

3.2 METHODOLOGY

3.2.1 DESK STUDY

A desktop review was carried out to identify features of ecological importance within the proposed masterplan site and the wider environment. Ecological impact assessment is conducted following a standard source-pathway-receptor model, where, in order for an impact to be established all three elements of this mechanism must be in place. The absence or removal of one of the elements of the mechanism is sufficient to conclude that a potential effect is not of any relevance or significance.

- Source(s) – *e.g.*, pollutant run-off from proposed works.
- Pathway(s) – *e.g.*, groundwater connecting to nearby qualifying wetland habitats.
- Receptor(s) – qualifying aquatic habitats and species of European sites.

Specific focus was put into the assessment of sensitive receptors of protected species/habitat features; as well as those of local or national importance. A source is any identifiable element of the proposal which is known to have interactions with ecological processes. Pathways are any connections or links between the source and the receptor. This report determines if direct, indirect or cumulative adverse effects will arise from the proposed development.

3.2.2 FIELD SURVEY

Data was collected during a walkover survey conducted on the 3rd of February 2022. The data represents a walkover of the proposed development site. A habitat survey of each park was conducted following standard guidelines set out in 'Best Practice Guidance for Habitat Survey and Mapping' developed by the Heritage Council of Ireland⁵. Habitats were classified using habitat descriptions and codes published by the Heritage Council in 'A Guide to Habitat Types in Ireland'⁶. Plant species nomenclature follows Rose's 'The Wild Flower Key: How to identify wild flowers, trees and shrubs in Britain and Ireland'⁷. A list of the dominant and notable plant species was taken for each habitat type. Particular emphasis was given to the possible occurrence of rare or legally protected plant species (as listed in Flora Protection Order 1999) or Red-listed plant species (Curtis & McGough 1985, Wyse Jackson *et al.* 2016).

Observations were made for fauna species present or likely to occur on site. Emphasis was placed on mammals and birds, and especially for species listed in the respective Red lists, namely; Gilbert *et al.* 2021⁸ (birds), and Marnell *et al.* 2019⁹ (mammals). For mammals, the survey was focused on signs of their presence/activity, such as tracks, feeding marks and droppings, as well as any direct observations. Regarding bats, the main focus was on evaluation of suitable habitats to support roosting individuals or communities; however, an ecological assessment of habitat suitability was undertaken throughout the site. The assessment process undertaken for bats followed the BCT Guidelines¹⁰. Chapter 4 of these guidelines identify the approach to assess 'preliminary ecological appraisal for bats'. This chapter sets out methods for identifying habitat suitability which do not constitute assumptions. Based on the information from the assessment the survey effort requirements are identified.

Bird species were recorded by sight and sound during a bird point count conducted during the ecological walk over, following the Birdwatch Ireland Country Breeding Bird survey methods. Particular attention was focused on areas within the site of high ecological value that interact or overlap with parts of the proposal to provide civil recreation.

⁵ Smith, George F., et al. "Best practice guidance for habitat survey and mapping." The Heritage Council: Ireland (2011)

⁶ Fossitt, J.A., 2000. A guide to habitats in Ireland. Heritage Council/ Chomhairle Oidhreachta

⁷ Rose, F., O'Reilly, C., Smith, D.P. and Collings, M., 2006. The wild flower key: how to identify wild flowers, trees and shrubs in Britain and Ireland. Frederick Warne.

⁸ Gilbert, G., et al. 2021. Birds of Conservation Concern in Ireland 4: 2020–2026. *Irish Birds*, 43, pp.1-22.

⁹ Marnell, F., Looney, D. & Lawton, C. (2019) Ireland Red List No. 12: Terrestrial Mammals. National Parks and Wildlife Service, Department of the Culture, Heritage and the Gaeltacht, Dublin, Ireland.

¹⁰ Collings, J. (ed.) 2016. Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust, London.

During all surveys, particular attention was given to assessing the presence of rare or protected species. Each species identified was assessed in term of the EU Habitat Directive (92/43/EEC), Bird Directive (2009/147/EC), the Wildlife Act (1976), the Wildlife Amendment Act (2000) and the Red Data Lists for threatened and protected species, published on the NPWS website¹¹.

3.2.3 LIMITATIONS

The ecological site walk-over to inform this assessment was carried out in early spring (3rd February 2022), which is not the optimum time for botanical and breeding bird surveys. However, the site consists mainly of artificial surfaces (roads) and an area of agricultural grassland, which is currently utilised and managed as such. The proposal is relatively small in scale and aims to construct a GIS and grid connection to be used by the proposed Kilshane Power Station, while retaining the current ecological features and sensitivities.

Due to these factors, the current survey effort and assessment is deemed sufficient for the proposed site context and the proposed development therein. Therefore, overall, it is considered that there are no significant limitations to the present assessment of the ecological importance of the site.

3.3 PROPOSED DEVELOPMENT

3.3.1 PROJECT OVERVIEW

The proposed site is located on a roadway, approximately 4.2km in length, which stretches from the R121 to L3120 Kilshane Road to the proposed development site of Kilshane Power Station. The proposed grid connection begins at the site where the existing Cruiserath 220kV substation is located and ends at an area of agricultural grassland (location of proposed Kilshane Power Station) to the west of Dublin Airport. The proposed grid connection is along various industrial commercial developments along with a large number of managed agricultural grasslands. The proposed development is part of plan put forward by Kilshane Energy to construct a grid connection and GIS substation for use with the proposed Kilshane Power Station.

Section 2 contains maps and further details.

3.4 RECEIVING ENVIRONMENT

3.4.1 OVERVIEW

The proposed GIS substation is located on an area of agricultural grassland in western Dublin County while the proposed grid connection route encompasses approximately 4.2km of road from Cruiserath, Co. Dublin to the location of the proposed GIS substation at Kilshane Cross, Co. Dublin. The area as is surrounded and bordered by areas of agricultural grassland, residential, commercial and industrial developments.

On a landscape scale, the proposed development lies within an area of low levels of biodiversity and offers little to the ecological value of the area. However, the treelines and hedgerows along the proposed development can provide refuge to local flora and fauna of the surrounding area. As mentioned already, the proposed site is situated on a water stream labelled as Mooretown 09 by the EPA, which flows south and then easternly into Dublin Bay approximately 19.5km from the proposed site (Figure 3.1).

3.4.2 ZONE OF INFLUENCE

The operational phase works are not anticipated to have any impacts beyond the plan boundary due to the proposed characteristics of the development. The construction phase works may have some effects beyond the boundary due to increased noise pollution, imposing of artificial lighting conditions,

¹¹ NPWS website for protected species and habitats data accessed at: <https://www.npws.ie/maps-and-data>

noise disturbance, and possible water quality effects to the surrounding area. There are no identified significant operational phase impacts due to the nature of the operational phase being in keeping with the current environment. A water stream flows through the proposed grid connection route, and connects to South Dublin Bay. However, this stream is already culverted and lies beneath the busy R121 dual carriage route. In addition, the proposed development is minor in scale, will not change the receiving environment of most of the grid connection area and route, and has a temporary construction phase.

Therefore, following the source-pathway-receptor model identifying the potential likely sources a Zone of Influence (ZOI) of 2km radius around the proposed site was established for the purposes of this assessment. Given the nature of the proposed works, impacts are not foreseen to be significant beyond this distance.

3.4.3 HYDROLOGY

As mentioned, the proposed site is located partly, on a water stream that flows into the Tolka River, which connects to Dublin Bay, approximately 19.5 km at the closest point. This stream is already culverted and lies beneath the busy R121 dual carriage route. There are no other surface water courses which directly connect the proposed site to Dublin Bay, or any other water course inland. The closest water quality station, approximately 3km downstream from the proposed development was assigned a quality value of 3 out of 5 by the EPA, which is defined as a poor status.

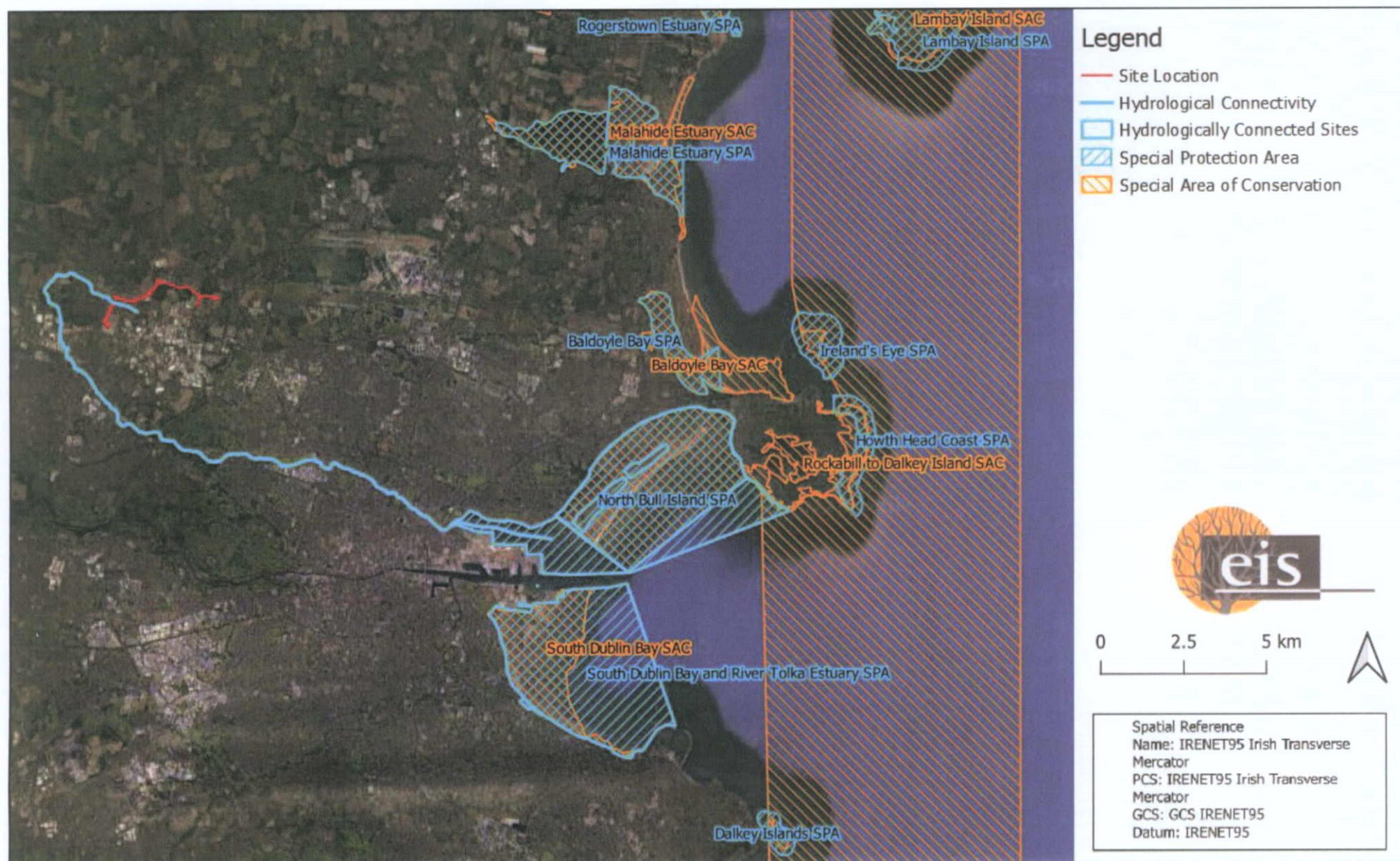


Figure 3.1 Hydrological connectivity of the proposed grid connection route

3.4.4 DESIGNATED AREAS

In accordance with the European Commission Methodological Guidance (EC, 2001), a list of European Designated Sites that can be potentially affected by the works has been compiled. A dedicated Appropriate Assessment Screening, reviewing all European sites within an appropriate pathway consideration zone¹² of the project, was undertaken. A review of the conservation objectives and qualifying interests of these sites was undertaken in order to identify what habitats and/or species could be vulnerable to risk of impact from the proposed project. This was done by assessing whether any source receptor links existed between the qualifying interests of the designated sites and the proposed parks.

When assessing ecological impacts, the CIEEM Guideline recommend a 15km pathway consideration zone as an adequate assessor for potential effects. Due to the characteristics and scale of the proposed project, all other Natura 2000 sites and pNHA/NHA sites beyond threshold distances of 15km are considered to be of sufficient distance from the proposed site, that no significant effects could be caused either directly or indirectly or in combination with other plans or projects to their interest features. Any impacts caused by the proposed development have no valid impact pathway to transfer along to reach any of the receptor interest features. These sites are thus 'screened out' and not considered further.

A stand-alone Appropriate Assessment Screening Report is submitted separately to this assessment, and expands on the potentially affected designated sites and their conservation objectives in more detail. Appendix 3.1 provides a list of all of the designated sites considered within the assessment arranged by distance from the proposed Development - which are assessed as part of this report. Figure 3.2 displays the Nature 2000 sites within a 15km radius of the proposed project. The proposed site has a direct surface water hydrological pathway connecting it to Natura 2000 sites in Dublin Bay, via a water stream that flows into the Tolka River, approximately 19.5km downstream at the closest point. However, this stream is already culverted and lies beneath the busy R121 dual carriage route.

In addition to examining European sites, NHAs and pNHA have been considered. Figure 3.3 displays the National sites within a 15km pathway consideration zone of the site. Although NHAs and pNHAs do not form part of the Natura 2000 Network, they often provide an important supporting role to the network, particularly when it comes to fauna species which often do not obey site boundaries. There are however, NHAs and pNHAs that are designated for features that are not important at an international level and thus may not interact with the Natura 2000 network.



¹² A pathway consideration zone is the area which was used to identify sites in the receiving area which might have ecological pathways connected to the zone of influence. Any ecological pathways beyond 15km are anticipated to be landscape scale interactions and therefore significant impacts are not likely given the availability of alternate resources.

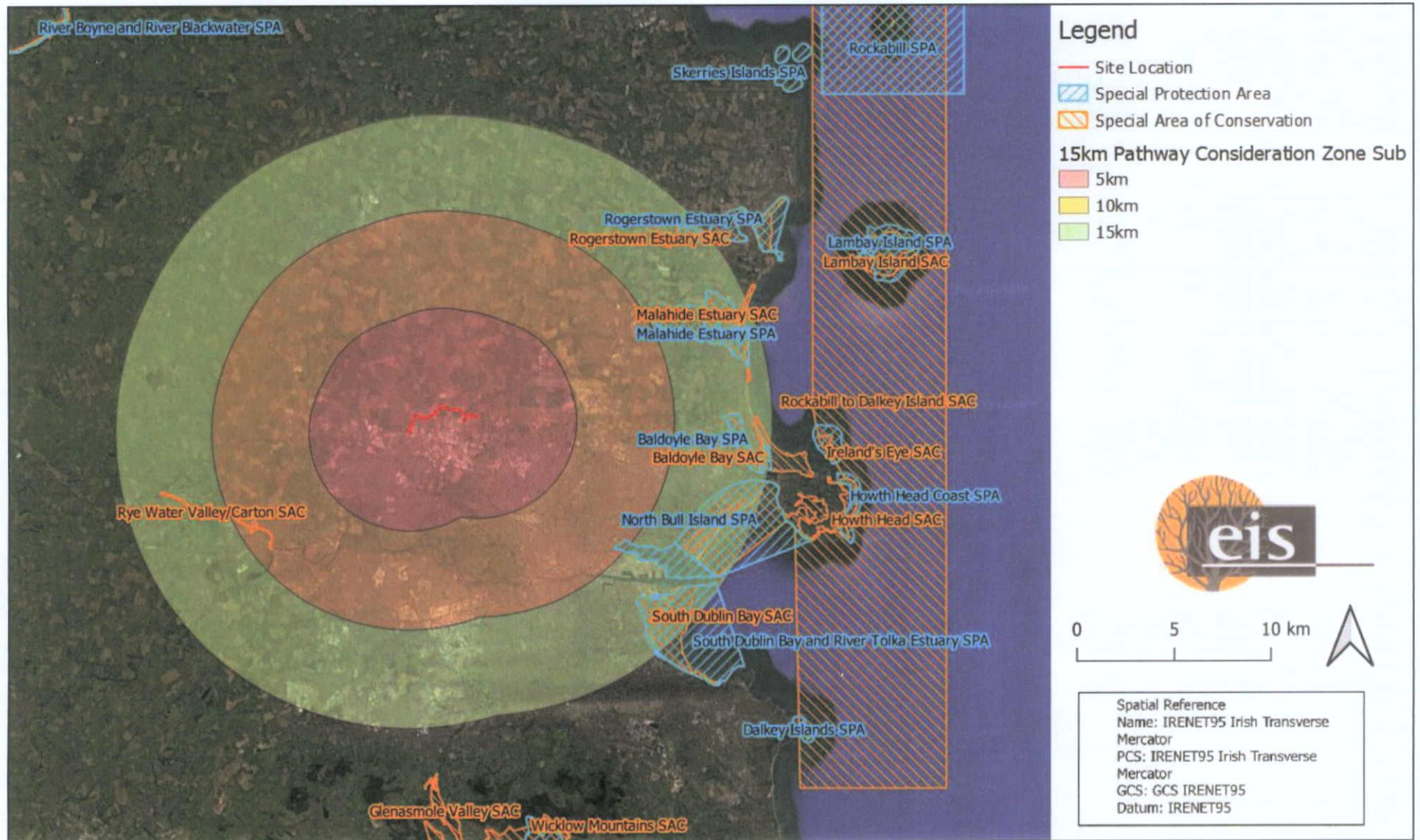


Figure 3.2 Natura 2000 sites within a 15km buffer of the proposed development area.

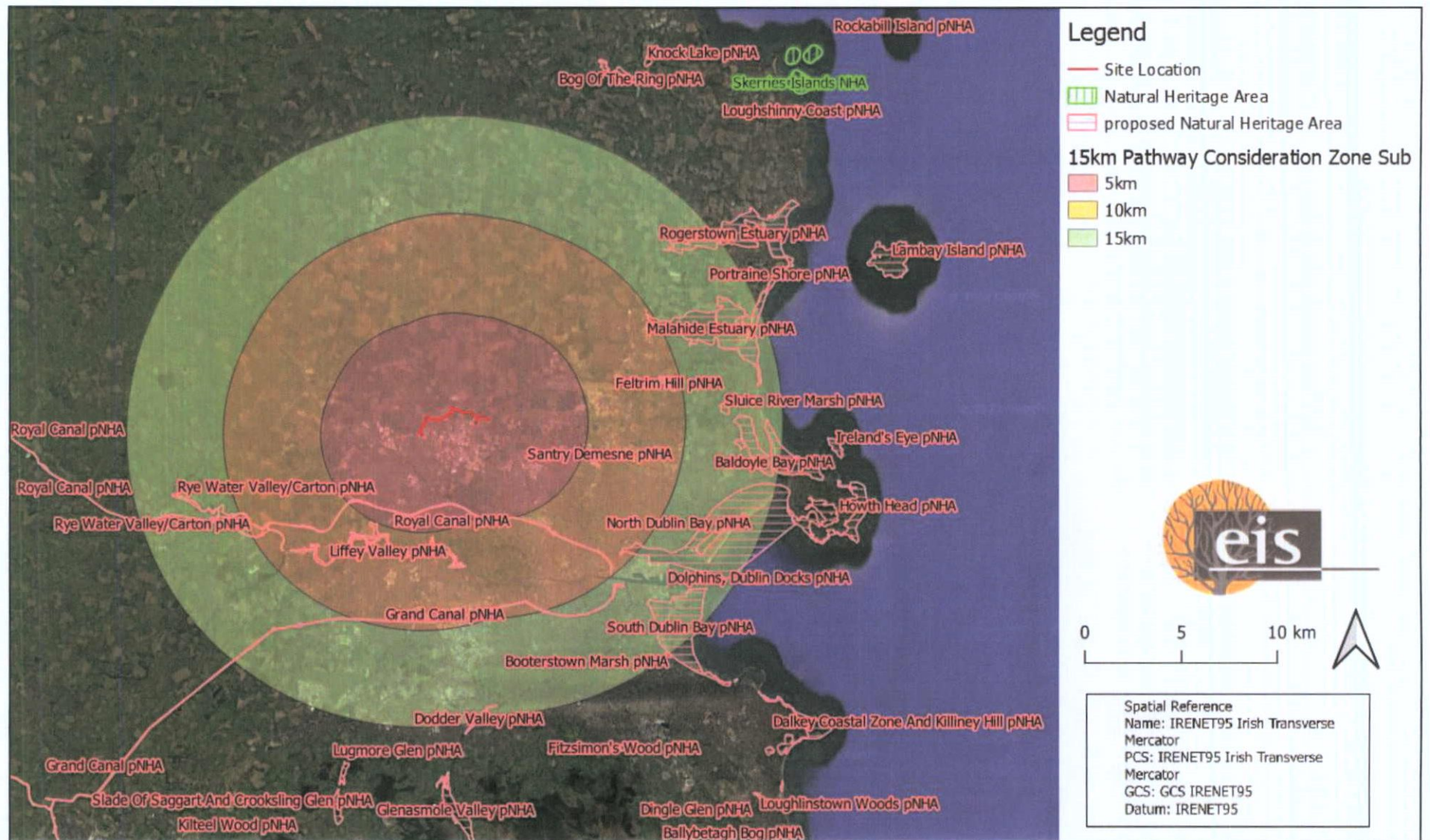


Figure 3.3 Natural Heritage Areas within a 15km buffer of the proposed development area.

3.4.5 RECORDS OF PROTECTED, RARE OR OTHER NOTABLE FLORA AND FAUNA SPECIES

The digital database of the National Biodiversity Data Centre (NBDC) was consulted to assess known records of rare, protected and invasive species that occur in the surrounding landscape. The collation of this information, as well as examination of aerial photographs allowed areas of potential ecological importance to be highlighted prior to field survey work. A search was undertaken of records of Red Data Book and Protected species held by the National Biological Data Centre (NBDC) database. A list of the rare and/or protected species recorded by the NBDC within the 10km x 10km grid squares (O14 & O04) which contains the study area of this assessment, is provided in Appendix 3.2¹³.

3.4.6 INVASIVE FLORA SPECIES

Publicly available NBDC data was accessed to identify invasive species in the 10km x 10km grid square which contains the study area (O14 & O04). 4 of the flora species and 5 of the fauna species listed in Appendix 3.2, that have been recorded in the NBDC hectads O14 & O04 which contain the proposed development site, are subject to restrictions (Third Schedule) under Regulation 49 of the European Communities (Birds and Natural Habitats) Regulations, 2011.

3.4.7 FIELD SURVEY RESULTS

The result of the ecological site visit of 3rd of February 2022 are discussed below. A detailed habitat map is provided in Figure 3.4.

Habitats and Flora

No Annex I habitats were found on site. The habitats present on the proposed site are of relatively low local importance in terms of support for local biodiversity and resource availability. Hedgerows do occur along the border of the agricultural grassland and along roadsides – and these can provide ecological connectivity for species in the surrounding area. As there are multiple commercial and industrial developments in the surrounding area – these hedgerow habitats are valuable foraging, commuting and nesting habitat.

The habitats found on site are typical of areas in which the proposed site is located; with the vast majority of habitats in the area consisting buildings and artificial surfaces (BL3) in the form of heavily used roadways, bordered by hedgerows (WL1). The site proposed for the GIS substation consists of agricultural grassland (GA1). The remaining habitats in the proposed area are made up of treelines (WL2), spoiled and bare ground (ED2) and pockets of buildings and artificial surfaces (BL3).

Most of the grassland in the proposed location of the GIS substation is composed of intensively managed agricultural grassland used for crop yields; these habitats offer very little ecological value to the area. The mature treeline composed of cypress to the northwest of the proposed site, along with an area of scrub dominated by brambles, may offer a small amount of ecological value however the treeline is in overall bad condition. The majority of hedgerows which border the agricultural grasslands are thin and sparse with little maturity and are of medium to low local ecological value. The habitats towards the south of the proposed substation have been impacted by disturbance from the quarry to the south of the proposed site.

The habitat types recorded, their distributions, and their ecological significance are aligned with what is expected of relatively urban roadsides and intensively managed grassland. A comprehensive habitat map of the proposed site is supplied in Figure 3.4 and a description of each of the habitats identified on site along with a species list for each can be found in Appendix 3.3.

Invasive species

No invasive species were recorded during the ecological walkover on February 3rd 2022. It is noted though, that there are 9 of the invasive species recorded for the area by the National Biodiversity Data

¹³ National Biodiversity Centre data. Accessed: 9th August 2022

Centre are subject to restrictions. Due to the majority of artificial buildings and surfaces and intensively managed agricultural grassland on the site, terrestrial invasive flora is not a threat to these sites currently.



Figure 3.4 Habitat map the proposed grid connection, using the Fossitt code¹⁴

¹⁴ Fossitt, J.A., 2000. *A guide to habitats in Ireland*. Heritage.

Fauna

Non-volant mammals

No evidence of badger setts was found on site. There were also not feeding or other signs of badger found on any of the sites. This could indicate low use of the site by badger, especially given the optimum season for signs, which is not surprising given the lack of suitable habitat. It is likely however that badger do not use the site as there are more favourable habitats in the surrounding area with more defined and mature treelines that would be much more suitable for badgers.

No evidence of any other non-volant mammals was found on any of the sites.

Bats

Due to the small scale and short-term of the proposed project – a bat activity survey was not deemed necessary for this assessment. In addition, there are negligible sources for impact regarding the loss of any potential roosting habitat. A small number of trees along a hedgerow are to be removed to accommodate the proposed grid connection on Bay Lane. The hedgerow was inspected and while the hedgerow itself would be considered of moderate quality. However, the location of the hedgerow along a roadside and an industrial area lowers the quality of the hedgerow and its roost potential. Due to this and the small-scale nature of the hedgerow removal, it is determined that any impact to local bat populations will be negligible.

Birds

The scrub and treeline to the north of the proposed location of the GIS substation provides high local value for birds. In addition to these areas in the north of the site, there are hedgerows bordering the location of the proposed grid connection which may hold some ecological value to local birds but the majority of these hedgerows are thin and sparse and are not likely to hold much ecological value.

A bird point count (Table 3.4) focused on passerines was conducted on site, for a duration of 15 minutes – in addition to any treeline walks and opportunistic records of species during surveying. The bird species seen and heard were recorded and the results in Table 2 below. 10 species, in total, were recorded. 8 of these species are on the green list, 2 on the amber list and none on the red list of the Birds of Conservation Concern in Ireland¹⁵.

Table 3.4 Bird survey results

Scientific name	Common name	List status
<i>Pica pica</i>	Magpie	Green
<i>Turdus merula</i>	Blackbird	Green
<i>Erithacus rubecula</i>	Robin	Green
<i>Columba palumbus</i>	Woodpigeon	Green
<i>Corvus monedula</i>	Jackdaw	Green
<i>Corvus frugilegus</i>	Rook	Green
<i>Passer domesticus</i>	House Sparrow	Amber
<i>Fringilla coelebs</i>	Chaffinch	Green
<i>Parus major</i>	Great Tit	Green
<i>Larus canus</i>	Common Gull	Amber

¹⁵ Gilbert, G., et al. 2021. Birds of Conservation Concern in Ireland 4: 2020–2026. Irish Birds, 43, pp.1-22.

Amphibians

No frogs were observed on site during the 3rd February 2022 walkover. There are little sources of potential local importance for amphibians in the proposed site, a dedicated amphibian survey was not deemed necessary for this assessment.

Invertebrates

There are little sources potential local importance for invertebrates in these habitats, an invertebrate survey was not deemed necessary for this assessment.

3.4.8 SUMMARY OF ECOLOGICAL EVALUATION AND RECOMMENDATIONS

Overall, the site of the proposed development has local importance relative to its surroundings in terms of ecological value. The site does contain aspects of low to medium local importance ecologically, such as the hedgerows along parts of the proposed grid connection.

Furthermore, buildings and artificial surfaces habitat types are of little to no value ecologically. The aim of the proposed development is to construct a GIS substation and grid connection for use with the proposed Kilshane Power Station at Kilshane Cross, Dublin with a view to minimal interruption or disturbance to the current habitats within the site.

As part of the proposed project, it is still imperative that all design and features are sensitive to the local ecology, and sensitive features. With regard to the noted ecological features resulting from the 3rd February 2022 site visit, the particularly sensitive features of Kilshane Cross, Dublin ecology with regard to the proposed project are:

1. the water stream that flows through part of the proposed grid connection; and,
2. the linear hedgerows along the roadside of parts of the proposed grid connection.

Therefore, executing the proposed development in an ecologically sensitive regard should have emphasis on the following (along with measures detailed in section 3.6):

1. ensuring measures are put in place and maintained during the construction phase to ensure the protection of the water stream that flows through part of the proposed grid connection; and,
2. retention of native vegetation where possible.

In addition, as the construction phase is the only phase identified here as having potential impacts, The Preliminary CEMP will be reviewed and developed as a detailed CEMP for the proposed project, detailing how the above sensitive ecological aspects of the proposed site, and the overall biodiversity of the proposed site, will be protected and monitored during the construction phase with regard to water quality, dust, noise and lighting. This will take account of mitigation measures set out in this ER and any conditions attached to a grant of planning permission.

The proposed project has potential for impacts to bird and bat populations during the construction phase, but as the project's construction phase is temporary with minimal vegetation and hedgerows to be removed, with an operational phase in keeping with the current conditions and usage of the surrounding area – potential for significant effects is negligible.

3.5 POTENTIAL IMPACTS

Based on the baseline ecological environment and the extent and characteristics of the proposed project, the following potential impacts have been identified:

1. Augmentation of existing habitats i.e., removal of hedgerows;
2. Water quality;
3. Construction, earthworks and dust;
4. Lighting during construction;
5. Noise and vibration; and,

These potential impacts are discussed below:

1. Augmentation of existing habitats, as well as the removal of hedgerows
 - The removal of any vegetation on site has potential to negatively impact breeding bird and bat populations via reduction of available foraging, roosting or breeding habitat.
 - Removal of vegetation could also result in a reduction in insect life, also indirectly affecting mammal and bird populations.
2. Water quality
 - The aforementioned stream is a sensitive aspect of this proposed project.
3. Construction and Earthworks
 - The proposed development could interact with local habitats vis dust, soil removal, and construction disturbance.
4. Lighting during construction
 - Strong lighting in the area of the proposed project could impact species that use the site for foraging and commuting, if not implemented with the appropriate ecological considerations.
 - Bats, non-volant mammals, and birds are sensitive to any significant changes in lighting within semi-natural habitat in which they reside.
5. Noise/vibration
 - The construction phase and movement of machinery could cause localised disturbance of breeding birds that may use the habitats within the site area.
 - However, there is likely to be an existing degree of habituation to human activity near the site so this impact may not be across the whole site.
 - The operational phase is expected to be similar to current noise and vibration levels from amenity usage of the site and thus no potential impact is foreseen for the operational phase.

3.5.1 POTENTIAL IMPACTS ON DESIGNATED SITES

The AA Screening Report accompanying this report sets out the likelihood and significance of any potential effects to European designated sites as a result of the proposed development. The AA screening found no significant adverse effects foreseen to be likely to affect the ecological integrity of any European sites. There is a direct hydrological link from the proposed site to European sites, via a water stream, which links the proposed site to Dublin Bay, approximately 19.5km downstream. However, the small nature of the proposed project, lack of interaction with the water stream (the stream is culverted underneath the busy R121 dual carriageway route), and short-term timeline of the construction phase are sufficient to ensure there are no likely potential for impacts to European sites as a result of the proposed project. Thus, there is no likelihood of interaction with European sites at any scale that would result in potential for significant adverse effects to their ecological integrity as a result of the proposed development.

3.6 MITIGATION MEASURES / MONITORING

The proposed site has been identified to have an overall low local ecological importance due to the small number of habitats on the proposed within the site and the relatively urban context of the larger surrounding area. However, there are habitats present on site which were identified as higher local importance during the walkover survey of February 2022.

Overall, it is assessed that the implementation of the proposed development will have little impact in terms of the ecological resources present and current levels of biodiversity. However, mitigation measures are required to ensure that the potential impacts identified are minimised.

Considering the key areas for potential impacts identified in section 3.5 above; the following mitigation measures are recommended for each one:

1. Augmentation of existing habitats, as well as the removal of hedgerows
The removal of trees on site has potential to negatively impact bat and breeding bird populations; however, only a small number of trees are to be removed and due to other treelines on and near the site there will be no long-term negative impact and the impact from the augmentation of the agricultural grassland on the ecology of the site will be negligible:
 - ✓ No vegetation will be removed during the breeding bird season (1st March to the 31st of August).
 - ✓ No vegetation is removed beyond the minimum required to complete the task.
 - ✓ Timing of works will be as brief as possible to minimise potential disturbance effects.
 - ✓ Any vegetation removal or disturbance works that must take place during the breeding season should have a suitable qualified ecologist consulted prior to any works commencing and where required an Ecological Clerk of Works will be appointed to oversee works.
2. Water quality
 - ✓ Ensure protection of the aforementioned stream by implementing standard best practice control measures during construction and keeping the construction phase as brief as possible.
3. Construction and Earthworks
Elements of the proposed development that have potential to interact with existing habitats which have been identified to have local importance overall with certain aspects having a higher local value such as the hedgerows on site. Therefore, it is recommended that:
 - ✓ Standard best practice dust and debris control measures will be implemented where relevant.
4. Lighting during construction
Strong lighting in the area of the proposed project during the construction phase impact species that use the site for foraging and commuting if not carefully controlled. Bats, other mammals, birds and insects would be sensitive to any significant changes in lighting within the habitats of the proposed site.
Construction phase lighting will need to be controlled to minimise light pollution as a matter of good practice – such as:
 - ✓ Implementation of lights out hours when construction is not active on site (evening and night hours).
5. Noise/vibration
Most of the construction phase works are small scale in size and temporary in time scale.
 - ✓ Nevertheless, the establishment of best practice measures for minimising and reducing noise and vibration from construction where possible should be detailed in a CEMP.

With the implementation of the above mitigation measures, the long-term impact of the proposed project is thus negligible on the ecological integrity and biodiversity of the proposed site itself, and for supporting local wildlife populations.

3.7 CUMULATIVE IMPACTS

Plans of relevance in the context of this proposal include:

- Fingal Development Plan 2023 - 2029
- Fingal Biodiversity Action Plan 2022 - 2030
- No additional relevant Local Area Plan

As the proposed development area is within a relatively industrialised area in Dublin, there are other proposed projects in the vicinity which are at planning stage or underway on various sites. A review of Fingal County Council's planning database for projects within the project area (200m radius from proposed development boundary) over the past 5 years identified that the projects within the area are small – large scale works relating to large scale projects to the alterations of existing structures. (see Appendix 3.4 for a complete list of all recent planning applications under the above search criteria).

These developments will increase cumulative impacts of the proposed development but only during the construction phase, and, given the overall long-term negligible impacts of the proposed development, the overall cumulative impacts for local biodiversity as a result of the proposed development are also negligible.

3.8 RESIDUAL IMPACTS

Given the nature of the works proposed, there will be no net decrease in terms of the ecological integrity of the proposed site due to the maintenance of the vast majority of natural features and vegetation and maintenance of existing habitat across the proposed site. Following the management and mitigation measures detailed in section 3.6, appropriate standard best practice construction phase measures; the potential impacts to the flora and fauna of the existing environment are foreseen to be negligible, and of a temporary duration (i.e., construction phase only). The operational phase will be in keeping with the current function and condition of the proposed site current use in terms of both human pressures and ecological condition. The characteristics of the development detailed above indicate that any potential residual impacts will be localised, and due to the magnitude of works being undertaken, any impacts will be negligible on the long-term biodiversity and ecological integrity of the site.

4 LAND, SOILS, GEOLOGY & HYDROGEOLOGY

4.1 INTRODUCTION/METHODOLOGY

This chapter assesses and evaluates the potential impacts of the Proposed Development on the land, soil, geological and hydrogeological aspects of the site and surrounding area, in accordance with the requirements of Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (i.e. the EIA Directive) (European Union, 2014a). This Chapter also provides a characterisation of the receiving hydrogeological environment within the proposed Project and within a wider study area in the vicinity of the proposed Project. In assessing likely potential and predicted effects, account is taken of both the importance of the attributes and the predicted scale and duration of the likely effects.

This chapter was prepared by Marcelo Allende (BSc, BEng). Marcelo is a Senior Environmental Consultant (Hydrologist) at AWN with over 15 years of experience in Environmental Consulting and water resources. Marcelo holds a degree in Water Resource Civil Engineering from the University of Chile. He has worked on a wide range of projects including multi-aspect environmental investigations, geo-environmental impact assessments, groundwater resource management, hydrological and hydrogeological conceptual and numerical modelling, strategic and site specific flood risk assessments, Due Diligence reporting, baselines studies, soils, surface water and groundwater monitoring and field sampling programmes on a variety of brownfield and greenfield sites throughout Ireland as well as overseas in Chile, Argentina, Peru and Panama. He also has detailed knowledge of environmental guidance, legislation, regulations & standards and expertise in GIS (expert level) and MATTE studies at COMAH establishments. He is currently a member of the International Association of Hydrogeologists (Irish Group) and a member of Engineers Ireland (MIEI).

4.1.1 RELEVANT GUIDANCE

The hydrogeological baseline assessment has been carried out in accordance with the following guidance and established best practice:

- Environmental Protection Agency (EPA) Advice notes on current practice in the preparation of Environmental Impact Statement (EPA, 2003) and Guidelines on the Information to be contained in Environmental Impact Statements (EPA, 2022a).
- TII/National Roads Authority Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (TII/formerly NRA, 2009).
- Water Framework Directive (WFD) - Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy. This relates to the improvement of water quality across Ireland including rivers and groundwater bodies.
- River Basin Management Plan 2018-2021 (including regional plans by Local Authority Waters Programme (Waters and Communities 2020)). Draft River Basin Management Plan 2022-2027.
- Institute of Geologists Ireland (IGI) -Geology in Environmental Impact Statements, a guide (IGI, 2002) and Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements (IGI, 2013).

Water resource management in Ireland is dealt with in the following key pieces of legislation and guidelines:

- European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. No. 9 of 2010).
- European Communities Environmental Objectives (Groundwater) Amendment Regulations 2016 (S.I. No. 366 of 2016); European Communities Environmental Objectives (Groundwater) (Amendment) Regulations 2022 S.I. No. 287 of 2022.
- Part IV of the First Schedule of the Planning and Development Act 2000, as amended.

- European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003)
- Environmental Protection Agency 'Towards Setting Guideline Values for the Protection of Groundwater in Ireland Interim Report', (EPA 2003).
- European Union (Drinking Water) Regulations 2014 (S.I. No. 122/2014).
- European Union (Drinking Water) (Amendment) Regulations (S.I. No. 464 of 2017).

4.1.2 CRITERIA FOR RATING OF EFFECTS

This chapter evaluates the effects, if any, which the Proposed Development will have on Land, Soils, Geology and Hydrogeology as defined in the Environmental Protection Agency (EPA) 'Guidelines on the Information to be contained in Environmental Impact Assessment Reports' (EPA, 2022).

The Draft EPA document entitled 'Advice Notes for Preparing Environmental Impact Statements' (EPA, 2015) is also followed in this geological and hydrogeological assessment and classification of environmental effects.

Due consideration is also given to the guidelines provided by the Institute of Geologists of Ireland (IGI) in the document entitled 'Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements' (IGI, 2013).

In addition, the document entitled 'Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes' by the Transport Infrastructure Ireland (TII, 2009) is referenced where the methodology for assessment of impact is appropriate.

The rating of potential environmental effects on the land, soil, geological and hydrogeological environment is based on standard EIAR impact predictions which take account of the quality, significance, duration, and type of effect characteristic identified (in accordance with impact assessment criteria provided in the EPA Guidelines (2022) publication).

The duration of each effect is considered to be either momentary, brief, temporary, short-term, medium term, long-term, or permanent. Momentary effects are considered to be those that last from seconds to minutes. Brief effects are those that last less than a day. Temporary effects are considered to be those which are construction related and last less than one year. Short term effects are seen as effects lasting one to seven years; medium-term effects lasting seven to fifteen years; long-term effects lasting fifteen to sixty years; and permanent effects lasting over sixty years.

The TII criteria for rating the magnitude and significance of impacts on the geological related attributes and the importance of hydrogeological attributes at the site during the EIA stage are also relevant in assessing the impact and are presented in Tables 1-5 in Appendix 4.1.

The principal attributes (and effects) to be assessed include the following:

- Geological heritage sites in the vicinity of the perimeter of the development site;
- Landfills, industrial sites in the vicinity of the subject site and the potential risk of encountering contaminated ground;
- The quality, drainage characteristics and range of agricultural uses of soil around the site;
- Quarries or mines in the vicinity, the potential implications (if any) for existing activities and extractable reserves;
- The extent of topsoil and subsoil cover and the potential use of this material on site as well or requirement to remove it off-site as waste for disposal or recovery;
- High-yielding water supply springs/ wells in the vicinity of the subject site to within a 2km radius and the potential for increased risk presented by the Proposed Development;
- Classification (regionally important, locally important etc.) and the extent of aquifers underlying the site perimeter area and increased risks presented to them by the Proposed Development associated with aspects such as for example removal of subsoil cover, removal of aquifer (in whole or part), drawdown in water levels, alteration in established flow regimes, change in groundwater quality;

- Natural hydrogeological/karst features in the area and potential for increased risk presented by the activities at the site; and
- Groundwater-fed ecosystems and the increased risk presented by operations both spatially and temporally.

4.1.3 SOURCES OF INFORMATION

Desk-based geological information on the substrata (both Quaternary deposits and bedrock geology) underlying the extent of the subject site was obtained through accessing databases and other archives where available. Data was sourced from the following:

- Geological Survey of Ireland (GSI) - on-line mapping, Geo-hazard Database, Geological Heritage Sites & Sites of Special Scientific Interest, Bedrock Memoirs and 1: 100,000 mapping;
- Teagasc soil and subsoil database;
- Ordnance Survey Ireland - aerial photographs and historical mapping;
- Environmental Protection Agency (EPA) – website mapping and database information;
- National Parks and Wildlife Services (NPWS) – Protected Site Register.

Site specific data was derived from the following sources:

- Site Investigation Report. Kilshane, Ballycoolin, Dublin 15. Site Investigation Ltd., December 2021;
- Various design site plans and drawings; and
- Consultation with site engineers.

4.2 THE PROPOSED DEVELOPMENT

The proposed development is located within the townlands of Kilshane, Bay, Hollywoodrath, Tyrrelstown, and Cruiserath, Dublin 11. The application site has an area of c. 13 hectares. The proposed development primarily comprises the provision of a 220kV Gas Insulated Switchgear (GIS) substation and associated Air Insulated Switchgear (AIS) compound on lands at Kilshane Road, Kilshane, Finglas, Dublin 11, and an underground 220kV transmission line connection from the proposed GIS substation to the existing Cruiserath 220kV GIS substation, located within an overall landholding bound to the south by the R121/Cruiserath Road, to the west by the R121/ Church Road and to the north by Cruiserath Drive, along with all associated and ancillary works.

The proposed 220kV GIS substation is to be located on lands at Kilshane Road, Kilshane, Finglas, Dublin 11, and will include a proposed GIS substation building with a gross floor area of 475 sq.m, within a c. 2.6 metre fenced compound. The proposed GIS substation building has a maximum height of c. 13.5 metres, excluding lighting protection masts c. 2 metres in height at roof level. The GIS substation building will accommodate a switchgear room, control room, battery room, workshop, generator room, and staff facilities. A 220kV AIS compound, including AIS electrical equipment within a fenced compound will be provided to the east of the GIS substation.

The proposed underground 220kV transmission line will run west from the proposed substation site at Kilshane Road, following Bay Lane to the west, before turning south at the roundabout at the western end of Bay Lane. The route then extends southwest along public roads to the R121. The transmission line then proceeds south along the R121 until it reaches Cruiserath substation, leaving the road and entering the substation compound from the west. The proposed underground 220kV transmission line will have a length of c. 4.69 km.

The development includes adjacent access paths, connections to the two substations (existing and proposed), provision of a medium voltage rural supply to the GIS substation (extending to the southwest of the GIS substation along Kilshane Road), surface treatments, joint bays and communications chambers on the transmission line route, services, 2 no. parking spaces within the substation compound, all associated construction works, and all ancillary works.

The proposed development will also include site and landscaping works, and all associated ancillary site development infrastructure such as foul and surface water drainage works and internal roads, footpaths, access routes, and all associated engineering and construction site works necessary to facilitate the development.

The proposed development is described in further detail in Chapter 2 *Proposed Development* and in the CEMP. The details of the construction and operation of the development in terms of Land, Soils Geology and Hydrogeology are detailed in the Table 4.1 below.

Table 4.1 Summary of Site Activities

Phase	Activity	Description
Construction	Discharge to Ground	Run-off percolating to ground at the construction site.
	Earthworks: Excavation of Superficial Deposits	<p>Ground works will be required to clear the site and levelling. All structures will require foundations to the structural engineers' specifications.</p> <p>The removal of localised overburden material will be required during preparation of the foundations and platform for the substation structures and also for the projected grid route. It is expected that the grid route will require a trench approximately 0.7m wide by 1.465m deep. Excavations into the bedrock are not foreseen.</p> <p>It is predicted that all the spoil generated during site preparation/levelling will be used in landscaped of berms. Material removed from site may be re-used off-site for beneficial use on other sites with appropriate planning / waste permissions / derogations (e.g. in accordance with Article 27 of the European Communities (Waste Directive) Regulations 2011) as amended, or will be reused, recovered and / or disposed off-site at appropriately authorised waste facilities.</p>
	Storage of soils/aggregates	<p>Aggregate materials such as sands and gravels will be stored in clearly marked receptacles within a secure compound area to prevent contamination and to ensure this resource is reused on-site for the purpose of landscaping where possible.</p> <p>Temporary storage of spoil will be managed to prevent accidental release of dust and uncontrolled surface water run-off which may contain sediment and solid matter. Materials will be sent off site for recycling where possible and, if not suitable for recycling, materials will be disposed of to an appropriate permitted/licensed waste disposal facility.</p>
	Storage of hazardous Material	Temporary storage of fuel required for on site for construction traffic. Liquid materials i.e. fuel storage will be located within temporary bunded areas, doubled skinned tanks or bunded containers (all bunds will conform to standard bunding specifications - BS8007-1987) to prevent spillage.
	Import/Export of Materials	<p>It has been estimated that 3,750m³ for the grid route and 200 m³ for the substation site of excavated subsoil and topsoil will be generated and it is currently anticipated that the totality of this will be reused for landscaping of the berms. There will not be a requirement for disposal off site. Importation of fill will not be required.</p> <p>Material removed from site may be re-used offsite for beneficial use on other sites with appropriate planning/waste permissions/derogations (e.g., in accordance with Article 27 of the European Communities (Waste Directive) Regulations 2011) as amended or will be reused, recovered and/or disposed off-site at appropriately authorised waste</p>

Phase	Activity	Description
		facilities. The removal of waste from the site will be carried out in accordance with Waste Regulations, Regional Waste Plan (Eastern Midland Region) and Waste Hierarchy/Circular Economy Principals. Refer to Chapter 8 Waste Management for further detail.
	Dewatering	The excavated trench will be dewatered if required, from a sump installed within the low section of the opened trench. Where dewatering is required, dirty water will be fully and appropriately attenuated, through silt bags, before being appropriately discharged to vegetation or surface water drainage feature. Only localised dewatering can be expected during the excavation works, mainly related with perched groundwater within the subsoil which will require to be drained.
Operation	Increase in hard standing area	The proposed surface water networks for the development collect runoff from roofs, roads and other hard standing areas through a filter drainage system and gullies. The proposed development represents an overall increase in hardstanding surfaces of c. 1,657m ² .
	Storage and management of hazardous Material	During operation measures there is no requirement for bulk fuels or chemical storage, no requirement for discharge to ground and no requirement for abstraction of groundwater.

As outlined in Table 4.1 above, the activities required for the construction phase of the proposed development represents the greatest risk of potential impact on the geological and hydrogeological environment. These activities primarily pertain to the site preparation, excavation, levelling and infilling activities required to facilitate construction of the proposed development.

4.3 THE RECEIVING ENVIRONMENT

The receiving environment is discussed in terms of land geology, soils, hydrogeology and site history including potential for existing and historical contamination.

4.3.1 GENERAL DESCRIPTION OF THE SITE

The site is located to north west of Dublin city centre, adjacent to the N2 national carriageway and to the north east of Ballycoolin industrial estates. The site comprises two portions of land at the locations for Kilshane and Cruiserath Substations (Refer to Figure 4.1) and includes a Transmission connection pathway which links said substations. The proposed development site is c. 13 hectares of partly developed and partly greenfield land located south west of the N2 flyover intersection of Kilshane road and Kilshane Cross in the townland Kilshane/Piperstown, Dublin 11 (Refer to Figure 4.1 below).

There is no existing surface water drainage network adjacent to or on-site. The site is comprised of multiple fields separated by hedgerows, and generally slopes from west to east. Surface water, rainfall, is generally percolated through the site via grass and soil. The topographic survey has confirmed that the internal and boundary hedgerows contain ditches which convey flow to an unnamed ditch system to the east of the site, during heavier rainfall events. These ditches only serve the subject site and the agricultural fields immediately to the west, located between the subject site and the Kilshane Road, and does not convey any upstream watercourse.

This ditch generally flows in a north-easterly direction to join the River Ward at St. Margaret's Golf and Country Club. The River Ward is a tributary of the Broadmeadow River, which in turn outfalls to the Irish Sea at the Malahide Estuary.

Since soil conditions within the substation were confirmed to be unsuitable for discharge of surface water to ground, an alternative solution involving discharge of surface water to existing drainage ditches located within the wider development (power station) site was identified. The existing drainage ditches are located within the wider development site, beyond the extents of the GIS substation compound. To facilitate discharge to them, it is proposed that the drainage network for the substation site ties into the drainage network for the wider development. Runoff from buildings, structures and the access road within the substation compound will drain into a local collection system, complete with flow restriction device ("hydrobrake" or similar) and a suitably sized attenuation tank to balance incoming flows. Flow at a restricted rate will then be passed into the wider development (power station) drainage system and outfall to the existing drainage ditch via that network.

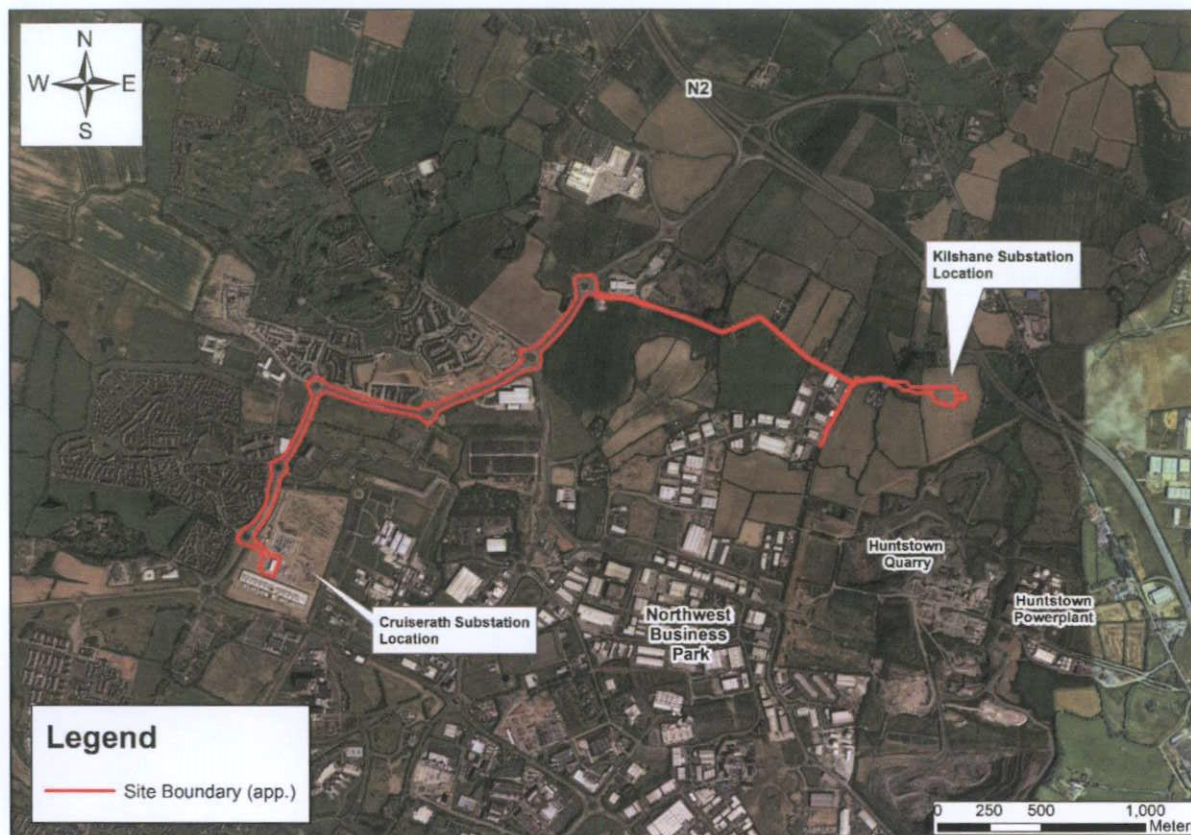


Figure 4.1 Site Location and Surrounding Activities

4.3.2 LAND USE

The site is characterized by a varied land function. The east portion of the site at Kilshane Substation is currently in use for arable agricultural activities and associated residential building structure. Access/entrance is found to the north via a driveway off Kilshane road. This section of the site is bounded to the east by the N2 national carriageway, to the north by Kilshane Road, and to the west by agricultural land. The west portion of the site at the Cruiserath Substation location is found on land occupied by a technology park and adjacent industrial buildings. The south of the site is bounded by agricultural land, directly adjacent to Huntstown Quarry and Huntstown Powerplant. The pathway for transmission line connection between the Kilshane and Cruiserath substations is occupied by roads such as the R121 and Bay Lane.

Land use in the vicinity of the site is characterised by a mixture of primarily agricultural and an industrial function. Land to the north and north east is dominated by farmland and scattered residential dwellings with an associated agricultural function with the exception of Bay Lane Quarry. Dublin Airport is approximately 3 km to the north east. Huntstown Quarry and adjacent Huntstown Powerplant are located directly to the south and southeast, while Dublin Airport Logistics Park and Northwest Business Park are found to the east and south of the site, respectively. The land to the west of Cruiserath

Substation is characterised by a residential function. Further south are more greenfield lands and the M50.

According to the EPA (2022) there are 3 no. licensed activities currently active in the vicinity of the subject site (between 550 and 1 km to the south of the southern boundary of the development site). These are:

- Energia Power Limited (P0077-02);
- Huntstown Power Company (P0483-04);
- Huntstwon Bioenergy Limited (P0993-02)

Huntstown quarry is a licensed inert waste recovery facility operating under license number W0277-03 issued in 2015. From a review of the Annual Environmental Reports and Licensee Reports related to the activities at the Huntstown Power Station and Huntstown Quarry on the EPA website a number of noncompliance issue were noted. However, there is no indication that these would result in adverse environmental impact on the subject site as it is located downgradient and therefore there would no effects on soils or groundwater underlying the subject site due to its operation (refer to Section 6.3.8 below).

Consultation with Fingal County Council have confirmed that there are no known illegal/historic landfills within 500 metres of the site. Historical Ordnance Survey maps were examined for the purpose of this assessment. O.S. maps were available from 1830 (the historic 6" maps) and 1900 from the historic 25" maps. The historic maps indicate that the subject site was greenfield up to the present. No evidence was noted to indicate commercial or industrial processes have been undertaken on the subject site. The subject site appears to be used for agricultural purposes possibly grazing, cropping, storing cattle. According to historical maps and aerial photographs this land use has not changed from 1830 to present. However, the associated building structures currently occupying the northwest corner of the site are absent from the 1830 and 1900 historical maps, suggesting these structures were established sometimes between then and when they are first displayed in the 1995 aerial photograph.

4.3.3 SITE INVESTIGATION WORKS

Site investigations were carried out by Site Investigation Ltd in 2021 near to the projected 220kV GIS substation. These investigations included the following:

- Excavation of sixteen (16) no. trial pits with dynamic probes across the large site area to examine soil conditions and if any infill or foreign material is present across the land (TP; depths up to 3.1 mbgl);
- Drilling of four (4) no. Cable Percussion Boreholes followed by rotary coreholes (depths up to 6.7 mbgl).

The locations of trial pits and boreholes from which representative samples were collected are presented Figure 4.2 below.

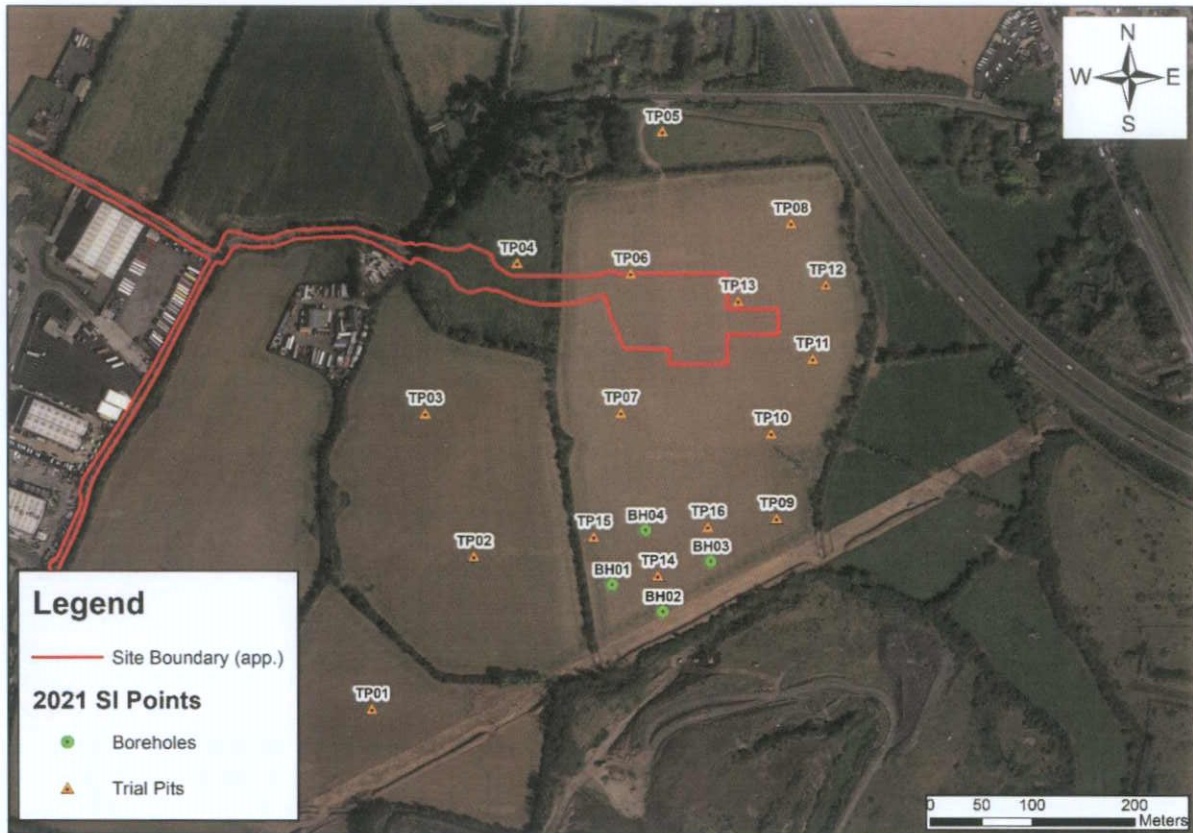


Figure 4.2 Site Investigation Points (Site Investigation Ltd., 2021)

4.3.4 SOILS

The GSI/ Tegasc mapping shows that the soil type beneath the local area is composed predominantly of BminPD mainly basic poorly drained soils coupled with BMinDW mainly basic deep well-drained mineral soils as presented in Figure 4.3 below. BminSW mainly basic shallow well drained soils is found in lesser abundance in the vicinity of the subject site.

A ground investigation undertaken by Site Investigation Ltd. (2021) reported the ground conditions to be consistent with cohesive brown and brown grey slightly sandy slightly gravelly silty CLAY with occasional black CLAYs encountered.

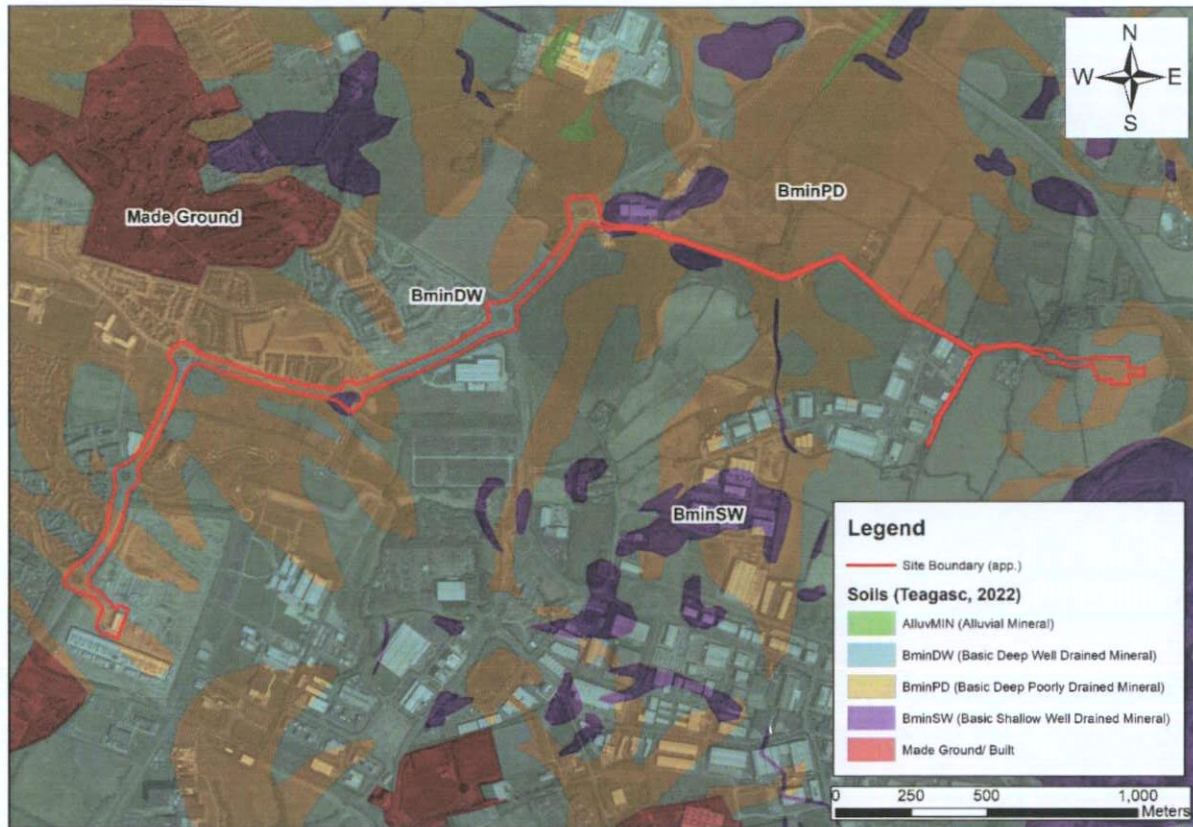


Figure 4.3 Soils Map (Source: Teagasc, 2022)

4.3.5 SUBSOILS

The Quaternary geological period extends from about 1.5 million years ago to the present day and can be sub-divided into the Pleistocene Epoch, which covers the Ice Age period, and which extended up to 10,000 years ago and the Holocene Epoch, which extends from that time to the present day. The GSI/Teagasc mapping database of the subsoils in the area of the subject site indicates one principal soil type, as shown in Figure 4.4 below. The quaternary subsoil type present across the site is:

- LIMESTONE till Carboniferous (TLs). The subject site is underlain primarily of TILL derived from limestone. This till is made up of glacial CLAYS which are less permeable than alluvium subsoils.
- Bedrock OUTCROP or shallow underlying SUBCROP. According to the GSI mapping, the transmission connection line portion of the site passes over localized areas of outcrop or shallow underlying subcrop along the R121 Regional road and Bay Lane.

The EPA soil mapping indicates that the soils comprise primarily of Carboniferous limestone diamictos (tills). The EPA have classed this area as non-irrigated agricultural land with arable farming function while the east portion of the site is characterised by a complex cultivation patterns.



Figure 4.4 Subsoils Map (Source: GSI, 2022)

As mentioned above, site investigations were undertaken in 2021 within the 220kV GIS substation site boundary and adjacent lands to establish the shallow soil and water conditions. Five trial pits were excavated within the site boundary (referenced TP04, TP05, TP06, TP08, TP10, TP11, TP12 and TP13). Four boreholes (referenced BH01 to BH04) were drilled using a rotary rig to a depth between 20.0 mbgl and 21.7 mbgl. Water strikes are detailed in the trial pit and borehole logs. The soil profile encountered can be summarised accordingly as follows:

- Topsoil: From ground level up to 0.2-0.3 mbgl.
- Subsoil: Cohesive Deposits (sandy gravelly Clay) underlie topsoil up to depths of 1.5-3.7 mbgl.
- Weathered Limestone Bedrock/ Bedrock was encountered below subsoil.

This profile encountered at the site is considered to be representative for characterising the site in question. Refer to Figure 4.2 above for locations of trial pits and boreholes.

4.3.6 BEDROCK GEOLOGY

Inspection of the available GSI (2020) records (Data Sheet 16 and on-line mapping database) shows that the bedrock geology of the site and the surrounding area is dominated by Calcareous shale and limestone conglomerates referred to as part of the Tober Colleen Formation (Rock Unit code: CDTOBE). The west portion of the subject site at Cuiserath substations and along the adjacent connecting Regional route R121 is underlain by a combination of conglomerate interbedded with laminated shale and thin Limestone, and dark Limestone/Shale known as the Rush Conglomerate and Lucan formation, respectively. Massive unbedded lime mudstone associated with the Waulsortian Limestones Formation (CDWAUL) are found underlying immediately southeast/east of the site. (Refer to Figure 4.5 below).

The regional area is highly geologically variable. Due to this variability the GSI (2022) bedrock geology map (100K structural database) indicates a number of faults in the study area, two of which transverse through the site at the projected substation and the transmission connection pathway along Bay Lane with a north-south orientation.

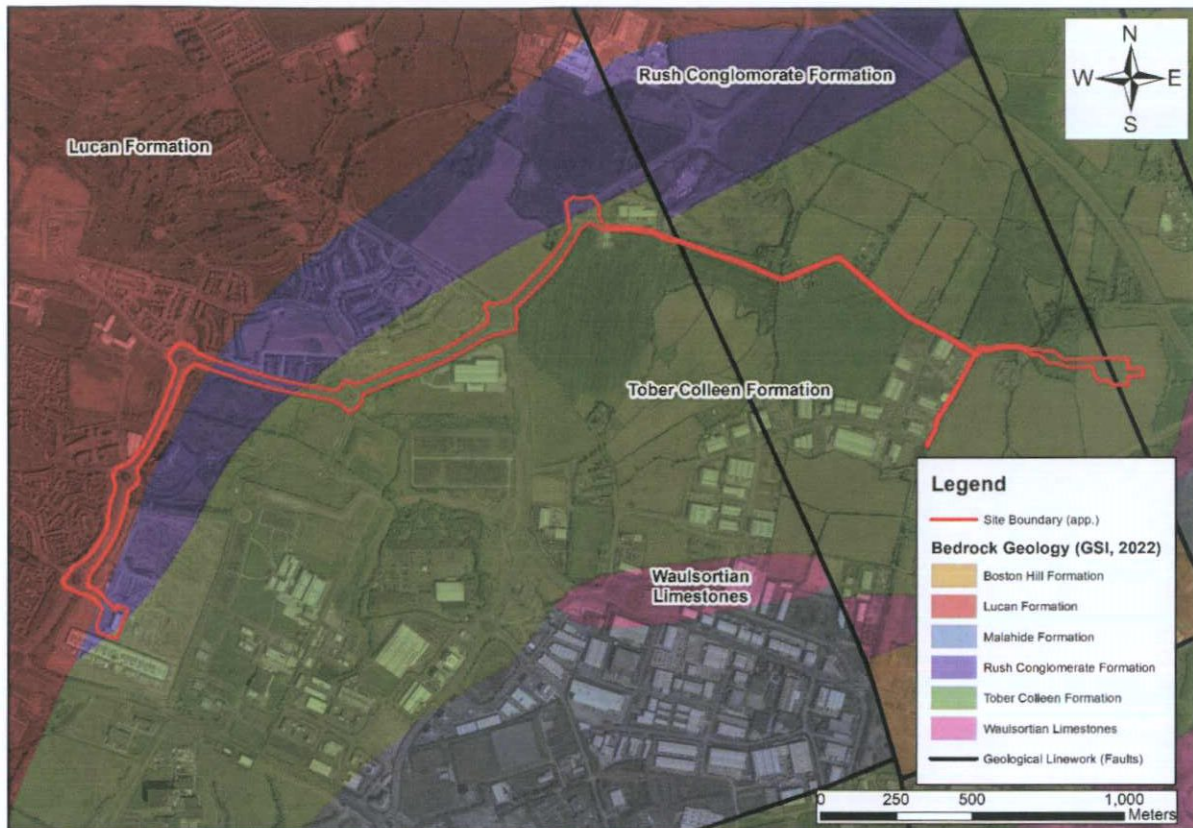


Figure 4.5 Bedrock Geology Map (Source: GSI, 2022)

Site investigations indicate bedrock depth immediately south of the site (while within the same agricultural plot of land) was recorded at 3.3 mbgl at BH02 and BH03 mbgl at BH03 to the east of GIS substation.

4.3.7 REGIONAL HYDROGEOLOGY

The GSI has devised a system for classifying the bedrock aquifers in Ireland. The aquifer classification for bedrock depends on a number of parameters including, the area extent of the aquifer (km²), well yield (m³/d), specific capacity (m³/d/m) and groundwater transmissivity (mm³/d). There are three main classifications: regionally important, locally important and poor aquifers. Where an aquifer has been classified as regionally important, it is further subdivided according to the main groundwater flow regime within it. This sub-division includes regionally important fissured aquifers (Rf) and regionally important karstified aquifers (Rk). Locally important aquifers are sub-divided into those that are generally moderately productive (Lm) and those that are generally moderately productive only in local zones (LI). Similarly, poor aquifers are classed as either generally unproductive except for local zones (PI) or generally unproductive (Pu).

From analysis of GSI National data the bedrock aquifer underlying the study site at GIS Substation and the transmission connection along Bay Lane is classified as Poor Aquifer which is characterised as Generally Unproductive except for Local Zones. GSI mapping has shown a Locally Important Aquifer (LI) which is moderately productive only in Local Zones underlying the portion of the site at Cruiserath Substation and the proximal section of the transmission line along R121 (refer to Figure 4.6 below).



Figure 4.6 Aquifer Classification Map (Source: GSI, 2022)

4.3.8 AQUIFER VULNERABILITY

Aquifer vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated generally by human activities. Due to the nature of the flow of groundwater through bedrock in Ireland, which is almost completely through fissures, the main feature that protects groundwater from contamination, and therefore the most important feature in protection of groundwater, is the subsoil (which can consist solely or of mixtures of peat, sand, gravel, glacial till, clays or silts).

The GSI currently displays/shows varied aquifer vulnerability across in the region. The extent of the subject site shows varies aquifer vulnerability. The GIS and Cruiserath Substations are located above an aquifer of High Vulnerability, in contrast to the area over the transmission connection (pathway) which transverses/overlies areas of moderate, high, and extreme vulnerability. As can be seen from Table 4.2 below an 'Extreme' vulnerability with clayey subsoil denotes a depth to bedrock of 0-3 mbgl with 'High' vulnerability categorised as 3-5 mbgl. The aquifer vulnerability class in the region of the site is presented below as Figure 4.7.

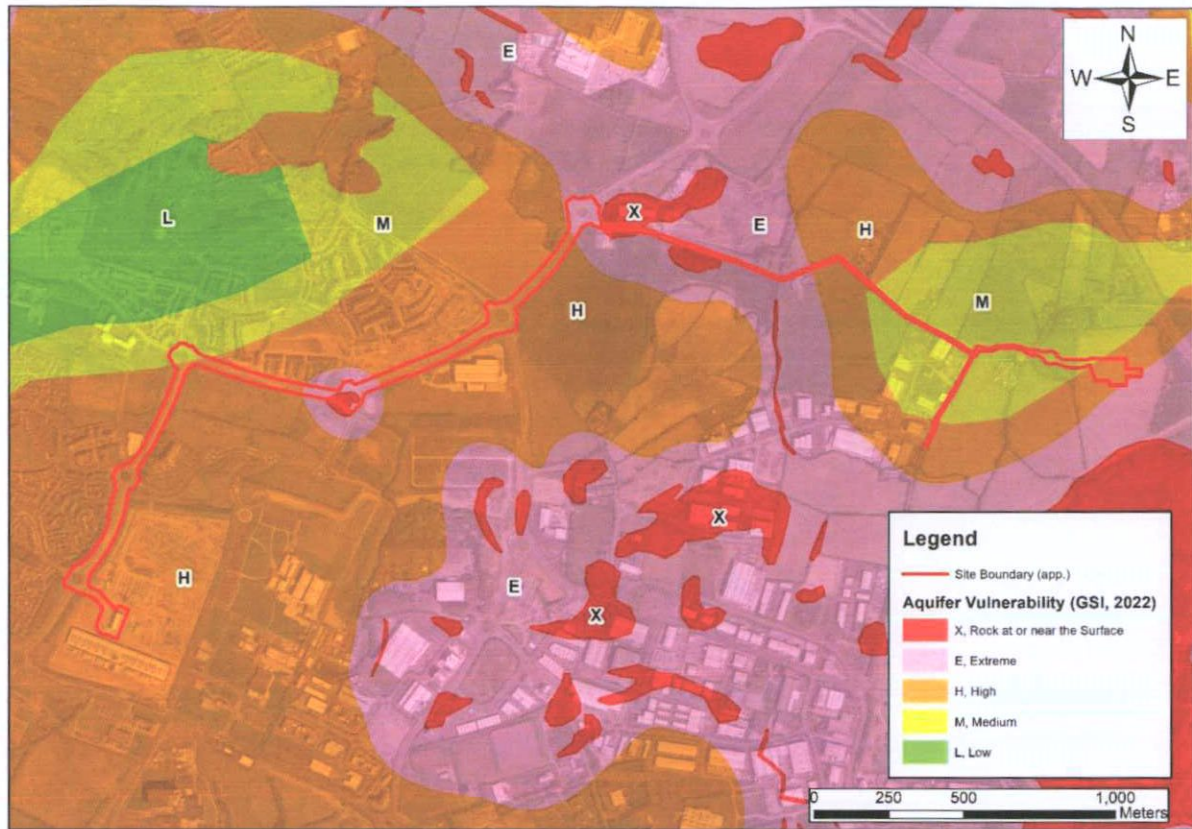


Figure 4.7 Aquifer Vulnerability Map (Source: GSI, 2022)

Table 4.2 Vulnerability Mapping Guidelines

Vulnerability Rating	Hydrogeological Condition				
	Subsoil Permeability (type) and Thickness			Unsaturated Zone (Sand/ gravel aquifers only)	Karst Features (<30 m radius)
	High Permeability (sand/gravel)	Moderate Permeability (e.g. sandy subsoil)	Low Permeability (e.g. clayey subsoil, clay, peat)		
Extreme (E)	0 - 3 m	0 - 3 m	0 - 3 m	0 - 3 m	-
High (H)	> 3 m	3 - 10 m	3 - 5 m	> 3 m	n/a
Moderate (M)	n/a	> 10 m	5 - 10 m	n/a	n/a
Low (L)	n/a	n/a	> 10 m	n/a	n/a

Notes: (1) n/a: Not applicable

(2) Precise permeability values cannot be given at present

(2) Release point of contaminants is assumed to be 1-2 below ground surface

The site investigations carried out by Site Investigations Ltd. in 2021 confirmed that the depth to bedrock to the east in the study area ranges between 1.5-3.7 mbgl which is representative of an 'Extreme' groundwater vulnerability.

4.3.9 GROUNDWATER WELLS AND FLOW DIRECTION

Regional groundwater flow would most likely be to the south – southeast towards the River Tolka and Dublin Bay. However, it is understood that dewatering activities are taking place at Huntstown quarry and these will likely have a local influence on the groundwater flow at the subject site. In particular they will control any potential migration pathway from the quarry towards the subject site.

4.3.10 SOIL QUALITY

There are no legislated threshold values for soils in Ireland. As such soil samples were compared to a Generic Assessment Criteria (GAC) derived to be protective of human health, water bodies (including groundwater) and also ecology for a resident and commercial/industrial end use.

GAC in the UK has been derived using the Contaminated Land Exposure Assessment (CLEA) model to be protective of human health for a number of different land uses. LQM (Land Quality Management) and the CIEH (Chartered Institute of Environmental Health) developed a document in July 2009 detailing their own research and derivation of their own 'LQM GACs'. A total of 82 substances including many organic substances had LQM GACs derived, for the standard land uses of residential, commercial/industrial and allotments. This was updated in 2015 following further research and the derived results are now called LQM/CIEH Suitable 4 Use Level (S4UL). The LQM/CIEH S4ULs are intended for use in assessing the potential risks posed to human health by contaminants in soil and as transparently derived and cautious "trigger values" above which further assessment of the risks or remedial action may be needed. For each contaminant S4ULs have been derived for six land use scenarios based on assessing exposure pathways in each planning scenario. In this instance the commercial scenario has been considered. Soil type and soil organic matter (SOM) has an influence on the behaviour of contaminants. S4ULs have been derived for three SOM contents (1%, 2.5% and 6%) to cover the likely range in soils. A prudent approach has been taken by considering the lower 1% SOM content.

The UK values do not have any legal standing within the Republic of Ireland and no statutory guidance for assessing the significance of soil contamination currently exists. However, the values do provide a means of placing the data within context when considering magnitude of risk and have been used in that capacity for this assessment.

In total, 11 no. soil samples were collected throughout the trial pitting exercise at the GIS site and analysed for a range of parameters to examine the soil quality and to investigate any present and/or past contamination occurred across the site.

The soil samples were analysed by ALS Life Sciences LTD, UK for the following parameters:

- Metals (As, Cd, Cr, Pb, Se, Cu, Ni, and Zn);
- Polychlorinated Biphenyls (PCB);
- Total Petroleum Hydrocarbons Criteria Working Group (TPH CWG);
- Polycyclic Aromatic Hydrocarbons (PAHs);
- Waste Acceptance Criteria (WAC) for inert waste landfills in accordance with the 2002 European Landfill Directive (2002/33/EC). This suite of parameters includes the following (carried out on 5 samples including 2 from onsite stockpiles);
- Mineral oil;
- Polycyclic aromatic hydrocarbons (PAHs);
- Polychlorinated biphenyls (PCBs);
- BTEX compounds (benzene, toluene, ethylbenzene and xylenes) and methyl tert-butyl ether (MTBE);
- Total organic carbon (TOC); and
- Leachable component of a range of organic and inorganic parameters.

For this EIA the soil results were compared to the GAC concentrations. GACs are soil concentrations that have been derived for a defined set of generic assumptions and are used as trigger values in determining whether further risk management action is required in cases where detailed quantitative risk assessment is not being undertaken.

Metals

All metal parameter concentrations recorded values below the most conservative threshold value for the LQM/CIEH for HHRA (Human Health Risk Assessment) Residential Threshold at 1% SOM.