

5.6.2.4.1 Increased tree provision

As detailed in section 5.6.2.2, the landscaping proposed for the Site entails the planting of over 700 trees, many of which are native species. This increase in tree cover across the Site will provide additional nesting/foraging resources for local passerines, along with a slight increase in habitat connectivity over what is currently open field habitat. This increase in tree cover at the Site will represent a **positive, moderate, permanent** impact at a local scale

5.6.2.4.2 Collision with Site Structures

Tall structures such as electrical pylons, wind farms and tall buildings can lead to fatal collisions with commuting bird species. This is particularly true for those species considered to be “poor” fliers, with relatively low manoeuvrability compared to other more agile bird species (see Eirgrid, 2012).

Some of the most at-risk groups (classified as ‘medium’ and ‘high’ collision risk species) include wader species; waterfowl such as geese, swan and duck species; and some raptor species. Gulls such as Black-headed Gull, Herring Gull and Lesser Black-backed Gull are classed as ‘low’ collision risk species due to their superior manoeuvrability when flying (Eirgrid, 2012).

Likelihood of Collision Impacts

The physical location of buildings and structures can influence the likelihood of bird collisions, with structures placed on or near areas regularly used by large numbers of feeding, breeding, or roosting birds, or on local flight path; such as those located between important foraging and roosting areas, can present a higher risk of collision.

The Site of the Proposed Development is located within an urban park in which waterfowl and shore bird species are known to feed among the various green spaces provided therein. While it is noted that Bull Island SPA is located ca. 1.1km to the east of the Site the Site is not located directly on the coast, or immediately adjacent to the SPA. The Site in itself is not deemed to represent suitable *ex-situ* feeding/roosting habitat for any such species (Habitats present largely comprise of built land and high sward rank grassland, transitioning to scrub).

Building Height

The Proposed Development entails building heights ranging from 4-7 storeys in height (See Figure 5-15) and as such, the risk of migrating birds colliding with the structure due to its height is deemed to be negligible [Migrating species tend to commute far above this with Swans and Geese flying up to 2500ft (ca.750m) during migration along Irish Coasts (Irish Aviation Authority, 2020). Birds that fly over the Site to commute across the city or in order to reach feeding grounds at various locations would fly lower than this, however, even at these lower flight heights, the bird species in question are capable of flying above the maximum height of the proposed buildings and, once the structures are made of visible materials i.e., not entirely comprised of reflective materials such as glass, the birds will simply fly around or over them.



Figure 5-15 Proposed building heights at the Site of the Proposed Development (Adapted from Foxlands, Design Statement, 2022)

Building Appearance

The overall façades of the proposed buildings are largely opaque in nature, with a varied material composition which breaks up any reflective areas. These architectural design features provide important visible cues as to the presence and extent of the proposed structures to any commuting/foraging bird species should they be in the vicinity of the Site. This overall visual heterogeneity of the building façades will be sufficient to further ensure that the risk of bird collisions as a result of the Proposed Development is negligible. These architectural design features are part of the overall design of the Proposed Development and are not considered to represent specific mitigation measures to prevent collisions, however, they will contribute to the overall effect in this regard.



Figure 5-16. Example of the proposed building façades (Block D) with opaque materials comprising coloured brick, stone panelling, and metalwork throughout (Adapted from Design Statement, Hawkins Brown, 2022).

As such, based on the heights and the physical appearance of the proposed structures, it is deemed that birds including SCI species such as Brent Geese and any other 'at-risk' bird species, do not have the potential to be impacted by the Proposed Development through collisions or obstructions to flight-lines over the Site, and the collision risk is therefore deemed to be **negligible** in the absence of any mitigation.

5.6.2.4.3 European Eel

European Eel have been recorded using the 'Duck Pond' located to the north-east of the Site of the Proposed Development. The Proposed Development entails the draining of Operational Phase surface water through the Site via a series of sewers, ultimately discharging to the Naniken River via a new sewer and headwall to be constructed to the north-east of the Site. The Naniken River forms a connection with 'Duck Pond' prior to its outflow into Dublin Bay and as such a hydrological connection exists between the Operational Phase of the Proposed Development and this pond containing European Eel.

In terms of the potential impacts to European Eel associated with Operational Phase surface water, the following was noted by Ms McMahon of Inland Fisheries Ireland (IFI)⁵

"The European eel is a hardy species and will survive in moderately polluted water. However, it will not thrive there, and pollution is likely to reduce its numbers. In particular, it will be

⁵ As detailed in Ms McMahon's affidavit in 2020 as part of a previous application on the Site.

impacted by eutrophication or chemical pollution of waters. Eutrophication occurs where there is inadequate dissolved oxygen available due to it being used up, usually by microorganisms. This often happens when excess phosphates or other nutrients are added to the water. Detergents and washing powders frequently contain phosphates, so that car washing in the car park of a development could lead to discharge of nutrients to storm water drains. ..."

In the absence of mitigation, there is the potential for contaminants from the Site's operation to enter the Naniken River and reach the pond in question. Such contaminated waters could include soapy run-off from future residents washing their cars, and hydrocarbon pollutants collected on vehicular roads within the Proposed Development.

Due to the intermittent nature of activities such as private car washing, any potential impact linked with surface water run-off containing soap is likely to be limited and somewhat dependent on rainfall levels at the Site. It is also noted that a suite of surface water management measures have been included in the proposed project design, including SUDS measures to improve the quality of the surface water generated by the Proposed Development prior to outflow to the Naniken. Even in the absence of these measures, significant impacts to European Eel are not considered likely due to the intermittent nature any potential pollution source and the dilution potential within the receiving waterbodies (Naniken River and Duck Pond).

Potential impacts in the absence of mitigation are therefore assessed in a precautionary manner as **negative, slight, permanent** as the impact source will exist as long as the development exists.

5.6.3 Potential Cumulative Impacts

In the Dublin City Development Plan 2016-2022 (**DCDP**) the site of the Proposed Development is zoned as "Zone Z15 Community and Institutional Resource Lands (Institutional and Community, Community, Green Infrastructure and Health)", while the surrounding area to the north-east and west is zoned as "Zone Z1: Sustainable Residential Neighbourhoods".

St Anne's Park to the north-west, east and south is zoned as "Zone Z9: Amenity/Open Space Lands/Green Network". A small section of the site to the northeast, is zoned Z9. This Zoning Objective is "To preserve, provide and improve recreational amenity and open space and green networks." No residential development is proposed on the lands contained within the application boundary which are zoned Z9.

Existing or proposed projects or plans impacting on the same KERs have the potential to lead to impacts of a higher level of significance when assessed cumulatively. This applies to potential impacts on bats as a consequence of the combined loss of suitable roosting, commuting and/or foraging habitat in the locality and potential impacts on birds as a consequence of the combined loss of suitable nesting bird habitat in the locality.

The Proposed Development is not likely to result in any significant impacts when assessed in isolation in relation to these receptors as the amount of proposed vegetation clearance is minimal. Given that it is unlikely that there would be wide-scale vegetation clearance in the surrounding locality (*i.e.* the surrounding area is predominantly made of residential houses and gardens and St Anne's Park) significant cumulative impacts are unlikely.

With regards to the *potential* cumulative impact on wintering birds as a result of the Proposed Development, acting in-combination with other plans or projects, the NIS (Enviroguide 2022) concludes that the Proposed Development in combination with other sites will not have any impact on the qualifying interests (*i.e.* wintering birds) for the following reasons:

- The number of sites with proposed development which will or could result in loss of grassland is 7 (8 including the Proposed Development) (these 7 sites are numbered 50, 6, 43, 55, 33, 51 and 59 in Table 15 of the NIS) and the birds in the highest usage scenario (e.g., 2020/21 season) are using just c. 60% (*i.e.*, ca. 90 sites) of the available network in any given winter. This means that the combined loss of all of these 7 sites if it were to occur is not significant in respect of the overall network.
- The highest level of usage by Light-bellied Brent Geese in the last six seasons, based on both live observations and droppings, was 90 sites used in 2020/21. This equates to c.60% of the available known sites being used. In this highest usage scenario there still remains c. 40% of available known sites being unused in a given winter.
- It has been demonstrated that the birds visit ex-situ sites on a fluid basis so that the effect of the loss of any individual site will result in the birds relocating to another site without duress.

Refer to the NIS (Enviroguide, 2022) accompanying this planning application for full details of this assessment.

5.6.4 “Do Nothing” Impact

In the event that the Site of the Proposed Development was not developed, there would be no resulting additional impacts on the Biodiversity (Flora and Fauna) at the Site. The habitat would likely remain as rank grassland meadow, gradually transitioning to scrub; with scrub habitats encroaching from the margins of the Site and the patches currently establishing throughout the fields. The lands would continue to be utilised by local mammals and breeding bird species, although limited wintering waterfowl or shorebird usage would be expected. The St. Paul's school pitch would likely be the focus of any such bird activity in the area.

5.7 Avoidance, Remedial & Mitigation Measures

5.7.1 Mitigation 1: Controlled Vegetation Removal

Hedgehog

During the Construction Phase of the Proposed Development Hedgehogs in particular have the potential to be significantly impacted through the loss of suitable hibernation and nest sites in the form of piles of dead wood, vegetation and leaves on site.

This can be mitigated through the careful removal of dead wood/leaves to another part of the site where they will not be affected. Woody debris from the proposed management of hedgerow/treeline areas on site should also be left in this out-of-the way area as compensatory hedgehog habitat during the Construction Phase.

Work likely to cause disturbance during hibernation – for example removal of hibernation habitats such as log piles and dense scrub/hedgerow – should not take place during Winter

i.e., 1st November to 1st March, but also must take into account the breeding bird season (1st March to 31st August.) in order to avoid potential nest destruction and bird mortality.

As such, it is recommended that any removal of trees or scrub be carried out in **September/October** in order to ensure the best biodiversity outcome and to comply with the Wildlife Acts 1976 and Amendments.

Nesting birds

The removal of trees and scrub will be completed outside the main bird nesting season i.e., **1st March to 31st August**. where possible, Should removal within this period be unavoidable, a suitably qualified Ecologist will be instructed to survey the affected vegetation prior to removal. Should any active nests and/or eggs be present, the section of vegetation containing them will be noted and fenced off and protected until the young birds have fledged and left the nest or, where possible, the end of the nesting season. Fledging will be confirmed by the Ecologist through further surveys. Once this has been confirmed the nest can be removed and the vegetation cleared under the supervision of the Ecologist. Please note that active nests will require a buffer zone to limit the disturbance of works in their vicinity. This will be agreed in consultation with the Ecologist.

5.7.2 Mitigation 2: Badgers

Transport Infrastructure Ireland's (TII, previously the NRA) *Guidelines for the treatment of badgers prior to the construction of national road schemes*, will be consulted in terms of the management of potential badger setts at the Site of the Proposed Development. The following measures are taken from this guidance document and the Badger Assessment Report prepared by Brian Keeley (2022) (See Appendix E) and adapted to apply to the Proposed Development.

Prior to the commencement of any construction works, a pre-construction badger survey will be carried out by a suitably qualified Badger specialist; to establish the current status of the badger setts (main and annexe setts) located in the north-western corner of the Site.

As badgers are known to inhabit the Site and surrounding lands, a Construction Phase Badger Management Plan will be prepared by the Badger specialist, to be approved by the NPWS prior to any works commencing on site. This document will detail any protection zones required to ensure the works do not undermine the setts or their tunnels, and the mitigation measures that will be required to protect badger for the extent of the Construction Phase e.g., no works buffer zone, badger-proof fencing to prevent access to the Site during works etc.

Works close to badger setts will only be conducted under the supervision of the badger specialist under licence from the NPWS. During the breeding season (December to July inclusive), no works should be undertaken within 50m of active setts nor blasting or pile driving within 150m of active setts.

Badger sett tunnel systems can extend up to ca. 20m from sett entrances. As there is the possibility that tunnels would be destroyed by movement of heavy plant over the ground above them, it is essential that no heavy plant cross within 30 metres of a sett entrance (where there is potential for chambers or tunnels beyond this, a 50 metre distance should be observed).

This will ensure that setts are not damaged and that badgers are not inadvertently crushed during construction. Lighter machinery (generally wheeled vehicles) will not be used within 20m of a sett entrance; light work, such as digging by hand or scrub clearance will not take place within 10m of sett entrances unless under the supervision of the badger specialist.

5.7.2.1 Sett removal

The retention of the setts in-situ is unfeasible due to spatial constraints and the footprint of the Proposed Development. As such, a suitably qualified Badger specialist will be instructed to prepare an exclusion plan for the decommissioning of the setts and their destruction once all badgers have been confirmed to have vacated. The objective is to allow the badgers to remain within their territory, even though a portion of their current territory will be lost as a result of the Proposed Development. The provision of an artificial sett within the Site of the Proposed Development will also be incorporated into the landscape plan as detailed below.

The existing setts will not be excluded or destroyed until the artificial replacement sett has been constructed.

Exclusion of badgers from the setts

Exclusion of badgers from the setts should only be carried out during the period of **August to November (inclusive)** in order to avoid the badger breeding season.

As per the TII guidance, the removal of badgers from affected setts and subsequent destruction of these setts will only be conducted with NPWS permission/approval, and by experienced badger specialists. The exclusion process will include monitoring to ensure that badgers have fully evacuated the setts prior to their destruction. The NPWS grant permission/approval to the experts undertaking the badger operations and not to the developer or contractor. A badger sett exclusion plan and method statement will be prepared by the badger specialist and provided to the NPWS prior to commencement for their approval. No works will take place without the supervision of the Badger specialist.

Measures to ensure the sett has been vacated and is devoid of all badgers will be designed by the Badger specialist, involving a combination of:

- one-way badger gates on active entrances,
- badger proof fencing,
- soft and hard blocking of inactive entrances, and
- recurring inspections.

Gates will be left installed, with regular inspections, over a minimum period of 21 days before the sett is deemed inactive. Any badger activity at all will require the procedures to be repeated or additional measures taken. Sett destruction should commence immediately following the 21 day exclusion period, provided that all badgers have been excluded. Should a badger be discovered during this operation, the NPWS will be advised immediately and all excavation will cease until it is agreed with NPWS that it may continue.

No exclusion will commence in advance of the completion of the artificial sett.

All setts should be assessed on a case by case basis by a suitably experienced badger expert, with measures adapted to suit the situation as per the expert's direction.

Sett destruction

The destruction of a successfully evacuated badger sett may only be conducted under the supervision of qualified and experienced personnel with approval/permission from the NPWS. The possibility of badgers remaining within a sett must always be considered; suitable equipment should be available on hand to deal with badgers within the sett or any badgers injured during sett destruction.

TII Guidelines recommend that sett destruction is usually undertaken with a tracked 12-25 ton digger, commencing at ca. 25m from the outer sett entrances and working towards the centre of the sett, cutting ca. 0.5m slices in a trench to a depth of 2m. Exposed tunnels may be checked for recent badger activity with full attention paid to safety requirements in so doing.

A report detailing the evacuation procedures, sett excavation and destruction, and any other relevant issues will be prepared by the badger specialist and submitted to the NPWS.

Artificial sett provision

An artificial main sett will be provided within the north-eastern corner of the Site as compensation for the loss of the existing main sett. The possibility of installing an artificial sett elsewhere in the park as compensation was also considered and is a viable alternative, however, the installation of the new sett within a suitable location at the Site is the preferred option.

The new sett location will be located in the north-eastern corner of the Site, approx. 230m east of the existing main sett and linked by the existing woodland corridor present along the Site's northern and eastern boundaries (See Figure 5-18). The new sett will be constructed and established before the badgers are excluded from the existing setts and they are destroyed.

The artificial sett will be accessed by six entrances and will require a minimum of six chambers to accommodate a breeding group of badgers. The badger specialist recommends an area of 15m x 15m for the sett. A dense section of scrub vegetation (e.g., Gorse, Brambles, Elder, Hawthorn, Blackthorn) will be planted within the designated artificial sett area; the goal being to connect the site with the woodland margin along the Site's eastern boundary and provide connectivity with the rest of the park for the badgers to forage as before, to provide shelter and protection for the sett and minimise human related disturbance from the Proposed Development; thus maximising the setts chances of being adopted.

All lighting will avoid illumination of the setts or any alternative setts installed within the Site.

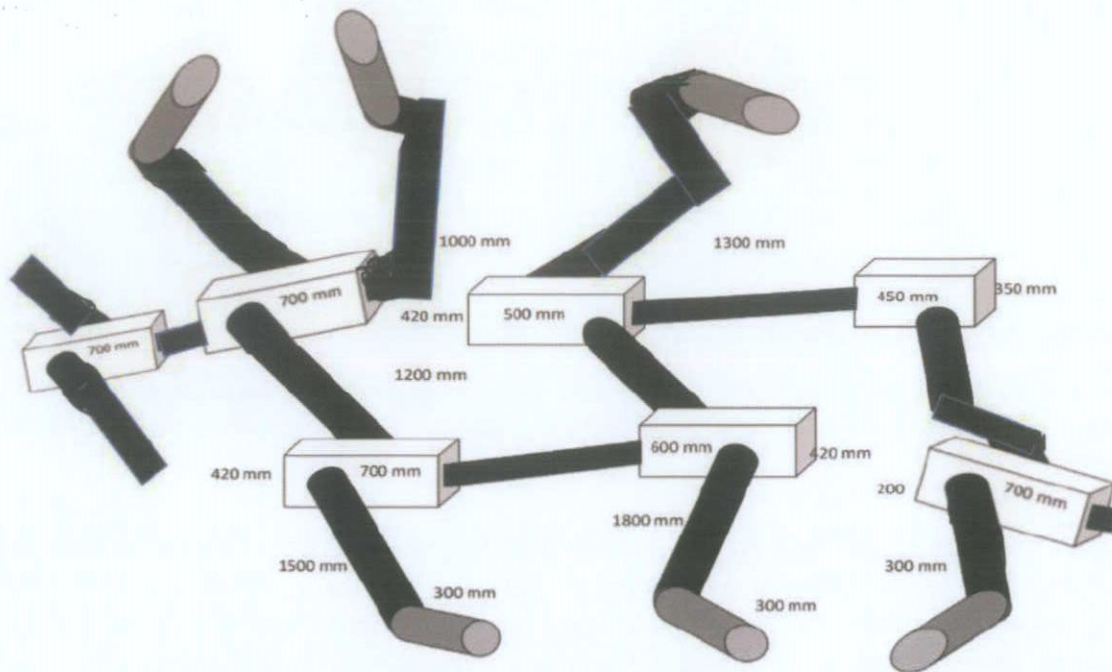


Figure 5-17. Schematic representation of an artificial sett design with 7 chambers and 6 entrances. Three open tunnels would allow expansion of the sett following occupation.
 Extracted from Badger Assessment Report (Keeley, 2022).

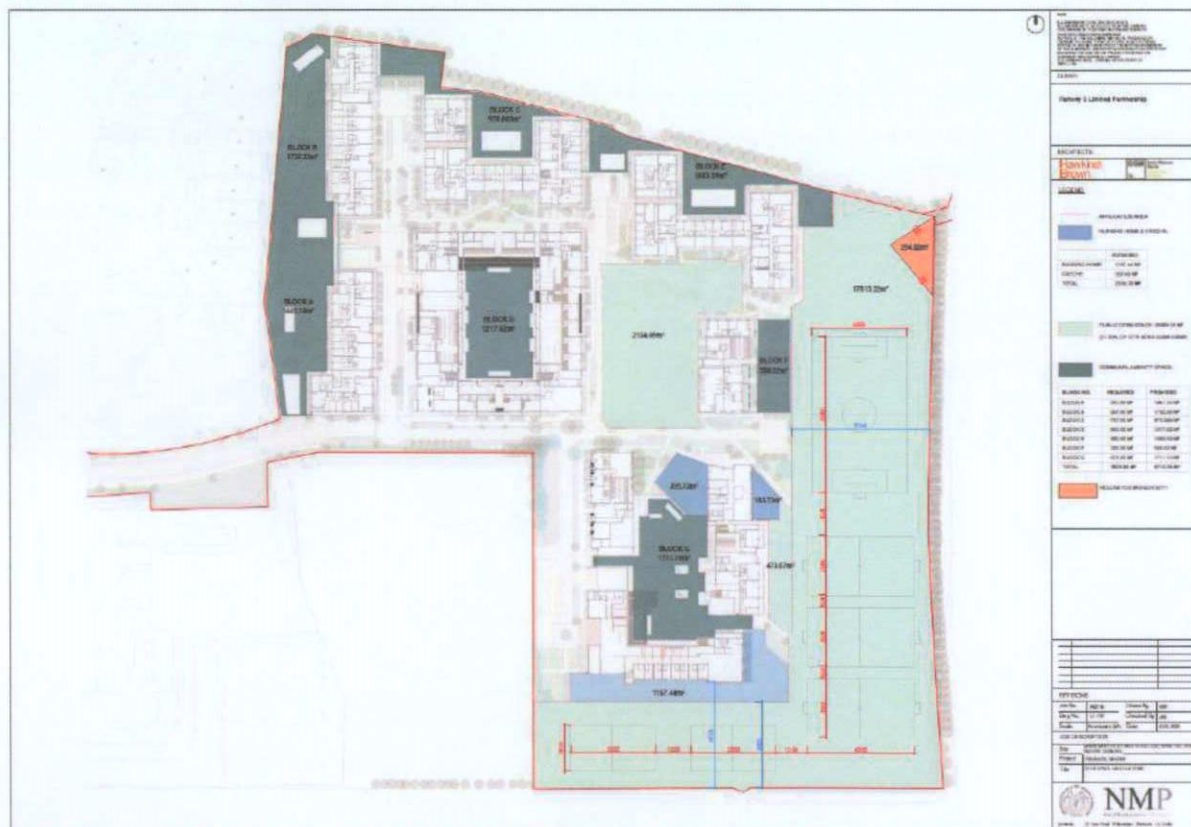


Figure 5-18. Image showing the location of the proposed artificial sett area within the north-eastern corner of the Site (Orange area).

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Construction of the artificial sett must not place existing setts in danger. All construction equipment must remain a minimum of 30 metres (up to 50 metres where there is potential for chambers or tunnels) from all existing (naturally constructed) sett entrances during the creation of the new sett.

Artificial setts will be constructed several months in advance of the closure of a breeding sett. In this interval, the affected badgers should be encouraged to utilise the artificial sett by means of attractive food baits (peanuts etc.) and materials from the breeding sett added to the new sett (such as bedding and spoil). The construction of an effective artificial sett is an exercise best conducted by experienced personnel. The constructed tunnels and chamber system will be located in well-drained soils and be landscaped and planted to ensure adequate cover and lack of disturbance.

Recommending monitoring of badger activity is discussed in section 5.9.

Disturbance limitation

In order to minimise the potential for human and dog related disturbance of the new sett area and its surrounding vegetation, access to this portion of the site will be restricted and discouraged through landscaping (e.g., fencing, dense planting) and signage (e.g., 'Dogs to be kept on leads to protect wildlife').

5.7.3 Mitigation 3: Bat-friendly Tree Felling & Pre-demolition Survey

Prior to the demolition of the prefab classroom structure, and/ or the felling of any mature trees within the Site, it is required that a roost inspection survey is carried out by a suitably qualified ecologist in order to determine the presence of any potential roosts, and this expert's input be provided throughout the demolition/tree felling phase.

Any potential bat roost trees, i.e., in particular those located within the north-western section of the subject lands, will be surveyed by a suitably qualified bat ecologist for bat emergence/activity **during the dusk and dawn immediately prior to felling**. This will apply to Horse Chestnut trees 38 and 101 (noted to have moderate-high roost potential on 26th July 2022) and any other trees noted to have roost potential by the bat specialist. If no bats are found to be roosting within these trees, then they will be soft-felled/ section-felled under the supervision of an experienced ecologist/bat specialist.

Felling will take place, where possible, during the months of **September and October**, to avoid both the nesting bird season and the hibernation period for bats; in which roosting bats are most at risk of death or injury during tree felling.

Tree-felling will be undertaken using heavy plant and chainsaw. There is a wide range of machinery available with the weight and stability to safely fell a tree. Normally trees are pushed over, with a need to excavate and sever roots in some cases. In order to ensure the optimum warning for any roosting bats that may still be present, the tree will be pushed lightly two to three times, with a pause of approximately 30 seconds between each nudge to allow bats to become active. Any affected trees should then be pushed to the ground slowly and should remain **in place for a period of at least 24 hours, and preferably 48 hours** to allow bats to escape.

Trees felled will not **under any circumstances** be cut up or mulched immediately after felling in case protected wildlife is present.

5.7.4 Mitigation 4: Bat-friendly Lighting

The impact of increased night-time lighting as a result of the Proposed Development will be mitigated through the incorporation of bat-friendly lighting measures into the project design and the lighting plan.

In order to minimise disturbance to bats commuting/foraging in the vicinity of the Site, lighting will be designed to minimise light-spill onto any hedgerows or treelines to be retained at the Site. This can be achieved by ensuring that the design of lighting adheres to the guidelines presented in the Bat Conservation Trust & Institute of Lighting Engineers *'Bats and Lighting in the UK - Bats and Built Environment Series'*, (ILP, 2018) the Bat Conservation Trust *'Artificial Lighting and Wildlife Interim Guidance'* and the Bat Conservation Trust *'Statement on the impact and design of artificial light on bats'*. Therefore, the lighting scheme will include the following:

- The minimisation of night-time lighting emitted during both the Construction and Operational Phases of the Proposed Development (once health and safety requirements are met).
- The avoidance of direct lighting of treelines and hedgerows at the Site, as well as areas of planting.
- Unnecessary light spill controlled through a combination of directional lighting and hooded / shielded luminaires.
- Where appropriate, luminaires on the site boundary will be fitted with light baffles to prevent light spill onto adjacent habitats.
- Areas around the perimeter should not be lit up nor lighting directed towards them. Lighting in these areas should not increase beyond existing night-time lux levels or 1 lux, whichever is the lesser.
- Movement sensor triggered lighting and low level bollards will be considered for paths around the perimeter of the Proposed Development, particularly areas of proposed tree planting.
- Vertical light spill at light sources will be below 3m to avoid potential bat flight paths.
- No floodlighting will be used – this causes a large amount of light spillage into the sky significantly impacting bats. The spread of light should be kept below the horizontal.
- Hoods, louvres, shields or cowls should be fitted on the lights to reduce light spillage.
- Lights will be of low intensity. It is better to use several low intensity lights than one strong light spilling light across the entire area.
- Narrow spectrum lighting should be used with a low UV component. Glass also helps reduce the UV component emitted by lights.
- The source of light will be Light Emitting Diodes (LEDs) as this is a narrow beam that is highly directional and a highly energy efficient light source.

Incorporation of the appropriate luminaire specifications as advised by a lighting professional can have a considerable input in mitigating the potential impact of night-time lighting on local bats.

Night-time lighting across the Site of the Proposed Development will be kept to a minimum during both the Construction and Operational Phases of the Proposed Development through the reduction of light spill from the building interior via windows/entrances, and the reduction of spill/glare from outdoor lighting in place on the building exterior and throughout the Site (see Figure 5-19).

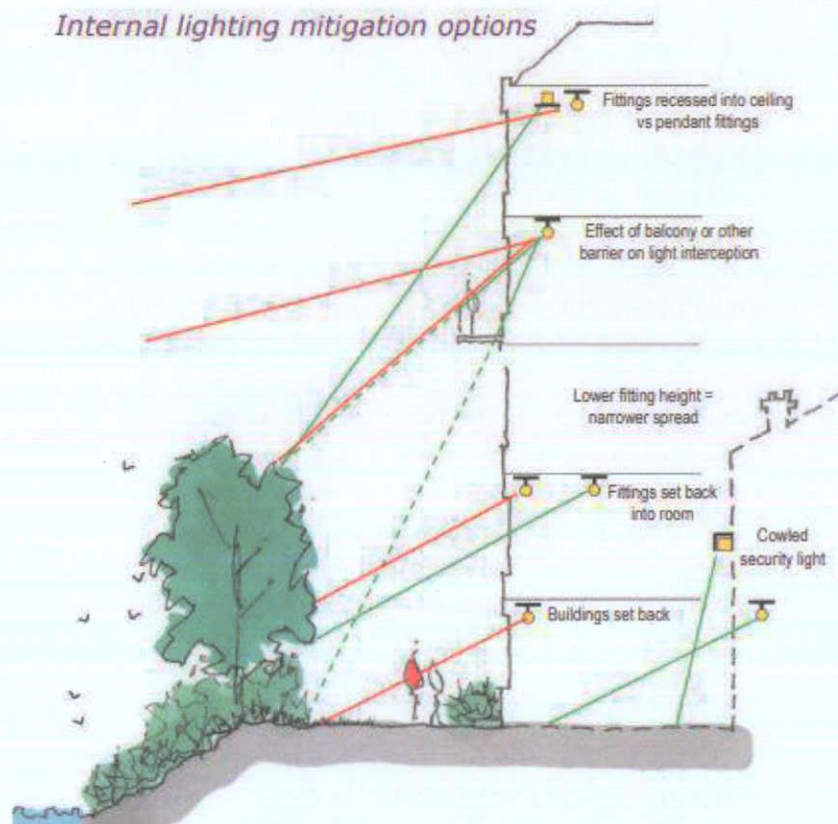


Figure 5-19. Internal Lighting Guidance Diagram adapted from ILP (2018).

It is noted that bat-friendly lighting measures as detailed above will have a similar positive effect with regard to commuting bird species flying at night. Further measures are outlined in 'Best Practices for Effective Lighting' (City of Toronto, 2017).

5.7.5 Mitigation 5: Habitat Protection

There is a potential impact on identified habitats locally and associated fauna, as a result of surface water run-off containing silt, oil or other pollutants into the drainage ditch adjacent to the Proposed Development, with a potential connection with the Naniken Stream (100m north of the Proposed Development) which eventually flows into North Bull Island's south lagoon.

The CEMP will be implemented by the appointed Contractor that details the suitable precautions to be followed in relation to any potential pollution of watercourses from

construction activities. The storage of materials, containers, stockpiles and waste, however temporary, must follow best practice at all times and be stored at designated areas away from watercourses.

The *Engineering Assessment Report* submitted with this planning application, details the comprehensive Sustainable Drainage System (SUDS) that is to be incorporated into the Proposed Development. Similarly, the *Arboriculture Report* completed by The Tree File Consulting Arborists, details the tree protection measures that will be implemented in order to protect trees that are to be retained as part of the Proposed Development.

5.7.6 Mitigation 6: Naniken Stream and European Eel

5.7.6.1 Construction Phase

The following is proposed to ensure that no potential adverse effects will arise from construction-related surface water discharges from the Proposed Development. All works adjacent to the Naniken River will be carried out in accordance with Inland Fisheries Ireland (IFI), "*Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters*". Contact will be made with IFI to ensure the works comply with the provisions of the Fisheries Act and Habitats Regulations, and in accordance with any detailed operational and construction requirements issued by IFI.

Best practise Construction measures for works within, or in the vicinity of watercourses will also be followed as per '*Guidelines for the crossing of watercourses during the construction of national road schemes*' (TII, 2008) and '*Control of water pollution from linear construction projects - CIRIA C648*' (CIRIA, 2006). The below measures will be included in the CEMP to prevent the release of hydrocarbons, polluting chemicals, sediment/silt and contaminated waters into the receiving surface water network:

- A suitably qualified Ecological Clerk of Works (ECoW) will be present on-site during the works being undertaken along the Naniken riverbank i.e., the installation of the surface water outfall.
- Specific measures to prevent the release of sediment over baseline conditions to the Naniken River during the construction work, which will be implemented as the need arises. These measures include, but are not limited to, the use of silt traps, silt fences, silt curtains, settlement ponds and filter materials. This is particularly important when undertaking any works/upgrading to the surface and foul water drainage networks at the site of the Proposed Development.
- It will be ensured that all river protection measures will be **maintained in good and effective condition** for the duration of the proposed works and checked regularly to ensure that the silt fencing and other mitigation measures are operating effectively. Daily checks will be appropriate during the initial site clearance, during works in the vicinity of the watercourse, and during and after storm events. Weekly or bi-weekly checks may be appropriate at other times.
- Provision of exclusion zones and barriers such as silt fences between earthworks, stockpiles and temporary surfaces to prevent sediment washing into the Naniken River and/or existing drainage systems and hence the downstream receiving water environment.

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- Silt traps will not be constructed immediately adjacent to the Naniken River, i.e. a buffer zone between the trap and the watercourse with natural vegetation must be left intact. Imported materials such as terram, straw bales, coarse to fine gravel should be used either separately or in-combination as appropriate to remove suspended matter from discharges.
- Provision of temporary construction surface drainage and sediment control measures will be in place before the construction of the pipeline and/or earthworks commence.
- Weather conditions will be taken into account when planning construction activities to minimise risk of run-off from the Site.
- Prevailing weather and environmental conditions will be taken into account prior to the pouring of cementitious materials for the works adjacent to the Naniken Stream and/or surface water drainage features, or drainage features connected to same. Pumped concrete will be monitored to ensure no accidental discharge. Mixer washings and excess concrete will not be discharged to the Naniken Stream or existing surface water drainage systems. Concrete washout areas will be located remote from the Naniken Stream or any surface water drainage features, where feasible, to avoid accidental discharge to watercourses.
- Any fuels or chemicals (including hydrocarbons or any polluting chemicals) will be stored in a bunded area to prevent any seepage of into the Naniken Stream, local surface water network or groundwater, and care and attention taken during refuelling and maintenance operations.
- Temporary oil interceptor facilities will be installed and maintained where site works involve the discharge of drainage water to receiving rivers and streams.
- All containment and treatment facilities are regularly inspected and maintained.
- All mobile fuel bowsters will carry a spill kit and operatives must have spill response training.
- All fuel containing equipment such as portable generators will be placed on drip trays. All fuels and chemicals required to be stored on-site will be clearly marked.
- Implementation of response measures to potential pollution incidents.
- Emergency procedures and spillage kits will be available and construction staff will be familiar with emergency procedures in the event of accidental fuel spillages.
- All trucks will have a built-on tarpaulin that will cover excavated material as it is being hauled off-site and wheel wash facilities will be provided at all site egress points.
- Water supplies will be recycled for use in the wheel wash. All waters will be drained through appropriate filter material prior to discharge from the construction sites.
- The removal of any made ground material, which may be contaminated, from the construction site and transportation to an appropriate licenced facility will be carried out in accordance with the Waste Management Act, best practice and guidelines for same.
- A discovery procedure for contaminated material will be prepared and adopted by the appointed contractor prior to excavation works commencing on site. These documents

will detail how potentially contaminated material will be dealt with during the excavation phase.

- Implementation of measures to minimise waste and ensure correct handling, storage and disposal of waste (most notably wet concrete, pile arisings and asphalt).

5.7.6.2 Operational Phase

With regard to the proposed discharge of treated operational surface water from the Proposed Development to the Naniken River, the potential for surface water generated at the Site of the Proposed Development to cause significant effects to downstream sensitivities during the Operational Phase would be considered negligible due in part to the SUDS measures incorporated in the Project Design. Project specific SUDS measures are described below.

The following attenuation and SUDS measures will be incorporated into the Proposed Development as detailed in the Engineering Assessment Report (Waterman Moylan, 2022):

- Permeable paving
- Filter drains throughout Site
- Extensive green roofs on the buildings
- Tree pits located throughout the Site
- Underground attenuation tank
- Flow control device (Hydrobrake or similar) and
- Class 1 Bypass petrol interceptor located prior to outfall to Naniken River.

5.7.7 Mitigation 7: Noise Management

A number of measures will be included in the final CEMP as set out in *BS 5228-1: A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*, that will be put in place during the Construction Phase of the Proposed Development. These will ensure that the level of noise caused by the proposed works will be controlled/reduced where possible so as to minimise the potential disturbance impact on local fauna species.

These measures will include but are not limited to:

- Selection of plant with low inherent potential for generating noise.
- Avoid unnecessary revving of engines and switch off plant items when not required.
- Keep plant machinery and vehicles adequately maintained and serviced.
- Proper balancing of plant items with rotating parts.
- Keep internal routes well maintained and avoid steep gradients.
- Minimise drop heights for materials or ensure a resilient material underlies.
- Use of alternative reversing alarm systems on plant machinery.
- Where noise becomes a source of resonating body panels and cover plates, additional stiffening ribs or materials should be safely applied where appropriate.
- Limiting the hours during which site activities likely to create high levels of noise are permitted.

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- Appointing a site representative responsible for matters relating to noise.
- Monitoring typical levels of noise during critical periods and at sensitive locations.

These measures will ensure that any noise disturbance to local birds or any other fauna species in the vicinity of the Site of the Proposed Development will be reduced to a minimum.

5.7.8 Mitigation 8: Reduction of Construction hazards

All construction waste with the potential to harm small mammals e.g., plastic sheeting, netting/mesh will be kept above ground; to reduce the risks to small mammal of suffocation/entrapment.

To prevent mammals becoming trapped in excavations during the Construction Phase, a means of escape e.g., ramps, or objects such as planks will be placed in pits overnight.

5.7.9 "Worst Case" Scenario

In a worst-case scenario at the Site of the Proposed Development, where the recommendations and mitigation measures described in this report were to be disregarded or should fail; vegetation would be cleared during the nesting bird season causing the destruction of all nests, eggs and some birds during the clearance works.

Should any mature trees marked for felling support roosting bats, and be felled without prior survey, roosting bats could be injured/killed during the works.

Should the badger management plan not be implemented under the correct supervision the works could result in the displacement, injury and death of badgers.

All of the above would represent violations of national wildlife legislation, i.e., offences under the Wildlife Act 1976 as amended; and the harming of bats and destruction of roosts would be contrary to the EU Habitats Directive 1992 and EC (Birds and Natural Habitats) Regulations 2011.

5.8 Residual Impacts

Residual impacts are impacts that remain once mitigation measures have been implemented or impacts that cannot be mitigated. Table 5-13 below provides a summary of the impact assessment for the identified KERs and details the nature of the impacts identified, mitigation proposed and the classification of any residual impacts.

Provided all mitigation measures are implemented in full and remain effective throughout the lifetime of the facility, no significant negative residual impacts on the local ecology or on any designated nature conservation sites, are expected from the Proposed Development. However, in terms of residual impacts to badgers, the loss of an active main breeding sett will result in an unavoidable significant residual impact.

As per the Badger Assessment Report prepared by Brian Keeley (2022), the Proposed Development will result in substantial changes to badger usage of the Site. The works will see a loss of two setts, comprising a breeding sett and a neighbouring annexe sett, as well as significant disruption to the badger family's foraging area. It is proposed that the artificial sett will provide an alternative to the main sett if adopted by the badgers and that the impact of

Proposed Development would then be mitigated to a significant, short-term impact; thus only comprising the loss of an annexe sett, foraging habitat and disruption through the removal of the both setts. Opportunities for continued foraging within St. Anne's Park will persist and the loss of feeding habitat will not be significant and will not affect the conservation status of these badgers. Badgers will be disrupted by the construction and occupancy of housing but with proper mitigation implementation should be free to forage and commute in the surrounding area and through the Site.

Table 5-13 Summary of Potential Impacts on KER(s), Mitigation Proposed and Residual Impacts.

Key Ecological Resource	Level of Significance	Potential Impact	Impact Without Mitigation				Proposed Mitigation Summary	Residual Impact
			Quality	Magnitude / Extent	Duration	Significance		
Designated Sites								
Relevant European Sites	International Importance	Surface water run-off containing silt / pollutants into drainage ditch adjacent to Site during Construction Phase, which has potential link to KERs through Naniken Stream nearby.	Negative	n/a	Short-term	Slight	Incorporation of comprehensive drainage system throughout Construction Phase.	Negligible
North Dublin Bay pNHA	National Importance						Incorporation of comprehensive sustainable drainage system (SuDS) during the Operational Phase (See NIS for further detail).	
Habitats								

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<p>Treelines (WL2)</p> <p>Scrub (WS1)</p> <p>Mixed Broadleaf Woodland (WD1)</p> <p>Scattered trees and Parkland (WD5)</p> <p>Stone Walls and other Stonework (BL1)</p>	Local importance (higher value)	Loss and/or damage to some sections of habitat during Construction Phase.	Negative	Local scale	Permanent	Slight	<p>Majority of Treelines and mature trees to be retained.</p> <p>Tree protection measures to be adhered to during Construction Phase.</p> <p>Sections of old stone wall at the Site to be retained.</p> <p>Significant increase in tree cover and diverse planting as a result of the proposed landscaping plan.</p>	<ul style="list-style-type: none"> Loss of habitat = Negligible Provision of new tree cover and planting = Positive, Permanent, Significant.
Mammals								
Badger	Local importance (higher value)	<p>Loss of a main and annexe sett.</p> <p>Sett removal while active (if active during construction).</p> <p>Construction noise disturbance.</p> <p>Loss of foraging habitat.</p> <p>Disturbance during operational phase by people/dogs</p>	Negative	Local scale	<p>Permanent</p> <p>Permanent</p> <p>Short-term</p> <p>Permanent</p> <p>Permanent</p>	<p>Significant</p> <p>Profound</p> <p>Significant</p> <p>Slight</p> <p>Moderate/significant</p>	<p>Preconstruction badger survey and assessment of status of setts in north-west of Site.</p> <p>Construction Phase badger management plan to be prepared by Badger expert and approved by NPWS.</p> <p>Mitigation measures as described in section 5.7.2 to be followed under supervision of Badger expert when excluding badgers from and destroying setts.</p> <p>Provision of an artificial sett on site as compensation, with protective screening vegetation</p>	<ul style="list-style-type: none"> Loss of an active sett and annexe sett= Negative, Significant, Short-term (if artificial sett provided) Noise disturbance = Negative, Slight, Short-term. Mortality/injury during sett destruction = No impact.

							<p>to provide shelter and foraging habitat.</p> <p>Suite of noise control measures to be included in the CEMP. Badger specific construction measures as agreed with Badger expert to reduce disturbance e.g., no work zones, screening etc.</p> <p>Operational Phase human disturbance to be minimised through protection of Sett area through landscaping (e.g., fencing, planting) and signage with regards dogs.</p>	<ul style="list-style-type: none"> Loss of foraging habitat = Negative, Slight, Permanent. Operational Phase disturbance = Negative, Slight, Permanent.
Hedgehog Pygmy Shrew	National Importance	<p>Loss and/or damage to some sections of potential habitat during Construction Phase.</p> <p>Disturbance due to noise generated during Construction Phase.</p> <p>Construction hazards</p>	Negative	Local scale	<p>Permanent</p> <p>Short-term</p> <p>Short-term</p>	<p>Slight</p> <p>Significant</p> <p>Slight</p>	<p>Abundant similar habitat in surrounding parkland.</p> <p>Proposed landscaping will provide grassland and verge habitats.</p> <p>Suite of noise control and waste management measures to be included in the CEMP.</p>	<ul style="list-style-type: none"> Loss of habitat = Negative, Short-term, Slight. Noise = Negligible Construction Hazards = Negligible.
Bat Assemblages	National importance	<p>Loss and/or damage to some sections of potential roosting and commuting habitat during Construction Phase.</p> <p>Felling of trees containing roosting bats.</p>	Negative	Local scale	<p>Permanent</p> <p>Short-term</p> <p>Short-term</p> <p>Permanent</p>	<p>Slight</p> <p>Significant</p> <p>Significant</p> <p>Significant</p>	<p>Majority of mature trees and boundary treelines to be retained.</p> <p>Pre-felling/demolition bat roost inspection/surveys to be carried out of bat roost potential trees.</p>	<ul style="list-style-type: none"> Loss of habitat = Negative, Short-term, Slight. Death/injury during felling/demolition= Negative, Short-

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		Increased lighting as a result of the construction of the Proposed Development. Increased lighting as a result of the operation of the Proposed Development.					Significant increase in tree cover and diverse planting as a result of the proposed landscaping plan. Bat sensitive lighting used during Construction and Operational Phases. 3+ bat boxes to be installed based on recommendations of bat specialist after pre-felling surveys.	term, imperceptible. <ul style="list-style-type: none">Increased Construction Phase lighting = Negative, Short term, Slight.Increased operational lighting = Negative, permanent, slight.
Birds								
Bird Assemblages (Red listed)	National importance	Loss and/or damage to some sections of potential nesting habitat during Construction Phase.	Negative	Local scale	Permanent	Moderate	Majority of mature trees and boundary treelines to be retained.	<ul style="list-style-type: none">Loss of habitat = Negative, Short-term, Slight.Increase in tree cover = Positive, Permanent, Moderate.
Bird Assemblages (Amber listed)	National importance	Nest destruction and mortality if vegetation clearance takes place during the nesting season.					Significant increase in tree cover and diverse planting as a result of the proposed landscaping plan.	
Bird assemblage (Green listed)	County importance	Disturbance due to noise generated during Construction Phase.					Avoidance of removal of vegetation during nesting season (see section 5.7.1 for detail). Suite of noise control measures to be included in the CEMP.	
SCI Waterfowl and shorebirds	International Importance	Impacts to SCI species are addressed in the AA Screening and NIS which accompany this application under separate cover.						

European Eel	National Importance	Potential pollution of 'Duck Pond' containing eel during construction of surface water outfall to Naniken River. Potential pollution of 'Duck Pond' containing eel during Operational Phase.	Negative	Local scale	Short-term Permanent	Significant Slight	Construction related surface water protection measures included to be in the CEMP. Suite of SUDS measures included in the project design (See Section 5.7.6 and EAR report for further detail).	<ul style="list-style-type: none"> Negative, Imperceptible, Permanent.
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5.9 Monitoring

5.9.1 Construction Phase

5.9.1.1 Bats

As a precautionary measure, it is recommended that the relevant potential bat roost trees, located within the north-western section of the subject lands, are section-felled under the supervision of an experienced ecologist. If bats are present, all works must cease, and NPWS contacted in order to obtain a derogation licence. The CEMP submitted with this planning application provides for a Project Environmental Consultant who will supervise or appoint a suitably qualified person to supervise any work that has potential to involve risk to the environment.

5.9.1.2 Surface water protection measures

The applicant will ensure that monitoring during the Construction Phase will be carried out by a suitably qualified person. This person will specifically ensure that mitigation measures set out in this report are fully implemented, particularly in relation to the protection of the Naniken Stream (i.e., silt fencing condition and supervision of works in or near the stream).

Surface water protection measures e.g., silt fences etc., will be monitored for their effectiveness for the duration of the works. Daily checks may be appropriate during the initial site clearance, during works in the vicinity of the watercourse, and during and after storm events. Weekly or bi-weekly checks may be appropriate at other times.

5.9.2 Operational Phase

5.9.2.1 Badger monitoring programme

Construction Phase

A suitably qualified Badger specialist will be employed prior to the commencement of works on site to survey the Site for badger activity and assess the status of the existing setts.

The specialist will be employed for the duration of the construction Phase and will supervise all works in the vicinity of the existing setts and the artificial sett once constructed. The construction of the artificial sett will also be carried out under the supervision of this specialist in consultation with NPWS.

The specialist will ensure no harm come to badgers during the Construction Phase e.g., exclusion fencing to prevent access to the construction site as required.

A schedule of checks will be drawn up by the specialist to cover the duration of the Construction Phase; to ensure that badger protection measures are in place and working effectively.

Post Construction

A post-construction monitoring programme is proposed for the Site to assess the success (or not) of the mitigation measures relating to badgers. The post construction monitoring will entail the assessment of badger activity at the Site post construction, and the assessment of the success of the artificial sett.

On completion of all works, an inspection of the artificial sett will be carried out to ensure it is accessible and in good repair. It is proposed that inspections be carried out six months and one year after the date of this initial inspection, using camera traps to determine whether the sett is being used and proposing any further remedial measures if relevant. All inspections, monitoring and license applications will be conducted by suitably qualified badger specialist, with reporting to the relevant authorities.

5.9.2.2 European Eel and operational surface water monitoring

A monitoring program will be put in place to survey the 'Duck Pond' for European Eel prior to the commencement of works, to establish a baseline of Eel usage of the pond. The pond will be surveyed again once construction has completed, and the Proposed Development is operational. The timing and frequency of this program of surveys will be agreed with Inland Fisheries Ireland and will be carried out by suitably qualified Ecologists with the appropriate licences from the NPWS as required.

The aim of this monitoring program will be to assess whether the operation of the Proposed Development is having an adverse effect on this European Eel population, through comparisons between the baseline survey results and those post development.

5.10 Interactions

5.10.1 Hydrology

The interactions identified between hydrology and biodiversity are with respect to the potential impact of water pollution on protected areas. This is addressed in further detail in the NIS that accompanies this application under separate cover.

5.10.2 Landscape and Visual

The landscaping proposed for the Site entails the planting of over 700 trees, many of which are native species. This increase in tree cover across the Site will provide additional nesting/foraging resources for local passerines, along with a slight increase in habitat connectivity over what is currently open field habitat.

5.10.3 Land and Soil

An assessment of the potential impact of the Proposed Development on land and soils is outlined in Chapter 6 – Land and Soils. These impacts are considered to be relevant to the ecological sensitivities associated with the Site of the Proposed Development discussed in this Chapter; and mitigation measures addressing these potential impacts are described in full in Chapter 6.

5.10.4 Air Quality and Climate

An assessment of the potential impact of the Proposed Development on Air Quality and Climate is outlined in Chapter 8 - Air Quality and Climate. Designated sites of ecological conservation importance, including SPAs, SACs, NHAs and nature reserves, within 200m of the Affected Road Network (ARN) are required to be included in the air quality assessment. No sites of ecological conservation importance have been identified within 200m of the ARN; therefore, this analysis has been excluded in the current assessment and significant effects

are not expected to occur. Therefore, the impact of the interaction between air quality and climate and biodiversity is insignificant.

5.10.5 Material Assets: Waste and Utilities

An assessment of the potential impact of the Proposed Development on Waste Management is outlined in Chapter 12.2 – Material Assets: Waste and Utilities. These impacts are considered to be relevant to the protection of small mammals which may become entangled or trapped in construction waste in the absence of mitigation, as discussed in this Chapter; and mitigation measures addressing these potential impacts are described in full in Chapter 12.

5.11 Difficulties Encountered When Compiling

No difficulties were encountered in preparing this Chapter.

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6 LAND AND SOIL

6.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) provides an assessment of the impact that the proposed mixed-use development at Foxlands in Raheny, Dublin 5 will have on the surrounding soil and geology in the vicinity of the site. It also sets out mitigation and remedial measures and methods of monitoring once the development is operational. It also sets out mitigation and remedial measures and methods of monitoring while the development is operational.

A full description of the development can be found in Chapter 2: Description of Proposed Development of this EIAR.

This chapter was completed by Waterman Moylan Consulting Engineers.

6.2 Study Methodology

A desktop study to classify the geological features related to the site was undertaken. Data from the Geological Survey of Ireland (GSI) was reviewed, including the following maps:

- Bedrock Geology Map
- Bedrock Aquifer Map
- Ground Water Vulnerability Map

This information was supplemented by a review of geotechnical Site Investigations carried out within the site by Ground Investigations Ireland Ltd. in September and October 2015. This ground investigation assessed the soil, rock and groundwater conditions across the site and included 10 no. cable percussion boreholes to a maximum depth of 8.0m below ground level, standpipe installations and groundwater monitoring, and laboratory testing of representative soil samples.

6.3 The Existing and Receiving Environment (Baseline Situation)

The subject site is located in Raheny, Dublin 5. It is bounded by St. Anne's Park to the north, east and south, and by St. Paul's Secondary School and a residential street known as The Meadows to the west.

The site is a greenfield site. Topographic survey data indicates that the site falls generally from west to east, with a high point of approximately 25.5m OD Malin at the west of the site and a low point of approximately 21.4m OD Malin at the south-eastern corner of the site.

The site falls within the catchment of the Naniken River, located approximately 100m north of the site. Although it is culverted further upstream of the site, the Naniken River is visible for its entire lower course where it flows through St. Anne's Park. The river discharges via a culvert beneath the James Larkin Road (R807) to the sea between North Bull Island and the mainland.

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6.3.1 Desktop Study

Geological Survey Ireland (GSI) produces a wide range of datasets, including bedrock geology mapping, extracted in the Figure below:

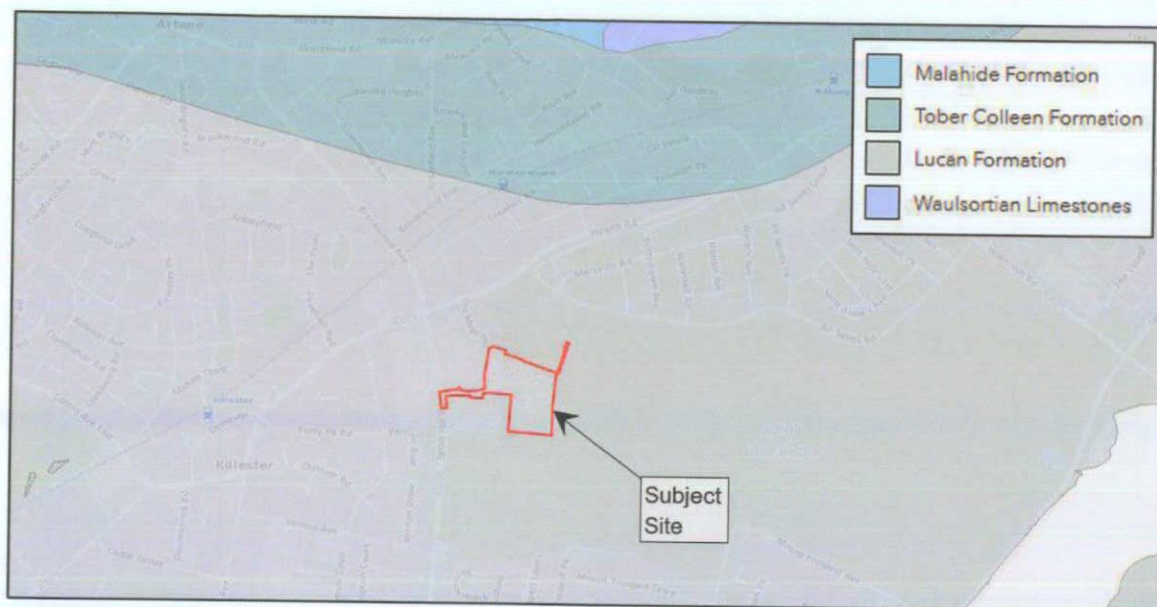


Figure 6-1: Extract from GSI Bedrock Geology Map

From the GSI bedrock map, extracted above, the subject site lies within the Lucan Formation, which covers much of Dublin. This formation comprises dark-grey to black, fine-grained, occasionally cherty, micritic limestones that weather paler, usually to pale grey. There are rare dark coarser grained calcarenitic limestones, sometimes graded, and interbedded dark-grey calcar. The beds are predominantly fine-grained distal turbidites in the north Dublin Basin, and the formation ranges from 300m to 800m in thickness.

The National Aquifer Bedrock Map prepared by the Geological Survey of Ireland was also consulted and is extracted below:

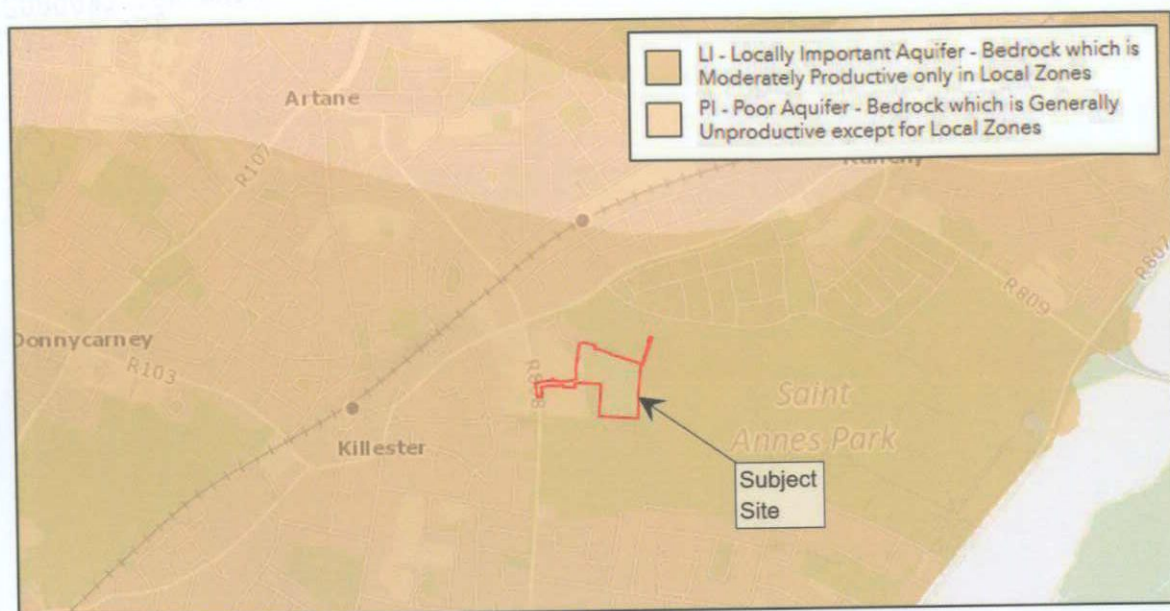


Figure 6-2: Extract from GSI Groundwater Aquifer Map

From this map, it was established that the entirety of the site is within the designation LI, which represents locally important moderately productive aquifer.

From the GSI groundwater vulnerability map, extracted below, the vulnerability of the aquifer in the vicinity of the proposed site is low:

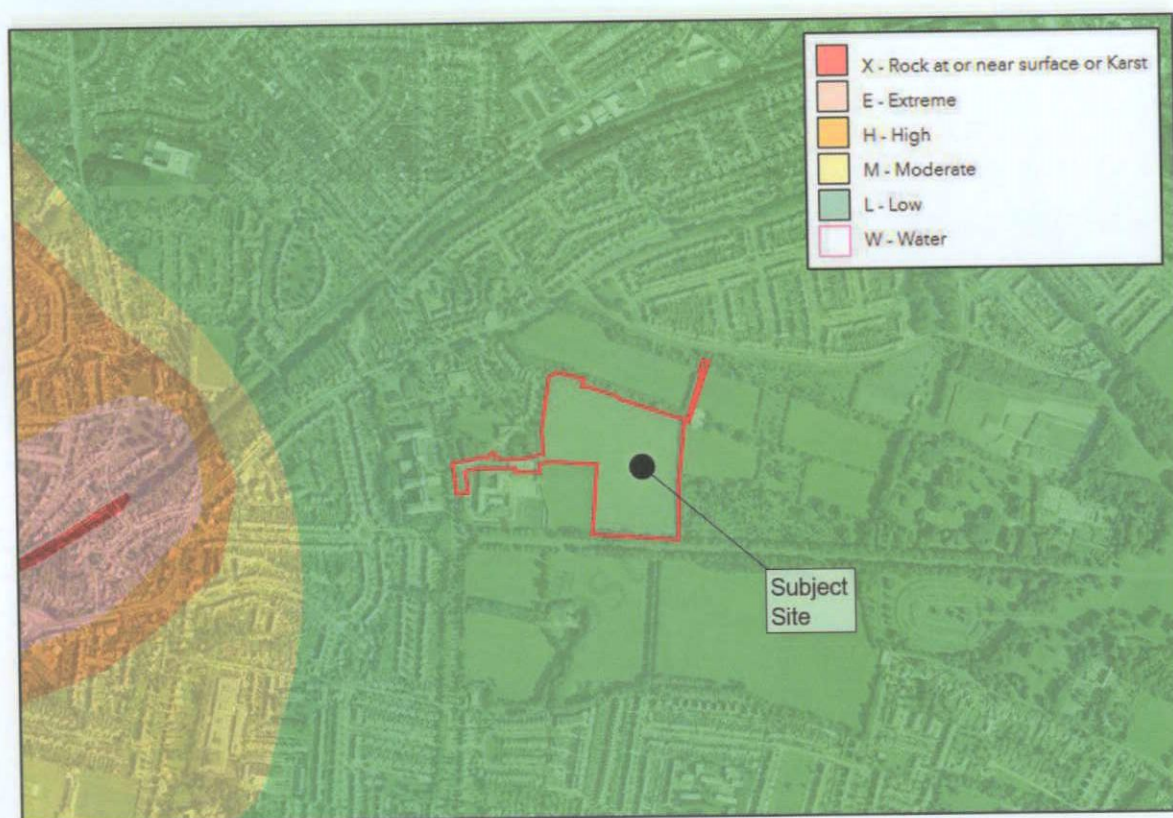


Figure 6-3: Extract from GSI Groundwater Vulnerability Map

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6.3.2 Ground Investigations

Intrusive ground investigations were carried out at the site by Ground Investigations Ireland Ltd. in September and October 2015. The scope of the site investigation works carried out at the site comprised the following:

- 10 No. Cable Percussion boreholes were drilled to a maximum depth of 8.0m below ground level using a Dando 2000 drilling rig with regular in-situ testing and sampling undertaken to facilitate the production of geotechnical logs and laboratory testing.
- Disturbed samples were taken from the boring tools at suitable depths, so that there is a representative sample at the top of each change in stratum and thereafter at regular intervals down the borehole until the next stratum was encountered. The disturbed samples were then sealed and sent to the laboratory where they were visually examined to confirm the description of the relevant strata.
- Standard Penetration Tests were carried out in the boreholes.
- Standpipe installations and groundwater monitoring to allow the equilibrium groundwater level to be determined.
- Samples were selected from the boreholes for a range of geotechnical classification laboratory testing to provide information for the proposed design.

The locations of the 10 No. boreholes are indicated on the Figure 6-4, circled in red for clarity

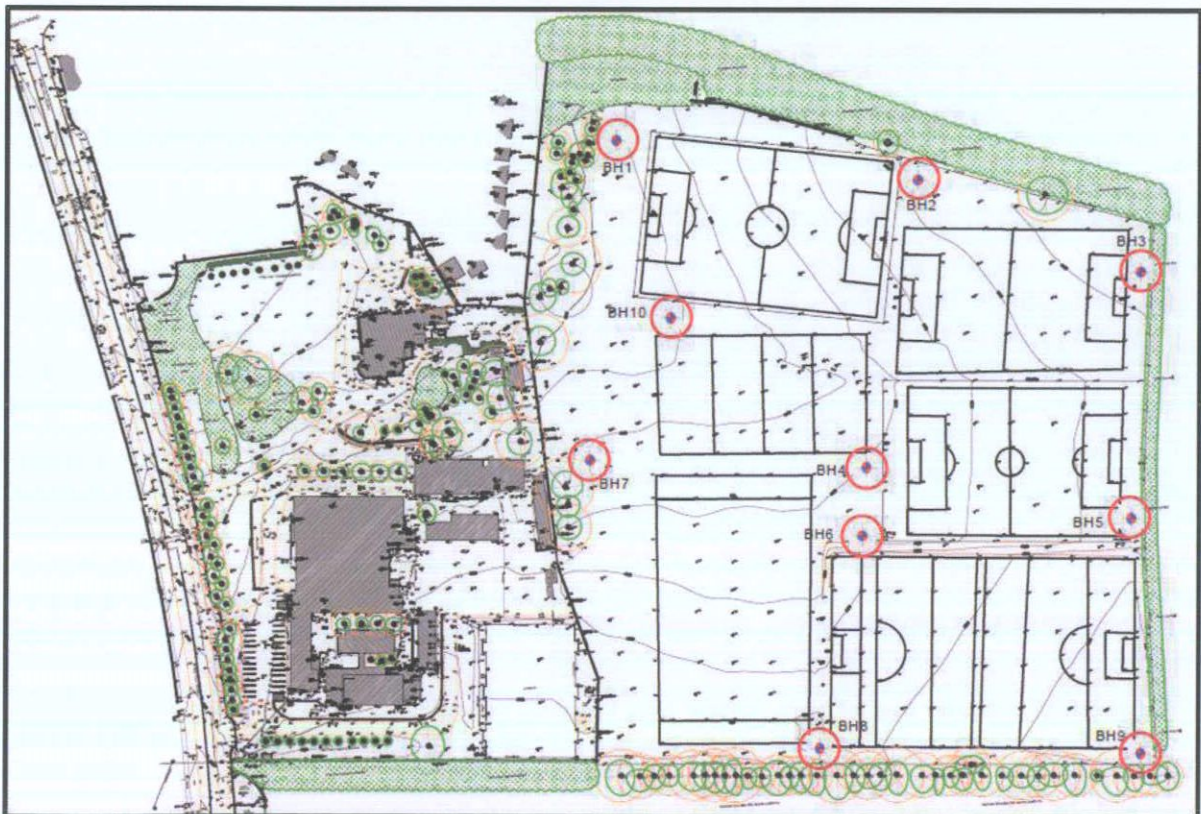


Figure 6-4: Site Investigation Locations

The sequence of strata encountered were consistent across the site and are generally consisted of;

- Made Ground
- Cohesive Deposits

Made Ground deposits were encountered beneath the ground surface or Topsoil and were present to depths of between 0.8 and 1.5m BGL in the boreholes. These deposits were described generally consisted of brown/grey sandy gravelly CLAY.

Stiff brown cohesive deposits were present below the Made Ground deposits in the boreholes and were typically described as brown sandy gravelly CLAY with occasional cobbles. This stratum was present to a depth of up to 2.3m BGL and was underlain by a stiff to very stiff black slightly sandy gravelly CLAY with occasional cobbles and boulders to a maximum depth of 8.0m BGL.

Groundwater strikes were generally not encountered during the investigation in the cohesive deposits. However, it is noted that the exploratory holes did not remain open for sufficiently long periods of time to establish the hydrogeological regime and groundwater levels would be expected to vary with the time of year, tidal influence, rainfall, nearby construction and other factors.

To better understand the hydrogeological regime and groundwater levels, standpipes were installed in BH1, BH2, BH3, BH6 and BH9. This allowed for the equilibrium groundwater level to be determined, as tabulated in Table 6-1:

Table 6-1: Groundwater Monitoring Levels

Borehole	Date	Groundwater	
		m BGL	m OD
BH1	19/10/2015	1.08	23.772
BH2	19/10/2015	1.79	20.699
BH3	19/10/2015	2.17	19.773
BH6	19/10/2015	Dry	-
BH9	19/10/2015	2.40	19.021

An allowable bearing capacity of 150kN/m² is recommended for the stiff brown cohesive deposits below the made ground depths of 0.80 – 1.50m below ground level. An allowable bearing capacity of 300kN/m² is recommended for deeper foundations based on the stiff black cohesive deposits. Excavations in the areas where deeper Made Ground deposits were encountered may require to be appropriately battered or the sides supported due to the variable strength of these deposits.

The full Site Investigation report is included as Appendix I to this report.

6.4 Characteristics of the Proposed Development

The Proposed Development consists of the construction of a residential and nursing home development set out in 7 no. blocks, ranging in height from 4 to 7 storeys, to accommodate 580 no. apartments, residential tenant amenity spaces, a crèche and a 100-bed nursing home, as set out in the schedule of accommodation (Table 6-2):

Description		1-Bed	2-Bed	3-Bed	Total
Apartment Blocks	Block A	31	25	5	61
	Block B	44	26	-	70
	Block C	46	57	9	113
	Block D	56	58	22	136
	Block E	47	46	3	96
	Block F	23	9	4	36
Mixed-Use (Block G)	Apartments	25	27	17	69
	Nursing Home	100 Bed-Spaces			-
	Crèche	6 Classrooms			-
Total		272	248	60	580

Table 6-2: Schedule of Accommodation

The proposal includes basement, podium and surface car parking with vehicular and pedestrian access from Sybil Hill Road, via a proposed new access road.

The development will include all associated site development works, landscaping and boundary treatment, cycle parking, bin stores, substation, drainage and service connections.

The proposed development, with respect to soils and geology, includes the following characteristics: -

- Stripping of topsoil.
- Excavation of foundations and basements.
- Excavation of drainage sewers and utilities.
- Regrading and landscaping.
- Disposal of any surplus excavated soils including any contaminated material.

6.5 Potential Impact of the Proposed Development

6.5.1 Construction Phase

The removal of topsoil during earthworks and the construction of roads, services and buildings, in particular basements and foundations, will expose subsoil to weathering and may result in the erosion of soils during adverse weather conditions. Surface water runoff from the surface of the excavated areas may result in silt discharges to the Naniken River.

Excavations for basements, foundations, roadworks and services will result in a surplus of subsoil. Surplus subsoil will be used in fill areas where applicable.

Dust from the site and from soil spillages on the existing road network around the site may be problematic, especially during dry conditions.

Accidental oil or diesel spillages from construction plant and equipment, in particular at refuelling areas, may result in oil contamination of the soils and underlying geological structures.

6.5.2 Operational Phase

During the operational stage of the Proposed Development, it is not envisaged that there will be any ongoing impacts on the underlying soil as a result of the proposed development. Any hydro-geological impacts are temporary and associated with the construction of the proposed development.

6.5.3 "Do Nothing" Impact

There is no impact on the soils and geology in the do-nothing scenario.

6.6 Avoidance, Remedial & Mitigation Measures

6.6.1 Construction Phase

To reduce the quantity of soil to be removed from or imported into the site, the floor levels of the proposed buildings and roads are designed to match existing levels as closely as is feasible, to minimise the cut and fill balance. The number of vehicle movements offsite will be minimised by this optimisation. However, given that there are two large basements proposed, it is anticipated that there will be a surplus of soil to be removed from the site.

Surplus subsoil and rock that may be required to be removed from site will be deposited in approved fill areas or to an approved waste disposal facility. Surplus subsoil will be stockpiled on site, in such a manner as to avoid contamination with builders' waste materials, etc., and so as to preserve the materials for future use as clean fill. A Construction Management Plan will need to include protocols for soil removal and should be implemented by the development's main contractor during the construction stage.

Soil samples taken from the site during the site investigations showed no evidence of contamination. However, any contaminated soils that are encountered during the works will be excavated and disposed of off-site in accordance with the Waste Management Act 1996, as amended, and associated regulations and guidance provided in Guidelines for the Management of Waste from National Road Construction Projects published by the National Roads Authority in 2008.

In the case of topsoil, careful planning and on-site storage can ensure that this resource is reused on-site as much as possible. Any surplus of soil not reused on site can be sold. However, topsoil is quite sensitive and can be rendered useless if not stored and cared for properly. It is therefore important that topsoil is kept completely separate from all other construction waste, as any cross-contamination of the topsoil can render it useless for reuse.

It is important to ensure that topsoil is protected from all kinds of vehicle damage and kept away from site-track, delivery vehicle turning areas and site plant and vehicle storage areas.

If topsoil is stored in piles of greater than two metres in height, the soil matrix (internal structure) can be damaged beyond repair. It should also be kept as dry as possible and used as soon as possible to reduce any deterioration through lengthy storage and excess moving around the site.

Records of topsoil storage, movements and transfer from site will be kept by the C&D Waste Manager.

The provision of wheel wash facilities at the construction entrance to the development will minimise the amount of soils deposited on the surrounding road network. The adjoining road network will be cleaned on a regular basis, as required, to prevent the build-up of soils from the development site on the existing public roads. Dampening down measures with water sprays will be implemented during periods of dry weather to reduce dust levels arising from the development works.

Measures will be implemented throughout the construction stage to prevent contamination of the soil and adjacent watercourses (in particular the Naniken River) from oil and petrol leakages. Suitable bunded areas will be installed for oil and petrol storage tanks. Designated fuel filling points will be put in place with appropriate oil and petrol interceptors to provide protection from accidental spills. Refuelling will be restricted to these allocated re-fuelling areas. This area is to be an impermeable bunded area designed to contain 110% of the volume of fuel stored.

During excavation works, temporary sumps will be used to collect any surface water run-off thereby avoiding standing water within the excavations. If groundwater is encountered during excavations, mechanical pumps will be required to remove the groundwater from sumps. Sumps should be carefully located and constructed to ensure that groundwater is efficiently removed from excavations and trenches.

Silt traps, silt fences and tailing ponds will need to be provided by the contractor where necessary to prevent silts and soils being washed away by heavy rains during the course of the construction stage. Surface water runoff and water pumped from the excavation works will be discharged via a silt trap / settlement pond to the existing foul drainage network. Straw bales will be used at the outfall to filter surface water to remove contaminants.

After implementation of the above measures, the proposed development will not give rise to any significant long term adverse impact. Moderate negative impacts during the construction stage will be short term only in duration.

A Construction Management Plan, Traffic Management Plan and Waste Management Plan will be implemented by the contractor during the construction stage to control the above remedial measures.

6.6.2 Operational Phase

On completion of the construction phase and following replacement of topsoil, a planting programme will commence to prevent soil erosion. Sustainable Drainage Systems (SuDS) and filtration devices are proposed to be provided as part of the development. These will help to remove pollutants from rainwater runoff. The SuDS proposals will also encourage infiltration of surface water to the ground.

6.7 Residual Impacts

6.7.1 Construction Phase

With the protective measures noted above in place during excavation works, any potential impacts on soils and geology in the area will not have significant adverse impacts, and no significant adverse impacts on the soils and geology of the subject lands are envisaged.

The proposed development will result in a surplus of excavated material, which may contain contaminants. Any contaminated material will be exported to an approved licensed waste facility.

6.7.2 Operational Phase

On completion of the construction phase and following replacement of topsoil and implementation of a planting programme, no further impacts on the soil are envisaged.

SuDS measures, including permeable paving, bioretention tree pits and open areas with low level planting, will assist with treating surface water runoff while replenishing the natural ground water table.

No significant adverse impacts are predicted on soils or geology.

6.7.3 "Worst Case" Scenario

The worst case scenario would be for contaminated soils to be encountered during the works. As noted above, any contaminated soils encountered will be excavated and disposed of off-site in accordance with the Waste Management Act 1996, as amended, and associated regulations and guidance provided in Guidelines for the Management of Waste from National Road Construction Projects published by the National Roads Authority in 2008.

In the worst case scenario, subsoil may be exposed to inclement weather during construction and may result in the erosion of soils. However, with the proposed mitigation measures the quantity of soils exposed and the duration of that exposure will be minimised.

6.8 Monitoring

6.8.1 Construction Phase

Monitoring during the construction phase is recommended, in particular in relation to the following:

- Adequate protection of topsoil stockpiled for reuse.
- Adequate protection from contamination of soils for removal.
- Monitoring of surface water discharging to existing watercourses, ditches and the Naniken River.
- Monitoring cleanliness of the adjoining road network.
- Monitoring measures for prevention of oil and petrol spillages.
- Dust control by dampening down measures close to the boundaries of the site, when required due to unusually dry weather conditions.

6.8.2 Operational Phase

During the operational phase, the surface water network (drains, gullies, manholes, Access Junctions (AJs), SuDS devices, attenuation system) will need to be regularly maintained and where required cleaned out. A suitable maintenance regime of inspecting and cleaning should be incorporated into the safety file/maintenance manual for the development.

6.9 Reinstatement

Excavations and trenches opened during construction will be backfilled with subsoil to reinstate existing ground levels. Upon completion no impact is foreseen.

6.10 Interactions

The interactions between Chapter 7 (Land and Soils) and the other chapters of the EIAR are set out below:

6.10.1 Population & Human Health

Dust from the site and from soil spillages on the existing road network around the site may impact human health, especially during dry conditions. Dampening down measures with water sprays will be implemented during periods of dry weather to reduce dust levels arising from the development works.

6.10.2 Water

Accidental oil or diesel spillages from construction plant and equipment, in particular at refuelling areas, may result in oil contamination of the soils and underlying geological structures, including surface water and groundwater. Measures will be implemented throughout the construction stage to prevent contamination of the soil and adjacent watercourses from oil and petrol leakages.

6.10.3 Climate (Air Quality & Climate Change)

Dust from the site and from soil spillages on the existing road network around the site may impact air quality, especially during dry conditions. Dampening down measures with water sprays will be implemented during periods of dry weather to reduce dust levels arising from the development works.

Air Quality will be controlled and monitored as set out in Chapter 8 of this EIAR.

6.10.4 Air (Noise & Vibration)

Heavy machinery used for excavations may impact on noise and vibration. Both will be controlled and monitored as set out in Chapter 9 of this EIAR.

6.10.5 Waste Management

Excess soil excavated during construction works, including any potential contaminated soils, will be managed and disposed of in approved locations as provided for in this EIAR.

6.10.6 Biodiversity

Accidental oil or diesel spillages from construction plant and equipment may impact local flora and fauna. Such spills will be mitigated in accordance with Chapter 6 of this EIAR.

6.10.7 Material Assets (Transport)

Excess soil excavated during construction works for the development will be transported by road for disposal in approved locations as provided for in this EIAR. Movements of construction traffic will be managed in accordance with the Construction Traffic Management Plan.

6.11 Difficulties Encountered When Compiling

There were no difficulties encountered when undertaking this assessment.

6.12 References

The following documents and sources were consulted during the preparation of Chapter 6:

- Geological Survey Ireland (GSI) Public Data Mapping;
- Ground Investigations Ireland Ltd.'s Site Investigation Report;
- EPA's Guidance on waste acceptance criteria at authorised soil recovery facilities;
- Waste Management Act 1996, as amended;
- NRA's Guidelines for the Management of Waste from National Road Construction Projects; and
- European Union Waste Management (Environmental Impact Assessment) Regulations 2020 S.I. 130 of 2020.

In addition to the sources listed above, design information from the other members of the project team was incorporated in Chapter 6 (Land and Soil).

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7 WATER (HYDROLOGY AND HYDROGEOLOGY)

7.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) provides a description of the hydrology and hydrogeology (water) environment within and immediately surrounding the Site of the Proposed Development and an assessment of the potential impacts of the Proposed Development on hydrology and hydrogeology and sets out any required mitigation measures where appropriate.

The principal objectives of this chapter are to identify:

- Hydrological and hydrogeological characteristics of the receiving environment at the Proposed Development Site;
- Potential impacts that the Proposed Development may have on the receiving water environment;
- Potential constraints that the environmental attributes may place on the Proposed Development;
- Required mitigation measures which may be necessary to minimise any adverse impacts related to the Proposed Development; and
- Evaluate the significance of any residual impacts.

7.1.1 Quality Assurance and Competence

Synergy Environmental Ltd., T/A Enviroguide Consulting, is a wholly Irish Owned multi-disciplinary consultancy specialising in the areas of the Environment, Waste Management and Planning. All of our consultants carry scientific or engineering qualifications and have a wealth of experience working within the Environmental Consultancy sectors, having undergone extensive training and continued professional development.

Enviroguide Consulting as a company remains fully briefed in European and Irish environmental policy and legislation. Professional memberships include the Institute of Geologists of Ireland (IGI), Chartered Institution of Wastes Management (CIWM), the Irish Environmental Law Association and Chartered Institute of Ecology and Environmental Management (CIEEM).

This EIAR Chapter was written by Candice Serbu BSc., MSc., Consultant with Enviroguide Consulting and Claire Clifford BSc., MSc., PGeo., EurGeol who is Technical Director - Contaminated Land and Hydrogeology with Enviroguide Consulting and is a Professional Geologist with the Institute of Geologists of Ireland and has extensive experience in preparing hydrogeological and environmental assessments for a range of project types and geological and hydrogeological site settings.

7.1.2 Description of the Proposed Development

Raheny 3 Limited Partnership are applying for permission for development on lands east of St Paul's College, Sybil Hill Road, Raheny, Dublin 5. The site is bound to the north, east and south by St Anne's Park and to the west by residential development at The Meadows, Sybil Hill House (a Protected Structure) and St Paul's College. Vehicular access to the site is from Sybil Hill Road.

The Proposed Development consists of the construction of a residential and nursing home development set out in 7 no. blocks, ranging in height from 4-7 storeys to accommodate 580 no. apartments, residential tenant amenity spaces, a crèche and a 100-bed nursing home. The site will accommodate car parking spaces, bicycle parking spaces, storage, services and plant areas at both basement and podium level.

Landscaping will include extensive communal amenity areas, and a significant public open space provision on the east and south of the site. The proposed application includes all site landscaping works, green roofs, substations, boundary treatments, lighting, servicing, signage, surface water attenuation facilities and associated and ancillary works, including site development works and services above and below ground. For a full description of the Proposed Development please refer to the Statutory Notices.

A detailed description of the aspects of the Construction and Operational Phases of the Proposed Development and relevant to the hydrological and hydrogeological environment is provided in Section 7.4.

7.2 Study Methodology

7.2.1 Regulations and Guidelines

The methodology adopted for the assessment has regard to the relevant guidelines and legislation including:

- Council Directive 2006/118/EC, 2006. On the protection of groundwater against pollution and deterioration. European Parliament and the Council of European Communities (Groundwater Directive (GWD)).
- Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy as amended by Directives 2008/105/EC, 2013/39/EU and 2014/101/EU (Water Framework Directive, WFD);
- Local Government (Water Pollution) Acts 1977 to 2007
- Water Services Act 2007 (No. 30/2007)
- Local Government, March 1977. No. 01/1977. Local Government (Water Pollution) Act, 1977.
- Local Government, July 1990. No. 21.1990. Local Government (Water Pollution) (Amendment) Act, 1990.
-
- S.I. No. 722/2003 – European Communities (Water Policy) and as amended
- S.I. No. 489/2011 – European communities (Technical Specifications for the Chemical Analysis and Monitoring of Water Status) Regulations, 2011.
- S.I. No. 122/2010 – European Communities (Assessment and Management of flood Risks) Regulations 2010 including amendment S.I. No. 495/2015.
- S.I. No. 272/2009 - European Communities Environmental Objectives (Surface Waters) Regulations 2009 and as amended.
- S.I. No. 9 of 2010 - European Communities Environmental Objectives (Groundwater) Regulations 2010 and as amended

Other guidance used in the assessment of potential impacts on the receiving water environment are referenced where relevant in this EIAR Chapter and includes

- Construction Industry Research and Information Association, 2001. Control of Water Pollution from Construction Sites (CIRIA – C532).
- Construction Industry Research and Information Association, 2015. Environmental good practice on site guide (CIRIA – C741).
- Construction Industry Research and Information Association, 2016. Groundwater control: design and practice (CIRIA – C750).
- Department of the Environment, Heritage and Local Government, Environmental Protection Agency and Geological Survey of Ireland, 1999. Groundwater Protection Schemes (DEHLG/EPA/GSI, 1999);
- Department of the Environment, Heritage and Local Government, 2009. Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities (DEHLG, 2009);
- Department of Housing, Planning and Local Government, August 2018. Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (DHPLG, 2018)
- Environmental Protection Agency, 2014. Guidance on the Authorisation of Discharges to Groundwater.
- Environmental Protection Agency, 2013. Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites.
- Environmental Protection Agency, 2004. Storage and Transfer of Materials for Scheduled Activities
- Environmental Protection Agency, May 2022. Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022);
- Institute of Geologists of Ireland Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements (IGI, 2013);
- National Roads Authority, 2009. Guidelines on Procedures for the Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (NRA, 2009);
- National Roads Authority, 2007 Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan (undated) in relation to impact mitigation; and
- OPR, June 2021. OPR Practice Note PN02. Environmental Impact Assessment Screening (OPR, 2021).
- WFD Working Group, 2005. Guidance on the Assessment of the Impact of Groundwater Abstractions (WFD, 2005).

7.2.2 Phased Approach

A phased approach was adopted for this EIAR in accordance with Environmental Protection Agency (EPA) and Institute of Geologists of Ireland (IGI) guidelines as set out above and is described in the following sections.

Element 1: An initial Assessment and Impact Determination stage was carried out by Enviroguide Consulting to establish the project location, type and scale of the Proposed Development, the baseline conditions, and the type of hydrological and hydrogeological environment, to establish the activities associated with the Proposed Development and to undertake an initial assessment and impact determination.

This stage of the assessment included a desktop study that comprised a review of published environmental information for the Proposed Development Site. The study area, for the purposes of assessing the baseline conditions for the Hydrology and Hydrogeology Chapter of the EIAR, extends beyond the Site boundaries and includes potential receptors within a 2.0km radius of the Proposed Development Site. Based which is based on the Institute of Geologists of Ireland (IGI) Guidelines (IGI, 2013) recommended recommended distance of 2.0km radius from the Proposed Development Site. Potential receptors outside of the 2.0km radius with a hydraulic connection to the Proposed Development Site were also included in the assessment that were identified on the basis of the Conceptual Site Model (CSM) and Source-Pathway-Receptor (S-P-R) model. The CSM and S-P-R approach underpins the Directive 2000/60/EC (Water Framework Directive; WFD) *amended by Directives 2008/105/EC, 2013/39/EU and 2014/101/EU* that has been transposed to Irish legislation as European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003) as amended, as well as EPA guidelines on the protection of groundwater and surface water resources including 'Guidance on the Authorisation of Discharges to Groundwater' (EPA, 2014).

The desk study involved collecting all the relevant data for the Proposed Development site and surrounding area including published information and details pertaining to the Proposed Development provided by the Applicant and design team.

The Element 1 stage of the assessment was completed by Enviroguide Consulting and included the review of the following sources of information:

- Environmental Protection Agency (EPA) webmapping (EPA, 2022);
- Geological Survey Ireland (GSI) Datasets Public Viewer and Groundwater webmapping (EPA, 2022);
- National Parks and Wildlife Services (NPWS) webmapping (NPWS, 2022);
- Ordnance Survey Ireland (OSI) webmapping (OSI, 2022);
- Water Framework Directive Ireland (WFD) webmapping (WFD, 2022);
- Teagasc webmapping (Teagasc, 2022);
- Office of Public Works (OPW) database on historic flooding and the Catchment Flood Risk Assessment and Management (CFRAM) maps (OPW, 2022); and
- Information provided by the Applicant pertaining to the Proposed Development including design drawings, design reports and relevant site investigation reports included with the planning application and referenced within this chapter where appropriate.

Element 2: Direct and Indirect Site Investigation and Studies stage was not carried out specifically for this EIAR Chapter as it was deemed that there was adequate valid information from the site investigations and assessments previously completed for the Site that were reviewed during Element 1. This site investigation information is considered valid for this assessment as there has been no material changes in the receiving environments or in the

nature of the Proposed Development which would require an undated assessment to be carried out.

Element 3: Evaluation of Mitigation Measures, Residual Impacts and Final Impact Assessment were based on the outcome of the information gathered in Element and Element 2. Mitigation measures to address all identified adverse impacts that were identified in Element 1 of the assessment were considered in relation to the Construction and Phase and Operational Phase of the Proposed Development. These mitigation measures were then considered in the impact assessment to identify any residual impacts.

Element 4: Completion of the Hydrology and Hydrogeology sections of the EIAR in this Chapter which includes all the associated figures and documents.

7.2.3 Description of Importance of the Receiving Environment

The National Roads Authority (NRA) criteria for estimation of the importance of hydrogeological features at the Proposed Development Site during the Environmental Impact Assessment (EIA) stage, as documented by IGI (IGI, 2013) are summarised in Table 7-1.

Table 7-1 Criteria for Rating Site Importance of Hydrogeological Features (IGI,2003)

Importance	Criteria	Typical Example
Extremely High	Attribute has a high quality or value on an international scale.	Groundwater supports river, wetland or surface water body ecosystem protected by European Union (EU) legislation e.g., SAC or SPA status.
Very High	Attribute has a high quality or value on a regional or national scale.	Regionally Important Aquifer with multiple wellfields. Groundwater supports river, wetland, or surface water body ecosystem protected by national legislation – e.g., NHA status. Regionally important potable water source supplying >2500 homes Inner source protection area for regionally important water source.
High	Attribute has a high quality or value on a local scale.	Regionally Important Aquifer. Groundwater provides large proportion of baseflow to local rivers. Locally important potable water source supplying >1000 homes. Outer source protection area for regionally important water source. Inner source protection area for locally important water source.
Medium	Attribute has a medium quality or value on a local scale.	Locally Important Aquifer Potable water source supplying >50 homes. Outer source protection area for locally important water source.
Low	Attribute has a low quality or value on a local scale.	Poor Bedrock Aquifer. Potable water source supplying <50 homes.

7.2.4 Description and Assessment of Potential Impact

Impacts will vary in quality from negative, to neutral or positive. The effects of impacts will vary in significance on the receiving environment. Effects will also vary in duration. The terminology and methodology used for assessing the 'impact' significance and the corresponding 'effect' throughout this Chapter as documented by the EPA (EPA, 2022) are described in Table 7-2.

Table 7-2 Assessment of Potential Impacts Terminology and Methodology (EPA, 2022)

Quality of Effects / Impacts	Definition
Negative	A change which reduces the quality of the environment
Neutral	No effects or effects that are imperceptible, within the normal bounds of variation or within the margin of forecasting error.
Positive	A change that improves the quality of the environment
Significance of Effects / Impacts	Definition
Imperceptible	An effect capable of measurement but without significant consequences.
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
Significant	An effect which, by its character, magnitude, duration, or intensity alters a sensitive aspect of the environment.
Very Significant	An effect which, by its character, magnitude, duration, or intensity significantly alters a sensitive aspect of the environment.
Profound	An effect which obliterates sensitive characteristics.
Duration of Effects / Impacts	Definition
Momentary	Effects lasting from seconds to minutes
Brief	Effects lasting less than a day
Temporary	Effects lasting one year or less
Short-term	Effects lasting one to seven years
Medium-term	Effects lasting seven to fifteen years
Long-term	Effects lasting fifteen to sixty years
Permanent	Effects lasting over sixty years
Reversible	Effects that can be undone, for example through remediation or restoration

7.3 The Existing and Receiving Environment (Baseline Situation)

7.3.1 Site Location and Description

The 6.7 ha site is located in Raheny, Dublin 5. The site is bounded by St. Anne's Park to the north, east and south and by St. Paul's Secondary School and a residential street known as The Meadows to the west. The site location is shown in Figure 7-1.

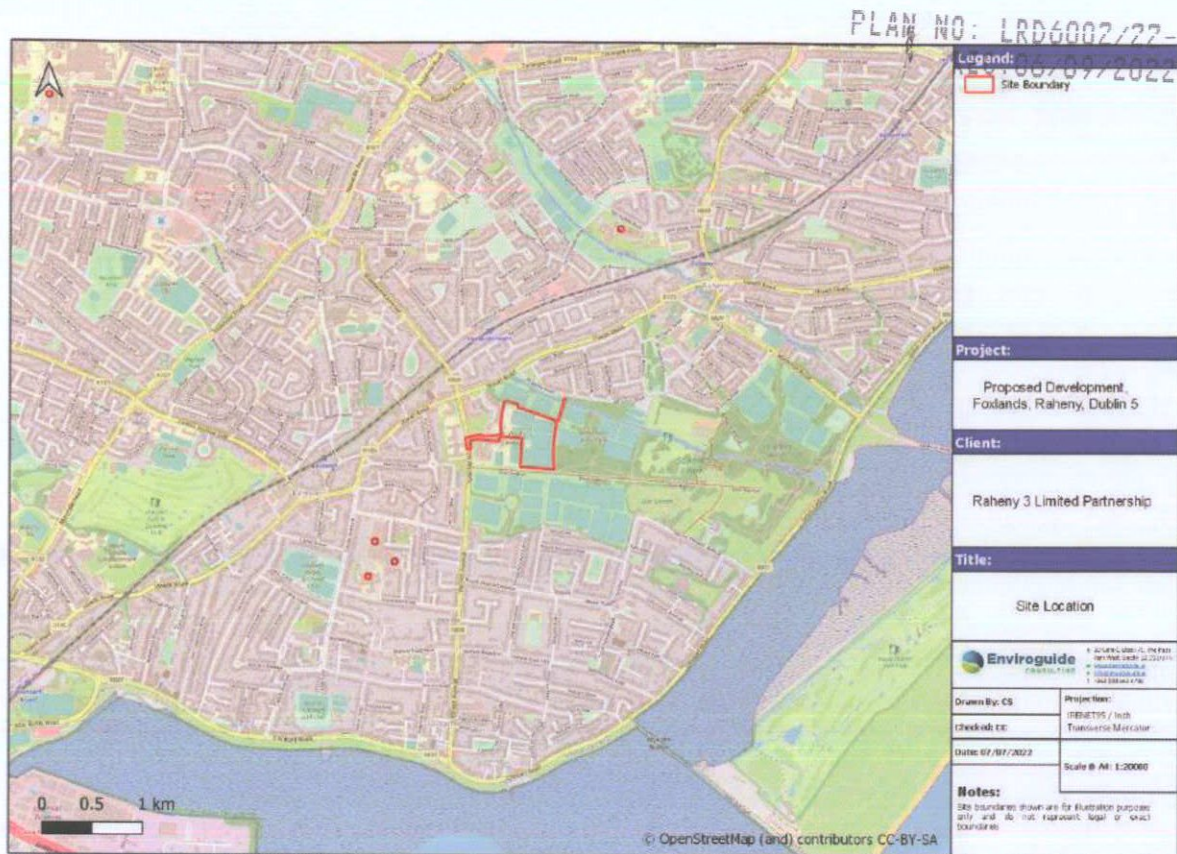


Figure 7-1 Site Location

7.3.2 Topography

The regional topography of Dublin City is generally flat, being on a low lying coastal plain, and the flood plain of the River Liffey.

A topographic survey was carried out to determine the existing topography at the site. The site generally falls from west to east, with a high point of approximately 25.5m OD Malin at the west of the site and a low point of approximately 21.4m OD Malin at the south-eastern corner of the site and 21.7m OD Malin at the north-eastern corner of the site.

7.3.3 Rainfall

Monthly rainfall data available for 1km x 1km grids (for the period 1981 to 2010) was sourced from Met Éireann (Walsh, 2012) and is presented in Table 7-3..

Table 7-3 Long Term Mean Monthly Rainfall Data (mm) (Walsh, 2012)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
70	51	57	57	63	69	60	77	64	86	79	77	812

Note: 1km x 1km Irish Grid Coordinates selected for the Proposed Development Site = X (Easting): 328000, Y (Northing):239000

Table 7-4 Average Potential Evapotranspiration (Met Eireann, 2022)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
11.4	26.3	37.8	52.8	75.6	90.5	91.0	63.7	47.2	31.9	14.8	11.0	554.0
Note: 1km x 1km Irish Grid Coordinates selected for the Proposed Development Site = X (Easting): 328000, Y (Northing):239000												

The average annual PE at the Proposed Development Site is 554.0mm/year (Met Eireann, 2022) (refer to Table 7.4). The GSI (GSI, 2022) have calculated an effective Rainfall (ER) value of 268.600mm/year for the Site with a recharge coefficient of 7.50%.

7.3.4 Soil, Geology

7.3.4.1 Regional Geology

Details of the soil and geology at the Site are provided in Chapter 6 of this EIAR and are summarised below.

Teagasc Soils beneath the Site are mapped as being mainly comprised of Till Derived Chiefly from Limestone with Made Ground in the western section of the Site (GSI, 2022). Quaternary sediments beneath the Site are described as Till derived from Limestones (TLs) (GSI, 2022).

The bedrock beneath the Site is mapped as being underlain by the Lucan Formation described as dark-grey to black, fine grained, occasionally cherty, micritic limestone that weather paler, usually to pale grey (GSI, 2022).

7.3.4.2 Site Investigation Results

Site investigation (Ground Investigations Ireland Ltd., 2015) was completed at the Site and included installation of ten (10no) cable percussion boreholes to depths between 5.6m below ground level (mbGL) and 8.5mbGL. The geology encountered is summarised in the Site Investigation Report (Ground Investigations Ireland Ltd., 2015. Refer to Appendix I) as follows:

'Made Ground Deposits: Made Ground deposits were encountered beneath the ground surface or Topsoil and were present to a depths of between 0.8 and 1.5m BGL in the boreholes. These deposits were described generally consisted of brown/grey sandy gravelly CLAY.

Cohesive Deposits: Stiff brown cohesive deposits were present below the Made Ground deposits in the boreholes and were typically described as brown sandy gravelly CLAY with occasional cobbles. This stratum was present to a depth of up to 2.3m BGL and was underlain by a stiff to very stiff black slightly sandy gravelly CLAY with occasional cobbles and boulders to a maximum depth of 8.0m BGL.'

Bedrock was not encountered in the boreholes installed as part of the site investigation (Ground Investigations Ireland Ltd., 2015).

Soil sample analytical data contained in Appendix 3 of the Site Investigation Report (Ground Investigations Ireland Ltd., 2015. Refer to Appendix I) for 11 samples collected at depths ranging from 0-1.0m to 3.0-4.0m indicates that the soil at the Site is generally free of anthropogenic type contamination with the exception of trace concentrations of petroleum hydrocarbons (TPH CWG) at two locations. The reported TPH CWG (petroleum

hydrocarbons) concentrations were 119mg/kg (BH1 1.0-2.0m) and 187mg/kg (BH3 2.0m) for samples collected at the northwest corner and northeast corner of the Site respectively.

The reported analytical results indicate that the soil is generally free from anthropogenic contamination and the trace TPH concentrations reported are not indicative of heavily contaminated soil source at the Site. All other analysed parameters including Polycyclic Aromatic Hydrocarbons (PAH 17 total), Polychlorinated Biphenyls (PCBs) and BTEX (benzene, toluene, ethylbenzene and xylene) were reported as less than limits of laboratory detection (i.e., not detected).

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7.3.5 Regional Hydrogeology

7.3.5.1 Groundwater Body

The bedrock aquifers beneath the Proposed Development Site are within the Dublin GWB (EU Code: IE_EA_G_008) (EPA, 2022). The Dublin GWB covers 837km² and occupies an area across Co. Dublin, Co. Kildare and Co. Meath (GSI, 2022).

Dublin City is highly urbanized with made ground and impermeable cover which limits recharge to the bedrock. The GSI description of the Dublin GWB identifies that the dominant recharge process will be diffuse recharge from water percolating through the subsoils and into the aquifer with recharge in the Dublin City area of the groundwater body occurring through infiltration in open areas such as parks, squares and gardens with some recharge occurring through leaking from sewers, mains and storm drains. Due to generally low permeability of the aquifers within Dublin Urban GWB, a high proportion of the recharge will run off and discharge rapidly to surface watercourses via the upper layers of the aquifer.

Dublin Urban GWB is at risk due to point and diffuse sources of pollution which are normally found in an urban environment such as contaminated land and leaking sewer networks.

Regional groundwater flow is towards Dublin Bay and the Irish Sea to the east (GSI, 2022).

7.3.5.2 Recharge

The GSI has calculated the average annual recharge for the aquifer beneath the Proposed Development Site as 20mm/year based on effective rainfall (ER) value of 268.600mm/year and a recharge coefficient of 7.50% (GSI, 2022). This low recharge potential is due to the presence of low permeability subsoil mapped beneath the Site.

7.3.5.3 Aquifer Classification and Vulnerability

The bedrock aquifer within the Lucan Formation beneath the Site is classified by the GSI (2022) as a Locally Important Aquifer – Bedrock which is Moderately Productive only in Local Zones. There are no gravel aquifers mapped within 2km radius of the Site.

The Groundwater Vulnerability Rating assigned to groundwater within the bedrock aquifer beneath the Site is Low (GSI, 2022).

The bedrock aquifer classification and groundwater vulnerability rating maps are provided in Figure 7-2 and Figure 7-3.

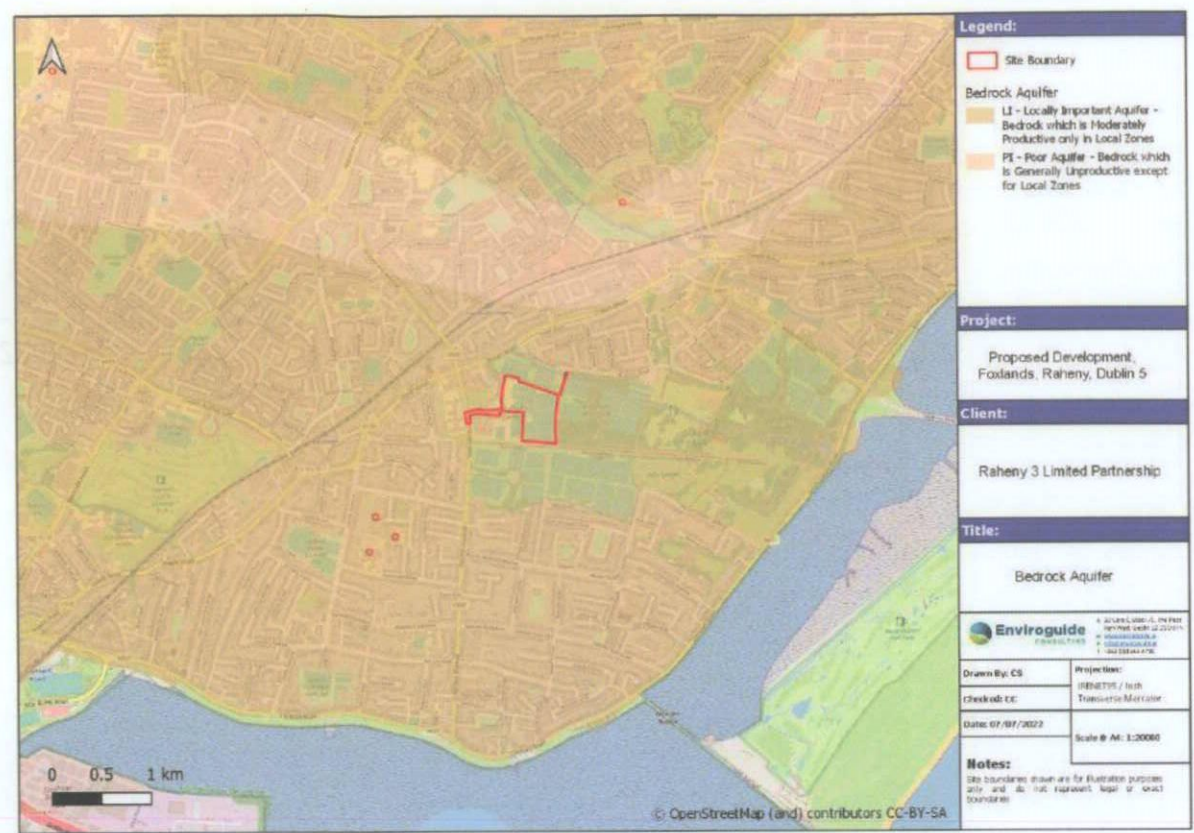


Figure 7-2 Aquifer Classification (Source: GSI, 2022)

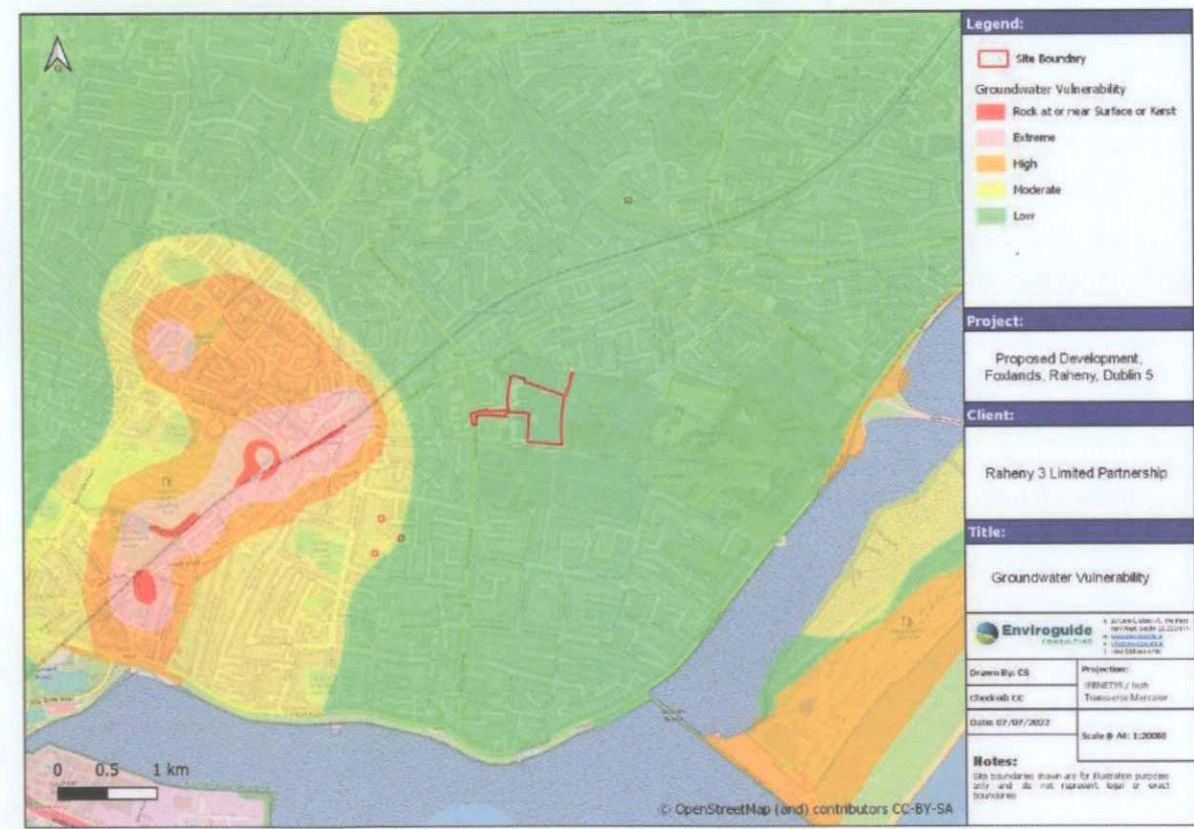


Figure 7-3 Groundwater Vulnerability (Source: GSI, 2022)