

4.0 ECOLOGY AND BIODIVERSITY

4.1 Introduction

This chapter of the remedial Environmental Impact Assessment Report (rEIAR) presents a retrospective assessment of the potential effects that may have occurred on biodiversity as a result of activities at the existing sand and gravel quarry site at Ballinabarny North and Bolagh Lower, Redcross, Co. Wicklow ('the Site') between 1990 and the present. Activities at the Site included the extraction of sand and gravel, together with processing and temporary stockpiling areas where materials are stored prior to being sold to market.

The Project Site is situated ca. 3.5 km southeast of Rathdrum, and ca. 3.5 km northwest of Redcross (Figure 4.1). The Site is currently accessed from the southeast from the L5155 that joins the L1152 to the north, which is a local road linking Rathdrum and the R772 and M11 to the east of the Site.

A detailed description of the Site and the activities that have been undertaken ('the development') can be found in Chapter 2 of this rEIAR (Project Description). A remedial Natura Impact Statement has also been produced and is included in the application. This report concludes that no significant impacts would have occurred to Natura 2000 sites as a result of the development since 1990.



Figure 4.1: Site Location

The lands that are the subject of this rEIAR (the Project Site) extend to ca. 23.7 ha and reflect the historic operational site area including the extractable area declared under S.261 quarry registration in 2005. The quarry extraction area that makes up the application for the substitute consent planning unit currently extends to ca. 20.16 ha, lying central to the Project Site. The lands adjacent to the Site are used for agricultural purposes (including pasture and tillage) with plantations of trees located along the western, and eastern edges of the Site. An area of heath and scrub occurs immediately adjacent to the south of the Site. Farmyards and one-off residential properties also occur in the vicinity of the Site Figure 4.2.

The current quarry void is centrally located within the Site and is roughly square in shape. The existing administration, maintenance, storage and welfare facilities are located at the southern edge of the Site, with the aggregate processing plant area located towards the centre of the Site (as shown in Figure 2.2, Chapter 2).

At baseline, in 1990 the quarried area has been determined to extend to ca. 2.9 ha. and in 2022 to have expanded laterally to ca. 20.16 ha, an increase of ca. 17 ha, with an average working depth of ca. 130 mAOD in 1990 and 114mOD in 2022. Satellite imagery is not available for the Site during 1990. However, Figure 4.2 below illustrates the Site during 1993 and this forms a useful baseline result.



Figure 4.2: The Site Baseline at 1993

4.1.1 Scope

The focus of this assessment, wherever possible, is centred on the establishment of likely baseline ecological conditions (flora, fauna and habitat composition) between 1990 and Spring 2022. This focus enables likely effects attributed to land take, disturbance and habitat loss and transition to be assessed and impacts identified as appropriate. Historical mapping, anecdotal evidence and habitat assessment of neighbouring lands have all been used to predict the Site conditions between 1990 and Spring 2022. In any retrospective assessment uncertainty may be a feature. As such, a conservative approach has been adopted to recognise impacts and the remedial mitigation strategy presented is also weighted in favour of a conservative scenario of mitigation hierarchy adoption.

4.2 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 biodiversity.

4.2.1 Legislation

- The Planning & Development Act 2000 & the Planning and Development (Amendment) Act, 2010 (as amended) hereafter referred to as the Planning Acts;
- The Wildlife Act 1976 as amended by the Wildlife (Amendment) Act, 2000 (as amended) hereafter referred to as the Wildlife Acts;
- The EIA Directive (Directive 2011/92/EU as amended by Directive 2014/52/EU), the Planning and Development Acts 2000-2018, and the Planning and Development Regulations, 2001-2018;
- European Communities (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018);
- European Commission (EC) Habitats Directive 92/43/EEC (as amended);
- EC Birds Directive 2009/147/EC;
- European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) hereafter referred to as the Birds and Habitats Regulations;
- Flora (Protection) Order, 2015;
- Environment (Miscellaneous Provisions) Act 2011; and
- The Local Government (Water Pollution) Act, 1977 (as amended by Sections 3 and 24 of the 1990 Act.).

4.2.2 Relevant Policies and Plans

- National Biodiversity Plan, 2017-2021;
- Ireland's National Strategy for Plant Conservation; and
- All Ireland Pollinator Plan 2015 – 2020.

4.2.3 Relevant Guidance

- Invasive Species in Ireland (NPWS, 2004);
- Guidelines for Ecological Impact Assessment in the United Kingdom and Ireland: Terrestrial, Freshwater and Coastal Environments (CIEEM, 3rd Edition 2018);
- Circular Letter PL 1/2017 - Implementation of Directive 2014/52/EU on the Effects of Certain Public and Private Projects on the Environment (EIA Directive), 15 May 2017;

- Key Issues Consultation Paper - Transposition of 2014 EIA Directive (2014/52/EU) in the Land Use Planning and EPA Licencing Systems, 2 May 2017;
- Environmental Impact Assessment of Projects - Guidance on the Preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU). European Commission of the European Union 2017;
- Guidelines on the information to be contained in Environmental Impact Statements (EPA, 2002);
- Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022)
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (Department of Environment, Community and Local Government, 2018);
- Environmental Impact Assessment of National Road Schemes – A Practical Guide (NRA, 2008);
- Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA, 2009);
- NRA Environmental Assessment and Construction Series Guidelines (NRA, 2006- 2009);
- A Guide to Habitats in Ireland. (Fossitt, 2000);
- Bat Surveys: Good Practice Guidelines (Collins, 2016);
- Bat Mitigation Guidelines for Ireland, Irish Wildlife Manuals No. 25 (Kelleher & Marnell, 2006); and
- Bats & Lighting Guidance Notes for Planners, engineers, architects and developers (Bat Conservation Ireland, December 2010).

4.3 Assessment methodology and significance criteria

4.3.1 Desktop Survey

A desktop review of publicly available relevant data was undertaken on the National Biodiversity Data Centre (NBDC) and National Parks & Wildlife Service (NPWS) websites. The National Biodiversity Data Centre was reviewed for relevant data, specifically i) existing species records for the 10km square in which the Site is located (T28) and ii) an indication of the relative importance of the wider landscape in which the Site is located, based on Model of Bat Landscapes for Ireland (Lundy et al. 2011). In the latter, the index ranges from 0 to 100, with 0 being least favourable and 100 most favourable for bats.

Furthermore, a comprehensive examination and comparison of historic aerial imagery, which is publicly available on the online resources of ordnance survey IE and GeoHive (<http://map.geohive.ie/>), was undertaken as a means of evaluating the expansion of the Site as regularly as possible between 1990 and 2022.

4.3.2 Designated Nature Conservation Site Assessment

Sites of international importance, including Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) are collectively known as Natura 2000 sites. These sites contain examples of some of the most important natural and semi-natural ecosystems in Europe. Designated sites, which also include Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs) were also searched for. The designated search area was 15 km from the site boundary for Natura 2000 sites, and 5 km from the site boundary for NHA and pNHA sites.

In the subsequent analysis of designated sites, particular attention was given to potential for the historic works to influence a designated site. In other words, potential ecological pathways were identified; these pathways can be hydrological, physically overlapping, in the past, or exhibiting habitat and species synergies that could result in temporary or residual effects being afforded to a designated site.

4.3.3 Ecological Survey

Habitats

Ecological walkover surveys were carried out on the 9th and 10th February 2022 by Tom O'Donnell BSc (Hons) MSc CEnv MCIEEM and Donnachadh Powell BSc (O'Donnell, 2022, Appendix 4.1) and an ecological walkover survey incorporating a Phase 1 habitat and flora assessment was carried out in accordance with the Heritage Council's guidelines (Smith *et al.* 2011). The dominant habitats present were classified according to Fossitt (2000) and key botanical species were identified. Any other records of interest (e.g. invasive plant species) were also marked on field maps and/or locations were recorded.

The Site based habitat appraisal was supplemented in a desk-based context and via information sharing between Golder colleagues who had attended the Site on a number of occasions in 2021 and 2022. Satellite imagery and historic mapping was also used to formulate the predicted baseline in a past tense context as previously indicated. This work was used to appraise the likely habitats and flora in the area within and adjacent to the development Site, and to detect the presence or likely presence of protected species, and the presence of suitable habitat for those species in a historical context. As previously described, the Site footprint increased by ca. 17 ha of outward (non-vertical) growth between 1990 and 2022. Ecological Survey methods were in general accordance with those outlined in the following documents:

- Heritage Council (2011). Best Practice Guidance for Habitat Survey and Mapping;
- Phase 1 Habitat Survey methodology (Joint Nature Conservation Committee (JNCC), 1990, revised 2010); and
- Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes (NRA, 2009).

As previously indicated, aerial photographs and Site maps assisted the habitat survey. Habitats have been named and described following Fossitt (2000).

Fauna

The primary considerations for all protected and notable species at the Site are based upon the availability of suitable habitat to support the species between 1990 and 2022. In all cases the likelihood of presence or indeed absence was addressed in congruence with an assessment of habitat availability to maintain a species at a favourable conservation status at the Site level. Where doubt over presence is perceived owing to the retrospective nature of the assessment a conservative prediction is made in favour of likely presence. It is noteworthy that some species may have colonised the Site as a consequence of the transition from pastoral flat habitat toward the availability of sandy cliff faces as a consequence of quarrying activities, for example Sand Martin, which is discussed later in the report.

Bats

The potential presence of bats in a roosting and foraging context between 1990 and 2022 was considered with due regard to guidance set out within 'Bat Mitigation Guidelines for Ireland' v2 (Kelleher & Marnell, 2022), and 'Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes' (NRA, 2006), with reference to good practice guidelines set out by the Bat Conservation Trust (Collins, 2016).

Avifauna

An assessment of the Site's ability to host breeding and foraging birds was undertaken. The likely bird assemblages were predicted by considering historical and satellite mapping and likely habitat composition over the previous three decades.

Mammals

An assessment of the Site's ability to host mammals was undertaken. The likely mammal assemblages were predicted by considering historical and satellite mapping and likely habitat composition over the previous three decades. Species assessed as part of this process and in accordance with Site habitats included:

- Badger (*Meles meles*);
- Red fox (*Vulpes vulpes*);
- European rabbit (*Oryctolagus cuniculus*);
- Red squirrel (*Sciurus vulgaris*);
- Bank vole (*Clethrionomys glareolus*); and
- Wood mouse (*Apodemus sylvaticus*).

Terrestrial mammal surveys were carried out during the course of ecological walkover surveys in 2022. Walkover surveys were carried out within the Site boundary, and also extending to a distance of 150 meters of the Site boundary in areas with potential to support underground mammal holes and burrows. Surveys involved a walkover of the Site to identify any mammal species present or signs of mammal activity such as droppings, tracks, burrows etc. Observations were recorded using field notes and/or handheld GPS units. Techniques used to identify mammal activity followed recognised guidelines (e.g. Clark 1988, Sutherland 1996, Bang & Dahlstrom 2004 and JNCC 2004).

Camera traps were deployed within the Site and recording was carried out for 28 days and nights from 25th January to 23rd February 2021. The cameras were infra-red equipped to allow monitoring of activity by night as well as by day. The cameras were triggered by movement, at which point a photo was recorded and a 10 second recording delay was applied. The aim of the camera trap survey was to record evidence of terrestrial mammal activity in order to inform the retrospective ecological impact assessment.

Daytime visual assessments were carried out to identify any bat roosting potential which may exist within the Site boundary. Treelines within the Site contain mature trees which were considered to have potential as bat roosts. Winter is the optimal time for 'preliminary ground roost assessments' of trees (Collins, 2016), due to greater visibility as a result of leaf fall and die back of ground level vegetation. The survey was non-destructive, and relevant Potential Roost Features (PRFs) were visually inspected from ground level to identify any evidence of bat roosting. Where accessible, potential roosting features were investigated using an endoscope. Signs of bat use include bat droppings, feeding remains, potential bat access points identified by characteristic staining and scratches, noise made by bats etc.

Herpetofauna and Invertebrates

An assessment of the Sites ability to host herpetofauna (reptiles and amphibians) and invertebrates was undertaken. The likely assemblages were predicted by considering historical and satellite mapping and likely habitat composition over the previous three decades.

Aquatic Ecology

The assessment considers the potential for hydrological connectivity between the Site and surface water features, and also considered what effects could be afforded to aquatic fauna and habitat receptors. It is important to note that no ditches or streams cross the Site. The Site is located within the Ovoca-Vartry catchment which forms part of the Easter River Basin District. A network of streams bounds the Site on all sides, draining to the northwest. Streams are predominantly fed by rainfall runoff from higher topographical areas.

The largest of the streams is the Newbawn which runs along the eastern and northern boundary of the Site and is perennial. The Newbawn runs westwards ca. 3.75 km until it joins the River Avonmore.

Prior to reaching the Avonmore, the Newbawn is fed by the northeasterly flowing Timullin located ca. 0.5 km from the Site. It is later fed by the southerly flowing Cunniamstown Little, Balleese Upper and Mountlusk located ca. 0.5, 1.45, 1.9 and 2 km respectively from the Site. The Kingston ca. 1 km southwest of the Site flows westwards before also joining the Avonmore. The Avonmore then flows ca. 3.5 km directly south where it joins the Avonbeg, forming the Avoca which flows ca. 15 km southeast until reaching the Irish Sea.

The WFD status of the Avonmore is classified as 'high' upstream of the Site, northwards of Rathdrum. The stretch of the Avonmore from Rathdrum to the Avoca is classified as 'moderate'. This includes the tributaries of the Newbawn, Timullin, Kingston, Cunniamstown Little, Balleese Upper and Mountlusk. The Avoca is classified as 'bad/poor', demonstrating the WFD status progressively deteriorates downstream. Where the Avonmore meets the Avoca it is noted as a Historically Polluted Site.

4.3.4 Survey Constraints or Limitations

A retrospective assessment based upon secondary data provides some limitations in terms of characterising a baseline that was likely to have been present during the 1990s. Nonetheless, every effort has been used to make conservative predictions on likely habitat composition and species assemblages to predict the nature of any effects. As previously indicated, any uncertainty in predictive assumptions given the nature of the assessment has been balanced by adopting a conservative approach to presence or likely absence.

Invasive Species

This assessment has not been designed to consider the presence of any invasive or non-native species. Accordingly, absence of invasive non-native species should not be assumed, and invasive or non-native species surveys should be undertaken as part of the on-going operation of the Site outside of this rEIR application.

4.3.5 Impact Assessment Method

Habitats and species were assessed in accordance with the guidance contained in the document *Guidelines for Ecological Impact Assessment in the United Kingdom and Ireland* (CIEEM, 2018) which recommends that the value of an ecological resource be determined within a defined geographical context (Figure 4.3).

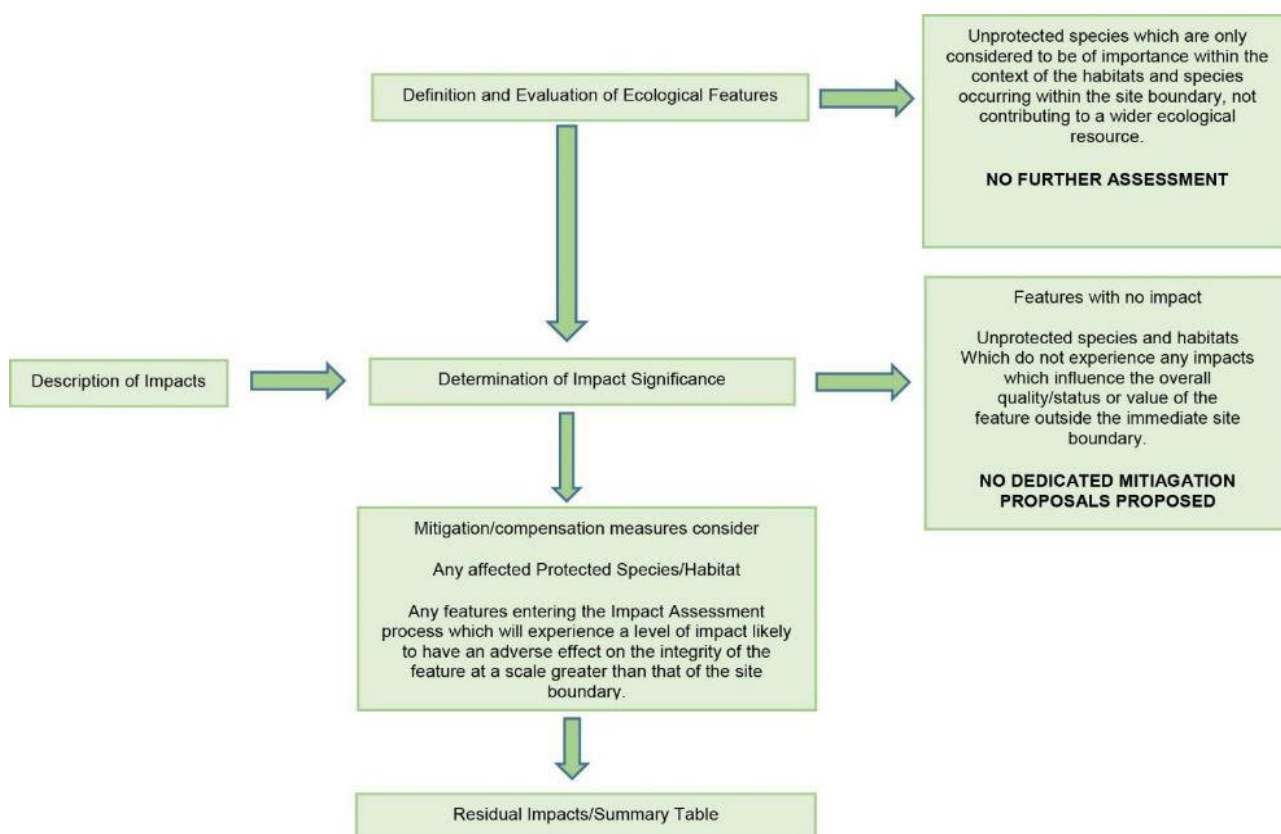


Figure 4.3: Impact Assessment Method

Defining Importance

The relative importance of each ecological feature has been defined on a geographical scale, from international importance, to having relevance only in the context of the site boundary. The definitions employed for the basis of the evaluation are presented in Table 4.3. It should be noted that professional judgement has been employed in the allocation of a level of importance to each feature **as it occurs on the site**. In other words, the value of the feature is presented in the context of its actual status within the site. **Therefore, a single individual of a species which is protected under the European Union (EU) Habitats Directive would not automatically be considered to be of European (international) Importance, but would be evaluated in the context of its relationship to the overall population and conservation status.**

Defining Impact

The impacts to ecological features are defined by their geographical significance in terms of the likely effect and the defined importance of the feature being affected. It is not possible in this system to have an impact greater than the overall geographical importance of the feature (e.g. the maximum possible impact to a feature of a regional importance would be one which is of regional significance). Impacts which do not have significance beyond the immediate area (the site) will be managed through the implementation of construction and habitat management plans. One exception to this is the case of impacts on Protected Species, where **any** impact would result in the implementation of mitigation measures.

Defining Magnitude of Change

Considering the potential for impacts as defined above, an assessment of the magnitude of change is arrived at. This is based on the table below, and relies on professional subjective judgement in deciding the level of magnitude of change.

Table 4.1: Criteria for Assessing Magnitude of Change

Impact Level	Description
Severe Impact	Ecological effects of a scale or magnitude which would result in permanent, total loss of an irreplaceable species or habitat of international or national importance (occasionally of local importance), or which would result in the substantial loss of a protected/rare habitat or a population of a protected/rare species. They represent key factors in the decision-making process. Typically, mitigation measures would be unlikely to remove such effects.
Major Impact	These effects are likely to relate to permanent impacts at a regional or local level, or temporary impacts at an international or national level, and could be potential concerns to the project depending upon the relative importance attached to the issue during the decision-making process. The effects are likely to be large in scale or magnitude, and result in substantial medium-term loss of protected/rare species or habitats. Mitigation and detailed design work are unlikely to entirely eliminate all ecological effects.
Moderate Impact	These effects are usually only at local or regional level, and may be short or medium term only, or temporary impacts on a small part of an international site. However, the cumulative effects of such issues may lead to an increase in the overall effect on ecological features. They represent issues where effects will be experienced, but mitigation measures and detailed design work may ameliorate/enhance some of the consequences upon affected interests, but some residual effects will still arise.
Minor Impact	These effects are likely to be local issues only; or small magnitude impacts at the regional and national level, they are usually temporary, and are unlikely to be of importance in the decision-making process. However, they are of relevance in enhancing the subsequent design of the development and consideration of mitigation measures.
Not Significant / No Impact	No perceivable impacts on ecological features (habitat or species). Impacts may be beneath levels of perception, within normal bounds of variation, within the margin of forecasting error, or impacting on exceptionally poor baseline conditions.
Beneficial / Positive Impact	These effects are those, which through implementation, would be anticipated to benefit the ecology of the site. They may advance the objectives of local, national or international species or habitats.

Outlining Mitigation, Compensation, and Enhancement Measures

Receptors subject to significant impacts (those which have the potential to affect the ecological resource outside of the immediate site boundary) are the focus of provision of mitigation measures which have been formulated according to the mitigation hierarchy (avoid, reduce / minimise, compensate). All mitigation measures follow industry best practice. Those for protected species follow the prescribed regulatory protocols.

Defining Residual Impact

Following the application of mitigation measures, impacts to each ecological feature are reassessed, and any residual remedial impacts are reported.

As stated by Chartered Institute of Ecology and Environmental Management CIEEM guidance (2018), ‘*The importance of an ecological feature should be considered within a defined geographical context*’. Accordingly, each feature has been assessed based on the scale described in Table 4.4.

Table 4.2: Criteria for Establishing Receptor Sensitivity/Importance

Importance	Ecological Valuation
International	Sites, habitats or species protected under international legislation e.g. Habitats and Species Directive. These include, amongst others: SAC's, SPA's, Ramsar sites, Biosphere Reserves, including sites proposed for designation, plus undesignated sites that support populations of internationally important species.
National	Sites, habitats or species protected under national legislation e.g. Wildlife Act 1976 and amendments. Sites include designated and proposed NHAs, Statutory Nature Reserves, National Parks, plus areas supporting resident or regularly occurring populations of species of national importance (e.g. 1% national population) protected under the Wildlife Acts, and rare (Red Data List) species.
Regional	Sites, habitats or species which may have regional importance, but which are not protected under legislation (although Local Plans may specifically identify them) e.g. viable areas or populations of Regional Biodiversity Action Plan habitats or species.
Local/County	Areas supporting resident or regularly occurring populations of protected and red data listed-species of county importance (e.g. 1% of county population), Areas containing Annex I habitats not of international/national importance, County important populations of species of habitats identified in county plans, Areas of special amenity or subject to tree protection constraints.
Local (Higher and Lower, NRA 2009)	Areas supporting resident or regularly occurring populations of protected and red data listed-species of local importance (e.g. 1% of local population), Undesignated sites or features which enhance or enrich the local area, sites containing viable area or populations of local Biodiversity Plan habitats or species, local Red Data List species etc. This may be split into higher and lower categories as per NRA, 2009.
Site	Very low importance and rarity. Ecological feature of no significant value beyond the Site boundary.

4.4 Baseline Results

4.4.1 Desk study

Designated Nature Conservation Sites

The Site is located in the WFD (Water Framework Directive) Wicklow Groundwater body (which is generally described as poorly productive and of 'good' water quality) and the WFD surface water catchment for the Ovoca-Vartry. The Site is situated in an area of Groundwater in Salmonid Regs (Wicklow IE_EA_G_076) (EPA, 2022).

National Parks & Wildlife Service (NPWS) designated site data encompass sites Special Areas of Conservation (SACs) and Special Protection Areas (SPAs). The closest designated sites are:

- Glenealy Woods (Site Code 001756) is situated ca. 3.5 km to the north of the Site with Deputy's Pass Nature Reserve (Site Code 000717) located within it. Glenealy Woods are considered a Proposed Natural Heritage Area (PNHA) and Deputy's Pass SAC.
- The Vale of Clara (Rathdrum Woods) (Site Code 000733) is located ca. 4.2 km to the northwest of the Site and is considered both a SAC and PNHA.
- The Avoca River Valley (Site Code 001748) located ca. 7.3 km south of the Site is a PNHA.
- Ballinacor Wood ca. 7.5 km west of the Site considered a PNHA.

A total of eleven SAC and SPA were recorded within the search area and those that may be ecologically relevant are presented in Table 1 and shown on Figure 4.5.

Table 4.3: Natura 2000 Sites within 15 km.

Natura 2000 Site	SAC/SPA (Key qualifying features)	Approximate distance to Site (KM)
Deputy's Pass Nature Reserve.	SAC - Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0]	3.6
Vale of Clara Wood	SAC – 3.8 km. Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0]	3.8
The Murrough Wetlands	SAC - Annual vegetation of drift lines [1210] Perennial vegetation of stony banks [1220] Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) [1330] Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410] Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i> [7210] Alkaline fens [7230]	11.8
Wicklow Mountains	SAC – Selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes): [3160] Dystrophic Lakes; [4010] Wet Heath; [4030] Dry Heath; [4060] Alpine and Subalpine Heaths; [6130] Calaminarian Grassland; [6230] Species-rich <i>Nardus</i> Grassland*; [7130] Blanket Bogs (Active)*; [8110] Siliceous Scree; [8210] Calcareous Rocky Slopes; [8220] Siliceous Rocky Slopes; [91A0] Old Oak Woodlands; and [1355] Otter (<i>Lutra lutra</i>).	12.2
Wicklow Mountains	SPA – The site is designated under the E.U. Birds Directive, of special conservation interest for the following species: Merlin and Peregrine.	12.2

A remedial Natura Impact Statement has been prepared for this Project which evaluates the potential for significant retrospective effects on the integrity of these EU sites. Given that no element of the Substitute Consent development was undertaken within or directly adjacent to any Natura 2000 site, there was no potential for direct effects on the qualifying interests of any designated site as a consequence of the development.

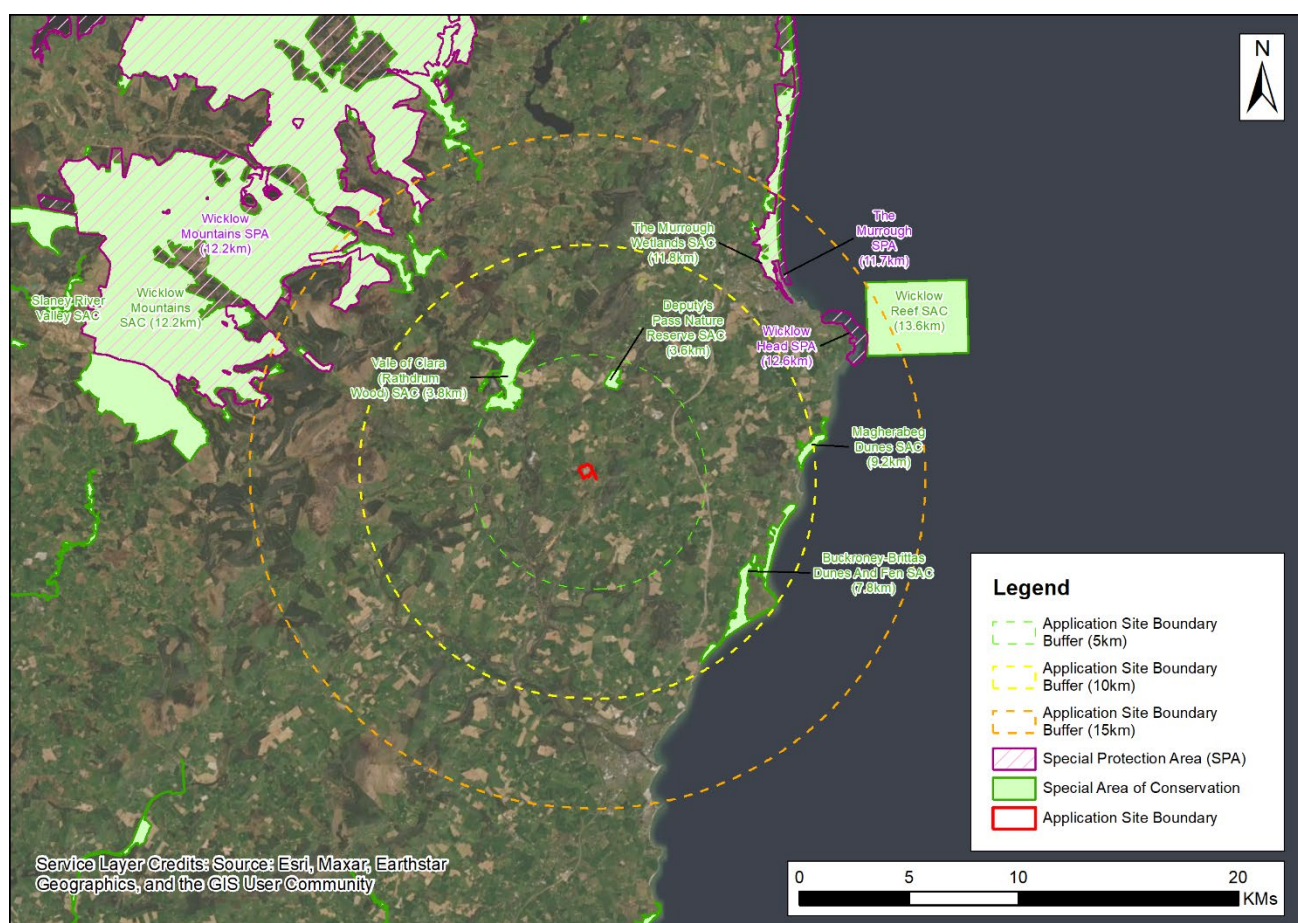


Figure 4.4: International Statutory Designations surrounding the site, including 5, 10, and 15 km buffers.

Fauna

Within the 10km grid square in which the Site is located (T28; NBDC) there are historic records for a total of 18 mammal species (see **Table 4.3**). Only Eurasian Badger (*Meles meles*) has previously been recorded in the 1km grid square in which the study area is located (T2286; NBDC).

Table 4.4: Mammal species previously recorded within the 10km grid square (T28) in which the site is located (NBDC).

Common Name	Species Name	Legal Protection*	Conservation Status*
American Mink	<i>Mustela vison</i>	AIS	AIS
Brown Rat	<i>Rattus norvegicus</i>	AIS	AIS
Chinese Muntjac	<i>Muntiacus reevesi</i>	AIS	AIS
Eastern Grey Squirrel	<i>Sciurus carolinensis</i>	AIS	AIS
Eurasian Badger	<i>Meles meles</i>	WA	LC
Eurasian Pygmy Shrew	<i>Sorex minutus</i>	WA	LC
Eurasian Red Squirrel	<i>Sciurus vulgaris</i>	WA	LC
European Otter	<i>Lutra lutra</i>	Annex II/IV, WA	LC
European Rabbit	<i>Oryctolagus cuniculus</i>	AIS	LC

Common Name	Species Name	Legal Protection*	Conservation Status*
Fallow Deer	Dama dama	WA	AIS
Feral Ferret	Mustela furo	AIS	AIS
Irish Hare	Lepus timidus hibernicus	Annex V, WA	LC
Irish Stoat	Mustela erminea hibernica	WA	LC
Pine Martin	Martes martes	Annex IV, WA	LC
Red Fox	Vulpes vulpes	-	LC
Sika Deer	Cervus nippon	AIS	AIS
West European Hedgehog	Erinaceus europaeus	WA	LC
Wood Mouse	Apodemus sylvaticus	-	LC

Source: <https://maps.biodiversityireland.ie/Map>. Accessed 15/02/2022.

* Annex status (EU Habitats Directive), WA (Protected under Wildlife Acts 1976 and 2000).

** LC – Least Concern (Marnell *et al.*, 2019); AIS - Alien Invasive Species.

The freely available desk study results should not be considered definitive data sets for the desk study area. An absence of desk study data does not necessarily dictate that a site is absent of notable flora or fauna in a historical or current context.

4.5 Habitat Assessment

The habitat assessment provides a likely baseline scenario from 1990 at the Site. Between 1990 and 2022 the footprint of the quarry increased by ca. 17 ha from ca. 3 ha to ca. 20 ha as shown in Table 4 below.

Table 4.5: Land Take between 1990 and 2022

Year	Approximate Area of Site Including plant & ancillary areas (roads, etc.) Hectares (ha)
1993 (earliest satellite data)	Ca. 3
1995	Ca. 5
2000	Ca. 10
2004	Ca. 14
2009	Ca. 18
2011	Ca. 18
2015	Ca. 19
2020	Ca. 20
2022	Ca. 20



Figure 4.5: The Site 1993



Figure 4.6: The Site 1995



Figure 4.7: The Site 2000



Figure 4.8: The Site 2004



Figure 4.9: The Site 2009



Figure 4.10: The Site 2011



Figure 4.11: The Site 2015



Figure 4.12: The Site 2021

4.6 Baseline Habitats 2022

The habitats present within the boundary of the Site during 2022 are described below. No Annex I habitats listed under the EU Habitats Directive are present within the Site and the dominant habitats present are of low ecological value. All species recorded during the botanical survey are considered common for these habitat types.

Active Quarries and Mines (ED4)

This is the dominant habitat type found on Site. Vegetation cover is virtually absent from these areas due to high levels of sustained disturbances associated with quarry activity such as heavy machinery, and regular movement of quarry products.



Figure 4.13: Active Quarries and Mines (ED4)

Scrub (WS1)

This habitat type is characterised by areas that are dominated by cover of shrubs and self-established trees with stunted growth (likely due to waterlogging and poor soil quality at this site). Gorse (*Ulex europaeus*) is the dominant plant with Broom (*Cytisus scoparius*), Horsetails (*Equisetum* spp.) and Bramble (*Rubus fruticosus*) occurring frequently. The habitat occurs frequently on the boundaries of the Site where berms of soil provide screening to the Site. Trees occur commonly in these Scrub habitats especially along the northern boundaries of the site, bordering the artificial lake and on the boundaries of the site, species include Silver Birch (*Betula pendula*), Willow (*Salix* sp.) and Alder (*Alnus glutinosa*).



Figure 4.14: Scrub (WS1)

Dry Meadows and Grassy Verges (GS2)

The habitat was located in areas where formerly disturbed ground or mounds of top-soil from quarry operations has completely revegetated to a grassland habitat dominated by common ruderal species. The habitat is not managed agriculturally but is occasionally grazing by deer. This habitat type occurs frequently within the Site, often forming mosaics with WS1 and ED4 habitats. Grasses including Bent grasses (*Agrostis* spp.) are dominant with Rushes (*Juncus* spp.) frequent. Other plants species recorded in GS2 habitats included Dandelions, Fox Glove (*Digitalis purpurea*), Spear thistle, Creeping Buttercup (*Ranunculus repens*) and Broom (*Cytisus scoparius*). Remnant stalks of Umbellifers from the previous year's growth were also apparent.



Figure 4.15: Dry Meadows and Grassy Verges (GS2).

Recolonising Bare Ground (ED3)

The spoil and rubble heaps occurring throughout the Site constitute the ED3 habitat type in the Site. Vegetation cover is greater than 50% in these areas, with mostly ruderal species such as Dandelions (*Taraxacum officinallis*), Spear thistle (*Cirsium vulgare*), Buttercups (*Ranunculus* spp.) and Willowherbs (*Epilobium* spp.). Butterfly Bush (*Buddleja davidii*) individuals occur occasionally and mostly in the eastern, less disturbed parts of the quarry.



Figure 4.16: Recolonising Bare Ground (ED3) habitat.

Other Artificial Lakes and Ponds (FL8)

There are several artificial lakes (some interconnected) occurring throughout the Site. Mallard Ducks and other waterfowl were observed here. Small stands of Winter Heliotrope (*Petasites fragrans*) have colonised the edges of some of these waterbodies.



Figure 4.17: Other Artificial Lakes and Ponds (FL8).

Reed and Large Sedge Swamps (FS2)

Reed swamp occurs in discrete locations on the borders of the artificial lakes, mostly on the northern boundary of the Site. Plant species recorded at FL8 habitats included Bull Rush (*Typha latifolia*), Reed Canary Grass (*Phragmites australis*), Clover (*Trifolium* spp.), Pointed Spear Moss (*Calliergonella cuspidata*). Willow commonly occurs occasionally within FS2 habitat.



Figure 4.18: Example of FS2 habitat (background) found within the Site.

Buildings and Artificial Surfaces (BL3)

Buildings and artificial surfaces occur associated with quarry operations.



Figure 4.19: Example of BL3 habitat found within the Site.

4.7 Retrospective Habitat Assessment

For the purposes of this assessment a baseline retrospective position to reflect habitat lost includes all habitat that it is considered would have been within the Site footprint is detailed below.

Table 4.6: Predicted Habitats on Site in 1990 (Fossitt, 2000)

Habitat	Habitat Code
Grassland (Certain to be present)	GA1
Trees and Treelines (likely to be present within hedge lines)	WD5 & WL2
Scrub (likely to be present as encroachment from field boundaries)	WS1
Hedgerows (Certain to be present)	WL1

Losses of habitat are certain to have occurred. It has been calculated that the footprint expansion of the Site between 1990 and 2020 amounts to ca. 17 ha. This loss is representative of grassland habitat with some hedgerow and scrub loss also certain.

4.7.1 Fauna Assessment

The presence, or potential presence, of species on the Site in a retrospective context was identified from the desk study, habitat classification work using historic and satellite mapping and also walkover surveys (Appendix 4.1). In all cases, conclusions regarding the potential presence or indeed absence of protected or notable species was cognisant of the likely ubiquitous terrestrial habitats found within the Site. Where any uncertainty remains a precautionary presumption of presence was made. The walkover surveys and camera trapping were carried out to identify mammal species utilising the Site in the present context and this allows confident assumptions to be made concerning likely historic presence, or indeed absence, of species.

Bats

Bat species would have potentially used the hedgerows and treelines along the boundaries of the Site as foraging and commuting habitat. There is no evidence to suggest that any trees removed from the Site would have had the relative age or complexity of growth to accommodate significant roosting features e.g. tracts of ancient woodland. Given the habitats present prior to quarrying works at the Site, it is considered that the Site periphery would have been of Site Importance in relation to common and widespread species of bats such as the common pipistrelle (*Pipistrellus pipistrellus*).

Avifauna

Given the habitats present on Site post 1990 the avifauna within the Site would have been impoverished with the sterile habitat of the quarry floor and operational disturbance offering detrimental Site conditions for all bird species. The Site periphery, including boundary features would be limited primarily to general passerine species using the hedgerows surrounding the Site for nesting and foraging. The hedgerows surrounding the Site have remained intact throughout operations and as such, birds using these would not have been affected by the historical operations. It is possible that Site operations have created habitat for some bird species. In many cases species such as sand martins which often colonise quarry sites will benefit from the availability of stockpiled sand and aggregates.

The presence of common and widespread bird species on the Site periphery is of Site importance.

Mammals

The Site footprint from the period 1990 to 2022 would generally exhibit a hostile environment for mammal species. The combination of vegetation absence and operational quarry noise sterilises the Site in terms of mammal use. The Site periphery including field boundaries may have hosted some habitat for mammal species in a foraging and commuting context. Small common mammals such as wood mouse (*Apodemus sylvaticus*), pygmy shrew (*Sorex minutus*) and European hedgehog (*Erinaceus europaeus*) would have used this peripheral habitat for foraging.

Larger mammals such as European rabbit (*Oryctolagus cuniculus*), Irish hare (*Lepus timidus hibernicus*) and red fox (*Vulpes vulpes*) may have also used the area for commuting and foraging. The baseline surveys of 2022 indicated the presence of rabbit, fox and badger. The potential presence of mammals on the Site periphery indicates that minor impacts in an operational disturbance context could have occurred between 1990 and 2022. The presence of common mammal species is of Site value.

Herpetofauna and Invertebrates

The Site from the period 1990 to 2020 would generally exhibit a hostile environment for the herpetofauna and invertebrate groups. The Common Frog (*Rana temporaria*) and the Smooth Newt (*Lissotriton vulgaris*) are afforded protection under the Wildlife Act (1976) and Wildlife (Amendment) Act, 2000. The Common lizard (*Zootoca vivipara*) is also afforded protection under the Wildlife Act (1976) and Wildlife (Amendment) Act, 2000. As the Site has been worked over the years the habitat composition has changed. Pastures have been lost and

more diversity has been created in terms of ponding water, scrub and mosaic habitats that could support herpetofauna and invertebrates.

The collective value of herpetofauna and invertebrates is of Site value only and impacts from operational disturbance are considered to be not significant e.g. no perceivable impacts on ecological features. Impacts may be beneath levels of perception, within normal bounds of variation, within the margin of forecasting error, or impacting on poor baseline conditions.

Aquatic Ecology

There are no water courses running through the Site. Ordnance Survey maps show that the nearest stream lies to the north of the Site boundary. Areas of open pooled water are noted on the quarry floor and much of this aquatic habitat has become semi-natural and supports waterfowl such as mallard. Some elements of Site and stream connectivity are known to occur through discharge. As such, it is important to understand the quality of these discharges to address potential effects.

The results of the surface water quality analysis at the Site are presented in Chapter 6 (Water) Appendix 6.2 and compared with the Environmental Quality Standards (EQS) for inland surface waters, as outlined in the European Communities Environmental Objectives (Surface Water) Regulations S.I. No.272/2009 including amendment S.I. No.386/2015 and, European Communities (Quality of Salmonid Waters) Regulations 1988 (SI 293 of 1988)¹.

The maximum allowable concentration (MAC) for inland water EQS values have been applied as more than two samples would be required to establish an average (AA) concentration for comparison against the AA EQS values. Where a screening value does not exist, the UK EQS were applied (Freshwaters specific pollutants and operational EQS and Freshwaters priority hazardous substances, priority substances and other pollutants²). Full screening results are presented as Appendix 6.2. The laboratory certificates for the results are included in Appendix 6.3.

Surface water is generally shown to be of good quality from 2020 – 2021 with no exceedances of the standard values during the 2020 and 2021 monitoring period. It should be noted that the limit of detection for dissolved mercury (0.1 µg/l) exceeds the MAC EQS of 0.07 µg/l, however dissolved mercury was found to be less than the limit of detection in all of the samples.

Orthophosphate, copper and hydrocarbons were all observed to be less than the limit of detection in the 2020-2021 surface water samples, showing an improvement on the previous monitoring in 2008 and 2016. Total suspended solids were also reported below the limit of detection at all sampling points with the exception of downgradient location SW3 on 09/09/2020 with a concentration of 16 mg/l, which is below the Salmonid Water Regulations. Faecal coliform and manganese, which both exceeded in previous monitoring, were not part of the analytic suite in 2020 and 2021.

Summary

The presence, or potential presence, of species in a retrospective context on the Site was identified from the desk study which included an extensive review of secondary data gleaned from previous ecological assessments undertaken at the Site and also from baseline surveys undertaken in 2022 (Appendix 4.1).

¹ Provided for comparative purposes only. The site-adjacent Newbawn stream and downstream Avonmore and Avoca rivers are not classed as salmonid waters within S.I. No. 293/1988. The closest salmonid waters identified within the regulations are the Rivers Slaney and Vartry, both of which are not in hydraulic connectivity with the site.

² www.gov.uk/guidance/surface-water-pollution-risk-assessment-for-your-environmental-permit#screening-tests-freshwaters, accessed in April 2022, last updated in February 2022.

Summary Table 4.6 lists the species which were considered likely to occur within the Site, on the basis of the presence of suitable habitat and/or the occurrence of recent records in the vicinity. The species, together with its legislative designation is listed.

The source(s) of information relating to each species could include:

- Existing records from desk study;
- Presence of suitable habitat identified during habitat survey;
- Results of specific survey work as applicable (i.e. relating to badger); and / or
- Direct observation.

For each species with the potential to occur on Site, the final column of Table 4.6 presents a brief summary of the status of the species in relation to the Site itself. If the survey fails to record the species and the habitats are unsuitable, then it is concluded that the species is unlikely to occur, and it is not considered further within the assessment. If a species is confirmed as present, an indication of the likely population size/status within the Site is provided. This information is used in the evaluation presented in Table 4.7.

Table 4.7: Assessment of the potential for faunal species to occur within the site between 1990 and 2022.

Species/Group	Status	Summary of likely status on site
Bats	Wildlife Acts (1976 – 2010) – EU Habitat Directive.	The Site supported some suitable foraging and commuting habitat for bat species. Trees within the Site would have been considered to have some potential for bats, possibly in a roosting context.
Avifauna	Wildlife Acts (1976 – 2010), EU Birds Directive, Birds of Conservation Concern (BoCC3, Ireland).	The peripheral Site supports some opportunities for foraging and nesting bird species. Common and widespread species were recorded on Site (Appendix 4.1). These species of avifauna are likely to have been present throughout 1990 to 2022.
Mammals	Wildlife Acts (1976 – 2010)	A possible badger sett was identified on Site a camera trapping surveys being undertaken and a photo of a badger near the sett has been captured. Some limited potential for common and widespread mammals such as rabbit and fox to use the Site periphery. The badger sett is likely to have existed for some time and mammal species may have used the Site periphery over some years.
Herpetofauna and Invertebrates	Wildlife Acts (1976 – 2010)	Limited available resources on the Site. Some limited potential to occur within the Site periphery in relation to scrub and hedgerows. Scoped out of the assessment.
Aquatic Fauna	Salmonids, Wildlife Acts (1976 – 2010) – EU Habitat Directive.	Salmonid waters reported near the Site (http://wfdfish.ie/wp-content/uploads/2019/03/ERBD_Avoca_2017.pdf) and some connectivity identified.

³ Colhoun, K. & Cummins, S. (2013) Birds of Conservation Concern in Ireland 2014–2019. Irish Birds 9: 523–544.

4.8 Evaluation

The evaluation of ecological features (sites, habitats and species) which could be affected by the operational Project between 1990 and 2022 is presented in Table 4.7. The table includes:

- Any statutory designated areas, with the exception of Natura 2000 sites, which are situated within 5 km of the project site that have potential ecological connection(s) with the Site;
- Any surface or groundwater bodies that have hydrological connectivity with the Site;
- Any habitat type recorded within the Site; and
- Any species of conservation importance which has been confirmed as occurring / has potential to occur within the Site.

The value of the feature is based upon how important the feature is in relation to its geographical context. In other words, at what level of geographical resolution would the feature contained within the Site (habitat or species) be recognised as contribution to biodiversity to a significant degree. The evaluation takes into account extent (or population size) within the Site compared to the resource elsewhere and whether it has characteristics which either elevate or depress its importance in comparison with a 'typical' example (for example, whether a habitat is particularly species rich, or depleted in species).

Common and widespread species or habitat, therefore, only have a level of importance in respect of the biodiversity of their immediate area (taken in this case to be represented by the boundary of the Site). Such features are not considered further within the Impact Assessment. Some protected species may, under certain circumstances (such as a single example occurring within the Site, as part of a much larger local population) be considered to only be of importance within the Site itself. Such species, on the basis of legal and planning regulation compliance, are included within the Impact Assessment and, (if necessary) dedicated impact mitigation measures are provided. Table 4.7 presents each feature occurring, together with the rationale for its evaluation.

Table 4-8: Classifying the Geographical Importance of Key Ecological Features

Key Ecological Features	Importance	Rationale
Habitats		
Active Quarry and Hardstanding	Negligible	This habitat offers negligible biodiversity value. Not considered further in this assessment.
Grassland (Site Periphery)	Site	This habitat represents a valuable resource in terms of farmland, but not in terms of biodiversity given the Site is in an area with abundant farmland, and this type of habitat is considered to be ubiquitous and not inherently biodiverse or rare in accordance with ecological value based upon the criteria defined by Ratcliffe (1977), namely: naturalness, size, rarity and diversity. This resource offers negligible biodiversity value in terms of the predicted losses between 1990 and 2022 (ca. 17 ha) and is not considered further in this assessment.
Colonising Ground	Site	This type of habitat is considered to be ubiquitous and not inherently biodiverse or rare in accordance with ecological value based upon the criteria defined by Ratcliffe (1977), namely: naturalness, size, rarity and diversity. Not considered further in this assessment.

Key Ecological Features	Importance	Rationale
Scrub (Site periphery)	Site	This habitat is not extensive within the Site and possible discrete losses since 1990 are part of the ca 17 ha of Site expansion (land take) that has occurred, this habitat is considered to be ubiquitous and not inherently biodiverse or rare in accordance with ecological value based upon the criteria defined by Ratcliffe (1977), namely: naturalness, size, rarity and diversity. Not considered further in this assessment.
Hedgerows and occasional trees	Local Importance (lower value) (following NRA, 2009)	Hedgerows on Site have been residually affected in the period 1990 to 2022. Losses since 1990 are part of the ca 17 ha of Site expansion (land take) that has occurred. Peripheral boundary hedges have been retained during this time and they are likely to represent a useful resource for fauna such as birds, and breeding birds in particular. This feature is carried forward into the design mitigation and impact assessment sections.
Species		
Bats	Local Importance (higher value) (following NRA, 2009).	The peripheral Site supports some suitable foraging and commuting habitat, some trees have low or moderate bat roosting potential. This species group were likely to have been present and potentially residually affected by the land taken between 1990 and 2020 (ca. 17 ha). This feature (species group) is carried forward into the design mitigation and impact assessment sections.
Avifauna	Site.	The peripheral Site scrub, hedgerows, and trees are likely to support a number of common and widespread bird species. These species were likely to have been present and potentially residually affected by the land taken between 1990 and 2022 (ca. 17 ha). This species group (breeding birds) is carried forward into the design mitigation and impact assessment sections.
Mammal	Local Importance (higher value) (following NRA, 2009).	The peripheral Site scrub, hedgerows, and trees may have supported a number of common and widespread mammal species. A possible badger sett has also been identified on Site. This species group were likely to have been present and potentially residually affected by the land taken between 1990 and 2022 (ca. 17 ha). This species group is carried forward into the design mitigation and impact assessment sections.
Aquatic (Salmonid habitat)	Local Importance (higher value) (following NRA, 2009).	Some potential for Site and aquatic (salmonid) habitat hydrological connectivity was identified. However, it should be noted that orthophosphate, copper and hydrocarbons were all observed to be less than the limit of detection in the 2020-2021 surface water samples, showing an improvement on the previous monitoring in 2008 and 2016. Total suspended solids were also reported below the limit of detection at all sampling points with the exception of downgradient location SW3 on 09/09/2020 with a concentration of 16 mg/l, which is below the Salmonid Water Regulations.

4.9 Impact Assessment

Given the nature of the assessment, the operational impacts alone during the period between 1990 and 2022 are assessed. Operational impacts are summarised below:

- Land take (permanent loss) ca. 17 ha;
- Habitat modification through anthropogenic effects;
- Disturbance to habitats and species through noise from traffic and mechanical excavation works;
- Individual species disturbance / mortality; and
- Impacts of dust as a result of extraction activities.

Potential direct and indirect impacts from water quality and quantity are as follows:

- Impacts of dust and Site runoff (sediments, fuel, etc.) as a result of quarrying activities; and
- Impacts on groundwater from site de-watering (drawdown) and usage.

4.9.1 Hedgerows and Occasional Trees

Characterisation of Unmitigated Impacts

Boundary hedgerows and trees have been largely retained during the assessment timeframe. However, permanent losses of hedgerows and trees will have occurred as part of the Site expansion amounting to ca. 17 ha of total land area. Accordingly, the potential for ecological impact to hedgerows and trees, in the absence of mitigation focuses on the following factors:

- Permanent loss of hedgerow and mature trees;
- Potential un-planned encroachment of machinery and quarry footprint (impacts on root protection zones); and
- Dust deposition and subsequent changes in habitat composition.

Permanent loss and damage to hedgerows or modification would afford a negative impact. In the absence of mitigation, this may restrict this availability and resource to fauna during the operational assessment timeframe.

Rationale for Prediction of Effect

Permanent loss and degradation of foraging habitat and potential habitat severance is less likely to cause stress to species associated with hedgerow habitat given the abundance of optimal habitat within the local setting. On a precautionary basis, it is considered certain that this impact will negatively affect the conservation status of these linear landscape features.

Effect without Mitigation

The unmitigated effect of this development would result in a **Moderate** negative impact on habitat of **local (lower)** sensitivity and importance. These effects are usually only at local or regional level, and may be short or medium term only, or temporary impacts on a small part of an international site. However, the cumulative effects of such issues may lead to an increase in the overall effect on ecological features. They represent issues where effects will be experienced, but mitigation measures and detailed design work may ameliorate/enhance some of the consequences upon affected interests, but some residual effects will still arise.

4.9.2 Bats

Characterisation of Unmitigated Impacts

The potential for ecological impacts to bats as a result of the operation of the quarry post 1990 focuses on the following factors:

- Permanent loss of roosting habitat;
- Loss of the bat foraging habitats that may be removed through any outward development of the quarry between 1990 and 2022; and
- Increased noise, lighting and human activity along commuting routes and within foraging habitats on the Site periphery.

The removal of woody vegetation such as trees and scrub would permanently remove roosting, foraging and commuting habitat for bats. Potential effects to bat species include a negative biophysical effect to scrub and peripheral habitat which may inhibit bat commuting value. Linear landscape features, such as hedgerows, are important habitats for bats, providing flight paths between roosts and foraging sites and as foraging habitats (e.g. Verboom and Huitema 1997, Oakeley and Jones 1998, Russ and Montgomery 2002). It is understood that the hedgerows at the Site periphery have remained unchanged since 1990, thus maintaining the value of this feature to foraging / commuting bats.

Noise effects associated with the operation of the quarry would be temporary during diurnal parts of the day and no nocturnal noise effects are anticipated to have occurred.

Rationale for Prediction of Effect

On a precautionary basis, the rationale for effect on bat species considers that roosting, foraging and commuting habitat has been degraded via direct, sensory and land take during the operational assessment period of the quarry. The Site is considered to be poor and relatively ubiquitous in terms of roosting, foraging and commuting value. Nevertheless, on a precautionary basis, it is considered likely that these impacts could negatively affect the conservation status of the bat population.

Effect without Mitigation

The unmitigated impact of this development would result in **minor negative** effects to species of **Local (higher)** importance. These effects are likely to be local issues only; or small magnitude impacts at the regional and national level, they are usually temporary, and are unlikely to be of importance in the decision-making process. However, they are of relevance in enhancing the subsequent design of the restoration and consideration of mitigation measures.

4.9.3 Breeding Birds

Characterisation of Unmitigated Impacts

The potential for ecological impact to the breeding bird group, in the absence of mitigation focuses on the following factors:

- Losses of scrub, hedgerow and tree nesting habitat;
- Operational noise (mechanical excavation and vehicle movements);
- Dust deposition and subsequent changes in habitat composition (changes to structural, foraging, breeding and commuting habitat); and
- Potential effects to bird species include a negative biophysical effect to vegetation availability which may disturb breeding birds and reduce available forage.

Potential losses of available nesting habitat as a result of the quarry operation would be discrete and dependant on habitat type. In the context of the available nesting habitat within the trees and scrub vegetation at the Site periphery the impact may be considered minor. Noise effects associated with the operation of the quarry would have been temporary and reversible.

Rationale for Prediction of Effect

The rationale for effect to bird species considers that discrete losses of available nesting habitat may occur and disturbance may occur to species protected at the National level. The Site periphery is considered to exhibit some suitable breeding bird habitat for passerines. It is considered that effects to treeline and hedgerow habitat are discrete and wholly reversible. Losses of scrub and trees, used for foraging and breeding, are unlikely to cause stress to this group given the abundance of habitat (mature trees, hedgerow and pasture) within the local setting. On a precautionary basis, it is considered likely that this temporary impact could have negatively affected the conservation status of the bird populations on and adjacent to Site.

Effect without Mitigation

The unmitigated impact on this feature would result in a **minor** effect to species of **site** importance. The majority of bird species are protected under the Wildlife Acts (1976-2012) where it is an offence to hunt, interfere with or destroy their breeding or resting places unless authority is obtained via statutory licence provision. Expansion of the quarry may have also had a positive effect on species such as Sand Martin as the increase in quarry footprint will have resulted in an increase in nesting opportunities (sand stockpiles) within the Site via quarry expansion between 1990 and 2022.

4.9.4 Mammals

Characterisation of Unmitigated Impact

The potential for ecological impact to the mammal group focuses on the following factors:

- Losses of hedgerow, scrub, grassland and tree habitat;
- Operational noise disturbance; and
- Dust deposition and subsequent changes in habitat composition (changes to structural, foraging and commuting habitat).

The mammal group includes badger, fox, rabbit, stoat, pygmy shrew, and hedgehog. Although this group of species are generally mobile, operational impacts attributed to noise, vegetation removal and dust deposition must be considered. Dust that settles on plants, can affect the plants' transpiration, respiration and other metabolic activity, by clogging pores and damaging waxy cuticles on the leaves, and by reducing available light. Dust can alter soil and water chemistry, structure and trophic status which may have impacts on the composition of plant and invertebrate communities. Dust can have direct impacts on insect and other invertebrate populations. Impacts on plant and invertebrate communities may result in effects further up the food chain (small mammals).

Rationale for Prediction of Effect

The variable effects associated with operational noise and potential habitat severance and loss at different distances from the source of disturbance, are very little understood for small to medium mammals. Habitat loss would be likely to afford a level of perceived stress and possible mortality, dependent on species mobility, though this is not certain. Minor losses of foraging habitat and potential habitat severance is less likely to cause stress to this species group given the availability of other suitable habitat (scrub, grassland) within the local setting. On a precautionary basis, it is considered likely that this impact could have negatively affected the conservation status of the local mammal population including a potential badger sett.

Effect without Mitigation

The unmitigated effect to this group would result in **minor** impacts to species of **Local (higher)** importance. Small mammals such as stoat and hare are protected under the Wildlife Acts (1976-2010).

4.9.5 Salmonid Habitat

Characterisation of Unmitigated Impacts

The potential for ecological impacts to salmonids as a result of the operation of the quarry post 1990 focuses on the following factors:

- Site based discharge to aquatic (salmonid habitat); and
- Reduction of water quality as a consequence of this discharge.

Rationale for Prediction of Effect

On a precautionary basis, the rationale for effect on salmonid species considers that water quality could be adversely affected via Site discharges. However, it should be noted that monitoring data presented in Chapter 6 indicates that no exceedance of the Salmonid regulations has occurred.

Effect without Mitigation

The unmitigated impact of this development would result in negligible to **minor negative** effects to species of **Local (higher)** importance. These effects are likely to be local issues only; or small magnitude impacts at the regional and national level, they are usually temporary, and are unlikely to be of importance in the decision-making process. However, they are of relevance in enhancing the subsequent design of the restoration and consideration of mitigation measures.

4.10 Remedial Mitigation, Compensation and Enhancement Measures

The principal objective of the remedial ecological mitigation is to take measures to reduce negative effects of the Project in a retrospective context. Details of committed remedial mitigation, compensation and enhancement measures including the provision of a concept restoration plan are outlined in this section.

4.10.1 Hydrocarbons/Chemical safeguards & Protection of site water

Proposed remedial mitigation measures are outlined as follows (these are already implemented at the existing quarry Site):

- Continue to ensure that any Site water discharges continue to meet the quality standards required for Salmonid waterbodies;
- All soil / overburden stockpiles shall be covered (i.e. vegetated) to minimise the risk of rain / wind erosion;
- Restoration of topsoil and overburden will be carried out on a phased basis to speed up restoration biodiversity value as defined in the concept restoration plan;
- All plant and machinery will continue to be regularly serviced before being used on Site;
- Mobile plant fuelling should take place in a designated area of Site. In addition, spill kits will be maintained on site to deal with all spills and leaks, and spill training will be provided to relevant staff members;
- Mobile bowzers, tanks and drums will be stored in secure, impermeable storage areas away from open water;
- Fuel and oil containers will be stored within a secondary containment system, e.g. bunds for static tanks or a drip tray for mobile stores;
- Containers and bunding for storage of hydrocarbons and chemicals will have a holding capacity of 110% of the volume to be stored;

- Fuel and oil stores including tanks and drums will be regularly inspected for leaks and signs of damage;
- Drip-trays will be used for fixed or mobile plant such as pumps and generators in order to retain oil leaks and spills;
- Only designated trained operators will be authorised to refuel mobile plant on Site;
- Procedures and contingency plans will be set up to deal with emergency accidents or spills; and,
- An emergency spill kit (including absorbers) will be available for use in the event of an accidental spill on the quarry floor and key personnel trained in their use.

4.10.2 Protection of Retained Habitat

To protect retained hedgerows and trees, such vegetation will be protected with secure fencing prior to the commencement of extractive works on Site. This protection will be designed following NRA guidance (NRA, 2005), in particular, with regard to root protection areas and fencing specifications (unless otherwise advised by a suitably qualified arboriculturalist). Dust suppression will be implemented in accordance with best practice guidance (CIRIA, 2016).

4.10.3 Habitat Compensation

Planting will be required to mitigate for tree and hedge removal that occurred post 1990 and the concept restoration plan will be required to replace any trees and shrub species removed on a “like for like” basis (as a minimum). Consideration will be given towards hawthorn, blackthorn mix with individual alder and birch (to form native tree hedges) and deciduous trees (native tree species include oak, alder, birch).

4.10.4 Invasive Species

Measures will be implemented throughout Site works to safeguard against the spread of any invasive non-native species (such as cotoneaster, Japanese knotweed or rhododendron). Indeed, where possible such plants will be removed from the Site (and disposed of appropriately, following an appropriate method statement). As such, an invasive species survey will be undertaken within the appropriate window for this type of work which is likely to be within the growing season (April to September inclusive).

4.10.5 Enhancement

The concept restoration plan for the Site offers opportunities for habitat enhancement over and above the existing situation. Such enhancement measures will be detailed in a formal concept restoration plan and will be drafted in line with the following principles regarding enhancement measures for habitats and for fauna.

Habitat

New habitat provision under the concept restoration plan will include provisions for trees, hedgerow, and shrub planting over and above the current situation. Where possible, these will be planted in association with other habitats of elevated value, such as wildflower grassland. Planting should comprise native species of local provenance. Where this is not possible, plants will be selected for their fruit, berry, or nectar bearing qualities. All landscape planting within the site will be managed for the benefit of wildlife.

Fauna

To increase opportunities for roosting bats and nesting birds, a number of bat and bird boxes will be incorporated in the concept restoration plan for the Site, placed on trees of a suitable size. In addition, to increase opportunities for invertebrates within the Site, invertebrate boxes will be provided under the concept restoration plan. These boxes will be located in sheltered areas of new and retained vegetation, such as in association with hedgerows.

4.11 Residual Effects

For the purposes of robust assessment, residual effects have been considered to be effects that were identified in the impact assessment process prior to the consideration of any additional mitigation, as full details of some of the additional mitigation are yet to be developed. These effects were all identified as being not significant to minor afforded to species of Site and Local (higher and lower) importance in the period 1990 to 2022. In essence, the favourable conservation status of species and habitats on Site between 1990 and 2022 has not been adversely compromised. The on-going operation of the quarry committed delivery of mitigation measures and eventual restoration of the quarry is likely to result in all effects being considered to be not significant. In essence, this can be described as having no perceivable impacts on ecological features (habitat or species). Impacts may be beneath levels of perception, within normal bounds of variation. Depending on the efficacy of the restoration proposals at eventual closure of the Site, there may be an opportunity to provide a minor positive (net gain) for biodiversity value at the Site level.

4.12 Cumulative Impacts

Golder have reviewed the planning portal websites and Wicklow County Development Plan in addition to being involved in projects where EIAR is required within Wicklow County and the broader region. It is noted that there are no extractive or sizable industries in the surrounds of the Site which may contribute to cumulative effects in a retrospective context. It is therefore considered that no significant cumulative impacts have occurred.

4.13 Summary and Conclusions

This chapter has evaluated the importance of the ecological resources present and defined the degree of significance of potential impacts resulting from the operational quarry between 1990 and 2022. The assessment approach has followed CIEEM (2018) and taken account of national planning policy and Local Plan policies in respect of nature conservation and protected species legislation in identifying impacts that may have occurred in a retrospective context. It has also identified and proposed any appropriate remedial avoidance, mitigation and compensation measures.

The assessment has concluded that no nature conservation sites have been directly or indirectly affected by the Project.

The habitat survey of the Site identified the presence of some habitat of elevated ecological value; namely trees within the Site, and hedgerows at Site boundaries.

Specific faunal survey work carried out identified the use of the Site by a number of common and widespread species, whilst potential for the use of the Site by species protected under national legislation was also identified. Accordingly, suitable mitigation and compensation measures have been outlined in this Chapter, to safeguard these species as remedial measures.

In addition to mitigation for any potential impacts of the development on local flora and fauna, the opportunity has been taken to incorporate a number of enhancement measures within the assessment, to improve habitat quality over and above the current situation, together with creating new opportunities for fauna within the Site. These enhancements focus on the concept restoration of the quarry. Habitat enhancements at minerals sites have the potential to enhance biodiversity and to provide a public benefit at the end of their working lives through restoration⁴.

⁴ <https://service-rspb.boldlight.co.uk/app/uploads/sites/3/2016/03/Nature-After-Minerals-report.pdf>

4.14 References

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APPENDIX 4.1

**O'Donnell (March 2022)
Walkover Survey Report**

Methodology

DESK STUDY

A desktop review of publicly available relevant data was undertaken on the National Biodiversity Data Centre (NBDC) and National Parks & Wildlife Service (NPWS) websites. The National Biodiversity Data Centre was reviewed for relevant data, specifically i) existing species records for the 10km square in which the study site is located (T28) and ii) an indication of the relative importance of the wider landscape in which the study site is located, based on Model of Bat Landscapes for Ireland (Lundy *et al.* 2011). In the latter, the index ranges from 0 to 100, with 0 being least favourable and 100 most favourable for bats.

FIELD SURVEYS

Ecological walkover surveys were carried out on 9th and 10th February 2022 by Tom O'Donnell BSc (Hons) MSc CEnv MCIEEM and Donnachadh Powell BSc (Hons).

Phase 1 Habitat Survey

A Phase 1 habitat and flora assessment in accordance with the Heritage Council's guidelines (Smith *et al.* 2011). This involved a walkover of the study site, where the habitats present were classified according to Fossitt (2000) and recorded on a field map. The purpose of this site visit was to describe and characterise the types of habitats present and determine whether there were ecologically sensitive or legally protected habitat types within the study area. Plants were identified to species level where possible (some plants are not identifiable to species level during winter months).

The evaluation of ecological receptors within the proposed development followed the criteria presented in the NRA Guidelines for Ecological Impact Assessment of National Road Projects (NRA, 2009).

Any other records of interest were marked on field maps and locations were recorded using GPS handheld units (Garmin GPSMAP 64x). The presence and extent of Invasive Alien Plant Species with the study area and the surrounding environs were also identified and recorded using a GPS handheld unit and mapped and incorporated into the habitat and botanical surveys.

Bird species seen and heard during the site visit were recorded.

Mammals

Survey for non-volant mammals was undertaken and involved a walkover of the site to identify any mammal species present or signs of mammal activity such as droppings, tracks, burrows etc. Observations were recorded using field notes and/or a handheld GPS unit. Techniques used to identify mammal activity followed recognised guidelines (e.g. Bang & Dahlstrom 2004 and Muir *et al.*, 2013).

The conservation status of mammal species was considered. The conservation status of mammals within Ireland and Europe is indicated by inclusion in one or more of the following: Irish Wildlife Acts (1976 - 2010); Red List of Terrestrial Mammals (Marnell *et al.* 2019); EU Habitats Directive.

Ground-level roost assessments were carried out to identify any bat roosting potential which may exist within the site. Potential Roost Features (PRFs) are described according to the scheme outlined in **Table 2.1**, below. Surveys were carried out according to 'Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition)' (Collins, 2016). The surveys were carried out during appropriate weather and light conditions and winter is the optimal period for ground level surveys of trees. Signs of bat use include bat droppings, feeding remains, potential bat access points identified by characteristic staining and scratches etc.

Table 2.1. Scheme for describing the potential suitability of features for bats

Suitability	Description
Negligible	Negligible features which are likely to be used by roosting bats.
Low	<p>A feature with one or more potential roost sites that could be used by individual bats opportunistically.</p> <p>Potential roost sites which do not provide appropriate conditions and / or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation).</p> <p>A tree of sufficient size and age to contain PRFs but with none seen from the ground or features seen with only very limited roosting potential.</p>
Moderate	A structure or tree with one or more potential roost sites that could be used by bats due to characteristics and surrounding habitat but unlikely to support a roost of high conservation status.
High	A structure or tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.

After 'Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edition)', Collins (2016). A preliminary ground-based assessment of trees was carried out to identify suitability for roosting bats. the survey followed guidance in Collins (2016).

Limitations

The Phase 1 habitat survey was undertaken outside the optimum survey period for botanical and habitat surveys. However, due to the nature of the habitats recorded within the proposed development site, the timing of the survey is not deemed to be a significant limitation in this instance. The survey occurred outside the breeding bird season and bat activity season.

Results

The study site represents a highly disturbed environment with disturbances associated with active quarries and related processes taking place regularly within the site environs. There are few or no areas within the site boundary where soil disturbance has not occurred during the operation of the quarry. The site has an approximate area of 24ha.

HABITATS

The habitats present within the boundary of the study site are described below and their location is mapped below. No Annex I habitats listed under the EU Habitats Directive are present within the study site and the dominant habitats present are of low ecological value. All species recorded during the botanical survey are considered common for these habitat types.

Active Quarries and Mines (ED4)

This is the dominant habitat type found on site. Vegetation cover is virtually absent from these areas due to high levels of sustained disturbances associated with quarry activity such as heavy machinery, regular movement of substrate etc.



Plate 3.1 – Active Quarries and Mines (ED4)

Scrub (WS1)

This habitat type is characterised by areas that are dominated by cover of shrubs and self-established trees with stunted growth (likely due to waterlogging and poor soil quality at this site). Gorse (*Ulex europaeus*) is the dominant plant with Broom (*Cytisus scoparius*), Horsetails (*Equisetum* spp.) and Bramble (*Rubus fruticosus*) occurring frequently. The habitat occurs frequently on the boundaries of the site where berms of soil provide screening to the site. Trees occur commonly in these Scrub habitats especially along the northern boundaries of the site, bordering the artificial lake and on the boundaries of the site, species include Silver Birch (*Betula pendula*), Willow (*Salix* sp.) and Alder (*Alnus glutinosa*).



Plate 3.2 – Scrub (WS1)

Dry Meadows and Grassy Verges (GS2)

The habitat was located in areas where formerly disturbed ground or mounds of top-soil from quarry operations has completely revegetated to a grassland habitat dominated by common ruderal species. The habitat is not managed agriculturally but is occasionally grazed by deer. This habitat type occurs frequently within the study area, often forming mosaics with WS1 and ED4 habitats. Grasses including Bent grasses (*Agrostis* spp.) are dominant with Rushes (*Juncus* spp.) frequent. Other plant species recorded in GS2 habitats included Dandelions, Fox Glove (*Digitalis purpurea*), Spear thistle, Creeping Buttercup (*Ranunculus repens*) and Broom (*Cytisus scoparius*). Remnant stalks of Umbellifers from the previous year's growth were also apparent.



Plate 3.3 – Dry Meadows and Grassy Verges (GS2).

Recolonising Bare Ground (ED3)

The spoil and rubble heaps occurring throughout the site constitute the ED3 habitat type in the study area. Vegetation cover is greater than 50% in these areas, with mostly ruderal species such as Dandelions (*Taraxacum officinalis*), Spear thistle (*Cirsium vulgare*), Buttercups (*Ranunculus* spp.) and Willowherbs (*Epilobium* spp.). Butterfly Bush (*Buddleja davidii*) individuals are occur occasionally and mostly occur in the eastern, less disturbed parts of the quarry.



Plate 3.4 – Recolonising Bare Ground (ED3) habitat.

Other Artificial Lakes and Ponds (FL8)

There are several artificial lakes (some interconnected) occurring throughout the quarry. Mallard Ducks and other waterfowl were observed here. Small stands of Winter Heliotrope (*Petasites fragrans*) have colonised the edges of some of these waterbodies.



Plate 3.5 – Other Artificial Lakes and Ponds (FL8).

Reed and Large Sedge Swamps (FS2)

Reed swamp occurs in discrete locations on the borders of the artificial lakes, mostly on the northern boundary of the study site. Plant species recorded at FL8 habitats included Bull Rush (*Typha latifolia*), Reed Canary Grass (*Phragmites australis*), Clover (*Trifolium* spp.), Pointed Spear Moss (*Calliergonella cuspidata*). Willow commonly occurs occasionally within FS2 habitat.



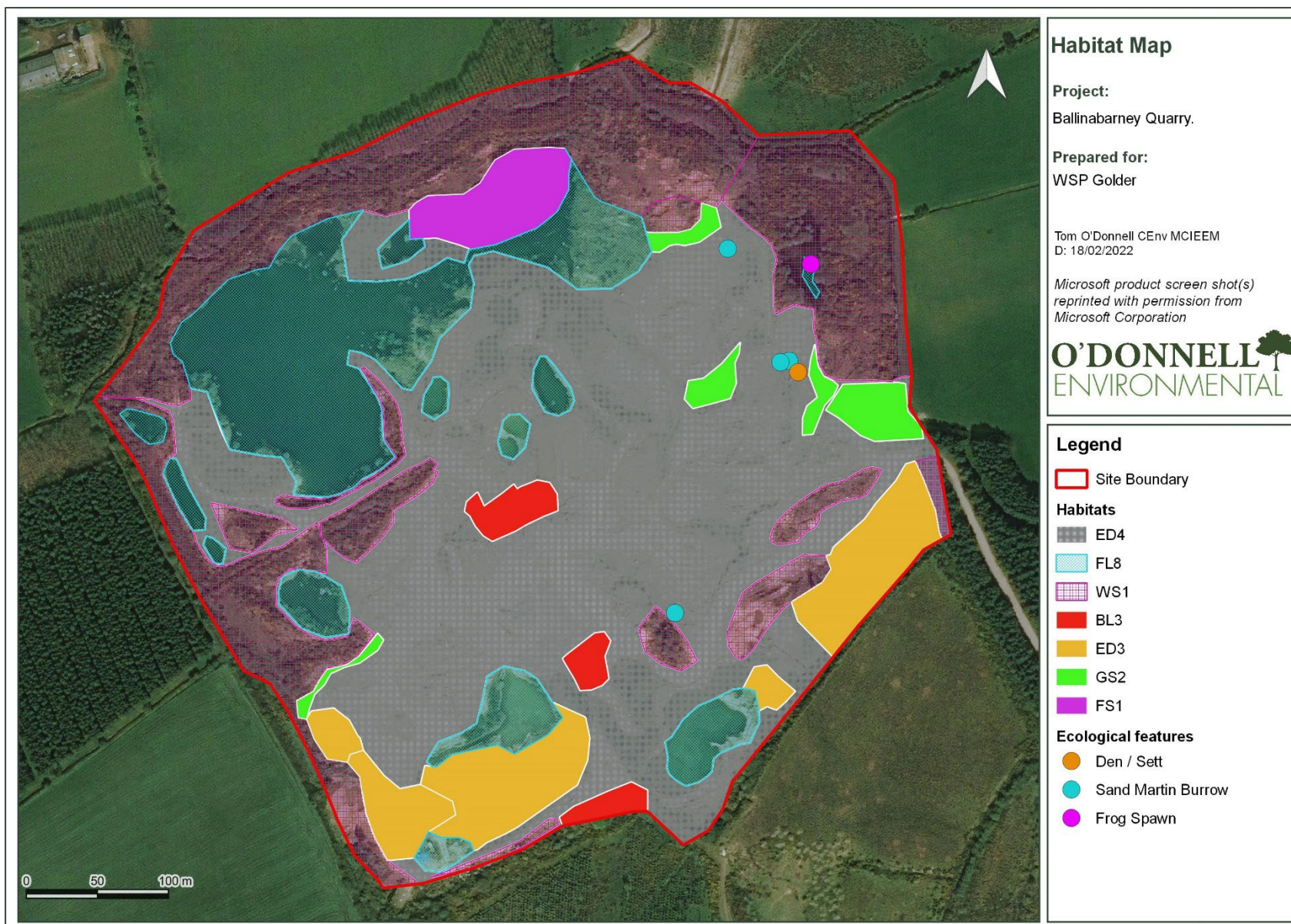
Plate 3.6 – Example of FS2 habitat (background) found within the study area.

Buildings and Artificial Surfaces (BL3)

Buildings and artificial surfaces occur associated with quarry operations.



Plate 3.1 – Example of BL3 habitat found within the study area.



MAMMALS

The results of surveys carried out for non-volant mammals and bats are outlined below.

Non-volant Mammals

Within the 10km grid square in which the study area is located (T28; NBDC) there are historic records for a total of 18 mammal species (see **Table 3.6**). Only Eurasian Badger (*Meles meles*) has previously been recorded in the 1km grid square in which the study area is located (T2286; NBDC).

Table 3.6 - Mammal species previously recorded within the 10km grid square (T28) in which the site is located (NBDC).

Common name	Species name	Legal Protection*	Conservation Status*
American Mink	<i>Mustela vison</i>	AIS	AIS
Brown Rat	<i>Rattus norvegicus</i>	AIS	AIS
Chinese Muntjac	<i>Muntiacus reevesi</i>	AIS	AIS
Eastern Grey Squirrel	<i>Sciurus carolinensis</i>	AIS	AIS
Eurasian Badger	<i>Meles meles</i>	WA	LC
Eurasian Pygmy Shrew	<i>Sorex minutus</i>	WA	LC
Eurasian Red Squirrel	<i>Sciurus vulgaris</i>	WA	LC
European Otter	<i>Lutra lutra</i>	Annex II/IV, WA	LC
European Rabbit	<i>Oryctolagus cuniculus</i>	AIS	LC
Fallow Deer	<i>Dama dama</i>	WA	AIS
Feral Ferret	<i>Mustela furo</i>	AIS	AIS
Irish Hare	<i>Lepus timidus hibernicus</i>	Annex V, WA	LC
Irish Stoat	<i>Mustela erminea hibernica</i>	WA	LC
Pine Martin	<i>Martes martes</i>	Annex IV, WA	LC
Red Fox	<i>Vulpes vulpes</i>	-	LC
Sika Deer	<i>Cervus nippon</i>	AIS	AIS
West European Hedgehog	<i>Erinaceus europaeus</i>	WA	LC
Wood Mouse	<i>Apodemus sylvaticus</i>	-	LC

Source: <https://maps.biodiversityireland.ie/Map>. Accessed 15/02/2022.

* Annex status (EU Habitats Directive), WA (Protected under Wildlife Acts 1976 and 2000).

** LC – Least Concern (Marnell *et al.*, 2019); AIS - Alien Invasive Species.

Evidence (prints and tracks) of Sika Deer, Irish Hare, European Rabbit, Red Fox and Badger were all recorded within the site boundaries during the walkover surveys and the study site provides foraging opportunities for these species. A single entrance underground dwelling which is likely to be a Fox den was recorded on site and appeared to be in regular use. The dwelling was dug into an exposed face of sand and in terms of size and shape is characteristic of a Fox den. No food remains or olfactory evidence of Fox was noted, and no bedding material was present at the entrance. Recent badger prints were evident in the sand and it cannot be excluded that the den is occupied at least occasionally by Badger as an 'outlier' sett.

Bats

All Irish bat species are protected under the Wildlife Act (1976) and Wildlife Amendment Act (2000). All Irish bats are listed in Annex IV of the Habitats Directive and the Lesser Horseshoe Bat (*Rhinolophus hipposideros*) is further listed under Annex II.

National Biodiversity Data Centre holds previous records of bat presence from within the 10km square (T28) in which the proposed site is located. These records are for Common Pipistrelle (*Pipistrellus pipistrellus*), Soprano Pipistrelle (*Pipistrellus pygmaeus*), Daubenton's Bat (*Myotis daubentonii*), Brown Long-eared Bat (*Plecotus auritus*), Leisler's Bat (*Nyctalus leisleri*), Natterer's Bat (*Myotis nattereri*) and. It is important to note that an absence of other bat species records is reflective of a lack of surveys undertaken to date rather than absence of bat species.

The overall bat suitability index value (39.89) according to 'Model of Bat Landscapes for Ireland' (Lundy *et al.* 2011) suggests the landscape in which the locality of the study area is of high suitability for bats in general. Species specific scores are provided in **Table 3.2**.

Table 3.2 - Suitability of the study area for the bat species according to 'Model of Bat Landscapes for Ireland' (Lundy *et al.* 2011).

Common name	Scientific name	Suitability index
<i>All bats</i>		39.89
Soprano pipistrelle	<i>Pipistrellus pygmaeus</i>	43
Brown long-eared bat	<i>Plecotus auritus</i>	53
Common pipistrelle	<i>Pipistrellus pipistrellus</i>	62
Lesser horseshoe bat	<i>Rhinolophus hipposideros</i>	1
Leisler's bat	<i>Nyctalus leisleri</i>	60
Whiskered bat	<i>Myotis mystacinus</i>	31
Daubenton's bat	<i>Myotis daubentonii</i>	31
Nathusius pipistrelle	<i>Pipistrellus nathusii</i>	9
Natterer's bat	<i>Myotis nattereri</i>	69

Bat Conservation Ireland (BCI) conducted a search of their records database at the request of O'Donnell Environmental on 8th February 2022. The relevant search area included a 1km radius from the development application boundary. No roost data exists within or in close proximity to the proposed site.

The structures and trees present on site were considered to be of 'negligible' suitability for roosting bats (following Collins, 2016). Two 'low' suitability trees were noted on an alternative access route to the site.

BIRDS

During the course of ecological walkover surveys, the following bird species were seen or heard:

- Robin (*Erithacus rubecula*)
- Blackbird (*Turdus merula*)
- Magpie (*Pica pica*)
- Wren (*Troglodytes troglodytes*)
- Grey Wagtail (*Motacilla cinerea*)
- Red Kite (*Milvus milvus*)
- Starling (*Sturnus vulgaris*)
- Jackdaw (*Corvus monedula*)
- Common Buzzard (*Buteo buteo*)
- Pheasant (*Phasianus colchicus*)
- Blue Tit (*Cyanistes caeruleus*)
- Woodpigeon (*Columba palumbus*)
- Raven (*Corvus corax*)
- Mallard (*Anas platyrhynchos*)
- Song Thrush (*Turdus philomelos*)
- Rook (*Corvus frugilegus*)

- Hooded Crow (*Corvus cornix*)

A pair of Red Kite were observed flying over the large artificial pond, possibly hunting small birds. Sand Martins are a migratory species which breed in burrows dug into river banks or quarries. Exposed faces of sand were found to have numerous burrows from the previous nesting season. The burrows were located on at least four faces and approximately 100 burrows in total were present.

The bird community recorded at the study site is characterised by the presence of mostly common and widespread bird species which reflects the disturbed nature of habitats available. The species recorded included two that are red-listed in *Birds of Conservation Concern in Ireland 2020-2026* (BoCCI; Gilbert *et al.*, 2021) namely Red Kite, Grey Wagtail. Sand Marten (*Riparia riparia*), Starling and Mallard are amber-listed (Gilbert *et al.*, 2021).

OTHER TAXA

Frog spawn was located in one location in a shallow seasonal pond.

ECOLOGICAL EVALUATION

Based upon the results of ecological walkover survey, and considering the local context of the study site, the ecological value of the study site is considered to be of **Local Importance (Lower Value)** overall.

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Photographs:



A1. View of the site showing ED4, GS2, FL8 and WS1 habitat types.



A2. Badger print recorded on site.



A3. Entrance to underground mammal dwelling.



A4. Stand of invasive Winter Heliotrope.



A5. Frogspawn in puddles at western side of site.



A6. Sand Martin burrows.



A7. Night-time commute of Badger captured on trail camera.



A8. Sika Deer captured on trail camera.