

**Section 16:  
Principle Mitigation Measures**

## 16.1 INTRODUCTION

The central purpose of EIA is to identify potentially significant adverse impacts at the pre-consent stage and to propose measures to mitigate or ameliorate such impacts. This chapter of the EIS document has been prepared by **John Spain Associates** and sets out a summary of the range of methods described within the individual chapters of this EIS document which are proposed for mitigation and monitoring. It is intended that this chapter of the EIS document will provide a useful and convenient summary to the competent/consent authority of the range of mitigation and monitoring measures proposed.

EIA related conditions that are normally imposed by the competent/consent authority as part of conditions of planning consent and form a key part of the Impact Anticipation and Avoidance strategy. Conditions are principally used to ensure that undertakings to mitigate are secured by explicitly stating the location, quality, character, duration and timing of the measures to be implemented. A secondary role of EIA related conditions is to ensure that resources e.g. bonds / insurances will be available and properly directed for mitigation, monitoring or remedial action, in the event that the impacts exceed the predicted levels.

*Monitoring* of the effectiveness of mitigation measures put forward in the EIS document, both by the competent authorities and the developer, is also an integral part of the process. Monitoring of environmental media and indicators arise either from undertakings or from conditions.

In the case of mitigation and monitoring measures it is important for all parties to be aware of the administrative, technical, legal and financial burdens that can accompany the measures proposed. It is also important to ensure that, where monitoring is provided for, it is clearly related to thresholds, which if exceeded cause a clearly defined set of actions to be implemented.

## 16.2 MITIGATION STRATEGIES

### 16.2.1 Introduction

There are three established strategies for impact mitigation - avoidance, reduction and remedy. The efficacy of each is directly dependent on the stage in the design process at which environmental considerations are taken into account (i.e. impact avoidance can only be considered at the earliest stage, while remedy may be the only option available to fully designed projects).

### 16.2.2 Mitigation by Avoidance

Avoidance is generally the fastest, cheapest and most effective form of impact mitigation. Environmental effects and consideration of alternatives have been taken into account at the earliest stage in the project design processes. The consideration of alternatives with respect to the proposed project has been fully described in Chapter 2. Where appropriate, on-going scoping as environmental constraints became apparent throughout

the EIA process has also resulted in mitigation by avoidance and by modifying the project design and layout.

### **16.2.3 Mitigation by Reduction**

This is a common strategy for dealing with effects which cannot be avoided. It concentrates on the emissions and effects and seeks to limit the exposure of the receptor. It is generally regarded as the "*end of pipe*" approach because it does not seek to affect the source of the problems (as do avoidance strategies above). As such this is regarded as a less sustainable, though still effective, approach.

### **16.2.4 Reducing the Effect**

This strategy seeks to intercept emissions, effects and wastes before they enter the environment. It monitors and controls them so that acceptable standards are not exceeded. Examples include wastewater treatment, filtration of air emissions and noise attenuation measures.

### **16.2.5 Reducing Exposure to the Impact**

This strategy is used for impacts which occur over an extensive and undefined area. Such impacts may include noise, visual impacts or exposure to hazard. The mitigation is effected by installing barriers between the location(s) of likely receptors and source of the impact (e.g. sound barriers, tree screens or security fences).

### **16.2.6 Mitigation by Remedy**

This is a strategy used for dealing with residual impacts which cannot be prevented from entering the environment and causing adverse effects. Remedy serves to improve adverse conditions which exist by carrying out further works which seek to restore the environment to an approximation of its previous condition or a new equilibrium.

## **16.3 HUMAN BEINGS (SOCIO-ECONOMIC IMPACT)**

### **16.3.1 CONSTRUCTION PHASE**

A range of construction related remedial and mitigation measures are proposed throughout this EIS document with reference to the various environmental topics examined and the inter-relationships between each topic. These remedial and mitigation measures are likely to result in any significant and likely adverse environmental impacts on Human Beings during the construction phases being avoided.

The following mitigation measures are proposed for the construction phase of the proposed development with reference to Human Beings:

- In order to ensure the protection of the residential amenities of adjoining residents a full Construction Management Plan (including traffic management) and phasing plan should be put in place prior to the commencement of development. The construction

management plan should specifically address the likely extended duration of the construction phase for the complete build – out of the proposed development and construction management issues associated with interim and partially complete phases.

- All construction phase remedial and mitigation measures included throughout this EIS document with reference to all environmental topics should be implemented.

#### **16.3.2 OPERATIONAL PHASE**

- A full Waste Management Plan should be prepared prior to the commencement of development;
- All operational phase remedial and mitigation measures included throughout this EIS document with reference to all environmental topics should be implemented.

#### **16.4 TRAFFIC AND TRANSPORTATION**

It is expected that the construction phase of this development would take place over an 18-month period, with the level of construction traffic varying over this period.

Mitigation measures (such as wheel wash facilities, road signage and designate haul routes) will be put in place during the construction phase to ensure that the adjacent road network is not affected by vehicular spoil or traffic delays.

On completion of the proposed development it is expected that, due to the limited traffic levels associated with the development and the availability of numerous forms of existing and proposed public transport and pedestrian and cyclist facilities, the proposed development would not impact on the operation of the surrounding road network.

#### **16.5 ARCHAEOLOGICAL HERITAGE**

It is not recommended that archaeological testing or monitoring be carried out during reconstruction on the footprint of the O'Devaney Gardens flats. Should, however, anything of archaeological interest be found during ground disturbance, the Department of the Environment, Heritage and Local Government, the National Museum and the City Archaeologist, Dublin City Council should be notified.

However, as the strip of land which has been handed over from the Department of Defence appears not to have been built over or disturbed in the past, it is recommended that an archaeological assessment, including test trenching, be carried out on that strip prior to commencement of development. Full excavation may subsequently be necessary, depending on the recommendations of the planning authority and the Department of the Environment, Heritage and Local Government.

## **16.6 ARCHITECTURAL HERITAGE**

The following mitigation measures are proposed.

### **16.6.1 CONSTRUCTION PHASE**

Appropriate measure will be undertaken by the contractor to reduce the impact of noise, dust and vibration associated with construction works and traffic.

Prior to demolition, in the interests of historical record, a drawn survey of the 1960s buildings and a photographic study of the entire site will be deposited in the Irish Architectural Archives.

### **16.6.2 OPERATIONAL PHASE**

The new residential units, expressed in a contemporary architectural idiom, will be a considerable improvement of the present empty spaces associated with the blocks, in a densely grained part of the city.

The importance of context has been addressed in the size, scale, and massing of the proposed development with an evident importance placed on scale. The proposed layout has responded to the architectural context of traditional tight urban grain that exists between Aughrim Street and the Phoenix Park. The Dublin Artisans Dwellings generally turn their back on the site and it is proposed to integrate three streets into the scheme by attaching terraced houses to existing buildings.

The heights of the new buildings are low, four storey buildings is generally limited to the centre of the site. The distribution of heights has been carefully considered with regard to their impact on adjacent dwelling houses.

There will be extensive planting in the newly formed 'Boulevard' and in the public park.

The design objective of the residential accommodation reflects the commitment, standards and ethos of DCC to provide innovative housing units to the highest spatial standards, contextual consciousness, energy efficiency and overall sustainability.

## **16.7 FLORA AND FAUNA**

The following mitigation measures are proposed.

### **16.7.1 PRIOR TO CONSTRUCTION**

- Do not remove trees or shrubs during the nesting season (Feb1st to August 31<sup>st</sup>).

### **16.7.2 CONSTRUCTION PHASE**

- Since there are no semi-natural habitats and few species of conservation interest that occur on the site it should be possible to

replace what is of limited local importance and even improve the site for biodiversity.

## Flora

### *Wildflower Meadows*

Suitable planting, perhaps in the form of wildflower meadows (including native clover species) or low cut floral lawns dotted around the site or in one relatively large area, should be provided for bumblebees and other nectar feeders. Additional planting that may include non-native species but which are known to attract bees and other invertebrates may also be used. Teasel can be included to attract seed-eating finch species. Wildflower meadows/floral lawns must be managed appropriately in order to maintain their biodiversity, therefore the site manager and/or relevant Dublin City Council staff should be informed of appropriate management regimes when landscaping is completed. A list of suppliers of native wildflower seeds is provided.

### *Tree lines*

For tree lines it is recommended that these be planted with native species, and where possible underplanted with native shrubs (list provided in Table 8.4). Trees should be allowed to grow to their maximum girth and height in order to provide optimal conditions for shelter and nesting for songbirds. Lighting of tree lines with street lights is not recommended.

At least one unbroken tree line should be planted in a north south direction from end of the site to the other, as well as from east to west.

## Fauna

### *Bats*

No evidence was found for bats emerging at night from any of the flat blocks during the bat survey. However, should bats be found prior to or during demolition works should cease and the local National Parks and Wildlife Conservation Ranger should be contacted for advice on how to proceed.

Tree lines as described above should be planted to improve the site for foraging and commuting bats. Street lighting should be kept to a minimum. Where possible tree lines should not be lit at night.

5 x woodcrete bat boxes (1FR Bat Tube) should be placed on south facing walls (at least 4m height) throughout the site, preferably adjacent to green spaces. Bat boxes should be placed above clear wall space (i.e. not above windows or doorways). Ideally, bat boxes should be sited with advice, onsite, from suitably trained bat worker.

### *Birds*

The planting of tree lines with native species, and other landscaping such as planting wildflower meadows, should benefit song birds and facilitate increases in numbers of these species using the site.

In addition, it is recommended that 10 x Schwegler No 18 nesting boxes for swifts be placed under soffits of buildings around the site (out of direct sunlight). As per bat boxes these should be placed over clear wall spaces, not above windows or doorways.

10 x Schwegler Sparrow Terrace nesting boxes for sparrows should also be placed on buildings around the site (out of direct sunlight) and not over windows or doorways.

### Dust, Sediment and Pollution

Appropriate measures should be taken to prevent movement of dust into adjacent habitats, such as the Phoenix Park during site demolition, clearance and reconstruction. Appropriate measures include covering flat blocks with synthetic fabric to contain dust during demolition, erection of plywood barriers around the site and bunding demolition waste prior to its removal from the site. A petrol/oil interceptor should be incorporated into the surface water system to prevent petrol or oil runoff into the Liffey catchment. All fuel tanks should be located in a suitable area and fully bunded. Inlets and outlets for these should be located within the bunded area.

#### **16.7.3 OPERATIONAL PHASE**

Maintain flowering lawn and/or wildflower meadow as per directions from supplier.

#### **16.8 LANDSCAPE AND VISUAL IMPACT**

##### **16.8.1 CONSTRUCTION STAGE**

A construction management plan will be prepared and will address the detail of mitigation measures that can be employed to reduce and minimise potentially negative impacts upon landscape character and visual amenity. These should include the following considerations.

Ensure each phase of development will be completed quickly – construction sites will most likely have a significant negative impact on visual amenity for adjoining properties roads and the public realm, therefore the sooner construction is complete and the site occupied, the sooner negative visual impacts are reduced or removed completely;

Ensure any design changes during the construction phase do not reduce the visual qualities of new buildings;

Where possible, complete early stages of construction that will screen construction activities behind them. For example, completing the construction of housing blocks A and D first would afford neighbouring

existing dwellings a degree of screening during the construction of Apartment Blocks B and C. Planting boundaries or open spaces as far in advance of construction as possible can deliver additional screening during the construction phase and a mature landscape by the time buildings are occupied;

Where practical, locate contractors' compounds, site offices and parking areas where they will be least overlooked from nearby roads and dwellings. Careful management of parked and waiting vehicles, particularly HGVs similar large construction traffic, will be required to avoid or minimise negative visual impacts extending beyond the site boundaries;

Review and adjust site lighting on site to minimise light (and noise from generators) spilling onto neighbouring dwellings; minimise security lighting.

## **16.8.2 OPERATIONAL PHASE**

All buildings and public areas should be maintained to a high standard to ensure: the successful establishment of new planting; a continuing high standard of finish to built structures, pavements and furniture; and avoidance of a build-up of litter or graffiti.

Some of the public open spaces may be used to accommodate temporary activities, events or structures, or there may be permanent changes deemed appropriate in the future. New negative visual impacts can be avoided or minimised by ensuring that temporary uses of these spaces do not cause any permanent damage to them, and where damage does occur, these must be rectified immediately and in accordance with the original design detailing. Deliberate and permanent changes to public open spaces, or indeed any of the adjoining buildings, must not degrade the quality and character of the proposed development.

## **16.9 SOIL, WATER, HYDROLOGY AND HYDROGEOLOGY**

### **16.9.1 CONSTRUCTION PHASE**

The following mitigation measures are proposed for the construction phase of the proposed development with reference to reduction of impact on solid and drift geology as well as hydrology and hydrogeology:

- Construction works will be carried out with the least feasible disturbance of soils. All sub soils should remain on site and engineered into the design solution in order to minimise materials leaving the site;
- Basement excavations should be kept to a minimum to reduce impacts to the subsoil, topsoil and drift geology;
- Where soil stripping/ excavation occurs the resulting excavated soil fractions will be separated into topsoil and subsoil stockpiles.
- Temporary storage of spoil will be managed to prevent accidental release of dust and uncontrolled surface water run-off which may contain sediment and solid matter.

- Heavy vehicle movement and construction works on exposed soils will be minimised during prolonged periods of wet weather.
- Areas compacted due to heavy vehicle/machinery movements will be concentrated wherever possible on areas proposed for future hardstanding / impervious features i.e. roads, buildings.
- Any soil excess to the requirements of the cut and fill operation at the site will be conveyed to an appropriately licensed or permitted facility by a licensed contractor in accordance with Local Authority/EPA guidelines. The soil volume will be kept to a minimum.
- Dewatering measures should only be employed where necessary;
- In the event of groundwater being encountered during the construction phase, mitigation measures will include dewatering by pumping to an appropriate treatment facility prior to discharge. Other measures would include excluding contaminating materials such as fuels and hydrocarbons from sensitive parts of the site i.e. highly vulnerable groundwater areas.
- To minimise any possible contamination of the surface watercourses in the vicinity, which would ultimately discharge to the River Liffey, a settlement pond and interceptor trenches will be constructed along the southern boundary (lowest contour level ) of the site.
- Mitigation measures should be put in place by the contractor in relation to storage of fuels and other materials and general maintenance of the site.
- Construction of the proposed roads infrastructure should be conducted in a controlled manner and in such a way as to prevent risk of flooding to locations downstream.
- Surface water collecting in excavations should be directed to on-site settlement ponds, where silt removal will be facilitated prior to discharge to the further reduce the possibility of contaminants entering the local water system.
- If concrete mixing is carried out on site, the mixing plant should be sited in a designated area with an impervious surface.
- When it is necessary to store diesel or oil fuels on site, they should be stored in appropriate containers in bunded storage areas.
- Any hazardous construction materials shall be stored appropriately;
- Sewage generated during the construction phase of the project would be discharged to temporary portable toilet facilities. These units would be maintained and the waste collected therein would be disposed of using an appropriate contractor. The potential impacts of wastewater on soil and groundwater media are therefore considered to be minimal.

#### **16.9.2 OPERATIONAL PHASE**

The following mitigation measures are proposed for the operational phase of the proposed development with reference to reduction of impact on solid and drift geology as well as hydrology and hydrogeology:

- Stormwater storage structures and drainage systems should incorporate infiltration to promote the potential for ground water recharge.
- Regular inspection of the hydraulic controls, gullies, catchpits and petrol interceptors will be required to prevent contamination and increased runoff from the site or contribution to the shallow hydrogeology. Warning alarms should be provided.
- In order to reduce the risk of defective or leaking sewers or water supply pipework, all new pipework should be laid in accordance with the relevant standards, pressure tested and CCTV surveyed as appropriate to ascertain any possible defects.

## **16.10 AIR QUALITY AND CLIMATE**

### **16.10.1 DEMOLITION PHASE**

In order to ensure that the demolition phase of the development does not have an adverse impact on local air quality, a strictly enforced air emissions programme shall be implemented at the site from the outset of demolition activities.

Best practice techniques specified in guidance documents for the Construction and Demolition Sector shall be implemented during the demolition phase and are detailed in this Section as follows:

- A 3m high solid wooden hoarding with a 3m high dust net shall be erected around the entire construction site perimeter giving a total dust barrier height of 6m.
- All buildings in which asbestos has been identified shall be sealed during the asbestos removal process. Asbestos shall only be removed by an appropriately permitted company. All asbestos waste shall be double bagged, stored in a dedicated sealed waste container/skip prior to removal off-site for disposal at an appropriately permitted/licenced facility. Records of all asbestos waste removed from site shall be maintained by the site manager and certificates of destruction shall be provided by the asbestos removal contractor. Asbestos surveys shall be conducted by an appropriately HSE approved contractor.
- Dust suppression techniques will include water spraying of stock piles and haul roads and temporarily curtailing specific operations when unfavourable weather conditions are prevailing (eg during dry, windy weather when the prevailing winds may cause dust to be blown towards local receptors).
- High Power water misting / spraying plant shall be used during the demolition activities to suppress and control dust emissions.
- All buildings shall be thoroughly wetted down prior to commencement of building demolition to suppress high level dust emissions.

- All demolition plant shall be fitted with high pressure water sprays to direct water onto demolition point. See Figure 11.3.
- Mobile crushing units (if utilised on-site) shall be fitted with spray bars to suppress dust generated by the crushing activity.
- Temporary dust screens shall be fitted around all mobile crushing plant (if used on-site).
- Demolition stockpiles shall be kept to an absolute minimum and all C&D waste shall be promptly removed from site.
- Demolition stockpiles shall be covered by tarpaulin during dry and windy weather.
- Dust screens comprising of wooden hoarding and fine mesh netting shall be erected at all site boundaries to minimise fugitive dust emissions extending beyond site boundaries to any occupied residential units or sensitive receptors.
- A road sweeper vehicle shall be on-site at all times to clean soiled public roads in the vicinity of the site.
- A mobile wheel wash unit shall be installed at the site exit to wash down the wheels of all trucks exiting the site.
- An independent environmental consultant shall be appointed by the contractor to prepare a dust control and monitoring method statement prior to the commencement of site activities and to witness all demolition activities to ensure that the specified dust mitigation measures are implemented.
- A weekly inspection of each dust gauge will ensure that the site manager identifies at the earliest instance if dust suppression techniques shall be implemented at the project site areas.
- A programme of dust deposition monitoring and real time PM10 monitoring shall be implemented at the site boundaries prior to and for the duration of demolition activities to ensure that the air quality standards relating to PM<sub>10</sub> are not exceeded.
- Where dust levels exceed specified air quality limit values, dust generating activities shall immediately cease and alternative working methods shall be implemented.
- A complaints log shall be maintained by the site manager and in the event of a complaint relating to dust nuisance, an investigation shall be initiated.

#### **16.10.2 CONSTRUCTION PHASE**

In order to ensure that adverse air quality impacts are minimised during the construction phase and that the potential for soiling of property and amenity and local public roads is minimised, the following mitigation

measures shall be implemented during the course of all construction activities.

- Avoid unnecessary vehicle movements and manoeuvring, and limit speeds on site so as to minimize the generation of airborne dust.
- Use of rubble chutes and receptor skips during construction activities
- During dry periods, dust emissions from heavily trafficked locations (on and off site) will be controlled by spraying surfaces with water and wetting agents.
- Hard surface roads will be swept to remove mud and aggregate materials from their surface while any un-surfaced roads will be restricted to essential site traffic only.
- Re-suspension in the air of spillages material from trucks entering or leaving the site will be prevented by limiting the speed of vehicles within the site to 10kmh and by use of a mechanical road sweeper.
- The overloading of trucks exiting the site shall not be permitted.
- Aggregates will be transported to and from the site in covered trucks.
- Where possible, material from the demolished stockpile shall be recycled and reused on site as fill material to minimise the usage of virgin aggregates from quarries. This shall reduce the energy required to both quarry and process the construction aggregates and the energy required to transport them from quarry to site.
- Where the likelihood of windblown fugitive dust emissions is high and during dry weather conditions, dusty site surfaces will be sprayed by a mobile tanker bowser.
- Wetting agents shall be utilised to provide a more effective surface wetting procedure.
- Exhaust emissions from vehicles operating within the construction site, including trucks, excavators, diesel generators or other plant equipment, will be controlled by the contractor by ensuring that emissions from vehicles are minimised by routine servicing of vehicles and plant, rather than just following breakdowns; the positioning of exhausts at a height to ensure adequate local dispersal of emissions, the avoidance of engines running unnecessarily and the use of low emission fuels.
- All plant not in operation shall be turned off and idling engines shall not be permitted for excessive periods.
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.

- Material stockpiles containing fine or dusty elements shall be covered with tarpaulins.
- Where concrete batching plants are erected on site, they shall be maintained and kept clean on a daily basis. If cement is stored in a silo on site, a filter will be fitted to the silo. Alternatively, ready-mix concrete will be supplied by truck. These plants shall be located at a site location away from the closest receptors to the site.
- Where drilling or pavement cutting, grinding or similar types of stone finishing operations are taking place, measures to control dust emissions will be used to prevent unnecessary dust emissions by the erection of wind breaks or barriers. All concrete cutting equipment shall be fitted with a water dampening system.
- An independent environmental consultant shall be appointed by the contractor to prepare a dust control and monitoring method statement prior to the commencement of site activities to ensure that the specified dust mitigation measures are implemented.
- A programme of dust deposition monitoring and real time PM<sub>10</sub> monitoring shall be implemented at the site boundaries prior to and for the duration of construction phase activities to ensure that the air quality standards relating to PM<sub>10</sub> are not exceeded.
- Where dust levels exceed specified air quality limit values, dust generating activities shall immediately cease and alternative working methods shall be implemented.
- A complaints log shall be maintained by the site manager and in the event of a complaint relating to dust nuisance, an investigation shall be initiated.

### **16.10.3 OPERATIONAL PHASE**

The Operational Phase of the re-developed site will not generate air emissions that would have an adverse impact on local ambient air quality or local human health and as such there are no mitigation measures specified for the Operational Phase.

## **16.11 NOISE AND VIBRATION**

### **16.11.1 GENERAL CONSTRUCTION SITE MANAGEMENT**

The following noise management measures shall be implemented at the site from the outset of site activities to control and manage noise levels during the demolition and operational phases.

- An independent acoustic consultant shall be engaged by the contractor prior to the commencement of site activities to ensure that all noise mitigation measures as specified in this Section of the EIS are implemented and to prepare a site specific *Construction Phase Noise Management Plan*. The Plan shall include all relevant noise and

vibration control measures as specified in *BS 5228:1997 – Noise and Vibration Control on Construction and Open Sites*. The Plan shall be submitted to Dublin City Council for approval.

- The nominated contractor shall appoint a designated person to manage all environmental complaints including noise.
- A noise complaint procedure shall be implemented in which the details of any noise related complaint are logged, investigated and where required, measures are taken to ameliorate the source of the noise complaint.
- A 3m solid and continuous wooden hoarding shall be erected around the entire site perimeter and shall serve to be an effective acoustic barrier.
- Appropriate signage shall be erected on all access roads in the vicinity of the site to inform HGV drivers that engines shall not be left idling for prolonged periods and that the use of horns shall be banned at all times.
- HGV's queuing on any local or public road shall not be permitted and it shall be the responsibility of site management to ensure this policy is enforced.
- The hours of operation for the site shall be limited to the following hours:  
  
07:00hrs – 19:00hrs Monday to Friday  
07:00hrs – 14:00hrs Saturday  
Closed on Sundays and Bank/Public Holidays
- All onsite generator units (if required) used to supply electricity to the site shall be super silenced and located away from any receptor.

#### **16.11.2 DEMOLITION & CONSTRUCTION PHASE NOISE MITIGATION**

In order to ensure that the demolition phase of the development does not have an unacceptable impact on existing ambient noise levels, a strictly enforced noise management programme shall be implemented at the site from the outset of demolition activities.

- The principal of controlling noise at source shall be implemented at the site. Best practice mitigation techniques as specified in *BS 5228:1997 – Noise and Vibration Control on Construction and Open Sites* for the Construction and Demolition Sector shall be implemented during the demolition phase and are detailed in this Section.
- A 3m high solid wooden hoarding surrounding the development site shall act as an effective noise barrier.
- All plant where possible shall be low noise rated.

- High noise activities such as pneumatic hammering shall not occur before 09:00hrs and not after 17:00hrs Mondays to Fridays.
- Where necessary the use of enclosures and noise screens shall be used to control noise from plant.
- Plant shall be located away from the closest noise sensitive receptors where practicable.
- All site vehicles shall either be turned off when not in use or throttled down when idle.
- Site plant and vehicles shall be maintained to ensure they are not excessively noisy.
- Vibration sources such as compressors, pumps or generators shall be isolated and placed on anti-vibration pads to minimise ground vibrations and vibrational noise.
- Site offices / cabins shall be grouped together in a manner that forms an additional noise barrier relative to the closest receptors to the site boundaries.
- Noise measurements shall be conducted in accordance with the requirements of *ISO 1996: Acoustics – description and measurement of environmental noise*. The measurement parameters to be recorded include wind speed, temperature,  $L_{Aeq}$ ,  $L_{A90}$ ,  $L_{A10}$  and  $L_{Amax}$ . Noise measurements shall be conducted at the closest receptors to the site on a routine (weekly) basis to verify the effectiveness of all noise mitigation measures.

### 16.11.3 DEMOLITION & CONSTRUCTION PHASE VIBRATION MITIGATION

The following demolition and construction phase vibration mitigation measures shall be implemented:

- In order to ensure that site demolition / construction activities are conducted to minimise the vibration impacts on the receiving environment, structural vibration monitoring shall be conducted during the course of the project works. It is proposed that vibration monitoring will be conducted at adjacent properties as required using calibrated vibration monitors and geophones and that audible and visual alarm units may be installed to ensure that if vibration levels approach or exceed specified warning and limit values, site personnel will be alerted to cease at the earliest instance and appropriate mitigation measures may then be implemented to minimise the vibrational impacts of protected structures.
- The transient vibration guide values for cosmetic damage as specified in British Standard *BS 7385: Evaluation and measurement for vibration in buildings, Part 2 1993 Guide to damage levels arising from ground borne vibration* is 15 mm/sec Peak Component Particle Velocity at 4 Hz increasing to 20 mm/sec at 15 Hz. This limit value rises to 50 mm/sec at frequencies of 40 Hz and greater. The applied

conservative limit of 12.5 mm/sec PPV (peak particle velocity) applied for this assessment is significantly lower than these levels.

- The limit level of permissible vibration is 12.5 mm/sec (PPV) is specified in *BS 7385: 1993*. This international standard states that *“the probability of damage tends towards zero at 12.5 mm/sec ppv”* and as such it is considered appropriate to adopt this conservative limit value for this assessment, however, a lower limit value of 5 mm/sec (PPV) shall be prescribed for all protected structures in the vicinity of the site.

#### **16.11.4 OPERATIONAL PHASE NOISE MITIGATION**

The following operational phase noise mitigation measures shall be implemented:

- Sound Insulation testing shall be conducted following the completion of each phase of the development to further verify compliance with Building Regulations.
- All external windows shall be triple glazed acoustically rated windows and frames to prevent the breakthrough of external noise including road traffic and social noise.
- Passive air vents on all external walls of all residential units shall be acoustically rated baffle filters to reduce the breakthrough of external noise into all residential units.
- All extraction ducting that may be incorporated into the ground floor retail/commercial units shall be appropriately constructed to ensure that vibration borne noise shall not occur within the building.
- All extraction fans serving any retail/commercial unit shall be located away from any residential unit, shall be installed in an acoustic enclosure and shall include acoustic silencers and baffles to minimise noise.
- Heating systems shall be located in the basement of the building structures and shall be contained in sound insulated rooms. All plant shall be set on anti-vibration mounts on floors and walls.
- All ventilation and air extraction systems serving building plant shall be located away from any residential unit and shall include acoustic silencers and baffles to minimise noise.
- All shop/supermarket retail units at ground floor level shall include low noise floor coverings in all retail area and storage areas. Deliveries to all retail units shall be limited to daytime hours. Delivery areas shall be enclosed to ensure that noise shall not adversely impact the closest receptors in Montpellier Gardens to the south of the site.

## **16.12 DAYLIGHT AND SUNLIGHT**

There are no mitigation measures which would be effective in increasing the sunlight and daylight access to the proposed Phase 1A development. Aurea Consulting has worked in conjunction with Dublin City Council architects in the design development in order to ensure that sunlight and daylight access is maximised, whilst also ensuring that the proposed Phase 1A development achieves its objectives in making the most appropriate use of this urban brownfield site.

## **16.13 MATERIAL ASSETS**

### **16.13.1 CONSTRUCTION PHASE**

The following mitigation measures are proposed for the construction phase of the proposed development with reference to reduction of impact on existing water based and utility based infrastructure:

- Temporary filtration should be provided prior to discharge to the public sewer. All levels of discharge to the public sewer are to be agreed with the local authority.
- Existing surface channels drainage within the subject site that serve adjacent lands should be retained to prevent causing flooding impacts.
- No flows shall enter the public sewer without the approval of the local authority
- All surface flows shall be managed on site in a sustainable fashion and to the agreement of the local authority.
- To minimise disruption to service, connections shall be made during low usage time periods and with the agreement of the utility providers and or local authority.
- Full liaison should take place with local residents both within the subject site and around the periphery with regard to access and service loss. A fully detailed programme should be prepared with outages and loss of access identified.

### **16.13.2 OPERATIONAL PHASE**

The following mitigation measures are proposed for the operational phase of the proposed development with reference to reduction of impact on existing water based and utility based infrastructure.

- A properly designed surface water system incorporating SUDS and designed in accordance with the Greater Dublin Strategic Drainage Study (GDSDS) would minimise the overall impact of the development on the existing environment and water based infrastructure. The reduction in treatment and pumping of water entering the combined sewer would also reduce energy demand beyond the site extents
- Surface water discharge rates should be reduced to past Greenfield run-off rates to prevent increased flood risk.

- Consideration should be given to at source management of surface water from roads using swales and filtration trenches.
- It is envisaged that the development would take place and be occupied over a reasonable time period , and therefore the downstream foul sewerage system (foul sewer network and wastewater treatment facility) would be gradually loaded.
- No remedial works would be required to the existing combined sewer pipe-work after the introduction of development generated foul flows.
- Water conservation methods such as the use of low flush toilets and grey water reuse should be incorporated into dwellings to reduce water volumes and related treatment and abstraction costs of the development.
- Building design should incorporate energy reduction measure to reduce the load on existing systems. Public Lighting systems should also seek to reduce consumption with at source generation.
- Consideration should be given to the development of a power hub to the development and utilising green technologies to feed supplies back where generated or abstracted.