# PROPOSED NAVITUS BAY WIND PARK

## PRELIMINARY ENVIRONMENTAL INFORMATION 3

## CHAPTER 26
## ONSHORE NOISE AND VIBRATION

**SEPTEMBER 2013**

NAVITUSBAY

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# 26. NOISE AND VIBRATION

## 26.1. Introduction

26.1. This chapter examines the potential onshore noise and vibration effects associated with the proposed onshore components of the Navitus Bay Wind Park ('the Project'). The assessment has considered the effects that may be generated during the construction, operation and maintenance (O&M), and decommissioning phases of the Project. For details of the Project description used within this assessment refer to Chapter 2, Navitus Bay Wind Park Project.

26.2. For the purpose of this assessment, the Onshore Development Area comprises the following project components: the cable landfall, a 35km onshore cable and associated accesses, temporary compounds and a new proposed onshore substation.

26.3. This chapter should be read in conjunction with the In-air Noise assessment in Chapter 8 of this document.

26.4. This assessment assumes the use of standard construction techniques and practices commensurate for works of this nature. The final installation techniques and their sequencing will be determined by NBDL and their contractors, in consultation with relevant authorities prior to commencement of construction.

## 26.2. Legislation, Policy and Guidance

26.5. This section outlines the legislation, policy and guidance relevant to the assessment of potential impacts of onshore noise and vibration associated with the onshore components of the project.

### 26.2.1. International

26.6. There is no international legislation relating to this assessment.

### 26.2.2. National

26.7. The Overarching National Policy Statement ('NPS') for Energy ('EN-1'), in conjunction with the NPS for Renewable Energy Infrastructure ('EN-3') and NPS for Electrical Networks Infrastructure ('EN-5') provide the primary policy framework within which the Project will be assessed.

26.8. Table 26.1 details the relevant matters set out in the NPSS in relation to noise and vibration matters and identifies where it is addressed in this chapter.

Table 26.1 Compliance with National Policy Statements

| Summary of NPS Provision | Consideration in PEI |
|---|---|
| **Noise Policy Statement for England** | |
| Aims of the NPSE are:<br>➢ Avoid significant adverse impacts on health and quality of life;<br>➢ Mitigate and minimise adverse impacts on health and quality of life;<br>➢ Where possible, contribute to the improvement of health and quality of life. | Impacts of the onshore components of the project, with reference to the quality of life of adjacent householders, are considered in the Impact Assessment Section. |
| **NPS EN-1** | |
| Assess potential impacts using appropriate standards | The assessment uses the appropriate British Standards, and ISO and WHO guidelines, as listed in the Legislation Policy and Guidance section. |
| **NPS EN-3** | |
| Considers noise impacts arising from the project | Refer to the Impact Assessment section for details |
| **NPS EN-5** | |
| Assess potential impacts using appropriate standards | The assessment uses the appropriate British Standards, and ISO and WHO guidelines, as listed in the Legislation Policy and Guidance section. |

26.9. In accordance with current standards, guidance and industry best practice, the following national legislation, standards and guidance are relevant to the assessment:

- The Department for Environment, Food and Rural Affairs (DEFRA). Noise Policy Statement for England. March 2010.
- Department of Energy and Climate Change (DECC). Overarching National Policy Statement for Energy (EN-1). July 2011.
- National Planning Policy Framework. March 2012.
- British Standard 4142: 1997 - Method for rating industrial noise affecting mixed residential areas.
- British Standard 5228: 1997 - Noise and vibration control on construction and open sites. Part 1: Code of practice for basic information and procedure for noise and vibration control.
- British Standard 5228: 2009 - Code of practice for noise and vibration control on construction and open sites. Part 2: Vibration.
- British Standards 7445: 2003 - Description and measurement of environmental noise. Part 1: Guide to environmental quantities and procedures.
- British Standard 8233:1999 - Sound insulation and noise reduction for buildings – Code of Practice.
- Department of the environment (DOE). Advisory Leaflet 72. Noise Control on Building Sites. Department of the Environment. 1976.
- ISO 9613-2 Acoustics – Attenuation of sound during propagation outdoors – Part 2 General method of calculation.
- World Health Organisation (WHO). Guidelines for Community Noise. 2000.

## 26.3. Assessment Methodology

### 26.3.1. Study area

26.10. The study area for the noise and vibration construction phase assessment has considered sensitive receptors located within 300 m of the boundary of Onshore Development Area. This is in accordance with the methodology set out in British Standard 5228:2009. The study area is shown in Figure 26.1.

26.11. Due to the length of the cable route, the study area encompasses in excess of 1300 noise sensitive receptors.

26.12. The sensitive receptors within 500m of the onshore substation site boundary have been considered as part of the operational phase assessment. This ensures that the nearest noise sensitive receptors in the vicinity of the onshore substation site boundary are assessed.

### 26.3.2. Consultations

26.13. The Environmental Health Officers (EHO) at New Forest District Council (NFDC) and East Dorset District Council (EDDC) were consulted regarding the methodology and scope of the noise and vibration assessment for the onshore works. A summary of all consultations undertaken to date is provided in Table 26.2.

Table 26.2 Summary of consultation

| Organisation and Date | Summary of Response | Where addressed in PEI |
|---|---|---|
| IPC Scoping Opinion, November, 2011 | Relevant Council Environmental Health Departments consulted to confirm scope and methodology for the study. | Refer to the Assessment Methodology section for details. |
| | 300 m assessment buffer around proposed Project works to be justified. | Refer to the Assessment Methodology section for details. |
| | Noise and vibration along roads and public rights of way to be addressed. | Refer to chapter 31 and the Impact Assessment of this chapter for details |
| | Worst case scenario approach to be adopted and all potential impacts to be assessed. | Addressed in the Impact Assessment section of this chapter. |
| | Information to be provided on the type of vehicles and plant to be used during the construction phase. Vibration caused by abnormal loads and heavy goods vehicles should be assessed. Cross reference to be made to the specialist transport assessment. | Assessment of traffic noise has been included within the assessment of construction noise in the Impact Assessment section of this chapter. |

| Table 26.2 Summary of consultation | | |
|---|---|---|
| | Assessment should inform the ecological assessment and historic environment topics as appropriate. | Refer to chapter 26 and chapter 30 for details |
| | Assessment of permanent apparatus at the substation would be required to determine whether operations and maintenance activities will have significant effects on receptors. | Addressed in the Impact Assessment section of this chapter. |
| | Noise impacts on people should be specifically addressed and particularly any potential noise disturbance at night and other unsocial times such as weekends and public holidays. | Addressed in the Impact Assessment section of this chapter. |
| | Assessment to consider worst case including the potential impact on the construction programme if requirements to limit hours and times of working were imposed on the development as means of mitigation. | Addressed in the Impact Assessment section of this chapter. |
| | Consideration should be given to monitoring noise complaints. | Addressed in the Assessment Methodology section of this chapter. |

| Table 26.2 Summary of consultation | | |
|---|---|---|
| East Dorset District Council, September 2012 | Construction and operational phase noise assessments to be undertaken in accordance with current guidance and best practice.<br>It was agreed that baseline noise monitoring was not required for cable route and landfall, and use of absolute noise levels permitted for construction noise assessment is appropriate.<br>Substation noise assessment to be undertaken in accordance with BS4142:1997. Rating noise level should not exceed the prevailing background noise level when measured at noise sensitive receptors (or proxy location). | Addressed in the Assessment Methodology, Impact Assessment and Potential Mitigation sections of this chapter. |

| Table 26.2 Summary of consultation | | |
|---|---|---|
| New Forest District Council ('NFDC'), September 2012 | Construction and operational phase noise assessments to be undertaken in accordance with current guidance and best practice.<br>It was agreed that baseline noise monitoring was not required for cable route and landfall, use of absolute noise levels permitted for construction noise assessment is appropriate.<br>NFDC indicated that a public relations campaign would be expected for the works.<br>Normal working hours for construction activities are:<br>➢ Monday to Friday – 8 am to 6 pm;<br>➢ Saturday – 8 am to 1 pm. | Addressed in the Assessment Methodology and Impact Assessment sections of this chapter. |

26.14. During the consultation process, an overview of the development proposals were provided, together with a summary of the primary noise sources for the construction and operational phases.

26.15. The proposed noise monitoring locations were subsequently agreed with the EHO via email correspondence on the 28 September 2012.

### 26.3.3. The scope of assessment

26.16. The scope of the noise and vibration assessment has been based on the best practice methods set out in British Standard 5228 and British Standard 4142. The assessment identifies the predicted noise levels and noise and vibration impacts for all phases of the project.

26.17. As described above two distinct study areas were defined, one for the cable route and a separate study area for the substation, both with distinct parameters. In order to characterise the existing environment measurements of ambient noise levels where taken at locations nearby sensitive receptors that have the potential to be affected by the development activities from the onshore substation. As agreed with the EHOs of NFDC and EDDC on the 28th September 2012, baseline noise surveys for the onshore cable corridor and landfall were not required.

26.18. The assessment covers the related noise and vibration impacts for the construction of the onshore cable corridor (including onshore landfall works) and the onshore substation. It is also includes an assessment of the operational noise of the onshore substation.

26.19. The assessment establishes the predicted noise levels during the operation of the substation and the associated impacts. The assessment will establish the predicted impacts on the nearest sensitive receptors to the onshore substation and recommend mitigation measures.

**Issues scoped out**

26.20. The assessment of operational noise and vibration along the cable corridor and the landfall has been scoped out, as there are no predicted operational impacts in respect of noise or vibration arising from the cable once installed underground.

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## Study Area Onshore Noise and Vibration Assessment

**Legend**

Onshore Development Area

**Study Area**

300m Buffer for Assessing Construction Impacts

500m Buffer for the Assessment of Operational Noise Associated with Onshore Substation Site

| | | |
|---|---|---|
| **Fig. No.:** Figure 26.1 | | **Date:** 08/08/2013 |
| **Author:** CB | **Checked:** MU | **Approved:** RB |
| **Scale@A3:** 1:75,000 | | **Revision No.:** 01 |
| **Coordinate System:** British National Grid | | **Data Sources:** OS Ramboll |
| **Datum:** OSGB 1936 | **Ref. No.:** 61030937/RAM | |

0 2 4 km

N

### 26.3.4. Impact assessment methodology

***Construction phase - noise***

26.21. Noise predictions are based on the methodology contained within BS5228:2009-1 for construction activities for given distances from the onshore development area. These noise predictions have been used to determine whether the construction phase works would result in significant effects at the surrounding noise sensitive receptors.

26.22. The significance criteria given in BS5228-1:2009 Annex E.2 have been used to assess the noise effect during the construction phase. This provides methods for deriving reasonable limits for construction related noise levels, including the Department of the Environment Advisory Leaflet 72. This process adopts the use of fixed noise limits at the façade of noise sensitive receptors in the vicinity of the proposed construction works. It is not dependent upon the background noise levels that will vary along the length of the 35 km cable route.

26.23. For the purposes of this assessment, a daytime construction noise limit of 70 decibels (dB) $L_{Aeq,T}$ for the core construction periods has been considered as the basis for identifying potentially significant construction effects. If work is extended into other periods beyond the core daytime hours, reduced threshold noise levels would apply. $L_{Aeq,T}$ is defined as the noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.

26.24. For the purpose of predicting the likely noise effects associated with the onshore cable corridor (including landfall), the construction works have been divided into the following phases:

- Site set up, including erection of fencing;
- Tree felling;
- Topsoil stripping/site preparation;
- Open trench excavations & duct installations;
- Trenchless duct installations i.e. Horizontal Directional Drilling (HDD);
- Cable pulling activities;
- Topsoil reinstatement;
- Site access routes construction;
- Primary compound set-up.

26.25. For the purpose of predicting the likely noise effects associated with the construction of the onshore substation, the works have been divided into the following phases:

- Site compound set-up;
- Perimeter fencing erection;
- Topsoil stripping & earthworks;
- Building & equipment foundations/bases (pad/strips, no piling);
- Gas insulated switchgear/control building superstructure erection;
- Substation equipment installations;
- Roads, car park and service installations.

26.26. To inform this assessment, properties within 300 m of the cable corridor have been derived from Ordnance Survey address-point data. Due to the nature of the land along the majority of the onshore cable corridor, soft ground attenuation has been assumed where the noise sensitive receptor is situated more than 25 m from the works. No allowance has been made for acoustic screening provided by intervening landforms or structures.

26.27. To assess the noise levels generated by construction traffic on the various temporary site access routes and local highways, the haul route method outlined in BS5228-1:2009 has been used. To inform the assessment the realistic worst case hourly traffic numbers have been considered as derived from the traffic and transportation assessment (see chapter 31).

***Construction phase - vibration***

26.28. Construction activities such as excavation, heavy vehicles, hydraulic breaking and driven piling can produce ground-borne vibration, which may be felt in nearby residential and commercial properties.

26.29. BS5228 notes that for the majority of people, vibration levels between 0.14 and 0.3 $mms^{-1}$ peak particle velocity are just perceptible. A vibration level

of 1.0 $mms^{-1}$ is sufficient to cause complaint, but tolerable with prior warning, whereas a level of 10 $mms^{-1}$ is intolerable for anything more than a very brief exposure. Table 26.3 provides indicative distances at which certain activities give rise to a just perceptible level of vibration. These figures are based on historical field measurements contained within BS5228-2.

**Table 26.3 Distances at which vibration may just be perceptible**

| Construction Activity | Distance from activity when vibration may just be perceptible (m) |
|---|---|
| Excavation | 10 - 15 |
| Heavy vehicles (e.g. dump trucks) | 5 - 10 |
| Hydraulic breaker | 15 - 20 |

26.30. The distances detailed in Table 26.3 have been used to assess if vibration from construction activities would result in an effect on surrounding properties. Properties situated at distances in excess of those presented in Table 26.3 have not been considered further, as the vibration levels are likely to be outside of the perceptible range.

***Operational and maintenance phase - noise***

26.31. As noted above, the operational assessment has considered the effects associated with the operation of the onshore substation only.

26.32. There are a number of noise sensitive receptors in the vicinity of the substation site boundary, and there is potential for disturbance to occur. The unmitigated noise emissions used in the assessment are given in Table 26.4.

**Table 26.4 Substation plant noise levels**

| Item of Plant | Sound Power Level | Number | Height of Noise Source above ground level (m) |
|---|---|---|---|
| SVC reactor | 80 dB(A) | 12 | 6.0 |
| SVC harmonic filter | 87 dB(A) | 24 | 7.5 / 3.5 |
| Harmonic filter | 91 dB(A) | 6 | 3.0 |
| Transformer (tank) | 91 dB(A) | 2 | 2.0 |
| Transformer (cooler) | 79 dB(A) | 2 | 3.0 |
| Fixed reactor | 80 dB(A) | 3 | 5.5 |

26.33. The substation would be operational on a 24 hour basis and, therefore, the operational noise assessment has considered both daytime and night-time periods.

26.34. The procedure in BS4142:1997 'Method of rating industrial noise affecting mixed residential and industrial areas' has been used to assess the likelihood of complaints from noise attributable to the operation of the onshore substation. The procedure compares the predicted noise level from the substation, the "specific noise level", with the background noise level. A +5 dB(A) character correction is applied to the specific noise level to take account of the potential for acoustic features (if present) to obtain the "rating level". The likelihood of noise provoking complaints is assessed by subtracting the background noise level from the rating noise level. BS4142 states:

"A difference of around +10 dB or higher indicates that complaints are likely. A difference of around +5 dB is of marginal significance. A difference of -10 dB is a positive indication that complaints are unlikely."

"The greater the difference, the greater the likelihood of complaints."

26.35. The BS4142 method is not suitable for assessing the noise measured inside buildings or when the background and rating noise levels are both very low (For the purposes of this standard, background noise levels below about 30 dB and rating levels below about 35 dB are considered to be very low).

26.36. The predicted noise levels generated by the operation of the onshore substation have been calculated using the proprietary noise modelling software CADNA-A®, which implements the common European methods of noise prediction. In this instance, the operational noise predictions have been undertaken in accordance with the noise prediction framework set out in ISO 9613-2 Acoustics – Attenuation of sound during propagation outdoors – Part 2 General method of calculation.

26.37. The topography on and around the onshore substation site has been modelled using Ordnance Survey mapping information. The acoustic ground absorbency is modelled according to local conditions.

***Operational and maintenance phase – vibration***

26.38. No significant vibration effects associated with the onshore substation have been identified by the equipment supplier for the operation and maintenance phase (Table 26.4). On this basis, the substation would not generate sufficient vibration forces that would be perceptible at the nearest vibration sensitive receptor and therefore a quantitative assessment has not been undertaken. A qualitative assessment has been carried out.

***Decommissioning phase – noise and vibration***

26.39. Noise and vibration impacts during the decommissioning would be broadly similar to those defined for the construction phase.

***Significance of effects***

26.40. The significance of an effect is generally determined as the combination of the 'sensitivity' of the affected environmental receptor and the predicted 'magnitude' of the effect of change on this receptor.

26.41. The assessment of significance ultimately relies on professional judgement, although comparing the extent of the effect with criteria and standards has guided this judgement.

26.42. The receptor sensitivities presented in Table 26.5 have been used to inform the assessment.

Table 26.5 Receptor sensitivity

| Receptor Sensitivity | Type of Receptor |
|---|---|
| High | Residential properties, schools, hospitals, churches, public houses, hotels, children's nursery, nursing homes |
| Medium | Commercial premises, halls, public municipal areas |
| Low | Industrial premises |

26.43. The magnitude of the effect within this assessment has been described using the following scale:

- High
- Medium
- Low
- Imperceptible

26.44. Although the lowest measure of magnitude of effect is defined as imperceptible, it should be noted that noise and vibration levels may still be audible/detectable, particularly during the construction.

26.45. For the purposes of this assessment, the criteria in Table 26.6 have been adopted for the magnitude of the effect. It should be noted that the construction phase effects would be temporary in nature, and the operational phase effects arising from the onshore substation would last throughout the operations and maintenance phase of the Project.

Table 26.6 Magnitude of effect criteria

| Effect | Criteria for magnitude | | | |
|---|---|---|---|---|
| | Imperceptible | Low | Medium | High |
| Construction Phase - Noise | Façade noise level less than 70 dB(A) threshold criteria[1] | Façade noise level at or above 70 dB(A) for a period not exceeding the noise insulation eligibility criteria[2] | Façade noise level at or above 75 dB(A) for a period not exceeding the noise insulation eligibility criteria[2] | Façade noise level at or above 75 dB(A) for a period exceeding the noise insulation eligibility criteria[2] |
| Construction Phase - Vibration | Undetectable levels of vibration[3] | Just detectable levels of vibration[3] | Vibration levels may cause complaint, but can be tolerated with prior warning[3] | Intolerable levels of vibration[3] |
| Operational Phase – Substation | Receptor rating noise level more than 10 dB(A) below background noise level | Receptor rating noise level not exceeding 5 dB(A) above background noise level | Receptor rating noise level not exceeding 10 dB(A) above background noise level | Receptor rating noise level more than 10 dB(A) above background noise level |

1 *Refer to the Impact Methodology for summary of noise threshold criteria*
2 *Refer to the Impact Methodology for summary of noise insulation eligibility criteria*
3 *Refer to the Impact Methodology for summary of vibration levels and effects*

26.46. The significance of an impact within this assessment has been defined as follows:

Table 26.7 Impact Significance Matrix

| Magnitude of effect | Sensitivity of a receptor: High | Medium | Low | Imperceptible |
|---|---|---|---|---|
| High | Major | Major OR Moderate | Moderate OR Minor | Negligible |
| Medium | Major OR Moderate | Moderate OR Minor | Minor | Negligible |
| Low | Moderate OR Minor | Minor | Minor | Negligible |
| Imperceptible | Negligible | Negligible | Negligible | Negligible |

- **Major significance** – Receptors would experience substantial increases in the noise climate in the permanent state due to the Project. Noise levels during temporary construction works would exceed the threshold criteria, for time periods exceeding the noise eligibility criteria. Levels of vibration would give rise to complaints.
- **Moderate significance** – Receptors would experience moderate increases in the noise climate in the permanent state, due to the Project. Noise levels during temporary construction works would exceed the threshold criteria, albeit for a period not exceeding the noise insulation eligibility criteria. Vibration levels that may cause a complaint if no prior notice is given.
- **Minor significance** – Receptors would experience minor increases in the noise climate in the permanent state due to the Project, although the increases are not sufficient to give rise to complaints. Noise levels during temporary construction works may exceed the threshold criteria, albeit for a period not exceeding the noise insulation eligibility criteria. Just detectable levels of vibration.

- **Negligible significance** – Receptors would not experience a perceptible increase in the noise climate in the permanent state, as a result of the Project. Noise levels during temporary construction works fall below the threshold criteria. Undetectable levels of vibration.

26.47. Professional opinion has been applied to determine whether the potential impact is significant, as shown in Table 26.7.

### 26.3.5. Limitations and embedded mitigation

26.48. As the final detailed design will not be established until a contractor is appointed, it is necessary to make assumptions to inform the appraisal of construction and operational phase effects in order to derive a robust and conservative assessment, and whose impacts would not be exacerbated through subsequent refinement of the design within the stated envelope. The assumptions made for the construction and operational and maintenance phases represent a worst case and are outlined below.

***Construction phase***

26.49. Construction activities would involve the use of a variety of working methods, for which an estimate of the expected noise levels over a representative period has been prepared, in accordance with industry best practice. A detailed breakdown of the assumed construction plant to be used during the landfall, cable corridor and substation works will be provided in the Environmental Statement that will support an application for development consent.

26.50. For the purposes of assessing construction impacts, it is assumed that each phase of the works would be programmed so it is not affected by preceding or subsequent work phases, as these would be separated by either time or distance. The degree of parallel working would be tailored and agreed in conjunction with the installation contractor undertaking the works to ensure that the noise threshold criteria are not exceeded.

26.51. Noise levels from the construction works experienced by a receptor would vary over time as the distances to noise producing plant and the type of construction activity change.

26.52. Construction work would be undertaken within daytime hours, between 8.00 am and 6.00 pm Monday to Friday and 8.00 am and 1.00 pm on Saturdays. At times 24 hour working may be required for exceptional activities for which separate authorisation would be secured with the Local Authorities e.g. for trenchless construction work at the landfall and for the selected river crossings, including the River Avon and Moors River.

26.53. In terms of nosie generating activities as part of the topsoil stripping/site preparation works it is assumed that a haul road along the full length of the cable corridor will not be required, as work will be carried out in sections, working from a series of construction compounds. Temporary ground improvement measures will be introduced as and where necessary. Typical options for this include steel track ways or plates, unbound aggregate haul roads laid over appropriate geotextile, timber boards or similar.

***Operational and maintenance phase***

26.54. The ISO 9613 noise prediction model assumes that individual noise sources act as point sources; the noise level reducing by 6dB for every doubling of distance. The model takes into account the distance between the sources and the receptors and the amount of attenuation due to atmospheric absorption, ground effect and dense foliage.

***Embedded mitigation***

26.55. Embedded mitigation the measures that have been incorporated into the project design to minimise likely significant adverse impacts. The embedded mitigation measures are taken into account during the impact assessment and, in some instances, are sufficient to prevent any significant impacts from occurring.

26.56. The following embedded mitigation measures relevant to this assessment have been incorporated into the Project:

- Wherever possible, the onshore cable corridor has been developed to avoid noise and vibration sensitive receptors;
- Sensitive siting of the onshore substation to provide considerable separation distance to the surrounding noise and vibration receptors;
- Programming of the works to ensure that the majority of construction activities are undertaken during core daytime hours, to avoid potential disturbance;

- Use acoustic screening for static items of plant and work areas where feasible;
- Compliance with a Code of Construction Practice (CoCP).

26.57. Best practicable means (BPM), as defined by the Control of Pollution Act 1974, would be implemented as part of the working methodology, these would be detailed in the CoCP that sets out requirements for the construction workers. This would serve to minimise the noise and vibration effects at receptors in the vicinity of the construction works. The reduction in noise levels provided through the implementation of BPM varies depending on the nature of the works, however, values of 5 to 10 dB are typically expected through a combination of appropriate measures.

26.58. Typically BPM measures include:

- Restricted working hours, as detailed in Chapter 2;
- Working hours to be planned to take account of the effects of noise and vibration upon persons in areas surrounding site operations and upon persons working on site;
- Where reasonably practicable, quiet working methods to be adopted, using plant with lower noise emissions;
- Where reasonably practicable, adopt working methods that minimise vibration generation;
- Locate plant away from noise and vibration sensitive receptors;
- Use silenced and well-maintained plant conforming with the relevant EU directives relating to noise and vibration;
- Avoid where practicable breaking out hard surfaces using percussion techniques;
- Avoid unnecessary revving of engines and switch off equipment when not required;
- Carry out regular inspections of noise mitigation measures to ensure integrity is maintained at all times;
- Provide briefings for all site-based personnel so that noise and vibration issues are understood and mitigation measures are adhered to;
- Manage plant movement to take account of surrounding noise sensitive receptors, as far as is reasonably practicable;
- Carry out compliance monitoring of on-site noise levels to ensure that the agreed noise and vibration limits are being adhered to.

## 26.4. Baseline Environment

### 26.4.1. Baseline data gathering methodology

***Data sources***

26.59. No external data sources were used to inform this assessment.

***Survey methodology***

26.60. As agreed with the EHOs of NFDC and EDDC on the 28th September 2012, baseline noise surveys for the onshore cable corridor and landfall were not required.

26.61. Noise surveys were undertaken at the onshore substation site to establish the baseline noise conditions, against which the predicted operational noise effects from the proposed development have been assessed. Further details of the methodology used for the baseline survey will be detailed within the Environmental Statement that will accompany an application for development consent.

26.62. An unattended noise survey was undertaken within the substation site, comprising noise measurements taken at positions situated along the western and northern boundaries of the substation site. The monitoring positions are denoted as LT1 and LT2 in Figure 26.2. LT1 and LT2 were chosen to establish the spatial noise climate at the substation site and to determine the typical noise levels experienced by noise sensitive receptors located beyond the onshore substation site boundary. The most exposed receptors in the vicinity of the site boundary are expected to experience noise levels similar to those measured at these monitoring positions.

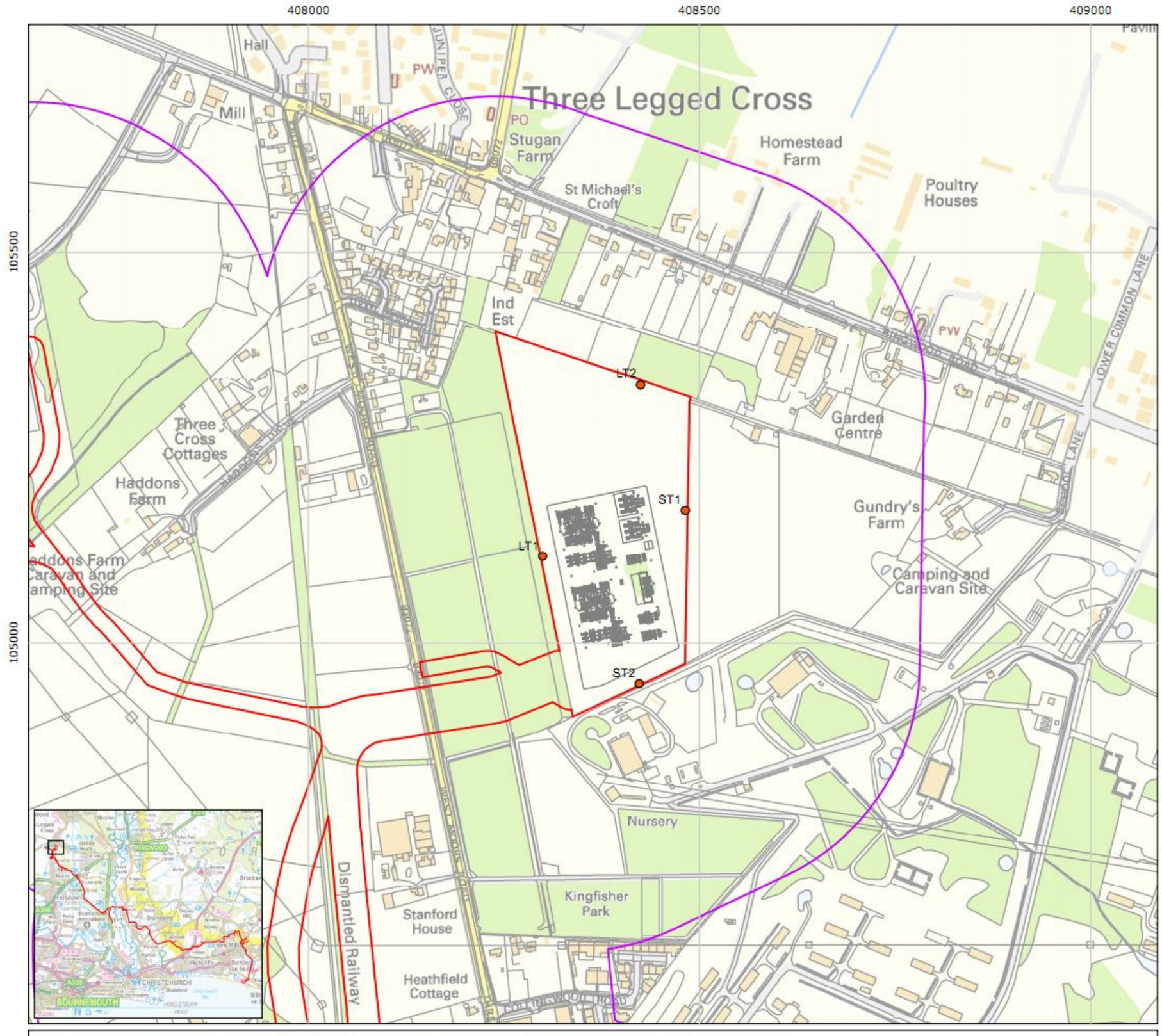
26.63. The measurements at LT1 were undertaken from Thursday 4 October 2012 until Wednesday 10 October 2012; the measurements LT2 were taken over a six hour period on Thursday 4 October 2012.

26.64. In addition to the unattended survey, an attended survey was undertaken at the substation site on Thursday 4 October 2012, comprising

measurements at two locations which are denoted as ST1 and ST2 in Figure 26.2. The attended monitoring locations were situated along the eastern and southern boundaries of the onshore substation site. Minimum 30 minute sample measurements were recorded at each attended monitoring location, at two periods throughout the day.

# Navitus Bay Development Ltd

## Onshore Substation Noise Monitoring Location Plan




### Legend

- Onshore Development Area
- 300m Buffer on Onshore Development Area
- Onshore Substation Site
- Noise Survey Locations

| | | |
|---|---|---|
| **Fig. No.:** Figure 26.2 | | **Date:** 08/08/2013 |
| **Author:** CB | **Checked:** MU | **Approved:** RB |
| **Scale@A3:** 1:5,000 | | **Revision No.:** 01 |
| **Coordinate System:** British National Grid | | **Data Sources:** OS Ramboll |
| **Datum:** OSGB 1936 | **Ref. No.:** 61030937/RAM | |

0 100 200 m

N

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***Noise levels at monitoring position***

26.65. A summary of the noise levels measured during the baseline survey is presented in Tables 26.8 to 26.11 below.

Table 26.8 Noise levels at monitoring position LT1

| Date | Time Period | Average $L_{Aeq,T}$ dB | Max. $L_{AF(Max)}$ dB | Average $L_{A90,T}$ dB | Lowest $L_{A90,15min}$ dB (time occurring) |
|---|---|---|---|---|---|
| Thursday 04/10/12 | Daytime* | 48.5 | 81.6 | 36.3 | 30.9 (22:00-22:15) |
| | Night-time | 54.6 | 73.2 | 42.3 | 30.6 (23:30-23:45) |
| Friday 05/10/12 | Daytime | 55.5 | 101.4 | 40.5 | 33.3 (20:30-20:45) |
| | Night-time | 44.0 | 72.7 | 38.8 | 34.9 (06:30-06:45) |
| Saturday 06/10/12 | Daytime | 43.6 | 74.9 | 39.6 | 33.5 (21:00-21:15) |
| | Night-time | 38.2 | 68.2 | 30.2 | 23.6 (03:15-03:30) |
| Sunday 07/10/12 | Daytime | 43.3 | 75.5 | 38.1 | 30.7 (22:45-23:00) |
| | Night-time | 38.0 | 71.5 | 30.9 | 23.9 (00:45-01:00) |
| Monday 08/10/12 | Daytime | 43.1 | 70.2 | 38.5 | 26.5 (22:45-23:00) |
| | Night-time | 36.2 | 65.7 | 28.4 | 23.4 (01:45-02:00) |
| Tuesday 09/10/12 | Daytime | 45.1 | 73.9 | 41.8 | 31.5 (22:45-23:00) |
| | Night-time | 37.8 | 75.7 | 30.3 | 26.0 (02:15-02:30) |
| Wednesday 10/10/12 | Daytime** | 44.6 | 79.4 | 40.7 | 35.9 (21:30-21:45) |

* *Readings taken from 18:00 to 23:00 only, not full daytime measurements*

** *Readings taken from 07:00 to 21:45 only, not full daytime measurements*

Table 26.9 Noise levels at monitoring position LT2

| Date | Time Period | Average $L_{Aeq, 15min}$ dB | Maximum $L_{AF(max)}$ dB | Average $L_{A90}$ dB |
|---|---|---|---|---|
| Thursday 04/10/12 | 18:00 to 18:15 | 46.9 | 55.2 | 44.5 |
| | 18:15 to 18:30 | 46.0 | 56.1 | 43.2 |
| | 18:30 to 18.45 | 47.1 | 71.2 | 42.4 |
| | 18:45 to 19:00 | 58.0 | 77.6 | 41.1 |
| | 19:00 to 19:15 | 43.8 | 56.2 | 41.0 |
| | 19:15 to 19:30 | 44.0 | 59.0 | 41.0 |
| | 19:30 to 19.45 | 43.7 | 54.9 | 40.1 |
| | 19:45 to 20:00 | 43.5 | 50.7 | 39.2 |
| | 20:00 to 20:15 | 42.7 | 54.2 | 37.5 |
| | 20:15 to 20:30 | 40.8 | 50.1 | 36.5 |
| | 20:30 to 20.45 | 42.1 | 56.0 | 36.2 |
| | 20:45 to 21:00 | 41.5 | 55.1 | 35.6 |
| | 21:00 to 21:15 | 44.9 | 57.2 | 35.8 |
| | 21:15 to 21:30 | 40.3 | 52.7 | 35.7 |
| | 21:30 to 21.45 | 40.9 | 54.5 | 35.6 |
| | 21:45 to 22:00 | 40.6 | 50.3 | 35.8 |
| | 22:00 to 22:15 | 40.6 | 52.2 | 34.0 |
| | 22:15 to 22:30 | 40.7 | 51.0 | 34.5 |
| | 22:30 to 22.45 | 41.8 | 57.8 | 36.7 |
| | 22:45 to 23:00 | 41.2 | 56.6 | 38.1 |
| | 23:00 to 23:15 | 43.7 | 55.4 | 41.0 |
| | 23:15 to 23:30 | 47.3 | 64.1 | 44.6 |
| | 23:30 to 23.45 | 43.7 | 55.9 | 40.7 |
| | 23:45 to 00:00 | 42.7 | 58.6 | 39.8 |

| Table 26.10 Noise levels at monitoring position ST1 eastern boundary of substation site | | | | |
|---|---|---|---|---|
| Date | Time Period | Average $L_{Aeq, 15min}$ dB | Maximum $L_{AF(max)}$ dB | Average $L_{A90}$ dB |
| Thursday 04/10/12 | 14:02 to 14:17 | 47.7 | 65.6 | 43.2 |
| | 14:17 to 14:32 | 46.0 | 65.3 | 43.4 |
| | 15:17 to 15.32 | 46.0 | 58.8 | 43.4 |
| | 15:32 to 15:47 | 46.6 | 60.7 | 43.8 |

26.66. The noise climate at monitoring location ST1 was dominated by distant road noise, bird song and rustling leaves. The noise climate is expected to be similar at adjacent noise sensitive receptors during these periods.

| Table 26.11 Noise levels at monitoring position ST2 southern boundary of substation site | | | | |
|---|---|---|---|---|
| Date | Time Period | Average $L_{Aeq, 15min}$ dB | Maximum $L_{AF(max)}$ dB | Average $L_{A90}$ dB |
| Thursday 04/10/12 | 14:40 to 14:55 | 48.2 | 63.2 | 45.4 |
| | 14:55 to 15:10 | 48.6 | 58.5 | 46.1 |
| | 15:56 to 16:11 | 49.2 | 62.7 | 45.9 |
| | 16:11 to 16:26 | 48.7 | 63.8 | 45.8 |

26.67. The noise climate at monitoring location ST2 was dominated by distant road noise, bird song and rustling leaves. The noise climate is expected to be similar at adjacent noise sensitive receptors during these periods.

## 26.5. Impact Assessment

26.68. The assessment work for the onshore cable route is currently ongoing because details of the mitigation measures to be deployed during construction are under discussion with relevant statutory consultees. Details of this mitigation will be finalised as part of the Environmental Statement that will accompany an application for development consent.

### 26.5.1. Impact assessment - cable corridor (including landfall)

***Construction phase***

26.69. Table 26.12 presents the predicted noise levels for the various phases of the unmitigated cable corridor works.

| Table 26.12 Predicted construction noise levels for cable corridor | |
|---|---|
| Element of Works | Overall Activity Noise level at 10 m ($L_{Aeq}$ dB) |
| Setting out and Fencing | 83 |
| Tree Felling | 90 |
| Topsoil Strip / Site Prep. | 85 |
| Excavation of trenches | 81 |
| Trenchless techniques - HDD | 88 |
| Cabling Installation | 85 |
| Topsoil reinstatement | 85 |
| Primary Compounds | 74 |

26.70. Based on the overall activity noise levels presented in Table 26.12, noise predictions have been made for all noise sensitive receptors within 200 m of the onshore cable corridor.

26.71. Table 26.13 presents the noise levels (dBA) at various distances from the unmitigated activities, by estimating the noise reduction with distance from the source. A +3 dB building façade correction factor has been applied in accordance with BS5228.

| Table 26.13 Noise levels for cable corridor construction at various distances (unmitigated) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Site Activity | Distance to Receptor (metres) | | | | | | |
| | 10 | 25 | 50 | 75 | 100 | 150 | 200 |
| Setting out and Fencing | 86 | 78 | 70 | 66 | 63 | 58 | 55 |
| Tree Felling | 93 | 85 | 77 | 73 | 70 | 65 | 62 |
| Topsoil Strip / Site Prep. | 88 | 80 | 72 | 68 | 65 | 60 | 57 |
| Excavation of trenches | 84 | 76 | 69 | 64 | 61 | 57 | 53 |
| Trenchless techniques | 91 | 83 | 75 | 71 | 68 | 63 | 60 |
| Cabling Installation | 88 | 80 | 73 | 68 | 65 | 61 | 58 |
| Topsoil reinstatement | 88 | 80 | 73 | 68 | 65 | 61 | 58 |

| Table 26.13 Noise levels for cable corridor construction at various distances (unmitigated) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Site Activity | Distance to Receptor (metres) | | | | | | |
| | 10 | 25 | 50 | 75 | 100 | 150 | 200 |
| Primary Compounds | 77 | 69 | 62 | 57 | 54 | 50 | 47 |

26.72. Table 26.14 identifies the receptors that are predicted to experience noise levels in excess of 70dB $L_{Aeq,T}$ as a result of the onshore cable corridor construction works. A range of values are presented for each activity to take account of the potential noise reduction of 5 to 10 dB, attributable to the use of BPM.

| Table 26.14 Number of properties exceeding threshold criteria (including embedded mitigation) | | |
|---|---|---|
| Element of Works | No. of Receptors with predicted Façade Noise Levels in excess of: | |
| | 70dB $L_{Aeq,T}$ | 75dB $L_{Aeq,T}$ |
| Setting out and Fencing | 8 to 26 | 4 to 8 |
| Tree Felling | 23 to 32 | 12 to 23 |
| Topsoil Strip | 22 to 34 | 7 to 22 |
| Excavation of trenches | 8 to 22 | 4 to 8 |
| Cable Installations | 22 to 31 | 7 to 22 |
| Trenchless techniques – HDD | 2 to 4 | 1 to 2 |
| Topsoil reinstatement | 22 to 35 | 7 to 22 |
| Primary Compounds | 0 | 0 |

26.73. It can be seen from Table 26.14 that the 70 dB $L_{Aeq,T}$ threshold criteria will be exceeded in seven out of the eight main cable corridor construction activities. Based on this, additional specific mitigation measures are required to control the noise emissions from the works in certain areas.

26.74. Based on a **high** receptor sensitivity for residential dwellings and **medium** magnitude of effect based on noise levels above 75 dB $L_{Aeq,T}$ for a period not exceeding the noise insulation criteria, the construction noise levels for the onshore cable corridor have been assessed to have an impact of **moderate** significance. It should be noted that this significance would only be applicable in a limited number of areas along the length of the onshore cable corridor, where the works are located in close proximity to surrounding noise sensitive receptors i.e. 20 to 50 m depending upon the construction activity. Examples of these locations in the 20 to 50m of the cable corridor are noted below:

- Farm building;
- Properties in close proximity to the works on West Moors Road, West Moors;
- Properties in close proximity to the works on Newmans Close, West Moors;
- Properties in close proximity to the works on Payne Close, West Moors;
- Properties in close proximity to the works on Ringwood Road, St. Leonards & St. Ives;
- Single dwelling on Lyndhurst Road, Hinton Admiral;
- Properties on Dark Lane, Bransgore;
- Properties in close proximity to the works on Bashley Road and Bashley Cross Road, New Milton;
- Two dwellings on Mark's Lane, New Milton;
- Single dwelling on Bashley Drive, New Milton;
- External amenity area to Bashley Caravan Park;
- Plough Inn public house, Sway Road, Hordle;
- Farm buildings on Vaggs Lane, Hordle;
- Properties in close proximity to the works on Ashley Lane, Hordle, west of the cable corridor;
- Properties in close proximity to the works on Hare Lane, Hordle.

26.75. This impact is therefore considered to be **Significant**.

***Construction traffic on site access routes and local road network***

26.76. Construction traffic associated with the Project has the potential to give rise to noise impacts at surrounding sensitive receptors. The effect of

construction traffic is generally greater on local sections of road closest to the site access routes. The predicted peak traffic movements across the public highway network is expected to be no greater than 46 HGVs per day, which equates to less than six HGV per hour over a typical 7.5 hour working day. There are relatively few locations where construction traffic serving more than one construction section may use the same road.

26.77. Based on an hourly HGV traffic flow of six, the noise from construction traffic travelling at 48 kph (30 mph) has been assessed, for a notional receptor situated 10 m from the road centreline. This gives a predicted hourly sound pressure level of 60 dB(A), which does not exceed the 70 dB(A) daytime construction limit. Based on a **high** receptor sensitivity for residential properties, and a **negligible** magnitude of effect, the noise levels associated with construction traffic on site access routes and the local road network have been assessed to be **Negligible** significance. This impact is therefore considered to be **Not Significant**.

***Construction vibration***

26.78. It is considered that unmitigated construction induced vibration, from both HDD and open cut works, has the potential to exceed just perceptible levels at the nearest receptors in the vicinity of the onshore cable corridor works, i.e. where properties are located within approx. 20 m of the onshore cable corridor. However, embedded mitigation would be adopted through the application of BPM.

26.79. Construction activities that have the potential to result in vibration impacts would be effectively managed so that, where practicable, they are undertaken away from sensitive receptors. In exceptional circumstances, the works would be undertaken using alternative techniques to ensure that vibration threshold limits would not be exceeded.

26.80. These mitigation measures would serve to reduce the effects of ground borne vibration so that the vibration levels are unlikely to exceed just perceptible levels at the surrounding receptors, and on this basis vibration from construction activities is assessed to have impact of **minor** significance. This impact is therefore considered to be **Not Significant**.

### 26.5.2. Impact assessment – Onshore Substation

***Construction noise***

26.81. The construction programme for the onshore substation is expected to have a duration of 18 months (excluding commissioning phase).

26.82. Table 26.15 presents the predicted noise levels during the construction of the onshore substation.

Table 26.15 Predicted construction noise levels for the onshore substation works

| Element of Works | Overall Activity Noise level at 10m ($L_{Aeq}$ dB) |
|---|---|
| Site Compound | 79 |
| Fencing | 81 |
| Site stripping & Earthworks | 85 |
| Building & equipment foundations | 82 |
| GIS/Control building | 80 |
| Substation equipment installation | 81 |
| External Works | 85 |

26.83. Table 26.16 presents the noise levels (dBA) at various distances from the activities by estimating the noise reduction with distance from the source, assuming 6 dB reduction per doubling of distance. A +3 dB building façade correction factor has been applied in accordance with BS5228.

Table 26.16 Noise levels for substation construction at various distances

| Site Activity | Distance to Receptor (metres) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 10 | 25 | 50 | 75 | 100 | 150 | 200 |
| Site Compound | 82 | 74 | 68 | 64 | 62 | 58 | 56 |
| Fencing | 84 | 76 | 70 | 66 | 64 | 60 | 58 |
| Site stripping & Earthworks | 88 | 80 | 74 | 70 | 68 | 64 | 62 |
| Building & equipment foundations | 85 | 77 | 71 | 68 | 65 | 62 | 59 |
| GIS/Control building | 83 | 75 | 69 | 66 | 63 | 60 | 57 |

| Table 26.16 Noise levels for substation construction at various distances | | | | | | | |
|---|---|---|---|---|---|---|---|
| Site Activity | Distance to Receptor (metres) | | | | | | |
| | 10 | 25 | 50 | 75 | 100 | 150 | 200 |
| Substation equipment installations | 84 | 76 | 70 | 67 | 64 | 61 | 58 |
| External Works | 88 | 80 | 74 | 71 | 68 | 65 | 62 |

26.84. It can be seen from Table 26.16, that noise levels are expected to be highest whilst the site stripping/earthworks and external works activities are being undertaken.

26.85. The nearest receptors in the vicinity of the substation are located more than 200 m from the onshore substation boundary.

26.86. Due to the location of noise sensitive residential receptors in the vicinity of the onshore substation site boundary, the construction noise levels associated with the substation works are predicted to be between 56 and 62 dB $L_{Aeq,T}$, lower than the 70 dB $L_{Aeq,T}$ threshold criterion. Based on a **high** receptor sensitivity for residential properties surrounding the site, and an **Imperceptible** magnitude of effect, the construction noise levels for the substation are assessed to be of **Negligible** significance. This impact is therefore considered to be **Not Significant**.

***Substation - operation and maintenance noise***

26.87. Based on the modelling parameters outlined in Assessment Methodology section, the predicted unmitigated noise levels at the closest noise sensitive premises have been determined.

26.88. An extract of the noise prediction model showing the contour plot attributable to the unmitigated operation of the proposed substation is presented in Figure 26.3. The figure presents the specific noise levels attributable to the onshore substation, and therefore excludes the +5 dB acoustic feature correction. The predicted noise levels at the most exposed receptors in each direction from the substation are between 35<49 dB(A) at Gundry's Farm (east) and the Ministry of Defence buildings (south) respectively.

26.89. For the purposes of the BS4142 assessment, the closest dwellings on Dymewood Road have been considered; this is a function of the sensitive nature of the receptors on Dymewood Road, their proximity to the onshore substation site boundary, and the background noise levels measured. The predicted noise level is 40dB(A).

26.90. The dwellings on Dymewood Road would experience noise levels similar to those recorded at LT1 (which was positioned at the western boundary of the substation site), due to the nature of the noise sources in the area. Based on this, the relevant background noise levels to be used for the BS4142 assessment are;

*Daytime Period*

- Lowest $L_{A90,60min}$ background level during the baseline survey = 30 dB
- Lowest average $L_{A90,16hr}$ background level during the day = 38 dB

*Night-time Period*

- Lowest $L_{A90,60min}$ background level during the baseline survey = 24 dB
- Lowest average $L_{A90,8hr}$ background level during the night = 28 dB

26.91. The noise levels measured during the night-time periods are very low. Section 1 of BS4142:1997 states that the standard is not suitable for background noise levels below about 30 dB and rating levels below about 35 dB(A) which are considered to be very low. Based on this, a rating noise level of 35 dB(A) has been used as the compliance criteria to assess the noise emissions from the substation i.e. 5 dB(A) above the 30 dB(A) lowest daytime background noise level.

26.92. In terms of absolute noise levels, a rating level of 35 dB(A) would satisfy both the WHO and BS8233 guidelines levels required for good sleeping/resting conditions within a dwelling, and would also not cause annoyance to people residing in external amenity areas i.e. gardens.

26.93. Based on the BS4142 assessment criteria, a +5 dB(A) acoustic feature correction has been applied for the noise emissions emanating from the onshore substation. This is to take account of the character of the noise source.

| Table 26.17 BS4142 assessment table (no mitigation) | | | |
|---|---|---|---|
| Residential receptors | Specific Noise Level at worst affected floor & façade | Rating Noise Level *(Specific level + 5dB acoustic feature correction)* | Difference between rating level & 30 dB(A) background noise level ($L_{A90,60min}$) |
| Dymewood Road dwellings | 40 dB(A) | 40 + 5 = 45 dB(A) | + 15 dB |

26.94. It should be noted that the specific noise level at the nearest residential receptor excludes a reflection correction from the building façade. This has been done to provide a like-for-like comparison with the free-field survey measurements obtained from the baseline survey.

26.95. Table 26.17 shows that the rating noise level at the closest noise sensitive premises is 45 dB(A), which is 15 dB(A) above the 30 dB(A) background noise level. Based on a **high** receptor sensitivity for residential properties and a **high** magnitude of effect, the operational noise levels from the substation would constitute an impact of **major** significance at the surrounding residential properties before the application of appropriate mitigation.

26.96. The assessed impact is therefore considered to be **Significant**. On this basis, appropriate mitigation measures are proposed in the Potential Mitigation section.

***Substation - operation and maintenance vibration***

26.97. No significant operational vibration effects associated with the onshore substation infrastructure have been identified by the substation equipment supplier, particularly when considered in relation to the significant separation distances to the surrounding vibration sensitive receptors. On this basis, vibration from the operation and maintenance phase of the onshore substation is **Not Significant**.

## 26.6. Potential Mitigation

### 26.6.1. Public awareness campaign during construction phase

26.98. A public awareness campaign is proposed to provide information to people residing in properties located in the vicinity of the construction works. The level of engagement would vary depending upon the expected effects experienced by individual receptors.

26.99. It is envisaged that the public awareness campaign would provide local residents with the following information:

- The nature of the works being undertaken;
- The expected duration of the works;
- The contractor's working hours;
- Mitigation measures that have been adopted to minimise noise will be detailed in the CoCP;
- Contact details in the event of a noise disturbance.

### 26.6.2. Onshore Cable corridor

***Cable corridor construction noise mitigation***

26.100. As presented in Table 26.14, noise levels above threshold values have been predicted at certain locations along the onshore cable route during the construction phase.

26.101. As stated above, the range of proposed mitigation measures would be agreed with the contractor to ensure that noise limits would not be exceeded. Examples of typical noise and vibration reduction measures for works of this nature are defined in the Embedded Mitigation section of this chapter.

26.102. To minimise the effects of construction noise at the nearest receptors, temporary noise barriers are an option at the boundary of the cable corridor in strategic locations if used. The barriers would be situated to ensure that an enhanced level of noise attenuation is provided to the most sensitive receptors. The indicative location of the temporary noise barriers are shown in Figures 26.4 a-i. Temporary noise barriers typically comprise earth

bunds, solid fencing with a mass per unit of surface area in excess of 7 kg/m$^2$, or proprietary acoustic screening systems.

26.103. BS5228-1:2009 states that the approximate acoustic attenuation provided by a barrier will be 5 dB when the top of the plant is just visible to the receiver over the noise barrier and 10 dB when the barrier completely hides the noise sources from the receiver.

26.104. Where satisfactory noise levels cannot be achieved despite the use of appropriate mitigation measures, noise insulation or temporary rehousing of occupants could be implemented by the Project. Eligibility for noise insulation, or the reasonable costs thereof, is dependent on trigger levels being exceeded for a significant period of time, as prescribed in BS5228-1:2009 i.e. 'for a period of ten or more days of working in any fifteen consecutive days, or for a total of days exceeding 40 days in any 6 month period.'

Annex E.4 of BS5228-1:2009 provides time periods, averaging times and noise levels associated with the determination of eligibility for noise insulation, which are reproduced in Table 26.18.

Table 26.18 Criteria for determination of eligibility for noise insulation

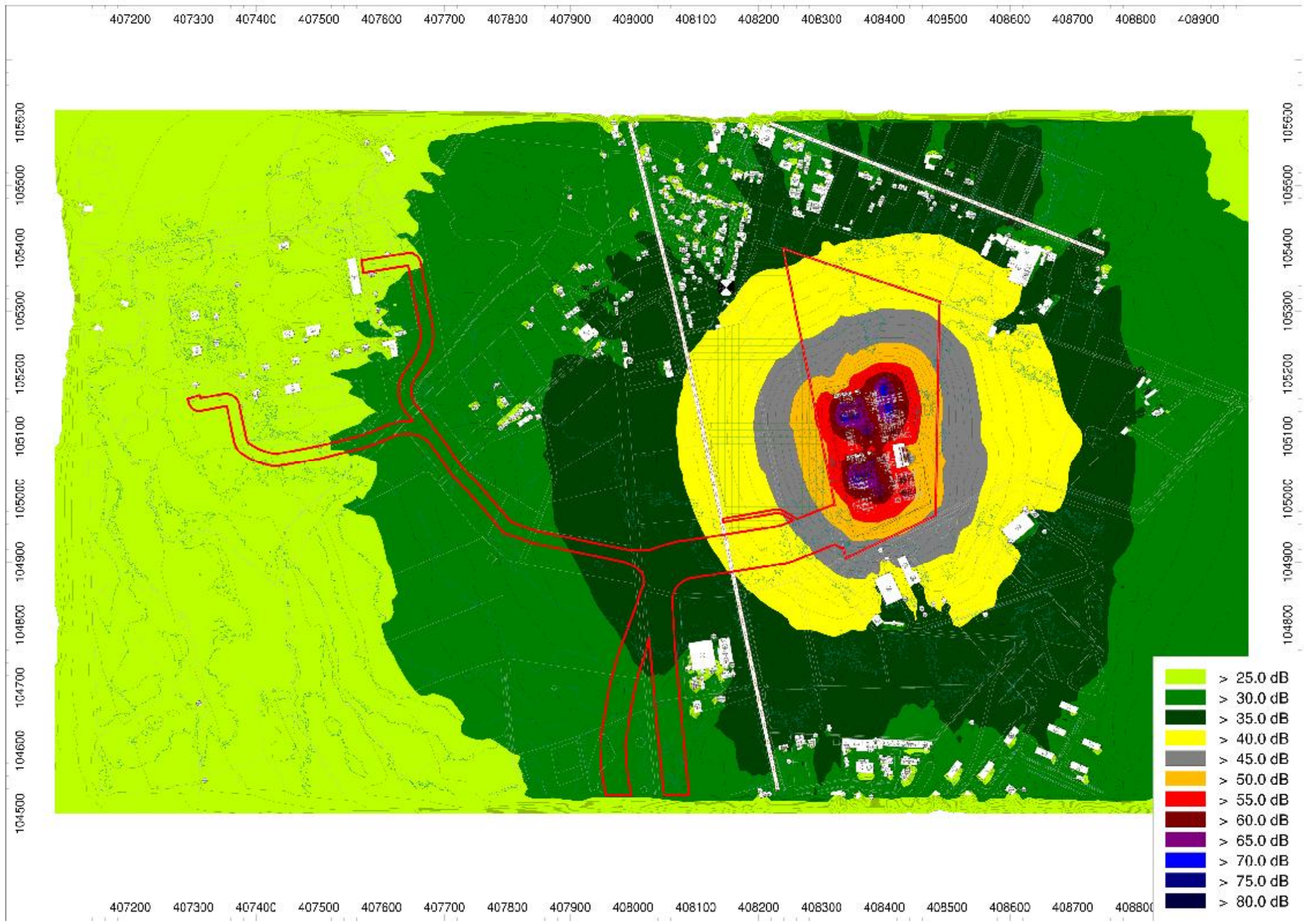
| Time | Relevant time period | Averaging time, T | Noise insulation trigger level dB $L_{Aeq,T}^{(A)}$ |
|---|---|---|---|
| Monday to Friday | 07.00 – 08.00 | 1 h | 70 |
| | 08.00 – 18.00 | 10 h | 75 |
| | 18.00 – 19.00 | 1 h | 70 |
| | 19.00 – 22.00 | 3 h | 65 |
| | 22.00 – 07.00 | 1 h | 55 |
| Saturday | 07.00 – 08.00 | 1 h | 70 |
| | 08.00 – 18.00 | 5 h | 75 |
| | 18.00 – 19.00 | 1 h | 70 |
| | 19.00 – 22.00 | 3 h | 65 |
| | 22.00 – 07.00 | 1 h | 55 |
| Sunday and Public Holidays | 07.00 – 08.00 | 1 h | 65 |
| | 21.00 – 07.00 | 1 h | 55 |

[A)] All noise levels are predicted or measured at a point 1 m in front of the most exposed of any windows and doors in any façade of any eligible dwelling.

26.105. At this stage in the design, there is one area along the length of the cable corridor where properties could have the potential to qualify for noise insulation or temporary re-housing. This is a function of the immediate proximity of the cable corridor to these residential properties. However, it is envisaged that the works in this area can be designed to minimise noise generation, and managed on site through temporary noise barriers and BPM to control noise levels at the neighbouring properties, so that noise insulation or temporary re-housing is not necessary. This will be subject to planning and programming of the works with the installation contractor. The requirement for noise insulation will be determined when the detailed construction programme and methodology are known.

# Navitus Bay Development Ltd

## Onshore Substation Noise Contour Plot (Without Mitigation)



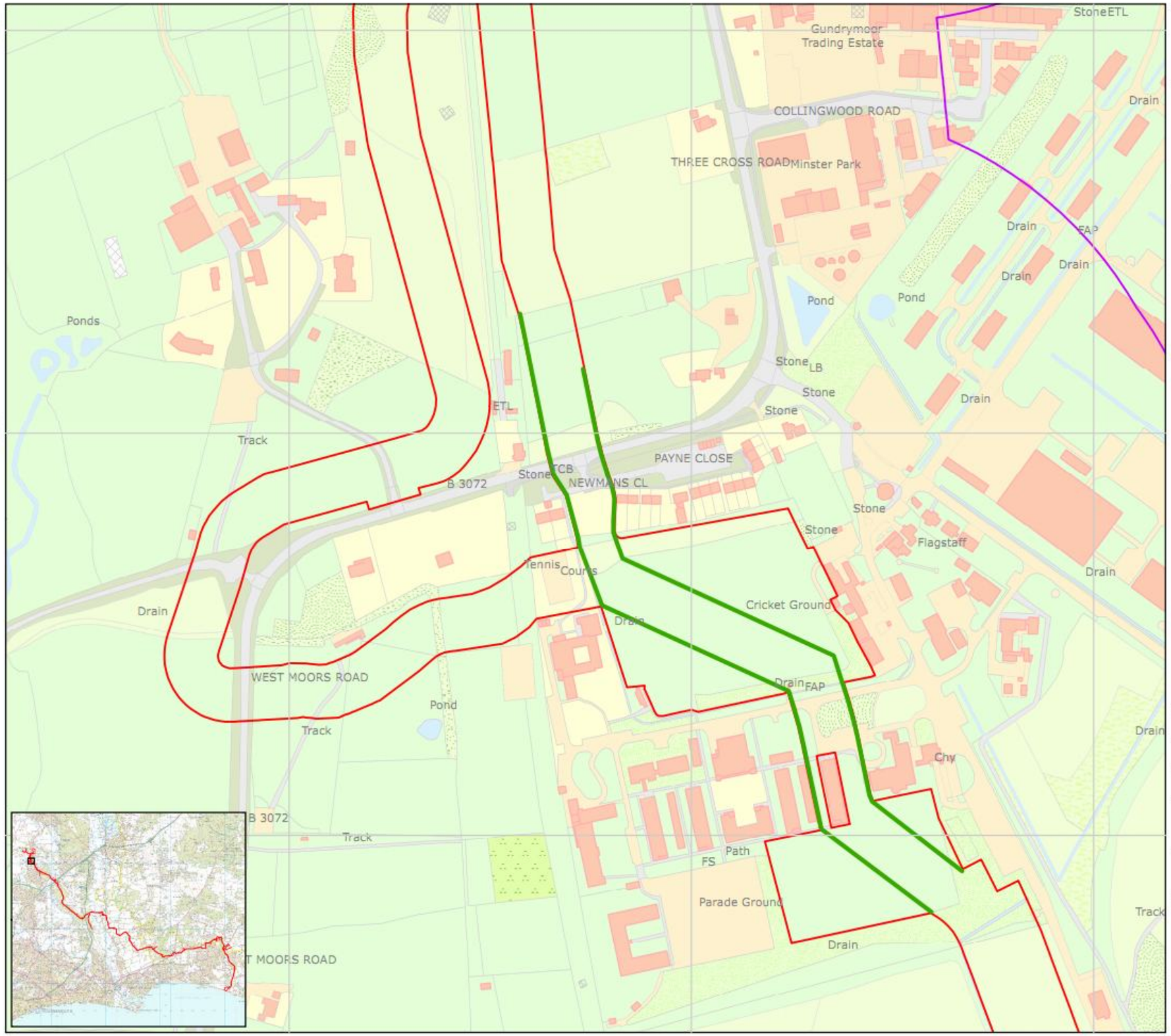

| | | |
|---|---|---|
| **Fig. No.:** Figure 26.3 | | **Date:** 19/06/2013 |
| **Author:** CB | **Checked:** MU | **Approved:** RB |
| **Scale@A3:** Not to Scale | | **Revision No.:** 00 |
| **Coordinate System:** British National Grid | | **Data Sources:** OS Noise Prediction Model Design Team |
| **Datum:** OSGB 1936 | **Ref. No.:** 61030937/RAM | |

N

NAVITUSBAY

407900 408200 408500

104600 104300 104000






# Navitus Bay Development Ltd

## Potential Noise Mitigation Locations

**Legend**

- Onshore Development Area
- 300m Buffer on Onshore Development Area
- Areas where Potential Mitigation is being Considered (During Construction)

| | | |
|---|---|---|
| **Fig. No.:** Figure 26.4a | | **Date:** 14/08/2013 |
| **Author:** CB | **Checked:** MU | **Approved:** RB |
| **Scale@A3:** 1:3,000 | | **Revision No.:** 01 |
| **Coordinate System:** British National Grid | | **Data Sources:** OS Ramboll |
| **Datum:** OSGB 1936 | **Ref. No.:** 61030937/RAM | |

0 50 100 m

N

NAVITUSBAY

410000 410300 410600

102500

102200

Drain
Pond
Drain
Drain
Mast
FB
RINGWOOD ROAD
Drain
Drain
Drain
ETL
Camping Site
Caravan and
Drain
Drain
Drain
Drain
Water
Drain
BOUNDARY LANE
Car Park
Drain
Track
Hurn Forest
Path (um)
Path (um)
Swimming Pool
Track

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## Potential Noise Mitigation Locations

**Legend**

- Onshore Development Area
- 300m Buffer on Onshore Development Area
- Areas where Potential Mitigation is being Considered (During Construction)

| | | |
|---|---|---|
| **Fig. No.:** Figure 26.4b | | **Date:** 14/08/2013 |
| **Author:** CB | **Checked:** MU | **Approved:** RB |
| **Scale@A3:** 1:3,000 | | **Revision No.:** 01 |
| **Coordinate System:** British National Grid | | **Data Sources:** OS Ramboll |
| **Datum:** OSGB 1936 | **Ref. No.:** 61030937/RAM | |

0 50 100 m

N

NAVITUSBAY

421100 421400 421700

95900

95600

Path Path Path WellPath Path Pond Pond Path Sluice Path Path Track A 35 Drain MP War Memorial B 3055 Pond Hinton DARK LANE DARK LANE Pond Pond Drain Collects

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## Potential Noise Mitigation Locations

**Legend**

- Onshore Development Area
- 300m Buffer on Onshore Development Area
- Areas where Potential Mitigation is being Considered (During Construction)

| | | |
|---|---|---|
| **Fig. No.:** Figure 26.4c | | **Date:** 14/08/2013 |
| **Author:** CB | **Checked:** MU | **Approved:** RB |
| **Scale@A3:** 1:3,000 | | **Revision No.:** 01 |
| **Coordinate System:** British National Grid | | **Data Sources:** OS Ramboll |
| **Datum:** OSGB 1936 | **Ref. No.:** 61030937/RAM | |

0 50 100 m

N



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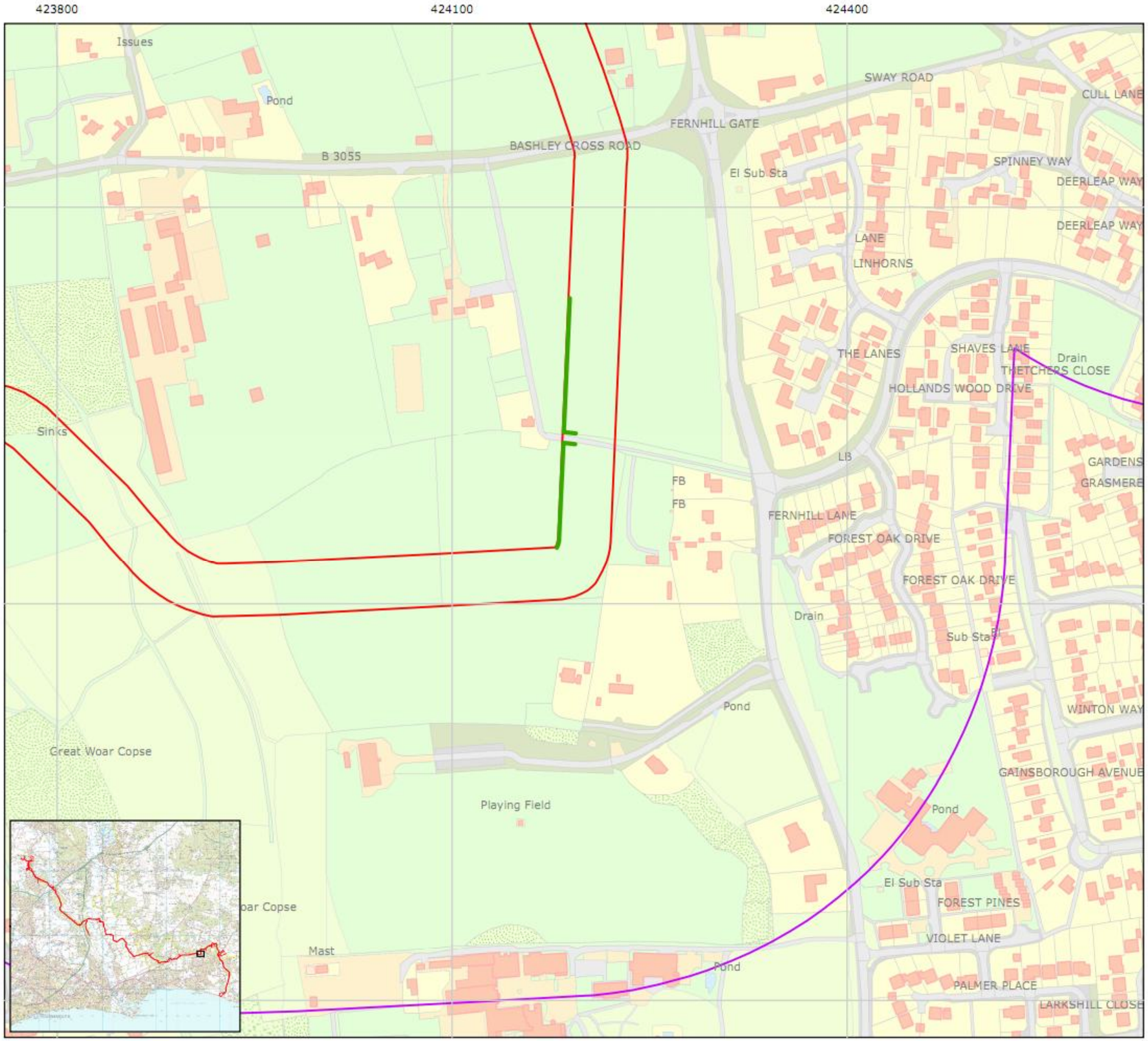
## Potential Noise Mitigation Locations




### Legend

- Onshore Development Area
- 300m Buffer on Onshore Development Area
- Areas where Potential Mitigation is being Considered (During Construction)

| | | |
|---|---|---|
| **Fig. No.:** Figure 26.4d | | **Date:** 14/08/2013 |
| **Author:** CB | **Checked:** MU | **Approved:** RB |
| **Scale@A3:** 1:3,000 | | **Revision No.:** 01 |
| **Coordinate System:** British National Grid | | **Data Sources:** OS Ramboll |
| **Datum:** OSGB 1936 | **Ref. No.:** 61030937/RAM | |

0 50 100 m

N

NAVITUSBAY

424100 424400 424700

97100 96800 96500

Football Ground L Twr L Twr L Twr Nursery B 3058 Cricket Ground ETL Caravan Park TCB LB Caravan Site Play Area BASHLEY DRIVE BASHLEY ROAD MARK'S LANE SWAY ROAD Drain Issues SWAY ROAD Drain CULL LANE COPSE KAMPTEE Pond FERNHILL GATE BASHLEY CROSS ROAD B 3055 El Sub Sta SPINNEY WAY DEERLEAP WAY Posts DEERLEAP WAY LANE LINHORNS WHITLEY WAY THE LANES SHAVES LANE Drain THETCHERS CLOSE HOLLANDS WOODDRIVE HOLLANDS WOOD DRIVE

# Navitus Bay Development Ltd

## Potential Noise Mitigation Locations

**Legend**

- Onshore Development Area
- 300m Buffer on Onshore Development Area
- Areas where Potential Mitigation is being Considered (During Construction)

| | | |
|---|---|---|
| **Fig. No.:** Figure 26.4e | | **Date:** 14/08/2013 |
| **Author:** CB | **Checked:** MU | **Approved:** RB |
| **Scale@A3:** 1:3,000 | | **Revision No.:** 01 |
| **Coordinate System:** British National Grid | | **Data Sources:** OS Ramboll |
| **Datum:** OSGB 1936 | **Ref. No.:** 61030937/RAM | |

0 50 100 m

N

NAVITUSBAY

424700 425000 425300

97100

96800

Pond
Ponds
Path (um)
Bashley Park
ETL
Caravan Park
El Sub Sta
Caravan Park
TCB
Caravan Park
LB
Caravan Site
Tennis Courts
Track
Track
Play Area
Golf Course
Bashley Park
SWAY ROAD
BASHLEY DRIVE
Track
Drain
Sub Sta El
Drain
HARRIS WAY
Issues
Drain
ROAD
PARTRIDGE GREEN
BROCKHILLS LANE
HOLLANDS WOOD DRIVE
WOODLANDS WAY
Drain

# Navitus Bay Development Ltd

## Potential Noise Mitigation Locations

**Legend**

- Onshore Development Area
- 300m Buffer on Onshore Development Area
- Areas where Potential Mitigation is being Considered (During Construction)

| | | |
|---|---|---|
| **Fig. No.:** Figure 26.4f | | **Date:** 14/08/2013 |
| **Author:** CB | **Checked:** MU | **Approved:** RB |
| **Scale@A3:** 1:3,000 | | **Revision No.:** 01 |
| **Coordinate System:** British National Grid | | **Data Sources:** OS Ramboll |
| **Datum:** OSGB 1936 | **Ref. No.:** 61030937/RAM | |

0 50 100 m

N

NAVITUSBAY

425300 425600 425900

97400

97100

96800

ETL Ponds El Ps ETL Collects Track Danes Stream Coppice Pond Caravan Site Track Pond B 3055 Track Drain Danes Stream Bridge Track SWAY ROAD Pond Pond Danes Stream Path (um) Pond El Sub Sta B 3055 LB GP B 3055 SWAY ROAD VAGGS LANE VAGGS LANE ETL El Ps El Sub Sta ETL El Ps ETL Track Path (um)

# Navitus Bay Development Ltd

## Potential Noise Mitigation Locations

**Legend**

- Onshore Development Area
- 300m Buffer on Onshore Development Area
- Areas where Potential Mitigation is being Considered (During Construction)

| | | |
|---|---|---|
| **Fig. No.:** Figure 26.4g | | **Date:** 14/08/2013 |
| **Author:** CB | **Checked:** MU | **Approved:** RB |
| **Scale@A3:** 1:3,000 | | **Revision No.:** 01 |
| **Coordinate System:** British National Grid | | **Data Sources:** OS Ramboll |
| **Datum:** OSGB 1936 | **Ref. No.:** 61030937/RAM | |

0 50 100 m

N

NAVITUSBAY

425600 425900 426200

96500 96200

Path (um) Danes Stream Path (um) Pond Bridge Foot Path (um) Track Stanley'sCopse Path (um) Path (um) Track Path (um) Path (um) Pond Danes Stream Path (um) Pond Pond Drain Pond Pond Hordle Lakes MP 97 SL MP 25

# Navitus Bay Development Ltd

## Potential Noise Mitigation Locations

**Legend**

- Onshore Development Area
- 300m Buffer on Onshore Development Area
- Areas where Potential Mitigation is being Considered (During Construction)

| | | |
|---|---|---|
| **Fig. No.:** Figure 26.4h | | **Date:** 14/08/2013 |
| **Author:** CB | **Checked:** MU | **Approved:** RB |
| **Scale@A3:** 1:3,000 | | **Revision No.:** 01 |
| **Coordinate System:** British National Grid | | **Data Sources:** OS Ramboll |
| **Datum:** OSGB 1936 | **Ref. No.:** 61030937/RAM | |

0 50 100 m

N

NAVITUSBAY

425900 426200 426500

95900 95600 95300

Stream Danes
Pond
Pond
Pond
Pond
Drain
Pond
Pond
Pond
WELLINGTONIA GARDENS
HORDLE MEWS
LAUREL CLOSE
BLENHEIM CRESCENT
GORSE CLOSE
SUNDEW CLOSE
Drain
COPPICE CLOSE
El Sub Sta
ASHLEY LANE
LB
AVENUE
STONELEIGH
HARE LANE
WINDSOR CLOSE
PINEWOOD ROAD
Stream Danes
ASHLEY LANE
Golden Hill
Golden Hill
HARE LANE
LAVENDER ROAD
LAVENDER GARDENS
PINEWOOD ROAD
Track
LAVENDER ROAD
Stream Danes
ROAD
LANE

# Navitus Bay Development Ltd

## Potential Noise Mitigation Locations

**Legend**

- Onshore Development Area
- 300m Buffer on Onshore Development Area
- Areas where Potential Mitigation is being Considered (During Construction)

| | | |
|---|---|---|
| **Fig. No.:** Figure 26.4i | | **Date:** 14/08/2013 |
| **Author:** CB | **Checked:** MU | **Approved:** RB |
| **Scale@A3:** 1:3,000 | | **Revision No.:** 01 |
| **Coordinate System:** British National Grid | | **Data Sources:** OS Ramboll |
| **Datum:** OSGB 1936 | **Ref. No.:** 61030937/RAM | |

0 50 100 m

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### 26.6.3. Substation

***Operation and maintenance noise mitigation***

26.106. It is proposed that reductions in noise levels would be realised through the use of enclosures around the main noise producing components within the substation. The proposed strategy for mitigation would be subject to the detailed design, during which alternative systems of mitigation may be adopted to achieve equivalent values of attenuation.

26.107. Noise reduction levels are presented in Table 26.19.

Table 26.19 Substation source noise reduction

| Item of Plant | Noise reduction at source (dB) |
|---|---|
| SVC reactor | 10 |
| SVC harmonic reactor | 10 |
| Harmonic filter reactor | 10 |
| Transformer (tank) | 10 |

26.108. Extracts of the noise prediction model showing the contour plot attributable to the unmitigated and mitigated operation of the proposed substation are presented in Figures 26.3 and 26.5. These figures present the specific noise levels attributable to the substation, and therefore exclude the +5 dB acoustic feature correction.

26.109. The predicted noise levels at the surrounding receptors are between 26 and 40dB(A) (Gundry's Farm and Ministry of Defence buildings).

26.110. For Dymewood Road Properties (north-west), the predicted noise leve with mitigation is 30dB(A).

26.111. With the implementation of mitigation measures, the revised BS4142 assessment is detailed in table 26.20.

Table 26.20 BS4142 assessment table (with mitigation)

| Residential receptors | Specific Noise Level at worst affected floor & façade | Rating Noise Level *(Specific level + 5dB acoustic feature correction)* | Difference between rating level & 30 dB(A) background noise level ($L_{A90,60min}$) |
|---|---|---|---|
| Dymewood Road dwellings | 30 dB(A) | 30 + 5 = 35 dB(A) | + 5 dB |

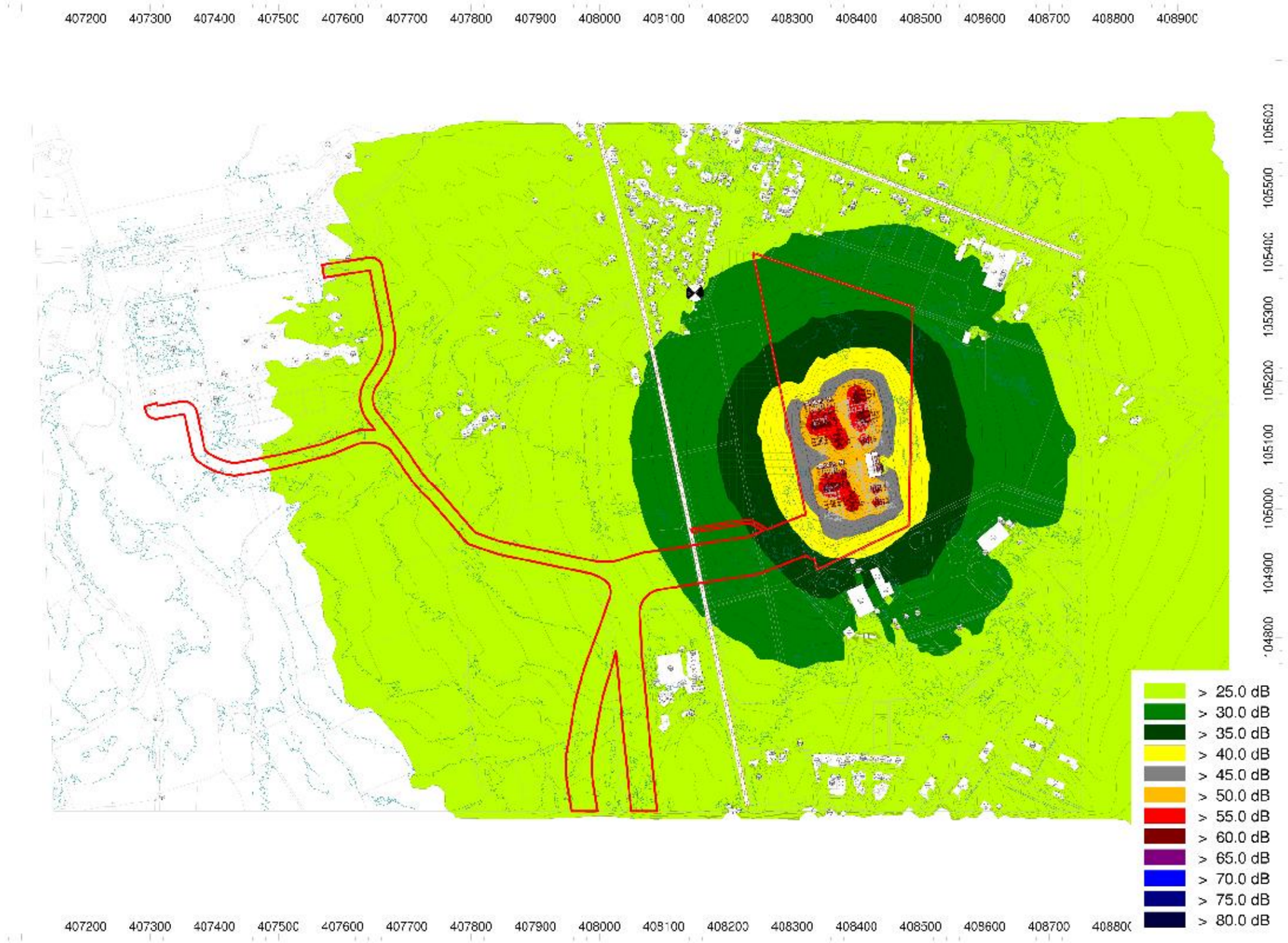
26.112. It can be seen from Table 26.20 that the rating noise level at the nearest residential receptor is 35 dB(A), which is 5 dB(A) above the 30 dB(A) background noise level. Based on a **high** receptor sensitivity for residential properties and a **low** magnitude of effect, the operational noise levels from the onshore substation would constitute an impact of **minor** significance at the surrounding residential properties. This impact is therefore considered to be **Not Significant**.

26.113. The predicted noise levels at the Ministry of Defence (MOD) buildings to the south of the onshore substation site are not considered sufficient to compromise the functionality of the receptor. Based on a **low** receptor sensitivity for buildings of an industrial nature and a **medium** magnitude of effect, the operational noise levels from the onshore substation would constitute an impact of **minor** significance at the Ministry of Defence buildings. This impact is therefore considered to be **Not Significant**.

26.114. Mitigation measures are being identified in discussion with relevant statutory consultees which will seek to minimise predicted impact.

# Navitus Bay Development Ltd

## Onshore Substation Noise Contour Plot (With Mitigation)




**Legend**

- > 25.0 dB
- > 30.0 dB
- > 35.0 dB
- > 40.0 dB
- > 45.0 dB
- > 50.0 dB
- > 55.0 dB
- > 60.0 dB
- > 65.0 dB
- > 70.0 dB
- > 75.0 dB
- > 80.0 dB

| | | |
|---|---|---|
| **Fig. No.:** Figure 26.5 | | **Date:** 19/06/2013 |
| **Author:** CB | **Checked:** MU | **Approved:** RB |
| **Scale@A3:** Not to Scale | | **Revision No.:** 00 |
| **Coordinate System:** British National Grid | | **Data Sources:** OS Noise Prediction Model Design Team |
| **Datum:** OSGB 1936 | **Ref. No.:** 61030937/RAM | |

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## Glossary

| TERM | DEFINITION |
|---|---|
| **A-weighting, dB(A)** | The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies. |
| **Decibel (dB)** | A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds $s_1$ and $s_2$ is given by 20 log10 ($s_1/s_2$). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa. |
| **Displacement, Acceleration and Velocity**<br>**Root Mean Square (r.m.s.) and Peak Values**<br>**Peak Particle Velocity (PPV)** | Vibration is an oscillatory motion. The magnitude of vibration can be defined in terms of displacement (how far from the equilibrium position that something moves), velocity (how fast something moves), or acceleration (the rate of change of velocity). When describing vibration, one must specify whether peak values are used (i.e. the maximum displacement or maximum velocity) or r.m.s. / r.m.q. values (effectively an average value) are used. Standards for the assessment of building damage are usually given in terms of peak velocity (usually referred to as Peak Particle Velocity, or PPV), whilst human response to vibration is often described in terms of r.m.s. or r.m.q. acceleration. |
| **Fast Time Weighting** | An averaging time used in sound level meters. Defined in BS5969. |
| **Free-Field** | Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5 metres |
| **$L_{10,T}$** | A noise level index. The noise level exceeded for 10% of the time over the period T. $L_{10}$ can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. |
| **$L_{90,T}$ or Background Noise Level** | A noise level index defined as the noise level exceeded for 90% of the time over the time period T. $L_{90}$ can be considered to be the "average minimum" noise level and is often used to describe the background noise. |
| **$L_{Aeq,T}$** | A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded. |
| **$L_{max,T}$** | A noise level index defined as the maximum noise level during the time period T. $L_{max}$ is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall $L_{eq}$ noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response. |
| **Noise Level Indices** | Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out. |
| **Sound Pressure** | Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure |
| **Sound Pressure Level (Sound Level)** | The sound level is the sound pressure relative to a standard reference pressure of 20μPa ($20x10^{-6}$ Pascals) on a decibel scale. |
| **VDV** | Vibration Dose Value |

## Abbreviations

| TERM | DEFINITION |
|---|---|
| **BPM** | Best practicable means |
| **dB** | Decibel |
| **dB(A)** | A-weighting decibel |
| **CoCP** | Code of Construction Practice |
| **DOE** | Department of the environment |
| **DECC** | Department of Energy and Climate Change |
| **DEFRA** | Department for Environment, Food and Rural Affairs |
| **EDDC** | East Dorset District Council |
| **EHO** | Environmental Health Officer |
| **ES** | Environmental Statement |
| **GIS** | Gas insulated switchgear |
| **NFDC** | New Forest District Council |
| **WHO** | World Health Organisation |