RSK Acoustics

Scottish Power Renewables

Whitelee Planning Support - Noise Assessment

Report Ref. 2061684-RSKA-RP-001

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Revision	Description	Date	Prepared	Approved
0	First issue	22 March 2023	Thomas Dalton/ Daniel Lilley	Matthew White
1	First revision	15 May 2023	Thomas Dalton	Matthew White

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Attachments

1 Introduction

1.1 Instruction

1.1.1 RSK Acoustics has been instructed by Scottish Power Renewables (SPR) to undertake a noise impact assessment to satisfy the Energy Consents Unit and East Ayrshire Council regarding noise impact concerns for a proposed Green Hydrogen Energy site and a Battery Energy Storage System (BESS) facility at Whitelee Windfarm, Eaglesham, Glasgow.

1.1.2 The proposed Hydrogren energy site and associated solar scheme is located to the west of the original Whitelee windfarm and the proposed BESS is located 800m from the existing Whitelee EXT substation, but within the Whitelee EXT windfarm site.

1.1.3 A glossary of relevant acoustic terminology is appended to this report.

1.2 May 2022 Noise Assessment

1.2.1 A noise report prepared by Wood, dated May 2022, was provided in support of a planning application for the proposed Green Hydrogen Energy site facility at Whitelee Windfarm. The noise report established noise limits for the proposed developments, based on achieving levels equal or below the background noise levels at the nearest receptors. The background noise levels used in the assessment were taken from the August 2012 Environmental Statement (ES) for Whitelee Windfarm extension (Phase 3).

1.2.2 Following the noise report, a meeting on 13th October 2022 took place between representatives of Scottish Power Renewables and the planning departments at Energy Consent Unit and East Ayrshire Council. It was suggested a front-end engineering design model prepared in SoundPlan, separating the area within the site boundaries into functional areas, ascribing a noise level to each individual functional area would be completed. This in turn, allowing for the calculation of realistic potential noise levels associated with equipment at each premises noise sensitive receptors to be predicted.

1.2.3 This report is intended to follow the Woods May 2022 report and demonstrate the likely noise levels from the proposed developments at receptor to satisfy the planning department of Energy Consents Unit and East Ayrshire Council.

1.2.4 A noise assessment has been prepared including noise modelling of noise sources from similar developments for representative assessment of 20MW Green Hydrogen site, and 50MW BESS site. The noise model has predicted the noise from representative noise levels and quantities of equipment against the background noise levels at the receptors. Where potential equipment will be designed based on noise level emission requirements, noise limits have been set for the equipment.

1.3 Objectives

1.3.1 The objectives of the noise impact assessment are as follows:

- Noise limits for the proposed Green Hydrogen Energy site and subsequent installation of a Battery Energy Storage System (BESS) facility at Whitelee are proposed based on previously assessed background noise levels by Wood.
- Calculate the noise levels generated by the proposed Green Hydrogen Energy site and BESS facility at the nearest or most exposed sensitive receptors;
- Assess the predicted noise levels against the noise limits; and,
- Provide noise level emission requirements for equipment which is likely to be designed to specification.

2 Proposed Development and Site Setting

2.1 Proposed Development

2.1.1 The proposed development comprises Green Hydrogen Energy site (20MW) and the installation of a BESS facility of (up to 50 MW), at the existing Whitelee Windfarm facility, in Eaglesham, Glasgow.

2.1.2 The proposed Hydrogren energy site and proposed BESS are located approximately 3.8km apart from the existing receptors located between the two sites, susceptible to cumulative impacts from both sites.

2.1.3 Based on previous experience, and discussions with engineers, the potential equipment likely to be representative of the proposed development have been determined.

2.1.4 Representative Green Hydrogen Energy site noise sources include:

- 10 Hydrogen Electrolyser Stackhouses (including associated transformers, chillers and ventilation plant)
- 2 Tower Cooling Units
- 5 Housed Compressor Units

2.1.5 The BESS compound will incorporate:

- 30 Power Containment System Inverters
- 15 Power Containment System Transformers
- 40 Battery Container HVAC Systems

2.2 Site Location and Description

2.2.1 The Green Hydrogen Energy Site is centred on approximate National Grid reference 251274.18E, 647210.90N and BESS Compound is to be located at Whitelee Wind Farm, centred on approximate National Grid reference 254638.87E, 644986.45N. The BESS compound will be accessed via the site access tracks which connect to the B741 local road network.

2.2.2 The Green Hydrogen site is located in the western areas of the proposed development boundary, with the BESS compound located approximately 3.8km south east of the Green Hydrogen Site.

2.2.3 The nearest receptors considered in this assessment were established in the May 2022 report and are presented in Table 2.1.

Receptor Area	Noise sensitive receptor	Distance from Noise Source (m)	Background Location
1	Cauldstones	1356	Shieldhill
	Kingswell	1380	
	Drumtree	1582	
2	Lochgoin Farm	1673	Lochgoin Farm
	Craigendunton	2075	

Table 2.1 – Surrounding noise sensitive receptors

2.2.4 It should be noted receptor from the Woods May 2022 noise assessment included receptor 'Moor'. It has been confirmed that the property is derelict and under the control of Scottish Power Renewables.

2.2.5 The site plan is presented in Figure 2. shows the proposed site boundary, taken from the Wood May 2022 report.

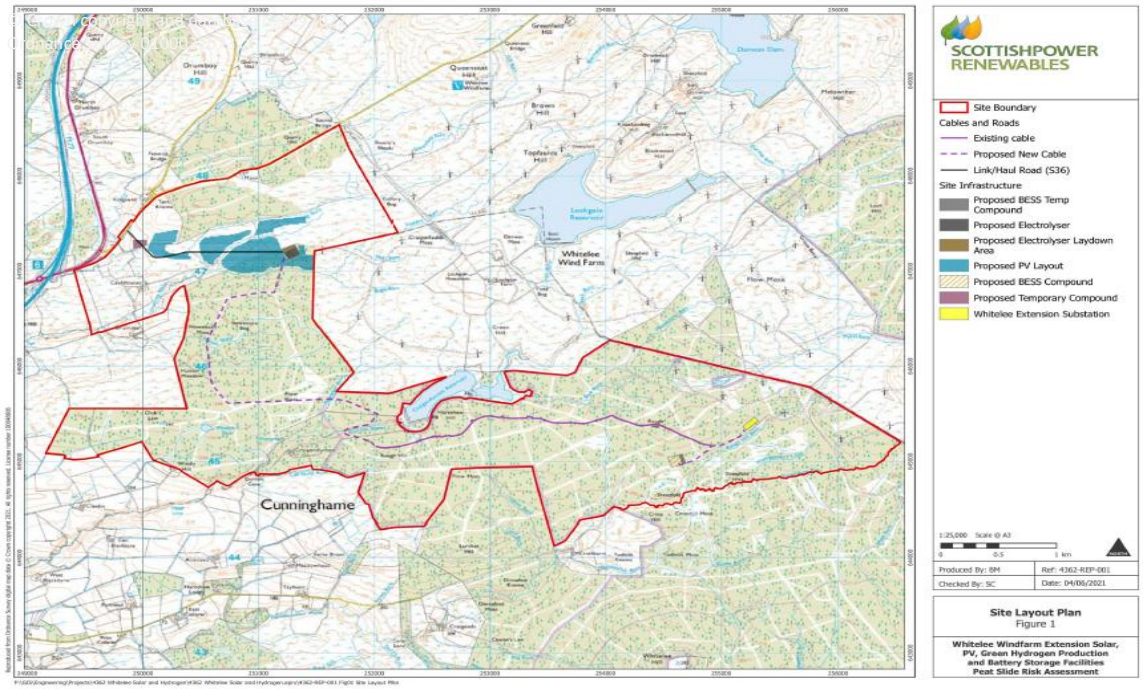


Figure 2.1– Site plan

2.2.6 The site plan presented in Figure 2. shows the locations of the nearest noise sensitive receptors in relation to the Green Hydrogen and BESS sites.

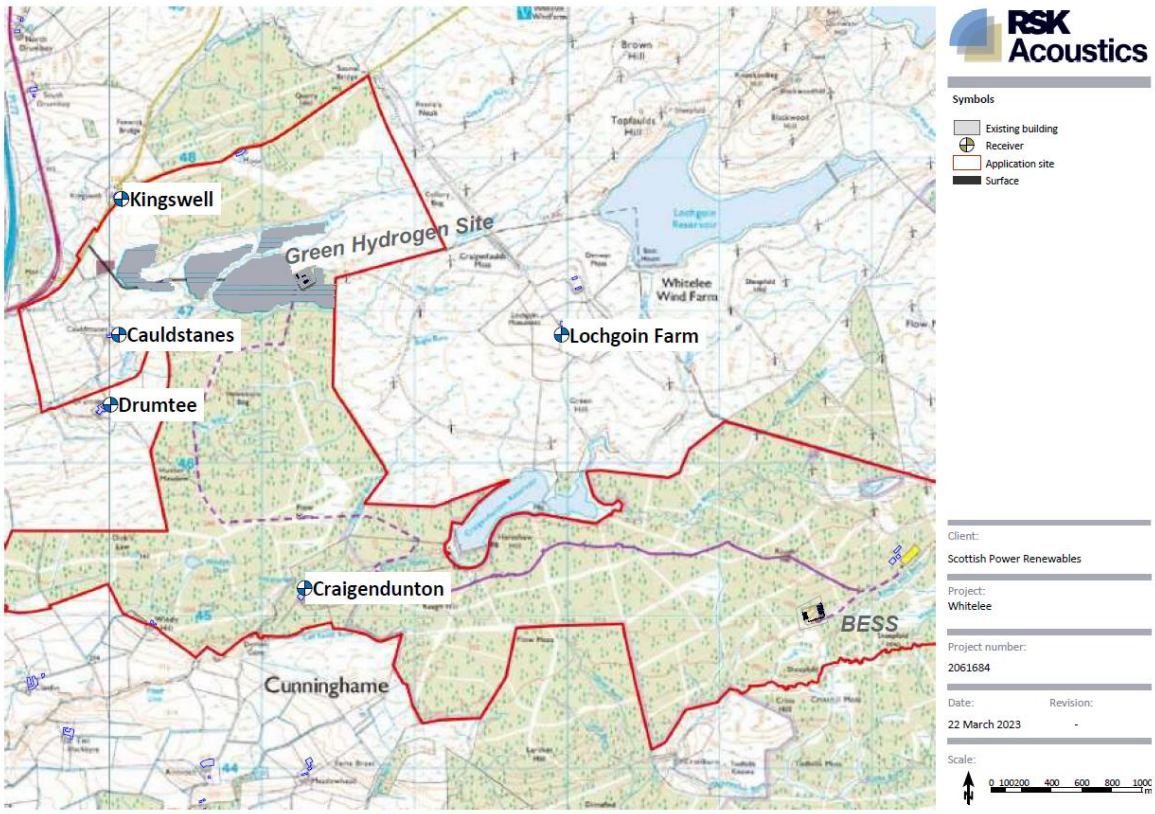


Figure 2.2 – Nearest noise sensitive receptors

2.2.7 The surrounding study area primarily comprises open grassland/agricultural land, woodland areas, isolated dwellings and farm buildings accessed by the local road network. The M77 is located directly to the west of the site.

2.2.8 It should be noted that receptors at Lochgoin Farm and Craigendunton are identified to be the nearest existing receptors to the BESS Site, but are also impacted by the Green Hydrogen site.

3 Assessment Methodology

3.1 Noise Emission Data

3.1.1 Table 3.1 and 3.2 present the noise emission data for the representative equipment installations that have been incorporated into the noise prediction model for the proposed Green Hydrogen Energy Site (Table 3.1) and BESS Compound (Table 3.2).

3.1.2 The Hydrogen Electrolyser Stackhouse's comprise of multiple noise sources including 9 external components, and 8 internal components. The total sound pressure of all these sources combined has been used as the representative noise levels for Hydrogen Electrolyser Stackhouse.

3.1.3 Noise levels specified for Compressor Housing Units and Cooling Towers are specified as the highest value possible with the assessed configuration. The noise level per unit is achievable based on existing data for relevant equipment.

Equipment	Quantity	Sound power level per Unit (L_{wA}, dB)	Sound pressure level per Unit*
Hydrogen Electrolyser Stackhouse	10	L_{wA} 87.5 dB	79.5 dB L_{Aeq} at 1m
Compressor Housing Unit	5	L_{wA} 83 dB	75 dB L_{Aeq} at 1m
Cooling Tower	2	L_{wA} 92 dB	84 dB L_{Aeq} at 1m

Table 3.1 – Equipment noise emissions- Green Hydrogen Energy Site
*Hemi-spherical point source assumption

Equipment	Quantity	Sound power level per Unit (L_{wA}, dB)	Sound pressure level per Unit*
Power Containment System Inverter	30	L_{wA} 87 dB	79 dB L_{Aeq} at 1m
Power Containment System Transformer	15	L_{wA} 76 dB	68 dB L_{Aeq} at 1m
Battery Container HVAC System	40	L_{wA} 92 dB	84 dB L_{Aeq} at 1m

Table 3.2 – Equipment noise emissions- BESS Compound
*Hemi-spherical point source assumption

3.1.4 The assessment has been undertaken on the basis that all plant items associated with the BESS and Green Hydrogen Energy Site will be in continuous use at their normal operating duty over a 24-hour period. This represents a robust assessment, as certain plant items will not be in continual use,

such as the HVAC equipment which would only be operational infrequently, during BESS discharge and charging periods.

3.1.5 If the noise emissions associated with the proposed installations increase beyond the values presented in Table 3.1 & 3.2, it may be necessary to revise the assessment.

3.2 Noise Prediction Model

3.2.1 The noise levels generated by the proposed facility have been calculated using a SoundPLAN noise prediction model. The model predicts noise levels under meteorological conditions favourable to noise propagation from the sound source to the receiver, such as downwind propagation.

3.2.2 An overview of the modelling parameters is provided in Table 3..

Element	Parameter
Algorithm	International Standard ISO 9613-2:1996 *'Acoustics, attenuation of sound during propagation outdoors. 'General method of calculation'*
Meteorological conditions	10 degrees Celsius. 70% humidity.
Ground absorption	The ground absorption has been set to reflect soft ground conditions between the BESS site and the surrounding receptors, with an absorption coefficient of 0.9.
Terrain	Derived from Scottish Remote Sensing Portal Survey Data - 1m DTM (Phase N54 & 55)
Receptor height	Free field level Ground floor level set at 1.5m above external ground level.
Source data	Noise sources at the Green Hydrogen Site have been incorpated as point sources, using the sound power level specified in Table 3.1. All noise sources at the Green Hydrogen site have been assumed to be at a height of 2m above local ground level. Noise sources at the BESS have been incorpated as point sources, using the sound power level specified in Table 3.1. All noise sources at the BESS site have been assumed to be at a height of 2m above local ground level. Where possible, a representative spectral shape has been applied to the noise sources, based on RSK's experience of similar developments.
Barriers/screening	The battery storage containers have not been incorporated into the noise model which are likely to provide some acoustic screening. Therefore, this makes predicted noise levels robust.

Table 3.3 – Modelling parameters

4 Impact Assessment

4.1 Maximum Target Noise Levels

4.1.1 With reference to intended noise levels not exceeding the background noise levels at the nearest noise sensitive receptors, the maximum target noise levels at the surrounding noise sensitive receptors are not to exceed the following:

- Lochgoin Farm $L_{Aeq\ ,16hrs}$ 28 dB(A) (07:00-23:00) background noise level;
- Shieldhill $L_{Aeq\ ,16hrs}$ 32 dB(A) (07:00-23:00) background noise level;
- Lochgoin Farm $L_{Aeq,8hrs}$ 22 dB(A) (23:00-07:00) background noise level;
- Shieldhill $L_{Aeq,8hrs}$ 28 dB(A) (23:00-07:00) background noise level;

4.1.2 Table 4.1 presents the predicted specific noise levels generated by the Green Hydrogen Energy Site & BESS at the surrounding noise sensitive receptors. The corresponding noise contour plot is presented in Figure 4.1.

4.1.3 Given the very low predicted noise levels and anticipated lack of perceptible acoustic character at the nearest receptors, it is not considered appropriate to apply an acoustic character penalty.

Receptor	Noise Limit (07:00-23:00) dB(A)	Predicted noise level $L_{Aeq\ ,16hrs}$ daytime (07:00-23:00) dB(A)	Noise Limit (23:00-07:00) dB(A)	Predicted noise level $L_{Aeq\ ,8hrs}$ night-time (23:00-07:00) dB(A)
Cauldstanes	32	22 **(-10)**	28	22 **(-6)**
Craigendunton	28	19 **(-9)**	22	19 **(-3)**
Drumtee	32	20 **(-12)**	28	20 **(-8)**
Kingswell	32	21 **(-11)**	28	21 **(-7)**
Lochgoin Farm	28	22 **(-6)**	22	22 **(=)**

Table 4.1 – Predicted noise levels at nearest noise sensitive receptors. Difference in **green**

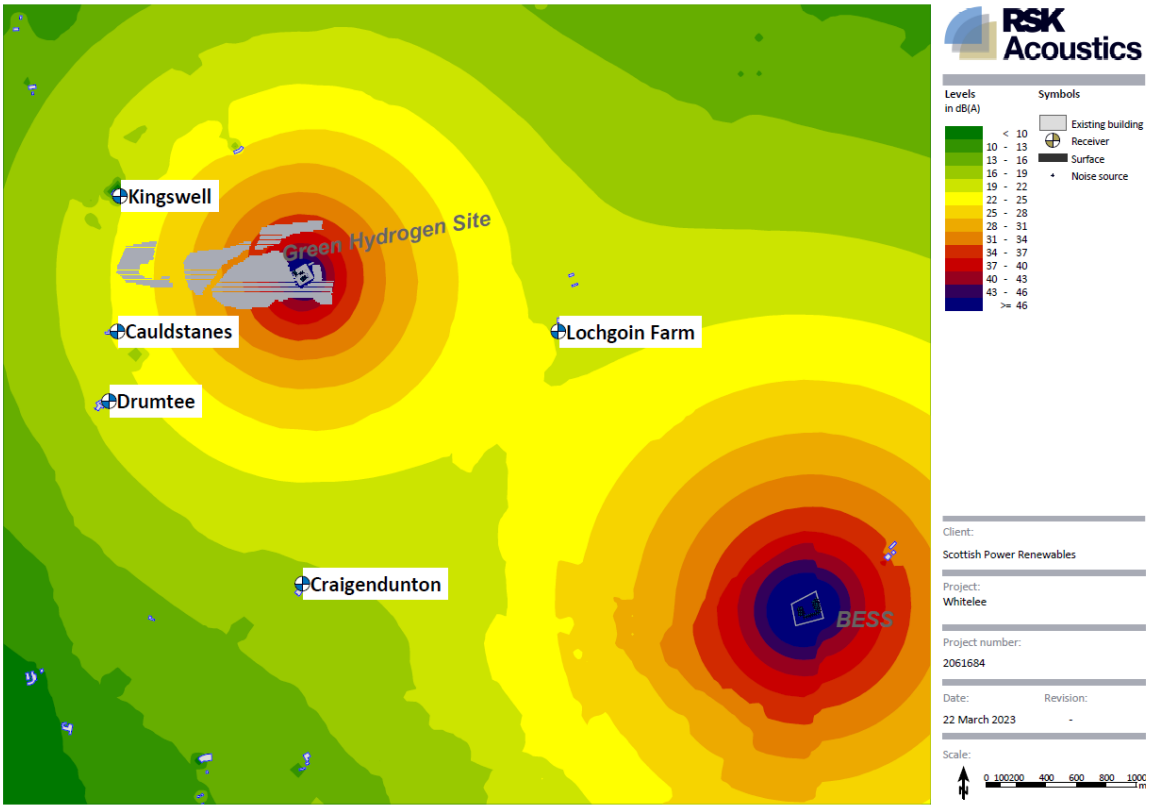


Figure 4.1– Noise contour plot

4.1.4 The results shown in Table 4.1 show that there are no exceedances above the proposed noise limits at any receptors during the daytime or night-time period. In addition, it can be seen that the highest noise levels generated by the Green Hydrogen Energy site and BESS are predicted to occur at Cauldstanes & Lochgoin Farm at 22 dB $L_{Aeq,T}$, which is considered to be a low noise level.

4.1.5 As noted in Section 3, the assessment has been undertaken on the basis that all plant items associated with the development will be in continuous use at their normal operating duty over a 24-hour period. This represents a robust assessment, as certain plant items will not be in continual use, such as the HVAC equipment which would only be operational infrequently, during BESS discharge and charging periods.

4.1.6 The predicted noise levels generated by the Hydrogen Green Energy site/ BESS are expected to be compliant with all maximum target noise level criteria, as set by the existing background noise levels.

5 Conclusions

5.1.1 RSK Acoustics has been instructed by Scottish Power Renewables (SPR) to undertake a noise impact assessment to discharge a planning condition for a proposed Hydrogen Green Energy site/ BESS facility at Whitelee Windfarm, Eaglesham, Glasgow.

5.1.2 A planning application was submitted for a Green Hydrogen Energy site and subsequent installation of a Battery Energy Storage System (BESS) facility. The planning application was supported by a noise report provided by Wood, dated May 2022 and detailed noise limits for the proposed development sites.

5.1.3 It is understood noise limits for the site was not detailed enough to satisfy Energy Consent Unit and East Ayrshire Council. Therefore, in the absence of designed development, representative noise sources have been assessed at the existing receptors.

5.1.4 As a part of this assessment, it has been concluded that in order to satisfy the concerns raised, noise emissions from the proposed site must be calculated to be equal to or below the existing background noise levels at the nearest noise sensitive receptors.

5.1.5 The potential noise levels generated by the proposed facility have been predicted at the surrounding sensitive receptors using a SoundPlan model. The resultant noise levels have subsequently been assessed against the existing background noise levels at the nearest noise sensitive receptors.

5.1.6 Due to the substantial distances between the Green Hydrogen Energy site, Battery Energy Storage System (BESS) facility and the surrounding sensitive receptors, the predicted noise levels are very low. As a result of this, the noise levels generated by the Green Hydrogen Energy site and Battery Energy Storage System (BESS) facility are expected to be compliant in terms of not exceeding the existing background noise levels.

5.1.7 It should be noted the background noise levels were obtained prior to the installation of Phase 3 of Whitelee Windfarm and therefore does not include noise generated from these turbines. Therefore, the background noise levels used for this assessment are likely to be lower than existing noise levels at receptors, and ensures a robust assessment.

Glossary of Acoustic Terms

L_{Aeq}

The notional steady sound level (in dB) which over a stated period of time, would have the same A-weighted acoustic energy as the A-weighted fluctuating noise measurement over that period. Values are sometimes written using the alternative expression dB(A) L_{eq}.

L_{Amax}

The maximum A-weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise when occasional loud noises occur, which may have little effect on the L_{Aeq} noise level. Unless described otherwise, L_{Amax} is measured using the "fast" sound level meter response.

L_{A10} & L_{A90}

If non-steady noise is to be described, it is necessary to know both its level and degree of fluctuation. The L_{An} indices are used for this purpose. The term refers to the A-weighted level (in dB) exceeded for n% of the time specified. L_{A90} gives an indication of the lower levels of fluctuating noise. It is often used to define the background noise.

L_a - Ambient Sound Level

Ambient sound level as defined in Section 3 of BS4142:2014+A1:2019 is the equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time. The ambient sound level comprises the residual sound level and the specific sound.

L_r – Residual Sound Level

Residual sound level as defined in Section 3 of BS4142:2014+A1:2019 is the equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval

L_S – Specific Sound Level

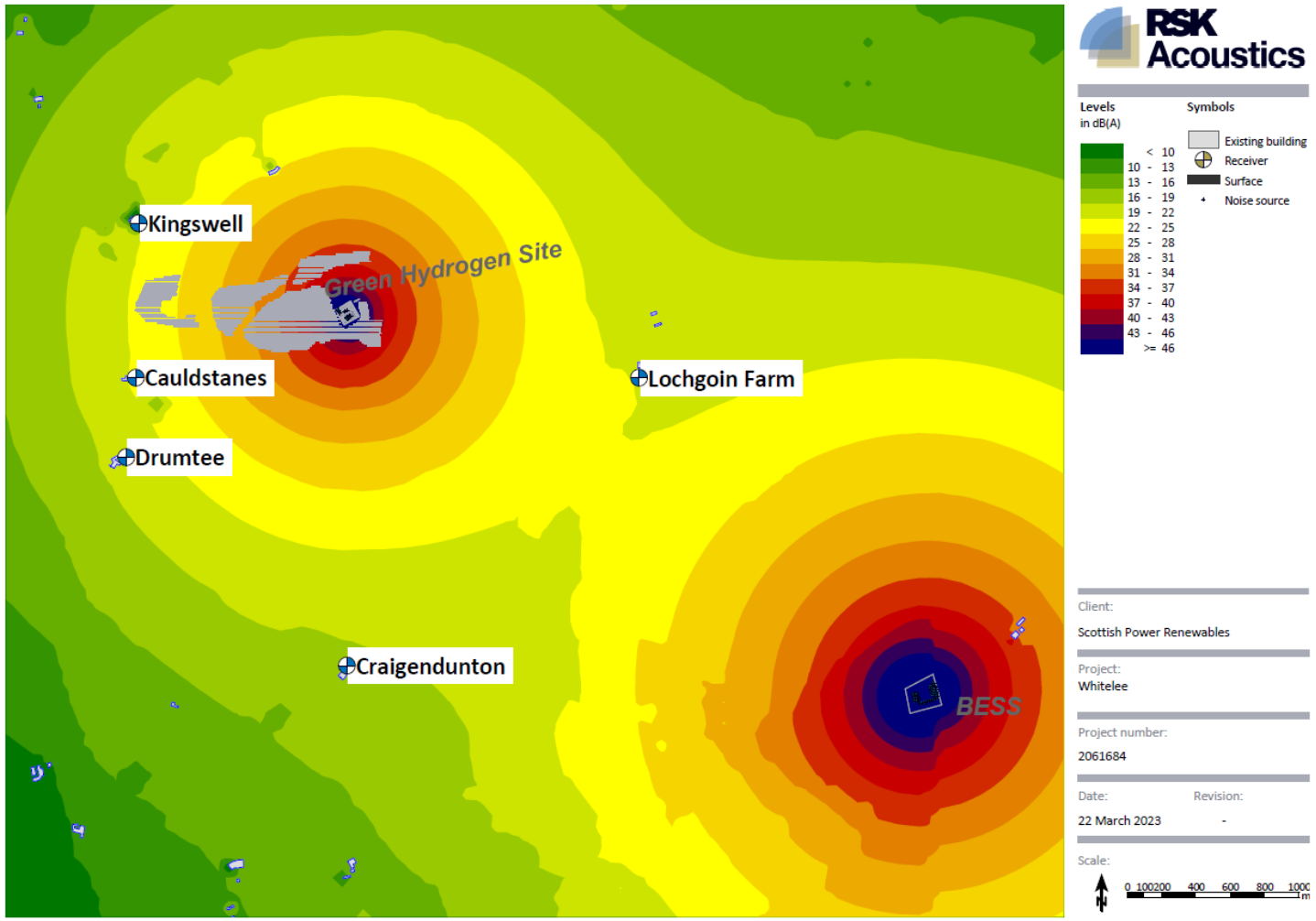
Specific sound level as defined in Section 3 of BS4142:2014+A1:2019 is the equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval.

$L_{Ar,Tr}$ – Rating Level

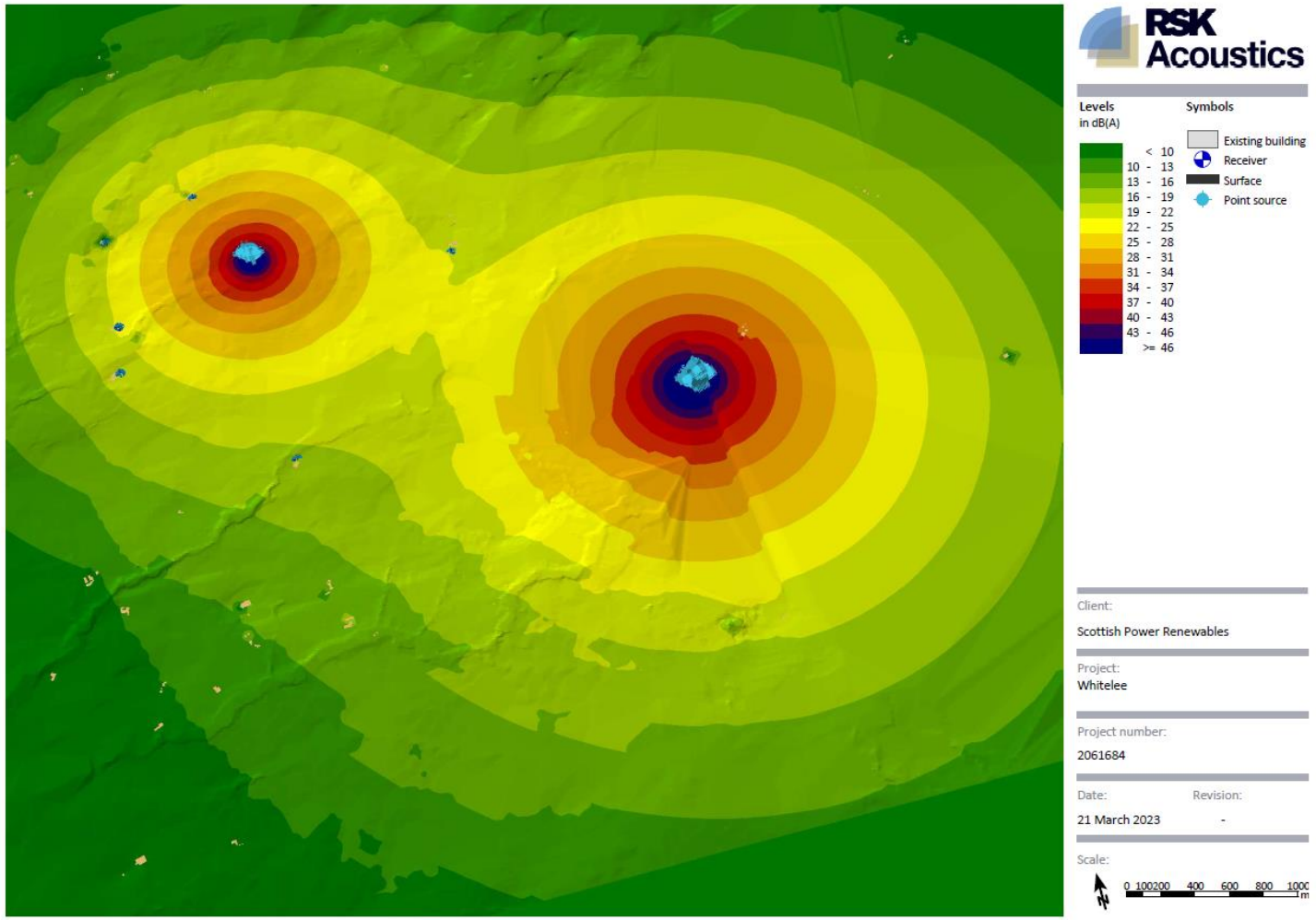
Specific sound level plus any adjustment for the characteristic features of the sound (impulsivity, tonality, intermittency), as defined in BS4142:2014+A1:2019.

End of Section

APPENDIX A



APPENDIX A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Levels
in dB(A)
< 10
10 - 13
13 - 16
16 - 19
19 - 22
22 - 25
25 - 28
28 - 31
31 - 34
34 - 37
37 - 40
40 - 43
43 - 46
>= 46
Symbols
Existing building
Receiver
Surface
Point source
Client:
Scottish Power Renewables
Project:
Whitelee
Project number:
2061684
Date:
21 March 2023
Revision:
-
Scale:
0 100200 400 600 800 1000
m