



The Sizewell C Project

6.3 Volume 2 Main Development Site Chapter 11 Noise and Vibration Appendix 11C Operational Phase: Sound Level Assessment

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SHARPS REDMORE

ACOUSTIC CONSULTANTS ▪ Established 1990



Report

**Sizewell C Project
Environmental Statement
Volume 2, Chapter 11,
Appendix 11C -
Operational Phase: Sound
Level Assessment**

Head Office

Sharps Redmore

The White House, London Road,
Coppdock, Ipswich, IP8 3JH

T 01473 730073

E contact@sharpsredmore.co.uk

W sharpsredmore.co.uk

Regional Locations

South England (Head Office),
North England, Wales, Scotland

Sharps Redmore Partnership Limited

Registered in England No. 2593855

Directors

RD Sullivan BA(Hons), PhD, CEng, MIOA, MAAS, MASA;

DE Barke MSc, MIOA;

KJ Metcalfe BSc(Hons), MIOA

Company Consultant

TL Redmore BEng, MSc, PhD, MIOA



Contents

- 1.0 Introduction
- 2.0 Description of the Proposed Sizewell C Station and Operational Phase
- 3.0 Receptor Locations and Background Sound Levels
- 4.0 Assessment Methodology and Criteria
- 5.0 SoundPLAN™ Predictive Sound Modelling
- 6.0 Predicted Sound Levels at Receptor Locations
- 7.0 Assessment Details
- 8.0 Conclusions

Annex

- A. SoundPLAN™ Sound Rating level contours for operational station (L_{Ar}) at 1.5m above ground level

Appendix A

Plans

Figure A1. Permanent site layout drawing (illustrative, SZC Co.)

Figure A2. Proposed back-up generator building indicative internal layout (SZC Co.)

Figure A3. Location plan of noise sensitive receptors

Figures A4a & A4b 3D Images of proposed Sizewell C main platform and sound sources

Tables

Table A1. Buildings schedule

Table A2. Operational station sound sources

Tables A3a and A3b. Back-up generator sound source details

1.0 Introduction

- 1.1 Sharps Redmore has been appointed by SZC Co. to undertake a sound level assessment of the proposed Sizewell C Nuclear power station during the operational phase anticipated from 2034.
- 1.2 This report assesses the potential impact of the operational sound levels from the proposed Sizewell C main station development on noise sensitive receptors.
- 1.3 The proposed Sizewell C station would comprise two reactor units (United Kingdom European Pressurised Reactor™ (UK EPR™) units) and associated supporting infrastructure.
- 1.4 **Section 2** of this report describes the proposed Sizewell C power station in more detail including the principal buildings, building scale and design, their function, and their associated sound sources. Details of the proposed development and sound source data used in this assessment has been provided by SZC Co.
- 1.5 **Section 3** of this report identifies the noise sensitive receptors for the assessment and summarises the typical existing sound levels at these receptor areas as measured during baseline sound surveys.
- 1.6 **Section 4** of this report sets out a summary of the established sound level assessment thresholds of significance for the operational phase of the proposed development in accordance with the BS 4142:2014¹ assessment methodology.
- 1.7 **Section 5** of this report describes the predictive sound level model, and the assumptions used in order to predict sound levels emitted from the operational phase of the proposed development. Sharps Redmore have predicted sound levels from the operational phase of the proposed development to twenty-four identified noise sensitive receptors using a predictive sound level model (SoundPLAN™).
- 1.8 **Section 6** of this report sets out the predicted sound level results at the noise sensitive receptor locations.
- 1.9 Predicted sound rating levels have then been derived and assessed in **section 7** of this report against the established criteria to determine whether or not operational noise would exceed significant noise thresholds. Finally, the assessment conclusions can be found in **section 8** to this report.
- 1.10 Vibration from the proposed operational station has been considered, however receptor locations would not be in close proximity to the Main Platform area. Any plant or equipment generating vibration energy within the station is likely to be locally isolated to protect surrounding equipment and infrastructure. No vibration energy is therefore expected to be detectable or measureable beyond the site. Vibration from the operational station has therefore been screened out from further assessment.

1. BSI BS 4142:2014+A1:2019. Methods for rating and assessing industrial and commercial sound.

2.0 Description of the Proposed Sizewell C Station and Operational Phase

Description

- 2.1 The full description of the permanent development is provided in the **Volume 2 Chapters 2 and 4** of this Environmental Statement (ES). Key details relevant to this sound level assessment report are outlined in this section.
- 2.2 The main development site would comprise a number of areas including the main platform where the power station would be located.
- 2.3 The main platform would include key operational elements for each of the two UK EPR™ reactor units (Unit 1 and Unit 2) as follows:
- A reactor building and associated buildings, including emergency diesel generators (known as the ‘Nuclear Island’);
 - Turbine halls and electrical buildings (the ‘Conventional Island’); and
 - Cooling water pump houses and associated buildings.
- 2.4 These key operational components of the main development site and associated infrastructure are indicated on the illustrative permanent site layout plan **Figure A1** of **Appendix A** to this report. The main power station buildings would be located on the main platform which would accommodate the Nuclear Islands, Conventional Islands, onshore cooling water infrastructure and other ancillary and storage buildings. This platform would have an elevation of 7.3 metres (m) Above Ordnance Datum (AOD).
- 2.5 SZC Co. has supplied Sharps Redmore with schedules of the main infrastructure elements and buildings and their sizes for populating the predictive sound level model. The buildings schedule is provided as **Table A1** in **Appendix A** to this report, and can also be found with further building descriptions in **Chapter 2** of **Volume 2** of this ES.
- 2.6 All sound sources have also been identified to Sharps Redmore by SZC Co., and their sound power data supplied including octave band data where available. This data has principally been obtained from the near identical power station under construction at Hinkley Point C, and from operational nuclear power stations operated by SZC Co. in France.
- 2.7 The sound sources have been assigned as point sources or area sources as appropriate and located within the predictive sound model which is further described in **section 5** of this report. All sound source data embedded in the predictive sound level model is set out in **Table A2** of **Appendix A** of this report. 3D images showing the distribution of sound sources around the proposed Main Platform area are provided as **Figures A4a** and **A4b** in **Appendix A** of this report.
- 2.8 The proposed power station would be served by emergency or back-up diesel generator systems in the event of the Loss Of Off-site Power (LOOP). These generator buildings are described in more detail later in this section.

Typical Operational Phase of Sizewell C nuclear power station

- 2.9 Following commissioning of the reactors and back-up generator facilities, for the purposes of the sound level assessment the proposed Sizewell C nuclear power station has been assumed to be continuously operating. Some sound sources associated with the station may be in intermittent use, however these have all been assumed to be operational at the

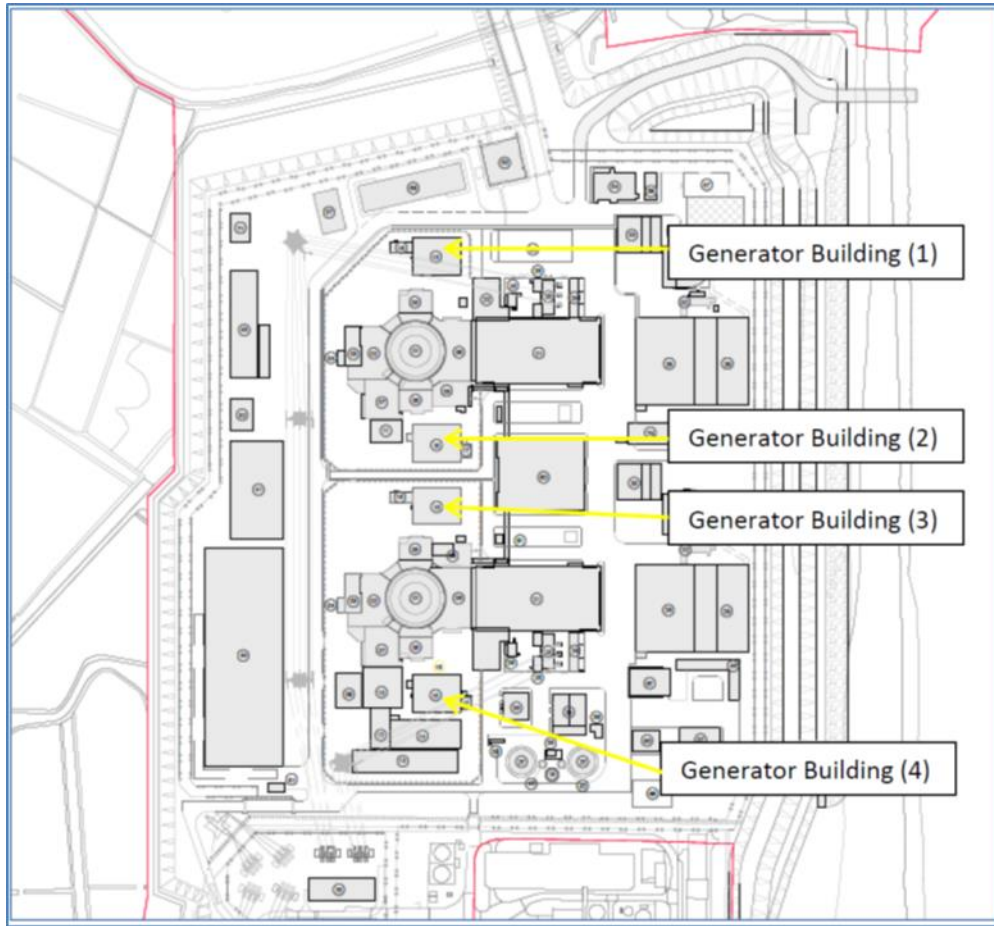
same time in the predictive sound level model. The resultant sound levels predicted are therefore considered a realistic worst case.

- 2.10 During commissioning of the reactor units, various tests are required which may result in sound emissions that differ from those during normal station operation. For example, over-speed tests of the turbines, and high pressure leak tests of critical systems may result in high frequency sound emissions. It is assumed that these tests however would be managed during daytime periods only and sound emissions would be of short duration. These commissioning tests have therefore not been further assessed.
- 2.11 During the operational life of the proposed power station (operational design life of 60 years), outages would be planned lasting up to 2 months, on a cycle of every 18 months. During these periods, the station would undergo a range of planned maintenance tasks as well as refuelling of the reactors. During an outage, typical sound emissions are expected to be at lower levels than those from the fully operational station.

Back-up Generator Facilities to Main Station

- 2.12 The proposed Sizewell C station would comprise two reactors (UK EPR's). Each of these reactors would be served by a pair of back-up generator buildings. Within each of the four buildings would be housed three diesel generators; two Emergency Diesel Generators (EDG's) and one Ultimate, or Station Blackout Diesel Generator (UDG or SBO).
- 2.13 In addition to the generators, the purpose built concrete buildings would also contain the fuel storage tanks, pipes and ductwork, and cooling fans to remove heated air. The generators would be contained in independent sections within each of the four generator buildings. The concrete generator buildings would offer significant attenuation of the noise generated through combustion operations.
- 2.14 The location of the four back-up generator buildings either side of the reactor units are highlighted on the section of the illustrative permanent site layout drawing in **Figure 2.1**.

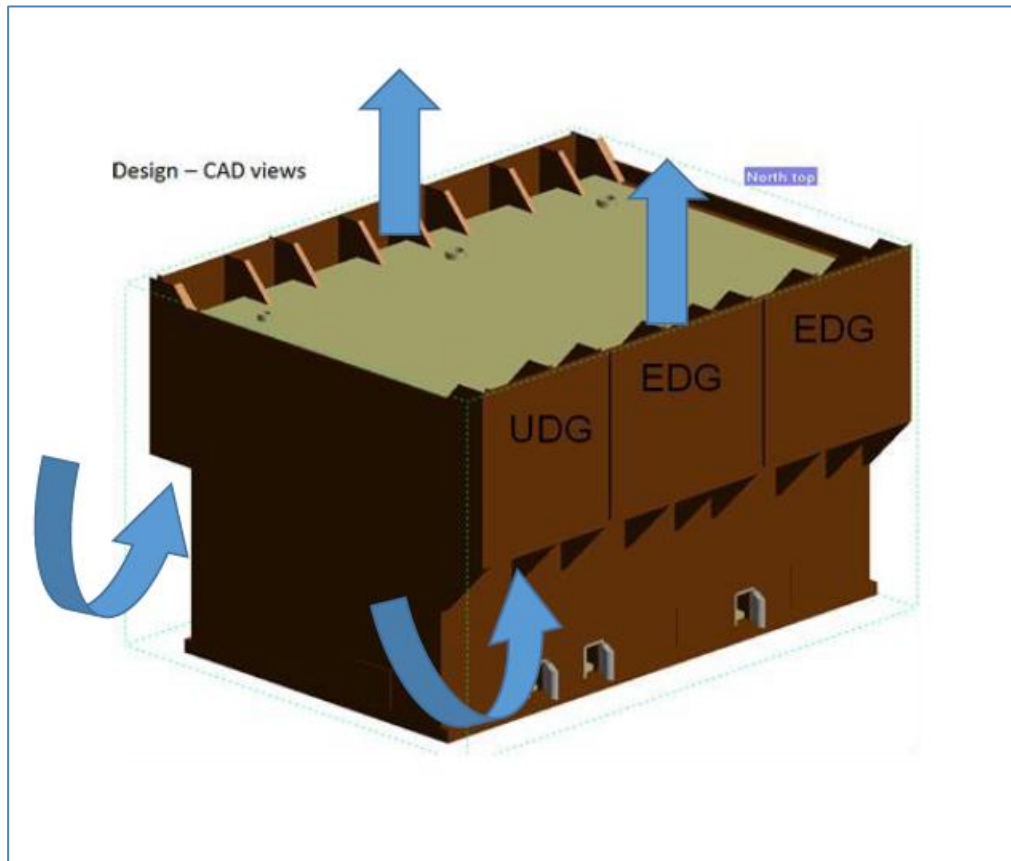
Figure 2.1 – Location of back-up generator buildings



Note: Generator Building labels for noise assessment purposes only

- 2.15 The back-up generator buildings would each contain three diesel generators. Each generator would require a fresh air supply, extraction of warm air (by a deck of extract/cooling fans), and an exhaust stack for dispersion of combustion gases to atmosphere. These three elements would comprise the sound sources during the operation of the back-up generators.
- 2.16 The general arrangement for each building is illustrated in **Figure 2.2**. The illustrative internal detail for each of these generator buildings is shown in cross-section as **Figure A2** in **Appendix A** to this report.

Figure 2.2 – General back-up generator building arrangement (illustrative only)



- 2.17 Following Commissioning testing, the generators would only operate for Routine testing purposes in accordance with a prescribed testing program. The main purpose of the generator facilities is to deal with emergency situations where there is a LOOP.

Commissioning

- 2.18 It is anticipated that the diesel generators serving reactor units 1 and 2 would be commissioned separately in consecutive years. It is further anticipated that during this commissioning period that there would only ever be a single generator running at any one time.

- 2.19 For each reactor unit therefore, expected commissioning hours would be 242.5 hours and 738 hours for the EDG's and UDG's respectively, a total of 2,446 hours per 12-month commissioning. Commissioning of the back-up generator facilities would take place during the same period as the reactors are being commission tested. This period would not reflect the typical operational condition of the station and therefore is not subject to specific assessment in this report.

Routine Testing

- 2.20 It is understood that following commissioning of the generators, future routine testing hours would be much reduced. It is assumed that immediately following an outage period, generators would be subject to sequential 24-hour tests. After these test runs it is expected that the annual run-time for each diesel generator during routine testing would be

approximately 60 hours (approximately 5 days), and that this would only need to take place during daytime hours (0700 – 2300hrs).

- 2.21 Sharps Redmore note that whereas the operational station would be continuous, for the back-up generator facilities, each generator would run for less than 1% of the year.
- 2.22 Routine back-up generator testing would take place throughout the operational life of the power station and therefore this scenario (including the 24 hour run following an outage) is considered in combination with the operational station in **sections 6 and 7** of this report.

LOOP events

- 2.23 In the event of LOOP, in order to keep the Sizewell C station on-line, it is expected that power would be supplied by the two EDG's within each generator building. In the event of both LOOP and EDG failure, then the UDG within each building would operate to maintain power to the Sizewell C station.
- 2.24 The anticipated duration of generator operation during LOOP events would be approximately 72 hours on full power, after which time it is anticipated either that off-site power is restored, or alternative longer-term power provision has been made.
- 2.25 The LOOP scenario represents an unplanned, emergency situation only. The LOOP scenario does not represent the typical operational status of the proposed station and therefore is not subject to further assessment in this report.

Back-up Generator Sound Sources and data

- 2.26 The primary sound sources of the back-up generator buildings and therefore input to the predictive sound level model are as follows:
- Exhaust stacks on roof at a total height of 34.5m AOD (for dispersion of generator combustion gases). Three stacks per building, one per generator.
 - Two fresh-air intakes at mid-level, one either side of the building (per generator), therefore a total of six per generator building.
 - Two fresh-air in/warm air out louvres per generator at higher level, therefore a total of six per generator building.
- 2.27 Until final manufacturing and test data of the equipment for the UK EPR™ are available, each sound source has been assigned an acoustic sound power level based on similar sources for which data is available from similar operational reactors in France. The primary sound sources described above have therefore been assigned sound power levels in accordance with advice of SZC Co. and presented in **Tables A3a and A3b** of **Appendix A** to this report.
- 2.28 Some flexibility may be required for the height of the exhaust stacks in the final scheme design. The final stack heights on the back-up generator buildings would be within the design range of 34 to 39m AOD. The noise impact of the stack heights at the upper end of this range has therefore also been assessed as a precaution and a qualitative assessment is reported within the assessments in **section 7** of this report.

3.0 Receptor Locations and Background Sound Levels

- 3.1 Twenty-four noise sensitive receptor locations from a range of distances and orientations away from development site (Main Platform) have been selected for this sound level assessment. These receptors have all been assessed as being occupied for residential purposes.
- 3.2 These noise sensitive receptors are identified and presented in **Figure A3** to this report.
- 3.3 The identified receptors have been input into the SoundPLAN™ predictive sound level model that is described in detail in **section 5** of this report with grid-references as set out in **Table 3.1** along with their approximate distance from the Main Platform.

Table 3.1 Noise sensitive receptors and grid references.

Receptor Name	Latitude (N)	Longitude (E)	Distance From Proposed Power Station Platform (m)
Abbey Farm	52°13'27.71"	1°35'26.25"	1,700
Abbey Road Leiston	52°13'01.39"	1°34'38.27"	2,600
Ash Wood Cottages	52°13'39.69"	1°36'7.10"	1,050
Barley Rise	52°12'18.32"	1°35'55.23"	1,750
Common Cottages	52°12'53.43"	1°35'41.14"	1,350
Crown Lodge	52°12'22.26"	1°35'46.84"	1,750
Halfway Cottages	52°12'16.24"	1°36'13.06"	1,600
Home Farm	52°12'16.64"	1°36'56.25"	1,350
Keepers Cottage	52°12'51.09"	1°36'13.76"	800
King George's Avenue, Leiston	52°12'21.26"	1°35'30.58"	2,000
Leiston Abbey	52°13'19.94"	1°34'37.69"	2,600
Lover's Lane/Sandy Lane junction	52°12'43.67"	1°35'39.97"	1,500
Old Abbey	52°13'13.10"	1°35'08.82"	2,000
Old Abbey Farm	52°13'16.84"	1°35'10.94"	2,000
Plantation Cottages	52°14'06.26"	1°35'45.72"	2,100
Potters Farm	52°13'49.59"	1°35'11.33"	2,300
Potters Road	52°13'53.52"	1°34'52.51"	2,650
Reckham Lodge	52°12'47.27"	1°36'03.46"	1,000
Rosery Cottages	52°12'34.04"	1°36'51.44"	850
Roundhouse	52°13'50.54"	1°35'32.89"	1,950
Sizewell Village	52°12'29.46"	1°37'13.58"	950
The Studio	52°12'46.42"	1°35'49.75"	1,300
Valley Road North	52°12'38.29"	1°35'04.26"	2,200
Vulcan Arms	52°12'25.28"	1°37'10.02"	1,100

Background sound level surveys

- 3.4 Sharps Redmore has undertaken extensive baseline sound level surveys across the study area with respect to the construction and operational phases of the proposed power station. These baseline surveys support the assessment and reporting with respect to the construction and operational phases of the proposed Sizewell C nuclear power station within the DCO application documentation. The full baseline sound survey data and survey methodology is provided in **Volume 2, Chapter 11, Appendix 11A** of the **ES**.
- 3.5 Sound level surveys have been undertaken individually at, or close to many of the receptors identified in **Table 3.1** above. In some cases a single survey location has been considered representative of a group of receptors, for example observations made, and survey data captured near Keepers Cottage is considered to be representative of the nearby receptors of Common Cottages, Reckham Lodge, The Studio and therefore other dwellings in this section of Sandy Lane.
- 3.6 Surveys were all undertaken using Type 1 precision sound level meters. All meters were field-calibrated at the beginning and end of each survey and no adverse measurement drift was noted. It was not possible to achieve permission to measure within the curtilage of all the noise sensitive receptors considered within this assessment. For practical reasons therefore measurements were taken close to a receptor (or group of receptors), with the microphone in free-field conditions and between 1.2 – 1.5m above ground.
- 3.7 All the survey locations were attended by a consultant for varying periods. Where sites were not able to have equipment secured for a longer period, then attended measurements were made at intervals throughout a day and night. In some locations the equipment was able to be secured for a longer period and for these sites a typical 24-hour period is presented in the baseline survey reports.
- 3.8 A British Standard BS 4142 assessment requires a comparison of the sound rating level of the proposed source(s), with the typical background sound level (measured with the $L_{90,T}$ parameter). The typical daytime and night-time background sound levels relevant to the operational phase receptors have therefore been extracted from the Baseline Chapter and summarised in **Table 3.2**. The measured survey sound levels have been reviewed, and a professional judgement made of the typical background sound levels at the survey locations for daytime and night-time periods in the knowledge that levels would vary from day to day and seasonally. Sound levels and characteristics were noted to be variable at locations close to the coast dependent on weather and sea conditions.

Table 3.2 Summary of measured background sound levels to noise sensitive receptors

Receptor Name	Representative Baseline Survey Reference	Typical Daytime background sound level (L _{A90,T})	Typical Night-time background sound level (L _{A90,T})
Abbey Farm	MS5	29dB	28dB
Abbey Road Leiston	MS19	40dB	30dB
Ash Wood Cottages	MS7	40dB	35dB
Barley Rise	MS42	45dB	35dB
Common Cottages	MS26	35dB	28dB
Crown Lodge	MS30	45dB	30dB
Halfway Cottages	MS42	45dB	35dB
Home Farm	MS28	43dB	40dB
Keepers Cottage	MS26	35dB	28dB
King Georges Avenue, Leiston	MS29	45dB	35dB
Leiston Abbey	MS12	38dB	27dB
Lover's Lane/Sandy Lane junction	MS25	45dB	30dB
Old Abbey	MS15	43dB	30dB
Old Abbey Farm	MS15	43dB	30dB
Plantation Cottages	MS5	29dB	28dB
Potters Farm	MS4	35dB	25dB
Potters Road	MS4	35dB	25dB
Reckham Lodge	MS26	35dB	28dB
Rosery Cottage	MS27	45dB	45dB
Roundhouse	MS6	35dB	35dB
Sizewell Village	MS28	43dB	40dB
The Studio	MS26	35dB	28dB
Upper Abbey	MS10	35dB	28dB
Valley Road North	MS24	40dB	28dB
Vulcan Arms	MS28	43dB	40dB

4.0 Assessment Methodology and Criteria

- 4.1 The most appropriate methodology for assessing the predicted sound levels from the operational phase of the proposed development is to be found within the British Standard BS 4142:2014+A1:2019. This methodology has been used to develop magnitude of impact, and then magnitude of effect thresholds to determine whether the proposed operational station would result in any significant impacts from noise to any of the receptors/receptor areas.
- 4.2 The detailed methodology and derivation of the assessment thresholds is set out within **Volume 2, Chapter 11** (Noise and Vibration) of this ES, and also within **Volume 1, Chapter 6, Appendix 6G**.
- 4.3 For the purposes of this assessment report the assessment criteria have been summarised.
- 4.4 The assessment of mechanical services noise from the operational power station is considered using the assessment approach from BS 4142:2014+A1:2019. The initial magnitude of effect is defined by the difference between the rating and background sound levels as shown in **Table 4.1**, prior to any consideration of context. “BG” in this table is shorthand for background sound level, L_{A90} , dB, assessed in accordance with the procedures in BS 4142. The daytime assessment period is taken to be 0700 to 2300 hours and the night-time assessment period to be 2300 to 0700 hours.

Table 4.1 Values to be used to assess the magnitude of impact for operational power station and other mechanical services, all values are free-field.

Sensitivity of receptor	Period	Magnitude of impact				Parameter
		Very low	Low	Medium	High	
High	Any	Bespoke assessment method to be used				
Medium or Low	Day	<BG+0*	BG+0*	BG+5*	BG+10*	L_{Ar} 1 hour, dB
	Night					L_{Ar} 15 mins, dB
Very low	Any	No assessment normally required				

* All assessments of significance must be considered in the context in which the sound occurs, in accordance with the guidance in BS 4142:2014+A1:2019.

- 4.5 In general, background and ambient sound levels in the vicinity of the main development site are low. The absolute level of sound needs to be considered when looking at context in this situation. BS 4142 advises that:
- “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.”*
- 4.6 Therefore, where background noise levels are at or below 30dB, L_{A90} , an adverse effect would not occur below an absolute threshold that represents the onset of an adverse impact. Since this would only occur in locations where the existing levels are low, it is appropriate to select a level below which there is very little likelihood of sleep disturbance at night. According to the WHO’s ‘Night Noise Guidelines for Europe²’, there is *“no sufficient evidence that the biological effects observed at the level below 40 dB $L_{night, outside}$ are harmful to health”*. On this basis, a value of 40dB, L_{night} represents a level above which an adverse effect might begin to occur in locations with low background sound levels at night.

2. World Health Organisation 2009. Night Noise Guidelines for Europe.

5.0 SoundPLAN™ Predictive Sound Modelling

- 5.1 Sharps Redmore has developed an acoustic model of the study area with the SoundPLAN™ predictive software to include the development site and surroundings and the receptor locations described in **section 3** of this report.
- 5.2 SoundPLAN™ implements predictive assessment of sound in accordance with the methodologies and recommendations of a range of published international standards. The standards and associated assessments and criteria are selected to suit each modelling task and in this case the prediction methodologies of ISO 9613³ were considered most appropriate.
- 5.3 Sharps Redmore has used the SoundPLAN™ version 8.0 noise modelling software package to predict the existing sound levels over the study area from the proposed operational phase of the Sizewell C nuclear power station. SoundPLAN™ calculates $L_{Aeq,T}$ levels at defined receptors in accordance with the appropriate standards. The calculation is based on a number of input parameters, including; source sound level data, see **section 2** of this report and **Appendix A** to this report, barriers (both natural and buildings), receptor positions, see **section 3** of this report, topography and intervening ground conditions.
- 5.4 The location and dimensions of the physical elements of the model such as location and dimensions of buildings, have been taken directly from architectural drawings (supplied by SZC Co). The sound contours can be plotted at defined intervals, and heights above ground level. For the residential receptors in this assessment, sound levels have been predicted to ground floor (1.5m above local ground level).
- 5.5 The buildings schedule data (**Table A1**) and sound source data (**Tables A2, A3a and A3b**) within **Appendix A** have been incorporated into the predictive sound level model.
- 5.6 The main operational station and distribution of the sound sources within the SoundPLAN™ model are illustrated in the 3D images presented as **Figures A4a and A4b** in **Appendix A** to this report.
- 5.7 For the modelling of sound emissions from the operational station (including back-up generator facilities), air absorption has been included in accordance with ISO 9613. With the exception of the proposed Sizewell C station (where hard ground has been assumed), then soft ground has been assumed between the operating station and the receptors. Predictions of sound levels to each receptor are made assuming a slight downwind condition between sound sources and each receptor.
- 5.8 Predictive sound level modelling has been undertaken to receptor positions for the operational phase as follows:
- Sound levels to noise sensitive receptors at 1.5m above local ground level ($L_{Aeq,T}$)
 - Sound levels to noise sensitive receptors at 4.5m above local ground level ($L_{Aeq,T}$)
- 5.9 Two sets of sound level results have been generated by the model representing the two operational phase scenarios for the proposed development as follows:

3. ISO 9613 Acoustics – Attenuation of sound during propagation outdoors; Part 1:1993 Calculation of the absorption of sound by the atmosphere. Part 2:1996 General method of calculation.

- Operational power station – continuous operation
 - Operational power station AND routine back-up generator tests (24-hour operation assessed for the occasions when generators tested immediately post-outage).
- 5.10 Both the operational station and back-up generators have been treated as continuous sources. The operational station would be continuous day and night, whereas routine back-up generator tests would be programmed during the daytime assessment period only. Generators would however be tested sequentially for a 24-hour period immediately following an outage period. Though this testing in total would only last for 12 days every 18 months, this worst-case routine testing (which includes night-time operation) has been assessed in this report.
- 5.11 The assessment considers routine testing of two EDG's or one UDG in a single generator building at any one time.
- 5.12 The sound levels predicted from these operational scenarios are set out in **section 6** of this report, followed by the assessment in **section 7** of this report.

6.0 Predicted Sound Levels at Receptor Locations

- 6.1 The SoundPLAN™ model calculates the predicted sound levels to the residential receptors considered in this assessment. The BS 4142:2014+A1:2019 assessment methodology adopted sets out within the Scope of the Standard that it is for the determination of rating levels of sources of sound of a commercial or industrial nature to outdoor locations. The method then facilitates the use of these outdoor sound levels to assess the likely effects on people who might be inside, or outside a dwelling or premises used for residential purposes.
- 6.2 The free-field sound levels (no façade reflection) to both the ground floor and first floor heights of the most exposed elevations of the residential receptors have been extracted from the model and are set out in **Table 6.1**, all values have been rounded to the nearest whole dB.

Table 6.1 Predicted sound levels (free-field external) from the operational phase of proposed Sizewell C power station.

Receptor	Ground Floor Free-field Sound Level at 1.5m above ground level ($L_{Aeq,T}$) dB	First Floor Free-field Sound Level at 4.5m above ground level ($L_{Aeq,T}$) dB
Abbey Farm	27	30
Abbey Road Leiston	23	25
Ash Wood Cottages	31	35
Barley Rise	30	31
Common Cottages	28	32
Crown Lodge	25	29
Halfway Cottages (Sizewell Gap Road)	27	31
Home Farm	33	36
Keepers Cottage	34	No upper floor
King Georges Avenue, Leiston	31	No upper floor (bungalows)
Leiston Abbey	24	27
Lover's Lane/Sandy Lane junction	30	34
Old Abbey	27	31
Old Abbey Farm	27	30
Plantation Cottages	28	31
Potters Farm	25	29
Potters Road	22	25
Reckham Lodge	32	35
Rosery Cottages	36	39
Roundhouse	26	29
Sizewell Village	30	32
The Studio	30	No upper floor
Upper Abbey	30	34
Valley Road North	26	30
Vulcan Arms	34	35

6.3 The predicted sound levels from the back-up generator buildings have also been extracted from the SoundPLAN™ model. The free-field sound levels (no façade reflection) to ground floor and first floor (1.5m and 4.5m above ground level respectively) of the most exposed elevations of the residential receptors during routine testing of the generators, and testing post-outage are set out in **Table 6.2**, all values have been rounded to the nearest whole dB.

Note: Only one generator building would be in operation/tested at any one time.

Table 6.2 Predicted sound levels (external) from routine testing of back-up generators.

Receptor	Free-field Sound Level (L _{Aeq,T}) dB							
	Gen Building 1		Gen Building 2		Gen Building 3		Gen Building 4	
	GF	FF	GF	FF	GF	FF	GF	FF
Abbey Farm	26	27	20	21	26	27	18	18
Abbey Road Leiston	19	19	21	22	21	22	21	22
Ash Wood Cottages	32	33	25	25	32	33	22	23
Barley Rise	17	18	25	26	20	21	25	28
Common Cottages	24	24	26	26	24	24	25	26
Crown Lodge	18	19	21	23	18	19	24	25
Halfway Cottages	10	16	25	26	19	20	26	28
Home Farm	14	15	21	22	16	16	30	31
Keepers Cottage	26	-	30	-	26	-	33	-
King Georges Avenue, Leiston	20	-	25	-	22	-	25	-
Leiston Abbey	21	22	22	22	22	22	20	20
Lover's Lane/Sandy Lane junction	22	23	25	26	24	24	25	26
Old Abbey	25	27	26	30	26	30	23	25
Old Abbey Farm	24	26	25	28	25	28	21	23
Plantation Cottages	26	27	19	20	25	26	17	18
Potters Farm	24	24	17	19	22	23	16	18
Potters Road	20	20	13	14	20	21	12	14
Reckham Lodge	24	26	28	29	25	25	32	33
Rosery Cottages	14	15	23	24	15	16	35	36
Roundhouse	24	26	19	20	25	27	18	19
Sizewell Village	17	18	19	20	18	19	24	25
The Studio	24	-	27	-	25	-	28	-
Upper Abbey	26	27	20	21	26	27	18	18
Valley Road North	19	19	21	22	19	20	22	23
Vulcan Arms	15	16	25	25	17	18	34	35

6.4 The final set of predicted sound levels presented combines the continuous operation of the proposed Sizewell C nuclear power station (**Table 6.1**), with sound levels from the generator building that contributes the higher levels to each individual receptor (**Table 6.2**). These levels reflect daytime routine back-up generator testing occurring for short periods of any given operational year, and represent the worst case of testing immediately

post-outage (including night-time). All levels presented are free-field external levels at 1.5m, and 4.5m above ground level. These predicted levels are presented in **Table 6.3**.

Table 6.3 Predicted sound levels (day and night-time) from operational station and routine back-up generator testing

Receptor	Free-field Sound Level ($L_{Aeq,T}$) dB					
	Highest sound level from generator building		Sound level from operational station		Combined sound level	
	GF	FF	GF	FF	GF	FF
Abbey Farm	26	27	27	30	30	32
Abbey Road Leiston	21	22	23	25	25	27
Ash Wood Cottages	32	33	31	35	35	37
Barley Rise	25	28	30	31	31	33
Common Cottages	26	26	28	32	30	33
Crown Lodge	24	25	25	29	28	31
Halfway Cottages	26	28	27	31	30	33
Home Farm	30	31	33	36	35	37
Keepers Cottage	33	-	34	-	37	-
King Georges Avenue, Leiston	25	-	31	-	32	-
Leiston Abbey	22	22	24	27	26	28
Lover's Lane/Sandy Lane junction	25	26	30	34	31	35
Old Abbey	26	30	27	31	30	34
Old Abbey Farm	25	28	27	30	29	32
Plantation Cottages	26	27	28	31	30	33
Potters Farm	24	24	25	29	28	30
Potters Road	20	21	22	25	24	27
Reckham Lodge	32	33	32	35	35	37
Rosery Cottages	35	36	36	39	39	41
Roundhouse	25	27	26	29	29	31
Sizewell Village	24	25	30	32	31	33
The Studio	28	-	30	-	32	-
Valley Road North	22	23	26	30	28	31
Upper Abbey	26	27	30	34	32	35
Vulcan Arms	34	35	34	35	37	38

7.0 Assessment Details

- 7.1 The predicted sound rating level contours ($L_{Ar,15\text{minute}}$ dB) for the operational station only are presented in **Annex A**. The contour plan shows the sound rating level contours at 1.5m above local ground level across the study area as an illustration of the sound propagation away from the proposed development. The derivation of the rating level is discussed further in this section.
- 7.2 As set out in **section 5** of this report, there are two assessment scenarios for the operational phase of the proposed Sizewell C station:
- Operational power station – continuous operation (24-hour)
 - Operational power station AND routine back-up generator tests (24-hour operation assessed for the occasions when generators tested immediately post-outage)

Operational Station Assessment

- 7.3 The assessment of the operational phase of the proposed power station compares the predicted sound rating levels with significance thresholds established in **section 4** of this report, and a consideration of the predicted sound levels at receptors in context. The criteria have been developed and established based on existing daytime and night-time background sound levels across the study area.
- 7.4 The significance thresholds established in accordance with BS 4142:2014+A1:2019 are for free-field sound rating levels. This British Standard is a methodology for considering outdoor sound levels and their likely effects on people who then may be outside or inside a dwelling. During the day, noise levels are determined for a ground floor receptor, at night, first floor of receptors are considered.
- 7.5 In terms of the sound rating level (L_{Ar}) during ordinary operation of the proposed power station, the specific sound levels predicted in **Table 6.1** must be adjusted to account for any particular sound characteristics of the station and back-up generators (acoustic correction, or acoustic penalty (BS4142)).
- 7.6 The operational Sizewell B nuclear power station has a characteristic tonal ‘hum’ in the near vicinity of the site. It is anticipated that the proposed Sizewell C station during operation would exhibit a similar sound characteristic.
- 7.7 Although it is not possible at this stage to determine whether such a hum from the proposed Sizewell C nuclear power station would be able to be differentiated from the existing Sizewell B station, the operational life of Sizewell C would extend beyond that of the Sizewell B station and therefore it is considered appropriate to apply an acoustic correction or penalty to the predicted sound levels at receptor locations to account for tonality.
- 7.8 The operation of the station and back-up generators (during their routine testing) would be continuous, and therefore sound emissions are not expected to exhibit any intermittency or impulsivity as described within BS 4142.

- 7.9 It is reasonable to add a rating level correction for tonality to the operational sound emissions from the station. In accordance with Section 9.2 of BS 4142:2014+A1:2019, the subjective method has been applied based on observations of the similar characteristics exhibited by the operational Sizewell B nuclear power station.
- 7.10 Weather conditions, and sea conditions (where receptors are close to the coast) would influence on a daily, and seasonal basis the perception of the tonality as experienced at each receptor location. There may be locations where the tonality would perhaps be clearly perceptible, but also receptor locations further away in the study area where at times tonality would be barely, if at all perceptible.
- 7.11 At this stage a precautionary approach has been adopted and an assumption that at times during the course of a year, tonality may be clearly perceptible at all the receptors described in this assessment. On that basis, a +4 dB character correction has been applied to the predicted (specific) sound levels at all receptor locations to derive the sound rating levels (L_{Ar}) for comparison with significance thresholds in the assessments that follow.
- 7.12 For the operational phase of the proposed Sizewell C nuclear power station, the predicted sound rating levels to each receptor location are compared with the existing background sound levels, and the magnitude of impact of those predicted sound rating levels are established. Assessment tables are presented for ground and first floor heights, and for daytime and night-time assessment periods respectively in **Tables 7.1** and **7.2** that follow.

Table 7.1 Operational station sound rating level (L_{Ar} dB) assessment - Daytime

Receptor	Predicted (free-field) sound rating level at ground floor (L _{Ar} dB)	Typical background sound level Day (L _{A90} dB)	L _{Ar} minus L _{A90} dB	Magnitude of impact
Abbey Farm	31	29	+2	Low
Abbey Road Leiston	27	40	-13	Very low
Ash Wood Cottages	35	40	-5	Very low
Barley Rise	34	45	-11	Very low
Common Cottages	32	35	-3	Very low
Crown Lodge	29	45	-16	Very low
Halfway Cottages	31	45	-14	Very low
Home Farm	37	43	-6	Very low
Keepers Cottage	38	35	+3	Low
King Georges Avenue, Leiston	35	45	-10	Very low
Leiston Abbey	28	38	-10	Very low
Lover's Lane/Sandy Lane junction	34	45	-11	Very low
Old Abbey	31	43	-12	Very low
Old Abbey Farm	31	43	-12	Very low
Plantation Cottages	32	29	+3	Low
Potters Farm	29	35	-6	Very low
Potters Road	26	35	-9	Very low
Reckham Lodge	36	35	+1	Low
Rosery Cottages	40	45	-5	Very low
Roundhouse	30	35	-5	Very low
Sizewell Village	34	43	-9	Very low
The Studio	34	35	-1	Very low
Upper Abbey	34	35	-1	Very low
Valley Road North	30	40	-10	Very low
Vulcan Arms	38	43	-5	Very low

Table 7.2 Operational station sound rating level (L_{Ar} dB) assessment – Night-time

Receptor	Predicted (free-field) sound rating level (L _{Ar} dB)		Typical background sound level at night (L _{A90} dB)	L _{Ar} minus L _{A90} dB		Magnitude of impact	
	GF	FF		GF	FF	GF	FF
Abbey Farm	31	34	28	+3	+6	Low	Medium
Abbey Road Leiston	27	29	30	-3	-1	Very low	Very low
Ash Wood Cottages	35	39	35	0	+4	Low	Low
Barley Rise	34	35	35	-1	0	Very low	Low
Common Cottages	32	36	28	+4	+8	Low	Medium
Crown Lodge	29	33	30	-1	+3	Very low	Low
Halfway Cottages	31	35	35	-4	0	Very low	Low
Home Farm	37	40	40	-3	0	Very low	Low
Keepers Cottage	38	-	28	+10	-	High	No upper floor
King Georges Avenue, Leiston	35	-	35	0	-	Low	No upper floor
Leiston Abbey	28	31	27	+1	+4	Low	Low
Lover's Lane/Sandy Lane junction	34	38	30	+4	+8	Low	Medium
Old Abbey	31	35	30	+1	+5	Low	Medium
Old Abbey Farm	31	34	30	+1	+4	Low	Low
Plantation Cottages	32	35	28	+4	+7	Low	Medium
Potters Farm	29	33	25	+4	+8	Low	Medium
Potters Road	26	29	25	+1	+4	Low	Low
Reckham Lodge	36	39	28	+8	+11	Medium	High
Rosery Cottages	40	43	45	-5	-2	Very low	Very low
Roundhouse	30	33	35	-5	-2	Very low	Very low
Sizewell Village	34	36	40	-6	-4	Very low	Very low
The Studio	34	-	28	+6	-	Medium	No upper floor
Upper Abbey	34	38	28	-1	+10	Very low	High
Valley Road North	30	34	28	+2	+6	Low	Medium
Vulcan Arms	38	39	40	-2	-1	Very low	Very low

Significance of noise effects during typical operational phase (no back-up generators)

Daytime (0700 to 2300hrs)

- 7.13 The predicted sound rating level (L_{Ar}) to all receptors represents a 'low' or 'very low' magnitude of impact compared with typical existing background sound levels. Predicted sound levels for normal station operation during daytime hours would result in a minor effect, and therefore are not considered to represent a significant impact to any receptors.
- 7.14 A negligible to minor adverse impact is predicted to Leiston Abbey however, SZC Co. will liaise further with the occupants to take account of the potentially more sensitive activities

that involve indoor and outdoor music performance. A higher category of effect is possible, depending on the activities at the Abbey.

Night-time (2300 to 0700hrs)

- 7.15 First floor heights (4.5m) have been considered for the night-time assessment period with the exception of Keepers Cottage and The Studio which are assumed to be single storey dwellings, and the bungalows at the end of King George's Avenue. For those receptors, the ground floor values have been reviewed. The magnitude of impact has been considered against the existing background sound levels measured at ground floor, which may under-represent the level that may be measured at a height of 4.5m for two-storey dwellings.
- 7.16 At fourteen of the receptor areas assessed, the predicted sound rating level (L_{Ar}) represents a 'low' or 'very low' magnitude of impact compared with typical existing background sound levels. Predicted sound levels for normal station operation during night-time hours would result in minor effect, and therefore are not considered to represent a significant impact to these receptors.
- 7.17 To nine receptor areas, the predicted sound rating level (L_{Ar}) represents a medium magnitude of impact, and to Reckham Lodge and Upper Abbey a high magnitude of impact compared with typical existing background sound levels. In accordance with the BS 4141:2014+A1:2019 methodology, these magnitudes of impact must be considered in context in order to conclude whether predicted sound levels represent a significant impact.
- 7.18 In general, background and ambient sound levels in the vicinity of the main development site are low. The absolute level of sound predicted from the operational station needs to be considered in context in this situation. BS 4142 advises that:
- "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."*
- 7.19 A significant effect may not occur unless the overall noise level exceeds an absolute level which represents a significant level, and it is appropriate to select a level below which there is very little likelihood of sleep disturbance at night. According to the WHO's '*Night Noise Guidance for Europe (NNGE)*', there is "no sufficient evidence that the biological effects observed at the level below 40dB $L_{night, outside}$ are harmful to health". On this basis, a value of 40dB, L_{night} represents a level above which an adverse effect might begin to occur and so should be avoided in locations with low background sound levels at night.
- 7.20 The predicted L_{night} would be below 40dB at all receptors where a medium or high magnitude of impact is indicated and therefore these change in level would not result in a significant adverse effect.
- 7.21 In summary, there would be no significant adverse noise effects resulting from the night-time operation of the proposed development.

Operational Station and Routine Back-up Generator Testing Assessment (including 24-hour tests immediately post-outage)

- 7.22 Predicted sound levels from the proposed routine back-up generator tests, and specifically when generators are run for 24-hours post-outage, have been combined with those from the proposed operational station. Sound rating levels to each receptor location are then compared with the existing background sound levels, and the magnitude of impact of those

predicted sound rating levels are established. Assessment tables are presented for ground and first floor heights, and for daytime and night-time assessment periods respectively in **Tables 7.3 and 7.4**. It should be noted that this 24 hour running of each generator in turn (post-outage), would occur approximately every 18 months, and routine daytime testing would be for limited hours per year.

7.23 It is noted from the Sizewell C project descriptions, that routine testing of each generator is anticipated to occur for less than 1% of the operational time in any given year. Further, Sharps Redmore has included for two generators per generator building operating at any one time during routine testing. This may therefore overstate the contribution from a generator building during test conditions when only a single generator is likely to be tested at any one time.

7.24 **Tables 7.3 and 7.4** set out the predicted sound rating levels from the operational station and routine back-up generator testing (daytime), and the combined station and post-outage generator testing (night-time). These predictions include the values from the generator building predicted to have the highest sound level emissions. Sound rating levels (L_{Ar}) have been derived by the addition of 4 dB for tonality to the combined sound levels in **Table 6.3**.

Table 7.3 Sound rating level (L_{Ar}) assessment of operational station and routine testing of back-up generators (24-hour testing post-outage) - daytime

Receptor	Predicted (free-field) sound rating level to ground floor (L_{Ar} dB)	Typical background sound level Day (L_{A90} dB)	L_{Ar} minus L_{A90} dB	Magnitude of impact
Abbey Farm	34	29	+5	Medium
Abbey Road Leiston	29	40	-11	Very low
Ash Wood Cottages	39	40	-1	Very low
Barley Rise	35	45	-10	Very low
Common Cottages	34	35	-1	Very low
Crown Lodge	32	45	-13	Very low
Halfway Cottages	34	45	-11	Very low
Home Farm	39	43	-4	Very low
Keepers Cottage	41	35	+6	Medium
King Georges Avenue, Leiston	36	45	-9	Very low
Leiston Abbey	30	38	-8	Very low
Lover's Lane/Sandy Lane junction	35	45	-10	Very low
Old Abbey	34	43	-9	Very low
Old Abbey Farm	33	43	-10	Very low
Plantation Cottages	34	29	+5	Medium
Potters Farm	32	35	-3	Very low
Potters Road	28	35	-7	Very low
Reckham Lodge	39	35	+4	Low
Rosery Cottages	43	45	-2	Very low
Roundhouse	33	35	-2	Very low
Sizewell Village	35	43	-8	Very low
The Studio	36	35	+1	Low
Upper Abbey	36	35	+1	Low
Valley Road North	32	40	-8	Very low
Vulcan Arms	41	43	-2	Very low

Table 7.4 Sound rating level (L_{Ar}) assessment of operational station and testing of back-up generators (24-hour testing post-outage) – night-time

Receptor	Predicted (free-field) sound rating level (L _{Ar} dB)		Typical background sound level at night (L _{A90} dB)	L _{Ar} minus L _{A90} dB		Magnitude of impact	
	GF	FF		GF	FF	GF	FF
Abbey Farm	34	36	28	+6	+8	Medium	Medium
Abbey Road Leiston	29	31	30	-1	+1	Very low	Low
Ash Wood Cottages	39	41	35	+4	+6	Low	Medium
Barley Rise	35	37	35	0	+2	Low	Low
Common Cottages	34	37	28	+6	+9	Medium	Medium
Crown Lodge	32	35	30	+2	+5	Low	Medium
Halfway Cottages	34	37	35	-1	+2	Very low	Low
Home Farm	39	41	40	-1	+1	Very low	Low
Keepers Cottage	41	-	28	+13	-	High	No upper floor
King Georges Avenue, Leiston	36	-	35	+1	-	Low	No upper floor
Leiston Abbey	30	32	27	+3	+5	Low	Medium
Lover's Lane/Sandy Lane junction	35	39	30	+5	+9	Medium	Medium
Old Abbey	34	38	30	+4	+8	Low	Medium
Old Abbey Farm	33	36	30	+3	+6	Low	Medium
Plantation Cottages	34	37	28	+6	+9	Medium	Medium
Potters Farm	32	34	25	+7	+9	Medium	Medium
Potters Road	28	31	25	+3	+6	Low	Medium
Reckham Lodge	39	41	28	+11	+13	High	High
Rosery Cottages	43	45	45	-2	0	Very low	Low
Roundhouse	33	35	35	-2	0	Very low	Low
Sizewell Village	35	37	40	-5	-3	Very low	Very low
The Studio	36	-	28	+8	-	Medium	No upper floor
Upper Abbey	36	39	28	+8	+11	Medium	High
Valley Road North	32	35	28	+4	+7	Low	Medium
Vulcan Arms	41	42	40	+1	+2	Low	Low

Significance of noise effects during typical operational phase with 24-hour back-up generator testing post-outage (worst case routine testing)

Daytime (0700 to 2300hrs)

- 7.25 With the exception of Abbey Farm, Keepers Cottage and Plantation Cottages, the predicted sound rating level ($L_{A,r}$) to all receptors represents a 'low' or 'very low' magnitude of impact compared with typical existing background sound levels. Predicted sound levels for normal station operation and occasional routine generator testing during daytime hours would result in a minor effect, and therefore not considered to represent a significant impact from noise.
- 7.26 At Abbey Farm, Keepers Cottage and Plantation Cottages a medium magnitude of impact is predicted during testing of backup generators. These predicted impacts are noted to be marginal and must be further considered in context.
- 7.27 One of the principal contextual considerations is the limited duration of the routine back-up generator testing. The back-up generators would be subject to testing for 60 hours per year (assumed approximately 5 days), per generator during daytime hours. The calculated values and assessment in **Table 7.3**, are based on the generator building that results in the highest sound level at each receptor and therefore presents the short-term worst case to each receptor. Therefore predicted sound levels would be reduced from generators tested in buildings further away, or more screened from these receptors.
- 7.28 At Abbey Farm and Plantation Cottages, routine testing from two of the generator buildings only would result in the levels predicted in **Table 7.3**, therefore the outcome is expected to occur on approximately ten days per year at each of these receptors. At Keepers Cottage, only one of the generator buildings under test is predicted to result in the levels set out in **Table 7.3**, therefore that level is expected to occur on five days per year.
- 7.29 When generators are tested post-outage, which will occur every 18 months, the levels predicted in **Table 7.3** are expected to occur for two days at Abbey Farm and Plantation Cottages, and for a single day at Keepers Cottage.
- 7.30 All of the calculations assume downwind propagation and it is not likely that these receptors would be downwind of the station during all days when generator testing is undertaken. A precautionary +4dB acoustic correction for tonality has been added to the predicted sound levels on the basis that a 'hum' may be clearly perceptible at the receptors. The perception of that acoustic characteristic would vary according to, inter alia, the prevailing weather conditions of which wind direction is one consideration.
- 7.31 It is possible that under conditions that are not downwind, the expected rating levels may be lower as a result of both the differing wind characteristics, and a reduced perception of the acoustic character.
- 7.32 The predicted rating levels in **Table 7.3** are considered to represent the worst-case outcomes, and given the relatively infrequent generator testing, it is not considered that the combination of the operational station and daytime back-up generator testing would represent a significant impact from noise to these receptors.
- 7.34 As discussed in **section 2.29** of this report, there is potential for the back-up generator exhaust stacks to be at a maximum height of 39m AOD. This scenario was therefore also

modelled to determine whether this would result in any differences to predicted sound levels at the receptor locations and therefore change any assessment outcomes. When combined with the predicted operational station sound levels, resultant predicted sound levels at receptor locations with exhaust stack heights at 39m AOD vary by between 1 and 2dB only at the closest receptors. For the majority of receptors, predicted sound levels remain unchanged. This is considered a marginal change only and therefore would not result in any change to the assessment outcomes presented.

Night-time (2300 to 0700hrs)

- 7.35 The only night-time running of the back-up generators outside of emergency situations, would be immediately after scheduled fuel and maintenance outages at the station. These would take place once every 18 months. It is understood that each individual generator (twelve in total), would be run for a 24-hour period.
- 7.36 First floor heights (4.5m) have been considered for the night-time assessment period with the exception of Keepers Cottage and The Studio which are known to be single storey dwellings, and the bungalows at the end of King George's Avenue. For those receptors, the ground floor values have been reviewed. Note that the magnitude of impact has been considered against the existing background sound levels measured at ground floor, which may under-represent the level at a height of 4.5m for two-storey dwellings.
- 7.37 At nine of the receptor areas assessed, the predicted sound rating level (L_{Ar}) represents a 'low' or 'very low' magnitude of impact compared with typical existing background sound levels. Predicted sound levels to these receptors during night-time operation of the station combined with post-outage back-up generator testing would result in a minor effect, therefore not considered to represent a significant impact to these receptors.
- 7.38 To thirteen receptor areas, the predicted sound rating level (L_{Ar}) represents a medium magnitude of impact, and to Keepers Cottage, Upper Abbey and Reckham Lodge a high magnitude of impact compared with typical existing background sound levels.
- 7.39 In accordance with the BS 4141:2014+A1:2019 methodology, these magnitudes of impact must be considered in context in order to conclude whether predicted sound levels represent a significant impact.
- 7.40 In this case, all predicted levels would be below 40dB, L_{night} and, thus, although the magnitude of impact would be medium or high, this would not result in a significant adverse effect.
- 7.41 The assessment in **Table 7.4** is also based upon levels predicted from the worst case generator building to each receptor, therefore predicted sound levels would be reduced from generators tested in buildings further away, or more screened from these receptors.
- 7.42 In summary, testing of the back-up generators post-outage at night would for a short period increase the sound levels predicted from the operational station alone. During these infrequent, and relatively short duration events, predicted levels would raise the existing background sound levels measured outside all the receptors except Rosery Cottages, Roundhouse and Sizewell Village. Predicted levels would however be below the threshold for harmful effects on sleep at night, and therefore considered below the threshold of a significant impact from noise.

Further Contextual Considerations & Uncertainty

- 7.43 A BS 4142:2014+A1:2019 assessment is not complete without a discussion of the contextual consideration of the numerical assessments and a review of uncertainty within the assessment. Some of this context is included in the assessment of the predicted sound levels above, further contextual factors relevant to the proposed development are discussed below.
- 7.44 The new nuclear power station is proposed at a site where two nuclear facilities are already located. Sizewell A is currently in the decommissioning phase, whilst Sizewell B remains operational. The existing sound levels and sound character in the vicinity of the development site are therefore influenced to a varying degree by existing nuclear power station activity. The extent to which receptors are exposed varies depending on weather conditions and more locally upon the state of the sea.
- 7.45 Both the operational station and the back-up generator facilities would be built to, and maintained at a high standard reflective of the operational control required at a nuclear power station.
- 7.47 The design of the power station will be refined in association with other similar facilities elsewhere in the country. As part of this design refinement, and as the design of the back-up generator buildings in particular evolves, further reductions in noise emissions may be possible to mitigate and minimise adverse effects on health and quality of life.
- 7.48 Post-commissioning, the time taken for routine testing of the back-up generators represents a very small fraction of any operational year, less than 1% of the time that the proposed Sizewell C power station would be operating. During the operational phase of the station, generators would only be operated at night immediately after an outage period for a 24-hour period per generator, approximately on an 18-month cycle.
- 7.49 As discussed in **Section 2.10**, all sound sources within the proposed operational station have been assumed to be on continuously for the purposes of this assessment.. In practice therefore at times sound levels could be lower than those presented.
- 7.50 Some uncertainty may arise in the source sound levels input into the predictive sound model. The data supplied is understood to be the most representative it can be from an operational station of a similar design to that proposed at Sizewell C.
- 7.51 In conclusion the sound source data adopted and approach taken in this assessment is considered to be robust, and representative.

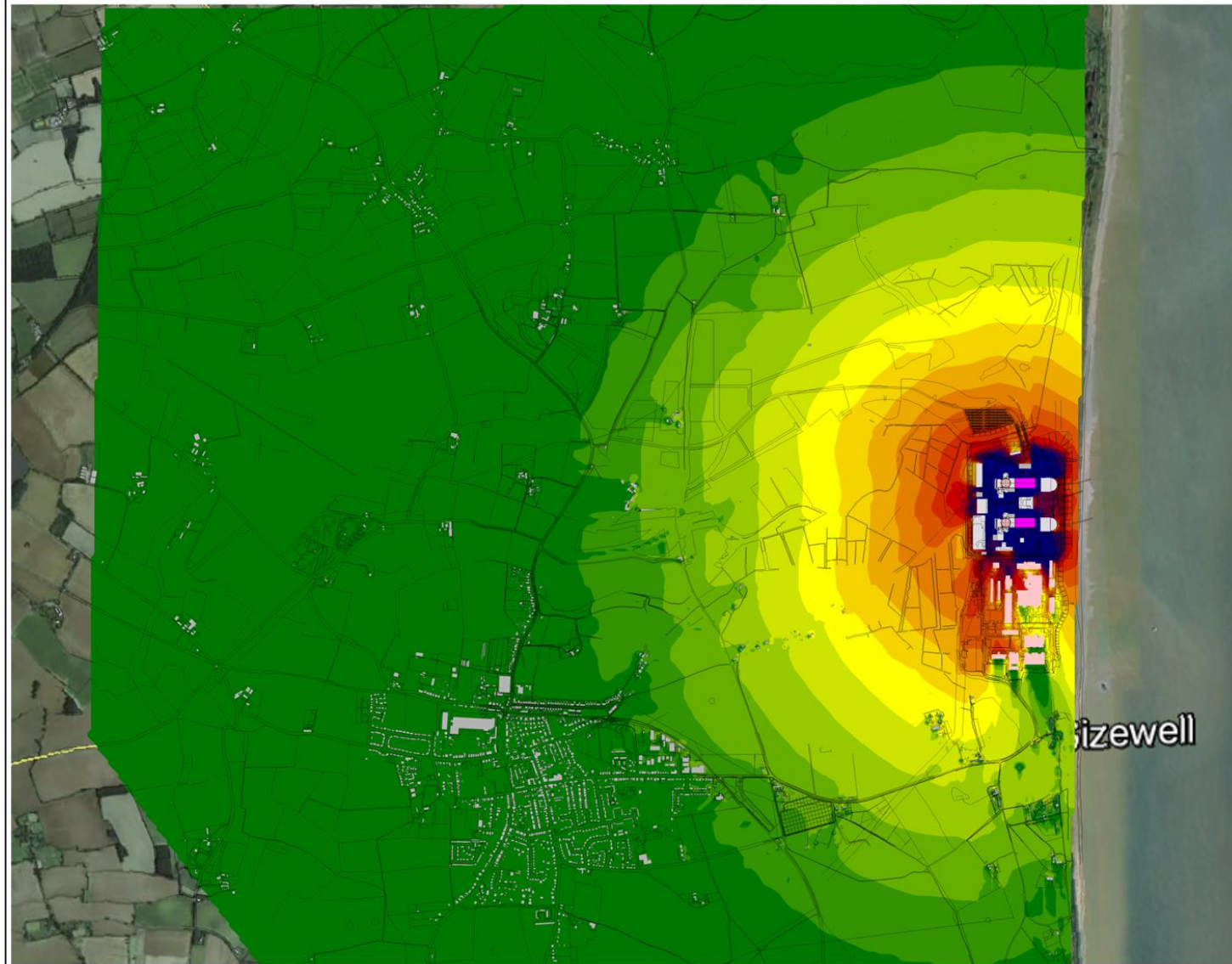
8.0 Conclusions

- 8.1 Sharps Redmore has undertaken a sound level assessment for the operational phase of the proposed Sizewell C nuclear power station in Suffolk, based on data supplied to SZC Co. and based on the design of Hinkley Point C, Somerset and Flamanville, France.
- 8.2 Sound levels from the proposed Sizewell C nuclear power station have been assessed for the following operational scenarios:
 - Operation power station – continuous operation day and night; and
 - Operational power station AND routine back-up generator tests – 24-hour operation assessed for the occasions when generators tested immediately post-outage.
- 8.3 After commissioning testing, each generator would operate for less than 1% of the year during the operational life of the proposed power station.
- 8.4 Sound levels and sound rating levels (L_{Ar}) have been predicted to residential receptor locations at a range of distances and orientations from the proposed development site and assessed against the thresholds of significance established in Section 4.
- 8.5 Operational noise levels would result negligible or minor effects for most receptors but some receptors would experience an increase in noise level at night with a medium or high magnitude. When levels are considered in context, predicted sound levels to all receptors would be below the threshold of a significant impact from noise.
- 8.5 Noise levels from routine testing of standby generators at Abbey Farm, Keepers Cottage and Plantation Cottages would result in a short-term, medium magnitude of impact during the day. When considered in context, it is concluded that there would be no significant adverse effect over the course of an operational year. At night, although the magnitude of levels would be medium or high for some receptors, the effect would not be significant, as the predicted levels would be below the threshold at which there would be harm to sleep.

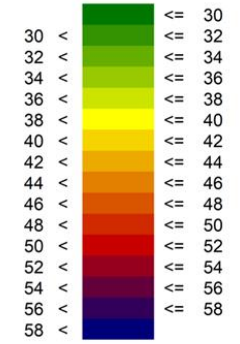
ANNEX A

SOUNDPLAN™ PREDICTED SOUND RATING LEVEL CONTOURS

SoundPLAN™ Sound rating level contours for operational station (L_{A7}) at 1.5m above ground level



Noise level
L_{Aeq}(T)
(dB)



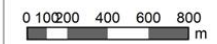
Sizewell

Operational Noise

Daytime noise levels

Contours at 1.5m
elevation

Scale 1:30000



SHARPS REDMORE
ACOUSTIC CONSULTANTS

APPENDIX A

PLANS & TABLES

Figure A1. Permanent site layout drawing (illustrative, SZC Co.)

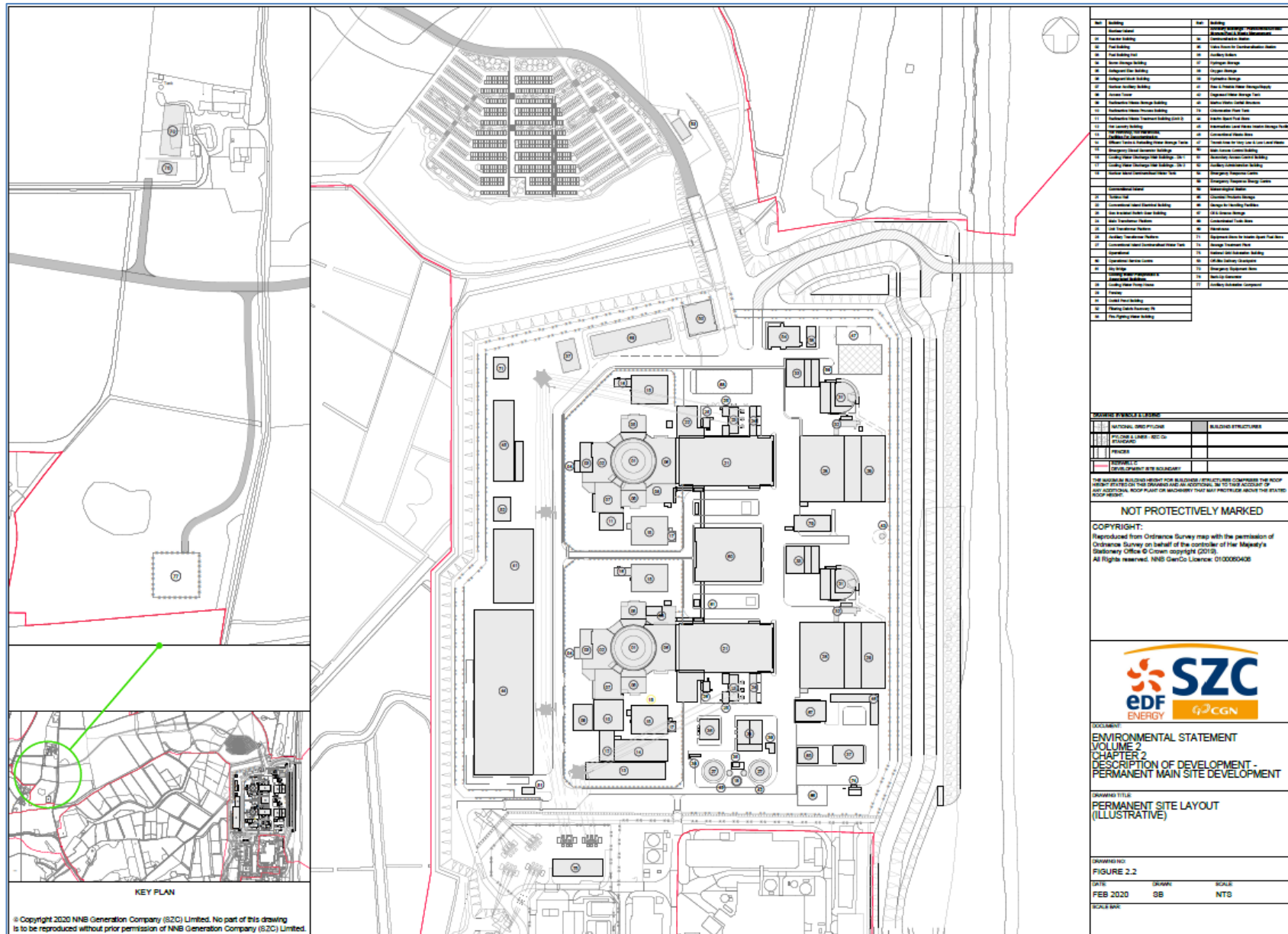


Figure A2. Proposed back-up generator building indicative internal layout (SZC Co.)

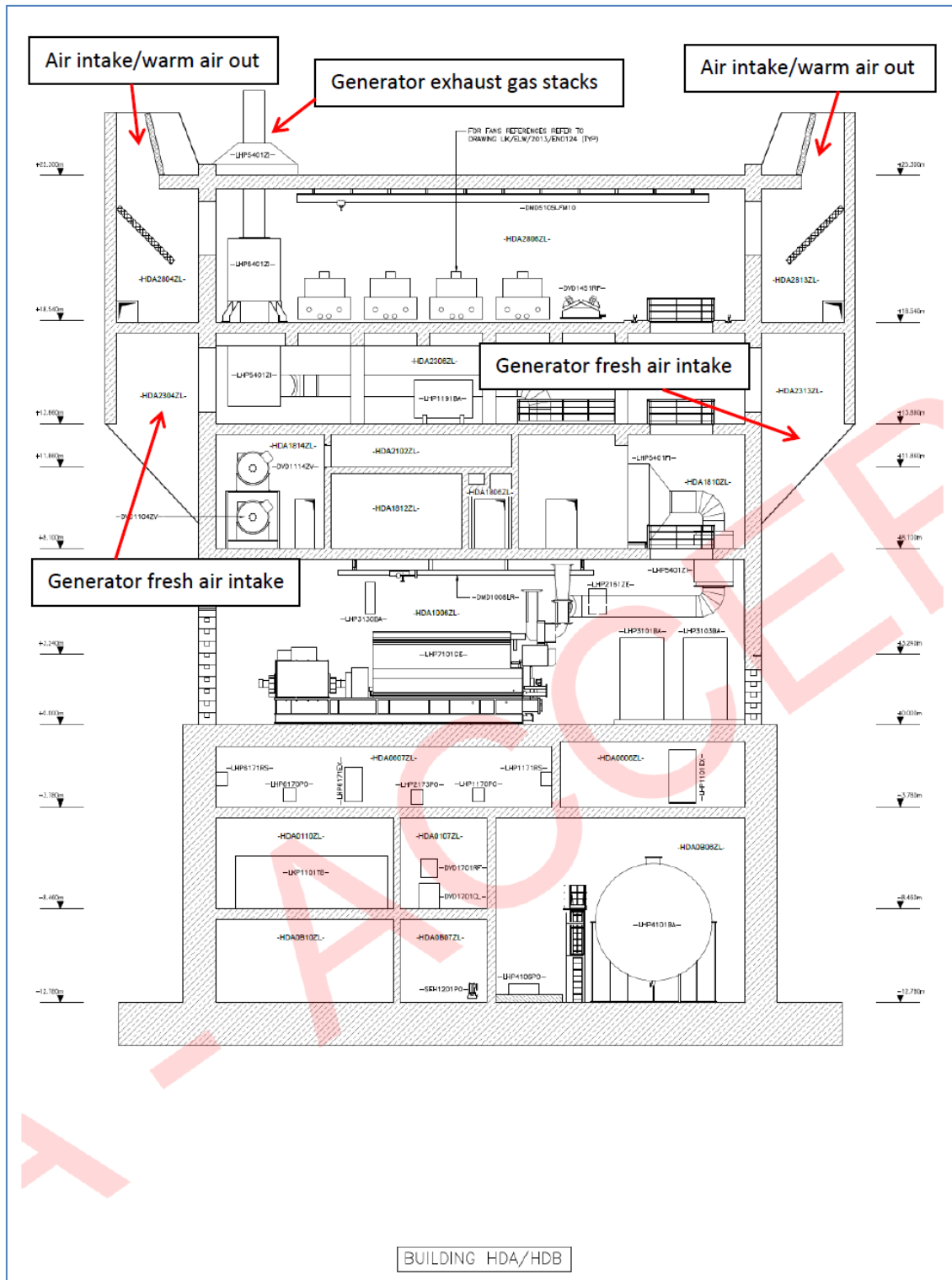


Figure A3. Location plan of noise sensitive receptors

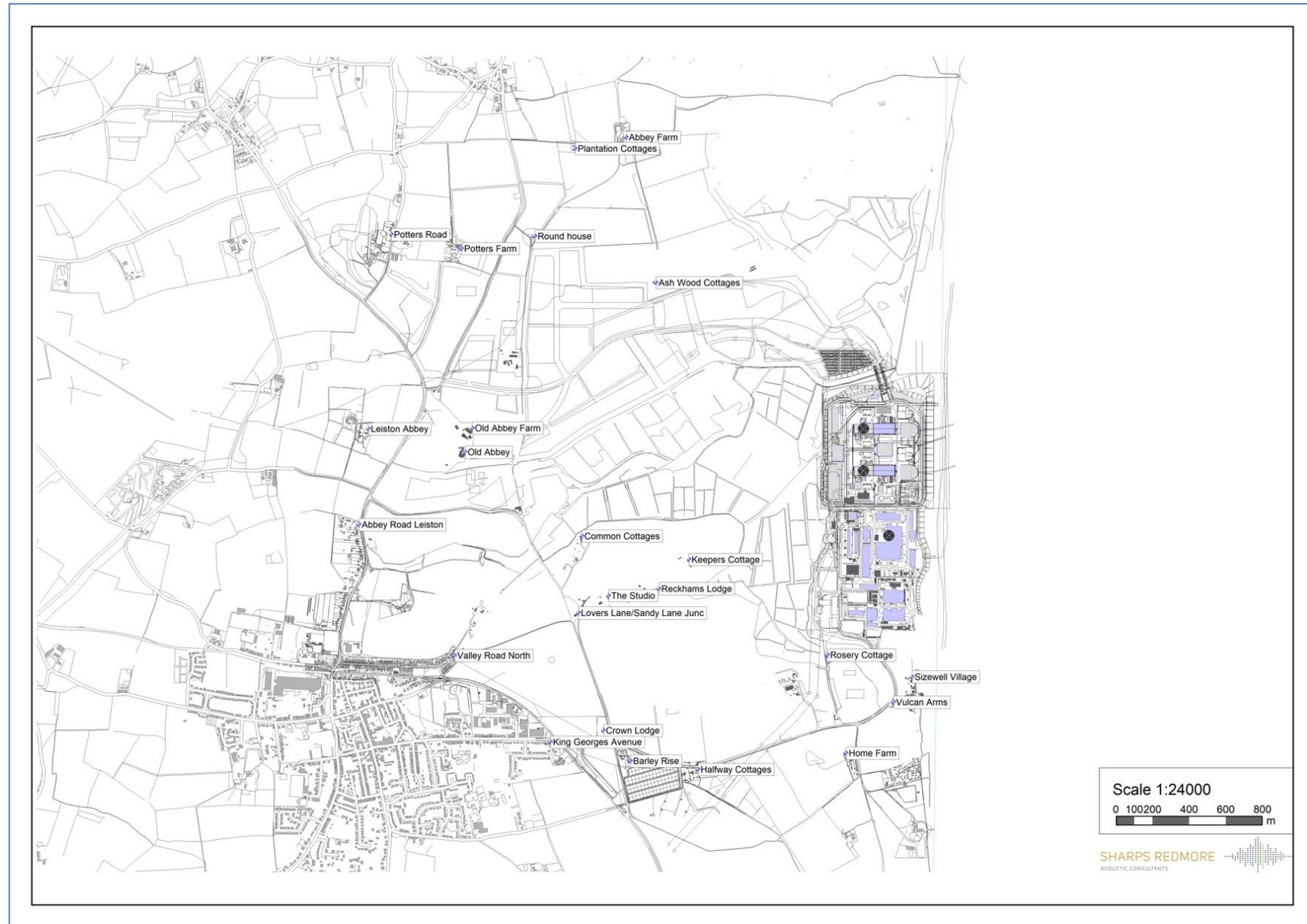


Figure A4a – Proposed main platform and distribution of sound sources as viewed from the SW

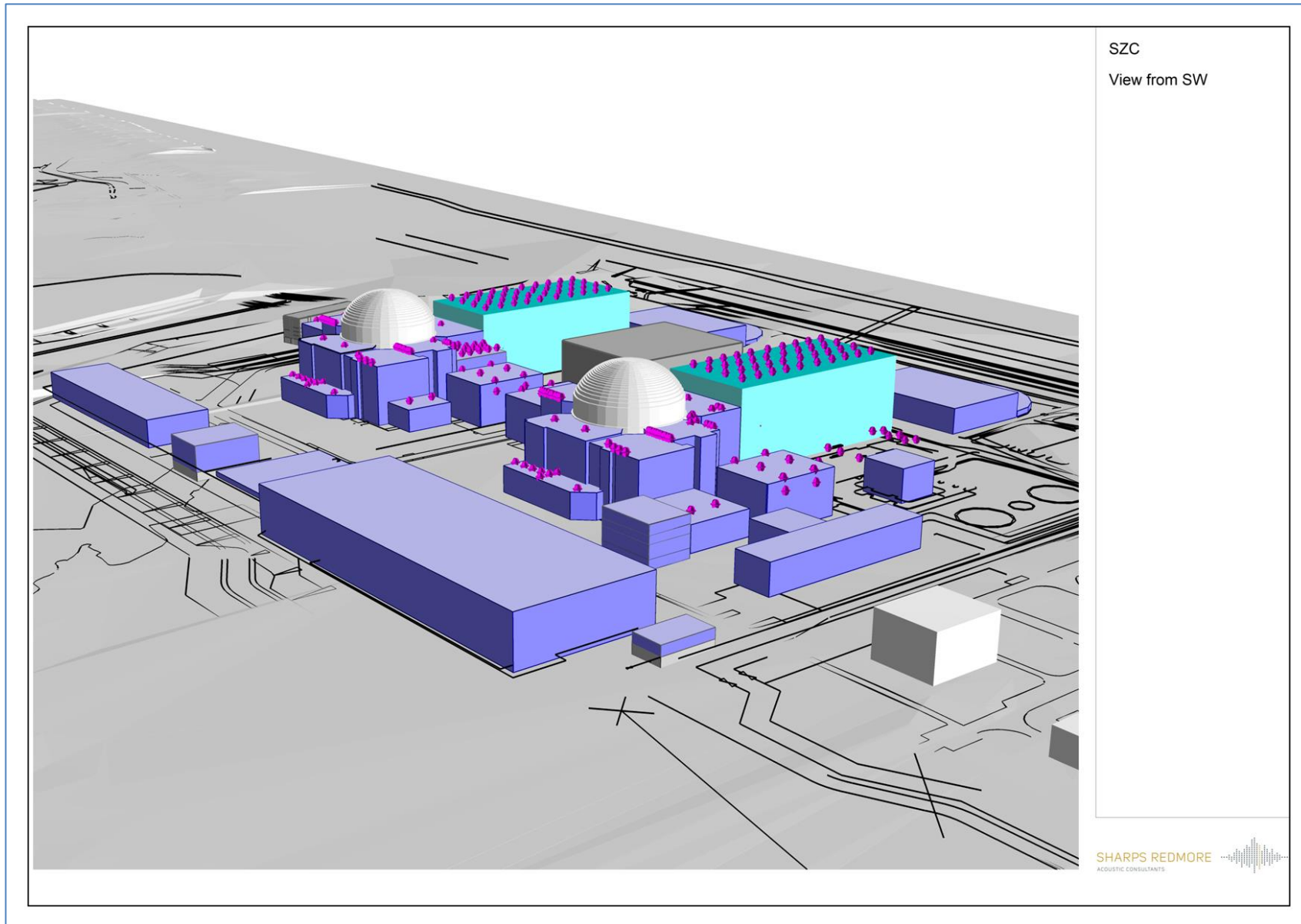


Figure A4b - Proposed main platform and distribution of sound sources as viewed from the North

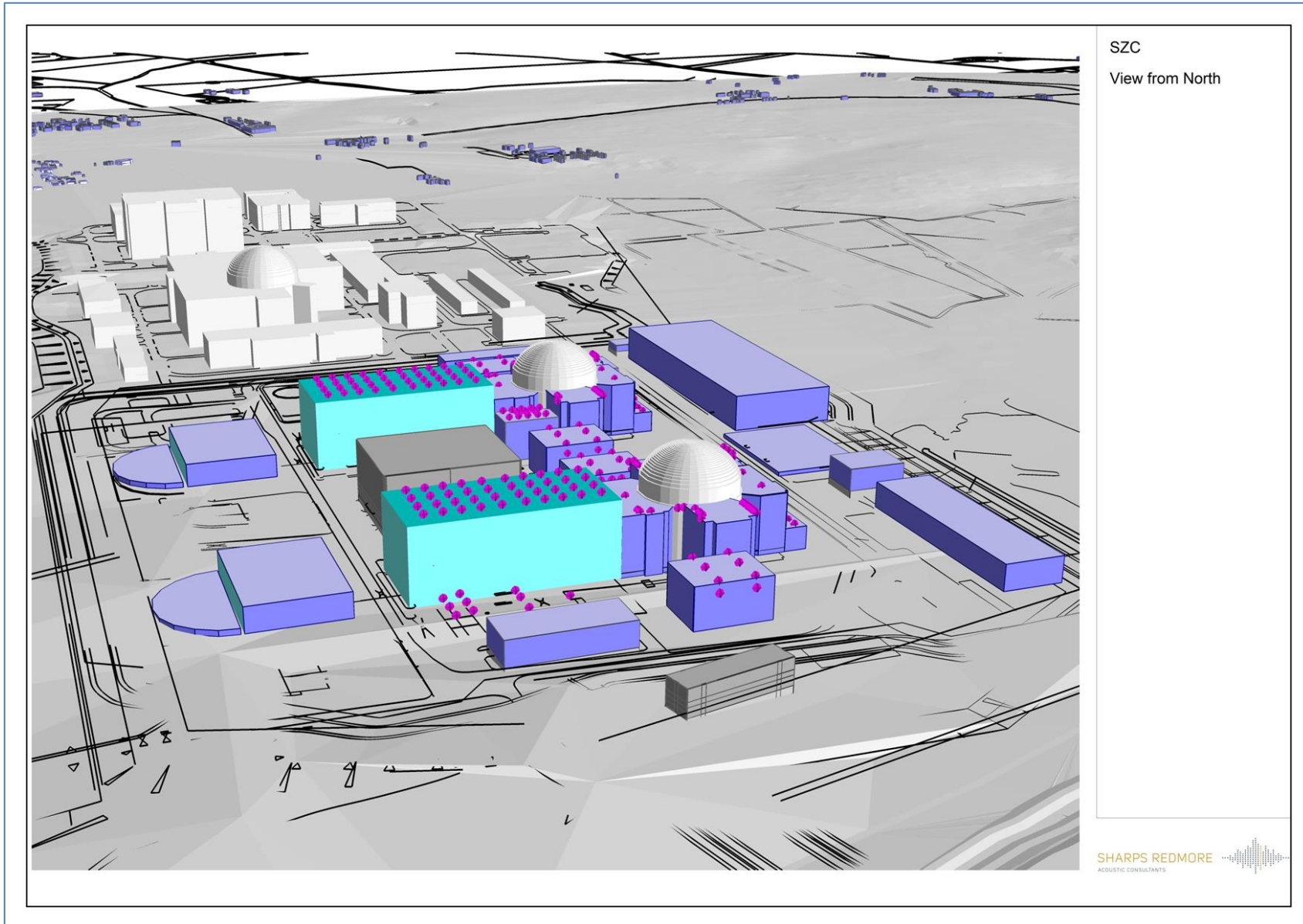


Table A1. Buildings schedule

Building Ref	Description	Building dimensions (m)	Building height (m)
69	Warehouse	47 x 25	14
60	Operational Services Centre	83 x 67	36
15	Emergency Diesel Generator Building	46 x 26	28 (stacks at 39.5)
68	Contaminated Tools Store	70 x 29	4 (fenced compound)
45	Intermediate Level Wastes Interim Storage Building	99 x 36	16
44	Interim Spent Fuel Store	150 x 65	26
2	Fuel Buildings	50 x 22	36 (stack at 70)
3	Fuel Hall Building	63 x 16	13
5	Safeguard Building 1	30 x 30	39
6	Safeguard Building 2 & 3	60 x 25	36
5	Safeguard Building 4	30 x 30	39
21	Turbine Hall	120 x 68	46
7	Nuclear auxiliary Building	39 x 38	35
10	Radioactive Waste Processing Building	39 x 37	15
H11	Radioactive Waste Treatment Building Unit 2	29 x 22	14
1	Reactor Building	57diameter	64
36	Auxiliary boilers	26 x 24	18
13	Hot workshop, hot warehouse, facilities for decontamination	98 x 24	16
8	Access Tower	24 x 37	26
22	Conventional Island Electrical Building	39 x 34	22
28	Cooling Water Pumphouse	82 x 555	18
24	Main transformer platform	36 x 14	12
25	Unit transformer platform	13 x 7	12
H26	Auxiliary transformer platform	13 x 11	12
9	Radioactive Waste Storage Building	35 x 25	16.3
12	Hot Laundry Building	38 x 18	15

14	Effluent Tanks and Refuelling Water Storage Tanks	27 x 66	15
16	Cooling Water Discharge Weir Building 1&2	20 x 10	Negligible screening
4	Boron storage	14 x 7	Negligible screening
-	Batteries load banks	5 x 5	Negligible screening
47	Transit area for very low and low level waste	45 x 20	4 (fenced compound) Negligible screening
-	Secondary Access Control Building	16 x 8	5
52	Auxiliary Admin Buildings	40 x 30 30 x 21	14.4
58	Emergency response energy centre	12 x 25	6
54	Emergency response centre	39 x 26	17
23	Gas insulated switch gear	32 x 13	15 Negligible screening
29	Forebay	82 x 50	-
31	Outfall Pond Building	43 x 27	10.5
32	Filtering debris recovery pit	37 x 18	1.1
50	Main Access Control Building	39 x 35	5
33	Firefighting Water Building	42x 33	8
34	Demineralisation station	38 x 31	10
37	Hydrogen storage	39 x 22	36
38	Oxygen storage	14 x 3	3.3
39	Hydrazine storage	12 x 11	6 Negligible screening
62	Chemical product store	19 x 25	7 Negligible screening
41	Raw and potable water supply & storage	90 x 50	8
79	Chlorination plant	50 x 20	Negligible screening
42	Degassed water storage tanks	5 x 5	Negligible screening
43	Marine outfall shaft		Negligible screening
46	Conventional waste storage	59 x 38	4 (fenced compound)
61	Sky bridge		Negligible screening
66	Garage for handling facilities	36 x 23	7.8
67	Oil & grease storage	38 x 29	9.1

SEO EO (underground)	By-pass separator	30 x 7	Negligible screening
74	Sewage treatment	7 x 2	1.7

Table A2. Operational station sound sources

Building Ref	Description	Noise source	Quantity per building	Sound power level (dB)								Overall LwA (dB)
				63	125	250	500	1k	2k	4k	8k	
21	Turbine Hall	Building façade – south	1	99	99	70	48	40	32	24	20	82
		Building façade – east	1	104	104	75	54	45	38	30	26	88
		Building façade – north	1	98	98	74	65	59	60	49	37	82
		Building façade – west	1	103	103	76	62	56	56	46	34	87
		Building façade – roof	1	106	105	76	55	46	38	30	26	89
		Vent opening	2	102	102	96	91	88	85	81	77	97
		Roof vents	40	78	72	78	68	67	69	61	56	75
5	Safeguard building 1	Intake ventilation opening	2	84	84	88	83	80	79	61	49	86
		Refrigeration plant	9	84	86	87	95	89	88	83	75	95
		Exhaust ventilation opening	1	94	83	92	93	92	86	76	62	95
		Steam piping	4				86					83
6	Safeguard building 2 & 3	Intake ventilation opening	1	95	84	93	94	93	87	77	63	91
		Exhaust ventilation opening	1	95	93	94	89	86	80	73	64	96
		Steam piping	4				86					83
5	Safeguard building 4	Intake ventilation opening	1	84	84	88	83	80	81	63	50	86
		Exhaust ventilation opening	1	84	86	87	95	89	88	83	75	95
		Steam piping	4				86					83
7	Nuclear Aux Bld	Ventilation opening	1	78	77	82	77	74	73	55	43	80
		Chimney stack (breakout)	1	94	89	91	92	77	75	75	66	92
		Chimney stack (outlet)	1	108	104	105	103	100	95	87	65	105
10	Radioactive waste	Compressors – roof mounted	2	85	88	93	96	97	96	94	89	101
22	Electrical building	Refrigeration – roof mounted	2	88	88	86	89	87	85	83	73	92
		Condensers CR71K	8	88	85	78	73	70	68	69	71	78
		Condensers CR90K	6	89	87	80	75	72	70	71	73	80
28	Pumping station	Breakout from building	1	87	89	81	89	76	68	60	50	90
24	Main transformer	Transformer	3	85	105	111	97	81	72	68	68	102
		Ventilation plant	3	96	94	96	92	85	82	76	64	93
25	Step down transformer	Transformer	2	77	91	101	91	86	64	55	56	96
		Ventilation plant	2	93	91	89	87	83	78	69	62	88
H26	Aux transformer	Transformer	1	77	91	101	91	86	64	55	56	96
		Ventilation plant	1	93	81	89	87	83	78	69	62	88

Table A3a. Back-up generator building sound source levels

Building		Sound sources	Sound Power Level dB L _{WA}
Emergency Diesel Generator Building	HDA & HDB (Reactor 1)	Fresh air in/warm air out louvre (high-level)	89 per opening
		Generator fresh air intake (mid-level)	105 per opening
		Generator exhaust stack	105 per opening
	HDA & HDB (Reactor 2)	Fresh air in/warm air out louvre (high-level)	89 per opening
		Generator fresh air intake (mid-level)	105 per opening
		Generator exhaust stack	105 per opening

Table A3b. Octave band (centre frequency) sound power data for sources in Table A3a

Source Frequency, Hz	Octave Band (centre frequency, Hz) Sound Power Level, dBlin L _w		
	Fresh air in/warm air out louvre (high- level)	Generator fresh air intake (mid-level)	Generator exhaust stack
31.5	90.8	92.8	92.8
63	87.1	104.5	104.5
125	86.9	100.6	100.6
250	91.4	108.2	108.2
500	86.3	103.6	103.6
1000	83.4	99.3	99.3
2000	82.4	94.2	94.2
4000	64.4	87.2	87.2
8000	52.1	80.2	80.2
dBA	89.3	105.2	105.2
dBlin	96.4	111.5	111.5