Whitehaven Residential Development

Planning Noise Assessment

August 2019

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This document has been prepared and checked in accordance with
Waterman Group's IMS (BS EN ISO 9001: 2015, BS EN ISO 14001: 2015 and BS OHSAS 18001:2007)

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Comments

Comments

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1. Introduction

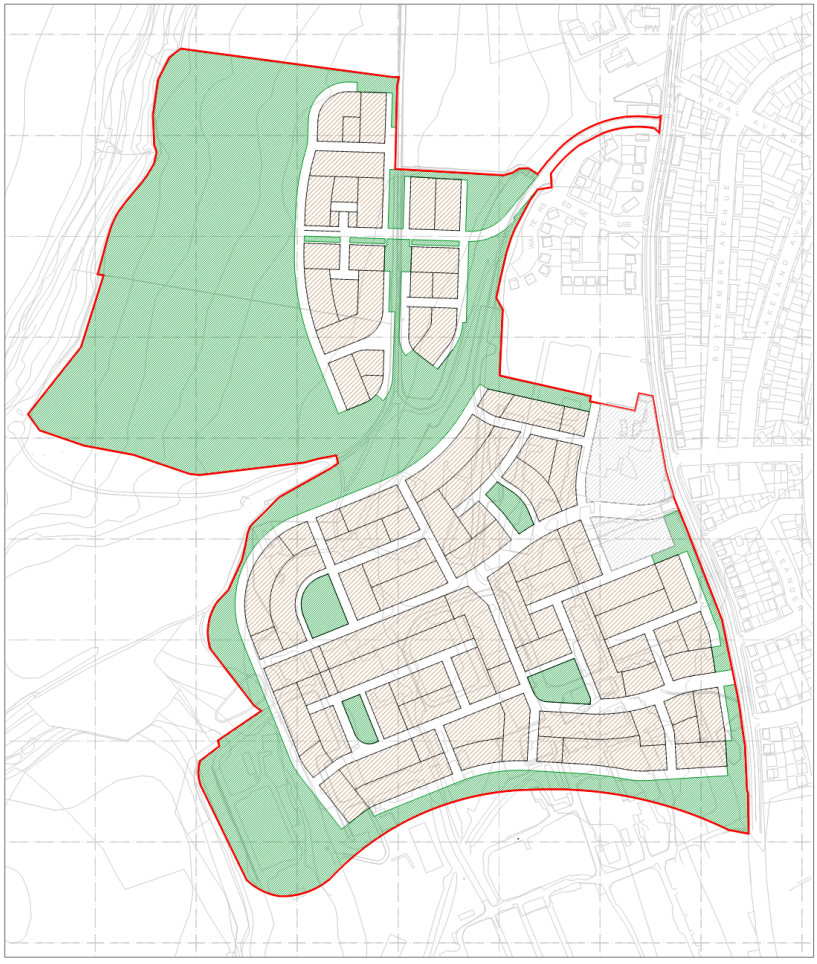
Persimmon Homes are seeking to submit a hybrid planning application for the redevelopment of land adjacent to High Road, Whitehaven for residential development. The application would be in detail for the first 100 units and outline for the remainder understood to be up to c. 600 units.

The dominant sources of existing noise and pollutants is road traffic noise, however, the site adjacent to the south is currently in for planning with Cumbria County Council for “Development of an existing surface mine entrance for a new underground metallurgical coal mine and associated surface development”, as such future baseline conditions would need to be considered. There are no prevailing vibration generating land uses adjacent or proximate to the Site, such as railway lines or industrial land-uses. Vibration is therefore not a material consideration with regard to the suitability of the site for residential use.

This report provides an assessment of the suitability of the land for residential development together with the potential impacts of the proposed development during the construction phase and from changes in road traffic noise once completed and fully occupied.

Figure 1 presents the location of the Site. The Site is bound to the west by High Road with residential areas to the west and north of the Site.

Figure 1: Location Plan of Site



Appendix A provides a summary of the acoustic terminology used within this report.

2. Noise Assessment Criteria

2.1 Residential Amenity

The most relevant and credited guidance covering desirable levels of environmental noise for indoor and outdoor environments are the World Health Organisation (WHO), 1999 'Guidelines for Community Noise'[1], BS 8233:2014[2] and ProPG 2017[3].

These documents set out guideline internal and external noise limits which should be met by all residential developments to ensure the critical effects of noise on sleep, annoyance and speech interference are guarded against. Further to this, ProPG advocates a holistic approach with good acoustic design being a key consideration which is not just reliant on achieving the required guideline noise limits.

A summary of the guideline advice presented within these documents and relevant to the proposed Development is provided in Table 1 with additional explanatory notes provided in Appendix B.

Table 1: Summary of Recommended Noise Levels – Residential Amenity (ProPG)

Activity	Location	Noise Level	
		Day time	Night-time
Resting	Living room	35 dB $L_{Aeq,16h}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16h}$	-
Sleeping (daytime resting)	Bedrooms	35 dB $L_{Aeq,16h}$	30 dB $L_{Aeq,8h}$ 45 dB $L_{Amax,F}$ (note 4)
Relaxing, Enjoyment	Private gardens	50-55dB $L_{Aeq,16h}$	-

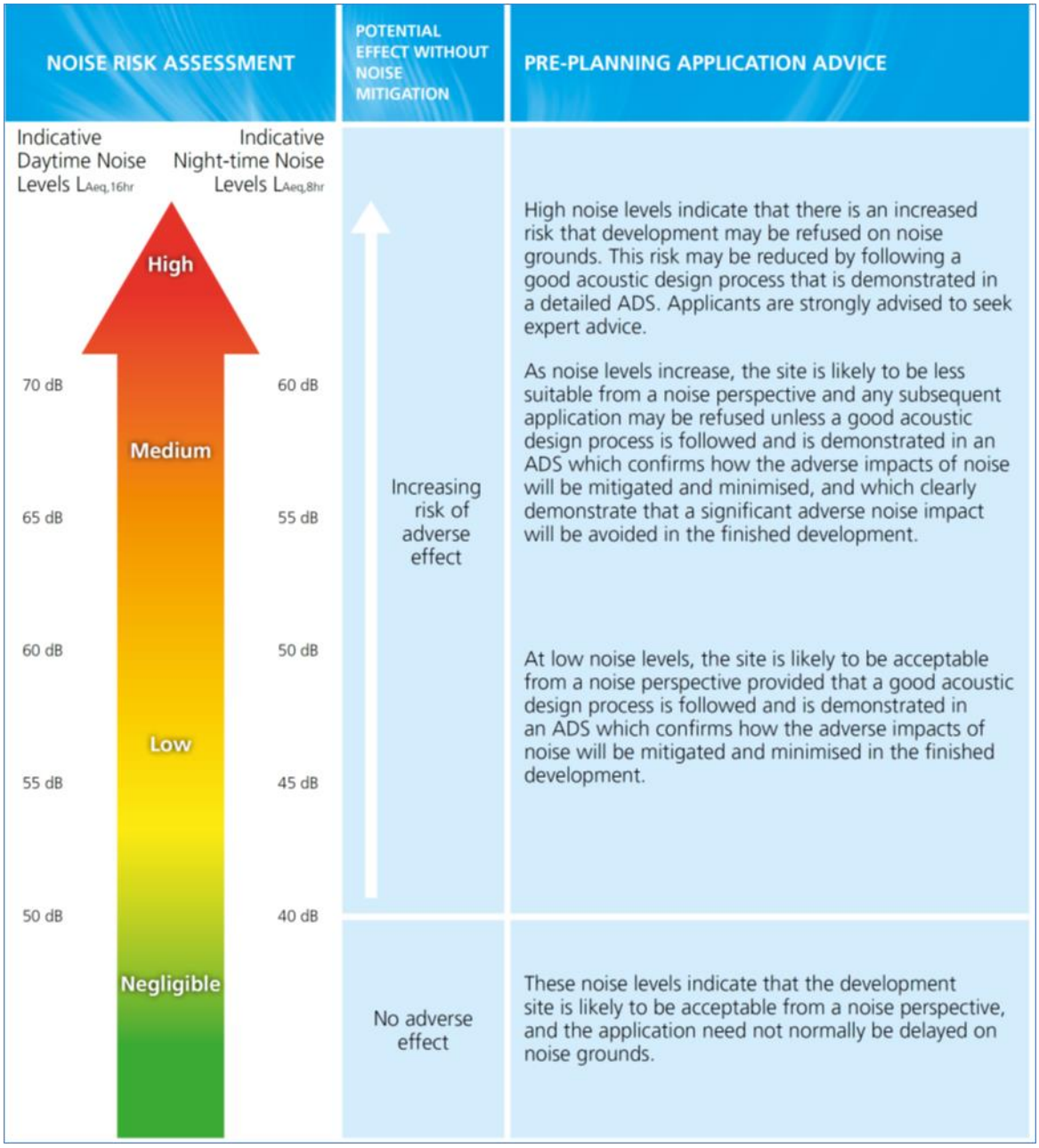
When considering external amenity spaces such as gardens, balconies and terraces, the guidance provided in BS 8233 and reproduced in ProPG states:

"the acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50-55 dB $L_{Aeq,16h}$. These guideline values may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels in these external amenity spaces but should not be prohibited."

Figure 2 has been reproduced from ProPG illustrating the associated noise risks based on the prevailing noise levels. It is important to note that the assessment of noise risk serves to provide an indication as to the initial suitability of the site for residential development and as to what the acoustic issues are likely to be.

1 World Health Organisation (WHO) (1999); '*Guidelines for Community Noise*', WHO, Geneva.
2 BSI (2014) BS8233 '*Guidance on sound insulation and noise reduction in buildings*'. BSI.
3 ProPG: (May 2017); Professional Practice Guidance on Planning & Noise. New Residential Development.

Figure 2: ProPG Stage 1 Initial Site Noise Risk Assessment



Note:
a). Indicative noise levels should be assessed without inclusion of the acoustic effect of any scheme specific noise mitigation measures.
b). Indicative noise levels are the combined free-field noise level from all sources of transport noise and may also include industrial/commercial noise where this is present but is “not dominant”.
c) $L_{Aeq,16h}$ is for daytime 0700-2300, $L_{Aeq,8hr}$ is for night-time 2300-0700.
d. An indication that there may be more than 10 noise events at night (2300-0700) with $L_{Amax,F}$>60dB means the site should not be regarded as negligible

The assessment of residential amenity also has regard to the overarching guidance detailed within the National Planning Policy Framework[4] (NPPF) which states in paragraph 180 that "*the 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*." Further to this NPPF state that the development should "*mitigate and reduce to a minimum potential adverse impacts resulting form noise from new development – and avoid noise giving rise to significant adverse impacts on health and quality of life*."

Paragraph 182 of the NPPF introduces the 'agent of change' principle, in that "*Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.*"

2.1 Fixed External Plant, Building Services Noise

The primary source of guidance in relation to noise which is industrial in nature, such as fixed building services plant, is provided in BS 4142:2014[5], BS 4142 states that the potential impact from industrial/commercial sound is based on the level difference between the source, known as the 'specific sound' level ($L_{Aeq,Tr}$), compared with the 'background sound level ($L_{A90,T}$) that exists in the absence of the source in question. Where the sound contains any acoustic characteristics such as tonality, impulsiveness and intermittency then the specific noise level is adjusted in-line with BS 4142 advice to determine the rating level ($L_{Ar,Tr}$).

Typically, the greater the difference between the rating level and the background sound level the greater the potential of an adverse impact. BS 4142 states:

- A difference of +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of +5dB or more is likely to be an indication of an adverse impact, depending on the context; and
- Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

BS4142 further states; '*Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact*.'

Context is an important consideration of a BS4142 assessment and the impact may require modification due to context, which may include:

- The absolute level of sound;
- The character and level of the residual sound compared to the character and level of the specific sound; and
- Design measures that secure good internal and/or outdoor acoustic conditions, such as; façade insulation treatment, ventilation and/or cooling that will reduce the need to have windows open and acoustic screening.

Should fixed external plant be introduced as part of the Development then noise limits are recommended having regard to the requirements of Copeland Borough Council, guidance within BS4142 and the

[4] Ministry of Housing, Communities and Local Government. (Feb 2019) National Planning Policy Framework. HMSO.
[5] British Standard Institute (BSI) (2014) Methods for rating and assessing industrial and commercial sound. BSI.

prevailing background noise levels.

Copeland Borough Council doesn't have specific noise limits for BS 4142 assessments and each case is considered separately based on context. For new developments they typically require the rating level to be no higher than the background level, but ideally less than +5dB above the prevailing background noise level.

2.2 Construction Noise and Vibration

To assess the likely significant effects of construction works on existing SRs surrounding the Site, the 'ABC Method' provided in BS 5228-1:2009+A1:2014, has been used. This method defines category threshold values, which are determined by the time of day and existing prevailing ambient noise levels. The noise generated by demolition and construction activities is compared with the threshold value. If the demolition and construction noise level exceeds the 'threshold value', a significant effect is deemed to occur.

Noise threshold levels have been established for the relevant existing SRs based upon the prevailing baseline noise levels. Noise levels associated with construction works have been predicted using the calculation methodology detailed within BS 5228-1:2009+A1:2014. Calculations representing a worst-case scenario over a one-hour period with plant operating at the closest point to the nearest SR and in the absence of mitigation are presented. In practice, noise levels would tend to be lower owing to greater separation distances, screening effects and periods of plant inactivity.

There are two aspects of vibration that require consideration:

- Potential vibration effects on people or equipment within buildings; and
- Potential vibration effects on buildings.

There are currently no British Standards that provide a methodology for predicting levels of vibration from construction activities other than BS 5228-2 'Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration', which relates to percussive, or vibratory, rolling and piling only. As stated in BS 5228-2, and as generally accepted, the threshold of vibration perception for humans in residential environments is typically in the PPV range 0.15 to 0.3 mm/s at frequencies between 8 Hertz (Hz) and 80Hz with complaints likely at 1 mm/s. Based on historical field measurements undertaken by Waterman and having regard to information contained within BS 5228-2, Table 2 details the distance at which certain activities may give rise to 'just perceptible' levels of vibration.

Table 2: Distance at Which Vibration May Just be Perceptible

Construction Activity	Distance from Activity when Vibration may Just be Perceptible (metres)[1]
Heavy vehicles	5 – 10
Excavation	10 – 15
CFA Piling	15 – 20
Rotary Bored Piling	20 – 30
Vibratory Piling	40 – 60

Note: [1]Distances for perceptibility are only indicative and dependent upon a number of factors, such as the radial distance between source and receiver, ground conditions, and underlying geology.

It is understood that the Development will not require piled foundations but spread concrete footing.

It is a widely held belief that if vibration can be felt, then damage to property is inevitable. However, vibration levels at least an order of magnitude higher than those for human disturbance are required to cause damage to buildings. It is generally accepted that building damage would not arise at PPV levels below 12.5 mm/s.

The assessment criteria presented as Table 3 has been used in the assessment of noise and vibration from construction operations.

Table 3: Impact Assessment Criteria for Construction Noise and Vibration

Significance	Level Above Threshold Value dB(A)	Level of Vibration	Definition
Negligible	≤ 0 to 2.9	< 0.14mm/s	The effect is not of concern
Adverse effect of minor significance	3.0 to 4.9	>0.14mm/s to <1mm/s	The effect is undesirable but of limited concern
Adverse effect of moderate significance	5.0 to 9.9	1mm/s to 3mm/s	The effect gives rise to some concern but is likely to be tolerable depending on scale and duration
Adverse effect of major significance	≥10	>3mm/s	The effect gives rise to serious concern and it should be considered unacceptable

2.2.1 Demolition and Construction Traffic Noise

Assessment of noise level changes arising from demolition and construction traffic was undertaken using the calculation methodology detailed within the Calculation of Road Traffic Noise[6] (CRTN) and assessment methodology of The Design Manual for Roads and Bridges, Volume 11 Section 3 Part 7-'Traffic Noise and Vibration' (DMRB)[7]. This involved the use of the existing traffic flows on the local road network by the transport engineers CBO Transport Ltd and forecast construction traffic.

The criteria in Table 4 were adopted to provide transparency in the definition of the significance of potential effects.

2.3 Road Traffic Noise

The changes in noise levels, attributable to changes in road traffic flows and composition resulting from the Development have been calculated using traffic data supplied by the transport engineers (CBO Transport Ltd). Traffic flow data has been provided for the 'with' and 'without' Development scenarios for the year that the Development would be fully complete and operational (2030).

Basic Noise Levels (BNLs) have been calculated for all the road links that potentially may be affected by the Development. The calculations used the 18-hour Average Annual Weekday Traffic (AAWT) flow, % HGV composition and average vehicle speed for each road link. The BNLs were calculated at positions 10m from the road using the calculation methodology of the Calculation of Road Traffic Noise (CRTN).

The likely effects of changes in road traffic noise were evaluated by consideration of the estimated changes in $L_{A10,(18\ hour)}$ road traffic noise level and the significance criteria of The Design Manual for Roads and Bridges, Volume 11 Section 3 Part 7-'Traffic Noise and Vibration' (DMRB). DMRB states that "a change in road traffic noise of 1 dB $L_{A10,(18\ hour)}$ in the short term (e.g. when a project is opened) is the smallest that is considered perceptible". Notwithstanding this, it is generally accepted by acoustic practitioners that subjectively an increase of 3dB in environmental noise is just noticeable, whereas an increase of 10dB, a tenfold increase in intensity is judged by most people as a doubling of loudness.

Table 4 presents the significance of the changes in road traffic noise levels

6 DoT (1988) Calculation of Road Traffic Noise, HMSO

7 Highways Agency (2011) Design Manual for Road and Bridges, Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 7 Noise and Vibration. The Stationery Office.

Table 4: Significance of Changes in Road Traffic Noise

Significance	Change or Difference in Noise Level, dB(A)
Negligible	0 to 0.9
Adverse effect of minor significance	1.0 to 2.9
Adverse effect of moderate significance	3.0 to 4.9
Adverse effect of major significance	≥ 5

3. Baseline Conditions

3.1 Sensitive Receptors

The nearest residential receptors to the Site are located to the east of High Road and to the north of the development Site boundary (Waters Edge Close) and are describe in Table 5 and illustrated in Figure 3.

Table 5: Sensitive Receptors

Reference	Description	Distance of Building from Site Boundary (m approx.)
SR A	Two storey residential properties (terrace, semi-detached and detached) east of High Road.	15
SR B	Two storey residential properties (semi-detached and detached) on Waters Edge Close.	10

3.2 Baseline Environmental Noise Survey

A baseline noise survey was undertaken from Thursday 10th September and Friday 11th September 2018 Two environmental noise sound level meters were installed for a period of 24 hours at the western and eastern Site boundaries to establish prevailing day and night-time noise levels. This was supplemented with an attended CRTN shortened measurement procedure adjacent to High Road within the vicinity of Waters Edge Close and a 1-hour daytime noise measurement to west of existing residential properties on Waters Edge Close. The noise monitoring location are illustrated in Figure 3.

The noise monitoring locations are described in Table 6 and illustrated in Figure 3.

Table 6: Description of Noise Monitoring Locations

Ref Figure 3	Location	Description
LT1	Free-field noise measurement approximately 4m from High Road.	Dominant noise source was road traffic noise from High Road.
ST2	Free-field noise measurement approximately western Site boundary.	Distant road traffic noise from High Road. Contributory noise from seagulls.
CRTN	Free-field noise measurement adjacent to High Road (approx. 2m from road edge)	Dominant noise source was road traffic noise from High Road.
ST1	Free-field noise measurement west of Waters Edge Close.	Distant road traffic noise from High Road with some contributory noise from residents (dog barking, DIY noise) and seagulls.

A summary of the measured noise levels is presented within Table 7, with full survey details presented within Appendix C.

Table 7: Summary of Baseline Noise Survey Results

Monitoring Location (Figure 3)	Period	$L_{Aeq,T}$ dB	$L_{A10,T}$ dB	$L_{A90,T}$ dB		$L_{AFmax,5min}$ dB
		Ave[1]	Ave[2]	Range	Ave[3]	95th Percentile[4]
LT1 (High Road)	Day (07:00-23:00)	64	68	29-53	39	83
	Night (23:00-07:00)	59	44	22-43	31	80
LT2 (West Boundary)	Day (07:00-23:00)	43	43	29-42	38	62
	Night (23:00-07:00)	38	37	21-42	35	54
CRTN (High Road)	Day (11:15-14:15)	67	71	38-51	40	91
ST1 (Waters Edge Close)	Day (10:35-10:05)	44	42	30-33	31	72

Notes: [1] Logarithmic average over the day and night survey periods; [2] Arithmetic average over the survey periods. [3] Modal value (most frequently occurring value) [4] The 95th percentile L_{AFmax} value (equivalent to the 5th highest measured L_{AFmax} level) is presented and considered representative of typical L_{AFmax} levels experienced. All figures rounded to nearest whole decibel.

The measured L_{A10} noise parameter during the CRTN shortened measurement adjacent to High Road was converted to a dB $L_{Aeq,16h}$ daytime value and a dB $L_{Aeq,8h}$ night-time value using the Transport Research Laboratory's calculation methodology[8]. Comparison was made with the measured value at LT1 to determine the subsequent noise model inputs.

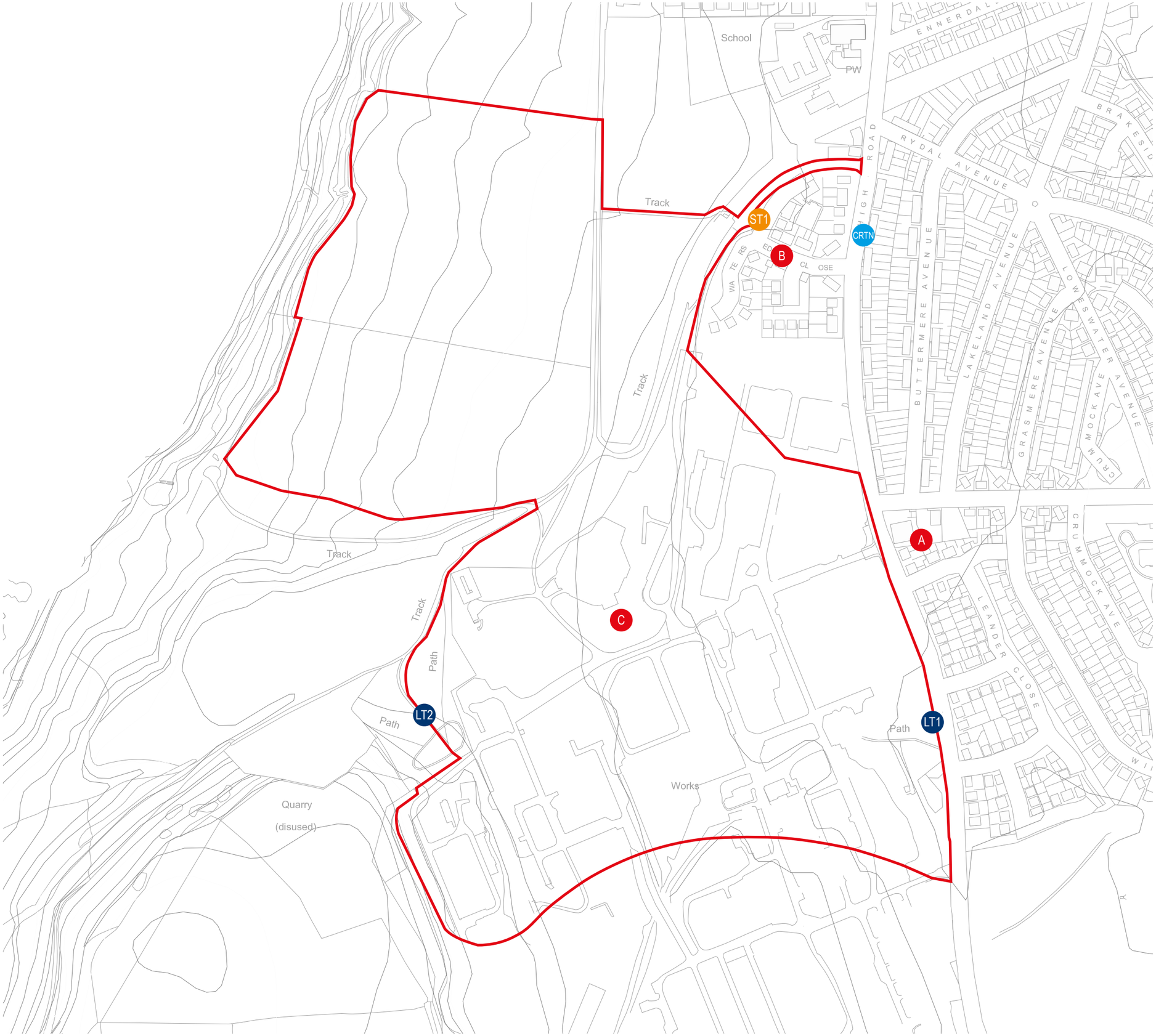
3.3 Future Noise Considerations

Planning permission has been granted (Planning Application 4/14/9007 Cumbria County Council) for 'Development of an existing surface mine entrance for a new underground metallurgical coal mine and associated surface development' which is located to the south of the Site. An EIA was undertaken as part of the planning submission, to determine the potential impact of the proposed development, which included the potential impact on the future proposed residential development, which is the subject of this report.

Chapter 14 Noise and Vibration of the ES, in combination with its associated technical appendices, indicated that the future baseline noise level along the southern development boundary with the proposed mine development will change slightly from prevailing. Based on the information within the ES the prevailing ambient during the day and night-time period would result in future daytime level of 38dB $L_{Aeq,T}$ (36dB+34dB) and future night-time noise level of 37dB $L_{Aeq,T}$ (34dB+34dB). Noise levels of this magnitude are significantly below the threshold where noise is normally considered a material planning consideration to residential development. As part of the mine development it is understood that there would be a large embankment between the mine site and the residential development site to reduce noise levels and improve visual amenity.

Taking account of the measured prevailing noise levels, noise emissions from the mine to the south, based on the EIA information, should not adversely impact on the proposed residential development.

[8] Abbott PG; Nelson PM (2002) Converting the UK traffic noise index LA10,18h to EU noise indices for noise mapping. (PR/SE/451/02) TRL



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- Site Boundary
- ST — Short Term Monitoring Locations
- LT — Long Term Monitoring Locations
- CRTN — Calculation of Road Traffic Noise Monitoring Locations
- X — Noise Sensitive Receptor

N

Project Details	WIE15084-100: Whitehaven
Figure Title	Figure 3: Noise Monitoring and Sensitive Receptor Locations
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4. Assessment of Residential Amenity

A 3-dimentional noise model has been developed using Cadna-A noise modelling software and calibrated using the results of the baseline noise survey. The Cadna-A noise model has then been used to generate daytime (0700-2300) and night-time (2300-0700) noise contours across the un-occupied Site to inform potential design constraints.

4.1 External Noise Levels

Figure 4 presents the daytime noise levels at 1.5 metres above ground level and Figure 5 presents the night-time noise levels at 4.0 metres above ground level. The height above ground level for the respective time periods are reflective of the general location of residents, daytime being within gardens and ground floor level and night-time within bedrooms at first floor level.

During the daytime period (refer to Figure 4) the prevailing noise levels are predominantly negligible (dark green ≤50dB $L_{Aeq,16h}$) with most of the un-occupied site being exposed to noise levels of ≤55dB LAeq,16h and therefore suitable for external residential amenity. A strip of land approximately 20m in depth directly adjacent to High Road is exposed to noise levels of medium risk, indicating that good acoustic design will need to be followed within this area of the Site in order to provide suitable residential amenity.

During the night-time period (refer to Figure 5) the prevailing noise levels are predominantly negligible (dark green ≤40dB $L_{Aeq,8h}$) to low risk (light green ≤45dB $L_{Aeq,8h}$). A strip of land approximately 30m in depth directly adjacent to High Road is exposed to noise levels of medium risk (dark orange ≤55dB LAeq,8h with a narrow strip approximately 10m in depth exposed to high risk noise levels.

The green areas on the Figures, illustrate where noise is not normally considered as a material planning consideration. The Stage 1 risk assessment indicates that good acoustic design will need to be followed within the area proximate to High Road in order to provide suitable residential amenity. It should be noted that once the Site is built out, the first row of buildings adjacent to High Road will screen and attenuate noise levels further west into the Site.

Acoustic design considerations based on established prevailing external noise levels are discussed in Section 6 of this report.

Figure 4: Daytime Noise Contour Plot dB $L_{Aeq,16h}$ (1.5m agl)

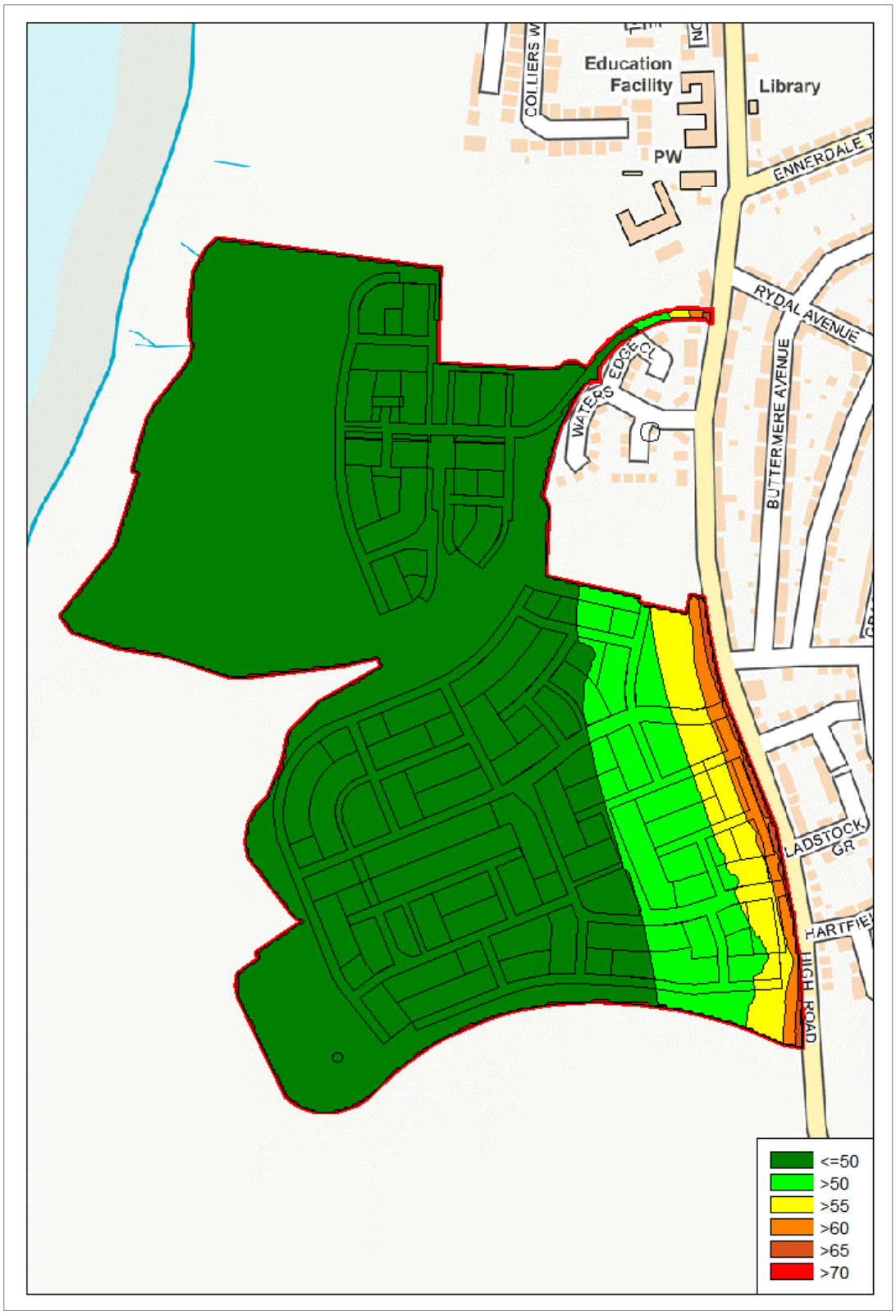
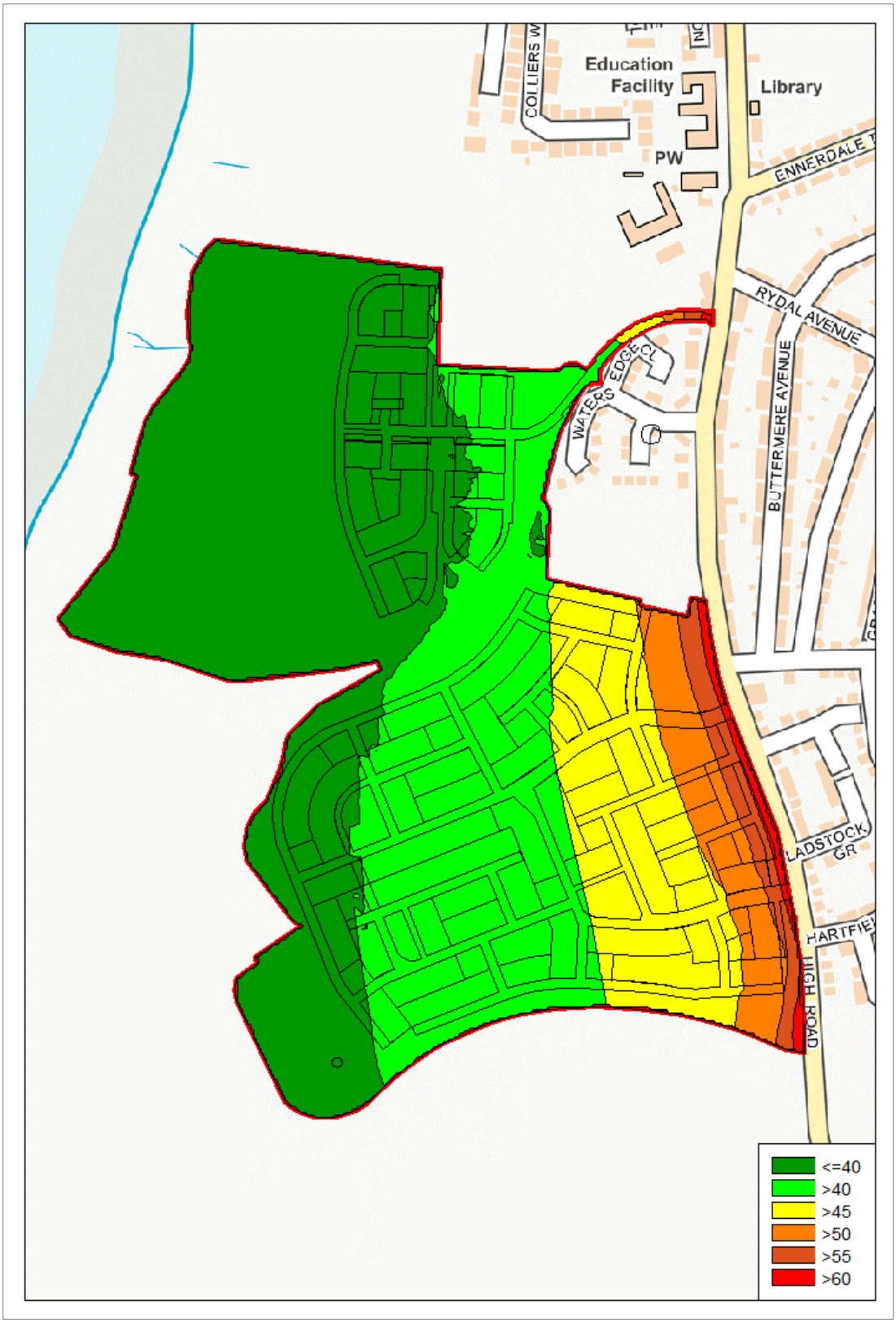


Figure 5: Night-Time Noise Contour Plot dB $L_{Aeq,8h}$ (4.0m agl)



4.1 Internal Ambient Noise Levels

It is generally accepted that where daytime façade noise levels are ≤50dB $L_{Aeq,16h}$ the internal ambient noise level (IANL) with windows open (based on 50% glazing) would be ≤35dB $L_{Aeq,16h}$ thereby satisfying the criteria of BS8233:2014. Similarly, night-time façade noise levels of ≤45dB $L_{Aeq,8h}$ and ≤60dB L_{Amax} would result in IANLs of ≤30dB $L_{Aeq,8h}$ and ≤45dB L_{Amax} with windows open, again satisfying the criteria of BS8233.

Where the design intent is a natural ventilation strategy through opening of windows then BS8233:2014 considers that IANLs could be increase by 5dB and reasonable internal conditions still provided. This equates to a daytime façade noise level of ≤55dB $L_{Aeq,16h}$ and night-time façade noise levels of ≤50dB $L_{Aeq,8h}$ and ≤65dB $L_{Amax.}$ This approach is also reflected in ProPG.

Figure 4, which presents the daytime prevailing noise levels, indicates that a natural ventilation strategy could be adopted for dwellings located within the green area without consideration of specific mitigation. As stated above, when the Site is built out, the amount of green area would increase due screening afforded by the intervening buildings.

Figure 5, which presents the night-time prevailing noise levels, indicates that a natural ventilation strategy for bedrooms could be adopted for dwellings located within the yellow area through application of the +5dB in guideline IANL value, without consideration of specific mitigation. Again, as stated above, the area of green (≤45dB $L_{Aeq,8h}$) would increase due to screening afforded by the intervening buildings.

Acoustic design considerations for dwellings proximate to High Road, based on established prevailing external noise levels, are discussed in Section 6 of this report.

5. Potential Impacts

5.1 Fixed External Plant and Building Services

Should fixed external plant form part of this Development, then established prevailing background noise levels (L_{A90}) and the requirements of SMBC could be used to set recommended noise limits at existing sensitive receptors and future residential receptors of the Development. Recommended noise limits for fixed external plant to safeguard residential amenity are presented with Section 6 of this report.

5.2 Construction

5.2.1 Construction Noise

Table 8 presents the predicted construction noise levels at the nearest existing sensitive receptors together with that at future residential receptors based on a phased build-out. The significance of the construction noise levels is also presented. Full calculation details are presented within Appendix D.

Table 8: Construction Noise Assessment (without mitigation)

SR	Receptor	Construction Threshold dB $L_{Aeq,T}$	Predicted Noise Level & Significance		
			Excavation	Concreting	Pavement
A	High Road	70	81	80	78
			Major Adverse	Major Adverse	Moderate Adverse
B	Waters Edge Close	65	84	83	81
			Major Adverse	Major Adverse	Major Adverse
C	Future Development Receptors	65	81	80	78
			Major Adverse	Major Adverse	Major Adverse

Note: The construction threshold noise level is the average noise level over the working day, which is taken to be 10 hours Monday to Friday and 5 hours Saturday.

It should be noted that the predicted noise levels presented in Table 8 are when works are being undertaken at the shortest distance to the receptor with no mitigation and are therefore indicative of worst-case construction noise levels. When works are undertaken at greater distance and when they include periods of inactivity, the overall average noise level will be lower than those presented within Table 8. Nonetheless, given that adverse effects have been predicted, mitigation measures would be required to reduce noise levels from construction phase of the proposed Development.

5.2.2 Construction Vibration

The construction works do not include piling, which is generally the operation associated with vibration impacts. Based on the information presented within Table 2 there is the potential for 'just' perceptible vibration to occur when works are within 15 metres of the receptor. On this basis taking account of distance separation and nature of the works, qualitatively it is considered that potential impacts from vibration would be negligible to minor adverse at worst.

5.2.3 Construction Traffic

During the construction phase the anticipated weekly HGV movements, based on schemes of comparable size to the proposed development, is understood to be 38 (15 rigid in/out and 4 articulated in/out). Assuming equal distribution over 5 days this equates to approximately 8 HGV movements per day. The currently flow of vehicles on High Road, based on a survey in 2018, ranges from 3688 to 3922 18-hour AAWT with 1 to 2% HGVs. During the construction phase the additional HGV vehicles would result in approximately 1% increase in traffic volume and 1% increase in % HGVs on High Road resulting in a noise increase of less than 1dB, which is negligible.

Vibration and L_{Amax} event noise levels are anticipated to be no greater than those currently experienced from HGV movements along High Road and is therefore also negligible.

5.3 Road Traffic Noise Assessment

Table 9 presents the predicted change in road traffic noise levels as a result of the proposed development. Predominantly the predicted change is less than 1dB and therefore negligible. On High Road, Ginns to Kells Road and Woodhouse Road a minor increase in road traffic noise is predicted as a result of the proposed Development. Given the change in traffic flow and composition is likely to be gradual, the predicted increase in road traffic noise, with the highest being +2.3dB on Woodhouse Road, is unlikely to be discernible.

Table 9: Road Traffic Noise Assessment

Road Link	Predicted Change in Road Traffic Noise Level dB	Significance
Swingpump Lane	0.8	Negligible
Irish Street	0.6	Negligible
B5345 Preston Street (N of Coach Rd)	0.8	Negligible
Coach Road	0.4	Negligible
B5345 Preston Street (S of Coach Rd)	0.9	Negligible
B5345 Meadow View	0.1	Negligible
B5345 St Bees Road (N of Woodhouse Rd)	0.2	Negligible
B5345 St Bees Road (S of Woodhouse Rd)	0.3	Negligible
Mirehouse Road	0.7	Negligible
B5345 St Bees Road (S of Wilson Pit Rd)	0.0	Negligible
Ginns to Kells Rd	1.5	Minor
High Road (N of Site Access N)	2.0	Minor
High Road (S of Site Access N)	1.8	Minor
High Road (N of Site Access S)	2.0	Minor
High Road (S of Site Access S)	1.2	Minor
Woodhouse Road	2.3	Minor
Wilson Pit Road	0.9	Negligible
A595 Loop Road N	0.2	Negligible
New Road	0.4	Negligible
A595 Loop Road N (S of New Rd)	0.0	Negligible
A595 Loop Road S	0.0	Negligible
Inkerman Terrace	0.0	Negligible
B5295 Ribton Moorside	0.0	Negligible
A595 Hensingham Bypass	0.0	Negligible
B5295 Egremont Road	0.2	Negligible
Homewood Road	0.2	Negligible
A595 Egremont Road	0.1	Negligible
Meadow Road	0.5	Negligible
A595 Egremont Road (S of Meadow Rd)	0.0	Negligible
Mirehouse Road	0.4	Negligible
A595 Egremont Road (S of Mirehouse Rd)	0.1	Negligible

6. Acoustic Design Considerations

6.1 Residential Amenity

Based on the result of the noise assessment, the following acoustic design considerations should be considered as part of the master planning process for the proposed residential development:

- Maximise set-back of dwellings from High Road within development constraints;
- Strategic design layout to augment screening to road traffic noise and mine facility to the south, although the EIA on the latter has indicated this not to adversely impact on the proposed residential development;
- Location of main garden areas to the rear of dwellings for those proximate to High Road;
- Location of bedrooms to rear of dwellings where practicable for those dwelling proximate to the High Road. Consideration of this should also be given to dwellings proximate to the southern boundary with the mine, although as stated above the EIA indicates it would not adversely impact on the proposed residential development; and
- Consideration of the environmental benefit of engineered boundary solution adjacent to High Road, taking account of master planning (set-backs, development layouts, location of acoustic grade garden fencing).

Table 10 presents indicative required glazing and ventilation strategy for dwellings within 10 metres of the High Road.

Table 10: Indicative Required Glazing & Ventilation Strategy 10m From High Road Boundary

Road	Prevailing Noise Level (10m free-field)	Sound Reduction Windows dB R_w+C_{tr}	Sound Reduction Ventilators $D_{n,e,w}+C_{tr}$
High Road	Day 68dB $L_{Aeq,8h}$ Night 60dB $L_{Aeq,8h}$ (bedrooms) Night 72dB L_{Amax} (bedrooms)	35	41

Table 10 indicates that enhanced glazing is likely to be required for facades of dwellings adjacent to and facing High Road in combination with a passive acoustic ventilation solution to minimise the requirement for residents to open windows for background ventilation.

7. Mitigation

7.1 Fixed External Plan and Building Services

Table 11 presents indicative plant noise limits based on established prevailing background noise levels and general requirement of Copeland Borough Council.

Table 11: Recommended Plant Noise Limits

Receptor	Period	Prevailing Background Noise Level dB L_{A90} (free-field)	Plant Noise Limit dB $L_{Ar,Tr}$ (free-field)[1]
High Road	Day	39	≤44
	Night	31	≤36
Waters Edge Close	Day	31	≤36
	Night	<30[2]	≤35
Future Development	Day	≤35 to >45	≤40 to 45
	Night	≤30 to >45	35 to <45

Note: [1] A maximum Rating Noise Level of 45dB $L_{Ar,Tr}$ is recommended where prevailing background noise levels are greater than 45dB L_{A90}. [2] Based on measured noise levels at LT2 and ST1.

The recommended plant noise limit is applicable at 1 metre from the sensitive receptor (converted to a free-field value). Where prevailing background noise levels are less than 30dB L_{A90}, then a maximum plant noise limit of 35dB $L_{Ar,Tr}$ is recommended, on the basis that residents would be indoors during the night-time period and would benefit from screening afforded by the building envelope. With windows partially open, an external plant noise limit of 35dB $L_{Ar,\ Tr}$ at the sensitive receptor would safeguard existing residential amenity.

7.2 Construction

Construction Environmental Management Plan (CEMP) would be formulated in consultation with Copeland Borough Council, incorporating relevant legislation and other relevant guidance. The CEMP would set out a range of mitigation measures and environmental controls which would include the management of construction related noise and vibration. Control measures to minimise noise would typically include:

- Use of hoarding to the required height and density appropriate to the noise sensitivity of the Site;
- Use of modern, quiet and well-maintained machinery such as electric powered plant, where possible and hoists should use the Variable Frequency Converter drive system;
- Vehicles and mechanical plant used for the works would be fitted with exhaust silencers, which would be maintained in good and efficient working order and operated in such a manner as to minimise noise emissions in accordance with the relevant EU / UK noise limits applicable to that equipment or no noisier than would be expected based the noise levels quoted in BS 5228. Plant should be properly maintained and operated in accordance with manufacturers' recommendations. Electrically powered plant would be preferred, where practicable, to mechanically powered alternatives;
- Establish noise and vibration target levels (a Section 61 agreement under the Control of Pollution Act 1974 (COPA)) to reduce noise and vibration to a minimum in accordance with best practicable means, as defined in Section 72 of COPA;
- Where required, monitoring of noise and vibration levels;

- Changing, where possible, methods and processes to keep noise levels low;
- Positioning plant as far away from residential property as physically possible;
- Works would be limited to the specified hours and would be subject to agreement with Copeland Borough Council. Hours worked on noisy operations would be limited; and
- Liaison with the occupants of adjacent properties most likely to be affected by noise or vibration from activities on the Site should also take place. The occupants should be informed of the nature of the works, proposed hours of work and anticipated duration prior to the commencement of activities.

With regards to traffic management during the construction works all traffic logistics would be agreed between Copeland Borough Council, contractors and the Applicant. Such measures would be set out within a Construction Traffic Management Plan (CTMP). Consideration would also be given to the avoidance (or limited) use of road during peak hours, where practicable.

Accounting for the implementation of mitigation, as set out above, which should afford 10dB(A) reduction, the likely residual noise levels associated with the construction works are presented in Table 12 together with the impact.

Table 12: Construction Noise Assessment (with mitigation)

Receptor	**Construction Threshold dB $L_{Aeq,T}$**	**Predicted Noise Level & Significance**		
		Excavation	Concreting	Pavement
High Road	70	71	70	68
		Negligible	Negligible	Negligible
Waters Edge Close	65	74	73	71
		Moderate Adverse	Moderate Adverse	Moderate Adverse
Future Development Receptors	65	71	70	68
		Moderate Adverse	Moderate Adverse	Minor Adverse

Note: The construction threshold noise level is the average noise level over the working day, which is taken to be 10 hours Monday to Friday and 5 hours Saturday.

During the construction phase when works are being undertaken at the shortest distance to the receptor then increases in the prevailing noise levels are predicted to occur. With the implementation of mitigation these are predicted to range from negligible to moderate adverse impacts.

7.3 Road Traffic Noise

The predicted change in road traffic noise is predominantly negligible (less than 1dB) with minor increases on High Road (1.2-2.0dB), Ginns to Kells Road (1.5dB) and Woodhouse Road (2.3dB). Given the increase is likely to be gradual, increase in road traffic noise of this magnitude are not normally discernible. On this basis mitigation is not proposed.

8. Conclusions

The following conclusions can be drawn following the results of the baseline noise survey and noise assessment:

- The prevailing day and night-time noise levels at the Site indicate the noise risk is predominantly negligible to low, excepting proximate to High Road where a strip of land is exposed to medium to high noise risk. This indicates that for the majority of the Site noise is not a material decision to planning. For the eastern area of the Site proximate to High Road, residential development is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed.
- Based on current Site conditions (un-occupied), specific noise mitigation is not required for dwellings located where daytime noise levels are ≤55dB $L_{Aeq,16h}$ illustrated as the green areas in Figure 4 and where night-time noise levels are ≤45dB $L_{Aeq,8h}$ illustrated as the green areas in Figure 5. This indicates that reasonable internal noise levels could be achieved with windows open in these areas.
- Mitigation considerations will be required for dwellings proximate to the western Site boundary adjacent to High Road. This could include maximising set-backs, location of gardens and bedrooms where Site constraints allow at the rear of buildings and provision of suitable glazing and ventilation.
- Strategic layout of the masterplan could be utilised to augment screening to road traffic noise for dwellings located further west into the Site.
- Consideration of engineered boundary treatments adjacent to High Road.
- Plant noise limits have been recommended to safeguard existing and future residential amenity, should fixed plant and building services be introduced as part of the Development.
- During the construction phase increases in the prevailing noise levels are predicted to occur. Through implementation of mitigation through a CEMP, levels will be reduced to acceptable levels. Due to distance from works and receptor locations, together with the type of works, essentially no piling, vibration should not give rise to adverse effects.
- Road traffic assessment indicates that changes in traffic flow and composition as a result of the Development would predominantly have negligible effect with some minor increases on High Road, Ginn to Kells Road and Woodhouse Road.

In summary, the Site is suitable for residential development with incorporation of acoustic design measures proximate to High Road. Noise emissions from the mine located to the south of the Site should not adversely impact the residential development based on the results of the EIA.

APPENDICES

A. Glossary of Acoustic Terminology

Ambient sound	The totally encompassing sound in a given situation at a given time, usually composed of sound from all sources near and far.
Assessment period	The period in a day over which assessments are made.
A-weighting	A frequency weighting applied to measured or predicted sounds levels in order to compensate for the non-linearity of human hearing.
Background noise	Background noise is the term used to describe the noise measured in the absence of the noise under investigation. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L_{90} noise level (see below).
Broadband	Containing the full range of frequencies.
C_{TR}	An adjustment to the Rw scale to take account of the lower performance against a typical spectrum of road traffic noise dominated by low frequencies.
Decibel [dB]	The level of noise is measured objectively using a Sound Level Meter. This instrument has been specifically developed to mimic the operation of the human ear. The human ear responds to minute pressure variations in the air. These pressure variations can be likened to the ripples on the surface of water but of course cannot be seen. The pressure variations in the air cause the eardrum to vibrate and this is heard as sound in the brain. The stronger the pressure variations, the louder the sound that is heard. The range of pressure variations associated with everyday living may span over a range of a million to one. On the top range may be the sound of a jet engine and on the bottom of the range may be the sound of a pin dropping. Instead of expressing pressure in units ranging from a million to one, it is found convenient to condense this range to a scale 0 to 120 and give it the units of decibels. The following are examples of the decibel readings of every day sounds: Four engine jet aircraft at 100m 120 dB Riveting of steel plate at 10m 105 dB Pneumatic drill at 10m 90 dB Circular wood saw at 10m 80 dB Heavy road traffic at 10m 75 dB Telephone bell at 10m 65 dB Male speech, average at 10m 50 dB Whisper at 10m 25 dB Threshold of hearing, 1000 Hz 0 dB
dB(A): A-weighted decibels	The ear is not as effective in hearing low frequency sounds as it is hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the 'A' filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter. The sound pressure level in dB(A) gives a close indication of the subjective loudness of the noise.
$D_{ne,w}$	Weighted element normalised level difference.
Façade Noise Level	A noise level measured or predicted at the façade of a building, typically at a distance of 1m, containing a contribution made up of reflections from the façade itself (+3 dB).
L_{Amax} noise level	This is the maximum noise level recorded over the measurement period.
L_{Amin} noise level	This is the lowest level during the measurement period.
$L_{Aeq,T}$ noise level	This is the 'equivalent continuous A-weighted sound pressure level, in decibels' and is defined in British Standard 7445 as the 'value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time interval, T, has the same mean square sound pressure as a sound under consideration whose level varies with time'.

	It is a unit commonly used to describe construction noise, noise from industrial premises and is the most suitable unit for the description of other forms of environmental noise.
L_{A90} noise level	This is the noise level that is exceeded for 90% of the measurement period and gives an indication of the noise level during quieter periods. It is often referred to as the background noise level and is used in the assessment of disturbance from industrial noise.
L_{A10} noise level	This is the noise level which is achieved for 10% of the monitoring period and is often used to describe road traffic noise.
PPV	Peak particle velocity (PPV) mm/s. Greatest instantaneous particle velocity during a given time interval. If measurements are made in 3-axis then the resultant PPV (peak particle velocity) is the vector sum i.e. the square root of the summed squares of the maximum velocities, regardless of when in the time history those occur.
Rating Level, $L_{Ar,Tr}$	Specific sound level plus any adjustment for the characteristic features of the sound.
Sound Reduction Index (R)	The sound reduction index is a single-number rating of the sound reduction through a wall or other building element. Since the sound reduction may be different at different frequencies, test measurements are subjected to a standard procedure which yields a single number that is about equal to the average sound reduction in the middle of the human hearing range.
Specific Sound Level, $L_{Aeq,Tr}$	Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r.
Weighted Sound Reduction Index (R_W)	Single number rating used to describe the **laboratory** airborne sound insulation properties of a material or building element over a range of frequencies, typically 100-3150Hz.
VDV Vibration Dose Value	Vibration Dose is a parameter that combines the magnitude of vibration and the time for which it occurs. When assessing intermittent vibration, such as arising from train events, It is necessary to use the vibration dose value (VDV), a cumulative measurement of the vibration level received over an 8-hour or 16-hour period.

B. Residential Amenity Noise Criteria

Table B1 provides a summary of the noise criteria used for the assessment of residential amenity which have been derived from advice provided within ProPG.

Table B1: Noise Criteria For Assessment of Residential Amenity

Activity	Location	Noise Level	
		Day time	Night-time
Resting	Living room	35 dB $L_{Aeq,16h}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16h}$	-
Sleeping (daytime resting)	Bedrooms	35 dB $L_{Aeq,16h}$	30 dB $L_{Aeq,8h}$ 45 dB $L_{Amax,F}$ (note 4)
Enjoyment and relaxing	Garden	50-55dB $L_{Aeq,16h}$	

Note 1: The Table provides recommended internal L_{Aeq} target levels for overall noise in the design of a building. These are the sum total of structure-borne and airborne noise sources. Ground-borne noise is assessed separately and is not included as part of these targets, as human response to ground-borne noise varies with many factors such as level, character, timing, occupant expectation and sensitivity.

Note 2: The internal L_{Aeq} target levels shown in the Table are based on the existing guidelines issued by the WHO and assume normal diurnal fluctuations in external noise. In cases where local conditions do not follow a typical diurnal pattern, for example on a road serving a port with high levels of traffic at certain times of the night, an appropriate alternative period, eg 1 hour, may be used, but the level should be selected to ensure consistency with the internal L_{Aeq} target levels in the Table.

Note 3: These internal L_{Aeq} target levels are based on annual average data and do not have to be achieved in all circumstances. For example, it is normal to exclude occasional events, such as fireworks night or New Year's Eve.

Note 4: Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values. In most circumstances in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only on the maximum noise levels but also on factors such as the source, number, distribution, predictability and regularity of noise events.

Note 5: Designing the site layout and the dwellings so that the internal target levels can be achieved with open windows in as many properties as possible demonstrates good acoustic. Where it is not possible to meet internal target levels with windows open, internal noise levels can be assessed with windows closed, however any façade openings used to provide whole dwelling ventilation (e.g. trickle ventilators) should be assessed in the 'open' position and, in this scenario, the internal L_{Aeq} target levels should not normally be exceeded, subject to the further advice in Note 7.

Note 6: Attention is drawn to the requirements of the Building Regulations.

Note 7: Where development is considered necessary or desirable, despite external noise levels above WHO guideline, the internal L_{Aeq} target levels may be relaxed by up to 5dB and reasonable internal conditions still achieved. The more often internal L_{Aeq} levels start to exceed the internal L_{Aeq} target levels by more than 5dB, the more that most people are likely to regard them as "unreasonable". Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal L_{Aeq} levels exceed the target levels by more than 10dB, they are highly likely to be regarded as "unacceptable" by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing "unacceptable" noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form.

C. Baseline Noise Survey

The baseline environmental noise survey was undertaken on Monday 26th February 2018 and Tuesday 27th February 2018. Two unattended environmental sound level meters were installed for a period of 24 hours, one at the boundary with High Road the other at the western boundary. A CRTN shortened measurement was undertaken adjacent to High Road near to Waters Edge Close with a short-term attended (30 minutes) noise measurement at the rear of properties on Waters Edge Close.

All noise measurements were taken with calibrated precision grade (Class 1) sound level meters to provide a detailed description of the prevailing environmental noise characteristics. The sound level meters were set to record over consecutive 5-minute periods the L_{eq}, L_{90}, L_{10}, and L_{max} noise indices in the A-weighting network over a 125ms fast response time constant interval for the duration of each survey. The indices are described in Appendix A of this report, but roughly translated they describe in turn the average, background, road traffic, and maximum noise level.

The Environmental Health Department of Copeland Borough Council was consulted prior to the noise survey to agree noise monitoring locations and the monitoring strategy.

Weather conditions were ideal for the measurement of noise, it being fine and dry throughout the measurement period, with wind speed <5ms^{-1}. The sound level meters were field calibrated with no significant drift.

Table C1 presents the equipment details used for the baseline noise survey.

Table C1: Noise Equipment Detail – Environmental Baseline Survey

Location	Equipment	Model	Serial No.
LT1	Sound Level Meter	Rion NL-52 Type 1	732098
LT2	Sound Level Meter	Rion NL-52 Type 1	01143558
CRTN and ST1	Sound Level Meter	Rion NL-32 Type 1	613614
All	Calibrator	CR 515	84555

Figures C1 and C2 presents the time history plot sof the measured noise levels at LT1 High Road and western boundary locations respectively.

Table C2 and C3 present the measured noise levels at CRTN (High Road) location and rear of Waters Edge Close location respectively.

Figure C1: Time History Plot LT1-High Road

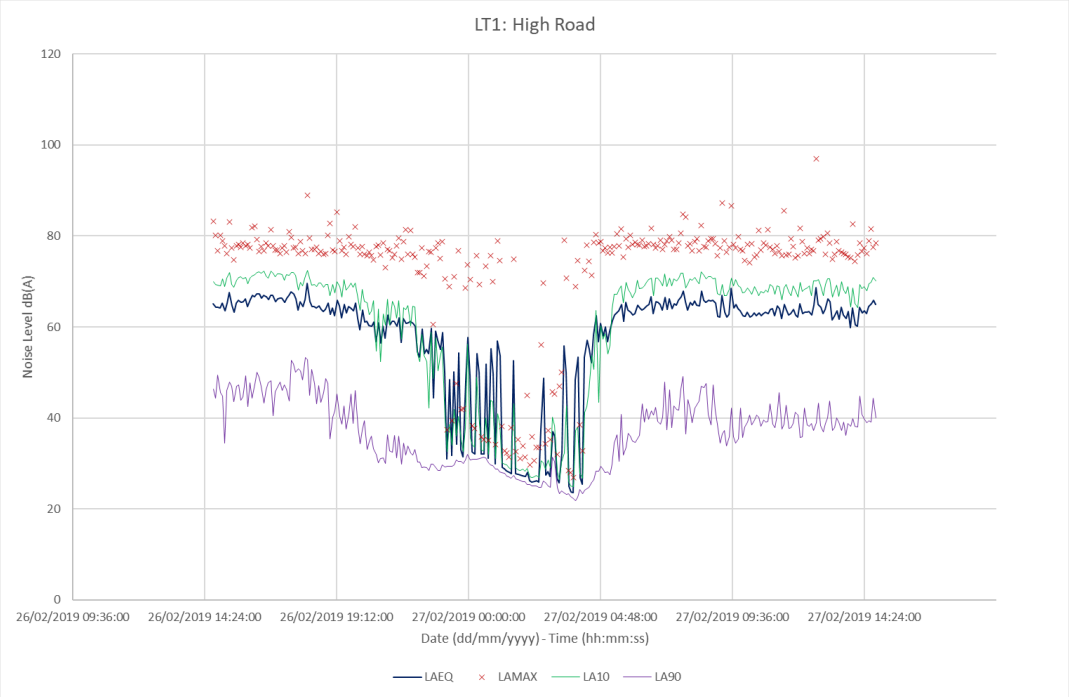


Figure C2: Time History Plot LT2-Western Boundary

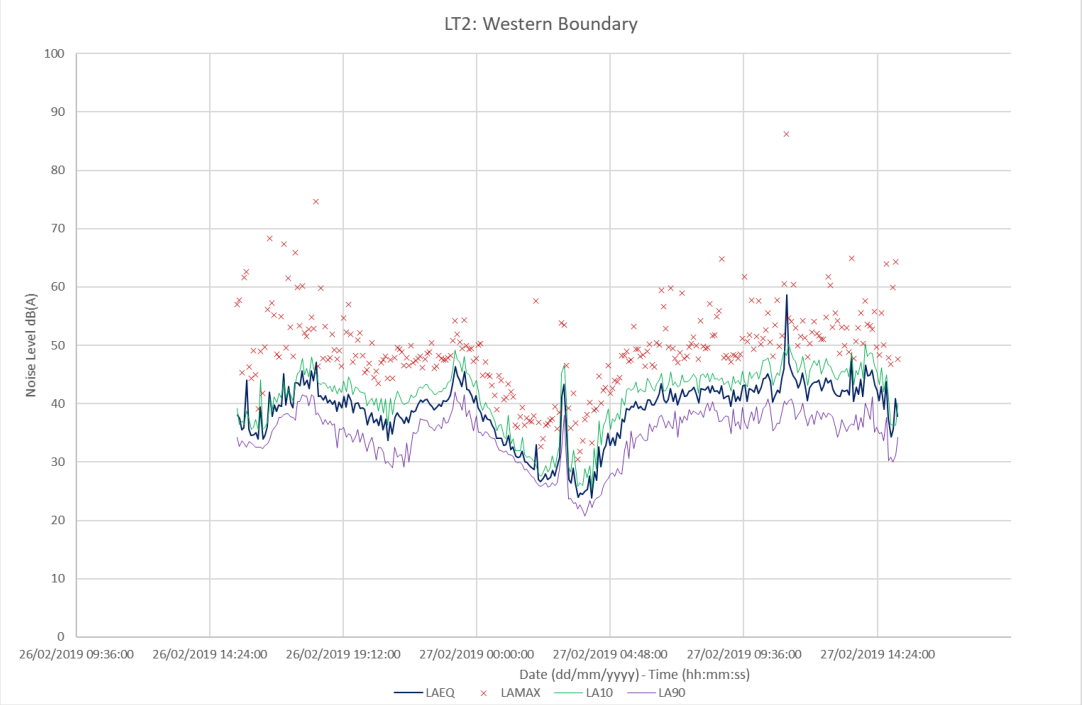


Table C2: CRTN Noise Measurements (High Road)

Address	Start Time	L_{Aeq}	L_{A10}	L_{A90}	L_{Amax}
1	27/02/2019 11:15	67.6	72.2	45.8	82.6
2	27/02/2019 11:20	67.1	71.7	45.6	80.6
3	27/02/2019 11:25	65.4	69.2	38.9	81.3
4	27/02/2019 11:30	69.6	72.2	38.2	95.5
5	27/02/2019 11:35	66.6	70.7	50.4	80.8
6	27/02/2019 11:40	65.7	69.2	37.9	82.1
7	27/02/2019 11:45	66.9	71.0	38.3	83.9
8	27/02/2019 11:50	67.1	71.4	44.0	81.7
9	27/02/2019 11:55	65.2	67.6	37.9	82.2
10	27/02/2019 12:00	67.4	71.7	39.0	85.6
11	27/02/2019 12:05	65.6	68.4	38.6	82.3
12	27/02/2019 12:10	68.3	72.6	46.6	85.3
13	27/02/2019 12:15	66.3	71.0	43.5	82.6
14	27/02/2019 12:20	66.6	71.4	39.7	80.9
15	27/02/2019 12:25	68.2	73.0	48.5	82.2
16	27/02/2019 12:30	66.8	70.7	39.4	82.8
17	27/02/2019 12:35	68.3	73.2	41.6	85.4
18	27/02/2019 12:40	68.9	73.9	48.2	83.2
19	27/02/2019 12:45	67.4	71.9	40.9	82.0
20	27/02/2019 12:50	69.5	72.6	40.4	88.3
21	27/02/2019 12:55	65.1	68.4	43.9	80.2
22	27/02/2019 13:00	65.6	70.4	47.1	80.2
23	27/02/2019 13:05	70.3	75.1	51.3	82.7
24	27/02/2019 13:10	67.2	71.9	40.7	82.0
25	27/02/2019 13:15	64.1	66.7	42.9	81.8
26	27/02/2019 13:20	67.2	70.9	43.8	86.4
27	27/02/2019 13:25	66.6	70.7	41.4	84.3
28	27/02/2019 13:30	65.5	66.5	41.7	91.4
29	27/02/2019 13:35	67.9	71.3	43.8	91.5
30	27/02/2019 13:40	65.9	70.2	40.1	83.0
31	27/02/2019 13:45	68.6	72.2	41.6	85.7
32	27/02/2019 13:50	66.2	70.9	38.8	81.3
33	27/02/2019 13:55	63.8	67.7	40.2	79.1
34	27/02/2019 14:00	64.8	67.8	37.9	84.0
35	27/02/2019 14:05	64.0	66.1	40.2	79.1
36	27/02/2019 14:10	66.3	70.0	40.3	82.6

Table C3: Rear Waters Edge Close

Address	Start Time	L_{Aeq}	L_{A10}	L_{A90}	L_{Amax}
1	27/02/2019 10:35	38.5	40.7	33.0	56.4
2	27/02/2019 10:40	38.2	40.8	31.3	53.9
3	27/02/2019 10:45	38.2	41.4	31.1	54.3
4	27/02/2019 10:50	49.4	46.0	31.1	71.6
5	27/02/2019 10:55	37.6	40.8	30.4	55.2
6	27/02/2019 11:00	45.0	41.7	32.2	71.4

D. Construction Noise Assessment

Demolition and Construction Noise Assessment

The significance criteria for the construction noise assessment are based on 'The ABC Method' from BS 5228-1:2009+A1:2014. An extract describing this method is provided below.

Example Method 1 – The ABC Method

Table E.1 shows an example of the threshold of likely significant effect at dwellings when the Site noise level rounded to the nearest decibel, exceeds the listed value. The table can be used as follows: for the appropriate period (night, evening / weekends or day), the ambient noise level is determined and rounded to the nearest 5 dB. This is then compared with the site noise level. If the site noise level exceeds the appropriate category value, then a significance effect is deemed to occur.

Table E.1 **Example threshold of significant effect at dwellings**

Assessment category and threshold value period (L_{Aeq})	Threshold value, in decibels (dB)		
	Category A[A)]	Category B [B)]	Category C [C)]
Night-time (23.00-07.00)	45	50	55
Evenings and weekends[D)]	55	60	65
Daytime (07.00-19.00) and Saturdays (07.00-13.00)	65	70	75

NOTE1 A likely significant effect is indicated if the site L_{AeqT} noise level, exceeds the threshold level for the Category appropriate to the ambient noise level.

NOTE 2 If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a likely significant effect is indicated if the total L_{Aeq} noise level for the period increases by more than 3 dB due to site noise.

NOTE 3 Applied to residential receptors only.

[A)] Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.

[B)] Category B: threshold values to use when the ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.

[C)] Category C: threshold values to use when the ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.

[D)] 19.00-23.00 weekdays, 13.00-23.00 Saturdays and 07.00-23.00 Sundays.

(Source: BS 5228-1:2009+A1:2014, Page119)

In this case, the threshold of significance has been determined using the ABC method of BS5228-1:2009+A1:2014. Calculations have not been undertaken for the evening or night-time periods as it is assumed that evening and night-time construction work would only be undertaken under exceptional circumstances and not without prior approval. Exceptional circumstances may include concreting operations where the pumping of concrete to foundations has to be a continuous process which may require operations outside the daytime period.

Table D1 presents the ABC BS5228 construction threshold daytime noise levels based on the measured prevailing noise levels.

Table D1: Construction Threshold Noise Levels

SR Ref	SR Description	Measured Daytime Noise Level dB $L_{Aeq,T}$	BS5228 ABC Threshold Noise Level dB $L_{Aeq,T}$	Shortest Distance from Works (approx. m)
A	High Road	64	70	15
B	Waters Edge Close (rear)	44	65	10
C	Future SRs	-	65	Within site but assumed 15m from construction works

Table D2 presents the significance criteria used in the assessment of predicted daytime construction noise level.

Table 9.4.2: Construction Noise Level Significance Criteria

Significance	Level Above Threshold Value dB(A)	Definition
Negligible	≤ 0 to 2.9	The effect is not of concern
Adverse effect of minor significance	3.0 to 4.9	The effect is undesirable but of limited concern
Adverse effect of moderate significance	5.0 to 10.0	The effect gives rise to some concern but is likely to be tolerable depending on scale and duration
Adverse effect of major significance	>10	The effect gives rise to serious concern and it should be considered unacceptable

Where T is taken as 10 hours Monday to Friday and 5 hours Saturday.

Generic calculations were undertaken using the data and procedures set out in BS 5228-1:2009+A1:2014 for the noisiest construction phases, to derive indicative noise levels at selected sensitive receptors (SRs). The highest noise levels tend to be associated with plant associated with, demolition, piling, construction of the substructure and superstructure. During the fit-out, construction noise would be significantly lower. The calculations assume that plant would be operating at the closest point to the receptor, and do not take into account any existing or proposed screening. The noisiest construction phases and associated noise levels are considered to be as follows:

- Earthworks 84 dB $L_{Aeq,1h}$ at 10m
- Concreting 83 dB $L_{Aeq,1h}$ at 10m
- Pavement 81 dB $L_{Aeq,1h}$ at 10m

Table D3 presents the generic plant and on-time used in the calculation of the construction noise levels. A maximum worst-case noise level over a one hour period was calculated, assuming that plant would be operating at the closest point to the nearest receptor in the absence of mitigation. In practice, noise levels would tend to be lower owing to greater separation distance as the works progress. They would also tend to reduce over a 10-hour working day (week-day, 5 hours Saturday) owing to periods of plant inactivity.

The closest receptors to the proposed Development are identified Figure 3.

The results of the assessment are presented in Table D4.

Table D3: Generic Construction Noise Levels

Phase / Plant	BS5228-1:1997+A1:2014	LAeq @10m	Kh	(t/T)*100	Partial Exposure	Barrier Attenuation	Noise Level @ NSR LAeq,1h (dB)	Overall LAeq,1h (dB)
Earthworks								**84**
Tracked Excavator (14t)	Table C2 ref 7	70	0	1	0	0	70.0	
Tracked Excavator (14t)	Table C2 ref 7	70	0	1	0	0	70.0	
Wheeled Backhoe Loader (8t)	Table C2 ref 8	68	0	1	0	0	68.0	
Hydraulic Vibratory Compactor (Tracked Excavator)	Table C2 ref 42	78	0	1	0	0	78.0	
Dozer (11t)	Table C2 ref 13	78	0	1	0	0	78.0	
Lorry (4-axle wagon)	Table C2 ref 34	80	0	1	0	0	80.0	
Concreting								**83**
Truck Mounted Concrete Pump + Boom Arm	Table C4 ref 29	80	0	1	0	0	80.0	
Concrete Mixer Truck	Table C4 Ref 20	80	0	1	0	0	80.0	
Pump Boom + Vibrating Poker	Table C4 ref 36	71	0	1	0	0	71.0	
Pavement Works								**81**
Road planer	Table C5 ref 7	82	0	0.25	-6	0	76.0	
Spreading chip and fill	Table C5 ref 12	77	0	0.25	-6	0	71.0	
Vibratory roller	Table C5 ref 20	75	0	0.25	-6	0	69.0	
Asphalt paver (+ tipper lorry)	Table C5 ref 30	75	0	0.25	-6	0	69.0	
Vibratory compactor (asphalt)	Table C5 ref 29	82	0	0.25	-6	0	76.0	
Lorry (4-axle wagon)	Table C2 ref 34	80	0	0.25	-6	0	74.0	

Table D4: Construction Predicted Noise Levels

Receptor	Demolition / Construction Activity	ABC Threshold Limit (dB(A))	Predicted Site Noise Level (dB(A))	Impact	Predicted Site Noise Level With Mitigation (dB(A))	Impact with Mitigation
A High Road	Earth Moving	70	81	Major	71	Negligible
	Concreting		80	Major	70	Negligible
	Road Paving		78	Moderate	68	Negligible
B Waters Edge Close	Earth Moving	65	84	Major	74	Moderate
	Concreting		83	Major	73	Moderate
	Road Paving		81	Major	71	Moderate
C Future SR	Earth Moving	65	81	Major	71	Moderate
	Concreting		80	Major	70	Moderate
	Road Paving		78	Major	68	Minor

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