

19 SUMMARY OF MITIGATION MEASURES

19.1 Introduction

This Chapter of the EIAR collates and summarise the mitigation measures recommended for each of the environmental topics examined in Chapters 5 – 18 of this EIAR.

These mitigation measures and any associated monitoring comprise what would be implemented during the Demolition, Construction and Operational Phase to reduce the potential for significant adverse impact of the proposed development on the environment.

This Chapter does not expand on the reasoning or expected effectiveness of the proposed mitigation or monitoring measures. For such descriptions, we refer to each of the individual chapters of the EIAR.

A number of the recommended mitigation measures would be expected to be required as a condition of any grant of permission by An Bord Pleanála.

19.2 Proposed Mitigation Measures

19.2.1 Population and Human Health (Chapter 5)

There are no specific mitigation measures proposed for Human Health. Mitigation measures proposed to minimise the potential impacts on human health in terms of air quality, landscape & visual impact and noise & vibration are discussed in the relevant sections of Chapters 9: Climate (Air Quality and Climate Change), Chapter 12: Air (Noise & Vibration) and Chapter 13: Landscape & Visual Impact respectively.

Chapter 14: Material Assets (Transportation), addresses mitigation measures proposed to reduce the impact of additional traffic movements to and from the development.

19.2.2 Biodiversity (Chapter 6)

Construction Stage

No designated conservation areas will be impacted in any way by the proposed development and no mitigation measures are required in this regard. Full details are provided in the accompanying report – Information for Screening for Appropriate Assessment.

In order to ensure that any ecological impacts are minimised and adequately mitigated a number of measures will be incorporated into the development design, as follows:

Habitats

As it is proposed to change the site from an agricultural to an urban character in the case of the Residential Area and from an agricultural to an amenity character in the case of the Golf Development Area, it is not possible to mitigate all of the potential impacts on local ecological receptors.

In order to mitigate the habitat loss, and in order to maximise the biodiversity value of the retained habitat and to ensure that habitat connectivity in the wider area is maintained, significant new planting will be incorporated into the landscape design (Chapter 13: Landscape and Visual Assessment) for the proposed development. This planting will, wherever possible, comprise an appropriate mixture of native trees and shrubs, preferably of local provenance, and including species attractive to pollinators.

The planting will also incorporate a range of species that will attract feeding invertebrates, including moths, butterflies and bees. It will take account of and implement the relevant objectives of the All-Ireland Pollinator Plan 2015-2020.

The planting will, over time, provide replacement habitat of benefit to the bats and birds that will continue to use the site and its boundaries. Connectivity to Shanganagh Park to the north will be maintained.

All site clearance and landscaping works will comply with current legislative requirements and best practice. In particular, trees to be retained will be treated in accordance with British Standard BS5837:2012 Trees in Relation to Design, Demolition and Construction – Recommendations, with protective fencing being installed around all trees and hedgerows to be retained, prior to commencement of development. All planting plans and landscaping proposals will further ensure that no invasive species are introduced, either deliberately or inadvertently, to the site.

Fauna

Where feasible and practicable, the removal of trees and other features suitable for use by nesting birds will be undertaken outside the bird nesting season (avoiding the period 1st March to 31st August). Should the construction programme require vegetation clearance between March and August bird nesting surveys will be undertaken by suitably experienced ecologists. If no active nests are recorded, vegetation clearance will take place within 24 hours. In the event that active nests are observed, an appropriately sized buffer zone will be maintained around the nest until such time as all the eggs have hatched and the birds have fledged – a period that may be three weeks from the date of the survey. Once it is confirmed that the birds have fledged and no further nests have been built or occupied, vegetation clearance may take place immediately.

No bat roosts have been recorded at Woodbrook and it will not be necessary to apply for a derogation licence under Regulation 54 or 55 of the European Communities (Birds and Natural Habitats) Regulations 2011-2015.

All mature trees shall be checked for bats by a bat specialist to identify trees with the highest potential prior to felling (this may change between the survey date and felling based on limb damage, storms etc.). From this, trees with the highest roost potential as determined by the bat specialist shall be subjected to a higher level of examination that shall include thorough checking of all suitable crevices, cavities, ivy cover or loose bark. This may require access via a hoist to reach all suitable cavities and crevices.

All mature oak, chestnut and ash are of high value as roost trees but individual trees with cavities, crevices, loose bark etc. may be beneficial regardless of species.

A total of six bat boxes (such as Schwegler 2F) and four bird boxes (such as Schwegler 1B or similar) will be erected, with advice from the project ecologist, on mature trees, within or on the perimeter of the proposed development site.

As described in Section 6.5.1.2, all new lighting for the proposed development at Woodbrook has been designed by Atkins Consulting Engineers taking account of the recommendations of Bat Conservation Ireland (2010), Bat Conservation Trust (2018) and the Institute of Lighting Professionals (2011).

In summary, the following measures are incorporated: -

- No floodlighting will be used – this causes a large amount of light spillage into the sky. The spread of light will be kept below the horizontal.
- Hoods, louvres, shields or cowls will be fitted on the lights if necessary to reduce light spillage if high intensity lighting is required or to protect trees or other potential roosts from light overspill.
- Lights will be of low intensity. Where applicable several low intensity lights will be used rather than one strong light spilling light across the entire area.
- Narrow spectrum lighting will be used with a low UV component and warm (3000K) colour temperature.

The lighting scheme for the proposed development, designed by Atkins, adheres to these lighting design characteristics. In particular, the following measures have been designed: -

- Luminaire selection limits upward light spill.
- Light levels will be reduced late at night.
- The lighting scheme achieves the recommended lux levels in accordance with current regulations and standards.
- The lighting scheme achieves good uniformity throughout the development to ensure good visibility at night.
- Light positions have been coordinated with the landscape Masterplan to ensure light positions do not clash with tree position.

Any ponds present in the fields to be disturbed will be inspected by a suitably experienced ecologist prior to works being undertaken. Should any frog spawn or tadpoles be discovered, a licence to remove frog spawn may be required from NPWS.

The badger sett, which is located outside of but immediately adjacent to the northern boundary of the Phase 1 site (shown in Figure 6.4), will be protected for the duration of the construction phase. Prior to any construction work being undertaken a solid 3m hoarding will be erected along the construction site perimeter to protect the sett from disturbance. Subject to licence and agreement with NPWS, the hoarding, which will be set back as far as possible from the sett, will be augmented with a buried vertical barrier to ensure that badgers are prevented from digging tunnels into the works area. This buried barrier will be installed outside of the badger breeding season (i.e. outside the period 1 December to 31 June) and under the supervision of an experienced ecologist.

The sett will be subject to regular monitoring throughout the construction phase. The sett protection measures will be retained in place until a new, replacement sett for the badger group has been constructed (see Section 6.5.1.1), unless otherwise agreed with NPWS and Dún Laoghaire-Rathdown County Council. The provision of a replacement sett does not form part of the current planning application.

All mitigation measures will be undertaken under the terms of a licence issued by NPWS, and in consultation with the local Conservation Ranger and the Dún Laoghaire-Rathdown County Council Biodiversity Officer.

Aquatic environment and watercourses

The construction management of the site will take account of the recommendations of the Construction Industry Research and Information Association (CIRIA) guides 'Control of Water Pollution from Construction Sites' and 'Groundwater control - design and practice' to minimise as far as possible the risk of pollution.

Together with the OCEMP (prepared by AWN Consulting) and the measures outlined in Chapter 8: Water, prepared by Atkins Consulting Engineers, the following best practice measures will be adopted: -

- Drainage ditches, nearby streams (i.e. the Crinken/Woodbrook Stream and the newly constructed storm water systems) will be protected from ingress of silt, debris and deleterious material during all phases of construction.
- Appropriately designed silt prevention measures will be installed if necessary and will be regularly maintained and retained in situ for the duration of the construction phase, until such time as all proposed permanent surface water protection measures are installed and operational.
- Discharge Licences – It will not be permitted to discharge into any newly constructed storm water systems or watercourse without adhering to the conditions of the discharge licence and agreeing the same with the Site Manager and Local Authority Area Engineer.

- Discharge of surface water from the construction site will be via silt/sediment trap and/or temporary hydrocarbon interceptors and will be monitored to meet any requirements set by the Local Authority/Environmental Protection Agency.
- No discharge will occur where there is a risk of cement or residue in the discharge.
- Concrete Washout – The washing out of concrete trucks on site will not be permitted as they are a potential source of high alkalinity in watercourses. Consequently it is a requirement that all concrete truck washout takes place back in the ready-mix depot.
- Control of spoil and other materials to prevent spillage, and through appropriate handling and selection of spoil/material storage locations.
- Careful siting and bunding of fuel storage facilities and any areas used for the storage of potentially hazardous materials.
- Appropriate construction techniques will seek to ensure that groundwater seepage into excavated areas does not take place.

The strategy for controlling and mitigating potential adverse environmental during construction will also include the following, as appropriate: -

- If required, sampling and testing of excavated spoil in order to assess the suitability of materials for reuse on site.
- The use of piling systems designed to minimise impacts on the groundwater.
- Dust suppression from soils by the regular use of water sprays during any dry conditions, sheeting of haulage vehicle loads, use of wheel washers.
- Should invasive weeds be found, they will be treated as controlled waste and disposed of off-site at a landfill site that is licensed to receive such material.
- The storage of hazardous liquids (fuels and chemicals) will be avoided in so far as is possible. The handling and storage of any potentially hazardous liquids on site will be controlled and best practice guidance such as that published by the EPA, will be followed. Storage tank/container facilities will be appropriately bunded within designated compound areas and sited as far as possible from any watercourse or surface drain.
- If hazardous liquids escape during the works, the bunds and other protective measures will contain the spillage until remedial action, which will be taken as soon as possible.
- Procedures will be drawn up to control all potentially contaminating materials brought on site.

The implementation and effectiveness of these standard best-practice mitigation measures will be inspected and recorded regularly during the construction period and where deficiencies or faults are identified they will be remedied immediately by the contractor.

19.2.3 Land, Soils and Geology (Chapter 7)

Construction Phase

Stripping of topsoil will be carried out in a controlled and carefully managed way and coordinated with the proposed staging for the development. At any given time, the extent of topsoil strip (and consequent exposure of subsoil) will be limited to the immediate vicinity of active work areas. Topsoil stockpiles will be protected for the duration of the works and will be located so as not to necessitate double handling.

The design of road levels and finished floor levels has been carried out in such a way as to minimise cut/fill type earthworks operations. The duration that subsoil layers are exposed to the effects of weather will be minimised. Disturbed subsoil layers will be stabilised as soon as practicable (e.g. backfill of service trenches, construction of road capping layers, construction of building foundations and completion of landscaping).

Similar to comments regarding stripped topsoil, stockpiles of excavated subsoil material will be protected for the duration of the works. Stockpiles of subsoil material will be located separately from topsoil stockpiles.

The excavation of material will be minimised as much as possible to reduce the impact on soils and geology. Topsoil and any native soils that can be used for amenity purposes will be stockpiled on the proposed development area for use as required in the final landscaping of the development.

Any surplus material, or materials which are deemed not suitable for onsite reuse will be Classified as non-hazardous or hazardous in accordance with the EPA waste Classification Guidelines (2015). It will be managed, transported and disposed of in accordance with the requirements of the Waste Management Act 1996, as amended, the Waste Framework Directive 2008/98/EC of the European Parliament and Council on waste and any relevant subsequent waste management legislation.

An Outline Construction and Demolition Waste Management Plan has been generated for the site (prepared by AWN Consulting Ltd.). A project specific Detailed Waste Management Plan will be fully implemented onsite for the duration of the project.

Mitigation measures for the prevention of soil / bedrock contamination during construction are proposed below. Mitigation measures outlined in Chapter 8: Water are also applicable to the protection of soils and geology during the construction phase: -

- Earthworks plant and vehicles delivering construction materials to site will be confined to predetermined haul routes around the site.
- Vehicle wheel wash facilities will be installed near any site entrances and road sweeping implemented as necessary to maintain the road network in the immediate vicinity of the site.
- Dust suppression measures (e.g. dampening down) will be implemented as necessary during dry periods.
- The employment of good construction management practices will serve to minimise the risk of pollution from construction activities at the proposed development in line with the Construction Industry Research and Information Association (CIRIA) publication entitled, Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors, CIRIA - C532 (2001) which are also detailed in Chapter 8: Water. Specifically, regarding soils and geology, the following will be adhered to: -
 - Fuels, lubricants and hydraulic fluids for equipment used on the construction site, as well as any solvents, oils, and paints will be carefully handled to avoid spillage, properly secured against unauthorised access or vandalism, and provided with spill containment according to best codes of practice.
 - Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the proposed development for disposal or re-cycling.
 - Any spillage of fuels, lubricants or hydraulic oils will be immediately contained and the contaminated soil removed from the proposed development and properly disposed of.
- All site vehicles used will be refuelled in bunded and adequately sealed and covered areas in the construction compound area.
- All plant and machinery will be serviced before being mobilised to site.
- No plant maintenance will be completed on site, any broken-down plant will be removed from site to be fixed.
- Refuelling will be completed in a controlled manner using drip trays at all times.
- Mobile bowsers, tanks and drums will be stored in secure, impermeable storage areas away from open water.
- Fuel containers will be stored within a secondary containment system, e.g. bunds for static tanks or a drip tray for mobile stores.

- Containers and bunding for storage of hydrocarbons and other chemicals will have a holding capacity of 110% of the volume to be stored.
- Ancillary equipment such as hoses and pipes will be contained within the bund.
- Taps, nozzles or valves will be fitted with a lock system.
- Fuel and chemical stores including tanks and drums will be regularly inspected for leaks and signs of damage.
- Drip-trays will be used for fixed or mobile plant such as pumps and generators to retain oil leaks and spills.
- Only designated trained operators will be authorised to refuel plant on site.
- Procedures and contingency plans will be set up to deal with emergency accidents or spills.
- An emergency spill kit with oil boom, absorbers etc. will be kept on-site for use in the event of an accidental spill. A specific team of staff will be trained in the use of spill containment.
- Strict supervision of contractors will be adhered to in order to ensure that all plant and equipment utilised on-site is in good working condition. Any equipment not meeting the required standard will not be permitted for use within the site. This will minimise the risk of soils and bedrock becoming contaminated through site activity.
- The highest standards of site management will be maintained and utmost care and vigilance followed to prevent accidental contamination or unnecessary disturbance to the site and surrounding environment during construction. A named person will be given the task of overseeing the pollution prevention measures agreed for the site to ensure that they are operating safely and effectively.
- All excavated materials will be stored away from the excavations, in an appropriate manner at a safe and stable location. The maximum height of temporary stockpiles will be 3m.
- A comprehensive monitoring and supervisory regime including monitoring of all excavations and stability assessments as required will be put in place to ensure that the proposed construction works do not constitute a risk to the stability of the site.

All of the above mitigation measures will form part of a site-specific Construction Environmental Management Plan (CEMP) which will be in operation during the construction phase.

Operational Phase

The area used for the rising mains will be reinstated. The land used for the rising mains can continue to be used for recreational purposes and incorporated into the pathways and landscaping areas associated with the burial grounds of Shanganagh Cemetery. 2.96 Ha of the main housing development area will be designated public open space. No mitigation measures will be required during the operational phase.

19.2.4 Water (Chapter 8)

Construction Phase

The construction management of the site will take account of the recommendations of the Construction Industry Research and Information Association (CIRIA) guides 'Control of Water Pollution from Construction Sites' and 'Groundwater control - design and practice' to minimise as far as possible the risk of pollution. With regard to groundwater and surface water protection impacts the following mitigation measures are proposed: -

- Fuels, lubricants and hydraulic fluids for equipment used on the construction site, as well as any solvents, oils, and paints will be carefully handled to avoid spillage, properly secured against unauthorised access or vandalism, and provided with spill containment according to best codes of practice.
- Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the proposed development for disposal or re-cycling.
- Any spillage of fuels, lubricants or hydraulic oils will be immediately contained and the contaminated soil removed from the proposed development and properly disposed of.
- All site vehicles used will be refuelled in bunded and adequately sealed and covered areas in the construction compound area.
- Strict supervision of contractors will be adhered to in order to ensure that all plant and equipment utilised on-site is in good working condition. Any equipment not meeting the required standard will not be permitted for use within the site. This will minimise the risk of groundwater becoming contaminated through site activity.
- Stripped soils should be stockpiled a minimum distance of 10m from the drainage ditch and should be appropriately covered. A temporary storm water management system should be implemented by the Contractor.
- All groundwater temporarily dewatered during the construction of the attenuation tanks, wastewater pumping station and any deep building foundations will be treated via the installation of a temporary in-situ water treatment system: -
 - This system should be designed and sized to ensure that all pumped groundwater water is treated prior to discharge to the existing drainage ditch onsite, which drains to the Rathmichael River.
 - The Contractor will be required to provide a site-specific dewatering plan, clearly setting out proposed excavation methodology, estimated dewatering rates, details of proposed treatment system, and discharge location.

The following standard mitigation measures regarding temporary oil / chemical storage and refuelling are proposed: -

- All oil stored on site for construction vehicles will be kept in a locked and bunded area.
- Generators, pumps and similar plant will be placed on drip-trays to prevent contamination.
- All site vehicles used will be refuelled in bunded areas.
- All temporary construction fuel tanks will also be located in a suitably bunded area and all tanks will be double skinned. In addition, oil absorbent materials will be kept on site in close proximity to any fuel storage tanks or bowsers during proposed site development works.
- All deliveries to on-site oil storage tanks will be supervised.
- Records will be kept of delivery dates and volumes.
- All valves should be of steel construction and the open and close positions should be clearly marked.

The following standard mitigation measures regarding cement handling during construction are proposed: -

- No mixing of concrete will be carried out on site. The measures detailed below will be employed where poured concrete is being used in the construction process.
- The production, transport and placement of all cementitious materials will be strictly planned and supervised. Site batching/production of concrete will not be carried out on site and therefore these aspects will not pose a risk to the waterbodies present, namely any temporarily exposed groundwater, or to the onsite drainage ditch or Rathmichael River.

- Shutters will be designed to prevent failure. Grout loss will be prevented from shuttered pours by ensuring that all joints between panels achieve a close fit or that they are sealed.
- Any spillages will be cleaned up and disposed of correctly.
- Where concrete is to be placed by means of a skip, the opening gate of the delivery chute will be securely fastened to prevent accidental opening.
- Where possible, concrete skips, pumps and machine buckets will be prevented from slewing over water when placing concrete.
- Surplus concrete will be returned to batch plant after completion of a pour.

The above mitigation measures will form part of the Outline Construction Environmental Management Plan (CEMP) submitted as part of this planning application, and which will be further developed by the Contractor within the project-specific Detailed CEMP which will be in operation during the construction phase.

Operational Stage

The following specific mitigation measures are proposed during the operational phase: -

- All plant and equipment utilised onsite during maintenance works should be checked and in good working condition. Any equipment not meeting the required standard will not be permitted for use within the site.
- Any minor volumes of fuel, oil or chemicals required during routine maintenance works will be brought to and from site by the maintenance contractor. While temporarily onsite all chemicals will be kept in secure and bunded areas. Any fuel / oil tanks temporarily stored on site will be located in a suitably bunded area and all tanks will be double skinned.
- In the unlikely event of a fuel / oil or chemical spill / leak during routine maintenance works, emergency spill response measures will be implemented with the aim of limiting the volume spilled and recovering as much of the lost product as possible.
- In the unlikely event of a domestic fuel spill / leak arising from the use of onsite home heating oil, emergency spill response measures will be implemented with the aim of limiting the volume spilled and recovering as much of the lost product as possible. Remedial works will be undertaken in order to fully address any potential environmental / human health impacts.
- The proposed wastewater pumping station and all associated equipment will be maintained in accordance with industry standards and routinely inspected for any equipment wear and tear in order to minimise risk the potential risk of equipment / pump failure.
- An emergency response plan should be prepared for the proposed wastewater pumping station. Typical details included in such a plan include the availability of infrastructure details, operation and maintenance plans, appropriately trained and equipped, personnel, and reporting and notification procedures for management, regulators and stakeholders.
- In a worst-case scenario of an emergency overflow of foul effluent, the system should be repaired as quickly as possible to limit the input of pollutants into receiving waters (dry drainage ditch and underlying groundwater, and the Rathmichael River). In the event of a major overflow (i.e. greater than 24 hours) consideration should be given to restricting inflows to the system. Once the system has been repaired an assessment of any potential groundwater, surface water or human health impacts should be immediately undertaken, and remedial action adopted as required. Potential human health risks can be managed by restricting access with temporary emergency fencing and by erecting warning signs. Any residents or members of the public likely to be directly affected by the overflow should be informed. Warning measures must remain in place until there is no potential human health risk arising from the overflow. It is noted that the potential occurrence of an emergency overflow of foul effluent is considered to be unlikely, and any such events would be rare.

19.2.5 Climate (Air Quality and Climate Change) (Chapter 9)

Construction Stage

Air Quality

The pro-active control of fugitive dust will ensure the prevention of significant emissions, rather than an inefficient attempt to control them once they have been released. The main contractor will be responsible for the coordination, implementation and ongoing monitoring of the dust management plan. The key aspects of controlling dust are listed below. Full details of the dust management plan can be found in Appendix 9.3.

- The specification and circulation of a dust management plan for the site and the identification of persons responsible for managing dust control and any potential issues.
- The development of a documented system for managing site practices with regard to dust control.
- The development of a means by which the performance of the dust management plan can be monitored and assessed.
- The specification of effective measures to deal with any complaints received.

At all times, the procedures within the plan will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust would be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.

Climate

Construction traffic and embodied energy of construction materials are expected to be the dominant source of greenhouse gas emissions as a result of the construction phase of the development. Construction vehicles, generators etc., may give rise to some CO₂ and N₂O emissions. However, due to short-term and temporary nature of these works, the impact on climate will not be significant.

Nevertheless, some site-specific mitigation measures can be implemented during the construction phase of the proposed development to ensure emissions are reduced further. In particular the prevention of on-site or delivery vehicles from leaving engines idling, even over short periods. Minimising waste of materials due to poor timing or over ordering on site will aid to minimise the embodied carbon footprint of the site.

Operational Stage

No additional mitigation measures are required as the operational phase of the proposed development as it is predicted to have an imperceptible impact on ambient air quality and climate.

19.2.6 Climate (Sunlight) (Chapter 10)

The subject application proposes the development of a greenfield site identified for major new development under statutory planning policy (i.e. the *Woodbrook – Shanganagh Local Area Plan 2017-2023*). In these circumstances, during the construction or operational phases scope for mitigation measures, which would preserve a sustainable level of density, is limited. As noted in the BRE Guide, *“it must be borne in mind that nearly all structures will create areas of new shadow, and some degree of transient overshadowing of a space is to be expected.”*

19.2.7 Climate (Daylight) (Chapter 11)

The subject application proposes the development of a greenfield site identified for major new development under statutory planning policy (i.e. the Woodbrook – Shanganagh Local Area Plan 2017 – 2023). In these circumstances, during the construction or operational phases scope for mitigation measures, which would preserve a sustainable level of density, is limited.

19.2.8 Air, Noise and Vibration (Chapter 12)

Mitigation measures for the construction phase are set out below in order to reduce potential impacts as far as practicable to within the adopted design goals for noise and vibration.

Construction Stage

The contract documents will clearly specify the construction noise criteria included in this chapter which the construction works must operate within. The Contractor undertaking the construction of the works will be obliged to take specific noise abatement measures and comply with the recommendations of *BS 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites - Noise* and the European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001. These measures will ensure that: -

- No plant used on site will be permitted to cause an ongoing public nuisance due to noise.
- The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations.
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract.
- Compressors will be attenuated models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers.
- Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use.
- Any plant, such as generators or pumps that is required to operate outside of normal permitted working hours will be surrounded by an acoustic enclosure or portable screen.

BS 5228 -1:2009+A1 2014 includes guidance on several aspects of construction site practices, which include, but are not limited to: -

- Selection of quiet plant.
- Control of noise sources.
- Screening.
- Hours of work.
- Liaison with the public.

Further comment is offered on these items in the following paragraphs.

Noise control measures that will be considered include the selection of quiet plant, enclosures and screens around noise sources, limiting the hours of work and noise monitoring. The contractor will be required to conduct construction noise predictions prior to works taking place and put in place the most appropriate noise control measures depending on the level of noise reduction required at any one location.

Selection of Quiet Plant

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 of plant will be selected wherever possible. Should a particular item of plant already on the site be found to generate high noise levels, the first action will be to identify whether or not said item can be replaced with a quieter alternative.

For static plant such as compressors and generators used at work areas such as construction compounds etc., the units will be supplied with manufacturers' proprietary acoustic enclosures where possible.

General Comments on Noise Control at Source

If replacing a noisy item of plant is not a viable or practical option, consideration will 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 or the best practice use of equipment and materials handling to reduce noise.

In practice, a balance may need to be struck between the use of all available techniques and the resulting costs of doing so. It is therefore proposed to adopt the concept of "*Best Available Techniques*". as defined in EC Directive 96/61. In this context "*best*" means "*the most effective in achieving a high general level of protection of the environment as a whole*".

Proposed techniques will also be evaluated in light of their potential effect on occupational health and safety. The following outline guidance relates to practical noise control at source techniques which relate to specific site considerations: -

- For mobile plant items such as cranes, dump trucks, excavators and loaders, the installation of an acoustic exhaust and/or maintaining enclosure panels closed during operation can reduce noise levels by up to 10dB. Mobile plant will be switched off when not in use and not left idling;
- For piling plant, noise reduction can be achieved by enclosing the driving system in an acoustic shroud. For steady continuous noise, such as that generated by diesel engines, it is possible to reduce the noise emitted by fitting a more effective exhaust silencer system or utilising an acoustic canopy to replace the normal engine cover.
- For all materials handling, the contractor will ensure that best practice site noise control measures are implemented including ensuring that materials are not dropped from excessive heights and drop chutes/dump trucks are lined with resilient materials, where relevant.
- Where compressors, generators and pumps are located in areas in close proximity to noise sensitive properties/ areas and have potential to exceed noise criterion, these will be surrounded by acoustic lagging or enclosed within acoustic enclosures providing air ventilation.
- Resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can be controlled by fixing resilient materials in between the surfaces in contact.
- Demountable enclosures can also be used to screen operatives using hand tools and may be moved around site as necessary.
- All items of plant will 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 other forms of noise control. The effectiveness of a noise screen will depend on the height and length of the screen, its mass, 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 will be wrapped around the source. BS 5228 - 1:2009+A1 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 will 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 10kg/m² will give adequate sound insulation performance.

Construction noise calculations have assumed a partial line of sight (-5dB) is achieved using a solid 2.4m high standard construction site hoarding. It will be a requirement for works occurring immediately in proximity to the closest noise sensitive locations along the Old Dublin Road, that the line of sight is further blocked such that a reduction of at least 10dB is achieved between the noise sensitive façade and construction activities. A reduction of this order can be achieved using a higher perimeter screen or using localised screening around specific items of plant.

Annex B of BS 5228-1:2009+A1:2014 (Figures B1, B2 and B3) provide typical details for temporary and mobile acoustic screens, sheds and enclosures that can be constructed on site from standard materials.

In addition, careful planning of the site layout will also be considered. The placement of temporary site buildings such as offices and stores between the site and sensitive locations can provide a good level of noise screening during the phasing of works.

Hours of Work

Construction noise impacts will be controlled through strict working hours. Construction activity will only be carried out between the hours of 0700 to 1900 Mondays to Fridays inclusive and between 0800 and 1400 hours on Saturdays. There will be no construction works carried out on Sundays or public holidays. Deviation from these times will only take place when written approval is granted by DLRCC in exceptional circumstances.

Consideration will be given to the scheduling of activities in a manner that reflects the location of the site and the nature of neighbouring properties. Each potentially noisy event/activity will be considered on its individual merits and scheduled according to its noise level, proximity to sensitive locations and possible options for noise control.

Liaison with the Public

Clear forms of communication will be established between the contractor and noise sensitive areas in proximity so that residents or building occupants are aware of the likely duration of activities likely to generate higher noise or vibration.

The duration of piling, excavation and other high noise or vibration activities works is usually short in relation to the length of construction work as a whole, and the amount of time spent working near to sensitive areas can represent only a part of the overall period. Subjective impacts during these phases can be significantly reduced if timelines and potential impacts are known in advance.

Vibration

On review of the likely vibration levels associated with construction activities, it may be concluded that the construction of the proposed development is not expected to give rise to vibration that is either significantly intrusive or capable of giving rise to structural or cosmetic damage to adjacent buildings.

In the case of vibration levels giving rise to human discomfort, in order to minimise such impacts, the following measures shall be implemented during the construction period: -

- A clear communication programme will be established to inform adjacent building occupants in advance of any potential intrusive works which may give rise to vibration levels likely to exceed perceptible levels. The nature and duration of the works will be clearly set out in all communication circulars.
- Appropriate vibration isolation shall be applied to plant, where feasible.
- Monitoring will be undertaken at identified sensitive buildings, where proposed works have the potential to be at or exceed the vibration limit values.

Operational Stage

Noise levels associated with operational plant will be designed to ensure the prevailing background noise environment is not increased by a significant level such that potential adverse noise impacts are avoided. During the detail design stage, the prevailing background noise environment will be verified through updated baseline studies at the nearest noise sensitive locations in order to set appropriate noise limits in accordance with BS 4142 (2014). Once noise emissions from fixed plant items are designed in accordance with BS 4142 resultant residual noise impact from this source will be of neutral, minor, long term impact.

The use of low noise operational plant items, siting items of plant away from noise sensitive boundaries, screening and acoustic attenuation measures will all be considered, where relevant during this stage.

The development will be designed to ensure that the design goals outlined in Section 12.7 can also be achieved for occupants of the dwelling units within the proposed development.

19.2.9 Landscape and Visual Impact (Chapter 13)

Construction Stage

The avoidance, remedial and mitigation measures during the construction phase include: -

- Trees to be retained along R119 Dublin Road, on the boundaries and internally will be protected in accordance with BS: 5837:2012 Trees in relation to design, demolition and construction. Recommendations.
- A specific Arboricultural Method Statement shall be prepared for works required within the root protection area of any tree to be retained. All such measures shall be prepared in consultation with the Project Arborist, who shall also supervise works for which an Arboricultural Method Statement is required.
- Provision of solid site hoarding, minimum 2.4m high along the construction site boundaries and around any on site construction compound.
- Existing boundaries will be retained and protected – other than where new entrances or accesses are to be provided.
- Construction works associated with the provision of new pedestrian accesses to Shanganagh Park, will be fenced-off and protected from public access. These works shall be co-ordinated with the Parks Department of DLRCC.

- Construction works in Shanganagh Park, associated with the installation of the service connection to St. Anne's Park shall be fenced off with solid hoarding and protected from public access. These works shall be co-ordinated with the Parks Department of DLRCC.
- Construction areas within or adjoining Woodbrook Golf Course will be fenced off for the duration of the construction works.

A Project Arborist and Project Landscape Architect will be retained for the duration of the construction phase to ensure that mitigation measures associated with existing trees and landscape proposals outlined above are put into effect and maintained.

Operational Stage

The landscape design and planting proposals include for specific mitigation measures to avoid and minimise landscape and visual impacts. Operational stage landscape and visual mitigation measures include: -

- Provision of a high quality landscape setting for the residential development.
- Provision three (3) main area of linear open space, providing amenity, connectivity and play opportunities.
- Provision of open space along the southern boundary of the Site for offset from planted boundaries and for connectivity.
- Provision of a high quality entrance off the R119 Dublin Road, with 'railing windows' inserted into the existing stone boundary wall for improvement visual connectivity to and from the Site.
- Provision of semi-private / communal open space courtyards for apartments.

A Project Arborist and Project Landscape Architect will be retained for a period of 12 months post-construction to ensure that landscape and visual mitigation measures outlined above are successfully established.

19.2.10 Material Assets (Transportation) (Chapter 14)

Construction Stage

The following mitigation measure shall apply: -

- All construction activities will be managed and directed by a Construction Traffic Management Plan (CTMP). The details of the CTMP will be agreed with the roads department of the Local Authority in advance of construction activities commencing on-site.

Operational Stage

The proposed development is consistent with all national, regional and local policies. In particular those policies and objectives aligned with active and sustainable travel and transportation. Specific mitigation measures proposed include the following: -

- Woodbrook DART Station is located on the eastern site boundary. The adjacent park and ride car park contains bus stop facilities to facilitate bus to rail interchange.
- The entire site is within 800m walking distance of the DART Station and Dublin Road bus corridor.
- The proposed development specifically facilitates the development of Woodbrook DART Station through the provision of Woodbrook Avenue, the main access route, together with the temporary park and ride car park.
- The site facilitates the upgrade of the Dublin Road bus corridor per the NTA plans for Bus Connects Core Bus Route 13.

- The development is adjacent and accessible to Routes 12A and 14 /N5 Greater Dublin Area Cycle Network Plan
- The development incorporates extensive pedestrian and cycle routes that link the site to the Dublin Road on the western boundary, Shanganagh Park on the northern boundary, Woodbrook DART Station on the eastern boundary and facilitation for future connections across the southern site boundary.
- The site is planned in the context of a Mobility Management Plan based on the physical infrastructure provisions of walking and cycling links and access to public transport bus and DART rail services.
- Demand Management is also underpinned by the co-location of residential, education, local retail and leisure and amenity facilities.
- The propensity for car ownership and car use is managed through measures that include reduced residential parking provision and increased cycle parking provision in line the 'Design Standards for New Apartments'. The provision of car club parking spaces will facilitate a lower level of car ownership.
- The development contains the required infrastructure to provide electric charging to all car parking spaces.

19.2.11 Material Assets (Waste) (Chapter 15)

This section outlines the measures that will be employed in order to reduce the amount of waste produced, manage the wastes generated responsibly and handle the waste in such a manner as to minimise the effects on the environment.

Construction Stage

As previously stated, a project specific C&D WMP has been prepared in line with the requirements of the requirements of the guidance document issued by the DoEHLG and is included as Appendix 15.1. Adherence to the high-level strategy presented in this C&D WMP will ensure effective waste management and minimisation, reuse, recycling, recovery and disposal of waste material generated during the demolition, excavation and construction phases of the proposed development. Prior to commencement, the contractor(s) will be required to refine/update the C&D WMP or submit an addendum to C&D WMP to DLRCC to detail specific measures to minimise waste generation and resource consumption and provide details of the proposed waste contractors and destinations of each waste stream.

A quantity of soil, stone, gravel and clay which will need to be excavated to facilitate the proposed development. Project Engineers have estimated that c. 69,434m³ of excavated material will need to be removed offsite, however it is envisaged that c. 29,300m³ of excavated material will be reused onsite along with all material excavated from earthworks on the new 2 no. golf holes. It is envisaged that approximately 8,700m³ of material will need to be removed from site. Correct classification and segregation of the excavated material is required to ensure that any potentially contaminated materials are identified and handled in a way that will not impact negatively on workers as well as on water and soil environments, both on and off-site.

In addition, the following mitigation measures will be implemented: -

- Building materials will be chosen with an aim to 'design out waste'.
- On-site segregation of waste materials will be carried out to increase opportunities for off-site reuse, recycling and recovery – it is anticipated that the following waste types, at a minimum, will be segregated:-
 - Concrete rubble (including ceramics, tiles and bricks).
 - Plasterboard.

- Metals.
- Glass.
- Timber.
- Left over materials (e.g. timber off-cuts, broken concrete blocks/bricks) and any suitable construction materials shall be re-used on-site, where possible.
- All waste materials will be stored in skips or other suitable receptacles in designated areas of the site.
- Any hazardous wastes generated (such as chemicals, solvents, glues, fuels, oils) will also be segregated and will be stored in appropriate receptacles (in suitably bunded areas, where required).
- A waste manager will be appointed by the main contractor(s) to ensure effective management of waste during the excavation and construction works.
- All construction staff will be provided with training regarding the waste management procedures.
- All waste leaving site will be reused, recycled or recovered where possible to avoid material designated for disposal.
- All waste leaving the site will be transported by suitable permitted contractors and taken to suitably registered, permitted or licenced facilities.
- All waste leaving the site will be recorded and copies of relevant documentation maintained.

Nearby sites requiring clean fill material will be contacted to investigate reuse opportunities for clean and inert material, if required. If any of the material is to be reused on another site as by-product (and not as a waste), this will be done in accordance with Article 27 of the EC (Waste Directive) Regulations (2011). EPA approval will be obtained prior to moving material as a by-product. However, it is not currently anticipated that Article 27 will be used.

These mitigation measures will ensure that the waste arising from the construction phase of the development is dealt with in compliance with the provisions of the Waste Management Act 1996, as amended, associated Regulations and the Litter Pollution Act 1997, the EMR Waste Management Plan (2015-2021). It will also ensure optimum levels of waste reduction, reuse, recycling and recovery are achieved and will encourage sustainable consumption of resources.

Operational Stage

As previously stated, a project specific OWMP has been prepared and is included as Appendix 15.2. Implementation of this OWMP will ensure a high level of recycling, reuse and recovery at the development. All recyclable materials will be segregated at source to reduce waste contractor costs and ensure maximum diversion of materials from landfill, thus achieving the targets set out in the EMR Waste Management Plan 2015 – 2021 and abiding by the DLRCC waste bye-laws and draft waste bye-laws.

In addition, the following mitigation measures will be implemented: -

- On-site segregation of all waste materials into appropriate categories including (but not limited to): -
 - Organic waste.
 - Dry Mixed Recyclables.
 - Mixed Non-Recyclable Waste.
 - Glass.
 - Waste electrical and electronic equipment (WEEE).

- Batteries (non-hazardous and hazardous).
- Cooking oil.
- Light bulbs.
- Cleaning chemicals (pesticides, paints, adhesives, resins, detergents, etc.).
- Furniture (and from time to time other bulky waste).
- Abandoned bicycles.
- All waste materials will be stored in colour coded bins or other suitable receptacles in designated, easily accessible locations. Bins will be clearly identified with the approved waste type to ensure there is no cross contamination of waste materials.
- All waste collected from the development will be reused, recycled or recovered where possible, with the exception of those waste streams where appropriate facilities are currently not available.
- All waste leaving the site will be transported by suitable permitted contractors and taken to suitably registered, permitted or licensed facilities.

These mitigation measures will ensure the waste arising from the development is dealt with in compliance with the provisions of the Waste Management Act 1996, as amended, associated Regulations, the Litter Pollution Act 1997, the EMR Waste Management Plan (2015 – 2021) and the DLRC waste bye-laws and draft waste bye-laws. It will also ensure optimum levels of waste reduction, reuse, recycling and recovery are achieved.

19.2.12 Material Assets (Built Services) (Chapter 16)

Construction Stage

The construction management of the site will take account of the recommendations of the Construction Industry Research and Information Association (CIRIA) guides 'Control of Water Pollution from Construction Sites' and 'Groundwater control - design and practice' to minimise as far as possible the risk of pollution. With regard to groundwater and surface water protection impacts the following mitigation measures are proposed: -

- Fuels, lubricants and hydraulic fluids for equipment used on the construction site, as well as any solvents, oils, and paints will be carefully handled to avoid spillage, properly secured against unauthorised access or vandalism, and provided with spill containment according to best codes of practice.
- Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the proposed development for disposal or re-cycling.
- Any spillage of fuels, lubricants or hydraulic oils will be immediately contained and the contaminated soil removed from the proposed development and properly disposed of.
- All site vehicles used will be refuelled in bunded and adequately sealed and covered areas in the construction compound area.
- Strict supervision of contractors will be adhered to in order to ensure that all plant and equipment utilised on-site is in good working condition. Any equipment not meeting the required standard will not be permitted for use within the site. This will minimise the risk of groundwater becoming contaminated through site activity.
- Stripped soils should be stockpiled a minimum distance of 10m from the drainage ditch and should be appropriately covered. A temporary storm water management system should be implemented by the Contractor.
- All groundwater temporarily dewatered during the construction of the attenuation tanks, wastewater pumping station and any deep building foundations will be treated via the installation of a temporary in-situ water treatment system: -

- This system should be designed and sized to ensure that all pumped groundwater water is treated prior to discharge to the existing drainage ditch onsite, which drains to the Rathmichael River.
- The contractor will be required to provide a site-specific dewatering plan, clearly setting out proposed excavation methodology, estimated dewatering rates, details of proposed treatment system, and discharge location.

The following standard mitigation measures regarding temporary oil / chemical storage and refuelling are proposed: -

- All oil stored on site for construction vehicles will be kept in a locked and bunded area.
- Generators, pumps and similar plant will be placed on drip-trays to prevent contamination.
- All site vehicles used will be refuelled in bunded areas.
- All temporary construction fuel tanks will also be located in a suitably bunded area and all tanks will be double skinned. In addition, oil absorbent materials will be kept on site in close proximity to any fuel storage tanks or bowsers during proposed site development works.
- All deliveries to on-site oil storage tanks will be supervised.
- Records will be kept of delivery dates and volumes.
- Every piece of equipment associated with the storage of fuel on site will be designed and installed to recognised BS codes.
- All valves should be of steel construction and the open and close positions should be clearly marked.
- The following standard mitigation measures regarding cement handling during construction are proposed: -
 - No mixing of concrete will be carried out on site. The measures detailed below will be employed where poured concrete is being used in the construction process.
 - The production, transport and placement of all cementitious materials will be strictly planned and supervised. Site batching/production of concrete will not be carried out on site and therefore these aspects will not pose a risk to the waterbodies present, namely any temporarily exposed groundwater, or to the onsite drainage ditch or Rathmichael River.
 - Shutters will be designed to prevent failure. Grout loss will be prevented from shuttered pours by ensuring that all joints between panels achieve a close fit or that they are sealed.
 - Any spillages will be cleaned up and disposed of correctly.
 - Where concrete is to be placed by means of a skip, the opening gate of the delivery chute will be securely fastened to prevent accidental opening.
 - Where possible, concrete skips, pumps and machine buckets will be prevented from slewing over water when placing concrete.
 - Surplus concrete will be returned to batch plant after completion of a pour.

The above mitigation measures will form part of the Outline Construction Environmental Management Plan (CEMP) submitted as part of this planning application, and which will be further developed by the Contractor within the project-specific Detailed CEMP which will be in operation during the construction phase.

In order to reduce the risk of defective or leaking sewers, all new sewers should be laid in accordance with Irish Water standards, pressure tested and CCTV surveyed to ascertain any possible defects. The construction compound will include adequate staff welfare facilities including foul drainage and potable water supply.

Foul drainage discharge from the construction compound will be removed off site to a licensed facility until a connection to the public foul drainage network has been established.

The construction compound's potable water supply shall be protected from contamination by any construction activities or materials. Where possible backup network supply to any services will be provided should the need for relocation or diversion or existing services be required otherwise relocation or diversion works will be planned to incur minimal impact, with users notified in advance of any works.

Connections to the existing gas and telecommunications networks will be coordinated with the relevant utility provider and carried out by approved contractors.

Operational Stage

All new drainage lines (foul and surface water) will be pressure tested and will be subject to a CCTV survey to identify any possible defects prior to being made operational.

All surface water will be attenuated in modular underground systems. Controlled discharge will ensure that discharge rates to the Rathmichael River are no greater than the greenfield rate. The network has been designed to cater for further phases that will be subject to agreement with the planning authority.

Water conservation methods such as the use of low flush toilets and low flow taps should be incorporated into dwellings to reduce water volumes and related treatment and abstraction costs of the development. Similarly, water conservation methods would reduce the loading on the foul sewer network and the treatment works at Shanganagh WWTP. The foul water network & pumping station will be constructed in accordance with Irish Water Code of Practice and Standard Details. The pumping station has been designed for the interim solution volume of 24 hours emergency storage for 685no. units.

On completion of the construction phase no further mitigation measures are proposed in relation to the electrical, gas and telecommunications infrastructure.

19.2.13 Cultural Heritage (Archaeology) (Chapter 17)

Preservation in-situ is considered to be the most appropriate manner in which to ensure the conservation of archaeological remains. However, it is not possible to avoid impacts on sites AA 1, AA 3-8, AA 10-11, AA 14-15 and AA 17, due to the requirements of the design layout. As such and in order to ameliorate negative impacts, the archaeological sites within the development area will be preserved by record (archaeological excavation), prior to construction taking place. This will be carried out under the direction of a licence eligible archaeologist, in consultation with the National Monuments Service of the DoCHG and the National Museum of Ireland.

it is not possible to avoid impacts on sites AA 2 and AA 16 as part of the golf course development due to the landscaping requirements. As such and in order to ameliorate negative impacts, the archaeological sites within the development area will be preserved by record (archaeological excavation), prior to construction taking place. This will be carried out under the direction of a licence eligible archaeologist, in consultation with the National Monuments Service of the DoCHG and the National Museum of Ireland.

All topsoil stripping associated with the proposed development will be monitored by a suitably qualified archaeologist. If any features of archaeological potential are discovered during the course of the works further archaeological mitigation may be required, such as preservation in-situ or by record. Any further mitigation will require approval from the National Monuments Service of the DoCHG.

19.2.14 Cultural Heritage (Architectural Heritage) (Chapter 18)

As mentioned above there is no direct impact on the surrounding built heritage and the retention of trees means that the visual impact will be minimal. The proposed school which will form part of Phase 2 of the development has the potential to have an adverse visual impact on the setting and views of the Church. Ameliorative, or reductive measures in the form of the carefully considered siting within in the adjoining site along with high quality sensitive design and scaling of the proposed school which is cognisant of the Church's protected status, its setting and the views. This approach has already been taken in relation to the proposed creche and Neighbourhood Centre which have been sensitively scaled and set back from the church.

Likewise road widening and land take associated with the proposed BusConnects will potentially have a significant adverse impact on the character of the R119 and the proposed development will have a greater visual impact on surrounding protected structures as a result.

This will be mitigated by the retention and enhancement of planting on and near the boundary under the current proposal.