HORIZON
NUCLEAR POWER

WYLFA NEWYDD

ENERGY WORKING FOR BRITAIN

Wylfa Newydd Project

6.2.20 ES Volume B - Introduction to the environmental assessments App B6-1 - Baseline noise monitoring

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This suite of documents was prepared and consulted on during the early stages of the project design, and therefore the project details have been superseded by that presented in Volume A (Application Reference Number 6.1) of the Environmental Statement.

HORIZON NUCLEAR POWER

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Baseline Noise Monitoring Plan

Wylfa Newydd main site and surrounds

DCRM Ref Number: HNP-S5-PAC-REP-00020 – Appendix B6.01

Revision: 1

Additional Requirements or Controls			
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Approvals Table				
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Originated by	Document Author	Gail Hitchins	[redacted]	21/10/14
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Approved by	EMT Representative	Rob Bromley	[redacted]	22/10/14

Revision History				
Date	**Rev No.**	**Summary of Changes**	**Ref Section**	**Purpose of Issue**
22/10/14	0.1			Approved by HNP and issue to NRW and IACC
15/10/15	0.2	Changes to Power Station Site and Wylfa Newydd Development Area boundaries	Fig.1.	PEIR2
15/12/15	0.3	Minor update following proof readers comments		
Jan2018	1	Final version		For issue

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1 About this Report

1.1 Purpose and Applicability

This Technical Note sets out the proposed approach to the baseline noise monitoring required to support the Environmental Impact Assessment (EIA) process for the main site of the Wylfa Newydd Project (known as the Power Station Site). The baseline noise data will also be used to support the Environmental Permit (EP) application(s) required for the Wylfa Newydd Power Station (Power Station).

This Technical Note is to form a basis of consultation regarding the baseline noise monitoring to be carried out with the Environmental Health Officer (EHO) at Isle of Anglesey County Council (IACC) and relevant personnel from Natural Resources Wales (NRW). The former will be responsible for the regulation of the enabling works, construction process and operation of the Power Station. The latter will be responsible for the regulation of activities subject to the EPs.

1.2 Responsible Parties

Table 1: Responsible Parties

RESPONSIBLE PARTY	DESCRIPTION
Horizon	Horizon Nuclear Power Ltd is a UK energy company developing a new generation of nuclear power stations. Wholly-owned subsidiary of Hitachi Ltd. Horizon will be responsible for supplying certain elements of the input data required for the noise and vibration assessments. The Horizon EIA and EP teams will be responsible for review of the noise and vibration assessments.
Jacobs	Consultants appointed by Horizon to undertake the Environmental Impact Assessments (EIA) and support the EP applications for the Power Station and associated developments. Jacobs will be undertaking the baseline noise monitoring.
IACC	IACC is the local Planning Authority responsible for determining the planning applications made under the Town and Country Planning Act (1990 as amended), and is a key consultee for the Development Consent Order (DCO). The IACC Environmental Health Department is a key consultee for all EIAs and EP applications. IACC will be responsible for the regulation of all construction activities for the Power Station and associated developments, and for the regulation of all aspects not subject to an EP. IACC also have responsibilities for noise regulation under the Statutory Nuisance regime under the Environmental Protection Act 1990.
NRW	NRW will determine the EP application(s), and will have responsibility for the regulation of those operational activities covered by the Permits.

2 Introduction

2.1 Previous Work

A baseline noise survey was undertaken in 2010 by Spectrum Acoustic Consultants, (Spectrum) after liaison with the IACC EHO. Noise monitoring was undertaken at the following four locations, for a period of two-three weeks:

- Felin Cafnan
- Tyn Refail, Tregele
- Clovelly, A5025
- Park Lodge, west of Cemaes

Noise levels at the monitoring locations were considered by Spectrum to be dominated by local and distant road traffic noise. In addition, noise generated by the passage of wind in vegetation and trees was also considered to influence baseline noise levels.

The survey identified that the existing Magnox power station (Existing Power Station) does contribute to the background noise levels in the surrounding area, under certain wind conditions. At the time of the 2010 survey, the Existing Power Station was generating electricity from two nuclear reactors. The National Grid transformer adjacent to the Existing Power Station was also found to contribute to the ambient noise environment of the local area. Noise from wind turbines in the area was considered by Spectrum to be ‘not significant’ in the area.

2.2 Survey Aim

The aim of this 2014 baseline noise survey will be to characterise the existing noise levels at the noise sensitive receptors in the vicinity of the Power Station Site. A 2014 survey is considered necessary, to ensure any changes in the noise climate since 2010 are captured and thus the EIA and EP assessments are based on the most up-to-date background and ambient noise level data available. Of particular note is that the Existing Power Station has now reduced its generation activities to one reactor.

The survey outlined by this baseline monitoring plan will characterise noise levels at sensitive receptors in the vicinity of the Power Station Site, and the adjacent site where there may be further development. The data will be used to support the applications for the Wylfa Newydd Power Station DCO.

It is recognised that additional noise monitoring will be required to support the associated development as part of the DCO and further Technical Notes detailing noise monitoring proposals in these areas will be developed.

3 Site Description

3.1 Noise Sensitive Receptors

Planning Guidance Technical Advice Note (Wales) 11: Noise (TAN11) identifies residential areas as noise sensitive, in addition to recognising that offices, hospitals and schools will contain buildings and activities that are noise sensitive.

Noise sensitive receptors in Tregele, Cemaes and the more sparsely populated area to the south and west of the Power Station Site are likely to be most affected by noise and vibration associated with construction activities. The land within and around the Power Station Site is undulating and characterised by drumlin topography with nearby properties generally having a partial view of the Power Station Site. Topography will influence both baseline and future noise levels experienced by noise sensitive receptors.

For the purpose of this Baseline Noise Monitoring Plan, the following groups of noise sensitive receptors have been defined:

- Cemaes village;
- Tregele village;
- Properties on A5025 between Cemaes and Tregele;
- Individual properties east of Wylfa Newydd site; and
- Individual properties south and west of the Wylfa Newydd site.

Noise monitoring is proposed to be carried out at sufficient locations to enable the noise levels for each receptor group to be characterised.

3.2 Existing Noise Sources

The baseline noise levels at the sensitive receptors identified in section 3.1 are considered likely to be influenced by a number of sources. Those that may affect current noise levels are summarised below:

- Local and distant road traffic;
- Wind effects on vegetation;
- Human activity, especially in Cemaes and Tregele villages;
- Aircraft movements;
- Meteorological conditions (e.g. rainfall);
- Existing Power Station generation activities;
- National Grid Transformer;
- Waves on shoreline;
- Wind turbines;
- Existing Power Station decommissioning activities; and
- Wylfa Newydd Project ground investigation activities.

It is recognised that the influence of each of these sources will be variable. Furthermore, there are some sources (such as the Existing Power Station generation and Power Station Site ground investigation activities) which will not be present in the future, during the construction and/or operational phases of Wylfa Newydd Project. The choice of monitoring location and micro-siting of the equipment at each location will seek to minimise the influence of noise from these sources. If necessary, processing of the monitoring data (e.g. by removing data under downwind conditions) can be undertaken to further reduce the influence of these noise sources on baseline noise levels.

The proposed survey duration of four weeks should ensure that the natural variability in other noise sources is fully characterised, enabling a robust baseline to be established.

4 Guidance Documents

4.1 British Standards

The following British Standards are considered to be relevant to the proposed baseline noise monitoring:

- BS4142:1997 Method for rating industrial noise affecting mixed residential and industrial areas
- BS 7445:2003 'Description and Measurement of Environmental Noise

5 Proposed Noise Monitoring Scheme

5.1 Noise Monitoring Locations

A site visit was carried out on Monday 19 May 2014 to identify suitable monitoring locations. During the site visit, observations on audible noise sources and area layout (presence of structures acting as acoustic barriers, acoustic effects of topography, ease of access etc.) were also made. The objective of the site visit was to identify monitoring locations which are likely to exhibit noise levels typical of a group of noise sensitive receptors.

The candidate noise monitoring locations identified are listed in table 2.

Table 2: Proposed Monitoring Locations

RECEPTOR GROUP	PREFERRED LOCATION	IST ALTERNATIVE	2ND ALTERNATIVE
Cemaes	14 Cae Derwydd	15 Cae Derwydd	16 Cae Derwydd
A5025	Mon Manaw, Ffordd Caergybi	Bron Wylfa, Ffordd Caergybi	Nant y Gof
Tregele	Marajon, Cae Garnedd	6 Cae Garnedd	8 Cae Garnedd

RECEPTOR GROUP	PREFERRED LOCATION	IST ALTERNATIVE	2ND ALTERNATIVE
Properties west of Power Station	Maes-y-Bugail	Pencarreg	Swn-y-Mor
Properties south of Power Station	Hafan (opposite Jam Factory)	The Cottage, west of Neuadd	Property south of The Cottage, west of Neuadd
Properties east of Power Station	Tre’r-gof-isaf	N/A	N/A

The equipment will be sited in a location where noise levels are considered representative of typical low levels likely to be experienced in the vicinity of the receptor. The Institute of Acoustics’ Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbines (2013) contains guidance on the siting of noise measuring equipment for the purposes of establishing typical background noise levels at noise sensitive locations in the vicinity of proposed wind turbine developments. It is considered that this aspect of the guidance is also relevant to the proposed survey, and will be taken into account when siting equipment.

On installation, all equipment will be photographed from at least two directions and observations on its location fully recorded along with GPS co-ordinates.

The choice of final monitoring locations was influenced by a number of constraints including ease of access and equipment security. The final locations are detailed in Table 3 and presented in Figure 1.

Table 3: Selected Monitoring Locations

RECEPTOR GROUP	SELECTED LOCATION
Cemaes	10 Maes Capel
A5025	Bron Wylfa, Ffordd Caergybi
Tregele	Ysgubor Ddegwm, Tregele
Properties west of Power Station	Maes-y-Bugail (plus Swn-y-Mor for 2 weeks)
Properties south of Power Station	Hafan (opposite Jam Factory)
Properties east of Power Station	Tre’r-gof-isaf

5.2 Noise Measurement Instrumentation

Ambient noise levels will be measured using an integrating-averaging sound level meter (SLM) or equivalent system conforming to Class 1 as defined by BS EN 61672:Part1:2013 (Electroacoustics, Sound Level Meters, Specifications). The SLM will be field calibrated before the start of each survey by applying an acoustic calibrator or pistonphone conforming to the latest versions of BS EN 60942:2003 (Electroacoustics - Sound Calibrators) to the microphone to check the sensitivity of the measuring equipment and checked at the end. Any drift in calibration levels will be noted.

The equipment used for the noise monitoring should also have undergone more extensive independent laboratory tests of the performance of the system within a period of two years prior to use.

Measurements of meteorological parameters (including wind speed, direction and rainfall) are made by the existing on-site meteorological station. The noise monitoring equipment will be time synchronised with met mast, to ensure that noise and met data can be correlated during the baseline data processing exercise.

5.3 Noise Survey Specification

Noise monitoring will be undertaken by suitably qualified and experienced Jacobs employees. This means qualified to the Institute of Acoustics Certificate of Competence in Environmental Noise Monitoring, or the Diploma in Acoustics and Noise Control, as a minimum.

Since the Power Station will operate on a continuous basis, noise measurements will also be undertaken on a continuous basis during the survey to ensure adequate characterisation of noise levels during the normal working day, evening, night time and weekend periods. The survey was planned to be of four weeks duration, commencing in mid to late September 2014. The equipment will be checked, calibrated and data downloaded on a weekly basis to ensure battery levels remain adequate and the instrumentation performs appropriately.

The microphone height will be between 1.2m and 1.5m above ground level. To minimise the influence of reflections, the microphone position will be at least 3.5m from any reflecting surface other than the ground. In the event of measurements having to be made within 3.5m of reflecting facades, a correction of 3dB should be made to all results to convert them to free-field levels.

To minimise the influence on the noise readings from extraneous sources of physical interference, the following will be adopted:

- a suitable foam windshield (conforming to Class 1 of BS EN 61672 in dry conditions, and Class 2 if saturated with 100mm of water) will be fitted to the microphone;
- data from the met mast will be used to identify periods of adverse weather conditions (rainfall, or wind speeds in excess of 5m/s), and data from these periods will be excluded from further analysis; and
- no noise measurements would be undertaken immediately adjacent to sources of electrical interference such as overhead power cables or radio transmitters.

At each location, noise would be measured using the logging facility and a sampling time of 100ms, with the A weighting and 'fast' time weighting selected.

A note of the type of instrumentation used for the surveys will be made, including serial number and any calibration details.

5.4 Parameters to be Measured

It is likely that noise limits for the construction and operation of the Power Station set by relevant DCO/planning conditions will be based on the L_{Aeq} and L_{A90} parameters over specified periods of time. These are defined below:

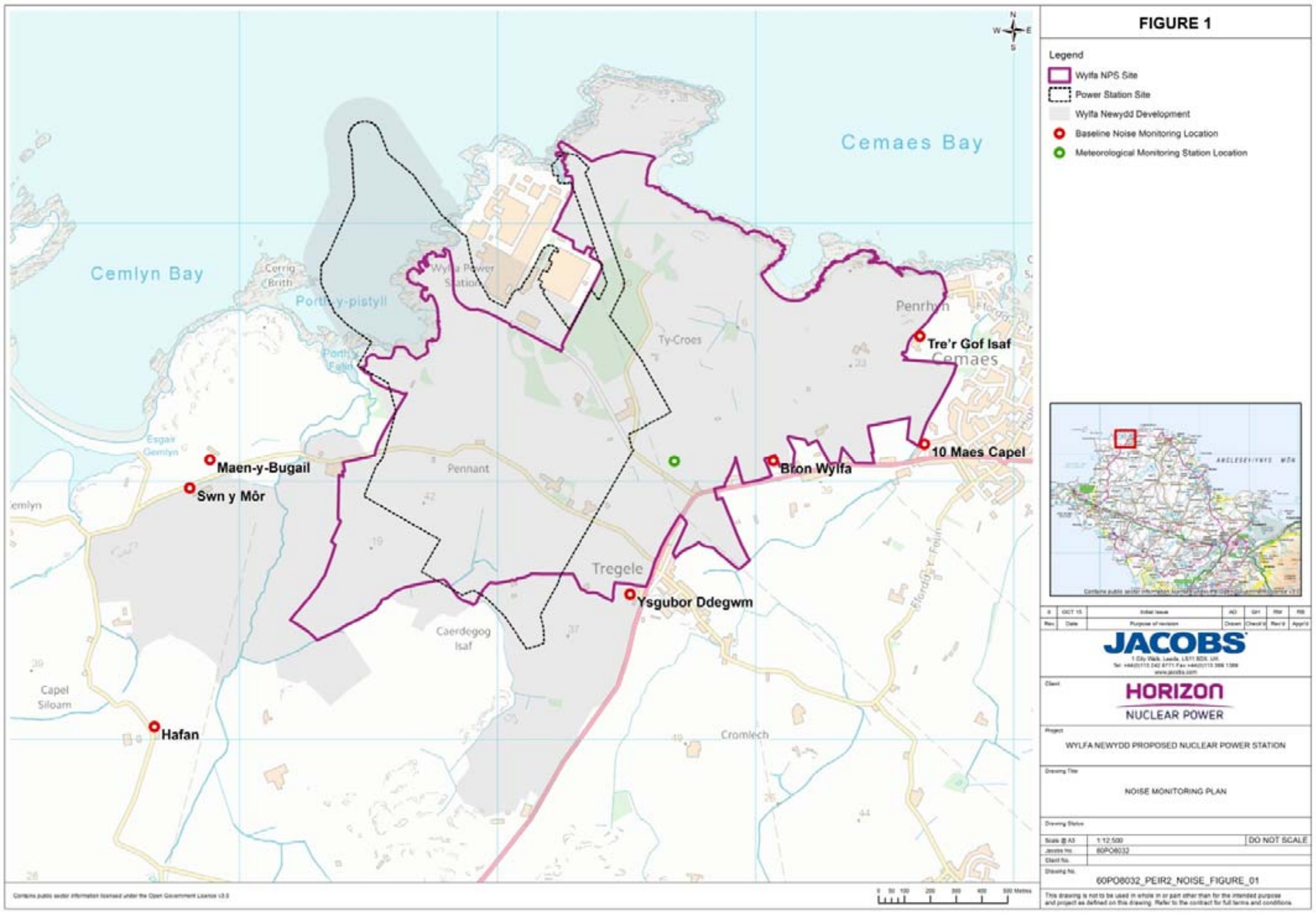
- L_{Aeq} is the equivalent continuous sound level and is the sound level of a steady sound having the same energy as a fluctuating sound over the same period. It is possible to consider this level as the ambient noise encompassing all noise at a given time. L_{Aeq} is considered the best general purpose index for environmental noise.
- L_{A90} – this index represents the noise level exceeded for 90 percent of the measurement period and is used to indicate quieter times during the measurement period. It is usually referred to as the background level.

The 100ms data recorded during the survey can be used to calculate a variety of noise parameters over a range of required time periods, including:

- $L_{Aeq\ T}$;
- $L_{A90\ T}$;
- L_{A10} – this index represents the noise level exceeded for 10 percent of the measurement period, and is a widely used descriptor of traffic noise;
- L_{Amax} – the maximum recorded noise level during the measurement period; and
- L_{Amin} – the minimum recorded noise level during the measurement period.

Observations will be made regarding audible noise sources, with particular attention paid to noise emanating from the Power Station Site or Existing Power Station.

Figure 1 Noise monitoring locations



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Baseline Noise Monitoring Plan

A5025 Road Improvement Scheme

DCRM Ref Number: WN03.03.01-S5-PAC-TEC-00006 – Appendix B6-01

Revision: 1

Additional Requirements or Controls			
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Approvals Table				
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Originated by	Document Author	Gail Hitchins	[redacted]	16/03/2015
Reviewed by	Document Reviewer	Sam Williams		16/03/2015
Checked by	Head of Section	Sam Williams		16/03/2015
Approved by	EMT Representative	Jamie Gleave		16/03/2015

Revision History				
Date	**Rev No.**	**Summary of Changes**	**Ref Section**	**Purpose of Issue**
26/02/15	0.1			For Horizon comment
16/03/15	0.2	Change format of grid references to British National Grid 6 figure eastings and northings.		Response to Horizon comment
15/10/15	0.3	Minor amendments to drawings Final monitoring locations detailed	Figs 1-4 Table 3	PEIR2
15/12/15	0.4	Amended following proof readers comments		
Jan2018	1			For issue

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1 About this Report

1.1 Purpose and Applicability

This Technical Note sets out the proposed approach to the baseline noise monitoring required as part of the Environmental Impact Assessment (EIA) for the proposed A5025 online and offline road improvements, which form part of the Wylfa Newydd Project. Baseline noise monitoring in the vicinity of the proposed new nuclear power station on Anglesey (the Power Station) has been detailed in a separate Technical Note (DCRM Ref Number: HNP-S5-PAC-REP-00020, dated October 2014).

This Technical Note is to form the basis of consultation regarding the baseline noise monitoring, to be carried out with the Environmental Health Officer (EHO) at Isle of Anglesey County Council (IACC) and relevant personnel from Natural Resources Wales (NRW). The former will be responsible for determining the relevant planning application(s) and for the regulation of the construction process. The latter will be a statutory consultee on the planning application(s).

1.2 Responsible Parties

Table 1: Responsible Parties

RESPONSIBLE PARTY	DESCRIPTION
Horizon	Horizon Nuclear Power Ltd is a UK energy company developing a new generation of nuclear power stations. Wholly-owned subsidiary of Hitachi Ltd. Horizon will be responsible for supplying certain elements of the input data required for the noise and vibration assessments. The Horizon EIA team will be responsible for review of the traffic and road construction noise and vibration assessments.
Jacobs	Consultants appointed by Horizon to undertake the Environmental Impact Assessments (EIA) for the Power Station and Associated Developments. Jacobs will be undertaking the baseline noise monitoring.
IACC	IACC is the Local Planning Authority responsible for determining planning applications made under the Town and Country Planning Act (1990) (as amended), and is a statutory consultee for the Development Consent Order (DCO) application. IACC's Environmental Health Department is a key consultee for all EIAs. IACC will be responsible for the regulation of all construction activities for the Power Station and associated developments, and for the regulation of all aspects not subject to an Environmental Permit (EP). IACC also have responsibilities for noise regulation under the Statutory Nuisance regime under the Environmental Protection Act 1990.

RESPONSIBLE PARTY	DESCRIPTION
NRW	NRW will determine the EP application(s), and will have responsibility for the regulation of those operational activities covered by the Permits. NRW do not have any direct regulatory responsibility for traffic noise, but are likely to be a consultee on the A5025 planning application(s).

2 Introduction

2.1 Previous Work

The baseline noise monitoring survey undertaken in October and November 2014 for the Power Station Site and its surrounds included two locations in close proximity to the A5025:

- Ysgubor Ddegwm, Tregele, (south of fuel filling station) – Approximate British National Grid Coordinates 235475, 392553
- Bron Wylfa, Ffordd Caergybi, located between the site access road to the existing power station and Cemaes - Approximate British National Grid Coordinates 236070, 393073

Monitoring at both of these locations was undertaken in rear gardens, with the dwellings providing screening from the closest part of the A5025. This was appropriate for the Power Station Site baseline survey, since its objective was to characterise the lowest typical noise levels experienced by receptors in close proximity to the Power Station. The survey at both locations was continuous over a period of over four weeks. Noise levels were found to be influenced by local and distant traffic, along with noise from the wind acting on vegetation. Noise from the existing power station and/or transformers was audible at night.

A previous baseline noise survey was undertaken in 2010 by Spectrum Acoustic Consultants, (Spectrum) after liaison with the IACC EHO. Noise monitoring was undertaken at two locations on the A5025, for a period of 2-3 weeks:

- Tyn Refail, Tregele – this location had clear line of sight to the A5025.
- Clovelly, Ffordd Caergybi, located between the site access road to the Existing Power Station – this location was in the rear garden, and screened from road traffic noise on the adjacent A5025.

Noise levels at the monitoring locations were considered by Spectrum to be dominated by local and distant road traffic noise. In addition, noise generated by the passage of wind in vegetation and trees was also considered to influence baseline noise levels.

Due to the spatial extent of the A5025 proposals, and the fact that some previous monitoring locations were deliberately screened from road traffic noise, it is necessary to carry out a baseline survey specifically designed to characterise road traffic noise generated by the A5025.

2.2 Survey Aim

The survey outlined by this baseline monitoring plan will characterise noise levels at sensitive receptors in the vicinity of sections of the A5025 expected to experience noticeable changes in traffic noise due to physical alterations to the carriageway's horizontal and/or vertical alignment, through the introduction of other components as part of the A5025 proposals, or through additional vehicle movements associated with the construction and operation of other elements forming the Wylfa Newydd Project. The survey aims are developed further below.

- Characterise existing daytime and night-time traffic noise levels along the existing route to enable validation of the baseline traffic noise models.
- Characterise existing daytime and night-time ambient noise levels at receptors close to the offline improvement areas, to inform the road construction noise assessment (it is envisaged that the online improvements will be much more focused in their scope and duration, and hence monitoring is not proposed specifically at these locations).
- Characterise the existing daytime and night-time road traffic noise levels at receptors close to the offline improvement sections, to inform the road traffic noise assessments.
- Characterise existing night-time L_{Amax} noise levels at receptors close to the offline improvement sections and those existing road sections predicted to experience an increase in night-time traffic.

The data will be used to inform the noise assessments being undertaken and reported as part of the planning application for the the Power Station DCO application.

It is recognised that additional noise monitoring may be required to support the relevant planning applications for other Associated Development within the Wylfa Newydd Project and further Technical Notes detailing noise monitoring proposals in these areas will be developed as appropriate.

3 Site Description

3.1 Noise Sensitive Receptors

Planning Guidance Technical Advice Note (Wales) 11: Noise (TAN11) identifies residential areas as noise sensitive, in addition to recognising that offices, hospitals and schools will contain buildings and activities that are noise sensitive. The Design Manual for Roads and Bridges Volume 11 Section 3 Part 7 Noise and Vibration (HD213/11 Revision 1) (DMRB) also provides examples of noise sensitive receptors, namely dwellings, hospitals, schools, community facilities, public rights of way and designated areas (e.g. Sites of Special Scientific Interest).

The Institute of Environmental Management and Assessment's Guidelines for Environmental Noise Impact Assessment published in October 2014 detail additional noise sensitive receptor types, including:

- places of worship;
- open air amenities;
- cemeteries;

- farms and kennels;
- retail premises; and
- some commercial and industrial installations.

Noise sensitive receptors in the settlements along the existing A5025 and along the proposed offline improvement sections from Valley in the south, to the Power Station Site in the north, are those likely to be most affected by the offline improvements construction noise, and changes to road traffic noise from the A5025. The A5025 from Valley to the Power Station Site will be the designated site access route for the Power Station Site, however it is envisaged that some local traffic may access the site from the north and east via Cemaes and Amlwch. This section of carriageway does not form part of the A5025 proposals, however if this additional traffic is considered likely to result in substantial increases in traffic noise, the need for additional monitoring will be discussed with IACC.

For the purpose of this Baseline Noise Monitoring Plan, the following groups of noise sensitive receptors have been defined:

- Valley – area for offline improvements;
- Llanynghenedl;
- Llanfachraeth - area for offline improvements;
- Llanfaethlu - area for offline improvements;
- Llanrhyddlad;
- Llanrhwydrus/Cefn Coch - area for offline improvements; and
- Tregele.

The spatial extent of each of the receptor groups is not limited to the main settlements, but extends to include the numerous individual receptors along the road.

Noise monitoring is proposed to be carried out at sufficient locations to enable the noise levels for each receptor group to be characterised. A combination of short term attended measurements and longer term unattended measurements will be required.

3.2 Existing Noise Sources

The baseline noise levels at the sensitive receptors identified in section 3.1 are considered likely to be influenced by a number of sources. Those that may affect current noise levels are summarised below:

- local and distant road traffic;
- wind effects on vegetation;
- human activity, especially in settlements;
- agricultural activity;
- aircraft movements;
- meteorological conditions (e.g. rainfall);
- Existing Power Station generation activities (northern part of the A5025 only);
- National Grid transformer (northern part of the route only);
- Existing Power Station decommissioning activities (northern part of the A5025 only); and

- Wylfa Newydd Development Area ground investigation activities (northern part of the A5025 only).

It is recognised that the influence of each of these sources will be variable. Furthermore, there are some sources (such as the Existing Power Station generation and Wylfa Newydd Development Area ground investigation activities) which will not be present in the future, during the construction and/or operational phases of the Wylfa Newydd Project. The choice of monitoring location and micro-siting of the equipment at each location will seek to minimise the influence of noise from these sources. If necessary, processing of the monitoring data (e.g. by removing data under downwind propagation conditions) can be undertaken to further reduce the influence of these noise sources on baseline noise levels.

4 Guidance Documents

4.1 British Standards

The following British Standards are considered to be relevant to the proposed baseline noise monitoring:

- Calculation of Road Traffic Noise (1988) – Department of Transport and Welsh Office.
- Design Manual for Roads and Bridges Vol 11 Environmental Assessment Section 3 Part 7 Noise and Vibration (HD213/11 Revision 1) 2011.
- BS 7445:2003 'Description and Measurement of Environmental Noise'

5 Proposed Noise Monitoring Scheme

5.1 Noise Monitoring Locations

A desk-based review of the road improvement proposals has been undertaken. At present, there are a number of design options proposed for the offline improvements. Baseline monitoring locations should therefore provide data relevant to all options, to ensure that sufficiently robust data is available for the assessment of the preferred option when selected.

The objective of the review was to identify monitoring locations which are likely to exhibit noise levels typical of a group of noise sensitive receptors. The monitoring locations are all in close proximity to either the existing A5025 or the proposed offline improvements. These locations are likely to experience the greatest change and/or absolute noise levels during the construction and operational phases. It is recognised that receptors at greater distances may also experience noise effects from the A5025 proposals, and these will be evaluated using noise modelling for the existing scenario (DMRB states that a road in a rural area may have impacts at distances beyond 600m, however it also acknowledges that for distances greater that 600m from the road, predicted noise levels become less reliable). It is therefore considered appropriate to compare modelled existing, baseline and 'do something' (i.e. with the A5025 proposals implemented) scenarios for these locations, since the sources of inaccuracy in the model will be reflected equally in all scenarios, leaving a good indication of noise level change when comparing results).

The candidate noise monitoring locations identified are listed in Table 2.

Table 2: Proposed Monitoring Locations

RECEPTOR GROUP	SELECTED LOCATION
R1. Valley	LT: a) Glyn Villa or Preswylfa (rear garden) ST: b) Cemetery (approx 10m from existing carriageway edge)
R2. Llanynghenedl	ST: a) Layby adjacent to Converted Chapel
R3. Llanfachraeth	LT: a) Erw Goch (garden rear to east of house) LT: b) 14 Parc Lynnon (rear or side gardens, east of house) LT: c) Bedo (garden west of house) LT: d) Field to east of primary school
R4. Llanfaethlu	LT: a) Rhos Ty Mawr (east of house) LT: b) Bryn Maethlu (east of houses) ST: c) Layby north of Rhos Ty Mawr
R5. Llanrhyddlad	ST: a) Layby north of westerly turning for Cylch y Garn
R6. Cefn Coch	LT: a) Tyn Felin (garden west of house) LT: b) Residential property at Cefn Coch
R7. Tregele	LT: a) Taldwrst, Tregele.
LT: Long term ST: Short term	

At each monitoring location, the equipment will be sited in a position where noise levels are considered representative of the highest traffic noise levels (either in the existing conditions, or the likely future conditions) likely to be experienced in the vicinity of the receptor.

On installation, all equipment will be photographed from at least 2 directions and observations on its location fully recorded along with GPS co-ordinates.

The choice of final monitoring locations was influenced by a number of constraints including ease of access and equipment security. The final locations are detailed in Table 3 and presented in Figures 1-4.

Table 3: Selected Monitoring Locations

RECEPTOR GROUP	SELECTED LOCATION
R1. Valley	LT: a) Glyn Villa (garden rear of house) ST: b) Cemetery (approx. 80m from carriageway)
R2. Llanynghenedl	ST: a) Layby adjacent to Converted Chapel
R3. Llanfachraeth	LT: a) Erw Goch (garden rear of house) LT: b) Dolydd (field rear of house) LT: c) Field adj to Bryn Farm LT: d) Field adj to primary school (SE).
R4. Llanfaethlu	LT: a) Rhos Ty Mawr (garden rear of house) LT: b) Bryn Gwyn (field adj north of house) ST: c) Layby north of Rhos Ty Mawr
R5. Llanrhyddlad	ST: a) Layby north of westerly turning for Cylch y Garn
R6. Cefn Coch	LT: a) Tyn Felin (garden rear of house) LT: b) Rhandir (side garden)
R7. Tregele	LT: a) Taldwrst, Tregele. (garden rear of house)
LT: Long term ST: Short term	

5.2 Noise Measurement Instrumentation

Ambient noise levels will be measured using an integrating-averaging sound level meter (SLM) or equivalent system conforming to Class 1 as defined by BS EN 61672:Part1:2013 (Electroacoustics, Sound Level Meters, Specifications). The SLM will be field calibrated before the start of each survey by applying an acoustic calibrator or pistonphone conforming to the latest versions of BS EN 60942:2003 (Electroacoustics - Sound Calibrators) to the microphone to check the sensitivity of the measuring equipment and checked at the end. Any drift in calibration levels will be noted.

The equipment used for the noise monitoring should also have undergone more extensive independent laboratory tests of the performance of the system within a period of two years prior to use.

Measurements of meteorological parameters (including wind speed, direction and rainfall) will be made at one long term monitoring location per receptor group. For the Tregele receptors, reference will be made to the met mast at the Wylfa Newydd Development Area. The noise monitoring equipment will be time synchronised with met masts, to ensure that noise and met data can be correlated during the baseline data processing exercise.

5.3 Noise Survey Specification

Noise monitoring was undertaken by experienced Jacobs' employees, suitably qualified to the Institute of Acoustics Certificate of Competence in Environmental Noise Monitoring, or the Diploma in Acoustics and Noise Control, as a minimum.

The Wylfa Newydd Project is likely to generate traffic at various times of the day and night, and in addition the A5025 proposals will introduce permanent alterations to the existing carriageway. The baseline monitoring will therefore include some unattended long term measurement positions utilising continuous monitoring for a period of one week. This will ensure baseline conditions are characterised during the normal working day, evening, night time and weekend periods. These long term positions will be supplemented by attended shorter term measurements, undertaken in accordance with the Calculation of Road Traffic Noise (CRTN) shortened measurement procedure, being daytime measurements of three hours in duration. The primary purpose of this shorter term data is to enable comparison with modelled baseline results for the existing conditions. Additional night-time (23.00-07.00) one to two hour measurements will also be undertaken at the short term monitoring locations, with a particular focus on capturing both night-time and early morning (06.00-07.00) periods.

The microphone height will be between 1.2m and 1.5m above ground level. To minimise the influence of reflections, the microphone position will be at least 15m from any reflecting surface other than the ground. In the event of measurements having to be made within 15m of reflecting facades, the microphone will be placed 1m from the facade, or a temporary $1m^2$ screen erected behind the measurement position. A correction of -2.5 dB will be made to all facade results to convert them to free-field levels (in accordance with CTRN).

To minimise the influence on the noise readings from extraneous sources of physical interference, the following will be adopted:

- a suitable foam windshield (conforming to Class 1 of BS EN 61672 in dry conditions, and Class 2 if saturated with 100mm of water) will be fitted to the microphone;
- data from the met mast will be used to identify periods of adverse weather conditions (rainfall, or wind speeds in excess of 5m/s at 1.5m height), and data from these periods will be excluded from further analysis; and
- no noise measurements would be undertaken immediately adjacent to sources of electrical interference such as overhead power cables or radio transmitters.

At each location, noise will be measured using the logging facility and a sampling time of 100ms, with the A weighting and 'fast' time weighting selected. This will allow various noise statistics to be calculated over a range of time periods of interest.

A note of the type of instrumentation used for the surveys will be made, including serial number and calibration details.

5.4 Parameters to be Measured

CRTN requires that traffic noise is characterised by the $L_{A10\ T}$ parameter (as defined below), however DMRB recognises that the $L_{Aeq\ T}$ parameter (as defined below) is also of relevance in characterising baseline conditions in rural areas where traffic noise may not be dominant.

It is likely that noise limits for the construction of the offline improvements set out in planning conditions will be based on the L_{Aeq} parameter over specified periods of time. Definitions of all the relevant noise description parameters are provided below.

- $L_{A10\ T}$ – the A-weighted sound level that is exceeded for 10% of the measurement period (T). This is the standard index used in the UK to describe traffic noise.
- $L_{A10\ 18h}$ – the arithmetic mean of all the levels of L_{A10} during the period from 06:00 to 24:00. Correlates well with subjective response to road traffic noise, according to research.
- L_{Aeq} is the equivalent continuous sound level and is the sound level of a steady sound having the same energy as a fluctuating sound over the same period. It is possible to consider this level as the ambient noise encompassing all noise at a given time. L_{Aeq} is considered the best general purpose index for environmental noise.

The 100ms data recorded during the survey can be used to calculate a variety of statistical noise parameters over a range of required time periods, including:

- $L_{A10\ T}$;
- $L_{Aeq\ T}$;
- $L_{A90\ T}$; – this index represents the noise level exceeded for 90 percent of the measurement period and is used to indicate quieter times during the measurement period. It is usually referred to as the background level.
- L_{Amax} – the maximum recorded noise level during the measurement period; and
- L_{Amin} – the minimum recorded noise level during the measurement period.

Observations will be made regarding audible noise sources, both traffic related and those from other sources. Manual traffic counts will be made for selected short periods during the attended short term monitoring.

Figure 1

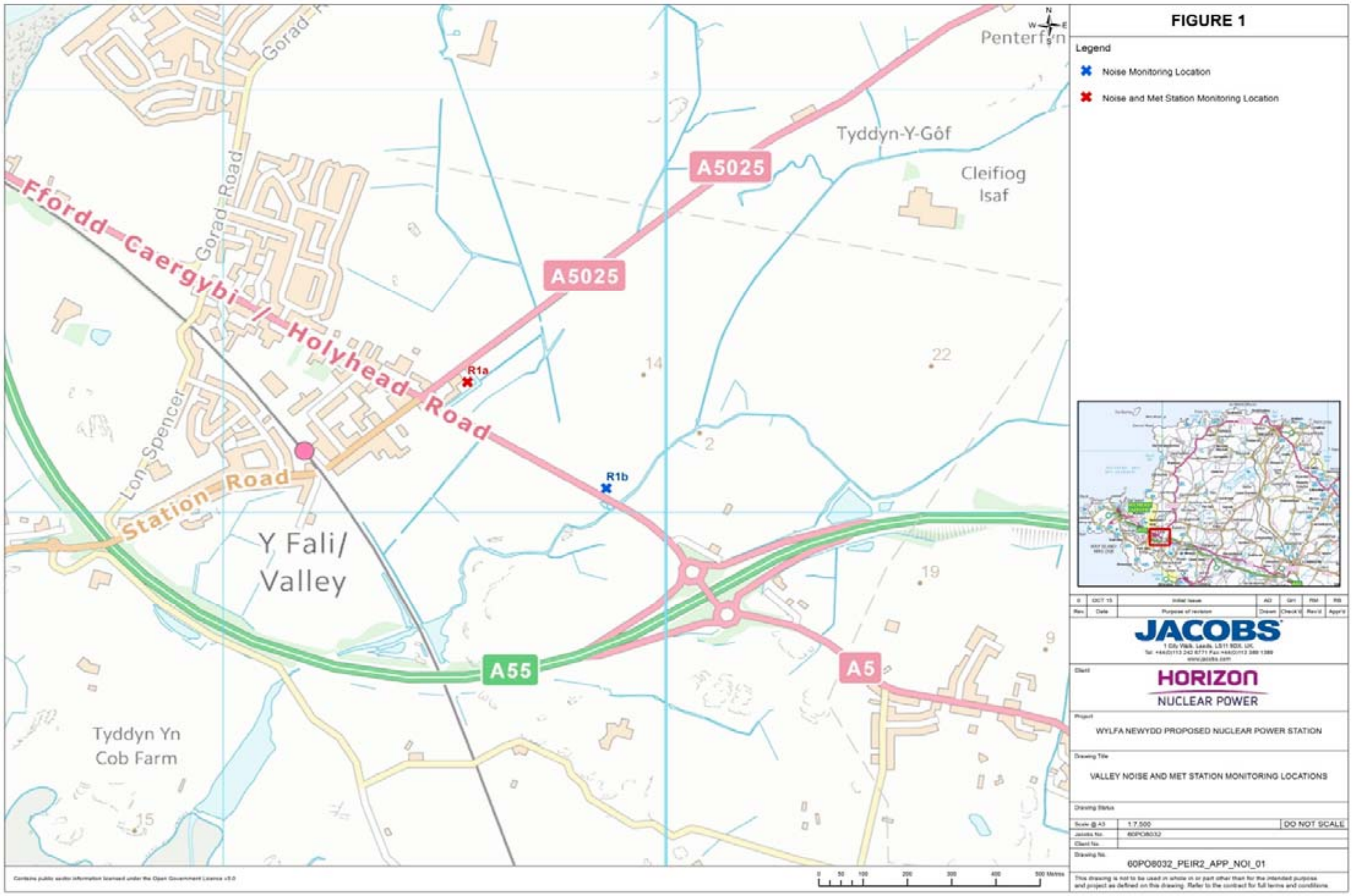

FIGURE 1
Legend
Noise Monitoring Location
Noise and Met Station Monitoring Location
Penterfyn
Tyddyn-Y-Gôf
Cleifiog Isaf
A5025
A5025
Ffordd Caergybi / Holyhead Road
Gorad Road
Gorad Road
Lon Spencer
Station Road
R1a
R1b
Y Fali/ Valley
A55
A5
Tyddyn Yn Cob Farm
14
22
2
19
9
15
0 50 100 200 300 400 500 Metres
JACOBS
HORIZON
NUCLEAR POWER
WYLFA NEWYDD PROPOSED NUCLEAR POWER STATION
VALLEY NOISE AND MET STATION MONITORING LOCATIONS
1:7,500
DO NOT SCALE
60PO8032_PEIR2_APP_NOI_01

Figure 2

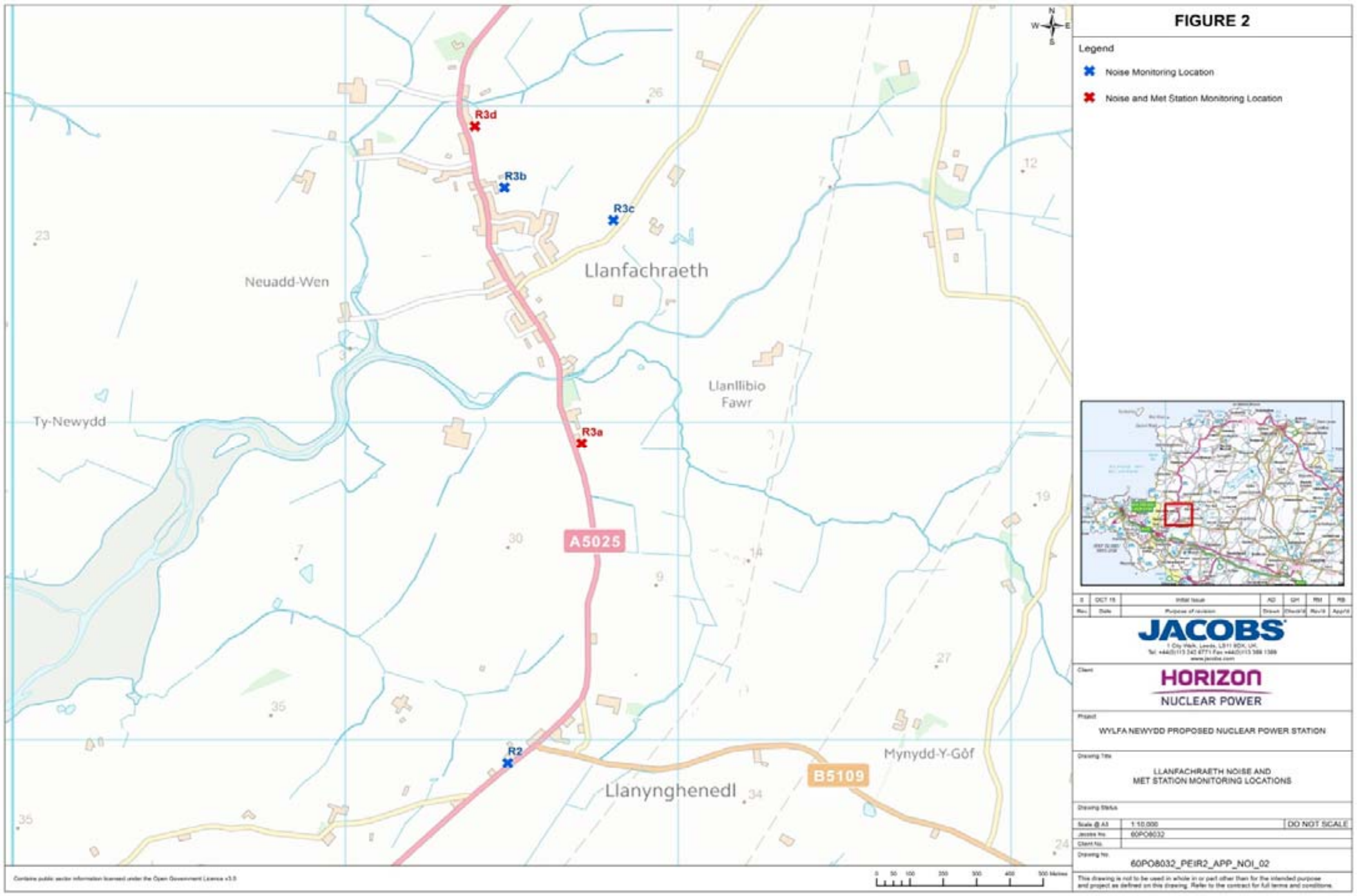

FIGURE 2
Legend
Noise Monitoring Location
Noise and Met Station Monitoring Location
R3d
R3b
R3c
R3a
R2
Llanfachraeth
Neuadd-Wen
Ty-Newydd
Llanllibio Fawr
A5025
B5109
Mynydd-Y-Gôf
Llanynghenedl
JACOBS
HORIZON
NUCLEAR POWER
WYLFA NEWYDD PROPOSED NUCLEAR POWER STATION
LLANFACHRAETH NOISE AND MET STATION MONITORING LOCATIONS
1:10,000
DO NOT SCALE
60PO8032
60PO8032_PEIR2_APP_NOI_02

Figure 3

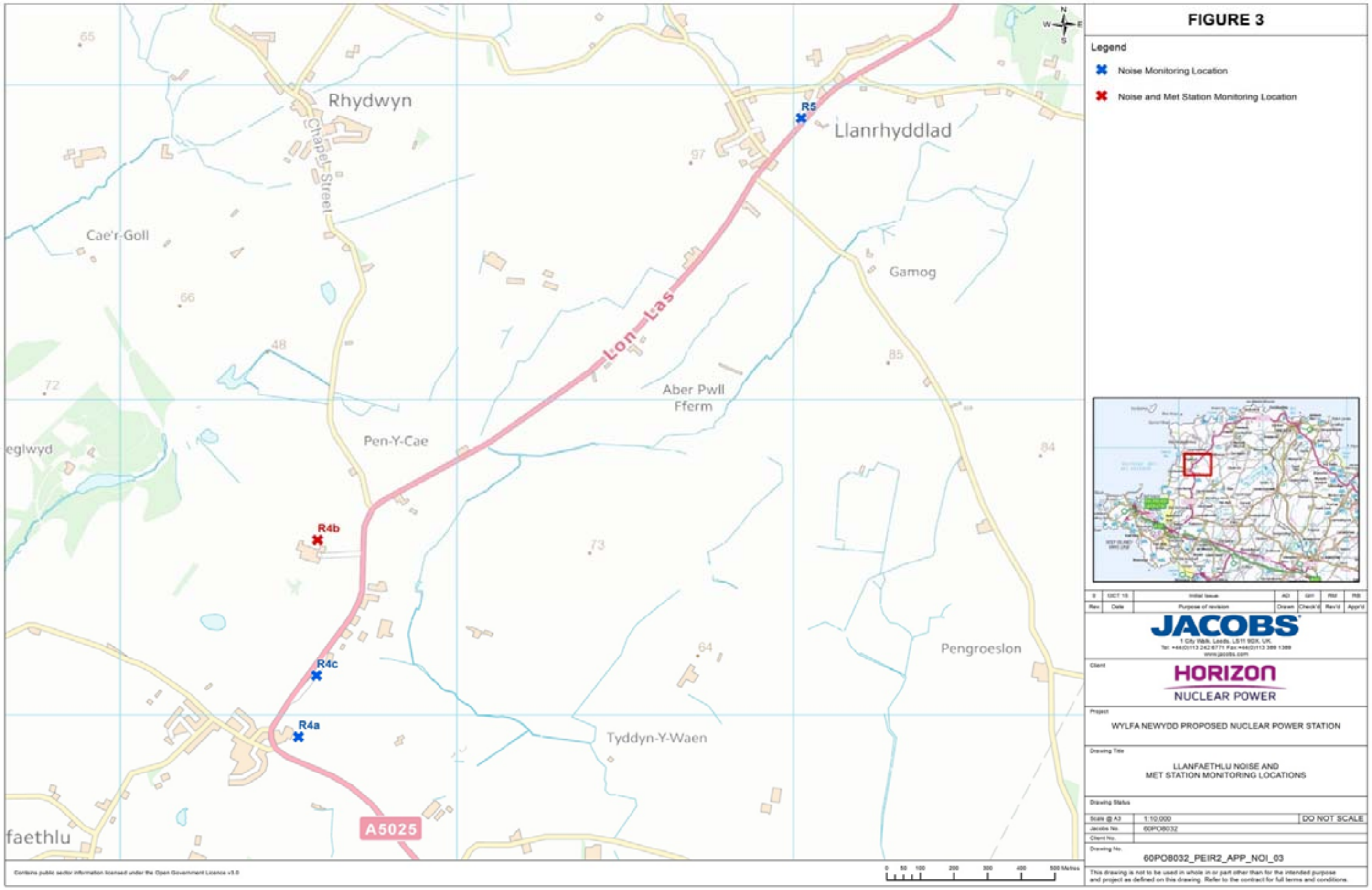

FIGURE 3
Legend
Noise Monitoring Location
Noise and Met Station Monitoring Location
Rhydwyn
Chapel Street
Llanrhyddlad
Cae'r-Goll
Gamog
Lon Las
Aber Pwll Fferm
Pen-Y-Cae
eglwyd
R5
R4b
R4c
R4a
Pengroeslon
Tyddyn-Y-Waen
faethlu
A5025
JACOBS
HORIZON
NUCLEAR POWER
WYLFA NEWYDD PROPOSED NUCLEAR POWER STATION
LLANFAETHLU NOISE AND MET STATION MONITORING LOCATIONS
DO NOT SCALE
60PO8032_PEIR2_APP_NOI_03

Figure 4

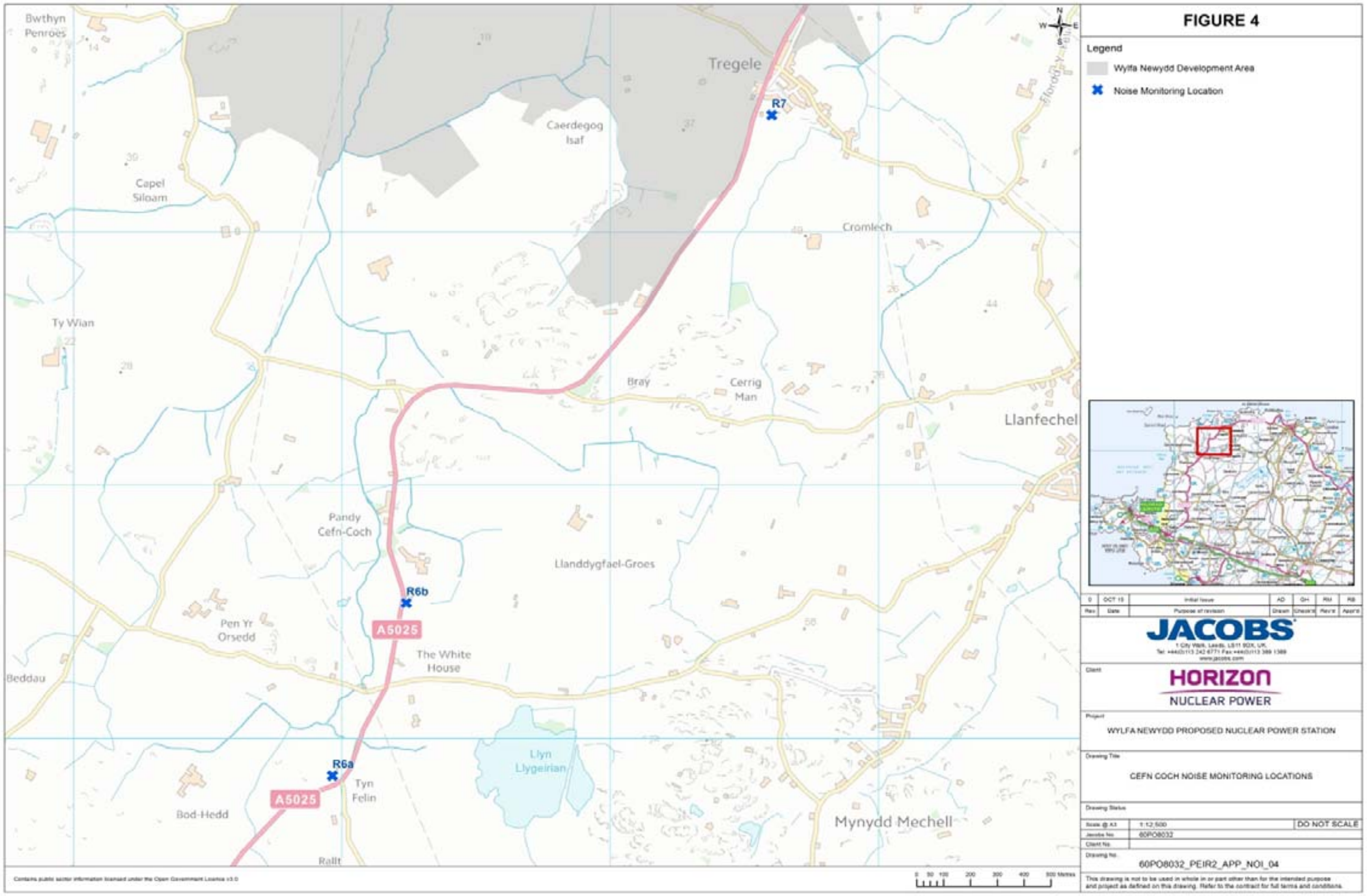

FIGURE 4
Legend
Wylfa Newydd Development Area
Noise Monitoring Location
Tregele
R7
Caerdegog Isaf
Capel Siloam
Cromlech
Ty Wian
Bray
Cerrig Man
Llanfechell
Pandy Cefn-Coch
Llanddygfael-Groes
R6b
A5025
Pen Yr Orsedd
The White House
Beddau
Llyn Llygeirian
R6a
Tyn Felin
A5025
Bod-Hedd
Mynydd Mechell
Rallt
JACOBS
HORIZON
NUCLEAR POWER
WYLFA NEWYDD PROPOSED NUCLEAR POWER STATION
CEFN COCH NOISE MONITORING LOCATIONS
DO NOT SCALE
60PO8032_PEIR2_APP_NOI_04

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MEMO

DCRM Number:	WN034-JAC-PAC-MEM-00014 – Appendix B6-01
To:	Mick Goodfellow, Isle of Anglesey County Council
From:	Gail Hitchins, Jacobs
Date:	01/03/2016
Subject:	Proposed survey methodology for noise monitoring for Park and Ride Facility at Dalar Hir

Additional Requirements or Controls			
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Comments:

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MEMO

Purpose and applicability

This Memorandum sets out the proposed approach to the baseline noise monitoring required to support the Environmental Impact Assessment (EIA) for the Park and Ride at Dalar Hir, which forms part of the Associated Development component of the Wylfa Newydd Project. The objective of the survey is to collect robust baseline noise data to characterise the baseline conditions in the vicinity of the Park and Ride at Dalar Hir.

Baseline noise monitoring in the vicinity of the proposed Wylfa Newydd Generating Station (the Power Station), and the A5025 Highway Improvements (the A5 and the A5025 from Valley to the Existing Power Station site access road), has been detailed in separate Technical Notes (DCRM Ref Number: HNP-S5-PAC-REP-00020, dated October 2014 and DCRM Ref Number: WN03.03.01-S5-PAC-TEC-00006, dated March 2015.

This Memorandum is to form the basis of consultation to be carried out with the Environmental Health Officer (EHO) at Isle of Anglesey County Council (IACC) and relevant personnel from Natural Resources Wales (NRW) regarding the baseline noise monitoring at the proposed Amlwch Temporary Workers' Accommodation site. The former will be responsible for the regulation of the construction process and operation of the associated developments. The latter will be a statutory consultee on the planning application(s).

Previous work

Baseline noise monitoring was previously undertaken in 2010, 2014 and 2015 at multiple locations in close proximity to the Power Station Site and proposed A5025 Road Improvement Scheme. These surveys did not extend further south or east than the A5 at Valley, and no monitoring has been undertaken in the vicinity of Dalar Hir.

Survey aim

The aim of this baseline noise survey will be to characterise the existing daytime and night-time noise levels at sensitive receptors in the vicinity of the proposed site. The data will be used to inform the noise assessments being undertaken and reported as part of the planning application for the Park and Ride at Dalar Hir. The data may also be used to support traffic noise assessments undertaken to support other applications required for the wider Wylfa Newydd Project.

Noise sensitive receptors

Planning Guidance Technical Advice Note (Wales) 11: Noise (TAN11) identifies residential areas as noise sensitive, in addition to recognising that offices, hospitals and schools will contain buildings and activities that are noise sensitive.

The Institute of Environmental Management and Assessment's *Guidelines for Environmental Noise Impact Assessment* published in October 2014 detail additional noise sensitive receptor types, including:

- places of worship;
- open air amenities;
- cemeteries;
- farms and kennels;
- retail premises; and

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- some commercial and industrial installations.

For the purpose of this Baseline Noise Monitoring Plan, the following groups of noise sensitive receptors have been defined:

- receptors north of the site, in Cefn Rhosydd;
- receptors to the east of the site, including Bryngoleu, and Gwyddfor Residential Home; and
- receptors to the west and south of the site including Penymyndd, Alltwen-ddû and Llanerch.

Noise monitoring is proposed to be carried out at sufficient locations to enable the noise levels for all receptor groups to be characterised. A combination of long term unattended measurements, and shorter term attended measurements and observations, will be required.

Existing noise sources

The baseline noise levels at the sensitive receptors identified in this document are considered likely to be influenced by a number of sources. Those that may affect current noise levels are summarised below:

- local and distant road traffic;
- go karting activities at Cartio Môn, Bryngoleu;
- human activity, especially in settlements;
- agricultural activity;
- wind effects on vegetation;
- aircraft movements; and
- meteorological conditions (e.g. rainfall).

It is recognised that the influence of each of these sources will be variable. The choice of monitoring location, and the micro-siting of the equipment at each location, will seek to minimise the influence of noise from these sources. If necessary, processing of the monitoring data can be undertaken to further reduce any ‘atypical’ influence of these noise sources on baseline noise levels.

Standards and Guidance

The following British Standards are considered to be relevant to the proposed baseline noise monitoring.

- BS 7445:2003 *Description and measurement of environmental noise* (BSI, 2003).
- BS 4142:2014 *Methods for rating and assessing industrial and commercial sound* (BSI, 2014).
- BS 5228-1 2009: +A1:2014 *Code of practice for noise and vibration control on construction and open sites, Part 1 Noise* (BSI, 2014).
- *Calculation of Road Traffic Noise* (CRTN) (Department for Transport and the Welsh Office, 1988).
- *Design Manual for Roads and Bridges* (DMRB) Vol 11 Environmental Assessment Section 3 Part 7 Noise and Vibration (HD213/11 – Revision 1) (Highways Agency, 2011).

Noise monitoring locations

A desktop review has been undertaken to identify suitable monitoring locations. The objective of the review was to identify monitoring locations which are likely to exhibit noise levels typical of a group of noise sensitive receptors or of significant noise sources. The noise sensitive locations are likely to experience the greatest change and/or absolute noise levels during the construction and operational phases of the Park and Ride at Dalar Hir.

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The proposed noise monitoring locations are listed in table 1 and shown in figure 1.

Table 1 - Proposed monitoring locations

Measurement location ID	Selected location	Approximate BNG coordinates	
		X	Y
LT1	Within curtilage of residential property to north of site, in Cefn Rhosydd.	232598	378909
LT2	Within Park and Ride at Dalar Hir site boundary, approximately 100m from A5 and in the central area of the site.	232840	378428
LT3	Within curtilage of Gwyddfor Residential Home.	233434	378554
ST1	A shortened CRTN three hour measurement at boundary edge of site, 10m from A5.	232831	378313

Due to the distances from major noise sources and similarities of local environment, LT2 will be used as a proxy location for properties in the south and west areas that are a similar distance to the A55 and A5.

On installation, all equipment will be photographed from at least four directions and observations on its location fully recorded along with GPS co-ordinates.

The choice of final monitoring locations will be influenced by a number of constraints including local noise sources, ease of access and equipment security.

Noise measurement instrumentation

Ambient and source noise levels will be measured using an integrating-averaging sound level meter (SLM) or equivalent system conforming to Class 1 as defined by BS EN 61672: Part1: 2013 (*Electroacoustics*, *Sound Level Meters, Specifications*). The SLM will be field calibrated before the start of each survey by applying an acoustic calibrator or pistonphone conforming to the latest versions of BS EN 60942:2003 (*Electroacoustics - Sound Calibrators*) to the microphone to check the sensitivity of the measuring equipment and checked at the end. Any drift in calibration levels will be noted.

The equipment used for the noise monitoring should also have undergone more extensive independent laboratory tests of the performance of the system within a period of two years prior to use.

Measurements of meteorological parameters (including wind speed, direction and rainfall) will be made at one long term monitoring location in the vicinity of the site.

Noise survey specification

Noise monitoring will be undertaken by experienced Jacobs' employees who are suitably qualified.

The baseline monitoring will include unattended long term measurement positions utilising continuous monitoring for a period of one week. This will ensure baseline conditions are characterised during the normal working day, evening, night time and weekend periods. These long-term positions will be supplemented by attended shorter term measurements and observations.

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The short term measurements will all be undertaken at ST1 over three consecutive hours. These will constitute a shortened CRTN measurement and will be located adjacent to the local road network. These measurements will occur on a typical weekday between 10:00 and 17:00.

In conjunction with the long term monitoring locations, evening and night-time observations will be made in the vicinity of locations LT1 to LT3. Health and safety, access and the avoidance of local disturbance will be considered when finalising these observation points during the site visit. During the evening (19:00- 23:00), observations of 15 minutes will be undertaken at each long term monitoring location. During the night-time (23.00-07.00), three observations of 15 minute duration will also be undertaken at each long term monitoring location, with a particular focus on capturing both night-time and early morning (06.00- 07.00) periods.

The microphone height will be between 1.2m and 1.5m above ground level. To minimise the influence of reflections, the microphone positions will be at least 3.5m from any reflecting surface other than the ground. Additionally, the roadside shortened CRTN measurement will be sited at least 15m from any significant reflecting surface other than the ground.

To minimise the influence on the noise readings from extraneous sources of physical interference, the following will be adopted:

- a suitable foam windshield (conforming to Class 1 of BS EN 61672 in dry conditions, and Class 2 if saturated with 100mm of water) will be fitted to the microphone;
- meteorological data will be used to identify periods of adverse weather conditions (rainfall, or wind speeds in excess of 5m/s at 1.5m height), and data from these periods will be excluded from further analysis; and
- no noise measurements would be undertaken immediately adjacent to sources of electrical interference such as overhead power cables or radio transmitters.

A note of the type of instrumentation used for the surveys will be made, including serial number and calibration details.

Parameters to be measured

It is likely that noise limits for the construction and operation of the associated developments set by relevant planning conditions will be based on the L_{Aeq} and L_{A90} parameters over specified periods of time. These are defined below.

- L_{Aeq} is the equivalent continuous sound level and is the sound level of a steady sound having the same energy as a fluctuating sound over the same period. It is possible to consider this level as the ambient noise encompassing all noise at a given time. L_{Aeq} is considered the best general purpose index for environmental noise.
- L_{A90} is this index represents the noise level exceeded for 90 percent of the measurement period and is used to indicate quieter times during the measurement period. It is usually referred to as the background level.

At the short-term measurement location, noise will be measured using the logging facility and a sampling time of one hour, as per the shortened CRTN measurement procedure. Each shortened CRTN measurement will consist of three consecutive hours to provide an $L_{A10,3hour}$ value per location.

At each long-term measurement location, noise will be measured using the logging facility and a sampling time of 100ms, with the A weighting and 'fast' time weighting selected. The 100ms sampling time will allow the data to be calculated over a range of required time periods.

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Both the short and long-term measurements will record the following parameters:

- L_{Aeq} T;
- L_{A90} T;
- L_{A10} – this index represents the noise level exceeded for 10 percent of the measurement period, and is a widely used descriptor of traffic noise;
- L_{Amax} – the maximum recorded noise level during the measurement period; and
- L_{Amin} – the minimum recorded noise level during the measurement period.

Observations will be made regarding audible noise sources in accordance with BS 7445. Manual traffic counts will be made for selected short periods during the attended short term monitoring.

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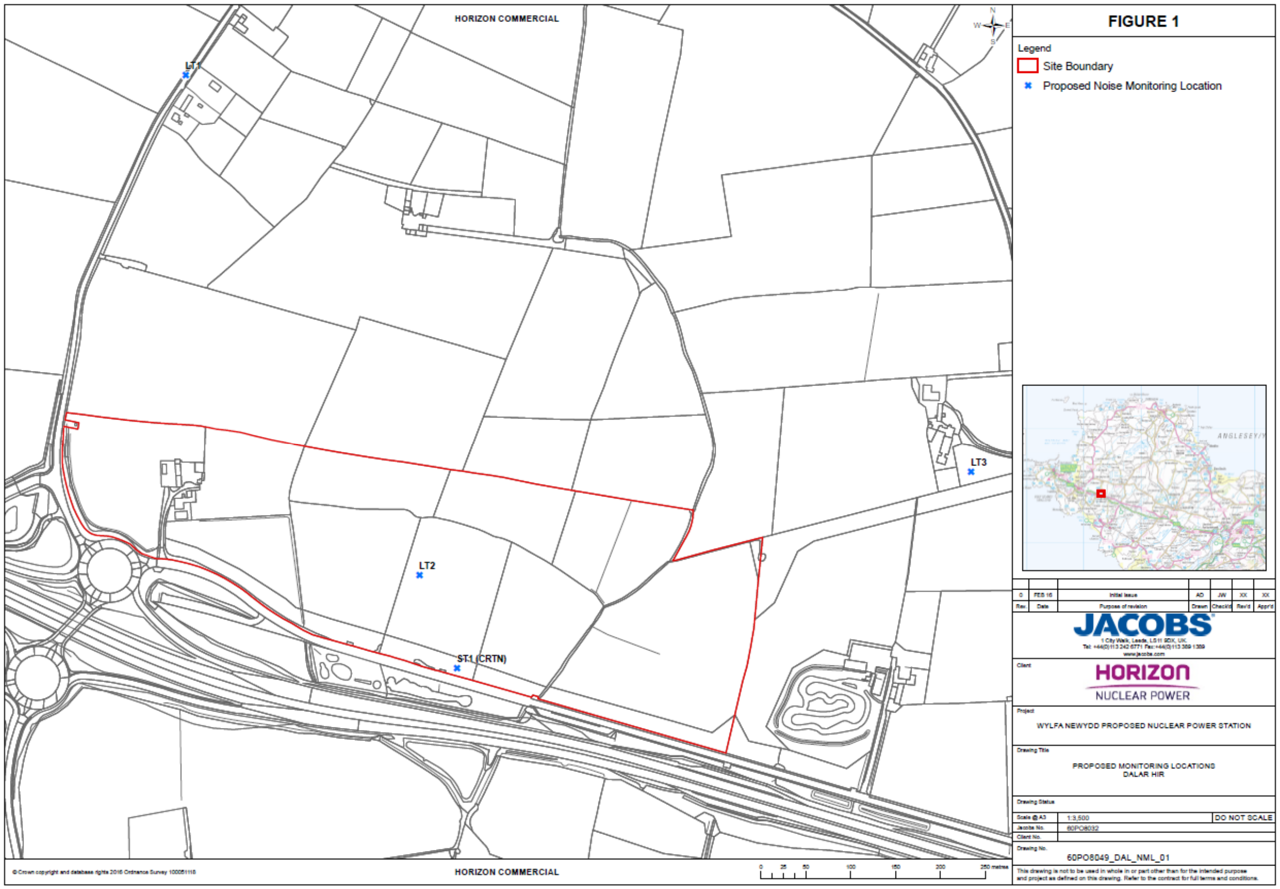
MEMO



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MEMO

DCRM Number:	WN034-JAC-PAC-MEM-00014 – Appendix B6-01
To:	Mick Goodfellow, Isle of Anglesey County Council
From:	Gail Hitchins, Jacobs
Date:	03/05/2017
Subject:	Proposed survey methodology for noise monitoring for Logistics Centre at Parc Cybi, Holyhead

Additional Requirements or Controls			
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MEMO

Purpose and applicability

This Memorandum sets out the proposed approach to the baseline noise monitoring required to support the Environmental Impact Assessment (EIA) for the proposed Logistics Centre at Parc Cybi, Holyhead, which forms part of the Associated Development component of the Wylfa Newydd Project. The objective of the survey is to collect robust baseline noise data to characterise the baseline conditions in the vicinity of the proposed Logistics Centre.

Baseline noise monitoring in the vicinity of the proposed Wylfa Newydd Generating Station (the Power Station) and the A5025 Highway Improvements (the A5 and the A5025 from Valley to the Existing Power Station site access road) has been detailed in separate Technical Notes (DCRM Ref Number: HNP-S5-PAC-REP-00020, dated October 2014 and DCRM Ref Number: WN03.03.01-S5-PAC-TEC-00006, dated March 2015. Further monitoring at Dalar Hir (Park and Ride) is detailed in Technical note WN034-JC-PAC-MEM-00014 dated March 2016.

This Memorandum is to form the basis of consultation to be carried out with the Environmental Health Officer (EHO) at the Isle of Anglesey County Council (IACC) and relevant personnel from Natural Resources Wales (NRW) regarding the baseline noise monitoring at the proposed Logistics Centre site. The former will be responsible for the regulation of the construction process and operation of the associated developments. The latter will be a statutory consultee on the planning application.

Previous work

Baseline noise monitoring was previously undertaken in 2010, 2014, 2015 and 2016 at multiple locations in close proximity to the Power Station Site and proposed A5025 Road Improvement Scheme, and Dalar Hir (proposed park and ride).

Survey aim

The aim of this baseline noise survey will be to characterise the existing daytime and night-time noise levels at sensitive receptors in the vicinity of the proposed site. The data will be used to inform the noise assessments being undertaken and reported as part of the planning application for the Logistics Centre. The data may also be used to support traffic noise assessments undertaken to support other applications required for the wider Wylfa Newydd Project.

Noise sensitive receptors

Planning Guidance Technical Advice Note (Wales) 11: Noise (TAN11) identifies residential areas as noise sensitive, in addition to recognising that offices, hospitals and schools will contain buildings and activities that are noise sensitive.

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The Institute of Environmental Management and Assessment's Guidelines for Environmental Noise Impact Assessment published in October 2014 detail additional noise sensitive receptor types, including:

- places of worship;
- open air amenities;
- cemeteries;
- farms and kennels;
- retail premises; and
- some commercial and industrial installations.

For the purpose of this Baseline Noise Monitoring Plan, the following groups of noise sensitive receptors have been defined:

- Residential receptors at:
  - Maes-Y-Delyn,
  - Kingsland Road,
  - Penryhn Geiriol; and
  - Trearddur Bay Caravan Park.

Noise monitoring is proposed to be carried out at sufficient locations to enable the noise levels for all receptor groups to be characterised. A combination of long term unattended measurements and short term attended measurements and observations will be required.

Existing noise sources

The baseline noise levels at the sensitive receptors identified in this document are considered likely to be influenced by a number of sources. Those that may affect current noise levels are summarised below:

- local and distant road traffic (including the A55);
- industrial operation;
- human activity, especially in settlements;
- agricultural activity;
- wind effects on vegetation;
- aircraft movements; and
- meteorological conditions (e.g. rainfall).

It is recognised that the influence of each of these sources will be variable. The choice of monitoring location and micro-siting of the equipment at each location will seek to minimise the influence of noise from these sources. If necessary, processing of the monitoring data can be undertaken to further reduce any 'atypical' influence of these noise sources on baseline noise levels.

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Standards and Guidance

The following British Standards are considered to be relevant to the proposed baseline noise monitoring:

- BS 7445:2003 Description and measurement of environmental noise (BSI, 2003);
- BS 4142:2014 Methods for rating and assessing industrial and commercial sound (BSI, 2014);
- BS 5228-1 2009: +A1:2014 Code of practice for noise and vibration control on construction and open sites, Part 1 Noise (BSI, 2014); and
- BS8233:2014 Guidance on sound insulation and noise reduction for buildings
- Design Manual for Roads and Bridges (DMRB) Vol 11 Environmental Assessment Section 3 Part 7 Noise and Vibration (HD213/11 – Revision 1) (Highways Agency, 2011).
- World Health Organisation's (WHO) Guidelines for community noise, 1999 (World Health Organisation, 1999)
- World Health Organisation's (WHO) Night noise guidelines for Europe, 2009 (World Health Organisation, 2009)

Noise monitoring locations

A desktop review has been undertaken to identify suitable monitoring locations. The objective of the review was to identify monitoring locations which are likely to exhibit noise levels typical of a group of noise sensitive receptors or baseline noise sources. The noise sensitive locations are likely to experience the greatest change and/or absolute noise levels during the construction and operational phases of the Logistics Centre.

The proposed noise monitoring locations are listed in table 1 and shown in figure 1.

Table 1 - Proposed monitoring locations

Measurement location ID	Selected location	Approximate BNG coordinates	
		X	Y
PC1	Location of proposed Logistics Centre	225814	380745
PC2	Adjacent to existing residential properties at Maes- Y-Delyn	225015	381212
PC3	Adjacent to existing residential properties at Kingsland Road	225069	380884
PC4	Adjacent to existing residential properties at Penrhyn Geiriol	225507	380172

PC5	Adjacent to Trearddur Bay caravan park	226149	379847

On installation, all equipment will be photographed from at least 4 directions and observations on its location fully recorded along with GPS co-ordinates.

The choice of final monitoring locations will be influenced by a number of constraints including local noise sources, ease of access and equipment security.

Noise measurement instrumentation

Ambient and source noise levels will be measured using an integrating-averaging sound level meter (SLM) or equivalent system conforming to Class 1 as defined by BS EN 61672:Part1:2013 (Electroacoustics, Sound Level Meters, Specifications). The SLM will be field calibrated before the start of each survey by applying an acoustic calibrator or pistonphone conforming to the latest versions of BS EN 60942:2003 (Electroacoustics - Sound Calibrators) to the microphone to check the sensitivity of the measuring equipment and checked at the end. Any drift in calibration levels will be noted.

The equipment used for the noise monitoring should also have undergone more extensive independent laboratory tests of the performance of the system within a period of two years prior to use.

Measurements of meteorological parameters (including wind speed, direction and rainfall) will be made at the long term monitoring location in the vicinity of the site.

Noise survey specification

Noise monitoring will be undertaken by experienced Jacobs' employees who are suitably qualified.

The baseline monitoring will include an unattended long term measurement position utilising continuous monitoring for a period of one week. This will ensure baseline conditions are characterised during the normal working day, evening, night time and weekend periods. This long term position will be supplemented by attended short term measurements and observations.

The short term measurements will all be undertaken using a 30min measurement period, for a total duration of 2 hours during the daytime (07:00 – 19:00) and duration of 1 hour during night-time (23:00 – 07:00) at each monitoring location.

In addition, observations will be made in the vicinity of all monitoring locations. Health and safety, access and the avoidance of local disturbance will be considered when finalising these observation points during the site visit

The microphone height will be between 1.2m and 1.5m above ground level. To minimise the influence of reflections, the microphone positions will be at least 3.5m from any reflecting surface other than the ground.

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To minimise the influence on the noise readings from extraneous sources of physical interference, the following will be adopted:

- a suitable foam windshield (conforming to Class 1 of BS EN 61672 in dry conditions, and Class 2 if saturated with 100mm of water) will be fitted to the microphone;
- meteorological data will be used to identify periods of adverse weather conditions (rainfall, or wind speeds in excess of 5m/s at 1.5m height), and data from these periods will be excluded from further analysis; and
- no noise measurements would be undertaken immediately adjacent to sources of electrical interference such as overhead power cables or radio transmitters.

A note of the type of instrumentation used for the surveys will be made, including serial number and calibration details.

Parameters to be measured

It is likely that noise limits for the construction and operation of the associated developments set by relevant planning conditions will be based on the L_{Aeq} and L_{A90} parameters over specified periods of time. These are defined below:

- L_{Aeq} is the equivalent continuous sound level and is the sound level of a steady sound having the same energy as a fluctuating sound over the same period. It is possible to consider this level as the ambient noise encompassing all noise at a given time. L_{Aeq} is considered the best general purpose index for environmental noise.
- L_{A90} is this index represents the noise level exceeded for 90 percent of the measurement period and is used to indicate quieter times during the measurement period. It is usually referred to as the background level.

At the short-term and long-term measurement locations, noise will be measured using the logging facility and a sampling time of 100ms, with the ‘A’ frequency weighting and ‘Fast’ time weighting selected. The 100ms sampling time will allow the data to be processed over a range of required time periods.

Both the short and long-term measurements will record the following parameters:

- L_{Aeq} T;
- L_{A90} T;
- L_{A10} – this index represents the noise level exceeded for 10 percent of the measurement period, and is a widely used descriptor of traffic noise;
- L_{Amax} – the maximum recorded noise level during the measurement period; and
- L_{Amin} – the minimum recorded noise level during the measurement period.

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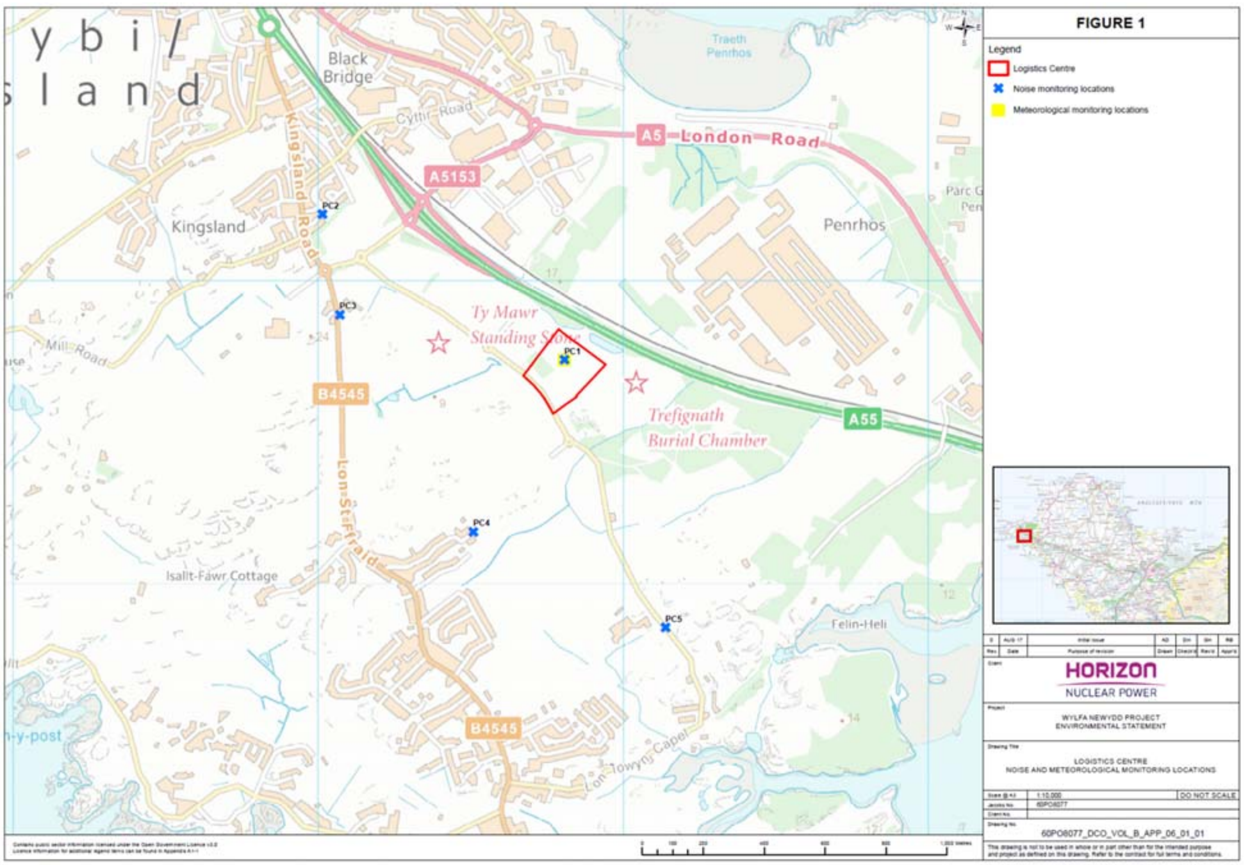
MEMO

Observations will be made regarding audible noise sources in accordance with BS 7445. Manual traffic counts will be made where appropriate during the attended short term monitoring.

Figure 1 Noise monitoring location



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HORIZON NUCLEAR POWER

Wylfa Newydd Project

Consultancy Report: Baseline Noise Monitoring Results

March 2016

Gail Hitchins

Document Number: 60PO8007/NAV/REP/002
Horizon Ref: WN03.03.01-JAC-PAC-REP-00001
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DATE	**April 2015**	**Document status : Final**		

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Executive Summary

Noise arising from new development can lead to annoyance, loss of amenity, and in some cases, adverse health effects. Potential noise effects to the local community are considered by the planning and regulatory frameworks, and noise emissions may be subject to conditions in planning consents and Environmental Permits.

To thoroughly assess potential noise effects, it is necessary to have an understanding of existing noise levels in the nearby community. Jacobs UK Ltd (Jacobs) on behalf of Horizon Nuclear Power has undertaken a baseline noise survey around the Wylfa Newydd Development Area to inform the various applications, assessments and permits that will be submitted for approval to construct and operate the Wylfa Newydd Project.

The main survey was undertaken between 30 September - 18 November 2014, and noise levels were monitored at six locations. Additional measurements were undertaken between 16 October – 20 November 2015 at one location. The noise levels were characterised by contributions from transport sources, existing power generation facilities, as well as from natural sources.

This report presents the following information:

- an overview of the methodology used for the baseline noise monitoring;
- details of the wind, rain and noise monitoring locations;
- the methodology used for the processing and filtering of the data;
- a summary of the consultation and engagement with the Local Authority;
- a description of the noise environment encountered at each monitoring location; and
- a summary of the results of the monitoring undertaken and comparison with relevant World Health Organisation (WHO) guidelines.

The noise results are presented for several time periods, and have been derived using a variety of indices and averaging techniques, in order to support the various noise assessments required to obtain the necessary permits and consents for the construction and operation of the Wylfa Newydd Power Station.

Noise levels generally comply with the relevant daytime and night-time WHO guideline values for community noise, however they are equal to or exceed the Night Noise Guideline presented by the WHO Night Noise Guidelines for Europe at five of the seven locations monitored. Night-time noise levels were observed to be influenced by natural sources, but a contribution from the Existing Power Station site was also noted at three of these five locations.

Contents

1 Introduction

1.1 Overview

Horizon Nuclear Power Ltd. (Horizon) is currently planning to develop a new nuclear power station at Wylfa, Anglesey as identified in the National Policy Statement for Nuclear Power Generation (EN-6). The Wylfa Newydd Project (the Project) will require a number of applications to be made under different legislation to different regulators. As a nationally significant infrastructure project under the Planning Act 2008, the construction and operation must be authorised by a development consent order.

Jacobs UK Ltd (Jacobs) was commissioned by Horizon to undertake a baseline noise survey to inform the various applications, assessments and permits that will be submitted for approval to construct and operate the Power Station.

1.2 Proposed Development

The Project includes the Power Station and Associated Development. The Power Station includes two UK Advanced Boiling Water Reactors (UK ABWR) to be supplied by Hitachi-GE Nuclear Energy Ltd, associated plant, and ancillary structures and features. In addition to the reactors, development on the Power Station Site will include steam turbines, control and service buildings, operational plant, radioactive waste storage buildings, ancillary structures, offices and coastal developments. The coastal developments will include a Cooling Water System (CWS), a Breakwater and a Marine Off-Loading Facility (MOLF). The Associated Development comprises development to support delivery of the Power Station, for example highway improvements along the A5025, Park and Ride facilities for construction workers, and Logistics Centre.

1.3 Site Description

The Wylfa Newydd Development Area (Power Station Site and surrounding area to be used for construction and operation of the Power Station) covers an area of approximately 380 ha. It is bounded to the north by the coast and the existing Magnox power station (Existing Power Station). To the east, it is separated from Cemaes by a narrow corridor of agricultural land. The A5025 and residential properties define part of the south-east boundary, with a small parcel of land spanning the road to the north-east of Tregele. To the south and west, the Wylfa Newydd Development Area abuts agricultural land, and to the west it adjoins the coastal hinterland and includese part of the Cestyll Garden.

The Wylfa Newydd Development Area includes the headland south of Mynydd-y-Wylfa which is a candidate local wildlife site. Also included in the Wylfa Newydd Development Area is one designated (on botanical grounds) site for nature conservation, Tre'r Gof Site of Special Scientific Interest (SSSI). It is also within 1km of the Cae Gwyn SSSI, Cemlyn Bay Special Area of Conservation (SAC) and the Ynys Feurig, the Skerries and Cemlyn Bay Special Protection Area (SPA) and SSSI.

1.4 Study Aims and Objectives

The objective of the baseline noise monitoring detailed in this report is to characterise the existing noise environment in the vicinity of the Wylfa Newydd Development Area and collect baseline data to inform the various applications, assessments and permits required to construct and operate the Power Station. This report does not provide baseline data used to inform any of the Associated Development.

Proposals regarding the baseline noise monitoring survey were discussed with Isle of Anglesey County Council (IACC) and Natural Resources Wales (NRW) in advance of the survey, during a meeting held on 1st September 2014 and formalised in the document ‘Baseline Noise Monitoring Plan Wylfa Newydd main site and surrounds’, (DCRM Ref Number HNP-S5-PAC-REP-00020). The Baseline Monitoring Plan set out the following information:

- The aims of the noise survey.
- A description of the site and surrounds, identifying key noise sensitive receptors and existing noise sources.
- Standards and guidance which are relevant to the noise survey.
- The proposed noise monitoring scheme, including locations, instrumentation and survey specification.

This report confirms where the methodology set out by the Baseline Monitoring Plan was implemented, identifies any changes required by local circumstances and presents the results of the monitoring undertaken.

2 Methodology

2.1 Noise Monitoring Locations

The choice of monitoring locations was influenced by a number of constraints including acoustic suitability, ease of access and equipment security. The final locations are detailed in table 2.1 and presented in figure 1. Photographs of the equipment installed at each location are presented in Appendix A. All locations were 'free-field' and were free from localised reflections.

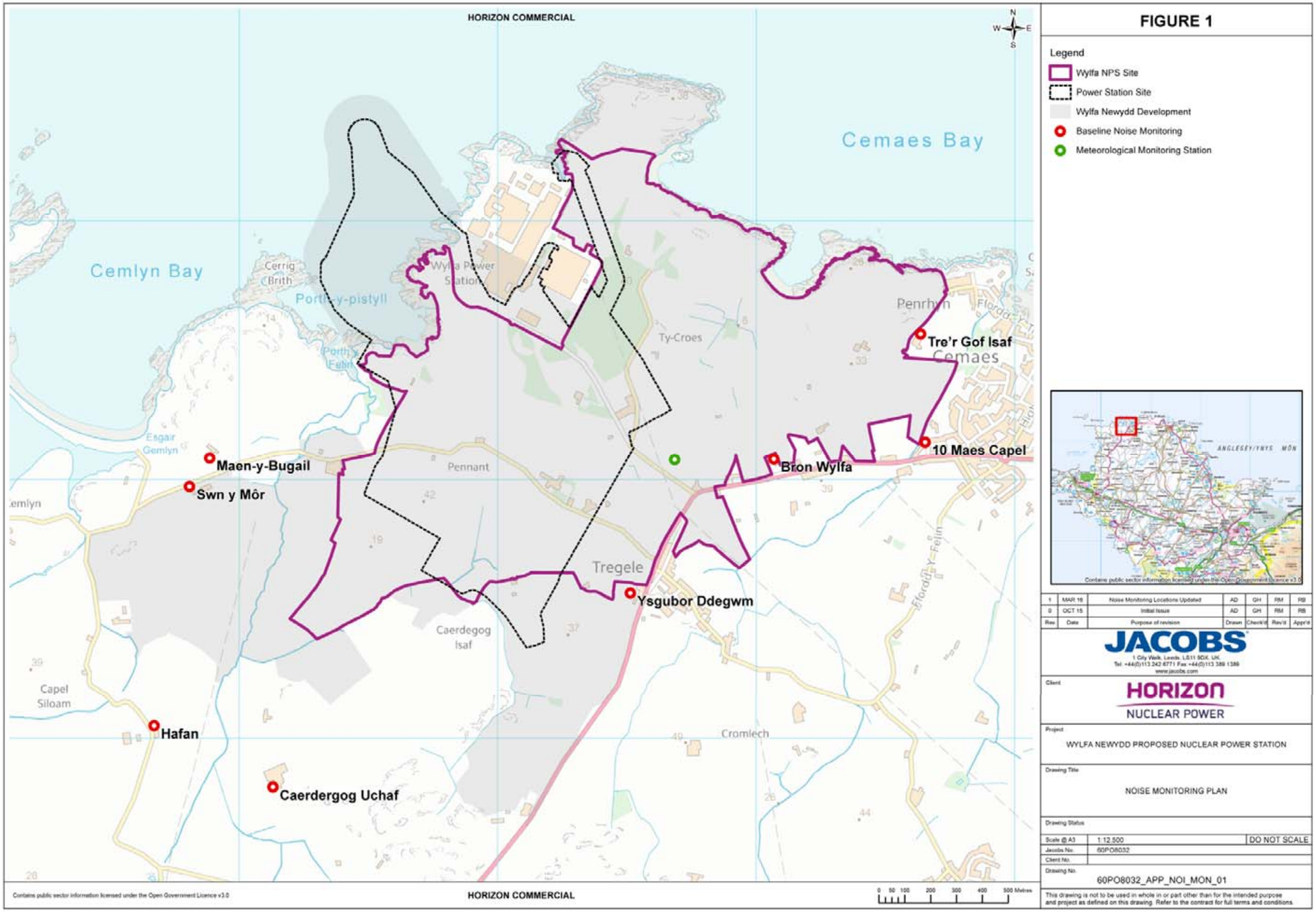
Table 2.1: Selected Monitoring Locations

Receptor Group	Selected Location	Approx. BNG Coordinates (m)		Notes
		Easting	Northing	
Properties east of Power Station Site	MP1 Tre'r-gof-isaf	236642	393569	Centre of front garden, 15m away from pond. Approximately 6m from garden boundaries adjacent to drive and house. No line of sight to Existing Power Station, but sea and wind turbines visible. Free-field location.
Properties to north east of Cemaes	MP2 10 Maes Capel	236649	393151	Centre of rear garden, approximately 4m from the conservatory and 7m from southern boundary. Free-field location. Partial line of sight to some vehicles using A5025, but no line of sight to road itself. Existing Power Station not visible.
Properties along A5025 to the west of Existing Power Station	MP3 Bron Wylfa, Ffordd Caergybi	236070	393073	Centre of rear garden, approximately 7m from the house and 12m from eastern boundary. Free-field location. No line of sight to A5025. Existing Power Station not visible.
Properties east of Power Station Site on south side of Cemeas	MP4 Maen-y-Bugail	233878	393086	To west of property on gravelled area. Approximately 6.5m from house and garage. No line of sight to Existing Power Station, but hedges lining local road visible. Free-field location.

Receptor Group	Selected Location	Approx. BNG Coordinates (m)		Notes
		Easting	Northing	
Properties south of Power Station Site	MP5 Hafan (opposite Jam Factory)	233676	392053	In middle of garden on concrete path. Row of trees approximately 20m to west. Good view of Existing Power Station and Nanner Road. Free-field location.
Properties in Tregele	MP6 Ysgubor Ddegwm, Tregele	235475	392553	Field to west of residential dwelling. North western corner used (approximately 12m from western boundary and 5m from northern boundary). Hen coop located in south eastern corner of field, approximately 30m away. Partial line of sight to A5025 and wind turbines (tips only), no clear view of Existing Power Station. Location chosen to maximise screening and distance from A5025. Free-field location.
Properties south of Power Station Site	MP7 Caerdergog Uchaf	234131	391813	In garden, approximately equidistance between property façade and greenhouse to south of property facade. Scattered vegetation in garden, but location sheltered from breeze due to garden wall. Approximately 470m from A5025. Free field location.

MP7 represents an additional monitoring location to those proposed in the document ‘Baseline Noise Monitoring Plan Wylfa Newydd main site and surrounds’. Monitoring was undertaken at this location in 2015 in response to a change in the access arrangements.

In addition to the above locations, monitoring was also undertaken at Swn-y-Mor, west of the Power Station Site for a short period. Due to the influence of the noise generated by wind through the coniferous trees at this property, monitoring was stopped as it was considered that the measurements at Maen-y-Bugail would be more representative of the lowest typical background noise levels affecting properties west of the Power Station Site.



HORIZON COMMERCIAL
FIGURE 1
Legend
Wylfa NPS Site
Power Station Site
Wylfa Newydd Development
Baseline Noise Monitoring
Meteorological Monitoring Station
Cemaes Bay
Cemlyn Bay
Cerrig Brith
Porth-y-pistyll
Wylfa Power Station
Penrhyn
Cemaes
Ty-Croes
Tre'r Gof Isaf
10 Maes Capel
Bron Wylfa
Maen-y-Bugail
Swn y Môr
Esgair Gemlyn
Pennant
Tregele
Ysgubor Ddegwm
Caerdegog Isaf
Capel Siloam
Hafan
Caerdergog Uchaf
Cromlech
ANGLESEY/YNYS MÔN
1 | MAR 16 | Noise Monitoring Locations Updated | AD | GH | RM | RB
0 | OCT 15 | Initial Issue | AD | GH | RM | RB
Rev | Date | Purpose of revision | Drawn | Check'd | Rev'd | Appr'd
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Client
HORIZON NUCLEAR POWER
Project
WYLFA NEWYDD PROPOSED NUCLEAR POWER STATION
Drawing Title
NOISE MONITORING PLAN
Drawing Status
Scale @ A3 | 1:12,500 | DO NOT SCALE
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0 50 100 200 300 400 500 Metres

2.2 Survey Staff and Duration

The noise equipment was deployed at all locations (with the exception of MP3 Bron Wylfa, and MP7 Caerdergog Uchaf) on 30 September and 1 October 2014. The equipment was set up by two appropriately qualified and experienced professionals, holding a BEng degree in Acoustics with Music, or the Institute of Acoustics Certificate of Competence in Environmental Noise Monitoring and the Diploma in Acoustics and Noise Control. The metrological equipment was installed on 1st October by the same staff.

Deployment at MP3 Bron Wylfa took place on 14 October 2014 due to a delay in obtaining access. Deployment at MP7 Caerdergog Uchaf took place on 16 October 2015.

The equipment was installed by two experienced professionals, at least one of whomholds the Institute of Acoustics Certificate of Competence in Environmental Noise Monitoring..

The Isle of Anglesey County Council (IACC) Environmental Health Officer was in attendance during all equipment deployment for the 2014 survey, approving the micro-siting of each kit and observing its set-up.

The noise and meteorological equipment was checked and calibrated on a weekly basis by two experienced staff, at least one of whom held the Institute of Acoustics Certificate of Competence in Environmental Noise Monitoring.

The 2014 survey was originally planned to last for approximately four weeks, however this was extended by two to three weeks due to the potential influence of adverse weather conditions and demolition activities in the area on the data set. The survey at MP1 – MP6 was completed on 18 November 2014, when all equipment was removed. The equipment was removed from MP7 Caerdergog Uchaf on 20 November 2015.

During a calibration and battery check visit on 3 November 2014, significant water ingress into the environmental protection case at MP6 Ysgubor Ddegwm was noted, and the equipment was found to have stopped recording noise levels at 12.55pm that day, during a period of particularly heavy rain. The equipment was retrieved for inspection and repair and re-deployed on 6 November 2014. However, issues with the power supply from the external batteries meant that from 6 November to the end of the survey, measurements were intermittent, being made only when adequate voltage was available from the internal batteries (which were changed frequently).

2.3 Noise Measurement Instrumentation and Set-up

Ambient noise levels were measured at each location using integrating-averaging sound level meters (SLM) or equivalent systems conforming to Class 1 as defined by BS EN 61672:Part1:2013 (Electroacoustics, Sound Level Meters, Specifications). Each SLM was field calibrated before the start of each survey by applying an acoustic calibrator conforming to the latest versions of BS EN 60942:2003 (Electroacoustics - Sound Calibrators) to the microphone to check the sensitivity of the measuring equipment. Calibration checks were performed on a weekly basis and at the end of the survey. The maximum overall drift over the survey period noted at any location was 0.2dB(A).

The equipment used for the noise monitoring was subject to more extensive performance tests, traceable to primary standards, at accredited independent laboratories within a period of 1 year prior to use. The calibration certificates detailing serial numbers and date of laboratory calibration of equipment used at each location are presented in Appendix B.

Battery levels were also checked on a weekly basis, and fully charged batteries installed as required. Battery voltage levels were maintained within appropriate parameters for the duration of the survey at all locations, with the exception of MP6 Ysgubor Ddegwm.

The noise monitoring equipment was time synchronised with the met mast, to ensure that noise and met data were able to be correlated during the baseline data processing exercise. The microphone height was between 1.2m and 1.5m above ground level. To minimise the influence of reflections, the microphone positions were at least 3.5m from any reflecting surface other than the ground. A suitable foam windshield (conforming to Class 1 of BS EN 61672 in dry conditions, and Class 2 if saturated with 100mm of water) was fitted to each microphone. At each location, the SLM was set to measure using the logging facility and a sampling time of 100ms, with the A-weighting filter and ‘fast’ time weighting selected.

2.4 Meteorological Instrumentation and Set-up

During the 2014 survey, measurements of wind speed and direction were made using a WindSonic ultrasonic wind sensor and SpaceLogger Wind Logger to provide time-stamped data averaged over a 10 second measurement period. The specification sheet presented in Appendix B provides further detail on this equipment.

Measurements of rainfall were made and recorded using a Texas Electronics TR-5251 0.2mm tipping bucket rain gauge and data logger, set up to measure using five minute periods.

The equipment was installed in the vicinity of the permanent on-site met mast, in the field north of the site access road. The anemometer was installed at approximately 3m above ground level, as recommended by BS7445:2003 ‘Description and Measurement of Environmental Noise’. The location is presented in figure 1.

During the 2015 measurements, a Lufft WS600 with CR6 data logger was used to measure wind speed, direction and rainfall on the same basis and at a similar location to that used in 2014.

3 Results

3.1 Observations on Audible Noise Sources

During equipment set up, check and retrieval visits, the audible noise sources at each location were noted. In addition, a night-time visit to the vicinity of each SLM from 00:00 on 1st October 2014 was also made to ensure that observations on night-time noise sources were also made. Similarly night-time observations were made at MP7 on 20th November 2015. These audible noise source observations are summarised in table 3.1.

Table 3.1: Audible Noise Sources

Location	Daytime Observations	Night-time Observations
MP1 Tre'r-gof-isaf	Mechanical equipment. Intermittent nearby aircraft noise. Wind through vegetation. Occasional aircraft in distance. Occasional birdsong.	Audible hum and short alarm from direction of Existing Power Station. Waves on shore. One aircraft in distance.
MP2 10 Maes Capel	Traffic on A5025 dominant. Tractor on adjacent track audible. Sheep noise. Distant dog barking. Wind in trees. Sporadic noise from seagulls and crows audible. Occasional aircraft.	Hum from direction of Existing Power Station dominant. Faint noise from wind in vegetation. Owl call.
MP3 Bron Wylfa, Ffordd Caergybi	Hum from direction of Existing Power Station faintly audible. Vegetation noise during wind audible. Occasional birdsong. Occasional aircraft.	Hum from direction of Existing Power Station dominant. Distant dog barking. Barely audible reversing alarm. Variable aerodynamic noise from direction of Existing Power Station.
MP4 Maen-y-Bugail	Aircraft, wind through vegetation. Dogs barking distantly audible. Sea noise distantly audible. Cows in adjacent field intermittently audible. Farm machinery.	Noise from sea dominant. No noise from Existing Power Station audible.
MP5 Hafan (opposite Jam Factory)	Birds intermittently audible. Wind noise through vegetation. Road noise distantly audible. Occasional car passing on adjacent road. Occasional aircraft.	Wind in vegetation. Very faint noise from sea. Dog barking in distance from direction of Tregele.
MP6 Ysgubor Ddegwm, Tregele	Traffic on A5025 dominant. Cockerel and other fowl (very audible, sporadic). Occasional aircraft. Mechanical noise in distance. Farm machinery.	Hum from direction of Existing Power Station dominant. Wild fowl calling and livestock noise. Variable aerodynamic noise from direction of Existing Power

		Station. Wind in vegetation.
MP7 Caerdergog Uchaf	Birdsong audible, and sporadic noise from A5025 barely audible.	Wind through vegetation was audible, as well as vehicle movements on the A5025.

3.2 Data Processing Methodology

In order to ensure that the data used to characterise the baseline noise environment is representative, the data was filtered using a number of criteria:

- Noise data during any five minute period where rainfall was recorded was excluded from the data set. In addition, noise data for the two periods (10 minutes) prior to and after each period affected by rain was also excluded, to take into account the sensitivity of the instrument, and the distance between the noise monitoring locations and the rain gauge.

- Noise data during any five minute period where the average wind speed recorded was over 5m/s was excluded. In addition, noise data from the preceding and subsequent periods (five minutes) was also excluded, to allow for the distance between the monitoring locations and met mast.

- Noise data which appeared 'atypical' was excluded. It is acknowledged that demolition activities which form part of the enabling works of the Wylfa Newydd Project were undertaken in the vicinity of some measurement locations at certain points during the survey period. The site works diary was used in conjunction with a visual review of the noise data to identify and remove data from potentially affected periods. Any other data which appears atypically elevated from a visual review of the data, and based on professional judgement, was also excluded.

It is noted that the transition between British Summer Time (BST) and Greenwich Mean Time (GMT) occurred during the 2014 survey period. The equipment was allowed to run on British Summer Time throughout the survey, with alterations made to the relevant time stamps after 02:00 (BST) on Sunday 26 October 2014 during the data processing.

The above criteria have been used to form a dataset of valid 100ms data points, which are presented on Figures 3-9

From these valid data points, a plot of wind direction and 100ms noise levels has been generated in order to check for any discrete noise sources which are clearly influencing the results e.g. existing transformers, wind turbines etc. This data is presented as Figure 2, and a comparison with Figures 3-9 indicates that no observable correlation between wind direction and noise level occurred at any location.

The valid data points have been used to derive the baseline statistical noise parameters required by the standards which will be used to assess the potential noise effects of the Wylfa Newydd Power Station. These standards include:

- BS5228-1:2009 + A1:2014 'Code of practice for noise and vibration control on construction and open sites, Part 1 Noise'
- MTAN1 Minerals Planning Policy (Wales) Minerals Technical Advice Note (Wales) 1: Aggregates

- BS4142:2014 Methods for rating and assessing industrial and commercial sound.

All valid data which fall in the 07:00-19:00 daytime period has been used to calculate the hourly L_{A90} and L_{Aeq} values (commencing on the hour), using the 01dB dBTrait 5.4 noise analysis software. Note some of these hourly values will be based on a full 60mins of data, whilst others will be based on reduced datasets due to excluded data. These values have been rounded to the nearest whole dB (as recommended by BS4142:2014, with values of 0.5 being rounded up) and plotted on graph to determine the distribution of the hourly values. This approach has been replicated for the evening hours of 19:00-23:00. For the night-time hours of 23:00-07:00, the data has been used to calculate 15 minute L_{A90} (as recommended by BS4142:2014) and L_{Aeq} values (commencing on the hour).

Histograms showing the distribution of daytime, evening and night-time noise levels are presented as Figures 10-23.

3.3 Baseline Noise Levels

The noise levels for the daytime, evening and night-time periods at each location have been evaluated using the 01dB dBTrait 5.4 noise analysis software, ignoring any periods influenced by rain and wind or atypical events (as described in Section 3.2). An explanation of the different indices is provided as follows:

- The 'L_{A90} calculated over survey' is the sound pressure level that was exceeded for 90% of the day/evening/night periods across the entire survey, ignoring any periods influenced by rain and wind or atypical events. This value has been calculated upon request from IACC.

- The mean and mode $L_{A90,1h}$, $L_{A90,15m}$ and daily $L_{A90,T}$ values have been calculated from values measured across the entire survey, ignoring any periods influenced by rain and wind or atypical events. The daily $L_{A90,T}$ values are the L_{A90} values calculated for each period on each calendar day. The night periods are the composite periods between 00:00-06:00 and 23:00-00:00 on each calendar day, rather than the contiguous nightly periods which span two calendar days.

- The modal values have been determined by rounding the values to the nearest 1dB and counting the number in each integer data 'bin', as demonstrated on Figures 9-20.

- The 'log average' value is the logarithmic average sound pressure level (i.e. L_{Aeq}) calculated over the entire measurement period.

Rounded summary values of the various calculated indices used to describe the $L_{A90,T}$ and $L_{Aeq,T}$ noise levels, for the operational and construction periods are provided in table 3.2 - table 3.5.

Table 3.2: Summary of measured $L_{A90,T}$ noise levels (Operational Assessment Periods)

Measurement location	Period	$L_{A90,T}$ dB Entire Survey	Mean 1h	Mean 15min	Mean Daily	Mode 1h	Mode 15min	Mode Daily
MP1 Tre'r-gof-isaf	Day (07:00 – 19:00)	33	36	36	35	35	35	33
	Evening (19:00 – 23:00)	32	35	35	34	35	35	33
	Night (23:00 – 07:00)	30	33	33	33	34	32	32
MP2 Maes Capel	Day (07:00 – 19:00)	39	40	40	40	41	41	41
	Evening (19:00 – 23:00)	37	39	39	39	40	40	39
	Night (23:00 – 07:00)	35	38	38	39	39	39	39
MP3 Bron Wylfa	Day (07:00 – 19:00)	36	39	39	38	38	38	38
	Evening (19:00 – 23:00)	31	36	35	35	39	38	39
	Night (23:00 – 07:00)	26	32	32	32	37	36	36
MP4 Maen-y-Bugail	Day (07:00 – 19:00)	32	36	36	36	35	35	34
	Evening (19:00 – 23:00)	30	35	35	35	36	36	29
	Night (23:00 – 07:00)	28	34	34	34	28	39	39
MP5 Hafan	Day (07:00 – 19:00)	32	36	35	34	37	35	31
	Evening (19:00 – 23:00)	27	31	31	31	37	32	37
	Night (23:00 – 07:00)	24	28	29	28	29	29	23
MP6 Ysgubor Ddegwm	Day (07:00 – 19:00)	37	39	39	37	40	39	40
	Evening (19:00 – 23:00)	29	32	32	32	34	30	33
	Night (23:00 – 07:00)	23	27	28	27	29	30	23
MP7 Caerdergog Uchaf	Day (07:00 – 19:00)	32	36	36	36	37	38	37
	Evening (19:00 – 23:00)	24	32	32	32	37	37	21
	Night (23:00 – 07:00)	19	28	28	28	18	19	18

Table 3.3: Summary of measured $L_{Aeq,T}$ noise levels (Operational Assessment Periods)

Measurement location	Period	$L_{Aeq,T}$ dB Mean 1h	Mean 15min	Log Average	Mode 1h	Mode 15min
MP1 Tre'r-gof-isaf	Day (07:00 – 19:00)	42	42	43	42	41
	Evening (19:00 – 23:00)	39	39	41	38	37
	Night (23:00 – 07:00)	36	36	38	34	34
MP2 Maes Capel	Day (07:00 – 19:00)	46	45	46	46	45
	Evening (19:00 – 23:00)	42	42	43	41	41
	Night (23:00 – 07:00)	40	40	42	40	40
MP3 Bron Wylfa	Day (07:00 – 19:00)	46	45	48	47	47
	Evening (19:00 – 23:00)	43	42	45	43	44
	Night (23:00 – 07:00)	37	37	40	40	39
MP4 Maen-y-Bugail	Day (07:00 – 19:00)	43	41	45	40	41
	Evening (19:00 – 23:00)	40	39	43	39	39
	Night (23:00 – 07:00)	38	37	41	39	41
MP5 Hafan	Day (07:00 – 19:00)	44	43	46	43	44
	Evening (19:00 – 23:00)	38	37	40	39	36
	Night (23:00 – 07:00)	34	33	39	36	33
MP6 Ysgubor Ddegwm	Day (07:00 – 19:00)	48	48	49	50	49
	Evening (19:00 – 23:00)	45	44	46	46	45
	Night (23:00 – 07:00)	38	37	41	39	36
MP7 Caerdergog Uchaf	Day (07:00 – 19:00)	44	44	46	44	43
	Evening (19:00 – 23:00)	39	39	42	38	38
	Night (23:00 – 07:00)	36	35	43	43	29

Table 3.4: Summary of measured $L_{A90,T}$ noise levels (Construction Assessment Periods)

Measurement location	Period	$L_{A90,T}$			
		Mean		Mode	
		1h	15min	1h	15min
MP1 Tre'r-gof-isaf	Weekday (07:00 – 19:00)	37	37	35	37
	Saturday Morning (07:00 – 13:00)	35	34	33	33
	Weekend Rest Periods	33	33	34	35
	Night (19:00 – 07:00)	34	34	35	35
MP2 Maes Capel	Weekday (07:00 – 19:00)	40	41	41	41
	Saturday Morning (07:00 – 13:00)	41	40	41	39
	Weekend Rest Periods	40	40	38	38
	Night (19:00 – 07:00)	39	39	39	39
MP3 Bron Wylfa	Weekday (07:00 – 19:00)	40	40	38	38
	Saturday Morning (07:00 – 13:00)	34	34	36	36
	Weekend Rest Periods	36	36	38	38
	Night (19:00 – 07:00)	33	33	37	38
MP4 Maen-y-Bugail	Weekday (07:00 – 19:00)	37	37	35	35
	Saturday Morning (07:00 – 13:00)	33	33	35	30
	Weekend Rest Periods	33	33	31	32
	Night (19:00 – 07:00)	34	34	40	39
MP5 Hafan	Weekday (07:00 – 19:00)	37	37	36	35
	Saturday Morning (07:00 – 13:00)	34	34	31	33
	Weekend Rest Periods	32	32	32	32
	Night (19:00 – 07:00)	29	29	29	29
MP6 Ysgubor Ddegwm	Weekday (07:00 – 19:00)	40	40	40	39
	Saturday Morning (07:00 – 13:00)	36	36	35	36
	Weekend Rest Periods	35	35	34	36
	Night (19:00 – 07:00)	29	29	29	30
MP7 Caerdergog Uchaf	Weekday (07:00 – 19:00)	37	37	37	38
	Saturday Morning (07:00 – 13:00)	35	35	38	38
	Weekend Rest Periods	35	35	37	38
	Night (19:00 – 07:00)	29	29	20	21

Table 3.5: Summary of measured $L_{Aeq,T}$ noise levels (Construction Assessment Periods)

Measurement location	Period	$L_{Aeq,T}$ Mean 1h	Mean 15min	Log Average	Mode 1h	Mode 15min
MP1 Tre'r-gof-isaf	Weekday (07:00 – 19:00)	43	42	44	42	43
	Saturday Morning (07:00 – 13:00)	42	41	43	41	41
	Weekend Rest Periods	40	40	41	40	40
	Night (19:00 – 07:00)	37	37	39	38	36
MP2 Maes Capel	Weekday (07:00 – 19:00)	46	45	47	46	46
	Saturday Morning (07:00 – 13:00)	46	45	46	46	46
	Weekend Rest Periods	45	44	46	45	41
	Night (19:00 – 07:00)	41	41	42	40	40
MP3 Bron Wylfa	Weekday (07:00 – 19:00)	47	46	48	49	47
	Saturday Morning (07:00 – 13:00)	44	43	44	45	43
	Weekend Rest Periods	45	44	48	47	47
	Night (19:00 – 07:00)	39	38	43	43	39
MP4 Maen-y-Bugail	Weekday (07:00 – 19:00)	44	42	46	40	41
	Saturday Morning (07:00 – 13:00)	41	40	43	44	38
	Weekend Rest Periods	40	39	43	38	36
	Night (19:00 – 07:00)	38	38	42	39	39
MP5 Hafan	Weekday (07:00 – 19:00)	45	44	46	44	44
	Saturday Morning (07:00 – 13:00)	44	43	45	43	43
	Weekend Rest Periods	41	41	43	40	39
	Night (19:00 – 07:00)	36	34	39	36	34
MP6 Ysgubor Ddegwm	Weekday (07:00 – 19:00)	49	49	50	50	49
	Saturday Morning (07:00 – 13:00)	45	46	46	42	49
	Weekend Rest Periods	45	44	46	44	44
	Night (19:00 – 07:00)	40	39	43	39	42
MP7 Caerdergog Uchaf	Weekday (07:00 – 19:00)	45	44	47	*	43
	Saturday Morning (07:00 – 13:00)	43	42	43	43	43
	Weekend Rest Periods	43	42	44	42	43
	Night (19:00 – 07:00)	37	36	42	43	38

*No modal value as multiple bins have equal number of occurrences

The L_{AeqT} results in Tables 3.3 and 3.5 have been compared with the World Health Organisation's Guideline for Community Noise (1999) which presents guideline noise levels for community noise in specific environments. The daytime and evening baseline noise levels are all well below the guideline value of 55dB $L_{Aeq\ T}$ associated with protecting the majority of people from 'serious annoyance' in outdoor living areas. Furthermore, with the exception of Ysgubor Ddegwm, these baseline noise levels are also below the guideline value of 50dB $L_{Aeq\ T}$ associated with protecting the majority of people from 'moderate annoyance' in outdoor living areas. At Ysgubor Ddegwm, the weekday daytime noise levels are close to this guideline value at 49-50dB(A).

With respect to sleep disturbance guidelines, the World Health Organisation (WHO) Guidelines for Community Noise (1999) recommend a guideline value of 45dB $L_{Aeq\ T}$ outside bedrooms. The night-time baseline noise levels presented in Tables 3.3 and 3.5 all comply with this guideline value.

In addition, reference has been made to the more recent WHO Night Noise Guidelines for Europe (2009) which reviews health effects associated with exposure to night-time noise and recommends night noise guideline values. The guidelines present a night noise guideline (NNG) of 40dB L_{night} (outside) and an interim target of 55 dB(A) aimed at situations where the 40dB(A) target is not achievable. It should be noted that these guidelines are applicable to WHO European Region Member States. Furthermore, the guideline value is expressed as a yearly average, and hence occasional exceedances should not necessarily be interpreted as likely to result in harmful effects.

Comparison of the $L_{Aeq\ T}$ Log average baseline results for the night period (23:00-07:00) presented in Table 3.3 with the interim target level and NNG indicates that whilst the interim target level is complied with at all locations, noise levels are equal to or above the NNG at the following locations,:

- Maes Capel (42dB(A)),
- Bron Wylfa (40dB(A)),
- Maen-y-Bugail (41dB(A))
- Ysgubor Ddegwm (41dB(A))
- Caerdergog Uchaf (43dB(A))

It should be remembered that the NNG is a yearly average noise level, hence these monitoring results are unable to fully confirm compliance or exceedance of this assessment criterion. Furthermore, it should be remembered that noise levels during periods of adverse weather or atypical conditions have been removed, and noise levels during these periods may be considerable higher.

The results presented in Tables 3.2 and 3.4 are $L_{A90\ T}$ values. No relevant guideline values exist for the $L_{A90\ T}$ parameter, however these values will form the basis of assessments in accordance with the following documents:

- BS4142:2014 *Methods for rating and assessing industrial and commercial sound* - provides a series of methods for the assessment of the likely effects of sound on people inside or outside residential dwellings. The standard is used for the purposes of investigating complaints, assessing industrial noise sources, and assessing noise at proposed new dwellings. The procedure contained in BS4142 is to compare the measured or predicted noise level from the source(s) in question (including any penalty applied to reflect certain acoustic features) at dwellings, with the background noise level ($L_{A90\ T}$) measured in the environment.
- *Minerals Planning Policy (Wales) Minerals Technical Advice Note (Wales) 1: Aggregates* (MTAN1) - noise limits should relate to the background noise levels, subject to a maximum daytime noise limit of 55dB(A) where background noise levels exceed 45dB(A).

4 Conclusions

Jacobs UK Ltd (Jacobs) has undertaken a baseline noise survey to inform the various applications, assessments and permits that will be submitted for approval to construct and operate the Wylfa Newydd Power Station.

The main survey was undertaken between 30 September - 18 November 2014, and noise levels were monitored at six locations. Additional measurements were undertaken between 16 October – 20 November 2015 at one location. The noise levels were characterised by contributions from transport sources, existing power generation facilities, as well as from natural sources.

The baseline data generated during the survey were processed to remove data points which may have been affected by adverse weather conditions or atypical noise sources. The noise results are presented using a variety of indices and averaging techniques.

The daytime and evening baseline noise levels generally comply with the WHO Guidelines for Community Noise guideline values for outdoor living areas, with the highest levels recorded at Ysgubor Ddegwm being close to (or equal to) the guideline value related to ‘moderate’ annoyance. The night-time baseline noise levels comply with the relevant WHO Guidelines for Community Noise guideline value, and the interim target level detailed in the WHO Night Noise Guidelines for Europe. However, the results indicate that night noise levels are equal to or may exceed the WHO Night Noise Guidelines at five of the seven locations monitored. Night-time noise levels were observed to be influenced by natural sources, but a contribution from the Existing Power Station site was also noted at three of these five locations.

5 References

BSI. (2003). BS 7445:2003 Description and measurement of environmental noise.

BSI. (2003). BS EN 60942:2003 Electroacoustics - Sound Calibrators

BSI. (2013) BS EN 61672:Part1:2013 Electroacoustics, Sound Level Meters, Specifications

BSI. (2014). BS 4142:2014 'Methods for rating and assessing industrial and commercial sound'.

BSI. (2014). BS 5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites. Noise'.

Department of Energy and Climate Change. (2011). EN-6 Nuclear Power Generation National Policy Statement.

Horizon Nuclear Power (2014) Baseline Noise Monitoring Plan Wylfa Newydd main site and surrounds', (DCRM Ref Number HNP-S5-PAC-REP-00020)

Welsh Government. (2004). Minerals Technical Advice Note (MTAN) Wales 1: Aggregates.

World Health Organisation. (1999). Guidelines for Community Noise.

World Health Organisation. (2009). Night Noise Guidelines for Europe.

6 Glossary

Term/abbreviation	Description
Ambient noise	Totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far.
dB	Decibel. The ratio between the quietest audible sound and the loudest tolerable sound is a million to one in terms of the change in sound pressure. Due to this wide range, a scale based on logarithms is used in noise level measurement. The scale used is the decibel (dB) scale which extends from 0 to 140 decibels (dB) corresponding to the intensity of the sound pressure level.
dB(A)	A-weighted decibel. The ear has the ability to recognise a particular sound depending on the pitch or frequencies found at the source. Microphones cannot differentiate noise in the same way as the ear; and to counter this weakness the noise measuring instrument applies a correction to correspond more closely to the frequency response of the ear. The correction factor is called “A Weighting” and the resulting measurements are written as dB(A). “A Weighting” refers to the noise level that represents the human ear’s response to sound. The dB(A) unit is internationally accepted and has been found to correspond well with people’s subjective reaction to noise.
Free-field	An environment in which there are no reflective surfaces within the frequency region of interest.
$L_{Aeq\ T}$	Is the A weighted equivalent continuous sound level over time period T. It is the sound level of a steady sound having the same energy as a fluctuating sound over the same period. It is possible to consider this level as the ambient noise encompassing all noise at a given time. L_{Aeq} is considered the best general purpose index for environmental noise.
$L_{A90\ T}$	Represents the A weighted noise level exceeded for 90 percent of the measurement period (T) and is used to indicate quieter times during the measurement period. It is usually referred to as the background noise level.
$L_{A10\ T}$	Refers to the A weighted noise level exceeded for 10% of the measurement period (T). $L_{A10\ T}$ is widely used as a descriptor of traffic noise.
$L_{Amax\ T}$	Is the maximum recorded A weighted noise level during the measurement period (T).
NNG	Night Noise Guideline, defined as 40 dB $L_{night\ (outside)}$ in WHO Night Noise Guidelines for Europe (2009).
WHO	World Health Organisation

Appendix A Photographs of Installed Equipment

MP1 Tre-gof-isaf

MP2 Maes Capel




MP3 Bron Wylfa

MP4 Maen-y-Bugail

MP5 Hafan

MP6 Ysgubor Ddegwm

MP7 Caerdergog Uchaf

Meteorological Equipment

Appendix B Calibration Certificates

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Date of issue 22/5/1/5 Certificate N° 1505285

AV Calibration
2 Warren Court
Chicksands, Shefford
Bedfordshire SG17 5QB
U.K.
Tel: +44 (0)1462 638600
Fax: +44 (0)1462 638601
Email: lab@avcalib.co.uk
www.avcalibration.co.uk
Acoustics Noise and Vibration Ltd trading as AV Calibration

Page 1 of 4 Pages

Signed [redacted]

G. Parry [ ] B. Baker [redacted]

CLIENT	Jacobs Ltd Enviros House Shrewsbury Business Park Sitka Drive Shrewsbury SY2 6LG
F.A.O.	Barry Salway
ORDER No	- Job No TRAC15/05127/04
DATE OF RECEIPT	12 May 2015
PROCEDURE	AV Calibration Engineer's Handbook section 3
IDENTIFICATION	(875) Sound level meter Rion type NL-32 serial No 00482602 connected via extension lead type EC-04 and preamplifier type NH-21 serial No 27706 to a half-inch microphone type UC-53A serial No 321107 fitted with a foam windshield type WS-03. Associated calibrator Rion type NC-74 serial No 34257024 with a one-inch housing and adapter type NC-74-002 for half-inch microphone.
CALIBRATED ON	22/5/1/5
PREVIOUS CALIBRATION	Calibrated on 14 March 2014, Certificate No. TCRT14/1092 issued by a non accredited calibration laboratory ANV Measurement Systems

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Date of issue 26 May 2015 Certificate N° 1505289

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Bedfordshire SG17 5QB
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www.avcalibration.co.uk

Page 1 of 4 Pages

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G. Parry [ ] B. Baker [✓]

Acoustics Noise and Vibration Ltd trading as AV Calibration

CLIENT	Jacobs Ltd Enviros House Shrewsbury Business Park Sitka Drive Shrewsbury SY2 6LG
F.A.O.	Barry Salway
ORDER No	- Job No TRAC15/05144/02
DATE OF RECEIPT	26 May 2015
PROCEDURE	AV Calibration Engineer's Handbook section 3
IDENTIFICATION	(0874) Sound level meter Rion type NL-32 serial No 00482614 connected via extension lead type EC-04 and preamplifier type NH-21 serial No 27718 to a half-inch microphone type UC-53A serial No 314307 fitted with a foam windshield type WS-03. Associated calibrator Rion type NC-74 serial No 34257024 with a one-inch housing and adapter type NC-74-002 for half-inch microphone.
CALIBRATED ON	26 May 2015
PREVIOUS CALIBRATION	Calibrated on 04 June 2014, Certificate No. TCRT14/1184 issued by a non accredited calibration laboratory ANV Measurement Systems

The measurements detailed herein are traceable to units of measurement realised at the National Physical Laboratory.

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Date of issue 22/5/1/5 Certificate N° 1505286

AV Calibration
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Page 1 of 4 Pages

Signed [redacted]

G. Parry [ ] B. Baker [✓]

CLIENT	Jacobs Ltd Enviros House Shrewsbury Business Park Sitka Drive Shrewsbury SY2 6LG
F.A.O.	Barry Salway
ORDER No	- Job No TRAC15/05127/03
DATE OF RECEIPT	12 May 2015
PROCEDURE	AV Calibration Engineer's Handbook section 3
IDENTIFICATION	(0873) Sound level meter Rion type NL-32 serial No 00482601 connected via extension lead type EC-04 and preamplifier type NH-21 serial No 27705 to a half-inch microphone type UC-53A serial No 321276 fitted with a foam windshield type WS-03. Associated calibrator Rion type NC-74 serial No 34257024 with a one-inch housing and adapter type NC-74-002 for half-inch microphone.
CALIBRATED ON	22/5/1/5
PREVIOUS CALIBRATION	Calibrated on 17 March 2014, Certificate No. TCRT14/1093 issued by a non accredited calibration laboratory ANV Measurement Systems

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Date of issue 26 May 2015 Certificate N° 1505287

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Page 1 of 4 Pages	
Signed [redacted]	
G. Parry [ ]	B. Baker [✓]

CLIENT	Jacobs Ltd Enviros House Shrewsbury Business Park Sitka Drive Shrewsbury SY2 6LG
F.A.O.	Barry Salway
ORDER No	- Job No TRAC15/05144/01
DATE OF RECEIPT	26 May 2015
PROCEDURE	AV Calibration Engineer's Handbook section 3
	(0872)
IDENTIFICATION	Sound level meter Rion type NL-31 serial No 00583275 connected via extension lead type EC-04 and preamplifier type NH-21 serial No 27505 to a half-inch microphone type UC-53A serial No 314015 fitted with a foam windshield type WS-03. Associated calibrator Rion type NC-74 serial No 34257024 with a one-inch housing and adapter type NC-74-002 for half-inch microphone.
CALIBRATED ON	26 May 2015
PREVIOUS CALIBRATION	Calibrated on 03 June 2014, Certificate No. TCRT14/1183 issued by a non accredited calibration laboratory ANV Measurement Systems

The measurements detailed herein are traceable to units of measurement realised at the National Physical Laboratory. This certificate may not be reproduced other than in full, except with the prior written approval of AV Calibration.

Certificate of Calibration

Issued by University of Salford (Acoustics Calibration Laboratory)
UKAS ACCREDITED CALIBRATION LABORATORY NO. 0801

UKAS CALIBRATION
0801

Page 1 of 2

APPROVED SIGNATORIES
Claire Lomax [ ]   Andy Moorhouse [✓] [redacted]
Gary Phillips [ ]   Danny McCaul [ ]

University of Salford MANCHESTER

acoustic calibration laboratory
The University of Salford, Salford, Greater Manchester, M5 4WT, UK
http://www.acoustics.salford.ac.uk
t 0161 295 3030/0161 295 3319 f 0161 295 4456 e c.lomax1@salford.ac.uk

Certificate Number: 01927/1   Date of Issue: 16 July 2014

CALIBRATION OF A SOUND CALIBRATOR

FOR:	Jacobs / Sinclair Knight Merz Ltd 6th Floor Newminster House 27-29 Baldwin Street Bristol BS1 1LT
FOR THE ATTENTION OF:	Sam Williams
DESCRIPTION:	Calibrator with housing for one-inch microphones and adaptor type BAC 21 for half-inch microphones.
MANUFACTURER:	01 dB
TYPE:	CAL 21
SERIAL NUMBER:	34634250 (2013) (881)
DATE OF CALIBRATION:	16/07/2014
TEST PROCEDURE:	CTP06 (Laboratory Manual)

Test Engineer (initial): [redacted]   Name: Gary Phillips

Calibrations marked 'Not UKAS Accredited' in this certificate have been included for completeness.

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

Figures 2 -23

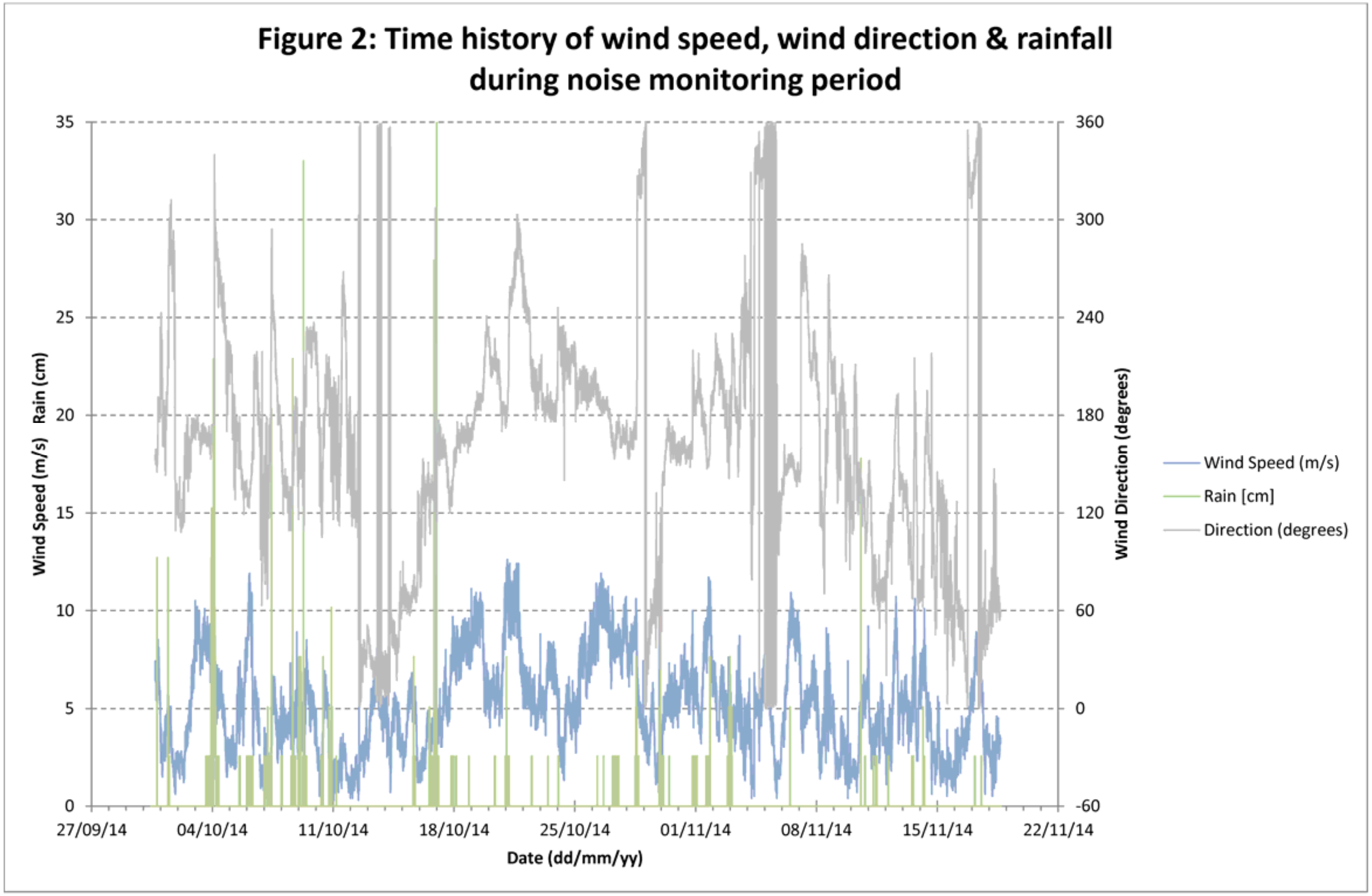
Figure 2: Time history of wind speed, wind direction & rainfall during noise monitoring period
Wind Speed (m/s) Rain (cm)
Wind Direction (degrees)
Date (dd/mm/yy)
27/09/14
04/10/14
11/10/14
18/10/14
25/10/14
01/11/14
08/11/14
15/11/14
22/11/14
0
5
10
15
20
25
30
35
-60
0
60
120
180
240
300
360
Wind Speed (m/s)
Rain [cm]
Direction (degrees)

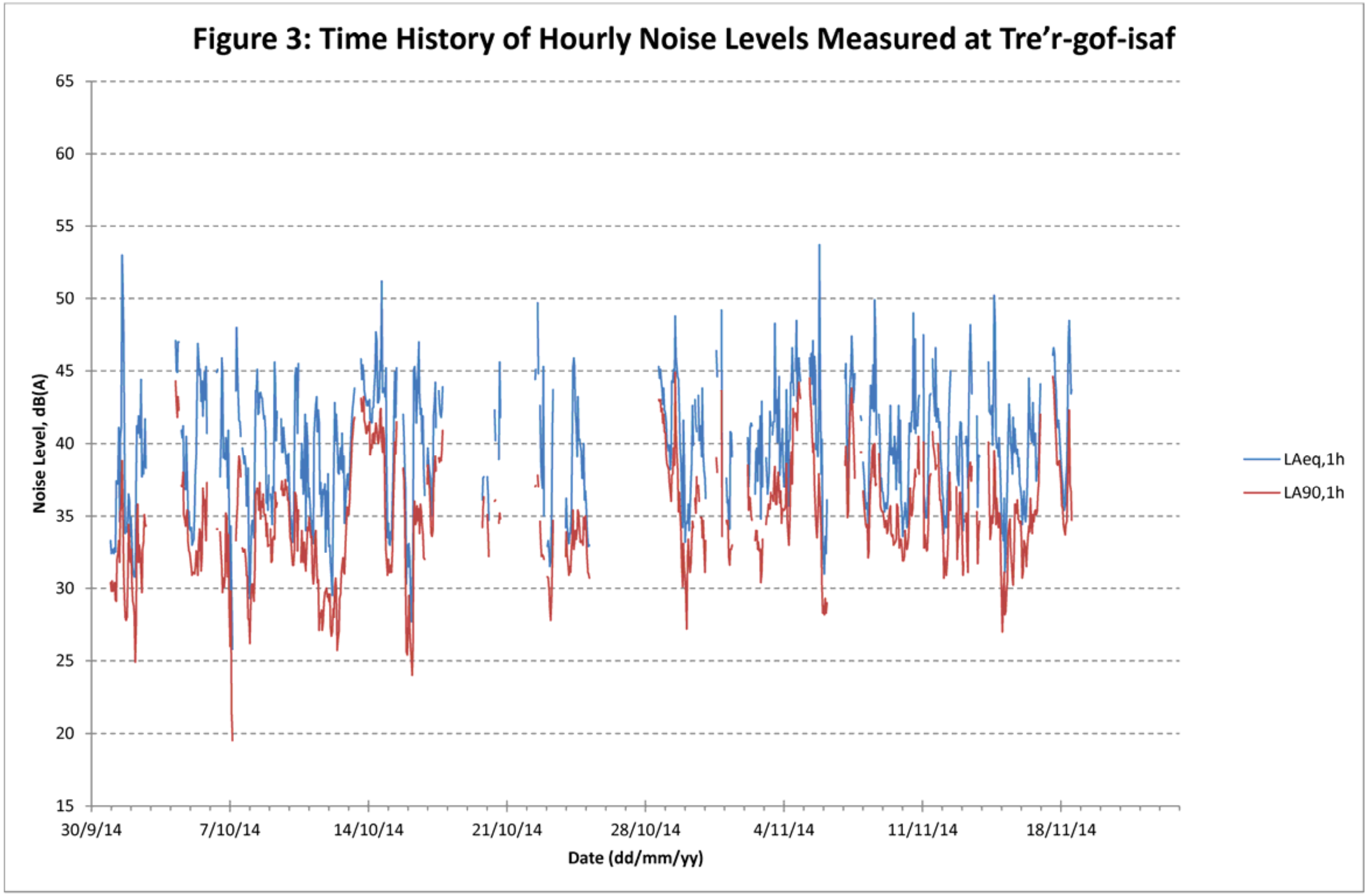

Figure 3: Time History of Hourly Noise Levels Measured at Tre'r-gof-isaf
Noise Level, dB(A)
65
60
55
50
45
40
35
30
25
20
15
30/9/14
7/10/14
14/10/14
21/10/14
28/10/14
4/11/14
11/11/14
18/11/14
Date (dd/mm/yy)
LAeq,1h
LA90,1h

JACOBS

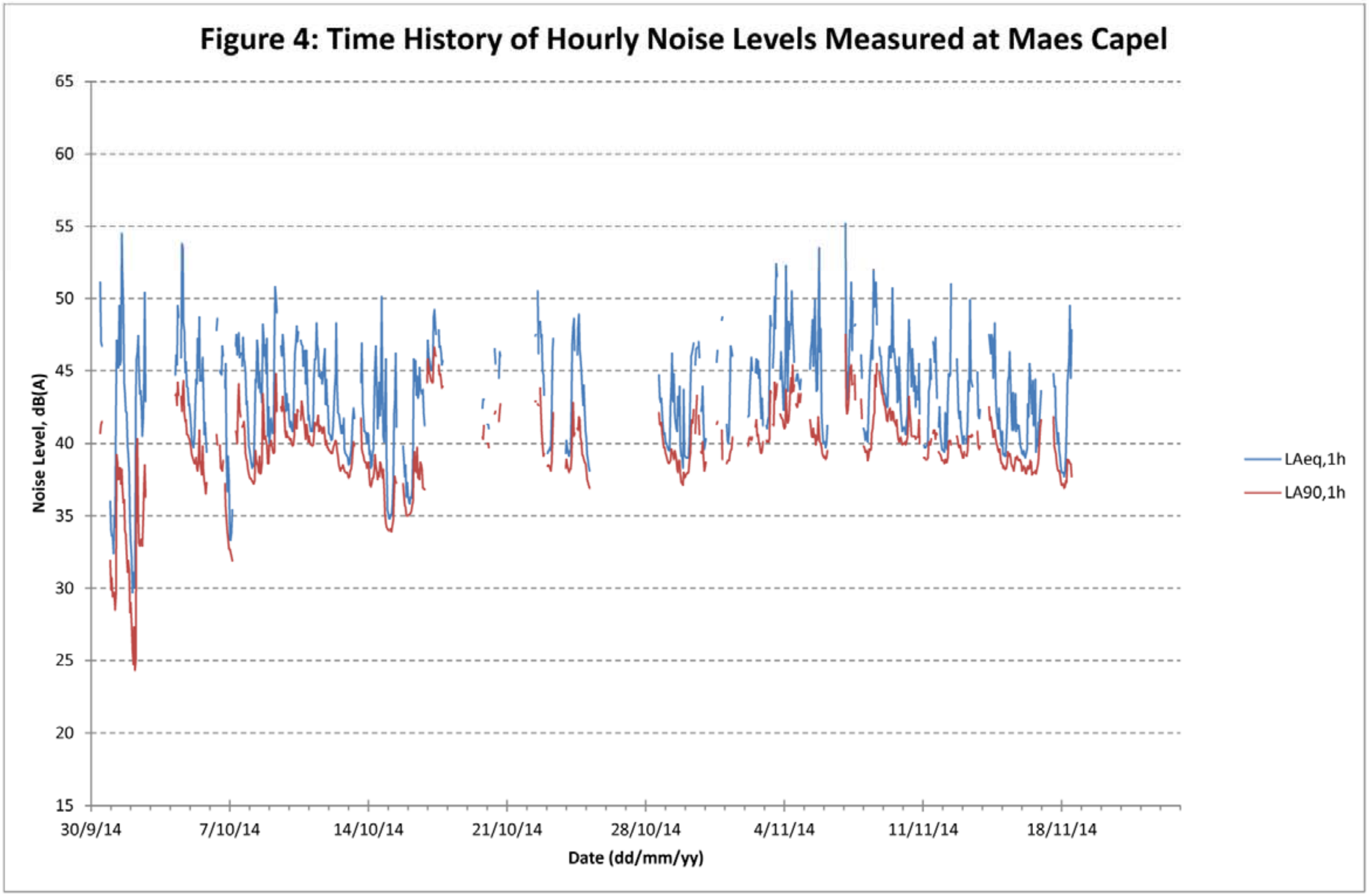
Figure 4: Time History of Hourly Noise Levels Measured at Maes Capel
65
60
55
50
45
40
35
30
25
20
15
Noise Level, dB(A)
30/9/14
7/10/14
14/10/14
21/10/14
28/10/14
4/11/14
11/11/14
18/11/14
Date (dd/mm/yy)
LAeq,1h
LA90,1h

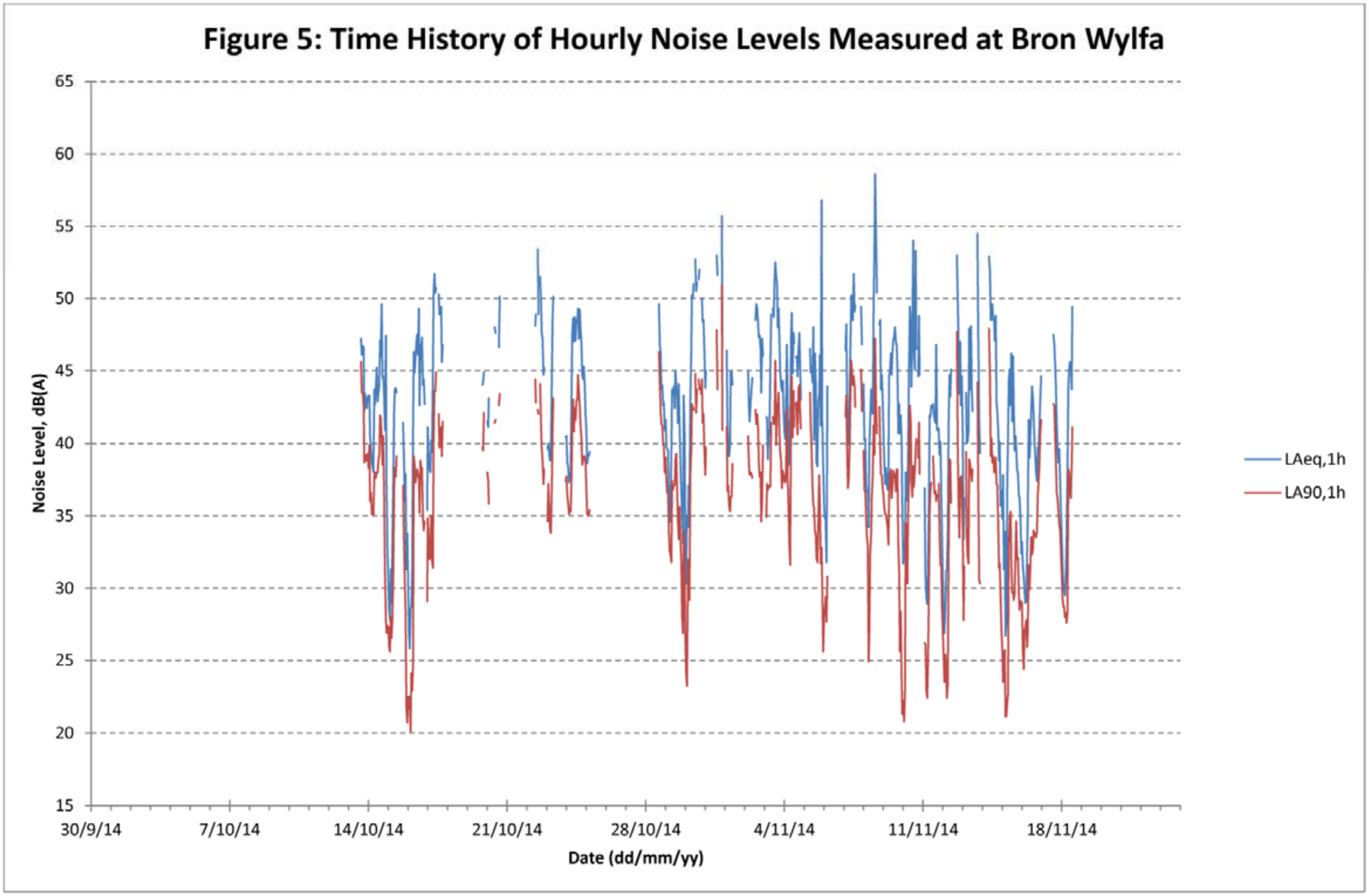
Figure 5: Time History of Hourly Noise Levels Measured at Bron Wylfa
Noise Level, dB(A)
65
60
55
50
45
40
35
30
25
20
15
30/9/14
7/10/14
14/10/14
21/10/14
28/10/14
4/11/14
11/11/14
18/11/14
Date (dd/mm/yy)
LAeq,1h
LA90,1h

JACOBS

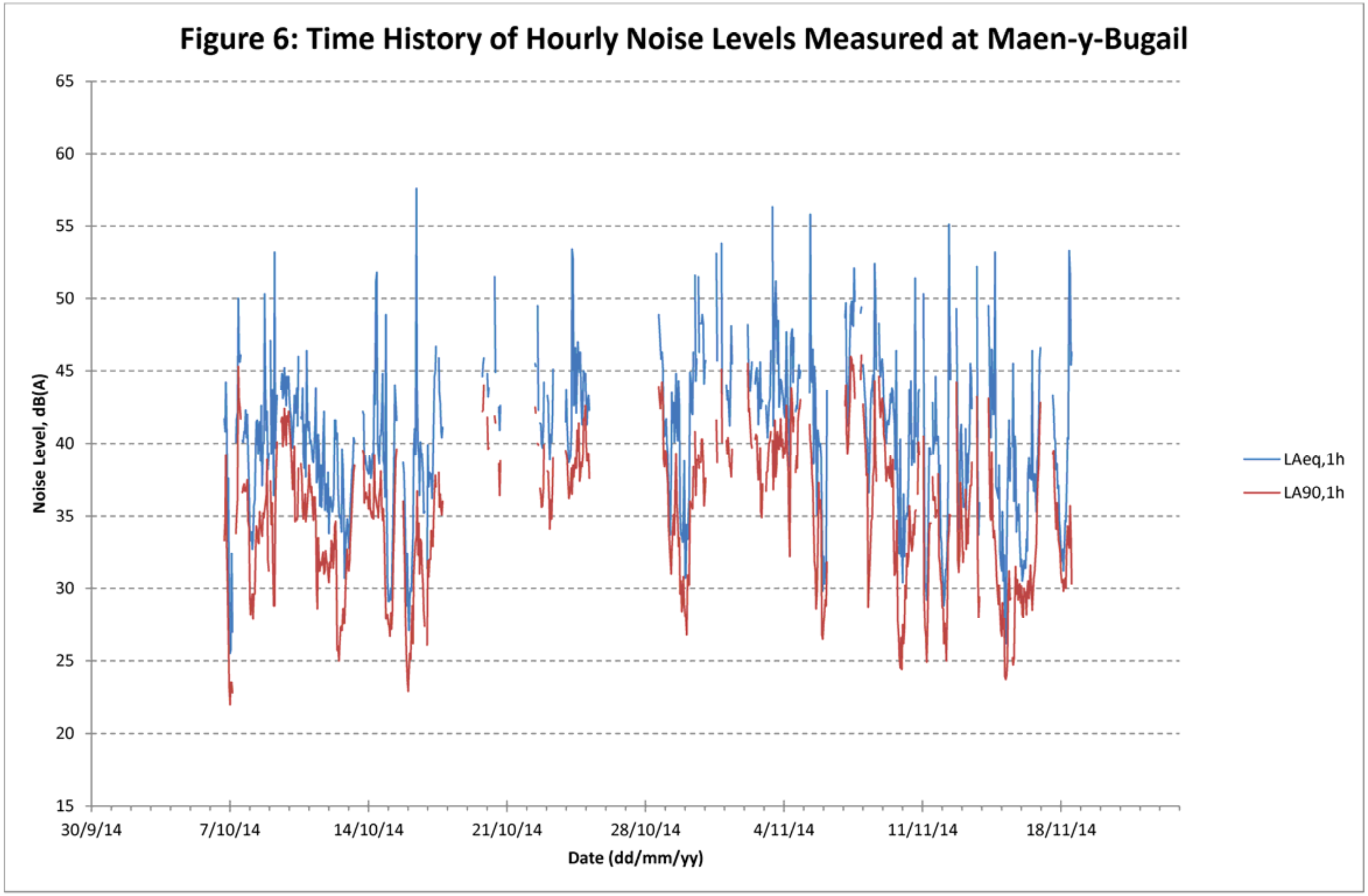
Figure 6: Time History of Hourly Noise Levels Measured at Maen-y-Bugail
65
60
55
50
45
40
35
30
25
20
15
Noise Level, dB(A)
30/9/14
7/10/14
14/10/14
21/10/14
28/10/14
4/11/14
11/11/14
18/11/14
Date (dd/mm/yy)
LAeq,1h
LA90,1h

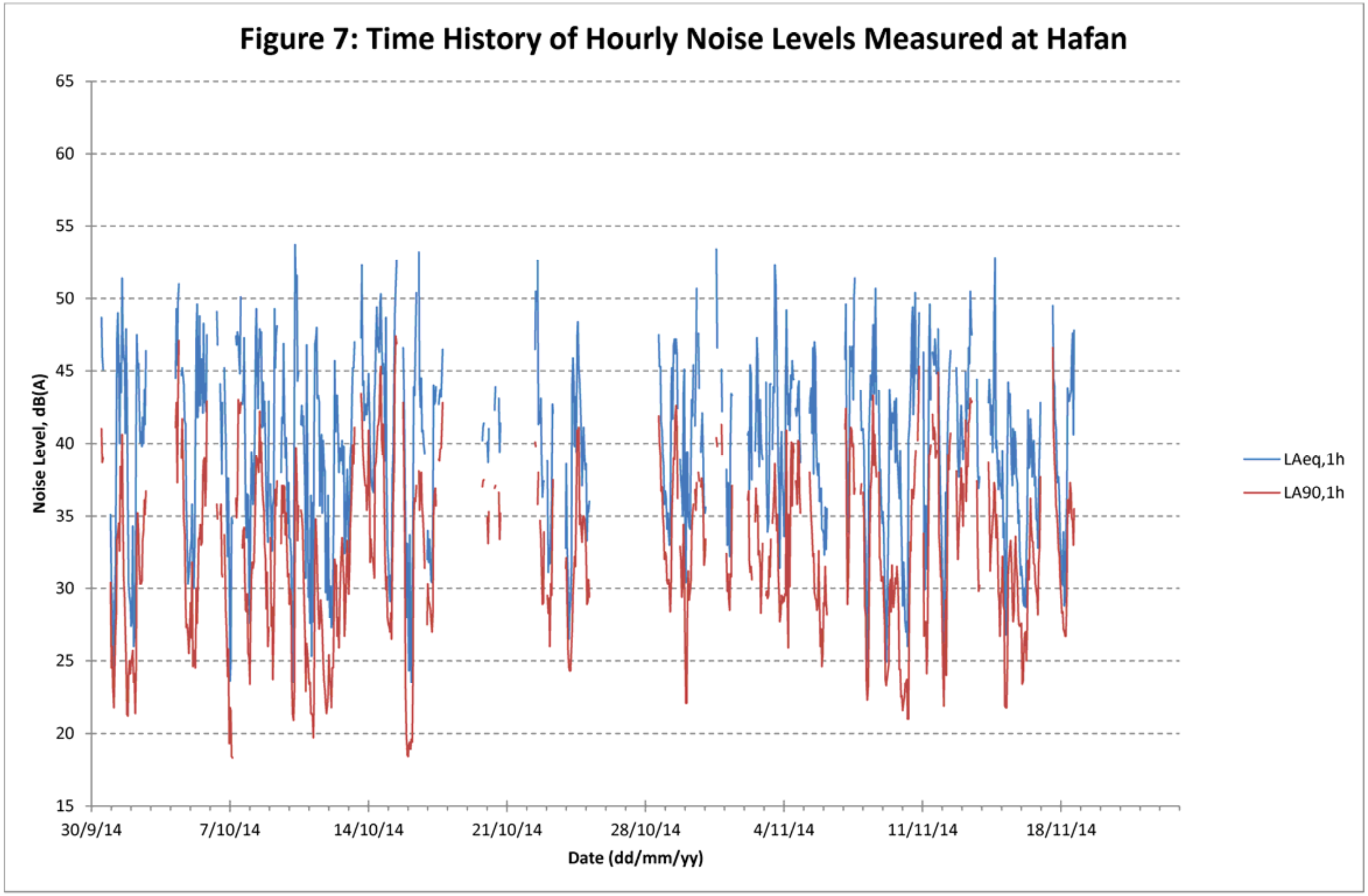

Figure 7: Time History of Hourly Noise Levels Measured at Hafan
Noise Level, dB(A)
65
60
55
50
45
40
35
30
25
20
15
30/9/14
7/10/14
14/10/14
21/10/14
28/10/14
4/11/14
11/11/14
18/11/14
Date (dd/mm/yy)
LAeq,1h
LA90,1h

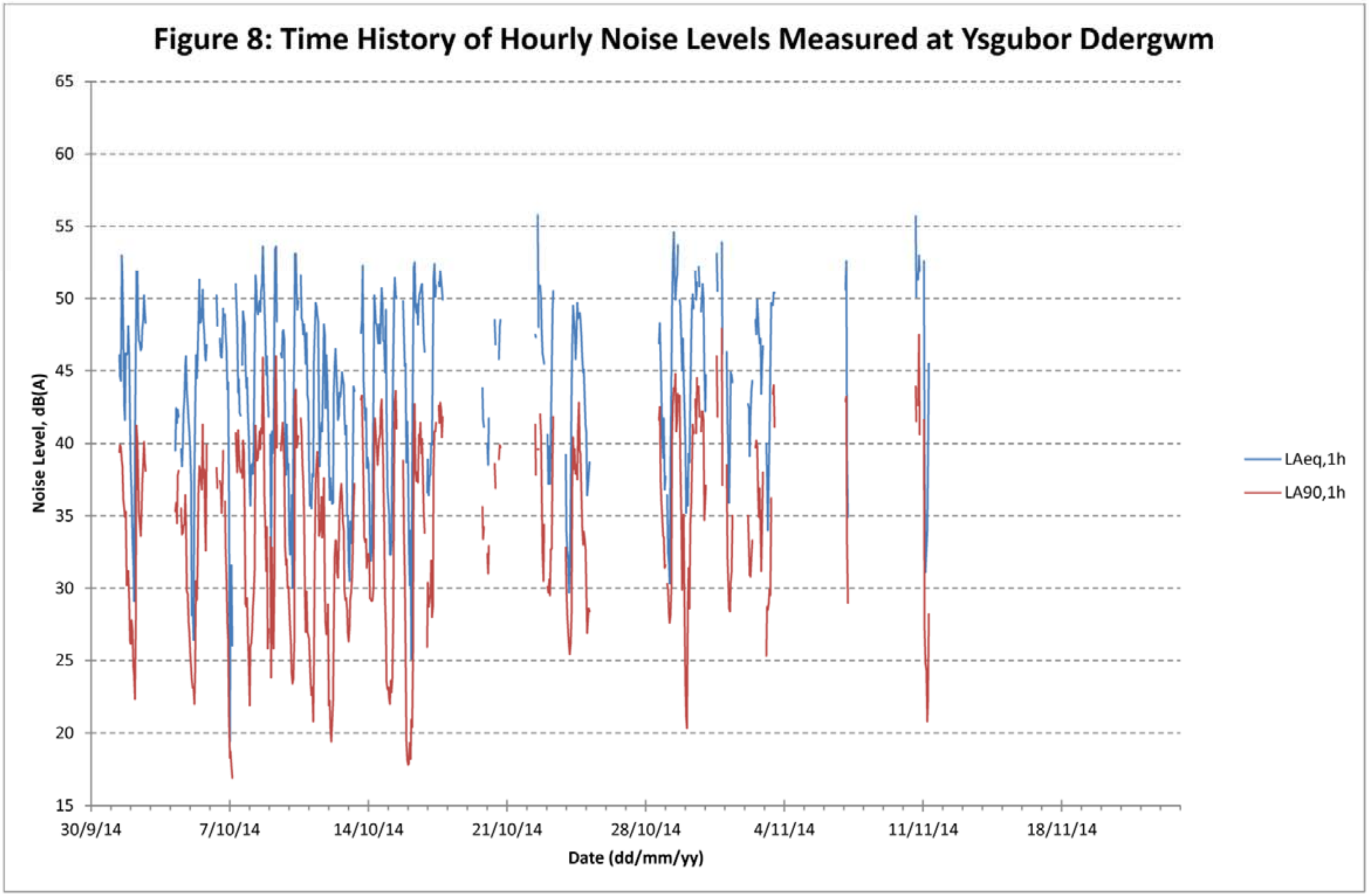
Figure 8: Time History of Hourly Noise Levels Measured at Ysgubor Ddergwm
65
60
55
50
45
40
35
30
25
20
15
Noise Level, dB(A)
30/9/14
7/10/14
14/10/14
21/10/14
28/10/14
4/11/14
11/11/14
18/11/14
Date (dd/mm/yy)
LAeq,1h
LA90,1h

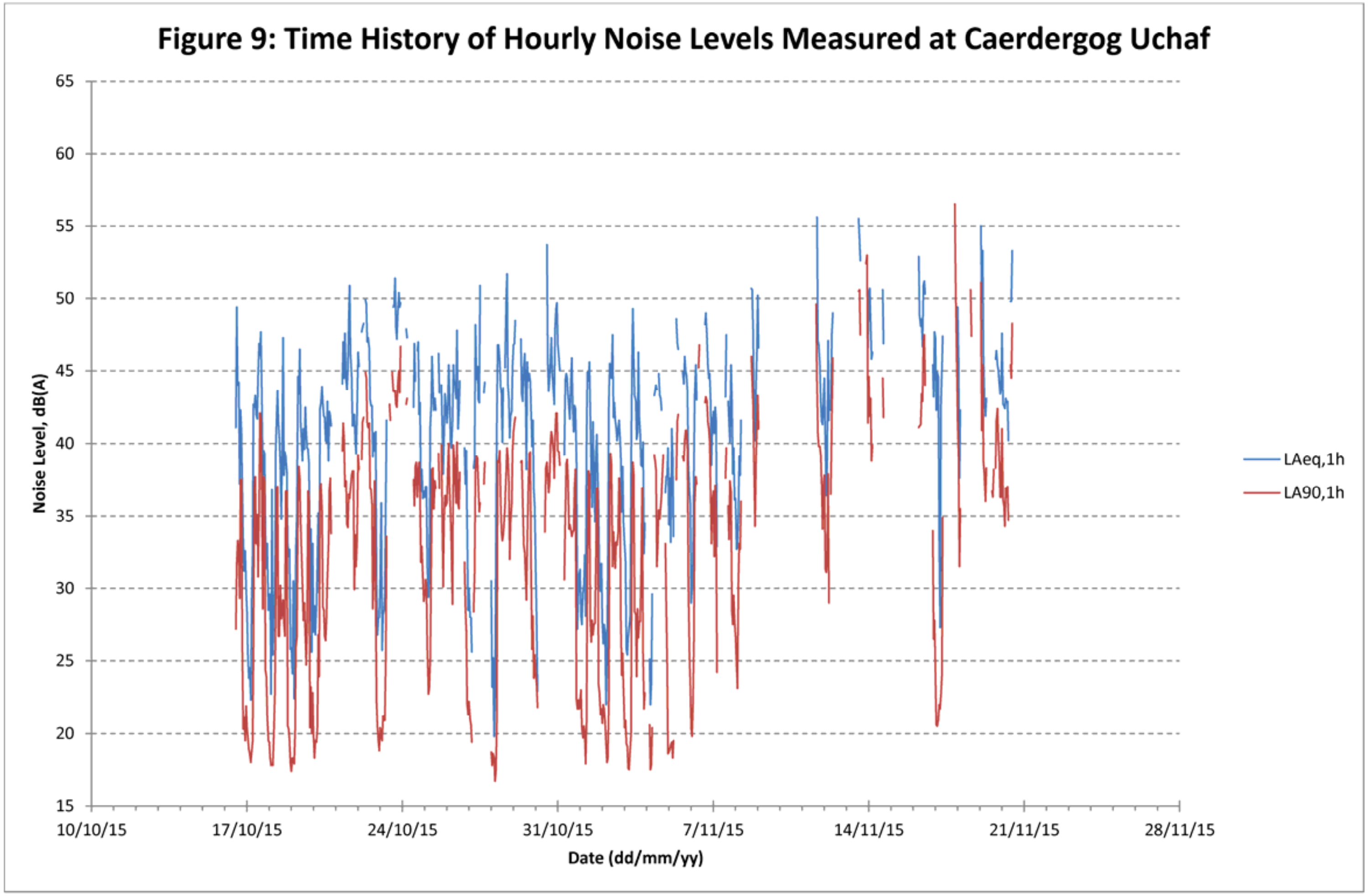

Figure 9: Time History of Hourly Noise Levels Measured at Caerdergog Uchaf
Noise Level, dB(A)
65
60
55
50
45
40
35
30
25
20
15
10/10/15
17/10/15
24/10/15
31/10/15
7/11/15
14/11/15
21/11/15
28/11/15
Date (dd/mm/yy)
LAeq,1h
LA90,1h

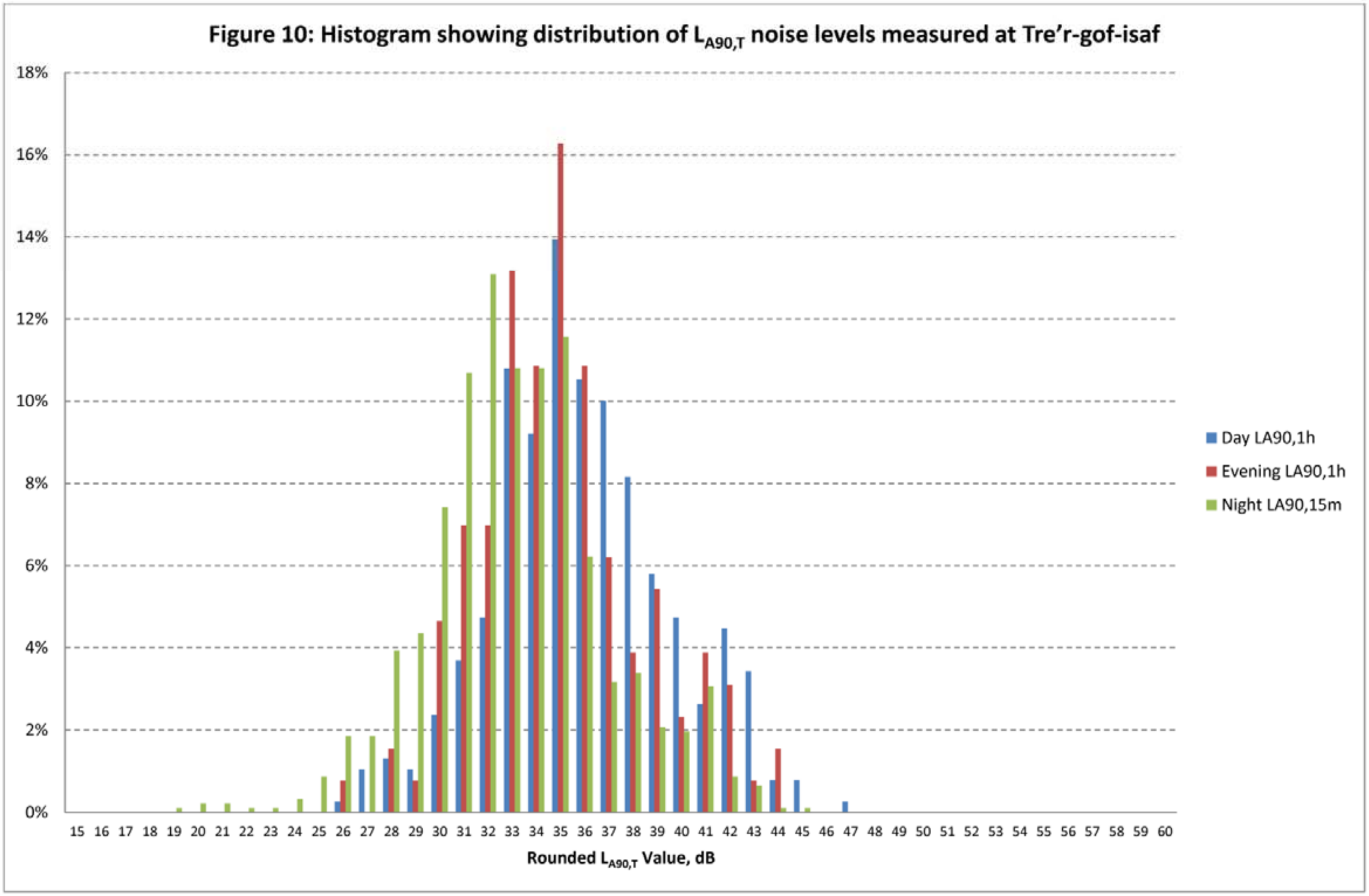
Figure 10: Histogram showing distribution of $L_{A90,T}$ noise levels measured at Tre'r-gof-isaf
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
Rounded $L_{A90,T}$ Value, dB
Day LA90,1h
Evening LA90,1h
Night LA90,15m

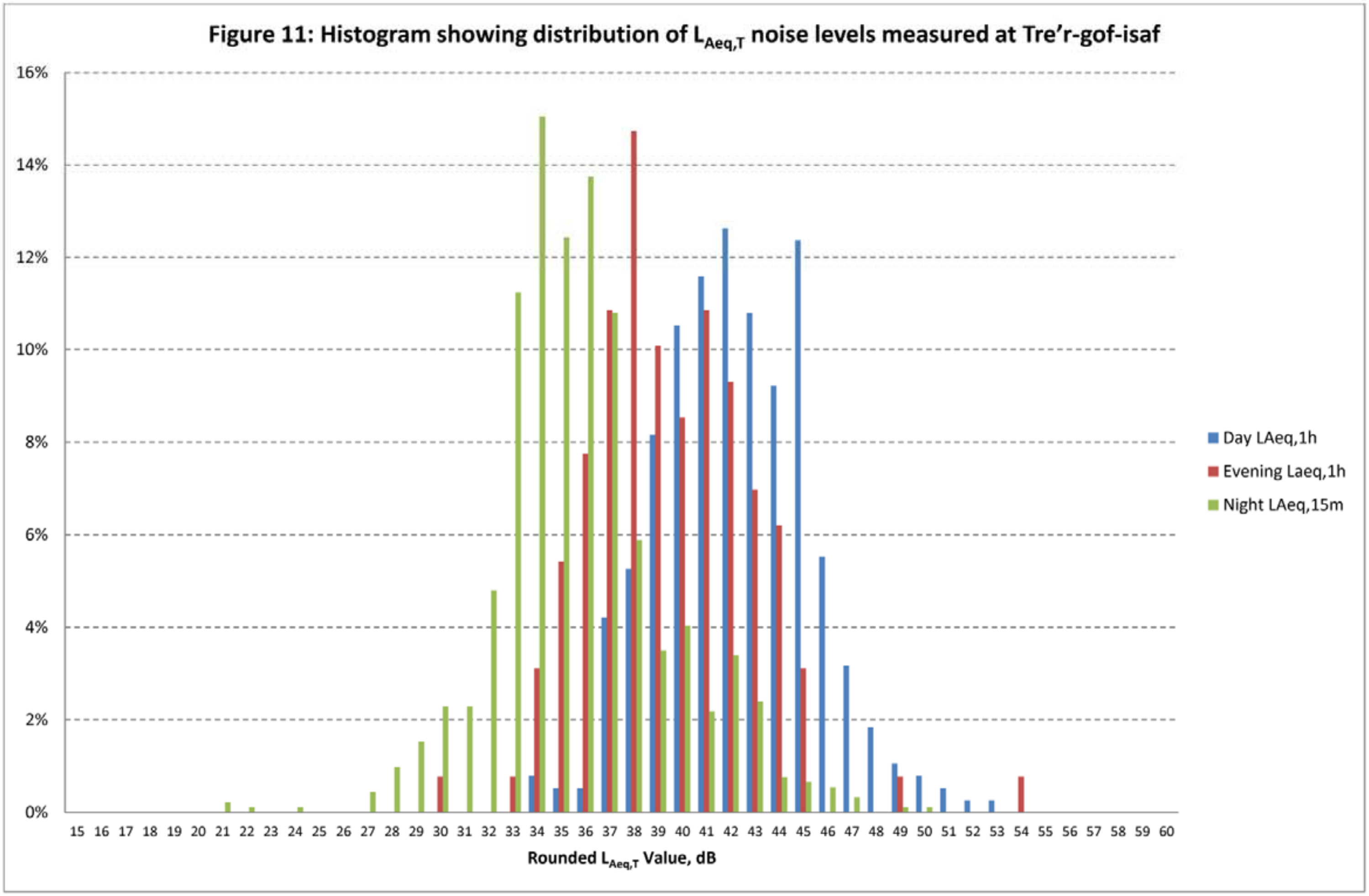
Figure 11: Histogram showing distribution of $L_{Aeq,T}$ noise levels measured at Tre'r-gof-isaf
16%
14%
12%
10%
8%
6%
4%
2%
0%
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
Rounded $L_{Aeq,T}$ Value, dB
Day LAeq,1h
Evening Laeq,1h
Night LAeq,15m

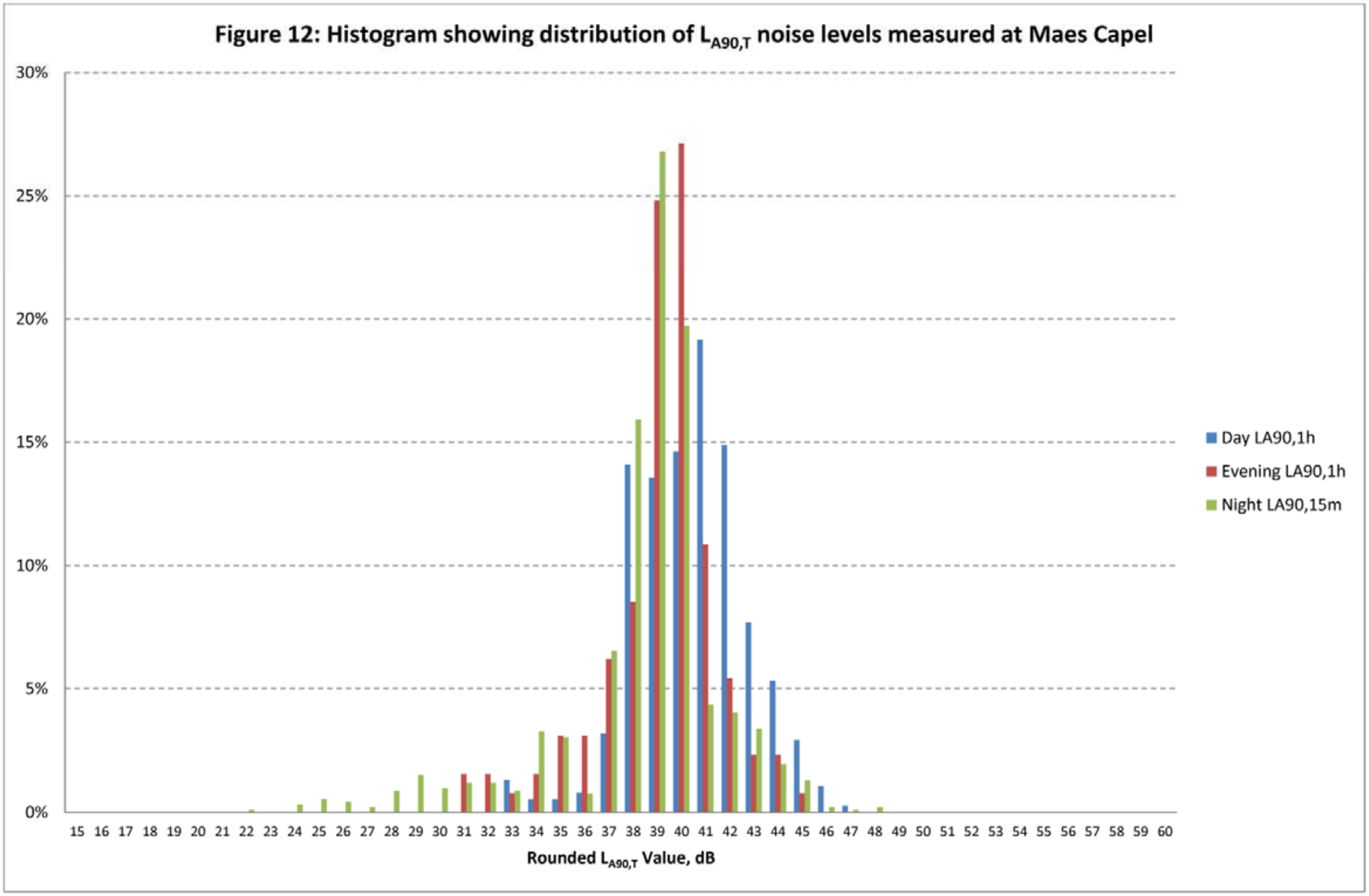

Figure 12: Histogram showing distribution of $L_{A90,T}$ noise levels measured at Maes Capel
30%
25%
20%
15%
10%
5%
0%
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
Rounded $L_{A90,T}$ Value, dB
Day LA90,1h
Evening LA90,1h
Night LA90,15m

JACOBS

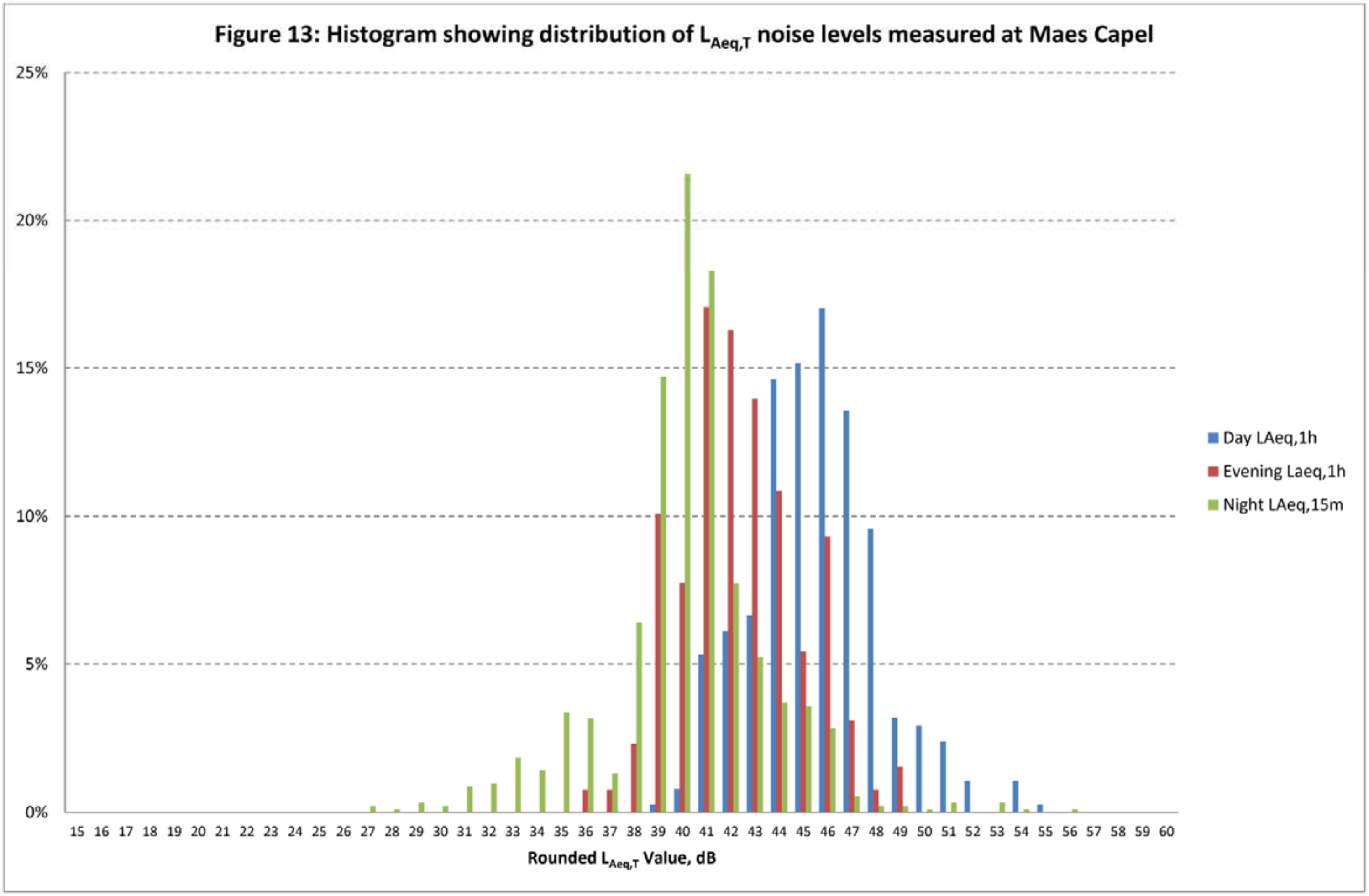
Figure 13: Histogram showing distribution of L Aeq,T noise levels measured at Maes Capel
25%
20%
15%
10%
5%
0%
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
Rounded L Aeq,T Value, dB
Day LAeq,1h
Evening Laeq,1h
Night LAeq,15m

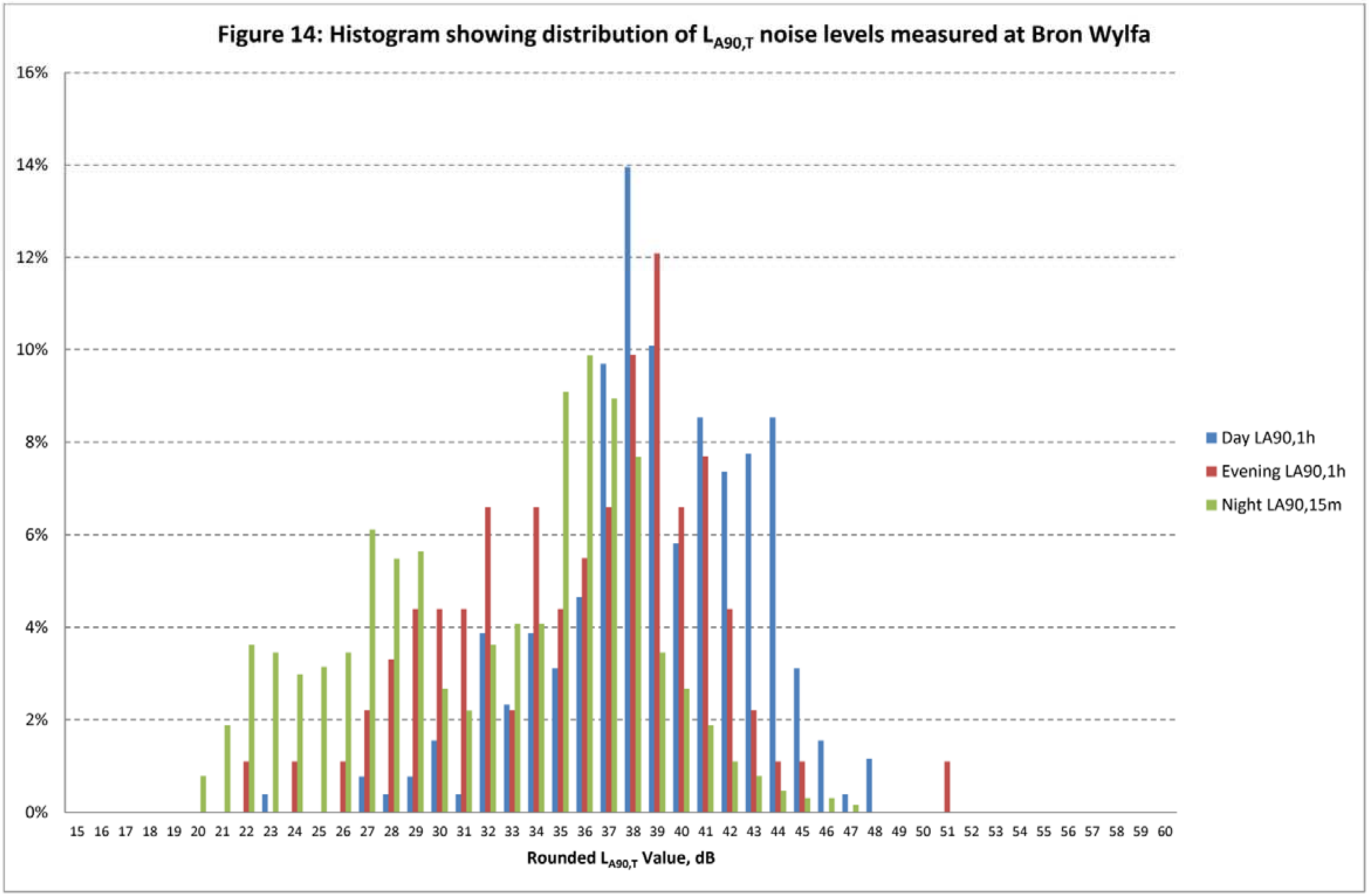
Figure 14: Histogram showing distribution of LA90,T noise levels measured at Bron Wylfa
16%
14%
12%
10%
8%
6%
4%
2%
0%
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
Rounded LA90,T Value, dB
Day LA90,1h
Evening LA90,1h
Night LA90,15m

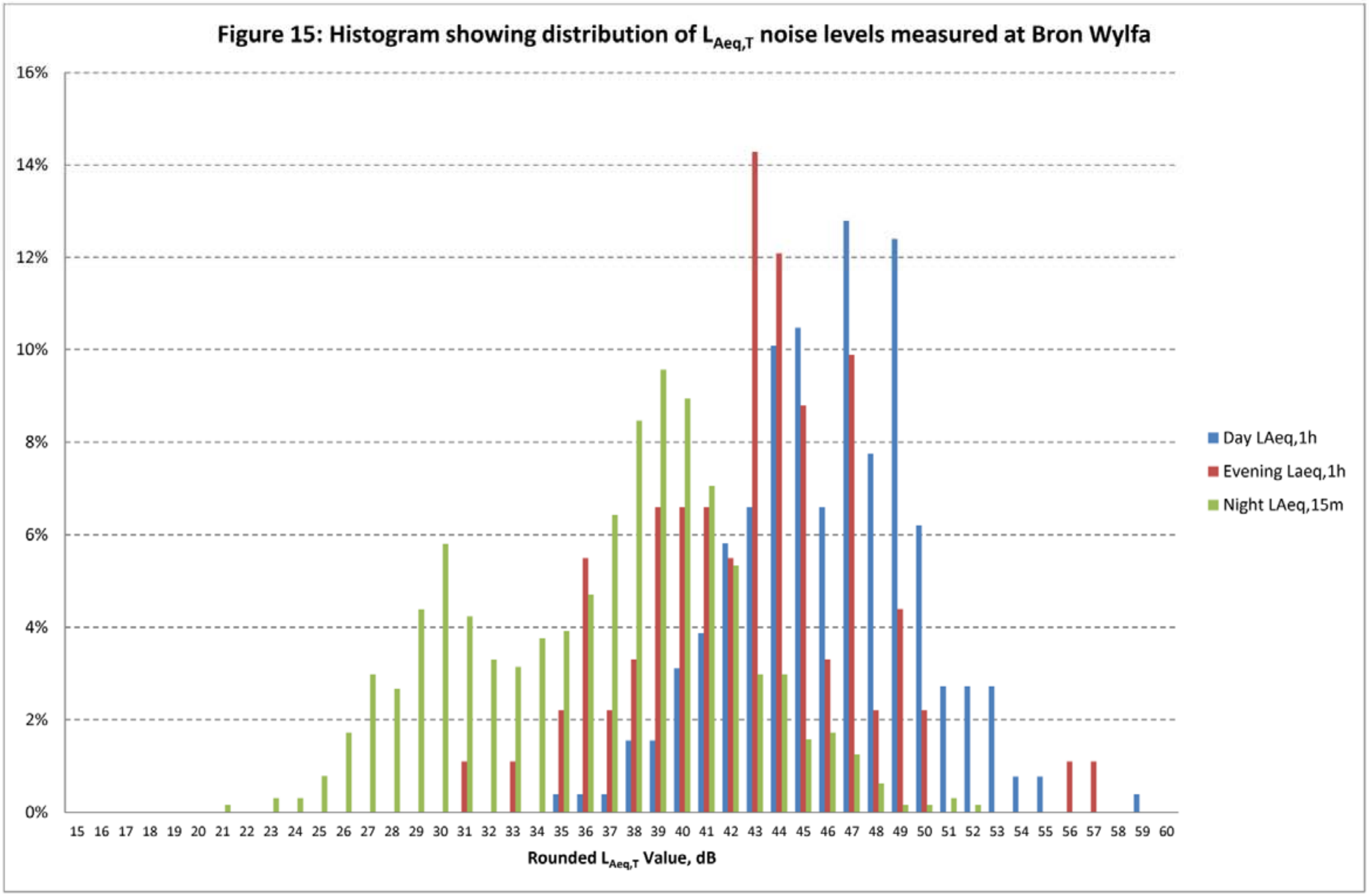
Figure 15: Histogram showing distribution of $L_{Aeq,T}$ noise levels measured at Bron Wylfa
16%
14%
12%
10%
8%
6%
4%
2%
0%
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
Rounded $L_{Aeq,T}$ Value, dB
Day LAeq,1h
Evening Laeq,1h
Night LAeq,15m

JACOBS

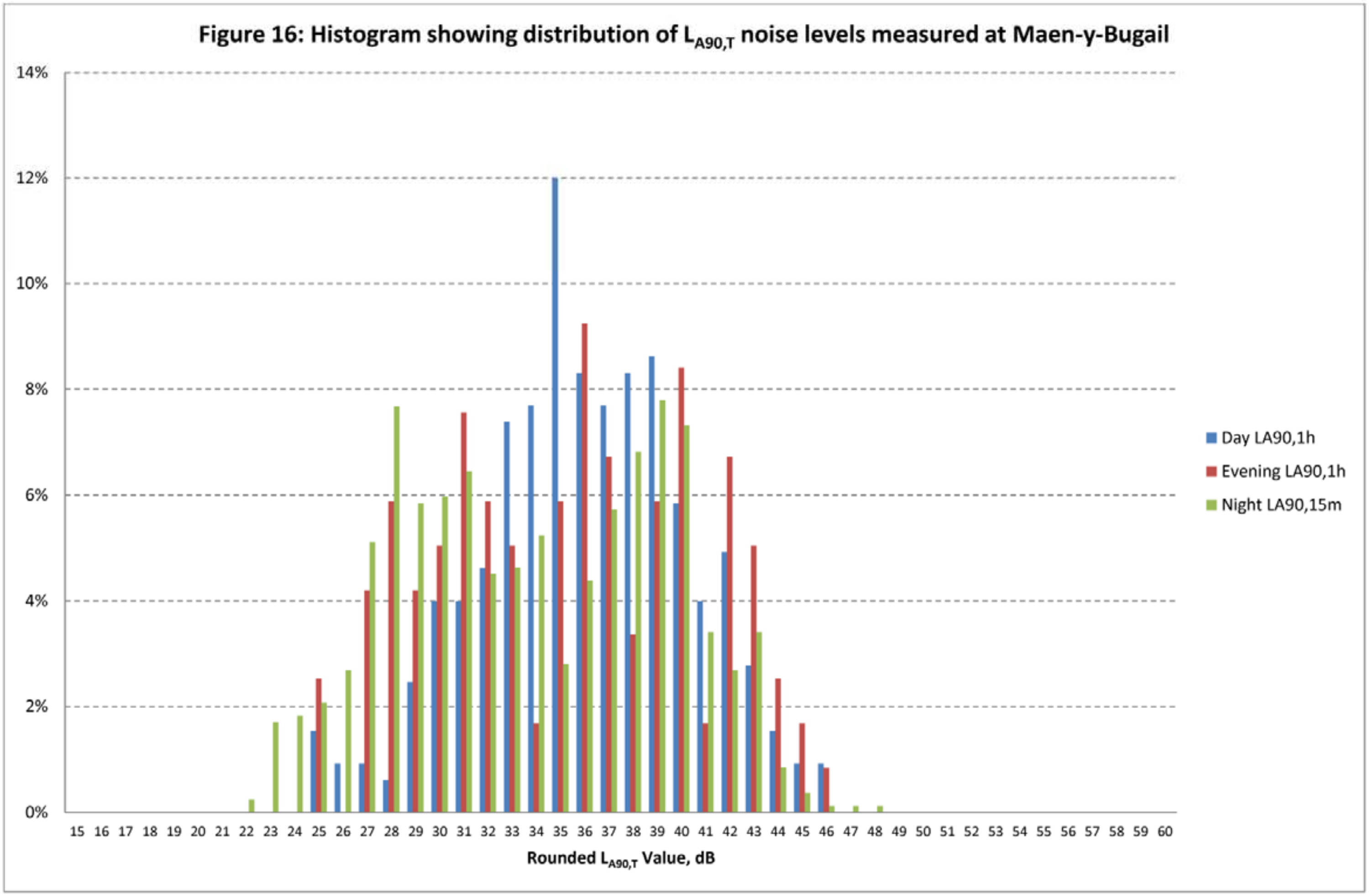

Figure 16: Histogram showing distribution of $L_{A90,T}$ noise levels measured at Maen-y-Bugail
14%
12%
10%
8%
6%
4%
2%
0%
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
Rounded $L_{A90,T}$ Value, dB
Day LA90,1h
Evening LA90,1h
Night LA90,15m

JACOBS

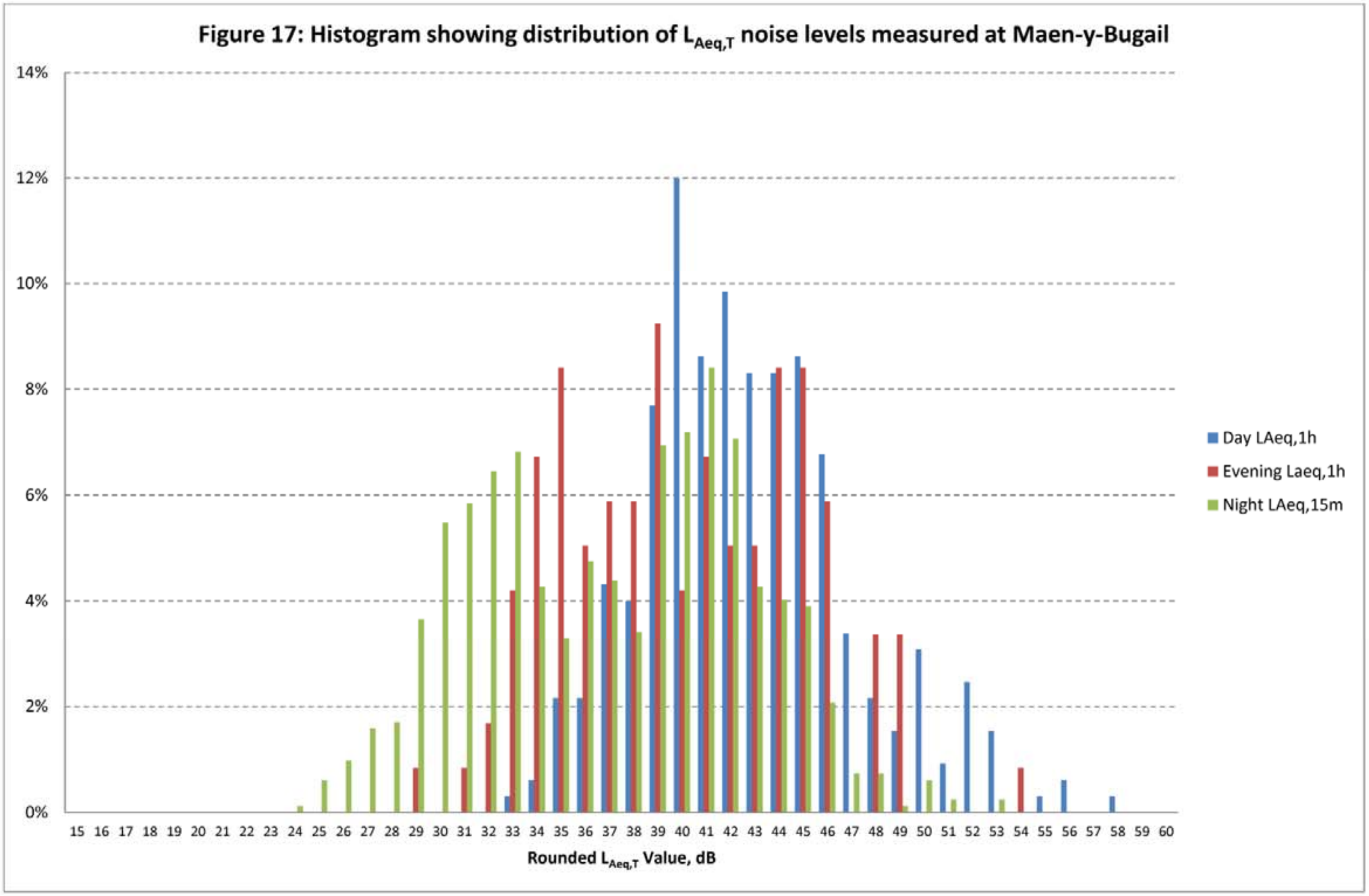

Figure 17: Histogram showing distribution of $L_{Aeq,T}$ noise levels measured at Maen-y-Bugail
14%
12%
10%
8%
6%
4%
2%
0%
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
Rounded $L_{Aeq,T}$ Value, dB
Day LAeq,1h
Evening Laeq,1h
Night LAeq,15m

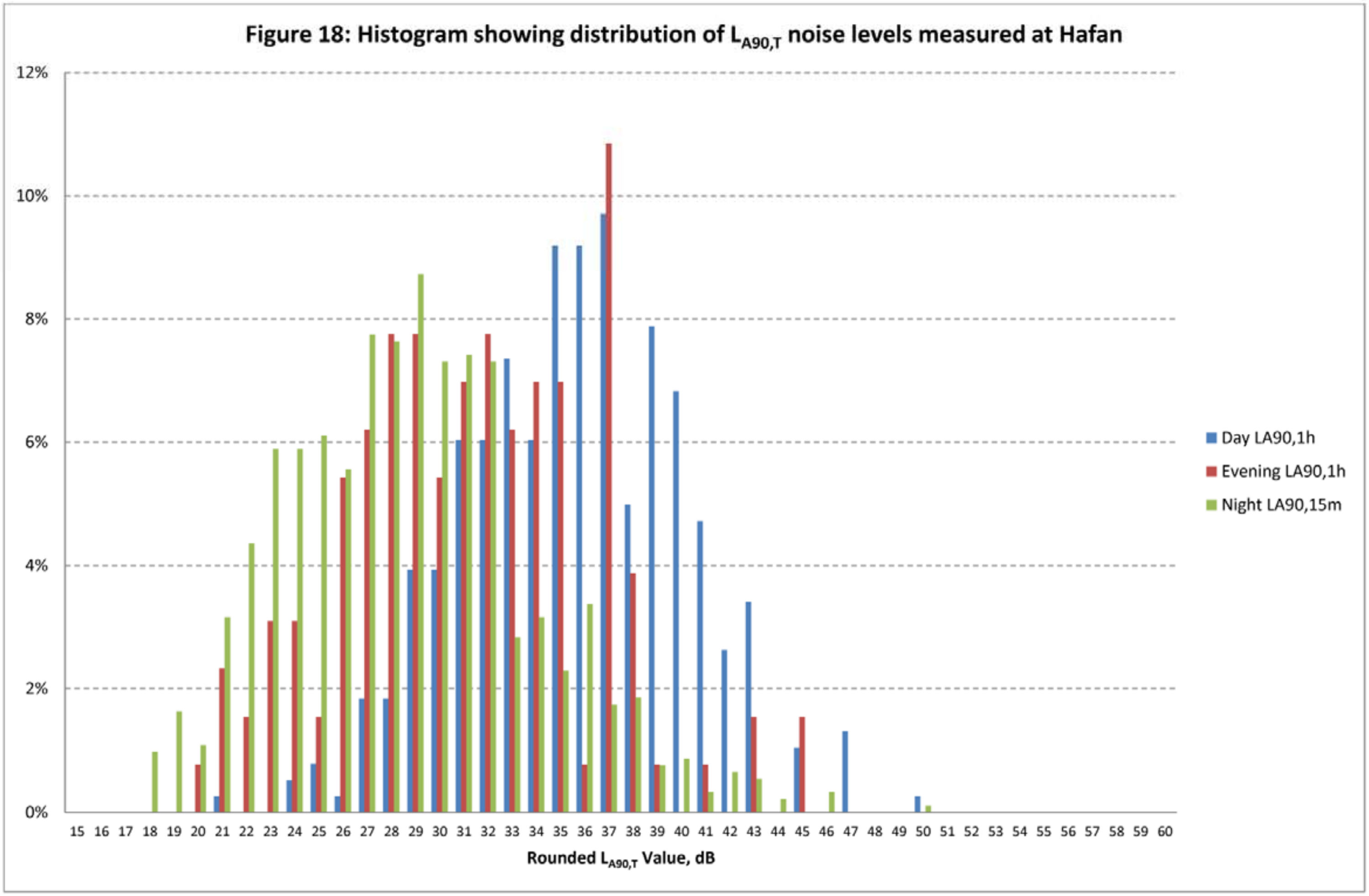
Figure 18: Histogram showing distribution of $L_{A90,T}$ noise levels measured at Hafan
12%
10%
8%
6%
4%
2%
0%
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
Rounded $L_{A90,T}$ Value, dB
Day LA90,1h
Evening LA90,1h
Night LA90,15m

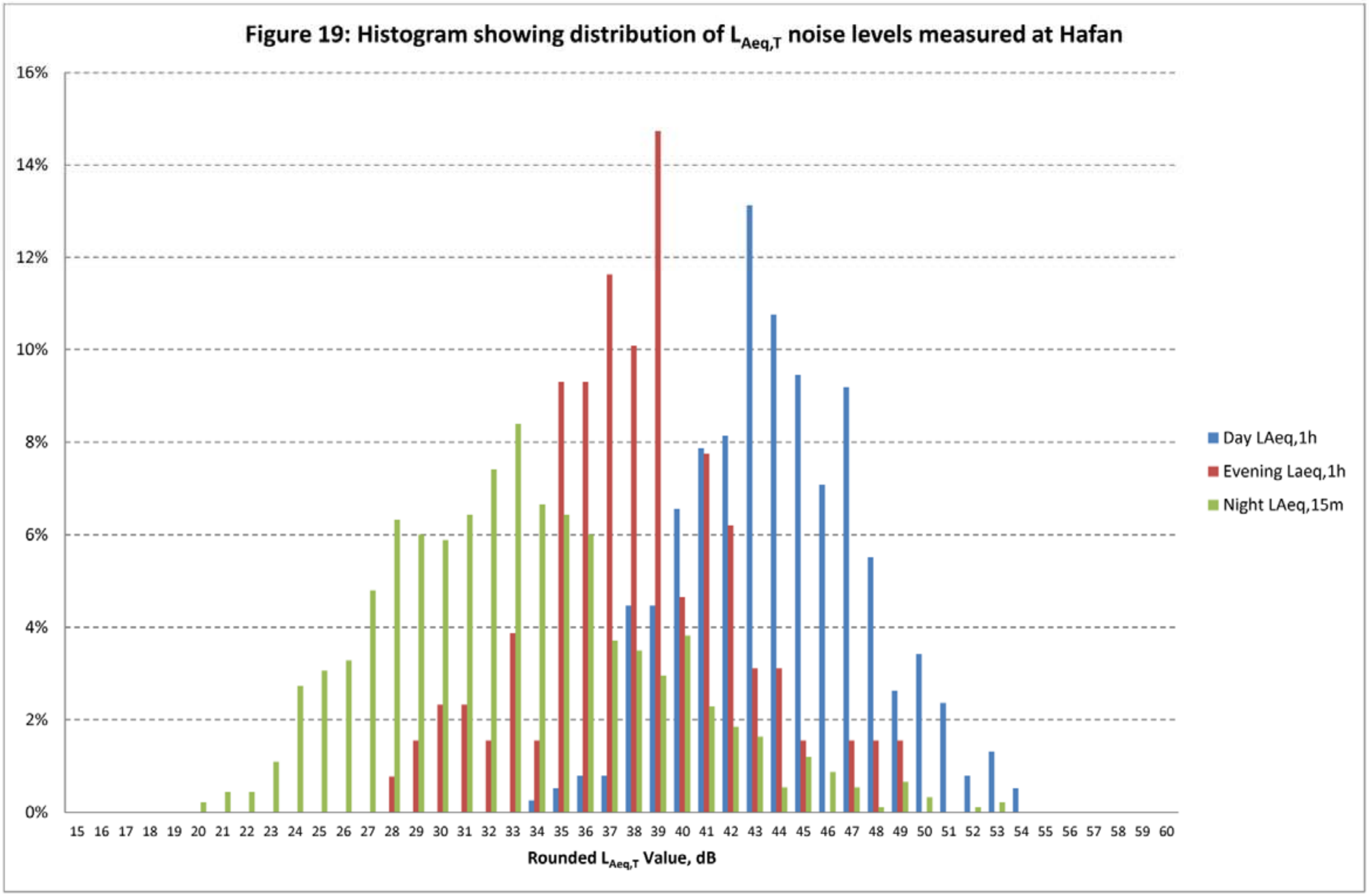
Figure 19: Histogram showing distribution of $L_{Aeq,T}$ noise levels measured at Hafan
16%
14%
12%
10%
8%
6%
4%
2%
0%
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
Rounded $L_{Aeq,T}$ Value, dB
Day LAeq,1h
Evening Laeq,1h
Night LAeq,15m

JACOBS

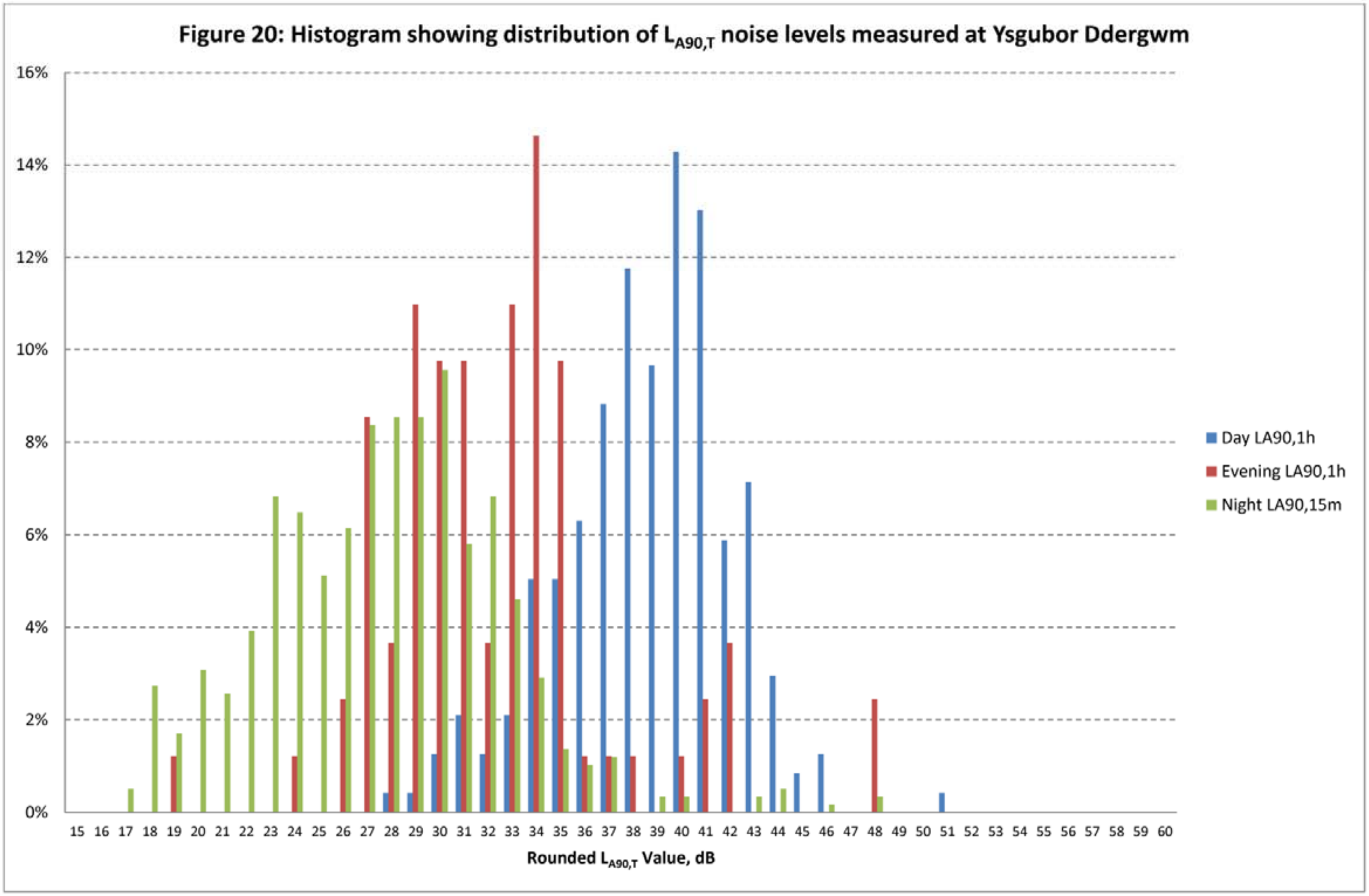

Figure 20: Histogram showing distribution of $L_{A90,T}$ noise levels measured at Ysgubor Ddergwm
16%
14%
12%
10%
8%
6%
4%
2%
0%
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
Rounded $L_{A90,T}$ Value, dB
Day LA90,1h
Evening LA90,1h
Night LA90,15m

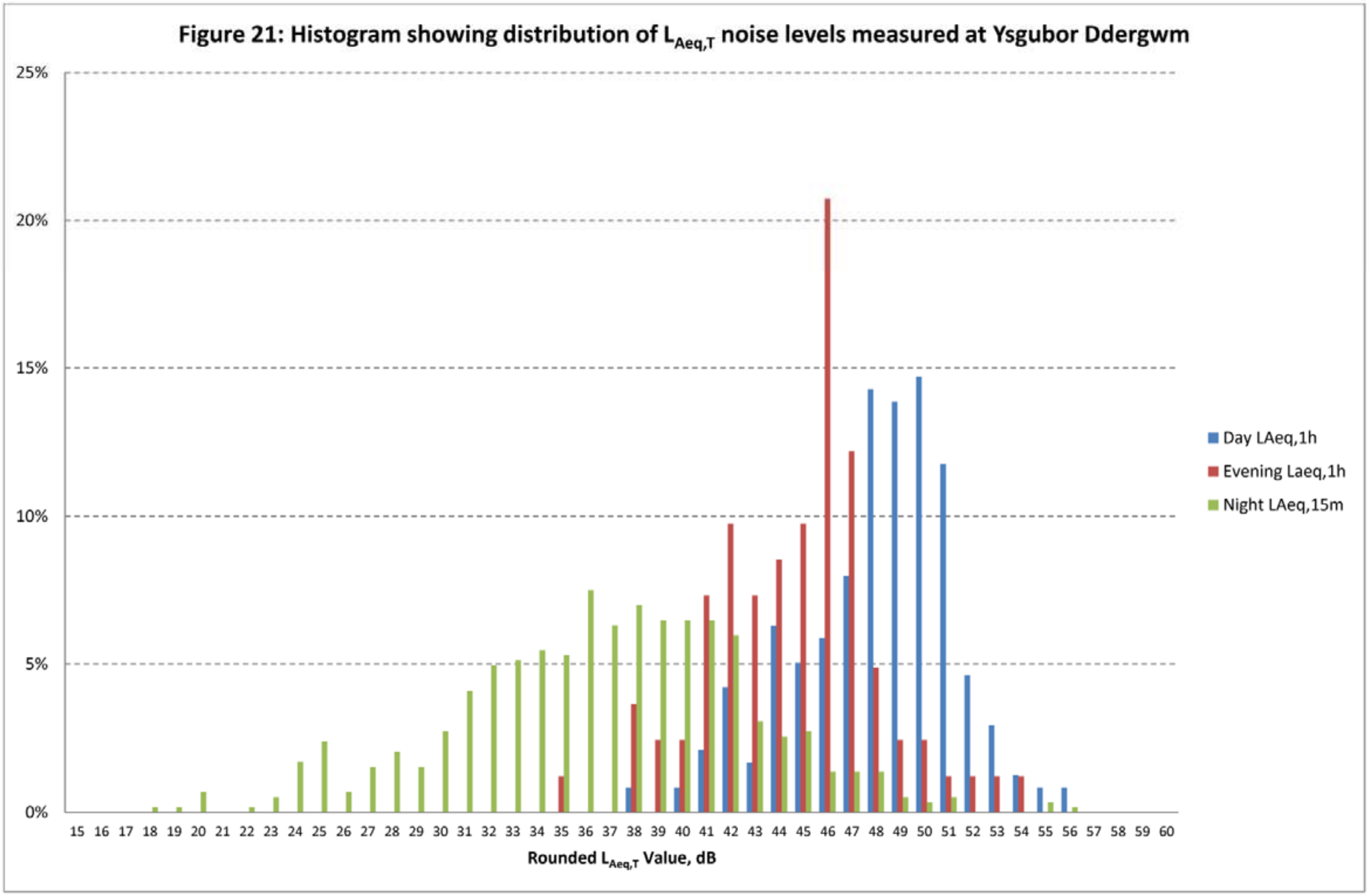

Figure 21: Histogram showing distribution of $L_{Aeq,T}$ noise levels measured at Ysgubor Ddergwm
25%
20%
15%
10%
5%
0%
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
Rounded $L_{Aeq,T}$ Value, dB
Day LAeq,1h
Evening Laeq,1h
Night LAeq,15m

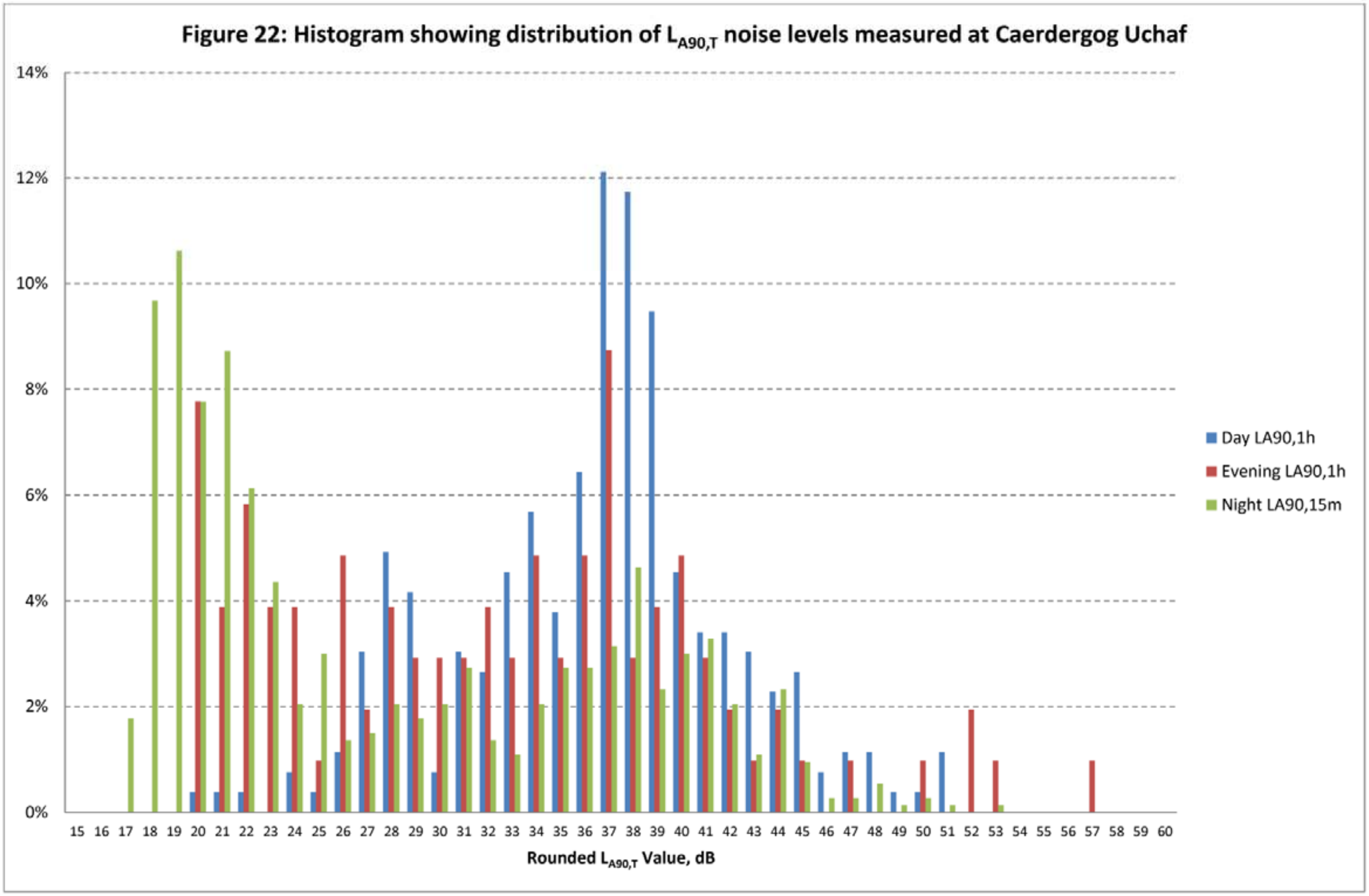
Figure 22: Histogram showing distribution of $L_{A90,T}$ noise levels measured at Caerdergog Uchaf
14%
12%
10%
8%
6%
4%
2%
0%
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
Rounded $L_{A90,T}$ Value, dB
Day LA90,1h
Evening LA90,1h
Night LA90,15m

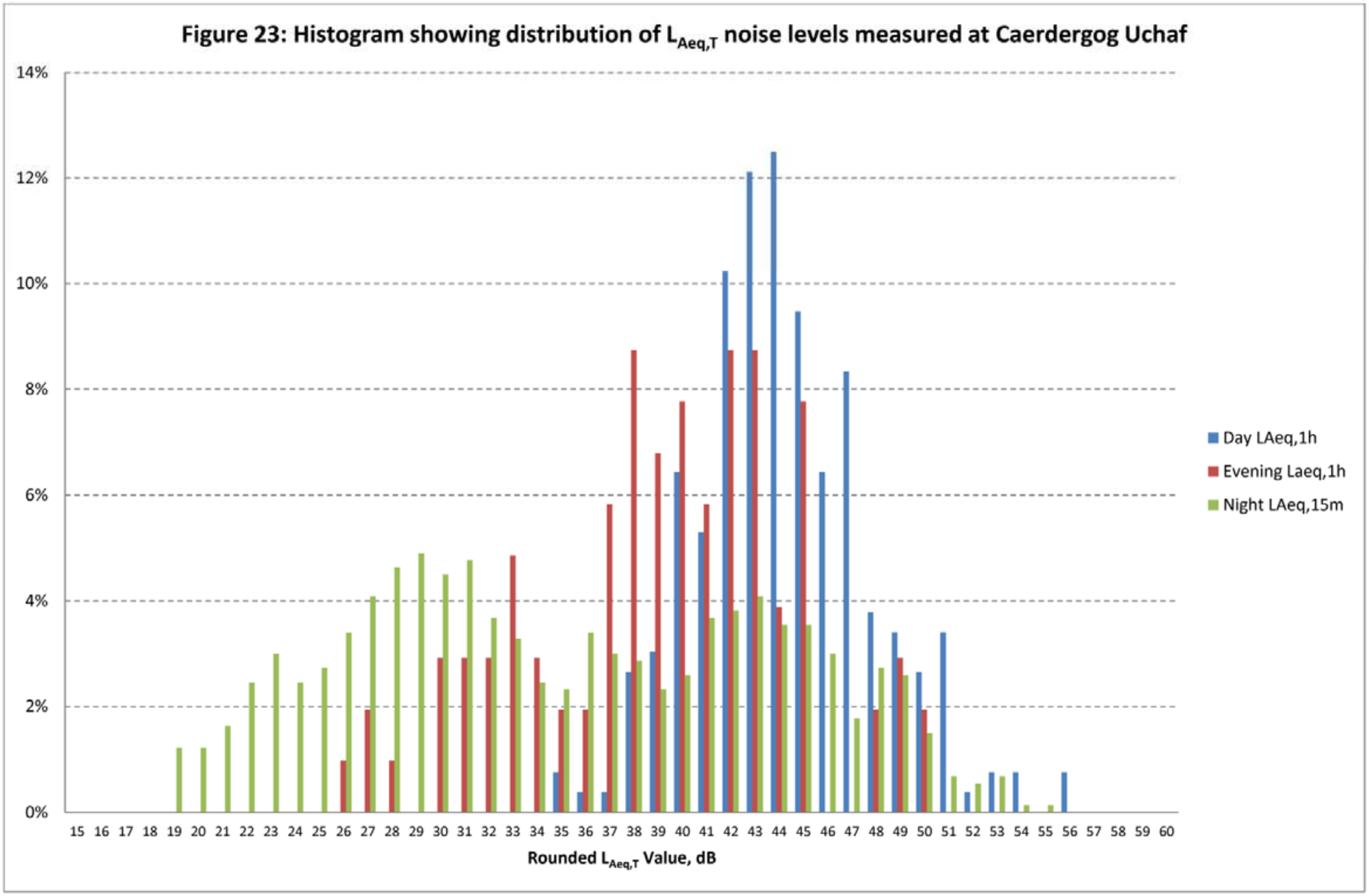

Figure 23: Histogram showing distribution of $L_{Aeq,T}$ noise levels measured at Caerdergog Uchaf
14%
12%
10%
8%
6%
4%
2%
0%
15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
Rounded $L_{Aeq,T}$ Value, dB
Day LAeq,1h
Evening Laeq,1h
Night LAeq,15m

Interim noise monitoring report:

External noise monitoring as undertaken at Clovelley, Cemaes Bay, Anglesey, LL67 0DA from 11:52am on the 29th February to 11:27am on the 7th March 2012.

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Figure One: monitoring location in the rear garden of Clovelley, Cemaes Bay, LL67 0DA (Wylfa visible in distance)

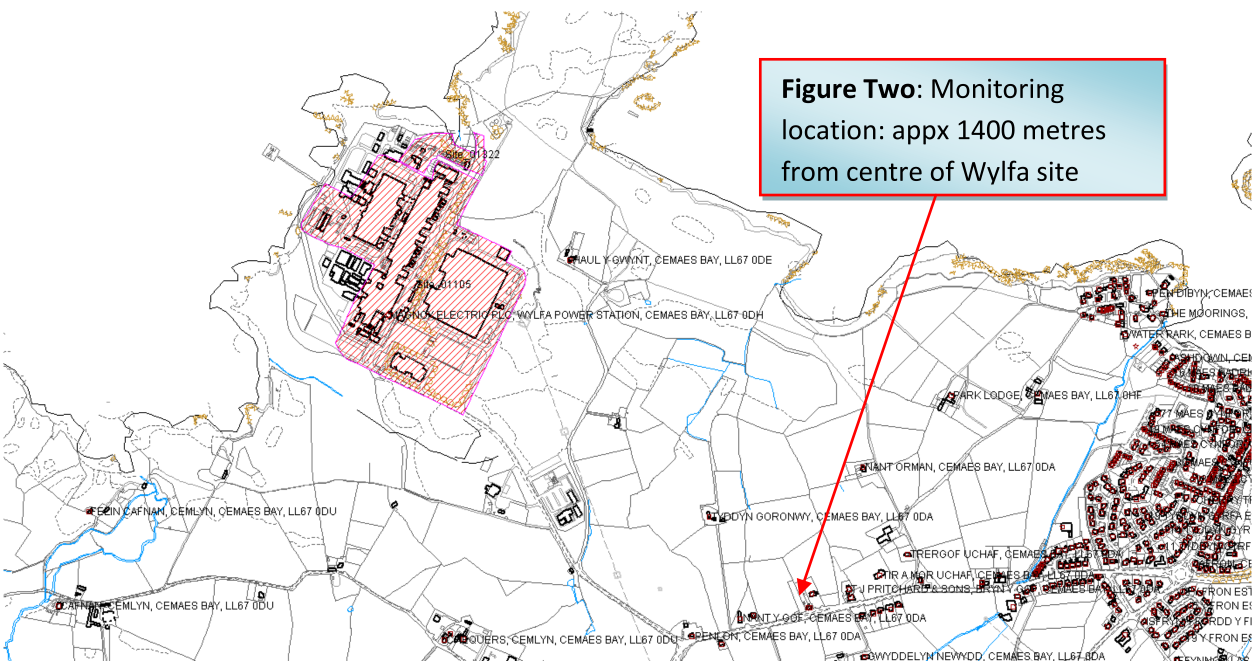
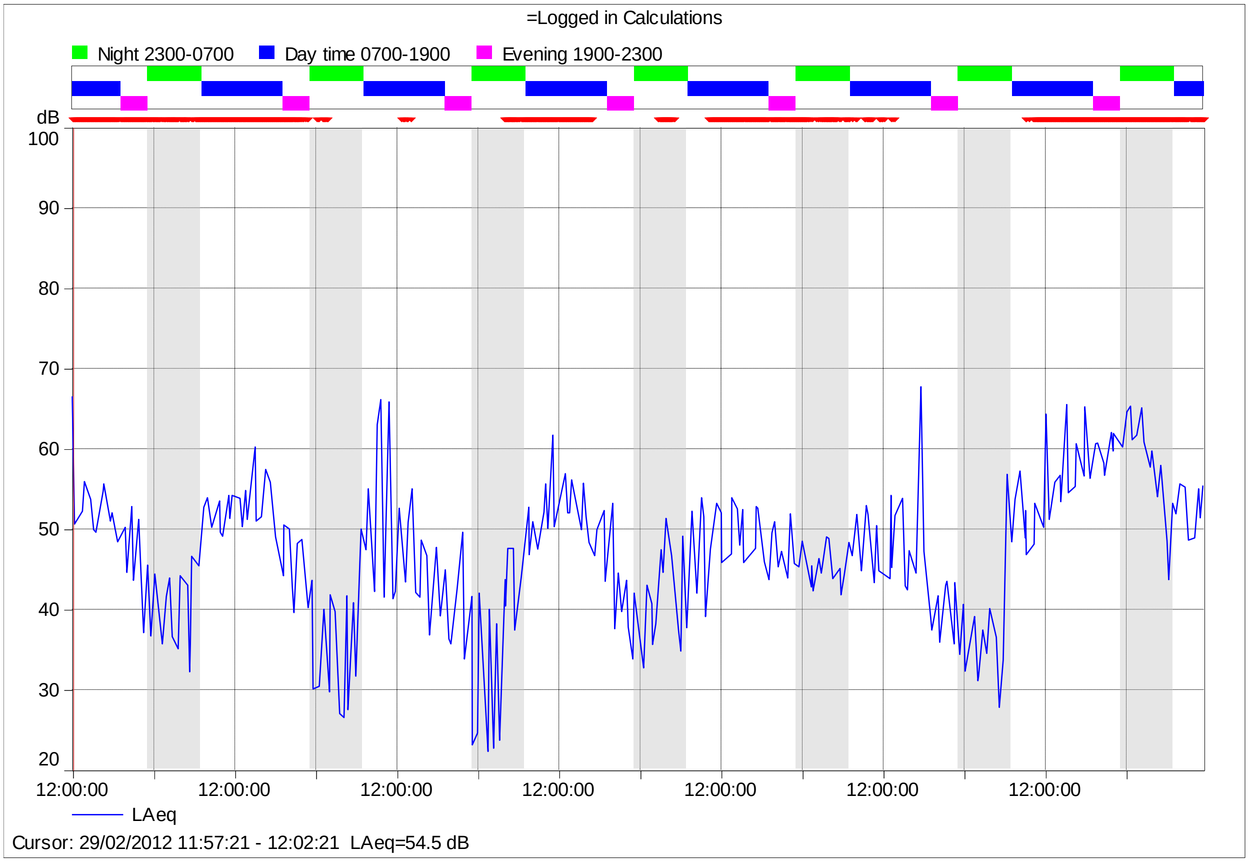


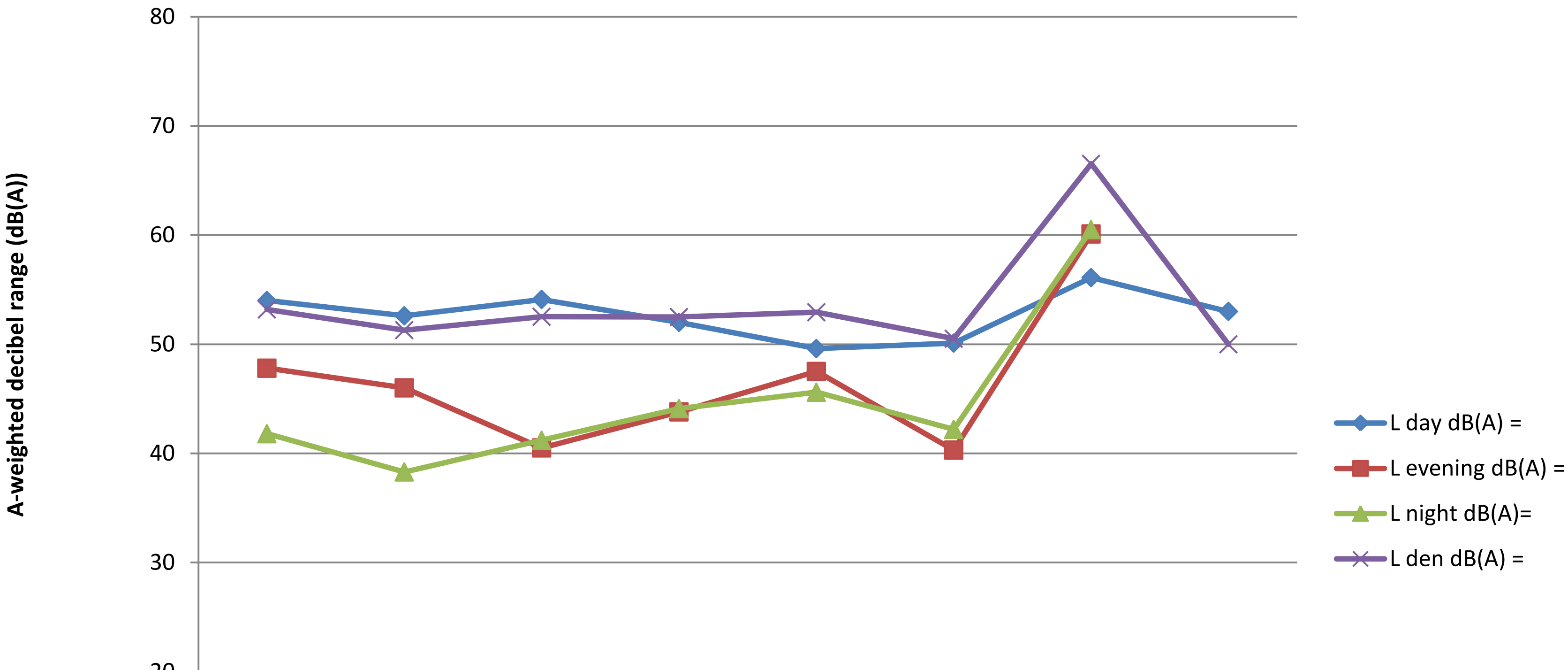
Figure Two: Monitoring location: appx 1400 metres from centre of Wylfa site

Figure Three: Graph depicting the total of 5-minute logged results



Noise recordings undertaken by M. Goodfellow, Environmental Health Officer with Isle Of Anglesey County Council.

External noise monitoring at Clovelley - 29th February 7th March 2012

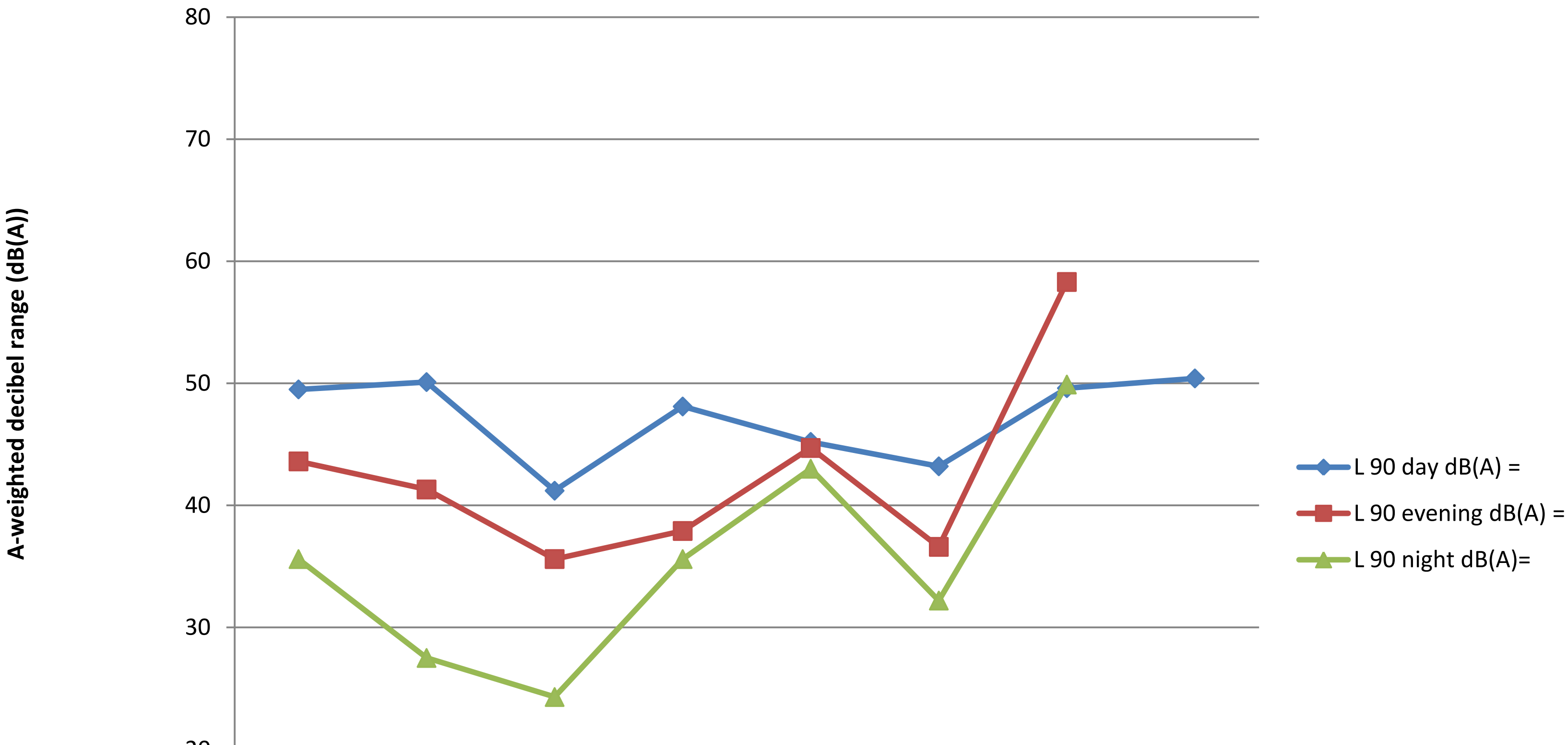


	29th February 2012	01 March 2012	02 March 2012	03 March 2012	04 March 2012	05 March 2012	06 March 2012	07 March 2012
L day dB(A) =	54	52.6	54.1	52	49.6	50.1	56.1	53
L evening dB(A) =	47.8	46	40.5	43.8	47.5	40.3	60.1	
L night dB(A)=	41.8	38.3	41.2	44.1	45.6	42.2	60.5	
L den dB(A) =	53.2	51.3	52.5	52.5	52.9	50.5	66.5	50.0

Monitoring period

Noise recordings undertaken by M. Goodfellow, Environmental Health Officer with Isle Of Anglesey County Council.

External noise monitoring at Clovelley 29th February to 7th March 2012



	29th February 2012	01 March 2012	02 March 2012	03 March 2012	04 March 2012	05 March 2012	06 March 2012	07 March 2012
L 90 day dB(A) =	49.5	50.1	41.2	48.1	45.2	43.2	49.6	50.4
L 90 evening dB(A) =	43.6	41.3	35.6	37.9	44.7	36.6	58.3	
L 90 night dB(A)=	35.6	27.5	24.3	35.6	43	32.2	49.9	

Monitoring period

Noise recordings undertaken by M. Goodfellow, Environmental Health Officer with Isle Of Anglesey County Council.

Table One: Results of recordings:

Name	Start time	End time	Duration	LAeq [dB]	LA10 [dB]	LA50 [dB]	LA90 [dB]
Total	29/02/2012 11:52:21	07/03/2012 11:27:21	167:35:00	52.8	55.9	47.8	36.3
(All) Night 2300-0700	29/02/2012 23:02:21	07/03/2012 07:02:21	56:00:00	52.5	56.3	41	31.3
(All) Day time 0700-1900	29/02/2012 11:52:21	07/03/2012 11:27:21	83:35:00	53.1	55.5	50.9	44.9
(All) Evening 1900-2300	29/02/2012 19:02:21	06/03/2012 23:02:21	28:00:00	52.4	59.2	44.7	37.9
Night 2300-0700	29/02/2012 23:02:21	01/03/2012 07:02:21	8:00:00	41.8	44.9	39.6	35.6
Night 2300-0700	01/03/2012 23:02:21	02/03/2012 07:02:21	8:00:00	38.3	42.1	32.7	27.5
Night 2300-0700	02/03/2012 23:02:21	03/03/2012 07:02:21	8:00:00	41.2	45.6	38	24.3
Night 2300-0700	03/03/2012 23:02:21	04/03/2012 07:02:21	8:00:00	44.1	48.7	40.5	35.6
Night 2300-0700	04/03/2012 23:02:21	05/03/2012 07:02:21	8:00:00	45.6	47.8	45	43
Night 2300-0700	05/03/2012 23:02:21	06/03/2012 07:02:21	8:00:00	42.2	42.8	35.6	32.2
Night 2300-0700	06/03/2012 23:02:21	07/03/2012 07:02:21	8:00:00	60.5	63.8	59.6	49.9
Day time 0700-1900	29/02/2012 11:52:21	29/02/2012 19:02:21	7:10:00	54	55.2	52.5	49.5
Day time 0700-1900	01/03/2012 07:02:21	01/03/2012 19:02:21	12:00:00	52.6	53.9	52.1	50.1
Day time 0700-1900	02/03/2012 07:02:21	02/03/2012 19:02:21	12:00:00	54.1	59.2	46.9	41.2
Day time 0700-1900	03/03/2012 07:02:21	03/03/2012 19:02:21	12:00:00	52	54.3	50.9	48.1
Day time 0700-1900	04/03/2012 07:02:21	04/03/2012 19:02:21	12:00:00	49.6	52.1	49.4	45.2
Day time 0700-1900	05/03/2012 07:02:21	05/03/2012 19:02:21	12:00:00	50.1	51.2	47.2	43.2
Day time 0700-1900	06/03/2012 07:02:21	06/03/2012 19:02:21	12:00:00	56.1	58.8	54.4	49.6
Day time 0700-1900	07/03/2012 07:02:21	07/03/2012 11:27:21	4:25:00	53	55.1	53	50.4
Evening 1900-2300	29/02/2012 19:02:21	29/02/2012 23:02:21	4:00:00	47.8	50.8	47.2	43.6
Evening 1900-2300	01/03/2012 19:02:21	01/03/2012 23:02:21	4:00:00	46	48.9	45	41.3
Evening 1900-2300	02/03/2012 19:02:21	02/03/2012 23:02:21	4:00:00	40.5	42.8	38.9	35.6
Evening 1900-2300	03/03/2012 19:02:21	03/03/2012 23:02:21	4:00:00	43.8	46.1	42.4	37.9
Evening 1900-2300	04/03/2012 19:02:21	04/03/2012 23:02:21	4:00:00	47.5	49.8	46.9	44.7
Evening 1900-2300	05/03/2012 19:02:21	05/03/2012 23:02:21	4:00:00	40.3	43	40.1	36.6
Evening 1900-2300	06/03/2012 19:02:21	06/03/2012 23:02:21	4:00:00	60.1	61.6	59.9	58.3

Noise recordings undertaken by M. Goodfellow, Environmental Health Officer with Isle Of Anglesey County Council.

L day dB(A) =	54	251188.6432	L 90 day dB(A) =	49.5	89125.09381
L evening dB(A) =	47.8	190546.0718	L 90 evening dB(A) =	43.6	72443.59601
L night dB(A)=	41.8	151356.1248	L 90 night dB(A)=	35.6	36307.80548
L den dB(A) =	**53.18**	**29th February 2012**			**29th February 2012**
L day dB(A) =	52.6	181970.0859	L 90 day dB(A) =	50.1	102329.2992
L evening dB(A) =	46	125892.5412	L 90 evening dB(A) =	41.3	42657.95188
L night dB(A)=	38.3	67608.29754	L 90 night dB(A)=	27.5	5623.413252
L den dB(A) =	**51.29**	**1st March 2012**			**1st March 2012**
L day dB(A) =	54.1	257039.5783	L 90 day dB(A) =	41.2	13182.56739
L evening dB(A) =	40.5	35481.33892	L 90 evening dB(A) =	35.6	11481.53621
L night dB(A)=	41.2	131825.6739	L 90 night dB(A)=	24.3	2691.534804
L den dB(A) =	**52.51**	**2nd March 2012**			**2nd March 2012**
L day dB(A) =	52	158489.3192	L 90 day dB(A) =	48.1	64565.4229
L evening dB(A) =	43.8	75857.7575	L 90 evening dB(A) =	35.6	11481.53621
L night dB(A)=	44.1	257039.5783	L 90 night dB(A)=	37.9	61659.50019
L den dB(A) =	**52.49**	**3rd March 2012**			**3rd March 2012**
L day dB(A) =	49.6	91201.08394	L 90 day dB(A) =	45.2	33113.11215
L evening dB(A) =	47.5	177827.941	L 90 evening dB(A) =	44.7	93325.43008
L night dB(A)=	45.6	363078.0548	L 90 night dB(A)=	43.0	199526.2315
L den dB(A) =	**52.93**	**4th March 2012**			**4th March 2012**
L day dB(A) =	50.1	102329.2992	L 90 day dB(A) =	43.2	20892.96131
L evening dB(A) =	40.3	33884.41561	L 90 evening dB(A) =	36.6	14454.39771
L night dB(A)=	42.2	165958.6907	L 90 night dB(A)=	32.2	16595.86907
L den dB(A) =	**50.50**	**5th March 2012**			**5th March 2012**
L day dB(A) =	56.1	407380.2778	L 90 day dB(A) =	49.6	91201.08394
L evening dB(A) =	60.1	3235936.569	L 90 evening dB(A) =	58.3	2137962.09
L night dB(A)=	60.5	11220184.54	L 90 night dB(A)=	49.9	977237.221
L den dB(A) =	**66.52**	**6th March 2012**			**6th March 2012**
L day dB(A) =	53	199526.2315	L 90 day dB(A) =	50.4	109647.8196
L evening dB(A) =	0	3.16227766	L 90 evening dB(A) =	**Not available**	3.16227766
L night dB(A)=	0	10	L 90 night dB(A)=	**Not available**	10
L den dB(A) =	**49.99**	**7th March 2012**			**7th March 2012**

Weather forecast for part of the monitoring period

10 Day Details

Date	Temperature	Conditions	UV Index	Precipitation	Wind
08 March	N/A /7°	Mostly Cloudy	2	20%	From Southwest at 31 kmph
09 March	10° /8°	Mostly Cloudy	1	20%	From Southwest at 31 kmph
10 March	10° /6°	AM Showers	1	40%	From West North West at 19 kmph
11 March	10° /6°	Partly Cloudy	2	20%	From North North West at 11 kmph
12 March	10° /6°	Partly Cloudy	2	20%	From Southeast at 10 kmph
13 March	9° /5°	Mostly Sunny	2	10%	From South South East at 13 kmph
14 March	9° /5°	Partly Cloudy	2	20%	From South at 18 kmph
15 March	10° /6°	Partly Cloudy	2	20%	From South at 21 kmph
16 March	9° /6°	Partly Cloudy	2	20%	From Southwest at 24 kmph
17 March	9° /6°	Scattered Showers	2	60%	From Southwest at 23 kmph

Authors comments:

This period of monitoring has been undertaken in order to establish background levels only within the vicinity of the monitoring location. No conclusions have been drawn in relation to the data set, as this is purely for information purposes. Additionally, 1/3 octave or FFT analysis has not been conducted upon the data set owing to limitations of the recording equipment as sound files have not been obtained for post-processing.

Unfortunately, owing to an auto logging default setting and operator error with the sound level meter, the data did not auto log and hence auto save, for the period between the 7th and 14th March 2012 at Clovelley. The only data available for this period therefore is as follows:

Data Record No:1 Buffer Data @ 12:20 14th March 2012 (335 hours 44 minutes 28 seconds)					
F Leq	51.2 dB(A)	**F SEL**	112.0 dB(A)	**F L1**	62.5 dB(A)
F SPL	No data	**F Max**	95.0 dB(A)	**F LepD**	50.9 dB(A)
F Peak	No data	**F Ovl**	0.6%		
F Max P	106.8 dB(A)	**F L90**	62.0 dB(A)		
F Min L	No data	**F L10**	54.0 dB(A)		

Interim noise monitoring report:

External noise monitoring as undertaken at The Douglas Inn, Tregele, LL67 0DN from the 14th to the 28th March 2012.

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Figure One: Monitoring location on the rear patio area of The Douglas Inn, Tregele, LL67 0DN (Wylfa visible in distance)

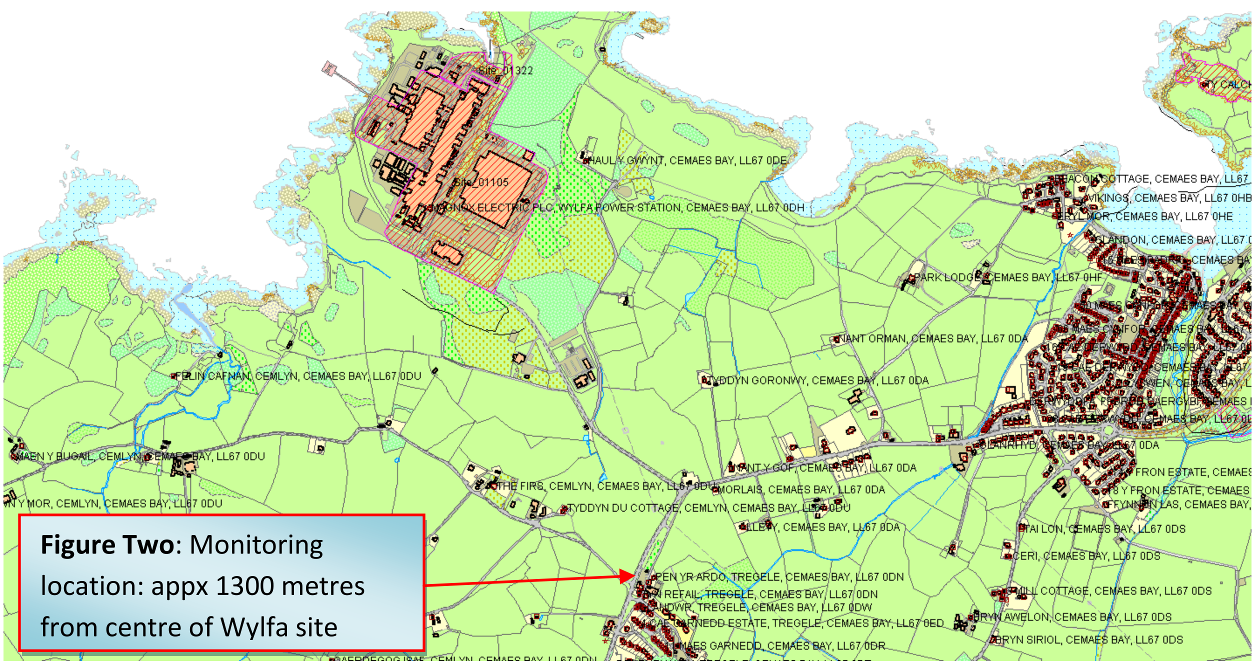


Figure Two: Monitoring location: appx 1300 metres from centre of Wylfa site

Figure Three: Graph depicting the total of 5-minute logged results

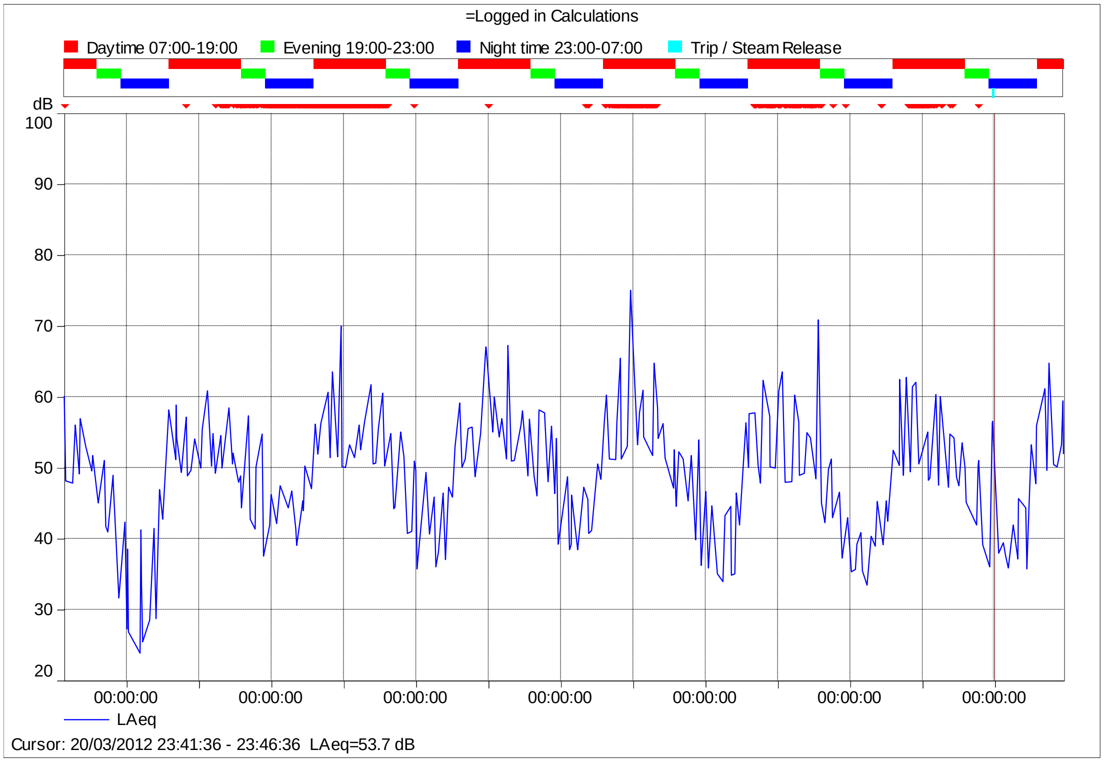


Figure Four: Graph depicting the total of 5-minute logged results

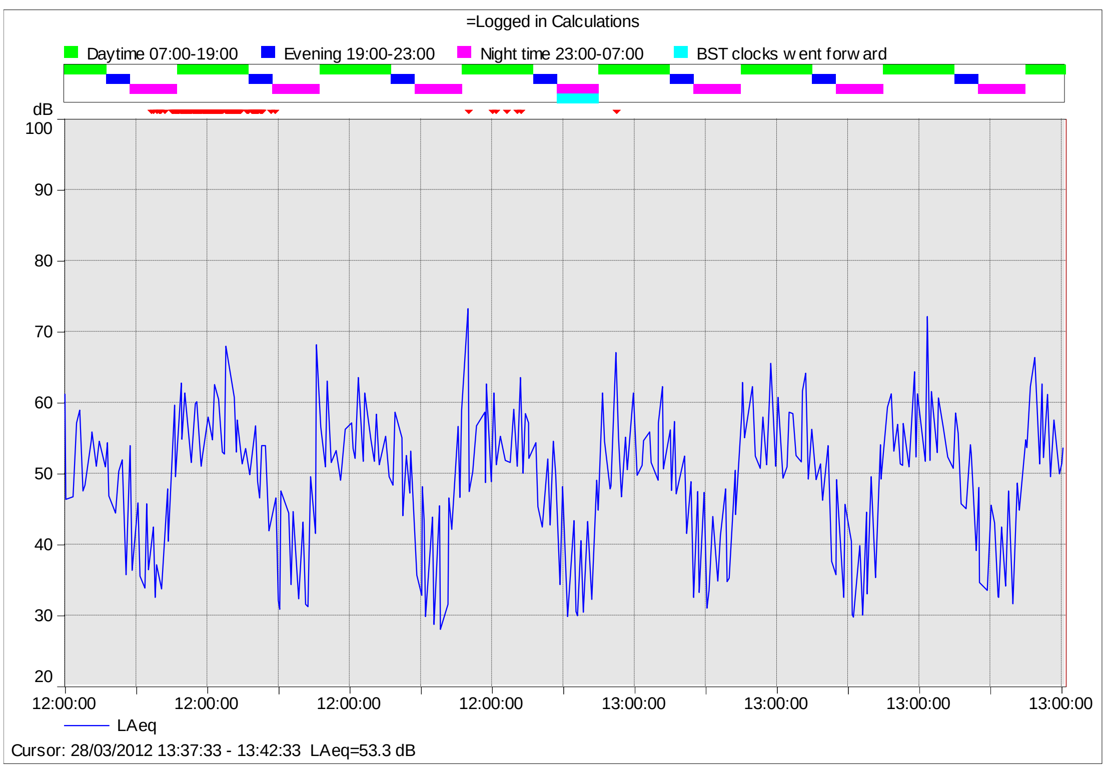
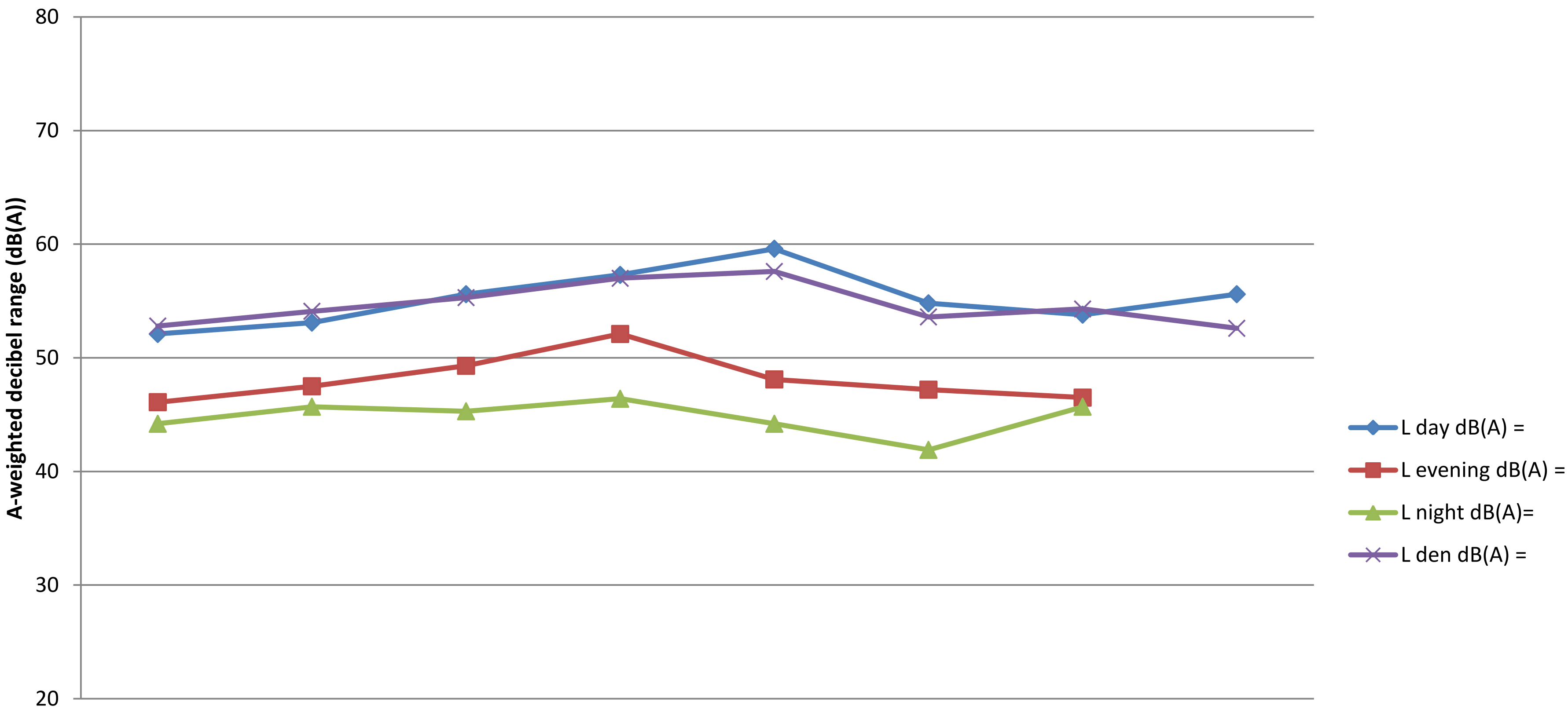


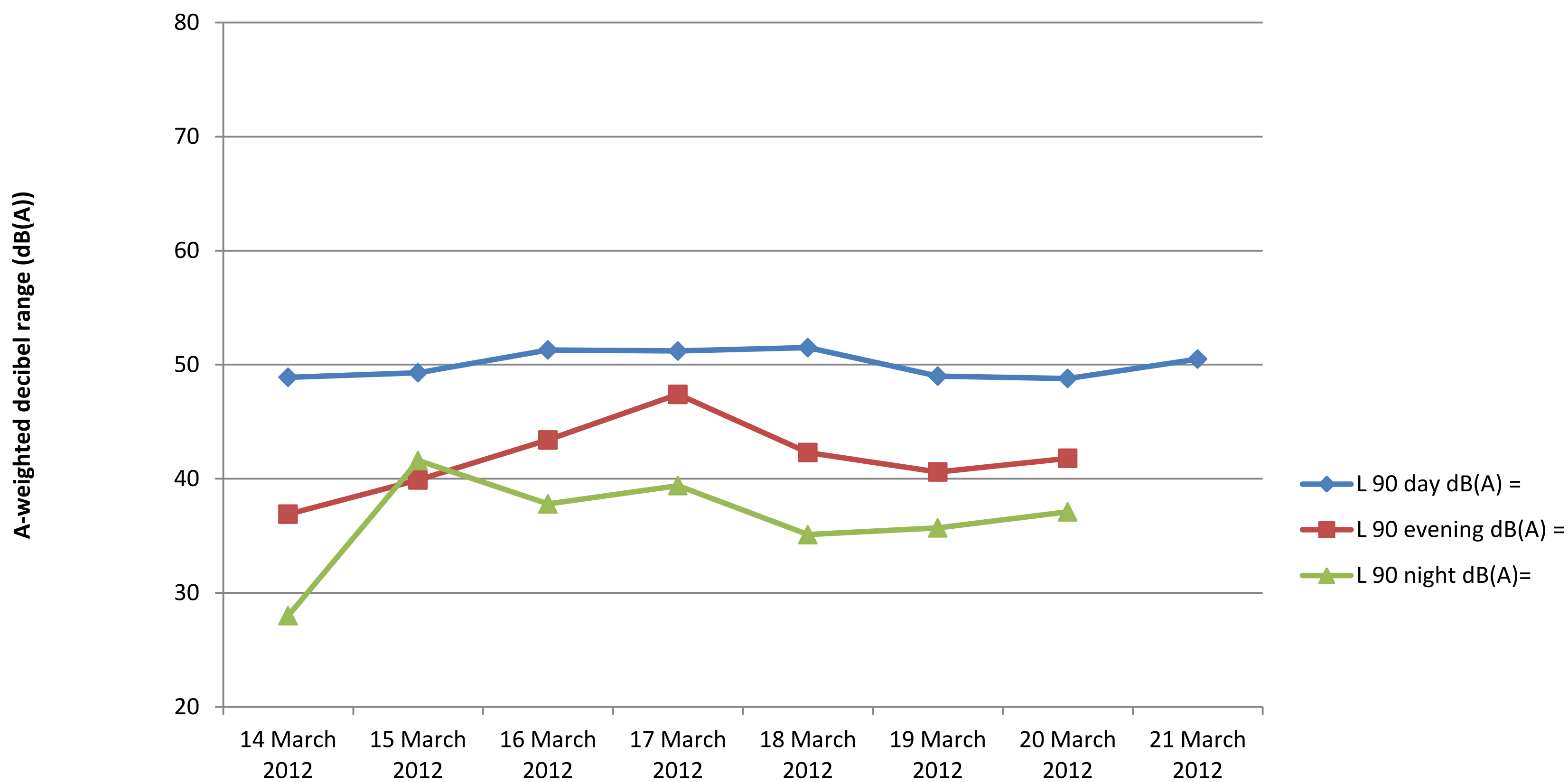
Figure Five: External noise monitoring as undertaken at The Douglas Inn between 13:36 14th March to 11:26 21st March 2012



	14 March 2012	15 March 2012	16 March 2012	17 March 2012	18 March 2012	19 March 2012	20 March 2012	21 March 2012
L day dB(A) =	52.1	53.1	55.6	57.3	59.6	54.8	53.8	55.6
L evening dB(A) =	46.1	47.5	49.3	52.1	48.1	47.2	46.5	
L night dB(A)=	44.2	45.7	45.3	46.4	44.2	41.9	45.7	
L den dB(A) =	52.8	54.1	55.3	57.0	57.6	53.6	54.3	52.6

Monitoring period

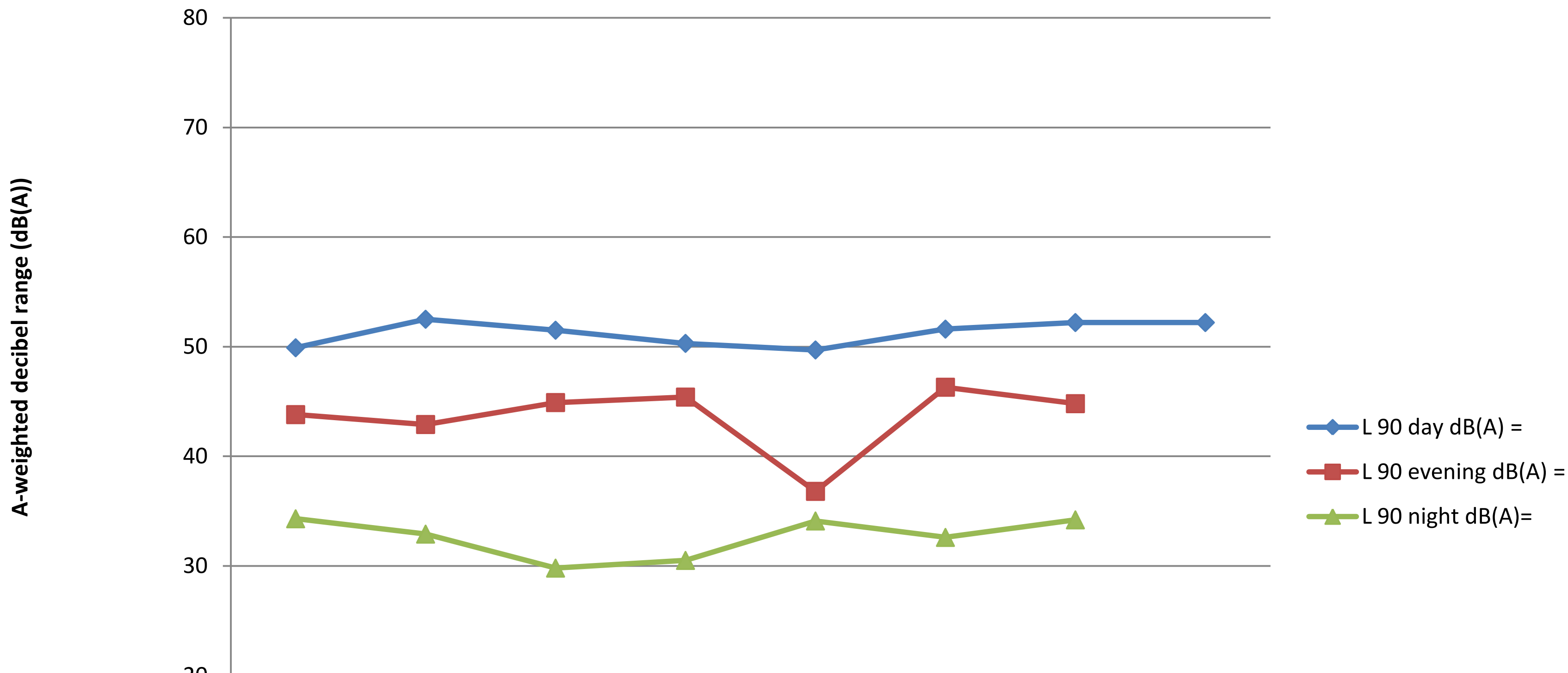
Figure Six: External noise monitoring as undertaken at The Douglas Inn between 13:36 14th March to 11:26 21st March 2012



	14 March 2012	15 March 2012	16 March 2012	17 March 2012	18 March 2012	19 March 2012	20 March 2012	21 March 2012
L 90 day dB(A) =	48.9	49.3	51.3	51.2	51.5	49	48.8	50.5
L 90 evening dB(A) =	36.9	39.9	43.4	47.4	42.3	40.6	41.8	
L 90 night dB(A)=	28	41.6	37.8	39.4	35.1	35.7	37.1	

Monitoring period

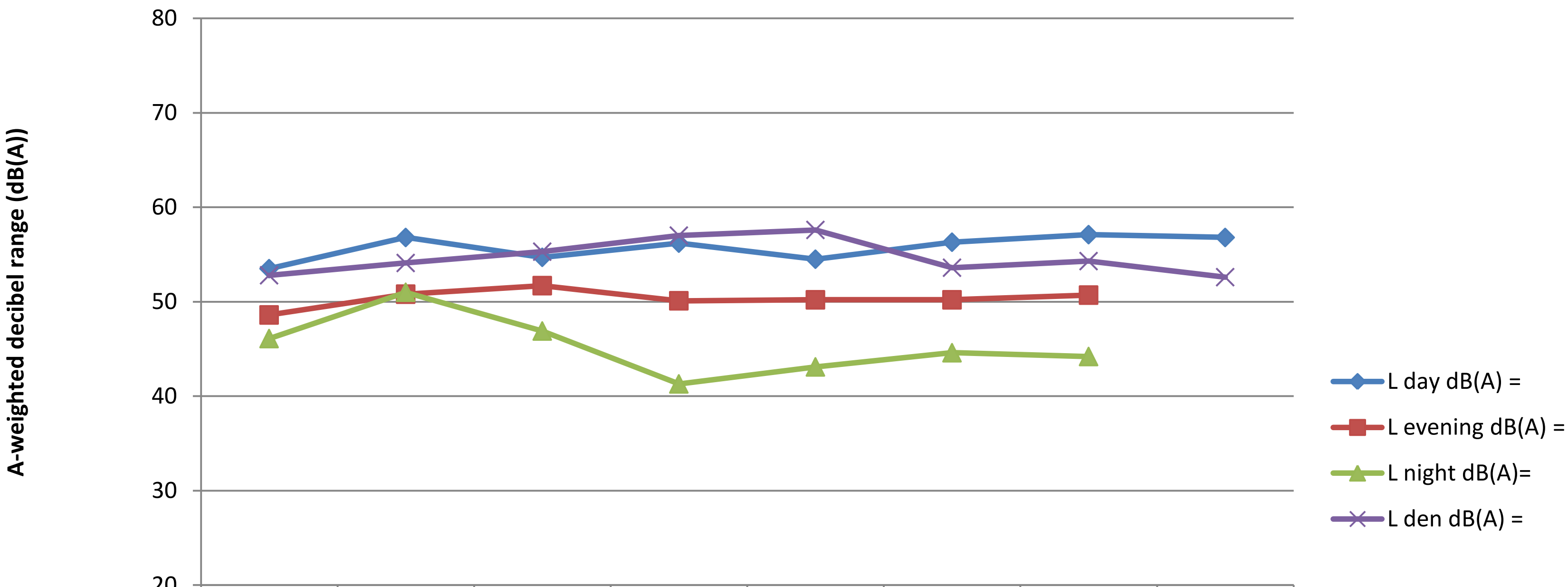
Figure Seven: External noise monitoring as undertaken at The Douglas Inn between 11:52 21st March to 13:42 28th March 2012



	21st March 2012	22nd March 2012	23rd March 2012	24th March 2012	25th March 2012	26th March 2012	27th March 2012	28th March 2012
L 90 day dB(A) =	49.9	52.5	51.5	50.3	49.7	51.6	52.2	52.2
L 90 evening dB(A) =	43.8	42.9	44.9	45.4	36.8	46.3	44.8	
L 90 night dB(A)=	34.3	32.9	29.8	30.5	34.1	32.6	34.2	

Monitoring period

Figure Eight: External noise monitoring as undertaken at The Douglas Inn between 11:52 21st March to 13:42 28th March 2012



	21st March 2012	22nd March 2012	23rd March 2012	24th March 2012	25th March 2012	26th March 2012	27th March 2012	28th March 2012
L day dB(A) =	53.5	56.8	54.7	56.2	54.5	56.3	57.1	56.8
L evening dB(A) =	48.6	50.8	51.7	50.1	50.2	50.2	50.7	
L night dB(A)=	46.1	51	46.9	41.3	43.1	44.6	44.2	
L den dB(A) =	52.8	54.1	55.3	57.0	57.6	53.6	54.3	52.6

Monitoring period

Noise recordings undertaken by M. Goodfellow, Environmental Health Officer with Isle Of Anglesey County Council.

Table One: Results of recordings from 14th to 21st March 2012:

Name	Start time	End time	Duration	LAeq [dB]	LA_{10} [dB]	LA_{50} [dB]	LA_{90} [dB]
Total	14/03/2012 13:36	21/03/2012 11:26	165:50:00	53.5	55.6	49.9	37.8
(All) Daytime 07:00-19:00	14/03/2012 13:36	21/03/2012 11:26	81:50:00	56.1	57.5	52.7	49.7
(All) Evening 19:00-23:00	14/03/2012 19:01	20/03/2012 23:01	28:00:00	48.6	51.7	46.7	41.7
(All) Night time 23:00-07:00	14/03/2012 23:01	21/03/2012 07:01	56:05:00	45	48.7	41	34.5
(All) Trip / Steam Release	20/03/2012 23:31	20/03/2012 23:51	0:20:00	55.1	56.8	56	52.4
Daytime 07:00-19:00	14/03/2012 13:36	14/03/2012 19:01	05:25:00	52.1	53.9	51.4	48.9
Daytime 07:00-19:00	15/03/2012 07:01	15/03/2012 19:01	12:00:00	53.1	55.5	52	49.3
Daytime 07:00-19:00	16/03/2012 07:01	16/03/2012 19:01	12:00:00	55.6	56.8	53.2	51.3
Daytime 07:00-19:00	17/03/2012 07:01	17/03/2012 19:01	12:00:00	57.3	59.1	54.3	51.2
Daytime 07:00-19:00	18/03/2012 07:01	18/03/2012 19:01	12:00:00	59.6	58.3	54.6	51.5
Daytime 07:00-19:00	19/03/2012 07:01	19/03/2012 19:01	12:00:00	54.8	55.9	51.3	49
Daytime 07:00-19:00	20/03/2012 07:01	20/03/2012 19:01	12:00:00	53.8	56.9	51.8	48.8
Daytime 07:00-19:00	21/03/2012 07:01	21/03/2012 11:26	04:25:00	55.6	59.7	53	50.5
Evening 19:00-23:00	14/03/2012 19:01	14/03/2012 23:01	04:00:00	46.1	48.8	45.8	36.9
Evening 19:00-23:00	15/03/2012 19:01	15/03/2012 23:01	04:00:00	47.5	50.2	46	39.9
Evening 19:00-23:00	16/03/2012 19:01	16/03/2012 23:01	04:00:00	49.3	52.2	47.7	43.4
Evening 19:00-23:00	17/03/2012 19:01	17/03/2012 23:01	04:00:00	52.1	55.1	51.1	47.4
Evening 19:00-23:00	18/03/2012 19:01	18/03/2012 23:01	04:00:00	48.1	50.7	47.5	42.3
Evening 19:00-23:00	19/03/2012 19:01	19/03/2012 23:01	04:00:00	47.2	49.6	46.2	40.6
Evening 19:00-23:00	20/03/2012 19:01	20/03/2012 23:01	04:00:00	46.5	50.1	46	41.8
Night time 23:00-07:00	14/03/2012 23:01	15/03/2012 07:01	08:00:00	44.2	46.1	30.8	28
Night time 23:00-07:00	15/03/2012 23:01	16/03/2012 07:01	08:00:00	45.7	47.9	45.1	41.6
Night time 23:00-07:00	16/03/2012 22:56	17/03/2012 07:01	08:05:00	45.3	49.6	42.4	37.8
Night time 23:00-07:00	17/03/2012 23:01	18/03/2012 07:01	08:00:00	46.4	50.3	43.2	39.4
Night time 23:00-07:00	18/03/2012 23:01	19/03/2012 07:01	08:00:00	44.2	49.1	37.5	35.1
Night time 23:00-07:00	19/03/2012 23:01	20/03/2012 07:01	08:00:00	41.9	44.9	39.5	35.7
Night time 23:00-07:00	20/03/2012 23:01	21/03/2012 07:01	08:00:00	45.7	49.4	38.4	37.1
Trip / Steam Release	20/03/2012 23:31	20/03/2012 23:51	00:20:00	55.1	56.8	56	52.4

Table Two: Results of recordings from 21st to 28th March 2012

Name	Start time	End time	Duration	LAeq [dB]	LA_{10} [dB]	LA_{50} [dB]	LA_{90} [dB]
Total	21/03/2012 11:52	28/03/2012 13:42	168:50:00	53.7	56.7	51.4	35.4
(All) Daytime 07:00-19:00	21/03/2012 11:52	28/03/2012 13:42	85:55:00	56	58.3	53.9	51.2
(All) Evening 19:00-23:00	21/03/2012 18:57	27/03/2012 22:57	28:00:00	50.4	53.3	49.4	44.3
(All) Night time 23:00-07:00	21/03/2012 22:57	28/03/2012 06:57	55:00:00	46.4	48.6	38.2	32.4
(All) BST clocks went forward	24/03/2012 22:57	25/03/2012 06:57	07:00:00	41.3	45.9	38	30.5
Daytime 07:00-19:00	21/03/2012 11:52	21/03/2012 19:02	07:10:00	53.5	55.1	52.6	49.9
Daytime 07:00-19:00	22/03/2012 06:57	22/03/2012 18:57	12:00:00	56.8	59	55.8	52.5
Daytime 07:00-19:00	23/03/2012 06:57	23/03/2012 18:57	12:00:00	54.7	56.3	53.6	51.5
Daytime 07:00-19:00	24/03/2012 06:57	24/03/2012 18:57	12:00:00	56.2	56.7	53.5	50.3
Daytime 07:00-19:00	25/03/2012 06:57	25/03/2012 18:57	12:00:00	54.5	55.9	52.9	49.7
Daytime 07:00-19:00	26/03/2012 06:57	26/03/2012 18:57	12:00:00	56.3	58.8	54.7	51.6
Daytime 07:00-19:00	27/03/2012 06:57	27/03/2012 18:57	12:00:00	57.1	59	54.4	52.2
Daytime 07:00-19:00	28/03/2012 06:57	28/03/2012 13:42	06:45:00	56.8	59.9	54.4	52.2
Evening 19:00-23:00	21/03/2012 18:57	21/03/2012 22:57	04:00:00	48.6	51.4	48	43.8
Evening 19:00-23:00	22/03/2012 18:57	22/03/2012 22:57	04:00:00	50.8	53.8	50	42.9
Evening 19:00-23:00	23/03/2012 18:57	23/03/2012 22:57	04:00:00	51.7	54.2	50	44.9
Evening 19:00-23:00	24/03/2012 18:57	24/03/2012 22:57	04:00:00	50.1	53.4	49.2	45.4
Evening 19:00-23:00	25/03/2012 18:57	25/03/2012 22:57	04:00:00	50.2	52.7	48.9	36.8
Evening 19:00-23:00	26/03/2012 18:57	26/03/2012 22:57	04:00:00	50.2	52.6	49.9	46.3
Evening 19:00-23:00	27/03/2012 18:57	27/03/2012 22:57	04:00:00	50.7	54.3	49.2	44.8
Night time 23:00-07:00	21/03/2012 22:57	22/03/2012 06:57	08:00:00	46.1	49.5	39.4	34.3
Night time 23:00-07:00	22/03/2012 22:57	23/03/2012 06:57	08:00:00	51	49.8	37.9	32.9
Night time 23:00-07:00	23/03/2012 22:57	24/03/2012 06:57	08:00:00	46.9	49.1	37.3	29.8
Night time 23:00-07:00	24/03/2012 22:57	25/03/2012 06:57	07:00:00	41.3	45.9	38	30.5
Night time 23:00-07:00	25/03/2012 22:57	26/03/2012 06:57	08:00:00	43.1	47.3	38.2	34.1
Night time 23:00-07:00	26/03/2012 22:57	27/03/2012 06:57	08:00:00	44.6	49.4	36.4	32.6
Night time 23:00-07:00	27/03/2012 22:57	28/03/2012 06:57	08:00:00	44.2	48.6	39.2	34.2
BST clocks went forward	24/03/2012 22:57	25/03/2012 06:57	07:00:00	41.3	45.9	38	30.5

Table Three: L_{DEN} calculations for 14th to 21st March 2012

L day dB(A) =	52.1	162181.0097
L evening dB(A) =	46.1	128824.9552
L night dB(A)=	44.2	263026.7992
L den dB(A) =	**52.79**	**14th March 2012**
L day dB(A) =	53.1	204173.7945
L evening dB(A) =	47.5	177827.941
L night dB(A)=	45.7	371535.2291
L den dB(A) =	**54.08**	**15th March 2012**
L day dB(A) =	55.6	363078.0548
L evening dB(A) =	49.3	269153.4804
L night dB(A)=	45.3	338844.1561
L den dB(A) =	**55.31**	**16th March 2012**
L day dB(A) =	57.3	537031.7964
L evening dB(A) =	52.1	512861.384
L night dB(A)=	46.4	436515.8322
L den dB(A) =	56.99	**17th March 2012**
L day dB(A) =	59.6	912010.8394
L evening dB(A) =	48.1	204173.7945
L night dB(A)=	44.2	263026.7992
L den dB(A) =	**57.62**	**18th March 2012**
L day dB(A) =	54.8	301995.172
L evening dB(A) =	47.2	165958.6907
L night dB(A)=	41.9	154881.6619
L den dB(A) =	**53.62**	**19th March 2012**
L day dB(A) =	53.8	239883.2919
L evening dB(A) =	46.5	141253.7545
L night dB(A)=	45.7	371535.2291
L den dB(A) =	**54.27**	**20th March 2012**
L day dB(A) =	55.6	363078.0548
L evening dB(A) =	0	3.16227766
L night dB(A)=	0	10
L den dB(A) =	**52.59**	**21st March 2012**

Table Four: L_{DEN} calculations for 21st to 28th March 2012

L day dB(A) =	53.5	223872.1139
L evening dB(A) =	48.6	229086.7653
L night dB(A)=	46.1	407380.2778
L den dB(A) =	**54.56**	21st March 2012
L day dB(A) =	56.8	478630.0923
L evening dB(A) =	50.8	380189.3963
L night dB(A)=	51	1258925.412
L den dB(A) =	**58.59**	22nd March 2012
L day dB(A) =	54.7	295120.9227
L evening dB(A) =	51.7	467735.1413
L night dB(A)=	46.9	489778.8194
L den dB(A) =	**55.90**	23rd March 2012
L day dB(A) =	56.2	416869.3835
L evening dB(A) =	50.1	323593.6569
L night dB(A)=	41.3	134896.2883
L den dB(A) =	54.88	24th March 2012
L day dB(A) =	54.5	281838.2931
L evening dB(A) =	50.2	331131.1215
L night dB(A)=	43.1	204173.7945
L den dB(A) =	**54.22**	25th March 2012
L day dB(A) =	56.3	426579.5188
L evening dB(A) =	50.2	331131.1215
L night dB(A)=	44.6	288403.1503
L den dB(A) =	**55.62**	26th March 2012
L day dB(A) =	57.1	512861.384
L evening dB(A) =	50.7	371535.2291
L night dB(A)=	44.2	263026.7992
L den dB(A) =	**56.09**	27th March 2012
L day dB(A) =	56.8	478630.0923
L evening dB(A) =	0	3.16227766
L night dB(A)=	0	10
L den dB(A) =	**53.79**	28th March 2012

Noise recordings undertaken by M. Goodfellow, Environmental Health Officer with Isle Of Anglesey County Council.

Weather forecast for part of the monitoring period

10 Day Details

Date	Temperature	Conditions	UV Index	Precipitation	Wind
08 March	N/A /7°	Mostly Cloudy	2	20%	From Southwest at 31 kmph
09 March	10° /8°	Mostly Cloudy	1	20%	From Southwest at 31 kmph
10 March	10° /6°	AM Showers	1	40%	From West North West at 19 kmph
11 March	10° /6°	Partly Cloudy	2	20%	From North North West at 11 kmph
12 March	10° /6°	Partly Cloudy	2	20%	From Southeast at 10 kmph
13 March	9° /5°	Mostly Sunny	2	10%	From South South East at 13 kmph
14 March	9° /5°	Partly Cloudy	2	20%	From South at 18 kmph
15 March	10° /6°	Partly Cloudy	2	20%	From South at 21 kmph
16 March	9° /6°	Partly Cloudy	2	20%	From Southwest at 24 kmph
17 March	9° /6°	Scattered Showers	2	60%	From Southwest at 23 kmph

Holyhead five-day forecast

Date	Time	Weather	Temp	Wind			Visibility
				Dir	Speed	Gust	
Mon 19 Mar	1500		9 °C	SW	20 mph	30 mph	Very Good
	1800		9 °C	SSW	21 mph	33 mph	Very Good
	2100		9 °C	SW	20 mph	31 mph	Very Good
Tue 20 Mar	0000		9 °C	SW	19 mph	30 mph	Very Good
	0300		9 °C	SW	18 mph	28 mph	Very Good
	0600		8 °C	SW	16 mph		Very Good
	0900		9 °C	SW	16 mph	26 mph	Very Good
	1200		10 °C	SW	18 mph	31 mph	Very Good
	1500		10 °C	SSW	17 mph	29 mph	Very Good
	1800		9 °C	SSW	18 mph		Very Good
	Night		8 °C	SSW	15 mph		Good
Wed 21 Mar	Day		10 °C	S	11 mph		Very Good
	Night		7 °C	E	7 mph		Good
Thu 22 Mar	Day		14 °C	E	8 mph		Very Good
	Night		8 °C	E	10 mph		Very Good
Fri 23 Mar	Day		13 °C	S	9 mph		Very Good
	Night		8 °C	SSE	9 mph		Good

Taken directly from http://www.metoffice.gov.uk/weather/uk/wl/holyhead_forecast_weather.html

Holyhead five-day forecast

Date	Time	Weather	Temp	Wind			Visibility
				Dir	Speed	Gust	
Wed 21 Mar	1800		10 °C	SE	3 mph		Very Good
	2100		8 °C	E	8 mph		Good
Thu 22 Mar	0000		7 °C	E	8 mph		Good
	0300		7 °C	ENE	10 mph		Good
	0600		6 °C	E	11 mph		Moderate
	0900		9 °C	ENE	12 mph		Good
	1200		13 °C	E	12 mph	22 mph	Good
	1500		14 °C	E	14 mph	25 mph	Good
	1800		12 °C	E	10 mph		Good
	Night		9 °C	SSE	8 mph		Good
Fri 23 Mar	Day		11 °C	S	10 mph		Very Good
	Night		7 °C	ESE	6 mph		Good
Sat 24 Mar	Day		13 °C	E	7 mph		Very Good
	Night		8 °C	E	8 mph		Very Good
Sun 25 Mar	Day		13 °C	ENE	6 mph		Very Good
	Night		7 °C	ESE	7 mph		Good

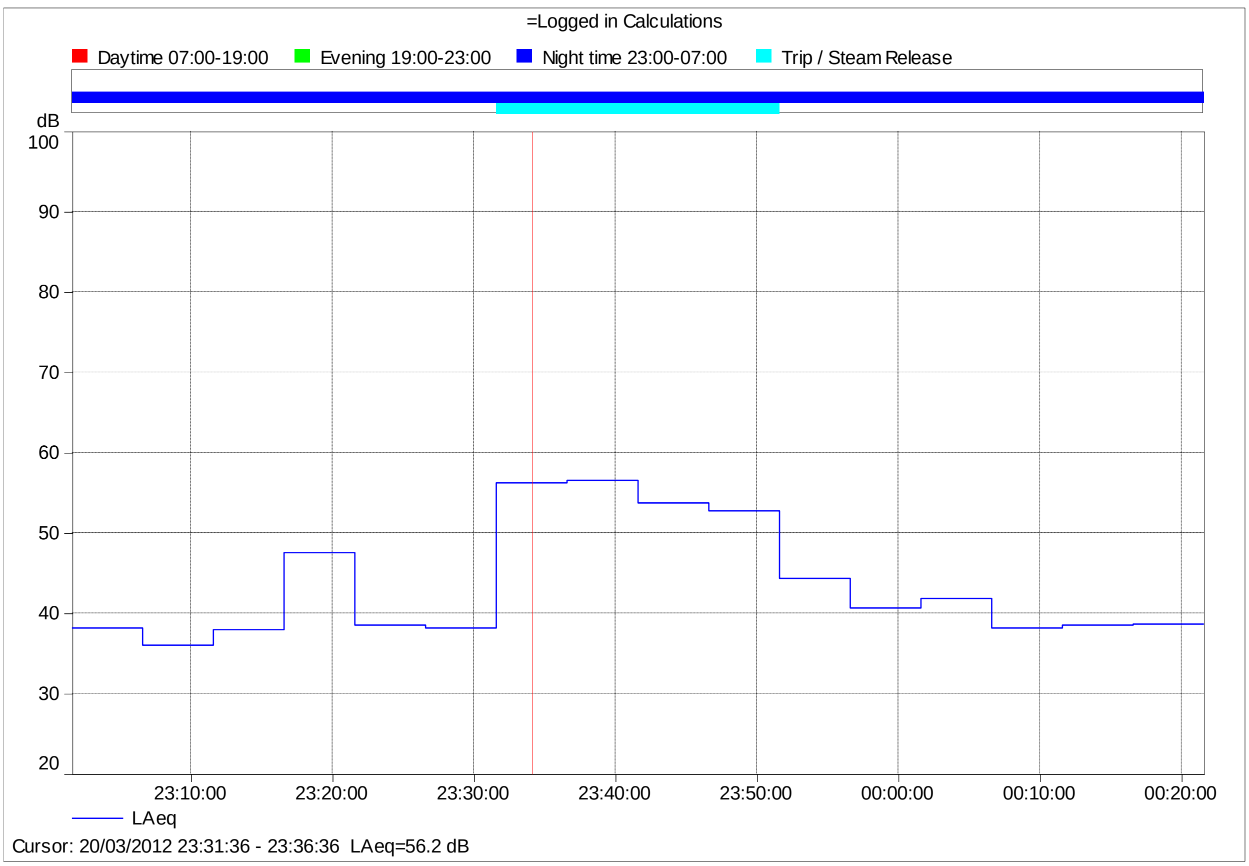
Last updated: 1601 on Wed 21 Mar 2012

Taken directly from http://www.metoffice.gov.uk/weather/uk/wl/holyhead_forecast_weather.html

Authors comments:

This period of monitoring has been undertaken in order to establish background levels only within the vicinity of the monitoring location. No conclusions have been drawn in relation to the data set, as this is purely for information purposes. Additionally, 1/3 octave or FFT analysis has not been conducted upon the data set owing to limitations of the recording equipment as sound files have not been obtained for post-processing.

From the results an event occurred on the 20th March 2012 during 23:31 to 23:51 in which the occupants of The Douglas Inn described it as "a steam release / trip from the Wylfa site". This resulted in the following noise increase from $L_{Aeq\ (5\text{-min})}$ 38.1 between 23:26 to 23:31 to $L_{Aeq\ (5\text{-min})}$ 56.2 (23:31-23:36) and $L_{Aeq\ (5\text{-min})}$ 56.5 (23:36-23:41). Whilst this a significant 18 dB increase above the background levels and is clearly demonstrated within the graph below, the actual event was relatively short and would be regarded as a "one off event".



Interim noise monitoring report:

External noise monitoring as undertaken at

Cafnan, Cemlyn, Cemaes Bay, Anglesey, LL67 0DU

from the 18th April to the 2nd May 2012.

Contents Page

Figure One: Monitoring location in a small paddock close to Cafnan, Cemlyn , Cemaes Bay LL67 0DU (Wylfa is visible in the distance)

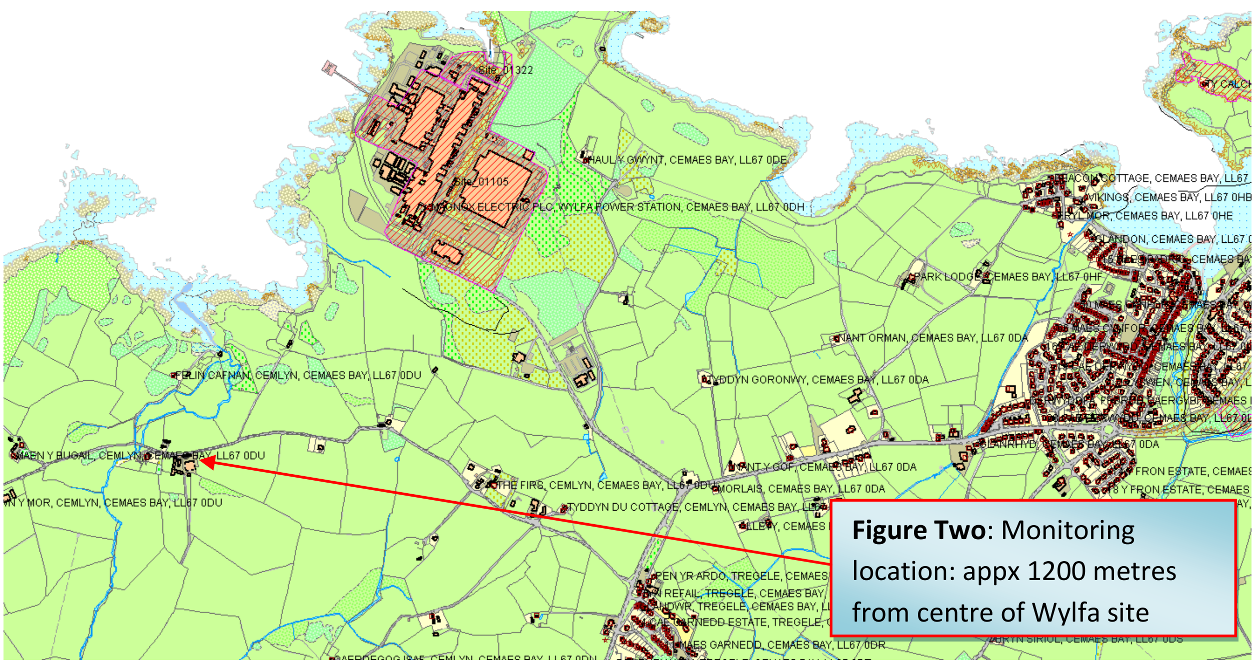


Figure Two: Monitoring location: appx 1200 metres from centre of Wylfa site

Figure Three: Graph depicting the total of 5-minute logged results

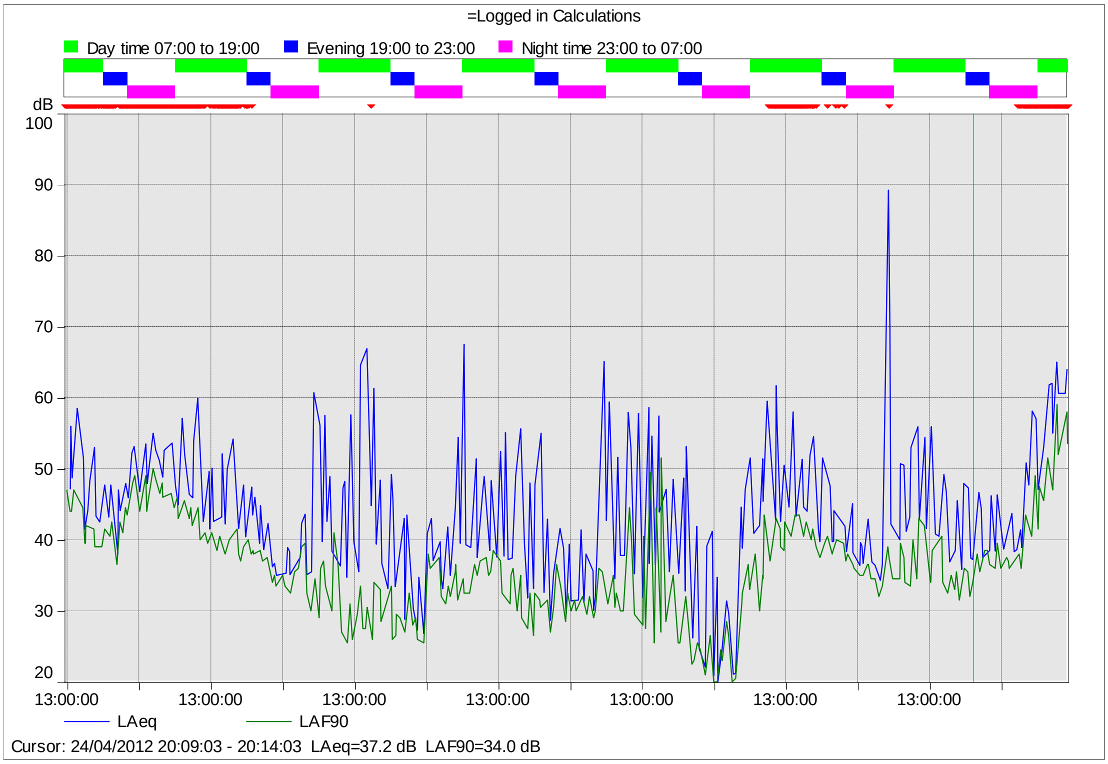
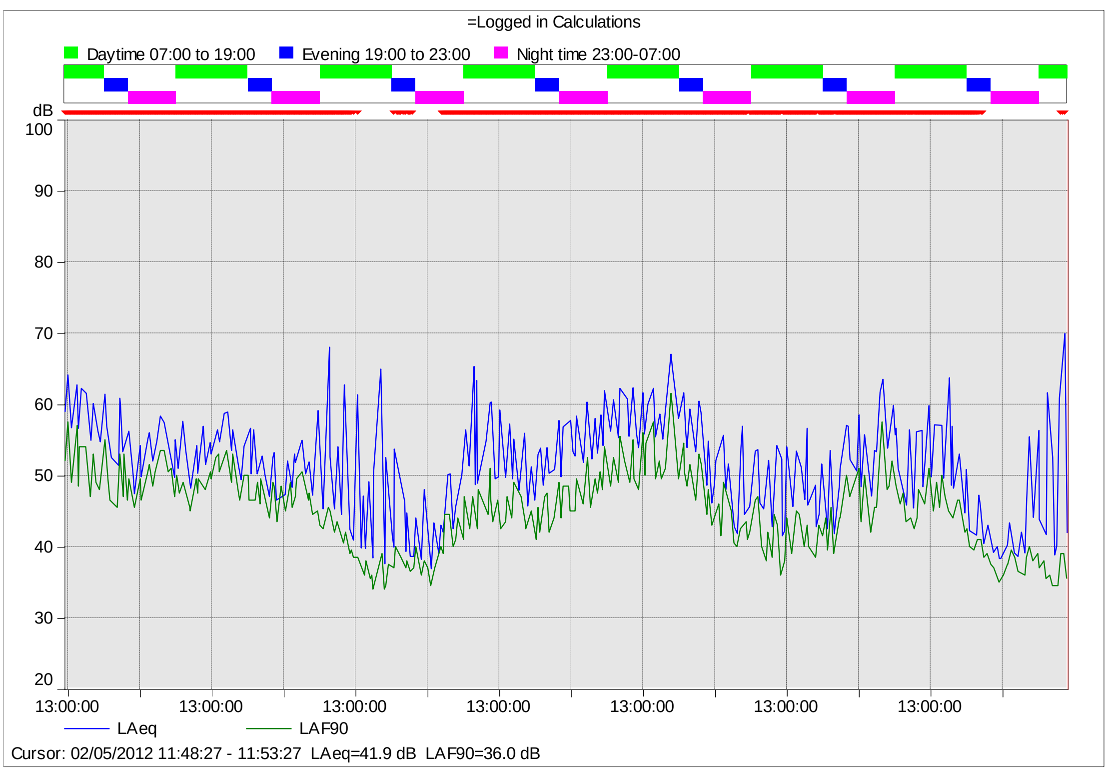
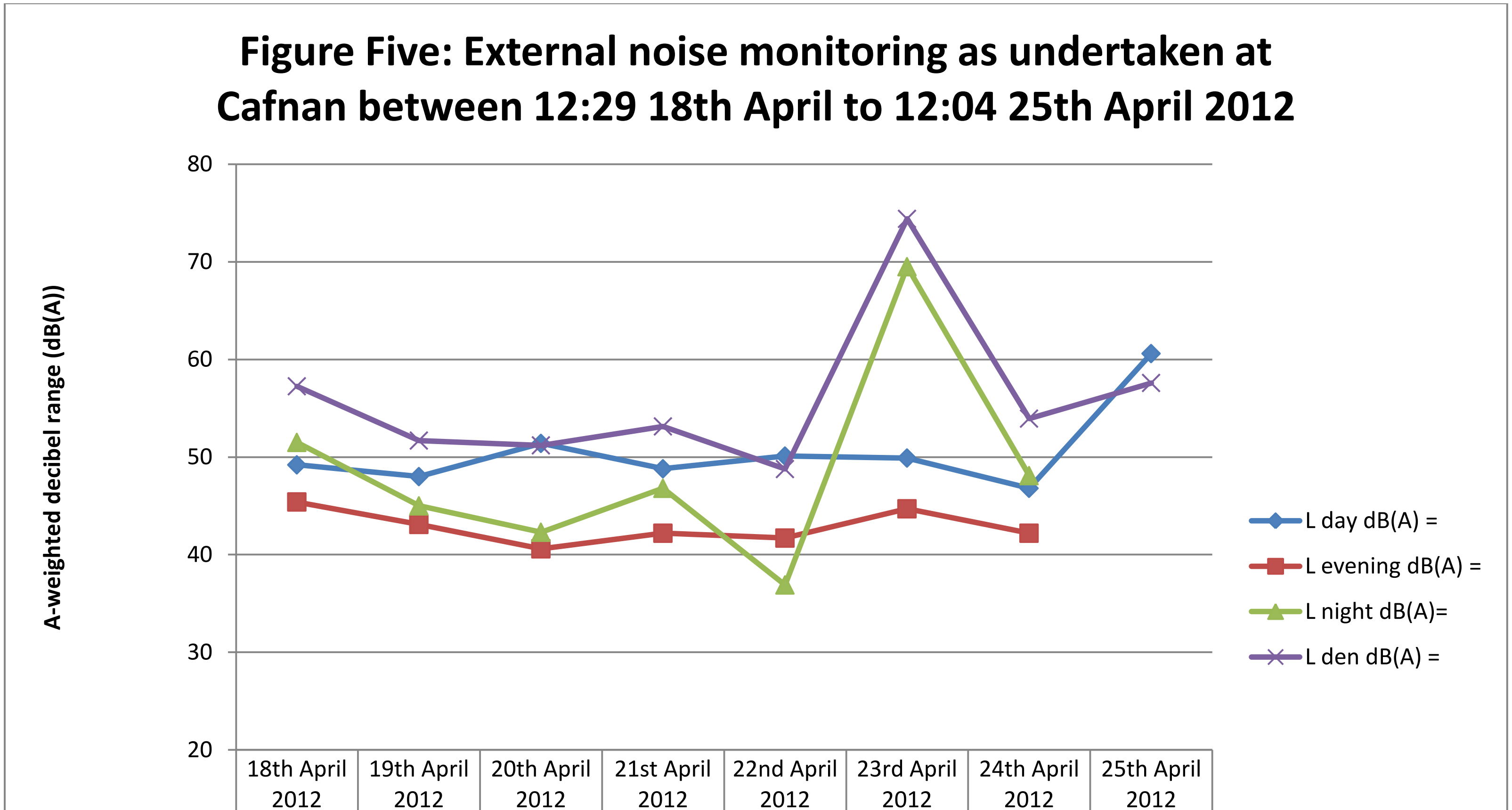


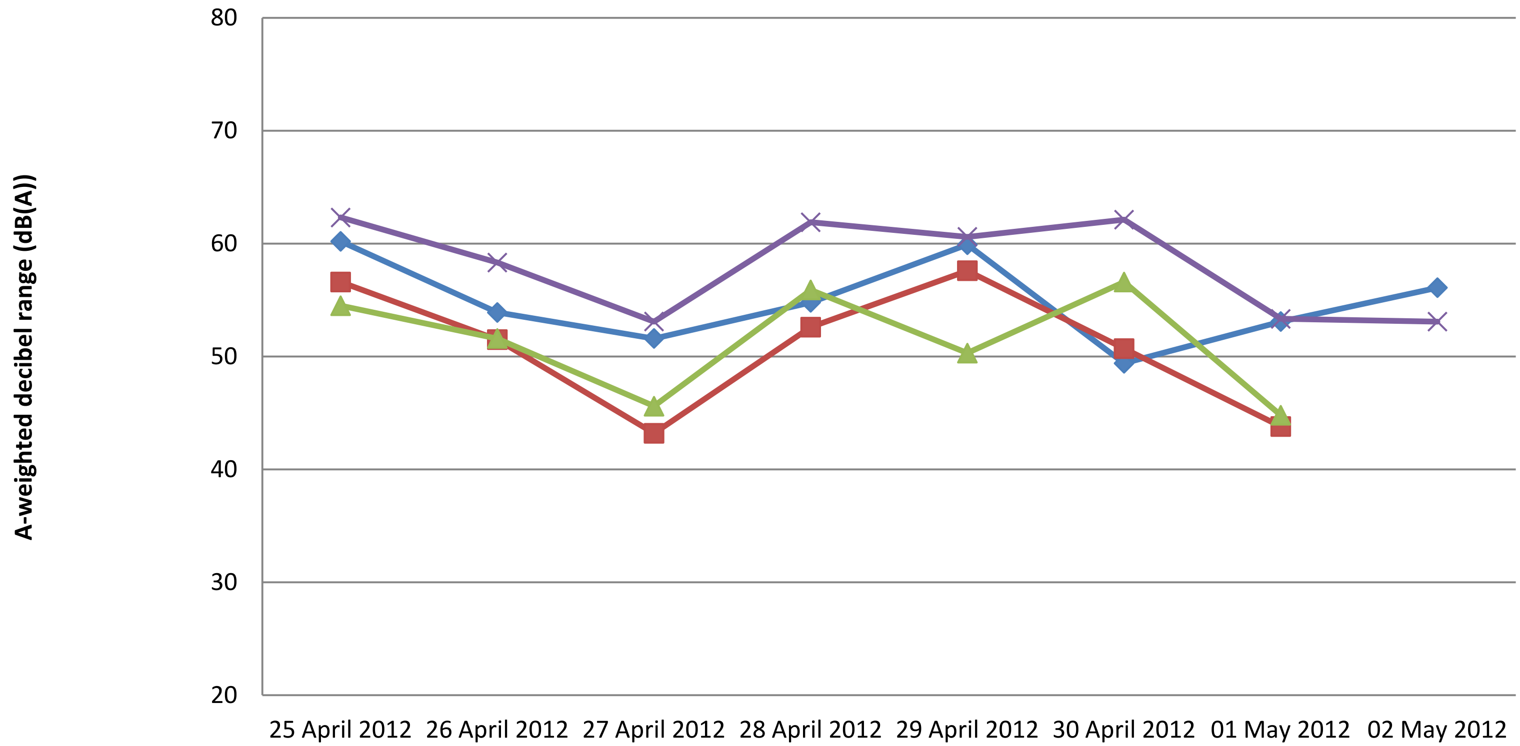
Figure Four: Graph depicting the total of 5-minute logged results





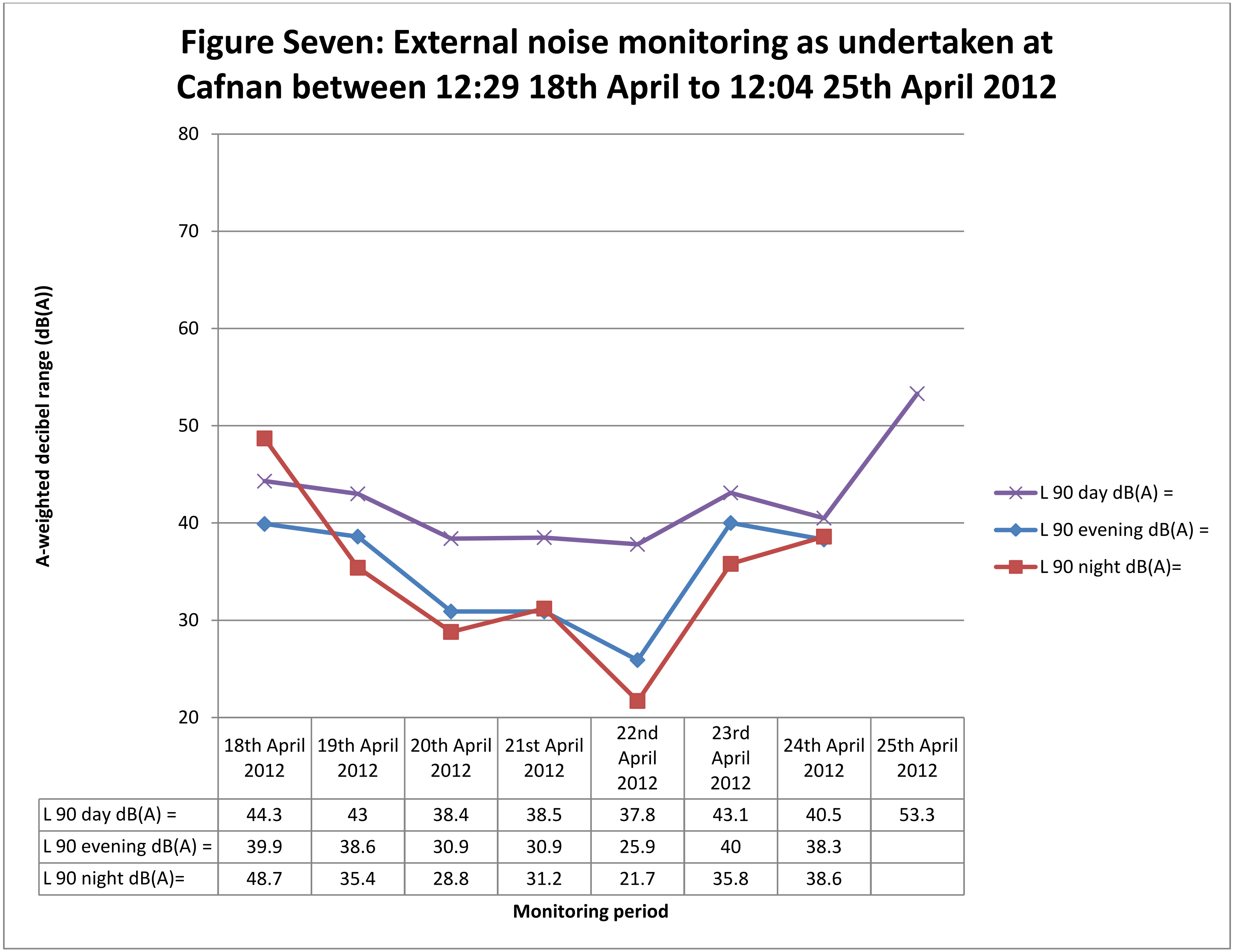
	18th April 2012	19th April 2012	20th April 2012	21st April 2012	22nd April 2012	23rd April 2012	24th April 2012	25th April 2012
L day dB(A) =	49.2	48	51.4	48.8	50.1	49.9	46.8	60.6
L evening dB(A) =	45.4	43.1	40.6	42.2	41.7	44.7	42.2	
L night dB(A)=	51.5	45	42.3	46.8	36.9	69.5	48.1	
L den dB(A) =	57.25	51.69	51.2	53.14	48.77	74.4	53.94	57.59

Figure Six: External noise monitoring as undertaken at Cafnan between 12:23 25th April to 11:53 2nd May 2012



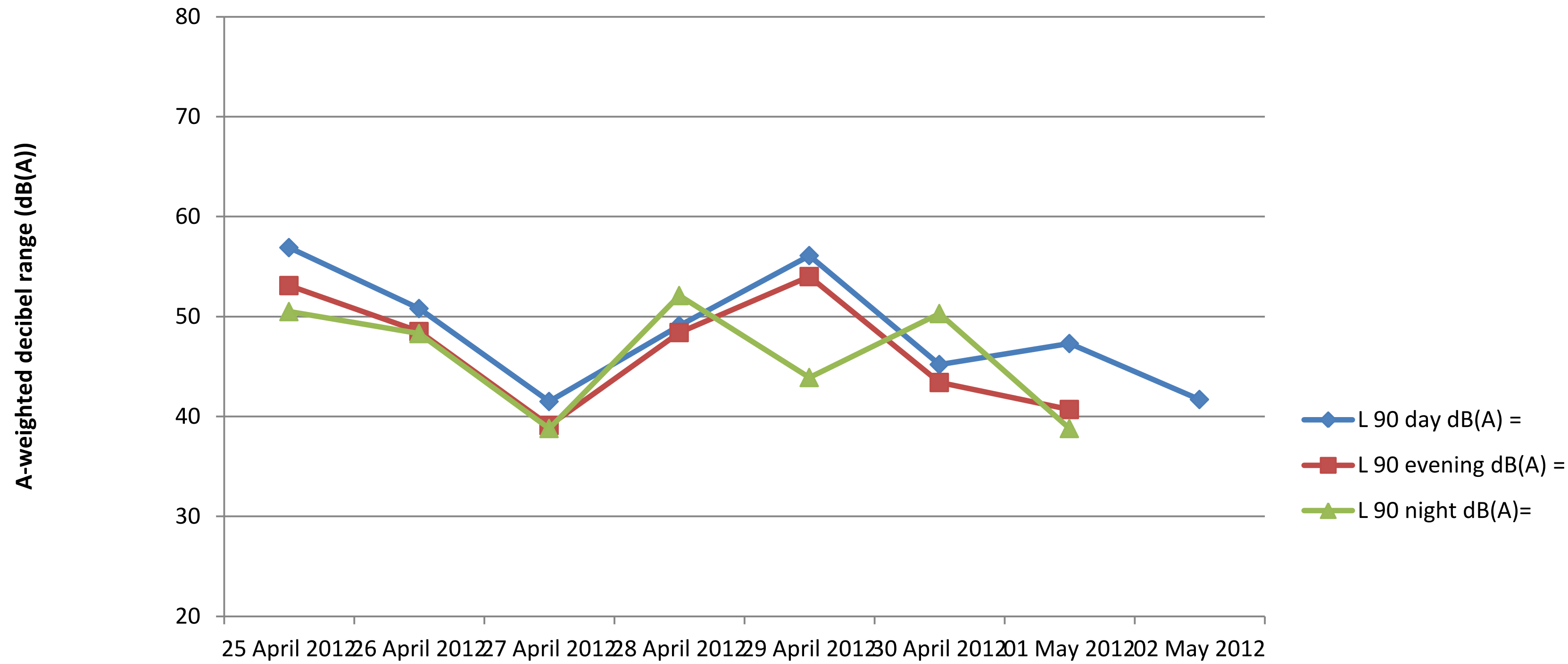
	25 April 2012	26 April 2012	27 April 2012	28 April 2012	29 April 2012	30 April 2012	01 May 2012	02 May 2012
L day dB(A) =	60.2	53.9	51.6	54.8	59.9	49.4	53.1	56.1
L evening dB(A) =	56.6	51.5	43.2	52.6	57.6	50.7	43.8	
L night dB(A)=	54.5	51.6	45.6	55.9	50.3	56.6	44.8	
L den dB(A) =	62.3	58.3	53.1	61.9	60.6	62.1	53.3	53.1

Noise recordings undertaken by M. Goodfellow, Environmental Health Officer with Isle Of Anglesey County Council.



	18th April 2012	19th April 2012	20th April 2012	21st April 2012	22nd April 2012	23rd April 2012	24th April 2012	25th April 2012
L 90 day dB(A) =	44.3	43	38.4	38.5	37.8	43.1	40.5	53.3
L 90 evening dB(A) =	39.9	38.6	30.9	30.9	25.9	40	38.3	
L 90 night dB(A)=	48.7	35.4	28.8	31.2	21.7	35.8	38.6	

Figure Eight: External noise monitoring as undertaken at Cafnan between 12:23 25th April to 11:53 2nd May 2012



	25 April 2012	26 April 2012	27 April 2012	28 April 2012	29 April 2012	30 April 2012	01 May 2012	02 May 2012
L 90 day dB(A) =	56.9	50.8	41.5	49.1	56.1	45.2	47.3	41.7
L 90 evening dB(A) =	53.1	48.5	39.1	48.4	54	43.4	40.7	
L 90 night dB(A)=	50.5	48.3	38.8	52.1	43.9	50.3	38.8	

Monitoring period

Table One: Results of recordings from 18th to 25th April 2012:

Name	Start time	End time	Duration	LAeq [dB]	LA_{10} [dB]	LA_{50} [dB]	LA_{90} [dB]
Total	18/04/2012 12:29	25/04/2012 12:04	167:35:00	57.1	52.1	43.4	34.3
(All) Day time 07:00 to 19:00	18/04/2012 12:29	25/04/2012 12:04	83:35:00	51.8	54.4	45.6	40.2
(All) Evening 19:00 to 23:00	18/04/2012 18:59	24/04/2012 22:59	28:00:00	43.1	46.6	41.1	32.5
(All) Night time 23:00 to 07:00	18/04/2012 22:59	25/04/2012 06:59	56:00:00	61.2	51.7	38.8	28.9
Day time 07:00 to 19:00	18/04/2012 12:29	18/04/2012 18:59	06:30:00	49.2	51.8	47.1	44.3
Day time 07:00 to 19:00	19/04/2012 06:59	19/04/2012 18:59	12:00:00	48	50.4	45.9	43
Day time 07:00 to 19:00	20/04/2012 06:59	20/04/2012 18:59	12:00:00	51.4	53.3	44.2	38.4
Day time 07:00 to 19:00	21/04/2012 06:59	21/04/2012 18:59	12:00:00	48.8	49.2	42.9	38.5
Day time 07:00 to 19:00	22/04/2012 06:59	22/04/2012 18:59	12:00:00	50.1	54.2	44.9	37.8
Day time 07:00 to 19:00	23/04/2012 06:59	23/04/2012 18:59	12:00:00	49.9	52.3	46.5	43.1
Day time 07:00 to 19:00	24/04/2012 06:59	24/04/2012 18:59	12:00:00	46.8	50.3	44.3	40.5
Day time 07:00 to 19:00	25/04/2012 06:59	25/04/2012 12:04	05:05:00	60.6	63.6	60.3	53.3
Evening 19:00 to 23:00	18/04/2012 18:59	18/04/2012 22:59	04:00:00	45.4	47.4	45.3	39.9
Evening 19:00 to 23:00	19/04/2012 18:59	19/04/2012 22:59	04:00:00	43.1	46.1	42.5	38.6
Evening 19:00 to 23:00	20/04/2012 18:59	20/04/2012 22:59	04:00:00	40.6	43.8	38.5	30.9
Evening 19:00 to 23:00	21/04/2012 18:59	21/04/2012 22:59	04:00:00	42.2	44.2	38.4	30.9
Evening 19:00 to 23:00	22/04/2012 18:59	22/04/2012 22:59	04:00:00	41.7	46.2	35.3	25.9
Evening 19:00 to 23:00	23/04/2012 18:59	23/04/2012 22:59	04:00:00	44.7	48.2	42.8	40
Evening 19:00 to 23:00	24/04/2012 18:59	24/04/2012 22:59	04:00:00	42.2	44.7	40.9	38.3
Night time 23:00 to 07:00	18/04/2012 22:59	19/04/2012 06:59	08:00:00	51.5	53.2	51.5	48.7
Night time 23:00 to 07:00	19/04/2012 22:59	20/04/2012 06:59	08:00:00	45	43.9	37.3	35.4
Night time 23:00 to 07:00	20/04/2012 22:59	21/04/2012 06:59	08:00:00	42.3	43.7	37.4	28.8
Night time 23:00 to 07:00	21/04/2012 22:59	22/04/2012 06:59	08:00:00	46.8	44.7	34.1	31.2
Night time 23:00 to 07:00	22/04/2012 22:59	23/04/2012 06:59	08:00:00	36.9	42.9	27.5	21.7
Night time 23:00 to 07:00	23/04/2012 22:59	24/04/2012 06:59	08:00:00	69.5	45.2	38.2	35.8
Night time 23:00 to 07:00	24/04/2012 22:59	25/04/2012 06:59	08:00:00	48.1	52.4	40.2	38.6

Table Two: Results of recordings from 25th April to 2nd May 2012:

Name	Start time	End time	Duration	LAeq [dB]	LA_{10} [dB]	LA_{50} [dB]	LA_{90} [dB]
Total	25/04/2012 12:23	02/05/2012 11:53	167:30:00	54.8	58.7	51.8	42.4
(All) Daytime 07:00 to 19:00	25/04/2012 12:23	02/05/2012 11:53	83:30:00	55.9	60	52.5	45.3
(All) Evening 19:00 to 23:00	25/04/2012 19:03	01/05/2012 23:03	28:00:00	53.4	57.6	51.1	41.5
(All) Night time 23:00-07:00	25/04/2012 23:03	02/05/2012 07:03	56:00:00	53.2	56.8	51	39.9
Daytime 07:00 to 19:00	25/04/2012 12:23	25/04/2012 19:03	06:40:00	60.2	62.6	59.7	56.9
Daytime 07:00 to 19:00	26/04/2012 06:58	26/04/2012 18:58	12:00:00	53.9	56.2	53.2	50.8
Daytime 07:00 to 19:00	27/04/2012 07:03	27/04/2012 19:03	12:00:00	51.6	51.9	46.1	41.5
Daytime 07:00 to 19:00	28/04/2012 07:03	28/04/2012 19:03	12:00:00	54.8	58.1	52.9	49.1
Daytime 07:00 to 19:00	29/04/2012 07:03	29/04/2012 19:03	12:00:00	59.9	62.7	58.8	56.1
Daytime 07:00 to 19:00	30/04/2012 07:03	30/04/2012 19:03	12:00:00	49.4	52.4	48.5	45.2
Daytime 07:00 to 19:00	01/05/2012 07:03	01/05/2012 19:03	12:00:00	53.1	56.2	51.9	47.3
Daytime 07:00 to 19:00	02/05/2012 07:03	02/05/2012 11:53	04:50:00	56.1	59.8	49.3	41.7
Evening 19:00 to 23:00	25/04/2012 19:03	25/04/2012 23:03	04:00:00	56.6	60.1	55.6	53.1
Evening 19:00 to 23:00	26/04/2012 19:03	26/04/2012 23:03	04:00:00	51.5	52.8	51.1	48.5
Evening 19:00 to 23:00	27/04/2012 19:03	27/04/2012 23:03	04:00:00	43.2	44.8	41.5	39.1
Evening 19:00 to 23:00	28/04/2012 19:03	28/04/2012 23:03	04:00:00	52.6	55.1	51.9	48.4
Evening 19:00 to 23:00	29/04/2012 19:03	29/04/2012 23:03	04:00:00	57.6	60.1	57.3	54
Evening 19:00 to 23:00	30/04/2012 19:03	30/04/2012 23:03	04:00:00	50.7	55.1	48.3	43.4
Evening 19:00 to 23:00	01/05/2012 19:03	01/05/2012 23:03	04:00:00	43.8	46.4	43.1	40.7
Night time 23:00-07:00	25/04/2012 23:03	26/04/2012 07:03	08:00:00	54.5	57	54.3	50.5
Night time 23:00-07:00	26/04/2012 23:03	27/04/2012 07:03	08:00:00	51.6	53.7	51	48.3
Night time 23:00-07:00	27/04/2012 23:03	28/04/2012 07:03	08:00:00	45.6	49.5	42.7	38.8
Night time 23:00-07:00	28/04/2012 23:03	29/04/2012 07:03	08:00:00	55.9	58.2	55.3	52.1
Night time 23:00-07:00	29/04/2012 23:03	30/04/2012 07:03	08:00:00	50.3	54.1	49.2	43.9
Night time 23:00-07:00	30/04/2012 23:03	01/05/2012 07:03	08:00:00	56.6	59.9	55.3	50.3
Night time 23:00-07:00	01/05/2012 23:03	02/05/2012 07:03	08:00:00	44.8	47.4	40.2	38.8

Table Three: L_{DEN} calculations for 18th to 25th April 2012

L day dB(A) =	49.2	83176.37711
L evening dB(A) =	45.4	109647.8196
L night dB(A)=	51.5	1412537.545
L den dB(A) =	**57.25**	**18th April 2012**
L day dB(A) =	48	63095.73445
L evening dB(A) =	43.1	64565.4229
L night dB(A)=	45	316227.766
L den dB(A) =	**51.69**	**19th April 2012**
L day dB(A) =	51.4	138038.4265
L evening dB(A) =	40.6	36307.80548
L night dB(A)=	42.3	169824.3652
L den dB(A) =	**51.20**	**20th April 2012**
L day dB(A) =	48.8	75857.7575
L evening dB(A) =	42.2	52480.74602
L night dB(A)=	46.8	478630.0923
L den dB(A) =	**53.14**	**21st April 2012**
L day dB(A) =	50.1	102329.2992
L evening dB(A) =	41.7	46773.51413
L night dB(A)=	36.9	48977.88194
L den dB(A) =	**48.77**	**22nd April 2012**
L day dB(A) =	49.9	97723.7221
L evening dB(A) =	44.7	93325.43008
L night dB(A)=	69.5	89125093.81
L den dB(A) =	**74.74**	**23rd April 2012**
L day dB(A) =	46.8	47863.00923
L evening dB(A) =	42.2	52480.74602
L night dB(A)=	48.1	645654.229
L den dB(A) =	**53.94**	**24th April 2012**
L day dB(A) =	60.6	1148153.621
L evening dB(A) =	0	3.16227766
L night dB(A)=	0	10
L den dB(A) =	**57.59**	**25th April 2012**

Table Four: L_{DEN} calculations for 25th April to 2nd May 2012

L day dB(A) =	60.2	1047128.548
L evening dB(A) =	56.6	1445439.771
L night dB(A)=	54.5	2818382.931
L den dB(A) =	**62.31**	**25 April 2012**
L day dB(A) =	53.9	245470.8916
L evening dB(A) =	51.5	446683.5922
L night dB(A)=	51.6	1445439.771
L den dB(A) =	**58.32**	**26 April 2012**
L day dB(A) =	51.6	144543.9771
L evening dB(A) =	43.2	66069.3448
L night dB(A)=	45.6	363078.0548
L den dB(A) =	**53.10**	**27 April 2012**
L day dB(A) =	54.8	301995.172
L evening dB(A) =	52.6	575439.9373
L night dB(A)=	55.9	3890451.45
L den dB(A) =	**61.89**	**28 April 2012**
L day dB(A) =	59.9	977237.221
L evening dB(A) =	57.6	1819700.859
L night dB(A)=	50.3	1071519.305
L den dB(A) =	**60.60**	**29 April 2012**
L day dB(A) =	49.4	87096.359
L evening dB(A) =	50.7	371535.2291
L night dB(A)=	56.6	4570881.896
L den dB(A) =	**62.12**	**30 April 2012**
L day dB(A) =	53.1	204173.7945
L evening dB(A) =	43.8	75857.7575
L night dB(A)=	44.8	301995.172
L den dB(A) =	**53.33**	**01 May 2012**
L day dB(A) =	56.1	407380.2778
L evening dB(A) =		3.16227766
L night dB(A)=		10
L den dB(A) =	**53.09**	**02 May 2012**

Weather forecast for part of the monitoring period

Holyhead five-day forecast

Date	Time	Weather	Temp	Wind			Visibility
				Dir	Speed	Gust	
Tue 24 Apr	1600		9 °C	NNW	6 mph		Excellent
	1900		9 °C	N	5 mph		Excellent
	2200		7 °C	E	8 mph		Very Good
Wed 25 Apr	0100		7 °C	ENE	12 mph		Very Good
	0400		7 °C	E	15 mph		Good
	0700		7 °C	E	23 mph	34 mph	Good
	1000		7 °C	ENE	30 mph	46 mph	Moderate
	1300		7 °C	ENE	30 mph	46 mph	Good
	1600		8 °C	ENE	25 mph	39 mph	Good
	1900		9 °C	ENE	22 mph	33 mph	Good
	Night		8 °C	NE	22 mph	32 mph	Moderate
Thu 26 Apr	Day		9 °C	N	21 mph		Very Good
	Night		8 °C	NNW	22 mph		Very Good
Fri 27 Apr	Day		9 °C	N	14 mph		Very Good
	Night		7 °C	NNE	12 mph		Very Good
Sat 28 Apr	Day		11 °C	ENE	17 mph	27 mph	Very Good
	Night		8 °C	NE	26 mph	38 mph	Good

Last updated: 1301 on Tue 24 Apr 2012

Taken directly from http://www.metoffice.gov.uk/weather/uk/wl/holyhead_forecast_weather.html

Holyhead five-day forecast

Date	Time	Weather	Temp	Wind			Visibility
				Dir	Speed	Gust	
Mon 30 Apr	1000		11 °C	E	19 mph	31 mph	Excellent
	1300		13 °C	ESE	14 mph	26 mph	Excellent
	1600		15 °C	E	17 mph	31 mph	Very Good
	1900		14 °C	ENE	14 mph	24 mph	Very Good
	2200		13 °C	ENE	16 mph	27 mph	Good
Tue 1 May	0100		11 °C	ENE	19 mph	31 mph	Very Good
	0400		11 °C	NE	22 mph	34 mph	Very Good
	0700		10 °C	NE	25 mph	39 mph	Very Good
	1000		11 °C	NE	24 mph	39 mph	Very Good
	1300		12 °C	ENE	19 mph	33 mph	Very Good
	1600		12 °C	ENE	16 mph	27 mph	Good
	1900		11 °C	ENE	15 mph		Good
	Night		9 °C	ENE	10 mph		Moderate
Wed 2 May	Day		12 °C	NE	10 mph		Good
	Night		9 °C	ENE	11 mph		Good
Thu 3 May	Day		11 °C	NNE	11 mph		Very Good
	Night		8 °C	NNE	10 mph		Good
Fri 4 May	Day		11 °C	NE	15 mph		Good
	Night		7 °C	NE	16 mph		Good

Last updated: 0901 on Mon 30 Apr 2012

Taken directly from http://www.metoffice.gov.uk/weather/uk/wl/holyhead_forecast_weather.html

Authors comments:

This period of monitoring has been undertaken in order to establish background levels only within the vicinity of the monitoring location. No conclusions have been drawn in relation to the data set, as this is purely for information purposes. Additionally, 1/3 octave or FFT analysis has not been conducted upon the data set owing to limitations of the recording equipment as sound files have not been obtained for post-processing.

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HORIZON NUCLEAR POWER

Wylfa Newydd Project: A5025 Highway Improvements

Consultancy Report: Baseline Noise Monitoring Results

February 2016

Document Number: 60PO8033/NAV/REP/001
Horizon Ref: HNP-S5-PAC-REP-00045
Document Date: February 2016
Version: 2

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Document control sheet

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Project:	**Wylfa Newydd Project: A5025 Highway Improvements**		
Client:	**Horizon Nuclear Power Ltd**	**Project Number:**	**60PO8033**
Document Title:	Consultancy Report: Baseline Noise Monitoring Results		
Ref. No:	60PO8033/NAV/REP/001		

	Originated by	Checked by	Reviewed by
ORIGINAL (REVISION 1)	NAME **James Wright**	NAME **Gail Hitchins**	NAME **Rob Mansfield**
Approved by	NAME **Jamie Gleave**	As Project Manager I confirm that the above document(s) have been subjected to Jacobs' Check and Review procedure and that I **approve them for issue**	INITIALS **JG**
DATE	**18-12-15**	**Document status: Client Issue**	

REVISION 2	NAME **Gail Hitchins**	NAME **Humphrey Roberts-Powell**	NAME **Humphrey Roberts-Powell**
Approved by	NAME **Jamie Gleave**	As Project Manager I confirm that the above document(s) have been subjected to Jacobs' Check and Review procedure and that I **approve them for issue**	INITIALS **JG**
DATE	**10-02-16**	**Document status: Client Issue**	

Executive Summary

Noise arising from new development can lead to annoyance, loss of amenity, and in some cases, adverse health effects. Potential noise effects on the local community are considered by the planning and regulatory frameworks, and noise emissions may be subject to conditions in planning consents.

To thoroughly assess potential noise effects, it is necessary to have an understanding of existing noise levels in the nearby community.

A series of On-line and Off-line Highway Improvements (the A5025 Highway Improvements) have been proposed along the existing A5025 between Valley and Tregele, on Anglesey.

This report details the methodology implemented for the A5025 Highway Improvements baseline noise monitoring and presents the results of monitoring undertaken during June and November 2015. The objective of the monitoring was to characterise existing noise levels at sensitive receptors in the vicinity of sections of the A5025 expected to experience changes in traffic noise due to physical alterations to the carriageway's horizontal and/or vertical alignment, through the introduction of other components as part of the A5025 Highway Improvements, or through additional vehicle movements associated with the construction and operation of other elements forming the Wylfa Newydd Project.

The baseline monitoring results have been compared with relevant guidance including the World Health Organisation guidelines and the Design Manual for Roads and Bridges, in order to contextualise the findings of the survey.

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Contents

1 Introduction

1.1 Background

Horizon Nuclear Power Wylfa Limited (Horizon) is a UK energy company planning to develop a new nuclear power station in north Anglesey, Wales as identified in the National Policy Statement for Nuclear Power Generation (EN-6).

The Wylfa Newydd Project (the Project) will require a number of applications to be made under different legislation to different regulators. A nuclear power station is a nationally significant infrastructure project under the Planning Act 2008. Horizon must therefore obtain a development consent order (DCO), which is granted by the Secretary of State for the Department of Energy and Climate Change.

In addition to the DCO for the Wylfa Newydd Generating Station, Horizon will also require marine licences, environmental permits and regulatory licences, including a Nuclear Site Licence. Planning permissions under the Town and Country Planning Act 1990 (TCPA) will be needed for Associated Development within the Project from the Isle of Anglesey County Council (IACC).

Associated Development comprises development to support delivery of the Generating Station, examples of which include highway improvements along the A5025, Park and Ride facilities for construction workers and a Logistics Centre.

Horizon is proposing to carry out works to upgrade and improve sections of the existing A5025 (the A5025 Highway Improvements) to address a number of constraints that affect existing traffic flows and movements, and to address potential effects on local communities that could arise from construction and worker traffic associated with the Project. A series of preliminary designs have been developed by Horizon between the settlements of Valley and Tregele. These range from minor modifications such as new signage and markings within the highway boundary (On-line Highway Improvements) to more extensive changes requiring construction of new junction arrangements and sections of carriageway within adjacent land (Off-line Highway Improvements).

Jacobs UK Ltd (Jacobs) was commissioned by Horizon to undertake a baseline noise survey at locations along the A5 at Valley and the A5025 from Valley to the proposed access for the Power Station Site, as part of a noise and vibration assessment of the A5025 Highway Improvements.

This report details the methodology and results of the noise monitoring exercise. The results are discussed in the context of relevant noise level guidelines. The baseline noise survey data will also be used within other assessments which will be submitted for approval to construct and operate the Wylfa Newydd Project.

1.2 The A5025 Highway Improvements

The section of carriageway associated with the A5025 Highway Improvements is approximately 18km long and commences at the A5 trunk road at Valley, south west of the Existing Power Station, and runs northwards, broadly parallel to the west coast of Anglesey towards the settlement of Cemaes.

Between Valley and Cemaes, the section of route requiring improvement passes through or adjacent to the communities of Llanfachraeth, Llanfaethlu, Llanrhyddlad, and Tregele. Beyond Cemaes, the A5025 continues to follow the coast on the eastern side of Anglesey connecting the Wylfa NPS Site to Amlwch, Benllech, Menai Bridge and other settlements before joining the A55 at Llanfairpwllgwyngyll on the southern coast by the Britannia Bridge, which connects Anglesey to the mainland.

The A5025 Highway Improvements have been divided into eight sections:

- Section 1: Junction 3 of the A55 to Valley Junction A5/A5025;
- Section 2: Valley Junction A5/A5025 to North of Llanynghenedl;
- Section 3: North of Llanynghenedl to North of Llanfachraeth;
- Section 4: North of Llanfachraeth to South of Llanfaethlu;
- Section 5: South of Llanfaethlu to North of Llanfaethlu;
- Section 6: North of Llanfaethlu to North of Llanrhyddlad;
- Section 7: North of Llanrhyddlad to North of Cefn Coch; and
- Section 8: North of Cefn Coch to the Existing Power Station site access road.

Horizon's preliminary designs have been informed by a staged process of option identification, assessment and evaluation, underpinned by consultation with statutory and non-statutory organisations. This process has identified a requirement for Off-line Highway Improvements within Sections 1, 3, 5 and 7, and On-line Highway Improvements within Sections 2, 4, 6 and 8, of the A5025.

1.3 Study aims and objectives

A monitoring plan was produced prior to the survey commencement. A draft version of the document was submitted to Mick Goodfellow, EHO at the IACC, for comment on Tuesday 21 April 2015. All comments were addressed in advance of the survey and formalised in the document 'Baseline Noise Monitoring Plan A5025 Road Improvement Scheme' (DCRM Ref Number WN03.03.01-S5-PAC-TEC-00006). The Baseline Monitoring Plan set out the following information:

- the aims of the noise survey;
- a description of the site and surrounds, identifying key noise sensitive receptors and existing noise sources;
- standards and guidance which are relevant to the noise survey; and
- the proposed noise monitoring scheme, including locations, instrumentation and survey specification.

The objective of the baseline noise monitoring was to characterise existing noise levels at sensitive receptors in the vicinity of sections of the A5025 expected to experience changes in traffic noise due to physical alterations to the carriageway's horizontal and/or vertical alignment, through the introduction of other components as part of the A5025 Highway Improvements, or through additional vehicle movements associated with the construction and operation of other elements forming the Wylfa Newydd Project.

The survey aims are developed further below.

- Characterise existing daytime and night-time traffic noise levels along the existing route to enable validation of the baseline traffic noise models.
- Characterise existing ambient noise levels at receptors close to the Off-line Highway Improvements, to inform the road construction noise assessment (it is envisaged that the online improvements will be much more focused in their scope and duration, and hence monitoring was not proposed specifically at these locations).
- Characterise the existing daytime and night-time road traffic noise levels at receptors close to the Off-line Highway Improvements, to inform the road traffic noise assessments.

- Characterise existing night-time L_{Amax} noise levels at receptors close to the Off-line Highway Improvements and those existing road sections predicted to experience an increase in night-time traffic.

This report confirms where the methodology set out by the Baseline Monitoring Plan was implemented, identifies any changes required by local circumstances, and presents the results of the monitoring undertaken.

2 Methodology

2.1 Noise sensitive receptors

Noise sensitive receptors in the settlements along the existing A5025 and along the proposed A5025 Off-line Highway Improvements from Valley in the south, to the Generating Station site in the north, are those likely to be most affected by the highway improvement construction noise and changes to road traffic noise from the A5025.

For the purpose of the baseline noise monitoring, the following groups of noise sensitive receptors were defined and agreed with the Environmental Health Officer (EHO) within the IACC (see section 1.5 below):

R1 – Valley: area for Off-line Highway Improvements;

R2 – Llanynghenedl;

R3 – Llanfachraeth: area for Off-line Highway Improvements;

R4 – Llanfaethlu: area for Off-line Highway Improvements;

R5 – Llanrhyddlad;

R6 – Llanrhwydrus/Cefn Coch: area for Off-line Highway Improvements; and

R7 – Tregele.

The spatial extent of each of the receptor groups is not limited to the main settlements, but extends to include the numerous individual receptors along the road.

Noise monitoring has been carried out at sufficient locations to enable the noise levels for each receptor group to be characterised through a combination of short term attended measurements and longer term unattended measurements.

In this survey, the short term measurements refer to attended monitoring, typically over 24 hours on one or more days. Long term measurements refer to continuous unattended monitoring, over multiple days (typically seven).

2.2 Noise monitoring locations

The selection of equipment positions was influenced by the scheme design and consideration was given to where the greatest potential noise effects may occur. The choice of monitoring locations was also influenced by a number of constraints including acoustic suitability, ease of access and equipment security. Therefore, the final locations were not necessarily situated where the current road traffic noise levels are highest.

The final locations are detailed in table 2.1 and are presented in appendix A. Photographs of the equipment installed at each location are presented in appendix B. All locations were 'free field' and were free from significant localised reflections.

Table 2.1 Selected monitoring locations

Receptor group	Selected locations	Approx. BNG coordinates (m) easting	northing	Notes
R1. Valley	a) Glyn Villa (LT)	229551	379308	a) Sound Level Meter (SLM) set up centre of rear garden
	b) Cemetery (ST)	229865	379057	b) SLM in cemetery approximately 80m from carriageway
R2. Llanynghenedl	a) Layby adjacent to Converted Chapel (ST)	231488	380926	a) On pavement near layby adjacent to Converted Chapel – approximately 4m from carriageway edge
R3. Llanfachraeth	a) Erw Goch Bach (LT)	231710	381935	a) Rear garden contained pond and water feature, SLM location moved to side of house to minimise effects
	b) Dolydd (LT)	231478	382743	b) Field rear of house adjacent to play park
	c) Field adjacent to Bryn Farm (LT)	231805	382639	c) Field adjacent to Bryn Farm
	d) Field adjacent to primary school (LT)	231389	382936	d) Field adjacent to primary school to the south east
R4. Llanfaethlu	a) Rhos Ty Mawr (LT)	231529	386930	a) Rear garden of house
	b) Bryn Gwyn (LT)	231586	387556	b) SLM set up in adjacent field (north of house)
	c) Layby north of Rhos Ty Mawr (ST)	231583	387124	c) Layby north of Rhos Ty Mawr
R5. Llanrhyddlad	a) Layby north of westerly turning for Cylch y Garn (ST)	233023	388895	a) Layby north of westerly turning for Cylch y Garn
R6. Cefn Coch	a) Tyn Felin (LT)	233964	389854	a) Rear garden of house
	b) Rhandir (LT)	234239	390534	b) Side garden of house
R7. Tregele	a) Taldwrst (LT)	235602	392459	a) Rear garden of house
LT: Long term ST: Short term				

2.3 Survey staff and durations

The survey measurements were obtained over two separate survey periods. The first was between Monday 1 June 2015 and Wednesday 24 June 2015, and the second was between Wednesday 4 November 2015 and Friday 20 November 2015.

The main survey period was in June 2015. During this period, measurements were taken at all locations and the IACC EHO (Mick Goodfellow) was present at a selection of the long term installations, as noted in table 2.2.

Unexpected equipment failure occurred at locations R4a and R4b, during the June 2015 survey period. A second survey at location R4a was undertaken in November 2015 to provide additional data to complement the existing dataset. Additional monitoring at R4b was not undertaken as the Llanfaethlu design option that was expected to bring the A5025 much closer to these receptors had been discounted as part of the route option evaluation and selection process.

During both survey periods, the equipment was set up by an appropriately qualified and experienced Jacobs' member of staff, holding the Institute of Acoustics Certificate of Competence in Environmental Noise Monitoring. Table 2.2 details the individual survey dates for each location; multiple entries occur in the table when the measurements were non-contiguous.

Table 2.2 Survey durations

ID	Type	Start date	End date	EHO present
R1a	Long term	15 June 2015	24 June 2015	Yes
R1b	Short term	16 June 2015	17 June 2015	No
R2a	Short term	3 June 2015	4 June 2015	No
R2a	Short term	16 June 2015	16 June 2015	No
R3a	Long term	1 June 2015	10 June 2015	Yes
R3b	Long term	1 June 2015	10 June 2015	No
R3c	Long term	1 June 2015	10 June 2015	No
R3d	Long term	1 June 2015	10 June 2015	Yes
R4a	Long term	15 June 2015	16 June 2015	Yes
R4a	Long term	4 November 2015	20 November 2015	No
R4b	Long term	15 June 2015	17 June 2015	Yes
R4c	Short term	15 June 2015	17 June 2015	No
R5a	Short term	3 June 2015	3 June 2015	No
R5a	Short term	15 June 2015	16 June 2015	No
R6a	Long term	15 June 2015	24 June 2015	Yes
R6b	Long term	15 June 2015	23 June 2015	Yes
R7a	Long term	15 June 2015	23 June 2015	No

2.4 Noise measurement instrumentation and set-up

The survey was undertaken with reference to the *British Standard 7445:2003 'Description and measurement of environmental noise*' (BSI, 2003) and the memorandum *Calculation of Road Traffic Noise* (CRTN) (Department for Transport and the Welsh Office, 1988), where applicable.

Ambient noise levels were measured at each location using integrating-averaging SLMs or equivalent systems conforming to Class 1 as defined by *BS EN 61672–Part1:2013 (Electroacoustics, Sound Level Meters, Specifications)* (BSI, 2013). Each SLM was field calibrated before the start of each survey by applying an acoustic calibrator conforming to the latest versions of *BS EN 60942:2003 (Electroacoustics - Sound Calibrators*) (BSI, 2003) to the microphone to check the sensitivity of the measuring equipment. Calibration checks were performed at the beginning and end of each survey. No significant calibration drift over the survey period was noted at any location; a summary of the survey log is included in appendix C.

The equipment used for the noise monitoring was also subject to more extensive performance tests, traceable to primary standards, at accredited independent laboratories within a period of one year prior to use. The calibration certificates detailing serial numbers and date of laboratory calibration of equipment used at each location are presented in appendix C.

The noise monitoring equipment was time synchronised with the meteorological equipment, to ensure that noise and met data were able to be correlated during the baseline data processing exercise. The microphone height was between 1.2m and 1.5m above ground level. The microphone positions were at least 3.5m from any reflecting surface other than the ground, to minimise the influence of reflections. Additionally, the roadside shortened CRTN measurements were sited at least 15m from any significant reflecting surface other than the ground. A suitable foam windshield (conforming to Class 1 of BS EN 61672 in dry conditions, and Class 2 if saturated with 100mm of water) was fitted to each microphone. At each location, the SLM was set to measure using the logging facility and a sampling time of 100ms, with the A-weighting filter and 'fast' time weighting selected.

2.5 Meteorological instrumentation and set-up

Measurements of wind speed, wind direction and precipitation were made using two ANV weather stations, to provide time-stamped data averaged over a one minute measurement period. The ANV weather station is a professional grade mobile weather station that uses a combination of ultrasonic and Doppler radar detection to provide logged meteorological field measurements.

The 'Baseline Noise Monitoring Plan A5025 Road Improvement Scheme' document stated that the meteorological mast located inside the Wylfa Newydd Development Area would be used for localised measurements near to R7a. However, due to differing measurement heights and sample periods between the ANV weather stations and the mast, it was decided not to use the mast data at this location and to use the data measured at R4b as a proxy. This allowed for consistency across all locations.

The 'Baseline Noise Monitoring Plan A5025 Road Improvement Scheme' document also stated that meteorological monitoring would take place at the R6 location area, but access constraints and a change of monitoring programme meant that this was not possible. The data measured at R4b was used as a proxy for locations R6a and R6b.

The meteorological equipment was installed at the locations and dates included in table 2.3. appendix A includes a figure showing the meteorological monitoring locations. The anemometer was installed at approximately 1.5m above ground level.

Table 2.3 Summary of meteorological installations

Location	Start Date	End Date
R3a Ewr Goch Bach	1 June 2015	14 June 2015
R3d Field adjacent to primary school	1 June 2015	14 June 2015
R4b Bryn Gwyn	14 June 2015	24 June 2015
Horizon owned land *	4 November 2015	20 November 2015

**Field adjacent to the Existing Power Station entrance - approximate BNG coordinates (m) easting 235607, northing 393116.*

Meteorological equipment failure at R1a resulted in no data being measured at the location. Meteorological data measured at R4b were used as a proxy for wind and rain data filtering. The meteorological data filtering process allows for the separation distance between locations by excluding periods before and after those when adverse weather conditions were recorded. The filtering method is described in more detail in section 2.5.

2.6 Data processing methodology

In order to ensure that the data used to characterise the baseline noise environment are representative, the data were filtered using a number of criteria.

I. Noise data during any one minute period where rainfall was recorded were excluded from the dataset. In addition, noise data for 10 minutes prior to and after each period affected by rain were also excluded, to take into account the sensitivity of the instrument, and the distance between the noise monitoring locations and the meteorological equipment.

II. Noise data during any one minute period where the average wind speed recorded was over 5m/s, were excluded. In addition, noise data for 10 minutes prior to and after each period affected by winds above 5m/s were also excluded, to take into account the sensitivity of the instrument, and the distance between the noise monitoring locations and the anemometer.

III. Any data which appeared atypically elevated from a visual review of the data, based on professional judgement, were excluded. Additionally, any atypical data that were noted by the residents was excluded (where details on time and activity were recorded).

The valid data points have been used to derive the baseline statistical noise parameters required by the standards that will be used to assess the potential noise effects of the A5025 Highway Improvements, as well as aspects of the wider Wylfa Newydd Project. These standards are:

- Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3, 2011;
- British Standard 5228:2009+A1 (BS5228), 2011;
- World Health Organisation's (WHO) Guideline for Community Noise, 1999; and
- World Health Organisation's (WHO) Night Noise Guidelines for Europe, 2009.

3 Results

3.1 Observations on audible noise sources during installation

Audible noise sources at each location were noted during the survey. These audible noise source observations are summarised in table 3.1.

Table 3.1 Observations on audible noise sources

ID	Daytime observations	Night-time observations
R1a	Dominant noise was from road traffic (A5025).	No night-time observations.
R1b	Dominant noise was from road traffic (A5025 and A55).	Dominant noise was from road traffic (A55).
R2a	Dominant noise was from road traffic (A5025).	Livestock and birdsong audible, road traffic noise in distance but barely audible.
R3a	Dominant noise was from road traffic (A5025).	Dominant noise was from road traffic (A5025).
R3b	Dominant noise was from road traffic (A5025).	Dominant noise was from road traffic (A5025) plus birdsong and livestock.
R3c	Traffic adjacent to field was audible, as was wind through vegetation.	Dominant noise was from road traffic (A5025) plus birdsong and livestock.
R3d	Wind through vegetation caused dominant noise, traffic clearly audible.	Dominant noise was birdsong and livestock, road traffic audible and mechanical hum in distance.
R4a	Dominant noise was from road traffic (A5025), dog kennels activity clearly audible.	Dominant noise was from road traffic (A5025) plus birdsong and livestock but all barely audible.
R4b	Road traffic noise barely audible, livestock and birdsong audible.	Livestock and birdsong audible, road traffic noise in distance but barely audible.
R4c	Dominant noise was from road traffic (A5025).	Distant traffic and direct pass-bys, wind through vegetation and livestock (barely audible).
R5a	Dominant noise was from road traffic (A5025).	Distant traffic and direct pass bys, wind through vegetation and livestock (barely audible).
R6a	Dominant noise was from road traffic (A5025), dog barking clearly audible.	Livestock and birdsong audible.
R6b	Dominant noise was from road traffic (A5025).	Livestock and birdsong audible.
R7a	Dominant noise was from road traffic (A5025).	Dominant noise was birdsong and livestock, road traffic audible and mechanical hum in distance. Single aeroplane flyover.

3.2 Baseline noise levels – construction

The noise levels for the daytime, evening/weekend and night-time periods (as per the 'ABC' methodology in BS5228-1:2009+A1:2014, (BSI, 2014)) at each location have been evaluated, ignoring any periods influenced by rain and wind or atypical events (as described in section 2.5). The evaluation includes processing the filtered 100ms measured data and deriving $L_{Aeq,T}$ values for each assessment time period.

Summary values ($L_{Aeq,T}$), rounded to the nearest whole dB, for the construction noise assessment periods are provided in table 3.2. These values are for the long term monitoring locations only.

Table 3.2 Summary of measured $L_{Aeq,T}$ noise levels

Location ID	$L_{Aeq,T}$ dB		
	Daytime	Evenings and Weekends	Night-time
R1a	56	52	47
R3a	62	59	52
R3b	53	51	41
R3c	53	50	46
R3d	55	50	45
R4a	49	44	41
R4b	49	43	39
R6a	54	51	44
R6b	57	55	48
R7a	52	50	46

Time history graphs have been included for the long term monitoring in appendix D.

3.3 Baseline noise levels – road traffic: long term measurements

The data collected at the long term measuring locations have been processed to report the weekday average $L_{A10,\ 18h}$ and L_{night} values, following the methodology in CRTN (Department for Transport and the Welsh Office, 1988) and DMRB. L_{night} is defined in DMRB as the free field $L_{Aeq,\ 8h}$ value for the period 23:00 to 07:00.

Table 3.3 details the calculated weekday and weeknight noise levels at the selected long term measurement locations.

Table 3.3 Long term road traffic noise summary

Location ID	$L_{A10,\ 18h}$ dB	L_{night} dB
R1a	53.4	46.7
R3a	62.8	52.2
R3b	47.6	41.0
R3c	50.1	46.5
R3d	52.8	45.5
R4a	49.3	41.1
R4b*	45.3	38.6
R6a	53.8	43.9
R6b	59.0	48.3
R7a	53.5	45.7

* Equipment failure resulted in locations R4b having significantly less data measured than the other locations.

It should be noted that although the values in table 3.3 have been selected to report day and night-time road traffic noise levels, depending on the proximity to major roads, there could be some influence from other local noise sources that may affect the overall values.

Time history graphs have been included for the long term monitoring in appendix D.

3.4 Baseline noise levels – road traffic: shortened CRTN measurements

For the four short term measurements, three consecutive $L_{A10,\ 1h}$ values were recorded. Using the methodology set out in CRTN, the $L_{A10,\ 1h}$ values were converted to $L_{A10,\ 18h}$. The conversion formula is as follows:

$$L_{A10,18h} = L_{A10,3h} - 1\ dB$$

Where $L_{A10,3h}$ is the arithmetic average of the three consecutive hourly L_{A10} values.

The results of the short term CRTN measurements are included in table 3.4.

Table 3.4 Summary of short term CRTN results

Location ID	Start	Duration (hh:mm)	$L_{A10,\ 1h}$ dB	$L_{A10,\ 18h}$ dB
R1b	10:00 - 16 June 2015	01:00	59.5	59.7
	11:00 - 16 June 2015	01:00	59.7	
	12:00 - 16 June 2015	01:00	63.0	
R2a	13:30 - 3 June 2015	01:00	73.3	72.5
	14:30 - 3 June 2015	01:00	72.9	
	15:30 - 3 June 2015	01:00	74.3	
R4c	13:30 - 16 June 2015	01:00	69.5	68.7
	14:30 - 16 June 2015	01:00	69.6	
	15:30 - 16 June 2015	01:00	70.1	
R5a	10:00 - 3 June 2015	01:00	67.4	66.6
	11:00 - 3 June 2015	01:00	68.5	
	12:00 - 3 June 2015	01:00	66.8	

3.5 Baseline noise levels – night time: short term measurements

A selection of attended short term sample measurements were taken to quantify the noise climate during the night-time and to compliment the long term datasets. Table 3.5 summarises the short term sample measurement results.

Table 3.5 Short term measurements summary

ID	Start	Duration (hh:mm)	L_{Aeq} dB	L_{Amin} dB	L_{Amax} dB	L_{A90} dB	L_{A10} dB
R1b	00:50 - 16 June 2015	00:15	52.1	36.3	69.6	43.5	54.2
R1b	02:29 - 16 June 2015	00:15	41.5	24.5	58.5	29.8	45.6
R1b	05:00 - 17 June 2015	00:15	52.2	37.7	72.0	41.4	53.3
R1b	05:54 - 17 June 2015	00:15	57.6	40.7	74.2	46.0	61.8
R1b	05:18 - 25 June 2015	00:15	55.4	31.6	81.4	36.8	51.3
R1b	06:10 - 25 June 2015	00:15	59.3	35.1	78.7	41.9	59.3
R2a	05:00 - 4 June 2015	00:15	60.2	31.6	84.9	35.6	52.8
R2a	06:21 - 4 June 2015	00:15	64.3	33.3	84.7	37.3	63.5
R2a	00:27 - 16 June 2015	00:15	55.3	29.1	81.6	32.5	40.9
R2a	02:09 - 16 June 2015	00:15	48.9	25.2	75.3	27.9	38.0
R4c	23:53 - 15 June 2015	00:15	57.3	24.4	80.8	27.7	41.7
R4c	01:45 - 16 June 2015	00:15	29.9	24.1	55.1	25.5	32.2
R4c	05:27 - 17 June 2015	00:15	55.1	31.5	79.2	34.5	46.4
R4c	06:36 - 17 June 2015	00:15	61.7	29.9	80.6	34.1	58.4
R4c	06:37 - 25 June 2015	00:15	63.6	29.8	80.2	36.1	66.8
R4c	05:44 - 26 June 2015	00:15	55.3	25.7	77.8	29.9	49.7
R5a	05:35 - 3 June 2015	00:15	51.3	27.2	78.8	32.0	45.3
R5a	06:55 - 3 June 2015	00:15	64.1	32.4	85.7	40.7	66.6
R5a	23:30 - 15 June 2015	00:15	60.4	20.8	88.2	22.9	39.6
R5a	01:24 - 16 June 2015	00:15	56.0	22.4	80.8	25.4	42.7

3.6 Baseline noise levels – night time: long term measurements

The long term measured data have been processed to quantify the noise climate during the night-time period. The results are summarised in table 3.6 and show the averaged noise levels at each long term monitoring location.

Table 3.6 Long term night-time results

ID	Averaged hourly values				
	L_{Aeq} dB	L_{Amin} dB	L_{Amax} dB	L_{A90} dB	L_{A10} dB
R1a	46.4	27.0	76.8	32.3	47.7
R3a	52.1	23.1	77.5	28.2	52.3
R3b	40.6	21.6	61.1	26.2	43.8
R3c	46.0	22.5	70.3	26.4	45.4
R3d	45.4	22.8	69.1	27.1	48.2
R4a	43.5	26.2	61.3	31.3	46.4
R4b	38.2	22.3	66.6	25.5	36.9
R6a	44.0	22.2	68.4	27.6	45.2
R6b	48.4	20.7	74.8	25.7	44.7
R7a	45.8	23.1	71.2	27.9	48.7

It should be noted that the averaging for the L_{Aeq} levels is logarithmic and the averaging for the other parameters is arithmetic.

4 Discussion of results

4.1 General

In this section, the baseline monitoring results have been compared with relevant guidance in order to contextualise the findings of the survey.

4.2 World Health Organisation's Guidelines for Community Noise (1999)

The $L_{Aeq,T}$ and L_{Amax} survey results have been compared with the World Health Organisation's (WHO) Guidelines for Community Noise (1999), which presents guideline noise levels for community noise in specific environments.

A value of 55dB $L_{Aeq,T}$ is associated with protecting the majority of people from 'serious annoyance' in outdoor living areas during the daytime and evening. The baseline noise levels (table 3.2) from the survey are all at or below the guideline value of 55dB $L_{Aeq,T}$ apart from locations: R1a, R3a, and R6b. Locations R3b, R3c, R6a and R7a are below the guideline value for 'serious annoyance' but are above the value for 'moderate annoyance', which is 50dB $L_{Aeq,T.}$ Only locations R4a and R4b are below the 50dB $L_{Aeq,T}$ guideline value, but the weekday daytime noise levels are very close to this guideline value at 49dB $L_{Aeq,T}$.

The long and short term measured $L_{Aeq,T}$ results in table 3.2 and table 3.5 have been compared with the night-time noise guidelines for sleep disturbance. The guideline outdoor value for night-time sleep disturbance is 45dB $L_{Aeq,T}$ and this is exceeded at four of the long term locations: R3a, R3c, R6b and R7a, and all of the short term locations, with the exception of R4c.

It should be noted that the short term locations were generally less screened from and closer to the dominant noise sources (e.g. road traffic) than the long term locations, and this may have contributed to the higher measured $L_{Aeq,T}$ values.

In addition to the night-time $L_{Aeq,T}$ comparison, the night-time L_{Amax} values measured during the long and short term measurements have also been compared with the World Health Organisation's (WHO) Guidelines for Community Noise (1999). For night-time sleep disturbance, the guideline value of 60dB L_{Amax} is provided. The measured L_{Amax} night-time values in tables 3.5 and 3.6 show that the guideline value of 60dB L_{Amax} is exceeded at all locations, for long and short term measurement. Although a single exceedance of the guideline limit does not in itself suggest a likely sleep disturbance scenario, multiple exceedances might give rise to sleep disturbance.

4.3 World Health Organisation's Night Noise Guidelines for Europe (2009)

Reference has been made to the WHO Night Noise Guidelines for Europe (2009), which reviews health effects associated with exposure to night-time noise and recommends night noise guideline values. The guidelines present a night noise guideline (NNG) of 40dB L_{night} (outside) and an interim target of 55 dB(A) aimed at situations where the 40dB(A) target is not achievable. Furthermore, the guideline value is expressed as a yearly average, and hence occasional exceedances should not necessarily be interpreted as likely to result in harmful effects.

Comparison of the $L_{Aeq,T}$ logarithmic average baseline results for the night-time period (23:00-07:00) presented in table 3.6 with the interim target level and NNG indicates that whilst the interim target level is complied with at all locations, noise levels are equal to or above the NNG at all locations, apart from R4b.

The NNG is a yearly average noise level, hence these monitoring results are unable to fully confirm compliance or exceedance of this assessment criterion. Furthermore, noise levels during periods of adverse weather or atypical conditions have been removed, and noise levels during these periods may be considerably higher.

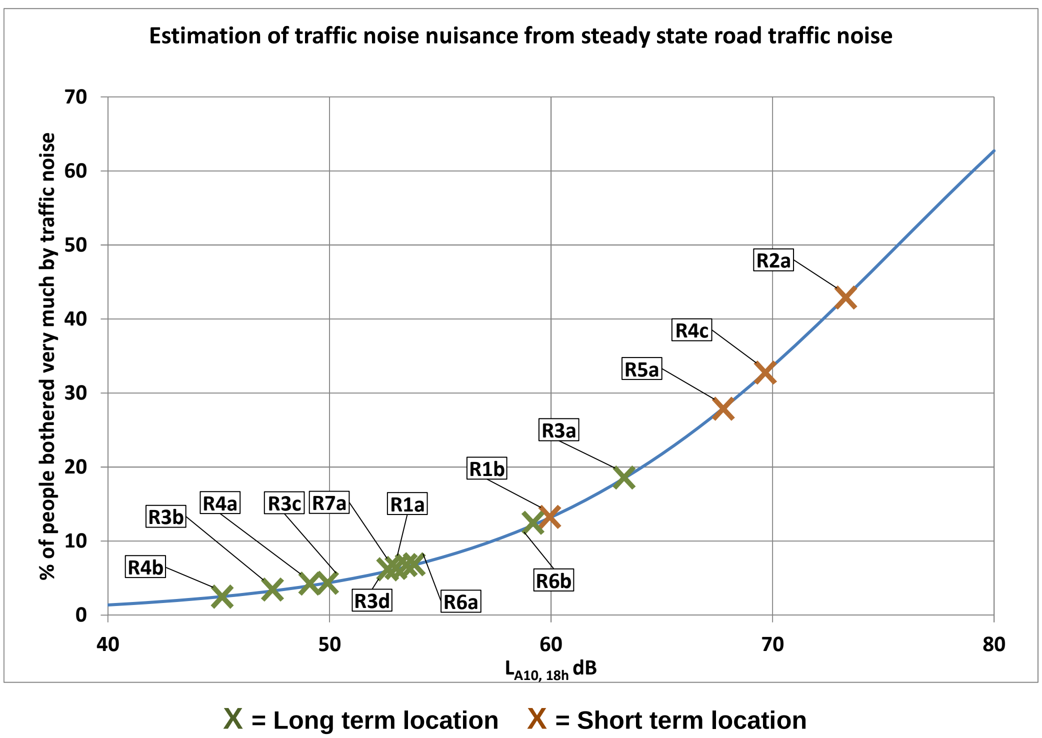
4.4 Design Manual for Roads and Bridges (DMRB)

Although DMRB does not propose a fixed limit or threshold for acceptable L_{A10} values, it does provide an estimation of the correlation between traffic noise nuisance and steady state traffic noise.

In figure 4.1, the $L_{A10,18hour}$ values from tables 3.3 and 3.4 have been plotted on the nuisance/road noise curve from DMRB. It can be seen that the majority of long term measurement locations are relatively low on the curve, and correlate with a percentage of the population likely to be bothered very much by traffic noise ranging from 3% to 18%. Conversely, it can be seen that the short term measurement locations are typically much higher on the curve, ranging from 13% to 44% of the population likely to be bothered. This is likely to be attributed to the reduced distance between the source and the measurement locations, coupled with the localised screening found at the long term locations.

It should be noted that although the short term levels are higher than the long term locations set up in residential gardens, there are properties close to the A5025 that may experience similar levels of noise and annoyance to those at the short term locations.

Figure 4.1 Estimation of traffic noise nuisance from steady state road traffic noise



5 Summary

Jacobs UK Ltd (Jacobs) has undertaken a baseline noise survey to inform the noise assessment of the A5025 Highway Improvements, and other traffic noise assessments required as part of the DCO application and other planning applications. This report presents the results of monitoring undertaken during 2015.

The survey was undertaken between Monday 1st June 2015 and Wednesday 24th June 2015, and noise levels were monitored at a selection of long and short term locations. Due to equipment failure, a second survey was mobilised between Wednesday 4 November 2015 and Friday 20 November 2015, when an additional long term dataset was collected.

This report presents the following information:

- a confirmation of the methodology used for the baseline noise monitoring;
- details of the wind, rain and noise monitoring locations;
- the methodology used for the processing and filtering of the data;
- a summary of the consultation and engagement of the IACC;
- a description of the noise environment encountered at each monitoring location;
- a summary the results of the monitoring undertaken; and
- a comparison of the measured results with applicable guidance.

The survey results are presented in a variety of formats to inform the Environmental Impact Assessment (EIA) of the A5025 Highway Improvements, and other assessments which will be undertaken for the various developments constituting the Wylfa Newydd Project.

6 References

BSI. (2003). BS 7445:2003 Description and measurement of environmental noise.

BSI. (2003). BS EN 60942:2003 Electroacoustics - Sound calibrators

BSI. (2013) BS EN 61672-Part1:2013 Electroacoustics, Sound level meters, Specifications

BSI. (2014). BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Noise.

Department of Energy and Climate Change. (2011). EN-6 Nuclear Power Generation National Policy Statement.

Horizon Nuclear Power (2015) Baseline Noise Monitoring Plan A5025 Road Improvement Scheme, (DCRM Ref Number WN03.03.01-S5-PAC-TEC-00006)

World Health Organisation. (1999). Guidelines for Community Noise.

World Health Organisation. (2009). Night Noise Guidelines for Europe.

Appendix A – Measurement locations

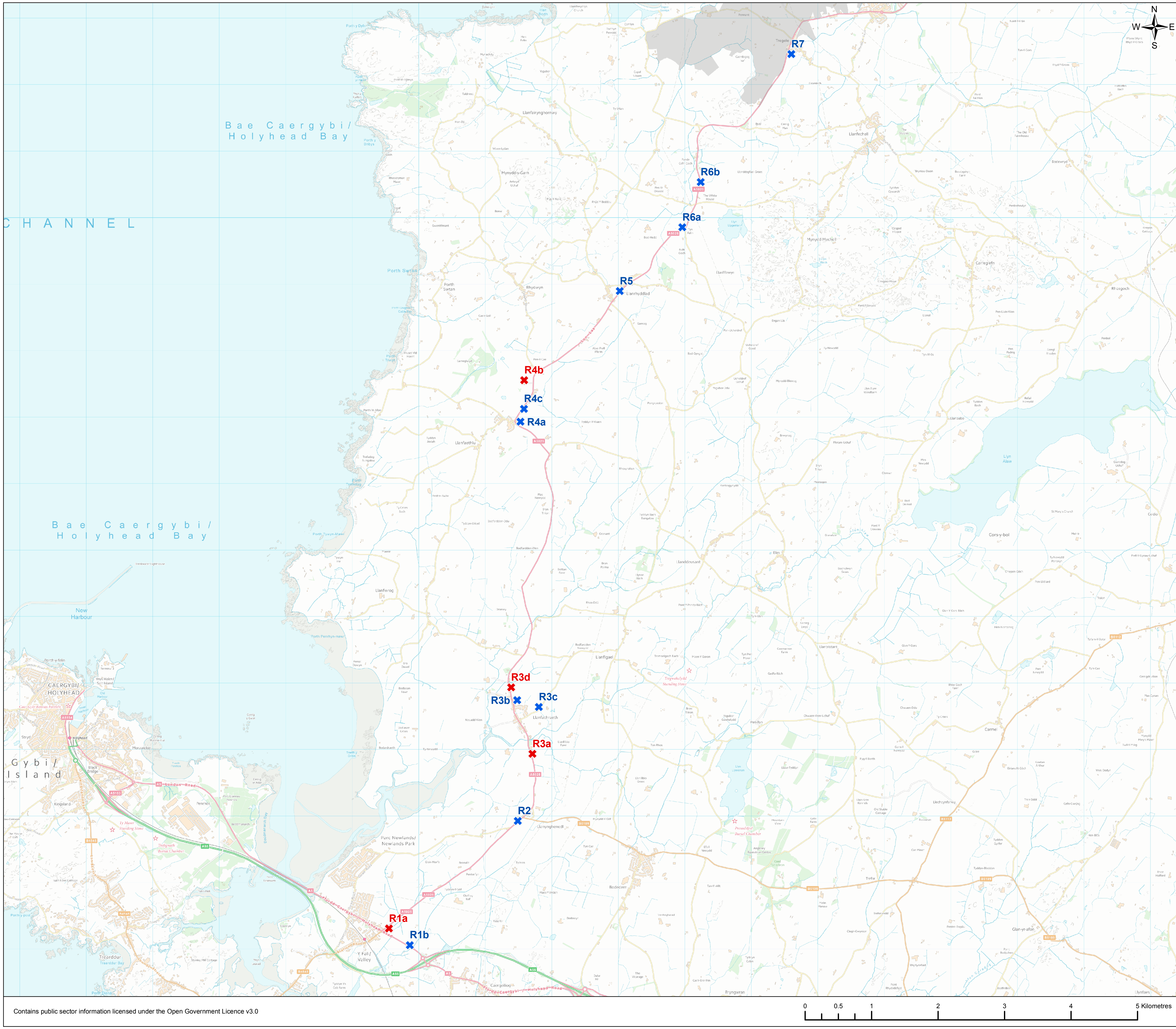
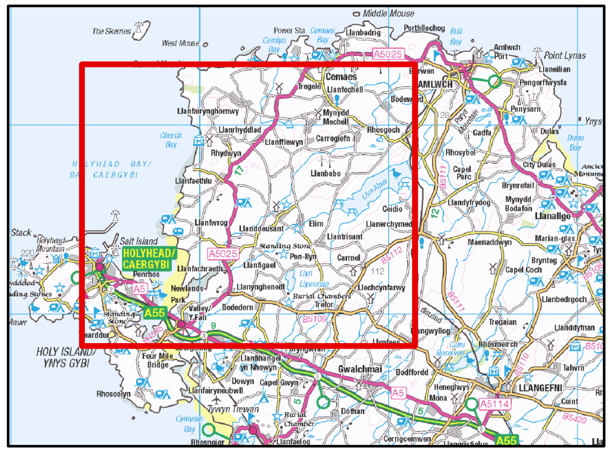


FIGURE 1

Legend

- Wylfa Newydd Development Area
- Noise Monitoring Location
- Noise and Met Station Monitoring Location



0	NOV 15	Initial Issue	AD	GH	RM	RB
Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd

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Client

HORIZON NUCLEAR POWER

Project

WYLFA NEWYDD PROPOSED NUCLEAR POWER STATION

Drawing Title

VALLEY NOISE AND MET STATION MONITORING LOCATIONS

Drawing Status

Scale @ A3	1:55,000	DO NOT SCALE
Jacobs No.	60PO8032	
Client No.		
Drawing No.	60PO8032_NOISEREPORT_01	

This drawing is not to be used in whole or in part other than for the intended purpose and project as defined on this drawing. Refer to the contract for full terms and conditions.

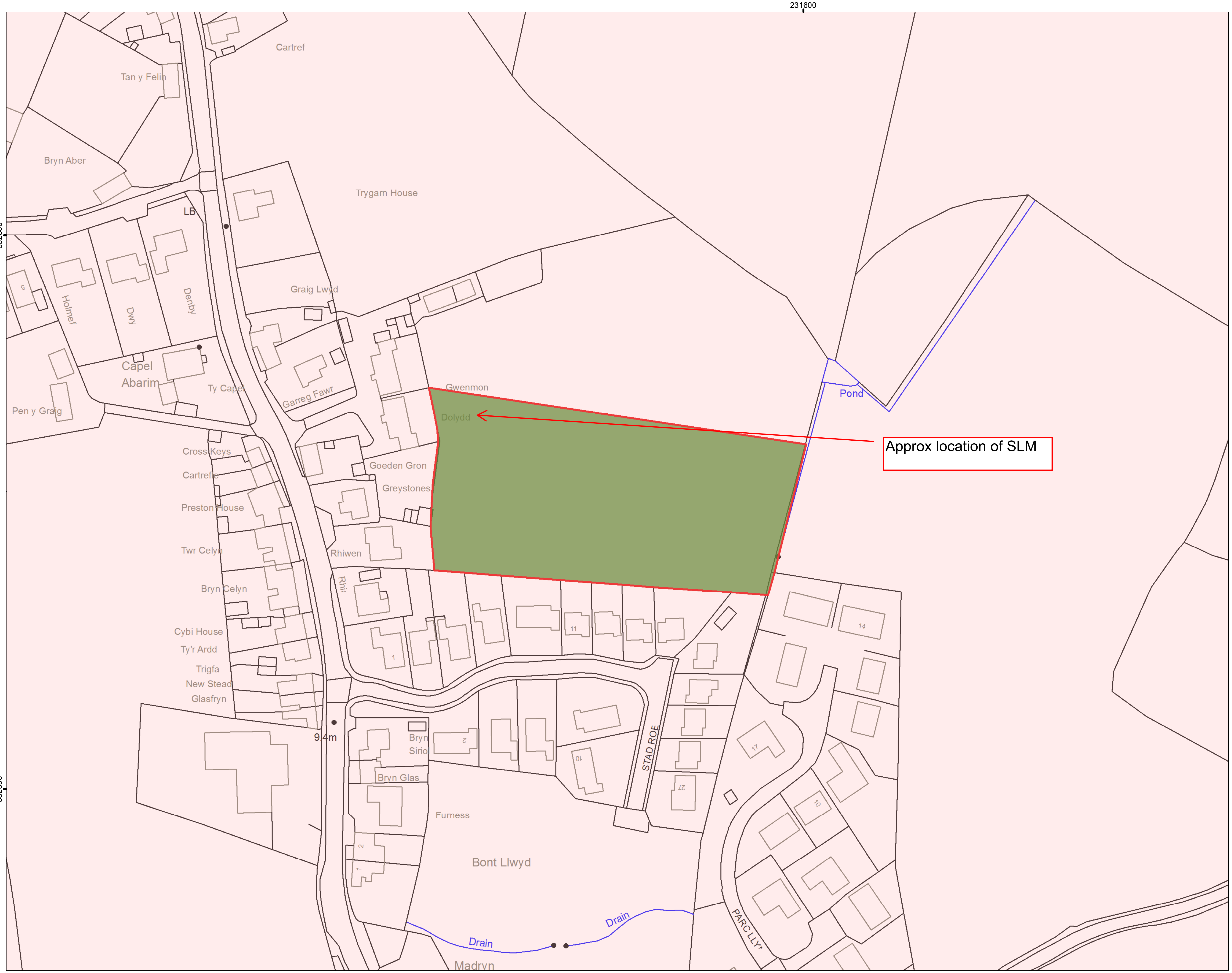
FISHER GERMAN

Promap®

FISHER GERMAN

Pond with running water in centre of garden so positioned SLM here. Weather station poisitoned between carriageway and SLM.

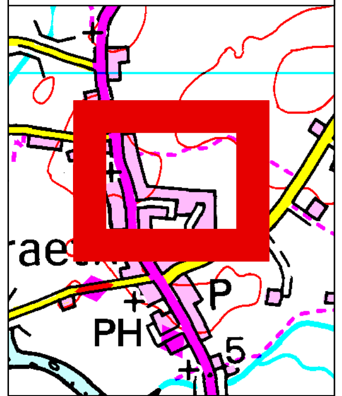
Promap®



N

0 5 10 20 30 40 Meters

OVERVIEW WINDOW



LEGEND:

Land of Interest

REVISION: A

CLIENT: HORIZON NUCLEAR POWER

SCHEME:

A5025 Road Sheme

TITLE:

PIL Plan 40901

SCALE: 1:1,250 @ A3

DATE: 12/12/2014

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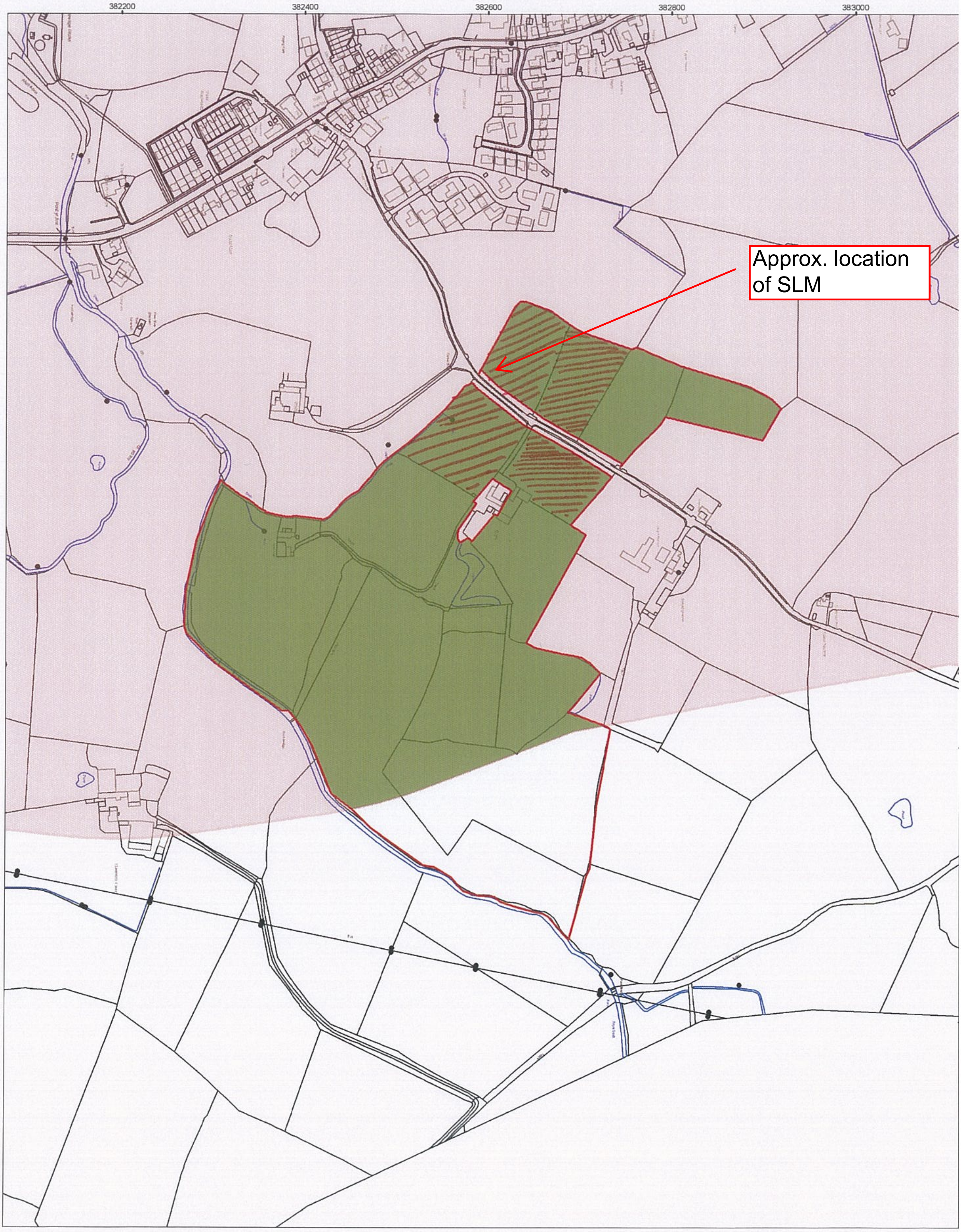
DRAWING NO:
HOR-WYLF-2014-12-PIL-JH-40901



OVERVIEW WINDOW

0 15 30 60 90 120 Meters

N

LEGEND:

Land of Interest

REVISION: A

CLIENT: HORIZON NUCLEAR POWER

SCHEME:

A5025 Road Sheme

TITLE:

PIL Plan 30011

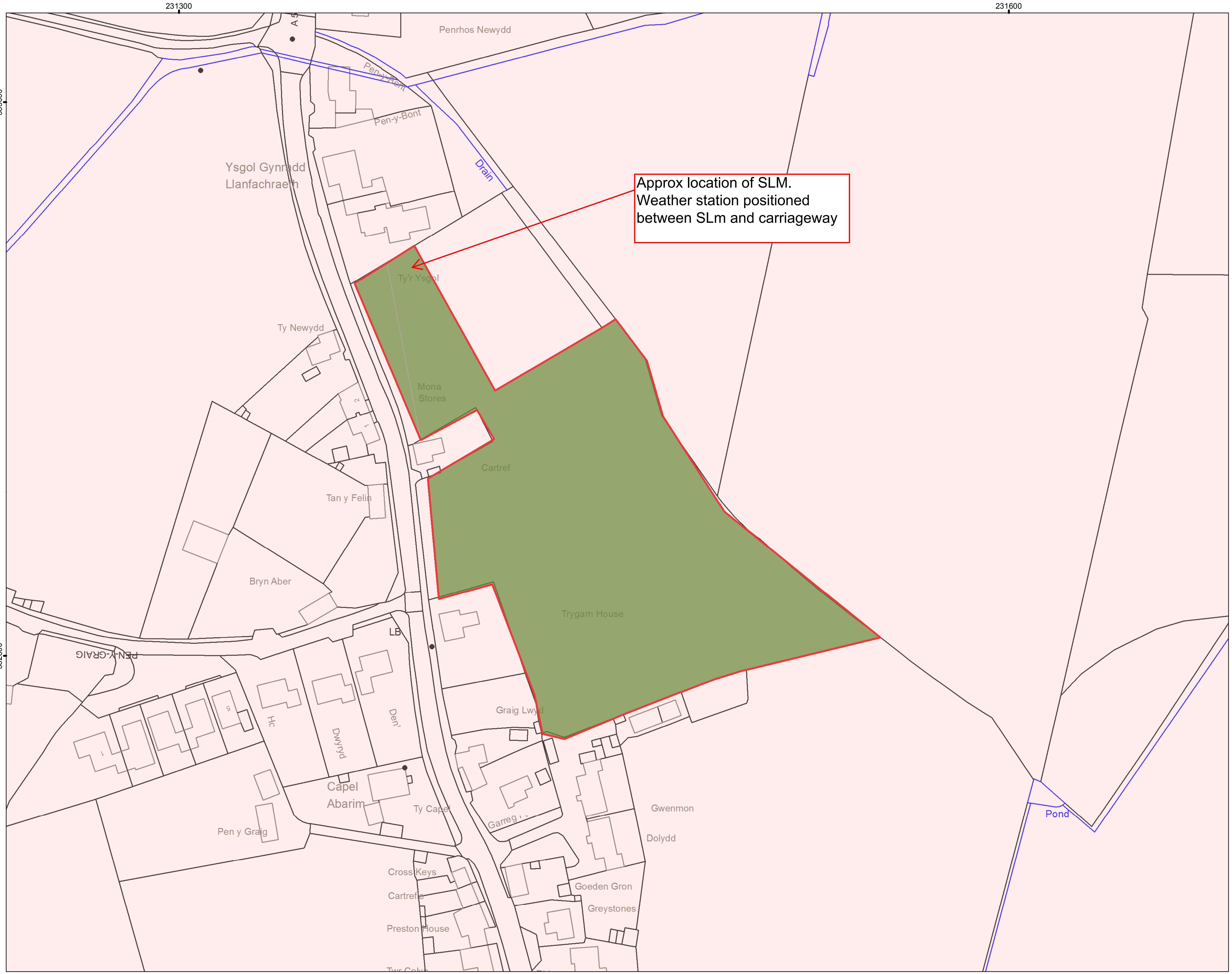
SCALE: 1:3,750 @ A3

DATE: 12/12/2014

Enabled by Ordnance Survey

FISHER GERMAN
Fisher German LLP, The Grange 80 Tamworth Road, Ashby de la Zouch, Leicestershire, LE65 2BW telephone 01530 412821 Fax: 01530 413896

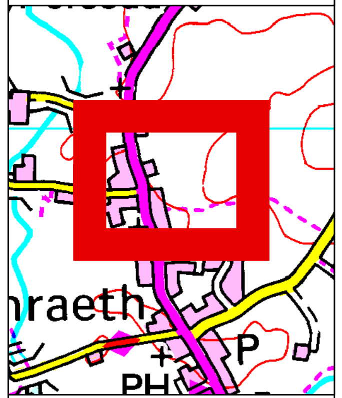
DRAWING NO: HOR-WYLF-2014-12-PIL-JH-30011



N

0 5 10 20 30 40 Meters

OVERVIEW WINDOW



LEGEND:

Land of Interest

REVISION: A

CLIENT: HORIZON NUCLEAR POWER

SCHEME:

A5025 Road Sheme

TITLE:

PIL Plan 10041

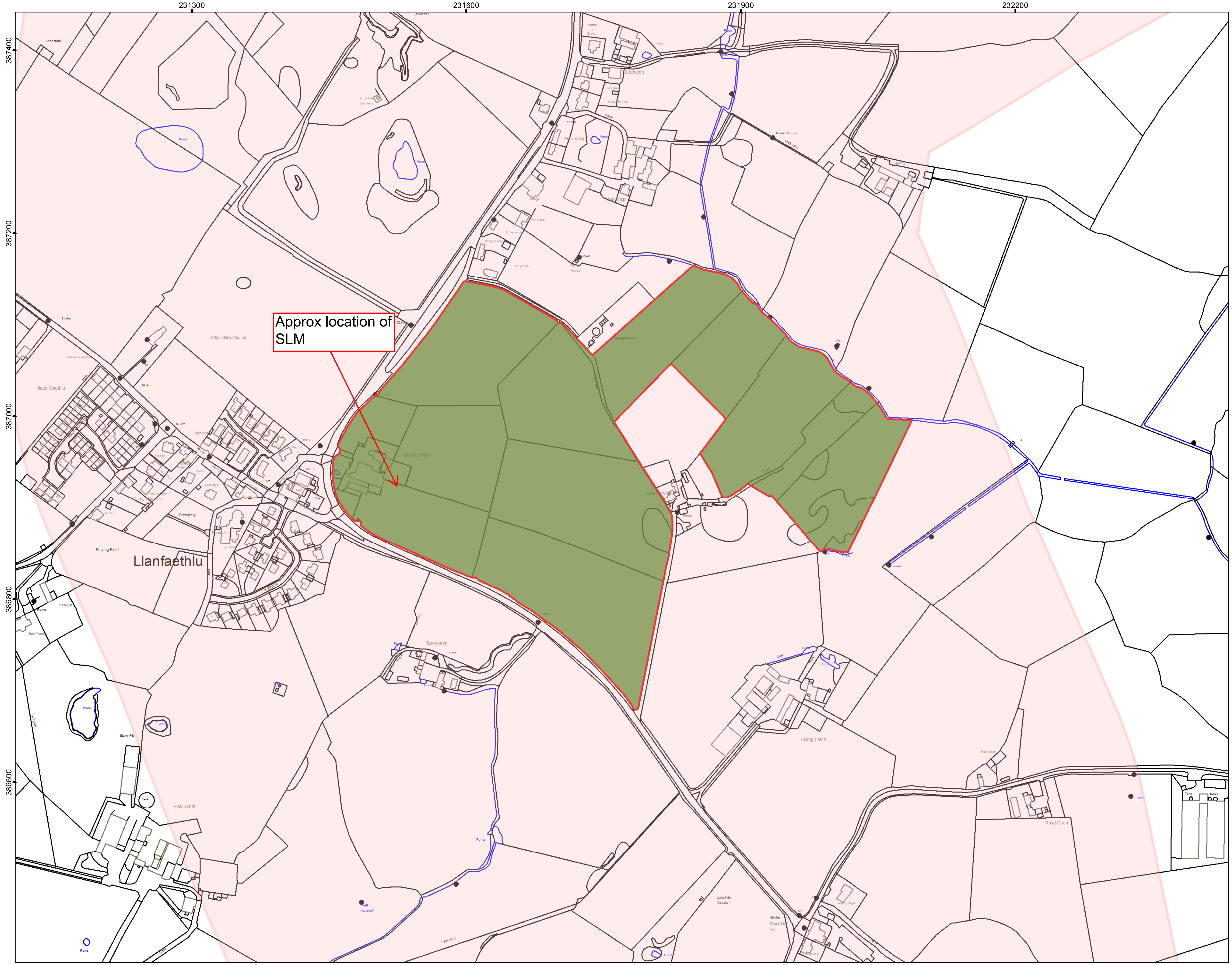
SCALE: 1:1,250 @ A3

DATE: 12/12/2014

FISHER GERMAN

Fisher German LLP, The Grange
80 Tamworth Road, Ashby de la Zouch,
Leicestershire, LE65 2BW
Telephone 01530 412821
Fax: 01530 413896

DRAWING NO:
HOR-WYLF-2014-12-PIL-JH-10041



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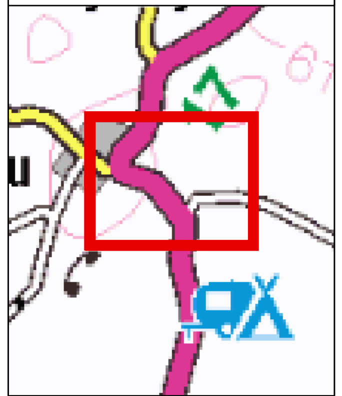
0 15 30 60 90 120 Meters

OVERVIEW WINDOW



LEGEND:

Land of Interest

REVISION: A

CLIENT: HORIZON NUCLEAR POWER

SCHEME:

A5025 Road Sheme

TITLE:

PIL Plan 20330

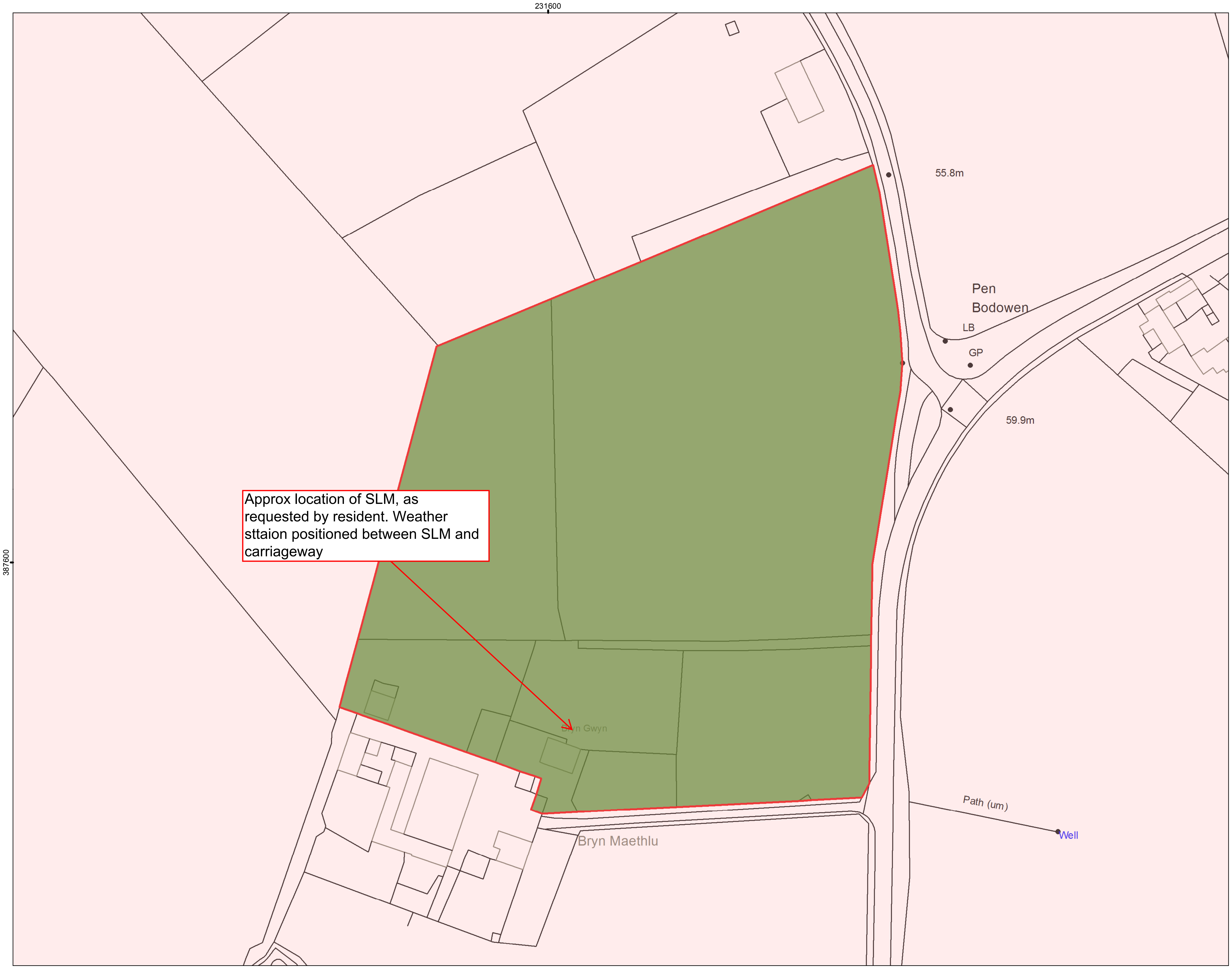
SCALE: 1:3,750 @ A3

DATE: 12/12/2014

FISHER GERMAN

Fisher German LLP, The Grange
80 Tamworth Road, Ashby de la Zouch, Leicestershire, LE65 2BW
Telephone 01530 412821
Fax: 01530 413896

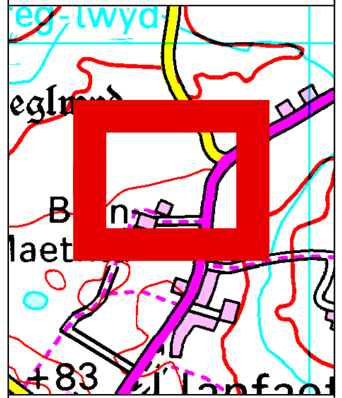
DRAWING NO: HOR-WYLF-2014-12-PIL-JH-20330



N

0 5 10 20 30 40 Meters

OVERVIEW WINDOW



LEGEND:

Land of Interest

REVISION: A

CLIENT: HORIZON NUCLEAR POWER

SCHEME:

A5025 Road Sheme

TITLE:

PIL Plan 30030

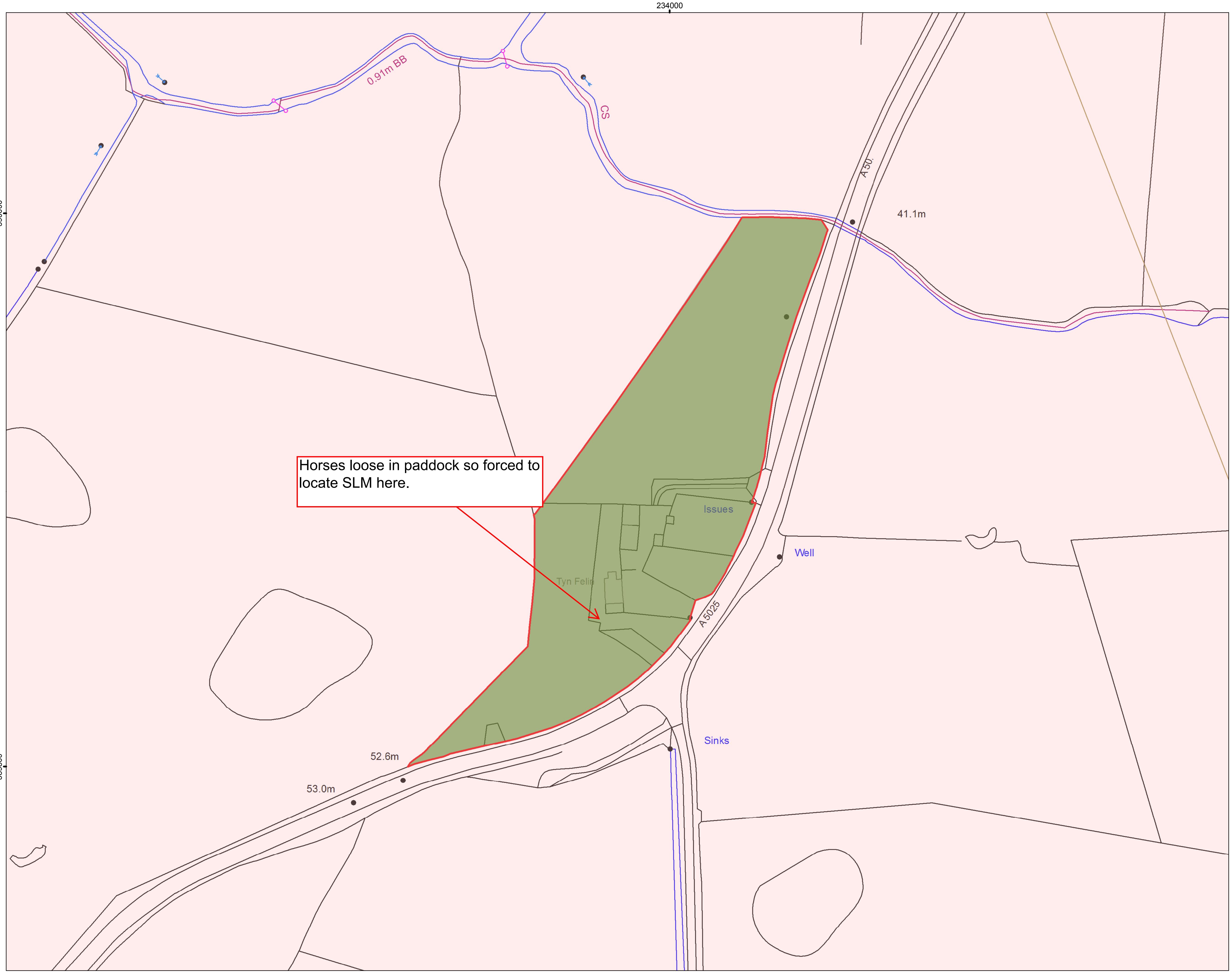
SCALE: 1:1,250 @ A3

DATE: 12/12/2014

FISHER GERMAN

Fisher German LLP, The Grange
80 Tamworth Road, Ashby de la Zouch,
Leicestershire, LE65 2BW
Telephone 01530 412821
Fax: 01530 413896

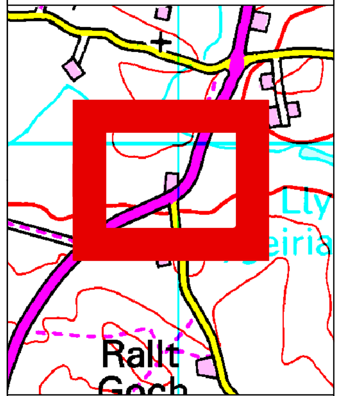
DRAWING NO:
HOR-WYLF-2014-12-PIL-JH-30030



N

0 5 10 20 30 40 Meters

OVERVIEW WINDOW



LEGEND:

Land of Interest

REVISION: B

CLIENT: HORIZON NUCLEAR POWER

SCHEME:

A5025 Road Sheme

TITLE:

PIL Plan 50800

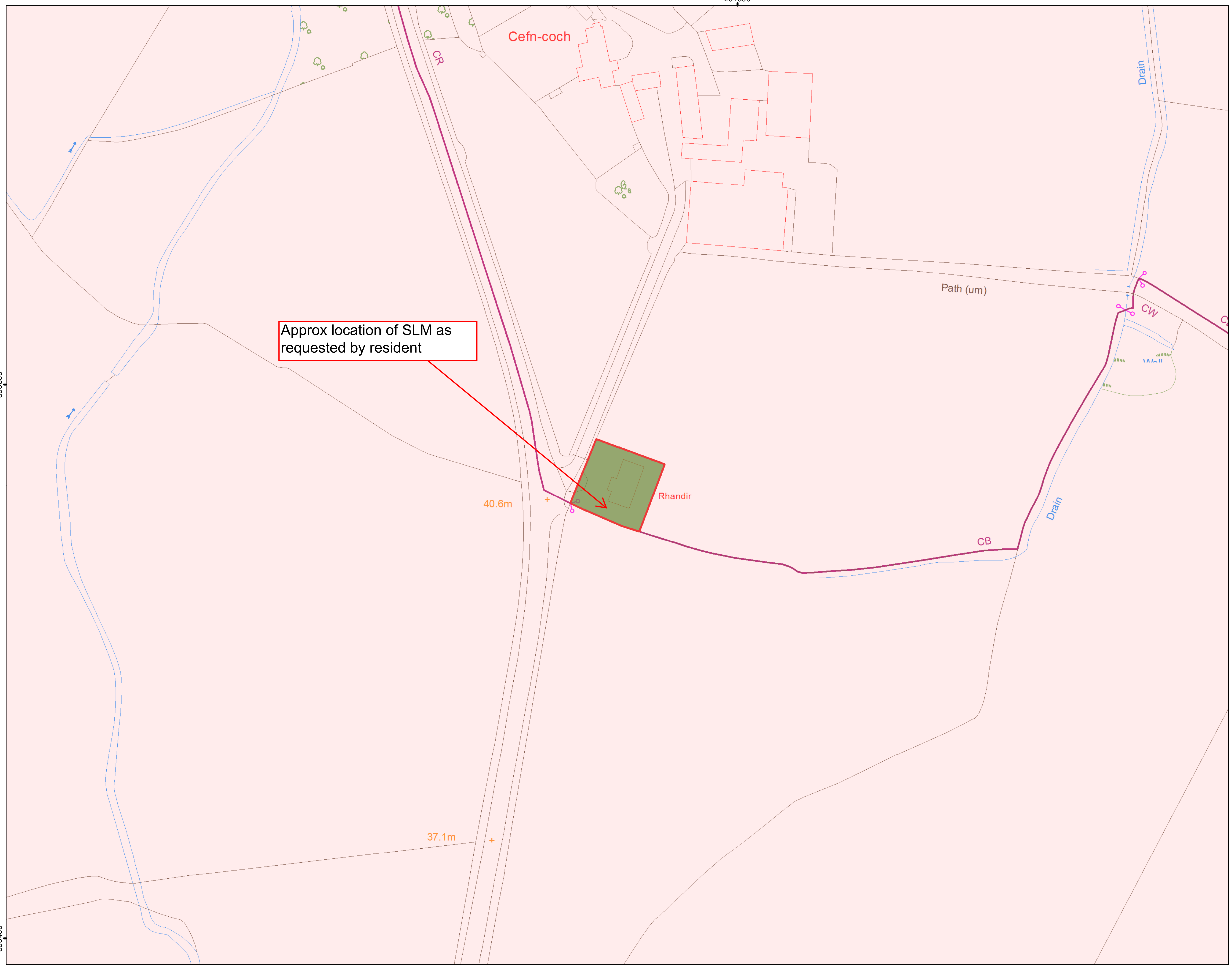
SCALE: 1:1,250 @ A3

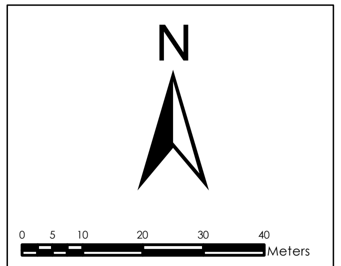
DATE: 17/03/2015

FISHER GERMAN

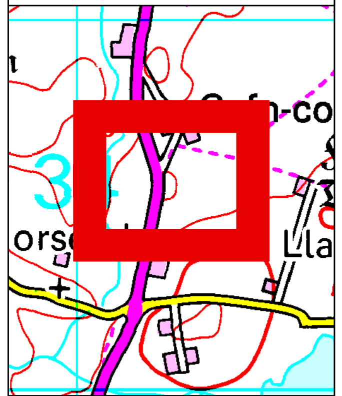
Fisher German LLP, The Grange
80 Tamworth Road, Ashby de la Zouch,
Leicestershire, LE65 2BW
Telephone 01530 412821
Fax: 01530 413896

DRAWING NO:
HOR-WYLF-2014-12-PIL-JH-50800





OVERVIEW WINDOW



LEGEND:

Land of Interest

REVISION: A

CLIENT: HORIZON NUCLEAR POWER

SCHEME:

A5025 Road Sheme

TITLE:

PIL Plan 20261

SCALE: 1:1,250 @ A3

DATE: 12/12/2014

FISHER GERMAN

Fisher German LLP, The Grange
80 Tamworth Road, Ashby de la Zouch, Leicestershire, LE65 2BW
Telephone 01530 412821
Fax: 01530 413896

DRAWING NO: HOR-WYLF-2014-12-PIL-JH-20261

Approx location of SLM

Appendix B – Photographs of installed equipment

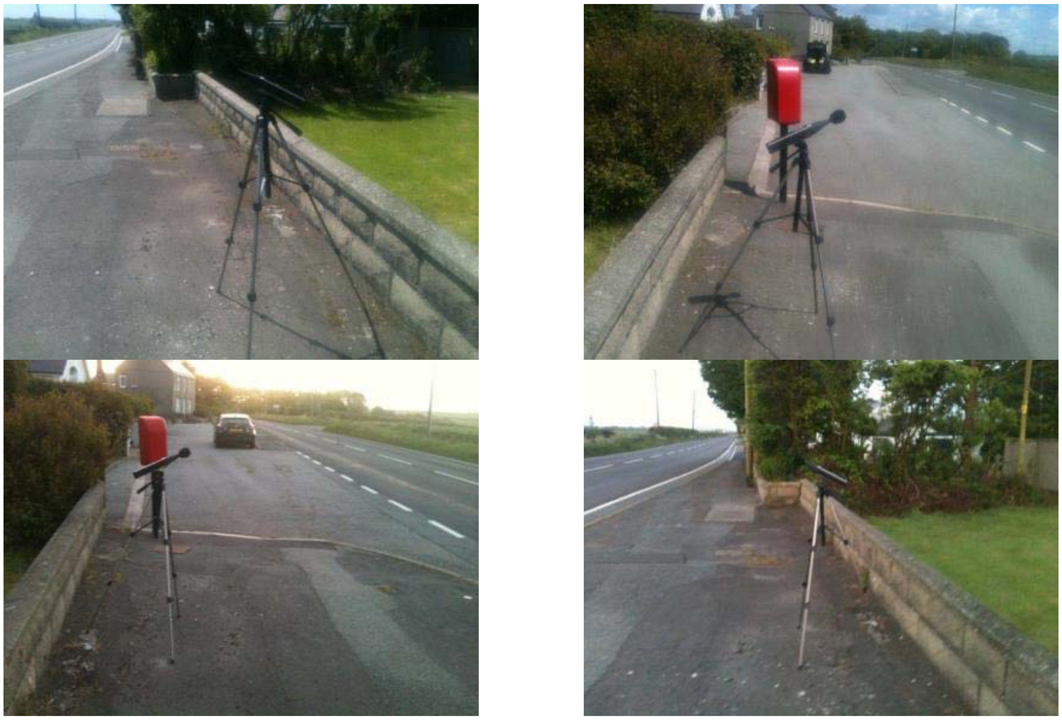
R1a - Valley - Glyn Villa



R1b - Valley - Cemetery




R2a - Llanynghenedl - layby adjacent to converted chapel



R3a - Llanfachraeth - Erw Goch

R3b - Llanfachraeth - Dolydd




R3c - Llanfachraeth - field adjacent to Bryn Farm




R3d - Llanfachraeth - field adjacent to primary school (SE)

R4a - Llanfaethlu - Rhos Ty Mawr

R4a - Llanfaethlu - Rhos Ty Mawr (second survey)




R4b - Llanfaethlu - Bryn Gwyn




R4c - Llanfaethlu - layby north of Rhos Ty Mawr

R5a – Llanrhyddlad - layby north of turning for Cylch y Garn

R6a - Cefn Coch - Tyn Felin

R6b - Cefn Coch - Rhandir

R7a – Tregele - Taldwrst




Appendix C – Calibration certificates

Blistol.

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Date of issue 12 November 2014 Certificate N° 1411524

AV Calibration
2 Warren Court
Chicksands, Shefford
Bedfordshire SG17 5QB
U.K.
Tel: +44 (0)1462 638600
Fax: +44 (0)1462 638601
Email: lab@avcalib.co.uk
www.avcalibration.co.uk

Page 1 of 3 Pages	
Signed	[redacted]
G. Parry [✓]	B. Baker [ ]

Acoustics Noise and Vibration Ltd trading as AV Calibration

CLIENT Jacobs UK Ltd
Newminster House
27 -29 Baldwin Street
Bristol
BS1 1LT

F.A.O. Humphrey Roberts-Powell

ORDER No See notes Job No TRAC14/10281/02

DATE OF RECEIPT 28 October 2014

PROCEDURE AV Calibration Engineer's Handbook, section 25

IDENTIFICATION Sound level meter Brüel & Kjær type 2250 serial No 2579749 connected via a preamplifier type ZC 0032 serial No 9587 to a half-inch microphone type 4189 serial No 2578591.

CALIBRATED ON 12 November 2014

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

The sound level meter was set up using a type 4231 sound calibrator supplied by the laboratory; it was set to frequency weighting A, and initially read 93.8 dB. It was then adjusted to read 94.0 dB (corresponding to 94.0 dB at standard atmospheric pressure). This reading was derived from the certified output level of the calibrator and manufacturers' information on the free-field response of the sound level meter. The calibration check frequency was 1kHz. The final microphone sensitivity calculated and stored by the instrument was 45.19 mV/Pa.

Procedures based on IEC 61672-3:2006 (BS EN 61672-3:2006) were used to perform the periodic tests.

RESULTS

The sound level meter submitted for testing has successfully completed the class 1 periodic tests carried out, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2 : 2003 (BS EN 61672-2 : 2003), to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1 : 2002 (BS EN 61672-1 : 2003), the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1 : 2002 (BS EN 61672-1 2003).

The self-generated noise recorded with the microphone replaced by the electrical input device was:

12.9 dB (A) 13.4 dB (C) 18.4 dB (Z) 27.2 dB (Z, Extended low frequency range)

The environmental conditions recorded at the start and end of testing were:

Start: 23 to 24 °C, 40 to 50 %RH and 98.9 to 99.0 kPa
End: 22 to 23 °C, 41 to 51 %RH and 99.0 to 99.1 kPa

Technical information including adjustment data specified in the manufacturers' Instruction Manual BE 1712-19 (2012) and User Manual BE 1713-24 (2009) has been used to carry out this verification. These data include manufacturer-specified uncertainties.

Publicly-available evidence has been found that the B&K 2250 sound level meter design has successfully undergone pattern evaluation in accordance with IEC 61672-2:2002 (BS EN 61672-2:2003) by Physikalisch-Technische Bundesanstalt (PTB), an independent testing organisation responsible for pattern approvals.

All measurement data are held at AV Calibration for a period of at least six years.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with the *Guide to the Expression of Uncertainty in Measurement* published by the International Organisation for Standards (ISO).

d

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Certificate N° 1411524

NOTES

1 All tests were carried out in "Broad Band".

2 Windscreen autodetect was set to "Off", windscreen correction to "None", soundfield to "Free-field" and microphone to "4189".

3 The extended low-frequency facility was set to "off" for all tests except for the additional self-generated noise reading and "Frequency and time weightings at 1kHz" test.

4 The microphone frequency response was measured by this laboratory using the electrostatic actuator method.

5 The electrical tests have been carried out with the instrument set for the nominal microphone sensitivity, as specified in the Instruction Manual. This may mean that the instrument has a slightly different linearity range when in normal use.

6 The measurement uncertainty for the output level of the sound calibrator used to set up the instrument has been increased slightly to take into account the unusually low atmospheric pressure at the time the verification was carried out.

7 The meter was supplied with a sound calibrator, CEL type 284/2 serial no. 4/02225060. However, this is not an approved calibrator for the 2250. For information only, the response of the meter to the 284/2 after being adjusted to read correctly with the laboratory's B&K calibrator was 114.0 dB(A).

8 Typical case reflection factors specified by the manufacturer have been used for this verification.

9 The instrument was running on hardware version 2.0

10 The instrument firmware settings were:

Module i.d.	Function	Version	Active?	Licenced?	Template used?
BZ 7222	SLM	2.4	Y	Y	N
BZ 7223	Frequency analysis	2.4	Y	Y	Y
BZ 7224	Logging	2.4	N	Y	N
BZ 7225	Enhanced logging	2.4	N	N	N
BZ 7226	Sound recording	2.4	N	Y	N
BZ 7227	Reverberation time	2.4	N	N	N
BZ 7228	Building acoustics	2.4	N	N	N
BZ 7229	Dual-Channel Building acoustics	N/A	N/A	N/A	N/A
BZ 7230	FFT analysis	2.4	N	N	N
BZ 7231	Tone assessment	2.4	N	N/A	N
BZ 7232	Noise monitoring	N/A	N/A	N/A	N/A
BZ 7233	Sound intensity	N/A	N/A	N/A	N/A
BZ 7234	Low frequency option	N/A	N/A	N/A	N/A
BZ 7235	TM Basic engine	N/A	N/A	N/A	N/A
BZ 7236	TM Z41 Gear	N/A	N/A	N/A	N/A

11 The customer order number was Jacobs Engineering/B2004700/00000023.

d

Certificate of Calibration

Issued by University of Salford (Acoustics Calibration Laboratory)
UKAS ACCREDITED CALIBRATION LABORATORY NO. 0801

UKAS CALIBRATION
0801

University of Salford MANCHESTER

APPROVED SIGNATORIES
Claire Lomax [ ] Andy Moorhouse [✓] [redacted]
Gary Phillips [ ] Danny McCaul [ ]

acoustic calibration laboratory
The University of Salford, Salford, Greater Manchester, M5 4WT, UK
http://www.acoustics.salford.ac.uk
t 0161 295 [illegible]/0161 295 3319 f 0161 295 4456 e c.lomax1@salford.ac.uk

Certificate Number: 01927/2 Date of Issue: 18 July 2014

PERIODIC TEST OF A SOUND LEVEL METER to IEC 61672-3:2006

FOR:	Jacobs UK Ltd 6th Floor Newminster House 27-29 Baldwin Street Bristol BS1 1LT
FOR THE ATTENTION OF:	Sam Williams
PERIODIC TEST DATE:	17th and 18th July 2014
TEST PROCEDURE:	CTP12 (Laboratory Manual)

Sound Level Meter Details

Manufacturer	01dB	
Model	DUO	
Serial number	10512 (883)	
Class	1	
Hardware version	3F2D3D	Application FW: 2.02

Associated Items	Microphone	Preamplifier
Manu	GRAS	01 dB
Model	40CD	PRE22
Serial Number	136891	10255

Test Engineer (initial): [redacted] Name: Gary Phillips

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

Certificate Number: 01927/2 Date of Issue: 18 July 2014

Procedures from IEC 61672-3: 2006 and TPS 49 Edition 2 June 2009 were used to perform the periodic tests.

Manufacturer's instruction manual was marked as follows: 01dB DUO DOC 1112 gb_P230-L-NUT-278-C - 1.04_1.22 Aug 26 2011.doc_DUO-latest update:August 2011.

Adjustment data used to adjust the sound levels indicated in response to the application of an electrostatic actuator to sound levels equivalent to those that would be indicated in response to plane, progressive sound waves were obtained from the manufacturer's instruction manual referred to in this certificate and information provided by the manufacturer's agent.

The sound level meter calibration check frequency is 1000 Hz, the reference level is 94 dB. As this instrument only has a single range, this range is the reference level range.

The environmental conditions in the laboratory at the start of the test were:
Static pressure 101.657 kPa, air temperature 21.2 °C, relative humidity 48.2 %.

The initial response of the instrument to application of a suitable laboratory sound calibrator was 93.7 dB (C). No adjustment of the instrument was required. This indication was obtained from the calibration certificate of the calibrator, 01503/1 and information in the manufacturer's instruction manual specified in this certificate, when the instrument is configured as follows; with the pre-amplifier connected via the supplied RAL135-10M microphone extension cable to the sound level meter's External input, Mic Input: External, Mic Type: 40CD, 10 Hz, 90 deg, Nose Cone.

With the microphone replaced by an electrical input device with a similar capacitance to that of the electrical input device specified in the manufacturer's instruction manual, the levels of self-generated noise were:

A:	**10.9 dB***
B:	**10.3 dB***
C:	**11.8 dB***
Z:	**17.1 dB***

* Under-range indicated on instrument display.

The environmental conditions in the laboratory at the end of the test were:
Static pressure 100.948 kPa, air temperature 23.6 °C, relative humidity 52.9 %.

Certificate Number: 01927/2 Date of Issue: 18 July 2014

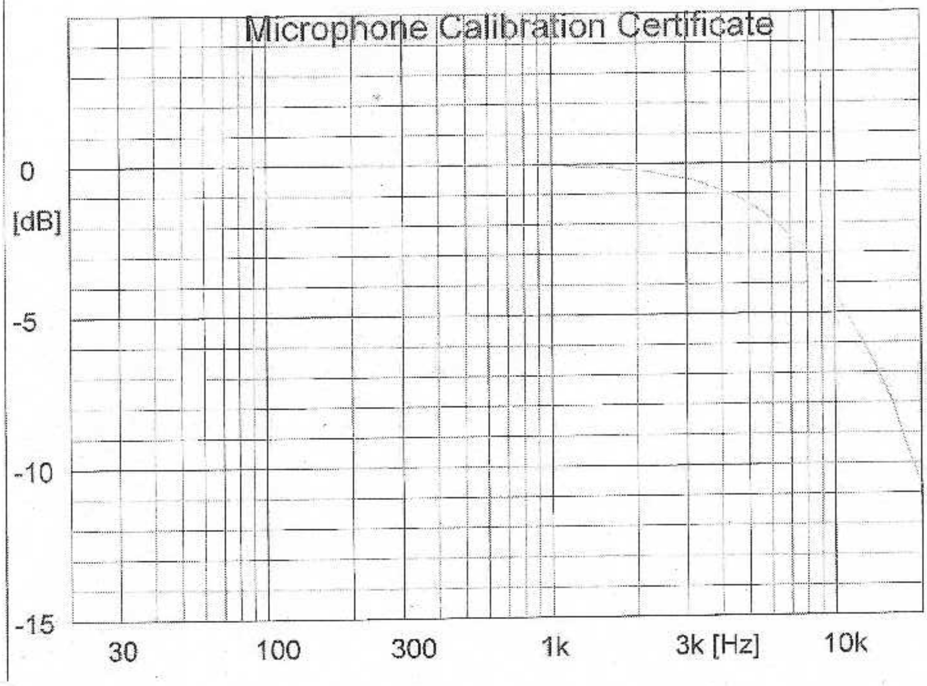
The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

No information on the uncertainty of measurement, required by 11.7 of IEC 61672-3:2006, of the adjustment data given in the instruction manual or obtained from the manufacturer or supplier of the sound level meter, was published in the instruction manual or made available by the manufacturer or supplier. The uncertainty of measurement of the adjustment data has therefore been assumed to be numerically zero for the purpose of this periodic test. If these uncertainties are not actually zero, there is a possibility that the frequency response of the sound level meter may not meet the requirements of IEC 61672-1:2002.

The microphone corrections applied as specified in 12.6 of IEC 61672-3:2006 were obtained from a frequency response measured by this Laboratory using the electrostatic actuator method. This response in isolation is not covered by our UKAS accreditation.

Instruments used in the verification procedure were traceable to *National Standards*. The electrostatic actuator method was employed in the acoustical tests of a frequency weighting.

The uncertainty evaluation has been carried out in accordance with UKAS requirements. All measurement results are retained at the acoustic calibration laboratory for at least four years.



16 July 2014

University of Salford MANCHESTER

GRAS 40CD
Serial No: 136891

Capacitance: 14.9 pF
Polarization Voltage: 0V

Actuator response

acoustic calibration laboratory
The University of Salford, The Crescent,
Salford, Greater Manchester, M5 4WT
http://www.cse.salford.ac.uk/calibration/
t: 0161 295 3030/0161 295 3319
f: 0161 295 4442 e c.lomax1@salford.ac.uk

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Date of issue 22/5/1/5 Certificate N° 1505281

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Chicksands, Shefford
Bedfordshire SG17 5QB
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Tel: +44 (0)1462 638600
Fax: +44 (0)1462 638601
Email: lab@avcalib.co.uk
www.avcalibration.co.uk
Acoustics Noise and Vibration Ltd trading as AV Calibration

Signed [redacted]

G. Parry [ ] B. Baker [✓]

CLIENT	Jacobs Ltd Enviros House Shrewsbury Business Park Sitka Drive Shrewsbury SY2 6LG
F.A.O.	Barry Salway
ORDER No	-
Job No	TRAC15/05127/02
DATE OF RECEIPT	12 May 2015
PROCEDURE	AV Calibration Engineer's Handbook section 3
IDENTIFICATION	(0871) Sound level meter Rion type NL-32 serial No 00751323 connected via extension lead type EC-04 and preamplifier type NH-21 serial No 23663 to a half-inch microphone type UC-53A serial No 308645 fitted with a foam windshield type WS-03. Associated calibrator Rion type NC-74 serial No 34257024 with a one-inch housing and adapter type NC-74-002 for half-inch microphone.
CALIBRATED ON	22/5/1/5
PREVIOUS CALIBRATION	Calibrated on 17 March 2014, Certificate No. TCRT14/1094 issued by a non accredited calibration laboratory ANV Measurement Systems

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

The sound level meter was set to frequency weighting A and adjusted to read 93.6 dB (corresponding to 93.6 dB at standard atmospheric pressure) in response to the sound calibrator supplied. This reading was derived from the Calibration Certificate No. 1505280 supplied by this laboratory and manufacturers' information on the free-field response of the sound level meter when fitted with the windshield.

The sound level meter was then tested, and its overall sensitivity adjusted as required.

An acoustic calibration at 1kHz was performed by application of a standard sound calibrator, whilst the tests at 125Hz and 8kHz were performed by the electrostatic actuator method.

At the end of the test, the sound calibrator was reapplied to the sound level meter and the meter reading was recorded.

RESULTS

The sound level meter was found to conform to the type 1 requirements of BS EN 60651:1994* and BS EN 60804:1994* for those tests carried out.

The self-generated noise recorded was:

10.9 dB (A) 16.3 dB (C) 23.2 dB (Lin)

The sound level meter reading obtained at the end of the test in response to the sound calibrator was 93.6 dB (corresponding to 93.6 dB at standard atmospheric pressure). This reading, corrected for ambient pressure, should be used henceforth to set up the sound level meter for field use.

The expanded level uncertainty of the Laboratory's 1 kHz sound calibrator used during this verification is ± 0.22 dB; that of the calibrator supplied with the sound level meter is ± 0.23 dB.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with the *Guide to the Expression of Uncertainty in Measurement* published by the International Organisation for Standards (ISO).

All measurement data are held at AV Calibration for a period of at least six years.

The case reflection factors have been taken as zero, since an extension lead has been used for this verification.

The reference range, linearity range and primary indicator range specified by the manufacturer have been used. *See note 5 Below.*

The Rion NL-32 sound level meter design has successfully undergone pattern evaluation at Physikalisch-Technische Bundesanstalt (PTB). It was found to meet the requirements of BS EN 60651* and BS EN 60804* and was granted pattern approval as a Type 1 sound level meter.

No component of uncertainty for manufacturer-specified corrections has been included in the uncertainty budget and, in accordance with amendments to the standards, the measured values obtained during the verification have not been extended by any measurement uncertainty when assessing conformance to each standard.

NOTES

*1 BS EN 60651:1994 and BS EN 60804:1994 were formerly numbered BS 5969:1981 and BS 6698:1986 respectively.

2 No suitable microphone frequency response information was supplied with the instrument. It was therefore measured by this laboratory using the electrostatic actuator method.

3 The instrument was tested with integral software as received.

4 The NL-32 does not have a "max hold" function available when operating with time weighting I. The results recorded for the test of time weighting I are therefore the highest instantaneous reading shown on the display. Whilst these results meet the requirements of the standard, those for response to a single tone burst in particular may give a misleading impression of the accuracy of time weighting I on this instrument.

5 After consultation with the manufacturer and their European agents, it has been established that the specifications given in the standard English-language handbook for the NL-32 are both incomplete and incorrect. An addendum to the handbook based on the PTB tests has been provided by Rion, and this revised specification has been used for the purposes of the present verification. For information, extracts from the addendum have been appended as page 4 of this certificate.

6 The instrument was labelled "Aspinwall 00871" and "SKM GB-A03516"

The following data supplied by Rion are included for completeness:

Addendum to the NL-32 Instruction Manual

Errata (page 133):

- Total range: 23 to 137 dB(A).
- Linearity range (on 30 - 120 dB reference range): 99 dB (28 to 127).

Additional information

- Primary indicator range (on 30 - 120 dB reference range): 32 - 111 dB, allowing a crest factor of 10 for Impulse time weighting.
- Pulse range: > 63 dB
- Measurement range for various LEVEL settings: See table below.

Measurement ranges				
Measurement range for various "LEVEL" range settings (dB) * Frequency weighting A-, C- and Lin.				
"LEVEL" Setting (dB)	Time weighting			Leq
	Fast/Slow	Impulse	Peak	
20 - 80	23 - 80 **	23 - 70 **	50 - 90	23 - 87 **
20 - 90	23 - 90 **	23 - 80 **	50 - 100	23 - 97 **
20 - 100	23 - 100 **	23 - 90 **	50 - 110	23 - 107 **
20 - 110	23 - 110 **	23 - 100 **	50 - 120	23 - 117 **
30 - 120	28 - 120 **	28 - 110 **	50 - 130	28 - 127 **
40 - 130	38 - 130	38 - 120	50 - 140	38 - 137

* For time weighting Fast and Slow a crest factor 3, and for time weighting Impulse a crest factor 10, is taken into account.
** The lower limit of the measurement range is 30 dB(C) for C-weighting and 35 dB(Lin) for Lin weighting.

END

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Date of issue 26 May 2015 Certificate N° 1505287

AV Calibration
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Bedfordshire SG17 5QB
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Tel: +44 (0)1462 638600
Fax: +44 (0)1462 638601
Email: lab@avcalib.co.uk
www.avcalibration.co.uk
Acoustics Noise and Vibration Ltd trading as AV Calibration

Signed [redacted]

G. Parry [ ] B. Baker [✓]

CLIENT	Jacobs Ltd Enviros House Shrewsbury Business Park Sitka Drive Shrewsbury SY2 6LG
F.A.O.	Barry Salway
ORDER No	- Job No TRAC15/05144/01
DATE OF RECEIPT	26 May 2015
PROCEDURE	AV Calibration Engineer's Handbook section 3
IDENTIFICATION	(0872) Sound level meter Rion type NL-31 serial No 00583275 connected via extension lead type EC-04 and preamplifier type NH-21 serial No 27505 to a half-inch microphone type UC-53A serial No 314015 fitted with a foam windshield type WS-03. Associated calibrator Rion type NC-74 serial No 34257024 with a one-inch housing and adapter type NC-74-002 for half-inch microphone.
CALIBRATED ON	26 May 2015
PREVIOUS CALIBRATION	Calibrated on 03 June 2014, Certificate No. TCRT14/1183 issued by a non accredited calibration laboratory ANV Measurement Systems

The measurements detailed herein are traceable to units of measurement realised at the National Physical Laboratory.

The sound level meter was set to frequency weighting A and adjusted to read 93.6 dB (corresponding to 93.6 dB at standard atmospheric pressure) in response to the sound calibrator supplied. This reading was derived from the Calibration Certificate No. 1505280 supplied by this laboratory and manufacturers' information on the free-field response of the sound level meter when fitted with the windshield.

The sound level meter was then tested, and its overall sensitivity adjusted as required.

An acoustic calibration at 1kHz was performed by application of a standard sound calibrator, whilst the tests at 125Hz and 8kHz were performed by the electrostatic actuator method.

At the end of the test, the sound calibrator was reapplied to the sound level meter and the meter reading was recorded.

RESULTS

The sound level meter was found to conform to the type 1 requirements of BS EN 60651:1994* and BS EN 60804:1994* for those tests carried out.

The self-generated noise recorded was:

10.5 dB (A) 16.5 dB (C) 23.3 dB (Lin)

The sound level meter reading obtained at the end of the test in response to the sound calibrator was 93.6 dB (corresponding to 93.6 dB at standard atmospheric pressure). This reading, corrected for ambient pressure, should be used henceforth to set up the sound level meter for field use.

The expanded level uncertainty of the Laboratory's 1 kHz sound calibrator used during this verification is ± 0.22 dB; that of the calibrator supplied with the sound level meter is ± 0.23 dB.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with the *Guide to the Expression of Uncertainty in Measurement* published by the International Organisation for Standards (ISO).

All measurement data are held at AV Calibration for a period of at least six years.

The case reflection factors have been taken as zero, since an extension lead has been used for this verification.

The reference range, linearity range and primary indicator range specified by the manufacturer have been used. *See note 5 Below.*

The Rion NL-31 sound level meter design has successfully undergone pattern evaluation at Physikalisch-Technische Bundesanstalt (PTB). It was found to meet the requirements of BS EN 60651* and BS EN 60804* and was granted pattern approval as a Type 1 sound level meter.

No component of uncertainty for manufacturer-specified corrections has been included in the uncertainty budget and, in accordance with amendments to the standards, the measured values obtained during the verification have not been extended by any measurement uncertainty when assessing conformance to each standard.

BB

NOTES

*1 BS EN 60651:1994 and BS EN 60804:1994 were formerly numbered BS 5969:1981 and BS 6698:1986 respectively.

2 No suitable microphone frequency response information was supplied with the instrument. It was therefore measured by this laboratory using the electrostatic actuator method.

3 The instrument was tested with integral software as received.

4 The NL-31 does not have a "max hold" function available when operating with time weighting I. The results recorded for the test of time weighting I are therefore the highest instantaneous reading shown on the display. Whilst these results meet the requirements of the standard, those for response to a single tone burst in particular may give a misleading impression of the accuracy of time weighting I on this instrument.

5 After consultation with the manufacturer and their European agents, it has been established that the specifications given in the standard English-language handbook for the NL-31 are both incomplete and incorrect. An addendum to the handbook based on the PTB tests has been provided by Rion, and this revised specification has been used for the purposes of the present verification. For information, extracts from the addendum have been appended as page 4 of this certificate.

6 The instrument was labelled "Aspinwall 00872" and "SKM GB-A03518"

BB

The following data supplied by Rion are included for completeness:

Addendum to the NL-31 Instruction Manual

Errata (page 133):

- Total range: 23 to 137 dB(A).
- Linearity range (on 30 - 120 dB reference range): 99 dB (28 to 127).

Additional information

- Primary indicator range (on 30 - 120 dB reference range): 32 - 111 dB, allowing a crest factor of 10 for Impulse time weighting.
- Pulse range: > 63 dB
- Measurement range for various LEVEL settings: See table below.

Measurement ranges				
Measurement range for various "LEVEL" range settings (dB) * Frequency weighting A-, C- and Lin.				
"LEVEL" Setting (dB)	Time weighting			Leq
	Fast/Slow	Impulse	Peak	
20 - 80	23 - 80 **	23 - 70 **	50 - 90	23 - 87 **
20 - 90	23 - 90 **	23 - 80 **	50 - 100	23 - 97 **
20 - 100	23 - 100 **	23 - 90 **	50 - 110	23 - 107 **
20 - 110	23 - 110 **	23 - 100 **	50 - 120	23 - 117 **
30 - 120	28 - 120 **	28 - 110 **	50 - 130	28 - 127 **
40 - 130	38 - 130	38 - 120	50 - 140	38 - 137

* For time weighting Fast and Slow a crest factor 3, and for time weighting Impulse a crest factor 10, is taken into account.
** The lower limit of the measurement range is 30 dB(C) for C-weighting and 35 dB(Lin) for Lin weighting.

END

BS

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Date of issue 22/5/1/5 Certificate N° 1505286

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Email: lab@avcalib.co.uk
www.avcalibration.co.uk
Acoustics Noise and Vibration Ltd trading as AV Calibration

Signed [redacted]

G. Parry [ ] B. Baker [✓]

CLIENT	Jacobs Ltd Enviros House Shrewsbury Business Park Sitka Drive Shrewsbury SY2 6LG
F.A.O.	Barry Salway
ORDER No	- Job No TRAC15/05127/03
DATE OF RECEIPT	12 May 2015
PROCEDURE	AV Calibration Engineer's Handbook section 3
IDENTIFICATION	(0873) Sound level meter Rion type NL-32 serial No 00482601 connected via extension lead type EC-04 and preamplifier type NH-21 serial No 27705 to a half-inch microphone type UC-53A serial No 321276 fitted with a foam windshield type WS-03. Associated calibrator Rion type NC-74 serial No 34257024 with a one-inch housing and adapter type NC-74-002 for half-inch microphone.
CALIBRATED ON	22/5/1/5
PREVIOUS CALIBRATION	Calibrated on 17 March 2014, Certificate No. TCRT14/1093 issued by a non accredited calibration laboratory ANV Measurement Systems

The sound level meter was set to frequency weighting A and adjusted to read 93.6 dB (corresponding to 93.6 dB at standard atmospheric pressure) in response to the sound calibrator supplied. This reading was derived from the Calibration Certificate No. 1505280 supplied by this laboratory and manufacturers' information on the free-field response of the sound level meter when fitted with the windshield.

The sound level meter was then tested, and its overall sensitivity adjusted as required.

An acoustic calibration at 1kHz was performed by application of a standard sound calibrator, whilst the tests at 125Hz and 8kHz were performed by the electrostatic actuator method.

At the end of the test, the sound calibrator was reapplied to the sound level meter and the meter reading was recorded.

RESULTS

The sound level meter was found to conform to the type 1 requirements of BS EN 60651:1994* and BS EN 60804:1994* for those tests carried out.

The self-generated noise recorded was:

9.3 dB (A) 15.5 dB (C) 22.2 dB (Lin)

The sound level meter reading obtained at the end of the test in response to the sound calibrator was 93.6 dB (corresponding to 93.6 dB at standard atmospheric pressure). This reading, corrected for ambient pressure, should be used henceforth to set up the sound level meter for field use.

The expanded level uncertainty of the Laboratory's 1 kHz sound calibrator used during this verification is ± 0.22 dB; that of the calibrator supplied with the sound level meter is ± 0.23 dB.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with the *Guide to the Expression of Uncertainty in Measurement* published by the International Organisation for Standards (ISO).

All measurement data are held at AV Calibration for a period of at least six years.

The case reflection factors have been taken as zero, since an extension lead has been used for this verification.

The reference range, linearity range and primary indicator range specified by the manufacturer have been used. *See note 5 Below.*

The Rion NL-32 sound level meter design has successfully undergone pattern evaluation at Physikalisch-Technische Bundesanstalt (PTB). It was found to meet the requirements of BS EN 60651* and BS EN 60804* and was granted pattern approval as a Type 1 sound level meter.

No component of uncertainty for manufacturer-specified corrections has been included in the uncertainty budget and, in accordance with amendments to the standards, the measured values obtained during the verification have not been extended by any measurement uncertainty when assessing conformance to each standard.

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

NOTES

*1 BS EN 60651:1994 and BS EN 60804:1994 were formerly numbered BS 5969:1981 and BS 6698:1986 respectively.

2 No suitable microphone frequency response information was supplied with the instrument. It was therefore measured by this laboratory using the electrostatic actuator method.

3 The instrument was tested with integral software as received.

4 The NL-32 does not have a "max hold" function available when operating with time weighting I. The results recorded for the test of time weighting I are therefore the highest instantaneous reading shown on the display. Whilst these results meet the requirements of the standard, those for response to a single tone burst in particular may give a misleading impression of the accuracy of time weighting I on this instrument.

5 After consultation with the manufacturer and their European agents, it has been established that the specifications given in the standard English-language handbook for the NL-32 are both incomplete and incorrect. An addendum to the handbook based on the PTB tests has been provided by Rion, and this revised specification has been used for the purposes of the present verification. For information, extracts from the addendum have been appended as page 4 of this certificate.

6 The instrument was labelled "Aspinwall 00873" and "SKM GB-A03515"

7 The combination of microphone response and WS-03 windshield corrections was causing a FAIL result at 8kHz - instrument fitted with new replacement UC-53A microphone for this verification.

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

The following data supplied by Rion are included for completeness:

Addendum to the NL-32 Instruction Manual

Errata (page 133):

- Total range: 23 to 137 dB(A).
- Linearity range (on 30 - 120 dB reference range): 99 dB (28 to 127).

Additional information

- Primary indicator range (on 30 - 120 dB reference range): 32 - 111 dB, allowing a crest factor of 10 for Impulse time weighting.
- Pulse range: > 63 dB
- Measurement range for various LEVEL settings: See table below.

Measurement ranges

Measurement range for various "LEVEL" range settings (dB) *
Frequency weighting A-, C- and Lin.

"LEVEL" Setting (dB)	Time weighting			Leq
	Fast/Slow	Impulse	Peak	
20 - 80	23 - 80 **	23 - 70 **	50 - 90	23 - 87 **
20 - 90	23 - 90 **	23 - 80 **	50 - 100	23 - 97 **
20 - 100	23 - 100 **	23 - 90 **	50 - 110	23 - 107 **
20 - 110	23 - 110 **	23 - 100 **	50 - 120	23 - 117 **
30 - 120	28 - 120 **	28 - 110 **	50 - 130	28 - 127 **
40 - 130	38 - 130	38 - 120	50 - 140	38 - 137

* For time weighting Fast and Slow a crest factor 3, and for time weighting Impulse a crest factor 10, is taken into account.
** The lower limit of the measurement range is 30 dB(C) for C-weighting and 35 dB(Lin) for Lin weighting.

END

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Date of issue 26 May 2015 Certificate N° 1505289

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www.avcalibration.co.uk
Acoustics Noise and Vibration Ltd trading as AV Calibration

Signed [redacted]

G. Parry [ ] B. Baker [✓]

CLIENT	Jacobs Ltd Enviros House Shrewsbury Business Park Sitka Drive Shrewsbury SY2 6LG
F.A.O.	Barry Salway
ORDER No	- Job No TRAC15/05144/02
DATE OF RECEIPT	26 May 2015
PROCEDURE	AV Calibration Engineer's Handbook section 3
IDENTIFICATION	(0874) Sound level meter Rion type NL-32 serial No 00482614 connected via extension lead type EC-04 and preamplifier type NH-21 serial No 27718 to a half-inch microphone type UC-53A serial No 314307 fitted with a foam windshield type WS-03. Associated calibrator Rion type NC-74 serial No 34257024 with a one-inch housing and adapter type NC-74-002 for half-inch microphone.
CALIBRATED ON	26 May 2015
PREVIOUS CALIBRATION	Calibrated on 04 June 2014, Certificate No. TCRT14/1184 issued by a non accredited calibration laboratory ANV Measurement Systems

The measurements detailed herein are traceable to units of measurement realised at the National Physical Laboratory.

The sound level meter was set to frequency weighting A and adjusted to read 93.6 dB (corresponding to 93.6 dB at standard atmospheric pressure) in response to the sound calibrator supplied. This reading was derived from the Calibration Certificate No. 1505280 supplied by this laboratory and manufacturers' information on the free-field response of the sound level meter when fitted with the windshield.

The sound level meter was then tested, and its overall sensitivity adjusted as required.

An acoustic calibration at 1kHz was performed by application of a standard sound calibrator, whilst the tests at 125Hz and 8kHz were performed by the electrostatic actuator method.

At the end of the test, the sound calibrator was reapplied to the sound level meter and the meter reading was recorded.

RESULTS

The sound level meter was found to conform to the type 1 requirements of BS EN 60651:1994* and BS EN 60804:1994* for those tests carried out.

The self-generated noise recorded was:

9.3 dB (A) 15.3 dB (C) 22.4 dB (Lin)

The sound level meter reading obtained at the end of the test in response to the sound calibrator was 93.6 dB (corresponding to 93.6 dB at standard atmospheric pressure). This reading, corrected for ambient pressure, should be used henceforth to set up the sound level meter for field use.

The expanded level uncertainty of the Laboratory's 1 kHz sound calibrator used during this verification is ± 0.22 dB; that of the calibrator supplied with the sound level meter is ± 0.23 dB.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with the *Guide to the Expression of Uncertainty in Measurement* published by the International Organisation for Standards (ISO).

All measurement data are held at AV Calibration for a period of at least six years.

The case reflection factors have been taken as zero, since an extension lead has been used for this verification.

The reference range, linearity range and primary indicator range specified by the manufacturer have been used. *See note 5 Below.*

The Rion NL-32 sound level meter design has successfully undergone pattern evaluation at Physikalisch-Technische Bundesanstalt (PTB). It was found to meet the requirements of BS EN 60651* and BS EN 60804* and was granted pattern approval as a Type 1 sound level meter.

No component of uncertainty for manufacturer-specified corrections has been included in the uncertainty budget and, in accordance with amendments to the standards, the measured values obtained during the verification have not been extended by any measurement uncertainty when assessing conformance to each standard.

NOTES

*1 BS EN 60651:1994 and BS EN 60804:1994 were formerly numbered BS 5969:1981 and BS 6698:1986 respectively.

2 No suitable microphone frequency response information was supplied with the instrument. It was therefore measured by this laboratory using the electrostatic actuator method.

3 The instrument was tested with integral software as received.

4 The NL-32 does not have a "max hold" function available when operating with time weighting I. The results recorded for the test of time weighting I are therefore the highest instantaneous reading shown on the display. Whilst these results meet the requirements of the standard, those for response to a single tone burst in particular may give a misleading impression of the accuracy of time weighting I on this instrument.

5 After consultation with the manufacturer and their European agents, it has been established that the specifications given in the standard English-language handbook for the NL-32 are both incomplete and incorrect. An addendum to the handbook based on the PTB tests has been provided by Rion, and this revised specification has been used for the purposes of the present verification. For information, extracts from the addendum have been appended as page 4 of this certificate.

6 The instrument was labelled "Aspinwall 00874" and "SKM GB-A03472"

The following data supplied by Rion are included for completeness:

Addendum to the NL-32 Instruction Manual

Errata (page 133):

- Total range: 23 to 137 dB(A).
- Linearity range (on 30 - 120 dB reference range): 99 dB (28 to 127).

Additional information

- Primary indicator range (on 30 - 120 dB reference range): 32 - 111 dB, allowing a crest factor of 10 for Impulse time weighting.
- Pulse range: > 63 dB
- Measurement range for various LEVEL settings: See table below.

Measurement ranges				
Measurement range for various "LEVEL" range settings (dB) * Frequency weighting A-, C- and Lin.				
"LEVEL" Setting (dB)	Time weighting			Leq
	Fast/Slow	Impulse	Peak	
20 - 80	23 - 80 **	23 - 70 **	50 - 90	23 - 87 **
20 - 90	23 - 90 **	23 - 80 **	50 - 100	23 - 97 **
20 - 100	23 - 100 **	23 - 90 **	50 - 110	23 - 107 **
20 - 110	23 - 110 **	23 - 100 **	50 - 120	23 - 117 **
30 - 120	28 - 120 **	28 - 110 **	50 - 130	28 - 127 **
40 - 130	38 - 130	38 - 120	50 - 140	38 - 137

* For time weighting Fast and Slow a crest factor 3, and for time weighting Impulse a crest factor 10, is taken into account.
** The lower limit of the measurement range is 30 dB(C) for C-weighting and 35 dB(Lin) for Lin weighting.

END

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Date of issue 22/5/1/5 Certificate N° 1505285

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Signed [redacted]

G. Parry [ ] B. Baker [✓]

Acoustics Noise and Vibration Ltd trading as AV Calibration

CLIENT Jacobs Ltd
Enviros House
Shrewsbury Business Park
Sitka Drive
Shrewsbury
SY2 6LG

F.A.O. Barry Salway

ORDER No - Job No TRAC15/05127/04

DATE OF RECEIPT 12 May 2015

PROCEDURE AV Calibration Engineer's Handbook section 3

(875)

IDENTIFICATION Sound level meter Rion type NL-32 serial No 00482602 connected via extension lead type EC-04 and preamplifier type NH-21 serial No 27706 to a half-inch microphone type UC-53A serial No 321107 fitted with a foam windshield type WS-03. Associated calibrator Rion type NC-74 serial No 34257024 with a one-inch housing and adapter type NC-74-002 for half-inch microphone.

CALIBRATED ON 22/5/1/5

PREVIOUS CALIBRATION Calibrated on 14 March 2014, Certificate No. TCRT14/1092 issued by a non accredited calibration laboratory ANV Measurement Systems

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Certificate N° 1505285

The sound level meter was set to frequency weighting A and adjusted to read 93.6 dB (corresponding to 93.6 dB at standard atmospheric pressure) in response to the sound calibrator supplied. This reading was derived from the Calibration Certificate No. 1505280 supplied by this laboratory and manufacturers' information on the free-field response of the sound level meter when fitted with the windshield.

The sound level meter was then tested, and its overall sensitivity adjusted as required.

An acoustic calibration at 1kHz was performed by application of a standard sound calibrator, whilst the tests at 125Hz and 8kHz were performed by the electrostatic actuator method.

At the end of the test, the sound calibrator was reapplied to the sound level meter and the meter reading was recorded.

RESULTS

The sound level meter was found to conform to the type 1 requirements of BS EN 60651:1994* and BS EN 60804:1994* for those tests carried out.

The self-generated noise recorded was:

8.7 dB (A) 14.3 dB (C) 21.9 dB (Lin)

The sound level meter reading obtained at the end of the test in response to the sound calibrator was 93.6 dB (corresponding to 93.6 dB at standard atmospheric pressure). This reading, corrected for ambient pressure, should be used henceforth to set up the sound level meter for field use.

The expanded level uncertainty of the Laboratory's 1 kHz sound calibrator used during this verification is ± 0.22 dB; that of the calibrator supplied with the sound level meter is ± 0.23 dB.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with the *Guide to the Expression of Uncertainty in Measurement* published by the International Organisation for Standards (ISO).

All measurement data are held at AV Calibration for a period of at least six years.

The case reflection factors have been taken as zero, since an extension lead has been used for this verification.

The reference range, linearity range and primary indicator range specified by the manufacturer have been used. *See note 5 Below.*

The Rion NL-32 sound level meter design has successfully undergone pattern evaluation at Physikalisch-Technische Bundesanstalt (PTB). It was found to meet the requirements of BS EN 60651* and BS EN 60804* and was granted pattern approval as a Type 1 sound level meter.

No component of uncertainty for manufacturer-specified corrections has been included in the uncertainty budget and, in accordance with amendments to the standards, the measured values obtained during the verification have not been extended by any measurement uncertainty when assessing conformance to each standard.

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Certificate N° 1505285

NOTES

*1 BS EN 60651:1994 and BS EN 60804:1994 were formerly numbered BS 5969:1981 and BS 6698:1986 respectively.

2 No suitable microphone frequency response information was supplied with the instrument. It was therefore measured by this laboratory using the electrostatic actuator method.

3 The instrument was tested with integral software as received.

4 The NL-32 does not have a "max hold" function available when operating with time weighting I. The results recorded for the test of time weighting I are therefore the highest instantaneous reading shown on the display. Whilst these results meet the requirements of the standard, those for response to a single tone burst in particular may give a misleading impression of the accuracy of time weighting I on this instrument.

5 After consultation with the manufacturer and their European agents, it has been established that the specifications given in the standard English-language handbook for the NL-32 are both incomplete and incorrect. An addendum to the handbook based on the PTB tests has been provided by Rion, and this revised specification has been used for the purposes of the present verification. For information, extracts from the addendum have been appended as page 4 of this certificate.

6 The instrument was labelled "Aspinwall 00875"

7 The combination of microphone response and WS-03 windshield corrections was causing a FAIL result at 8kHz - instrument fitted with new replacement UC-53A microphone for this verification.

The following data supplied by Rion are included for completeness:

Addendum to the NL-32 Instruction Manual

Errata (page 133):

- Total range: 23 to 137 dB(A).
- Linearity range (on 30 - 120 dB reference range): 99 dB (28 to 127).

Additional information

- Primary indicator range (on 30 - 120 dB reference range): 32 - 111 dB, allowing a crest factor of 10 for Impulse time weighting.
- Pulse range: > 63 dB
- Measurement range for various LEVEL settings: See table below.

Measurement ranges				
Measurement range for various "LEVEL" range settings (dB) * Frequency weighting A-, C- and Lin.				
"LEVEL" Setting (dB)	Time weighting			Leq
	Fast/Slow	Impulse	Peak	
20 - 80	23 - 80 **	23 - 70 **	50 - 90	23 - 87 **
20 - 90	23 - 90 **	23 - 80 **	50 - 100	23 - 97 **
20 - 100	23 - 100 **	23 - 90 **	50 - 110	23 - 107 **
20 - 110	23 - 110 **	23 - 100 **	50 - 120	23 - 117 **
30 - 120	28 - 120 **	28 - 110 **	50 - 130	28 - 127 **
40 - 130	38 - 130	38 - 120	50 - 140	38 - 137

* For time weighting Fast and Slow a crest factor 3, and for time weighting Impulse a crest factor 10, is taken into account.
** The lower limit of the measurement range is 30 dB(C) for C-weighting and 35 dB(Lin) for Lin weighting.

END

Bristol

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Date of issue 13 November 2014 Certificate N° 1411527

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Acoustics Noise and Vibration Ltd trading as AV Calibration

Signed [redacted]

G. Parry [✓] B. Baker [ ]

CLIENT	Jacobs UK Ltd Newminster House 27 -29 Baldwin Street Bristol BS1 1LT
F.A.O.	Humphrey Roberts-Powell
ORDER No	See notes — Job No TRAC14/10281/01
DATE OF RECEIPT	28 October 2014
PROCEDURE	AV Calibration Engineer's Handbook section 2
IDENTIFICATION	Sound Calibrator CEL type 284/2 serial number 4/02225060 with half-inch housing
CALIBRATED ON	13 November 2014

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

MEASUREMENTS

The sound pressure level generated by the Sound Calibrator in its half-inch configuration was measured three times using a B&K type 4134 microphone with the protective grid in position. The microphone sensitivity was traceable to National Standards.

RESULTS

The mean level of the calibrator output, corrected to the standard atmospheric pressure of 101.3 kPa using manufacturers' data, was

113.86 ± 0.16 dB rel 20 μPa

The fundamental frequency of the sound output was 1000 Hz ± 0.06 %, and its total distortion was (0.22 ± 0.03) %.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with the *Guide to the Expression of Uncertainty in Measurement* published by the International Organisation for Standards (ISO).

During the measurements the laboratory environmental conditions were:

Temperature: 22 to 23 °C
Atmospheric pressure: 99.7 to 99.8 kPa
Relative humidity: 43 to 53 %

NOTE

A small correction factor may need to be applied to the sound pressure level quoted in this certificate if the instrument is used to calibrate a sound level meter fitted with a free-field response microphone. Please consult the manufacturers' instruction manual for details.

ADDITIONAL NOTE

The instrument was found to be malfunctioning on receipt, the sound level produced being too variable to be measured accurately. Cleaning, minor repairs and adjustments were therefore carried out prior to the above calibration.

The customer order number was Jacobs Engineering/B2004700/00000023.

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CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Date of issue 22 May 2015 Certificate N° 1505280

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Email: lab@avcalib.co.uk
www.avcalibration.co.uk

Signed [redacted]

G. Parry [ ] B. Baker [✓]

Acoustics Noise and Vibration Ltd trading as AV Calibration

CLIENT	Jacobs Ltd Enviros House Shrewsbury Business Park Sitka Drive Shrewsbury SY2 6LG
F.A.O.	Barry Salway
ORDER No	see note Job No TRAC15/05139/01
DATE OF RECEIPT	20 May 2015
PROCEDURE	AV Calibration Engineer's Handbook section 2
	(884) New purchase. 28/5/15.
IDENTIFICATION	Sound Calibrator Rion type NC-74 serial number 34257024 with one-inch housing and adapter type NC-74-002 for half-inch microphone
CALIBRATED ON	22 May 2015
PREVIOUS CALIBRATION	None known

MEASUREMENTS

The sound pressure level generated by the Sound Calibrator in its half-inch configuration was measured three times using a B&K type 4134 microphone with the protective grid in position. The microphone sensitivity was traceable to National Standards.

RESULTS

The mean level of the calibrator output, corrected to the standard atmospheric pressure of 101.3 kPa using manufacturers' data, was

94.00 ± 0.13 dB rel 20 μPa

The fundamental frequency of the sound output was 1002 Hz ± 0.06 %, and its total distortion was (0.59 ± 0.05) %.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor *k*=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with the *Guide to the Expression of Uncertainty in Measurement* published by the International Organisation for Standards (ISO).

During the measurements the laboratory environmental conditions were:

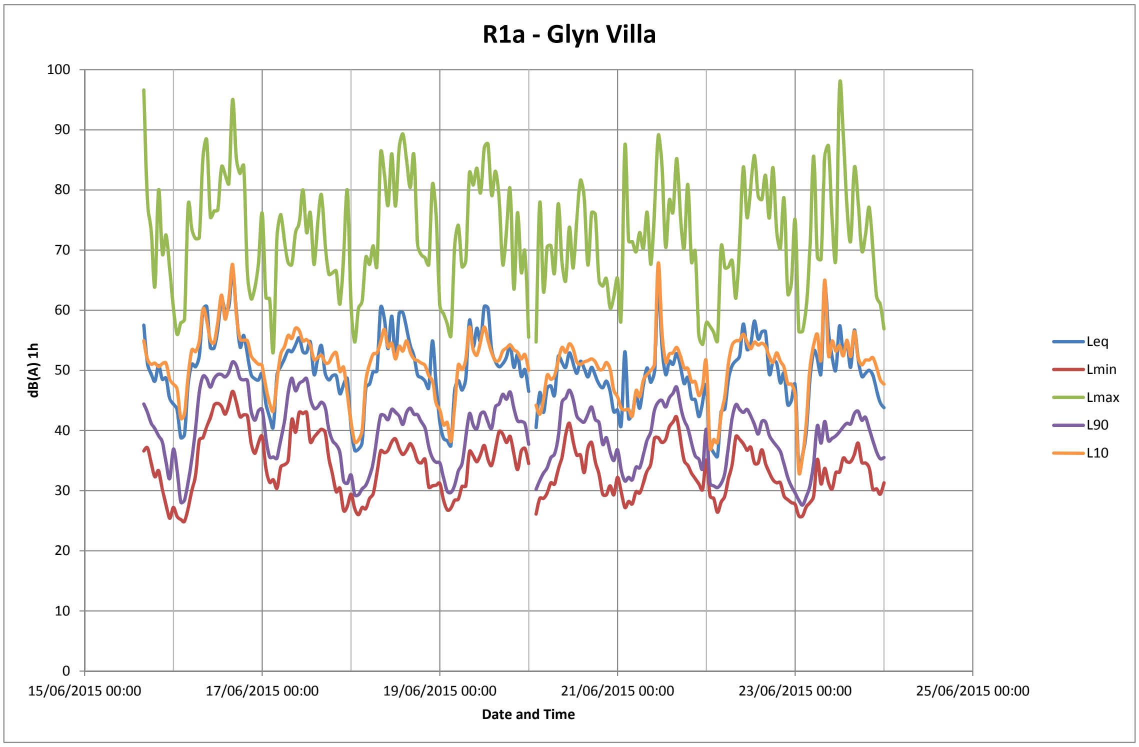
Temperature: 22 to 23 °C
Atmospheric pressure: 101.9 to 102.0 kPa
Relative humidity: 39 to 49 %

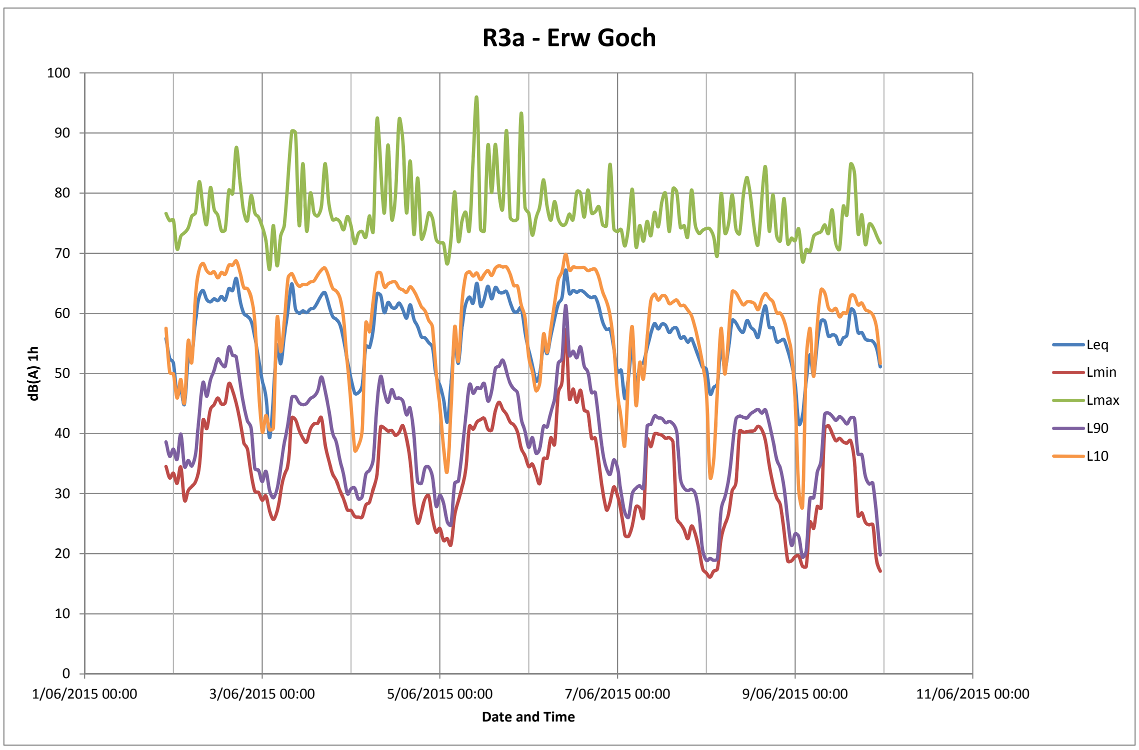
NOTE
The order number for this calibration was Jacobs Engineering/B2004700/00000060

END

BR

Appendix D – Time history graphs


R1a - Glyn Villa
dB(A) 1h
100
90
80
70
60
50
40
30
20
10
0
15/06/2015 00:00
17/06/2015 00:00
19/06/2015 00:00
21/06/2015 00:00
23/06/2015 00:00
25/06/2015 00:00
Date and Time
Leq
Lmin
Lmax
L90
L10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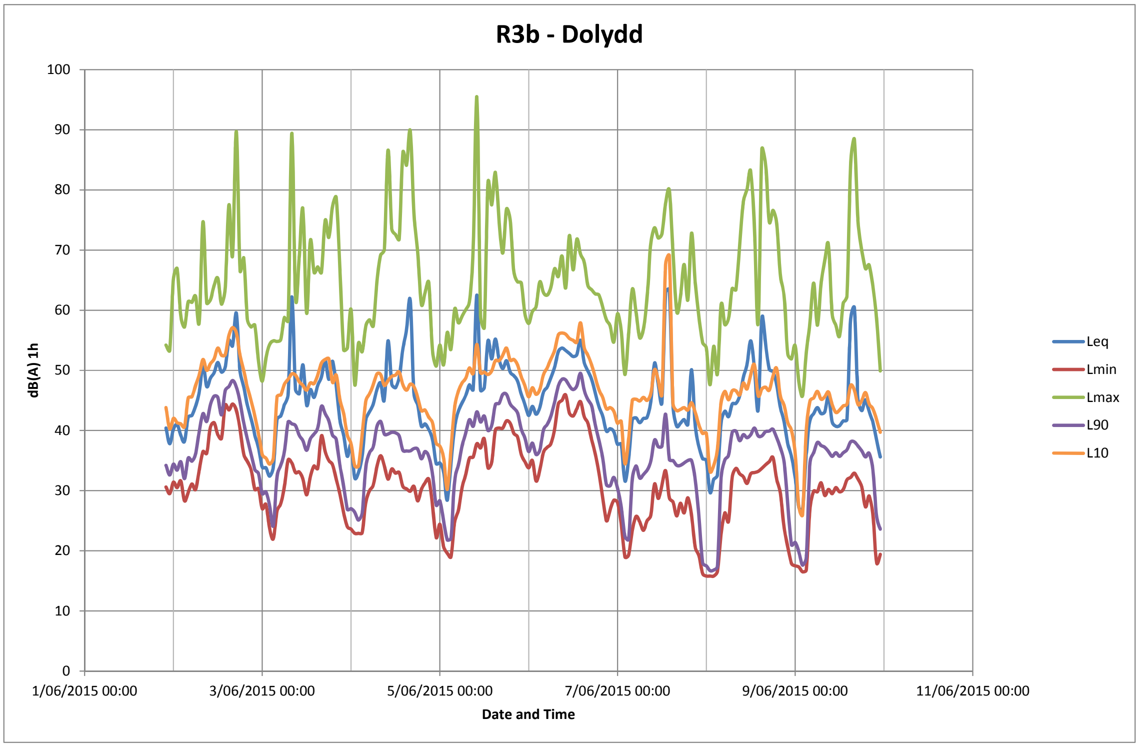
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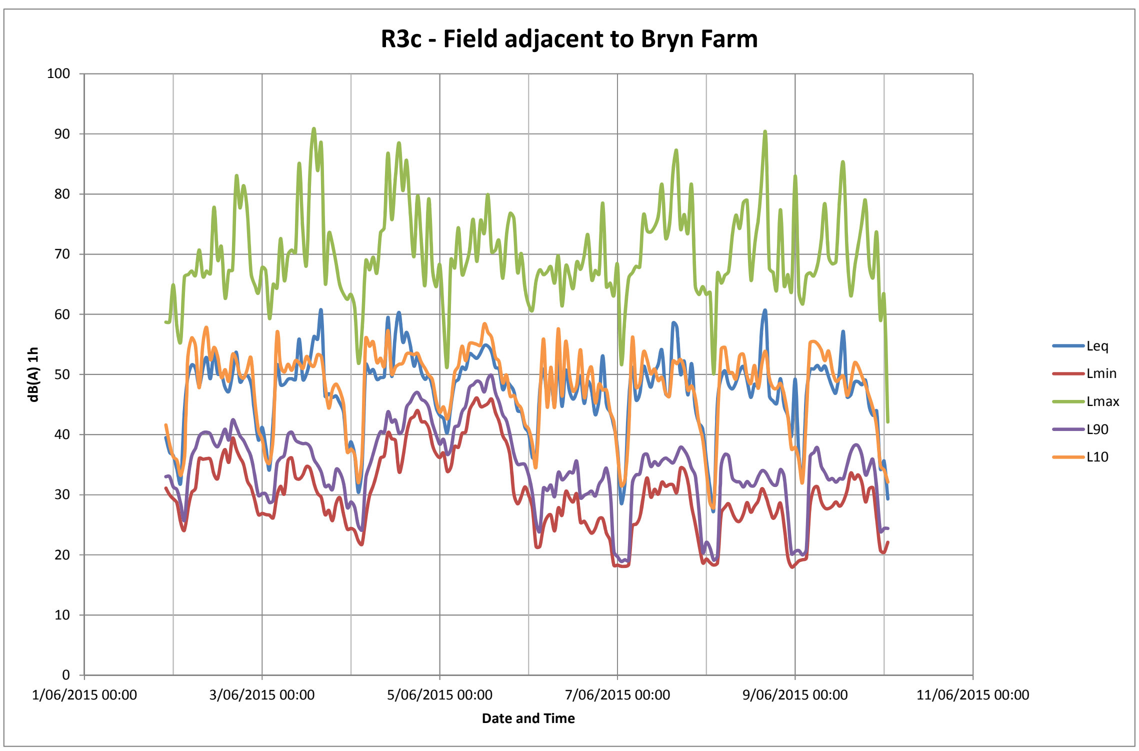
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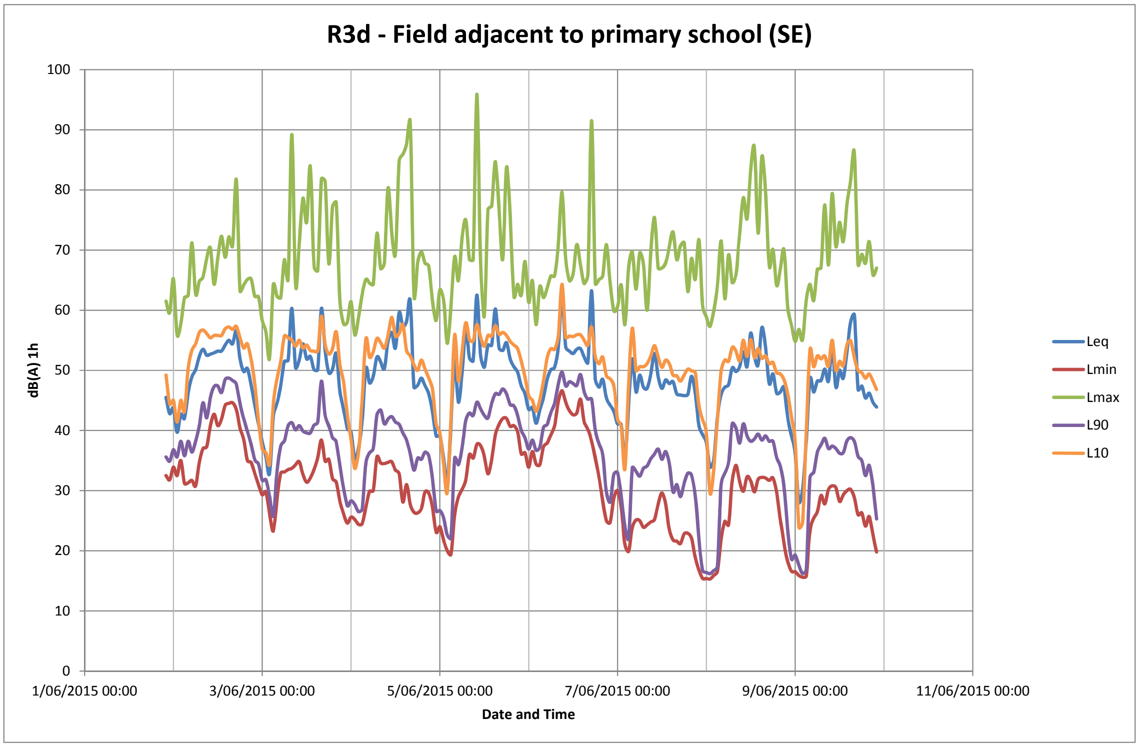

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5/06/2015 00:00
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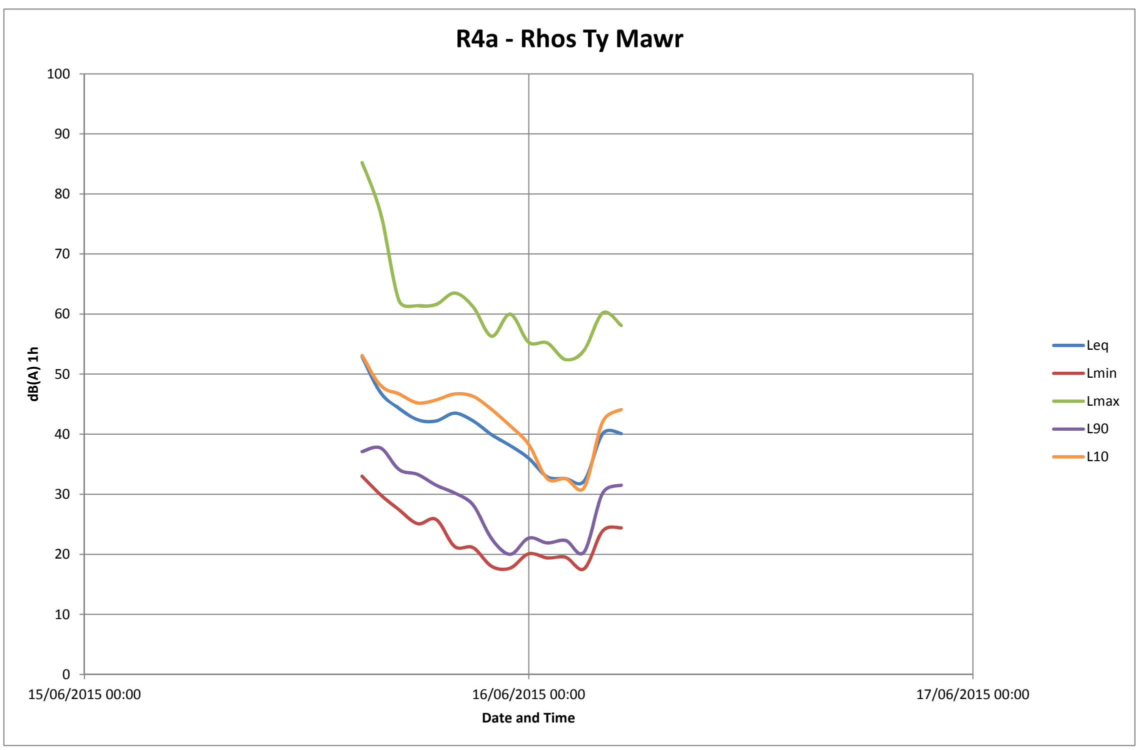

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dB(A) 1h
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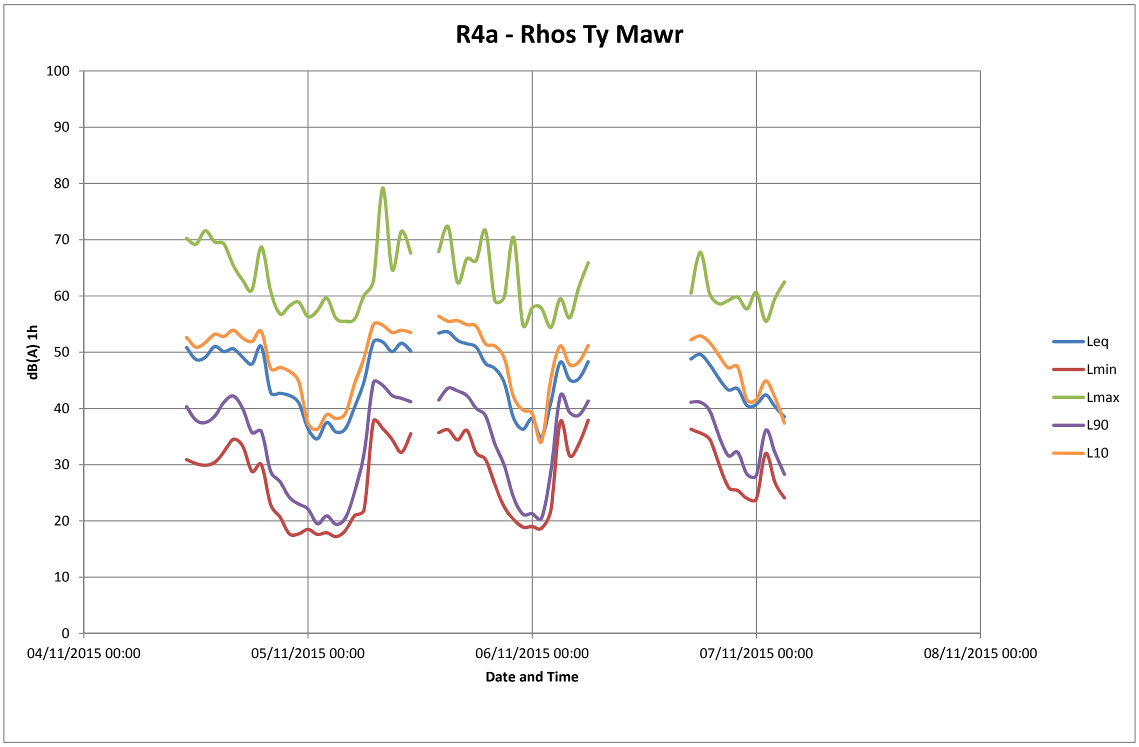
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R4a - Rhos Ty Mawr
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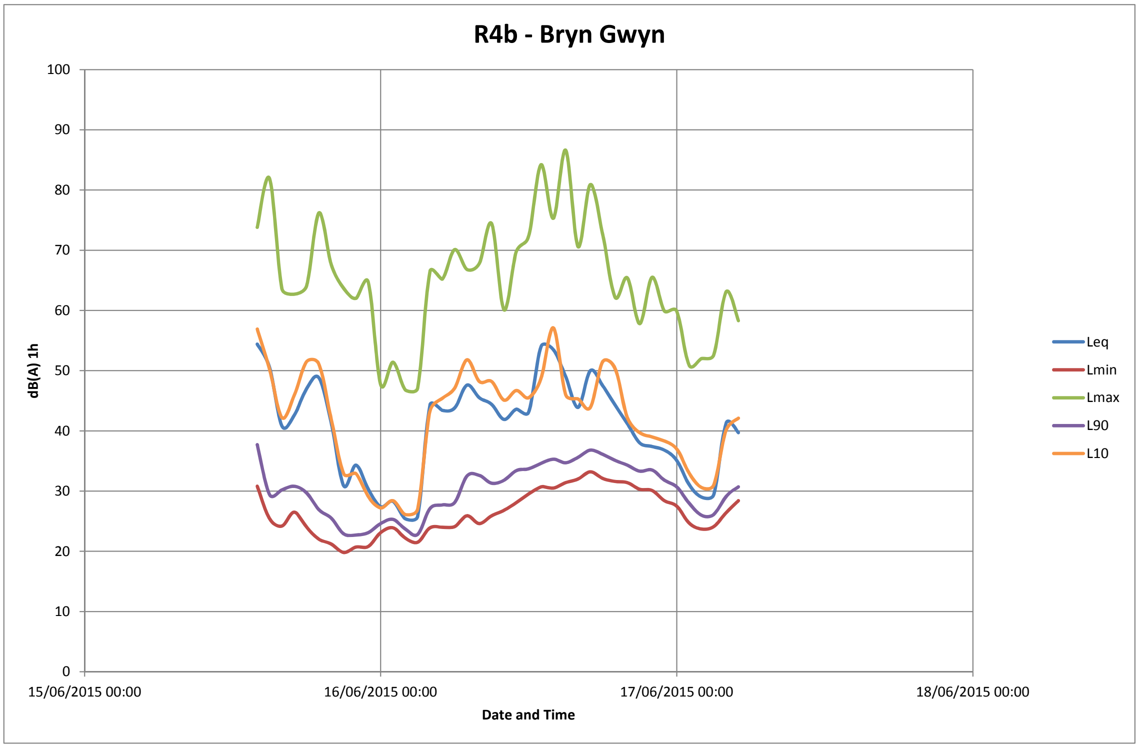
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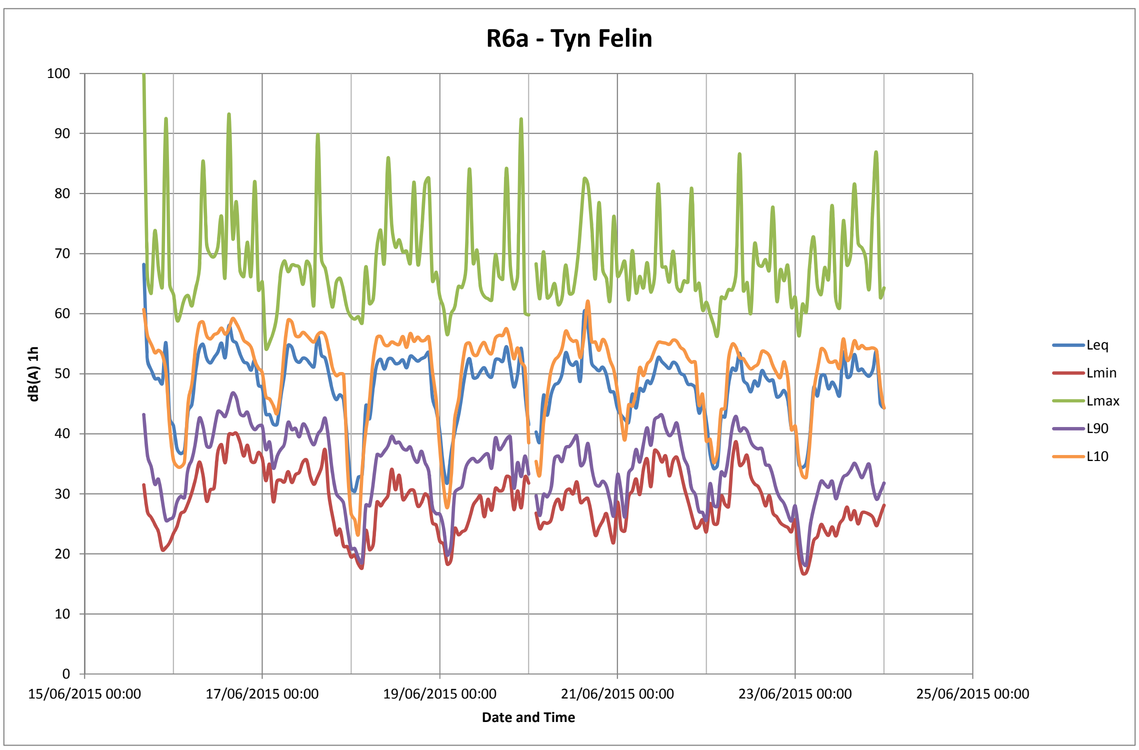
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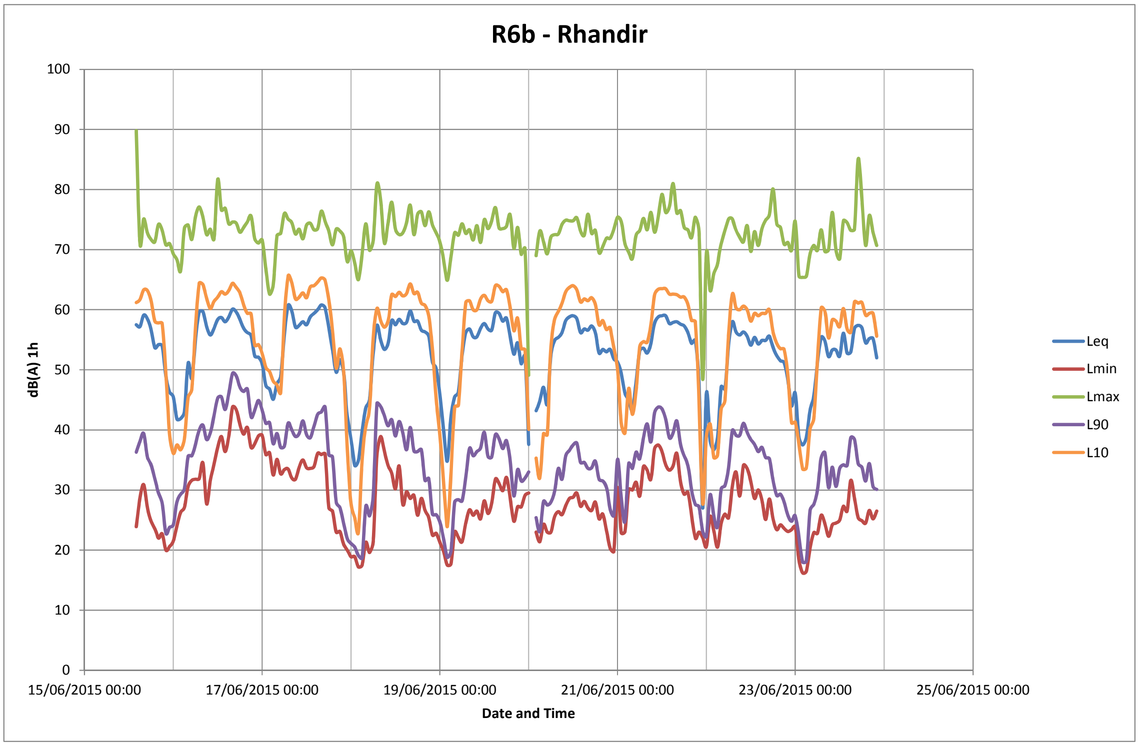
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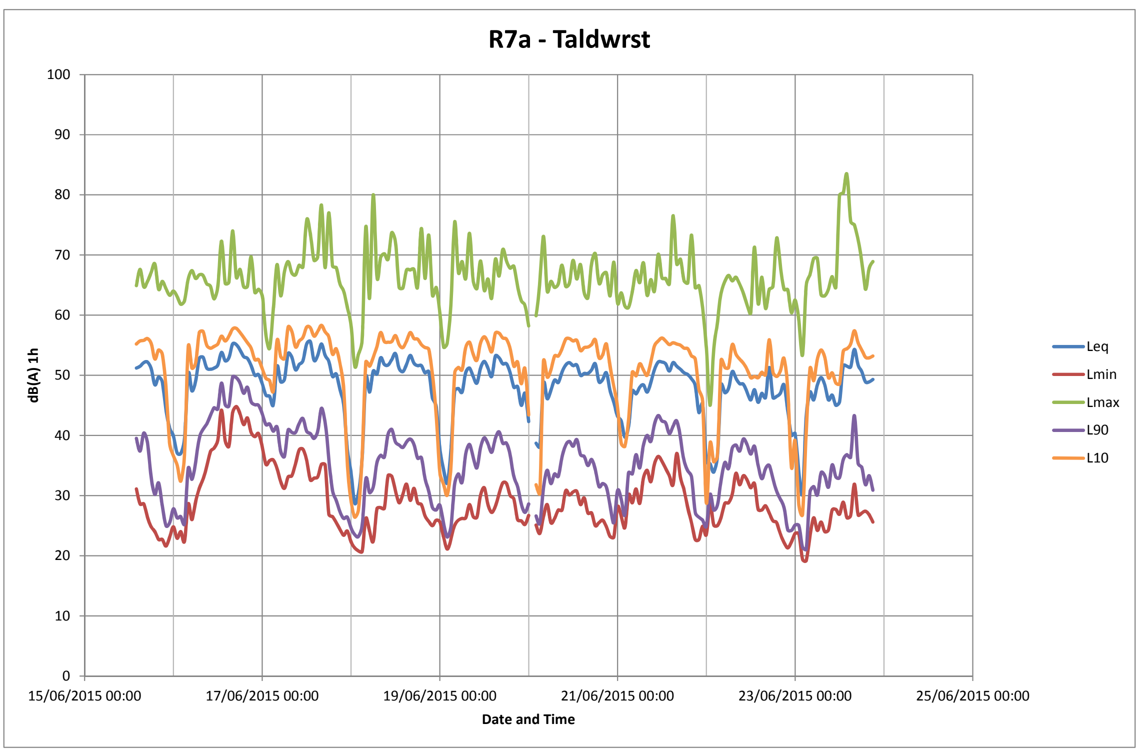
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HORIZON NUCLEAR POWER

ENERGY WORKING FOR BRITAIN

WYLFA NEWYDD PROJECT: PARK AND RIDE FACILITY AT DALAR HIR

Baseline Noise Monitoring Results

DCRM Ref Number: WN034-JAC-PAC-REP-00088   Revision: 1.0

Additional Requirements or Controls			
LISTED READERS ONLY		LEGALLY PRIVILEGED	

Comments:

Distribution		
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Date	**Rev No.**	**Summary of Changes**	**Ref Section**	**Purpose of Issue**
15/09/16	0.1	Initial draft for comment		For comment
Jan2018	1	For issue		For issue

Contents

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Executive Summary

Noise arising from new development can lead to annoyance, loss of amenity, and in some cases, adverse health effects. Potential noise effects to the local community are considered by the planning and regulatory frameworks, and noise emissions may be subject to conditions in planning consents and environmental permits.

To assess potential noise effects thoroughly, it is necessary to have an understanding of existing noise levels in the nearby community.

This report details the methodology and results of a baseline noise survey undertaken in relation to the proposed development of the Park and Ride facility at Dalar Hir, in the north of Anglesey.

The survey was undertaken between in June and July 2016 at a total of three long-term and a single short-term monitoring location. The noise levels were characterised by contributions from transport sources, birdsong, livestock, the sound of rustling leaves and military/commercial aircraft.

This report presents the following information:

- an overview of the methodology used for the baseline noise monitoring;
- details of the wind, rain and noise monitoring locations;
- the methodology used for the processing and filtering of the data;
- a summary of the consultation and engagement with the Local Authority;
- a description of the noise environment encountered at each monitoring location; and
- a summary of the results of the monitoring undertaken and comparison with relevant guidance and standards.

The noise results are presented for several time periods, and have been derived using a variety of indices and averaging techniques, in order to support the various noise assessments required to obtain the necessary permits and consents for the construction and operation of the Park and Ride facility at Dalar Hir.

The daytime ambient baseline noise levels at the three long-term locations range from 55 to 58dB $L_{Aeq,16hr}$, which are equal to or exceed (by as much as 3dB) the WHO guideline value for serious annoyance in outdoor living areas given within WHO (1999) *Guidelines for Community Noise.*

The night time ambient baseline noise levels at the three long-term locations range from 45 to 50 dB $L_{Aeq,8hr}$, and as such are at, or exceed by as much as 5dB, the relevant guideline limit value of 45 dB $L_{Aeq,8hr}$ outside bedrooms from WHO (1999) *Guidelines for Community Noise*. The noise levels are equal to, or as much as 10dB below, the 55dB $L_{night,outside}$ ‘interim target’ level detailed in the WHO’s (2009) *Night Noise Guidelines for Europe*. However, the results indicate that night noise levels exceed the WHO’s night noise guideline (40dB $L_{night,outside}$) at each of the three long-term locations, by between 5 and 10dB.

Daytime and night time noise levels were observed to be dominated by road traffic, occasional commercial/passenger aircraft movements, livestock and the sound of wind blowing through vegetation.

1 Introduction

1.1 Overview

Horizon Nuclear Power Wylfa Limited (Horizon) is a UK energy company planning to develop a new nuclear power station in north Anglesey, Wales as identified in the National Policy Statement for Nuclear Power Generation (EN-6).

The Wylfa Newydd Project will require a number of applications to be made under different legislation to different regulators. A nuclear power station is a nationally significant infrastructure project under the Planning Act 2008. Horizon must therefore obtain a Development Consent Order (DCO), which is granted by the Secretary of State for the Department of Energy and Climate Change.

In addition to the DCO for the Wylfa Newydd Generating Station (Generating Station), Horizon will also require marine licences, environmental permits and regulatory licences, including a Nuclear Site Licence.

Associated Development comprises development to support delivery of the Generating Station, examples of which include highway improvements along the A5025, Park and Ride facilities for construction workers and a Logistics Centre.

Assessment of workforce requirements and locations has identified a proportion who will be accommodated both on and off the island of Anglesey in private accommodation. Part of the proposed strategy is to transport these workers to the construction site at Wylfa on a daily basis by bus. The proposed development shall provide a temporary transport hub for construction workers of the construction site, which would mitigate the potential effects of construction worker transport on Anglesey's highway network. It would act as a transport hub, and it would allow transfer of construction workers/staff from private vehicles to buses, thus reducing the number of vehicles travelling along the A5025.

The proposed Park and Ride facility at Dalar Hir, located north-east of Junction 4 of the A55, allows for secure vehicle parking and transportation of the workers to the Wylfa site by bus in a controlled manner.

Jacobs UK Ltd (Jacobs) was commissioned by Horizon to undertake a baseline noise survey at locations in the vicinity of the Park and Ride facility at Dalar Hir, in order to inform future, detailed assessments of the potential effects of the development upon noise and vibration levels at nearby noise and vibration-sensitive receptors.

This report details the methodology and results of the noise monitoring exercise. The results are discussed in the context of relevant noise level guidelines. The baseline noise survey data may also be used within other assessments which will be submitted for approval to construct and operate the Wylfa Newydd Project.

1.2 Proposed Development

As outlined above, the proposed development consists of a Park and Ride facility at Dalar Hir. A summary of the proposals for the scheme is provided below:

- secure parking for up to 2,526 cars, 55 mini buses, 20 disabled car spaces, 94 motorbikes and 84 bicycles;

- bus waiting, pick up and drop off zones for up to 40 buses;
- bus transport facility building, including waiting area, welfare facilities, bus driver canteen, cycle store and management office facilities;
- access via a new roundabout located near the existing A55-A5 junction, with associated roundabouts at the western tip of the site;
- improved existing junction roundabout for buses; and
- substation.

The proposed facility would use 15.5 hectares of land. The largest building on site, the bus transport facility, is anticipated to be 61m in length, 27m in width and 10m in height. The cycle store will be 20m in length, 11m in width, and 6m high, whilst the substation dimensions will be 1m by 11m by 6m.

It is anticipated that construction activity at Wylfa would take place over a period of approximately eight years. According to latest available estimates construction worker numbers are anticipated to reach between 8,000 and 10,000 shift workers during peak periods. The proposed Park and Ride facility would be in use throughout the main construction of the Wylfa Newydd Project from 2019 to approximately 2026.

The bus transport facility is located centrally on the site to minimise the pedestrian route to the building while also maximising the offset distance between the facility and nearby noise and vibration sensitive receptors. The bus waiting, pick up and drop off zone is located next to the bus transport facility in order to minimise the distance to the bus entry point, thereby reducing boarding time, while again also maximising offset distances to receptors.

1.3 Site Description

The site is a 28 hectare greenfield site owned by Horizon with no neighbouring developments constraining the use of the land, and is located within a predominantly rural area east of the village of Caergeiliog. Figure 1 shows the proposed location of the facility.

Whilst the site is predominantly rural in character, there are a number of important noise sources in the area, most notably the North Wales Expressway (A55) and Holyhead Road (A5), which both pass close to the southern boundary of the proposed development.

The site and surrounding area are characterised by open countryside with a number of isolated farm properties nearby, including two farmsteads. The site is bounded by Holyhead Road to the south, London Road to the west, a go karting centre to the east and a Driver and Vehicle Standards Agency weighbridge and lorry checkpoint to the east. Hedgerows mark the northern and eastern extents of the site.

The nearest settlements to the site are Llanfihangel yn Nhywyn, located 400m to the south, and Caergeiliog, located 900m to the south-west. Surrounding sensitive land uses include a go-kart centre located next to the eastern boundary and the Gwyddfor Residential Home located approximately 250m north-east of the site.

The Llynnau y Fali – Valley Lakes Site of Special Scientific Interest (SSSI) is located 1.2km south-west of Dalar Hir. This SSSI consists of a series of small shallow lakes, supporting a variety of aquatic flora and fauna: the northernmost of these (Llyn Dinam) is a designated

Special Area of Conservation (SAC). Llyn Traffwll SSSI is located 900m south, designated for its shallow lake supporting wildfowl.

1.4 Study aims and objectives

The aim of the baseline noise monitoring detailed in this report is to characterise the existing noise environment (both day and night) in the vicinity of the proposed Park and Ride facility at Dalar Hir and to collect baseline information to inform the various applications, assessments and permits required to construct and operate the proposed development.

A monitoring plan was produced prior to the survey commencement (Jacobs, 2016) and submitted to Mick Goodfellow, Environmental Health Officer (EHO) at Isle of Anglesey County Council (IACC), for comment on Friday 29 April 2016.

The proposed survey methodology set out the following information:

- the aims and objectives of the noise survey;
- a description of the site and surroundings, identifying key noise sensitive receptors and existing noise sources;
- standards and guidance which are relevant to the noise survey; and
- the proposed noise monitoring scheme, including locations, instrumentation and survey specification.

The stated aim of the baseline noise survey was to characterise the existing daytime and night time noise levels at sensitive receptors in the vicinity of the proposed site..

The IACC provided their response to the above by email on 12 May 2016, stating that the proposed methodology and noise monitoring locations were acceptable. The EHO was invited to attend site during deployment of the equipment, in order to oversee micro-siting of the noise monitors.

This report confirms where the methodology set out within the Proposed Survey Methodology was implemented, identifies any changes required by local circumstances, and presents the results of the monitoring undertaken.

2 Methodology

2.1 Noise Monitoring Locations

The choice of monitoring locations was also influenced by a number of constraints including acoustic suitability, ease of access and equipment security. The final locations are detailed in table 1 and are presented in figure 1. Photographs of the equipment installed at each location are presented in appendix A. All locations were ‘free-field’ and were free from significant localised reflections.

Table 1: Selected monitoring locations

Location ID	Description	Approx. BNG Coordinates (m)		Notes
		Easting	Northing	
LT1	Open land at rear of residential property in Cefn Rhosydd	232601	378872	Sound Level Meter (SLM) positioned within a field east of Cefn Rhosydd and 52m from the London Road carriageway.
LT2	Open land adjacent to Holyhead Road	232868	378370	SLM positioned within a field close to the centre of the proposed Park and Ride facility and 90m north of the Holyhead Road carriageway.
LT3	Rear of Gwyddfor Residential Home, Holyhead Road	233423	378508	SLM positioned within field on the southern boundary of the residential home and 375m north of the Holyhead Road carriageway.
ST1	Open land adjacent to B5111	232889	378289	SLM positioned within a field close to the southern boundary of the Park and Ride Facility and 17m north of the Holyhead Road carriageway.

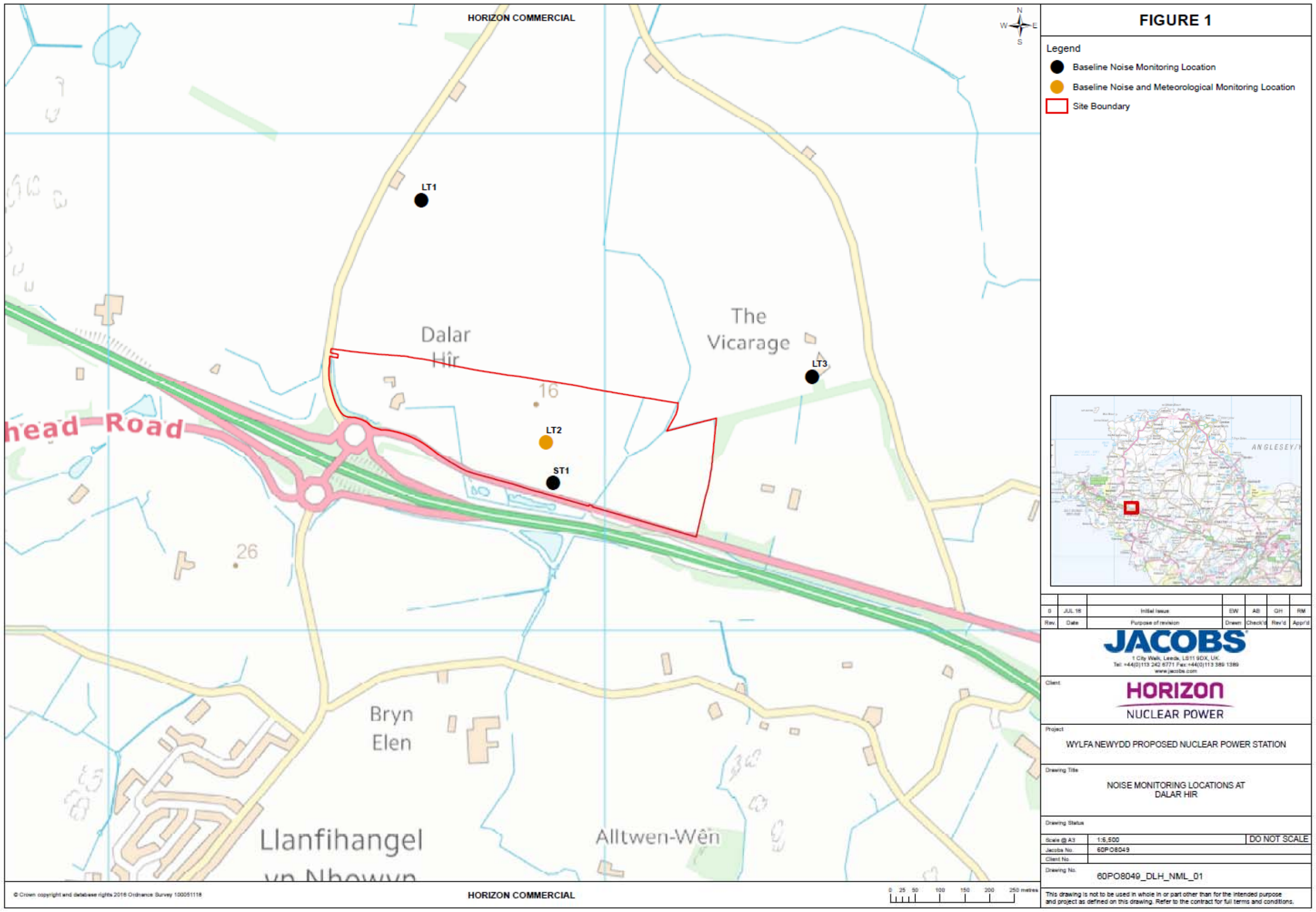

Figure 1: Noise and meteorological monitoring locations

With the exception of some minor, micro-siting adjustments the locations selected for the long-term and short-term monitoring exercise are consistent with those originally proposed.

2.2 Survey staff and durations

Long-term survey measurements were obtained over a period of approximately two weeks, between Wednesday 22 June to Thursday 07 July 2016 at locations LT1 and LT3, and between Thursday 23 June and Thursday 07 July 2016 at location LT2. Short-term measurements at ST1 were obtained prior to the long-term survey commencing, on Thursday 16 June 2016.

The environmental health department of IACC was invited to participate in the deployment and micro-siting of equipment at all positions.

For all surveys, the equipment was set up by an appropriately qualified and experienced member of Jacobs staff, holding the Institute of Acoustics Certificate of Competence in Environmental Noise Monitoring. Table 2details the individual survey dates for each location.

Table 2: Survey durations

LOCATION ID	TYPE	START DATE	END DATE
LT1	Long-term	22 June 2016	07 July 2016
LT2	Long-term	23 June 2016	07 July 2016
LT3	Long-term	22 June 2016	07 July 2016
ST1	Short-term	16 June 2016	16 June 2016

2.3 Noise measurement instrumentation and set up

The survey was undertaken with reference to the British Standards BS 7445-1:2003 (British Standards Institution, 2003a) and BS 7445-2:1991 (British Standards Institution, 1991), and the memorandum *Calculation of Road Traffic Noise (*CRTN) (Department of Transport & Welsh Office, 1988), where applicable.

Ambient noise levels were measured at each location using integrating-averaging sound level meters (SLM) or equivalent systems conforming to Class 1 as defined by BS EN 61672-1:2013 (British Standards Institution, 2013). Each SLM was field calibrated before the start of each survey by applying an acoustic calibrator conforming to BS EN 60942:2003 (British Standards Institution, 2003b) to the microphone to check the sensitivity of the measuring equipment. Calibration checks were performed on a weekly basis and at the end of the survey. No drift in calibration was noted at any of the SLMs.

The equipment used for the noise monitoring was subject to more extensive performance tests, traceable to primary standards, at accredited independent laboratories within a period of one year prior to use. The calibration certificates detailing serial numbers and date of laboratory calibration of equipment used at each location are presented in appendix B.

Battery levels were also checked on a weekly basis, and fully charged batteries installed as required. Battery voltage levels were maintained within appropriate parameters for the duration of the survey at all locations.

The noise monitoring equipment was time synchronised with the meteorological monitoring equipment, to ensure that noise and meteorological data were able to be correlated during the baseline data processing exercise. The microphone height was between 1.2m and 1.5m above ground level. To minimise the influence of reflections, the microphone positions were at least 3.5m from any reflecting surface other than the ground. A suitable foam windshield (conforming to Class 1 of BS EN 61672-1:2013 (British Standards Institution, 2013) in dry conditions, and Class 2 if saturated with 100mm of water) was fitted to each microphone. At each location, the SLM was set to measure using the logging facility and a sampling time of 100ms, with the A-weighting filter and 'fast' time weighting selected.

2.4 Meteorological instrumentation and set up

Measurements of wind speed, wind direction and precipitation were made using an ANV Measurement Systems weather station, to provide time-stamped data averaged over a one minute measurement period. The ANV weather station is a professional grade mobile weather station that uses a combination of ultrasonic and Doppler radar detection to provide logged meteorological field measurements.

The meteorological equipment was installed at location LT2, as illustrated on figure 1. Data was continually measured and logged between the time the equipment was installed, 23 June 2016, and the time it was collected, 07 July 2016. The anemometer, and other sensing equipment, were installed at a height of approximately 1.5m above ground level. Noise data recorded prior to the meteorological station being deployed has not been included within the averages and graphs presented in this report.

2.5 Data processing methodology

In order to ensure that the data used to characterise the baseline noise environment is representative of the noise environment, the data was filtered using a number of criteria:

- Noise data measured during any period (one minute duration) of rainfall was excluded from the dataset. In addition, noise data for the one hour periods preceding and following each one minute period affected by rainfall were also excluded, to allow for the distance between the monitoring locations and weather station.
- Noise data measured during any period (one minute duration) where the average recorded wind speed exceeded 5m/s were excluded from the dataset. In addition, noise data for the one hour period preceding and following each one minute period affected by high average wind speeds were also excluded, to allow for the distance between the monitoring locations and weather station.
- Any data that appeared atypically elevated following initial screening of the data, based on professional judgement, were excluded. Additionally, any atypical (namely elevated) data that coincided with events noted by local residents as being atypical were also excluded (where details on time and activity were recorded).

The valid data points have been used to derive the baseline statistical noise parameters required by the standards that will be used to assess the potential noise effects of the Wylfa Newydd Project. These standards include:

- BS5228-1:2009 + A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise (British Standards Institution, 2014b);
- Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3, 2011 (Highways Agency, 2011);
- BS4142:2014 Methods for rating and assessing industrial and commercial sound (British Standards Institution, 2014a);
- BS8233:2014 Guidance on sound insulation and noise reduction for buildings (British Standards Institution, 2014c);
- World Health Organisation's (WHO) *Guidelines for community noise*, 1999 (World Health Organisation, 1999); and
- World Health Organisation's (WHO) *Night noise guidelines for Europe*, 2009 (World Health Organisation, 2009).

3 Results

This section presents observations made of audible noise sources at the noise monitoring locations and the results of the monitoring study. Appendix C presents the time history graphs for the three long-term monitoring locations, while appendices D and E present the distribution histogram of the $L_{A90,T}$ and $L_{Amax,1min}$ noise levels, respectively, measured at the three long-term monitoring locations.

3.1 Observations on audible noise sources

Audible noise sources at each location were noted during the survey. These audible noise source observations are summarised in table 3 and were noted as being broadly consistent between the daytime and night time periods.

Table 3: Audible noise sources

LOCATION ID	DAYTIME AND NIGHT TIME OBSERVATIONS
LT1	Numerous light and heavy goods vehicles (LGV/HGV) passing on London Road; traffic from surrounding road network including the A55; livestock in adjacent fields; breeze blowing through vegetation (including the rustling of leaves); birdsong; commercial/passenger jets.
LT2	Numerous Light and heavy goods vehicles (LGV/HGV) passing on Holyhead Road; traffic from surrounding road network including the A55; breeze blowing through vegetation (including the rustling of leaves); birdsong (barely audible to audible); lorries parked in layby.
LT3	Occasional light and heavy goods vehicles (LGV/HGV) passing on B5112; traffic from surrounding road network including the A55; livestock in adjacent fields; breeze blowing through vegetation (including the rustling of leaves); birdsong

LOCATION ID	DAYTIME AND NIGHT TIME OBSERVATIONS
ST1	Numerous Light and heavy goods vehicles (LGV/HGV) passing on Holyhead Road; traffic from surrounding road network including the A55; breeze blowing through vegetation (including the rustling of leaves); birdsong; commercial/passenger jets; livestock. During the daytime period an additional intermittent, 'strimming' type, noise source was observed emanating from the residential property to the west of the monitoring location.

3.2 Baseline noise levels – construction and decommissioning

The ambient noise levels for the daytime, evening/weekend and night time periods (as per table E.1 in BS5228-1:2009+A1:2014, (British Standards Institution, 2014b)) at each location have been evaluated, omitting any periods unduly influenced by rain and wind or atypical events (as described in section 2.5). The evaluation includes processing the filtered 100ms measured data and deriving $L_{Aeq,T}$ values for each assessment time period.

Summary values ($L_{Aeq,T}$), rounded to the nearest whole dB, for the construction noise assessment periods are provided in table 4. These values are provided for the long-term monitoring locations only.

Table 4: Summary of measured $L_{Aeq, T}$ noise levels, free-field

	$L_{Aeq, T}$ dB		
LOCATION ID	DAYTIME	EVENINGS AND WEEKENDS	NIGHT TIME
LT1	58	49	45
LT2	60	53	50
LT3	57	48	48

The average ambient noise levels presented in table 4may be used in the assessment of construction and decommission phases of the proposed development. Working hours during construction and decommissioning shall be focused towards weekday daytime rather than weekend or night time hours wherever possible. Additional analysis of the ambient noise levels presented above, for example to provide weekday and weekend average level, shall be undertaken during the environmental impact assessment stage as required.

3.3 Baseline noise levels – road traffic: long-term measurements

The data collected at the long-term measuring locations have been processed to report the weekday average $L_{A10,\ 18h}$ and $L_{night,\ outside}$ values, following the methodology in CRTN (Department of Transport & Welsh Office, 1988) and DMRB (Highways Agency, 2011). $L_{night,\ outside}$ is defined in DMRB as the free-field $L_{Aeq,\ 8h}$ value for the period from 23:00 to 07:00.

Table 5 details the calculated weekday and weeknight noise levels at the selected long-term measurement locations.

Table 5: Long-term road traffic noise summary, free-field

LOCATION ID	$L_{A10,\ 18hr}$ dB	L_{night} dB
LT1	53	45
LT2	57	50
LT3	51	48

It should be noted that although the values in table 5 have been selected to report day and night time road traffic noise levels, depending on the proximity to major roads, there could be some influence from other local noise sources that may affect the overall values.

3.4 Baseline noise levels – road traffic: shortened CRTN measurement

Three consecutive $L_{A10,1hr}$ values were recorded at the short-term monitoring location. Using the methodology set out in CRTN, the $L_{A10,\ 1h}$ values were converted to $L_{A10,\ 18h.}$ The conversion formula is as follows:

$$L_{\mathrm{A10,18hr}} = L_{\mathrm{A10,3hr}} - 1\ dB$$

Where $L_{A10,3h}$ is the arithmetic average of the three consecutive hourly L_{A10} values. The results of the short-term CRTN measurement is included in table 6

Table 6: Summary of short-term CRTN results, free-field

LOCATION ID	START	DURATION (HH:MM)	$L_{A10,\ 1hr}$ dB	$L_{A10,\ 18hr}$ dB
ST1	10:14 – 7 June 2016	01:00	55.0	56
	11:14 – 7 June 2016	01:00	58.4	
	12:14 – 7 June 2016	01:00	57.4	

3.5 Baseline noise levels – commercial/industrial noise

The background noise levels for the daytime and night time periods (as per BS4142:2014 (British Standards Institution, 2014a)) at each location have been evaluated, omitting any periods unduly influenced by rain and wind or atypical events (as described in Section 2.5). The evaluation includes processing the filtered 100ms measured data and deriving $L_{A90,T}$ values for each assessment time period.

Both the mean and modal values were determined. Summary values ($L_{A90,\ T}$), rounded to the nearest whole dB, for the daytime and night time assessment periods are provided in table 7. These values are provided for the long-term monitoring locations only.

Table 7: Summary of measured $L_{A90,\ T}$ noise levels, free-field

LOCATION ID	$L_{A90,\ 16hr}$ dB	$L_{A90,\ 8hr}$ dB

	Mean	Mode	Mean	Mode
LT1	42	44 and 46	32	31
LT2	47	52	34	37
LT3	44	56	36	31

At LT1 it can be seen that a single mode $L_{A90,16hr}$ integer value is not present within the dataset. Instead the dataset may be considered to present a bimodal distribution, with two modes at 44 and 46 dB $L_{A90,16hr}$.

3.6 Baseline noise levels – site suitability for occupancy

The ambient noise levels for the daytime and night time periods (as per BS8233:2014 (British Standards Institution, 2014c)) measured at the long-term monitoring locations have been evaluated, omitting any periods unduly influenced by rain and wind or atypical events (as described in section 2.5). The evaluation includes processing the filtered 100ms measured data and deriving $L_{Aeq,T}$ values for each assessment time period.

Summary values ($L_{Aeq,T}$), rounded to the nearest whole dB, for the daytime and night time assessment periods are provided in table 8. These values are for the long-term monitoring locations only.

Table 8: Summary of measured $L_{Aeq,\,T}$ noise levels, free-field

Location ID	$L_{AEQ,\,16hr}$ dB	$L_{AEQ,\,8hr}$ dB
LT1	57	45
LT2	58	50
LT3	55	48

3.7 Baseline noise levels – night time L_{Amax} noise levels

The maximum noise levels measured at night at each of the long-term monitoring locations have been evaluated, omitting any periods unduly influenced by rain and wind or atypical events (as described in section 2.5). The evaluation includes processing the filtered 100ms measured data and deriving L_{Amax} values for the night time period. Summary levels have not been reported, however the distribution histogram of the measured $L_{Amax,1min}$ levels have been are presented in appendix E.

The distribution histograms illustrate the fluctuation in $L_{Amax,1min}$ noise levels currently experienced in the vicinity of the proposed development and show that maximum $L_{Amax,1min}$ noise levels of 88, 84 and 87 were measured at location LT1, LT2 and LT3 respectively. While LT2 experienced the lowest ‘maximum’ $L_{Amax,1min}$ noise level (84dB), the histogram demonstrates the $L_{Amax,1min}$ noise levels were frequently measured between approximately 51 and 61dB, which compares to approximately 43 and 55dB at LT1 and 45 and 55dB at LT3. This is likely due to LT2 being positioned closer to the A5 and A55 roads than either LT1 or LT3.

Further analysis of the 100ms measured data shall be undertaken, as required, at the environmental impact assessment stage.

3.8 Baseline noise levels – WHO guideline noise limit value comparison

The daytime ambient baseline noise levels (table 8) at the three long-term locations range from 55 to 58dB $L_{Aeq,16hr}$, with the highest level, 58dB measured at LT2, exceeding the WHO guideline value for serious annoyance in outdoor living areas, given within WHO (1999) *Guidelines for Community Noise*, by a factor of 3dB. The guideline value for serious annoyance is exceeded by 2dB at LT1, while the daytime ambient noise level measured at LT3 is equal to (at 55dB) the guideline limit value for serious annoyance.

The night time ambient baseline noise levels at the three long-term locations range from 45 to 50dB $L_{Aeq,8hr}$, and as such are at, or exceed by as much as 5dB, the relevant guideline limit value of 45 dB $L_{Aeq,8hr}$ outside bedrooms from WHO (1999) *Guidelines for Community Noise*. The noise levels are equal to, or as much as 10dB below, the 55dB $L_{night,outside}$ interim target level detailed in the WHO's (2009) *Night Noise Guidelines for Europe*. However, the results indicate that night noise levels exceed the WHO's night noise guideline (40dB $L_{night,outside}$) at each of the three long-term locations, by between 5 and 10dB.

Daytime and night time noise levels were dominated by road traffic, occasional commercial/passenger aircraft movements, livestock and the sound of wind blowing through vegetation.

4 Conclusions

Jacobs has undertaken a baseline noise survey to inform the various applications, assessments and permits that will be submitted for approval to construct and operate the Wylfa Newydd Project.

The survey at Dalar Hir (to inform planning applications for the proposed Park and Ride facility at Dalar Hir) was undertaken between 22 June 2016 and 07 July 2016 at a total of three long-term monitoring locations. Additionally, a short-term, road traffic noise measurement was undertaken at a single measurement location. The noise levels were characterised by contributions from transport sources (including HGVs), birdsong, livestock, the sound of rustling leaves and commercial/passenger aircraft traffic.

The baseline data generated during the survey were processed to remove data points which may have been affected by adverse weather conditions or atypical noise sources. The noise results are presented using a variety of indices and averaging techniques.

The daytime ambient baseline noise levels at the three long-term locations range from 55 to 58dB $L_{Aeq,16hr}$, which are equal to or exceed (by as much as 3dB) the WHO guideline value for serious annoyance in outdoor living areas given within WHO (1999) *Guidelines for Community Noise.*

The night time ambient baseline noise levels at the three long-term locations range from 45 to 50dB $L_{Aeq,8hr}$, and as such are at, or exceed by as much as 5dB, the relevant guideline limit value of 45dB $L_{Aeq,8hr}$ outside bedrooms from WHO (1999) *Guidelines for Community Noise*. The noise levels are equal to, or as much as 10dB below, the 55dB $L_{night,outside}$ 'interim target' level detailed in the WHO (2009) *Night Noise Guidelines for Europe*. However, the results indicate that night noise levels exceed the WHO night noise guideline (40dB $L_{night,outside}$) at each of the three long-term locations, by between 5 and 10dB.

Daytime and night time noise levels were observed to be dominated by road traffic, occasional commercial/passenger aircraft movements, livestock and the sound of wind blowing through vegetation.

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6 Glossary

TERM/ABBREVIATION	DESCRIPTION
Ambient noise	Totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far.
dB	Decibel. The ratio between the quietest audible sound and the loudest tolerable sound is a million to one in terms of the change in sound pressure. Due to this wide range, a scale based on logarithms is used in noise level measurement. The scale used is the decibel (dB) scale which extends from 0 to 140 decibels (dB), corresponding to the intensity of the sound pressure level.
dB(A)	A-weighted decibel. The ear has the ability to recognise a particular sound depending on the pitch or frequencies found at the source. Microphones cannot differentiate noise in the same way as the ear, and to counter this weakness the noise measuring instrument applies a correction to correspond more closely to the frequency response of the ear. The correction factor is called "A Weighting" and the resulting measurements are written as dB(A). "A Weighting" refers to the noise level that represents the human ear's response to sound. The dB(A) unit is internationally accepted and has been found to correspond well with people's subjective reaction to noise.
Free-field	An environment in which there are no reflective surfaces within the frequency region of interest.
IACC	Isle of Anglesey County Council
$L_{Aeq\ T}$	Is the A-weighted equivalent continuous sound level over time period (T). It is the sound level of a steady sound having the same energy as a fluctuating sound over the same period. It is possible to consider this level as the ambient noise encompassing all noise at a given time. L_{Aeq} is considered the best general purpose index for environmental noise.
$L_{A90\ T}$	Represents the A-weighted noise level exceeded for 90 percent of the measurement period (T) and is used to indicate quieter times during the measurement period. It is usually referred to as the background noise level.
$L_{A10\ T}$	Refers to the A-weighted noise level exceeded for 10% of the measurement period (T). $L_{A10\ T}$ is widely used as a descriptor of traffic noise.
$L_{Amax\ T}$	Is the maximum recorded A-weighted noise level during the measurement period (T).
$L_{night,\ outside}$	The A-weighted equivalent noise level over the eight hour night time period from 2300-0700hrs.
Night noise guideline	The night noise guideline is defined as 40 dB $L_{night\ (outside)}$ in the WHO's (2009) *Night Noise Guidelines for Europe*.
SLM	Sound Level Meter
WHO	World Health Organisation

Appendix A Photographs of installed equipment

LT1 – open land at rear of residential property in Cefn Rhosydd

LT1 – view towards east	**LT1 – view towards west**
	
LT1 – view towards south	**LT1 – view towards north**
	

LT2 – open land adjacent to Holyhead Road

LT2 (unfenced) – view towards north	**LT2 (unfenced) – view towards east**
	
LT2 (unfenced) – view towards south	**LT2 (unfenced) – view towards west**
	

LT2 (fenced) – view towards north	**LT2 (fenced) – view towards west**
	
LT2 (fenced) – view towards east	
	

LT3 – rear of Gwyddfor residential home, Holyhead Road

LT3– view towards south	LT3– view towards east
	
LT3– view towards west	
	

ST1 – open land adjacent to B5111

ST1– view towards west	**ST1– view towards north**
	
ST1– view towards south	**ST1– view towards east**
	

Appendix B Calibration certificates

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Date of issue 22/5/1/5 Certificate N° 1505281

AV Calibration
2 Warren Court
Chicksands, Shefford
Bedfordshire SG17 5QB
U.K.
Tel: +44 (0)1462 638600
Fax: +44 (0)1462 638601
Email: lab@avcalib.co.uk
www.avcalibration.co.uk
Acoustics Noise and Vibration Ltd trading as AV Calibration

Page 1 of 4 Pages

Signed [redacted]

G. Parry [ ] B. Baker [✓]

CLIENT	Jacobs Ltd Enviros House Shrewsbury Business Park Sitka Drive Shrewsbury SY2 6LG
F.A.O.	Barry Salway
ORDER No	- Job No TRAC15/05127/02
DATE OF RECEIPT	12 May 2015
PROCEDURE	AV Calibration Engineer's Handbook section 3
	(0871)
IDENTIFICATION	Sound level meter Rion type NL-32 serial No 00751323 connected via extension lead type EC-04 and preamplifier type NH-21 serial No 23663 to a half-inch microphone type UC-53A serial No 308645 fitted with a foam windshield type WS-03. Associated calibrator Rion type NC-74 serial No 34257024 with a one-inch housing and adapter type NC-74-002 for half-inch microphone.
CALIBRATED ON	22/5/1/5
PREVIOUS CALIBRATION	Calibrated on 17 March 2014, Certificate No. TCRT14/1094 issued by a non accredited calibration laboratory ANV Measurement Systems

The measurements detailed herein are traceable to units of measurement realised at the National Physical Laboratory.

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Date of issue 26 May 2015 Certificate N° 1505287

AV Calibration
2 Warren Court
Chicksands, Shefford
Bedfordshire SG17 5QB
U.K.
Tel: +44 (0)1462 638600
Fax: +44 (0)1462 638601
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www.avcalibration.co.uk
Acoustics Noise and Vibration Ltd trading as AV Calibration

Page 1 of 4 Pages

Signed [redacted]

G. Parry [ ] B. Baker [✓]

CLIENT	Jacobs Ltd Enviros House Shrewsbury Business Park Sitka Drive Shrewsbury SY2 6LG
F.A.O.	Barry Salway
ORDER No	- Job No TRAC15/05144/01
DATE OF RECEIPT	26 May 2015
PROCEDURE	AV Calibration Engineer's Handbook section 3
	(0872)
IDENTIFICATION	Sound level meter Rion type NL-31 serial No 00583275 connected via extension lead type EC-04 and preamplifier type NH-21 serial No 27505 to a half-inch microphone type UC-53A serial No 314015 fitted with a foam windshield type WS-03. Associated calibrator Rion type NC-74 serial No 34257024 with a one-inch housing and adapter type NC-74-002 for half-inch microphone.
CALIBRATED ON	26 May 2015
PREVIOUS CALIBRATION	Calibrated on 03 June 2014, Certificate No. TCRT14/1183 issued by a non accredited calibration laboratory ANV Measurement Systems

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Date of issue 22/5/1/5 Certificate N° 1505286

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Page 1 of 4 Pages

Signed [redacted]

G. Parry [ ] B. Baker [✓]

CLIENT Jacobs Ltd
Enviros House
Shrewsbury Business Park
Sitka Drive
Shrewsbury
SY2 6LG

F.A.O. Barry Salway

ORDER No - Job No TRAC15/05127/03

DATE OF RECEIPT 12 May 2015

PROCEDURE AV Calibration Engineer's Handbook section 3

(0873)

IDENTIFICATION Sound level meter Rion type NL-32 serial No 00482601 connected via extension lead type EC-04 and preamplifier type NH-21 serial No 27705 to a half-inch microphone type UC-53A serial No 321276 fitted with a foam windshield type WS-03. Associated calibrator Rion type NC-74 serial No 34257024 with a one-inch housing and adapter type NC-74-002 for half-inch microphone.

CALIBRATED ON 22/5/1/5

PREVIOUS CALIBRATION Calibrated on 17 March 2014, Certificate No. TCRT14/1093 issued by a non accredited calibration laboratory ANV Measurement Systems

The measurements detailed herein are traceable to units of measurement realised at the National Physical Laboratory.

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Date of issue 22/5/1/5 Certificate N° 1505285

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Acoustics Noise and Vibration Ltd trading as AV Calibration

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Signed	[redacted]
G. Parry [ ]	B. Baker [✓]

CLIENT	Jacobs Ltd Enviros House Shrewsbury Business Park Sitka Drive Shrewsbury SY2 6LG		
F.A.O.	Barry Salway		
ORDER No	-	Job No	TRAC15/05127/04
DATE OF RECEIPT	12 May 2015		
PROCEDURE	AV Calibration Engineer's Handbook section 3		
IDENTIFICATION	(375) Sound level meter Rion type NL-32 serial No 00482602 connected via extension lead type EC-04 and preamplifier type NH-21 serial No 27706 to a half-inch microphone type UC-53A serial No 321107 fitted with a foam windshield type WS-03. Associated calibrator Rion type NC-74 serial No 34257024 with a one-inch housing and adapter type NC-74-002 for half-inch microphone.		
CALIBRATED ON	22/5/1/5		
PREVIOUS CALIBRATION	Calibrated on 14 March 2014, Certificate No. TCRT14/1092 issued by a non accredited calibration laboratory ANV Measurement Systems		

Appendix C Time history graphs

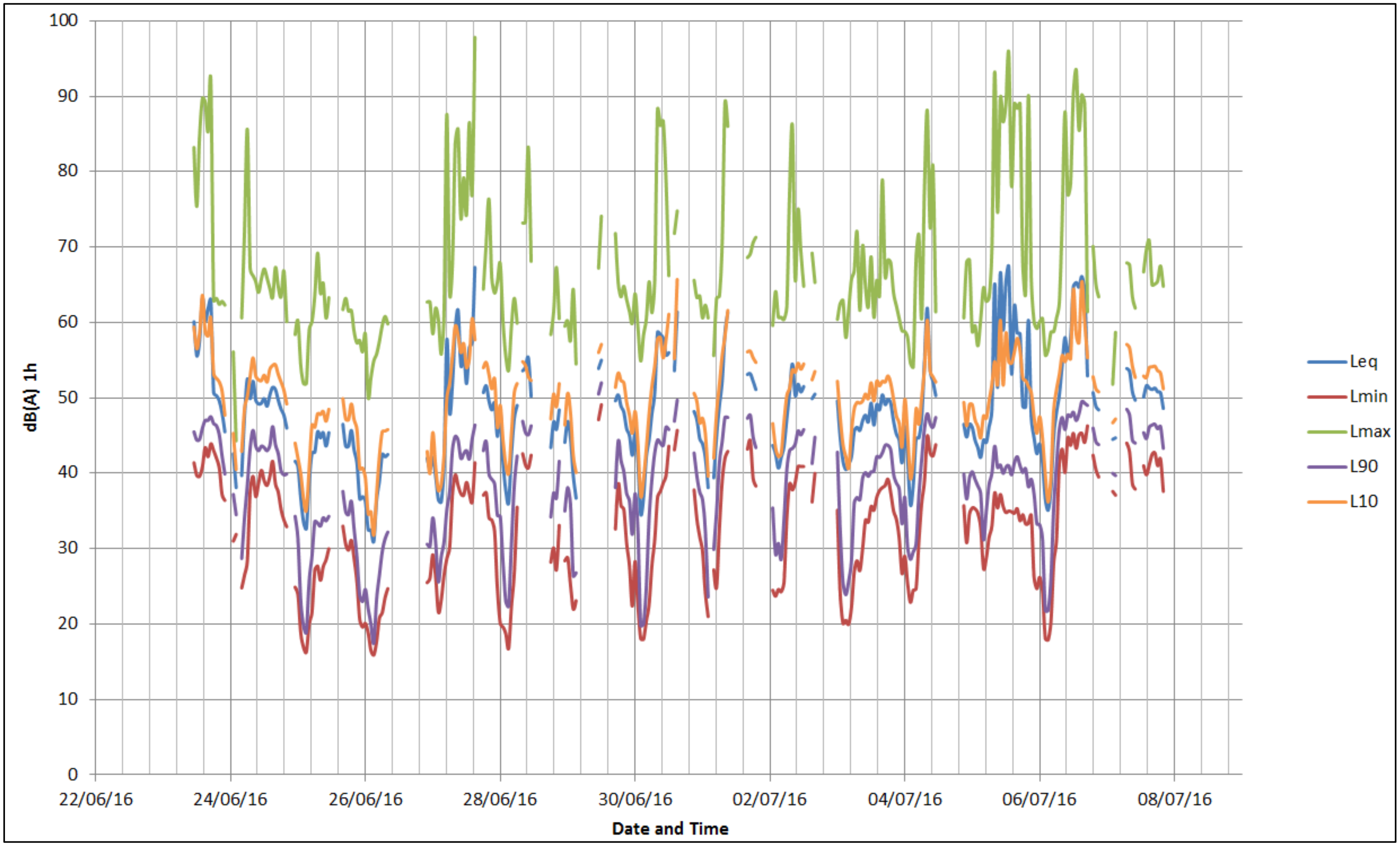

Figure 2: Time history of noise levels measured at LT1

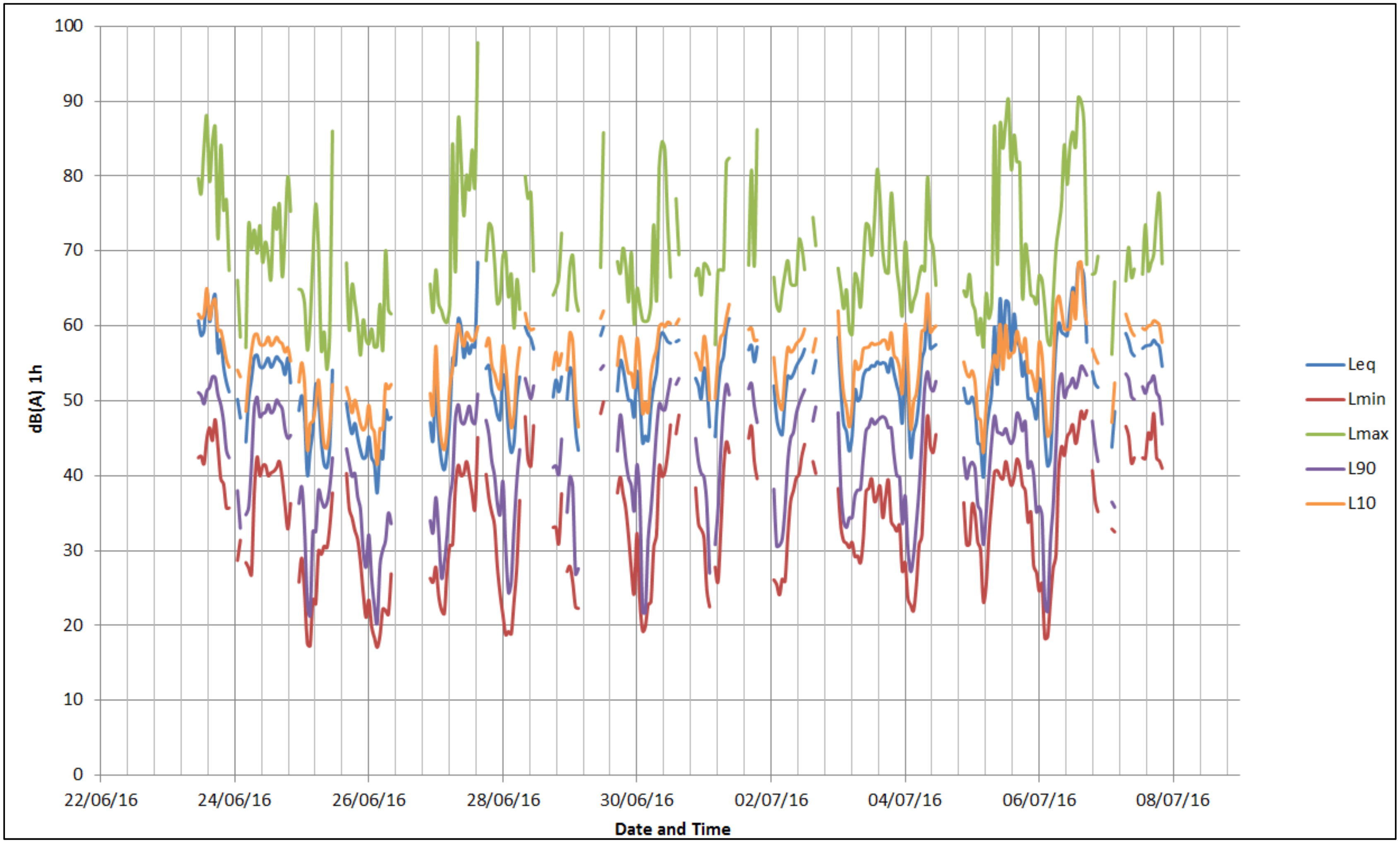

Figure 3: Time history of noise levels measured at LT2

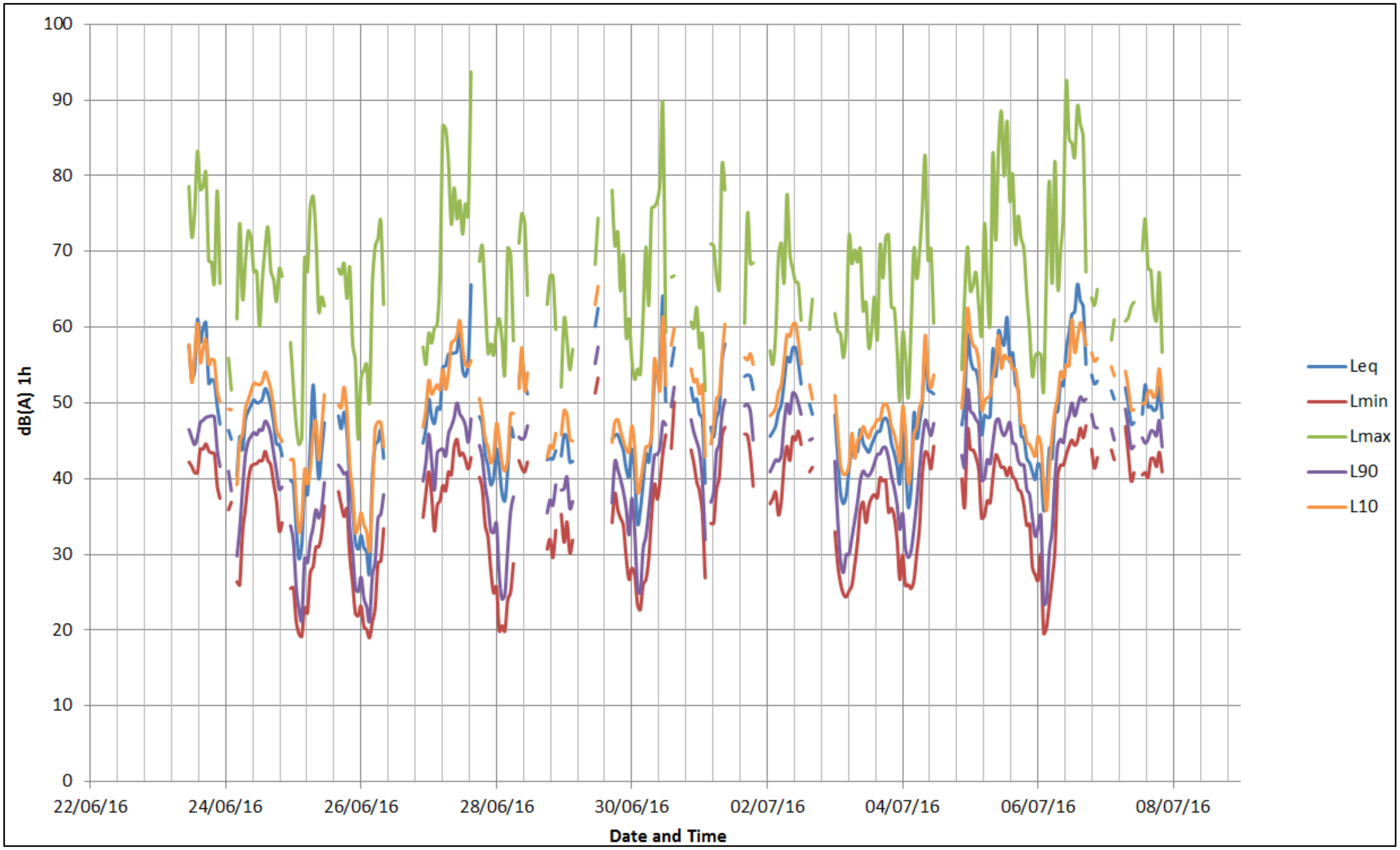

Figure 4: Time history of noise levels measured at LT3

Appendix D Distribution of $L_{A90,T}$ noise levels

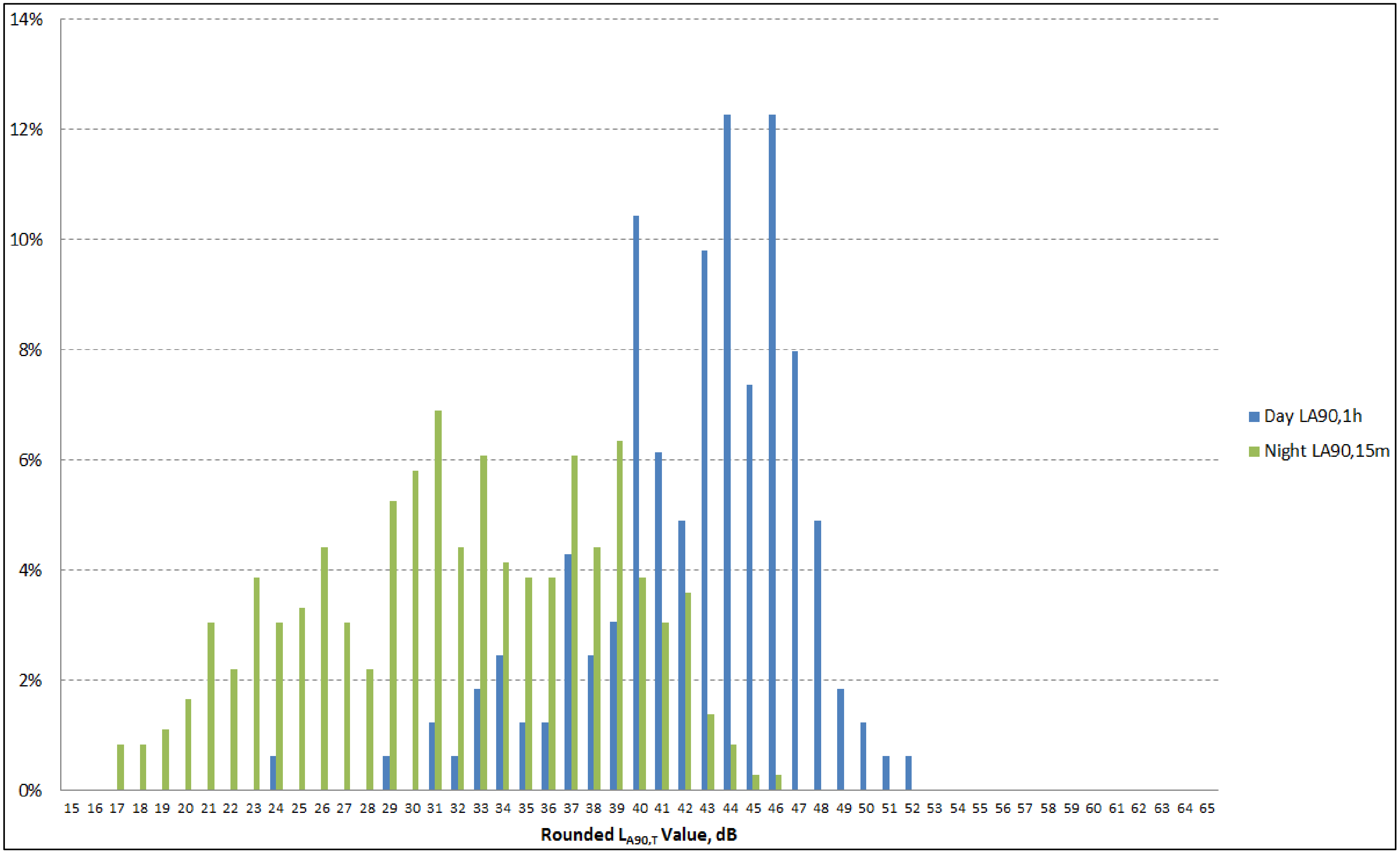

Figure 5: Histogram showing distribution of $L_{A90,\,T}$ noise levels measured at LT1

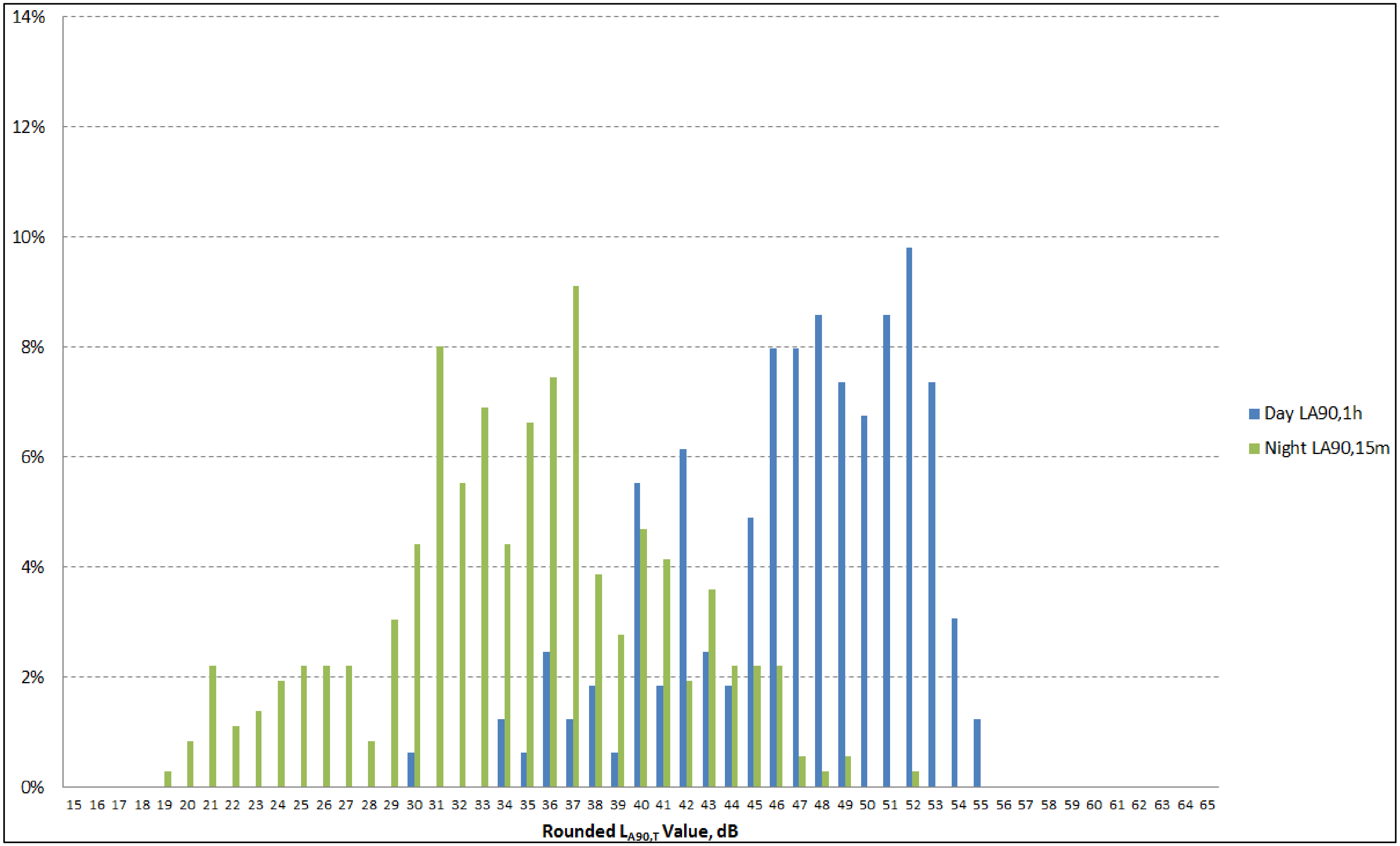

Figure 6: Histogram showing distribution of $L_{A90,\,T}$ noise levels measured at LT2

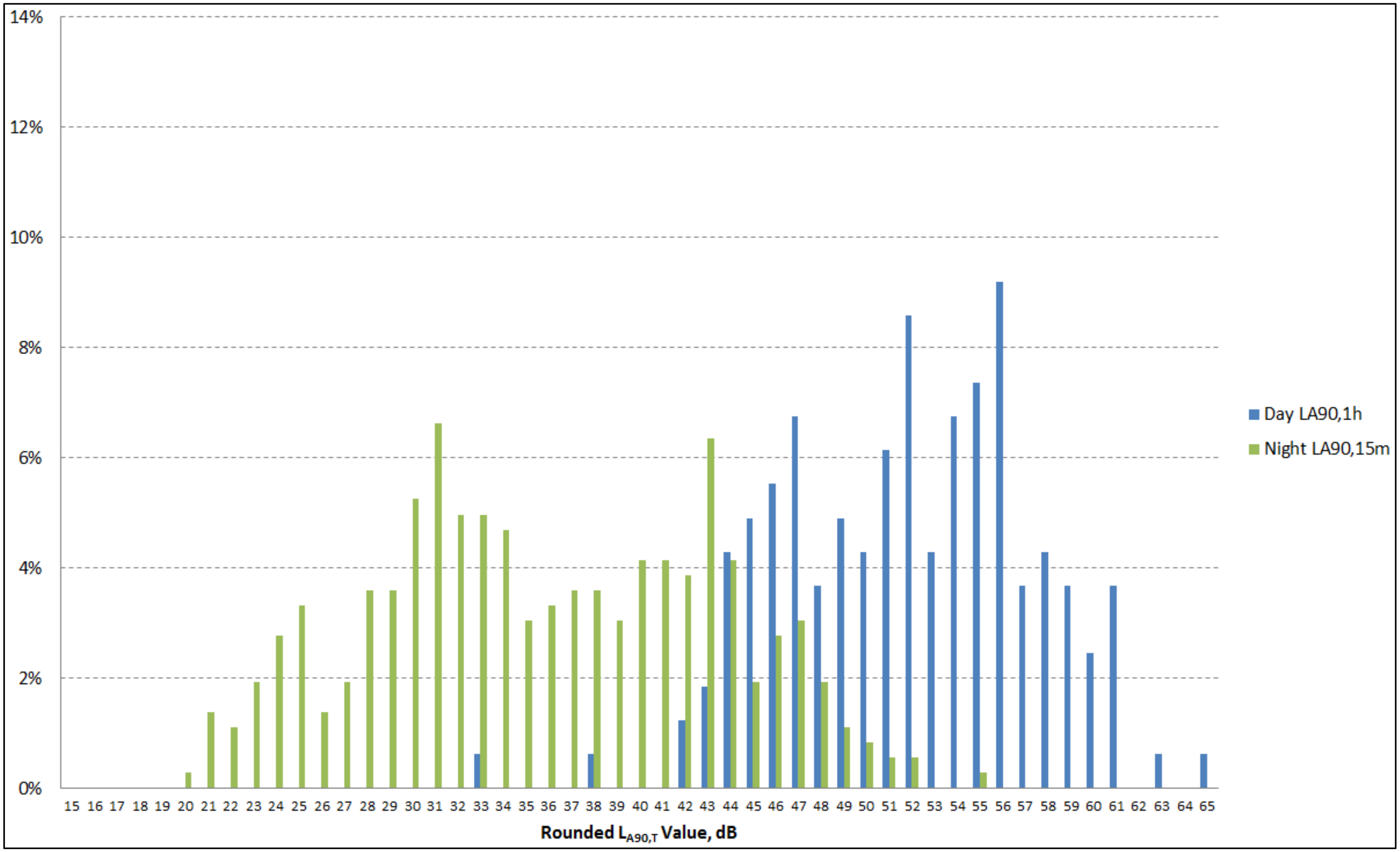

Figure 7: Histogram showing distribution of $L_{A90,\ T}$ noise levels measured at LT3

Appendix E Distribution of $L_{Amax,1m}$ noise levels

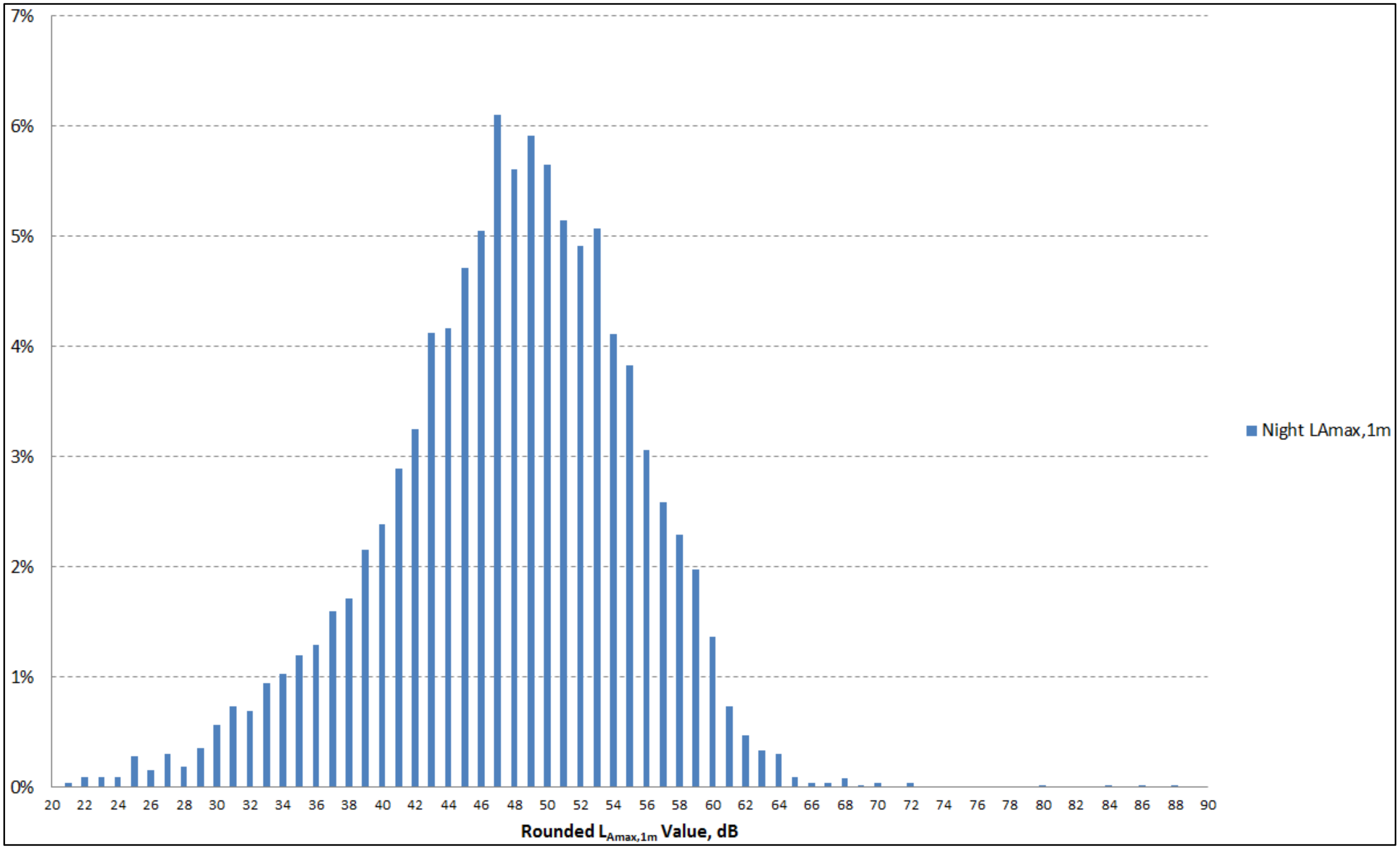

Figure 8: Histogram showing distribution of $L_{Amax, 1min}$ noise levels measured at LT1

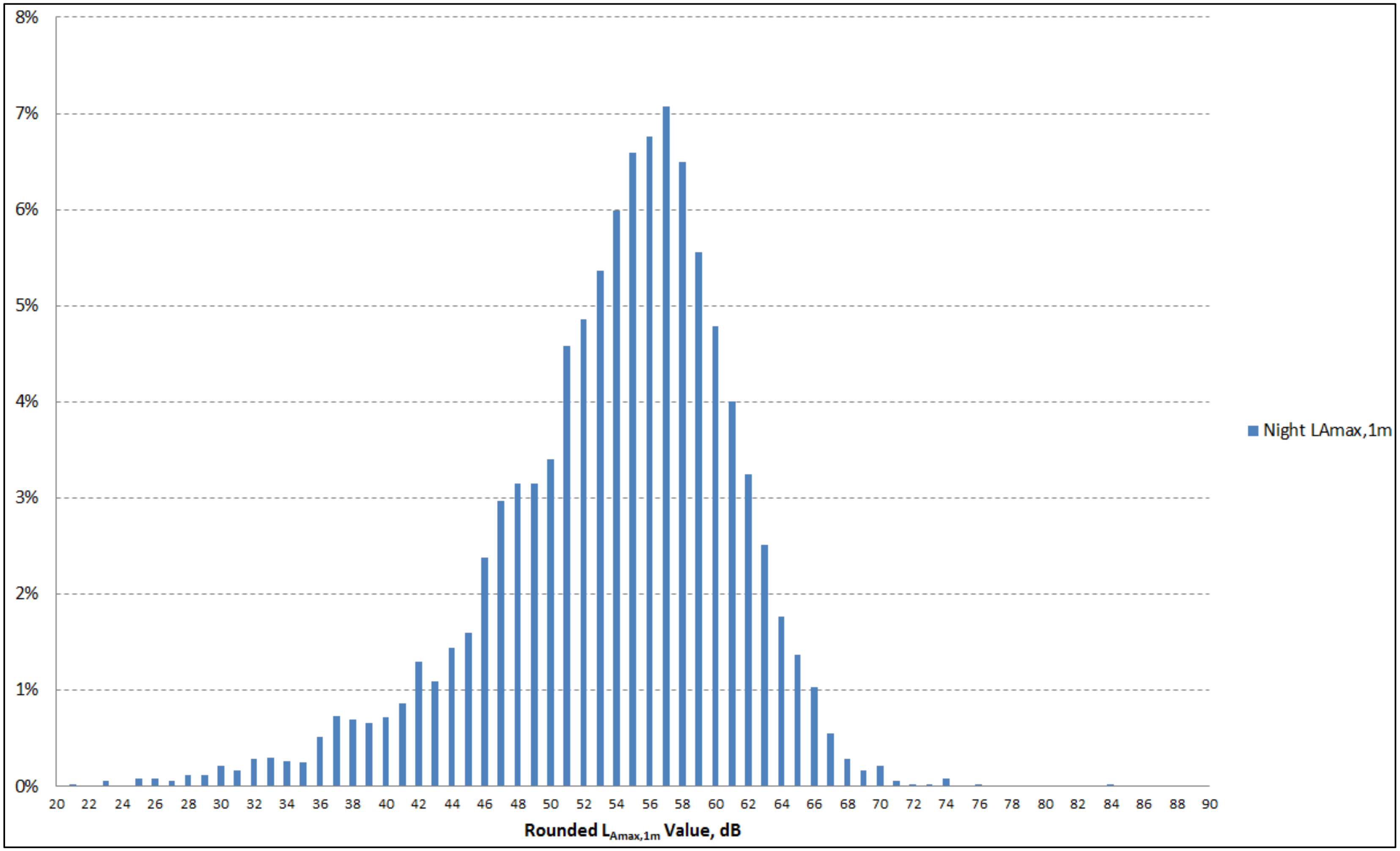

Figure 9: Histogram showing distribution of $L_{Amax,\ 1min}$ noise levels measured at LT2

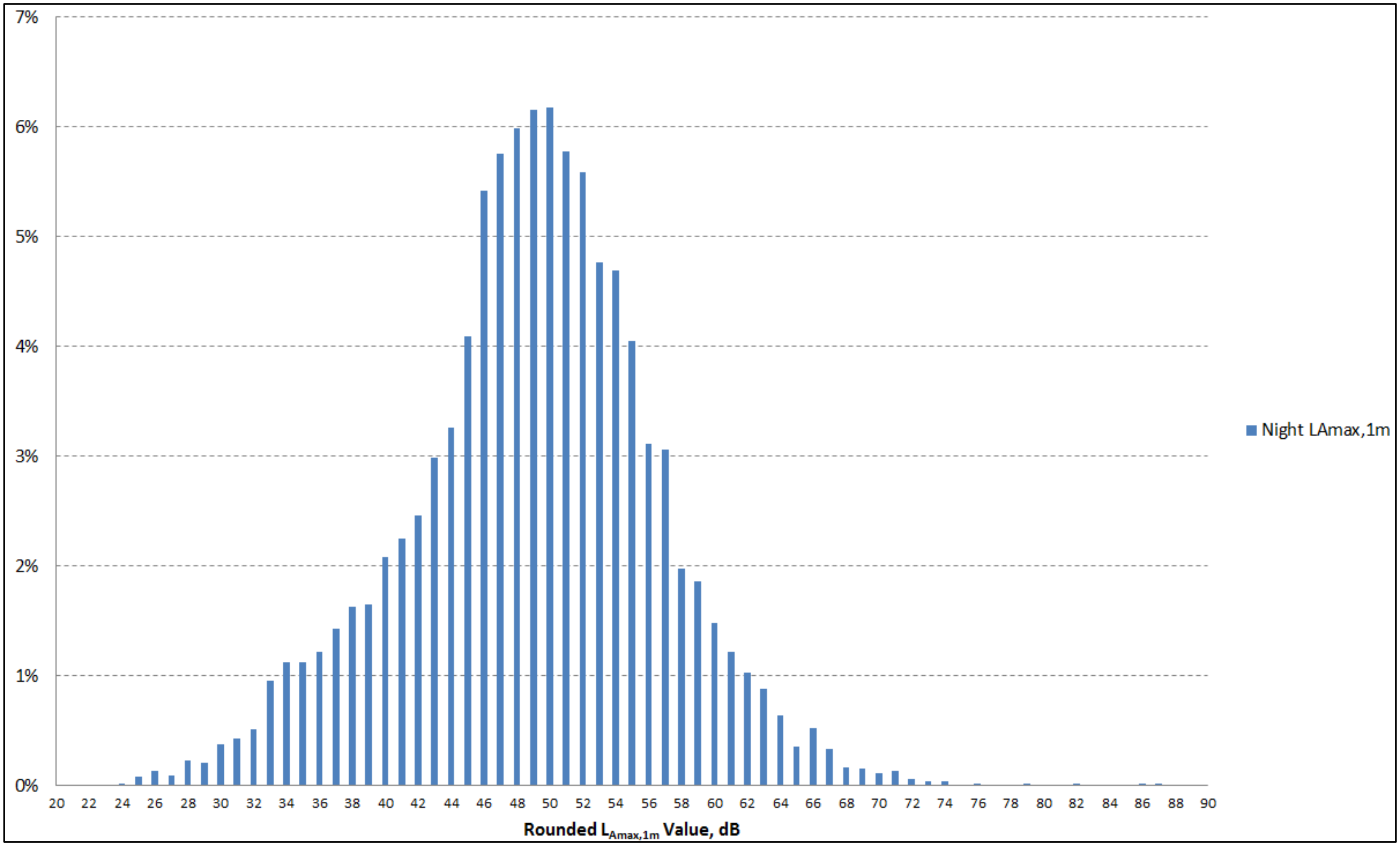

Figure 10: Histogram showing distribution of $L_{Amax,\ 1min}$ noise levels measured at LT3

ENERGY WORKING FOR BRITAIN

WYLFA NEWYDD PROJECT: PARC CYBI LOGISTICS CENTRE

Baseline Noise Monitoring Results

DCRM Ref Number: WN0902-JAC-PAC-REP-00068 Revision: 1.0

Additional Requirements or Controls			
LISTED READERS ONLY		LEGALLY PRIVILEGED	

Comments:

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Approvals Table				
	Role	**Printed Name**	**Signed Name**	**Date**
Originated by	Document Author	Dan Boote		05/07/2017
Reviewed by	Document Reviewer	Gail Hitchins		06/07/2017
Checked by	Head of Section	Gail Hitchins		06/07/2017
Approved by	EMT Representative	Rob Bromley		Jan 2018

Revision History				
Date	**Rev No.**	**Summary of Changes**	**Ref Section**	**Purpose of Issue**
05/07/2017	0	Initial draft for comment		For comment
09/08/2017	0.1	Draft following comments		For comment
Jan2018	1			For issue

Contents

Table of Figures

List of Tables

1 Executive Summary

Noise arising from new development can lead to annoyance, loss of amenity, and in some cases, adverse health effects. Potential noise effects to the local community are considered by the planning and regulatory frameworks, and noise emissions may be subject to conditions in planning consents and Environmental Permits.

To thoroughly assess potential noise effects, it is necessary to have an understanding of existing noise levels in the nearby community.

This report details the methodology and results of a baseline noise survey undertaken in relation to the proposed development of the Logistics Centre at Parc Cybi, in the north of Anglesey.

The survey was undertaken in May 2017 at one long-term and four short-term monitoring locations.

The daytime noise levels were characterised by contributions from road traffic, local fauna (livestock and birdsong), military and commercial aircraft and other, localised sources (e.g. construction) in certain locations.

At night, the noise levels were characterised predominantly by local road traffic with some localised sources (e.g. industrial) noted at some measurement locations.

This report presents the following information:

- an overview of the methodology used for the baseline noise monitoring;
- details of the wind, rain and noise monitoring locations;
- the methodology used for the processing and filtering of the data;
- a summary of the consultation and engagement with the Local Authority;
- a description of the noise environment encountered at each monitoring location; and
- a summary of the results of the monitoring undertaken and comparison with relevant guidance and standards.

The noise results are presented for several time periods, and have been derived using a variety of indices and averaging techniques, in order to support the various noise assessments required to obtain the necessary permits and consents for the construction, operation and decommissioning of the Logistics Centre.

Noise levels generally comply with the relevant daytime and night-time World Health Organisation (WHO) guideline values for community noise. However, the measured night time noise levels generally exceed the guidline levels presented in WHO Night Noise Guidelines for Europe (World Health Organisation, 2009) for increased motility whilst sleeping, with levels at measurement location PC3 exceeding the guidline level for effects harmful to health. Night noise levels are below the Interim Target of 55dB $L_{night,outside}$ recommended in the WHO Night Noise Guidelines for Europe (World Health Organisation, 2009) to avoid adverse health effects.

2 Introduction

2.1 Overview

Horizon Nuclear Power Wylfa Limited (Horizon) is a UK energy company planning to develop a new nuclear power station in north Anglesey, Wales as identified in the National Policy Statement for Nuclear Power Generation (EN-6).

The Wylfa Newydd Project (the Project) will require a number of applications to be made under different legislation to different regulators. A nuclear power station is a nationally significant infrastructure project under the Planning Act 2008. Horizon must therefore obtain a development consent order (DCO), which is granted by the Secretary of State for the Department for Business, Energy and Industrial Strategy.

In addition to the DCO for the Wylfa Newydd Generating Station, Horizon will also require marine licences, environmental permits and regulatory licences, including a Nuclear Site Licence. Planning permissions under the Town and Country Planning Act 1990 (TCPA) will be needed for Associated Development within the Project from the Isle of Anglesey County Council (IACC).

Associated Development comprises development to support delivery of the Generating Station, examples of which include highway improvements along the A5025, Park and Ride facilities for construction workers and a Logistics Centre.

Horizon commissioned a baseline noise survey at locations in the vicinity of the Parc Cybi site, in order to inform detailed assessments of the potential effects of the proposals upon noise and vibration levels at nearby noise and vibration-sensitive receptors. In addition, the survey results will be used to inform consideration of the potential suitability of the site for its proposed use.

This report details the methodology and results of the noise monitoring exercise. The results are discussed in the context of relevant noise level guidelines. The baseline noise survey data may also be used within other assessments which will be submitted for approval to construct and operate the Wylfa Newydd Project.

2.2 Proposed development

The Logistics Centre at Parc Cybi (hereafter referred to as the ‘Logistics Centre’) forms part of the Wylfa Newydd Project to which the application for Development Consent relates. The Logistics Centre would only be used during the construction phase of the Power Station to control the flow of goods vehicles along the A5025.

The Logistics Centre site is located approximately 2km to the south-east of Holyhead town, in the north-west of the Parc Cybi employment area. It is approximately 19km south-west of the Wylfa Newydd Development Area. The proposals for the Logistics Centre consist of:

- a welfare/security building;
- security kiosks (at the entrance/exit of the site);
- a covered inspection bay;
- a heavy goods vehicle (HGV) scanner;
- parking zones consisting of 100 parking bays for HGVs; and

- 12 staff parking bays (including one disabled parking space).

Following construction of the Power Station, the site would be available for another appropriate employment use. If further planning permission is required for any external changes, this would be applied for closer to the time at which the facility would become available.

2.3 Site description

The proposed development site is located in a predominantly rural area on the south-eastern outskirts of Holyhead.

Whilst the site is predominantly rural in character, there are a number of important noise sources in the area, including the A5 and A55 which pass the site to the northeast, and other, minor roads such as the B4545 which passes west of the site. There is also a manufacturing plant to the northeast of the site.

The site is located close to a number of areas of existing residential development and outlying residential properties, in addition to a range of non-residential noise and vibration-sensitive receptors (e.g. schools etc.). These are described in more detail in Section 3 to follow.

2.4 Study aims and objectives

A monitoring plan was produced prior to the survey commencement ('Proposed survey methodology for noise monitoring for Parc Cybi Logistics Centre', DCRM Ref Number WN034-JAC-PAC-MEM-00014).

The proposed survey methodology set out the following information:

- the aims of the noise survey;
- a description of the site and surroundings, identifying key noise sensitive receptors and existing noise sources;
- standards and guidance which are relevant to the noise survey; and
- the proposed noise monitoring scheme, including locations, instrumentation and survey specification.

The stated aim of the baseline noise survey was to characterise the existing noise levels at sensitive receptors in the vicinity of the proposed site, including future site occupants. The survey aims were further developed to characterise existing daytime and night-time ambient noise levels at receptors close to the proposed site, to inform the construction and operational noise assessment.

This report confirms where the methodology set out within the proposed survey methodology was implemented, identifies any changes required by local circumstances, and presents the results of the monitoring undertaken.

3 Methodology

3.1 Noise monitoring locations

The choice of monitoring locations was influenced by a number of constraints including acoustic suitability, ease of access and equipment security. The final locations are detailed in table 1 and are presented in **Error! Reference source not found.**. Photographs of the equipment installed at each location are presented in Appendix A. Insofar as possible, locations were 'free field' and were free from significant localised reflections. However, at some locations this was not possible and, as such, there is potential for localised reflections to have influenced the measured noise levels. Further details are provided in table 1 below.

Location ID	Description	Approx. BNG coordinates (m)		Notes
		Easting	Northing	
PC1	Proposed Parc Cybi site	225806	380739	SLM positioned in a pastoral field approximately 140m from A55
PC2	Maes y Delyn	225013	381220	SLM positioned on pathway in front of residential property. Stone wall within 3.5m to the rear right of the SLM.
PC3	Kingsland Road (B4545)	225068	380888	SLM positioned on pathway adjacent to driveway, approximately 1m from a stone wall.
PC4	Penryhn Geiriol	225507	380173	SLM positioned on pathway at end of cul-de-sac.
PC5	Adjacent to Treaddur Bay Caravan Park	226138	379859	SLM positioned on grass layby approximately 2m away from a low level stone wall

Table 1: Selected monitoring locations

With the exception of some minor, micro-siting adjustments, all monitoring locations are consistent with those originally proposed.

3.2 Survey staff and durations

The unattended measurement (PC1) was undertaken from Wednesday 17th May 2017 to Wednesday 24th May 2017, a period of one week. Attended short term measurements at PC2, PC3, PC4 and PC5 were completed on 17 and 18 May 2017.

All measurements were undertaken by an appropriately qualified and experienced person who holds a Certificate of Competence in Environmental Noise Monitoring from the Institute of Acoustics.

Table 2 details the individual survey dates for each location.

LOCATION ID	TYPE	START DATE	END DATE
PC1	Long term	17 May 2017	24 May 2017
PC2	Short term	17 May 2017	18 May 2017
PC3	Short term	17 May 2017	18 May 2017
PC4	Short term	17 May 2017	18 May 2017
PC5	Short term	17 May 2017	18 May 2017

Table 2: Survey durations

The short term measurement consisted of three daytime (between 10:00 and 18:00) and two night time (between 23:00 and 04:00) measurements at each location. Each measurement was of 30 minutes duration.

3.3 Noise measurement instrumentation and set up

The survey was undertaken with reference to the British Standards BS 7445-1:2003 (British Standards Institute, 2003) and BS 7445-2:1991 (British Standards Institute, 1991), where applicable.

Ambient noise levels were measured at each location using integrating-averaging sound level meters (SLM) or equivalent systems conforming to Class 1 as defined by BS EN 61672-1:2013 (British Standards Institute, 2013). Each SLM was field calibrated before the start of each survey by applying an acoustic calibrator conforming to BS EN 60942:2003 (British Standards Institute, 2003) to the microphone to check the sensitivity of the measuring equipment. Further calibration checks were performed at the end of the survey. The maximum overall drift over the survey period noted at any location was 0.1dB(A).

The equipment used for the noise monitoring was subject to more extensive performance tests, traceable to primary standards, at accredited independent laboratories within a period of 1 year prior to use. The calibration certificates, detailing serial numbers and date of laboratory calibration, of equipment used at each location are presented in appendix B.

The noise monitoring equipment was time synchronised with the meteorological mast (detailed below), to ensure that noise and meteorological data were able to be correlated during the data processing following the survey.

The microphone height was between 1.2m and 1.5m above ground level. To minimise the influence of reflections, the microphone positions were at least 3.5m from any reflecting surface other than the ground where possible. A suitable foam windshield (conforming to Class 1 of BS EN 61672-1:2013 (British Standards Institute, 2013) in dry conditions, and Class 2 if saturated with 100mm of water) was fitted to each microphone.

At each location, the SLM was set to measure using the logging facility and a sampling time of 100ms, with the ‘A’ frequency weighting and ‘Fast’ time weighting filters selected.

3.4 Meterological instrumentation and set up

Measurements of wind speed, wind direction and precipitation were made using an ANV weather station, to provide time-stamped data averaged over a one minute measurement period. The ANV weather station is a professional grade mobile weather station that uses a combination of ultrasonic and Doppler radar detection to provide logged meteorological field measurements.

The meteorological equipment was installed approximately 10m from PC1 with the anemometer at approximately 1.5m above ground level.

3.5 Data processing methodology

In order to ensure that the data used to characterise the baseline noise environment are representative, the data was filtered using a number of criteria:

- Noise data during any period where precipitation was recorded was excluded from the data set. In addition, noise data for the ten minute period prior to and after each period affected by rain was also excluded, to take into account the sensitivity of the instrument, and the distance between the noise monitoring locations and the rain gauge;
- Noise data during any period where the average wind speed recorded was over 5m/s was excluded. In addition, noise data from the preceding and subsequent periods (ten minutes) was also excluded; and
- Any data which appeared atypically elevated from a visual review of the data, based on professional judgement, were excluded.

All attended measurments were taken during periods of suitable weather, therefore it is only the unattended measurement that has been filtered. The valid data points have been used to derive the baseline statistical noise parameters required by the standards which will be used to assess the potential noise effects of the Logistics Centre and the wider Project. These standards include:

- BS5228-1:2009 + A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise (British Standards Institute, 2014);
- Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3, 2011 (The Highways Agency, 2011);
- BS4142:2014 Methods for rating and assessing industrial and commercial sound (British Standards Institute, 2014);
- BS8233:2014 Guidance on sound insulation and noise reduction for buildings (British Standards Institute, 2014);
- World Health Organisation’s (WHO) Guidelines for community noise, 1999 (World Health Organisation, 1999); and
- World Health Organisation’s (WHO) Night noise guidelines for Europe, 2009 (World Health Organisation, 2009).

The onset of some adverse health effects is given in the WHO Guidelines for Community Noise (World Health Organisation, 1999). A level of 50dB $L_{Aeq,16hour}$ is given for moderate annoyance in outdoor living areas, increasing to 55dB $L_{Aeq,16hour}$ for serious annoyance, in the majority of the population.

The WHO Night Noise Guidelines for Europe (World Health Organisation, 2009) indicate that there are no effects on sleep at noise levels below 30dB $L_{night,outside}$ and that effects at levels below 40dB $L_{night,outside}$ are not harmful to health. At levels above 55dB $L_{night,outside}$, adverse health effects occur frequently, and this level is set as an Interim Target.

4 Results

4.1 Observations on audible noise sources

For the long term monitoring location, audible noise sources were noted during equipment set up and on collection. For the short term attended monitoring, audible noise sources at each location were noted throughout the survey period. These audible noise source observations are summarised in table 3.

LOCATION ID	OBSERVATIONS	
	DAYTIME	NIGHT TIME
PC1	A55 is the dominant noise source (direct line of sight); Bird song is constant and audible; Livestock in adjacent field is barely audible.	*No attended night time monitoring periods at this location*.
PC2	Sound environment dominated by construction work in an adjacent property; Road traffic from Kingsland Road is audible; Aircraft (including military) was audible at various times.	Road traffic from Kingsland Road is audible; Some Heavy Goods Vehicles (HGVs) audible on A5153; Distant alarm audible briefly.
PC3	Road traffic on B4545 is dominant; Military aircraft audible at various times; Natural sounds (vegetation and birdsong) also audible at various times.	Road traffic on B4545 is dominant.
PC4	Bird song and livestock audible throughout measurements; Road traffic noise from B4545 audible; Military aircraft flyovers during most measurements.	Livestock and breeze through vegetation audible throught measurements; Helicopter fly over in the distance; Electrical buzz from telegraph poles in field to east of measurement.
PC5	Road traffic noise from A55 is dominant; Various aircraft (helicopter and military) audible; Livestock in adjacent field audible.	Reversing alarms from nearby lorry park; Road Traffic noise from A55 audible; Livestock audible from adjacent field.

Table 3: Observations on audible noise sources

4.2 Baseline noise levels – construction

The ambient noise levels for the daytime, evening/weekend and night-time periods at each location have been evaluated as per the 'ABC' method set out in BS 5228-1:2009+A1:2014 (British Standards Institute, 2014, p. 119).

Periods affected by rain, wind or atypical events (as described in Section 3.5) have been ignored. The evaluation includes processing the filtered 100ms measured data and deriving $L_{Aeq,T}$ values for each assessment time period.

Summary values ($L_{Aeq,T}$), rounded to the nearest whole dB, for the construction noise assessment periods are provided in table .

	$L_{AEQ,T}$ dB		
LOCATION ID	**DAYTIME^{A}**	**EVENINGS AND WEEKENDS^{B}**	**NIGHT-TIME^{C}**
PC1	50	48	50
PC2	52	-	35
PC3	67	-	51
PC4	56	-	36
PC5	56	-	37

Table 4: Summary of measured $L_{Aeq,T}$ noise levels

A) 07:00 – 19:00 on weekdays and 07:00 – 13:00 on SaturdaysB) 19:00 – 23:00 on weekdays, 13:00 – 23:00 on Saturdays, and 07:00 – 23:00 on Sundays

C) 23:00 – 07:00

4.3 Baseline noise levels – road traffic: long term measurements

The data collected at the long term measuring location has been processed to report the weekday average $L_{A10,18h}$ and $L_{night,outside}$ values, following the methodology in CRTN (Department of Transport Welsh Office, 1988) and DMRB (The Highways Agency, 2011). $L_{night,outside}$ is defined in DMRB as the free field $L_{Aeq,8h}$ value for the period 23:00 to 07:00.

Table details the calculated weekday and weeknight noise levels at PC1.

LOCATION ID	**$L_{A10,18HR}$ dB**	**$L_{NIGHT,OUTSIDE}$ dB**
PC1	52	50

Table 5: Long term road traffic noise summary

It should be noted that although the values in table have been selected to report day and night-time road traffic noise levels, depending on the proximity to major roads, there could be some influence from other local noise sources that may affect the overall values.

4.4 Baseline noise levels – commercial/industrial noise

The background noise levels for the daytime and night-time periods have been evaluated as per BS4142:2014 (British Standards Institute, 2014) at each location. Periods influenced by rain, wind or atypical events (as described in Section 3.5) have been ignored. The evaluation includes processing the filtered 100ms measured data and deriving $L_{A90,T}$ values for each assessment time period.

Both the mean and modal values have been determined for the long term measurement location. Summary values ($L_{A90, T}$), rounded to the nearest whole decibel, for the daytime and night-time assessment periods are provided in Table 3.

Location ID	$L_{A90, 16HR}$ dB		$L_{A90, 8HR}$ dB	
	Mean	Mode	Mean	Mode
PC1	42	43	38	40

***Table** 3: Summary of measured $L_{A90, T}$ noise levels at PC1*

Tables 7 to 10 below provide the $L_{Aeq, T}$ and $L_{A90, T}$ noise levels measured during the daytime and night-time periods at each of the short term monitoring locations. The daytime noise levels presented are for 30 minute periods, whilst the night time noise levels presented are for 15 minute back-to-back periods.

Start Date	Start Time	Day/Night	$L_{Aeq, T}$ dB	$L_{A90, T}$ dB
17/05/2017	10:08	Day	46	38
17/05/2017	13:37	Day	52	40
17/05/2017	16:16	Day	48	41
17/05/2017	23:00	Night	36	31
			34	28
18/05/2017	01:24	Night	34	30
			34	31
18/05/2017	10:43	Day	55	39

Table 4: Summary of measured $L_{Aeq, T}$ and $L_{A90, T}$ noise levels at PC2

It was noted on site that there was localised construction and domestic noise during all daytime measurements at PC2. The measured levels are still within the guidelines set out in WHO Guidelines for Community Noise (World Health Organisation, 1999) for outdoor living areas in the daytime.

The measured night time noise levels at PC2 exceed the guideline level set out in WHO Night Noise Guidelines for Europe (World Health Organisation, 2009) for increased motility during sleep, but not the level at which effects can be harmful to health.

START DATE	START TIME	DAY/NIGHT	$L_{AEQ,T}$ dB	$L_{A90,T}$ dB
17/05/2017	11:36	Day	66	44
17/05/2017	14:15	Day	67	48
17/05/2017	16:53	Day	69	52
17/05/2017	23:34	Night	56	31
			46	29
18/05/2017	02:00	Night	45	35
			44	33
18/05/2017	11:19	Day	65	44

Table 8: Summary of measured $L_{Aeq,T}$ and $L_{A90,T}$ noise levels at PC3

The measured daytime noise levels are above the WHO Guidelines for Community Noise (World Health Organisation, 1999) guideline level for serious annoyance.

The measured night time noise levels at PC3 exceed the guideline level set out in WHO Night Noise Guideline for Europe (World Health Organisation, 2009) for effects harmful to health.

START DATE	START TIME	DAY/NIGHT	$L_{AEQ,T}$ dB	$L_{A90,T}$ dB
17/05/2017	12:15	Day	39	33
17/05/2017	14:51	Day	62	36
17/05/2017	17:31	Day	49	38
18/05/2017	00:10	Night	36	32
			39	35
18/05/2017	02:36	Night	35	33
			34	32
18/05/2017	11:56	Day	47	35

Table 9: Summary of measured $L_{Aeq,T}$ and $L_{A90,T}$ noise levels at PC4

The measured daytime noise levels are generally below the WHO Guidelines for Community Noise (World Health Organisation, 1999) guideline level for moderate annoyance.

The measured night time noise levels at PC4 exceed the guideline level set out in WHO Night Noise Guideline for Europe (World Health Organisation, 2009) for increased motility during sleep, but not the level at which effects can be harmful to health.

START DATE	START TIME	DAY/NIGHT	$L_{AEQ, T}$ dB	$L_{A90, T}$ dB
17/05/2017	12:58	Day	51	32
17/05/2017	15:30	Day	52	38
18/05/2017	00:48	Night	38	34
			38	35
18/05/2017	03:13	Night	34	31
			36	32
18/05/2017	10:06	Day	50	31
18/05/2017	12:36	Day	61	32

Table 10: Summary of measured $L_{Aeq, T}$ and $L_{A90, T}$ noise levels at PC5

The measured daytime noise levels are generally below the WHO Guidelines for Community Noise (World Health Organisation, 1999) guideline level for serious annoyance.

The measured night time noise levels at PC5 exceed the guideline level set out in WHO Night Noise Guideline for Europe (World Health Organisation, 2009) for increased motility during sleep, but not the level at which effects can be harmful to health.

4.4.1 Derivation of Representative Ambient Noise Levels

The results from the unattended noise measurements obtained at PC1 provide an indication of the typical diurnal variation in noise levels throughout each day of the week at the location of the proposed Logistics Centre, whilst the short term attended noise measurements obtained at PC2 – PC5 provide further indication of the variation in noise levels at the surrounding areas.

To derive estimates of long term noise levels at attended monitoring locations, correction factors for each attended location have been derived by comparing the synchronous measured levels at each location. This correction factor has been applied to the mode daytime, $L_{A90,16hr}$ and night time $L_{A90,8hr}$ noise levels obtained at PC1 to derive daytime and night time background $L_{A90,T}$ values for PC2 – PC4.The results are presented in table 11 below.

LOCATION	PC1 MEASURED $L_{A90,T}$, dB		DIFFERENCE BETWEEN PC1 AND ATTENDED MEASUREMENTS, dB		DERIVED NOISE LEVEL, dB	
	Daytime	Night time	Daytime	Night time	Daytime	Night time
PC2	43	40	1	8	42	32
PC3			-5	5	48	35
PC4			6	7	37	33
PC5			8	7	35	33

Table 11: Derivation of Representative Ambient Noise Levels

5 Conclusions

A baseline noise survey has been undertaken to inform the various applications, assessments and permits that will be submitted for approval to construct and operate the Wylfa Newydd Project.

The survey for Parc Cybi Logistics Centre was undertaken between 17th May and 24th May 2017 at one long-term monitoring location. Additionally, a series of short-term, measurements were undertaken at a further four positions between 17th and 18th May 2017. The noise levels were characterised by contributions from transport sources, local fauna, livestock, localised industrial/commercial noise sources in some areas, and military/commercial aircraft traffic.

The baseline data generated during the survey were processed to remove data points which may have been affected by adverse weather conditions or atypical noise sources. The noise results are presented using a variety of indices and averaging techniques.

The daytime and evening baseline noise levels generally comply with the WHO Guidelines for Community Noise guideline values for outdoor living areas.

The night-time baseline noise levels comply with the relevant WHO Guidelines for Community Noise guideline value, and the interim target level detailed in the WHO Night Noise Guidelines for Europe.

Night-time noise levels were observed to be predominantly influenced by natural sources and road traffic noise.

6 References

British Standards Institute, 1991. *BS 7445-2:1991 Description and measurement of environmental noise - Part 2: Guide to the acquisition of data pertinent to land use..* London: BSI Standards Limited.

British Standards Institute, 2003. *BS EN 60942:2003 Electroacoustics. Sound calibrators.* London: BSI Standards Limited.

British Standards Institute, 2003. *BS 7445-1:2003 Description and measurement of environmental noise - Part 1: Guide to quantities and procedures.* London: BSI Standards Limited.

British Standards Institute, 2013. *BS EN 61672-1:2013 Electroacoustics. Sound Level Meters Specifications.* London: BSI Standards Limited.

British Standards Institute, 2014. *BS 5228-1:2009 + A1:2014 Code of practice for noise and vibration control on construction and open sites - Part 1: Noise.* London: BSI Standards Limited.

British Standards Institute, 2014. *BS 8233:2014 Guidance on sound insulation and noise reduction for buildings.* London: BSI Standards Limited.

British Standards Institute, 2014. *BS 4142:2014 - Methods for Rating and Assessing Industrial and Commercial Sound.* London: BSI Standards Limited.

Department of Transport Welsh Office, 1988. *Calculation of Road Traffic Noise.* London: Her Majesty's Stationery Office.

The Highways Agency, 2011. *Design Manual for Roads and Bridges - Volume 11 Section 3 Part 7 Revision 1 HD213/11.* London: The Stationery Office.

World Health Organisation, 1999. *Guidelines for Community Noise.* Geneva: World Health Organisation.

World Health Organisation, 2009. *Night Noise Guidelines for Europe.* Copenhagen: World Health Organisation.

7 Glossary

TERM/ABBREVIATION	DESCRIPTION
Ambient noise	Totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far.
dB	Decibel. The ratio between the quietest audible sound and the loudest tolerable sound is a million to one in terms of the change in sound pressure. Due to this wide range, a scale based on logarithms is used in noise level measurement. The scale used is the decibel (dB) scale which extends from 0 to 140 decibels (dB) corresponding to the intensity of the sound pressure level.
dB(A)	A-weighted decibel. The ear has the ability to recognise a particular sound depending on the pitch or frequencies found at the source. Microphones cannot differentiate noise in the same way as the ear; and to counter this weakness the noise measuring instrument applies a correction to correspond more closely to the frequency response of the ear. The correction factor is called “A Weighting” and the resulting measurements are written as dB(A). “A Weighting” refers to the noise level that represents the human ear’s response to sound. The dB(A) unit is internationally accepted and has been found to correspond well with people’s subjective reaction to noise.
Free-field	An environment in which there are no reflective surfaces within the frequency region of interest.
$L_{Aeq\ T}$	Is the A weighted equivalent continuous sound level over time period T. It is the sound level of a steady sound having the same energy as a fluctuating sound over the same period. It is possible to consider this level as the ambient noise encompassing all noise at a given time. L_{Aeq} is considered the best general purpose index for environmental noise.
$L_{A90\ T}$	Represents the A weighted noise level exceeded for 90 percent of the measurement period (T) and is used to indicate quieter times during the measurement period. It is usually referred to as the background noise level.
$L_{A10\ T}$	Refers to the A weighted noise level exceeded for 10% of the measurement period (T). $L_{A10\ T}$ is widely used as a descriptor of traffic noise.
$L_{Amax\ T}$	Is the maximum recorded A weighted noise level during the measurement period (T).
NNG	Night Noise Guideline, defined as 40 dB $L_{night\ (outside)}$ in WHO Night Noise Guidelines for Europe (2009).
WHO	World Health Organisation.

Appendix A Photographs of Installed Equipment

PC1

Noise monitoring equipment	
	
	

Meteorological equipment	
	
	

PC2

PC3

PC4

PC5

Appendix B Calibration Certificates

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Date of Issue 01 August 2016 Certificate N° 1608404

AV Calibration
2 Warren Court
Chicksands, Shefford
Bedfordshire SG17 5QB
U.K.
Tel: +44 (0)1462 638600
Fax: +44 (0)1462 638601
Email: lab@avcalib.co.uk
www.avcalibration.co.uk

Acoustics Noise and Vibration Ltd trading as AV Calibration

Page 1 of 2 Pages

Signed [redacted]

G. Parry [[redacted]

B. Baker [ ] J. Hardman [ ]

CLIENT Jacobs Ltd
Jacobs House
Shrewsbury Business Park
Sitka Drive
Shrewsbury
Shropshire
SY2 6LG

F.A.O. David Howells

ORDER No Jacobs UK\60PO8082\00000010 Job No TRAC16/07233/01

DATE OF RECEIPT 18 July 2016

PROCEDURE AV Calibration Engineer's Handbook section 2

[881]

IDENTIFICATION Sound Calibrator 01dB type Cal21 serial number 34634250(2013) with one-inch housing and adapter type BAC21 for half-inch microphone

CALIBRATED ON 01 August 2016

CERTIFICATE OF CALIBRATION

ISSUED BY AV CALIBRATION

Date of issue 03 August 2016 Certificate N° 1608412

AV Calibration
2 Warren Court
Chicksands, Shefford
Bedfordshire SG17 5QB
U.K.
Tel: +44 (0)1462 638600
Fax: +44 (0)1462 638601
Email: lab@avcalib.co.uk
www.avcalibration.co.uk
Acoustics Noise and Vibration Ltd trading as AV Calibration

Page 1 of 3 Pages

Signed [redacted]

G. Parry [✓]
B. Baker [ ] J. Hardman [ ]

CLIENT	Jacobs Ltd Jacobs House Shrewsbury Business Park Sitka Drive Shrewsbury Shropshire SY2 6LG
F.A.O.	David Howells
ORDER No	Jacobs UK\60PO8062\00000010 Job No TRAC16/07233/03
DATE OF RECEIPT	18 July 2016
PROCEDURE	AV Calibration Engineer's Handbook section 25

[8521]

IDENTIFICATION	Sound level meter 01dB type DUO serial No 10154 connected via its internal preamplifier to a half-inch microphone type GRAS 40CD serial No 136891 fitted with a 'short' foam windshield. Associated calibrator 01dB type Cal21 serial No 34634250(2013) with a one-inch housing and adapter type BAC21 for half-inch microphone.
CALIBRATED ON	03 August 2016

Werkszeugnis DIN EN 10204/3.1
Inspection certificate
Certificat d'usine

CERTIFIED
DIN EN ISO 9001
NR 70100222
CERTIFICADO

Lufft

Smart Weather Sensor

Model type	WS600
Serial number	309.1114.0701.040

This is to certify, that this Lufft product has been tested according to the QM of the G. LUFFT Mess- und Regeltechnik GmbH manual in accordance with DIN EN ISO 9001. Ordering specifications are complied with. Execution of instruments / systems as well as testing of accuracy was carried out following LUFFT quality assurance procedures. Quality inspection was successfully passed. This Lufft product has been calibrated according to specifications using references traceable to international standard units administrated by the national metrology institutes like PTB, NIST, NPL or other recognized national standard laboratories.

Measurements

	Reference value	*Actual value*	*Status*
Relative humidity	50,0 %	50,2 %	✓
Temperature	5,99 °C	5,86 °C	✓
Air pressure	993,3 hPa	993,3 hPa	✓

Precipitation

	Reference value	*Actual value*	*Status*
Drop size small	0,115 mm	0,116 mm	✓
Drop size medium	0,670 mm	0,671 mm	✓
Drop size large	2,730 mm	2,678 mm	✓

Wind direction and speed

Angular deviation (0°...360° in steps of 22,5°)

	2,0 m/s	*5,0 m/s*	*10,0 m/s*	*20,0 m/s*	*50,0 m/s*	*Status*
RMSE	1,0°	0,3°	0,6°	0,6°	1,0°	✓

Wind speed

	2,0 m/s	*5,0 m/s*	*10,0 m/s*	*20,0 m/s*	*50,0 m/s*	*Status*
RMS	2,0 m/s	5,0 m/s	10,0 m/s	19,9 m/s	49,9 m/s	✓

This test certificate may not be reproduced other than in full except with the permission of the exhibiting company. Test certificates without signature and seal are not valid.

Datum *Date*	Qualitätssicherung *Quality control*	Bearbeiter *Person in charge*
	[redacted]	[redacted]
09.12.2014	i. V. Rolf Großmann	i. A. Rosalia Massimo

ANV MEASUREMENT SYSTEMS

CERTIFICATE OF CALIBRATION

UKAS CALIBRATION 7623

Date of Issue: 22 December 2016

Certificate Number: UCRT16/1372

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 3 Pages

Approved Signatory

[redacted]

M. Breslin [ ] K. Mistry [ ] J. Harriman [✓]

Customer	ANV Measurement Systems Beaufort Court 17 Roebuck Way Milton Keynes MK5 8HL

Order No.	ANV MS Hire			
Description	Sound Level Meter / Pre-amp / Microphone / Associated Calibrator			
Identification	*Manufacturer*	*Instrument*	*Type*	*Serial No. / Version*
	Rion	Sound Level Meter	NL-32	01193084
	Rion	Firmware		1.400AN1003
	Rion	Pre Amplifier	NH-21	31085
	Rion	Microphone	UC-53A	315704
	Rion	Calibrator	NC-74	34536109
		Calibrator adaptor type if applicable		NC-74-002

Performance Class 1

Test Procedure TP 2.SLM 61672-3 TPS-49

Procedures from IEC 61672-3:2006 were used to perform the periodic test.

Type Approved to IEC 61672-1:2002 No Approval Number

If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2003

Date Received 21 December 2016 ANV Job No. UKAS16/12240

Date Calibrated 22 December 2016

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1:2002 because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002 and because the periodic tests of IEC 61672-3:2006 cover only a limited subset of the specifications in IEC 61672-1:2002.

Previous Certificate	*Dated*	*Certificate No.*	*Laboratory*
	13 November 2015	UCRT15/1304	7623

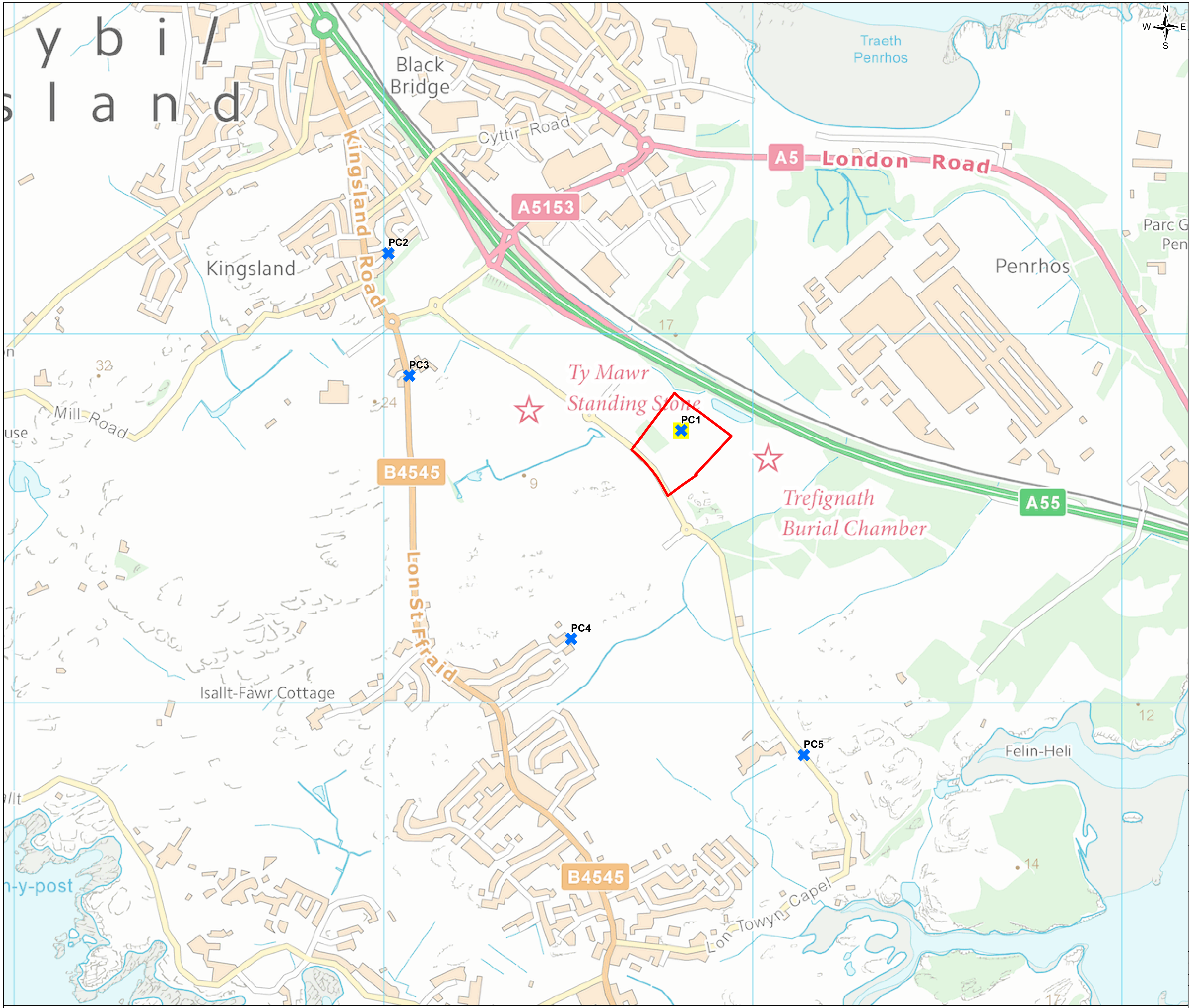
Appendix C Measurement locations

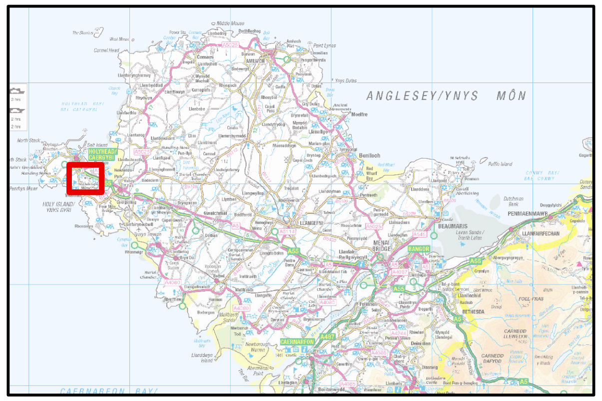
Figure 1: Location of monitoring at Parc Cybi

FIGURE 1

Legend

- Logistics Centre
- Noise monitoring locations
- Meteorological monitoring locations





Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	AUG 17	Initial Issue	AD	DH	GH	RB

Client

HORIZON NUCLEAR POWER

Project

WYLFA NEWYDD PROJECT
ENVIRONMENTAL STATEMENT

Drawing Title

LOGISTICS CENTRE
NOISE AND METEOROLOGICAL MONITORING LOCATIONS

Scale @ A3	1:10,000	DO NOT SCALE
Jacobs No.	60PO8077	
Client No.		

Drawing No.

60PO8077_DCO_VOL_B_APP_06_01_01

Appendix D Time History Graphs

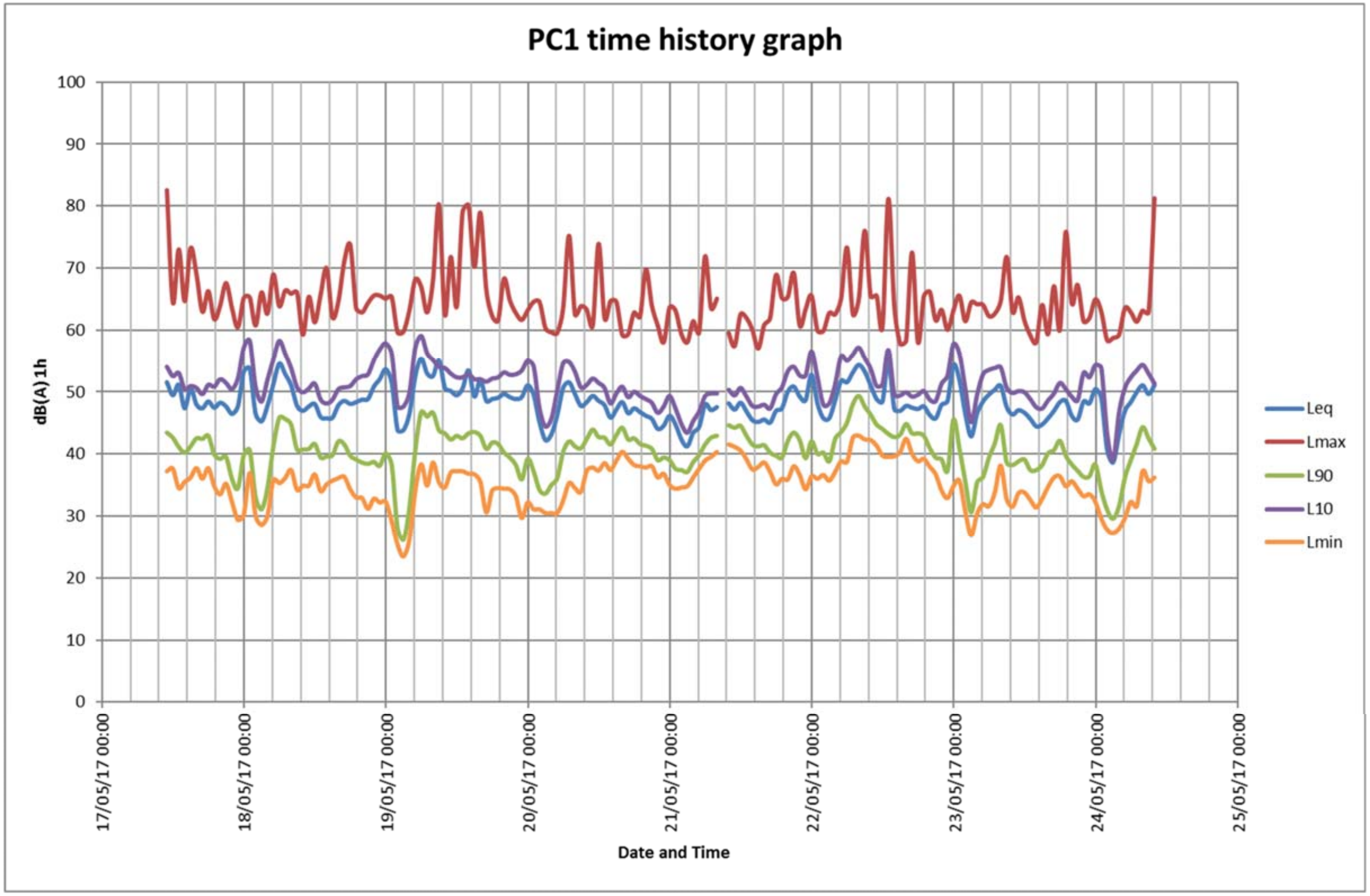


Figure 2: Time history of noise levels measured at PC1

Appendix E Distribution of $L_{A90, T}$ Noise Levels

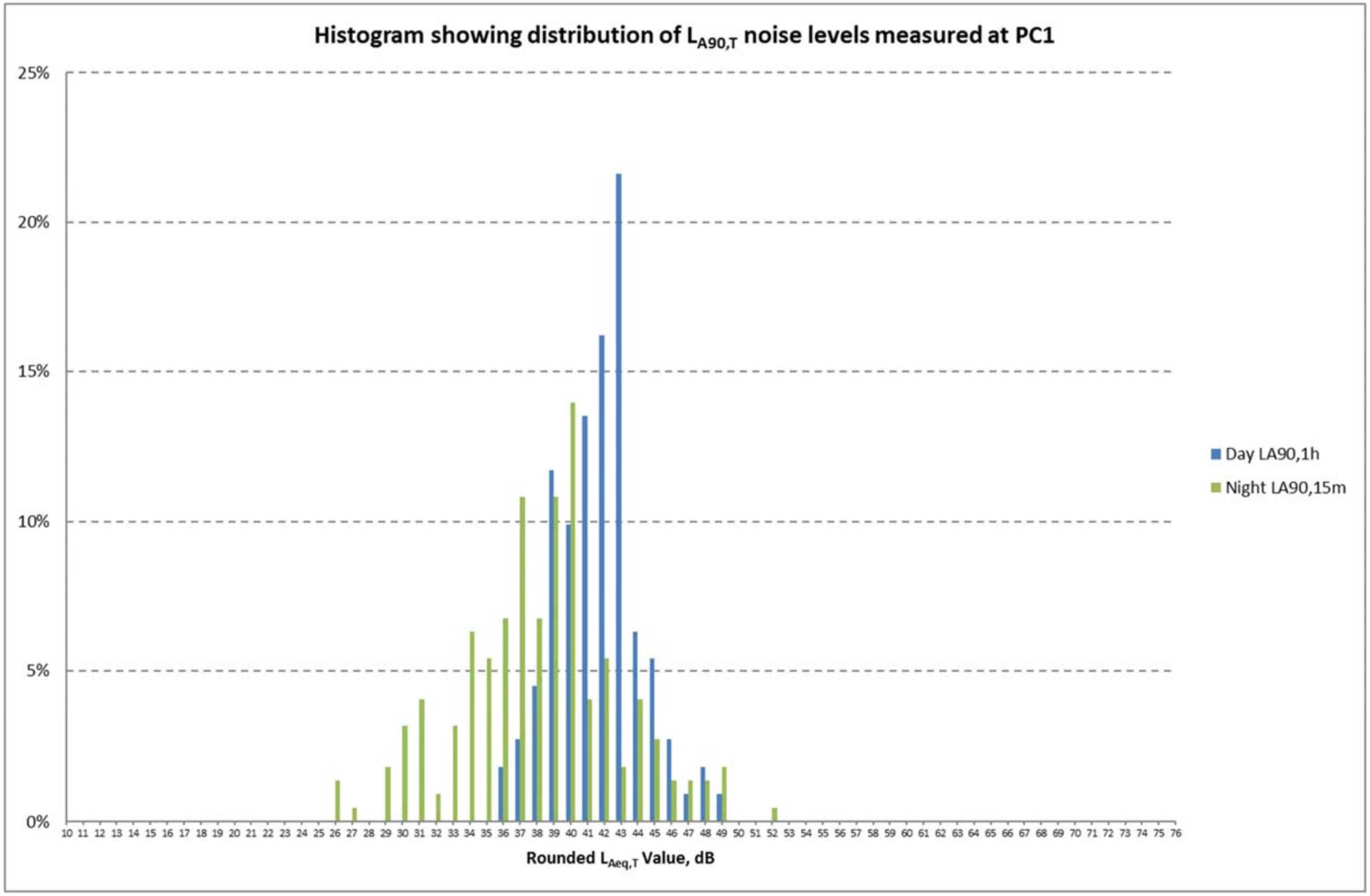


Figure 3: Histogram showing distribution of $L_{A90,\,T}$ noise levels measured at PC1