A30 Chiverton to Carland Cross
TR010026

6.2 ENVIRONMENTAL STATEMENT CHAPTER 11 NOISE AND VIBRATION

Planning Act 2008

APFP Regulation 5(2)(a)
Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

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The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

A30 Chiverton to Carland Cross
Development Consent Order 201[x]

6.2 ENVIRONMENTAL STATEMENT

CHAPTER 11 NOISE AND VIBRATION

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11 Noise and Vibration

11.1 Introduction

11.1.1 This chapter of the ES describes the findings of the noise and vibration assessment of the scheme, during construction and operation.

11.1.2 A description is given of the baseline noise climate, assessment methodology, results and conclusions for the 'Detailed' assessment approach as described in DMRB HD 213/11[1].

11.2 Competent Expert

11.2.1 The Noise and Vibration lead expert holds a Diploma in Acoustics and Noise Control and an MSc in Acoustics and Noise Control, and is a Member of the Institute of Acoustics. Full details are provided in Volume 6 Document Ref 6.4 Appendix 1.1.

11.3 Legislative and policy framework

Legislation

EIA Regulations (Town and Country Planning (Environmental Impact Assessment) Regulations 2017)

11.3.1 The EIA Regulations[2] enact the amended EU directive[3] "on the assessment of the effects of certain public and private projects on the environment" and sets out the assessment requirements for certain types of planning applications in England. The regulations describe the types of project subject to a formal Environmental Impact Assessment to support the planning application, and how the process of assessment, consulting, mitigation and decision-making should be carried out.

Land Compensation Act

11.3.2 The Land Compensation Act[4] Part 1 entitles property or land owners to apply for compensation if the value of their property goes down because of pollution or disturbance from the use of a new or altered road[5].

Noise Insulation Regulations

11.3.3 The Noise Insulation Regulations (NIR)[6] define the conditions under which dwellings are eligible for noise insulation to control internal noise levels. The conditions relate to the level of traffic noise at the façade, the increase in noise levels as a result of the highway, and the contribution of the new or altered project to the noise level received at the façade. In summary, noise insulation qualification criteria require that:

- the facade noise threshold of 68dB$L_{pA10,18h}$ is met or exceeded;

[1] THE HIGHWAYS AGENCY, TRANSPORT SCOTLAND, WELSH ASSEMBLY, DRD (2011), Design Manual for Roads and Bridges Volume 11, Section 3, Part 7,HD 213/11 – Revision 1, TSO
[2] TSO, (2017) Town and Country Planning (Environmental Impact Assessment) Regulations 2017
[3] European Union Directive (2014), Directive 2014/52/EU of The European Parliament and of The Council, on the assessment of the effects of certain public and private projects on the environment.
[4] HMSO (1973), Land Compensation Act, HMSO
[5] https://www.gov.uk/compensation-road-property-value
[6] HMSO (1988), Noise Insulation (Amendment) Regulations, HMSO

- there must be a noise increase of at least 1dB(A) compared to the prevailing noise level immediately before the construction of a highway or an additional carriageway were begun;
- the noise caused by traffic on new or altered roads makes an effective contribution of at least 1dB(A); and
- the property is 300 metres or less from the nearest point on the carriageway of a highway to which the Regulations apply.

National Policy

11.3.4 The Government's noise policy is set out in the Noise Policy Statement for England (NPSE)[7]. In legislative and policy terms, noise is taken to include vibration.

11.3.5 Government noise policy sets three aims, which are to be met within the context of the government policy on sustainable development:

- to avoid significant adverse impacts on health and quality of life;
- to mitigate and minimise adverse impacts on health and quality of life; and
- where possible, contribute to the improvement of health and quality of life.

11.3.6 The same three aims are also reflected in:

- National Planning Policy Framework (NPPF)[8]; and
- Planning Practice Guidance – Noise (PPG-Noise)[9].
- the National Policy Statement for National Networks (NN NPS)[10] (Department for Transport (DfT), 2014).

11.3.7 PPG-Noise provides guidance on the application of Government noise policy. PPG-Noise notes that unacceptable adverse effects on health and quality of life due to noise exposure (set at a level higher than significant adverse impacts on health and quality of life) should be 'prevented'[11].

11.3.8 Thresholds for identifying adverse effect levels in terms of Government noise policy[12] are not clearly defined numerically in any Government document. Rather they are to be established specifically for each scheme and context, and exceptionally, may include some professional judgement depending on the local circumstances or specific receptor. The values adopted for this assessment, unless a justified variation was made for an individual receptor, were established through consultation with the Overseeing Organisation (Highways England). These thresholds are discussed later in this chapter (Paragraph 11.6.40).

[7] Department for Environment Food and Rural Affairs (2010), Noise Policy Statement for England (NPSE)
[8] revised Department for Communities and Local Government (2018), National Planning Policy Framework, http://www.communities.gov.uk/publications/planningandbuilding/nppf
[9] Department for Communities & Local Government (2014), Planning Practice Guidance – Noise, http://planningguidance.communities.gov.uk/blog/guidance/noise/noise-guidance/
[10] Department for Transport (2014), National Policy Statement for National Networks (NN NPS)
[11] PPG-N defines an unacceptable adverse effects as 'noticeable and very disruptive', with outcomes described as 'Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, eg regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, eg auditory and non-auditory'.
[12] Adverse effects, significant adverse effects and unacceptable adverse effects on health and quality of life

11.3.9 The general thresholds adopted to identify noise policy adverse effect levels have been applied following the precedent set on recent major infrastructure schemes and agreement with the Overseeing Organisation.

11.3.10 In addition to Government noise policy, the scope and methodology for this assessment has also taken account of relevant guidance, particularly DMRB HD213/11 as described below.

Local Policy

The Cornwall Local Plan Strategic Polices 2010-2030 (adopted 2016)

11.3.11 The Cornwall Local Plan sets out a number of requirements which relate to noise and vibration control with regard to development:

- Policy 12: 'Design' - notes that development proposals will be required to protect individuals and property against 'unreasonable noise and disturbance'.
- Policy 13: 'Development Standards' - expects development design to avoid or mitigate adverse impacts from noise (and other impacts) during construction and operation.
- Policy 16 'Health and wellbeing' - requires that development protects and alleviates risk to people and the environment by avoiding harmful effects and health risks - including those from noise.

The Truro and Kenwyn Neighbourhood Development Plan 2015-2030 (adopted)

11.3.12 The Neighbourhood Development Plan (adopted) covers part of the area of the scheme. This Plan states the importance of environment and local setting but does not specifically refer to noise and vibration. However, it refers generally to The Cornwall Local Plan and the NPPF and it is stated that the Neighbourhood Development Plan must align with the regional and national policies on matters of environmental controls with regard to development planning.

11.3.13 This assessment incorporates these local and regional policy requirements in relation to noise and vibration impacts.

Guidance

DMRB – Environmental Assessment, Volume 11, Section 3, Part 7

11.3.14 The DMRB is guidance and standard for the design of a new road or improvements to an existing road. In particular, Volume 11 Section 3 Part 7: HD 213/11 Revision 1 sets out the method for assessing noise and vibration associated with road traffic. HD 213/11 provides guidance on the selection of the scheme assessment area and the relevant assessment years. The assessment presented in this ES has been based upon these procedures.

Calculation of Road Traffic Noise

11.3.15 HD 213/11 requires that road traffic noise is calculated under the method described in Calculation of Road Traffic Noise[13] (CRTN). This describes a procedure for determining the level of noise from the highway based upon the traffic flow parameters, road surface, propagation distance, screening, intervening

[13] DEPARTMENT OF TRANSPORT WELSH OFFICE (1988), Calculation of Road Traffic Noise, HMSO

ground cover and topographical features between the highway and receptor. This is the accepted methodology to quantify traffic noise levels for use with highway noise assessment procedures.

WebTAG environmental impacts worksheets

11.3.16 The Department for Transport's Transport Analysis Guidance (TAG) can be used to present the results of a transport scheme appraisal as part of a business case. The noise assessment takes the form of an analysis[14] of noise levels with and without a proposed highway scheme to calculate the monetised impacts of noise. This has been carried out in addition to the assessment presented in this ES and is reported in WebTAG: environmental impacts worksheets.

BS 5228-1:2009+A1:2014 and BS 5228-2 Code of Practice for noise and vibration on construction and open sites

11.3.17 BS 5228-1[15] provides guidance on the assessment and control of noise and vibration from construction operations. The Standard contains detailed information on noise reduction measures and promotes the 'best practicable means' approach to control noise and vibration to minimise the impact on local residents and construction workers. A methodology for predicting construction noise is included. The Standard also provides criteria for vibration disturbance to people.

BS 7385-2 Evaluation and measurement for vibration in buildings – Guide to damage levels from groundborne vibration

11.3.18 BS 7385-2[16] provides criteria for the effects of vibration upon buildings.

BS ISO 4866: 2010 Mechanical vibration and shock – Vibration of fixed structures – Guidelines for the measurement of vibrations and evaluation of their effects on structures

11.3.19 BS ISO 4866[17] provides damage categories methodologies for the measurement and effects of vibration upon buildings.

BS 8233: 2014 Guidance on sound insulation and noise reduction for buildings

11.3.20 BS 8233[18] provides advice for the control of noise in and around buildings and guidance criteria for noise levels inside new buildings.

Cornwall Council Public Health and protection - Guidance Note: Noise and Dust Control on Construction and Demolition Sites

11.3.21 This guidance note[19] provides information regarding the expectations of the Council with regard to control of construction noise and vibration emissions, hours of working and working practices.

[14] Department for Transport (2017) https://www.gov.uk/government/publications/webtag-environmental-impacts-worksheets
[15] BRITISH STANDARDS INSTITUTION (2014) BS 5228-1:2009+A1:2014 and BS 5228-2:2009+A1:2014 Code of Practice for Noise and Vibration Control on Open Construction Sites
[16] BRITISH STANDARDS INSTITUTION (1993) BS 7385-2 *Evaluation and measurement for vibration in buildings – Guide to damage levels from groundborne vibration,* British Standards Institution
[17] BRITISH STANDARDS INSTITUTION (2010) BS ISO 4866: 2010, Mechanical vibration and shock – Vibration of fixed structures – Guidelines for the measurement of vibrations and evaluation of their effects on structures, British Standards Institution
[18] BRITISH STANDARDS INSTITUTION (2014) BS 8233 Guidance on sound insulation and noise reduction for buildings, British Standards Institution
[19] Cornwall Council Public Health and protection (2010) - Guidance Note: Noise and Dust Control on Construction and Demolition Sites

11.4 Study area

11.4.1 The determination of the operational assessment study area has been based on the HD 213/11 guidance. For the 'Detailed' level of assessment used for this study, HD 213/11 requires that a quantitative noise impact study is made for all noise sensitive properties within 600m of the scheme. Also, sections of existing roads within 1 km of the scheme that are predicted to be subject to a change in noise level of more than 1dB(A) as a result of the scheme at the 'baseline' year (or 3dB in the 'future' year), are also assessed[20] within a 600m calculation area. The terms 'baseline' and 'future' years are used in HD 213/11 for the noise assessment. These are defined as follows in Paragraph 3.8 of the guidance:

'For an assessment of permanent noise and vibration impacts, the baseline year is taken as the opening year of the road project' ….. '*The future assessment year for operation is typically the 15th year after the opening year of the road project, but in some circumstances this may occur before the 15th year. For example, inspection of the traffic model outputs may highlight that the greatest traffic flows do not occur in the 15th year*.'

11.4.2 Existing roads subject to a change of 1dB(A) or more were identified by forecast traffic changes arising from the scheme. HD 213/11 notes that a change in noise level of 1dB is associated with an increase in flow by at least 25% or decrease by 20% in the scheme opening year. The area for which these detailed quantitative calculations are made is defined as the calculation area (HD 213/11).

11.4.3 DMRB HD 213/11 requires consideration of potential noise impacts on existing roads outside the study area, where traffic increases are forecast to be greater than 25% in the short term (i.e. on opening). These are described as 'affected' routes and this assessment has been carried out as part of the ES.

11.4.4 The study area for the construction assessment comprises noise-sensitive properties within approximately 300m from the proposed works. BS 5228 notes that the prediction results should be treated with caution at distances greater than this (as the prediction results may be less reliable).

11.5 Potential Impacts

11.5.1 The construction works would include grade separated junction works at three locations: Chiverton, further east at Chybucca and at the eastern end of the scheme at Carland Cross. Works at these locations will potentially affect noise sensitive receptors for a longer period than the mainline sections of the scheme construction. Away from the junctions, the new or improved carriageway works would progress more rapidly along the scheme, and hence would be alongside any one receptor location for a shorter period (a high level construction programme can be found in section 2.7 of the ES). Only where dwellings are very close to the works, is there likely to be potential for vibration impacts depending on the particular plant machinery used. However, the potential impacts are considered on an activity-by-activity basis according to the intensity of the process and the distance at which vibration could be perceptible.

11.5.2 Operational noise impacts would be greatest where the scheme would be aligned closer to nearby noise sensitive receptors than the existing highway. Where the

[20] The more sensitive test is the 1dB change in the baseline year.

distance between the highway and receptor is halved (or even closer), there is the potential for significant adverse effects. Minor changes in alignment, particularly where the receptors are some distance from the existing highway, would be less likely to result in impacts as the proportionate change in distance would be small. Conversely, there are locations where the scheme would be substantially further from receptors such that there is the potential for significant beneficial effects.

11.6 Assessment Methodology

Value of receptor

11.6.1 In addition to residential receptors, the guidance for noise assessment in HD 213/11 identifies a range of non-residential properties as noise sensitive, which should also be considered in the assessment. These include hospitals, schools, community facilities and designated[21] areas. Volume 6 Document Reference 6.3 ES Figure 11.1 shows the residential and non-residential assessment locations considered in this assessment. HD 213/11 does not specifically assign levels of sensitivity to different type of receptor. However, sensitivity has been considered in the assessment based on common practice for noise assessment. Therefore, residential receptors, hospitals and schools are considered high sensitivity (with regard to noise and vibration). Community facilities maybe high or medium sensitivity depending on their specific use. This also applies to other non-residential sensitive receptors, where each case must be assessed according to its particular use and times of operation.

Magnitude of impacts

Construction noise

11.6.2 The noise assessment from the construction of the scheme has been determined using BS 5228–1:2009+A1:2014. This standard provides information on the prevention and control of construction noise, and includes a procedure for predicting construction noise. Calculations of noise levels at selected receivers have been based on typical noise levels for construction processes (mainly taken from BS 5228). Calculations also take account of propagation distance, details of the intervening ground cover, topography and screening.

11.6.3 Temporary direct impacts from airborne noise may be caused, for example, by construction activities associated with site clearance, earthworks and pavements.

11.6.4 The assessments have been undertaken at locations that are representative of a number of dwellings or other sensitive receptors. For groups of properties, receptors are chosen to be representative of the worst case (most exposed) location in the group of properties. Where a receptor has multiple uses the assessment has been made based on the most sensitive use.

11.6.5 Construction noise levels have been predicted as the logarithmic average over a calendar month as an $L_{Aeq,T}$. The predictions consider the variation in the programme and the working area for the period assessed. The assessment results present the range of monthly noise levels for a specified assessment location.

[21] e.g. green space designated because of its tranquillity

11.6.6 The predictions are presented as façade levels relating to a position 1m from the building. The assessment considers monthly noise levels but levels would vary day-to-day. Highest daily levels may sometimes be around 5dB higher than the monthly level but would also be substantially lower on other days in that month.

11.6.7 Many of the construction processes would move progressively along the line of route. For these processes, noise levels have been considered for the worst case, i.e. when the process is closest to the receptor, and point furthest from the receptor within the same month to derive an average monthly noise level.

Construction vibration

11.6.8 Ground-borne vibration during the construction of the scheme may potentially arise due to the use of compaction plant and/or rollers for earthworks and pavement construction. Vibratory sheet piling may occur at limited locations (rather than percussive), such that impulsive vibration effects would be minimised. Impacts at sensitive receptors will be dependent on their proximity to the works and the intervening ground conditions.

11.6.9 The effects in terms of people's response are expected to be governed mainly by the type of activities undertaken although public liaison and prior notice of potential impacts are also important factors. Effects in terms of cosmetic or structural damage to buildings may also be a factor to consider where buildings are exposed to levels of vibration much higher than the lowest perceptible levels.

11.6.10 BS 5228–2:2009+A1:2014 provides a methodology for predicting typical levels of vibration from certain types of construction activities, based on case study data and empirical models. This, or other empirical data gathered by Arup has been used where appropriate to consider the likelihood that vibration from the works may exceed the thresholds for perception and disturbance.

Operational noise

11.6.11 Geographical Information Systems (GIS) have been used to construct a three-dimensional noise model of the prescribed calculation area for the scheme. The model includes highways, terrain data, buildings and other structures that might screen or reflect noise, and types of ground cover.

11.6.12 For each road link in the model, data on traffic flow, speed[22], proportion of heavy goods vehicles (HGVs) and road surface type[23] were obtained for inclusion into the model. Once the data were complete and the inputs checked, noise level calculations were carried out according to the CRTN methodology. Traffic noise levels were calculated across a grid of receptor positions over the calculation area, and contours of noise level exposure were established. Additional calculations were also conducted at specific assessment locations to represent noise sensitive receptors (e.g. residential properties). The study area and calculation area according to HD 213/11 are defined in Paragraph 11.3.1 and Volume 6 Document Reference 6.3 ES Figure 11.1.

[22] The traffic speeds for the assessment were determined for each section of highway following the procedure given in Interim Advice Note 185/15 which provides supplementary advice to users of DMRB Volume 11, SECTION 3, PART 1 (HA207/07) and PART 7 (HD213/11). The note provides advice on the assessment of link speeds and generation of speed-bands for use with scheme noise assessments.
[23] Taken from the Highways England Pavement Management System database.

11.6.13 The traffic data used in the model were those forecasted under the Do-Something and Do-Minimum scenarios in the baseline year[24] 2023 and those in the future assessment year, i.e. the year of maximum projected traffic flow within 15 years of opening – in this case, the design year (2038). The traffic modelling approach and data verification are described in the **Transport Report** (Volume 7 Document Ref 7.5).

11.6.14 The noise prediction model was used to calculate noise levels within the noise calculation area, at a height of 4m above local ground, in terms of the free-field[25] $L_{A10,18h}$ index in accordance with CRTN methodology, as required by HD 213/11.

11.6.15 The $L_{A10,18h}$ index represents the arithmetic mean of all the hourly values of L_{A10} during the period between the hours of 06:00 and 24:00. The CRTN procedure is based upon empirical noise data with a slightly positive wind vector component blowing downwind from source to receptor. The CRTN prediction therefore assumes an adverse wind component to represent a typical worst case scenario. The additional advice given in HD 213/11 has been adopted regarding CRTN procedures. These include revisions to vehicle classification, traffic data and corrections due to road surface.

11.6.16 For the purposes of this assessment, the $L_{A10,18h}$ results are converted to the corresponding L_{Aeq} scale for daytime noise, i.e. $L_{Aeq,16h}$ (see Glossary in Appendix 11.1). This provides a direct comparison with the quantitative L_{Aeq} criteria described later for assessing significance with respect to the Government's noise policy (NPSE). The $L_{Aeq,16h}$ scale has also been adopted for traffic noise assessment as part of the government's WebTAG methodology for environmental impact assessment.

11.6.17 Baseline noise survey results (see Section 11.4) and **Baseline noise survey report** (Volume 6 Document 6.4 ES Appendix 11.2)) have been reviewed to provide indicative information to validate the predicted noise climates, across the study area.

11.6.18 As part of the procedure for a Detailed Assessment, HD 213/11 requires that the magnitude of the noise impact is reported using a suggested scale of magnitude to describe the increase or decrease in noise level associated with the scheme. The magnitude scale is described in more detail in the section on assessment criteria (Paragraph 11.6.39).

11.6.19 The assessment has considered short term and long term noise effects as described in DMRB HD213/11. This assessment has focused primarily on the long term change (i.e. with-scheme 2038 (Do-Something) vs without-scheme 2023 (Do-Minimum), as this is the likely worst case considering traffic growth, and represents the permanent effect of the scheme. The Do-Minimum 'future assessment' year (i.e. design year) was also considered to determine whether any significant effects identified are a consequence of traffic growth or changes to the road surface.

11.6.20 In addition, traffic noise nuisance reporting tables are also stipulated in HD 213/11 for a Detailed assessment. The noise nuisance level is presented in percentage

[24] HD 213/11 Para 3.6 notes that: '*For an assessment of permanent noise and vibration impacts, the baseline year is taken as the opening year of the road project*.'
[25] Free Field: An external sound field in which no significant sound reflections occur (apart from the ground).

bands relating to the change in percentage of people 'bothered' by the noise change.

11.6.21 For the Do-Minimum scenario, the change in 'steady state' nuisance between the baseline and future years is reported. For the Do-Something scenario, it is the highest increase in nuisance that occurs between the baseline and future assessment years for each dwelling that is reported (or the least beneficial reduction in noise) in accordance with HD 213/11 methodology.

11.6.22 Eligibility for sound insulation measures under the Noise Insulation Regulations 1975 (as amended 1988) has been considered to identify residential dwellings that potentially qualify under the Regulations.

Night-time noise

11.6.23 HD 213/11 Detailed Assessment also requires that a night-time noise assessment is carried out. The L_{night} descriptor is used to represent the noise level at dwellings between the hours of 23:00 and 07:00. Method 3 from the Transport Research Laboratory (TRL) report *'Converting the UK traffic noise index $L_{A10,18hr}$ to EU noise indices for noise mapping'*[26] was used for predicting L_{night} noise levels. Method 3 uses daily traffic flow data converting predicted daytime noise levels ($L_{A10,18h}$) to night-time noise levels. This method was appropriate as there was nothing considered to be unusual in the proportionate traffic flow volumes for this route between daytime and night-time.

11.6.24 The assessment of impact magnitude for night-time noise follows the same method as that for daytime.

Assessment scenarios

11.6.25 The assessment scenarios were those specified in HD 213/11 for the 'baseline' and 'future' years.

11.6.26 In this case the future year is 15 years after opening, i.e. the scheme design year (2038). These traffic data were included in the noise model to produce predictions for the following scenarios:

- Do-Minimum (without the scheme) 'baseline' year at completion of scheme construction (2023);
- Do-Minimum (without the scheme) 'future' year (design year) (2038);
- Do-Something (with the scheme) 'baseline' year at the completion of scheme construction (2023); and
- Do-Something (with the scheme) 'future' year (design year) (2038).

11.6.27 The Do-Minimum 2038 design year scenario was considered to determine the extent to which impacts are a consequence of traffic growth.

Assessment of significance

Approach to assessment of effects – all sources and receptors

11.6.28 The method for identifying likely significant effects of noise and vibration from construction and operation of the scheme, as required by the EIA Regulations,

[26] Abbott, PG & Nelson PM (2002), PR/SE/451/02, Converting the UK traffic noise index $L_{A10,18h}$ to EU noise indices for noise mapping, TRL

draws on best practice from other major infrastructure projects, and is aligned with DMRB HD213/11 and Government noise policy.

11.6.29 Taking Government noise policy (Defra 2010) and PPG-Noise (DCLG, 2014) together, they are based on the premise that once noise becomes perceptible, the effect on people in dwellings and other receptors used by people (for example schools and hospitals) increases as the total level of noise increases. Government policy and practice guidance defines four levels of effect on health and quality of life in increasing severity:

- No effect;
- Adverse effect;
- Significant adverse effect; and
- Unacceptable adverse effect.

11.6.30 It follows from Government noise policy NPSE, PPG-Noise and NN-NPS that thresholds should be set to define the onset of the following levels of effect:

- Lowest Observed Adverse Effect Levels (LOAEL) to identify the onset of adverse impact on health and quality of life;
- Significant Observed Adverse Effect Levels (SOAEL) to identify the onset of significant impacts on health and quality of life.

11.6.31 These thresholds must be identified to achieve the Government policy aims to 'avoid significant adverse impacts on health and quality of life; to mitigate and minimise adverse impacts on health and quality of life; and, where possible, contribute to the improvement of health and quality of life'.

11.6.32 In an explanatory note, NPSE states: 'It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times.'. The Policy notes that these thresholds should reflect the nature of the noise source, the sensitivity of the receptor and the local context. Assessment criteria for this study are defined in a later section (see Paragraph 11.6.39).

Significant adverse effects on health and quality of life

11.6.33 The EIA Regulations require the identification of 'likely significant effects'. Where the calculated noise or vibration indicates a significant adverse impact on health and quality of life (i.e. the noise level exceeds the relevant SOAEL threshold – see Table 11-6), then this is assessed as a likely significant observed adverse effect at each receptor. For example, such noise levels would disrupt activities indoors, as described in the assessment framework given in PPG-Noise.

Adverse effects on health and quality of life

11.6.34 In line with best practice, DMRB HD213/11 and previous projects, this assessment also identifies likely significant effects where the calculated noise or vibration is only an adverse impact on health and quality of life. Specifically, this describes a situation when the construction or operational noise is greater than the relevant LOAEL but is less than the SOAEL.

11.6.35 In this case, the basis for the likely significant effect is the change in noise caused by the scheme, with consideration of other factors such as the existing level of noise exposure. With regard to PPG-Noise, such likely significant effects relate,

for example, to a change in the outdoor “acoustic character” of an area due to a noise increase, or decrease as a result of the scheme.

11.6.36 Table 11-1 summarises how noise levels in terms of Government noise policy and change in noise levels (in terms of DMRB HD213/11) have been used to identify likely significant effects.

Types of receptor, direct and indirect effects

11.6.37 The assessment approach considers a range of receptors and effects. Additional detail on each of the following types of receptor is described in **Detailed approach to assessment of effects** (Volume 6 Document Reference 6.4 ES Appendix 11.3):

- Residential receptors: direct effects – exceeding the SOAEL;
- Residential receptors: direct effects – between LOAEL and SOAEL;
- Non-residential receptors: direct effects;
- All above receptors: indirect effects - i.e. those effects not resulting directly from the scheme itself, such as changes in noise on existing roads due to construction traffic, or additional traffic on existing roads due to operation of the scheme.

11.6.38 The criteria used to assess the significance of the above effects for different receptor types and noise exposure levels are described in the following section (Assessment criteria).

11.6.39 The approach to assess the potential for airborne vibration is considered in **Detailed approach to assessment of effects** (Volume 6 Document Reference 6.4 ES Appendix 11.3).

Table 11-1 Noise and vibration assessment approach to address both the EIA and Government Policy requirements

	Perception	Government policy		EIA		Mitigation	
		Effect	Action	Assessment	Effect	Project	Receptor
← Increasing level of noise or vibration	not noticeable	no observed effect	no specific measures required	special cases	no adverse effect	special cases	none
	noticeable and not intrusive	no observed adverse effect	no specific measures required				
	Lowest observed adverse effect level – LOAEL						
	noticeable and intrusive	observed adverse effect	mitigate and reduce to a minimum	noise level change as indicator of impact/effect magnitude + contextual significance criteria	change or absolute level may cause adverse effect on acoustic character. May be considered significant in EIA terms	maximise mitigation as far as sustainable	none
	Significant observed adverse effect level – SOAEL						
	noticeable and disruptive	significant observed adverse effect	avoid	exceeding SOAEL is a significant effect	significant adverse effect	maximise mitigation as far as sustainable. Prevent UAELs where possible	noise insulation
	noticeable and very disruptive	unacceptable adverse effect	prevent	exceeding UAEL is a significant effect			potentially re-house where noise is from the scheme

Assessment criteria

11.6.40 Assessment criteria have been established that respond to the requirements of:

- Government policy, set out in NPSE, NPPF, NN NPS and PPG- Noise;
- DMRB HD213/11;
- Relevant regulations, guidance and standards;
- Best practice as set by previous relevant projects; and
- Agreement with the Overseeing Organisation (Highway England) for this scheme.

Construction noise assessment criteria

11.6.41 Potential adverse effect thresholds in Government policy terms have been established based upon the ABC Method described in BS5228-1:2009+A1:2014. These thresholds, described in Table 11-2, have been used to establish assessment criteria for monthly average construction noise levels. The numerical thresholds for the ABC Method are defined in Table 11-3. These criteria have been used to derive LOAEL and SOAEL thresholds for the purpose of this assessment in agreement with the Overseeing Organisation.

Table 11-2 LOAEL and SOAEL thresholds for construction noise at all receptors in terms of Government Policy

Time period	LOAEL	SOAEL	Notes
Day (0700-1900 weekday and 0700-1200 Saturdays)	Exceeds existing $L_{Aeq,T}$ noise level	Threshold level determined as per BS 5228:2009 + A2014 Section E3.2 (see Table 11-3 below)	LOAEL is set at a level where construction noise becomes the dominant source. SOAEL is set where construction noise exceeds BS5228 thresholds (see Table 11-3). Existing noise level shall be determined based on ambient noise monitoring, noise model prediction or estimation based on published noise level datasets (for example Defra Noise Mapping)
Night (2300-0700)	Exceeds existing $L_{Aeq,T}$ noise level	Threshold level determined as per BS 5228:2009 + A2014 Section E3.2	
Evening and weekends (time periods not covered above)	Exceeds existing $L_{Aeq,T}$ noise level	Threshold level determined as per BS 5228:2009 + A2014 Section E3.2	

The threshold of potential adverse effect described in BS5228-1:2009+A1:2014 is evaluated in accordance with Table 11-3.

Table 11-3 Threshold of potential significant effect at dwellings according to ABC method in BS 5228–1:2009 + A1:2014

Assessment category and threshold value period	Threshold value, dB(A)		
	Category A	Category B	Category C
Night-time (23:00 – 07:00)	45	50	55
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75
Other: Weekday evenings (19:00 – 23:00) Saturdays (13:00 – 23:00) Sundays (07:00 – 23:00)	55	60	65
Category A: threshold value to use when ambient noise levels (rounded to the nearest 5dB) are less than these values Category B: threshold value to use when ambient noise levels (rounded to the nearest 5dB) are the same as Category A values Category C: threshold value to use when ambient noise levels (rounded to the nearest 5dB) are higher than Category A values.			

11.6.42 The ABC method described in BS5228-1:2009+A1:2014 determines the adverse impact threshold at a dwelling using the existing ambient noise level, rounded to the nearest 5dB. This is then used to determine the assessment category: A, B or C, which defines the adverse noise impact threshold. The predicted construction noise level is then compared to the appropriate noise impact threshold level. If the L_{Aeq} construction noise level exceeds the appropriate noise impact threshold level shown in Table 11-3, then an adverse impact with the potential to cause a significant effect is identified.

11.6.43 For example, for a site exposed to an existing ambient noise level of 68dB(A), this would be rounded to 70dB(A). An ambient level of 70dB(A) is higher than the Category A value of 65dB(A), therefore the Category C value of 75dB(A) would apply as a threshold for potential significant effect.

11.6.44 Having established if there is a potentially significant effect using the ABC method, the final assessment of significance is made using professional judgement. This is evaluated by considering various other factors described at the end of this section (paragraph 11.6.59) such as the expected duration of the activity. Further background and information on the assessment approach is given in **Detailed approach to assessment of effects** (Volume 6 Document Reference 6.4 ES Appendix 11.3).

11.6.45 For non-residential receptors, significant effects would be evaluated on a receptor-by-receptor basis, using established noise impact criteria for the type of receptor and professional judgement based on the factors described at the end of this section (paragraph 11.6.59).

Construction vibration assessment criteria

11.6.46 BS 5228–2:2009+A1:2014 indicates that the threshold of perception in residential environments corresponds with a Peak Particle Velocity (PPV) of 0.3mm/s. The Standard also states that a complaint is likely where levels occur above 1.0mm/s PPV at residential properties but this exposure can be tolerated if prior warning and explanation has been given to residents. Levels of vibration of 10mm/s PPV

and above are likely to be intolerable for any more than a very brief exposure to this level.

11.6.47 BS 5228-2:2009+A1:2014, section B2, states that PPV vibration levels are considered to be an appropriate vibration parameter to be used when considering construction vibration, and the Standard provides guidance upon the 'instantaneous' human response to vibration in buildings in terms of overall vibration velocity levels (Table 11-4)[27]. These criteria have been used to derive LOAEL and SOAEL thresholds for the purpose of this assessment in agreement with the Overseeing Organisation.

11.6.48 The overall significance of the effect is assessed using professional judgement by considering not only the criteria above but also other factors, such as the duration of exposure and the particular characteristics of the source.

Table 11-4 LOAEL and SOAEL thresholds of likely effects of vibration for building occupants derived from BS 5228-2:2009+A1:2014)

Time period	LOAEL	SOAEL	Notes
All time periods	0.3mm.s^{-1} PPV	1.0mm.s^{-1} PPV	LOAEL is set at the lowest level of perception, SOAEL is set where levels can be tolerated with prior warning (ref BS5228:2).

11.6.49 Risk of damage to buildings from groundborne vibration is assessed using the criteria in Table 11-5. The criteria are derived from British Standard BS7385, Part 2 '*Evaluation and measurement for vibration in buildings – Guide to damage levels from groundborne vibration*' (BSI, 1993). This ensures there is no risk of the lowest damage category ('cosmetic') being exceeded, as defined in BS ISO 4866:2010 *Mechanical vibration and shock – Vibration of fixed structures – Guidelines for the measurement of vibrations and evaluation of their effects on structures* (BSI, 2010). However, effects in terms of even cosmetic damage to buildings would occur only for vibration exposures much higher than the lowest perceptible levels.

Table 11-5 Vibration impact criteria for buildings (conservative criteria below which there is no risk of cosmetic damage)

Category of building	Peak particle velocity[1] (mm.s^{-1})	
	Transient[2] vibration	Continuous[3] vibration
Potentially vulnerable building	6	3
Structurally sound buildings	12	6

Notes:
[1] At the building foundation
[2] Transient relative to building response e.g. from percussive piling
[3] Continuous relative to building response e.g. from vibratory piling, vibrating rollers

[27] BS 5228-2 notes in Table B.1: 'The values are provided to give an initial indication of potential effects, and where these values are routinely measured or expected then an assessment in accordance with BS 6472-1 or -2, and/or other available guidance, might be appropriate to determine whether the time varying exposure is likely to give rise to any degree of adverse comment.' Consideration has been given to other guidance with regard to time varying exposure where appropriate – the BS 6472 guidance makes use of the 'Vibration Dose Value' metric (VDV).

Operational noise assessment criteria

11.6.50 Adverse effect levels have been set in in accordance with Government noise policy (NPPF, NPSE, and PPG-Noise) and with regard to the guidance from the World Health Organisation (Guidelines for Community Noise[28]; and WHO Night Noise Guidelines for Europe[29], the Noise Insulation Regulations 1975 (as amended), and best practice from other projects. These criteria have been used to derive LOAEL and SOAEL thresholds for the purpose of this assessment in agreement with the Overseeing Organisation.

Table 11-6 LOAEL and SOAEL thresholds of likely effects of operational noise at all receptors in terms of Government Policy

Time period	LOAEL	SOAEL	Notes
Day (06:00-24:00)	55dB$L_{A10,18h}$ (façade) 50dB$L_{Aeq,16h}$ (free-field)	68dB$L_{A10,18h}$ (façade) 63dB$L_{Aeq,16h}$ (free-field)	The daytime LOAEL is based on the onset of moderate community annoyance, and the daytime SOAEL is based on the onset of cardiovascular health effects (ref. WHO Guidelines for Community Noise) and the Noise Insulation Regulation Threshold. The slightly lower Noise Insulation Threshold should be used for consistency with other parts of the DMRB methodology.
Night	40dB$L_{Aeq,8hr}$ $L_{night,outside}$ (free-field)	55dB$L_{Aeq,8hr}$ $L_{night,outside}$ (free-field)	The night time LOAEL is defined using the WHO Night Noise Guidelines, and the night time SOAEL is equivalent to the levels above which cardio vascular health effects become the major public health concern (ref. WHO Night Noise Guidelines).

11.6.51 The magnitude of the impact and effect caused by long term change in noise levels attributable to the scheme, where the overall 'end state' (i.e. operational noise level of the completed scheme), is between the lowest and the significant observed adverse effect levels, (i.e. between the SOAEL and LOAEL) is evaluated in accordance with Table 11-7.

11.6.52 DMRB, HD213/11 provides a basis for evaluating the magnitude of the impact and effect caused by noise change both in the short term and long-term. This assessment has focused primarily on the long term, permanent change as this is the likely worst case considering traffic growth. This is also consistent with DMRB, HD213/11 that notes:

"In terms of permanent impacts… In the long-term, a 3dB(A) change is considered perceptible. Such increases in noise should be mitigated if possible".

11.6.53 The focus on long term effects also relates to the evidence that underpins DMRB, HD213/11. This evidence shows that the reported sensitivity to small changes in noise levels (less than 3dB(A)) may be coloured by factors other than noise at the time a new road opens[30].

[28] WORLD HEALTH ORGANISATION (1999), Guidelines for Community Noise, World Health Organization
[29] WORLD HEALTH ORGANISATION (2009), Night Noise Guidelines for Europe, WHO, Bonn: WHO, regional Office for Europe, 2007
[30] Paragraph A5.4, DMRB, HD 213/11 Revision 1

Table 11-7 Classification of magnitude of noise impact in the long term under DMRB HD 213/11, where the 'end-state' of overall exposure is between LOAEL and SOAEL

Noise change [dB(A)]	Magnitude of impact in the long-term
0	No change
0.1 – 2.9	Negligible
3.0 – 4.9	Minor
5.0 – 9.9	Moderate
10.0 +	Major

11.6.54 Where the overall exposure is greater than the relevant significant observed adverse effect level (SOAEL), then there is increasing risk of likely health effects associated with long term (permanent) exposure.

11.6.55 Some areas in the scheme noise study area already have a designated status as being exposed to high levels of road traffic noise (i.e. Noise Important Areas – see Volume 6 Document Reference 6.3 ES Figure 11-1). It is considered appropriate to give greater weight to noise change where the existing baseline noise level is already high, i.e. in excess of the relevant SOAEL. This is to reflect the consideration of health effects. In these situations, the magnitude of the impact and effect caused by change in noise levels attributable to the scheme is shown in Table 11-8. DMRB HD 213/11 also assigns these impact levels to noise changes in the short-term; it should be noted that relative to Table 11-7 above, the equivalent impact descriptors are assigned to smaller noise changes, hence the impact scale is more sensitive.

Table 11-8 Classification of magnitude of noise impact under DMRB HD 213/11 in the short term where the 'end-state' of overall exposure between LOAEL and SOAEL, or where the baseline noise level is greater than SOAEL

Noise change [dB(A)]	Magnitude of impact
0	No change
0.1 – 0.9	Negligible
1.0 – 2.9	Minor
3.0 – 4.9	Moderate
5.0 +	Major

11.6.56 An impact of 3dB or greater is taken as an indicator of a potential significant effect for noise exposures between the LOAEL and SOAEL in either the short or long term. The magnitude of impact and effect is evaluated using Table 11-8 or Table 11-7 respectively according to whether the impact is short term or long-term. For example, a 3dB change in the short term is described as a moderate impact, whereas a 3dB change in long term is described as a minor impact.

11.6.57 For areas exposed to higher noise levels (above SOAEL), a smaller impact (1dB or greater) is taken as an indicator of potential significance with the magnitude of impact and effect being evaluated using Table 11-8. The final assessment is based upon the indicated potential significance, as described above, and consideration of additional factors described at the end of this section (paragraph 11.6.59).

11.6.58 For non-residential buildings, the assessment considers the noise and vibration exposure at each receptor based on the above criteria, and also the receptor's generic sensitivity. Table 11-9 and paragraph 11.6.62 summarise the additional assessment criteria used for assessment on a likely worst case basis.

Table 11-9 Noise impact screening criteria at non-residential receptors (construction and operation)

Description	Impact (screening) criterion		Outcome	Reference
	Day 0700-2300	Night 2300-0700		
Places of meeting for religious worship; courts; cinemas; lecture theatres; museums; and small auditoria or community halls	50dB$L_{Aeq,T}$ and a change >3dB	--	disturbance	BS8233: 2014, EFAs Acoustics Performance Standards[1], HTM08-01[2], WHO guidelines
Schools; colleges; hospitals*; hotels*; and libraries	50dB$L_{Aeq,T}$ and a change >3dB	*45dB$L_{Aeq,T}$ [3] and a change >3 dB	disturbance and sleep disturbance*	
Offices	55dB$L_{Aeq,T}$[4] and a change >3dB	--	disturbance	BS 8233

Notes:

[1] Based on an internal level of 35dB$L_{Aeq,T}$ consistent with Education Funding Agency (EFA) (2012) and BS8233 (BSI, 2014). Equivalent external level assumes 15 dB for a partially open window

[2] Department of Health (2013)

[3] Based on an internal level of 30dB$L_{Aeq,T}$ consistent with BS8233, WHO guidelines. Equivalent external level assuming 15dB for a partially open window.

[4] Based on an internal level of 40dB$L_{Aeq,T}$ consistent with BS8233 and BCO (British Council for Offices, 2014) guidelines. Equivalent external level assuming 15dB attenuation for a partially open window.

Additional factors considered in determining significance of noise and vibration effects

Residential receptors

11.6.59 In considering whether the level of effect is significant in EIA terms, the following criteria have been taken into account:

- the change in noise levels (and resulting noise effect on receptors);
- for operational noise, if the change in noise level is near the top or bottom of the DMRB HD 213/11 impact magnitude range;
- the level of noise exposure once the scheme is in operation, particularly if above SOAEL;
- for operational noise, the relationship difference between short term and long term changes
- acoustic context in respect of the level and character of the existing noise environment;
- any unique features of the source or receiving environment in the local area;
- circumstances of receptor – e.g. whether sensitive facades are exposed to noise impact;
- designated sites – the proportion of the resource affected by noise impact;
- combined exposure to noise and vibration;

- for construction, the duration of the adverse or beneficial effect; and
- the effectiveness of mitigation measures that are provided.

11.6.60 The results used to inform the significance decisions reported in the operational assessment is presented in Table 11-12 to Table 11-15. Numerical noise level results for all receptors in the long term (the permanent impact) are shown in Appendix 11.5, i.e. absolute noise levels for the Do Minimum and Do Something scenarios and the change in noise levels.

Non-residential receptors

11.6.61 Medical buildings, educational buildings and community facilities, along with buildings having specific noise and vibration sensitive resources, are called non-residential sensitive receptors in this assessment.

11.6.62 Assessment of the level of effect of noise or vibration on a non-residential receptor should consider the above criteria, in addition to the following factors:

- the receptor's generic sensitivity to noise or vibration, which is dependent on the use of the receptor; and
- the receptor's specific sensitivity to noise or vibration, for example, the location, construction and layout of a school. This would include matters such as whether the most sensitive parts of the school are closest to and face the scheme or are further from and on the opposite side of a building to the scheme; and the sound insulation performance of the building.

11.6.63 The assessment has considered the noise and vibration exposure at each non-residential receptor and the receptor's generic sensitivity. On a worst-case basis, it assumes that the receptor is the most sensitive it can be. For example, that the most sensitive use in the building is on the side facing the scheme.

11.7 Baseline Conditions

11.7.1 Noise or vibration sensitive locations have been identified for inclusion in the assessment; (see **Baseline noise survey** (Volume 6 Document Ref 6.4 ES Appendix 11.2). Baseline noise survey locations have been agreed with Cornwall Council and surveys have been carried out at sufficient locations to represent noise sensitive areas alongside the scheme. The noise survey was carried out in accordance with the ‘Shortened measurement procedure’, described in paragraph 43 of CRTN (survey procedures and locations are described in **Baseline noise survey** (Volume 6 Document Ref 6.4 ES Appendix 11.2). The baseline survey locations are shown in Volume 6 Document Reference 6.3 ES Figure 11.1.

11.7.2 It is assumed that local noise conditions would not change substantively between the survey period and the commencement of proposed works.

11.7.3 The baseline noise conditions (i.e. Do-Minimum) for the operational traffic assessment have been determined by the CRTN noise prediction model for a forecast traffic scenario of 2023. This has provided a detailed coverage of noise levels across the entire calculation area.

11.7.4 HD 213/11 states that prediction is the preferred approach for establishing the Do-Minimum baseline noise conditions, which are then directly comparable with the noise levels predicted in the same way for the Do-Something future assessment year.

11.7.5 Volume 6 Document Reference 6.3 ES Figure 11.1 shows the locations of the noise receptors (dwellings and other noise sensitive properties) and their proximity to the existing A30 and the surrounding roads. The predicted traffic noise level contours for the baseline year (i.e. Do-Minimum 2023 for the noise assessment) are also shown so the relative baseline noise exposures of the different sensitive receptors can be seen. Noise Important Areas (NIA) are shown to identify dwellings in areas of relatively high noise exposure recognised by Defra[31].

11.7.6 The following sections summarise the sensitive receptor locations across the scheme area, the locations are described using the chainage references for the scheme alignment. Volume 6 Document Reference 6.3 ES Figure 11.1 shows the location of dwellings and other buildings within the study area. The following sections should be read with reference to Volume 6 Document Reference 6.3 ES Figure 11.1.

Chainage: east of 0+000.000 – 4+000.000

11.7.7 Approximately 300m south of Chiverton Cross junction at the southern end of the scheme, the closest dwelling to A30 (Burra Burra Farm) is approximately 40m from the highway A30 on the eastern side at chainage 0+400.000. There are also other dwellings set further back from the highway around this area. Approximately 300m west of this location is the Trevarth Holiday Park with Chiverton Caravan and Touring Park immediately to the north. Around the existing junction itself, there are dwellings within 100m of the junction, e.g. Burrow Farm to the north, and Highfield to the south (Highfield is within NIA 3254). Around chainage 0+700.000, where the proposed new Chiverton Junction would be located just north of the existing alignment, there are a small number of isolated dwellings within 200m of the existing A30 (e.g. The Stables, The Barn). The Church of St Peter and Mithian Church Hall are just to the west of these properties.

11.7.8 Moving northeast (chainage 1+400.000), Holly Tree Cottage is located approximately 500m northwest of the A30 with other dwellings nearby (Silverdene). Approximately the same distance away from the A30 on the south side is Lands Vue House (dwelling). Closer to the A30 at 1+500.000, just south of the proposed new Chiverton Junction, is a single dwelling (Roscarnick Farm House).

11.7.9 Further northeast there is a group of dwellings between 400 - 600m from the A30 (e.g. Poltaire, Littledown, Burleigh Croft). Fourburrow Farm House, at about chainage 2+250.000, is directly alongside the A30 on the north side (within NIA 13097). Moving northeast, Pendale Farm and a small group of other dwellings are situated about 500m from the A30. At chainage 4+000.000 where the B3284 joins the A30 there is a dwelling (Callestick Vean Bungalow) approximately 80m from the A30 on the north side.

11.7.10 There are no known designated Quiet Areas within this section of the scheme.

Chainage: 4+000.000 – 7+500.000

11.7.11 North of the proposed Chybucca grade separated junction is Creegmeor Farm approximately 250m from the A30. Hillview Farm (chainage 5+000.000) is located

[31] DEFRA (2016), Noise Action Planning Important Areas Round 2 England, (https://data.gov.uk/dataset/fc786717-3756-4fd1-9c7d-c082331e40e4/noise-action-planning-important-areas-round-2-england)

approximately 350m south of the A30 along the B3284. The scheme would be aligned closer to this dwelling at about 250m distance.

11.7.12 Further northeast at chainage 5+500.500 there is a group of dwellings which are approximately 600m south of the A30 (e.g. Rosedale and Fenton Cottage), the scheme alignment would be about 100m closer here. North of the A30 at about the same chainage are a group of dwellings setback from the A30 within the range 15-150m, the closest being (Lower Tresawen). The scheme alignment would be about 100m further away from these properties than the existing A30.

11.7.13 Nanteague Farm is situated approximately 250m on the south side of the A30 at chainage 6+250.000; the scheme alignment would be about 100m closer here.

11.7.14 Moving northeast to chainage 7+000.000, a number of dwellings around the Marazanvose Farm group of dwellings are located close to, or directly alongside the A30 (within NIA 3291). Elmsleigh is the closest of these to the A30 on the north side. Just beyond chainage 7+250.000 on the south side is the NFH group of properties, the closest dwelling here (The Villa) being about 100m from the A30. The wedding venue associated with the farm is about 200m from the A30.

11.7.15 There are no known designated Quiet Areas within this section of the scheme.

Chainage: 7+500.000 – 11+000.000

11.7.16 At chainage 8+000.000 there are two isolated dwellings approximately 100m to the north of the A30 (Merton Lodge, St Freda); Hill House is 30m to the south of the A30 here. Around chainage 8+500.000 about 100m north of the A30 are a group of six dwellings at Zelah Lane Farm. Tolgroggan Farm is 500m southeast of the A30 at about the same chainage.

11.7.17 Moving northeast towards to the village of Zelah, the closest dwellings on the northwest side of the A30 are approximately 100m from the road. Beyond Zelah, Henver Cottage on Henver Lane is about 10m from the A30 (within NIA 3292). There are also three other dwellings on Henver Lane within about 125m of the A30; the proposed alignment would move further from these properties here. Trevalso Farm is approximately 150m southwest of the A30 here at chainage 9+500.500.

11.7.18 At chainage 10+500.500, Mount Pleasant Farm is 25m northwest of the A30 with Tregorland directly alongside the road on the opposite side (Tregorland and Zelah Hill Cottage are within NIA 3293 here).

11.7.19 Further east, Pennycomequick (dwelling) at chainage 11+000.000 is located about 15m south of the A30. The proposed A30 alignment would be about 200m south of the current position to the south of this property. Honeycombe Farm is located about 350m south of the existing A30 at this same chainage and would therefore be relatively close to the proposed realignment.

11.7.20 There are no known designated Quiet Areas within this section of the scheme.

Chainage: 11+000.000 – 14+000.000

11.7.21 Just beyond chainage 11+000.000 Penglaze (dwelling) is located about 150m north of the A30.

11.7.22 Further east at chainage 12+000.000, Treworrian Manor is located 60m to the north of the A30. A little further on, also on the north side, Racland House and

Fourwinds (within NIA 3294) are 30m from the road. Directly south of this position, Ennis Farm is 600m south of the A30.

11.7.23 At chainage 12+500.500, Higher Ennis Farm is located 400m to the south of the A30. The proposed alignment would be approximately 100m south of the existing A30 here, and hence closer to this property.

11.7.24 At chainage 13+500.000, Carland Cross Cottages and Rosehill Farm are 75m and 125m respectively to the south of the existing A30.

11.7.25 There are no known designated Quiet Areas within this section of the scheme.

11.8 Consultation

Cornwall Council has been consulted to agree the methodology and survey locations. The Planning Inspectorate were consulted during the scoping stage and provided an opinion. These responses have been considered and included, where appropriate, in the **Scoping opinion** (Volume 6 Document Ref 6.4 Appendix 4.2).

11.9 Assessment Assumptions and Limitations

Construction

11.9.1 Appropriate assumptions have been made as to the type and number of construction plant and the intensity and duration of the construction processes. This has been based on the available construction planning information and data taken from similar highway construction works where construction method information was more developed. The assumptions are shown in **Construction plant machinery** (Volume 6 Document Ref 6.4 ES Appendix 11.4) and are considered suitable to represent the types of works and associated impacts for this scheme assessment.

11.9.2 Construction noise predictions are based on the expected programme and construction methods. The predictions represent the logarithmic noise average over a calendar month. Where necessary, assumptions have been made with the advice of the scheme design engineers regarding aspects of the construction process. These construction method assumptions are considered to be sufficiently representative for this assessment. The assumptions are shown in **Construction plant machinery** (Volume 6 Document Ref 6.4 ES Appendix 11.4).

11.9.3 It is likely that a number of short term activities would be required to be undertaken during extended working hours and sometimes at night. These primarily relate to works to, or on existing transport corridors (such as safety-critical aspects of bridge works) in order to reduce the impact on existing roads. From the information available at the time of the assessment, the potential for effects from these activities would be very limited given the short duration of such works, and hence these have been screened out of the assessment.

11.9.4 It is assumed that traffic will not be diverted away from the existing A30 highway boundaries onto other roads during the construction works. Hence, there will not be diversion effects giving rise to traffic noise changes. Construction traffic will generally only access the works via the existing A30 or other major roads, rather than minor roads around the scheme. Hence, construction traffic noise impacts

would be negligible relative to existing traffic on the A30 and surrounding major roads.

Operation

11.9.5 Road traffic flows and speeds used in the assessment were provided by the project traffic engineers for all of the scenarios listed in Paragraph 11.6.25.

11.9.6 Low noise surface would be laid on all new and altered roads in the scheme. It is assumed that, in the absence of the scheme, all sections of the existing A30 in the study area would be surfaced with low noise surface by the Do-Minimum future year (2038). Landscape earthworks proposed for the scheme to reduce visual and landscape impact (refer to **Landscape** (Volume 6 Document Reference 6.2 ES Chapter 7)) are assumed as an integrated part of the permanent scheme. These features would reduce wayside noise; the locations alongside the scheme are indicated in Volume 6 Document Reference 6.3 ES Figure 11-2).

11.9.7 Noise insulation would be offered where future noise levels exceed the noise level trigger value of 68dB$L_{pA10,18hr}$ (façade noise level) and the other requirements referred to in the Noise Insulation Regulations 1975 (as amended) (NIR).

Assessment and baseline gaps

11.9.8 The assessment of construction noise and vibration effects has been based on the typical construction stages and processes for a highway scheme. Where necessary, assumptions have been made with the advice of the scheme design engineers regarding aspects of the construction process. When scheme contractors have developed a full construction method statement, more detailed information on programme and processes will be available. However, the current construction method assumptions are considered to be representative of the type and intensity of the works, and are suitable for this ES.

11.9.9 The effects of noise and vibration on ecological receptors have been considered in **Ecology and nature conservation** (Volume 6 Document Ref 6.2 ES Chapter 8).

Limits of deviation

11.9.10 An assessment has been conducted within the limits of deviation outlined in Limits of Deviation within **Approach to EIA** (Volume 6 Document Ref 6.2 ES Chapter 4)

11.9.11 A sensitivity test has been undertaken to examine noise level variation which might occur should the vertical alignment elevations be altered from the current levels assumed for the ES road noise model (Volume 6 Documents Reference 6.2 Chapter 11). The maximum height variation considered has been set at ± 0.5m (note: certain areas described in Paragraph 4.3.7 of **Approach to EIA** (Volume 6 Document Ref 6.2 ES Chapter 4) have been excluded where deviation would not be permissible).

11.9.12 An initial review was undertaken to establish an approximate setback distance, within which noise receptors might be subject to noise changes from the vertical alignment change which could affect the ES assessment result. From this analysis, all noise sensitive properties within 40m from the scheme were subject

to a more detailed prediction of the noise changes that would occur from a 0.5m alteration of the road elevation.

11.9.13 It is considered that applying a downwards alteration would not result in a detrimental effect at any of the noise sensitive receptors. Therefore, only an upwards alteration of +0.5m was considered.

11.9.14 Using the ES noise model, the proposed A30 mainline carriageways were adjusted, such that the vertical elevations were increased uniformly by +0.5m over a 1km section, 500m either side of each of the noise sensitive properties identified above. Calculations were carried out for the most exposed façade(s) of each property i.e. those closest to the proposed A30 alignment.

11.9.15 In all cases, the noise level changes predicted were well below 1dB. There were no situations where the slight increases recorded (typically 0.2dB) would result in any noise changes which would alter the ES assessment outcome.

11.9.16 Small changes to the horizontal alignment are less critical as they would not substantially alter screening or the mean height of propagation. The maximum lateral carriageway deviation could be ± 0.5m. The proportionate change in horizontal distance between the noise source and even the closest receptors associated with the horizontal limit of deviation (including any vertical deviation within the LOD) is not considered large enough to result in any change to the ES assessment results presented in Volume 6 Documents Reference 6.2 Chapter 11.

11.10 Design, Mitigation and Enhancement Measures

Construction mitigation

11.10.1 The construction noise and vibration assessment assumes that the works would be undertaken following the principles and processes set out in the Outline Construction Environmental Management Plan (**Outline CEMP**) (Volume 6 Document Ref 6.4 ES Appendix 16.1) provided with the ES. The mechanism to ensure implementation of noise and vibration controls is given in the Register of Environmental Actions and Commitments within the **Outline CEMP** (Volume 6 Document Ref 6.4 ES Appendix 16.1 and associated Annex K: Outline Noise and Vibration Management Plan).

11.10.2 Best Practicable Means (BPM) is conditioned (by means of the Outline CEMP) as incorporated mitigation to control construction noise in the form of low noise emission plant and processes (as specified in detail in BS 5228 Annex B - Noise sources, remedies and their effectiveness).

11.10.3 BPM would include noise and vibration control at source - for example:

- the selection of quiet and low vibration equipment;
- review of construction programme and methodology to consider quieter methods (including non-vibratory compaction plant, where required);
- sensitive location of noise generating equipment on site, control of working hours (to be set out in the Outline CEMP (Volume 6 Document Reference 6.4 ES Appendix 16.1) and controlled through Section 61 agreement);
- the provision of acoustic enclosures and the use of less intrusive alarms; such as broadband vehicle reversing warnings; and
- screening - for example local screening of equipment, perimeter hoarding or the use of temporary stockpiles.

11.10.4 If situations arise where despite the implementation of BPM, the noise exposure exceeds the criteria defined in the **Outline CEMP** (Volume 6 Document Ref 6.4 ES Appendix 16.1), the main contractors may offer:

- noise insulation; or ultimately
- temporary re-housing.

11.10.5 As set out in section 11.11 of this chapter, further mitigation could be detailed as required in the Outline CEMP (Volume 6 Document Reference 6.4 ES Appendix 16.1) following dialogue with local authorities. Cornwall Council have recommended a Section 61 (of the Control of Pollution Act 1974) application to agree appropriate controls and protocols.

Engineering design

11.10.6 Mitigation measures designed into the scheme to reduce impacts, including noise during operation, are careful design of the horizontal and vertical alignment and cuttings, and roadside landscaping, as described in **Landscape** (Volume 6 Document Ref 6.2 ES Chapter 7).

11.10.7 Further to this, following the stakeholder consultation exercise and responses, the engineering design was reviewed. Specifically, the vertical alignment was re-considered at Chiverton Cross and Marazanvose/NFH area. This exercise confirmed that alignment changes at Chiverton Cross were not feasible, but it was practicable to deepen the cutting alongside NFH, where other engineering considerations would allow. These changes, up to 2m greater cutting depth in places, were made, in part, to be able to provide more noise screening. This has provided additional noise attenuation as well as other screening measures described in the following section.

11.10.8 A low noise road surface will be incorporated throughout the scheme[32].

Operational mitigation

11.10.9 As described above in Paragraph 11.10.6, the magnitude of noise increases and the number of people adversely affected by them across the scheme has been minimised by noise mitigation integrated into the engineering design. This is in line with the aim of government noise policy to minimise as far as sustainable adverse impact on health and quality of life.

11.10.10 To avoid significant observed adverse effects from the scheme, and minimise as far as sustainable other likely significant adverse effects from the scheme, the incorporated noise mitigation described in Table 11-10 is also proposed. These particular measures were included solely for noise screening mitigation (Cornish Hedges and noise fencing). These were integrated into the landscape and visual mitigation design following the stakeholder consultation exercise and responses.

11.10.11 To ensure mitigation is practicable and sustainable across the scheme, the provision has been subject to the following tests:

- stakeholder engagement and consultation responses;
- engineering practicability;
- consideration of noise benefit compared to cost of the mitigation; and

[32] It is assumed that, in the absence of the scheme, all sections of the existing A30 in the study area would be surfaced with low noise surface by the Do-Minimum future year (2038).

- other environmental effects potentially caused by the mitigation (for example landscape or visual effects).

Table 11-10 Incorporated noise mitigation measures for operation of the scheme

Location (See Figure 11.2)	Indicative chainage	Indicative barrier length (m)	Total barrier height (m)	Description
Proposed Chiverton Junction	0+900.000 to 2+100.000	2190	1.8	Cornish Hedge (earth-filled stone wall)
Marazanvose/ NFH area	6+840.000 to 7+520.000	670	3	Noise Fencing

11.10.12 The mechanism to ensure implementation of operational noise controls is given in the Register of Environmental Actions and Commitments with the **Outline CEMP** (Volume 6 Document Ref 6.4 ES Appendix 16.1).

Enhancement

11.10.13 The horizontal and vertical alignment of the scheme, as part of the engineering design, has resulted in larger distances between the dwellings and the proposed new A30 in some locations, or increased screening (from cuttings). This would result in reduced noise exposure which are identified in the following assessment.

11.10.14 In particular, this engineering design has addressed, where practicable, dwellings currently in very close proximity to the existing road which are exposed to high noise levels. These noise reductions in Noise Important Areas respond to the requirement stated in the revised NPPF[33] (described in 11.3.6) that 'Development should, wherever possible, help to improve local environmental conditions…', and hence provide enhancement where sustainable to do so.

11.10.15 Further to the avoidance and mitigation measures integrated along the length of the scheme to minimise adverse noise effects, consideration will be given to developing enhancements during detailed design of the scheme. For example, when more design detail can be confirmed, there may be opportunities to extend environmental screening (e.g. Cornish Hedges) in certain areas if it can be shown that this would provide beneficial enhancements with regard to noise. This would not be likely to apply to extents of noise screening described in Table 11-10 which were identified specifically as optimal noise mitigation measures, and no further noise mitigation is considered sustainable.

11.10.16 Any such enhancement would have to be shown to be sustainable based on the criteria described in Paragraph 11.10.11, particularly the landscape and visual impacts of any such measures.

11.11 Assessment of Effects

11.11.1 The assessment approach for construction and operation considers a range of receptors and effects as descried in Table 11-1. The following assessment sections are divided as follows:

[33] revised National Planning Policy Framework (2018) Paragraph 170(e)

- Residential receptors: direct and indirect effects exceeding the SOAEL;
- Residential receptors: direct and indirect effects between the LOAEL and SOAEL;
- Non-residential receptors: direct and indirect effects.

11.11.2 Additional detail on the assessment methodologies for each of these types of receptor is described in **Detailed approach to assessment of effects** (Volume 6 Document Ref 6.4 ES Appendix 11.3)

Construction effects

Noise

11.11.3 For the purposes of assessment, the principle construction activities have been considered and divided into the following 12 phases associated with the overall work:

- site clearance, tree and vegetation removal;
- traffic management;
- boundary fence;
- temporary works;
- topsoil strip;
- earthworks cut/fill;
- drainage;
- subbase;
- surface water channel;
- pavement/surfacing;
- concrete barrier; and
- structures.

11.11.4 These represent distinct activities with potentially different levels of noise impact. **Construction plant machinery** (Volume 6 Document Ref 6.4 ES Appendix 11.4) describes the plant machinery assumed for the assessment.

11.11.5 Table **11-11** identifies the daytime potential significance thresholds respectively based on the BS5228 ABC method as described in Paragraph 11.6.41. The baseline traffic noise prediction model has been used to estimate the ambient noise levels at each receptor location. The appropriate ABC method assessment category (and therefore the SOAEL) for each location has been determined from the predicted ambient noise level at the façade (taken from the baseline noise level prediction for 2023).

11.11.6 Table **11-11** also presents predicted monthly construction noise levels at each receptor (see Figure 11.1 for receptor locations for the construction assessment). These have been predicted using the methodology described in Paragraph 11.6.2. Where the cell text is in grey/italic font, the range of predicted monthly construction noise levels are below the ambient noise level (baseline noise level prediction for 2023) and therefore below the LOAEL for construction noise (see criterion in Table 11-2). Where the text is in bold font, the highest predicted value exceeds the ABC potential significance threshold and therefore also exceeds the SOAEL for construction noise (Table 11-2).

Table 11-11 Daytime construction noise assessment at residential locations

Location (see Figure 11.1)	SOAEL – ABC method dB threshold (day)(BS 5228)	Range of predicted monthly daytime construction noise levels* $dBL_{Aeq, day}$
R1 Highfield	75	54 - **78**
R2 Silversprings	65	51 - **76**
R3 Silverwell Forge	65	36 - 62
R4 Roscarnick Farm	70	51 - **76**
R5 Silverdene	65	48 - **73**
R6 Four Burrows Farm	75	*42 - 66*
R7 Callestick Vean Bungalow	70	46 - 70
R8 Creegmeor Farm	65	37 - 63
R9 Hillview Farm	65	*35 - 59*
R10 Lower Tresawsen	75	*43 - 68*
R11 Nanteague Farm	65	39 - 65
R12 Elmsleigh	75	53 - **78**
R13 NFH Villa	65	46 - **76**
R14 Bracken Woods	65	37 - 62
R15 Merton Lodge	65	47 - **78**
R16 Hill House**	70	55 - **79**
R17 Zelah Lane Farm	65	42 - **74**
R18 2 Church Lane	65	40 - 65
R19 Henver Cottage	75	53 - **77**
R20 2 Tregorland	70	44 - 68
R21 Honeycombe Barn	65	56 - **82**
R22 Pennycomequick	70	54 - **79**
R23 The Lodge	70	44 - 68
R24 Higher Ennis Farm	65	32 - 56
R25 1-3 Carland Cross Cottages	70	43 - 68
R26 Treventon Farm	65	*28 - 54*
R27 The Willows	70	*32 - 56*

* Noise level includes correction for façade acoustic reflection (i.e. noise level at 1m from façade). Where the cell text is grey/italic, the range of predicted noise levels are below the LOAEL. Where the text is in bold font, the highest predicted value exceeds the ABC potential significance threshold and therefore exceeds the SOAEL for construction noise (Table 11-2).

** Hill House is expected to be purchased as part of the scheme proposal

Residential receptors: direct effects exceeding the SOAEL

11.11.7 The ABC potential significance threshold and therefore the SOAEL would be exceeded during some months of the construction at the following construction assessment receptors. Nearby receptors which are expected to experience similar noise levels to the assessment receptors are shown in parentheses.

- R1 Highfield (also The Annex and Burrow Farm);
- R2 Silversprings (also the residences at The Old Vicarage, Old Vicarage Court, The Gatehouse and Chyverton House);
- R4 Roscarnick Farm;
- R5 Silverdene (also Ferriera and Silverwell Yard);

- R12 Elmsleigh (also Barn Wyn, Treffry Cottage, 1 The Cottages, Ranger Barn);
- R13 NFH Villa;
- R15 Merton Lodge (also St Freda);
- R16 Hill House**;
- R17 Zelah Lane Farm (also Zelah Lane Farm Annexe, Trolgroggan Bungalow, Chapel Cottage, The Nook Zelah Lane and The Chapel);
- R19 Henver Cottage (also Henver Lane Cottage);
- R21 Honeycombe Barn (also Honeycombe House and residential Caravan); and
  R22 Pennycomequick.

11.11.8 The construction phases resulting in the highest noise levels are generally structures and/or topsoil strip. The activities associated with the structures phase, including Chiverton Cross underbridge, Chybucca overbridge, Tresawsen underbridge, Nancarrow green bridge, Tolgroggan accommodation overbridge, Trevalso underbridge, Pennycomequick underbridge and Carland Cross underbridge will take place in particular parts of the scheme and so affect only some of the receptors. It is assumed all other activities take place across the length of the scheme.

11.11.9 The greatest exceedance of the ABC threshold for potential significant effects (SOAEL) is at receptor R21 Honeycombe Barn some 25m from the edge of the works with a predicted construction noise level of up to 17dB(A) above the SOAEL. The predicted noise levels are representative of those at other residences (Honeycombe House and residential Caravan) located at a similar distance from the works.

11.11.10 The next greatest exceedance of the SOAEL is at receptor R15 Merton Lodge with a predicted construction noise level of up to 13dB(A) above the SOAEL. It is anticipated noise levels up to this value would also be experienced at St Freda. These dwellings are in close proximity to the construction works (some 5m and 15m respectively to the closest point of the works).

11.11.11 Noise predictions at Receptor R13 NFH Villa are up to 11dB(A) above the SOAEL. This receptor is some 20m from the earthworks associated with the proposed ramp to the green bridge. The main dwelling at the NFH properties, which is some 80m from this ramp, is predicted to be subject to noise levels typically 6dB(A) less than those predicted at NFH Villa and so, in some months, is also predicted to result in a noise level above the SOAEL[34].

11.11.12 Noise predictions at Receptor R2 Silversprings are up to 11dB(A) above the SOAEL. This is some 30m from the closest point of works. It is anticipated noise levels up to this level would also be experienced at The Old Vicarage, Old Vicarage Court, The Gatehouse and Chyverton House which are located a similar distance from the works.

11.11.13 Noise predictions at Receptors R16 Hill House**, R17 Zelah Lane Farm and R22 Pennycomequick are up to 9dB(A) above the SOAEL. These dwellings are some 10m, 10m and 40m respectively to the closest point of the works. The following residential receptors are located near to Zelah Lane Farm and are therefore

[34] The noise effects on the wedding venue are discussed in the non-residential effects section below.

anticipated to experience similar noise levels: Zelah Lane Farm Annexe, Trolgroggan Bungalow, Chapel Cottage, The Nook Zelah Lane and The Chapel.

11.11.14 Noise predictions at the other receptors identified in 11.11.7 the exceedances are lower - predicted to be up to 8dB above the SOAEL.

11.11.15 The predicted noise levels are above the SOAEL in some months for all receptors listed in 11.11.7 which is an indication of a significant observed adverse effect. The temporal aspects and rate of progression of the works have been considered within the assessment and on this basis, these receptors are assessed as **temporary significant** effects above the SOAEL and are also considered significant in EIA terms.

11.11.16 Specific mitigation, including eligibility for noise insulation, will be included, where relevant, in the **Outline CEMP** (Volume 6 Document Ref 6.4 ES Appendix 16.1).

Residential receptors: direct effects between LOAEL and SOAEL

11.11.17 In locations with lower existing noise levels (between the LOAEL and SOAEL), these noise changes may be considered by the local community as an adverse effect on the acoustic character of the area and hence be perceived as a change in the quality of life.

11.11.18 The construction noise levels are predicted to exceed the LOAEL (existing ambient noise level) in some months, but not exceed the SOAEL at the following receptors:

- R3 Silverwell Forge (also Albany View, Holly Tree Cottage, The Paddock);
- R7 Callestick Vean Bungalow;
- R8 Creegmeor Farm;
- R11 Nanteague Farm;
- R14 Bracken Woods;
- R18 2 Church Lane (also 1 Church Lane, Halfmoon House, Woodwards Barn, Stepping Stones, Treveth, Berlewen, Balmerino, Byways, Cranbourne, Sansigra House and residences on south side of Chapel Crescent);
- R20 2 Tregorland (also 1 Tregorland, Zelah Hill Cottage, Mount Pleasant Farm, Mount Pleasant Cottage);
- R23 The Lodge (also Raglan House, Four Winds);
- R24 Higher Ennis Farm; and
- R25 1-3 Carland Cross Cottages.

The construction noise levels are below the SOAEL and therefore are not an indication of significant adverse effect and are assessed as not significant in EIA terms.

Residential receptors: indirect effects

11.11.19 There are no indirect effects associated with the construction activities.

Non-residential receptors: direct effects

11.11.20 Mithian Church Hall is a community facility located some 90m from the works and is anticipated to experience similar noise levels to R2 Silversprings. The predicted construction noise levels would exceed the SOAEL by 4dB(A) (defined by the ABC threshold - as described in Table 11-2) in some months. The predicted construction noise levels would also exceed the existing ambient and therefore

the LOAEL in some months. Assuming a 10-15dB(A) reduction for a partially open window the range of predicted monthly construction noise levels inside would be 30-59dB$L_{Aeq, day}$. The highest of these internal noise levels assumes the lowest attenuation value for a partially open window. This would, therefore, in some months, exceed the BS8233 guidance upper limit of 35dB$L_{Aeq,T}$ for places of worship which is also considered to be applicable to some of the uses of this hall. The baseline indicates an existing ambient noise level of 58dB$L_{Aeq,day}$ outside which would result in noise levels inside exceeding the BS8233 guidance limit assuming the same loss (10-15dB(A)) for a partially open window. Given the impact level of the construction works, the likely effects at this receptor are assessed as **temporary significant.**

11.11.21 The Church of St Peter is located some 150m from the works and is predicted to experience monthly construction noise levels of 40-64dB$L_{Aeq, day}$ at the façade. These levels are not predicted to exceed the SOAEL however do exceed the LOAEL (existing ambient noise level) in some months. Assuming a 10-15dB(A) reduction for a partially open window the range of predicted monthly construction noise levels inside would be 25-54dB$L_{Aeq,day}$. This would, therefore, in some months, exceed the BS8233 guidance upper limit of 35dB$L_{Aeq,T}$ for places of worship. The baseline indicates an existing ambient noise level of 52dB$L_{Aeq,day}$ outside, which would result in noise levels inside exceeding the BS8233 guidance limit assuming the same loss for a partially open window. However, given the impact level of the construction works, the likely effects at this receptor are assessed as **temporary significant**.

11.11.22 The NFH wedding venue is some 140m from the proposed works and includes several converted barns and an outside space. The predicted monthly construction noise level is 33-59dB$L_{Aeq,day\ (free\text{-}field)}$. Therefore, during some of the months it is predicted the noise level will exceed the BS8223 guideline range of 50-55dB$L_{Aeq,T}$ for external amenity space. The predicted construction noise levels are predicted to be below the SOAEL but above the existing ambient levels (LOAEL) in some months. Assuming a 10-15dB(A) reduction for the façade of one of the barns, the range of predicted monthly construction noise levels inside would be 18-49dB$L_{Aeq,day}$. This would, in some months, exceed the BS8233 guidance upper limit of 40dB$L_{Aeq,T}$ for a use as a ballroom/banqueting hall. The baseline noise predictions indicate an existing ambient noise level of 48dB$L_{Aeq,day}$ outside which is anticipated to meet the BS8233 guidance limits for restaurants (internal) and for an external amenity space. The likely effects of noise from the construction works reaching the barn and external wedding venue areas, is assessed as **temporary significant**.

11.11.23 Trevarth Holiday Park is some 340m from the works at the nearest point. The predicted monthly construction noise level is 28-53dB$L_{Aeq, day\ (free\text{-}field)}$. This is therefore predicted to be below the SOAEL but above the LOAEL (existing ambient noise level) during some months. The noise level is predicted to be below the BS8223 guideline range of 50-55dB$L_{Aeq,T}$ for external amenity space. The likely effects at this receptor are assessed as not significant.

11.11.24 Nanteague Stables is some 30m from the edge of the works. The predicted monthly construction noise level is 44-70dB$L_{Aeq, day\ (free\text{-}field)}$. This is therefore predicted to be above the SOAEL and LOAEL in some months. During some months it is predicted the noise level will exceed the “Acoustics of Schools: a design guide” guideline limits of 50-55dB$L_{Aeq,T}$ for outdoor teaching/recreation areas. The baseline indicates an existing ambient noise level of 57dB$L_{Aeq,day}$

which exceeds upper guidance limit. The likely effects at this receptor are assessed as **temporary significant.**

11.11.25 Chiverton Riding Centre is some 260m from the edge of the works. The predicted monthly construction noise level is 30-56dBL$_{Aeq, day (free-field)}$. This is predicted to be below the SOAEL but above the LOAEL during some months. It is predicted the noise level will just exceed the "Acoustics of Schools: a design guide" guideline limits of 50-55dBL$_{Aeq,T}$ for outdoor teaching/recreation areas in some months. The baseline indicates an existing ambient noise level of 49dBL$_{Aeq,day}$ which would meet the guidance limits. However, given the predicted 1dB exceedance of the guideline levels for only part of the works, the likely effects at this receptor are assessed as not significant.

Non-residential receptors: indirect effects

11.11.26 There are no indirect effects associated with the construction activities.

Vibration

11.11.27 Soil nailing is proposed at two retaining structures at around chainage 7+650.000 and 12+900.000. The nearest residential receptors are Bracken Woods, NFH, and Higher Ennis Farm which are over 200m from the works. It is considered that at these distances no effects due to vibration would occur at the receptors.

11.11.28 Temporary sheet piling is proposed on an existing section of road between chainage 0+500.000 and 0+700.000 by the Chiverton roundabout as part of the temporary works phase. The nearest residential receptors to these temporary works (70-110m away) will be:

- Highfields (to the southeast, at closest point to temporary works);
- Burrow Farm (to the southeast, at closest point to temporary works);
- Chy-an-Godolghyn (to the south, at closest point to temporary works);
- Burra Burra Farm (to the south, at closest point to temporary works).

11.11.29 The closest non-residential property to these temporary works will be the Starbucks premises, which would be within 15m of the sheet piling rig at its closest point.

11.11.30 Predicted PPV levels at all of the residential properties, for a worst case assessment (closest point between source and receptor), lie between 0.5 and 1.5mms^{-1}. However, this would only be for an approximate duration of one week, whilst the piling rig passes by the closest point to each receptor.

11.11.31 The PPV levels predicted at the closest non-residential property, Starbucks, would potentially reach 7.5mms^{-1}. Effective mitigation measures to minimise any vibration from sheet piling, would be to use hydraulic piling. This method presses the steel piles into place, removing the need for percussive or vibratory drivers. Hence this would be a not significant effect.

11.11.32 It is likely that vibratory compactors would be used for the earthworks, road pavement subbases and surfacing. The advantage of vibratory plant is to increase both the effectiveness and speed of construction. Vibration generated by this plant could affect residential receptors that are in close proximity to the boundary of these works. However, the closest works would likely be only for a short duration i.e. approximately 1 or 2 weeks. Those properties identified as being particularly close to these works are as follows:

- R1 Highfield (also The Annex and Burrow Farm);
- R2 Silversprings (also the residences at The Old Vicarage, Old Vicarage Court, The Gatehouse and Chyverton House);
- R4 Roscarnick Farm;
- R12 Elmsleigh (also Barn Wyn, Treffry Cottage, 1 The Cottages, Ranger Barn);
- R13 Nancarrow Villa;
- R15 Merton Lodge (also St Freda);
- R16 Hill House**;
- R19 Henver Cottage (also Henver Lane Cottage);
- R21 Honeycombe Barn (also Honeycombe House and residential Caravan); and
- R22 Pennycomequick.

** Hill House is expected to be purchased as part of the scheme proposal

11.11.33 An assessment of the predicted vibration levels has been undertaken based upon the construction information available at this time. However, this information does provide sufficient detail to enable approximations of the instantaneous 'peak particle velocity' (PPV) to be undertaken. Vibration predictions were made to represent a 'typical' (i.e. average distance between plant and receptor) and a 'worst case' condition (i.e. closest point between plant and receptor) for each receptor.

11.11.34 Vibratory compactors will be the principle source of vibration during the road scheme construction. They generate vibrational energy at an optimised and precisely controlled operating frequency, to maximise ground compaction efficiency. In general, the heavier the machine, the higher the vibration energy imparted into the ground.

11.11.35 Predictions of vibration levels were undertaken using the formulae provided in Annex E of BS 5228 (Hiller & Crabb)[35]. These formulae provide a reliable method of predicting vibration levels at defined distances from vibratory compaction plant. Implementing this method results in a 'free field' PPV external to a vibration sensitive building. To obtain an actual PPV within the building, an appropriate transfer function[36] is then calculated and applied to the 'external' PPV.

11.11.36 All these factors have been accounted for in the resultant predicted vibration levels at each of the receptors identified in Paragraph 11.11.32.

11.11.37 The predicted PPV provides an indication of the overall instantaneous level of vibration perceptible to the occupants, and also provides a directly related parameter to gauge potential effects of vibration upon the building structure itself.

11.11.38 A broad selection of typical vibratory compactors has been used to undertake the vibration predictions. These range from a 'large' 12 tonne unit, likely to be used for undertaking much of the road pavement construction, to a 'medium' capacity 9 Tonne unit, and lastly a 'small' 1.5 Tonne hand driven unit. The latter two units

[35] HILLER D.M. and CRABB G.I. Ground-borne vibration caused by mechanised construction works. TRL report 429. Wokingham: TRL, 2000.

[36] By application of established empirical data (Nelson: Transportation Noise Reference Book: 1987), both coupling losses of ground and foundation, as well as amplification due to the building's structural elements such as floor resonances, can be accounted for and a transmission correction factor applied to the 'external' PPV to derive the internal PPV. A 'worst case' 1st floor vibration level has been assumed in all calculations.

would be suitable to undertake earthwork construction activities, whilst the former unit would be considered inappropriate (too large) for certain activities. The predictions provide a range of values, permitting an evaluation of the closest distances that the 'medium' and 'small' units might be used in respect to each receptor, in terms of PPV vibration levels. The predicted values are considered and discussed further in the following sections.

11.11.39 Based upon the resultant predictions for the daytime construction activities requiring each of the vibratory compactors described in section 11.10.35, all the predicted PPVs derived at the 'typical' working distances, for each of the identified receptor locations, would be below the SOAEL criteria of 1mm.s^{-1} stated in Table 11-4. There would be a marginal (5% percentile) chance at Locations R13, 15 and 19 where vibration levels could exceed 1mm.s^{-1} PPV should the large vibratory compactor is to be used. If a risk of such a situation were to arise, a simple mitigation measure would be to either operate in 'static' mode, i.e. non vibratory, or to use a smaller compactors in vibratory mode, to remain below the SOAEL. This would therefore be not significant in Government policy terms.

11.11.40 Predicted PPVs at the closest pass-by distances (worst case) would result in higher vibration levels, albeit for much shorter durations. The majority of the closest works involve earthworks only (with the exception of very close road pavement works at R15), and therefore only predictions for the 'medium' and 'small' vibratory compactors have been considered. To ensure vibration levels would be adequately controlled, it would not be possible to operate the large compactor within such close proximity to any of these dwellings without exceeding the SOAEL.

11.11.41 Based upon the more realistic 33% percentile, the PPV predictions for the medium compactor would remain below 1mm.s^{-1} at locations R2, R4, R12, R21 and R22, and only slightly higher for R13. Predicted PPVs for the remaining locations R1, R15, R16, R15 and R19 would lie above the SOEAL. However, whilst there would potentially be large exceedances, simple ameliorative measures are available and should be adopted to mitigate these PPVs down to more satisfactory levels. In these circumstances, the best practicable means of mitigation would be to operate compactors in 'static' mode only, to avoid possible adverse comment and potential discomfort to residents. These effects would be controlled to be not significant. However, compaction will take longer to complete without vibration.

11.11.42 The PPV levels are also used to evaluate the 'instantaneous' vibration levels that buildings might be exposed to. As already stated in section 11.11.41, the PPVs predicted for typical vibratory compaction works are either below or just above 1mm.s^{-1}, based upon a 5% percentile. Even when taking this percentile into account, the levels remain well below the criteria given in Table 11-5 for onset of building damage. During worst case (closest) scenarios, and taking a more realistic 33% percentile for the 'medium' sized vibratory compactor, the highest PPV would be below cosmetic building damage criteria. However, as noted above vibration would be mitigated to meet acceptable levels in terms of human exposure, hence vibration would be controlled well below building cosmetic damage thresholds.

11.11.43 The vibration levels at these receptors will be assessed by the contractor when more detailed information is available, and if any are found to exceed the

threshold values set in Table 11-4 or Table 11-5, then these would be controlled accordingly.

11.11.44 Therefore, with suitable controls where vibration impacts are identified at sensitive receptors close to the construction works boundary, vibration effects are assessed as not significant[37]. Control measures are set out in the **Outline CEMP** (Volume 6 Document Ref 6.4 ES Appendix 16.1).

Operational effects

11.11.45 Daytime and night-time traffic noise levels within the study area have been predicted and are assessed in terms of:

- Government Policy (NPSE) - for receptors exceeding the SOAEL; and
- Environmental Impact Assessment significance - for receptors between the LOAEL and SOAEL.

11.11.46 Table 11-12 to Table 11-15 below summarize the assessment of the short term and long term noise impacts and significant effects for daytime and night-time resulting from the operational scheme.

11.11.47 Figures 11.2 and 11.3 show the long term noise level contours and the noise difference contours (i.e. the changes in noise) resulting from the operational scheme in 2038. Those specific residential receptors where a long term (permanent) noise effect has been identified in the following assessment for the operation of the scheme in 2038 are highlighted on Figure 11.4. These are coloured according to the magnitude of impact scale shown in Table 11-7 and Table 11-8, as shown in the key to the figure. **Assessment locations and noise prediction** (Volume 6 Document Ref 6.4 ES Appendix 11.5) provides tabulated noise level results and indicates associated impacts.

11.11.48 The results table in **Assessment locations and noise prediction** (Volume 6 Document Ref 6.4 ES Appendix 11.5), shows either one or two long term results for each dwelling:

- Firstly, the noise impact on the façade with the least beneficial change, i.e. the façade with the largest noise increase, or the smallest noise reduction (if all facades show noise reductions).
- A second result may be shown if there is a different façade at the same dwelling with a noise level that is greater than the SOAEL. This is only reported if the result greater than SOAEL is not for the same facade as that with the least beneficial change. The purpose of this is to ensure a comprehensive assessment, i.e. that the largest noise change is reported, as well as identifying any facades exceeding the SOAEL.

11.11.49 The assessment results are described in the following sections and these are supported by the figures and tables described above. The effects are reported separately for each of the four scheme sections, west to east, as previously described under baseline conditions (Section 11.6), i.e.:

- Chainage: west of 0+000.000 - 4+000.000;

[37] BS 5228-2 notes that an assessment in accordance with BS 6472-1 or -2, and/or other available guidance, might be appropriate to determine whether the time varying exposure is likely to give rise to any degree of adverse comment. However, the assessment has concluded that appropriate mitigation measures are available to control vibration exposure to avoid adverse significant effects according to the criteria set out in Table 11-4, hence assessment in terms time varying exposure has not been presented.

- Chainage: 4+000.000 – 7+500.000;
- Chainage: 7+500.000 – 11+000.000;
- Chainage: 11+000.000 – east of 14+000.000.

Section 1 - Chainage: west of 0+000.000 – 4+000.000:

11.11.50 On this section, the scheme alignment would be to the north of the existing A30 until it reaches the B3284 where it would re-join the existing alignment. As shown in Figure 11.3 (noise change map), this would result in noise increases around the proposed new Chiverton Junction, affecting dwellings in this area (e.g. Silverdene) and those further to the northeast (e.g. Callestick Vean properties).

11.11.51 However, the reduced traffic on the existing A30 would result in noise reductions to the south of the scheme on this section (e.g. Roscarnick Farm and Fourburrow Farm, the latter is currently in a Noise Important Area). Although there would be no change in alignment around the existing Chiverton Junction, the low noise road surface would result in some noise reductions at Three Burrows (relative to the Do minimum baseline scenario). Again, these noise reductions are shown in Figure 11.3.

11.11.52 It should be noted that reductions due solely to the low noise road surface would occur in the absence of the scheme, as it is assumed that the existing A30 would be resurfaced with low noise surface by 2038 in any case.

11.11.53 Table 11-12 describes the assessment decision for all receptors on this section of the scheme (i.e. adverse or beneficial/significant or not significant) and the level of impact associated with the significance assessment. The final column describes the basis of the significance conclusion in relation to the assessment criteria described in Section 11.6. The text following the table describes the noise effects associated with scheme in more detail in terms of noise changes above the SOAEL and those between the LOAEL and SOAEL.

Table 11-12 Significant environmental effects (residential) - Section 1; west of chainage 0+000.000 to 4+000.000

Receptor	Magnitude of impact	Conclusion of significance of environmental effect	Direct/ indirect effect	Justification of significance conclusion
Boscawen Cottage, TR4 8EZ	Minor Beneficial	Significant	Direct	Minor impact, beneficial effect above the SOAEL from the short term (note that significant effect assessed for a smaller noise change when noise exposure above SOAEL) (*See operational impact criteria in Table 11-8, potential significance criteria described in Paragraph 11.6.57, and additional factors considered in determining significance in Paragraph 11.6.59.*)
7 Coronation Terrace, TR4 8SY	Minor Beneficial	Significant	Indirect	Minor impact, beneficial effect above the SOAEL in the long term
Sunset, North Hill, TR4 8ES	Minor Beneficial	Significant	Indirect	Minor impact, beneficial effect above the SOAEL in the long term (reducing below SOAEL)
6 North Hill, TR4 8ES	Minor Beneficial	Significant	Indirect	Minor impact, beneficial effect above the SOAEL in the long term (reducing below SOAEL)
4 North Hill, TR4 8ES	Minor Beneficial	Significant	Indirect	Minor impact, beneficial effect above the SOAEL in the long term (reducing below SOAEL)
5 North Hill, TR4 8ES	Minor Beneficial	Significant	Indirect	Minor impact, beneficial effect above the SOAEL in the long term (reducing below SOAEL)
26 High View, TR4 8EL	Minor Beneficial	Significant	Indirect	Minor impact, beneficial effect above the SOAEL (In the long term one façade reduces but remains above SOAEL, whilst another façade reduces to below SOAEL)
Landscape View, TR4 8EW	Minor Beneficial	Significant	Indirect	Minor impact, beneficial effect above the SOAEL in the long term
1 High View, TR4 8EL	Minor Beneficial	Significant	Indirect	Minor impact, beneficial effect above the SOAEL in the long term
Llamedos, North Hill, TR4 8EP	Minor Beneficial	Significant	Indirect	Minor impact, beneficial effect above the SOAEL in the long term
Creston, North Hill, TR4 8EP	Minor Beneficial	Significant	Indirect	Minor impact, beneficial effect above the SOAEL in the long term (reducing below SOAEL)
Carn Meadow, Carnhot, TR4 8HB	Minor Beneficial	Significant	Direct	Minor impact, beneficial effect above the SOAEL from the short term

Receptor	Magnitude of impact	Conclusion of significance of environmental effect	Direct/ indirect effect	Justification of significance conclusion
Carnhot Cottage, Carnhot, TR4 8HB	Minor Beneficial	Significant	Direct	Minor impact, beneficial effect above the SOAEL from the short term
Lynden House, East Hill, TR4 8HW	Moderate Adverse	Significant	Indirect	Moderate impact, adverse effect from the short term
Managers Accommodation, Chyverton Park, TR4 8HS	Minor Adverse	Significant	Indirect	Minor impact, adverse effect from the short term. Just over the threshold of potential significance
Burra Burra Farm, Three Burrows, TR4 8HU	Minor Beneficial	Significant	Direct	Minor impact, beneficial effect above the SOAEL in the long term
Chy-An-Godolghyn, Three Burrows, TR4 8HU	Moderate Beneficial	Significant	Direct	Moderate impact, beneficial effect above the SOAEL from the short term (reducing below SOAEL)
Ruby Cottage, Three Burrows, TR4 8HU	Minor Beneficial	Not Significant	Indirect	Minor impact, beneficial effect above the SOAEL in the short term, but negligible in the long term i.e. not permanent beneficial effect hence assessed as not significant
Highfield, TR4 8HT	Moderate Beneficial	Significant	Indirect	Moderate impact, beneficial effect above the SOAEL from the short term
The Annexe, Highfields, TR4 8HT	Minor Beneficial	Significant	Indirect	Minor impact, beneficial effect above the SOAEL from the short term
Old Vicarage, Chiverton Cross, TR4 8HS	Minor Adverse	Significant	Direct	Minor impact, adverse effect in the long term
Old Vicarage Court, Chiverton Cross, TR4 8HS	Minor Adverse	Significant	Direct	Minor impact, adverse effect in the long term
Acland House, TR4 8HX	Minor Beneficial	Not Significant	Indirect	Minor impact, beneficial effect above the SOAEL in the short term, but negligible in the long term i.e. not permanent effect hence assessed as not significant
Silversprings, Chiverton Cross, TR4 8SR	Moderate Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
Rose Gardens, Penstraze, TR4 8TR	Minor Beneficial	Not Significant	Indirect	Minor impact, beneficial effect above the SOAEL in the short term, but negligible in the long term i.e. not permanent effect hence assessed as not significant
Tresco, Penstraze, TR4 8PL	Minor Beneficial	Significant	Indirect	Minor impact, beneficial effect above the SOAEL in the long term (reducing below SOAEL)
Caravan, Riding & Driving For The Disabled, Silverwell, TR4 8JQ	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact

Receptor	Magnitude of impact	Conclusion of significance of environmental effect	Direct/ indirect effect	Justification of significance conclusion
The Barn, Silver Springs Farm, TR4 8SR	Moderate Adverse	Significant	Direct	Moderate impact, adverse effect from the short term
Trelawney, Penstraze, TR4 8PH	Moderate Adverse	Significant	Indirect	Moderate impact, adverse effect in the short term, but negligible in the long term
St. Levan, Penstraze, TR4 8PH	Moderate Adverse	Significant	Indirect	Moderate impact, adverse effect in the short term, but negligible in the long term
Allendale, Penstraze, TR4 8PH	Minor Beneficial	Not Significant	Indirect	Minor impact, beneficial effect above the SOAEL in the short term, but negligible in the long term i.e. not permanent effect hence assessed as not significant
Hawthorn Cottage, Penstraze, TR4 8PH	Minor Beneficial	Significant	Indirect	Minor impact, beneficial effect above the SOAEL in the long term
Penmore, Penstraze, TR4 8PH	Moderate Beneficial	Significant	Indirect	Moderate impact, beneficial effect above the SOAEL in the long term
Plot Adj, Garth Lodge, TR4 8PH	Major Adverse	Significant	Indirect	Major impact, adverse effect from the short term
Garth Lodge, Penstraze, TR4 8PH	Moderate Adverse*	Significant	Indirect	Moderate impact, adverse effect from the short term (beneficial* effect, reducing below a SOAEL from short term on another façade)
Croftside, Penstraze, TR4 8PH	Minor Beneficial	Significant	Indirect	Minor impact, beneficial effect above the SOAEL in the long term (reducing below SOAEL)
Tregenna Barton, TR4 8JA	Major Adverse	Significant	Indirect	Major impact, adverse effect from the short term
Silverwell Forge, Silverwell, TR4 8JG	Minor Adverse	Significant	Direct	Minor impact, adverse effect in the long term. Just over the threshold of potential significance
Lands Vue, TR4 8JA	Moderate Adverse	Significant	Indirect	Moderate impact, adverse effect in the short term, but negligible in the long term i.e. not permanent effect hence assessed as not significant
Landsview Farm, TR4 8JA	Moderate Adverse	Significant	Direct	Moderate impact, adverse effect in the short term, but negligible in the long term i.e. not permanent effect hence assessed as not significant
The Dog House, Lands Vue Farm, TR4 8JA	Moderate Adverse	Significant	Direct	Moderate impact, adverse effect in the short term, but negligible in the long term i.e. not permanent effect hence assessed as not significant
Albany View, Silverwell, TR4 8JG	Moderate Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact

Receptor	Magnitude of impact	Conclusion of significance of environmental effect	Direct/ indirect effect	Justification of significance conclusion
The Paddock, Silverwell, TR4 8JG	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
Holly Tree Cottage, Silverwell, TR4 8JG	Minor Adverse	Significant	Direct	Minor impact, adverse effect in the long term
Ferriera, Silverwell, TR4 8JG	Moderate Adverse	Significant	Direct	Moderate impact, adverse effect from the short term
Silverdene, Silverwell, TR4 8JG	Moderate Adverse	Significant	Direct	Moderate impact, adverse effect in the long term
Poltaire, Silverwell, TR4 8JG	Minor Adverse	Significant	Direct	Minor impact, adverse effect in the long term
Shed Adj, The White Cottage, TR4 8JG	Moderate Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
White Cottage, Silverwell, TR4 8JG	Moderate Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
The Sycamores, Silverwell, TR4 8JF	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the level of impact
Williamsville, Silverwell, TR4 8JG	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
Foxfields, Silverwell, TR4 8JF	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
Four Burrows Farm House, Four Burrows, TR4 8JB (within NIA 13097)	Major Adverse*	Significant	Direct	Major impact, adverse effect from the short term (Major impact, beneficial* effect, reducing below SOAEL from short term on another façade)
,Callestick Vean Bungalow, TR4 9NF	Moderate Adverse	Significant	Direct	Moderate impact, adverse effect, moving from between LOAEL and SOAEL to above the SOAEL in the short term
352 properties (other than those above)		Not significant	Due to low impact below potential significance threshold	

Receptor	Magnitude of impact	Conclusion of significance of environmental effect	Direct/ indirect effect	Justification of significance conclusion
Summary of Section 1		• Significant Adverse: 21 dwellings • Significant Beneficial: 21 dwellings • Not Significant Effects: 361 dwellings • Negligible Effects (above SOAEL): 19 dwellings		

*Residential receptors: **direct** effects exceeding the SOAEL*

11.11.54 The avoidance and mitigation measures integrated into the scheme would minimise the direct adverse effects on the majority of receptors. The mitigation incorporated for the assessment reported in this ES assumes measures where they are practicable and hence sustainable in terms of providing a clear noise benefit to both the individual dwellings, and also affected communities where these dwellings are clustered close together. On this section of the scheme, the noise mitigation incorporated to minimise noise impacts around the proposed Chiverton junction is described in Table 11-10. The location of the mitigation (noise screening provided by Cornish Hedges) is also shown in Figures 11.2 and 11.3.

11.11.55 There is one dwelling on this section of the scheme predicted to experience direct effects from increased noise levels higher than the relevant significant observed adverse levels (SOAEL as described in Table 11-1 and criteria defined in Table 11-6). The property is Callestick Vean bungalow at approximate chainage 4+000.000. This noise change refers to a direct effect where there is at least a 1dB impact as a result of the scheme in the future year (2038), rather than effects from non-scheme roads. This represents a significant observed adverse effect in terms of Government noise policy. The property would be potentially eligible for noise insulation under the Noise Insulation Regulations (NIR) 1975 (as amended), which would avoid the significant observed adverse effects. However, there are differences in the method of assessment for HD 213/11 used in this assessment and NIR, and hence this will need to be confirmed within six months of the scheme opening to traffic via a dedicated NIR assessment (this is also discussed in Paragraph 11.9.7).

11.11.56 As noted, there are locations where the noise levels would reduce as a result of the scheme (as shown in the noise difference contours – Figure 11.3). The reductions are large enough to be assessed as beneficial impacts at four dwellings, as shown in Table 11-12 and highlighted in Figure 11.4 (**significant beneficial** effects). For one dwelling on this section of the scheme (Chy-An-Godolghyn), noise levels would reduce such that the noise exposure would fall below the SOAEL with the scheme in operation in both the short term and long term. This reduction is assessed as a direct **significant beneficial** effect.

*Residential receptors: **indirect** effects exceeding the SOAEL*

11.11.57 There are no dwellings on this section of the scheme that are predicted to be subject to indirect noise increases resulting in noise levels higher than the

relevant significant observed adverse levels. This refers to effects where there is at least a 1dB impact as a result of traffic noise changes on non-scheme roads.

11.11.58 Fifteen dwellings would exceed the SOAEL but with a less than 1dB change (either increase or decrease). Some of these dwellings would already exceed the SOAEL in the absence of the scheme. For these dwellings there is negligible noise change, hence no direct adverse or beneficial effect.

11.11.59 There are locations where the noise levels would reduce as a result of the scheme as shown in Table 11-16. For nine dwellings, the reductions are large enough to be assessed as **significant beneficial** indirect effects although still remaining above the SOAEL, as highlighted in Figure 11.4.

11.11.60 For seven dwellings on this section of the scheme, noise levels would reduce such that the noise exposure would fall below the SOAEL with the scheme in operation. This large reduction is assessed as an indirect **significant beneficial** effect.

*Residential receptors: **direct** effects between LOAEL and SOAEL*

11.11.61 Figure 11.4 shows the long term 40dB night-time noise level contour from the operation of the scheme in 2038. The extent of the 40dB night-time noise level contour is larger than, the 50dB daytime contour. In general, below these levels, adverse effects are not expected (refer to LOAEL description in Table 11-1 and thresholds in Table 11-6

11.11.62 Above 40dB during the night and 50dB during the day, the effect of noise is dependent on the baseline noise levels in that area in 2023 (Do-Minimum) and the change in noise level (magnitude of impact) brought about by the scheme in the same year and by the future assessment year of 2038 (Do-Something). The noise impacts and effects predicted for the operation of the scheme are shown in Table 11-12 and on Figure 11.4.

11.11.63 Table 11-12 shows the properties identified as having predicted impacts within this section of the scheme between the LOAEL and SOAEL. There are residential dwellings, mainly situated near to the proposed new Chiverton junction, which will be subject to significant adverse direct effects as a result of the operation of the scheme. The assessment is based upon the change in noise caused by the scheme, with consideration of other factors such as the existing level of noise exposure (see Methodology Section 11.6). However, these impacts are minimised by the incorporated mitigation designed around the proposed new junction to reduce these impacts as far as is practicable. There are five dwellings that will have a **significant adverse** effect in the short term. This will rise to eleven dwellings subject to a **significant adverse** effects in the long term. Full details of these are shown in Table 11-12. There are no dwellings subject to beneficial direct effects between the LOAEL and SOAEL within this section of the scheme.

11.11.64 These impacts are minimised as far as is practicable as a result of the noise mitigation in the form of acoustic screening[38] around the proposed Chiverton junction.

[38] Noise screening (Cornish Hedges) – see Table 11-10

*Residential receptors: **indirect** effects between LOAEL and SOAEL*

11.11.65 On this section of the scheme there are eight dwellings identified as being subject to **significant adverse** indirect noise effects, as a result of changes in road traffic noise associated with non-scheme roads (see Table 11-12). Three of these dwellings will realise a small noise decrease in the long term, resulting in negligible noise effects. There are no dwellings subject to beneficial indirect effects. It is not considered sustainable to provide mitigation to these dwellings. In some cases this is because it would require a considerable length of noise screening structure to achieve even a small noise benefit at a single dwelling. In other cases, around the proposed Chiverton Junction, noise would already be attenuated by the proposed screening measures, but the residual noise effect, although mitigated, remains significant.

11.11.66 A total of 361 dwellings will experience a small impact which is rated as a not significant effect in the long term. These are summarised in Table 11-12.

*Non-residential sensitive receptors: **direct** effects*

11.11.67 Around chainage 0+700.000, near the proposed new Chiverton Junction, the Church of St Peter and Mithian Church Hall approximately 200m west of the scheme would be subject to small noise increases less than 3dB. These receptors would remain below a LOAEL. Also, these receptors would not meet the criteria in Table 11-9 for a potential significant effect.

*Non-residential sensitive receptors: **indirect** effects*

11.11.68 There are no non-residential noise sensitive properties that lie above the SOAEL along this section of the scheme. There are however, six properties which lie between the LOAEL to SOAEL along this section of the scheme. Two of these are Tiggers Too Day Nursery and Three Bridges Education School which would benefit from a small noise decreases of just over 1dB in the short term. However, these will change to small noise increases of less than 1dB in the long term, a negligible noise change, hence there would be no direct adverse or beneficial effects. A similar situation arises for Passmore Education Institute. Blackwater Community School in North Hill and Valley View Touring Site would both receive small noise reductions, although these would be assessed as negligible indirect effects.

11.11.69 The Trevarth Holiday Park lies approximately 300m west of chainage 0+400.000, and would generally be subject to small increases in noise of less than 1dB. Chiverton Caravan and Touring Park immediately to the north of Trevarth Holiday Park. Both of these areas presently lie below the LOAEL. However, the Caravan and Touring Park would be subject to increases in the 3-5dB range, but only on its on its western edge due to indirect noise impacts from the lane on this boundary. The noise increase will move part of this site from below the LOAEL to between LOAEL and SOAEL. As a proportion of the whole site, this represents a relatively small impacted area and the resulting noise levels on this boundary do not exceed the BS8223 guideline range for external amenity spaces (50-55dB$L_{Aeq,T}$). For both sites, these caravans are not permanent residential properties, and hence classified as non-residential receptors. This is assessed as a not significant adverse indirect effect in this area.

11.11.70 There are also two churches which lie below the LOAEL. These are the Church of Saint Peter and Mithian Church, both of which will be subject to noise increase.

Only the former will see an increase of just over 3dB, although this would still be rated as a not significant indirect effect as it remains below a LOAEL.

11.11.71 Further to this, a total of four non-residential receptors will experience a small noise increase (less than 1dB) in the long term, which are rated as not significant effects. Two non-residential receptors will also experience a small noise decrease in both the short term and long term, which is rated as a not significant effect.

Noise Important Areas

11.11.72 Four Burrows Farm House is within NIA 13097. As noted above, a noise reduction of 15dB is predicted at this location on the southwest side near the existing A30, although the property is subject to a smaller noise increase on the northwest façade which faces towards the proposed new alignment. The large reduction in noise as a result of the scheme would reduce the noise level from above the SOAEL to well below the SOAEL.

11.11.73 Also, as a result of the scheme, the noise levels at Highfields and the Annexe within NIA 3254 would result in significant beneficial effects.

11.11.74 These noise reductions in Noise Important Areas respond to the requirement stated in the revised NPPF (described in 11.3.6) that 'Development should, wherever possible, help to improve local environmental conditions…', and hence provide enhancement where sustainable to do so.

Section 2 - Chainage: 4+000.000 – 7+500.000:

11.11.75 At the western end of this assessment section around chainage 4+700.000, the scheme would include the Chybucca grade separated junction connecting the scheme to the existing A30 on the north side, and the B3284 to the south. The scheme would then continue on the south side of the existing A30 to the end of this section.

11.11.76 As shown in Figure 11.3 (noise change map), this would result in noise increases south of the scheme, and noise decreases north of the existing A30 around communities at Little Tresawen and Marazanvose. The noise reductions at Marazanvose would occur within NIA 3291.

Table 11-13 Significant environmental effects (residential) - Section 2; chainage 4+000.000 to 7+500.000

Receptor	Magnitude of impact	Conclusion of significance of environmental effect	Direct/indirect effect	Justification of significance conclusion
New Bungalow, Creegmeor Farm, TR4 9NF	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
Little Chywoon Barn, Little Chywoon Farm, TR4 9DL	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
Little Chywoon Farm, TR4 9DL	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of

Receptor	Magnitude of impact	Conclusion of significance of environmental effect	Direct/indirect effect	Justification of significance conclusion
				any adverse effect, hence not significant despite the impact
Hillview Cottage, TR4 9DL	Minor Adverse	Significant	Indirect	Minor impact, adverse effect above the SOAEL from the short term
Hillview Farm, TR4 9DL	Minor Adverse	Significant	Direct	Minor impact, adverse effect in the long term
R G Keast & Son, Rose Cottage, TR4 9DL	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
Cranberry Cottage, Allet Farm, TR4 9DL	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
Polglaze, TR4 9DL	Minor Adverse	Significant	Indirect	Minor impact, adverse effect above the SOAEL from the short term
Allet Cottage, TR4 9DJ	Moderate Adverse	Significant	Indirect	Moderate impact, adverse effect from the short term
Allet Nurseries, TR4 9DJ	Moderate Adverse	Significant	Indirect	Moderate impact, adverse effect from the short term
Rosedale, TR4 9DJ	Minor Adverse	Significant	Direct	Minor impact, adverse effect in the long term
Little Ennis, TR4 9DJ	Moderate Adverse	Significant	Indirect	Moderate impact, adverse effect from the short term
Linkendale, TR4 9DJ	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
The Flat, Linkendale, TR4 9DJ	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
Fenton Cottage, TR4 9DJ	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
Anfugah, TR4 9DW	Minor Adverse	Significant	Indirect	Minor impact, adverse effect, moving from between LOAEL and SOAEL to above the SOAEL from the short term
The Bungalow, Hillcrest, TR4 9DW	Minor Adverse	Significant	Indirect	Minor impact, adverse effect, moving from between LOAEL and SOAEL to above the SOAEL in the long term

Receptor	Magnitude of impact	Conclusion of significance of environmental effect	Direct/indirect effect	Justification of significance conclusion
Hillcrest Cottage, TR4 9DW	Minor Adverse	Significant	Indirect	Minor impact, adverse effect above the SOAEL from the short term
Springfield, TR4 9DJ	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
Lower Tresawsen, TR4 9HF	Major Beneficial	Significant	Direct	Major impact, beneficial effect above the SOAEL from the short term (reducing below SOAEL)
Nanteague Farm, TR4 9DH	Moderate Adverse	Significant	Direct	Moderate impact, adverse effect from the short term
Little Nanteague, TR4 9DN	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
Polvenna Farm, TR4 9HE	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
Ninnis Cottage, TR4 9DG	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
Killivose Cottage, TR4 9DG	Moderate Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
Chynoweth, TR4 9DG	Moderate Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
1 The Cottages, TR4 9DQ	Major Beneficial	Significant	Direct	Major impact, beneficial effect above the SOAEL from the short term
Treffry Cottage, TR4 9DQ	Major Beneficial	Significant	Direct	Major impact, beneficial effect above the SOAEL from the short term
Barn Wyn, TR4 9DQ	Moderate Beneficial	Significant	Direct	Moderate impact, beneficial effect above the SOAEL from the short term (reducing below SOAEL)
Ranger Barn, TR4 9DQ	Moderate Beneficial	Not Significant	Direct	Moderate impact, beneficial effect in the short term, but negligible in the long term i.e. not permanent effect hence assessed as not significant

Receptor	Magnitude of impact	Conclusion of significance of environmental effect	Direct/indirect effect	Justification of significance conclusion
Elmsleigh, TR4 9DQ	Major Beneficial	Significant	Direct	Major impact, beneficial effect above the SOAEL from the short term
48 properties (other than those above)		Not significant	Due to low impact below potential significance threshold	
Summary of Section 2		• Significant Adverse: 12 dwellings • Significant Beneficial: 5 dwellings • Not Significant Effects: 62 dwellings • Negligible Effects (above SOAEL): 0 dwellings		

*Residential receptors: **direct** effects exceeding the SOAEL*

11.11.77 The avoidance and mitigation measures integrated into the scheme, including those described around the Marazanvose/NFH area (Table 11-10), would minimise the direct adverse effects on the majority of receptors. There are no dwellings on this section of the scheme predicted to experience direct effects from increased noise levels higher than the relevant significant observed adverse levels. This refers to a direct effect where there is at least a 1dB impact as a result of the scheme, rather than effects from non-scheme roads.

11.11.78 As noted, there are locations where the noise levels would reduce as a result of the scheme (as shown in the noise difference contours – Figure 11.3). For three dwellings (including NIA 3291 at Marazanvose), the reductions are large enough to be assessed as beneficial impacts, as shown in Table 11-13 and highlighted in Figure 11.4 (**significant beneficial** effects). For an additional two dwellings on this section of the scheme (Barn Wyn and Lower Tresawen), noise levels would reduce such that these dwellings that were above the SOAEL, would be below the SOAEL with the scheme in operation, i.e. **significant beneficial** effect.

*Residential receptors: **indirect** effects exceeding the SOAEL*

11.11.79 As shown in Table 11-13, there are five dwellings on this section of the scheme predicted to be subject to indirect noise increases resulting in noise levels higher than the relevant significant observed adverse levels. These impacts are predicted alongside the B3284, just east of the existing A30. These are indirect **significant observed adverse** effects where there is at least a 1dB impact as a result of traffic noise changes on non-scheme roads. In these cases, it is not considered practicable to provide noise screening alongside 'non scheme' highways outside of the scheme application boundary. Also, the properties affected are not in close proximity to one another. Thus it would not be sustainable to provide noise mitigation on an individual property basis.

*Residential receptors: **direct** effects between LOAEL and SOAEL*

11.11.80 There are three dwellings on this section of the scheme subject to a **significant adverse** direct effect between the LOAEL and SOAEL (Rosedale, Hillview Farm and Nanteague Farm). There are two dwellings where the reductions are large

enough to be assessed as **significant beneficial** effects as shown in Table 11-13.

*Residential receptors: **indirect** effects between LOAEL and SOAEL*

11.11.81 On this section of the scheme there are three dwellings identified as being subject to a **significant adverse** indirect noise effects, as a result of the increase in road traffic noise around Allet Common on the lane between the A30 (around chainage 6+000.000) and the B3284.

11.11.82 A total of 62 dwellings will experience a small impact which is rated as a not significant effect in the long term. These are summarised in Table 11-13.

*Non-residential sensitive receptors: **direct** effects*

11.11.83 There are no non-residential noise sensitive receptors assessed as subject to adverse or beneficial direct effects on this section of the scheme. At the NFH wedding venue, the mitigated scheme would result in small noise changes (increases and decreases less than 1dB) around most of the venue. This is shown in the noise difference contours – Figure 11.3. There is some increase indicated in the small barnyard area between the wedding venue buildings (less than 3dB). This is a relatively small level of impact that would not meet the increase criterion for a potentially significant effect for a non-residential receptor (Table 11-9). The baseline noise prediction indicates an existing ambient noise level of 47dB$L_{Aeq,day}$ free field at ground floor height at the west end of the wedding venue buildings. Between the buildings, the baseline noise prediction indicates an existing ambient noise level of 39dB$L_{Aeq,day}$ free field at ground floor height. All parts of the NFH venue area lie below the LOAEL in the baseline, and remain so in the Future year.

11.11.84 The BS8223 guideline range for external amenity spaces is to not exceed 50-55dB$L_{Aeq,T}$. The operational noise level with the scheme would not be increased for most areas of the venue, and the resulting noise levels in all locations would be below the lower end of the external amenity criterion (see above). Internal noise levels, assuming a partially open window (10-15dB attenuation) would meet the BS8233 guidance upper design range of 40dB$L_{Aeq,T}$ for use as a ballroom/banqueting hall.

*Non-residential sensitive receptors: **indirect** effects*

11.11.85 On the B3284 around the Allet Common area, the Allet Methodist Church would be subject to a noise increase of just less than 3dB. The church is already above a SOAEL, and therefore with the forecast noise increase, this would be rated as a **significant adverse** indirect noise effect. The Summer Valley Touring Park further south off the B3284 would realise a less than 3dB increase. As this remains below a LOAEL, it is rated as a not significant adverse indirect noise effect. The same also applies to Chyverton Estate Equestrian Park. However, for the campsite at Fair View, the less than 3dB increase will move it from below the LOAEL just into the LOAEL to SOAEL range. However, due to the relatively small noise increase and small exceedance of the SOAEL. This is assessed as a not significant indirect effect in this area.

Noise Important Areas

11.11.86 Marazanvose Farm group of dwellings are located close to, or directly alongside the A30 (within NIA 3291). Noise reductions of between 1 to 5dB are predicted at this location, with the larger reductions occurring on the facades facing the

existing A30 (where traffic flows would be substantially reduced). The increased distance to the new A30 alignment would reduce noise levels which are above the SOAEL in this NIA. Hence the scheme would bring about beneficial effects in this NIA.

11.11.87 These noise reductions in Noise Important Areas respond to the requirement stated in the revised NPPF (described in 11.3.6) that 'Development should, wherever possible, help to improve local environmental conditions…', and hence provide enhancement where sustainable to do so.

Section 3 - Chainage: 7+500.000 – 11+000.000:

11.11.88 East of NFH, the scheme re-aligns with the existing A30 until chainage 8+500.000 where the scheme diverges to the southeast, further away from the community of Zelah. Further east, around chainage 10+000.000, the scheme diverges further southeast, up to approximately 200m from the existing A30.

11.11.89 As shown in Figure 11.3 (noise change map), this would result in noise increases southeast of the scheme, although there are generally fewer properties close to the A30 on this side of the highway. There would also be noise decreases north of the existing A30, for example at Henver Cottage within NIA 3292, and Tregorland and Zelah Hill Cottage within NIA 3293.

Table 11-14 Significant environmental effects (residential) - Section 3; chainage 7+500.000 to 11+000.000

Receptor	Magnitude of impact	Conclusion of significance of environmental effect	Direct/ indirect effect	Justification of significance conclusion
Bracken Woods, TR4 9HD	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
Garden Lodge, TR4 9HB	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
St. Freda, TR4 9DG	Minor Adverse	Significant	Direct	Minor impact, adverse effect in the long term
The Nook Zelah Lane, TR4 9HR	Moderate Beneficial	Significant	Direct	Moderate impact, beneficial effect from the short term
1 Denell Villa, TR4 9HP	Moderate Beneficial	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
2 Denell Villa, TR4 9HP	Moderate Beneficial	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact

Receptor	Magnitude of impact	Conclusion of significance of environmental effect	Direct/ indirect effect	Justification of significance conclusion
The Old Post Office, TR4 9HS	Moderate Beneficial	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
1 Trelynian Cottages, TR4 9HT	Major Beneficial	Significant	Indirect	Major impact, beneficial effect from the short term
1 Myrtle Villas, TR4 9HU	Major Beneficial	Significant	Direct	Major impact, beneficial effect from the short term
Trevalso Cottage, TR4 9HZ	Moderate Adverse	Significant	Direct	Moderate impact, adverse effect takes it just above the SOAEL threshold in the long term
Trerice Farm, TR4 9QX	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
Tolcarne, TR4 9QX	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
Henver Cottage, TR4 9HZ (within NIA 3292)	Major Beneficial	Significant	Direct	Major impact, beneficial effect above the SOAEL from the short term (reducing below a SOAEL)
Caravan, Tolcarne Farm, TR4 9QX	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
H G Lutey & Son, Trevalso Farm, TR4 9HZ	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
Tolcarne Bungalow, TR4 9QX	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
Middle Tolcarne Bungalow, TR4 9QX	Moderate Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
Middle Tolcarne Chalet, TR4 9QX	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect,

Receptor	Magnitude of impact	Conclusion of significance of environmental effect	Direct/ indirect effect	Justification of significance conclusion
				hence not significant despite the impact
Tolcarne Barn, TR4 9QX	Negligible	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
Tolcarne Chalet, TR4 9QX	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
Trefronick Manor, Trefronick, TR4 9QX	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
The Bungalow, Trefronick Farm, TR4 9QX	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
Trefronick Farm, TR4 9QX	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
Zelah Hill Cottage, TR4 9JB (within NIA 3293)	Major Beneficial	Significant	Direct	Major impact, beneficial effect above the SOAEL from the short term (reducing below a SOAEL on one facade)
1 Tregorland, TR4 9JB (within NIA 3293)	Major Beneficial	Significant	Direct	Major impact, beneficial effect above the SOAEL from the short term (reducing below a SOAEL)
2 Tregorland, TR4 9JB (within NIA 3293)	Major Beneficial	Significant	Direct	Major impact, beneficial effect above the SOAEL from the short term (reducing below a SOAEL)
Mount Pleasant Cottage, TR4 9JB	Major Beneficial	Significant	Direct	Major impact, beneficial effect above the SOAEL from the short term (reducing below a SOAEL)
Mount Pleasant Farm, TR4 9JB	Major Beneficial	Significant	Direct	Major impact, beneficial effect above the SOAEL from the short term (reducing below a SOAEL)
Caravan, Honeycombe House, TR4 9QX	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect,

Receptor	Magnitude of impact	Conclusion of significance of environmental effect	Direct/ indirect effect	Justification of significance conclusion
				hence not significant despite the impact
Honeycombe House, TR4 9QX	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
Honeycombe Barn, TR4 9QX	Major Adverse	Significant	Direct	Major impact, adverse effect from the short term
Pennycomequick, TR4 9JD	Major Beneficial	Significant	Direct	Major impact, beneficial effect above the SOAEL from the short term (reducing to below a SOAEL)
114 properties (other than those above)	Not significant	Due to low impact below potential significance threshold		
Summary of Section 3	• Significant Adverse: 3 dwellings • Significant Beneficial: 10 dwellings • Not Significant Effects: 133 dwellings • Negligible Effects (above SOAEL): 2 dwellings			

*Residential receptors**: direct** effects exceeding the SOAEL*

11.11.90 The avoidance and mitigation measures integrated into the scheme would minimise the direct adverse effects on the majority of receptors. There is one dwelling on this section of the scheme predicted to experience direct **significant observed adverse** effects from increased noise levels higher than the relevant significant observed adverse effect level. This refers to a direct effect where there is at least a 1dB impact as a result of the scheme. This is Trevalso Cottage around chainage 9+600.000. The property would be potentially eligible for noise insulation under the Noise Insulation Regulations (NIR) 1975 (as amended), which would avoid the significant observed adverse effects. However, there are differences in the method of assessment for HD 213/11 used in this assessment and NIR, and hence this will need to be confirmed within six months of the scheme opening to traffic via a dedicated NIR assessment (this is also discussed in Paragraph 11.9.7). Highways England's Project Evaluation process is described in Section 11.12, which includes consideration of NIR eligibility.

11.11.91 The noise level information (**Assessment locations and noise predictions** (Volume 6 Document Ref 6.4 ES Appendix 11.5)) shows that two dwellings would exceed the SOAEL but with a less than 1dB change (either increase or decrease). For these dwellings there is negligible noise change, hence no direct adverse or beneficial effect.

11.11.92 As noted in Table 11-14, there are locations where the noise levels would reduce as a result of the scheme (as shown in the noise difference contours –

Figure 11.3). In the cases of Henver Cottage (10+000.000), within NIA 3292, and Zelah Hill Cottage, No.1 and No.2 Tregorland in NIA 3293, the reductions are assessed as a beneficial impact (**significant beneficial** effect), as highlighted in Figure 11.4, and would result in these properties reducing to below a SOAEL. For three further dwellings on this section of the scheme (and shown in Table 11-14), noise levels would also reduce such that dwellings that were above the SOAEL would be below the SOAEL with the scheme in operation, i.e. **significant beneficial** effects.

*Residential receptors: **indirect** effects exceeding the SOAEL*

11.11.93 There are no dwellings on this section of the scheme predicted to be subject to indirect noise increases or decreases resulting in noise levels higher than the relevant significant observed adverse levels.

*Residential receptors: **direct** effects between LOAEL and SOAEL*

11.11.94 There are two dwellings on this section of the scheme subject to **significant adverse** direct effects between the LOAEL and SOAEL, St Freda (8+100.00) and Honeycombe Barn (11+000.000), as identified in Table 11-14. It is not considered sustainable to provide noise mitigation at these locations. This is because it would require a considerable length of noise screening structure to achieve even a small noise reduction at these single dwellings in separate locations. There are two dwellings identified as being subject to a **significant beneficial** direct noise effects as shown in Table 11-14.

*Residential receptors: **indirect** effects between LOAEL and SOAEL – communities*

11.11.95 On this section of the scheme there is one dwelling identified as being subject to a **significant beneficial** indirect noise effect as shown in Table 11-14. There are no properties identified as being subject to adverse indirect noise effects along this section, as a result of the increase in road traffic noise associated with non-scheme roads.

11.11.96 A total of 133 dwellings will experience a small impact which is rated as a not significant effect in the long term. These are summarised in Table 11-14.

*Non-residential sensitive receptors: **direct** effects*

11.11.97 Around chainage 9+300.000, the Zelah Village Hall approximately 200m west of the scheme would be subject noise reductions on most facades, although a small noise increases just over 1dB is also predicted on one façade. This location is below the LOAEL in the baseline and future years. This would not meet the criteria in Table 11-9 for a potential significant effect.

*Non-residential sensitive receptors: **indirect** effects*

11.11.98 There are no non-residential noise sensitive receptors assessed as subject to adverse or beneficial indirect effects on this section of the scheme.

Noise Important Areas

11.11.99 There would be noise decreases north of the existing A30, at Henver Cottage within NIA 3292, and Tregorland and Zelah Hill Cottage within NIA 3293. These dwellings would be subject to beneficial effects as a result of the scheme, and the

reductions in noise would reduce the noise level from above the SOAEL to below the SOAEL.

11.11.100 These noise reductions in Noise Important Areas are brought about by the engineering design of the scheme to realign the A30 further from dwellings here. This responds to the requirement stated in the revised NPPF (described in 11.3.6) that 'Development should, wherever possible, help to improve local environmental conditions…', and hence provide enhancement where sustainable to do so.

Section 4 - Chainage: 11+000.000 – east of 14+000.000

11.11.101 On this easternmost section, the scheme is aligned just south of existing A30 until chainage 13+000.000 where the scheme crosses to the north of the existing A30 to form the proposed Carland Cross grade separated junction. The scheme re-aligns further east with the existing A30 at chainage 14+000.000.

11.11.102 As shown in Figure 11.3 (noise change map), this would result in noise increases south of the scheme, although there are generally fewer properties close to the A30 on this side of the highway. There would also be noise decreases north of the existing A30, for example at Racland House and Four Winds (within NIA 3294) which are 30m from the road. On the south side of the proposed Carland Cross grade separated junction, the scheme would be further from the dwellings here than the existing A30, resulting in noise reductions around the area of the Carland Cross Cottages.

Table 11-15 Significant environmental effects (Residential) - Section 4; chainage 11+000.000 to 14+000.000

Receptor	Magnitude of impact	Conclusion of significance of environmental effect	Direct/ indirect effect	Justification of significance conclusion
Trenerry Farm, TR4 9QX	Minor Adverse	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
Venton Teague, TR4 9QX	Moderate Adverse	Significant	Direct	Minor impact, adverse effect in the long term
Raglan House, TR4 9JD	Moderate Beneficial	Significant	Direct	Moderate impact, beneficial effect above the SOAEL from the short term (reducing below a SOAEL)
Four Winds, TR4 9JD (NIA 3294)	Moderate Beneficial	Significant	Direct	Moderate impact, beneficial effect above the SOAEL from the short term (reducing below a SOAEL)
Sunnyside, TR4 9BE	Minor Adverse	Significant	Indirect	Minor impact, adverse effect in the long term
Higher Ennis Farm, TR4 9BE	Minor Adverse	Significant	Direct	Minor impact, adverse effect in the long term
Trewaters Bungalow, TR4 9BE	Minor Adverse	Significant	Indirect	Minor impact, adverse effect in the long term

Receptor	Magnitude of impact	Conclusion of significance of environmental effect	Direct/ indirect effect	Justification of significance conclusion
Trewaters House, TR4 9BE	Minor Adverse	Significant	Indirect	Minor impact, adverse effect in the long term
The Bungalow, TR8 5AX	Minor Beneficial	Significant	Direct	Minor impact, beneficial effect above the SOAEL from the short term (reducing below a SOAEL)
12 St. Francis Meadow, TR8 5DB	Minor Beneficial	Significant	Direct	Minor impact, beneficial effect above the SOAEL from the short term
14 St. Francis Meadow, TR8 5DB	Minor Beneficial	Significant	Direct	Minor impact, beneficial effect above the SOAEL from the short term
Boston House, 15 St. Francis Meadow, TR8 5DB	Minor Beneficial	Significant	Direct	Minor impact, beneficial effect above the SOAEL from the short term
Margill, 16 St. Francis Meadow, TR8 5DB	Minor Beneficial	Significant	Direct	Minor impact, beneficial effect above the SOAEL from the short term
17 St. Francis Meadow, TR8 5DB	Minor Beneficial	Significant	Direct	Minor impact, beneficial effect above the SOAEL from the short term
3 Pipers Court, TR8 5EH	Minor Beneficial	Not Significant	Direct	Minor impact, beneficial effect above the SOAEL in the short term, but negligible in the long term i.e. not permanent effect hence assessed as not significant
4 Pipers Court, TR8 5EH	Minor Beneficial	Not Significant	Direct	Minor impact, beneficial effect above the SOAEL in the short term, but negligible in the long term, although just below the threshold of potential significance
5 Pipers Court, TR8 5EH	Minor Beneficial	Significant	Direct	Minor impact, beneficial effect above the SOAEL from the short term (reducing below a SOAEL)
6 Pipers Court, TR8 5EH	Minor Beneficial	Not Significant	Direct	Minor impact, beneficial effect above the SOAEL in the short term, but negligible in the long term although just below the threshold of potential significance
2 Four Winds, TR8 5AS	Minor Beneficial	Significant	Direct	Minor impact, beneficial effect above the SOAEL from the short term
The Annexe, Tregerles Farm, TR8 4PW	Moderate Beneficial	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect,

Receptor	Magnitude of impact	Conclusion of significance of environmental effect	Direct/ indirect effect	Justification of significance conclusion
				hence not significant despite the level of impact
Tregerles Farm, TR8 4PW	Moderate Beneficial	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
Caravan, Tregerles Farm, TR8 4PW	Moderate Beneficial	Not Significant	-	Below LOAEL, i.e. low noise level is below level of any adverse effect, hence not significant despite the impact
145 properties (other than those above)	Not significant	Due to low impact below potential significance threshold		
Summary of Section 4	• Significant Adverse: 5 dwellings • Significant Beneficial: 10 dwellings • Not Significant Effects: 149 dwellings • Negligible Effects (above SOAEL): 3 dwellings			

*Residential receptors: **direct** effects exceeding the SOAEL*

11.11.103 The avoidance and mitigation measures integrated into the scheme would minimise the direct adverse effects on the majority of receptors. There are no dwellings on this section of the scheme predicted to experience direct effects from increased noise levels higher than the relevant significant observed adverse effect level. This refers to a direct effect where there is at least a 1dB impact as a result of the scheme.

11.11.104 The noise level information (**Assessment locations and noise prediction** (Volume 6 Document Ref 6.4 ES Appendix 11.5)) shows that three dwellings would exceed the SOAEL but with a less than 1dB change (either increase or decrease). For these dwellings there is negligible noise change, hence no direct adverse or beneficial effect.

11.11.105 For six dwellings, the reductions are large enough to be assessed as beneficial impacts, as shown in Table 11-15 and highlighted in Figure 11.4 (**significant beneficial** effects). For four further dwellings on this section of the scheme, as shown in Table 11-15, noise levels would reduce to below the SOAEL with the scheme in operation, one of these is Four Winds, which is located in NIA 3294. All of these properties will experience a greater than 1dB reduction, and are therefore assessed as a significant beneficial effect.

*Residential receptors**: indirect** effects exceeding the SOAEL*

11.11.106 There are no dwellings on this section of the scheme predicted to be subject to indirect noise increases resulting in noise levels higher than the relevant significant observed adverse effect level. This refers to indirect effects where there is at least a 1dB impact as a result of traffic noise changes on non-scheme roads.

*Residential receptors: **direct** effects between LOAEL and SOAEL*

11.11.107 There are two dwellings on this section of the scheme subject to **significant adverse** direct effects between the LOAEL and SOAEL, as identified in Table 11-15. These properties lie to the south of the scheme. It is not considered sustainable to provide noise mitigation at these locations. This is because it would require a considerable length of noise screening structure to achieve even a small noise benefit at these single dwellings in separate locations.

*Residential receptors: **indirect** effects between LOAEL and SOAEL*

11.11.108 On this section of the scheme there are three dwellings identified as being subject to a **significant adverse** indirect noise effect as a result of the increase in road traffic noise associated with non-scheme roads, as shown in Table 11-15. There are no properties identified as being subject to beneficial indirect noise effects along this section. In these cases, it is not considered practicable to provide noise screening alongside 'non scheme' highways outside of the scheme application boundary. Also, the properties affected are widely separated from each other, requiring long extents of separate screening. Thus it would not be sustainable to provide noise mitigation on an individual property basis.

11.11.109 A total of 149 dwellings will experience a small impact which is rated as a not significant effect in the long term. These are summarised in Table 11-15.

*Non-residential sensitive receptors: **direct** effects*

11.11.110 There are no non-residential noise sensitive receptors assessed as subject to adverse or beneficial direct effects on this section of the scheme.

*Non-residential sensitive receptors: **indirect** effects*

11.11.111 There are no non-residential noise sensitive receptors assessed as subject to adverse or beneficial indirect effects on this section of the scheme.

Noise Important Areas

11.11.112 Four Winds is within NIA 3294. As a result of the scheme, the noise levels here would reduce, resulting in a beneficial impact (significant beneficial effect) and the reductions in noise would reduce the noise level from above the SOAEL to below the SOAEL.

11.11.113 These noise reductions in this Noise Important Area are brought about by the engineering design of the scheme to realign the A30 further from dwellings here. This responds to the requirement stated in the revised NPPF (described in 11.3.6) that 'Development should, wherever possible, help to improve local environmental conditions…', and hence provide enhancement where sustainable to do so.

Assessment of affected routes further from the calculation area

11.11.114 DMRB HD 213/11 requires consideration of impacts on existing roads outside the study area[39], where there is a possibility of change of 1dB$L_{A10,18hr}$ or more in the short term (i.e. on opening), or 3dB$L_{A10,18hr}$ in the long term (typically 15 years after project opening). These are described as 'affected' links, where traffic noise changes would be associated with traffic flow changes on the wider road network beyond the scheme.

11.11.115 There are 36 such road links in the short term and eight classed as 'affected' in the long-term. HD 213/11 requires a count of the number of receptors within 50m of these road links. A total of 431 properties which will experience no change. A further 1058 properties on 'affected' links will realise a noise increase. Of these, 638 dwellings beyond the study area are assessed as being subject to indirect significant adverse effects. In the long term, there are 624 properties within 50m of the 'affected' links with a noise decrease, although these benefits are assessed as not significant.

11.11.116 Table 11-16 summarises the number of properties within 50m of the 'affected' links to the north of the scheme.

Table 11-16 Summary of number of properties within 50m of the 'affected' links to the north of the scheme beyond the study area

Road	Noise increase or decrease	Number of noise sensitive receptors within 50m of 'affected' link	Assessment
B3285, near to Perranporth/Travellas	Decrease	290	There is a short term noise decrease of around 2dB(A) on the B3285 road link, near to Perranporth/Travellas. In the long term the noise decrease is negligible (not significant).
Road between B3285/Henver Lane and A3075	Increase	2	There is a short-term noise increase of around 1.5dB(A) on the road link located between the B3285 and A3075. In the long term, the noise increase is less than 3dB in long term (not significant).
Station Road	Increase	174	In the short-term, there is an increase of less than 1dB(A) on Station Road. In the long term, the noise increase is just over 3dB(A). This is classed as a minor impact (**significant adverse** indirect effect).
Road between B3285 and Station Road	Increase	10	There is a short-term noise increase of 0.5dB(A) on the road between B3285 and Station Road. The long term increase is over 3dB(A). This is

[39] Defined as 1km from the scheme and existing routes which are bypassed or improved.

Road	Noise increase or decrease	Number of noise sensitive receptors within 50m of 'affected' link	Assessment
			classed as a minor impact (**significant adverse** indirect effect).
A3076 between Mitchell and A3058	Increase	11	In the short-term, there is an increase of around 1.5dB(A) on the A3076 between Mitchell and A3058. There is a long term increase of over 3dB(A). This is classed as a minor impact (**significant adverse** indirect effect).

11.11.117 Table 11-17 summarises the number of properties within 50m of the 'affected' links to the south of the scheme.

Table 11-17 Summary of number of properties within 50m of the 'affected' links to the south of the scheme beyond the study area

Road	Noise increase or decrease	Number of noise sensitive receptors within 50m of 'affected' link	Assessment
Section of road between Mitchell and Trelassick, approximately 1km to the south of Mitchell	Increase	2	In the short term there is a noise increase of less than 2dB(A) on a section of road between Mitchell and Trelassick (approximately 1km to the south of Mitchell). In the long term, the noise increase is much less than 2dB(A) (not significant).
B3284 between Allet Common and Shortlanesend	Increase	55	In the short term there is a noise increase of less than 2 dB(A) for the B3284 between the Allet Common and Shortlanesend. In the long term, the noise increase is up to 2dB(A) (not significant).
Truro –Tregurra Lane, Dobbs Lane, Compringney Hill and St George's Road	Increase	167	In the short term there is a noise increase around 1 to 2dB(A) on several roads in Truro). In the long term an increase of around 1 to 2dB(A) (not significant) is predicted on these roads.
Truro – A390 (by Trafalger Roundabout) Mitchell Hill, Bodmin Road, Lemon Street	Increase/Decrease, depending on short-term or long-term	387	In the short term there is a noise change between around -2dB(A) and +1dB(A) on several roads in Truro. In the long term an increase of 1dB(A) or less (not significant) is predicted on these roads.
Truro – Union Street, Bodmin Road, Treffry Road, Lemon Street,	Decrease	334	At several roads in Truro the noise decease is predicted to be around 1dB(A) in the short term. In the long term, the noise decrease is

Road	Noise increase or decrease	Number of noise sensitive receptors within 50m of 'affected' link	Assessment
Moresk Road, Castle Street			predicted to be less than 3dB(A) (not significant).
Roads near to Treliske Roundabout and A390 adjacent to Threemilestone	Increase/Decrease, depending on short term or long-term	44	At the roads near to Treliske Roundabout and on the A390 on the section adjacent to Threemilestone, there are noise changes of around between -2 to +1dB(A) in the short term. In the long term, noise increases up to 1dB(A) are predicted (not significant).

11.11.118 Table 11-18 summarises the number of properties within 50m of the 'affected' links to the south of the scheme.

Table 11-18 Summary of number of properties within 50m of the 'affected' links to the south-west of the scheme beyond the study area

Road	Noise increase or decrease	Number of noise sensitive receptors within 50m of 'affected' link	Assessment
A3047 between the A30 slip road junction and B3298	Increase	12	On the A3047 between the A30 slip road junction and B3298, there is around a 1 to 3dB(A) increase in the short-term. In the long term the noise increase is predicted to be less than 5dB(A) (minor impact) on one section of this road for which there are 5 noise sensitive receptors. This is partially due to natural traffic growth. The long term noise increase is predicted to be less than 3dB(A) for the other sections of this road alongside the other 7 noise sensitive receptors. Due to the larger noise increases (minor impacts), this is considered as a **significant adverse** indirect effect.
A3047 between the Avers Roundabout and Tolgus Place	Increase	67	There is a short term change of 1dB(A) on the A3047 between the Avers Roundabout and Tolgus Place. In the long term this is less than 3dB(A) (not significant).
B3298, between Scorrier and Gwennap	Increase	233	On the B3298 between Scorrier and Gwennap there are short term noise increases of around 2dB(A). In the long term the noise increase is just over 3dB(A). The noise change over 3dB(A) is classed as a minor impact which would be a **significant adverse** indirect effect. The change is partially due to natural traffic growth which

Road	Noise increase or decrease	Number of noise sensitive receptors within 50m of 'affected' link	Assessment
			would already occur in the absence of the scheme.
A393 between Gwennap and Four Cross	Increase	127	In the short term there is an increase in noise level of under 2dB(A) on the A393 between Gwennap and Four Cross. In the long term the noise change is under 3dB(A) (not significant).
B3292 between Four Cross and Harbour Village	Increase	21	On the B3292 between Four Cross and Harbour Village, there is a short term noise increase of less than 3dB(A) in the short term. This is over 3dB(A) in the long term and is partially due to natural traffic growth. The effect is considered a **significant adverse** indirect effect.
B3300 near Redruth	Increase	177	In the short term there is around a 1.5dB(A) increase on the B3300 near Redruth. In the long term the change is 3dB and is therefore considered a **significant adverse** indirect effect.

Operational ground-borne vibration assessment

11.11.119 No operational ground-borne vibration impacts are expected. This is because, in accordance with highway construction standards, the surface of the proposed pavement alterations would be smooth with no surface irregularities, which could generate significant levels of ground-borne vibration. It is a standard requirement under the specification for new highways that the new road surfaces would be free of significant discontinuities.

11.11.120 The size of irregularities necessary to cause perceptible ground-borne vibration is only expected in 'exceptional circumstances'. It is not considered that any such exceptional circumstances would arise during operation of the scheme. For more detail on operational ground-borne vibration assessment see **Detailed approach to assessment of effects** (Volume 6 Document Ref 6.4 ES Appendix 11.3).

11.12 Monitoring

11.12.1 The prediction and assessment methodologies set out in section 11.6 of this chapter would be used to support the verification of the effectiveness of mitigation measures. This would be carried out as part of Highways England's Project Evaluation procedures, which evaluates how highway schemes are delivered and would highlight any issues with meeting the accepted design.

11.12.2 Where access is required onto private land for monitoring purposes, prior consultation would be undertaken with the occupier and appropriate arrangements would be made to enable the monitoring to be undertaken.

11.12.3 Highways England has a duty under Regulation 6 of the NIR to assess noise levels following the opening of the scheme to traffic. The purpose of this is to establish the buildings which previously did not qualify for an original offer of carrying out or making a grant in respect of carrying out noise insulation work, but which would have become eligible by virtue of increased traffic flow. Assessments would be carried out in accordance with the obligations set out in the NIR.

11.13 Summary

11.13.1 Construction and operational traffic noise has been assessed in terms of Government Policy (for receptors exceeding the SOAEL), and Environmental Impact Assessment significance (between the LOAEL and SOAEL). These different types of effect are explained in Table 11-1.

Construction

11.13.2 Construction noise and vibration has been assessed from the available construction information. The assessment assumes that the works would be undertaken following the principles, controls and processes set out in the **Outline CEMP** (Volume 6 Document Ref 6.4 ES Appendix 16.1).

11.13.3 The principal activities with the potential to cause noise and vibration effects have been considered across 12 stages of construction.

11.13.4 Temporary significant construction noise effects have been assessed at twelve residential locations, some of which include several other dwellings. Construction assessment locations are shown in Figure 11.1. These are direct effects above the SOAEL threshold, as described in Government Policy (see table 11-6)

11.13.5 These residential locations are:

- R1 Highfield (also The Annex and Burrow Farm);
- R2 Silversprings (also the residences at The Old Vicarage, Old Vicarage Court, The Gatehouse and Chyverton House);
- R4 Roscarnick Farm;
- R5 Silverdene (also Ferriera and Silverwell Yard);
- R12 Elmsleigh (also Barn Wyn, Treffry Cottage, 1 The Cottages, Ranger Barn);
- R13 NFH Villa;
- R15 Merton Lodge (also St Freda);
- R16 Hill House**;
- R17 Zelah Lane Farm (also Zelah Lane Farm Annexe, Trolgroggan Bungalow, Chapel Cottage, The Nook Zelah Lane and The Chapel);
- R19 Henver Cottage (also Henver Lane Cottage);
- R21 Honeycombe Barn (also Honeycombe House and residential Caravan); and
- R22 Pennycomequick.

** Hill House is expected to be purchased as part of the scheme proposal

11.13.6 The results are shown in

11.13.7 Table **11-11**. The phases resulting in the highest noise levels are generally structures and/or topsoil strip. The activities associated with the structures phase will take place only in particular parts of the scheme, and so affect only some of the receptors.

11.13.8 For direct effects at residential receptors between the LOAEL and SOAEL, likely noise effects are assessed as not significant in EIA terms for construction.

11.13.9 Likely noise impacts are also assessed as temporary significant effects at four non-residential receptors, these are direct effects:

- Mithian Church Hall,
- The Church of St Peter,
- NFH wedding venue;
- Nanteague Stables.

11.13.10 The likelihood of construction generated vibration has been considered for the processes with potential to cause vibration effects. In the case of the works proposed these are: soil nailing, temporary sheet piling, and vibratory compaction. With suitable controls to minimise impacts where vibration impacts are identified at sensitive receptors close to the construction works boundary, vibration effects are assessed as not significant. Control measures have been developed in the **Outline CEMP** (Volume 6 Document Ref 6.4 ES Appendix 16.1).

Operation

11.13.11 Incorporated mitigation is envisaged (see **Table 11-19**) to avoid significant observed adverse effects from the scheme, and to minimise, as far as practicable (and sustainable), other likely significant adverse effects from the scheme.

11.13.12 Daytime and night-time traffic noise levels within the study area have been predicted and are assessed in terms of:

- Government Policy[40] (NPSE) - for receptors exceeding the SOAEL; and
- Environmental Impact Assessment significance - for receptors between the LOAEL and SOAEL.

11.13.13 Operational noise effects, both direct and indirect, were identified for dwellings where existing noise levels exceed the SOAEL, i.e. a significant effect in Government Policy terms (see Table 11-1). The effects are associated with a noise change of 1dB or more as well as other considerations (see Paragraph 11.6.59). Specifically, the identified effects are:

- two dwellings assessed as subject to direct adverse effects above the SOAEL;
- five dwellings assessed as subject to indirect adverse effects above the SOAEL. Indirect effects are those resulting from traffic noise changes on non-scheme roads.

11.13.14 It should be noted that many of the residential locations in the study area would already exceed the SOAEL in the absence of the scheme, and some of these receptors are already in Noise Important Areas. Without the scheme, 70

[40] The specific policy aims in relation highway noise are common to the NPSE, NPPF, PPG-N and NN NPS – these are discussed in Paragraphs 11.3.5 to 11.3.10.

residential properties are predicted to be exposed to high noise levels at or above the SOAEL in the Do Minimum baseline year (2023).

11.13.15 Reductions in noise would occur in the Do-Something scenario (with scheme 2038) for some residential locations that already exceed the SOAEL in the Do-Minimum scenario (without scheme 2023). These are predicted, as follows:

- 22 dwellings are assessed with beneficial effects (with scheme 2038), although still remaining above the SOAEL;
- 21 dwellings would reduce from a level above the SOAEL to below the SOAEL (with scheme 2038) with beneficial effects.

11.13.16 The largest residential community that would be subject to direct, likely significant adverse effects in 2038 is to the northwest of the scheme, nearest to the proposed new Chiverton Junction around the area of chainage 1+500.000.

11.13.17 These impacts are minimised for this group of dwellings and those further beyond, as a result of the mitigation design incorporated around the proposed junction (i.e. screening provided by Cornish Hedges).

11.13.18 Across the whole scheme, the total number of significant effects at dwellings assessed at lower noise exposure levels below the SOAEL (i.e. between the LOAEL and SOAEL) is:

- 13 beneficial effects; and
- 32 adverse effects.

11.13.19 Other than those communities described above around the proposed Chiverton Junction, it is not considered sustainable to provide noise screening for these individual properties which are widely separated in different locations across the scheme.

11.13.20 Direct and indirect noise changes are reflected in the HD 213/11 noise impact tables shown in Appendix 11.5, and the associated noise nuisance tables in **Assessment locations and noise prediction** (Volume 6 Document Ref 6.4 ES Appendix 11.5).

11.13.21 For non-residential sensitive receptors, there is only one indirect operational adverse effect assessed as significant (Allet Methodist Church).

11.13.22 Two dwellings are indicated to be potentially[41] eligible for noise insulation under the Noise Insulation Regulations (NIR) 1975 (as amended). These are, Callestick Vean bungalow at approximate chainage 4+000.000, and Trevalso Cottage around chainage 9+600.000.

11.13.23 The assessment indicates noise decreases at dwellings in four noise important areas:

- Four Burrows Farm House (NIA 13097);
- Marazanvose Farm group of dwellings (NIA 3291);
- Henver Cottage (NIA 3292);
- Tregorland and Zelah Hill Cottage (NIA 3293).

[41] There are differences in the method of assessment for HD 213/11 used in this assessment and NIR, and hence this will need to be confirmed within six months of the scheme opening to traffic via a dedicated NIR assessment.

11.13.24 These noise reductions in Noise Important Areas respond to the requirement stated in the revised NPPF (described in 11.3.6) that 'Development should, wherever possible, help to improve local environmental conditions…', and hence provide enhancement where sustainable to do so.

11.13.25 DMRB HD 213/11 requires consideration of impacts on existing roads outside the study area. These are described as 'affected' links, where traffic noise changes would be associated with traffic flow changes on the wider road network beyond the scheme. There are 36 such road links in the short term and eight classed as 'affected' in the long-term. HD 213/11 requires a count of the number of receptors within 50m of these road links. A total of 431 properties which will experience no change. A further 1058 properties on 'affected' links will realise a noise increase. Table 11-16 to Table 11-18 identify that 638 dwellings beyond the study area are assessed as being subject to indirect significant adverse effects. In the long term, there are 624 properties within 50m of the 'affected' links with a noise decrease, although these benefits are assessed as not significant.

11.13.26 Operational vibration effects have been assessed as not significant.

Table 11-19 Summary impact table

Description of potential impact	Incorporated design, mitigation and enhancement measures	Duration of impact	Significance of impact
Assessment of effects due to construction			
Noise impacts due to construction works at new junctions, online improvements and offline scheme sections. Noise and vibration effects have been considered across 12 stages of construction. Phases resulting in the highest noise levels are generally structures and/or topsoil strip. The activities associated with the structures phase will take place only in particular parts of the scheme.	Works would be undertaken according to Best Practicable Means as set out in the Outline Construction Environmental Management Plan. BPM measures to include: • selection of quiet and low vibration plant equipment, • consider quieter methods (including non-vibratory compaction, where required), • location of equipment on site, • control of working hours, • provision of acoustic enclosures and the use of less intrusive vehicle alarms, • screening.	Temporary – junctions works likely to affect nearby receptors for longer periods than mainline works.	• Temporary significant construction noise effects at 12 residential areas above SOAEL (see Table 11-1 for definition of SOAEL). • Temporary construction noise effects assessed as not significant at residential areas between LOAEL and SOAEL. • Temporary significant effects at four non-residential receptors. • Construction vibration effects have been assessed as not significant, subject to suitable mitigation protocols to be defined in the **Outline CEMP** (Volume 6 Document Ref 6.4 ES Appendix 16.1).
Assessment of effects due to operation			
Noise impacts due to altered or new highways; potential noise increases in locations where new alignment would be closer to noise sensitive locations; potential noise decreases in locations where new alignment would be further from noise sensitive locations.	Screening is incorporated as part of the landscape and visual mitigation design; screening height has been increased in the proposed Chiverton Junction and Marazanvose/NFH areas. A low noise surface would be also incorporated as part of the scheme.	Permanent	• Two dwellings assessed as subject to direct adverse effects above the SOAEL (see Table 11-1 for definition of SOAEL). • Five dwellings assessed as subject to indirect adverse effects above the SOAEL. • 22 dwellings are assessed with beneficial effects, although still remaining above the SOAEL. • 21 dwellings would reduce to a level below the SOAEL with beneficial effects.

Description of potential impact	Incorporated design, mitigation and enhancement measures	Duration of impact	Significance of impact
			• The total number of significant effects at noise exposure levels between the LOAEL and SOAEL is: thirteen beneficial effects, and 32 adverse effects. • Noise decreases at dwellings in four Noise Important Areas (NIA). • Table 11-16 to Table 11-18 identify those affected links beyond the study area where noise changes are assessed as significant. There are indirect significant adverse effects identified at 638 dwellings.

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