8 NOISE AND VIBRATION

Introduction

8.1 This chapter presents the assessment of noise and vibration effects that could arise from the construction, operation and decommissioning of the proposed development. This chapter relates only to the terrestrial environment, with the noise and vibration effects on the marine environment covered in Chapter 6. This chapter describes: the assessment methodology; the baseline conditions at the site and surroundings; the likely environmental noise and vibration effects; and the mitigation measures required to reduce and minimise any adverse effects.

Assessment Methodology

8.2 This section sets out the legislation, planning policy context and planning guidance that is relevant to the noise and vibration assessment; the assessment methodologies and baseline forecasting methods employed and a summary of the consultation that has been undertaken. Further details of the relevant policy and guidance documentation are provided in **Appendix 8.1**.

Planning Policy Context

8.3 The following policy has been referred to within the assessment of noise and vibration effects:

- Planning Policy Wales (PPW) Edition 10;
- Planning Guidance (Wales) Technical Advice Note (TAN) 11, Noise;
- Updates to Technical Advice Note (TAN) 11: Noise; and
- Pembrokeshire County Council Local Development Plan (LDP).

Relevant Guidance

8.4 The following legislation and guidance have been referred to within the assessment of noise and vibration effects:

- Part III of the Control of Pollution Act 1974 (CoPA);
- The Environmental Protection Act 1990 (EPA);
- BS 5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites - Part 1: Noise';
- BS 5228-2:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites - Part 2: Vibration';
- BS 4142:2014 'Methods for rating and assessing industrial and commercial sound';
- BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings';

- BS 6472-1:2008 'Guide to evaluation of human exposure to vibration in buildings. Part 1: Vibration sources other than blasting';
- Calculation of Road Traffic Noise (CRTN); and
- Design Manual for Roads and Bridges (DMRB).

Study Area

8.5 A study area of 500 m from the site boundary has been considered in the assessment. The following noise and vibration sensitive receptors (NVSRs) have been identified within this area:

- South Pembrokeshire Hospital and Surehaven Pembroke Hospital, Fort Road (located circa 30 m to the south of the site boundary);
- residential properties on Martello Road, St Patrick's Hill, Southampton Row and Victoria Road (located circa 60 m to 200 m to the south of the site boundary);
- residential properties in Llanreath (located circa 250 m to 500 m to the south-east of the site boundary);
- commercial properties in The Terrace (located circa 80 m to the east of the site boundary);
- residential properties on Catalina Avenue, Mellville Street, Mellville Terrace, Cumby Terrace, Princes Street, Market Street and Co-op Lane (located circa 100 m to 450 m to the south-east of the site boundary); and
- residential properties on Commercial Row and streets to the west (circa 400 m to 500 m east of the site boundary).

Baseline Methodology

8.6 Three sound level meters (SLMs) were set out for one week between 25th September 2018 and 2nd October 2018 to determine the ambient levels of the noise environment in the vicinity of the identified receptors. These meters were located at 1 Catalina Avenue (LT1), 31 St Patricks Hill (LT2) and 15 King Street (LT3), and they began logging data at 11:30, 12:30 and 14:00 hours respectively.

8.7 1 Catalina Avenue is located adjacent to Melville Terrace, approximately 80 m east of South Pembrokeshire Hospital and 140 m south of the site. The SLM was set up next to a fence 1 m from the northern façade of the house. Walls to the north of the property approximately 2.5 m high provide some screening of the site and the ground to site is generally flat and hard-surfaced.

8.8 31 St Patricks Hill, known as "Yate Rocks", is located approximately 130 m south of the site and immediately south of the hospital grounds. The SLM was set up in the middle of the back garden approximately 5 m from the northern façade of the house. The garden is approximately 25 m above sea level and the ground slopes down to site. The intervening terrain between the monitor and the site was a combination of soft and hard ground with some foliage.

8.9 15 King Street is located approximately 80 m east of the site, with some intervening hard and soft ground. The SLM was set up in the middle of the rear garden, which is bounded by hedges to the west and garages approximately 3 m tall to the south. A community hall to the west provides some screening of the site.

8.10 Sound level measurements were made using 'Class 1' Rion NL-52 sound level meters at LT1 (s/n: 610205), LT2 (s/n: 932321) and LT3 (s/n: 932321) in accordance with BS 7445-2:1991. Each microphone was mounted on a metal pole approximately 1.2 m above local ground height. The equipment calibration level was checked with a Brüel & Kjær Type 4231 calibrator (s/n: 2393954) at the beginning and end of the monitoring period and no significant deviations were found. The meters were programmed to measure various parameters including the $L_{Aeq,T}$, L_{AFmax} and $L_{A90,T}$ values, logging at contiguous 15 minute intervals throughout the monitoring period.

8.11 A data-logging weather station was co-located with the SLM at 1 Catalina Avenue to provide wind speed and direction, precipitation levels and temperature at regular intervals over the course of the survey.

8.12 The measurements conformed to the requirements of BS 7445-2:1991.

Consultation

8.13 A summary of the consultation with stakeholders and consultees is provided in Table 8.1 below. A formal request for a Scoping Opinion was submitted to Pembrokeshire County Council (PCC), which included a section regarding the noise and vibration assessment. No consultation responses were received from PCC or any other consultees. Therefore, it has been assumed that PCC is in broad agreement with the scope of the noise and vibration assessment and no further consultation has been undertaken.

Table 8.1: Consultation Responses Relevant to this Chapter

Date	Consultee and Issues Raised	How/ Where Addressed
Date	**Consulteee and Issues Raised**	**How/ Where Addressed**
28 June 2018	PCC, NRW No noise and vibration issues raised on Scoping Report	n/a

Assessment Criteria and Assignment of Significance

Receptor Sensitivity

8.14 Table 8.2 summarises the definitions of receptor sensitivity for the proposed development.

Table 8.2: Definitions of Sensitivity of Receptors

Sensitivity	Typical Descriptors
Very High	Very high importance and rarity, international scale and very limited potential for substitution.
High	High importance and rarity, national scale, and limited potential for substitution.
Medium	High or medium importance and rarity, regional scale, limited potential for substitution.
Low	Low or medium importance and rarity, local scale.
Negligible	Very low importance and rarity, local scale.

8.15 The assessment criteria for determining the magnitude of impacts adopted within the following sections combine with receptors defined as being of medium sensitivity, unless particular circumstances dictate otherwise. This reflects typical sensitivity for any class of receptor. Consequently, as no atypical circumstances have been identified, residential receptors are deemed to be of medium sensitivity. The hospitals are also of typical character and therefore also of medium sensitivity.

Magnitude of Impact

8.16 The criteria for determining the magnitude of impact vary for the construction and operational phases and are dependent upon the nature of the source. Therefore, there is not one fixed set of criteria that apply in all circumstances. The general criteria in Table 8.3 have been applied throughout the assessment, although more specific guidance has been applied to various parts of the assessment as outlined in the sections below.

Table 8.3: General Definitions of Magnitude of Impact

Sensitivity	Typical Descriptors
High	A major shift away from baseline conditions. A change large enough to be noticeable and very disruptive, depending on baseline conditions and the context. The noise/vibration causes a material change in behaviour and/or attitude. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.
Medium	A moderate shift away from baseline conditions. A change large enough to be noticeable and may be disruptive, depending on baseline conditions and the context. Noise/vibration can be heard/felt and causes small changes in behaviour and/or attitude. Affects the acoustic character of the area such that there is a perceived change in the quality of life.
Low	A minor shift away from baseline conditions. A change large enough to be noticeable and may be intrusive, depending on baseline conditions and the context. Noise/vibration can be heard/felt, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.
Negligible	Very little change from baseline conditions. A change small enough such that it is unnoticeable or unlikely to be intrusive, depending on baseline conditions and the context.
No change	No change to baseline conditions.

Construction Noise and Vibration

8.17 Noise effects have been assessed with reference to BS 5228-1:2009+A1:2014. The Standard provides guidance, information and procedures on the control of noise from construction sites and promotes a 'Best Practicable Means' (BPM) approach to control noise.

8.18 Adverse effects due to construction noise associated with this type of development tend to be relatively limited. Construction noise has, therefore, been addressed qualitatively on the basis of professional judgement and experience of similar schemes. Potential effects have been determined based on the semantic scale provided in Table 8.3.

8.19 Vibration effects have been assessed with reference to BS 5228-2:2009+A1:2014. The Standard provides guidance, information and procedures on the control of noise from construction sites and promotes a BPM approach to control vibration.

8.20 Vibration from construction activities, particularly piling and vibratory compaction, may impact on adjacent buildings and occupants; however, given the minimum distances to the nearest buildings, it is considered most unlikely that adverse effects would occur. Furthermore, it is considered unlikely that percussive piling methods, which have the greatest potential to cause adverse effects, would be used in the construction of the proposed development. Construction vibration has therefore been addressed qualitatively on the basis of professional judgement and experience of similar schemes. Potential effects will be determined based on the semantic scale provided in Table 8.3.

Operational Plant and Site Traffic

8.21 Sound immissions from the development have been predicted at the nearest NVSRs identified in paragraph 10.5. For each group of NVSRs, a single location has been modelled, which is representative of the closest NVSRs to the site within that group.

8.22 Predictions have been carried out using SoundPLAN Version 8.0 sound modelling software utilising the propagation method contained in ISO 9613-2:1996 'Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation'. Source data have been derived from a combination of typical plant data published in BS 5228-1:2009+A1:2014 and measurements carried out by RPS of similar operations on other sites. The building façades would be constructed of standard Kingspan insulated panels. Details of the source data and building façade specifications used for the assessment are provided in **Appendix 8.2**.

8.23 The site currently has no restrictions in relation to operations such that it can operate on a 24/7 basis. Therefore, as a worst-case, it has been assumed that night-time operations would be the same as daytime operations. Percentage use times have been applied and are provided in **Appendix 8.2**. Predictions have been made at ground and first floor level, and the maximum predicted sound level for each NVSR has been used for the assessment.

Residential NVSRs

8.24 Noise effects on residential properties due to the operation of the proposed development have been assessed according to the guidance in BS 4142:2014. This Standard primarily provides a numerical method by which to determine the significance of sound of an industrial nature (i.e. the 'specific sound' from the proposed development) at residential NVSRs. The specific sound level may then be corrected for the character of the sound (e.g. perceptibility of tones and/or impulses), if appropriate, and it is then termed the 'rating level', whether or not a rating penalty is applied. The

'residual sound' is defined as the ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.

8.25 BS 4142:2014 requires that the background sound levels adopted for the assessment be representative of the period/s being assessed. The Standard recommends that the background sound level should be derived from continuous measurements of normally not less than 15-minute intervals, which can be contiguous or disaggregated. However, the Standard states that there is no 'single' background sound level that can be derived from such measurements. It is particularly difficult to determine what is 'representative' of the night-time period because it can be subject to a wide variation in background sound levels between the shoulder night periods.

8.26 The approach that has been adopted for this project is to determine the background and residual sound levels in 15-minute periods and take the average of each period. Further information regarding the determination of ambient and background sound levels is provided under 'Baseline Conditions'.

8.27 The specific sound levels have been determined separately in terms of the $L_{Aeq,T}$ index over a period of T = 1-hour during the daytime and T = 15-minutes during the night-time. Daytime is typically between 07:00 and 23:00 hours and night-time is typically between 23:00 and 07:00 hours, so these periods have been adopted for this assessment.

8.28 At each NVSR, the rating level has been determined from the predicted specific sound level. Where RPS has considered it to be appropriate, a rating penalty has been applied for tonality, impulsivity and/or intermittent specific sounds as described in the commentary to paragraph 9.2 of BS 4142:2014. This has been applied with consideration for the main sound sources from site that contribute to the level of specific sound at the NVSR location.

8.29 As per the requirements of the standard, an initial estimate of the impact of the specific sound has been obtained by subtracting the measured background sound level from the rating level of the specific sound. Table 8.4 provides the initial evaluation of impact following this method.

Table 8.4: General Definitions of Magnitude of Impact

Magnitude	Typical Descriptors
High	Difference between Rating Level and Background Level of more than +10 dB.
Medium	Difference between Rating Level and Background Level of +5 to +10 dB.
Low	Difference between Rating Level and Background Level of 0 dB to +5 dB.
Negligible	Difference between Rating Level and Background Level of less than 0 dB.
No change	Difference between Rating Level and Background Level of less than - 10 dB.

8.30 Following the initial evaluation of impact, the context of the sound has also been considered, which is a key requirement of the Standard. In evaluation of the context, the following factors have been considered:

- the absolute level of the sound;
- the character and level of the residual sound compared to the character and level of the specific sound; and

- the sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions.

8.31 The evaluation of the magnitude of noise impacts at receptors has been amended following consideration of the above contextual factors.

Non-Residential NVSRs

Hospitals

8.32 Noise effects on hospitals have been considered with respect to the guidance in HTM-08-01 'Health Technical Memorandum 08-01: Acoustics'. Table 1 of HTM-08-1 provides criteria for noise intrusion from external sources in various spaces within medical facilities. This specifies levels of 40 dB $L_{Aeq,30mins}$ for standard treatment rooms and wards during the daytime, and of 35 dB $L_{Aeq,30mins}$ for wards during the night-time. Assuming a window would provide a sound reduction of 15 dB, the maximum sound immission that would not result in an exceedance of these guideline levels would be 55 dB $L_{Aeq,30mins}$ during the daytime and 50 dB $L_{Aeq,30mins}$ during the night-time.

8.33 The predicted noise levels from the operation of the proposed development at the hospitals has been added to the baseline ambient sound level. Where the combined sound level exceeds the external levels stated above this is considered to result in a medium or high impact depending upon the level of exceedance, and effects would be significant. Where the combined sound level is below the levels stated above, this is considered to result in a negligible or low impact, depending upon the change in the ambient sound level, and effects would not be significant.

Commercial Receptors

8.34 Noise effects on commercial receptors have been considered with respect to the guidance in BS 8233:2014. Table 6 of BS 8233:2014 provides guideline noise levels for non-domestic buildings. This specifies levels of between 35 and 45 dB $L_{Aeq,T}$ for office spaces depending upon the specific use of the space. Assuming a window would provide a sound reduction of 15 dB, the maximum sound immissions that would not result in an exceedance of these guideline levels would be between 50 and 60 dB $L_{Aeq,T}$.

8.35 The predicted noise levels from the operation of the proposed development at commercial receptors has been added to the baseline ambient sound level. Where the combined sound level exceeds the range of external sound levels stated above this is considered to result in a medium or high impact depending upon the level of exceedance, and effects would be significant. Where the combined sound level is below the range of external sound levels stated above, this is considered to result in a negligible or low impact, depending upon the change in the ambient sound level, and effects would not be significant. Where the combined noise level sits within this range, the effects will be considered either significant or not significant, depending upon the overall change in noise levels.

Off-site Operational Traffic

8.36 The noise changes identified in Table 8.5 below have been used to determine the magnitude of noise effects associated with construction traffic on the local road network and from temporary

diversion routes resulting from construction of the proposed development. These are based on the guidance in DMRB, Volume 11, Section 3, Part 7 'Noise and Vibration' (Highways Agency et al 2011, now Highways England), for the classification of magnitude of noise effects in the short-term and long-term.

Table 8.5: Magnitude of Impact for Operational Traffic Noise in the Long Term

Predicted Change In $L_{Aeq,T}$ or $L_{A10,T}$	Magnitude of Impact
0 dB	No change
Increase of 0.1 to 2.9 dB	Negligible
Increase of 3 to 4.9 dB	Low
Increase of 5 to 9.9 dB	Medium
Increase of more than 10 dB	High

8.37 The magnitude of effect is considered to be 'Very Low' at NVSRs if noise levels are sufficiently low such they do not have the potential to cause or contribute to some harmful or otherwise unwanted effect. Similarly, a small change in noise level where noise levels are already high would result in a greater magnitude of effect than those above. Consequently, the absolute levels of road traffic noise have also been considered in terms of guidance contained within the WHO 'Guidelines for Community Noise' and the Noise Insulation Regulations (NIR).

8.38 The NIR provides a $L_{A10,18h}$ level above which insulation would be offered, assuming other factors are satisfied. This level applies to permanent traffic or construction traffic where the road is being altered or built and, therefore, the need to provide noise insulation does not apply here. However, they have been used to evaluate significance. For daytime traffic, the combined traffic noise level from the new or altered highway together with other traffic in the vicinity must not be less than 68 dB $L_{A10,18hr}$ and the contribution to the increase in the relevant noise level from the new or altered highway must be at least 1 dB. This corresponds to a free-field level of 63 dB $L_{Aeq,16h}$. Therefore, a change in traffic noise levels of greater than 3 dB would result in a 'medium' magnitude of effect, and a change of 5 dB would result in a 'high' magnitude of effect if the combined traffic noise level exceeds 63 dB $L_{Aeq,16h}$.

8.39 The WHO 'Guidelines for Community Noise' provides guidance on noise levels for typical situations. For daytime external noise levels, it is considered that:

'To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55 dB L_{Aeq} on balconies, terraces, and outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50 dB L_{Aeq}. Where it is practical and feasible, the lower outdoor sound level should be considered the maximum desirable sound level for new development.'

8.40 Based on this guidance, noise effects from road traffic are only considered to be significant if the traffic noise level exceeds a level of 50 dB $L_{Aeq,16hr}$. Below this level, the magnitude of effect is at most 'very low' from this source alone.

8.41 New guidance was issued by the WHO in 2018. The guidelines are intended to provide recommendations for protecting human health from exposure to environmental noise originating

from various sources: transportation noise (road traffic, railway and aircraft), wind turbine noise and leisure noise. For traffic noise, the guidelines recommend reducing noise levels produced by road traffic noise to below 53 dB L_{den} and 45 dB L_{night}.

8.42 The WHO guidelines utilise the L_{den} and L_{night} parameters which are annual average noise levels excluding the effect of the façade. Averaging variations in traffic flow and meteorological effects over a period of a year the annual average noise level would be lower than the noise level under conditions favourable to sound propagation or during the peak traffic assessed as part of this study.

8.43 The use of yearly average parameters is a fundamental aspect of the WHO guidance. The thresholds are based on potential health effects at population level due to long-term exposure to noise. It follows that it is unlikely that exposure to higher levels of noise over a shorter period of time would result in the same health impacts. In addition, it cannot be assumed that thresholds applicable at population level for the purpose of making strategic decisions on long-term transportation policy can be applied directly to assessing the potential significance of noise on a single property due to a project of limited duration.

8.44 Furthermore, the WHO guideline values give the lowest threshold noise levels below which the occurrence rates of particular effects can be assumed to be negligible. Exceedances of the WHO guideline values do not necessarily imply significant noise impact and, indeed, it may be that significant impacts do not occur until much higher degrees of noise exposure are reached.

Significance of Effects

8.45 The assessment of significance is based on the matrix provided in Table 8.6.

Table 8.6: Assessment Matrix

Sensitivity	Magnitude of Impact				
	No Change	Negligible	Low	Medium	High
Negligible	No change	Negligible	Negligible or Minor	Negligible or Minor	Minor
Low	No change	Negligible or Minor	Negligible or Minor	Minor	Minor or Moderate
Medium	No change	Negligible or Minor	Minor	Moderate	Moderate or Major
High	No change	Minor	Minor or Moderate	Moderate or Major	Major or Substantial
Very High	No change	Minor	Moderate or Major	Major or Substantial	Substantial

8.46 Where the matrix offers more than one significance option, professional judgement has been used to decide which option is most appropriate.

8.47 Effects that are moderate, major or substantial are considered to be significant with respect to the EIA Regulations. Negligible and minor effects are not significant.

8.48 The broad definitions of the terms used should be in line with the following:

- Substantial: Only adverse effects are normally assigned this level of significance. They represent key factors in the decision-making process. These effects are generally, but not

exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category.

- Major: These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process.
- Moderate: These beneficial or adverse effects may be important but are not likely to be key decision-making factors. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse effect on a particular resource or receptor.
- Minor: These beneficial or adverse effects may be raised as local factors. They are unlikely to be critical in the decision-making process but are important in enhancing the subsequent design of the project.
- Negligible: No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

Limitations of the Assessment

Baseline Noise Monitoring

8.49 For surveys, there are limitations associated with: the instrumentation itself; and the use of instrumentation, i.e. the measurements. Uncertainty due to instrumentation error has been significantly reduced with the introduction of modern instrumentation and is reduced further by ensuring that all instrumentation is calibrated before and after each measurement period and is within accepted formal calibration intervals. Every effort has been made to reduce the uncertainty of the baseline sound level measurements, by carrying out the baseline sound level survey over a period of several days and allowing analysis of how representative the baseline data is given the naturally varying noise levels at the site.

Noise Modelling and Calculations

8.50 For noise modelling and calculations, there are limitations in the source data used and the sound propagation model or calculation method.

8.51 Operational sound emissions from the development have been determined from the data within BS 5228-1:2009+A1:2014 or from measurements made by RPS of similar plant and facilities. Therefore, these data are estimates of realistically achievable sound levels although the final plant installed within the application site may vary from that which has been modelled.

8.52 Sound immissions at NVSRs have been calculated using the prediction methodology in ISO 9613-2:1996. ISO 9613-2 is widely used for the prediction of industrial noise. For source heights up to 30 m and prediction distances between 100 m and 1000 m, ISO 9613-2:1996 claims accuracy of +/- 3dB.

8.53 The assessment of noise from road traffic is limited to the traffic data provided. Further details of the assumptions used in deriving the traffic data are provided in Chapter 11 (Transportation).

8.54 The CRTN calculation method is based on free-flowing traffic on main roads and typical noise levels from cars and HGVs within 1988. It is unlikely that traffic will always be free-flowing within the vicinity of the development. Vehicles have also changed since the time that the methodology was drafted and, typically, it is expected that HGVs in particular will be quieter. Therefore, the predictions of absolute noise levels produced by road traffic have the potential to be higher than road traffic noise levels will be in practice. Predictions of changes in noise levels are therefore likely to be fairly robust.

Assessment of Effects

8.55 The acoustics standards and guidance adopted for the assessment of effects are based on the subjective response of the majority of the population. This is considered to be the best that can be achieved in a population of varying subjective responses, which are dependent upon a wide range of factors.

8.56 On the basis of the above, it is considered that limitations to the assessment have been minimised and that the results provide a robust estimate of the likely noise effects of the development.

Baseline Environment

8.57 Observations were made of the acoustic environment at the time of setting up and collecting the SLMs.

8.58 The acoustic environment at 1 Catalina Avenue was dominated by road traffic. A low-level hum, movement alarms and a horn from the Port were audible when the road became quiet. Other noise sources included wind in flora and conkers dropping from a tree 5 to 10 m away.

8.59 The acoustic environment at 31 St Patricks Hill was quiet and dominated by a combination of wind in flora and a low frequency hum that appeared to originate from the Port. Other noted noise sources were: insects; road traffic and horns to the east; an aeroplane overhead; strimming and mowing in the distance; glass tipping and impulses from the Port area; lifting and loading noises from a nearby highway maintenance crew; and dogs barking.

8.60 The acoustic environment at 15 King Street was dominated by road traffic. Other noted sources of noise were: a ship and alarms at the Port; wind in flora; dogs barking; and pedestrian conversation.

8.61 Rain was detected between 01:00 and 01:45 hours on 2nd October 2018, so this data has been excluded from the results. A façade correction of +3 dB has been applied to measurements at LT1.

8.62 A summary of the measured data is provided in Table 8.7 below. These have been derived from the arithmetic average of the survey data, analysed in 15-minute periods. Data are rounded to the nearest whole number. Graphical plots of the survey data and further details of the survey are provided in **Appendix 8.3**.

Table 8.7: Measured Baseline Sound Levels

Period	Noise Survey Metric	Location		
		LT1 1 Catalina Avenue	LT2 31 St Patrick's Hill	LT3 15 King Street
Daytime (07:00 - 23:00)	Ambient sound level, dB $L_{Aeq,T}$	55	43	48
	Background sound level, dB $L_{A90,T}$	38	37	40
	Ambient sound level, dB $L_{Aeq,T}$	42	37	41

Night-time (23:00 - 07:00)	Background sound level, dB $L_{A90,T}$	33	35	33

8.63 Baseline sound levels have been characterised for the NVSRs provided in paragraph 8.5 of this ES chapter, as summarised in Table 8.8 below.

Table 8.8: Representative Baseline Sound Levels at NSRs.

Group of Receptors	Baseline Location	Background Sound Level $L_{A90,T}$ dB		Ambient Sound Level $L_{Aeq,T}$ dB	
		Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
South Pembrokeshire Hospital, Fort Road	LT1	38	33	55	42
Surehaven Pembroke Hospital, Fort Road	LT1	38	33	55	42
Residential properties on Martello Road, St Patrick's Hill, Southampton Row and Victoria Road and Llanreath	LT2	37	35	43	37
Commercial properties in The Terrace	LT1	38	33	55	42
Residential properties on Catalina Avenue, Mellville Street, Mellville Terrace, Cumby Terrace, Princes Street and Market Street	LT1	38	33	55	42
Residential properties on Commercial Row, Co-op Lane and streets to the west	LT3	40	33	48	41

Future Baseline Conditions

8.64 The future baseline traffic data indicate that there would be an increase in baseline noise levels from road traffic due to natural growth. However, the increases are low and are only likely to influence the assessment of operational noise effects from off-site road traffic and have, therefore, only been included within that assessment.

8.65 The 2017 EIA Regulations require consideration of how climate change would influence the future baseline. There is no established relationship between climate change and noise and/or vibration effects, so this is not considered relevant to this chapter.

Mitigation Measures Adopted as Part of the Project

Demolition and Construction Phase Mitigation

8.66 Demolition and construction works would follow Best Practicable Means (BPM) outlined in Section 72 of the Control of Pollution Act 1974 (as amended) (HMSO 1974) to minimise noise and vibration effects. Such details would be included within a Construction Environmental Management Plan (CEMP) to be submitted to PCC prior to commencement of construction activities and following the appointment of a contractor. These will be based upon the guidance contained in BS 5228-1:2009+A1:2014 and BS 5228-2:2009+A1:2014:

- **Communication:** Occupiers of residential and business properties that are likely to be affected by the works will be notified in advance of the works. A Construction Liaison Officer would be

appointed to take primary responsibility for the day-to-day implementation of the CEMP during the construction phase and to act as the first point of contact on environmental matters for PCC, other external bodies and the general public. Information regarding the nature and duration of the works and named contact details for key members of staff will be displayed on a noticeboard near to the site.

- **Standard Construction Hours:** Working hours would be as specified in Chapter 2 (Project Description), i.e. that in general, working hours would be 07:00 to 19:00 hours Monday to Friday, 07:00 to 13:00 hours on Saturday with no construction on Sundays or on public or bank holidays. However, some works will be tidally restricted and will, therefore, need to take place outside of these hours, as will exceptional circumstances, such as a continuous concrete pour. Works required outside of these hours would be agreed in advance with PCC and appropriate measures would be taken to avoid exceeding agreed noise levels. In such instances, the contractor may be required to apply to PCC for written consent prior to work commencing by submitting a Section 61 consent application in line with the Control of Pollution Act.

- **Access Routes:** The sole construction access to the site would be from Whites Farm Way and all routes to the site entrance would be agreed with PCC prior to commencement of construction. Full details of construction access routes are provided in Chapter 11 (Transportation).

- **Equipment:** Quieter alternative methods, plant and equipment would be used, where reasonably practicable.

- **Worksite:** Plant, equipment, site offices, storage areas and worksites would be positioned away from existing NVSRs, where reasonably practicable.

- **Hoardings:** Site hoardings will be installed along the site boundary prior to any works commencing. Portable acoustic enclosures/screens will also be used, as required.

- **Maintenance:** All vehicles, plant and equipment would be maintained and operated in an appropriate manner, to ensure that extraneous noise from mechanical vibration, creaking and squeaking is kept to a minimum.

- **Piling:** The method for any piling activities would be agreed in consultation with PCC prior to work commencing and would be undertaken using the most appropriate technique, with minimal noise and vibration generation in mind.

Operational Phase Mitigation

8.67 In order to reduce noise levels, the following mitigation measures for noise have been incorporated into the design of the concrete batching plant in Area D:

- The concrete batching plant has been positioned in an enclosure, with an entry point to the north, i.e. away from receptors; and

- a 5 m retaining wall or fence will be installed along the southern boundary of the site.

8.68 In practice, the batching plant may be relocated in an alternative part of the site. It's location in Area D presents the worst-case scenario as this is the closet part of the site to the NVSRs, which are to the south. The batching plant is also likely to be a temporary installation when in use and may differ in type to the one considered in the assessment. Taking all of these factors into consideration, the final mitigation measures for the concrete batching plant may vary from those provided within this ES Chapter.

Assessment of Construction Effects

8.69 Details of the construction of the development are provided in Chapter 2 (Project Description).

8.70 For each phase, noise emissions are likely to be highest at the early stages of works, i.e. during demolition, site/ground preparation and civils works, and decrease during the plant and building erection and fit-out stages.

8.71 For the majority of the demolition and construction period, plant on-site would comprise various diesel mechanised construction plant including excavators (with various tool attachments depending upon the task being undertaken), dump trucks, telehandlers, mobile cranes and delivery lorries.

8.72 Demolition works would require the use of concrete breakers. Construction of hardstanding areas, roads and building foundations would require concrete mixers and pumps, as well as concrete rollers and vibrators. In addition, a concrete batching plant and concrete crushing plant would be in use intermittently during the demolition and construction works.

8.73 It is anticipated that bored or driven precast concrete piling will be required for building foundations. In general, other methods of piling are likely to produce the same level of noise or lower, so the above methods would produce the worst case piling noise emissions from the site. As foundation loadings are not high for the majority of the development, the need for driven piling is expected to be limited and alternative methods will be employed where possible.

8.74 There are three proposed new buildings on site. Building A is located in the south-west corner of the site, around 80 m from the nearest NVSR on Martello Road. Building B is located to the north of the site, around 400 m from the nearest NVSR (South Pembrokeshire Hospital) to the south of the site. Building C is located in the south-east corner of the site approximately 30 m from Surehaven Pembroke Hospital to the south.

8.75 Dredging would be required for the extended slipway. The slipway would then be formed of precast concrete units. Dredging vessels can generate high levels of noise. However, as this activity would be to the north of the site, some 600 m away from the nearest NVSRs, it is unlikely to result in significant impacts at NVSRs. Furthermore, dredging is more likely to be undertaken by a pontoon mounted backhoe excavator than a dredger.

8.76 With reference to paragraph 8.5 of this chapter, the closest existing NVSRs to the site are South Pembrokeshire Hospital and Surehaven Pembroke Hospital both approximately 30 m to the south of the site on Fort Road. The nearest residential properties are around 60 m to 100 m from the site,

to the south on Martello Road and Southampton Row and the south-east on Melville Terrace. There are also commercial properties to the east on The Terrace.

8.77 Table 8.5 of this chapter confirms that baseline ambient noise levels are relatively low in the area and **Appendix 8.4** includes relevant meteorological information at the time of the survey work. Therefore, noise from construction activities is likely be noticeable at the nearest NVSRs. It is likely that noise from construction works would exceed these levels by a significant margin at times, particularly during construction of Buildings A and C and during other works to the south of the site. However, noise generating works would be intermittent and therefore, on average, would likely be felt as a minor shift from baseline conditions, and are unlikely to result in any changes to behaviour or attitude. Furthermore, noise from construction activities would be controlled through mitigation which would be enforced through the CEMP.

8.78 Driven precast concrete piling has the potential to cause vibration. However, the propagation of ground-borne vibration is subject to significant losses due to the distances between the site and NVSRs and the varying densities of the subsurface geology and are therefore unlikely to be perceptible at distances of 200 m from the site construction activity. There is potential for levels of vibration to be noticeable and intrusive at the nearest NVSRs to Building A on Martello Road and to Building C at South Pembrokeshire Hospital and Surehaven Pembroke Hospital. However, the vibration would be for a relatively short period and at a level that would be tolerable with prior notification of the exposure and likely duration. Therefore, the magnitude of effect from vibration would be low and the significance of effect would be minor. It should be confirmed whether there is any vibration sensitive equipment in the hospitals, as if there is, then specific vibration mitigation measures may need to be put in place to protect this equipment.

8.79 In summary, it is unlikely that construction works will generate noise levels at NVSRs that are disturbing or that affect activities commonly occurring in residential areas. Noise levels are likely to be noticeable for limited and short durations when significant works such as piling are being undertaken. Vibration may be perceptible at the closest NVSRs to the site but is unlikely to be at a level that would be intrusive. Construction activities will take place to a predetermined schedule following the BPM measures stated within the mitigation section above. There would be very little change to the evening, night-time or weekend baseline noise conditions, as most construction activities will be outside of these more sensitive periods.

8.80 With reference to Table 8.3, the magnitude of noise impacts, prior to mitigation, would be low. The sensitivity of receptors is medium. Therefore, there is likely to be a direct, temporary, medium-term noise effect on NVSRs of minor adverse significance prior to the implementation of mitigation measures. The magnitude of vibration impacts, prior to mitigation, would be negligible to low. The sensitivity of receptors is medium. Therefore, there is likely to be a direct, temporary, medium-term vibration effect on NVSRs of negligible to minor adverse significance prior to the implementation of mitigation measures.

Further Mitigation

8.81 Reasonable mitigation for noise and vibration from construction effects has been provided by applying BPM as outlined within the mitigation measures adopted as part of the project in paragraph 8.66. With this mitigation in place, construction noise and vibration effects are expected to be minor

adverse and of a temporary nature. On this basis, it is not expected that there will be a need for further mitigation measures to be employed.

Future Monitoring

8.82 Noise and vibration monitoring could be carried out during construction works in accordance with the 2017 EIA Regulations where there is a requirement to actually determine effects to ensure that those occurring are no worse than those predicted. This could either comprise short-term measurements or monitoring over a longer period via a remote access noise monitor with set noise thresholds. Procedures for noise monitoring would be discussed and agreed with PCC and provided in the CEMP. Monitoring may also be carried out to address any complaints that may occur.

Accidents

8.83 Some operational accidents may cause an instantaneous increase in noise levels. However, the likelihood of an accident occurring that would result in a noise or vibration effect is very low.

Assessment of Operational Effects

Noise from Plant and Equipment on Site

8.84 The predicted noise levels from the site are provided in **Appendix 8.3**. Noise contour plots are provided in **Figures 8.1** and **8.2** for the daytime and night-time periods, respectively.

8.85 An assessment has been carried out at the closest NSRs to the site for both the daytime (07:00 to 23:00 hrs) and night-time (23:00 to 07:00 hrs) periods. For residential receptors, the assessment has been carried out in accordance with BS 4142:2014. For the health facilities, an assessment has been carried out based on the guidance in HTM 08-01. For commercial receptors, an assessment has been carried out based on the guidance in BS 8233:2014.

Residential NSRs

8.86 Noise from the plant on the proposed development would be from a number of sources, which it is assumed would all operate simultaneously, and there is no individual item of plant that would be readily distinctive enough to attract attention. Therefore tonal, impulsive or other sound characteristics are unlikely to occur off-site. Accordingly, no character correction has been applied to the specific sound level which becomes the rating level of noise from the plant in this case.

8.87 Calculations have been made at the closest receptors as described in paragraph 8.5 of this chapter. The results of the BS 4142:2014 assessments for the daytime and the night-time periods are provided in Tables 8.9 and 8.10 below.

Table 8.9: Daytime Assessment of Noise at Residential Receptors

1. Receptor	2. Predicted Specific Sound Level $L_{Aeq,T}$ dB	3. Background Sound Level $L_{A90,T}$ dB	4. Rating Level $L_{Ar,Tr}$ dB	5. Difference Between Rating and Background Sound Level dB	6. Residual Sound Level $L_{Aeq,T}$ dB	7. Total Sound Level Specific Plus Residual $L_{Aeq,T}$ dB	8. Change in Noise Level dB
St. Patrick's Hill	46	37	46	+8*	43	47	+5*
Catlina Avenue	42	38	42	+4	55	55	0

Commercial Row	40	40	40	+1*	48	49	+1
Martello Road	48	37	48	+11	43	49	+6
*Integer values may vary by +/- 1 dB due to rounding.							

Table 8.10: Night-time Assessment of Noise at Residential Receptors

1. Receptor	2. Predicted Specific Sound Level $L_{Aeq,T}$ dB	3. Background Sound Level $L_{A90,T}$ dB	4. Rating Level $L_{Ar,Tr}$ dB	5. Difference Between Rating and Background Sound Level dB	6. Residual Sound Level $L_{Aeq,T}$ dB	7. Total Sound Level Specific Plus Residual $L_{Aeq,T}$ dB	8. Change in Noise Level dB
St. Patrick's Hill	48	35	48	+13	37	48	+11
Catlina Avenue	43	33	43	+10	42	45	+3
Commercial Row	41	33	41	+8	41	44	+3
Martello Road	48	35	48	+14*	37	49	+11
*Integer values may vary by +/- 1 dB due to rounding.							

8.88 From Table 8.9, with the proposed development operating during the daytime, the differences between the rating and the background sound levels range between +1 dB and +11 dB at residential NVSRs. From Table 8.10, with the proposed development operating during the night-time, the difference between the rating and the background sound levels range between +8 dB and +14 dB at residential NVSRs.

8.89 The highest level difference is +14 dB, occurring at Martello Road during the night-time period. From BS 4142:2014, the relevant commentary is:

'A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.'

8.90 BS 4142:2014 goes on to state that the following are pertinent factors when considering the context of the sound:

- the absolute level of the sound;
- the character and level of the residual sound compared to the character and level of the specific sound; and
- the sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions.

8.91 Furthermore, it states in the scope of BS 4142:2014 that outdoor levels should be used to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident; and under the assessment of the impacts section (page 17), it states:

- *"adverse impacts include, but are not limited to, annoyance and sleep disturbance…"*

8.92 Column 7 of Tables 8.9 and 8.10 sets out the absolute levels of sound, when the specific sound is added to the residual sound level range between 47 and 55 dB $L_{Aeq,T}$ during the daytime and between 44 and 49 dB $L_{Aeq,T}$ during the night-time. At Catalina Avenue and Commercial Row, the specific sound level generated from the proposed development (column 2) is broadly the same or lower than the residual sound levels (column 6), and therefore the change in noise level (column 8) is 3 dB or lower. At St. Patrick's Hill and Martello Road, the specific sound level is higher than existing residual levels and therefore there would be a change in noise level of 5 to 6 dB during the daytime and 11 dB during the night-time. Therefore, with consideration of the absolute level of sound and existing residual sound levels, it is likely that sound from the development would be distinctive above other sources of sound at NVSRs on St. Patrick's Hill and Martello Road, but not at NVSRs on Catalina Avenue or Commercial Row.

8.93 The NVSRs are currently influenced by noise from other industrial activities among other sources. With this in mind, noise arising from activities on site would be similar in character to some of the residual sound experienced at the closest NVSRs.

8.94 The third part of the contextual consideration is to determine whether residential NVSRs already incorporate design measures that secure good internal and/or outdoor conditions. BS 8233:2014 provides guidance on external and internal noise levels from external sound sources. The guidance is intended for steady-state sources such as road traffic for new or refurbished buildings and therefore sound generated by industrial sources at existing residential receptors lies outside of this guidance to some extent. However, in the absence of any specific guidance relating to absolute sound levels from industrial noise sources, the guidance in BS 8233:2014 is considered to be the most relevant guidance when considering the impact of the development on residential receptors. The guidance in BS 8233:2014 considers the following:

- daytime internal sound levels for resting;
- night-time internal sound levels for sleeping; and
- daytime external sound levels in amenity areas.

8.95 Based on the review of the area and age of residential properties, it would be reasonable to assume that there are no specific acoustic design measures incorporated into the buildings and therefore that an open window would be relied upon for ventilation. Tables 8.11 and 8.12 provide a summary of the predicted internal sound levels based on a combination of the specific sound levels and existing residual (ambient) sound levels for a standard open window for the daytime and night-time periods respectively.

Table 8.11: Assessment of Daytime External Sound Levels and Internal Sound Levels in Living Rooms

Receptor	Predicted Specific Sound Level $L_{Aeq,T}$ dB	Residual Sound Level $L_{Aeq,T}$ dB	Total Sound Level Specific Plus Residual $L_{Aeq,T}$ dB	Internal Sound Level $L_{Aeq,T}$ dB
St. Patrick's Hill	46	43	47	32

Catlina Avenue	42	55	55	40
Commercial Row	40	48	49	34
Martello Road	48	43	49	34

Table 8.12: Assessment of Night-time Internal Sound Levels in Bedrooms

Receptor	Predicted Specific Sound Level $L_{Aeq,T}$ dB	Residual Sound Level $L_{Aeq,T}$ dB	Total Sound Level Specific Plus Residual $L_{Aeq,T}$ dB	Internal Sound Level $L_{Aeq,T}$ dB
St. Patrick's Hill	48	37	48	33
Catlina Avenue	42	42	45	30
Commercial Row	41	41	44	29
Martello Road	48	37	49	33

8.96 Table 4 of BS 8233:2014 provides guidance levels for steady state continuous noise levels within residential dwellings. The respective guidance levels are 35 dB $L_{Aeq,16hour}$ or lower in living rooms during the daytime and 30 dB $L_{Aeq,8hour}$ or lower in bedrooms at night.

8.97 From Table 8.11, the daytime guideline level would be met in all locations, with the exception of Catalina Avenue. At Catalina Avenue, the existing residual sound level is not increased by noise from the development and, therefore, the high internal sound level is not due to the development.

8.98 From Table 8.13, the night-time guideline level would be met at Catalina Avenue and Commercial Row but would be exceeded by 3 dB at St. Patrick's Hill and Martello Road. Therefore, there is potential for sleep disturbance to occur at times when windows are partially open for ventilation.

8.99 With consideration of the context, the impact of noise from the proposed development is expected to be low at receptors on Catalina Avenue and Commercial Row, and medium at receptors on St. Patrick's Hill and Martello Road. The sensitivity of receptors is medium. Therefore, there is likely to be a direct, long term noise effect on NVSRs of minor to moderate adverse significance prior to the implementation of mitigation measures.

8.100 It is noted that moderate effects, where they occur, are due to the operation of the concrete batching plant, which is likely in practice to be a temporary installation for short-term use. Therefore, the above effects represent a worst-case assessment and without the batching plant in operation, effects are likely to be lower.

Healthcare Receptors

8.101 The predicted change in noise levels at South Pembrokeshire Hospital and Surehaven Pembroke Hospital are provided in Tables 8.13 and 8.14 for the daytime and night-time periods respectively. These have been compared against the guideline levels in HTM-08-01 to determine the magnitude of impact.

Table 8.13: Daytime Assessment of Noise at Healthcare Receptors

Receptor	Predicted Noise Level $L_{Aeq,T}$ dB	Existing Ambient Noise Level $L_{Aeq,T}$ dB	Total Noise Level, Existing Plus Predicted $L_{Aeq,T}$ dB	Change in Noise Level dB	Internal Noise Level $L_{Aeq,T}$ dB
South Pembrokeshire Hospital	54	55	58	+2	43
Surehaven Pembroke Hospital	51	55	57	+1	42

Table 8.14: Night-time Assessment of Noise at Healthcare Receptors

Receptor	Predicted Noise Level $L_{Aeq,T}$ dB	Existing Ambient Noise Level $L_{Aeq,T}$ dB	Total Noise Level, Existing Plus Predicted $L_{Aeq,T}$ dB	Change in Noise Level dB	Internal Noise Level $L_{Aeq,T}$ dB
South Pembrokeshire Hospital	54	42	54	+12	39
Surehaven Pembroke Hospital	51	42	52	+10	37

8.102 During the daytime period, at South Pembrokeshire Hospital and Surehaven Pembroke Hospital, there would be a change in noise levels of 1 to 2 dB. Based on a noise reduction of 15 dB from a standard double-glazed window, internal noise levels would be 42 to 43 dB $L_{Aeq, T.}$ This is above the guideline level in HTM 08-01 of 40 dB $L_{Aeq,T}$ for the daytime period.

8.103 During the night-time period, at South Pembrokeshire Hospital and Surehaven Pembroke Hospital, there would be a change in noise levels of 10 to 12 dB. Based on a noise reduction of 15 dB from a standard double-glazed window, internal noise levels would be 39 to 37 dB $L_{Aeq,T.}$ This is above the guideline level in HTM 08-01 of 35 dB $L_{Aeq,T}$ for the night-time period.

8.104 On the basis of the above, there is potential for some disturbance to daytime activities and some sleep disturbance effects at night. Therefore, the magnitude of impact is considered to be medium. The sensitivity of receptor is medium. On this basis, there would be a direct, long-term effect of moderate significance at South Pembrokeshire Hospital and Surehaven Pembroke Hospital.

8.105 It is noted that the moderate effects stated above, are due to the operation of the concrete batching plant, which is likely in practice to be a temporary installation. Therefore, the above effects represent a worst-case assessment and without the batching plant in operation, effects are likely to be lower.

Office Receptors

8.106 The predicted change in noise levels at offices on The Terrace is provided in Tables 8.15. These have been compared against the criteria in BS 8233:2014 to determine the magnitude of impact.

Table 8.16: Daytime Assessment of Noise at Office Receptors

Receptor	Predicted Noise Level $L_{Aeq,T}$ dB	Existing Ambient Noise Level $L_{Aeq,T}$ dB	Total Noise Level, Existing Plus Predicted $L_{Aeq,T}$ dB	Change in Noise Level dB	Internal Noise Level $L_{Aeq,T}$ dB
Offices on The Terrace	47	42	48	+7	41

8.107 At offices on The Terrace, there would be a change in noise levels of 7 dB. Based on a noise reduction of 15 dB from a standard double-glazed window, internal noise levels would be 41 dB $L_{Aeq,T.}$ From Table 6 of BS 8233:2014, this would be within design range for office uses. With consideration of both the noise change and absolute level of noise, the magnitude of impact is considered to be low. The sensitivity of the receptor is medium. On this basis, there would be a direct, long term effect of minor significance at offices on the Terrace.

Off-Site Road Traffic

8.108 Noise effects from traffic on the local road network have been assessed for all road links that are included within the traffic routes provided in Chapter 11 (Transportation).

8.109 Baseline traffic data have been provided for the base year (2018); and baseline and development traffic have been provided for the opening year (2020), ten years after opening (2030) and fifteen years after opening (2035). DMRB states that the baseline year should be the opening year of the project. Therefore, 2020 has been taken as a suitable baseline year for the assessment of noise from off-site road traffic. DMRB states that the future year should preferably be fifteen years following the opening of the project, or whichever year in the first fifteen years yields the greatest level of traffic. Therefore the 2035 year has been used as the future year for this assessment. An evaluation has been made of the short-term noise effect by comparing the base year (2020) with the development to the base year (2020) without the development. An evaluation has been made of the long-term noise effect by comparing the future year (2035) with the development and the base year (2020) without the development. Although not a requirement of the DMRB, the future year (2035) with the proposed development has also been assessed against the forecast traffic flows for the future year (2035) without the proposed development, to provide a realistic assessment of the noise levels and noise change arising from the development.

8.110 In summary, the following scenarios have been evaluated:

- 'Base Year (2020) with Development' minus 'Base Year (2020) without Development'.
- 'Future Year (2035) with Development' minus 'Base Year (2020) without Development'.
- 'Future Year (2035) with Development' minus 'Future Year (2035) without Development'.

8.111 A summary of the calculations and assessment is provided in **Appendix 8.5**.

8.112 The assessment for the 'Base Year (2020) with Development' minus 'Base Year (2020) without Development' indicates that there would be a noise change on one link 'Front Street' of +7.5 dB. However, as the overall predicted noise level is less than 50 dB $L_{Aeq,16hr}$, this is considered to be a low magnitude of effect. There are around 50 residential receptors on Front Street, which are of medium sensitivity and therefore experience an effect of minor significance. There are changes in noise levels of between +1 and +2.9 dB on Meyrick Owen Way, Meyrick Owen Way (west) and Meyrick Owen Way (east), which is considered to be a negligible magnitude of effect. There are no residential noise sensitive receptors on Meyrick Owen Way. However, there are commercial receptors on The Terrace, Melville Street and Commercial Row that have line-of-sight to this link, which are of low/medium sensitivity. Therefore, there could be some noise effects due to increases in traffic on Meyrick Owen Way, albeit these would be negligible. On the remaining links, the change in noise levels would be less than 1 dB, and would therefore be of negligible magnitude, resulting in a negligible significance of effect.

8.113 The assessment for the 'Future Year (2035) with Development' minus 'Base Year (2020) without Development' indicates that there would be a noise change on one link 'Front Street' of +7.6 dB. However, as the overall predicted noise level is less than 50 dB $L_{Aeq,16hr}$, this is considered to be a low magnitude of effect. There are around 50 residential receptors on Front Street, which are of medium sensitivity and therefore experience an effect of minor significance. On the remaining links, the change in noise levels would be less than 3 dB, and would therefore be of negligible magnitude, resulting in a negligible significance of effect.

8.114 The assessment for the 'Future Year (2035) with Development' minus 'Future Year (2035) without Development' indicates that there would be a noise change on one link 'Front Street' of +7.6 dB. However, as the overall predicted noise level is less than 50 dB $L_{Aeq,16hr}$, this is considered to be a low magnitude of effect. There are around 50 residential receptors on Front Street, which are of medium sensitivity and therefore experience an effect of minor significance. On the remaining links, the change in noise levels would be less than 3 dB, and would therefore be of negligible magnitude, resulting in a negligible significance of effect.

8.115 On the basis of the above, there would be effects of minor significance at around 50 residential receptors and potential minor effects at a few commercial receptors. Effects at the remaining receptors would be negligible.

Further Mitigation

8.116 As there are predicted to be moderate adverse effects during the operation of the development, then further mitigation would be required. The main contributor to noise from site operations is noise from the concrete batching plant and associated ancillary plant and equipment in Area D of the development. Therefore, the mitigation would likely require limiting activities within Area D of the proposed development within the more sensitive night-time period. As discussed under 'Operational Phase Mitigation' the assessment is based on fairly outline assumptions at this stage, and the location and type of the concrete batching plant may vary from the location and type considered in this assessment. Furthermore, the plant would only be for occasional temporary use and the exact durations of this use are yet to be determined. As such, as worst-case scenario has been assessed and appropriate mitigation measures should be determined during the detailed design stages. This can be secured through a planning condition.

Future Monitoring

8.117 Due to the potential for moderate adverse effects, it is recommended that operational noise monitoring should be provided at the nearest receptors on Martello Road, St. Patrick's Hill, South Pembrokeshire Hospital and Surehaven Pembroke Hospital in accordance with the 2017 EIA Regulations.

Accidents

8.118 Some operational accidents may cause an instantaneous increase in noise levels. However, the likelihood of an accident occurring that would result in a noise or vibration effect is very low.

Potential Changes to the Assessment as a Result of Climate Change

8.119 There is no published research into the effects of climate change on noise levels. Furthermore, all noise assessments are based on standardised meteorological conditions, with noise monitoring carried out in specific conditions. On this basis, there would be no changes to the noise and vibration assessment as a result of climate change.

Assessment of Cumulative Effects

8.120 There are two development sites within sufficiently close proximity to the proposed development that cumulative construction noise and vibration effects may occur. These are Meta Phase 1 and Martello Quays. Both of these are to the north of the proposed development and therefore further away from the receptors at which there are potential effects from the proposed development. It is unlikely, therefore, that construction of Meta Phase 1 and/or Martello Quays would result in noise and vibration effects at common receptors.

8.121 As for operation, again, the sites that are considered sufficiently close for potential cumulative operational noise and vibration effects to occur are Meta Phase 1 and Martello Quays. Martello Quays is a mixed-use development comprising residential and other uses that are compatible with residential and is therefore unlikely to result in a noise and vibration effect that is of greater than minor significance. Furthermore, the nearest receptors for Martello Quays are to the east of Pembroke Port, where effects from the operation of the proposed development are minor. Therefore, cumulative effects with the proposed development are likely to be no greater than minor.

8.122 As a planning application is yet to be submitted for Meta Phase 1, there is insufficient detail to assess the effects from this development. However, this development is to the north of Pembroke Port and therefore unlikely to result in significant effects at common receptors, which are to the south of the Port.

8.123 Cumulative operational effects from off-site traffic have been taken into account to the extent that the traffic from other developments has been included in the traffic data provided for this assessment.

Inter-relationships

8.124 The data inputs for this assessment have been informed by the outputs of the assessment of traffic and transport (see Chapter 11 (Transportation)).

Summary of Effects

8.125 This assessment has considered noise and vibration effects during the construction and operational phases of the proposed development.

8.126 During the construction phase, there is likely to be a direct, temporary, medium-term residual noise effect on NVSRs of minor adverse significance. There is likely to be a direct, temporary, medium-term residual vibration effect on NVSRs of negligible to minor adverse significance.

8.127 During the operational phase, there is likely to be a direct, long term noise effect on NVSRs of minor to moderate adverse significance prior to the implementation of mitigation measures. These effects are mainly as a result of activities occurring in Area D of the site during the night-time. Therefore, further mitigation would be required that would likely require limiting activities within Area D of the proposed development within the more sensitive night-time period. Such additional mitigation can be secured through an appropriately worded planning condition.

8.128 Noise from off-site road traffic has also been considered within the assessment and this would result in effects of minor significance at around 50 residential receptors and a limited number of commercial receptors.

8.129 Subject to suitable operational controls at the more detailed design stage to reduce the significance of effects the proposed development does not, in noise and vibration terms, conflict with national or local policies.

References

All references listed throughout the chapter are listed below:

The Stationery Office Limited (1974) Control of Pollution Act, Chapter 40, Part III

The Stationery Office Limited (1990) Environmental Protection Act, Chapter 43, Part III

Welsh Government. Planning Policy Wales (2018) Edition 10.

Technical Advice Note (TAN) 11 (1997): Noise.

Updates to Technical Advice Note (TAN) 11: Noise.

Pembrokeshire County Council (2013) Local Development Plan. Planning Pembrokeshire's Future.

British Standard 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites - Part 1: Noise.

British Standard 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites - Part 2: Vibration.

British Standard 4142 (2014) Methods for rating and assessing industrial and commercial sound.

British Standard 8233 (2014) Guidance on sound insulation and noise reduction for buildings.

Department of Health (2013) Health Technical Memorandum HTM-08-01: Acoustics.

British Standard 6472-1 (2008) Guide to evaluation of human exposure to vibration in buildings. Part 1: Vibration sources other than blasting.

Department of Transport (1988) Calculation of Road Traffic Noise. HMSO.

Highways Agency (2008) Design Manual for Roads and Bridges. Volume 11. Section 3 - Part 7: Noise and Vibration.

The Town and Country Planning (2017) Environmental Impact Assessment Regulations.

Non-Technical Summary

The potential noise and vibration effects from the construction and operation of the project are considered to be:

- Construction phase - temporary effects of noise and vibration from construction works; and the
- Operational phase –noise from plant and activities on site and noise from development traffic on the local area.

The proposed development site is located within an operational port. The surrounding area is a relatively quiet, suburban location. The main sources of sound are from activities within the Port, sea-going vessels and natural sources.

Construction and demolition plant are likely to include noise generating plant such as excavators, dump trucks, telehandlers, mobile cranes, delivery lorries, concrete breakers, concrete mixers and pumps, concrete rollers and vibrations, a concrete batching plant and concrete crushing plant. Piling will be required for building foundations and hence adverse vibration effects may also occur.

There are residential properties and two hospitals relatively close to the site and within 100 m. Therefore, without mitigation, there is potential for noise disturbance and albeit less likely, vibration disturbance as a result of construction activities. Noise and vibration would be controlled during the construction phase by means of a Construction Environmental Management Plan (CEMP), to reduce this to a minimum. If there is vibration sensitive equipment in either of the hospitals then measures to minimise impacts on this equipment may need to be taken into account in the CEMP.

During the operational phase, without suitable mitigation, there is potential for noise to arise as a result of activities within certain parts of the development that could include some minor annoyance during the daytime and sleep disturbance during the night-time. Therefore, controls will need to be secured to ensure that levels are below those that could give rise to sleep disturbance. Such controls include standard noise suppression measures and can be controlled via appropriately worded planning conditions.

Noise from traffic associated with the development would increase from baseline in some locations, so may be noticeable, but is unlikely to result in annoyance.

In summary, although there is potential for significant adverse effects to arise, with adequate controls, the construction and operation of the proposed development should not, in noise and vibration terms, conflict with national or local policies.

Table 8.16: Summary of Likely Environmental Effects due to Noise and Vibration

Receptor	Sensitivity of receptor	Description of impact	Short / medium / long term	Magnitude of impact	Significance of effect	Significant / Not significant	Notes
Construction Phase							
Residential Properties within 200 m of the site boundary (Martello Road, St Patrick's Hill, Southampton Row, Victoria Road, Mellville Terrace, Grimsby Terrace). South Pembrokeshire Hospital. Surehaven Pembroke Hospital. Commercial Properties in The Terrace.	Medium	Noise	Short-term	Low	Minor Adverse	Not Significant	
Other Receptors within study area	Medium	Noise	Short-term	Negligible	Negligible	Not Significant	
Residential Properties within 60 m of building construction works (Martello Road). South Pembrokeshire Hospital. Surehaven Pembroke Hospital.	Medium	Vibration	Short-term	Low	Minor Adverse	Not Significant	
Other Receptors within study area	Medium	Vibration	Short-term	Negligible	Negligible	Not Significant	
Operational Phase							
Residential Properties within Martello Road, St Patrick's Hill, Victoria Road. South Pembrokeshire Hospital. Surehaven Pembroke Hospital.	Medium	Noise	Long-term	Medium	Moderate Adverse	Significant	
Residential Properties on Catalina Avenue, Commercial Row and surrounds. Commercial Properties in The Terrace	Medium	Noise	Long-term	Low	Minor Adverse	Not significant	
50 residential receptors and a few commercial receptors along traffic access routes	Medium	Noise	Long-term	Low	Minor Adverse	Not significant	