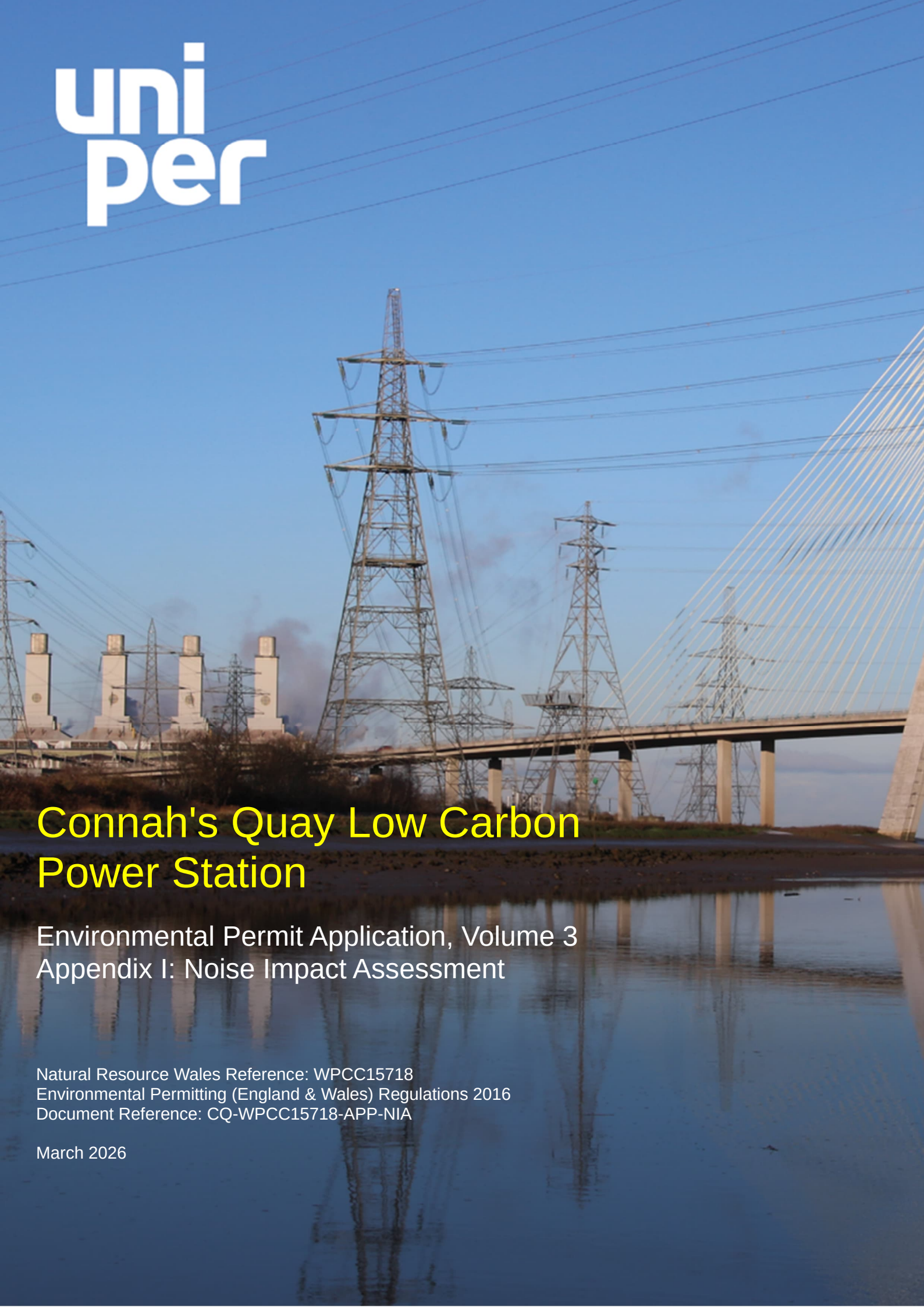

Connah's Quay Low Carbon Power Station

Environmental Permit Application, Volume 3 Appendix I: Noise Impact Assessment

Natural Resource Wales Reference: WPCC15718
Environmental Permitting (England & Wales) Regulations 2016
Document Reference: CQ-WPCC15718-APP-NIA

March 2026

Prepared for:

Uniper UK Limited

Prepared by:

AECOM Limited

Table of Contents

Figures

Tables

1. Synopsis

This Noise Impact Assessment (NIA) has been prepared by AECOM on behalf of Uniper, referred to as 'the Operator', in support of a new Environmental Permit application for the proposed Connah's Quay Combined Cycle Gas Turbine (CCGT) with Carbon Capture Plant (CCP), referred to as the 'Proposed Installation'. The Proposed Installation is positioned on the south bank of the River Dee in northeast Flintshire.

It should be noted that the Environmental Permit application and consequently this NIA is being carried out prior to completion of detailed design of the plant. As such, some worst-case assumptions have been applied to the assessment, which may lead to an over-prediction of the potential impacts. At the detailed design stage, Best Available Techniques (BAT) for noise mitigation control will be identified and applied to the plant design. Following detailed design, it is proposed that this NIA assessment be reviewed, updated, and resubmitted to Natural Resources Wales (NRW), if required, through a pre-operational condition to be included in the Environmental Permit.

The NIA has been prepared following NRW's *Noise and Vibration Management: Environmental Permits* guidance and Method implementation document (MID) for BS 4142[1]. The BS 4142:2014+A1:2019 '*Methods for rating and assessing industrial and commercial sound*' (BS 4142)[2] assessment has considered the existing Power Station, the proposed installation and the combined existing Power Station and Proposed Installation, as requested by NRW .

The focus of the NIA has been on the potential effects of operational sound upon the nearest residential Noise Sensitive Receptors (NSRs) to the Proposed Installation.

The assessment comprises the following:

- Review of baseline surveys undertaken in April and May 2024 as part of the Environmental Impact Assessment (EIA) to support the Development Consent Order (DCO) for CQLCP (Connah's Quay Low Carbon Power Project | National Infrastructure Planning);
- Review of baseline surveys undertaken in July 2024 during a maintenance shutdown at the existing Connah's Quay Power Station;
- Review of previous noise assessments and noise surveys submitted as part of the existing Environmental Permit for Connah's Quay Power Station;
- BS 4142 assessment of the existing Power Station, the Proposed Installation, and the combined simultaneous operation of the existing Power Station and Proposed Installation (i.e. worst-case scenario future operation). This includes consideration of the context of the ambient/residual sound climate and the recent diurnal operational pattern of the 4 units of the existing Power Station;
- Proposal of options to prevent or reduce noise impact, in line with BAT or appropriate measures.

A sound propagation model has been created using CadnaA to provide a 3D representation of the Proposed Installation.

In accordance with BS 4142, the representative *background sound levels* at NSRs have been compared against the predicted operational *rating levels* (the *specific sound levels* with character correction).

The initial BS 4142 assessment indicates a potential significant adverse impact for the existing Power Station, before context considerations.

[1] Environment Agency, Natural Resources Wales and Northern Ireland Environment Agency, (2023) Method implementation document (MID) for BS 4142

2 British Standards Institute (2014) BS 4142:2014+A1:2019 – Methods for rating and assessing industrial and commercial sound

The initial BS 4142 assessment for the Proposed Installation, indicates potential for significant adverse impacts at NSRs R20, R21, R22 and R23 when the *rating level* is compared to the *background sound level* without contribution from the existing Power Station, before the context considerations.

In comparison to the *rating levels* for the existing Power Station (38-47dB), the levels for the Proposed Installation (35-45 dB) are broadly similar in magnitude.

For the scenario of the existing Power Station and Proposed Installation operating simultaneously, there is the potential for significant adverse impacts. However, this is a very worst case scenario with all plant operating at maximum capacity, whereas in reality both the existing Power Station and Proposed Installation will not be both fully operational at the same time. It is probable that the number of generating units on the existing Power Station would reduce significantly once the first unit of the Proposed Installation becomes operational. At this stage the final combined operations are not yet confirmed.

The context of the existing industrial and road traffic sound, which all contribute to the overall acoustic environment, is also taken into consideration.

Mitigation proposed in Section 7 of this report follows the principles of BAT. With the mitigation measures incorporated into the design, a *rating level* of no greater than 45 dB for the Proposed Installation is predicted. This is similar in magnitude to *rating levels* that have arisen in recent years from operation of the existing Power Station. Taking into consideration this context and the influence of road traffic noise it is considered that the Proposed Installation sound source could potentially result in an adverse, but not significant impact on nearby NSRs. However further assessment will be undertaken during the detailed design phase to confirm the proposed mitigation and updated BS 4142 assessment.

During the detailed design stage for the Proposed Installation, the Operator will continue to explore opportunities to reduce the *rating levels* further.

This NIA has been used to develop an initial Noise Management Plan (NMP) for the Proposed Installation (Reference: CQ-WPCC15718-APP-NMP in Environmental Permit Application, Volume III, Appendix G).

2. Introduction

2.1 Background

AECOM has been commissioned by Uniper to undertake a Noise Impact Assessment (NIA) to support a bespoke Environmental Permit application for the proposed Connah's Quay Combined Cycle Gas Turbine (CCGT) with Carbon Capture Plant (CCP), henceforth, Proposed Installation'.

The Proposed Installation will be located to the west of the existing Connah's Quay Power Station.

This report presents the results of the NIA and a BS 4142:2014+A1:2019 '*Methods for rating and assessing industrial and commercial sound*' (BS 4142)[3] assessment at nearest noise sensitive receptors (NSRs).

The Proposed Installation will provide capacity to capture carbon emissions from the gas turbines to help decarbonise the United Kingdom's (UK) energy sector and ultimately assist transition towards net zero.

It is recognised that at the time of writing, there are currently two competitive FEED designs under consideration by the Applicant and the design of the Proposed Installation will continue to be refined until the completion of the detailed design stage. A number of the design aspects and features of the Proposed Installation cannot be confirmed until the Principal Contractor(s) have been appointed. Uniper will confirm the final technology selected as part of Permit pre-operational conditions. As such where possible, conservative or worst-case assumptions have been used in this application to potentially minimise any updates required.

2.2 Proposed Installation

The design of the Proposed Installation is subject to ongoing technical studies to provide flexibility and to align with the current grid connection but it is expected to comprise the development of two CCGT units achieving a net electrical output capacity of up to 1,380 megawatts (MW; referred to as MWe for electrical output) onto the national electricity transmission network.

The Proposed Installation will generate electricity from combustion of natural gas within a CCGT. Hot exhaust gas from the combustion process will be used to drive the gas turbine (GT), and steam which will be generated from the heat of the exhaust gas, in the heat recovery steam generator (HRSG), which will then be used to drive the steam turbine (ST). The exhaust gas will then pass through pre-treatment stages, including selective catalytic reduction (SCR) using ammonia (NH_3) to reduce oxides of nitrogen (NOx) in the gas and subsequently cooled via a direct contact cooler (DCC), in the CCP. The CCP will use an amine-based solvent to absorb carbon dioxide (CO_2) from the exhaust gas within a packed column (absorber), via a weak acid-base reaction. The CO_2-depleted exhaust gas then passes through water and acid wash sections and is released to atmosphere via an absorber emissions stack. Continuous emissions monitoring (CEMs) equipment will be located within the stack to monitor pollutants to air.

The CO_2-rich solvent exits the absorber, and passes through a lean/rich heat exchanger, and then into the desorber. The CO_2 is liberated from the solvent by heat, supplied by low pressure steam from the HRSG in normal operation. This steam is supplied to the desorber reboiler. The now lean/rich solvent will be recirculated within the plant. The CO_2 rich vapour exits the top of the desorber, and passes through a reflux stage to maximise solvent-CO_2 separation. The CO_2 vapour is conditioned to reduce water and oxygen to transport and storage network's specifications, after entering a low-pressure compressor to compress the gas to the export pipeline pressure (8-43 Bara). The CO_2 is then metered and exported to the transport and storage network's CO_2 pipeline which is operated by ENI. The solvent will accumulate impurities over time, and these will be removed via a solvent reclaiming process which will be a thermal process, either continuously via a slipstream or as a batch process.

[3] British Standards Institute (2014) BS 4142:2014+A1:2019 – Methods for rating and assessing industrial and commercial sound

The CCP emissions will be residual pollutants from the combustion and treatment processes, including NOx, NH_3, and carbon monoxide (CO). The CCP will be designed to capture a minimum of 95% of the CO_2 emissions from the CCP as an annual average of all normal operating conditions. There may also be trace pollutants within the flue gas, including trace levels of solvent and solvent break-down products from within the process. Emissions will be minimised using the water and acid wash steps on the absorber and monitored at the emission point within the abated flue gas stack prior to release. In addition to the CCP emission point, there will be an intermittent-use emission point from the stack serving the HRSG exhaust. Emissions from the CCP stack, and HRSG stack will meet the emission limits for LCP under the Industrial Emissions Directive (IED).

Other supporting infrastructure and plant for the Proposed Installation will include the storage of solvent, caustic soda, sulphuric acid and water-treatment chemicals, demineralisation water treatment plant to produce high-purity water for use in boilers, blending, closed loop cooling and other processes. It will include an electric auxiliary boiler for start-up and dispatchability support, emergency diesel generator(s) for safe-shutdown during a power failure scenario, closed surface water drainage and appropriate treatment facilities, and infrastructure for natural gas import and conditioning and CO_2 conditioning and export. The number and thermal rating of the emergency generator(s) will be determined during detailed design and may be classed as medium combustion plant (MCP).

The Proposed Installation will also be supported by natural gas supply, existing potable water supply, existing water abstraction and discharge, electrical connections, utilities, access works and CO_2 export connection. The water abstraction for the Proposed Installation's cooling system will be in line with the extraction at the existing Connah's Quay Power Station and is not expected to exceed the current abstraction permit requirements. Process water and/or wastewater from the site will also be discharged to the existing Connah's Quay Power Station lagoon before being purged into the River Dee.

The Proposed Installation will make use of CO_2 transport and storage networks owned and operated by Liverpool Bay CCS Limited, currently under development as part of the HyNet Carbon Dioxide Pipeline Project (referred to as the 'HyNet CO_2 Pipeline Project'), which will transport CO_2 captured from existing and new industries in North Wales and North-West England, as well as from new hydrogen production facilities that are proposed as part of HyNet North West Project. The captured CO_2 will be stored in depleted offshore gas reservoirs in Liverpool Bay.

A high-level process flow diagram for the Installation is provided in Volume IV of the permit application.

The Proposed Installation will be designed to optimise the capture of CO_2 when operating in dispatchable mode, while minimising emissions and waste generation and maximizing energy efficiency. Best Available Techniques (BAT) assessments have been prepared to demonstrate the Proposed Installation will be designed and operated in accordance with BAT for Large Combustion Plant (LCP), Energy Efficiency (EE), Post-Combustion Carbon Capture (PCC) plant design and cooling. Full details of the proposed installation's technology and processes are provided in Section 4 of the Supporting Statement (Document Reference: WPCC15718/APP/SS, Environmental Permit Application, Volume II).

2.3 Existing Site Operations

The existing CCGT Power Station became operational in 1996 with a 1420 MW output capacity. The existing Power Station is fuelled by natural gas. It was built to replace an older coal fired Power Station.

The existing Power Station is operated under an Environmental Permit (permit number EPR/NP3037AF). Clause 3.4.3 Environmental Permit states:

'The operator shall carry out a noise monitoring and assessment exercise from the site (over a calendar year) at the nearest sensitive receptors during the day and night-time hours as per BS4142:2014 at least every 4 years. A full report together with any recommendations shall be submitted to Natural Resources Wales as soon as reasonably practicable following the report being made available.'

The existing Power Station has been required to undertake regular (every 4 years) noise monitoring at locations around the site. Uniper Technologies undertake the monitoring and copies of recent reports have been reviewed to determine the existing specific sound levels from the existing site operations and to provide context of the area. Copies of the previous monitoring reports can be found in Appendix A.

Uniper investigate all noise complaints received and keep a log of complaints and any actions taken, through their existing Environmental Management System (EMS). Noise from day-to-day operations on the existing Power Station is well controlled and there have been no recent noise complaints. Over the operational lifetime of the existing Connah's Quay Power Station there have been three complaints, which were associated with the cooling towers, these were investigated and mitigated accordingly.

2.4 Scope of Assessment

The assessment comprises the following items:

- Review of baseline surveys undertaken in April and May 2024 as part of the Environmental Impact Assessment (EIA) to support the DCO for CQLCP (Connah's Quay Low Carbon Power Project | National Infrastructure Planning).
- Review of baseline surveys undertaken in July 2024 during a maintenance shutdown at the existing Connah's Quay Power Station.
- Review of previous noise assessments and noise surveys submitted as part of the existing Environmental Permit for Connah's Quay Power Station.
- BS 4142 assessment of the existing Power Station, the proposed plant, and the combined existing and Proposed Installation (i.e. worst-case scenario future operation). This includes consideration of the context of the ambient/residual sound climate and the recent diurnal operational pattern of the 4 units of the existing Power Station.
- Presentation of options to prevent or reduce noise impact, in line with BAT.

3. Assessment Locations

The Proposed Installation is situated on the south bank of the River Dee, approximately 0.6 kilometres (km) north-west of the town of Connah's Quay in Flintshire, north-east Wales. The surrounding area is a mixture of residential and industrial. Residential estates are to the south, whereas Deeside Industrial Park and Tata Steel UK Limited are to the east. Beyond the industrial facilities, the wider area is largely agricultural.

Key NSR locations, have been identified based upon knowledge of the local area and professional judgement. It is considered that if noise and vibration levels from the Proposed Installation are suitably controlled at these receptors, then noise and vibration levels will be suitably controlled at other more distant sensitive receptors in the surrounding area.

For the purposes of this assessment the NSR numbering from the DCO ES Chapter 9 Noise and Vibration have been retained. Measurements conducted by Uniper Technologies are labelled as "UP X".

The representative NSRs used in this assessment are shown in Table 1 along with the distance to installation.

Table 1 Key Representative Noise Sensitive Receptors

Receptor ID	Name	Receptor Type	Distance to the Installation Boundary (m)
R19	Glantraeth Farm	Residential	50
R20	Rockliffe Lane Properties	Residential	95
R21	Kelsterton Road Properties (west)	Residential	22
R22	Wenlo / The Sheiling, Kelsterton Road	Residential	67
R23	Cae Coch Cottages, Kelsterton Road	Residential	33
R24	Kelsterton Farm	Residential	190
R25	The Coach House / Kelsterton Hall	Residential	82
R26	Perenna Court Properties	Residential	185
R28	Kelsterton Lodge / 85-105 Kelsterton Road	Residential	160
R29	66-102 Kelsterton Road	Residential	110
R30	36-64 Kelsterton Road	Residential	400
R31	2-34 Kelsterton Road	Residential	620

Note: Receptor ID is retained from DCO ES Chapter 9. R1-R18 are further away from the proposed installation. R27 and R32 are education facilities and have not been included in the BS4142 assessment.as BS 4142 states it is for assessing premises for residential use only.

The closest NSRs to the Installation are R19, R21, R22 and R23. The existing noise climate at these NSRs consists of the current operations at the existing Connah's Quay Power Station, contributions from other industrial uses in the area (Tata Steel, Deeside Industrial Estate, Oakenholt Recycling centre and Essity UK (paper mill), road traffic noise from A458 and railway noise. The surrounding ground type and cover between the Proposed Installation and the receptors primarily comprise local roads, railway line and open space (gardens and fields).

4. Methodology

4.1 Baseline Sound Surveys

General Methodology

A range of noise surveys were also undertaken in April and May 2024 as part of the Environmental Impact Assessment (EIA) to support the DCO application for the Proposed Development at locations representative of the nearest NSRs. The existing Power Station was included in the *background sound levels* as specified by the Planning Inspector in the scoping opinion. A BS 4142 assessments carried out for an Environmental Permit variation would require a *background sound level* to be established without the contributions from the existing Power Station. Although the Proposed Installation will have a new bespoke permit which is separate to the existing Power Station, during pre-consultation NRW have requested that the assessment include consideration of a *background sound level* (L_{A90}) without the existing Power Station operational.

Each of the 4 units of the existing Power Station operate independently and flexibly in response to the UK energy market and various processes on the existing Power Station operate continuously 24 hours a day, 7 days a week. There was a planned maintenance shut down between 08 and 10 July 2024. Therefore, noise monitoring was undertaken during this period to establish the background sound level without the presence of the existing Power Station.

The monitoring procedures followed guidance from British Standard (BS) 7445-1:2003 *Description and measurement of environmental noise - Part 1: Guide to quantities and procedures*[4] (herein referred to as BS 7445).

All measurements were taken at approximately 1.5 m above ground level and were positioned at least 3.5 m from any acoustically reflecting surface, other than the ground (i.e. free-field measurements). Each sound level meter was set to log the $L_{AF10,15mins}$, $L_{Aeq,15mins}$, $L_{AF90,15mins}$ and L_{AFmax} parameters. A weather station was set up at one of the unattended monitoring locations The weather conditions were used to exclude data collected when wind and precipitation were outside parameters set out in the relevant guidance documents including BS 7445 and BS 4142.

During the planned maintenance shutdown in July 2024, unattended measurements were undertaken at locations representative of key NSRs for a period of approximately 48 hours. The unattended sound level meter was housed in a weatherproof box with batteries to power the instrument for the measurement duration. Appropriate outdoor all-weather equipment was used on all microphones. Observations were made of existing sound sources at set up and collection of the sound level meters. A weather station was set up at location LT1 to monitor wind speed, wind direction and rainfall. Short-term attended measurements and observations were also undertaken at LT4, which have not been included in this assessment as this location is representative of NSRs further away from the Installation.

Surveyors made observations during night-time to understand the noise sources at the measurement locations, which are detailed in Table 17 in Appendix A.

4.2 Operational Sound Prediction and Assessment

Operational Sound Prediction

The predictions of operational sound from the Proposed Installation have been based on information provided by the Operator using concept engineering information.

The proposed plant sound power levels and the assumptions applied to the prediction methodology are detailed in Appendix B.

A three-dimensional sound propagation model has been developed using the modelling software CadnaA® Version 2025 to predict the levels of sound generated by the Proposed Installation. CadnaA® implements the prediction method *ISO 9613-2024 'Attenuation of sound during propagation outdoors*',

[4] British Standard (BS) 7445-1:2003 *Description and measurement of environmental noise - Part 1: Guide to quantities and procedures*

which has been employed to calculate sound levels at surrounding NSRs due to the Proposed Installation.

A digital terrain model created using publicly available ground elevation spot height data has been used to position buildings and other noise sources at the proposed heights relative to ground. Areas of acoustically soft (e.g. vegetation) and hard (e.g. concrete) ground have been identified from the Ordnance Survey (OS) MasterMap Topographic Layer and modelled accordingly.

The following sources of information have been reviewed and form the basis of the assessment:

- Surrounding area ground heights – data from the Environment Agency National LIDAR programme - downloaded from Open Survey Data;
- Ordnance Survey MasterMap Topography Layer of the Order limits and surrounding areas;
- Pre front end engineering design (FEED) Environmental Impacts Inputs Summary;
- Sound power level data from similar projects which have been reviewed by Uniper; and
- Proposed Installation layout plans.

The prediction method assumes that the prevailing wind direction is always from source to receiver, which is likely to overestimate sound from the plant for much of the time at the closest NSRs which are located to the south of the Proposed Installation given the prevailing wind is from the south-west.

BS 4142 Assessment

Based upon the predicted sound levels from the model, an assessment of potential impacts at nearby NSRs has been undertaken using the guidance in BS 4142.

A key aspect of the BS 4142 assessment procedure is a comparison between the *'background sound level'* in the vicinity of residential locations and the *'rating level'* of the sound source under consideration. The relevant parameters in this instance are as follows:

- *background sound level* – $L_{A90,T}$ – defined in the Standard as the "A-weighted sound pressure level that is exceeded by the residual sound for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels";
- *specific sound level* – L_s ($L_{Aeq,Tr}$) – the "equivalent continuous A-weighted sound pressure level produced by the *specific sound source* at the assessment location over a given reference time interval, Tr";
- *rating level* – $L_{Ar,Tr}$ – the "*specific sound level* plus any adjustment made for the characteristic features of the sound",
- *ambient sound level* L_a ($L_{Aeq,T}$) *"equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval*" and
- *residual sound level,* L_r ($L_{Aeq,T}$) *"ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that is does not contribute to the ambient sound, over a given time interval."*

BS 4142 requires that a one-hour assessment period is considered during the day (07:00 to 23:00) and a 15-minute assessment period at night (23:00 to 07:00). When in operation the sound produced by the Proposed Installation will be constant in nature. As the Proposed Installation may operate at any time of day or night, the predicted *specific sound levels* will be the same for both day and night. The predicted free-field operational *specific sound levels* at the NSRs have been predicted at a height of 4m, representative of a first-floor bedroom.

BS 4142 also allows for corrections to be applied based upon the presence or expected presence of the following at the receptor location:

- tonality: up to +6 dB penalty;
- impulsivity: up to +9 dB penalty (this can be summed with tonality penalty); and
- other sound characteristics (neither tonal nor impulsive but still distinctive): +3 dB penalty.

Once any adjustments have been made, the *background sound level* and the *rating level* are compared. The standard states that:

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

BS 4142 requires that the *rating level* of the sound source under assessment be considered in the context of the environment when defining the overall significance of the impact.

IEMA Guidelines for Environmental Noise Impact Assessment

The Institute of Environmental Management and Assessment's (IEMA) 'Guidelines for Environmental Noise Impact Assessment'[5] have been used to undertake an assessment of the impact of changes to the ambient /residual sound level at NSRs due to operation of the Proposed Installation. On the impact of noise level changes, paragraph 2.7 of the guidelines state "*For broad band sounds which are very similar in all but magnitude, a change or difference in noise level of 1 dB is just perceptible under laboratory conditions, 3 dB is perceptible under most normal conditions, and a 10 dB increase generally appears to be twice as loud. These broad principles may not apply where the change in noise level is due to the introduction of a noise with different frequency and/or temporal characteristics compared to sounds making up the existing noise climate. In which case, changes of less than 1 dB may be perceptible under some circumstances*." The IEMA Guidelines provide criteria for magnitude of impacts due to noise level changes, as shown in Table 2, and these have been used within this NIA in respect of predicted changes in ambient/residual sound levels with and without the Proposed Installation. This guidance has been used to help with the context as required by BS 4142 assessment.

Table 2 Categorising the Magnitude of the Noise Change

Magnitude Of Impact	Noise Change, (dB)
No Change	0
Low	0.1 to 2.9
Medium	3 to 4.9
High	>5

[5] Institute of Environmental Management and Assessment (IEMA). (2014). Guidelines for Environmental Noise Impact Assessment

5. Noise Monitoring Data, Equipment, Meteorology and Predictions

5.1 Previous Surveys

Uniper Permitting Surveys

The periodic noise impact assessment of the operation of the existing Power Station in November 2023 supplied to NRW, contains details of previous background level surveys results. Table 3 provides details of historic background L_{A90} levels that have formed the basis of the periodic BS 4142 assessments undertaken by Uniper Technologies.

Table 3 Summary of previous background L_{A90} sound levels

Receptor	Night Time Background Mean L_{A90} dB			
	Aug 2007	July 2012	July/Aug 2017	Representative Level
R21 Rockcliffe Cottages	36	34	***33***	***33***
R23 Cae Coch Cottages	35	35	**36**	**36**
R24 Kelsterton Farm	36	35	**35**	**35**
R28 102 Kelsterton Road	33	**33**	29	33

DCO Baseline Sound Levels

As part of the assessment for the DCO application, baseline sound surveys were undertaken in April and May 2024, whilst the existing Power Station was operational. Table 4 presents a summary of the baseline sound levels as reported in DCO ES Chapter 9 Noise and Vibration for the representative NSRs used in this NIA.

Table 4 Representative Ambient Sound Levels (L_{Aeq}) and Background Sound Levels (L_{A90}) as reported in DCO Chapter 9 Noise and Vibration

Monitoring Location*	Representative of NSRs	Time Period	$L_{Aeq,T}$ dB	Highest L_{Amax} dB	Representative $L_{A90,T}$ dB
LT1	R26, R27, R28, R29	Daytime	53	104	44
		Night-time	47	74	37
LT2	R19, R20, R21, R22, R23, R24, R25	Daytime	54	96	45
		Night-time	52	84	37
LT6	R33	Daytime	55	105	39
		Night-time	52	81	36
LT8	R30, R31	Daytime	57	89	45
		Night-time	54	87	35

5.2 Baseline Sound Surveys During Maintenance Shut-down

Sound level monitoring was undertaken at the locations described in Table 5 along with the NSRs they represent. For the purposes of this assessment the monitoring location and NSR numbering from the DCO ES Chapter 9 Noise and Vibration have been retained. Details of ongoing activities and noise

sources in the area were recorded whilst in attendance at the monitoring locations and around the Installation, with further details provided in Appendix A.

The unattended monitoring locations are shown on Figure 2 in Appendix A and the representative NSRs are shown on Figure 3 in Appendix A.

Table 5 Noise Monitoring Locations

Location	Description	Representative of NSRs	What 3 Words	Measurement Date/Times
LT1 – Coleg Cambria	Adjacent to the edge of Coleg Cambria campus.	R26, R28, R29	///Plotter.Prepared.Safe	08/07/2024 14:39 – 10/07/2024 09:59
LT8 - National Grid Deeside Substation	South of the National Grid Deeside Substation adjacent to the trainline at the opposite side of the tracks to R30 and R31.	R30, R31	///Homeward.Grasp.Claim	08/07/2024 15:15 – 10/07/2024 10:33
UP1 – Rockcliffe Cottages	Along Kelsterton Road to the west of Connah's Quay Power Station.	R19, R20, R21, R22	///Seasick.Icebergs.Bibs	04/07/2024 20:00 - 10/07/2024 10:30
UP2 – Cae Coch Cottages	Along Kelsterton Road to the west of Connah's Quay Power Station.	R23, R24, R24, R25	///Bloomers.Spaces.Topples	04/07/2024 20:00 - 10/07/2024 10:15

Sound Monitoring Equipment

The following equipment was used for the baseline noise surveys in July 2024.

Table 6 Sound Monitoring Equipment

Description	Manufacturer	Type	Serial Number	Locations Used
Calibrator	Brüel & Kjær	4231	3005464	All locations
Sound Level Meter	Rion	NL-52	00386762	LT6
Sound Level Meter	Rion	NL-52	00710387	LT1
Sound Level Meter	Rion	NL-52	00620964	LT8
Weather Station	Davis Vantage Vue Weather Station	DAV 6250	10-ML16081005	LT1
Sound Level Meter	Rion	NL-53	00630271	UP1
Sound Level Meter	Rion	NL-32	00451267	UP2
Calibrator	Brüel & Kjær	4231	1883787	UP1 & UP2

The above noise monitoring equipment has in-date accredited laboratory calibration certificates as shown in Appendix A. The sound level meters had their calibration checked in the field before and after conducting measurements. No significant drift was recorded as presented in Table 7. The accuracy of the calibrator can be traced to the National Physical Laboratory Standards.

Table 7 Sound Level Meter Calibration Results

Locations	Start Calibration	End Calibration
LT1	94.0	94.0
LT6	94.0	94.0
LT8	94.1	94.1

Locations	Start Calibration	End Calibration
UP1	Missed	93.6
UP2	93.7	93.6

Meteorological Conditions

The weather station positioned at monitoring location LT1 was used to monitor meteorological data throughout the duration of unattended surveys. Periods of rain from 03:39 – 10:54 and 20:39 - 22:24 on 10 July 2024 were excluded from the analysis. The wind direction was mostly from the west during the daytime periods on the 8th and 9th July. During the night-time period on 8/9th July the wind direction was mostly from the west, and during the night period on 9/10th July the wind direction was from the east.

Connah's Quay Power Station Operating Conditions

Unattended and attended baseline noise measurements were conducted in July 2024 whilst during a planned maintenance shut down at the existing Connah's Quay Power Station, although parts of the site was minimally operational. Surveyors visited the Uniper car park at Connah's Quay at approximately 15:00 and 23:00 on 08/07/2024. Although much quieter than observed during previous site visits, some plant processes were still operating to some degree since noises were audible in the form of a stationary, broadband noise. Surveyors contacted the site contact to understand to what extent the Power Station was operating. According to the Uniper site contact:

> "A*ll the main doors to the Boiler house were confirmed closed by the Operations Shift team.*
>
> *But there are residual processes that needed to continue to maintain the integrity of the plant – i.e. process pumps in the HRSG. Auxiliary boiler noise was noticeable at the gatehouse.*
>
> *There would be some low level of breakout from the main plant building, including from some open air inlet slots in the HRSG wall/roof – plus some essential ventilation fans*".

It is therefore understood that the Power Station processes were running as minimally as possible and that this low level of residual plant activity was persistent throughout the unattended measurement period. Uniper provided plant running status data which showed that the majority of normal Power Station processes were shutdown between 19:15 on 08 July 2024 and 09:15 on 10 July 2024. This has been used to filter the measurements so that only baseline measurements without the Power Station active are considered in this assessment.

Details of the survey locations, equipment used, full survey results, and observations recorded at the NSRs can be found in Appendix A.

Representative Residual Sound Levels

For the July 2024 survey undertaken during the whole site shutdown, representative *residual sound levels* (ambient sound levels without contribution from the existing power station) have been established for night-time periods based on reviewing the mean, mode, median and 90th percentile levels. Table 8 summarises the defined *residual sound levels* and *background sound levels* taken forward within this assessment for the NSRs in the vicinity of each noise monitoring location.

Table 8 Representative Residual sound levels (L_{Aeq}) and background sound levels (L_{A90})

Receptor	Monitoring Location	Night-time *Residual Sound Levels*, $L_{Aeq,T,}$ dB	Night-time *Background Sound Levels*, $L_{A90,T,}$ dB
R19	UP1	41	31
R20	UP1	41	31
R21	UP1	41	31
R22	UP1	41	31

Receptor	Monitoring Location	Night-time *Residual Sound Levels*, $L_{Aeq,T,}$ dB	Night-time *Background Sound Levels*, $L_{A90,T,}$ dB
R23	UP2	45	34
R24	UP2	45	34
R25	UP2	45	34
R26	LT1	37	29
R28	LT1	37	29
R29	LT1	37	29
R30	LT8	46	29
R31	LT8	46	29

At R21 and R23 (UP1 and UP2 monitoring locations), the selected representative L_{A90} levels are approximately 2dB lower than previously assumed background levels.

Wind direction data indicated that the wind direction was an easterly direction during the early morning periods of the 9th and 10th July 2024. Easterly winds are not common and may have influenced propagation of traffic noise and other industrial sources, possibly explaining why the July 2024 background sound levels were lower than in previous assessments.

5.3 Predictions

Existing Operational Sound Levels

As mentioned in Section 2.3, the permit for the existing Connah's Quay Power Station requires a noise impact assessment to be undertaken every 4 years. The most recent assessment was based on attended and continuous monitoring undertaken at NSRs in November-December 2023

However, prior to that the plant had experienced a number of complications associated with maintenance of the 40 hybrid cooling towers due to the coastal climate and estuary water. A variety of changes have been implemented by Uniper to increase cooling performance, improve reliability and reduce maintenance complications. Most significantly, in 2016 Uniper provided detailed noise assessments[6] to NRW to justify and demonstrate the consequence of removal of outlet silencers from tower cells in combination with upgrades to lower noise from fans.

Further information related to the historic operation patterns for the existing Power Stations relevant to the context of the noise climate is provided in Section 6.2.

The future operational pattern of the existing Power Station is not certain at this point, however should there be a phased construction of train 1 & 2 for the Proposed Installation one probable scenario is a reduction from 4 to 2 operational units, until the second train of the Proposed Installation is operational.

In this scenario, at the closest NSR to the existing Power Station, R23, Uniper's predictions indicate past and future operational sound levels from two-unit operation would range from approximately 41 to 45 dB (depending on which two units were generating).

For the purpose of the comparative BS 4142 assessment, the operational sound levels from the existing Power Station have been taken from the most recent noise monitoring and assessment reports prepared by Uniper in 2023[7].

During that survey, none of the four units were generating, but the cooling towers on three units were still running following earlier power generation. In addition, a separate cooling tower process which

[6] Uniper Technologies, September 2016, CONNAH'S QUAY POWER STATION: IMPACT ASSESSMENT OF OUTLET ATTENUATOR REMOVAL ON U3 AND U4 COOLING TOWERS, UTG/16/PMP/199/R Revision 1
[7] Uniper Technologies, 2024, CONNAH'S QUAY POWER STATION: ENVIRONMENTAL NOISE ASSESSMENT- Autumn Winter 2023, UTL/23/PSP/EC/3631/R

operates independently of the main unit cooling tower systems was operating. It is associated with the cooling of process water prior to being purged back into the estuary and typically operate continuously, irrespective of unit generation. These purge pond cooling towers are located near to R23 and, of the existing Power Station's sound sources, historically have been one of the most significant noise contributors at NSR R23.

Since it is relatively common for the existing Power Station to be in the process cooling state overnight, the NSR survey and equivalent modelling data from that survey is considered to be relevant to the Proposed Installation assessment.

The *specific sound levels* calculated from the 2023 survey levels have been used in the BS 4142 assessment in the following section as this is representative of this common operating scenario of the existing Power Station as shown in Table 9.

Table 9 Operational Sound Levels- Existing Power Station (Common Overnight Cooling Mode)

Receptor*	***Specific Sound level $L_{Aeq,Tr}$ dB From 2023 Survey***
R21 Rockcliffe	37
R22 Sheiling/Wenlo	39
R23 Cae Coch/ Woodfield 'Railway'	44
R24 Kelsterton Farm	38
R28 102 Kelsterton Road	35

* The receptor locations in the 2023 Uniper report have been matched with the receptor ID used in this report to allow comparison of NSRs.

5.4 The Proposed Installation Operational Sound Levels

As stated in Section 4, operational sound modelling has been undertaken using available sound level data for the Proposed Installation plant and information based on similar projects. As part of the operational assessment for the DCO EIA, AECOM modelled the Proposed Installation using concept engineering information in relation to the initial design parameters. The initial assessment indicated the potential for significant adverse noise impacts and exceedance of the proposed operational sound limit as stated in DCO ES Chapter 9.

Therefore, the proposed sound sources were ranked from highest to lowest, based on the level of impact at the most affected NSR (R21). The suggested attenuation shown in Table 10 were applied to the key noise emitting plant to minimise the impact. The predicted *specific sound levels* in Table 11 include these proposed reductions.

Table 10 Suggested attenuation of plant items/buildings

Plant Item	**Number of Item of Plant**	**Attenuation (dB)**
Flue Gas Blower	4	20
Cooling Tower	2	20
Cooling Make-up Tower	1	15
Make-up Transfer Pump	1	15
Rich Amine Pump	2	15
Knock Out Water Pump	4	15
Lean Amine Booster pump	2	15
cooling water pumps	6	15

Absorber Wash pump	4	10
Turbine Intake	2	10
Absorber acid wash pump	2	10
Lean Amine Circulation Pump	2	10
CO_2 Compression Walls	1	10
CO_2 Compression roof	1	10
HRSG Walls	2	10
Aux Cooling Water Pumps	1	10
CO_2 stripper reflux pump	1	10
HRSG Roof	2	10
DCC Backwash Pump	2	10
Gas Turbine Walls	2	10
Low Pressure Condensate Pump	2	10
Stripping Air Blower	2	10
Gas Turbine Roof	2	10
Absorber Stack	4	5
DCC Circulation Pump	2	10

In accordance with BS 4142 the daytime assessment considers a 1-hour period, and the night-time assessment considers a 15-minute period. As the Proposed Installation may operate at any time of day or night, the predicted specific sound levels will be the same for both day and night. No 'on-time' correction is applicable due to the continuous nature of the operation. The free-field operational *specific sound levels* are predicted at the first floor of the representative receptors. Assuming continual 24-hr operation, the predicted sound levels apply to both the 1-hour daytime and the 15-minute night-time BS 4142 assessment periods.

It is assumed the potential for sound of a tonal, impulsive or intermittent nature will be designed out of the Proposed Installation plant during the detailed design phase by the selection of appropriate plant, building cladding, louvres and silencers/attenuators as necessary.

The predicted free-field operational *specific sound levels* are the NSRs around the Proposed Installation are presented in Table 11.

Table 11 Predicted Operational Sound Levels- Proposed Installation

Receptor	***Specific Sound Level*** $L_{Aeq,Tr}$ **dB**
R19	34
R20	38
R21	42
R22	40
R23	40
R24	37
R25	36
R26	33
R28	32

R29	31
R30	31
R31	28

6. Sound Impact Assessment

6.1 BS 4142 Assessment Results

This noise impact assessment is undertaken for a new separate bespoke environmental permit for the operation of the Proposed Installation. However, in recognition of the presence of the existing Power Station, NRW have requested that the assessment also considers the operation of that plant when assessing the potential impact associated with the Proposed Installation. The existing Power Station and the Proposed Installation operations are presented individually and then combined to form a theoretical overall cumulative sound level.

The overall combined sound level from the two installations will be a very worst-case scenario, which is unlikely to occur as both the existing Power Station and the Proposed Installation will not both operate at full capacity at the same time. It is probable that the number of generating units on the existing Power Station would reduce significantly once the first train of the Proposed Installation becomes operational.

As previously discussed, NRW have requested that *background sound levels* without contributions from the existing Power Station operations are considered as part of the BS 4142 assessment.

The representative *background sound level* without contribution from the existing Power Station, and the *specific sound levels* for the existing Power Station and the Proposed Installation are stated in Section 5. The BS 4142 assessment focuses on the closest NSRs to the existing Power Station and Proposed Installation. As the existing Power Station and Proposed Installation can operate 24 hours a day, 7 days a week, the BS 4142 assessment is undertaken for the night-time period, as this is when *background sound levels* are lower. During day and evening periods when background L_{A90} and residual L_{Aeq} sound levels are higher, the impact from the installations would be lower.

The following tables present the BS 4142 assessment summary during the night-time period. The predicted *specific sound level* is rounded to whole decibels. The assessment is based on the difference between the representative *background sound level* and the predicted *rating level,* $L_{Ar,Tr}$ dB (i.e. the *specific sound level* $L_{Aeq, Tr}$ plus any character correction) at the NSR. Positive values in the table indicate an excess of the *rating level* over the *background sound level*.

Although tonal, impulsive or intermittent nature will be designed out, the inclusion of a +3 dB correction for other distinctive character has been included at this stage as a conservative approach. This has been applied for NSRs where the s*pecific sound level* is equal to or greater than the existing *background sound level*, as there is the potential to identify the new sound source in the existing acoustic environment.

Existing Power Station

Table 12 shows the initial BS 4142 assessment for the existing Power Station operation.

Table 12 Existing Power Station BS4142 Assessment

NSR	*Specific Sound Level* L_s ($L_{Aeq,Tr}$), (dB)	Acoustic Feature Correction, (dB)	*Rating Level* ($L_{Ar,Tr}$), (dB)	Representative *Background Sound Level* ($L_{A90,T}$), (dB)	Excess of *Rating Level* Over *Background Sound Level* ($L_{Ar,Tr}$ - $L_{A90,T}$), (dB)	BS 4142 Impact Category
R21	37	3	40	31	9	An indication of a significant adverse impact, depending on the context
R22	39	3	42	31	11	An indication of a significant adverse impact, depending on the context
R23	44	3	47	34	13	An indication of a significant adverse impact, depending on the context
R24	38	3	41	34	7	An indication of an adverse impact, depending on the context
R28	35	3	38	29	9	An indication of a significant adverse impact, depending on the context

The results in Table 12 for the existing operations indicate that there is potential for an adverse to significant adverse impacts at the closest NSRs due to the excess of *rating level* over the *background sound level*. However, as stated above, the existing Connah's Quay Power Station has been operational without significant public complaint for many years and is considered part of the existing sound climate.

Proposed Installation

Table 13 shows the initial BS 4142 assessment for the Proposed Installation.

Table 13 Proposed Installation BS4142 Assessment

NSR	*Specific Sound Level* L_s ($L_{Aeq,Tr}$), (dB)	Acoustic Feature Correction (dB)	*Rating Level* ($L_{Ar,Tr}$), (dB)	Representative *Background Sound Level* ($L_{A90,T}$), (dB)	Excess of *Rating Level* Over *Background Sound Level* ($L_{Ar,Tr}$ - $L_{A90,T}$), (dB)	BS 4142 Impact Category
R19	34	3	37	31	6	An indication of an adverse impact, depending on the context
R20	38	3	41	31	10	An indication of a significant adverse impact, depending on the context
R21	42	3	45	31	14	An indication of a significant adverse impact, depending on the context

R22	40	3	43	31	12	An indication of a significant adverse impact, depending on the context
R23	40	3	43	34	9	An indication of a significant adverse impact, depending on the context
R24	37	3	40	34	6	An indication of an adverse impact, depending on the context
R25	36	3	39	34	5	An indication of an adverse impact, depending on the context
R26	33	3	36	29	7	An indication of an adverse impact, depending on the context
R28	32	3	35	29	6	An indication of an adverse impact, depending on the context
R29	31	3	34	29	5	An indication of an adverse impact, depending on the context
R30	31	3	34	29	5	An indication of an adverse impact, depending on the context
R31	28	0	28	29	-1	Indication of low impact

The results in Table 13 for the Proposed Installation show a potential for significant adverse impacts at NSRs R20, R21, R22 and R23 when the *rating level* is compared to the *background sound level* without contribution from the existing Power Station. However, as the existing Power Station can operate 24 hours a day, 7 days a week with a constant noise source, the low *background sound levels* will only occur during full site outages which are extremely infrequent. When the predicted *rating level* for the Proposed Installation alone is compared to the existing *background sound levels* with the normal contributions from the existing Power Station, as reported in Chapter 9 of the DCO EIA, the maximum excess of rating level over the *background sound level* is 8 dB, which along with context considerations is not a significant impact.

In addition, it is informative to compare the *rating level* excesses for the Proposed Installation to those calculated for the current operation of the existing Power Station.

At R21, the *rating level* excess due to common overnight process water cooling operation of the existing Power Station is +9 dB and for the Proposed Installation is +13 dB

Conversely, at R23, the *rating level* excess due to common overnight process cooling operation of the existing Power Plant is +13 dB and for the Proposed Installation is +9 dB.

Existing Power Station and Proposed Installation Combined

Table 14 shows the initial BS4142 assessment for the theoretical scenario of the existing Power Station and Proposed Installation operating concurrently.

Table 14 Existing Power Station and Proposed Installation combined BS4142 Assessment

NSR	*Specific Sound Level* L_s ($L_{Aeq,Tr}$), (dB)	Acoustic Feature Correction, (dB)	*Rating Level* ($L_{Ar,Tr}$), (dB)	Representative *Background Sound Level* ($L_{A90,T}$), (dB)	Excess of *Rating Level* Over *Background Sound Level* ($L_{Ar,Tr}$ - $L_{A90,T}$), (dB)	BS 4142 Impact Category
R21	43	3	46	31	15	An indication of a significant adverse impact, depending on the context
R22	43	3	46	31	15	An indication of a significant adverse impact, depending on the context
R23	46	3	49	34	15	An indication of a significant adverse impact, depending on the context
R24	41	3	44	34	10	An indication of a significant adverse impact, depending on the context
R28	37	3	40	29	11	An indication of a significant adverse impact, depending on the context

Table 14 shows that when the operational sound levels from the existing Power Station and the Proposed Installation are combined there is the potential for significant adverse impacts. However, these are very worst-case scenarios with all plant operating at maximum capacity, whereas in reality the existing Power Station and Proposed Installation will not be both fully operational at the same time. At this stage the final combined operations are not yet confirmed.

The context of the area and the existing sound climate should be taken into consideration when determining the overall impact.

6.2 Considerations of Context

The existing Connah's Quay Power Station has been an operating industrial source in the study area since the original power station began operations in 1954, with the current CCGT operating since 1996. Additionally, on Connah's Quay Power Station site there was a gas treatment plant which was an additional industrial sound source in the area until 2023. This is likely to mean that residents currently living in the area are already accustomed to the sound of an additional industrial plant operating on the Proposed Installation.

Relevant contextual considerations include:

- Character of the existing ambient sound environment – this is dominated by existing infrastructure at and near the existing Connah's Quay Power Station (including National Grid substations), rail traffic and traffic on the local road network including the A548, B5129 and Chester Road. The Proposed Installation is unlikely to alter the character of the area;
- Historical context of the use of the area – since 1954 there have been industrial plant on the Connah's Quay Power Station site and the current CCGT has been operating since 1996;
- Lack of complaints – Noise from day-to-day operations on the existing Power Station is well controlled and there have been no recent noise complaints. Over the operational lifetime of the existing Connah's Quay Power Station there have been three complaints, which were associated with the cooling towers, these were investigated and mitigated accordingly.

- Operating scenario-, an assessment based on of all plant operating at full power at the same time is considered a robust worst-case scenario, and in reality, operational noise levels will be lower.

In relation to the existing noise climate, road traffic has a significant influence on the L_{Aeq} levels throughout both the daytime and night-time period. Welsh Government noise maps[8] indicate the NSRs nearest to the Proposed Installation (R19, R20, R21, R22 and R23) to be in the close vicinity of the 50 dB L_{Aeq} night-time prediction contour for road traffic noise. This is consistent with 52 dB L_{Aeq} measured during the long-term monitoring undertaken at LT2 near to R21 in April and May 2024 for the DCO ES assessment, as shown in Table 4.

Table 15 present the existing *residual sound levels* and future predicted specific sound levels during the operation of the Proposed Development at NSRs with reference to the IEMA impact guidance as set out in Section 4.2 and Table 2.

Table 15 Change in Residual L_{Aeq} Due To Night-Time Operation of Proposed Installation.

NSR	Existing Residual Sound Level $L_{Aeq,T,}$ (dB)	Predicted *Specific Sound Level*, Ls $L_{Aeq,T,}$ (dB)	Logarithmic Sum of Existing *Residual Sound Level* with Predicted *Specific Sound Level*, $L_{Aeq,T,}$ (dB)	Predicted Increase in *Sound Level* due to the Proposed Installation, $L_{Aeq,T,}$ (dB)	Magnitude of Impact of Noise Change Using IEMA Guidelines
R19	51.9	34.2	52.0	0.1	Low
R20	51.9	37.8	52.1	0.2	Low
R21	51.9	42.0	52.3	0.4	Low
R22	51.9	39.9	52.2	0.3	Low
R23	51.9	40.0	52.2	0.3	Low
R24	51.9	37.2	52.0	0.1	Low
R25	51.9	35.7	52.0	0.1	Low
R26	46.9	33.3	47.1	0.2	Low
R30	54.4	30.5	54.4	0.0	No Change

Table 15 shows that the predicted change in sound levels experienced at NSRs R19, R20, R21, R22, R23, R24, R25 and R26 would represent a low magnitude of impact during the night and R30 would have no change in the residual levels once the Proposed Installation is operational.

Additional insight into the local circumstances is gained by considering the magnitude of *specific/rating levels* from the Proposed Installation relative to the current range of levels due to operation of the existing Power Station. As indicated in Section 5.3, the existing 4 unit Power Station operates in various modes. It is rarely completely shutdown and typically there are cooling processes that operate overnight irrespective of whether a unit is generating power. Figure 1 shows the percentage of nights when the existing site was in a given operational state overnight between midnight to 5am. The 'none' and '1 or more' points on Figure 1 sum to 100% as these classifications cover all possible scenarios. The other points/lines provide a breakdown of the unit operation combinations behind the '1 or more' percentage.

[8] https://datamap.gov.wales/maps/new?layergroup=geonode:Environmental_Noise_Mapping_2022#/ (Environmental Noise Mapping 20222 – Road Traffic noise – all Roads (L_{night}) 2022 layer)

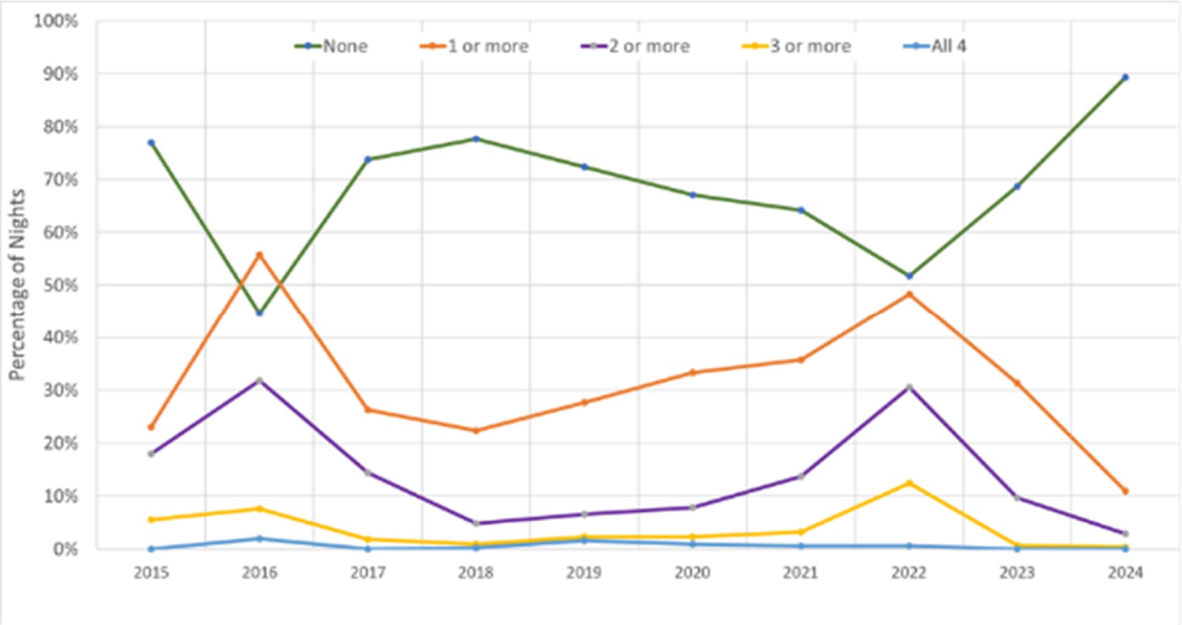

Figure 1 – Summary of Site Operational Pattern

Whilst it was usual in 2024 for there to be no units generating electricity overnight, the pattern of generation varies between years. In 2022 it was common for one or more units to be generating electricity (48% of the night-time periods) and 2 or more units operated overnight 31% of the time. The Uniper noise model predicts that for two existing units operating overnight, a *specific sound level* of 41 to 45 dB L_{Aeq} (depending on unit combination) would have arisen at the nearest NSR, R23.

It is considered important to take into account the fact that the existing Power Station has not resulted in any recent noise complaint during past operation. It is predicted that the *specific level* from the operation of the Proposed Installation would be similar to those that have arisen at NSR in the past due to the existing Power Station, hence a similar absence of complaint could be anticipated. Furthermore, the influence of road traffic across the daytime and night-time periods means that changes in ambient/residual L_{Aeq} are assessed as being of low impact.

Once adjusted for context, the initial indication of significant adverse impact has been changed to the Proposed Installation has the potential to give rise to an adverse, but not significant impact at the nearest NSR.

At the detailed design stage, opportunities to reduce the predicted specific sound levels for the Proposed Installation and review of the existing noise emissions will be further explored and are discussed in Section 7.

7. Noise Control

The Proposed Installation is being designed, to avoid or minimise impacts and effects of noise and vibration through the process of design development, and by embedding measures into the design including increased sound insulation and enclosure of plant and acoustic lagging, although additional and/or alternative solutions may be identified as the design evolves.

The operational assessment has assumed that potential sound of a tonal, impulsive or intermittent nature would be designed out of the Proposed Installation during the detailed design phase by the selection of appropriate plant, building cladding, louvres and silencers/attenuators as necessary.

Based on the predicted specific sound level at the closest NSR (R21), mitigation measures during the detailed design stage will be identified to control the operational noise to ensure compliance with a *rating level* equal to or less than 45 dB at the closest existing residential property. Further assessment and review will be undertaken to investigate the feasibility of reducing the sound emissions from the Proposed Installation as low as practicable through the application of BAT. These measures are summarised in Table 16.

During detailed design of the plant, it may be desirable or more practical to apply higher attenuation to some plant items/buildings than listed Table 10 in order to reduce the attenuation applied to other plant items/buildings and still achieve the operational sound criterion. Furthermore, during detailed design, an operational sound control scheme (including noise limits as agreed with the local authority) would be prepared and is secured by a Requirement of the draft DCO (EN010166/APP/3.1).

Table 16 Mitigation Measures and Best Available Techniques

Techniques	Description	Applicability
Eliminate	Review if the proposed plant and design and where possible remove unnecessary items from the scope of the design	This will be considered as part of the FEED stage.
Operational Measures	These include: • Inspection and maintenance of equipment • Closing of doors and windows of buildings and enclosed areas, where possible • Plant operated by experienced staff • Avoidance of noisy activities at night, if possible	These are part of good working practices at the installation.
Low-noise equipment	Select low noise equipment where possible	When equipment is new or being replaced. Where practicable low noise equipment will be procedure for the Proposed Installation.
Noise Attenuation	• These include: • use of screening or bunding to shield receptors from noise sources; • reducing the breakout noise from plant through the use of enhanced enclosures, or potentially containing them within a building; • screening or enclosing the compressors or other equipment;	Consideration of screening where required and the layout of the Proposed Installation has incorporated consideration for the potential of noise impact to occur, within the constraints of the plot plan.

Techniques	Description	Applicability
Noise Control Equipment	• This includes: • reducing air inlet noise emissions by the addition of in-line attenuation; • reducing stack outlet noise emissions by the addition of silencers or sound proofing panels; • reducing noise emissions by screening, re-sizing, fitting low noise fans or attenuation; • use of anti-vibration supports and interconnections for equipment;	To be considered during the during the detailed design of the Proposed Installation.
Appropriate Location of Equipment and buildings	Orientation of plant within the Installation to provide screening of ground level noise sources by other buildings and structures, or orientating fans and the air inlets away from sensitive receptors.	This is generally applicable to new plant and has been considered during the development of the Proposed Installation and will continue to be considered during the detailed design.

Throughout the development of the Proposed Installation, practical measures to mitigate noise will be incorporated into the design as detailed above and where the implementation of mitigation on proposed plant may be prohibitive, and use of BAT will be taken in to account.

Uniper will continue to investigate noise complaints, keeping a log of the complaint and any actions taken. In addition, an initial Noise Management Plan has been prepared to support the Environmental Permit application.

8. Assessment Uncertainty

As outlined previously, the operational noise is assessed against the background sound levels obtained in July 2024 during a planned maintenance shut down. There are inherent uncertainties involved with the use of any measurement survey data, due to the general variation in area activities on different occasions and meteorology influenced propagation conditions. The BS 4142 assessment has used the night-time *background sound levels*, as this is quietest period and less influence from other external noise sources such as road and rail noise.

Any sound level predictions have an associated degree of uncertainty. Modelling processes have been carried out in such a way to reduce such uncertainty, by using indicative design layout and maximum heights for structures and noise sources. In particular, the following sources of uncertainty have been noted:

- Sound levels for each sound source have been provided by the design team based on preliminary worst-case data and from similar projects and would be further updated during detailed design;
- The octave band spectra have not been available for each sound source so data have been taken from the same or similar plant items from other similar projects; and
- Predictions of sound pressure levels according to ISO 9613-2 are based on moderate downwind propagation from sound source to receptor and can therefore be considered as a reasonable worst-case prediction with respect to wind speed and direction. The standard indicates an estimated accuracy of ±3 dB(A) in predicted levels at the distances and heights relevant to this assessment.
- For the scenario of the existing Power Station and Proposed Installation operating simultaneously, is a very worst-case scenario with all plant operating at maximum capacity, whereas in reality both the existing Power Station and Proposed Installation will not be both fully operational at the same time. It is probable that the number of generating units on the existing Power Station would reduce significantly once the first train of the Proposed Installation becomes operational. At this stage the final combined operations are not yet confirmed.

Although the Proposed Installation will operate 24 hours a day, 7 days a week, not all of the plant will operate all of the time, as operation is dependent upon demand and ambient temperatures. Therefore, the assessment of all plant operating at full power at the same time is considered a robust worst-case scenario.

9. Conclusions

This noise assessment has been prepared by AECOM on behalf of Uniper to support a bespoke Environmental Permit application (application reference number WPCC15718) for the proposed Combined Cycle Gas Turbine with Carbon Capture Plant (Proposed Installation') which forms part of the Connah's Quay Low Carbon Power Project located on the southern bank of the River Dee.

The focus of the assessment has been on operational sound level impacts upon the nearest residential NSR to the Proposed Installation.

Baseline sound surveys were undertaken during a planned maintenance shutdown at the existing Power Station and have been used to determine the existing representative *background sound levels* and residual sound levels at the NSRs without contribution from the existing Power Station.

Previous noise assessments and monitoring undertaken by Uniper Technologies for the current Environmental Permit have been reviewed to determine the specific sound levels from the existing Power Station. The *specific sound levels* determined from surveys undertaken in 2023 and detailed plant model of for the existing Power Station have been used in this assessment.

A sound propagation model was created as part of the DCO application for CQLCP using the sound modelling software CadnaA to provide a 3D representation of the Proposed Installation and to predict sound levels at NSRs in accordance with ISO 9613-2.

Following BS 4142, the defined representative *background sound levels* at the NSRs have been compared against the predicted operational *rating levels* (*the specific sound levels* plus appropriate character corrections).

The BS 4142 assessment has considered the sound during the common overnight operational mode of the existing Power Station, the Proposed Installation and the combined existing Power Station and Proposed Installation.

The initial BS 4142 assessment indicated a potential significant adverse impact for the existing Power Station before context considerations.

The initial BS 4142 assessment for the Proposed Installation, indicates potential for significant adverse impacts at NSRs R20, R21, R22 and R23 when the *rating level* is compared to the *background sound level* without contribution from the existing Power Station.

For the theoretical scenario of the existing Power Station and Proposed Installation operating concurrently there is the potential for significant adverse impacts. However, this is a very worst-case scenario with all plant operating at maximum capacity, whereas in reality the existing Power Station and Proposed Installation will not be fully operational at the same time. At this stage the final combined operations are not yet confirmed, but one possible initial scenario would be the number of existing Power Station units reducing from 4 to 2.

With the mitigation measures incorporated into the design, a *rating level* of less than 45 dB for the Proposed Installation is predicted. This is similar in magnitude to *rating levels* that would have arisen in recent years from operation of the existing Power Station.

When the predicted rating level for the Proposed Installation alone is compared to the common existing *background levels* which include the contributions from the existing Power Station, as reported in Chapter 9 of the DCO EIA, the maximum excess of *rating level* over the background sound level is 8 dB which along with context considerations is a not significant impact.

It is estimated that the night-time ambient L_{Aeq} at NSRs will increase by less than 0.5dB due to the operational sound from the Proposed Installation, which is assessed as being a low impact based on IEMA guidelines.

The overall extent and level of attenuation needed across the plant which is suggested in Appendix B, and Section 5, will guide the noise mitigation approach of the FEED and detailed design stages Following the principles of BAT the noise control strategy for the Proposed Installation will be further refined during detailed design stages to ensure a *rating level* no greater than 45 dB is achieved at the nearest NSRs.

Although the initial BS 4142 assessment suggests a significant adverse impact for the Proposed Installation, the local context suggests it would have an impact broadly comparable to that which has arisen from operation of the existing Power Station.

In the context of an ambient sound climate influenced by road traffic, sound from various operational states of the existing Power Station has not given rise to public complaint recently and a broadly similar outcome could be expected for the Proposed Installation.

Overall, as proposed in the DCO ES, it is considered that the site context means that sound from the Proposed Installation, could potentially result in an adverse, but not significant impact on nearby NSRs.

This NIA has been used to develop an initial Noise Management Plan (NMP) for the proposed installation (Document reference: CQ-WPCC15718-APP-NMP, Environmental Permit Application Volume III, Appendix G).

Appendix A Baseline Monitoring Locations and Survey Data

Monitoring Locations.

The monitoring locations are shown on Figure 2 and the noise sensitive receptors used in the assessments are shown in Figure 3.

Figure 2 Measurement locations

Figure 3 NSR locations.

Surveyors made observations at a number of locations during the night of the 08/07/2024 as provided in Table 17 below.

Table 17 Night-time observations during minimal operation conditions.

Time	Observation
22:53	Surveyors walked west from UP1 down the road. Road noise was audible from the southeast. Power station and papermill were not audible.
22:57	Surveyors walked east up the road to https://w3w.co/frightens.eagles.could. Power Station was slightly audible. Noise was broadband and low level with a slight low frequency rumble. No measurement was made because Uniper kit was deployed at this location, UP 2 near R23
23:08	Surveyors went to the Uniper car park to hear the noise source at the Power Station. The Power Station was audible but much quieter than observed during the previous site visit when the main plant processes were operational.
23:15	The papermill was dominant and clearly audible at LT4. An attended measurement was made at https://w3w.co/ramble.whimpered.bump from 23:22 to 00:02.
00:12	https://w3w.co/honeybees.meanest.roofs near to R31 The Power Station was not audible at this location.
00:18	https://w3w.co/magnetic.napkins.retraced near to R30. Distant road traffic noise was audible. Surveyors then moved to https://w3w.co/exits.schools.primary (near to LT8). Industrial noise was audible, thought to be Tata steel. High-frequency buzzing was also audible from the National Grid.
00:29	https://w3w.co/texts.roadmap.gossiped. near to LT6. Noise sources included industrial noise (likely Tata steel), dock, traffic noise, and rain noise.
00:45	The Power Station was audible at https://w3w.co/chat.shaped.printouts. near to R23.
00:48	https://w3w.co/restores.apply.pencils between R21 and R22. Possible plant noise from east, as audible at previous measurement location. Train pass by and distant road traffic noise. Possible this noise is related to the train pass by.
00:53	Rain noise dominant and forecast to worsen hence no further attended measurements made

Full Sound Survey Results

LT 1 – Coleg Cambria

At the time of equipment deployment and collection, the sound sources at LT1 included road noise from the east, and natural sounds such as birdsong and wind blowing through nearby trees. It was noted that everyday noise from the college was significantly quieter than during the previous survey undertaken for the DCO.

Table 18 Monitoring Location LT1 Measured Sound Levels

Time Period	Mean Average $L_{Aeq,15min}$ dB	Mean Average $L_{AF90,15min}$ dB	Range L_{Amax} dB
08/07/2024 Daytime	46	41	48 – 72
08/07/2024 Night-time	42	38	47 – 65
09/07/2024 Daytime	47	43	46 – 75
09/07/2024 Night-time	39	33	44 – 65
10/07/2024 Daytime	47	43	56 - 65

**Daytime is defined as 07:00 to 23:00 and night-time is defined as 23:00 to 07:00.*

Table 19 Monitoring Location LT1 Background Sound Levels-Analysis

Time Period	Mean Average $L_{AF90,15min}$ dB	Median $L_{AF90,15min}$ dB	Mode $L_{AF90,15min}$ dB	90th Percentile $L_{AF90,15min}$ dB
Daytime	43	43	43	45
Night-time	35	35	29	42

Figure 4 LT 1 Coleg Cambria Sound Survey Results from 08/07/24 to 10/07/24

LT 6 – Dee View Road

Distant road traffic was identified to be the dominant noise source with occasional train passbys, planes flying overhead, children, and birdsong. Provided for information only. This data has not been used in the BS 4142 assessment.

Table 20 Monitoring Location LT6 Measured Sound levels

Time Period	Mean Average $L_{Aeq,15min}$ dB	Mean Average $L_{AF90,\ 15min}$ dB	Range L_{Amax} dB
08/07/2024 Daytime	44	36	45 - 76
08/07/2024 Night-time	42	39	43 - 71
09/07/2024 Daytime	46	40	47 - 76
09/07/2024 Night-time	38	32	42 - 75
10/07/2024 Daytime	46	40	53 - 74

**Daytime is defined as 07:00 to 23:00 and night-time is defined as 23:00 to 07:00.*

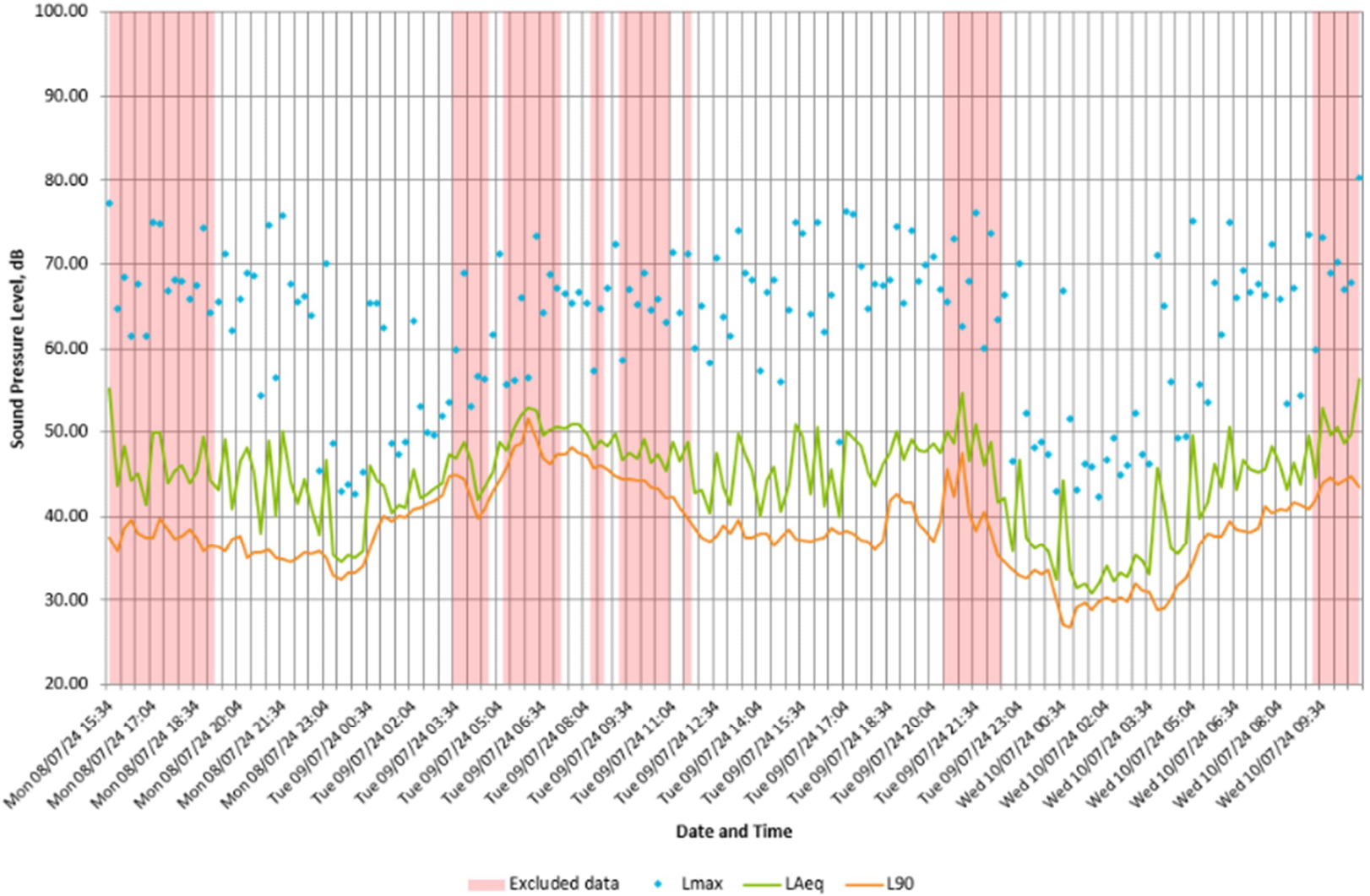

Figure 5 LT 6 Dee View Road Sound Survey Results from 08/07/24 to 10/07/24

LT 8 – National Grid Substation

Wind blowing through the trees and road traffic were identified as the dominant noise sources at the time of equipment deployment, with occasional noise from overhead aircraft and trains passing by.

Table 21 Monitoring Location LT8 Measured Sound levels

Time Period	Mean Average $L_{Aeq,15min}$ dB	Mean Average $L_{AF90,\ 15min}$ dB	Range L_{Amax} dB
08/07/2024 Daytime	52	40	52 – 89
08/07/2024 Night-time	45	39	50 – 89
09/07/2024 Daytime	54	44	54 – 89
09/07/2024 Night-time	45	34	50 – 86
10/07/2024 Daytime	52	45	54 - 84

**Daytime is defined as 07:00 to 23:00 and night-time is defined as 23:00 to 07:00.*

Table 22 Monitoring Location LT8 Background Sound Levels-Analysis

Time Period	Mean Average $L_{AF90,\ 15min}$ dB	Median $L_{AF90,\ 15min}$ dB	Mode $L_{AF90,\ 15min}$ dB	90th Percentile $L_{AF90,\ 15min}$ dB
Daytime	44	44	44	47
Night-time	36	35	29	44

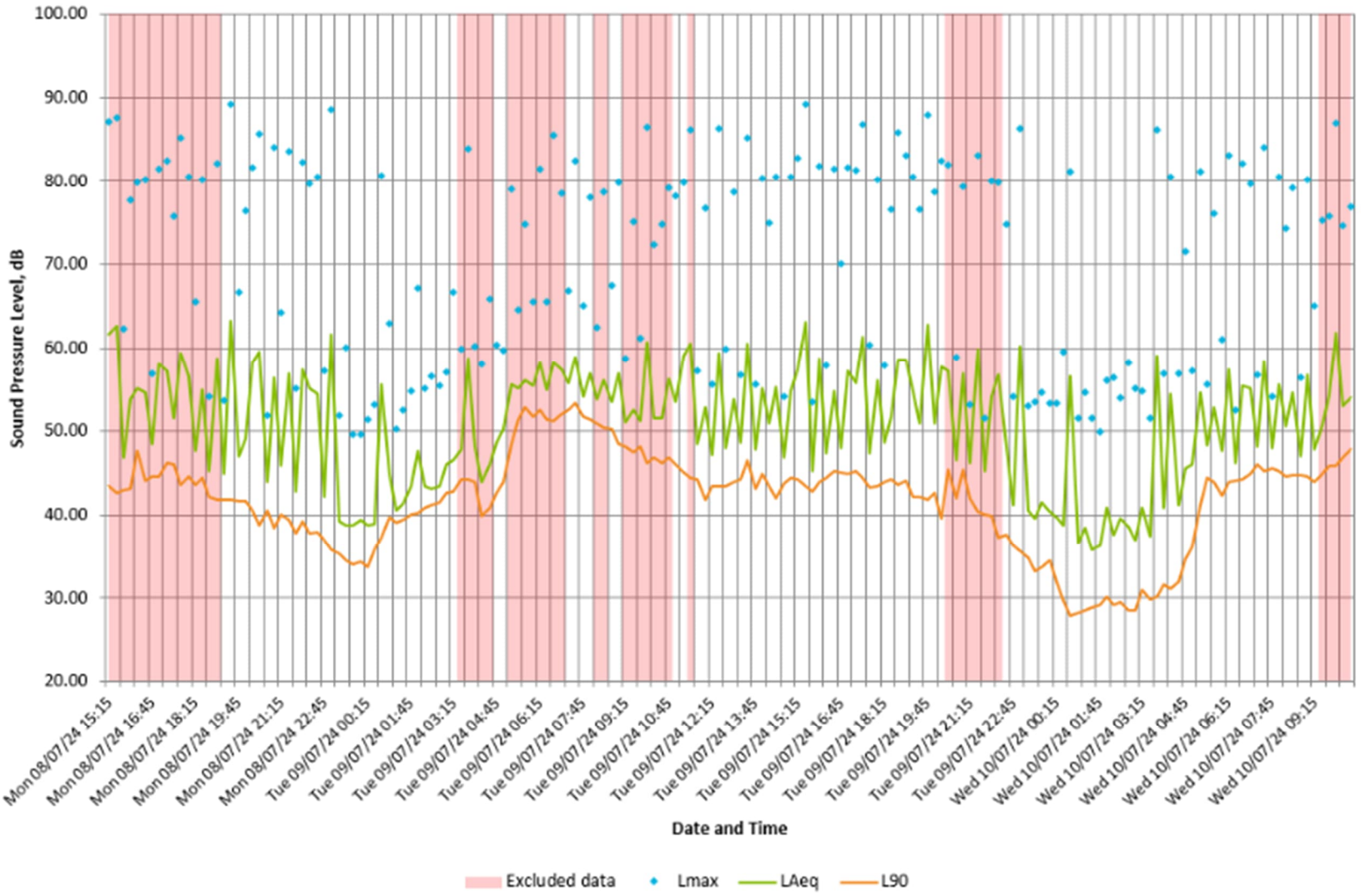

Figure 6 LT 8 National Grid Substation Sound Survey Results from 08/07/24 to 10/07/24

Uniper Monitoring Locations

UP 1 – Rockcliffe Cottages

Table 23 Monitoring Location UP1 Measured Sound levels

Time Period	Mean Average $L_{Aeq,15min}$ dB	Mean Average $L_{AF90,\ 15min}$ dB	Range L_{Amax} dB
08/07/2024 Daytime	54	44	N/A
08/07/2024 Night-time	48	40	N/A
09/07/2024 Daytime	57	50	N/A
09/07/2024 Night-time	49	36	N/A
10/07/2024 Daytime	59	53	N/A

**Daytime is defined as 07:00 to 23:00 and night-time is defined as 23:00 to 07:00.*

Table 24 Monitoring Location UP1 Background Sound Levels-Analysis

Time Period	Mean Average $L_{AF90,\ 15min}$ dB	Median $L_{AF90,\ 15min}$ dB	Mode $L_{AF90,\ 15min}$ dB	90th Percentile $L_{AF90,\ 15min}$ dB
Daytime	49	50	51	54
Night-time	38	36	31	50

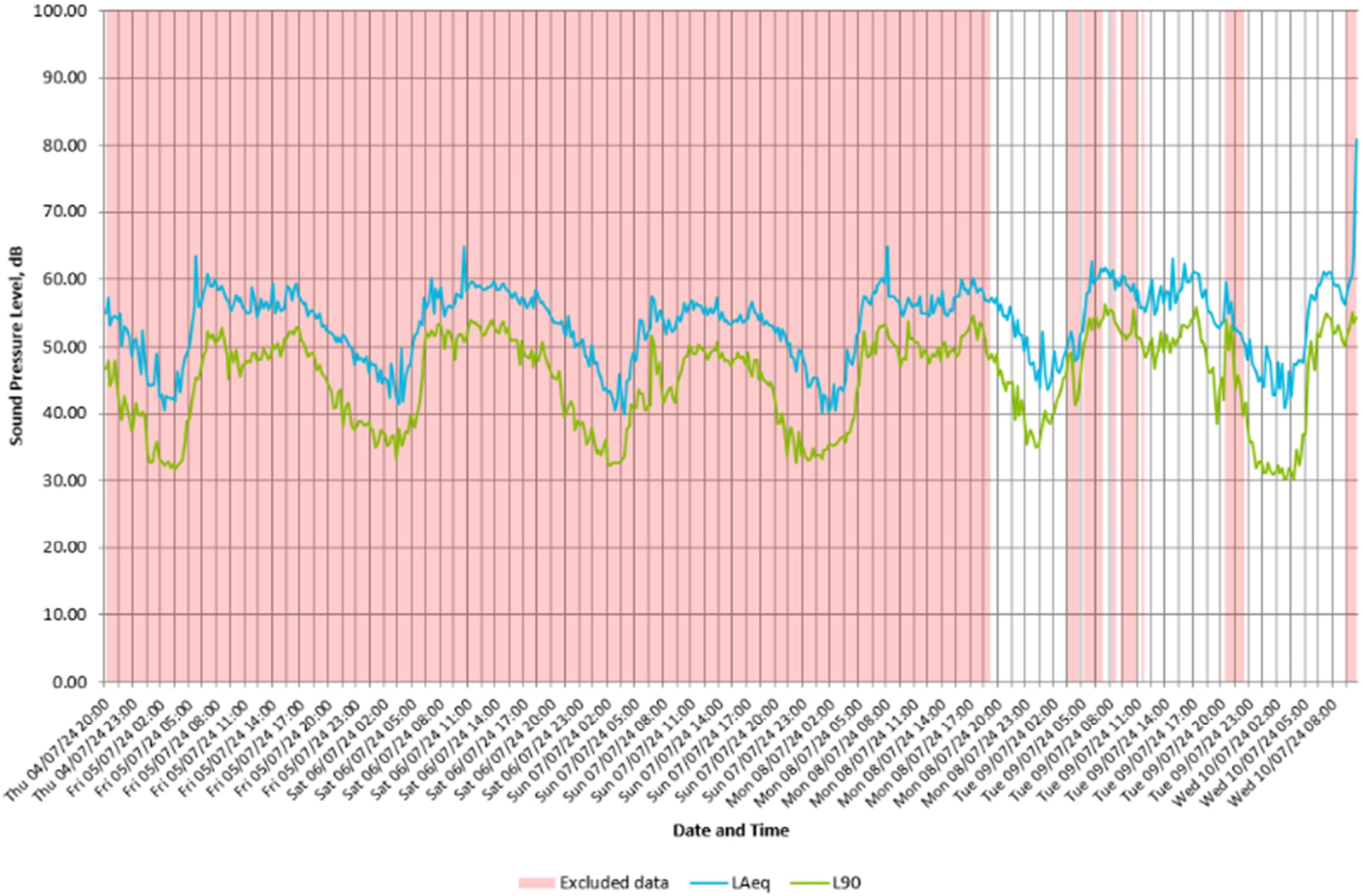

Figure 7 UP1 Rockcliffe Sound Survey Results from 04/07/24 to 10/07/24

UP 2 – Cae Coch Cottages

Table 25 Monitoring Location UP 2 Measured Sound levels

Time Period	Mean Average $L_{Aeq,15min}$ dB	Mean Average $L_{AF90,\ 15min}$ dB	Range L_{Amax} dB
08/07/2024 Daytime	57	45	N/A
08/07/2024 Night-time	50	40	N/A
09/07/2024 Daytime	60	50	N/A
09/07/2024 Night-time	52	38	N/A
10/07/2024 Daytime	63	54	N/A

**Daytime is defined as 07:00 to 23:00 and night-time is defined as 23:00 to 07:00.*

Table 26 Monitoring Location UP2 Background Sound Levels-Analysis

Time Period	Mean Average $L_{AF90,\ 15min}$ dB	Median $L_{AF90,\ 15min}$ dB	Mode $L_{AF90,\ 15min}$ dB	90th Percentile $L_{AF90,\ 15min}$ dB
Daytime	49	49	52	55.9
Night-time	39	39	34	49

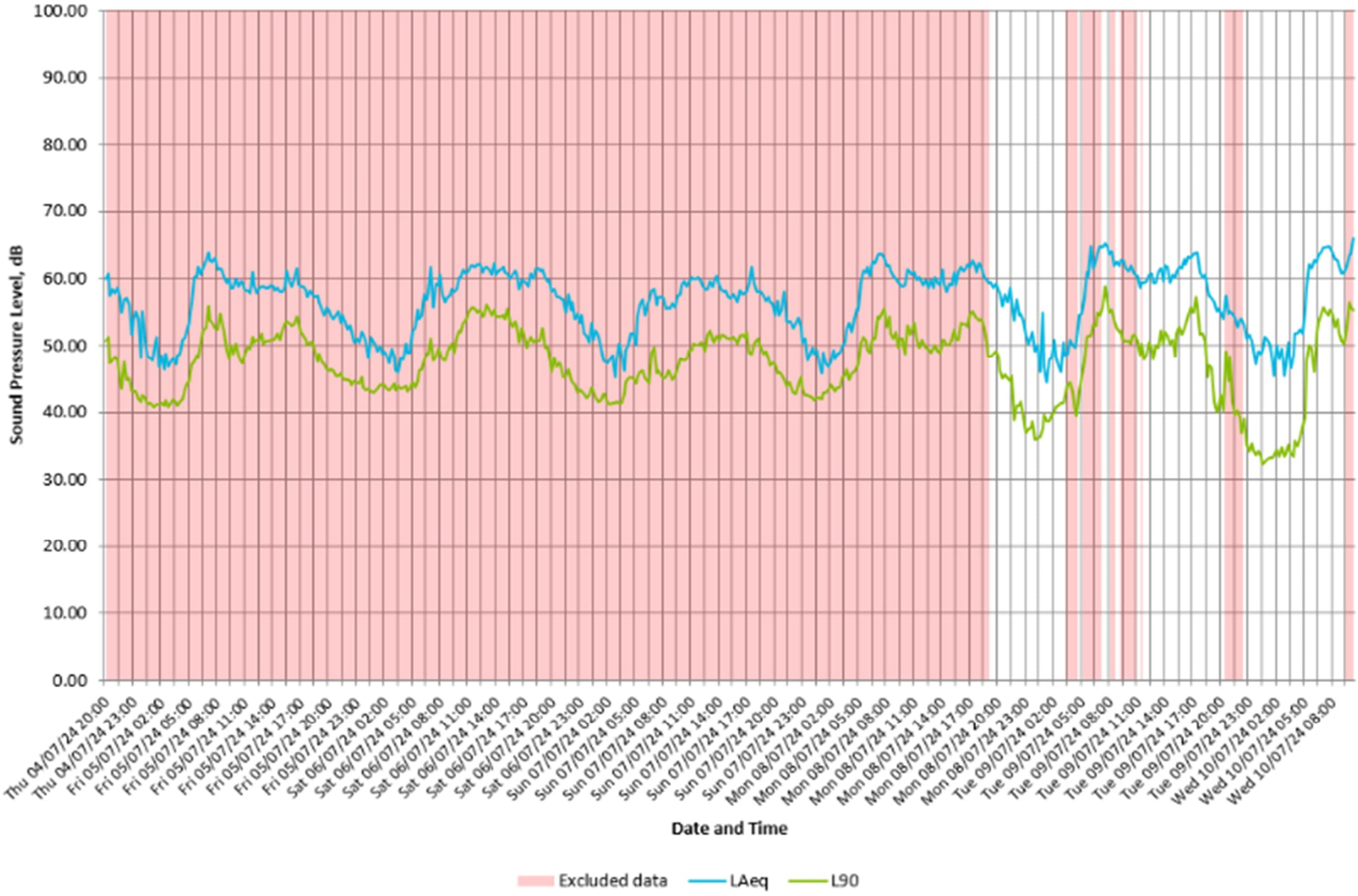

Figure 8 UP2 Cae Coch Sound Survey Results from 04/07/24 to 10/07/24

Photographic Record of Monitoring Locations

Figure 9 LT 1 Equipment set up

Figure 10 LT 1 Weather Station Set Up

Figure 11 LT 6 Equipment Set Up

Figure 12 LT 8 Equipment Set Up

Figure 13 UP1 Equipment Set Up

Figure 14 UP2 Equipment Set Up

Calibration Certificates

LT1

CERTIFICATE OF CALIBRATION

0653

Date of Issue: 22 December 2023 **Certificate Number: UCRT23/2618**

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

Page 1 of 2 Pages

Approved Signatory

K. Mistry

Customer	AECOM Limited 100 Embankment Level 4 Manchester M3 7FB

Order No.	1627338			
Description	Sound Level Meter / Pre-amp / Microphone / Associated Calibrator			
Identification	*Manufacturer*	*Instrument*	*Type*	*Serial No. / Version*
	Rion	Sound Level Meter	NL-52	00710387
	Rion	Firmware		2.1
	Rion	Pre Amplifier	NH-25	10930
	Rion	Microphone	UC-59	19663
	Rion	Calibrator	NC-75	34334830
		Calibrator adaptor type if applicable		NC-75-022
Performance Class	1			
Test Procedure	TP 10. SLM 61672-3:2013			
	Procedures from IEC 61672-3:2013 were used to perform the periodic tests.			
Type Approved to IEC 61672-1:2013	Yes			
	If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2013			
Date Received	19 December 2023		ANV Job No.	UKAS23/12859
Date Calibrated	22 December 2023			

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

Previous Certificate	*Dated*	*Certificate No.*	*Laboratory*
	Initial Calibration		

CERTIFICATE OF CALIBRATION

UKAS Accredited Calibration Laboratory No. 0653

Certificate Number
UCRT23/2618

Page 2 of 2 Pages

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

SLM instruction manual title	NL-52/NL-42 Description for IEC 61672-1			
SLM instruction manual ref / issue	No. 58034 21-03	Source	Rion	
Date provided or internet download date	19 March 2021			

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

Total expanded uncertainties within the requirements of IEC 61672-1:2013	YES	
Specified or equivalent Calibrator	Specified	
Customer or Lab Calibrator	Lab Calibrator	
Calibrator adaptor type if applicable	NC-75-022	
Calibrator cal. date	18 December 2023	
Calibrator cert. number	UCRT23/2596	
Calibrator cal cert issued by Lab	0653	
Calibrator SPL @ STP	94.01 dB	Calibration reference sound pressure level
Calibrator frequency	1000.00 Hz	Calibration check frequency
Reference level range	Single dB	

Accessories used or corrected for during calibration - None

Environmental conditions during tests	Start	End	
Temperature	23.08	23.03	± 0.30 °C
Humidity	44.3	44.3	± 3.00 %RH
Ambient Pressure	100.13	100.13	± 0.03 kPa

Indication at the Calibration Check Frequency				
Initial indicated level	94.1 dB	Adjusted indicated level	94.0	dB
Uncertainty of calibrator used for Indication at the Calibration Check Frequency ±			0.10	dB

Self Generated Noise

Microphone installed -	Less Than	18.4	dB	A Weighting					
Microphone replaced with electrical input device -				UR = Under Range indicated					

Weighting	A			C			Z		
	12.3	dB	UR	17.1	dB	UR	24.2	dB	UR

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

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

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

None

END

Calibrated by: B. Bogdan R 2

LT6

CERTIFICATE OF CALIBRATION

0653

Date of Issue: 12 August 2022 **Certificate Number: UCRT22/2001**

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

Page 1 of 2 Pages

Approved Signatory

K. Mistry

Customer: AECOM, 12 Regan Way, Chetwynd Business Park, Nottingham, NG9 6RZ

Order No. 1535420

Description: Sound Level Meter / Pre-amp / Microphone / Associated Calibrator

Identification:

Manufacturer	*Instrument*	*Type*	*Serial No. / Version*
Rion	Sound Level Meter	NL-52	00386762
Rion	Firmware		2.0
Rion	Pre Amplifier	NH-25	76912
Rion	Microphone	UC-59	12802
Brüel & Kjær	Calibrator	4231	2217877
	Calibrator adaptor type if applicable		UC 0210

Performance Class 1

Test Procedure: TP 10. SLM 61672-3:2013
Procedures from IEC 61672-3:2013 were used to perform the periodic tests.

Type Approved to IEC 61672-1:2013 Yes
If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2013

Date Received 11 August 2022 ANV Job No. UKAS22/08525

Date Calibrated 12 August 2022

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

Previous Certificate	*Dated*	*Certificate No.*	*Laboratory*
	14 July 2020	UCRT20/1623	0653

CERTIFICATE OF CALIBRATION

UKAS Accredited Calibration Laboratory No. 0653

Certificate Number UCRT22/2001

Page 2 of 2 Pages

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

SLM instruction manual title	NL-52/NL-42 Description for IEC 61672-1				
SLM instruction manual ref / issue	No. 56034 21-03	Source	Rion		
Date provided or internet download date	19 March 2021				
	Case Corrections	Wind Shield Corrections	Mic Pressure to Free Field Corrections		
Uncertainties provided	Yes	Yes	Yes		
Total expanded uncertainties within the requirements of IEC 61672-1:2013	YES				
Specified or equivalent Calibrator	Equivalent				
Customer or Lab Calibrator	Customers Calibrator				
Calibrator adaptor type if applicable	UC 0210				
Calibrator cal. date	11 August 2022				
Calibrator cert. number	UCRT22/1994				
Calibrator cal cert issued by Lab	0653				
Calibrator SPL @ STP	93.98	dB	Calibration reference sound pressure level		
Calibrator frequency	999.97	Hz	Calibration check frequency		
Reference level range	Single	dB			
Accessories used or corrected for during calibration -	Extension Cable & Wind Shield WS-15				
Note - The Extension Cable was used between the SLM and the pre-amp for this calibration.					

Environmental conditions during tests	Start	End		
Temperature	22.56	23.73	± 0.30	°C
Humidity	48.8	46.5	± 3.00	%RH
Ambient Pressure	100.97	100.92	± 0.03	kPa

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

Self Generated Noise									
Microphone installed -	Less Than	18.4	dB	A Weighting					
Microphone replaced with electrical input device -				UR = Under Range indicated					
Weighting	A			C			Z		
	12.7	dB	UR	16.5	dB	UR	22.3	dB	UR

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

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

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

None

END

Calibrated by: PB/BB

R 1

CERTIFICATE OF CALIBRATION

0653

Date of Issue: 16 February 2024 **Certificate Number: UCRT24/1267**

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

Page 1 of 2 Pages

Approved Signatory

K. Mistry

Customer	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-52	00620964
Rion	Firmware		2.0
Rion	Pre Amplifier	NH-25	21005
Rion	Microphone	UC-59	03884
Rion	Calibrator	NC-75	34334830
	Calibrator adaptor type if applicable		NC-75-022

Performance Class 1
Test Procedure TP 2.SLM 61672-3 TPS-49
Procedures from IEC 61672-3:2006 were used to perform the periodic tests.
Type Approved to IEC 61672-1:2002 YES Approval Number 21.21 / 13.02
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 15 February 2024 ANV Job No. UKAS24/02141
Date Calibrated 16 February 2024

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 organisation 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.

Previous Certificate	*Dated*	*Certificate No.*	*Laboratory*
	29 March 2023	UCRT23/1443	0653

CERTIFICATE OF CALIBRATION

UKAS Accredited Calibration Laboratory No. 0653

Certificate Number
UCRT24/1267

Page 2 of 2 Pages

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

SLM instruction manual title	Sound Level Meter	NL-42 / NL-52	
SLM instruction manual ref / issue		11-03	
SLM instruction manual source		Manufacturer	
Internet download date if applicable		N/A	
Case corrections available		Yes	
Uncertainties of case corrections		Yes	
Source of case data		Manufacturer	
Wind screen corrections available		Yes	
Uncertainties of wind screen corrections		Yes	
Source of wind screen data		Manufacturer	
Mic pressure to free field corrections		Yes	
Uncertainties of Mic to F.F. corrections		Yes	
Source of Mic to F.F. corrections		Manufacturer	
Total expanded uncertainties within the requirements of IEC 61672-1:2002		Yes	
Specified or equivalent Calibrator		Specified	
Customer or Lab Calibrator		Lab Calibrator	
Calibrator adaptor type if applicable		NC-75-022	
Calibrator cal. date		22 January 2024	
Calibrator cert. number		UCRT24/1118	
Calibrator cal cert issued by		0653	
Calibrator SPL @ STP		94.00 dB	Calibration reference sound pressure level
Calibrator frequency		1000.00 Hz	Calibration check frequency
Reference level range		25 - 130 dB	

Accessories used or corrected for during calibration - Extension Cable & Wind Shield WS-15
Note - if a pre-amp extension cable is listed then it was used between the SLM and the pre-amp.

Environmental conditions during tests	Start	End	
Temperature	22.90	23.01	± 0.30 °C
Humidity	47.2	51.2	± 3.00 %RH
Ambient Pressure	100.58	100.61	± 0.03 kPa

Response to associated Calibrator at the environmental conditions above.

Initial indicated level	94.1 dB		Adjusted indicated level	94.0 dB	
The uncertainty of the associated calibrator supplied with the sound level meter ±				0.10 dB	

Self Generated Noise — This test is currently not performed by this Lab.

Microphone installed (if requested by customer) = Less Than	N/A dB	A Weighting	
Uncertainty of the microphone installed self generated noise ±	N/A dB		

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

Weighting	A			C			Z		
	11.8	dB	UR	15.2	dB	UR	21.2	dB	UR
Uncertainty of the electrical self generated noise ±							0.12	dB	

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

For the test of the frequency weightings as per paragraph 12. of IEC 61672-3:2006 the actual microphone free field response was used.

The acoustical frequency tests of a frequency weighting as per paragraph 11 of IEC 61672-3:2006 were carried out using an electrostatic actuator.

END

Calibrated by: K. Zablocki R 1

Additional Comments The results on this certificate only relate to the items calibrated as identified above.
None

Field Calibrator

CERTIFICATE OF CALIBRATION

0653

Date of Issue: 04 October 2023

Certificate Number: UCRT23/2291

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

Page 1 of 2 Pages

Approved Signatory

K. Mistry

Customer	AECOM Limited Floor 4 100 Embankment East Tower Cathedral Approach Salford Manchester, M3 7FB
Order No.	713192
Test Procedure	Procedure TP 1 Calibration of Sound Calibrators
Description	Acoustic Calibrator

Identification	*Manufacturer*	*Instrument*	*Model*	*Serial No.*
	Brüel & Kjær	Calibrator	4231	3005464

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

ANV Job No.	UKAS23/10681
Date Received	02 October 2023
Date Calibrated	04 October 2023

Previous Certificate		
	Dated	09 December 2022
	Certificate No.	UCRT22/2452
	Laboratory	0653

CERTIFICATE OF CALIBRATION	Certificate Number UCRT23/2291
UKAS Accredited Calibration Laboratory No. 0653	Page 2 of 2 Pages

Measurements

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

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

Results

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

94.10 ± 0.10 dB rel 20 µPa
114.12 ± 0.10 dB rel 20 µPa

Functional Tests and Observations

The frequency at	94 dB	999.99	±	0.12 Hz
The frequency at	114 dB	999.99	±	0.12 Hz
The total distortion at	94 dB	0.26	±	0.03 % Distortion
The total distortion at	114 dB	0.36	±	0.04 % Distortion

During the measurements environmental conditions were

Temperature	23	to	24	°C
Relative Humidity	34	to	40	%
Barometric Pressure	101.5	to	101.6	kPa

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

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

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

..... END .....

Note:

Calibrator adjusted prior to calibration?	NO	
Initial Level 1	N/A	dB
Initial Level 2	N/A	dB
Initial Frequency	N/A	Hz

Additional Comments The results on this certificate only relate to the items calibrated as identified above.
None

Calibrated by: K. Zablocki R 1

Uniper Calibration Certificates:

UP1

CERTIFICATE OF CALIBRATION

0653

Date of Issue: 05 October 2023 **Certificate Number: UCRT23/2300**

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

Page 1 of 2 Pages
Approved Signatory
K. Mistry

Customer	Uniper Technologies Limited Technology Centre Ratcliffe-on-Soar Nottingham NG11 0EE
Order No.	4500851867/D53/2122
Description	Sound Level Meter / Pre-amp / Microphone / Associated Calibrator

Identification

Manufacturer	*Instrument*	*Type*	*Serial No. / Version*
Rion	Sound Level Meter	NL-53	00630271
Rion	Firmware		01.00
Rion	Pre Amplifier	NH-25	33096
Rion	Microphone	UC-59	23635
Rion	Calibrator	NC-75	34835125
	Calibrator adaptor type if applicable		NC-75-022

Performance Class 1
Test Procedure TP 10. SLM 61672-3:2013
Procedures from IEC 61672-3:2013 were used to perform the periodic tests.
Type Approved to IEC 61672-1:2013 No
If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2013
Date Received 04 October 2023 ANV Job No. UKAS23/10687
Date Calibrated 05 October 2023

The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the sound level meter to the full specifications of IEC 61672-1:2013 because (a) 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 class 1 specifications in IEC 61672-1:2013 and (b) because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in IEC 61672-1:2013.

Previous Certificate	*Dated*	*Certificate No.*	*Laboratory*
	Initial Calibration		

UP2

CERTIFICATE OF CALIBRATION

Date of Issue: 03 April 2024

Certificate Number: TCRT24/1277

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 4 Pages

Approved Signatory

K. Mistry

CUSTOMER	Uniper Technologies Limited Technology Centre Ratcliffe-on-Soar Nottingham NG11 0EE
ORDER No	4500899607
Job No	TRAC24/03133
DATE OF RECEIPT	27 March 2024
PROCEDURE	Calibration Engineer's Handbook section 3
IDENTIFICATION	Sound level meter Rion type NL-32 serial No 00451267 connected via extension lead type EC-04A and preamplifier type NH-21 serial No 15260 to a half-inch microphone type UC-53A serial No 316788 fitted with a foam windshield type WS-03. Associated calibrator Brüel & Kjær type 4231 serial No 1883787 with a one-inch housing and adapter type UC 0210 for half-inch microphone.
CALIBRATED ON	03 April 2024
PREVIOUS CALIBRATION	Calibrated on 23 February 2022, Certificate No. TCRT22/1157 issued by this laboratory.

Field Calibrator

HBK HOTTINGER BRÜEL & KJÆR

The Calibration Laboratory
Teknikerbyen 28, DK-2830 Virum, Denmark

ilac-MRA DANAK CAL Reg.No. 307 Member of EA MLA

CERTIFICATE OF CALIBRATION

No: CDK2302276 Page 1 of 6

CALIBRATION OF

Calibrator:	Brüel & Kjær Type 4231	No: 1883787 Id: -
Acoustical Adaptor:	Brüel & Kjær Type UC-0210 (1/2" Adaptor)	
Pattern Approval:	None	

CUSTOMER

Uniper Technologies Limited
Technology Centre
Ratcliffe On Soar
NG11 0EE Nottingham
United Kingdom

CALIBRATION CONDITIONS

Preconditioning:	4 hours at 23°C ± 3°C
Environment conditions:	*See actual values in **Environmental conditions** section.*

SPECIFICATIONS

The Calibrator Brüel & Kjær Type 4231 has been calibrated in accordance with the requirements as specified in IEC 60942:2017 Annex B - Microphone method. The accreditation assures the traceability to the international units system SI.

PROCEDURE

The measurements have been performed with the assistance of Brüel & Kjær Calibrator Calibration System 3630 with application software type 7763 (version 8.6 - DB: 8.60) by using procedure P_4231_4180_M01.

RESULTS

Calibration Mode: **Calibration as received.**

The reported expanded uncertainty is based on the 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 EA-4/02 from elements originating from the standards, calibration method, effect of environmental conditions and any short time contribution from the device(s) under calibration. The results are only applicable for the specific device(s) listed above.

Date of calibration: 2023-03-23

Jeannie Nielsen
Jeannie Gerd Nielsen
Calibration Technician

Date of issue: 2023-03-26

Jesper Bo Vedel
Jesper Bo Vedel
Approved Signatory

Previous Noise Monitoring Reports

2016 Report – Issued to NRW to support the variation to the cooling towers at the existing Power Station

2023 Report- Issued to NRW as part of the 4 years monitoring as per the Environmental Permit (permit number EPR/NP3037AF). Clause 3.4.3

Appendix B Operational Sound Information

Noise Model Settings

The Proposed Installation has been constructed in CadnaA (version 2025) acoustic modelling software. This software implements the sound propagation calculation methodology set out in International Organization for Standardization (ISO) (Part 2: 2024). ISO 9613 Acoustics - Attenuation of sound during propagation outdoors.

Data Sources

The following data sources have been used:

- surrounding area ground heights – data from the Environment Agency National LIDAR programme - downloaded from Open Survey Data;
- Ordnance Survey MasterMap Topography Layer of the Order limits and surrounding areas;
- pre-FEED Environmental Impacts Inputs Summary;
- sound power level data from similar projects which has been reviewed by Uniper; and
- Proposed Installation layout plans.

Modelling Assumptions

The model has been prepared with the following configurations and assumptions:

- building dimensions – taken from the design drawings;
- receptor buildings heights – taken from OS MasterMap Building Height Attribute dataset;
- receptor heights – modelled as 4 m above ground to represent first floor;
- ground effect – industrial areas and hardstanding 0.0, vegetation 1.0, road surfaces 0.0, water bodies 0.0. The locations of each area have been determined from the OS MasterMap Topography Layer;
- source sound levels – as provided by the design team as estimated base-case A-weighted sound power levels or sound pressure levels at 1 m from each sound source, and supplemented with octave band spectra from other comparable projects. Sound power levels following BAT mitigation consistent with attenuation suggested in Table 9-22 of DCO ES;
- the Proposed Installation would operate continually at full load, 24 hours a day, 365 days a year (which would be more than the actual operational duration currently anticipated);
- the sound emitted by each building façade has been calculated based on the total sound power level for the building, distributed according to the surface area of the façade;
- all pumps have been modelled as point sources;
- where sound pressure level data for plant items has been provided inside an enclosure, it has not yet been confirmed what material these enclosures would be constructed from. As a conservative assumption it has been assumed this would be 0.4 mm thick steel cladding; and
- the prediction of sound pressure levels according to ISO 9613 are based on an atmospheric temperature of 10◦C and relative humidity of 70%, which is representative of typical average UK conditions in the absence of specific local data, and are based on an assumption of moderate downwind propagation from source to receptor as a worst-case calculation.

Table 27 Sound Power Levels of Operational Equipment (Base case assumption plus assumed mitigated BAT)

	Base Case Data											
	Linear Sound Power Level Each Frequency Band dB											
Equipment Item	**31 Hz**	**63 Hz**	**125 Hz**	**250 Hz**	**500 Hz**	**1 kHz**	**2 kHz**	**4 kHz**	**8 kHz**	***Number operational in Proposed Installation***	**LWA dB****	**Potential Mitigation Concept LWA, dB ****
Gas Turbine Building	131	121	96	87	63	55	47	37	44	2	97	87
Gas Turbine Intake	129	121	113	92	82	95	88	90	87	2	102	92
HRSG Building	131	121	96	87	63	55	47	37	44	2	97	87
Flue Gas Blower	-	102	103	84	96	85	77	67	55	4	104	84
Direct Contact Cooler	91	82	79	76	78	61	48	30	32	4	76	76
Absorber Tower	115	106	105	98	104	96	92	80	82	4	103	98
Stripping Air Blowers	110	107	93	84	80	80	71	68	60	2	94	84
Cooling Towers	117	112	115	85	97	89	94	94	90	2	105	85
Compressor Building	136	125	101	91	52	44	29	26	23	1	101	91
DCC Circulating Water Filter Back Wash Pump	75	76	77	76	79	82	79	75	69	2	86	76
Auxiliary CW Pumps	82	83	84	85	86	89	86	82	76	1	95	85
Main CW Pumps	84	85	86	80	88	91	88	84	78	6	95	80
Rich Amine Pump	84	85	86	80	88	91	88	84	78	2	95	80
Absorber 1st Wash Stage	84	85	86	85	88	91	88	84	78	2	95	85

Base Case Data

Equipment Item	Linear Sound Power Level Each Frequency Band dB									*Number operational in Proposed Installation*	LWA dB**	Potential Mitigation Concept LWA, dB **
	31 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz			
Absorber 2nd Wash Stage	84	85	86	85	88	91	88	84	78	2	95	85
Acid Wash Pump	83	84	85	84	87	90	87	83	77	2	94	84
Lean Amine Booster Pump	84	85	86	80	88	91	88	84	78	2	95	80
CO_2 Reflux Stripper Pump	78	79	80	79	82	85	82	78	72	1	89	79
Low Pressure Condensate	77	78	79	78	81	84	81	77	71	2	88	78
DCC Circulation Pump	86	87	88	87	90	93	90	86	80	2	97	87
DCC Produced Water Contactor	77	78	79	88	81	84	81	77	71	2	88	88
DCC Treated Water Discharge Pump	71	72	73	82	75	78	75	71	65	2	82	82
Knock-Out Water Pump	60	61	62	56	64	67	64	60	54	4	71	56
Lean Amine Circulation	83	84	85	84	87	90	87	83	77	2	94	84
Fresh Amine Storage	55	56	57	66	59	62	59	55	49	2	66	66
Fire Water Jockey Pumps	55	56	57	66	59	62	59	55	49	1	66	66
CCS Condensate Return	62	63	64	73	66	69	66	62	56	2	73	73
NaOH Storage Pump	62	63	64	73	66	69	66	62	56	2	73	73
Acid Drain Drum Pump	62	63	64	73	66	69	66	62	56	2	73	73

Base Case Data

Equipment Item	Linear Sound Power Level Each Frequency Band dB									*Number operational in Proposed Installation*	LWA dB**	Potential Mitigation Concept LWA, dB **
	31 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz			
Acid Storage Pump	62	63	64	73	66	69	66	62	56	2	73	73
Amine Drain Drum Pump	62	63	64	73	66	69	66	62	56	1	73	73
Demineralised Water Storage	62	63	64	73	66	69	66	62	56	2	73	73
Cooling Tower Make-Up	83	84	85	79	87	90	87	83	77	1	94	79
Make-Up Transfer Pumps	83	84	85	79	87	90	87	83	77	1	94	79
Above-Ground Installation (AGI)	101	96	85	76	63	45	48	59	63	3	76	76

**Number operational represents worst-case twin absorber design*

*** Sound Power Level for each individual item of plant*