5.0 BIODIVERSITY

5.1 Introduction

This chapter examines the potential likely significant effects of the proposed sand and gravel pit at Ballymullen, Abbeyleix, Co. Laois on the baseline condition and ecology of the receiving environment. Where likely significant effects are identified, appropriate mitigation measures to reduce / avoid these effects are outlined. The account has been updated where necessary in response to a *Request for Further Information* from Laois County Council (LCC Reg. Ref. 23/60390) dated 15th November 2023.

A standalone Natura Impact Statement (NIS) has also been produced and revised accordingly, which evaluates the potential for significant effects on the Natura 2000 sites within a defined zone of influence of the proposed development.

5.1.1 Statement of Competency

Roger Goodwillie B.A. (Hons.), M.Sc.
Roger Goodwillie has been in ecological practice for 40 years, working first with An Foras Forbartha (The Planning Institute) and then as a consultant with projects for NPWS and other agencies as well as private developers and companies. He qualified in botany and is County Recorder for Kilkenny for the Botanical Society of Britain and Ireland. He is a full member of the Chartered Institute for Ecology and Environmental Management (CIEEM).

Sarah Ingham MSc BSc (Hons.)
Sarah Ingham has worked as an Ecologist and Project Manager for several environmental consultancies since 2009 and has prepared about 100 Appropriate Assessment Screening Reports, Natura Impact Statements and Ecological Impact Assessments. She is primarily a bird expert with robust professional experience in surveying and studying bird ecology; she has also been the on-site Ecological Clerk of Works at several wind farms under construction. She is an Associate member of the CIEEM.

5.2 Materials and Methods

5.2.1 Desktop Review

A desktop review was carried out to identify features of ecological importance on the site and in its immediate surroundings.

Sites designated for nature conservation were also reviewed by examining the most recent updates of GIS shapefiles downloaded from the NPWS website and exploring these within QGIS 2.18.15. These included European sites i.e. Special Areas of Conservation and Special Protection Areas, as well as nationally designated Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs) within a 15km radius of the proposed

development, as per published guidance on the Department of the Environment and Local Government (2009).

A review of the published literature was undertaken in order to collate data on the receiving environment, including species and habitats of conservation importance in the study area. Publicly available documents from the following agencies and bodies were accessed as part of the desktop review:

- Environmental Protection Agency (EPA);
- Laois County Council (LCC);
- Inland Fisheries Ireland (IFI);
- Inland Waterways Association of Ireland (IWAI);
- National Parks and Wildlife Service (NPWS);
- Water Framework Directive (WFD);
- Botanical Society of Britain & Ireland (BSBI)
- National Biodiversity Data Centre (NBDC);
- Bird Watch Ireland (BWI);
- Bat Conservation Ireland (BCI).
- Abbeyleix Bog Project

5.2.2 Site Survey

The application site has been visited over the course of five years, in summer 2019 (13th June), autumn 2020 (20th October), 2021 (15th February) and 2022 (30th June) when the site itself and the surrounding area was examined as recommended by Best Practice guidance. These visits were augmented by a specialised study of badger and bat species carried out in July 2022 (revised 2024) and a grassland study on 12th May 2024 . Ecological receptors and justification for their respective survey areas are presented in Table 5.1.

The weather on survey days was optimum with overcast skies allowing for fair visibility, no precipitation, a light breeze and an ambient temperature of 10/20 º C.

Table 5.1: Study area in relation to ecological receptors.

Ecological Receptor	Geographical Boundary of the Study Area	Justification for the Study Area Extents
Habitats	The proposed application area.	Professional judgement and as per Best Practice (CIEEM, 2016).
Designated Sites including European Sites, NHAs, pNHAs.	Appraised in the Appropriate Assessment reporting document.	A zone of influence of 15km was taken.
Birds	The proposed application area.	Professional judgement and as per Best Practice (CIEEM, 2016).
Ground Mammals	The proposed application area. Followed up by field survey (2022).	Badgers, as per Best Practice guidelines published by the NRA (2005). Other mammal species, professional judgement and as per Best Practice (CIEEM, 2016)
Bats	Desk study of hectads S48 within which proposed application area is located. Followed up by field survey (2022).	Professional judgement and as per: "*Bat Surveys for Professional Ecologists: Good Practice Guidelines,* Collins, (2016)"
Amphibians & Reptiles	The proposed application area only.	Professional judgement and as per Best Practice (CIEEM, 2016).
Invertebrates	The proposed application area only.	Professional judgement and as per Best Practice (CIEEM, 2016).

5.2.3 Habitat and flora

A Phase I habitat survey was undertaken to describe the ecology and allow for evaluation of importance in accordance with methods outlined in the Heritage Council publication, "Guidance for Habitat Survey and Mapping" (Smith et al., 2011). Habitats were recorded using the habitat classification scheme published by the Heritage Council in A Guide to Habitats in Ireland (Fossitt, 2000) and evaluated using the geographical frame of reference scheme as per "Guidelines for Assessment of Ecological Impacts of National Road Schemes" (NRA, 2009; please see Table 6-2 below for an outline of this evaluation scheme).

The flora of the habitats is described with nomenclature as in Stace (2019).

5.2.4 Fauna Survey and Evaluation

5.2.4.1 Birds

A list of birds, both seen and heard in the study area, was made on all days.

5.2.4.2 Mammals including Bats

The area of broad-leaved woodland and scrub in the centre of the application site contains suitable foraging and breeding habitat for badgers Meles meles. As such, all suitable habitat was assessed during the walkover surveys for evidence of badger activity – setts (active or disused), latrines, snuffle-holes and tracks. A dedicated survey was carried out in July 2022 and repeated in February and June 2024.

There were no buildings which could potentially act as bat roosts within 150m of the application area boundary. However, its use for feeding and possible tree roosting was assessed in 2022 and 2024.

The closest watercourse to the application site is the Ballymullen Stream (1st order) which flows in a northerly direction at the edge of Abbeyleix Bog, approximately 250m to the west of the site. Given the distance between the site and the Ballymullen stream and that there is also a minor road (L5731) running between the two locations, an otter (Lutra lutra) survey was not warranted.

Records of tracks or signs of other mammals such as red fox Vulpes vulpes, pine marten Martes martes, Irish hare Lepus timidus, European rabbit Oryctolagus cuniculus, red squirrel Sciurus vulgaris, bank vole Clethrionomys glareolus and wood mouse Apodemus sylvaticus were also noted if encountered.

In addition to field records, a desktop review of all mammal and bat species records within hectad S48 (NBDC, 2019) in which the application area is located was undertaken.

5.2.4.3 Amphibians and Reptiles

Any sightings and suitable habitat of amphibians and reptiles were noted during the site ecology walkover survey.

5.2.4.4 Invertebrates

A survey of suitable habitat of invertebrate species was undertaken during the site ecology walkover survey. Butterflies and bumble bee species were noted.

5.2.4.5 Water Quality

A hydrology report to accompany this application was prepared by Hydro-Environmental Services (HES) (see Chapter 7.0 Water).

5.2.5 Criteria for Evaluating Likely Significant Effects

The significance of a likely effect is a combined function of the value of the affected feature (its ecological importance), the type of effect and the magnitude of the effect. It is necessary to identify the value of ecological features within the study area in order to evaluate the significance and magnitude of possible effects.

Each habitat type within the study area has been evaluated and given an overall significance rating on the basis of the criteria outlined in the National Roads Authority (2009) Guidelines for the Ecological Assessment of Road Schemes. This system, presented in Table 5.2 in Section 5.2.6.1 below, outlines criteria for evaluating the significance of effects on designated sites at various geographical scales.

5.2.5.1 Geographical Context for Determining Ecological Value

Ecological features are evaluated on the following geographical frame of reference when determining value:

- International importance
- National importance
- County importance (or vice-county in the case of plant or insect species)
- Local importance (higher value)
- Local importance (lower value)

The local scale is approximately equivalent to one 10km square but can be operationally defined to reflect the character of the area of interest. This system is presented in Table 5.2 below and is taken from the NRA publication "*Guidelines for the Assessment of the Ecological Impacts of National Road Schemes*" (NRA, 2009).

Table 5.2: Criteria used to determine the ecological value of the site (adapted from NRA, 2009).

Ecological Valuation	Criteria
International Importance	• 'European Site' including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA) or proposed Special Area of Conservation. • Site that fulfills the criteria for designation as a 'European Site' (see Annex III of the Habitats Directive, as amended). • Features essential to maintaining the coherence of the Natura 2000 Network. • Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive. • Resident or regularly occurring populations (assessed to be important at the national level) of the following: o Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and/or o Species of animal and plants listed in Annex II and/or IV of the Habitats Directive. • Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971). • World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972). • Biosphere Reserve (UNESCO Man and the Biosphere Programme). • Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979). • Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979). • Biogenetic Reserve under the Council of Europe. • European Diploma Site under the Council of Europe. Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988).
National Importance	• Site designated or proposed as a Natural Heritage Area (NHA). • Statutory Nature Reserve. • Refuge for Fauna and Flora protected under the Wildlife Acts. • National Park. • Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA); Statutory Nature Reserve; Refuge for Fauna and Flora protected under the Wildlife Act; and/or a National Park.

Ecological Valuation	Criteria
	• Resident or regularly occurring populations (assessed to be important at the national level) of the following: ○ Species protected under the Wildlife Acts; and/or ○ Species listed on the relevant Red Data list. Site containing 'viable areas' of the habitat types listed in Annex I of the Habitats Directive.
County Importance	• Area of Special Amenity. • Area subject to a Tree Preservation Order. • Area of High Amenity, or equivalent, designated under the County Development Plan. • Resident or regularly occurring populations (assessed to be important at the County level) of the following: ○ Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; ○ Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; ○ Species protected under the Wildlife Acts; and/or ○ Species listed on the relevant Red Data list. • Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance. • County important populations of species, or viable areas of semi-natural habitats or natural heritage features identified in the National or Local BAP, if this has been prepared. • Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county. • Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.
Local Importance (Higher Value)	• Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared; • Resident or regularly occurring populations (assessed to be important at the Local level) of the following: ○ Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; ○ Species of animal and plants listed in Annex II and/or IV of the Habitats Directive; ○ Species protected under the Wildlife Acts; and/or

Ecological Valuation	Criteria
	○ Species listed on the relevant Red Data list. • Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality; • Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential.
Local Importance (Lower Value)	• Sites containing small areas of semi-natural habitat that are of some local importance for wildlife; • Sites or features containing non-native species that are of some importance in maintaining habitat links.

5.2.5.2 Impact Assessment

The process of impact assessment examines the impacts and their effects, incorporating mitigation measures and determining the significance of residual effects. The CIEEM Guidelines for environmental impact assessment in Britain and Ireland (2019) which are followed here lists ecological aspects to be considered. These are listed below.

- Available resources – e.g. animal territory, food, soil nutrients, water movement
- Environmental processes – geomorphology and weather
- Ecological processes and relationships – vegetation and population dynamics, food webs including recycling
- Human influences – farming management, disturbance, air quality
- Ecosystem properties – productivity, trophic status, fragility, fragmentation, connectivity

Impacts on any of these factors are assessed as to their extent and magnitude, duration, frequency and timing and reversibility and whether they are positive or negative. Their significance after mitigation may be expressed as follows.

Table 5.3: Significance of Effects (adapted from EPA, 2017)

Significance of Effect	Description
Imperceptible	An effect capable of measurement but without noticeable changes in the character of the environment.
Not Significant	An effect which causes noticeable changes in the character of the environment but without noticeable consequences.
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging trends.
Significant	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters the majority of a sensitive aspect of the environment.
Profound	An effect which obliterates sensitive characteristics.

5.3 Receiving Environment

5.3.1 Designated Sites

5.3.1.1 Natura 2000 Sites

There are four EU designated sites (3 Special Areas of Conservation – SACs and 1 Special Protected Area – SPA) located within 15km of the application area.

Table 5.4: Natura 2000 sites located within a 15km radius of the application area at Ballymullen

Natura 2000 Site	Distance and direction from the application area
River Barrow and River Nore SAC (Site Code: 002162)	2.2km to the west
River Nore SPA (Site Code: 004233)	2.3km to the west
Lisbigney Bog SAC (Site Code: 000869)	4.4km to the south
Knockacoller Bog SAC	14.5km to northwest

There are no surface hydrological connections between the application area and any Natura 2000 site though it could have a groundwater connection to the River Barrow & River Nore SAC and the River Nore SPA.

A Natura Impact Statement report, which evaluates the likely significant effects of the project on the above listed European sites, is included as part of the planning application.

Evaluation: EU designated sites are of International Importance.

5.3.1.2 Nationally Designated Sites

There are no full Natural Heritage Areas (NHAs) but six proposed Natural Heritage Areas (pNHAs) located within 15km of the application area (Table 5.5).

The project site has no surface hydrology connection with any of the NHAs or pNHAs though it could have a groundwater connection to the River Nore/Abbeyleix Woods pNHA as it is in the same catchment.

Table 5.5: Proposed NHAs within a 15km radius of the site at Ballymullen.

NHA/pNHA and Site Codes	Distance and direction from the application area
River Nore/Abbeyleix Woods Complex pNHA (Site Code: 002076)	2.2km to the west (mostly included in SAC)
Lisbigney Bog pNHA (Site Code: 000869)	4.4km to the south (same boundary as SAC)
Grantstown Wood & Lough pNHA (0417)	9.9km to west
Cuffsborough pNHA (0418)	11.6km to west
Coolacurragh Wood pNHA(0862)	12.6km to WSW
Knockacoller Bog pNHA (0419)	14.5km to NW

Evaluation: NHAs and proposed NHAs are of National Importance.

5.3.1.3 Undesignated sites of ecological value

Abbeyleix (Killamuck) Bog is located west of the site on the opposite side of the road L5731. It is a relatively small raised bog, roughly oval in shape, which developed over a former lake contained by a glacial moraine on its eastern side. The bog is the subject of an ongoing conservation programme known as the Abbeyleix Bog Project and numerous ecological studies have been carried out which have informed the Abbeyleix Bog Project Conservation Management Plan 2015-2020 (Ryle, 2014) and subsequent management.

The bog consists of a central area of raised bog surrounded by a periphery of cutover and marshy lagg – a more natural transition to the surrounding habitat. Abbeyleix Bog supports a number of semi-natural and modified habitats. By far the largest component is raised bog which is now extending as a result of the blocking of former drains. Estimates from the Bord na Mona study in 2009 suggest 99.4ha of high bog, 1.1ha of active bog (Annex I habitat) and a potential for 4.6ha after restoration of potential active bog. Later measurement shows that the active bog had grown to 3.19ha in 2014 and 13.78ha in 2020 (Ecology and Environmental Consultants Ireland, 2020).

The high bog is largely surrounded by cutover bog, in which a myriad of different habitats have also developed. These are mostly forested with open, self-sown Scot's pine and other trees. They include mixed woodland and peripheral conifer plantation, much of which was originally planted by the Abbeyleix Estate. In places, the woodland is naturally regenerating or at the least, self-seeding across the bog. Along the western boundary of the cutover, there is some naturally developing bog woodland dominated by Scot's Pine. Elsewhere

within the cutover, scrub and other semi-natural woodland types (bog and wet woodland) are present.

Of considerable ecological value is the presence of an intact lagg (comprising fen carr along with a number of other transitional wet woodland types) along the eastern margins of the bog (Smith & Cowley, 2020). These transitional zones around raised bogs are extremely rare in Ireland (3 intact sites), having generally been destroyed by peat-cutting. A significant feature is a calcareous spring in the NE part which corresponds to the Habitat Directive Annex I habitat of 'petrifying springs 7220'. On an existing grading system this was reckoned to be of High Conservation value (Lyons and Kelly, 2016) though there is no deposit of calcium carbonate (tufa). The nearby fen area is also of notable value with transition mire of two sorts (bogbean and bottle sedge), poor fen and flush habitats (Smith & Cowley op. cit.). Transition mire (7140) is again listed in Annex I of the Habitats Directive, as is Bog Woodland 91D0.

Although not designated, the site was included in the Review of Raised Bog Natural Heritage Area Network carried by the Dept of Arts, Heritage & the Gaeltacht (2014). It was assessed as being of moderate value for its size and habitat quality but of high value for its location (south of most of the habitat) and ecological diversity. On the criteria in Table 5.2 it would be considered of National value.

There is no surface water connection between the application area and the bog but its proximity to the project and ecological importance warrants its inclusion in the evaluation of likely significant effects.

5.3.2 Habitats in the Receiving Environment

The habitats recorded in and beside the application area are presented and evaluated below as in "Guidelines for Assessment of Ecological Impacts of National Road Schemes" (NRA, 2009; please see Table 5-2 in Section 5.2.6.1 for an outline of the geographic frame of reference valuation scheme). Habitats have been categorized as in Fossitt (2000). A Phase 1 habitat map is shown below (Plate 5.1).

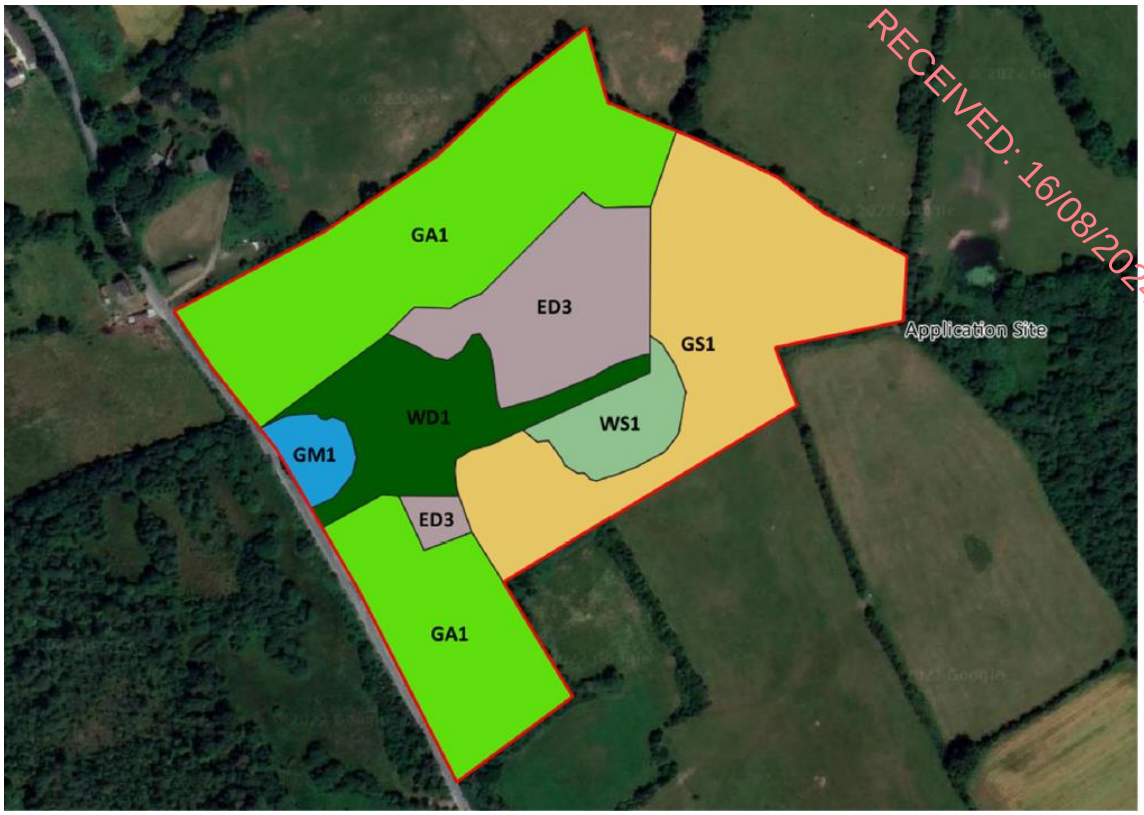

Plate 5.1. Habitat Map of site. Codes in text.

5.3.2.1 Improved Agricultural Grassland GA1

This habitat comprises approximately 60% of the application area. It is dominated by grasses – rye-grass *Lolium perenne* and meadow-grass *Poa trivialis* – with species such as dandelion *Taraxacum officinale* agg., creeping buttercup *Ranunculus repens*, ribwort plantain *Plantago lanceolata*, nettle *Urtica dioica*, creeping thistle *Cirsium arvense*, spear thistle *Cirsium vulgare* and broad-leaved dock *Rumex obtusifolius* occurring occasionally within the sward (Plate 5.2).

Improved agricultural grassland is common throughout Ireland and is evaluated as not important as a result. This habitat can be scoped out of further consideration in this report.

Plate 5.2: Field of improved agricultural grassland at NW end of site

5.3.2.2 Dry Calcareous Grassland GS1

This habitat occurs in the north-eastern section of the application site on a free-draining limestone soil. It consists of a wide range of grasses and broadleaved herbs (Plate 5-2). Grasses include bent *Agrostis capillaris*, meadow-grass *Poa pratensis*, crested dog's-tail *Cynosurus cristatus* sweet vernal-grass *Anthoxanthum odoratum* meadow foxtail *Alopecurus pratensis*, quaking grass *Briza media*, timothy *Phleum pratense*, cock's-foot *Dactylis glomerata* and Yorkshire-fog *Holcus lanatus* with more local patches of yellow oat-grass *Trisetum flavescens* and downy oat-grass *Avenula pubescens*. The grass-like field clubrush *Luzula campestris*, glaucous sedge *Carex flacca* and spring sedge *C. caryophyllea* also occur in a few places where the soil is thin. The broadleaved herbs include:

Bulbous buttercup	*Ranunculus bulbosus*
Yarrow	*Achillea millefolium*
Common knapweed	*Centaurea nigra*
Selfheal	*Prunella vulgaris*
Common Bird's-foot Trefoil	*Lotus corniculatus*
Lady's bedstraw	*Galium verum*
Burnet saxifrage	*Pimpinella saxifraga*
Heath speedwell	*V. officinalis*
Field scabious	*Knautia arvensis*
Sandwort	*Arenaria serpyllifolia*

Mosses include *Rhytidiadelphus squarrosus* and *Scleropodium purum* while a single spotted orchid *Dactylorhiza fuchsii* was present in early July. In autumn quite high numbers of waxcap fungi were fruiting, especially *Cuphophyllus virgineus.* This is a characteristic group for established pastures that are not overly fertilised.

The condition described above obtained in 2019-2022. Further examination in 2024 showed that it occurred over restricted patches only. In general the grassland is one of the Group 3 series as described by O'Neill et al (2013). However only very small parts could be called the *Briza media-Thymus polytrichus* type, the EU Annex I habitat called 3a in that paper. To determine the distribution of these types nine relevés were carried out in May 2024 (see below). The locations were at 9m intervals in a random zig-zag route through this grassland. The first four illustrate the vegetation within the site, the other five lie outside it but there is no boundary and the field is managed as one unit and grazed by horses.

Table 5.6: showing % cover of plant species in sampled quadrats in grassland

Species	1	2	3	4	5	6	7	8	9
Anthoxanthum odoratum	30	40	40	15	40	60	20	5	10
Poa trivialis	-	30	10	40	-	5	30	10	10
Cynosurus cristatus	-	5	10	10	-	10	+	30	20
Lolium perenne	-	-	-	10	-	-	20	10	40
Holcus lanatus	-	-	+	5	5	5	15	-	20
Poa pratensis	5	-	10	+	10	-	5	10	+
Festuca rubra	5	-	+	5	10	10	-	-	-
Luzula campestris	20	5	10	+	+	5	-	-	-
Dactylis glomerata		+	-	+	+	+	5	5	-
Plantago lanceolata	15	5	+	5	10	5	-	+	-
Achillea millefolium	10	+	+	+	5	10	-	-	-
Trifolium repens	-	+	5	+	5	5	+	10	5
Senecio jacobaea	5	+	+	+	-	5	-	5	+
Cerastium fontanum	+	+	-	+	+	+	+	-	+
Ranunculus bulbosus	5	+	10	+	15	-	+	+	-
Taraxacum agg	5	5	-	+	5	+	-	+	-
Veronica chamaedrys	+	5	-	+	10	-	-	-	-
Ranunculus repens	-	-	-	-	5	5	-	-	-
Bellis perennis	-	+	-	-	-	-	-	10	-
Hypochaeris radicata	5	+	-	-	-	-	-	-	-
Rumex acetosa	-	-	+	-	-	+	-	-	-
Trifolium pratense	5	+	-	-	+	-		-	-
Veronica arvensis	-	+	-	-	-	-	-	+	-
Pimpinella saxifraga	+	+	-	-	-	-	-	-	-
Bromus hordeaceus	-	+	-	+	-	-	-	-	-
Agrostis capillaris	-	+	5	+	-	-	-	-	-
Poa annua	-	-	-	-	-	-	-	+	-
Cerastium glomeratum	-	-	-	-	-	-	-	+	-

Additional species on edge of quadrat: pignut Conopodium majus, bird's-foot trefoil Lotus corniculatus, bluebell Hyacinthoides non-scriptus and quaking grass Briza media.

This data show that none of the high quality indicators of the Annex I grassland occurred within the quadrats sampled and only two outside them – Lotus corniculatus and Briza

media. The absence of the two sedges Carex flacca or C.caryophyllea was particularly striking. The community in fact fits better into the 3d type in O'Neill et al (ibid.) – Cynosurus cristatus-Trifolium pratense grassland.

It is clear in the field that the pasture is now occasionally fertilised and that the vegetation is responding to this input. The prominence of Poa trivialis and Lolium perenne in the recent survey and the total absence of mosses illustrate this, as does the fact that the more interesting ground (relevés 1-3) is on a small hill where tractor spreading of fertiliser would be impossible. It was here that many of the species noted for the dry calcareous grassland in 2022 occurred. Some probably survive but were not sampled by the more random methods now used.

In summary the habitat does not qualify as the Annex I habitat – Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia). It is evaluated as of Local Importance (higher value).

Plate 5.3: Area of dry calcareous and neutral grassland in the north-eastern section and highest point of the application site.

5.3.2.3 (Mixed) Broadleaved Woodland WD1

This habitat occurs on a small scale in the central section of the application site (Plate 5-4) and is composed of mature and semi-mature ash *Fraxinus excelsior*, beech *Fagus sylvatica*, sycamore *Acer pseudoplatanus*, willow *Salix caprea* and Scot's pine *Pinus sylvestris* which are interspersed with the occasional planted Douglas fir *Pseudotsuga menziesii.* Tree density is patchy and grades into open grassy spaces with regenerating brambles *Rubus fruticosus*. A few herbaceous species occur at ground level such as yellow pimpernel *Lysimachia nemorum*, wood dock *Rumex sanguineus*, wood sanicle *Sanicula europaea* and celandine

Ficaria verna. Where the woodland abuts on the former scrub areas, primrose *Primula vulgaris*, pignut *Conopodium majus* and wood avens *Geum urbanum* are frequent.

This habitat in the application site is evaluated as of Local importance (Lower value).

Plate 5.4: Mixed broadleaved woodland area in the centre of the application site.

5.3.2.4 Recolonising bare ground ED3

Scrub was a feature of the central area of the site until March 2022 when practically all of it was cleared by the grazier (see aerial photo above). What remains is a bed of shredded wood and twigs punctuated by regenerating blackthorn *Prunus spinosa*, bramble *Rubus fruticosus* and hawthorn *Crataegus monogyna* as well as some wild raspberry *Rubus idaeus* and an abundance of bracken *Pteridium aquilinum*, Yorkshire fog *Holcus lanatus* and sweet vernal grass *Anthoxanthum odoratum*. Sorrel *Rumex acetosa* and knapweed *Centaurea nigra* are frequent and there is some remaining hedge woundwort *Stachys sylvatica* and field rose *Rosa arvensis.* The lower section around a former dwelling supports a sward of ground elder *Aegopodium podagraria*, sweet rocket *Hesperis matrionalis* and Welsh poppy *Meconopsis cambrica*.

The habitat has been classified as recolonising bare ground but may return to scrub depending on the grazing pressure. It has little current value.

5.3.2.5 Scrub WS1

An open gorse scrub occurs on a slope on the western side of the grassland area and as a hedge along the lower field. Scattered plants of perforate St John's wort *Hypericum perforatum*, burdock *Arctium minus*, wall lettuce *Mycelis muralis* and white campion *Silene*

latifolia occur here with a little hemlock *Conium maculatum*. The habitat is of low conservation interest.

5.3.2.6 Hedgerow/Treeline WL1/WL2

Field boundaries surrounding the entire site are made up of a hedgerow/treeline composition. The species are typically hawthorn, blackthorn, gorse, holly, dog-rose *Rosa canina* and bramble with occasional beech, ash, horse chestnut *Aesculus hippocastanum* and sycamore. These linear habitats are stockproof and generally in good condition.

The eastern section of the marginal hedge contains several trees/bushes of Irish whitebeam *Sorbus hibernica* which is rare in the county and otherwise found around Portlaoise. Because of this species, this habitat within the application site is evaluated as of Local importance (Higher value).

Plate 5.5: Hedgerow/treeline comprise field boundaries around the entire application site.

5.3.2.7 Marsh GM1

A small wetland occurs at the southwest base of the wooded area. It has a shallow organic layer with a fluctuating watertable. The vegetation consists of sedges and grasses, especially bottle sedge *Carex rostrata*, brown sedge *C. disticha*, oval sedge *C. leporina* and carnation sedge *C. panicea* as well as grasses – red fescue *Festuca rubra*, quaking grass *Briza media* and sweet-grass *Glyceria notata*. The broad-leaved plants include

Devil's-bit	*Succisa pratensis*
Purple loosestrife	*Lythrum salicaria*
Tormentil	*Potentilla erecta*

Fleabane	*Pulicaria dysenterica*
Lesser spearwort	*Ranunculus flammula*
Ragged robin	*Silene flos-cuculi*
Marsh bedstraw	*Galium palustre*
Marsh willowherb	*Epilobium palustre*
Square-stemmed St John's wort	*Hypericum tetrapterum*
Spotted orchid	*Dactylorhiza fuchsii*

A number of willows occur, some of them killed by bark-stripping, and there is also a little Sherard's rose *Rosa sherardii* at the edge. This is an uncommon rose, more usually associated with hilly regions to the south.The marsh is a good if very small habitat and can be thought of as of Local importance (Higher value) though it is replicated by habitats just to the west.

*5.**3.2.8 Protected Flora***

No protected plant species were found during the habitat surveys and there are no Flora Protection Order records within hectad S48, the location of the proposed sand and gravel pit (NBDC, 2019).

*5.**3.2.9 Invasive Plant Species***

No invasive plant species were found during the Phase I habitat survey. Records of the high impact invasive species, Japanese Knotweed *Fallopia japonica* and Rhododendron *Rhododendron ponticum*, were registered in 2010 and 2007 elsewhere in the hectad S48.

5.3.3 Fauna in the Receiving Environment

5.3.3.1 Birds

The site survey recorded the presence of a number of common bird species. The presence of pockets of scrub and broadleaved woodland makes for suitable nesting and roosting sites for a range of these species. A buzzard *Buteo buteo* was recorded on two occasions circling and soaring over the site, most likely hunting in the surrounding agricultural fields. A total of 14 species were recorded in the application area.

Bird species diversity and abundance recorded during the site visits are shown in Table 5.6. No species cited as Red-listed under the Birds of Conservation Concern in Ireland (Gilbert *et al*. 2021) were recorded during the walk-over survey. The species assemblage is evaluated as important at the Local level.

Common and Scientific Name	Total no. birds observed	Conservation Status	
		BoCCI	Annex I
Buzzard *Buteo buteo*	2	Green	No
Blackbird *Turdus merula*	2	Green	No
Song thrush *Turdus philomelos*	1	Green	No
Coal Tit *Periparus ater*	3	Green	No
Chaffinch *Fringilla coelebs*	5	Green	No
Great Tit *Parus major*	1	Green	No
Goldcrest *Regulus regulus*	2	Amber	No
Robin *Erithacus rubecula*	3	Green	No
Dunnock *Prunella modularis*	2	Green	No
Rook *Corvus frugilegus*	8	Green	No
Hooded Crow *Corvus cornix*	8	Green	No
Wood Pigeon *Columba palumbus*	3	Green	No
Wren *Troglodytes troglodytes*	3	Green	No
Chiffchaff *Phylloscopus collybita*	1	Green	No

Table 5.7: Bird species and abundance recorded during surveys in the application area.

Experience of the habitats elsewhere in Laois and adjoining counties suggest that sparrowhawk, blackcap, whitethroat and linnet are very likely to occur, at least on a sporadic basis; they all are recorded within this 10km square by Balmer *et al* (2013). Of these the linnet has an amber rating in the current Birds of Conservation Concern. The bird fauna in general has been reduced by the clearance of scrub.

5.3.3.2 Ground Mammals

Evidence of badger activity was noted in 2020 and 2022 with an out-of-use sett in the northern site boundary (see Badger & Bat report Appendix). There has been no further activity around this sett in 2022, 2023 or 2024. Two individual badgers were seen feeding in 2022 but not in the subsequent surveys. In all seven mammal species were recorded

Badger	*Meles meles*
Pine marten	*Martes martes*
Irish hare	*Lepus timidus hibernicus*
Rabbit	*Oryctolagus cuniculus*
Wood mouse	*Apodemus sylvaticus*
Fox	*Vulpes vulpes*
Grey squirrel	*Sciurus carolinensis*

Additional records for hectad 48 are shown in the table below with the likelihood of visits from the species.

Species	Suitable Habitat	Protected Status
Eurasian Otter	Near to site	Habitats Directive Annex II and Wildlife Act
Pine Marten	On site	Habitats Directive Annex II and Wildlife Act
Mountain (Irish) Hare	On site	Habitats Directive Annex V and Wildlife Act
Hedgehog	Near to site	Wildlife Act
Fallow Deer	Near to site	Wildlife Act
Irish Stoat	On site	Wildlife Act
Pygmy Shrew	On site	None
Greater white-toothed shrew	Near to site	None
Rabbit	On site	None
Bank Vole	On site	None
House Mouse	Near to site	None
Brown Rat	Near to site	None
Feral Goat	Near to site	None
American Mink	Near to site	None

Table 5.8: Other mammal records for hectad S48 in which the application area is located. Source: National Biodiversity Data Centre (2024).

5.3.3.3 Bats (see Badger & Bat report in Appendix)

The separate surveys in 2022 and 2024 found that no animals were using the trees on site as roosts. However six species were encountered feeding, i.e.

Leisler's bat
Common pipistrelle
Soprano pipistrelle
Myotis including Natterer's bat & Daubenton's bat
Brown long-eared bat

The application area is considered to be important to feeding bats at a Site level.

5.3.3.4 Amphibians and Reptiles

The Common Frog *Rana temporaria* and the Smooth Newt *Lissotriton vulgaris* are afforded protection under the Wildlife Act (1976) and Wildlife (Amendment) Act, 2000. Both occur in hectad S48 (NBDC, 2019 – accessed 16/12/2019), on Abbeyleix Bog and a frog was seen in the marshy area at the NW corner of the site.

The Viviparous lizard *Zootoca vivipara* is also afforded protection under the Wildlife Act (1976) and Wildlife (Amendment) Act, 2000. It occurs on Abbeyleix Bog but none was seen during the habitat survey, as expected given the habitats present.

5.3.3.5 Invertebrates

There was no specific invertebrate survey during site analysis except for noting obvious bumble bees and butterflies. Speckled wood, small white, small tortoiseshell and common blue butteflies were encountered as well as early, white-tailed, red-tailed and common carder bumblebee *Bombus pratorum*, *B. lucorum*, *B. lapidarius* and *B. pascuorum*. Table 5.8 lists other invertebrates that have been recorded in the appropriate hectad S48 (NBDC, 2019 – accessed 16/12/2019). Considering the limited extent and quality of semi-natural scrub and woodland habitat within the site, it is unlikely any rare or threatened invertebrate fauna occur.

Species Name (Latin)	Faunal Group
Common Tiger Beetle *Cicindela campestris*	Insect – beetle
Ringlet	Insect – butterfly
Silver-washed Fritillary *Argynnis paphia*	Insect – butterfly
Peacock *Inachis io*	Insect – butterfly
Meadow Brown *Maniola jurtina*	Insect – butterfly
Comma *Polygonia c-album*	Insect – butterfly
Holly blue *Celastrina argiolus*	Insect – butterfly
Large Red Damselfly *Pyrrhosoma nymphula*	Insect – damselfly
Brown Aeshna *Aeshna grandis*	Insect – dragonfly
Chevron *Eulithis testata*	Insect – moth
Flame Carpet *Xanthorhoe designata*	Insect – moth

Table 5.9: Invertebrate species recorded in hectad S48 likely to occur on site (Source: National Biodiversity Data Centre (2019) accessed 16/12/2019)

The proposed application area is considered to be important to invertebrates only at a Site level.

5.4 Likely Significant Effects

5.4.1 Source-Pathway-Receptor-Effect Conceptual Model

Using Source-Pathway-Receptor-Effect (consequences) modelling, all characteristics and activities associated with the proposed development are evaluated for their likelihood to cause significant effects (in the absence of mitigation) on the sensitive ecological aspects of the receiving environment. The conceptual model is presented in Table 5.10 below.

The description, significance, magnitude, probability, duration and type of effects are then described in the subsequent subsections in accordance with the CIEEM Guidelines of Ecological Impact Assessment in the UK and Ireland (2019).

Table 5.10: Source-Pathway-Receptor-Effect model.

Source	Pathway	Receptor	Effect (Consequences)	Potential for Significant Effects (Y/N)
Sand and gravel excavation activities	Surface water runoff	• Natura 2000 Designated Sites	Indirect effects through surface water contamination and sediment runoff.	**No.** Absence of surface water hydrological connectivity between the site and local water courses ensures no measurable effects.
	Groundwater flow-paths		Indirect effects through groundwater contamination by virtue of percolation of hydrocarbons.	**Yes.** Project is in catchment of Ballymullen Stream which feeds into the Nore.
	Surface water runoff	• NHAs and pNHAs	Indirect effects through surface water contamination and sediment runoff.	**No.** Absence of surface water hydrological connectivity between the site and local water courses ensures no measurable effects.
	Groundwater flow-paths		Indirect effects through groundwater contamination by virtue of percolation of hydrocarbons.	**Yes.** Project is in catchment of Ballymullen Stream which feeds into the Nore pNHA. **No.** Absence of groundwater hydrological flow-path connectivity between the site and local water courses ensures no measurable effects on other sites.
	Surface water runoff	• Water quality/Aquatic Ecology/Adjacent habitats	Indirect effects through surface water contamination and sediment runoff.	**No.** Absence of surface water hydrological connectivity between the site and local water courses ensures no measurable effects. Rainwater accumulations would disperse in substrate
	Groundwater flow-paths		Indirect effects through groundwater contamination or quality by virtue of	**Yes.** Probable connection of site as source area to water quality in lagg area of Abbeyleix Bog, including spring.

Source	Pathway	Receptor	Effect (Consequences)	Potential for Significant Effects (Y/N)
			percolation of hydrocarbons or alteration of gravel body	Significance of effect evaluated in Section 5.4.6.
	Land take	• Habitats (effects on birds and mammals)	Direct reduction/loss of habitats within the application area.	**Yes.** Significance of effect evaluated in Section 5.4.6.
	Fugitive Dust Emissions	• Habitats	Indirect effects on vegetative habitats within the adjacent Abbeyleix Bog through fugitive dust emissions.	**Yes.** Significance of effect evaluated in Section 5.4.7.

5.4.2 Potential Effects on Designated Sites

5.4.2.1 European & Nationally Designated Sites

There are four EU sites located within a 15km radius of the application area (see Table 5.4) as well as six pNHA. A Natura Impact Statement has been prepared for the former, which evaluates the potential for significant effects on the integrity of the EU site network. The NIS accompanies the planning application as a stand-alone document.

Groundwater flow from the sand and gravel aquifer of the project area is assumed to discharge in a westerly direction and enter the River Barrow and River Nore SAC and River Nore SPA indirectly (either via the Ballymullen Stream, spring discharge or as baseflow). The River Nore/Abbeyleix Woods complex pNHA is similarly at potential risk. The SAC and SPA are located approximately 2.2km west and downstream of the proposed development site but since there will be no alteration of the regional hydrogeological regime (see Water section 7.7.4.2) there is no likelihood of physical effects on these designated areas. All other designated sites are located further from the site and have no hydrogeological connection to it. They therefore cannot be impacted by the proposed development.

However there could be an oil loss to groundwater during construction or operation so the possibility exists of it entering the Ballymullen Stream by base flow.

5.4.2.2 Mitigation

During the extraction of each phase an infiltration swale will be dug on the lower side of the excavations to ensure any run-off percolates into the ground. A 30m wide zone (as shown in Figure 3.4, Chapter 3) will also be left along the road with its existing vegetation. This will act as a soakaway and natural buffer for the wetland habitats west of the road and for the Ballymullen Stream.

The following mitigation is proposed for hydrocarbon materials:

- All plant and machinery will be serviced before being mobilised to site;
- Refuelling will be completed in a controlled manner, at all times, in the specially designed fuelling facility on site that drains to via a full retention hydrocarbon interceptor (refer to Drawing PP-110-04A);
- Only designated trained operators will be authorised to refuel plant on site;
- Procedures and contingency plans will be set up to deal with emergency accidents or spills;
- An emergency spill kit with oil boom, absorbers etc. will be kept on-site for use in the event of an accidental spill; and,
- Runoff from the site entrance and overflows from the wheel wash and refueling area will be directed to a silt trap and full retention hydrocarbon interceptor* prior to discharge to ground.

Drainage from the proposed refuelling area, the wheel wash, and the site entrance will pass through a silt trap and full retention oil interceptor prior to discharge to ground via a soakaway.

*The full retention hydrocarbon interceptor will be sized to cope with a 10-year storm return period

5.4.2.3 Residual Effect

Any effect on the Natura 2000 site network and on the Nationally designated sites from the use of hydrocarbons on site is unlikely to occur. At worst it would have a medium term and slight effect on the nearest part of the watercourse. Wetland systems, especially peatlands, are effective in breaking down hydrocarbons, both natural and man-made (Moore et al. 1999).

5.4.3 Potential Effects on the Existing Environment

5.4.3.1 Habitats and Mammals

The removal of broadleaved woodland and grassland will result in the irreversible and permanent loss of these habitats from the site. All the woodland will be removed (in total 0.74ha) but only about 12% of the area of calcareous grassland (1.96ha) as a whole, because the habitat extends 600m outside the site to the southeast.

5.4.3.2 Mitigation

The landscape chapter details the planting and preparation measures for restoration to be incorporated into each phase of the extraction. Broadly these are to establish tree cover on the side slopes of the pit and grassland for agricultural use on the base. The front hedge will be replanted to allow for traffic visibility while all marginal hedges will be retained.

The use of native species of woody plants is emphasised in the Notice Nature publication for extractive developments while the maintenance and replacement of hedgerows fulfils the network objectives.

Once complete the landscaping will result in a partial replacement of the woodland area with benefits to biodiversity that will increase in time.

The possibility of grazing the central grassy areas will be examined once several phases have created sufficient area. Grazing by sheep would limit potential damage to tree growth.

Biosecurity measures will be employed during the construction to avoid the introduction of any non-native invasive species on site. Any hired equipment and machinery used on site will be washed before its arrival on site. The NRA guidelines *'The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads'* (2010) will be followed for the project as there are currently no invasive species.

5.4.3.3 Residual Effect

There will be a significant loss of calcareous grassland habitat in the area (12% of total) since it is one of relatively few examples in the locality that is managed by extensive grazing. However, the greater part of this habitat (off-site) to the southeast will remain intact. For the site area it may be seen potentially as a medium-term effect since the community could eventually regenerate on remaining substrate if managed appropriately.

Although extraction will be limited to the current phase at any time, the site area will be closed off from grazing so the herb species in the grassland will flower more freely than at present. This will be a beneficial impact to pollinators and other invertebrates and would be seen as a medium-term positive effect.

The loss of woodland will have a permanent effect in the long-term. Future woodland is likely to be linear and comparable to treelines/hedgerows although its total area will be the same.

The removal of a feeding area for badgers and bats will reduce their local populations though because of the size of badger territories and the presence of foraging habitat west of the road, this effect is likely to be significant on site but slight in the general area. Bat numbers are likely to recover as the new tree planting grows.

5.4.4 Disturbance/displacement of breeding birds

Breeding birds occur in the woodland, scrub and hedges through the site and will be affected by habitat loss, both breeding sites and feeding area. This effect will be permanently negative for the woodland species – buzzard, sparrowhawk, rook, hooded crow and chiffchaff. There is alternative habitat along the edges of Abbeyleix Bog, however.

5.4.4.1 Mitigation

No removal of vegetation will be undertaken on-site between 1st March and 31st August (incl).

5.4.4.2 Residual effect

There will be a moderate reduction in the breeding bird population for the long-term.

5.4.5 Disturbance/displacement of mammals

The reduction and loss of habitat area will obviously affect breeding and foraging mammals.

5.4.5.1 Mitigation (see badger report for more detail)

- No interference with ground levels will occur within 30m of the sett identified consistent with the NPWS procedure. NPWS will be notified before work begins.
- Measures will be taken to allow access through the peripheral fencing for badgers and other mammals

5.4.5.2 Residual impact

New woodland habitat on the side slopes of the extraction area will remain unsuitable for badger feeding. The impact may be seen as a likely, long-term effect but not significant to the resident social group of badgers.

5.4.6 Potential effects on surrounding habitats (Abbeyleix Bog)

The Water chapter notes that there is no likelihood of any surface water flow from the project area to the lands west of the road as the gravel material on site is coarse and very permeable to infiltration. The development occurs in the catchment of the Ballymullen Stream which runs south about 340m east of the project site. It then curves westwards to reach the basin of Abbeyleix Bog (Figure 7.2). Although originally divided around the bog edge, the majority of the water now flows northward in an artificial channel inside the lagg zone (and therefore west of the fen areas). Water from this stream is unlikely to infiltrate the fen which is fed by general groundwater levels controlled by infiltration from the east and the watertable on the bog.

As discussed in Section 7.7.4.6 of the Water chapter, there will be no impact on groundwater flow volumes/quantity to the springs/wet woodland as the catchment for collection will remain the same. Changes in quality might be thought possible from contamination of the groundwater by hydrocarbons or from a change in calcareous content. However, recent work on the groundwater included in the Water chapter (Section 7.7.4.6) shows that the flow feeding the petrifying spring area (including the transition mire) originates somewhat to the south of the proposed extraction site, not from within it. It appears therefore that the calcareous input is not controlled by processes within the extraction site and is most likely an effect originating in the underlying marl.

The potential hydrocarbon contamination risk is assessed to be significant in the medium-term but can be prevented.

5.4.6.1 Mitigation

Phase 4 of the extraction plan is significantly reduced and there will be no extraction in the southern end of the site immediately upstream of the petrifying spring. The existing vegetation will be retained so that the situation will remain as it is today.

Measures for the prevention of oil contamination are listed in Section 5.4.2.2.

5.4.6.2 Residual impact

No significant effects on groundwater amount or quality are expected.

5.4.7 Airborne Dust

Fugitive dust arising from sand and gravel extraction activities, bare ground and stockpiles/overburden has the potential to become deposited on habitats in the adjacent Abbeyleix Bog. Dust may affect photosynthesis, respiration, transpiration and allow the penetration of phytotoxic gaseous pollutants. It may also change the pH of surrounding land if an acid peatland and *Sphagnum* moss is involved. Visible injury symptoms may occur and generally there is decreased productivity (Farmer, 1993, Kovatsa 2021). In the absence of mitigation, these effects have the potential to be moderate to significant at a Site level. However, the fact that the nearest communities are dominated by sedges rather than *Sphagnum* reduces any potential risk.

5.4.7.1 Mitigation

Measures to avoid likely effects of dust emissions on Abbeyleix Bog are outlined in Chapter 9 of the EIAR. They include a wheel-wash at the entrance to the site and the use of a water bowser. Also the phased pattern of extraction will limit the area of exposed sediment at any one time. The absence of grading at the site will reduce the exposure of fines (which could become wind-borne) while the extracted material will be damp over much of the year.

The seeding of berms and fully extracted areas will be done as soon as they are exposed (see landscape section).

5.4.7.2 Residual effects

No significant effects are expected from the operation of the quarry.

5.4.8 Unplanned Events

Section 171A (b) (ii) of the Planning and Development Act 2000, as amended, in addition to the 2014 EIA Directive both require an EIAR to include such examination, analysis and evaluation of the expected direct and indirect significant effects on the environment derived from the vulnerability of the proposed development to risks of major accidents or disasters that are relevant to the development.

There are no unplanned events identified in relation to biodiversity to which the proposed development could potentially be vulnerable to.

5.4.9 Potential In-combination Effects

There are a number of existing sand and gravel pits in the area, the closest one is a small disused pit located approximately 500m to the southeast of the site. This is currently used as a Defence Forces and An Garda Síochána Firing Range.

The existing Booth Precast Products manufacturing facility is located 1.3km to the south of the site. Material extracted from the proposed development will be transported to this facility.

The impacts of this plant on Abbeyleix Bog were significant in the past with an escape of calcareous water to the lagg area and into the Owveg River. The settlement arrangements for silt were inherited from a previous owner but werereplaced by a new, closed circulation system (2021). Silty water from the washing plant is pumped to the northern lagoon in the NW corner and after settlement flows through a hydrobrake to the southern lagoon. This clarified water joins the flow from two other silt ponds on the eastern side to produce the wash water. Only the southernmost pond on the eastern side discharges through a gravel filter and joins the field drain along the southern boundary.

The continuation of use of the concrete plant will not be a cumulative impact with the proposed extraction as it does not now have negative ecological impacts to the surrounding area (Abbeyleix Bog).

Other sand quarries in the Abbeyleix area are located at Knockbaun (Spink) and Dysart. In ecological terms there is no communication between Ballymullen and these other areas and no cumulative impacts are likely.

There will be improvements to the local road infrastructure arising from a successful grant of planning permission for the proposed development. The nature of these works and the design and management of any associated environmental controls will be agreed with the local authority. The public roadworks envisaged are relatively small in scale and will be carried out by the APplicant under licence from Laois County Council's and on the Local Authority's behalf in accordance with the *Roads Act, 1993* (as amended) in the event of a grant of permission for the proposed development.

There are no other known permitted or proposed developments in the local area that are likely to act in combination with the proposed development.

5.4.10 Evolution of Site in Absence of Project

The current habitats and vegetation are controlled by farming practices and if these continue without changing, the habitats will likewise remain as they are. Agricultural intensification of the calcareous grassland would devalue its plant communities.

5.4.11 Summary of Likely Effects

The main impacts identified as a result the proposed development relate to the loss/reduction of habitat for breeding birds and mammals and a reduction of the calcareous grassland. It will not act in combination with the process area to the south

to produce a cumulative effect on the local ecology as this has no significant ecological effects on the environment of Abbeyleix Bog. There are no other developments in the area which could result in a significant cumulative impact.

Table 5.11 presents a summary of the likely effects on the sensitive ecological receptors on and near the application area.

Table 5.11: Residual effects of the proposed application on significant elements.

Element	+/-	Extent	Magnitude	Duration	Reversibility
Woodland	-	All at outset of site clearance	0.7ha	Medium-term	New planting will substitute in part
Calcareous grassland	-/+	Phases 5-8	1.89ha	Short-term Temporary benefit to insect life	Yes. Habitat could re-develop on new substrate
Mammal	-	Removal of woodland species	0.7ha feeding area for badgers	Medium-term	New planting will substitute in part
Birds	-/+	Loss of woodland species.	Decline of 30% of total species	Medium-term. Hedgerow birds to benefit from increased cover	Yes, new trees will reach mature size
Adjacent habitat (Abbeyleix Bog)	0	None	None	None	

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http://ec.europa.eu/environment/water/water-framework/

Appendix 5.1: *Bat and Badger Assessment*, dated July 2024, by Wildlife Surveys Ireland

A Bat and Badger Assessment of The Proposed Quarry at Ballymullen, Abbeyleix, County Laois

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Contents

Non-Technical Summary

Surveys for protected mammals at the proposed quarry site at Ballymullen were undertaken in May and July 2022 and again in February and June 2024 to include responses to observations made by Laois County Council to the planning application. The surveys provided evidence of feeding and commuting bats of six species and the presence of an outlier badger sett, feeding

and commuting badgers and the presence of pine martens, foxes, squirrel signs (probably grey), red deer, Irish hare and rabbit warrens. The impacts to the mammals range from the loss of a minor badger sett, loss of foraging for badgers and other ground mammals, the loss of mature trees that may lead to bat roost loss and loss of foraging and risk to bats without proper mitigation. The mitigation proposed includes an examination of all trees prior to removal, the checking of badger sett(s) prior to closure by a badger specialist (in advance of heavy plant activity within the site), absence of lighting, provision of feeding areas for bats following extraction of materials, provision of bat boxes. The site shall be monitored following one year of operation for residual impacts. The bat boxes shall be checked after 2 years for use. Measures to correct the failure of mitigation shall be put in place if required.

Introduction

Most of Ireland's mammals enjoy protection under the Wildlife Act (1976) and the more recent updating of this legislation (Wildlife (Amendment) Act 2000, S.I. No. 94 of 1997, S.I. No. 378 of 2005, European Communities (Natural Habitats) (Amendment) Regulations, 2005). In conjunction with the enactment of the Habitats Directive into Irish legislation, all native mustelid species and bat species are protected with further protection given to otters and lesser horseshoe bats. Lesser horseshoe bats are not found in County Laois or neighbouring counties. Bats account for nine of Ireland's terrestrial mammal species, approximately one quarter of the species of the Irish land mass. All of the species found to date and indeed all bat species that may remain undetected up to the present are afforded legal protection under Irish and EU legislation and agreements (Wildlife Act (1976), Wildlife (Amendment) Act (2000), S.I. No. 94 of 1997 and S.I. No. 378 OF 2005 implementing the EU Habitats Directive, Bonn Convention (The Convention on the Conservation of Migratory Species of Wild Animal) and the Bern Convention (Convention on the Conservation of European Wildlife and Natural Habitats).

A speedy and productive means of determining the mammal fauna within a site is to walk the entire site concerned, paying particular attention to all hedgerow, woodland, watercourses, fence lines, paths etc. to locate mammal signs. Determining the fauna of the surrounding area may involve a much greater level of assessment if the aim of the survey is to catalogue all

mammals in all townlands but this is too detailed for the aim of creating mitigation for most developments except where the species under consideration are particularly elusive or specialised and leave few signs. The survey undertaken within the site of the proposed quarry at Abbeyleix allows a targeting of mitigation measures to the appropriate or most efficient sites to prevent accidental death or injury in and to assist in providing mitigation for losses brought about in feeding and commuting.

Excavation and extraction create sequential changes to a site that usually lead to considerable landmass loss, vegetation loss and a change from a green site to a greater level of exposed stone. Many mammals that have legal protection may be placed at risk from this including bats, badgers, otters, pine martens, red squirrels and hares to name but a few. While larger mammals such as badgers and otters may be monitored and protected once their presence is noted, bats pose a greater challenge due to their life cycle, small size, secretive and nocturnal habits and their choice of resting places ranging from ground level (or subterranean) up to treetops. In the current site, felling of trees creates potential risks to bats.

In relation to badgers, the clearance of hedgerow or scrub poses the risk of the removal of the badgers' home burrow and the associated burrows (all of which are known as setts) that are used seasonally or occasionally throughout the year. In winter, this is especially risky if the sett is not identified before hedgerow removal operations, as this is the time when badger cubs are born. In the classification used in this report, setts are considered to fall into four categories, which are best elaborated by long-term studies but can be interpreted to a relatively good accuracy in terms of status based on basic observations.

The basic sett type within which badgers are typically present throughout the year is the main sett. This is almost always the sett within which cubs are born. Bedding outside the entrance to these setts often identifies their use as such and paw prints and dung pits or latrines nearby also assist in their categorisation. There are typically a number of entrances to a main sett, some of which may be disused. Paths leading from the main sett are often very easy to trace for some distance.

Annexe setts are similar in construction to main setts and are typically accessed by a number of entrances. They are often discernibly connected to a main sett by well-worn paths, which is within 150 metres of the annexe sett. Badgers do not necessarily use this type of sett throughout the year, and they may be inactive at the time of any short-term study. Subsidiary setts are again not always active throughout the year. There may be a number of entrances to the sett, and they are not clearly associated with any other sett.

The last type of sett, the outlier sett, may only have one entrance and has no path leading to it. This type of sett is only sporadically used and may even be in areas subject to flooding or seasonally unsuitable to badger use. These setts may be overlooked if they have remained inactive for several weeks.

Setts may be under threat from the operation of a quarry if they are adjacent to the excavation activity or are affected by the increased human activity. Setts outside of this land take area may also be threatened with damage from the normal activities of the heavy plant equipment required for extraction. For example, if a badger sett entrance were located outside of the land take of the project but led to a system of tunnels that lay under the working area of the heavy plant, there is a clear risk that the tunnels would be crushed under the repeated movement of equipment. These tunnels may occasionally go as deep as two metres underground (or deeper) but are also liable to surface to shallower depth to avoid rocky substrate or water.

Thus, badger setts may be affected by the immediate impact upon them from the excavation and removal of the soil within which they are established or by the indirect destruction of tunnels that lie under the commuting corridor of equipment within the quarry.

This report deals with bats and badgers and any other mammal species encountered within or immediately adjoining the proposed quarry site. This report also addresses a Request for Further Information issued by Laois County Council in response to the submission of a Planning Application at the site (Planning Ref. No: 23/60390). Surveys for badgers were undertaken in 2022 in the summer period and was supplemented with seasonally appropriate surveying in February 2024 as proposed by Laois County Council. Bat surveys were

undertaken during 2 survey periods at times of the year when bat activity is very high (May and July) and therefore the assessment provides a comprehensive picture of the protected fauna of the site. Mitigation is proposed for the preparatory phase and also the operational phase of the quarry for badgers and bats. Mitigation has been adjusted to address an observation regarding the conflict of lighting mitigation while no lighting will be installed for the extraction at this site.

Bats are a widespread element of the Irish fauna. They are known to occur from much of the rural landscape and to a lesser extent, the urban environment and here they occupy buildings and occasionally trees for short or long periods. Houses and other buildings are a vital element of the annual cycle of all Irish bat species and at no time more so than the period May to August. But many bats may also avail of trees or buildings as hibernation sites. In sites such as the proposed quarry site where there are several buildings surrounding but not within the site, there is the potential for roosting within any one of the buildings if appropriate conditions are met to provide safe shelter from the elements and predation. Furthermore, trees within the site proposed for development may have roost potential. Changes to a site including tree and hedgerow removal may destroy roosts, placing bats at risk during such procedures and may reduce the options available to bats as a roosting site and may also affect their feeding and commuting activity.

Bats are protected by Irish and EU law and to prevent unlawful injury or death, it is essential that a full understanding of the site is available in advance to protect the resident bats from unintentional disturbance, injury or death and to create a pathway by which a legal derogation and exemption may be designed in consultation with the National Parks and Wildlife Service of Department of Housing, Local Government and Heritage.

Statement of Authority

Brian Keeley is Director and Principal Ecologist with Wildlife Surveys Ireland Limited. Brian Keeley is an ecologist who studied Zoology at University College Dublin and has worked as a fieldworker surveying for bats and badgers for over 35 years. Brian has trained with Bat Conservation Trust and Bat Conservation Ireland and has been undertaking surveys since

working with Dr Tom Hayden, Zoology Mammalogy lecturer at University College Dublin. Brian has undertaken surveys for NPWS, OPW, most county councils in Ireland, Department of Education and National Roads Authority / Transport Infrastructure Ireland for whom he compiled and wrote the Guidelines documents for bats in the planning and construction of national roads. Brian has served as an expert witness for NPWS in a badger prosecution in 2023 and again in 2024 and has been issued with licences and derogations relating to bats and badgers for over 20 years. Fionn Keeley who was the second surveyor for this project is also an honours Science graduate of UCD and a Masters in Science (Palaeobiology) graduate from Bristol University. Fionn has been undertaking bat surveys for over 10 years and has surveyed throughout Ireland.

Materials and Methods

Badgers

Equipment employed:

Maps of proposed quarry, Motorola G8 Smartphone, Nikon 8 x 42 Aculon binoculars and by a Hawke Frontier ED 8 x 42 binoculars, Google Maps. Pulsar Helion XP 50 Pro Thermal Imager.

Badger presence was determined by:

1) the identification of setts or structures likely to be setts (some animal burrows may require further checking to rule out (or confirm) as badger setts).

2) badger tracks (digging and paw prints and badger dung and hairs)

The badger fauna was sought during surveys undertaken within the site over 2 separate years. The first survey was carried out over 2 dates in summer 2022: on 24th to 25th May and 27th to 28th July 2022. The follow-up survey was undertaken on 23rd February 2024. All hedgerow drains and streams, tree cover, soil and stone banks, obvious mounds or depressions and gorse within the survey band (the quarry area and adjoining areas) were examined for the presence of badger setts or other animal burrows. Any identified setts are typically considered in terms of the number of entrances, signs of activity, location relative to the development and the likelihood of alternative setts in the vicinity. The entire site was also checked for badger paw prints and tracks, badger hairs snagged in barbed wire, badger dung in latrines or single dung pits and badger snuffle holes or other digging. In 2024, any signs noted within the 2022 surveys were re-checked for badger evidence,

Motion activated cameras were installed at two locations on the edge of an extensive area of gorse to record any badger activity in July 202. An examination of the sett noted in 2022 and February 2024 was also carried out on 18th and 19th June 2024. The sett was examined for evidence of occupancy, a motion activated camera was installed to record any badger activity and a thermal imager was used for a walkover of the site at sunset and prior to sunrise. A thermal imager was also used on July 27th and 28th 2022 to determine if badgers were feeding or commuting through the site.

Survey constraints

The badger survey in 2024 was undertaken in winter, at a time when vegetation has died back, and areas are very clear overall (away from dense gorse). Nettles and dock are absent, and brambles are much clearer due to the absence of leaves or the shrivelling of remaining leaves. A follow-up evaluation of the sett and the survey area was also carried out in summer 2024 and this was more difficult for examining sett presence but was suitable for determining badger field signs and sett usage for the known sett. The first ground mammal survey was carried out in May and July 2022, a period when wild vegetation is dense and badger signs may be difficult to pinpoint.

While the February 2024 survey was undertaken in winter, the gorse was still almost impenetrable overall, and the assessment of the gorse concentrated on determining if there were fresh badger tracks entering the gorse from any angle. The gorse was checked around its circumference on 2 occasions entirely for any evidence of badger tracks to reduce the risk of overlooking tracks. All possible access points were entered until the gorse became impenetrable.

Bats

Equipment employed: 2022 Date of survey: 24th to 25th May 2022 and 27th to 28th July 2022
Map of Abbeyleix, County Laois 2 smartphone makes with digital camera
Anabat Walkabout Broadband Bat detector
Echometer Touch 2 Pro broad spectrum detector Songmeter Mini Bat static monitor x 2
This assessment included a visual inspection from ground level of trees and shrubs and scrub within the site and adjacent areas in May and July 2022 and again in February 2024. A bat activity survey was undertaken on 24th May 2022 up to sunrise of 25th May 2022 and again on 27th July to 28th July 2022. The survey involved a passive monitoring survey and an active survey undertaken by a surveyor with 30 years' experience of bat surveys. A static Songmeter Mini Bat broad spectrum recorder was placed close to the mature trees within the site and a second close to the dense gorse cover in May 2022.

In July 2022, one static monitor was placed on a gate post at the nearest house where there was potential for house roosts. The active surveyor availed of an Echometer Touch 2 Pro bat detector and an Anabat Walkabout heterodyne and time expansion bat detector to convert bat signals both to audible and recordable signals. All signals were analysed by Kaleidoscope Pro software and automatic identifications were checked manually.

Monitoring involved assessment of trees for evidence of emerging bats at sunset and sunrise. The surveyor also examined bat feeding and commuting activity within the site to determine the usage of the site both for feeding and moving across the landscape.

Equipment employed: 18th to 19th June 2024
Batlogger 2 and Echometer Touch 2 Pro broad spectrum detector
Songmeter Mini Bat static monitor
Pulsar Helion XP 50 Pro Thermal Imager.

The survey in June 2024 involved 2 surveyors undertaking the active survey and the use of a static attached to the horse chestnut with high bat roost potential within the site. One surveyor concentrated om the area with a variety of trees with roost potential to the west of the entrance gate to the main fields. The scone surveyor moved through the site and covered the entirety of the survey area between the dusk and dawn surveys.

Surveying commenced prior to sunset and continued for 1.5 hours from prior to 22.00 hours to 23.30 hours. Surveying re-commenced at 03.30 hours and continued up to 05.00 hours. Post – surveying analysis included use of Kaleidoscope Pro software and a manual check of all uncommon bat species and signals that could be noise that is often misidentified as Leisler's bat signals. This was carried out on a HP desktop computer.

Survey constraints

Conditions were ideal for surveying in May and July 2022 and June 2024 and bat activity was noted on all occasions during the survey dates. The nights were dry, calm and warm. The

weather conditions on 19th June 2024 at 03.33 hours was 11 degrees Celsius, dry and calm with a cloudless sky.

Results For Badgers and Other Mammals

Species of mammal noted at Abbeyleix

Badger	*Meles meles*
Irish hare	*Lepus timidus hibernicus*
Rabbit	*Oryctolagus cuniculus*
Wood mouse	*Apodemus sylvaticus*
Fox	*Vulpes vulpes*
Grey Squirrel	*Sciurus carolinensis*
Pine marten	*Martes martes*

There was one badger sett noted on the hedgerow at the northern boundary. This sett is not a main sett and is almost certainly an outlier sett. There was no evidence of activity at the time of survey in summer 2022 or again in winter 2023 / 2024 (i.e., no paw prints, no fresh spoil, no dung) or in summer 2024. There was no evidence of bedding, no fresh spoil, no paw prints and no dung at the sett. There were numerous signs of regular badger activity within the site in summer 2022, including clearly-defined paths throughout the site (and observations of badgers during the survey). There were no signs of badgers within the site in June 2024 and the camera at the outlier sett registered no badger activity. There was no clearly defined track to the northern badger sett in May or July 2022, nor was there a track to the sett in February 2024. This sett would be affected by the Phase 2 most significantly but also very probably by Phase 1 of extraction.

Badgers were encountered feeding within the site on the two occasions of survey in May and July 2022 but not in June 2024. On both occasions in 2022, two badgers were present. The badgers were either recorded on camera as in May 2022 or were observed with the thermal imager in July 2022.

There were badger dung pits noted in two places within the site in 2022 and well-defined badger tracks throughout, badger foraging signs, snagged hairs and thermal image recordings are included of two badgers present on July 27th 2022. Neither dung pit had been used in recent

times in February 2024 and there were no badger dungs noted within the site, whatsoever. There were extremely limited signs of badger activity within any area of the site in February 2024. There were a small number of snuffle holes noted within the site and some tracks that may have been of badger origin but there were no snagged hairs, no paw prints, no dung deposits, and no fresh spoil at the one sett noted.

There were no badger tracks leading into or out of the gorse. There were no paw prints in this area and no concentration of signs of foraging. In June 2024, there was no evidence of badgers at the gorse and no evidence of badgers with the aid of a thermal imager at this section of the site. There is no evidence of badger setts within this area and no main setts or significant setts within the site. Examples of activity at a main sett in February 2024 are included within the photographs from another site at the exact same time of year (see Appendices).

Other mammal species noted include Irish hare (seen), red deer (hoof prints) and pine marten (dung) (see Appendices).

Results For Bats

Species roosting within the footprint of the proposed quarry

None

Species of bat feeding within the site

Leisler's bat
Common pipistrelle
Soprano pipistrelle
Myotis including Natterer's bat and Daubenton's bat
Brown long-eared bat

There are a number of suitable roost trees within the site, but no bats were seen to emerge or return to any tree. The trees with greatest roost potential include a horse chestnut and a split *Acer* within the partially cleared area in the wooded section of the site. There are no buildings within the site. There are also a number of conifers (cedar trees) with roost potential for individual bats towards the public road.

There are a wide variety of bat species (6) within and around the site including common pipistrelle (the most commonly encountered species throughout) and soprano pipistrelles (noted at the pond on the edge of the site and briefly in other areas). Leisler's bats were present over pasture, close to the public road and were seen drinking from the pond in 2022 and flew north through the siter in June 2024.

Myotis bat signals were noted within the site in 2022 and 2024. In 2024, was recorded both by the static monitor at the horse chestnut tree and a Daubenton's bat was recorded during the active survey within the same overall area. Daubenton's and *Myotis* were more commonly recorded in 2022 but neither level of activity was significantly high. Automatic ID of one series of signals by Kaleidoscope Pro proposed the presence of whiskered bat along the road passing the entrance of the site.

Brown long-eared bat signals were noted very infrequently both during the active survey in 2022 and during the static survey in 2024. This species has a low, highly directional signal. *Myotis* signals were noted along the road and along the trees close to the dense gorse cover.

Potential Impacts On Ground Mammals

1. Badger sett loss

There will be one sett removed based on the examinations of May and July 2022 and February and June 2024. The only noted sett was an inactive outlier sett at the northern edge of the site. The sett lies within a field boundary on the perimeter of the site and is a very minor sett based on the entrance size and scarcity of a spoil heap. It was not in use in the period of evaluation (May and July 2022 and February and June 2024) It was not entirely overgrown up to June 2024, but it was completely obscured in June 2024. It was definitely used occasionally prior to June 2024. It is definitely not a main sett and no breeding occurs within this sett.

2. Interference with commuting badgers and other mammals

Badger movement will be altered by the presence of the quarry and there will be a loss of foraging within the quarry area. This may lead to an alteration of badger movement, but it is

unlikely to cause a loss of the badger social group from the area. Any steep sides may create a risk of falling for badgers along the quarry edge.

Mitigation For Badgers

1. Exclusion of the badger sett(s) with approval from NPWS

All identified setts that are placed at risk of damage during excavation shall be excluded by a procedure proposed by NPWS. The only noted sett to date is outside the proposal land take but may be damaged during quarrying works and may require exclusion and closure until all work in this area is complete. All sett exclusions must be completed prior to any extractions or heavy plant movement around setts.

Potential Impacts On Bats

1. Loss of roost sites

2. Death or injury during tree felling and clearance

3. Loss of feeding

4. Interruption to commuting

1. Loss of roost sites

There is potential for roost loss through tree removal. If undertaken without proper measures, this would lead to injury or death of protected bats.

2. Death or injury during tree felling and clearance

While no tree roosts were noted, these are difficult to rule out. If undertaken without proper assessment at the time of removal, this could lead to fatalities (if undertaken when present at any time of year).

3. Loss of feeding

The removal of hedgerow and mature trees removes feeding opportunities for bats. There will be a loss of a small number of mature trees and areas of scrub.

4. Interruption to Commuting (and Feeding)

This may arise from a combination of tree loss, hedgerow loss and increased lighting.

Mitigation For Bats

1. Examination of all trees earmarked for removal for the presence of bats 2. Provision of bat boxes for bats within the surrounding area 3 No Lighting of the quarry or perimeter

1. Examination of all trees earmarked for removal for presence of bats.

All mature trees proposed for removal or tree surgery shall be examined for the presence of bats by a bat specialist prior to any procedures that will lead to their complete removal or the removal of mature limbs or parts of limbs that may possess suitable splits or cavities for roost sites for bats.

Should any tree be noted to be a roost site for bats, the tree shall require a derogation issued by NPWS to allow the planned destruction of a protected structure. A programme of measures shall be designed and approved by NPWS and implemented under the guidance of a bat specialist. This may include additional bat boxes or other features for alternative roost sites as well as a schedule of the timing of felling and the specific procedure required to prevent injury or death to bats.

2. Provision of bat boxes for bats within the surrounding area

It is proposed that 15 Schwegler 2F bat boxes are erected on trees (that will be retained outside of the site or on poles where this cannot be achieved) within the adjoining the land take, 10 with Double Front Panel and 5 x 2FN bat boxes. All boxes should be no less than 3 metres from the ground, mainly in southerly directions and unlit from any source, clear of dense branches or scrub and away from busy roads. The boxes may be installed at a maximum of three to any one tree, but this should only be done where a tree is substantial in girth and boxes are not crowded together.

3 No Lighting of the quarry or perimeter

There shall be no lighting of the site. All work shall be undertaken in daylight.

4. Provision of feeding areas for bats following all excavations

Following the completion of excavations, the restored lands shall include feeding opportunities and roost potential for bats. This should include mature trees and where possible a waterbody for bats.

5. Protection of existing pond

The pond adjacent to the site is important both as a feeding area and drinking area for bat (and birds). No excavated materials shall enter the water or in any way reduce the quality of the water for wildlife.

Monitoring

All measures proposed for the site shall be confirmed as in place and operational by an ecologist. The fence around areas of the quarry with sheer sides (e.g. cliff faces or steep side) shall be confirmed as adequate for reducing the potential for badger entry by an ecologist.

The site shall be checked following 1 year of operation to ensure that there is no lighting and therefore no light pollution.

All bat boxes shall be checked after 2 years for use, by a licensed bat specialist, and shall be re-positioned if there is no evidence of take-up. Measures shall be taken to correct any failures in mitigation.

Impacts After Mitigation

The success of mitigation is dependent upon its full implementation. It is essential that the measures proposed are implemented in full to ensure that impacts are restricted to a medium term and are not permanent. With proper lighting avoidance, dust (and other waste) control, planting, protective measures and roost replacement, there should be a medium-term impact on bats and other mammals. With proper remediation, there is the potential to restore the site to a varied biodiversity as is currently present. The site will be depleted of biodiversity in stages during its exploitation and there will be a similar re-colonisation of the site over time following depletion of the excavated material.

APPENDICES

Badger signs within the Ballymullen site 24th May and 27th July 2022 and February 2024

Legend

Probable badger sett to the north of the site

Probable rabbit warren

Area of dense gorse with noted badger activity but no setts visible

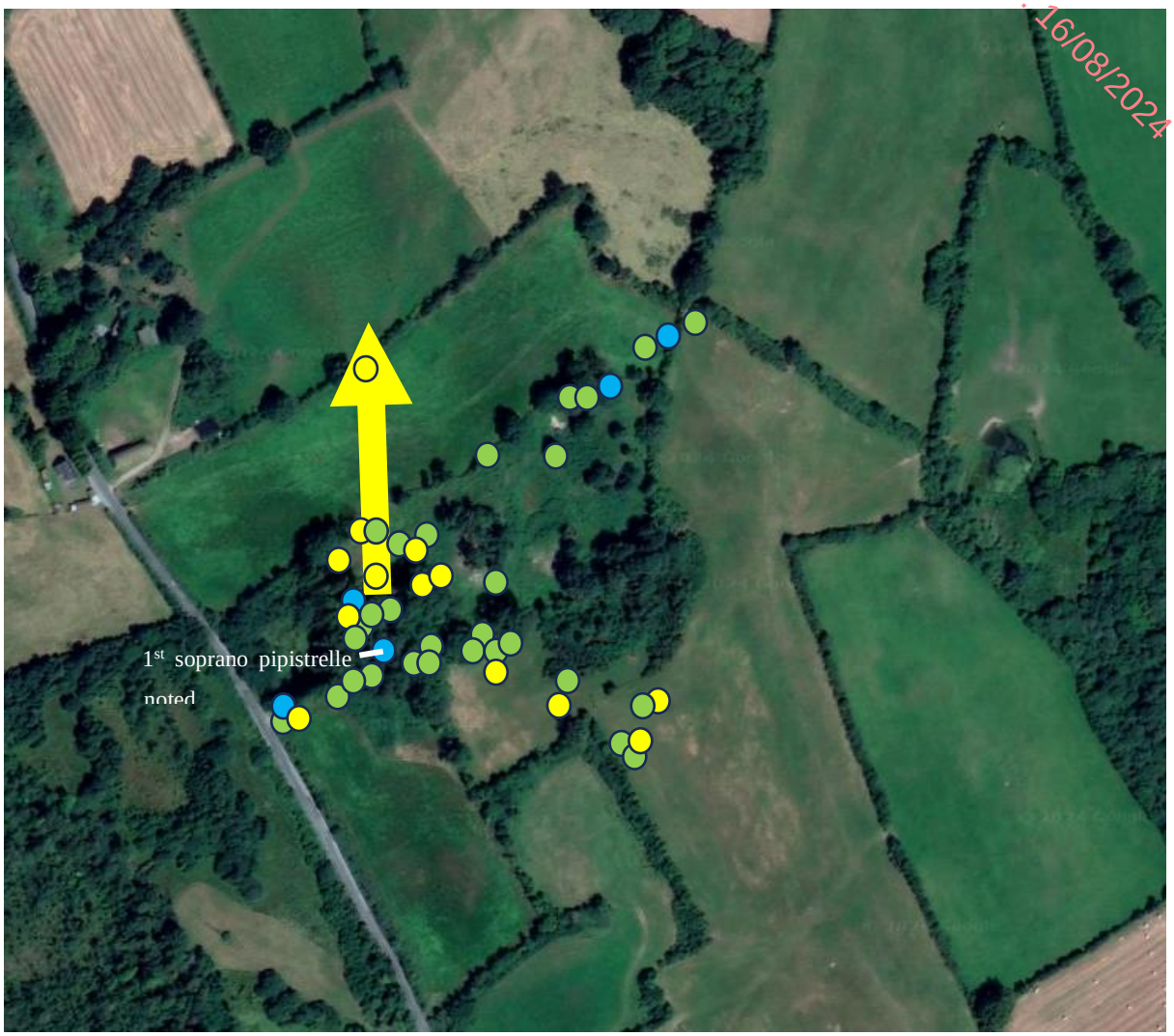
Red deer hind and fawn

Red deer prints February 2024

Pine marten scat

Other mammals noted within the site include fox, Irish hare, squirrel. Bats are dealt with separately.

Bats within the site 18th June 2024



Bat activity from sunset to 23.30 hours on 18th June 2024

- Daubenton's bat (single pass)
- Leisler's bat passes
- Direction of first Leisler's bat and first record (base of arrow)
- Common pipistrelle passes
- Soprano pipistrelle passes

Bats within the site 19th June 2024

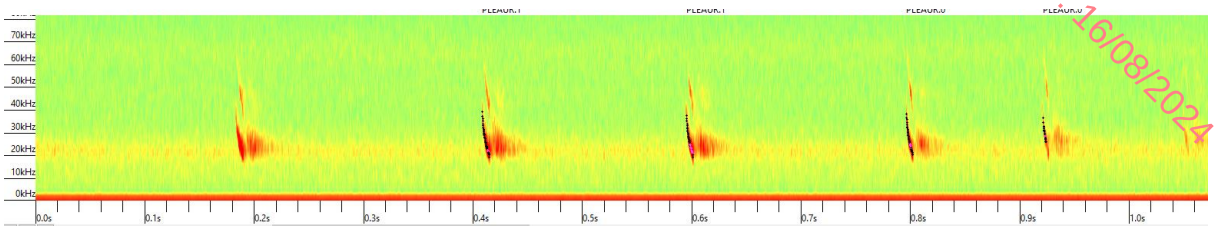
Bat activity up to sunrise from 03.30 hours on 19th June 2024

Common pipistrelle passes

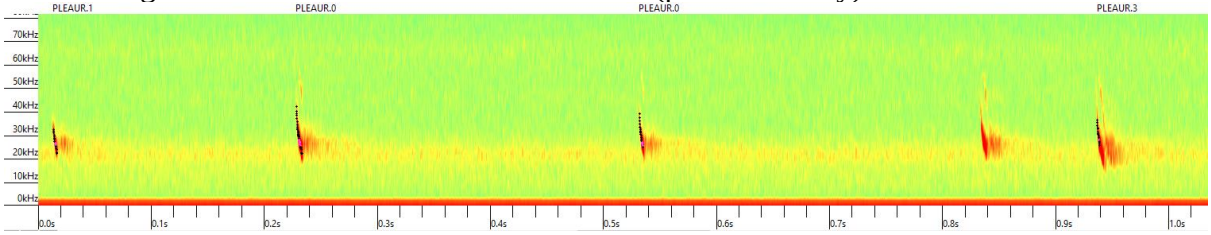
Soprano pipistrelle passes

Static monitor recording overnight

Bats within the site based on spectrograms

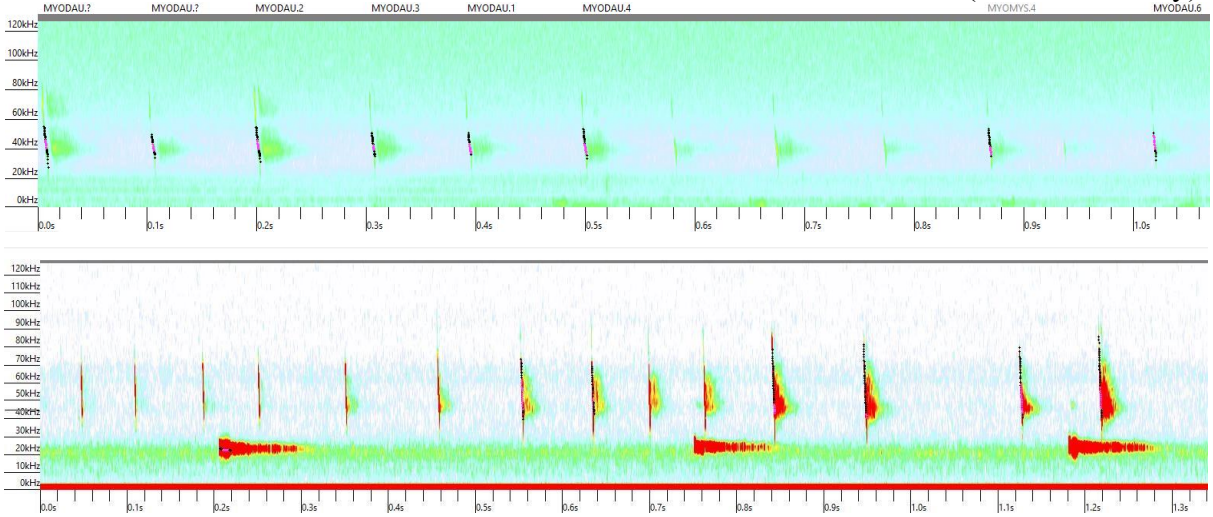


Brown long-eared bat 23.10 hours 18th June 2024 (passive survey)

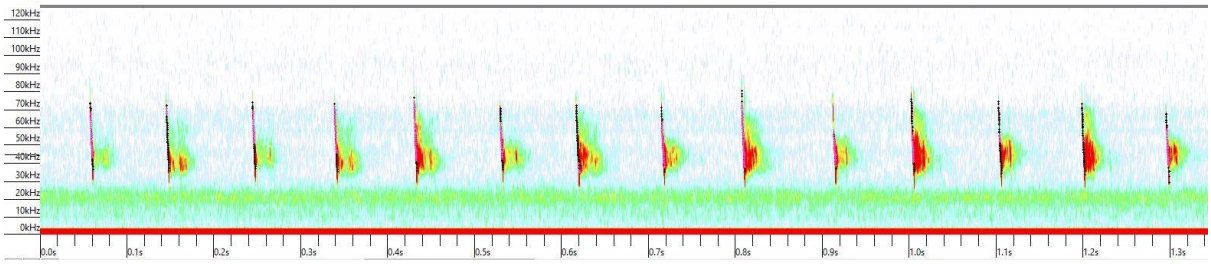


Brown long-eared bat 01.40 hours 19th June 2024 (passive survey)

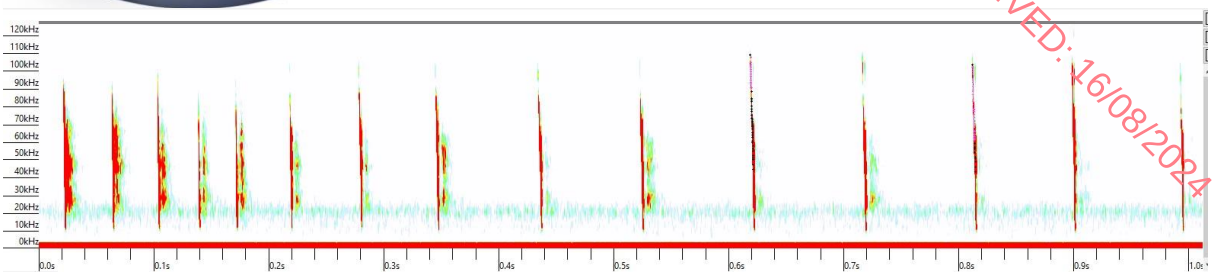
Daubenton's bat at 22.53 hours 18th June 2024 (active survey)



Leisler's bat signals and possibly Daubenton's bat signals (but clearly a *Myotis* bat species)



Signals auto-identified at whiskered bat on 28th July 2022. This may be of another *Myotis* species



Natterer's bat signal at 01.09 hours at house gate 28th July 2022

Bat passes recorded by static monitor at the nearby house gate northwest of the site 27th July 2022 within the site 17th to 18th June 2024

The Natterer's bat signals may be greater and may be included with Myotis and Daubenton's bat signals

Bat species	Bat passes per hour									
	0	1	2	3	4	5	21	22	23	Grand
Brown long-eared bat				1					1	2
Common pipistrelle	48	37	7	5	20	10	2 1	96	97	341
Daubenton's bat	2	1	1	1	5			2	1	13
Leisler's bat	2	1			4	1	1 9	35	4	66
MYOTIS								2		2
Natterer's bat		1								1
pipistrelle							1	11		12
Soprano pipistrelle	7	8	1	1	9	3	2	93	16	140
Grand Total	59	48	9	8	38	14	43	239	119	577

Static monitor data from overnight monitoring at horse chestnut tree within the site (18th to 19th June 2024)

	Bat passes per hour								
Species	**0**	**1**	**2**	**3**	**4**	**21**	**22**	**23**	**Grand Total**
MYOTIS			1						1
Leisler's bat	2			1	1		3	6	13
Pipistrelle	1								1
Common pipistrelle	5	1	1	2		1	26	15	51
Soprano pipistrelle	3			1	1		4	3	12
Brown long-eared bat		1						1	2
Grand Total	**11**	**2**	**2**	**4**	**2**	**1**	**33**	**25**	**80**

Handheld monitor data within the site 18th to 19th June 2024 (surveyor 1)

	Bat passes per hour				
Species	**3**	**4**	**22**	**23**	**Grand Total**
Daubenton's bat			1		1
Leisler's bat	1			10	11
Pipistrelle		1		1	2

Common pipistrelle	3	1	12	17	33
Grand Total	**4**	**2**	**13**	**28**	**47**

Handheld monitor data within the site 18th to 19th June 2024 (surveyor 2)

	Bat passes per hour				
Species	**3**	**4**	**22**	**23**	**Grand Total**
Leisler's bat		**2**	**1**	**7**	**10**
Pipistrelle				**1**	**1**
Common pipistrelle	**1**	**10**	**55**	**37**	**103**
Soprano pipistrelle	**1**	**6**	**5**	**11**	**23**
Grand Total	**2**	**18**	**61**	**55**	**136**

Leisler's bat drinking from pond 23.29 hours 27th July 2022

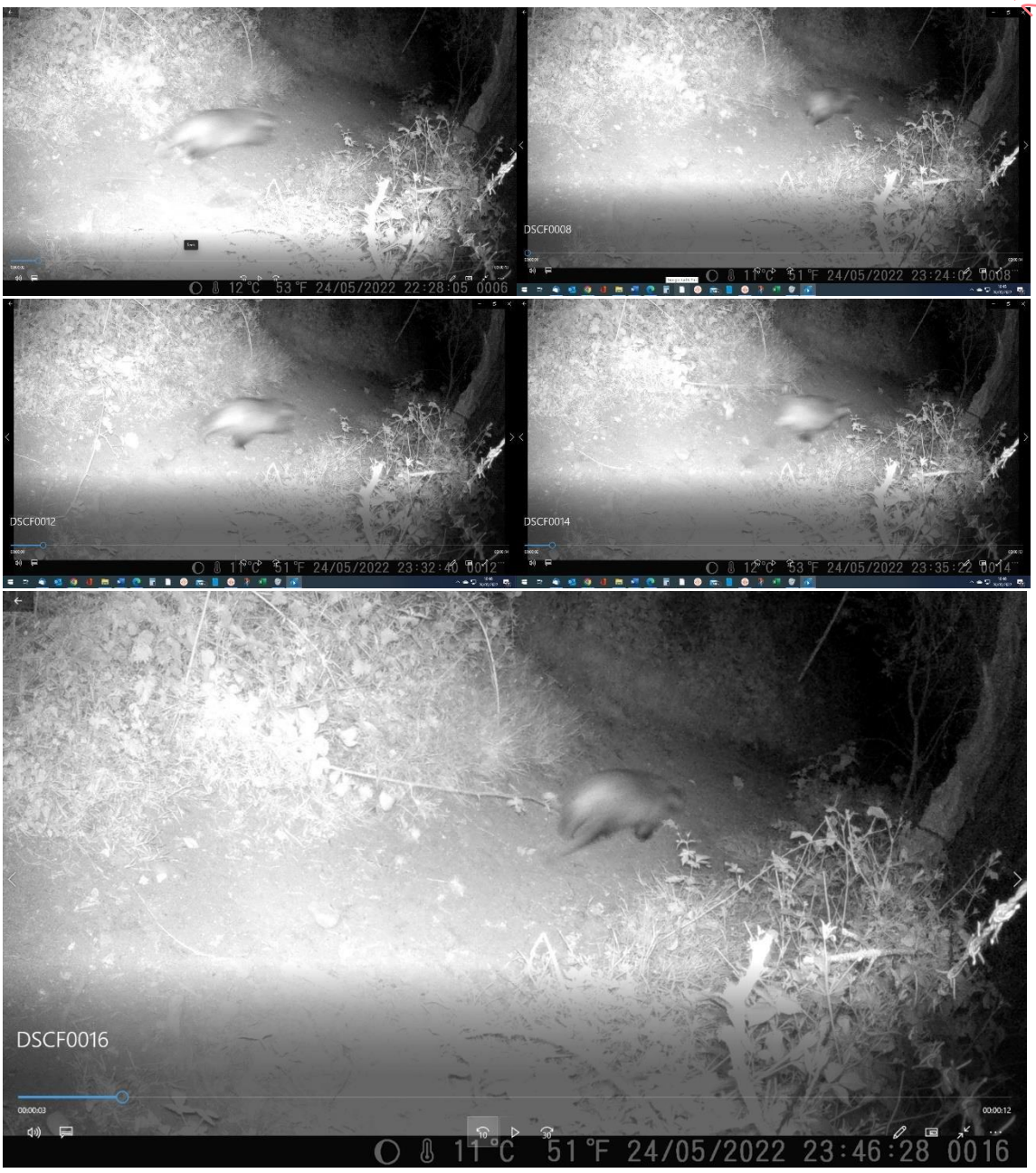
Bats within the site recorded by a thermal imager 2022

Badgers within the site 17th to 18th June 2022 Foraging badgers recorded by a thermal imager

Red deer hind and fawn and Irish hare (top 2 images) June 2022 Irish hare at 05.44 hours

Squirrel at 05.44 hours

Two badgers present May 2022



Badger images from the installed cameras May 2022

Badger sett (top left February 2024) (top, middle May 2022), badger dung, badger hairs and badger digging

The sett was entirely overgrown in June 2024

Gorse with sett potential; and pine marten scat on cow dung 2022

Pond used by bats for drinking and feeding and cedars with minor roost potential

Badger digging February 2024

Probable badger track through scrub February 2024

Badger foraging signs February 2024

Scrub with no badger sett evidence February 2024

Trees and bat roost potential

No trees were occupied on the survey dates in May and July 2022

Badger sett February 2024 and May 2022

Badger dung, badger hairs and badger digging 2022

Image for comparative purposes
Sett entrances and significant tracks between the entrances at a sett in Westmeath in February 2024

Image for comparative purposes
Badger tracks leading from a sett in Westmeath in February 2024

Gorse with sett potential but no evidence of badgers in February 2024 and no evidence of a sett in May or July 2022 (left) or in June 2024 and pine marten scat on cow dung (centre) and pine marten scat on track February 23rd 2024 (right)

Gorse area February 2024

Area of clear-fell checked for badgers February 2024

Red deer tracks within the site February 23rd 2024

Pond used by bats for drinking and feeding and cedars with minor roost potential.

Trees and bat roost potential

No trees were occupied on the active survey dates in May and July 2022 or June 2024. There was no evidence of bat usage noted of any tree within the site on February 23rd 2024.

Bat Conservation Ireland data: search results 22 Jun 2024			
Search parameters: Roosts Transects Ad-hoc observation sites with observations of all species within 1000m of S4419283942			
Roosts			
Name	Grid ref	Species observed	
14LSAX10KB	S4383		
14LSAX11KB	S4383		
14LSAX12KB	S4383		
14LSAX13KB	S4383		
14LSAX14KB	S4383		
14LSAX15KB	S4383		
14LSAX16KB	S4383		
14LSAX17KB	S4383		
14LSAX1KB	S4383		
14LSAX2KB	S4383		
14LSAX3KB	S4383		
14LSAX4KB	S4383		
14LSAX5KB	S4383		
14LSAX6KB	S4383		
14LSAX7KB	S4383		
14LSAX8KB	S4383		
14LSAX9KB	S4383		
Transects			
Name	Grid ref start	Species observed	
Ad-hoc observations			
Survey	Grid ref	Date	Species observed
BATLAS 2020	S4384	05/09/2018	Nyctalus leisleri, Pipistrellus pygmaeus, Pipistrellus pipistrellus (45kHz)
NBDC Bat Records	S4383	08/06/2013	Pipistrellus pygmaeus, Pipistrellus pipistrellus (45kHz)
Pilot Woodland Monitoring Scheme 2016-2017	S4383	30/08/2017	Nyctalus leisleri, Pipistrellus pygmaeus, Pipistrellus pipistrellus (45kHz),Plecotus auritus, Myotis nattereri, Myotis mystacinus
Pilot Woodland Monitoring Scheme 2016-2017	S4383	28/07/2017	Pipistrellus nathusii, Pipistrellus pygmaeus, Pipistrellus pipistrellus (45kHz),Myotis mystacinus

6.0 LAND, SOILS & GEOLOGY

6.1 Background and Objectives

Hydro-Environmental Services (HES) has carried out an impact assessment of any potential significant and likely effects of a proposed sand and gravel pit at Ballymullen, Abbeyleix, Co. Laois on land, soil and geology aspects of the receiving environment.

This chapter of the EIAR provides a baseline assessment of the environmental setting of the proposed sand and gravel pit in terms of land, soils and geology and discusses the potential likely effects that the proposed aggregate extraction will have. Where required, appropriate mitigation measures to limit any identified significant effects to land, soils and geology are recommended. This chapter has been updated on foot of Laois County Council's *Request for Further Information* (LCC Reg. Ref. 23/60390).

6.2 Proposed Development Overview

The proposed development is a new sand and gravel pit within a greenfield site at Ballymullen, Abbeyleix, Co. Laois. The estimated volume of material to be extracted from the application site is altered as a result of the RFI. There is now approximately 735,687m^3 (compared to 787,310m^3 originally estimated) of material, of which 17,400m^3 consists of overburden which will be used to construct berms and restore the site. Therefore, the volume of material to be transported to the manufacturing facility is approximately 718,287m^3 or 1.44million tonnes (using a conversion factor of 2m^3/tonne.

The extraction will be carried out over 8 no. phases. Phases 1-3 will essentially be the northern half of the site and Phases 4-8 the southern half of the site. The proposed development will require the erection of minor infrastructure to include a porta-loo toilet and a wheelwash. These facilities will be located on a hardcore gravel area close to the entrance to the site. Please note, the southern portion of Phase 4 (the portion directly upslope/upstream of the mapped petrifying spring area in Abbeyleix Bog) has been removed from the previously proposed extraction plan as presented in the withdrawn application (LCC Reg. Ref. 21/694) (i.e. there will be no extraction of aggregate upslope/upstream of the petrifying spring area).

Extracted material will be transported from the site to the existing Booth Precast Products Ltd manufacturing facility located approximately 1.3km to the south of the site. Refer to Figure 6.1 below which shows the proposed site layout and extraction plan.

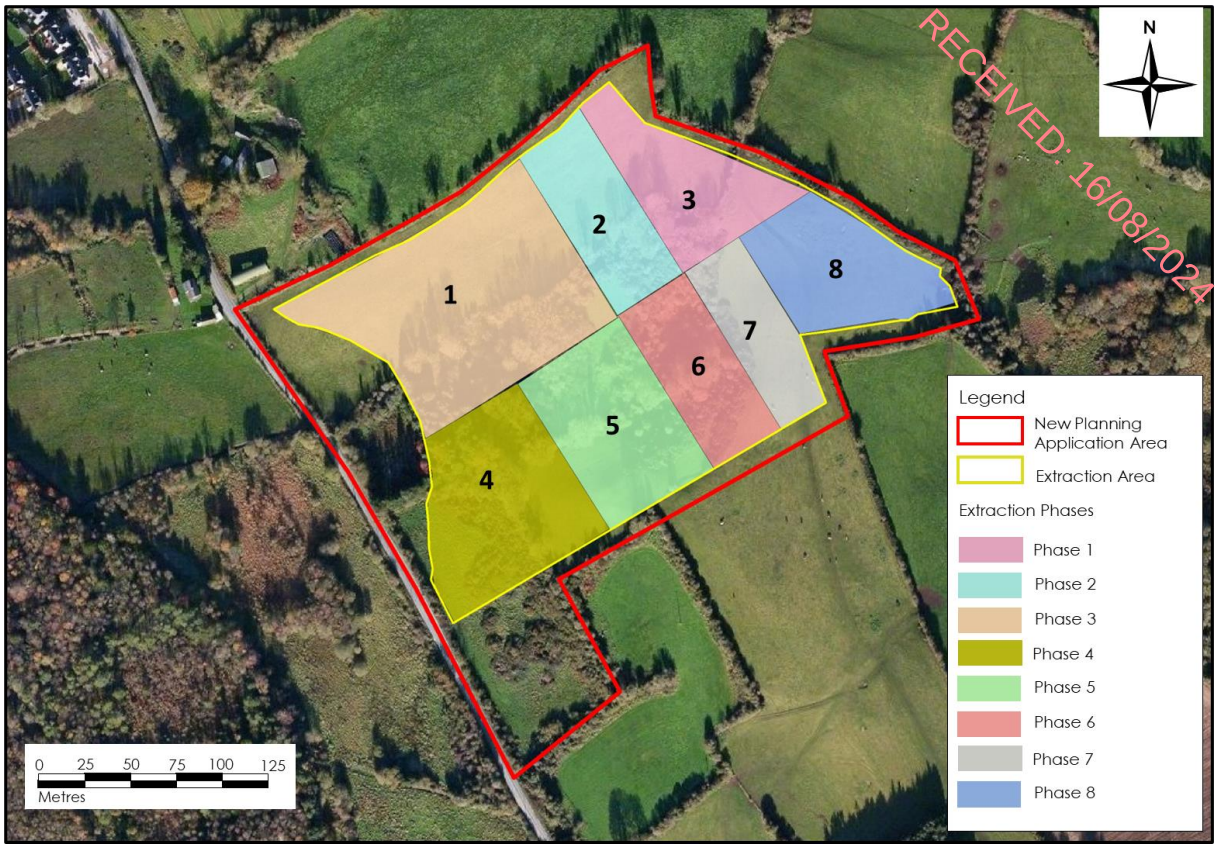


Figure 6.1: Proposed Site Layout and Extraction Plan.

6.3 Relevant Legislation

The Land, Soils and Geology Chapter of the EIAR is prepared in accordance with the requirements of European Union Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (the 'EIA Directive') as amended by Directive 2014/52/EU. Regard has also been taken of the requirements of the following legislation.

- *European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2001 – 2019*;
- The *Planning and Development Acts 2000*, as amended;
- *Planning and Development Regulations 2001*, as amended;
- S.I. No. 4/1995: The Heritage Act 1995, as amended; and,
- Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment, including 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).

6.4 Relevant Guidance

The Land, Soils and Geology Chapter of the EIAR is carried out in accordance with guidance contained in the following:

- Environmental Protection Agency (May 2022): Guidelines on the Information to be Contained in Environmental Impact Assessment Reports;
- Institute of Geologists Ireland (2013): Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements;
- National Roads Authority (2005): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (NRA, 2005);
- Department of the Environment, Heritage and Local Government; Quarries and Ancillary Activities – Guidance for Authorities (April, 2014);
- Guidance on the preparation of the EIA Report (Directive 2011/92/EU as amended by 2014/52/EU), (European Union, 2017); and,
- Environmental Protection Agency (2006): Environmental Management in the Extractive Industry (Non-Scheduled Minerals).

6.5 Schedule of Works

6.5.1 Desk Study

A desk study of the proposed site and surrounding area was completed prior to the undertaking of field mapping, walkover assessments and site investigations. The desk study involved collecting all relevant geological and hydrogeological data for the study area. This included consultation with the following:

- Environmental Protection Agency database (www.epa.ie);
- Geological Survey of Ireland (GSI) - Groundwater Database (www.gsi.ie);
- Met Eireann Meteorological Databases (www.met.ie);
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);
- EPA/Water Framework Directive “Catchments” Map Viewer (www.catchments.ie);
- Bedrock Geology 1:100,000 Scale Map Series, Sheet 16 (Geology of Kildare - Wicklow); Geological Survey of Ireland (GSI, 1994); and,
- Geological Survey of Ireland (GSI) - Groundwater Body Characterisation Reports.

6.5.2 Baseline Surveys and Investigations

To complete the Land, Soils and Geology Chapter of the EIAR, the following surveys and investigations were carried out:

- A walkover survey to assess the ground conditions and layout of the proposed site including surveys of adjacent lands;
- Drilling of 5 no. investigation holes/monitoring wells to assess overburden lithology, depth to the bedrock and for groundwater level monitoring and sampling;

- Particle Size Distribution analysis was undertaken on material samples which were taken at 3m depth intervals;
- 3 no. peat augers were completed on the edge of Abbeyleix Bog adjacent to the application site;
- Previous studies of the geology of Abbeyleix Bog were also reviewed and summary data have been presented in the baseline characterisation of local geology; and,
- Mineral soils and subsoils were logged according to BS: 5930:2015 Code of Practice for Ground Investigations.

6.5.3 Impact Assessment Methodology

Please refer to Chapter 1.0 of the EIAR for details on the impact assessment methodology (EPA, 2022). In addition to the above methodology, the importance of the land, soils and geological environment receptors was assessed on completion of the desk study and baseline study.

Using the National Roads Authority (2008) guidance, an estimation of the importance of the land, soils and geological environments within the study area are quantified, using the criteria set out in Table 6.1.

Table 6.1: Estimation of Importance of Geology Attributes (NRA, 2008)

Importance	Criteria	Typical Example
Very High	• Attribute has a high quality, significance or value on a regional or national scale. • Degree or extent of soil contamination is significant on a national or regional scale. • Volume of peat and/or soft organic soil underlying route is significant on a national or regional scale.	• Geological feature rare on a regional or national scale (NHA/SAC). • Large existing quarry or pit. • Proven economically extractable mineral resource.
High	• Attribute has a high quality, significance or • value on a local scale. • Degree or extent of soil contamination is significant on a local scale. • Volume of peat and/or soft organic soil underlying site is significant on a local scale.	• Contaminated soil on site with previous heavy industrial usage. • Large recent landfill site for mixed wastes. • Geological feature of high value on a local scale (County Geological Site). • Well drained and/or high fertility soils. • Moderately sized existing quarry or pit. • Marginally economic extractable mineral resource.
Medium	• Attribute has a medium quality, significance or value	• Contaminated soil on site with previous light industrial usage.

	on a local scale. • Degree or extent of soil contamination is moderate on a local scale. • Volume of peat and/or soft organic soil underlying site is moderate on a local scale.	• Small recent landfill site for mixed Wastes. • Moderately drained and/or moderate fertility soils. • Small existing quarry or pit. • Sub-economic extractable mineral resource.
Low	• Attribute has a low quality, significance or value on a local scale. • Degree or extent of soil contamination is minor on a local scale. • Volume of peat and/or soft organic soil underlying site is small on a local scale.	• Large historical and/or recent site for construction and demolition wastes. • Small historical and/or recent landfill site for construction and demolition wastes. • Poorly drained and/or low fertility soils. • Uneconomically extractable mineral resource.

The guideline criteria for the assessment of likely significant effects require that likely effects are described with respect to their extent, magnitude, type (i.e. negative, positive or neutral) probability, duration, frequency, reversibility, and transfrontier nature (if applicable).

The impact descriptors used in this assessment are those set out in (the EIA Directive, and EPA (2022)) in the Glossary of effects as shown in Chapter 1.0 of this EIAR.

6.6 Existing Environment

6.6.1 Site Description and Topography

The proposed development site is situated at Ballymullen townland which is located ~1km south of Abbeyleix town, Co. Laois. The application site, which is currently a greenfield site, has an area of approximately 8.5ha.

The site is located at the topographic transition between the Castlecomer Plateau to the east and Laois Central Lowlands to the west. Much of the site area has a characteristic hummocky, hilly terrain, which is typical of a glaciofluvial deposition area. The land then flattens westward towards the River Nore which is located 2.2km west of the site.

The site, which has an elevation range of between approximately 94 and 130m OD (Ordnance Datum), is located on a hillside that steadily slopes in a westerly direction towards the lower lying and flatter peatlands (Abbeyleix Bog) that exists to the west of the site.

The proposed development site, which comprises mainly grassland with some woodland and scrub in the central area, is bordered by agricultural grassland to the east, north and south and

by a local public road to the west which defines the western site boundary. West of the local public road, the land is low-lying and slightly boggy before it transitions into peatland.

The site is made up of several grazing fields which are separated by hedgerows. Access to the site is from the public road to the west.

6.6.2 Land-use

Based on the Corine (2018) mapping the proposed site and most of the local area is mapped as Agricultural Areas/Pastures.

Abbeyleix Bog is located immediately to the southwest of the site and this is mapped by Corine (2018) as Mixed Forests and Peat Bogs.

The proposed site currently comprises mainly grassland (6.4ha) with some tree coverage/scrub (2ha) over sand and gravel deposits with a thickness of up to 37.2m being confirmed above bedrock (described below). The ground elevation ranges between approximately 94m OD on the west and 130m OD on the east. The landuse is agricultural and mainly for animal grazing.

Land-use in the surrounding area is largely agricultural with a scattered rural pattern of residential dwellings along the local roads to the west. Further north (~200m) along the public road to the west, there are a number of housing estates on the outskirts of Abbeyleix. There are a number of existing sand and gravel pits in the area, the closest one is a small disused pit located approximately 500m to the southeast of the site. This is currently used as a Defence Forces and An Garda Síochána Firing Range. The existing Booth Precast Products manufacturing facility is located approximately 1.3km to the south of the site.

The closest EPA licensed facility is located approximately 500m to the northwest of the application site. Stonearch previously manufactured Vitamin K3 for use as a supplement in animal feed until closure in the early 2000s. The facility is still licensed by the EPA (P0332).

6.6.3 Local Soils and Subsoils

The published soils map (www.epa.ie) for the area shows that the majority of the proposed development site (and surrounding area) is mapped to be overlain by shallow well-drained mineral soil while the western low-lying side of the site is mapped to be overlain by shallow poorly drained soil. Immediately west of the local road (which defines the western boundary of the site) cutover peat is mapped. Down in a hollow immediately to the east of the site lacustrine clays are mapped in an area where a pond forms during wet periods.

Based on the GSI subsoil map (www.gsi.ie), glaciofluvial sands and gravels are mapped within the site boundary and these deposits are mapped to extend to the north, south and east of the site. Cutover bog, as described above, is mapped to the west of the site. A local subsoil geology map is shown in Figure 6.2.

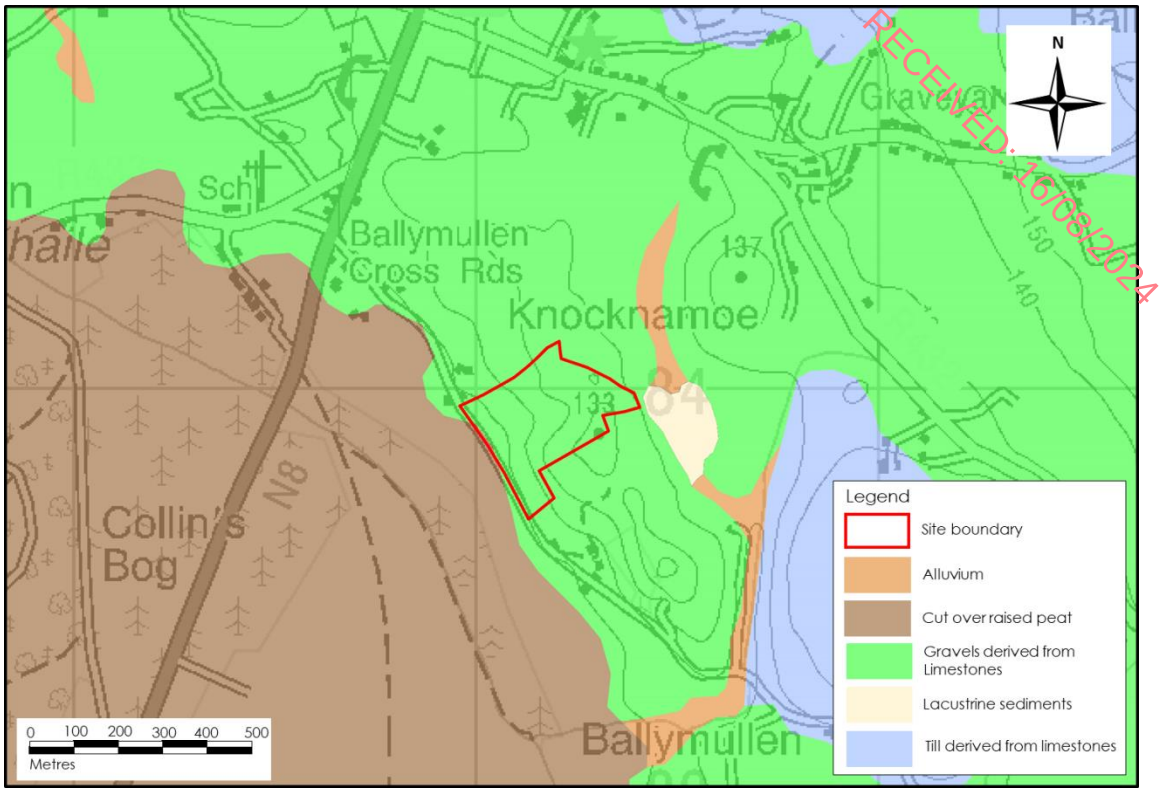


Figure 6.2: GSI Local Subsoils Map

6.6.4 Local Bedrock Geology

Based on the GSI bedrock geology map (www.gsi.ie), Dinantian Pure Bedded Limestones are mapped to underlie the proposed development and these comprise two bedrock formations in the area of the site, namely; the Ballyadams Formation and the Clogrenan Formation with the former underlying the majority of the site.

The Ballyadams Formation, which is mapped to underlie the central, western and northern sections of the site comprise crinoidal wackestone / packstone LIMESTONE. The Clogrenan Formation, which is mapped to underlie the eastern section of the site comprise cherty, muddy, calcarenitic LIMESTONE. A local bedrock geology map is shown as Figure 6.3.

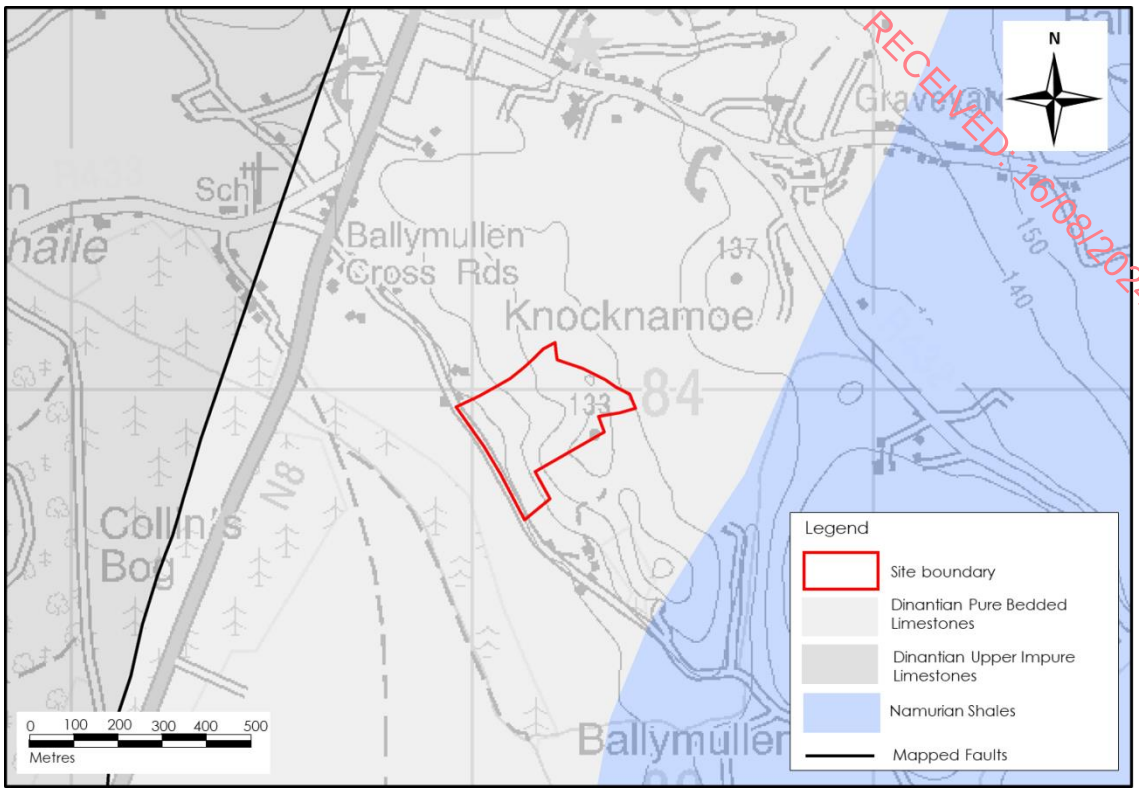


Figure 6.3: GSI Local Bedrock Map

6.6.5 Site Geology

Five investigation holes/monitoring wells (MW01 to MW05) were drilled by Peterson Drilling Services Ltd at the site under the supervision of HES between the 29th July and 2nd August 2019. Refer to Appendix 6.1 for drilling logs.

Based on the site investigations undertaken for the proposed development, the subsoil deposits on the more elevated eastern side of the site (@ MW01 and MW02) comprised mainly dense, medium to fine coarse, brown SAND (gravelly and/or silty) with infrequent layers (1-2) of dense, medium coarse, brown SAND & GRAVEL (with frequent cobbles) or GRAVEL (sandy). The SAND & GRAVEL/GRAVEL layers are typically 3-4m in thickness. The above described profile was confirmed down to 37.2m below ground level (89.2 m OD) in MW01 where the top of bedrock was met and to 37mbgl (92.36m OD) in MW02 where the hole was terminated before meeting bedrock.

In the lower-lying central (@ MW03 and MW04) and western side (@ MW05) of the site the SAND & GRAVEL/GRAVEL layers are more frequent and are interbedded with the SAND layers. SAND & GRAVEL and GRAVEL then become more dominant with depth (>17 – 20mbgl or <90 – 95m OD in the central area and >8mbgl or <87m OD at the western side).

The base of the sand and gravel was proven to be at 37.2mbgl (89.2m OD) at monitoring well location MW01 and at 30.6mbgl (84.7m OD) at MW03 when dark grey LIMESTONE was

encountered. The variation in the top of bedrock elevation at these two locations suggests that the limestone bedrock formation is dipping southwesterly.

6.6.6 Bog Geology

HES completed 3 no. hand augers on land adjacent to Abbeyleix Bog. These hand augers were completed to allow logging of the geology, and also to allow the installation of shallow piezometers at the edge of Abbeyleix Bog. The locations of these investigation points are illustrated in Figure 7.8, and geological logs are attached in Appendix 6.2. The 3 no. deep sub peat piezometers (P1, P2 and P3) were installed into wet SAND which was found to underlie the PEAT. The 2 no. shallow standpipes (PH1 and PH3) were installed to the base of the peat only.

Peat depths at the 3 no. Auger locations ranged between 0.52 to 1.0m in depth.

The SAND (mineral subsoil) encountered below the peat at P1 and P3 was well sorted and coarse while the SAND at P2 was slightly gravelly.

Swanson (2017)[1] completed a wider survey (refer to Figure 6.4) of the geology and hydrogeology of Abbeyleix Bog. His findings with regard to geology can be summarised as follows:

- 29 piezometers were installed. The peat depth and sub-peat geology were recorded at those 29 locations across the bog.
- 6 no. boreholes were drilled around the bog.
- Peat depth ranged between 1.00 to 8.45m.
- 14 no. locations were underlain by grey SAND.
- 7 no. locations were underlain by shell Marl.
- 6 no. locations were underlain by clay (probably lacustrine clay)
- 1 no. location, the sub-peat geology could not be determined as the peat was too hard to auger through.

Swanson (2017), also noted generally deeper sub-soil north and east of the bog than south and west of the bog, and that the subsoils below the eastern part of the bog (BH1 and BH2) were located on an esker complex and contained sand with between 10–21% fine-grained materials (passing through a 0.063 mm sieve) by dry mass. He also determined that to the west of the bog (BH4 and BH5), a stiff clay layer was observed at 5-5.5m depth.

The HES sub-peat geological data corresponds well with the information presented by Swanson (2017).

Swanson (2017) also recorded bedrock depths below the bog of between 3.0m (BH6) and 12.8 (BH2).

[1] *Greenhouse Gas Emissions and Eco-hydrology of a Raised and Cutover Bog* (Swanson, 2017).

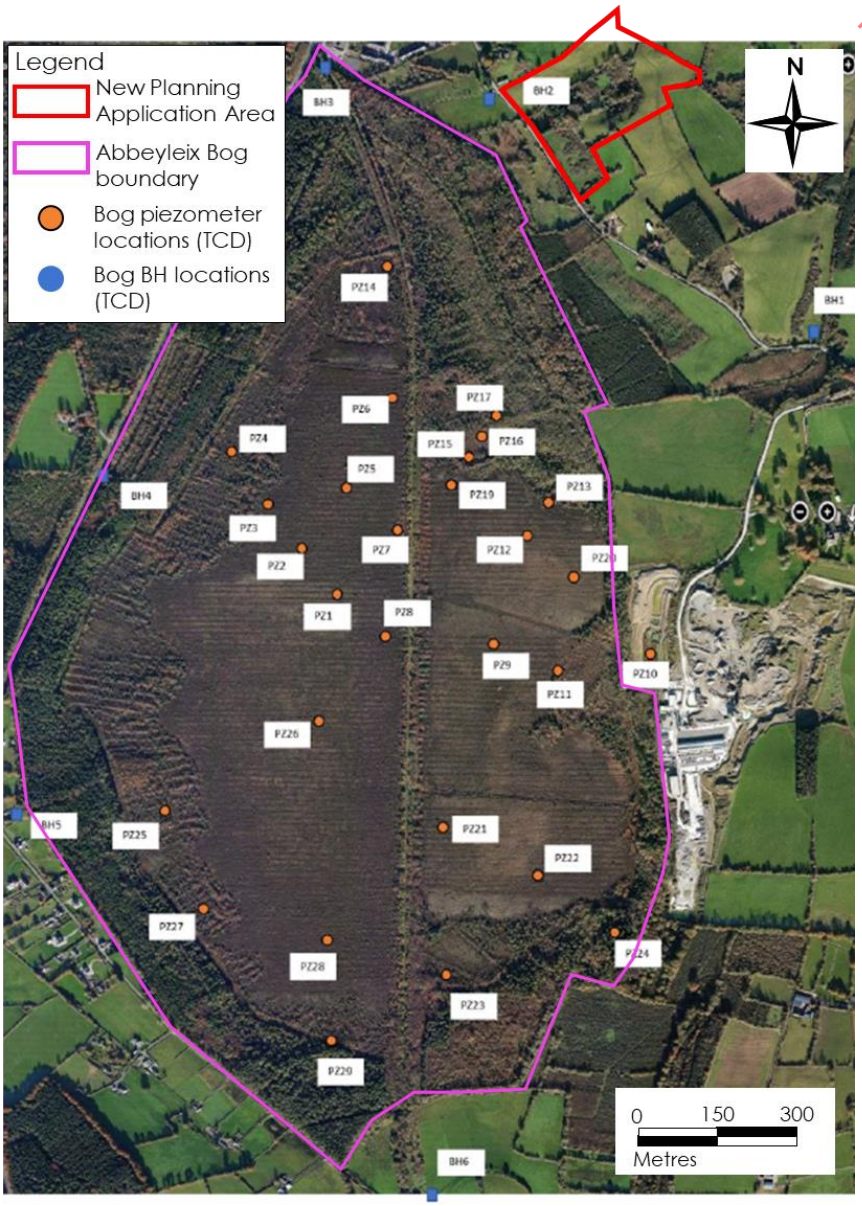


Figure 6.4: Abbeyleix Bog – Geological Data Locations (after Swanson, 2017)

6.6.7 Economic Geology

The GSI database[2] shows that the site is located in an area of Very High Potential for granular aggregate.

The sand and gravel at the site could be classified as high importance (refer to Table 6.1). The sand and gravel deposits are a proven economically extractable mineral resource for construction purposes, and this is supported by the long history of aggregate extraction in the area.

[2] Source: GSI online Aggregate Potential Mapping Database.

6.6.8 Geological Heritage and Designated Sites

The proposed development is not located within any geological heritage site. The closest geological heritage site is Abbeyleix Bog (site code LS001). This bog is referred to as Collin's Bog and Killamuck on the OSI mapping.

Abbeyleix Bog comprises an extensive area of peatland south of Abbeyleix town. The bog peat is Quaternary in age having formed in marshy conditions since deglaciation. The bog covers an area of approximately 4km^2 (400Ha).

Designated sites include National Heritage Areas (NHAs), proposed National Heritage Areas (pNHAs), Special Areas of Conservation (SACs), candidate Special Areas of Conservation (cSAC) and Special Protection Areas (SPAs). The closest designated site to the proposed site is the River Barrow and River Nore SAC and the River Nore SPA which is located approximately 2.2km west of the proposed site.

No impacts on local geological heritage sites or designated sites are expected from a land, soils and geology perspective. Indirect hydrological effects are assessed in Chapter 8.0 – Water.

6.6.9 Soil Contamination

There are no known areas of soil contamination at the site or in the surrounding area. During the site walkover and drilling investigations, no areas of contamination concern were identified and the results from the groundwater sampling (refer to Chapter 7.0 – Water) also indicate no contamination issues. As the proposed site is a greenfield site, no historical contamination issues would be expected. There are no known historic mines at or in the immediate vicinity of the proposed development, that could potentially have contaminated tailings.

6.7 Potential Impacts of the Proposed Development

6.7.1 Characteristics of the Proposed Development

Development proposals include the extraction of approximately 1.44m tonnes of sand and gravel material (excl. overburden). The proposed extraction depth varies between 97.3m OD on the west of the site and 102.5m OD on the east of the site. This is just over 3m above the monitored groundwater levels to allow for higher groundwater levels in winter.

There will also be a requirement to remove approximately 17,400m^3 of topsoil to access the underlying sand and gravel. The topsoil from Phase 1 and some of the sand and gravel will use to create berms along the western boundary of the site with topsoil from subsequent phases used to restore the previous phases. The material in the berm will be used to restore the final phase of extraction once completed and for restoration of the pit upon completion of extraction of material. There will be no aggregate extraction below the groundwater table.

It also should be noted that there will be no discharge of wastewater at the site, as wastewater will be contained within a Portaloo and moved off-site to a licenced facility for disposal. Fuel and oil will be delivered to a licensed facility and moved off-site for disposal.

Fuel and oil will be delivered to site by a bowser and dispensed directly into plant and equipment. There will be no storage of oils and fuels on-site.

6.7.2 "Do Nothing" Scenario

If the proposed development does not go ahead, the site will remain as a greenfield site.

6.7.3 Potential Construction Phase Impacts

6.7.3.1 Initial Excavation of Soil and Subsoils including Berm and Entrance Construction

The initial site development construction works will include creation of the site entrance, stripping of topsoil and creation of screening berms.

These activities will require the movement and excavation of soils and subsoils and the creation of screening berms. The volume of material involved is small. The removal of vegetative cover and topsoil will be over small localised area (~0.34Ha) and will likely be completed in a short amount of time.

Receptor: Local Soil and Subsoils
Pathway/Mechanism: Aggregate extraction, movement and placement in berms
Pre-mitigation Impact: Negative, irreversible, slight, direct, likely, permanent effect on soil and subsoils.

Impact Assessment:

As outlined above, these works are small-scale, and they will be completed over a small area (~0.34Ha), and also over a short period. These works are an essential part of the initial site development, and allow entrance creation, and screening berms to be established.

Mitigation Measures:

Initial site earthworks and entrance/berm creation will result in a direct impact on the local geological environment, albeit this is an acceptable and unavoidable part of the proposed sand and gravel pit development. These impacts will be localised (i.e. only at the point of extraction/placement) and will be mostly mitigated through the adoption of a suitable landscape and restoration plan which will be undertaken following completion of extraction phase.

The soil and subsoil which will be removed are not notable from a geological heritage point of view and are widely abundant in the area. The stripped topsoil will be used to form a berm along the western boundary and for the ultimate restoration of the site.

Residual Effect:

The soil and subsoil which will be removed are not notable from a geological heritage point of view and are widely abundant in the area. The works area will be small, and the volume of material excavated and used in berm construction is relatively small. The stripped topsoil will be used to form a berm along the western boundary and for the ultimate restoration of the site.

The residual effects are considered to be - negative, irreversible, slight, direct, likely, permanent effect on soils and subsoils.

Significance of Effects:

For the reasons outlined above, and with the implementation of the outlined mitigation, no significant effects on the soils and geology environment will occur during the construction phase.

6.7.4 Potential Extraction Phase Impacts

6.7.4.1 Excavation of Soil and Subsoils (Aggregate)

As stated in Section 6.2 above, the proposed development will involve the extraction of approximately 735,687m^3 /1.47 million tonnes (incl. overburden) of sand and gravel aggregate down to a level of between 97.3 and 102.5m OD.

In order to extract the aggregate, approximately 17,400m^3 of topsoil will be removed in phases and this will be used to construct a temporary berm along the western boundary and then ultimately used in the restoration of the site post extraction. For example overburden material removed from Phase 2 will be used to restore the pit floor of Phase 1. This will continue to be the case with further phases of extraction.

Receptor: Soil and subsoils
Pathway/Mechanism; Aggregate extraction
Pre-mitigation Impact: Negative, irreversible, moderate, direct, likely, permanent effect on soil and subsoils.

Mitigation Measures:

Site earthworks and aggregate extraction will result in a direct impact on the local geological environment, albeit this is an acceptable and unavoidable part of the proposed sand and gravel pit development. These impacts will be localised (i.e. only at the point of extraction) and will be mostly mitigated through the adoption of a suitable landscape and restoration plan which will be undertaken during the operational phase and on completion of extraction.

The soil and subsoil which will be removed are not notable from a geological heritage point of view and are widely abundant in the area. The stripped topsoil will be used to form a berm along the western boundary and for the ultimate restoration of the site.

Residual Effect:

Site earthworks and aggregate extraction will result in a direct impact on the local geological environment, however, the excavated area will be progressively restored as excavation advances. The area of ground exposed at any one time will be minimized. The residual effects are considered to be - negative, irreversible, slight, direct, likely, permanent effect on soils and subsoils.

Significance of Effects:

For the reasons outlined above, and with the implementation of the recommended mitigation measures, no significant effects on soils and subsoils will occur.

6.7.4.2 Contamination of Soil and Subsoils from Oil / Fuel Spills and Leaks

Excavation, processing and transporting of aggregate at the site will be completed using machinery. Such machinery is powered by diesel engines and operated using hydraulics. Unless managed carefully such plant and machinery have the potential to leak hydraulic oils or cause fuel leaks during refuelling operations.

Only small volumes of fuel/oils will be present (in the machines) on-site and therefore no significant effects are expected as long as standard mitigation is implemented.

Receptor: Soil and Subsoils
Pathway: Soil and bedrock pore space
Pre-mitigation Impact: Negative, reversible, slight, direct, likely, long-term effect on soil and subsoils.

Mitigation Measures:

The following mitigation is proposed:

- All plant and machinery will be serviced before being mobilised to site;
- Refuelling will be carried out on a proposed refuelling pad at all times;
- Only designated trained operators will be authorised to refuel plant on site;
- Procedures and contingency plans will be set up to deal with emergency accidents or spills; and,
- An emergency spill kit with oil boom, absorbers etc. will be kept on-site for use in the event of an accidental spill.

Residual Effect:

The use of hydrocarbons is a standard risk associated with all construction sites. Proven and effective measures to mitigate the risk of spills and leaks have been proposed above and will break the pathway between the potential source and the receptor. The residual effect will be - negative, reversible, imperceptible, direct, likely, long term effect on soil and subsoil.

Significance of Effects:

For the reasons outlined above, and with the implementation of the recommended mitigation measures, no significant effects on soils and subsoils will occur.

6.7.4.3 Effects on Land and Landuse

The proposed site currently comprises mainly grassland (6.4ha) with some tree coverage/scrub (2ha) over sand and gravel deposits with a thickness of up to 37.2m being confirmed above bedrock (described below). The ground elevation ranges between approximately 94m OD on the west and 130m OD on the east. The landuse is agricultural and mainly for animal grazing. The land post restoration is described below.

Receptor: Land and Landuse
Pathway: Aggregate Extraction
Pre-mitigation Impact: Negative, reversible, significant, direct, likely, long-term effect on land and landuse.

Mitigation Measures:

Post extraction phase a landscape and restoration plan will be implemented. This will involve previously stripped overburden being placed on the pit floor to establish grassland which will provide a level of protection to groundwater. The newly created embankment will be graded for stability and topsoil will be re-laid onto the new surface to create a growing medium for the planned replacement planting. Post restoration, the possibility of grazing the central grassy areas will be examined once several phases have created sufficient area. which will reduce the risk of illegal activities such as fly-tipping.

The restoration plan involves returning the pit to grassland by spreading/contouring previously stripped overburden over the extraction area. The site contouring will slope to the west as it currently does with the restored elevation ranging between ~94m OD on the west of the site and between 102.5 – 103m OD on the east.

The newly re-landscaped side slope will have a strip of land left intact along the edge of the quarry cutting, which will be planted up with a mix of tree species during the winter dormant season that follows the completion of the quarrying works. A strip of land of approximately 12m between the existing hedgerows and the edge of the pit face will be left unplanted and kept clear to allow for maintenance works to the hedgerows and reduce the potential shading and competition on the hedges caused by the new planting as it matures.

When completed, the new woodland planting will cover an area somewhat greater than the area cleared of tree cover to facilitate the quarry works.

Residual Effect:

The site will be restored to allow for use as agricultural land with potential for some grazing. The residual effects are considered to be - negative, irreversible, moderate, direct, likely, permanent effect on land and landuse.

Significance of Effects:

For the reasons outlined above, and with the implementation of the recommended mitigation measures, no significant effects on soils and subsoils will occur.

6.7.5 Restoration Phase and Post Restoration Phase

The restoration plan involves an increase in tree planting and returning the pit to grassland by spreading the topsoil/overburden that was previously stripped and stored at the site. No negative impacts on the land, soil and geological environments are expected during the restoration or post-restoration phase. The restoration will have a positive effect in terms of returning the site back to greenfield, with potential future agricultural use.

Residual Effect:

Positive, reversible, moderate, direct, likely, permanent effect on land and landuse.

Significance of Effects:

For the reasons outlined above, and with the implementation of the recommended mitigation measures, no significant effects on soils and subsoils will occur.

6.7.6 Human Health Effects

Potential health effects in relation to soils and geology mainly occur due to direct and indirect (dust) contact with contaminated soil. However, as stated in Section 6.7.3.2 there will be best practice controls in place to ensure any potential sources of contamination on the site will be managed appropriately. Also, the site will not be open to the public and therefore direct contact is unlikely.

Hydrocarbons, in the form of fuels and oils, will be used on-site during extraction works. However, the volumes will be small in the context of the scale of the project and will be handled in accordance with best practice mitigation measures. The potential residual impacts associated with soil and geology contamination and subsequent health effects are imperceptible.

6.7.7 Cumulative Effects on Land/Soils & Geology

Other developments assessed for potential geological cumulative impacts within ~5km of the proposed development site are listed in Tables 3.2 and 3.4 of the EIAR. All developments were

assessed for potential cumulative impacts. The other developments assessed are in the following industrial sectors – windfarms (2 no.), EPA licenced facilities (2 no.), quarries/pits/extractive (15 no.), public wastewater treatment plants (2 no.), storage container (1 no.) and electricity infrastructure (1 no.).

The other land use activities in the area are plantation forestry, existing farming operations and residential land uses, and the existing manufacturing facility which is located 1.3km to the south of the site.

There will be no increase in daily processing rates/quantities at the manufacturing facility/processing plant. Aggregate from the proposed pit will replace the material that is being currently hauled in from remote pits.

Other development works are required to facilitate the proposed development, as well as improving road infrastructure generally for the area. These works include proposals to improve the carriageway of the Local Road L5731-25 over a distance of 1.3km to the southeast. However, as effects on the land and soils environment are local to the point of excavation (within the extraction area) no effects will occur outside of the proposed development site, therefore in-combination effects with public road improvement works will not occur.

In summary, due to the relatively small scale of the proposed development and the lack of significant residual impacts from the development that would affect the wider environment, there will be no significant cumulative impacts to land, soils and geology resulting from this project, and other local existing developments, projects and plans. All potential impacts on land, soils and geology relating to the proposed project will be localised and within the proposed development footprint.

6.8 Monitoring

An inspection of the geological environment will be undertaken by a competent Geologist and Geotechnical Engineer on a biannual basis (i.e. every two years).

Appendix 6.1: Monitoring Wells – Drilling and Construction Logs.

Appendix 6.1 – Monitoring Wells – Drilling and Construction Logs

petersen drilling services ltd. on behalf of **Booth Concrete** Rotary Drilling Log

Depth of Stratum Top (m)	Driller's Stratum Description	Sample / Hole / Test Details: No	Type	Insitu test	From (m)	To (m)	Drilling Details: Core run time (hhmm)	Total core Recovery (m)	Flush Return %	Flush Colour	Standard Penetration Test: Self Weight Pen (mm)	75 mm	150 mm	Seating Pen (mm)	75 mm	150 mm	225 mm	300 mm	Main Pen (mm)	N value	Casing Depth (m)	Water/ flush level (m)
0.00	Firm sandy TOPSOIL		RO		0.00	38.00	0000		100	brown												30.00
0.40	Dense brown medium coarse SAND & GRAVEL frequent cobbles																					
3.50	Medium dense brown SAND																					
11.00	Dense brown silty fine SAND																					
14.50	Dense brown gravelly SAND with frequent cobbles and boulders																					
37.20	Strong dark grey LIMESTONE																					

Shift details

Start time (hhmm)	Hole (m)	Water (m)	Casing (m)
0910			
Finish time (hhmm)	Hole (m)	Water (m)	Casing (m)
1635	0.00		

Drilling Equipment Details

Casing (C) Open Hole (RO) Coring (RC)	Dia. (mm)	From (m)	To (m)	Barrel	Liner Type	Core Dia (mm)	Bit Type	Bit serial No	Flush	Polymer
C	140.00	0.00	38.00							
RO	154.00	0.00	38.00				DTH	115	Air	No

Ground Water Record

Time of strike	Depth Struck (m)	Casing (m)	Inflow	5 min	10 min	15 min	20 min	Depth Sealed (m)
1240	30.00	30.00	Slow	0.00	0.00	0.00	0.00	N/S

Backfill (m)

Type	From (m)	To (m)

Time from	Duration (hhmm)	Remarks or details of any additional testing information, Dayworks
		General; mobilisation to site near Abbeyleix Co. Laois

SPT I.D. Number	pd1	Calibration Date	18/09/2017
SPT Rod Type	2 3/8 Regular	SPT Energy Ratio	0.00
Drilling Crew Details			CSCS No
Support Operative	john whyte		
Lead Driller	stephan petersen		
Site category	Green		
Project Engineer	D Brotherick		
Lead Driller's signature			

Project Title

Ballymullen Abbeyleix

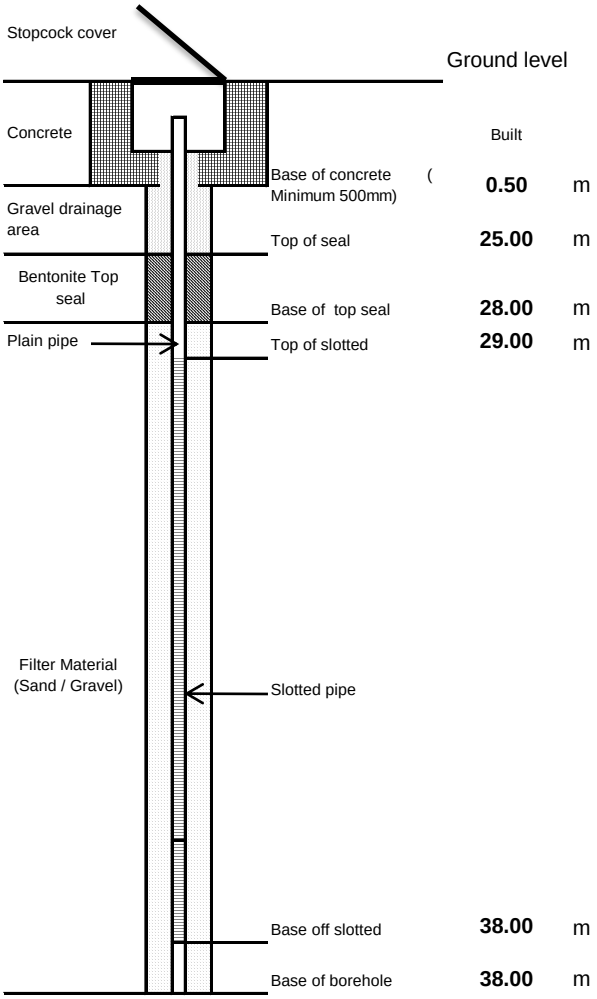
Weather	Sunny	Project No	13/12,
Date	29/07/2019	Day	Monday
Rig type	Knebel hy79	Borehole Number	
Inclination	Orientation	MW 1	
Sheet	1 of 1	Completed	Y

AGS

petersen drilling services ltd.

Summary of Standpipe Installation

Schematic Diagram (not to scale)



Installation Details

Standpipe diameter (id)	50	mm
Borehole diameter	154	mm
Slot size	1	mm
Geosock	Yes	
Gas tap	None	
Filter type	Gravel	
Type of cover	Upright	
Initial reading	30.50	m
Time of Initial reading	1530	hhmm

	Base (m)	Top (m)
Concrete	0.50	GL
Gravel drainage	25.00	0.50
Borehole seal top	28.00	25.00
Filter zone	38.00	28.00
Plain pipe	29.00	GL
Slotted zone	38.00	29.00
Base of borehole	38.00	

Remarks

Rig type	knebel hy79	**Project Title**			
Drilling Crew Details		Ballymullen Abbeyleix			
Support Operative	john whyte				
Lead Driller	stephan petersen	**Project No**		13/12,	
Site category	Green	**Day**	Monday	**Date**	July 29, 2019
Engineer	D Brotherick			**Borehole Number**	
Lead Driller's signature				**MW 1**	

petersen drilling services ltd. on behalf of **Booth Concrete** Rotary Drilling Log

Depth of Stratum Top (m)	Driller's Stratum Description	Sample / Hole / Test Details					Drilling Details				Standard Penetration Test												
		No	Type	Insitu test	From (m)	To (m)	Core run time (hhmm)	Total core Recovery (m)	Flush Return %	Flush Colour	Self Weight Pen (mm)	75 mm	150 mm	Seating Pen (mm)	75 mm	150 mm	225 mm	300 mm	Main Pen (mm)	N value	Casing Depth (m)	Water/ flush level (m)
0.00	Firm sandy TOPSOIL		RO		0.00	42.00	0000		100	brown												29.00
0.20	Dense to very dense brown medium coarse SAND & GRAVEL with frequent cobbles and boulders																					
4.50	Medium dense brown gravelly SAND																					
7.20	Dense brown greyish sandy coarse GRAVEL with frequent cobbles and boulders																					
11.00	Medium dense brown gravelly SAND																					
23.50	Medium dense brown very silty SAND																					

Shift details

Start time (hhmm)	Hole (m)	Water (m)	Casing (m)
1030			
Finish time (hhmm)	Hole (m)	Water (m)	Casing (m)
1705	0.00		

Drilling Equipment Details

Casing (C) Open Hole (RO) Coring (RC)	Dia. (mm)	From (m)	To (m)	Barrel	Liner Type	Core Dia (mm)	Bit Type	Bit serial No	Flush	Polymer
C	140.00	0.00	42.00							
RO	154.00	0.00	42.00				DTH	115	Air	No

Ground Water Record

Time of strike	Depth Struck (m)	Casing (m)	Inflow	5 min	10 min	15 min	20 min	Depth Sealed (m)

Backfill (m)

Type	From (m)	To (m)

Time from	Duration (hhmm)	Remarks or details of any additional testing information, Dayworks

SPT I.D. Number	pd1	Calibration Date	18/09/2017
SPT Rod Type	2 3/8 Regular	SPT Energy Ratio	0.00
Drilling Crew Details			CSCS No
Support Operative	john whyte		
Lead Driller	stephan petersen		
Site category	Green		
Project Engineer	D Brotherick		
Lead Driller's signature			

Project Title

Ballymullen Abbeyleix

Weather	Fine	Project No	13/12,
Date	31/07/2019	Day	Wednesday
Rig type	Knebel hy79	Borehole Number	
Inclination	Orientation		MW 2
Sheet	1 of 2	Completed	Y

petersen drilling services ltd. on behalf of **Booth Concrete** Rotary Drilling Log

Depth of Stratum Top (m)	Driller's Stratum Description	Sample / Hole / Test Details					Drilling Details				Standard Penetration Test												
		No	Type	Insitu test	From (m)	To (m)	Core run time (hhmm)	Total core Recovery (m)	Flush Return %	Flush Colour	Self Weight Pen (mm)	75 mm	150 mm	Seating Pen (mm)	75 mm	150 mm	225 mm	300 mm	Main Pen (mm)	N value	Casing Depth (m)	Water/ flush level (m)
30.00	Dense grey very silty SAND																					
37.00	Medium dense brown becoming gravelly SAND																					

Shift details				Drilling Equipment Details										Ground Water Record								Backfill (m)		
Start time (hhmm)	Hole (m)	Water (m)	Casing (m)	Casing (C) Open Hole (RO) Coring (RC)	Dia. (mm)	From (m)	To (m)	Barrel	Liner Type	Core Dia (mm)	Bit Type	Bit serial No	Flush	Polymer	Time of strike	Depth Struck (m)	Casing (m)	Inflow	5 min	10 min	15 min	20 min	Depth Sealed (m)	Type	From (m)	To (m)
1030															1310	28.00	28.00	Very Slow	0.00	0.00	0.00	0.00	N/S			
Finish time (hhmm)	Hole (m)	Water (m)	Casing (m)												1505	38.00	38.00	Slow	0.00	0.00	0.00	0.00	N/S			
1705	0.00																									

Time from	Duration (hhmm)	Remarks or details of any additional testing information, Dayworks

SPT I.D. Number	pd1	Calibration Date	18/09/2017
SPT Rod Type	2 3/8 Regular	SPT Energy Ratio	0.00
Drilling Crew Details			CSCS No
Support Operative	john whyte		
Lead Driller	stephan petersen		
Site category	Green		
Project Engineer	D Brotherick		
Lead Driller's signature			

Project Title

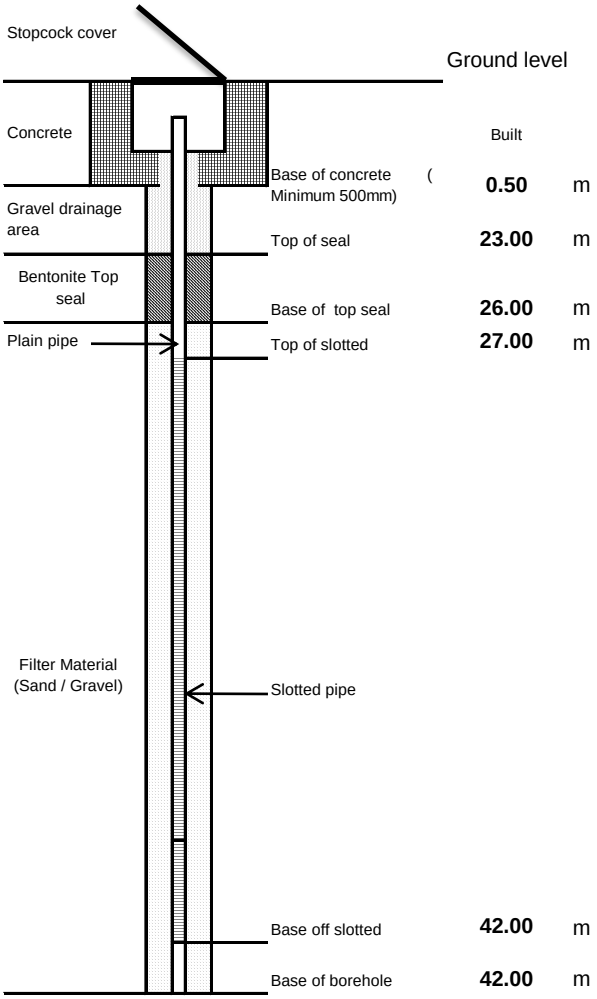
Ballymullen Abbeyleix

Weather	Fine	Project No	13/12,
Date	31/07/2019	Day	Wednesday
Rig type	Knebel hy79	Borehole Number	
Inclination	Orientation		MW 2
Sheet	2 of 2	Completed	Y

petersen drilling services ltd.

Summary of Standpipe Installation

Schematic Diagram (not to scale)



Installation Details

Standpipe diameter (id)	50	mm
Borehole diameter	154	mm
Slot size	1	mm
Geosock	Yes	
Gas tap	None	
Filter type	Gravel	
Type of cover	Upright	
Initial reading	29.00	m
Time of Initial reading	1705	hhmm

	Base (m)	Top (m)
Concrete	0.50	GL
Gravel drainage	23.00	0.50
Borehole seal top	26.00	23.00
Filter zone	42.00	26.00
Plain pipe	27.00	GL
Slotted zone	42.00	27.00
Base of borehole	42.00	

Remarks

Rig type	knebel hy79	**Project Title**			
Drilling Crew Details		Ballymullen Abbeyleix			
Support Operative	john whyte				
Lead Driller	stephan petersen	**Project No**		13/12,	
Site category	Green	**Day**	Wednesday	**Date**	July 31, 2019
Engineer	D Brotherick			**Borehole Number**	
Lead Driller's signature				**MW 2**	

petersen drilling services ltd. on behalf of Booth Concrete — Rotary Drilling Log

Depth of Stratum Top (m)	Driller's Stratum Description	Sample / Hole / Test Details: No	Type	Insitu test	From (m)	To (m)	Drilling Details: Core run time (hhmm)	Total core Recovery (m)	Flush Return %	Flush Colour	Standard Penetration Test: Self Weight Pen (mm)	75 mm	150 mm	Seating Pen (mm)	75 mm	150 mm	225 mm	300 mm	Main Pen (mm)	N value	Casing Depth (m)	Water/ flush level (m)
0.00	Firm sandy TOPSOIL		RO		0.00	32.00	0000		100	brown												20.00
0.30	Dense brown SAND & GRAVEL with occasional cobbles and boulders																					
4.30	Medium dense brown slightly gravelly SAND																					
20.50	Dense grey very silty sandy GRAVEL with occasional cobbles and boulders																					
30.60	Strong dark grey LIMESTONE																					

Shift details

Start time (hhmm)	Hole (m)	Water (m)	Casing (m)
0810			
Finish time (hhmm)	Hole (m)	Water (m)	Casing (m)
1455	0.00		

Drilling Equipment Details

Casing (C) Open Hole (RO) Coring (RC)	Dia. (mm)	From (m)	To (m)	Barrel	Liner Type	Core Dia (mm)	Bit Type	Bit serial No	Flush	Polymer
C	140.00	0.00	32.00							
RO	154.00	0.00	32.00				DTH	115	Air	No

Ground Water Record

Time of strike	Depth Struck (m)	Casing (m)	Inflow	5 min	10 min	15 min	20 min	Depth Sealed (m)
1150	20.00	20.00	Slow	0.00	0.00	0.00	0.00	N/S
1250	30.00	30.00	Medium	0.00	0.00	0.00	0.00	N/S

Backfill (m)

Type	From (m)	To (m)

Time from	Duration (hhmm)	Remarks or details of any additional testing information, Dayworks
1430	0230	Dayworks: Airlift developing of all 5 wells

SPT I.D. Number	pd1	Calibration Date	18/09/2017
SPT Rod Type	2 3/8 Regular	SPT Energy Ratio	0.00
Drilling Crew Details			CSCS No
Support Operative	john whyte		
Lead Driller	stephan petersen		
Site category	Green		
Project Engineer	D Brotherick		
Lead Driller's signature			

Project Title

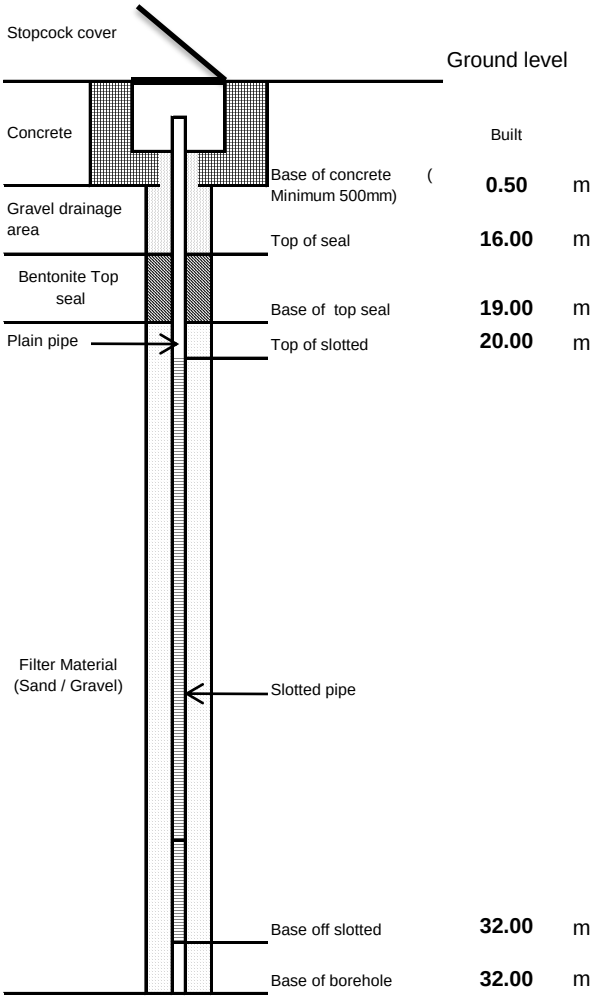
Ballymullen Abbeyleix

Weather	Fine	Project No	13/12,
Date	01/08/2019	Day	Thursday
Rig type	Knebel hy79	Borehole Number	
Inclination	Orientation		MW 3
Sheet	1 of 1	Completed	Y

petersen drilling services ltd.

Summary of Standpipe Installation

Schematic Diagram (not to scale)



Installation Details

Standpipe diameter (id)	50	mm
Borehole diameter	154	mm
Slot size	1	mm
Geosock	Yes	
Gas tap	None	
Filter type	Gravel	
Type of cover	Upright	
Initial reading	20.50	m
Time of Initial reading	1450	hhmm

	Base (m)	Top (m)
Concrete	0.50	GL
Gravel drainage	16.00	0.50
Borehole seal top	19.00	16.00
Filter zone	32.00	19.00
Plain pipe	20.00	GL
Slotted zone	32.00	20.00
Base of borehole	32.00	

Remarks

Rig type	knebel hy79	**Project Title**			
Drilling Crew Details		Ballymullen Abbeyleix			
Support Operative	john whyte				
Lead Driller	stephan petersen	**Project No**		13/12,	
Site category	Green	**Day**	Thursday	**Date**	August 1, 2019
Engineer	D Brotherick			**Borehole Number**	
Lead Driller's signature				**MW 3**	

petersen drilling services ltd. on behalf of **Booth Concrete** Rotary Drilling Log

Depth of Stratum Top (m)	Driller's Stratum Description	Sample / Hole / Test Details					Drilling Details				Standard Penetration Test												
		No	Type	Insitu test	From (m)	To (m)	Core run time (hhmm)	Total core Recovery (m)	Flush Return %	Flush Colour	Self Weight Pen (mm)	75 mm	150 mm	Seating Pen (mm)	75 mm	150 mm	225 mm	300 mm	Main Pen (mm)	N value	Casing Depth (m)	Water/ flush level (m)
0.00	Firm sandy gravelly TOPSOIL		RO		0.00	30.00	0000		100	brown												12.70
0.40	Medium dense brown gravelly SAND																					
3.90	Dense brown SAND & GRAVEL with frequent cobbles and boulders																					
5.50	Medium dense brown gravelly SAND																					
17.00	Dense brown rounded SAND & GRAVEL with cobbles and boulders																					
18.50	Dense light grey silty SAND & GRAVEL with frequent limestone boulders																					

Shift details

Start time (hhmm)	Hole (m)	Water (m)	Casing (m)
0805			
Finish time (hhmm)	Hole (m)	Water (m)	Casing (m)
1405	0.00		

Drilling Equipment Details

Casing (C) Open Hole (RO) Coring (RC)	Dia. (mm)	From (m)	To (m)	Barrel	Liner Type	Core Dia (mm)	Bit Type	Bit serial No	Flush	Polymer
C	140.00	0.00	30.00							
RO	154.00	0.00	30.00				DTH	115	Air	No

Ground Water Record

Time of strike	Depth Struck (m)	Casing (m)	Inflow	5 min	10 min	15 min	20 min	Depth Sealed (m)
1025	14.00	14.00	Very Slow	0.00	0.00	0.00	0.00	N/S

Backfill (m)

Type	From (m)	To (m)

Time from	Duration (hhmm)	Remarks or details of any additional testing information, Dayworks

SPT I.D. Number	pd1	Calibration Date	18/09/2017
SPT Rod Type	2 3/8 Regular	SPT Energy Ratio	0.00
Drilling Crew Details			CSCS No
Support Operative	john whyte		
Lead Driller	stephan petersen		
Site category	Green		
Project Engineer	D Brotherick		
Lead Driller's signature			

Project Title

Ballymullen Abbeyleix

Weather	Fine	Project No	13/12,
Date	30/07/2019	Day	Tuesday
Rig type	Knebel hy79	Borehole Number	
Inclination	Orientation	MW 4	
Sheet	1 of 2	Completed	Y

AGS

petersen drilling services ltd. on behalf of **Booth Concrete** Rotary Drilling Log

Depth of Stratum Top (m)	Driller's Stratum Description	Sample / Hole / Test Details: No	Type	Insitu test	From (m)	To (m)	Drilling Details: Core run time (hhmm)	Total core Recovery (m)	Flush Return %	Flush Colour	Standard Penetration Test: Self Weight Pen (mm)	75 mm	150 mm	Seating Pen (mm)	75 mm	150 mm	225 mm	300 mm	Main Pen (mm)	N value	Casing Depth (m)	Water/ flush level (m)
27.50	Very dense light grey angular coarse sandy GRAVEL with abundant limestone boulders possible highly weathered karst limestone																					

Shift details

Start time (hhmm)	Hole (m)	Water (m)	Casing (m)
0805			
Finish time (hhmm)	Hole (m)	Water (m)	Casing (m)
1405	0.00		

Drilling Equipment Details

Casing (C) Open Hole (RO) Coring (RC)	Dia. (mm)	From (m)	To (m)	Barrel	Liner Type	Core Dia (mm)	Bit Type	Bit serial No	Flush	Polymer

Ground Water Record

Time of strike	Depth Struck (m)	Casing (m)	Inflow	5 min	10 min	15 min	20 min	Depth Sealed (m)
1140	19.00	19.00	Medium	0.00	0.00	0.00	0.00	N/S
1145	27.50	27.50	Fast	0.00	0.00	0.00	0.00	N/S

Backfill (m)

Type	From (m)	To (m)

Time from	Duration (hhmm)	Remarks or details of any additional testing information, Dayworks

SPT I.D. Number	pd1	Calibration Date	18/09/2017
SPT Rod Type	2 3/8 Regular	SPT Energy Ratio	0.00
Drilling Crew Details			CSCS No
Support Operative	john whyte		
Lead Driller	stephan petersen		
Site category	Green		
Project Engineer	D Brotherick		
Lead Driller's signature			

Project Title

Ballymullen Abbeyleix

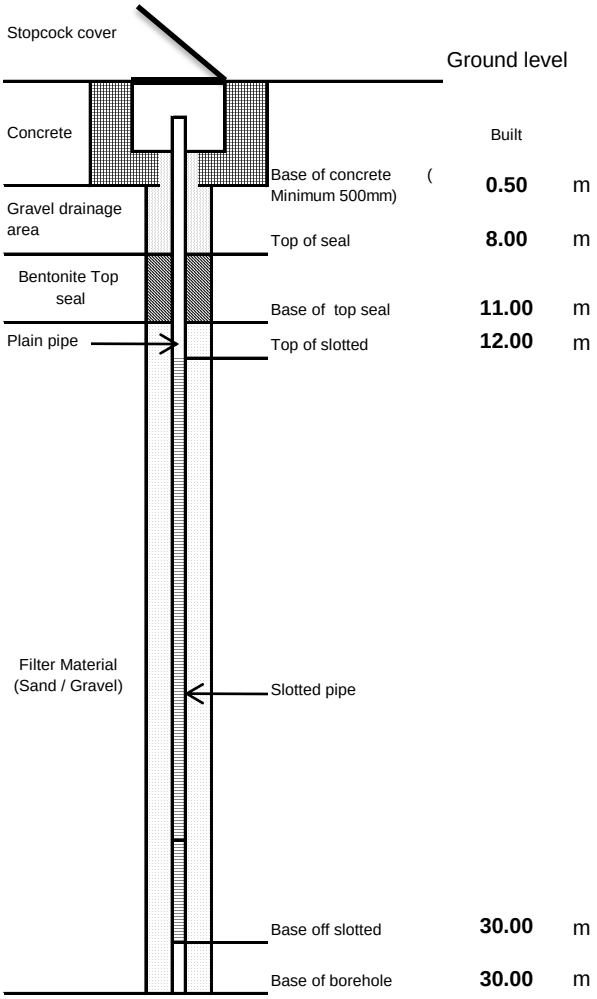
Weather	Fine	Project No	13/12,
Date	30/07/2019	Day	Tuesday
Rig type	Knebel hy79	Borehole Number	
Inclination	Orientation		MW 4
Sheet	2 of 2	Completed	Y

AGS

petersen drilling services ltd.

Summary of Standpipe Installation

Schematic Diagram (not to scale)



Installation Details

Standpipe diameter (id)	50	mm
Borehole diameter	154	mm
Slot size	1	mm
Geosock	Yes	
Gas tap	None	
Filter type	Gravel	
Type of cover	Upright	
Initial reading	12.70	m
Time of Initial reading	1400	hhmm

	Base (m)	Top (m)
Concrete	0.50	GL
Gravel drainage	8.00	0.50
Borehole seal top	11.00	8.00
Filter zone	30.00	11.00
Plain pipe	12.00	GL
Slotted zone	30.00	12.00
Base of borehole	30.00	

Remarks

Rig type	knebel hy79	**Project Title**			
Drilling Crew Details		Ballymullen Abbeyleix			
Support Operative	john whyte				
Lead Driller	stephan petersen	**Project No**		13/12,	
Site category	Green	**Day**	Tuesday	**Date**	July 30, 2019
Engineer	D Brotherick			**Borehole Number**	
Lead Driller's signature				**MW 4**	

petersen drilling services ltd. on behalf of **Booth Concrete** Rotary Drilling Log

Depth of Stratum Top (m)	Driller's Stratum Description	Sample / Hole / Test Details: No	Type	Insitu test	From (m)	To (m)	Drilling Details: Core run time (hhmm)	Total core Recovery (m)	Flush Return %	Flush Colour	Standard Penetration Test: Self Weight Pen (mm)	75 mm	150 mm	Seating Pen (mm)	75 mm	150 mm	225 mm	300 mm	Main Pen (mm)	N value	Casing Depth (m)	Water/ flush level (m)
0.00	Firm sandy TOPSOIL		RO		0.00	20.00	0000		100	brown												2.50
0.30	Loose brown gravelly SAND																					
6.40	Loose dark brown silty GRAVEL																					
8.00	Dense light brown sandy GRAVEL with cobbles and boulders																					
9.80	Dense light grey brownish silty sandy GRAVEL with frequent cobbles and boulders																					
15.30	Dense to very dense light grey very silty sandy GRAVEL with frequent limestone boulders																					

Shift details

Start time (hhmm)	Hole (m)	Water (m)	Casing (m)
1405			
Finish time (hhmm)	Hole (m)	Water (m)	Casing (m)
1710	20.00	3.00	20.00

Drilling Equipment Details

Casing (C) Open Hole (RO) Coring (RC)	Dia. (mm)	From (m)	To (m)	Barrel	Liner Type	Core Dia (mm)	Bit Type	Bit serial No	Flush	Polymer
C	140.00	0.00	20.00							
RO	154.00	0.00	20.00				DTH	115	Air	No

Ground Water Record

Time of strike	Depth Struck (m)	Casing (m)	Inflow	5 min	10 min	15 min	20 min	Depth Sealed (m)
1455	2.00	2.00	Slow	0.00	0.00	0.00	0.00	N/S
1515	6.50	6.50	Medium	0.00	0.00	0.00	0.00	N/S

Backfill (m)

Type	From (m)	To (m)

Time from	Duration (hhmm)	Remarks or details of any additional testing information, Dayworks

SPT I.D. Number	pd1	Calibration Date	18/09/2017
SPT Rod Type	2 3/8 Regular	SPT Energy Ratio	0.00
Drilling Crew Details			CSCS No
Support Operative	john whyte		
Lead Driller	stephan petersen		
Site category	Green		
Project Engineer	D Brotherick		
Lead Driller's signature			

Project Title

Ballymullen Abbeyleix

Weather	Variable	Project No	13/12,
Date	30/07/2019	Day	Tuesday
Rig type	Knebel hy79	Borehole Number	
Inclination	Orientation		MW 5
Sheet	1 of 2	Completed	Y

petersen drilling services ltd. on behalf of **Booth Concrete** Rotary Drilling Log

Depth of Stratum Top (m)	Driller's Stratum Description	Sample / Hole / Test Details					Drilling Details				Standard Penetration Test											
		No	Type	Insitu test	From (m)	To (m)	Core run time (hhmm)	Total core Recovery (m)	Flush Return %	Flush Colour	Self Weight Pen (mm)	75 mm	150 mm	Seating Pen (mm)	75 mm	150 mm	225 mm	300 mm	Main Pen (mm)	N value	Casing Depth (m)	Water/ flush level (m)

Shift details

Start time (hhmm)	Hole (m)	Water (m)	Casing (m)
0800	20.00	1.60	20.00
Finish time (hhmm)	Hole (m)	Water (m)	Casing (m)
1030	0.00		

Drilling Equipment Details

Casing (C) Open Hole (RO) Coring (RC)	Dia. (mm)	From (m)	To (m)	Barrel	Liner Type	Core Dia (mm)	Bit Type	Bit serial No	Flush	Polymer

Ground Water Record

Time of strike	Depth Struck (m)	Casing (m)	Inflow	5 min	10 min	15 min	20 min	Depth Sealed (m)

Backfill (m)

Type	From (m)	To (m)

Time from	Duration (hhmm)	Remarks or details of any additional testing information, Dayworks

SPT I.D. Number	pd1	Calibration Date	18/09/2017
SPT Rod Type	2 3/8 Regular	SPT Energy Ratio	0.00
Drilling Crew Details			CSCS No
Support Operative	john whyte		
Lead Driller	stephan petersen		
Site category	Green		
Project Engineer	D Brotherick		
Lead Driller's signature			

Project Title

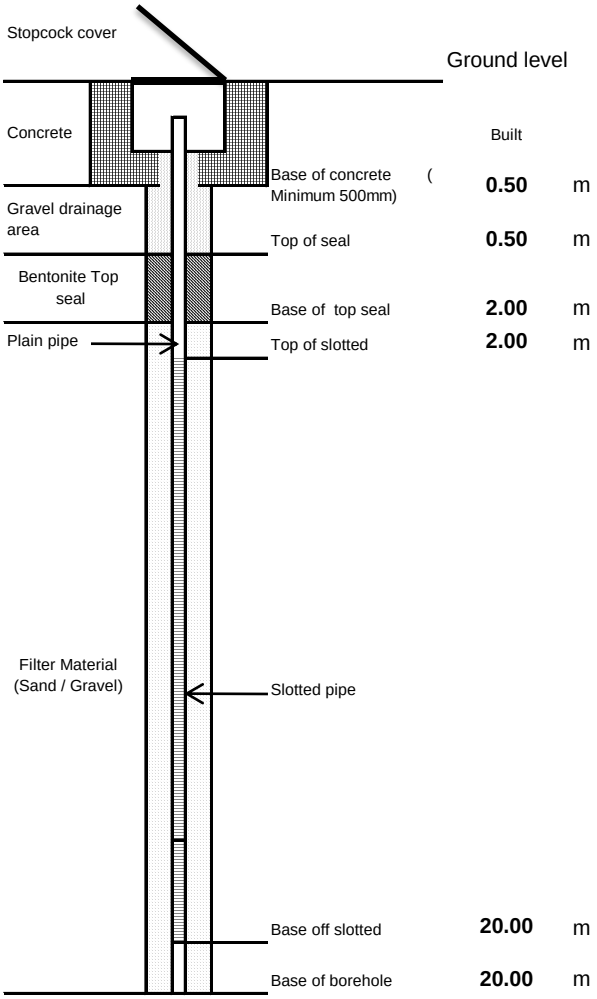
Ballymullen Abbeyleix

Weather	Cloudy	Project No	13/12,
Date	31/07/2019	Day	Wednesday
Rig type	Knebel hy79	Borehole Number	
Inclination	Orientation		MW 5
Sheet	2 of 2	Completed	Y

petersen drilling services ltd.

Summary of Standpipe Installation

Schematic Diagram (not to scale)



Installation Details

Standpipe diameter (id)	50	mm
Borehole diameter	154	mm
Slot size	1	mm
Geosock	Yes	
Gas tap	None	
Filter type	Gravel	
Type of cover	Upright	
Initial reading	1.80	m
Time of Initial reading	0930	hhmm

	Base (m)	Top (m)
Concrete	0.50	GL
Gravel drainage	0.50	0.50
Borehole seal top	2.00	0.50
Filter zone	20.00	2.00
Plain pipe	2.00	GL
Slotted zone	20.00	2.00
Base of borehole	20.00	

Remarks

Rig type	knebel hy79	**Project Title**			
Drilling Crew Details		Ballymullen Abbeyleix			
Support Operative	john whyte				
Lead Driller	stephan petersen	**Project No**		13/12,	
Site category	Green	**Day**	Wednesday	**Date**	July 31, 2019
Engineer	D Brotherick			**Borehole Number**	
Lead Driller's signature				**MW 5**	

Appendix 6.2: Peat Auger Logs.

Appendix 6.2– Peat Auger Logs

Peat Auger Log

Core No: P1 & PH1

Project No: P1486-3 | **Date:** 21/07/2022 | **Easting:** 643909

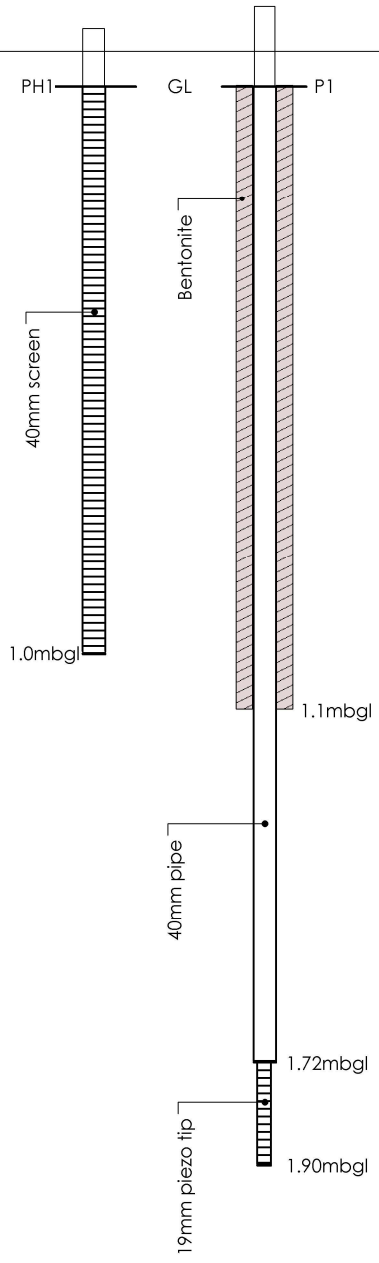
Site: Ballymullen, Co. Laois | **Method:** Hand Auger | **Northing:** 683793

Client: Booth Concrete | **Hole DIA:** 60mm | **Elevation:** 92.552mOD

SUBSURFACE PROFILE

Depth	Description	Depth/Elev.	Shear Vane kPa (20 40 60 80)	Shear Vane (kPa)	Humification Scale	Water Levels	Comments
0	Ground Surface	92.552					
	Soft wet, black PEAT with reeds (H6 / H7)	0.000					
1	Soft brown, amorphous PEAT (H8 / H9)	91.552 1.000 91.452 1.100					
	Dense, wet, well sorted coarse SAND						
		90.652 1.900					
2							

Piezometer Details



Remarks:

Upstands: P1 (0.72m)
PH1 (0.54m)

Final depth: 1.9mbgl

Logged by: M. Gill

Scale as shown

Sheet: 1 of 1

HYDRO-ENVIRONMENTAL SERVICES 22 Lower Main Street Dungarvan Co. Waterford Tel: 058-44122 Email: info@hydroenvironmental.ie

Peat Auger Log

Core No: P2

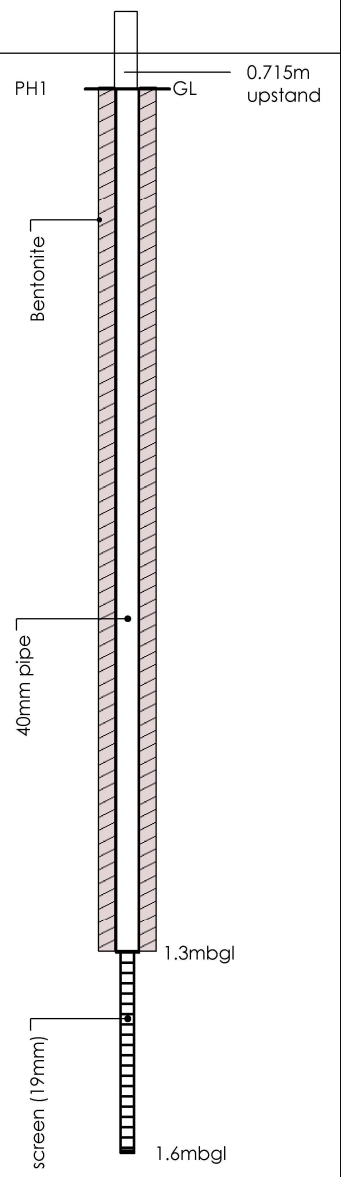
Project No: P1486-3 | **Date:** 21/07/2022 | **Easting:** 644005

Site: Ballymullen, Co. Laois | **Method:** Hand Auger | **Northing:** 683813

Client: Booth Concrete | **Hole DIA:** 60mm | **Elevation:** 93.277mOD

SUBSURFACE PROFILE

Depth	Symbol	Description	Depth/Elev.	Shear Vane kPa 20 40 60 80	Shear Vane (kPa)	Humification Scale	Water Levels	Comments	Piezometer Details
0		Ground Surface	93.277						
		Soft, dry, brown PEAT (H4 / H5)	0.000						
			92.757						
		Beige, damp, slightly gravelly SAND	0.520						
1			91.677						
			1.600						



Remarks:

Upstands: P2 (0.715m)

Final depth: 1.6mbgl

Logged by: M. Gill

Scale as shown

Sheet: 1 of 1

HYDRO-ENVIRONMENTAL SERVICES

Peat Auger Log

Core No: P3 & PH3

Project No: P1486-3

Date: 21/07/2022

Easting: 643959

Site: Ballymullen, Co. Laois

Method: Hand Auger

Northing: 683874

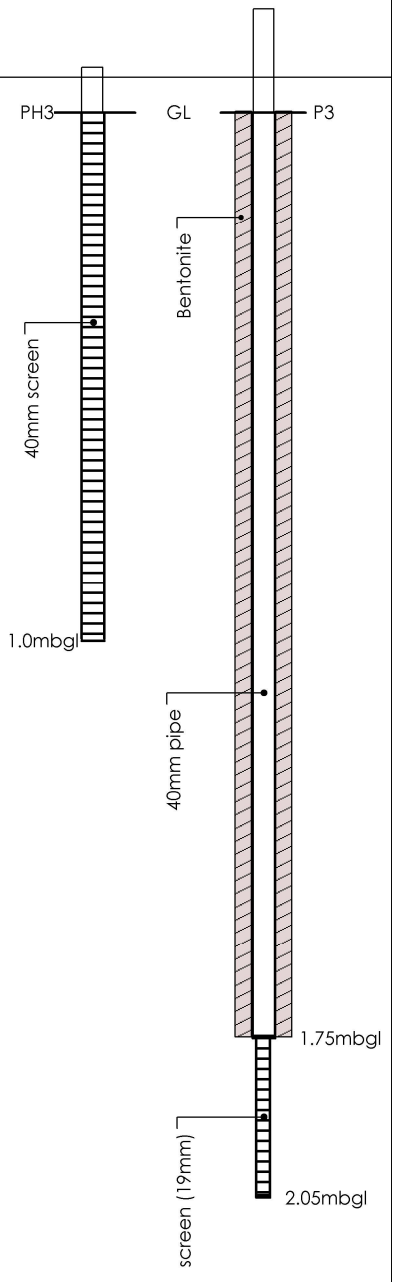
Client: Booth Concrete

Hole DIA: 60mm

Elevation: 92.679mOD

SUBSURFACE PROFILE

Depth	Symbol	Description	Depth/Elev.	Shear Vane kPa 20 40 60 80	Shear Vane (kPa)	Humification Scale	Water Levels	Comments	Piezometer Details
0		Ground Surface	92.679						
		Soft wet, brown PEAT. Tall reeds at ground level.	0.000						
1		Grey/beige wet, coarse well sorted SAND	91.639 1.040						
2			90.629 2.050						



Remarks:

Upstands: P3 (1.365m)
PH3 (0.6m)

Final depth: 2.05mbgl

Scale as shown

Logged by: M. Gill

Sheet: 1 of 1

7.0 WATER

7.1 Background and Objectives

Hydro-Environmental Services (HES) was engaged to carry out an impact assessment of any potential significant and likely effects of a proposed sand and gravel pit at Ballymullen, Abbeyleix, Co. Laois on water aspects (hydrology and hydrogeology) of the receiving environment:

The objectives of the assessment are:

- Produce a baseline study of the existing water environment (surface water and groundwater) in the area of the proposed development;
- Identify any likely effects of the proposed development on surface water and groundwater receptors during the construction phase, operational phase and restoration phase of the development;
- Identify mitigation measures to avoid, remediate or reduce likely significant negative effects and,
- Assess whether there are any likely significant residual effects and cumulative effects of the proposed development with other local developments.

This EIAR chapter has been updated (where required) in response to a Further Information Request issued by Laois County Council on 15th November 2023.

7.2 Proposed Development Overview

The proposed development is a new sand and gravel pit within a greenfield site at Ballymullen, Abbeyleix, Co. Laois. The development proposes to extract 718,287m^3/1.44 million tonnes (excl. overburden estimated to be 17,400m^3) of sand and gravel aggregate from an area of approximately 8.5 Ha. All material will be excavated and transported off-site to the manufacturing facility. There will be no processing of material at the application site.

The following design measures are proposed as surface water and groundwater protection measures in response to third-party concerns relating to Abbeyleix Bog:

- All aggregate extraction will be undertaken above the local groundwater level. There are no proposed surface water discharges to local watercourses from the extraction area. A proposed wheel wash (close to the site entrance) will discharge to ground via a full retention oil interceptor. Refer to Chapter 3.0 of the Revised EIAR for the proposed site layout and extraction plan.
- There will be no processing of the extracted material on site (i.e., there will be no separation of fines from the sand and gravel excavated at the site and therefore there will be no requirement for management of spoil waste/residual material at the site).

- The applicant proposes to extract the sand and gravel material and transport the material to the applicants existing manufacturing facility located approximately 1.3km to the south of the application site.
- The only proposed infrastructure at the site is a new site entrance, wheel wash, refuelling area and full retention oil interceptor and a Portaloo toilet. With regard to surface water drainage control, there will be infiltration trenches/swales installed at each phase of the extraction (the purpose of these is described further below in the chapter).
- A ~30m undisturbed greenfield buffer will remain along the western portion of the site. This area will provide a natural infiltration area/buffer for any localised site runoff.

In addition to be above measures, the southern portion of Phase 4 (the portion directly upslope/upstream of the mapped petrifying spring area) has been removed from the extraction plan (i.e. there will be no extraction of aggregate upslope/upstream of the petrifying spring area). This is discussed in more detail below. Refer to Figure 3.3 of the Revised EIAR for the revised extraction plan which shows the area of the site now excluded from extraction.

7.3 Relevant Legislation

The Water Chapter of this Revised EIAR is prepared in accordance with the requirements of European Union Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (the 'EIA Directive') as amended by Directive 2014/52/EU. Regard has also been taken to the requirements of the following legislation:

- S.I. No. 349/1989: European Communities (Environmental Impact Assessment) Regulations, and subsequent Amendments (S.I. No. 84/1995, S.I. No. 352/1998, S.I. No. 93/1999, S.I. No. 450/2000 and S.I. No. 538/2001), S.I. No. 30/2000, the Planning and Development Act, and S.I. 600/2001 Planning and Development Regulations and subsequent Amendments. These instruments implement EU Directive 85/373/EEC and subsequent amendments, on the assessment of the effects of certain public and private projects on the environment;
- Directives 2011/92/EU and 2014/52/EU on the assessment of the effects of certain public and private projects on the environment, including 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);
- Planning and Development Act, 2000, as amended;
- S.I. No. 94/1997: European Communities (Natural Habitats) Regulations, resulting from EU Directives 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive) and 79/409/EEC on the conservation of wild birds (the Birds Directive);
- S.I. No. 293/1988: Quality of Salmon Water Regulations, resulting from EU Directive 78/659/EEC on the Quality of Fresh Waters Needing Protection or Improvement in order to Support Fish Life;

- S.I. No. 272/2009: European Communities Environmental Objectives (Surface Waters) Regulations 2009 and S.I. No. 722/2003 European Communities (Water Policy) Regulations which implement EU Water Framework Directive (2000/60/EC) and provide for the implementation of 'daughter' Groundwater Directive (2006/118/EC). Since 2000 water management in the EU has been directed by the Water Framework Directive (WFD). The key objectives of the WFD are that all water bodies in member states achieve (or retain) at least 'good' status by 2015. Water bodies comprise both surface and groundwater bodies, and the achievement of 'Good' status for these depends also on the achievement of 'good' status by dependent ecosystems. Phases of characterisation, risk assessment, monitoring and the design of programmes of measures to achieve the objectives of the WFD have either been completed or are ongoing. In 2015 it will fully replace a number of existing water related directives, which are successively being repealed, while implementation of other Directives (such as the Habitats Directive 92/43/EEC) will form part of the achievement of implementation of the objectives of the WFD;
- S.I. No. 41/1999: Protection of Groundwater Regulations, resulting from EU Directive 80/68/EEC on the protection of groundwater against pollution caused by certain dangerous substances (the Groundwater Directive);
- S.I. No. 122/2014: European Communities Environmental Objectives (Drinking Water) Regulations 2014;
- S.I. No. 272/2009: European Communities Environmental Objectives (Surface Waters) Regulations 2009;
- S.I. No. 9/2010: European Communities Environmental Objectives (Groundwater) Regulations 2010;
- S.I. No. 296/2009: European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009; and
- S.I. No. 349/1989: European Communities (Environmental Impact Assessment) Regulations, and subsequent Amendments (S.I. No. 84/1995, S.I. No. 352/1998, S.I. No. 93/1999, S.I. No. 450/2000 and S.I. No. 538/2001), S.I. No. 30/2000, the Planning and Development Act, and S.I. 600/2001 Planning and Development Regulations and subsequent Amendments. These instruments implement EU Directive 85/337/EEC (EIA Directive) and subsequent amendments, on the assessment of the effects of certain public and private projects on the environment.

7.4 Relevant Guidance

The Water Chapter of this Revised EIAR is carried out in accordance with the guidance contained in the following:

- *Guidance on the preparation of the EIA Report* (Directive 2011/92/EU as amended by 2014/52/EU);
- Environmental Protection Agency (May 2022): *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports*;
- Institute of Geologists Ireland (2013): *Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements*;

- National Roads Authority (2008): *Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes*;
- CIRIA 2006: *Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors*. CIRIA C532. London, 2006;
- Department of the Environment, Heritage and Local Government; *Quarries and Ancillary Activities – Guidance for Authorities* (April, 2014); and,
- Environmental Protection Agency (2006): *Environmental Management in the Extractive Industry (Non-Scheduled Minerals)*.

7.5 Schedule of Works

7.5.1 Desk Study

A desk study of the proposed site and surrounding area was completed prior to the undertaking of field mapping, walkover assessments and site investigations. The desk study involved collecting all relevant geological, hydrological, hydrogeological and meteorological data for the study area. The desk study information presented in the original EIAR was reviewed and updated where required in June 2024. This included consultation with the following datasets (last accessed in June 2024):

- Environmental Protection Agency database (www.epa.ie);
- Geological Survey of Ireland (GSI) - Groundwater Database (www.gsi.ie);
- Met Eireann Meteorological Databases (www.met.ie);
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);
- EPA/Water Framework Directive "Catchments" Map Viewer (www.catchments.ie);
- Bedrock Geology 1:100,000 Scale Map Series, Sheet 16 (Geology of Kildare - Wicklow); Geological Survey of Ireland (GSI, 1994);
- Geological Survey of Ireland (GSI) - Groundwater Body Characterisation Reports;
- OPW Indicative Flood Maps (www.floodmaps.ie);
- Environmental Protection Agency – "Hydrotool" Map Viewer (www.epa.ie);
- CFRAM Preliminary Flood Risk Assessment (PFRA) maps (www.cfram.ie); and,
- Department of Environment, Community and Local Government online mapping viewer (www.myplan.ie).

7.5.2 Baseline Surveys and Investigations

To complete the Water Chapter of the EIAR, the following surveys and investigations were carried out:

- Walkover surveys and hydrological mapping of the proposed site and the surrounding area were undertaken whereby surface water flow directions and drainage patterns were recorded;
- A preliminary assessment of flood risk was completed for the proposed development area and local watercourses;

- Drilling of 5 no. investigation holes/monitoring wells to assess overburden lithology, depth to the bedrock and groundwater level monitoring and sampling;
- Groundwater sampling (3 no.) to assess baseline groundwater quality up-gradient and down-gradient of the site;
- Groundwater level monitoring by means of in-situ dataloggers (pressure transducers)
- Field hydrochemistry measurements (electrical conductivity, pH and temperature) were taken to determine the origin and nature of surface water flows; and,
- Visit to Abbeyleix Bog on 11th March 2021 to monitor petrifying spring discharge and hydrochemistry along with sampling (in the company of a member of the Abbeyleix Bog Project);
- 3 no piezometer couples/sets (3 no. deep sub peat piezometers, and 2 no. shallow standpipes) were installed along the north-eastern boundary of Abbeyleix Bog in July 2022 between the proposed site and the petrifying spring.
- Manual recording of groundwater levels in the on-site monitoring wells on 10 no. occasions between August 2019 and June 2024;
- Manual recording of groundwater levels in the installed piezometer couples on 8 no. occasions between July 2022 and April 2024; and,
- Continuous recording of water levels in 3 no. on-site monitoring wells between 8th August and 4th December 2019 through the use of in-situ dataloggers.

7.5.3 Impact Assessment Methodology

Please refer to Chapter 1.0 of the Revised EIAR for details on the impact assessment methodology (EPA, 2022). In addition to the above methodology, the importance of the water environment receptors was assessed on completion of the desk study and baseline study. Using the National Roads Authority (2008) guidance, an estimation of the importance of the hydrological and hydrogeological environments within the study area is quantified, using the criteria set out in Table 7.1 and Table 7.2.

Table 7.1: Estimation of Importance of Hydrology Attributes (NRA, 2008)

Importance	Criteria	Typical Example
Extremely High	Attribute has a high quality or value on an international scale.	• River, wetland or surface water body ecosystem protected by EU legislation, e.g. 'European sites' designated under the Habitats Regulations or 'Salmonid waters' designated pursuant to the European Communities (Quality of Salmonid
Very High	Attribute has a high quality or value on a regional or national scale.	• River, wetland or surface water body ecosystem protected by national legislation – NHA status. • Regionally important potable water source supplying >2500 homes. • Quality Class A (Biotic Index Q4, Q5). • Flood plain protecting more than 50 residential or commercial properties from flooding. • Nationally important amenity site for a wide range of leisure activities.
High	Attribute has a high quality or value on a local scale.	• Salmon fishery Locally important potable water source supplying >1000 homes. • Quality Class B (Biotic Index Q3-4). • Flood plain protecting between 5 and 50 residential or commercial properties from flooding. • Locally important amenity site for a wide range of leisure activities.
Medium	Attribute has a medium quality or value on a local scale	• Coarse fishery. • Local potable water source supplying >50 homes Quality Class C (Biotic Index Q3, Q2-3). • Flood plain protecting between 1 and 5 residential or commercial properties from flooding.
Low	Attribute has a low quality or value on a local scale.	• Locally important amenity site for a small range of leisure activities. • Local potable water source supplying <50 homes. • Quality Class D (Biotic Index Q2, Q1) Flood plain protecting 1 residential or commercial property from flooding. • Amenity sites used by small numbers of local people.

Table 7.2: Estimation of Importance of Hydrogeology Attributes (NRA, 2008)

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

7.6 Existing Environment

7.6.1 Site Description and Topography

The proposed development site is situated at Ballymullen townland which is located ~1km south of Abbeyleix town, Co. Laois. The application site, which is currently a greenfield site, has an area of approximately 8.5ha.

The site is located at the topographic transition between the Castlecomer Plateau to the east and Laois Central Lowlands to the west. Much of the site area has a characteristic hummocky/hilly terrain, which is typical of a glacial sand and gravel deposition area. The land then generally flattens out to the west, towards the River Nore.

The site, which has an elevation range of between approximately 94 and 130m OD (Ordnance Datum), is located on a hillside that steadily slopes westerly towards the lower-lying and flatter boglands (Abbeyleix Bog) that exists to the west of the site. The River Nore flows in a southerly direction approximately 2.2km west of the site (further west of Abbeyleix Bog).

The site, which comprises mainly grassland with some woodland and scrub in the central area, is bordered by agricultural grassland to the east, north, and south, and by a local public road to the west. This public road defines the western boundary of the site. West of the local public road, the land is low-lying and boggy before transitioning into peatland at Abbeyleix Bog.

The site is made up of several grazing fields which are separated by hedgerows. Access to the site is from the public road to the west.

7.6.2 Land-Use

Landuse in the surrounding area is largely agricultural with a scattered rural pattern of residential dwellings along the local roads to the west. Further north (~200m) along the public road to the west, there are a number of housing estates on the outskirts of Abbeyleix. Abbeyleix Bog to the west of the site has been planted in areas with coniferous forestry. The closest EPA licensed facility is located approximately 500m to the northwest of the application site. At that licenced facility Stonearch previously manufactured Vitamin K3 for use as a supplement in animal feed until its closure in the early 2000s. The facility is still licensed by the EPA (P0332).

There are a number of existing sand and gravel pits in the area, the closest one is a small disused pit located approximately 500m to the southeast of the site. The existing Booth Precast Products Ltd manufacturing facility is located 1.3km to the south of the application site.

7.6.3 Water Balance

Long-term rainfall and evaporation data were sourced from Met Éireann. The 30-year annual average rainfall (AAR) recorded at Abbeyleix (Blandsfort), ~5km northeast of the site, is presented in Table 7.3 below.

Table 7.3: Annual Average Long-Term Rainfall Data (mm).

Station		X-Coord		Y-Coord		Ht (MAOD)		Opened		Closed		
Abbeyleix						164		1943		-		Total
Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec	
93.5	67.4	72	63.3	63	67	70.1	86.6	73.5	105.1	91.4	90.1	943

The closest synoptic station where the average potential evapotranspiration (PE) is recorded is Kilkenny, approximately 27km south of the site. The long-term average PE for this station is 460mm/year. This value is used as the best estimate of the site PE. Actual Evaporation (AE) at the site is estimated as 437mm/year (which is 0.95 × PE).

The effective rainfall represents the water available for surface water runoff and groundwater recharge. The effective rainfall for the site is calculated as follows:

Effective rainfall = AAR – AE
= 943mm/year – 437mm/year
ER = 506mm/year

Based on recharge coefficient estimates from the Geological Survey of Ireland (GSI), an annual conservative groundwater recharge coefficient of 85% is used for the site hydrogeological setting which is *"sand & gravels aquifer, overlain by well-drained soil".* The hydrogeology of the area is discussed in more detail below. Therefore, annual recharge and runoff rates for the site are estimated to be 430mm/year and 76mm/year respectively. Based on a site landholding area of 8.5ha, annual average recharge and runoff volumes for the site are estimated to be 36,550m^3/year and 6,460m^3/year respectively (or ~100 and ~17.7m^3/day).

7.6.4 Regional and Local Hydrology

Regionally the proposed site is located in the River Nore surface water catchment within Hydrometric Area 15 of the south-eastern River Basin District. The River Nore flows in a southerly direction approximately 2.2km west of the proposed site. A regional hydrology map is shown in Figure 7.1.

On a more local scale, the proposed site is located within the Ballymullen Stream surface water catchment. The Ballymullen stream flows in a northerly direction through Abbeyleix Bog approximately 250m to the west of the application site. The Ballymullen Stream rises in higher hills to the east of the application site before passing to the south of the site and

flowing north/northwest towards the River Nore which exists approximately 3km downstream of the site. A local hydrology map is shown in Figure 7.2.

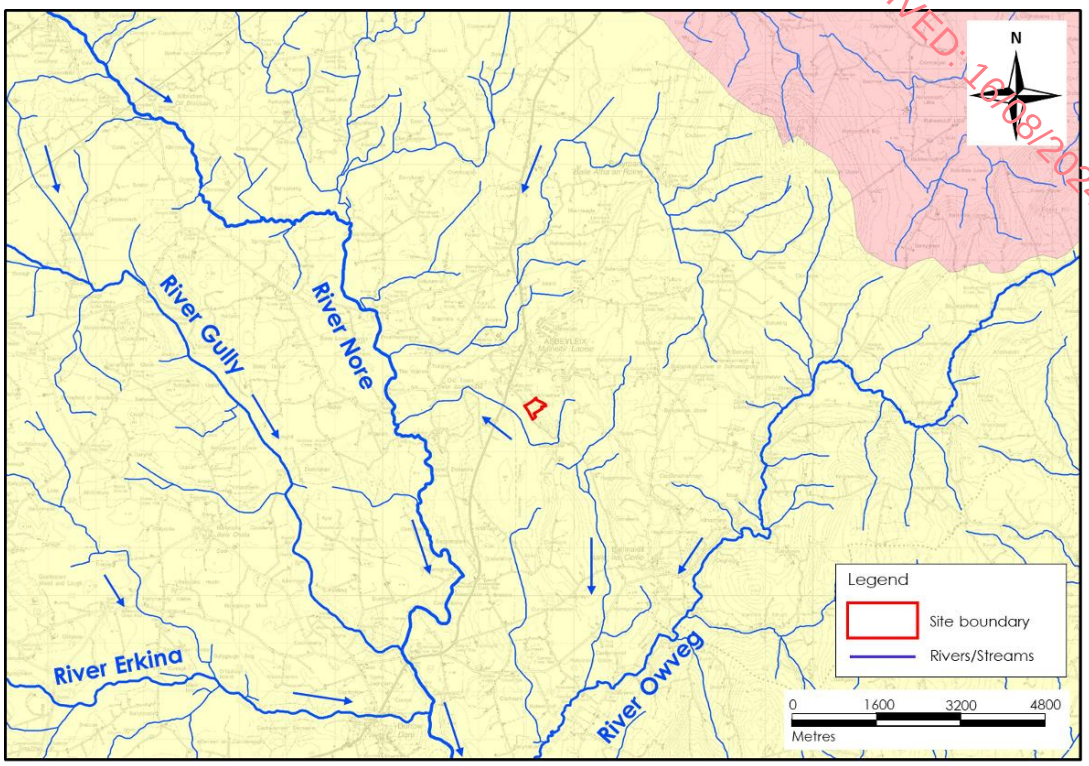


Figure 7.1: Regional Hydrology Map

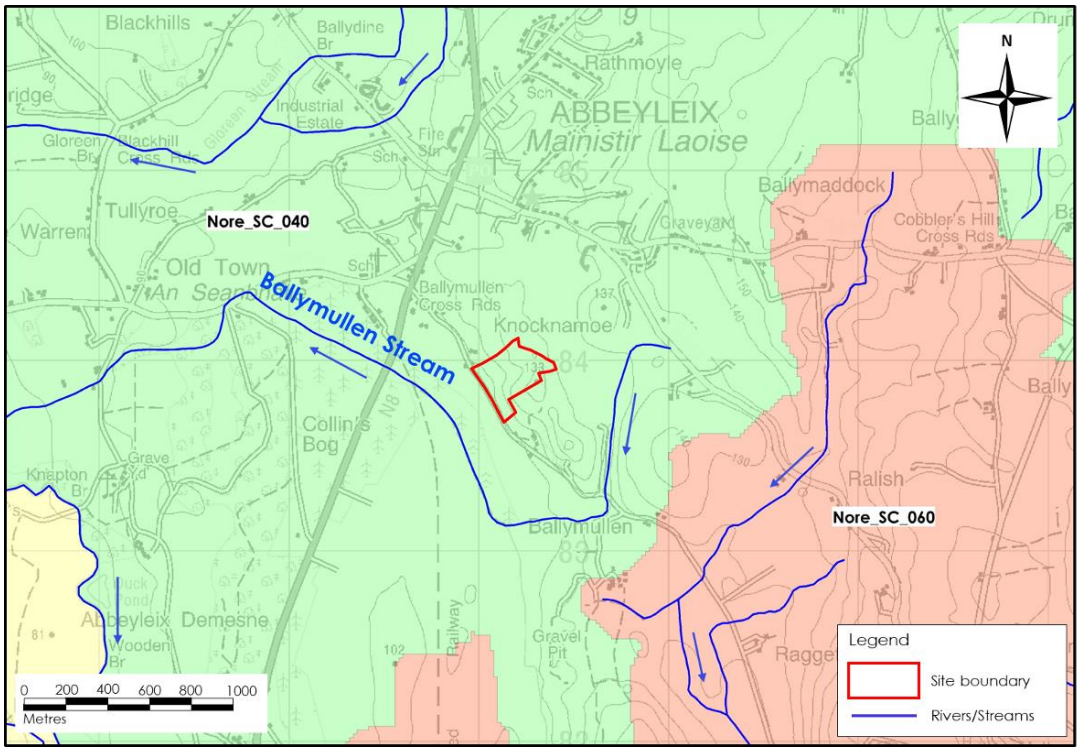


Figure 7.2: Local Hydrology Map

7.6.5 Existing Site Drainage

There are no natural permanent surface water features within the site or adjacent to the site. The closest natural surface water feature to the site is a seasonal pond which is located in a hollow approximately 30m to the east of the site. On the OSI 6-inch and 1:5,000 scale mapping (Figure 7.3), this feature is referred to as a "turlough". A turlough is a groundwater fed lake that is typically found in a karst limestone geological setting and not on sand and gravel deposits.

This feature was fully dried up during the period when the initial walkover surveys and site investigations for this project were being carried out (June – September 2019, but there was some water in it in July/August 2022). Water was noted at this location during subsequent walkover surveys completed in April and May 2024. A walkover of the pond area and its catchment along with the intrusive site investigations (discussed below) confirm that this feature is surface water fed and not groundwater fed. The pond area and its catchment area to the north and east are underlain by poorly draining soils (lacustrine silts and clay) which retain water during wet periods (typically over the winter). Based on the investigation drilling, the pond is perched over the underlying sand and gravel deposits. This is discussed further below.

There are a number of drains on the land to the east of the pond that drains into the pond. The pond does not have any apparent surface water outfall which suggests there is some infiltration into the underlying sand and gravel deposits.

Overall, the proposed development site is largely well drained with good ground conditions as would be expected in a sand and gravel setting.

The western, low-lying side of the site adjacent to the public road is slightly boggy and can experience localised surface water ponding over the winter, particularly the southwestern corner of the most northerly field. This can be attributed to a shallow groundwater table during winter.

Based on the fact that there are no drainage outfalls from the site, all effective rainfall landing on the site has to percolate/recharge to the ground. The GSI recharge coefficient of 85% is likely to be closer to 100% in reality.

West of the public road (which runs along the western boundary) there are numerous land drains in the adjacent field. There is no drainage outfall (i.e. culvert below the road) from the site towards these drains. Refer to Figure 7.3 for an existing site drainage map.

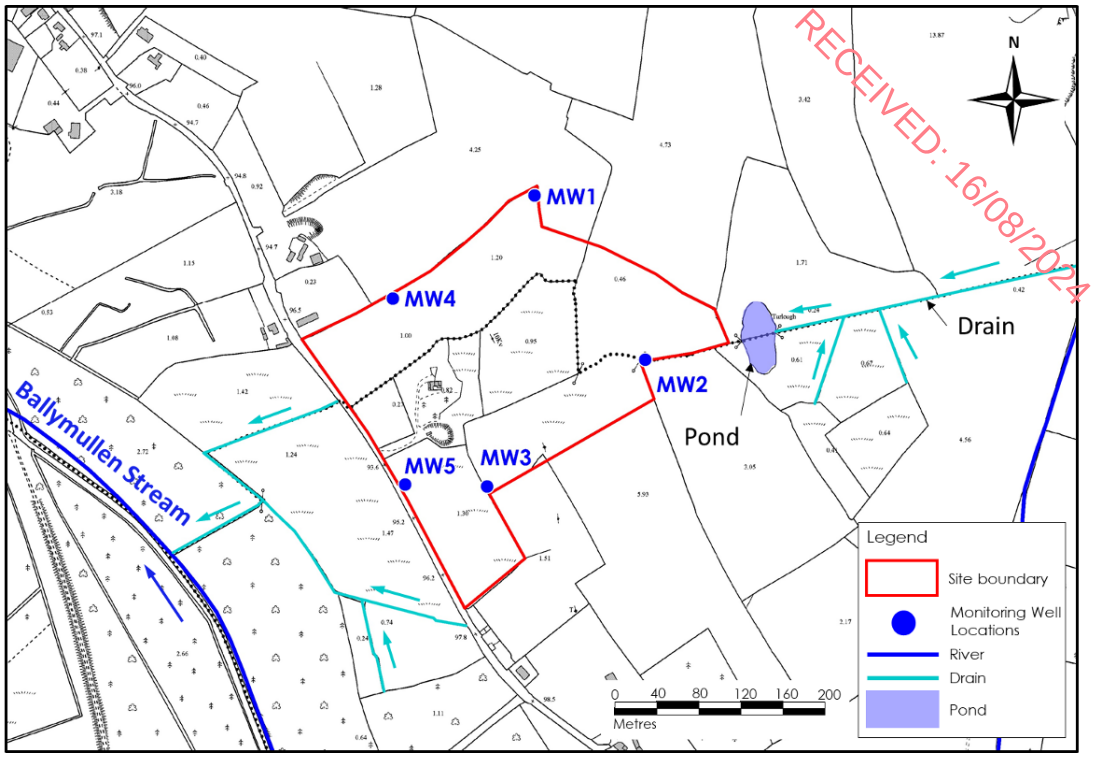


Figure 7.3: Site Drainage Map

7.6.6 Flood Risk Identification

CFRAM Flood Extents Mapping, National Indicative Fluvial Mapping (NIFM), Past Flood Event Mapping and historical mapping (*i.e.* 6" & 25" base maps) were consulted to identify those local areas as being at risk of flooding.

CFRAM Flood Extents Mapping is available for the River Nore to the west of the site. The site is significantly above (>4m) the 100-year and 1000-year flood zone of the River Nore which is what would be expected given the site's much higher elevation.

CFRAM Flood Extents Mapping for the area is shown in Figure 7.4. There are no flood zones mapped in the immediate area of the site. The NIFM does not cover the area of the proposed site.

OPW's Past Flood Events mapping (Figure 7.5) was consulted to identify those areas as being at risk of flooding. There were no reports of flooding at the site location or along the Ballymullen Stream downstream of the site.

There is no text on local available historical 6" or 25" mapping for the proposed site that identifies areas that are "prone to flooding" within the site boundary, or downstream of the site.

There are no proposed surface water discharges from the proposed development site. There will be no alternation of the drainage at the site.

Based on the above there is no potential risk of fluvial flooding at the development site, and there is no flood risk in downstream watercourses.

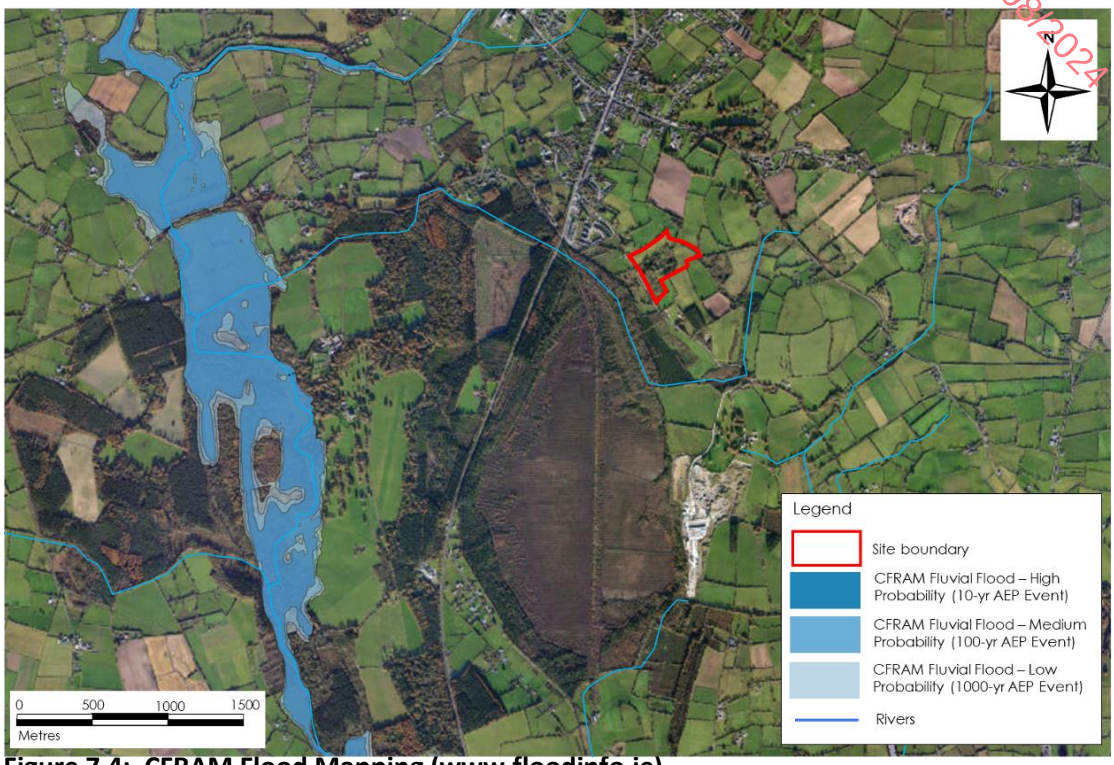


Figure 7.4: CFRAM Flood Mapping (www.floodinfo.ie)

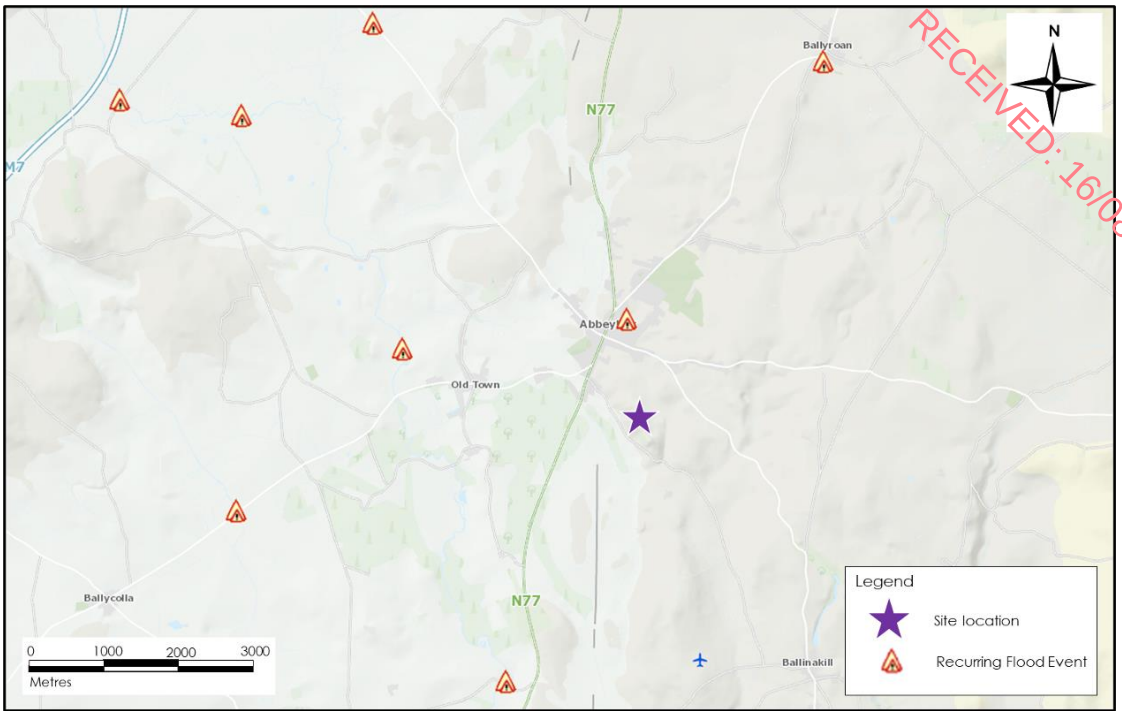


Figure 7.5: OPW Flood Hazard Mapping

7.6.7 Surface Water Quality

EPA Q-rating data are available for the River Nore upstream and downstream of the proposed site location. Recent water quality monitoring (2022) shows that the upstream monitoring point at Poorman's Bridge (EPA Station Code: RS15N010900) has a Q4 rating (Good Status) and the downstream monitoring location at Watercastle Bridge (EPA Station Code: RS15N011100) has a Q4 rating (Good Status). No Q-rating data are available for the Ballymullen Stream.

7.6.8 Local Hydrogeology

The Groundwater Body (GWB) in which the proposed site is located is called the Abbeyleix Gravels GWB (IE_SE_G_171).

The sand and gravel deposits which overlie the bedrock in this GWB are classified by the GSI as a Locally Important Gravel Aquifer (Lg). The total area of the gravel aquifer is mapped at approximately 7km^2.

In the vicinity of the site the sand and gravels are also underlain by the following bedrock aquifer type:

- The Dinantian Pure Bedded Limestones (as described fully in Chapter 6 – Land, Soils and Geology), which are mapped to underlie the majority of the site, are classified by

the GSI as a Regionally Important Karstified Aquifer (RKd). Faults and joints can be enlarged by karstification as groundwater moves through the limestones (GSI, 2004).

The GSI bedrock and gravel aquifer map for the area is shown in Figure 7.6 below. The recharge to the sand and gravel aquifer in this area is direct from precipitation landing on the ground surface and also possibly from streams that emerge from the more elevated, less permeable lands/hills to the east.

Discharge from the sand and gravel aquifer is expected to be to the River Nore as baseflow. There are known spring locations present along the east of the River Nore which are likely to be discharge zones from the gravels and/or underlying limestone aquifer. With respect to the underlying karstified limestone bedrock aquifer, most groundwater flow is likely to be concentrated in the upper 20m or so (GSI, 2004).

Recharge to the karstified limestone bedrock is likely to occur by a combination of three mechanisms (GSI, 2004):

- Directly by rainfall recharge in upland areas to the east (where overburden depths are thinner);
- At the contact with the Namurian shales (further east of the site) where there are likely to be streams flowing over bedrock outcrop (such rivers may not sink completely but will lose some flow as they cross the boundary onto the limestones); and,
- By indirect recharge from the overlying sand and gravel aquifer.

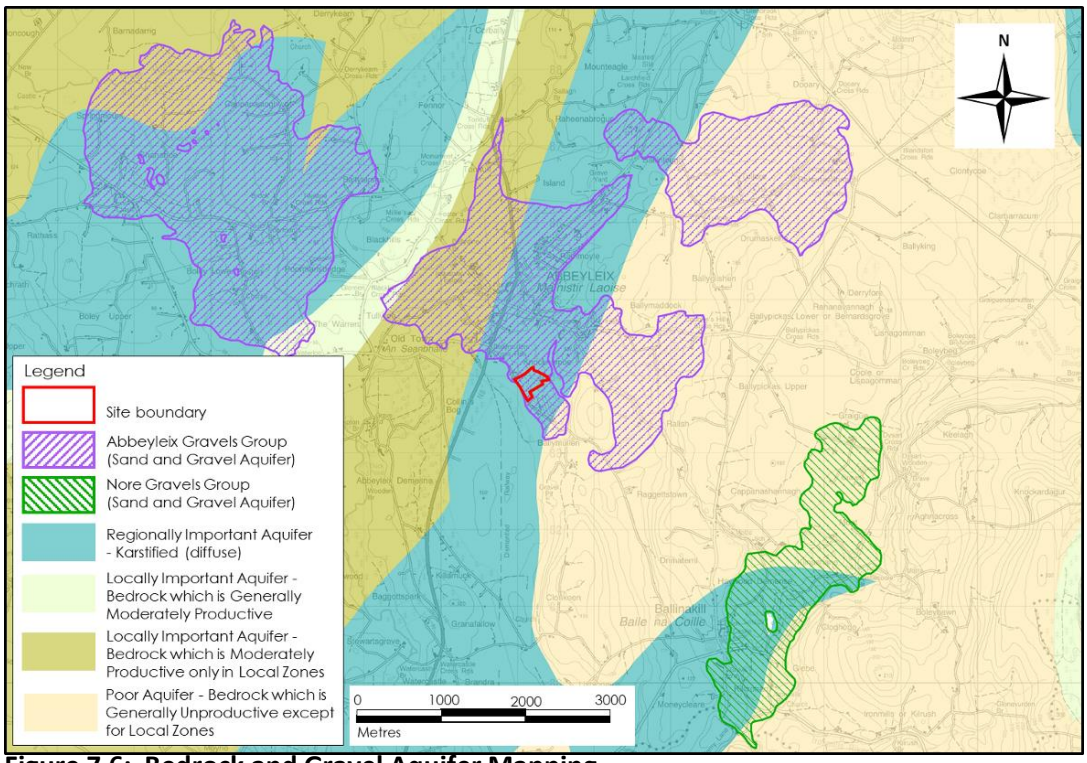


Figure 7.6: Bedrock and Gravel Aquifer Mapping

7.6.9 Site Hydrogeology

7.6.9.1 Original Site Investigations/Monitoring

Five investigation holes/monitoring wells (MW1 to MW5) were drilled by Peterson Drilling Services Ltd at the site under the supervision of HES between the 29th July and 2nd August 2019. Refer to Chapter 6.0 – Land, Soils and Geology for details and Appendix 6-1 for drilling logs.

The site is directly underlain by a locally Important Gravel Aquifer (Lg) made of glaciofluvial deposits. Based on the site investigation works undertaken for the proposed development, the deposits were generally found to comprise mainly of SAND with some interbedded SAND & GRAVEL and GRAVEL layers (described fully in Chapter 6.0 – Land, Soils and Geology). GRAVELS with boulders and cobbles were becoming more abundant at the base of the investigation holes on the central and western sides of the site. There were very few clays or silts noted in the sand and gravel during the investigation drilling.

The base of the sand and gravel was proven to be at 37.2mbgl (89.2m OD) at monitoring well location MW1 and at 30.6mbgl (84.7m OD) at MW3 when dark grey LIMESTONE was encountered. The variation in the top of bedrock elevation at these two locations suggests that the bedrock formation is dipping south-westerly towards the River Nore valley.

Data loggers for automated groundwater monitoring were only installed in MW2, MW4 and MW5 between 8th August and 4th December 2019. Groundwater levels in the remaining wells (MW1 & MW3) were manually measured on several occasions over this period. All wells were then manually dipped again on 4 no. occasions between 29th July and 19th August 2022.

Data loggers were purposely only installed in these 3 wells to get representative groundwater level variations in the upper (east), middle and lower (west) parts of the proposed site. Groundwater level variations and flow patterns in sand and gravel aquifers are generally more subdued than in bedrock aquifers and therefore the installation of 3 no. loggers in the pattern described were deemed sufficient to monitor overall groundwater level fluctuations at the site.

Figure 7.7 below as provided in the original EIAR includes all the available continuous groundwater level monitoring data. No updated graph is required for the reason outlined above (i.e. no data exists).

Groundwater levels measured in the on-site monitoring wells are shown in Table 7-4 below. Groundwater levels across the site during the monitoring period varied spatially between 1.027m (94.04m OD) and 29.961m (99.398m OD) with the gradient flowing from east to the west.

During the initial monitoring period (August – December 2019), the depth to the groundwater table on the easterly, more elevated side of the site, was approximately 30 metres below ground level (mbgl), in the central area the depth to groundwater was

between 11.5 and 20mbgl and on the westerly low-lying section it was approximately only 1m.

The groundwater level difference across the site from west to east is approximately 5m (gradient – 0.017). The gradient is a result of the hilly, sloping nature of the site and the direct recharge into the relatively fine SAND deposits which results in groundwater table mounding.

Table 7.4: Proposed Site Groundwater Levels/Elevations

Monitoring Well No.	Ground Level (m OD)	WL (m bgl)	WL (m OD)	WL (m bgl)	WL (m OD)	WL (m bgl)	WL (m OD)
		08/08/2019		25/08/2019		04/12/2019	
MW1	126.419	29.821	96.958	29.926	96.493	30.71	96.193
MW2	129.359	29.961	99.398	30.026	99.333	30.58	99.257
MW3	115.301	20.412	94.889	20.472	94.829	20.9	94.869
MW4	105.902	11.482	94.42	11.547	94.335	12.03	94.312
MW5	95.067	0.982	94.085	1.027	94.04	1.54	94.085

Automated groundwater level (by means of in-situ dataloggers) was undertaken between 8th August and 4th December 2019 (Figure 7.7). The variation in the groundwater level in each borehole across the site during this continuous monitoring period was <0.3m, with further seasonal variation (from dipping data presented in Table 7.4) in MW1 of between up to ~0.46 to ~0.76m.

3 no. piezometer couples/sets (3 deep sub peat piezometers, and 2 no. shallow standpipes) were installed along the northeastern boundary of Abbeyleix Bog in July 2022 between the proposed site and the petrifying spring. The area where the 3 no. piezometers sets are located is classified ecologically as wet grassland.

Refer to Figure 7.8 below for the bog piezometer locations. The piezometer logs are attached as Appendix 6-2 (Land, Soils and Geology Chapter).

The 3 no. deep sub peat piezometers (P1, P2 and P3) were installed into wet SAND which was found to underlie the PEAT at the 3 no. piezometers locations. The 2 no. shallow standpipes (PH1 and PH3) were installed to the base of the peat only. No PH2 piezometer was installed due to the shallow depth, and dry nature, of peat at the P2 location (0.52m).

The SAND (mineral subsoil) encountered below the peat at P1 and P3 was well sorted and coarse while the SAND at P2 was slightly gravelly.

Water level monitoring at the 3 no. piezometer sets, and at all 5 no. on-site monitoring wells were completed during July and August 2022. The data is presented in Table 7.5 below. The water level recorded in the deep sub-peat piezometers (P1, P2 & P3) is representative of the regional groundwater table while the water level in the shallow piezometer reflects the phreatic surface of the water in the peat. The 5 no. on-site monitoring wells also measure the regional groundwater level below the application site.

Based on the measured groundwater levels (Table 7.5), the SAND below the peat is saturated, but the potentiometric groundwater level is below the bog surface which means there is no potential for upwelling of groundwater onto the ground surface (as springs/seepages) as seen at the petrifying spring area which is located further to the southwest.

It may be the case that the upwelling that feeds the mapped petrifying spring is a discrete and localised phenomenon.

Table 7.5. Proposed Site and Abbeyleix Bog Groundwater Levels/Elevations

Monitoring Well Location	Ground Level (m OD)	WL (m OD)	WL (m OD)	WL (m OD)	WL (m OD)
		29/07/2022	04/08/2022	11/08/2022	19/08/2022
MW1	126.419	96.26	96.25	96.23	96.23
MW2	129.359	99.17	99.15	99.15	99.15
MW3	115.301	95.08	95.07	95.09	95.09
MW4	105.902	94.18	94.16	94.15	94.15
MW5	95.067	94.01	93.96	93.93	93.93
PH1	92.552	92.29	92.32	92.25	92.25
PH3	92.679	92.52	92.54	92.49	92.49
P1	92.552	92.26	92.29	92.24	92.24
P2	93.277	92.28	92.55	92.69	92.69
P3	92.679	92.50	92.52	92.47	92.47

Groundwater levels were measured on 11th August 2022 in the deep sub peat piezometers (P1, P2 and P3) and the 5 no. site monitoring wells. These data were used to create a groundwater level contour map as shown in Figure 7.9 below.

Based on the groundwater levels measured as part of these investigations, the groundwater gradient (flow direction) within the sand and gravel aquifer in the area of the site is westerly (Figure 7.9), with groundwater likely discharging into the Ballymullen Stream as baseflow

(also as springs at Abbeyleix Bog) and into the River Nore via the Ballymullen Stream and/or via baseflow/springs.

There is a mapped petrifying (calcified) spring located on the edge of Abbeyleix Bog to the southwest of the proposed development. The proposed development site is located to the northeast of the spring. However, due to the revised extraction plan (i.e. reduced area at Phase 4 as described in Section 7.2 above), there is now no proposed aggregate extraction directly up-gradient of the spring location (refer to Figure 7.9 below with the revised extraction area and groundwater flow direction and contour mapping.

Based on the groundwater levels measured at the proposed development site wells and in the bog area piezometers near the spring area, groundwater flow feeding the main petrifying spring area to the southwest does not originate from within the revised area proposed for extraction (i.e. the area proposed for extraction is not a recharge zone for the main petrifying spring area located to the southwest of the proposed development site. Abbeyleix Bog and the spring are discussed further in Section 7.6.13 below.

On the OSI 6-inch and 1:5,000 scale mapping, a "turlough" is mapped approximately 30m to the east of the site. A turlough is a groundwater fed lake that is typically found in a karst limestone geological setting and not on sand and gravel deposits. The base of the pond was surveyed to be at 110.9m OD. The groundwater level measured in the nearby monitoring well (MW2) is approximately 99.4m OD which is 11.5m below the base of the pond. This suggests that the pond is surface water fed and is perched on a lens of lower permeability deposits (lacustrine silts/clays) which sit on top of the sand and gravels. Refer to Figure 7.9 for site groundwater levels and flow directions.

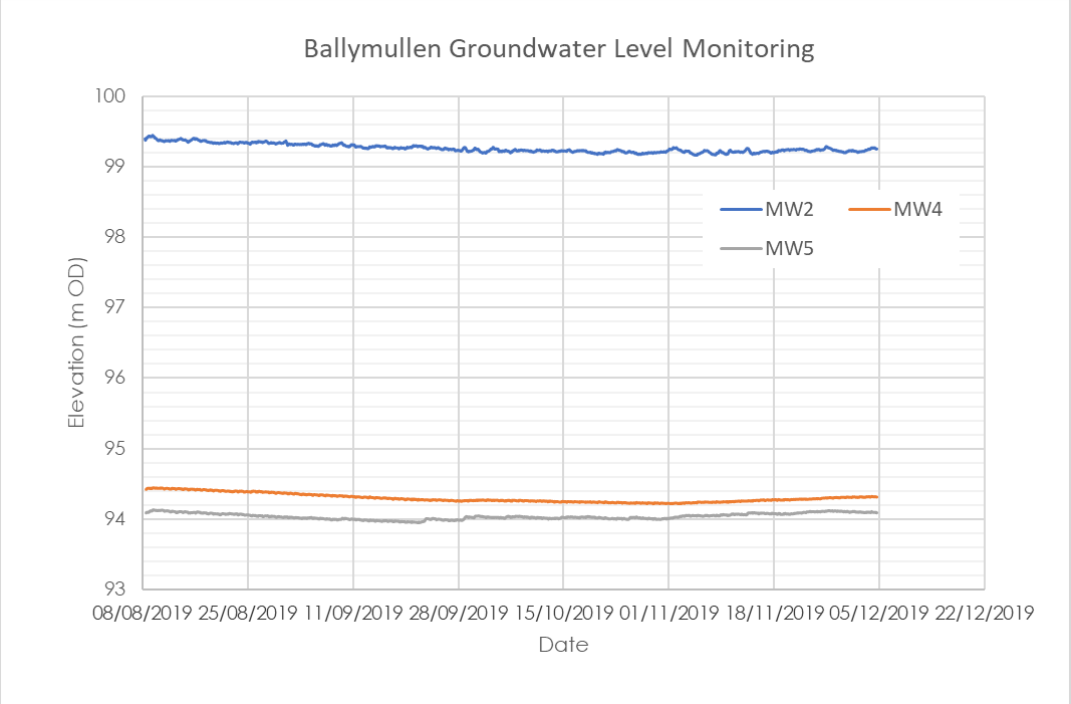


Figure 7.7: Groundwater Level Plots

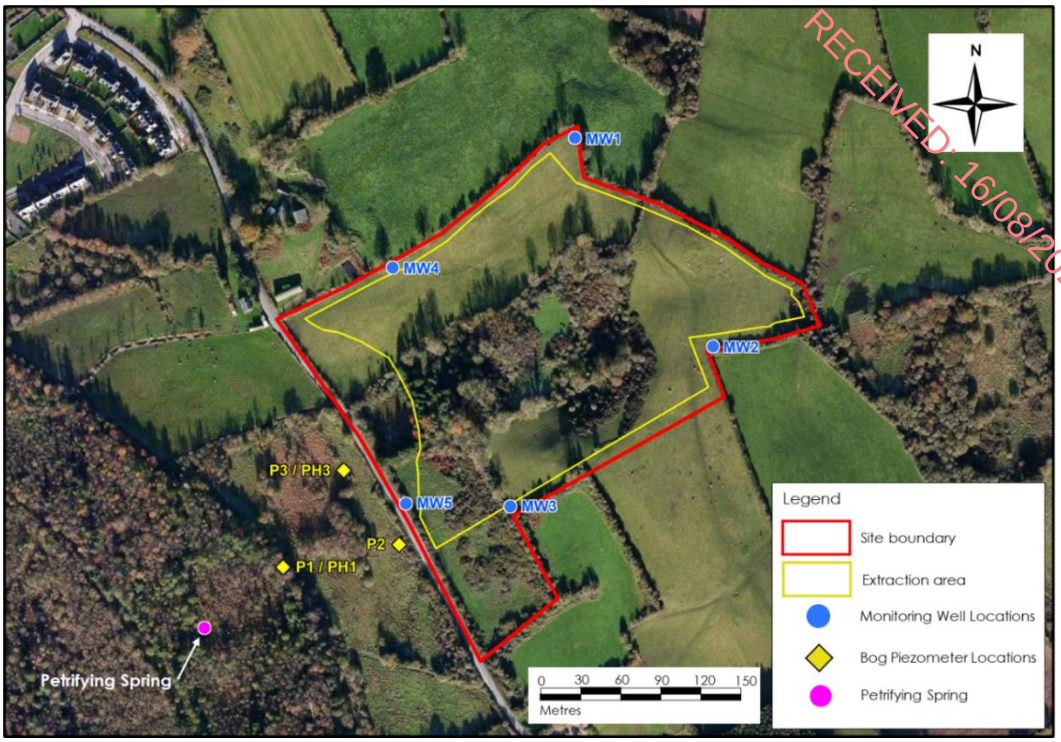


Figure 7.8: Abbeyleix Bog Piezometer Sets & Site Monitoring Well Locations

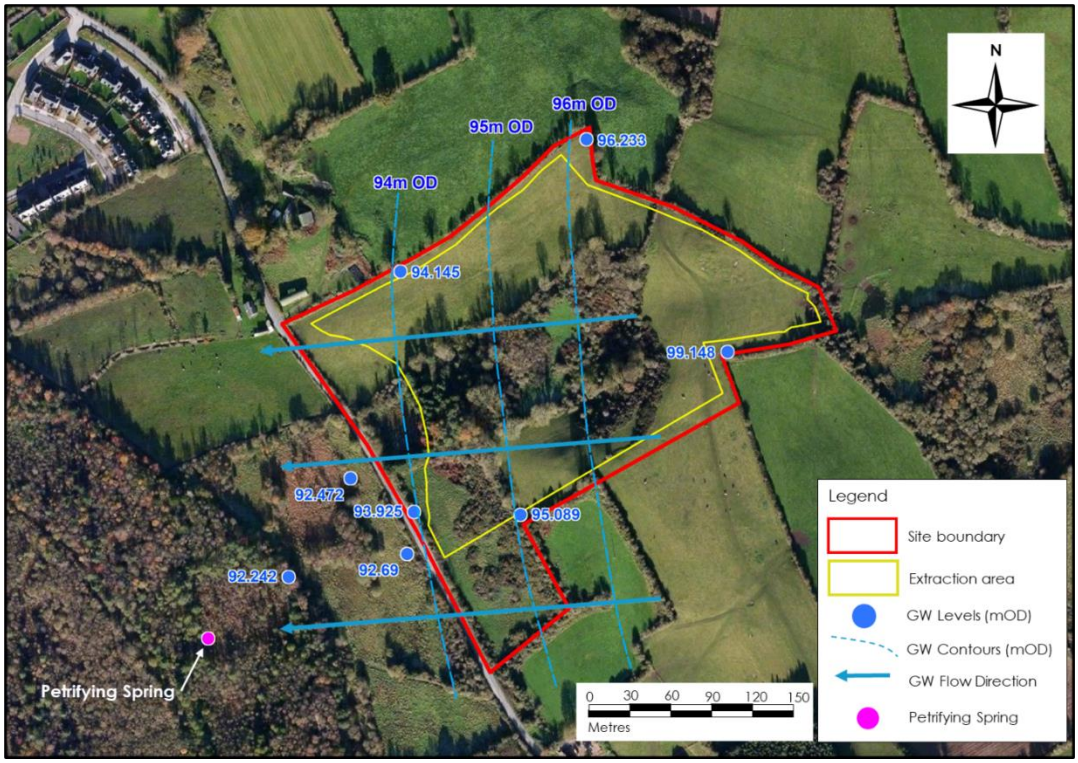


Figure 7.9: Groundwater Levels and Flow Direction (11/08/2022)

7.6.9.2 Recent Monitoring

In response to the RFI, additional groundwater level monitoring comprising of 4 no, rounds of manual water level monitoring has been completed (16th March 2023, 4th and 12th April and 13th June 2024). This recent additional monitoring (Table 7.6) was completed to supplement the data presented in Section 7.6.9.1.

The highest water levels in the onsite boreholes were recorded in April 2024, whereby water levels ranged from 94.9mOD at MW5 to 100.24mOD at MW2. Subsequent monitoring in June 2024 had shown that water levels in the onsite boreholes had begun to fall with the onset of the summer regression. Water levels in this monitoring round typically fell by ~0.1m in comparison with the April water levels. Meanwhile, the water levels only fell by 1cm in MW2 and MW3. Nevertheless, lower water levels were recorded in all boreholes, indicating the onset of the summer regression.

Table 7.6. Recent Groundwater Level Monitoring

Monitoring Well Location	Ground Level (m OD)	WL (m OD)	WL (m OD)	WL (m OD)	WL (m OD)
		16/03/2023	04/04/2024	12/04/2024	13/06/2024
MW1	126.419	97.18	97.55	97.64	97.51
MW2	129.359	99.81	100.23	100.24	100.23
MW3	115.301	95.69	96.05	96.10	96.09
MW4	105.902	94.90	95.27	95.29	95.18
MW5	95.067	94.53	94.91	94.90	94.80
PH1	92.552	92.58	92.57	92.57	92.33
PH3	92.679	92.70	92.69	92.70	92.67
P1	92.552	92.45	92.43	92.44	92.39
P2	93.277	93.43	93.36	93.36	93.35
P3	92.679	92.68	92.68	92.68	92.63

7.6.9.3 Combined Monitoring Dataset

This section combined the recorded water levels in the various rounds of monitoring completed at the site and the results are presented in Table 7.7 and Figure 7.10.

From the available data, it is shown that there is a very small range in water levels in the sand and gravel aquifer. The greatest recorded range in groundwater levels was recorded at MW1 which had a range of 1.42m. The greatest water levels were recorded in recent monitoring rounds and this is a reflection of the meteorological conditions (refer to Section 0 below.

Table 7.7: Combined Water Level Data

Monitoring Well Location	Ground Level (m OD)	Min WL (mOD)	Max WL (mOD)	Range (m)
MW1	126.419	96.22	97.64	1.42
MW2	129.359	99.14	100.24	1.10
MW3	115.301	94.83	96.10	1.27
MW4	105.902	94.14	95.29	1.15
MW5	95.067	93.92	94.91	0.99
PH1	92.552	92.25	92.58	0.33
PH3	92.679	92.48	92.70	0.22
P1	92.552	92.24	92.45	0.21
P2	93.277	92.28	93.43	1.15
P3	92.679	92.45	92.68	0.21

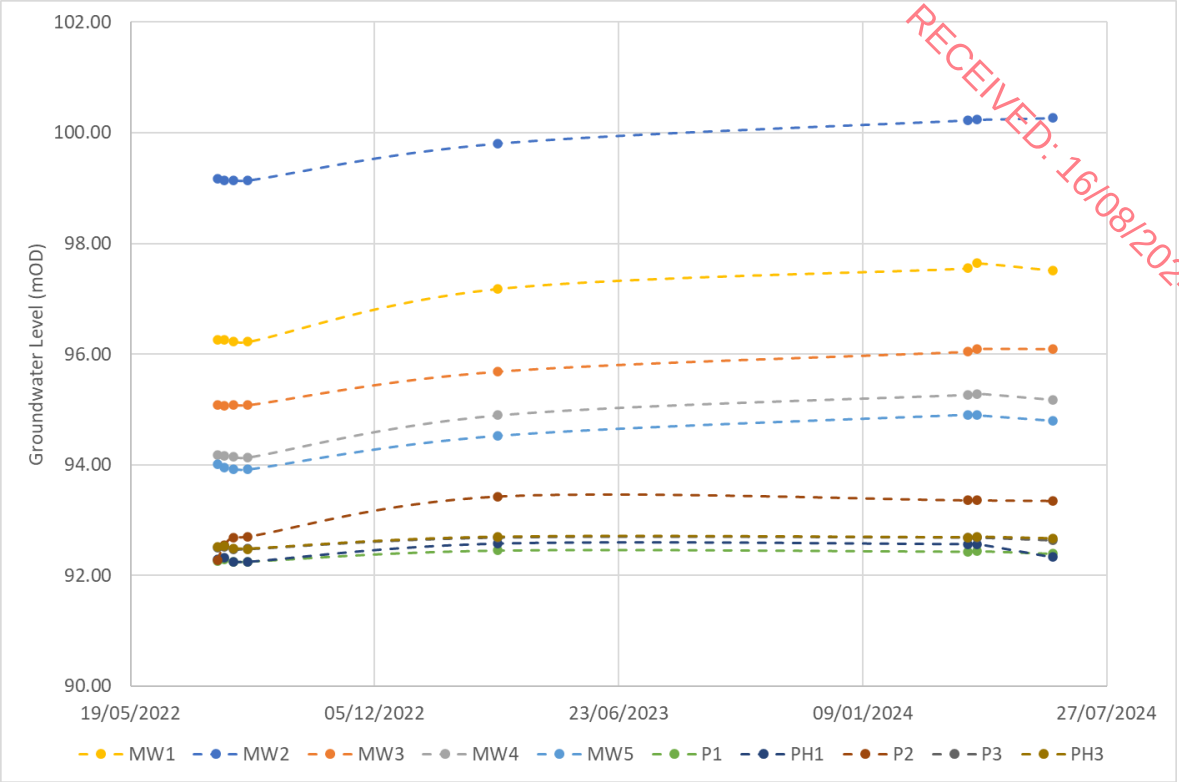


Figure 7.10: Manual Groundwater Levels (2022 to June 2024)

7.6.9.4 Rainfall And Monitored Groundwater Levels

Whilst water levels have been recorded intermittently across the monitoring period (August 2019 – June 2024), several of the monitoring rounds coincided with some of the wettest periods in recent years. Figure 7.11 below presents the monthly rainfall totals for the past 17 months compared to the Long-Term Average (LTA) for Oak Park rainfall station, Co. Carlow (~27km east/southeast of the site). As seen from the graph, the LTA rainfall was exceeded in several months during this monitoring period. Recent rounds of groundwater level monitoring were completed on 16th March 2023 and 4th April 2024. Both of these monitoring rounds occurred at a time when water levels would typically be at a seasonal high, prior to the onset of a summer regression. Furthermore, these monitoring rounds were completed during times of high rainfall. The rainfall recorded at Oak Park in March 2023 equated to 163% of the LTA whilst the rainfall totals recorded in March 2024 equated to 174% of the LTA. Therefore, the recorded water levels during these monitoring rounds are likely to represent maximum winter water levels. Subsequent monitoring of water levels on 13th June 2024 showed that the water levels have begun to fall as expected during the summer months.

Therefore, we consider that the period of groundwater monitoring is sufficient based on the following:

- The meteorological conditions during recent monitoring rounds which captured maximum groundwater levels; and,

- The small range in recorded groundwater levels suggests that any additional water level monitoring would be superfluous.

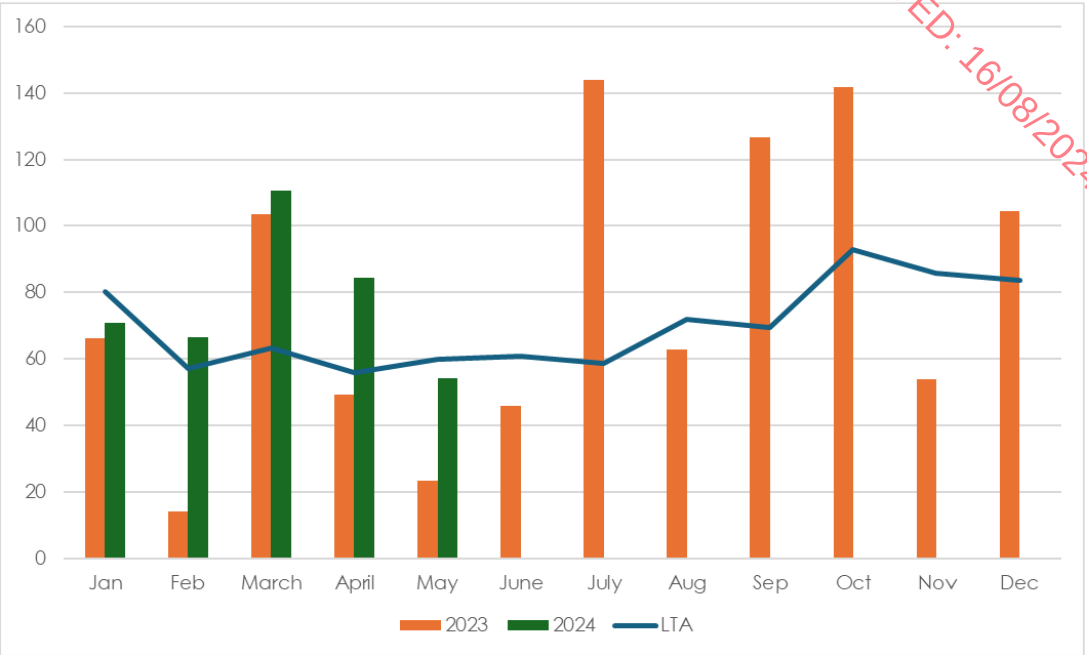


Figure 7.11: Monthly Rainfall Values for Oak Park Rainfall Station, Co. Carlow (www.met.ie)

7.6.10 Groundwater Vulnerability

Based on the GSI mapping, the sand and gravel aquifer in the area of the site has a "High" groundwater vulnerability rating (All of Abbeyleix Gravels GWB is assigned a "High" rating) which is relatively consistent with the hydrogeological conditions at the site (refer to the hydrogeological conditions presented in Table 7.8 with respect to the site groundwater levels presented in the preceding sections).

Vulnerability Rating	Hydrogeological Conditions				
	Subsoil Permeability (Type) and Thickness			Unsaturated Zone	Karst Features
	High permeability (sand/gravel)	Moderate permeability (e.g. Sandy subsoil)	Low permeability (e.g. Clayey subsoil, clay, peat)	(Sand/gravel aquifers only)	(<30 m radius)
Extreme (E)	0 - 3.0m	0 - 3.0m	0 - 3.0m	0 - 3.0m	-
High (H)	>3.0m	3.0 - 10.0m	3.0 - 5.0m	>3.0m	N/A
Moderate (M)	N/A	>10.0m	5.0 - 10.0m	N/A	N/A
Low (L)	N/A	N/A	>10.0m	N/A	N/A

Notes: (1) N/A = not applicable.
(2) Precise permeability values cannot be given at present.
(3) Release point of contaminants is assumed to be 1-2 m below ground surface.

Table 7.8: Site Groundwater Vulnerability Criteria

7.6.11 Groundwater Quality

Groundwater sampling of MW2, MW4 and MW5 was undertaken on 8th August 2018.

Certificates of analysis are shown in Appendix 7.1 (Groundwater Quality). In terms of the local groundwater gradients and flow directions, MW2 and MW5 are located up-gradient and down-gradient of the site respectively and MW4 is located across-gradient to the site along the northern boundary.

There were no exceedances with respect to the groundwater regulation values. The only exceedances with respect to the drinking water regulation values were for iron and manganese which are likely to be naturally elevated due to the local geology. Iron and Manganese were only elevated in MW4. Levels of nutrients (i.e. nitrate, ortho-phosphate, ammonia) are relatively low which indicates that the use of surrounding land for agriculture is not affecting groundwater quality at the site.

The electrical conductivity varies between 620 and 633µs/cm and the pH were approximately 7.2.

7.6.12 Water Framework Directive Status and Risk Result

Local Groundwater Body (GWB) and Surface water Body (SWB) status and risk result information are available for view from (www.catchments.ie).

The WFD Status (2016-2021) and Risk Result for the Nore River (Nore_SC_040) upstream and downstream of the proposed site are reported to be “Good Status” and “Not at Risk” respectively. The Nore_SC_040 SWB also includes the Ballymullen Stream. No significant pressures have been listed to be impacting this SWB.

The Abbeyleix Gravels GWB (GWB: IE_SE_G_171) underlies the proposed development site. It is assigned 'Good Status'[1] in the latest WFD cycle (2016-2021), this applies to both quantitative status and chemical status. This GWB is deemed to be 'not at risk' and no significant pressures have been identified.

7.6.13 Designated Sites and Habitats

Designated sites include National Heritage Areas (NHAs), proposed National Heritage Areas (pNHAs), Special Areas of Conservation (SACs), candidate Special Areas of Conservation (cSAC) and Special Protection Areas (SPAs). A designated site map for the area of the proposed development is shown in Figure 7.12.

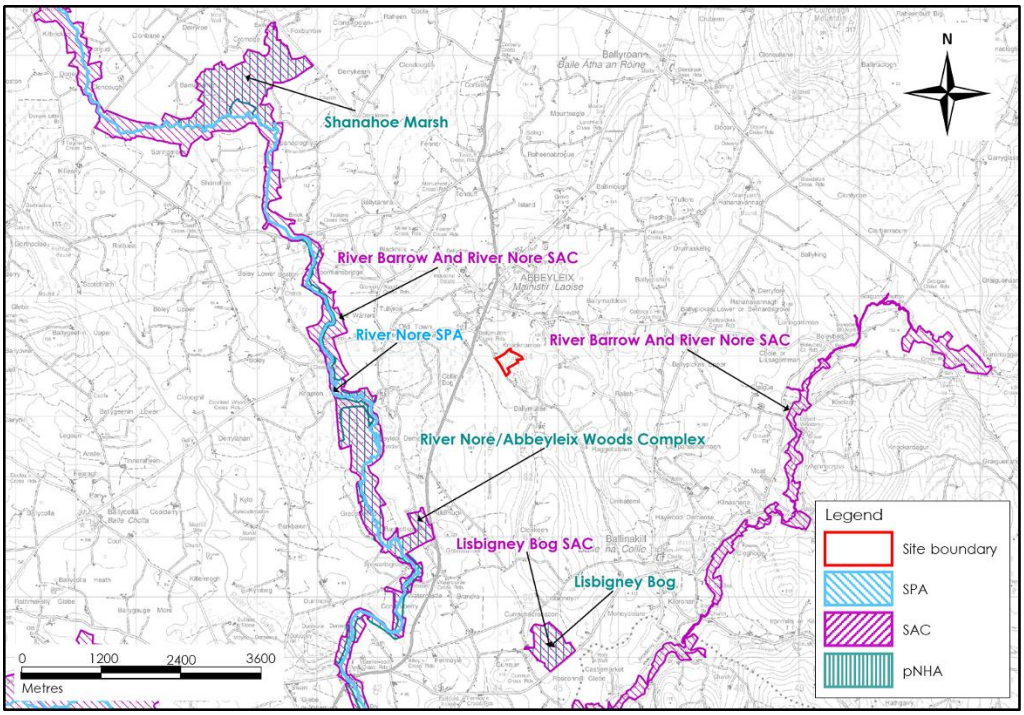


Figure 7.12: Designated Site Map

The closest designated site to the proposed site is the River Barrow and River Nore SAC and the River Nore SPA which is located approximately 3km downstream of the site via the Ballymullen Stream and ~2.2km downstream via groundwater flow paths.

However, there are no surface water discharges or runoff from the proposed site and therefore there are no direct surface water linkages between the proposed site and the SAC/SPA via the Ballymullen Stream.

[1] 'Status' means the condition of the water in the waterbody. It is defined by its chemical status and its ecological status, whichever is worse. Waters are ranked in one of 5 classes: High, Good, Moderate, Poor and Bad (WFD, 2010).

As discussed above, it is expected that groundwater flows in the area of the proposed development discharge into the River Nore via the Ballymullen Stream or via spring discharges close to the River Nore channel itself.

Abbeyleix Bog, which is located immediately to the west (Figure 7.13), is currently not designated. Abbeyleix Bog also contains a number of Annex 1 Priority Habitats including a Petrifying Spring and Bog Woodland. These are discussed further below regarding the proposed development.

The location of the mapped Petrifying Spring area adjacent to the proposed development site is shown in Figure 7.14 below.

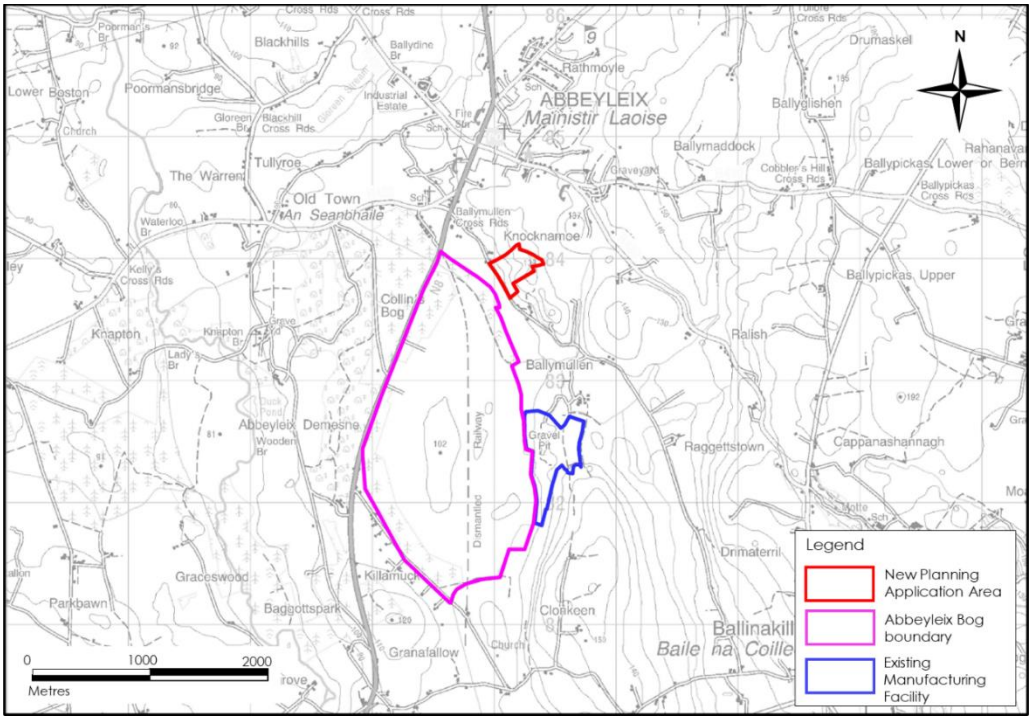


Figure 7.13: Abbeyleix Bog Location

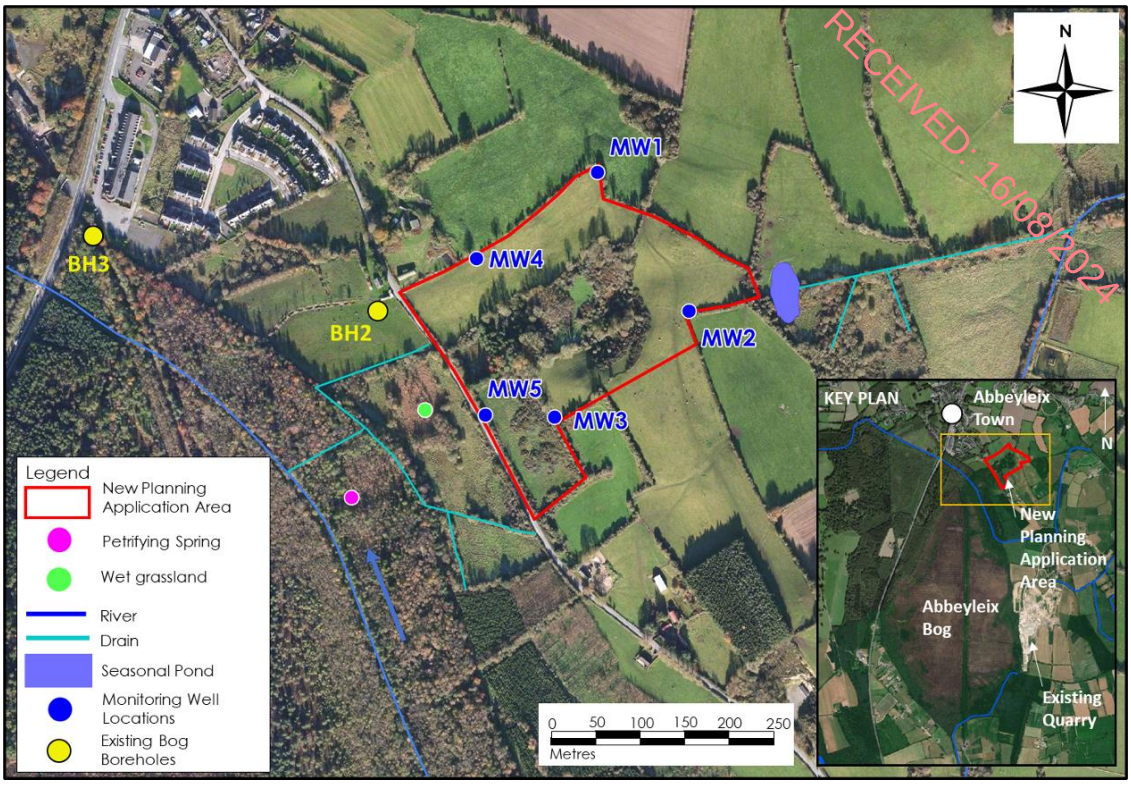


Figure 7.14: Abbeyleix Bog Area of Interest

A number of hydrological /hydrological investigations have been undertaken on Abbeyleix Bog and the most extensive of these is a PhD Thesis by Michael Swenson of Trinity College (2017).

The PhD investigated the regional scale hydrology and hydrogeology at Abbeyleix Bog to characterize the catchment scale hydrology and water balance. The underlying hydrogeology was largely found to have relatively little impact on the majority of the bog surface eco-hydrology and this was due to the raised nature of the bog and the fact that the bog is underlain by shell marl, particularly the north-eastern section of the bog (section adjacent to the proposed development site. Thus, the surface eco-hydrology was more strongly controlled by local topography.

The investigation determined a shallow marl lake was likely present at the north-eastern section of the bog as there are still calcified springs (petrifying spring area) and seepages along the north-eastern edge of Abbeyleix Bog adjacent to the sand and gravel esker complex on which the proposed development site is located. These spring area and seepages are fed by a groundwater head and elevation gradient from the esker complex (i.e. sand and gravels at the site) down to the bog which is ultimately driven by rainfall recharge.

A geological cross-section of the esker ridge and Abbeyleix Bog at the application site is shown in Figure 7.15 below.

Based on the groundwater level monitoring completed, only the most southerly end of the proposed application site is located in the recharge area of the spring area. However, there is no proposed extraction in the area of the proposed site that is located within the groundwater catchment to the spring area.

The proposed extraction area is located further to the north of any groundwater flowpaths that potentially feed the petrifying spring area from the east.

HES visited Abbeyleix Bog on 11th March 2021 and again between 29th July and 19th August 2022 and confirmed that the spring discharge is mineralised (i.e., pH 7.6 – 8 and EC 500 – 600µs/cm). The discharge volume from the spring is also relatively small (<1L/s). Sampling of the spring also indicates mineralised groundwater (total alkalinity 244mg/L $CaCO_3$). The spring discharge is likely emerging from the calcareous sand deposits below the peat.

The hydrochemistry of the spring discharge is similar to the hydrochemistry of the groundwater below the proposed development site. MW05 at the proposed development site and the spring were both sampled on 11th March 2021 and sent for laboratory analysis. Laboratory reports are included in Appendix 7-1.

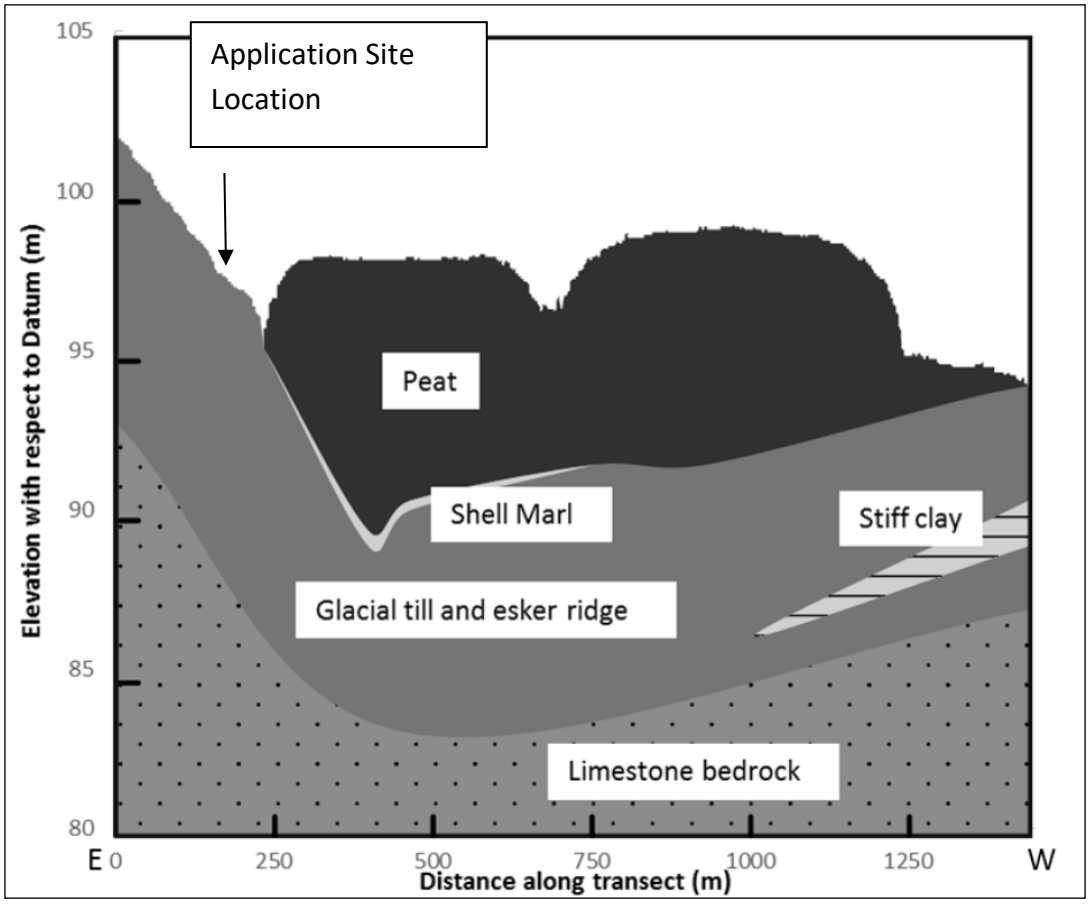


Figure 7.15: Abbeyleix Bog – Geological Cross-Section (Swenson, 2017)

7.6.14 Local Water Supplies

There are no public water supply or National Federation Group Water Scheme groundwater protection zones mapped in the area of the proposed site.

The Geological Survey of Ireland (GSI) well database (www.gsi.ie) has no mapped wells within 1km of the application site (refer to Figure 7.16 below). There are several wells located beyond the 1km radius.

As the GSI well database is not exhaustive in terms of the locations of all wells in the area (as the database relies on the submission of data by drillers and the public, etc.) a door-to-door well survey of dwellings in close proximity (300m of site boundary) was carried out on 15th August 2019 and no private wells were identified.

A 300m setback distance was considered a large enough distance for the private well survey because due to the sand and gravel's ability to effectively filter groundwater as it flows through the deposits, no impacts on groundwater quality (i.e. namely turbidity) would be expected at distances more than 300m from the proposed development site. Also, there is no proposed dewatering, wet extraction or abstraction of groundwater for processing purposes at the proposed site, therefore groundwater level/flow impacts on local wells will not occur.

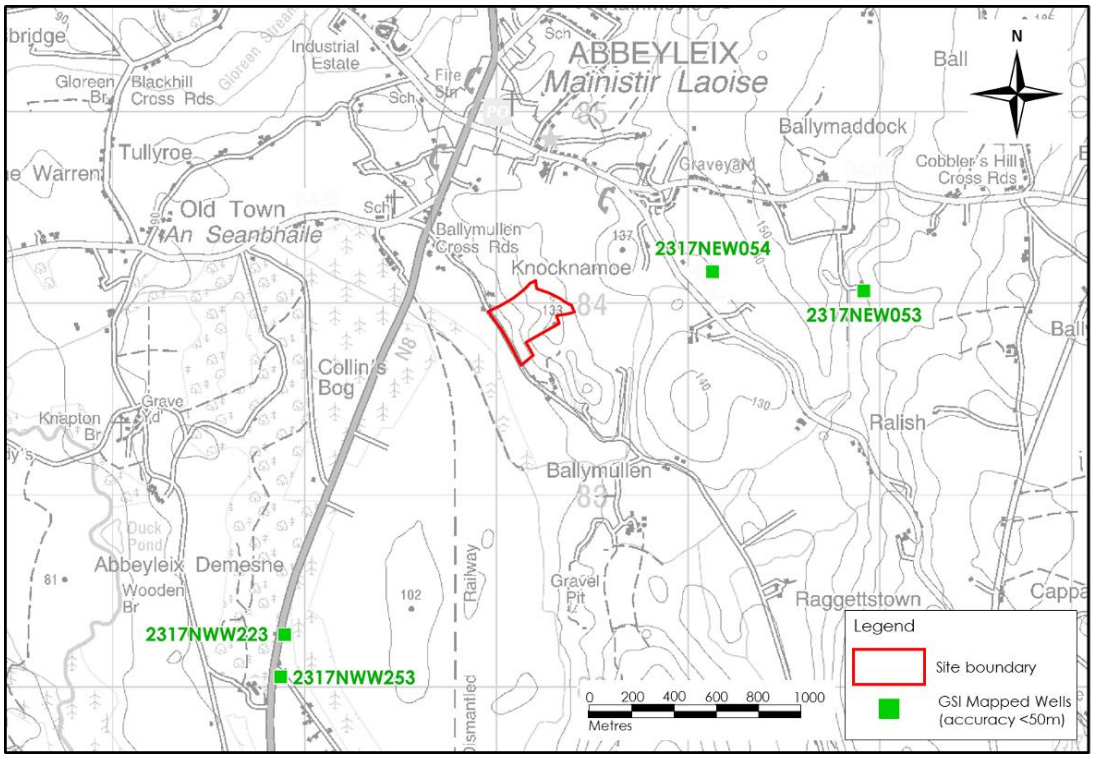


Figure 7.16: GSI Mapped Groundwater Supplies

7.6.15 Hydrogeological Conceptual Model

A hydrogeological conceptual model was developed for the site based on the information gathered from both the desk survey and site investigation works previously outlined.

The proposed development site is directly underlain by a Locally Important Sand and Gravel Aquifer. The glaciofluvial deposits in the area of the site comprise mainly of SAND with some interbedded SAND & GRAVEL and GRAVEL layers. GRAVELS with boulders and cobbles were becoming more abundant at the base of the investigation holes on the central and western sides of the site.

Underneath the sand and gravel aquifer, a regionally karstified limestone aquifer is mapped (the investigation drilling indicates limestone is present below the site depths ranging between 30.6mbgl (central area) and 37.2mbgl (eastern area). The depth to bedrock on the western area of the site is likely to be between 15 – 20mbgl.

Based on surveys and groundwater level monitoring undertaken at the site to date, the groundwater level in the area of the proposed development varies spatially between 1.027m (94.04m OD) and 29.961m (99.398m OD) with temporal variations of <0.3m over the monitoring period.

Based on groundwater levels measurements, the groundwater flow direction in the area of the site is westerly with discharge likely to the Ballymullen Stream as groundwater baseflow or petrifying spring discharge and into the River Nore via the Ballymullen Stream itself and also possibly as springs/baseflow.

At the wet grassland on the edge of Abbeyleix Bog, the SAND below the peat is saturated, but there is no potential for upwelling of groundwater onto the ground surface (as springs/seepages) as seen at the petrifying spring area which is located further to the southwest.

With regard to the main petrifying spring area (located to the southwest of the proposed development site), the groundwater level monitoring shows that the groundwater catchment/recharge area to the spring area exists to the south of the proposed extraction area. The most southerly end of the proposed application site is located in this recharge area, but the southerly end of the proposed application site is now not proposed for extraction as part of the revised extraction plan.

7.6.16 Receptor Sensitivity/Importance

Based on the criteria set out in Table 7.1 above, groundwater at the site is classed as Medium Importance because the Abbeyleix Gravels GWB is classified as a Locally Important Aquifer (Lg). Due to the fact that no dewatering or groundwater abstraction is proposed, no impacts on groundwater quantity (levels or flows) are expected. Groundwater quality impacts and recharge effects are discussed further below.

Surface waters such as the Ballymullen Stream and the River Nore could be considered to have an Extremely High Importance due to the SAC/SPA designated status of the latter. The Ballymullen Stream drains directly into the River Nore so the importance can be considered the same as the River Nore. However, there are no proposed surface water discharges or surface water runoff from the site therefore impacts on surface water quality from potentially contaminated runoff (sediments/oils/fuels etc) will not occur.

The River Barrow / River Nore SAC and the River Nore SPA have Extremely High Importance classification. However, as there are no direct surface water linkages/pathways between the proposed site and these designated sites, no significant effects will ocuur.

The only potential pathway for downstream receptors (surface waters/SPA/SAC) can only be indirect via groundwater flow and emerging baseflow.

Abbeyleix Bog itself, which can be considered Very High Importance, is not sensitive to impact from the proposed development as there is no surface water connection between the bog and the proposed development site. Also, as discussed above, the underlying hydrogeology was found to have relatively little influence on the bog surface eco-hydrology and therefore the proposed development has little or no potential to impact on the bog via groundwater pathways. The associated wet woodland and petrifying spring area, which can be considered of Extremely High Importance, are directly connected to the site via groundwater linkages and are therefore very sensitive.

However, due to the revised extraction plan (i.e. reduced area at Phase 4), there is now no proposed aggregate extraction directly up-gradient of the spring location. (refer to Figure 7.9 above with the revised extraction area and groundwater flow direction.

Groundwater quality will be the main sensitive receptor with respect to potential oil/fuel leaks and spills from plant and machinery.

All potential contamination sources are to be carefully managed at the site during the extraction phase of the development and mitigation measures are proposed within the Revised EIAR to deal with these potential minor impacts.

No third-party wells were identified within a 300m distance down-gradient of the site and therefore impacts on groundwater supplies are not expected.

7.7 Potential Impacts of the Proposed Development

7.7.1 Characteristics of the Proposed Development

The estimated volume of material to be extracted from the application site is approximately 735,687m^3, of which 17,400m^3 consists of overburden which will be used to construct berms and restore the site. The volume of material to be transported to the manufacturing facility is approximately 718,287m^3/1.44 million tonnes.

The development will be completed over 8 no. phases and each phase will be reinstated before the next phase commences. The high number of phases will ensure only a small section of the site is being worked on at any one time.

The overburden removed at each phase will be used to create a berm along the northern boundary of the site and for restoration of the pit on completion of the phase. There will be no aggregate extraction below the groundwater table.

There will be no processing of the extracted material on site. All material will be transported to the applicants existing manufacturing facility located approximately 1.3km to the south of the site. There will be no requirement to store spoil/residual fines at the proposed site.

The proposed extraction depth varies between 97.3m OD on the west of the site and 102.5m OD on the east of the site. This is just over 3m above the monitored groundwater levels to allow for higher groundwater levels in winter.

It also should be noted that there will be no discharge of domestic wastewater at the site, as wastewater will be contained and moved off-site. Groundwater quality impacts from wastewater will therefore not occur. Drainage from the proposed refuelling area, the wheel wash, and the site entrance will pass through a silt trap and full retention oil interceptor prior to discharge to ground via a soakaway.

Fuel and oil will be delivered to the site and dispensed directly into plant and equipment. There will be no storage of oils and fuels on-site.

7.7.2 "Do Nothing" Scenario

If the proposed development does not go ahead, the site will remain as greenfield agricultural land.

7.7.3 Potential Construction Phase Impacts

7.7.3.1 Impacts on Groundwater due to Initial Site Development Works

The initial site development construction works will include the creation of the site entrance, stripping of topsoil and creation of screening berms.

These activities have the potential to generate the release of suspended solids to surface watercourses and could result in an increase in the suspended sediment load, resulting in increased turbidity which in turn could affect the water quality and fish stocks of downstream water bodies. However, the removal of vegetative cover will be over small localised areas (~0.34Ha) and will likely be completed in a short amount of time. There is no direct hydraulic connection between the application site and any downstream drain, stream, or watercourse. Therefore, the only potential receptor is the underlying groundwater system (in terms of vulnerability and groundwater quality.

Receptor: Groundwater vulnerability and groundwater quality
Pathway/Mechanism; Aggregate extraction, movement and placement in berms
Pre-mitigation Impact: Negative, irreversible, slight, direct, likely, permanent effect on groundwater vulnerability rating.
Negative, slight, indirect, unlikely, temporary effect on groundwater quality below the site.

Impact Assessment:

As outlined above, these works are small-scale, and they will be completed over a small area (~0.34Ha), and over a short period. There is no direct connection to any downstream drain, stream or watercourse, and the main potential receptor is the underlying groundwater system.

Albeit there will be a slight increase in groundwater vulnerability due to the removal of overburden, there will be no extraction within 3m of the groundwater table and therefore there will be no effect on the current GSI groundwater vulnerability rating which is "High".

Note that due to the abnormally high water level during the spring of 2024, the floor of the quarry has been increased by ~1m over the entire excavation footprint to ensure that there is no extraction within 3m of the groundwater table.

Mitigation Measures:

The main mitigation with respect to groundwater quality protection during the construction phase will be the employment of best practice measures with respect to oil usage and refuelling of plant and machinery which are dealt with in Section 7.7.4.3 below.

Post construction and extraction phase a landscape and restoration plan will be implemented. This will involve previously stripped overburden being placed on the pit floor to establish grassland which will provide a level of protection to groundwater. Post restoration, the site will be returned to agriculture.

Residual Effect:

The thickness of sand and gravel will be altered by the construction works, however, a depth of 3m will be maintained above the water table and the site will be reinstated with topsoil and will be reseeded. Any potential compaction issues will be removed by removing the berms and ploughing the underlying subsoils. Also, the potential for the release of hydrocarbons is a risk to groundwater, and also to downstream surface water bodies. However, proven and effective measures to mitigate the risk of releases of hydrocarbons have been proposed above and will break the pathway between the potential source and the underlying groundwater system, and the associated downstream surface water bodies.

The residual effects are considered to be - negative, irreversible, slight, direct, likely, permanent effect on groundwater vulnerability rating; Negative, imperceptible, indirect, unlikely, temporary effect on groundwater quality below the site.

Significance of Effects:

For the reasons outlined above, and with the implementation of the outlined mitigation, no significant effects on groundwater vulnerability, nor groundwater quality, will occur during the construction phase.

7.7.4 Potential Extraction / Operation Phase Impacts

7.7.4.1 Impacts on Groundwater Vulnerability Rating due to Aggregate Extraction

The proposed development will involve the extraction of material which will increase the vulnerability of the aquifer which is currently rated as "High".

Receptor: Groundwater vulnerability rating
Pathway/Mechanism; Aggregate extraction
Pre-mitigation Impact: Negative, irreversible, slight, direct, likely, permanent effect on groundwater vulnerability rating.

Mitigation Measures:

Albeit there will be a slight increase in groundwater vulnerability due to the removal of overburden, there will be no extraction within 3m of the groundwater table and therefore there will be no effect on the current GSI groundwater vulnerability rating which is "High".

The main mitigation with respect to groundwater quality protection during the extraction phase will be the employment of best practice measures with respect to oil usage and refuelling of plant and machinery which are dealt with in Section 7.7.4.3 below.

Post extraction phase a landscape and restoration plan will be implemented. This will involve previously stripped overburden being placed on the pit floor to establish grassland which will provide a level of protection to groundwater. Post restoration, the site will be returned to agriculture.

Residual Effect:

The thickness of sand and gravel will be altered by the extraction works, however, a depth of 3m will be maintained above the water table and the site will be reinstated with topsoil and will be reseeded. Any potential compaction issues will be removed by removing the berms and ploughing the underlying subsoils. Also, the potential for the release of hydrocarbons is a risk to groundwater, and also to downstream surface water bodies. However, proven and effective measures to mitigate the risk of releases of hydrocarbons have been proposed above and will break the pathway between the potential source and the underlying groundwater system, and the associated downstream surface water bodies. The residual effect is considered to be - negative, irreversible, imperceptible, direct, likely, permanent effect on groundwater vulnerability.

Significance of Effects:

No significant effects on groundwater vulnerability will occur.

7.7.4.2 Effects on Groundwater Recharge

This section assesses the potential for effects on groundwater recharge due to the removal of vegetation/topsoil, alteration of the site ground surface/levels as a result of the proposed aggregate extraction and potential compaction of the pit floor by plant and machinery.

The proposed development will require the removal of the grass vegetation /topsoil layer and then the excavation of up to 10m of the underlying sand and gravel deposits.

Receptor: Groundwater Recharge
Pathway/Mechanism; Unsaturated zone recharge flowpaths
Pre-mitigation Impact: Negative, imperceptible, direct, likely, permanent effect on groundwater recharge.

Assessment / Mitigation Measures:

Section 7.6.5 discusses the greenfield baseline drainage regime at the site. Due to the lack of surface drainage features within the site and the absence of drainage outfalls from the site, all effective rainfall landing on the site must currently recharge to the ground.

Typically, the removal of vegetation cover has the potential to increase surface water runoff, however, due to the well-drained nature of the underlying sand and gravel deposits at the site a significant increase in runoff will not occur. Sand and gravel pits that operate above the groundwater table, generally have a dry pit floor with maybe some very localised ponding (measures are proposed below to deal with potential ponding). This is HES's experience from visiting many sand and gravel pits across the country.

However, it is proposed that the extraction of aggregate will be done in 8 no. phases and therefore all the vegetation will not be stripped at once. Once each phase is extracted, the ground will be reinstated with topsoil and reseeded before the next phase commences. This will mitigate against the risk of increased runoff at the site.

Due to the revised extraction plan (i.e. reduced area at Phase 4), there is now no proposed aggregate extraction directly up-gradient of the spring location. Therefore, there will be no alternation of the recharge/runoff regime directly up-gradient of the mapped petrifying spring area.

In addition, as a surface water control measure, it is proposed to excavate an infiltration drain/swale along the perimeter of each phase bench level within the pit to ensure all potential runoff is collected and diverted to the ground. This will ensure there will be no reduction in groundwater recharge at the site. Currently, at the greenfield site, there are no drainage outfalls and this will continue to be the case at the proposed developed site.

The proposed development at each phase will initially require the stripping of vegetation cover which will expose the underlying sand and gravel deposits. Therefore, in the absence of vegetation, during the operational /extraction phase of the development, there is actually the potential for slightly increased groundwater recharge during the spring/summer months due to a reduction in evapotranspiration. However, due to the fact that the site will be extracted in 8 no. phases as described above, the effect would not be significant.

Compaction of the pit floor due to quarry traffic/machinery (leading to increased surface water runoff and reduced recharge) is not expected as the material proposed for extraction was found to be dense with no significant fines (i.e. silts/clays) and regular course layers (i.e. clay/silt) proportions. Therefore, the material by its nature has a very limited ability to compact and seal. Any areas of minor pockets of surface water ponding that might occur will be drained into the proposed infiltration trenches/swales as outlined above. Also, once each phase is completed, the exposed deposits will be ploughed before reinstating the topsoil layer to ensure good drainage/percolation is maintained.

There will be no processing of aggregate at the application site, therefore there will be no requirement to manage or store fines (clay and silts) at the site. The fact that fines will not be separated and will not require management at the application site will prevent the risk of increased runoff as a result of the storage of such material.

Finally, a greenfield corridor (approx. 30m wide) will remain along the low-lying western side of the application site. This is the lowest point on the site, particularly the northwestern section/field of the site, where runoff collects naturally during very wet periods and percolates to the ground over a period of time. This section of the site will remain as grassland as it acts as a natural soakaway for the existing site. This will act as a natural drainage buffer between the proposed extraction area and Abbeyleix Bog.

Therefore, even in the absence of mitigation, the proposed development would have no significant potential to impact on groundwater recharge at the application site. However, the proposed mitigation measures outlined above will maintain the existing drainage regime at the application site and ensure no negative effects on groundwater recharge.

Residual Effect:

The thickness of sand and gravel will be altered by the extraction works, however, a depth of 3m will be maintained above the water table and the site will be reinstated with topsoil and will be reseeded. Any potential compaction issues will be removed by ploughing. Therefore, the recharge mechanisms that exist in the baseline scenario will be maintained post-restoration. As a result, the residual effect is considered to be - neutral, imperceptible, direct, likely, permanent effect on groundwater recharge.

Significance of Effects:

For the reasons outlined above, and with the implementation of the listed mitigation, no significant effects on groundwater recharge will occur.

7.7.4.3 Surface Water and Groundwater Contamination from Oil / Fuel Spills and Leaks

Excavation of aggregate at the site will be completed using machinery. Such machinery is powered by diesel engines and operated using hydraulics. Unless managed carefully such plant and machinery have the potential to leak hydraulic oils or cause fuel leaks during refuelling operations.

Only small volumes of fuel/oils will be present on-site (in the machines) and therefore no significant effects are expected as long as standard mitigation is implemented. There will be no storage of fuel at the site. The only plant which will be refuelled at the site will be excavators. Road trucks will be refuelled off-site.

Also, runoff from the site entrance and water in the wheel wash has the potential to become contaminated by oil/fuel leaks and spills.

The IFI in their submission requested that surface water runoff from the entire site (including the infiltration trenches/swales) be discharged through the wheel wash area and associated treatment system.

The proposed development is a sand and gravel pit and it would therefore be near to impossible to convey all surface water runoff from the site and discharge it through the wheel wash area and associated treatment system as recommended by IFI. Sand and gravel pits typically have a dry floor as rainfall/surface runoff percolates to the ground.

Similarly, infiltration trenches/swales by nature of design collect/hold water and let it seep into the underlying ground. They are not designed to convey water as the water will be lost through the base/sides of the trenches/swales.

Across the site, best practice measures for managing oils and fuels will be employed. This would be standard practice in a sand and gravel pit where unlike in a bedrock quarry the majority of the water can be pumped and treated.

No fuel or hydrocarbon products will be stored at the proposed development and plant and machinery will be serviced regularly to prevent potential leakages. Refuelling of plant will take place over the proposed refuelling area with all fuel dispensed by competent and authorised fuel distributors.

Sand and gravel pits also have the benefit of an underlying natural filter and therefore treatment of fine in runoff is not required.

Receptor: Groundwater and surface water (indirectly via groundwater system)
Pathway: Groundwater flowpaths

Pre-mitigation Impact: Negative, reversible, slight, indirect, unlikely, long-term effect on surface water and groundwater quality.

Mitigation Measures:

The following mitigation is proposed:

- All plant and machinery will be serviced before being mobilised to the site;
- Refuelling will be completed at the dedicated refuelling area, with a controlled drainage system that drains via a full retention hydrocarbon interceptor;
- Only designated trained operators will be authorised to refuel plant on site;
- Procedures and contingency plans will be set up to deal with emergency accidents or spills;
- An emergency spill kit with an oil boom, absorbers etc. will be kept on-site for use in the event of an accidental spill; and,
- Runoff from the site entrance and overflows from the wheel wash and refuelling area will be directed to a silt trap and full retention hydrocarbon interceptor* prior to discharge to the ground.

Drainage from the proposed refuelling area, the wheel wash, and the site entrance will pass through a silt trap and full retention oil interceptor prior to discharge to ground via a soakaway.

*The full retention hydrocarbon interceptor will be sized to cope with a 10-year storm return period.

Residual Effect:

The potential for the release of hydrocarbons is a risk to groundwater, and also to downstream surface water bodies. However, proven and effective measures to mitigate the risk of releases of hydrocarbons have been proposed above and will break the pathway between the potential source and the underlying groundwater system, and the associated downstream surface water bodies. The residual effect is considered to be - Negative, imperceptible, indirect, unlikely, long-term effect on groundwater quality, and downstream surface water quality.

Significance of Effects:

For the reasons outlined above, and with the implementation of the listed mitigation measures, no significant effects on surface water or groundwater quality are expected.

7.7.4.4 Groundwater Quality Impacts on Local Wells

As discussed in Section 7.6.14 above, no wells were identified within 300m of the site. Due to the fact that no dewatering or groundwater abstraction is proposed, no impacts on groundwater quantity (levels or flows) are expected. Mitigation measures with respect to oils/fuels and groundwater quality are dealt with in Section 7.7.4.3 above.

Receptor: Local wells

Pathway: Groundwater flowpaths
Impact: No impacts on local groundwater wells are anticipated.

7.7.4.5 Hydrological Impacts on Downstream Designated Sites

Groundwater flow from the local sand and gravel aquifer in the vicinity of the proposed development site is expected to discharge in a westerly direction and enter the River Barrow and River Nore SAC indirectly (either via the Ballymullen Stream, spring discharge or as baseflow).

The River Barrow and River Nore SAC is located approximately 2.2km west and downstream (groundwater flow) of the proposed development site and since there will be no surface water discharges from the site, no significant effects are expected.

Also, for the reasons explained in Section 7.7.4.2, there will be no potential to significantly alter the local hydrogeology in the area of the proposed development site. Therefore, effects on the regional hydrogeological regime and groundwater-dependent designated sites further downstream of the proposed development site such as the River Barrow and River Nore SAC will not occur.

All other designated sites are located remote from the site therefore there is no hydrogeological connection to the proposed development and therefore they cannot be impacted by the proposed development. The other remote designated sites are in separate groundwater catchments from the proposed development site.

Mitigation measures with respect to oils/fuels and groundwater quality are dealt with in Section 7.7.4.3 above.

Receptor: Local SAC/SPA
Pathway: Groundwater flowpaths
Impact: No impacts on local designated sites are anticipated.

7.7.4.6 Hydrological/Hydrogeological Impacts on Abbeyleix Bog and Related to Designated Habitats

The proposed application site is located to the east and immediately up-gradient of Abbeyleix Bog. The proposed site is also located close to the groundwater catchment of petrifying spring and bog woodland which are water dependent habitats associated with Abbeyleix Bog. Therefore, activities at the proposed application site have the potential for indirect hydrogeological effects (groundwater quantity and quality). There are no surface water connections between the proposed site and Abbeyleix Bog nor the designated habitats.

Receptor: Abbeyleix Bog and Designated Habitats
Pathway: Groundwater flowpaths

Impact: Negative, irreversible, imperceptible, indirect, likely, long-term effect on Abbeyleix Bog and related designated habitats.

Assessment / Mitigation Measures:

With regard to Abbeyleix Bog itself, the investigations carried out as part of a PhD Thesis found that the underlying hydrogeology was largely found to have relatively little impact on the surface eco-hydrology and this was due to the raised nature of the bog and the fact that the bog is underlain by shell marl, particularly the north-eastern section of the bog adjacent to the application site. In addition, due to the fact that there are no surface water connections between Abbeyleix Bog and the proposed site, no significant effects on the hydrology of Abbeyleix Bog can occur.

The petrifying spring and bog woodland, which are both water dependent habitats, are located southwest/west respectively of the proposed site.

Based on the groundwater levels measured at the proposed development site wells and in the wet grassland area piezometers near the spring area, groundwater flow feeding the main petrifying spring area does not originate from within the area proposed for extraction (i.e. the area proposed for extraction is not a recharge zone for the main petrifying spring area located to the southwest of the proposed development site.

The proposed extraction area is located further to the north of any groundwater flowpaths that potentially feed the petrifying spring from the east.

Nevertheless and as discussed/assessed in Section 7.7.4.2 above, there will be no impact on groundwater flow volumes/quantity to the spring area/wet woodland as the proposed development will have no effect on groundwater levels and no significant effect on groundwater recharge at the application site. There will also be no alteration to the surface water flowpaths/drainage around the wet woodland.

A number of measures are proposed to ensure the drainage regime at the application site is maintained and these include the following:

- No groundwater dewatering is required. Sand and gravel extraction will be by dry working, and will occur above the groundwater table;
- Removal of vegetation/Extraction and restoration of the site in 8 phases therefore only a small section of the site will be worked at any one time;
- Due to the revised extraction plan (i.e. reduced area at Phase 4), there is now no proposed aggregate extraction within the groundwater catchment to the main spring area. The catchment area to the important spring has been avoided;
- Therefore, there will be no alternation of the recharge/runoff regime directly up-gradient of the spring area;
- Installation of temporary perimeter swales/drains to ensure all rainfall is collected and percolated to the ground;
- Ploughing of the pit ground level at the end of each phase prior to reinstating topsoil to ensure good drainage percolation is maintained; and,

- Maintaining a greenfield/grassland corridor on the lower lying western side of the site which acts as a natural drainage buffer between the proposed extraction area and Abbeyleix Bog.

Best practice measures for managing oils and fuels at the site, which are present in Section 7.7.3.3 above, will ensure no significant impacts on groundwater quality will occur. Drainage from the proposed refuelling area, the wheel wash, and the site entrance will pass through a silt trap and full retention oil interceptor prior to discharge to ground via a soakaway.

Good practice measures with regard to oils and fuels will be employed around the rest of the site area.

Residual Effect:

No residual effects on Abbeyleix Bog or its designated habitats will occur.

Significance of Effects:

No significant effects on Abbeyleix Bog or its designated habitats will occur.

7.7.4.7 Hydrological and Water Quality Effects on Downstream Watercourses

The proposed application site is located within the surface water catchment of the Ballymullen stream. The Ballymullen stream is a tributary of the River Nore.

Receptor: Ballymullen Stream and River Nore
Pathway: No direct discharge is proposed. The only pathway is via groundwater and baseflow to the Ballymullen Stream
Impact: Neutral, indirect, unlikely, long-term effects on water quality and water quantity in the Ballymullen stream and the River Nore.

Mitigation by Design:

- All excavation will occur 3m above the groundwater table.
- No dewatering and no discharge from the site is required or proposed.
- All processing of water excavated at the site will occur at the existing processing facility.

Assessment / Mitigation Measures:

Irrespective of the sensitivity of the downstream receiving hydrological environment, the potential for effects to the surface water environment is limited due to the characteristics of the proposed development, which includes the following:

- There will be no discharge to surface watercourses at the site;
- There will be no surface water runoff from the site;

- All drainage water at the site will be discharged to ground, mimicking the existing hydrogeological regime whereby rainwater percolates through the permeable sand and gravel deposits until it reaches the underlying groundwater table;
- This will ensure that there is no change in rainfall recharge rates or groundwater quantity and flows (i.e. there will be no effect on baseflow volumes to local surface waters from the local overburden and bedrock aquifers);
- The underlying glaciofluvial deposits are excellent natural filters and will remove any suspended sediment as the water percolates through these deposits;
- Best practice mitigation measures, as prescribed in the submitted Revised EIAR, in relation to the storage and use of fuels and hydrocarbons will be implemented for the duration of the proposed development. This includes the storage of fuels in bunded containers and the use of emergency spill-kits;
- Some areas of the site have a heightened risk of potential contamination, however additional mitigation measures and treatment systems will be in place in these areas:
- Water from the wheelwash and dedicated refuelling area will be treated by silt and hydrocarbon interceptors prior to discharge to ground;
- Furthermore, as requested by IFI, no extraction will take place until the permitter berms, wheel wash and associated interceptor system are in place.

Best practice measures for managing oils and fuels at the site, which are present in Section 7.7.3.3 above, will ensure no significant impacts on groundwater quality will occur. Drainage from the proposed refuelling area, the wheel wash, and the site entrance will pass through a silt trap and full retention oil interceptor prior to discharge to ground via a soakaway.

Residual Effect:

No residual effects on water quality or water quantity in the Ballymullen Stream or the River Nore.

Significance of Effects:

No significant effects on water quality or water quantity in the Ballymullen Stream or in the River Nore will occur.

7.7.5 Restoration Phase and Post Restoration Phase

The restoration plan involves returning the pit to grassland by spreading/contouring previously stripped overburden over the extraction area.

No impacts on the hydrological or hydrogeological regime are expected during the restoration or post-restoration phase. The restoration phase itself will have a positive effect in terms of reduced groundwater vulnerability and reduced risk of illegal activities such as fly-tipping. Albeit, the required restoration is borne out of the proposed excavation works.

7.7.6 Monitoring

Continuous automated groundwater level monitoring (by means of data loggers) and quarterly groundwater quality monitoring will be undertaken at the 5 no. monitoring well locations within the proposed development. The proposed list of parameters to be analysed for is attached as Appendix 7.2.

Regular inspections of the full retention hydrocarbon interceptor from the wheel wash, including the sampling of overflow water from the interceptor, will ensure the system is operating at its highest standard.

Daily visual inspections and monitoring of the effectiveness of the infiltration, and the drainage swale will be included in the overall Environmental Management Plan (EMP) for the site during construction and operation. Discharge into the infiltration, and the drainage swale will be via check dams/silt traps and these elements will also require regular weekly monitoring and cleaning.

With regard to Abbeyleix Bog, a proposed Hydrological Monitoring Plan is attached as Appendix 7.3 and is summarised in Table 7.9 below. This proposed hydrological monitoring plan is subject to agreement with Abbeyleix Bog Committee.

Table 7.9: Summary of the Abbeyleix Bog Hydrological Monitoring Plan

Location	Automated	Monthly	Quarterly	Annual
Development Site Monitoring Wells (5 no.) & Bog Piezometers Sets (3 no.), and BH2 and BH3 from the existing bog monitoring network.	Data loggers installed in MW1 – MW5	Manual Water level Measurement (mbtoc)(1)	-	-
Bog Piezometer Set 3 no. (at petrifying Spring)	-	Estimation of discharge/flow (L/s) & Manual Water level Measurement	-	-
MW5, and Bog Piezometers Sets (3 no.)	-	-	Field Hydrochemistry (pH, Electrical Conductivity & Temperature)(2)	-
MW5, and Bog Piezometers Sets (3 no.)	-	-	-	Laboratory Hydrochemistry Analysis (refer to **Appendix I** of the plan (Appendix 7.3) for the suite of parameters) (2)

7.7.7 Human Health Effects

Potential health effects arise mainly through the potential for groundwater contamination and impacts on local wells. Hydrocarbons, in the form of fuels and oils, will be used on-site during aggregate extraction.

There are no wells down-gradient of the proposed site within 300m as described in Section 7.6.14 above.

Regardless, in terms of groundwater protection measures as stated in Section 7.7.4.3 above, there will be best practice controls in place to ensure any potential sources of contamination on the site will be managed appropriately and the volumes present will be small in the context of the scale of the project. The potential residual impacts associated with groundwater contamination and subsequent health effects are not likely.

7.7.8 Cumulative Hydrological Effects

The other developments assessed for potential hydrological/hydrogeological cumulative impacts within ~5km of the proposed development site are listed in Tables 3.2 and 3.4 of this Revised EIAR. All developments were assessed for potential cumulative impacts. The other developments assessed are in the following industrial sectors – windfarms (2 no.), EPA licenced facilities (2 no.), quarries/pits/extractive (15 no.), public wastewater treatment plants (2 no.), storage container (1 no.) and electricity infrastructure (1 no.).

All the other developments are located in the same regional catchment (i.e. River Nore) as the proposed development and therefore the pathway for potential impacts exists.

The industry with the most developments in the area of the application site is quarries/pits/extractive. The potential for significant cumulative hydrological impacts with other quarries/pits is unlikely the proposed development has no proposed discharge to surface water, and therefore no downstream interactions can occur.

There is no potential for cumulative effects with public wastewater treatment plants or EPA licenced facilities, as the proposed development will not discharge organic or process wastewater.

The 2 no. proposed wind farms are the furthest removed from the proposed development site location. Construction phase activities in particular (at the wind farm sites) have the potential to generate turbid runoff, however, both developments have proposals for robust drainage control measures and therefore the potential for significant cumulative impacts is unlikely. In addition, the proposed development at Ballymullen has no proposed discharge to surface water, therefore no downstream interactions can occur.

However, most importantly, there will be no licenced surface water or groundwater discharges from the proposed development itself and therefore the potential for significant cumulative effects do not exist. The other more local land use activities in the area are

plantation forestry, existing farming operations and residential land uses, and the existing manufacturing facility which is located 1.3km to the south of the site. Both the proposed pit and the manufacturing facility (1.3km away) are located in separate groundwater catchments, and therefore no cumulative impacts on hydrology/hydrogeology can occur.

Other factors which will prevent hydrological/hydrogeological cumulative effects on local surface water/groundwater bodies, Abbeyleix Bog and River Nore SAC are outlined as follows:

- There are no groundwater level effects occurring at the existing manufacturing facility/processing plant; and,
- There will be no increase in daily processing rates/quantities at the existing manufacturing facility/processing plant. Aggregate from the proposed development will replace the material that is being currently hauled in from remote pits at a greater distance away from the application site.

Also, for the reasons explained above there will be no potential to significantly alter the local hydrogeology in the area of the proposed development site. Therefore, effects on the regional hydrogeological regime and groundwater-dependent designated sites further downstream of the proposed development site such as the River Barrow and River Nore SAC will not occur. In the absence of dewatering, and given the small footprint/scale of the proposed development, the potential for generating hydrological/hydrogeological impacts at catchment scale (>2.2km from the site to the River Barrow and River Nore SAC) is imperceptible.

Other development works are required to facilitate the proposed development, as well as improving road infrastructure generally for the area. These works include proposals to improve the carriageway of the Local Road L5731-25 over a distance of 1.3km to the southeast. However, as there is no proposed discharge to surface water from the proposed development, in-combination effects with public road improvement works on the water environment will not occur.

7.8 Assessment Summary

Our assessment is summarised as follows:

- A comprehensive hydrological and hydrogeological assessment with respect to the proposed development is presented above;
- The impact assessment is underpinned by desk study data and site-specific geological and hydrogeological data (water level and water quality data);
- The hydrological and hydrogeological assessment has been completed by competent and experienced hydrogeologists (David Broderick and Michael Gill). Also note, that Michael Gill has been working on wetland characterisation and impact assessments for 25 years. This is particularly relevant to the assessment relating to Abbeyleix Bog;
- The potential for the proposed development to impact the Water Environment has been mitigation through design, including:

- The proposed development comprises of a dry working sand and gravel pit;
- No extraction below the groundwater table is proposed. All proposed excavation will occur at least 3m above the highest recorded groundwater levels at the site;
- As a result, no dewatering is required;
- There is no proposed surface water discharge from the Ballymullen site. A proposed wheel wash (close to the site entrance) will discharge to ground via a full retention oil interceptor;
- 3m of subsoil will remain in-situ above the groundwater table;
- Processing of the excavated material will be completed at the existing permitted facility;
- The extraction works will be phased, and each phase will be reinstated as works progress;
- As such, the potential area of exposed ground will at all times be minimised;
- The potential for rainfall to recharge the underlying groundwater system across the site will not be altered in any significant manner;
- The direction of groundwater flow below the site has been recorded and is illustrated in Figure 7.9; and,
- The proposed extraction phasing has been altered to ensure the groundwater flow towards the identified petrifying spring is not affected.

- The findings of the Water Section are unambiguous and are underpinned by an appropriate and comprehensive geological and hydrogeological dataset.
- Having spent my career protecting wetlands of all sorts, Michael Gill of HES would never support or defend any development that had the potential to generate a significant impact on any peatland site, designated or not.
- This development proposal simply does not have the potential to impact the Water Environment or Abbeyleix bog in any significant manner.

Appendix 7.1: Groundwater Quality Laboratory Reports.

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ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 111T

Contact Name	David Broderick	**Report Number**	**161522 - 1**
Address	Hydro-Environmental Services 22 Lower Main Street, Dungarvan,	**Sample Number**	161522/001
		Date of Receipt	09/08/2019
		Date Started	09/08/2019
Tel No	058 44122	**Received or Collected**	Hand
Customer PO	P1486	**Date of Report**	28/08/2019
Quotation No	QN009167	**Sample Type**	Ground Waters
Customer Ref	Ballymullen MW2	**Condition on receipt**	Satisfactory

CERTIFICATE OF ANALYSIS

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
BOD									
	BOD		EW001	1.0		<1.0	mg/L	INAB	
COD-Chemical Oxygen Demand									
	COD		EW184	8		<8	mg/L	INAB	
Gallery Plus-Suite A									
	Ammonia as NH3 (Calc)		EW175	0.006		<0.006	mg/l NH3	INAB	
	Total Oxidised Nitrogen (TON) as N		EW175	0.15		4.6	mg/l N	INAB	
	Nitrate as N		EW175	0.15		4.6	mg/l N	INAB	
	Nitrate as NO3 (Calc)		EW175	0.66		21	mg/l NO3	INAB	
	Nitrite as N		EW175	0.005		<0.005	mg/l N	INAB	
	Nitrite as NO2 (Calc)		EW175	0.016		<0.016	mg/l NO2	INAB	
	Phosphate (Ortho/MRP) as µg/L P		EW175	5		<5	µg/L P		
	Chloride mg/L		EW175	1.0		15	mg/L	INAB	
	Sulphate mg/L		EW175	1.0		7.4	mg/L	INAB	
GCFID-(LVI) EPH C8 to C40 (Mineral Oil C8-C40)									
	EPH-C8 to C40 (Calc ug/l)		EO063	10		150	µg/L	INAB	
	EPH->C8 to <C40		EO063	0.01		0.15	mg/L	INAB	
	EPH >C8 - C10 (Petrol Range)		EO063	0.01		<0.01	mg/L		
	EPH >C10 - C20 (Diesel Range)		EO063	0.01		0.04	mg/L		
	EPH >C20 - <C40 (Motor Oil Range)		EO063	0.01		0.11	mg/L		
Metals-Dissolved									
	Iron-Dissolved		EW188	20		<20	ug/L	INAB	
	Manganese-Dissolved		EW188	1.0		42	ug/L	INAB	
	Cadmium-Dissolved		EW188	0.1		<0.1	ug/L	INAB	
	Chromium-Dissolved		EW188	1.0		<1.0	ug/L	INAB	
	Copper-Dissolved		EW188	0.003		<0.003	mg/L	INAB	
	Lead-Dissolved		EW188	0.3		<0.3	ug/L	INAB	
	Magnesium-Dissolved		EW188	0.3		15.4	mg/L	INAB	
	Nickel-Dissolved		EW188	0.5		1.0	ug/L	INAB	
	Zinc-Dissolved		EW188	1.0		1.1	ug/L	INAB	
	Mercury-Dissolved		EW188	0.02		<0.02	ug/L	INAB	
	Potassium-Dissolved		EW188	0.2		1.1	mg/L	INAB	
	Sodium-Dissolved		EW188	0.5		16.0	mg/L	INAB	
Suspended Solids									

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5.ACCRED=Indicates matrix accreditation for the test,a blank field indicates not accredited
6."*" Indicates sub-contract test
7.Where the date of sampling has not been provided,sample stability times cannot be assessed. It is therefore possible that the results provided may be compromised

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Address	Hydro-Environmental Services 22 Lower Main Street, Dungarvan,	**Sample Number**	161522/001
		Date of Receipt	09/08/2019
		Date Started	09/08/2019
Tel No	058 44122	**Received or Collected**	Hand
Customer PO	P1486	**Date of Report**	28/08/2019
Quotation No	QN009167	**Sample Type**	Ground Waters
Customer Ref	Ballymullen MW2	**Condition on receipt**	Satisfactory

CERTIFICATE OF ANALYSIS

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
Suspended Solids									
	Suspended Solids		EW013	5		121	mg/L	INAB	
Total Dissolved Solids (TDS)									
	Total Dissolved Solids (TDS)		EW046	15		392	mg/L	INAB	
Total Kjeldahl Nitrogen-TKN (CalcGallery)									
	Total Kjeldahl Nitrogen-TKN (CalcGallery)		EW010	1.0		<1.0	mg/l N		
Total Nitrogen									
	Total Nitrogen		EW140	1.0		5.1	mg/L	INAB	

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Contact Name	David Broderick	**Report Number**	**161522 - 1**
Address	Hydro-Environmental Services 22 Lower Main Street, Dungarvan,	**Sample Number**	161522/002
		Date of Receipt	09/08/2019
		Date Started	09/08/2019
Tel No	058 44122	**Received or Collected**	Hand
Customer PO	P1486	**Date of Report**	28/08/2019
Quotation No	QN009167	**Sample Type**	Ground Waters
Customer Ref	Ballymullen MW4	**Condition on receipt**	Satisfactory

CERTIFICATE OF ANALYSIS

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
BOD									
	BOD		EW001	1.0		<1.0	mg/L	INAB	
COD-Chemical Oxygen Demand									
	COD		EW184	8		9	mg/L	INAB	
Gallery Plus-Suite A									
	Ammonia as NH3 (Calc)		EW175	0.006		<0.006	mg/l NH3	INAB	
	Total Oxidised Nitrogen (TON) as N		EW175	0.15		<0.15	mg/l N	INAB	
	Nitrate as N		EW175	0.15		0.15	mg/l N	INAB	
	Nitrate as NO3 (Calc)		EW175	0.66		0.67	mg/l NO3	INAB	
	Nitrite as N		EW175	0.005		<0.005	mg/l N	INAB	
	Nitrite as NO2 (Calc)		EW175	0.016		<0.016	mg/l NO2	INAB	
	Phosphate (Ortho/MRP) as µg/L P		EW175	5		<5	µg/L P		
	Chloride mg/L		EW175	1.0		15	mg/L	INAB	
	Sulphate mg/L		EW175	1.0		17	mg/L	INAB	
GCFID-(LVI) EPH C8 to C40 (Mineral Oil C8-C40)									
	EPH-C8 to C40 (Calc ug/l)		EO063	10		277	µg/L	INAB	
	EPH->C8 to <C40		EO063	0.01		0.28	mg/L	INAB	
	EPH >C8 - C10 (Petrol Range)		EO063	0.01		<0.01	mg/L		
	EPH >C10 - C20 (Diesel Range)		EO063	0.01		0.10	mg/L		
	EPH >C20 - <C40 (Motor Oil Range)		EO063	0.01		0.18	mg/L		
Metals-Dissolved									
	Iron-Dissolved		EW188	20		2400	ug/L		
	Manganese-Dissolved		EW188	1.0		350	ug/L		
	Cadmium-Dissolved		EW188	0.1		<0.1	ug/L	INAB	
	Chromium-Dissolved		EW188	1.0		<1.0	ug/L	INAB	
	Copper-Dissolved		EW188	0.003		<0.003	mg/L	INAB	
	Lead-Dissolved		EW188	0.3		<0.3	ug/L	INAB	
	Magnesium-Dissolved		EW188	0.3		17.9	mg/L	INAB	
	Nickel-Dissolved		EW188	0.5		2.2	ug/L	INAB	
	Zinc-Dissolved		EW188	1.0		15	ug/L	INAB	
	Mercury-Dissolved		EW188	0.02		<0.02	ug/L	INAB	
	Potassium-Dissolved		EW188	0.2		1.0	mg/L	INAB	
	Sodium-Dissolved		EW188	0.5		9.0	mg/L	INAB	
Suspended Solids									
	Suspended Solids		EW013	5		290	mg/L	INAB	

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		Date of Receipt	09/08/2019
		Date Started	09/08/2019
Tel No	058 44122	**Received or Collected**	Hand
Customer PO	P1486	**Date of Report**	28/08/2019
Quotation No	QN009167	**Sample Type**	Ground Waters
Customer Ref	Ballymullen MW4	**Condition on receipt**	Satisfactory

CERTIFICATE OF ANALYSIS

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
Total Dissolved Solids (TDS)									
	Total Dissolved Solids (TDS)		EW046	15		392	mg/L	INAB	
Total Kjeldahl Nitrogen-TKN (CalcGallery)									
	Total Kjeldahl Nitrogen-TKN (CalcGallery)		EW010	1.0		1.3	mg/l N		
Total Nitrogen									
	Total Nitrogen		EW140	1.0		1.4	mg/L	INAB	

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Contact Name	David Broderick	**Report Number**	**161522 - 1**
Address	Hydro-Environmental Services 22 Lower Main Street, Dungarvan,	**Sample Number**	161522/003
		Date of Receipt	09/08/2019
		Date Started	09/08/2019
Tel No	058 44122	**Received or Collected**	Hand
Customer PO	P1486	**Date of Report**	28/08/2019
Quotation No	QN009167	**Sample Type**	Ground Waters
Customer Ref	Ballymullen MW5	**Condition on receipt**	Satisfactory

CERTIFICATE OF ANALYSIS

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
BOD									
	BOD		EW001	1.0		<1.0	mg/L	INAB	
COD-Chemical Oxygen Demand									
	COD		EW184	8		<8	mg/L	INAB	
Gallery Plus-Suite A									
	Ammonia as NH3 (Calc)		EW175	0.006		<0.006	mg/l NH3	INAB	
	Total Oxidised Nitrogen (TON) as N		EW175	0.15		4.8	mg/l N	INAB	
	Nitrate as N		EW175	0.15		4.8	mg/l N	INAB	
	Nitrate as NO3 (Calc)		EW175	0.66		21	mg/l NO3	INAB	
	Nitrite as N		EW175	0.005		<0.005	mg/l N	INAB	
	Nitrite as NO2 (Calc)		EW175	0.016		<0.016	mg/l NO2	INAB	
	Phosphate (Ortho/MRP) as µg/L P		EW175	5		<5	µg/L P		
	Chloride mg/L		EW175	1.0		15	mg/L	INAB	
	Sulphate mg/L		EW175	1.0		10	mg/L	INAB	
GCFID-(LVI) EPH C8 to C40 (Mineral Oil C8-C40)									
	EPH-C8 to C40 (Calc ug/l)		EO063	10		109	µg/L	INAB	
	EPH->C8 to <C40		EO063	0.01		0.11	mg/L	INAB	
	EPH >C8 - C10 (Petrol Range)		EO063	0.01		<0.01	mg/L		
	EPH >C10 - C20 (Diesel Range)		EO063	0.01		0.03	mg/L		
	EPH >C20 - <C40 (Motor Oil Range)		EO063	0.01		0.08	mg/L		
Metals-Dissolved									
	Iron-Dissolved		EW188	20		<20	ug/L	INAB	
	Manganese-Dissolved		EW188	1.0		13	ug/L	INAB	
	Cadmium-Dissolved		EW188	0.1		<0.1	ug/L	INAB	
	Chromium-Dissolved		EW188	1.0		<1.0	ug/L	INAB	
	Copper-Dissolved		EW188	0.003		<0.003	mg/L	INAB	
	Lead-Dissolved		EW188	0.3		<0.3	ug/L	INAB	
	Magnesium-Dissolved		EW188	0.3		13.7	mg/L	INAB	
	Nickel-Dissolved		EW188	0.5		<0.5	ug/L	INAB	
	Zinc-Dissolved		EW188	1.0		6.8	ug/L	INAB	
	Mercury-Dissolved		EW188	0.02		<0.02	ug/L	INAB	
	Potassium-Dissolved		EW188	0.2		1.1	mg/L	INAB	
	Sodium-Dissolved		EW188	0.5		10.1	mg/L	INAB	
Suspended Solids									
	Suspended Solids		EW013	5		35	mg/L	INAB	

Signed : 28/08/2019

Tunde Gaspar-Technical Manager

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3.OOS=Result which is outside specification highlighted as OOS-A
4.LOQ=Limit of Quantification or lowest value that can be reported
5.ACCRED=Indicates matrix accreditation for the test,a blank field indicates not accredited
6."*" Indicates sub-contract test
7.Where the date of sampling has not been provided,sample stability times cannot be assessed. It is therefore possible that the results provided may be compromised

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ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 111T

Contact Name	David Broderick	**Report Number**	**161522 - 1**
Address	Hydro-Environmental Services 22 Lower Main Street, Dungarvan,	**Sample Number**	161522/003
		Date of Receipt	09/08/2019
		Date Started	09/08/2019
Tel No	058 44122	**Received or Collected**	Hand
Customer PO	P1486	**Date of Report**	28/08/2019
Quotation No	QN009167	**Sample Type**	Ground Waters
Customer Ref	Ballymullen MW5	**Condition on receipt**	Satisfactory

CERTIFICATE OF ANALYSIS

TEST	ANALYTE	SUB	METHOD	LOQ	SPEC	RESULT	UNITS	ACCRED.	OOS
Total Dissolved Solids (TDS)									
	Total Dissolved Solids (TDS)		EW046	15		409	mg/L	INAB	
Total Kjeldahl Nitrogen-TKN (CalcGallery)									
	Total Kjeldahl Nitrogen-TKN (CalcGallery)		EW010	1.0		1.1	mg/l N		
Total Nitrogen									
	Total Nitrogen		EW140	1.0		5.9	mg/L	INAB	

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6."*" Indicates sub-contract test
7.Where the date of sampling has not been provided,sample stability times cannot be assessed. It is therefore possible that the results provided may be compromised

Appendix 7.2: Groundwater Monitoring Parameters.

Groundwater Laboratory Analysis Suite

Parameters	**Units**
Alkalinity Total	mg/l $CaCO_3$
Alkalinity Total	mg/l HCO_3
Sulphate	mg/l SO_4
Chloride	mg/l Cl
Nitrate	mg/l NO_3N
Orthophosphate	mg/l P
Ammonia N	mg/l NH_3-N
Total Calcium	mg/l
Magnesium	mg/l
Sodium	mg/l
Potassium	mg/l
Iron	mg/l
Manganese	mg/l

Appendix 7.3: Ballymullen Proposed Hydrological Monitoring Plan.

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PROPOSED HYDROLOGICAL MONITORING PLAN FOR ABBEYLEIX BOG

Prepared for:
Booth Precast Products Ltd

Prepared by:
Hydro-Environmental Services

DOCUMENT INFORMATION

Document Title:	**PROPOSED HYDROLOGICAL MONITORING PLAN FOR ABBEYLEIX BOG**
Issue Date:	**05th September 2022** **Revised August 2024**
Project Number:	**P1486-2**
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Author(s):	**MICHAEL GILL** **DAVID BRODERICK**
Signed:	Michael Gill _____ **Michael Gill B.A., B.A.I., M.Sc., MIEI** **Managing Director – Hydro-Environmental Services**

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This report has been prepared by HES with all reasonable skill, care and diligence within the terms of the reference agreed with the client, and in line with instructions and information provided by the client, and incorporating our terms and conditions and taking account of the resources devoted to it by agreement with the client. The report contains information from sources and data which we believe to be reliable, but we have not confirmed that reliability and make no representation as to their accuracy or completeness. We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above. The flood risk assessment undertaken as part of this study is site-specific, and the report findings cannot be applied to other sites outside of the survey area which is defined by the site boundary. This report is confidential to the client, and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies upon the report at their own risk.

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FIGURES IN TEXT

1. INTRODUCTION

1.1 BACKGROUND

Hydro-Environmental Services (HES) were requested by Booth Precast Products Ltd to prepare a Hydrological Monitoring Plan for Abbeyleix Bog with regard to the proposed development of a sand and gravel pit at Ballymullen, Abbeyleix, Co. Laois.

The monitoring plan defines hydrological monitoring proposals within Abbeyleix Bog and at the proposed development site during the planning application stage along with post-consent stages if the planning application is successful.

The proposed development site is shown in **Figure A.** Abbeyleix Bog is located immediately to the west/southwest of the proposed development site.

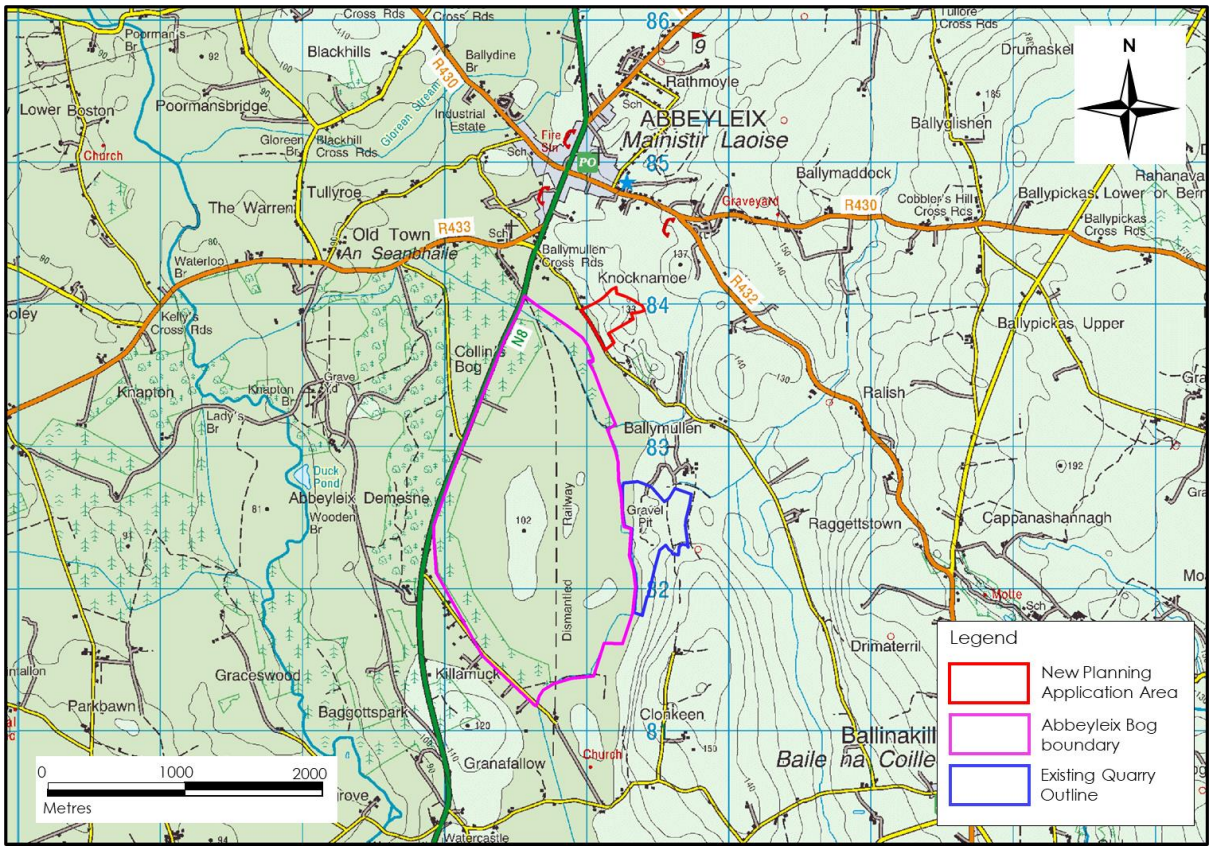

Figure A: Site Location Map

1.2 STATEMENT OF EXPERIENCE

Hydro-Environmental Services ("HES") are a specialist hydrological, hydrogeological and environmental practice which delivers a range of water and environmental management consultancy services to the private and public sectors across Ireland and Northern Ireland. HES was established in 2005, and our office is located in Dungarvan, County Waterford.

Our core area of expertise and experience is in hydrology and hydrogeology. We routinely work on surface and groundwater monitoring and prepare monitoring plans.

Michael Gill is an Environmental Engineer with 18 years of environmental consultancy experience in Ireland. Michael has completed numerous hydrological and hydrogeological assessments for various developments across Ireland. Michael has worked on bog hydrology

projects since 1996 and has extensive experience in terms of characterisation and hydrological management of raised bogs.

David Broderick is a Hydrogeologist with 13 years of environmental consultancy experience in Ireland. David has completed numerous hydrological and hydrogeological assessments for various developments across Ireland. David has significant experience in extraction pit and quarry development, and also has completed many hydrological assessments of bogs and sensitive wetlands.

1.3 PROPOSED DEVELOPMENT

The proposed development is a new sand and gravel pit within a greenfield site at Ballymullen, Abbeyleix, Co. Laois. The development proposes to extract c. 735,687m^3/1.47 million tonnes (incl. overburden) of sand and gravel aggregate from an area of approximately 8.0 Ha. The proposed application area is shown in **Figure A**.

The applicant proposes to extract the sand and gravel material and transport the material to the applicants existing manufacturing facility located approximately 1.3km to the south of the application site. There will be no processing of the extracted material on site (i.e., there will be no separation of fines from the sand and gravel excavated at the site and therefore there will be no requirement for management of spoil waste/residual material at the site). The only proposed infrastructure at the site is a new site entrance, wheel wash, and full retention oil interceptor.

All aggregate extraction will be undertaken above the local groundwater level. There are no proposed surface water discharges. The proposed wheel wash will discharge to the ground via a full retention oil interceptor.

1.4 KEY ISSUES REGARDING HYDROGEOLOGY

Abbeyleix Bog is located to the west/southwest and immediately down-gradient of the proposed development site. The proposed development site is located within the groundwater and surface water catchment of petrifying springs and bog woodland which are water dependent habitats located at the edge of Abbeyleix Bog. Therefore, activities at the proposed application site have the potential to create indirect hydrogeological effects (groundwater quantity and quality) at those locations.

The main concern raised by Paul Johnston (Trinity College Dublin) in his previous planning submission mainly relates to impacts on groundwater flow volumes to the petrifying springs and wet woodland by way of altering recharge (i.e., reducing rainfall recharge) at the proposed development site due to extraction works.

A number of mitigation measures are proposed to ensure that there will be no alteration of the groundwater recharge regime at the proposed development site:

- The extraction works will be dry workings (i.e., above the water table), and there will be no washing or processing of the material at the Ballymullen site;
- All material processing and washing will be completed at the existing facility;
- Removal of vegetation/extraction and restoration of the site in 8 phases and not all at once. The Phasing has been altered to remove extraction from the area directly east of the petrifying spring area;
- Installation of temporary perimeter swales/drains to ensure all rainfall is collected and percolated to the ground;
- Ploughing of the pit ground level at the end of each phase prior to reinstating topsoil to ensure good drainage percolation is maintained; and,

- Maintaining a greenfield/grassland corridor on the lower lying western side of the site which acts as a natural drainage (recharge) buffer between the proposed extraction area and Abbeyleix Bog.

2. SITE SETTING AND BASELINE CONDITIONS

2.1 INTRODUCTION

This section provides summary details on the existing environment and the hydrological/hydrogeological characteristics in the area of the proposed development site and Abbeyleix Bog.

2.2 PROPOSED DEVELOPMENT SITE

The proposed development site (i.e., sand and gravel pit) is directly underlain by a Locally Important Sand and Gravel Aquifer. The glaciofluvial deposits in the area of the site comprise mainly of SAND with some interbedded SAND & GRAVEL and GRAVEL layers. GRAVELS with boulders and cobbles were becoming more abundant at the base of the investigation holes on the central and western sides of the site.

Underneath the sand and gravel aquifer, a regionally karstified limestone aquifer is mapped (the investigation drilling indicates limestone is present below the site depths ranging between 30.6mbgl (central area) and 37.2mbgl (eastern area). The depth to bedrock on the western area of the site is likely to be between 15 – 20mbgl.

Based on surveys and groundwater level monitoring undertaken at the site to date, the groundwater level in the area of the proposed development varies spatially between 1.027m (94.04m OD) and 29.961m (99.398m OD) with temporal variations of <0.3m over the monitoring period.

Based on groundwater level measurements, the groundwater flow direction in the area of the site is westerly towards Abbeyleix Bog with discharge likely to the Ballymullen Stream as groundwater baseflow or petrifying spring discharge.

2.3 ABBEYLEIX BOG

Abbeyleix Bog is not a designated site (i.e., it's not a SPA/SAC/NHA/pNHA). The bog is heavily modified by manmade drainage. However, the manmade drainage is there for a long time and now forms part of the hydrological baseline. The bog is mentioned in the 2017 – 2023 Laois County Development Plan but is not mentioned in the new 2021 – 2027 CDP. The bog is also mentioned in the National Peatland Strategy (NPWS, 2015), but it is only mentioned in the context of a Bord na Mona owned site where some bog restoration works have been undertaken.

Ecological mapping and hydrological studies of the bog confirm the presence of wet woodland and petrifying springs which are both Annex I Priority Habitats.

A number of hydrological /hydrological investigations have been undertaken on Abbeyleix Bog and the most extensive of these is a PhD Thesis by Michael Swenson of Trinity College (2017). See the map of the existing hydrological monitoring network on Abbeyleix Bog below in **Figure B**.

The PhD investigated the regional scale hydrology and hydrogeology at Abbeyleix Bog to characterize the catchment scale hydrology and water balance. The underlying hydrogeology was found to have relatively little impact on the surface eco-hydrology, and this was due to the raised nature of the bog and the fact that the bog is underlain by shell marl, particularly the north-eastern section of the bog (section adjacent to the proposed development site). Thus, the surface eco-hydrology was more strongly controlled by local topography.

The investigations (by Swanson, 2007) determined a shallow marl lake was likely present at the north-eastern section of the bog as there are still calcified springs (petrifying springs) and seepages along the north-eastern edge of Abbeyleix Bog adjacent to sand-gravel esker complex on which the proposed development site is located. These springs and seepages are fed by a groundwater head and elevation gradient from the esker complex (i.e., sand and gravel at the site) down to the bog which is ultimately driven by rainfall recharge. The proposed application site is potentially located in the recharge area of these springs. (The alteration of the proposed extraction phasing has limited this potential overlap as explained in Section 7.6.9 of the EIAR).

HES visited Abbeyleix Bog on 11th March 2021 and confirmed that the spring discharge is mineralised (i.e., pH 7.6 – 8 and EC 500 – 600µS/cm). The discharge volume from the spring is also relatively small (<1L/s). We were accompanied during the site visit by Mr Chris Uys of the Abbeyleix Bog Project.

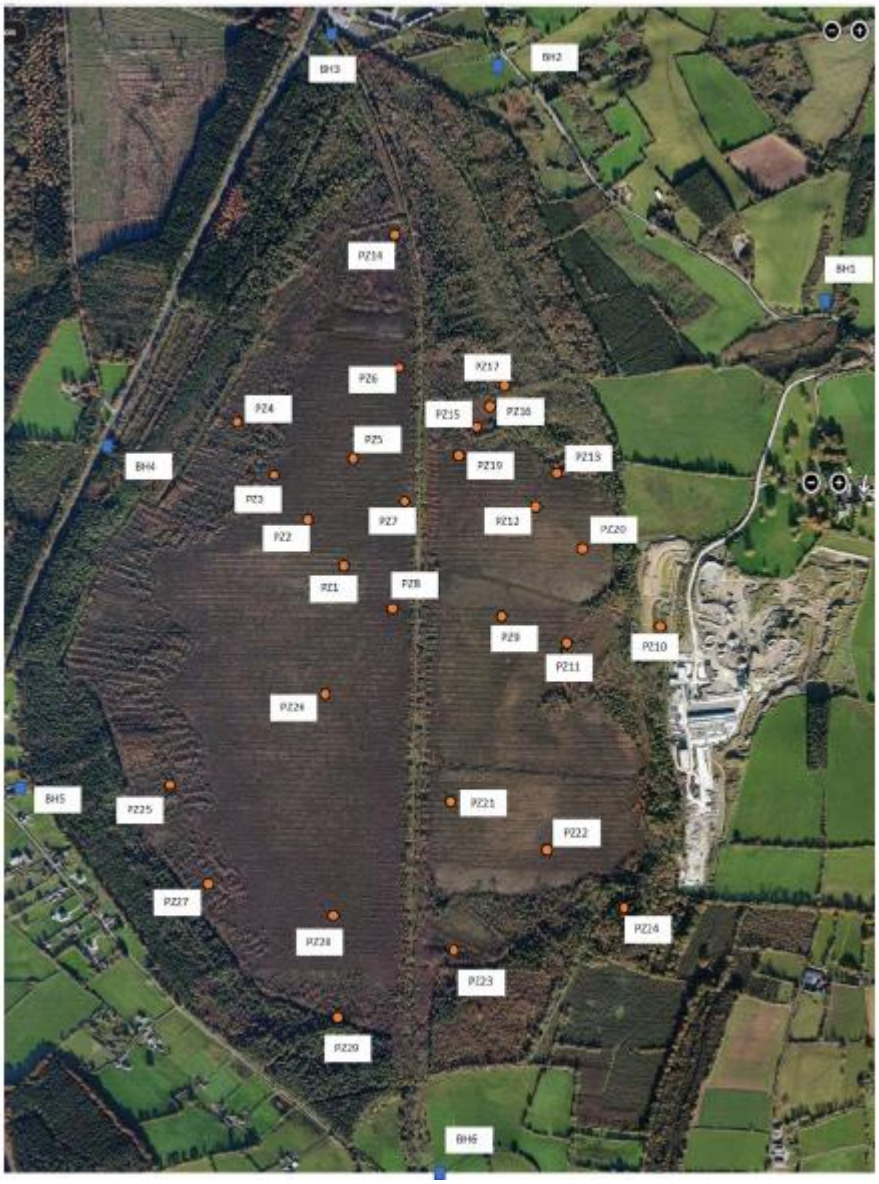

Figure B: Existing Borehole and Piezometer Monitoring Network at Abbeyleix Bog (after Swenson, 2017)[1]

[1] *Greenhouse Gas Emissions and Eco-hydrology of a Raised and Cutover Bog (PhD by Swenson M, 2017)*

3 no. piezometer couples/sets (3 deep sub peat piezometers, and 2 no. shallow standpipes) were installed along the northeastern boundary of Abbeyleix Bog in July 2022 between the proposed site and the petrifying spring. The area where the 3 no. piezometers sets are located is classified ecologically as wet grassland.

Refer to Figure C below for the bog piezometer locations. The piezometer logs are attached as Appendix 6-2 (Land, Soils and Geology Chapter).

The 3 no. deep sub peat piezometers (P1, P2 and P3) were installed into wet SAND which was found to underlie the PEAT at the 3 no. piezometers locations. The 2 no. shallow standpipes (PH1 and PH3) were installed to the base of the peat only. No PH2 piezometer was installed due to the shallow depth, and dry nature, of peat at the P2 location (0.52m).

These piezometers can be used in the proposed hydrological monitoring plan.

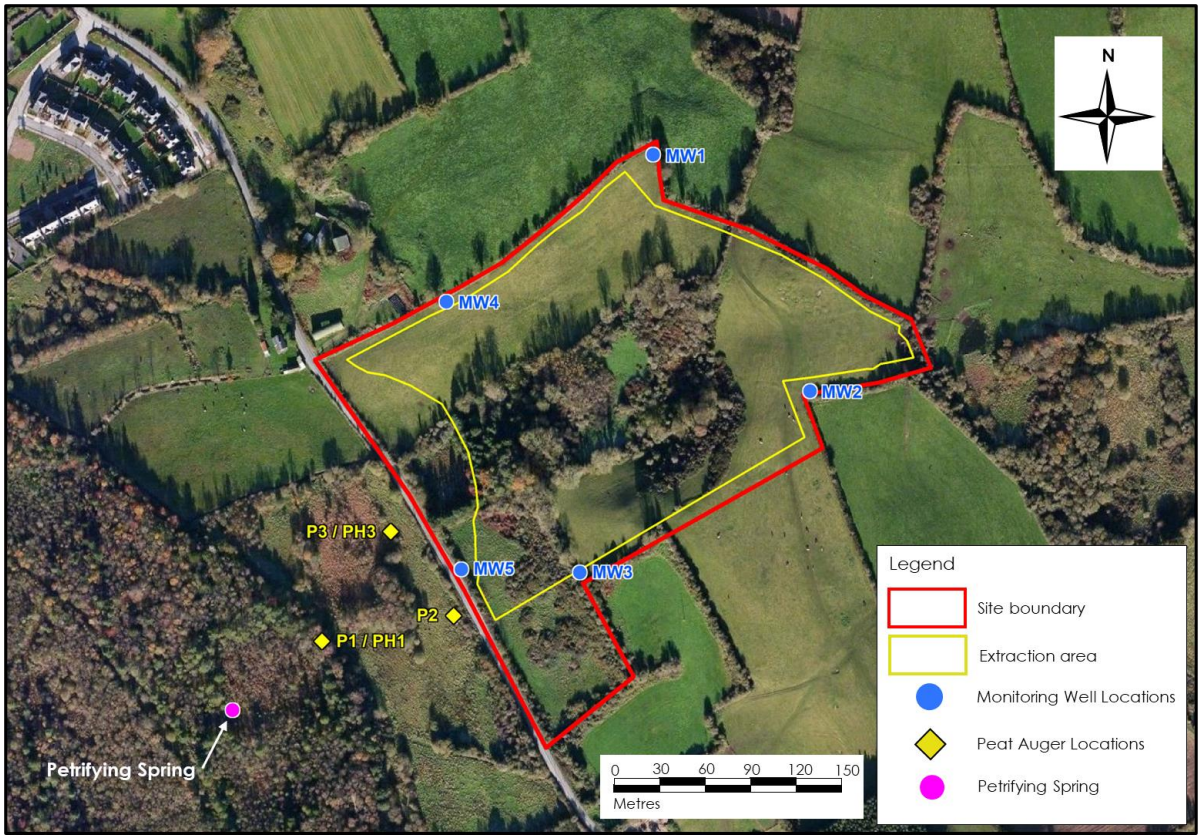

Figure C: Abbeyleix Bog Piezometer Sets & Site Monitoring Well Locations

3. PROPOSED HYDROLOGICAL MONITORING PLAN

3.1 INTRODUCTION

This section sets out the hydrological related monitoring plan and timeframes to be completed at Abbeyleix Bog in respect of the proposed development over a period of 5 years.

3.2 PROPOSED MONITORING LOCATIONS

Groundwater monitoring at the proposed development site will be carried out at 5 no. existing monitoring wells (MW1 – MW5) which were drilled at the site in July/August 2019. Refer to **Figure D** below for these monitoring well locations.

As outlined above, 3 no. sets of piezometers have been installed within the lag zone at Abbeyleix Bog.

It is also proposed to monitor water levels in two of the existing boreholes on the bog network. These are BH2 and BH3, and these locations are also shown in **Figure D**.

3.3 MONITORING DURATION, FREQUENCY AND PARAMETERS

The monitoring plan will have a duration of 5 years. This will include the monitoring completed during the RFI stage of the current planning application and a minimum of 1-year pre-commencement (subject to planning approval) and 4 years post-planning consent. Monitoring will continue through the planning process. The proposed monitoring plan is summarised in **Table A** below.

Table A: Summary of Proposed Hydrological Monitoring Plan

Location	Automated	Monthly	Quarterly	Annual
Development Site Monitoring Wells (5 no.) & Bog Piezometers Sets (3 no.), and BH2 and BH3 from the existing bog monitoring network.	Data loggers installed in MW1 – MW5	Manual Water level Measurement (mbtoc)(1)	-	-
Bog Piezometer Set 3 no. (at petrifying Spring)	-	Estimation of discharge/flow (L/s) & Manual Water level Measurement	-	-
MW5, and Bog Piezometers Sets (3 no.)	-	-	Field Hydrochemistry (pH, Electrical Conductivity & Temperature)(2)	-
MW5, and Bog Piezometers Sets (3 no.)	-	-	-	Laboratory Hydrochemistry Analysis (refer to **Appendix I** of the plan for the suite of parameters) (2)

1) mbtoc – metres below the top of the piezometer casing
2) Note that during the pre-commencement phase monitoring period, 2 no. rounds of Field Hydrochemistry, and 1 no. round of Laboratory Hydrochemistry Analysis will be completed.

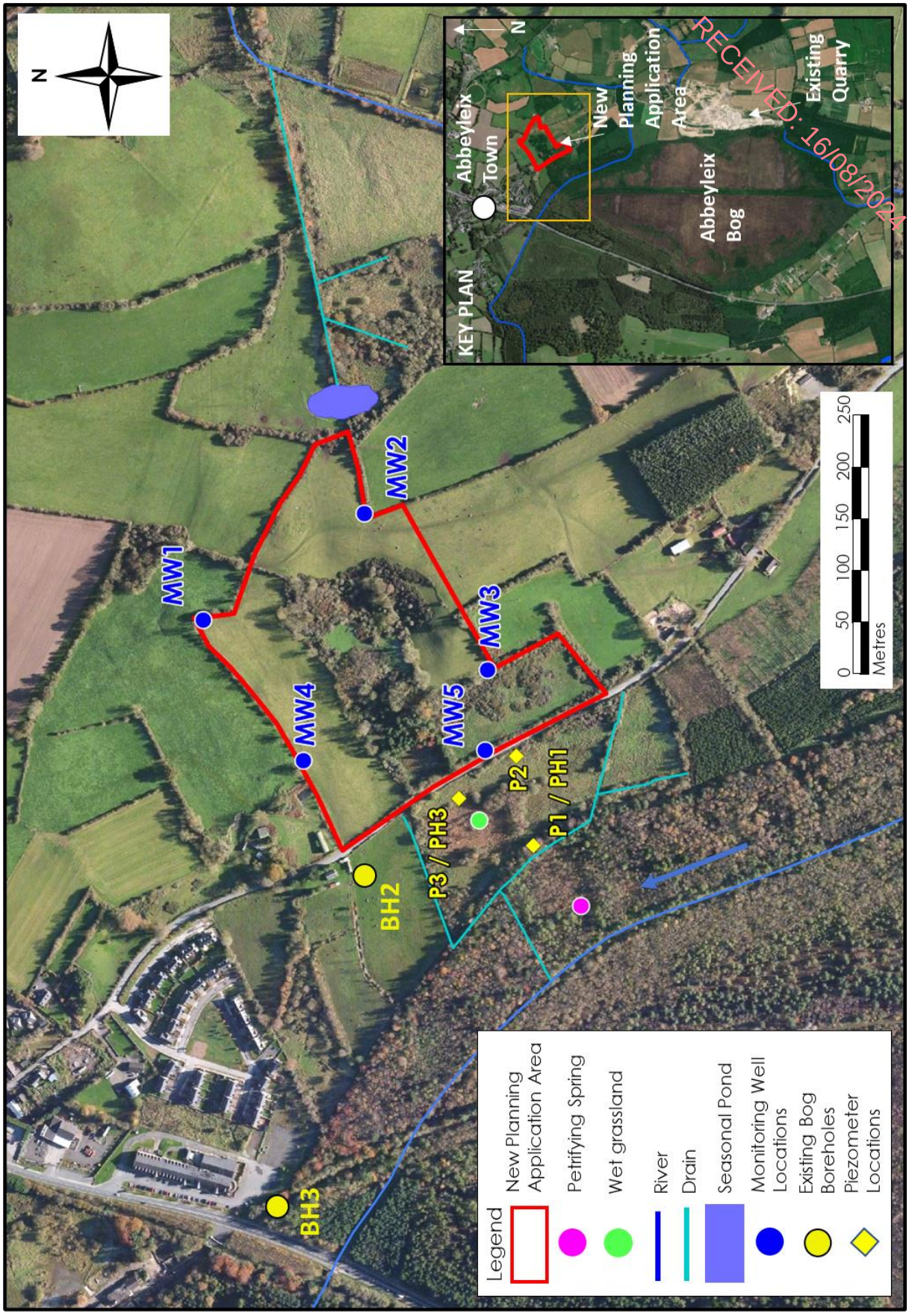

Figure D: Proposed Hydrological Monitoring Locations

3.4 REPORTING

All currently available monitoring data is included in the EIAR for the proposed development.

Subject to planning approval future monitoring reports will be completed by HES on an annual basis, with a trend analysis undertaken on a quarterly basis. The annual report will include the presentation of water level hydrographs for the piezometers and a discussion/analysis of the hydrochemistry data. The trend analysis will determine if there is any significant quarterly variation in water levels that requires action/investigation in advance of the annual report.

Annual monitoring reports will be shared with all Stakeholders as defined by Abbeyleix Bog Committee.

4. MONITORING PLAN SUMMARY

A proposed hydrological monitoring plan has been proposed for a 5-year period. The plan includes:

- Monitoring groundwater levels and hydrochemistry at appropriate monitoring locations at the proposed sand and gravel pit and Abbeyleix bog;
- The piezometer sets (3 no.) are located in the lagg zone of the bog between the proposed development site and the petrifying spring area and within the wet grassland area. Discharge/flow measurements will be undertaken at the spring location (if possible and subject to agreement on the method with the Abbeyleix Bog Committee); and,
- The monitoring plan will have a duration of 5 years. This will include the RFI monitoring period and a minimum of 1-year pre-commencement (subject to planning approval) and 4 years post-planning consent. Monitoring will continue through the planning process. Trend analysis will be completed on a quarterly basis, and annual monitoring reports will be shared with with all Stakeholders as defined by Abbeyleix Bog Committee.

* *

Appendix I
Groundwater Laboratory Analysis Suite

Groundwater Laboratory Analysis Suite

Parameters	Units
Alkalinity Total	mg/l $CaCO_3$
Alkalinity Total	mg/l HCO_3
Sulphate	mg/l SO_4
Chloride	mg/l Cl
Nitrate	mg/l NO_3N
Orthophosphate	mg/l P
Ammonia N	mg/l NH_3-N
Total Calcium	mg/l
Magnesium	mg/l
Sodium	mg/l
Potassium	mg/l
Iron	mg/l
Manganese	mg/l

Appendix 7.4: Water Framework Directive Compliance Assessment

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WATER FRAMEWORK DIRECTIVE COMPLIANCE ASSESSMENT
BALLYMULLEN SAND AND GRAVEL PIT, ABBEYLEIX, CO. LAOIS

FINAL REPORT

Prepared for:

BOOTH CONCRETE PRODUCTS LTD

Prepared by:

HYDRO-ENVIRONMENTAL SERVICES

DOCUMENT INFORMATION

Document Title:	**WATER FRAMEWORK DIRECTIVE COMPLIANCE ASSESSMENT FOR BALLYMULLEN SAND AND GRAVEL PIT, CO. LAOIS**
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current revision no:	**FINAL_REV F0**
Author:	**MICHAEL GILL** **CONOR MCGETTIGAN** **CIARA RODAHAN**
Signed:	 **Michael Gill B.A., B.A.I., M.Sc., MIEI** **Managing Director – Hydro-Environmental Services**

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FIGURES (IN TEXT)

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1. INTRODUCTION

1.1 BACKGROUND

Hydro-Environmental Services (HES) were requested by Booth Concrete Products Ltd, to complete a Water Framework Directive (WFD) Compliance Assessment for the proposed sand and gravel pit at Ballymullen, Abbeyleix, Co. Laois (i.e. the 'Proposed Development').

The purpose of this WFD assessment is to determine if any specific components or activities associated with the Proposed Development will compromise WFD objectives or cause a deterioration in the status of any surface water or groundwater body and/or jeopardise the attainment of good surface water or groundwater status. This assessment will determine the water bodies with the potential to be impacted, describe the proposed mitigation measures and determine if the project is in compliance with the objectives of the WFD.

This WFD Assessment is intended to supplement the Revised EIAR submitted as part of the response to a Request for Further Information issued by Laoise County Council on 15th November 2023. The Proposed Development is described in full in Chapter 3 of the Revised EIAR.

For the purposes of this WFD Assessment, and consistent with the Revised EIAR Chapter 7, the following terminology is used: 'Proposed Development' and the 'Proposed Development site'.

1.2 STATEMENT OF AUTHORITY

Hydro-Environmental Services (HES) are a specialist hydrological, hydrogeological and environmental practice that delivers a range of water and environmental management consultancy services to the private and public sectors across Ireland and Northern Ireland. HES was established in 2005, and our office is located in Dungarvan, County Waterford. We routinely complete impact assessments for hydrology and hydrogeology for a large variety of project types including wind farms.

This WFD assessment was prepared by Michael Gill, Conor McGettigan and Ciara Rodahan.

Michael Gill (P. Geo., B.A.I., MSc, Dip. Geol., MIEI) is an Environmental Engineer with over 22 years' environmental consultancy experience in Ireland. Michael has completed numerous hydrological and hydrogeological impact assessments of commercial developments in Ireland. He has also managed EIAR assessments for infrastructure projects and private residential and commercial developments. In addition, he has substantial experience in wastewater engineering and site suitability assessments, contaminated land investigation and assessment, wetland hydrology/hydrogeology, water resource assessments, surface water drainage design and SUDs design, and surface water/groundwater interactions.

Conor McGettigan (BSc, MSc) is an Environmental Scientist with 4 years' experience in environmental consultancy in Ireland. Conor holds an M.Sc. in Applied Environmental Science (2020) and a B.Sc. in Geology (2016) from University College Dublin. Conor has prepared the Land, Soils and Geology and Hydrology and Hydrogeology Chapters for numerous wind farm EIAR projects. Conor routinely competes WFD Assessments for a wide variety of projects including sand and gravel pits, bedrock quarries and proposed renewable energy developments.

Ciara Rodahan is a Junior Environmental Scientist. Ciara holds a BSc in Environmental Science from UCC. Ciara is currently in the process of completing an MSc in Applied Environmental Geoscience.

1.3 WATER FRAMEWORK DIRECTIVE

The EU Water Framework Directive (2000/60/EC), as amended by Directives 2008/105/EC, 2013/39/EU and 2014/101/EU ("**WFD**"), was established to ensure the protection of the water environment. The Directive was transposed in Ireland by the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003).

The WFD requires that all member states protect and improve water quality in all waters, with the aim of achieving good status by 2027 at the latest. Any new development must ensure that this fundamental requirement of the WFD is not compromised.

The WFD is implemented through the River Basin Management Plans (RBMP) which comprises a six-yearly cycle of planning, action and review. RBMPs include identifying river basin districts, water bodies, protected areas and any pressures or risks, monitoring and setting environmental objectives. In Ireland the first RBMP covered the period from 2010 to 2015 with the second cycle plan covering the period from 2018 to 2021.

The River Basin Management Plan (2018 - 2021) objectives, which have been integrated into the design of the proposed wind farm development, include:

- Ensure full compliance with relevant EU legislation;
- Prevent deterioration and maintain a 'high' status where it already exists;
- Protect, enhance and restore all waters with aim to achieve at least good status by 2027;
- Ensure waters in protected areas meet requirements; and,
- Implement targeted actions and pilot schemes in focused sub-catchments aimed at (1) targeting water bodies close to meeting their objectives and (2) addressing more complex issues that will build knowledge for the third cycle.

Furthermore, the Department of Housing, Local Government and Heritage are currently in the latter stages of preparing the 3rd Cycle River Basin Management Plan (2022 - 2027). As of July 2024, the plan has not been published while the draft plan is available to view at https://www.gov.ie/en/consultation/2bda0-public-consultation-on-the-draft-river-basin-management-plan-for-ireland-2022-2027/.

2. WATERBODY IDENTIFICATION CLASSIFICATION

2.1 INTRODUCTION

This section identifies those Surface Waterbodies (SWBs), Groundwater Bodies (GWBs) and protected areas with potential to be affected by the Proposed Development and reviews any available WFD information.

2.2 SURFACE WATERBODY IDENTIFICATION

Regionally the application site is located in the River Nore surface water catchment in Hydrometric Area 15 of the south-eastern River Basin District (SERBD). Locally the Proposed Development site is mapped in the River Nore sub-catchment (Nore_SC_040) and the Nore_100 WFD river sub-basin.

Within the Nore_100 river sub-basin the Ballymullen stream flows in a northerly direction through Abbeyleix Bog approximately 250m to the west of the Proposed Development site. The Ballymullen Stream joins the River Nore ~ 2.68km downstream of the Site. All watercourses in the vicinity of the Site, including the Ballymullen Stream, form part of the Nore_100 SWB. The River Nore continues to the southeast, where it is joined by several other tributaries including the Gully and Erkina rivers which discharge into the Nore_110 SWB to the north of Durrow. The River Nore continues to the southeast, flowing through Kilkenny City before the Nore_250 SWB discharges into the Nore Estuary near Inistioge (~49.6km southeast of the Site as the crow flies).

Table A presents the total downstream catchment area of the SWBs downstream of the Site. In the vicinity of the Site the Nore_100 SWB has a total upstream catchment area of ~485km^2. Meanwhile, the Nore_250 SWB near Inistioge has a total upstream catchment of ~2,450km^2. Therefore, the SWBs which are located in close proximity to the Site (i.e. the Ballymullen Stream) are more susceptible to potential effects. The River Nore is not susceptible to potential effects due to its significant catchment area.

Figure A below is a local hydrology map of the area.

Table A: Catchment Area Downstream of the Proposed Development site

WFD River Sub-Basin	Total downstream Catchment Area (km^2)
Nore sub-catchment (Nore_SC_040)	
Nore_100	~485
Nore_110	~944
Nore_120	~1,058
Nore_130	~1,070
Nore_140	~1,105
Nore_150	~1,233
Nore_160	~1,560
Nore_170	~1,648
Nore_180	~1,705
Nore_190	~1,744
Nore_200	~1,746
Nore_210	~1,776
Nore_220	~2,239
Nore_230	~2,360
Nore_240	~2,419
Nore_250	~2,445

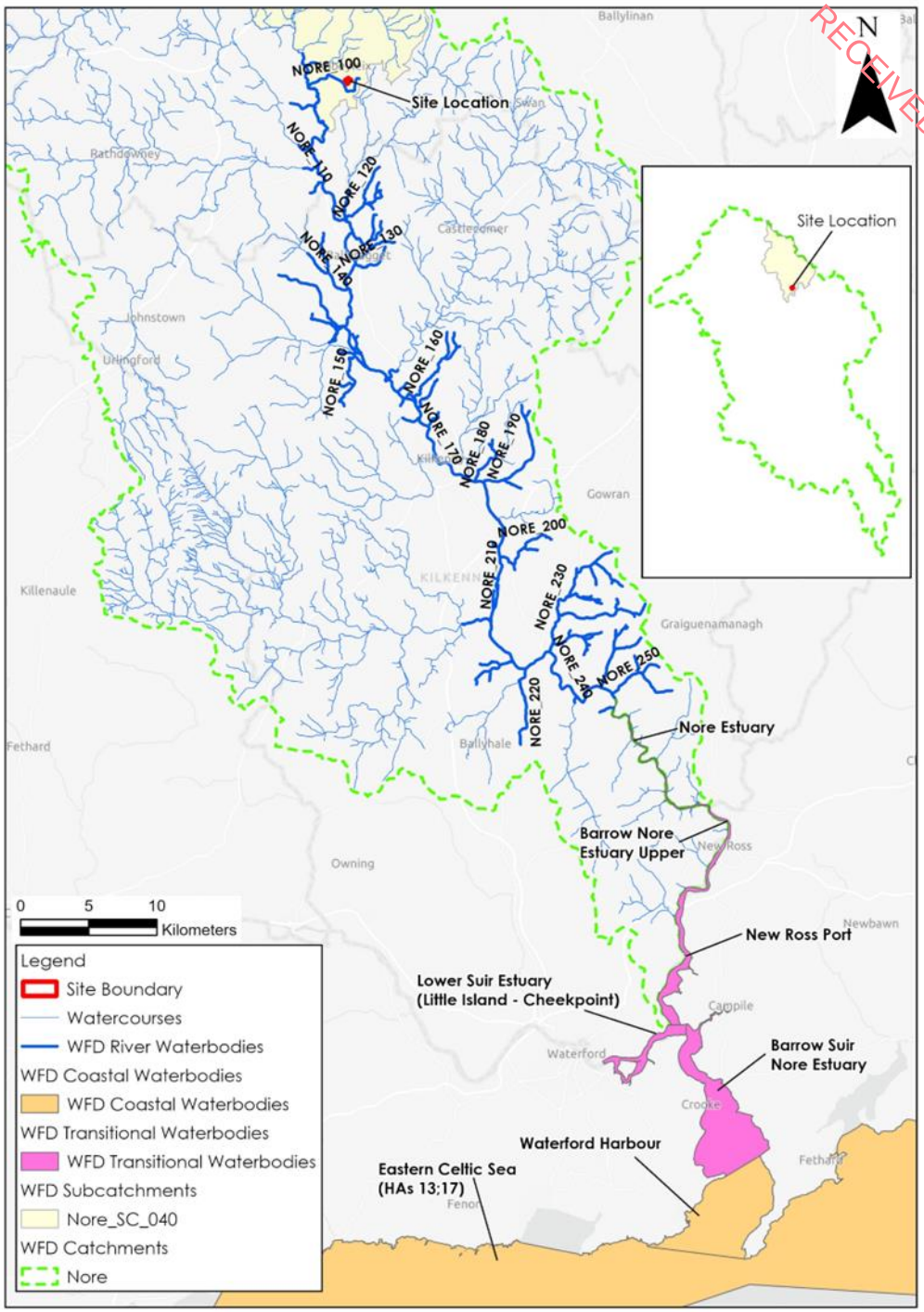

Figure A: Local Hydrology Map

2.3 SURFACE WATER BODY CLASSIFICATION

A summary of the WFD status and risk result for Surface Water Bodies (SWBs) downstream of the Proposed Development site are shown in **Table B**. The overall status of SWBs is based on the ecological, chemical and quantitative status of each SWB.

Local Groundwater Body (GWB) and Surface water Body (SWB) status information is available from (www.catchments.ie).

As stated above the Proposed Development site is located in the Nore_SC_040 sub-catchment and the Nore_100 WFD river sub-basin. In the vicinity of the Site, the Nore_100 SWB achieved 'Good' status in the latest WFD cycle (2016-2021). The Nore_100 SWB has been assessed as being "Not at risk" of failing to meet its WFD objectives in the future. There are no significant pressures identified to be impacting which impact the Nore_100 SWB.

Meanwhile, downstream of Nore_100 SWB, the River Nore (_110 to _250 SWBs) mostly achieved "Good" status in the latest WFD cycle (2016 -2021) and have been assessed as "not at risk" of failing to meet their WFD objectives in the future. However, some river sections including the Nore_120, _190, and _230, achieved "Moderate" status and are deemed to be "At risk" of failing to meet their WFD objectives. The main significant pressures currently facing these SWBs include Urban run-off and urban wastewater.

The transitional (Nore Estuary, Barrow Nore Estuary Upper, New Ross Port, Lower Suir Estuary and Barrow Suir Nore Estuary) and coastal waterbodies (Waterford Harbour) further downstream all achieved "Moderate" status in the latest WFD cycle. These waterbodies are "at risk" and agriculture is listed as a significant pressure on these SWBs.

The SWB status for the 2016-2021 WFD cycle are shown on **Figure B**.

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Table B: Summary WFD Information for Surface Water Bodies

SWB	Overall Status (2010-2015)	Overall Status (2013-2018)	Overall Status (2016-2021)	Risk Status (2013-2018)	Pressures
Nore Catchment					
Nore_100	Good	High	Good	Not at risk	None
Nore_110	Good	Good	Good	Not at risk	None
Nore_120	Unassigned	Good	Moderate	At risk	None
Nore_130	Good	Good	Good	Not at risk	None
Nore_140	Unassigned	Good	Good	Not at risk	None
Nore_150	Good	Good	Good	Not at risk	None
Nore_160	Unassigned	Good	Good	Not at risk	None
Nore_170	Good	Good	Good	Not at risk	None
Nore_180	Good	Good	Good	Not at risk	None
Nore_190	Unassigned	Moderate	Moderate	Review	Urban run-off & Urban wastewater,
Nore_200	Unassigned	Moderate	Good	Review	Urban run-off & Urban wastewater,
Nore_210	Moderate	Good	Good	Review	None
Nore_220	Good	Moderate	Good	Review	None
Nore_230	Good	Moderate	Moderate	At risk	None
Nore_240	Good	Moderate	Good	Review	None
Nore_250	Good	Good	Good	Not at risk	None
Nore Estuary	Moderate	Good	Moderate	At risk	Agriculture,
Barrow Nore Estuary Upper	Good	Moderate	Moderate	At risk	Agriculture & Urban run-off
New Ross Port	Moderate	Moderate	Moderate	At risk	Agriculture
Lower Suir Estuary (Little	Moderate	Good	Moderate	At risk	Agriculture

Island - Cheekpoint)					
Barrow Suir Nore Estuary	Good	Moderate	Moderate	At risk	Agriculture
Waterford Harbour	Good	Moderate	Moderate	At risk	Agriculture & Urban Run-off

2.4 GROUNDWATER BODY IDENTIFICATION

The Ballyadams Formation is mapped to underlie the majority of the Proposed Development site, while the Clogrenan Formation is mapped to underlie the northeast and a small section of the south of the Site. Both limestone bedrock formations are classified by the GSI (www.gsi.ie) as a Regionally Important Aquifer (RKD) - Karstified (diffuse). The Site is also overlain by a Locally Important Gravel Aquifer (Lg).

In terms of GWBs, the Proposed Development site is mapped to overlie the Durrow (IE_SE_G_156) Karstic GWB and the Abbeyleix Gravels GWB.

The GWB status for the 2016-2021 WFD cycle are shown on Figure B.

2.5 GROUNDWATER BODY CLASSIFICATION

The GWBs are assigned a status based on the assessment of groundwater chemical and quantitative figures. Summary WFD information for GWBs underlying the Proposed Development is presented in **Table C**.

The Durrow GWB (IE_SE_G_156) underlies the Proposed Development site and is currently assigned "Poor" Status, which is defined based on the quantitative status and chemical status of the GWB. The Durrow GWB is "at risk" of failing its WFD objectives. Agriculture has been identified as a significant pressure impacting this GWB.

The Abbeyleix aquifer (IE_GSI_sgAq_40K_78) underlies the Proposed Development site and is currently assigned "Good" status, which is defined based on the quantitative status and chemical status of the GWB. The Abbeyleix Aquifer is "not at risk" of failing to meet its WFD objectives. There are no significant pressures impacting this GWB.

The GWB status for the 2016-2021 WFD cycles are shown on Figure B.

Table C: Summary WFD Information for Groundwater Bodies

GWB	Overall Status (2010-2015)	Overall Status (2013-2018)	Overall Status (2016-2021)	Risk Status (2013-2018)	Pressures
Durrow	Good	Poor	Poor	At risk	Agriculture
Abbeyleix Aquifer	Good	Good	Good	Not at risk	None

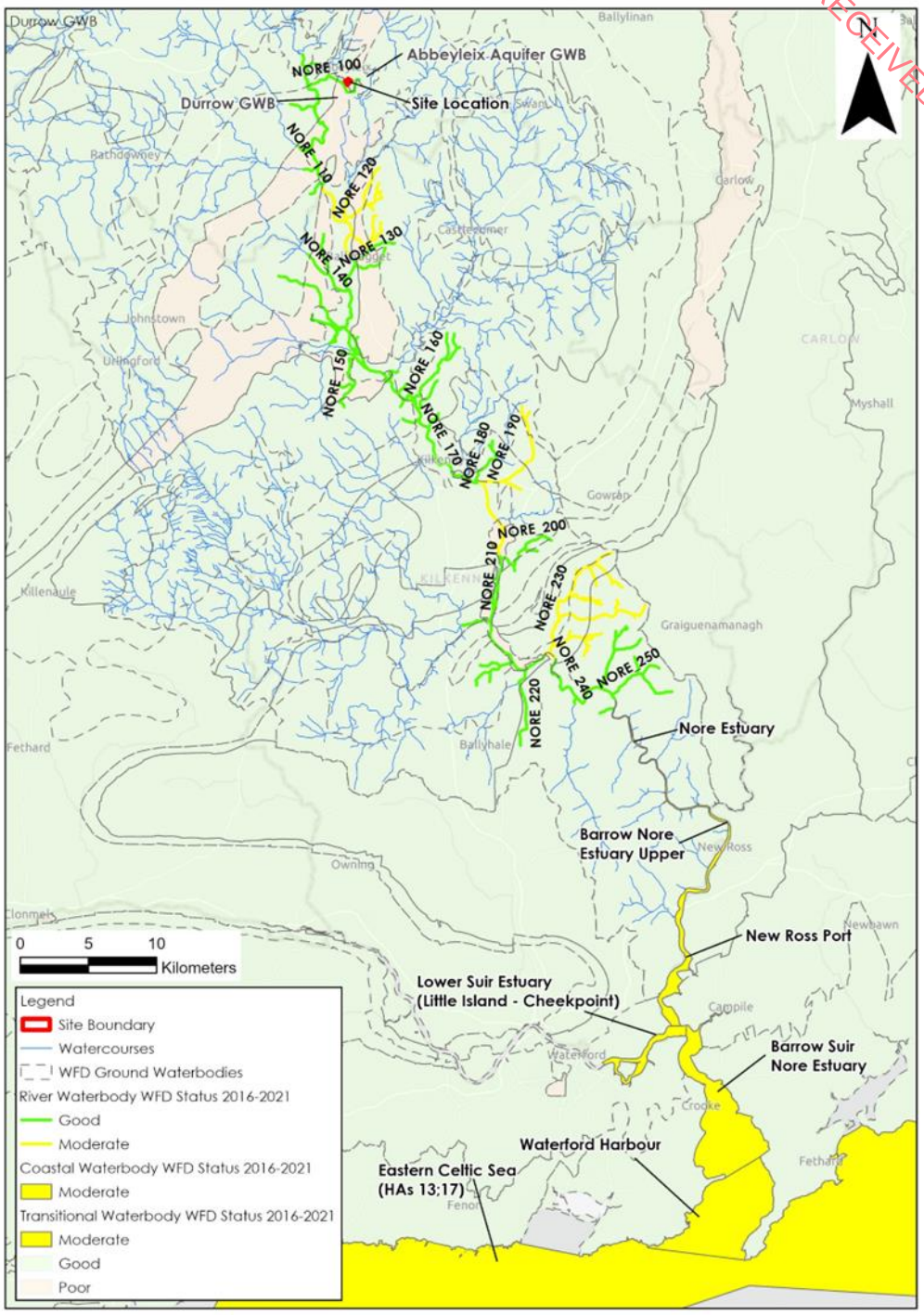

Figure B: WFD Groundwater and Surface Waterbody Status (2016-2021)

2.6 PROTECTED AREAS IDENTIFICATION

2.6.1 Nature Conservation Designations

Proposed Natural Heritage Areas (pNHAs), Natural Heritage Areas (NHAs), Special Areas of Conservation (SACs), candidate Special Areas of Conservation (cSAC) and Special Protection Areas (SPAs).

Ramsar sites are wetlands of international importance designated under the Ramsar Convention (adopted in 1971 and came into force in 1975), providing a framework for the conservation and wise use of wetlands and their resources.

The Proposed Development site is not located within any designated conservation site.

The nearest designated site is the River Barrow and River Nore SAC (Site Code: 002162) which is located southwest of Abbeyleix town, approximately 2.2km west of the site, and ~3km downstream of the Site via the indirect hydrological connections (groundwater flowpaths to the Ballymullen Stream).

The River Nore/Abbeyleix Woods Complex pNHA (Site Code: 002076) is located approximately 2.1km southwest from the Site. There are indirect hydrological connections between the Proposed Development site, and this designated site as the groundwater at the Site discharges into the Ballymullen Stream which discharges into the River Nore, which flows though this pNHA.

The River Nore SPA (Site Code: 004233) is located approximately 2.3km west of the Proposed Development site. There are indirect hydrological connections between the Proposed Development site, and this designated site as the groundwater at the Site discharges into the Ballymullen Stream which in turn discharges into the River Nore.

The nearest Natural Heritage area to the Proposed Development site is the Lisbigney Bog NHA (Site Code: 000869). This NHA is located ~4.4km south to the south of the proposed Development Site.

There are no other designated sites within 5km of the Proposed Development site.

Meanwhile, Abbeyleix Bog, which is located immediately to the west, is currently not designated. Abbeyleix Bog also contains a number of Annex 1 Priority Habitats including a Petrifying Spring and Bog Woodland.

2.6.2 Bathing Waters

Bathing waters are those designated under the Bathing Water Directive (76/160/EEC) or the later revised Bathing Water Directive (2006/7/EC).

There is 1 no. designated bathing waters located within the Barrow Suir Nore Estuary, and 2 no. designated bathing waters located within Waterford Harbour coastal waterbody. These designated bathing waters are located at:

- The Duncannon bathing waters (Identification Code: IESEBWT100_0100_0100) lies within the Barrow Suir Nore Estuary and is located approximately 81km to the southeast of the site. The Duncannon bathing waters are assigned "Sufficient Water Quality" status as per the latest testing period 2020-2023.
- The Counsellors' Strand, Dunmore East bathing waters (Identification Code: IESEBWC100_0000_0100) lies within Waterford Harbour and is located approximately 86.5km to the southeast of the site. The Counsellors' Strand, Dunmore East bathing

waters are assigned "Good Water Quality" status as per the latest testing period 2020-2023.

- The Dunmore Strand, Dunmore East bathing waters (Identification Code: IESEBWC100_0000_0200) lies within Waterford Harbour and is located approximately 86.6km to the southeast of the site. The Dunmore Strand, Dunmore East bathing waters are assigned "Good Water Quality" status as per the latest testing period 2020-2023.

2.6.3 Nutrient Sensitive Areas

Nutrient Sensitive Areas (NSA) comprise Nitrate Vulnerable Zones and polluted waters designated under the Nitrates Directive (91/676/EEC) and areas designated as sensitive areas under the Urban Wastewater Treatment Directive (UWWTD)(91/271/EEC). Sensitive areas under the UWWTD are water bodies affected by eutrophication associated with elevated nitrate concentrations and act as an indication that action is required to prevent further pollution caused by nutrients.

The EPA carried out a review of Nutrient Sensitive Areas (NSAs) downstream of large urban wastewater discharges in 2020. Once the regulations are in place, and nutrient sensitive areas have been identified, additional nutrient removal must be applied (if not already applied) to wastewater treatment plants discharging to the sensitive area. If this treatment was in place the objective was deemed to have been met.

There are 4 no. NSAs downstream of the Proposed Development site. The NSA's are located along and downstream of the River Nore and include the following:

- Nore (River) (_180 - _250 SWBs) associated with the Kilkenny City urban wastewater agglomeration.
- Nore Estuary, associated with the Kilkenny City urban wastewater agglomeration.
- Barrow-Nore Estuary, associated with the New Ross urban wastewater agglomeration.
- New Ross Port, associated with the New Ross urban wastewater agglomeration.

NSA objectives are being met for all NSAs downstream of the Proposed Development.

2.6.4 Shellfish Areas

The Shellfish Waters Directive (2006/113/EC) aims to protect or improve shellfish waters in order to support shellfish life and growth.

There are no shellfish protected areas in the vicinity of the Proposed Development site. The closest shellfish protected area is the Waterford Harbour (Cheekpoint / Arthurstown /Creadan) (IE_SE_100_0100) shellfish area is located ~72.7km downstream from the Proposed Development site, mapped within the New Ross Port, Lower Suir Estuary (Little Island – Cheekpoint), and Barrow Suir Nore Estuary transitional waterbodies.

2.6.5 Salmonid Waters

The Salmonid Waters directive ((S.I. 293 / 1988) aims to protect or improve water quality in order to support Salmon, Trout, Char, and Whitefish life and growth.

There are no Salmonid waters within the vicinity of the site. However, there is a hydrological connection to the River Nore, which has been identified as designated Salmonid waters (IE_SE_15N011100). The Ballymullen Stream discharges into the River Nore ~ 2.68km downstream of the Site.

2.6.6 Drinking Water

The 3rd Cycle Nore Catchment Report (EPA, 2024) states that there are 3 no. SWBs in the catchment which have been identified as Drinking Water Protected Areas (DWPAs). The closest downstream DWPA is the Nore_120 river waterbody located ~ 7.68km (straight line

distance) southwest of the Proposed Development site. The Nore_120 met its DWPA objectives in 2019 and is associated with the Ballyragget Public Water Supply (PWS).

Other DWPA's downstream of the application site include the Nore_160 DWPA (IE_SE_15N011750), and the Nore_220 DWPA (IE_SE_15N012310). Both of these DWPA's met their DWPA's in 2019 and are located within the South Eastern RBD.

Meanwhile, all GWB's in Ireland are considered as Drinking water protected areas. The Durrow GWB (IE_SE_G_156) underlies the Proposed Development site. In addition, the Abbeyleix Gravels GWB is mapped to overlie the bedrock aquifer in the vicinity of the Proposed Development site. However, there are no public or group water supplies within the Site or in the surrounding lands. The nearest Public Water Supply (PWS) is the Ballyroan PWS, located ~ 2.13km northeast of the Site. The Fermoyle Public Water Supply is located 4.4km southwest of the Proposed Development site.

3. WFD SCREENING

As discussed in Section 2, there are a total of 15 no. river water bodies that are located in the vicinity or downstream of the Proposed Development site. Furthermore, the Proposed Development site is underlain by 2 no. GWBs. Protected areas downstream of the Proposed Development include the River Barrow and River Nore SAC and River Nore SPA.

3.1 SURFACE WATER BODIES

As shown in Figure A above, there are 15 no. SWBs located in the vicinity or downstream of the Proposed Development site along the River Nore as far as Inistioge where the river becomes tidal.

With consideration for the construction, operational and decommissioning phases of the Proposed Development, it is considered that the Nore_100 SWB will be carried through to the WFD Compliance Assessment as the Proposed Development site is located within this WFD river sub-basin. Furthermore, the Nore_110 SWB will be included in the compliance assessment due to its proximal location to the Proposed Development site and its location immediately downstream of the Nore_100 SWB. The Proposed Development works must not in any way result in a deterioration in the status of these SWBS and/or prevent them from meeting the biological and chemical characteristics for good status in the future.

Meanwhile, the sections of the River Nore further downstream (Nore_120 to Nore_250 SWBs) have been screened out due to their distant location from the Proposed Development site and the increasing volumes of water within the River Nore. The Proposed Development has no potential to cause a deterioration in status of these SWBs and/or jeopardise the attainment of good surface water status in the future.

Furthermore, all transitional and coastal waterbodies downstream of the Proposed Development site have been screened out due to their distant location from the Proposed Development site, the large volume of water within these SWBs and the saline nature of these waters.

3.2 GROUNDWATER BODIES

With respect to GWBs, the Durrow and Abbeyleix Gravels GWBs have been screened in due to their location directly underlying the Proposed Development site. The Proposed Development works must not in any way result in a deterioration in the status of these GWBs and/or prevent them from meeting the biological and chemical characteristics for good status in the future.

3.3 PROTECTED AREAS

The River Barrow and River Nore SAC consists of the freshwater sections of the Rivers Nore and Barrow, extending as far upstream as the Slieve Bloom Mountains. The SAC also includes the tidal elements and estuary as far as Creadun Head, Co. Waterford. The SAC has several EU /Habitats directive Annex I / Annex II habitats and species, with listed habitats including Petrifying Springs, Old Oak Woodlands, and Alluvial Forests. There are also several protected species, including the otter, Freshwater Pearl mussel, Atlantic Salmon, and white-clawed crayfish. This SAC is located ~3km downstream of the Proposed Development site. However, there are no surface water discharges or runoff from the Site and therefore, there are no direct surface water linkages between the Site and the SAC. However, it is expected that groundwater flows in the area of the Site discharge into the Ballymullen Stream or the River Nore. Therefore, this SAC will be included in the WFD compliance assessment. The River Nore SPA is an SPA under the EU Birds Directive due to the presence of Kingfishers within the site.

The Kingfisher is an Annex I species, and as such the Nore SPA has high ornithological importance as it supports a nationally important population of Kingfishers. Other bird species of note found within the River Nore SPA include cormorant, Moorhen, Mute Swan, and sand martin. However, there are no surface water discharges or runoff from the site and therefore, there are no direct surface water linkages between the Site and the SPA. However, it is expected that groundwater flows in the area of the Site discharge into the Ballymullen Stream or the River Nore. Therefore, this SPA will be included in the WFD compliance assessment.

Lisbigney Bog pNHA has been screened out of the WFD compliance assessment due to the lack of hydrological and hydrogeological connections between the Site and this pNHA.

Abbeyleix bog, which is located immediately to the west of the Site, is currently not designated. Abbeyleix Bog also contains a number of Annex 1 Priority Habitats including a Petrifying Spring and Bog Woodland. The Bog will be included in the WFD compliance assessment due to its close proximity to the Site.

The NSA's downstream of the Proposed Development site, within the Nore_180 to Nore_250 SWB, the Nore Estuary, Barrow-Nore Estuary, and New Ross Port have been screened out due to their distant location downstream to the Proposed Development site and the large and increasing volume of water within the River Nore (associated with increasing upstream catchment areas as outlined in **Table A**).

The Waterford Harbour (Cheekpoint / Arthurstown /Creadan) shellfish area has been screened out due to its distant location downstream of the Proposed Development site, approximately 72.7km. The proposed works do not have the potential to cause a deterioration in the status of this designated shellfish area.

The River Nore salmonid area has been screened in due to its location downstream of the Proposed Development site in the main channel of the River Nore (Nore_100 SWB). There are no surface water discharges or runoff from the Site and therefore, there are no direct surface water linkages between the Site and the main channel of the River Nore. However, it is expected that groundwater flows in the area of the Site discharge into the Ballymullen Stream or the River Nore. Therefore, the protected salmonid water of the River Nore will be included in the WFD compliance assessment.

The DWPA's downstream of the Proposed Development site, within the River Nore (Nore_120, Nore_160, and Nore_220 SWBs) have been screened out due to their distant location from the Proposed Development site and the increasing volumes of water within the River Nore.

3.4 WFD SCREENING SUMMARY

A summary of WFD Screening discussed above is shown in **Table D**.

Table D: Screening of WFD water bodies located within the study area

Type	WFD Classification	Waterbody Name/ID	Inclusion in Assessment	Justification
	River	Nore_100	**Yes**	The Proposed Development site is located within the Nore_100 WFD river sub-basin. Therefore, an assessment is required to consider the potential impacts of the Proposed Development on this SWB.
	River	Nore_110	**Yes**	The Nore_110 SWB is located immediately downstream of the Nore_100 SWB and in close proximity to the Proposed Development site. An assessment is required to consider the potential impacts of the Proposed Development on this SWB.
	River	Nore_120	**No**	The Nore_120 SWB has been screened out due to its distant location from the Proposed Development site and the increasing volumes of water within this SWB. Therefore, the Proposed Development has no potential to affect the status of this SWB.
	River	Nore_130	**No**	The Nore_130 SWB has been screened out due to its distant location from the Proposed Development site and the increasing volumes of water within this SWB. Therefore, the Proposed Development has no potential to affect the status of this SWB.
	River	Nore_140	**No**	The Nore_140 SWB has been screened out due to its distant location from the Proposed Development site and the increasing volumes of water within this SWB. Therefore, the Proposed Development has no potential to affect the status of this SWB.
	River	Nore_150	No	The Nore_150 SWB has been screened out due to its distant location from the Proposed Development site (~17.8km) and the increasing volumes of water within the River Nore. Therefore, the Proposed Development has no potential to affect the status of this SWB.
	River	Nore_160	No	The Nore_160 SWB has been screened out due to its distant location from the Proposed Development site (~21.3km) and the increasing volumes of water within the River Nore. Therefore, the Proposed Development has no potential to affect the status of this SWB.
	River	Nore_170	No	The Nore_170 SWB has been screened out due to its distant location from the Proposed Development site (~24.9km) and the increasing volumes of water within the River Nore. Therefore, the Proposed Development has no potential to affect the status of this SWB.
	River	Nore_180	No	The Nore_180 SWB has been screened out due to its distant location from the Proposed Development site (~29.8km) and the increasing volumes of water within the River Nore. Therefore, the Proposed Development has no potential to affect the status of this SWB.
	River	Nore_190	No	The Nore_190 SWB has been screened out due to its distant location from the Proposed Development site (~30.8km) and the increasing volumes of water within the River Nore. Therefore, the Proposed Development has no potential to affect the status of this SWB.
	River	Nore_200	No	The Nore_200 SWB has been screened out due to its distant location from the Proposed Development site (~36.1km) and the increasing volumes of water within the River Nore. Therefore, the Proposed Development has no potential to affect the status of this SWB.
Groundwater Body	Groundwater	Durrow GWB	**Yes**	The Durrow GWB underlies the Proposed Development site. An assessment is required to consider potential impacts of the Proposed Development on this GWB.
	Groundwater	Abbeyleix Gravels GWB	**Yes**	The Abbeyleix Gravels GWB underlies the Proposed Development site. An assessment is required to consider potential impacts of the Proposed Development on this aquifer GWB.

Protected Area	Nature Conservation Site	River Barrow and River Nore SAC	**Yes**	The River Barrow and River Nore SAC is mapped ~3km downstream of the Proposed Development site, and is located 2.2km west (as the crow flies) of the proposed Development site. There are no direct hydrological linkages between the Site and the SAC, as there are no direct surface water discharges from the Site. It is expected that groundwater flows in the area of the site discharge into the Ballymullen Stream or as spring discharges close to the River Nore. Therefore, given the indirect hydrogeological connection, an assessment is required to consider the potential impacts of the Proposed Development on this protected area.
		River Nore/Abbeyleix Woods Complex pNHA	**Yes**	The River Nore/Abbeyleix Woods Complex pNHA is mapped ~ 2.11km south west (straight line distance) of the Proposed Development site. There are no direct hydrological linkages between the Site and the pNHA, as there are no direct surface water discharges from the Site. It is expected that groundwater flows in the area of the site discharge into the Ballymullen Stream or as spring discharges close to the River Nore. Therefore, given the indirect hydrogeological connection, an assessment is required to consider the potential impacts of the Proposed Development on this protected area.
		River Nore SPA	**Yes**	The River Nore SPA is mapped ~ 2.3km south of the Proposed Development site. There are no direct hydrological linkages between the Site and the pNHA, as there are no direct surface water discharges from the Site. It is expected that groundwater flows in the area of the site discharge into the Ballymullen Stream or as spring discharges close to the River Nore. Therefore, given the indirect hydrogeological connection, an assessment is required to consider the potential impacts of the Proposed Development on this protected area.
		Lisbigney Bog NHA	No	Lisbigney Bog NHA can be screened out of the compliance assessment due it its distant location (~4.4km to the south) from the Proposed Development site and the lack of any direct or indirect hydrological pathways between the Site and this pNHA. The Proposed Development has no potential to impact this NHA.
		Abbeyleix Bog	Yes	Abbeyleix Bog is located in close proximity to the Proposed Development site. Therefore, an assessment is required to consider the potential impacts of the Proposed Development on this sensitive area.
	Nutrient Sensitive Areas	Nore (River) (_180 - _250)	No	The Nore (River) (_180 -_250) NSA has been screened out due to its distant location downstream of the Proposed Development site, and the large volume of water within the River Nore. The Proposed Development has no potential to impact these nutrient sensitive areas.
		Nore Estuary	No	The Nore Estuary NSA has been screened out due to its distant location downstream of the Proposed Development site, and the large volume of water within the Nore at this point. The Proposed Development has no potential to impact these nutrient sensitive areas.
		Barrow-Nore Estuary	No	The Barrow-Nore Estuary NSA has been screened out due to its distant location downstream of the Proposed Development site, and the large volume of water within the transitional waterbody at this point. The Proposed Development has no potential to impact these nutrient sensitive areas.
		New Ross Port	No	The New Ross Port NSA has been screened out due to its distant location downstream of the Proposed Development site, and the large volume of water within the transitional waterbody at this point. The Proposed Development has no potential to impact these nutrient sensitive areas.
	Bathing waters	Duncannon bathing waters	No	The Duncannon bathing waters have been screened out due to its distant location downstream from the Proposed Development site and the large volume of water within the Barrow Suir Nore Estuary. The Proposed Development has no potential to impact these

				bathing Waters.
		Counsellors' Strand, Dunmore East bathing waters	No	The Counsellors' Strand, Dunmore East bathing waters have been screened out due to its distant location downstream from the Proposed Development site and the large volume of water within Waterford Harbour. The Proposed Development has no potential to impact these bathing Waters.
		Dunmore Strand, Dunmore East Bathing Waters	No	The Dunmore Strand, Dunmore East bathing waters have been screened out due to its distant location downstream from the Proposed Development site and the large volume of water within Waterford Harbour. The Proposed Development has no potential to impact these bathing Waters.
	Shellfish Waters	Waterford Harbour (Cheekpoint /Arthurstown/Creadan)	No	The Waterford Harbour (Cheekpoint/Arthurstown/Creadan) shellfish waters have been screened out due to its distant location from the Proposed Development site. The Proposed Development has no potential to impact these Shellfish Waters.
	Salmonid Waters	River Nore	**Yes**	The River Nore Salmonid waters have been screened in due to its close proximity and location directly downstream of the Proposed Development site. The main channel of the Nore_100 SWB is designated as salmonid waters. An assessment is required to consider the potential impacts of the Proposed Development on these salmonid waters.
	DWPA	Nore_120 DWPA	**Yes**	The Nore_120 DWPA has been screened out due to its distant location from the Proposed Development site and the large volumes of water within the River Nore at this location. The Proposed Development has no potential to impact this DWPA.
		Nore_160 DWPA	No	The Nore_160 DWPA has been screened out due to its distant location downstream from the Proposed Development site and the large volume of water within the river at this point. The Proposed Development has no potential to impact this DWPA.
		Nore_220 DWPA	No	The Nore_220 DWPA has been screened out due to its distal location downstream from the Proposed Development site and the large volume of water within the river at this point. The Proposed Development has no potential to impact this DWPA.

4. WFD COMPLIANCE ASSESSMENT

4.1 PROPOSALS

The Proposed Development is a new sand and gravel pit within a greenfield site at Ballymullen, Abbeyleix, Co. Laois. The development proposes to extract 735,687m^3 of sand and gravel aggregate from an area of approximately 8.5 Ha. All material will be excavated and transported off-site to the manufacturing facility c. 1.3km away operated by the Applicant, Booth Precast Products Limited. There will be no processing of material at the Proposed Development site. The proposed sand and gravel pit infrastructure would include a new site entrance, wheel wash, refuelling area and full retention oil interceptor, and a Portaloo toilet.

The proposed extraction depth varies between 97.3m OD on the west of the site and 102.5m OD on the east of the site. This is just over 3m above the monitored groundwater levels to allow for higher groundwater levels in winter.

It also should be noted that there will be no discharge of domestic wastewater at the site, as wastewater will be contained and moved off-site. Groundwater quality impacts from wastewater will therefore not occur. The proposed refuelling area and wheel wash will discharge to ground via a full retention oil interceptor.

Fuel and oil will be delivered to the site and dispensed directly into plant and equipment. There will be no storage of oils and fuels on-site.

The full development description is provided in Chapter 3 of the Revised EIAR.

4.2 POTENTIAL EFFECTS

4.2.1 Construction Phase (Unmitigated)

4.2.1.1 Potential Surface Water Quality Effects

The initial site development construction works including topsoil stripping, creation of the site entrance, and creation of screening berms will require varying degrees of earthworks resulting in excavation of soil, mineral subsoil and fill where present.

These activities can result in the release of suspended solids to surface watercourses, which could result in an increase in the suspended sediment load, resulting in increased turbidity which in turn could affect the water quality and fish stocks of downstream watercourses such as the Ballymullen Stream and the River Nore.

However, the removal of vegetative cover will be over small, localised areas (~0.34Ha) and will likely be completed in a short amount of time. There is no direct hydraulic connection between the Proposed Development site and any downstream drain, stream, or watercourse. Therefore, the only potential for surface water to be impacted is through connectivity with the underlying groundwater system.

A summary of potential status change to SWBs arising from surface water quality impacts during the construction phase of the Proposed Development in an unmitigated scenario are outlined in **Table E**.

Table E: Surface Water Quality Effects During the Construction Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Nore_100	IE_SE_15N011100	Good	Good
Nore_110	IE_SE_15N011300	Good	Good

4.2.1.2 Potential Groundwater Quality/Quantity Effects

Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a major pollution risk to groundwater. The accumulation of small spills of fuels and lubricants during routine plant use can also be a pollution risk. These sources of contamination have the potential to impact on groundwater quality in the underlying groundwater bodies in the area of the Proposed Development. However, measures have been proposed to mitigate the risk of release of hydrocarbons, thus breaking the pathway between the potential source and the associated downstream surface water and groundwater water bodies.

However, given the scale of the overall Durrow GWB (173.25 km^2) and the Abbeyleix Aquifer (7.02 km^2) in comparison to the scale of the Proposed Development site, there is limited potential for the Proposed Development to impact the overall qualitative status of these GWBs.

There will be a slight increase in groundwater vulnerability due to the removal of overburden, however there will be no extraction within 3m of the groundwater table, thus there will be no effect on the current GSI groundwater vulnerability rating which is "High".

Note that due to the abnormally high water level during the spring of 2024, the floor of the quarry has been increased by ~1m over the entire excavation footprint to ensure that there is no extraction within 3m of the groundwater table.

A summary of potential status change to GWBs arising from potential groundwater quality/quantity impacts during the construction phase of the Proposed Development in the unmitigated scenario are outlined in **Table F.**

Table F: Potential Effects on Groundwater Quality/Quantity During the Construction Phase (Unmitigated)

GWB	WFD Code	Current Status	Assessed Potential Status Change
Durrow	IE_SE_G_156	Poor	Poor
Abbeyleix Aquifer	IE_SE_G_171	Good	Good

4.2.1.3 Potential Effects on Protected Areas

Activities at the Proposed Development site have the potential for indirect hydrological effects on downstream designated sites due to the connection between the underlying groundwater system and local surface watercourses including the Ballymullen Stream and the River Nore.

The designated sites included in this assessment and deemed to be indirectly connected to the Proposed Development site include:

- River Barrow and River Nore SAC
- River Nore/Abbeyleix Woods Complex pNHA
- River Nore SPA
- Nore_120 DWPA
- River Nore Salmonid waters

Any deterioration in groundwater quality may have an effect on local surface water quality. The greatest potential for effects will be in the Ballymullen Stream with the potential for effects downstream limited by the large volumes of water within the River Nore. However, due to the nature of the site preparation works during this phase of the Proposed Development there is limited potential for effects,

Furthermore, the Proposed Development site is located to the east and in close proximity to the Abbeyleix Bog. The Proposed Development site is also located close to the groundwater catchment of a petrifying spring and bog woodland which are water dependent habitats associated with Abbeyleix Bog. Therefore, activities at the Proposed Development site have the potential for indirect hydrogeological effects (groundwater quantity and quality). There are no surface water connections between the Proposed Development site and Abbeyleix Bog or the habitats within this site

4.2.2 Extraction / Operation Phase (Unmitigated)

4.2.2.1 Potential Effects on Surface Water Quality/Quantity

There are no surface water bodies mapped within or adjacent to the site boundary, therefore during the extraction / operation phase there would be limited potential to affect the WFD status of the downstream SWBs. Surface watercourses can only be impacted by the indirect connections which exist via groundwater flowpaths from the Proposed Development site. The underlying sand and gravel subsoils are excellent natural filters and will prevent the requirement for treatment of waters for suspended solids (all water within the extraction area will be discharged to ground).

During the operational phase, the excavation of aggregate at the site will be completed using machinery. Such machinery is powered by diesel engines and operated using hydraulics. Unless managed carefully such plant and machinery have the potential to leak hydraulic oils or cause fuel leaks during refuelling operations.

However, only small volumes of fuel/oils will be present on-site (in the machines) and therefore no significant effects are expected as long as standard mitigation is implemented. There will be no storage of fuel at the site. The only plant which will be refuelled at the site will be excavators. Road trucks will be refuelled off-site.

Also, runoff from the site entrance and water in the wheel wash has the potential to become contaminated by oil/fuel leaks and spills. During the operational phase of the Proposed Development, runoff from the site entrance and water in the wheel wash has the potential to become contaminated by oil/fuel leaks and spills. There is the potential for spills/leaks of chemicals resulting in contamination of surface waters.

Therefore, during the operational phase there would be limited potential for the Proposed Development to affect the WFD status of the downstream SWBs.

A summary of potential status change to SWBs arising from surface water quality/quantity impacts during the extraction / operation phase of the Proposed Development in an unmitigated scenario are outlined in **Table G.**

Table G: Surface Water Quality Effects During the Extraction / Operation Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Nore_100	IE_SE_15N011100	Good	Good
Nore_110	IE_SE_15N011300	Good	Good

4.2.2.2 Potential Effects on Groundwater Quality / Quantity

During the extraction / operation phase of the Proposed Development, the overburden and topsoil will be stripped to allow the extraction of the underlying sand and gravel. This will result in an increase in the groundwater vulnerability of the underlying aquifer which is currently rates as "high".

The removal of vegetation/topsoil and the alteration of the site ground levels as a result of the proposed extraction and potential compaction of the pit floor by plant and machinery could alter groundwater recharge rates. However, no significant effects on groundwater quantity will occur, as there will be no extraction below the groundwater table and no dewatering is proposed.

There is the potential for spills/leaks of chemicals resulting in contamination of groundwater.

However, given the scale of the overall Durrow GWB (173.25 km^2) and the Abbeyleix aquifer (7.02 km^2) in comparison to the scale of the Proposed Development site, there is limited potential for the Proposed Development to impact the overall status of these GWBs.

A summary of potential status change to the underlying GWBs during the extraction / operation phase of the Proposed Development in the unmitigated scenario are outlined in **Table H**.

Table H: Potential Groundwater Quality Effects During Extraction / Operation Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Durrow	IE_SE_G_156	Poor	Poor
Abbeyleix Aquifer	IE_SE_G_171	Good	Good

4.2.2.3 Potential Effects on Protected Areas

During the extraction / operation phase, the risk that the Proposed Development may affect the conservation objectives of regional hydrological downstream designated sites is limited provided that there is compliance with the extraction conditions, and given the lack of any direct hydrological connection to downstream surface watercourses.

With regards to Abbeyleix Bog, the potential for effects are limited given that the Proposed Development will not effect groundwater levels or groundwater recharge rates. There will also be no alteration to the surface water flowpaths/drainage around the wet woodland within the Bog.

4.3 MITIGATION MEASURES

In order to mitigate against the potential negative effects on surface and groundwater quality, quantity and flow patterns, mitigation measures will be implemented during the construction and extraction / operation phases of the Proposed Development. These are outlined below.

4.3.1 Construction Phase

4.3.1.1 Mitigation Measures to Protect Against Surface Water Quality Effects

There are no direct surface water connections between the Proposed Development site and downstream watercourses.

The mitigation measures described below for the protection of groundwater quality will also ensure the protection of downstream surface water quality.

4.3.1.2 Mitigation Measures to Protect Against Groundwater Quality

The main mitigation with respect to groundwater quality protection during the construction phase will be the employment of best practice measures with respect to oil usage and refuelling of plant and machinery as follows.

- All plant and machinery will be serviced before being mobilised to the site;
- Refuelling will be completed at the dedicated refuelling area, with a controlled drainage system that drains via a hydrocarbon interceptor;
- Only designated trained operators will be authorised to refuel plant on site;
- Procedures and contingency plans will be set up to deal with emergency accidents or spills;
- An emergency spill kit with an oil boom, absorbers etc. will be kept on-site for use in the event of an accidental spill; and,
- Runoff from the site entrance and overflows from the wheel wash will be directed to a silt trap and full retention hydrocarbon interceptor* prior to discharge to the ground.

*The full retention hydrocarbon interceptor will be sized to cope with a 10-year storm return period.

4.3.2 Extraction / Operation Phase

4.3.2.1 Mitigation Measures to Protect Against Changes to Groundwater Vulnerability Rating due to Aggregate Extraction

Albeit there will be a slight increase in groundwater vulnerability due to the removal of overburden, there will be no extraction within 3m of the groundwater table and therefore there will be no effect on the current GSI groundwater vulnerability rating which is "High".

The main mitigation with respect to groundwater quality protection during the extraction phase will be the employment of best practice measures with respect to oil usage and refuelling of plant and machinery which are dealt with in Section 4.3.1.2 above.

Post extraction phase a landscape and restoration plan will be implemented. This will involve previously stripped overburden being placed on the pit floor to establish grassland which will provide a level of protection to groundwater. Post restoration, the site will be returned to agriculture.

4.3.2.2 Mitigation Measures in Relation to Changes to Groundwater Recharge Rates

The Proposed Development will require the removal of the grass vegetation / topsoil layer, and then the excavation of up to 10m of the underlying sand and gravel deposits. The site ground surface / levels will be altered by the proposed aggregate extraction and may potentially result in the compaction of the pit floor by plant and heavy machinery.

Due to the lack of surface drainage features within the site and the absence of drainage outfalls from the site, all effective rainfall landing on the site must currently recharge to the ground.

In relation to the risk of impacts to the groundwater flow, the following measures will be employed:

- Extraction of aggregate will be done in 8 no. phases and therefore all the vegetation will not be stripped at once. Once each phase is extracted, the ground will be reinstated with topsoil and reseeded before the next phase commences;
- No proposed aggregate extraction directly up-gradient of the petrifying spring location;
- It is proposed to excavate an infiltration drain/swale along the perimeter of each phase bench level within the pit to ensure all potential runoff is collected and diverted to the ground;
- Compaction of the pit floor due to quarry traffic/machinery (leading to increased surface water runoff and reduced recharge) is not expected as the material proposed for extraction was found to be dense with no significant fines (i.e. silts/clays) and regular course layers (i.e. clay/silt) proportions. Therefore, the material by its nature has a very limited ability to compact and seal. Any areas of minor pockets of surface water ponding that might occur will be drained into the proposed infiltration trenches/swales. Once each phase is completed, the exposed deposits will be ploughed before reinstating the topsoil layer to ensure good drainage/percolation is maintained;
- There will be no processing of aggregate at the Proposed Development site, therefore there will be no requirement to manage or store fines (clay and silts) at the site;
- A greenfield corridor (approx. 30m wide) will remain along the low-lying western side of the proposed site. This is the lowest point on the site, particularly the northwestern section/field of the site, where runoff collects naturally during very wet periods and percolates to the ground over a period of time. This section of the site will remain as grassland as it acts as a natural soakaway for the existing site. This will act as a natural drainage buffer between the proposed extraction area and Abbeyleix Bog.

Highest standards of site management will be maintained, and utmost care and vigilance followed to prevent accidental contamination of the environment during the operational phase of the Proposed Development. A named person will be given the task of overseeing the pollution prevention measures agreed for the site to ensure that they are operating safely and effectively.

4.3.2.3 Mitigation Measures to Protect Surface Water and Groundwater Contamination from Oil / Fuel Spills and Leaks

Excavation of aggregate at the Proposed Development site will be completed using machinery. Such machinery is powered by diesel engines and operated using hydraulics. Unless managed carefully such plant and machinery have the potential to leak hydraulic oils or cause fuel leaks during refuelling operations.

Only small volumes of fuel/oils will be present on-site (in the machines) and therefore no significant effects are expected as long as standard mitigation is implemented. There will be

no storage of fuel at the site. The only plant which will be refuelled at the site will be excavators. Road trucks will be refuelled off-site.

Also, runoff from the site entrance and water in the wheel wash has the potential to become contaminated by oil/fuel leaks and spills.

Proposed mitigation measures are outlined as follows:

- All plant and machinery will be serviced before being mobilised to the site;
- Refuelling will be completed at the dedicated refuelling area, with a controlled drainage system that drains via a hydrocarbon interceptor;
- Only designated trained operators will be authorised to refuel plant on site;
- Procedures and contingency plans will be set up to deal with emergency accidents or spills;
- An emergency spill kit with an oil boom, absorbers etc. will be kept on-site for use in the event of an accidental spill; and,
- Runoff from the site entrance and overflows from the wheel wash will be directed to a silt trap and full retention hydrocarbon interceptor* prior to discharge to the ground.

*The full retention hydrocarbon interceptor will be sized to cope with a 10-year storm return period.

4.3.2.4 Mitigation for Hydrological Impacts on Downstream Designated Sites

Mitigation measures for oils and fuels during the extraction / operation phase of the Proposed Development will ensure the protection of underlying groundwater quality and downstream surface water quality and downstream designated sites.

It can be concluded that with best practice methods adhered to during the extraction / operation phase of the Proposed Development, the potential for the project to impact upon the qualifying interests of the local designated sites is not significant.

4.3.2.5 Mitigation for Hydrological/Hydrogeological Impacts on Abbeyleix Bog and Related to Designated Habitats

The Proposed Development site is located immediately up-gradient of Abbeyleix Bog. The site is also within close proximity to the groundwater catchment of a petrifying spring and bog woodland, which are water-dependant habitats associated with Abbeyleix bog. Therefore, activities at the Proposed Development site have the potential for indirect hydrological effects (groundwater quality and quantity). There are no surface water connections between the Proposed Development and Abbeyleix bog and associated designated habitats.

With regard to Abbeyleix Bog itself, the investigations carried out as part of a PhD Thesis found that the underlying hydrogeology was largely found to have relatively little impact on the surface eco-hydrology and this was due to the raised nature of the bog and the fact that the bog is underlain by shell marl, particularly the north-eastern section of the bog adjacent to the Proposed Development site. In addition, due to the fact that there are no surface water connections between Abbeyleix Bog and the proposed site, no significant effects on the hydrology of Abbeyleix Bog can occur.

Based on the groundwater levels measured at the Proposed Development site wells and in the wet grassland area piezometers near the spring area, groundwater flow feeding the main petrifying spring area does not originate from within the area proposed for extraction (i.e. the area proposed for extraction is not a recharge zone for the main petrifying spring area located to the southwest of the Proposed Development site.

Therefore, there will be no impact on groundwater flow volumes/quantity to the spring area/wet woodland as the Proposed Development will have no effect on groundwater levels

and no significant effect on groundwater recharge at the Proposed Development site. There will also be no alteration to the surface water flowpaths/drainage around the wet woodland.

A number of measures are proposed to ensure the drainage regime at the Proposed Development site is maintained and these include the following:

- No groundwater dewatering is required. Sand and gravel extraction will be by dry working, and will occur above the groundwater table;
- Removal of vegetation/Extraction and restoration of the site in 8 phases therefore only a small section of the site will be worked at any one time;
- Due to the revised extraction plan (i.e. reduced area at Phase 4), there is now no proposed aggregate extraction within the groundwater catchment to the main spring area. The catchment area to the important spring has been avoided;
- Installation of temporary perimeter swales/drains to ensure all rainfall is collected and percolated to the ground;
- Ploughing of the pit ground level at the end of each phase prior to reinstating topsoil to ensure good drainage percolation is maintained; and,
- Maintaining a greenfield/grassland corridor on the lower lying western side of the site which acts as a natural drainage buffer between the proposed extraction area and Abbeyleix Bog.

Best practice measures for managing oils and fuels at the site will ensure no significant impacts on groundwater quality will occur. Runoff from the site entrance and overflows from the wheel wash will be discharged via a hydrocarbon interceptor.

Good practice measures with regard to oils and fuels will be employed around the rest of the site area.

4.3.1 Restoration Phase and Post restoration Phase

The restoration plan involves planting the side slopes of the pit and part of the pit floor with new woodland planting, and also by spreading/contouring previously stripped overburden and topsoil over the extraction area and creating a species rich grassland.

No impacts on the hydrological or hydrogeological regime are expected during the restoration or post-restoration phase. The restoration phase itself will have a positive effect in terms of reduced groundwater vulnerability and reduced risk of illegal activities such as fly-tipping. Albeit the required restoration is borne out of the proposed excavation works.

No significant effects on groundwater or surface waters will occur during the restoration phase and post restoration phase of the Proposed Development.

4.3.2 Potential Effects with the Implementation of Mitigation

In all instances, the mitigation measures described in Section 4.3 are sufficient to meet the WFD Objectives. The assessment of WFD elements for the WFD waterbodies is summarised in **Table I** below.

Table I: Summary of WFD Status for Unmitigated and Mitigated Scenarios

SWB / GWB	WFD Code	Current Status	Assessed Potential Status Change- Unmitigated	Assessed Status with Mitigation Measures
Nore_100	IE_SE_15N011100	Good	Good	Good
Nore_110	IE_SE_15N011300	Good	Good	Good
Durrow GWB	IE_SE_G_156	Poor	Poor	Poor
Abbeyleix Gravels GWB	IE_SE_G_171	Good	Good	Good

5. WFD ASSESSMENT CONCLUSION

WFD status for SWBs (Surface Water Bodies) and GWBs (Groundwater Bodies) hydraulically linked to the Proposed Development site are defined in Section 2 above.

The Proposed Development site does not include any direct hydrological connections to downstream SWBs. All water within the Proposed Development site currently recharges to ground. The only connection between the Proposed Development site and downstream SWBs is via groundwater flow in the underlying aquifers.

The Proposed Development does not involve any abstraction of groundwater. The extraction of sand and gravel will be at least 3m above the highest recorded groundwater levels at the Proposed Development site. No groundwater dewatering is proposed. The current hydrogeological regime is characterised by high rates of groundwater recharge due to the permeable nature of the sand and gravel subsoils and this will be unaltered by the Proposed Development. Therefore, the quantitative status of the underlying groundwater bodies (i.e., the available quantity (volume) of groundwater) will remain unaltered during the construction and extraction / operation phases of the Proposed Development.

The Proposed Development site is underlain by the Durrow GWB and the Abbeyleix Gravels GWB. Due to the scale of the Proposed Development in comparison to the overall scale of the underlying GWBs, there is no potential for a change in the qualitative status of the underlying GWBs. Nevertheless, mitigation measures for the protection of groundwater quality will be implemented during the construction, extraction / operation and decommissioning phases of the Proposed Development.

The Proposed Development is located within close proximity to a number of protected sites. Whilst Abbeyleix Bog is not a designated site, its ecological significance is noted and is included in this Assessment. This site is of interest due to the presence of a petrifying spring and bog woodland. A section of the Proposed Development is mapped within the groundwater catchment area of the petrifying spring. As a result, the proposed extraction phasing has been altered to ensure no aggregate extraction occurs within the main spring groundwater catchment. Therefore, the groundwater flow towards the identified petrifying spring is not affected.

Furthermore, mitigation for the protection of groundwater quality during the construction, extraction / operation, restoration and post restoration phases of the Proposed Development will ensure the qualitative status of downstream SWBs will not be altered by the Proposed Development.

There will be no change in GWB or SWB status in the underlying GWBs or downstream SWBs resulting from the Proposed Development. There will be no change in quantitative (volume) or qualitative (chemical) status, and the underlying GWBs and downstream SWBs are protected from any potential deterioration.

As such, the Proposed Development will not impact upon any surface water or groundwater body as it will not cause a deterioration of the status of the body and/or it will not jeopardise the attainment of good status.

As such, the Proposed Development:

- will not cause a deterioration in the status of all surface and groundwater bodies assessed;
- will not jeopardise the objectives to achieve 'Good' surface water/groundwater status;
- does not jeopardise the attainment of 'Good' surface water/groundwater chemical status;

- does not jeopardise the attainment of 'Good' surface water/groundwater quantity status;
- does not permanently exclude or compromise the achievement of the objectives of the WFD in other waterbodies within the same river basin district;
- is compliant with the requirements of the Water Framework Directive (2000/60/EC); and,
- is consistent with other Community Environmental Legislation including the EIA Directive (2014/52/EU), the Habitats Directive (92/43/EEC) and the Birds Directive (2009/147/EC) (Note that a full list of legislation complied with in relation to hydrology and hydrogeology is included in Section 7.3 of the Revised EIAR).

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8.0 CLIMATE

8.1 Introduction

This section of the EIAR assesses the development in terms of climate and climate change and assesses potential impacts that the development may have with regards to climate. Climate can be thought of as the 'average weather' over an extended period of time and so refers to temperature, precipitation and wind.

This chapter has been updated on foot of Laois County Council's *Request for Further Information* (LCC Reg. Ref. 23/60390).

The topic of 'Climate' is more often discussed with reference to 'Climate Change' which is any significant change in the measures of climate lasting for an extended period of time. In other words, climate change includes major changes in temperature, precipitation, or wind patterns, among others, that occur over several decades or longer.

8.2 Methodology

The methodology for the description of the current climate in the region of the proposed development included a desk study review of the data available from Met Éireann, EPA and other bodies which have responsibility for the Climate of Ireland. Met Éireann Data for the Kilkenny Station was used to assess the climate in the region of the application site.

8.3 Climate Change

Climate change is a significant change in the average weather or climate that a region experiences. Climate change can be caused by natural factors such as variations in solar intensity or volcanic eruptions. The term climate change is now generally used to refer to changes in our climate due to the build-up of Greenhouse Gases (GHGs) in the atmosphere. This build-up of GHGs is caused by excess emissions due to certain human activities, like burning fossil fuels for energy, transport and heating.

8.3.1 Kyoto Protocol

The Kyoto Protocol was adopted in Kyoto, Japan on the 11th December, 1997, but not enacted or enforced until the 16th February, 2005. The protocol was adopted to help combat the adverse effects of climate change, or global warming.

Recognizing that developed countries were principally responsible for the current high levels of GHG emissions in the atmosphere as a result of more than 150 years of industrial activity, the Protocol placed a heavier burden on developed nations under the principle of "common but differentiated responsibilities."

Under the Kyoto Protocol, Ireland was required to limit total national greenhouse gas emissions to 314.2 Mtonnes of CO_2eq over the five year period 2008 – 2012 which is equivalent to 62.8 Mtonnes of CO_2eq per annum. The Kyoto Protocol limit was calculated as being 13% above Ireland's 1990 baseline value which was established and fixed at 55.61 Mtonnes of CO_2eq following an in-depth review of Ireland's 2006 greenhouse gas inventory submission to the UNFCCC (United Nations Framework Convention on Climate Change).

8.3.2 Paris Agreement 2015

A legally binding, global agreement on climate change was agreed in Paris on 12th December 2015. It is a legally binding, global agreement on climate change which aims to strengthen the ability of countries to deal with the impacts of climate change. It sets out a long-term goal to limit global warming to below 2°C above pre-industrial levels, and to pursue efforts to limit the temperature increase to 1.5°C. The Agreement requires each Party to prepare and communicate a Nationally Determined Contribution (NDC) that it intends to achieve. NDCs are submitted every five years to the United Nations Framework Convention on Climate Change (UNFCCC). Ireland will contribute to the Agreement through the NDC tabled by the EU on behalf of Member States in 2016, which commits to a 40% reduction in EU-wide emissions by 2030 compared to 1990. All Parties are required to submit new or updated NDCs in 2020.

8.3.3 EU Emissions Trading System (EU ETS)

The EU emissions trading system (EU ETS) is the world's first major carbon market and remains the biggest one. The system was first introduced in 2005 and has undergone several changes since then. The implementation of the system has been divided up into distinct trading periods over time, known as phases which are detailed below.

- Phase 1 (2005-2007)
- Phase 2 (2008-2012)
- Phase 3 (2013-2020)
- Phase 4 (2021-2030)

The EU ETS:

- operates in all EU countries plus Iceland, Liechtenstein and Norway.
- limits emissions from more than 11,000 heavy energy-using installations (power stations & industrial plants) and airlines operating between these countries.
- covers around 40% of the EU's greenhouse gas emissions.

The EU ETS works on a 'cap and trade' basis, so there is a 'cap' or limit set on the total greenhouse gas emissions allowed by all participants covered by the system and this cap is converted into tradable emission allowances.

Within the cap, participants receive or buy emission allowances, which they can trade with one another as needed. They can also buy limited amounts of international credits from

emission-saving projects around the world. The limit on the total number of allowances available ensures that they have a value.

The system covers the following sectors and gases, focusing on emissions that can be measured, reported and verified with a high level of accuracy:

- Carbon dioxide (CO_2) from
  - Power and heat generation
  - Energy-intensive industry sectors including oil refineries, steel works and production of iron, aluminium, metals, cement, lime, glass, ceramics, pulp, paper, cardboard, acids and bulk organic chemicals
  - Commercial aviation
- Nitrous oxide (N_2O) from production of nitric, adipic and glyoxylic acids and glyoxal
- Perfluorocarbons (PFCs) from aluminium production

There will be a revision of the EU's ETS to include polluting sectors, such as buildings, road transport and maritime transport as of 2027, will be known as ETS 2. ETS 2 is required due to the insufficient reductions in these sectors and has an aim to ensure the sectors realign with a trajectory to Net Zero by 2050. The carbon price set by the ETS 2 will provide a market incentive for investments in building renovations and low-emissions mobility. To protect a Just Transition, 20 million additional allowances will be released to stabilise the market should energy prices rise above exceptional levels. It will be fuel suppliers, rather than end users such as households or car users, that will be required to purchase and surrender allowances to cover their emissions.

8.3.4 Effort Sharing Legislation

The Effort Sharing legislation establishes binding annual greenhouse gas emission targets for Member States for the periods 2013–2020 and 2021–2030. These targets concern emissions from most sectors not included in the EU Emissions Trading System (EU ETS), such as transport, buildings, agriculture and waste.

The Regulation on binding annual emission reductions by Member States from 2021 to 2030 (Effort Sharing Regulation) adopted in 2018 is part of the Energy Union strategy and the EU's implementation of the Paris Agreement. It sets national emission reduction targets for 2030 for all Member States, ranging from 0% to -40% from 2005 levels.

Emission Trading Scheme (ETS) and non-ETS sectors targets were further increased to 62% and 42%, respectively to align with updated limits. EU-wide GHG emissions reduction target to at least 55% for 2030 to limit warming to 1.5^0C and align with the goal of the Paris Agreement, legislatively supported 'Fit for 55 Package' to align current laws with the 2030 and 2050 ambitions.

For non-ETS sectors, which includes emissions from agriculture, transport, buildings, and light industry, Member States' nationally binding targets (for the period 2021 to 2030) are covered by the Effort Sharing Regulation (ESR) (Initially adopted in 2018, the Regulation was amended in 2023). Under the ESR, Ireland is required to reduce its emissions from these

sectors by 42% (~27.6 Mt CO_2eq). However this value is not firmly set, the 2023 revision of the Regulation maintained the emission limits for the years 2021 and 2022 and the annual emissions allocations for the years 2026-2030 will be determined in 2025, following a comprehensive review of the emission data.) by 2030, relative to 2005 levels. Together, the ETS and ESR will facilitate achievement of the EU-wide target of at least a 55% GHG emissions reduction by 2030 as set in the European Climate Law.

To fight carbon leakage from the EU by the purchasing and importing of products from outside the EU using more carbon intensive methods, the EU Carbon Border Adjustment Mechanism (CBAM) has been developed. It is a tax that puts fair price on the carbon emitted during the production of carbon intensive goods that are entering the EU, and to encourage cleaner industrial production in non-EU countries. This will be achieved by obliging companies that import into the EU to purchase so-called CBAM certificates to pay the difference between the carbon price paid in the country of production and the price of carbon allowances in the EU ETS. The gradual introduction of the CBAM is aligned with the phase-out of the allocation of free allowances under the EU Emissions Trading System (ETS) to support the decarbonisation of EU industry. The CBAM will initially apply to imports of cement, iron and steel, aluminium, fertilisers, electricity and hydrogen as they are considered highly carbon intensive and at most significant risk of carbon leakage. This will be expanded 50% of the emissions in ETS covered sectors.

In February 2024 the European Commission stated its recommendation of a 90% net greenhouse gas emissions reduction by 2040 compared to 1990 levels, which is in line with recent scientific advice and the EU's commitments under the Paris Agreement. This target is under discussion with the European Parliament and the Member States, with legislative proposals to follow. Decarbonisation of industry will be a key part of this aim along with carbon capture, storage and re-use. The Commission published the 2040 climate target in order to also help European industry, investors, citizens and governments to make decisions in this decade that will keep the EU on track to meet its climate neutrality objective in 2050.

This emphasises the continued focus on reducing carbon emissions at an EU level and will continue to impact climate action in Ireland.

8.3.5 National Policy

Following on from Ireland declaring a climate and biodiversity emergency in May 2019, and the European Parliament approving a resolution declaring a climate and environment emergency in Europe in November 2019, the Government approved the publication of the General Scheme in December 2019, followed by the publication of the Climate Action and Low Carbon Development (Amendment) Bill 2021 (hereafter referred to as the 2021 Climate Bill) in March 2021. The Climate Act was signed into Law on the 23rd July 2021, giving statutory effect to the core objectives stated within the CAP.

The purpose of the 2021 Climate Act (Government of Ireland, 2021) is to provide for the approval of plans "*for the purpose of pursuing the transition to a climate resilient, biodiversity rich and climate neutral economy by no later than the end of the year 2050*". The 2021 Climate Act will also "*provide for carbon budgets and a decarbonisation target*

range for certain sectors of the economy". The 2021 Climate Act defines the carbon budget as "*the total amount of greenhouse gas emissions that are permitted during the budget period*".

In relation to carbon budgets, the 2021 Climate Action and Low Carbon Development (Amendment) Act states "*A carbon budget, consistent with furthering the achievement of the national climate objective, shall be proposed by the Climate Change Advisory Council, finalised by the Minister and approved by the Government for the period of 5 years commencing on the 1 January 2021 and ending on 31 December 2025 and for each subsequent period of 5 years (in this Act referred to as a 'budget period')*". The carbon budget is to be produced for 3 sequential budget periods, as shown in Table 8.1. The carbon budget can be revised where new obligations are imposed under the law of the European Union or international agreements or where there are significant developments in scientific knowledge in relation to climate change. In relation to the sectoral emissions ceiling, the Minister for the Environment, Climate and Communications (the Minister for the Environment) shall prepare and submit to government the maximum amount of Greenhouse Gas (GHG) emissions that are permitted in different sectors of the economy during a budget period and different ceilings may apply to different sectors. The sectorial emission ceilings for 2030 are published in the 2024 Climate Action Plan (DECC, 2023) and are shown in Table 8.2. Industry has a 35% reduction requirement and a 2030 emission ceiling of 4 Mt CO_2e[1].

Table 8.1: 5-Year Carbon Budgets 2021-2025, 2026-2030 and 2031-2025.

Budget Period	Carbon Budget	Reduction Required
2021-2025	295 Mt CO_2e	Reduction in emissions of 4.8% per annum for the first budget period.
2026-2030	200 Mt CO_2e	Reduction in emissions of 8.3% per annum for the second budget period.
2031-2035	151 Mt CO_2e	Reduction in emissions of 3.5% per annum for the third provisional budget.

[1] Mt CO_2e denotes million tonnes carbon dioxide equivalent.

Table 8.2: Sectoral Emission Ceilings 2030 (DECC, 2023a).

Sector	Baseline (Mt CO_2e)	Carbon Budgets (Mt CO_2e)		2030 Emissions (Mt CO_2e)	Indicative Emissions % Reduction in Final Year of 2025- 2030 Period (Compared to 2018)
	2018	2021-2025	2026-2030		
Electricity	10	40	20	3	75
Transport	12	54	37	6	50
Built Environment - Residential	7	29	23	4	40
Built Environment - Commercial	2	7	5	1	45
Industry	7	30	24	4	35
Agriculture	23	106	96	17.25	25
Other (F-gases, waste, petroleum refining)	2	9	8	1	50
Land Use, Land-use Change and Forestry (LULUCF)	5	Reflecting the continued volatility for LULUCF baseline emissions to 2030 and beyond, CAP24 puts in place ambitious activity targets for the sector reflecting an EU-type approach.			
Total	68				
Unallocated Savings	-	-	26	-5.25	-
Legally Binding Carbon Budgets and 2030 Emission Reduction Targets	-	295	200	-	51

In December 2023, CAP24 was published (DECC, 2023a). This is the second CAP since the publication of the carbon budgets and sectoral emissions ceilings and builds on the progress of CAP23, and it aims to implement the required changes to achieve a 51% reduction in carbon emissions by 2030 and 2050 net zero goal. The CAP has six vital high impact sectors where the biggest savings can be made: renewable energy, energy efficiency of buildings, transport, sustainable farming, sustainable business and change of land-use. CAP24 states that the decarbonisation of Ireland's manufacturing industry is key for Ireland's economy and future competitiveness. There is a target to reduce the embodied carbon in construction materials by 10% for materials produced and used in Ireland by 2025 and by

at least 30% for materials produced and used in Ireland by 2030. CAP24 states that these reductions can be brought about by product substitution for construction materials and reduction of clinker content in cement. Cement and other high embodied carbon construction elements can be reduced by the adoption of the methods set out in the Construction Industry Federation 2021 report Modern Methods of Construction. In order to ensure economic growth can continue alongside a reduction in emissions, the IDA Ireland will also seek to attract businesses to invest in decarbonisation technologies.

In April 2023 the Government published a draft *Long-Term Strategy on Greenhouse Gas Emissions Reductions* (DECC, 2023b). This strategy provides a long-term plan on how Ireland will transition towards net carbon zero by 2050, achieving the interim targets set out in the Climate Action Plan. The strategy will be updated on the basis of a second round of public consultation throughout 2023 with an updated strategy published after this is complete.

8.3.6 Ireland's Emissions

Ireland's GHG emissions in 2022 were 60.76 million tonnes carbon dioxide equivalent (Mt CO_2e), which is 1.9% lower (or 1.15 Mt CO_2e) than emissions in 2021 (61.75 Mt CO_2e) and follows a 5.1% increase in emissions reported for 2021 (EPA, 2024). In 2022 emissions in the stationary emissions trading scheme (ETS) sector decreased by 4.1% and emissions under the ESR (Effort Sharing Regulation) decreased by 1.1%. When LULUCF is included, total national emissions decreased by 2.7%. The sector with the highest emissions in 2022 (excluding LULUCF) was agriculture at 36% of the total, followed by transport at 18%. Decreased emissions in 2022 compared to 2021 were observed in the largest sectors except for transport and waste. These sectors showed increases in emissions (6.0%, 6.7% respectively). For 2022, the total national emissions (excluding LULUCF) were 60,605 kt CO_2e as shown in Table 8.3 (EPA, 2024).

Table 8.3: Total National GHG Emissions in 2022.

Sector	2021 Emissions (Mt CO_2e)	2022 Emissions (Mt CO_2e)	% Total 2022 (including LULUCF)	% Change from 2021 to 2022
Agriculture	23.436	23.357	36%	-0.3%
Transport	11.089	11.751	18%	6.0%
Energy Industries	10.262	10.078	16%	-1.8%
Residential	6.879	5.787	9%	-15.9%
Manufacturing Combustion	4.614	4.302	7%	-6.8%
Industrial Processes	2.472	2.288	4%	-7.4%
F-Gases	0.745	0.741	1%	-0.5%
Commercial Services	0.765	0.765	1%	0.0%
Public Services	0.672	0.657	1%	-2.2%
Waste	0.823	0.878	1%	6.7%
LULUCF	4.628	3.983	6%	-13.9%
Total excluding LULUCF	61.755	60.605	94%	-1.9%
Total including LULUCF	66.383	64.588	100%	-2.7%

Note 1 Reproduced from Latest emissions data on the EPA website (EPA, 2024)

Note 2 Waste includes emissions from solid waste disposal on land, solid waste treatment (composting and anaerobic digestion), wastewater treatment, waste incineration and open burning of waste

8.3.7 Local & Regional Climate

The Irish climate is subject to strong maritime influences, the effects decreasing with increasing distance from the Atlantic coast. The climate in the area of the site is typical of the Irish climate, which is temperate maritime. Over the summer months the influence of anti-cyclonic weather conditions on the western and north-western region results in dry continental air interspersed by the passage of Atlantic frontal systems. During much of the winter period the climate is characterised by the passage of Atlantic low-pressure weather systems and associated frontal rain belts. Occasionally the establishment of a high-pressure area or anticyclone over Ireland results in calm conditions and during the winter months these are characterised by clear skies and the formation of low-level temperature inversions with light wind conditions at night time.

By collecting weather information all around the country and by analysing these records over a long period of time, typically 30 years, average values for Ireland are calculated. The closest Met Éireann Synoptic Station is Kilkenny which is located approximately 28km to the

south of the application site however this station was closed in 2007 therefore no more recent data is available, more recent long term data is available from other stations including Casement Aerodrome. Parameters recorded at the station include temperature, relative humidity, sunshine, rainfall, wind speed and direction.

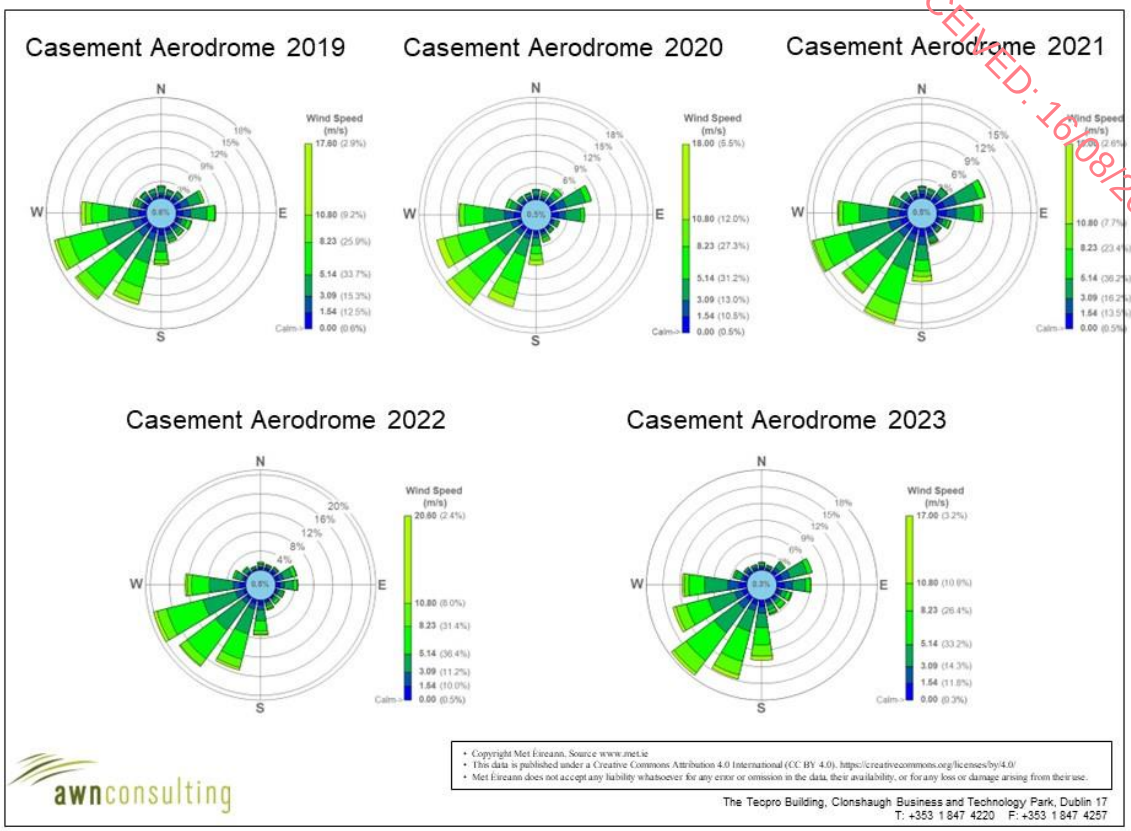
The average annual rainfall (AAR) at Casement for the 30 years period from 1991 – 2020 was 783.5mm/year. In relation to rainfall intensity, the mean number of days where there was ≥0.2mm of rainfall was 193.9, ≥1mm of rainfall 136.4 days and ≥5mm of rainfall 49.9 days. The windrose for Casement weather station for the period of 2019 to 2023 is illustrated in Plate 8.1. The windrose shows that the majority of wind blows from a westerly and south westerly direction.

Table 8.4: Monthly, Annual Mean and Extreme Values at Casement Station

Casement 1991–2020 averages													
Temperature (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
mean daily max	8	8.5	10.3	12.4	15.4	18	19.8	19.4	17	13.7	10.3	8.3	13.4
mean daily min	2.4	2.2	3.1	4.5	6.9	9.6	11.6	11.4	9.6	7.2	4.4	2.6	6.3
mean temperature	5.2	5.3	6.7	8.5	11.2	13.8	15.7	15.4	13.3	10.4	7.4	5.4	9.9
absolute max.	15	17.2	19.8	22.4	25.7	27.6	30.9	28.9	25.2	20.2	17	14.8	30.9
absolute min.	-12.4	-8.1	-9	-5.9	-3.6	0.3	4.5	2.2	-0.7	-4.3	-9.1	-15.7	-15.7
mean no. of days with air frost	6.8	7.1	5	2.9	0.8	0	0	0	0.1	1.1	3.7	7.3	34.8
mean no. of days with ground frost	13.9	13.6	12.8	10.3	4.6	0.7	0	0	1.1	4.7	8.8	13.8	84.5
Rainfall (mm)													
mean monthly total	65	55.2	51.8	55.3	59.1	65.7	59.4	71.2	61.6	81.6	81.9	75.7	783.5
greatest daily total	30	35.6	34.18	41.54	36	98.48	33.7	36	51.1	86.1	82	46.8	98.48

Casement 1991–2020 averages													
Temperature (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
mean num. of days with >= 0.2mm	17.6	15.8	15.5	14.8	15.4	14.8	16.3	16.8	14.9	16.7	17.8	17.5	193.9
mean num. of days with >= 1.0mm	12.3	11.4	10.2	10.9	10.5	10.1	11.9	11.5	10	12	12.4	13.2	136.4
mean num. of days with >= 5.0mm	4.7	3.4	3.3	3.8	3.6	3.9	3.7	4.5	4.1	4.7	5.1	5.1	49.9
Wind (knots)													
mean monthly speed	12.4	12	11.1	9.5	9	8.4	8.4	8.7	9	10.1	10.9	11.7	10.1
max. gust	80	74	71	59	62	55	45	53	59	64	64	82	82
max. mean 10-minute speed	57	47	47	43	43	41	31	34	41	46	41	54	57
mean num. of days with gales	3.6	2.2	2.4	0.3	0.4	0.1	0.1	0.2	0.5	1.3	1.9	3.1	16
Weather (mean no. of days with...)													
snow or sleet	3.2	3.1	2.2	0.7	0.1	0	0	0	0	0	0.6	2	11.9
snow lying at 0900UTC	1	0.9	0.6	0	0	0	0	0	0	0	0.1	0.7	3.4
hail	1.1	1.8	2.3	2.7	1.5	0.3	0.2	0	0.1	0.1	0.5	0.7	11.3
thunder	0.1	0.1	0.2	0.6	0.8	0.9	1.2	1.1	0.4	0.4	0.1	0	6.1
fog	1.7	1.4	1.8	1.3	1.1	1.1	0.9	1.4	2.6	2.3	1.8	2.2	19.8

Plate 8.1: Casement Aerodrome Windrose 20019 - 2023



8.3.8 Land-Use

Land in the vicinity of the application site consists of agricultural land with livestock grazing being the predominant sector practiced where productive land exists. The application site is bounded to the north, south and east by agricultural land with a local road to the west which the application site gains access off. A number of residential dwellings are located along the local road. Further north (~200m) along the local road to the west, there are a number of housing estates on the outskirts of Abbeyleix.

There are a number of existing sand and gravel pits in the area, the closest one is a small disused pit located approximately 500m to the southeast of the site. This is currently used as a Defence Forces and An Garda Síochána Firing Range.

Abbeyleix Bog is situated to the southwest of the application site and consists of approximately 500 acres of diverse habitats including degraded (but recovering) raised bog, lagg, cutaway, wet carr woodland and meadows.

The existing Booth Precast Products Ltd sand and gravel pit and manufacturing facility is located 1.3km to the south of the site. The closest EPA licensed facility is located approximately 500m to the northwest of the application site. Stonearch previously

manufactured Vitamin K3 for use as a supplement in animal feed until closure in the early 2000s. The facility is still licensed by the EPA (P0332).

8.4 Characteristics of the Development

The application site consists of a greenfield area of 8.5 hectares comprising of several grazing fields with some woodland and scrub in the central area. The applicant proposes to remove the existing woodland, vegetation and overburden and extract the underlying sand and gravel material in line with an eight-phase extraction plan.

It is proposed to construct a berm along the western boundary using overburden and sand and gravel material removed from Phase 1. As extraction proceeds into various phases, overburden removed from the working phase will be used to restore the previous phase where material has been extracted. This will be undertaken on a rolling basis to minimise the uncovered area of the site.

All extracted sand and gravel material from the application site will be transported to the applicants manufacturing facility located approximately 1.3km to the south of the application site.

The proposed development will require the erection of minor infrastructure to include a wheel wash and refuelling area. These facilities will be located close to the entrance to the site. Plant and machinery which will operate at the application site will consist of excavators, road trucks and a water bowser.

The pit will operate between the hours of 0800 to 1800 hours Monday to Saturday (during daylight hours) and will not operate on Sundays or Public Holidays. The maximum rate of extraction will be in the region of 200,000 tonnes/annum; however, this will depend on the demand for material. Therefore, the applicant is seeking a 10-year permission in order to extract the available material taking into account years when the maximum extraction rate will not be achieved. The application site will be landscaped and restored in line with the proposed landscape and restoration plan.

8.5 Impact Assessment

The proposed development will consist of the removal of trees, vegetation and overburden material, construction of a screening berm and minor operational infrastructure and extraction of the available resource. Potential impacts associated with day-to-day activities are assessed under the following headings.

8.5.1 Plant & Vehicle Emissions

The operation of plant and vehicles associated with the removal of vegetation and overburden, extraction, processing and transport of material will generate exhaust

emissions (e.g. $C0_2$ and N_20) which cannot be eliminated as in order for products to be produced, plant and vehicles need to operate. Emissions associated with this activity are assessed as having an imperceptible impact over a long-term period.

The proposed development will result in an overall reduction of emissions associated vehicles transporting materials to and from the manufacturing facility as material will sourced closer to the facility rather than transporting over long distances from pits located at a greater distance away than the application site. Plate 8.2 details the quarries and pits where material is currently sourced from.

Emission factors for laden and unladen HGVs have been sourced from the *2023 CO_2 Emission Factor Source Greenhouse gas reporting: conversion factors for freighting goods* from the UK Department for Energy Security and Net Zero (UK DESN, 2023).

- 100% Laden:0.98496 KgCO_2e per km
- Unladen: 0.6425 KgCO_2e per km

The assumption of one journey being laden and the return being unladen has been applied across the calculations. The total number of trips required and distance to the location has been used alongside the emission factors to calculate the total CO_2e.

Emissions of CO_2e from baselines HGVs are shown in Table 8.5, with the projected HGV CO_2e emissions shown in Table 8.6. Table 8.7 illustrates the change in emissions due to the sourcing of materials from Ballymullen Road rather than other quarries further away. An almost 80% reduction in emissions is estimated.

It is assumed that the energy required to extract the material remains consistent at all quarries and therefore the transport distance is the most significant variable. In addition, a 100% diesel fleet has been assumed in these calculations. Emissions will differ if alternative fuels or electric vehicles are used to transport the loads however the assumption will be that these differences would be consistent across all scenarios. However, there is the potential that the short trip length to Ballymullen Road would make use of electric HGV become more appealing in future as a charging point would be within a short distance and "range anxiety" would not be as great a factor.

Table 8.5: Baseline HGV Transport Emissions

Haul Route	Supplier	Location	Total Loads	Distance km to location	CO_2e 100% Laden of Total Distance Annually (kg)	CO_2e unladen of Total Distance Annually (kg)	Total CO_2e (kg)
A	Lagan	Coolrain	925	24	22	14	36,342
B	Arkil quarries	Allenwood	107	55	5,767	3,762	9,529
C	Carroll quarries	Castletown	259	18	4,516	2,946	7,462
D	Dunphys	Ballacolla	742	10	7,057	4,604	11,661
E	Dowlings	Lisduff	193	29	5,507	3,593	9,099
F	Firoda s&g	Kilkenny	1,186	19	22,560	14,718	37,277
G	Hardings	Kilkenny	-	56	-	-	-
H	Kilkenny block	Freshford	127	35	4,429	2,889	7,318
I	Manor stone	Ballacolla	142	10	1,351	881	2,232
J	O'deas pit	Balllypickas	1,355	5	6,444	4,204	10,647
K	Ramsbottom	Timahoe	548	14	7,818	5,100	12,918
L	Shiels quarries	Shanahoe	389	6	2,466	1,609	4,076
M	Wisely s&g	Mountmellick	38	34	1,265	825	2,090
N	Wholesale supplies	Firoda	261	7	1,862	1,215	3,076
Total			6,272	322.7	93,034	60,695	153,729

Note 1 CO2 Emission Factor Source Greenhouse gas reporting: conversion factors 2023 UK Department for Energy Security and Net Zero (UK DESN, 2023)

Table 8.6: Projected HGV Transport Emissions

Haul Route	Supplier	Location	Total Loads	Distance km to location	CO_2e 100% Laden of Total Distance Annually (kg)	CO_2e unladen of Total Distance Annually (kg)	Annual Total CO_2e (kg)
A	Lagan	Coolrain	-	24.1	-	-	-
B	Arkil quarries	Allenwood	-	54.7	-	-	-
C	Carroll quarries	Castletown	-	17.7	-	-	-
D	Dunphys	Ballacolla	720	9.7	6,848	4,467	11,315
E	Dowlings	Lisduff	-	29.0	-	-	-
F	Firoda s&g	Kilkenny	120	19.3	2,283	1,489	3,772
G	Hardings	Kilkenny	-	56.3	-	-	-
H	Kilkenny block	Freshford	-	35.4	-	-	-
I	Manor stone	Ballacolla	-	9.7	-	-	-
J	O'deas pit	Balllypickas	120	4.8	571	372	943
K	Ramsbottom	Timahoe	-	14.5	-	-	-
L	Shiels quarries	Shanahoe	120	6.4	761	496	1,257
M	Wisely s&g	Mountmellick	-	33.8	-	-	-
N	Wholesale supplies	Firoda	-	7.2	-	-	-
O	Ballymullen road	Ballymullen	5,192	1.6	8,230	5,369	13,599
Total			*6,272*	300.1	18,692	12,194	30,886

Note 1 CO2 Emission Factor Source Greenhouse gas reporting: conversion factors 2023 UK Department for Energy Security and Net Zero (UK DESN, 2023)

Table 8.7: Change in HGV Transport Emissions Annually

Scenario	CO_2e (kg)
Baseline Transport Emissions	153,729
Projected Transport Emissions	30,886
Change	-122,842
% Reduction from Baseline	79.9%

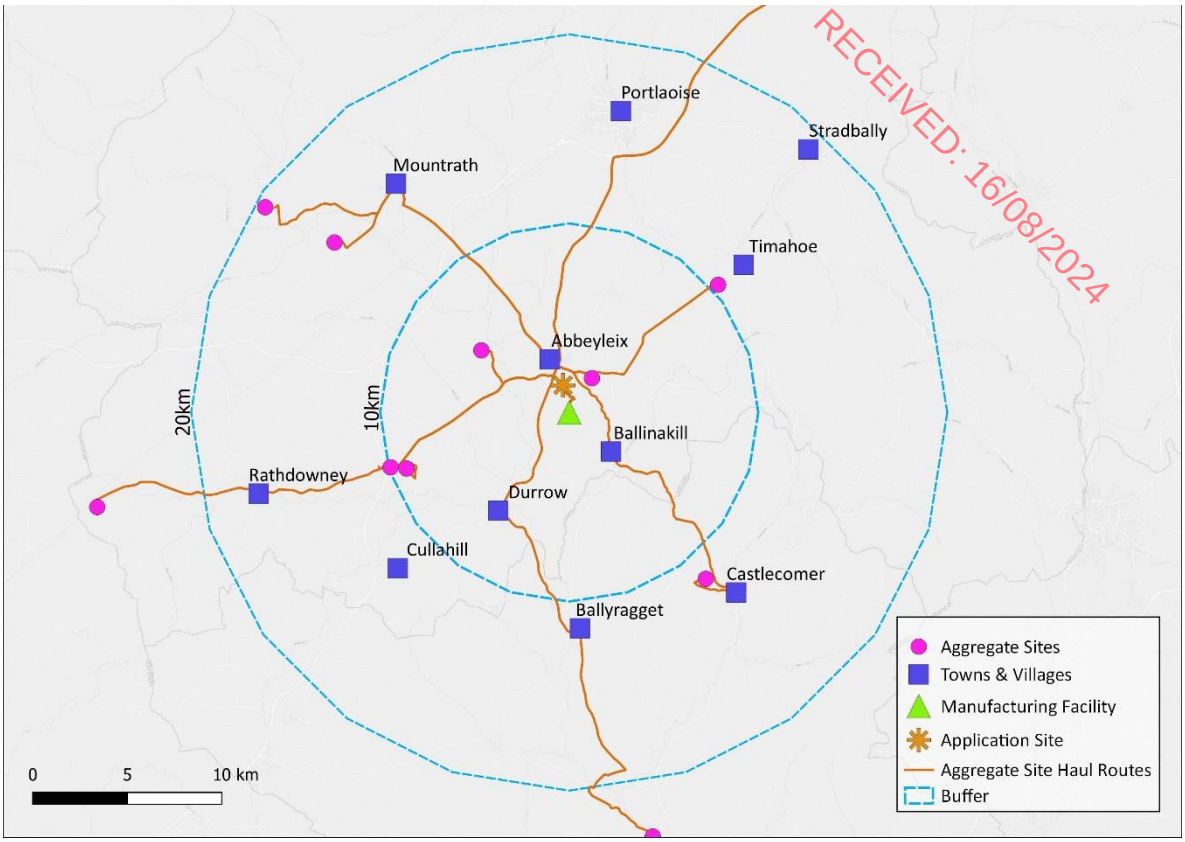


Plate 8.2: Sources Sites.

8.5.2 Unplanned Events

The proposed development must also be assessed in relation to unplanned events in terms of vulnerability to the risks of major accidents and/or disasters which are relevant to the project. The unplanned events in relation to climate which the proposed development could potentially be vulnerable to include flooding, extreme temperatures, storms and high wind events.

Flooding - Extreme rainfall events are becoming frequent and can potentially lead to flooding of low lying areas. It is unlikely that the proposed development will lead to a flood event due to the porous nature of the underlying material which water will percolate through to ground. The extraction of material will result in a reduction in the slope of the ground therefore reducing the potential for run-off. Therefore, the potential effect is assessed as neutral.

Storm Events - Extreme windy conditions could potentially lead to damage to buildings and infrastructure if not structurally sound. The infrastructure proposed will be limited and will be structurally safe with no loose items located on infrastructure or stored in areas around the pit that could be carried by winds. Therefore, the potential effect is assessed as neutral.

Extreme Temperatures – Extreme temperatures particularly freezing temperatures increase the potential for accidental collisions or slips by employees working at the proposed development. All weather warnings issued by the National Meteorological Service will be reviewed to assess driving conditions for vehicles transporting material to the manufacturing facility. The pit will not operate when 'red warning alerts' are issued. Therefore, the potential effect is assessed as neutral.

8.5.3 Cumulative Impact

Other contributors of CO_2 emissions within the study area which are listed in Tables 3.2 and 3.4 of Chapter 3.0 Project Description were assessed in relation to Climate. The main potential cumulative impact would be associated with vehicles using the local road infrastructure, agricultural activity and the Applicant's manufacturing facility located to the south of the application site. Due to the low level of activity the potential cumulative impact is assessed as a medium imperceptible effect.

In addition, in order to facilitate the proposed development, some local road improvement works are required. These will be undertaken in advance of construction commencing at the site.

With respect to the requirement for a cumulative assessment PE-ENV-01105 (TII, 2022b) states that as the sensitive receptor "*for GHG Assessment is the global climate and impacts on the receptor from a project are not geographically constrained, the normal approach for cumulative assessment in EIA is not considered applicable*." However, by presenting the GHG impact of a project in the context of its alignment to Ireland's trajectory of net zero and any sectoral carbon budgets, this assessment demonstrates the potential for the proposed scheme to affect Ireland's ability to meet its national carbon reduction target. Therefore, the assessment approach is considered to be inherently cumulative.

8.5.4 Do-Nothing Effect

If the proposed development is not granted planning permission, the site will continue to be used for agricultural use and material will continue to be sourced from pits and quarries located at a greater distance from the application site.

8.6 Mitigation Measures

The following mitigation measures will be practiced at the proposed development in order to limit the effects of the development on the local and regional climate:

- Strict adherence to 'good site/engineering practices' such as switching off all vehicles and plant when not in use.
- Plant will be serviced regularly to ensure efficient fuel consumption.

- Energy consumption and emission volumes will be considered when purchasing new plant and vehicles.
- It is proposed to implement energy audits in order to assess energy requirements and areas where energy usage can be reduced which will lead to a reduction in greenhouse gas emissions.

8.7 Residual Impacts

No residual impacts are predicted.

8.8 Technical Difficulties

No technical difficulties were encountered.

8.9 References

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