Botley West Solar Farm

Environmental Statement

Volume 3

Appendix 13.3: Operational Phase Noise

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Glossary

Term	Meaning
1/3-Octave bands	A frequency band whose upper band-edge frequency is the lower band frequency multiplied by the cube root of two.
Attenuation	The reduction in magnitude of sound energy.
Background sound level, $L_{A90,T}$	The A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, *T*, measured using fast time-weighting, F, and quoted to the nearest whole number of decibels.
Decibel	The ratio between two physical quantities, typically expressed as a logarithmic power ratio.
Dimensionless	A pure number having no units attached and having a numerical value that is independent of whatever system of units may be used to derive it.
Environmental Impact Assessment	The process of identifying and assessing the significant effects likely to arise from a project. This requires consideration of the likely changes to the environment, where these arise as a consequence of a project, through comparison with the existing and projected future baseline conditions.
Environmental Statement	The document presenting the results of the Environmental Impact Assessment (EIA) process.
Ground factor, G	A dimensionless parameter which allows for the consideration of the acoustic properties of the ground surface between a sound source and the receptor.
Hemispherical radiation	The emission of sound throughout a hemisphere in the presence of a single reflective surface (e.g. the ground). Corresponds to a radiation loss of 8 dB.
Impulsivity	A method for describing how sudden or sharp a sound of short duration is. Examples of impulsive sounds include bangs or gun shots.
Intermittency	A measure of the 'on/off' nature of a sound source which may result in higher perceptibility at a receptor.
Noise	An unwanted or unexpected sound.
Porosity	The ratio of space or holes and the total volume of a material. A means of defining the ability of a material to allow sound to transmit through it.
Power Conversion Station (PCS)	A device for bidirectional conversion of electrical energy connected between the battery system and the grid and/or load.
Propagation	The transmission of acoustic energy through a medium via a sound wave.
Residual sound level, $L_r = L_{Aeq,T}$	The ambient sound level at a receptor in the absence of influence from the sound source under assessment.

Term	Meaning
Study area	This is an area which is defined for each environmental topic which includes the Project Site Boundary as well as potential spatial and temporal considerations of the impacts on relevant receptors. The study area for each topic is intended to cover the area within which an impact can be reasonably expected.
Sound	Fluctuations of pressure within a medium (gas, solid or fluid) within the audible range of loudness and frequencies which excite the sensation of hearing.
Specific sound level, $L_{s,} = L_{Aeq,Tr}$	The equivalent continuous A-weighted sound pressure level produced by the specific noise source at the assessment location over a given reference time internal, T_r.
Spectrum	The presentation of sound in terms of the amount of energy at different frequencies.
The Applicant	SolarFive Ltd
The Project	The Botley West Solar Farm
Tonality	A method to account for the dominance of a single frequency in a sound's spectrum which may be more perceptible at a receptor.
Transformer	A component of a substation required to transform voltage from high to low, or the reverse, or perform any of several other important functions. Before being used, electric power may flow through several transformer substations at different voltage levels. A transformer substation includes transformers to change voltage levels between high transmission voltages and lower distribution voltages, or at the interconnection of two different transmission voltages

Abbreviations

Abbreviation	Meaning
BS	British Standard
ES	Environmental Statement
GIS	Gas Insulated Switchgear
HV	High Voltage
ISO	International Organisation for Standardisation
MV	Medium Voltage
NGET	National Grid Electricity Transmission
OS	Ordnance Survey
PCS	Power Converter Station
PV	Photovoltaic

Abbreviation	Meaning
SGT	Super Grid Transformer

Units

Unit	Description
dB	Decibel
dB(A)	Decibel (A-weighted)
Hz	Hertz
kV	Kilovolt
km	Kilometre
dB	Decibel

1 Operational Noise

1.1 Introduction

1.1.1 This document forms Appendix 13.3 of Volume 3 of the Environmental Statement (ES) prepared for the Botley West Solar Farm Project (BWSF), henceforth referred to as the Project. The ES presents the findings of the Environmental Impact Assessment (EIA) process.

1.1.2 This document provides details of the assessment of noise impacts on nearby noise sensitive receptors within the noise and vibration study area due to the operation of the Project.

1.2 Assessment Methodology

Study Area

1.2.1 The study area for the noise and vibration assessment of the Project focuses on receptors where potential noise and vibration impacts are most likely to occur. These have been identified as being situated within a study area of 1 km from the location of the operational noise sources associated with the Project Site.

1.2.2 The study area relevant to the operational noise assessment for this ES is defined as:

- the area of land to be temporarily or permanently occupied during the construction, operation, and decommissioning of the Project; and
- noise sensitive receptors located within 1 kilometre (km) of any operational noise sources.

1.2.3 The study area is presented graphically in Figure 13.3 of Volume 2: Figures of the ES.

Legislation & Guidance

1.2.4 Operational noise levels due to the Project have been calculated at the nearest noise sensitive receptors using a 3D acoustic computer noise model. Subsequently, the predicted levels have been assessed with reference to the guidance in British Standard (BS) 4142:2014+A1:2019 – 'Methods for rating and assessing industrial and commercial sound'.

BS 4142:2014+A1:2019

1.2.5 British Standard 4142:2014+A1:2019 – 'Methods for rating and assessing industrial and commercial sound' provides a method for rating industrial and commercial sound and a method for assessing resulting impacts upon people. The method is applicable to fixed plant installations, sound from industrial and manufacturing process and other associated activities.

1.2.6 In summary, this British Standard provides guidance on determining 'rating sound levels' by correcting the 'specific sound level' from the site or operations

under consideration to account for any distinctive acoustic characteristics such as tonality, impulsivity, and intermittency. The British Standard provides the following corrections to be applied where each is appropriate.

- '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 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.
- 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.'

1.2.7 An initial estimate of the impact of the source is obtained by subtracting the measured background sound level from the rating sound level of the proposed plant. Background sound levels at the receptors were identified from baseline sound surveys undertaken in May 2023 and July 2024 (see Volume 3, Appendix 13.2: Baseline Sound Survey of the ES).

1.2.8 Section 11 of British Standard 4142:2014+A1:2019 states the following:

"Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following.

1) The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.

Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night."

1.2.9 The representative background sound levels at each receptor are presented in Volume 1, Chapter 13: Noise and Vibration of the ES.

1.2.10 Typically, the greater the difference between the measured background sound level and the rating sound level, the greater the magnitude of the impact. The operational noise criteria adopted for the Project are presented in Volume 1, Chapter 13: Noise and Vibration of the ES and in **Table 1** below for brevity and ease of reference.

Table 1: Operational noise impact magnitude criteria

Magnitude of Impact	BS 4142:2014+A1:2019 Semantic Description	Difference Δ between rating sound Level $L_{Ar,Tr}$ and background sound level $L_{A90,T}$ (dB)
High	A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.	Δ ≥ 10
Medium	A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.	5 ≤ Δ < 10
Low	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.	0 ≤ Δ < 5
Negligible		-10 ≤ Δ < 0

1.2.11 All nearby receptors are residential and are thus considered to be of medium sensitivity, as discussed in Section 8.8 of Volume 1, Chapter 13: Noise and Vibration of the ES.

1.2.12 A contextual assessment of the likely impacts is then required to assess the significance of the effect.

1.3 Acoustic Modelling Methodology

1.3.1 A computational 3D acoustic model has been constructed using the SoundPLAN v8.2 software package. This software implements the outdoor sound propagation method detailed within ISO 9613-2:1996: 'Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation'. Sound levels have been predicted under light down-wind conditions based on hemispherical radiation with corrections added for atmospheric absorption, ground effects, screening, and source directivity, where each is appropriate. This standard is widely accepted as the industry-standard model.

1.3.2 As outlined in Volume 1, Chapter 13: Noise and Vibration of the ES, an indicative site layout has been provided for the operational phase, this layout has been used for this assessment.

1.3.3 The input parameters relevant to the Project include the information outlined in the following paragraphs.

Local Topographical Features

1.3.4 Variable local topography can affect the 'line of sight' of a receptor to the source and result in greater or fewer obstacles between the source of noise and the receptor such as ground cover, hills, and buildings.

1.3.5 The receptors and other buildings which may provide screening effects have been obtained by importing OS Mastermap Topography Layer.

1.3.6 A digital ground model has been calculated using detailed OS Terrain 5 data for the substation site locations.

Ground Effects

1.3.7 Sound propagating outdoors comprises direct waves travelling straight from source to receiver and reflected waves which interact with the ground. Harder surfaces reflect more sound thereby resulting in enhanced noise levels at the receptor. Softer surfaces (such as grass, trees, or vegetation) have a higher porosity and thus can absorb reflected waves resulting in lower noise levels at the receptor.

1.3.8 The acoustic properties of the ground are accounted for using the ground factor G which is a dimensionless parameter between 0 and 1. ISO 9613-2:1996 specify a ground factor of 0 for hard surfaces and 1 for porous surfaces.

1.3.9 Whilst the solar photovoltaic (PV) installation areas are currently grassland and thus relatively porous in nature, the solar PV panels would introduce additional reflective surfaces thus rendering these areas as acoustically hard. Moreover, the Project Site is likely to operate at its highest capacity during the summer months where the ground becomes more arid and thus more reflective. As such, the area has been modelled with a ground factor of G=0.2. This represents the maximum design scenario.

Noise Sensitive Receptors

1.3.10 The nearest noise sensitive receptors to the Project Site are presented in **Figure 1** to **Figure 3** below.

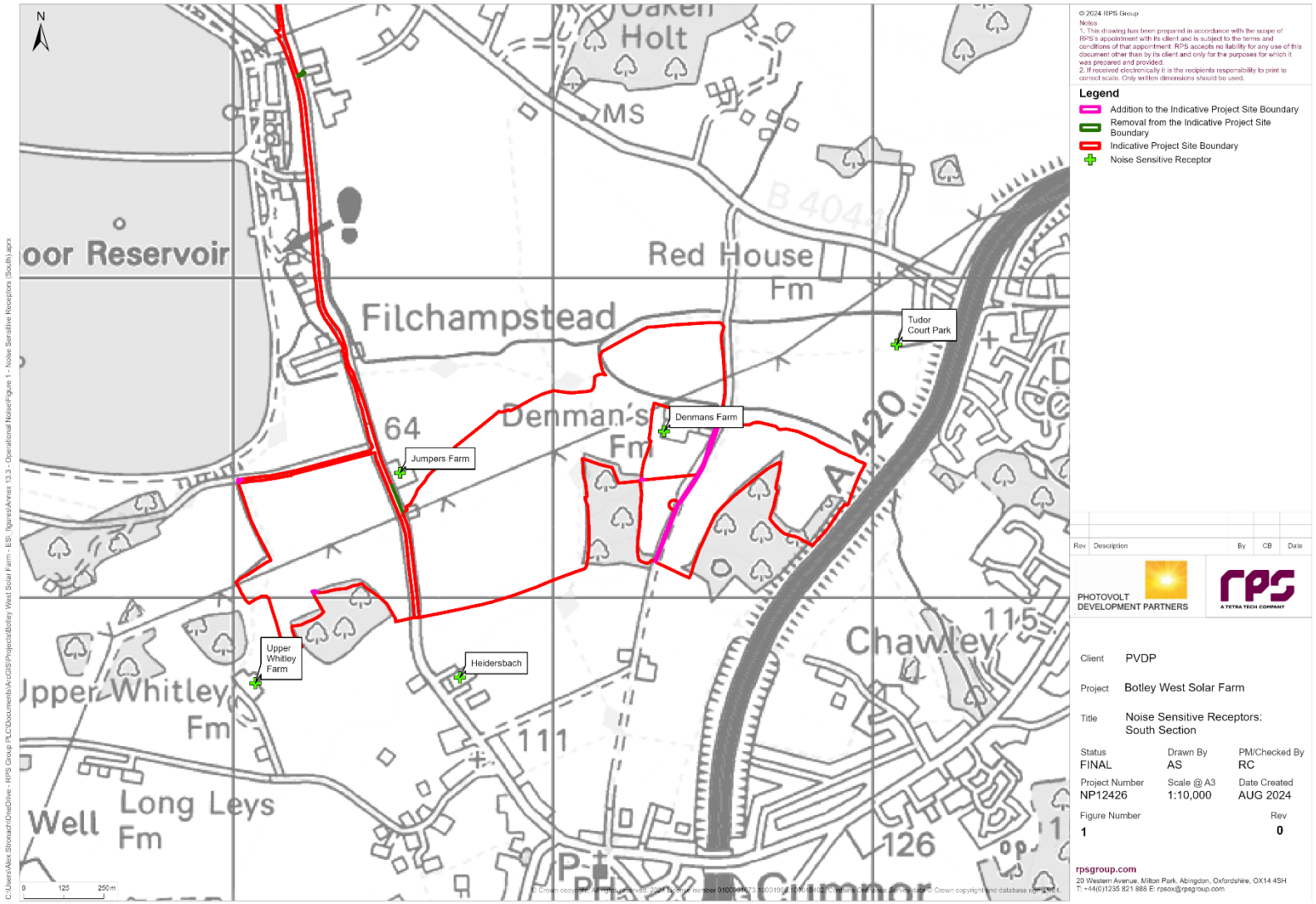


Figure 1: Noise sensitive receptors (south section)

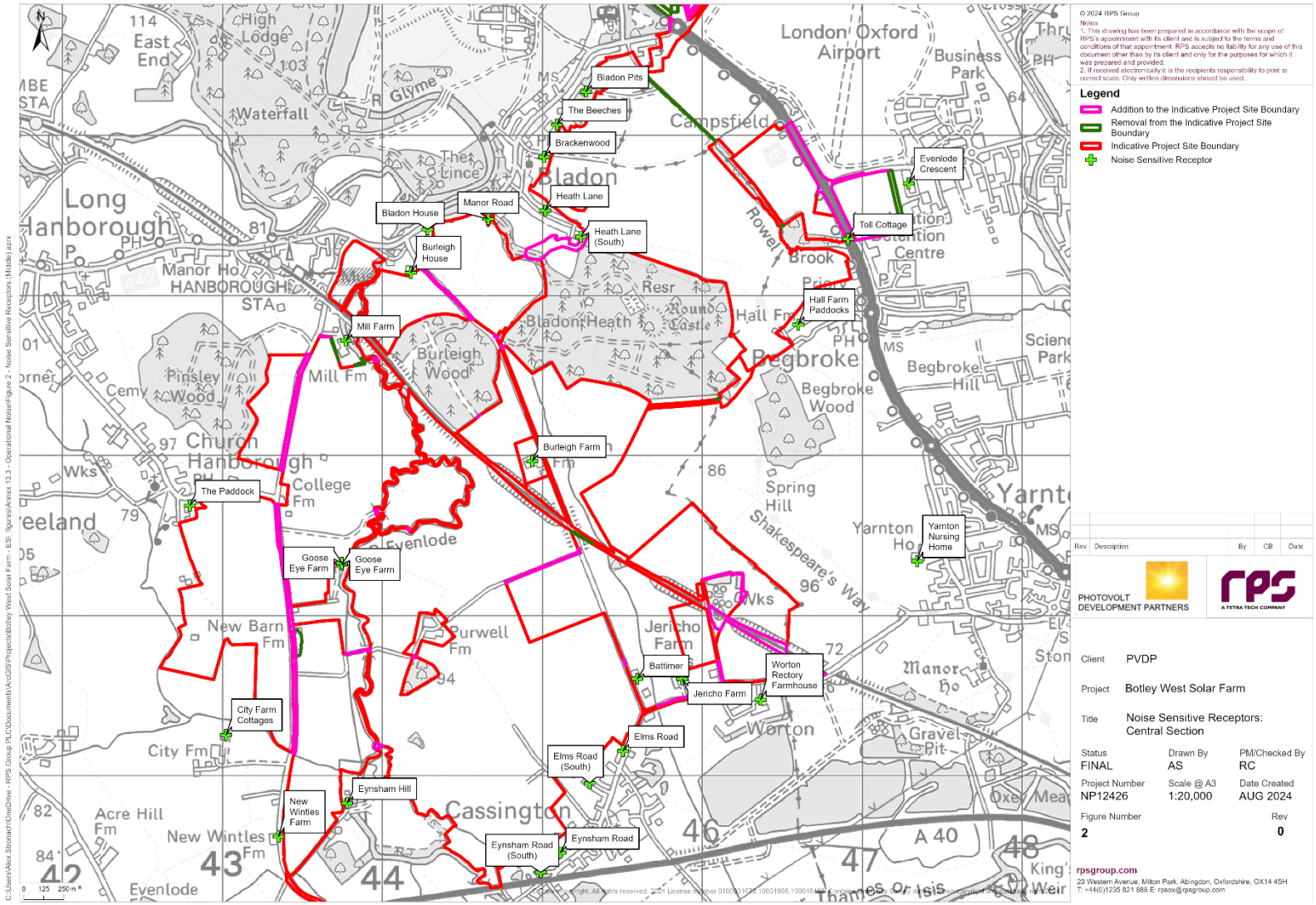


Figure 2: Noise sensitive receptors (central section)

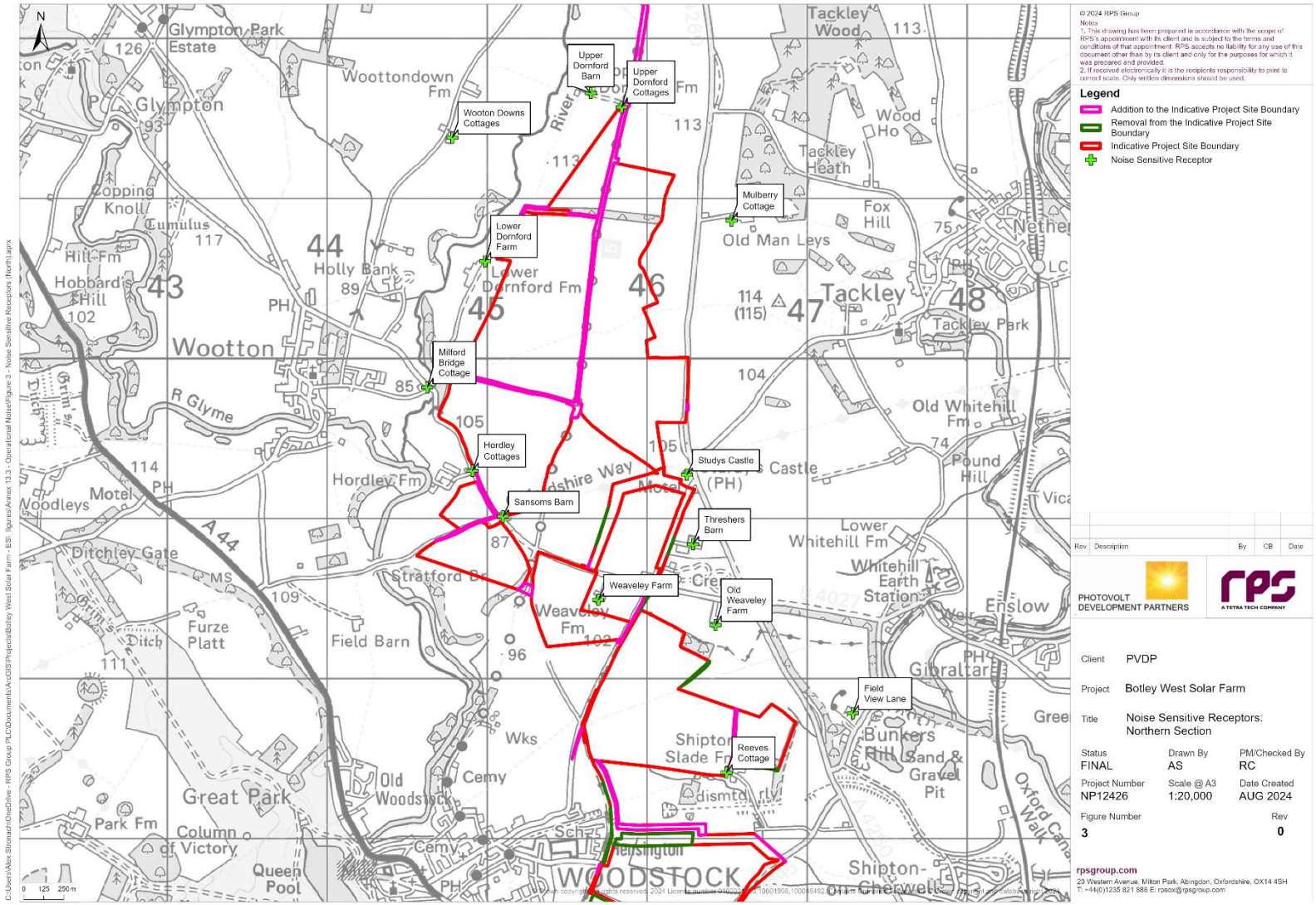


Figure 3: Noise sensitive receptors (northern section)

1.4 Plant Strategy & Layout

1.4.1 The operational noise sources associated with the Project Site are listed in **Table 2** below.

Table 2: Operational noise sources.

Noise Source	Quantity	Location
Power Converter Station (PCS)	156	Solar photovoltaic (PV) installation areas.
Project Substation	6	Solar photovoltaic (PV) installation areas.
	1	Southern Site Area.
National Grid Electricity Transmission (NGET) substation	1	Southern Site Area.

1.4.2 An indicative site layout has been used to construct the 3D acoustic model. Details of how each of the above noise sources has been considered in the modelling are provided below. Full noise source spectra are presented in Annex A.

PCS Units

1.4.3 The PCS units are situated throughout the Project Site within the southern, central, and northern solar PV installation areas. The units are containerised systems housing:

- 2x Solar PV inverters; and
- 1x Medium Voltage (MV) transformer.

1.4.4 The PCS units have been modelled as small industrial buildings containing the above. The dominant noise source for these units is the inverters.

1.4.5 Manufacturer's noise data has been used to inform the acoustic modelling. An acoustic test report for the SMA SCS3950UP-XT inverter has been provided which details measured sound power levels for each face of the unit. It should be noted that the data provided is for a unit operating with an apparent power of 4600 kilovolt-amperes (kVA). However, each PCS unit proposed for the Project will have an apparent power of 3000 kVA and thus the noise levels modelled are higher than the true level emitted by PCS units when operational.

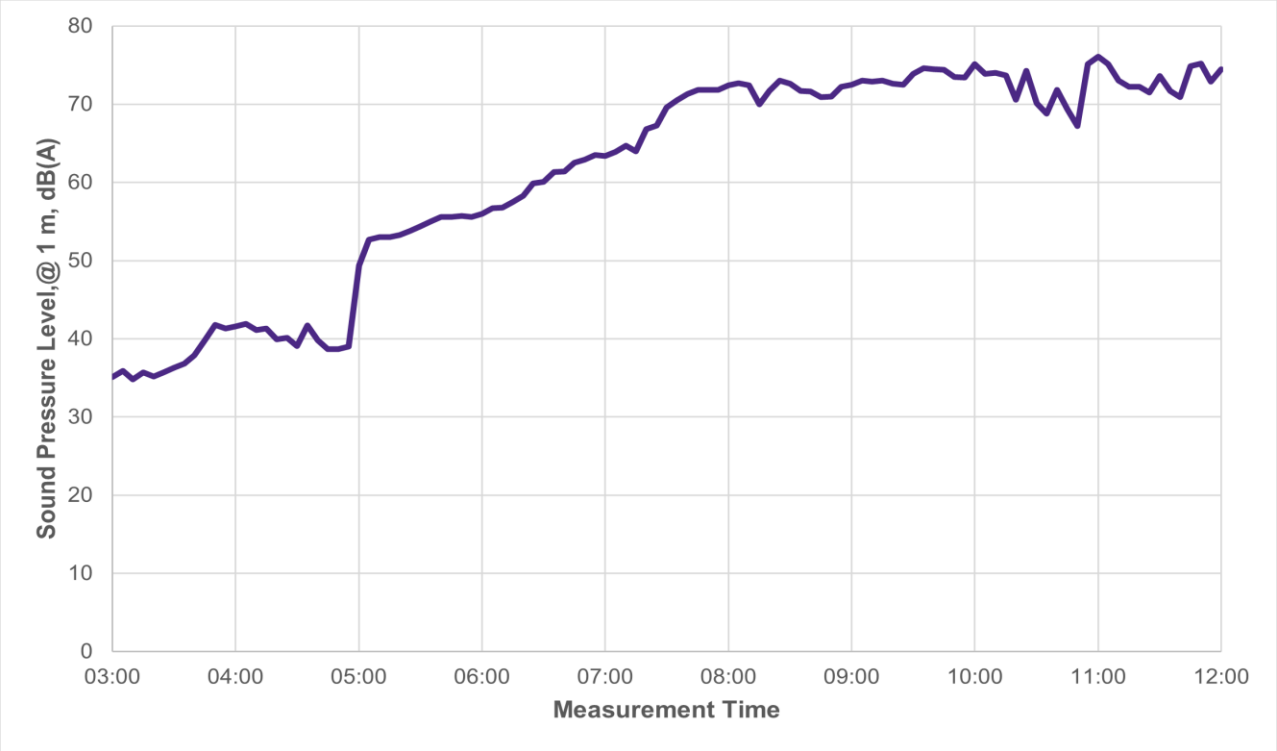
Table 3: Modelled noise emission levels for PCS units.

Equipment	Height (m)	Sound Power Level L_{W}, dB(A)
PCS Units	3	92

1.4.6 The solar PV inverters are assumed not to operate during the night-time. However, it is understood from experience with other solar energy schemes that the inverters 'ramp up' in the early hours of the morning. Based on previously undertaken measurements of the noise emission levels from solar PV inverters during the early morning period in the middle of the summer when

the site is likely to operate at maximum capacity. The variation in noise emission level measured between 0300 hours and 1200 hours is shown in **Figure 4** below.

Figure 4: Variation in noise emission levels by solar PV inverters with time



1.4.7 Simulations have been undertaken using 20 years' of solar PV inverter data to predict the hourly capacity on June 21st which is the day with the highest potential for solar output in the northern hemisphere due to the summer solstice.

1.4.8 These simulations show that the maximum operational capacity of the PCS units will be around 68%. However, the units may be required to operate at a 100% capacity during the daytime for a maximum of 400 hours a year and, as such, it is this scenario which has been considered within the assessment.

1.4.9 In summary, the following periods have been considered within the assessment:

- Daytime (0700-2300 hours): PCS units operate at 100% capacity
- Night-time (2300-0500 hours): Negligible output from the PCS units
- Early morning (0500-0700 hours): PCS units operate at 25% capacity

Secondary Substations

1.4.10 There are a total of six secondary substations associated with the Project each containing a transformer. An overview of these transformers is provided in **Table 4** below.

Table 4: Secondary substation transformers

Transformer Reference	Substation	Location	Transformer Rating (MVA)	Sound Power Level L_W, dB(A)
TR11	Secondary substation 1	Southern section	45	73
TR12	Secondary substation 2	Central section	180	85
TR13	Secondary substation 3	Central section	220	86
TR14	Secondary substation 4	Central section	220	86
TR15	Secondary substation 5	Northern section	60	76
TR16	Secondary substation 6	Northern section	220	86

1.4.11 The noise-emitting element of each transformer has a height of approximately 6 m and have been modelled as appropriately sized cuboids with the total sound power level spread across each of the five exposed sides of the unit.

Main Substation

1.4.12 The main substation is situated in the southern section of the Project Site and comprises two High Voltage (HV) transformers with a rating of 500 MVA, as well as a 400 kV Gas Insulated Switchgear (GIS) building with an approximate height of 15 m. An overview of the noise emitting elements is provided in **Table** 5 below.

Table 5: Main substation transformers

Transformer Reference	Substation	Location	Transformer Rating (MVA)	Sound Power Level L_W, dB(A)
TR01/TR02	Main substation	Southern section	500	93

1.4.13 The noise-emitting element of each transformer has a height of approximately 5 m and have been modelled as appropriately sized cuboids with the total sound power level spread across each of the five exposed sides of the unit.

NGET Substation

1.4.14 The Project will connect to the National Grid transmission system via a new National Grid 400kV substation to be located close to the existing National Grid 400kV line that runs between Cowley and Walham. As outlined in Volume 1, Chapter 6: Project Description of the ES, the substation will be located in one of two possible locations:

- **Option 1**: On land within the Applicant's control, at its Southern Site, at the western most extremity, south of the Farmoor Reservoir.
- **Option 2**: On land near the Applicant's Southern Site, to the west of and adjoining that Site, south of the Farmoor Reservoir

1.4.15 An assessment of both options has been undertaken with the results of Option 1 informing the operational phase assessment of the Project and the results of

Option 2 informing the assessment of cumulative effects in Volume 1, Chapter 13: Noise and Vibration of the ES.

1.4.16 The NGET substation comprises three 460 MVA transformers, and some additional electrical equipment. However, it is understood that only the transformers produce a noise emission which requires assessment.

1.4.17 An indicative layout has been provided by National Grid and the maximum sound power level of the SGTs is detailed in **Table 6** below.

Table 6: NGET substation transformers

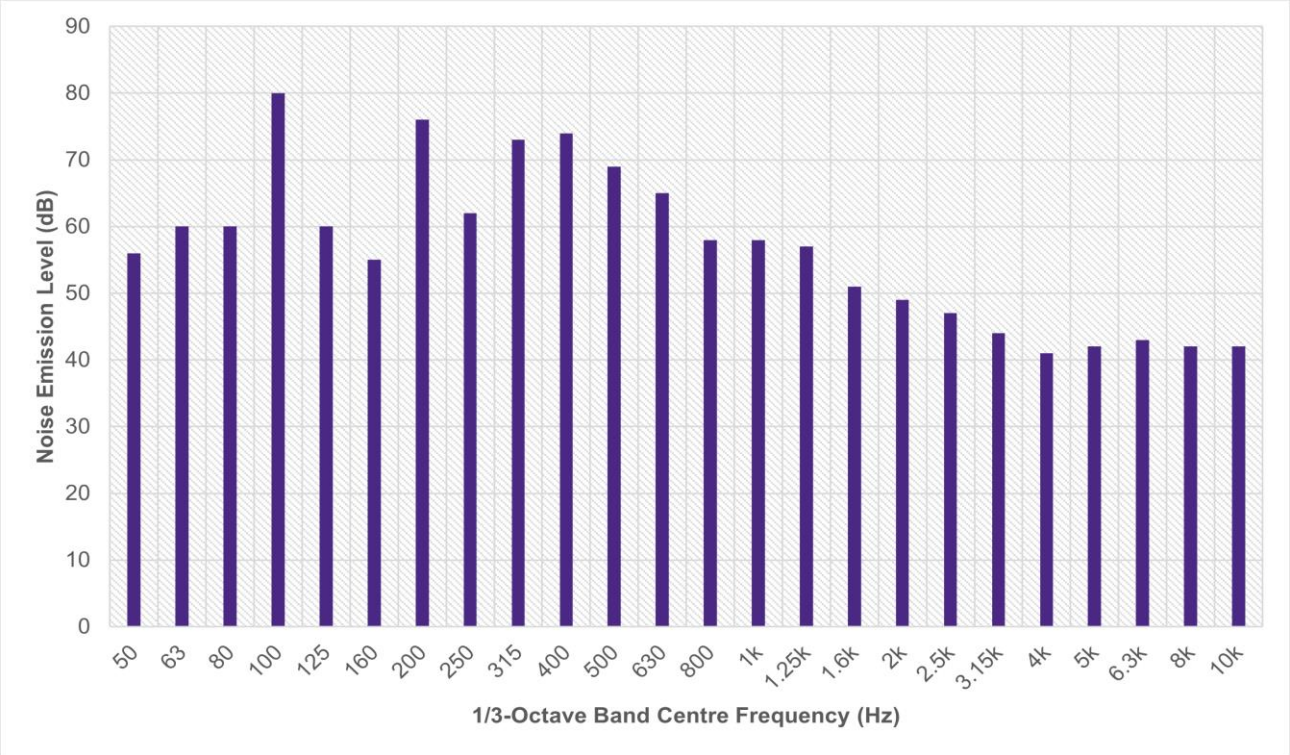
Transformer Reference	Substation	Location	Transformer Rating (MVA)	Sound Power Level L_{W}, dB(A)
SGT1 – SGT3	NGET substation	Southern section	460	95

1.4.18 The noise-emitting element of each transformer has a height of approximately 5 m and have been modelled as appropriately sized cuboids with the total sound power level spread across each of the five exposed sides of the unit.

Transformer Noise

1.4.19 HV transformers typically have a tonal component to their noise emission spectrum at low frequencies (around 100 Hz). As such, the frequency content is an important consideration when assessing noise from substations. A typical noise emission spectrum in 1/3-octave bands for a substation transformer has been obtained from a paper by Gange (2011). This spectrum is presented in **Figure 5** below where the peak at 100 Hz (and subsequent harmonics) is evident. It should be noted that it is the shape of this spectrum that is of importance and not the noise emission level at each frequency.

Figure 5: Typical noise emission spectrum of a HV transformer (Gange, 2011)



1.4.20 The transformers are assumed to operate 24/7 at maximum capacity with the noise emission levels detailed in **Table 4** to **Table 6** above. The true operation of any substation varies with the equivalent load on the system. The noise emission from a substation reduces with reduced load. As such, the assessment represents the maximum design scenario.

Mitigation

1.4.21 Mitigation measures will be adopted as part of the design process to aid in the reduction of operational noise from the Project at nearby receptors.

1.4.22 The plant layout will be designed to reduce noise impacts as much as is reasonably practicable and additional mitigation measures, such as acoustic enclosures and acoustic barriers, may be implemented as part of the Project design. The exact measures will be determined as the design progresses; and consideration has been given to the limiting plant noise emission levels and the type of mitigation measures which may allow for these levels to be achieved.

1.4.23 Acoustic enclosures are available which attenuate sound at the 100 Hz 1/3-octave band of a transformer by around 20 dB (National Grid, 2021). An enclosure which can achieve this amount of low frequency attenuation will reduce noise levels at higher frequencies by a greater amount. However, an overall noise reduction of 20 dB has been applied as a conservative assumption in the absence of a full enclosure specification.

1.5 Operational Noise Model Output and Assessment

1.5.1 The full operational noise assessment results are presented in Annex B in tabular form for each section of the Project with a summary provided below.

Southern Section

1.5.2 The southern section of the Project Site has been modelled to consider both Option 1 and Option 2 detailed above for the location of the NGET substation.

1.5.3 The daytime levels at receptors are typically influenced by noise from the PCS units. However, noise is controlled sufficiently such that impacts are negligible to low from these units alone.

1.5.4 At receptors closer to the main substation and NGET substation sites, there is increased contribution to the overall noise level from the transformers, particularly those proposed at the NGET site. This becomes more apparent at night-time and in the early morning where baseline sound levels in the area are lower.

1.5.5 Unmitigated, it is possible that the tonal nature of the transformers may be perceptible at the nearest receptors. As such, a character correction of +4 dB has been applied to the specific sound levels during the night-time and early morning periods at Heidersbach, Jumpers Farm, and Upper Whitley Farm.

1.5.6 Noise from the main substation and NGET substation transformers results in the following exceedances in **Table 7** of the representative background sound level at Jumpers Farm during the night-time and early morning periods for Option 1 and Option 2.

Table 7: Exceedance of background sound level at Jumpers Farm (unmitigated scenario)

Receptor	Exceedance of Representative Background Sound Level (dB)			
	Option 1		Option 2	
	Night (2300-0500)	Early Morning (0500-0700)	Night (2300-0500)	Early Morning (0500-0700)
Jumpers Farm	+16	+10	+14	+8

1.5.7 The assessment shows that there is a need to control noise from the substations to reduce the noise impact. Enclosing the main substation and NGET substation transformers, as outlined in **paragraph 1.4.23** above, reduces noise levels sufficiently such that the magnitude of impact is low at Jumpers Farm for both Option 1 and Option 2 as shown in **Table 8** below.

Table 8: Exceedance of background sound level at Jumpers Farm (mitigated scenario)

Receptor	Exceedance of Representative Background Sound Level (dB)			
	Option 1		Option 2	
	Night (2300-0500)	Early Morning (0500-0700)	Night (2300-0500)	Early Morning (0500-0700)
Jumpers Farm	+2	-3	+2	-4

Northern and Central Sections

1.5.8 The results of the modelling show that the impacts predicted during all operational periods in the northern and central sections of the Project are below the background sound level. Subsequently, the magnitude of the effect is negligible and thus no additional mitigation measures are required.

1.6 References

British Standards Institution (2019) 'British Standard 4142:2014+A1:2019 – *'Methods for rating and assessing industrial and commercial sound'*.

British Standards Institution (2014) 'British Standard 8233:2014– *'Guidance on sound insulation and noise reduction for buildings'.*

Gange. M (2011), *'Low-frequency and Tonal Characteristics of Transformer Noise'*, Proceedings of ACOUSTICS 2011, Gold Coast, Australia

International Organisation for Standards (1996) *'ISO 9613-2:1996 – Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation'.*

National Grid (2021), *'Operational Noise Assessment for the Proposed Little Horsted 400 kV Substation*', Available: https://planning.wealden.gov.uk/plandisp.aspx?recno=153380. Accessed November 2023

Annex A: Operational noise model spectra

Frequency (Hz)	Sound Power Level (dB) at 1/3-Octave Band Centre Frequency (Hz)								
	TR01/ TR02	TR11	TR12	TR13	TR14	TR15	TR16	NGET SGT	PCS Units
50	75	55	67	68	68	58	68	77	86
63	79	59	71	72	72	62	72	81	85
80	79	59	71	72	72	62	72	81	85
100	99	79	91	92	92	82	92	101	87
125	79	59	71	72	72	62	72	81	82
160	74	54	66	67	67	57	67	76	81
200	95	75	87	88	88	78	88	97	84
250	81	61	73	74	74	64	74	83	85
315	92	72	84	85	85	75	85	94	86
400	93	73	85	86	86	76	86	95	84
500	88	68	80	81	81	71	81	90	80
630	84	64	76	77	77	67	77	86	77
800	77	57	69	70	70	60	70	79	79
1k	77	57	69	70	70	60	70	79	77
1.25k	76	56	68	69	69	59	69	78	75
1.6k	70	50	62	63	63	53	63	72	76
2k	68	48	60	61	61	51	61	70	74
2.5k	66	46	58	59	59	49	59	68	78
3.15k	63	43	55	56	56	46	56	65	88
4k	60	40	52	53	53	43	53	62	68
5k	61	41	53	54	54	44	54	63	70
6.3k	62	42	54	55	55	45	55	64	80
8k	61	41	53	54	54	44	54	63	69
10k	61	41	53	54	54	44	54	63	69
dB(A)	**93**	**73**	**85**	**86**	**86**	**76**	**86**	**95**	**92**

Annex B: Operational noise model output

Receptor	Southern Site – Unmitigated (Option 1)											
	Background Sound Level, $L_{A90,T}$ (dB)			Rating Level, $L_{Ar,Tr}$ (dB)			Difference Δ Between Rating Sound Level and Background Sound Level (dB)			Magnitude of Impact		
	Day	Night	Early AM	Day	Night	Early AM	Day	Night	Early AM	Day	Night	Early AM
Denmans Farm (N)	43	37	38	36	22	33	-7	-15	-5	Negligible	Negligible	Negligible
Denmans Farm (W)	43	37	38	36	29	34	-7	-8	-4	Negligible	Negligible	Negligible
Heidersbach	37	32	38	33	37	37	-4	+5	-1	Negligible	Medium	Negligible
Jumpers Farm (W)	39	31	37	30	28	29	-9	-3	-8	Negligible	Negligible	Negligible
Jumpers Farm (E)	39	31	37	40	40	40	+1	+9	+3	Low	Medium	Low
Jumpers Farm (S)	39	31	37	43	47	47	+4	+16	+10	Low	High	High
Tudor Court Park	43	31	38	27	25	26	-16	-6	-12	Negligible	Negligible	Negligible
Upper Whitley Farm	37	32	38	34	39	39	-3	7	+1	Negligible	Medium	Low

Receptor	Southern Site – Unmitigated (Option 2)											
	Background Sound Level, $L_{A90,T}$ (dB)			Rating Level, $L_{Ar,Tr}$ (dB)			Difference Δ Between Rating Sound Level and Background Sound Level (dB)			Magnitude of Impact		
	Day	Night	Early AM	Day	Night	Early AM	Day	Night	Early AM	Day	Night	Early AM
Denmans Farm (N)	43	37	38	36	22	33	-7	-15	-5	Negligible	Negligible	Negligible
Denmans Farm (W)	43	37	38	36	28	33	-7	-9	-5	Negligible	Negligible	Negligible
Heidersbach	37	32	38	32	36	37	-5	4	-1	Negligible	Low	Negligible
Jumpers Farm (W)	39	31	37	30	26	29	-9	-5	-8	Negligible	Negligible	Negligible
Jumpers Farm (E)	39	31	37	35	35	36	-4	4	-1	Negligible	Low	Negligible
Jumpers Farm (S)	39	31	37	41	45	45	2	14	8	Low	High	Medium
Tudor Court Park	43	31	38	26	23	25	-17	-8	-13	Negligible	Negligible	Negligible
Upper Whitley Farm	37	32	38	33	37	37	-4	5	-1	Negligible	Medium	Negligible

Receptor	Southern Site – Mitigated (Option 1)											
	Background Sound Level, $L_{A90,T}$ (dB)			Rating Level, $L_{Ar,Tr}$ (dB)			Difference Δ Between Rating Sound Level and Background Sound Level (dB)			Magnitude of Impact		
	Day	Night	Early AM	Day	Night	Early AM	Day	Night	Early AM	Day	Night	Early AM
Denmans Farm (N)	43	37	38	36	14	33	-7	-23	-5	Negligible	Negligible	Negligible
Denmans Farm (W)	43	37	38	26	18	32	-11	-19	-6	Negligible	Negligible	Negligible
Heidersbach	37	32	38	28	22	25	-11	-10	-13	Negligible	Negligible	Negligible
Jumpers Farm (W)	39	31	37	33	17	25	-6	-14	-12	Negligible	Negligible	Negligible
Jumpers Farm (E)	39	31	37	35	27	30	-4	-4	-7	Negligible	Negligible	Negligible
Jumpers Farm (S)	39	31	37	24	33	34	-19	2	-3	Negligible	Low	Negligible
Tudor Court Park	43	31	38	24	13	21	-13	-18	-17	Negligible	Negligible	Negligible
Upper Whitley Farm	37	32	38	36	23	24	-7	-9	-14	Negligible	Negligible	Negligible

Receptor	Southern Site – Mitigated (Option 2)											
	Background Sound Level, $L_{A90,T}$ (dB)			Rating Level, $L_{Ar,Tr}$ (dB)			Difference Δ Between Rating Sound Level and Background Sound Level (dB)			Magnitude of Impact		
	Day	Night	Early AM	Day	Night	Early AM	Day	Night	Early AM	Day	Night	Early AM
Denmans Farm (N)	43	37	38	36	14	33	-7	-23	-5	Negligible	Negligible	Negligible
Denmans Farm (W)	43	37	38	36	17	32	-7	-20	-6	Negligible	Negligible	Negligible
Heidersbach	37	32	38	26	22	25	-11	-10	-13	Negligible	Negligible	Negligible
Jumpers Farm (W)	39	31	37	28	16	25	-11	-15	-12	Negligible	Negligible	Negligible
Jumpers Farm (E)	39	31	37	32	24	29	-7	-7	-8	Negligible	Negligible	Negligible
Jumpers Farm (S)	39	31	37	34	33	33	-5	2	-4	Negligible	Low	Negligible
Tudor Court Park	43	31	38	24	12	21	-19	-19	-17	Negligible	Negligible	Negligible
Upper Whitley Farm	37	32	38	24	23	24	-13	-9	-14	Negligible	Negligible	Negligible

Receptor	Central Site											
	Background Sound Level, $L_{A90,T}$ (dB)			Rating Level, $L_{Ar,Tr}$ (dB)			Difference Δ Between Rating Sound Level and Background Sound Level (dB)			Magnitude of Impact		
	Day	Night	Early AM	Day	Night	Early AM	Day	Night	Early AM	Day	Night	Early AM
Battimer	43	32	33	35	17	30	-8	-15	-3	Negligible	Negligible	Negligible
Bladon House	43	32	33	30	11	28	-13	-21	-5	Negligible	Negligible	Negligible
Bladon Pits	41	31	36	28	13	25	-13	-18	-11	Negligible	Negligible	Negligible
Brackenwood	41	31	36	30	13	27	-11	-18	-9	Negligible	Negligible	Negligible
Burleigh Farm	35	31	35	30	10	27	-5	-21	-8	Negligible	Negligible	Negligible
Burleigh House	41	31	36	34	13	32	-7	-18	-4	Negligible	Negligible	Negligible
City Farm Cottages	46	32	39	26	13	23	-20	-19	-16	Negligible	Negligible	Negligible
Elms Road	37	34	36	34	14	31	-3	-20	-5	Negligible	Negligible	Negligible
Elms Road (South)	37	34	36	29	11	26	-8	-23	-10	Negligible	Negligible	Negligible
Evenlode Crescent	46	32	44	29	19	26	-17	-13	-18	Negligible	Negligible	Negligible
Eynsham Hill	46	32	39	29	24	27	-17	-8	-12	Negligible	Negligible	Negligible
Eynsham Road	37	34	36	29	12	26	-8	-22	-10	Negligible	Negligible	Negligible
Eynsham Road (South)	37	34	36	30	13	27	-7	-21	-9	Negligible	Negligible	Negligible
Goose Eye Farm	38	30	36	32	15	28	-6	-15	-8	Negligible	Negligible	Negligible
Goose Eye Farm	38	30	36	30	12	29	-8	-18	-7	Negligible	Negligible	Negligible
Hall Farm Paddocks	46	32	36	32	18	29	-14	-14	-7	Negligible	Negligible	Negligible
Heath Lane	39	29	38	25	12	24	-14	-17	-14	Negligible	Negligible	Negligible

Heath Lane (South)	39	29	38	26	14	25	-13	-15	-13	Negligible	Negligible	Negligible
Jericho Farm	37	34	36	29	17	26	-8	-17	-10	Negligible	Negligible	Negligible
Manor Road	39	29	38	27	9	25	-12	-20	-13	Negligible	Negligible	Negligible
Mill Farm	43	32	33	23	9	21	-20	-23	-12	Negligible	Negligible	Negligible
New Barns Farm	38	30	36	31	6	11	-7	-26	-28	Negligible	Negligible	Negligible
New Wintles Farm	46	32	39	12	15	27	-34	-15	-9	Negligible	Negligible	Negligible
Purwell Farm	38	30	36	30	11	23	-8	-20	-13	Negligible	Negligible	Negligible
The Beeches	41	31	36	20	11	22	-21	-21	-11	Negligible	Negligible	Negligible
The Paddock	43	32	33	25	21	28	-18	-11	-16	Negligible	Negligible	Negligible
Toll Cottage	46	32	44	30	14	26	-16	-23	-13	Negligible	Negligible	Negligible
Worton Rectory Farmhouse	38	37	39	29	8	14	-9	-29	-25	Negligible	Negligible	Negligible
Yarnton Nursing Home	38	37	39	16	17	30	-22	-15	-3	Negligible	Negligible	Negligible

Receptor	Background Sound Level, $L_{A90,T}$ (dB)			Rating Level, $L_{Ar,Tr}$ (dB)			Difference Δ Between Rating Sound Level and Background Sound Level (dB)			Magnitude of Impact		
	Day	Night	Early AM	Day	Night	Early AM	Day	Night	Early AM	Day	Night	Early AM
Northern Site												
Field View Lane	45	31	39	22	8	19	-23	-23	-20	Negligible	Negligible	Negligible
Hordley Cottages	37	33	34	33	13	29	-4	-20	-5	Negligible	Negligible	Negligible
Lower Dornford Farm	40	31	38	28	9	24	-12	-22	-14	Negligible	Negligible	Negligible
Milford Bridge Cottage	37	33	34	20	6	18	-17	-27	-16	Negligible	Negligible	Negligible
Mulberry Cottage	40	31	38	24	10	20	-16	-21	-18	Negligible	Negligible	Negligible
Old Weaveley Farm	45	31	39	29	18	26	-16	-13	-13	Negligible	Negligible	Negligible
Reeves Cottage	45	31	39	34	13	29	-11	-18	-10	Negligible	Negligible	Negligible
Sansoms Barn	37	33	34	28	10	24	-9	-23	-10	Negligible	Negligible	Negligible
Studys Castle	37	33	34	26	21	24	-11	-12	-10	Negligible	Negligible	Negligible
Threshers Barn	45	31	39	24	16	21	-21	-15	-18	Negligible	Negligible	Negligible
Upper Dornford Barn	40	31	38	23	6	20	-17	-25	-18	Negligible	Negligible	Negligible
Upper Dornford Cottages	40	31	38	27	7	23	-13	-24	-15	Negligible	Negligible	Negligible
Weaveley Farm	45	31	39	32	13	28	-13	-18	-11	Negligible	Negligible	Negligible
Wooton Downs Cottages	40	31	38	21	4	18	-19	-27	-20	Negligible	Negligible	Negligible