5 Land, Soils and Geology

5.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) provides an assessment of potential impacts to, and the significance of effects on, soils, land and geology as a result of the Proposed Project.

The Proposed Project is the restoration of a disused quarry by import of clean soil and stone from construction and demolition. The lands on which the Proposed Project occur (the 'Application site' or 'Site') are located in the townland of Coolsickin or Quinsborough, Co. Kildare.

The Application Site[1] includes a disused quarry void and associated historical working areas. It also includes a private access road that connects the disused quarry to the public road network, and agricultural lands to the east of that road where it is proposed to locate the temporary facilities required to manage the importation of clean soil and stone required for the Proposed Project.

All lands within the Application Site are within the ownership of the Applicant, Bison Quarries Ltd (BQL).

This EIAR is submitted in support of an application under Section 37L of the Planning and Development Act 2000, as amended.

The following assessment was prepared by Zak Bursey (B.A. (mod)), Lisa Cleary (B.A. (mod), PIEMA), and Rhian Llewellyn (MGeol, PhD, PIEMA). Zak and Lisa are both environmental scientists each with 2 years' experience, and Rhian is a geologist with over 15 years' experience.

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 carried out during the Proposed Project. This assessment considers the potential sources of change resulting from the Proposed Project activities detailed in the Project Description (Chapter 2) of this EIAR.

It should be noted that this assessment does not, however, constitute a contaminated land risk assessment, a geotechnical/geohazard risk assessment, or a detailed quantitative human health risk assessment.

The potential effects associated with hydrogeological and hydrological receptors are considered in Chapter 6 (Water) of this EIAR, with reference to water quality in relation to

[1] Shown by the Section 37L planning application boundary in Figure 5-1.

land quality in this chapter. The effects of the Proposed Project on population and human health are addressed in Chapter 3 (Population & Human Health) of this EIAR. Any secondary effects on ecology or biodiversity due to changes in land quality or habitat removal are considered in Chapter 4 (Ecology and Biodiversity).

5.1.2 Geographical and Temporal Scope

The geographical study area for the assessment covers lands within the EIA boundary with a study area extending to 1 km from the EIA boundary (see Figure 5-1) because most potential effects to land, geological and soil receptors are anticipated to occur within the development footprint or immediately adjacent to it. In this assessment, lands within the EIA Boundary are referred to as within the EIA unit.

The Application Site (approximately 6.63 ha) is entirely contained within the EIA project boundary (approximately 10.62 ha). The Section 37L planning Application boundary[2] is shown on the drawing set which accompanies the planning application and is presented in Figure 5-1.

The temporal scope of the assessment covers the 10-year construction phase. The construction phase comprises:

- enabling works carried out to install the site facilities (welfare facilities, hard standing areas, weighbridge, etc), and upgraded/realigned private access road and site entrance; and
- acceptance of clean soil and stone to the Application Site and its placement to restore the disused quarry in the north of the Application Site.

The restoration, following the construction phase infilling works, largely comprises aftercare and maintenance activities. The restoration phase has been scoped out of this assessment due to the nature of the works to be carried out in that project phase and the short-term nature of the phase having limited potential to impact land, geology and soils.

It is noted that striped topsoil will be stockpiled for later reinstatement, where practical. At late construction stages, it is anticipated that topsoil will be imported to the Application Site to progressively restore the final levels (e.g. within the quarry void space area). Imported topsoil may be temporarily stored in stockpiles prior to emplacement. Potential impacts associated with stockpiles are considered in the assessment of activities in construction phase.

[2] i.e. the Application site.

Figure 5-1 - Site Location and Study Area

5.1.3 Project Description Summary

The Proposed Project consists of the restoration of lands through the import of approximately 720,000 tonnes clean soil and stone as by-product (non-waste) from development sites to infill a disused historical quarry and raise ground levels to tie in with ground levels of surrounding land.

Restoration of the lands will be to agricultural grassland, an artificial waterbody, and a hedgerow habitat with the lands returned to their pre-extraction agricultural use.

The proposed duration of infilling is 10 years depending on market conditions for the anticipated acceptance of clean soil and stone, and a further 3 years for the completion of final restoration activities.

The Application Site is located in the townland of Coolsickin or Quinsborough, Co Kildare. The Application Site is accessed by a privately-owned access road connecting to a local road (L7049).

The following temporary facilities will be installed and maintained during the life of the Proposed Project:

- office and fully serviced welfare facilities;

- weighbridge and associated portacabin;
- closed-system wheel wash;
- 6 no. parking bays;
- 2 no. waste inspection bays and 1 no. bunded waste quarantine area;
- hardstanding area (vehicle movement and storage); and,
- surface water drainage infrastructure from hard standing and discharge to ground, including 2 no. interceptors and 2 no. soakaways.
- security features, including security gates and fencing.
- Power supply. It is intended that approval will be sought for a connection to the ESB Network for the office and fully serviced welfare facilities. Diesel generators will be used to power mobile lighting, if required.

The Proposed Project site entrance and private access road will be upgraded and realigned. These will be retained following to completion of the Proposed Project.

A full project description in provided in Chapter 2 of this EIAR.

5.2 Policy and Legislation 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 (Introduction, Scope and Methodology).

5.2.1 Legislation

This assessment has been made with cognisance to relevant legislation, including but not limited to:

- European Union Directive 2011/92/EU as amended by Directive 2014/52/EU – these Directives required that certain private and public projects which are likely to have significant resultant environmental impacts are subject to a formalised Environmental Impact Assessment prior to their consent;
- European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (SI No. 296 of 2018) which amended the Planning and Development Act, 2000, and the Planning and Development Regulations, 2001. The 2014/52/EU Directive was transposed into Irish law through this Directive;
- 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; and

- 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.

5.2.2 Relevant Policies and Plans

- 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”;
- The Kildare County Development Plan 2023-2029 was adopted on 09 December 2022. The key policies and objectives of this plan are listed in Section 2.9.4 of the Project Description (Chapter 2).

5.2.3 Relevant Guidance

This assessment has been made cognisant of relevant guidance and advice, including but not limited to:

- Relevant European Commission guidance – Guidance on the Preparation of the Environmental Impact Assessment Report (2017);
- The EPA Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (May 2022) – 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;
- Department of Housing, Planning and Local Government. Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (August 2018);
- The National Roads Authority Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (2008) 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;
- Environmental Good Practice on Site Guide (C811D, fifth edition, October 2023), in relation to source of impact and mitigation;
- The EPA guidelines on Environmental Management in the Extractive Industry (Non-Scheduled Minerals) (2006), for a more environmentally sustainable quarry and pit industrial sector, greater protection for the environment and human health; and

- The CIRIA guidance Publication C532 Control of water pollution from construction sites: guidance for consultants and contractors (2001), which provides advice on environmental good practice for the control of water pollution arising from construction activities.

5.3 Assessment Methodology and Significance Criteria

This section presents the method used to assess the impacts and effects of the Proposed Project 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.

5.3.1 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, desk-based information on land, soils and geology available from the Geological Survey of Ireland (GSI), the EPA and site investigations carried out at the Site. The assessment follows a staged approach, which is summarised below:

1. Confirm baseline conditions – determine baseline by consideration of available records and data sets, site reports and published information.
2. Confirm the key receptors and their value/importance - this may vary over time as new receptors are added (e.g. addition of residential housing).
3. Qualitatively characterise the magnitude of impacts on the receptors – describe what potential changes could occur to each receptor because of the Proposed Project, identify source-pathway receptor linkages, and assign the magnitudes of impact. This stage considers embedded design mitigation, good practice in construction environment management and pollution prevention.
4. Determine the 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 magnitude of any impact and associated effect.
6. Assess the residual impact magnitude and residual effect significance after all mitigation is applied.
7. Identify any monitoring that may be required to measure the success of the mitigation measures.

Stages 1 and 2 have been completed using published literature, guidance and available information specific to the Proposed Project, which is presented in Chapter 2 of this EIAR. 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 Guidelines on the Information to be Contained in EIARs (EPA, 2022), with some modifications made to increase clarity. The

descriptions for 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. 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. Harm to human health – death, disease, serious injury, genetic mutation, birth defects or the impairment of reproductive functions.

Magnitude of impact (change)		Typical description
		Harm to buildings/infrastructure/plant - Structural failure, substantial damage.
	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 occurs as a direct result of the Proposed Project and is likely to occur at or near the Proposed Project 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 Project 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 Project.

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 (i.e. less than the construction phase);
- 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 the 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.

5.3.2 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 topic section if a single significance category is reported. 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.

Significance Category	Typical Description
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.
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 will be presented that will be used to avoid, prevent, or reduce the magnitude of the potential impact (Stage 5). The significance of the effect considering 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 included (Stage 7) (see Section 5.8).

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 (Water).

5.4.1 Land Use

The Site comprises lands which are currently used for quarrying activities. The current extent of the proposed fill area is approximately 6.05 ha in area.

The current land usage is identified from September 2024 aerial photography for the lands surrounding the quarry (Figure 5-1) and the quarry area and walkovers carried out by WSP on 08 March 2024

Two main land uses have been identified within the Site and the study area (1 km from the Site boundary). These are agricultural and forest and semi-natural areas (Copernicus Land Monitoring Service, 2020). The lands surrounding the Site can be characterised as rural in nature, with land uses in the area being agricultural and single-house residential. Sheep rearing, grazing of cattle and tillage are the main activities in the area.

Land use in the south of the EIA unit are agricultural (tillage) and include a private access road. The lands in the north of the EIA unit comprise a disused quarry and associated stockpile areas created by historical extraction activities understood to have been carried out over 2000-2006[3]. Following closure of the quarry in 2006 the disused working/stockpile areas have been recolonised by vegetation. Additionally, water has collected in the quarry void space.

Historical mapping and aerial imagery indicates that prior to 2000 the lands within the EIA were in agricultural use form at least 1834 (Heritage Council Online heritage maps viewer, 2025).

The County Kildare Wetland Survey identified part of the Site as a wetland for local biodiversity interest in Kildare. The quarry void space and immediately surrounding area are assigned KWS Site Code: 170 and have been assigned a rank of 'D' which is classified as 'Moderate value, locally important' and defined using the following criteria:

- Sites containing some semi-natural habitat or locally important for wildlife.
- Small water bodies with some coarse fisheries value or some potential salmonid habitat.
- Any water body with unpolluted water (Q-value rating 4-5).

5.4.2 Superficial Geology (Soil and Quaternary Sediments)

Teagasc's Irish Soil Information System (SIS) mapping shows the soil cover over the entire Site area (Figure 5-2). This soil map is representative of the baseline soils at the Site prior to activities within the extraction area.

[3] Historical extraction activities at the Site are the subject of a Substitute Consent Application (including retrospective EIAR) that was prepared broadly concurrent to this EIAR.

Figure 5-2 - **Irish Soil Information System (SIS) Mapping overlain on Google Earth September 2024 Aerial**

Soil associations are groups of soil types that commonly occur together in the landscape and these associations make up the Irish Soil Information System national database (EPA, 2024). There are 11 Soil Great Groups, which are a hierarchical arrangement that can be used for taxonomical classifications. Table 5-5 lists the different soil categories within the Study Area.

GSI (2024) data indicated that the soil associations mapped within the study area consists of luvisols, alluvial and ombrotrophic soils, which are described as follows (EPA, 2025):

- Luvisols have high activity clays throughout and lack the abrupt textural change of Planosols. These are soils in which clay is washed down from the surface soils to an accumulation horizon at some depth.
- Alluvial soils are formed in deposits of river, lake, estuarine or marine alluvium. The majority of series described are associated with recent rivers and streams. The lake alluviums found in Ireland are mostly associated with depressions at the sites of glacial or post-glacial lakes.
- Ombrotrophic peat soils are rain-fed peat soils in lowland (raised bog) and upland positions (blanket peat). They are oligotrophic with a pH < 4.0 (in $CaCl_2$ 1:2.5 undried, equivalent to pH 4.5 in 1:2.5 H_2O) throughout the reference section.

Table 5-5 - SIS Associations within the Study Area

Soil Association Code	Soil Great Group	Description
Elton (1000c)	Luvisol	Fine loamy drift with limestones
Lake (05LAK)	Alluvial	Lake alluvium
River (05RIV)	Alluvial	River alluvium
Peat (1xx)	Ombrotrophic	Rain-fed peat soils

GSI (2025) data indicates that the subsoils underlying the Site are composed of gravels derived from limestones and till derived from limestones (Figure 5-3). In the northern section of the study area GSI mapping indicates there is cut over raised peat. To the west of the study area there are areas of alluvium and lacustrine sediments.

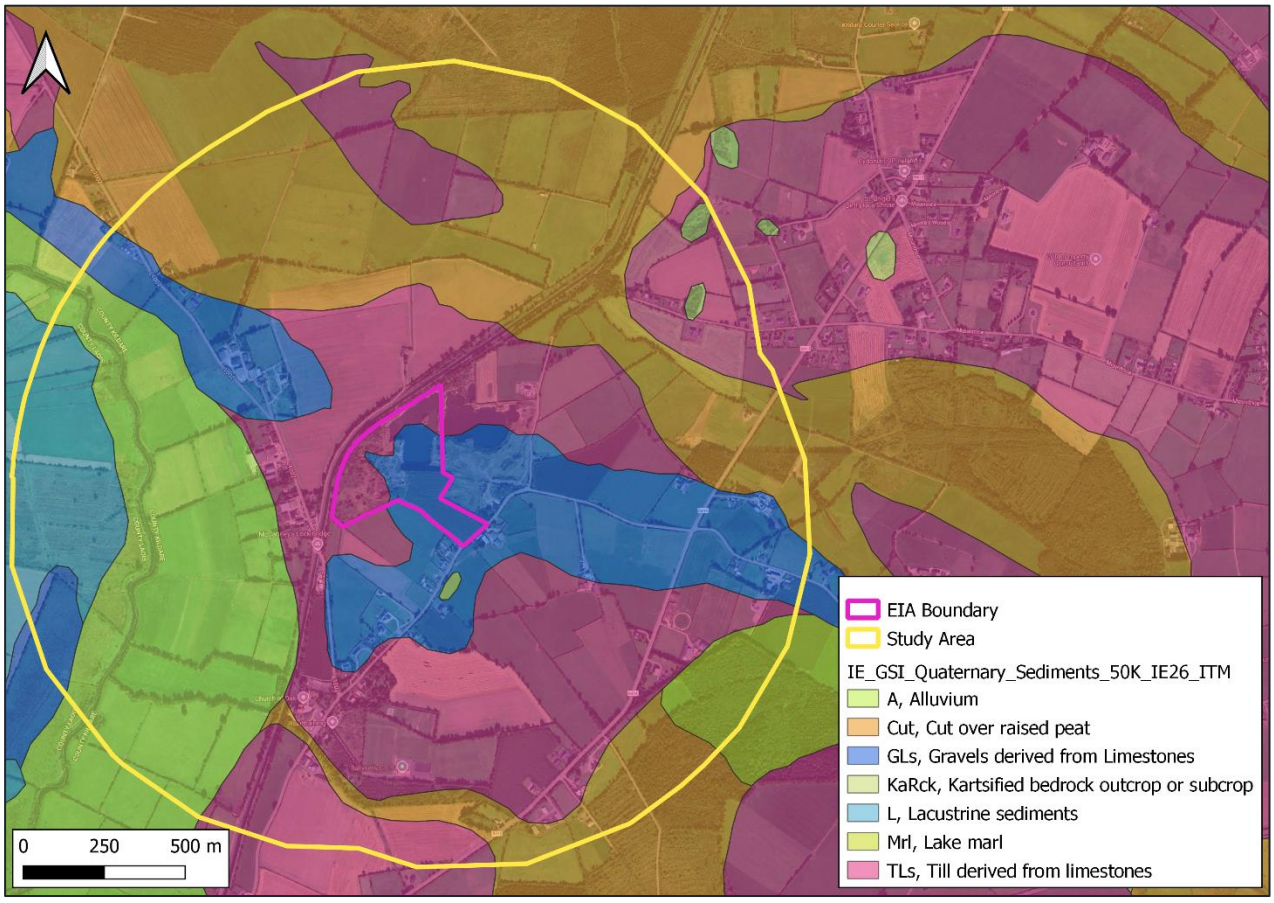

Figure 5-3 - Underlying Quaternary Sediments (subsoil) (GSI, 2022) overlain on Google Earth September 2024 Aerial

5.4.3 Bedrock Geology

The GSI Bedrock Geology 1:100,000 map (Figure 5-4) indicates that the Site is underlain by the Allenwood Formation, which is described as consisting of pale-grey generally massive

shelf limestones and their dolomitised equivalents. The Allenwood Formation is Carboniferous in age.

The area to the west of the study area is underlain by the Lucan Formation, which consists of dark-grey to black, fine-grained, occasionally cherty, micritic limestones that weather paler, usually to pale grey. The Lucan Formation is Carboniferous in age.

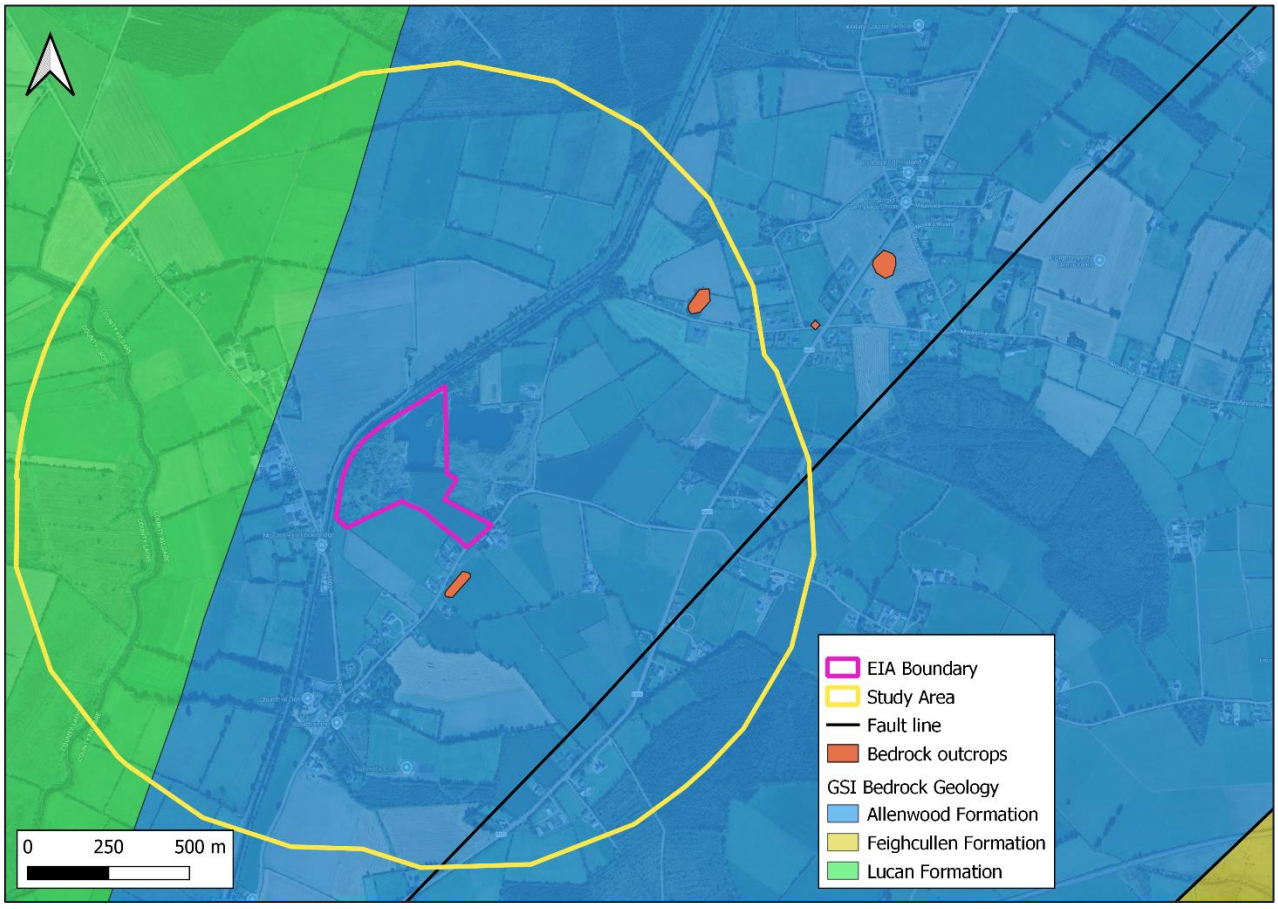

Figure 5-4 - Underlying Bedrock Geology (GSI, 2022) overlain on Google Earth September 2024 Aerial

5.4.4 Site Investigations

Boreholes logs produced during the installation of groundwater monitoring wells indicate drift (overburden, and sands and gravels) thickness ranges from approximately 6 m (BH4) to the east of the Site, to approximately 11.5 m (BH2) to the northwest of the Site. This indicates that sands and gravels of the drift thicken to the west of the Site. A summary of the borehole logs and a figure showing their locations is provided in Chapter 6 (Water).

5.4.5 Geological Assets and Heritage

There are no designated County Geological Sites located within the study area (Parkes and Sheehan-Clarke 2005).

5.4.6 Geohazards

The GSI's landslide susceptibility classification layer (GSI, 2023) indicates that lands within the study area are of 'Low' landslide susceptibility. There have been no previously recorded landslide events within the study area (GSI, 2022).

GSI data indicates that there are no karst features in the area.

It is noted that the risk of instability of soils and/or bedrock which would result in a partial collapse of material can occur in a quarry environment. However it is noted that the quarry is disused. Further discussion of geotechnical hazards has been provided in Chapter 13 (Major Accidents and Disasters) of this EIAR.

The Radon Map for Ireland (EPA, 2023) indicates that the Site and study area are located in an area where 1 in 5 homes are estimated to have high radon levels. 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).

5.5 Selection of Sensitive Receptors

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 5-6.

Table 5-6 - Land, Soil and Geology Receptors

Receptor	Importance and Reasoning
Land (soil/sub-soils) at and immediately adjacent to the Proposed Project	Negligible (no designation, no rarity, local importance)
Mineral or aggregate reserves	Low (no rarity, ubiquitous across Ireland, local importance)
Human Health (workers during works phase activities)	High (human health receptor)

The Application Site is located in an area underlain by limestones. Given that intrusive works are relatively shallow and limited to enabling works required for the installation of temporary site facilities, surface water drainage, and soil stripping there is considered limited potential for impacts from geohazards relating to encountering karsts as a result of the Proposed Project.

5.6 Do Nothing Scenario

In the event that the Proposed Project does not progress, geological, land and soil environment in the area of the Application Site would remain unchanged. The quarry void space would remain and continue to contain collected waters.

Should the Proposed Project not progress, the agricultural potential of the lands will not be restored. Potential effects to occupational human health would not occur.

5.7 Characteristics of the Proposed Project

The Proposed Project is described in Chapter 2 (Project Description) and summarised in Section 5.1.3. Key elements that could present sources of impact to land quality include the importation of soil and stone, fuel/oil use, use of a wheel wash, surface water drainage systems, and the use and maintenance of temporary facilities (e.g. welfare facilities).

5.7.1 Embedded Mitigation

This initial assessment of the significance of potential effects resulting from the Proposed Project takes into consideration embedded design, proposed construction and waste management methods, and commonly undertaken good practice mitigation. The elements of the Proposed Project design and good working practices that reduce the potential for impacts to soils, land and geology include the following:

- Vehicle movements outside the area where infilling will take place will be restricted to dedicated routes or on areas of hardstanding.
- Existing topsoil on site will be removed and temporarily stored in stockpiles, where practicable. The topsoil to be reused during the land reinstatement.
- Topsoil will be stockpiled to heights that result in no deformation to the structure of the soil.
- Stockpiles of material will be evaluated and monitored and kept stable for safety and to minimise erosion.
- Any topsoil imported will be inert and sourced from a suitability licenced third party supplier.
- No deep excavation is planned; only shallow topsoil stripping and land raise.
- There is no known land contamination at the site. If during works previously unidentified contamination is encountered, work will be undertaken to characterise this and determine if there is a risk to land quality or human health that requires action.
- The land raise, and all facilities required to enable construction, will be developed using inert soil and stone (e.g. land raise) and concrete slab and/or aggregate/tarmacadam to install hardstanding (e.g. site entrance curtain, waste inspection bays and bunded waste quarantine area, paved internal accessed road).
- Material acceptance for the imported clean soil and stone will be as set out in Chapter 2 (Project Description). No contaminated soils will be accepted at the facility. Authorised vehicles only will be received. The origin and weight of incoming material will be known. Representative samples will be taken from a certain proportion of loads to make sure they comply with acceptance criteria.
- Biosecurity measures in relation to imported soil and stone will be carried out in line with the Invasive Species Management Plan (ISMP) provided in Appendix 2B to Chapter 2 of this EIAR.

- There will be 2 No. waste inspection bays and a bunded waste quarantine area that are enclosed on three sides and base-lined with concrete.
- During emplacement of materials, the site operative will inspect what is being laid down. Suspect or non-compliant material will be transferred to the quarantine area for further inspect and classification. Materials that are not compliant with acceptance criteria requirements will be removed from the Site for disposal at an appropriate facility.
- Temporary slopes in the infilled soils will be visually inspected, at least once a month, by site staff and records will be kept. Should these inspections give rise for concern, an inspection of the affected area(s) will be undertaken by a qualified geotechnical engineer and measures will be implemented to address any instability issues associated with infilling.
- There will be no underground storage tanks.
- There will be no on-site concrete batching undertaken for the construction of facilities or hardstanding areas.
- Any refuelling of plant onsite will take place on the hardstanding area and drip traps will be used. Refuelling will be undertaken by a trained person.
- Spill kits will be maintained on Site to deal with any spills and leaks, and spill training will be provided to relevant staff members.
- Mobile plant parking will be available on the hardstanding for vehicle movement and storage.
- The wheel washing facility will be located upon hardstanding that will be maintained for the duration of the Proposed Project. The effluent water from the wheel wash will be recycled within the system.
- Any sludge collected from wheel wash will be tested and either used as land restoration process (if the quality and end use is acceptable) or disposed of to an appropriate licensed waste disposal facility.
- All hard-standings adjacent to administration buildings, including the waste inspection and quarantine bays, the internal haul road, and the hardstanding at the site entrance will be drained to a surface water drainage system. The run-off from hard-standing will be directed to an interceptor and discharged to soak pit that will be constructed on the Site. The interceptor will be maintained, as required.
- Any waste removal will be managed and undertaken by a competent contractor appointed by the Site Operator according to industry standard practice and disposed of accordingly by a licensed waste disposal contractor.
- An EMS (Environmental Management System) will be developed for the Site and will be in keeping with industry best practice and statutory guidelines. Plans within the EMS will set out how the construction of the Proposed Project will be managed. The plans will include widely used good practice measures to avoid or reduce the potential impact of construction works on workers, members of the public and the environment. These will include, but not be limited to, the following:
    - All works will be conducted in accordance with the appropriate site rules.

- Appropriate Personal Protection Equipment (PPE) will be used by all workers.
- Any hazardous materials will be labelled clearly, transported with care by competent and trained persons, and stored in dedicated areas in appropriately bunded containers.
- Maintenance checks and procedures will be completed to reduce the potential for leaks and spills from plant and vehicles.
- Pollution management measures will be implemented to prevent contamination by machinery pollutants, such as fuels, oils and lubricants during construction phase. These measures will be informed by guidance provided in relevant documents, such as the CIRIA guides to environmental good practice on site.
- Other information on good practice to reduce the potential for environmental pollution that will be consulted includes the following documents developed by the Environment Agency (England and Wales), the Scottish Environment Protection Agency and the Northern Ireland Environment Agency:
  - GPP 1 Understanding your environmental responsibilities - good environmental practices;
  - GPP 2 Above ground oil storage tanks;
  - PPG 6 Working at construction and demolition sites;
  - GPP 8 Safe storage and disposal of used oils;
  - GPP 13 Vehicle washing and cleaning;
  - GPP 21 Pollution incident response planning;
  - GPP 22 Dealing with spills; and
  - GPP 26 Safe storage - drums and intermediate bulk containers.

5.8 Potential Effects

The potential sources of impact that are considered in the assessment of effects relate to the following:

- Soil erosion or compaction resulting from plant movement;
- Stockpile stability;
- Importation of materials that could be unsuitable for the intended after-use;
- Restriction of future extraction at the Site by infilling the disused quarry void;
- Activities or events during the construction phase that might impact land quality (e.g. leaks and spills from machinery or stored material and substances, or discharges); and
- Mobilisation of existing contamination in soils by construction works (e.g. during works phase soils stripping) should there be historical contamination at the Proposed Project, which could impact workers and land quality.

5.8.1 Enabling Works

This section includes the consideration of potential sources of impact that could take place only within enabling works, or originate in the enabling works activities, but may also be present during the infilling activities of the wider construction phase. Where a source of

impact may also be present during the wider construction phase, this is stated and shown in the evaluation of initial impacts and effects that is presented in Table 5-7.

Construction activities will only take place where permitted. Vehicle movements outside of the area where infilling will take place, or where construction phase related tasks occur, will be restricted to dedicated routes or on areas of hardstanding. Stockpiles will be designed and managed to limit erosion. This will limit the potential for unnecessary soil compaction and erosion and limit the impact on soil structure. The potential impact on soils is predicted to be '*low (adverse)*'.

General earthworks (e.g. soil stripping) have the potential to affect human health of workers if they were to become unstable. Excavation will be limited to shallow soil stripping. The stability of stockpiles will be monitored and managed, so the potential impact human health is predicted to be *'negligible (adverse)'.*

Through material imported as part of the construction process (e.g. to install hardstanding), leaching from the import and use of contaminated materials has the potential to impact existing land quality or construction workers. The embedded mitigation associated with assessment of the suitability and quality of any imported materials means the potential impacts on adjacent land quality and human health are predicted to be '*negligible (adverse)'*.

Fuel and other substance leaked or spilled from machinery/equipment could affect the chemistry of the soil and general land quality, or the health of workers that could come into contact with it. There will be no underground tanks, no septic tanks, no concrete batching, no fuel stored on site, refuelling will take place in dedicated areas and drip trays will be used, spill kits and spill training will be provided, waste from the welfare facility will be disposed of off-site, other waste will be disposed of by a competent contractor, the EMS and maintenance and management procedures will be followed. Wheel washing will be used to reduce the deposition of material on surrounding roads. The water will be reused within the wheel wash. The wheel wash will be maintained and sludge emptied and disposed of appropriately. The potential impacts on land quality and human health are predicted to be '*negligible (adverse)*'.

Historical land use in the application site comprises agriculture and extraction of sand, gravel and bedrock. There is no evidence to suggest widespread contamination of the land. There are no planned deep excavations and only the top thin layer of soils will be stripped during construction and stored. The potential for construction works to encounter and mobilise existing contamination is considered to be limited. Work will be undertaken to assess previously unidentified contamination if it is encountered during construction. Therefore, the potential impacts on land quality and human health are predicted to be '*negligible (adverse)'*.

5.8.2 Infilling Works

Many of the same source of impact identified for the enabling works also apply to the infilling activities and have not been reconsidered here (e.g. welfare waste; wheel wash; storage, transport and use of fuels and other potentially polluting substances - i.e. leaks and spills).

Quarried faces and temporary slopes in the infill areas have the potential to affect human health of workers if they were to become unstable. Slopes will be inspected and any that give concern will be evaluated by a qualified geotechnical engineer. Where necessary, measures to improve stability that are recommended will be applied. Therefore, the potential impact is predicted to be '*negligible (adverse)*'.

Infilling of the quarry area will restrict the future extraction of bedrock at the Site. The mineral and aggregate reserves at the Site are ubiquitous across Ireland and are of local importance. Therefore, the potential magnitude of impact to the mineral or aggregate reserves is predicted to be *'Medium (adverse)'.*

Import of contaminated material for infilling could impact human health of workers and land quality. The Applicant will adhere to the material acceptance criteria and procedures as set out in the Project Description (see Chapter 2 of this EIAR). No contaminated soils will be accepted at the facility. There will be load inspection and quarantine/removal (if required). An EMS that details material inspection protocols and any PPE required will be followed. The ISMP (see Appendix 2B to chapter 2 of this EIAR) will be implemented in full. Therefore, the potential impacts on land quality and human health are predicted to be '*negligible (adverse)*'.

As the final ground levels are reach in the fill area, the stripped soils will be replaced and/or imported topsoil will be emplaced (as required). After land raising and replacement of soils, the land will be returned to agriculture, as it was before historical quarrying took place. Therefore, the potential impact to land and land use is predicted to be '*negligible (beneficial)*'.

5.8.3 Evaluation of Effect Significance

The evaluation of effects takes into account the predicted impact magnitude combined with receptor sensitivity. The evaluation of effect significance from each of the initial construction impacts (taking account of embedded mitigation) discussed above is presented in **Table 5-7**.

Table 5-7 - Evaluation of Initial Impacts and their Effect Significance

Receptor	Sensitivity	Source of Potential Impact/Description of Change*	Impact Magnitude*	Level of Effect *	Significance of effect
Land / Soils / Land use	Negligible	Structure of stripped and stored soils due to vehicle movement and stockpiling	Low (adverse)	Imperceptible (mitigation considered sufficient for lower significance category)	Not significant
		Potential change in land quality due to import of potentially contaminated construction materials	Negligible (adverse)	Imperceptible	Not significant
		Potential change in land quality due to disturbance and mobilisation of existing ground contamination	Negligible (adverse)	Imperceptible	Not significant
Human Health - construction workers	High	Stability of soil stockpiles leading to injury	Negligible (adverse)	Slight	Not significant
		Contact with potentially contaminated imported construction materials	Negligible (adverse)	Slight	Not significant
		Contact with previously unidentified existing ground contamination	Negligible (adverse)	Slight	Not significant

Receptor	Sensitivity	Source of Potential Impact/Description of Change*	Impact Magnitude*	Level of Effect *	Significance of effect
Human Health – workers	High	Potential change in land quality due to substance leaks and spills (various sources – see text)	Negligible (adverse)	Slight	Not significant
Land / Soils / Land use	Negligible	Potential change in land quality due to import of potentially contaminated infill materials	Negligible (adverse)	Imperceptible	Not significant
		Potential change in land quality due to change in land use	Negligible (adverse)	Imperceptible	Not significant
Human Health - workers	High	Emplaced material slope stability leading to injury	Negligible (adverse)	Slight	Not significant
		Import of potentially contaminated infill materials	Negligible (adverse)	Slight	Not significant
Mineral and aggregate reserves	Low	Infilling will restrict the future extraction of bedrock at the Site	Medium (adverse)	Slight	Not significant

5.9 Additional Mitigation and Monitoring

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 (i.e. those that have been evaluated as 'large' or 'profound'). Therefore no further measures to mitigate the initial effects are proposed.

5.9.1 Monitoring

Regular geotechnical stability surveys of the infill slopes (i.e. slopes of emplaced clean soil and stone) will be carried out during construction phase.

5.10 Residual Effects

A summary of the sources of impact, impact type, impact duration, impact revisability, and predicted magnitudes of residual impact (accounting for embedded mitigation) is presented in Table 5-8. In all cases the residual effect is not greater than '*Slight'* and therefore **Not Significant.**

Table 5-8 - 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
Land / Soils / Land use (negligible)	Structure of stripped and stored soils	Direct	Short term	Reversible	Appropriate temporary storage of soils. Designated areas for vehicle movements.	Low (adverse)	Imperceptible (not significant)
	Import of potentially contaminated construction materials	Direct	Permanent	Reversible	Material acceptance procedures.	Negligible (adverse)	Imperceptible (not significant)
	Disturbance and mobilisation of existing ground contamination	Direct	Permanent	Reversible	Procedure for dealing with previously unidentified contamination during construction.	Negligible (adverse)	Imperceptible (not significant)
Human Health - construction workers (high)	Stability of soil stockpiles	Direct	Short term	Reversible	Stockpile design (strip and store only what required, appropriate stockpile heights and slopes) and inspection / monitoring	Negligible (adverse)	Slight (not significant)
	Contact with potentially contaminated	Direct	Short term	Reversible	Material acceptance procedures. Follow procedures in the EMS.	Negligible (adverse)	Slight (not significant)

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
	construction materials						
	Contact with existing ground contamination	Direct	Short term	Reversible	Procedure for dealing with previously unidentified contamination during construction.	Negligible (adverse)	Slight (not significant)
Land / Soils / Land use (negligible)	Substance leaks and spills (various sources – see text)	Direct	Permanent	Reversible	No underground tanks (fuel or septic). No concrete batching. No fuel storage. Refuelling protocols. Spill procedures and training. Waste management. Good practice pollution prevention measures. Waste management procedures. Follow procedures in the EMS. See main text for detail.	Negligible (adverse)	Imperceptible (not significant)
Human Health - workers (high)	Contact with substance leaks and spills (various sources – see text)	Direct	Short term	Reversible	No fuel storage on site. Refuelling protocols. Spill procedures and training. Waste management. Good practice pollution prevention measures. Waste management procedures. Follow procedures in the	Negligible (adverse)	Slight (not significant)

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
					EMS. See main text for detail. Bottled drinking water will be available at the site facilities.		
Land / Soils / Land use (negligible)	Import of potentially contaminated infill materials	Direct	Permanent	Reversible	Clean soil and stone only. Material acceptance and quarantine procedures.	Negligible (adverse)	Imperceptible (not significant)
	Change in land use	Direct	Permanent	Irreversible	Reinstatement of stripped agricultural soils with improved drainage	Negligible (beneficial)	Imperceptible (not significant)
Human Health - workers (high)	Emplaced material slope stability	Direct	Short term	Reversible	Slope design and inspection. Follow procedures in the EMS.	Negligible (adverse)	Slight (not significant)
	Contact with potentially contaminated infill materials	Direct	Short term	Reversible	Inert material only. Material acceptance and quarantine procedures. Follow procedures in the EMS.	Negligible (adverse)	Slight (not significant)
Mineral and Aggregate Reserves	Infilling will restrict the future extraction of bedrock at the Site	Direct	Permanent	Irreversible	N/A	Medium (adverse)	Slight (not significant)

5.11 Cumulative Impacts

The geology and land use in the wider area is the same, or similar to, that at the Proposed Project. Potential impacts and associated effects on land, geology and soils are typically restricted to within the footprint of a proposed development. Additionally, it is assumed that the other permitted / under construction developments are also designed to current standards and adopt widely used good practice mitigation with respect to pollution prevention. Therefore, it is considered likely that they will also result in negligible impacts to the land; leading to imperceptible-to-slight (and **Not Significant**) cumulative effects on land / soils / land use.

There could be the potential for many developments in an area to result in cumulative loss of agricultural land, but this has not been considered here because the Proposed Project returns the land to agricultural use and does not result in a loss.

The consideration of human health in this assessment of the Proposed Project only applies to site workers. It is assumed that these workers will not also be working on other developments at the same time, and that the potential sources of impact to human health from this and other proposed developments would be restricted to within the development boundaries. Therefore, it is considered that there will be no cumulative impacts and effects on human health.

5.12 Difficulties Encountered

No difficulties were encountered in undertaking the assessment of impacts and effects on soils, land and geology.

Historical land use does not suggest that the land is likely to be contaminated. All developments have the potential for encountering previously unidentified contamination; however, this has been addressed in the embedded mitigation.

5.13 References

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