5.0 LAND, SOILS AND GEOLOGY

5.1 Introduction

This chapter addresses the magnitude of potential impacts to, and the significance of effects on, soils, land and geology. Associated impacts to the water environment and ecology are addressed in separate chapters (Chapters 6 and 4, respectively).

5.1.1 Technical Scope

The technical scope of this assessment is to consider the potential impacts and effects on soils, land and geology that can be reasonably foreseen as consequences of the normal construction and operation of the Proposed Development. The assessment considers the potential sources of change resulting from Proposed Development activities detailed in the project description (Chapter 2).

The loss of agricultural soils will also be considered, as will the potential impact on land quality. Associated secondary potential impacts from changes to land quality on human health are also considered. It should be noted that this assessment does not, however, constitute a contaminated land risk assessment, a geotechnical/geohazard risk assessment, or detailed quantitative human health risk assessment.

The potential effects associated with hydrogeological and hydrological receptors are considered in Chapter 6 (Water). The effects of the Proposed Development on population and human health are addressed in Chapter 3 (Population & Human Health), although as noted above the potential effects of land quality on human health are considered in the current chapter. Any secondary effects on ecology or biodiversity due to changes in land quality or habitat removal are considered in Chapter 4 (Ecology & Biodiversity).

5.1.2 Geographical and Temporal Scope

The geographical study area for the assessment is that defined by the EIA project boundary (Site) (identified on Figure 5.1) and a buffer zone of 500 m from the EIA boundary (i.e. the study area), because most potential effects to geological and soil receptors are anticipated to occur within the Proposed Development footprint or immediately adjacent to it. The Proposed Development area (26.87 ha.) is entirely contained within the EIA project boundary (Site) that encloses 46.14 ha. In the context of the EIAR, the Site boundary contains lands which form the existing quarry site, the proposed extension areas and some areas which extend beyond the working areas. The 37L application (the Planning Application) boundary is shown on the drawing set which accompanies the planning application.

The temporal scope of the assessment covers the current quarrying activities on the Site and the extension of these permitted activities into the future with the Section 37L application boundary. Given the phased nature of the extractive industry and the similarities between the construction and operational phases of the Proposed Development, these will be considered together in this chapter as the overall operational phase.

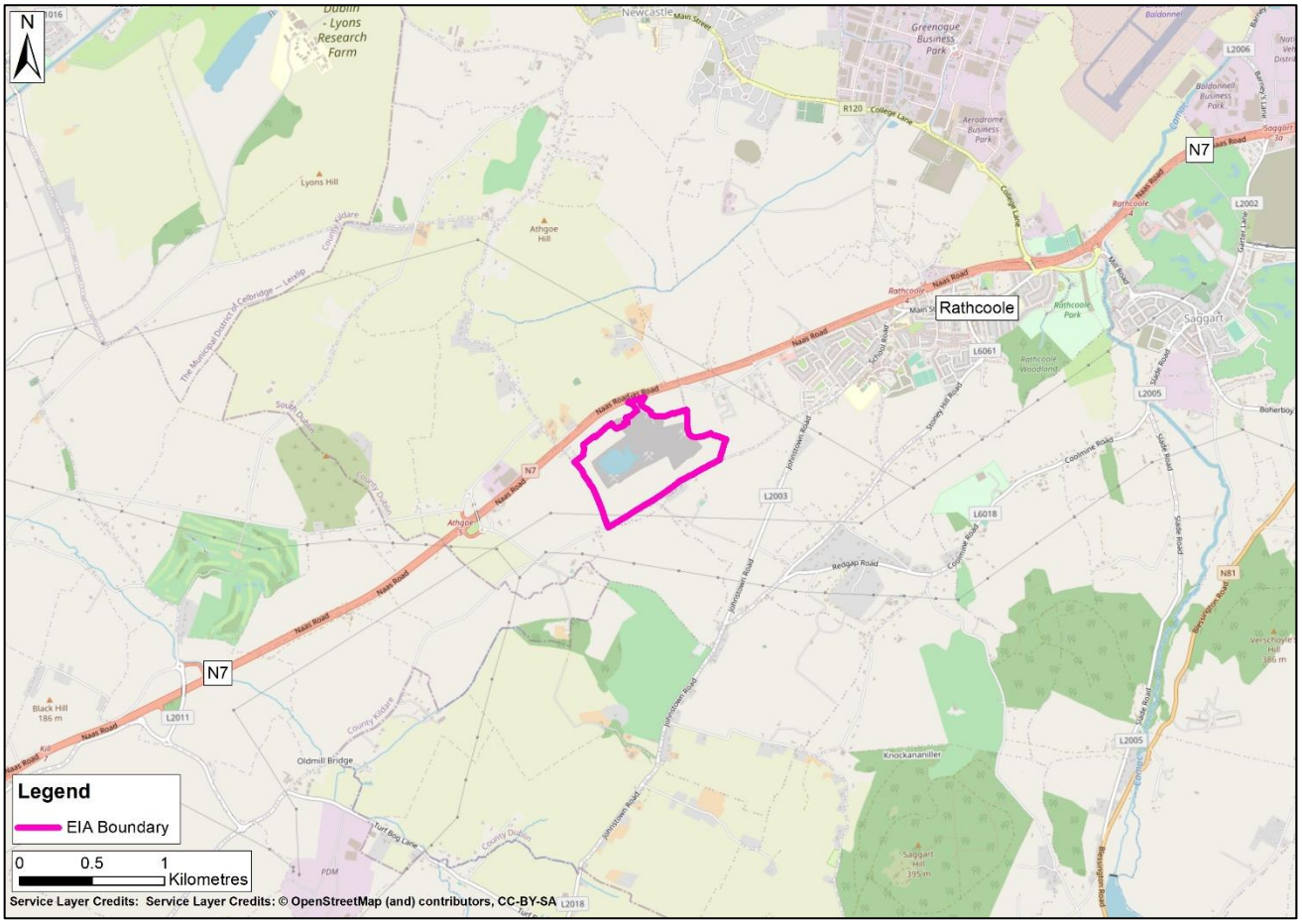

Figure 5.1: Location of the Site (EIA site boundary).

5.2 Legislative and Policy Context

This section addresses the legislation and guidance that has been considered when preparing this chapter, and key policy context relevant to soils, land and geology that has guided the focus of the assessment. The overarching EIA legislation under which this assessment is required is addressed separately in Chapter 1.

5.2.1 Legislation and Guidance

In addition to the Regulations that underpin the EIA process (see Chapter 1), this assessment has been made with cognisance to relevant guidance, advice and legislation, including, but not limited to:

- The European Communities (Environmental Liability) Regulations 2008 (as amended) - These Regulations (SI 547/2008) transpose EU Directive 2004/35/CE on environmental liability with regard to the prevention and remedying of environmental damage. The purpose of these Regulations is to establish a framework of environmental liability based on the 'polluter-pays' principle, to prevent and remedy environmental damage. The Environmental Protection Agency (EPA) is designated as the competent authority for all aspects of these Regulations.
- The Environmental Protection Agency Act 1992 and the Protection of the Environment Act 2003 – which detail the requirements associated with general pollution control and activities that come under integrated pollution prevention and control.
- The EPA Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (Draft, August 2017) – which presents key topics of interest, high-level information on the interactions that should be considered in relation to EIA legislation, and overviews on the recommended approach to

describing the baseline environment, completing impact assessments, describing effects, and addressing mitigation and monitoring.

- The EPA Advice Notes for Preparing Environmental Impact Statements (Draft, September 2015).
- Department of Housing, Planning and Local Government. Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (August 2018).
- Gov.uk online guidance, Guidance on Land Contamination Risk Management (LCRM). Available at https://www.gov.uk/guidance/land-contamination-how-to-manage-the-risks. Uses a tiered approach to risk assessment, including preliminary risk assessment, generic quantitative risk assessment and detailed quantitative risk assessment.
- The National Roads Authority Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (undated) in relation to aspects to be considered and assessment approach (including relative receptor importance and cross discipline interactions).
- Institute of Geologists of Ireland. Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements (April 2013).
- The National Roads Authority Guidelines for the Creation, Implementation and Maintenance of an Environmental Monitoring Plan (undated) in relation to impact mitigation.
- CIRIA C741: Environmental Good Practice on Site (2015, Fourth Edition) in relation to source of impact and mitigation.
- Scottish and Northern Irish Pollution Prevention Guidelines (PPGs) and Guidance for Pollution Prevention (GPPs) – these, although not Irish guidance, provide environmental good practice guidance for activities such as oil and chemical storage, works in or near water, works on construction sites, and dealing with spills and pollution incidents.

5.2.2 Local Policy

The **National Planning Framework (Project Ireland 2040)** includes National Policy Objective 60 to “Conserve and enhance the rich qualities of natural and cultural heritage of Ireland in a manner appropriate to their significance”.

There is currently no local plan for Rathcoole, however the **South Dublin County Council Development Plan 2016-2022** incorporated the relevant policies and objectives for the area.

The area is included in Zoning Objective ‘RU’ of the South Dublin County Council Development Plan 2016-2022 which has the description *‘to protect and improve rural amenity and to provide for the development of agriculture’.*

Specific policies relating to the protection of the geological environment and land include the following:

- IE2 Objective 10: To require adequate and appropriate investigations to be carried out into the nature and extent of any soil and groundwater contamination and the risks associated with site development work, in particular for brownfield development.
- ET10 Objective 1: To facilitate mineral extraction in suitable locations subject to the protection of amenity and environmental quality.
- ET10 Objective 2: To limit the operation of the extractive industry and ancillary uses at environmentally sensitive locations and within areas designated with Zoning Objective ‘HA – DM’, ‘HA-LV’ and ‘HA-DV’

where extraction would result in significant adverse effects and/or prejudice the protection of the County's natural and built heritage. (The Site sits within Zoning Objective 'RU').

- ET10 Objective 3: To ensure the satisfactory reinstatement and/or re-use of disused quarries and extraction facilities, where active use has ceased.
- ET1 Objective 2: To promote enterprise and employment development at locations that are proximate to or integrated with transportation and other urban land uses, to promote compact urban development and sustainable transport.

5.3 Assessment Methodology and Significance Criteria

5.3.1 Introduction

This section presents the method used to assess the impacts and effects of the Proposed Development on soils, land and geology, and to secondary associated human health receptors. It establishes the stages of the assessment, and the qualitative criteria used to assess impact magnitude and determine the level of effect significance.

5.3.2 Qualitative Assessment Method

The assessment of potential effects has been undertaken using the qualitative assessment method outlined below, and is supported by the baseline condition information and the Proposed Development design. The assessment follows a staged approach. A summary of the stages involved is included below:

1) Confirm baseline conditions – determine baseline and develop conceptual site model by consideration of available records and data sets, site reports and published information.
2) Confirm the key receptors and their value/importance.
3) Qualitatively characterise the magnitude of impacts on the receptors – describe what potential changes could occur to each receptor as a result of the Proposed Development, identify source-pathway receptor linkages, and assign the magnitudes of impact. This stage takes into account embedded design mitigation, good practice in construction environment management and pollution prevention.
4) Determine the initial effect significance of each potential impact on each sensitive receptor.
5) Consider the need for additional mitigation if it is considered necessary to reduce the initial magnitude of the impact and associated effect significance further.
6) Assess the residual impact magnitude and residual effect significance after all mitigation is applied.

Stages 1 and 2 have been undertaken using published literature and guidance and available information specific to the Proposed Development, which is presented in Chapter 2. For the identification of receptor value/importance that completes Stage 2, and for the description of impact magnitude (Stage 3), a common framework of assessment criteria and terminology has been used based on the EPA's draft Guidelines on the Information to be Contained in EIARs (EPA, 2017), with some modifications made to increase clarity. The descriptions for value (sensitivity) of receptors are provided in Table 5.1 and the descriptions for magnitude of impact are provided in Table 5.2.

The potential for an impact to occur at a receptor has been determined using the understanding of the baseline environment and its properties and consideration of whether there is a feasible linkage between a source of impact and each receptor (i.e. a conceptual site model). This follows the method of preliminary risk assessment that is widely presented in some of the guidance documents listed in Section 5.2.

Table 5.1: Environmental value (sensitivity) and descriptions.

Value (sensitivity) of receptor / resource	Typical description
High	High importance and rarity, national scale, and limited potential for substitution. For example: Global/European/National designation Large volumes of nationally or locally important peat Well drained and highly fertile soils Proven economically extractable mineral resource Human health.
Medium	Medium or high importance and rarity, regional scale, limited potential for substitution. For example: Regionally important sites Moderately drained and/or moderate fertility soils.
Low	Low or medium importance and rarity, local scale. For example: Locally designated sites Poorly drained and/or low fertility soils.
Negligible	Very low importance and rarity, local scale.

Table 5.2: Magnitude of impact and typical descriptions.

Magnitude of impact (change)		Typical description
High	Adverse	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements. Significant harm to human health - death, disease, serious injury, genetic mutation, birth defects or the impairment of reproductive functions. Significant harm to buildings/infrastructure/plant - Structural failure, substantial damage or substantial interference with any right of occupation.
	Beneficial	Large scale or major improvement of resource quality; extensive restoration; major improvement of attribute quality.
Medium	Adverse	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements.
	Beneficial	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality.
Low	Adverse	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements.
	Beneficial	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring.
Negligible	Adverse	Very minor loss or alteration to one or more characteristics, features or elements.
	Beneficial	Very minor benefit to or positive addition of one or more characteristics, features or elements.

The assessment of magnitude of impact considers whether the change that causes the impact is positive or negative, and whether the impact is direct or indirect, short- medium- or long-term, temporary or permanent, and if it is reversible.

For the purposes of this assessment, a direct impact is one that occurred as a direct result of the Proposed Development and was likely to have occurred at or near the Proposed Development itself. Indirect impacts (or secondary/tertiary impacts) are those where a direct impact on one receptor has another knock-on impact on one or more other related receptor(s) (e.g. the Proposed Development results in a change in land quality, which then has an indirect impact on human health). Indirect impacts can occur within the study area or away from the Proposed Development.

For the purposes of this assessment, the following definitions of duration have been used:

- Temporary – effect likely to last less than 1 year without intervention;
- Short term – effect likely to last 1 to 7 years without intervention;
- Medium term – effect likely to last 7 to 15 years without intervention;
- Long term – effect likely to last 15 to 60 years without intervention; and
- Permanent – effect likely to last over 60 years without intervention.

An irreversible impact is defined as a change to the baseline that would not reverse itself naturally. Such impacts will usually be long-term and irreversible, such as the removal of best and most versatile agricultural soils. A reversible impact is defined as a change to the baseline conditions that would reverse naturally once the source of the impact is exhausted or has stopped.

5.3.3 Significance Criteria

The approach followed to derive effects significance from receptor value and magnitude of impacts (Stage 4) is shown in Table 5.3. Where Table 5.3 includes two significance categories, reasoning is provided in the text if the lower of the two significance categories is selected. A description of the significance categories used is provided in Table 5.4.

Table 5.3: Significance Matrix.

	Magnitude of Impact (Degree of Change)				
Environmental value (Sensitivity)		Negligible	Low	Medium	High
	High	Slight	Slight or moderate	Moderate or large	Profound
	Medium	Imperceptible or slight	Slight or moderate	Moderate	Large or profound
	Low	Imperceptible	Slight	Slight	Slight or moderate
	Negligible	Imperceptible	Imperceptible or slight	Imperceptible or slight	Slight

Table 5.4: Significance categories and typical descriptions

Significance Category	Typical Description
Profound	An effect which obliterates sensitive characteristics.
Large	An effect which, by its character, magnitude, duration or intensity alters a significant proportion of a sensitive aspect of the environment.
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.

Significance Category	Typical Description
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Imperceptible	An effect capable of measurement but without significant consequences.

Residual adverse effects of 'large' or 'profound' significance are considered to be 'significant' for the purposes of this assessment.

If required following the assessment of the level of effect significance, additional mitigation measures are presented that will be used to avoid, prevent or reduce the magnitude of the potential impact (Stage 5). The significance of the effect taking into account the additional mitigation is then assessed (Stage 6) to give the residual effect significance. Any monitoring that will be required to measure the success of the mitigation is also presented in residual impacts and effects tables (Stage 7) (see Section 5.9).

The effects of the Proposed Development are also considered cumulatively with those that could foreseeably result from other known developments in the assessment study area that are going through the planning process.

5.4 Baseline Conditions

This Section presents baseline information on soils, land use, land quality and geology. Information about the water environment (including hydrogeology) is included in Chapter 6.

5.4.1 Land

According to the EPA 2017 EIA Draft Guidelines in referencing and describing 'land' it is clarified that the amended Directive introduces Land as a prescribed environmental factor; "*Recital 9 gives context to this addition, showing that it relates to the issue of 'land take'. This change aligns the Directive with proceedings of the United Nations Conference on Sustainable Development (Rio de Janeiro, 2012) and with Commission strategy.*"

The Environment Directorate-General of the European Commission sets down policies in relation to myriad environmental factors including 'land' opening as follows;

"Land is a finite resource. It is subject to competing pressures from urbanisation, infrastructure, increased food, feed, fibre and fuel production and the provision of key ecosystem services.

But it's also a shrinking resource. Almost 1000 km^2 of agriculture or natural land disappears every year in the EU, as it is converted into artificial areas. More EU land is affected by degradation all the time, and ecosystem services are lost as a result.

This is a global problem. The EU contributes to land degradation in third countries, as we are a net "importer" of land embedded into imported products. Demand for areas to settle, grow food and biomass is rising around the world, and climate change is likely to impact on land demand, availability and degradation.

But the EU is taking action. The 2011 Road Map for Resource-Efficient Europe, part of Europe 2020 Strategy has the following aim: "By 2020, EU policies take into account their direct and indirect impact on land use in the EU and globally, and the rate of land take is on track with an aim to achieve no net land take by 2050"."

The total S37L application site area is 26.87 ha., the lateral extent of the proposed void is 4.1 ha. and it is estimated that total of 5 ha. of land will be disturbed in the course of this application (combination of lateral void

and formation of screening bunds). The majority of the Proposed Development relates to a deepening of the existing void area form an average of 173 mAOD to 150 mAOD.

5.4.2 Land Use

The Site area is ca. 46.14 ha in size and contains agricultural fields, the existing quarry areas (including extraction areas and plant) and the proposed extension areas.

A review of available OSI historical mapping and site walkovers during 2019, 2020 and 2021 has been undertaken to assess the land use within the area.

There are a number of historical maps available for the area (Ordnance Survey of Ireland (2021), Google Earth (2021) and GSI (2021)) which relate to the Site and study area:

- 6" historical map (1837-1842);
- 25'' OSI maps (1888-1913);
- 6" Cassini Map (1830s to 1930s);
- 19th February 1991, 30th May 1994, 6th May 2000 and 8th September 2004 aerial imagery (OSI);
- 24th March 2012, 17th March 2016 and 1st June 2020 aerial imagery (Google Earth);
- December 2019 drone survey of the quarry area (Murphy Surveys);
- October 2020 drone survey of the quarry area (Shannon Valley); and
- GSI's (2021) aggregate potential mapping online viewer (historical quarries layer).

A review of the 6" historical map (1837 -1842) identifies two small quarries within the Site area. One was located to the west of the existing pit, along the unidentified local road and the other was located to the south of the existing pit, along the local road (L6065). Neither quarry was located within the footprint of the existing pit. Neither of these quarries are identified on the Cassini Map. The 25" inch map (1837 – 1842) identifies the western quarry only and it appears to have expanded eastwards towards what is now the existing western pit area. A review of the GSI's aggregate potential mapper identifies a cluster of four historical pits where the western pit was identified on earlier maps. Three of these quarries are considered to be Early to Mid-20th Century quarries and one is a Mid-19th Century quarry, most likely that identified on the older maps.

The oldest available aerial for the area is a 1991 OSI orthophotography survey, with further aerial photography available up to 2020.

Three main land uses have been identified within the Site and the study area (500 m from the EIA boundary), these are agricultural and single-house residential lands, N7 road network and the quarry site. The lands to the north, west, south and east can be characterised as rural in nature, with land uses in the area being agricultural and single-house residential. Dry cattle, sheep rearing and grazing of horses are the main activities in the area, with further arable activities to the south-west.

Between the period 1991 and 2020 the N7 road and agricultural and single-house residential land use has remained unchanged. Some additional housing is accommodated in the landscape during this period, but the overall land use remains unchanged. The extraction area expanded from an initial approximate area of just over 10 ha in 1991 (Table 5.3) to the current 28.8 ha. The extraction area expanded over this period first in a westerly direction up to 2000, then both western and eastern expansion occurs between 2000 and 2020. The current land usage identified from 2020 aerial photography and site visits is presented in Figure 5.2, below.

Figure 5.2: Existing land use based on Google Earth 2020 aerial photography, a December 2019 drone survey of the quarry and an October 2020 drone survey of the quarry.

The Corine landcover classification (EPA, 2018) has also been considered in this assessment (Figure 5.3). This classification dataset is representative of ca. 2018. The classification for the area bears the same Level 3 classification as the adjacent N7 (Road and Rail Network), however the area of land should be classified as 'Mineral Extraction Sites' which is typical of such rock quarries. The lands to the south, east and west are defined as 'Agricultural Areas' and 'Pastures'.

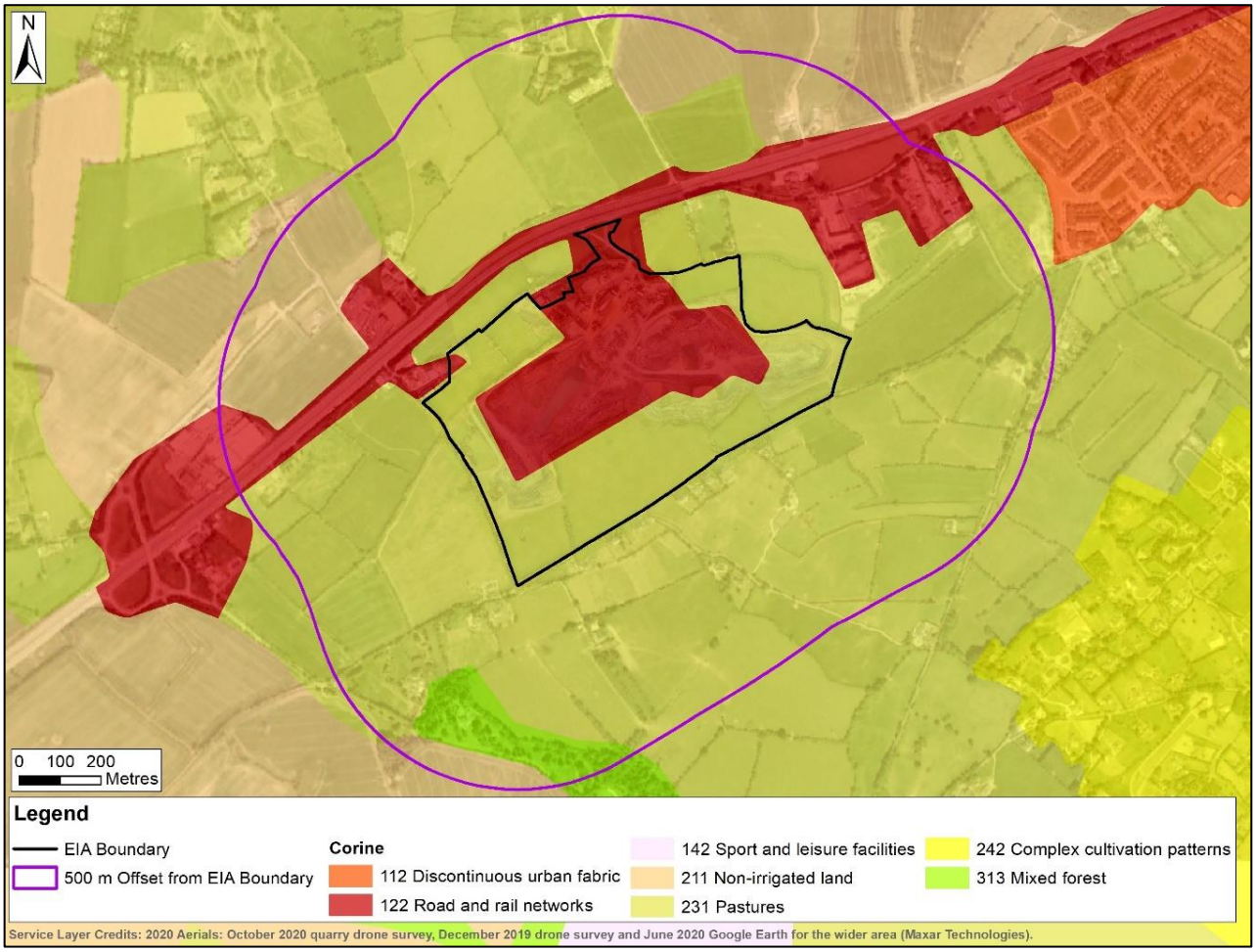

Figure 5.3: Corine land use mapping (EPA, 2018).

A review of the South Dublin County Council Development Plan (2016 – 2022) indicates that the proposed north western extraction area is listed as a site 'to provide for Traveller Accommodation Sites to be Selected'. The Draft South Dublin County Council Traveller Accommodation Plan 2019 – 2024 further identifies that the site is an indicative location with sites to be selected depending on need. The South Dublin County Council Development Plan also identifies the Site sits within an area designated as 'Rural' in which extractive industry is 'Permitted in Principle' while Traveller Accommodation is 'Open for Consideration'.

5.4.3 Superficial Geology (Soils)

There are no soils remaining in-situ in the existing extraction area due to historical extraction activities onsite. The plant area is composed of Made Ground (e.g. concrete pads, hard standing and concrete foundation areas for the plant area) overlying natural ground (soils). The northern, southern and western parts of the Site containing agricultural fields are underlain by natural ground.

A review of the EPA's online map viewer (EPA, 2021) maps soil cover over the entire Site area, however, as stated previously some of this soil cover is no longer in-situ, therefore this soil map is more representative of the original baseline soils prior to extraction activities. The Irish Soil Information System layer (EPA, 2021) indicates that soils on the Site were once compositionally uniform across much of the EIA study area, prior to extraction activities. Superficial deposits were comprised of a clayey drift with siliceous stones and these currently remain in-situ in the proposed north western and north eastern extension areas. These superficial deposits are described as glacial tills derived from the Silurian bedrock. Further north, by the Site entrance from the N7, the soil cover is indicated as fine loamy over shale or slate bedrock.

Teagasc (2021) classifies the soils over the Site as ‘Drumkeeran’, which is a ‘heavy’ soil commonly composed of Surface-water Gleys (EPA, 2014).

Figure 5.4: Location of boreholes drilled in March 2020 on the Site.

Subsoils are mapped by the EPA (2021) as being sandstone and shale tills which have a clayey texture and are derived from Lower Paleozoic parent material around the northern perimeter of the Site and underlying the majority of the wider study area. The majority of subsoils underlying the quarry area have been mapped by the EPA (2021) as bedrock which is at surface, this extends into the south, west and east of the study area.

The GSI has created an aggregate potential map database for Ireland. This mapping database identifies overburden scores, and the database was developed during the period November 2007 and October 2013 (GSI, 2021). Within the Site the overburden score is indicated as ‘10’, with no sand and gravel or aggregate potential identified due to the shallow depth to bedrock (noted as 0 – 1 m).

Four wells were installed in March 2020 (Figure 5.4), and borehole logs for these wells identified a very thin soil cover (ca. 0.5 – 1 m thick) before encountering the bedrock interface composed of a weathered/fractured greywacke which becomes very competent with depth. The very thin soil thickness observed in the boreholes is in line with the GSI’s subsoil mapping which identified bedrock at surface over the majority of the Site and it is also in line with the GSI’s low score for overburden potential as no sand and gravel or aggregate potential has been identified on the Site.

The proposed extension areas, to the northwest and northeast, are currently agricultural fields. Borehole BH1 located at the north western corner of the existing extraction area (Figure 5.4) encountered a very thin 0.5 m soil layer. BH3, to the north of the existing plant, encountered no superficial deposits as this area had already been stripped.

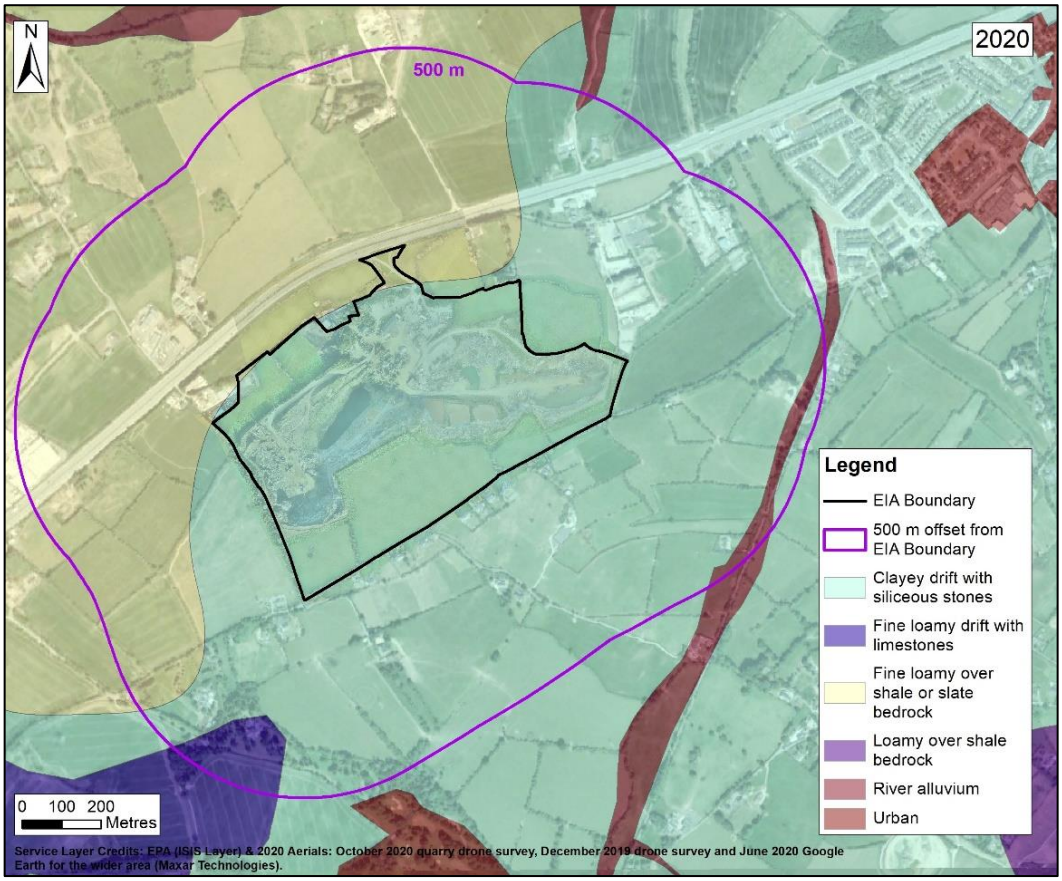

Figure 5.5: Soil mapping (EPA, 2021) overlain on the 2020 aerial imagery.

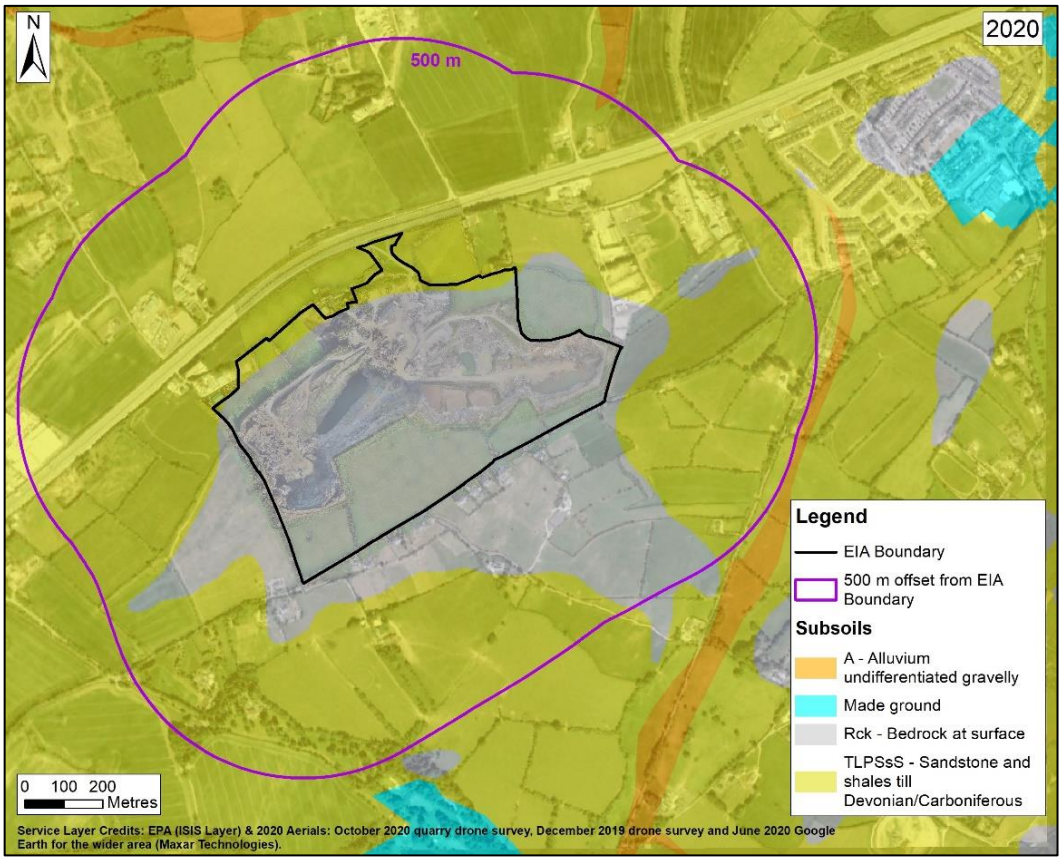

Figure 5.6: Subsoil mapping (Irish Soil Information System, EPA, 2021) overlain on the 2020 aerial imagery.

5.4.4 Bedrock Geology

The regional setting is one of large-scale northeast-southwest trending upward (anticline) and downward (syncline) fold features which are dissected by (predominantly) northwest-southeast trending faults. No faults are shown to cross the Site (GSI, 2021).

The Site is located on the northern limb of a syncline which dips around 50° to the south east. The Site is underlain by the Carrighill formation of Silurian calcareous greywacke, siltstone and shale (Figure 5.7). This is the youngest and most fine grained of the Kilcullen group bedrock unit.

During a previous drilling programme (Cross, 2013), the rock encountered was described as a greywacke, with calcite present within the quarry area and blue/brown shale within the adjoining lands. The quarry faces are described as varying from weathered in the upper faces to some slight weathering in the lower faces. The rock is described as thin to medium bedded, weathered to moderately strong, fine grained greywacke with localised inter- banding of siltstone. Zones of deformed rhyolitic rocks have been identified in the west part of the quarry.

Drilling of four water wells in 2019 on the Site identified very shallow bedrock (ca. 0.5 – 1 mbgl) with the superficial deposit – bedrock interface composed of a weathered greywacke profile which becomes very competent and tight with depth (Appendix 5.1).

The current visible floor of the existing quarry is at ca. 150 mAOD, and a water body in the existing western extraction area has a water level of ca. 149 mAOD and a floor of 120 mAOD (Cross, 2013).

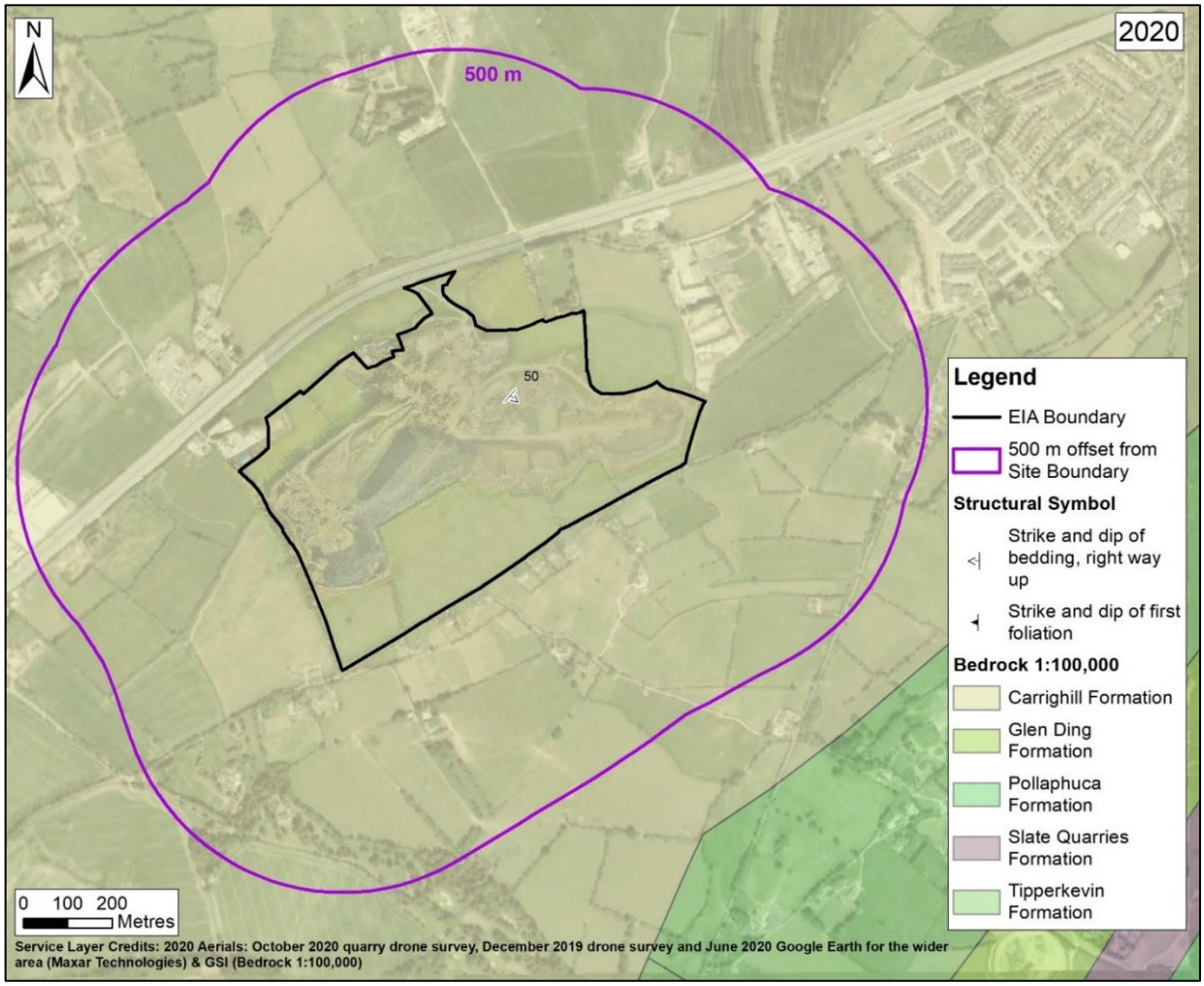

Figure 5.7: Bedrock Geology 1:100,000.

5.4.5 Geological Assets and Heritage

A review of available aerial photography indicates that the Site is the only extraction operation within the study area and no other designated geological assets or heritage sites are identified within the study area.

5.4.6 Geohazards

A review of the GSI's landslide susceptibility classification layer (GSI, 2021) indicates that the majority of the Site area has a classification of Moderately Low to High susceptibility. In the wider study area, the classification is Low.

The risk of instability of soils and/or bedrock which would result in a partial collapse of material can occur in a quarry environment.

In general, adequate protection bunds/berms have been put in place along the crests (top of faces/benches) of excavations. Toe protection (catch-berms) is required to be put in place along the bottoms of the majority of non-active/production faces. Non-active/production faces should have their access blocked off with berms/bunds and relevant warning signage.

Silt from the water treatment plant is deposited in a series of silt ponds located in southern part of the quarry floor. These are constructed from rock and overburden materials recovered on the Site. The ponds are filled with silt sequentially to ensure even settlement within the ponds.

5.4.7 Radon

The Radon Map for Ireland (EPA, 2021) indicates that the Site and study area are located in an area where between 1% and 5% of homes are estimated to be above the radon reference level. A High Radon Area is classified by the EPA as any area where it is predicted that 10% or more of homes will exceed the Reference Level of 200 becquerel per cubic metre (Bq/m^3).

5.4.8 Designated Geological Sites

There are no geological sites of interest at, or within 0.5 km of the Site (GSI, 2021).

5.4.9 Selection of Sensitive Receptors

The Proposed Development involves the extension of extraction activities in a north-westerly and north-easterly direction. This will result in agricultural land loss in these areas as these lands are currently used for agriculture. However, the soils are quite thin and there is limited potential for intensive farming given that soils in this area are Surface-water Gleys which are considered a heavy soil for agricultural uses. The lands within the proposed north western extension area have a separate designation with the South Dublin County Council Development Plan (2016 – 2022) that the lands may be developed for Traveller Accommodation. Land will be considered further in this assessment in the context of loss of agricultural lands and potential loss of lands for Traveller Accommodation.

No geological heritage sites have been identified as part of the baseline. Therefore, the impacts to, and effects on, geological sites have not been considered further in this assessment.

The superficial deposits are very thin, isolated to the north western and north eastern proposed extraction areas and are of low local importance and have low economic value. The bedrock geology beneath the Site is of medium/high economic value both locally and regionally and provided material for several developments within the area, including the N7 roadway. However, the bedrock has no special designation and is ubiquitous in the area.

Human receptors within the area (including workers onsite) have the potential to be impacted by the proposed activities and will be considered in the context of the human health receptor.

Taking account of the above and the receptor classification method described in Section 5.3, the receptors carried forward in this assessment and their assigned importance are presented in Table 5.5.

Table 5.5: Soil, Land and Geology Receptors.

Receptor	Importance and Reasoning
Superficial deposits (soil/sub-soils) at the Site and within the study area	Negligible (no designation, no rarity, local importance)
Bedrock Geology at the Site and within the Study Area	Medium (no designation, no rarity, medium/high economic importance)
Land (agricultural land and potential Traveller Accommodation)	Low (indicative location to provide for Traveller Accommodation dependent on need, low potential and value for agricultural uses)
Human health at the Site and within the Study Area	High (human health receptor)

5.5 Characteristics of the Proposed Development

The Proposed Development consists of further development of a quarry over an area of 26.87 ha. that largely coincides with an existing operational quarry void currently at an average working depth of approximately 173 mAOD and final floor of approximately 150 mAOD. It is proposed to laterally extend the existing quarry void to the north by approximately 4.1 ha. over a total of 5.16 ha. to accommodate screening berms and to also further extract the existing quarry void to a final average depth of 150 mAOD, east and west of a centrally located existing administration and processing plant area. A restoration plan to return the application site and existing administration and processing plant area to agricultural and amenity use upon completion of proposed extraction has been prepared and is proposed to be implemented upon cessation of extraction. The proposal duration is 20 years to reflect anticipated extraction of remaining reserve within 10 – 15 years depending on market conditions, and a further 2 - 5 years for restoration.

The existing quarry is accessed at a single location from the N7. The reserve consists of sandstone (greywacke) and is currently extracted by blasting and mechanical means. The excavated material is crushed at the working face by mobile plant and transported to a central plant area for washing, grading and processing. The further development of the quarry relates to further extraction only and is to utilise the extant existing administration and processing plant area and quarry access that are included in a concurrent application for substitute consent.

5.5.1 Embedded Mitigation

This initial assessment of the significance of potential effects resulting from the Proposed Development takes into consideration any embedded design and commonly undertaken good practice mitigation. The elements of the Proposed Development design and good working practices that reduce the potential for impacts to soils and geology include the following:

- The design of Proposed Development extension area follows the Health and Safety Authority's *'Guidelines to the Safety, Health and Welfare at Work (Quarries) Regulations 2008*, (as amended), and will be extracted in accordance with the proposed design;
- Site operations will be managed in accordance with relevant health and Safety legislation (Safety, Health & Welfare at Work Act (2005, as amended); and the Mines and Quarries Act (1965, as amended)) and subsequent Quarries Regulations relating to health and safety, training, and appropriate site management;

- Fencing will be maintained at the Site to ensure that the risk of injury to the public and livestock is minimised. The entrance gate is locked and controlled by the Site's management;
- Exposed edges in the quarry will be protected with safety berms;
- Blasting will continue to take place at the Site using licenced and experienced operators. Site management give advance notification of blast events to nearby residents as is standard procedure for the existing quarry;
- Site management practices will be implemented to mitigate the impact to the water environment, as identified in Chapter 6 of this EIAR, including:
  - Safe storage and handling of hazardous substances;
  - Maintenance of equipment and plant to ensure there are no leakages of fuels, oils and potentially contaminating substances;
- The removal of soils will be conducted in a phased basis to reduce the overall potential impact on the land use and underlying groundwater;
- Mobile plant on the Site will be regularly maintained, and where plant is damaged or leaking, it will either be removed from the Site for repair or removed to an on-site maintenance shed for maintenance and/or repair (depending on the extent of the damage to the plant). Damaged or leaking plant will be fixed or replaced immediately, as part of the operational management of the Site;
- Overburden will only be removed in favourable environmental conditions. In addition, restoration activities will also occur during favourable environmental conditions;
- Re-handling of the topsoil will be kept to a minimum to preserve the integrity of the material;
- Stockpiles will be evaluated and monitored and kept stable for safety and to minimise erosion;
- Groundwater monitoring of existing wells on site will continue to be undertaken (refer to Chapter 6, Water); and
- The quarry manager will continue to ensure compliance with relevant safety and statutory legislation and best practices recommended by the Irish Concrete Federation (ICF) and National/EU Legislation (and Guidelines).
- Refuelling and the addition of hydraulic oils or lubricants to vehicles or generators will take place on-site only in designated areas.

5.6 Potential Effects

The main potential impacts and associated effects that will be considered in the assessment relate to the following:

- Activities or events that might impact land quality (e.g. leaks and spills from machinery or stored substances, or discharges);
- Change of land use/land take (i.e. loss of agricultural lands and loss of potential lands for Traveller Accommodation);
- Loss of superficial deposits and bedrock; and
- Destabilisation and/or subsidence of unconsolidated soils, sub-soils or rock faces;

These are considered and assessed in the following sections.

5.6.1 Land Quality

Fuel and other substance leaks or spills from stored substances or from machinery/equipment used during the Proposed Development could affect the chemistry of the soil (where it is still in-situ) or could infiltrate to the groundwater through the bedrock. A review of water quality during the assessment period (refer to Chapter 6, Section 6.4.10) indicates that groundwater quality is generally good.

The magnitudes associated with the potential groundwater and surface water impacts at the Site were assigned as negligible or low in Chapter 6 due to:

- Limited off-site hydraulic connectivity of groundwater has limited the migration of contaminants from the Site and localised the drawdown to areas immediately adjacent to the excavated areas;
- Low or undetected concentrations of hydrocarbons in groundwater and surface water and the presence of embedded mitigation to prevent contaminant migration;
- No exceedances of surface water EQS threshold values for inland waters and generally good quality of water in the River Griffeen observed;
- The estimated low volumes of discharge to the culvert

As a result, the predicted potential impact on human health is **negligible (adverse).**

5.6.2 Change of Land Use/Land Take

Superficial deposits will be removed in the north western and north eastern areas of the Site and stockpiled for future site restoration throughout the life of the quarry. Superficial deposits are primarily a very thin, surface-water Gley which is considered a heavy soil for agricultural usage and not highly productive. The existing land occupied by the quarry (including extraction areas, plant and ancillary areas) is ca. 28.8 ha. The Proposed Development will see a further development of void over ca. 4.1 ha. and associate disturbance and bunding to a total area of ca. 5 ha.

Given the low productivity and value of the land as an agricultural resource and the resource potential of the underlying rock for use in the extractive industry, the impact on agricultural land loss is considered to be **low (adverse).**

The loss of potential lands due to the Proposed Development will remove the potential for this land to be used as a future site providing Traveller Accommodation, however, two alternative sites exist within close proximity which could be suitable alternative sites, if they are required. The impact on potential land to be used to provide Traveller Accommodation is therefore considered to be **low (adverse).**

5.6.3 Loss of Superficial Deposits and Bedrock

The nature of the Proposed Development involves the removal and storage of superficial deposits. The impact on these can be considered temporary in nature, as they will be stored for reuse as a fundamental part of the Site's restoration. The superficial deposits are very thin (ca. 0.5 – 1 m) and of low value locally, ca. 47,400 m^3 soil will be removed from its current location as part of the Proposed Development. The removed soils will remain in the immediate area as they are to be utilised at the margins of the disturbed area as screening berms. The magnitude of the impacts on superficial deposits is considered to be **low (adverse).**

By the nature of quarrying the underlying deposit of rock will be removed which will result in a direct and irreversible impact on the Site, and the deposit has a medium/high resource potential and will be used in construction projects for the greater Dublin region with ca. 5 Mt to be extracted. The magnitude of the impact of the loss of bedrock at the Site is considered to be **medium (adverse)**.

5.6.4 Geotechnical Instability

General earthworks (e.g. excavation, soil movement, ground compaction, stockpiling, reprofiling) have the potential to affect human health of workers if they were to become unstable. Stability issues may also arise during the excavation of the quarry faces and the construction and management of the silt ponds.

The extraction plan for the proposed extension has incorporated industry standard for slope design, thus mitigating any potential geotechnical / geohazard risks and the existing quarry is well maintained and managed.

The management of the existing quarry faces, and silt ponds will be in accordance with the Health and Safety Authority's *'Guidelines to the Safety, Health and Welfare at Work (Quarries) Regulations 2008*, (as amended),and the recommendations of geotechnical appraisals carried out on site.

The stability of excavations and stockpiles will be monitored and managed, so the potential impact is predicated to be **negligible (adverse)**.

5.6.5 Evaluation of Effects

The evaluation of effects takes into account the predicted impact magnitude combined with receptor sensitivity. The evaluation of effect significance for each of the receptors (taking account of embedded mitigation) discussed above is presented in Table 5.6. As can be seen from Table 5.3, any negligible initial impact magnitude will result in a slight, not significant or imperceptible level of effect significance, which are all 'not significant'. Therefore, Table 5.6 only includes those sources of impact that may result in a low to high initial impact magnitude.

Table 5.6: Evaluation of Initial Impacts and their Effect Significance.

Receptor	Sensitivity	Source of Impact/Description of Change*	Impact Magnitude*	Level of Effect *
Superficial deposits (soil/sub-soils) at the Site and within the Study Area	Negligible	Removal of superficial deposits at the Site	Low (adverse)	Slight
Bedrock Geology at the Site and within the Study Area	Medium	Removal of bedrock at the Site	Medium (adverse)	Moderate
Land	Low	Change in land use by the advancement of the extraction area through time and a loss of agricultural lands	Low (adverse)	Slight
		Potential loss of land which may be provided as future Traveller Accommodation by the advancement of the extraction area through time	Low (adverse)	Slight

* Taking account of embedded mitigation

5.7 'Do-Nothing' Scenario

In the event that the Proposed Development does not progress (i.e. no further extraction takes place), there are unlikely to be further impacts on the geological, land or soil environment in the area of the Project Site.

5.8 Mitigation and Management

5.8.1 Mitigation

Additional mitigation and/or management is intended to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment. The initial assessment of potential effects (taking into account embedded mitigation) has not identified any significant adverse effects. However, to further mitigate the initial effects associated with land, soils and geology, the following additional mitigation will take place:

- If evidence of previously unidentified potential contamination (either visual or olfactory) is identified during works, construction good practice and management procedures will be followed that may include investigation and assessment works;
- The management of the existing quarry faces, and silt ponds will be in accordance with the Health and Safety Authority's *'Guidelines to the Safety, Health and Welfare at Work (Quarries) Regulations 2008*, (as amended),and the recommendations of geotechnical appraisals carried out on site; and
- The Applicant will maintain a Complaints Register. This register will record complaints of an environmental nature related to the operation. In each entry the Applicant will record the date and time of the complaint, the name of the complainant (if provided), and will give details of the nature of the complaint. A record shall also be kept of any response made in the case of each complaint.

5.8.2 Monitoring

The monitoring programme at the Site will include regular stability surveys of the quarry faces and regular monitoring of groundwater quality in monitoring wells.

5.9 Residual Effects

A summary of the sources of impact, predicted magnitudes of residual impact (accounting for embedded mitigation and additional mitigation) and subsequent residual effect significance is presented in Table 5.7.

In all cases the residual effect is Not Significant and not greater than imperceptible.

The assessment concludes that the Proposed Development will not give rise to significant adverse effects on the land, soil or geology at or surrounding the Site. In all cases the residual adverse effect is **Not Significant and not greater than Slight** and no additional mitigation measures are required (although some have been proposed to further reduce any residual impacts).

5.10 Cumulative Impacts

The nearest extraction operation to the Proposed Development is Belgard Quarry, ca. 7 km northeast of the Site. Given the distances between the developments it is considered that there will be no cumulative effects of their activities on land, soils and geology.

Table 5.7: Evaluation of Predicted Residual Impacts and their Effect Significance.

Receptor (importance)	Potential Source of Impact	Direct or Indirect	Duration*	Reversible or Irreversible	Summary of Combined Mitigation (embedded and additional)	Residual Magnitude of Impact (direction)	Residual Effect Significance
Superficial deposits (soil/sub-soils) at the Site and within the Study Area	Removal of superficial deposits at the Site	Direct	Medium - Long term	Reversible	Soils will be reinstated on the Site during restoration works	Negligible	Not significant/ Imperceptible
Bedrock Geology at the Site and within the Study Area	Removal of bedrock at the Site	Direct	Permanent	Irreversible	Soils will be reinstated on the Site during restoration works, and where possible, bedrock will be dressed with soil cover	Low (adverse)	Slight
Land	Change in land use by the advancement of the extraction area through time and a loss of agricultural lands	Direct	Permanent	Irreversible	Soils will be reinstated in areas of the Site during restoration works. Restoration design for the pit floor proposes to include a groundwater body across the lower areas of the quarry void.	Low (adverse)	Slight

Receptor (importance)	Potential Source of Impact	Direct or Indirect	Duration*	Reversible or Irreversible	Summary of Combined Mitigation (embedded and additional)	Residual Magnitude of Impact (direction)	Residual Effect Significance
	Potential loss of land which may be provided as future Traveller Accommodation by the advancement of the extraction area through time	Direct	Medium - Long Term	Reversible	Soils will be reinstated on the Site during restoration works resulting in lands being returned to use.	Negligible	Not significant/ Imperceptible

** Maximum duration without intervention*

5.11 References

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Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment, Department of Environment, Community and Local Government, 2018.

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Institute of Geologists of Ireland. 2013. Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements.

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Teagasc Soils Guide, (2021): Online guide - http://gis.teagasc.ie/soils/soilguide.php?series_id=0700DK. Accessed 4 March 2021.

South Dublin County Development Plan 2016 – 2022.

Irish Soil Information System – Synthesis Report. Report Number 130 (2014). EPA.

Department of the Environment, Quarries and Ancillary Activities, Guidelines for Planning Authorities 2004.

Windmill Hill Remedial Environmental Impact Statement, 2013. Cross Architect and Building Surveyor and Byrne Environmental Consulting Ltd.

Geological, Groundwater and Hydrological Assessment (2020). Viridus.

APPENDIX 5.1

Borehole Logs

Drillhole ID:	**BH1**	**Client**	**Behan's Quarry**
Collar Easting	699,497.30	**Status:**	Drilling
Collar Northing	725,650.80	**Start date:**	16-Mar-20
Collar Elev_mAOD	174.75	**Finish date:**	17-Mar-20
Dip (deg)	-90	**EOH (m)**	33.0 m

Driller: Leo Dempsey

From (m)	To (m)	Interval (m)	Code	Description
0.00	0.50	0.50	OB	**OB** - clayey drift with siliceous stones
0.50	2.50	2.00	wGW	**Weathered Greywacke** - thin to medium bedded, weathered, fine grained greywacke with localised inter-banding of siltstone.
2.50	33.00	30.50	GW	**Greywacke** - thin to medium bedded, moderately strong to strong, fine grained greywacke with localised inter- banding of siltstone.
				Water make at ca. 26 m (ca. 200 gallons/hr)
				Installation: 6.5m solid at base, followed by 6m screen from 26.5m, followed by 20.5m of solid screen, backfilled with pea gravel & bentonite seal
33.00				**Final Depth**

GOLDER

Drillhole ID:	**BH2**	**Client**	**Behan's Quarry**
Collar Easting	700,126.80	**Status:**	Drilling
Collar Northing	725,954.30	**Start date:**	18-Mar-20
Collar Elev_mAOD	174.91	**Finish date:**	19-Mar-20
Dip (deg)	-90	**EOH (m)**	72.0 m

Driller: Leo Dempsey

From (m)	To (m)	Interval (m)	Code	Description
0.00	0.75	0.75	OB	**OB** - clayey drift with siliceous stones
0.75	1.50	0.75	wGW	**Weathered Greywacke** - thin to medium bedded, weathered, fine grained greywacke with localised inter-banding of siltstone.
1.50	72.00	70.50	GW	**Greywacke** - thin to medium bedded, moderately strong to strong, fine grained greywacke with localised inter- banding of siltstone.
				Water make at ca. 64 m (ca. 400 gallons/hr)
				Installation: 6m solid at base, followed by 6m screen from 66m, followed by 60m of solid screen, backfilled with pea gravel & bentonite seal
72.00				**Final Depth**

GOLDER

Drillhole ID:	**BH3**	**Client**	**Behan's Quarry**
Collar Easting	699,691.40	**Status:**	Drilling
Collar Northing	725,930.40	**Start date:**	20-Mar-20
Collar Elev_mAOD	160.64	**Finish date:**	23-Mar-20
Dip (deg)	-90	**EOH (m)**	36.0 m

Driller: **Leo Dempsey**

From (m)	To (m)	Interval (m)	Code	Description
0.00	0.00	0.00	OB	**OB** - clayey drift with siliceous stones
0.00	1.50	1.50	wGW	**Weathered Greywacke** - thin to medium bedded, weathered, fine grained greywacke with localised inter-banding of siltstone.
1.50	36.00	34.50	GW	**Greywacke** - thin to medium bedded, moderately strong to strong, fine grained greywacke with localised inter- banding of siltstone.
				Water make at ca. 22 m (ca. 300 gallons/hr)
				Installation: 11m solid at base, followed by 6m screen from 25m, followed by 19m of solid screen, backfilled with pea gravel & bentonite seal
36.00				**Final Depth**

GOLDER

Drillhole ID:	**BH4**	**Client**	**Behan's Quarry**
Collar Easting	700,211.40	**Status:**	Drilling
Collar Northing	725,611.60	**Start date:**	24-Mar-20
Collar Elev_mAOD	194.57	**Finish date:**	26-Mar-20
Dip (deg)	-90	**EOH (m)**	146.0 m

Driller: **Leo Dempsey**

From (m)	To (m)	Interval (m)	Code	Description
0.00	0.50	0.50	OB	**OB** - clayey drift with siliceous stones
0.50	2.00	1.50	wGW	**Weathered Greywacke** - thin to medium bedded, weathered, fine grained greywacke with localised inter-banding of siltstone.
2.00	146.00	144.00	GW	**Greywacke** - thin to medium bedded, moderately strong to strong, fine grained greywacke with localised inter- banding of siltstone.
				Water make between 75-80m (ca. 10-20 gallons/hr)
				Installation: No piezometer - steel casing to 6m, then OH to 146m
146.00				**Final Depth**

GOLDER