



# **East Anglia ONE North Offshore Windfarm**

## **Appendix 25.5** Operational Phase Assessment

### **Environmental Statement Volume 3**

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## Glossary of Acronyms

|      |                                      |
|------|--------------------------------------|
| AAWT | Annual Average Weekday Traffic       |
| ATC  | Automatic Traffic Count              |
| BS   | British Standard                     |
| CoCP | Code of Construction Practice        |
| DfT  | Department for Transport             |
| ETG  | Expert Topic Group                   |
| eVDV | Estimated Vibration Dose Value       |
| HVAC | High Voltage Alternating Current     |
| HVDC | High Voltage Direct Current          |
| ISO  | International Standards Organisation |

## Glossary of Terminology

|   |   |
|---|---|
| Applicant   | East Anglia ONE North Limited.  |
| Cable sealing end compound                        | A compound which allows the safe transition of cables between the overhead lines and underground cables which connect to the National Grid substation.  |
| Cable sealing end (with circuit breaker) compound | A compound (which includes a circuit breaker) which allows the safe transition of cables between the overhead lines and underground cables which connect to the National Grid substation.   |
| Construction consolidation sites                  | Compounds associated with the onshore works which may include elements such as hard standings, lay down and storage areas for construction materials and equipment, areas for vehicular parking, welfare facilities, wheel washing facilities, workshop facilities and temporary fencing or other means of enclosure.   |
| dB(A)   | Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise level in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A). |
| dB(Z) (or previously L <sub>leq</sub> )           | Decibels measured on a sound level meter incorporating a flat frequency weighting (Z weighting) across the frequency range.   |
| Decibel (dB)                                      | A unit of noise level derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure level the reference quantity is 20 µPa, the threshold of normal hearing is 0dB, and 140dB is the threshold of pain. A change of 1dB is only perceptible under controlled conditions. Under normal conditions a change in noise level of 3dB(A) is the smallest perceptible change.   |
| Development area                                  | The area comprising the onshore development area and the offshore development area (described as the 'order limits' within the Development Consent Order).  |
| East Anglia ONE North project                     | The proposed project consisting of up to 67 wind turbines, up to four offshore electrical platforms, up to one offshore operation and maintenance platform, inter-array cables, platform link cables, up to one operational meteorological mast, up to two offshore export cables, fibre optic cables, landfall infrastructure, onshore cables and ducts, onshore substation, and National Grid infrastructure.   |
| East Anglia ONE North windfarm site               | The offshore area within which wind turbines and offshore platforms will be located.  |
| National electricity grid                         | The high voltage electricity transmission network in England and Wales owned and maintained by National Grid Electricity Transmission   |

|  |  |
|--|--|
| European site                                      | Sites designated for nature conservation under the Habitats Directive and Birds Directive, as defined in regulation 8 of the Conservation of Habitats and Species Regulations 2017 and regulation 18 of the Conservation of Offshore Marine Habitats and Species Regulations 2017. These include candidate Special Areas of Conservation, Sites of Community Importance, Special Areas of Conservation and Special Protection Areas. |
| Horizontal directional drilling (HDD)              | A method of cable installation where the cable is drilled beneath a feature without the need for trenching.  |
| HDD temporary working area                         | Temporary compounds which will contain laydown, storage and work areas for HDD drilling works.   |
| Jointing bay                                       | Underground structures constructed at intervals along the onshore cable route to join sections of cable and facilitate installation of the cables into the buried ducts.   |
| L <sub>A10, T</sub>                                | The A weighted noise level exceeded for 10% of the specified measurement period (T). L <sub>A10</sub> is the index generally adopted to assess traffic noise.  |
| L <sub>A90, T</sub>                                | The A weighted noise level exceeded for 90% of the specified measurement period (T). In BS 4142:2014+A1:2019 it is used to define the 'background' noise level.  |
| L <sub>Aeq, T</sub>                                | The equivalent continuous sound level – the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T). L <sub>Aeq,T</sub> is used to describe many types of noise and can be measured directly with an integrating sound level meter.   |
| L <sub>Amax</sub>                                  | The maximum A-weighted sound pressure level recorded during a measurement.   |
| Landfall   | The area (from Mean Low Water Springs) where the offshore export cables would make contact with land and connect to the onshore cables.  |
| Link boxes   | Underground chambers within the onshore cable route housing electrical earthing links.   |
| Mitigation areas                                   | Areas captured within the onshore development area specifically for mitigating expected or anticipated impacts.  |
| National Grid infrastructure                       | A National Grid substation, cable sealing end compounds, cable sealing end (with circuit breaker) compound, underground cabling and National Grid overhead line realignment works to facilitate connection to the national electricity grid, all of which will be consented as part of the proposed East Anglia ONE North project Development Consent Order but will be National Grid owned assets.                                  |
| National Grid overhead line realignment works      | Works required to upgrade the existing electricity pylons and overhead lines (including cable sealing end compounds and cable sealing end (with circuit breaker) compound) to transport electricity from the National Grid substation to the national electricity grid.  |
| National Grid overhead line realignment works area | The proposed area for National Grid overhead line realignment works.   |
| National Grid substation                           | The substation (including all of the electrical equipment within it) necessary to connect the electricity generated by the proposed East Anglia ONE North project to the national electricity grid which will be owned by National Grid but is being consented as part of the proposed East Anglia ONE North project Development Consent Order.  |

|                                   |  |
|-----------------------------------|--|
| National Grid substation location | The proposed location of the National Grid substation.   |
| Natura 2000 site                  | A site forming part of the network of sites made up of Special Areas of Conservation and Special Protection Areas designated respectively under the Habitats Directive and Birds Directive.  |
| Onshore cable corridor            | The corridor within which the onshore cable route will be located.   |
| Onshore cable route               | This is the construction swathe within the onshore cable corridor which would contain onshore cables as well as temporary ground required for construction which includes cable trenches, haul road and spoil storage areas.   |
| Onshore cables                    | The cables which would bring electricity from landfall to the onshore substation. The onshore cable is comprised of up to six power cables (which may be laid directly within a trench, or laid in cable ducts or protective covers), up to two fibre optic cables and up to two distributed temperature sensing cables.                             |
| Onshore development area          | The area in which the landfall, onshore cable corridor, onshore substation, landscaping and ecological mitigation areas, temporary construction facilities (such as access roads and construction consolidation sites), and the National Grid Infrastructure will be located (described as the 'order limits' within the Development Consent Order). |
| Onshore infrastructure            | The combined name for all of the onshore infrastructure associated with the proposed East Anglia ONE North project from landfall to the connection to the national electricity grid.   |
| Onshore preparation works         | Activities to be undertaken prior to formal commencement of onshore construction such as pre-planting of landscaping works, archaeological investigations, environmental and engineering surveys, diversion and laying of services, and highway alterations.   |
| Onshore substation                | The East Anglia ONE North substation and all of the electrical equipment within the onshore substation and connecting to the National Grid infrastructure.   |
| Onshore substation location       | The proposed location of the onshore substation for the proposed East Anglia ONE North project.  |
| Transition bay                    | Underground structures at the landfall that house the joints between the offshore export cables and the onshore cables.  |

## 25.5 Operational Phase Assessment

### 25.1 Introduction

1. This appendix details the approach taken to the proposed East Anglia ONE North project operational noise impact assessment modelling.
2. **Chapter 25 Noise and Vibration** details the methodology, assessment criteria and assumptions relevant to the assessment of the operational phase noise impacts.
3. **Appendix 25.4** details the differences in construction noise impacts in relation to three construction scenarios. Operational phase impacts however, have been assessed as follows:
  - Operation of the proposed East Anglia ONE North project (project alone) substation; and
  - Operation of the proposed East Anglia ONE North project and proposed East Anglia TWO project substations.
4. **Section 25.7** of **Chapter 25 Noise and Vibration** provides more detail concerning the proposed East Anglia ONE North project.
5. As described in **Chapter 5 EIA Methodology**, there are two co-located onshore substation locations for either the proposed East Anglia ONE North project or the proposed East Anglia TWO project. It should be noted that the draft DCOs for both the proposed East Anglia ONE North and East Anglia TWO projects have the flexibility for either project to use either onshore substation location.
6. In this appendix and in **Chapter 25 Noise and Vibration**, the assessment is based on the intended development strategy of the proposed East Anglia ONE North project using the western onshore substation location and the proposed East Anglia TWO onshore substation using the western onshore substation location. However, **section 25.7** of this appendix is provided in order to present the impacts in the eventuality that the onshore substation for the proposed East Anglia ONE North project used the alternative onshore substation location, as allowed for in the draft DCO.

### 25.2 Operational Phase Noise Modelling Approach

7. The operational phase was modelled using SoundPLAN noise modelling software. This package directly implements the calculation methods outlined in

ISO9613-2 (International Organization for Standardization 1996) and other nationally and internationally recognised acoustic standards.

### 25.3 Operational Phase Receptors

8. A total of 35 sensitive receptor locations were agreed as part of consultation at the Expert Topic Group (ETG) meetings held for the proposed East Anglia ONE North and proposed East Anglia TWO projects. Of the 35 agreed receptors, 12 representative locations were determined (through consultation with the ETG meetings) as relevant within the onshore substation and National Grid infrastructure study area.
9. The 12 receptor locations within the onshore substation and National Grid infrastructure study area are detailed within **Table A25.5.1**.
10. Of these 12 receptors, nine of these were surveyed due to access constraints.

**Table A25.5.1 Receptor Locations – Onshore Substation and National Grid Infrastructure Study Area**

| Receptor identifier | Parish/ location   | X      | Y      | Nearest postcode | Measurements Taken |
|---------------------|--|--------|--------|------------------|--------------------|
| SSR1                | Grove Rd, Saxmundham IP17 1TN, UK                          | 641720 | 261614 | IP17 1TN         | Yes                |
| SSR2                | New Haven, Friston Rd, Saxmundham IP17 1TL, UK             | 641841 | 261176 | IP17 1TL         | Yes                |
| SSR3                | Unnamed Road, Saxmundham IP17, UK                          | 641231 | 261673 | IP17 1XA         | Yes                |
| SSR4                | Saxmundham Rd, Saxmundham IP17 1NJ, UK                     | 640930 | 260737 | IP17 1NJ         | No Access          |
| SSR5                | Saxmundham Rd, Saxmundham IP17, UK                         | 641157 | 260802 | IP17 1PU         | Yes                |
| SSR5 NEW*           | Woodside Farm, Saxmundham Road, Saxmundham IP17, UK        | 641220 | 260648 | IP17 1PU         | Yes                |
| SSR6                | 3 Church Rd, Friston, Church Path, Saxmundham IP17 1PX, UK | 641413 | 260559 | IP17 1PX         | No Access          |
| SSR7                | School Rd, Saxmundham IP17 1TN, UK                         | 641808 | 261655 | IP17 1TN         | Yes                |
| SSR8                | Saxmundham Rd, Saxmundham IP17 1NH, UK                     | 640338 | 260994 | IP17 1NH         | No Access          |
| SSR9                | Fristonmoor Ln, Saxmundham IP17, UK                        | 640980 | 261693 | IP17 1XD         | Yes                |
| SSR10               | 1 Friston Hall Cottages, Friston, Saxmundham IP17 1NQ, UK  | 639927 | 260384 | IP17 1NQ         | Yes                |

| Receptor identifier | Parish/ location   | X      | Y      | Nearest postcode | Measurements Taken |
|---------------------|--|--------|--------|------------------|--------------------|
| SSR11               | 77 Friston Hall Cottages, Friston, Saxmundham IP17 1NL, UK | 640518 | 260309 | IP17 1NL         | Yes                |
| SSR12               | Unnamed Road, Saxmundham IP17 1NF, UK                      | 640377 | 261580 | IP17 1NF         | Yes                |

\*SSR5 and SSR5 NEW represent different buildings at the same receptor location. SSR5 NEW represents the closest residential dwelling at the receptor location, SSR5 an uninhabited agricultural barn building.

- The sections below present a detailed assessment of the modelling results at SSR2 and SSR5 NEW<sup>1</sup> because SSR2 is the receptor in closest proximity to the proposed East Anglia TWO project onshore substation and SSR5 NEW is the receptor in closest proximity to the proposed East Anglia ONE North onshore substation. A further summary of the operational noise at all receptors is provided in **Chapter 25 Noise and Vibration**.

#### 25.4 Indicative Onshore Substation Layout

- Plate A25.5.1** shows the proposed indicative layout of the onshore substation infrastructure for the proposed East Anglia ONE North project and proposed East Anglia TWO project.

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<sup>1</sup> SSR5 NEW is used for the operational assessment as it represents the location of the residential dwelling at this receptor location.

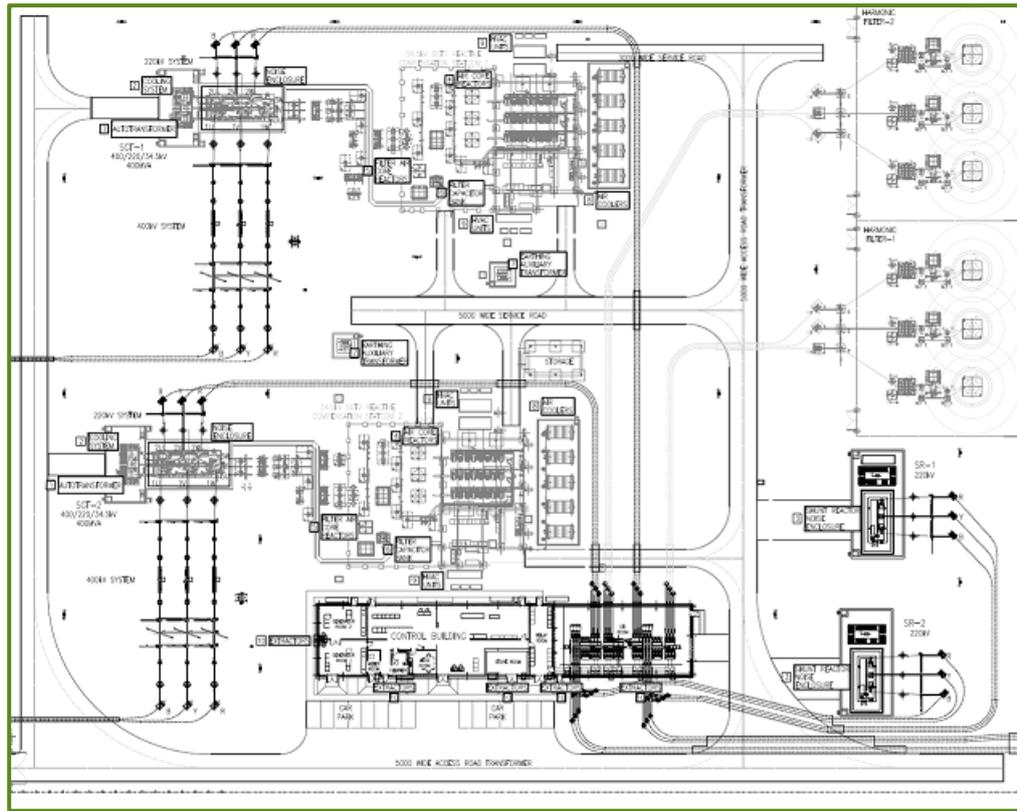


Plate A25.5.1 Indicative Onshore Substation Layout – HVAC

### 25.5BS4142:2014+A1:2019 Rating Levels East Anglia ONE North Project Alone

13. **Table A25.5.2** shows the derivation of the Rating level at SSR2 based on the proposed indicative layout of the onshore substation infrastructure for the proposed East Anglia ONE North project following the BS4142:2014+A1:2019 guidance format with reference to relevant clauses in the guidance provided.

Table A25.5.2 Rating Level at SSR2 – East Anglia ONE North Onshore Substation

| Results                      | Relevant Clause of BS4142          | Commentary for East Anglia ONE North onshore substation  |
|------------------------------|------------------------------------|--|
| Measured ambient sound level | $L_{Aeq,(15mins)} = 43dB$<br>7.3.2 | Measured in absence of proposed sound source. Site is not operational and will introduce new sound sources to the locale. Average figure obtained from all night time (8hr) survey periods. Considered representative as the proposed sound sources will operate 24hrs, 7 days per week during normal conditions. Rounded up from 42.9dBA. |
| Residual sound level         | $L_{Aeq,(15mins)} = 43dB$<br>7.3.3 | Specific sound not active to determine the correction to be made to the measured ambient sound level.  |

| Results  | Relevant Clause of BS4142  | Commentary for East Anglia ONE North onshore substation   |
|--|----------------------------|---|
|  |                            | Measured ambient sound level and residual sound are equivalent.   |
| Background sound level (night)   | $L_{A90(5mins)} = 31.5dB$  | 8.2<br>The background sound level was measured during a baseline survey in June to July 2018, without the presence of the specific sound. Considered representative of future normal operating periods and conditions. Statistical analysis undertaken to obtain a representative sound level.  |
| On time correction   | 0dB                        | 7.3.15<br>Proposed sound sources will operate 24hrs, 7 days per week during normal conditions.  |
| Assessment made during the night time so reference time interval is 15 minutes |                            | 7.2<br>All sound sources modelled as being operational for 100% on-time over the reference time period.   |
| No correction to specific sound level  | $L_{Aeq(15mins)} = 23.7dB$ | Specific sound level is taken from noise modelling of the proposed onshore infrastructure. Sound levels provided by the project engineering team.<br><br>Sound propagation calculated in accordance with ISO 9613 from source to receiver.  |
| Acoustic character correction tonality   | 0dB                        | 9.2<br>No acoustic features present.<br><br>Tonality screening assessed using a derivative of the Objective Method described in Annex C of BS4142.<br><br>All fixed plant assessed using the method based on source levels detailed in the <b>Chapter 25 Noise and Vibration (Table 25.32)</b> .<br><br>Further assessment undertaken of the predicted noise levels at the receptor using a derivative of the Objective Method.<br><br>No tonality identified based on the current available information. |
| Acoustic feature correction intermittency                                      | 0dB                        | 9.2<br>The process will typically run for the full 24hrs each day, with no expected stops/starts to the fixed plant. No intermittency. Where there may be air cooling fans stop/start, this is not considered to be distinctively audible at the receptor, above baseline sound characteristics due to masking effects.   |
| Acoustic feature correction impulsivity  | 0dB                        | 9.2<br>The process will typically run for the full 24hrs each day, with no expected stops/starts to the fixed plant. There are no items of fixed plant with impulsive characteristics under typical operating conditions.   |

| Results  |                                  | Relevant Clause of BS4142 | Commentary for East Anglia ONE North onshore substation  |
|--|----------------------------------|---------------------------|--|
| Acoustic feature correction other  | 0dB                              | 9.2                       | No other sound characteristics.  |
| Rating level   | 23.7dB                           |                           | No penalties to be added. This is the predicted rating noise level at SSR2 during operation of East Anglia ONE North onshore substation  |
| Background sound level   | L <sub>A90(5 min)</sub> = 31.5dB |                           | Representative background noise level used in assessment   |
| Excess of rating over background sound level   | 23.7 – 31.5 = -7.8dB             | 11                        | -7.8dB below is the unmitigated difference between the background sound level and the modelled rating level during operation.  |
| <p>The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.</p> |                                  | 11                        | <p>The rating level is lower than the measured background sound level and the requirement of the draft DCO will stipulate an operational rating noise limit in accordance with BS4142:2014+A1:2019 of 34dBA at the nearest sensitive receptors.</p> <p>The draft DCO requirement is derived from using the statistically repeatable L<sub>A90</sub>, measured during a baseline survey at SSR2.</p> <p>The 2018 World Health Organization guidance establishes a 45dB L<sub>Aeq</sub> external noise level as desirable. The windows, and any purge ventilation (i.e. trickle ventilators) are normally the weakest part of a brick and block façade and building envelope. BS8233:2014 states that “If partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15 dB”.</p> <p>In terms of NPPG and NPSE guidance an outside night time noise level of 45dB L<sub>Aeq</sub>, is defined as the LOAEL. This is determined on the basis that a partially open window will attenuate the outside noise level by 15dBA, thus achieving the recommended night time resting criteria (30dBA) stated for habitable rooms.</p> <p>The draft DCO requirement proposes the use of an external rating level (including any character penalties) in accordance with BS4142:2014+A1:2019 of 34dB L<sub>Aeq,5mins</sub>. The purpose of the requirement is such that should any predicted noise levels at the identified and agreed receptors exceed the 34dBA limit, the operator is required to provide commensurate mitigation to ensure this rating level is achieved.</p> <p>The proposed draft DCO requirement of 34dBA L<sub>Aeq,5mins</sub> is considered appropriate as it is considerably below the external recommendation of 45dBA L<sub>Aeq</sub> detailed in BS8233:2014, in order to achieve a night time internal</p> |

| Results                       |  | Relevant Clause of BS4142 | Commentary for East Anglia ONE North onshore substation   |
|-------------------------------|--|---------------------------|---|
|                               |  |                           | level of 30dBA, even when relying on openable windows as a means of rapid ventilation.  |
| Uncertainty of the assessment |  | 10                        | <p>The measurements were taken under repeatable conditions and the uncertainty in the result will be low.</p> <p>Noise modelling inputs were based on all fixed plant operating at 100% on-time.</p> <p>Sound levels for the fixed plant were provided by the project engineering team based on previous experience of similar sized schemes, using currently available technology.</p> |

14. **Plate A25.5.2** shows the predicted noise levels at the façade of the nearest sensitive receptors (NSRs) from the proposed East Anglia ONE North onshore substation infrastructure.

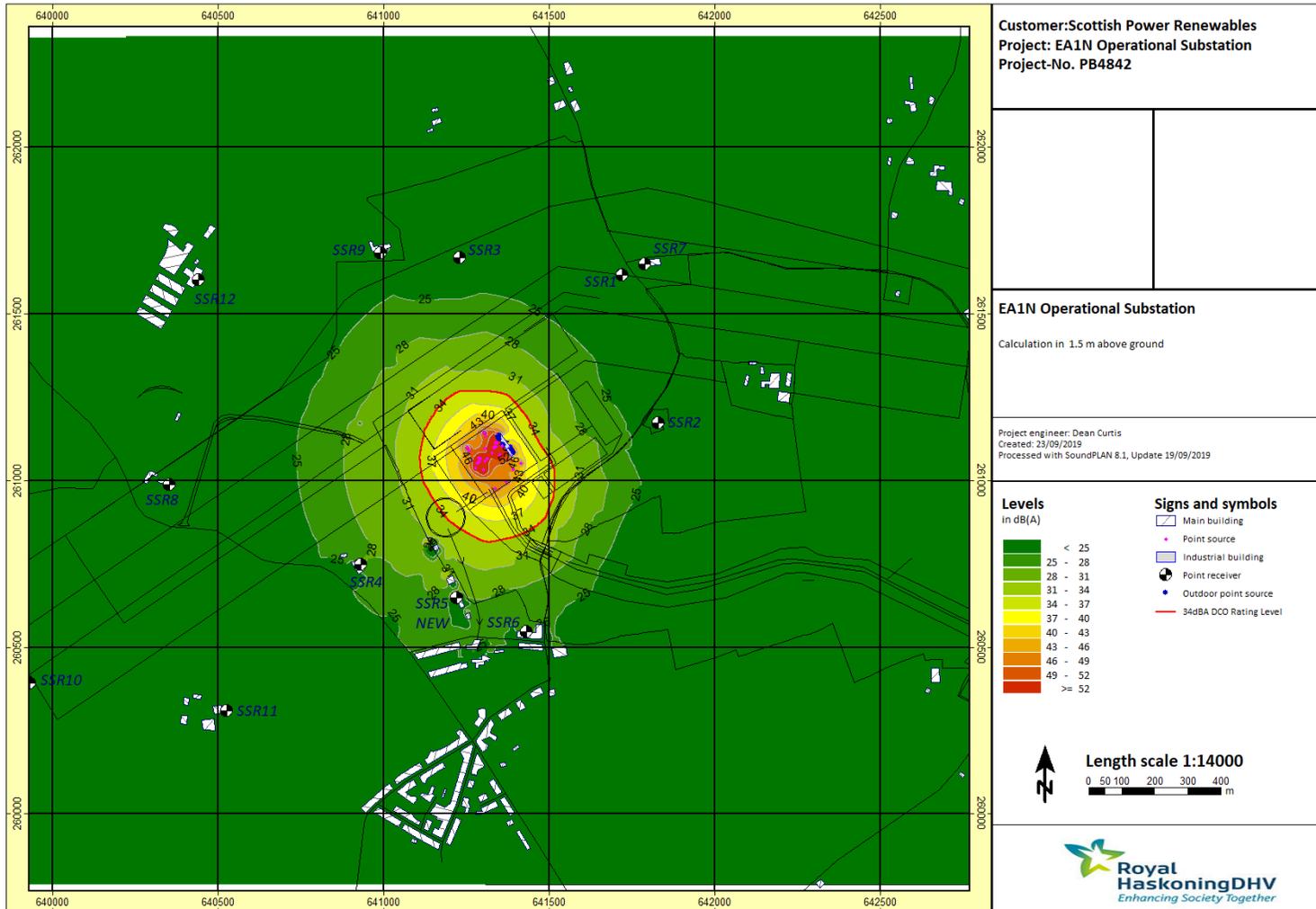


Plate A25.5.2 Predicted Noise Levels East Anglia ONE North

15. **Table A25.5.3** shows the derivation of the Rating level at SSR5 NEW based on the proposed indicative layout of the onshore substation infrastructure for the proposed East Anglia ONE North project following the BS4142:2014+A1:2019 guidance format with reference to relevant clauses in the guidance provided.

**Table A25.5.3 Rating Level at SSR5 NEW – East Anglia ONE North Onshore Substation**

| Results  |                            | Relevant Clause of BS4142 | Commentary for East Anglia ONE North onshore substation   |
|--|----------------------------|---------------------------|---|
| Measured ambient sound level   | $L_{Aeq,(15mins)} = 37dB$  | 7.3.2                     | Measured in absence of proposed sound source. Site is not operational and will introduce new sound sources to the locale. Average figure obtained from all night time (8hr) survey periods. Considered representative as the proposed sound sources will operate 24hrs, 7 days per week during normal conditions. |
| Residual sound level   | $L_{Aeq(15mins)} = 37dB$   | 7.3.3                     | Specific sound not active to determine the correction to be made to the measured ambient sound level.<br><br>Measured ambient sound level and residual sound are equivalent.  |
| Background sound level (night)   | $L_{A90(5mins)} = 29dB$    | 8.2                       | The background sound level was measured during a baseline survey in June to July 2018, without the presence of the specific sound. Considered representative of future normal operating periods and conditions. Statistical analysis undertaken to obtain a representative sound level.                           |
| On time correction   | 0dB                        | 7.3.15                    | Proposed sound sources will operate 24hrs, 7 days per week during normal conditions.  |
| Assessment made during the night time so reference time interval is 15 minutes |                            | 7.2                       | All sound sources modelled as being operational for 100% on-time over the reference time period.  |
| No correction to specific sound level  | $L_{Aeq(15mins)} = 29.4dB$ |                           | Specific sound level is taken from noise modelling of the proposed onshore infrastructure. Sound levels provided by the project engineering team.<br><br>Sound propagation calculated in accordance with ISO 9613 from source to receiver.  |
| Acoustic character correction tonality   | 0dB                        | 9.2                       | No acoustic features present.<br><br>Tonality screening assessed using a derivative of the Objective Method described in Annex C of BS4142.<br><br>All fixed plant assessed using the method based on source levels detailed in <b>Chapter 25 Noise and Vibration (Table 25.32)</b> .                             |

| Results   | Relevant Clause of BS4142      | Commentary for East Anglia ONE North onshore substation   |  |
|---|--------------------------------|---|--|
|   |                                | Further assessment undertaken of the predicted noise levels at the receptor using a derivative of the Objective Method.<br><br>No tonality identified based on the current available information. |  |
| Acoustic feature correction intermittency   | 0dB                            | 9.2   | The process will typically run for the full 24hrs each day, with no expected stops/starts to the fixed plant. No intermittency.  |
| Acoustic feature correction impulsivity   | 0dB                            | 9.2   | The process will typically run for the full 24hrs each day, with no expected stops/starts to the fixed plant. There are no items of fixed plant with impulsive characteristics under typical operating conditions. Where there may be air cooling fans stop/start, this is not considered to be distinctively audible at the receptor, above baseline sound characteristics due to masking effects.  |
| Acoustic feature correction other   | 0dB                            | 9.2   | No other sound characteristics.  |
| Rating level  | 29.4dB                         |   | No penalties to be added. This is the predicted noise level at SSR5 NEW during operation of East Anglia ONE North onshore substation   |
| Background sound level  | L <sub>A90(5 min)</sub> = 29dB |   | Representative background noise level used in assessment   |
| Excess of rating over background sound level  | 29.4 – 29 = +0.4dB             | 11  | +0.4dB is the unmitigated difference between the background sound level and the modelled rating level during operation.  |
| The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact.<br><br>The assessment indicates a potential for an adverse impact, depending on the context. |                                | 11  | Although the excess of rating over the measured background sound level is +0.4dBA, the requirement of the draft DCO will stipulate an operational rating noise limit (in accordance with BS4142:2014+A1:2019 of 34dBA at the nearest sensitive receptors.<br><br>This operational noise limit is derived from using the statistically repeatable L <sub>A90</sub> , measured during a baseline survey at SSR5.<br><br>As SSR5 NEW is the closest receptor, by stipulating an operational rating noise limit (in accordance with BS4142:2014+A1:2019) of 34dBA at SSR5 NEW, other noise sensitive receptors would experience lower predicted levels due to their increased separation distance from the specific sound source (onshore substation). Therefore, this is considered a conservative assessment approach. |

| Results | Relevant Clause of BS4142 | Commentary for East Anglia ONE North onshore substation   |
|---------|---------------------------|---|
|         |                           | <p>The allowance for up to +5dBA above the background level was derived from consideration of the context of the existing environment and the proposed onshore infrastructure in accordance with BS4142.</p> <p>Consideration also needs to be given to the cumulative sound level outside in free-field conditions at the closest façade or amenity space of the receptor.</p> <p>The difference between the operational rating noise limit (including character penalties) in accordance with BS4142:2014+A1:2019 of 34 dBA to the prevailing ambient/residual sound level of 37dBA is around 3dBA.</p> <p>Adding the specific sound source <math>L_{Aeq,15mins}</math> to the existing ambient sound level <math>L_{Aeq,15mins}</math> increases the cumulative (Absolute) sound level by &lt;1.0dBA. A sound level difference of 3dBA is the minimum perceptible change in environmental noise.</p> <p>Furthermore, although the plant noise may be considered as somewhat different in character to the existing acoustic environment (rural) the operational noise rating limit rating limit (including character penalties) in accordance with BS4142:2014+A1:2019 of 34dBA (post mitigation and compliance with the requirement of the draft DCO) is low and will have little impact on residents using their amenity space during the night time (most sensitive period).</p> <p>The 2018 World Health Organization guidance establishes a 45dB <math>L_{Aeq}</math> external noise level as desirable. The windows, and any purge ventilation (i.e. trickle ventilators) are normally the weakest part of a brick and block façade and building envelope. BS8233:2014 states that “If partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15 dB”.</p> <p>In terms of NPPG and NPSE guidance an outside night time noise level of 45dB <math>L_{Aeq}</math>, is defined as the LOAEL. This is determined on the basis that a partially open window will attenuate the outside noise level by 15dBA, thus achieving the recommended night time resting criteria (30dBA) stated for habitable rooms.</p> <p>The draft DCO requirement proposes the use of an external rating level in accordance with BS4142:2014+A1:2019 of 34dB <math>L_{Aeq,5mins}</math>. The purpose of the condition is such that should any predicted noise levels at the identified and agreed receptors exceed the 34dBA limit, the operator is required to provide commensurate mitigation to ensure this rating level is achieved.</p> <p>The proposed draft DCO requirement of 34dBA <math>L_{Aeq,5mins}</math> is considered appropriate as it is considerably below the external recommendation of 45dBA <math>L_{Aeq}</math> detailed in</p> |

| Results                       |  | Relevant Clause of BS4142 | Commentary for East Anglia ONE North onshore substation  |
|-------------------------------|--|---------------------------|--|
|                               |  |                           | BS8233:2014, in order to achieve a night time internal level of 30dBA, even when relying on openable windows as a means of rapid ventilation.  |
| Uncertainty of the assessment |  | 10                        | The measurements were taken under repeatable conditions and the uncertainty in the result will be low.<br><br>Noise modelling inputs were based on all fixed plant operating at 100% on-time.<br><br>Sound levels for the fixed plant were provided by the project engineering team based on previous experience of similar sized schemes, using currently available technology. |

## 25.6 BS4142:2014+A1:2019 Rating Levels Cumulative with East Anglia TWO

16. **Table A25.5.4** shows the derivation of the cumulative Rating level at SSR2 based on the proposed indicative layout of the onshore substation infrastructure for the proposed East Anglia ONE North and East Anglia TWO projects following the BS4142:2014+A1:2019 guidance format with reference to relevant clauses in the guidance provided.

**Table A25.5.4 Rating Level at SSR2 – East Anglia ONE North and East Anglia TWO**

| Results                        |                           | Relevant Clause in BS4142 | Commentary for East Anglia TWO and East Anglia ONE North onshore substations   |
|--------------------------------|---------------------------|---------------------------|--|
| Measured ambient sound level   | $L_{Aeq,(15mins)} = 43dB$ | 7.3.2                     | Measured in absence of proposed sound source. Site is not operational and will introduce new sound sources to the locale. Average figure obtained from all night time (8hr) survey periods. Considered representative as the proposed sound sources will operate 24hrs, 7 days per week during normal conditions. Rounded up from 42.9dBA. |
| Residual sound level           | $L_{Aeq,(15mins)} = 43dB$ | 7.3.3                     | Specific sound not active to determine the correction to be made to the measured ambient sound level.<br><br>Measured ambient sound level and residual sound are equivalent.   |
| Background sound level (night) | $L_{A90(5mins)} = 31.5dB$ | 8.2                       | The background sound level was measured during a baseline survey in June to July 2018, without the presence of the specific sound. Considered representative of future normal operating periods and conditions. Statistical analysis undertaken to obtain a representative sound level.  |
| On time correction             | 0dB                       | 7.3.15                    | Proposed sound sources will operate 24hrs, 7 days per week during normal conditions.   |

| Results  | Relevant Clause in BS4142  | Commentary for East Anglia TWO and East Anglia ONE North onshore substations  |
|--|----------------------------|---|
| Assessment made during the night time so reference time interval is 15 minutes |                            | 7.2<br>All sound sources modelled as being operational for 100% on-time over the reference time period.   |
| No correction to specific sound level  | $L_{Aeq(15mins)} = 33.4dB$ | Specific sound level is taken from noise modelling of the proposed onshore infrastructure. Sound levels provided by the project engineering team.<br>Sound propagation calculated in accordance with ISO 9613 from source to receiver.  |
| Acoustic character correction tonality   | 0dB                        | 9.2<br>No acoustic features present.<br>Tonality screening assessed using a derivative of the Objective Method described in Annex C of BS4142.<br>All fixed plant assessed using the method based on source levels detailed in <b>Chapter 25 Noise and Vibration (Table 25.32)</b> .<br>Further assessment undertaken of the predicted noise levels at the receptor using a derivative of the Objective Method.<br>No tonality identified based on the current available information. |
| Acoustic feature correction intermittency                                      | 0dB                        | 9.2<br>The process will typically run for the full 24hrs each day, with no expected stops/starts to the fixed plant. No intermittency.  |
| Acoustic feature correction impulsivity  | 0dB                        | 9.2<br>The process will typically run for the full 24hrs each day, with no expected stops/starts to the fixed plant. There are no items of fixed plant with impulsive characteristics under typical operating conditions. Where there may be air cooling fans stop/start, this is not considered to be distinctively audible at the receptor, above baseline sound characteristics due to masking effects.  |
| Acoustic feature correction other  | 0dB                        | 9.2<br>No other sound characteristics.  |
| Rating level   | 33.4dB                     | No penalties to be added. This is the predicted noise level at SSR2 during operation of East Anglia TWO and East Anglia ONE North onshore substations   |
| Background sound level   | $L_{A90(5 min)} = 31.5dB$  | Representative background noise level used in assessment  |

| Results  |                         | Relevant Clause in BS4142 | Commentary for East Anglia TWO and East Anglia ONE North onshore substations   |
|--|-------------------------|---------------------------|--|
| Excess of rating over background sound level   | 33.4 – 31.5<br>= +1.9dB | 11                        | +1.9dB is the unmitigated difference between the background sound level and the modelled rating level during operation.  |
| <p>The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact.</p> <p>The assessment indicates a potential for an adverse impact, depending on the context.</p> |                         | 11                        | <p>Although the excess of rating over the measured background sound level is +1.9dBA, the requirement of the draft DCO will stipulate an operational noise rating limit in accordance with BS4142:2014+A1:2019 of 34dBA at the nearest sensitive receptors.</p> <p>This operational noise limit is derived from using the statistically repeatable <math>L_{A90}</math>, measured during a baseline survey at SSR2.</p> <p>As this is the closest receptor, by stipulating an operational noise rating limit in accordance with BS4142:2014+A1:2019 of 34dBA at SSR2, other noise sensitive receptors would experience lower predicted levels due their increased separation distance from the specific sound source (onshore substation). Therefore, this is considered a conservative assessment approach.</p> <p>The allowance for up to +5dBA above the background level was derived from consideration of the context of the existing environment and the proposed onshore infrastructure in accordance with BS4142.</p> <p>Consideration also needs to be given to the cumulative sound level outside in free-field conditions at the closest façade or amenity space of the receptor.</p> <p>The difference between operational noise limit of 34dBA to the prevailing ambient/residual sound level of 43dBA is just under 10dBA</p> <p>A sound level difference of -10dBA or more does not result in a change in the absolute noise level.</p> <p>Furthermore, although the plant noise may be considered as somewhat different in character to the existing acoustic environment (rural) the operational noise rating limit in accordance with BS4142:2014+A1:2019 of 34dBA (post mitigation and compliance with the requirement of the draft DCO) is low and will have little impact on residents using their amenity space during the night time (most sensitive period).</p> <p>The 2018 World Health Organization guidance establishes a 45dB <math>L_{Aeq}</math> external noise level as desirable. The windows, and any purge ventilation (i.e. trickle ventilators) are normally the weakest part of a brick and block façade and building envelope. BS8233:2014 states that “If partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15 dB”.</p> |

| Results                       |  | Relevant Clause in BS4142 | Commentary for East Anglia TWO and East Anglia ONE North onshore substations   |
|-------------------------------|--|---------------------------|--|
|                               |  |                           | <p>In terms of NPPG and NPSE guidance an outside night time noise level of 45dB L<sub>Aeq</sub>, is defined as the LOAEL. This is determined on the basis that a partially open window will attenuate the outside noise level by 15dBA, thus achieving the recommended night time resting criteria (30dBA) stated for habitable rooms.</p> <p>The draft DCO requirement proposes the use of an external rating level in accordance with BS4142:2014+A1:2019 of 34dB L<sub>Aeq,5mins</sub>. The purpose of the condition is such that should any predicted noise levels at the identified and agreed receptors exceed the 34dBA limit, the operator is required to provide commensurate mitigation to ensure this rating level is achieved.</p> <p>The proposed draft DCO requirement condition of 34dBA L<sub>Aeq,5mins</sub> is considered appropriate as it is considerably below the external recommendation of 45dBA L<sub>Aeq</sub> detailed in BS8233:2014, in order to achieve a night time internal level of 30dBA, even when relying on openable windows as a means of rapid ventilation.</p> |
| Uncertainty of the assessment |  | 10                        | <p>The measurements were taken under repeatable conditions and the uncertainty in the result will be low.</p> <p>Noise modelling inputs were based on all fixed plant operating at 100% on-time.</p> <p>Sound levels for the fixed plant were provided by the project engineering team based on previous experience of similar sized schemes, using currently available technology.</p>  |

17. **Table A25.5.5** shows the derivation of the Rating level at SSR5 NEW based on the proposed indicative layout of the onshore substation infrastructure for the proposed East Anglia ONE North project and East Anglia TWO project following the BS4142:2014+A1:2019 guidance format with reference to relevant clauses in the guidance provided.

**Table A25.5.5 Rating Level at SSR5 NEW – East Anglia ONE North and East Anglia TWO**

| Results                      |                                  | Relevant Clause of BS4142 | Commentary for East Anglia TWO and East Anglia ONE North onshore substations  |
|------------------------------|----------------------------------|---------------------------|---|
| Measured ambient sound level | L <sub>Aeq,(15mins)</sub> = 37dB | 7.3.2                     | Measured in absence of proposed sound source. Site is not operational and will introduce new sound sources to the locale. Average figure obtained from all night time (8hr) survey periods. Considered representative as the proposed sound sources will operate 24hrs, 7 days per week during normal conditions. |

| Results  |                            | Relevant Clause of BS4142 | Commentary for East Anglia TWO and East Anglia ONE North onshore substations   |
|--|----------------------------|---------------------------|--|
| Residual sound level   | $L_{Aeq(15mins)} = 37dB$   | 7.3.3                     | Specific sound not active to determine the correction to be made to the measured ambient sound level.<br><br>Measured ambient sound level and residual sound are equivalent.   |
| Background sound level (night)   | $L_{A90(5mins)} = 29dB$    | 8.2                       | The background sound level was measured during a baseline survey in June to July 2018, without the presence of the specific sound. Considered representative of future normal operating periods and conditions. Statistical analysis undertaken to obtain a representative sound level.  |
| On time correction   | 0dB                        | 7.3.15                    | Proposed sound sources will operate 24hrs, 7 days per week during normal conditions.   |
| Assessment made during the night time so reference time interval is 15 minutes |                            | 7.2                       | All sound sources modelled as being operational for 100% on-time over the reference time period.   |
| No correction to specific sound level  | $L_{Aeq(15mins)} = 30.1dB$ |                           | Specific sound level is taken from noise modelling of the proposed onshore infrastructure. Sound levels provided by the project engineering team.<br><br>Sound propagation calculated in accordance with ISO 9613 from source to receiver.   |
| Acoustic character correction tonality   | 0dB                        | 9.2                       | No acoustic features present.<br><br>Tonality screening assessed using a derivative of the Objective Method described in Annex C of BS4142.<br><br>All fixed plant assessed using the method based on source levels detailed in <b>Chapter 25 Noise and Vibration (Table 25.32)</b> .<br><br>Further assessment undertaken of the predicted noise levels at the receptor using a derivative of the Objective Method.<br><br>No tonality identified based on the current available information. |
| Acoustic feature correction intermittency                                      | 0dB                        | 9.2                       | The process will typically run for the full 24hrs each day, with no expected stops/starts to the fixed plant. No intermittency. Where there may be air cooling fans stop/start, this is not considered to be distinctively audible at the receptor, above baseline sound characteristics due to masking effects.   |
| Acoustic feature   | 0dB                        | 9.2                       | The process will typically run for the full 24hrs each day, with no expected stops/starts to the fixed plant. There  |

| Results   |  | Relevant Clause of BS4142 | Commentary for East Anglia TWO and East Anglia ONE North onshore substations  |
|---|--|---------------------------|---|
| correction impulsivity  |  |                           | are no items of fixed plant with impulsive characteristics under typical operating conditions.  |
| Acoustic feature correction other   | 0dB                                    | 9.2                       | No other sound characteristics.   |
| Rating level  | 30.1dB                                 |                           | No penalties to be added. This is the predicted noise rating level at SSR5 NEW during operation of East Anglia TWO onshore substation   |
| Background sound level  | $L_{A90(5 \text{ min})} = 29\text{dB}$ |                           | Representative background noise level used in assessment  |
| Excess of rating over background sound level  | $30.1 - 29 = +1.1\text{dB}$            | 11                        | +1.1dB is the unmitigated difference between the background sound level and the modelled rating level during operation.   |
| The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact.<br><br>The assessment indicates a potential for an adverse impact, depending on the context. |  | 11                        | <p>Although the excess of rating over the measured background sound level is +1.1dBA, the requirement of the draft DCO will stipulate an operational rating noise limit in accordance with BS4142:2014+A1:2019 of 34dBA at the nearest sensitive receptors.</p> <p>This operational rating noise limit is derived from using the statistically repeatable <math>L_{A90}</math>, measured during a baseline survey at SSR2 and SSR5.</p> <p>As this is the closest receptor, by stipulating an operational rating noise limit in accordance with BS4142:2014+A1:2019 of 34dBA, other noise sensitive receptors would experience lower predicted levels due to their increased separation distance from the specific sound source (onshore substations). Therefore, this is considered a conservative assessment approach.</p> <p>The allowance for up to +5dBA above this background level was derived from consideration of the context of the existing environment and the proposed onshore infrastructure in accordance with BS4142.</p> <p>Furthermore, although the plant noise may be considered as somewhat different in character to the existing acoustic environment (rural) the operational rating noise limit in accordance with BS4142:2014+A1:2019 of 34dBA (post mitigation and compliance with the requirement of the draft DCO) is low and will have little impact on residents using their amenity space during the night time (most sensitive period).</p> <p>The 2018 World Health Organization guidance establishes a 45dB <math>L_{Aeq}</math> external noise level as desirable. The windows, and any purge ventilation (i.e. trickle ventilators) are normally the weakest part of a</p> |

| Results                       | Relevant Clause of BS4142 | 10 | Commentary for East Anglia TWO and East Anglia ONE North onshore substations   |
|-------------------------------|---------------------------|----|--|
|                               |                           |    | <p>brick and block façade and building envelope. BS8233:2014 states that “If partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15 dB”.</p> <p>In terms of NPPG and NPSE guidance an outside night time noise level of 45dB L<sub>Aeq</sub>, is defined as the LOAEL. This is determined on the basis that a partially open window will attenuate the outside noise level by 15dBA, thus achieving the recommended night time resting criteria (30dBA) stated for habitable rooms.</p> <p>The draft DCO requirement proposes the use of an external rating level in accordance with BS4142:2014+A1:2019 of 34dB L<sub>Aeq,5mins</sub>. The purpose of the requirement is such that should any predicted noise levels at the identified and agreed receptors exceed the 34dBA limit, the operator is required to provide commensurate mitigation to ensure this rating level is achieved.</p> <p>The proposed draft DCO requirement of 34dBA L<sub>Aeq,5mins</sub> is considered appropriate as it is considerably below the external recommendation of 45dBA L<sub>Aeq</sub> detailed in BS8233:2014, in order to achieve a night time internal level of 30dBA, even when relying on openable windows as a means of rapid ventilation.</p> |
| Uncertainty of the assessment |                           | 10 | <p>The measurements were taken under repeatable conditions and the uncertainty in the result will be low.</p> <p>Noise modelling inputs were based on all fixed plant operating at 100% on-time.</p> <p>Sound levels for the fixed plant were provided by the project engineering team based on previous experience of similar sized schemes, using currently available technology.</p>  |

18. **Plate A25.5.3** shows the predicted noise levels at the façade of the nearest sensitive receptors (NSRs) from the proposed cumulative East Anglia ONE North and East Anglia TWO onshore substation infrastructure.

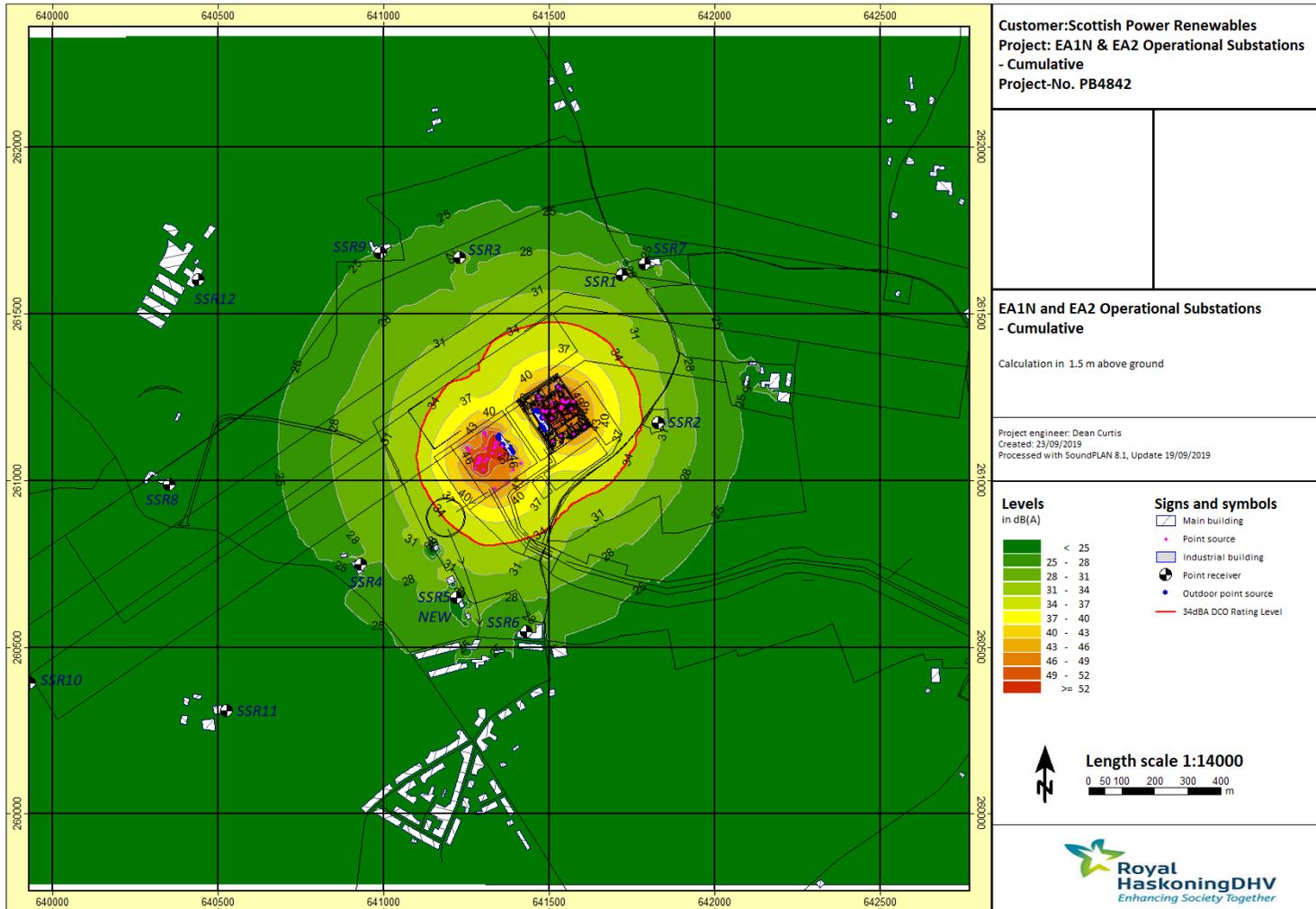


Plate A25.5.3 Predicted Cumulative Noise Rating Levels East Anglia ONE North and East Anglia TWO

## 25.7 East Anglia ONE North Onshore Substation Alternative Location

19. This section presents the project alone impacts in the eventuality that the onshore substation for the proposed East Anglia ONE North project used the alternative (eastern footprint) onshore substation location, as allowed for in the draft DCO. Results are presented in **Table A25.5.6** and **Table A25.5.7**. Cumulative impacts would remain as presented in **section 25.5**.

**Table A25.5.6 Rating Level at SSR2 –East Anglia ONE North Onshore Substation Alternative Location**

| Results   |                            | Relevant Clause of BS4142 | Commentary for East Anglia ONE North onshore substation (alternative location)   |
|---|----------------------------|---------------------------|--|
| Measured ambient sound level  | $L_{Aeq,(15mins)} = 43dB$  | 7.3.2                     | Measured in absence of proposed sound source. Site is not operational and will introduce new sound sources to the locale. Average figure obtained from all night time (8hr) survey periods. Considered representative as the proposed sound sources will operate 24hrs, 7 days per week during normal conditions. Rounded up from 42.9dBA. |
| Residual sound level  | $L_{Aeq,(15mins)} = 43dB$  | 7.3.3                     | Specific sound not active to determine the correction to be made to the measured ambient sound level.<br><br>Measured ambient sound level and residual sound are equivalent.   |
| Background sound level (night)  | $L_{A90,(5mins)} = 31.5dB$ | 8.2                       | The background sound level was measured during a baseline survey in June to July 2018, without the presence of the specific sound. Considered representative of future normal operating periods and conditions. Statistical analysis undertaken to obtain a representative sound level.  |
| On time correction  | 0dB                        | 7.3.15                    | Proposed sound sources will operate 24hrs, 7 days per week during normal conditions.   |
| Assessment made during the night time, so reference time interval is 15 minutes |                            | 7.2                       | All sound sources modelled as being operational for 100% on-time over the reference time period.   |
| No correction to specific sound level   | $L_{Aeq,(15mins)} = 33dB$  |                           | Specific sound level is taken from noise modelling of the proposed onshore infrastructure. Sound levels provided by the project engineering team.<br><br>Sound propagation calculated in accordance with ISO 9613 from source to receiver.   |
| Acoustic character  | 0dB                        | 9.2                       | No acoustic features present.<br><br>Tonality screening assessed using a derivative of the Objective Method described in Annex C of BS4142.  |

| Results   | Relevant Clause of BS4142                | Commentary for East Anglia ONE North onshore substation (alternative location)  |   |
|---|--|---|---|
| correction tonality   |  | <p>All fixed plant assessed using the method based on source levels detailed in the <b>Chapter 25 Noise and Vibration (Table 25.32)</b>.</p> <p>Further assessment undertaken of the predicted noise levels at the receptor using a derivative of the Objective Method.</p> <p>No tonality identified based on the current available information.</p> |   |
| Acoustic feature correction intermittency   | 0dB                                      | 9.2   | The process will typically run for the full 24hrs each day, with no expected stops/starts to the fixed plant. No intermittency. Where there may be air cooling fans stop/start, this is not considered to be distinctively audible at the receptor, above baseline sound characteristics due to masking effects.  |
| Acoustic feature correction impulsivity   | 0dB                                      | 9.2   | The process will typically run for the full 24hrs each day, with no expected stops/starts to the fixed plant. There are no items of fixed plant with impulsive characteristics under typical operating conditions.  |
| Acoustic feature correction other   | 0dB                                      | 9.2   | No other sound characteristics.   |
| Rating level  | 33dB                                     |   | No penalties to be added. This is the predicted rating noise level at SSR2 during operation of East Anglia ONE North onshore substation (alternative location)  |
| Background sound level  | $L_{A90(5 \text{ min})} = 31.5\text{dB}$ |   | Representative background noise level used in assessment  |
| Excess of rating over background sound level  | $33 - 31.5 = +1.5\text{dB}$              | 11  | +1.5dB is the unmitigated difference between the background sound level and the modelled rating level during operation.   |
| The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact.<br><br>The assessment indicates a potential for an adverse impact, depending on the context. |  | 11  | <p>Although the excess of rating over the measured background sound level is +1.5dBA, the requirement of the draft DCO will stipulate an operational rating noise limit in accordance with BS4142:2014+A1:2019 of 34dBA at the nearest sensitive receptors.</p> <p>This operational noise limit is derived from using the statistically repeatable <math>L_{A90}</math>, measured during a baseline survey at SSR2.</p> <p>As this is the closest receptor, by stipulating an operational rating noise limit in accordance with BS4142:2014+A1:2019 of 34dBA at SSR2, other noise sensitive receptors would experience lower predicted levels due to their increased separation distance from the specific sound source (onshore substation).</p> |

| Results | Relevant Clause of BS4142 | Commentary for East Anglia ONE North onshore substation (alternative location)  |
|---------|---------------------------|---|
|         |                           | <p>Therefore, this is considered a conservative assessment approach.</p> <p>The allowance for up to +5dBA above the background level was derived from consideration of the context of the existing environment and the proposed onshore infrastructure in accordance with BS4142.</p> <p>Consideration also needs to be given to the cumulative sound level outside in free-field conditions at the closest façade or amenity space of the receptor.</p> <p>The difference between the operational noise rating limit in accordance with BS4142:2014+A1:2019 of 34dBA to the prevailing ambient/residual sound level of 43dBA is just under 10dBA.</p> <p>A sound level difference of around -10dBA or more does not result in a change in the absolute noise level.</p> <p>Furthermore, although the plant noise may be considered as somewhat different in character to the existing acoustic environment (rural) the operational noise rating limit in accordance with BS4142:2014+A1:2019 of 34dBA (post mitigation and compliance with the requirement of the draft DCO) is low and will have little impact on residents using their amenity space during the night time (most sensitive period).</p> <p>The 2018 World Health Organization guidance establishes a 45dB <math>L_{Aeq}</math> external noise level as desirable. The windows, and any purge ventilation (i.e. trickle ventilators) are normally the weakest part of a brick and block façade and building envelope. BS8233:2014 states that “If partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15 dB”.</p> <p>In terms of NPPG and NPSE guidance an outside night time noise level of 45dB <math>L_{Aeq}</math>, is defined as the LOAEL. This is determined on the basis that a partially open window will attenuate the outside noise level by 15dBA, thus achieving the recommended night time resting criteria (30dBA) stated for habitable rooms.</p> <p>The draft DCO requirement proposes the use of an external rating level in accordance with BS4142:2014+A1:2019 of 34dB <math>L_{Aeq,5mins}</math>. The purpose of the requirement is such that should any predicted noise levels at the identified and agreed receptors exceed the 34dBA limit, the operator is required to provide commensurate mitigation to ensure this rating level is achieved.</p> <p>The proposed DCO requirement of 34dBA <math>L_{Aeq,5mins}</math> is considered appropriate as it is considerably below the external recommendation of 45dBA <math>L_{Aeq}</math> detailed in</p> |

| Results                       |  | Relevant Clause of BS4142 | Commentary for East Anglia ONE North onshore substation (alternative location)   |
|-------------------------------|--|---------------------------|--|
|                               |  |                           | BS8233:2014, in order to achieve a night time internal level of 30dBA, even when relying on openable windows as a means of rapid ventilation.  |
| Uncertainty of the assessment |  | 10                        | The measurements were taken under repeatable conditions and the uncertainty in the result will be low.<br><br>Noise modelling inputs were based on all fixed plant operating at 100% on-time.<br><br>Sound levels for the fixed plant were provided by the project engineering team based on previous experience of similar sized schemes, using currently available technology. |

**Table A25.5.7 Rating Level at SSR5 NEW –East Anglia ONE North Onshore Substation Alternative Location**

| Results  |                           | Relevant Clause of BS4142 | Commentary for East Anglia One North onshore substation (alternative location)  |
|--|---------------------------|---------------------------|---|
| Measured ambient sound level   | $L_{Aeq,(15mins)} = 37dB$ | 7.3.2                     | Measured in absence of proposed sound source. Site is not operational and will introduce new sound sources to the locale. Average figure obtained from all night time (8hr) survey periods. Considered representative as the proposed sound sources will operate 24hrs, 7 days per week during normal conditions. |
| Residual sound level   | $L_{Aeq,(15mins)} = 37dB$ | 7.3.3                     | Specific sound not active to determine the correction to be made to the measured ambient sound level.<br><br>Measured ambient sound level and residual sound are equivalent.  |
| Background sound level (night)   | $L_{A90(5mins)} = 29dB$   | 8.2                       | The background sound level was measured during a baseline survey in June to July 2018, without the presence of the specific sound. Considered representative of future normal operating periods and conditions. Statistical analysis undertaken to obtain a representative sound level.                           |
| On time correction   | 0dB                       | 7.3.15                    | Proposed sound sources will operate 24hrs, 7 days per week during normal conditions.  |
| Assessment made during the night time so reference time interval is 15 minutes |                           | 7.2                       | All sound sources modelled as being operational for 100% on-time over the reference time period.  |

| Results  |                            | Relevant Clause of BS4142 | Commentary for East Anglia One North onshore substation (alternative location)   |
|--|----------------------------|---------------------------|--|
| No correction to specific sound level  | $L_{Aeq(15mins)} = 21.3dB$ |                           | Specific sound level is taken from noise modelling of the proposed onshore infrastructure. Sound levels provided by the project engineering team.<br><br>Sound propagation calculated in accordance with ISO 9613 from source to receiver.   |
| Acoustic character correction tonality   | 0dB                        | 9.2                       | No acoustic features present.<br><br>Tonality screening assessed using a derivative of the Objective Method described in Annex C of BS4142.<br><br>All fixed plant assessed using the method based on source levels detailed in <b>Chapter 25 Noise and Vibration (Table 25.32)</b> .<br><br>Further assessment undertaken of the predicted noise levels at the receptor using a derivative of Objective Method.<br><br>No tonality identified based on the current available information. |
| Acoustic feature correction intermittency  | 0dB                        | 9.2                       | The process will typically run for the full 24hrs each day, with no expected stops/starts to the fixed plant. No intermittency. Where there may be air cooling fans stop/start, this is not considered to be distinctively audible at the receptor, above baseline sound characteristics due to masking effects.   |
| Acoustic feature correction impulsivity  | 0dB                        | 9.2                       | The process will typically run for the full 24hrs each day, with no expected stops/starts to the fixed plant. There are no items of fixed plant with impulsive characteristics under typical operating conditions.   |
| Acoustic feature correction other  | 0dB                        | 9.2                       | No other sound characteristics.  |
| Rating level   | 21.3dB                     |                           | No penalties to be added. This is the predicted noise level at SSR5 NEW during operation of East Anglia ONE North onshore substation (alternative location)  |
| Background sound level   | $L_{A90(5 min)} = 29dB$    |                           | Representative background noise level used in assessment   |
| Excess of rating over background sound level   | $21.3 - 29 = -7.7dB$       | 11                        | -7.7dB is the unmitigated difference between the background sound level and the modelled rating level during operation.  |
| The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will |                            | 11                        | The rating level is lower than the measured background sound level and the requirement of the draft DCO will stipulate an operational rating noise limit in accordance with BS4142:2014+A1:2019 of 34dBA at the nearest sensitive receptors.   |

| Results   | Relevant Clause of BS4142 | Commentary for East Anglia One North onshore substation (alternative location)  |
|---|---------------------------|---|
| <p>have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.</p> |                           | <p>The draft DCO requirement is derived from using the statistically repeatable <math>L_{A90}</math>, measured during a baseline survey at SSR5.</p> <p>The 2018 World Health Organization guidance establishes a 45dB <math>L_{Aeq}</math> external noise level as desirable. The windows, and any purge ventilation (i.e. trickle ventilators) are normally the weakest part of a brick and block façade and building envelope. BS8233:2014 states that “If partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15 dB”.</p> <p>In terms of NPPG and NPSE guidance an outside night time noise level of 45dB <math>L_{Aeq}</math>, is defined as the LOAEL. This is determined on the basis that a partially open window will attenuate the outside noise level by 15dBA, thus achieving the recommended night time resting criteria (30dBA) stated for habitable rooms.</p> <p>The draft DCO requirement proposes the use of an external rating level (in accordance with BS4142:2014+A1:2019) of 34dB <math>L_{Aeq,5mins}</math>. The purpose of the requirement is such that should any predicted noise levels at the identified and agreed receptors exceed the 34dBA limit, the operator is required to provide commensurate mitigation to ensure this rating level is achieved.</p> <p>The proposed draft DCO requirement of 34dBA <math>L_{Aeq,5mins}</math> is considered appropriate as it is considerably below the external recommendation of 45dBA <math>L_{Aeq}</math> detailed in BS8233:2014, in order to achieve a night time internal level of 30dBA, even when relying on openable windows as a means of rapid ventilation.</p> |
| <p>Uncertainty of the assessment</p>  | <p>10</p>                 | <p>The measurements were taken under repeatable conditions and the uncertainty in the result will be low.</p> <p>Noise modelling inputs were based on all fixed plant operating at 100% on-time.</p> <p>Sound levels for the fixed plant were provided by the project engineering team based on previous experience of similar sized schemes, using currently available technology.</p>   |

## 25.8 Conclusion

20. Operational noise impacts were assessed for the proposed East Anglia ONE North project alone are fully detailed in **section 25.6** of **Chapter 25 Noise and Vibration**.
21. Operational noise impacts were assessed for the proposed East Anglia ONE North project and proposed East Anglia TWO project cumulatively are fully detailed in **section 25.7** of **Chapter 25 Noise and Vibration**.
22. The proposed East Anglia ONE North project and proposed East Anglia TWO project will limit operational noise from the onshore substations through a requirement of the draft DCOs. The requirements of the draft DCOs will stipulate an operational rating noise limit in accordance with BS4142:2014+A1:2019 of 34dBA at the nearest sensitive receptors (SSR2 and SSR5 NEW). The operational noise limit is derived from using the statistically repeatable background  $L_{A90}$ , measured during a baseline survey at SSR5 (a 34dBA operational rating noise limit represents an up to +5dBA increase above the background level at SSR5). The allowance for up to +5dBA above the background level was derived from consideration of the context of the existing environment and the proposed onshore infrastructure in accordance with BS4142:2014+A1:2019.
23. As SSR2 and SSR5 are the closest receptor, by stipulating an operational rating noise limit (including any character penalties) in accordance with BS4142:2014+A1:2019 of 34dBA, other noise sensitive receptors would experience lower predicted levels due to their increased separation distance from the specific sound source (onshore substations). Therefore, this is considered a conservative assessment approach.
24. Furthermore, although the plant noise may be considered as somewhat different in character to the existing acoustic environment (rural) the operational rating noise limit in accordance with BS4142:2014+A1:2019 of 34dBA (post mitigation and compliance with the requirement of the draft DCO limit) is low and will have little impact on residents using their amenity space during the night time (most sensitive period).

## **25.9 References**

BSI (2019). British Standards Institution [BS] 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound, BSI, London.

International Organization for Standardization, (1996) ISO9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation. ISO, Switzerland.

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