	April 2028	25	April 2030	
Landscaping	Final site clearance, reinstatement of temporary compounds, access and drainage. Installation of remaining landscape measures.	Feb 2029	11	Dec 2029	
Testing and Commissioning	Testing and commissioning of facility.	Mar 2030	8	Oct 2030	

11.5.1.1.20 Based on **Technical Appendix 12.1 Construction Traffic Management Plan**, the table below provides an initial estimate of vehicle movements for the site in Table 0.4.

Table 0.4: Estimated Construction Traffic Schedule

Phase	AIL	Low Loader	Tipper	Flat Bed	Concrete	Staff	Total
Enabling Works		600	154,160			62,400	217,160
AC & DC Building Works and Electrical Fit Out	18	72	53,000	4,400	6,200	102,500	166,190
Total	36	1344	414,320	8,800	12,400	329,800	766,700

11.5.1.1.21 From the outlined construction schedule, work is expected 7 days a week. It is likely that the majority of construction works will occur during daytime periods, however, may extend into evening periods at weekends. It is not known what activities within each phase will take place at what times, therefore, all activities within each phase are assumed to take place in the evening. Therefore, the 55 dB(A) limit has been adopted in this case to ensure a conservative assessment takes place.

11.5.1.1.22 With a noise limit of 55 dB(A) identified from BS 5228-1, the following magnitude of impact at receptors can be determined from Table 0.5.

Table 0.5: Construction Noise - Magnitude of Impact at Receptors

Magnitude of Impact	Construction Noise Level (dB(A))
High	> 60
Medium	56 to 60
Low	BGN to 55
Negligible	< BGN

11.5.1.1.23 Construction traffic for local haul roads and Site access are incorporated to the BS5228-1:2009, however additional criteria extend to construction traffic on highways. Table 0.6 shows noise impact criteria for the assessment of changes to road traffic noise due to the addition of Proposed Development related construction traffic, with reference from Table 3.17 of DMRB, LA 111 Noise and Vibration.

Table 0.6: Construction Traffic - Magnitude of Impact at Receptors

Magnitude of Change	Traffic Noise Level Change
No Change	x < 0
Negligible	0.1= x < 0.9
Low	1.0 = x < 2.9
Medium	3 = x < 4.9
High	x > 5

11.5.1.1.24 In accordance with the EIA Regulations construction noise and construction traffic noise shall be defined as a significant effect where it is determined that a High or Medium magnitude of impact will occur for a duration exceeding:

- 10 or more days or nights in any 15 consecutive days or nights; and/or
- a total number of days exceeding 40 in any 6 consecutive months.

Construction Vibration

11.5.1.1.25 A desk-based construction vibration appraisal has been prepared for the purpose of assessing the effects of the construction works on any nearby residents. This appraisal has been produced in line with British Standard 5228-2:2009 +A1:2014 (BS5228), Code of Practice for Noise and Vibration Control on Construction and Open Sites.

11.5.1.1.26 Potential of heavy goods vehicle (HGV) vibration on receptors along haul roads will be predicted using the procedures in Transport and Road Research Laboratory (TRL) Research Report 246 – Traffic Induced Vibrations in Buildings.

11.5.1.1.27 Criteria for construction vibration due to access tracks and foundation works are taken from Table B.1 in BS5228-2 and shown in Table 0.7. Vibration is measured as peak particle velocity (PPV) measured in millimetres per second ($mm{\cdot}s^{-1}$).

Table 0.7: Construction Vibration Impact Assessment Criteria

Impact Magnitude	Vibration Level, Peak Particle Velocity (PPV) ($mm.s^{-1}$)	Effect
Negligible	0.14 $mm{\cdot}s^{-1}$	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
Low	0.3 $mm{\cdot}s^{-1}$	Vibration might be just perceptible in residential environments.

Impact Magnitude	Vibration Level, Peak Particle Velocity (PPV) (mm.s^{-1})	Effect
Medium	1.0 mm·s^{-1}	It is likely that vibration of this level in residential environments will cause complaints but can be tolerated if prior warning and explanation have been given to residents.
High	10 mm·s^{-1}	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.

11.5.1.1.28 Excess over the 10 mm·s^{-1} criteria will result in High impact magnitude. Construction vibration between the 1 mm·s^{-1} and 10 mm·s^{-1} threshold will result in Medium impact magnitude. Below 1 mm·s^{-1} will result in Low impact magnitude.

Operational Noise

11.5.1.1.29 Information from the rating level, the background sound level, and the stated impacts from a BS4142 assessment have been converted into representative impact magnitudes, detailed in Table 0.8.

Table 0.8: BS4142 Impact Magnitude

Impact Magnitude	Definition
Negligible	Impact to the receptor is immeasurable, undetectable or within the range of normal natural background variation.
Low	The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.
Medium	A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
High	A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

11.5.1.1.30 The assessment within BS4142 is context-based, as is stated in the definitions of determining impact. There is no theoretical limit to how the context can or should influence the impact assessment, but any alteration of the conclusions of an assessment due to the context should be sufficiently explained and justified for the specific circumstances in question. Section 11 of BS4142: "Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night." The assessor will include additional consideration for internal noise levels during nighttime periods, where it is less likely that the external amenity is in use, and the preservation of internal conditions and the reduction of potential sleep disturbance is of more concern. For nighttime conditions, operational noise shall constitute a significant effect where:

- a High or Medium magnitude of impact is determined at the external amenity
- the internal noise limits of 30 dB(A) are exceeded as set out in BS8233, or the noise exceeds NR20 criteria.

11.5.1.1.31 This is due to the context of the assessment, during nighttime conditions it is more appropriate to consider internal noise and the potential for sleep disturbance, rather than the external amenity which is likely not in use during these times.

Significance of Effect

11.5.1.1.32 After assessing the sensitivity of the NSR in its baseline state, and then the impact magnitude of the noise likely to affect the NSR, an estimate of the significance of effect can be derived by applying a calculation matrix (Table 0.9).

11.5.1.1.33 The measure of significance is the key output of the impact assessment process and drives the requirement for mitigation measures to be applied during operation to offset or reduce potential project generated effects.

11.5.1.1.34 The predicted significance of the effect was determined through the recommendations in TAN 2011 and based on professional judgement, considering both sensitivity and magnitude of change as detailed in Table 0.9.

Table 0.9: Matrix for Determination of Significance of Effects

Significance		Level of Significance Relative to Sensitivity of Receptor		
		Low	**Medium**	**High**
Impact Magnitude	**High**	Minor/Moderate	Moderate/Major	Major
	Medium	Minor	Moderate	Moderate/Major
	Low	Negligible/Minor	Minor	Minor/Moderate
	Negligible	Neutral/Slight	Neutral/Minor	Minor
	No change	Neutral	Neutral	Neutral

11.5.1.1.35 The evaluation of effect significance shall be performed by following professional judgment, considering where context and a conservative approach to methodology has been applied, where worst-case results are reported, and to account for potential uncertainties affecting baseline data. Resulting effects of Moderate and Major impacts are considered significant.

11.5.1.1.36 A detailed model of the Site and surrounding area has been constructed in SoundPLAN 9, considering geometric spreading, topography, screening, meteorological conditions and detailed information regarding the sources of noise, allowing for analysis of the predicted impact of the site for NSRs. All modelling assumptions are conservative and expected to result in slightly higher levels than those that would be measured. SoundPLAN 9 is the primary tool for assessing operational noise.

11.5.1.1.37 Elevation data to a resolution of 50 m has been used to create a digital ground model, this is appropriate due to the distances from source to receiver and there being no major topography features in the surrounding area. Detailed plans for the Proposed Development layout have been provided by SSEN Transmission and used to model the site. Satellite imagery and Ordnance Survey maps have been used to aid the modelling of the surrounding area.

11.5.1.1.38 All modelling events are for worst-case scenarios, and therefore modelling results are considered conservative worst-case results. These conservative estimates come inherently with the model parameters and environmental conditions assumed, the use of non-acoustically optimised input data where specifics are not available at this stage of the project, and the use of maximum utilisation load levels for specific items such as cooling system (where in-situ these items would operate at lower loading levels).

11.5.1.1.39 Propagation was modelled using ISO 9613-2[1], with the following parameters:

- Ground absorption: 0.0 on paved surfaces, 0.6 elsewhere.
- Receiver height: 1.5 m above ground / floor
- Temperature: 10°C
- Relative humidity: 70 %

11.5.1.1.40 Noise data for the proposed equipment have been based on design information and data from Hitachi. All noise from the units has been assumed to operate at a similar spectra to equipment of the same type, according to Hitachi. The equipment information supplied by Hitachi is non-acoustically optimised, therefore, relatively conservative at this stage of the assessment. A slight deviation has been applied to noise from the valve coolers in the converter station to reflect the utilisation of similar coolers at Blackhillock Substation and Spittal Substation. Additionally, some air handling units, chillers, and climate systems have been housed internally rather than externally.

11.5.1.1.41 In the modelling phase, the buildings that enclose the noise sources have been assumed to be treated for good acoustic reduction. The specific material sound reduction data sheet has been provided giving an overall sound

1 ISO 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation, ISO, 15 December 1996.

reduction index (Rw) of 36 dB(A). Louvres and chimneys are included on the building facades and roofs as noise breakout areas. The chimneys are also assumed to be acoustically treated, providing a Rw of 14 dB(A).

Limitations and Assumptions

11.5.1.1.42 Estimated noise emissions from the construction of the Proposed Development have been based on the assessor's experience of previous projects of a similar nature. There is always a degree of uncertainty when conducting assessments on developments prior to completion of detailed design. This assessment considers conservative assumptions to produce a worst-case assessment. This ensures that, in practicality, noise levels would be expected to be lower than the assessment details.

11.5.1.1.43 Modelled sound sources represent candidate plant only. The noise output of individual items of plant may vary from what is presented in this chapter after final plant specification. The assessment assumes all sound sources are operating continuously, simultaneously and at maximum noise output. In reality, not all sources will be operating at maximum noise level all of the time and operational noise levels may be lower than are presented in this chapter.

11.5.1.1.44 The sound level output of any auxiliary infrastructure is considered insignificant in comparison to the primary sound sources detailed in this chapter. Accordingly, no other items of plant have been considered within the assessment.

11.5.1.1.45 Unless otherwise stated, all sound levels refer to free field levels i.e. sound levels without influence from any nearby reflective surfaces.

11.5.1.1.46 In accordance with ISO 9613, all assessment locations are modelled as downwind of all sound sources. Propagation calculations are based on a moderate ground-based temperature inversion, such as commonly occurs at night.

11.5.1.1.47 Whilst some information gaps have been identified, it is considered that there is sufficient information to enable an informed decision to be taken in relation to the identification and assessment of likely significant environmental effects on noise and vibration.

TECHNICAL APPENDIX 11.6: SOURCE NOISE LEVELS

APPENDIX 11.6 SOURCE NOISE LEVELS

Table 0-1: Equipment Sound Power Levels – HVDC Converter Station

Equipment	Quantity	Housing Arrangements	Sound Power Level (SWL) (dB(A))
Alternating Current (AC) Hall Heating Ventilation Air Conditioning (HVAC)	2	External	80
Air Exhaust HVAC	4	Internal	71
Air Intake Climate System Air Handling Units (AHU)	4	Internal	70
Air Intake HVAC System AHU	4	Internal	67
Chiller	14	Internal	4 @ 70, 4 @ 80, 2 @ 85, 4 @ 92
Climate System Overpressure Fresh Air Intake	4	Internal	2 @ 68, 2 @ 71
Climate System Fresh Air Reactivation	4	Internal	2 @ 57, 2 @ 60
Climate System Wet Air Outlet	8	Internal	4 @ 40, 4 @ 71
Cooler Bank	2	External	95
DC Hall AHU	8	External	80
Exhaust Air Outlet Climate System	4	Internal	71
Relay Building HVAC	3	External	2 @ 75, 1 @ 80
Storage Building HVAC	3	External	80
Transformers Fans	6	External	80
Transformers in Building	6 (across 2 buildings)	Internal	106
Filter Reactor	6 (across 2 buildings)	Internal	75
Converter Reactor	6 (across 2 buildings)	Internal	90

Table 0-2: Equipment Sound Power Levels – AC Substation

Equipment	Quantity	Housing Arrangements	SWL (dB(A))
Air Handling Units (AHU) – 400 kV	6	Internal	3 @ 75, 3 @ 85
AC Transformer – 400 kV	2	Internal	87.0
Standby Diesel Generators	1	Internal	65.0
Earthing Transformers	2	Internal	55.0
Control Room EVAC fans – 132 kV	2	External	65.8
Wet Area EVAC fans – 132 kV	2	External	78.0

Table 0-3: Sound Reduction – Building Facades - 200mm Rockspan and Firemaster Ultima

Sound Insulation Prediction (v7.0.13)

- Key No. 2517

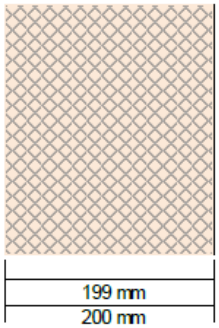
Margin of error is generally within Rw +/- 3 dB

Job Name:

Job No.: Page No.: Notes:

Date: 30 Apr 20 Initials:tim ashley

File Name: insul



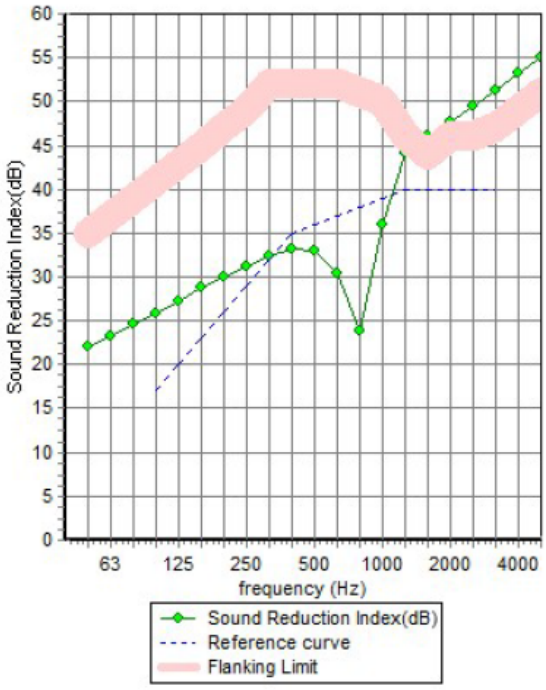
Rw	36 dB
C	-3 dB
C_{tr}	-5 dB

System description

Panel 1 Outer layer: 1 x 200.0 mm Rockspan Ultima 200mm- (m=37.7 kg/m2, fc=119690 Hz, Damping=0.01) Profile

frequency (Hz)	R(dB)	R(dB)
50	22	
63	23	23
80	25	
100	26	
125	27	27
160	29	
200	30	
250	31	31
315	32	
400	33	
500	33	32
630	30	
800	24	
1000	36	28
1250	44	
1600	46	
2000	48	48
2500	49	
3150	51	
4000	53	53
5000	55	

Panel Size 2.7x4 m



TECHNICAL APPENDIX 11.7: LZ90 SPECTRA

TECHNICAL APPENDIX 11.7 LZ90 SPECTRA

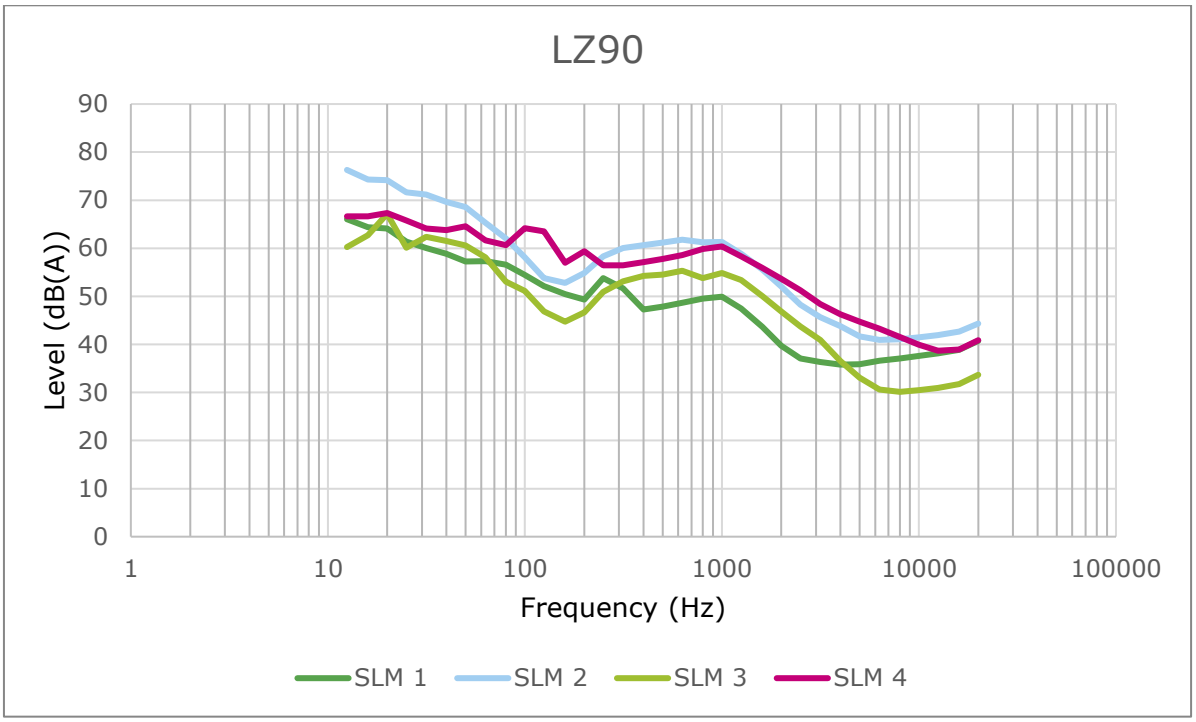


Figure 0-1: Daytime Measured LZ90 Frequency Spectra at Measured Locations

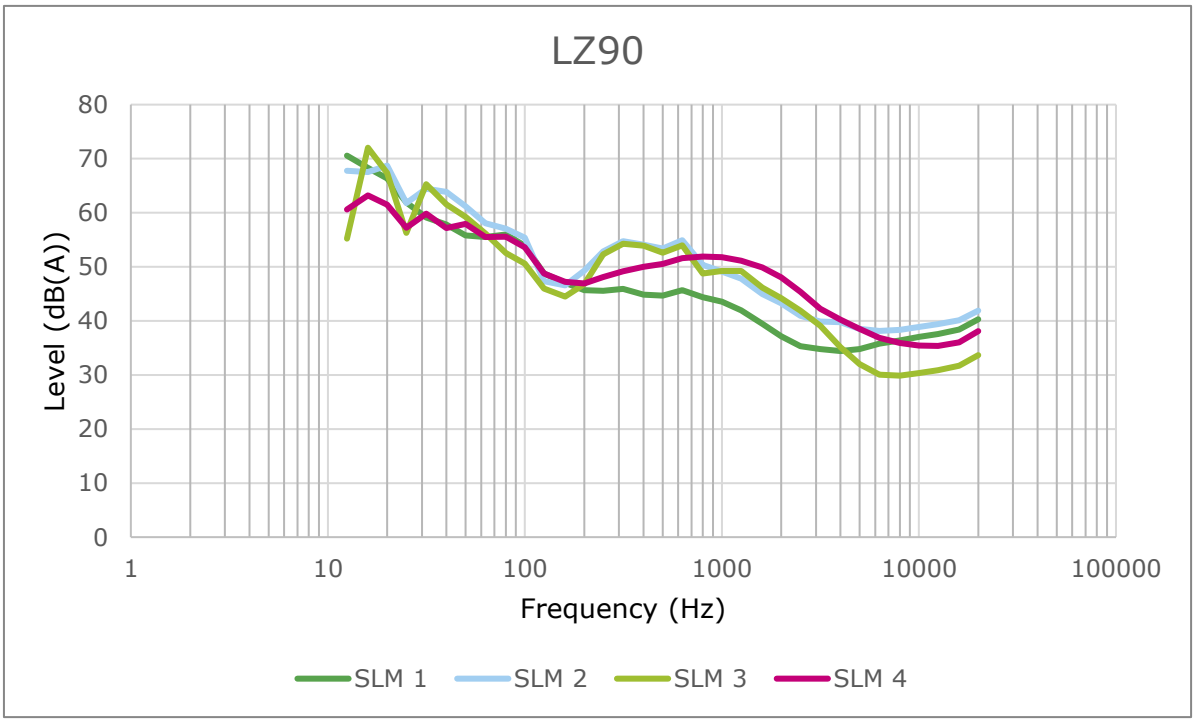


Figure 0-2: Night-time Measured LZ90 Frequency Spectra at Measured Locations

TECHNICAL APPENDIX 11.8: CONSTRUCTION ACTIVITIES

A.1 WORST CASE CONSTRUCTION ACTIVITIES AND ASSOCIATED NOISE LEVELS FOR PLATFORM WORKS

Activity	Plant Item	Quantity	Utilisation %	Sound Power, LW (dB(A))	Sound Power corrected for quantity and utilisation, LW (dB(A))	L_{Aeq} at 10 m (dB)
Access, Enabling Works, and Platform Creation	C2.16 Tracked Excavator	4	90%	107	113	85
	C6.26 Articulated Dump Truck	4	90%	107	113	85
	C1.13 Tracked Excavator	2	80%	114	116	89
	C1.14 Tracked Crusher	2	80%	109	111	84
	C5.27 Vibratory Roller	2	80%	95	97	69
	C5.28 Vibratory Roller	2	80%	103	105	77
	C4.88 Water Pump (Diesel)	3	70%	97	100	72
	C2.34 Lorry	2	50%	108	108	80
	C8.20 Tipper Lorry	1	20%	107	100	73
	C4.55 Telescopic Handler	4	40%	99	101	73
	C6.38 Tractor (Towing Water Bowser)	1	80%	111	111	83
	C4.21 Large Lorry Concrete Mixer	2	30%	105	103	75
	C5.14 Bulldozer	1	50%	113	110	82
	C4.79 Diesel Generator	2	30%	92	90	62
	C4.86 Diesel Generator	10	50%	93	100	73
	C6.31 Grader	2	60%	115	115	87
	C9.15 Tracked Semi-Mobile Crusher	2	60%	124	125	97
Total					127	99

A.2 WORST CASE CONSTRUCTION ACTIVITIES AND ASSOCIATED NOISE LEVELS FOR PEAT WORKS

Activity	Plant Item	Quantity	Utilisation %	Sound Power, LW (dB(A))	Sound Power corrected for quantity and utilisation, LW (dB(A))	L_{Aeq} at 10 m (dB)
Access, Enabling Works, and Platform Creation	C2.16 Tracked Excavator	4	90%	107	113	85
	C6.26 Articulated Dump Truck	3	90%	107	111	84
	C8.20 Tipper Lorry	3	20%	107	105	77
	C5.14 Bulldozer	1	50%	113	110	82
	C4.79 Diesel Generator	1	30%	92	87	59
	C4.86 Diesel Generator	2	50%	93	93	66
Total					117	89

A.3 WORST CASE CONSTRUCTION ACTIVITIES AND ASSOCIATED NOISE LEVELS FOR CIVIL WORKS

Activity	Plant Item	Quantity	Utilisation %	Sound Power, LW (dB(A))	Sound Power corrected for quantity and utilisation, LW (dB(A))	L_{Aeq} at 10 m (dB)
Civil Works	C2.16 Tracked Excavator	3	70%	101	104	76
	C2.24 Tracked Excavator	1	70%	107	105	77
	C6.26 Articulated Dump Truck	2	70%	107	109	81
	C1.1 Breaker Mounted On Wheeled Backhoe	1	10%	120	110	82
	C5.27 Vibratory Roller	1	40%	95	91	63
	C5.28 Vibratory Roller	1	40%	103	99	71
	C4.88 Water Pump (Diesel)	4	20%	97	96	68
	C2.34 Lorry	10	70%	108	117	89
	C8.20 Tipper Lorry	2	60%	107	108	80
	C4.55 Telescopic Handler	2	70%	99	100	72
	C4.41 Mobile Telescopic Crane	3	90%	99	103	75
	C6.38 Tractor (Towing Water Bowser)	2	60%	111	112	84
	C4.21 Large Lorry Concrete Mixer	5	60%	105	110	82
	C4.50 Tracked Mobile Crane	1	90%	99	98	70
	C4.59 Diesel Scissor Lift	3	60%	106	109	81
	C4.86 Diesel Generator	10	40%	93	100	72
Total					121	93

A.4 WORST CASE CONSTRUCTION ACTIVITIES AND ASSOCIATED NOISE LEVELS FOR TRANSFORMERS INSTALLATION

Activity	Plant Item	Quantity	Utilisation %	Sound Power, LW (dB(A))	Sound Power corrected for quantity and utilisation, LW (dB(A))	L_{Aeq} at 10 m (dB)
Transformer Installation	C2.34 Lorry	2	50%	108	108	80
	C4.55 Telescopic Handler	1	70%	99	97	69
	C4.41 Mobile Telescopic Crane	1	60%	99	97	69
	C4.74 Tractor (Towing Equipment)	1	30%	108	103	75
	C4.59 Diesel Scissor Lift	2	80%	106	108	80
Total					112	93

A.5 WORST CASE CONSTRUCTION ACTIVITIES AND ASSOCIATED NOISE LEVELS FOR BALANCE OF PLANT WORK

Activity	Plant Item	Quantity	Utilisation %	Sound Power, LW (dB(A))	Sound Power corrected for quantity and utilisation, LW (dB(A))	L_{Aeq} at 10 m (dB)
Balance of Plant Work	C4.59 Diesel Scissor Lift	6	50%	91	96	68
	C4.41 Mobile Telescopic Crane	1	20%	99	92	64
	C4.55 Telescopic Handler	2	50%	99	99	71
Total					101	73

A.6 WORST CASE CONSTRUCTION ACTIVITIES AND ASSOCIATED NOISE LEVELS FOR BUNDING, LANDSCAPING AND REMOVAL OF TEMPORARY LAYDOWN AND WELFARE

Activity	Plant Item	Quantity	Utilisation %	Sound Power, LW (dB(A))	Sound Power corrected for quantity and utilisation, LW (dB(A))	L_{Aeq} at 10 m (dB)
Bunding, Landscaping and Removal of Temporary Laydown and Welfare	C2.24 tracked excavator	2	30%	101	99	71
	C2.14 tracked excavator	1	20%	107	100	72
	c6.26 articulated dump truck	1	10%	107	97	69
	c5.27 vibratory Roller	1	10%	95	85	57
	c4.88 water pump (diesel)	1	20%	97	90	62
	C2.34 Lorry	2	25%	108	105	77
	c4.55 telescopic handler	1	5%	99	86	58
	C6.38 Tractor (towing water bowser)	1	10%	111	101	73
	C5.14 Bulldozer	1	10%	113	103	75
	c4.79 diesel generator	1	10%	92	82	54
Total					110	82

TECHNICAL APPENDIX 11.9: CONSTRUCTION NOISE ASSESSMENT

TECHNICAL APPENDIX 11.9 CONSTRUCTION NOISE ASSESSMENT

Table 1.9.1 BS 5228-1 Assessment – Evenings and Weekends

NSR	Distance to Boundary of Site (m)	Access, Enabling Works and Platform Creation SPL at Receptor (dB)	Construction Noise Limit Exceedance SPL at Receptor (dB)	Civils Platform Works SPL at Receptor (dB)	Construction Noise Limit Exceedance	Transformer Installation SPL at Receptor (dB)	Construction Noise Limit Exceedance	Balance of Plant Works SPL at Receptor (dB)	Construction Noise Limit Exceedance	Bunding, Landscaping and Removal of Temporary Laydown and Welfare Works SPL at Receptor (dB)	Construction Noise Limit Exceedance
Creed Lodge	612	60	5	54	-1	55	0	45	-10	47	-8
Macauley Farm	180	72	17	65	10	66	11	47	-8	55	0
Lochside Arena	390	64	9	58	3	59	4	43	-12	48	-7
Creed Recycling Centre	520	61	6	55	0	56	1	42	-13	46	-9
Castle Grounds South Path	580	61	6	54	-1	55	0	42	-13	45	-10
Castle Grounds North of River	512	62	7	55	0	56	1	42	-13	46	-9
Castle Grounds Cnoc an Croich	970	56	1	50	-5	50	-5	42	-13	43	-12
Castle Grounds Path West	550	61	6	55	0	55	0	42	-13	46	-9
19B Moor Cottages	161	63	8	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Riverside	124	65	10	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

TECHNICAL APPENDIX 11.10: NOISE CONTOUR MAP

TECHNICAL APPENDIX 11.10 NOISE CONTOUR MAP