

Chapter 11:

Noise and Vibration

11.0 NOISE AND VIBRATION

11.1 INTRODUCTION

This chapter assesses the noise and vibration impact associated with the proposed residential extension to the Frascati Centre, which is currently the subject of rejuvenation under a permitted scheme which is at an advanced stage of construction.

The subject site is bounded generally by the Frascati Road and Blackrock Shopping Centre beyond to the east, by the N31 Road to the north-east; George's Avenue to the south-east; Frascati Park to the south and south-west; and the rear of Lisalea apartments to the north-west. The closest noise and vibration sensitive properties are those located along Frascati Park, George's Avenue and the Lisalea apartment complex which directly bound the site.

This chapter will assess the potential impacts of the proposed development in light of the most relevant guidelines and standards relating to noise and vibration for a project of this nature.

11.2 STUDY METHODOLOGY

The following methodology has been undertaken for this study:

- A baseline survey of the existing noise environment prepared for the permitted rejuvenation scheme has been reviewed and discussed in order to characterise the prevailing noise environment.
- A review of the most applicable standards and guidelines has been conducted in order to set a range of acceptable noise and vibration criteria for the construction and operational phases of the proposed development;
- The noise and vibration impacts relating to the construction phase have been assessed making reference to source data contained within BS 5228 (2009 +A1 2014) *Code of Practice for the Control on Noise and Vibration on Construction and Open Sites*. Part 1: *Noise* and Part 2: *Vibration*.
- Predictive calculations have been performed to assess the potential impacts associated with the operational of the development at the most sensitive locations surrounding the development site.
- A schedule of mitigation measures have been proposed to reduce, where necessary, the identified potential impacts relating to noise and vibration from the proposed development.

11.3 EXISTING RECEIVING ENVIRONMENT

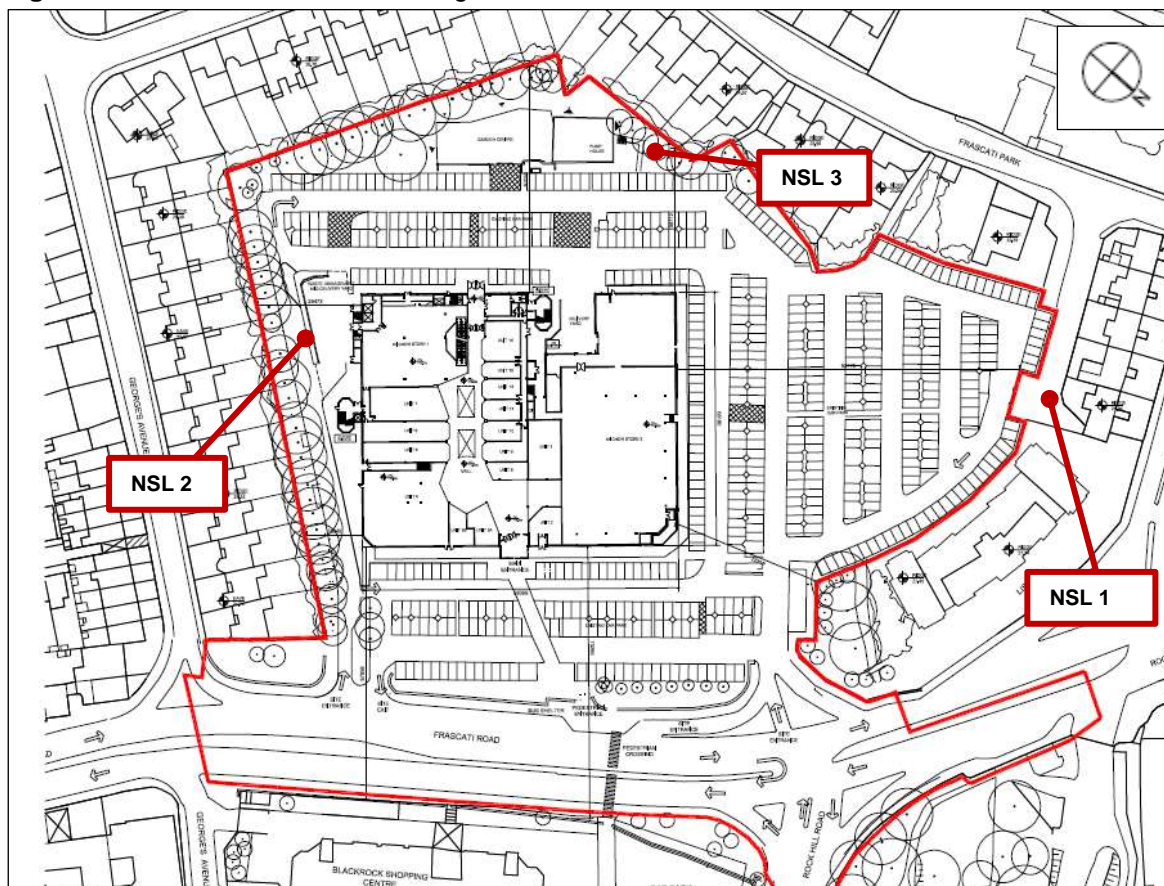
A noise survey was conducted in order to characterise the noise environment in the vicinity of the site prepared for the permitted rejuvenation project. Given the permitted scheme is currently under construction, it is not possible to measure existing ambient noise levels in the absence of construction activities in support of this application. Given, however, the surrounding noise sources which contribute to the normal ambient noise environment, the results of the previous survey are still considered valid.

Survey details are set out below.

11.3.1 Choice of Measurement Locations

Noise measurements were conducted at three locations in the vicinity of the proposed site. Figure 11.1 shows the approximate locations of the measurement positions representative of the nearest noise sensitive locations (NSL's). These are described overleaf.

Figure 11.1 Baseline Noise Monitoring Locations



NSL 1

This monitoring position was located off Frascati Park to the rear of residential properties fronting Mount Merrion Avenue and adjacent to the entrance of the Lisalea apartments.

NSL 2

This monitoring position was located on the south eastern boundary of the site adjacent to the rear garden of residential dwellings located along George’s Avenue.

NSL 3

This monitoring position was located along the western boundary of the site adjacent to a maintenance yard for the store. The monitoring location is adjacent to the rear gardens of the residential dwellings located within Frascati Park.

11.3.2 Survey Periods

Noise measurements were conducted at NSL’s 1 to 3 over the course of two survey periods as follows:

- Daytime: 15:12hrs to 17:51hrs on 8 October 2013;
- Night-time: 23:07hrs on 8 October to 01:04hrs on 9 October 2013.

The daytime measurements cover a period that was selected in order to provide a typical snapshot of the existing noise climate, with the primary purpose being to ensure that the proposed noise criteria associated with the development are commensurate with the prevailing environment. The night-time period provides a measure of the existing background noise levels.

11.3.3 Personnel and Instrumentation

AWN Consulting Limited performed the measurements during the survey periods. The noise measurements were performed using a Brüel & Kjær Type 2260 Precision Sound Level Analyser. Before and after the survey the measurement apparatus was check calibrated using a Brüel & Kjær Type 4231 Sound Level Calibrator.

11.3.4 Procedure

Measurements were conducted at NSL’s 1 to 3 on a cyclical basis. Sample periods for the noise measurements were 15 minutes during both daytime and night-time periods. The results were noted onto a Survey Record Sheet immediately following each sample, and were also saved to the instrument memory for later analysis where appropriate. Survey personnel noted all primary noise sources contributing to noise build-up.

11.3.5 Measurement Parameters

The survey results are presented in terms of the following three parameters:

L_{Aeq} is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period. It is typically used as a descriptor for ambient noise.

L_{A10} is the sound level that is exceeded for 10% of the sample period. It is typically used as a descriptor for traffic noise.

L_{A90} is the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise.

The “A” suffix denotes the fact that the sound levels have been “A-weighted” in order to account for the non-linear nature of human hearing. All sound levels in this report are expressed in terms of decibels (dB) relative to 2×10^{-5} Pa.

11.3.6 Survey Results and Discussion

NSL 1

The survey results for NSL 1 are summarised in Table 11.1.

Table 11.1 Summary of Noise Measurements at NSL 1

Time (hrs)		Measured Noise Levels (dB re. 2×10^{-5} Pa)		
		L _{Aeq}	L _{A10}	L _{A90}
Daytime	15:12 – 15:27	53	54	48
	16:14 – 16:29	54	56	50
	17:16 – 17:31	53	56	48
Night-time	23:07 – 23:22	49	55	47
	00:11 – 00:26	50	54	44

During daytime monitoring periods, the dominant source of noise in this area was road traffic on Mount Merrion Avenue and Rock Road. During the second measurement, some activities from local works to a residential dwelling contributed to the measured noise levels. Daytime ambient noise levels were in the range of 53 to 54dB L_{Aeq}. Daytime background noise levels were in the range of 48 to 50dB L_{A90}.

The night-time noise levels at this location were again dominated by road traffic on Mount Merrion Road and the Rock Road. Night-time ambient noise levels were in the range 49 to 50dB L_{Aeq} . Night-time background noise levels were in the range 44 to 47dB L_{A90} .

NSL 2

The survey results for NSL 2 are summarised in Table 11.2.

Table 11.2 Summary of Noise Measurements at NSL 2

Time (hrs)		Measured Noise Levels (dB re. 2×10^{-5} Pa)		
		L_{Aeq}	L_{A10}	L_{A90}
Daytime	15:37 – 15:52	58	62	46
	16:38 – 16:53	57	61	47
	17:36 – 17:51	58	62	47
Night-time	23:28 – 23:43	50	56	46
	00:30 – 00:45	45	47	41

During daytime monitoring periods, the dominant source of noise in this area was road traffic on the Frascati Road. Other sources noted were occasional vehicle movements along the access road to the car park and plant noise from the Frascati Shopping Centre building. Daytime ambient noise levels were in the range of 57 to 58dB L_{Aeq} . Daytime background noise levels were in the range of 46 to 47dB L_{A90} .

The night-time noise levels at this location were dominated by road traffic on the Frascati Road. In addition, plant noise was audible from the Frascati Shopping Centre building. Night-time ambient noise levels were in the range 45 to 50dB L_{Aeq} . Night-time background noise levels were in the range 41 to 46dB L_{A90} .

Location 3

The survey results for NSL 3 are summarised in Table 11.3.

Table 11.3 Summary of Noise Measurements at NSL 3

Time (hrs)		Measured Noise Levels (dB re. 2×10^{-5} Pa)		
		L_{Aeq}	L_{A10}	L_{A90}
Daytime	15:56 – 16:11	50	51	45
	16:58 – 17:13	51	52	45
Night-time	23:46 – 00:01	41	45	40
	00:49 – 01:04	42	46	36

During daytime monitoring periods, the dominant source of noise in this area was vehicle movements within the store car park, road traffic along surrounding roads and occasional leaf rustle. During the second measurement period, a bottle bank was being filled. Daytime ambient noise levels were in the range of 50 to 51dB L_{Aeq} . Daytime background noise levels were of the order of 45dB L_{A90} .

The night-time noise levels at this location were dominated by distant road traffic. In addition, some low level plant noise was just audible from the Frascati Shopping Centre building. Night-time ambient noise levels were in the range 41 to 42dB L_{Aeq} . Night-time background noise levels were in the range 36 to 40dB L_{A90} .

11.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

Planning permission is being sought for a residential extension to the Rejuvenated Frascati Shopping Centre, which is at an advanced stage of construction at present, within the designed district centre of Blackrock.

The proposal is for a residential development of 45 no. apartment units over 3 no. storeys, from second to fourth floor level, over the permitted ground and first floor levels of retail / restaurant floorspace and permitted lower ground floor car park. The proposal will be an extension of the Rejuvenation Scheme permitted under Reg. Ref.: D14A/0134 (which was the subject of an EIS), as amended by Reg. Ref.: D16A/0235 / ABP Ref.: PL 06D.246810, Reg. Ref.: D16A/0798, Reg. Ref.: D16A/0843 and Reg. Ref.: D17A/0599.

The proposed apartment mix consists of 3 no. 1 bed units, 36 no. 2 bed units and 6 no. 3 bed units. Balconies are provided for the residential apartments on the north eastern, north western, south eastern and south western elevations. The development includes 54 no. bicycle parking spaces for the apartments, located at lower ground floor level and the proposed first floor level podium car park. The development also includes a bin store and plant area at lower ground floor level, two communal terrace areas at second floor level and roof level and plant enclosures at roof level. The proposal will result in the omission of the second floor level restaurant unit and storage floorspace permitted under the Rejuvenation Scheme.

The proposal includes a first floor level podium car park, over the permitted podium car park, located at the north west of the site, which will provide 81 no. car parking spaces. The total car parking provision for the scheme as amended by this permission will be 604 no. spaces, which comprises of 51 no. spaces for the proposed residential units and 553 no. spaces for the permitted retail and restaurant floorspace.

The proposal is an extension of the Rejuvenation of Frascati Shopping Centre, which is currently at an advanced stage of construction, and which related to an overall application site area of approximately 3.41 hectares, including the Frascati Road area included in the red line boundary of that application, the development site area, i.e. excluding Frascati Road, is 2.7 hectares. The development comprises primarily of the improvement of the current retail offer within the centre, along with the inclusion of additional retail services floorspace, the provision of additional café/restaurant floorspace and the reorganisation of the current car parking provision and access and circulation system.

The basement area, which will accommodate the car parking area for the residential units, has been constructed and the replacement car parking for the retail floorspace is proposed in an additional podium level as part of this residential extension application.

In terms of the noise and vibration impacts of this proposal, this chapter has considered the impact from the short-term construction phase which will involve primarily the new structural element of the apartment buildings above the existing built structures.

During the operational phase, the key potential sources of noise and vibration will be long term and will include car parking, additional vehicles on surrounding roads, and mechanical and electrical plant.

The two phases are considered in this document.

11.5 POTENTIAL IMPACT OF THE PROPOSED DEVELOPMENT

11.5.1 Assessment Criteria

Noise

Construction Phase

In line with the permitted development under construction, the following construction noise limits are proposed for the residential extension to the Frascati Centre. These are included in Table 11.4.

Table 11.4 Construction Noise Limits

Location	Threshold value, dB $L_{Aeq,1hr}$
Properties North West / South West	65
Properties South / North	70
Properties West	65

Referring to Table 11.4, construction noise levels should be controlled to not exceed 65dB to 70dB $L_{Aeq,1hr}$ at the nearest noise sensitive locations surrounding the site taking into account the prevailing noise environment at the nearest noise sensitive locations.

A Construction Management Plan (CMP) for the permitted development refers to the noise limits contained within the EIS prepared for the original planning application which are replicated in Table 11.4.

The CMP also notes that standard construction working hours will apply between 8am to 6pm Mondays to Fridays, and 8am to 1pm on Saturdays. Any works outside this period shall be strictly by agreement with the Local Authority.

Operational Phase

For new developments, Dun Laoghaire Rathdown County Council (DLRDCC) environmental control division apply the noise criteria set out in the EPA's document *Guidance Note for Noise – Licence Applications, Surveys and Assessments in Relation to Scheduled Activities NG4* (2012).

This document sets the following criteria:

- Daytime (07:00 to 19:00 hours) 55dB $L_{Aeq,T}$
- Evening (19:00 to 23:00 hours) 50dB $L_{Aeq,T}$
- Night-time (23:00 to 07:00 hours) 40dB $L_{Aeq,T}$

Due to the fact that there is the potential for short periods of noise to cause a greater disturbance at night, a shorter assessment time period (T) is adopted. Appropriate periods are 1 hour for daytime and evening (07:00 to 23:00 hours) and 5 minutes for night-time (23:00 to 07:00 hours).

Given that vehicle movements on public roads are assessed using a different parameter (the ten percentile noise level; L_{A10}), it is appropriate to consider the increase in traffic noise level that arises as a result of vehicular movements associated with the development in terms of the L_{A10} parameter.

In order to assist with the interpretation of the noise associated with vehicular traffic on public roads, Table 11.5 offers guidance as to the likely impact associated with any particular change in traffic noise level.

Table 11.5 Likely impact associated with change in noise level

Change in Sound Level (dB LA10)	Subjective Reaction	Impact
< 3	Inaudible	Imperceptible
3 – 5	Perceptible	Slight
6 – 10	Up to a doubling of loudness	Moderate
11 – 15	Over a doubling of loudness	Significant
> 15		Profound

Vibration Criteria

In line with the permitted development under construction, the following construction vibration limits are proposed for the residential extension to the Frascati Centre. These are included in Table 11.6.

Table 11.6 Allowable Vibration During Construction Phase

Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of:-		
Less than 15Hz	15 to 40Hz	40Hz and above
12 mm/s	20 mm/s	50 mm/s

11.5.2 Impact Assessment

Construction Phase

The construction phase of the project will be undertaken within the bounds of the existing permitted construction site. Given the ground preparation works, excavation and foundation works of the permitted development are substantially complete, the construction phase relating to the residential extension will predominately involve building works associated with the apartment extension.

The majority of works to be undertaken will therefore comprise construction of the buildings involving use of cranes, mobile plant, and manual works. There will be vehicular movements to and from the site that will, out of necessity, make use of existing roads. The extent of the works are in line with existing construction activities on-going at the site during the super structure works phase.

Construction Noise

Given that works during any phase will be transient in nature and will involve the use of several different plant items at any one time, it is difficult at this stage of the assessment to state accurately what items of plant will be in use and what levels of noise will be experienced during construction works.

The construction works associated with the apartment structure will make use of the mobile and tower cranes positioned within the site as part of the ongoing works. Other site activities from smaller lifting equipment, mobile plant, compressors, generators etc. will also be in use.

As noted in Section 11.5.1, any works associated with the construction of the residential extension will be required to operate within the construction noise limits applied to the permitted scheme. For the purpose of preparing construction noise calculations relating to the proposed residential extension, an overall sound power level of 115dB LW(A) for this work has been used. This level is equivalent to 5 items of construction plant operating simultaneously with a sound pressure level of 80dB LAeq each at a distance of 10m. Given the range of activities during any one phase, this is considered to provide a good approximation of noise from a busy site.

The closest noise sensitive buildings to the proposed residential extension are typically 40m to the south along Georges Avenue and at 50m to the north-west at the Lisalea apartments along Frascati Road. Given the extent of existing structures already completed as part of the rejuvenation development, however, the main noise sources associated with this element of the extension (e.g. tower cranes, generators, lifting equipment etc.) will be largely screened from the nearest noise sensitive properties by these structures within the confines of the site.

Indicative construction noise levels based on the above assumptions are calculated at 68 and 65dB L_{Aeq} at the closest noise sensitive locations. The calculated noise levels are within the recommended construction noise limits outlined in Table 11.4 for properties to the north and south, closest to the proposed apartment extension.

Cumulative Impact

There are potential for cumulative construction noise levels from the permitted upgrade works to Blackrock Shopping Centre (Planning Reg. Ref.: D17A/0644) opposite the Frascati Centre where works are ongoing. Construction work is also ongoing at the former Enterprise House redevelopment (Planning Reg. Ref.: D16A/0418 and ABP PL06D.247702). Both sites are located across the Frascati Road which is a heavily trafficked route and in the absence of construction works is the dominant noise source at properties closest to the road edge. Given the proximity of the proposed residential extension at the Frascati site to the noise sensitive locations to the north and south, construction works associated with this scheme will be the main contributor to construction noise levels when compared to the contribution from the other construction sites noted above.

Notwithstanding the above, it will be a requirement of the contractor to ensure that all best practice measures relating to the control and minimisation of noise and vibration are employed during all phases of work including ongoing works associated with the permitted rejuvenation scheme. Further details are set out in Section 11.7.1 of this document.

Construction Vibration

There are no significant vibration sources expected during the construction phase of the residential extension as no intrusive ground works, foundations or excavation works are required for this phase. In this regard, vibration levels at the closest neighbouring buildings are expected to be orders of magnitude below the limits set out in Table 11.6 to avoid any cosmetic damage to buildings. Vibration levels are also expected to be below a level that would cause disturbance to building occupants.

Operational Phase

During the operational phase of the development, the noise and vibration environment is expected to remain nominally unchanged compared to those associated with the permitted rejuvenation scheme. The key areas of the site which have the potential to generate noise include:

- Car parking;
- Additional vehicles on surrounding roads, and;
- Mechanical and electrical plant.

These are discussed in turn below.

Car Parking

The proposal includes a first-floor level podium car park, over the permitted podium car park, located at the north west of the site, which will provide 81 no. car parking spaces. The total car parking provision for the scheme as amended by this permission will be 604 no. spaces, which comprises of 51 no. spaces for the proposed residential units at basement level and 553 no. spaces for the permitted retail and restaurant floorspace within the basement and podium car parking areas.

In terms of potential noise impacts, due to the enclosed nature of the underground car parking area, activities within this area will be adequately screened from the external environment and hence noise breakout will be minimal.

The new first floor podium car park level will accommodate an additional 81 cars. In order to provide some quantitative assessment, noise levels associated with a busy car park, previously measured by AWN has been used to determine the contribution of car parking at the closest boundary. The typical noise level 10m beyond the boundary of a typical busy commercial car park has been found to be of the order 48 dB $L_{Aeq,T}$. Using this figure and the taking into account the distance to the nearest properties along the north boundary the calculated noise level is 45dB $L_{Aeq,T}$. The associated noise level is within the day and night-time criteria of 55 and 45 dB $L_{Aeq,T}$ respectively. It is not anticipated, however, that there will be any significant activity within car park areas during night time periods. The noise levels refer to herein relate to those from all aspects of the cumulative development at the Frascati site. The overall impact is minor and long term.

Additional vehicles on surrounding roads

A traffic assessment has been prepared by ILTP for the proposed residential development. The assessment notes that the scale of the additional development of 45 no. apartments, in the context of the overall development permitted on the site is relatively small.

The number of vehicle trip movements associated with the proposed apartments is determined to increase traffic on the adjoining Frascati Road in the order of approximately 0.46% and 0.29% for the morning and evening peak traffic hour periods, respectively. This relates to additional 9 vehicles during the AM peak and 7 vehicles during the PM peak onto Frascati Road. The traffic generated by the proposed development is concluded to have little or no material impact on the existing background traffic on Frascati Road.

From a noise point of view, an increase of traffic of this magnitude will be of negligible impact (an increase of less than 0.5dB) and will not be perceptible. The overall impact is negligible, long term.

Mechanical and Electrical Plant

The proposed development will incorporate new plant areas at ground floor level and a new plant area at roof level above the apartment buildings. The specific details of the plant items within these areas is not yet fully progressed known at this stage of the assessment, it is therefore best practice to set appropriate operational limits which can be used as part of the detailed design.

The operational noise criteria outlined in Section 11.5.1 will be used which is applied to the full extent of the permitted rejuvenated site including those associated with the commercial and residential elements of the combined scheme. In this instance, the operation of any new and existing plant items, coupled with those within the existing permitted site, will be required to have a cumulative noise level which does not exceed the following operational limits at the nearest noise sensitive locations:

- 55dB $L_{Aeq,1\text{ hour}}$ during daytime periods;
- 50dB $L_{Aeq,1\text{ hour}}$ during evening periods, and:

- 45dB $L_{Aeq, 5mins}$ during night-time periods.

Noise emissions from any operational plant items should have no tonal or impulsive characteristics.

The selection of plant items for the permitted rejuvenation and proposed residential extension will need to be fully considered at detail design stage to ensure that the type, number and location of plant items with noise emissions to atmosphere are suitably selected to ensure the limit values above are complied with.

11.6 DO NOTHING IMPACT

Should the planned residential extension to the centre not take place, noise emissions associated with the permitted rejuvenated scheme are expected to remain nominally unchanged. There are no planned changes to operating hours, delivery schedules, operating plant or car parking under this scenario; hence the overall impact from the Do Nothing scenario is neutral.

11.7 AVOIDANCE, REMEDIAL AND MITIGATION MEASURES

11.7.1 Construction Phase

With regard to construction activities, best practice operational and control measures for noise and vibration from construction sites are found within BS 5228 (2009 +A1 2014) Parts 1 and 2. Reference to the best practice measures included within these standards is included within the CMP for the overall site.

BS 5228 includes guidance on several aspects of construction site practices, including, but not limited to:

- liaison with the Public;
- noise monitoring;
- selection of quiet plant;
- control of noise sources, and;
- screening (boundary, and or localised plant screening).

Detailed comment is offered on these items in the following paragraphs. Noise control measures that will be considered include liaison with the public, noise monitoring, the selection of quiet plant, enclosures and screens around noise sources and limiting the hours of work.

Liaison with the Public

The Contractor will provide proactive community relations and will notify the public and sensitive premises before the commencement of any works forecast to generate appreciable levels of noise or vibration, explaining the nature and duration of the works. The Contractor will distribute information circulars informing people of the progress of works and any likely periods of significant noise and vibration.

A designated noise liaison should be appointed to site during construction works. Any complaints should be logged and followed up in a prompt fashion. In addition, prior to particularly noisy construction activity, e.g. rock breaking, piling, etc., the site contact should inform the nearest noise sensitive locations of the time and expected duration of the works. It is understood that such operations are implemented to date in relation to the site in terms of recent construction works and in relation to day to day activities associated with existing site operations. These measures will be continued during the construction phase of the proposals considered in this assessment.

Noise Monitoring

During the construction phase consideration should be given to noise monitoring at the nearest sensitive locations. Again, as part of current site management a number of permanent noise monitors are managed and maintained in order to monitor noise emissions from the site. Figure 11.2 illustrates the monitoring stations (orange dots). This practice will be continued as part of the proposed construction works associated with the development works under consideration here.

Figure 11.2 Unattended Noise Monitoring Stations



Noise monitoring is and will be conducted in general accordance with the International Standard *ISO 1996: 2007: Acoustics – Description, measurement and assessment of environmental noise*.

Selection of Quiet Plant

This practice is recommended in relation to sites with static plant such as compressors and generators. It is recommended that these units be supplied with manufacturers' proprietary acoustic enclosures where possible. The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site. The least noisy item should be selected wherever possible. Should a particular item of plant already on the site be found to generate high noise levels, the first action should be to identify whether or not said item can be replaced with a quieter alternative.

Noise Control at Source

If replacing a noisy item of plant is not a viable or practical option, consideration should be given to noise control "at source". This refers to the modification of an item of plant or the application of improved sound reduction methods in consultation with the supplier. For example, resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can often be controlled by fixing resilient materials in between the surfaces in contact.

BS5228 states that "*as far as reasonably practicable sources of significant noise should be enclosed*". In applying this guidance, constraints such as mobility, ventilation, access and safety must be taken into

account. Items suitable for enclosure include pumps and generators. Demountable enclosures will also be used to screen operatives using hand tools and will be moved around site as necessary.

BS5228 makes a number of recommendations in relation to “*use and siting of equipment*”. These recommendations will be adopted on site.

“Plant should always be used in accordance with manufacturers’ instructions. Care should be taken to site equipment away from noise-sensitive areas. Where possible, loading and unloading should also be carried out away from such areas. Special care will be necessary when work has to be carried out at night.

Circumstances can arise when night-time working is unavoidable. Bearing in mind the special constraints under which such work has to be carried out, steps should be taken to minimise disturbance to occupants of nearby premises.

Machines such as cranes that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum. Machines should not be left running unnecessarily, as this can be noisy and waste energy.

Acoustic covers to engines should be kept closed when the engines are in use and idling. The use of compressors that have effective acoustic enclosures and are designed to operate when their access panels are closed is recommended.

Materials should be lowered whenever practicable and should not be dropped. The surfaces on to which the materials are being moved could be covered by resilient material.”

All items of plant should be subject to regular maintenance. Such maintenance can prevent unnecessary increases in plant noise and can serve to prolong the effectiveness of noise control measures.

Screening

Typically screening is an effective method of reducing the noise level at a receiver location and can be used successfully as an additional measure to all other forms of noise control. The effectiveness of a noise screen will depend on the height and length of the screen and its position relative to both the source and receiver.

The length of the screen should in practice be at least five times the height; however, if shorter sections are necessary then the ends of the screen should be bent around the source. The height of any screen should be such that there is no direct line of sight between the source and the receiver. For critical areas in close proximity to the works where other forms of noise control measures do not sufficiently reduce noise levels below the significant criteria, a standard 2.4m high hoarding is recommended around the site perimeter.

BS 5228 states that on level sites the screen should be placed as close as possible to either the source or the receiver. The construction of the barrier should be such that there are no gaps or openings at joints in the screen material. In most practical situations the effectiveness of the screen is limited by the sound transmission over the top of the barrier rather than the transmission through the barrier itself. In practice screens constructed of materials with a mass per unit of surface area greater than 7 kg/m² will give adequate sound insulation performance.

In addition, careful planning of the site layout should also be considered. The placement of site buildings such as offices and stores and in some instances materials such as topsoil or aggregate can provide a degree of noise screening if placed between the source and the receiver.

The use of mobile localised screens should also be considered for use around items of high noise levels. Mobile screens also have the benefit of placing the screen close to the source in addition to screening the plant item of concern from the closest noise sensitive locations, depending on its location on site.

N&V CONST 1- Noise Mitigation

The appointed contractor will ensure that relevant measures to control noise from construction works as set out within BS 5882 Part 1: 2009 +A1 2014 are employed to ensure construction noise limits are not exceeded. These control measures are included in the existing Construction Management Plan.

11.7.1 Operational Phase

Mitigation measures to control noise and vibration during the operational phase of the residential extension are set out below.

Car Parking on the Site

The noise impact assessment outlined above has demonstrated that mitigation measures are not required.

Additional Vehicular Traffic on Public Roads

The noise impact assessment outlined in this chapter has demonstrated that mitigation measures are not required.

Plant

N&V OPERAT 1: Mechanical and Electrical Plant

A design goal has been set for building services plant at the nearest noise sensitive locations in order to avoid any significant increase to the existing noise environment. In order to achieve the design goal, best practice control measures will be adopted during the detailed design stage. This will typically involve the following forms of noise control techniques:-

- selection of plant with low noise and vibration emissions;
- provision of solid barriers or acoustic louvered panels screening external plant;
- installation of duct mounted attenuators on the atmosphere side of air moving plant;
- installation of splitter attenuators or acoustic louvres providing free ventilation to internal plant areas, and;
- anti-vibration mounts on reciprocating plant.

11.8 PREDICTED IMPACTS OF THE PROPOSED DEVELOPMENT

The predicted residual impacts of the development are set out below taking account of the predicted impacts and control measures.

11.8.1 Construction Phase

During the construction phase of the project there will be short term impacts on some of the nearby properties due to noise emissions from activity on-site and truck movements to and from the site.

The application of binding noise limits, monitoring, controlled working hours, along with implementation of appropriate noise and vibration mitigation measures as set out above, will ensure that noise and vibration impact is sufficiently controlled to within the relevant criteria.

With mitigation measures implemented and construction limits adhered to, the proposed development will result in a moderate to major, short term impact.

11.8.2 Operational Phase

Car Parking on the Site

The impact from the reconfigured car parking arrangements within the permitted rejuvenated site are not considered to generate any increase to the noise environment at the nearest properties. The impact from this phase is considered to be minor, long term

Additional Vehicular Traffic on Public Roads

The impact from additional vehicular traffic on the surrounding road network and junctions is determined to be negligible and imperceptible. The impact is negligible and long term.

Mechanical and Electrical Plant

The impact from any additional mechanical and electrical plant use to service the new buildings will be designed to comply with the day and night-time noise criteria set. Assuming the adopted criteria are not exceeded, the resultant impact from this area of the site will be minor, long term.

11.9 MONITORING

11.9.2 Construction Phase

During the construction phase consideration will be given to noise monitoring at the nearest sensitive locations, where necessary, i.e. in the event that noisy activities are expected.

Noise monitoring will be conducted in accordance with the International Standard ISO 1996: 2007: *Acoustics – Description, measurement and assessment of environmental noise* and survey locations should be located a distance of greater than 3.5m away from any reflective surfaces, e.g. walls, in order to ensure a free-field measurement without any influence from reflected noise sources.

11.9.2 Operational Phase

There are no proposed noise or vibration monitoring requirements during the operational phase.

11.10 REINSTATEMENT

Not applicable

11.11 INTERACTIONS

This chapter has been compiled with reference to the main design drawings and project descriptions, details on the construction phase provided by the project manager / applicant, the transport report and the EIS prepared for the rejuvenation project, which included a CMP.

11.12 DIFFICULTIES ENCOUNTERED IN COMPILING

No difficulties were encountered in compiling this chapter.

11.13 REFERENCES

British Standard BS 5228 (2009 +A1 2014): Code of Practice for Control of Noise and Vibration on Construction and Open Sites *Part 1: Noise & Part 2: Vibration*.

British Standard BS 7385 (1993): *Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration*.

Calculation of Road Traffic Noise, Department of Transport Welsh Office, HMSO, 1988

Dublin Agglomeration Action Plan Relating to the Assessment and Management of Environmental Noise (July 2013 – November 2018).

EPA: *Guidance Note for Noise – Licence Applications, Surveys and Assessments in Relation to Scheduled Activities NG4* (2012).

ISO 1996: 2007: *Acoustics – Description, measurement and assessment of environmental noise*.

ISO 9613 (1996): *Acoustics – Attenuation of sound during propagation outdoors, Part 2: General method of calculation*.