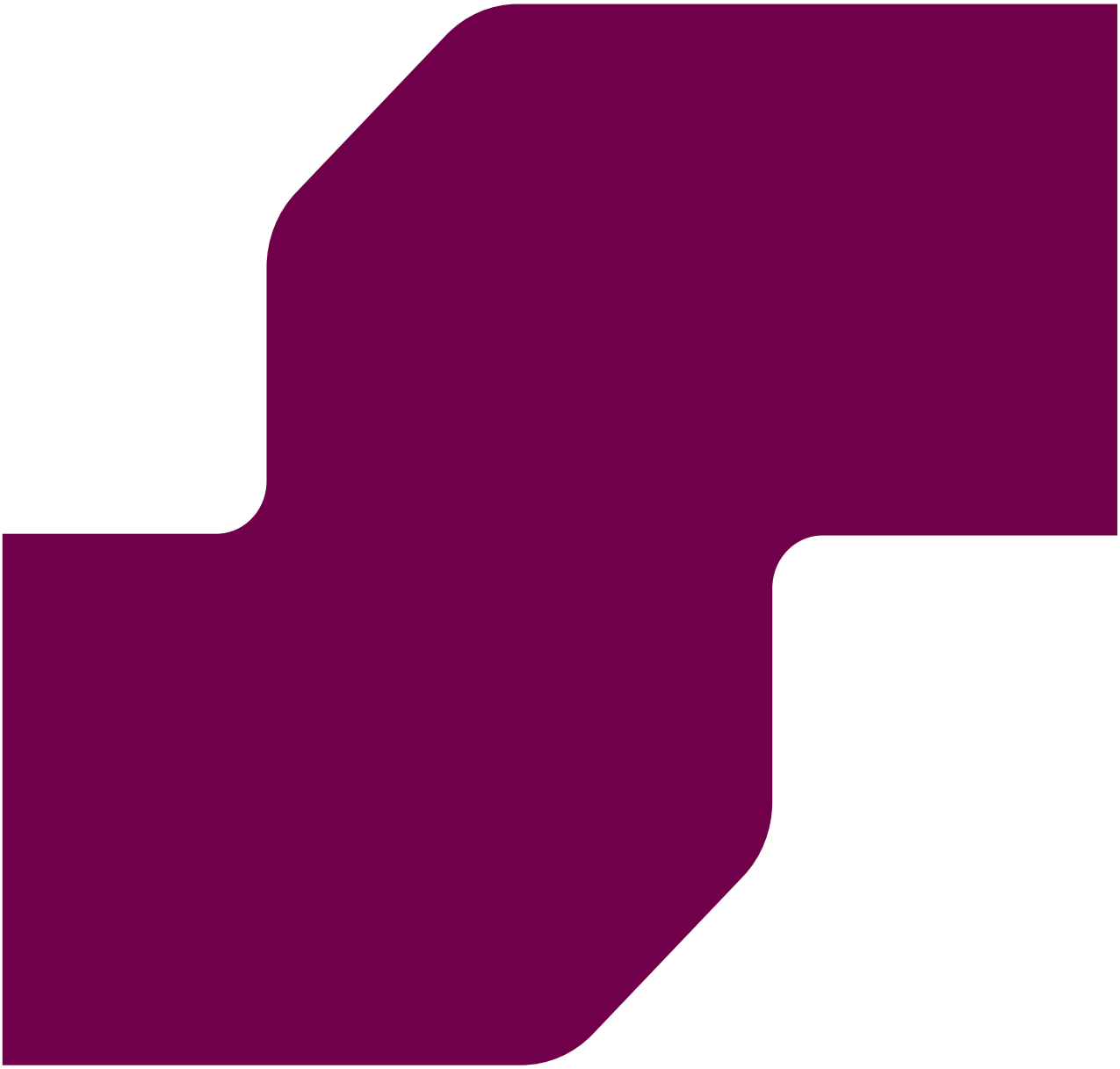
Noise Assessment for Environmental Permitting

Redcar Energy Centre

For Redcar Holdings Limited



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Quality Management

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1 Introduction

1.1 RPS has been commissioned by Redcar Holdings Limited (Redcar Holdings) to undertake a noise impact assessment (NIA) to form part of a permitting application for the proposed Redcar Energy Centre (REC) on land located at the Redcar Bulk Terminal, approximately 4.5 km west of Redcar town centre and 8.5km northeast of Middlesbrough city centre. The site is located within the administrative boundary of the Redcar and Cleveland Borough Council (RCBC).

1.2 Baseline noise conditions at the nearest noise sensitive receptors (NSRs) were established by the baseline monitoring undertaken on site over a 7-day period from 13:00 hours on 6th April 2022 to 13:00 hours on 13th April 2022.

1.3 The NIA has been carried out in accordance with the British Standard (BS) 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound' [1], which is the industry standard methodology for the assessment of commercial and industrial sound.

1.4 The NIA has been undertaken based upon information describing the proposed development provided by Redcar Holdings, manufacturer's data and including reference data for similar facilities.

1.5 RPS is a member of the Association of Noise Consultants (ANC), the representative body for acoustics consultancies, having demonstrated the necessary professional and technical competence. The NIA has been undertaken with integrity, objectivity and honesty in accordance with the Code of Conduct of the Institute of Acoustics (IOA) and ethically, professionally and lawfully in accordance with the Code of Ethics of the ANC.

1.6 This assessment was carried out by Stephen Hale (acoustic consultant) under the supervision of Christina Ioannidou, Susan Hirst and Lise W. Tjellesen. Personnel and individual qualifications are provided within the Quality Management table at the start of this report and in Appendix A in accordance with the requirement of Section 12 of BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound' [1]. This report has been peer reviewed within the RPS team to ensure that it is technically robust and meets the requirements of our Integrated Management System (IMS).

2 Policy, Guidance and Standards

2.1 This section of the report describes the key policy, guidance and standards relevant to the assessment.

Environmental Permitting Regulations

2.2 The Environmental Permitting (England and Wales) Regulations 2016 (EPR) designate the Environment Agency (EA) as the 'Regulator' responsible for enforcing the regime. As part of its role as regulator, the EA is responsible for producing guidance for use in enforcing the EPR.

2.3 The EA, Scottish Environment Protection Agency (SEPA), Natural Resources Wales (NRW) and Northern Ireland Environmental Agency (NIEA) have produced a new guidance "Noise and vibration management: environmental permits" [2]. This current guidance replaces the previous Environmental Agency Horizontal Guidance for Noise (H3) parts 1 and 2 as well as SEPA's Guidance on control of noise at PPC installations.

2.4 The guidance covers:

- how the environment agencies will assess noise from certain industrial processes
- what the law says you must do to manage noise and vibration
- advice on how to manage noise – in particular, how to carry out a noise impact assessment and what operators should include in a noise management plan

2.5 The EA has produced guidance 'Noise impact assessments involving calculations or modelling' [3] which states information required. General information that must provide including:

"You must provide a description of:

- *the site location and layout*
- *your proposed activities and sources of any noise*
- *local receptors and reasons for selection*
- *your noise remediation approach*

You must also provide a:

- *map showing the site and surrounding area including receptors*
- *site plan including the site boundary*

You must also provide a:

- *full noise survey report if you have carried out a BS4142 assessment*
- *description of the noise mitigation measures you propose using and supporting evidence, such as the manufacturer's engineering specification for items that mitigate noise emissions, or calculations of the screening effect of barriers"*

2.6 Other requirements for information include:

- *"Fixed and mobile plant*
- *Noise emitting buildings*
- *Site traffic*
- *Off-site buildings*
- *Site acoustic barriers*
- *Terrain data*
- *Receptors"*

2.7 The Regulations require that installations should be operated in such a way that all appropriate preventative measures are taken against pollution, in particular with the application Best Available Techniques (BAT). BAT includes both the technology used and the way in which the installation is designed, built, operated and decommissioned.

Noise and vibration management: environmental permits (NVMEP)

2.8 The Environment Agency, Scottish Environment Protection Agency (SEPA), Natural Resources Wales and Northern Ireland Environment Agency have produced a guidance[1] on environmental permits to help holders and potential holders of permits apply for, vary, and comply with their permits.

2.9 For permits in England the guidance contained within "Risk assessments for your environmental permit" is applicable. The guidance was published on 1 February 2016 (last update in March 2021) and it replaces H3 guidance.

[1] A website link to the guidance is given here: https://www.gov.uk/government/publications/noise-and-vibration-management-environmental-permits/noise-and-vibration-management-environmental-permits

2.10 The guidance on “Control and monitor emissions for your environmental permit” was introduced in February 2016. This covers a range of topic areas with noise being mentioned in the section on “Noise and vibration management plan”.

2.11 For any particular case, the regulatory authorities have to decide whether or not a proposed facility is causing (or are likely to cause) unacceptable noise pollution, even if appropriate measures are used. It is the applicant’s responsibility to avoid significant pollution and to demonstrate that BAT or other appropriate measures are used to prevent, or where that is not practicable, to minimise the noise impact.

2.12 The scope and level of detail in a noise management plan (NMP) should be enough to show that noise emissions are efficiently managed from a facility. All NMPs should, as a minimum, include:

- a clear statement that the applicant understands and accepts their responsibilities for controlling noise impact, and that they will regularly review the effectiveness of their NMP;
- a commitment that either the applicant, or their contractors or subcontractors, will make sure that any noise control equipment is designed, operated and maintained appropriately so it controls noise effectively at all times;
- a risk assessment of noise problems from normal and abnormal situations, including worst case scenarios due to, for example, weather, temperature, breakdowns and accidents;
- details of the appropriate controls (both physical and management) needed to manage the identified risks;
- confirmation of the level of monitoring that should be in place;
- details of the actions the applicant will take, contingencies, and responsibilities, when problems arise (it is particularly important that the applicant includes expected actions resulting from exceptional circumstances or where serious pollution may occur);
- confirmation of the procedures in place to consider reducing or stopping operations to avoid serious noise pollution, and
- a procedure for engaging with neighbours to minimise their concerns and respond to complaints.

British Standard 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'

2.13 BS 4142:2014+A1:2019 primarily provides a numerical method by which to determine the significance of sound of an industrial nature (i.e. the 'specific sound' from the proposed development) at residential NSRs. The specific sound level may then be corrected for the character of the sound (e.g. perceptibility of tones and/or impulses), if appropriate, and it is then termed the 'rating level', whether or not a rating penalty is applied. The 'residual sound' is defined as the ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.

2.14 The specific sound levels should be determined separately in terms of the $L_{Aeq,T}$ index over a period of T = 1-hour during the daytime and T = 15-minutes during the night-time. For the purpose of the Standard, daytime is typically between 07:00 and 23:00 hours and night-time is typically between 23:00 and 07:00 hours.

2.15 BS 4142:2014+A1:2019 requires that the background sound levels adopted for the assessment be representative for the period being assessed. The Standard recommends that the background sound level should be derived from continuous measurements of normally not less than 15-minute intervals, which can be contiguous or disaggregated. However, the Standard states that there is no 'single' background sound level that can be derived from such measurements.

2.16 BS 4142:2014+A1:2019 states that measurement locations should be outdoors, where the microphone is at least 3.5 m from any reflecting surfaces other than the ground and, unless there is a specific reason to use an alternative height, at a height of between 1.2 m and 1.5 m above ground level. However, where it is necessary to make measurements above ground floor level, the measurement position, height and distance from reflecting surfaces should be reported, and ideally measurements should be made at a position 1 m from the façade of the relevant floor if it is not practical to make the measurements at least 3.5 m from the facade.

2.17 With regards to the rating correction, paragraph 9.2 of BS 4142:2014+A1:2019 states:

"Consider the subjective prominence of the character of the specific sound at the noise-sensitive locations and the extent to which such acoustically distinguishing characteristics will attract attention."

2.18 The commentary to paragraph 9.2 of BS 4142:2014+A1:2019 suggests the following subjective methods for the determination of the rating penalty for tonal, impulsive and/or intermittent specific sounds:

*"**Tonality***

For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a rating penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.

Impulsivity

A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible.

NOTE 2 If characteristics likely to affect perception and response are present in the specific sound, within the same reference period, then the applicable corrections ought normally to be added arithmetically. However, if any single feature is dominant to the exclusion of the others then it might be appropriate to apply a reduced or even zero correction for the minor characteristics.

Intermittency

When the specific sound has identifiable on/off conditions, the specific sound level should be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. … If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.

Other sound characteristics

Where the specific sound features characteristics that are neither tonal nor impulsive, nor intermittent, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied."

2.19 An initial estimate of the impact of the specific sound is obtained by subtracting the measured background sound level from the rating level of the specific sound. In the context of the Standard, adverse impacts include, but are not limited to, annoyance and sleep disturbance. Typically, the greater this difference, the greater is the magnitude of the impact:

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

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

2.20 Whilst there is a relationship between the significance of impacts determined by the method contained within BS 4142:2014+A1:2014 and the significance of effects described in the PPGN, there is not a direct link. It is not appropriate to ascribe numerical rating / background level differences to LOAEL and SOAEL because this fails to consider the context of the sound, which is a key requirement of the Standard.

2.21 The significance of the effect of the noise in question (i.e. whether above or below SOAEL and LOAEL) should be determined on the basis of the initial estimate of impact significance from the BS 4142:2014+A1:2014 assessment with reference to the examples of outcomes described within the PPGN and after having considered the context of the sound. It is necessary to consider all pertinent factors, including:

- the absolute level of sound;
- the character and level of the residual sound compared to the character and level of the specific sound; and
- the sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:
  - facade insulation treatment; and
  - ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation.

Impacts at Ecological NSRs

2.22 There is no specific national guidance on the effects of noise disturbance upon birds, however a number of studies have been undertaken to assess the likely cause and thresholds at which disturbance is likely to occur.

2.23 In the majority of cases, the concept of disturbance relates to changes in feeding and roosting behaviour as a result of a noise induced startle effect. The temporal character of the noise (i.e. its impulsiveness) is more likely to lead to this type of disturbance rather than the absolute noise level.

2.24 Startle disturbance will be different to that experienced by birds whose habitat is near a source of continuous noise and where high noise levels may lead to masking or changing characteristics of bird song with an associated effect on species bonding.

2.25 In both of the above cases, it is important to consider the frequency characteristics of the noise when determining the potential impact. The A-weighting scale is based on human sensitivity to noise and as such, cannot be assumed to be representative of the auditory sensitivity of birds. It is therefore important to review the frequency characteristics of the noise source in relation to the sensitivity of birds and also to consider the temporal variation of the different noise sources.

2.26 Data presented in the 'Avian Hearing and the Avoidance of Wind Turbines' report, published by the National Renewable Energy Laboratory (NREL) (NREL, 2002), shows the average audiograms for different bird species relative to A-weighting frequency characteristics and normalised to a frequency of 1 kHz.

2.27 The data demonstrates that if a noise with a given sound pressure level had predominantly low frequency characteristics, a bird would be expected to exhibit less response to this than to a source of noise with the same overall sound pressure level but with higher frequency (>500 Hz) characteristics.

2.28 The 'Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance' report summarises the findings of several studies undertaken by the 'Institute of Estuarine & Coastal Studies' (IECS) (IECS, 2009) regarding the disturbance of birds in response to flood defence works at Saltend on the Humber estuary and the effects of piling noise on estuarine birds etc.

2.29 It should be noted that, whilst the report is primarily focussed on disturbance associated with construction activity, regular and steady state noise effects are also considered. In this regard, the IECS report states that:

> *"Birds were also seen to; in general, accept a wide range of steady state noise level from between 55 dB(A)to 85 dB(A) in some cases."*

2.30 In lieu of explicit operational noise impacts on birds, it is considered that the threshold for impacts due to steady state or regular noise associated with construction activity (50 dBA for regular noise as outlined in Table 3 of the IECS report) would be equivalent for steady state and/or regular noise from operational industrial facilities, such as the REC.

2.31 On the basis of the above, the magnitude of construction and operational noise impacts on the important ecological sites is summarised in Table 2.1.

Table 2.1: Magnitude of Impact Criteria (Impacts at Ecological NSRs)

Magnitude of Impact	Disturbance Effect	Noise Level (dBA)	Type of Noise
High	Movement off site	Not defined	
	Movement out of zone but remaining on site	>85[1]	Piling (impulsive)
Medium	Movement within zone	70 to 85[1]	Piling (impulsive)
Low	Behavioural changes (alarm calls, heads up, change in feeding/roosting activity)	<70[1]	Piling (impulsive)
Negligible	No disturbance	<50[2]	Regular / Steady State

Notes:
1. Considered to be L_{AFmax}
2. Considered to be $L_{Aeq,T}$

Guidelines for Community Noise

2.32 The World Health Organisation (WHO) published guidance on the desirable levels of environmental noise in 2000. In this document, Guidelines for Community Noise (GCN) [4], the authors consider that sleep disturbance criteria should be taken as an internal noise level of 30 dB $L_{Aeq,8h}$ or an external level of 45 dB $L_{Aeq,8h}$, measured at 1 m from the façade. It is also suggested that internal L_{Amax} levels of 45 dB and external L_{Amax} levels of 60 dB, should not be exceeded.

2.33 For daytime levels, it is considered that:

> *"To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55 dB L_{Aeq} on balconies, terraces, and outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50 dB L_{Aeq}. Where it is practical and feasible, the lower outdoor sound level should be considered the maximum desirable sound level for new development."*

3 Site Description

Site Description

3.1 The site is located on land approximately 1710 m west of Redcar Golf Course, TS10 5BE. The site layout can be seen in Figure 3.1

3.2 Most developments immediately surrounding the site are industrial in nature with residential properties approximately 2260 m to the southeast.

3.3 The topography in the area is generally flat with coastal features.

Figure 3.1: Proposed Site Layout

Description of proposed site activities

3.4 The proposed scheme will introduce new noise sources to the local area in the form of externally located fixed plant. It is understood that the main noise sources will be a Transformer, Turbine, ACC Inlet, ACC, Tipping Hall, Turbine Air Cooler, FGT, Stack Outlet (Silenced) x2, Furnace and Boiler Hall, Ash Handling and MRF.

Noise Sensitive Receptors

3.5 The nearest 'noise sensitive receptors' (NSRs) to the site are described below in Table 3.1. The NSR locations are also shown in Figure 4.1.

Table 3.1: NSR Location and Distances to Site

NSR	Receptor Name	Type of Receptor	Direction from Site	Distance from Site Boundary	Distance To Nearest Noise Source
A	Bran Sands	Ecological Receptor	North	109 meters	164 meters
B	Seal Sands	Ecological Receptor	West	1746 meters	1730 meters
C	Coatham Sands	Ecological Receptor	East	794 meters	805 meters
D	S Gare ACC Road	Residential	East	2239 meters	2257 meters
E	72 Broadway Way	Residential	Southeast	2893 meters	2897meters

4 Baseline Sound Description

Baseline Sound Monitoring Dates and Locations

4.1 In order to establish baseline acoustic conditions at the nearest NSRs, two unattended long-term (LT) sound level monitors were deployed on 13:00 hours on 6th April 2022 and collected 13:00 hours on 13th April 2022 at locations LT1 and LT2.

4.2 A short-term measurement was taken at one location (ST1) for a duration of 1 hour on 13th April 2022.

4.3 The purpose of each long-term and short-term monitor was to capture the background and ambient sound levels considered representative at each NSR:

- LT1 is considered representative of NSR A-C
- LT2 is considered representative of NSR D
- ST1 is considered representative of NSR E

4.4 The monitoring locations along with NSR locations are shown in Figure 4.1.

4.5 At each position the microphone was mounted on a pole 1.5 m above ground level in a free-field position (at least 3.5 m from any reflecting surface, excluding the ground).

4.6 All sound level measurements were made using ‘Class 1’ Rion NL-52 sound level meters (SLMs) in accordance with BS 7445-2:1991 [5]. The SLMs were set up to log the A-weighted broadband sound pressure level (SPL) in 100 ms periods. Levels were post-processed into 15-minute periods.

4.7 The equipment calibration level was checked prior to and after the monitoring periods; no significant deviation (i.e. above +/- 0.5 dB) was noted.

Instrumentation

4.8 Details of the instrumentation used during the survey are provided in Table 4.1 below. Calibration certificates of the equipment are available upon request.

Table 4.1: Sound Survey Instrumentation

Measurement Location	Make / Model	Serial Number	Calibration Ref / Start / End	Last Calibration Date
LT1	Rion NL52	943367	94.0 / 94.0 / 94.0	19/04/2021
LT2	Rion NL52	164423	94.0 / 94.0 / 94.0	19/04/2021
ST2	Rion NL52	164424	94.0 / 94.0 / 94.0	16/06/2021
Calibrator	Rion NC-74	34472822	N/A	30/09/2021

Meteorological Conditions

4.9 Meteorological conditions have been assessed using an RPS weather station deployed at location LT1.

4.10 The survey period had no rain events however wind speeds exceeded 5 m/s at times; as such, data from these periods has been removed from the subsequent analysis.

4.11 Full weather data can be seen in Appendix A.

Figure 4.1: Site, Noise Sensitive Receptors and Baseline Survey Locations

Results and Discussion

4.12 Table 4.2 and Table 4.3 below provide a summary of baseline sound levels measured at LT1 and LT2 and over the 7-day survey period respectively.

4.13 Appendix A, found at the end of the report, provides a graphical presentation of post processed 15-minute levels for LT1 and LT2.

4.14 Table 4.4 below provide a summary of baseline sound levels measured at ST1 over the 1-hour survey period respectively

Table 4.2: LT1 Baseline Sound Levels

Period	Residual Sound Levels (dB $L_{Aeq,15min}$)						Background Sound Levels (dB $L_{A90,15min}$)				
	Min	25th %[1]	50th %	75th %	Max	Linear Average	Min	25th %	50th %	75th %	Max
Daytime (07:00 to 23:00)	37	43	46	48	71	50	35	41	43	45	52
Night-time (23:00 to 07:00)	40	44	45	47	54	46	38	42	44	45	47

Notes:
1. Percentile value, for example 25th % is the value below which 25% of the data is found.

Table 4.3: LT2 Baseline Sound Levels

Period	Residual Sound Levels (dB $L_{Aeq,15min}$)						Background Sound Levels (dB $L_{A90,15min}$)				
	Min	25th %[1]	50th %	75th %	Max	Linear Average	Min	25th %	50th %	75th %	Max
Daytime (07:00 to 23:00)	35	44	47	49	64	49	30	40	43	45	50
Night-time (23:00 to 07:00)	36	41	43	46	64	48	33	39	41	43	48

Notes:
1. Percentile value, for example 25th % is the value below which 25% of the data is found.

Table 4.4: ST1 Baseline Sound Levels

Period	Residual Sound Levels (dB $L_{Aeq,15min}$)						Background Sound Levels (dB $L_{A90,15min}$)				
	Min	25th %[1]	50th %	75th %	Max	Linear Average	Min	25th %	50th %	75th %	Max
Daytime (12:15 to 13:15)	55	56	59	60	60	58	48	49	49	49	50

Notes:
1. Percentile value, for example 25th % is the value below which 25% of the data is found.

Subjective Assessment of Sound Climate

4.15 At the time of setting up and collecting the long term surveys the sound climate was judged to be built up of the following noises: natural sounds (wind in trees, bird calls, insects etc.) and distant road traffic.

4.16 At the time of conducting the short term surveys the sound climate was judged to be built up of the following noises: road traffic noise and natural sounds (wind in trees, bird calls, insects etc.).

Representative Baseline Sound Levels

4.17 BS 4142:2014+A1:2019 requires that the background sound levels adopted for the assessment are representative of the period(-s) being assessed. The Standard recommends that the background sound level should be derived from continuous measurements of normally not less than 15-minute intervals, which can be contiguous or disaggregated (paragraph 8.13 of BS 4142:2014+A1:2019).

4.18 However, the Standard states that there is no 'single' background sound level that can be derived from such measurements. It is particularly difficult to determine what is 'representative' of the night-time period because it can be subject to a wide variation in background sound level between the beginning and end of the night period, and the quieter middle part of the night period. The accompanying note states that "a representative level should account for the range of background sounds levels and should not automatically be assumed to be either the minimum or modal value".

4.19 In this instance the 25th percentile from the surveyed period has been used to characterise the baseline sound environment. This is not the lowest sound level encountered but is lower than that obtained using the average. It therefore represents somewhere in the range of lower sound levels that are likely to be encountered and provides a precautionary assessment. Use of the 25th percentile ensures that any periods when higher wind speeds could have affected the measured baseline sound levels do not unduly affect the analysis.

4.20 Representative baseline residual levels have been based on the linear averages of $L_{Aeq,15min}$ during the relevant period.

4.21 Table 4.5 below provides a summary of representative sound levels used in the subsequent assessment for LT1, LT2 and ST1 respectively.

Table 4.5: Representative Baseline Sound Levels

Location	Period	Background Sound Level $L_{A90,T}$ (dB)	Residual Sound Level $L_{Aeq,T}$ (dB)
LT1	Daytime (07:00 to 23:00)	41	50
	Night-time (23:00 to 07:00)	42	46
LT2	Daytime (07:00 to 23:00)	40	49
	Night-time (23:00 to 07:00)	39	48
ST1	Daytime (12:15 to 13:15)	49	58

5 Calculations and Modelling

5.1 In order to calculate noise impacts associated with operation of the solar farm at NSRs, a 3D sound model has been built using SoundPLAN v8.2 noise modelling software.

5.2 The model predicts sound levels under light down-wind conditions based on hemispherical sound propagation with corrections for atmospheric absorption, ground effects, screening and directivity based on the procedure detailed in ISO 9613-2:1996 'Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation' [6].

5.3 The noise generating aspects of the development are detailed in Table 5.1.

5.4 Acoustic input properties of the proposed sources have been based on data supplied by Redcar Holdings and RPS' experience of similar sites.

Table 5.1: Modelled Plant Sources

Plant	Number of Sources	Modelled Source Type	Maximum Sound Power Level (dBA L_W)	Source On Time	Information on Data Set Used
MRF Building	1	Industrial Building	80	100%	Info: Averaged value of about 150 industrial sources such as cooler, fan, compressor
Bunker	1	Industrial Building	84	100%	Info: Averaged value of about 150 industrial sources such as cooler, fan, compressor
Tipping Hall	1	Industrial Building	80	100%	Info: Averaged value of about 150 industrial sources such as cooler, fan, compressor
Boiler Hall	1	Industrial Building	84	100%	Info: Averaged value of about 150 industrial sources such as cooler, fan, compressor
Substation	1	Industrial Building	85	100%	Info: Averaged value of about 150 industrial sources such as cooler, fan, compressor
Turbine hall	1	Industrial Building	80	100%	Info: Averaged value of about 150 industrial sources such as cooler, fan, compressor
ACC	1	Area Source	92	100%	Source: RPS Library - 6.1 Air Cooled Condenser (7662e)
Ash Handling	1	Area Source	90	100%	Source: British Standard BS 5228-1:2009, Table C6

Plant	Number of Sources	Modelled Source Type	Maximum Sound Power Level (dBA L_W)	Source On Time	Information on Data Set Used
Conveyor	1	Line Source	80.5	100%	Source: British Standard BS 5228-1:2009, Table C10
ACC Inlet	1	Point Source	90	100%	Source: RPS Library - 6.1 Air Cooled Condenser (7662e)
Stack Outlet	2	Point Source	87	100%	Source: RPS Library - Odour abatement system – stack noise emission
FGT	1	Point Source	85	100%	Source: RPS Library - Odour abatement system – stack noise emission*
Turbine Air Cooler	1	Point Source	90	100%	Source: RPS Library - 6.1 Air Cooled Condenser (7662e)
* Noise emission used as worse case.					

5.5 Spectral data for plant items has been based data on RPS data sets.

5.6 In the model the MRF Building, Tipping Hall, Bunker, Boiler, Substation and Turbine Hall have been modelled as industrial buildings with radiating facades. ACC and Ash Handling have been modelled as area sources. The Conveyor has been modelled as a line source. The ACC Inlet, Stack Outlet, FGT and Turbine Air Cooler have all been modelled as point sources.

5.7 The model layout of the site has been based on the drawing submitted as part of the planning application 'Redcar Energy Centre Proposed Site Plan' (ref: 19216-RPS-SI-XX-DR-A-5002_Site Plan).

5.8 The following assumptions have been incorporated into the noise model:

- the topography of the site and the surrounding area has been obtained from site surveyed topographical data and Ordnance Survey OS) open data (Terrain 50);
- the effect of screening from solid structures (buildings) has been incorporated into the modelling process by importing OS Open Data 'Settlement Area' shape file data into the model;
- the ground type in the model has been set to soft (G=1) with REC modelled as hard (G=0);
- All equipment has been assumed to be continuously operational and therefore no 'on time' corrections have been applied and
- All equipment has been assumed to operate at the same time.

Model Results

5.9 Table 5.2 below provides a summary of modelled specific sound levels at the nearest NSRs for the daytime and night-time periods.

5.10 Daytime and Night-time levels are presented graphically in Appendix B at the end of the report.

Table 5.2: Predicted Specific Sound Levels

NSR	Specific Sound Level $L_{Aeq,Tr}$ (dB)	
	Daytime (07:00 to 23:00 hours)	Night-time (23:00 to 05:00 hours)
Bran Sands	39	39
Coatham Sands	29	29
NSR A	22	22
NSR B	18	18
Seal Sands	22	22

6 Assessment

BS 4142:2014+A1:2019 Assessment

6.1 This section of the report describes the assessment of noise impacts based on the guidance in BS 4142:2014+A1:2019. This includes a comparison of the specific sound (i.e. sound from the development) corrected for 'acoustic character' (once corrected this is known as the 'rating level') against the background sound levels at noise sensitive receptors.

6.2 With reference to BS 4142:2014+A1:2019, a character correction can be applied to the specific sound level depending on the acoustic characteristics of the sound, including tonality and impulsivity.

6.3 Noise from site is unlikely to be impulsive or intermittent enough to attract attention. Due to the absolute level of noise produced by the site (very low) and the nature of equipment it is considered unlikely that tonal noise will be audible at the receptor locations. However, to represent a reasonable worst-case scenario, a character correction has been applied to the specific sound level of + 2 dB for 'a tone that is just perceivable' at the receptor location.

6.4 In accordance with BS 4142:2014+A1:2019 Table 6.1 and Table 6.2 below provide an initial estimate of the noise impact at the nearest NSRs during operation from Redcar Energy Centre during the daytime and night-time periods respectively.

Table 6.1: BS 4142:2014+A1:2019 Assessment (Daytime)

NSR	Specific Sound Level $L_{Aeq,Tr}$ (dB)	Character Correction, dB	Rating Level, dB $L_{Ar,Tr}$	Background Level, dB $L_{A90,T}$	Rating / Background Level Difference, dB
NSR A	22	2	24	40	-16
NSR B	18	2	20	49	-29

Table 6.2: BS 4142:2014+A1:2019 Assessment (Night-time)

NSR	Specific Sound Level $L_{Aeq,Tr}$ (dB)	Character Correction, dB	Rating Level, dB $L_{Ar,Tr}$	Background Level, dB $L_{A90,T}$	Rating / Background Level Difference, dB
NSR A	22	2	24	39	-15
NSR B	18	2	20	39*	-19
* LT2 data used for this position due to the duration of ST1 survey					

6.5 With regards to the rating / background level difference, BS 4142:2014+A1:2019 states:

- 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; and
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

6.6 With reference to Table 6.1 and Table 6.2 it has been found that rating levels do not exceed background sound levels at any receptor during any of the assessment periods.

6.7 The BS4142:2014+A1:2019 assessment therefore indicates that adverse noise impacts are unlikely to occur and that that any impacts are likely to be low, depending on the context.

6.8 Also, when comparing residual sound levels shown in Table 4.5 against specific sound levels shown in Table 5.2 these are more than 10 dB lower during the day and night, therefore won't increase sound levels at these locations, as shown in Table 6.3 below.

Table 6.3: Change in Ambient Level

NSR	Day/Night	Residual Sound Level (dB $L_{Aeq,T}$)	Specific Sound Level (dB $L_{Aeq,Tr}$)	Ambient Sound Level (dB $L_{Aeq,T}$)	Change in Ambient
Bran Sands	Day	50	39	50	0
	Night	46	39	46	0
Coatham Sands	Day	49	29	49	0
	Night	48	29	48	0
S Gare ACC Road	Day	49	22	49	0
	Night	48	22	48	0
72 Broadway Way	Day	58	18	58	0
	Night	46*	18	46	0
Seal Sands	Day	50	22	50	0
	Night	46	22	46	0
* Worse case sound level used for this position					

6.9 With reference to WHO guidelines for desirable levels of environmental noise, paragraph 2.33 of this report, no specific levels exceed 50 dB L_{Aeq} therefore no risk of the majority of people from being moderately annoyed during the daytime.

6.10 It is therefore concluded that operation of the proposed scheme would not result in adverse impacts on nearby noise sensitive receptors.

Impacts of Operational Noise on Ecological Receptors

6.11 Graphical presentations of noise levels are provided as Appendix B. The indicated levels are the energetical average ($L_{Aeq,T}$), representative of steady or continuous noise.

6.12 With reference to Table 5.2 and Appendix B, operational noise levels at Bran Sand are less than 40 dB $L_{Aeq,T}$, with noise levels for Coatham Sands and Seal Sands less than 30 dB $L_{Aeq,T}$.

6.13 On this basis and with reference to Table 2.1, maximum operational noise impacts associated with would be of a negligible magnitude.

Summary

6.14 On the basis of the above, when considering noise from the proposed REC, it has been found that:

- Predicted rating levels do not exceed background sound levels at any NSRs at time;
- Noise from the proposed development is likely to be of very low absolute magnitude (< 40 dB) at all NSR locations and likely not be noticeable / intrusive when compared to the baseline acoustic environment; and
- The existing ambient sound levels would not be increased as a result of the proposed scheme at any NSR.

6.15 Therefore, significant adverse noise impacts on health and the quality of life would be avoided and there would be no adverse effects or harm on residential amenity.

7 Uncertainty

7.1 In all assessments, it is good practice to consider uncertainty which can arise from a number of different aspects. There are degrees of uncertainty associated with: instrumentation used for surveying; measurement technique and the variables influencing the measurement results such as transmission path and weather conditions; source terms used for modelling; calculation uncertainty; assessment uncertainty; and the subjective response of residents to noise sources.

7.2 Uncertainty due to instrumentation has been significantly reduced with the introduction of more modern instrumentation and is reduced further by undertaking field calibration checks on sound level meters before and after each measurement period and that all instrumentation is within accepted laboratory calibration intervals.

7.3 Every effort has been made to reduce the uncertainty of the baseline sound level measurements. The duration of the baseline survey is considered to significantly reduce the uncertainty associated with the baseline sound levels. Based on professional judgement including substantial experience of acquiring and analysing baseline data for numerous sites in various locations, and a desk-based review of the site and surrounding area, it is considered that the baseline data acquired during the survey is typical of the area.

7.4 Calculation uncertainty and assessment uncertainty have been reduced by peer review of all baseline data, model input data, model results and assessment calculations, and by using the appropriate level of precision at each stage of the assessment calculations.

7.5 A quantitative assessment has been undertaken based on source levels measured by RPS personnel, provided by the project team for the proposed equipment or based on recognised and accepted empirical calculation methodologies. Where assumptions have been made, they have favoured a worst-case scenario.

7.6 With regards to subjective response, the noise standards adopted for the assessment will have been based upon the subjective response of the majority of the population or will be based upon the most likely response of the majority of the population. This is considered to be the best that can be achieved in a population of varying subjective response which will vary dependent upon a wide range of factors.

7.7 All areas and potential consequences of uncertainty have been minimised at every stage of the assessment process. On the basis of the above, and in the context of subjective response, the effects of uncertainty on the assessment are considered minimal.

8 Conclusions

8.1 RPS has been commissioned by Redcar Holdings Limited (Redcar Holdings) to undertake a noise impact assessment (NIA) to form part of a permitting application for the proposed Redcar Energy Centre (REC) on land located at the Redcar Bulk Terminal, approximately 4.5 km west of Redcar town centre and 8.5km northeast of Middlesbrough city centre. The site is located within the administrative boundary of the Redcar and Cleveland Borough Council (RCBC).

8.2 Baseline noise conditions at the nearest noise sensitive receptors (NSRs) were established by the baseline monitoring undertaken on site over a 7-day period from 13:00 hours on 6th April 2022 to 13:00 hours on 13th April 2022.

8.3 The assessment was carried out in accordance with the British Standard (BS) 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound' [1]methodology, which is the industry standard for assessment of commercial and industrial sound.

8.4 The BS 4142:2014+A1:2019 initial estimate of impact indicates that no adverse impacts are likely to occur at any of the NSRs considered within this assessment, depending on the context.

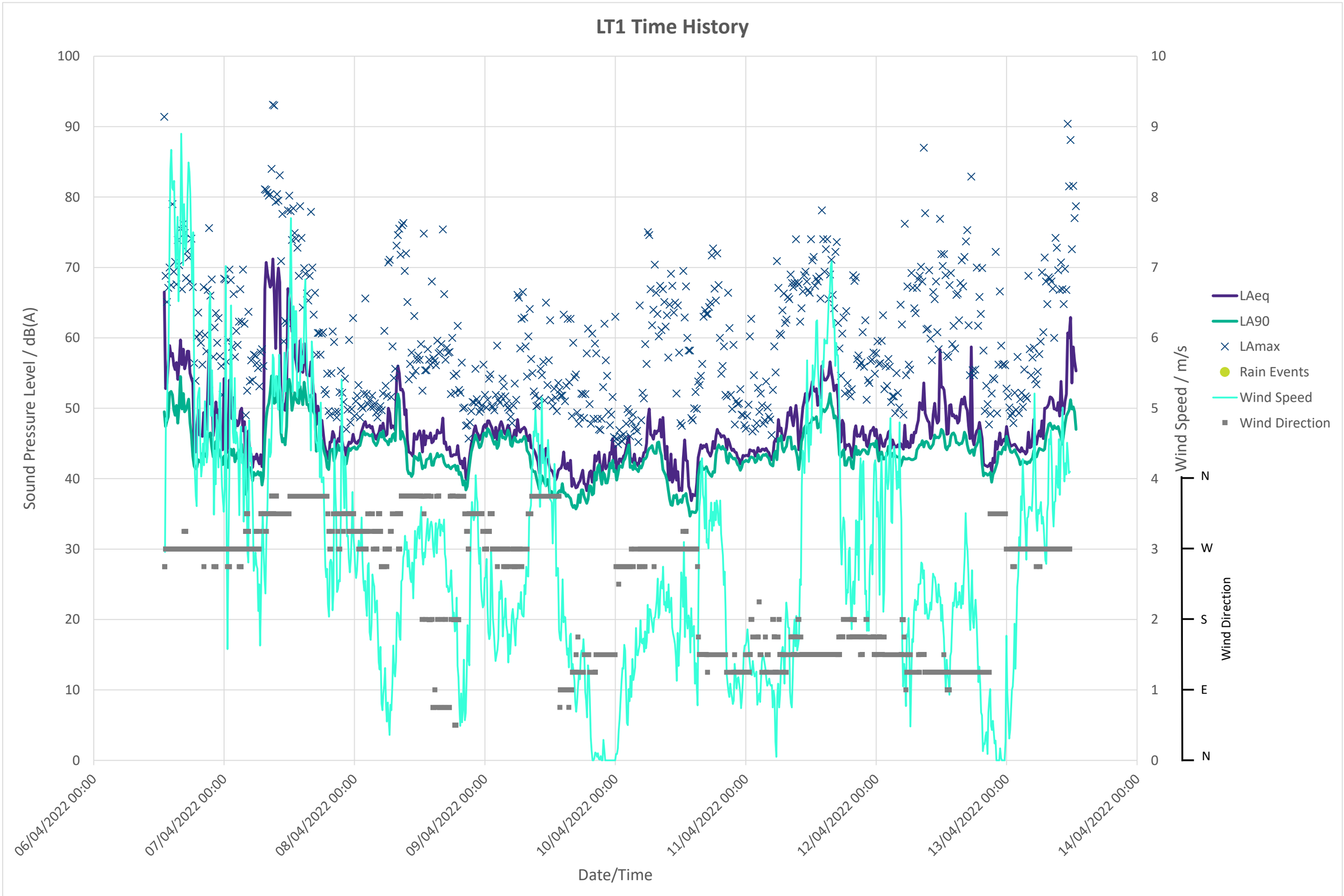
8.5 Taking into account the context, the BS 4142:2014+A1:2019 initial estimate of impact is confirmed and therefore no adverse impacts are predicted at any of the NSRs.

8.6 The results of the NIA show that operation of REC would result in low specific noise levels at noise sensitive receptors (NSRs), with Rating Levels not exceeding the background sound level at any time.

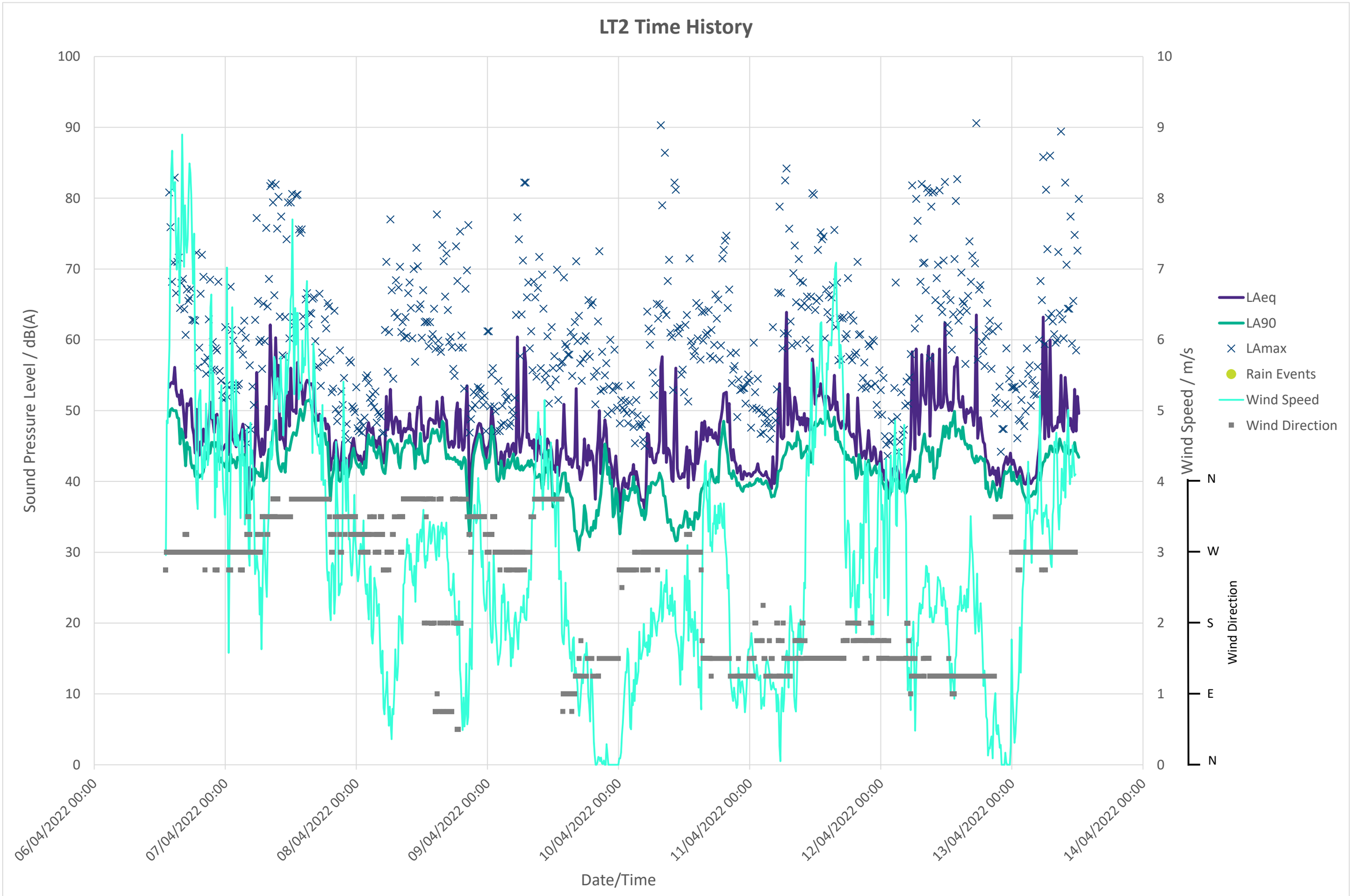
8.7 On the basis of the above, it is concluded that levels of sound arising from the operation of the facility will not result in any adverse impacts, significant or otherwise, at any of the nearby NSRs.

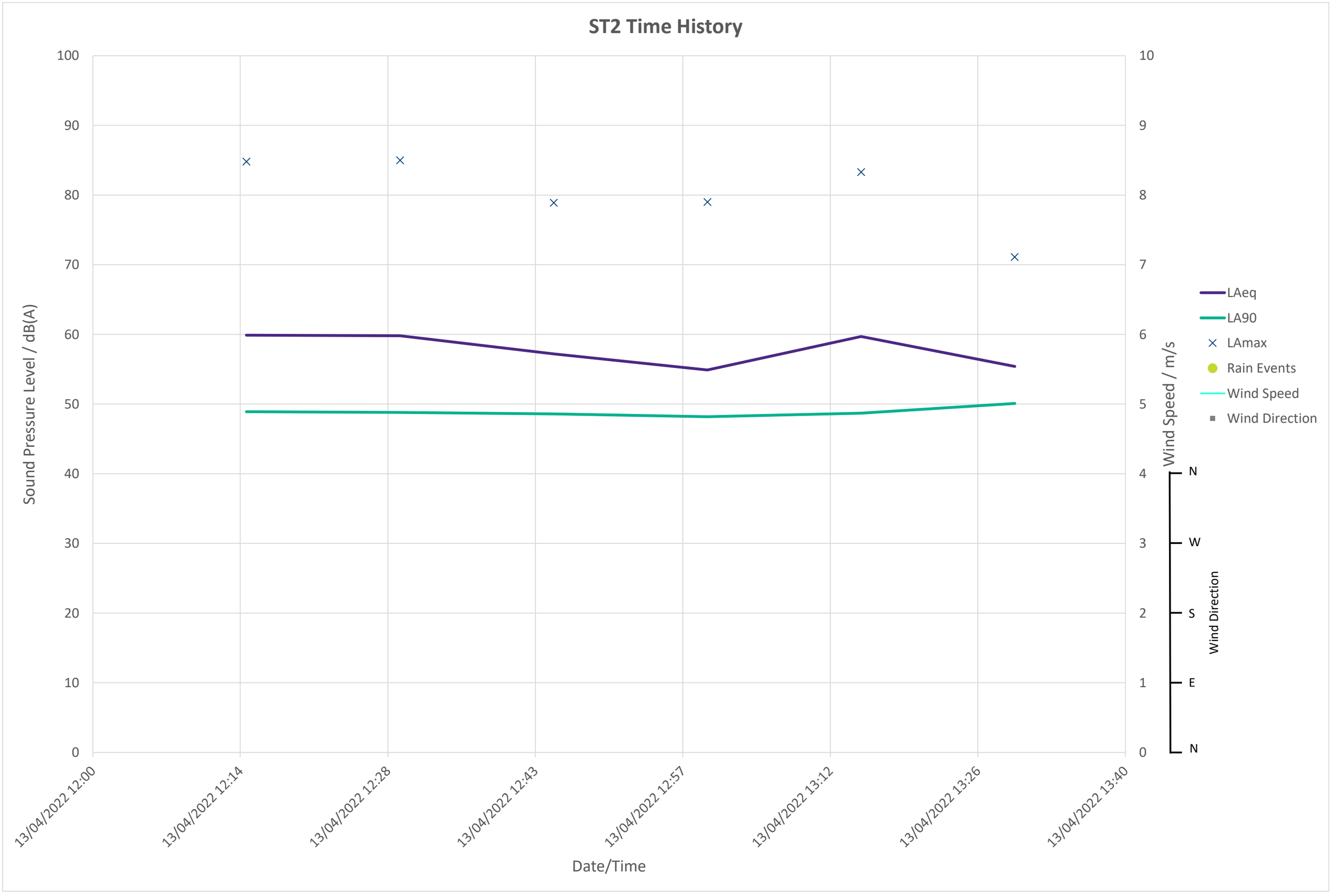
Appendix A: LT1 and LT2 Time Histories and Weather Graph

LT1 Time History

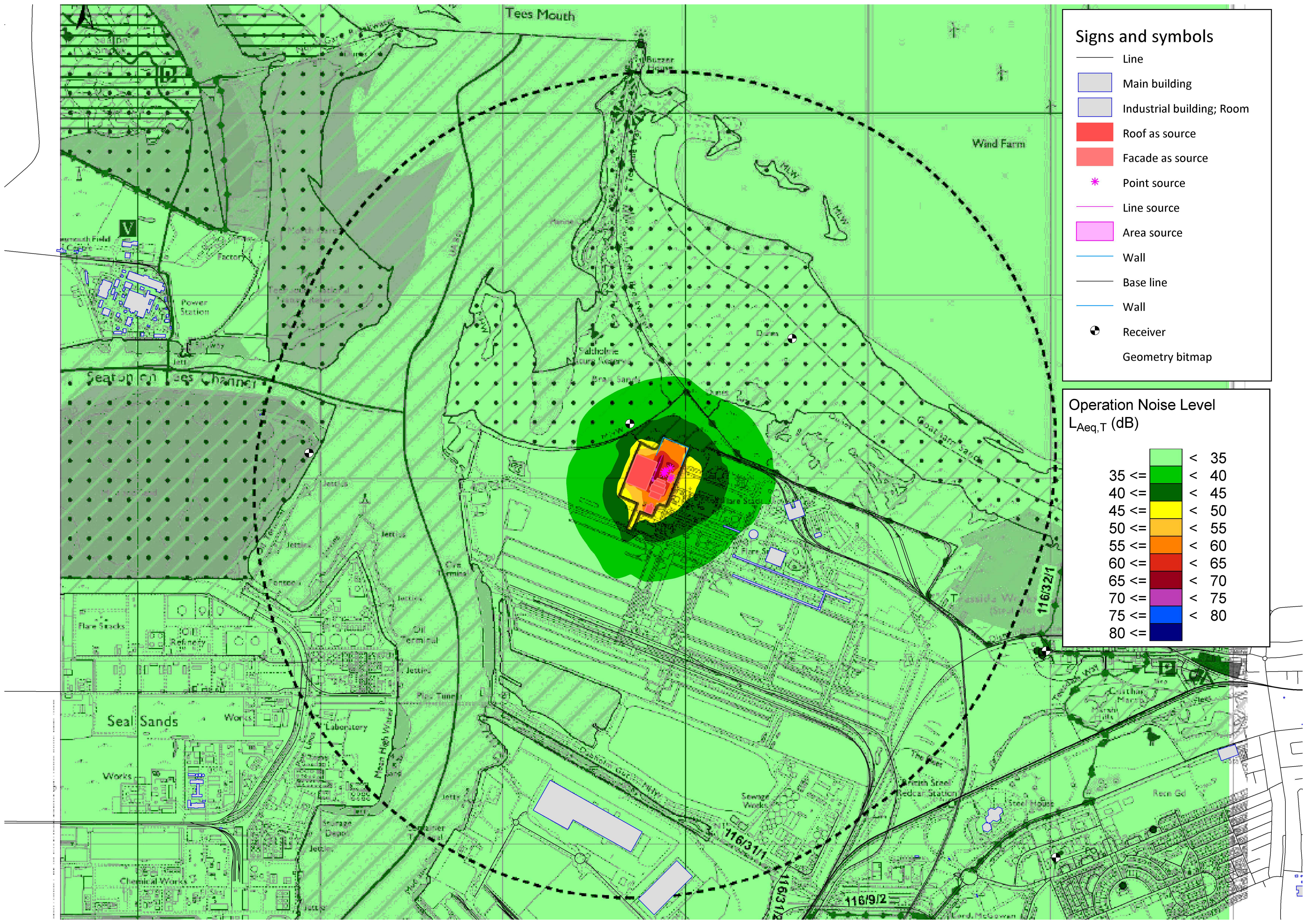


LT2 Time History




ST2 Time History
Sound Pressure Level / dB(A)
Wind Speed / m/s
Wind Direction
Date/Time
100
90
80
70
60
50
40
30
20
10
0
10
9
8
7
6
5
4
3
2
1
0
N
W
S
E
N
13/04/2022 12:00
13/04/2022 12:14
13/04/2022 12:28
13/04/2022 12:43
13/04/2022 12:57
13/04/2022 13:12
13/04/2022 13:26
13/04/2022 13:40
LAeq
LA90
LAmax
Rain Events
Wind Speed
Wind Direction

Appendix B: Grid Noise Maps


Signs and symbols
Line
Main building
Industrial building; Room
Roof as source
Facade as source
Point source
Line source
Area source
Wall
Base line
Wall
Receiver
Geometry bitmap
Operation Noise Level
$L_{Aeq,T}$ (dB)
< 35
35 <= < 40
40 <= < 45
45 <= < 50
50 <= < 55
55 <= < 60
60 <= < 65
65 <= < 70
70 <= < 75
75 <= < 80
80 <=
Tees Mouth
Wind Farm
Seaton on Tees Channel
Seal Sands
Power Station
Oil Refinery
Oil Terminal
Flare Stacks
Chemical Works
Laboratory
Works
116/31/1
116/32/1
116/9/2

Appendix C: BS 4142:2014+A1:2019 Statements

Lise W. Tjellesen – Technical Director – Acoustics

MSc Eng Acoustics; Member of the Institute of Acoustics; Member Acoustical Society of America; Member of Danish Acoustic Society; Member of Audio Engineering Society

A.1 Lise is Technical Director of the RPS Acoustics Team with 20 years of experience in acoustics. She is a specialist acoustic consultant with a wide range of experience gained in the UK, Denmark and worldwide. She has worked with electroacoustics, psychoacoustics, architectural acoustics, vibrations and environmental acoustics. She has gained particular experience in the fields of architectural acoustics (building and room) working with the construction industry on a variety of projects, including residential, commercial, education, health and entertainment.

A.2 Lise is an expert on the subject of room acoustics and room acoustic computer simulations, as well as a leading expert on the emerging field of archaeoacoustics. She has published several papers on the above subjects and on acoustics of offices.

A.3 Lise has been involved in many BS 4142 noise assessments for both the previous (2014) and current (2019)version of BS 4142. She has given evidence at public inquiries where BS 4142 has been the primary assessment methodology. On the basis of Lise's overall experience in acoustics (particularly in relation to environmental noise) combined with particular focus on BS 4142, she is deemed competent for BS 4142 assessments.

A.4 For this project Lise has taken on the role of Project Director responsible for overseeing and delivering the project.

A.5 Lise was also responsible for reviewing the assessment and reviewing and authorising the report chapter, figures and appendices.

Susan Hirst – Principal Consultant – Acoustics

BSc (Hons) Acoustics; Member of the Institute of Acoustics

A.6 Susan is a Principal Acoustic Consultant and environmental acoustics specialist with over 14 years' experience. She has been a member of the Institute of Acoustics since 2007 and a corporate Member of the Institute of Acoustics (MIOA) since 2012.

A.7 Susan has managed projects and undertaken assessments for a variety of developments, including: large scale mixed-use developments, incorporating commercial, retail, leisure and residential elements; on-shore and off-shore windfarms and their associated infrastructure; energy from waste facilities; manufacturing facilities; power stations; warehouses; minerals extraction and processing; and road schemes.

A.8 She has provided input into Environmental Impact Assessments (EIAs) and undertaken noise assessments to support planning applications, discharge planning conditions and planning appeals; provided technical advice on mitigation options and attended planning hearings. She has a Continuous Professional Development Record to support this competency and experience.

A.9 Susan has carried out many BS 4142 noise assessments using both the previous (2014) and current 2019 version of the standard. On the basis of Susan's overall experience in acoustics combined with particular focus on BS 4142, she is deemed competent to undertake BS 4142 assessments.

A.10 For this project Susan has been responsible for reviewing the assessment and reviewing the report chapter, figures and appendices.

Stephen Hale –Consultant – Acoustics

BSc (Hons) Sound Engineering,

A.11 Stephen is an Acoustic Consultant and Sound Insulation specialist with over seven years' experience. He has a First-Class Bachelor of Science Degree in Sound Engineering and also has an Institute of Acoustics Certificate of Confidence in Environmental Noise Measurement. He is a corporate Member of the Institute of Acoustics (MIOA).

A.12 Stephen joined RPS in 2021, he has project managed and undertaken noise assessments for a variety of developments, including: large scale mixed-use developments, incorporating commercial, retail, leisure and residential elements; energy from waste facilities; manufacturing facilities; distribution centres; retail units; minerals extraction and exploration and solar farms. He has provided input into Environmental Impact Assessments (EIAs) and undertaken noise assessments to support planning applications and discharge planning conditions. He has a Continuous Professional Development (CPD) Record to support this competency and experience.

A.13 Stephen has been involved BS 4142 noise assessments for both the previous (2014) and current 2019 version of BS 4142. He is familiar with the Standard and has received training regarding the revised 2019 version of the Standard. On the basis of Stephen's overall experience in acoustics, combined with particular focus on BS 4142 and with the assistance of more experienced colleagues, he is deemed competent for BS 4142 assessments.

A.14 For this project Stephen has taken on the role of Project Manager and has been responsible for overseeing the project.

A.15 Stephen was also responsible for downloading and processing the survey data, undertaking the assessment, undertaking the modelling, and preparing the report, figures and appendices.

Appendix D: Spectral Data

Octave Band Relative Sound Power Level (dB LW) Spectral Data

	31Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
Averaged Industry	-	9.20	4.10	0.73	-3.57	-6.20	-9.10	-11.27	-13.19
C10.23 Field conveyor (rollers)	-	85.98	79.98	79.98	70.98	70.98	69.98	47.68	74.98
C6.34 Wheeled loader	-	109.98	109.98	98.98	100.98	96.98	94.98	93.98	85.98
6.1 Air Cooled Condenser (7662e)	-	133.20	123.10	110.63	102.23	97.00	88.80	84.03	82.11
Odour abatement system – stack noise emission	152.45	136.20	122.10	111.62	104.24	98.00	92.80	89.03	114.11

References

1 British Standards Institution. British Standard 4142:2014+A1:2019. ‘Methods for rating and assessing industrial and commercial sound’. 2019.

2 Environmental Agency, Scottish Environment Protection Agency, Natural Resources Wales, Northern Ireland Environment Agency. Noise and vibration management: environmental permits. 2022.

3 Environmental Agency. Guidance ‘Noise impact assessments involving calculations or modelling’. 2018.

4 Berglund, B. et al. Guidelines for Community Noise. World Health Organisation. 2000.

5 British Standards Institution. British Standard 7445-2:1991 ‘Description and measurement of environmental noise - Part 2: Guide to the acquisition of data pertinent to land use’. 1991.

6 ISO. International Standard ISO 9613-2:1996. Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation.

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