8. NOISE AND VIBRATION

This section of the environmental impact statement was prepared by TMS Environment Ltd and considers the potential noise and vibration impacts associated with the proposed development. Impacts of the construction and operational phases are considered in the context of appropriate standards and guidelines, together with requirements for noise and vibration monitoring and control.

8.1 Methodology

8.1.1 Assessment Approach

The draft Guidelines published by the EPA in 2017 *Revised Guidelines on the Information to be Contained in Environmental Impact Statements* are considered in this assessment. Impacts or effects are described in the draft Guidance in terms of quality, significance, magnitude, probability, duration and type. Table 8.1 below presents the description of the significance of effects and Table 8.2 presents the description of the duration of effects as shown in the Draft Guidelines.

Table 8.1 Describing the Significance of Effects

"Significance" is a concept that can have different meaning for different topics – in the absence of specific definitions for different topics the following definitions may be useful.	
Imperceptible	An effect capable of measurement but without noticeable consequences
Not significant	An effect which causes noticeable changes in the character of the environment but without noticeable consequences.
Slight Effects	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities
Moderate Effects	An effect that alters the character of the environment in a manner that is consistent with existing and emerging trends.
Significant Effects	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
Profound Effects	An effect which obliterates sensitive characteristics

Table 8.2 Describing the Duration of Effects

'Duration' is a concept that can have different meanings for different topics – in the absence of specific definitions for different topics the following definitions may be useful.	
Momentary Effects	Effects lasting from seconds to minutes.
Brief Effects	Effects lasting less than a day.
Temporary Effects	Effects lasting less than a year.

Short-term Effects	Effects lasting one to seven years.
Medium-term Effects	Effects lasting seven to fifteen years.
Long-term Effects	Effects lasting fifteen to sixty years.
Permanent Effects	Effects lasting over sixty years.
Reversible Effects	Effects that can be undone for example through remediation or restoration

In addition to the above, the methodologies presented below were used to inform the noise and vibration impact assessment and to identify and assess all cumulative impacts with the potential to impact upon the receiving environment and to propose mitigation and avoidance measures where required.

1. **Baseline noise measurements.** A baseline noise survey was completed in the vicinity of the subject site according to the requirements of ISO 1996: Acoustics - Description and Measurement of Environmental Noise and in addition, with reference to the EPA publication; Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4), 2016. Noise monitoring was carried out at representative noise monitoring locations in order to determine the existing noise environment at the proposed development site. The detailed baseline noise monitoring survey report is presented in Appendix 8.A.

2. **Impact assessment criteria.** Criteria against which to assess the significance of the noise and vibration impacts associated with the proposed development are identified and described. Criteria for noise and vibration assessment are discussed in Section 8.1.

3. **Noise modelling**. Predictions of resultant noise and vibration levels at the nearest sensitive receptors are presented and assessed against the selected assessment criteria. Noise prediction modelling was carried out in order to predict the noise emissions that would be experienced at sensitive receptor locations as a result of the various activities associated with the proposed development. Prediction calculations for the noise generating activities including plant and equipment operation, construction activities and vehicle movements on site have been conducted generally in accordance with ISO 9613: Acoustics – Attenuation of sound during propagation outdoors, Part 2: General method of calculation, 1996.

4. **Mitigation and avoidance measures** are proposed where required.

5. Identify and assess all cumulative impacts with potential to impact upon the receiving environment.

8.1.2 Noise Impact Assessment Criteria

There is no specific Irish legislation which sets out environmental noise limits that must be achieved and therefore the assessment criteria that are presented in this report are based on the guidelines set out by regulatory bodies such as the Environmental Protection Agency (EPA), the World Health Organisation (WHO), the Department of Housing, Planning, Community and Local Government whose guidance and standards are based on international best practice. This section of the report describes the various criteria against which the construction and operation phase noise impacts are assessed.

1. Construction Noise Criteria

Construction noise is temporary in nature and is usually experienced over a short to medium-term period. British Standard 5228-1:2009+A1:2014 –*Code of Practice for Noise and Vibration Control on Construction and Open Sites Part 1: Noise (BS 5228-1)* is a commonly used Standard to assess the potential noise impacts associated with the construction phase of a project. This Standard states that noise complaints related to new industrial/commercial noise sources are more likely to arise as the difference between the industrial noise source and the existing background noise increases. Practical noise reduction measures are detailed in BS 5228-1 and these measures can be implemented in order to reduce the overall noise emissions from a construction site.

In the absence of specific Irish Guidance, noise impacts are assessed in terms of the requirements of BS 5228-1. Annex E of this Standard details acceptable construction noise limits for differing scenarios. Annex E.2 looks at the significant of noise impacts based on fixed noise limits and states:

"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:

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

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

'These limits are for daytime working outside living rooms and offices. In noise-sensitive situations, for example, near hospitals and educational establishments – and when working outside the normal hours say between 19.00 and 22.00 hours – the allowable noise levels from building sites will be less: such as the reduced values given in the contract specification or as advised by the Environmental Health Officer (a reduction of 10 dB(A) may often be appropriate). Noisy work likely to cause annoyance locally should not be permitted between 22.00 hours and 07.00 hours."

International best practice dictates that noise limits in the range LAeq,1hr = 65 - 75 dB(A) are generally acceptable in the community during daytime construction activities.

The National Roads Authority (NRA) is the only government body in Ireland to publish construction noise limits which are presented in their document 'Guidelines for the Treatment of Noise and Vibration in National Road Schemes'.

The guidelines are not mandatory but are recommended to achieve appropriate consistency with respect to the treatment of noise and vibration. The NRA Guidelines were prepared taking cognisance of the obligations as set out in the Environmental Noise Directive. The Guidelines set a desirable design goal for national road schemes of 60dB L_{den} (free field residential façade criterion). However, the NRA guidelines accept that it may not always be sustainable to provide adequate mitigation in order to achieve the design goal and they acknowledge that it may be appropriate to adopt different design goals for diverse situations.

The NRA points out that there is no published Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. However, they say that Local Authorities, where appropriate, should control construction activities by imposing limits on the hours of operation and consider noise limits at their discretion. The NRA presents indicative noise levels that are typically deemed acceptable during construction phase of road developments. These are presented below in Table 8.3. These noise limits set out in Table 8.3 represent a good compromise between the practical limitations in a

construction project such as this one and the requirement to ensure acceptable noise levels at the nearest nose sensitive receptor locations. For this development project it is therefore considered appropriate to adopt the construction noise criteria presented in Table 8.3 above for all sensitive receptor locations.

Table 8.3 NRA Maximum Permissible Construction Phase Noise Levels at the façade of dwellings

Days & Times	$L_{Aeq, (1hr)}$ dB	$L_{pA(max) slow}$ dB
Monday to Friday - 07:00 to 19:00hrs	70	80
Monday to Friday - 19:00 to 22:00hrs	60[2]	65[2]
Saturday - 08:00 to 16:30hrs	65	75
Sundays and Bank Holidays - 08:00 to 16:30hrs	60[2]	65[2]

Note

1: Noise levels measured at facade of dwellings.

2: Construction activity at these times, other than that required in respect of emergency works, will normally require the explicit permission of the relevant local authority.

2. Operational Noise Criteria

British Standard 4142:2014 *Methods for Rating and Assessing Industrial and Commercial Sound (BS 4142)* is the Standard typically used to assess the impact of industrial or commercial noise on the receiving sensitive receptors. The methods described in this Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

BS 4142 is based on the measurement of background noise using L_{A90} noise measurements, compared to source noise levels measured in L_{Aeq} units. The differential between the two measurements once any corrections have been applied for source noise tonality, distinct impulses or other noise characteristics determines the likelihood of complaints.

The Standard defines the relevant terms used in the assessment as follows:

> **ambient sound level, $L_a = L_{Aeq,T}$:** equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T. NOTE The ambient sound level is a measure of the residual sound and the specific sound when present.
>
> **background sound level, $L_{A90,T}$:** A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.
>
> **rating level, $L_{Ar,Tr}$:** specific sound level plus any adjustment for the characteristic features of the sound
>
> **residual sound level, $L_r = L_{Aeq,T}$:** equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T.

specific sound level, $L_s = L_{Aeq,Tr}$: 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.

If the resultant rating level has a differential of +10dB(A) or more above background noise levels, then the standard says that a significant adverse impact is likely. A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. 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.

The WHO Guidelines for Community Noise states that, "in dwellings, the critical effects of noise are on sleep, annoyance and speech interference". In order to avoid sleep disturbance it is recommended that indoor guideline values for bedrooms are 30dB L_{Aeq} for continuous noise and 45dB L_{AMax} for single sound events. However, it is noted that lower levels may be annoying, depending on the nature of the noise source. During the night-time, sound pressure levels at the outside facades of the living spaces should not exceed 45dB L_{Aeq} and 60dB L_{AMax}, so that people may sleep with bedroom windows open. These values have been determined by the WHO by assuming that the noise reduction from outside to inside with a window partly open is 15dB. Similarly, during the daytime the outdoor sound level from steady, continuous noise should not exceed 50dB L_{Aeq} on balconies, terraces and in outdoor living areas to protect the majority of people from being moderately annoyed.

The draft Guidelines for Noise Impact Assessment produced by the Institute of Acoustics / Institute of Environmental Management and Assessment Working Party state that for any assessment, the noise level threshold and significance should be determined by the assessor, based upon the specific evidence and likely subjective response to noise.

The draft document presents an impact scale for the comparison of future noise against the existing noise levels and the impact scale applied in the assessment of cumulative noise is provided below in Table 8.4.

Table 8.4 Impact Scale for Comparison of Future Noise against Existing Noise

Noise Level Change dB(A)	Subjective Response	Significance
0	No change	No impact
0.1 - 2.9	Barely perceptible	Minor impact
3.0 – 4.99	Noticeable	Moderate impact
5.0 – 9.9	Up to a doubling or halving of loudness	Substantial impact
10.0 or more	More than a doubling or halving of loudness	Major impact

The criteria above reflect the key benchmarks that relate to human perception of noise. A change of 3dB(A) is generally considered to be the smallest change in environmental noise that is perceptible to the human ear. A 10dB(A) change in noise represents a doubling or halving of the noise level.

It is considered that the criteria specified in Table 7.4 above provide a good indication as to the likely significance of changes in noise levels in this case and have been used to assess the impact of the operational noise.

8.1.3 Vibration Assessment Criteria

Some activities during the construction phase of the proposed project have the potential to generate ground vibrations at sensitive receptor locations. Activities such as movement of loaded Heavy Goods Vehicles (HGVs) and other construction traffic can all cause significant vibration to occur. The levels of vibration associated with these activities would not normally be expected to cause structural damage to buildings but may have the potential to impact negatively on humans depending on environmental factors such as distance from source and mitigation measures employed. The operational phase of the proposed development will not generate any observable vibration emissions and is consequently not required to be considered.

Vibration standards are concerned with those dealing with human comfort, and those dealing with structural or cosmetic damage to buildings. In both instances, it is appropriate to consider the magnitude of vibration in terms of Peak Particle Velocity (PPV).

Humans are particularly sensitive to vibration and can detect vibration levels as low as 0.3 mm/sec PPV and levels above this may cause annoyance. However, significantly higher levels than this are tolerated for single short-term events and do not cause annoyance or disturbance to humans. British Standard BS 5228-2:2009+A1:2014 *Code of Practice for Noise and Vibration Control on Construction and Open Sites* provides guidance on vibration and its control and management on various site types. The standard also presents details on the human response to vibration and Table 8.5 below outlines these effects.

Table 8.5 Human Response to Vibration

Vibration Level PPV (mm/sec)	Effect
0.14	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3	Vibration might be just perceptible in residential environments.
1.0	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
10	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.

The response of a building to ground-borne vibration is affected by numerous factors including the type of foundation, underlying ground conditions, the building construction and the state of repair of the building.

British Standard 7385 Evaluation and Measurement for Vibration in Buildings provides guidance on vibration measurement, data analysis and reporting as well as building classification and guide values for building damage. The damage threshold criteria presented in BS 7385-2 are based upon systematic studies using a carefully controlled vibration source in the vicinity of buildings. The Standard states that there should be no

cosmetic damage to buildings if transient vibration levels do not exceed 15 mm/sec in the low frequency range and this rises to 20 mm/sec at frequencies of 15 Hz and 50 mm/sec at 40 Hz and above. These guidelines should be reduced by up to 50% for listed structures or similar. It is also noted that the probability of damage tends towards zero at 12.5 mm/sec at component PPV.

The NRA in their Guidance Document recommends vibration levels to ensure that there is no potential for vibration damage during road construction activities. These values have been derived through consideration of various European standards and compliance with their guidance should ensure that there is little to no risk of even cosmetic damage to buildings. The guide values are presented below in Table 7.6.

Table 8.6 NRA Maximum Permissible Construction Phase Vibration Levels

Vibration Level – Peak Particle Velocity at the closest part of any sensitive property to the source of vibration at a frequency of		
Less than 10Hz	**10 to 50Hz**	**50 to 100Hz (and above)**
8 mm/s	12.5 mm/s	20 mm/s

8.2 Description of the Existing Environment

8.2.1 Introduction

The baseline noise monitoring survey consisted of carrying out noise measurements at selected locations in the vicinity of the proposed accommodation site. The detailed noise monitoring survey report (TMS Environment Ltd Ref No 22989-3) is presented in Appendix 8.A of this report and a summary of the principal findings is presented here.

8.2.2 Existing Noise Climate

The proposed Development Area is situated on a recreational sports field area on the Southern boundary of the Belfield Campus, which adjoins the Roebuck Castle Residential Estate to the West of the Development site. The Roebuck Road runs in an east-west direction along the southern boundary of the proposed site along the Roebuck Precinct. The western boundary of the proposed site merges with Campus facilities including student residential accommodation and 2 no. training pitches. To the north, the proposed site adjoins the college campus, including the UCD Southerland School of Law and the Belgrove Student Residences.

The noise monitoring locations were chosen in order to best represent the current noise climate at the nearest noise sensitive receptor (NSR) locations and other key NSR locations in the vicinity of the proposed development site. Four NSR locations (N1 to N4) were selected at various locations surrounding the site and these are shown on a map in Appendix 8.A and summarised in Table 8.7 below.

The baseline noise monitoring locations were chosen in order to best represent the current noise climate at the nearest noise sensitive receptor (NSR) locations in the vicinity of the subject site. In total four NSR locations were chosen to complete the baseline survey and measurements were carried out during the day-time period (07.00 to 19.00), the evening time period (19.00 to 23.00) and the night-time period (23.00 to 07.00).

Table 8.7 Noise Monitoring Locations

Monitoring Location	Description
N1	On path outside of Residential property 111 Roebuck Castle Estate
N2	On path outside of Residential property 213/214 Roebuck Castle Estate
N3	On green area to North of Roebuck Hall Residence
N4	On green area to West of Merville Student Residence

Note: Refer to noise monitoring location map in Appendix 8.A.

The measurement parameters included meteorological observations of prevailing conditions at the time of the survey. The main measurement parameter was the equivalent continuous A-weighted sound pressure level, $L_{Aeq,\ T}$. Monitoring periods for the noise survey were 15 minute intervals. A statistical analysis of the measurement results was also completed so that the percentile levels, $L_{AN,\ T}$, for N = 90% and 10% over 15-minute measurement intervals were also recorded. The percentile levels represent the noise level in dB(A) exceeded for N% of the measurement time. A glossary of noise related terms is presented in Appendix 8.A.

The results of the baseline noise monitoring survey are summarised in Table 8.8 below. These results are an accurate representation of the existing baseline noise climate in the vicinity of the site. The results show that daytime construction activity at the nearby Ashfield student accommodation centre is significant at two locations but does not exceed the permissible daytime levels as outlined in section 8.1. At all other times traffic is the dominant influence on the noise climate in the area.

Table 8.8 Baseline Noise Monitoring Results

NSR	L_{ART} dB(A)	
	Day	Night
N1	**61**	**39**
Dominant influence	*Construction at adjacent student accommodation*	*Traffic*
N2	**61**	**40**
Dominant influence	*Traffic*	*Traffic*
N3	**47**	**39**
Dominant influence	*Construction at adjacent student accommodation*	*Traffic*
N4	**60**	**32**
Dominant influence	*Traffic*	*Traffic*

8.2.3 Existing Vibration Climate

There are no significant sources of vibration in the vicinity of the site. The main vibrations experienced at the nearest sensitive receptor locations relate to the passing traffic along the surrounding road network. Low-level, short-term vibrations could be experienced when fully loaded HGVs travelling at speeds in excess of 50km/hr pass in close proximity to private residences. There is no residential area close enough to the subject

site to be of concern in terms of vibration activity. The existing student accommodation centres will generally be unoccupied during the day and no construction deliveries will occur at night so any potential impacts are avoided.

8.3 Characteristics of the Proposed Development

The application site is located to the southwest of the centre of the main UCD Campus and occupies an area of approximately 12.95ha. The proposed development for which planning permission is sought in this application comprises student accommodation of up to 10 storeys, landscaping and associated underground services.

8.4 Potential Impact of the Proposed Development

8.4.1 Impact assessment predictions

Noise modelling was carried out in accordance with the ISO 9613-2 standard, *"Acoustics - Attenuation of sound during propagation outdoors"*, which is an international standard used to undertake noise prediction modelling. The noise model was constructed based on the ISO 9613-2 standard method at residential receptor locations as outlined in Table 8.7. Ground topography was considered as flat as there are no hills, mountains, valleys or notable geographical features in the vicinity of the subject site. This section of the report presents the predicted noise levels that will be experienced at the closest noise sensitive locations in the vicinity of the subject site. Calculations have been made for the construction and operation phases.

8.4.2 Construction Phase

8.4.2.1 Predicted Impact of Construction Noise

The proposed construction works is expected to span a number of years, with the hours of construction typically from 08.00 to 19.00 Monday to Friday and 08.00 to 12.00 Saturdays. Although there may occasionally be the need to work outside the normal hours of construction, heavy or noisy construction activities will be minimised during these periods in accordance with best practice.

A variety of items of plant will be in use for the purposes of site clearance, preparation and construction activities. There will be no blasting techniques used during construction.

The actual noise level produced by construction work will vary at the nearest sensitive receptor boundary at any time depending upon a number of factors including the type of plant in use, plant location, duration of operation, hours of operation and intervening topography. The impact assessment carried out for the proposed development presents the highest likely noise levels at the nearest receptors based on soil movement, infrastructure work, general site activities and building construction work at the closest approach to the nearest noise sensitive receptors. This conservative approach may overestimate impacts but ensures that appropriate mitigation and avoidance measures are proposed.

The modelling calculations use the methodology described in BS 5228-1. For this method the sound power level of the noise source is defined and the attenuation is calculated between its location and the selected receiver, taking account of distance, screening due to barriers, ground attenuation and the time that a noise source would be operating.

The different stages of the construction phase have been assessed in order to best represent the actual conditions at the site during the different construction phase works. The input data used in the noise model for the construction phase works is presented below in Table 8.9.

Table 8.9 Construction Phase Noise Source Details

Construction Works	Plant Detail	Sound Power Level Lw(dB(A)	Operating Time %
Excavation and Site Preparation	Tracked Excavator x 2	105	66
	Dozer x 2	107	66
	Wheeled loader x 2	104	66
	Excavator mounted rock breaker x 2	113	66
	Dump Truck x 4	107	66
General Site Activities	Dump Truck x 2	107	66
	Wheeled loader	104	66
	Mobile Telescopic Crane	95	66
	Generator x 2	88	100
	Angle Grinder	108	66
Building Construction	Tracked Excavator	105	66
	Mobile Telescopic Crane	95	100
	Tower Crane	104	100
	Dump Truck x 2	107	66
	Generator x 2	88	100
	Concrete Pump & Truck	103	66
	Poker Vibrator	101	66
	Cutting/Grinding	107	66

Predicted noise levels have been calculated for each of the four noise sensitive receptor (NSR) locations that have been identified during the baseline noise survey completed for the subject site. Table 8.10 below presents the predicted noise level for each of the construction phase stages. A worst case scenario is assumed by having all plant and equipment items operating continuously for two thirds of the day at the construction boundary point closest to the noise sensitive receptor even though in reality they will be much further removed. The generators and cranes are assumed to operate for 100% of the time.

Therefore, the results presented in Table 8.10 show the maximum noise level predicted for each NSR and represent the noise levels when the construction activity is ongoing at the closest point within the construction site to each NSR. The predicted construction noise levels and their associated impact ratings are presented in Table 8.11.

Table 8.10 Noise Predictions for Highest Likely Construction Noise at closest receptors

Noise Sensitive Receptor	Noise Level dB(L_{Aeq})		
	Excavation & Site preparation	General Site Activities	Building Construction
NSR1	51	52	57
NSR2	49	51	54
NSR3	51	52	57
NSR4	51	51	57

Table 8.11 Predicted Noise Levels at Noise Sensitive Receptor Locations for the Construction Phase Works

Noise Sensitive Receptor	Measured Baseline (Day) L_{Aeq} (dB(A))	Maximum Predicted Construction Noise L_{Aeq} (dB(A))	Cumulative L_{Aeq} Minus Baseline L_{Aeq} (dB(A))	Impact Rating	Compliance with Assessment Criteria 70dB(A)
NSR1	61	57	1	Minor	Yes
NSR2	61	54	1	Minor	Yes
NSR3	47	57	0	No impact	Yes
NSR4	60	57	2	Minor	Yes

The results indicate that the predicted construction noise level associated with site works will not exceed the NRA assessment criteria for construction works of 70dB(A) at any of the named receptor locations.

The Impact Rating for daytime construction activities at the named receptor locations resulted in a Minor impact at four receptor locations for all construction phases; in all cases the 70 dB(A) assessment criteria is met.

It should be noted however, that in reality it is anticipated that noise levels as a result of construction works will be lower as it is highly unlikely that all the items of machinery modelled will be in operation simultaneously and they will not be located at the nearest boundary point. It should also be noted that these construction noise levels are short-term impacts and are transient in nature. It is considered that the predicted noise levels are not excessive for construction works and noise levels at all receptor locations at a result of construction activity will be significantly less than the 70dB(A) criteria level.

8.4.2.2 Predicted Impact of Construction Traffic

The noise contribution from site traffic during the construction phase will not be observable and can be classified as "imperceptible" as the change in noise level attributable to construction traffic will not be noticeable.

8.4.2.3 Predicted Impact of Construction Vibration

The nearest residential receiver to the proposed development will not experience vibration impact during construction. The only construction activity with the potential to generate noticeable vibration levels will be construction vehicles but the level will not be detectable at the closest residences.

8.4.3 Operational Phase

The proposed development will have very low noise outputs associated with the completed structures. The development will provide residential accommodation and the only noise sources associated with the proposed development will be building services noise and traffic on the internal road network. There will be no source of vibration associated with the operational phase of the proposed development.

Once a development of this nature becomes fully operational, the plant that will be capable of generating noise to some degree include ventilation, heating and chiller units. Some of this plant could operate 24 hours a day, and hence would be most noticeable during quiet periods, including night-time. Noise levels will not be audible at nearby receptors.

Noise levels from fixed plant operating at the development site are assessed against BS4142. The BS 4142 standard is based on the measurement of background noise using L_{A90} noise measurements, compared to source noise levels measured in L_{Aeq} units. The differential between the two measurements once any corrections have been applied for source noise tonality, distinct impulses or other noise characteristics determines the likelihood of complaints.

If the rated plant noise level is +10dB or more above the pre-existing background noise level then this indicates that complaints are likely to occur and that there will be a significant adverse impact. A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context. In all cases for all receptors the rating level does not exceed the background sound level, even when a 5dB penalty is added for tonal noise, and this shows that the predicted operational noise (or specific sound source) will have a very low impact and the noise contribution from the subject site will be imperceptible at the nearest receptors.

8.4.4 Traffic Impacts

For the purposes of assessing potential noise impact, the relative increase in noise level associated with traffic movements on existing roads and junctions with and without the development are considered. The predicted increase in noise levels due to additional vehicular traffic associated with the proposed development is barely perceptible with a negligible impact.

8.4.5 Unplanned Events

There is no potential for unplanned events to cause significant adverse impacts on the noise and vibration climate in the area.

8.5 Proposed Mitigation and Avoidance Measures

8.5.1 Construction Phase

Whilst the construction phase is not expected to give rise to negative noise impacts at sensitive receptors, the guidance on the control of noise and vibration from demolition and construction activities presented in BS5228 will be followed. The proposed measures include the following:

- Unnecessary revving of engines will be avoided and equipment will be switched off when not required
- Internal haul routes will be well maintained and there will be no steep gradients
- Rubber linings will be used in chutes and dumpers to reduce impact noise
- The drop height of materials will be minimised
- Plant and vehicles will be started sequentially rather than all together.
- In accordance with best practicable means, plant and activities to be employed on site will be reviewed to ensure that they are the quietest available for the required purpose.
- Where required, improved sound reduction methods, e.g. enclosures will be used.
- Site equipment will be located away from noise sensitive areas, as much as is feasible.
- Regular and effective maintenance by trained personnel will be carried out to reduce noise and/or vibration from plant and machinery.
- Noisy construction works will be limited to 8am to 7pm weekdays with Saturday working from 8am to 1pm unless otherwise agreed with the local authority. Relatively quiet construction activities could be carried out outside these hours, subject to controls in place.
- Ongoing contact with local residents will be maintained to ensure any complaints relating to construction phase noise for the project from local residents can be addressed. Also, prior to any particularly noisy activities, local residents will be contacted in order to minimise the perceived noise impact.
- Monitoring of typical levels of noise and vibration will be undertaken during critical periods and at sensitive locations for comparison with limits and background levels.

The site contractor will be tasked to prepare a Noise and Vibration Management Plan (NVMP) which will deal specifically with onsite activities in a strategic manner to remove or reduce significant noise and vibration impacts associated with the construction works. The NVMP will specify the noise and vibration monitoring and reporting that will be carried out.

In addition, the contractor will be tasked to appoint a community relations officer who will deal on a one-to-one basis with local stakeholders and will notify them before the commencement of any works forecast to generate appreciable levels of noise or vibration, explaining the nature and duration of the works. The community relations officer will also distribute information circulars informing people of the progress of works and any likely periods of significant noise and vibration.

8.5.2 Operational Phase

There are no adverse noise impacts associated with the operational phase of the development and consequently there are no mitigation measures proposed.

8.6 Predicted Impact of the Proposed Development

8.6.1 Construction Phase

During the construction phase of the proposed development there will be some noise impacts experienced at the nearest receptors to the subject site. It is predicted that the mitigation measures proposed will ensure that noise and vibration impacts are kept to a minimum. The predicted noise and vibration impacts on the receiving environment during the construction phase are considered to be not significant and temporary.

8.6.2 Operational Phase

The potential for noise generation during the operational phase of the proposed development is limited to building services and additional vehicles on the surrounding road network. The building services for the most part will be housed and will result in low noise emissions and the change in vehicle numbers predicted is insignificant in an overall context. The predicted noise and vibration impacts on the receiving environment during the operational phase are considered to be imperceptible and long-term.

Appendix 8.A: Baseline Noise Monitoring Report