TEESWORKS

DORMAN POINT ENVIRONMENTAL STATEMENT

VOLUME 2: CHAPTER E
NOISE AND VIBRATION

DECEMBER 2020

Dorman Point, South Tees

Volume 2: Environmental Statement (December 2020)

Chapter E: Noise and Vibration

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Contents

E1.0 Introduction

E1.1 This Chapter of the Environmental Statement ('ES') has been prepared by Arup on behalf of the applicant, South Tees Development Corporation ('STDC'). It assesses the likely significant effects of the proposed development described in Chapter B at Dorman Point with respect to noise and vibration.

E1.2 This Chapter describes the methods used to assess the potential construction and operational impacts and effects; the baseline conditions in the surrounding area; mitigation measures to reduce or offset any negative environmental effects; and the likely residual environmental effects after these measures have been adopted.

E1.3 This Chapter is supported by the following technical appendices:-

1 **Appendix E1**: Consultation correspondence.

About the Author

E1.4 The author of this Chapter, Gwanyoung Youn, is a Consultant at Arup. He has thirteen years of experience in acoustics consultancy and is a Corporate Member of Institute of Acoustics. The author holds MSc in Sound and Vibration Studies from University of Southampton.

E1.5 The author has extensive experience in environmental assessment to form part of EIA applications across a range of projects, from small-scale schemes to Nationally Significant Infrastructure Projects (NSIPs).

E1.6 This assessment has been reviewed by, David Hiller, an Associate Director at Arup who has over 30 years of experience in noise and vibration prediction and assessment, a Chartered Engineer and a Corporate Member of Institute of Acoustics. He holds a PhD on the prediction of groundborne vibration from construction works.

E1.7 This assessment has been approved by, Greg Harris, an Associate at Arup who has 30 years of experience in noise assessment, and a Corporate Member of Institute of Acoustics.

E2.0 Policy Context

E2.1 The assessment approach reflects the requirements of the Government's noise policy and the Environmental Impact Assessment ('EIA') Regulations [1]. The following summarises relevant legislation and planning policy.

National Planning Policy

National Planning Policy and Guidance

E2.2 The National Planning Policy Framework ('NPPF') [2] took effect in 2012 to define the Government's planning policies for England and it was last updated in February 2019. Key to this assessment are paragraphs 170, 180, 204 and 205 of NPPF.

E2.3 Paragraph 170 of NPPF states:

"*Planning policies and decisions should contribute to and enhance the natural and local environment by…preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of … noise pollution;*

E2.4 Paragraph 180 of NPPF states:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a *mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*

b *identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason;*

E2.5 The NPPF planning objectives reflect and are linked to the policies and objectives set out in the Noise Policy Statement for England ('NPSE') [3].

E2.6 The Noise Policy vision is to:

"promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development", and its aims are:

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

E2.7 The NPSE provides the policy framework to assist in the implementation of the Environmental Noise Directive ('END') and the Regulations [21].

E2.8 The NPSE uses the key phrases 'significant adverse' and 'adverse' and extends concepts established by the World Health Organization ('WHO') to describe effect levels.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse health effects on health and quality of life occur.

E2.9 The NPSE notes that 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. It is for a project to identify relevant SOAELs taking account of the different sources of exposure and different receptors.

E2.10 Any receptor forecast to experience an overall exposure from the proposed development that exceeds the relevant SOAEL is identified as being subject to significant adverse impact on health and quality of life (under Government noise policy) and hence identified as a likely significant adverse effect in EIA terms.

E2.11 Where the noise level from the proposed development is between LOAEL and SOAEL, the NPSE states:

"all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur."

E2.12 The magnitude of noise change can result in impacts between LOAEL and SOAEL being reported as likely significant effects in EIA terms. The EIA process requires that likely significant effects are identified along with the envisaged mitigation to avoid or reduce these significant effects.

Guidance and Standards

E2.13 The noise assessment has taken account of the following relevant guidance and standards:

1 Guideline for community noise (World Health Organization, 1999) [4]

2 Night noise guidelines for Europe (World Health Organisation Europe, 2009) [5]

3 BS8233 Guidance on sound insulation and noise reduction for buildings (British Standards Institution, 2014) [6]

4 BS4142: 2014 + A1 2019 - Methods for rating and assessing industrial and commercial sound (British Standards Institution, 2019) [7]

5 BS 5228-1:2009 + A1 2014 Code of practice for noise and vibration control on construction and open sites – noise (British Standards Institution, 2014) [8]

6 BS 5228-2:2009 + A1 2014 Code of practice for noise and vibration control on construction and open sites – vibration (British Standards Institution, 2014) [9]

7 ISO9613 Acoustics – Attenuation of Sound during Propagation Outdoors: Part 2: General Method of Calculation (1996) [10]

8 Calculation of road traffic noise (CRTN) (HMSO, Department of Transport, Welsh Office, 1988) [11]

9 Calculation of railway noise (CRN) (HMSO, Department for Transport, 1995) [12]

10 The Design Manual for Roads and Bridges (DMRB) LA 111, Revision 2 (Highways Agency and Welsh Office, 2020) [13]

11 Environmental Noise Guidelines for the European Region (World Health Organization: 2018)

Primary Legislation

E2.14 Relevant legislation includes the Control of Pollution Act 1974 [14]. The construction noise and vibration assessment and envisaged mitigation are informed by this legislation. Specific references are made to sections of legislation as necessary. For example, 'best practicable means' is defined in Section 72 of the Control of Pollution Act; and prior consent for the construction method and steps to minimise noise can be sought from local authorities under Section 61 of the Control of Pollution Act.

E3.0 Assessment Methodology & Significance Criteria

Assessment Methodology

E3.1 The following describes the assessment methods applied, including the means by which noise and vibration levels have been predicted. Significance of the predicted impacts has then been assessed by reference to criteria developed for each type of impact for the 'do minimum' and 'do something' scenarios. The 'do minimum' scenario represents the situation without the proposed scheme in 2033. The 'do something' scenario represents the situation with the proposed scheme in 2033.

E3.2 The assessment considers the potential effects arising from the construction and operation of the proposed development at:

- Residential receptors (high sensitive receptors to noise and vibration); and
- Non-residential receptors, such as retail, commercial, industrial and offices, schools (medium and low sensitive receptors to noise and vibration).

Construction Activity Noise

E3.3 In the absence of detailed information on construction programming and method of working, the temporary construction noise effects have been assessed quantitatively at a high level based on the assumptions set out below.

E3.4 The noise generated by construction activities experienced by nearby sensitive receptors depends upon a number of variables, the most significant of which are:

- The noise generated by construction plant and equipment, generally expressed as sound power level;
- The periods of operation of the construction plant, known as its 'on-time'; and
- The distance between the noise source and the receptor.

E3.5 Construction noise levels resulting in impacts will vary during the different construction activities and depending upon the proximity of the plant to the receptors.

E3.6 Construction noise levels have been calculated based on the methodology set out in BS5228-1, which also states the limitation that:

"at distances over 300m noise predictions have to be treated with caution, especially where a soft ground correction factor has been applied, because of the increasing importance of meteorological effects."

Construction Traffic Noise

E3.7 As this is an outline planning application, the end users of the proposed development and therefore specifics of construction (including construction traffic flows and routes) are not known at the time of writing. As such, an assessment of construction traffic will be undertaken when the detailed design of the scheme and construction programme and traffic flow are confirmed. As set out in Chapter C (Transport) of this ES it will be undertaken on the basis of a series of embedded mitigation measures that are in built into the design of development. Those of relevant include the Framework Construction Environmental Management Plan (Framework CEMP) and the Construction Traffic Management Plan (CTMP).

Construction Vibration

E3.8 Vibration generated from construction activities has the potential to affect adjacent buildings and their occupants. The principal concern is generally vibration due to piling and from the use of vibratory compaction plant for construction of roads and hard standings. For piling, the risk of causing a significant adverse effect depends on the piling method, the ground conditions and the distance from the receptor. For compaction, the vibration generated depends on the characteristics of the roller and the distance, as described in BS 5228-2.

E3.9 BS 5228-2 also provides vibration limits for different types of buildings and for human response to vibration, in terms of peak particle velocity ('PPV'). These criteria can provide a basis for assessing impacts and threshold levels to determine significant effects in EIA terms.

E3.10 In the absence of detailed information, a qualitative assessment is undertaken in this EIA. It is based on the assumption that hydraulic impact piling is considered as a reasonable worst-case scenario for foundation construction. Best practice measures will be included within the Framework CEMP to reduce the impacts of vibration on nearby residential and non-residential receptors. Once the ground conditions on the site and construction techniques are confirmed, a detailed construction vibration study will be carried out to quantify the risk of causing a significant effect and to determine any additional mitigation needed.

Operational Building Services and Industrial Activity Noise

E3.11 As this is an outline application, the design has not yet progressed to the level where detailed information regarding the end usage is known. Therefore, design of the mechanical services plant or type of industrial noise has been assessed on the basis of assumed plant and activities. A detailed assessment on building services and plant noise will be carried out once these details are known.

E3.12 The proposed development will consist of General Industrial (B2), Storage or Distribution (B8) and up to 10% ancillary Office accommodation (E). Indicative predictions and assessment of noise associated with heavy goods vehicle (HGV) deliveries, non-HGV movements, air handling units and the breakout noise from warehouse is considered in the assessment.

E3.13 On-site traffic flow for the operation of HGVs and light vehicles has been provided as part of the Transport Assessment (see Chapter C (Transport)).

E3.14 Traffic noise has been calculated using the methodology set out in CRTN. Break out noise from the buildings and any associated plant noise has been calculated by using the methodology set out in ISO9613, using SoundPLAN acoustic prediction software.

E3.15 The Environmental Health Officer at RCBC was consulted in respect of operational noise limits at noise sensitive receptors: these should not exceed the existing ambient noise levels.

Operational Road Traffic Noise

E3.16 Road traffic noise during operation of the proposed development has been predicted using CRTN. This uses traffic flow data for the baseline and future baseline year (2033), with and without the proposed development, provided by the Arup transport team (see Chapter C (Transport)).

E3.17 As described in Chapter C, the traffic data includes committed developments and this assessment is therefore inherently a cumulative impact assessment.

E3.18 The impact associated with operational traffic noise has been assessed by following the methods and principles of CRTN and DMRB.

Rail Noise and Vibration

E3.19 The proposed development is located near an existing railway line. To establish the baseline ambient noise levels, railway noise levels have been calculated using SoundPLAN acoustic prediction software which has modular function adopted for rail noise levels by following the methodology set out in CRN. It has been assumed that there would be no alteration in rail operations in the future year. It is not anticipated that the proposed development would affect the existing rail operation and so rail noise and vibration is scoped out of the assessment.

Significance Criteria

E3.20 As a whole, this ES uses the defined significance criteria set out in Chapter A (Introduction and Background), section A7.0 and this classifies the effects of environmental matters by reference to a common list of criteria, including: Substantial, Moderate, Minor, Negligible or Neutral. These can be adverse or beneficial effects. The noise and vibration assessment methodology adopted within this chapter uses a different approach to assessing criteria which is based on the relevant guidance listed in E.10 References and professional judgement. It is explained in detail for each assessment below. This is a common approach used by noise and vibration professionals in Environmental Impact Assessments.

Derivation of Significance Criteria

E3.21 The assessment of noise and vibration considers the likely significant effects arising from the construction and operation of the proposed development. It is important to differentiate between impacts and effects. The following definitions are adopted for this assessment:

1 Impact - the introduction of new (including a change in) noise or vibration into an existing environment; and

2 Effect - the effect on the receptor/community subject to an impact. The effect is therefore linked to the level of the impact, the sensitivity of the receptor and other key matters such as the existing acoustic environment.

Construction Activity Noise

Residential Receptors

E3.22 Direct, temporary effects of noise are associated with construction. Impact thresholds for construction noise have been established by reference to the 'ABC method' described in Annex E of BS5228-1. The ABC method defines the thresholds at building facades on the basis of existing noise levels as set out in Table E3.1.

Table E3.1 Thresholds of potential significant effects of demolition and construction noise at residential buildings (adapted from BS 5228-1)

Period	Threshold value in decibels, $dBL_{Aeq,T}$		
	Category A (LOAEL)*	**Category B (LOAEL)***	**Category C (SOAEL)**
Weekday Daytime (07:00-19:00) Saturday (07:00-13:00)	65	70	75
Weekdays (19:00-23:00) Saturday (13:00-23:00) Sunday (07:00-23:00)	55	60	65
Night-time (23:00-07:00)	45	50	55

Period	Threshold value in decibels, $dBL_{Aeq,T}$		
	Category A (LOAEL)*	**Category B (LOAEL)***	**Category C (SOAEL)**
Notes: All noise levels are defined outdoors at the façade of the receptor Assessment Category A: impact criteria to use when baseline ambient sound levels (rounded to the nearest 5 dB) are less than these values; Assessment Category B: impact criteria to use when baseline ambient sound levels (rounded to the nearest 5 dB) are the same as category A values; and Assessment Category C: impact criteria to use when baseline ambient sound levels (rounded to the nearest 5 dB) are higher than category A values. * dependent on existing ambient noise levels			

E3.23 Predicted free field noise levels have been converted to façade levels by adding 3dB, as specified in BS5228-1.

Definition of Significance

E3.24 For residential receptors, where the forecast construction noise exceeds the relevant threshold this is an indicator of a potential temporary significant effect i.e. it may be assessed as a significant effect once other aspects are considered. An effect is either assessed as Significant or Not Significant.

E3.25 For daytime, the widely used threshold of $75dBL_{Aeq}$ (category C in Table E1) has been considered as the SOAEL level for construction noise. Typically, a duration for the impact is also considered, such as being exceeded for one month or more. The threshold was originally set to avoid interference with normal speech indoors, with windows closed [16]. Windows and their sound insulation properties have improved substantially since the Wilson Report; the $75dBL_{Aeq}$ SOAEL is therefore likely to be precautionary for modern properties.

E3.26 The daytime SOAEL assumed for construction reflects that construction noise is temporary and that higher levels of noise generally only occur for part of the construction programme.

E3.27 For evening time, similarly the threshold of $65dBL_{Aeq}$ (Category C) has been considered as the SOAEL level for construction noise.

E3.28 For night-time, the Night Noise Guidelines for Europe [5] introduced an interim target of $55dBL_{Aeq,8hr}$ measured outdoors as an annual average. Exceeding this noise threshold (category 'C' of the ABC impact criteria at night as shown in Table E1), for one month or longer has been adopted as the SOAEL for night-time construction noise. The Night Noise Guidelines for Europe is based on evidence gathered for long term exposure to primarily road and aircraft noise. There is no evidence of short-term construction noise leading to significant health effects. The WHO's interim target of $55dBL_{Aeq}$ is, therefore, applied to construction on a precautionary basis.

Non-Residential Receptors

E3.29 With regards to non-residential receptors such as an office building, BS 5228-1 states the following:

E3.30 *"Noise from construction and demolition sites should not exceed the level at which conversation in the nearest building would be difficult with the windows shut. […] Noise levels, between say 07.00 and 19.00 hours, outside the nearest window of the occupied room closest to the site boundary should not exceed:*

1 *70 decibels (dBA) in rural, suburban and urban areas away from main road traffic and industrial noise;*

2 *75 decibels (dBA) in urban areas near main roads in heavy industrial areas."*

E3.31 It is proposed that the above methodology is adopted for assessing potential construction significant effects at non-residential receptors. Since the non-residential receptors are located in an urban area near main roads, rail and industrial areas, the adopted external noise criterion has been based on 75dBL_{Aeq} and is considered as the SOAEL for non-residential receptors.

Definition of Significance

E3.32 Potential temporary construction significant effects are identified if the forecast construction noise exceeds relevant threshold levels at individual noise sensitive receptors. An effect is either defined as being Significant or Not Significant.

Operational Building Services and Industrial Activity Noise

E3.33 The assessment of mechanical services and industrial noise is based on the intrusive noise within noise sensitive receptors compared to recommended background levels.

E3.34 Industrial noise is often assessed using BS4142, which relies upon knowledge of the background (L_{A90}) sound level at receptors. A predicted baseline has been used for the assessment since it has not been possible to carry out a representative noise survey due to the Covid-19 pandemic (the impact of Covid-19 is discussed more widely in the Assumptions and Limitations section of this chapter). BS4142 recommends that the absolute level of sound should also be taken into consideration when assessing potential impact from industrial sound sources. The noise from industrial plant is predicted for daytime and night-time periods and compared with external noise criteria. Absolute noise levels are predicted without BS4142 corrections applied (i.e. penalties to account for noise sources of distinctive character, i.e. tonal, intermittent or impulsive). Industrial noise assessment criteria have been agreed with the Environmental Health Officer at RCBC such that the industrial noise emission at noise sensitive receptors should not exceed the existing ambient noise levels.

Definition of Significance

E3.35 To determine the significance of effects the following have been considered:

1 Predicted baseline noise level at noise sensitive receptors;

2 Difference between the predicted baseline noise levels and the future noise levels with the industrial noise, at the receiver location; and

3 Sensitivity of the receptor.

E3.36 Permanent significant effects are identified if the industrial noise emission levels exceed the existing ambient noise levels at individual noise sensitive receptors and considering the sensitivity of the receptors. An effect can either by Significant or Not Significant.

Road Traffic Noise

E3.37 The operational noise impacts and effects are related to both the absolute noise level and the change in noise level caused by the proposed development.

E3.38 The Government's noise policy provides the basis for evaluating the magnitude of the effect as discussed earlier. In this assessment, residential receptors (dwellings) are forecast to experience a likely Significant Adverse noise effect from the operation of the scheme if noise outside of the dwellings is:

1 $68dBL_{A10,18hr}$ (equivalent to $63dBLA_{eq,16hr\ free\text{-}field}$) or greater during the day; or

2 $55dBL_{Aeq,8hr}$ (i.e. 23:00-07:00) or greater during the night.

E3.39 The rationale for this is as follows.

E3.40 During the daytime the level of $68dBL_{A10,18hr}$ is considered a SOAEL (equivalent to $63dBL_{Aeq,16hr\ free\text{-}field}$). This is consistent with the daytime trigger level in the Noise Insulation (Amendment) Regulations 1988. Aligning the SOAEL with noise insulation trigger thresholds is consistent with the advice in PPG-N that notes as an example of the consequence of noise exposure above the SOAEL, people start *"avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise"*.

E3.41 The WHO Night Noise Guidelines for Europe sets an interim target of $55dBL_{Aeq,8hr}$ outdoors. This has been taken to be a SOAEL for night-time traffic noise.

E3.42 In this assessment residential receptors (dwellings) are forecast to experience an adverse effect in noise policy terms [4] where noise from the operation of the scheme outside dwellings is:

1 $50dBL_{Aeq,16hr}$ or greater during the day; and

2 $40dBL_{Aeq,8hr}$ or greater at night.

E3.43 These are the LOAELs adopted for operational noise in this assessment.

E3.44 For the daytime LOAEL the WHO Guidelines for Community Noise identifies that 50 to $55dBL_{Aeq}$ (outdoor noise level), represents: *"day-time levels below which a majority of the adult population will be protected from becoming moderately or seriously annoyed, respectively."*

E3.45 In the Night Noise Guidelines for Europe, the night noise guideline of $40dBL_{night}$ (outside) is described explicitly as a LOAEL. This is an annual average level measured over the 8hr night-time period from 2300 to 0700.

E3.46 The thresholds of $50dBL_{Aeq,16hr}$ and $40dBL_{Aeq,8hr}$ therefore represent the onset of the lowest observed community noise effects during the day (annoyance) and night (potential for some reported sleep disturbance) consistent with WHO and Government guidance. No adverse effects are therefore generally likely below these levels.

E3.47 Forecast operational sound levels from the scheme of between $50dBL_{Aeq}$ and $68dBL_{A10,18hr}$ (equivalent to $63dBL_{Aeq,16hr\ free\text{-}field}$), or $40dBL_{Aeq,8hr}$ and $55dBL_{Aeq,8hr}$ night-time (i.e. between the respective LOAELs and SOAELs) are adverse effects with regard to noise policy.

E3.48 These LOAEL and SOAEL values for the road traffic noise assessment are summarised in Table E3.2.

Table E3.2: Adverse effect levels from road traffic noise

Effect level	Period	Noise level
LOAEL	Day	$50dBL_{Aeq,16hr}$
	Night	$40dBL_{Aeq,8hr}$
SOAEL	Day	$63dBL_{Aeq,16hr}$
	Night	$55dBL_{Aeq,8hr}$

E3.49 DMRB, LA 111 provides a basis for evaluating the magnitude of the impact and effect caused by noise change both in the short-term and long-term. DMRB, LA 111 notes:

"3dB change is the impact taken as the initial assessment of a potential significant effect – other factors relating to the context are also considered."

E3.50 Where the overall noise level with the proposed development in operation is between the LOAEL and the SOAEL, the magnitude of the impact and potential effect is indicated by the change in noise levels attributable to the proposed development. In this assessment, it is considered appropriate to follow the principle of the scoping assessment methodology described in DMRB LA 111 and assessment has been undertaken by comparing the predicted noise of the Do-Minimum and Do-Something scenarios in opening year of the scheme (2033). The comparisons have been used to determine the magnitude of change in accordance with DMRB LA 111 is shown in Table E3.3.

Table E3.3: Classification of magnitude of traffic noise impact on dwellings in the short-term under DMRB

Magnitude of impact in the short term	Short term noise change (dB $L_{A10,18hr}$ or L_{night})
Negligible	Less than 1.0
Minor	1.0 to 2.9
Moderate	3.0 to 4.9
Substantial	Greater than or equal to 5.0

Definition of Significance

E3.51 Summarising, the following factors are considered to identify the significance:

1 A Moderate impact (3dB or greater) is taken as an indicator of a potential Significant effect for noise exposures between the LOAEL and SOAEL; or

2 For areas exposed to higher noise levels (above SOAEL), a Minor impact (1dB or greater) is taken as an indicator of potential significance.

Consultation

E3.52 Consultations were undertaken with the Redcar and Cleveland Borough Council ('RCBC') Environmental Health Officer ('EHO') to confirm their approval of the scope, approach to baseline, and assumptions used for the noise and vibration assessment (Appendix E1). The proposed approaches were accepted. The agreed approach is summarised below:

- In order to establish baseline noise levels at noise sensitive receptors surrounding the site, a desk-top study may be undertaken, due to the Covid-19 pandemic, of rail and road traffic noise.
- Construction assessment is to be based on a reasonable worst-case scenarios of typical construction activities.
- In the absence of the background noise levels (L_{A90}), due to the Covid-19 pandemic preventing the survey, operational assessment of building services and on-site activities to be carried out based on comparative assessment between the existing ambient noise levels and the predicted noise emission levels at noise sensitive receptors.

E3.53 Operational assessment of road traffic noise is to be undertaken following the method set out in DMRB LA 111.

Assumptions and Limitations

E3.54 As the scheme is currently at outline stage, assumptions have been made about the types of plant and equipment which are likely to be used during construction and operation.

E3.55 The assumptions that inform the assessments can only be considered to be indicative at this stage in the development of the project but they are considered to be representative of a reasonably foreseeable worst case.

Baseline Conditions

E3.56 The assessment has been undertaken during the Covid-19 pandemic, therefore, it has not been possible to undertake a baseline sound level survey to quantify the noise climate under what would be considered normal conditions. The baseline sound level climate has, therefore, been informed by noise prediction modelling and professional judgement.

E3.57 The calculated baseline sound levels include rail and road noise sources. Other sound sources in the area, for example, industrial are not included. It is not possible to predict noise levels from the industrial units however this leads to a conservative approach since the noise levels may be higher where there are existing industrial or other noise sources. It is considered, therefore, that the predicted baseline is cautious.

Construction

E3.58 The temporary construction assessment is based on the assumption that construction works will be undertaken

- Using best practicable means (BPM) including the approaches described in BS5228-1;
- Using hydraulic piling (which would only be appropriate if it constitutes the BPM of delivering the works) which is likely to generate the highest noise levels. In the absence of detailed construction programme and plant information, this is considered as a reasonable worst-case scenario;
- A piling rig operating at each proposed building at the same time and at the closest possible distance to each receptor;
- 20 % of on-time assumed for the piling rig and a source height assumed to be 4m above local ground level; and
- Construction works are assumed to be 24 hours a day, 7 days a week.

E3.59 In practice, if this technique is used, other associated plant would need to be in operation to support the piling, such as a crane and delivery vehicles. The highest noise would be generated from the piling rig itself and therefore, in this assessment, noise from other construction plant would be insignificant in comparison and so, given that the plant details are not yet available, they have not been included in the analysis.

Operational

Operational Building Services and Industrial Activity Noise

E3.60 At this stage in the design, no specific operators have been identified for the proposed site. Therefore, the potential noise from the operational phase of the development is assessed based on the following assumptions:

- Operating hours are 24 hrs a day, 7 days per week;

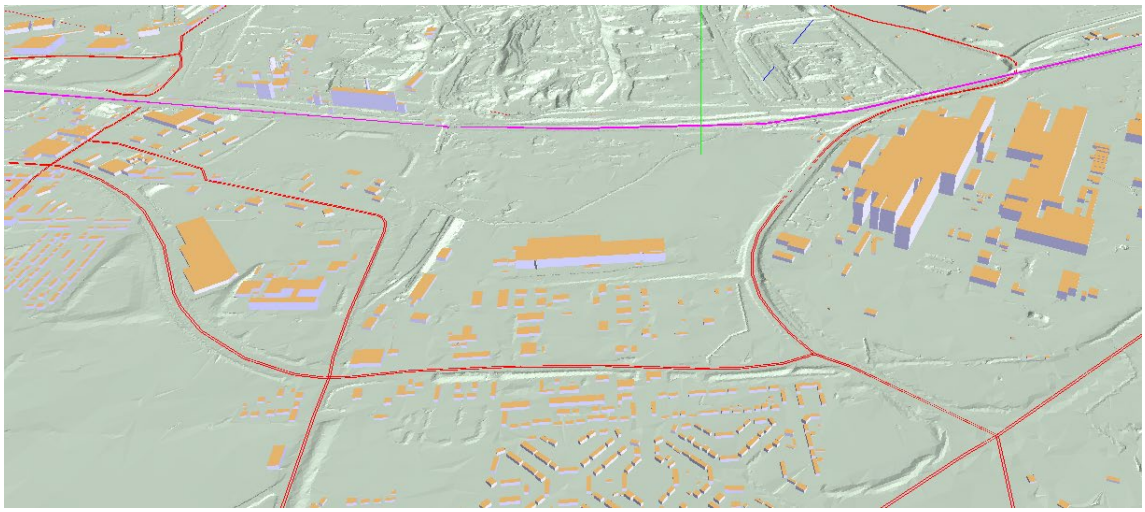
- Each building has an associated industrial AHU/large extract fan on the façade of the building facing receptors and positioned near the roof. The sound power level of such an AHU unit is assumed to be at 94 dBA;
- Each building will have an internal reverberant sound level of 85dBA, which is relevant to hearing protection zones in the working environment so unlikely to be routinely exceeded;
- Building height is 36m; and
- It is assumed that existing landscape and buildings outside the red line boundary act as natural barriers and provide embedded mitigation that was considered during the assessment.

E4.0 Baseline Conditions

E4.1 Noise from road traffic and rail traffic is considered to be the main contributor to the existing environment at noise sensitive receptors. The baseline sound level climate has, therefore, been informed by noise prediction modelling with sources of noise from road and rail.

E4.2 A three dimensional SoundPLAN noise prediction model of rail and road traffic has been created (Figure E4.1). The model has been used to calculate baseline noise levels across and around the site.

Figure E4.1: Computer model used for predicting baseline noise levels (looking north).



Rail

E4.3 The Darlington to Saltburn railway line forms the north-west site boundary and has hourly services to Bishop Auckland (via Darlington) and Saltburn. The railway line is considered to be the main contributor to the noise climate at noise sensitive receptors. The existing baseline rail noise levels have been predicted based on rail traffic data derived from RealTimeTrains [18].

Road

E4.4 Baseline 2020 and future baseline in 2033 road traffic flow data have been provided by the Arup transport team (See Chapter C). The following highways within close proximity to the site have been identified as main source of road traffic noise:

- Eston Road, to the west of the site and the main access into the proposed development, which connects to the A66;
- The A66, a dual four-lane carriageway, located to the south and south west of the site; and
- Trunk Road to the east of the site and connected to the A66.

E4.5 Road traffic noise has been modelled using CRTN.

Noise Sensitive Receptors

E4.6 Residential receptors have been identified to the south and the west of the site on the vicinity of the A66. Non-residential (commercial) receptors have also been identified to the south and the west of the site.

E4.7 Noise sensitive receptors are listed in Table E4.1 and Table E4.2. Their locations and the site boundary are presented in Figure E4.2.

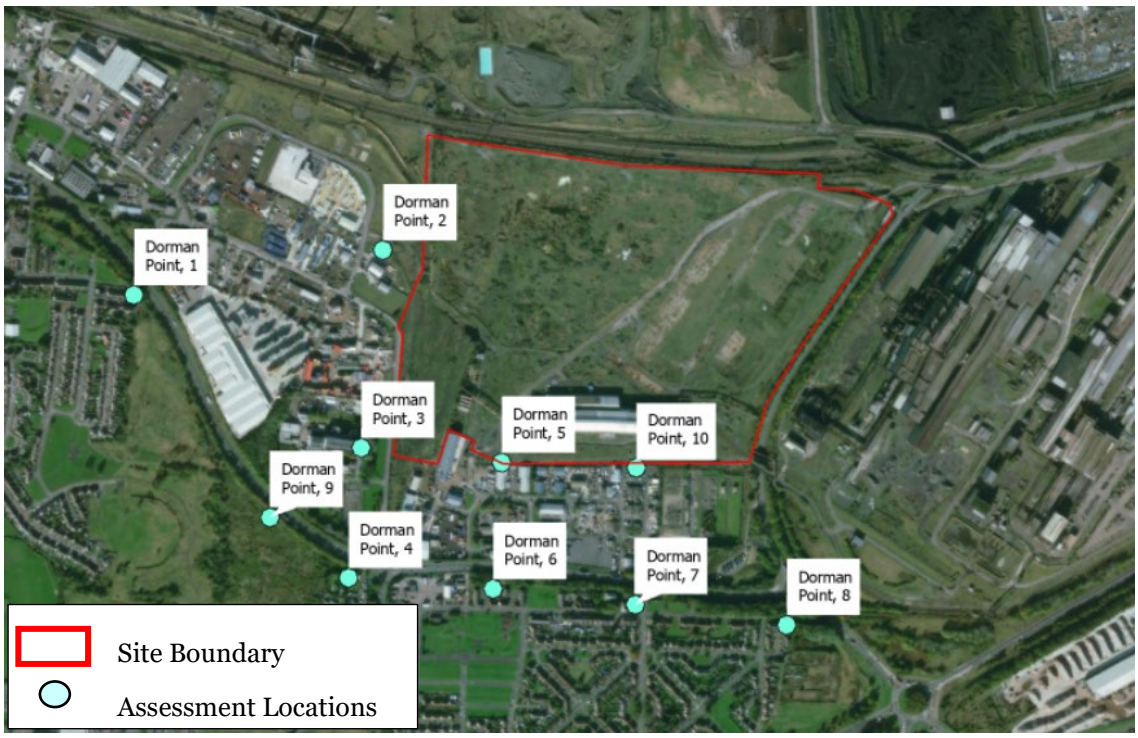
Table E4.1: Noise Sensitive Receptors - Residential receptors

Receptor	Address/ Description	Receptor Sensitivity	Approximate distance to the site boundary, metres
Dorman Point 1	19 Jones Road, South Bank, Middlesbrough, TS6 6QQ	High	580
Dorman Point 4	Elgin Avenue, South Bank, Middlesbrough, TS6 6TP	High	280
Dorman Point 6	8 St. James Court, Grangetown, Middlesbrough, TS6 7SX	High	270
Dorman Point 7	72 Bolckow Road, Grangetown, Middlesbrough, TS6 7EG	High	310
Dorman Point 8	26 Corncroft Mews, Middlesbrough, TS6 7HJ	High	360
Dorman Point 9	Committed development for residential properties, R.2014.0372.OOM	High	270

Table E4.2: Noise Sensitive Receptors - Non-residential receptors

Receptor	Address/ Description	Receptor Sensitivity	Approximate distance to the site boundary, metres
Dorman Point 2	Dental Repair Shop (Non-residential receptor, Office)	Low	90
Dorman Point 3	Materials Processing Institute (Non-residential receptor, Education and lab /testing facilities).	Medium	70
Dorman Point 5	M&K Design Shop (Non-residential receptor, Office)	Low	10
Dorman Point 10	Workshops (East of M&K Design Shop, Non-residential receptor, Office)	Low	10

Figure E4.2: Noise sensitive receptor locations and site boundary



Noise Important Areas

E4.8 The third round of strategic noise mapping undertaken during 2017 [22], mapped 65 agglomeration areas, including Teesside. Important Areas ('IA') within each agglomeration were identified where Noise Action Plans should be considered.

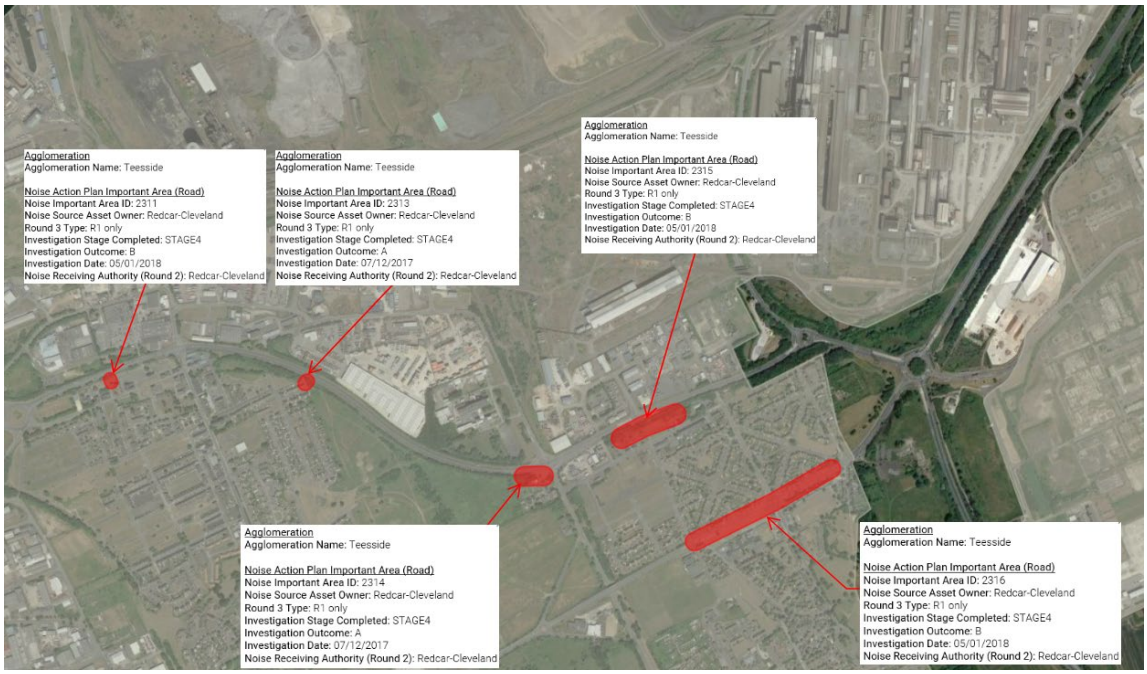
E4.9 IAs potentially affected by the proposed development have been identified in this assessment.

E4.10 The IAs in the vicinity of the proposed development are listed in Table E4.3 and shown in Figure E4.3.

Table E4.3: Important Areas

Important Area ID	Road Links
2311	A66
2313	A66
2314	A66
2315	A66
2316	Trunk Road/Broadway

Figure E4.3: Important Areas identified around the proposed site



Existing Conditions

E4.11 The existing baseline sound levels at residential receptors are presented in Table E4.4 for daytime, evening and night-time.

Table E4.4: Predicted existing baseline sound levels at residential receptors

Receptor (Figure E4.2)	Predicted noise level, daytime* $dBL_{Aeq,\ 07:00\text{-}19:00hrs}$	Predicted noise level, evening time $dBL_{Aeq,\ 19:00\text{-}23:00}$	Predicted noise level, daytime** $dBL_{Aeq,\ 07:00\text{-}23:00}$	Predicted noise level, night-time $dBL_{Aeq,\ 23:00\text{-}07:00hrs}$
Dorman Point 1 (19 Jones Road)	69	66	69	60
Dorman Point 4 (Elgin Avenue)	69	66	68	60
Dorman Point 6 (8 St. James Court)	62	59	62	54
Dorman Point 7 (72 Bolckow Road)	67	64	66	58
Dorman Point 8 (26 Corncroft Mews)	64	61	64	56
Dorman Point 9 (Committed development)	70	67	70	61

*Predicted day time (07:00-19:00hrs) noise levels are used to determine the construction threshold noise levels.

**Predicted day time (07:00-23:00hrs) noise levels are used to assess the potential impact from the buildings services plant and operational noise

E4.12 All residential receptors are located in the vicinity of the A66 where the existing baseline noise levels[1] are predicted to be between 60 and 70dBL$_{Aeq, 07:00-19:00hrs}$, 60 and 65 dBL$_{Aeq, 19:00-23:00hrs}$ and between 55 and 60dBL$_{Aeq, 23:00-07:00hrs}$ during day, evening and night-time periods. These figures are rounded to the nearest 5.

E4.13 The predicted existing baseline sound levels at non-residential receptors are presented in Table E4.5 for daytime and night-time.

Table E4.5: Predicted existing baseline sound levels at non-residential receptors

Receptor (Figure E4.2)	Predicted noise level, 12hr daytime* dBL$_{Aeq,}$ 07:00-19:00hrs	Predicted noise level, evening time dBL$_{Aeq,}$ 19:00-23:00	Predicted noise level, 16hr daytime** dBL$_{Aeq, 07:00-23:00hrs}$	Predicted noise level, night-time dBL$_{Aeq, 23:00-07:00hrs}$
Dorman Point 2 (Dental Repair shop)	50	48	49	45
Dorman Point 3 (Materials Processing Institute)	57	54	57	49
Dorman Point 5 (M&K Design shop)	54	51	54	47
Dorman Point 10 (M&K Design Workshops)	56	53	56	48

*Predicted day time (07:00-19:00hrs) noise levels are used to determine the construction threshold noise levels.

**Predicted day time (07:00-23:00hrs) noise levels are used to assess the potential impact from the buildings services plant and operational noise.

E4.14 All non-residential receptors are located away from main roads and the predicted noise levels are between 49 and 57dBL$_{Aeq, 07:00-23:00hrs}$. It is assumed that all non-residential receptors are occupied during daytime only considering its use.

Future Baseline

E4.15 The predicted future baseline sound levels at residential receptors in 2033 are presented in Table E4.6 and at non-residential receptors are presented in Table E4.7 for daytime and night-time. Details of the assumptions on the traffic movements in a future baseline scenario can be found in Chapter C. Should the proposed development not go ahead then it is likely that some alternative development would happen on the site given both the local planning policy position set out in chapter B and existing permissions. Therefore the future baseline would be similar to that of the proposed development.

Table E4.6: Predicted future (do minimum) baseline sound levels at residential receptors

Receptor (Figure E4.2)	Predicted noise level, daytime $dBL_{Aeq, 07:00-23:00hrs}$	Predicted noise level, night-time $dBL_{Aeq, 23:00-07:00hrs}$
Dorman Point 1 (19 Jones Road)	69	61
Dorman Point 4 (Elgin Avenue)	69	60
Dorman Point 6 (8 St. James Court)	62	54
Dorman Point 7 (72 Bolckow Road)	66	58
Dorman Point 8 (26 Corncroft Mews)	64	56
Dorman Point 9 (Committed development)	70	62

Table E4.7: Predicted future baseline sound levels at non-residential receptors

Receptor (Figure E4.2)	Predicted noise level, daytime $dBL_{Aeq, 07:00-23:00hrs}$	Predicted noise level, night-time $dBL_{Aeq, 23:00-07:00hrs}$
Dorman Point 2 (Dental Repair shop)	50	46
Dorman Point 3 (Materials Processing Institute)	57	50
Dorman Point 5 (M&K Design shop)	54	47
Dorman Point 10 (M&K Design Workshops)	56	49

E4.16 The predicted future baseline noise levels are used to assess the potential change in noise levels during operation phase.

E5.0 Potential Effects

Embedded Mitigation

Construction

E5.1 For the construction phase of development, the assessment assumes the implementation of the principles set out in the Framework CEMP (as set out within Chapter B (Site Description and Scheme Proposals) of this ES).

E5.2 The Parameters Plan shows the development as having a minimum of three access points. The traffic associated with the construction phase of the proposed development shall be managed through a Construction Traffic Management Plan ('CTMP') and this will aid in ensuring that noise associated with the construction stage of the development is kept to a minimum.

Operation

E5.3 There are no embedded mitigation measures that relate to the operational phase of development.

Major Hazards and Accidents

E5.4 The potential for major hazards and accidents associated with the proposed development and surrounding area is not relevant to the noise and vibration assessment.

Phasing

E5.5 Appendix N2 provides a basis for making assumptions as to the potential build-out rate and phasing of development. It is expected that the proposed development is fully constructed 2032. It is also anticipated that some part of the proposed development may be completed prior to 2032. The operational noise assessment has been undertaken in 2033 as a worst-case when the site expected to be is fully occupied.

E5.6 At this stage, details of phasing of the proposed development is not fully developed; detailed assessment of the construction and operational phase of the proposed development will be considered at detailed design stage.

Construction

Construction Vibration

E5.7 Once the ground conditions on the site and construction techniques are confirmed, a detailed construction vibration study will be carried out to quantify the risk of causing a significant effect. Using professional expertise a qualitative assessment has been carried out. Given the large distances from the identified receptors, there would be no risk of causing building damage, however vibration could be potentially perceptible to occupants. Implementation of the principles set out in the Framework CEMP and following the embedded best practicable means ('BPM'), no temporary Significant effect is anticipated.

Construction Traffic Assessment

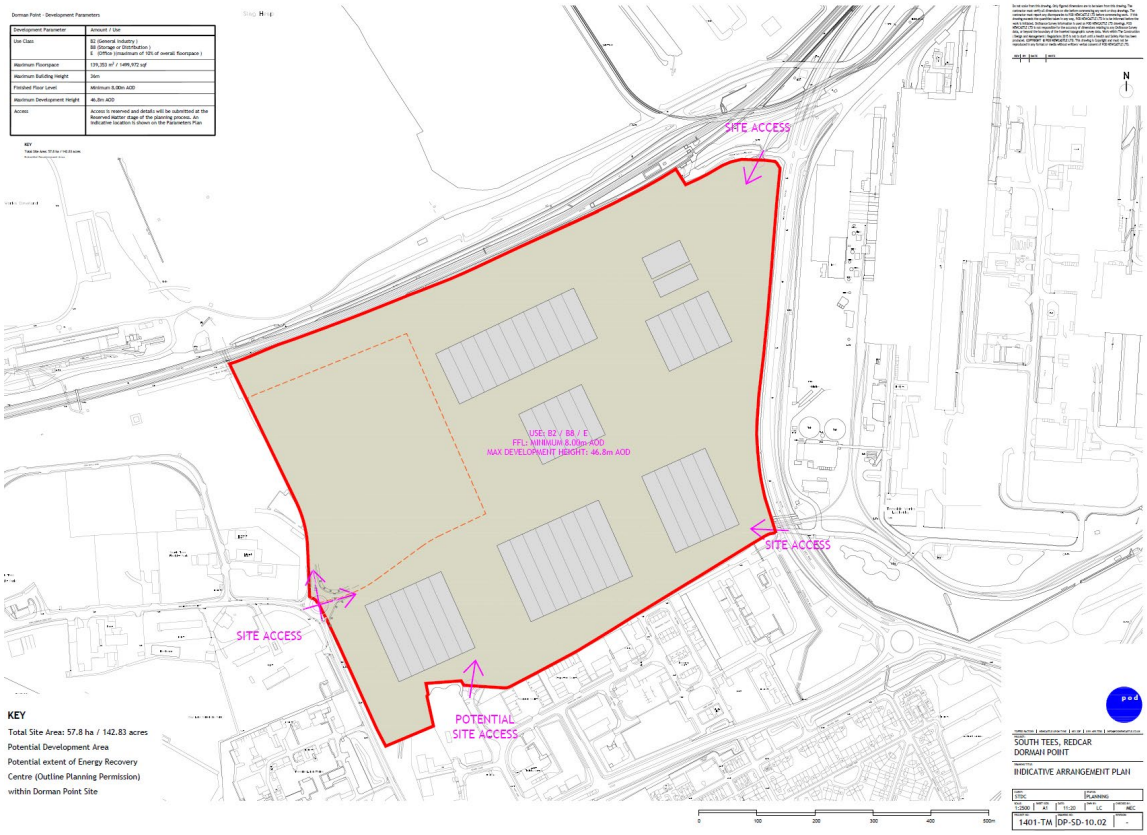
E5.8 Construction traffic is not included within the scope of the assessment as the volume of construction traffic is unknown at this stage. Once construction traffic data for the construction phase is available, a construction traffic noise assessment will be carried out to determine whether further mitigation, over and above the proposed CEMP and CTMP, is required in order

to minimise the temporary impacts. The current measures are already considered appropriate to address a worst case scenario.

Construction Activity Noise

E5.9 The potential construction noise levels at surrounding noise sensitive receptors have been calculated by considering the source noise levels from a hydraulic hammer (impact piling) that would be located within the building footprint arrangement of an indicative proposed development. The Indicative Arrangement Plan submitted with this ES is set out in Figure E5.1 below. It is acknowledged that this arrangement is indicative.

Figure E5.1: Indicative Arrangements Plan



E5.10 The assumed sound source levels for the piling are shown in Table E5.1.

Table E5.1: Noise level data used for hydraulic hammer (impact piling) prediction (BS5228-1 Table C.3-3)

Equipment	Number of items	Equipment size	Sound pressure level $dBL_{Aeq,T}$ at 10m (single item of plant)
Hydraulic hammer (impact piling)	4	240 mm pile diameter	88

E5.11 The construction noise levels have been calculated based on the assumptions set out in Section E3.0 of this Chapter.

E5.12 The predicted construction noise impacts and identification of potential significant effects at residential receptors during day, evening and night-time are presented in Table E5.2, Table E5.3 and Table E5.4.

Table E5.2: Construction noise levels at residential receptors – Day time (07:00-19:00hrs)

Receptor (Figure E4.2)	Predicted ambient noise level, $dBL_{Aeq, T}$	Threshold value (dB)	Predicted construction noise level, $dBL_{Aeq,T}$ (façade)	Level above threshold, dB	Exceedance Above Threshold (Yes/ No)
Dorman Point 1 (19 Jones Road)	69	75	43	-32	No
Dorman Point 4 (Elgin Avenue)	69	75	49	-26	No
Dorman Point 6 (8 St. James Court)	62	65	53	-12	No
Dorman Point 7 (72 Bolckow Road)	67	70	54	-16	No
Dorman Point 8 (26 Corncroft Mews)	64	70	51	-19	No
Dorman Point 9 (Committed development)	70	75	43	-32	No

Table E5.3: Construction noise levels at residential receptors – Evening time (19:00-23:00hrs)

Receptor (Figure E4.2)	Predicted ambient noise level, $dBL_{Aeq, T}$	Threshold value (dB)*	Predicted construction noise level, $dBL_{Aeq,T}$ (façade)	Level above threshold, dB	Exceedance Above Threshold (Yes/ No)
Dorman Point 1 (19 Jones Road)	66	69	43	-26	No
Dorman Point 4 (Elgin Avenue)	66	69	49	-20	No
Dorman Point 6 (8 St. James Court)	59	65	53	-12	No
Dorman Point 7 (72 Bolckow Road)	64	67	54	-13	No
Dorman Point 8 (26 Corncroft Mews)	61	65	51	-14	No
Dorman Point 9 (Committed development)	67	70	43	-27	No

*where ambient noise level exceeds the Category C threshold values, threshold levels are adjusted to 3dB higher than the ambient noise levels.

Table E5.4: Construction noise levels at residential receptors – Night-time (23:00-07:00hrs)

Receptor (Figure E4.2)	Predicted ambient noise level, $dBL_{Aeq, T}$	Threshold value (dB)*	Predicted construction noise level, $dBL_{Aeq,T}$ (façade)	Level above threshold, dB	Exceedance Above Threshold (Yes/ No)
Dorman Point 1 (19 Jones Road)	60	63	43	-20	No
Dorman Point 4 (Elgin Avenue)	60	63	49	-14	No
Dorman Point 6 (8 St. James Court)	54	57	53	-4	No
Dorman Point 7 (72 Bolckow Road)	58	61	54	-7	No
Dorman Point 8 (26 Corncroft Mews)	56	59	51	-8	No
Dorman Point 9 (Committed development)	61	64	43	-21	No

*where ambient noise level exceeds the Category C threshold values, threshold levels are adjusted to 3dB higher than the ambient noise levels.

E5.13 As the predicted noise levels do not exceed the threshold, no temporary construction Significant effect has been identified at residential receptors.

E5.14 The predicted construction noise levels at non-residential receptors during daytime are presented in Table E5.5.

Table E5.5: Summary of ambient noise levels and construction noise criteria at non-residential receptors for day time

Receptor (Figure E4.2)	Predicted ambient noise level, $dBL_{Aeq, day\ time}$	Threshold value (dB)	Predicted construction noise level, $dBL_{Aeq,T}$ (façade)	Level above threshold, dB	Exceedance Above Threshold (Yes/ No)
Dorman Point 2 (Dental Repair shop)	50	75	47	-28	No
Dorman Point 3 (Materials Processing Institute)	57	75	56	-19	No
Dorman Point 5 (M&K Design shop)	54	75	59	-16	No
Dorman Point 10 (M&K Design Workshops)	50	75	61	-14	No

E5.15 No temporary construction Significant effect has been identified at non-residential receptors as the predicted noise levels do not exceed the thresholds. It should be noted that this assessment is based on the assumptions set out in Section E3.0 of this Chapter. The nature of construction work means that the worst-case situation with the plant working at the closest point may exist for a short time, that is, a few hours or days. It is likely that construction works would also be stopped during site staff breaks.

Operation

Road Traffic Noise

E5.16 The predicted noise levels for the future 'Do minimum' and 'Do something' scenarios with relative changes in noise levels are presented in Table E5.6, Table E5.7 and Table E5.8.

Table E5.6: Predicted road traffic noise level at residential receptors - daytime

Receptor (Figure E4.2)	Daytime noise levels, free field ($dBL_{Aeq,16h}$)			
	'Do minimum' road traffic noise, 2033	'Do something' road traffic noise, 2033	Difference in road traffic noise	Potential significant effect (Yes/No)
Dorman Point 1 (19 Jones Road)	69	69	0.2	No
Dorman Point 4 (Elgin Avenue)	69	69	0.3	No
Dorman Point 6 (8 St. James Court)	62	63	0.5	No
Dorman Point 7 (72 Bolckow Road)	66	67	0.5	No
Dorman Point 8 (26 Corncroft Mews)	64	65	0.6	No
Dorman Point 9 (Committed development)	70	70	0.3	No

Table E5.7: Predicted road traffic noise levels at non-residential receptors – daytime

Receptor (Figure E4.2)	Daytime noise levels, free field ($dBL_{Aeq,16h}$)			
	'Do minimum' road traffic noise, 2033	'Do something' road traffic noise, 2033	Difference in road traffic noise	Potential significant effect (Yes/No)
Dorman Point 2 (Dental Repair shop)	50	50	0.5	No
Dorman Point 3 (Materials Processing Institute)	57	59	2.3	No
Dorman Point 5 (M&K Design shop)	54	55	0.9	No
Dorman Point 10 (M&K Design Workshops)	56	57	0.7	No

Table E5.8: Predicted road traffic noise levels at residential receptors – night-time

Receptor (Figure E4.2)	Night-time noise levels, free field ($dBL_{Aeq,8h}$)			
	'Do minimum' road traffic noise, 2033	'Do something' road traffic noise, 2033	Difference in road traffic noise	Potential significant effect (Yes/No)
Dorman Point 1 (19 Jones Road)	61	61	0.2	No
Dorman Point 4 (Elgin Avenue)	60	61	0.3	No
Dorman Point 6 (8 St. James Court)	54	55	0.5	No
Dorman Point 7 (72 Bolckow Road)	58	59	0.5	No
Dorman Point 8 (26 Corncroft Mews)	56	57	0.6	No
Dorman Point 9 (Committed development)	62	62	0.3	No

E5.17 At residential receptors, the predicted noise levels are above the SOAEL (of 63$dBL_{Aeq,\ 16hr}$ and 55$dbL_{Aeq,\ 8hr}$ during day and night time periods respectively) in the absence of the proposed development. The changes in noise levels are less than 1dB as a result of the proposed development and therefore no permanent significant adverse effects have been identified. These effects are Not Significant.

E5.18 The traffic movements are predicted to result in an increase of road traffic noise levels along Eston Road which is one of the access points to the proposed development. The change in noise level due to the increase in traffic flows is predicted to be 2.3dB at a non-residential receptor, Dorman Point 3. Based on the operational traffic noise criteria as per Table E3.3 this is considered as a minor impact. This is Not Significant.

E5.19 The predicted noise levels in the absence of the proposed development at Dorman Point 3 are between LOAEL and SOAEL. Considering the changes in noise levels being less than 3dB and the existing noise exposure level is between LOAEL and SOAEL, it is not assessed as a significant effect.

E5.20 No permanent significant effects have been identified due to the proposed development on the local road networks.

Operational Building Services and Industrial Activity Noise

E5.21 At this stage in the design, no specific operators have been identified for this site. Therefore, this assessment provides a high-level assessment based on the professional understanding of noise arising from predominantly B2 and B8 uses and the development assumption that operating hours are 24hrs a day, 7 days per week.

E5.22 Assumptions on the operational phase of the proposed developments are set out in E3.60.

E5.23 The building envelope is assumed to be a lightweight panel construction with a transmission loss, based on professional experience from previous similar projects, as shown in Table E5.9.

Table E5.9: Sound reduction indices for a lightweight wall/roof panelling system

Material	Octave band sound pressure level, Hz					
	125	250	500	1k	2k	4k
Lightweight wall/roof panelling	17	20	23	23	23	41

E5.24 Road traffic movements on site (HGV and non-HGV activities) have been included in the predicted operational noise levels at receptors.

E5.25 With regards to assessing industrial types of noise source, in the absence of measured background (L_{A90}) noise levels, noise criteria for assessing the potential noise effects has been agreed with the EHO that the industrial noise levels should not exceed the existing ambient (L_{Aeq}) noise levels.

E5.26 The predicted noise from building services and on-site activities at noise sensitive receptors are presented in Tables E5.10, E5.11 and E5.12.

Table E5.10: Predicted operational noise levels at residential receptors – day time (07:00-23:00hrs)

Receptor (Figure E4.2)	Predicted ambient noise level, daytime $dBL_{Aeq,07:00-23:00hrs}$	Predicted total operational external noise level, daytime $dBL_{Aeq,07:00-23:00hrs}$	Difference, $dBL_{Aeq,07:00-23:00hrs}$	Exceedance above ambient noise level (Yes/No)
Dorman Point 1 (19 Jones Road)	69	37	-31	No
Dorman Point 4 (Elgin Avenue)	68	41	-27	No
Dorman Point 6 (8 St. James Court)	62	45	-17	No
Dorman Point 7 (72 Bolckow Road)	66	45	-21	No
Dorman Point 8 (26 Corncroft Mews)	64	43	-20	No
Dorman Point 9 (Committed development)	70	38	-32	No

Table E5.11: Predicted operational noise levels at non-residential receptors – daytime (07:00-23:00hrs)

Receptor (Figure E4.2)	Predicted ambient noise level, daytime $dBL_{Aeq,07:00-23:00hrs}$	Predicted total operational external noise level, daytime $dBL_{Aeq,07:00-23:00hrs}$	Difference, $dBL_{Aeq,07:00-23:00hrs}$	Exceedance above ambient noise level (Yes/No)
Dorman Point 2 (Dental Repair shop)	49	46	-3	No
Dorman Point 3	57	48	-9	No

Receptor (Figure E4.2)	Predicted ambient noise level, daytime $dBL_{Aeq,07:00-23:00hrs}$	Predicted total operational external noise level, daytime $dBL_{Aeq,07:00-23:00hrs}$	Difference, $dBL_{Aeq,07:00-23:00hrs}$	Exceedance above ambient noise level (Yes/No)
(Materials Processing Institute)				
Dorman Point 5 (M&K Design shop)	54	52	-2	No
Dorman Point 10 (M&K Design Workshops)	56	52	-4	No

Table E5.12: Prediction operational noise levels at residential receptors – night-time (23:00-07:00hrs)

Receptor (Figure E4.2)	Predicted ambient noise level, night-time $dBL_{Aeq,23:00-07:00hrs}$	Predicted total operational external noise level, night-time $dBL_{Aeq,23:00-07:00hrs}$	Difference, $dBL_{Aeq,23:00-07:00hrs}$	Exceedance above ambient noise level (Yes/No)
Dorman Point 1 (19 Jones Road)	60	37	-21	No
Dorman Point 4 (Elgin Avenue)	60	41	-19	No
Dorman Point 6 (8 St. James Court)	54	45	-9	No
Dorman Point 7 (72 Bolckow Road)	58	45	-13	No
Dorman Point 8 (26 Corncroft Mews)	56	43	-13	No
Dorman Point 9 (Committed development)	61	38	-23	No

E5.27 No permanent likely significant effects have been identified due to the building service plant and operation of the proposed site.

E6.0 Mitigation and Monitoring

Construction

E6.1 As set out in the Potential Effects section of this Chapter, the effects are not considered to be significant, however notwithstanding this to ensure noise associated with the construction stage of the development is kept to a minimum, a risk assessment identifying the probability of noise and vibration from any piling or compaction activities and construction traffic should be carried out prior to the commencement of the works. This will also determine the need for any periodic or continuous construction noise or vibration monitoring.

Operation

Operational Building Services and Industrial Activity Noise

E6.2 Building services plant is envisaged to be placed at roof level. The specification of plant machinery with low noise emission and properly attenuated supply and extract terminations will help to ensure that noise emissions are minimised. The use of enclosures, local screening, mufflers and silencers should also be used as appropriate.

E6.3 As set out in the Potential Effects section of this Chapter, the effects are not considered to be significant, however the following mitigation of on-site activities will help to ensure the noise emissions are minimised in accordance with noise guidance:

- Noisy plant or equipment shall be situated as far as possible from any noise sensitive buildings.
- Plant shall be maintained in good working order so that extraneous noise is kept to a minimum; and
- An appropriate speed limit will be implemented for on-site vehicle movements, i.e. 10mph.

E6.4 Noise emission from building services plant and industrial activities will be considered during detailed design to ensure that operational noise does not adversely affect any noise sensitive receptors. Operational noise would therefore be kept at or below the existing ambient noise levels, preventing any significant effects of noise.

Road Traffic Noise

E6.5 The additional traffic movements associated with the development resulted in changed noise levels, particularly receptors are located in vicinity of Eston. This is not considered to be significant and therefore no mitigation is proposed.

E7.0 Residual Effects

During Construction

E7.1 No temporary Significant effects have been identified. The proposed mitigation set out within section E6.0 above (e.g. noise risk assessment and potential monitoring) will ensure that noise associated with the construction phase is minimised. As the detail and requirement for this mitigation has not yet been finalised, the residual effects are assumed to remain as set out in Section E5.0 e.g. Not Significant.

During Operation

E7.2 The Potential Effects section of this chapter did not identify any significant effect for the operational building services and on-site industrial activities. Implementing the recommended mitigation measures set out above will help minimise the noise effects further and they will remain Not Significant.

E8.0 Summary & Conclusions

E8.1 Noise and vibration assessment due to the proposed development at Dorman Point site has been carried out.

E8.2 The Environmental Health Officer (EHO) at RCBC was consulted in November 2020 regarding the noise impact assessment. It was agreed that the existing noise environment around the site could be established based on predicted noise levels of road and rail traffic movements in the area. It was also agreed for the industrial noise source (including building services plant and on-site activities) that noise emissions at noise sensitive receptors should not exceed the existing ambient noise levels.

E8.3 The construction noise emission levels at the noise sensitive receptors as a result of the construction works (impact piling works assumed, as a reasonable worst-case scenario) shows there is no exceedance above the threshold levels. Therefore no significant construction effects have been identified and no residual significant effect has been identified. Notwithstanding this, best practicable means of working have been identified to ensure noise is kept to a minimum.

E8.4 Operational road traffic noise has been assessed by considering the changes in noise levels using the criteria set out in Table E3.2 due to the additional traffic movement associated with the operation of the site. No permanent significant effects have been identified due to the proposed development.

E8.5 An assessment of noise emissions from the industrial noise source (including building services plant and on-site activities) has been carried out. No permanent significant effects have been identified due to the building services plant and on-site activities of the site. At the detailed planning stage, the design of building services plant and industrial noise sources would be designed in line with BS4142 and national policies.

E8.6 Table E8.1 provides a summary of the effects identified throughout this Chapter. It should be noted that the additional mitigation measures are identified to seek to keep noise to a minimum, rather than being required to reduce a significant impact.

Table E8.1: Potential effect summary for construction and operation

Receptor	Impact	Potential Effects (taking account of embedded mitigation)	Additional Mitigation and Monitoring	Residual Effects
During Construction				
Dorman Point 1 (19 Jones Road)	Temporary construction impacts due to construction activities, especially from piling works.	Not Significant	A risk assessment identifying the probability of noise and vibration from any piling or compaction activities and construction traffic should be carried out prior to the commencement of the works	Not Significant
Dorman Point 2 (Dental Repair shop)				
Dorman Point 3 (Materials Processing Institute)				
Dorman Point 4 (Elgin Avenue)				
Dorman Point 5 (M&K Design shop)				

Receptor	Impact	Potential Effects (taking account of embedded mitigation)	Additional Mitigation and Monitoring	Residual Effects
Dorman Point 6 (8 St. James Court)				
Dorman Point 7 (72 Bolckow Road)				
Dorman Point 8 (26 Corncroft Mews)				
Dorman Point 9 (Committed development)				
Dorman Point 10 (M&K Design Workshops)				
During Operation				
Dorman Point 1 (19 Jones Road)	Permanent operational impacts due to the activities associated with building services plant and on-site activities.	Not Significant	Noisy plant or equipment shall be situated as far as possible from any noise sensitive buildings. Plant shall be maintained in good working order so that extraneous noise is kept to a minimum; and An appropriate speed limit will be implemented for on-site vehicle movements, i.e. 10mph.	Not Significant
Dorman Point 2 (Dental Repair shop)				
Dorman Point 3 (Materials Processing Institute)				
Dorman Point 4 (Elgin Avenue)				
Dorman Point 5 (M&K Design shop)				
Dorman Point 6 (8 St. James Court)				
Dorman Point 7 (72 Bolckow Road)				
Dorman Point 8 (26 Corncroft Mews)				
Dorman Point 9 (Committed development)				
Dorman Point 10 (M&K Design Workshops)				

E9.0 Abbreviations & Definitions

Definitions

1 **Decibel (dB)**

The ratio of sound pressures which we can hear is a ratio of 10^6:1 (one million:one). For convenience, therefore, a logarithmic measurement scale is used. The resulting parameter is called the 'sound pressure level' (L_p) and the associated measurement unit is the decibel (dB). As the decibel is a logarithmic ratio, the laws of logarithmic addition and subtraction apply.

2 **dB(A)**

The unit used to define a weighted sound pressure level, which correlates well with the subjective response to sound. The 'A' weighting follows the frequency response of the human ear, which is less sensitive to low and very high frequencies than it is to those in the range 500Hz to 4kHz.

In some statistical descriptors the 'A' weighting forms part of a subscript, such as L_{A10}, L_{A90}, and L_{Aeq} for the 'A' weighted equivalent continuous noise level.

3 **Equivalent Continuous Sound Level**

An index for assessment for overall noise exposure is the equivalent continuous sound level, $L_{eq, T}$. This is a notional steady level which would, over a given period of time, deliver the same sound energy as the actual time-varying sound over the same period. Hence fluctuating levels can be described in terms of a single figure level.

4 **Frequency**

Frequency is the rate of repetition of a sound wave. The subjective equivalent in music is pitch. The unit of frequency is the hertz (Hz), which is identical to cycles per second. A 1000Hz is often denoted as 1kHz, e.g. 2kHz = 2000Hz. Human hearing ranges approximately from 20Hz to 20kHz. For design purposes the octave bands between 63Hz to 8kHz are generally used. The most commonly used frequency bands are octave bands, in which the mid frequency of each band is twice that of the band below it. For more detailed analysis, each octave band may be split into three one-third octave bands or in some cases, narrow frequency bands.

5 **Statistical noise levels**

For levels of noise that vary widely with time, for example road traffic noise, it is necessary to employ an index which allows for this variation. The L_{10}, the level exceeded for 10% of the time period under consideration, and can be used for the assessment of road traffic noise (note that L_{Aeq} is used in BS 8233 for assessing traffic noise). The L_{90}, the level exceeded for 90% of the time, has been adopted to represent the background noise level. The L_1, the level exceeded for 1% of the time, is representative of the maximum levels recorded during the sample period. A weighted statistical noise levels are denoted L_{A10}, dBL_{A90} etc. The reference time period (T) is normally included, e.g. $dBL_{A10, 5min}$ or $dBL_{A90, 8hr}$.

6 **Sound Power Level**

The sound power level (L_w) of a source is a measure of the total acoustic power radiated by a source. The sound power level is an intrinsic characteristic of a source (analogous to its volume or mass), which is not affected by the environment within which the source is located.

7 **Sound Pressure Level**

The sound power emitted by a source results in pressure fluctuations in the air, which are heard as sound.

The sound pressure level (L_p) is ten times the logarithm of the ratio of the measured sound pressure (detected by a microphone) to the reference level of 2 x 10-5Pa (the threshold of hearing).

Thus L_p (dB) = 10 log (P_1/P_{ref})2 where Pref, the lowest pressure detectable by the ear, is 0.00002 pascals (i.e. 2x10-5 Pa).

The threshold of hearing is 0dB, while the threshold of pain is approximately 120dB. Normal speech is approximately 60dBA and a change of 3dB is only just detectable. A change of 10dB is subjectively twice, or half, as loud.

8 **Facade level**

A façade level refers to noise levels an assessment location between 1 and 3.5m from the façade of a building or other reflective structure. The difference between the façade and free field noise level depends on the distance from the reflecting surface.

9 **Free field level**

The term 'free field' is used to define noise levels that have been measured or predicted in the absence of any influence of reflections from nearby surfaces, other than the ground. In practice, a noise level is considered to be free field if it is at a distance greater than 3.5m from any reflecting surfaces, other than the ground.

10 **Typical Levels**

Some typical dB(A) noise levels are given below:

Noise Level, dB(A)	Example
130	Threshold of pain
120	Jet aircraft take-off at 100m
110	Chain saw at 1m
100	Inside disco
90	Heavy lorries at 5m
80	Kerbside of busy street
70	Loud radio (in typical domestic room)
60	Office or restaurant
50	Domestic fan heater at 1m
40	Living room
30	Theatre
20	Remote countryside on still night
10	Sound insulated test chamber

Abbreviations

1 NPPF – The National Planning Policy Framework
2 NPSE – National Policy Statement for England
3 NOEL – No Observed Effect Level
4 LOAEL – Lowest Observed Adverse Effect Level
5 SOAEL – Significant Observed Adverse Effect Level
6 BPM – Best Practicable Means
7 WHO – World Health Organization
8 DMRB – Design Manual for Roads and Bridges
9 CRTN – Calculation of Road Traffic Noise
10 CRN – Calculation of Rail Noise
11 HGV – Heavy Goods Vehicles
12 PPG-N – Planning Practice Guidance – Noise
13 ES – Environmental Statement
14 STDC – South Tees Development Corporation
15 NSIPs – Nationally Significant Infrastructure Projects
16 EHO – Environmental Health Officer
17 RCBC – Redcar and Cleveland Borough Council

E10.0 References

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22 Strategic Noise Mapping Round three, detailed information can be found on: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/902825/strategic-noise-mapping-round3.pdf