Proposed Derrygreenagh Power Project

Appropriate Assessment Screening Report and Natura Impact Statement

Bord na Móna Powergen Limited

Project number: 60699676

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Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
DRAFT	01 Sept 23	Draft before review and LV	EB	Emma Boston	Principal Ecologist
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1. Introduction

1.1 Background

AECOM was commissioned by Bord na Móna Powergen Limited to carry out a report to inform both the Appropriate Assessment Screening Report (AASR) and Natura Impact Statement (NIS) stages of its proposal to develop Combined Cycle Gas Turbine (CCGT) and Open Cycle Gas Turbine (OCGT) units, electricity grid connection including substations and associated buildings and infrastructure (hereafter referred to as the 'Proposed Development') on lands within a subset of the Derrygreenagh Bog Group in Co. Offaly (within Drumman Bog, Derryarkin Bog, Ballybeg Bog). This report has been prepared to allow the competent authority to reach a conclusion with regard to an Appropriate Assessment that is required under Part XAB of the Planning and Development Acts 2000 (as amended) and under Article 6 (3) of the European Habitats Directive. The location of the Proposed Development is presented in Figure 1.

The first part of the report, the Screening assessment, is undertaken to identify any likely significant effects arising from the Proposed Development on European sites (which comprise Special Areas of Conservation (SACs) and Special Protection Areas (SPAs)). Where likely significant effects from the Proposed Development cannot be excluded, either alone or in-combination with other plans or projects, an Appropriate Assessment will be carried out by the competent authority (i.e., An Bord Pleanála (ABP)), which will be informed by this AASR/NIS, to determine whether the Proposed Development could result in adverse effects on the integrity of any relevant European site, either alone or in-combination with other plans or projects, and in view of the European site's conservation objectives. Where a potential for adverse effects on site integrity is present, this NIS identifies the mitigation measures that will be delivered to protect the integrity of European sites, and the overall coherence of the Natura 2000 network.

This report has been prepared in compliance with Part XAB of the Planning and Development Acts 2000 (as amended), the Planning and Development Regulation 2001 - 2019 and relevant jurisprudence of the European and Irish Courts. It was also prepared in accordance with all relevant guidance including the European Commission's Assessment of plans and projects in relation to Natura 2000 sites - Methodological guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC (EC, 2021), *Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC* (EC, 2018), *the Department of the Environment's Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities* (December 2009, amended 11 February 2010) and OPR Practice Note PN01 (2021).

1.2 Overview of the Proposed Development

This Section provides a description of the Proposed Development.

1.2.1 Description of the Proposed Development

The Proposed Development relates to the components for which planning permission is being sought, which will involve the construction of a thermal power plant comprising separate CCGT and OCGT units, gas Above Ground Installation (AGI) (known as Derrygreenagh AGI), water abstraction and water treatment infrastructure, respective surface and process water discharge connection routes (hereafter Power Plant Area), and a 220 kV substation west of the R400 road, pylon towers, overhead lines, undergrounding compound, underground cabling, associated cabling and connections to a new loop-in 400kV substation site and compound (hereafter Electricity Grid Connection).

Included in the Overall Project is an underground gas pipeline that will connect to the existing high pressure 'Gas Pipeline to the West (BGE/77)' via an Above Ground Installation at the tie-in location on the high pressure line, c. 10km to the northwest of the Power Plant Area (hereafter Gas Connection Corridor). The Gas Connection Corridor is not being applied for in the planning application for the Proposed Development (as it will be applied for by Gas Networks Ireland under separate consenting processes). It is therefore discussed, to the fullest extent possible at this stage, in the 'in combination' section (Section 6 below).

The following terms are used to describe the Proposed Development and its wider project context (including the Overall Project):

- **'Proposed Development'** – relates to the components for which planning permission is being sought (i.e., the 'red line boundary') – this includes the Power Plant Area and Electricity Grid Connection as defined below.

- **'Power Plant Area' –** relates to the main thermal power plant area east of the R400 road, which includes Combined Cycle Gas Turbine (CCGT) and Open Cycle Gas Turbine (OCGT) plant; a gas Above Ground Installation (AGI) ('Derrygreenagh AGI'); water abstraction and water treatment infrastructure; respective surface and process water discharge connection routes; and a permanent peat and spoil deposition area for overburden material excavated from the Power Plant Area. The process water discharge pipe will extend west of the R400 road before ultimate discharge south into the Yellow River.
- **'Electricity Grid Connection'** - this is part of the Proposed Development and will consist of the 220 kV substation west of the R400 road, pylon towers, overhead lines, Line-cable Interface compound, underground cabling, associated cabling and a new loop-in 400kV substation and compound.
- **'Gas Connection Corridor'** - this is part of the Overall Project, as defined below, and will enable the Proposed Development to connect to the existing high pressure Gas Pipeline to the West (BGE/77), north of the Power Plant Area via an AGI at the tie-in location and an underground pipeline. The underground gas connection is not being applied for in the planning application for the Proposed Development (as it will be applied for by Gas Networks Ireland (GNI) under separate consenting processes). However, the Gas Connection Corridor, identified by GNI during the preliminary design stage is assessed in this EIAR as part of the Overall Project for completeness, as it will be integral to the operation of the Proposed Development. The route of the Gas Connection Corridor is the preferred route, as indicated by GNI, at the time of writing but may be subject to change as part of the detailed design process to be carried out.
- **'the Overall Project'** – relates to the Proposed Development (i.e. the components for which planning permission is being sought) and, to ensure a robust environmental assessment, includes the Gas Connection Corridor as described above.

The Proposed Development and Overall Project aims to develop flexible, fully dispatchable gas-fired technology at the site in Derrygreenagh for the production of electrical power for export to the National high voltage transmission grid. This development will support the intermittent nature of renewable energy generation and the security of the electrical grid network by providing for the replacement of older conventional power systems with lower carbon gas-fired technology. The Proposed Development will have capability to operate off renewable gas blends, including biomethane and hydrogen, from supply chains that are expected to be developed in the future, in accordance with the Hydrogen Strategy for Ireland.

<u>The Power Plant Area</u>

The power plant has been designed in accordance with Best Available Techniques (BAT) for Large Combustion Plant (LCP) (Commission Implementing Decision (EU) 2021/2326. The Power Plant Area includes both CCGT and OCGT technology, which will operate primarily off natural gas with dual fuel capability for firing off back-up Secondary Fuel stored onsite.

The OCGT process operates on the Brayton thermodynamic cycle in order to produce electricity. Air for the gas turbine is drawn in from the atmosphere across an intake filter where it enters the compressor. The air is then compressed through a multistage axial flow compressor to the final pressure required for combustion. Upon exiting the compressor, the compressed air enters the combustion chamber where it is mixed with fuel, either natural gas or secondary fuel, and ignited. The energy contained in the fuel-air mixture is released through the process of combustion with the resulting hot combustion gases expanding through a turbine. This provides the mechanical power to drive the turbine compressor section and the attached electrical generator, where it is converted to electrical energy. The exhaust gases exiting the gas turbine are discharged to atmosphere via an exhaust stack. The OCGT plant has been specified to comply with the emissions requirements of the CID (EU) 2021/2326 establishing best available techniques (BAT) for Large Combustion Plant (LCP) Industrial Emissions Directive (IED) without supplemental emissions abatement such as selective catalytic reduction.

The CCGT process consists of two thermodynamic cycles, the Brayton thermodynamic cycle and Rankine cycles working together to produce electricity through a combined cycle. The process will operate off a 'single shaft' arrangement consisting of gas turbine, steam turbine and generator arranged on a single shaft or power train. It is possible to generate approximately 50% more power output through capturing heat from hot exhaust gases (otherwise discharged to atmosphere in the OCGT) to create steam from water in the Heat Recovery Steam Generator (HRSG) to power a steam turbine generator to produce electricity.

The plant units will comply with requirements of CO2 emission limits as detailed in the Electricity Regulation (EU) 2019/943, Article 22 paragraph 4 and the requirements of BAT for LCP (2021/2326/EU) in both OCGT and CCGT plants.

All process wastewater arising from the facility will be collected in the process wastewater tank prior to discharge. The proposed process water discharge pipe will be located to the south-southwest of the Power Plant Area and discharge to the Yellow River. The tank will be an open topped below ground concrete structure. Monitoring and treatment system will be located at ground level adjacent to the tank. The process wastewater tank is provided with a monitoring and treatment system. The discharge pipe is provided with pH, temperature and flow measurements, sampling and injection points and a recirculation loop. Discharge only takes place if the quality of the wastewater is within the Emission Limit Values (ELVs) for the consented discharge point. The process wastewater tank will be sized to allow 24 hours of plant operation without discharge to the Yellow river. It is anticipated that the working volume of the tank will be approximately 500 m³.

Foul water will be treated in a packaged treatment plant and then discharged to the process wastewater plant and then to the consented discharge point on the Yellow river.

Surface water runoff will be generated from all hard-finished surfaces within the power plant site which are exposed to rainwater or to which water is applied for wash down etc. Approximately 1.1ha of the site is expected to drain to the proposed surface water system, while 1.8ha of the site will permeate to ground naturally. The drainage systems are designed in accordance with the Sustainable Urban Drainage System (SUDs) guidance and EN 752 and EN 12056. All surface water arising from hardstanding areas within the power plant site will be collected in an open topped below ground concrete attenuation tank. The attenuation tank working volume will be approximately 6,600 m³. Power Plant Area. Water in the attenuation tank will be pumped to the consented discharge point on the Mongagh River. The discharge flow is monitored and controlled to maintain the rate within the limits specified in the permit.

Electrical Grid Connection

Electrical outputs from generating assets (i.e. OCGT and CCGT plant) will be fed to transformers where the voltage will be stepped up to 220 kV. The power will be transferred via underground cables linking the Power Plant Area (east of R400 road) to the Electricity Grid Connection 220 kV substation (west of the R400 road) via an existing road underpass along the former light railway line.

The Electricity Grid Connection has been designed in accordance with EirGrid Transmission policies and requirements. The connection method is a new 220 kV substation with associated transmission system in the form of a 220 kV double circuit hybrid transmission infrastructure, comprising of c. 5km of overhead line (OHL) and c. 3.3km of underground cable (UGC), which will connect to a new 400 kV substation which will connect into the national grid (400 kV Oldstreet-Woodland overhead transmission line) via a loop-in connection. The proposed 400kV substation will consist of a 4-bay C-type design and is located adjacent to the existing 400 kV Oldstreet-Woodland overhead transmission line. The transfer from OHL to UGC will be facilitated by a line-cable interface compound. The proposed connection method is due to significant suitable aligned with the requirements as set out by EirGrid for the connection point into of the facility to the national grid network (i.e. Oldstreet-Woodland 400 kV).

The overhead line will be carried on ‘double circuit’ 220 kV pylon towers of both intermediate (suspension) and angle (strain) type designs over a c. 5km route from the 220 kV substation in a southern direction to the Line-Cable interface compound through Derryarkin Bog and Ballybeg Bog.

Towers comprise galvanised lattice steel structures characterised by having a circuit (comprising three conductors) arranged in vertical formation on either side of the tower. The conductors are attached to the supporting crossarms by means of electrical insulators. One earth wire is supported on the peak of the tower. The pylon towers will be c. 45m in height.

The 220 kV underground cable will be routed along the existing railway line and machine pass on Bord na Móna lands. The cables will be buried at a depth of c. 1.5m.

1.2.2 Existing Baseline Environment Description

The Proposed Development is located in the townlands of Knockdrin, Derrygreenagh, Derryarkin, Derryiron, Ballybeg, Coolcor, Barrysbrook, Clonin, Togher and Coole.

The Power Plant Area is approximately 5.6 hectares and will be located predominantly on the site of the existing Derrygreenagh Works east of the R400 road. The Power Plant Area sits partially on the site of the existing Derrygreenagh Works (which predominantly comprises existing brownfield land, administration buildings and workshops), with a section of grassy meadows and verges in its southern extent, and areas of cutover bog (Drumman Bog) to the north and southeast. The Electricity Grid Connection is approximately 1.5 hectares in total

and will be located largely to the south of the Power Plant Area, predominantly within the bogs of Derryarkin and Ballybeg. The total area of the Proposed Development (the 'red line' planning application area) is c.308 hectares (See Figure 1).

The cutover bog within Drumman, Derryarkin and Ballybeg bogs are highly degraded, with natural vegetation removed to facilitate peat harvesting, resulting in extensive areas of bare peat. Recolonization by native species is beginning in some areas resulting in a mosaic of habitats including scrub and bog woodland. Wet ditches across the Proposed Development are in, or are likely to be in, hydrological connection with the Mongagh River, Castlejordan River and an unnamed tributary, Yellow River (Castlejordan) and Castletown Tara Stream and Grand Canal).

The surrounding land adjacent to the Proposed Development site primarily comprises cutover bog and agricultural fields, with a small parcel of woodland and some residential properties also being present. A remnant area of relatively intact raised bog is adjacent to the southern end of the Proposed Development, immediately north of the Grand Canal.

1.3 Legislative context

Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, which is more commonly known as the 'Habitats Directive', requires Member States of the European Union (EU) to take measures to maintain or restore, at favourable conservation status, natural habitats and wild species of fauna and flora of Community interest. The provisions of the Habitats Directive require that Member States designate SACs for habitats listed in Annex I and for species listed in Annex II. Similarly, Directive 2009/147/EC on the conservation of wild birds (more commonly known as the 'Birds Directive') provides a framework for the conservation and management of wild birds. It also requires Member States to identify and classify SPAs for rare or vulnerable species listed in Annex I of the Birds Directive, as well as for all regularly occurring migratory species. Collectively, SACs and SPAs are known as 'European sites'.

In Ireland, the habitats and/or species which are the reason(s) for designation of an SAC are referred to as the 'Qualifying Interest(s)' (QI) of that European site. In relation to SPAs, the bird species for which a particular European site is designated are referred to as the 'Special Conservation Interests' (SCI).

Under Article 6(3) of the Habitats Directive, any plan or project which is not directly connected with or necessary to the management of a European site but would be likely to have a significant effect on such a European site, either individually or in combination with other plans or projects, must be subject to an AA of its implications for the SAC / SPA in view of the European site's conservation objectives.

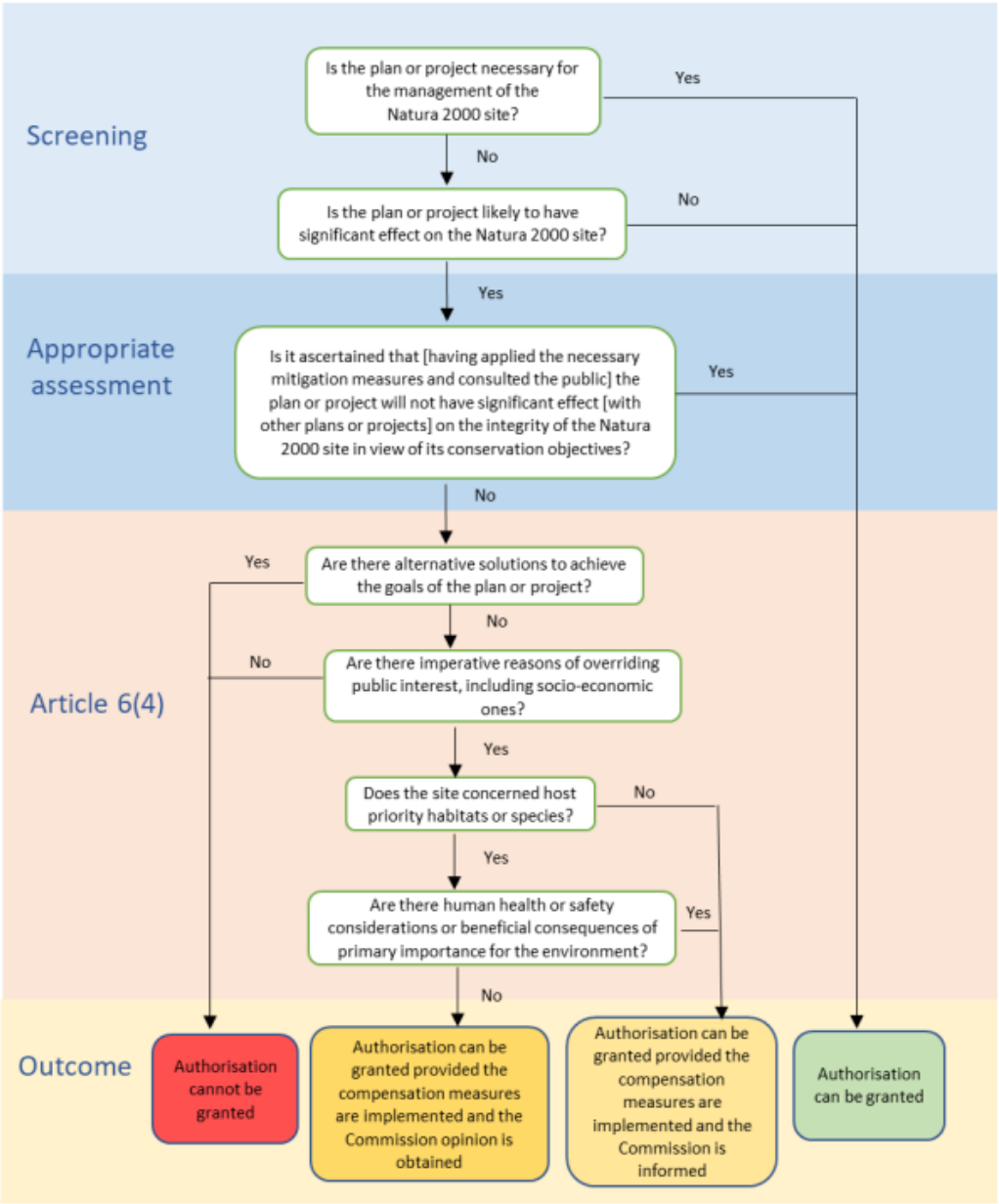
In Ireland, the requirements of Article 6(3) are transposed into national law through Part XAB of the Planning and Development Act 2000 (as amended) (known as the 'PDA') for planning matters, and by the European Communities (Birds and Natural Habitats) Regulations 2011 in relation to other relevant approvals / consents. The legislative provisions for AA for planning applications are set out in Section 177U, Section 181A and Article 250 of the Planning and Development Act 2000 (as amended).

The competent authority, which is responsible for determining decisions regarding AA, is the relevant consenting body for each plan or project, which in this case is Offaly County Council.

1.4 Overview of the Appropriate Assessment Process

The process required by Articles 6(3) and 6(4) of the Habitats Directive for AA is sequential and must be followed in sequence. Diagram 1 outlines the stages of AA according to European Commission (EC) guidance (EC, 2021). The stages are essentially iterative, being revisited as necessary in response to more detailed information, recommendations, and any relevant changes to the plan or project until no significant adverse effects remain.

Diagram 1: The stages of Appropriate Assessment (EC, 2021).



The first step in the sequence of tests is to establish whether an AA is required. This is often referred to as AA 'Screening'. The purpose of AA Screening is to determine, in view of best available scientific knowledge, whether a plan or project, either alone or in combination with other plans or projects, could have likely significant effects on the QI / SCI of a European site. For this purpose and as a result of case law 'likely' means 'possible'.

Section 177(U)(5) of the PDA states: "*The competent authority shall determine that an appropriate assessment of a … proposed development … is required if it cannot be excluded, on the basis of objective information, that the … proposed development, individually or in combination with other plans or projects, will have a significant effect on a European site*".

If the competent authority determines that there are no likely significant effects (including 'in-combination' effects from other plans or projects), then no further assessment is necessary and the plan or project can, subject to any other issues, be taken forward. If, however, the competent authority determines that there are likely significant effects, or if there is reasonable scientific doubt, then an AA must be initiated and a more detailed Stage 2 of Appropriate Assessment process (NIS) must be carried out for 'screened in' impact pathways.

One of the key considerations during the Stage 2 of Appropriate Assessment process (NIS) is whether there is available mitigation that would entirely address potential effects. If adverse effects on integrity will arise even after considering mitigation, then further stages of assessment are required, specifically considering whether there are

less harmful alternatives, Imperative Reasons of Overriding Public Interest why the project should proceed despite the harm it will cause, and appropriate compensation can be delivered.

1.5 Sources of guidance

This AASR/NIS has been prepared in accordance with the European Commission (EC) guidance document 'Assessment of Plans and Projects in relation to Natura 2000 Sites: Methodological Guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive 92/43/EEC' (EC, 2021). In addition, the following sources of guidance have also been considered during the preparation of this Report:

- *Appropriate Assessment of Plans and Projects in Ireland* (DoEHLG, 2010);
- *Appropriate Assessment Screening for Development Management. Office of the Planning Regulator (OPR) Practice Note PN01 (OPR, 2021)*
- *Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC* (EC, 2018); and
- *Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities. Circular Letter NPWS 1/10 & PSSP 2/10* (NPWS, 2010).

1.6 Purpose of this Natura Impact Statement

Whilst the various steps involved in AA must be carried out by a competent authority, the information needed for them to undertake the assessment can be provided by project proponents or their consultants.

Therefore, this AASR/NIS provides the information needed for the competent authority to determine whether the Proposed Development, either alone or in-combination with other plans or projects, could have adverse effects on the integrity of any European sites, also known as Natura 2000 sites, in view of the conservation objectives of any such sites. It is designed to enable the competent authority, to make a decision as to whether the Proposed Development can be consented, subject to other relevant considerations, without the requirement to consider alternative solutions and Imperative Reasons of Overriding Public Interest (IROPI).

1.7 Quality Assurance

This AASR/NIS, and the appraisal described within it, has been completed in accordance with the AECOM Integrated Management System (IMS). Our IMS places emphasis on professionalism, technical excellence, quality, as well as covering health, safety, environment, and sustainability management. All AECOM staff members are committed to maintaining our accreditation to those parts of BS EN ISO 9001:2015 and 14001:2015, as well as BS OHSAS 18001:2007 and ISO 45001:2018 that are relevant to a consultancy service.

The AASR/NIS have been carried out by AECOM ecologists with experience in conducting such appraisals. All are members of the Chartered Institute of Ecology and Environmental Management (CIEEM) at the appropriate grade and adhere to their strict Code of Professional Conduct. This NIS was prepared by Dr Erfan Fadaei and Dr Damiano Weitowitz, reviewed by Dr Emma Boston and Dr Paul Lynas, and verified by Dr James Riley.

Dr Erfan Fadaei BSc (Hons) ACIEEM is a Senior Ecologist with a wealth of experience carrying out a wide range of ecological surveys including bat activity, wintering and breeding bird, badger, pine marten, otter, smooth newt, common lizard, deer, and invasive species. Erfan has undertaken numerous Appropriate Assessments for both public and private sector clients in the UK and the Republic of Ireland, and for a wide range of projects such as power stations, renewable energy parks, reservoirs and residential housing developments.

Dr Damiano Weitowitz is an Associate Member of CIEEM and AECOM Principal Ecologist. Damiano holds a PhD in Ecology from the University of Roehampton, London. He has more than five years of experience in professional consultancy and works as an AA and Habitats Regulations Assessment (HRA; the equivalent to AA in the UK) specialist in AECOM's wider ecology team. Damiano has been preparing AAs and HRAs for a wide range of projects and plans across England, Wales, Scotland and Ireland.

Dr Emma Boston BSc (Hons) MCIEEM MRSB (Principal Ecologist) has over 18 years' experience in research, conservation, and consultancy. She has published 16 peer-reviewed publications from her research conducted across a number of international research institutions. Emma has lectured and delivered training at a range of levels (citizen scientists to graduates). She has experience in a variety of ecological survey methods and has worked independently and as part of a multidisciplinary environmental team as consultant. She has significant experience in project management and the delivery of projects from their development to completion.

Dr Paul Lynas BSc (Hons) MRes CEnv MCIEEM is an Associate Director for Ecology and is an all-round ecologist with over 18 years' professional conservation and consultancy experience and is the immediate past Convener of the Irish Section of CIEEM. He has undertaken numerous flora and fauna assessments for both public and private sector clients, working in multi-disciplinary teams on many large infrastructure and small-scale projects, from roads to data centres to residential developments where he has also worked extensively on Appropriate Assessments throughout.

Dr James Riley CEnv MCIEEM, AECOM is a Technical Director who leads AECOMs Appropriate Assessment business across the UK and Republic of Ireland and holds an honours degree in ecology, a master's degree in crop protection and a doctorate in habitat restoration. He has been working on AA Screening and Appropriate Assessment for twenty years.

2. AASR/NIS Methodology

2.1 Data sources

A desk-based study was carried out to help establish the baseline conditions relevant to the Proposed Development. The following resources were consulted to determine the baseline conditions of the Proposed Development Site and for assessing sensitivities of relevant European sites:

- Environmental Protection Agency (EPA) maps website (https://gis.epa.ie/EPAMaps/) (accessed 10 August 2023);
- National Parks and Wildlife Service (NPWS) Protected Sites in Ireland website (https://www.npws.ie/protected-sites) (accessed 10 August 2023);
- Google maps website (https://maps.google.com/) (accessed 07 July 2023);
- The Status of European Union (EU) Protected Habitats and Species in Ireland (Article 17 Report) (https://www.npws.ie/publications/article-17-reports/article-17-reports-2019) (accessed 10 August 2023);
- National Biodiversity Data Centre (NBDC) (accessed 10 August 2023); and
- Water Framework Directive (WFD) website (https://www.catchments.ie/guide-waterframework-directive/) (accessed 10 August 2023).

Data on QI / SCI species collected in ecological surveys in support of the Ecological Impact Assessment Report (EIAR, Chapter 9, Volume I) was also used. Relevant results pertaining to the Proposed Development are summarised in Appendix B. The non-breeding bird surveys undertaken by BioSphere Environmental Services are appended in Appendix C. The Aquatic Baseline Report produced for the Proposed Development site, including surveys of QI otter, is appended in Appendix D. Air quality modelling data (NOx, ammonia and nitrogen deposition) obtained for the Raheenmore Bog SAC, Split Hills and Long Hill Esker SAC, Lough Ennell SAC, Mount Hevey Bog SAC and Wooddown Bog SAC, are summarised in Appendix E.

2.2 Establishing the Zone of Influence (ZoI)

When seeking to identify relevant European sites, consideration was given to identified impact pathways and the source-pathway-receptor approach, rather than adopting a purely ‘zones’-based approach. The source-pathway-receptor approach is a standard tool in environmental assessment. In order for an effect to occur, all three elements of this mechanism must be in place. The absence or removal of one of the elements of the mechanism means there is no likelihood for an effect to occur. Furthermore, even where an impact is predicted to occur, it may not result in significant effects.

Office of the Planning Regulator Practice Note PN01 (OPR, 2021) and the Department of the Environment, Heritage and Local Government guidance (DoEHLG, 2010) state that European sites with the potential to be affected by a plan or project should be identified taking into consideration the potential for direct, indirect and/or cumulative (in-combination) effects. DoEHLG guidance also states that the specific approach in each case is likely to differ depending on the scale and likely effects of the plan or project. However, it advises that the following sites should generally be included:

- All European sites within or immediately adjacent to the plan or project area;
- All European sites within the likely ‘zone of influence’ of the plan or project; and,
- Adopting the Precautionary Principle (UNESCO, 2005), all European sites for which there is doubt as to whether or not such sites might be significantly affected.

The likely zone of influence (ZoI) of a plan or project is the geographic extent over which significant ecological effects are likely to occur. In the case of projects, the DoEHLG guidance acknowledges that the ZoI must be devised on a case-by-case basis with reference to the following criteria: the nature, size / scale and location of the project, sensitivity of ecological features under consideration, and cumulative effects.

Consideration was given to potential impact sources from the Proposed Development at all stages and pathways to European sites by which effects could arise from these impacts on relevant receptors[1]. The process of

[1] i.e. QI or SCI, or the ecological features or processes which support them.

determining which (if any) European sites are within the potential ZoI of the Proposed Development is a progressive process that effectively 'screens in' European sites if they considered to be within the ZoI for a particular impact. Therefore, all Designated Sites within 15km of the Proposed Development have been considered as a minimum. Any sites greater than 15km away which are hydrologically connected to the Proposed Development have also been considered, as well as those with mobile species as outlined in Section 2.2.1, This process is conducted in Table 3 and undertaken in relation to all impact sources described in Section 2.2.1.

2.2.1 Impact Sources

Several impacts could arise during the construction, operational and decommissioning phases of the Proposed Development. A description of all impact sources identified, and their potential relevance to the QIs / SCIs of European sites, is provided in this section. No consideration has been given to direct habitat loss from a European site as the Proposed Development will involve no works inside any SACs or SPAs.

Loss of functionally linked habitat

Habitat outside European site boundaries that supports the QI / SCI species of a given designated site, is defined as being functionally linked to it. The ruling in the Holohan and Others v An Bord Pleanála (C-461/17) case concluded that the loss of functionally linked habitat could result in significant impacts on the qualifying features of a European site if this prevented the European site from meeting its Conservation Objectives.

By definition, this impact pathway only applies to mobile animal species that routinely move beyond the designated site boundary, such as for foraging. To determine whether habitat is functionally linked to a European site requires detailed study, often including targeted field surveys. For many bird species, the limits of potential functional habitat linkage are defined by the maximum foraging distances travelled by SCIs (more detail on this is published in SNH, 2016). These distances were utilised in identifying SPAs which may be within the ZoI of the Proposed Works. Accordingly, SPAs up to 20km were searched for, as this is given as the largest core foraging range for any species (non-breeding pink-footed goose *Anser brachyrhynchus* and greylag goose *Anser anser*). Furthermore, Natural England have published guidance on the maximum foraging ranges of key bird groups, including species that are SCIs of European sites in Ireland (Knight, 2019).

For other mobile terrestrial, aquatic or amphibious animals for which SACs are designated in Ireland, the following distances were used when searching for European sites which could be impacted by loss of functionally linked habitat:

- otter *Lutra lutra* – studies quoted in Harris and Yalden (2008) suggest that the mean linear range size for four male otters in north-east Scotland was 48km. For one male in Perthshire the maximum range was 39km and for another male in Suffolk the range was also 39km. According to the same source, female otters generally have smaller ranges of between 16-21km. A buffer of 40km was used when searching for SACs designated for otter (but only if direct hydrological linkage to the Proposed Works exist);
- fish species – no set distance is used when considering potential impacts on fish species in functionally linked habitats. Where a direct hydrological link between the Proposed Works and an SAC designated for fish is present, there is a potential for impacting their functionally linked habitat usage.

Water pollution

Construction and operational works have the potential to pollute watercourses and/or waterbodies unless appropriately controlled. These could themselves represent QI of a European site, may be within a European site and support the QI of that site, or may be outside of a European site but be functionally-linked to such a site if used by the qualifying animals. Waterborne pollution may arise through spillages of fuels, oils, chemicals, or other pollutants, or from the uncontrolled released of sediment. Discharges of effluent, which could increase the nutrient levels in the water would also fall under this category of impact. There will be discharge of uncontaminated stormwater run-off and process water to watercourses within and immediately adjacent to the Proposed Development.

Waterborne pollution can degrade habitats and can lead to the direct mortality of QI species such as fish and injury to QI predators including otter and kingfisher. The distance over which such impacts could have effects would depend on the severity of the pollution and the assimilative capacity of the waterbody. However, any European site which has a direct hydrological connection to the Proposed Development, but not including estuarine or marine designations (where a huge dilution effect on any pollution would occur from the massive volume of the sea), is considered to be within the ZoI.

Air pollution

Atmospheric pollution could occur during the construction and decommissioning phases due to the generation of dust or from emissions from construction plant and vehicles, and during the operation phase due to emissions of ammonia (NH_3) and oxides of nitrogen (NO_x) from power plant stacks. As for waterborne pollution, above, airborne pollution could impact on qualifying, supporting or functionally-linked habitats.

Dust generated during construction activities can directly impact vegetation or aquatic environments and can indirectly impact animal species (for example where these habitats are used by them for foraging). Guidance from the Institute for Air Quality Management (IAQM) specifies that during extended periods of dry weather, dust can cover plant foliage and adversely affect photosynthesis or other biological functions. Rainfall can then remove deposited dust and rapidly leach chemicals into the soil (Holman *et al*., 2014). The same guidance advises that consideration should be given to construction-related air quality impacts on nature conservation sites within 50m of works, including any access routes, extending to 500m from the entrance to the construction site.

Vehicles and plant which operate through internal combustion engines emit airborne pollutants. The most important of these for European sites are. At close distances to its source, NO_x may have a directly toxic effect on vegetation at very high concentrations. However, the contribution of NO_x to the total nitrogen (N) deposition to soils is potentially of greater concern. An increase in atmospheric N deposition can, if sufficiently great, enhance soil fertility and lead to eutrophication. This may have adverse effects on community composition and the quality of semi-natural, nitrogen-limited terrestrial and aquatic habitats (e.g. Wolseley *et al.,* 2006; Dijk, 2011, http://www.apis.ac.uk/search-pollutant-impacts).

In addition to contributing to nitrogen deposition alongside NOx, ammonia is also a significant pollutant in itself, and can be toxic to vegetation, particularly lichens and bryophytes. Ammonia emissions originate from agricultural practices[2], with some chemical processes also making notable contributions, but some vehicle exhausts (notably petrol cars) also contribute ammonia at a local scale.

Both the IAQM and the Design Manual for Roads and Bridges (DMRB) advise that such impacts are only likely to extend to a maximum of 200m from a road (or works area), and that air pollution levels fall sharply within the first few tens of metres (Holman *et al*., 2019; Highways England *et al*. 2019). For point sources, NOx and ammonia can both be emitted and can disperse over a considerable distances. In the UK, Environment Agency guidance[3] is for air quality impacts from stack emissions to be assessed on European sites within 10km of the facility (15km for major emitters defined as those with greater than 50 megawatt output). All European sites withing 15km are assessed with regards air quality impacts as a precaution.

According to the World Health Organisation, the critical NOx concentration (critical level) for the protection of vegetation is 30 μgm^{-3}; the threshold for sulphur dioxide is 20 μgm^{-3}, while that for ammonia is 1 μgm^{-3} where lichens and bryophytes are a concern, and 3 μgm^{-3} for all other vegetation. In addition, ecological studies have determined 'critical loads'[4] of atmospheric nitrogen deposition (that is, NOx combined with ammonia NH_3). For nitrogen deposition each habitat has a critical load, expressed in kilograms of nitrogen per hectare per year (kgN/ha/yr). The critical load varies from habitat to habitat. These are presented on www.apis.ac.uk for European sites across the UK and Republic of Ireland. The minimum part of the critical load range is generally used for assessments. In May 2023, critical loads for many habitats were revised downwards. These revised critical loads have been used in the modelling to support this report. Although the critical load and critical level define thresholds below which no adverse effects are likely to occur, guidance (such as that published by Natural England)[5] states that '*An exceedance alone is insufficient to determine the acceptability (or otherwise) of a project'*. Where an exceedance of the Critical Load is expected, it is also necessary to consider whether the forecast dose will be imperceptible. As per paragraph 4.25 of same guidance '*…1% of critical load/level are considered by Natural England's air quality specialists (and by industry, regulators and other statutory nature conservation bodies) to be suitably precautionary, as any emissions below this level are widely considered to be imperceptible…There can therefore be a high degree of confidence in its application to screen for risks of an effect'*. These assessment principles are also used in Republic of Ireland.

Changes to surface water and groundwater hydrology

[2] Pain, B.F.; Weerden, T.J.; Chambers, B.J.; Phillips, V.R.; Jarvis, S.C. 1998. A new inventory for ammonia emissions from U.K. agriculture. Atmospheric Environment 32: 309-313

[3] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

[4] The critical load is the rate of deposition beyond which research indicates that adverse effects can reasonably be expected to occur

[5] http://publications.naturalengland.org.uk/publication/4720542048845824

Changes to surface water hydrology can occur as a result of engineering activities during the construction phase. Abstraction of water (e.g. for use in dust suppression or other construction works) may reduce water levels and flows in local watercourses. These impacts can act on the qualifying habitats or species of European sites if they pass through or occur within the relevant part of the watercourse. Therefore, any European site with direct hydrological connectivity to the Proposed Works could be impacted by changes in surface water hydrology.

Alterations of groundwater conditions can occur due to excavations or the installation of piled structures (for example by interrupting groundwater flows). Guidance published by the Scottish Environment Protection Agency (SEPA) suggests that such activities may impact on groundwater-dependent terrestrial ecosystems (GWDTEs) up to 100m from excavations less than 1m in depth, extending up to 250m for deeper excavations (SEPA, 2017).

Visual, noise and vibration disturbance of QI / SCI species

Construction activities and operational phase maintenance works have the potential to cause disturbance to qualifying animal species. Disturbance can be caused by visual cues (for example by the presence of personnel and plant, or as a result of artificial illumination of habitats), elevated noise levels (particularly irregular noise peaks) and vibration emanating from construction works. This may disturb qualifying species within designated site boundaries and while using functionally linked habitats.

The potential for disturbance to be caused will depend on the type, scale and location of activities, the distribution of ecological receptors, and the species-specific sensitivity to noise and visual disturbance. Where disturbance is caused, it can have various behavioural and physiological impacts on species including increased energy expenditure, reduced feeding time and displacement.

Based on published guidance referenced below, the following distances are used when considering how far construction activities may disturb qualifying species:

- otter – 150m is the guidance published for otter breeding sites (NRA, 2008), reduced to 20m for other resting sites not used for breeding purposes;
- non-breeding waterbirds – the Waterbird Disturbance Mitigation Toolkit provides species-specific information on the sensitivity of several bird species which are qualifying features of SPAs (Cutts *et al.*, 2013). As a precautionary approach, it suggests that visual and noise disturbance of non-breeding waterbirds can occur up to 300m from construction works.

Spread of invasive non-native species (INNS)

Invasive non-native species (INNS) can have detrimental effects on native flora and fauna. Any construction works have the potential to introduce or spread INNS to designated habitats, thereby impacting the faunal and floral community composition of European sites.

When carrying out this report to inform AA Screening, it has been assumed that the spread of INNS could occur where construction works take place up to a distance of 50m from a European site on a precautionary basis, or where there is otherwise a direct hydrological connection between the Proposed Development and a European site.

3. Proposed Development Baseline Information

3.1 European sites

European sites in the ZoI of the Proposed Development (both the Power Plant Area and the Electricity Grid Connection) were determined on an individual basis with cognisance of any potential ecological pathway or hydrological link between the QI habitats/species and/or SCI species. All Designated Sites within 15km of the Proposed Development have been considered at a minimum. Any sites greater than 15km away which are hydrologically connected to the Proposed Development have also been considered, as well as those with mobile species such as birds or otter. The following European sites are considered to be within the ZoI of the Proposed Development:

- Lough Ennell SAC;
- Lough Ennell SPA;
- Raheenmore Bog SAC;
- Split Hills and Long Hill Esker SAC;
- Mount Hevey Bog SAC;
- Wooddown Bog SAC;
- River Boyne and River Blackwater SAC;
- River Boyne and River Blackwater SPA;

European sites are considered to lie within the ZoI of the Proposed Development either due to proximity, hydrological linkage or potential ecological pathways linking to the QIs / SCIs. An overview of these European sites is provided in Table 1 and Table 2 and further background is provided in the following text. The Screening assessment of scoped in European sites is undertaken in Section 4, and a more detailed NIS carried out in Section 5 (where relevant). The locations of these European sites relative to the Proposed Development is presented in Figure 1 & 2 (Appendix A).

Table 1: Establishing the ZoI of the Proposed Development.

European site name and code	QI / SCI	Potential linking impact pathways	Approximate distance from the Proposed Development
Lough Ennell SAC [000685]	• Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. [3140] • Alkaline fens [7230]	While the site is sensitive to waterborne pollution, there is no direct hydrological linkage with the Power Plant Area. Not inside its ZoI for water pollution. Pollution-sensitive habitats are present. Lies within the ZoI for atmospheric pollutants released from the operational stack.	10.2km northwest
Lough Ennell SPA [004044]	• Pochard *Aythya ferina* [A059] • Tufted duck *Aythya fuligula* [A061] • Coot *Fulica atra* [A125] • Wetland and Waterbirds [A999]	While the site is sensitive to waterborne pollution, there is no direct hydrological linkage with the Power Plant Area. Not inside its ZoI for water pollution. While the SPA lies too far from the Power Plant Area for direct visual / noise disturbance impacts in the construction / operational / decommissioning phases, SCI species in functionally linked habitats could be impacted by such disturbance. SCI species are mobile and rely on functionally linked habitats beyond the designated site boundary. Any natural habitat within the Power Plant Area that is developed in the construction phase has the potential to result in the loss of functionally linked habitat. Species with indirect sensitivity to atmospheric pollution are present. Lies within the potential ZoI for atmospheric pollutants released from the operational stack, as well as the ZoI for dust deposition in construction / decommissioning phases (to functionally linked habitats).	10.8km northwest
Raheenmore Bog SAC [000582]	• Active raised bogs [7110] • Degraded raised bogs still capable of natural regeneration [7120] • Depressions on peat substrates of the *Rhynchosporion* [7150]	Pollution-sensitive habitats are present. Lies within the ZoI for atmospheric pollutants released from the operational stack.	7.1km southwest
Split Hills and Long Hill Esker SAC [001831]	• Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210]	Pollution-sensitive habitats are present. Lies within the ZoI for atmospheric pollutants released from the operational stack.	11.1km southwest
Mount Hevey Bog SAC [002342]	• Active raised bogs [7110] • Degraded raised bogs still capable of natural regeneration [7120] • Depressions on peat substrates of the *Rhynchosporion* [7150]	Pollution-sensitive habitats are present. Lies within the ZoI for atmospheric pollutants released from the operational stack.	13.9km northeast
Wooddown Bog SAC [0002205]	• Degraded raised bogs still capable of natural regeneration [7120]	Pollution-sensitive habitats are present. Lies within the ZoI for atmospheric pollutants released from the operational stack.	15km north

European site name and code	QI / SCI	Potential linking impact pathways	Approximate distance from the Proposed Development
River Boyne and River Blackwater SAC [002299]	• Alkaline fens [7230] • Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] • River lamprey *Lampetra fluviatilis* [1099] • Salmon *Salmo salar* [1106] • Otter *Lutra lutra* [1355]	The QI habitats and species are sensitive to waterborne pollution and spread of INNS arising in the construction and decommissioning phases (both within the designated site and functionally linked habitats). There is a direct hydrological link between the Power Plant Area and the SAC. While the SAC lies too far from the Power Plant Area for direct visual / noise / vibration disturbance impacts in the construction / operational / decommissioning phases, QI species utilising functionally linked habitats could be subject to such disturbance. Pollution-sensitive habitats and species with indirect sensitivity are present. Lies within the potential ZoI for atmospheric pollutants released from the operational stack, as well as the ZoI for dust deposition in construction / decommissioning phases (to functionally linked habitats).	16.6km northeast, >25km downstream
River Boyne and River Blackwater SPA [004263]	• Kingfisher *Alcedo atthis* [A229]	The SCI species is indirectly sensitive to waterborne pollution arising in the construction and decommissioning phases (both within the designated site and functionally linked habitats). There is a direct hydrological link between the Power Plant Area and the SPA.	16.6km northeast, >25km downstream

Table 2: Establishing the ZoI of the Electricity Grid Connection

European site name and code	QI / SCI	Potential linking impact pathways	Approximate distance from the Proposed Development
Lough Ennell SPA [004044]		While the SPA lies too far from the Power Plant Area for direct visual / noise disturbance impacts in the construction / operational / decommissioning phases, SCI species in functionally linked habitats could be impacted by such disturbance. Species with indirect sensitivity to atmospheric pollution are present. Lies within the potential ZoI for dust deposition in construction / operational / decommissioning phases (to functionally linked habitats). Mobile SCI species from the Lough Ennell SPA may routinely use functionally linked habitats around the Electricity Grid Connection for foraging, preening and loafing. SCIs foraging in the vicinity of or traversing the Electricity Grid Connection are at risk of mortality from collision with powerlines.	11.1km northwest
River Boyne and River Blackwater SAC [002299]	See summary of QI habitats / species and SCI species above, where relevant.	The QI habitats and species are sensitive to waterborne pollution and spread of INNS arising in the construction and decommissioning phases (both within the designated site and functionally linked habitats). There is a direct hydrological link between the Electricity Grid Connection and the SAC.	17.3km northeast, >25km downstream

European site name and code	QI / SCI	Potential linking impact pathways	Approximate distance from the Proposed Development
		While the SAC lies too far from the Electricity Grid Connection for direct visual / noise / vibration disturbance impacts in the construction / operational / decommissioning phases, QI species utilising functionally linked habitats could be subject to such disturbance. Species with indirect sensitivity to atmospheric pollution are present. Lies within the potential ZoI for dust deposition in construction / operational / decommissioning phases (to functionally linked habitats).	
River Boyne and River Blackwater SPA [004263]		The SCI species is indirectly sensitive to waterborne pollution arising in the construction and decommissioning phases (both within the designated site and functionally linked habitats). There is a direct hydrological link between the Electricity Gird Connection and the SPA.	17.3km northeast, >25km downstream

3.1.1 Lough Ennell SAC

Lough Ennell is a large, limestone lake with oligo-mesotrophic water, located 3 km south of Mullingar in Co. Westmeath. Much of the lake is shallow with a marl deposit. The River Brosna flows into the lake from the north at Butler's Bridge, and out from the south. Lough Ennell is a very good example of a marl lake with stonewort and cyanobacterial crust vegetation. A total of 13 stonewort species have been recorded, including two Red Data Book species (NPWS, 2021a). The lake supports a rich variety of invertebrate species, and its lakeshore habitats which include alkaline fen, an Annex I habitat, support a diverse flora.

The conservation objectives are to maintain the favourable conservation condition of alkaline fens and hard water lakes.

3.1.2 Lough Ennell SPA

Lough Ennell SPA is a large limestone lake approximately 6.5 km long and 2 km wide. The lake is of special conservation interest for pochard *Aythya ferina*, tufted duck *Aythya fuligula*, and coot *Fulica atra*, and wetland habitats. Lough Ennell is one of the most important Midland lakes for wintering migratory waterfowl, with nationally important populations of pochard (738), tufted duck (1,303) and coot (433). The population of tufted duck represents over 3% of the all-Ireland population. The site is also utilised by an internationally important population of non-migratory mute swan (340). Other species which occur include golden plover (1,000 in 1998/99), lapwing (673), mallard (93), little grebe (30), great crested grebe (24) and goldeneye (22). The conservation objectives are to maintain the favourable conservation condition of the three SCI species measured through populations trends and distribution.

3.1.3 Raheenmore Bog SAC

Raheenmore Bog SAC is a raised bog in a small basin in the catchment of the Brosna and Boyne rivers, situated about 5 km from Daingean in Co. Offaly. The bog has a well-developed hummock and hollow system with very deep peat, up to 15 m in places (NPWS, 2013a). Raheenmore Bog contains a relatively large wet central core of active raised bog, with very good cover of *Sphagnum* moss across the bog. Pools are well-represented, with the pool edges and wet lawns with well-developed *Rhynchosporion* habitat. Degraded raised bog dominates the marginal areas of the uncut high bog where drainage effects are most pronounced. The vegetation of these degraded areas is still dominated by species typical of intact raised bog, but tends to be less species-rich and *Sphagnum* cover is usually below 25%.

The conservation objectives for the SAC are to restore the favourable conservation condition of active raised bog and to increase the cover of this habitat from 52.3 ha to 70 ha; and re-establish the peat-forming capability of the degraded raised bog.

3.1.4 Split Hills and Long Hill Esker SAC

Split Hills and Long Hill Esker is a 5 km long site which crosses the main Galway to Dublin Road between Kilbeggan and Tyrrellspass in Co. Westmeath. It is a prominent feature on the local landscape. Split Hill and Long Hill Esker is one of the finest and longest wooded eskers in the country (NPWS, 2013b). It is also one of the few woodlands in the area and a fine geomorphological feature of great scenic value. The trees are particularly well-grown and impressive, and much of the woodland has developed naturally on its steep slopes. The presence of a species-rich ground flora, which includes the rare and legally protected narrow-leaved bitter-cress *Cardamine impatiens* at its only known Irish location, makes this site of great botanical and ecological importance. The site also supports some excellent examples of calcareous grassland which is rich in orchids. The increasing rarity of this habitat (due to agricultural intensification) is recognised in that it is awarded priority status on Annex I of the E.U. Habitats Directive.

The conservation objectives of the SAC are to restore the favourable conservation condition of semi-natural dry grasslands and scrubland facies on calcareous substrates.

3.1.5 Mount Hevey Bog SAC

The SAC comprises a long narrow bog separated into four sub-sections including both areas of high bog and cutover bog. The site supports a good diversity of raised bog microhabitats, including hummock/hollow complexes, pools, flushes and regenerating cutover, as well as a number of scarce plant species. The larger eastern section supports a wet quaking area with hummock / hollows and pool complex, and hummock / hollow complex also occurs in the south-west and north-west lobes of the site. An infilled lake is now a soak system. There is abandoned cutover bog all around the bog and particularly on the western section. There are some wet and actively

regenerating areas of the cutover along the southern margins of the western lobe and along the railway (NPWS, 2014b).

The conservation objectives for the SAC are to restore the favourable conservation condition of active raised bog and to increase the cover of this habitat from 60 ha to 77.8 ha; and re-establish the peat-forming capability of the degraded raised bog.

3.1.6 Wooddown Bog SAC

The site is part of a larger raised bog system that has developed in a topographic basin, and the SAC itself includes both areas of raised bog and cutover bog. Until recently, most of the high bog was covered by coniferous forestry, which has now been cleared and former drainage blocked up. However, the SAC is designated as Degraded Raised Bog due to the former drainage which has led to an absence of pools and a reduction in the cover of *Sphagnum.* Since management has been implemented, raised bog vegetation has returned to the high bog, and it is anticipated that the wettest areas will be restored to active bog in 20 years (NPWS, 2016b).

The conservation objectives for the SAC are to restore the favourable conservation condition of the degraded raised bog.

3.1.7 River Boyne and River Blackwater SAC

This site comprises the freshwater element of the River Boyne as far as the Boyne Aqueduct, the Blackwater as far as Lough Ramor and the Boyne tributaries including the Deel, Stoneyford and Tremblestown Rivers. The main areas of alkaline fen in this site are concentrated in the vicinity of Lough Shesk, Freehan Lough and Newtown Lough. Wet woodland fringes many stretches of the Boyne. Atlantic salmon use the tributaries and headwaters of the Boyne as spawning grounds. River lamprey are present in the lower reaches of the Boyne River, while otter can be found throughout the site.

The conservation objectives for the SAC are to restore the favourable conservation condition a particular habitat or species at the site.

3.1.8 River Boyne and River Blackwater SPA

The River Boyne and River Blackwater SPA is a long, linear site that comprises stretches of the River Boyne and River Blackwater and several of their tributaries; most of the site is in Co. Meath, but it also extends into counties Cavan, Louth and Westmeath. The SPA is designated for kingfisher, of which there were 19 pairs recorded in 2010 (NPWS, 2010b).

The conservation objectives are to maintain the favourable conservation condition of kingfisher measured through populations trends and distribution.

3.2 Terrestrial QI and SCI species

3.2.1 Birds

Following a desktop data search, the National Biodiversity Data Centre (NBDC) provided single record of tufted duck was recorded from within a 2km buffer of the Power Plant Area and Electricity Grid Connection, which is a Special Conservation Interest (SCI) of Lough Ennell SPA, see Table 3.

Table 3: Notable species records returned by NBDC data search within 2km of the Proposed Development (Power Plant Area and the Electricity Grid Connection).

Common name	Scientific name	Number of records
Tufted duck	*Aythya fuligula*	1

The habitats within the Proposed Development site and wider survey area are suitable for supporting a range of wintering waterbirds. Peak counts of 68 and 77 tufted duck were recorded at ponds in Derryarkin Bog to the south of the Power Plant Area and within the Electricity Grid Connection. Peak counts of 140 and 163 tufted duck were recorded at Drumman Bog to the north of the Power Plant Area. A pair of coot bred successfully at Derryarkin quarry pond in 2021 and 2022.

While only a pair of coot were recorded, the numbers of tufted duck within the Proposed Development site at Derryarkin Bog were compared to the mean peak count of Lough Ennell SPA (1303), which represents over 3% of

the all-Ireland population. The Derryarkin Bog count is the equivalent of approximately 5% of the SPA population, and 0.18% of the all-Ireland population. However, tufted duck is a common and widespread species in Ireland, not restricted to SPAs, and therefore there are many locations where tufted duck may be found that are not functionally-linked to Lough Ennel SPA.

3.2.2 Otter

Three records of otter were returned by the NBDC database search within 2km of the Power Plant Area, and fourteen within 2km of the Electricity Grid Connection during the desktop search.

No signs of otter were identified within 150m of the Power Plant Area. The nearest otter evidence identified to the Power Plant Area was an otter spraint, recorded incidentally approximately 0.9km to the northwest of the Power Plant Area on the Mongagh River.

Suitable habitat for otter was identified along the Yellow River which intersects with the Electricity Grid Connection, and the Grand Canal, which is located 65m to the south. Small streams and ditches are found within the Electricity Grid Connection Site are also suitable for commuting and foraging otter, however, the only evidence of otter found was an otter spraint at a culvert crossing the Yellow River (ITM 649643, 736505), and a potential holt at the top of a peaty embankment adjoining a pipe culvert on the Coolcor Stream (ITM 650601, 733322), c. 9m outside the Electricity Grid Connection area.

The Mongagh River/Castlejordan River and Yellow River have a direct hydrological links to the River Boyne and River Blackwater SAC, for which otter is a Qualifying Interest (QI) species.

4. Appropriate Assessment (AA) Screening

4.1 AA Screening assessment

The screening exercise set out in Table 4 and 5 initially considers all possible impact source types and their applicability to the Power Plant Area, and the Electricity Grid Connection respectively. For applicable impact source types, it then considered whether a pathway for an effect on European sites exists and the nature of any effect (if any) on relevant receptors (comprising QI, SCI or the ecological features/processes supporting them for which an impact pathway exists). This effectively establishes the ZoI of the Proposed Development for each impact source, and any European sites (if any) within the ZoI are stated. In assessing the potential for the Proposed Development to result in a significant effect on any European sites, any measures that avoid or reduce the harmful effects of the project on European sites are not taken into account at AA Screening stage.

The construction, operational and decommissioning phases of the Proposed Development have been considered here. Impacts associated with the decommissioning stage (i.e. demolition noise, traffic movements and water quality impacts) for the Power Plant Area are considered to be the same as the construction stage on a highly precautionary basis as the duration and magnitude of the decommissioning phase is likely to be significantly less than the construction phase. The impacts associated with the construction and decommissioning phase of the Power Plant Area have therefore been covered together in Table 4. The only impact that would arise during construction but not decommissioning is loss of functionally linked habitat.

The Electricity Grid Connection will be managed by the transmission asset operators (TAO) and transmission service operators (TSO) (ESBN and EirGrid for electricity) as part of the national grid electricity. Upon decommissioning of the Power Plant Area, the 220 kV substation and 400 kV substation and associated transmission infrastructure will remain in-situ and form part of the national grid infrastructure. The impacts associated with the construction and operation phase are covered in Table 5. There will be no decommissioning phase emissions associated with the Electricity Grid Connection.

Table 4: AA Screening assessment of impact pathways linking to European sites – Power Plant Area.

Potential impact source	Pathway to European site(s)	Potential for effect(s) on receptors* in European sites	European sites screened in for detailed NIS
Construction and/or decommissioning phases			
Waterborne pollution impacts on QI habitats, or supporting habitats, of QI / SCI species.	The Power Plant Area is hydrologically linked with the River Boyne and River Blackwater SAC / SPA via the River Castlejordan and River Boyne (flow distance of over 25km). There are no hydrological links to the Lough Ennell SAC / SPA. Deposition or spillage of soils, sediments, oils, fuels, or other construction chemicals / wastewater during construction or decommissioning could enter watercourses which eventually flow into the designated sites. SACs and SPA. Likewise, mobilisation of contamination following disturbance of existing contaminated ground, or sediments, or uncontrolled site run-off could also eventually reach the European sites.	<u>River Boyne and River Blackwater SAC</u> Waterborne pollution is the primary impact pathway associated with the Power Plant Area of the Proposed Development. Excavation works have the potential to release soil / sediment into watercourses and trigger potential knock-on impacts in hydrologically connected European sites. Furthermore, construction works are generally associated with the risk of toxic and non-toxic water pollution, such as those arising from fuel / oil spills, runoff from laydown areas and others. Pollutants and sediment in runoff may affect the water environment through changes to water quality, smothering of riverbeds, plants and habitats, and causing physical and physiological adverse impacts on aquatic organisms (such as abrasion and irritation). Contamination from metals, oils, fuels and construction materials could have lethal and sub-lethal effects on aquatic organisms and impact water pH which may affect habitats such as alkaline fens. While the River Boyne and River Blackwater SAC / SPA lies a relatively long distance from the Power Plant Area, there is a direct hydrological connection via the River Castlejordan (situated to the north-east) and River Boyne. **Despite the relatively long flow distance between the Power Plant Area and the River Boyne and River Blackwater SAC, potential water quality impacts are screened into the more detailed Stage 2 of Appropriate Assessment (NIS).** <u>River Boyne and River Blackwater SPA</u> The River Boyne and River Blackwater SPA is designated for QI kingfisher. These birds forage on various species of small fish (stickleback, minnow, chub) in slow-moving, clear rivers. **Despite the relatively long flow distance between the Power Plant Area and the River Boyne and River Blackwater SPA, potential water quality impacts are screened into the more detailed Stage 2 of Appropriate Assessment (NIS) on a precautionary basis.**	• River Boyne and River Blackwater SAC • River Boyne and River Blackwater SPA
Disturbance of QI or SCI species as a result of increased noise, artificial lighting and/or the increased presence of personnel, plant and machinery both in designated site boundaries	The Lough Ennell SPA is deemed to lie well beyond the distance at which construction or decommissioning-related disturbance would be expected to impact its SCI species. However, tufted duck, a mobile SCI species has been recorded in significant numbers in the bogs adjacent to the Proposed Development and may be	<u>Lough Ennell SPA</u> Due to the distance of over 10km from the Power Plant Area to the Lough Ennell SPA, there is no potential for visual and noise disturbance of QI species within the designated site boundary. There is suitable habitat for SCI birds within the cutover bog opposite the Power Plant Area and peak counts of 77 and 68 tufted duck were recorded in Derryarkin Bog. However, most of the bog will remain physically undisturbed by construction / decommissioning disturbance. Using a 300m	• River Boyne and River Blackwater SAC

Potential impact source	Pathway to European site(s)	Potential for effect(s) on receptors* in European sites	European sites screened in for detailed NIS
and functionally linked habitats	impacted by construction activities in the Power Plant Area. Watercourses connecting the Power Plant Area to River Boyne and River Blackwater SAC, which may be used by commuting and foraging otter.	disturbance buffer, it is estimated that the maximum approximate area of Derryarkin Bog temporarily unavailable to SCI species would equate to 40ha. Approximately 240ha of wetland habitat in the bog would remain undisturbed, with additional habitat being available in surrounding bogs (e.g. Ballybeg Bog). Overall, even if small numbers of tufted duck were disturbed in and displaced from the vicinity of the Power Plant Area by construction works, large areas of bog would remain available and there are numerous alternative lakes and ponds in the surrounding landscape which provide adequate support for this species. This should also be set into context of the likely foraging distance of tufted duck, and thus the likelihood of tufted duck recorded on the bog being part of the Lough Ennell SPA population. Although a 20km zone of influence was used to identify SPAs requiring consideration, this was based on those bird species which travel furthest to forage or roost; most waterfowl and waders, including tufted duck, will travel much smaller distances from their core areas to roost or feed at night or high tide, typically 500m to 2km. Tufted duck is a common and widespread species in Ireland that is not only associated with SPAs. Overall, therefore, it is concluded that works in the Power Plant Area will not result in LSEs on the Lough Ennell SPA regarding visual and noise disturbance. <u>River Boyne and River Blackwater SAC</u> Disturbance to the River Boyne and River Blackwater SAC itself can be excluded due to the distance to the Power Plant Area (over 25km). However, the SAC is designated for mobile QI species, including river lamprey, Atlantic salmon and otter. These species depend on functionally linked waterbodies beyond the SAC boundary. However, the closest waterbody to the Power Plant Area is the Mongagh/Castlejordan River (where the discharge pipe will be located). The level of construction related noise at this point is expected to be minimal meaning that there is little potential for disturbance impacts (noise, visual, vibration) to river lamprey and Atlantic salmon. Otter, which have extensive home ranges, are likely to commute along and forage within the watercourses for which the discharge pipeline from the Power Plant Area will be located. **Therefore, potential temporary disturbance impacts on QI otter are screened into the more detailed Stage 2 of Appropriate Assessment (NIS) on a precautionary basis.**	
Loss of functionally linked habitats	The integrity of all European sites designated for SCI bird species is partially reliant on functionally linked habitats that lie outside the designated site boundary. Any risk of functionally linked habitat loss is highest where greenfield sites are converted to development. The dependence of different bird species on functionally linked habitats varies considerably, generally being most prominent for certain swan and goose species. Formal guidance on the maximum foraging ranges of birds is available from Natural England and NatureScot. Generally, a land	<u>Lough Ennell SPA</u> The Lough Ennell SPA is designated for a range of mobile SCI species, namely pochard, tufted duck and coot. All bird species may routinely travel beyond designated site boundaries for essential activities, including foraging, roosting, loafing and preening. Maintaining an adequate supply of functionally linked habitats is critical for the SCIs in the Lough Ennell SPA and this impact pathway requires closer inspection with regard to the Proposed Development. At its closest point, the Proposed Development lies approx. 10.8km from the SPA. According to the best available guidance (produced by Natural England, although	None.

Potential impact source	Pathway to European site(s)	Potential for effect(s) on receptors* in European sites	European sites screened in for detailed NIS
	parcels or waterbody is considered to be functionally linked to a European site where it supports at least 1% of the qualifying population of a given SCI. The proportion is set so low to capture the need to consider 'in combination' effects i.e. multiple parcels that support relatively few birds collectively supporting a high proportion of the SPA population.	the behaviour of the same species in Ireland is not expected to be significantly different), all wintering birds (except for wintering waders, grazing wildfowl, wigeon and geese) typically forage or roost within 500m to 2km of their core areas (e.g. the SPA). This indicates strongly that the tufted duck recorded within the proximity of the Power Plant Area are very unlikely to be part of the qualifying population of the SPA (over 10km away). As highlighted in the Environmental Impact Assessment Report (EIAR), the Power Plant Area is of limited suitability for wintering birds, with only occasional overflight being recorded. Data provided by the NBDC only indicates one record of tufted duck within 2km of the Power Plant Area. Furthermore, any functionally linked habitat loss should also be put in context of the frequent availability of suitable habitats in the wider area surrounding the Proposed Development. There are numerous undisturbed lakes and ponds in the bog landscape, which will continue to provide suitable supporting habitat for SCI birds.	
Airborne pollution impacts on QI habitats, or supporting habitats, of QI / SCI species.	Dust impacts from construction are not significant beyond a short distance, hence construction / decommissioning dust assessment for ecological receptors is recommended to extend to 50m from a development site and to 50m from roads used by construction vehicles (for roads up to 500m from the development site) (IAQM, 2014). Gaseous vehicle emissions (in this case from construction vehicles, and in particular oxides of nitrogen (NO_X)) are insignificant beyond 200m from the roadside, dropping to immaterial concentrations beyond this distance (IAQM, 2020).	There is no potential for direct impacts on European sites as none are located within the 50m screening distance for dust impacts or the 200m screening distance from roads to be used by construction traffic. <u>Lough Ennell SPA</u> The habitats within and immediately surrounding the Power Plant Area that could support SCI species are not sensitive to dust or other airborne pollutants in such a way that they would become unsuitable for these species. <u>River Boyne and River Blackwater SAC</u> None of the waterbodies in close proximity to the Power Plant Area (e.g. the River Castlejordan) that are in hydrological connectivity with the River Boyne and River Blackwater SAC, and are potential functionally linked habitat for QI species, lie within the relevant 50m screening distance from the Power Plant Area for negative dust impacts.	None.
Spread of invasive non-native species (INNS).	Watercourses	Any construction activities have the potential to facilitate the dispersal of INNS through the introduction of seeds and plant fragments transported by construction machinery and clothing / footwear of construction workers. **Given the proximity of construction works to watercourses, including the location of the discharge pipe into the Mongagh/Castlejordan River which are upstream of European sites, the risk of INNS introduction cannot be excluded.**	• River Boyne and River Blackwater SAC • River Boyne and River Blackwater SPA
Operational phase			
Disturbance of QI or SCI species as a result of increased visual and noise disturbance, use of artificial	The Lough Ennell SPA is deemed to lie well beyond the distance at which construction-related disturbance would be expected to impact its SCI species. However, tufted duck, a mobile SCI species has been recorded in bogs	<u>Lough Ennell SPA</u> As highlighted previously, there is only a potential for visual and noise disturbance to the SPA, where tufted duck, pochard and coot utilise functionally linked habitats opposite the Power Plant Area. However, compared to the construction phase, the	None.

Potential impact source	Pathway to European site(s)	Potential for effect(s) on receptors* in European sites	European sites screened in for detailed NIS
lighting and/or the increased presence of personnel, plant and machinery both in designated site boundaries and functionally linked habitats	adjacent to the Proposed Development and may be impacted by construction activities in the Power Plant Area. Watercourses connecting the Power Plant Area to River Boyne and River Blackwater SAC, which may be used by commuting and foraging otter.	limited use of machinery and number of personnel required in the operational phase, reduce any disturbance potential further. Furthermore, the Power Plant Area is likely to be well beyond the core foraging range for birds from the SPA, such that it is unlikely that any tufted duck recorded at the bog are part of the SPA population (as this is a common and widespread species of waterfowl, not just found in SPAs but across waterbodies in Ireland), and there are many alternative waterbodies in the wider geographic area. <u>River Boyne and River Blackwater SAC</u> Disturbance to the River Boyne and River Blackwater SAC itself can be excluded due to the distance to the Power Plant Area (over 25km). However, the SAC is designated for mobile QI species, including river lamprey, Atlantic salmon and otter. These species depend on functionally linked waterbodies beyond the SAC boundary. However, the closest waterbody to the Power Plant Area is the Mongagh/Castlejordan River at approx. 530m distance from the main power plant, where the discharge pipe will be located, meaning that there is no potential for disturbance impacts (noise, visual, vibration) to river lamprey and Atlantic salmon from plant operations. Otter may commute and forage along nearby watercourses, but at this distance there is no potential for impact. Furthermore, will be carried out during the day, when otter are likely to be least active, further limiting any disturbance potential.	
Waterborne pollution impacts on QI habitats, or supporting habitats, of QI / SCI species.	The Power Plant Area is hydrologically linked with the River Boyne and River Blackwater SAC / SPA via the River Castlejordan and RiverBoyne (flow distance of over 25km). There are no hydrological links to the Lough Ennell SAC / SPA. Pollutants in surface water runoff could enter watercourses which adjoin the Power Plant Area, eventually reaching the SAC and SPA.	<u>River Boyne and River Blackwater SAC</u> On a precautionary basis there is potential for operational waterborne pollution generated in the Power Plant Area of the Proposed Development, for example through accidental distillate fuel spillages from the proposed tanks and pipelines within the Power Plant Area, to enter local watercourses. **Such pollutants have the potential to impact the QI habitats and species of the River Boyne and River Blackwater SAC and are screened into the more detailed Stage 2 of Appropriate Assessment (NIS) on a precautionary basis.** Pollutants and sediment in runoff may affect the water environment through changes to water quality, smothering of riverbeds, plants and habitats, and causing physical and physiological adverse impacts on aquatic organisms (such as abrasion and irritation). Contamination from metals, oils, fuels and construction materials could have lethal and sub-lethal effects on aquatic organisms and impact water pH which may affect habitats such as alkaline fens. <u>River Boyne and River Blackwater SPA</u> The River Boyne and River Blackwater SPA is designated for QI kingfisher. These birds forage on various species of small fish (stickleback, minnow, chub) in slow-moving, clear rivers. **Despite the relatively long flow distance between the Power Plant Area and the River Boyne and River Blackwater SPA, potential water quality impacts generated in the Power Plant Area through accidental**	• River Boyne and River Blackwater SAC • River Boyne and River Blackwater SPA

Potential impact source	Pathway to European site(s)	Potential for effect(s) on receptors* in European sites	European sites screened in for detailed NIS
		distillate fuel spillages from the proposed tanks and pipelines to enter local watercourses. Water quality impacts are screened into the more detailed Stage 2 of Appropriate Assessment (NIS) on a precautionary basis.	
Airborne pollution impacts on QI habitats, or supporting habitats, of QI / SCI species.	Emissions of NH_3 and NOx from the stack could be deposited onto sensitive receptors, including raised bogs, alkaline fens, and calcareous grasslands. Gaseous vehicle emissions (in particular oxides of nitrogen (NOX)) are insignificant beyond 200m from the roadside, dropping to immaterial concentrations beyond this distance (IAQM, 2020).	Stack emissions According to the Air Pollution Information System (www.apis.ac.uk) the following European sites within 15km of the Power Plant Area are vulnerable to atmospheric nitrogen deposition, NOx and ammonia: Lough Ennell SAC, Raheenmore Bog SAC, Split Hills and Long Hill Esker SAC, Mount Hevey Bog SAC and Wooddown Bog SAC. Air Quality Modelling data for the Proposed Development is presented in Appendix E. Lough Ennell SPA The three SCI species in the Lough Ennell SPA are not considered to be sensitive to stack emissions from the Proposed Development in this particular geographic context. APIS does highlight a sensitivity of pochard and tufted duck to NOx, NH_3 and nitrogen, but only where these are present in the context of saltmarsh. However, this habitat type is not present in the Lough Ennell SPA. Lough Ennell SAC Alkaline fens, QI habitat in the Lough Ennell SAC, are sensitive to NOx and NH_3 emissions, as well as overall nitrogen deposition. For example, due to the presence of bryophytes, the SAC has a lower NH_3 Critical Level of 1μgm^{-3}). Furthermore, a nitrogen Critical Load range of 5-10 kg N/ha/yr is specified for alkaline fens. Raheenmore Bog SAC All three QI habitats in the Raheenmore Bog SAC are sensitive to nitrogen deposition, as well as NOx and NH_3 emissions. For example, active raised bogs and degraded raised bogs still capable of natural regeneration are both associated with a nitrogen Critical Load of 5-10 kg N/ha/yr. Split Hills and Long Hill Esker SAC The Split Hills and Long Hill Esker SAC is designated for semi-natural dry grasslands and scrubland facies on calcareous substrates with an identified nitrogen Critical Load of 5-15 kg N/ha/yr. Implications of elevated nitrogen deposition include declines in species richness, loss of subordinate vascular plants, loss of characteristic mosses and lichens, and increased risk of drought effects. Mount Hevey Bog SAC	None.

Potential impact source	Pathway to European site(s)	Potential for effect(s) on receptors* in European sites	European sites screened in for detailed NIS
		All three QI habitats in the Mount Hevey Bog SAC are sensitive to nitrogen deposition, as well as NOx and NH_3 emissions. For example, active raised bogs and degraded raised bogs still capable of natural regeneration are both associated with a nitrogen Critical Load of 5-10 kg N/ha/yr. Wooddown Bog SAC The Wooddown Bog SAC is designated for degraded raised bogs still capable of natural regeneration, which are sensitive to nitrogen deposition, as well as NOx and NH_3 emissions. However, for all four sites, Raheenmore Bog SAC, Split Hills and Long Hill Esker SAC, Mount Hevey Bog SAC and Wooddown Bog SAC, annual average NOx concentrations will remain below the critical level (as per the conservation objectives for each site), with total concentrations including baseline, the Proposed Development and the LEL Castlelost project (as per the air quality modelling) (the Predicted Environmental Concentration or PEC) being a maximum of 13.8% of the critical level. Short-term (24hr) NOx concentrations will remain similarly low, with the PEC being a maximum of 11.9% of the critical level. Since the critical level will not be exceeded, no likely significant effect will arise from NOx. Annual average NH_3 concentrations will exceed the most stringent critical level ($1\mu gm^{-3}$) with or without the Proposed Development due to existing sources such as agriculture. In these circumstances, the Natural England Guidance[6] indicates that if the contribution of the Proposed Development, in combination with other projects, will not exceed 1% of the critical level, the impact can be considered not significant. For NH_3, the in combination effect (Process Contribution or PC) from the Proposed Development and LEL Castlelost project will be a maximum of 0.6% of the critical level. Annual average nitrogen deposition rates also exceed the lowest part of the critical load range for the most sensitive habitats in these European sites (5kgN/ha/yr for bogs) due to existing sources such as agriculture. However, the in combination effect (Process Contribution or PC) from the Proposed Development and LEL Castlelost project will be a maximum of 1% of the critical load. It is therefore possible to conclude that no likely significant effect will arise on any European sites from stack emissions of the Proposed Development. Dust Generation Lough Ennell SPA	

[6] [6] http://publications.naturalengland.org.uk/publication/4720542048845824

Potential impact source	Pathway to European site(s)	Potential for effect(s) on receptors* in European sites	European sites screened in for detailed NIS
		The habitats within and immediately surrounding the Power Plant Area that could support SCI species are not sensitive to dust or other airborne pollutants in such a way that they would become unsuitable for these species. River Boyne and River Blackwater SAC None of the waterbodies in close proximity to the Power Plant Area (e.g. the River Castlejordan) that are in hydrological connectivity with the River Boyne and River Blackwater SAC, and are potential functionally linked habitat for QI species, lie within the relevant 50m screening distance from the Power Plant Area for negative dust impacts. In addition, as highlighted in Chapter 5 (Proposed Development and Overall Project, Appendix F), the total number of operational vehicle movements at the Power Plant Area is likely to be small, with the total number of personnel employed between 45-50. Only a small portion of employees will be present within the site at any given time (e.g. three-man operations team supported by a small management / maintenance / administrative team), such that any dust generation will be minimal.	

Table 5: AA Screening assessment of impact pathways linking to European sites – Electricity Grid Connection.

Potential impact source	Pathway to European site(s)	Potential for effect(s) on receptors*	European sites screened in for detailed NIS
Construction or decommissioning phases			
Waterborne pollution impacts on QI habitats, or supporting habitats, of QI / SCI species.	The Electricity Grid Connection is hydrologically linked with the River Boyne and River Blackwater SAC / SPA, although there is a long flow distance to these European sites of more than 25km. Deposition or spillage of soils, sediments, oils, fuels, or other construction chemicals / wastewater during construction or decommissioning could enter watercourses which eventually flow into the European sites. Likewise, mobilisation of contamination following disturbance of existing contaminated ground, or sediments, or uncontrolled site run-off could also eventually reach the European sites.	Construction and decommissioning works, particularly the excavation works, in the Electricity Grid Connection have the potential for water quality impacts in any traversed watercourses. This could result in the release of soil / sediment into local watercourses and potential knock-on impacts in hydrologically connected European sites. Furthermore, construction works are generally associated with the risk of toxic and non-toxic water pollution, such as those arising from fuel / oil spills, runoff from laydown areas and others. Pollutants and sediment in runoff may affect the water environment through changing water quality, smothering riverbeds and plants, and causing physical and physiological adverse impacts on aquatic organisms (such as abrasion and irritation). Contamination from metals, oils, fuels and construction materials could have toxic and sub-toxic effects on aquatic organisms and impact water pH which may affect habitats such as alkaline fens.	• River Boyne and River Blackwater SAC • River Boyne and River Blackwater SPA

Potential impact source	Pathway to European site(s)	Potential for effect(s) on receptors*	European sites screened in for detailed NIS
		River Boyne and River Blackwater SAC The River Boyne and River Blackwater SAC lies a relatively long flow distance from the Electricity Grid Connection, such that direct water quality impacts on QI features within the site boundary are unlikely. However, there are several hydrological connections via the Yellow River (Castlejordan) and Castletown Tara Stream. The QI species (river lamprey, Atlantic salmon, otter) routinely range beyond designated site boundaries and can be impacted through water quality changes in functionally linked habitats. **Overall, therefore, in line with the assessment for the Power Plant Area, potential water quality impacts in the Electricity Grid Connection area on the River Boyne and River Blackwater SAC are screened into the more detailed Stage 2 of Appropriate Assessment (i.e., NIS) on a precautionary basis.** River Boyne and River Blackwater SPA The River Boyne and River Blackwater SPA is designated for QI kingfisher. These birds forage on various species of small fish (stickleback, minnow, chub) in slow-moving, clear rivers. **Despite the relatively long flow distance between the Electricity Grid Connection and the River Boyne and River Blackwater SPA, potential water quality impacts are screened into the more detailed Stage 2 of Appropriate Assessment (NIS) on a precautionary basis.**	
Disturbance of QI or SCI species as a result of increased noise, artificial lighting and/or the increased presence of personnel, plant and machinery both in designated site boundaries and functionally linked habitats	The Lough Ennell SPA is deemed to lie well beyond the distance at which construction-related disturbance would be expected to impact its SCI species. However, tufted duck, a mobile SCI species has been recorded in bogs adjacent to the Proposed Development and may be impacted by construction activities in the Power Plant Area. There are watercourses connecting the Electricity Grid Connection to the River Boyne and River Blackwater SAC, which may be used by commuting and foraging otter.	Lough Ennell SPA There is no pathway for disturbance effects of SCI bird species occurring within the boundary of European sites due to the intervening distances. The Electricity Grid Connection stretches from the northern edge of Derryarkin Bog, southward through Ballybeg Bog to the proposed Substation. As discussed previously, all bog habitat in the vicinity of the Electricity Grid Connection is potentially suitable for tufted duck, pochard and coot (SCI species in the Lough Ennell SPA). As discussed in Chapter 5 (Proposed Development and Overall Project, Appendix F), construction of the Overhead Line Route will involve a range of equipment, including tractor / trailer, crane, tracked excavator, tracked dumper and sheet piling rig). Construction activities undertaken in the Electricity Grid Connection are likely to result in temporary visual and noise disturbance of adjoining bog habitats. However, according to guidance published by Natural England for the UK, wintering birds in Bird Group 2 to which tufted duck, pochard and coot belong, have recorded maximum foraging distances of 500m. The closest point of the Electricity Grid Connection lies over 10km from the Lough Ennell SPA, far beyond the off-site distances that these SCIs are expected to travel. Furthermore, while a peak count of tufted duck of 77 individuals was recorded (equating to 5.9% of the designated population), this (or similarly high numbers) were only observed on two occasions. It is also noted that the construction works along the Electricity Grid Connection will be limited to 20 months and staged (therefore not exposing its entire length to disturbance). Large sections of Derryarkin Bog and Ballybeg Bog will remain	• River Boyne and River Blackwater SAC

Potential impact source	Pathway to European site(s)	Potential for effect(s) on receptors*	European sites screened in for detailed NIS
		undisturbed (see similar discussion for the Power Plant Area), with abundant alternative pools and lakes in nearby bogs available for buffering any temporary displacement, LSEs of the Electricity Grid Connection on the Lough Ennell SPA regarding visual and noise disturbance can be excluded. <u>River Boyne and River Blackwater SAC</u> The River Boyne and River Blackwater SAC is designated for mobile species, including river lamprey, Atlantic salmon and otter. These QIs depend on functionally linked waterbodies beyond the SAC boundary, such as the Yellow River and Castletown Tara Stream, both of which traverse the Electricity Grid Connection. However, it is unlikely that river lamprey and salmon are present this far upstream near the source of this river system. The nearest location where these species have been recorded is over 11km downstream, such that any noise, visual and vibration disturbance would be immaterial. Otter, which have extensive home ranges, are likely to commute along and forage within the watercourses traversing the Electricity Grid Connection. **Therefore, potential temporary disturbance impacts on QI otter are screened into the more detailed Stage 2 of Appropriate Assessment (NIS) on a precautionary basis.**	
Loss of functionally linked habitat	The integrity of all European sites designated for SCI bird species is partially reliant on functionally linked habitats that lie outside the designated site boundary. Any risk of functionally linked habitat loss is highest where greenfield sites are converted to development. The dependence of different bird species on functionally linked habitats varies considerably, generally being most prominent for certain swan and goose species. Formal guidance on the maximum foraging ranges of birds is available from Natural England and NatureScot. Generally, a land parcels or waterbody is considered to be functionally linked to a European site where it supports at least 1% of the qualifying population of a given SCI.	<u>Lough Ennell SPA</u> The Lough Ennell SPA is designated for a range of mobile SCI species, namely pochard, tufted duck and coot. All bird species may routinely travel beyond designated site boundaries for essential activities, including foraging, roosting, loafing and preening. Maintaining an adequate supply of functionally linked habitats is critical for the SCIs in the Lough Ennell SPA and this impact pathway requires closer inspection with regard to the Proposed Development. At its closest point, the Proposed Development lies approx. 2.5km from the SPA. According to Natural England guidance, all wintering birds (except for wintering waders, grazing wildfowl, wigeon and geese) have maximum foraging distances of 500m. This implies that the tufted duck and coot within the red line boundary are unlikely to be part of the qualifying population of the SPA. As highlighted in the Environmental Impact Assessment Report (EIAR), the Power Plant Area is of limited suitability for wintering birds, with only occasional overflight being recorded. Data provided by the NBDC only indicates one record of tufted duck within 2km of the Power Plant Area. Furthermore, any functionally linked habitat loss should also be put in context of the frequent availability of suitable habitats in the wider area surrounding the Proposed Development. There are numerous undisturbed lakes and ponds in the bog landscape, which will continue to provide suitable supporting habitat for SCI birds.	None.
Airborne pollution impacts on QI habitats, or supporting habitats, of QI / SCI species.	Dust impacts from construction are not significant beyond a short distance, hence construction / decommissioning dust assessment for ecological receptors is recommended to extend to 50m from a development site and to 50m from roads used by construction vehicles (for	There is no potential for direct impacts on European sites as none are located within the 50m screening distance for dust impacts or the 200m screening distance from roads to be used by construction traffic.	None.

Potential impact source	Pathway to European site(s)	Potential for effect(s) on receptors*	European sites screened in for detailed NIS
	roads up to 500m from the development site) (IAQM, 2014). Gaseous vehicle emissions (in this case from construction vehicles, and in particular oxides of nitrogen (NO_X)) are insignificant beyond 200m, dropping to immaterial concentrations beyond this distance (IAQM, 2020).	Lough Ennell SPA The habitats within and immediately surrounding the Electricity Grid Connection that could support SCI species are not sensitive to dust or other airborne pollutants in such a way that they would become unsuitable for these species. River Boyne and River Blackwater SAC As highlighted in Chapter 14 (Traffic, Appendix G), the Electricity grid route will be accessed from several locations, including accesses to the 220kV station and local Quarry both off the R400. Furthermore, to provide internal access, several access roads will need to be constructed within the Electricity Grid Connection. However, these access routes do not lie within the 50m screening distance for dust generation from the relevant waterbodies (River Yellow (Castlejordan) and Catsletown Tara Stream) that are likely to be functionally linked to the River Boyne and River Blackwater SAC. Furthermore, the volume of construction traffic for specific construction activities will remain in the low double figures (for example, an Annual Average Daily Traffic [AADT] of 40 Heavy Goods Vehicles [HGVs} is forecast in the construction period for the 400kV Station), well below the threshold of 100 AADT that is used to screen development projects.	
Spread of invasive non-native species (INNS).	Watercourses	Any construction activities have the potential to facilitate the dispersal of INNS through the introduction of seeds and plant fragments transported by construction machinery and clothing / footwear of construction workers. **Given the proximity of construction works to watercourses which are upstream of European sites, the risk of INNS introduction cannot be excluded and are screened into the more detailed Stage 2 of Appropriate Assessment (NIS) on a precautionary basis.**	• River Boyne and River Blackwater SAC • River Boyne and River Blackwater SPA
Operational phase			
Mortality and injury from collision/electrocution with overhead lines; disturbance and displacement in proximity to overhead lines.		Lough Ennell SPA Collision with overhead powerlines is a potential cause of death and injury, and this may be a frequent cause of mortality for tufted duck (EirGrid, 2016). There are a range of factors that contribute to determining collision mortality risk with power lines, including bird morphology, vision, age, weather and others. It is widely accepted that birds with high wing loading (i.e. ratio of body height to wing area) and broad wings are significantly more vulnerable to collision, mainly because this limits their ability to swiftly react to unexpected obstacles. None of the three species in the Lough Ennell SPA have high wing loadings and are, therefore, expected to show good evasive action when needed. Flight height and the length of time remaining at potential collision height with power lines is a key determinant of collision risk. In contrast to migrating birds (which tend to fly at high altitudes), the tufted duck and coot in the Lough Ennell SPA are likely to undertake regular commuting flights and lower heights, placing them at increased collision risk. The power lines in the EGC will traverse the Derryarkin and Ballybeg Bogs, both supporting species for which Lough Ennell SPA is designated. Both bogs	• Lough Ennell SPA

Potential impact source	Pathway to European site(s)	Potential for effect(s) on receptors*	European sites screened in for detailed NIS
		were covered in wintering bird surveys that were undertaken by BioSphere Environmental Services. Transect survey data discussed in the report highlight that tufted duck were present on Roadstone and Kilmurray quarry ponds throughout the survey period in small numbers (<10 individuals). Yet, on two dates, significant numbers (77 and 68 individuals) were observed on the Roadstone quarry pond. From this data it appears that the 220kV Overhead Line has the potential to result in collision injury / mortality of tufted duck for which the SPA is designated. In addition, to collision risk, there is the potential risk that SCI bird species may be displaced from suitable habitat by the proximity to the overhead lines (Eirgrid, 2020), which lead to indirect wintering habitat loss and can act as a partial barrier to movement. However, the actual number of collisions is likely to be limited, and combined with the small number of birds likely to be present in or commuting through the area around the Electricity Grid Connection. **Notwithstanding this, this impact pathway is screened into the more detailed Stage 2 of Appropriate Assessment (NIS) on a precautionary basis.**	
Disturbance of QI or SCI species as a result of increased noise, artificial lighting and/or the increased presence of personnel, plant and machinery both in designated site boundaries and functionally linked habitats	The Lough Ennell SPA is deemed to lie well beyond the distance at which construction-related disturbance would be expected to impact its SCI species. However, tufted duck, a mobile SCI species has been recorded in bogs adjacent to the Proposed Development and may be impacted by construction activities in the Power Plant Area. There are watercourses connecting the Electricity Grid Connection to the River Boyne and River Blackwater SAC, which may be used by commuting and foraging otter.	Operational activities are likely to be very minor in nature and will involve infrequent visits by small numbers of personnel to conduct operational and maintenance activities. Even though SCI species (e.g. tufted duck) are likely to be present in surrounding habitat, it is very unlikely that there would be any material disturbance by operational activities. These will be minor and similar in scale to routine agricultural activities in this area. Otter is a mobile QI species of the SAC, and may commute and forage along the watercourses traversed by the Electricity Grid Connection. However, operational activities will be limited to routine inspections and maintenance, which will be carried out during the day. It is highly unlikely that, even if present within the Electricity Grid Connection during these maintenance works, there would be any material disturbance to nocturnal otter.	None.
Waterborne pollution impacts on QI habitats, or supporting habitats, of QI / SCI species.	The Electricity Grid Connection is hydrologically linked with the River Boyne and River Blackwater SAC / SPA, although there is a long flow distance to these European sites of more than 25km. Pollutants in surface water runoff could enter watercourses which traverse the Electricity Grid Connection, eventually reaching the SAC and SPA.	<u>River Boyne and River Blackwater SAC</u> Due to the long distance to the Electricity Grid Connection (over 25km), and the scale and nature of surface water runoff and potential for pollution or sediment runoff from operational site traffic on the Electrical Grid Connection. Chapter 14 (Traffic, Appendix G), highlights that the total number of operational vehicle movements within the Electricity Grid Connection is likely to be minimal, with substations being unmanned and periodic inspection / maintenance activities being restricted to 1 – 2 staff. Any resulting dust generation is likely to be exceedingly low and will not cause material ecological impacts. As such, water pollution impacts to the QI habitats and species of the SAC are screened out from the NIS. <u>River Boyne and River Blackwater SPA</u>	None.

Potential impact source	Pathway to European site(s)	Potential for effect(s) on receptors*	European sites screened in for detailed NIS
		The River Boyne and River Blackwater SPA is designated for QI kingfisher. These birds forage on various species of small fish (stickleback, minnow, chub) in slow-moving, clear rivers. Due to the long distance to the Power Plant Area (over 25km), and the scale and nature of surface water runoff and potential for pollution or sediment runoff from operational site traffic on the Electrical Grid Connection. Water pollution impacts on this species are screened out from the NIS.	
Airborne pollution impacts on QI habitats, or supporting habitats, of QI / SCI species.	Dust generated from vehicles.	Lough Ennell SPA The habitats within and immediately surrounding the Electricity Grid Connection that could support SCI species are not sensitive to dust or other airborne pollutants in such a way that they would become unsuitable for these species. River Boyne and River Blackwater SAC Watercourses traversed by the Electricity Grid Connection that are functionally linked to the River Boyne and River Blackwater SAC, are potentially sensitive to dust generated by operational site traffic. However, as highlighted in Chapter 14 (Traffic, Appendix G), the total number of operational vehicle movements within the Electricity Grid Connection is likely to be minimal, with substations being unmanned and periodic inspection / maintenance activities being restricted to 1 – 2 staff. Any resulting dust generation is likely to be exceedingly low and will not cause material ecological impacts.	None.

4.2 AA Screening Conclusion

Following an examination of the Proposed Development, encompassing the Power Plant Area and Electricity Grid Connection, and the likely impacts arising from construction, operation and decommissioning it has been concluded that in the absence of mitigation there is potential for likely significant effects of the Proposed Development on the following European sites:

- Lough Ennell SPA;
- River Boyne and River Blackwater SAC; and
- River Boyne and River Blackwater SPA

Therefore, it was established that the Proposed Development should progress to a more detailed examination of effects on the integrity of the European sites through the preparation of a Stage 2 of Appropriate Assessment (NIS), which is detailed in Section 5 of this Report.

5. Natura Impact Statement (NIS)

This section undertakes the NIS for each of the impacts for which LSEs could not be excluded in Section 4.

5.1 Construction and Decommissioning Phases

5.1.1 Water Quality – Power Plant Area & Electricity Grid Connection

River Boyne and River Blackwater SAC & SPA

The construction and decommissioning works anticipated in the Power Plant Area and Electricity Grid Connection have the potential to result in water quality impacts through the release of soils and sediments, potential spillage of oils, fuels or other construction chemicals, mobilisation of contaminants following disturbance to ground, or uncontrolled site run-off. Toxic and non-toxic pollutants may impact adjoining watercourses that comprise functionally linked habitats for QI species from the River Boyne and River Blackwater SAC, which is hydrologically linked through the Mongagh/Castlejordan River, Yellow River and Castletown Tara Stream. All QI species in the SAC depend on adequate water quality through all stages of their life cycle, while the kingfisher, the QI species of the SPA requires clean water in which to forage on various species of small fish (stickleback, minnow, chub).

Both river lamprey and Atlantic salmon depend on rivers being in good hydrochemical condition along the entire river continuum from estuaries to spawning grounds. Aside from direct obviously deleterious toxic pollution events (e.g. large-scale release of fuels, oils and solvents), sedimentation from construction compounds can have major impacts on the reproductive success of both species by smothering spawning gravels and nursery silts (Maitland, 2003; Hendry & Cragg-Hine, 2003). Excessive sediment release to spawning areas can clog interstitial spaces, increase Biological Oxygen Demand and reduce overall dissolved oxygen concentrations. This can trigger further knock-on effects by changing floral and faunal community composition, both of which are important in maintaining river lamprey and Atlantic salmon populations. At their extreme, pollution events can hinder successful migratory behaviour of anadromous fish by severing potentially suitable stretches of river, preventing adults from reaching their preferred upstream spawning grounds. In contrast, within naturally occurring limits, water chemistry is considered to have little impact on otter directly (unless severe toxic pollution is involved), exerting its main role via changes to their food supply (Chanin, 2003). Of the toxic contaminants with reported direct impacts on otter (oil / fuel spillages, radioactivity, heavy metals, pesticides and polychlorinated biphenyl compounds [PCBs]), potential toxic spillages are most likely to result from construction / decommissioning works in the Power Plant Area and Electricity Grid Connection.

An assessment of potential water quality impacts should always be undertaken in cognisance of the current hydrochemical condition of the waterbodies likely to be affected. A review of data on the Environmental Protection Agency (EPA) website, indicates that the stretch of the Mongagh/Castlejordan River closest to the Power Plant Area has Good Ecological Status or Potential according to the most recent monitoring programme (2016-2021)[7]. In contrast, the Castletown Tara Stream (traversed by the Electricity Grid Connection) is identified as 'At Risk' under Water Framework Directive (WFD) standards, primarily due to Moderate Invertebrate Status or Potential and several Moderate scores for hydrochemical parameters[8]. It is noted that several other streams and rivers (including sections of the River Boyne), which are not hydrologically linked to the Proposed Development, also contribute to the quality of aquatic habitats that are linked to the River Boyne and River Blackwater SAC. Many of these are subject to their own environmental pressures from other developments, suggesting that potential water quality impacts are amplified when considered in-combination.

As highlighted in Chapter 5: Proposed Development and Overall Project (Appendix F), the Proposed Development incorporates a range of mitigation measures that will help avoid or minimise any potential for water quality related adverse effects on the integrity of European sites, including the River Boyne and River Blackwater SAC. A Construction Environmental Management Plan (CEMP) has been prepared in support of the Proposed Development (Appendix H) to avoid or mitigate environmental impacts. The CEMP comprises a series of protection measures that will be deployed by the relevant contractors as appropriate. The following measures will ensure the protection of water quality in adjoining watercourses and any hydrologically linked European sites:

[7] Available at: https://www.catchments.ie/data/?_gl=1*wg625v*_ga*MTQyMzI5OTM0OC4xNjk2NjAzMTQy*_ga_TPK2CK9KEX*MTY5Njg2NTc2Ni40LjEuMTY5Njg2NTc2Ni4wLjAuMA..#/waterbody/IE_EA_07C040100?_k=2b3byc [Accessed 10 October 2023]
[8] Available at: https://www.catchments.ie/data/?_gl=1*y02jhc*_ga*MTQyMzI5OTM0OC4xNjk2NjAzMTQy*_ga_TPK2CK9KEX*MTY5NjkyNzQ4OS42LjEuMTY5NjkyNzQ4OS4wLjAuMA..#/waterbody/IE_EA_07C080190?_k=n3c9qo [Accessed 10 October 2023]

- The contractor will be required to implement appropriate communications including reporting of environmental practice on-site, toolbox talks, daily briefings, an environmental noticeboard (with ecological information, spill/emergency response and refuelling area / procedure) and signage (including ecological exclusion areas);
- All site personnel involved in the construction of the Proposed Development will be made aware of sensitive ecological features present, general working procedures and mitigation measures during site induction (Toolbox Talk), with particular focus on high-risk works (e.g. soil excavations and safe materials storage);
- Contractors will not be permitted to use materials that could lead to run-off containing heavy metals, sulphides, acids and fine clays; and
- Prior to the commencement of construction, a suitably qualified and experienced Ecological Clerk of Works (ECoW) will be appointed to input into the contractor's site-specific Method Statement and construction programme, as well as overseeing the implementation of the CEMP (and any mitigation measures identified therein).

The CEMP, which is included in the planning application and continues to be a live working document after obtaining planning consent, prescribes that best practice guidance on pollution prevention will be followed at all times during the construction / decommissioning of the Proposed Development. These best practice measures include:

- Controls and contingency measures to manage run-off from construction areas and fine sediment;
- All oils, fuels, lubricants, or other chemicals will be stored in appropriate bunded containers in suitable storage areas, with spill kits provided at the storage location and relevant places across the Proposed Development. There will be no storage of any oils, fuels, lubricants or other chemicals within 30m of watercourses;
- All refuelling and servicing of vehicles and plant will be carried out in designated bunded areas with impermeable bases, which will be situated at least 30m from watercourses;
- The use of concrete will only occur outside the set-back zone of 30m from watercourses and will be carefully controlled to avoid the release of dust and contaminated run-off. No on-site batching should occur. Washout from concrete chutes will be only carried out in designated impermeable areas;
- Temporary storage of excavated materials will be located at least 30m from watercourses;
- Soil exposure during the construction works will be minimised and exposed soil will be reinstated as rapidly as possible; and
- A Pollution Prevention Plan (or similar document) will include procedures and diagrams for:
  - Identification if a water quality incident has occurred and any remedial actions to be undertaken;
  - Dewatering of excavations to designated treatment area;
  - Temporary soil storage;
  - Fuel storage / refuelling;
  - Concrete wash-out area;
  - Controlling surface water entering the Proposed Development;
  - Preventing existing drainage features becoming pathways for construction run-off;
  - Reducing soil exposure and reinstating as rapidly as possible;
  - Temporary construction mitigation measures such as silt fencing and straw bales; and,
  - Contingency measures.

Overall, the CEMP (Appendix H,) to, provides a documented account of the implementation of the environmental commitments, which are set out in the EIAR and this NIS. It will be updated to include for any future measures stipulated in the planning conditions.

The best practice pollution prevention measures that will be implemented to avoid negative water quality impacts, ensure that there will be no material aquatic pollution of surface waters and any downstream European sites (including the River Boyne and River Blackwater SAC & SPA). Therefore, it is concluded that the Power Plant Area and Electricity Grid Connection will not result in adverse effects on the integrity of the River Boyne and River Blackwater SAC & SPA regarding water quality.

5.1.2 Visual and noise disturbance – Power Plant Area & Electricity Grid Connection

River Boyne and River Blackwater SAC

Potential visual and noise disturbance from construction works in the Power Plant Area and the Electricity Grid Connection to QI otter in the River Boyne and River Blackwater SAC was screened into the NIS stage of AA, given the location of the discharge pipe into the Mongagh/Castlejordan River in the first instance, and the proximity of proposed works to the Yellow River, both hydrologically linked to the SAC, in which otter evidence was found. While the SAC itself lies over 25km in flow distance from both the Power Plant Area and the Electricity Grid Connection, otter have extensive home ranges of up to 40km and routinely commute, forage, rest up and breed beyond designated site boundaries. Therefore, it was concluded that otter from the SAC may routinely utilise functionally linked watercourses adjacent to the Power Plant Area and that traverse the Electricity Grid Connection, such as the Mongagh/Castlejordan River, the Yellow River and Castletown Tara Stream. Significant disturbance can interfere with and hinder the Conservation Objectives set for otter in the River Boyne and River Blackwater SAC (currently identified to be in 'favourable conservation condition') in NPWS guidance, such as by causing a significant decline in terrestrial habitats (10m either side of suitable watercourses) and couches / holts, as well as increasing barriers to connectivity.

Generally, one of the challenges of assessing noise impacts to European otter is that there is no available research into their hearing thresholds. However, research undertaken into the North American otter enabled a probable hearing threshold for the European otter to be determined by Bureau Veritas. Otter have very acute high frequency hearing sensitivity (16 kilohertz [kHz]) but much poorer hearing sensitivity than humans at frequencies below 4kHz (most anthropogenic noise and construction activities tend to be in the low frequency spectrum). This is likely to be the reason why they frequently inhabit 'noisy' environments, such as roads, industrial buildings, quarries and other sites impacted by anthropogenic activities (Ref.55). Their particular hearing threshold enables otter to exploit a wide range of habitats, including areas that are impacted by human disturbance.

Bureau Veritas identified that a sound pressure level below $50dB_{ht}$ (*Lutra lutra*) would probably result in a low likelihood of disturbance for otters as it does for humans and many marine species (Ref.56). Furthermore, the report established that most construction activities involving ground penetration or noise would not result in disturbance (i.e., noise levels above $50dB_{ht}$ impacting on European otter) if undertaken over 30m from a watercourse. However, other types of construction activities (e.g.,piling) may disturb up to 80m from source. Therefore, in line with a precautionary approach, highly disturbing construction noise (e.g., that arising from driven / impact piling) is assumed to have disturbance potential up to 100m from where it is carried out.

To appraise the suitability of watercourses and associated terrestrial habitats in the wider area around the Proposed Development to otter, aquatic ecology baseline surveys in support of the EIAR were undertaken in August and September 2022 (see Appendix D). No signs of otter using this section of the Mongagh/Castlejordan River at the proposed discharge point were found, though they are known both up and downstream from this site, while only two signs of otter were recorded in watercourses traversing the Electricity Grid Connection. An otter spraint was recorded at a culvert crossing of the Yellow River in close proximity to the Overhead Line Route. Furthermore, a potential holt was identified at the top of a peaty embankment along the Castletown Tara Stream (approx. 9m outside the Electricity Grid Connection). However, based on the presence of cobwebs and the absence of otter prints or slides, this holt was concluded to the be inactive in 2022 and 2023. Generally, otter are prey-limited, with population distributions being partially determined by fish availability. Appendix D (Aquatic Survey Report) highlights that the Yellow River is a moderate quality salmonid nursery, with brown trout, minnow and pike being recorded through electro-fishing. Due to the presence of abundant and healthy fish populations, the main watercourses within the Electricity Grid Connection (e.g. Yellow River) are deemed to be generally suitable to otter. Furthermore, small streams and ditches within the Electricity Grid Connection are considered suitable as potential commuting routes.

According to NRA guidance (2008)[9], certain habitat features used by otter require specific protection buffers. For example, otter holts and couches (different types of resting places) require a 20m protection zone in which no

[9] National Roads Authority (2008) Guidelines for The Treatment of Otters Prior to the Construction of National Road Schemes.

activities are permitted. This protection buffer increases to 150m for natal dens, accounting for the fact that female otter with young have heightened sensitivity. The aquatic baseline survey did not record any such features in the survey area (the holt along Castletown Tara Stream is inactive), meaning that no exclusion areas will be required with regards the Power Plant Area and the Electricity Grid Connection.

Notwithstanding this, the occasional otter records in the headwaters of the River Boyne catchment, indicate that construction works in the Power Plant Area and Electricity Grid Connection may temporarily disturb commuting / foraging otter, where they are undertaken within 30m of the Mongagh/Castlejordan River, Yellow River and Castletown Tara Stream (which would increase to a precautionary distance of 100m where impact piling is involved). According to the construction methodology set out in Chapter 5 (Proposed Development and Overall Project), Appendix F, piling and other construction activities will be involved in the construction of the 19 220kV pylon towers (the precise locations of which are unknown at the time of writing) and the 400kV loop-in substation in the southern extent of the Proposed Development, potentially within 100m of main watercourses (or closer). Therefore, it is concluded that mitigation measures will be required to minimise potential negative impacts on commuting and foraging otter.

Several actions implemented across the Proposed Development and secured in the CEMP, reduce the visual and noise disturbance potential to otter travelling along the major watercourses. These include the following:

- All construction works are largely restricted to daylight hours (07:00 – 19:00), limiting greatest disturbance impacts to times when otter, which are predominantly nocturnal, are least active.
- Lighting, where necessary, will be kept to essential locations only (particularly near waterbodies), with the position and direction of lighting designed to minimise intrusion and disturbance to waterbodies. Using full cut-off lanterns would minimise light spillage through directional lighting (directing the cone of light downward) and not allowing light across the horizontal plane. Furthermore, all lighting will have the minimum brightness and power rating to perform the required function.
- Drainage and attenuation ducts will restrict otter entry, and any temporary features which are liable to trap wildlife should be covered or have a means of escape fitted.
- Excavations near riverbanks will either be covered or fenced off at the end of each working day or include a means of escape for trapped animals (e.g., mammal ramps or ladders).

Overall, the NIS determined that there will be a potential for disturbance to otter foraging and commuting along the major watercourses associated with the Power Plant Area and the Electricity Grid Connection. Notwithstanding this, it should be noted that otter is generally fairly tolerant of anthropogenic noise, particularly where no resting places or natal dens are present. Furthermore, the construction methodology comprises several elements (e.g. no night-time works, directional lighting) that will mitigate any existing disturbance impacts to otter. It is concluded that the Power Plant Area and Electricity Grid Connection will not result in adverse effects on the River Boyne and River Blackwater SAC regarding construction disturbance to otter.

5.1.3 Spread of invasive non-native species – Power Plant Area & Electricity Grid Connection

River Boyne and River Blackwater SAC & SPA

As highlighted in Chapter 5 (Proposed Development and Overall Project, Appendix F), the Proposed Development incorporates a range of mitigation measures that will help avoid or minimise any potential for the spread of invasive non-native species to European sites during construction and decommission, comprising the River Boyne and River Blackwater SAC and SPA. A Construction Environmental Management Plan (CEMP) has been prepared in support of the Proposed Development (Appendix H) to avoid or mitigate environmental impacts. Invasive species can be introduced into a location by contaminated plant, machinery and equipment which were previously used in locations that contained invasive species. Good site organisation and hygiene management shall be maintained always on site, and best practice measures will be implemented, as follows:

- The Contractor will prepare an Invasive Species Action Plan to be implemented during construction, and all personnel will be made aware of the requirements.
- Plant and machinery will be inspected upon arrival and departure from site and cleaned / washed as necessary to prevent the spread of invasive aquatic / riparian species such as Japanese knotweed *Fallopia japonica* and Himalayan Balsam *Impatiens glandulifera*. A sign off sheet will be maintained by the contractor to confirm the implementation of measures.

- Site hygiene signage will be erected in relation to the management of non-native invasive material.

It is concluded that the Power Pant Area and Electricity Grid Connection will not result in adverse effects on the River Boyne and River Blackwater SAC& SPA regarding the spread of invasive non-native species during construction.

5.2 Operational Phase

5.2.1 Water quality – Power Plant Area

River Boyne and River Blackwater SAC & SPA

Release of toxic and non-toxic pollutants, via foul wastewater discharge and surface water runoff (including accidental distillate fuel spillages from the proposed tanks and pipelines) may impact adjoining watercourses that comprise functionally linked habitats for QI species from the River Boyne and River Blackwater SAC, which is hydrologically linked through the Mongagh/Castlejordan River, Yellow River and Castletown Tara Stream. All QI species in the SAC depend on adequate water quality through all stages of their life cycle, while the kingfisher, the QI species of the SPA requires clean water in which to forage on various species of small fish (stickleback, minnow, chub).

The CEMP will include a Pollution Prevention Plan (PPP) (or similar document), and the use of SuDs during operation will mitigate the risk of water pollution to watercourses.

- A Pollution Prevention Plan (or similar document) will include procedures and diagrams for:
- Identification if a water quality incident has occurred and any remedial actions to be undertaken;
- Dewatering of excavations to designated treatment area;
- Fuel storage / refuelling;
- Controlling surface water entering the Proposed Development; and,
- Contingency measures.

Overall, the CEMP (Appendix H) provides a documented account of the implementation of the environmental commitments, which are set out in the EIAR and this NIS. It will be updated to include for any future measures stipulated in the planning conditions.

The best practice pollution prevention measures that will be implemented to avoid negative water quality impacts, ensure that there will be no material aquatic pollution of surface waters and any downstream European sites (including the River Boyne and River Blackwater SAC & SPA) during operation. Therefore, it is concluded that the Power Plant Area will not result in adverse effects on the integrity of the River Boyne and River Blackwater SAC & SPA regarding water quality during the operational phase.

5.2.2 Collision with powerlines – Electricity Grid Connection

Lough Ennell SPA

Potential injury and mortality from collisions with the Overhead Line in the EGC to the SCI species in the Lough Ennell SPA could not be excluded at the AA Screening stage. While no pochard and coot were recorded in the wintering bird surveys, large flocks of tufted duck occurred on the Roadstone quarry pond on two separate occasions (See Appendix C). On its route to the Interface Compound (onwards from which the 220kV line will be buried), the Overhead Line traverses both of these bogs, which are considered to comprise suitable supporting habitats for all three SCI species. It is widely accepted that in contrast to migratory birds (which travel at greater altitudes), bird individuals that commute between roost sites and foraging areas, are at greater collision risk with power lines due to their relatively low flight heights (EirGrid, 2016).

According to guidance published by Natural England, designated sites for wintering birds (except for some wintering waders, grazing wildfowl, wigeon and geese) are likely to be associated with maximum foraging distances of between 500m and 2km (Knight, 2019), and therefore the tufted duck assemblage recorded within Derryarkin Bog, within the Electricity Grid Connection is unlikely to host individuals from the SPA population. In addition, construction in the Electricity Grid Connection Area will be limited to 20 months and staged and therefore large sections of bog habitat will remain physically undisturbed by construction and there will remain numerous alternative lakes and ponds in the surrounding landscape. Based on this evidence, it is considered **unlikely** that

the tufted duck assemblage recorded on Derryarkin Bog is part of the designated SCI population in the Lough Ennell SPA.

Bird strikes with power lines are regarded as localised incidents that predominantly impact the more common and widespread species (Jenkins *et al*., 2010). Most studies on power line collisions have assessed short sections (typically less than 5km) at identified collision hotspots, yielding estimated collision rates of between 0.1 and 489 casualties per km per year (Drewitt & Langston, 2008). As such, the consensus in the published literature is that mortality from power line collisions is a rare event and this impact pathway is unlikely to impact bird species at the population scale. This is important because, by definition, adverse effects on the integrity of European sites will only occur if an impact pathway translates to population-level impacts.

The Overhead Line will extend over 5km from the 220kV substation to the Interface Compound, traversing both Derryarkin and Ballybeg Bogs. The pylon towers carrying the power lines will be c. 45m in height, which places them within the range of the typical flight heights for various bird species. The 45m height of the pylons and Overhead Line falls within the Band 2 flight height (25-175m) that was recorded for many other birds. For example, many of the recorded flocks of lapwing spent at least a third of the recorded flight duration at heights placing them at potential collision risk with the Overhead Line. However, the vantage point surveys did not record any flight activity for the three SCI species associated with the Lough Ennell SPA (tufted duck, pochard, coot).

Considering the available evidence from the wintering bird surveys and published literature, mitigation will be delivered to minimise the risk of collision and electrocution of birds with the Overhead Line in the Electricity Grid Connection, including SCI species, as a matter of good practice, even though there is no evidence that the Overhead Line route represents functionally-linked habitat to any SPA. Transmission lines will be fitted with devices such as flight diverters, hanging tags, and marker spheres, to make them more visible to flying birds. Adequate marking of power lines may reduce collision mortality by up to 78% compared to unmarked sites (Barrientos *et al*., 2011).

Overall, given that the recorded tufted duck are **unlikely** to be part of the qualifying population in the Lough Ennell SPA (as per guidance), then no SCI species were recorded flying within the vantage point survey collision risk zone. In addition, the mitigation described above will minimise the incidence of collisions as per good practice, it is concluded that the EGC of the Proposed Development will not result in adverse effects on the integrity of the Lough Ennell SPA regarding operational phase collision mortality.

6. In-combination assessment

Cumulative effects can result from individually insignificant but collectively significant actions taking place over the same time period or concentrated in a location (CIEEM, 2019). Effects which arise in-combination with other projects or plans must be considered as part of AA. Plans and projects which have received permission and have already been constructed or implemented form part of the baseline and do not require consideration in the in-combination assessment.

6.1.1 Cumulative Assessment – interaction of effects between the various elements of the Proposed Development and Overall Project

The potential cumulative impacts from interactions between various elements of the Proposed Development and Overall Project, as described in Section 1.2.1, have been considered in terms of likely significant effects on European sites. Due to the proximity, scale, and timelines associated with each element, there is potential for cumulative effects within the Proposed Development and the Overall Project.

This AASR/NIS has considered all elements of the Proposed Development in combination, during the construction, operation, and decommissioning phases, and in combination with the Overall Project which may lead to likely significant effects to European site within the Zone of Influence, outlined in Section 2.2.

Power Plant Area

The Electricity Grid Connection is part of this application while a separate consent application for the Gas Connection Corridor will be made by Gas Networks Ireland (GNI) under Section 39A of the Gas Act. These elements of the Overall Project are integral to the operation of the Power Plant Area. Therefore, there is potential for overlapping construction phases of each element of the Overall Project (i.e., Grid Connection, Gas Connection Corridor and Power Plant Area) creating cumulative ecological impacts.

Following the Appropriate Assessment Screening of the Power Plant Area and the likely impacts arising from construction, operation and decommissioning it has been concluded that in the absence of mitigation there is potential for likely significant effects of the Proposed Development on the River Boyne and River Blackwater SAC and SPA in relation to water pollution, and the spread of non-native invasives species during construction/decommissioning phases, and in relation to water pollution via foul wastewater discharge and surface water discharge during operation.

Given the implementation of the mitigation outlined at the Stage 2 of Appropriate Assessment (NIS), Section 5. The best practice pollution prevention measures that will be implemented to avoid negative water quality impacts, will ensure that there will be no material aquatic pollution of surface waters or spread of invasive non-native species at any downstream European sites (including the River Boyne and River Blackwater SAC & SPA). Therefore, it is concluded that the Power Plant Area will not result in adverse effects on the integrity of the River Boyne and River Blackwater SAC and SPA during construction/decommissioning and operation. Considered in combination with the same impact pathways for pollution and the spread of non-native invasive species arising from the construction of the Electricity Grid Connection, it is concluded that the implementation of these best practice pollution prevention measures, as outlined in the CEMP (Appendix H) will not result in adverse effects on the integrity of the River Boyne and River Blackwater SAC and SPA. Operational phase water pollution impacts were screened out at Stage 1 for the Electricity Grid Connection due to low levels of site access and maintenance.

The Gas Connection Corridor similarly shares a hydrological link with the River Boyne and River Blackwater SAC and SPA, albeit at a greater distance than the Power Plant Area and Electricity Grid Connection elements. Should construction occur at the same time, then there is again the potential for in combination effects on water quality and the spread of non-native invasive species. With the implementation of the same best practice pollution prevention measures it is considered that the effect will not lead to adverse effects on the integrity of these European sites. No operational phase water quality impacts are anticipated during the operation of the Gas Connection Corridor.

Electricity Grid Connection

The Electricity Grid Connection is part of this application with the Power Plant Area application, while a separate consent application for the Gas Connection Corridor will be made by GNI under Section 39A of the Gas Act. These are all part of the Overall Project and are all integral for the overall operation. Therefore, there is potential for

overlapping construction phases of each element of the Overall Project (i.e., Grid Connection, Gas Connection Corridor and Power Plant Area) creating cumulative ecological impacts.

Following the Appropriate Assessment Screening of the Electricity Grid Connection and the likely impacts arising from construction and operation it has been concluded that in the absence of mitigation there is potential for likely significant effects of the Proposed Development on the Lough Ennell SAC and SPA, and the River Boyne and River Blackwater SAC and SPA in relation to water pollution, and the spread of non-native invasives species, as mentioned in the previous section, and with regards visual and noise disturbance during construction. As well as the risk of collision with powerlines during the operational phase.

With the implementation of the best practice pollution prevention measures outlined at the Stage 2 of Appropriate Assessment (NIS), Section 5. There will be no material aquatic pollution of surface waters or spread of invasive non-native species at any downstream European sites (including the River Boyne and River Blackwater SAC & SPA) for each element, the Electricity Grid Connection, Power Plant Area and Gas Connection Corridor. And it is not considered likely to lead to in combination adverse effects on the integrity of these European sites.

The visual and noise disturbance from the construction of the Electricity Grid Connection was screened into the Stage 2 Appropriate Assessment, given the proximity of the works to the Yellow River, which is hydrologically connected to the River Boyne and River Blackwater SAC, and may support functionally linked habitat for otter, a QI species for this site. However, given the distance of the main works at the Power Plant Area from the watercourse, this impact pathway was screened out at Stage 1, and therefore will not act in combination. However, there is the potential for there to be visual and noise disturbance impacts to otter during construction of the Gas Connection Corridor which could act in combination.

It should be noted that otter are generally fairly tolerant of anthropogenic noise, particularly where no resting places or natal dens are present (as is the case in the Electricity Grid Connection). Furthermore, the construction methodology comprises several elements (e.g. no night-time works, directional lighting) that will help mitigate any existing disturbance impacts to otter. It has therefore been concluded at Stage 2 that the Electricity Grid Connection will not result in adverse effects on the River Boyne and River Blackwater SAC regarding construction disturbance to otter, which will reduce the likely in-combination effects, should any arise from the construction of the Gas Connection Corridor.

The risk of collision with overhead powerlines during the operation of the Electricity Grid Connection, is an impact unlikely to act in combination with other elements given that the erection of these overhead lines is specific to this element of the project.

Gas Connection Corridor

The Gas Connection Corridor will be subject to separate consenting applications which will be made by GNI. However, the Gas Connection Corridor has been considered part of the Overall Project as it is integral to the operation of the Proposed Development. Therefore, there is potential for overlapping construction phases of each element of the Overall Project (i.e., Electricity Grid Connection, Gas Connection Corridor and Power Plant Area) creating cumulative ecological impacts.

The proposed Gas Connection Corridor (GCC) comprises an underground high-pressure natural gas pipeline for the transport of natural gas from the BGE/77 Transmission Pipeline to the Power Plant Area of the Proposed Development (approx. 9.7km in distance). The GCC predominantly traverses agricultural land, as well as various roads and two streams within counties Offaly and Westmeath.

An NIS for the Gas Connection Corridor has not been undertaken to date. However, due to the proximity of the GCC to the Proposed Development, there is potential for several in-combination effects, including:

- Visual and noise disturbance to birds utilising functionally linked habitats due to construction works; and
- Water quality impacts (e.g. due to sedimentation, spillages) on local watercourses in connectivity with the River Boyne and River Blackwater SAC.

Notwithstanding this, likely significant effects from the Proposed Development could not be screened out alone and mitigation measures will be adopted to entirely address its impact potential. The GCC will need to deliver similar mitigation to protect European sites and ensure that no residual in-combination effects are present.

6.1.2 Cumulative in-combination effects – Other nearby projects

A review of the National Planning Application Database (NPAD) webpage indicates that in the last five years there have been four applications for planning permissions for medium to large-scale developments within 2km of the

Proposed Development, (see Table 6). A 2km buffer has been chosen because that is the maximum zone within which there is potential for the Proposed Development to operate alongside other plans or projects on European sites. Although a 15km zone of influence was considered in relation to stack emissions, and a 20km zone of influence was used for scoping in European sites designated for mobile species (such that functionally linked habitat could be affected), this was based on the furthest distance travelled by SPA birds; the AA screening established that the only SCI birds recorded within the Proposed Development site were those which travel relatively short distances (2km) from their main SPA roosts.

Proposed developments within this search area were assessed using the NPAD webpage and Planning Applications webpages of Offaly and Westmeath County Councils to determine the risk of in-combination likely significant effects with the Proposed Development. Most applications were in relation to smaller planning applications predominantly for extensions or alterations to existing dwellings. These are not listed in Table 5 as they are not considered to be relevant to the in-combination assessment given that their small scale. Modifications to existing dwellings are not considered to materially contribute to impact pathways linking to European sites. Furthermore, both small and large-scale housing applications will be allocated under strategic development plans, which are subject to their own consenting process (including AA Screening and NIS).

Table 6: Planning applications with the potential for in-combination effects within 2km of the Proposed Development within the last five years

Planning Reference	Location	Description	In-combination Assessment	Planning Decision
2260051	Farthingstown townland	Proposed sand and gravel pit, including phased extraction of sand and gravel of an area of c. 51.3 ha over 15 years.	An NIS completed for this development found that the proposed works and activities at the application site will not undermine the conservation objectives for screened-in European sites, either alone or in-combination with other projects or plans. With mitigation considered, the development will not have an adverse effect on the integrity or pose a risk of likely significant effects on European sites. Therefore, given that the current Proposed Development will also not result in likely significant effects on European sites, there will be no cumulative 'in combination' effects. This is because a) for shared impact pathways where mitigation is required (i.e. water quality) each set of mitigation will reduce the impacts of the respective project to an imperceptible level, and b) there are no other shared impact pathways from the Proposed Development and the other projects.	In planning
20329	Drumman biomass facility, Derrygrenagh and Knockdrin townlands	Permission for the continued operation of the existing development until 2030. The development is for the storage and seasoning of biomass logs followed by chipping of the seasoned logs on a site area of 29.17ha.	An AA Screening completed for the project determined that there would be no likely significant effects on any European sites. Given the nature of the development proposal and the lack of likely significant effects there will be no cumulative 'in combination' effects with the Proposed Development. This is because a) for shared impact pathways where mitigation is required (i.e. water quality) each set of mitigation will reduce the impacts of the respective project to an imperceptible level, and b) there are no other shared impact pathways from the Proposed Development and the other projects.	Conditional approval on 07/04/2021
19176	Derrygreenagh townland	Erection of a guyed wind monitoring mast, with instruments, 100m in height, for a period of six years. The purpose of the proposed mast is to assess the	An AA Screening completed for the project found that there would be no likely significant effects on any European sites. As this development is already constructed and given the	Conditional approval on 17/07/2019

Planning Reference	Location	Description	In-combination Assessment	Planning Decision
		suitability of the company's adjacent lands for wind farm development.	size and location of the Proposed Development, there will be no cumulative effects.	
23277	Derrygrenagh and Knockdrin townlands	To import soil and stone not exceeding 25,000 tons over a period of 2 yrs for the purpose of raising existing ground levels not exceeding 1.2m in height, installation of new drainage over 2.4ha with restoration to agricultural use on completion, temporary installation of a suitable wheel wash at the entrance and all ancillary site works.	An AA Screening completed for the project found that there would be no likely significant effects on any European sites. Given the nature of the development proposal and the lack of likely significant effects, there will be no cumulative 'in combination' effects with the Proposed Development. This is because a) for shared impact pathways where mitigation is required (i.e. water quality) each set of mitigation will reduce the impacts of the respective project to an imperceptible level, and b) there are no other shared impact pathways from the Proposed Development and the other projects.	In planning
PL2/21/515	LEL Castlelost	LEL Castlelost incorporates three projects. These will comprise five (5no.) open cycle gas turbine (OCGT) Electricity generating units, totalling approximately 275MWe (megawatts Electricity), ancillary plant, buildings and infrastructure (The LEL Flexgen Castlelost). This will connect to a proposed 220kV Gas Insulated Switchgear (GIS) Electricity substation, including installation of 2No. 220kV underground circuits connecting to the existing Shannonbridge-Maynooth 22kv overhead line via two (2No.) with new mini-interface Electricity compounds and two single circuit 23m high towers (The Lel GIS Castlelost Project). An open area battery storage system compound, synchronous condenser compound, IPP (customer) building and all ancillary Electricity equipment and development works, (Lel ESS Castlelost Project), will store surplus renewable energy generated during periods of low demand.	NOx emissions from the exhaust stack of this development would result in effects in combination with the Proposed Development when operational, in terms of both elevated NOx concentrations and elevated nitrogen deposition on sensitive habitats within European sites, However, the two projects have been modelled in combination and the combined effect does not exceed 1% of the critical level or critical load for any of the modelled pollutants.	Permitted

Source: National Planning Application Database (NPAD).

As there are no anticipated significant risks from the Proposed Development or other plans or projects within a 2km buffer of the Proposed Development (15km for stack emissions and 20km for mobile QI species), and that mitigation measured will be incorporated to all projects, it is considered that **there will be no significant in-combination impacts which pose a significant risk to European sites**.

7. Conclusions

The NIS has been prepared based on best scientific knowledge and in accordance with the requirements and provisions under the Habitats Directive, Habitat Regulations and Planning and Development Act, most up to date AA case law and published guidance.

Eight European sites were determined to lie within the potential ZoI of the Proposed Development: Lough Ennell SAC, Lough Ennell SPA, Raheenmore Bog SAC, Split Hills and Long Hill Esker SAC, Mount Hevey Bog SAC, Wooddown Bog SAC, River Boyne and River Blackwater SAC, and River Boyne and River Blackwater SPA. The sites were assessed in relation to several impact pathways, including loss of functionally linked habitat, water pollution, air pollution, hydrology, noise and visual disturbance, spread of invasive non-native species and collision mortality. Impacts were assessed separately for the two elements of the Proposed Development (Power Plant Area and Electricity Grid Connection) and its different phases (construction, operation and decommissioning).

Upon review of scientific evidence, likely significant effects were excluded for most identified impact pathways. However, it was determined that the more detailed NIS stage of AA was required with regard to the following impact sources:

- Water quality impacts in the construction and decommissioning phases – Power Plant Area and Electricity Grid Connection;
- Spread of non-native invasive species during the construction and decommissioning phases– Power Plant Area and Electricity Grid Connection;
- Visual and noise disturbance in the construction and decommissioning phases – Electricity Grid Connection;
- Water quality impacts during operational phase - Power Plan Area; and
- Collision with powerlines in the operational phase – Electricity Grid Connection.

The NIS considered these impacts in more detail, considering field survey data collected for the EIAR (appended where relevant) and any mitigation measures.

Regarding the River Boyne and River Blackwater SAC and SPA, the NIS identified that construction / decommissioning works in the Power Plant Area and Electricity Grid Connection, and the operational phase of the Power Plant Area could lead to negative impacts on water quality, particularly in functionally linked stretches of connecting waterbodies in proximity to the Proposed Development. However, the detailed CEMP (Appendix H) accompanying the planning application sets out an extensive list of mitigation measures that will be deployed to safeguard the water environment including a Pollution Prevention Plan. Given that adequate protection measures will be adopted, it is concluded that the Proposed Development (with other plans and projects) will not result in adverse effects on the integrity of the River Boyne and River Blackwater SAC and SPA regarding water quality in view of their conservation objectives.

During construction / decommissioning works in the Power Plant Area and Electricity Grid Connection the spread of non-native invasive species was screened into the Stage 2 Appropriate Assessment. However, since the Proposed Development incorporates a range of mitigation measures that will help avoid or minimise any potential for the spread of invasive non-native species to European sites, outlined in the CEMP (Appendix H). It is concluded that the Proposed Development (with other plans and projects) will not result in adverse effects on the integrity of the River Boyne and River Blackwater SAC and SPA in the view of their conservation objectives.

Also, regarding the River Boyne and River Blackwater SAC, it was also established that construction / decommissioning works in the Power Plant Area and Electricity Grid Connection may result in visual and noise disturbance to roaming and foraging otter given the proximity of the works to hydrologically linked watercourses with evidence of otter. While only two field signs of otter were recorded in baseline ecology surveys covering watercourses traversed by the Electricity Grid Connection, it is assumed as a precautionary measure that all local watercourses may be functionally linked to the SAC. A range of measures secured in the CEMP are considered to adequately mitigate disturbance impacts to otter, including a restriction of works to daylight hours, minimal / directional lighting and adequate securing of drainage ducts and excavations. Overall, provided that the above protection measures are implemented, it is concluded that the Proposed Development (with other plans and

projects) will not result in adverse effects on the integrity of the River Boyne and River Blackwater SAC regarding visual and noise disturbance to otter in the view of its conservation objectives.

The potential for the operational phase of the Electricity Grid Connection to result in collision mortality, loss of foraging habitat and disturbance of SCI species in the Lough Ennell SPA was also assessed in the NIS. Peak counts of 77 and 68 tufted duck were recorded in Derryarkin Bog in non-breeding bird surveys. Due to the distance between the Electricity Grid Connection and the SPA (more than 10km), it can be concluded that the recorded tufted tuck at Derryarkin Bog, ***do not*** form part of the qualifying assemblage of the SPA. No flight heights for tufted duck, (a qualifying SCI), were recorded in the vantage point surveys. However, the anticipated pylon height of 45m falls within the recorded range of flight heights reported for many other surveyed birds (25-175m). Therefore, as a standard measure, marker devices will be fitted to the powerline to minimise the risk of bird strike (including that of SCI species). Therefore, given that birds using the area around the Proposed Development are unlikely to be part of the SPA assemblage and additional precautionary mitigation in the form of bird flight diverters will be delivered, it is concluded that the Proposed Development (with other plans and projects) will not result in adverse effects on the integrity of the Lough Ennell SPA regarding collision mortality, in view of its conservation objectives.

Considering the conclusions reached above about each of the European sites screened into this NIS, then overall it can be concluded that following implementation of mitigation measures, it is considered that all aspects of the Proposed Development will have no adverse impact on the integrity of any European sites, either alone or in-combination with other plans or projects.

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Appendix A Figures

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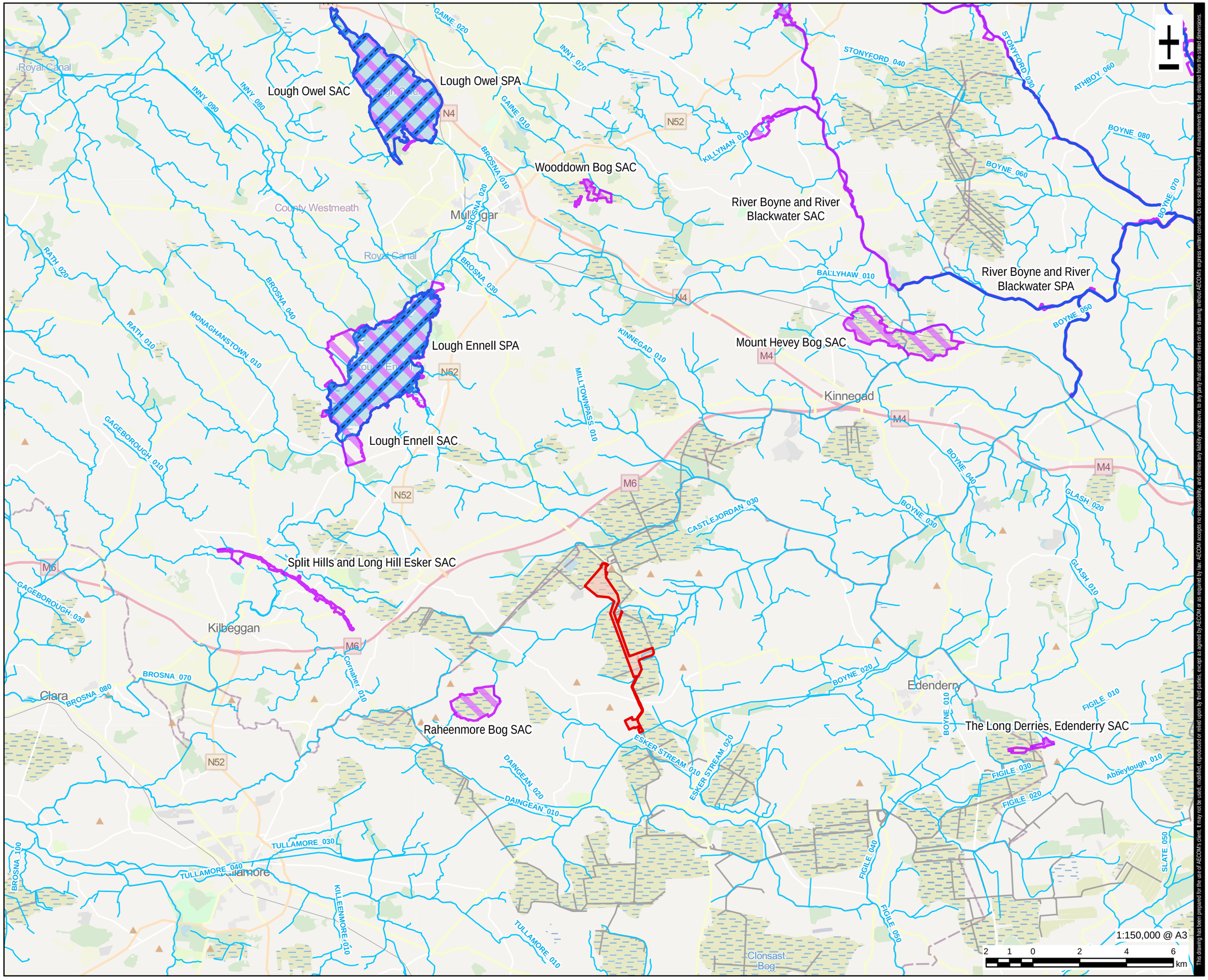

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PROJECT

Proposed Derrygreenagh Power Project

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LEGEND

- Electricity Grid Connection Boundary

Water and Drainage

- Watercourse
- Waterbody

Designated Sites

- Special Protection Area (SPA)
- Special Area of Conservation (SAC)

NOTES

ISSUE PURPOSE

FOR ISSUE

PROJECT NUMBER

60699676

FIGURE TITLE

Designated Sites in Proximity to the Electricity Grid Connection

FIGURE NUMBER

Figure 9.7

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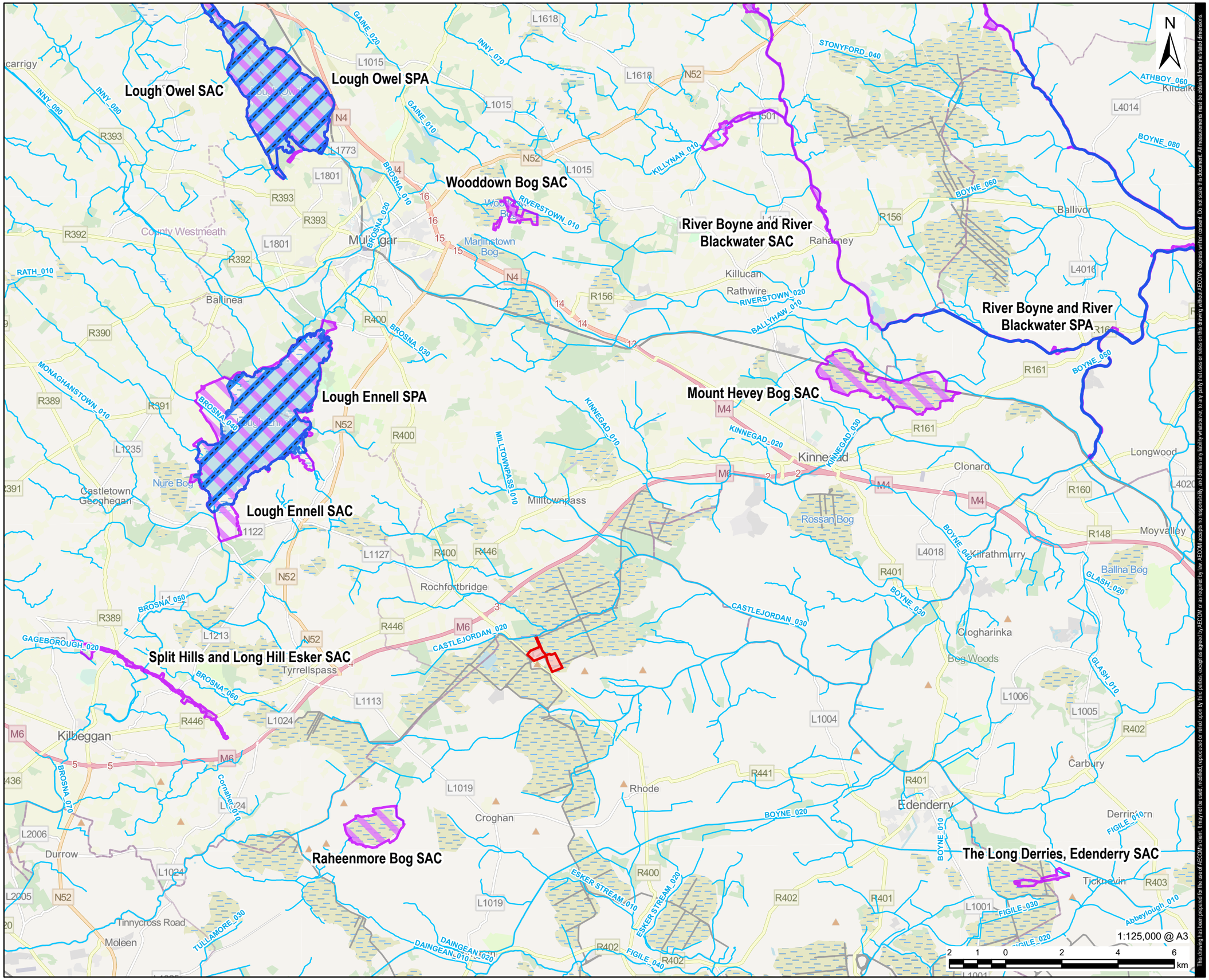

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LEGEND

- Power Plant Area Boundary

Water and Drainage

- Watercourse
- Waterbody

Designated Sites

- Special Protection Area (SPA)
- Special Area of Conservation (SAC)

NOTES

ISSUE PURPOSE

FOR ISSUE

PROJECT NUMBER

60699676

FIGURE TITLE

Designated Sites in Proximity to the Power Plant Area

FIGURE NUMBER

Figure 9.3

Appendix B Baseline Site Environment

Power Plant Area

Habitats

The Power Plant Area is located on a brownfield site known locally as Derrygreenagh Works, which is dominated by existing buildings and artificial surfaces. These areas are immediately surrounded by amenity grassland, dry meadows and grassy verges, scrub, immature woodland and mixed broadleaved/conifer woodland. Areas of cutover bog are present to the north and southeast, within Drumman bog, and to the northwest within Derryarkin bog. An area of Drumman bog is included within the red line boundary as an area for permanent peat storage following construction.

The Mongagh River is a tributary of the Yellow River ((Castlejordan)_010, 020 and 030 WFD waterbodies) and flows eastwards, north of the Power Plant Area. Wet drainage ditches (FW4) transect the cutover bog habitats. These ditches are, or are likely to be in, hydrological connection with the River Castlejordan.

The cutover bog within Drumman bog is highly degraded, with natural vegetation removed to facilitate peat harvesting, resulting in extensive areas of bare peat. Recolonization by native species is beginning in some areas resulting in a mosaic of habitats including scrub and bog woodland. Bog woodland within the Power Plant Area does not correspond to the Annex I habitat 'bog woodland (91D0)', as this Annex I habitat only occurs on intact raised bog.

Other habitats present within the Power Plant Area comprise acid oligotrophic lakes, reed and large sedge swamps, marsh, spoil and bare ground, recolonising bare ground, hedgerows and treelines.

Protected and Notable Species

Wintering bird surveys were carried out within the bogs surrounding the Power Plant Area i.e. Drumman bog and Derryarkin bog. There is suitable habitat for wintering birds within the cutover bog opposite the Power Plant Area with peak counts of 77 and 68 tufted duck in Derryarkin bog, and peak counts of 140 and 163 tufted duck at Drumman bog. No coot or pochard were recorded in the vicinity of the Power Plant Area in wintering bird surveys. The Power Plant Area itself is of limited use or suitability to wintering birds, with the peat storage area the most suitable, and most recorded birds only occasionally flying over.

During breeding bird surveys of Derryarkin bog in 2022, there was a single observation of a non-breeding kingfisher over a large quarry pond, beyond the Power Plant Area to the northwest. No breeding kingfisher were recorded within or surrounding the Power Plant Area.

No signs of otter were identified within 150m of the Power Plant Area. One otter spraint was identified on the Mongagh River approximately 0.9km to the northwest of the Power Plant Area. The Mongagh River is used by commuting otter, but no holts or layups were identified. The river has been modified and channelised which reduces its suitability as otter breeding habitat. In addition, ditches connected to the Mongagh River may be used by commuting otter.

Two locations on the Mongagh Riveer, and further downstream in the Castlejordan, were surveyed for fish and aquatic species. Salmonids and lamprey (*Lampreta* sp.) were recorded at various sites.

Electricity Grid Connection

Habitats

The Electricity Grid Connection runs from the Power Plant Area, with a 220kV substation in the north, through Derryarkin and Ballybeg bogs, to a 400kV substation in the south.

With respect to the proposed 220kV substation of the Electricity Grid Connection, habitats in this area comprise cutover bog, dry meadows and grassy verges, bog woodland, scrub, amenity grassland, recolonising bare ground and spoil and bare ground. The areas of cutover bog within the Derryarkin bog and contains both bare and partly vegetated peat.

With respect to the proposed 400kV substation of the Electricity Grid Connection, habitats in this area are dominated by improved grassland in agricultural fields with associated field boundary hedgerows. Immediately to the east of the proposed 400kV substation are scrub, spoil and bare ground, and bare cutover bog. An area of

raised bog, which is considered to qualify as the Annex I priority habitat Active Raised Bogs (7110), is present approximately 120m east of the proposed substation.

The proposed 220kV overhead line and associated infrastructure including the undergrounding compound traverses a variety of habitats, including cutover bog (specifically Ballybeg bog). Cutover bog here is both bare and partly vegetated. Oher habitats traversed by the 220kV overhead line comprise dry meadows and grassy verges, acid oligotrophic lakes, scrub, spoil and bare ground, scrub and immature woodland mosaic, immature woodland, mixed broadleaved/conifer woodland, and bog woodland. Bog woodland within the Electricity Grid Connection does not correspond to the Annex I habitat 'bog woodland (91D0)', as this Annex I habitat only occurs on intact raised bog.

Protected and Notable Species

A suite of wintering bird surveys was carried out in 2021 – 2022 and 2022 – 2023 within Derryarkin bog and Ballybeg bog. All bog habitat in the vicinity of the Electricity Grid Connection is potentially suitable for tufted duck, pochard and coot. Tufted duck were present on Roadstone and Kilmurray quarry ponds (Derryarkin bog) throughout the wintering bird surveys in small numbers (<10 individuals). However, on two occasions, 77 and 68 individuals were observed on the Roadstone quarry pond. No coot or pochard were recorded in the vicinity of the Electricity Grid Connection in wintering bird surveys.

During breeding bird surveys of Derryarkin bog in 2022, there was a single observation of a non-breeding kingfisher over a large quarry pond, beyond the Electricity Grid Connection to the north.

The Yellow River and the Castletown Tara Stream support salmonids and lamprey (*Lampreta* sp.), with evidence of otter also recorded. A potential holt was identified at the top of a peaty embankment adjoining a pipe culvert along the Castletown Tara Stream (approximately 9m outside the Electricity Grid Connection). However, based on the presence of cobwebs and the absence of otter prints or slides, the holt was concluded to be inactive in 2022 and 2023. An otter spraint was identified at a culvert crossing the Yellow River near the 220kV overhead line route. No other evidence of otter was identified (e.g., tracks, holts etc) was identified within 150m of the Electricity Grid Connection. Areas with the best quality otter habitat within proximity to the Electricity Grid Connection are the Yellow River (which intersects the Electricity Grid Connection), and the Grand Canal which is located 65m to the south. Small streams and ditches are found within the Electricity Grid Connection Site which are considered suitable for commuting and foraging otter, but no evidence of otter was recorded within these areas.

Appendix C Wintering Birds Survey Reports

BORD NA MONA
WINTER BIRD SURVEY
2021-2022

DERRYARKIN BOG GROUP
(DERRYARKIN, DRUMMAN, DERRYHINCH & BALLYBEG)

DRAFT REPORT

View of area out of recent commercial peat production, Ballybeg Bog, December 2021

Prepared for

Bord na Móna

by

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CONTENTS

APPENDICES

EXECUTIVE SUMMARY

- A baseline study of wintering birds associated with Derryarkin Bog Group (comprising Derryarkin, Drumman, Derryhinch and Ballybeg bogs) was carried out between October 2021 and March 2022. For Derryarkin and Drumman, this followed winter bird surveys carried out at the two sites in the 2020/2021 winter, as well as in six of the previous winters since 2012/2013. For Derryhinch and Ballybeg bogs, previous winter surveys had been carried out in winters 2012/13 and 2013/14.

- Derryarkin bog comprises regenerating cutaway bog habitats, including extensive wetland habitats, regenerating bog and heath and developing scrub on cutaway. A Roadstone quarry and production facility occurs within the site and this includes a large quarry lake and sparsely vegetated areas of gravel.

- Drumman bog is a large site and includes a sector that is extensively used for quarrying. The Mongagh River flows through the central area of the site. The majority of the sector of Drumman bog to the south of the Mongagh River corridor has been in recent commercial production and still comprises mainly bare peat though there are developing areas of regenerating cutaway bog vegetation. An extensive area of regenerating cutaway bog occurs north of the Mongagh River. A large wetland area with ponds and standing water has been created in the northeast section. The gravel and sand extraction area to the south of the cutaway includes a quarry lake.

- Derryhinch Bog was until recently (January 2021) mostly in commercial production and much of the site is still largely bare or sparsely vegetated peat. A small mineral island is located in the mid-west section and is dominated by birch scrub. Further stands of birch dominated scrub occur in the extreme northwest corner of the site and along the south end of the eastern boundary. Fringe habitats found along the boundaries of the site include dry grassland and scrub. An area of cutover and remnant high bog occurs along the southern boundary (south of the railway).

- Ballybeg Bog is contiguous with Derryarkin bog to the north and Cavemount bog to the south. Ballybeg Bog is sharply divided into three main ecological units: the northern part which has been out of production for some time and is re-vegetating cutaway dominated by birch scrub, the southern part which has been in recent commercial industrial production and is still largely bare peat , and the small southern outlier of largely intact raised bog, known as Coole bog.

- The study included a desk review and consultations with relevant agencies, namely National Parks & Wildlife Service, BirdWatch Ireland and the Irish Peatland Conservation Council. Field methods employed were a combination of transect surveys, vantage point watches (following method of Scottish Natural Heritage 2017) and focused surveys for wetland birds and especially swans.

- The bog sites are not part of any designated area for nature conservation.

- A review of past bird information relating to the study area concluded that generally there is very little past information available that is specific to the Bord na Móna bogs

in the study area.

- Brief descriptions of the four bog sites are given, followed by details of target species recorded, the potential for other target species, details of other species of note recorded and an overview of the value of the site for wintering birds. Maps showing locations of sampling transects and vantage points, plus flight lines of target species, are presented.

- For **Derryarkin Bog** the principal interest is the wintering population of Whooper Swans, which peaked at 102 in January 2022. While the swans feed principally on improved grassland in fields adjoining the Bord na Móna bog site, they do at times feed on regenerating wet bog and, importantly, roost within the Bord na Móna site at night (mainly on quarry lake but also at times on flooded bog). From the survey data, including the winter surveys since 2012/13, it is considered that the Whooper population is of county or regional importance. The site also supports wintering Golden Plover and Lapwing – again, these species are attracted largely to the agricultural fields which adjoin the bog site but at times use the bog for roosting purposes. Hen Harrier uses the site in winter for foraging purposes though was recorded only once in winter 2021/22. Peregrine is regular over the site during winter (nests on a man-made structure on site). As in previous winters, Little Egret was an occasional visitor to the site in winter 2021/22. Derryarkin supports a range of other species of conservation interest. Kestrel and Snipe, both Red-listed, are regular on site during winter, along with Meadow Pipit, with Woodcock localised. Amber-listed species recorded on site included Mute Swan, Teal, Tufted Duck, Lesser Black-backed Gull, Skylark (scarce), Starling and Linnet. On the basis of an important and regular population of Whooper Swan, and also usage on a regular basis by Hen Harrier (and in some winters Merlin), as well as by wetland species such as Golden Plover and Lapwing, plus a range of other Red and Amber listed species, it is recommended from the now eight winters of survey that a rating of at least **County Importance** is considered appropriate for wintering birds at Derryarkin Bog.
- The surveys over the eight winters of survey have shown that **Drumman Bog** is used occasionally as a feeding and/or roost site by small numbers of Whooper Swans and that small parties at times pass over the site. Of particular note is the Mute Swan population, which is largely resident on site, and peaked at 138 in December 2021. Other wetland birds are fairly scarce, with occasional flocks of Lapwing and Golden Plover landing within the site though both these species regularly pass over the site. while Teal, Water Rail and Snipe are also present. A notable flock of Tufted Duck was present on site through much of the winter, with a peak count of 163 in February 2022. Drumman provides good foraging habitat for raptors, with Hen Harrier, Merlin, Peregrine, Kestrel, Sparrowhawk and Buzzard all recorded during winter. The site supports a range of other species of conservation interest. Meadow Pipit, Red-listed on basis of breeding population, occurs throughout much of the site during winter. Further Amber listed species recorded on site included Teal, Skylark, Starling and Linnet. On the basis of the occurrence of some wetland bird species (inc. Annex I listed Golden Plover) and fairly regular usage by Hen Harrier, Merlin and Kestrel, plus a range of other Red and Amber listed species, it is recommended from the seven winters of surveying that a rating of **County Importance** is considered appropriate for wintering birds at Drumman Bog.
- **Derryhinch Bog** is in an early stage of re-vegetation and has relatively low potential

for wintering birds. However, Golden Plover was recorded over the site, with birds landed on bare peat on several occasions. Snipe occurs in small numbers on site. The site provides useful habitat for various bird of prey species and especially Kestrel (Red listed) and Buzzard. Species such as Hen Harrier and Merlin could be expected to pass through the site at times. Meadow Pipit, Red-listed on basis of breeding population, occurs throughout much of the site during winter. The Red-listed Redwing is regular in area during winter and at times occurs within the site. Amber-listed species recorded on site included Skylark, Goldcrest, Starling and Linnet. On the basis of the occurrence of some wetland bird species (inc. Annex I listed Golden Plover) and fairly regular usage by bird of prey species, it is recommended from the 2021/22 winter survey that a rating of **Local Importance (higher value)** is appropriate for wintering birds at Derryhinch Bog.

- **Ballybeg Bog** is characterised by various types of habitats, with (i) well re-vegetated cutaway bog dominated by scrub, (ii) mostly bare peat from recent commercial production (now ceased), and (iii) a small area of fairly intact high bog (Coole Bog). Both Whooper Swan and Mute Swan were recorded passing over the site, presumably commuting between Derryarkin and Cavemount to the south. Golden Plover was recorded landed on bare peat on two occasions, as well as birds flying over the site. Lapwing was also recorded passing over the site. Snipe (Red-listed) occurs within the site though mostly in small numbers. The site provides useful habitat for various bird of prey species and especially Kestrel (Red listed), Sparrowhawk and Buzzard. Merlin was recorded on site in winter 2021/22, while Hen Harrier would be expected at times and Peregrine may hunt over the site. Meadow Pipit, Red-listed on basis of breeding population, occurs throughout much of the site during winter. The Red-listed Redwing is regular in area during winter and at times occurs within the site. Amber-listed species recorded on site included Skylark, Goldcrest, Starling and Linnet. On the basis of the occurrence of some wetland bird species (inc. Annex I listed Golden Plover and Merlin) and fairly regular usage by bird of prey species, it is recommended from the 2021/22 winter survey that a rating of **Local Importance (higher value)** is appropriate for wintering birds at Ballybeg Bog.

1.0 INTRODUCTION

Bord na Móna is considering using some of its bogs in the midlands for wind farm development and has carried out some high level assessment of the suitability of various sites for this purpose.

As part of the planning work, Bord na Móna had commissioned baseline surveys of wintering birds on the Derryarkin Bog Group (comprising Derryarkin, Drumman, Ballybeg and Derryhinch bogs).

For Derryarkin and Drumman bogs, winter surveys were carried out in 2012/13, 2013/14, 2014/15, 2015/16, 2016/17, 2018/19 and 2020/21 (project reports prepared by BES 2013, 2014, 2015, 2016, 2017, 2019, 2021).

For Ballybeg and Derryhinch bogs, winter surveys were carried out in 2012/13 and 2013/14 (project reports prepared by BES 2013, 2014).

These surveys will provide key baseline data in the assessment of the impact on birds of potential wind farm construction and operation.

To progress the above further, Bord na Móna issued a request for a bird study of the Derryarkin Bog Group (4 bog sites) in winter 2020/21.

A contract to carry out the required work was awarded to BioSphere Environmental Services in September 2021.

As with the previous winter surveys, key requirements of the study were as follows:

- Consult with appropriate bodies, such as NPWS and BWI, regarding sightings and any existing information on the site or surrounding area and discuss / agree appropriate methodologies in the context of the scale and nature of the sites
- provide GIS maps of features and sightings of interest
- provide a detailed recommended methodology for future bird surveys should the project proceed to EIS
- provide a description of the suitability of the habitats present for key species not recorded but which could potentially occur
- provide a summary of likely constraints with regard to the known bird community.

The present report considers the results of the 2021/22 surveys for the Derryarkin bog sites, with reference made to the earlier surveys.

2.0 SURVEY METHODS

2.1 Desk Review and Consultations

A thorough desk review had been carried out for available information for the sites in the Derryarkin Bog Group for the winter bird surveys starting in 2012/13.

Since then, the present writer is not aware of any additional sources of external information relating to the four Derryarkin Bog Group sites.

2.2 Field Surveys

The tender documentation had noted the following points in respect of survey methodology:

- The Winter Bird Surveys should be undertaken between the months of October and March (i.e. 6 months) and should focus in particular on wintering waders, wildfowl - notably geese and swans, any winter Hen Harrier roosts, other raptors, Annex 1 species and birds of conservation interest.
- The survey should include all, or a selection of the following; focused wetlands surveys; transects; vantage point surveys; bog walks; roost watches; flight paths and migration studies; or other methodologies as appropriate.
- All vantage points (as described in the tender brief) should be surveyed to achieve or exceed the 36 hr observation duration required by the Vantage Point methodology (Scottish Natural Heritage, 2017).

The tender also noted that '*adherence to approved methodologies is a key requirement of the project. However, given the scale and fragmented nature of the area to be surveyed, and the nature of the studies to be undertaken, a pragmatic approach is required. This must balance the detail required to be acceptable for a planning application for a wind farm project of very significant scale with the fact that much of the area is still utilised for industrial scale peat extraction or peat extraction has ceased only recently*.'

Taking the above into account, the following approach was taken at the sites:

2.2.1 Number of site visits

Monthly site visits were made to all sites between October 2021 and March 2022 (i.e. 6 rounds of site visits).

2.2.2 Survey methods

Use of the following methods was employed at the sites as relevant. However, transect surveys and vantage point watches were the main methods and a combination of these were used in all sites.

Surveys were carried out largely in suitable weather conditions, with avoidance of persistent rain, mist/fog and winds in excess of F4-5.

Transects surveys

The use of transects to record birds within sites is a well-established survey method (Bibby *et al.* 2000). The method is particularly useful for open habitats such as peatlands. The value of the method is that it is repeatable over time, which is particularly relevant to the Bord na Móna cutaway bogs where habitat conditions are somewhat transient and bird communities can be expected to change over time in response to vegetation types present.

The transects selected typically followed identifiable tracks (inc. rail tracks) which made coverage quicker and also safer compared to across open bog. Further, tracks are often slightly elevated which makes recording more efficient. The number of transects used at each site was determined by the size of the site and the diversity of habitats present.

Bird recording is normally within a zone 200-300 m wide either side of the transect though the flat nature of the sites made larger sized or obvious birds (such as Golden Plover flocks) at further distances easily visible. Birds were recorded by sight (with aid of binoculars) and sound.

Vantage point surveys

Vantage point surveys were carried out in accordance with the methodology used for assessing impacts of wind farms on bird communities published by Scottish Natural Heritage (2017). The purpose of these surveys was mainly to detect birds of prey and passing waterbirds (swans, geese, duck, waders etc.), though all birds observed during watches were recorded. At the Derryarkin bogs, the full duration of 36 hours of observations over the site during the winter period was achieved as required by the methodology.

A representative number of vantage points were established to provide views over large areas of the site and adjoining lands, with focus on expanses of habitats of potential value to wintering birds. The vantage points were positioned on elevated ground where feasible – these range from naturally higher ground (hillocks etc) to roads/embankments.

When a target species was sighted during a watch, the flightline was plotted onto a field map along with estimated flight height[1], duration of observation and any other parameters such as age and gender of bird, behaviour of bird (e.g. hunting, flying, roosting) etc.

Focused surveys for wetland birds

Search was made in the areas surrounding the bog site for potential wetland or grassland sites which could support wintering waterbirds.

2.2.3 Target species

The winter surveys were focused on the potential presence of the following groups of birds or species:

- Waterfowl, especially Whooper Swan and Greenland White-fronted Geese
- Waders, especially flocks of Golden Plover, Lapwing and Curlew
- Hen Harrier, Merlin and other birds of prey
- Any other Annex 1 species of EU Birds Directive
- Any Red or Amber listed species as given in Gilbert et al. 2021.

2.3 Survey Limitations

Surveys following standard methods and within the recommended time frame were carried

[1] While actual flight height of target species was estimated in field, values are given in the following bands in Appendix 2: 0-25 m; 25-175 m; >175 m

out at the Derryarkin bogs during the 2020/21 winter and hence there were no survey limitations.

However, bird populations can vary between years, mainly as a result of weather but also due to other factors such as breeding success, local disturbance at sites, etc. (see Crowe 2005). For instance, species such as Golden Plover and Lapwing are highly affected by cold weather events. Cold weather usually results in large-scale movements, particularly from their preferred inland feeding areas to the relatively ice-free coastline. Under more severe conditions, they may vacate Ireland altogether, possibly for France and Iberia. Whooper Swans may also be affected by severe cold weather and in the 2010 national census results were considered to be affected by the severe weather at the time, which resulted in flocks being widely dispersed and in locations where they had not previously been recorded as a result of the freezing-over of water bodies (Boland *et al*. 2010). It is therefore preferable to have more than one season's data in evaluating the importance of sites so as to dampen annual fluctuations in numbers (Crowe 2005). With baseline data available for each winter since 2012/13, the results of the present survey will provide a more robust assessment of the importance of the Derryarkin bogs for wintering birds.

2.4 Criteria for Evaluation of Ornithological Importance of Sites

The importance of winter wetland bird populations is evaluated according to the standard 1% thresholds for national (all-Ireland) and international importance (see Crowe 2006, Boland & Crowe 2012, Delaney and Scott 2006).

Evaluation of sites may also be made on the basis of the presence of species listed in Annex I of the EU Birds Directive or species listed as 'Birds of Conservation Concern', either on the Red List (High conservation concern) or Amber List (Medium conservation concern) (after Gilbert et al. 2021). As evaluating sites due to the presence of such is not quantitative, a subjective assessment may need to be made – for instance, the regular presence within a site of a breeding pair of Peregrines (Annex I species) would be of more significance than the occasional record of hunting birds.

For an overall ecological assessment of the importance of a site, taking into account not just ornithological interests but also habitats, flora and other fauna types etc., reference is made to the NRA *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (NRA, 2009). Whilst the NRA guidelines were devised specifically for road schemes, they can be applied to general environmental impact assessment. The NRA system uses the following five-point scale:

- International Importance
- National Importance
- County Importance
- Local Importance (higher value)
- Local Importance (lower value)

3.0 RESULTS AND DISCUSSION

3.1 Sites Designated for Nature Conservation

No parts of the bog sites which are the subject of the present report are part of any site designated for nature conservation.

A list of designated sites within a distance of approximately 15 km of the study area is given below. These comprise Special Protection Areas (SPAs), Special Areas of Conservation (SACs), Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs).

It is noted that apart from SPAs, these sites do not necessarily have ornithological interests though many would support some birds of conservation interest.

Lough Ennell SPA (code 004040) and SAC (code 000685)

Lough Ennell is a large, limestone lake. The lake is classified as a mesotrophic system by the EPA though it had been eutrophic in the past. The site is an SAC due to the presence of the Annex I habitat alkaline fen.

Lough Ennell is one of the most important midland lakes for wintering waterfowl, with nationally important populations of Mute Swan, Pochard, Tufted Duck and Coot. At times, the lake is utilised as a roost (with limited feeding) by the internationally important midland lakes population of Greenland White-fronted Goose (*c*.400 strong). The site also attracts Golden Plover (200) and Lapwing (673) though these species feed mainly outside of the SPA site.

Lough Ennell is located approximately 10 km to the north-west of Drumman and Derryarkin bogs.

Raheenmore Bog SAC (code 000582)

Raheenmore Bog is a classic example of a largely intact raised midland bog. It is located approximately 4 km southeast of Derryarkin bog.

The NPWS site synopsis notes the site is within the breeding territory of a pair of Merlin, and supports typical bogland birds such as Red Grouse and Snipe.

Mount Hevey Bog SAC (code 002342)

Mount Heavy Bog SAC is a good example of a mostly intact raised bog. It is located to the northeast of Kinnegad and approximately 11 km north east of Drumman Bog.

This site is not of known ornithological interest.

Milltownpass Bog NHA (code 002323)

This NHA is a fine example of a relatively intact raised bog. It is located approximately 3 km north of Drumman Bog.

This site is not of known ornithological interest.

Molerick Bog NHA (code 001582)

This NHA is a fine example of a relatively intact raised bog. It is located about 4 km west of Longwood and approximately 15 km northeast of Drumman Bog.

This site is not of known ornithological interest.

Cloncrow Bog (New Forest) NHA (code 000677)

This NHA, which is a fine example of a relatively intact raised bog, is located over 5 km west-northwest of Derryarkin.

The NHA is not of known ornithological interest.

Black Castle Bog NHA (code 000570)

This NHA is a good example of a relatively intact raised bog and is noted for its easterly location. It is located about 7 km east-southeast of Derryarkin bog.

This NHA site is not of known ornithological interest.

Daingean Bog NHA (code 0002033)

This NHA is a good example of a relatively intact raised bog. It is located about 9 km south west of Derryarkin bog.

This NHA site is not of known ornithological interest.

Grand Canal pNHA (code 02104)

The Grand Canal pNHA runs approximately 5 km to the south of Derryarkin.

The canal supports a wide range of ecological interests, including bird species such as Mute Swan, Moorhen, Mallard and Kingfisher.

Royal Canal pNHA (code 02103)

The Royal Canal pNHA passes approximately 7 km north of Drumman Bog.

The canal supports a wide range of ecological interests, including bird species such as Mute Swan, Moorhen, Mallard and Kingfisher.

Murphy's Bridge Ridge Esker pNHA (code 01775)

The pNHA is a good example of an esker ridge with calcareous grassland and supports the rare and protected hemp nettle. It is situated within about 8 km southwest of Derryarkin Bog.

This site is not of known ornithological interest.

3.2 Review of Past Data for Study Area

Apart from a commissioned study of breeding birds at six bog sites, including Drumman Bog, in the Derrygreenagh/Ballydermot group by Dr Alex Copland (BirdWatch Ireland) in 2010 and 2011 (Copland 2010, 2011), and some general information on the two sites collated by

the Bord na Móna ecology team, there is no specific past reference to the birds of the Derryarkin bogs.

Bird Reports

The recording catchment for the report ***Birds in Central Ireland – Mid Shannon Bird Report*** (edited by Stephen Heery) unfortunately is just on the western margin of the Derryarkin study area (report area extends east to a strip from Raheen Lough to Lough Ennel). Nevertheless, the report is a useful comparative source of information and does make reference to sites such as Lough Ennel and Raheenmore Bog, as well as occasional reference to Bord na Móna sites further east such as Ballycon bog. Issues of the report are available for the following periods: 1992-1995, 1996-1999, 2000-2003, 2004-2007, 2008-2011 and 2012-2016.

Other Sources of Information

NPWS

The study area is covered by NPWS Conservation Ranger Mr Colm Malone. Colm has noted that NPWS would not have any specific bird information relating to the Derryarkin bog sites.

Irish Peatland Conservation Council

The IPCC does not have any information specific to Derryarkin and Drumman Bogs.

BirdWatch Ireland

Dr Alex Copland (formerly) of BirdWatch Ireland carried out on behalf of Bord na Móna a breeding bird survey of Drumman Bog and Ballybeg Bog as part of a study on six bog sites in the Derrygreenagh and Ballydermot group during 2010 and 2011 (see Copland 2010, 2011). However, the study was confined to breeding birds and did not include the wintering period.

Overall Appraisal of Available Information

The desk review which had been carried out for the bog sites within the Derrygreenagh and Ballydermot Bog Groups concluded as follows:

"…*while there is some past bird information relating to the study area, including recent collation of bird records from the bog sites by the Bord na Móna ecology team, the information is generally derived from casual observations and is of limited value in the context of the present study*. "

This conclusion applies to the two bog sites which are the subject of the present report.

3.3 Derryarkin Bog

3.3.1 Site Description

Derryarkin bog is a large site located at Derrygreenagh to the western side of the R500 road. The site adjoins Drumman bog to the east and Ballybeg bog to the southeast. Access is easily available from a road leading to the Kilmurray quarry works and an active farm (latter known as Derryarkin farm for purpose of this study). Access is also available from the Roadstone quarry facility (within the site). The site extends for up to 2 km from north to south and for up to 4 km from east to west. The site has been out of commercial peat production for a considerable time.

Derryarkin bog comprises regenerating cutaway bog habitats, including extensive wetland habitats, regenerating bog and developing scrub. Associated with the Roadstone facility is one large quarry lake with a gravel islet and several smaller lakes and ponds, as well as bare or sparsely vegetated areas of gravel. Kilmurray quarry to the southwest also has a number of large ponds, with active excavations in progress at the time of the 2021/22 survey.

The site is adjoined by further areas of cutaway bog to the west and also to the south-east. A forest plantation (on former bog) occurs to the southwest, while agricultural lands occur to the north and to the south of the site.

Plate 1. View of eastern sector of Derryarkin Bog showing well developed wetland habitats on cutaway bog.

3.3.2 Survey Locations

Transect 1 starts from the internal access road and follows the railway line in a northwest direction for approximately 2 km. The transect continues along the railway line in a southwest direction towards the western end of the site. This transect covers a large area of regenerating cutaway bog including the wetlands on site.

Vantage Point 1 is located along the internal access road and looks over a large area of mainly wetland habitats.

Vantage Point 2 is located along transect 1 and looks over much of the central area of the site including the Roadstone quarries.

Vantage Point 3 is located towards the end of transect 1 and looks over the western sector of the site (regenerating cutaway bog with scrub).

3.3.3 Results and Discussion

A summary of the variables (date, time, weather etc.) for the vantage point watches carried out at Derryarkin Bog between October 2021 and March 2022 is presented in Appendix 1. Survey raw data for the vantage point watches are presented in Appendix 5.

Scientific names of bird species are given in Appendix 9.

Target species recorded

Whooper Swan

As in each of the winters since 2012/13, the Derryarkin site area was used by a population of Whooper Swans through the 2021/22 winter. Swans had arrived in the Derryarkin area by the survey on 20th November, with 58 birds feeding in the adjoining grassland fields.

Numbers increased during December, with 98 present on the 16th, and 102 on 20th January (winter peak). Numbers remained at this level for remainder of winter, with 96 counted on 3rd March. At least 26 birds were still present on 25th March.

As in previous winters, most swan observations were made in the fields adjoining the cutaway bog to the south and southwest. Some usage was made of the cutaway bog by feeding swans (maximum of 34 on 24th January) and at times night roosting birds.

The Roadstone quarry pond remained the principal location for night roosting though some roosting occurred on the Kilmurray quarry ponds and, as noted, on the cutaway bog. Flightlines from the feeding fields to the ponds were recorded quite regularly in the late afternoon period, as well as in the mornings.

Flightlines were recorded on ten occasions, most were considered to represent birds flying between feeding and roost sites. Flight heights were invariably low, with all less than 20 m.

Mute Swan

Mute Swan was regular through the winter on Roadstone and Kilmurray quarry ponds, with at least 10 birds present on most dates through the winter. A higher count of 48 was made at the Roadstone quarry pond on 17th February, which was expected to be birds from Drumman where there was a regular winter population (at times exceeding 100 birds).

Four flightlines were recorded, which appeared mostly to involve birds commuting to or from Drumman.

Little Egret

One to two Little Egrets wintered in the area (inc. Drumman). Two were recorded feeding in cutaway bog on 21st October, with a further four records involving single birds.

The presence of Little Egret at these sites has been a feature in recent winters.

Hen Harrier

One record, as follows:

- 14th February – female type bird hunting over cutaway bog from VP1

Hen Harrier is an occasional winter visitor, 1-2 birds recorded in most winters.

Sparrowhawk

Sparrowhawk was recorded on four occasions through the winter. Records involved hunting birds, with a pair displaying on 28th February (breeds on site).

Buzzard

Buzzard was recorded on site through much of the winter – most records involved single birds but three together on 22nd October and two together on three dates (19th November, 20th January, 17th February). 1-2 pairs of Buzzard breed locally.

Kestrel

Kestrel was recorded on site in all months. All records were of single birds and involved male and female birds. Most observations were of hunting birds. Kestrel breeds locally

Peregrine

There were six records of Peregrine over the site through the winter. Peregrine breeds on site, with birds observed at the breeding location in February and March.

Golden Plover

A regular flock of Golden Plover winters in the pasture fields (Derryarkin farm) which adjoin the cutaway bog. This flock also frequents the Drumman bog area and fields to the north of the motorway and was estimated to be up to 1,000 birds. Birds roost at times on the cutaway bog in the eastern sector of Derryarkin.

There were eight flightlines over the site between October and February. High numbers included 400+ on 29th October, 500+ on 16th December, and 360 on 14th February.

Lapwing

Regular through winter in pasture fields adjoining the cutaway bog and usually associating with the Golden Plover flock (as described above). Occurs also at times on the cutaway bog.

There were six flightlines over the site between October and February. Highest number was at least 200 on 20th November.

Territorial birds observed on cutaway bog from February onwards.

Woodcock

Two Woodcock were flushed along a track in western sector of site on 17th December. Woodcock has been recorded in this area of site previously.

Curlew
As in previous winters, a regular flock of Curlew was present in the Derryarkin pasture fields and at the Kilmurray quarry ponds from October to February. Numbers were mostly between 20 and 40 birds, though a higher count of 52 was made on 29th October. No flightlines were recorded over site.

Kingfisher
On 19th November, one flew across quarry pond and landed on a willow.

Potential for other target species

Merlin has been recorded on site in the past and is likely to pass through site at times.

Other species of note

Greylag Goose – five on Roadstone quarry pond in March were considered feral birds.

Mallard – regular through the winter on quarry ponds and flooded bog. Peak of 50+ on Roadstone quarry pond on 29th October.

Teal – present on site (bog ponds and quarry lakes) through the winter though in relatively small numbers. Peak count of 11 on 19th November.

Tufted Duck – present on Roadstone and Kilmurray quarry ponds throughout the survey period in small numbers (<10). High counts of 77 and 68 on the Roadstone quarry pond on 24th January and 3rd March (mostly males) respectively – these were probably part of the wintering flock which was regular at Drumman.

Great Crested Grebe – two on the Roadstone quarry pond in February and three in March (one obvious pair).

Little Grebe – present through the winter on Roadstone quarry ponds (maximum of 5) and Kilmurray quarry ponds (maximum of 4). Calling birds in March.

Snipe – recorded on site in low numbers (<10) and usually singly. Hight count of 18 in cutaway bog on 14th February.

Redshank – two recorded at Roadstone quarry pond on 14th February.

Lesser Black-backed Gull – flock of 63 roosting on Roadstone quarry pond on 29th October. Smaller numbers (up to 28) seen on several dates in October and November.

Skylark – recorded in October (5), November (1) and March (11).

Mistle Thrush – flock of 21 birds flew across cutaway bog in western sector on 21st October. Small numbers (<5) recorded on site through much of winter.

Redwing – flocks present in marginal hedging and in fields in December and January, with high counts of 200+ on 10th December and c.300 on 6th January.

Stonechat – present through winter, with at least two territorial pairs in February and March.

Starling – large flocks observed as follows: c.2,000 on 25th November; c.6,000 on 16th December; c.5,000 on 6th January, c.3,000 on 24th January. These birds were recorded in late afternoon/evening (dusk) going to roost in conifer plantation to west of site (a regular roost used each winter).

Meadow Pipit – regular on site through the winter though in small numbers in the mid-winter period. Peak of 15 in February transect survey. Also, a flock of 28 in cutaway bog in eastern sector on 22nd October.

SITE: DERRYARKIN – TRANSECT SURVEYS, 2021-22

Species	Date 21/11/21	Date 19/01/22	Date 27/02/22	BoCCI Status
Whooper Swan		**58**	**45**	**A**
Mute Swan	**5**	**4**	**8**	**A**
Teal	**5**	**0**	**3**	**A**
Mallard	23	16	9	**G**
Grey Heron	2	1	6	**G**
Little Egret	1	0	0	**G**
Sparrowhawk	0	0	0	G
Buzzard	2	0	1	**G**
Kestrel	**0**	**0**	**1**	**R**
Moorhen	3	0	1	**G**
Lapwing	**9**	**0**	**5**	**R**
Snipe	**5**	**2**	**3**	**R**
Curlew	**0**	**0**	**0**	**R**
Woodpigeon	22	10	5	**G**
Magpie	3	1	1	**G**
Rook	50+	10	0	**G**
Jackdaw	30+	12	101	**G**
Hooded Crow	7	5	5	**G**
Raven	0	2	0	**G**
Goldcrest	**2**	**0**	**1**	**A**
Blue Tit	0	0	3	**G**
Great Tit	2	0	2	**G**
Dunnock	1	0	1	**G**
Coal Tit	7	0	4	**G**
Skylark	**2**	**0**	**6**	**A**
Starling	**10+**	**50**	**10**	**A**
Wren	7	2	9	**G**
Blackbird	5	5	7	**G**
Fieldfare	0	100+	0	**G**
Song Thrush	1	1	2	**G**
Redwing	**0**	**100+**	**0**	**R**
Mistle Thrush	4	2	3	G
Robin	5	4	9	G
Stonechat	3	1	3	G
Meadow Pipit	**10**	**8**	**15**	**R**
Pied Wagtail	2	2	1	**G**
Chaffinch	14	100+	12	**G**
Goldfinch	0	20+	6	**G**
Linnet	**3**	**50+**	**5**	**A**
Lesser Redpoll	12	8	4	**G**
Siskin	0	0	0	**G**
Reed Bunting	4	3	6	**G**

BoCCI Status: **R – Red**; **A – Amber**; **G – Green** (after Gilbert et al. 2021)

General discussion

The 2021/22 survey at Derryarkin has added to the baseline winter bird assessments carried out in winters 2012/13, 2013/14, 2014/15, 2015/16, 2016/17, 2018/19 and 2020/21. A consistent pattern of bird usage at the site is apparent, particular by waterbirds, but also by foraging raptors. Of principal interest is the wintering population of Whooper Swans, which peaked at 102 in January. The swans are present more or less continuously through the winter, feeding principally on improved grassland in fields adjoining the Bord na Móna bog site but at times feed on regenerating wet bog and use the local quarry ponds for night roosting (with some roosting also on the cut bogs). The average monthly peak count from November through to March was 86, which is below the threshold for national importance (*i.e.* 150) but certainly considered of regional/county importance.

As in previous years, the site also supports wintering Golden Plover and Lapwing – as with the swans, these species are attracted largely to the agricultural fields which adjoin the bog site but do at times use the cutaway bog for feeding and/or roosting purposes. It is estimated that the flock size in the wider area for Golden Plover and Lapwing was a minimum of 1,000 and 400 respectively. The number of Golden Plover within the Derryarkin site area is above the threshold for national importance (920), while the number of Lapwing is below the threshold for national importance (850).

Small numbers of other wetland species, including Mute Swan, Teal and Snipe, occur within the site, along with Little Egret and, on one occasion, Kingfisher. Woodcock (Red-listed) is also a winter visitor to the site (probably under-recorded).

Hen Harrier has been an occasional winter visitor in all the winter surveys though only one bird was recorded in the 2021/2022 winter. Peregrine is regular over the site (reflecting the presence of a nesting location on site). Sparrowhawk, Buzzard and Kestrel (Red-listed) are regular on site and in adjoining areas.

The site supports a range of other species of conservation interest. Meadow Pipit (Red-listed on basis of breeding population) occurs throughout much of the site during winter though in small numbers for the main winter period. Redwing (now a Red list species) is regular in the local hedgerows and fields though does not use the cutaway bog habitats.

Other species of interest (all Amber-listed) include Great Crested Grebe, Tufted Duck, Skylark, Goldcrest, Starling (roost on boundary of site) and Linnet.

3.3.4 Evaluation and Rating of Derryarkin Bog for Wintering Birds

There follows a summary of the conservation status of species recorded on Derryarkin Bog in winter 2021/22:

EU Birds Directive Annex I listed species

Whooper Swan
Little Egret
Hen Harrier
Peregrine
Golden Plover
Kingfisher

Red Listed species (after Gilbert et al. 2021)

Kestrel
Lapwing
Golden Plover
Snipe
Curlew
Woodcock
Redwing
Meadow Pipit

Amber Listed species (after Gilbert et al. 2021)

Great Crested Grebe
Mute Swan
Whooper Swan
Teal
Tufted Duck
Lesser Black-backed Gull
Skylark
Starling
Linnet

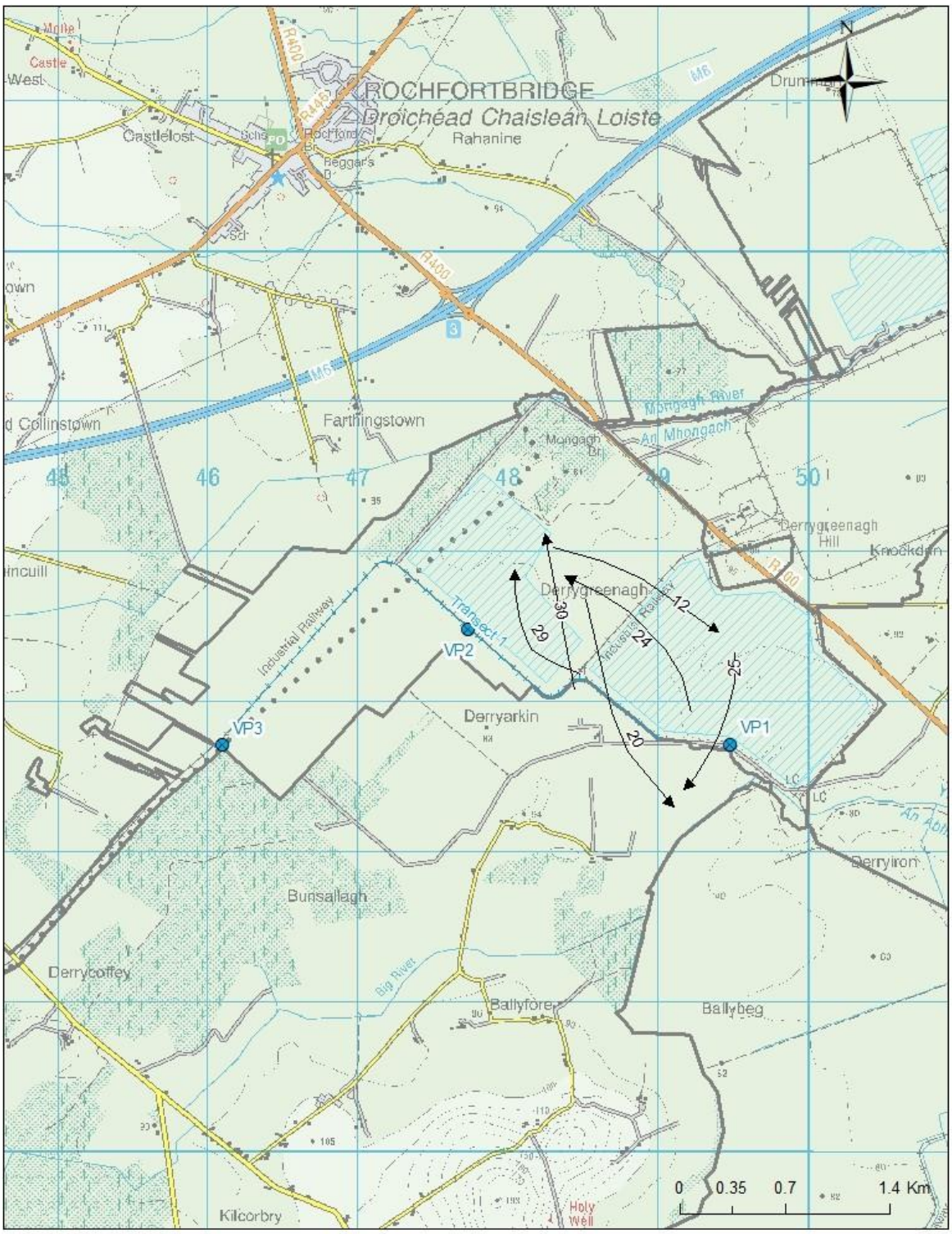
Derryarkin cutaway bog has habitats suitable for supporting a wide range of wintering birds. Of particular note is the developing wetland habitat, which includes permanent ponded areas. Also of note is a substantial artificial lake at the Roadstone works which is used by wetland birds.

Since at least the 2013/14 winter survey, the Derryarkin bog site and adjoining areas have supported a population of Whooper Swans which in some winters has reached the threshold for National Importance (though not in winter 2021/22). While the swans may at times utilise cutaway bog sites in the wider area (such as Cavemount and possibly Ballycon bogs), the Derryarkin area is the primary site for the population. On the data of recent winters, it is considered appropriate to rank the Derryarkin swan population of County or Regional importance rather than National importance.

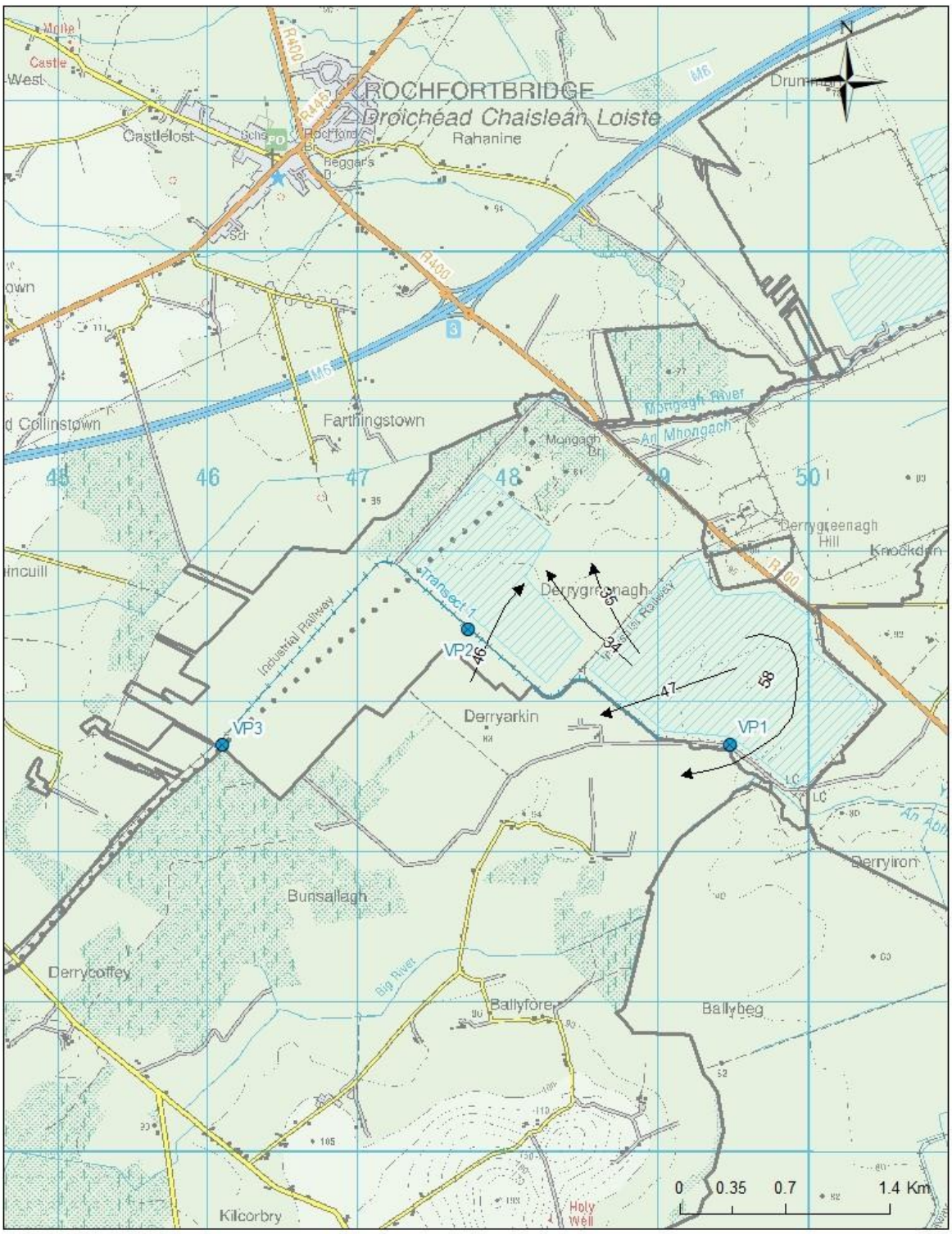
The other main feature of the Derryarkin site is that it is used by Hen Harrier for foraging and also provides useful habitat for other raptor species including Peregrine and Kestrel.

On the basis of an important and regular population of Whooper Swan, and also usage on a regular basis by Hen Harrier as well as other wetland species such as Golden Plover and Lapwing, plus a range of Red and Amber listed species, it is recommended from the now eight winters of surveying that a rating of **County or Regional Importance** is considered appropriate for wintering birds at Derryarkin Bog.

Derryarkin Map 1a: Map showing transect and vantage point locations, with Whooper Swan flightlines.



Derryarkin Map 1b: Map showing transect and vantage point locations, with Whooper Swan flightlines.

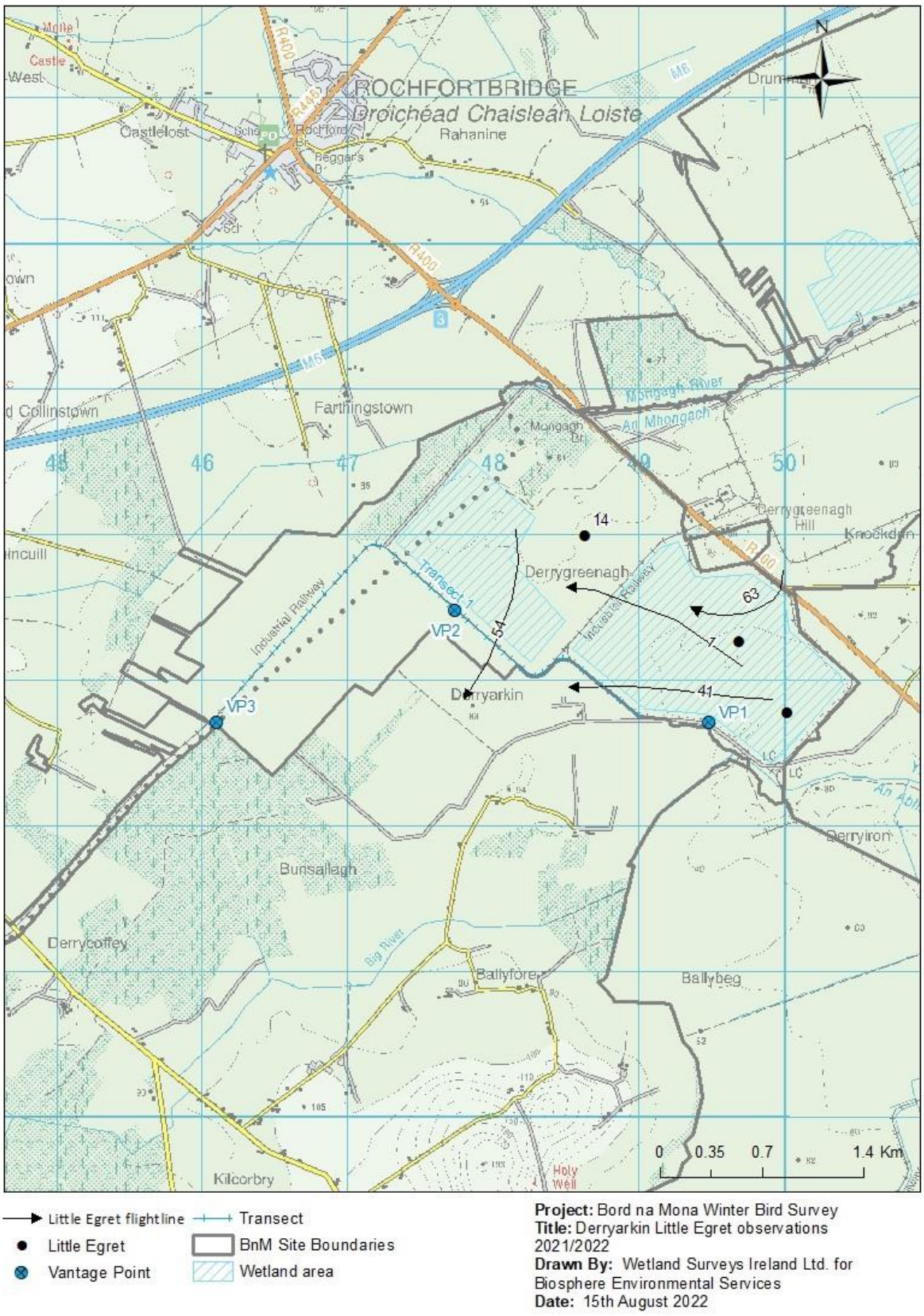


Whooper Swan flightline
Vantage Point
Transect
BnM Site Boundaries
Wetland area

Project: Bord na Mona Winter Bird Survey
Title: Derryarkin Whooper Swan observations 2021/2022
Drawn By: Wetland Surveys Ireland Ltd. for Biosphere Environmental Services
Date: 15th August 2022

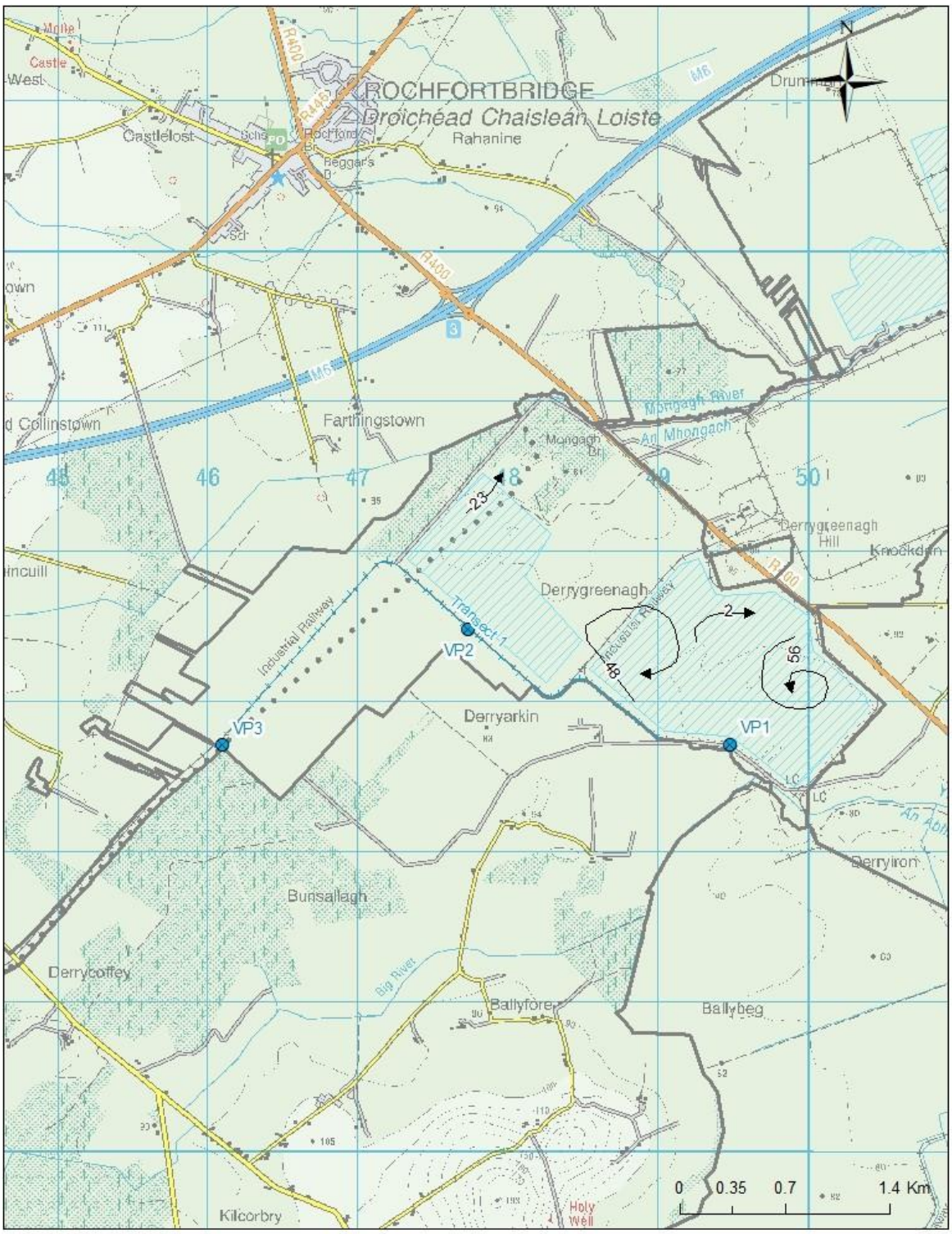
Derryarkin Map 2: Map showing transect and vantage point locations, with Mute Swan flightlines.

Derryarkin Map 3: Map showing transect and vantage point locations, with Little Egret flightlines.



Derryarkin Map 4: Map showing transect and vantage point locations, with Hen Harrier flightlines.

Derryarkin Map 5: Map showing transect and vantage point locations, with Sparrowhawk flightlines.



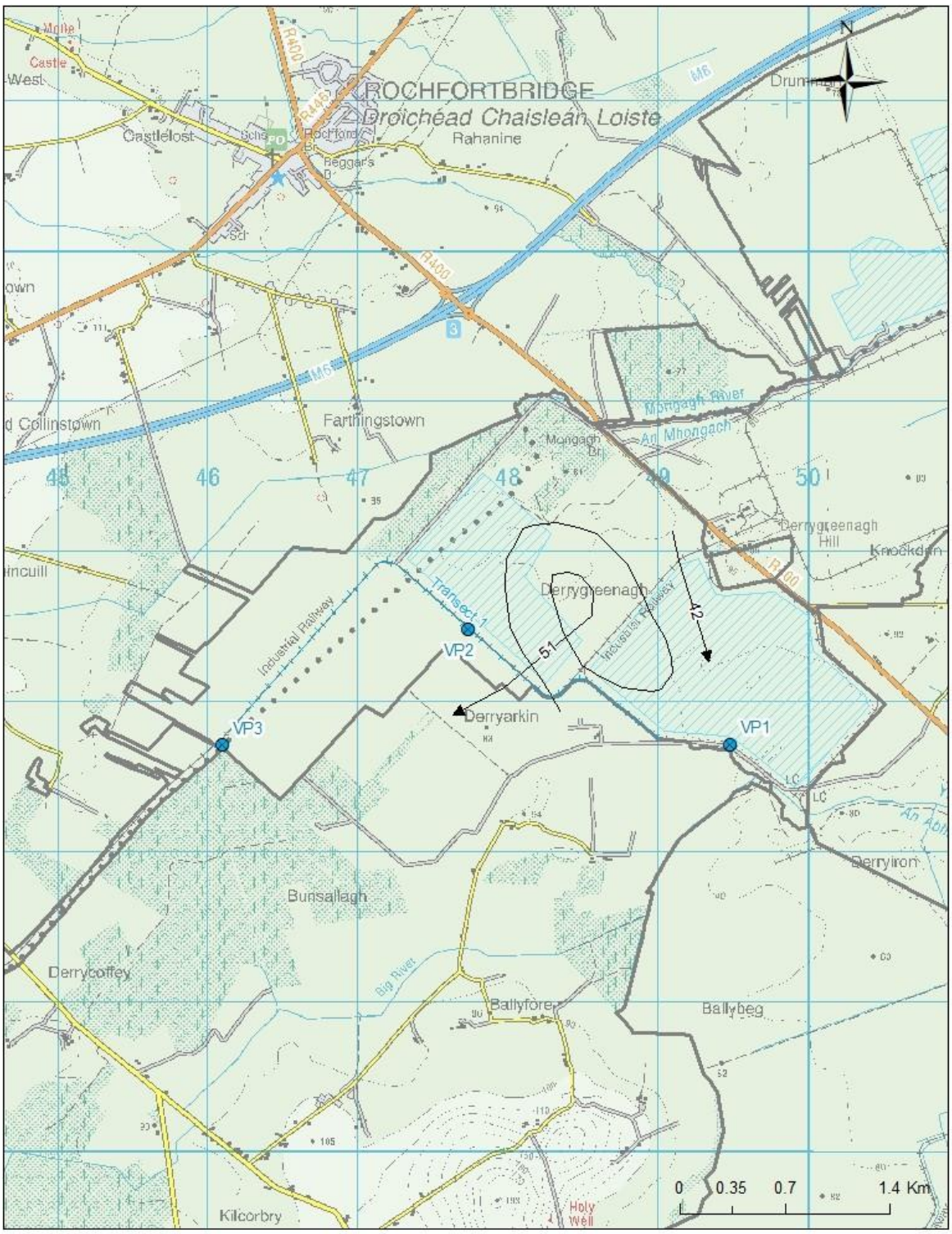
Derryarkin Map 6: Map showing transect and vantage point locations, with Buzzard flightlines.

Derryarkin Map 7: Map showing transect and vantage point locations, with Peregrine flightlines.

Derryarkin Map 8: Map showing transect and vantage point locations, with Kestrel flightlines.

Derryarkin Map 9a: Map showing transect and vantage point locations, with Golden Plover flightlines.

Derryarkin Map 9b: Map showing transect and vantage point locations, with Golden Plover flightlines.



Golden Plover flightline
Vantage Point
Transect
BnM Site Boundaries
Wetland area

Project: Bord na Mona Winter Bird Survey
Title: Derryarkin Golden Plover observations 2021/2022
Drawn By: Wetland Surveys Ireland Ltd. for Biosphere Environmental Services
Date: 15th August 2022

Derryarkin Map 10: Map showing transect and vantage point locations, with Lapwing flightlines.

Derryarkin Map 11: Map showing transect and vantage point locations, with Kingfisher flightline and Woodcock location.

3.4 Drumman Bog

3.4.1 Site Description

Drumman Bog is a large site located between the M6 motorway (which skirts its northwest boundary) and the R400 road (which skirts its western boundary). The site adjoins Derryarkin bog to the southwest (though sites are divided by the R400). The main access to the site is along an internal road from the R400. The site extends for up to 3.5 km from north to south and for up to 4 km from east to west. In addition to commercial peat production, the site has been used extensively for quarrying and is also used for stockpiling of logs. The Mongagh River flows through the central area of the site.

Much of the sector of Drumman bog to the south of the Mongagh River has been in recent industrial peat production and comprises mainly bare peat. Scattered throughout are strips and patches of pioneering vegetation of cutaway bog, mostly birch scrub, dry grassland and poor fen communities. There are parts in recent production and comprise bare peat. Also in recent commercial production is a sector in the northeast (Carrick bog), which is somewhat separated from the rest of the site by the Mongagh River and local topography. This area is still largely bare peat.

An extensive area of cutaway bog occurs north of the Mongagh River. A large wetland area with ponds and standing water has been created in the northeast section after an outfall was blocked in 2005. The open water forms a mosaic with emergent reedbeds and extensive fringing poor fen communities. Strips of birch scrub are also present.

The established gravel and sand extraction area to the south of the cutaway (and north of Mongagh River) includes one large artificial lake, several smaller lakes or ponds and large mounds of aggregates. More recently, extraction has occurred to the south of the Mongagh River and access road, with substantial ponds now present.

Plate 2. View of pond which has developed within quarried area of site – a substantial Mute Swan population occurs here in winter.

A conifer plantation in the northeast sector was developed by Coillte in the 1990s, with a further plantation in the northwest.

In recent years felled trees have been stored along parts of the main access road through the site and the storage area has been extended into the quarry zone.

The Mongagh River, which is within the Boyne catchment, is the main watercourse associated with the site. The channel has been deepened and is skirted by large berms. Natural riparian zones are poorly developed along the river.

The site is adjoined by slivers of bog to the east and north-west, with agricultural land to the south.

3.4.2 Survey Locations

Transect 1 starts from the internal access road and traverses the northern sector of the site along a straight line with two offline loops. This transect covers a large area of regenerating cutaway bog including the wetlands on site.

Transect 2 also starts from the internal access road and traverses the southern sector of the site. The transect includes two offline sections. This transect covers a large area of regenerating cutaway bog as well as bare peat areas.

Transect 3 runs from the centre of the site eastwards along the Mongagh River towards the eastern offshoot (recent commercial peat field).

Vantage Point 1 is located along transect 1 and looks over much of the northern sector of the site including wetland habitats.

Vantage Point 2 is located along transect 2 and looks over much of the southern sector of the site.

Vantage Point 3 is located off the R500 road and looks over the south-western part of the site, though large parts of the central area of the site are visible.

Vantage Point 4 is located in the extreme north-eastern offshoot (Carrick bog) and looks over this entire sector. All of the area is recent commercial peat fields.

3.4.3 Results and Discussion

A summary of the variables (date, time, weather etc.) for the vantage point watches carried out at Drumman Bog between October 2021 and March 2022 is presented in Appendix 2. Survey raw data for the vantage point watches are presented in Appendix 6.

Scientific names of bird species are given in Appendix 9.

Target species recorded

Whooper Swan

Whooper Swan is an occasional visitor to Drumman bog and mostly in small numbers.

Three on quarry pond on 23rd November later took flight in a westwards direction. Five flew north over the northwest corner of the site on 14th January.

As in previous winters, it is considered that the records at Drumman involve birds associated with the Derryarkin flock.

Mute Swan

A substantial flock of Mute Swan occurred on site through the winter – this flock had also been present through the summer and previous winter (2020/21). Most of the birds are adults.

On 27th October, 62 birds in large flock, plus 18 on other ponds (total of 80). On 23rd November, a high count of 132 swans was made, with a winter peak of 138 on 9th December. Numbers had decreased to 99 birds on 26th January, with 47 on 12th February. A total of 68 birds was present on 12th March.

Flightlines were recorded four occasions, and involved internal site movements.

Little Egret

One to two Little Egrets wintered in the area (inc. Derryarkin). At Drumman, the birds were recorded feeding or roosting both in the wetlands north of the Mongagh River and in the large quarry pond to the south. Records were of single birds other than two together on 12th February.

The presence of Little Egret at these sites has been a feature in recent winters.

Hen Harrier

There were two records, as follow:

- Female type bird hunting over cutaway in southern sector of site on 24th November 2021.
- Male hunting in northern sector on 14th January 2022.

Hen Harrier is an occasional visitor to Drumman and is recorded on site in most winters.

Sparrowhawk

There were eight records of Sparrowhawk on site through the winter.

All records were of single birds other than two (in display) on 23rd February. Most records were of birds hunting.

Sparrowhawk is known to breed on site.

Buzzard

Buzzard was regularly recorded within and around site through the winter.

Two together were recorded on five dates, with three interacting on 11th February. Birds were recorded hunting, flying and circling.

It is considered that the Drumman site is within the range of one to two pairs of breeding

Buzzard.

Kestrel

Kestrel was recorded on site throughout the winter period (apart from in March), with a total of ten records. All were of single birds, involving both males and females. Most of the birds were hunting actively on site.

Kestrel breeds locally (though probably not on site).

Merlin

There were two records of Merlin during the surveys, both in the southern sector of the site. On 27th January, a male bird was observed perched on bog and then hunting. On 23rd February, one was observed briefly flying through scrub.

Surveys over several winters have shown that Merlin is a regular though scarce winter visitor to Drumman bog. As birds have also been recorded in summer, it is expected that there is a breeding territory in the local area (though not necessarily on site).

Peregrine

Peregrine was recorded on seven occasions through the winter. Apart from a circling female bird on 13th March, all records were of single birds flying over the site.

The birds observed in winter at Drumman are considered to be associated with the breeding pair at Derryarkin (which nests on a man-made structure).

Golden Plover

Golden Plover was recorded at Drumman on seven occasions during the winter. Records were between 23rd October and 11th February. The largest flock was c.400 over the northeast sector on 21st December – this flock landed briefly on bare peat.

The plover which occur at Drumman are almost certainly from the regular wintering population (estimated up to 1,000 birds) which frequents the fields at Derryarkin as well as fields to the north of the motorway.

Lapwing

Lapwing was recorded over site on six occasions, with breeding birds present during March. Numbers were relatively low, with the largest flock being c.200. Birds were recorded roosting on bare peat or at the wetlands on three of the occasions.

It is noted that there is a regular wintering flock of several hundreds centred in the fields at Derryarkin and to the north of the motorway.

Lesser Black-backed Gull

There were three records on two dates, 24th November and 24th February.

Potential for other target species

Kingfisher could be expected at times to pass through the site.

Other species of note

Mallard – present throughout winter though in relatively small numbers (peak of 65 on 27th

October). Mostly recorded from quarry ponds though also singles or pairs flushed from drains and ponds throughout site.

Teal – peak count of 18 on quarry ponds on 22nd November.

Wigeon – 22 on large quarry pond on 22nd November. Wigeon is a scarce visitor to the site.

Tufted Duck – flock of at least 140 on central quarry pond on 27th October. 26 there on 10th December and c.30 on 24th January. Large flock of 163 on central pond on 17th February (almost all male birds). This flock also utilised the large Roadstone quarry pond at Derryarkin (77 there on 24th January).

Little Grebe – small numbers (up to 7) on quarry ponds through winter period. Displaying pairs in March.

Great Crested Grebe – three on quarry ponds in February and March (inc. pair).

Water Rail: heard from large drain near VP2 on 27th January and 10th March.

Ringed Plover – two at quarry ponds in March.

Snipe – recorded in small numbers (max. 9) on transects walks and on some vantage point watches.

Skylark – recorded in October (4), November (1) and March (9) (latter territorial birds).

Mistle Thrush – 23 flew across southern area of site on 23rd October. Otherwise, low numbers (<5) on most visits.

Redwing – flocks present locally from December to January, with high count of 300+ on 23rd November.

Robin - present on site through winter in scrub habitats (though in low numbers).

Stonechat – recorded on most visits through the winter. Two territorial pairs in March.

Meadow Pipit – regular on site through the winter though mostly in small numbers (<10). One flock of 22 birds on transect walk on 17th November. Territorial birds on site in March.

Goldcrest – present on site through winter in scrub habitats (though in low numbers).

Starling – large flocks recorded in late afternoon period as follows: 5,000+ flying north through site from 15.30 hrs on 20th December; c.4,000 flying northwest across site from 15.15 hrs on 14th January; c.5,000 flew northwards across site from 16.10 hrs on 27th January.

Linnet – relatively small numbers (up to 30) scattered across site through the winter.

SITE: DRUMMAN – TRANSECT SURVEYS, 2021-2022

Species	Date 17/11/21	Date 16/01/22	Date 25/02/22	BoCCI Status
Mute Swan	**82**	**30**	**27**	**A**
Mallard	20	9	11	**G**
Tufted Duck	**72**	**60**	**120**	**A**
Teal	**9**	**0**	**5**	**A**
Pheasant	3	0	2	**G**
Grey Heron	3	3	7	**G**
Sparrowhawk	0	0	0	G
Buzzard	1	0	2	**G**
Kestrel	**0**	**1**	**0**	**R**
Moorhen	1	2	4	**G**
Lapwing	**0**	**0**	**3**	**R**
Snipe	**5**	**2**	**6**	**R**
Woodpigeon	50+	12	6	**G**
Magpie	3	2	4	**G**
Jay	0	0	2	**G**
Jackdaw	0	20+	3	**G**
Hooded Crow	5	2	4	**G**
Raven	5	0	0	**G**
Goldcrest	**2**	**0**	**1**	**A**
Blue Tit	3	0	2	**G**
Great Tit	2	1	1	**G**
Dunnock	0	0	2	**G**
Coal Tit	12	5	4	**G**
Skylark	**0**	**0**	**2**	**A**
Long-tailed Tit	0	0	6	**G**
Starling	**100+**	**20**	**10**	**A**
Wren	9	5	10	**G**
Blackbird	6	4	7	**G**
Fieldfare	0	100+	0	**G**
Song Thrush	2	0	3	**G**
Redwing	**0**	**60+**	**0**	**R**
Mistle Thrush	7	1	3	G
Robin	4	4	7	G
Stonechat	3	2	3	G
Meadow Pipit	**22**	**7**	**15**	**R**
Pied Wagtail	3	2	2	**G**
Chaffinch	50	26	10	**G**
Goldfinch	20+	5	10+	**G**
Linnet	**15**	**0**	**4**	**A**
Lesser Redpoll	28	9	4	**G**
Reed Bunting	5	2	5	**G**

BoCCI Status: **R – Red**; **A – Amber**; **G – Green**

General discussion

The 2021/22 winter survey at Drumman bog has added to the baseline winter bird assessments carried out in winters 2012/13, 2013/14, 2014/15, 2015/16, 2016/17, 2018/19 and 2020/21.

The recent survey confirmed that Whooper Swans pass over the site on occasions and feed/roost on the quarry ponds (though in small numbers). Mute Swan is regular on the quarry ponds in very substantial numbers, along with relatively low numbers of Mallard and Teal. Wigeon was recorded on one date. A large flock of Tufted Duck was present at times through the winter and also visited the quarry ponds at Derryarkin.

Golden Plover and Lapwing were recorded over the site on occasions, with birds landing on the bare peat and wetland areas - these birds are considered to be part of larger populations of these species that winter in the local area extending to Derryarkin and to fields north of the motorway. Snipe was fairly widespread on site though in small numbers. Up to two Little Egrets wintered between Drumman and Derryarkin. Lesser Black-backed Gull was recorded in autumn and spring.

As in previous winter surveys, the 2021/22 survey showed that Drumman provides good foraging habitat for raptors, with Hen Harrier, Merlin, Peregrine, Kestrel, Sparrowhawk and Buzzard all recorded on site. The long-term data shown that Hen Harrier and Merlin are regular winter visitors to the site (usually several records of each during winter).

The site supports a range of other species of conservation interest. Meadow Pipit, Red listed on basis of breeding population, occurs throughout much of the site during winter. The Red-listed Redwing is regular in area during winter and at times occurs on site.

Amber-listed species recorded on site included Skylark, Goldcrest, Starling and Linnet.

3.4.4 Evaluation and Rating of Drumman Bog for Wintering Birds

There follows a summary of the conservation status of species recorded on Drumman Bog in winter 2021/22:

EU Birds Directive Annex I listed species

Whooper Swan
Little Egret
Merlin
Peregrine
Golden Plover

Red Listed species (after Gilbert et al. 2021)

Kestrel
Golden Plover
Lapwing
Snipe
Redwing
Meadow Pipit

Amber Listed species (after Gilbert et al. 2021)

Mute Swan
Whooper Swan
Great Crested Grebe
Wigeon
Teal
Tufted Duck
Lesser Black-backed Gull
Skylark
Goldcrest
Starling
Linnet

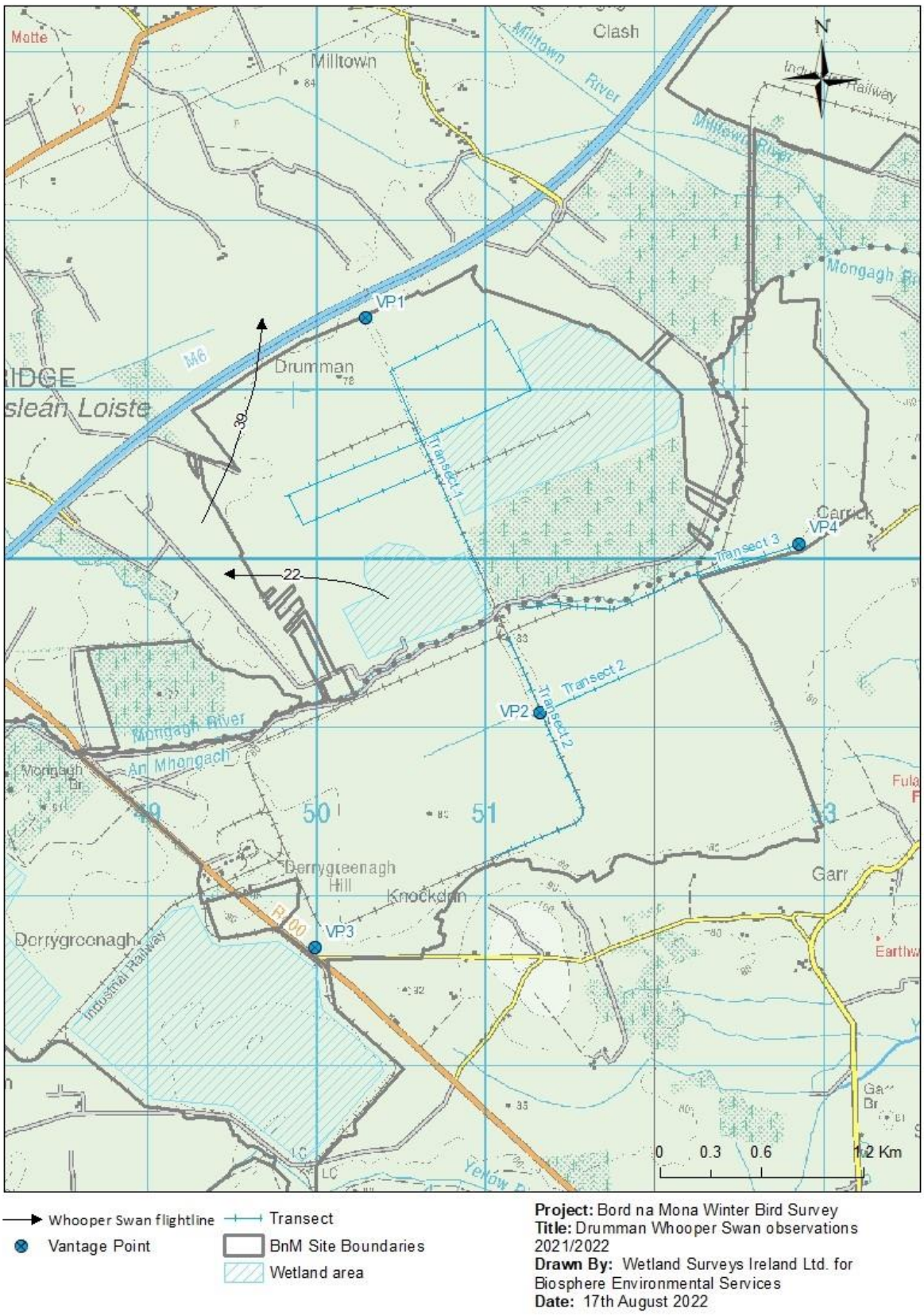
Overall, the site has habitats suitable for supporting a wide range of wintering birds, including wetland birds. These are particularly well developed to the north of the Mongagh River corridor though birds of prey regularly hunt in the southern sector as well (where cutaway habitats are in early stage of revegetation).

While a range of wetland species occur on site, these are mostly present in small numbers. However, the regular presence of a substantial wintering flock of Mute Swan is notable, as is the occasional use of the site by Golden Plover and Lapwing.

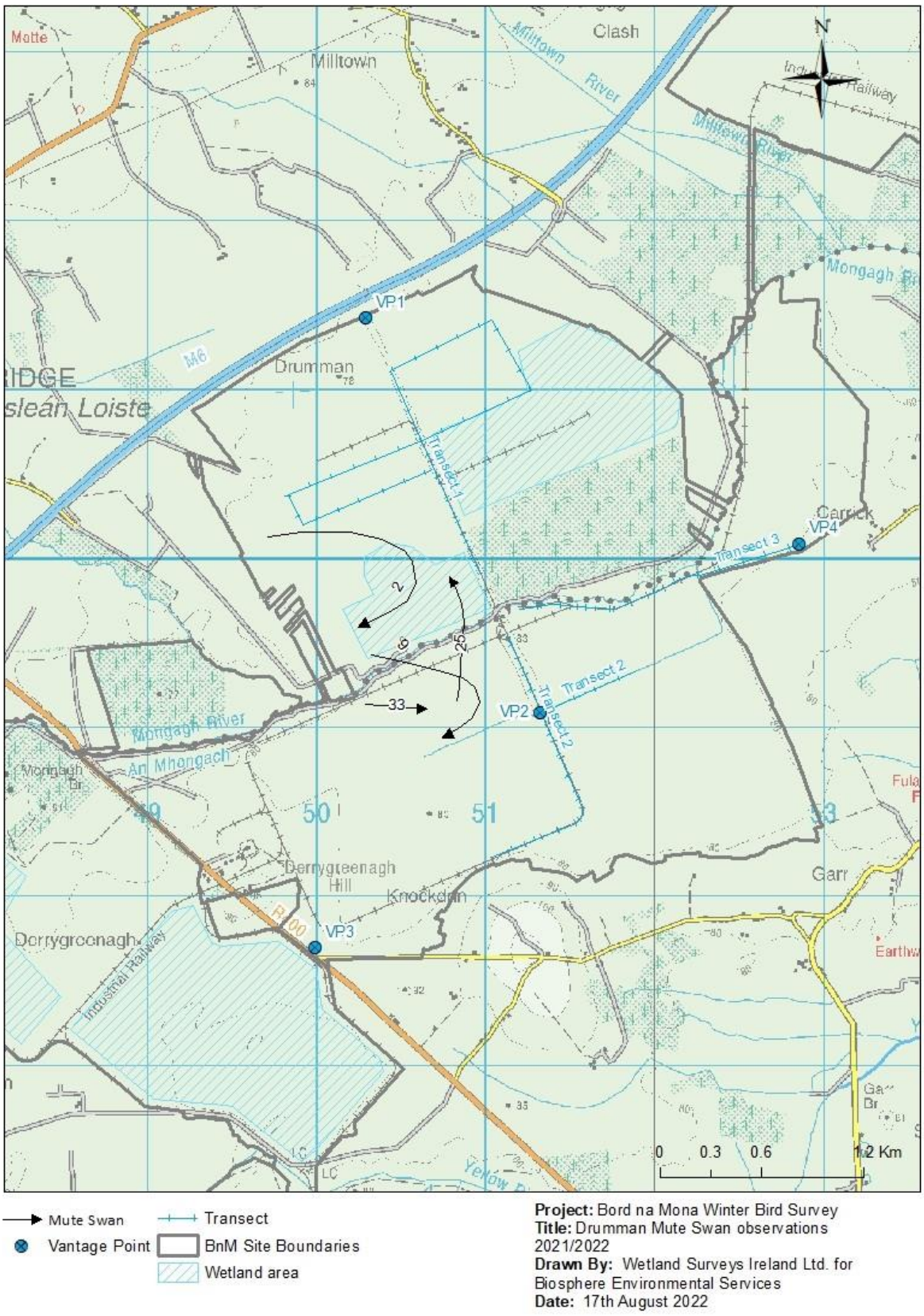
A feature of the Drumman site is that it is used regularly for hunting by birds of prey, including Merlin, Hen Harrier and the Red-listed Kestrel.

On the basis of presence of some wetland bird species and usage by various Annex I listed species, plus a range of Red- and Amber-listed species, it is recommended from the now eight winters of surveying that a rating of **County Importance** is considered appropriate for wintering birds at Drumman Bog.

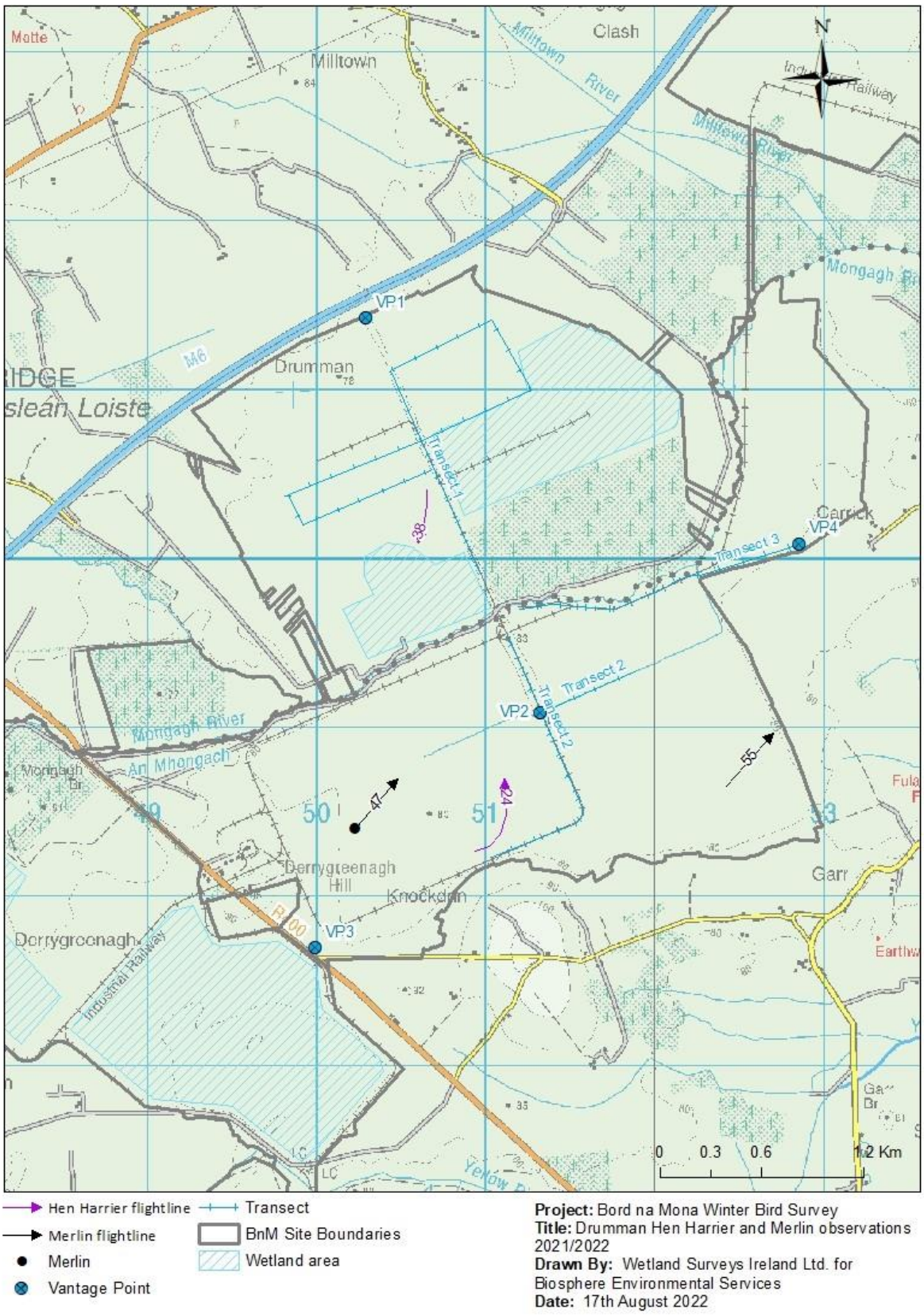
Drumman Map 1: Map showing transect and vantage point locations, with Whooper Swan flightlines.



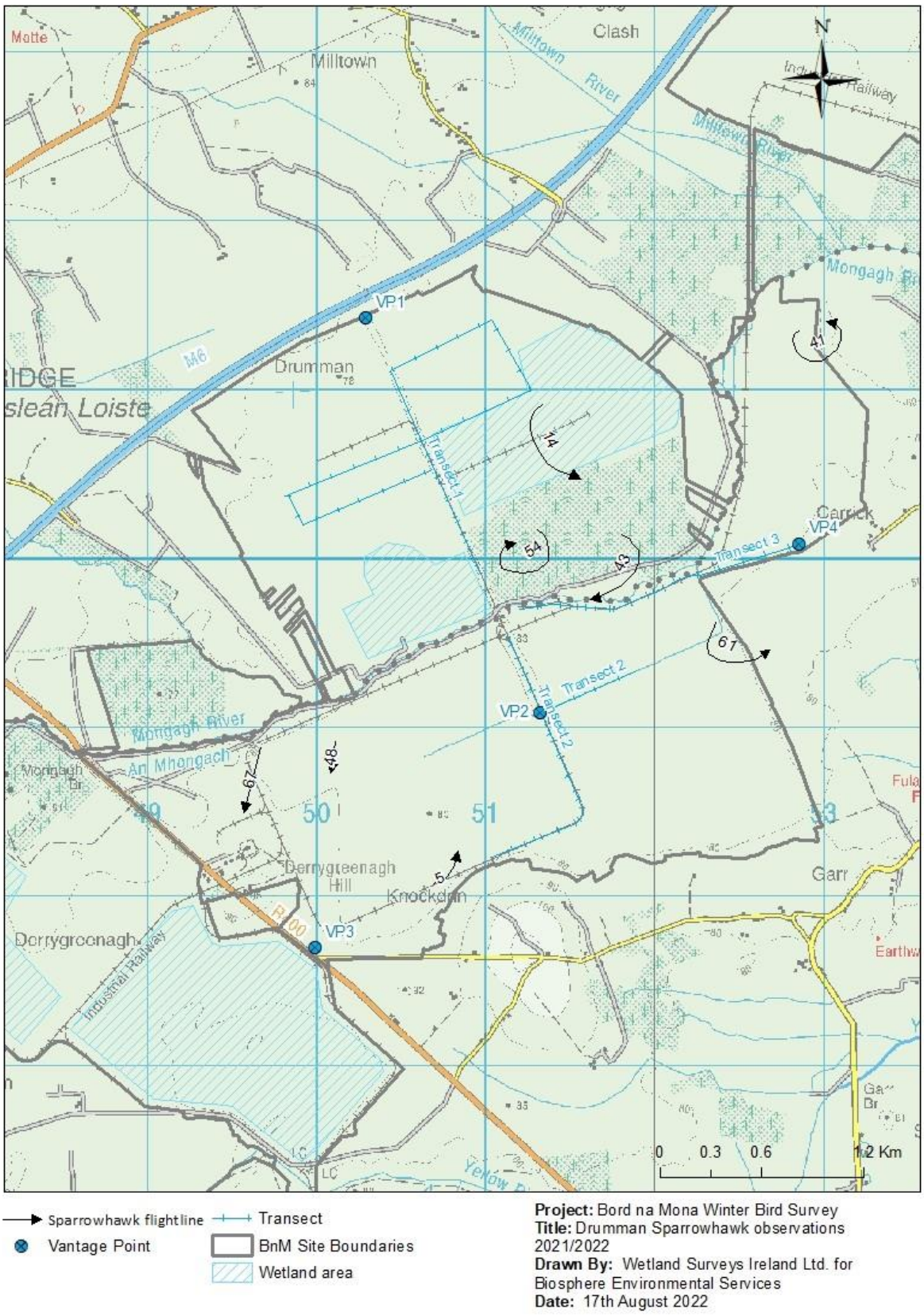
Drumman Map 2: Map showing transect and vantage point locations, with Mute Swan flightlines.



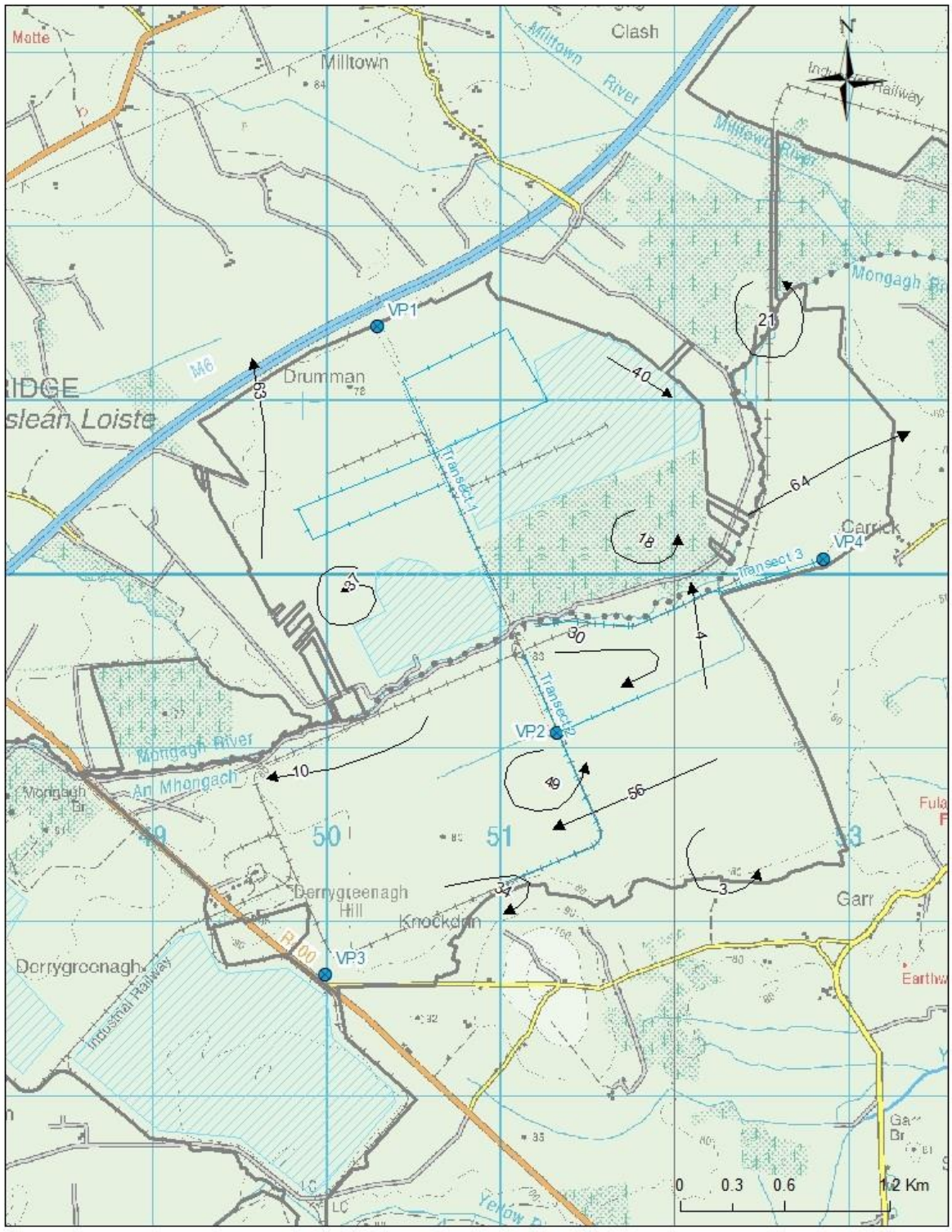
Drumman Map 3: Map showing transect and vantage point locations, with Hen Harrier and Merlin flightlines.



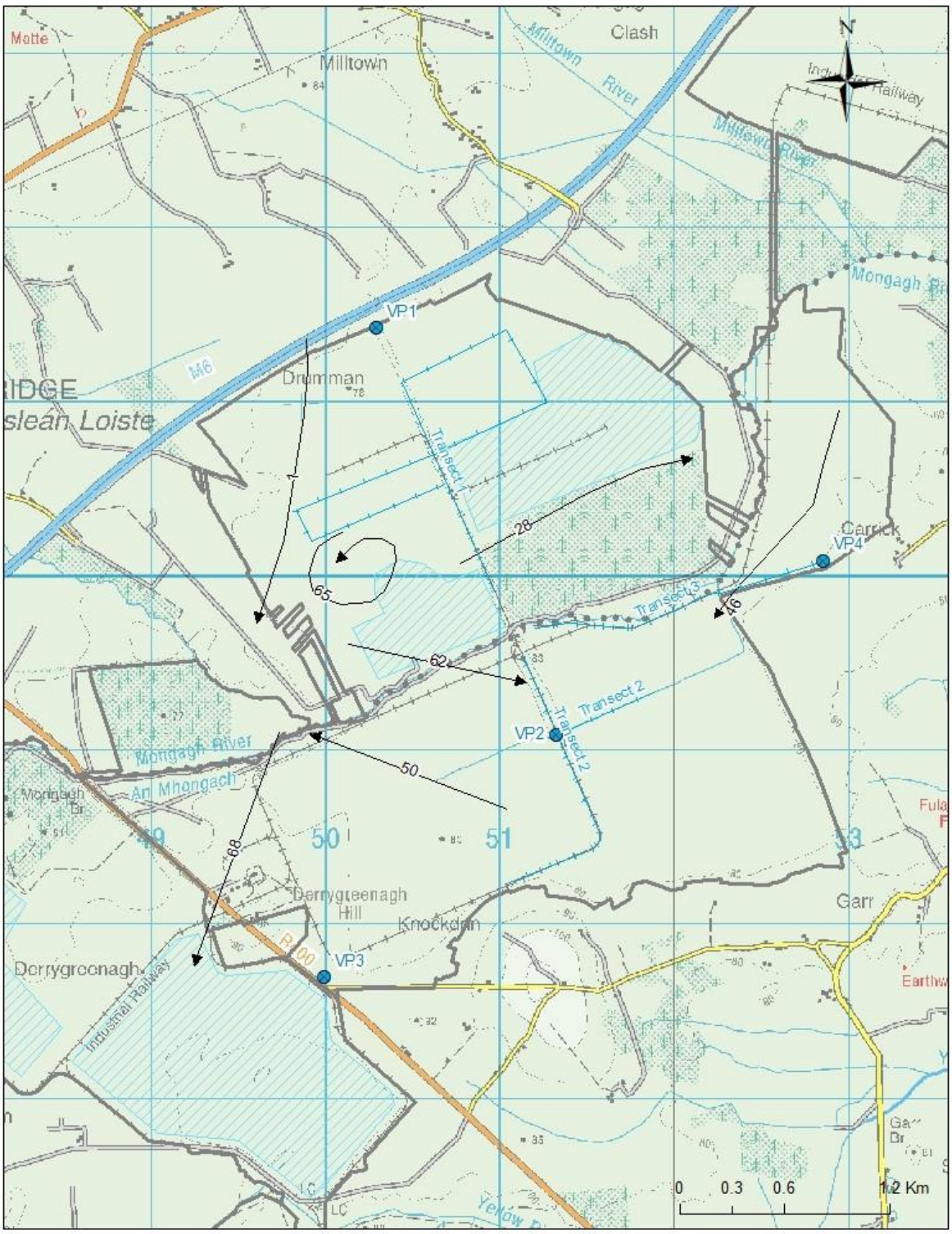
Drumman Map 4: Map showing transect and vantage point locations, with Sparrowhawk flightlines.



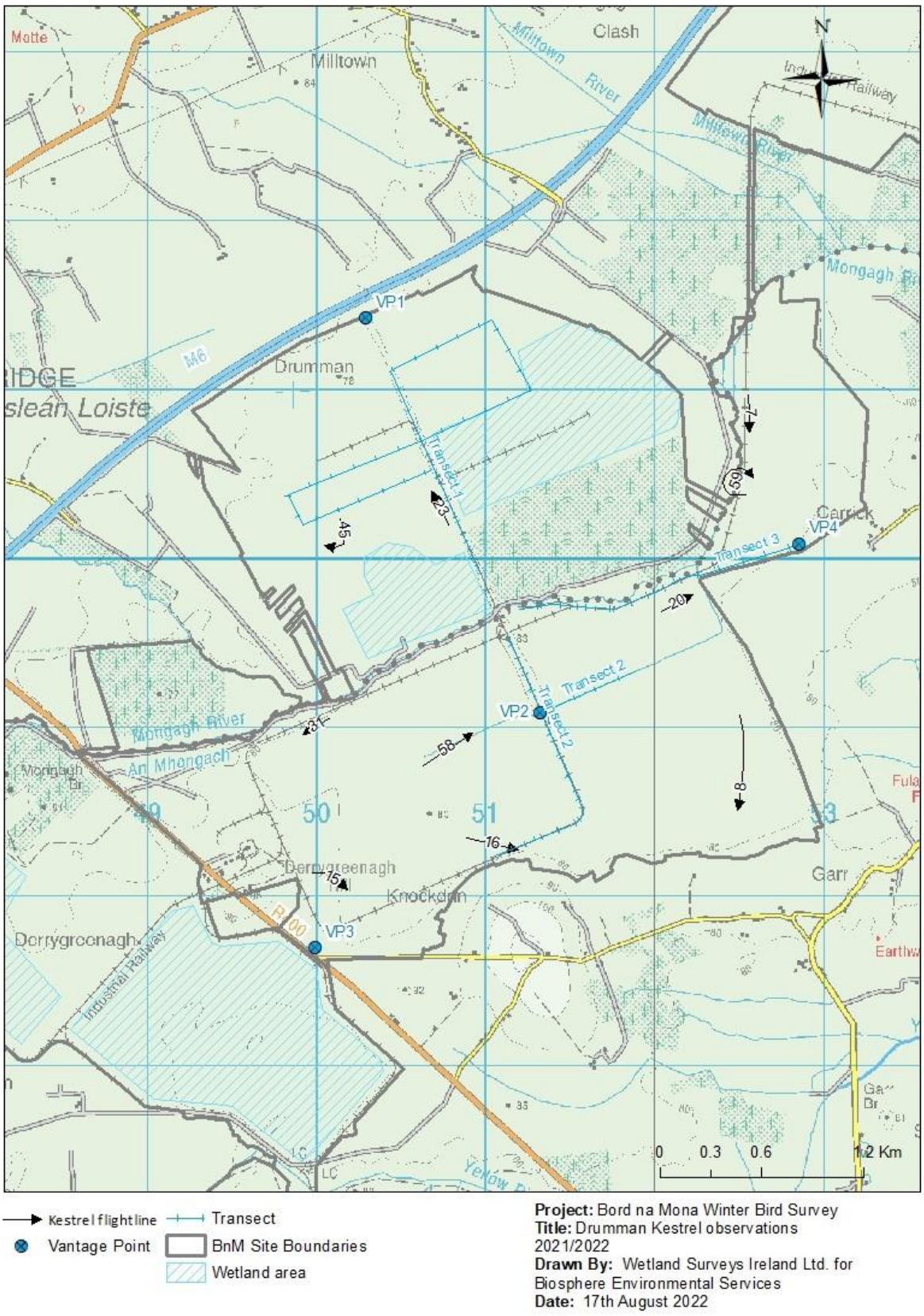
Drumman Map 5: Map showing transect and vantage point locations, with Buzzard flightlines.



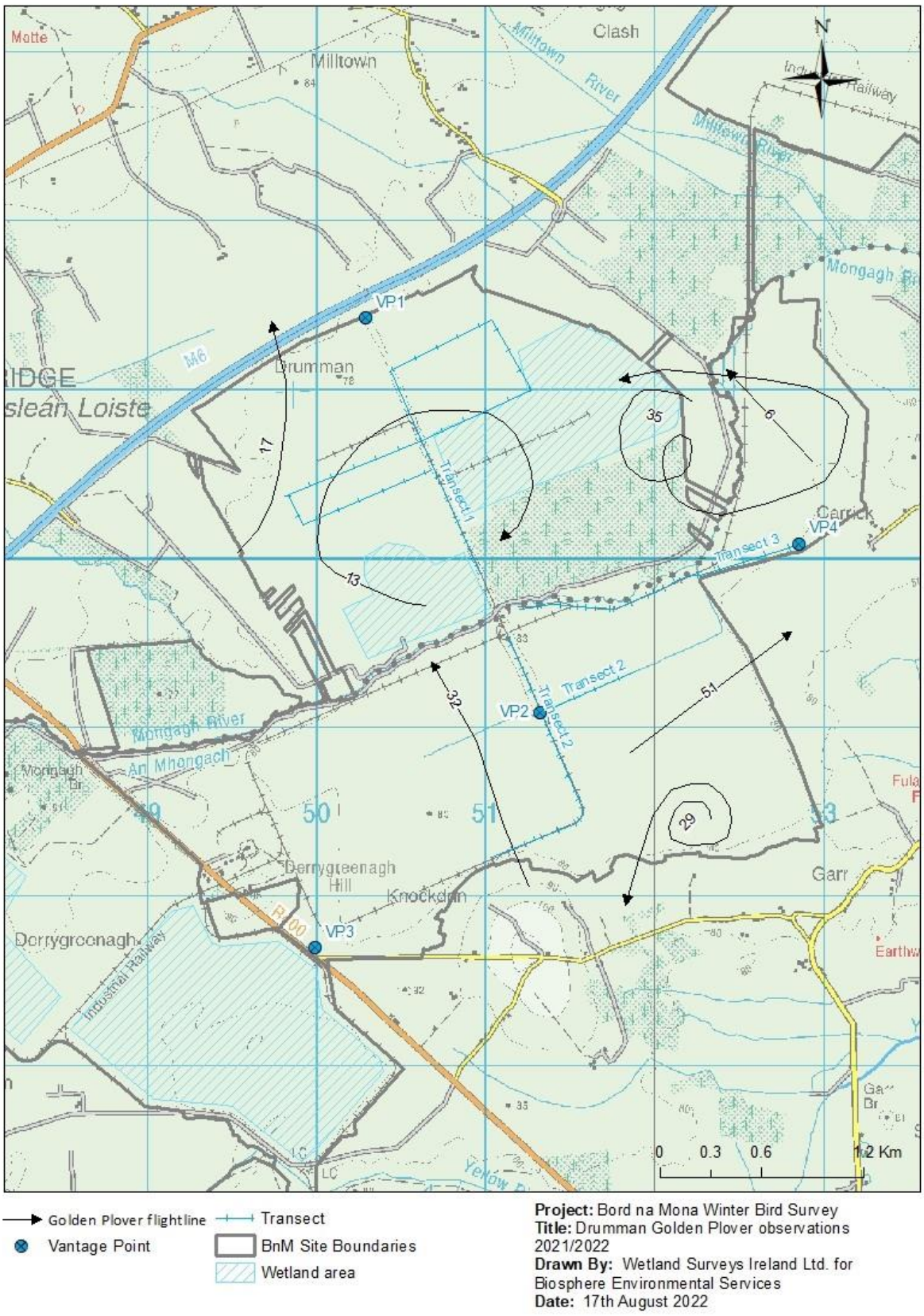
Drumman Map 6: Map showing transect and vantage point locations, with Peregrine flightlines.



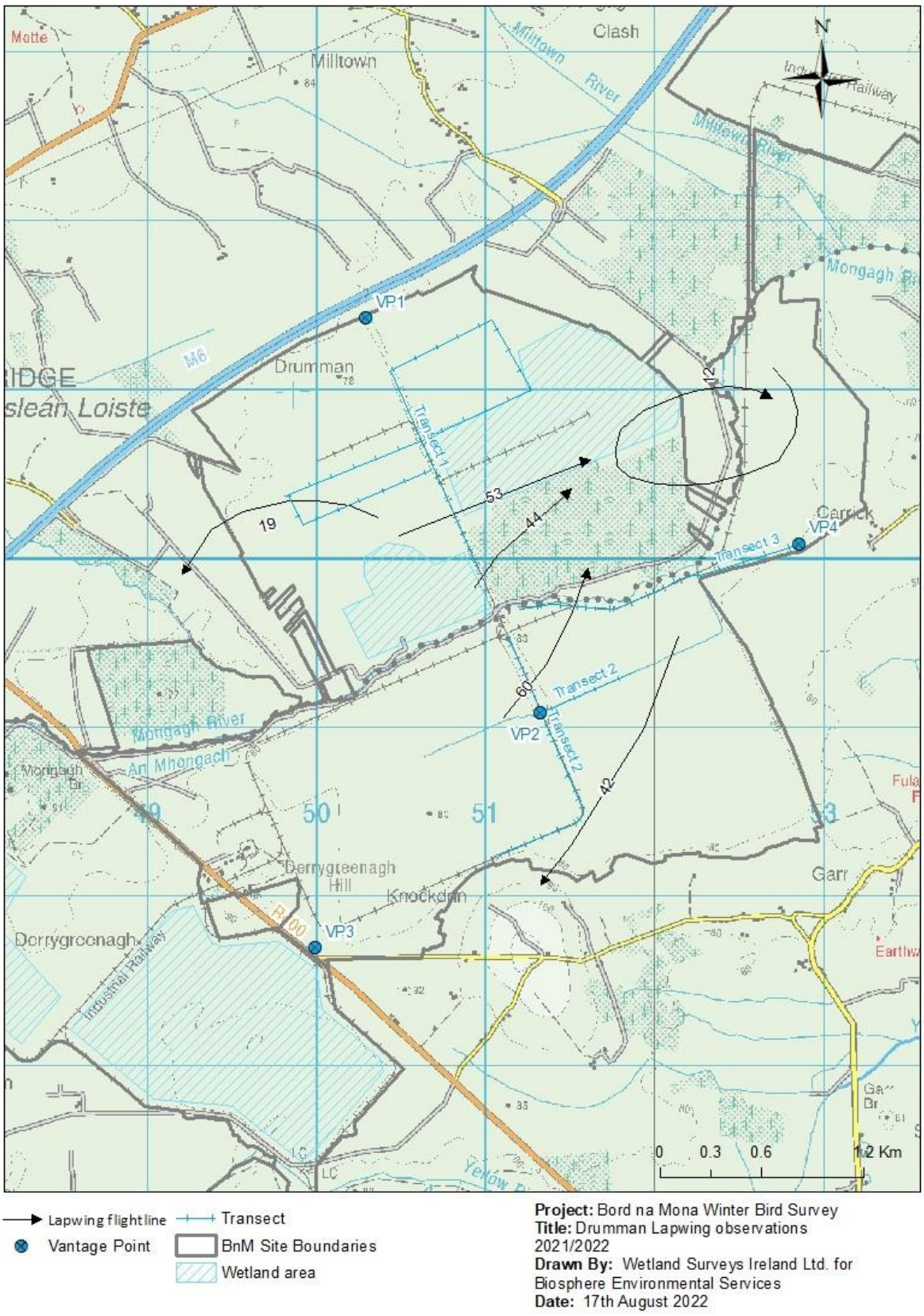
Drumman Map 7: Map showing transect and vantage point locations, with Kestrel flightlines.



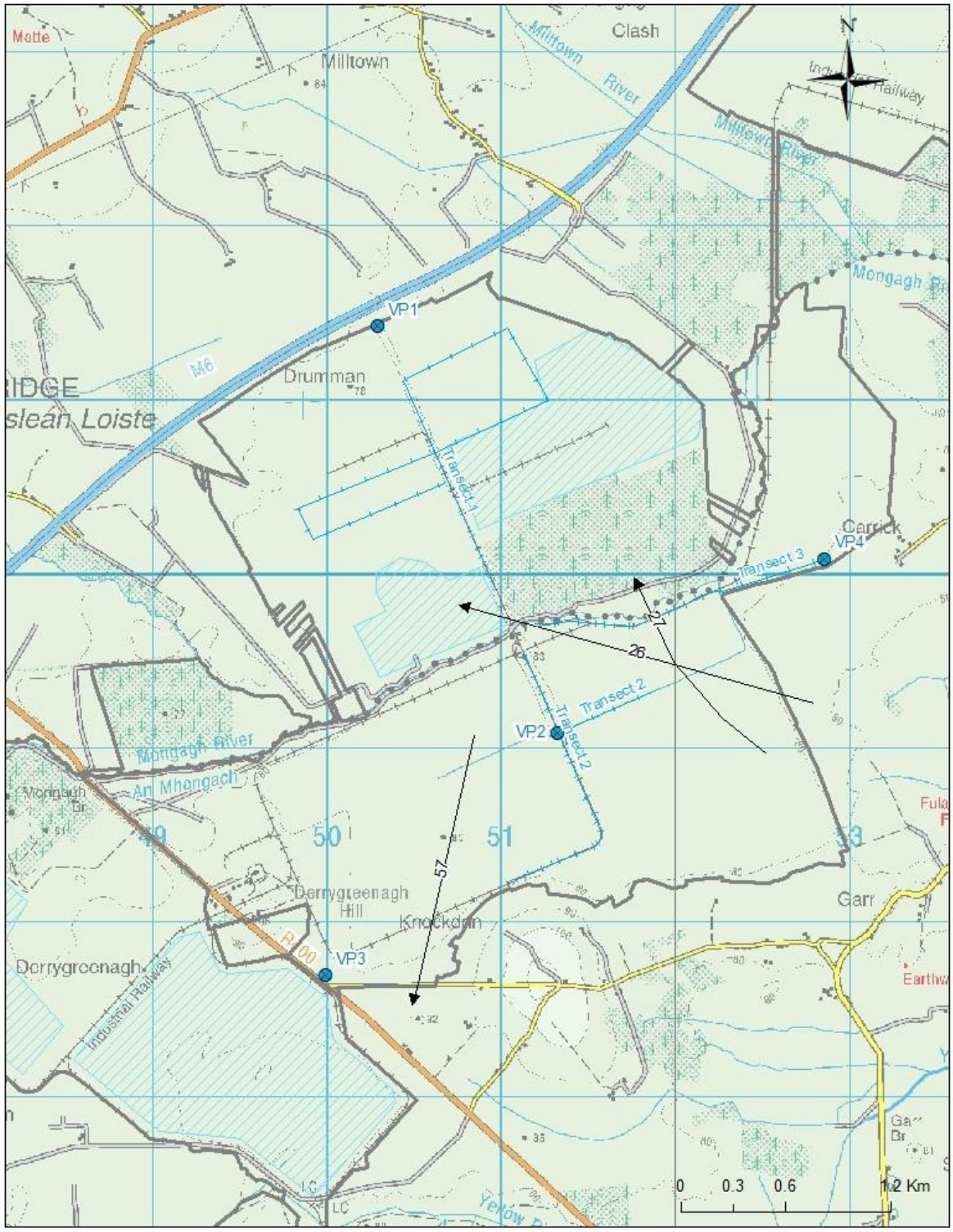
Drumman Map 8: Map showing transect and vantage point locations, with Golden Plover flightlines.



Drumman Map 9: Map showing transect and vantage point locations, with Lapwing flightlines.



Drumman Map 10: Map showing transect and vantage point locations, with Lesser Black backed Gull flightlines.



3.5 Derryhinch Bog

3.5.1 Site Description

Derryhinch Bog is a medium sized site located approximately 1.5 km east of Milltownpass. It is connected by a rail line to Drumman Bog, which is located approximately 1 km to the south-southwest. The main access to the site is from a private lane leading from a third class road to the north. The entire western boundary of the bog is bounded by the M6 motorway. The site extends for up to 1.5 km from north to south and for approximately 2.5 km from east to west.

Until recently (January 2021), the majority of Derryhinch Bog had been in commercial production and was almost entirely bare peat. A small mineral island is located in the mid-west section and is dominated by birch scrub. Further stands of birch dominated scrub occur in the extreme northwest corner of the site and along the south end of the eastern boundary. Fringe habitats found along the boundaries of the site include dry grassland and scrub. An area of cutover and remnant high bog occurs along the southern boundary (south of the railway).

Since production ceased, the site is in early stage of re-vegetation, though wetlands with permanent water are largely absent. During wet periods, ponding forms and especially in the southwest sector where some wetland vegetation is developing (see Plate 1).

A substantial area of cutover bog adjoins the site to the east and northeast. Agricultural land occurs to the north and southwest, while there are stands of commercial conifer forest to the south.

3.5.2 Survey locations

Transect 1 runs along the northern, eastern and much of the southern boundary of the site.

Vantage Point 1 is located in the centre of the northern boundary and gives a sweeping southwards view over almost the entire site.

Vantage Point 2 is located off the motorway and gives a view eastwards over the entire western half of the site.

3.5.3 Results and Discussion

A summary of the variables (date, time, weather etc.) for the vantage point watches carried out at Derryhinch Bog between October 2021 and March 2022 is presented in Appendix 3. Survey raw data for the vantage point watches are presented in Appendix 7.

Scientific names of bird species are given in Appendix 9.

Plate 1. Derryhinch Bog – some wetland development is occurring in the south-west sector of the site though this is expected to mostly dry out during summer (March 2022).

Target species recorded

Mute Swan

A party of 5 birds flew across site on 11th December.

Sparrowhawk

There were five records of Sparrowhawk on site through the winter.

Three of the records were of hunting birds through scrub, with two records of pairs in display (25th February & 13th March). Sparrowhawk is known to breed on site.

Buzzard

Buzzard was the most frequently recorded bird of prey during the winter and was recorded throughout the site.

Most of the records involved single birds hunting and flying. Pairs interacting and/or displaying were recorded on 26th October and 10th February.

Several pairs of Buzzard are known to breed within the wider area of Derryhinch.

Kestrel

Kestrel was recorded on site throughout the winter period, with a total of eight records. All were of single birds, involving both males and females. Most of the birds were hunting actively on site.

Kestrel breeds locally (though probably not on site).

Peregrine

Peregrine was recorded flying over the site on five occasions through the winter. All records were of single birds.

The birds observed in winter at Derryhinch are considered to be associated with the breeding pair at Derryarkin (which nests on a man-made structure).

Golden Plover

Golden Plover was recorded on three dates as follows:

On 28th October, a flock of c.400 birds flew in from the west and landed on bare peat for c.1 hour. The flock then got up and flew south.

On 17th November, a flock of c.40 birds arose from bare peat and flew southwards – it is expected that they had been roosting on the peat since the start of the morning watch.

On 11th December, a flock of c.150 birds flew in from the north and landed on bare peat in central area of site for c. 20 minutes. The flock then got up and flew south.

The plover which occur at Derryhinch are almost certainly from the regular wintering population (estimated up to 1,000 birds) which frequents the fields at Derryarkin as well as fields to the north of the motorway, and also at times Drumman Bog.

Lesser Black-backed Gull

A flock of 22 birds flew into site on 25th February and landed on bare peat. The flock appeared to be mostly sub-adults.

Potential for other target species

Hen Harrier and Merlin (recorded on site in March 2013) could be expected at times to pass through the site.

Lapwing had been recorded on site in winter 2013/14.

Other species of note

Mallard – recorded on several occasions in large drains and ponded areas, though in low numbers (1-4).

Snipe – snipe is fairly scarce on site being recorded mainly in the developing wetland area in the southwest sector where up to 10 birds were flushed in early March.

Skylark – recorded in October (3) and March (7) (latter territorial birds).

Mistle Thrush – recorded regularly on site, with peak count of 11 on 26th October.

Redwing – flocks present in marginal hedging and flying over site on several dates in December and January. Highest count was c.500 on 11th December (accompanied by similar number of Fieldfares).

Robin - present on site through winter in scrub habitats (though in low numbers).

Stonechat – recorded on most visits through the winter. Two territorial pairs in March.

Meadow Pipit – regular on site through the winter though mostly in small numbers (<10). Total of 21 on transect walk on 27th February comprised flocking birds and some territorial birds.

Goldcrest – present on site through winter in scrub habitats (though in low numbers).

Starling – large flocks recorded in late afternoon period as follows: 2,000+ flying south over site from 15.15 hrs on 11th December; 3,000+ flying southeast across site from 15.00 hrs on 28th December (came in from over motorway); up to 5,000 flew generally southwards over site from 16.15 hrs on 19th January.

Linnet – flock of c.60 with chaffinches and goldfinches along northern margin of site on 20th November.

SITE: DERRYHINCH – TRANSECT SURVEYS, 2021-2022

Species	Date 20/11/21	Date 15/01/22	Date 27/02/22	BoCCI Status
Mallard	3	0	2	**G**
Pheasant	2	1	4	**G**
Grey Heron	1	0	0	**G**
Sparrowhawk	0	0	1	G
Buzzard	1	0	1	**G**
Kestrel	**0**	**0**	**0**	**R**
Snipe	**3**	**0**	**1**	**R**
Woodpigeon	10+	9	14	**G**
Magpie	1	1	2	**G**
Jay	0	0	0	**G**
Jackdaw	20	10	8	**G**
Hooded Crow	3	1	3	**G**
Raven	4	0	0	**G**
Goldcrest	**1**	**1**	**2**	**A**
Blue Tit	2	0	1	**G**
Great Tit	1	0	1	**G**
Dunnock	0	0	2	**G**
Coal Tit	4	2	1	**G**
Skylark	**0**	**0**	**2**	**A**
Long-tailed Tit	5	0	0	**G**
Starling	**50**	**20**	**20**	**A**
Wren	11	4	7	**G**
Blackbird	9	8	5	**G**
Fieldfare	0	50+	0	**G**
Song Thrush	1	1	2	**G**
Redwing	**0**	**50+**	**0**	**R**
Mistle Thrush	3	2	2	G
Robin	5	2	4	G
Stonechat	2	1	3	G
Meadow Pipit	**14**	**10**	**21**	**R**
Pied Wagtail	4	0	3	**G**
Chaffinch	c.100	12	10+	**G**
Goldfinch	20+	0	12	**G**
Linnet	**60**	**5**	**2**	**A**
Lesser Redpoll	30+	10	10	**G**
Reed Bunting	2	0	3	**G**

BoCCI Status: **R – Red**; **A – Amber**; **G – Green**

General discussion

The 2021/22 winter survey at Derryhinch bog has added to the baseline winter bird assessments carried out in winters 2012/13 and 2013/14 (albeit the earlier surveys were at time when commercial production was in progress).

While bog rehabilitation, and especially wetland development, is still at an early development stage at Derryhinch, the site provides useful habitat for various bird of prey species and especially Kestrel (Red listed) and Buzzard. Species such as Hen Harrier and Merlin could be expected to pass through the site at times.

These birds are considered to be associated with a regular winter population in the wider areas which uses cutaway bogs and agricultural fields. Snipe (Red-listed) also occurs though mainly in the area in the southwest where some wetland vegetation is developing. Lesser Black-backed Gull was recorded landed in the site on one occasion.

The site supports a range of other species of conservation interest. Meadow Pipit, Red listed on basis of breeding population, occurs throughout much of the site during winter. The Red-listed Redwing is regular in area during winter and at times occurs within the site.

Amber-listed species recorded on site included Skylark, Goldcrest, Starling and Linnet.

3.5.4 Evaluation and Rating of Derryhinch Bog for Wintering Birds

There follows a summary of the conservation status of species recorded on Derryhinch Bog in winter 2021/22:

EU Birds Directive Annex I listed species

Peregrine (flying over)
Golden Plover

Red Listed species (after Gilbert et al. 2021)

Kestrel
Golden Plover
Snipe
Redwing
Meadow Pipit

Amber Listed species (after Gilbert et al. 2021)

Mute Swan (flying over)
Lesser Black-backed Gull
Skylark
Goldcrest
Starling
Linnet

Overall, the site has developing habitats suitable for supporting a range of wintering birds, including some wetland birds and notably Golden Plover.

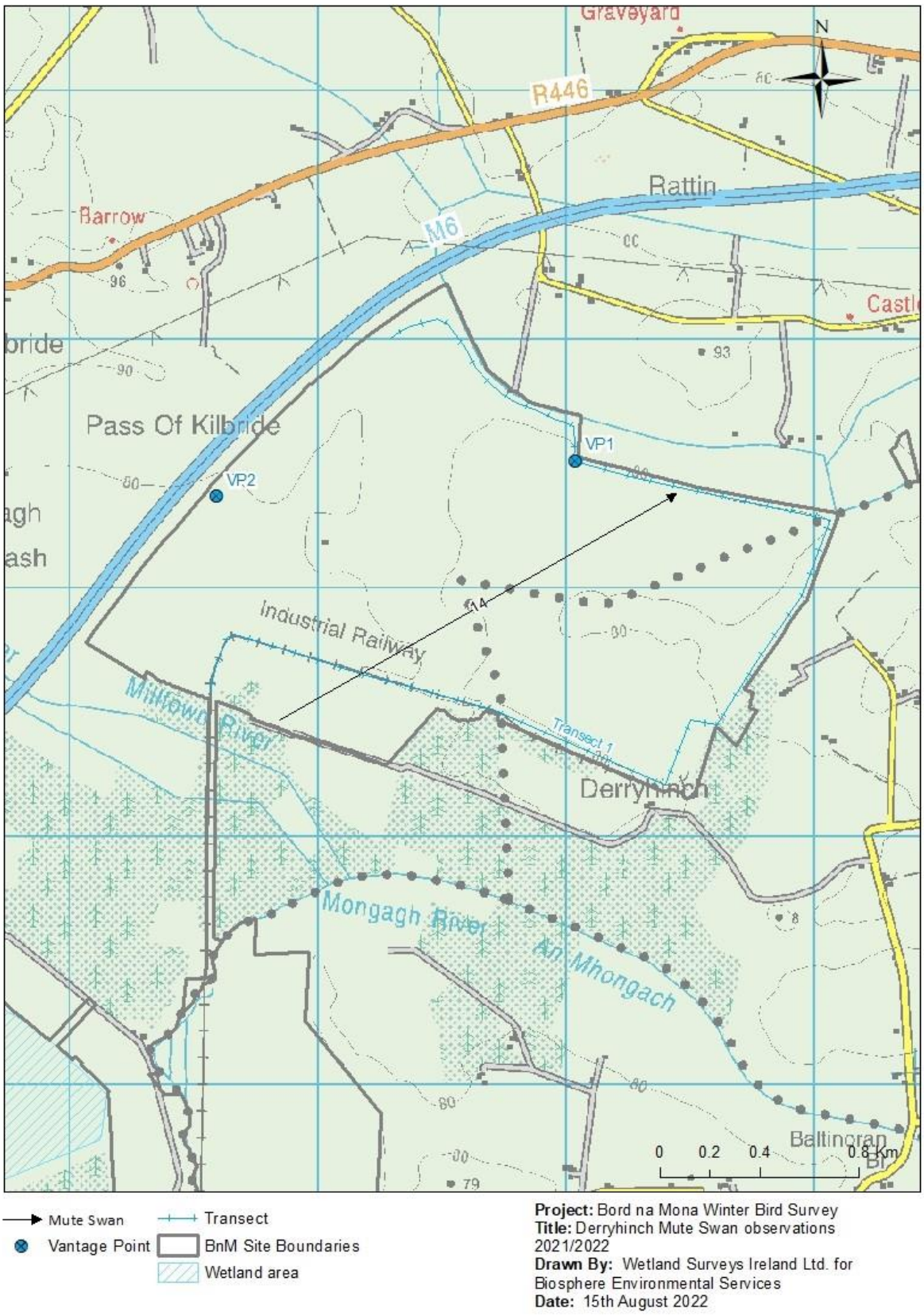
A feature of Derryhinch Bog is that it is used regularly for hunting by birds of prey, notably

Kestrel, Buzzard and Sparrowhawk.

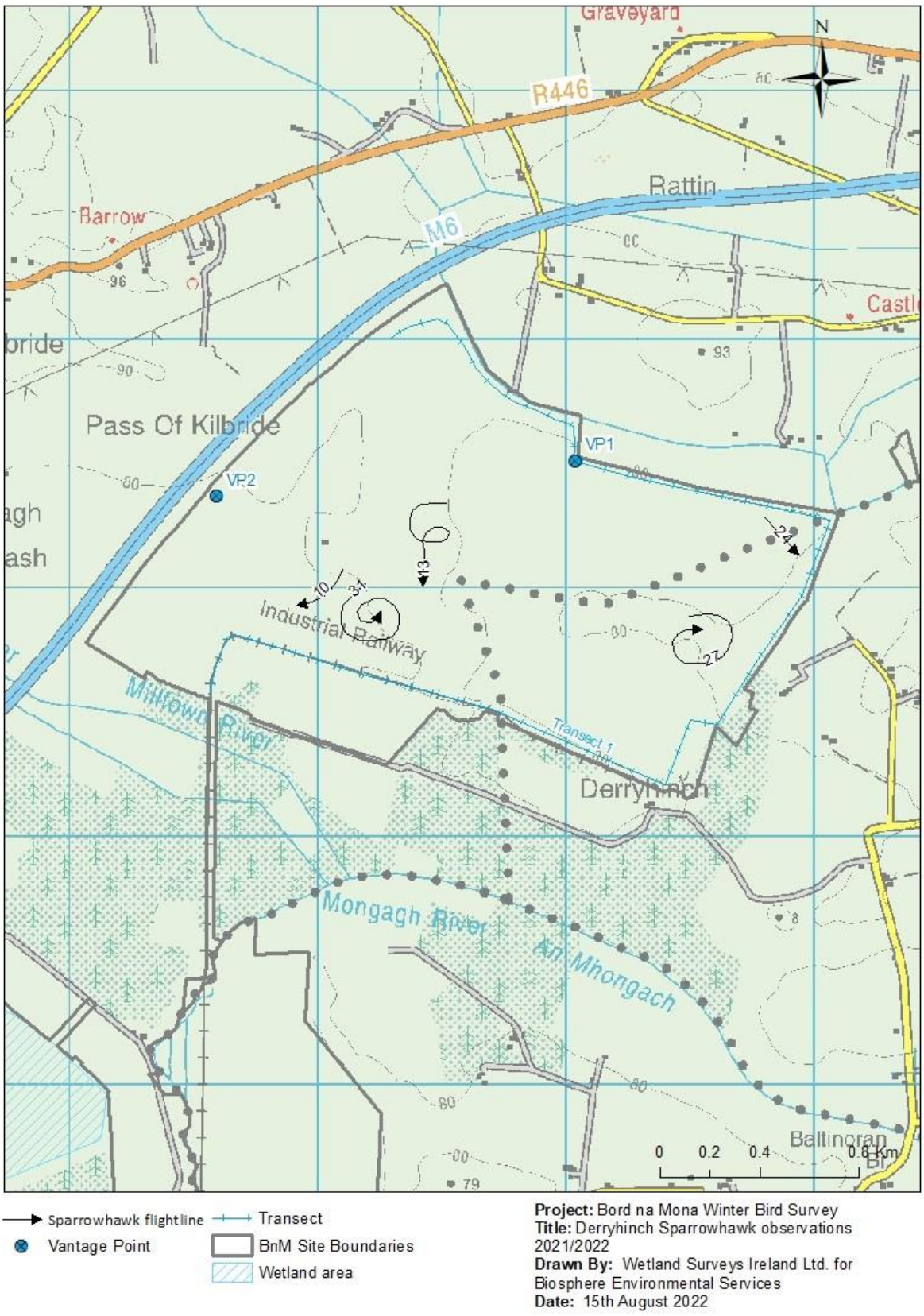
From the location of the site, it can be considered as part of a larger complex of cutaway bog sites, comprising Drumman, Derryarkin and Ballybeg bogs.

On the basis of usage of the site by Annex I listed species, plus some Red- and Amber-listed species, it is recommended that a rating of **Local Importance (higher value)** is considered appropriate for wintering birds at Derryhinch Bog.

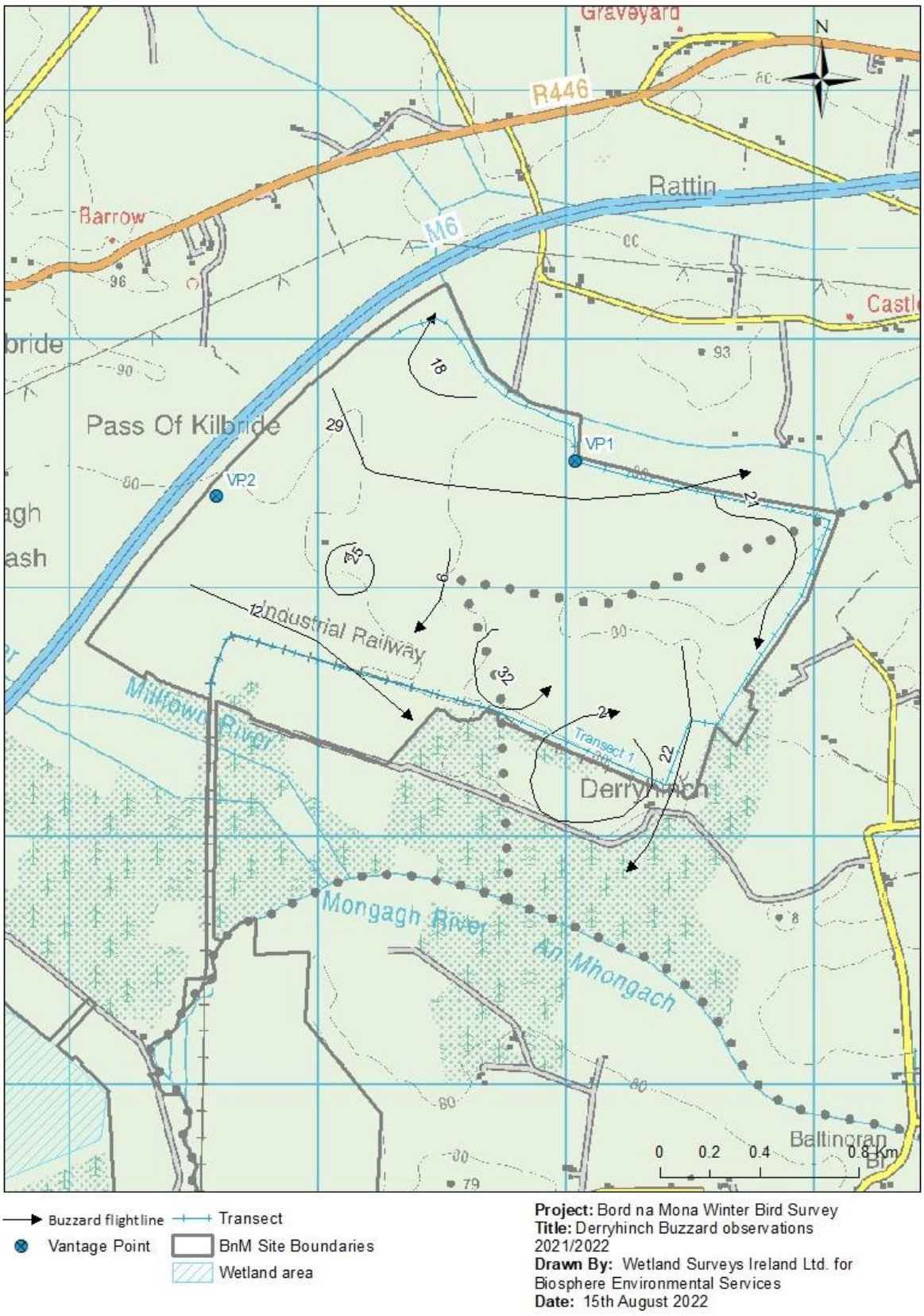
Derryhinch Map 1: Map showing transect and vantage point locations, with Mute Swan flightlines.



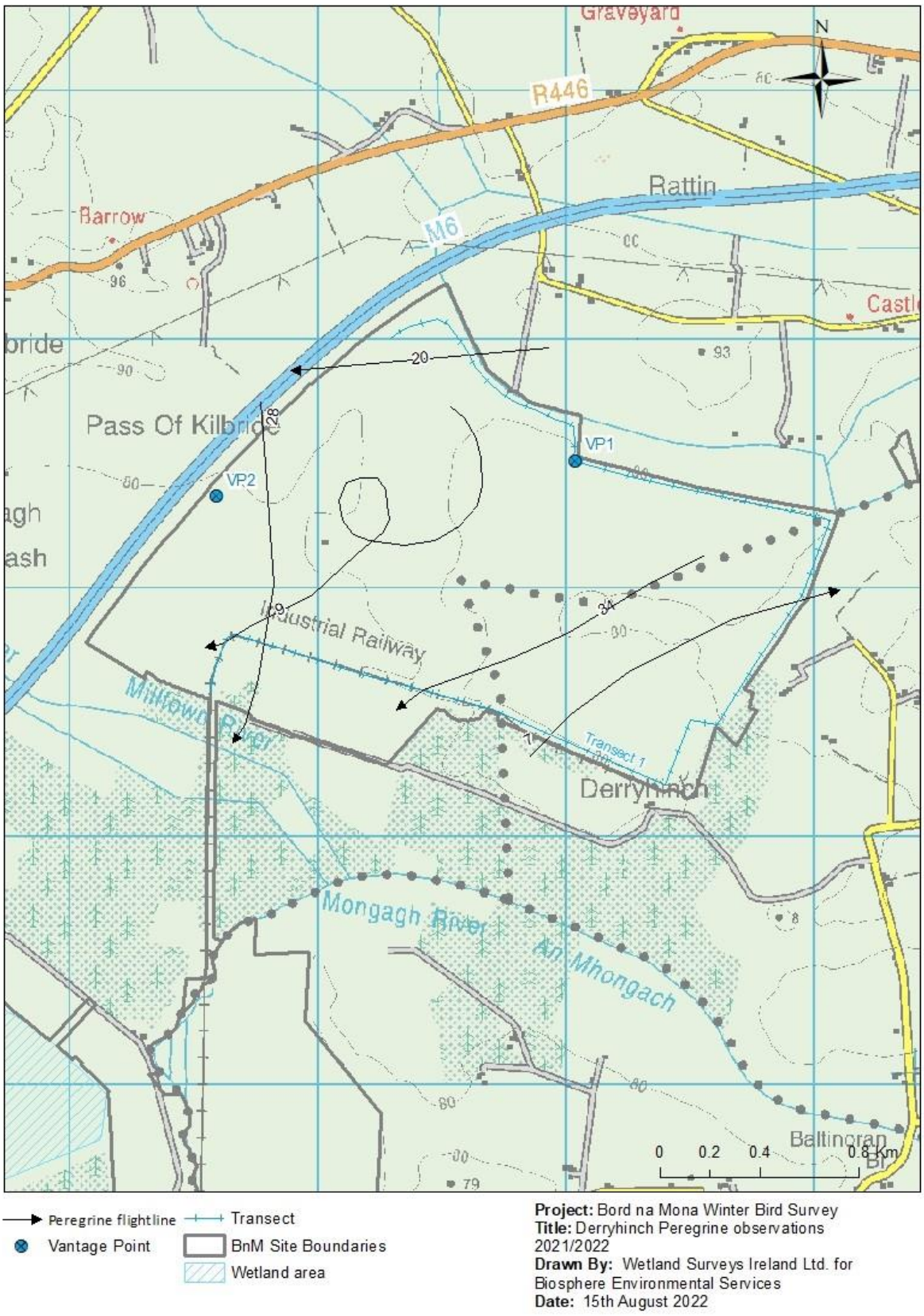
Derryhinch Map 2: Map showing transect and vantage point locations, with Sparrowhawk flightlines.



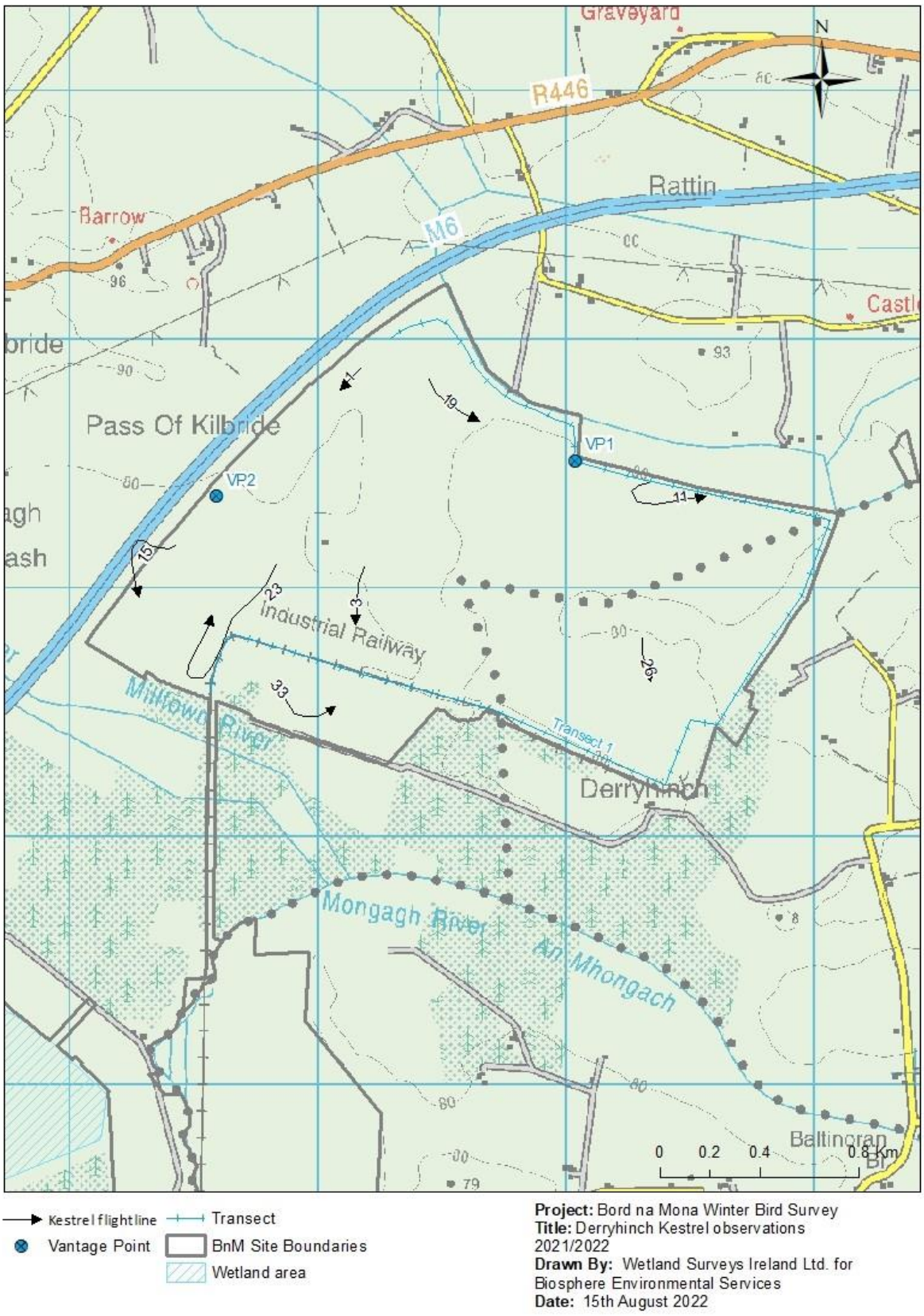
Derryhinch Map 3: Map showing transect and vantage point locations, with Buzzard flightlines.



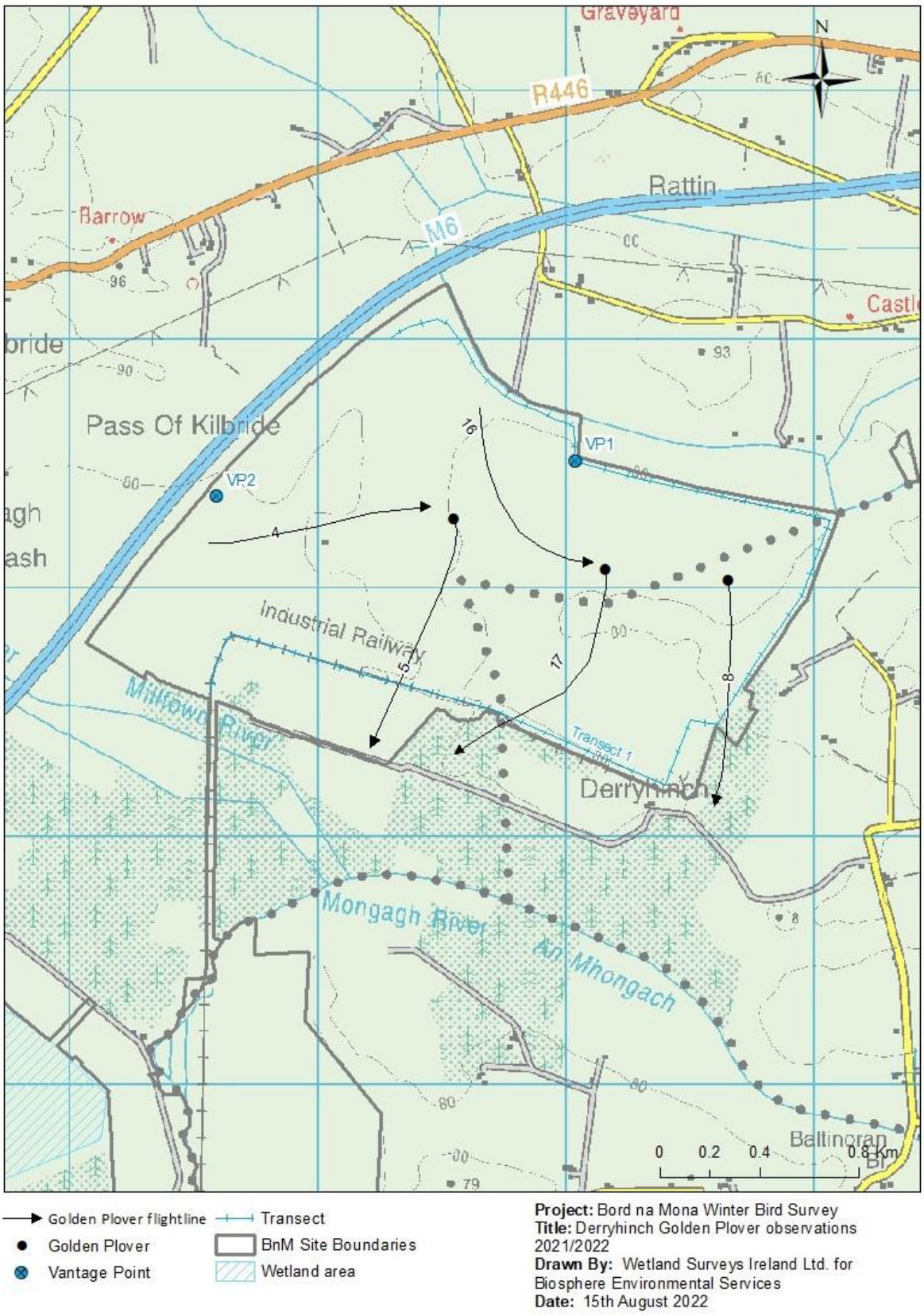
Derryhinch Map 4: Map showing transect and vantage point locations, with Peregrine flightlines.



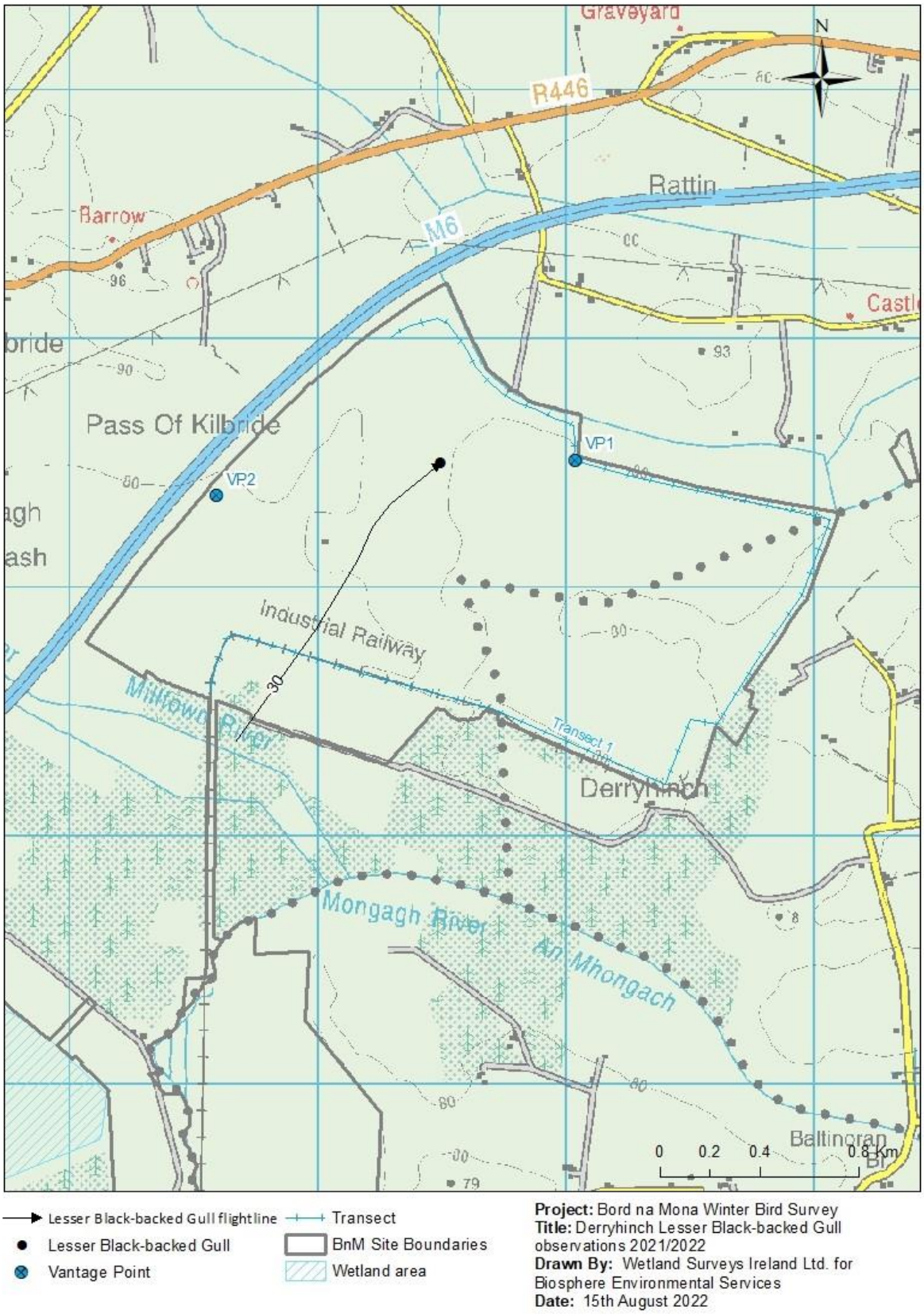
Derryhinch Map 5: Map showing transect and vantage point locations, with Kestrel flightlines.



Derryhinch Map 6: Map showing transect and vantage point locations, with Golden Plover Swan flightlines.



Derryhinch Map 7: Map showing transect and vantage point locations, with Lesser Black-backed Gull flightlines.



3.6 Ballybeg Bog

3.6.1 Site Description

Ballybeg Bog is located to the west of the R400 road and between Croghan Hill and the town of Rhode. It is contiguous with Derryarkin bog to the north and Cavemount bog to the south. The most southern sector is an outlier from the main site and lies between a local road and the Grand Canal pNHA.

In addition to recent commercial peat production (now ceased since January 2021), a large area (c.60 ha) of cutaway east of the main railway line had been planted with alder as a biomass trial for East Offaly Power. The extreme northeast section of the site had been used for gravel extraction.

Ballybeg Bog is sharply divided into three main ecological units: the northern part which has been out of production for some time and is re-vegetating cutaway, the southern part which has been in recent commercial industrial production, and the small southern outlier of largely intact raised bog, known as Coole bog.

The northern cutaway sector contains a range of habitats but is dominated by birch scrub or developing bog woodland. There are some small wetlands with permanent or temporary water. Wetland vegetation, however, is poorly developed. Bare peat still occurs in places. As noted, a substantial portion of the cutaway has been developed as an Alder biomass trial, and is classified as short rotation coppice.

The southern part of the site is in the early stage of re-vegetation though as of yet vegetation cover is sparse. A portion to the east of the railway line and west-southwest of the (former) Works area comprises disturbed ground associated with the old Rhode Power Station. This area is dominated by scrub, dense bracken and dry grassland.

An area of undeveloped high bog occurs in the southernmost sector of the site (part of this bog is not within Bord na Móna ownership). This is largely intact bog though there is active turbary along the western margin and a network of surface drains had been inserted in the past. A remnant strip of high bog also occurs along the northeast boundary, while patches of cutover bog occur in places along the margins of the site.

The site is adjoined by slivers of bog to the east and north-west, with agricultural land to the south and west.

3.6.2 Survey locations

Transect 1 follows the train track through the site.

Vantage Point 1 is located along the northeast boundary of the site and gives a view over the entire northern sector of the site.

Vantage Point 2 is located on a peat track in the central areas of the site (at edge of the established cutaway) and gives a view over much of the southern sector of the site.

Vantage Point 3 is located on the train track near the southern entrance to the site and gives a view over the extreme southernmost parts of site, including the Coole Bog outlier.

3.5.3 Results and Discussion

A summary of the variables (date, time, weather etc.) for the vantage point watches carried out at Ballybeg Bog between October 2021 and March 2022 is presented in Appendix 4. Survey raw data for the vantage point watches are presented in Appendix 8.

Scientific names of bird species are given in Appendix 9.

Plate 1. The southern sector of Ballybeg Bog is still largely bare peat after recent commercial production. Looking west across site towards Croghanhill, September 2021.

Plate 2. The northern sector of Ballybeg Bog is mostly dominated by birch scrub, with some shallow pools though with sparse vegetation, September 2021.

Target species recorded

Mute Swan

There were two records: a party of three flew southwards towards Cavemount on 30th October and a pair flew southeast on 16th January.

Mute swan occurs regularly at Derryarkin/Drumman and Cavemount, and birds may also be observed along the canal. Some interaction is expected between the locations.

Whooper Swan

There were five flightlines over the site, as follows:

On 21st November, a party of 7 was observed flying northwest over the site at 15.14 hrs.

On 29th November, a party of 9 flew south over the site at 16.10 hrs.

On 11th December, a party of 6 was observed flying north over the site at 14.56 hrs.

On 20th December, a party of 6 was observed flying south over southern part of site at 15.15 hrs.

On 13th February, a party of 5 flew northwards from Cavemount at 08.48 hrs.

The pattern of flightlines indicates that there is some movement of Whooper Swans between Cavemount Bog and Derryarkin. However, the numbers recorded were relatively low and not on a regular basis. The observations at Derryarkin have shown that the majority of feeding swans use the local quarry ponds for night roosting.

Sparrowhawk

There were six records of Sparrowhawk on site through the winter.

Two of the records (20th October & 22nd February) involved circling pairs, with the other records of single birds. All of the records were from the northern half of the site.

Sparrowhawk is known to breed on site.

Buzzard

Buzzard was recorded frequently during the winter and throughout the site.

Three of the records (21st November, 22nd January, 22nd February) involved pairs interacting / displaying, with the other records involving single birds hunting and/or flying.

Several pairs of Buzzard are known to breed within the wider area of Ballybeg.

Kestrel

Kestrel was recorded on site throughout the winter period, with a total of twelve records. Apart from a pair together on 15th March, all records were of single birds, involving both males and females. Most of the birds were hunting actively on site.

Kestrel breeds locally (though probably not on site).

Merlin

There was one record of Merlin on 13th February – this involved a bird hunting low over sparsely vegetated bog. The bird may have been roosting on peat beforehand as it was not seen flying in to the area.

Merlin is expected to be an occasional winter visitor to the site.

Peregrine

Peregrine was recorded flying over the site on two occasions, 29th November and 25th February.

The birds observed in winter at Ballybeg are considered to be associated with the breeding pair at Derryarkin (which nests on a man-made structure).

Golden Plover

Golden Plover was recorded on three dates as follows:

On 26th October, a flock of c.80 birds was roosting on bare peat in the southern sector of the site and then flew northwards.

On 22nd November, a flock of 50+ birds flew in from northwest and landed on bare peat for approximately 50 minutes. The birds then got up and flew back northwards.

On 22nd January, a flock of c.200 birds was observed circling over the northern boundary of the site.

The plover which occur at Ballybeg are almost certainly from the regular wintering population (estimated up to 1,000 birds) which frequents the fields at Derryarkin as well as fields to the north of the motorway, and also at times Drumman Bog.

Lapwing

Lapwing was recorded on three dates as follows:

On 30th October, a flock of 28 birds flew northwards over the southern part of the site.

On 29th November, a flock of 100+ birds was observed circling over the northern boundary of the site.

On 20th December, a flock of 18 birds flew southwards over the site.

The Lapwing which occur at Ballybeg are expected to be associated with the wintering population (estimated up to 400 birds) which frequents the fields at Derryarkin as well as fields to the north of the motorway, and also at times Drumman Bog. Birds may at times also utilise Cavemount Bog.

Potential for other target species

Hen Harrier could be expected at times to pass through the site (one recorded in site in March 2013).

Other species of note

Mallard – recorded on several occasions in large drains and ponded areas, though in low numbers (up to 3).

Snipe – snipe is fairly scarce on site, with 1-2 birds being recorded mainly in the few wetland areas in the northern part of site and on the southernmost bog (Coole). However, 11 were flushed from a wet area of Coole Bog on 13th February.

Skylark – recorded in March (4) (territorial birds).

Mistle Thrush – recorded regularly on site, with peak count of 19 on 30th October.

Redwing – flocks present in marginal hedging in southern sector of site and also passing over site in December and January. Highest count was c.200 on 16th January (accompanied by several hundred Fieldfares).

Robin - present on site through winter in scrub habitats.

Stonechat – recorded on most visits through the winter. Three territorial pairs in March.

Meadow Pipit – regular on site through the winter though mostly in small numbers (<10). Total of 23 on transect walk on 26th February comprised mostly territorial birds.

Goldcrest – present on site through winter in scrub habitats (though in low numbers).

Starling – large flocks recorded passing over site in late afternoon periods from late-November to February, with estimates of over 1,000 birds as follows: c.2,000 west over site from 16.05 hrs on 29th November; c.4,000 northwest across site from 15.45 hrs on 18th December; c.6,000 north over site from 16.00 hrs on 22nd January; c.2,000 flew northwest across site from 16.25 hrs on 13th February.

Linnet – regular on site in numbers up to 20 through the winter.

SITE: BALLYBEG – TRANSECT SURVEYS, 2021-2022

Species	Date 01/12/21	Date 23/01/22	Date 26/02/22	BoCCI Status
Mallard	0	0	3	**G**
Pheasant	2	0	1	**G**
Grey Heron	2	0	1	**G**
Sparrowhawk	0	0	0	G
Buzzard	2	1	0	**G**
Kestrel	**0**	**0**	**1**	**R**
Lapwing	**13**	**0**	**0**	**R**
Snipe	**1**	**0**	**2**	**R**
Woodpigeon	20+	6	10	**G**
Magpie	3	1	3	**G**
Jay	1	0	1	**G**
Jackdaw	24	10+	15	**G**
Hooded Crow	2	4	4	**G**
Raven	0	3	0	**G**
Goldcrest	**0**	**1**	**3**	**A**
Blue Tit	0	2	2	**G**
Great Tit	1	1	2	**G**
Dunnock	0	0	1	**G**
Coal Tit	6	0	4	**G**
Skylark	**0**	**0**	**0**	**A**
Long-tailed Tit	0	0	5	**G**
Starling	**100+**	**200+**	**12**	**A**
Wren	7	4	11	**G**
Blackbird	12	5	6	**G**
Fieldfare	0	50+	0	**G**
Song Thrush	2	0	2	**G**
Redwing	**0**	**40+**	**0**	**R**
Mistle Thrush	2	3	2	G
Robin	4	3	5	G
Stonechat	5	2	6	G
Meadow Pipit	**17**	**12**	**23**	**R**
Pied Wagtail	5	2	2	**G**
Chaffinch	30+	8	20+	**G**
Goldfinch	14	5	4	**G**
Linnet	**12**	**9**	**2**	**A**
Lesser Redpoll	20+	13	17	**G**
Reed Bunting	3	2	3	**G**

BoCCI Status: **R – Red**; **A – Amber**; **G – Green**

General discussion

The 2021/22 winter survey at Ballybeg bog has added to the baseline winter bird assessments carried out in winters 2012/13 and 2013/14 (albeit the earlier surveys were at time when commercial production was in progress over the central and southern parts of site).

While bog rehabilitation, and especially wetland development, is still at an early development stage at Ballybeg, the site provides useful habitat for various bird of prey species and especially Kestrel (Red listed), Sparrowhawk and Buzzard. Species such as Hen Harrier and Merlin pass through the site at times and Peregrine may hunt over the site (site is within the range of the breeding pair at Derryarkin).

Golden Plover was recorded landed on bare peat on two occasions, as well as birds flying over the site. Lapwing was also recorded over the site. These two species are considered to be associated with the regular winter populations in the wider Derryarkin area, though birds may also commute to Cavemount bog. Snipe (Red-listed) occurs within the site though mostly in small numbers. Both Whooper Swan and Mute Swan were recorded flying over the site. These birds are expected to be commuting between Derryarkin and Cavemount, as Ballybeg does not presently have habitats to support swans.

The site supports a range of other species of conservation interest. Meadow Pipit, Red listed on basis of breeding population, occurs throughout much of the site during winter. The Red-listed Redwing is regular in area during winter and at times occurs within the site. Amber-listed species recorded on site included Skylark, Goldcrest, Starling and Linnet.

3.6.4 Evaluation and Rating of Ballybeg Bog for Wintering Birds

There follows a summary of the conservation status of species recorded on Ballybeg Bog in winter 2021/22:

EU Birds Directive Annex I listed species

Whooper Swan (flying over)
Merlin
Peregrine (flying over)
Golden Plover

Red Listed species (after Gilbert et al. 2021)

Kestrel
Golden Plover
Lapwing
Snipe
Redwing
Meadow Pipit

Amber Listed species (after Gilbert et al. 2021)

Mute Swan (flying over)
Whooper Swan (flying over)
Skylark
Goldcrest

Starling
Linnet

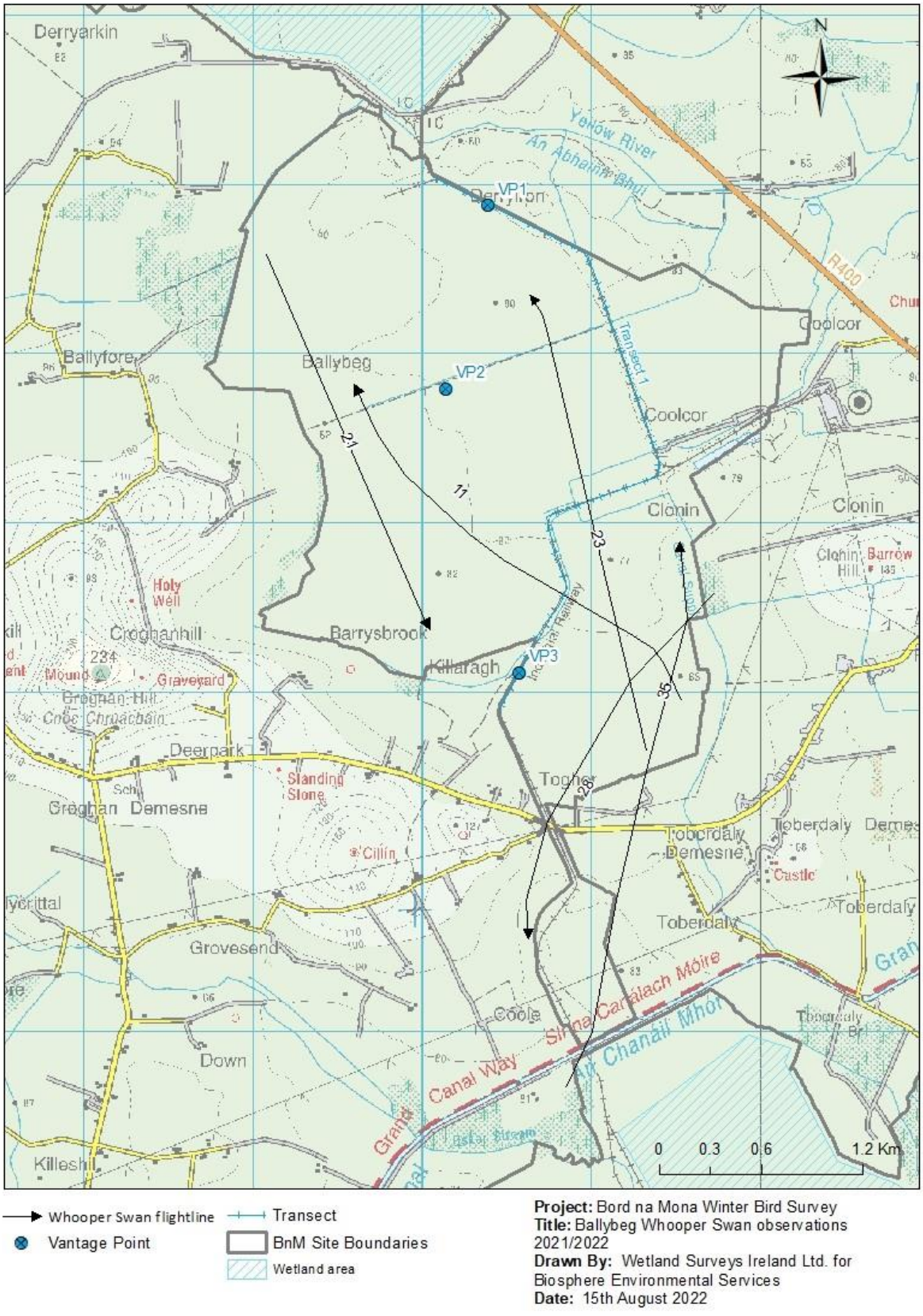
Overall, the site has existing and developing habitats suitable for supporting a range of wintering birds, including some wetland birds and notably Golden Plover.

A feature of Ballybeg Bog is that it is used regularly for hunting by birds of prey, notably Kestrel, Buzzard and Sparrowhawk but also on occasions by Merlin. The site is also within the range of a local breeding pair of Peregrine.

From the location of the site, it can be considered as part of a larger complex of cutaway bog sites, comprising Derryarkin, Drumman and Ballybeg bogs, along with Cavemount Bog to the south.

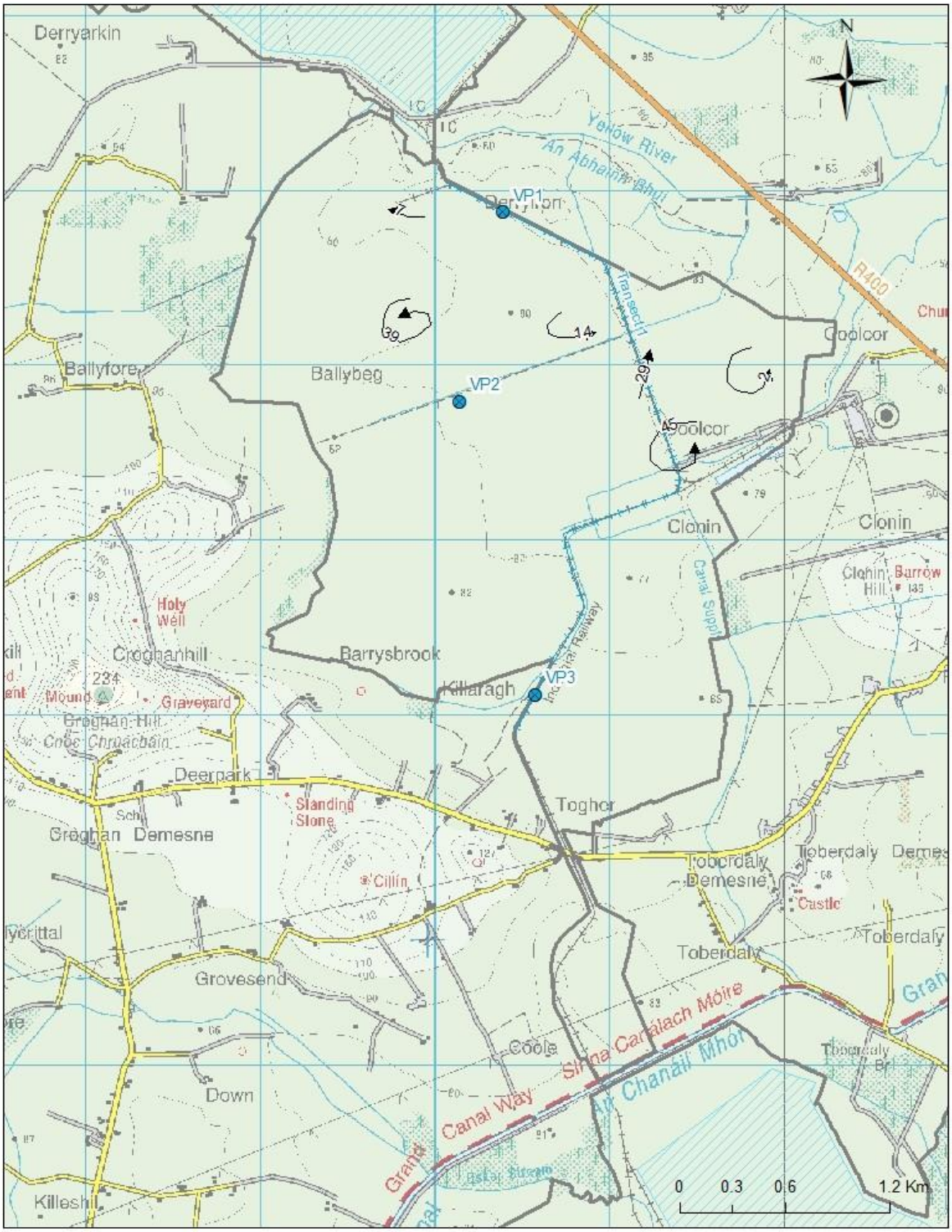
On the basis of usage of the site by Annex I listed species, plus some Red- and Amber-listed species, it is recommended that a rating of **Local Importance (higher value)** is considered appropriate for wintering birds at Ballybeg Bog.

Ballybeg Map 1: Map showing transect and vantage point locations, with Whooper Swan flightlines.

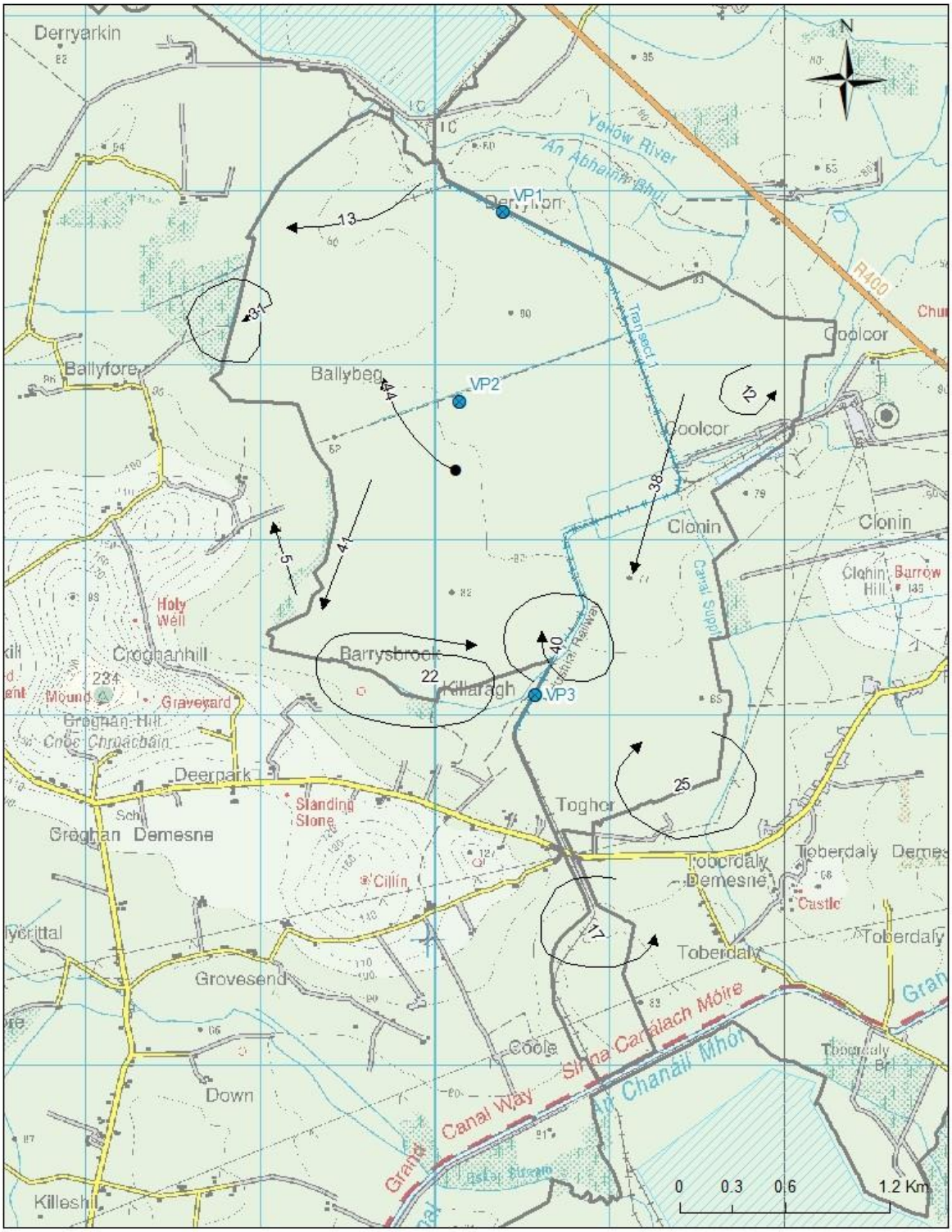


Ballybeg Map 2: Map showing transect and vantage point locations, with Mute Swan flightlines.

Ballybeg Map 3: Map showing transect and vantage point locations, with Sparrowhawk flightlines.

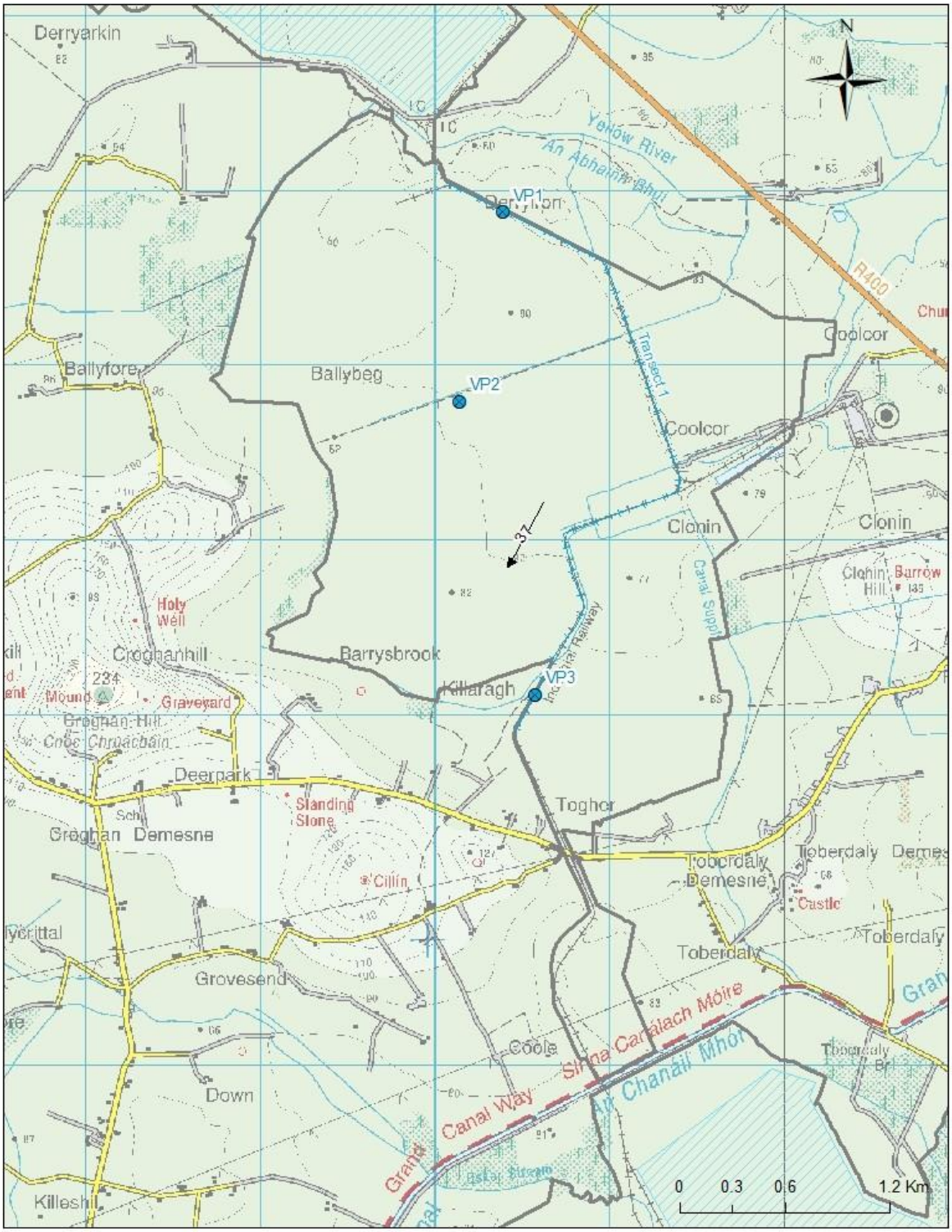


Ballybeg Map 4: Map showing transect and vantage point locations, with Buzzard flightlines.

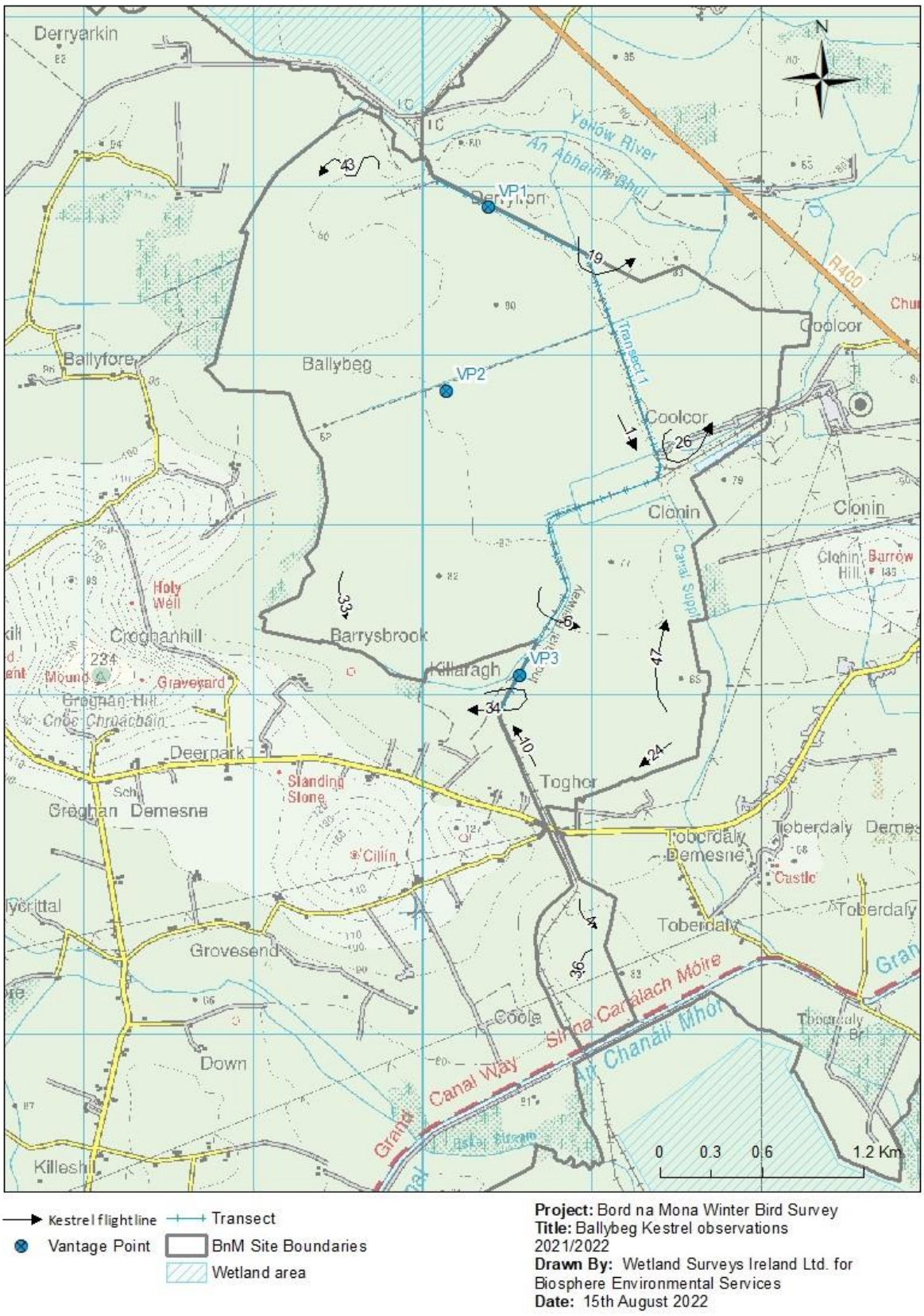


Ballybeg Map 5: Map showing transect and vantage point locations, with Peregrine flightlines.

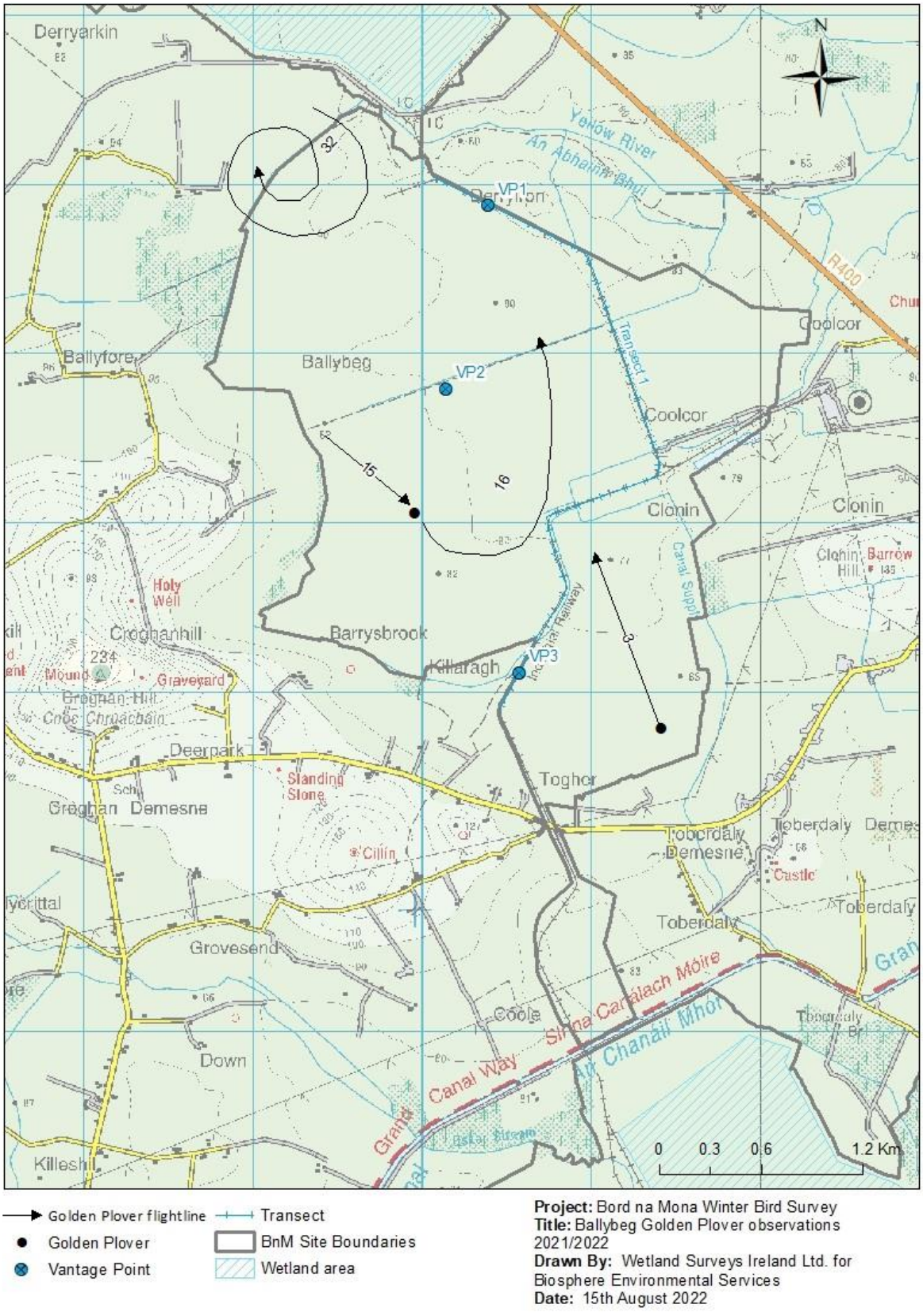
Ballybeg Map 6: Map showing transect and vantage point locations, with Merlin flightlines.



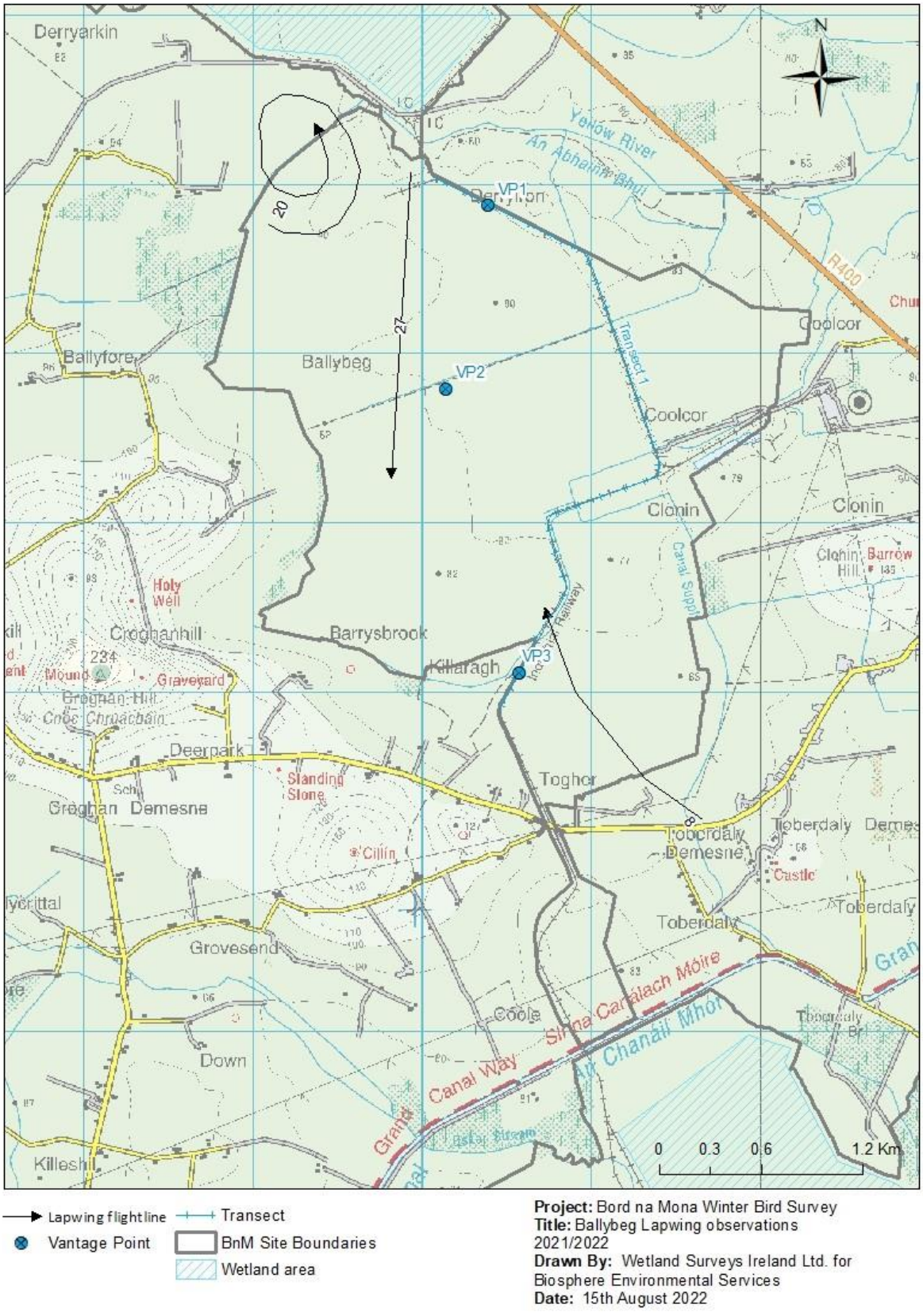
Ballybeg Map 7: Map showing transect and vantage point locations, with Kestrel flightlines.



Ballybeg Map 8: Map showing transect and vantage point locations, with Golden Plover flightlines.



Ballybeg Map 9: Map showing transect and vantage point locations, with Lapwing flightlines.



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APPENDIX 1.

Summary of vantage point (VP) watch variables, Derryarkin Bog, October 2021 to March 2022

Date	Season	VP no.	Duration (hrs)	Start Time	Weather conditions
21/10/2021	Winter	1	3	08:15	Dry, Good visibility, SW wind, F3
21/10/2021	Winter	3	3	12:15	Dry, Good visibility, SW wind, F3
22/10/2021	Winter	2	3	09:30	Dry, Good visibility, SW wind, F2
22/10/2021	Winter	1	3	14.00	Dry, Good visibility, SW wind, F3
29/10/2021	Winter	2	3	09:15	Showers, Good visibility, W wind, F2
29/10/2021	Winter	3	3	13.00	Showers, Good visibility, W wind, F2
19/11/2021	Winter	2	3	09.00	Dry, Good visibility, N wind, F2
19/11/2021	Winter	3	3	14.00	Dry, Good visibility, NW wind, F2
20/11/2021	Winter	1	3	08:30	Dry, Good visibility, W wind, F3
20/11/2021	Winter	3	3	12:15	Dry, Good visibility, W wind, F3
25/11/2021	Winter	1	3	09:30	Drizzle, Good visibility, SW wind, F2
25/11/2021	Winter	2	3	14.30	Dry, Good visibility, SW wind, F2
10/12/2021	Winter	1	3	08:00	Dry, Good visibility, E wind, F2
10/12/2021	Winter	2	3	13:00	Dry, Good visibility, E wind, F2
16/12/2021	Winter	3	3	09.30	Dry, Good visibility, SW wind, F4
16/12/2021	Winter	2	3	14:00	Dry, Good visibility, SW wind, F3
17/12/2021	Winter	1	3	08.45	Dry, Good visibility, SW wind, F2
17/12/2021	Winter	3	3	12:30	Dry, Good visibility, W wind, F2
06/01/2022	Winter	2	3	09:30	Showers, Good visibility, SW wind, F3
06/01/2022	Winter	1	3	13:30	Dry, Good visibility, SW wind, F2
20/01/2022	Winter	3	3	09:00	Dry, Good visibility, S wind, F2
20/01/2022	Winter	2	3	13.30	Dry, Good visibility, S wind, F2
24/01/2022	Winter	1	3	08:30	Dry, Good visibility, W wind, F4
24/01/2022	Winter	3	3	13:30	Dry, Good visibility, W wind, F3
14/02/2022	Winter	1	3	09:00	Dry, Good visibility, SE wind, F2
14/02/2022	Winter	2	3	13:00	Dry, Good visibility, S wind, F2
17/02/2022	Winter	3	3	08:00	Dry, Good visibility, SW wind, F2
17/02/2022	Winter	2	3	12:00	Dry, Good visibility, SW wind, F2
28/02/2022	Winter	1	3	10:00	Dry, Good visibility, W wind, F3
28/02/2022	Winter	3	3	14:00	Dry, Good visibility, W wind, F3
11/03/2022	Winter	1	3	08:30	Drizzle, Mod visibility, SE wind, F1
11/03/2022	Winter	2	3	12:30	Showers, Good visibility, S wind, F2
14/03/2022	Winter	3	3	09:45	Dry, Good visibility, SW wind, F3

Date	Season	VP no.	Duration (hrs)	Start Time	Weather conditions
14/03/2022	Winter	2	3	14:00	Dry, Good visibility, SW wind, F3
25/03/2022	Winter	1	3	10:00	Dry, Good visibility, SW Wind, F3
25/03/2022	Winter	3	3	14:00	Dry, Good visibility, SW Wind, F2

APPENDIX 2

Summary of vantage point (VP) watch variables, Drumman Bog, October 2021 to March 2022

Date	Season	VP no.	Duration (hrs)	Start Time	Weather conditions
19/10/2021	Winter	1	3	09:15	Dry, good visibility, S wind, F2
19/10/2021	Winter	2	3	13:30	Dry, good visibility, S wind, F2
23/10/2021	Winter	3	3	08.30	Showers, good visibility, SW wind, F3
23/10/2021	Winter	4	3	13:00	Showers, good visibility, SW wind, F3
25/10/2021	Winter	2	3	08.15	Showers, good visibility, SW wind, F3
25/10/2021	Winter	3	3	13:30	Dry, good visibility, W wind, F2
27/10/2021	Winter	4	3	10:00	Dry, good visibility, NW wind, F2
27/10/2021	Winter	1	3	14.00	Dry, good visibility, NW wind, F2
15/11/2021	Winter	3	3	08:15	Dry, Good visibility, SW wind, F3
15/11/2021	Winter	1	3	13:00	Dry, Good visibility, SW wind, F2
16/11/2021	Winter	2	3	09.00	Dry, Good visibility, W wind, F2
16/11/2021	Winter	4	3	13:30	Dry, Good visibility, W wind, F2
23/11/2021	Winter	1	3	09:15	Showers, Good visibility, SW wind, F3
23/11/2021	Winter	4	3	14:00	Showers, Good visibility, SW wind, F3
24/11/2021	Winter	3	3	08:30	Drizzle, Mod visibility, SE wind, F3
24/11/2021	Winter	2	3	12:30	Showers, Good visibility, SE wind, F3
09/12/2021	Winter	1	3	09:15	Dry, Good visibility, SW wind, F2
09/12/2021	Winter	2	3	13:00	Dry, Good visibility, SW wind, F2
18/12/2021	Winter	3	3	08:45	Showers, Good visibility, NW Wind, F3
18/12/2021	Winter	4	3	13:00	Dry, Good visibility, NW Wind, F3
20/12/2021	Winter	3	3	08:30	Dry, Good visibility, SW wind, F3
20/12/2021	Winter	2	3	12:30	Dry, Good visibility, SW wind, F3
21/12/2021	Winter	4	3	09:30	Dry, Good visibility, W wind, F1
21/12/2021	Winter	1	3	12:45	Showers, Good visibility, W wind, F1
14/01/2022	Winter	3	3	08:30	Dry, Good visibility, W wind, F2
14/01/2022	Winter	1	3	13:30	Dry, Good visibility, W wind, F2
15/01/2022	Winter	4	3	09:15	Dry, Good visibility, NW wind, F3
15/01/2022	Winter	2	3	14:00	Dry, Good visibility, NW wind, F3
26/01/2022	Winter	1	3	09:10	Showers, Good visibility, SW wind, F4
26/01/2022	Winter	4	3	12.45	Dry, Good visibility, SW wind, F3
27/01/2022	Winter	3	3	08:15	Dry, Good visibility, W wind, F2
27/01/2022	Winter	2	3	12:30	Dry, good visibility, W wind, F2

Date	Season	VP no.	Duration (hrs)	Start Time	Weather conditions
11/02/2022	Winter	3	3	08:00	Dry, Good visibility, S wind, F2
11/02/2022	Winter	2	3	12:30	Dry, Good visibility, S wind, F2
12/02/2022	Winter	4	3	09.30	Dry, Good visibility, SW wind, F3
12/02/2022	Winter	1	3	14:00	Dry, Good visibility, SW wind, F3
23/02/2022	Winter	1	3	09:15	Drizzle clearing, Mod-good visibility, S wind, F2
23/02/2022	Winter	2	3	13:15	Dry, Good visibility, SW wind, F3
24/02/2022	Winter	3	3	08:30	Showers, Good visibility, NW wind, F3
24/02/2022	Winter	4	3	13:00	Showers, Good visibility, NW wind, F3
10/03/2022	Winter	2	3	09:15	Showers, Good visibility, W wind, F3
10/03/2022	Winter	4	3	13:15	Dry, Good visibility, W wind, F3
12/03/2022	Winter	1	3	08:45	Dry, Good visibility, SW wind, F2
12/03/2022	Winter	3	3	13:30	Dry, Good visibility, SW wind, F2
13/03/2022	Winter	4	3	09.30	Dry, good visibility, NW wind, F3
13/03/2022	Winter	1	3	14:00	Dry, good visibility, NW wind, F3
23/03/2022	Winter	3	3	10:00	Dry, good visibility, S wind, F2
23/03/2022	Winter	2	3	14:00	Dry, good visibility, S wind, F2

APPENDIX 3

Summary of vantage point (VP) watch variables, Derryhinch Bog, October 2021 to March 2022

Date	Season	VP no.	Duration (hrs)	Start Time	Weather conditions
26/10/2021	Winter	1	3	09:30	Dry, Good visibility, W wind, F2
26/10/2021	Winter	2	3	14:15	Dry, Good visibility, W wind, F3
28/10/2021	Winter	2	3	08:00	Dry, Good visibility, SW wind, F1
28/10/2021	Winter	1	3	13.00	Dry, Good visibility, SW wind, F2
17/11/2021	Winter	1	3	09.00	Drizzle, Mod visibility, SE wind, F2
17/11/2021	Winter	2	3	13.00	Dry, Good visibility, S wind, F3
26/11/2021	Winter	1	3	09:30	Showers, Good visibility, NW wind, F3
26/11/2021	Winter	2	3	14:30	Showers, Good visibility, NW wind, F3
11/12/2021	Winter	2	3	08:45	Dry, Good visibility, SW wind, F2
11/12/2021	Winter	1	3	13:00	Dry, Good visibility, SW wind, F2
28/12/2021	Winter	1	3	09.30	Dry, Good visibility, W wind, F3
28/12/2021	Winter	2	3	13:00	Dry, Good visibility, W wind, F3
10/01/2022	Winter	2	3	08:30	Showers, Good visibility, S wind, F2
10/01/2022	Winter	1	3	13:00	Dry, Good visibility, SW wind, F3
19/01/2022	Winter	1	3	09:00	Dry, Good visibility, SW wind, F2
19/01/2022	Winter	2	3	13.30	Dry, Good visibility, SW wind, F2
10/02/2022	Winter	1	3	09:00	Dry, Good visibility, N wind, F2
10/02/2022	Winter	2	3	13:30	Dry, Good visibility, N wind, F2
25/02/2022	Winter	3	3	08:00	Dry, Good visibility, W wind, F3
25/02/2022	Winter	2	3	12:00	Dry, Good visibility, W wind, F3
13/03/2022	Winter	1	3	08:00	Showers, good visibility, SE wind, F2
13/03/2022	Winter	2	3	12:00	Showers, Good visibility, SE wind, F2
26/03/2022	Winter	1	3	10:30	Dry, Good visibility, SW wind, F3
26/03/2022	Winter	2	3	14:30	Dry, Good visibility, SW wind, F3

APPENDIX 4

Summary of vantage point (VP) watch variables, Ballybeg Bog, October 2021 to March 2022

Date	Season	VP no.	Duration (hrs)	Start Time	Weather conditions
20/10/2021	Winter	1	3	09:30	Dry, Good visibility, W wind, F2
20/10/2021	Winter	2	3	14:00	Dry, Good visibility, W wind, F3
26/10/2021	Winter	3	3	08:30	Showers, Good visibility, SW wind, F3
26/10/2021	Winter	2	3	12.30	Dry, Good visibility, SW wind, F3
30/10/2021	Winter	1	3	07:45	Drizzle, Mod-good visibility, NW wind, F2
30/10/2021	Winter	3	3	14.30	Showers, Good visibility, NW wind, F2
21/11/2021	Winter	3	3	08.15	Drizzle, Good visibility, S wind, F2
21/11/2021	Winter	2	3	13.00	Dry, Good visibility, S wind, F3
22/11/2021	Winter	1	3	09:00	Dry, Good visibility, W wind, F3
22/11/2021	Winter	2	3	13:00	Dry, Good visibility, W wind, F3
29/11/2021	Winter	3	3	08:45	Dry, Good visibility, SW wind, F2
29/11/2021	Winter	1	3	14.00	Dry, Good visibility, SW wind, F2
11/12/2021	Winter	1	3	08:30	Showers, Good visibility, E wind, F3
11/12/2021	Winter	2	3	12:30	Showers, Good visibility, E wind, F3
18/12/2021	Winter	3	3	09.00	Dry, Good visibility, SW wind, F2
18/12/2021	Winter	2	3	13:30	Dry, Good visibility, SW wind, F2
20/12/2021	Winter	1	3	09.00	Dry, Good visibility, NW wind, F3
20/12/2021	Winter	3	3	13:30	Dry, Good visibility, NW wind, F3
16/01/2022	Winter	2	3	09:15	Dry, Good visibility, SW wind, F3
16/01/2022	Winter	3	3	13:00	Dry, Good visibility, SW wind, F2
22/01/2022	Winter	1	3	08:30	Dry, Good visibility, W wind, F3
22/01/2022	Winter	2	3	12.30	Dry, Good visibility, W wind, F3
25/01/2022	Winter	1	3	08:45	Showers, Good visibility, W wind, F4
25/01/2022	Winter	3	3	13:30	Showers, Good visibility, W wind, F3
13/02/2022	Winter	3	3	08:00	Dry, Good visibility, S wind, F2
13/02/2022	Winter	2	3	12:00	Dry, Good visibility, S wind, F2
22/02/2022	Winter	1	3	09:30	Dry, Good visibility, SW wind, F3
22/02/2022	Winter	2	3	14:00	Dry, Good visibility, SW wind, F3
25/02/2022	Winter	1	3	09:00	Dry, Good visibility, NW wind, F3
25/02/2022	Winter	3	3	13:00	Dry, Good visibility, NW wind, F3
15/03/2022	Winter	1	3	09:15	Drizzle, Mod-good visibility, S wind, F1

Date	Season	VP no.	Duration (hrs)	Start Time	Weather conditions
15/03/2022	Winter	2	3	12:30	Showers, Good visibility, S wind, F2
26/03/2022	Winter	3	3	09:45	Dry, Good visibility, SW wind, F3
26/03/2022	Winter	2	3	14:00	Dry, Good visibility, SW wind, F3
29/03/2022	Winter	3	3	10:00	Dry, Good visibility, W Wind, F3
29/03/2022	Winter	1	3	14:00	Dry, Good visibility, W Wind, F2

APPENDIX 5

Vantage Point raw data & flight activity, Derryarkin Bog, October 2021 – March 2022

Date	VP No	Map Reference	Species	No.	Flight Time	Flight Duration (s)	Band 1 (0-25m)	Band 2 (25-175m)	Band 3 (175+m)	Comments
21/10/2021	1	1	Little Egret	2	09.45	120	60	60	0	Two feeding / resting, then flew up
		2	Sparrow hawk	1	11.13	30	30	0	0	Hunting
21/10/2021	3	3	Kestrel	1	13.14	180	60	120	0	Flying / hunting - male
22/10/2021	2	4	Mute Swan	7	10.20	120	90	30	0	On pond, flew up
		5	Peregrine	1	11.37	90	0	90	0	Flew in and out
		6	Kestrel	1	11.56	60	60	0	0	Hunting
22/10/2021	1	7	Lapwing	22	14.50	120	90	30	0	Flew up
		8	Buzzard	3	15.14	600		300	300	Trio interacting
29/10/2021	2	9	Golden plover	400+	10.10	300	0	200	100	Flock circling – later seen landed on bog
		10	Kestrel	2	11.01	180	120	60	0	Two – pair ?
23/10/2021	3	11	Buzzard	1	15.45	120	90	30	0	Flying / hunting
19/11/2021	2	12	Whooper Swan	12	09:35	90	90	0	0	Flew from pond
		13	Peregrine	2	11.15	180	0	180	0	Circling
		14	Little Egret	1						On pond
		14a	King fisher	1	11.38	30	30	0	0	Flew over pond and landed on a willow – not seen leaving
19/11/2021	3	15	Golden Plover	200+	15.16	180	0	100	80	Circling over sit e& fields
		16	Buzzard	2	15.42	120	0	120	0	Flying
20/11/2021	1	17	Golden plover	150+	09.12	90	30	60	0	Flock flew up from bog
		18	Lapwing	200+	09.40	120	90	30	0	Flock flying towards Drumman
		19	Kestrel	1	10.49	60	60	0	0	Hunting along road - female
20/11/2021	3									No target species
25/11/2021	1	20	Whooper Swan	28	09.44	120	120	0	0	Flock flying to grassland – 20+ already there
		21	Buzzard	1	09.58	45	45	0	0	
		22	Golden plover	28	10.14	60	30	30	0	Flock had been roosting
25/11/	2	23	Sparrow	1	15.09	20	20	0	0	Hunting

Date	VP No	Map Reference	Species	No.	Flight Time	Flight Duration (s)	Band 1 (0-25m)	Band 2 (25-175m)	Band 3 (175+ m)	Comments
2021			hawk							
		24	Whooper swan	36	15.58	90	90	0	0	Flew to quarry pond & settled
10/12/2021	1	25	Whooper Swan	28	08.45	60	60	0	0	Flew to feeding fields – had been roosting
		26	Golden plover	200 +	10.40	300	60	140	100	Flock circling (from grass field)
10/12/2021	2	27	Mute swan	12	14.15	60	60	0	0	Flew towards Drumman
		28	Buzzard	1	15.09	90	60	30	0	Hunting
		29	Whooper swan	35	15.46	60	60	0	0	To roost
		30	Whooper swan	26	15.55	60	60	0	0	To roost
16/12/2021	3	31	Kestrel	1	10.12	120	60	60	0	Hunting
		32	Lapwing	100 +	11.30	300	150	150	0	Circling
16/12/2021	2	33	Golden Plover	500 +	16.12	120	0	120	0	Large flock flew in
		34	Whooper swan	18	16.10	60	60	0	0	To roost
		35	Whooper swan	40	16.24	180	180	0	0	Arrive in parties
17/12/2021	1	36	Lapwing	34	09.20	90	90	0	0	Flew towards field
17/12/2021	3	37	Wood cock	2	16.15					Flushed on way back from watch – birds separated by c.10 m
06/01/2022	2	38	Mute swan	8	10:15	60	60	0	0	Flew in from Drumman
		39	Lapwing	33	10.46	90	60	30	0	Flew in & settled at pond edge
		40	Lapwing	33	10.59	60	60	0	0	Towards fields
06/01/2022	1	41	Little Egret	1	14.15	60	60	0	0	
		42	Golden Plover	40	15.24	90	40	50	0	Flew in from Drumman direction & landed on bog
		43	Kestrel	1	15.37	60	0	60	0	Flying
20/01/2022	3	44	Peregrine	1	10:15	90	0	90	0	Flying
20/01/2022	2	45	Buzzard	2	14:20	180	0	90	90	Pair interacting
		46	Whooper swan	27	16.12	60	60	0	0	Flew to pond (others heard flying in on way back)
24/01/	1	47	Whooper	34	09.09	90	90	0	0	Had been roosting –

Date	VP No	Map Reference	Species	No.	Flight Time	Flight Duration (s)	Band 1 (0-25m)	Band 2 (25-175m)	Band 3 (175+ m)	Comments
2022			swan							lots of feathers
		48	Sparrow hawk	1	10.40	120	0	60	60	Female circling
24/01/2022	3									No target species GP flock heard to east but not seen
14/02/2022	1	49	Hen Harrier	1	10.13	60	60	0	0	Female type hunting
		50	Peregrine	1	10.54	90	0	90	0	Male flying
14/02/2022	2	51	Golden plover	300 +	13.50	600	0	300	300	Flock circling over site – returned to fields
		52	Buzzard	1	15.11	60	60	0	0	Hunting
17/02/2022	3	53	Buzzard	2	09.53	240	0	100	140	Pair
17/02/2022	2	54	Little Egret	1	12.55	60	60	0	0	Flew presumably into Kilmurray ponds
		55	Peregrine	1	14.15	90	30	60	0	Bird circled and landed on silo
28/02/2021	1	56	Sparrow hawk	2	10.56	300	0	100	200	Pair in display
			Lapwing							At least 3 territorial birds
28/02/2021	3	57	Kestrel	1	15.25	90	60	30	0	Hunting - dropped
11/03/2022	1	58	Whooper swan	7	09.45	60	60	0	0	Had been feeding on bog – flew into field to join others there
		59	Buzzard	1	10.40	60	60	0	0	Hunting low
11/03/2022	2	60	Kestrel	1	12.55	60	0	60	0	Over quarry works
14/03/2022	3									No target species
14/03/2022	2	61	Mute swan	5	16:04	60	60	0	0	Flew in to pond. Also on pond: Tufted duck 22, Great crested Grebe pair, Little Grebe – 2 prs, Coot pr
25/03/2022	1	62	Peregrine	1	11.15	90	30	60	0	Male flew towards Kilmurray area
		63	Little Egret	1	12.32	60	60	0	0	Flew in and settled to feed
25/03/2022	3	64	Buzzard	1	14.16	90	0	90	0	Flying over site

APPENDIX 6

Vantage Point raw data & flight activity, Drumman Bog, October 2021 – March 2022

Date	VP No	Map Ref.	Species	No.	Flight Time	Flight Duration (s)	Band 1 (0-25m)	Band 2 (25-175m)	Band 3 (175+ m)	Comments
19/10/2021	1	1	Peregrine	1	10:11	90	0	90	0	Flew across west of site
		2	Mute swan	8	10.55	120	60	30	0	Flew in to ponds (40+ already there)
19/10/2021	2	3	Buzzard	2	14.40	180	0	100	80	Pair rising
		4	Buzzard	1	15.12	120	120	0	0	Hunting
23/10/2021	3	5	Sparrow hawk	1	09.54	30	30	0	0	Female hunting
23/10/2021	4	6	Golden plover	15	13.25	60	30	30	0	On peat, got up
		7	Kestrel	1	15.23	90	60	30	0	Hunting
25/10/2021	2	8	Kestrel	1	10.08	120	0	120	0	Flying
25/10/2021	3	9	Mute swan	21	14:12	120	120	0	0	Flew onto pond
		10	Buzzard	1	14.35	150	120	30	0	Hunting
		11	Little Egret	1	15.12	90	90	0	0	Flew into pond
27/10/2021	4	12	Lapwing	200	10.44	300	100	200	0	Flock circling
27/10/2021	1	13	Golden plover	150 +	15.05	600	0	300	300	Flock active over area
		14	Sparrow hawk	1	15.45	60	0	60	0	Drifting
15/11/2021	3	15	Kestrel	1	09.18	120	60	60	0	Hovering, then dropped - male
		16	Kestrel	1	09.56	60	0	60	0	Flying – same male bird
15/11/2021	1	17	Golden plover	80	14.24	90	0	90	0	Flew over site north over motorway
		18	Buzzard	2	15.00	180	0	60	120	Circling over wood
		19	Lapwing	44	15.24	120	30	90	0	Flock got up and flew west
16/11/2021	2	20	Kestrel	1	10.09	60	60	0	0	Hunting
16/11/2021	4	21	Buzzard	2	13.35	300	0	150	150	Pair circling over conifers
23/11/2021	1	22	Whooper swan	3	09.25	60	60	0	0	Flew up from ponds
		23	Kestrel	1	11.48	180	30	150	0	Hunting along edge of main track

Date	VP No	Map Ref.	Species	No.	Flight Time	Flight Duration (s)	Band 1 (0-25m)	Band 2 (25-175m)	Band 3 (175+ m)	Comments
23/11/2021	4									No target species
24/11/2021	3	24	Hen harrier	1	10.10	45	45	0	0	Female type hunting actively
		25	Mute swan	6	10.45	60	60	0	0	Flew up from main pond
24/11/2021	2	26	Lesser black back gull	13	15.28	120	0	120	0	Loose flock
		27	Lesser Black back gull	8	15.42	75	0	75	0	As above
09/12/2021	1	28	Peregrine	1	10:24	60	0	60	0	
09/12/2021	2	29	Golden Plover	60+	13.28	120	0	120	0	Circling & flew south
		30	Buzzard	1	14.52	180	60	120	0	Hunting
18/12/2021	3	31	Kestrel	1	09.32	60	60	0	0	Hunting along margin
		32	Golden plover	200+	10.40	180	0	80	100	Large flock north
18/12/2021	4									No target species
20/12/2021	3	33	Mute swan	4	09.12	60	60	0	0	Flew in to pond
		34	Buzzard	1	10.23	120	120	0	0	Hunting
20/12/2021	2									No target species
21/12/2021	4	35	Golden plover	400	11.12	600	60	240	300	Large flock swirling – landed briefly on bog and then up
21/12/2021	1	36	Little egret	1	14.14	60	60	0	0	Flew in to wetland
		37	Buzzard	2	15.10	180	0	180	0	Pair interacting
14/01/2022	3									No target species
14/01/2022	1	38	Hen harrier	1	13.48	60	60	0	0	Male hunting
		39	Whooper swan	5	14.34	90	60	30	0	Flying north of motorway
		40	Buzzard	1	15.08	60	60	0	0	Flying
15/01/2022	4	41	Sparrow hawk	1	10.41	90	0	90	0	Female type circling
15/01/2022	2	42	Lapwing	44	14.54	180	0	180	0	Loose flock southwest
26/01/2022	1	43	Sparrow hawk	1	10.25	90	0	90	0	Circling over wood
		44	Lapwing	9	10.48	90	60	30	0	Flew in to ponds
		45	Kestrel	1	11.15	180	90	90	0	Hunting

Date	VP No	Map Ref.	Species	No.	Flight Time	Flight Duration (s)	Band 1 (0-25m)	Band 2 (25-175m)	Band 3 (175+ m)	Comments
26/01/2022	4	46	Peregrine	1	14:25	90	0	90	0	Male flying
27/01/2022	3	47	Merlin	1	10.10	30	30	0	0	Male bird perched, then hunting over bog
		48	Sparrow hawk	1	10.38	20	20	0	0	Hunting
27/01/2022	2									No target species
11/02/2022	3	49	Buzzard	2	09:04	300	0	200	100	Pair in display
		50	Peregrine	1	09:48	60	0	60	0	Flew fast NW
11/02/2022	2	51	Golden plover	60+	12.56	180	0	80	100	Flock moving NE
12/02/2022	4									No target species
12/02/2021	1	52	Little egret	2	15.19	120	60	60	0	2 feeding at ponds, got up flew west
		53	Lapwing	5	15.48	60	60	0	0	May have got up from wetland in site, landed again
23/02/2022	1	54	Sparrow hawk	2	11.28	300		150	150	Pair circling, interacting
23/02/2022	2	55	Merlin	1	14.50	30	3	0	0	Bird glimpsed flying through scrub
		56	Buzzard	1	15.08	90	0	90	0	
24/02/2022	3	57	Lesser black-back gull	15	08.48	90	30	60	0	Probably had been roosting on pond
		58	Kestrel	1	10.10	60	60	0	0	Flying low - male
24/02/2022	4	59	Kestrel	1	14.18	120	60	60	0	Hunting along margin
10/03/2022	2	60	Lapwing	5	10.24	90	90	0	0	Flying low
		61	Sparrow hawk	1	10.50	120	0	120	0	Circling
10/03/2022	4									No target species
12/03/2022	1	62	Peregrine	1	09.18	90	0	90	0	
		63	Buzzard	1	10.26	120	0	120	0	Flying out of site
12/03/2022	3									Not target species
13/03/2022	4	64	Buzzard	1	10:49	90	0	90	0	Flew across bog
13/03/2022	1	65	Peregrine	1	15.19	300	0	300	0	Circling – female type
		66	Little	1	16.09	120	60	60	0	Bird on wetland

Date	VP No	Map Ref.	Species	No.	Flight Time	Flight Duration (s)	Band 1 (0-25m)	Band 2 (25-175m)	Band 3 (175+ m)	Comments
			Egret							got up - flew towards main pond
23/03/2022	3	67	Sparrow hawk	1	11.11	120	60	60	0	Circling
		68	Peregrine	1	11.42	45	0	45	0	Flying fast – probable male
23/03/2022	2									No target species

APPENDIX 7

Vantage Point raw data & flight activity, Derryhinch Bog, October 2021 – March 2022

Date	VP No	Map Ref.	Species	No.	Flight Time	Flight Duration (s)	Band 1 (0-25m)	Band 2 (25-175m)	Band 3 (175+ m)	Comments
26/10/2021	1	1	Kestrel	1	10.14	180	90	90	0	Hovering male bird
		2	Buzzard	2	11.35	300	0	200	100	2 circling / interacting
26/10/2021	2	3	Kestrel	1	15.15	90	0	90	0	Probably same male as earlier
28/10/2021	2	4	Golden plover	400	09.10	340	30	180	100	Flock came in, landed for c. 1hr, then up again
		5	Golden plover	400	10.12	120	40	80	0	As above
28/10/2021	1	6	Buzzard	1	15.25	120	120	0	0	Hunting low
		7	Peregrine	1	15.50	90	0	90	0	Flying
17/11/2021	1	8	Golden plover	40	11.08	120	30	90	0	Flock got up from bare peat – probably there unseen from start of watch
17/11/2021	2	9	Peregrine	1	14:42	300	0	200	100	Came in high, bit of circling / drifting over site, female type
		10	Sparrow hawk	1	15.35	20	20	0	0	Hunting
26/11/2021	1	11	Kestrel	1	11.04	180	90	90	0	Male hunting along edge of track
26/11/2021	2	12	Buzzard	1	15.00	120	0	120	0	Flying
		13	Sparrow hawk	1	15.42	120	0	120	0	Female type circling /gliding
11/12/2021	2	14	Mute Swan	5	09.23	120	120	0	0	Flew low and direct across site
		15	Kestrel	1	10.18	180	60	120	0	Flying / hunting along boundary
11/12/2021	1	16	Golden plover	120	15.19	240	60	180	0	Flock flew in, landed for c.20 minutes then out again
		17	Golden plover	120	15.40	180	30	150	0	As above
28/12/	1									No target species

Date	VP No	Map Ref.	Species	No.	Flight Time	Flight Duration (s)	Band 1 (0-25m)	Band 2 (25-175m)	Band 3 (175+ m)	Comments
2021										
28/12/2021	2	18	Buzzard	1	14.10	90	60	30	0	a bit of hunting then flew out of site
		19	Kestrel	1	15.40	60	60	0	0	Hunting
10/01/2022	2	20	Peregrine	1	10.18	45	0	45	0	Flying direct
10/01/2022	1	21	Buzzard	1	15.14	180	0	180	0	Flying
		22	Buzzard	1	15.42	90	90	0	0	Probably same bird as earlier
19/01/2022	1									No target species
19/01/2022	2	23	Kestrel	1	14.15	300	100	200	0	Hunting actively - male
10/02/2022	1	24	Sparrow hawk	1	09:48	30	30	0	0	Hunting
		25	Buzzard	2	11.40	360	0	160	200	Pair soaring
10/02/2022	2	26	Kestrel	1	15.09	90	90	0	0	Hovering low, then dropped
25/02/2022	1	27	Sparrow hawk	2	10.05	600	0	400	200	Pair in display
		28	Peregrine	1	10.48	60	0	60	0	Flew over SW sector of site
25/02/2022	2	29	Buzzard	1	13.10	180	0	180	0	Flew in from motorway and drifted over VP1
		30	Lesser Black-back Gull	22	15.35	240	40	200	0	Loose flock flew in and landed on bog. Still present when leaving. A lot of sub-adults
13/03/2022	1	31	Sparrow hawk	2	09.45	280	0	100	180	Pair in display
		32	Buzzard	1	10.08	120	0	120	0	Flying
13/03/2022	2	33	Kestrel	1	14.19	90	0	90	0	Hunting
26/03/2022	1	34	Peregrine	1	12.10	120	0	120	0	Male
26/03/2022	2									No target species Party of 10+ sand martins

APPENDIX 8

Vantage Point raw data & flight activity, Ballybeg Bog, October 2021 – March 2022

Date	VP No	Map Ref.	Species	No.	Flight Time	Flight Duration (s)	Band 1 (0-25m)	Band 2 (25-175m)	Band 3 (175+ m)	Comments
20/10/2021	1									No target species
20/10/2021	2	1	Kestrel	1	15.02	120	60	60	0	Male hunting
		2	Sparrow hawk	2	15.48	300	0	200	100	Probable pair
26/10/2021	3	3	Golden plover	80	08.40	120	30	90	0	Flock on bare peat flew up northwards
		4	Kestrel	1	09.28	180	60	120	0	Male hunting over bog
26/10/2021	2	5	Buzzard	1	13.01	90	0	90	0	Off site
		6	Kestrel	1	14.52	60	60	0	0	Probable same male
30/10/2021	1	7	Sparrow hawk	1	09.10	30	30	0	0	Hunting
30/10/2021	3	8	Lapwing	28	15.24	120	0	120	0	Flock moving north
		9	Mute Swan	3	16.09	90	90	0	0	Flying direct towards Cavemount
21/11/2021	3	10	Kestrel	1	09.18	90	30	60	0	Female along track hovering
21/11/2021	2	11	Whooper swan	7	15:14	240	120	120		Flew NW losing height
		12	Buzzard	2	15.43	300	0	200	100	Two flying / interacting
22/11/2021	1	13	Buzzard	1	10.10	180	0	180	0	Flying / hunting
		14	Sparrow hawk	1	11.00	60	0	60	0	Flying - female
22/11/2021	2	15	Golden plover	50 +	14.52	60	30	30	0	Flock flew in & landed on bare peat –
		16	Golden plover	50 +	15.38	180	30	100	50	Flock got up and circled northward
29/11/2021	3	17	Buzzard	1	09.52	180	0	180	0	Flying
		18	Peregrine	1	11.11	120	0	120	0	Flew towards Cavemount
29/11/2021	1	19	Kestrel	1	14.18	180	70	110	0	Hovering on boundary
		20	Lapwing	100+	15.27	300	0	200	100	Flock circling

Date	VP No	Map Ref.	Species	No.	Flight Time	Flight Duration (s)	Band 1 (0-25m)	Band 2 (25-175m)	Band 3 (175+ m)	Comments
		21	Whooper swan	9	16.10	240	120	120	0	Flying south presumed towards Cavemount - calling
11/12/2021	1									No target species
11/12/2021	2	22	Buzzard	1	12.44	300	100	200	0	Flying / hunting on & off site
		23	Whooper swan	6	14.56	120	120	0	0	Flying low north
18/12/2021	3	24	Kestrel	1	10.04	180	0	180	0	Flying / hovering
		25	Buzzard	1	10.37	300	0	200	100	Bird circling & rising
18/12/2021	2	26	Kestrel	1	14.14	90	60	30	0	Hunting
20/12/21	1	27	Lapwing	18	10.10	120	0	120	0	Flying south
20/12/21	3	28	Whooper swan	6	15.15	150	120	30	0	Flying towards Cavemount, losing height & calling
16/01/2022	2	29	Sparrow hawk	1	10.12	30	30	0	0	Hunting
		30	Mute swan	2	11.59	90	0	90	0	Pair flying SSE
16/01/2022	3									No target species
22/01/2022	1	31	Buzzard	2	10.53	360	0	320	340	Pair interacting & rising
		32	Golden plover	200+	11.11	300	0	100	200	Flock circling
22/01/2022	2	33	Kestrel	1	13.21	60	60	0	0	Hunting – bird dropped to ground
25/01/2022	1									No target species
25/01/2022	3	34	Kestrel	1	14.14	120	60	60	0	Male hovering / hunting over track
13/02/2022	3	35	Whooper swan	5	08.48	120	120	0	0	Party of 5 flying north (from Cavemount) up east side of site
		36	Kestrel	1	10.19	90	0	90	0	Hovering just at pylon
13/02/2022	2	37	Merlin	1	13.34	60	60	0	0	Probably had been roosting on peat – hunting low
		38	Buzzard	1	14.45	120	120	0	0	Flying
22/02/	1	39	Sparrow	2	10.40	300	0	150	150	Pair circling /

Date	VP No	Map Ref.	Species	No.	Flight Time	Flight Duration (s)	Band 1 (0-25m)	Band 2 (25-175m)	Band 3 (175+ m)	Comments
2022			hawk							interacting
22/02/2022	2	40	Buzzard	2	15.05	600	0	200	400	Pair rising high out of sight
		41	Buzzard	1	16.27	120	120	0	0	Flying low across bog
25/02/2022	1	42	Peregrine	2	09.27	60	0	60	0	Male bird flying leisurely
25/02/2022	3									No target species
15/03/2022	1	43	Kestrel	2	11.24	400	0	300	100	Pair interacting / display Also, c.20 sand martins
15/03/2022	2	44	Buzzard	1	12.50	60	60	0	0	Bird on peat, got up & flew north
		45	Sparrow hawk	1	14.14	120	60	60	0	Bird circling
26/03/2022	3	46	Mute swan	1	10.13	60	60	0	0	Flying east to west
26/03/2022	2									No target species 2 wheatears along track
29/03/2022	3	47	Kestrel	1	11.32	120	0	120	0	Flying
29/03/2022	1									No target species

APPENDIX 5

Scientific Names of Bird Species

Little Grebe	*Tachybaptus ruficollis*
Great Crested Grebe	*Podiceps cristatus*
Grey Heron	*Ardea cinerea*
Little Egret	*Egretta garzetta*
Whooper Swan	*Cygnus cygnus*
Mute Swan	*Cygnus olor*
Greenland White-fronted Goose	*Anser albifrons flavirostris*
Greylag Goose	*Anser anser*
Teal	*Anas crecca*
Wigeon	*Anas penelope*
Mallard	*Anas platyrhynchos*
Tufted Duck	*Aythya fuligula*
Buzzard	*Buteo buteo*
Hen Harrier	*Circus cyaneus*
Sparrowhawk	*Accipiter nisus*
Kestrel	*Falco tinnunculus*
Merlin	*Falco columbarius*
Peregrine	*Falco peregrinus*
Red Grouse	*Lagopus lagopus*
Moorhen	*Gallinula chloropus*
Pheasant	*Phasianus colchicus*
Water Rail	*Rallus aquaticus*
Ringed Plover	*Charadrius hiaticula*
Golden Plover	*Pluvialis apricaria*
Lapwing	*Vanellus vanellus*
Jack Snipe	*Lymnocryptus minimus*
Snipe	*Gallinago gallinago*
Woodcock	*Scolopax rusticola*
Greenshank	*Tringa nebularia*
Curlew	*Numenius arquata*
Black-headed Gull	*Chroicocephalus ridibundus*
Lesser Black-backed Gull	*Larus fuscus*
Long-eared Owl	*Asio otus*
Kingfisher	*Alcedo atthis*
Woodpigeon	*Columba palumbus*
Skylark	*Alauda arvensis*
Meadow Pipit	*Anthus pratensis*
Pied Wagtail	*Motacilla alba*
Wren	*Troglodytes troglodytes*
Robin	*Erithacus rubecula*
Stonechat	*Saxicola torquata*
Blackbird	*Turdus merula*
Fieldfare	*Turdus pilaris*
Song Thrush	*Turdus philomelos*
Mistle Thrush	*Turdus viscivorus*
Goldcrest	*Regulus regulus*
Coal Tit	*Parus ater*
Blue Tit	*Parus caerulus*

Great Tit	*Parus major*
Magpie	*Pica pica*
Hooded Crow	*Corvus corone*
Raven	*Corvus corax*
Starling	*Sturnus vulgaris*
Chaffinch	*Fringilla coelebs*
Goldfinch	*Carduelis carduelis*
Siskin	*Carduelis spinus*
Linnet	*Carduelis cannabina*
Lesser Redpoll	*Carduelis flammea*
Bullfinch	*Pyrrhula pyrrhua*
Reed Bunting	*Emberiza schoeniclus*

TOBIN
CONSULTING ENGINEERS
BUILT ON KNOWLEDGE

Bord na Móna

Energy Park Wind Farm

Winter 2022/23 Bird Surveys: Summary Report

Document Control Sheet	
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1. BACKGROUND

This report details the results of bird surveys undertaken by TOBIN Consulting Engineers at the proposed Energy Park Wind Farm Site from October 2022 to March 2023.

1.1 VANTAGE POINT SURVEY

Twelve Vantage Points (VPs) across the Energy Park were surveyed over a total of 472 hours during the non-breeding/winter period 2022/23. The survey results include almost 19,000 individuals of 27 species flying over the Energy Park site, with October and November 2022 being the months with highest flight activity (**Table 1.1**). Moreover, records were also taken during the VP surveys of non-flying birds (**Table 1.2**), and 848 individuals were observed roosting/perching at the Energy Park site during the winter 2022/23.

Table 1.1: Summary of 2022/23 Vantage Point Surveys (Target Species Flying Observation)

Species	October	November	December	January	February	March	Total
European Golden Plover	8,097	6,840	452		8		**15,397**
Northern Lapwing	180	1,085	150	886	71		**2,372**
Whooper Swan	31	6	55	225		7	**324**
Mute Swan	106	23	14	11	21	13	**188**
Common Buzzard	17	20	27	8	26	25	**123**
Common Kestrel	28	22	14	27	10	18	**119**
Grey Plover	88						**88**
Mallard	29	15	3	5	6	9	**67**
Eurasian Curlew	9		32				**41**
Lesser Black-backed Gull	22	3	4			2	**31**
Eurasian Sparrowhawk	5	7	7	7	2		**28**
Grey Heron	9	1	1	5	5	3	**24**
Redwing			20				**20**
Black-headed Gull	8		5			5	**18**
Peregrine Falcon	1	3		5	2	1	**12**
Merlin			2	2		5	**9**
Hen Harrier	1	1	2		1	3	**8**
Mew Gull			7				**7**
Ruddy Turnstone		5					**5**
Common Snipe	3			1			**4**
Little Egret	1			2			**3**
Great Black-backed Gull						2	**2**
Pink-footed Goose				2			**2**
Little Grebe			1				**1**
Greylag Goose			1				**1**
Common Redshank			1				**1**
Cormorant	1						**1**
Total	**8,636**	**8,031**	**798**	**1,186**	**152**	**93**	**18,896**

Table 1.2: Summary of 2022/23 Vantage Point Surveys (Target Species Non-Flying Occurrences)

Species	October	November	December	January	February	March	Total
European Golden Plover	367						**367**
Whooper Swan				194	102	29	**325**
Redwing		10	37	12	6	12	**77**
Eurasian Curlew		42	17				**59**
Northern Lapwing			1			4	**5**
Mallard				3			**3**
Common Kestrel				2			**2**
Pink-footed Goose					1	1	**2**
Great Crested Grebe					2		**2**
Common Buzzard					2		**2**
Little Grebe					1		**1**
Mute Swan				1			**1**
Common Snipe				1			**1**
Grey Heron		1					**1**
Total	**367**	**53**	**55**	**213**	**114**	**46**	**848**

1.2 Hen Harrier Roost Survey 2022/23

Activity of any birds of prey observed during the Hen Harrier Roost Survey 2022/23 was recorded, but the most relevant result was the identification of a Hen Harrier ringtail roosting in the immediate vicinity of the Drumman bog (**Table 1.3**).

Table 1.3: Summary of 2022/23 Hen Harrier Roost Survey Results

	October	November	December	January	February	Total
Common Buzzard						
Flying		1				**1**
Common Kestrel						
Hunting	1	1				**2**
Hen Harrier						
Hunting	1		1	6		**8**
Hunting/Roosting					1	**1**
Roosting				2	1	**3**
Total	**2**	**2**	**1**	**2**	**2**	**4**

1.3 I-WeBS 2022/23

Almost 4,000 waterbirds, belonging to 28 species, were observed over the Zone of Influence for wintering waterbirds during the I-WeBS in the winter season 2022/23. European Golden Plover, Northern Lapwing and Common Coot were the most abundant species, each with 700 or more sightings, in total (**Table 1.4**).

Table 1.4: Summary of I-WeBS 2022/23 Results

Species	October	November	December	January	February	March	Total
European Golden Plover	205		7	6	560	1	**779**
Northern Lapwing	40	12	85	28	569	24	**758**
Common Coot	4		15	350	255	76	**700**
Little Grebe	24	2	5	306	9	12	**358**
Eurasian Teal	9	33	51	121	86	41	**341**
Mute Swan	27	96	58	61	54	23	**319**
Mallard	17	25	34	49	58	31	**214**
Whooper Swan	6	15	25	7	52		**105**
Common Snipe	20	13	2	6	5	3	**49**
Common Moorhen	1	8	2	3	3	27	**44**
Eurasian Wigeon					20	23	**43**
Grey Heron	7	7	5	6	3	5	**33**
Tufted Duck		15	12				**27**
Cormorant	2	2	2	1		12	**19**
Common Buzzard	5	3	4		3	2	**17**
Black-headed Gull	1		7		4	3	**15**
Great Crested Grebe	2	3			2	3	**10**
Common Kestrel	4	1	1				**6**
Northern Shoveler					2	2	**4**
Ringed Plover					3	1	**4**
Little Egret				1	2	1	**4**
Great Egret	1	1					**2**
Eurasian Sparrowhawk		1				1	**2**
Water Rail	1			1			**2**
Osprey	2						**2**
Peregrine Falcon						1	**1**
Lesser Black-backed Gull		1					**1**
Merlin				1			**1**
Total	**378**	**238**	**315**	**947**	**1,690**	**292**	**3,860**

1.4 Winter 2022/23 Transect Survey

Twelve transects across the Energy Park site were surveyed during the winter 2022/23, registering 511 individual birds, of 24 species (**Table 1.5**).Whooper Swan and Common Snipe

were the most abundant species, summing up to almost 60% of the total bird sightings over this survey.

Table 1.5: Summary of Winter 2022/23 Transects Survey Results

Species	October	November	December	January	February	March	Total
Whooper Swan	5		72	103	14	12	**206**
Common Snipe	5	57	4	14	11	7	**98**
Tufted Duck					35		**35**
Mute Swan	4	17		7	4		**32**
Northern Lapwing		24				7	**31**
European Golden Plover		1	30				**31**
Mallard	2	6		3		10	**21**
Redwing						10	**10**
Meadow Pipit	7						**7**
Eurasian Teal	4				2		**6**
Eurasian Wigeon				4			**4**
Common Kestrel		1		2	1		**4**
Grey Heron	1	2			1		**4**
Common Greenshank			3				**3**
Peregrine Falcon		1	1	1			**3**
Gadwall			3				**3**
Common Kingfisher				1		1	**2**
Common Buzzard					1	1	**2**
Little Grebe					2		**2**
Eurasian Curlew		2					**2**
Great Black-backed Gull						2	**2**
Eurasian Sparrowhawk					1		**1**
Hen Harrier		1					**1**
Greylag Goose			1				**1**
Total	**28**	**112**	**114**	**135**	**72**	**50**	**511**

1.5 WHOOPER SWAN ABUNDANCE AT THE ENERGY PARK

The abundance and frequency of observations of Whooper Swan during the bird surveys at the Energy Park site over the winter season 2022/23 warrants a preliminary dedicated analysis of this species occurrence. In fact, following Percival (2003), which defines two important factors for the classification of the Energy Park Site's importance to Whooper Swan:

- National Important Site – site holds >1% of the national population; and
- Regional Important Site – site holds >1% of the regional population.

Considering the most recent Whooper Swan Census results (Burke *et al.*, 2021), the national population of Whooper Swan is 19,111 individuals, whereas the regional (Offaly County) population of Whooper Swan is 1,506 individuals. **Table 1.6** includes the maximum number of

Whooper Swan individuals recorded during the winter 2022/23 bird surveys, appropriately coloured when the abundance is of National Importance (>191 individuals) or Regional Importance (>15 individuals)

Table 1.6: Summary of Winter 2022/23 Whooper Swan Observations

Abundance higher than 1% of County population

Abundance higher than 1% of National population

Date	Maximum number of birds
VP (non-flights)	
19/10/2022	320
22/11/2022	21
23/11/2022	10
20/12/2022	17
22/12/2022	25
23/12/2022	12
25/01/2023	1
26/01/2023	12
27/01/2023	152
02/02/2023	1
22/02/2023	102
23/02/2023	6
26/03/2023	12
28/03/2023	29
I-WeBS	
20/10/2020	6
24/11/2020	10
21/12/2020	14
04/11/2022	1
19/12/2022	6
30/01/2023	7
01/02/2023	3
20/02/2023	8
21/02/2023	22
Winter Transects	
19/10/2022	5
15/12/2022	32
24/01/2023	103
03/02/2023	14
23/03/2023	12
Incidentals	
20/10/2022	4
20/12/2022	62
26/01/2023	3
27/01/2023	7

2. REFERENCES

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BORD NA MONA
WINTER BIRD SURVEY
2022-2023

BALLYBEG BOG

View of central area of Ballybeg Bog in early stage of re-vegetation (looking westwards)

Prepared for

Bord na Móna

by

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CONTENTS

EXECUTIVE SUMMARY

- A baseline study of wintering birds associated Ballybeg Bog was carried out between October 2022 and March 2023. This followed a similar study in winter 2021/2022. Previous winter bird surveys had been carried out in 2012/13 and 2013/14 when part of site was still in commercial production.

- Ballybeg Bog is contiguous with Derryarkin bog to the north and Cavemount bog to the south. Ballybeg Bog is sharply divided into three main ecological units: the northern part which has been out of production for some considerable time and is re-vegetating cutaway dominated by birch scrub and woodland, the southern part which has been in commercial industrial production up to 2021 and is still largely bare peat though with pioneer bog vegetation, and the small southern outlier of largely intact raised bog, known as Coole bog.

- Field methods employed were a combination of transect surveys, vantage point watches (following method of Scottish Natural Heritage 2017) and focused surveys for wetland birds and especially swans, including monthly visits to Derryarkin Bog and Cavemount Bog.

- Ballybeg Bog is characterised by various types of habitats, with (i) well re-vegetated cutaway bog dominated by scrub and low woodland, (ii) areas of pioneer bog vegetation and bare peat where commercial production had occurred (now ceased), and (iii) a small area of fairly intact high bog (Coole Bog). Both Whooper Swan and Mute Swan were recorded passing over the site, presumably commuting between Derryarkin and Cavemount (where both species occur regularly). There was one record of Whooper Swan (no. 3) landed on a ponded wetland within the site. Golden Plover and Lapwing was recorded passing over the site, along with Little Egret. Snipe (Red-listed) occurs within the site though mostly in small numbers. The site provides useful habitat for various bird of prey species and especially Kestrel (Red listed), Sparrowhawk and Buzzard. Merlin was recorded on site on one occasion (as it had in previous winter), and Peregrine hunts over the site. Meadow Pipit, Red-listed on basis of breeding population, occurs throughout much of the site during winter. The Red-listed Redwing is regular in area during winter and at times occurs within the site. Amber-listed species recorded on site included Skylark, Goldcrest, Starling and Linnet. On the basis of the occurrence of some wetland bird species and fairly regular usage by bird of prey species, it is recommended from the 2022/23 winter survey (supported by the previous 2021/22 winter data) that a rating of **Local Importance (higher value)** is appropriate for wintering birds at Ballybeg Bog.

1.0 INTRODUCTION

As part of the planning work for energy related projects, Bord na Móna commissioned a baseline survey of birds in winter 2022/2023 on Ballybeg Bog in County Offaly.

Ballybeg is part of the Derryarkin Bog Group (comprising also Derryarkin, Drumman and Derryhinch bogs). A previous winter bird survey had been carried out at Ballybeg, along with the other bogs in the Group, in 2021/2022. Prior to that, winter bird surveys had been carried out in 2012/2013 and 2013/2014 when much of bog was in commercial production. Breeding bird surveys have also been carried out in 2021 and 2022.

A contract to carry out the required work was awarded to BioSphere Environmental Services in October 2022.

The present report considers the results of the 2022/23 surveys for Ballybeg Bog, with reference made to earlier surveys at Ballybeg and the other bogs.

2.0 SURVEY METHODS

2.1 Desk Review and Consultations

A thorough desk review had been carried out previously for available information for the sites in the overall Derryarkin Bog Group for winter and breeding birds.

Since then, the present writer is not aware of any additional sources of external information relating to Ballybeg Bog or the adjoining bog sites.

2.2 Field Surveys

The tender documentation had noted the following points in respect of survey methodology:

- The Winter Bird Surveys should be undertaken between the months of October and March, *i.e.* 6 months, and should focus in particular on wintering waders, wildfowl - notably geese and swans, any winter Hen Harrier roosts, other raptors, Annex 1 species and birds of conservation interest.
- The survey should include all, or a selection of the following; focused wetlands surveys; transects; vantage point surveys; bog walks; roost watches; flight paths and migration studies; or other methodologies as appropriate.
- All vantage points (as described in the tender brief) should be surveyed to achieve or exceed the 36 hr observation duration required by the Vantage Point methodology (Scottish Natural Heritage, 2017).

The tender also noted that '*adherence to approved methodologies is a key requirement of the project. However, given the scale and fragmented nature of the area to be surveyed, and the nature of the studies to be undertaken, a pragmatic approach is required. This must balance the detail required to be acceptable for a planning application for a wind farm project of very significant scale with the fact that much of the area is still utilised for industrial scale peat extraction or peat extraction has ceased only recently*.'

Taking the above into account, the following approach was taken at the sites:

2.2.1 Number of site visits

Monthly site visits were made to Ballybeg Bog between October 2022 and March 2023 (i.e. 6 rounds of site visits).

2.2.2 Survey methods

Use of the following methods was employed at the site as relevant. However, transect surveys and vantage point watches were the main methods and a combination of these were used. In addition, focused surveys for presence of Whooper Swans at Derryarkin Bog and Cavemount Bog were carried out.

Surveys were carried out largely in suitable weather conditions, with avoidance of persistent rain, mist/fog and winds in excess of F4-5.

Transects surveys

The use of transects to record birds within sites is a well-established survey method (Bibby *et al.* 2000). The method is particularly useful for open habitats such as peatlands. The value of the method is that it is repeatable over time, which is particularly relevant to the Bord na Móna cutaway bogs where habitat conditions are somewhat transient and bird communities can be expected to change over time in response to vegetation types present.

The transects selected typically followed identifiable tracks (inc. rail tracks) which made coverage quicker and also safer compared to across open bog. Further, tracks are often slightly elevated which makes recording more efficient. The number of transects used was determined by the size of the site and the diversity of habitats present.

Bird recording is normally within a zone 200-300 m wide either side of the transect though the flat nature of the sites made larger sized or obvious birds (such as Golden Plover flocks) at further distances easily visible. Birds were recorded by sight (with aid of binoculars) and sound.

One transect route had been selected in the previous surveys on this site (**Transect no. 1**) – this follows the Bord na Móna train track through the site from north to south.

Vantage point surveys

Vantage point surveys were carried out in accordance with the methodology used for assessing impacts of wind farms on bird communities published by Scottish Natural Heritage (now NatureScot) (2017). The purpose of these surveys was mainly to detect birds of prey and passing waterbirds (swans, geese, duck, waders etc.), though all birds observed during watches were recorded. At the Derryarkin bogs, the full duration of 36 hours of observations over the site during the winter period was achieved as required by the methodology.

A representative number of vantage points were established to provide views over large areas of the site and adjoining lands, with focus on expanses of habitats of potential value to wintering birds. The vantage points were positioned on elevated ground where feasible – these range from naturally higher ground (hillocks etc) to roads/embankments.

When a target species was sighted during a watch, the flightline was plotted onto a field map along with estimated flight height[1], duration of observation and any other parameters such as age and gender of bird, behaviour of bird (e.g. hunting, flying, roosting) etc.

Three vantage points has been selected for this site in previous surveys, as follows:

Vantage Point 1 is located along the northeast boundary of the site and gives a view over the entire northern sector of the site.

Vantage Point 2 is located on a peat track in the central areas of the site (at edge of the established cutaway) and gives a view over much of the southern sector of the site.

Vantage Point 3 is located on the train track near the southern entrance to the site and gives a view over the extreme southernmost parts of site, including the Coole Bog outlier.

Focused surveys for wetland birds

Surveys were carried out in each month (apart from October) for wetland birds, and principally Whooper Swan, at Derryarkin Bog to the north of Ballybeg and at Cavemount Bog to the south of Ballybeg Bog.

2.2.3 Target species

The winter surveys were focused on the potential presence of the following groups of birds or species:

- Waterfowl, especially Whooper Swan and Greenland White-fronted Geese
- Waders, especially flocks of Golden Plover, Lapwing and Curlew
- Hen Harrier, Merlin and other birds of prey
- Any other Annex 1 species of EU Birds Directive
- Any Red or Amber listed species as given in Gilbert et al. 2021.

[1] While actual flight height of target species was estimated in field, values are given in the following bands in Appendix 2: 0-25 m; 25-175 m; >175 m

2.3 Survey Limitations

Surveys following standard methods and within the recommended time frame were carried out at Ballybeg Bog during the 2022/23 winter and hence there were no survey limitations.

However, bird populations can vary between years, mainly as a result of weather but also due to other factors such as breeding success, local disturbance at sites, etc. (see Crowe 2005). For instance, species such as Golden Plover and Lapwing are highly affected by cold weather events. Cold weather usually results in large-scale movements, particularly from their preferred inland feeding areas to the relatively ice-free coastline. Under more severe conditions, they may vacate Ireland altogether, possibly for France and Iberia. Whooper Swans may also be affected by severe cold weather and in the 2010 national census results were considered to be affected by the severe weather at the time, which resulted in flocks being widely dispersed and in locations where they had not previously been recorded as a result of the freezing-over of water bodies (Boland *et al*. 2010). It is therefore preferable to have more than one season's data in evaluating the importance of sites so as to dampen annual fluctuations in numbers (Crowe 2005). With baseline data available now for two winter periods (and since winter 2012/2013 for the adjoining Derryarkin and Drumman Bogs), the results of the surveys will provide a fairly robust assessment of the importance of Ballybeg Bog for wintering birds.

2.4 Criteria for Evaluation of Ornithological Importance of Sites

The importance of winter wetland bird populations is evaluated according to the standard 1% thresholds for national (all-Ireland) and international importance (see Crowe 2006, Boland & Crowe 2012, Delaney and Scott 2006).

Evaluation of sites may also be made on the basis of the presence of species listed in Annex I of the EU Birds Directive or species listed as 'Birds of Conservation Concern', either on the Red List (High conservation concern) or Amber List (Medium conservation concern) (after Gilbert et al. 2021). As evaluating sites due to the presence of such is not quantitative, a subjective assessment may need to be made – for instance, the regular presence within a site of a breeding pair of Peregrines (Annex I species) would be of more significance than the occasional record of hunting birds.

For an overall ecological assessment of the importance of a site, taking into account not just ornithological interests but also habitats, flora and other fauna types etc., reference is made to the NRA *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (NRA, 2009). Whilst the NRA guidelines were devised specifically for road schemes, they can be applied to general environmental impact assessment. The NRA system uses the following five-point scale:

- International Importance
- National Importance

- County Importance
- Local Importance (higher value)
- Local Importance (lower value)

3.0 RESULTS AND DISCUSSION

3.1 Site Description

Ballybeg Bog is located to the west of the R400 road and between Croghan Hill and the town of Rhode. It is contiguous with Derryarkin bog to the north and Cavemount bog to the south. The most southern sector is an outlier from the main site and lies between a local road and the Grand Canal pNHA.

In addition to recent commercial peat production (now ceased since January 2021), a large area (c.60 ha) of cutaway east of the main railway line had been planted with alder as a biomass trial for East Offaly Power. The extreme northeast section of the site had been used for gravel extraction.

Ballybeg Bog is sharply divided into three main ecological units: the northern part which has been out of production for some time and is re-vegetating cutaway, the southern part which has been in recent commercial industrial production, and the small southern outlier of largely intact raised bog, known as Coole bog.

The northern cutaway sector contains a range of habitats but is dominated by birch scrub or developing bog woodland. There are some small wetlands with permanent or temporary water. Wetland vegetation, however, is poorly developed. Bare peat still occurs in places. As noted, a substantial portion of the cutaway has been developed as an Alder biomass trial, and is classified as short rotation coppice.

The southern part of the site is in the early stage of re-vegetation though as of yet vegetation cover is sparse. A portion to the east of the railway line and west-southwest of the (former) Works area comprises disturbed ground associated with the old Rhode Power Station. This area is dominated by scrub, dense bracken and dry grassland.

An area of undeveloped high bog occurs in the southernmost sector of the site (part of this bog is not within Bord na Móna ownership). This is largely intact bog though there is active turbary along the western margin and a network of surface drains had been inserted in the past. A remnant strip of high bog also occurs along the northeast boundary, while patches of cutover bog occur in places along the margins of the site.

The site is adjoined by slivers of bog to the east and north-west, with agricultural land to the south and west.

3.2 Results and Discussion

A summary of the variables (date, time, weather etc.) for the vantage point watches carried out at Ballybeg Bog between October 2022 and March 2023 is presented in Appendix 1. Survey raw data for the vantage point watches are presented in Appendix 2.

Scientific names of bird species are given in Appendix 3.

Plate 1. View of ponded area in February 2023 – a small party of Whooper Swan was present here on 5th February 2023.

Plate 2. The northern sector of Ballybeg Bog is mostly dominated by birch scrub and low woodland, with occasional shallow pools sparsely vegetated.

Target species recorded

Mute Swan

There were three records involving small numbers (max. 4) of birds moving north and south over the site.

Mute swan occurs regularly at the Derryarkin/Drumman bog and at Cavemount to the south of Ballybeg, and birds may also be observed along the canal. Some interaction is expected between the various locations.

Whooper Swan

There were four flightlines over the site, as follows:

On 12th December, a party of 9 was observed flying northwards over the site at 10.14 hrs.

On 18th January, a party of 4 flew south over the site at 16.32 hrs.

On 21st January, a party of 12 was observed flying south over the site at 09.57 hrs.

On 5th February, a party of 3 were observed on a wetland within the site – these later flew north over site.

The pattern of flightlines indicates that there is some movement of Whooper Swans between Cavemount Bog and Derryarkin. These are regular wintering sites for Whooper Swan, as follows:

- At Cavemount, birds were present from December to March, with a peak of 28 on 19th

January.

- At Derryarkin, birds were observed from mid-November to early late-March, with a peak of over 120 on 5th February.

However, the numbers recorded at Ballybeg were relatively low and not on a regular basis. The observations at Derryarkin have shown that the majority of feeding swans use the local quarry ponds for night roosting (rather than flying to Cavemount). The record of three birds on a wetland in Ballybeg in February represents the first time birds were observed (by present author) actually using the developing wetland habitats within Ballybeg.

Little Egret

A Little Egret flew over the northeast sector of the site on 18th February.

Little Egret is a regular species at Derryarkin and Drumman Bogs and also occurs at Cavemount. There is some pond habitat, including silt ponds, at Ballybeg suitable for the species.

Sparrowhawk

There were three records of Sparrowhawk on site through the winter.

One records (18th February) involved a displaying pair over the northern sector of site (where sparrowhawk is known to breed).

Buzzard

Buzzard was recorded frequently during the winter and throughout the site.

Four of the records involved pairs interacting / displaying, with the other records involving single birds hunting and/or flying.

Several pairs of Buzzard are known to breed within the wider area of Ballybeg.

Kestrel

Kestrel was recorded on site throughout the winter period, with a total of ten records. All were of single birds, involving both males and females. Most of the birds were hunting actively on site.

Kestrel breeds locally (though not on site).

Merlin

There was one record of Merlin on 12th December – this involved a bird observed perched along the side of the track in southern sector of site – it then flew a short distance out of site.

Merlin is expected to be an occasional winter visitor to the site (one also recorded in February 2022).

Peregrine

Peregrine was recorded flying over the site on two dates. The first record was on 29th October, when a bird landed on bare peat with a prey item – it later flew northwards. The second record involved a bird circling high over northern part of site on 5th February.

The birds observed in winter at Ballybeg are considered to be associated with the breeding pair at Derryarkin (which nests on a man-made structure).

Golden Plover

There was one record of Golden Plover involving a flock of over 200 circling high over the northernmost part of site and drifting over Derryarkin.

The plover which occur at Ballybeg are almost certainly from the regular wintering population (sometimes up to 1,000 birds) which frequents the fields at Derryarkin as well as fields to the north of the motorway, and also at times Drumman Bog.

Lapwing

Lapwing was recorded on three dates during a severe cold spell in December. Two of the records involved bird flying northwards over the site, and one involved a flock (200+) circling over northernmost part of site.

While these records may have been associated with local cold weather movements, there is a regular wintering population (estimated up to 400 birds) which frequents the fields at Derryarkin as well as fields to the north of the motorway, and also at times Drumman Bog. Birds may at times also utilise Cavemount Bog.

Potential for other target species

Hen Harrier could be expected at times to pass through the site - one had been recorded within the site in March 2013 and the species is occasional during winter at Derryarkin and Drumman bogs.

Other species of note

Mallard – recorded on site in small numbers (up to 6 maximum), mostly in area of Bord na Móna ponds in eastern sector.

Snipe – snipe is fairly scarce on site, with 1-2 birds being recorded mainly in the few wetland areas in the northern part of site and on the southernmost bog (Coole).

Skylark – small numbers (<4) present in October, with returning breeding birds present from late February.

Mistle Thrush – recorded regularly on site, with peak count of 11 on 25th October.

Redwing – large flocks, along with Fieldfares, present in marginal hedging from late November into January. High numbers particularly through cold spell in December. Numbers regularly in the hundreds.

Robin - present on site through winter in scrub habitats.

Stonechat – recorded on most visits through the winter. At least two territorial pairs in March.

Meadow Pipit – regular on site through the winter though mostly in small numbers (<10). Total of 21 on transect walk on 27th November. Loose flock of c.30 in southernmost part of site (Coole Bog area) on 25th October.

Goldcrest – present on site through winter in scrub habitats (though in low numbers).

Starling – large flocks recorded passing over site in late afternoon periods from late-November to mid-February, with estimates of over 1,000 birds as follows: c.1,000+ flew northwest over site from on 9th December; c.2,000 northwards over site on 19th December;

probably up to 4,000 northwards over site on 20th January.

Linnet – regular on site in small numbers (<10), though flock of 50+ on track alongside Coole Bog on 29th October.

SITE: BALLYBEG – TRANSECT SURVEYS, 2022-2023

Species	Date 27/11/22	Date 19/01/23	Date 23/02/23	BoCCI Status
Mallard	4	0	2	A
Pheasant	1	1	0	G
Grey Heron	1	2	0	G
Sparrowhawk	0	0	0	G
Buzzard	1	0	1	G
Kestrel	**1**	**0**	**0**	**R**
Snipe	**3**	**0**	**0**	**R**
Woodpigeon	30+	20	20	G
Magpie	4	0	1	G
Jackdaw	12	6	8	G
Hooded Crow	6	2	3	G
Raven	2	0	0	G
Goldcrest	**0**	**0**	**3**	**A**
Blue Tit	2	0	3	G
Great Tit	1	0	2	G
Dunnock	1	0	1	G
Coal Tit	9	2	7	G
Skylark	**0**	**0**	**3**	**A**
Long-tailed Tit	11	0	0	G
Starling	**50+**	**200+**	**20**	**A**
Wren	9	3	15	G
Blackbird	8	4	7	G
Fieldfare	120+	60	0	G
Song Thrush	4	2	2	G
Redwing	**100+**	**50+**	**0**	**R**
Mistle Thrush	7	0	3	G
Robin	3	1	4	G
Stonechat	7	3	5	G
Meadow Pipit	**21**	**8**	**16**	**R**
Pied Wagtail	6	0	4	G
Chaffinch	12	7	10+	G
Goldfinch	0	0	12	G
Linnet	**30+**	**0**	**6**	**A**
Lesser Redpoll	20+	9	14	G
Reed Bunting	3	1	4	G

BoCCI Status: **R – Red**; **A – Amber**; **G – Green**

General discussion

The 2022/2023 winter survey at Ballybeg bog has added to the baseline winter bird assessment carried out in winter 2021/2022 (earlier surveys had been carried out in winters 2012/13 & 2013/14 when commercial production was in progress over the central and southern parts of site).

While bog rehabilitation, and especially wetland development, is still at an early development stage over part of Ballybeg, the site provides useful habitat for various bird of prey species and especially Kestrel (Red listed), Sparrowhawk and Buzzard. There was one record of Merlin within the site (as there had been in previous winter) and Peregrine hunts over the site (site is within the range of the breeding pair at Derryarkin). It is likely that Hen Harrier passes through the site at times (one had been recorded in March 2013).

Whooper Swan was recorded flying over the site, with one record of three landed on a ponded area within site. The Whooper Swans are expected to be commuting between Derryarkin and Cavemount bogs. Little Egret was recorded flying over the site but can be expected to utilise the site at times.

There were records of Golden Plover and Lapwing flying over the site, though in October and November 2021 Golden Plover had been recorded resting on the bare peat. These two species are considered to be associated with the regular winter populations in the wider Derryarkin area. Snipe (Red-listed) occurs within the site though in small numbers.

The site supports a range of other species of conservation interest. Meadow Pipit, Red listed on basis of breeding population, occurs throughout much of the site during winter. The Red-listed Redwing is regular in area during winter and at times occurs within the site. Amber-listed species recorded on site included Skylark, Goldcrest, Starling and Linnet.

3.3 Evaluation and Rating of Ballybeg Bog for Wintering Birds

There follows a summary of the conservation status of species recorded on Ballybeg Bog in winter 2022/23:

EU Birds Directive Annex I listed species

Whooper Swan
Little Egret
Merlin
Peregrine
Golden Plover

Red Listed species (after Gilbert *et al.* 2021)

Kestrel
Golden Plover

Lapwing
Snipe
Redwing
Meadow Pipit

Amber Listed species (after Gilbert *et al*. 2021)

Mute Swan (flying over)
Whooper Swan
Mallard
Skylark
Goldcrest
Starling
Linnet

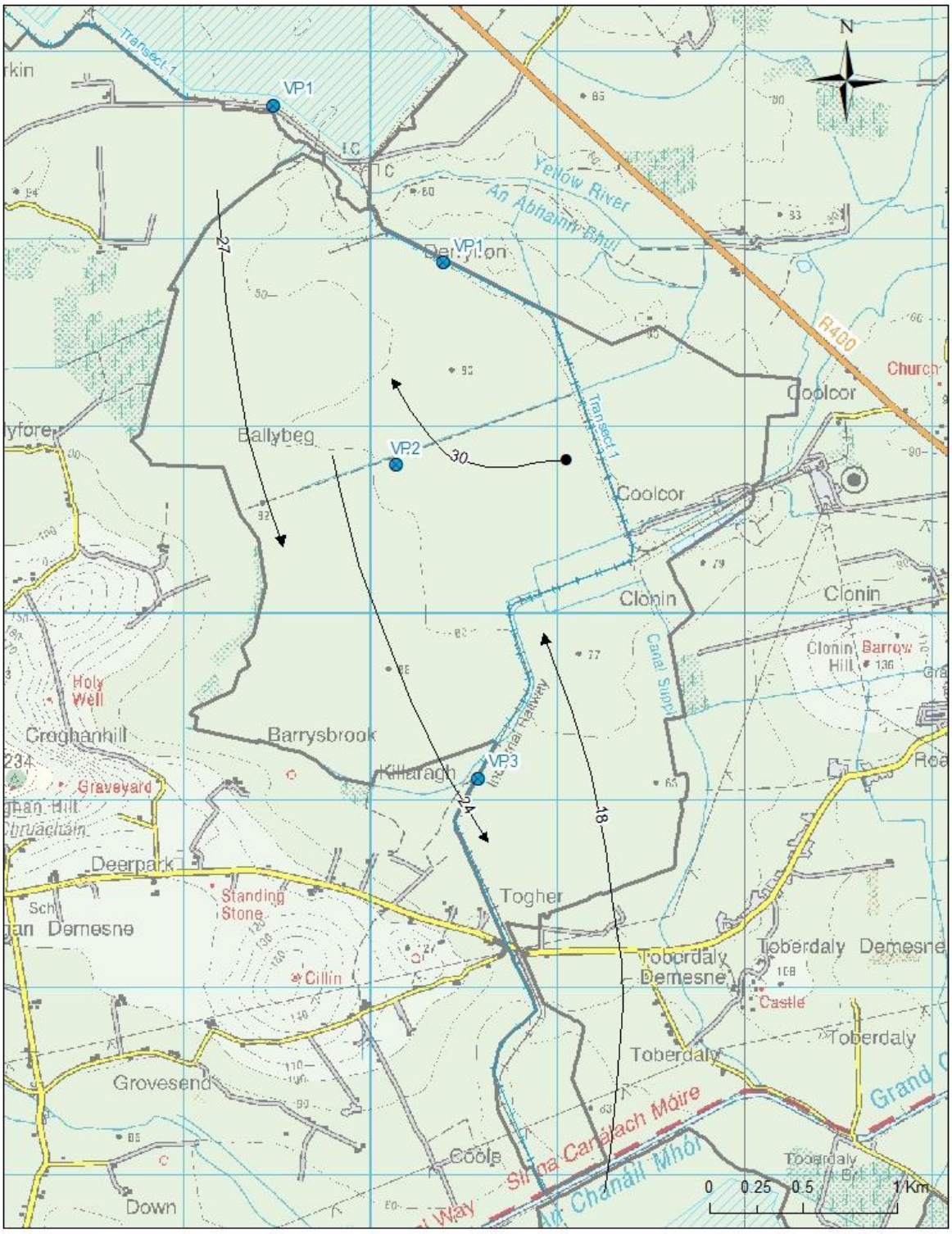
Overall, the site has existing and developing habitats suitable for supporting a range of wintering birds, including some wetland birds.

A feature of Ballybeg Bog is that it is used regularly for hunting by birds of prey, notably Kestrel, Buzzard and Sparrowhawk but also on occasions by Merlin. The site is also within the range of a local breeding pair of Peregrine.

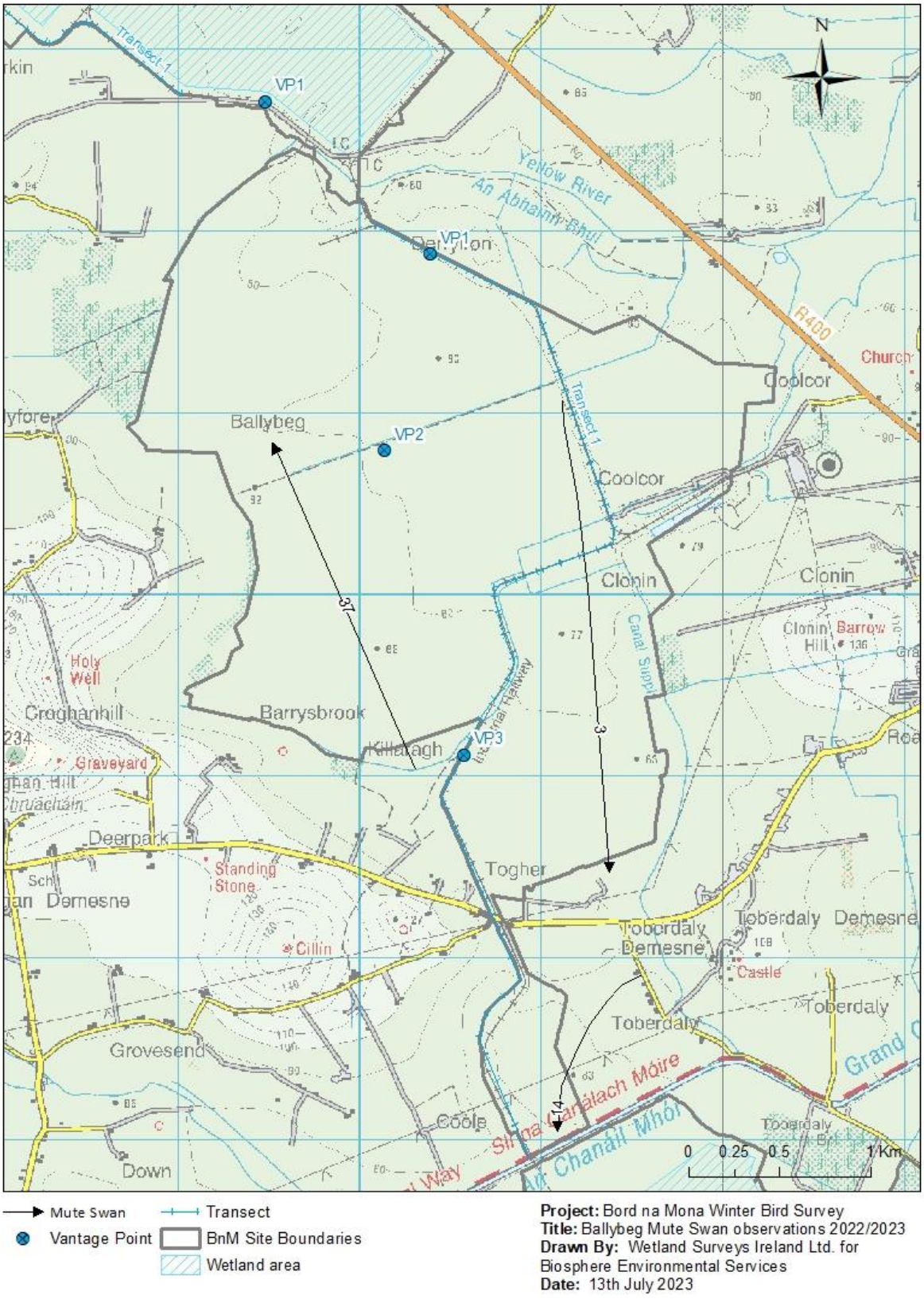
From the location of the site, it can be considered as part of a larger complex of cutaway bog sites, comprising Derryarkin, Drumman and Derryhinch bogs, along with Cavemount Bog to the south.

On the basis of usage of the site by Annex I listed species, plus some Red- and Amber-listed species, it is recommended that a rating of **Local Importance (higher value)** is considered appropriate for wintering birds at Ballybeg Bog.

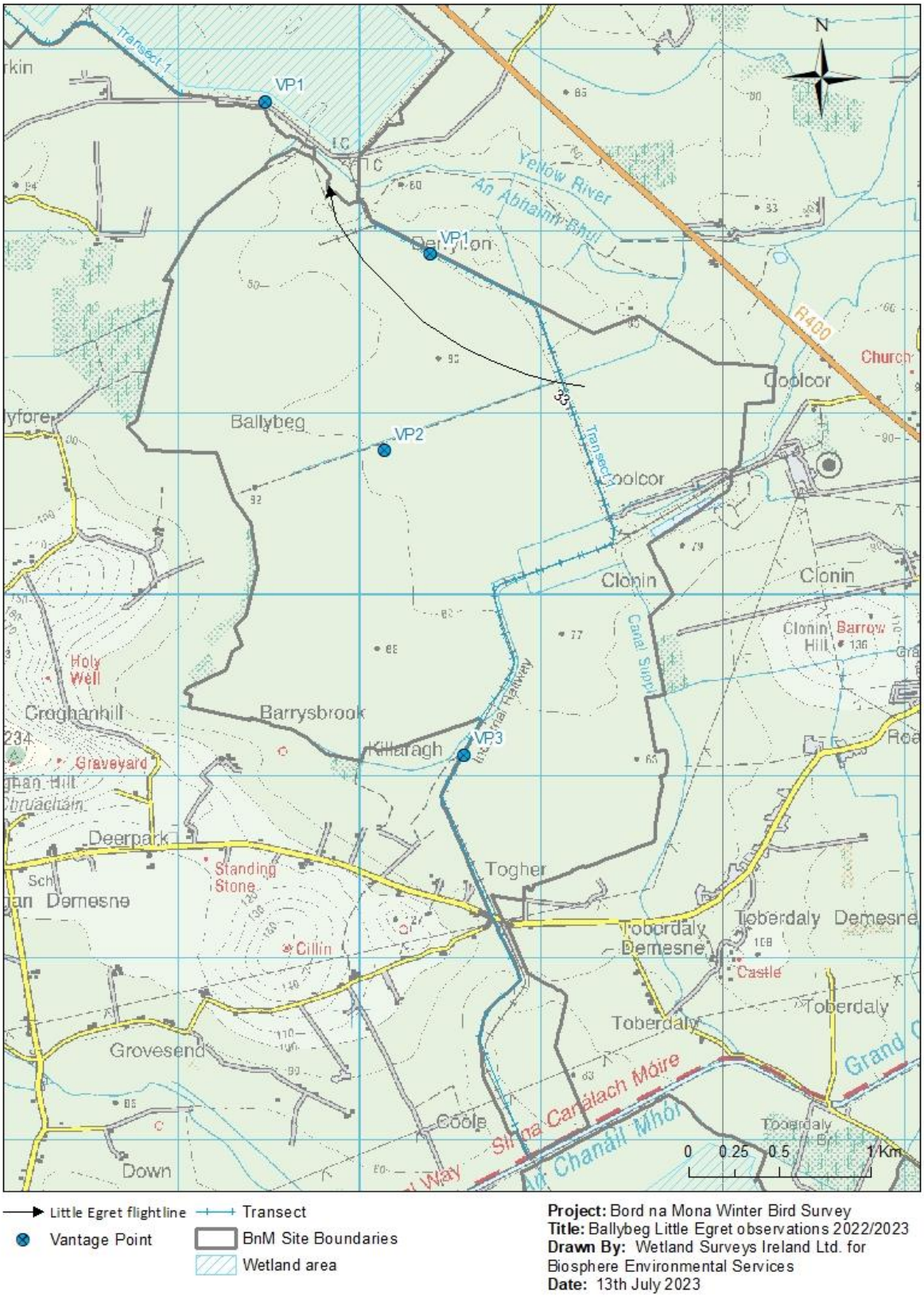
Ballybeg Map 1: Map showing transect and vantage point locations, with Whooper Swan flightlines.



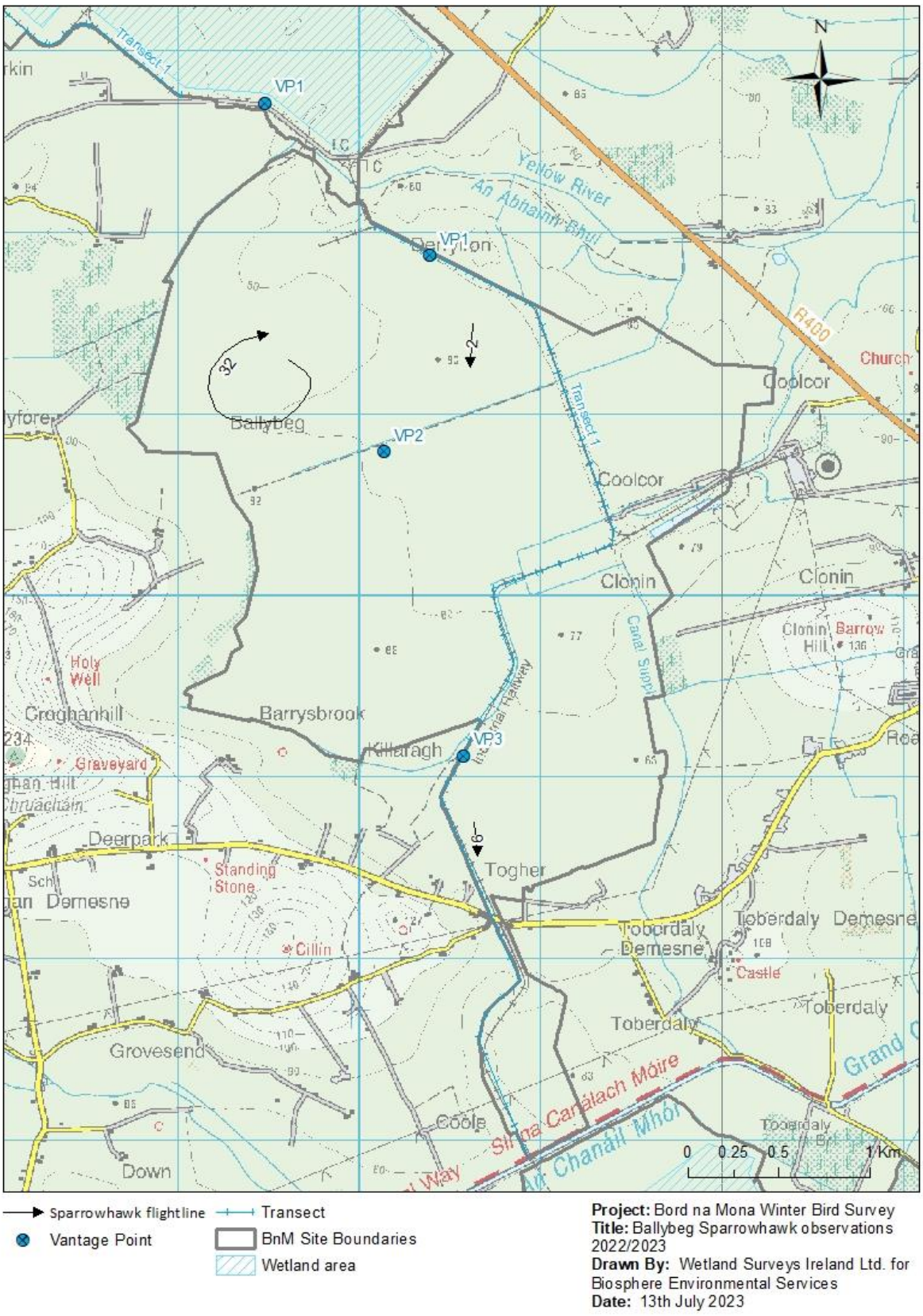
Ballybeg Map 2: Map showing transect and vantage point locations, with Mute Swan flightlines.



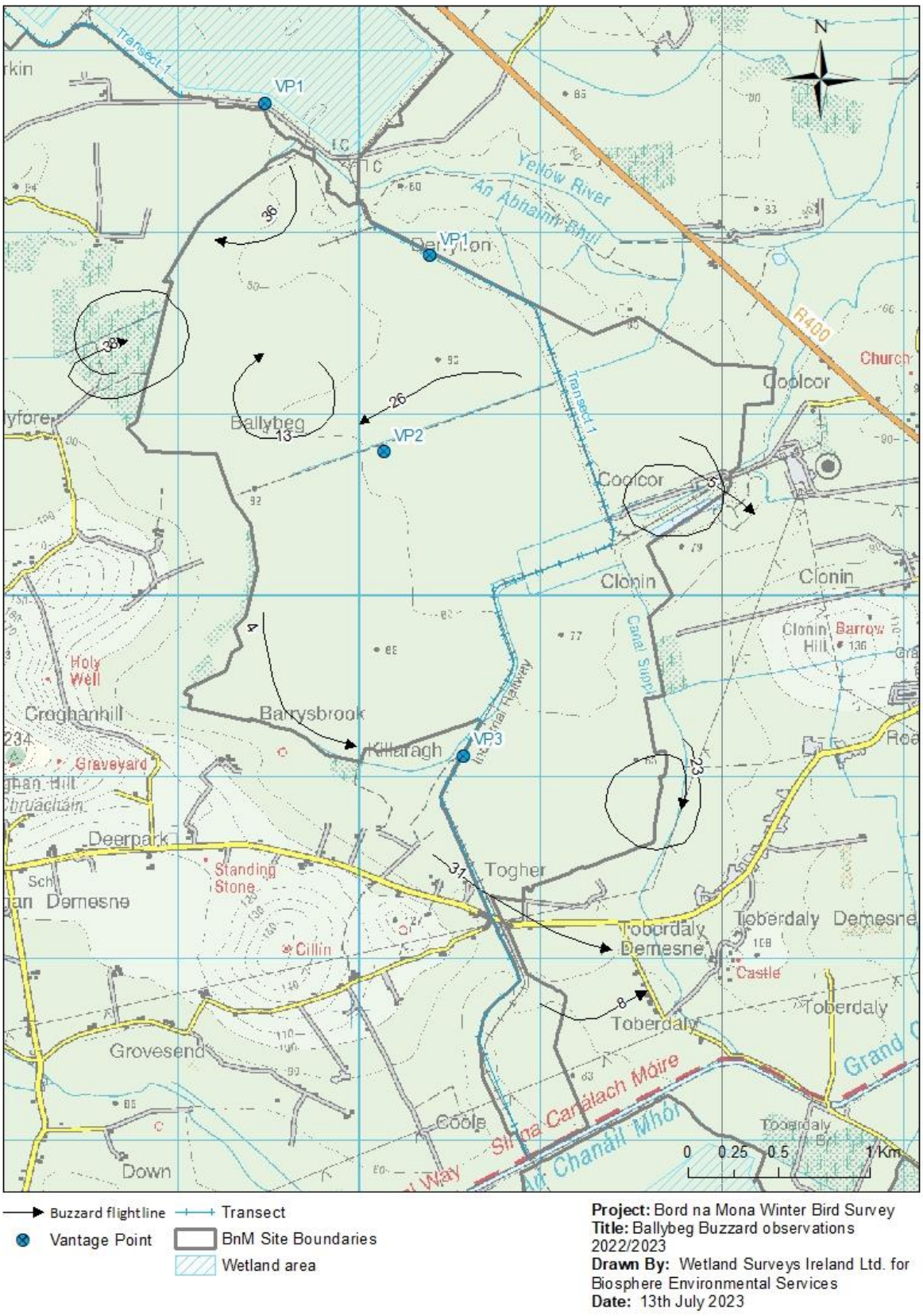
Ballybeg Map 3: Map showing transect and vantage point locations, with Little Egret flightlines.



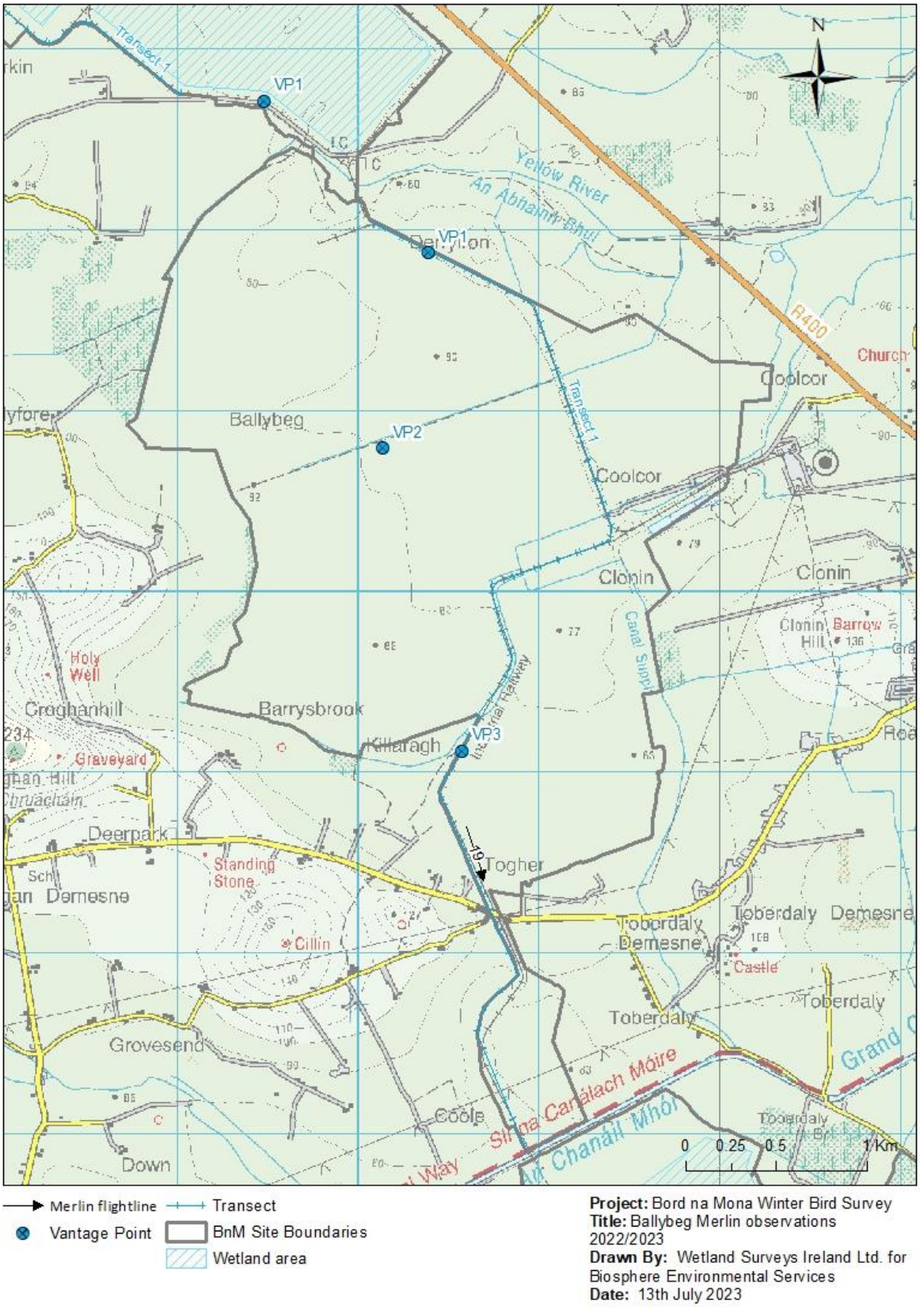
Ballybeg Map 4: Map showing transect and vantage point locations, with Sparrowhawk flightlines.



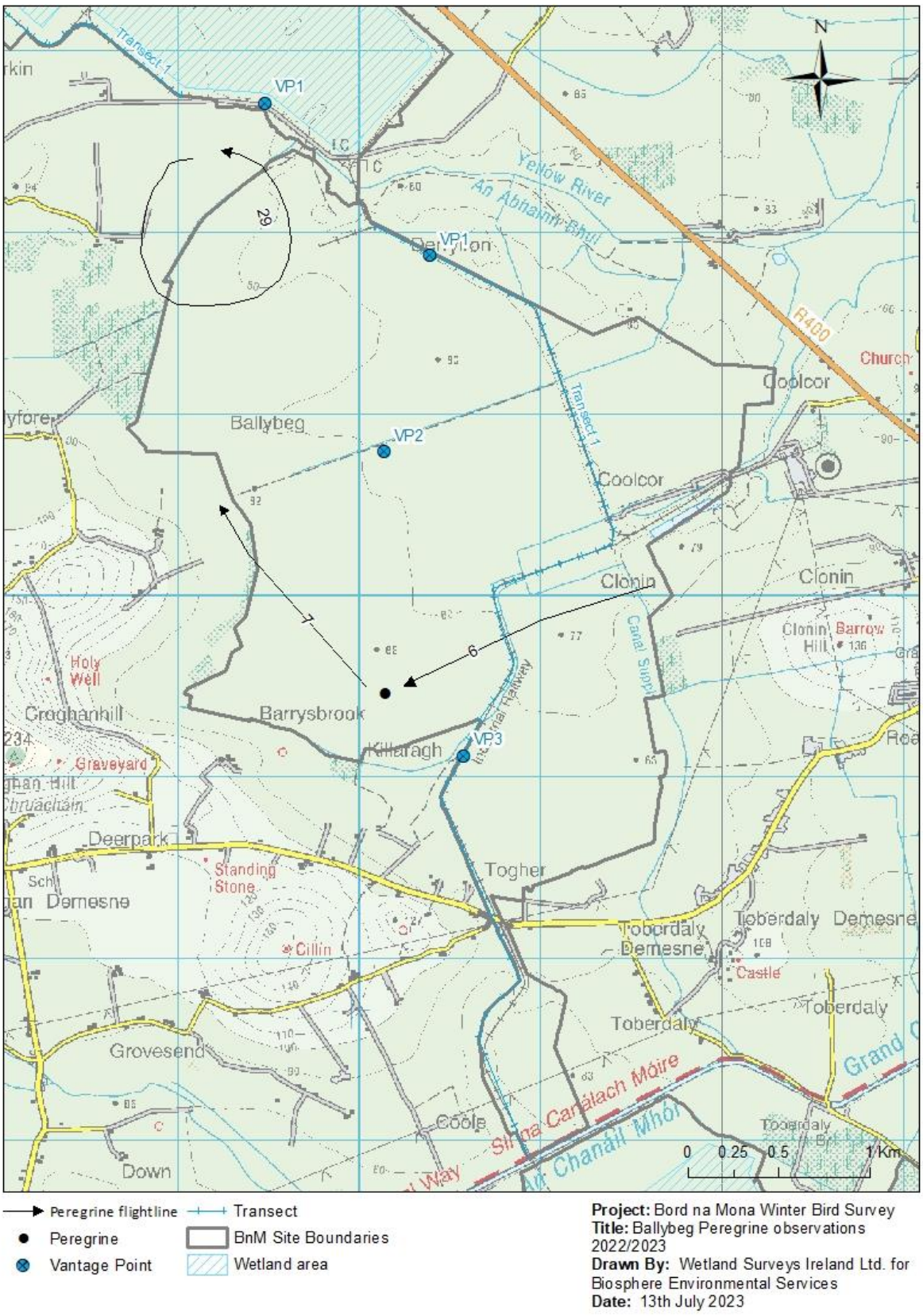
Ballybeg Map 5: Map showing transect and vantage point locations, with Buzzard flightlines.



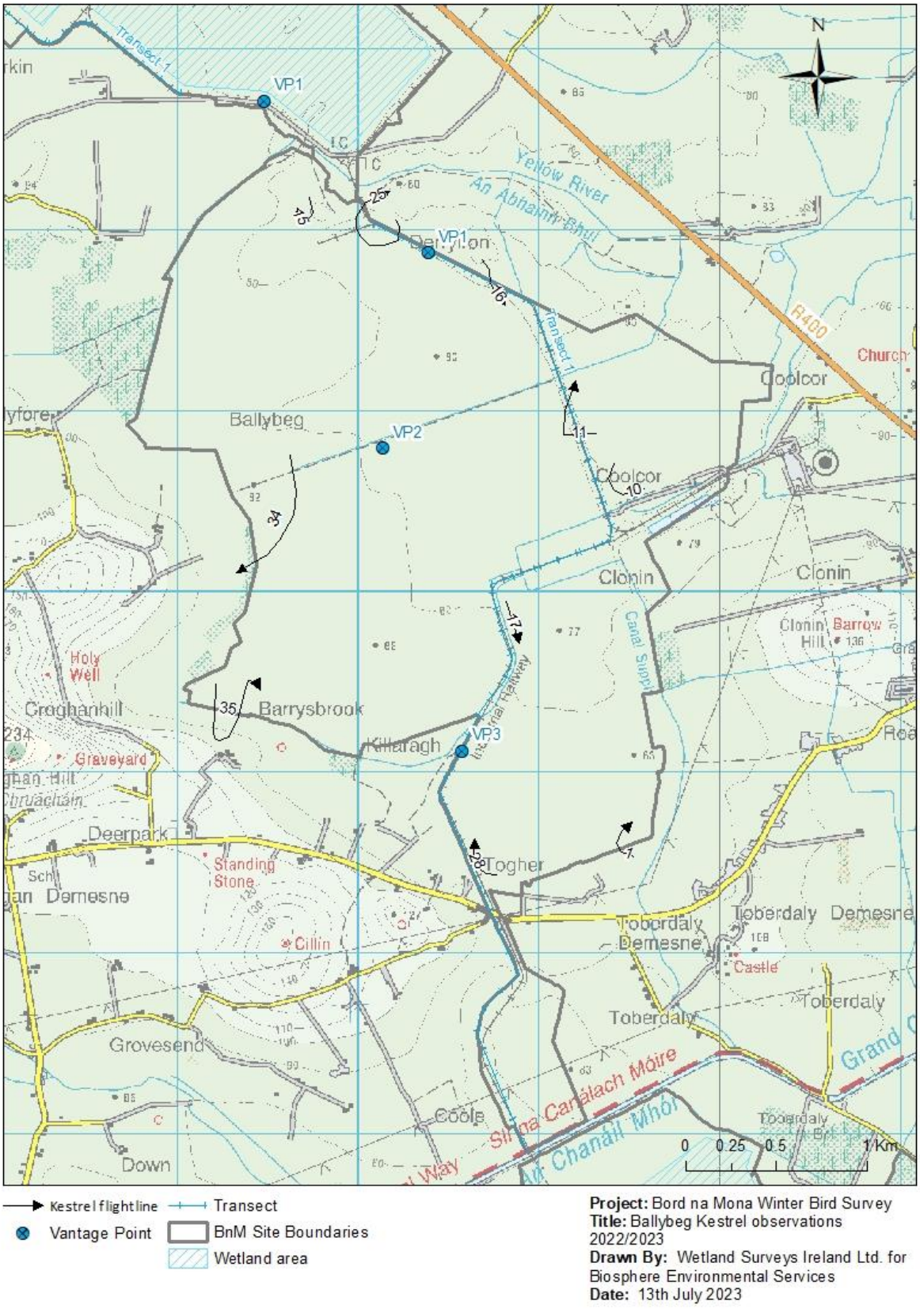
Ballybeg Map 6: Map showing transect and vantage point locations, with Merlin flightlines.



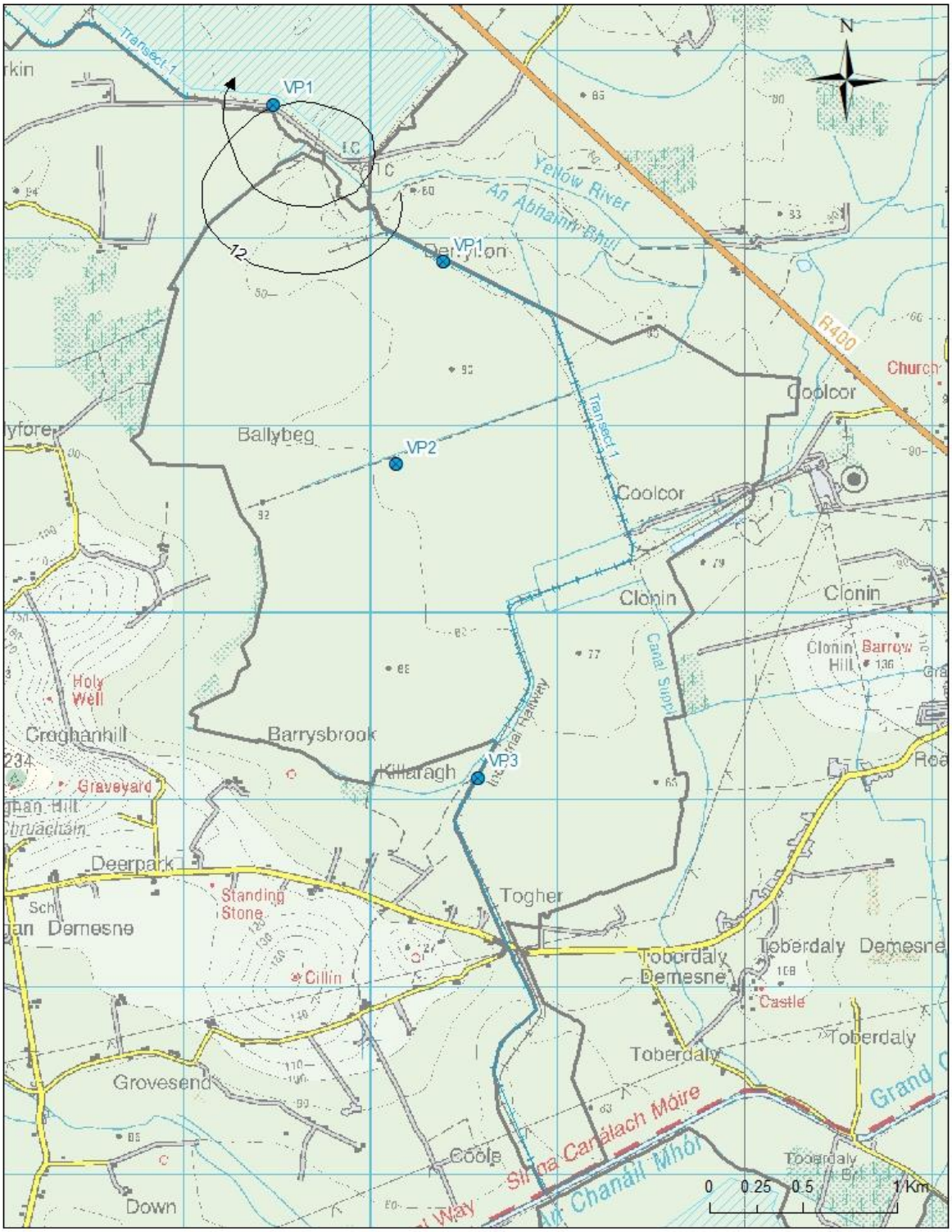
Ballybeg Map 7: Map showing transect and vantage point locations, with Peregrine flightlines.



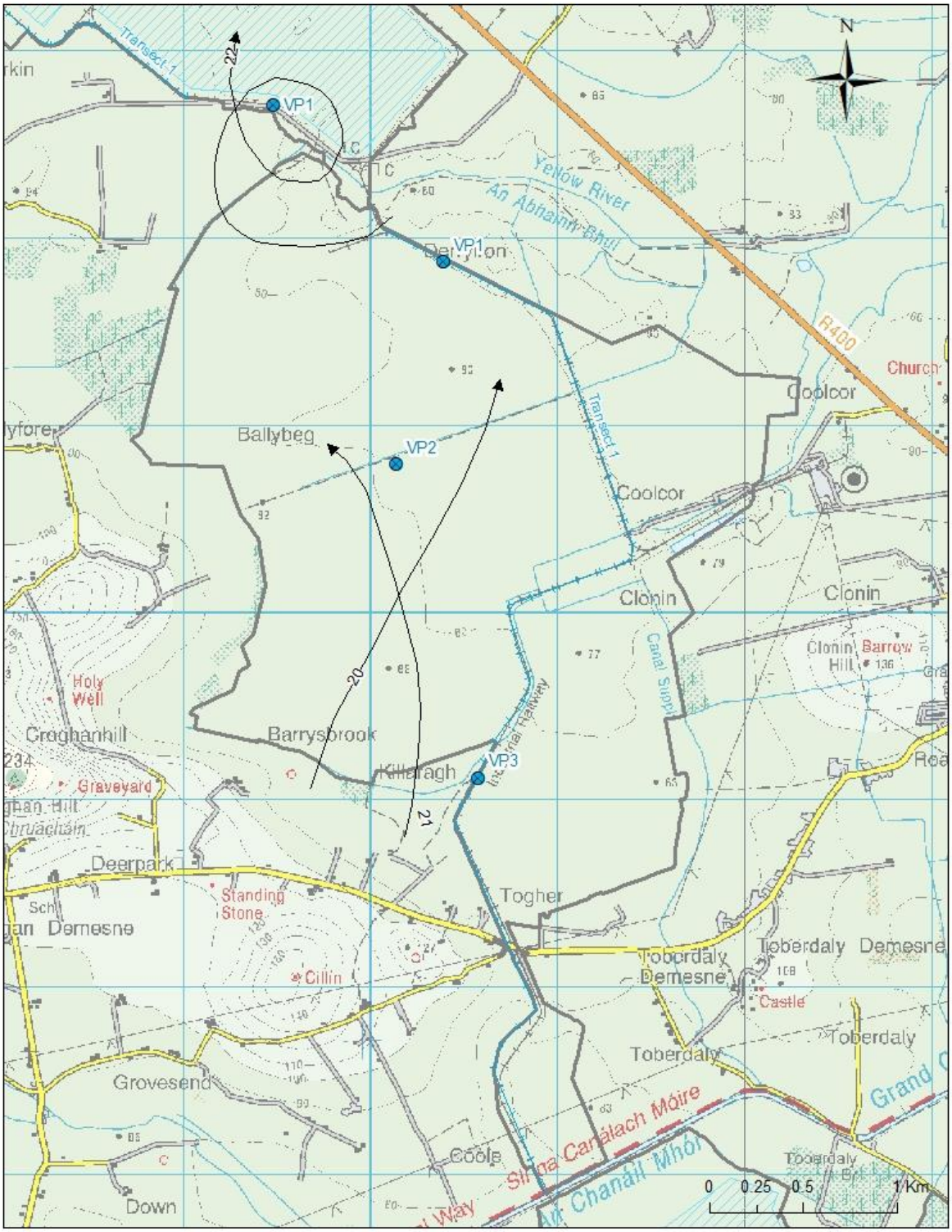
Ballybeg Map 8: Map showing transect and vantage point locations, with Kestrel flightlines.



Ballybeg Map 9: Map showing transect and vantage point locations, with Golden Plover flightlines.



Ballybeg Map 10: Map showing transect and vantage point locations, with Lapwing flightlines.



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APPENDIX 1

Summary of vantage point (VP) watch variables, Ballybeg Bog, October 2022 to March 2023

Date	Season	VP no.	Duration (hrs)	Start Time	Weather conditions
25/10/2022	Winter	3	3	08:00	Dry, Good visibility, SW wind, F3
25/10/2022	Winter	1	3	12:00	Dry, Good visibility, SW wind, F3
28/10/2022	Winter	2	3	10:15	Showers, Good visibility, W wind, F2-3
28/10/2022	Winter	1	3	14.30	Dry, Good visibility, SW wind, F2-3
29/10/2022	Winter	2	3	07:45	Dry, Good visibility, W wind, F2
29/10/2022	Winter	3	3	13.30	Showers, Good visibility, NW wind, F3
21/11/2022	Winter	2	3	08.15	Showers, Good visibility, NW wind, F3
21/11/2022	Winter	3	3	13.30	Dry, Good visibility, NW wind, F3
25/11/2022	Winter	1	3	09:30	Dry, Good visibility, S wind, F2
25/11/2022	Winter	3	3	13:30	Dry, Good visibility, S wind, F2
26/11/2022	Winter	1	3	08:00	Dry, Good visibility, SW wind, F3
26/11/2022	Winter	2	3	12.00	Dry, Good visibility, SW wind, F3
09/12/2022	Winter	2	3	08:30	Dry, Good visibility, E wind, F3
09/12/2022	Winter	1	3	12:30	Dry, Good visibility, E wind, F3
12/12/2022	Winter	3	3	09.00	Dry, Good visibility, SE wind, F1
12/12/2022	Winter	2	3	13:30	Dry, Good visibility, SE wind, F2
19/12/2022	Winter	1	3	09.00	Showers, Good visibility, SW wind, F3
19/12/2022	Winter	3	3	13:30	Dry, Good visibility, SNW wind, F3
18/01/2023	Winter	3	3	09:15	Dry, Good visibility, W wind, F3
18/01/2023	Winter	2	3	14:00	Dry, Good visibility, W wind, F3
20/01/2023	Winter	1	3	08:00	Dry, Good visibility, SW wind, F4
20/01/2023	Winter	2	3	12.00	Dry, Good visibility, SW wind, F3
21/01/2023	Winter	1	3	09:00	Showers, Good visibility, SW wind, F2
21/01/2023	Winter	3	3	13:30	Showers, Good visibility, W wind, F3
05/02/2023	Winter	1	3	07:45	Showers, Good visibility, NW wind, F2
05/02/2023	Winter	2	3	14:00	Showers, Good visibility, NW wind, F2
18/02/2023	Winter	3	3	09:30	Dry, Good visibility, SW wind, F3
18/02/2023	Winter	1	3	13:00	Dry, Good visibility, SW wind, F3
22/02/2023	Winter	3	3	08:45	Dry, Good visibility, SW wind, F2
22/02/2023	Winter	2	3	13:30	Dry, Good visibility, SNW wind, F3

Date	Season	VP no.	Duration (hrs)	Start Time	Weather conditions
07/03/2023	Winter	1	3	10:00	Showers, Mod-good visibility, S wind, F2
07/03/2023	Winter	2	3	14:30	Showers, Good visibility, S wind, F3
16/03/2023	Winter	3	3	08:00	Dry, Good visibility, W wind, F4
16/03/2023	Winter	1	3	12:00	Dry, Good visibility, W wind, F4
27/03/2023	Winter	2	3	07:15	Dry, Good visibility, SW Wind, F3
27/03/2023	Winter	3	3	11:00	Dry, Good visibility, SW Wind, F3

APPENDIX 2

Vantage Point raw data & flight activity, Ballybeg Bog, October 2022 – March 2023

Date	VP No	Map Ref.	Species	No.	Flight Time	Flight Duration (s)	Band 1 (0-25m)	Band 2 (25-175m)	Band 3 (175+ m)	Comments
25/10/2022	3	1	Kestrel	1	09.56	150	60	90	0	Male hunting
25/10/2022	1	2	Sparrow hawk	1	12.43	20	20	0	0	Hunting
28/10/2022	2	3	Mute Swan	4	11.19	180	0	180	0	Flying towards Cavemount
		4	Buzzard	1	11.50	90	60	30	0	Hunting low
28/10/2022	1									No target species
29/10/2022	2	5	Buzzard	2	09.24	240	0	160	80	Two rising
		6	Peregrine	1	10.06	75	25	50	0	Male flew in and land on bare peat – appeared to have prey item
		7	Peregrine	1	10.17	40	20	20	0	Bird flew up
29/10/2022	3	8	Buzzard	1	14.25	60	0	60	0	Flying
		9	Sparrow hawk	1	14.48	30	30	0	0	Hunting along track
21/11/2022	2	10	Kestrel	1	09.54	120	60	60	0	Hovering then dropped – female type
		11	Kestrel	1	10.38	90	0	90	0	Presumed same individual
21/11/2022	3									No target species; good numbers of fieldfares & redwings in area – not really on bog though
25/11/2022	1	12	Golden plover	200	10.38	300	0	100	200	Flock wheelin & circling – flew north
		13	Buzzard	2	11.11	180	30	150	0	Probably pair - circling over woods
25/11/2022	3	14	Mute swan	2	15.45	75	30	45	0	Flew towards Cavemount – just cleared electric line
26/11/2022	1	15	Kestrel	1	09.28	120	60	60	0	Male hunting over old pits
		16	Kestrel	1	10.30	60	0	60	0	Along track –

Date	VP No	Map Ref.	Species	No.	Flight Time	Flight Duration (s)	Band 1 (0-25m)	Band 2 (25-175m)	Band 3 (175+ m)	Comments
										different bird from earlier (imm./ female type)
26/11/2022	2									No target species Flock of 500+ starling in fields to west – came onto bog and landed on bare peat for while
09/12/2022	2	17	Kestrel	1	10.10	120	30	90	0	Hunting along track
09/12/2022	1									No target species – large numbers (100s) of Fieldfares & Redwings – weather cold
12/12/2022	3	18	Whooper swan	9	10.14	140	40	100	0	Flock flying north over site – presumably from Cavemount
		19	Merlin	1	11.18	20	20	0	0	Male perched on track, got up and flew south
12/12/2022	2	20	Lapwing	28	14.45	180	80	100	0	Loose flock flying north
		21	Lapwing	50+	15.28	220	90	130	0	Further flock; Still lots of winter thrushes in area
19/12/2022	1	22	Lapwing	200+	09.56	300	0	100	200	Large flock circling
19/12/2022	3									No target species - quiet
18/01/2023	3	23	Buzzard	2	11.11	240	60	180	0	Pair – some display behaviour
18/01/2023	2	24	Whooper swan	4	16.32	180	0	180	0	Flying towards Cavemount
20/01/2023	1	25	Kestrel	1	09.24	120	0	120	0	Flying over track
		26	Buzzard	1	10.38	90	90	0	0	Hunting over trees
20/01/2023	2									No target species Sparrowhawk seen hunting on way to VP – female type
21/01/2023	1	27	Whooper swan	12	09.57	180	60	180	0	Flock rising and southwards
21/01/2023	3	28	Kestrel	1	15.15	120	60	60	0	Male hovering / hunting along track
05/02/2023	1	29	Peregrine	1	09.14	180	0	60	120	Circling high – large bird

Date	VP No	Map Ref.	Species	No.	Flight Time	Flight Duration (s)	Band 1 (0-25m)	Band 2 (25-175m)	Band 3 (175+ m)	Comments
05/02/2023	2	30	Whooper swan	3	14.16	60	60	0	0	Had been on ponded wetland – got up and flew north
18/02/2023	3	31	Buzzard	1	10.06	90	0	90	0	Flying
18/02/2023	1	32	Sparrow hawk	2	14.35	240	0	100	140	Pair in display
		33	Little egret	1	15.22	120	120	0	0	Flying low – probably arose from old ponds
22/02/2023	3									No target species
22/02/2023	2	34	Kestrel	1	15.00	90	0	90	0	Flying – male
		35	Kestrel	1	15.24	120	90	30	0	Hunting – male as above
07/03/2023	1	36	Buzzard	1	12.12	180	60	120	0	Hunting
07/03/2023	2	37	Mute swan	3	15.50	120	120	0	0	Three imms.
16/03/2023	3									No target species 10+ sand martins
16/03/2023	1	38	Buzzard	2	14.32	180	0	180	0	Pair in display
27/03/2023	2									No target species 2 wheatears on track
27/03/2023	3									No target species

APPENDIX 3

Scientific Names of Bird Species

Little Grebe	*Tachybaptus ruficollis*
Great Crested Grebe	*Podiceps cristatus*
Grey Heron	*Ardea cinerea*
Little Egret	*Egretta garzetta*
Whooper Swan	*Cygnus cygnus*
Mute Swan	*Cygnus olor*
Greenland White-fronted Goose	*Anser albifrons flavirostris*
Greylag Goose	*Anser anser*
Teal	*Anas crecca*
Wigeon	*Anas penelope*
Mallard	*Anas platyrhynchos*
Tufted Duck	*Aythya fuligula*
Buzzard	*Buteo buteo*
Hen Harrier	*Circus cyaneus*
Sparrowhawk	*Accipiter nisus*
Kestrel	*Falco tinnunculus*
Merlin	*Falco columbarius*
Peregrine	*Falco peregrinus*
Red Grouse	*Lagopus lagopus*
Moorhen	*Gallinula chloropus*
Pheasant	*Phasianus colchicus*
Water Rail	*Rallus aquaticus*
Ringed Plover	*Charadrius hiaticula*
Golden Plover	*Pluvialis apricaria*
Lapwing	*Vanellus vanellus*
Jack Snipe	*Lymnocryptus minimus*
Snipe	*Gallinago gallinago*
Woodcock	*Scolopax rusticola*
Greenshank	*Tringa nebularia*
Curlew	*Numenius arquata*
Black-headed Gull	*Chroicocephalus ridibundus*
Lesser Black-backed Gull	*Larus fuscus*
Long-eared Owl	*Asio otus*
Kingfisher	*Alcedo atthis*
Woodpigeon	*Columba palumbus*
Skylark	*Alauda arvensis*
Meadow Pipit	*Anthus pratensis*
Pied Wagtail	*Motacilla alba*
Wren	*Troglodytes troglodytes*
Robin	*Erithacus rubecula*
Stonechat	*Saxicola torquata*
Blackbird	*Turdus merula*
Fieldfare	*Turdus pilaris*
Song Thrush	*Turdus philomelos*
Mistle Thrush	*Turdus viscivorus*
Goldcrest	*Regulus regulus*
Coal Tit	*Parus ater*
Blue Tit	*Parus caerulus*

Great Tit	*Parus major*
Magpie	*Pica pica*
Hooded Crow	*Corvus corone*
Raven	*Corvus corax*
Starling	*Sturnus vulgaris*
Chaffinch	*Fringilla coelebs*
Goldfinch	*Carduelis carduelis*
Siskin	*Carduelis spinus*
Linnet	*Carduelis cannabina*
Lesser Redpoll	*Carduelis flammea*
Bullfinch	*Pyrrhula pyrrhula*
Reed Bunting	*Emberiza schoeniclus*

Appendix D Aquatic Baseline Report

Aquatic baseline report for Derrygreenagh Power, Co Offaly & Co. Westmeath

Prepared by Triturus Environmental Ltd. for Bord na Móna Powergen Limited

February 2023

Please cite as:

Triturus (2023). Aquatic baseline report for Derrygreenagh Power, Co. Offaly & Co. Westmeath. Report prepared by Triturus Environmental Ltd. for Bord na Móna Powergen Limited. February 2023.

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1. Introduction

1.1 Background

Triturus Environmental Ltd. were commissioned by Bord na Móna Powergen Limited to conduct baseline aquatic surveys to inform EIAR preparation for the proposed Derrygreenagh Power gas-fired development, inclusive of potential grid connection and gas pipeline routes. The following report provides a baseline assessment of the aquatic ecology including fisheries and biological water quality, as well as protected aquatic species and habitats in the vicinity of the proposed project, located near Rhode, Co. Offaly and Rochfortbridge, Co. Westmeath.

Undertaken on a catchment-wide scale, the baseline surveys focused on the detection of freshwater habitats and species of high conservation value. These included surveys for white-clawed crayfish (*Austropotamobius pallipes*), macro-invertebrates (biological water quality) and fish of high conservation value, inclusive of supporting nursery and spawning habitat. The surveys also documented macrophyte and aquatic bryophyte communities including Annex I habitat associations in the vicinity of the project (**Figure 2.1**). Aquatic surveys were undertaken during August-September 2022.

1.2 Project description

The development comprises a power station consisting of two units, a flexible mid merit combined cycle gas turbine unit (CCGT) and a reserve / peaking open cycle gas turbine unit (OCGT) with a proposed site power generation capacity of 600 MW.

A full description of the proposed project will be provided in any Environmental Impact Assessment Report used to support consenting applications.

2. Methodology

2.1 Selection of watercourses for assessment

All freshwater watercourses which could be affected directly or indirectly by the proposed development were considered as part of the current baseline. A total of *n*=31 riverine sites were selected for detailed aquatic assessment (see **Table 2.1, Figure 2.1** below). The nomenclature for the watercourses surveyed is as per the Environmental Protection Agency (EPA) system of identification. Aquatic survey sites were present on the Rochfortbridge Stream (EPA code: 07R04), Castlejordan River (07C04) and unnamed tributary, Kiltonan Stream (07K04), Milltownpass River (07M04), Kinnegad River (07K01), Hightown River (07H16), Yellow River (07Y02), Coolcor Stream (07C08), Clonin Stream (07C74), Road River (14R53) and unnamed tributary, Esker Stream (14E03), Rochfort Demesne Stream (25R11), Gallstown River (07G36), Derry River (07D28), Toberdaly Stream (14T28) and the Grand Canal (**Table 2.1**).

The aquatic survey sites were located within the Yellow[Castlejordan]_SC_010, Boyne_SC_030, Figile_SC_020 and Brosna_SC_010 river sub-catchments. The proposed development and associated infrastructure was not located within a European site although there was downstream hydrological connectivity (via several watercourses) with the Lough Ennell SAC (000685), Lough Ennell SPA (004044) and the River Barrow and River Nore SAC (002162). Hydrological connectivity also existed with the River Boyne and Blackwater SAC (002299) and River Boyne and River Blackwater SPA (004232).

Please note this aquatic report should be read in conjunction with the final Environmental Impact Assessment Report (EIAR) prepared for the proposed project. More specific aquatic methodology is outlined below and in the appendices of this report.

2.2 Aquatic site surveys

Aquatic surveys of the watercourses within the vicinity of the proposed development were conducted on Wednesday 31st August and Thursday 1st, Friday 2nd, Thursday 22nd, Friday 23rd September 2022. Survey effort focused on both instream and riparian habitats at each aquatic sampling location (**Figure 2.1**). Surveys at each of these sites included a fisheries assessment (electro-fishing and or fisheries habitat appraisal), white-clawed crayfish survey, macrophyte and aquatic bryophyte survey and (where suitable) biological water quality sampling (Q-sampling) (**Figure 2.1**).

Habitat suitability for white-clawed crayfish and presence was assessed at each survey site in conjunction with environmental DNA (eDNA) sampling undertaken for the species at *n*=4 strategically chosen riverine locations within the vicinity of the project. These water samples were also analysed for crayfish plague (*Aphanomyces astaci*). This holistic approach informed the overall aquatic ecological evaluation of each site in context of the proposed project and ensured that any habitats and species of high conservation value would be detected to best inform mitigation for the development.

In addition to the ecological characteristics of the site, a broad aquatic and riparian habitat assessment was conducted utilising elements of the methodology given in the Environment Agency's 'River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003' (EA, 2003) and the Irish

Heritage Council's 'A Guide to Habitats in Ireland' (Fossitt, 2000). This broad characterisation helped define the watercourses' conformity or departure from naturalness. All sites were assessed in terms of:

- Physical watercourse/waterbody characteristics (i.e. width, depth etc.) including associated evidence of historical drainage
- Substrate type, listing substrate fractions in order of dominance (i.e. bedrock, boulder, cobble, gravel, sand, silt etc.)
- Flow type by proportion of riffle, glide and pool in the sampling area
- An appraisal of the macrophyte and aquatic bryophyte community at each site
- Riparian vegetation composition

2.3 Fish stock assessment (electro-fishing)

A single anode Smith-Root LR24 backpack (12V DC input; 300V, 100W DC output) was used to electro-fish sites on watercourses in the vicinity of the proposed Derrygreenagh Power development in August-September 2022 (**Table 2.1, Figure 2.1; Appendix A**), following notification to Inland Fisheries Ireland, under the conditions of a Department of the Environment, Climate and Communications (DECC) licence. The survey was undertaken in accordance with best practice (CFB, 2008; CEN, 2003) and Section 14 licencing requirements.

Furthermore, a fisheries habitat appraisal of the aquatic survey sites (**Figure 2.1**) was undertaken to establish their importance for salmonid, lamprey (*Lampetra* sp.), European eel (*Anguilla anguilla*) and other fish species. The baseline assessment also considered the quality of spawning, nursery and holding habitat for salmonids and lamprey within the vicinity of the survey sites. For detailed survey methodology, please refer to accompanying fisheries assessment report in **Appendix A.**

2.4 White-clawed crayfish survey

White-clawed crayfish surveys were undertaken at the aquatic survey sites in August-September 2022 under a National Parks and Wildlife (NPWS) open licence (no. C31/2022), as prescribed by Sections 9, 23 and 34 of the Wildlife Act (1976-2021), to capture and release crayfish to their site of capture, under condition no. 6 of the licence. As per Inland Fisheries Ireland recommendations, the crayfish sampling started at the uppermost site(s) of the catchment/sub-catchments in the survey area to minimise the risk of transferring invasive propagules (including crayfish plague) in an upstream direction.

Hand-searching of instream refugia and sweep netting was undertaken according to Reynolds et al. (2010). An appraisal of white-clawed crayfish habitat at each site was conducted based on physical channel attributes, water chemistry and incidental records in mustelid spraint. Additionally, a desktop review of crayfish records within the wider Derrygreenagh survey area was completed.

Table 2.1 Location of *n*=31 aquatic survey sites in the vicinity of the proposed Derrygreenagh Power development, Co. Offaly & Co. Westmeath (* denotes eDNA sampling)

Site no.	Watercourse	EPA code	Location	X (ITM)	Y (ITM)	Potential associated infrastructure (watercourse crossing)
A1	Rochfortbridge Stream	07R04	R400 road crossing, Castlelost West	644392	741635	Gas pipeline route option 1
A2	Castlejordan River	07C04	R400 road crossing, Farthingstown	646879	740315	Gas pipeline route option 1 & 2
A3	Kiltonan Stream	07K04	Mongagh Bridge	648553	738867	Gas pipeline route option 1 & 2
A4	Kiltonan Stream	07K04	Farthingstown, east of R400 road crossing	649613	739013	Gas pipeline route option 1 & 3
A5	Unnamed stream	n/a	Carrick	652197	739948	Gas pipeline route option 1 & 3
A6	Castlejordan River	07C04	Carrick	652484	741375	Gas pipeline route option 1 & 3
A7	Unnamed stream	n/a	Milltown	652487	742166	Gas pipeline route option 1 & 3
A8	Milltownpass River	07M04	Milltown	652497	742393	Gas pipeline route option 1 & 3
B1	Kinnegad River	07K01	Rattin	653352	744648	Gas pipeline route option 1 & 3
B2	Hightown River	07H16	R446 road crossing, Rattin	653436	744861	Gas pipeline route option 1 & 3
***B3**	Kinnegad River	07K01	Killaskillen	658163	744354	n/a
C1	Yellow River	07Y02	Derrygreenagh	649916	736283	Electricity GCR option 2
C2	Yellow River	07Y02	R400 road crossing, Derryiron	651801	735983	Electricity GCR option 3
C3	Coolcor Stream	07C08	Barrysbrook	650625	733333	Electricity GCR option 1 & 2
C4	Coolcor Stream	07C08	Coolcor	651310	734459	Electricity GCR option 2
C5	Coolcor Stream	07C08	R400 road crossing, Coolcor	652286	735536	Electricity GCR option 3
C6	Clonin Stream	07C74	R400 road crossing, Coolcor	652408	735420	Electricity GCR option 3
***C7**	Yellow River	07Y02	Clongall Bridge	659381	737570	n/a
D1	Unnamed stream	n/a	Rathcobican	653388	732740	Electricity GCR option 3
D2	Road River	14R53	Rathcobican	652986	731991	Electricity GCR option 3
***D3**	Esker Stream	14 E03	Newtown Bridge	652952	728554	n/a

Site no.	Watercourse	EPA code	Location	X (ITM)	Y (ITM)	Potential associated infrastructure (watercourse crossing)
E1	Rochfort Demesne Stream	25R11	Kilbrennan	642171	742741	Gas pipeline route option 1
***E2**	Rochfort Demesne Stream	25R11	Stoneford Bridge	641792	744109	n/a
X1	Gallstown Stream	07G36	R400 road crossing, Gortumly	645879	742809	Gas pipeline route option 2
X2a	Derry River	07D28	R400 road crossing, Castlelost	646378	741569	Gas pipeline route option 2
X2b	Rochfortbridge Stream	07R04	Castlelost	646370	741537	Adjacent to gas pipeline route option 2
X3	Yellow River	07Y02	Derrygreenagh	649706	736462	Electricity GCR option 1 & 2
X4	Grand Canal	n/a	Coole	650889	730911	Electricity GCR option 1
X5	Grand Canal	n/a	Toberdaly	651780	731377	Electricity GCR option 1
X6	Toberdaly Stream	14T28	Toberdaly	651751	731394	Electricity GCR option 1
X7	Toberdaly Stream	14T28	Toberdaly	651791	731158	Electricity GCR option 1

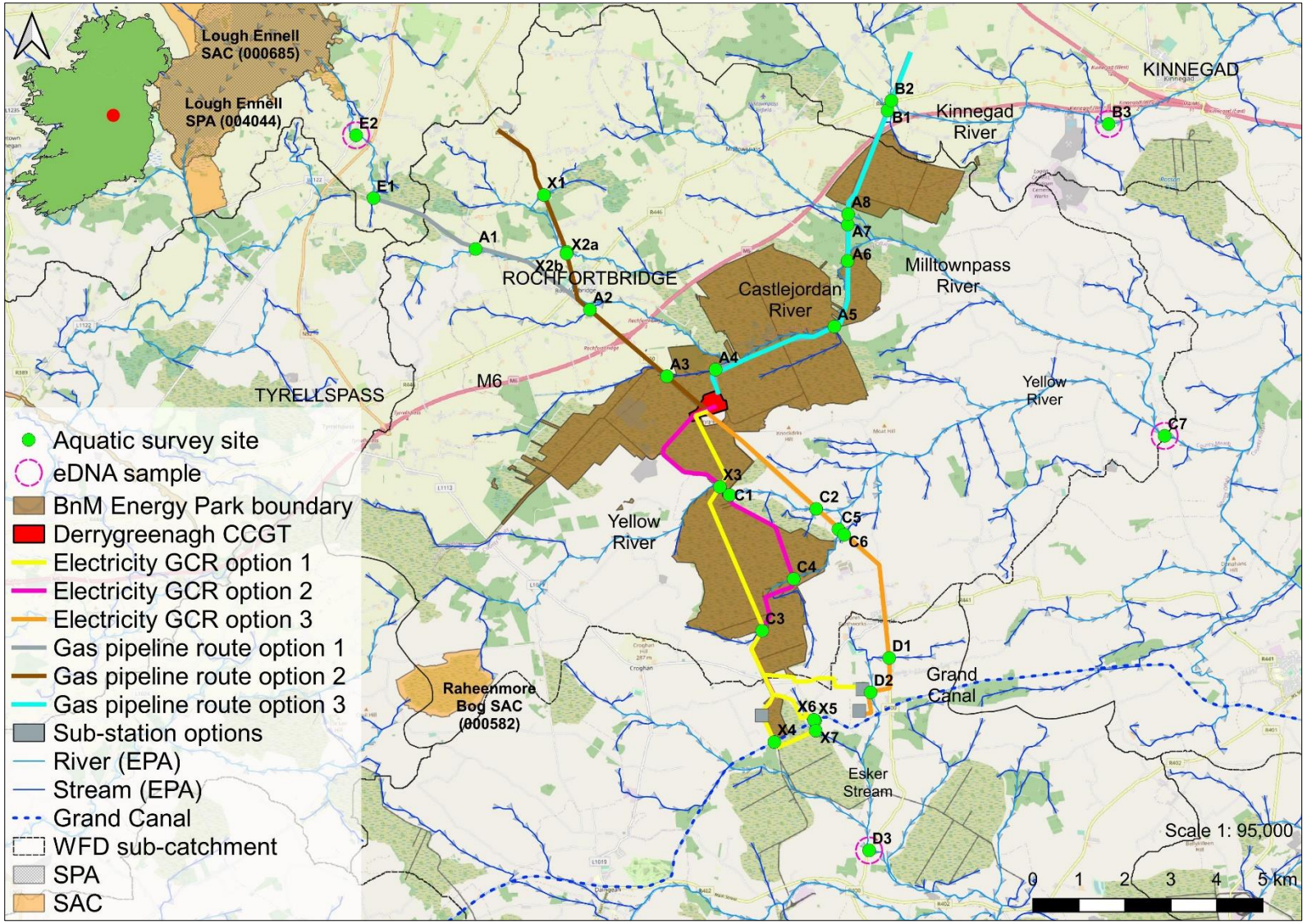

Figure 2.1 Overview of the *n*=31 aquatic survey site locations for the proposed Derrygreenagh Power development, Co. Offaly & Co. Westmeath, July 2022

2.5 eDNA analysis

To validate site surveys and to detect potentially cryptically low populations within the study area, *n*=4 composite water samples were collected from the Kinnegad River (site B3), Yellow River (C7), Esker River (D3) and Rochfort Demesne Stream (E2) and analysed for white-clawed crayfish eDNA (**Figure 2.1**). This would help to validate the site surveys. Samples were also analysed for crayfish plague. The water samples were collected on Friday 2nd September 2022, with the sites strategically chosen to maximise longitudinal (instream) coverage within the catchment (i.e. facilitating a greater likelihood of species detection).

In accordance with best practice, a composite (500ml) water sample was collected from the sampling point, maximising the geographic spread at the site (20 x 25ml samples at each site), thus increasing the chance of detecting the target species' DNA. The composite sample was filtered on-site using a sterile proprietary eDNA sampling kit. The fixed sample was stored at room temperature and sent to the laboratory for analysis within 48 hours of collection. A total of *n*=12 qPCR replicates were analysed for the site. Given the high sensitivity of eDNA analysis, a single positive qPCR replicate is considered as proof of the species' presence (termed qPCR No Threshold, or qPCR NT). Whilst an eDNA approach is not currently quantitative, the detection of the target species' DNA indicates the presence of the species at and or upstream of the sampling point. Please refer to **Appendix D** for full eDNA laboratory analysis methodology.

2.6 Biological water quality (Q-sampling)

The 31 no. riverine survey sites were assessed for biological water quality through Q-sampling in July 2022 (**Figure 2.1).** Sites A7 (unnamed stream), C6 (Clonin Stream), D1 (unnamed stream) and X7 (Toberdaly Stream) were dry at the time of sampling and sites X4 and X5 on the Grand Canal were unsuitable for Q-sampling and thus a three-minute sweep from marginal macrophyte mesohabitat was undertaken. Thus, biological water quality samples were collected from a total of 27 no. riverine sites. All samples were taken with a standard kick sampling hand net (250mm width, 500µm mesh size) from areas of riffle/glide utilising a 2-minute kick sample, as per Environmental Protection Authority (EPA) methodology (Feeley et al., 2020). Large cobble was also washed at each site for 1-minute (where present) to collect attached macro-invertebrates (as per Feeley et al., 2020). Samples were elutriated and fixed in 70% ethanol for subsequent laboratory identification. Samples were converted to Q-ratings as per Toner et al. (2005) and assigned to WFD status classes. Any rare invertebrate species were identified from the NPWS Red List publications for beetles (Foster et al., 2009), mayflies (Kelly-Quinn & Regan, 2012), stoneflies (Feeley et al., 2020) and other relevant taxa (i.e. Byrne et al., 2009; Nelson et al., 2011).

Table 2.2 Reference categories for EPA Q-ratings (Q1 to Q5)

Q Value	WFD status	Pollution status	Condition
Q5 or Q4-5	High status	Unpolluted	Satisfactory
Q4	Good status	Unpolluted	Satisfactory
Q3-4	Moderate status	Slightly polluted	Unsatisfactory
Q3 or Q2-3	Poor status	Moderately polluted	Unsatisfactory
Q2, Q1-2 or Q1	Bad status	Seriously polluted	Unsatisfactory

2.7 Physiochemical water quality

Physiochemical water quality samples were collected from a subset of 14 no. sites on the Castlejordan River (site A2 & A6), Kiltonan Stream (A3), Milltownpass River (A8), Kinnegad River (B3), Yellow River (C2, C7 & X3), Esker Stream (D3), Rochfort Demesne Stream (E2), Rochfortbridge Stream (X2b) and the Grand Canal (X4 & X5) (**Figure 2.1**). Samples were collected in September 2022 and delivered to the laboratory on the same day for analysis. In order to collate a broad water quality baseline for the study area, a range of physio-chemical parameters for each site were laboratory-tested, namely;

- pH
- Total alkalinity (mg $CaCO_3$/l)
- Total oxidised nitrogen (mg N/l)
- Total ammonia (mg N/l)
- Total phosphorus (mg P/l) (canal sites only)
- Molybdate Reactive Phosphorus (MRP) (mg P/l)
- Chloride (mg Cl/l)
- Biochemical Oxygen Demand (BOD) (mg O_2/l)
- Chemical Oxygen Demand (COD) (mg O_2/l)
- Suspended solids (mg/L)
- Chlorophyll a (µg/l) (canal sites only)

2.8 Macrophytes and aquatic bryophytes

Surveys of the macrophyte and aquatic bryophyte community were conducted by instream wading at each of the *n*=29 riverine and *n*=2 canal survey sites, with specimens collected (by hand, sweep nets or via grapnel) for on-site identification. An assessment of the aquatic vegetation community helped to identify any rare macrophyte species (Flora Protection Order or Wyse-Jackson et al., 2016) or habitats corresponding to the Annex I habitats, e.g., 'Water courses of plain to montane levels, with submerged or floating vegetation of the *Ranunculion fluitantis* and *Callitricho-Batrachion* (low water level during summer) or aquatic mosses [3260]' (more commonly referred to as 'floating river vegetation').

2.9 Otter signs

The presence of otter (*Lutra lutra*) at each aquatic survey site was determined through the recording

of otter signs within 150m of each survey site. Notes on the age and location (ITM coordinates) were made for each otter sign recorded, in addition to the quantity and visible constituents of spraint (i.e. remains of fish, crustaceans, molluscs etc.).

2.10 Aquatic ecological evaluation

The evaluation of aquatic ecological receptors contained within this report uses the geographic scale and criteria defined in the 'Guidelines for Assessment of Ecological Impacts of National Road Schemes' (NRA, 2009).

2.11 Biosecurity

A strict biosecurity protocol following IFI (2010) and the Check-Clean-Dry approach was adhered to during surveys for all equipment and PPE used. Disinfection of all equipment and PPE before and after use with Virkon™ was conducted to prevent the transfer of pathogens or invasive propagules between survey sites. Specific consideration was given to highly virulent crayfish plague given known historical outbreaks in connecting downstream catchments. Surveys were undertaken at sites in a downstream order to minimise the risk of upstream mobilisation of pathogens and invasive species. Where feasible, equipment was also thoroughly dried (through UV exposure) between survey areas. Any aquatic invasive species or pathogens recorded within or adjoining the survey areas were geo-referenced. All Triturus staff are certified in 'Good fieldwork practice: slowing the spread of invasive non-native species' by the University of Leeds.

3. Receiving environment

3.1 Derrygreenagh catchment and survey area description

The proposed Derrygreenagh Power development (CCGT & OCGT) is located in an area of cutover bog at Derrygreenagh, Co. Offaly approx. 4km south-east of Rochfortbridge, Co. Westmeath (**Figure 2.1**). The proposed development is within hydrometric areas 07 (Boyne), 25 (Lower Shannon) and 14 (Barrow). The aquatic survey sites were located within the Yellow [Castlejordan]_SC_010, Boyne_SC_030, Figile_SC_020 and Brosna_SC_010 river sub-catchments.

The watercourses and aquatic surveys sites in the vicinity of Derrygreenagh are small, historically modified lowland depositing (FW2; Fossitt, 2000) and drainage channels (FW4). Predominantly, watercourses flow over areas of Visean limestone & calcareous shale with localised Tournaisian limestone (Geological Survey of Ireland data). Land use practices in the wider survey area are dominated by peat bogs (CORINE 412) with localised transitional woodland scrub (CORINE 324), coniferous forest (CORINE 312) and extensive adjoining pastures (CORINE 231).

3.2 Fisheries asset of the survey area

The Kinnegad River, Yellow River and the Castlejordan River (aka Mongagh River) are known to support *Lampetra* sp. (O'Connor, 2006). These rivers are also known to support good stocks of small-sized brown trout (*Salmo trutta*) (O'Reilly, 2009). The Kinnegad River and Castlejordan (Mongagh) River support a genetically distinct sub-population of trout within the Boyne catchment (Massa-Gallucci & Mariani, 2011).

The Grand Canal is known to support a range of coarse fish species, including perch, pike (*Esox lucius*), bream (*Abramis brama*), roach (*Rutilus rutilus*), rudd (*Scardinius erythropthalmus*) and their respective hybrids, European eel (*Anguilla anguilla*), tench (*Tinca tinca*), highly localised common carp (*Cyprinus carpio*) and brown trout (IFI data; McLoone, 2011; Tierney et al., 1999; pers. obs.). *Lampetra* sp. lamprey have also been recorded at a low number of locations, e.g. 11th lock, ROD, 2016; 7th lock, Caffrey et al., 2006; 5th lock, MKO, 2019).

Fisheries data for the other watercourses within the survey area was not available at the time of survey.

3.3 Protected aquatic species

A comprehensive desktop review of available data (NPWS, NBDC, BSBI & other data) for 10km grid squares containing and adjoining the project (i.e. N43, N44, N52, N53, N54, N63 & N64) identified records for a low number of rare and or protected aquatic species within the vicinity of the proposed development, although most did not overlap directly with the survey area (**Figure 3.1**).

Records for white-clawed crayfish were widespread within the wider survey area (45 records), primarily on the on the Kinnegad River but also the Yellow River, Castlejordan River and Lough Ennel (**Figure 3.1**). These records ranged from 1971-2018 (the most recent being from the Yellow River).

There were a very high number of records available for otter (*lutra lutra*) records in the relevant grid squares (>80 records). Whilst many were historical (1980-1991), the majority were contemporary records (2005-2018) (**Figure 3.1**). Records were available for several watercourses and waterbodies including the Rochfortbridge Stream, Kinnegad River, Kiltonan Stream, Castlejordan (Mongagh) River, Yellow River and Esker Stream and numerous settlement ponds in vicinity of the proposed development.

A low number of records were available for smooth newt (*Lissotriton vulgaris*) in grid squares N44, N52 and N63. Common frog (*Rana temporaria*) were widespread throughout the respective 10km grid squares (>60 records).

3.4 EPA water quality data (existing data)

The following outlines the available water quality data for the watercourses in context of the proposed development. Only recent water quality is summarised below (i.e. since 2015). There was no contemporary EPA biological monitoring data available for several watercourses in vicinity of the survey area, namely the unnamed Castlejordan River tributary, Kiltonan Stream (07K04), Hightown River (07H16), Coolcor Stream (07C08), Clonin Stream (07C74), Road River (14R53) and unnamed tributary, Esker Stream (14E03), Rochfort Demesne Stream (25R11), Gallstown River (07G36), Derry River (07D28) or the Toberdaly Stream (14T28).

Please note that biological water quality analysis was undertaken as part of this study, with the results presented in the **section 4** and **Appendix B** of this report.

3.4.1 Rochfortbridge Stream

There was a single contemporary EPA biological monitoring station located on the Rochfortbridge Stream (07R04). At station RS07R040300 (survey site X2b) the river achieved Q3-4 (moderate status) in 2020.

Upstream of survey site X2b, the Rochfortbridge Stream (Rochfortbridge Stream_010 river waterbody) was of moderate status in the 2016-2021 period and was 'at risk' of failing to achieve good WFD status (WFD Risk 3rd cycle). Downstream of this point, the Castlejordan_010 river waterbody was of poor status in the 2016-2021 period and also considered 'at risk'. Peat extraction is the major risk to the Rochfortbridge Stream within these two river waterbodies (EPA, 2018a).

3.4.2 Castlejordan River

There were three contemporary EPA biological monitoring station located on the Castlejordan River (07C04). However, at Baltinoran Bridge (station RS07C040100), halfway between survey sites A6 and A7, the river achieved Q4 (good status) in 2020. The river also achieved Q4 (good status) at station RS07C040190, Castlejordan Bridge) in 2020.

The Castlejordan River upstream of Rochfortbridge (Castlejordan_010 river waterbody) was of moderate status in the 2016-2021 period and was 'at risk' of failing to achieve good ecological status (WFD Risk 3rd cycle). However, downstream the Castlejordan_020 and _030 river waterbodies were of good status and were 'under review' and 'not at risk', respectively. Peat extraction (including elevated

ammonia levels) and diffuse agriculture are the main risk to water quality in these river waterbodies (EPA, 2018a).

3.4.3 Milltownpass River

There was a single contemporary EPA biological monitoring station located on the Milltownpass River (07M04). At station RS07M040400 (c.3km upstream of survey site A8) the river achieved Q3-4 (moderate status) in 2020.

The middle and lower reaches of the river are located within the Castlejordan_020 river waterbody which was of good status in the 2016-2021 period and 'not at risk' of failing to achieve good WFD status (WFD Risk 3rd cycle). Peat extraction (including elevated ammonia levels) and diffuse agriculture are the main risk to water quality in these river waterbodies (EPA, 2018a).

3.4.4 Kinnegad River

Two contemporary EPA biological monitoring stations were located on the Kinnegad River (07K01) in vicinity if the survey area. At station RS07K010060 (downstream of survey site B1) and station RS07K010070 (survey site B3) the river achieved Q3 (poor status) in 2020.

Upstream of Kinnegad, the Kinnegad River (within the Kinnegad_010 and Kinnegad_020 river waterbodies) was of poor status in the 2016-2021 period and was considered 'at risk' of failing to achieve good WFD status and 'under review', respectively (WFD Risk 3rd cycle). Agriculture, peat extraction and hydromorphology are the biggest risks to water quality within these river waterbodies (EPA, 2018b).

3.4.5 Yellow River

Three contemporary EPA biological monitoring stations were located on the Yellow River (07Y02) in vicinity of the survey area. At station RS07Y020070 (survey site X3) the river achieved Q3 (poor status) in 2020. However, at Garr Bridge (station RS07Y020100), the river achieved Q4 (good status) in 2020. The river also achieved Q4 (good status) at station RS07Y020300 (Clongall Bridge, survey site C7) in 2020.

In vicinity of the proposed development, the Yellow River (within Yellow (Castlejordan)_020 and _030 river waterbodies) was of good status in the 2016-2021 period and was considered 'not at risk' of failing to achieve good WFD status (WFD Risk 3rd cycle).

3.4.6 Coolcor Stream

There were two contemporary EPA biological monitoring stations located on the Coolcor Stream (07C08). At station RS07C080020 (0.5km downstream of survey site C4) the river achieved Q3-4 (moderate status) in 2020. The stream also achieved Q3-4 (moderate status) at station RS07C080190 (survey site C5) in 2020.

The stream is located within the Castletown tara Stream_010 river waterbody which was of moderate status in the 2016-2021 period and 'at risk' of failing to achieve good WFD status (WFD Risk 3rd cycle). Peat extraction is the main risk to water quality in this river waterbody (EPA, 2018a).

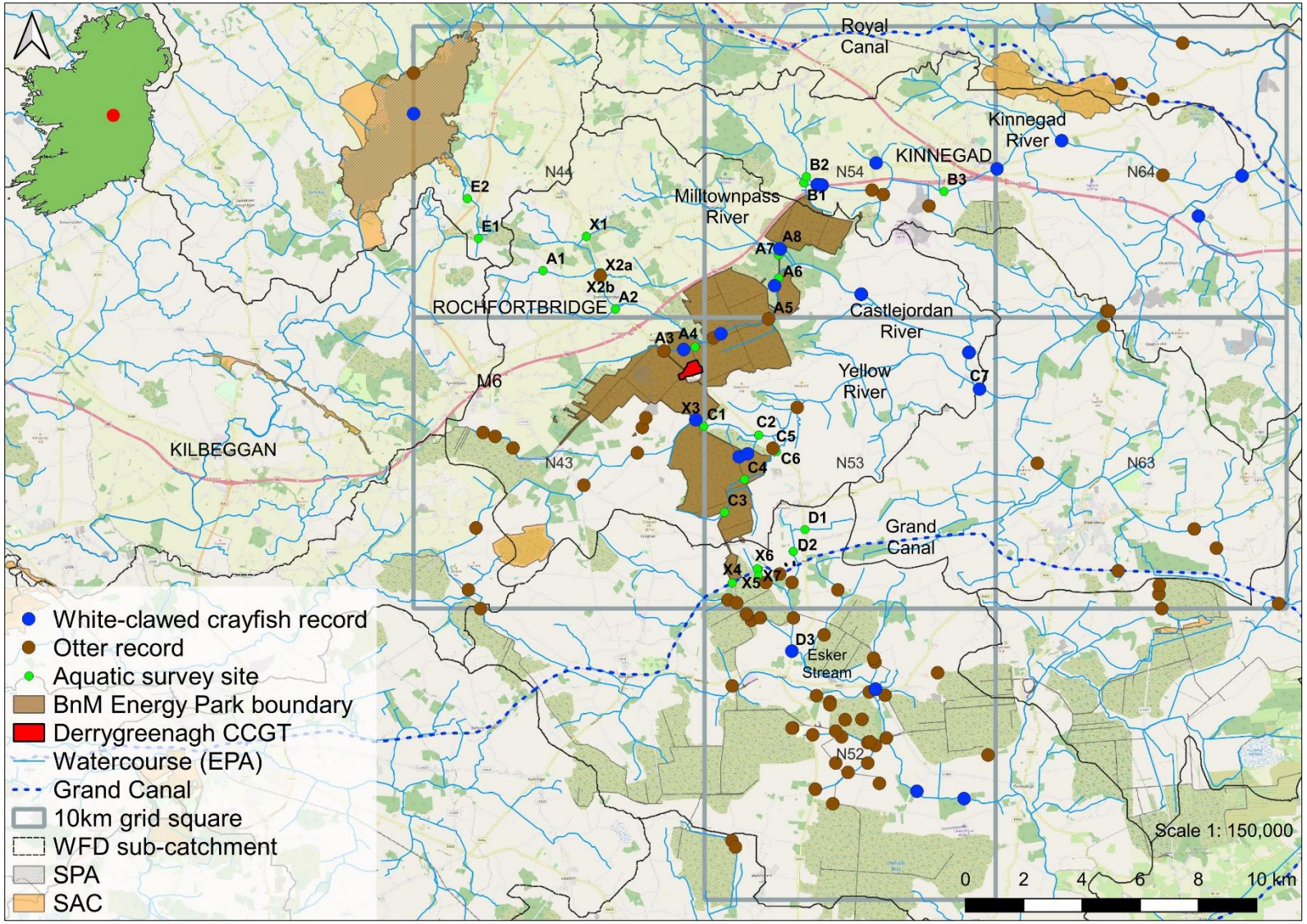

Figure 3.1 Selected protected aquatic species records in the vicinity of the proposed Derrygreenagh Power Project (source: NPWS & NBDC data, 2000-2018)

4. Results of aquatic surveys

The following section summarises each of the *n*=31 survey sites in terms of physical characteristics to broadly establish their hydromorphological condition. Furthermore, each survey site was assessed in terms of its fisheries habitats, inclusive of electro-fishing data compiled. Surveys for white-clawed crayfish and macrophyte/aquatic bryophyte communities were also undertaken. Biological water quality (Q-sample) results were also summarised for each riverine sampling site inclusive of species lists. Please refer to **Appendix A** (fisheries assessment report) for more detailed fisheries results and **Appendix B** for invertebrate species lists and biological Q sampling summaries for each survey site. Habitat codes are presented according to Fossitt (2000) and scientific names are provided at first mention only. The surveys were carried out between July and September 2022 during low water to best observe aquatic species and habitats. High level summaries of the fish species recorded at each survey site is provided in **Table 4.2**. Additionally, a summary of the aquatic species and habitats of high conservation concern recorded during the surveys is provided in **Table 4.3**. An evaluation of the aquatic ecological importance of each survey site based on these aquatic surveys is provided and summarised in **Table 4.4**.

4.1 Aquatic survey site results

4.1.1 Site A1 – Rochfortbridge Stream, Castlelost West

Site A1 was located on the Rochfortbridge Stream (07R04) at the R400 road and potential gas pipeline route option 1 crossing. The heavily modified lowland depositing watercourse (FW2) had been historically deepened and straightened with resulting poor hydromorphology in a U-shaped channel. The stream averaged 3-4m wide and 0.1-0.3m deep. The profile was dominated by very slow flowing shallow glide with localised riffle and shallow pool. The substrata comprised scattered cobble and mixed gravels that were heavily bedded and heavily silted. Livestock poaching was evidently contributing to the siltation of the channel. The site supported abundant cover of watercress (*Nasturtium officinale*) and fool's watercress (*Apium nodiflorum*). Common duckweed (*Lemna minor*) was locally abundant and covered c.10% of the stream's surface. Aquatic bryophytes were not recorded. Filamentous algal cover was moderate (20%) with abundant floc[1]. The stream margins supported frequent great willowherb (*Epilobium hirsutum*), hedge bindweed (*Calystegia sepium*), bramble (*Rubus fruticosus* agg.), meadowsweet (*Filipendula ulmaria*) and iris (*Iris pseudacorus*). The riparian areas supported scattered mature grey willow (*Salix cinerea*), hawthorn (*Crataegus monogyna*) and ash (*Fraxinus excelsior*) with scrub in the understories. The site was bordered by heavily improved pasture (GA1).

Three-spined stickleback (*Gasterosteus aculeatus*) and lamprey *(Lampetra* sp.) were the only fish species recorded via electro-fishing at site A1 (**Appendix A**). The site was a poor quality salmonid nursery being degraded due to historical drainage, poor flow rates, heavy siltation and evident enrichment. The quality of spawning habitat was also poor (for both salmonids and lamprey) being

[1] floc is defined as an aggregation of (mostly dead) organic material, mainly from algae and diatoms, but also with potential origins from decaying macrophytes and associated decomposers (bacteria and fungi). The floc can form a layer at the surface of the substrate, or infiltrate the substrate, generally where there is insufficient flow to keep the material in suspension (Moorkens & Killeen, 2020)

reduced by the deterioration of the bed from algae and sedimentation. Holding water for adult salmonids was also poor given very limited deeper areas. However, the site was of moderate value for lamprey ammocoetes with localised shallow silt deposits supporting a low density population. There was some suitability for European eel and white-clawed crayfish given the presence of dense macrophyte refugia but the poor flows and more limited cobble and boulder refugia reduced the overall value (none recorded). No otter signs were recorded in vicinity of the site

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of lamprey (*Lampetra* sp.), the aquatic ecological evaluation of site A1 was of **local importance (higher value) (Table 4.4).**

Plate 4.1 Representative image of site A1 on the Rochfortbridge Stream, August 2022

4.1.2 Site A2 – Castlejordan River, Farthingstown

Site A2 was located on the Castlejordan River (07C04) at the R400 road and potential gas pipeline route 1 and 2 crossing. The heavily modified lowland depositing watercourse (FW2) had been historically deepened and straightened with resulting poor hydromorphology in a U-shaped channel. The bank heights were 2.5-3m. The river averaged 2-2.5m wide and 0.1-0.4m deep. The profile was dominated exclusively by very slow flowing glide. The substrata comprised scattered cobble and mixed gravels that were heavily bedded in silt. The site featured >95% coverage of fool's watercress with no areas of open water. Aquatic bryophytes were not recorded. The riparian areas supported scattered mature ash with dry grassy understories and scattered great willowherb, thistles (*Cirsium* sp.) and nettle (*Urtica dioica*). The site was bordered by heavily improved pasture (GA1).

With the exception of three-spined stickleback, recorded in low densities (**Appendix A**), the site was not of fisheries value given historical modifications, poor hydromorphology, low flows and heavy siltation. There was no suitability for white-clawed crayfish. No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). However, it should be noted that this is a tentative rating given poor flows and lack of suitable riffle areas for sampling (as per Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the absence of aquatic species or habitats of higher conservation value, in addition to poor status water quality, the aquatic ecological evaluation of site A2 was of **local importance (lower value)** (**Table 4.4**).

Plate 4.2 Representative image of site A2 on the Castlejordan Stream, August 2022

4.1.3 Site A3 – Kiltonan Stream, Mongagh Bridge

Site A3 was located on the Kiltonan Stream (07K04) (also known as the Mongagh River) at Mongagh Bridge, a potential gas pipeline route 1 and 2 crossing. The heavily modified lowland depositing watercourse (FW2) had been extensively deepened and straightened with resulting poor hydromorphology in a deep U-shaped/trapezoidal channel. Over-deepening had resulted in banks of 8-10m in height. The stream averaged 2-3m wide (in a wider 4-6m channel) and 0.3-0.6m deep. The profile was of slow-flowing glide with accelerated flows in vicinity of the road culvert only. The substrata comprised deep silt with very limited hard substrata present (localised boulder only). Fool's watercress was abundant with the channel lined by abundant reed canary grass (*Phalaris arundinacea*). Cover of filamentous algae was high, indicating enrichment. The riparian areas supported dense bramble, gorse (*Ulex europaeus*), hedge bindweed, great willowherb, wild angelica (*Angelica sylvestris*) and grey willow. The site was bordered to the north by improved pasture (GA1) with cutover bog (PB4) and quarrying areas (ED2, ED3, ED4) present downstream.

Brown trout (*Salmo trutta*) and three-spined stickleback were the only fish species recorded via electro-fishing at site A3 (**Appendix A**). The site was considered a moderate quality salmonid nursery given the historical drainage, slower flow, heavy sedimentation and dense macrophyte growth. The spawning quality was poor due to the heavy sedimentation of the channel. Holding habitat was

moderate overall due to the heavy macrophyte growth and the limited pool habitat. The channel had high suitability for lamprey ammocoetes given the soft organic rich sediment. However, very limited spawning habitat was present given heavy sedimentation and an absence of hard substrata (no lamprey were recorded). European eel habitat was moderate overall given the presence of dense macrophyte growth and pockets of deeper glide, although no eel were recorded. There was some moderate suitability for white-clawed crayfish given abundant instream refugia. However, whilst none were recorded during targeted crayfish surveys, crayfish remains were identified in otter spraint downstream of the R400 road culvert (ITM 648570, 738859).

Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids, in addition to otter utilisation, the aquatic ecological evaluation of site A3 was of **local importance (higher value) (Table 4.4).**

Plate 4.3 Representative image of site A3 on the Kiltonan Stream, September 2022

4.1.4 Site A4 – Kiltonan Stream, Farthingstown

Site A4 was located on the Kiltonan Stream (07K04) adjacent to Derryarkin Sand & Gravel Quarry, approx. 0.25km upstream of the Castlejordan River confluence and 1km downstream of site A3. The river, also known as the Mongagh River at this location, had been historically straightened and over-deepened with a very deep, steep trapezoidal channel and bankfull heights of up to 8m. The river averaged 1.5-2m wide in a heavily vegetated two-stage channel of up to 8m wide. The depth was a homogenous 0.5m. The profile comprised deep slow-flowing depositional glide with no riffle or pool areas. The substrata, given historical excavation, comprised compacted clay with very localised boulder and superficial gravels. Macrophyte cover was very high (>95%) with abundant fool's watercress, watercress and water mint (*Mentha aquatica*). Branched bur-reed (*Sparganium erectum*) was frequent instream and along channel margins. Broad-leaved pondweed (*Potamogeton natans*) and common duckweed were locally frequent with occasional water starwort (*Callitriche* sp.) and water plantain (*Alisma plantago-aquatica*). Aquatic bryophytes were not recorded. Filamentous algae

were present (10% cover), further indicating significant enrichment. The riparian zones (mostly GS2 habitat) supported abundant reed canary grass, great willowherb, purple loosestrife (*Lythrum salicaria*), creeping bent grass (*Agrostis stolonifera*) with scattered bramble and gorse scrub (WS1). The site was bordered by an active quarry to the south (ED3) and scrub and cutover bog (PB4) to the north.

Brown trout, lamprey, roach (*Rutilus rutilus*) and three-spined stickleback were recorded via electro-fishing at site A4 (**Appendix A**). The site was of poor value to salmonids (single adult trout recorded) given poor flows, poor hydromorphology and evident siltation and enrichment pressures. Spawning habitat was not present and the site was not of value as a salmonid nursery. Despite the presence of frequent soft sediment accumulations, the site only supported a very low density of *Lampetra* sp. ammocoetes. This was considered to reflect the poor flows/hydromorphology and clay-dominated substrata. Despite some good suitability for European eel and white-clawed crayfish, none were recorded. While some foraging habitat existed for otter no otter signs were recorded in the vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q2-3 (poor status)** (**Appendix B**). However, it should be noted that this was a tentative rating given poor flows and an absence of suitable riffle areas for sampling (Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids and lamprey (*Lampetra* sp.), the aquatic ecological evaluation of site A4 was of **local importance (higher value)** (**Table 4.4**).

Plate 4.4 Representative image of site A4 on the Kiltonan Stream, August 2022

4.1.5 Site A5 – unnamed stream, Carrick

Site A5 was located on the lowermost reaches of an unnamed stream at the potential gas pipeline route option 1 and 3 crossing, immediately upstream of the Castlejordan River confluence and downstream of a mature peat settlement pond. The lowland depositing channel (FW2) had been historically straightened and over-deepened, with a steep trapezoidal channel featuring bankfull heights of up to 5m. The channel flowed under the track crossing via a pipe culvert with a 0.3m fall on the downstream side at low summer flows. Downstream of the culvert, the modified river channel averaged 2.5-3.5m wide and 0.3-0.6m deep. A deeper plunge pool below the culvert was up to 1.6m in depth. The profile comprised very slow-flowing glide with localised pool (no riffle). The substrata were dominated by silt with a high clay fraction although some superficial (excavated) gravels were also present nearer the culvert (heavily bedded in silt). More organic-rich soft sediment accumulations were present along the steeply sloping channel margins. The site supported frequent invasive Nuttall's pondweed (*Elodea nuttallii*) with occasional common water starwort blue water speedwell (*Veronica anagallis-aquatica*), water plantain and broad-leaved pondweed. Branched bur-reed was rare in stream and common along the margins. Macrophyte coverage was very high (>95%) in the main river, with Nuttall's pondweed and broad-leaved pondweed dominant. Aquatic bryophytes were not recorded. The margins of the channel supported abundant reed canary grass with frequent hedge bindweed, willowherb species and occasional bottle sedge (*Carex rostrata*). The scrubby riparian zones also supported these species with occasional bramble scrub and scattered gorse and willow. The site was adjoined by cutover bog on the south bank and coniferous afforestation (WD4) on the north bank.

A total of six fish species were recorded via electro-fishing at site A5, namely lamprey (*Lampetra* sp.), roach, minnow (*Phoxinus phoxinus*), perch (*Perca fluviatilis*), gudgeon (*Gobio gobio*) and pike (**Appendix A**). The site was primarily of value as a coarse fish nursery. The site was of poor value to salmonids given poor flows, poor hydromorphology and evident siltation pressures. No salmonids were recorded via electro-fishing. However, the plunge pool at the culvert provided some low potential as an adult holding habitat (as did the downstream-connecting Castlejordan River). Spawning habitat was almost entirely absent and the site was not of value as a salmonid nursery. Despite the presence of frequent soft sediment accumulations, the site only supported a low density of *Lampetra* sp. ammocoetes. This was considered to reflect the poor flows/hydromorphology and clay-dominated substrata. Despite some good suitability for European eel and white-clawed crayfish, none were recorded. No otter signs were recorded in the vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). However, it should be noted that this is a tentative rating given poor flows and lack of suitable riffle areas for sampling (as per Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of lamprey (*Lampetra* sp.), the aquatic ecological evaluation of site B1 was of **local importance (higher value)** (**Table 4.4**).

Plate 4.5 Representative image of site A5 on an unnamed Castlejordan River tributary, August 2022 (facing downstream to river confluence)

4.1.6 Site A6 – Castlejordan River, Carrick

Site A6 was located on the Castlejordan River (07C04) (aka Mongagh River) at a livestock access bridge and potential gas pipeline route option 1 and 3 crossing, approx. 4.5km downstream of site A4. As per upstream, the river had been historically straightened and deepened, with old embankments present. The lowland depositing watercourse (FW2) was 4-5m wide and >1.2m deep, with a short section near the cattle bridge 0.2-0.4m deep. The profile was of slow-flowing depositional glide with only a short section of faster glide/riffle in the immediate vicinity of the bridge. Given low summer flows, much of the deeper glide habitat resembled pool habitat. The substrata were dominated by deep silt (with a high clay content given historical excavation). However, the short faster-flowing section near the bridge featured mixed gravels with occasional cobble and boulder. These were heavily silted and partially bedded. Soft sediment accumulations were abundant and siltation was very high overall. The slow-flowing site was very heavily vegetated (>90% cover) with abundant branched bur-reed, broad-leaved pondweed and invasive Nuttall's pondweed. Marginal (floating) stands of watercress and fool's watercress were frequent. Blue water speedwell, water plantain, water mint and water starwort (*Callitriche* sp.) were occasional, with common duckweed, ivy-leaved duckweed (*Lemna trisulca*) and small pondweed (*Potamogeton pusillus*) recorded as rare. Aquatic bryophytes were limited to *Fontinalis antipyretica* and *Leptodictyum riparium* on rare cobble and boulder. Filamentous algae was abundant instream (30% cover), further indicating significant enrichment. The narrow riparian zones supported a typical nitrophilous community of great willowherb, reed canary grass, broad-leaved dock (*Rumex obtusifolius*), nettle, thistles (*Cirsium* spp.), bent grass (*Agrostis* sp.) and rank grasses. The site was bordered by dry meadows and grassy verges (GS2) and improved pasture to the west (GA1). Peat settlement ponds adjoined the channel upstream.

Brown trout, lamprey, pike, perch and stone loach (*Barbatula barbatula*) were recorded via electro-fishing at site A6 (**Appendix A**). The site was of moderate value for salmonids given considerable hydromorphological and siltation pressures, supporting a very low density of brown trout. Except for the short section near the bridge (moderate value), the site was not of value as a salmonid spawning or nursery habitat. However, given the predominance of deeper glide areas, good holding opportunities were present. Given the poor hydromorphological condition of the channel the site was primarily of value as a coarse fish habitat. Despite some good suitability for European eel and white-clawed crayfish (abundant instream refugia), none were recorded. No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids and lamprey in addition to otter utilisation, the aquatic ecological evaluation of site A6 was of **local importance (higher value) (Table 4.4).**

Plate 4.6 Representative image of site A6 on the Castlejordan River, August 2022

4.1.7 Site A7 – unnamed stream, Milltown

Site A7 was located on an unnamed stream at the potential gas pipeline route option 1 and 3 crossing, approx. 0.6km upstream of the Castlejordan River (Mongagh River) confluence. Despite being present on EPA mapping, no riverine channel was identified during the survey, with a dry peat-base drainage ditch present alongside the mapped route of the stream. The Castlejordan River tributary was likely realigned historically as part of land drainage works. Site A7 was not of fisheries value given an absence of any permanent water. Furthermore, given the dry nature of the site, it was not possible to collected a biological water quality sample at the time of survey.

In light of the absence of permanent water in the ephemeral channel, the aquatic ecological evaluation of site A7 was of **local importance (lower value) (Table 4.4).**

Plate 4.7 Representative image of site A7 on an unnamed Castlejordan River tributary, August 2022 (no channel or aquatic habitats present)

4.1.8 Site A8 – Milltownpass River, Milltown

Site A8 was located on the Milltownpass River (07M04) at a Bord na Móna rail and potential gas pipeline route option 1 and 3 crossing, approx. 0.8km upstream of the Castlejordan River confluence. The lowland depositing watercourse (FW2) had been historically straightened and deepened throughout, with bank modifications (gabion baskets including twin bore culvert) in the vicinity of the bridge crossing. The river flowed in a trapezoidal channel with bankfull heights of 2-3m. The river averaged 3m wide with a wider section in vicinity if the bridge of up to 6-7m. The depth ranged from 0.3-0.5m in glide habitat to 1.8m in pool areas underneath the bridge. The profile was of slow-flowing glide with deep pool in vicinity of the bridge only. The substrata were dominated by silt with a high clay fraction although a short section (10m) downstream of the bridge featured loose mixed gravels. Cobble and small boulder were present but localised in the upstream and downstream vicinity of the culverts. Soft sediment accumulations were abundant, particularly underneath the bridge adjoining deep glide and pool. Apart from the bridge area (open water), the river at this location was very heavily vegetated. Upstream, macrophyte cover exceeded 95% with abundant branched bur-reed and broad-leaved pondweed. Downstream of the bridge supported abundant watercress, lesser water parsnip (*Berula erecta*) and fool's watercress, with frequent mare's-tail (*Hippuris vulgaris*), branched bur-reed and less frequent unbranched bur-reed (*Sparganium emersum*). Water starwort (*Callitriche* sp.), ivy-leaved duckweed and small pondweed were occasional. Aquatic bryophytes were limited to very localised greater water-moss (*Fontinalis antipyretica*), Kneiff's feather-moss (*Leptodictyum riparium*) and jagged germanderwort (*Riccardia chamedryfolia)* on cobble and boulder (the latter a calcareous indicator). The sloping riparian zone supported abundant reed canary grass and hedge bindweed with

great willowherb and other herbaceous species such as common valerian (*Valeriana officinalis*). The site was bordered by historical clear-fell (WS5; now recolonising with abundant rosebay willowherb (*Chamaenerion angustifolium*) and scrubby areas with scattered willow species.

Brown trout, lamprey (*Lampetra* sp.) and pike were recorded via electro-fishing at site A8 (**Appendix A**). Site A8 was of high value for salmonids, despite hydromorphological, enrichment and siltation pressures, supporting a moderate density of primarily adult brown trout. The site as of highest value as a holding area for adult salmonids (excellent quality pool habitat under the bridge. Good quality spawning habitat for both salmonids and lamprey was present downstream of the aforementioned pool (mobile mixed gravels). The site was of relatively poor value as a salmonid nursery. However, the site was an excellent quality lamprey nursery (abundant soft sediment accumulations) and supported a moderate density of ammocoetes. Despite high suitability for European eel and white-clawed crayfish, none were recorded. The site was also of good value for coarse fish species such as pike, perch and roach given the deeper vegetated channel (although the latter two species were not recorded during the current survey). A very regular spraint site, complete with two slides and a latrine, was recorded under the bridge (north bank) on soft peat-clay bank (ITM 652521, 742386). The observed spraints did not contain crayfish remains. A couch site was also identified at the latrine area.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids and *Lampetra* sp., in addition to utilisation by otter, the aquatic ecological evaluation of site A8 was of **local importance (higher value)** (**Table 4.4**).

Plate 4.8 Representative image of site A8 on the Milltownpass River, August 2022

4.1.9 Site B1 – Kinnegad River, Rattin

Site B1 was located on the upper reaches of the Kinnegad River (07K01) at the potential gas pipeline route option 1 and 3 crossing. The lowland depositing river (FW2) had been historically deepened and straightened along field boundaries but showed some good recovery instream. The river averaged 4-5m wide and 0.1m deep with localised areas up to 0.3m. The banks heights were 2-5m (a sign of over-deepening). The site had a deep U-shaped profile dominated by very slow-flowing glide with riffle habitat upstream adjoining the R446 road crossing. The substrata comprised mixed small boulder, cobble and gravels with silt becoming more frequent moving downstream from the R446. Livestock poaching was present locally. The potential pipeline crossing area featured abundant fool's watercress which covered the majority of the channel's width. Aquatic bryophytes were not recorded. The riparian areas were more open with low lying scrub and rank grasses on the west bank and a mature treeline of ash, sycamore (*Acer pseudoplatanus*), and hawthorn on the east bank. The site was bordered by heavily improved pasture (GA1).

Brown trout and three-spined stickleback were the only fish species recorded via electro-fishing at site B1 (**Appendix A**). The site was considered a moderate quality salmonid nursery, despite moderate to heavy siltation. Whilst some areas of good quality spawning habitat were present locally, the overall value was reduced due to historical drainage and sedimentation pressures. Holding habitat was of poor quality given a paucity of deeper glide and pool habitat. The site provided some good quality lamprey spawning habitat. Despite some suitability locally in soft sediment accumulations, no larval lamprey were recorded. Whilst the site was of moderate suitability for European and white-clawed crayfish (ample refugia), none were recorded. No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids, the aquatic ecological evaluation of site B1 was of **local importance (higher value)** (**Table 4.4**).

Plate 4.9 Representative image of site B1 on the Kinnegad River, August 2022

4.1.10 Site B2 – Hightown River, Rattin

Site B2 was located on the Hightown River (07H16) at the R446 road and potential gas pipeline route option 1 and 3 crossing, approx. 0.3km upstream of the Kinnegad River confluence. The heavily modified lowland depositing river (FW2) had been historically deepened and straightened along field boundaries but retained some semi-natural characteristics, including a hard bed and areas of riffle and glide. The river averaged 2-4m wide and 0.2-0.4m, with bank heights of 2-3m. The deep U-shaped channel featured a profile of swift flowing glide with more localised riffle and pool. The substrata were dominated by mixed medium and fine gravels which were heavily silted and bedded. Exposed clay was also present locally. The site supported abundant fool's watercress and localised water mint. In terms of aquatic bryophytes, the star-headed liverwort (*Marchantia polymorpha* subsp. *Polymorpha*) was abundant instream. The riparian areas comprised of dense scrub with scattered sycamore and ash. The site was bordered by heavily improved pasture (GA1).

Brown trout, minnow and three-spined stickleback were recorded via electro-fishing at site B2 (**Appendix A**). The site was considered a moderate quality salmonid nursery given the presence of localised riffle and slow flowing glide, despite moderate to heavy siltation and compaction. The spawning value for salmonids and lamprey was locally good but moderate overall given historical drainage and siltation pressures. Holding habitat quality was moderate overall due to a paucity of deeper pool habitat. Whilst some suitable soft sediment areas for lamprey ammocoete was present locally, none were recorded during targeted electro-fishing. Despite some moderate suitability, no European eel or white-clawed crayfish were recorded. No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids, the aquatic ecological evaluation of site B2 was of **local importance (higher value)** (**Table 4.4**).

Plate 4.10 Representative image of site B2 on the Hightown River, August 2022

4.1.11 Site B3 – Kinnegad River, Killaskillen

Site B3 was located on the Kinnegad River (07K01) at the L8021 road crossing, approx. 5km downstream of site B1. The lowland depositing river (FW2) had been extensively straightened and deepened historically resulting in a trapezoidal channel with poor hydromorphology. The heavily modified channel averaged 4-6m wide and 1.3-1.8m deep with bank heights of 4-6m. The profile was of deep slow-flowing glide with a bed dominated by soft silt. The site was heavily vegetated with abundant fool's watercress, branched bur-reed and broad-leaved pondweed which restricted flows. Watercress and water mint were also present locally. The riparian areas supported abundant reed canary grass, great willowherb, meadowsweet and thistles with scattered grey willow and hawthorn. The site was bordered by heavily improved pasture (GA1).

Electro-fishing was not undertaken at site B3 given prohibitive depths of >1.3m and a soft riverbed (deep silt). The Kinnegad River at this location was considered a poor quality salmonid nursery given the poor flows, heavy sedimentation and dense macrophyte growth. The spawning quality was also poor due to the absence of even moderate flows. The site was of some value as a holding area for adult salmonids. The site was more suited to coarse fish species. The site could theoretically support ammocoetes given the abundant soft sediment accumulations but the very low flows reduced the suitability for the species in addition to the absence of suitable spawning habitat. European eel habitat was moderate overall given the presence of dense macrophyte growth and deep pools. There was also moderate suitability for white-clawed crayfish given the presence of abundant macrophyte refugia although none were recorded during the survey. Environmental DNA analysis also failed to detect the species (**Table 4.1**). Despite some foraging suitability, no otter signs were recorded in the vicinity of the site. Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). However, it should be noted that this is a tentative rating given poor flows and lack of suitable riffle areas for sampling (as per Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given some suitability for aquatic species of higher conservation value such as European eel and otter, the aquatic ecological evaluation of site B3 was of **local importance (higher value)** (**Table 4.4**).

Plate 4.11 Representative image of site B3 on the Kinnegad River, August 2022

4.1.12 Site C1 – Yellow River, Derrygreenagh

Site C1 was located on the upper reaches of the Yellow River (07Y02) at a potential electricity GCR option 2 crossing in an area of peatland. The lowland depositing river (FW2) had been extensively deepened historically, resulting in an over-deepened trapezoidal channel with 8-10m bank heights and poor hydromorphology. The river averaged 6m wide and 0.3-1.2m deep. The profile comprised deep, slow-flowing glide and localised pool (no riffles). The substrata were dominated by mixed coarse gravels bedded in deep silt and peat, with occasional boulder. The gravels were also moderately compacted. The site supported abundant branched bur-reed and broad-leaved pondweed with occasional fool's watercress and water mint. Occasional boulders supported the thalloid liverwort endive pellia (*Pellia endiviifolia*). No filamentous green algae were present but localised red algae (rhodophytes) were present. The riparian areas supported dense bramble and gorse scrub (WS1) with hedge bindweed, great willowherb, wild angelica, reed canary grass and grey willow. The site was bordered by cutover bog (PB4) and a peat settlement pond.

Brown trout, perch, pike (*Esox lucius*) and three-spined stickleback were recorded via electro-fishing at site C1 (**Appendix A**). The heavily vegetated channel of the Yellow River was considered a good habitat for coarse fish and supported pike and perch. The site was considered a poor to moderate quality salmonid nursery given the historical drainage, slower flow, heavy sedimentation and dense macrophyte growth. The spawning quality was poor due to the heavy siltation of the channel. Holding habitat was moderate overall due to the heavy macrophyte growth despite the presence of deeper glide and localised pools. The channel had moderate suitability for lamprey ammocoetes given the presence of soft sediment, but the peat influences and very limited spawning habitat reduced the potential for the species and none were recorded. Despite some moderate suitability for European eel and white-clawed crayfish, none were recorded. No otter signs were recorded in the vicinity of the site although a spraint site was recorded c.0.3km upstream at site X3 (see section 4.1.27).

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). However, it should be noted that this is a tentative rating given poor flows and lack of suitable riffle areas for sampling (as per Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids, the aquatic ecological evaluation of site C1 was of **local importance (higher value) (Table 4.4).**

Plate 4.12 Representative image of site C1 on the Yellow River, September 2022

4.1.13 Site C2 – Yellow River, Derryiron

Site C2 was located on the upper reaches of the Yellow River (07Y02) at the R400 and potential electricity GCR option 3 crossing. The lowland depositing river channel (FW2) had been extensively deepened and straightened with a deep U-shaped profile but exhibited good recovery with semi-natural characteristics. The river averaged 6-7m wide and 0.3-0.6m deep with bank heights of 6-8m. The profile was dominated by swift-flowing glide with localised riffles and pools associated with large woody debris dams and overhanging willow. The substrata comprised boulder, cobble and coarse gravels with moderate to heavy siltation. The site was heavily vegetated locally with abundant branched bur-reed and broad-leaved pondweed with occasional fool's watercress, water mint and water forget-me-not (*Myosotis scorpioides*). Endive pellia was occasional on scattered boulder. The riparian areas supported dense bramble, hedge bindweed and purple loosestrife. The site was bordered by improved pasture (GA1).

Brown trout and stone loach were the only fish species recorded via electro-fishing at site C2 (**Appendix A**). The site was a good quality salmonid habitat supporting relatively high numbers of mixed-cohort brown trout. Good quality nursery habitat was present although this was reduced by evident siltation and enrichment pressures. Localised deeper glide and pool, in addition to macrophyte beds, provided some good quality holding habitat for adult salmonids. Some good quality spawning habitat for salmonids and lamprey was present but again the value was reduced by siltation. The site was of poor suitability for lamprey ammocoetes given the dominance of hard substrata and none were recorded. Despite some good suitability (abundant refugia), no European eel or white-clawed crayfish were recorded. No otter signs were recorded in the vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids and relatively high value as a salmonid spawning and nursery habitat, the aquatic ecological evaluation of site C2 was of **local importance (higher value)** (**Table 4.4**).

Plate 4.13 Representative image of site C2 on the Yellow River, September 2022

4.1.14 Site C3 – Coolcor Stream, Barrysbrook

Site C3 was located on the upper reaches of the Coolcor Stream (07C08) at a bog access track and potential electricity GCR option 1 and 2 crossing (pipe culvert). The lowland depositing stream (FW2) had been extensively straightened and over-deepened historically, with resulting very steep trapezoidal banks (5m bankfull heights) and poor hydromorphology. The canalised stream averaged 2m and 0.5m deep at the time of survey. The profile comprised very slow flowing glide and pool (seasonally stagnant). Peat staining was very high at the time of survey (draining peatland). The substrata were 100% deep peat with slumping of the steep banks evident. Macrophyte cover was high with abundant fool's watercress and occasional watercress and common duckweed. Filamentous algae were present (5%), indicating enrichment. Terrestrial encroachment was also high with abundant bent grass (*Agrostis* sp.) and great willowherb. The steep sloping banks supported gorse, bramble and bracken (*Pteridium aquilinum*) scrub (WS1) with scattered immature downy birch (*Betula pubescens*) and rank grasses. The site was bordered by extensive areas of cutover bog (PB4).

With the exception of three-spined stickleback and ten-spined stickleback[2] (*Pungitius pungitius*) (recorded at moderate densities), site C3 was not of fisheries value given poor hydromorphology, heavy siltation and poor connectivity with superior downstream habitats. There was no suitability for salmonids given low seasonal flows and heavy siltation pressures. There was some low suitability for European eel although connectivity issues would likely preclude the species. Suitability for white-clawed crayfish was low (none recorded). Whilst no otter signs were recorded in vicinity of the site, an otter holt was recorded at the top of the peaty embankment adjoining the pipe culvert (ITM 650601, 733322; **Plate 4.15**). The presence of cobwebs at the entrance to this burrow would indicate a lack of recent utilisation.

[2] The species is highly tolerant of low oxygen conditions and is often found in very shallow channels exposed to seasonal flow pressures (Lewis et al., 1972).

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). However, it should be noted that this is a tentative rating given poor flows and lack of suitable riffle areas for sampling (as per Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of an otter holt (potential breeding/resting area), the aquatic ecological evaluation of site C3 was of **local importance (higher value) (Table 4.4).**

Plate 4.14 Representative image of site C3 on the Coolcor Stream, September 2022

Plate 4.15 Otter holt excavated in sloping peat bank at site C3 on the Coolcor Stream, September 2022

4.1.15 Site C4 – Coolcor Stream, Coolcor

Site C4 was located on the Coolcor Stream (07C08) at a bog access track and potential electricity GCR option 2 crossing at a pumping station approx. 1.6km downstream of site C3. The lowland depositing stream (FW2) stream had been extensively straightened and deepened historically, with resulting steep trapezoidal banks (3m bankfull heights) and poor hydromorphology. The heavily modified, canalised stream averaged 5-6m and >1.5m deep at the time of survey. Deep glide and pool predominated with bidirectional flows regulated by a pumping station. As a result, the site was typically representative of a pond habitat with no flows. Deep areas near the pumping station exceeded 1.8m. Peat staining was very high at the time of survey. The bed comprised 100% deep peat with slumping of banks evident. This slumping contributed some mixed gravels and clay to the channel margins. Given high peat staining, macrophyte growth was limited with only very occasional water plantain and watercress. Aquatic bryophytes were not recorded. The steep margins supported narrow fringes of reed canary grass which often formed overhangs. The loose peaty loam banks were dominated by purple moor grass (*Molinia caerulea*), silverweed (*Potentilla anserina*), purple loosestrife, tormentil (*Potentilla erecta*) and scattered grey willow. The site was bordered by extensive areas of cutover bog (PB4).

Electro-fishing was not undertaken at site C4 given prohibitive depths of >1.5m and a soft bed (deep silt). With the exception of three-spined stickleback and ten-spined stickleback (recorded via sweep netting), site C4 was not of fisheries value given poor hydromorphology, heavy siltation and poor connectivity with superior downstream habitats. There was no suitability for salmonids given regulated flows and siltation pressures. There was some low suitability for European eel although connectivity issues would likely obstruct the species from passing upstream (west) of the pumping station. Suitability for white-clawed crayfish was low and none were recorded. No otter signs were recorded in the vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q2-3 (poor status)** (**Appendix B**). However, it should be noted that this is a tentative rating given poor flows and lack of suitable riffle areas for sampling (as per Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the absence of aquatic species or habitats of higher conservation value, in addition to poor status water quality, the aquatic ecological evaluation of site C4 was of **local importance (lower value)** (**Table 4.4**).

Plate 4.16 Representative image of site C4 on the Coolcor Stream, September 2022

4.1.16 Site C5 – Coolcor Stream, Coolcor

Site C5 was located on the Coolcor Stream (07C08) at the R400 road and potential electricity GCR option 3 crossing, approx. 1.7km downstream of site C4. The lowland depositing stream (FW2) stream had been extensively straightened historically, with resulting poor hydromorphology. The heavily modified, canalised stream averaged 2-2.5m wide and 0.4-0.6m deep with banks of 1.5m in height. Peat staining was high at the time of survey. The U-shaped channel had a deep silt base with high levels of terrestrial encroachment. The site featured abundant fool's watercress and intermittent stands of branched bur reed. No aquatic bryophytes were recorded. The scrubby channel margins supported purple loosestrife, hedge bindweed, reed canary grass and nettle. The channel was bordered by heavily improved pasture (GA1).

With the exception of three-spined stickleback, recorded in low densities (**Appendix A**), the site was not of fisheries value given historical modifications, poor hydromorphology, low flows and heavy siltation. There was no suitability for white-clawed crayfish and none were recorded. No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). However, it should be noted that this is a tentative rating given poor flows and lack of suitable riffle areas for sampling (as per Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the absence of aquatic species or habitats of higher conservation value, in addition to poor status water quality, the aquatic ecological evaluation of site C5 was of **local importance (lower value)** (**Table 4.4**).

Plate 4.17 Representative image of site C5 on the Coolcor River, September 2022

4.1.17 Site C6 – Clonin Stream, Coolcor

Site C6 was located on the uppermost reaches of the Clonin Stream (07C74) at the R400 road and potential electricity GCR option 3 crossing. The Castlejordan River tributary was dry at the time of survey with no aquatic species or habitats present. The ephemeral stream represented a historically straightened and deepened U-shaped drainage channel (FW4), 2m wide and with 1m bank heights. The site was bordered by heavily improved pasture (GA1). Site C6 was not of fisheries value given the ephemeral nature of the channel. For this reason it was not possible to collected a biological water quality sample at the time of survey.

Given the absence of aquatic habitats in the ephemeral channel, the aquatic ecological evaluation of site C6 was of **local importance (lower value) (Table 4.4).**

Plate 4.18 Representative image of site C6 on the Clonin Stream (dry, ephemeral channel)

4.1.18 Site C7 – Yellow River, Clongall Bridge

Site C7 was located on the Yellow River (07Y02) at Clongall Bridge, >9km downstream of site C2. The lowland depositing river (FW2) had been extensively deepened and straightened historically with a resulting trapezoidal profile and bank heights of 6-8m. Nonetheless, the river retained some good semi-natural characteristics. The river averaged 8-10m wide and 0.6-1.3m deep. The profile was of deep swift-flowing glide with localised riffle and deep pool. The substrata were dominated by small boulder, cobble and gravels which were heavily bedded. Siltation was moderate. The site supported abundant branched bur-reed, common club rush (*Schoenoplectus lacustris*) and lesser water-parsnip along river margins. Fool's watercress was frequent and occasional water mint was also present. The liverwort species endive pellia was frequent on submerged boulder and cobble. The moss species *Fontinalis antipyretica* and *Leptodictyum riparium* were recorded as occasional. The riparian areas supported abundant reed canary grass, great willowherb, meadowsweet, iris, hedge bindweed and thistles with scattered grey willow, white willow (*Salix alba*) and hawthorn. The site was bordered by heavily improved pasture (GA1) with narrow riparian zones.

A total of six fish species were recorded via electro-fishing at site C7, namely Atlantic salmon (*Salmo salar*), brown trout, lamprey (*Lampetra* sp.), European eel, stone loach and minnow (**Appendix A**). This was the only survey site found to support Atlantic salmon. The site was a good salmonid nursery with swift flowing glide habitat and abundant boulder and cobble refugia. Spawning habitat was of moderate quality overall given limited gravels and dominance of boulder and cobble. Good quality holding habitat was present given abundant deep glide and pool in addition to overhanging vegetation and scoured banks. Whilst some good quality lamprey nursery habitat was present, soft sediment areas only supported a very low density of ammocoetes. Suitability for European eel was very high given abundant refugia, with a single adult recorded. Despite some high suitability for white-clawed crayfish, none were recorded. However, eDNA sampling detected the species at this site, alongside crayfish plague (*Aphanomyces astaci*) (**Table 4.1**). No otter signs were recorded in vicinity of the site although this likely reflected a paucity of marking opportunities.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids (including Atlantic salmon), lamprey (*Lampetra* sp.) and European eel, the aquatic ecological evaluation of site C7 was of **local importance (higher value)** (**Table 4.4**).

Plate 4.19 Representative image of site C7 on the Yellow River at Clongall Bridge, September 2022

4.1.19 Site D1 – unnamed stream, Rathcobican

Site D1 was located on an unnamed stream at the R400 road and potential electricity GCR option 3 crossing, approx. 0.5km upstream of the Road River confluence. The stream was dry at the time of survey with no aquatic species or habitats present. The ephemeral stream represented a historically straightened and deepened U-shaped drainage channel (FW4), 1m wide and with 1m bank heights. The mud-based channel was lined by mature hedgerows of hawthorn and blackthorn (*Prunus spinosa*). The site was bordered by residential properties and heavily improved pasture (GA1). Site D1 was not of fisheries value given an absence of aquatic habitats.

Given the dry nature of the channel, it was not possible to collected a biological water quality sample at the time of survey.

Due to the ephemeral nature of the channel, the aquatic ecological evaluation of site D1 was of **local importance (lower value) (Table 4.4).**

Plate 4.20 Representative image of site D1 on an unnamed stream, August 2022 (dry channel)

4.1.20 Site D2 – Road River, Rathcobican

Site D2 was located on the Road River (14R53) at a potential electricity GCR option 3 crossing. The lowland depositing river (FW2) had been extensively straightened historically with resulting poor hydromorphology. The canalised channel averaged 1-1.5m wide with stagnant pools of 0.2-0.4m deep at the time of survey (i.e. no flows). The substrata comprised exclusively deep silt and the channel was very heavily vegetated. Fool's watercress and invasive least duckweed (*Lemna minuta*) were abundant. Terrestrial encroachment of herbaceous vegetation was high with abundant purple loosestrife, great willowherb, hedge bindweed and reed sweet grass (*Glyceria maxima*) in the channel. The riparian areas were predominantly open with scattered willow. The site was bordered by heavily improved pasture (GA1).

Apart from three-spined stickleback (recorded at low densities), site D2 was not of fisheries value given poor hydromorphology, heavy siltation and poor connectivity with superior downstream habitats. There was no suitability for white-clawed crayfish and the species was not recorded during the survey. No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q2 (bad status)** (**Appendix B**). However, it should be noted that this is a tentative rating given poor flows and lack of suitable riffle areas for sampling (as per Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the absence of aquatic species or habitats of higher conservation value, in addition to bad status water quality, the aquatic ecological evaluation of site D2 was of **local importance (lower value)** (**Table 4.4**).

Plate 4.21 Representative image of site D2 on the Road River, August 2022

4.1.21 Site D3 – Esker Stream, Newtown Bridge

Site D3 was located on the Esker Stream (14E01) at Newtown Bridge. The semi-natural lowland depositing watercourse (FW2) had been historically widened and averaged 4-7m wide (10m wide channel) and 0.1-0.3m deep. The profile was dominated by shallow glide with no riffle habitat present due to very low summer flows at the time of survey. Pool habitat was localised and associated with meanders. The substrata were dominated by small boulder, cobble and coarse gravels which were moderately bedded and heavily silted. Macrophyte cover was high with abundant common duckweed and ivy-leaved duckweed. The site also supported frequent narrow fruited-watercress (*Nasturtium microphyllum*) and lesser water parsnip with occasional blue water-speedwell. The site also supported occasional water starwort (*Callitriche* sp.), broad-leaved pondweed and yellow water lily (*Nuphar lutea*). The moss *Fontinalis antipyretica* was occasional on larger boulder. Filamentous algal cover was also high with c.70% of the bed covered by *Cladophora glomerata*. The riparian areas supported mature ash, grey willow and blackthorn with bramble understories. The site was bordered by heavily improved pasture (GA1).

Brown trout, minnow, stone loach and invasive dace (*Leuciscus leuciscus*) were recorded via electro-fishing at site D3 (**Appendix A**). The site was a moderate quality salmonid nursery, being degraded due to historical drainage, siltation and enrichment. Some moderate quality spawning habitat (for both salmonids and lamprey) was present but was also reduced in quality due to filamentous algae and sedimentation. Holding habitat for adult salmonids was present but localised. Although some suitability existed for larval lamprey, none were recorded via targeted lector-fishing of soft sediment deposits. Despite good suitability for European eel and white-clawed crayfish, none were recorded. Environmental DNA analysis did not detected crayfish at this site (**Figure 4.1**). Despite some foraging suitability, no otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of a brown trout population and semi-natural supporting habitat, the aquatic ecological evaluation of site D3 was of **local importance (higher value)** (**Table 4.4**).

Plate 4.22 Representative image of site D3 on the Esker Stream at Newtown Bridge, September 2022

4.1.22 Site E1 – Rochfort Demesne Stream, Kilbrennan

Site E1 was located on the upper reaches of the Rochford Demesne Stream (25R11) at the L1127 road and potential gas pipeline route option 1 crossing, approx. 3.6km upstream of the Lough Ennell confluence. The lowland depositing watercourse (FW2) had been heavily modified (straightened and deepened) resulting in a canalised channel more representative of a U-shaped drainage channel than a stream. The channel averaged 2-3m wide and 0.2-0.4m deep with a near imperceptible flow at the time of survey. The profile was of very slow-flowing homogenous glide. The substrata comprised scattered, superficial gravels heavily bedded in deep peat. Common duckweed was abundant and covered >75% of the water's surface. Branched bur-reed was occasional. No aquatic bryophytes were recorded. The riparian areas were predominantly open but supported scattered gorse, bramble, grey willow, ash and hazel (*Corylus avellana*). The site was bordered by improved pasture (GA1).

With the exception of three-spined stickleback, recorded in low densities (**Appendix A**), the site was not of fisheries value given historical modifications, poor hydromorphology, poor connectivity with downstream habitats, low flows and very heavy siltation. There was no suitability for white-clawed crayfish. No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q2-3 (poor status)** (**Appendix B**). However, it should be noted that this is a tentative rating given poor flows and lack of suitable riffle areas for sampling (as per Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the absence of aquatic species or habitats of higher conservation value, in addition to poor status water quality, the aquatic ecological evaluation of site E1 was of **local importance (lower value)** (**Table 4.4**).

Plate 4.23 Representative image of site E1 on the Rochford Demesne Stream, September 2022

4.1.23 Site E2 – Rochfort Demesne Stream, Stoneford Bridge

Site E2 was located on the Rochford Demesne Stream (25R11) at Stoneford Bridge, approx. 1.6km downstream of site E1 and 2km upstream of the Lough Ennell confluence. The lowland depositing watercourse (FW2) had been heavily modified (straightened and deepened) resulting in a deep U-shaped profile. The channel averaged 4m wide and 0.2-0.2m deep. The profile was of slow-flowing glide with very localised riffle and pool. The substrata were dominated by cobble and mixed gravels which were heavily bedded and silted. Common duckweed was locally abundant (10% cover). Watercress and fool's watercress were frequent. No aquatic bryophytes were recorded. Filamentous algal was also low due to riparian shading. The margins supported frequent reed canary grass and great willowherb. The riparian areas supported mature sycamore and hawthorn with dense bramble in the understories. The site was bordered by heavily improved pasture (GA1).

Brown trout and three-spined stickleback were the only fish species recorded via electro-fishing at site E2 (**Appendix A**). The site was a moderate quality salmonid nursery, supporting a moderate density of juvenile trout, with some moderate quality spawning habitat also present. However, the value was considerably reduced due to historical drainage, siltation and enrichment pressures. The shallow site was a poor quality holding habitat for adult salmonids. The site was also of poor quality for lamprey ammocoetes in terms of burial habitat given limited areas of organic-rich silt and limited suitable spawning areas. Despite some moderate suitability for European eel and white-clawed crayfish, none were recorded. No otter signs were recorded in the vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q2-3 (poor status)** (**Appendix B**). However, it should be noted that this is a tentative rating given poor flows and lack of suitable riffle areas for sampling (as per Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the absence of aquatic species or habitats of higher conservation value, in addition to poor status water quality, the aquatic ecological evaluation of site E2 was of **local importance (lower value)** (**Table 4.4**).

Plate 4.24 Representative image of site E2 on the Rochford Demesne Stream, September 2022

4.1.24 Site X1 – Gallstown River, Gortumly

Site X1 was located on the Gallstown Stream (07G36) at the R400 and potential gas pipeline route option 2 crossing. The lowland depositing river channel (FW2) had been historically straightened and deepened resulting in a trapezoidal channel with poor hydromorphology. The stream averaged 2m wide and 0.1-0.2m deep with 1.5m high banks and was stagnant at the time of survey (i.e. no flows). Peat staining was high. The substrata comprised deep, humic silt (peat derived) with no hard substrata. The site was very heavily vegetated with abundant fool's watercress. No aquatic bryophytes were recorded. The channel margins supported mature ash, sycamore, hawthorn and downy birch with bramble, ivy and nettle in the understories. The site was bordered by heavily improved pasture (GA1).

With the exception of three-spined stickleback, recorded in low densities (**Appendix A**), the site was not of fisheries value given historical modifications, poor hydromorphology, poor connectivity with downstream habitats, low flows and very heavy siltation. There was no suitability for white-clawed crayfish. No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q2-3 (poor status)** (**Appendix B**). However, it should be noted that this is a tentative rating given poor flows and lack of suitable riffle areas for sampling (as per Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the absence of aquatic species or habitats of higher conservation value, in addition to poor status water quality, the aquatic ecological evaluation of site X1 was of **local importance (lower value)** (**Table 4.4**).

Plate 4.25 Representative image of site X1 on the Gallstown River, September 2022

4.1.25 Site X2a – Derry River, Rahanine

Site X2a was located on the Derry River (07D28) at the R400 and potential gas pipeline route option 2 crossing. The lowland depositing river channel (FW2) had been historically straightened and deepened resulting in a trapezoidal channel with poor hydromorphology. The heavily modified river averaged 2-2.5m wide and 0.1-0.2m deep with 2-3m high banks. The channel was stagnant at the time of survey (i.e. no flows). Peat staining was high. The substrata comprised deep, humic silt (peat derived) with superficial mixed gravels. The river was heavily tunnelled and this precluded the presence of macrophytes and aquatic bryophytes. The channel was lined by mature lime (*Tilia* sp.), hawthorn and grey willow with a dense bramble understory. The site was bordered by heavily improved pasture (GA1) and amenity grassland (GA2) of a residential property. There was no visible connection with the Rochfortbridge Stream west of the R400 (site X2b), albeit the drainage connection could be overgrown with vegetation and likely runs perpendicular under the R400.

Site X2a was not suitable for electro-fishing due to seasonal flows (**Appendix A**). The site was not of fisheries value given historical modifications, poor hydromorphology, poor connectivity with downstream habitats, very limited water and heavy siltation. There was no suitability for white-clawed crayfish. No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q2 (bad status)** (**Appendix B**). However, it should be noted that this is a tentative rating given poor flows and lack of suitable riffle areas for sampling (as per Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the absence of aquatic species or habitats of higher conservation value, in addition to bad status water quality, the aquatic ecological evaluation of site X2a was of **local importance (lower value)** (**Table 4.4**).

Plate 4.26 Representative image of site X2a on the Derry River, September 2022

4.1.26 Site X2b – Rochfortbridge Stream, Rahanine

Site X2b was located on the Rochfortbridge Stream (07R04) adjoining the R400 road and potential gas pipeline route option 2 crossing, approx. 2.1km downstream of site A1. The lowland depositing river (FW2) had been historically realigned along the border of the R400 and adjoining improved grassland (GA1), resulting in a U-shaped channel with poor hydromorphology. Bank heights were 3m. The river averaged 3m wide and 0.5-1m deep with an imperceptible flow at the time of survey (i.e. stagnant). The profile was of stagnant glide and pool (no riffle). The substrata comprised soft silt with superficial mixed gravels. The channel had a bed of soft silt and mixed gravels. The site was very heavily vegetated with abundant fool's watercress, branched bur-reed, great willowherb and very localised water mint. The channel was lined by an intermittent treeline of hawthorn, downy birch and grey willow. The site was bordered by heavily improved pasture (GA1).

With the exception of three-spined stickleback, recorded in low densities (**Appendix A**), the site was not of very poor fisheries value given historical modifications, poor hydromorphology, poor connectivity with downstream habitats, low flows and very heavy siltation. However, there was some low suitability for European eel and white-clawed crayfish (none recorded). No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q2-3 (poor status)** (**Appendix B**). However, it should be noted that this is a tentative rating given poor flows and lack of suitable riffle

areas for sampling (as per Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the absence of aquatic species or habitats of higher conservation value, in addition to poor status water quality, the aquatic ecological evaluation of site X2b was of **local importance (lower value)** (**Table 4.4**).

Plate 4.27 Representative image of site X2b on the Derry River, September 2022

4.1.27 Site X3 – Yellow River, Derrygreenagh

Site X3 was located on the Yellow River (07Y02) at a potential electricity GCR option 1 crossing approx. 0.3km upstream of site C1. The lowland depositing river (FW2) had been extensively deepened historically, resulting in an over-deepened U-shaped channel with 4-6m bank heights and poor hydromorphology. The river averaged 6m wide (but up to 10m in places) and 0.3-1m deep, with locally deeper pool to 1.5m. The profile comprised deep, slow-flowing glide and localised deep pool (no riffles). The substrata were dominated by sand with localised gravel and small boulder. Branched bur-reed was frequent with more localised watercress and fool's watercress. The site also supported occasional bog pondweed (*Potamogeton polygonifolious*) and frequent small pondweed. The moss species *Leptodictyum riparium* was present locally alongside the liverwort species endive pellia. The margins supported dense scrub comprised of bramble, gorse, thistle, meadowsweet and rosebay willowherb on steep embankments. The site was bordered by extensive cutover bog (PB4).

Brown trout, minnow and pike were recorded via electro-fishing at site X3 (**Appendix A**). The site was a moderate quality salmonid nursery, supporting a low density of juveniles. This reflected the hydromorphological modifications. However, some moderate quality spawning habitat was present for both salmonids and lamprey. The site of good value as an adult salmonid holding habitat with deeper pools and glide being abundant. Soft sediment accumulations were humic in nature and

unsuitable for lamprey ammocoetes (none recorded). Despite some moderate suitability for European eel and white-clawed crayfish, none were recorded. However, crayfish remains were identified in otter spraint at the culvert crossing upstream of the survey area (ITM 649643, 736505).

Biological water quality, based on Q-sampling, was calculated as **Q2-3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the presence of salmonids and utilisation by otter, the aquatic ecological evaluation of site X3 was of **local importance (higher value) (Table 4.4).**

Plate 4.28 Representative image of site X3 on the Yellow River, September 2022

4.1.28 Site X4 – Grand Canal, Coole

Site X4 was located on the Grand Canal at a Bord na Móna lifting bridge and a potential electricity GCR option 1 crossing. The canal (FW3) averaged 15m wide and 1-1.5m deep with a slightly deeper central (navigation) channel. The bed comprised soft silt (with a high clay fraction). Boulder and cobble was present occasionally along the margin. Although the canal in vicinity of the bridge had been recently cleared of vegetation (for navigation purposes), the site supported a high cover of macrophytes with frequent invasive Nuttall's pondweed, stonewort (*Chara* sp.) and yellow lily. Spiked water-milfoil (*Myriophyllum spicatum*) and ivy-leaved duckweed was occasional. The invasive macrophyte New Zealand pygmyweed (*Crassula helmsii*) was recorded as occasional in the shallow margins alongside water plantain. Mare's-tail was present but rare. Linear stands of branched bur-reed and common reed (*Phragmites australis*) lined the margins. Filamentous algal mats were also present. Aquatic bryophytes were not recorded. The narrow riparian fringes supported bracken, bramble, meadowsweet, scattered willow and downy birch with rank grasses. The site was bordered by cutover bog (PB4) with localised areas of improved grassland (GA1) and willow-dominated woodland (WN7).

Electro-fishing was not undertaken at site X4 given prohibitive depths and inherent unsuitability (i.e. canal site). However, a fisheries appraisal was undertaken. Site X4 was of high value for coarse fish species with abundant nursery and spawning habitat present given abundant macrophyte cover. Species such as roach and perch were visibly abundant in vicinity of the bridge. The site was also highly suitable as a European eel habitat and provided high quality otter foraging habitat. Suitability for white-clawed crayfish in this area was high although the species is not known from the western extent of the waterway.

The canal site was not suitable for biological water quality assessment via Q-sampling. However, a composite sweep sample was taken to gain a representation of the macro-invertebrate community. No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded (**Appendix B**).

Given the location of the site within the Grand Canal pNHA (002104), the aquatic ecological evaluation of site X4 was of **national importance (Table 4.4)**. The site was also of high value for Red-listed European eel and a range of coarse fish species.

Plate 4.29 Representative image of site X4 on the Grand Canal, September 2022

4.1.29 Site X5 – Grand Canal, Toberdaly

Site X5 was located on the Grand Canal at a potential electricity GCR option 1 crossing, approx. 0.8km downstream of site X4. The canal (FW3) averaged 15-18m wide and 1.2-1.6m deep with a slightly deeper central (navigation) channel. The bed comprised soft silt (with a high clay fraction). Boulder and cobble was present occasionally along the margin. Although the canal had been recently cleared of vegetation (for navigation), the site supported a high cover of macrophytes with abundant invasive Nuttall's pondweed and frequent spiked-water milfoil. The invasive macrophyte New Zealand

pygmyweed was recorded as occasional. Yellow lily and water plantain were also occasional, with rare broad-leaved pondweed, bulrush (Typ*ha latifolia*), amphibious bistort (*Persicaria amphibia*), fennel pondweed (*Stuckenia pectinata*) and water horsetail (*Equisetum fluviatile*). Linear stands of branched bur-reed and common reed lined the margins. Filamentous algal mats were also present. Aquatic bryophytes were not recorded. The narrow riparian fringes supported herbaceous species such as purple loosestrife, meadowsweet, common reed and scattered alder with a mature sycamore, alder, ash, grey willow, downy birch and hawthorn treeline on the south bank.

Electro-fishing was not undertaken at site X4 given prohibitive depths and inherent unsuitability (i.e. canal site). However, a fisheries appraisal was undertaken. Site X4 was of high value for coarse fish species with abundant nursery and spawning habitat present given abundant macrophyte cover. Species such as roach and perch were visibly abundant in vicinity of the bridge. The site was also highly suitable as a European eel habitat and provided high quality otter foraging habitat. Suitability for white-clawed crayfish in this area was high although the species is not known from the western extent of the waterway.

The canal site was not suitable for biological water quality assessment via Q-sampling. However, a composite sweep sample was taken to gain a representation of the macro-invertebrate community. The diving water beetle dinghy skipper (*Laccophilus hyalinus*) was recorded in the sweep sample. This species is listed as 'vulnerable' in Ireland (Foster et al., 2009). No other macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded (**Appendix B**).

Given the location of the site within the Grand Canal pNHA (002104), the aquatic ecological evaluation of site X5 was of **national importance (Table 4.4)**. The site was also of high value for Red-listed European eel, otter and supported the IUCN vulnerable dinghy skipper diving beetle.

Plate 4.30 Representative image of site X5 on the Grand Canal, September 2022

4.1.30 Site X6 – Toberdaly Stream, Toberdaly

Site X6 was located on the Toberdaly Stream (14T28) at a potential electricity GCR option 1 crossing adjacent to the Grand Canal (site X5). The lowland depositing stream (FW2) had been extensively realigned, straightened and deepened, flowing parallel to the Grand Canal Greenway, resulting in a trapezoidal channel with very poor hydromorphology. The stream averaged 2m wide and 0.5m deep with homogenous slow-flowing glide. The substrata comprised compacted clay and cobble that was heavily silted (peat-derived). The channel was heavily vegetated with abundant fool's watercress with occasional watercress and branched bur-reed with rare water starwort (*Callitriche* sp.). The margins supported narrow fringes of common reed. The trapezoidal slopes supported abundant reed canary grass, great willowherb, hedge bindweed and nettle with scattered bramble. The site was bordered by the Grand Canal and improved pasture (GA1).

With the exception of three-spined stickleback, recorded in low densities (**Appendix A**), the site was not of fisheries value given historical modifications, poor hydromorphology, low flows and heavy siltation. There was low suitability for white-clawed crayfish but none were recorded. No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q2-3 (poor status)** (**Appendix B**). However, it should be noted that this is a tentative rating given poor flows and lack of suitable riffle areas for sampling (as per Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Given the absence of aquatic species or habitats of higher conservation value, in addition to poor status water quality, the aquatic ecological evaluation of site X6 was of **local importance (lower value)** (**Table 4.4**).

Plate 4.31 Representative image of site X6 on the Toberdaly Stream, September 2022

4.1.31 Site X7 – Toberdaly Stream, Toberdaly

Site X7 was located on the Toberdaly Stream (14T28) south of the Grand Canal at the potential electricity GCR option 1 crossing. As outlined above, the stream had been evidently realigned and the section south of the channel did not appear hydrologically connected with that surveyed at site X6. The stream at this location was dry at the time of survey. The ephemeral U-shaped channel had been extensively straightened and deepened, with a 2m wide channel and banks of up to 1.5m high. The channel was heavily shaded by birch-willow woodland (WN7) and bramble-dominated scrub (WS1) and did not support macrophytes or aquatic bryophytes. The site was bordered by semi-improved pasture with mosaics of species-poor wet grassland (GS4).

Site X7 was not of fisheries value given an absence of water in the channel (i.e. ephemeral nature). Given the dry nature of the site, it was not possible to collected a biological water quality sample at the time of survey.

Given the absence of aquatic habitats in the ephemeral channel, the aquatic ecological evaluation of site X7 was of **local importance (lower value) (Table 4.4).**

Plate 4.32 Representative image of site X7 on the Toberdaly Stream, September 2022 (dry, ephemeral channel)

4.2 White-clawed crayfish survey

No white-clawed crayfish were recorded via hand-searching or sweep netting of instream refugia during the survey in August-September 2022. However, crayfish remains were identified in otter spraint recorded on the Kiltonan River (aka. Mongagh River) at site A3 and the Yellow River at site X3.

White-clawed crayfish eDNA was also detected in the water sample collected from the Yellow River at Clongall Bridge (site C7) (section 4.3 below).

4.3 eDNA analysis

White-clawed crayfish eDNA was only detected in the composite water sample collected from the Yellow River at Clongall Bridge (site C7) (1 positive qPCR replicates out of 12, respectively) (**Table 4.1; Appendix D**). This result was considered as evidence of the species' presence at and or upstream of the sampling location. White-clawed crayfish were not detected in samples from the Kinnegad River sample (site B3), Esker River (site D3) or Rochfort Demesne Stream (site E2).

Site C7 on the Yellow River also tested positive for crayfish plague (*Aphanomyces astaci*) (10 positive qPCR replicates out of 12) (**Table 4.1**). Crayfish plague was not detected at the Kinnegad River, Esker River or Rochfort Demesne Stream sampling sites.

Table 4.2 eDNA results in the vicinity of the proposed Derrygreenagh Power development, Co. Westmeath (positive qPCR replicates out of 12 in parentheses)

Sample	Watercourse	White-clawed crayfish	Crayfish plague
FK769	Kinnegad River (site B3)	Negative (0/12)	Negative (0/12)
FK783	Yellow River (site C7)	**Positive (1/12)**	**Positive (10/12)**
FK781	Esker Stream (site D3)	Negative (0/12)	Negative (0/12)
FK768	Rochfort Demesne Stream (site E2)	Negative (0/12)	Negative (0/12)

4.4 Otter signs

A total of *n*=8 otter signs were recorded across 4 no. survey sites during aquatic surveys undertaken in August and September 2022. Spraint sites were recorded on the Kiltonan Stream (site A3), Yellow River (X3) and Milltownpass River (A8).

Site A8 also supported a heavily used latrine and couch (ITM 652521, 742386). An otter holt was recorded at the top of the peaty embankment adjoining the pipe culvert at site C3 on the Coolcor Stream (ITM 650601, 733322).

4.5 Invasive aquatic species

The invasive macrophyte New Zealand pigmyweed (*Crassula helmsii*) was abundant at sites X4 and X5 on the Grand Canal. The plant is considered a high-risk invasive species in Ireland (O' Flynn et al., 2014)

and is listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011-2021 (S.I. 477/2011). This species is known from the Grand Canal (NBDC data).

The invasive macrophyte Nuttall's pondweed (*Elodea nuttallii*) was recorded at sites on the Castlejordan River (A6) and an unnamed tributary (A5), as well as the Grand Canal at sites X4 and X5. The species is widespread in Ireland (naturalised) and is listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011-2021 (S.I. 477/2011). Nuttall's pondweed is considered a high-risk invasive species in Ireland (O' Flynn et al., 2014)

Least duckweed (*Lemna minuta*) was recorded (abundant) at site D2 on the Road River. The floating macrophyte is considered a medium impact species (O'Flynn et al., 2014).

Dace (*Leuciscus leuciscus*) are an invasive cyprinid species in Ireland (O'Flynn et al., 2014) and have been present in the River Barrow since 1992 (Caffrey et al., 2007). The species is now firmly established throughout the River Barrow catchment including the upper reaches and was recorded (via electro-fishing) at site D3 on the Esker Stream.

Roach (*Rutilus rutilus*) is a widespread medium impact invasive fish species in Ireland (O'Flynn et al., 2014) listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011-2021 (S.I. 477/2011). It was recorded via electro-fishing at site A4 on the Kiltonan Stream and A5 on an unnamed stream (both tributaries of the Castlejordan/Mongagh River). Roach are also known to be present in the Grand Canal and were observed at sites X4 and X5 during the survey.

Environmental DNA analysis detected the non-native pathogen crayfish plague (*Aphanomyces astaci*) in the Yellow River at site C7 (Clongall Bridge) (**Table 4.1**; see section 4.3 above).

4.6 Biological water quality (macro-invertebrates)

The diving water beetle dinghy skipper (*Laccophilus hyalinus*) was recorded in the sweep sample from site X5 on the Grand Canal. This species is listed as 'vulnerable' in Ireland (Foster et al., 2009). No rare or protected macro-invertebrate species (according to national red lists) were recorded in the biological water quality samples taken from the remaining sampling sites in July 2022 (**Appendix A**).

None of the 27 no. sample sites achieved **Q4 (good status)** water quality and thus all sites failed to meet the target good status (≥Q4) requirements of the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 and the Water Framework Directive (2000/60/EC) (**Figure 4.2**). This was given the absence of at least one pollution-sensitive group A taxa in fair numbers (5% of total abundance) (**Appendix B**).

A total of 3 no. sites on the Kiltonan Stream (A3), Castlejordan River (A6) and Yellow River (C2) achieved **Q3-4 (moderate status)** water quality. This was given the low numbers (<5%) of group A species, namely the stoneflies *Nemurella picteti* (A3), *Protonemura meyeri* (C2) and Heptageniidae mayfly (A6). These sites also supported a low number of group B species such as the mayfly *Alainites muticus* in addition to a dominance of pollution-tolerant group C species such as the mayflies *Baetis rhodani* and *Seratella ignita* and freshwater shrimp (*Gammarus duebeni*) (**Appendix B**).

A total of 20 no. sites on the Rochfortbridge Stream (A1, X2b), Castlejordan River (A2) and unnamed

tributary (A5), Kiltonan Stream (A4), Milltownpass River (A8), Kinnegad River (B1, B3), Hightown River (B2), Yellow River (C1, C7, X3), Coolcor Stream (C3, C4, C5), Esker Stream (D3), Rochfort Demesne Stream (E1, E2), Gallstown River (X1) and Toberdaly Stream (X6) achieved **Q2-3 or Q3 (poor status)** based on an absence of group A species; low numbers or an absence of group B species and a dominance of group C species, particularly *Baetis rhodani*, *Gammarus duebeni* and Corixid species (**Appendix B**). Sites were reduced to the intermediate **Q2-3** rating where there was a greater proportion of pollution-tolerant group D species such as freshwater hoglouse (*Asellus aquaticus*) and the wandering snail (*Ampullacaena balthica*) (**Appendix B**). It should be noted that half of these ratings (i.e. sites A4, B3, C3, C4, C5, E1, E2, X1, X2b & X6) were tentative due to low summer flows and or a lack of suitable riffle areas for sampling (Toner et al., 2005).

Sites D2 on the Road River and X2a on the Derry River achieved **Q2 (bad status)** given a dominance of group D taxa. However, both ratings were also tentative due to poor flows (i.e. absence of riffle-glide habitat).

4.7 Physiochemical water quality

Physiochemical water quality samples were collected from a subset of 14 no. sites in September 2022 (i.e. sites A2, A3, A6, A8, B3, C2, C4, C7, D3, E2, X2b, X3, X4 & X5). The results of the laboratory analysis are summarised below and provided in full in **Appendix C**.

The pH levels of the sample sites ranged from 7.53 to 8.14, reflecting the calcareous influences within the survey area. Similarly, calcareous influences resulted in high alkalinity (>100mg $CaCO_3$) at all sites, with the exception of the heavily modified site C4 on the Coolcor Stream (moderate alkalinity).

Apart from sites A6 (Castlejordan River), A8 (Milltownpass River) and C4 (Coolcor Stream) all sampling sites met the good status targets for total ammonia (i.e. ≤0.040 mg N/l) as set out under the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 (S.I. No. 77/2019). Total ammonia levels at sites A6 (0.41mg N/l)) and A8 (0.421mg N/l) were elevated with the level at site C4 especially high (1.668 mg N/l) (**Appendix C**).

Levels of total oxidised nitrogen (TON) were typically moderate at the riverine sites sampled, ranging from 0.978 to 2.670mg N/l. Levels were low (<0.010mg N/l) on both Grand Canal sites (A4 & X5) (**Appendix C**). TON is comprised mainly of nitrate (N as NO_3) given that the concentration of nitrite is typically negligible (O'Boyle et al., 2019). The European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 (S.I. 77 of 2019) sets no specific boundary conditions for nitrate. However, EPA assessment of high-quality water sources has set boundary conditions of 0.8mg/l NO_3-N (nitrate as nitrogen) for high quality waters and 1.8mg/l NO_3-N for good quality waters. Thus, with the exception of sites A2 (Castlejordan River) and A3 (Kiltonan Stream) (both >2mg N/l), all sampling sites fell within accepted parameters for good quality water based on TON levels.

The majority of riverine sampling sites showed low levels of Levels of Molybdate Reactive Phosphorus (MRP) (the amount of phosphorus bioavailable for plant uptake) (i.e. ≤0.0239 mg P/l) and thus complying with the Surface Water Regulations (S.I. 77 of 2019) good status target for rivers i.e. ≤0.035 mg P/l. However, sites A2 (0.050mg P/l), D3 (0.052mg/l) and X2b (0.050mg P/l) exceeded this threshold (**Appendix C**). Both Grand Canal sites (X4 and X5) met the good status target (<0.025mg P/l) for total phosphorus (**Appendix C**).

Biochemical oxygen demand (BOD) levels were typically low across the riverine sampling sites, with most sites meeting the good status threshold of ≤1.5mg O_2/l as set out under the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 (S.I. No. 77/2019). However, BOD was significantly elevated at sites B3 (6.8 mg O_2/l) and C4 (5.8 mg O_2/l) (**Appendix C**). Higher BOD levels are indicative of some form of pollution and reduce the dissolved oxygen available for aquatic biota. However, slow-flowing waters (such as modified watercourses) often feature higher BOD levels for a given volume of organic and inorganic material than in faster-flowing, highly aerated waters.

Apart from sites B3 (50.5mg/l) and C4 (14.0mg/l), suspended solids were low across the sampling sites (**Appendix C**). Both of these sites had been historically modified and were heavily silted.

4.8 Macrophytes and aquatic bryophytes

No rare or protected macrophytes or aquatic bryophytes were recorded at the *n*=31 survey sites in August-September 2022. Similarly, no examples of Annex I aquatic vegetation habitats were recorded during the surveys.

4.9 Aquatic ecological evaluation

An aquatic ecological evaluation of each survey site was based on the results of desktop review (i.e., presence of species of high conservation value), fisheries assessments and habitat assessments, the presence of protected or rare invertebrates (e.g. white-clawed crayfish), environmental DNA analysis, the presence of rare macrophytes and aquatic bryophytes and or associated representations of Annex I habitats. Furthermore, biological water quality status also informed the aquatic evaluation (**Table 4.4**).

Sites X4 and X5 on the Grand Canal were evaluated as **national importance** given their location within the Grand Canal pNHA (002104).

None of the remaining aquatic survey sites were evaluated as greater than **local importance (higher value)**. Of the remaining 29 no. survey sites, fifteen were evaluated as **local importance (higher value).** These sites were present on the Rochfortbridge Stream (site A1), Kiltonan Stream (A3 & A4), unnamed stream (A5), Castlejordan River (A6), Milltownpass River (A8), Kinnegad River (B1, B3), Hightown River (B2), Yellow River (C1, C2, C7, X3), Coolcor Stream (C3) and the Esker Stream (D3). The **local importance (higher value)** evaluation was primarily due to the presence of salmonids, lamprey (*Lampetra* sp.) or other species of high conservation value such as otter (**Table 4.4**).

The remaining 14 no. sites were evaluated as **local importance (lower value)**. These sites of limited aquatic ecological value were situated on the Castlejordan River (A2), unnamed stream (A7), Coolcor Stream (C4, C5), Clonin Stream (C6), unnamed stream (D1), Road River (D2), Rochfort Demesne Stream (E1, E2), Gallstown Stream (X1), Derry River (X2a), Rochfortbridge Stream (X2b) and the Toberdaly Stream X6 & X7). Primarily their low aquatic ecological evaluation related to poor hydromorphology because of historical drainage pressures, their small size, poor flow regimes and the absence of aquatic species including fish and or habitats of high ecological value.

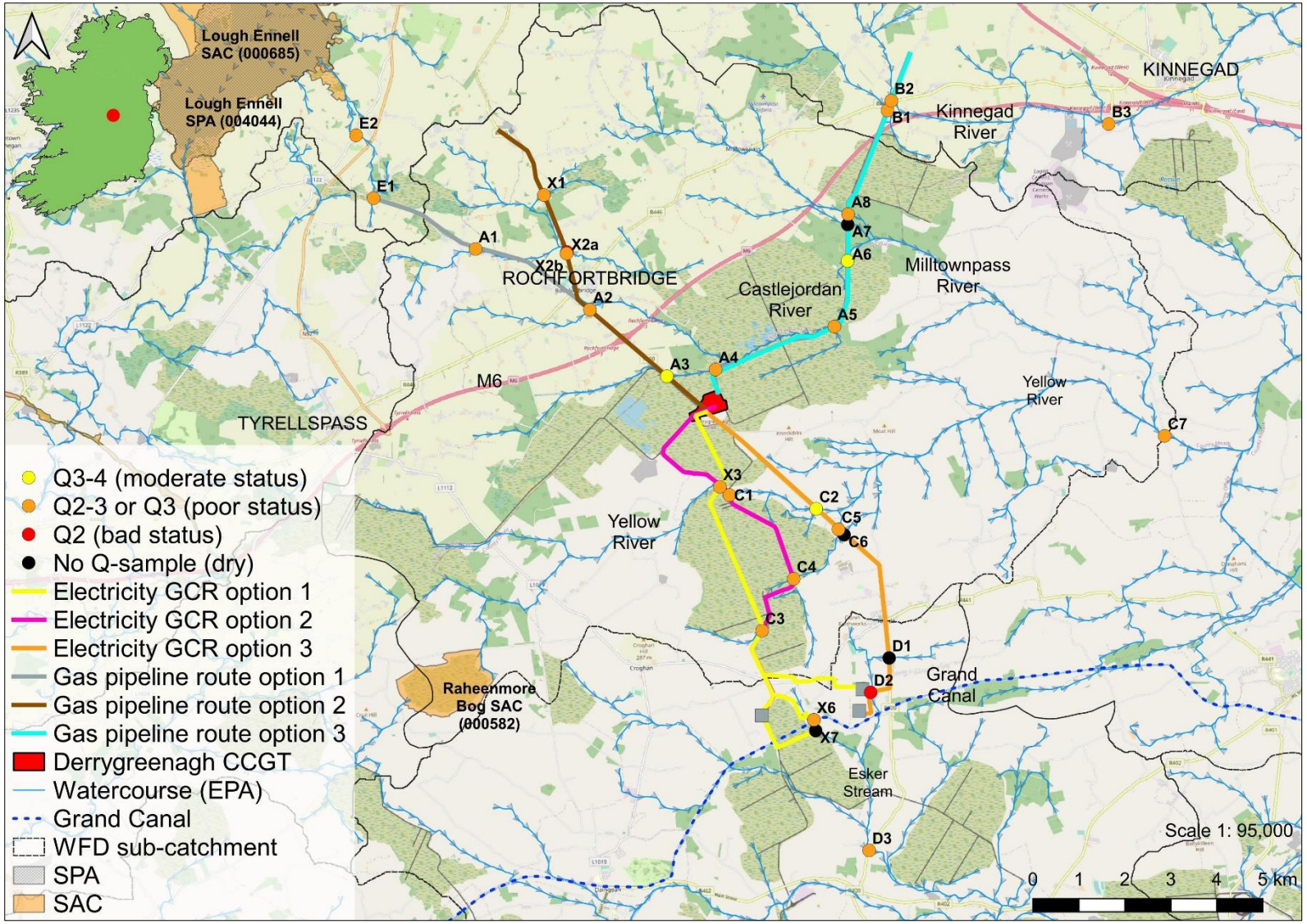

Figure 4.1 Overview of the biological water quality status in the vicinity of the proposed Derrygreenagh Power development, Co. Westmeath, Aug-Sept 2022

Table 4.2 Summary of fish species of higher conservation value and relative abundances (low, medium, high & very high) recorded via **electro-fishing** per survey site in the vicinity of the proposed Derrygreenagh Power development, August-September 2022

Site	Watercourse	Relative abundance				Other species
		Atlantic salmon	Brown trout	*Lampetra* sp.	European eel	
A1	Rochfortbridge Stream			Low		Three-spined stickleback
A2	Castlejordan River					Three-spined stickleback
A3	Kiltonan Stream			Low		Three-spined stickleback
A4	Kiltonan Stream		Low	Low		Three-spined stickleback, roach
A5	Unnamed stream			Low		Roach, perch, pike, gudgeon, minnow
A6	Castlejordan River		Low	Low		Stone loach, perch, pike
A7	Unnamed stream	No fish recorded (dry channel)				
A8	Milltownpass River		Medium	Medium		Pike
B1	Kinnegad River		Medium			Three-spined stickleback
B2	Hightown River		Medium			Three-spined stickleback, minnow
B3	Kinnegad River	No electro-fishing undertaken (too deep)				
C1	Yellow River		Low			Three-spined stickleback, pike, perch
C2	Yellow River		High			Stone loach
C3	Coolcor Stream					Three-spined stickleback, ten-spined stickleback
C4	Coolcor Stream	No electro-fishing undertaken (too deep)				
C5	Coolcor Stream					Three-spined stickleback
C6	Clonin Stream	No fish recorded (dry channel)				
C7	Yellow River	Medium	Medium	Low	Low	Stone loach, minnow
D1	Unnamed stream	No fish recorded (dry channel)				
D2	Road River					Three-spined stickleback
D3	Esker Stream		Medium			Dace, minnow, stone loach
E1	Rochfort Demesne Stream					Three-spined stickleback
E2	Rochfort Demesne Stream		Medium			Three-spined stickleback
X1	Gallstown Stream					Three-spined stickleback

Site	Watercourse	Relative abundance				Other species
		Atlantic salmon	Brown trout	*Lampetra* sp.	European eel	
X2a	Derry River	No fish recorded				
X2b	Rochfortbridge Stream					Three-spined stickleback
X3	Yellow River		Medium			Pike, minnow
X4	Grand Canal	n/a – fisheries appraisal only				
X5	Grand Canal	n/a – fisheries appraisal only				
X6	Toberdaly Stream					Three-spined stickleback
X7	Toberdaly Stream	No fish recorded (dry channel)				

Conservation value: Atlantic salmon (*Salmo salar*), brook lamprey (L*ampetra planeri*) and river lamprey (*Lampetra fluviatilis*) are listed under Annex II of the Habitats Directive [92/42/EEC]. Atlantic salmon and river lamprey are also listed under Annex V of the Habitats Directive [92/42/EEC]. European eel are 'critically endangered' according to most recent ICUN red list (Pike et al., 2020) and listed as 'critically engendered' in Ireland (King et al., 2011). With the exception of the Inland Fisheries Acts 1959 to 2017, brown trout and coarse fish species have no legal protection in Ireland.

Table 4.3 Summary of aquatic species (**excluding fish**) and habitats of higher conservation value recorded in the vicinity of the proposed Derrygreenagh Power development, Co. Offaly & Co. Westmeath

Site	Watercourse	White-clawed crayfish	Otter signs[4]	Annex I aquatic habitats	Rare or protected macrophytes/ aquatic bryophytes	Rare or protected macro-invertebrates	Other species/habitats of high conservation value
A1	Rochfortbridge Stream	None recorded	No signs	Not present	None recorded	None recorded	None recorded
A2	Castlejordan River	None recorded	No signs	Not present	None recorded	None recorded	None recorded
A3	Kiltonan Stream	**None recorded but remains in otter spraint**	**Regular spraint site**	Not present	None recorded	None recorded	None recorded
A4	Kiltonan Stream	None recorded	No signs	Not present	None recorded	None recorded	None recorded
A5	Unnamed stream	None recorded	No signs	Not present	None recorded	**Dinghy skipper (*Laccophilus hyalinus*) (vulnerable; Foster et al., 2009)**	None recorded
A6	Castlejordan River	None recorded	No signs	Not present	None recorded	None recorded	None recorded
A7	Unnamed stream	None recorded	No signs	Not present	None recorded	None recorded	None recorded
A8	Milltownpass River	None recorded	**Regular spraint site, latrine & couch**	Not present	None recorded	None recorded	None recorded
B1	Kinnegad River	None recorded	No signs	Not present	None recorded	None recorded	None recorded
B2	Hightown River	None recorded	No signs	Not present	None recorded	None recorded	None recorded
B3	Kinnegad River	None recorded; negative eDNA result at site	No signs	Not present	None recorded	None recorded	None recorded
C1	Yellow River	None recorded	No signs	Not present	None recorded	None recorded	None recorded
C2	Yellow River	None recorded	No signs	Not present	None recorded	None recorded	None recorded
C3	Coolcor Stream	None recorded	**Holt**	Not present	None recorded	None recorded	None recorded

Site	Watercourse	White-clawed crayfish	Otter signs[4]	Annex I aquatic habitats	Rare or protected macrophytes/ aquatic bryophytes	Rare or protected macro-invertebrates	Other species/habitats of high conservation value
C4	Coolcor Stream	None recorded	No signs	Not present	None recorded	None recorded	None recorded
C5	Coolcor Stream	None recorded	No signs	Not present	None recorded	None recorded	None recorded
C6	Clonin Stream	None recorded	No signs	Not present	None recorded	None recorded	None recorded
C7	Yellow River	**None recorded but positive eDNA result at site**	No signs	Not present	None recorded	None recorded	None recorded
D1	Unnamed stream	None recorded	No signs	Not present	None recorded	None recorded	None recorded
D2	Road River	None recorded	No signs	Not present	None recorded	None recorded	None recorded
D3	Esker Stream	None recorded; negative eDNA result at site	No signs	Not present	None recorded	None recorded	None recorded
E1	Rochfort Demesne Stream	None recorded	No signs	Not present	None recorded	None recorded	None recorded
E2	Rochfort Demesne Stream	None recorded; negative eDNA result at site	No signs	Not present	None recorded	None recorded	None recorded
X1	Gallstown Stream	None recorded	No signs	Not present	None recorded	None recorded	None recorded
X2a	Derry River	None recorded	No signs	Not present	None recorded	None recorded	None recorded
X2b	Rochfortbridge Stream	None recorded	No signs	Not present	None recorded	None recorded	None recorded
X3	Yellow River	**None recorded but remains in otter spraint**	**Regular spraint site**	Not present	None recorded	None recorded	None recorded
X4	Grand Canal	None recorded	No signs	Not present	None recorded	None recorded	None recorded
X5	Grand Canal	None recorded	No signs	Not present	None recorded	None recorded	None recorded
X6	Toberdaly Stream	None recorded	No signs	Not present	None recorded	None recorded	None recorded
X7	Toberdaly Stream	None recorded	No signs	Not present	None recorded	None recorded	None recorded

Conservation value: White-clawed crayfish (*Austropotamobius pallipes*) and Eurasian otter (*Lutra lutra*) are listed under Annex II and Annex V of the Directive on the Conservation of Natural Habitats of Wild Fauna and Flora (92/43/EEC) ('EU Habitats Directive') and all are protected under the Irish Wildlife Acts 1976-2021. White-clawed crayfish (Füreder et al., 2010) is listed as 'Endangered' according to the IUCN Red List. The European Union (Invasive Alien Species) (Freshwater Crayfish) Regulations 2018 (SI 354/2018) affords further protection to native, white-clawed crayfish by prohibiting the introduction and spread of five no. invasive 'Union concern' crayfish species listed under EU Regulation 1143/2014.

[4] Otter signs within 150m of the survey site

Table 4.4 Aquatic ecological evaluation summary of the Derrygreenagh Power development survey sites according to NRA (2009) criteria

Site no.	Watercourse	EPA code	Evaluation of importance	Rationale summary
A1	Rochfortbridge Stream	07R04	**Local importance (higher value)**	Heavily modified, heavily silted lowland depositing stream with poor flows; *Lampetra* sp. & three-spined stickleback recorded via electro-fishing; **Q3** (poor status) water quality
A2	Castlejordan River	07C04	Local importance (lower value)	Heavily modified, heavily silted lowland depositing stream with abundant aquatic vegetation, poor flows & poor aquatic value; three-spined stickleback recorded via electro-fishing; **Q3** (poor status) water quality (tentative rating); no aquatic species or habitats of high conservation value
A3	Kiltonan Stream	07K04	**Local importance (higher value)**	Heavily modified, heavily silted & over-deepened lowland depositing river with evident enrichment; brown trout & three-spined stickleback recorded via electro-fishing; otter spraint site (with white-clawed crayfish remains) recorded; **Q3-4** (moderate status) water quality
A4	Kiltonan Stream	07K04	**Local importance (higher value)**	Heavily modified, heavily vegetated & over-deepened lowland depositing river with evident enrichment; brown trout, *Lampetra* sp., roach & three-spined stickleback recorded via electro-fishing; **Q2-3** (poor status) water quality
A5	Unnamed stream	n/a	**Local importance (higher value)**	Heavily modified, heavily silted & over-deepened lowland depositing stream with evident enrichment but of good value as coarse fish nursery; *Lampetra* sp., roach, minnow, perch, gudgeon & pike recorded via electro-fishing; **Q3** (poor status) water quality (tentative rating)
A6	Castlejordan River	07C04	**Local importance (higher value)**	Semi-natural, historically modified lowland depositing river with heavy siltation and abundant aquatic vegetation; brown trout, *Lampetra* sp., perch, pike & stone loach recorded via electro-fishing; **Q3-4** (moderate status) water quality
A7	Unnamed stream	n/a	Local importance (lower value)	Historically realigned channel with no aquatic species or habitats in vicinity of the survey site; no aquatic species or habitats of high conservation value
A8	Milltownpass River	07M04	**Local importance (higher value)**	Historically straightened and deepened lowland depositing river with abundant aquatic vegetation with evident enrichment & siltation pressures; brown trout, *Lampetra* sp. & pike recorded via electro-fishing; otter spraint site, latrine & couch recorded with potential holt area under bridge; **Q3** (poor status) water quality
B1	Kinnegad River	07K01	**Local importance (higher value)**	Historically modified lowland depositing river with some good instream recovery; brown trout & three-spined stickleback recorded via electro-fishing; **Q3** (poor status) water quality
B2	Hightown River	07H16	**Local importance (higher value)**	Historically modified lowland depositing river with some good instream recovery; brown trout, minnow & three-spined stickleback recorded via electro-fishing; **Q3** (poor status) water quality
B3	Kinnegad River	07K01	**Local importance (higher value)**	Heavily modified, heavily silted, heavily vegetated & over-deepened lowland depositing river with evident enrichment & poor hydromorphology; electro-fishing not undertaken due to prohibitive depths (>1.3m) but of some value for European eel & coarse fish species; **Q3** (poor status) water quality (tentative rating)

Site no.	Watercourse	EPA code	Evaluation of importance	Rationale summary
C1	Yellow River	07Y02	**Local importance (higher value)**	Heavily modified, heavily vegetated & over-deepened lowland depositing river with evident enrichment; brown trout, perch, pike & three-spined stickleback recorded via electro-fishing; **Q3** (poor status) water quality (tentative rating)
C2	Yellow River	07Y02	**Local importance (higher value)**	Historically modified lowland depositing river with some good instream recovery and good salmonid nursery habitat; brown trout (high densities) & stone loach recorded via electro-fishing; **Q3-4** (moderate status) water quality
C3	Coolcor Stream	07C08	**Local importance (higher value)**	Heavily modified, heavily silted, heavily vegetated & over-deepened lowland depositing stream with evident enrichment; ten-spined stickleback & three-spined stickleback recorded via electro-fishing; otter **holt** recorded on banktop; **Q3** (poor status) water quality (tentative rating)
C4	Coolcor Stream	07C08	Local importance (lower value)	Heavily modified, heavily silted, heavily vegetated & over-deepened lowland depositing stream with evident enrichment and very poor hydromorphology/fluvial connectivity; electro-fishing not undertaken due to prohibitive depths (>1.5m) but ten-spined stickleback & three-spined stickleback recorded via sweep netting; **Q2-3** (poor status) water quality (tentative rating); no aquatic species or habitats of high conservation value
C5	Coolcor Stream	07C08	Local importance (lower value)	Heavily modified, heavily vegetated & canalised lowland depositing river with very poor hydromorphology & poor aquatic value; three-spined stickleback recorded via electro-fishing; **Q3** (poor status) water quality (tentative rating); no aquatic species or habitats of high conservation value
C6	Clonin Stream	07C74	Local importance (lower value)	Historically modified ephemeral channel with an absence of aquatic species or habitats at the time of survey
C7	Yellow River	07Y02	**Local importance (higher value)**	Historically modified & over-deepened lowland depositing river with some good recovery & very god salmonid nursery value; Atlantic salmon, brown trout, *Lampetra* sp. European eel, stone loach & minnow recorded via electro-fishing; **Q3** (poor status) water quality
D1	Unnamed stream	n/a	Local importance (lower value)	Heavily modified, dry ephemeral channel with no aquatic value at the time of survey
D2	Road River	14R53	Local importance (lower value)	Heavily modified, heavily silted, heavily vegetated lowland depositing river with evident enrichment & poor hydromorphology; three-spined stickleback recorded via electro-fishing; **Q2** (bad status) water quality (tentative rating); no aquatic species or habitats of high conservation value
D3	Esker Stream	14 E03	**Local importance (higher value)**	Historically modified, swift-flowing lowland depositing river with some good instream recovery and moderate quality salmonid habitat; brown trout , minnow, dace & stone loach recorded via electro-fishing; **Q3** (poor status) water quality
E1	Rochfort Demesne Stream	25R11	Local importance (lower value)	Heavily modified, heavily vegetated & canalised lowland depositing stream with very poor hydromorphology & poor aquatic value; three-spined stickleback recorded via electro-fishing; **Q2-3** (poor status) water quality (tentative rating); no aquatic species or habitats of high conservation value

Site no.	Watercourse	EPA code	Evaluation of importance	Rationale summary
E2	Rochfort Demesne Stream	25R11	Local importance (lower value)	Historically modified lowland depositing stream with some instream recovery & moderate quality salmonid habitat; brown trout and three-spined stickleback recorded via electro-fishing; **Q2-3** (poor status) water quality (tentative rating); no aquatic species or habitats of high conservation value
X1	Gallstown Stream	07G36	Local importance (lower value)	Heavily modified, heavily silted, heavily vegetated & over-deepened lowland depositing stream with poor flows & evident enrichment; three-spined stickleback recorded via electro-fishing; **Q2-3** (poor status) water quality (tentative rating); no aquatic species or habitats of high conservation value
X2a	Derry River	07D28	Local importance (lower value)	Heavily modified, heavily silted, heavily vegetated & over-deepened lowland depositing stream with no flows (stagnant); no fish recorded via electro-fishing; **Q2** (bad status) water quality (tentative rating); no aquatic species or habitats of high conservation value
X2b	Rochfortbridge Stream	07R04	Local importance (lower value)	Historically straightened, heavily silted, heavily vegetated & over-deepened lowland depositing stream with imperceptible flows; three-spined stickleback recorded via electro-fishing; **Q2-3** (poor status) water quality (tentative rating); no aquatic species or habitats of high conservation value
X3	Yellow River	07Y02	**Local importance (higher value)**	Heavily modified, heavily vegetated & over-deepened lowland depositing river with evident enrichment; brown trout, minnow & pike recorded via electro-fishing; otter spraint site (with white-clawed crayfish remains) recorded; **Q2-3** (poor status) water quality
X4	Grand Canal	n/a	**National importance**	Located within Grand Canal pNHA (002104); site of high value for European eel & coarse fish species
X5	Grand Canal	n/a	**National importance**	Located within Grand Canal pNHA (002104); site of high value for European eel & coarse fish species; site supported the IUCN vulnerable diving beetle dinghy skipper (*Laccophilus hyalinus*)
X6	Toberdaly Stream	14T28	Local importance (lower value)	Heavily modified, heavily silted, heavily vegetated lowland depositing stream with poor hydromorphology; three-spined stickleback recorded via electro-fishing; **Q2-3** (poor status) water quality (tentative rating); no aquatic species or habitats of high conservation value
X7	Toberdaly Stream	14T28	Local importance (lower value)	Heavily modified, dry ephemeral channel not considered of high aquatic value

Conservation value: Atlantic salmon (*Salmo salar*), *Lampetra* spp. and otter (*Lutra lutra*) are all listed under Annex II of the Habitats Directive [92/42/EEC]. Furthermore, Atlantic salmon, *Lampetra* spp. are also listed under Annex V of the Habitats Directive [92/42/EEC] while otter are also listed on under Annex IV of the Habitats Directive [92/42/EEC]. Otters (along with their breeding and resting places) are also protected under provisions of the Irish Wildlife Acts 1976 to 2021. European eel are 'critically endangered' according to most recent ICUN red list (Pike et al., 2020) and listed as 'critically engendered' in Ireland (King et al., 2011). With the exception of the Inland Fisheries Acts 1959 to 2017, brown trout and coarse fish species have no legal protection in Ireland.

5. Discussion

5.1 Most valuable areas for aquatic ecology

Sites X4 and X5 on the Grand Canal were evaluated as **national importance** given their location within the Grand Canal pNHA (002104). Both sites were also of high value for a range of coarse fish species, European eel and foraging otter. Site X5 supported the dinghy skipper (*Laccophilus hyalinus*), a diving water beetle listed as 'vulnerable' in Ireland (Foster et al., 2009).

None of the remaining 29 no. aquatic survey sites in the vicinity of the proposed Derrygreenagh Power development were evaluated as of greater than **local importance (higher value)** in terms of their aquatic ecology. A total of 15 no. **local importance (higher value)** sites were present on the Rochfortbridge Stream (site A1), Kiltonan Stream (A3 & A4), unnamed stream (A5), Castlejordan River (A6), Milltownpass River (A8), Kinnegad River (B1, B3), Hightown River (B2), Yellow River (C1, C2, C7, X3), Coolcor Stream (C3) and the Esker Stream (D3). This evaluation was primarily due to the presence of salmonids (*n*=11 sites), lamprey (*Lampetra* sp.) (*n*=7 sites) or other species of high conservation value such as otter (signs recorded at *n*=4 sites) (**Table 4.4**). All 4 no. survey sites on the Yellow River were evaluated as **local importance (higher value)**.

The remaining 14 no. sites on the Castlejordan River (A2), unnamed stream (A7), Coolcor Stream (C4, C5), Clonin Stream (C6), unnamed stream (D1), Road River (D2), Rochfort Demesne Stream (E1, E2), Gallstown Stream (X1), Derry River (X2a), Rochfortbridge Stream (X2b) and the Toberdaly Stream X6 & X7) were evaluated as **local importance (lower value)** in terms of their aquatic ecology given poorer hydromorphological character, an absence of aquatic species or habitats of high conservation value and or **less than Q4 (good status)** water quality.

5.1.1 Fish species of high conservation value

Brown trout were recorded, invariably in low densities, at a total of 11 no. sites (**Table 4.2**). Atlantic salmon were present, in moderate densities, at a single site on the Yellow River (site C7). In general, the Yellow River provided the best quality salmonid habitat and supported the highest salmonid density (site C7) within the survey area (**Appendix A**).

Lamprey ammocoetes (*Lampetra* sp.) were recorded from 7 no. sites on the Rochfortbridge Stream (A1), Kiltonan Stream (A3 & A4), unnamed stream (A5), Castlejordan River (A6), Milltownpass River (A8) and the Yellow River (C7) (**Table 4.2**). Apart from site A8 on the Milltownpass River, which supported a medium density of 4.4 per m^2, ammocoetes were present in low densities of ≤1.5 per m^2. This reflected the often low summer flows, the poor hydromorphology of most sites and the dominance of peat-dominated soft sediment (**Appendix A**).

European eel were only recorded (in low densities) from a single site on the Yellow River at Clongall Bridge (C7) (**Table 4.2; Appendix A**). European eel are Red-listed in Ireland (King et al., 2011) and are classed as 'critically endangered' on a global scale (Pike et al., 2020). As eel occurrence decreases significantly with increasing distance from the sea (Degerman et al., 2019), the paucity of eel observed in the Yellow[Castlejordan]_SC_010, Boyne_SC_030, Figile_SC_020 and Brosna_SC_010 river sub-catchments can be largely explained by the distance between the survey area and marine habitats (Chadwick et al., 2007) (>100km nearest instream distance) (**Appendix A**).

5.1.2 Otter

Despite some suitability at numerous survey locations, otter signs were only recorded at a total of 4 no. sites. Spraint sites were recorded on the Kiltonan Stream (site A3), Yellow River (X3) and Milltownpass River (A8). Given the heavily modified (straightened, deepened) nature of many of the surveyed watercourses there was a general paucity of marking opportunities for otter (e.g. boulders, grassy promontories) and this reflected the low number of signs recorded.

Site A8 on the Milltownpass River also supported a heavily used latrine and couch (ITM 652521, 742386). An otter holt was recorded at the top of the peaty embankment adjoining the pipe culvert at site C3 on the Coolcor Stream (ITM 650601, 733322). This did not appear active at the time of survey given the presence of cobwebs at the entrance, with no indications of recent access (e.g. slides, prints).

As otters are food-limited and prey availability is a crucial factor in determining mortality, breeding success and the status of local populations (Sittenhaler et al., 2019; Ruiz-Olmo et al., 2009), those watercourses with healthier and more abundant fish populations provided the best quality otter habitat. These would include the Yellow River, Castlejordan River, Milltownpass River, Esker Stream and Grand Canal.

5.1.3 White-clawed crayfish & crayfish plague

Historical white-clawed crayfish records were relatively widespread in the vicinity of the proposed development, with records available for the Castlejordan River, Esker Stream and, most recently (in 2018), the Yellow River (**Figure 3.1**). However, no white-clawed crayfish were detected via hand searching (*n*=31 sites) or field examination of otter spraint (*n*=4 sites) during the survey period. No crayfish DNA was detected at sites on the Kinnegad River (B3), Esker Stream (D3) or Rochfort Demesne Stream (E2). Nonetheless, white-clawed crayfish and crayfish plague eDNA was detected at site C7 on the Yellow River at Clongall Bridge (upper Boyne catchment) in September 2022 (1 and 10 positive qPCR replicates out of 12, respectively) (**Table 4.1**; **Appendix D**).

The patchy distribution and often low abundances of white-clawed crayfish in a given river system may also strongly influence detection probability (Sint et al., 2022). Our results highlight the importance of a multifaceted approach to crayfish surveying, i.e. a combination of traditional crayfish surveys, inspection of otter spraint and eDNA sampling.

Crayfish plague is listed at one of the world's 100 worst invasive species (GISD, 2022; Lowe et al., 2000) and is becoming highly prevalent across Ireland. *Aphanomyces astaci* is considered an obligate crayfish parasite not capable of surviving for a long period outside a crayfish host (Strand et al., 2011; Söderhall & Cerenius, 1999). Thus, the detection of crayfish plague in the Yellow River is likely to further jeopardise existing crayfish populations within the river and wider Boyne catchment.

5.1.4 Macro-invertebrates & biological water quality

The diving water beetle dinghy skipper (*Laccophilus hyalinus*) was recorded in the sweep sample from site X5 on the Grand Canal. This species favours well-vegetated margins of rivers and lakes and is listed as 'vulnerable' in Ireland (Foster et al., 2009). No other rare or protected macro-invertebrate species

(according to national red lists) were recorded in the biological water quality samples taken from 25 no. riverine or 2 no. canal sites in August-September 2022 (**Appendix B**).

None of the 25 no. Q-sampling sample sites achieved **Q4 (good status)** water quality and thus **all sites failed** to meet the target good status (≥Q4) requirements of the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 and the Water Framework Directive (2000/60/EC) (**Figure 4.2**).

The biological water quality of the wider survey area was evidently impacted by historical modifications (poor hydromorphology) and low summer flows at the time of sampling, with the Q-rating for a total of 12 no. sites considered tentative (**Appendix B**) given poor flows and or an absence of suitable riffle areas for sampling (as per Toner et al., 2005). Impacts from peat extraction and agriculture are known to be significant threats to water quality in the wider survey area (EPA, 2018a, 2018b) and this was supported by observations made during the aquatic surveys.

5.2 Aquatic ecology summary

In summary, approximately half of the surveyed watercourses in the vicinity of the proposed Derrygreenagh Power development were of **local importance (higher value)** in terms of their aquatic ecology given the presence of species of high conservation value such as salmonids, lamprey (*Lampetra* sp.), white-clawed crayfish and otter. However, widespread historical drainage pressures (hydromorphology) and siltation (primarily from peat escapement) have significantly reduced the quality of aquatic habitats on most watercourses in the vicinity of the proposed project.

Typically, larger watercourses with higher flow rates, greater water volumes and better connectivity, such as the Yellow River, Milltownpass River and (to the south) Esker Stream, are better able to buffer against such impacts and these watercourses supported the best quality aquatic habitats within the vicinity of the proposed development for aquatic receptors of high conservation value. The Grand Canal at sites X4 and X5 (i.e. at potential electricity grid transmission crossings) were evaluated as **national importance** given their location within the Grand Canal pNHA (002104) and also given these important water corridors provide high quality habitats for a range of high conservation value aquatic species. This includes fish species such as red-listed European eel and the vulnerable diving water beetle dinghy skipper (*Laccophilus hyalinus*), recorded during the current survey.

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7. Appendix A – fisheries assessment report

Please see accompanying fisheries assessment report

Fisheries assessment report for Derrygreenagh Power, Co. Offaly & Co. Westmeath

Prepared by Triturus Environmental Ltd. for Bord na Móna Powergen Limited

February 2023

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1. Introduction

1.1 Background

Triturus Environmental Ltd. were commissioned by Bord na Móna Powergen Limited to undertake a baseline fisheries assessment of numerous watercourses in the vicinity of the proposed Derrygreenagh Power gas-fired development, inclusive of proposed grid connection and gas pipeline routes, located near Rochfortbridge, Co. Offaly & Co. Westmeath (**Figure 2.1**).

The survey was undertaken to establish baseline fisheries data used in the preparation of the EIAR for the proposed project. In order to gain an accurate overview of the existing and potential fisheries value of the riverine watercourses within the vicinity of the proposed project, a catchment-wide electro-fishing survey across *n*=29 riverine sites was undertaken (**Table 2.1; Figure 2.1**), where possible. Of the 29 riverine survey sites it was not possible to electro-fish seasonal channels that contained very limited or no water at the time of the survey (i.e. survey sites B3, C4, C6, D1, X2a and X4). Electro-fishing helped to identify the importance of the watercourses as nurseries and habitats for salmonids, lamprey (*Petromyzon marinus* and *Lampetra* spp.) and European eel (*Anguilla anguilla*). Other species of lower conservation value were also recorded. A fisheries assessment (no electro-fishing) was also undertaken on 2 no. sites on the Grand Canal which overlapped proposed development infrastructure. The presence and or absence of fish populations and or associated supporting habitat would help inform impact assessment and any subsequent mitigation for the project.

Triturus Environmental Ltd. made an application under Section 14 of the Fisheries (Consolidation) Act, 1959 as substituted by Section 4 of the Fisheries (Amendment) Act, 1962, to undertake a catchment-wide electro-fishing survey in the vicinity of the proposed development. Permission was granted on the 23rd August 2022 and the survey was undertaken in late August and September 2022.

1.2 Fisheries asset of the survey area

The *n*=31 survey sites[1] were located within the Yellow[Castlejordan]_SC_010, Boyne_SC_030, Figile_SC_020 and Brosna_SC_010 river sub-catchments. The proposed development and associated infrastructure was not located within a European site although there was downstream hydrological connectivity (via several watercourses) with the Lough Ennell SAC (000685), Lough Ennell SPA (004044) and the River Barrow and River Nore SAC (002162). Fisheries survey sites were present on the Rochfortbridge Stream (EPA code: 07R04), Castlejordan River (07C04) and unnamed tributary, Kiltonan Stream (07K04), Milltownpass River (07M04), Kinnegad River (07K01), Hightown River (07H16), Yellow River (07Y02), Coolcor Stream (07C08), Clonin Stream (07C74), Road River (14R53) and unnamed tributary, Esker Stream (14E03), Rochfort Demesne Stream (25R11), Gallstown River (07G36), Derry River (07D28), Toberdaly Stream (14T28) and the Grand Canal (**Table 2.1**).

The Kinnegad River, Yellow River and the Castlejordan River (aka Mongagh River) are known to support *Lampetra* sp. (O'Connor, 2006). These rivers are also known to support good stocks of small-sized brown trout (*Salmo trutta*) (O'Reilly, 2009). The Kinnegad River and Castlejordan (Mongagh) River

[1] The fisheries survey included 29 riverine sites and 2 canal sites with some of the riverine channels dry at the time of the survey as detailed in this report

support a genetically distinct sub-population of trout within the Boyne catchment (Massa-Gallucci & Mariani, 2011).

The Grand Canal, crossed by the potential electricity GCR option 1, is known to support a range of coarse fish species, including perch (*Perca fluviatilis*), pike (*Esox lucius*), bream (*Abramis brama*), roach (*Rutilus rutilus*), rudd (*Scardinius erythropthalmus*) and their respective hybrids, European eel (*Anguilla anguilla*), tench (*Tinca tinca*) and highly localised common carp (*Cyprinus carpio*) and brown trout (IFI data; McLoone, 2011; Tierney et al., 1999; pers. obs.). *Lampetra* sp. lamprey have also been recorded at a low number of locations, e.g. 11th lock, ROD, 2016; 7th lock, Caffrey et al., 2006; 5th lock, MKO, 2019).

Fisheries data for the other watercourses within the survey area was not available at the time of survey.

2. Methodology

2.1 Fish stock assessment (electro-fishing)

A single anode Smith-Root LR24 backpack (12V DC input; 300V, 100W DC output) was used to electro-fish sites on watercourses in the vicinity of the proposed Derrygreenagh Power development on Wednesday 31st August and Thursday 1st, Friday 2nd, Thursday 22nd, Friday 23rd September 2022, following notification to Inland Fisheries Ireland and under the conditions of a Department of the Environment, Climate and Communications (DECC) licence. Both river and holding tank water temperature was monitored continually throughout the survey to ensure temperatures of 20°C were not exceeded, thus minimising stress to the captured fish due to low dissolved oxygen levels. A portable battery-powered aerator was also used to further reduce stress to any captured fish contained in the holding tank.

Salmonids, European eel and other captured fish species were transferred to a holding container with oxygenated fresh river water following capture. To reduce fish stress levels, anaesthesia was not applied to captured fish. All fish were measured to the nearest millimetre and released in-situ following a suitable recovery period.

As three primary species groups were targeted during the survey, i.e., salmonids, lamprey, and eel, the electro-fishing settings were tailored for each species. By undertaking electro-fishing using the rapid electro-fishing technique (see methodology below), the broad characterisation of the fish community at each sampling reach could be determined as a longer representative length of channel can be surveyed. Electro-fishing methodology followed accepted European standards (CEN, 2003) and adhered to best practice (e.g., CFB, 2008).

The catchment-wide electro-fishing (CWEF) survey was undertaken across *n*=29 sites with a fisheries appraisal undertaken on the Grand Canal given prohibitive depths for back-pack electro-fishing (see **Table 2.1, Figure 2.1**).

2.1.1 Salmonids and European eel

For salmonid species and European eel, as well as all other incidental species, electro-fishing was carried out in an upstream direction for a 10-minute CPUE, an increasingly common standard approach for wadable streams (Matson et al., 2018). A total of approx. 50-100m channel length was surveyed at each site, where feasible, to gain a better representation of fish stock assemblages. At certain, more minor watercourse sites or sites with limited access, it was more feasible to undertake electro-fishing for a 5-minute CPUE. Discrepancies in fishing effort (CPUE) between sites are accounted for in the subsequent results section (**Table 3.1**).

Relative conductivity of the water at each site was checked in-situ with a conductivity meter and the electro-fishing backpack was energised with the appropriate voltage and frequency to provide enough draw to attract salmonids and European eel to the anode without harm. For the moderate to high conductivity waters of the sites (draining calcareous geologies) a voltage of 200-230v, frequency of 35-40Hz and pulse duration of 3.5-4ms was utilised to draw fish to the anode without causing physical damage.

2.1.2 Lamprey

Electro-fishing for lamprey ammocoetes was conducted using targeted box quadrat-based electro-fishing (as per Harvey & Cowx, 2003) in objectively suitable areas of sand/silt, where encountered. As lamprey take longer to emerge from silts and require a more persistent approach, they were targeted at a lower frequency (30Hz) burst DC pulse setting which also allowed detection of European eel in sediment, if present. Settings for lamprey followed those recommended and used by Harvey & Cowx (2003), APEM (2004) and Niven & McAuley (2013). Using this approach, the anode was placed under the water's surface, approx. 10-15cm above the sediment, to prevent immobilising lamprey ammocoetes within the sediment. The anode was energised with 100V of pulsed DC for 15-20 seconds and then turned off for approximately five seconds to allow ammocoetes to emerge from their burrows. The anode was switched on and off in this way for approximately two minutes. Immobilised ammocoetes were collected by a second operator using a fine-mesh hand net as they emerged.

Lamprey species were identified to species level, where possible, with the assistance of a hand lens, through external pigmentation patterns and trunk myomere counts as described by Potter & Osborne (1975) and Gardiner (2003).

2.2 Fisheries habitat

A broad appraisal / overview of the upstream and downstream habitat at each site was also undertaken to evaluate the wider contribution to salmonid and lamprey spawning and general fisheries habitat. River habitat surveys and fisheries assessments were also carried out utilising elements of the approaches in the River Habitat Survey Methodology (Environment Agency, 2003) and Fishery Assessment Methodology (O'Grady, 2006) to broadly characterise the riverine sites (i.e., channel profiles, substrata etc.).

2.3 Biosecurity

A strict biosecurity protocol following IFI (2010) and the Check-Clean-Dry approach was adhered to during surveys for all equipment and PPE used. Disinfection of all equipment and PPE before and after use with Virkon™ was conducted to prevent the transfer of pathogens or invasive propagules between survey sites. Specific consideration was given to highly virulent crayfish plague (*Aphanomyces astaci*) given known historical outbreaks in connecting downstream catchments. Surveys were undertaken at sites in a downstream order to minimise the risk of upstream propagule mobilisation of pathogens and invasive species. Where feasible, equipment was also thoroughly dried (through UV exposure) between survey areas. Any aquatic invasive species or pathogens recorded within or adjoining the survey areas were geo-referenced. All Triturus staff are certified in 'Good fieldwork practice: slowing the spread of invasive non-native species' by the University of Leeds.

Table 2.1 Location of *n*=31 aquatic survey sites in the vicinity of the proposed Derrygreenagh Power development, Co. Offaly & Co. Westmeath († fisheries assessment only)

Site no.	Watercourse	EPA code	Location	X (ITM)	Y (ITM)	Potential associated infrastructure (watercourse crossing)
A1	Rochfortbridge Stream	07R04	R400 road crossing, Castlelost West	644392	741635	Gas pipeline route option 1
A2	Castlejordan River	07C04	R400 road crossing, Farthingstown	646879	740315	Gas pipeline route option 1 & 2
A3	Kiltonan Stream	07K04	Mongagh Bridge	648553	738867	Gas pipeline route option 1 & 2
A4	Kiltonan Stream	07K04	Farthingstown, east of R400 road crossing	649613	739013	Gas pipeline route option 1 & 3
A5	Unnamed stream	n/a	Carrick	652197	739948	Gas pipeline route option 1 & 3
A6	Castlejordan River	07C04	Carrick	652484	741375	Gas pipeline route option 1 & 3
A7	Unnamed stream	n/a	Milltown	652487	742166	Gas pipeline route option 1 & 3
A8	Milltownpass River	07M04	Milltown	652497	742393	Gas pipeline route option 1 & 3
B1	Kinnegad River	07K01	Rattin	653352	744648	Gas pipeline route option 1 & 3
B2	Hightown River	07H16	R446 road crossing, Rattin	653436	744861	Gas pipeline route option 1 & 3
***B3**	Kinnegad River	07K01	Killaskillen	658163	744354	n/a
C1	Yellow River	07Y02	Derrygreenagh	649916	736283	Electricity GCR option 2
C2	Yellow River	07Y02	R400 road crossing, Derryiron	651801	735983	Electricity GCR option 3
C3	Coolcor Stream	07C08	Barrysbrook	650625	733333	Electricity GCR option 1 & 2
C4	Coolcor Stream	07C08	Coolcor	651310	734459	Electricity GCR option 2
C5	Coolcor Stream	07C08	R400 road crossing, Coolcor	652286	735536	Electricity GCR option 3
C6	Clonin Stream	07C74	R400 road crossing, Coolcor	652408	735420	Electricity GCR option 3
***C7**	Yellow River	07Y02	Clongall Bridge	659381	737570	n/a
D1	Unnamed stream	n/a	Rathcobican	653388	732740	Electricity GCR option 3
D2	Road River	14R53	Rathcobican	652986	731991	Electricity GCR option 3
***D3**	Esker Stream	14 E03	Newtown Bridge	652952	728554	n/a

Site no.	Watercourse	EPA code	Location	X (ITM)	Y (ITM)	Potential associated infrastructure (watercourse crossing)
E1	Rochfort Demesne Stream	25R11	Kilbrennan	642171	742741	Gas pipeline route option 1
***E2**	Rochfort Demesne Stream	25R11	Stoneford Bridge	641792	744109	n/a
X1	Gallstown Stream	07G36	R400 road crossing, Gortumly	645879	742809	Gas pipeline route option 2
X2a	Derry River	07D28	R400 road crossing, Castlelost	646378	741569	Gas pipeline route option 2
X2b	Rochfortbridge Stream	07R04	Castlelost	646370	741537	Adjacent to gas pipeline route option 2
X3	Yellow River	07Y02	Derrygreenagh	649706	736462	Electricity GCR option 1 & 2
X4†	Grand Canal	n/a	Coole	650889	730911	Electricity GCR option 1
X5†	Grand Canal	n/a	Toberdaly	651780	731377	Electricity GCR option 1
X6	Toberdaly Stream	14T28	Toberdaly	651751	731394	Electricity GCR option 1
X7	Toberdaly Stream	14T28	Toberdaly	651791	731158	Electricity GCR option 1

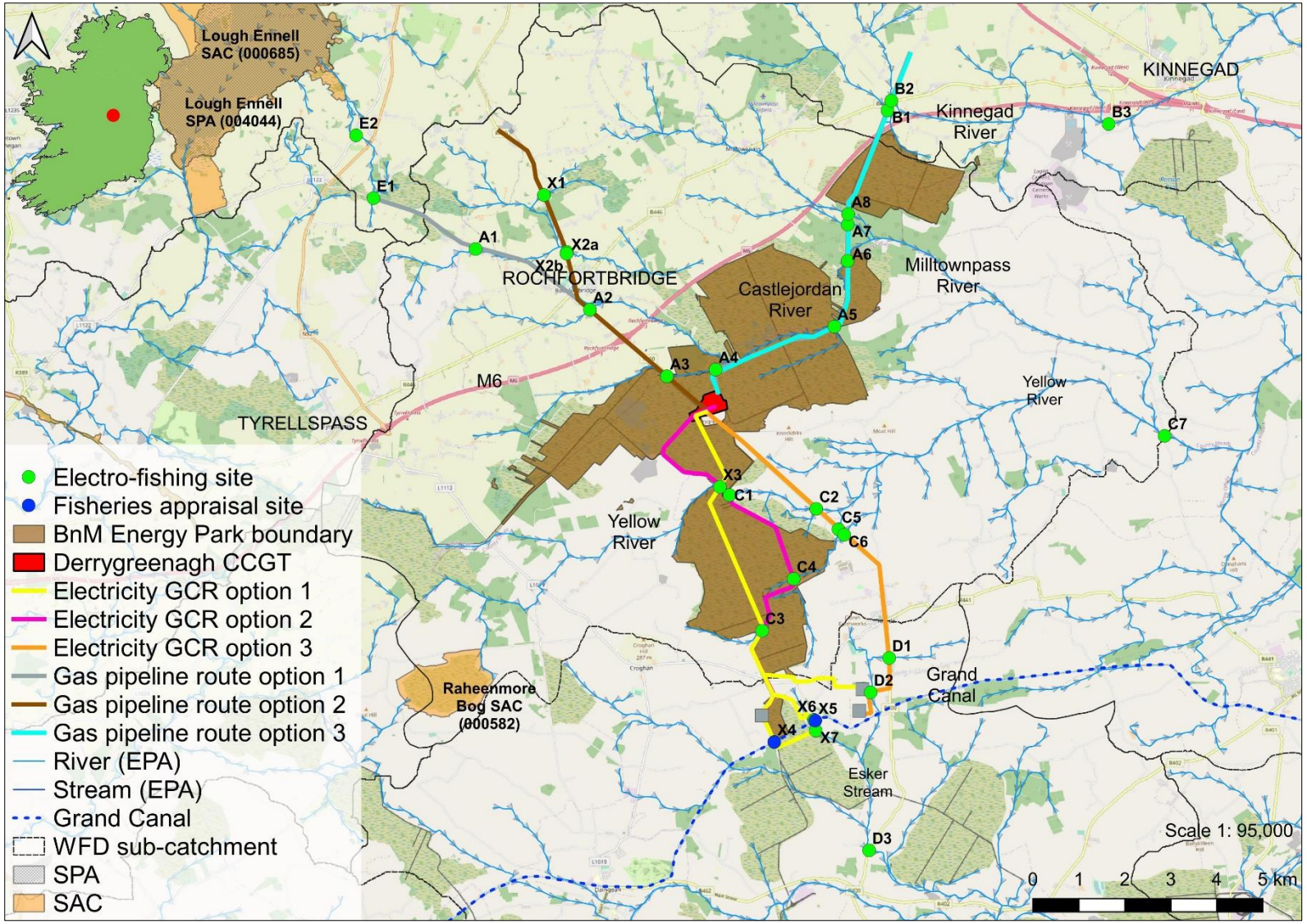

Figure 2.1 Overview of the *n*=31 fisheries survey site locations in vicinity of the proposed Derrygreenagh Power development, Aug-Sept 2022

3. Results

A catchment-wide electro-fishing survey of *n*=29 riverine sites in the vicinity of the proposed Derrygreenagh Power development was conducted on Wednesday 31st August and Thursday 1st, Friday 2nd, Thursday 22nd, Friday 23rd September 2022, following notification to Inland Fisheries Ireland. A fisheries appraisal (no electro-fishing) was also undertaken on 2 no. sites on the Grand Canal. The results of the survey are discussed below in terms of fish population structure, population size and the suitability and value of the surveyed areas as nursery and spawning habitat for salmonids, European eel and lamprey species. Scientific names are provided at first mention only.

3.1 Fisheries assessment & appraisal

3.1.1 Site A1 – Rochfortbridge Stream, Castlelost West

Three-spined stickleback (*Gasterosteus aculeatus*) (*n*=16) and lamprey *(Lampetra* sp.) (*n*=2) were the only fish species recorded via electro-fishing at site A1 (**Figure 3.1**).

The site was a poor quality salmonid nursery being degraded due to historical drainage, poor flow rates, heavy siltation and evident enrichment. The quality of spawning habitat was also poor (for both salmonids and lamprey) being reduced by the deterioration of the bed from algae and sedimentation. Holding water for adult salmonids was also poor given very limited deeper areas. However, the site was of moderate value for lamprey ammocoetes with localised shallow silt deposits supporting a low density population (0.5 per m^2). There was some suitability for European eel given the presence of dense macrophyte refugia but the poor flows and more limited cobble and boulder refugia reduced the overall value (none recorded).

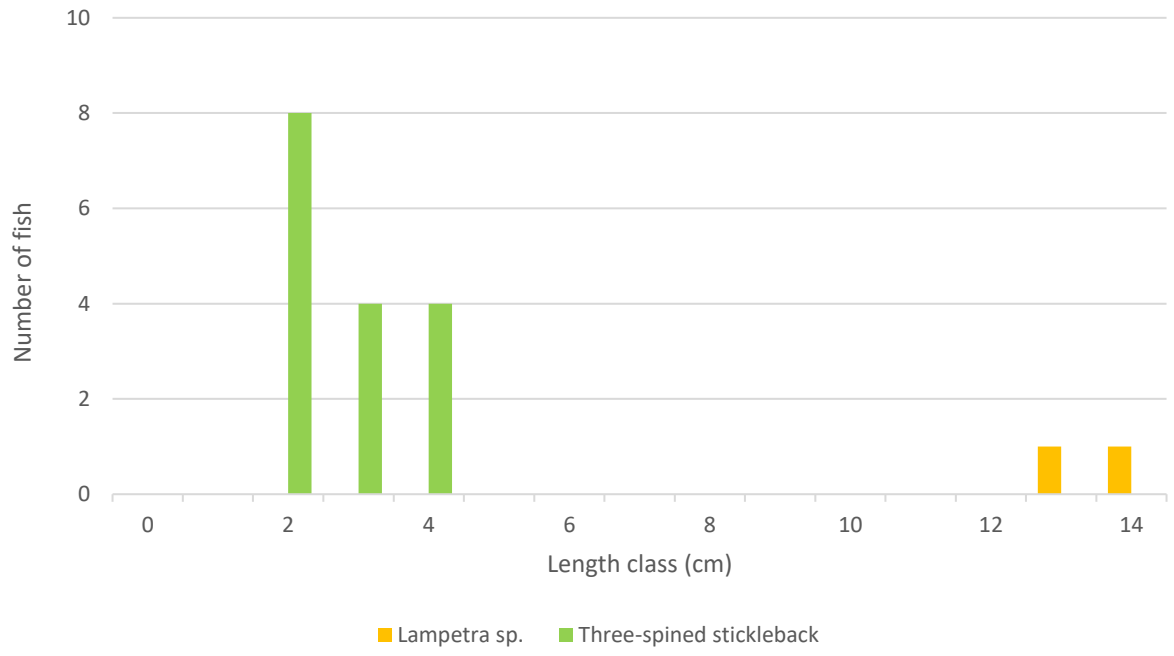

Figure 3.1 Length frequency distribution recorded via electro-fishing at site A1 on the Rochfortbridge Stream, August 2022

Plate 3.1 Representative image of site A1 on the Rochfortbridge Stream, August 2022

3.1.2 Site A2 – Castlejordan River, Farthingstown

Three-spined stickleback (*n*=16) was the only fish species recorded via electro-fishing at site A2 (**Figure 3.1**).

Apart from three-spined stickleback, the heavily vegetated site was not of fisheries value given historical modifications, poor hydromorphology, low flows and heavy siltation.

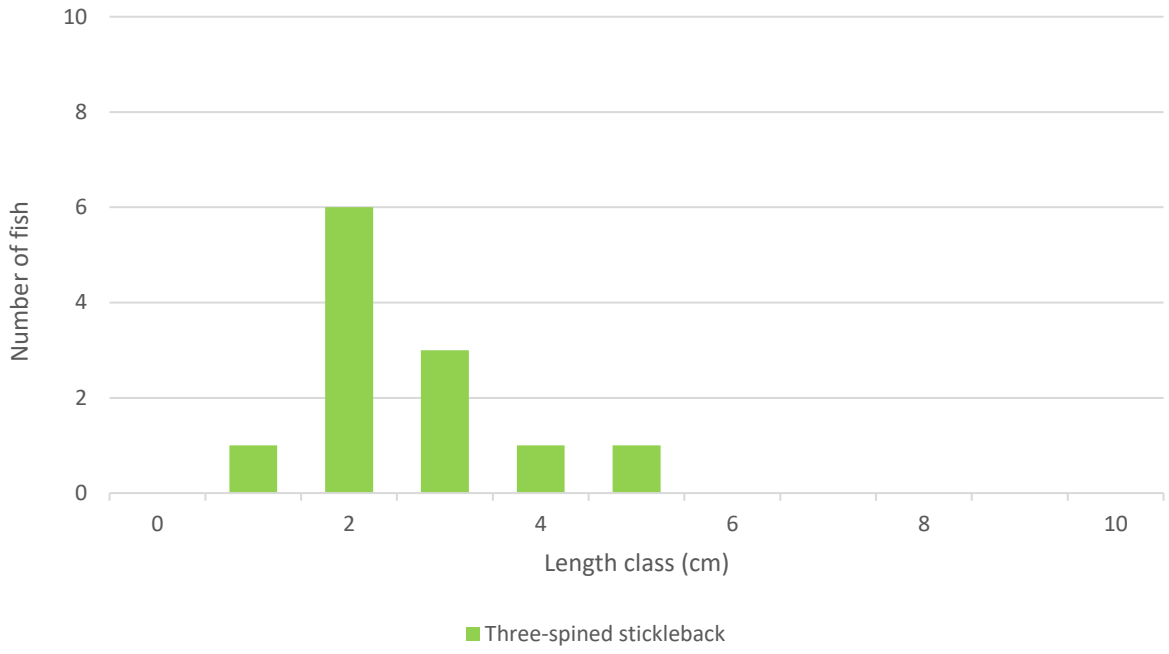

Figure 3.2 Length frequency distribution recorded via electro-fishing at site A2 on the Castlejordan Stream, August 2022

Plate 3.2 Representative image of site A2 on the Castlejordan Stream, August 2022

3.1.3 Site A3 – Kiltonan Stream, Mongagh Bridge

Brown trout (*Salmo trutta*) (*n*=8) and three-spined stickleback (*n*=8) were the only fish species recorded via electro-fishing at site A3 (**Figure 3.3**).

The modified site was considered a moderate quality salmonid nursery given the historical drainage, slower flow, heavy sedimentation and dense macrophyte growth. The spawning quality was poor due to the heavy sedimentation of the channel. Holding habitat was moderate overall due to the heavy macrophyte growth and the limited pool habitat. The channel had high suitability for lamprey ammocoetes given the soft organic rich sediment. However, very limited spawning habitat was present given heavy sedimentation and an absence of hard substrata (no lamprey were recorded). European eel habitat was moderate overall given the presence of dense macrophyte growth and pockets of deeper glide, although no eel were recorded.

Plate 3.3 Brown trout recorded at site A3 on the Kiltonan Stream (Mongagh River), September 2022

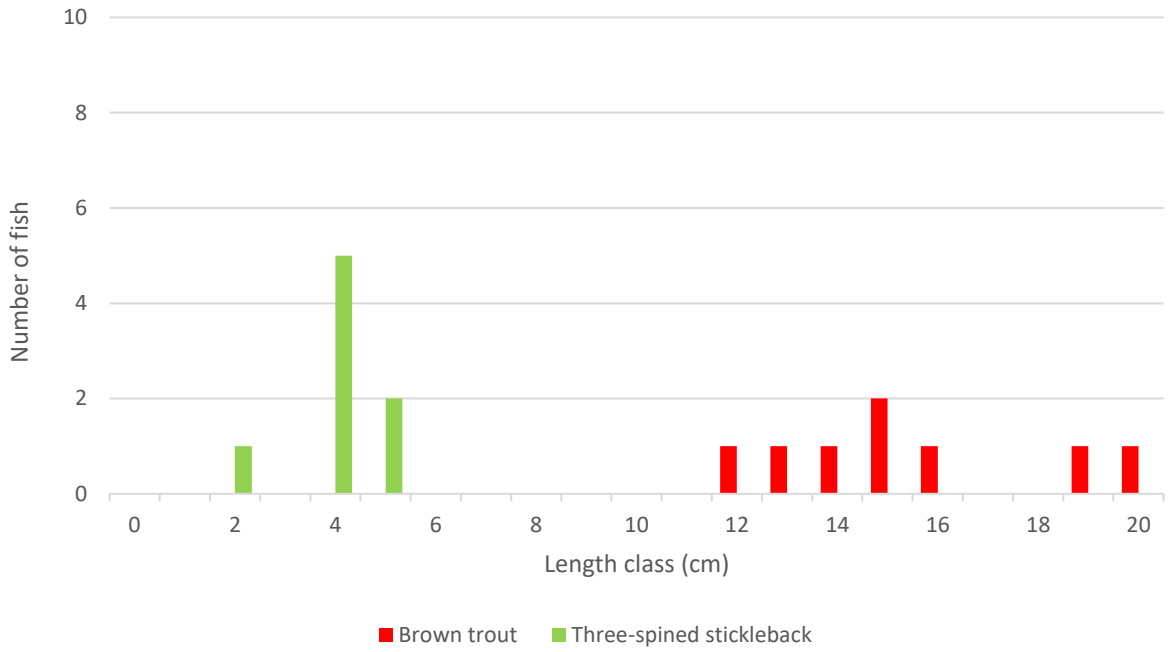

Figure 3.3 Length frequency distribution recorded via electro-fishing at site A3 on the Kiltonan Stream, September 2022

3.1.4 Site A4 – Kiltonan Stream, Farthingstown

Brown trout (*n*=1), lamprey (*Lampetra* sp.) (*n*=2), roach (*Rutilus rutilus*) (*n*=6) and three-spined stickleback (n=20) were recorded via electro-fishing at site A4 (**Figure 3.4**).

The site was of poor value to salmonids (only a single adult trout recorded) given poor flows, poor hydromorphology and evident siltation and enrichment pressures. Spawning habitat was not present and the site was not of value as a salmonid nursery. Despite the presence of frequent soft sediment accumulations, the site only supported a low density of *Lampetra* sp. ammocoetes (0.67 per m^2). This was considered to reflect the poor flows/hydromorphology and clay-dominated substrata. Despite some good suitability for European eel, none were recorded. Juvenile non-native roach were present in low numbers.

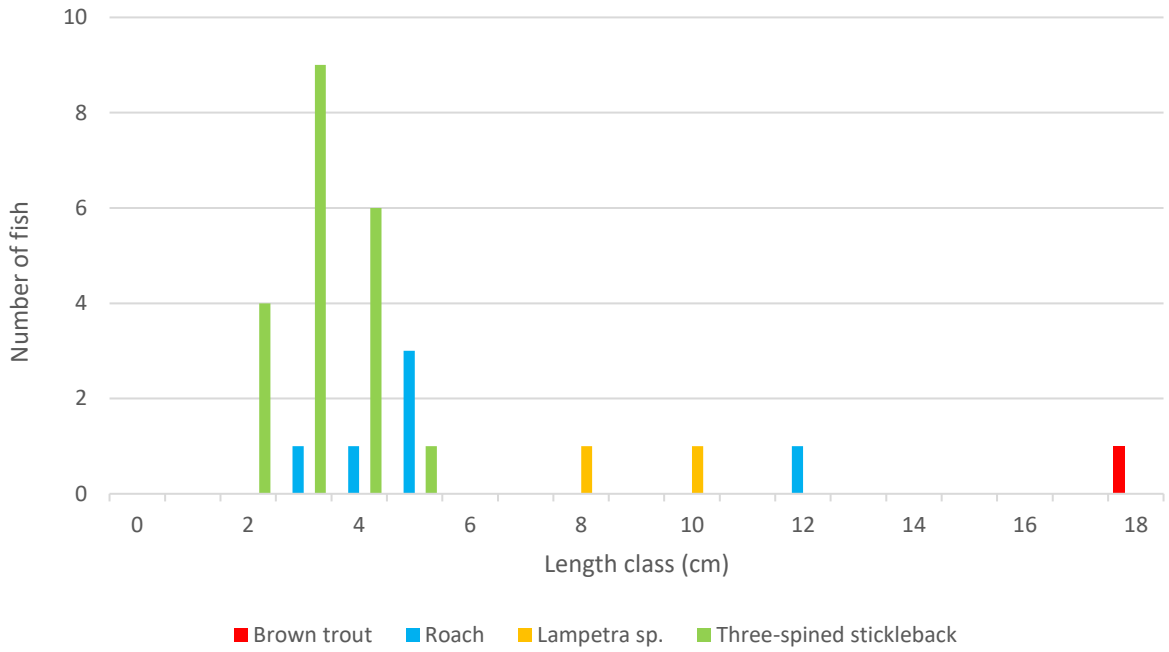

Figure 3.3 Length frequency distribution recorded via electro-fishing at site A4 on the Kiltonan Stream, August 2022

Plate 3.4 Representative image of site A4 on the Kiltonan Stream (Mongagh River), August 2022

3.1.5 Site A5 – unnamed stream, Carrick

A total of six fish species were recorded via electro-fishing at site A5, namely lamprey (*Lampetra* sp.) (*n*=2), roach (*n*=51), minnow (*Phoxinus phoxinus*) (*n*=6), perch (*Perca fluviatilis*) (*n*=1), gudgeon (*Gobio gobio*) (*n*=1) and pike (*Esox lucius*) (*n*=1) (**Figure 3.5**).

The site was of poor value to salmonids given poor flows, poor hydromorphology and evident siltation pressures - none were recorded. However, the plunge pool at the culvert provided some low potential as an adult holding habitat (as did the downstream-connecting Castlejordan River). Spawning habitat was almost entirely absent and the site was not of value as a salmonid nursery. The site was primarily of value as a coarse fish nursery, supporting high numbers of (mostly juvenile) non-native roach. Despite the presence of frequent soft sediment accumulations, the site only supported a low density of *Lampetra* sp. ammocoetes (0.75 per m^2). This was considered to reflect the poor flows/hydromorphology and clay-dominated substrata. Despite some good suitability for European eel, none were recorded.

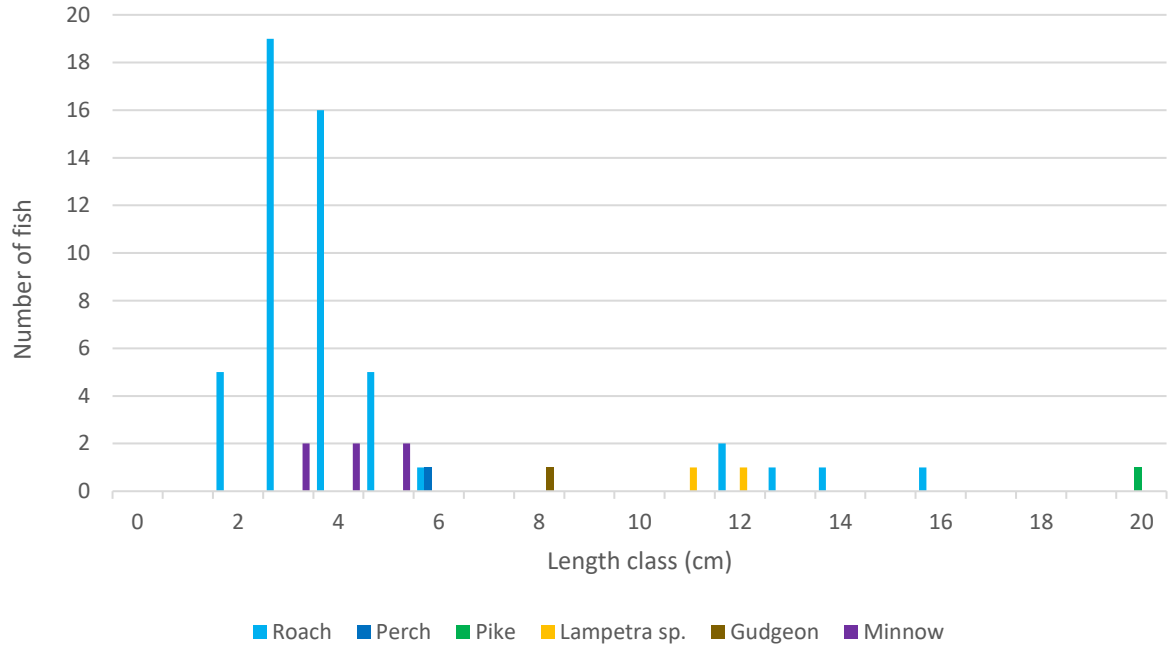

Figure 3.5 Length frequency distribution recorded via electro-fishing at site A5 on an unnamed Castlejordan River tributary, August 2022

Plate 3.5 Juvenile and adult roach recorded at site A5 on an unnamed Castlejordan River tributary, August 2022

3.1.6 Site A6 – Castlejordan River, Carrick

Brown trout (*n*=1), lamprey (*Lampetra* sp.) (*n*=1), pike (*n*=1), perch (*n*=4) and stone loach (*Barbatula barbatula*) (*n*=2) were recorded via electro-fishing at site A6 (**Figure 3.6**).

The site was of moderate value for salmonids given considerable hydromorphological and siltation pressures, supporting a very low density of brown trout (single juvenile only). Except for the short section near the bridge (moderate value), the site was not of value as a salmonid spawning or nursery habitat. However, given the predominance of deeper glide areas, good holding opportunities were present. The site was primarily of value as a coarse fish habitat. Despite the presence of frequent soft sediment accumulations, the site only supported a low density of *Lampetra* sp. ammocoetes (0.5 per m^2). Despite some good suitability for European eel (abundant instream refugia), none were recorded.

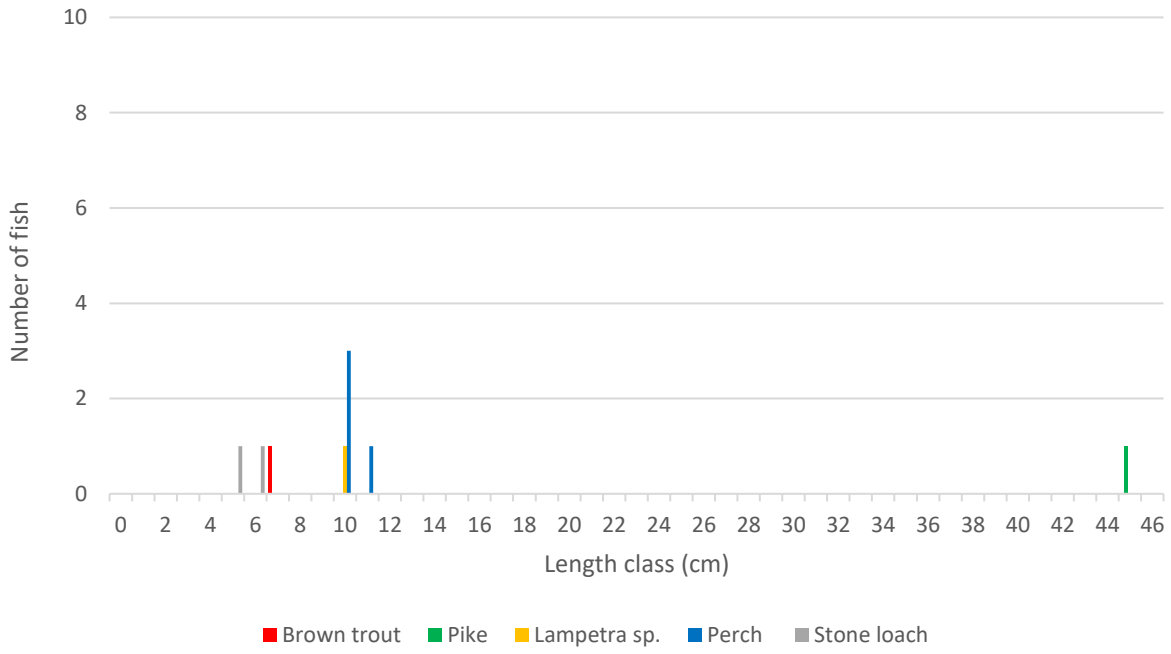

Figure 3.6 Length frequency distribution recorded via electro-fishing at site A6 on the Castlejordan River (Mongagh River), August 2022

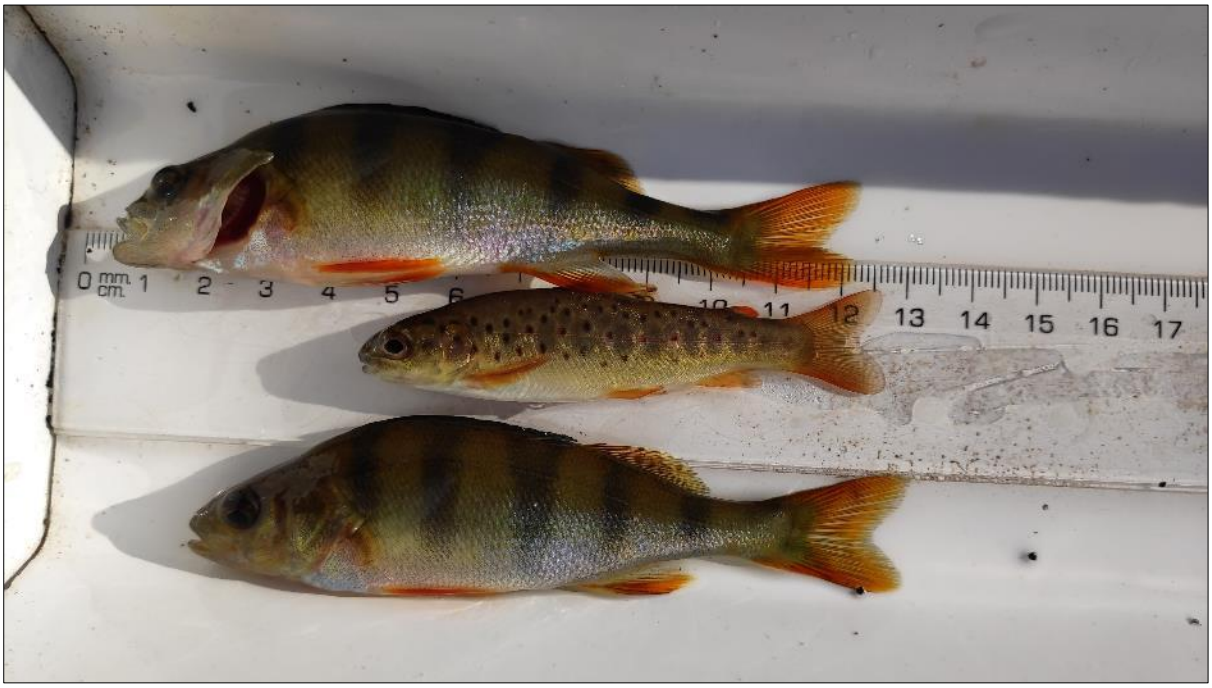

Plate 3.6 Juvenile perch and brown trout recorded at site A6 on the Castlejordan River (Mongagh River), August 2022

3.1.7 Site A7 – unnamed stream, Milltown

Site A7 was located on an unnamed stream at a potential gas pipeline route option 1 and 3 crossing, approx. 0.6km upstream of the Castlejordan River (Mongagh River) confluence. Despite being present on EPA mapping, no channel was identified during the survey, with a dry peat-base drainage ditch

present alongside the mapped route of the stream. The Castlejordan River tributary was likely realigned historically as part of land drainage works. Site A7 was not of fisheries value given an absence of aquatic habitats.

Plate 3.7 Representative image of site A7 on an unnamed Castlejordan River tributary, August 2022 (no channel or aquatic habitats present)

3.1.8 Site A8 – Milltownpass River, Milltown

Brown trout (*n*=20), lamprey (*Lampetra* sp.) (*n*=11) and pike (*n*=1) were recorded via electro-fishing at site A8 (**Figure 3.7**).

Site A8 was of high value for salmonids, despite hydromorphological, enrichment and siltation pressures, supporting a moderate density of primarily adult brown trout. The site was of highest value as a holding area for adult salmonids (excellent quality pool habitat under the bridge). Good quality spawning habitat for both salmonids and lamprey was present downstream of the aforementioned pool (mobile mixed gravels). The site was of relatively poor value as a salmonid nursery. However, the site was an excellent quality lamprey nursery (abundant soft sediment accumulations) and supported a moderate density of ammocoetes (4.4 per m^2) – this was the highest density recorded during the survey. Despite high suitability for European eel, none were recorded. The site was also of good value for coarse fish species such as pike, perch and roach (although the latter two species were not recorded).

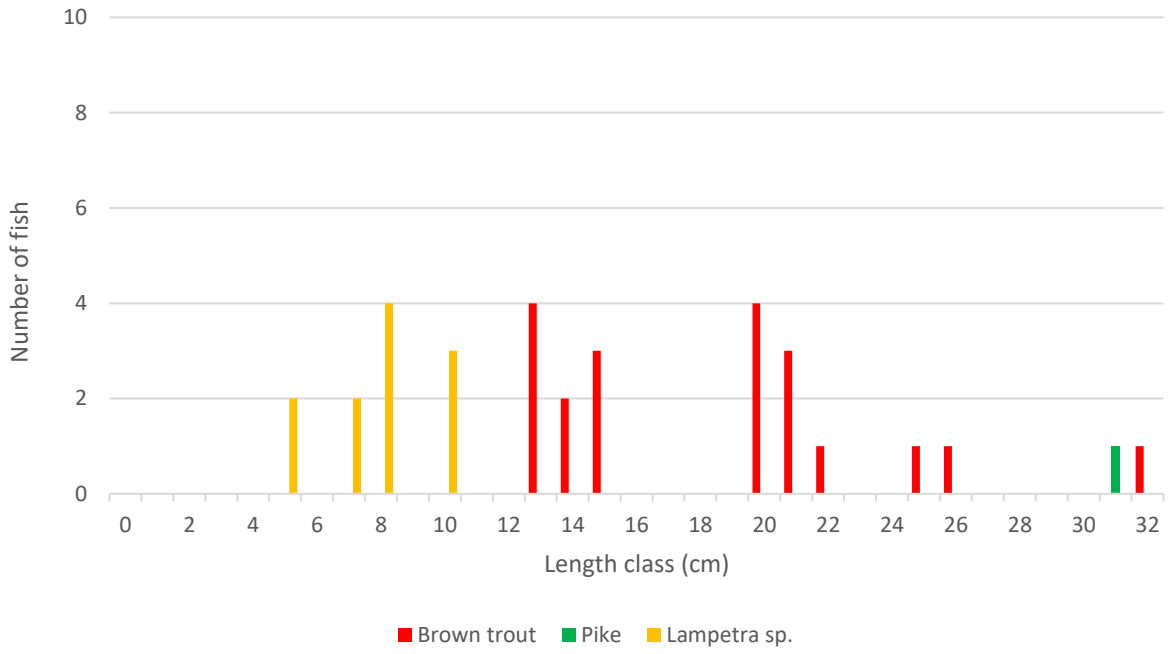

Figure 3.7 Length frequency distribution recorded via electro-fishing at site A8 on the Milltownpass River, August 2022

Plate 3.8 Adult brown trout and juvenile pike recorded at site A8 on the Milltownpass River, August 2022

3.1.9 Site B1 – Kinnegad River, Rattin

Brown trout (*n*=11) and three-spined stickleback (*n*=3) were the only fish species recorded via electro-fishing at site B1 (**Figure 3.8**).

The site was considered a moderate quality salmonid nursery, despite moderate to heavy siltation. Whilst some areas of good quality spawning habitat were present locally, the overall value was reduced due to historical drainage and sedimentation pressures. Holding habitat was of poor quality given a paucity of deeper glide and pool habitat. The site provided some good quality lamprey spawning habitat. Despite some suitability locally in soft sediment accumulations, no larval lamprey were recorded. Whilst the site was of moderate suitability for European eel given the presence of ample refugia, none were recorded.

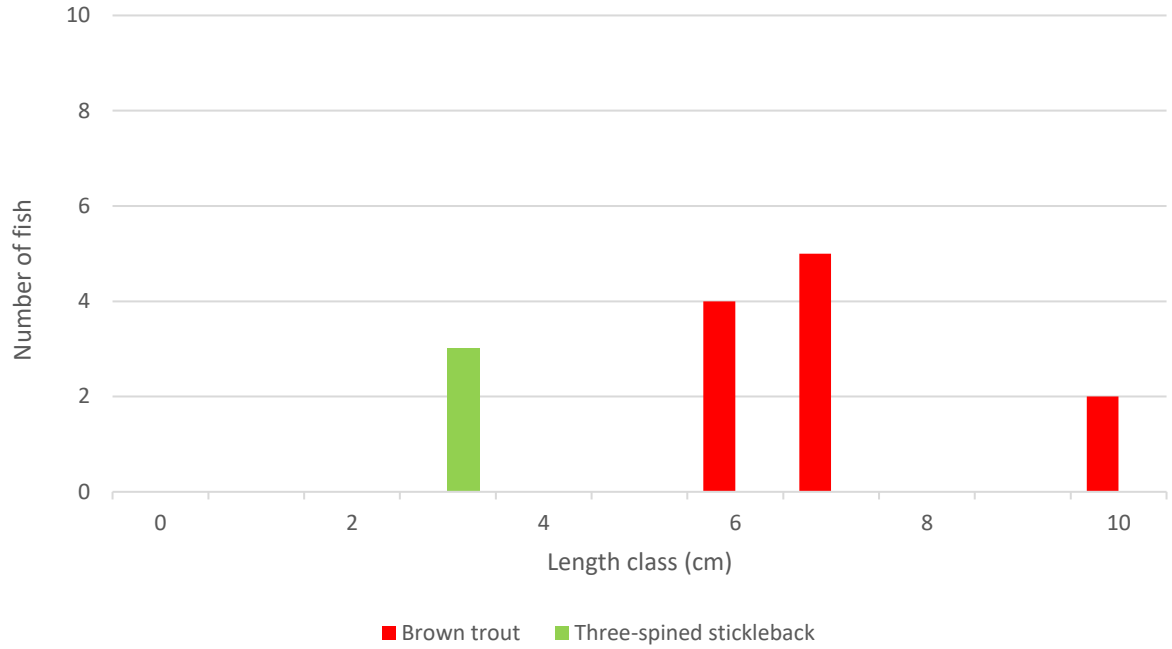

Figure 3.8 Length frequency distribution recorded via electro-fishing at site B1 on the Kinnegad River, August 2022

Plate 3.9 Representative image of site B1 on the Kinnegad River, August 2022

3.1.10 Site B2 – Hightown River, Rattin

Brown trout (*n*=18), minnow (*n*=6) and three-spined stickleback (*n*=3) were recorded via electro-fishing at site B2 (**Figure 3.9**).

The site was considered a moderate quality salmonid nursery given the presence of localised riffle and slow flowing glide, despite moderate to heavy siltation and compaction. A moderate density of juvenile trout were recorded. The spawning value for salmonids and lamprey was locally good but moderate overall given historical drainage and siltation pressures. Holding habitat quality was moderate overall due to a paucity of deeper pool habitat. Whilst some suitable soft sediment areas for lamprey ammocoete was present locally, none were recorded during targeted electro-fishing. Despite some moderate suitability, no European eel were recorded.

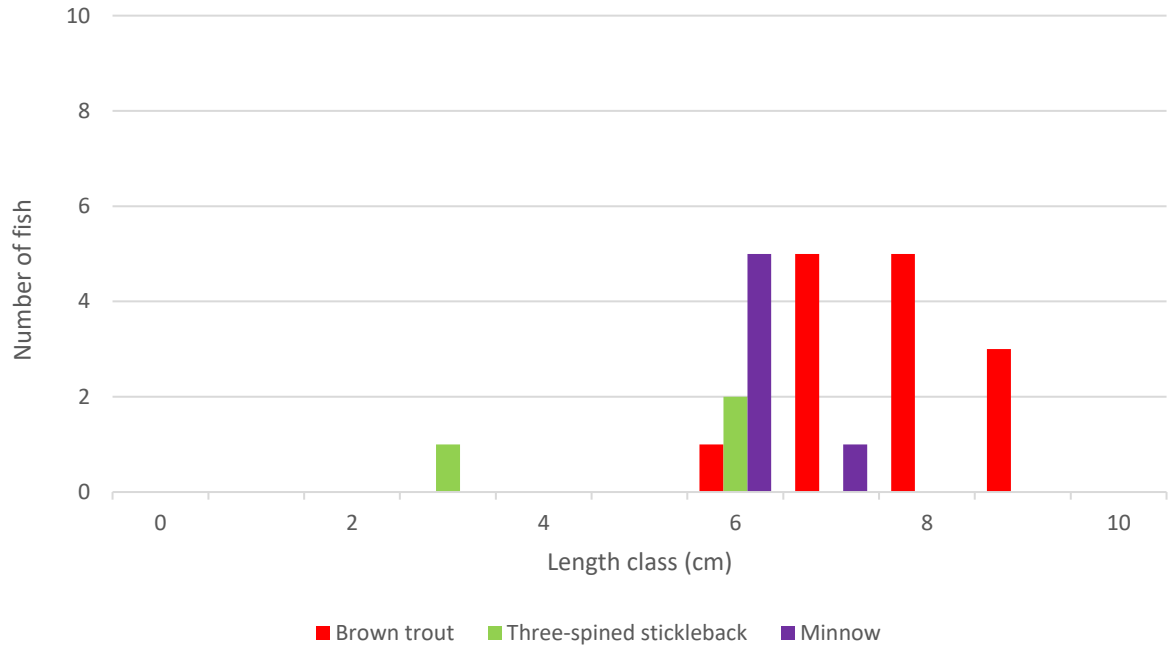

Figure 3.9 Length frequency distribution recorded via electro-fishing at site B2 on the Hightown River, August 2022

Plate 3.10 Brown trout recorded at site B2 on the Hightown River, August 2022

3.1.11 Site B3 – Kinnegad River, Killaskillen

Electro-fishing was not undertaken at site B3 given prohibitive depths of >1.3m and a soft riverbed (deep silt). The Kinnegad River at this location was considered a poor quality salmonid nursery given the poor flows, heavy sedimentation and dense macrophyte growth. The spawning quality was also poor due to the absence of even moderate flows. The site was of some value as a holding area for adult salmonids but overall the site was more suited to coarse fish species such as roach and pike. The site could theoretically support ammocoetes given the abundant soft sediment accumulations but the very low summer flows observed reduced the suitability for the species in addition to the absence of suitable spawning habitat. European eel habitat was moderate overall given the presence of dense macrophyte growth and deep pools.

Plate 3.11 Representative image of site B3 on the Kinnegad River, August 2022

3.1.12 Site C1 – Yellow River, Derrygreenagh

Brown trout, perch, pike and three-spined stickleback were recorded via electro-fishing at site C1 (**Figure 3.10**).

The heavily vegetated site was considered a good habitat for coarse fish and supported low numbers of pike and perch. The site was considered a poor to moderate quality salmonid nursery given the historical drainage, slower flow, heavy sedimentation and dense macrophyte growth. Only a low number of small brown trout were recorded. The spawning quality was poor due to the heavy siltation of the channel. Holding habitat was moderate overall due to the heavy macrophyte growth despite the presence of deeper glide and localised pools. The channel had moderate suitability for lamprey ammocoetes given the presence of soft sediment, but the peat influences and very limited spawning habitat reduced the potential for the species (none recorded). Despite some moderate suitability for European eel, none were recorded.

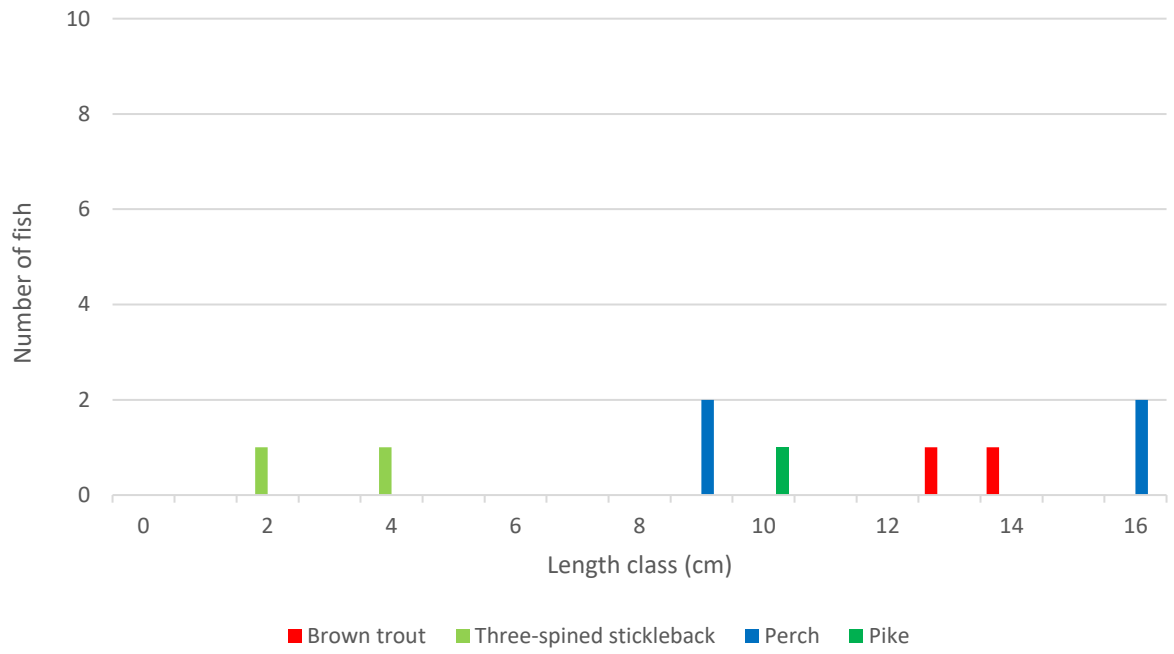

Figure 3.10 Length frequency distribution recorded via electro-fishing at site C1 on the Yellow River, September 2022

Plate 3.12 Perch and juvenile pike recorded at site C1 on the Yellow River, September 2022

3.1.13 Site C2 – Yellow River, Derryiron

Brown trout (*n*=55) and stone loach (*n*=1) were the only fish species recorded via electro-fishing at site C2 (**Figure 3.11**).

The site was a good quality salmonid habitat supporting relatively high numbers of mixed-cohort brown trout (the highest density recorded during the survey). Good quality nursery habitat was present although this was reduced by evident siltation and enrichment pressures. Localised deeper glide and pool, in addition to macrophyte beds, provided some good quality holding habitat for adult salmonids. Some good quality spawning habitat for salmonids and lamprey was present but again the value was reduced by siltation. The site was of poor suitability for lamprey ammocoetes given the dominance of hard substrata and none were recorded. Despite some good suitability (abundant refugia), no European eel were recorded.

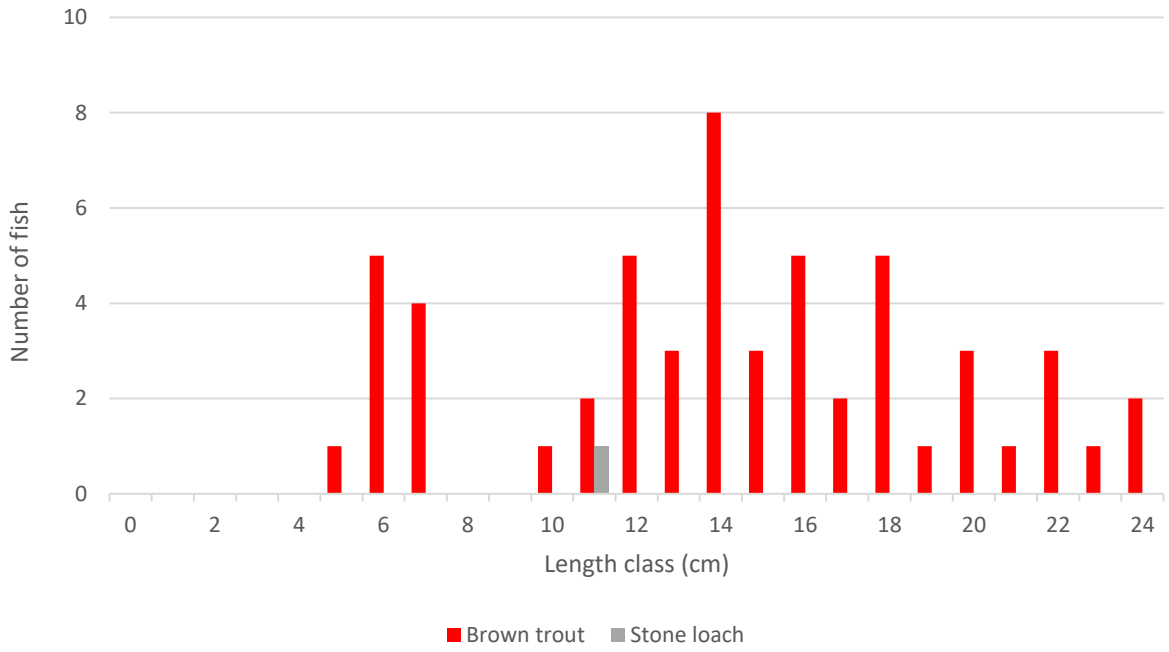

Figure 3.11 Length frequency distribution recorded via electro-fishing at site C2 on the Yellow River, September 2022

Plate 3.13 Representative image of site C2 on the Yellow River, September 2022

3.1.14 Site C3 – Coolcor Stream, Barrysbrook

Three-spined stickleback (*n*=25) and ten-spined stickleback (*Pungitius pungitius*) (*n*=2) were the only fish species recorded via electro-fishing at site C3 (**Figure 3.12**).

Apart from stickleback species, site C3 was not of fisheries value given poor hydromorphology, heavy siltation and poor connectivity with superior downstream habitats. There was no suitability for salmonids given low seasonal flows and heavy siltation pressures. There was some low suitability for European eel although connectivity issues would likely preclude the species.

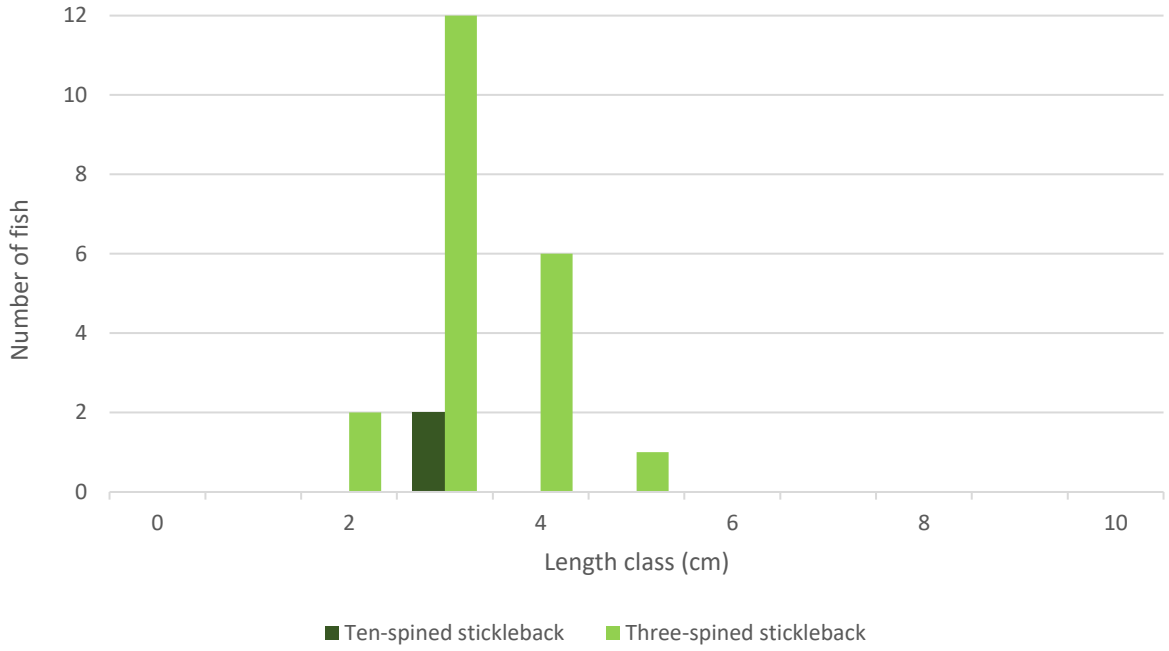

Figure 3.12 Length frequency distribution recorded via electro-fishing at site C2 on the Yellow River, September 2022

Plate 3.14 Three-spined & ten-spined stickleback recorded at site C3 on the Coolcor Stream, September 2022

3.1.15 Site C4 – Coolcor Stream, Coolcor

Electro-fishing was not undertaken at site C4 given prohibitive depths of >1.5m and a soft bed (deep silt). Except for three-spined stickleback and ten-spined stickleback (recorded via sweep netting), site

C4 was not of fisheries value given poor hydromorphology, heavy siltation and poor connectivity with superior downstream habitats. There was no suitability for salmonids given regulated flows and siltation pressures. There was some low suitability for European eel although connectivity issues would likely obstruct the species from passing upstream (west) of the pumping station.

Plate 3.15 Representative image of site C4 on the Coolcor Stream, September 2022

3.1.16 Site C5 – Coolcor Stream, Coolcor

Three-spined stickleback (*n*=12) was the only fish species recorded via electro-fishing at site C5 (**Figure 3.13**).

Except for three-spined stickleback, recorded in low densities, the site was not of fisheries value given historical modifications, poor hydromorphology, low flows and heavy siltation.

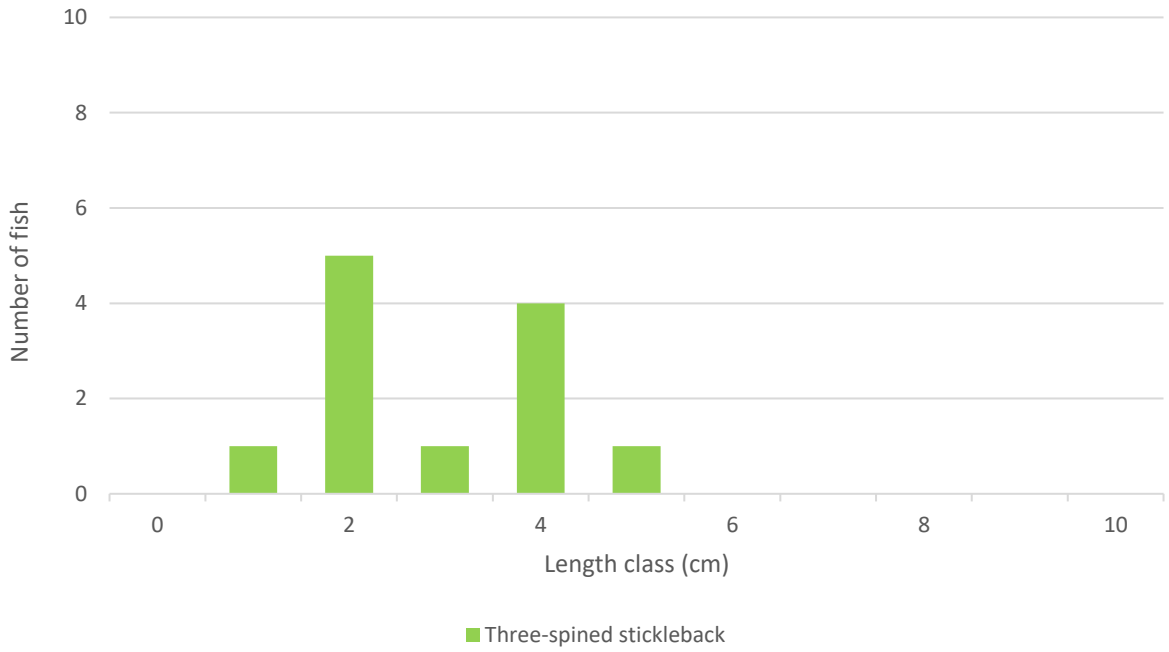

Figure 3.13 Length frequency distribution recorded via electro-fishing at site C5 on the Coolcor River, September 2022

Plate 3.16 Representative image of site C5 on the Coolcor River, September 2022

3.1.17 Site C6 – Clonin Stream, Coolcor

Site C6 was located on the uppermost reaches of the Clonin Stream (07C74) at the R400 road and potential electricity GCR option 3 crossing. The Castlejordan River tributary was dry at the time of survey with no aquatic species or habitats present. Site C6 was not of fisheries value given an absence of aquatic habitats.

Plate 3.17 Representative image of site C6 on the Clonin Stream (dry, ephemeral channel)

3.1.18 Site C7 – Yellow River, Clongall Bridge

A total of six fish species were recorded via electro-fishing at site C7, namely Atlantic salmon (*Salmo salar*) (*n*=20), brown trout (*n*=14), lamprey (*Lampetra* sp.) (*n*=3), European eel (*n*=1), stone loach (*n*=3) and minnow (*n*=10) (**Figure 3.14**). This was the only survey site found to support Atlantic salmon and European eel.

The site was a good salmonid nursery with swift flowing glide habitat and abundant boulder and cobble refugia, supporting moderate densities of juvenile Atlantic salmon. Spawning habitat was of moderate quality overall given limited gravels and dominance of boulder and cobble. Good quality holding habitat was present given abundant deep glide and pool in addition to overhanging vegetation and scoured banks – such areas supported a low density of adult brown trout. Whilst some good quality lamprey nursery habitat was present, soft sediment areas only supported a low density of ammocoetes (1.5 per m^2). Suitability for European eel was very high given abundant refugia, with a single adult recorded.

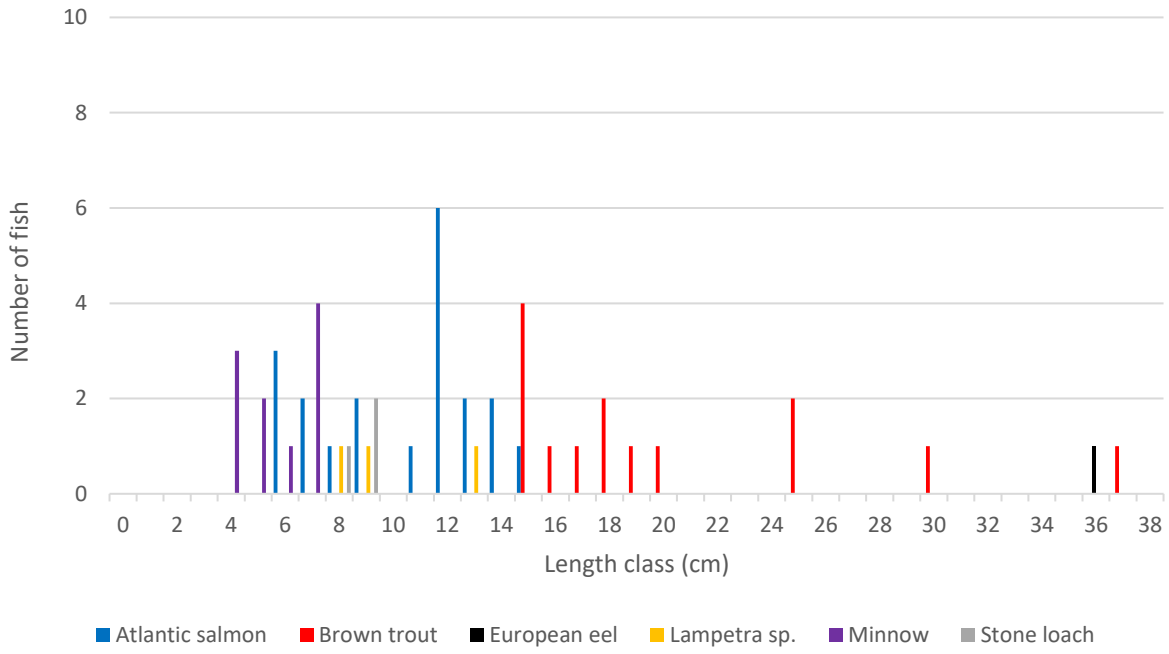

Figure 3.14 Length frequency distribution recorded via electro-fishing at site C7 on the Yellow River at Clongall Bridge, September 2022

Plate 3.18 Atlantic salmon parr recorded at site C7 on the Yellow River, September 2022

3.1.19 Site D1 – unnamed stream, Rathcobican

Site D1 was located on an unnamed stream at the R400 road and potential electricity GCR option 3 crossing, approx. 0.5km upstream of the Road River confluence. The stream was dry at the time of survey with no aquatic species or habitats present. Site D1 was not of fisheries value given an absence of aquatic habitats.

Plate 3.19 Representative image of site D1 on an unnamed stream, August 2022 (dry channel)

3.1.20 Site D2 – Road River, Rathcobican

Three-spined stickleback (*n*=9) was the only fish species recorded via electro-fishing at site D2 (**Figure 3.15**).

With the exception of three-spined stickleback (recorded at low densities), site D2 was not of fisheries value given poor hydromorphology, heavy siltation and poor connectivity with superior downstream habitats.

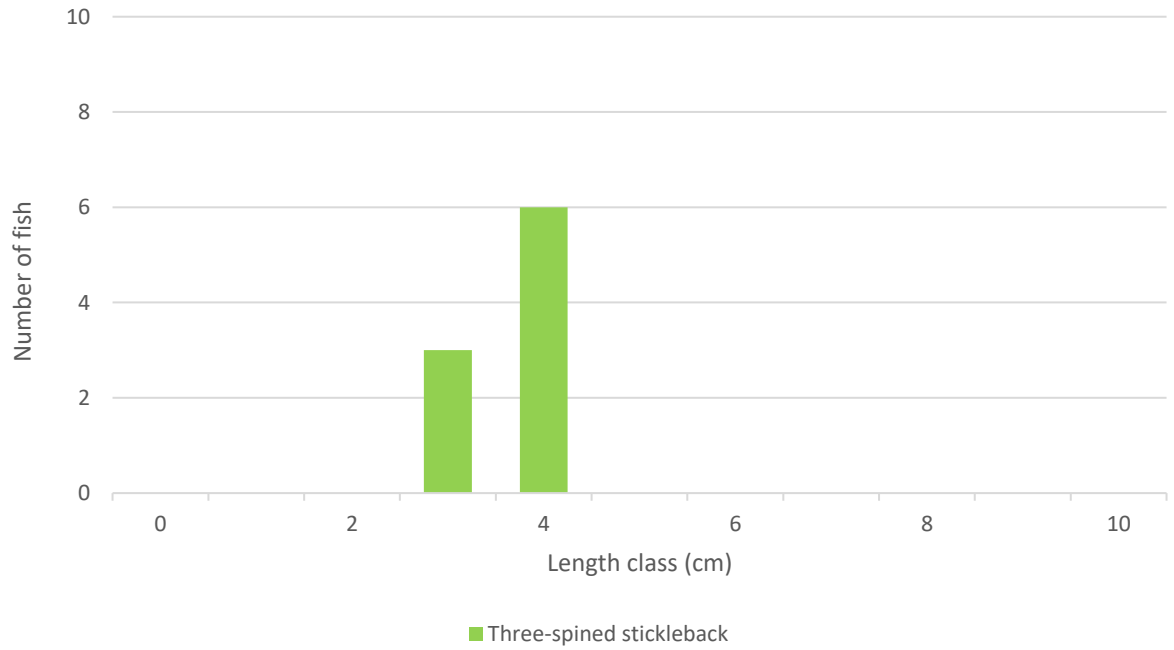

Figure 3.15 Length frequency distribution recorded via electro-fishing at site D2 on the Road River, August 2022

Plate 3.20 Representative image of site D2 on the Road River, August 2022

3.1.21 Site D3 – Esker Stream, Newtown Bridge

Brown trout (*n*=23), minnow (*n*=8), stone loach (*n*=5) and dace (*Leuciscus leuciscus*) (*n*=26) were recorded via electro-fishing at site D3 (**Figure 3.16**).

The site was a moderate quality salmonid nursery, although it supported only a low density of juvenile trout due to historical drainage, siltation and enrichment pressures. Some moderate quality spawning habitat (for both salmonids and lamprey) was present but was also reduced in quality due to filamentous algae and sedimentation. Holding habitat for adult salmonids was present but localised, and the site supported mostly adult trout. Although some suitability existed for larval lamprey, none were recorded via targeted lector-fishing of soft sediment deposits. Despite good suitability for European eel, none were recorded. Mixed cohorts of the invasive dace were present.

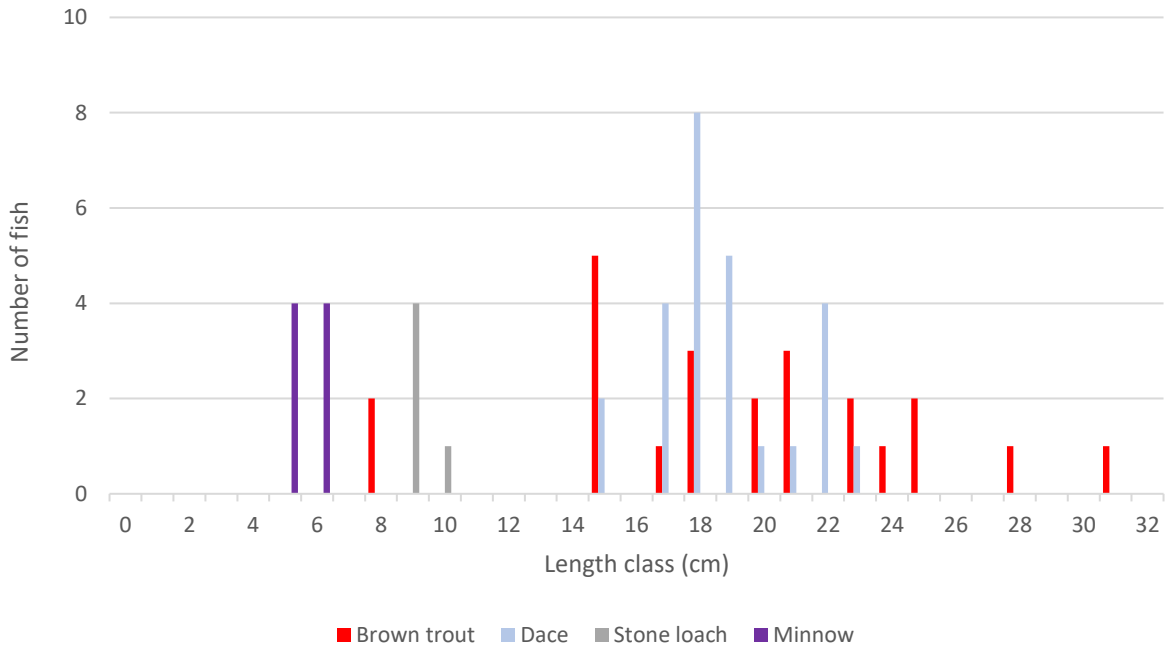

Figure 3.16 Length frequency distribution recorded via electro-fishing at site D3 on the Esker Stream at Newtown Bridge, September 2022

Plate 3.21 Minnow and stone loach recorded at site D3 on the Esker Stream at Newtown Bridge, September 2022

3.1.22 Site E1 – Rochfort Demesne Stream, Kilbrennan

Three-spined stickleback (*n*=12) was the only fish species recorded via electro-fishing at site E1 (**Figure 3.17**).

With exception of three-spined stickleback, the site was not of fisheries value given historical modifications, poor hydromorphology, poor connectivity with downstream habitats, low flows and very heavy siltation.

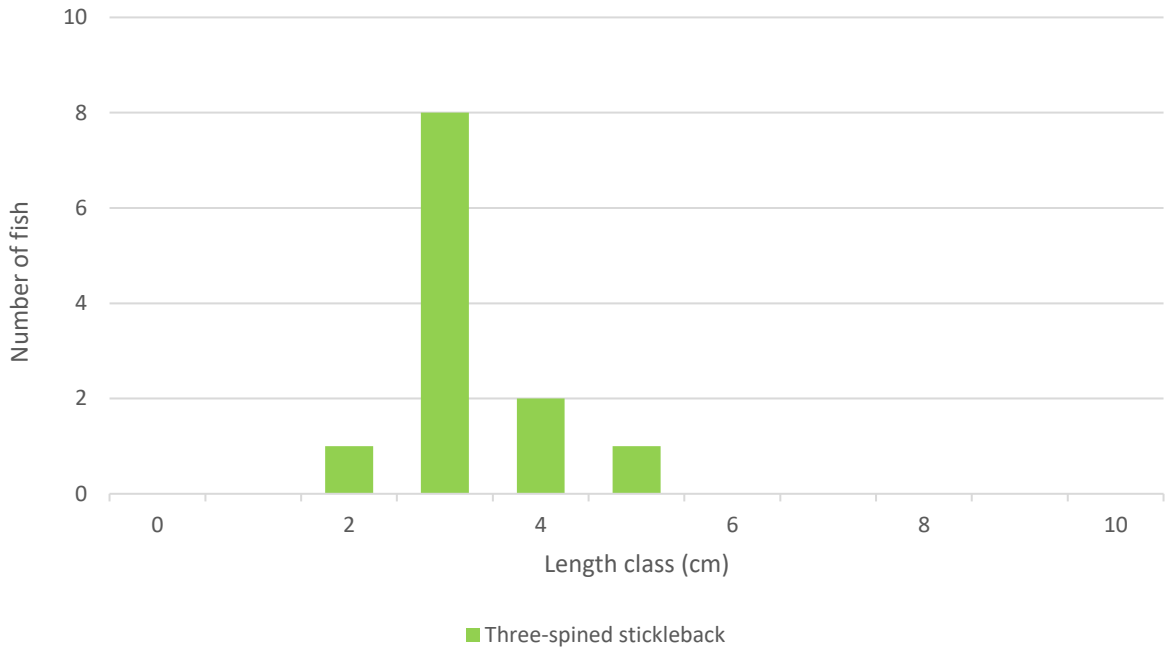

Figure 3.17 Length frequency distribution recorded via electro-fishing at site E1 on the Rochford Demesne Stream, September 2022

Plate 3.22 Representative image of site E1 on the Rochford Demesne Stream, September 2022

3.1.23 Site E2 – Rochfort Demesne Stream, Stoneford Bridge

Brown trout (*n*=14) and three-spined stickleback (*n*=12) were the only fish species recorded via electro-fishing at site E2 (**Figure 3.18**).

The site was a moderate quality salmonid nursery, supporting a moderate density of juvenile trout, with some moderate quality spawning habitat also present. However, the value was considerably reduced due to historical drainage, siltation and enrichment pressures. The shallow site was a poor quality holding habitat for adult salmonids. The site was also of poor quality for lamprey ammocoetes

in terms of burial habitat given limited areas of organic-rich silt and limited suitable spawning areas (none recorded). Despite some moderate suitability for European eel, none were recorded.

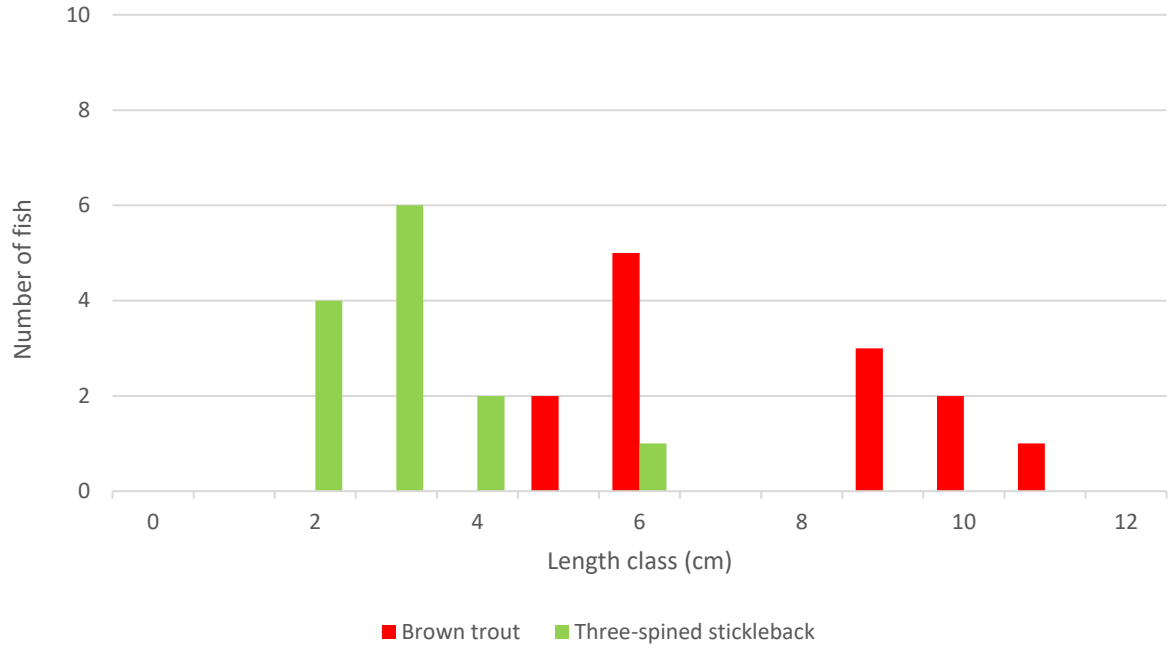

Figure 3.18 Length frequency distribution recorded via electro-fishing at site E2 on the Rochford Demesne Stream, September 2022

Plate 3.23 Representative image of site E2 on the Rochford Demesne Stream, September 2022

3.1.24 Site X1 – Gallstown River, Gortumly

Three-spined stickleback (*n*=7) was the only fish species recorded via electro-fishing at site X1 (**Figure 3.19**). Apart from three-spined stickleback, recorded in low densities, the site was not of fisheries value given historical modifications, poor hydromorphology, poor connectivity with downstream habitats, low flows and very heavy siltation.

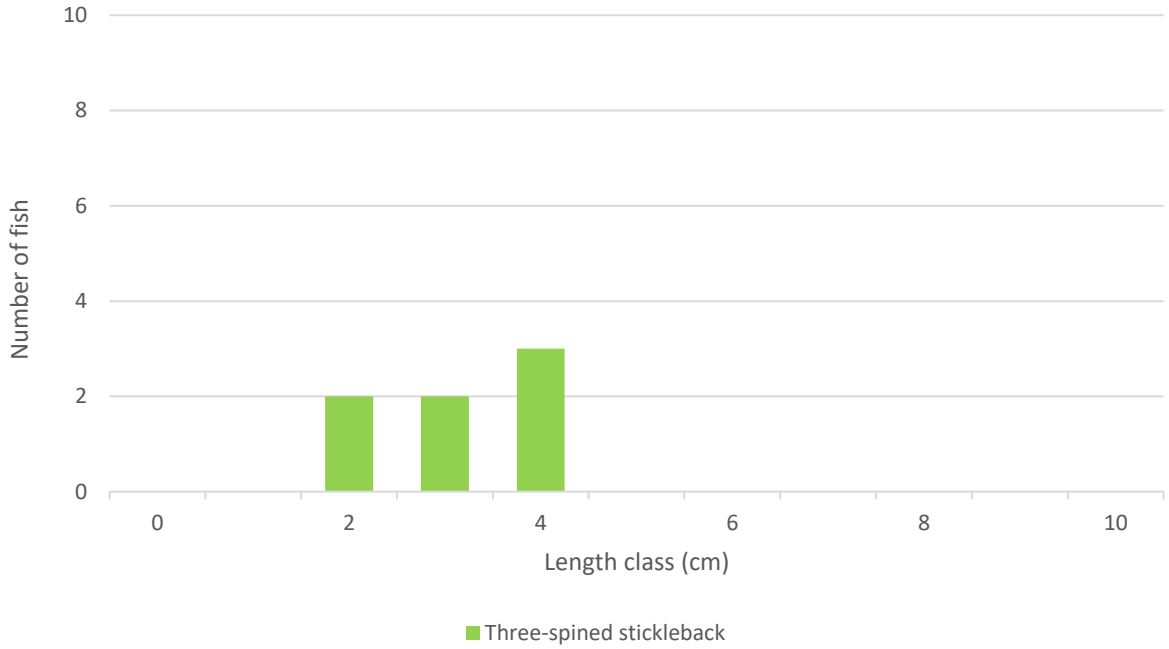

Figure 3.19 Length frequency distribution recorded via electro-fishing at site X1 on the Gallstown River, September 2022

Plate 3.24 Representative image of site X1 on the Gallstown River, September 2022

3.1.25 Site X2a – Derry River, Rahanine

Survey site X2a was not suitable electro-fishing due to isolated pools of water being present only. The site was not of fisheries value given historical modifications, poor hydromorphology, heavy shading, poor connectivity with downstream habitats, no flowing water and heavy siltation.

Plate 3.25 Representative image of site X2a on the Derry River, September 2022

3.1.26 Site X2b – Rochfortbridge Stream, Rahanine

Three-spined stickleback (*n*=14) was the only fish species recorded via electro-fishing at site X2b (**Figure 3.20**).

Apart from three-spined stickleback, recorded at low densities, the site was not of very poor fisheries value given historical modifications, poor hydromorphology, poor connectivity with downstream habitats, low flows and very heavy siltation. However, there was some low suitability for European eel (none recorded).

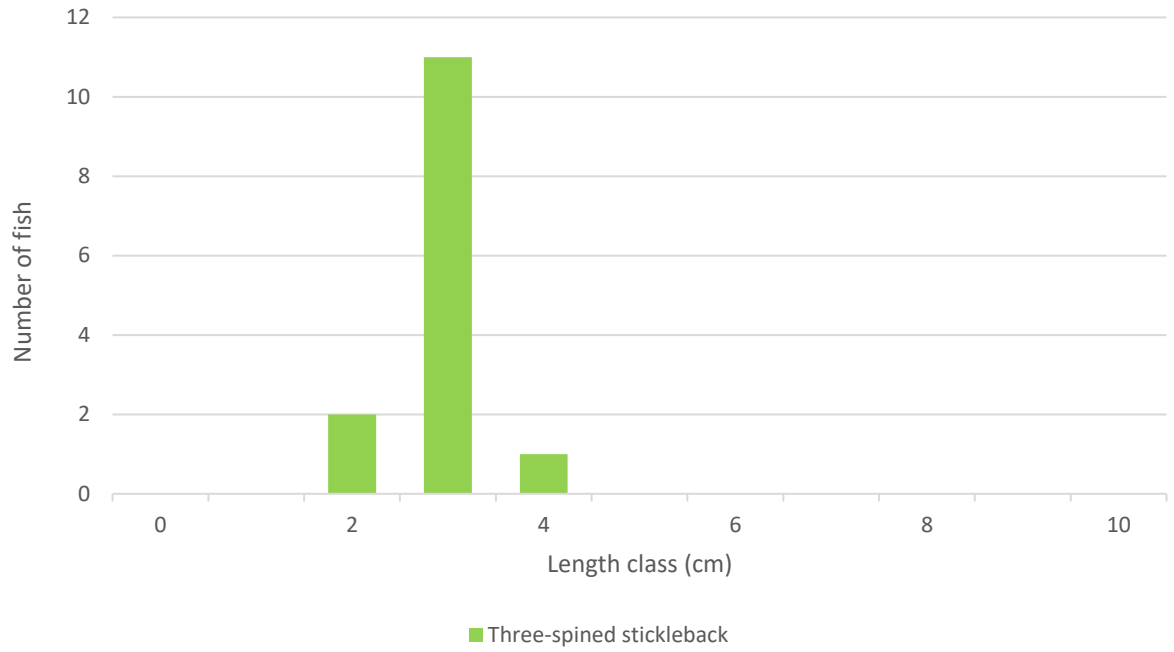

Figure 3.20 Length frequency distribution recorded via electro-fishing at site X2b on the Derry River, September 2022

Plate 3.26 Representative image of site X2b on the Derry River, September 2022

3.1.27 Site X3 – Yellow River, Derrygreenagh

Brown trout (*n*=11), minnow (*n*=1) and pike (*n*=2) were recorded via electro-fishing at site X3 (**Appendix A**). The site was a moderate quality salmonid nursery, supporting a low density of juvenile brown trout. This reflected the significant hydromorphological modifications. However, some moderate quality spawning habitat was present for both salmonids and lamprey. The site of good

value as an adult salmonid holding habitat with deeper pools and glide being abundant. Soft sediment accumulations were humic in nature and unsuitable for lamprey ammocoetes (none recorded). Despite some moderate suitability for European eel, none were recorded.

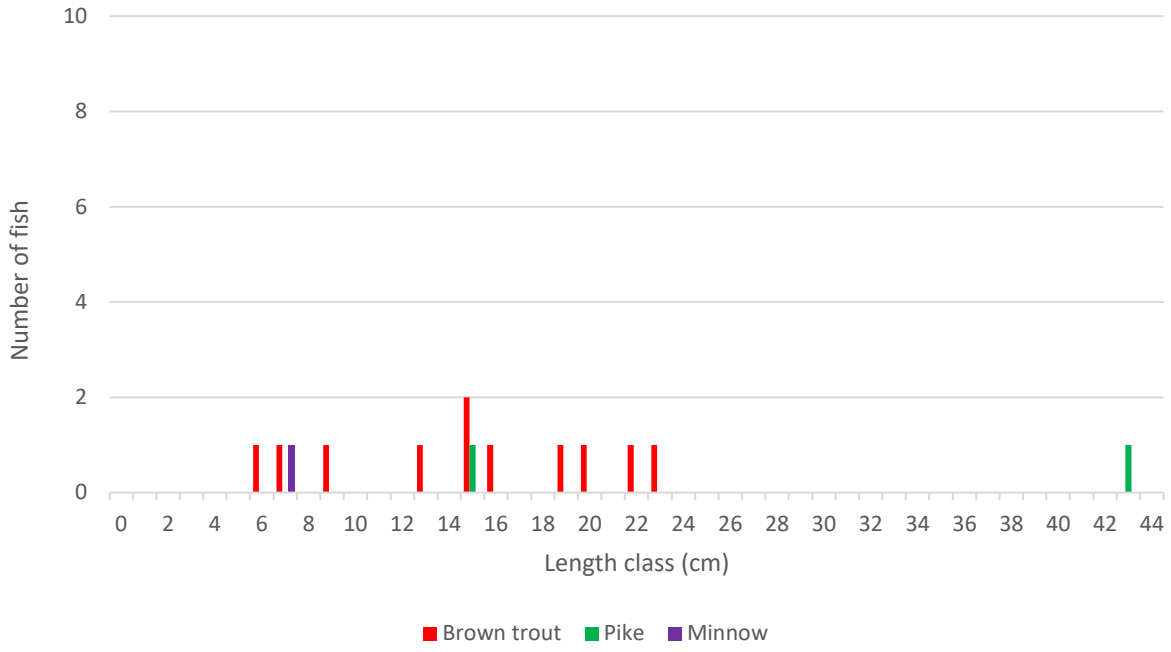

Figure 3.21 Length frequency distribution recorded via electro-fishing at site X3 on the Yellow River, September 2022

Plate 3.27 Juvenile pike recorded at site X3 on the Yellow River, September 2022

3.1.28 Site X4 – Grand Canal, Coole

Electro-fishing was not undertaken at site X4 given prohibitive depths and inherent unsuitability (i.e. canal site). However, a fisheries appraisal was undertaken. Site X4 was of high value for a range of coarse fish species with abundant nursery and spawning habitat present given abundant macrophyte cover. Species such as roach and perch were visibly abundant in vicinity of the bridge. The site was also highly suitable as a European eel habitat.

Plate 3.28 Representative image of site X4 on the Grand Canal, September 2022

3.1.29 Site X5 – Grand Canal, Toberdaly

Electro-fishing was not undertaken at site X4 given prohibitive depths and inherent unsuitability (i.e. canal site). However, a fisheries appraisal was undertaken. Site X4 was of high value for a range of coarse fish species with abundant nursery and spawning habitat present given abundant macrophyte cover. Species such as roach, perch and pike were observed during the survey. The site was also highly suitable as a European eel habitat as with site X4 on the Grand Canal.

Plate 3.29 Representative image of site X5 on the Grand Canal, September 2022

3.1.30 Site X6 – Toberdaly Stream, Toberdaly

Three-spined stickleback (*n*=15) was the only fish species recorded via electro-fishing at site X6 (**Figure 3.20**). With exception of three-spined stickleback, the site was not of fisheries value given historical modifications, poor hydromorphology, low flows and heavy siltation. There was low suitability for European eel but none were recorded.

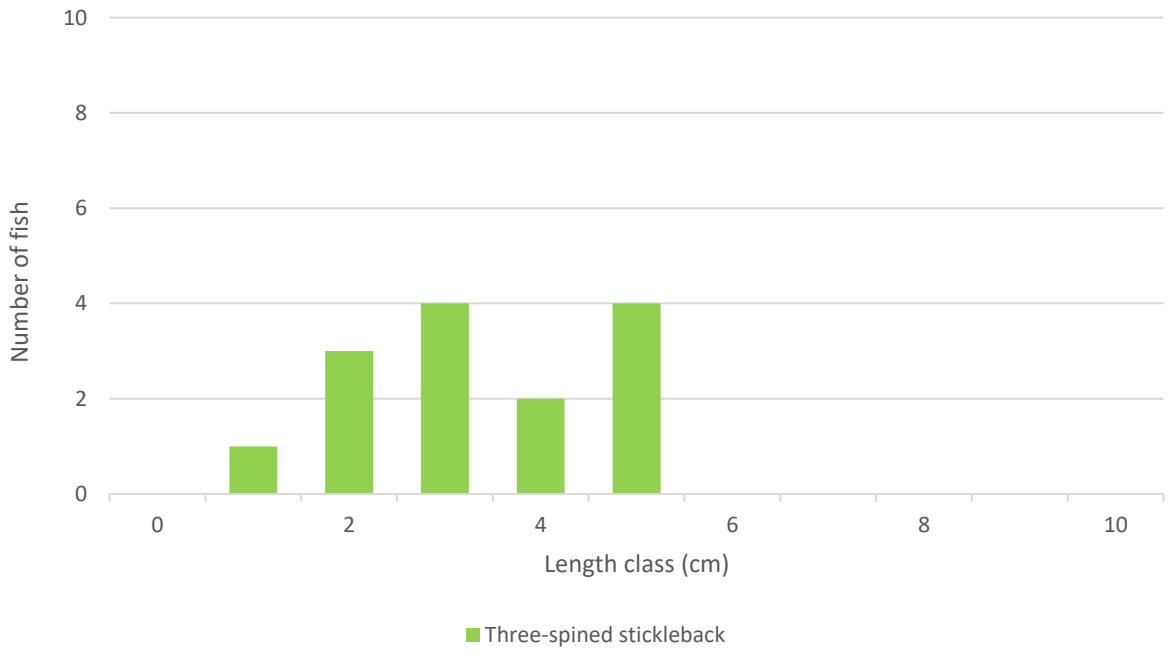

Figure 3.22 Length frequency distribution recorded via electro-fishing at site X6 on the Toberdaly Stream, September 2022

Plate 3.30 Representative image of site X6 on the Toberdaly Stream, September 2022

3.1.31 Site X7 – Toberdaly Stream, Toberdaly

Site X7 was located on the Toberdaly Stream (14T28) south of the Grand Canal. The stream had been evidently realigned and the section south of the channel did not appear hydrologically connected with that surveyed at site X6. The stream at this location was ephemeral and dry at the time of survey. Thus, site X7 was not of fisheries value given an absence of aquatic habitats.

Plate 3.31 Representative image of site X7 on the Toberdaly Stream, September 2022 (dry, ephemeral channel)

Table 3.1 Fish species densities per m^2 recorded at sites in the vicinity of the proposed Derrygreenagh Power development via electro-fishing in August-September 2022 (values in bold represent the highest densities recorded for each species, respectively)

Site	Watercourse	CPUE (elapsed time)	Approx. area fished (m^2)	Fish density (per m^2)												
				Atlantic salmon	Brown trout	*Lampetra* sp.	European eel	Three-spined stickleback	Ten-spined stickleback	Roach	Perch	Pike	Gudgeon	Minnow	Stone loach	Dace
A1	Rochfortbridge Stream	5	170	0.000	0.000	0.5 per m^2	0.000	0.094	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A2	Castlejordan River	5	50	0.000	0.000	0.000	0.000	0.240	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A3	Kiltonan Stream	10	80	0.000	0.100	0.000	0.000	0.100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
A4	Kiltonan Stream	10	100	0.000	0.010	0.67 per m^2	0.000	0.200	0.000	0.060	0.000	0.000	0.000	0.000	0.000	0.000
A5	Unnamed stream	5	75	0.000	0.000	0.75 per m^2	0.000	0.000	0.000	**0.680**	0.013	**0.013**	**0.013**	**0.080**	0.000	0.000
A6	Castlejordan River	10	180	0.000	0.006	0.5 per m^2	0.000	0.000	0.000	0.000	**0.022**	0.006	0.000	0.000	0.011	0.000
A7	Unnamed stream	n/a	n/a - dry channel	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
A8	Milltownpass River	10	210	0.000	0.095	**4.4 per m^2**	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000
B1	Kinnegad River	10	200	0.000	0.055	0.000	0.000	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
B2	Hightown River	10	200	0.000	0.090	0.000	0.000	0.015	0.000	0.000	0.000	0.000	0.000	0.030	0.000	0.000
B3	Kinnegad River	n/a	n/a - too deep	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
C1	Yellow River	10	390	0.000	0.005	0.000	0.000	0.005	0.000	0.000	0.010	0.003	0.000	0.000	0.000	0.000
C2	Yellow River	10	380	0.000	**0.145**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000
C3	Coolcor Stream	5	60	0.000		0.000	0.000	**0.417**	**0.033**	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C4	Coolcor Stream	n/a	n/a - too deep	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
C5	Coolcor Stream	5	50	0.000		0.000	0.000	0.240	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Site	Watercourse	CPUE (elapsed time)	Approx. area fished (m^2)	Fish density (per m^2)												
				Atlantic salmon	Brown trout	*Lampetra* sp.	European eel	Three-spined stickleback	Ten-spined stickleback	Roach	Perch	Pike	Gudgeon	Minnow	Stone loach	Dace
C6	Clonin Stream	n/a	n/a - dry channel	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
C7	Yellow River	10	320	**0.063**	0.044	1.5 per m^2	**0.003**	0.000	0.000	0.000	0.000	0.000	0.000	0.031	0.009	0.000
D1	Unnamed stream	n/a	n/a - dry channel	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
D2	Road River	5	40	0.000	0.000	0.000	0.000	0.225	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
D3	Esker Stream	10	300	0.000	0.077	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.027	**0.017**	**0.087**
E1	Rochfort Demesne Stream	5	80	0.000	0.000	0.000	0.000	0.150	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
E2	Rochfort Demesne Stream	10	280	0.000	0.050	0.000	0.000	0.043	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	Gallstown Stream	5	50	0.000	0.000	0.000	0.000	0.140	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X2a	Derry River	5	40	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X2b	Rochfortbridge Stream	5	50	0.000	0.000	0.000	0.000	0.280	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X3	Yellow River	10	280	0.000	0.039	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.000	0.004	0.000	0.000
X6	Toberdaly Stream	5	80	0.000	0.000	0.000	0.000	0.188	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X7	Toberdaly Stream	n/a	n/a - dry channel	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table 3.2 Summary of fish species of higher conservation value and relative abundances (low, medium, high & very high) recorded via **electro-fishing** per survey site in the vicinity of the proposed Derrygreenagh Power development, August-September 2022

Site	Watercourse	Relative abundance				Other species
		Atlantic salmon	Brown trout	*Lampetra* sp.	European eel	
A1	Rochfortbridge Stream			Low		Three-spined stickleback
A2	Castlejordan River					Three-spined stickleback
A3	Kiltonan Stream			Low		Three-spined stickleback
A4	Kiltonan Stream		Low	Low		Three-spined stickleback, roach
A5	Unnamed stream			Low		Roach, perch, pike, gudgeon, minnow
A6	Castlejordan River		Low	Low		Stone loach, perch, pike
A7	Unnamed stream	No fish recorded (dry channel)				
A8	Milltownpass River		Medium	Medium		Pike
B1	Kinnegad River		Medium			Three-spined stickleback
B2	Hightown River		Medium			Three-spined stickleback, minnow
B3	Kinnegad River	No electro-fishing undertaken (too deep)				
C1	Yellow River		Low			Three-spined stickleback, pike, perch
C2	Yellow River		High			Stone loach
C3	Coolcor Stream					Three-spined stickleback, ten-spined stickleback
C4	Coolcor Stream	No electro-fishing undertaken (too deep)				
C5	Coolcor Stream					Three-spined stickleback
C6	Clonin Stream	No fish recorded (dry channel)				
C7	Yellow River	Medium	Medium	Low	Low	Stone loach, minnow
D1	Unnamed stream	No fish recorded (dry channel)				
D2	Road River					Three-spined stickleback
D3	Esker Stream		Medium			Dace, minnow, stone loach
E1	Rochfort Demesne Stream					Three-spined stickleback
E2	Rochfort Demesne Stream		Medium			Three-spined stickleback

Site	Watercourse	Relative abundance				Other species
		Atlantic salmon	Brown trout	*Lampetra* sp.	European eel	
X1	Gallstown Stream					Three-spined stickleback
X2a	Derry River	No fish recorded				
X2b	Rochfortbridge Stream					Three-spined stickleback
X3	Yellow River		Medium			Pike, minnow
X4	Grand Canal	n/a – fisheries appraisal only				
X5	Grand Canal	n/a – fisheries appraisal only				
X6	Toberdaly Stream					Three-spined stickleback
X7	Toberdaly Stream	No fish recorded (dry channel)				

Conservation value: Atlantic salmon (*Salmo salar*), brook lamprey (L*ampetra planeri*) and river lamprey (*Lampetra fluviatilis*) are listed under Annex II of the Habitats Directive [92/42/EEC]. Atlantic salmon and river lamprey are also listed under Annex V of the Habitats Directive [92/42/EEC]. European eel are 'critically endangered' according to most recent ICUN red list (Pike et al., 2020) and listed as 'critically engendered' in Ireland (King et al., 2011). With the exception of the Inland Fisheries Acts 1959 to 2017, brown trout and coarse fish species have no legal protection in Ireland.

4. Discussion

The watercourses in the vicinity of the proposed Derrygreenagh Power development were typically small, modified, lowland depositing channels draining areas of cutover bog. Historical drainage pressures (straightening & deepening) and siltation have significantly reduced the quality and heterogeneity of aquatic habitats in the vicinity of the proposed development. Nevertheless, the larger watercourses, such as the Yellow River, Milltownpass River, Castlejordan River and Esker River, were found to support salmonid populations and or lamprey (*Lampetra* sp.) and provided better quality fisheries habitats. The Grand Canal was of very high value for a range of coarse fish species, as well as European eel.

Brown trout were recorded, invariably in low densities, at a total of 11 no. sites on the Kiltonan Stream (site A4), Castlejordan River (A6), Milltownpass River (A8), Kinnegad River (B1), Hightown River (B2), Yellow River (C1, C2, C7 & X3), Esker Stream (D3) and the Rochfort Demesne Stream (E2) (**Table 3.1, 3.2**). The Kinnegad River and Castlejordan (Mongagh) River support a genetically distinct sub-population of trout within the Boyne catchment (Massa-Gallucci & Mariani, 2011) and are thus of particular conservation value. All 4 no. survey sites on the Yellow River supported salmonids, with Atlantic salmon recorded in moderate densities at site C7 (Clongall Bridge), the only site found to support the species during the survey. The Yellow River supported the highest Atlantic salmon (C7) and brown trout (C2) densities recorded.

Without exception, all watercourses surveyed in the vicinity of the proposed Derrygreenagh Power development had been historically modified and the majority were exposed to considerable siltation pressures. Historical straightening and deepening of watercourses damages habitat and hydromorphological heterogeneity, encourages sediment deposition and invariably results in an irreparable reduction in fisheries potential, particularly for salmonids (O'Grady et al., 2017, O'Grady, 2006). Diffuse siltation is one of the greatest threats to salmonid populations, particularly in peat and agricultural catchments such as that adjoining the proposed development. Sediment not only blocks interstitial spaces in substrata (colmation) and limits oxygen supply to salmonid eggs (required for healthy embryonic development & successful hatching) but can also smother substrata, thus reducing available spawning habitat and impact macro-invertebrate communities on which salmonids feed (Kelly-Quinn et al., 2020; Davis et al., 2018; Conroy et al., 2016; Cocchiglia et al., 2012; Louhi et al., 2008, 2011; Walling et al., 2003; Soulsby et al., 2001). Gravel compaction from sedimentation reduces the spawning capacity of a channel and it has been shown that eggs laid in clean gravels which have subsequently been silted over by peat have failed to hatch (Crisp 1993, 2000).

Lamprey ammocoetes (*Lampetra* sp., likely *L. planeri* given the location in the upper reaches of the respective catchments) were recorded from 7 no. sites on the Rochfortbridge Stream (A1), Kiltonan Stream (A3 & A4), unnamed stream (A5), Castlejordan River (A6), Milltownpass River (A8) and the Yellow River (C7) (**Table 3.1, 3.2**). Apart from site A8 on the Milltownpass River which supported a medium density of ammocoetes (4.4 per m^2), lamprey were present at low densities in the remaining survey areas containing the species (i.e. ≤1.5 per m^2) of targeted larval survey habitat. These low densities in the Castlejordan/Yellow sub-catchment were similar to those recorded by O'Connor (2006) who found a widespread albeit clumped distribution of lamprey in these catchments.

Lamprey habitat was generally poor across the survey area and the abundances and distribution of *Lampetra* sp. ammocoetes observed during this survey reflected the often low summer flows, the poor hydromorphology of most sites and the dominance of peat-dominated soft sediment. Owing to their relatively small morphologies, *Lampetra* species such as brook lamprey require clean, fine gravels in which to dig their redds (Lasne et al., 2010; Rooney et al., 2013; Dawson et al., 2015) although areas may also include fractions of sand, larger gravels, and cobble (Nika & Virbickas, 2010). Spawning habitat in the vicinity of the proposed development was appreciably sparse and of poor quality due to significant (peat) siltation pressures (as outlined above). Furthermore, lamprey ammocoetes require the deposition of fine, organic-rich sediment ≥5cm in depth in which to burrow and mature (Gardiner, 2003; Goodwin et al., 2008; Aronsuu & Virkkala, 2014). Peat-dominated substrata (i.e., humic deposits), such as those typically found in the vicinity of the proposed development, do not provide suitable burial/burrowing habitat complexity or structure for ammocoetes given their invariably fine and flocculent nature (pers. obs.).

European eel were only recorded (single individual) from a one site on the Yellow River, at Clongall Bridge (C7) (**Table 3.1, 3.2**). European eel are Red-listed in Ireland (King et al., 2011) and are classed as 'critically endangered' on a global scale (Pike et al., 2020). This restricted distribution largely reflected the poor hydromorphology and reduced instream habitat heterogeneity resulting from historical modifications, providing a low frequency of suitable refugia (e.g. boulders, pools) required by the species (Laffaille et al., 2003). Nevertheless, numerous sites provided some good physical suitability for the species but no eel were recorded. As eel occurrence decreases significantly with increasing distance from the sea (Degerman et al., 2019), the paucity of eel and patchy distribution recorded during the electro-fishing survey in the Yellow[Castlejordan]_SC_010, Boyne_SC_030, Figile_SC_020 and Brosna_SC_010 river sub-catchments can be further explained by the considerable distance between the survey area and marine habitats (>100km nearest instream distance) (Matondo et al., 2021; Chadwick et al., 2007).

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8. Appendix B – Q-sample results (biological water quality)

Table 8.1 Macro-invertebrate Q-sampling results for sites A1, A2, A3, A4, A5, A6, A8, B1, B2, B3, C1, C2, C3 & C4, September 2022

Group	Family	Species	A1	A2	A3	A4	A5	A6	A8	B1	B2	B3	C1	C2	C3	C4	EPA group
Ephemeroptera	Heptageniidae	sp. indet.						1									A
Plecoptera	Nemouridae	*Protonemura meyeri*												2			A
Plecoptera	Nemouridae	*Nemurella picteti*			1												A
Ephemeroptera	Baetidae	*Alainites muticus*			3			10		20	22		3				B
Ephemeroptera	Baetidae	*Centroptilum luteolum*										1					B
Plecoptera	Leuctridae	*Leuctra hippopus*												2			B
Trichoptera	Goeridae	*Silo pallipes*						8									B
Trichoptera	Limnephilidae	*Limnephilus lunatus*			1	8			9				1				B
Trichoptera	Phryganeidae	*Agrypnia obsoleta*					1										B
Trichoptera	Sericostomatidae	*Sericostoma personatum*									3						B
Odonata	Calopterygidae	*Calopteryx splendens*				1		7	1			3	9				B
Odonata	Aeshnidae	*Aeshna* sp.											2				B
Odonata	Coenagrionidae	*Coenagrion* sp.					4										B
Ephemeroptera	Baetidae	*Baetis rhodani*			65	8	47	256	31	20	183		6	165			C
Ephemeroptera	Ephemerellidae	*Serratella ignita*						33	35	1	1			7			C
Ephemeroptera	Caenidae	*Caenis luctuosa*					1										C
Trichoptera	Caseless caddis pupa	sp. indet.				1					1						C
Trichoptera	Hydropsychidae	*Hydropsyche instabilis*				17		8					1	83			C
Trichoptera	Polycentropodidae	*Polycentropus kingi*						1									C
Trichoptera	Polycentropodidae	*Polycentropus flavomaculatus*											2				C
Crustacea	Gammaridae	*Gammarus duebeni*	13	52	1	1	11		52	38	82	5	57	54	2		C
Gastropoda	Bithnyiidae	*Bithynia tentaculata*							4								C
Gastropoda	Lymnaeidae	*Stagnicola fuscus*	1	101								1	2		9		C
Gastropoda	Lymnaeidae	*Lymnaea stagnalis*				4		2							10		C
Gastropoda	Physidae	*Physella acuta*					7	12									C

Group	Family	Species	A1	A2	A3	A4	A5	A6	A8	B1	B2	B3	C1	C2	C3	C4	EPA group
Gastropoda	Planorbidae	*Bathyomphalus contortus*	2										3		3		C
Gastropoda	Planorbidae	*Planorbis planorbis*					11		3								C
Gastropoda	Planorbidae	*Gyraulus albus*				10	8										C
Gastropoda	Tateidae	*Potamopyrgus antipodarum*			1			6		2		1	2	2			C
Coleoptera	Dytiscidae	Dytiscidae larva			9	1	2						1				C
Coleoptera	Dytiscidae	*Dytiscus* sp.											1				C
Coleoptera	Dytiscidae	*Graptodytes pictus*											5		1		C
Coleoptera	Dytiscidae	*Ilybius fuliginosus*													2	2	C
Coleoptera	Dytiscidae	*Nebrioporus depressus*					1		1								C
Coleoptera	Dytiscidae	*Stictonectes lepidus*					1						1		3	2	C
Coleoptera	Dytiscidae	*Agabus nebulosus*				1											
Coleoptera	Elmidae	*Brychius elevatus*			4				5								C
Coleoptera	Elmidae	*Elmis aenea*				3		2	23		6		1	4			C
Coleoptera	Elmidae	*Limnius volckmari*											1				C
Coleoptera	Gyrinidae	Gyrinidae nymph			2												C
Coleoptera	Gyrinidae	*Gyrinus substriatus*		1							2		1		1		C
Coleoptera	Gyrinidae	*Orectochilus villosus*				11											C
Coleoptera	Haliplidae	*Haliplus lineatocollis*										1	1		11		C
Coleoptera	Haliplidae	*Haliplus ruficollis group*			5		8	1	1						5	2	C
Coleoptera	Hydrophilidae	*Anacaena globulus*		1													C
Coleoptera	Hydrophilidae	*Helophorus brevipalpis*			1					1							C
Diptera	Chironomidae	Non-*Chironomus* spp.			12		11			1		1					C
Diptera	Dixidae	sp. indet.			6			15		2							C
Diptera	Ephydridae	sp. indet.														1	C
Diptera	Pediciidae	Dicranota sp.											1				C
Diptera	Simuliidae	sp. indet.						26	1		18		3				C
Hemiptera	Corixidae	Corixidae nymph			7		1						1			8	C

Group	Family	Species	A1	A2	A3	A4	A5	A6	A8	B1	B2	B3	C1	C2	C3	C4	EPA group
Hemiptera	Corixidae	*Hesperocorixa sahlbergi*													1		C
Hemiptera	Corixidae	*Hesperocorixa* sp.											2				C
Hemiptera	Corixidae	*Siagara* sp.					22		2			1			25	16	C
Hemiptera	Gerridae	Gerridae nymph			1				1	1		5					C
Hemiptera	Gerridae	*Gerris* sp.		3	1		3				1		1	1	1		C
Hemiptera	Hydrometridae	*Hydrometra stagnorum*			2	1									1		C
Hemiptera	Nepidae	*Nepa cinerea*					1										C
Hemiptera	Notonectidae	*Notonecta marmorea viridis*					3	1									C
Hemiptera	Veliidae	Veliidae nymph			2				1	1	1						C
Hydracarina	Hydrachnidiae	sp. indet.		1	2	1	8										C
Crustacea	Asellidae	*Asellus aquaticus*	15		14	107	24	52	29		1		67	3	21		D
Gastropoda	Lymnaeidae	*Ampullacaena balthica*		106	14	12	9								1	37	D
Gastropoda	Physidae	*Physa fontinalis*		103				2	2								D
Mollusca	Sphaeriidae	sp. indet.					21	2									D
Hirudinidae	Glossiphoniidae	sp. indet.		3	1			1									D
Megaloptera	Sialidae	*Sialis lutaria*			2				1			3					D
Diptera	Chironomidae	*Chironomus* spp.			13		7										E
Annelidae	Oligochaeta	sp. indet.		1							1	1					n/a
Nematomorpha	Gordiidae	sp. indet.								1							n/a
Abundance			**31**	**372**	**170**	**187**	**212**	**446**	**202**	**88**	**322**	**23**	**175**	**323**	**97**	**68**	
Q-rating			**3**	**2-3**	**3-4**	**2-3***	**3**	**3-4**	**3**	**3**	**3**	**3***	**2-3**	**3-4**	**3***	**2-3***	
WFD status			**Poor**	**Poor**	**Mod**	**Poor**	**Poor**	**Mod**	**Poor**	**Poor**	**Poor**	**Poor**	**Poor**	**Mod**	**Poor**	**Poor**	

*tentative Q-rating due to poor flows and or lack of suitable riffle areas for sampling (Toner et al., 2005)

Table 8.2 Macro-invertebrate Q-sampling results for sites C5, C7, D2, D3, E1, E2, X1, X2a, X2b, X3, X4, X5 & X6, September 2022

Group	Family	Species	C5	C7	D2	D3	E1	E2	X1	X2a	X2b	X3	X4	X5	X6	EPA group
Ephemeroptera	Baetidae	*Alainites muticus*		7												B
Plecoptera	Leuctridae	*Leuctra hippopus*		2												B
Trichoptera	Cased caddis pupa	sp. indet.		1			1	1								B
Trichoptera	Goeridae	*Silo pallipes*									1					B
Trichoptera	Leptoceridae	*Triaenodes bicolor*											1			B
Trichoptera	Limnephilidae	*Limnephilus lunatus*						23				1			1	B
Trichoptera	Sericostomatidae	*Sericostoma personatum*						1			1					B
Odonata	Calopterygidae	*Calopteryx splendens*	1													B
Odonata	Coenagrionidae	Coenagrion sp.											11	23	1	B
Ephemeroptera	Baetidae	*Baetis rhodani*		2		30		15				3				C
Ephemeroptera	Ephemerellidae	*Serratella ignita*		4		1		1				1				C
Ephemeroptera	Caenidae	*Caenis luctuosa*											2			C
Trichoptera	Hydropsychidae	*Hydropsyche instabilis*		10		1										C
Trichoptera	Hydropsychidae	*Hydropsyche siltalai*				1										C
Trichoptera	Polycentropodidae	*Polycentropus kingi*				2										C
Trichoptera	Polycentropodidae	*Plectrocnemia conspersa*											1			C
Trichoptera	Polycentropodidae	*Plectrocnemia geniculata*												2		C
Crustacea	Gammaridae	*Gammarus duebeni*	35	15	3	115	15	58	22	6	6	5	4	3		C
Gastropoda	Bithnyiidae	*Bithynia tentaculata*		1										6		C
Gastropoda	Lymnaeidae	*Stagnicola fuscus*	3					1							3	C
Gastropoda	Lymnaeidae	*Lymnaea stagnalis*	23													C
Gastropoda	Physidae	*Physella acuta*												1		C
Gastropoda	Planorbidae	*Bathyomphalus contortus*						2			6				4	C
Gastropoda	Planorbidae	*Planorbis planorbis*			1			3			19					C
Gastropoda	Planorbidae	*Gyraulus albus*											1			C

Group	Family	Species	C5	C7	D2	D3	E1	E2	X1	X2a	X2b	X3	X4	X5	X6	EPA group
Gastropoda	Tateidae	*Potamopyrgus antipodarum*				204						17	1			C
Gastropoda	Valvatidae	*Valvata piscinalis*											1	1		C
Coleoptera	Dytiscidae	Dytiscidae larva			1			1				2				C
Coleoptera	Dytiscidae	*Hydroporus tessellatus*							1							C
Coleoptera	Dytiscidae	*Ilybius fuliginosus*	3					2	1							C
Coleoptera	Dytiscidae	*Laccophilus hyalinus*†												1		C
Coleoptera	Dytiscidae	*Nebrioporus depressus*									2	7				C
Coleoptera	Dytiscidae	*Stictonectes lepidus*												1		C
Coleoptera	Elmidae	*Brychius elevatus*		4		7										C
Coleoptera	Elmidae	*Elmis aenea*		8		3		12			1					C
Coleoptera	Elmidae	*Limnius volckmari*						1								C
Coleoptera	Gyrinidae	Gyrinidae nymph	2			2										C
Coleoptera	Gyrinidae	*Gyrinus substriatus*				11									2	C
Coleoptera	Haliplidae	*Haliplus flavicollis*										1				C
Coleoptera	Haliplidae	*Haliplus lineatocollis*	1										1			C
Coleoptera	Haliplidae	*Haliplus ruficollis group*	4											3		C
Diptera	Chironomidae	Non-*Chironomus* spp.				8		5		4		1		1		C
Diptera	Culicidae	sp. indet.											1			C
Diptera	Muscidae	*Limnophora* sp.				2			1							C
Diptera	Pediciidae	Dicranota sp.		1				1								C
Diptera	Tipulidae	*Tipula* sp.								2						C
Diptera	Simuliidae	sp. indet.		2		1										C
Hemiptera	Corixidae	*Siagara* sp.	12									7	1	23		C
Hemiptera	Gerridae	Gerridae nymph				2		1								C
Hemiptera	Gerridae	*Gerris* sp.		23				1								C
Hemiptera	Hydrometridae	*Hydrometra stagnorum*	2								1					C
Hemiptera	Veliidae	Veliidae nymph					1									C

Group	Family	Species	C5	C7	D2	D3	E1	E2	X1	X2a	X2b	X3	X4	X5	X6	EPA group
Hydracarina	Hydrachnidiae	sp. indet.						3					1	22		C
Platyhelminthes	Dugesiidae	*Dugesia* sp.												5		C
Platyhelminthes	Planariidae	sp. indet.				1										C
Crustacea	Asellidae	*Asellus aquaticus*	6		45	26	16	129	25		17	16	3	6	3	D
Gastropoda	Lymnaeidae	*Ampullacaena balthica*	15							2		75			31	D
Gastropoda	Physidae	*Physa fontinalis*									9					D
Hirudinidae	Glossiphoniidae	sp. indet.			1	3		2		2					2	D
Megaloptera	Sialidae	*Sialis lutaria*					2					1				D
Diptera	Chironomidae	*Chironomus* spp.	2			7	2	1	1	6		1				E
Annelidae	Oligochaeta	sp. indet.	1					1								n/a
Arachnida	Dictynidae	*Argyroneta aquatica*												2		n/a
Abundance			**110**	**80**	**51**	**427**	**37**	**265**	**51**	**22**	**63**	**138**	**29**	**100**	**47**	
Q-rating			3*	3	2*	3	2-3*	2-3*	2-3*	2*	2-3*	2-3	n/a	n/a	2-3*	
WFD status			Poor	Poor	Bad	Poor	Poor	Poor	Poor	Bad	Poor	Poor	n/a	n/a	Poor	

*tentative Q-rating due to poor flows and or lack of suitable riffle areas for sampling (Toner et al., 2005)

† the water beetle dinghy skipper *Laccophilus hyalinus* is listed as 'vulnerable' in Ireland (Foster et al., 2009)

Sites X4 and X5 were located on the Grand Canal and thus unsuitable for Q-sampling (i.e. sweep sample only)

9. Appendix C – physiochemical water quality results

Table 9.1 Summary of physio-chemical water quality results in the vicinity of the proposed Derrygreenagh Power development, September 2022 (values in **bold** exceed the good status thresholds set out under the Surface Water Regulations (S.I. 77 of 2019))

Parameter	A2	A3	A6	A8	B3	C2	C4	C7	D3	E2	X2b	X3	X4	X5
pH	8.13	7.53	7.69	7.69	7.87	7.99	7.38	7.97	7.7	7.62	7.72	7.82	8.14	8.12
Total Alkalinity (mg $CaCO_3$/l)	349	332	196	195	282	249	74	245	218	236	312	207	167	166
Total Oxidised Nitrogen (mg N/l)	2.670	2.030	1.183	1.181	1.082	1.225	1.459	1.213	1.165	1.015	0.978	1.418	<0.010	<0.010
Total Ammonia (mg N/l)	0.044	0.023	**0.410**	**0.421**	0.024	0.015	**1.668**	0.016	0.019	0.052	0.022	0.055	0.008	0.010
Total P (mg P/l)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.018	0.016
MRP (mg P/l)	**0.050**	0.015	0.015	0.016	0.029	0.011	0.010	0.013	**0.052**	0.028	**0.050**	0.012	n/a	n/a
Chloride (mg Cl/l)	24.57	28.79	16.69	16.53	40.69	14.88	9.37	14.42	19.79	18.02	22.26	14.54	n/a	n/a
BOD (mg O_2/l)	0.6	0.9	1.5	**1.8**	**6.8**	0.8	**5.8**	1.0	**1.8**	1.4	1.2	**1.9**	n/a	n/a
COD (mg O_2/l)	10.1	28.7	59.0	58.5	44.7	42.1	82.3	45.6	45.1	52.0	29.1	45.6	n/a	n/a
Suspended Solids (mg/l)	2.0	2.7	2.2	1.8	50.5	1.5	14.0	2.7	2.5	3.2	2.2	2.3	1.5	1.8
Chlorophyll a (µg/l)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6.51	4.93

10. Appendix D – eDNA analysis lab report

SureScreen Scientifics

Folio No: E15394
Report No: 1
Purchase Order: edna Sep 22 Derrygreenagh
Client: Triturus Environmental Limited
Contact: Ross Macklin

TECHNICAL REPORT

ANALYSIS OF ENVIRONMENTAL DNA SAMPLES FOR THE DETECTION OF CRAYFISH SPECIES AND CRAYFISH PLAGUE

SUMMARY

All organisms continuously release small amounts of environmental DNA (eDNA) into their habitat. By collecting and analysing this eDNA from water samples from lakes, ponds or rivers we can detect the presence or absence of crayfish species including: the white-clawed crayfish (Austropotamobius pallipes), signal crayfish (*Pacifastacus leniusculus*), the marbled crayfish (*Procambarus virginalis*) and the crayfish plague (*Aphanomyces astaci*).

RESULTS

Date sample received at Laboratory: 13/09/2022
Date Reported: 20/09/2022
Matters Affecting Results: None

Lab Sample ID.	Site Name	O/S Reference	Species	Result	SIC	DC	IC	Positive Replicates
FK768	E2 Derrygreenagh		*White-Clawed Crayfish*	Negative	Pass	Pass	Pass	0
			Crayfish Plague	Negative	Pass	Pass	Pass	0
FK769	B3 Derrygreenagh		*White-Clawed Crayfish*	Negative	Pass	Pass	Pass	0
			Crayfish Plague	Negative	Pass	Pass	Pass	0
FK781	D3 Derrygreenagh		*White-Clawed Crayfish*	Negative	Pass	Pass	Pass	0
			Crayfish Plague	Negative	Pass	Pass	Pass	0

Forensic Scientists and Consultant Engineers
SureScreen Scientifics Ltd, Morley Retreat, Church Lane, Morley, Derbyshire, DE7 6DE
UK Tel: +44 (0)1332 292003 Email: scientifics@surescreen.com
Company Registration No. 08950940

SureScreen Scientifics

FK783	C7 Derrygreenagh		*White-Clawed Crayfish*	Positive	Pass	Pass	Pass	1
			Crayfish Plague	Positive	Pass	Pass	Pass	10

If you have any questions regarding results, please contact us: ForensicEcology@surescreen.com

Reported by: Chelsea Warner **Approved by:** Gabriela Danickova

METHODOLOGY

The analysis is conducted in two phases. The sample first goes through an extraction process where the filter is incubated in order to obtain any DNA within the sample. The extracted sample is then tested via real time PCR (also called q-PCR) for each of the selected target species. This process uses species-specific molecular markers (known as primers) to amplify a select part of the DNA, allowing it to be detected and measured in 'real time' as the analytical process develops. qPCR combines amplification and detection of target DNA into a single step. With qPCR, fluorescent dyes specific to the target sequence are used to label targeted PCR products during thermal cycling. The accumulation of fluorescent signals during this reaction is measured for fast and objective data analysis. The primers used in this process are specific to a part of mitochondrial DNA only found in each individual species. Separate primers are used for each of the species: white-clawed crayfish, signal crayfish and crayfish plague, ensuring no DNA from any other species present in the water is amplified.

Analysis of eDNA requires scrupulous attention to detail to prevent risk of contamination. True positive controls, negative controls and spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared and reported. Stages of the DNA analysis are also conducted in different buildings at our premises for added security. These methods have been extensively tested since 2015 in a number of different environments, habitats, conditions and ecological situations in order to successfully enable the full application of eDNA for the detection of crayfish species and the crayfish plague.

RESULTS INTERPRETATION

SIC: **Sample Integrity Check** [Pass/Fail]
When samples are received in the laboratory, they are inspected for any tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to inconclusive results.

DC: **Degradation Check** [Pass/Fail]
Analysis of the spiked DNA marker to see if there has been degradation of the kit or sample, between the date it was made to the date of analysis. Degradation of the spiked DNA marker may indicate a risk of false negative results.

IC: **Inhibition Check** [Pass/Fail]
The presence of inhibitors within a sample are assessed using a DNA marker. If inhibition is detected, samples are purified and re-analysed. Inhibitors cannot always be removed, if the inhibition check fails, the sample should be re-collected.

Result: **Presence of eDNA** [Positive/Negative/Inconclusive]
Positive: DNA was identified within the sample, indicative of species presence within the sampling location at the time the sample was taken or within the recent past at the sampling location.
Positive Replicates: Number of positive qPCR replicates out of a series of 12. If one or more of these are

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SureScreen Scientifics

found to be positive the pond is declared positive for species presence. It may be assumed that small fractions of positive analyses suggest low level presence, but this cannot currently be used for population studies. In accordance with Natural England protocol, even a score of 1/12 is declared positive. 0/12 indicates negative species presence.

Negative: eDNA was not detected or is below the threshold detection level and the test result should be considered as evidence of species absence, however, does not exclude the potential for species presence below the limit of detection.

Inconclusive: Controls indicate inhibition or degradation of the sample, resulting in the inability to provide conclusive evidence for species presence or absence.

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INTERPRETATION OF RESULTS

SIC: **Sample Integrity Check** [Pass/Fail]
When samples are received in the laboratory, they are inspected for any tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to inconclusive results.

DC: **Degradation Check** [Pass/Fail]
Analysis of the spiked DNA marker to see if there has been degradation of the kit or sample, between the date it was made to the date of analysis. Degradation of the spiked DNA marker may indicate a risk of false negative results.

IC: **Inhibition Check** [Pass/Fail]
The presence of inhibitors within a sample are assessed using a DNA marker. If inhibition is detected, samples are purified and re-analysed. Inhibitors cannot always be removed, if the inhibition check fails, the sample should be re-collected.

Result: **Presence of eDNA** [Positive/Negative/Inconclusive]

Positive: DNA was identified within the sample, indicative of species presence within the sampling location at the time the sample was taken or within the recent past at the sampling location.

Positive Replicates: Number of positive qPCR replicates out of a series of 12. If one or more of these are found to be positive the pond is declared positive for species presence. It may be assumed that small fractions of positive analyses suggest low level presence, but this cannot currently be used for population studies. Even a score as low as 1/12 is declared positive. 0/12 indicates negative species presence.

Negative: eDNA was not detected or is below the threshold detection level and the test result should be considered as evidence of species absence, however, does not exclude the potential for species presence below the limit of detection.

Inconclusive: Controls indicate inhibition or degradation of the sample, resulting in the inability to provide conclusive evidence for species presence or absence.

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Company Registration No. 08950940

Triturus Environmental Ltd.

42 Norwood Court,

Rochestown,

Co. Cork,

T12 ECF3.

Appendix E Air Quality Modelling Data

Table D 1: Summary of annual mean ammonia concentrations at European site receptors.

Receptor	Background	Maximum Process Contribution (PC)	% maximum PC of Critical Level	Maximum Predicted Environmental Concentration (PEC)	% maximum PEC of Critical Level
E1	2.50	0.003	0.30	2.50	250.3
E2a	2.53	0.004	0.38	2.53	253.4
E2b	2.47	0.004	0.39	2.47	247.4
E2c	2.92	0.003	0.31	2.92	292.3
E3a	2.55	0.002	0.22	2.55	255.2
E3b	2.54	0.003	0.26	2.54	254.3
E3c	2.47	0.003	0.33	2.47	247.3
E3d	2.44	0.003	0.33	2.44	244.3
E3e	2.32	0.003	0.32	2.32	232.3
E4	2.65	0.006	0.60	2.66	265.6
E5	2.35	0.005	0.46	2.35	235.5

The ecological receptors are the following: Raheenmore Bog SAC (E1), Split Hills and Long Hill Esker SAC (E2a, E2b, E2c), Lough Ennell SAC (E3a, E3b, E3c, E3d, E3e), Mount Hevey Bog SAC (E4) and Wooddown Bog SAC (E5).

Table D 2: Summary of annual mean and short-term (24-hour) maximum NOx concentrations at European site receptors.

Type of NOx Parameter	Receptor	Background	Maximum Process Contribution (PC)	% maximum PC of Critical Level	Maximum Predicted Environmental Concentration (PEC)	% maximum PEC of Critical Level
Annual mean	E1	3.1	0.05	0.2	3.1	10.3
	E2a	3.2	0.07	0.2	3.3	11.0
	E2b	3.3	0.07	0.2	3.3	11.1
	E2c	3.3	0.06	0.2	3.3	11.1
	E3a	3.1	0.04	0.1	3.1	10.4
	E3b	3.0	0.05	0.2	3.0	10.1
	E3c	3.1	0.06	0.2	3.1	10.4
	E3d	3.0	0.06	0.2	3.1	10.2
	E3e	2.9	0.07	0.2	3.0	10.0
	E4	4.0	0.12	0.4	4.2	13.9
	E5	3.4	0.09	0.3	3.5	11.5
24-hour maximum	E1	6.1	1.28	1.7%	7.4	9.8%
	E2a	6.46	1.68	2.2%	8.1	10.9%
	E2b	6.5	1.82	2.4%	8.3	11.1%
	E2c	6.54	2.10	2.8%	8.6	11.5%
	E3a	6.14	1.75	2.3%	7.9	10.5%
	E3b	5.96	1.42	1.9%	7.4	9.8%
	E3c	6.12	1.53	2.0%	7.7	10.2%
	E3d	5.98	1.46	1.9%	7.4	9.9%
	E3e	5.86	1.12	1.5%	7.0	9.3%
	E4	8.08	1.29	1.7%	9.4	12.5%
	E5	6.74	1.15	1.5%	7.9	10.5%

The ecological receptors are the following: Raheenmore Bog SAC (E1), Split Hills and Long Hill Esker SAC (E2a, E2b, E2c), Lough Ennell SAC (E3a, E3b, E3c, E3d, E3e), Mount Hevey Bog SAC (E4) and Wooddown Bog SAC (E5).

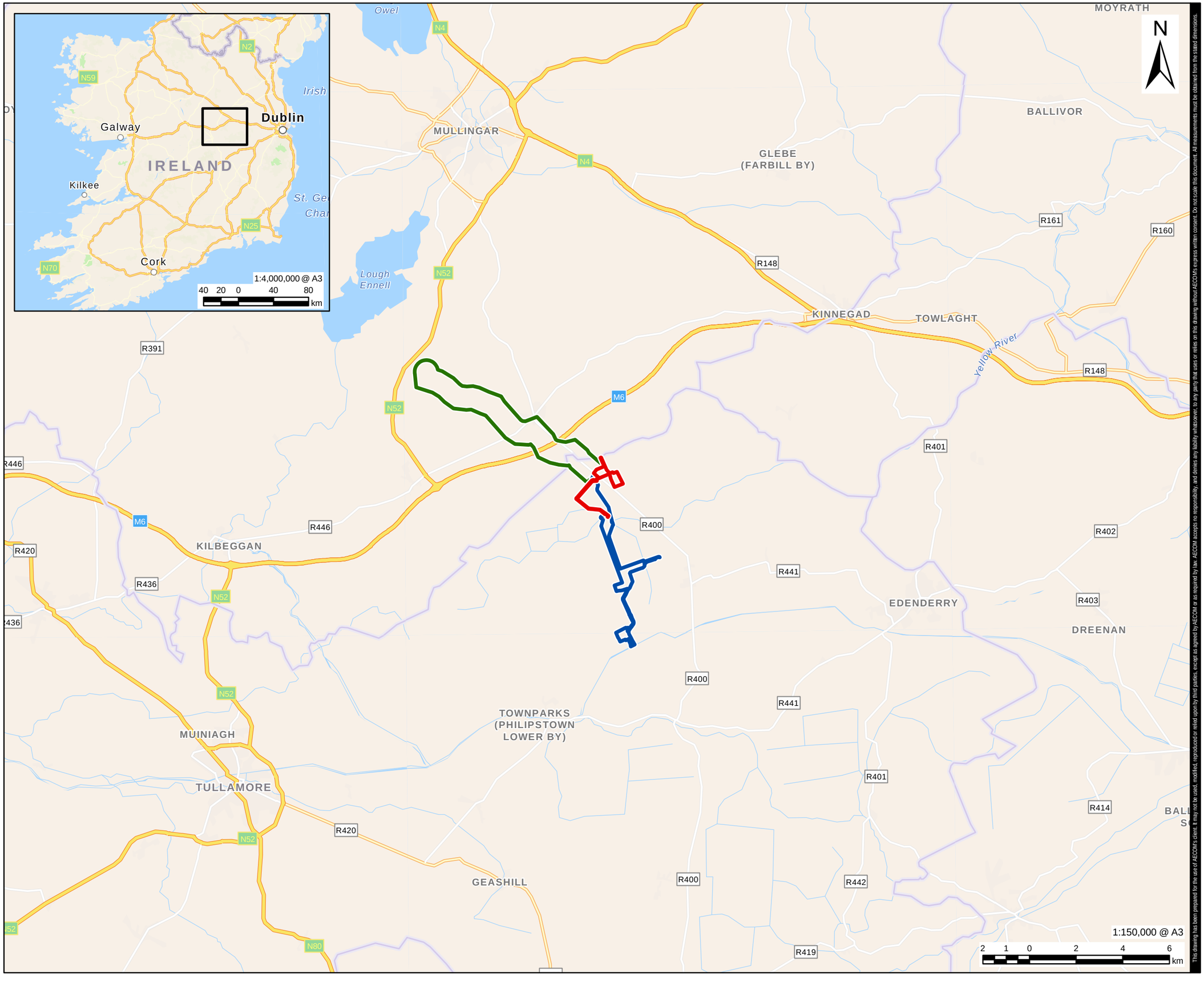
Table D 3: Summary of annual mean and short-term (24-hour) maximum NOx concentrations at European site receptors.

Receptor	Background	Maximum Process Contribution (PC)	% maximum PC of Critical Level	Maximum Predicted Environmental Concentration (PEC)	% maximum PEC of Critical Level
E1	7.53	0.01	0.4%	7.55	151.0%
E2a	6.34	0.02	1.0%	6.39	127.8%
E2b	6.84	0.02	1.0%	6.89	137.8%
E2c	6.96	0.02	0.8%	7.00	140.0%
E3a	7.04	0.01	0.3%	7.06	141.1%
E3b	6.28	0.01	0.4%	6.30	126.0%
E3c	6.51	0.01	0.5%	6.54	130.7%
E3d	7.5	0.02	0.9%	7.54	150.9%
E3e	5.98	0.01	0.5%	6.01	120.1%
E4	6.82	0.02	1.0%	6.87	137.4%
E5	6.77	0.01	0.7%	6.81	136.1%

The ecological receptors are the following: Raheenmore Bog SAC (E1), Split Hills and Long Hill Esker SAC (E2a, E2b, E2c), Lough Ennell SAC (E3a, E3b, E3c, E3d, E3e), Mount Hevey Bog SAC (E4) and Wooddown Bog SAC (E5).

Appendix F Proposed Development and Overall Project

Revision: P01 Drawn: JB Checked: AB Approved: POC Date: 2024-01-16



AECOM

PROJECT

Proposed Derrygreenagh Power Project

CLIENT

Bord na Móna

CONSULTANT

AECOM Limited
10th Floor The Clarence West Building
2 Clarence St W, Belfast
BT2 7GP
Tel: +44 (0)28 9060 7200
www.aecom.com

LEGEND

- Power Plant Area Boundary
- Electricity Grid Connection Boundary
- Gas Connection Corridor Boundary

NOTES

ISSUE PURPOSE

FOR ISSUE

PROJECT NUMBER

60699676

FIGURE TITLE

Site Location

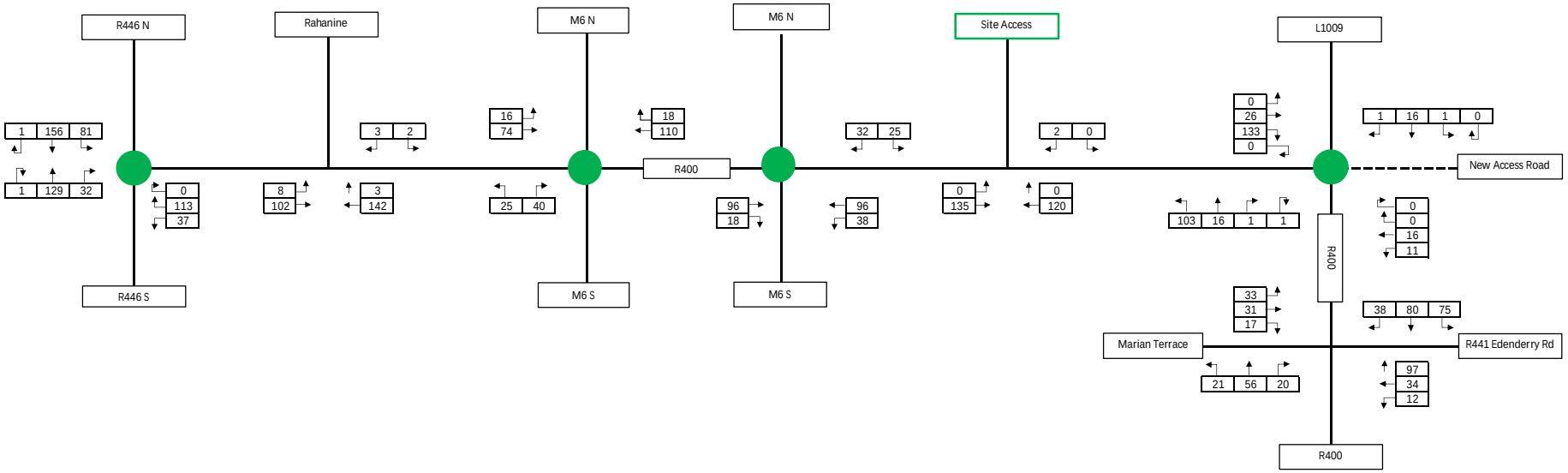
FIGURE NUMBER

Figure 1.1

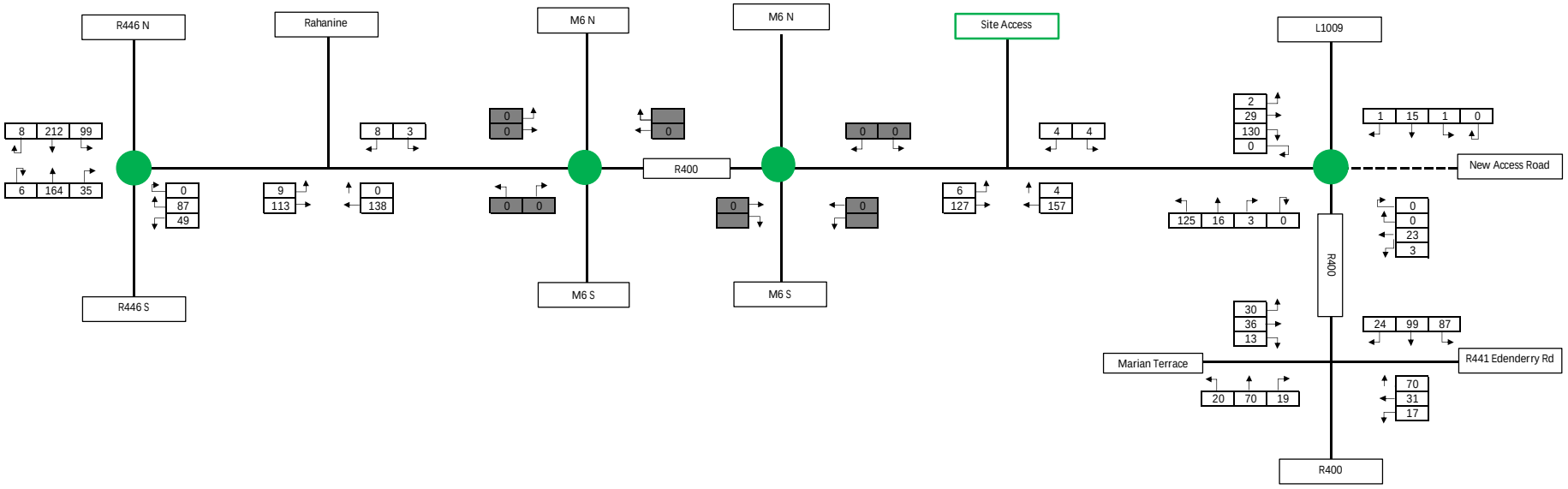
Filename: C:\Users\Barn1\Desktop\Work_Local\60699676_Derrygreenagh\02_Maps\IntoChapters\IntoFigures.aprx

Appendix G Traffic

Base Flows



2021 PM Peak Flows - 17:00-18:00 - Taken From Application 2260051



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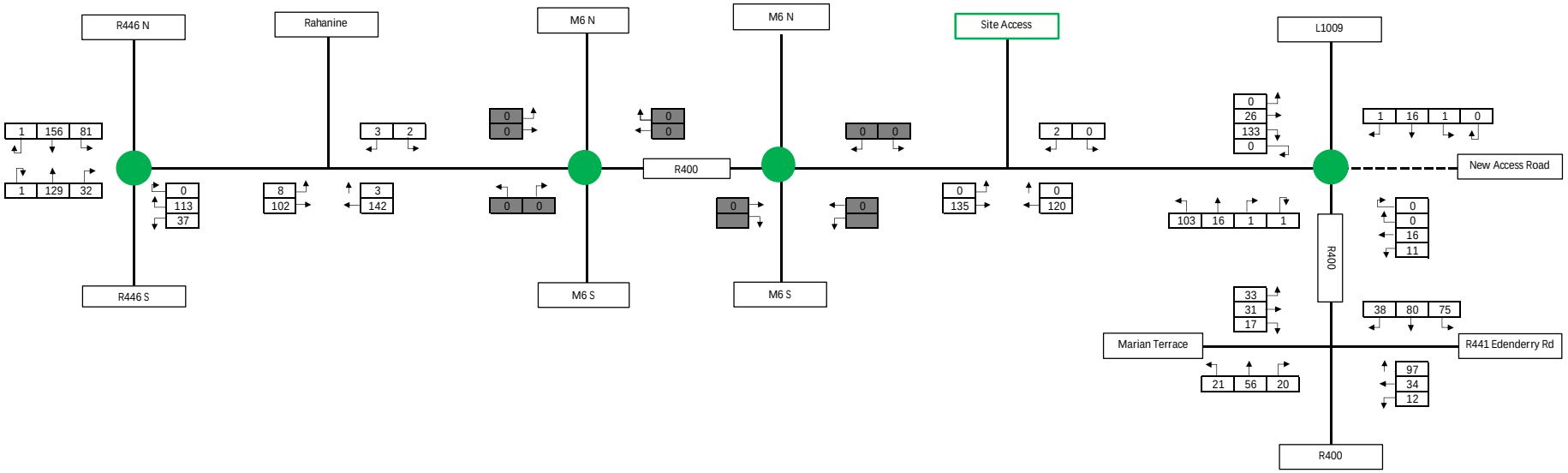
R446 N
Rahanine
M6 N
M6 N
Site Access
L1009
R446 S
M6 S
M6 S
R400
New Access Road
R400
Marian Terrace
R441 Edenderry Rd
R400
1 156 81
1 129 32
0 113 37
8 102
3 142
3 2
0 0
0 0
0 0
0 0
0 0
0 0
0 135
0 120
2 0
0 26 133 0
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1 16 1 0
0 0 16 11
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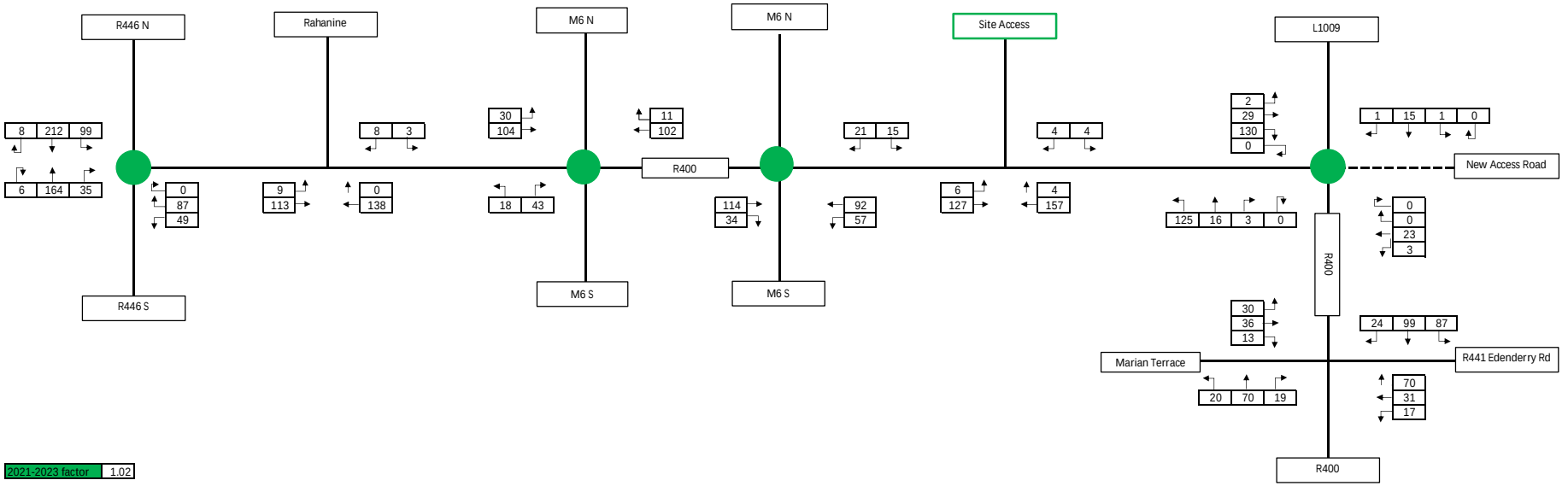
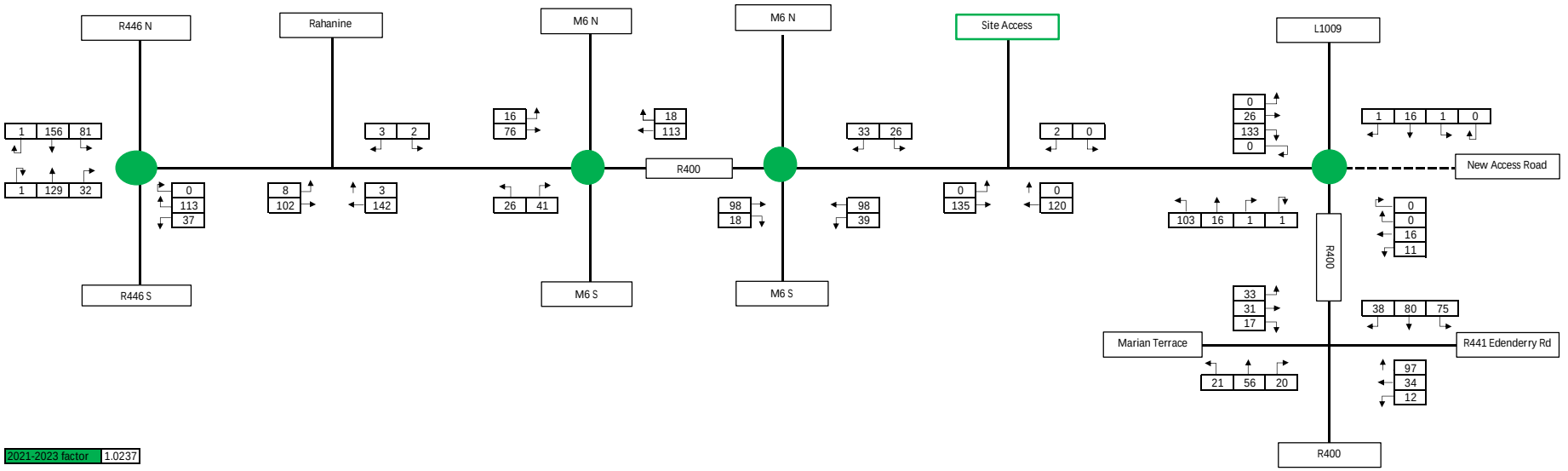
2023 Survey PM Peak Flows - 17:00-18:00



2023 AM Peak Flows - 08:15-09:15 (All Junctions)



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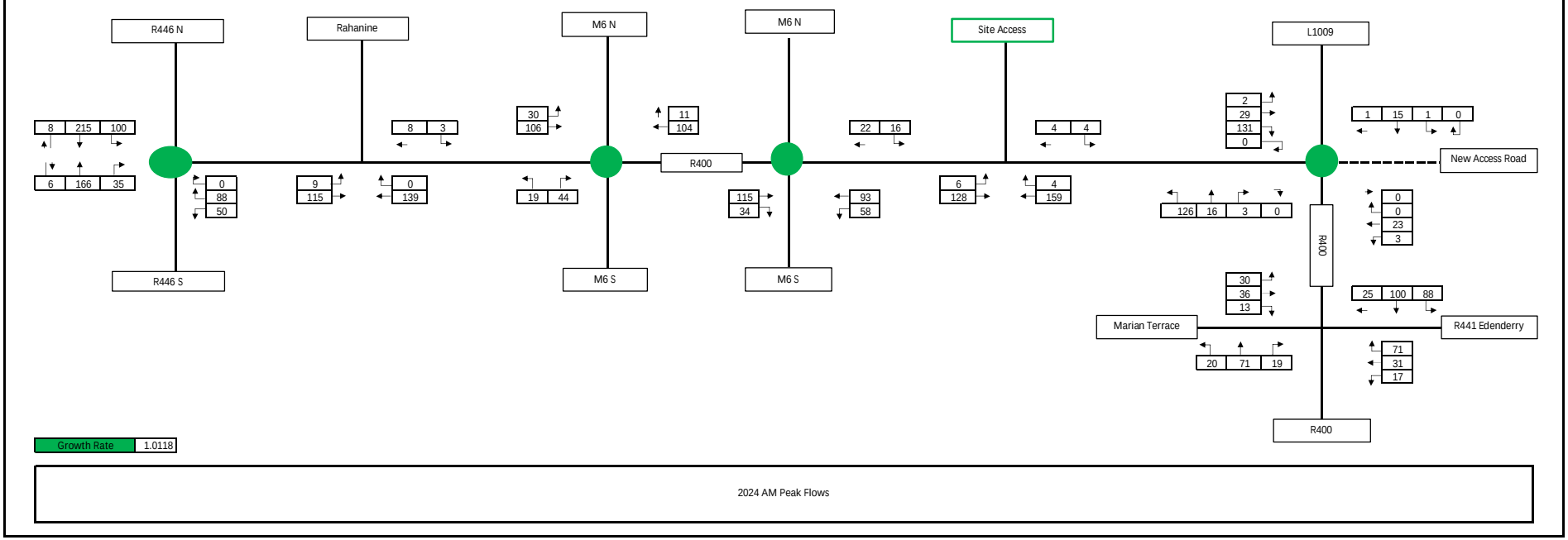
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Rahanine
M6 N
M6 N
Site Access
L1009
New Access Road
R400
R446 S
M6 S
M6 S
R400
Marian Terrace
R441 Edenderry
8 215 100
6 166 35
0 88 50
9 115
8 3
0 139
30 106
19 44
11 104
115 34
22 16
93 58
6 128
4 4
4 159
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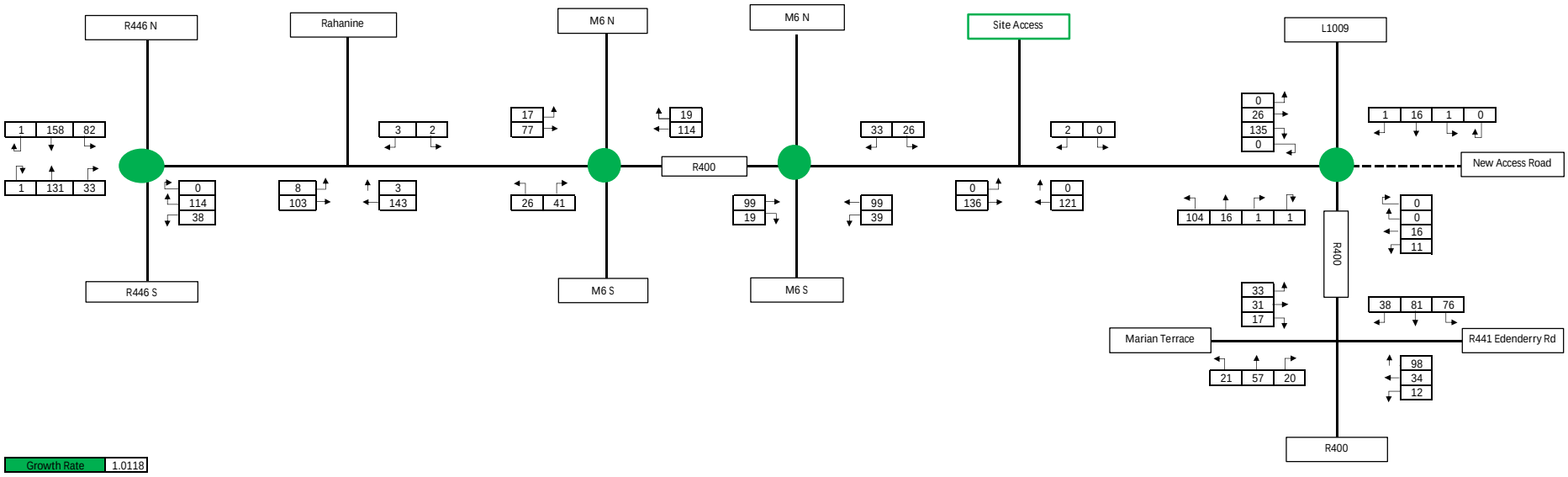
1 15 1 0
0 0 23 3
30 36 13
20 71 19
25 100 88
71 31 17
Growth Rate 1.0118
2024 AM Peak Flows


R446 N
Rahanine
M6 N
M6 N
Site Access
L1009
R400
New Access Road
R446 S
M6 S
M6 S
R400
Marian Terrace
R441 Edenderry Rd
R400
1 158 82
1 131 33
0 114 38
8 103
3 143
3 2
17 77
26 41
19 114
99 19
99 39
33 26
0 136
0 121
2 0
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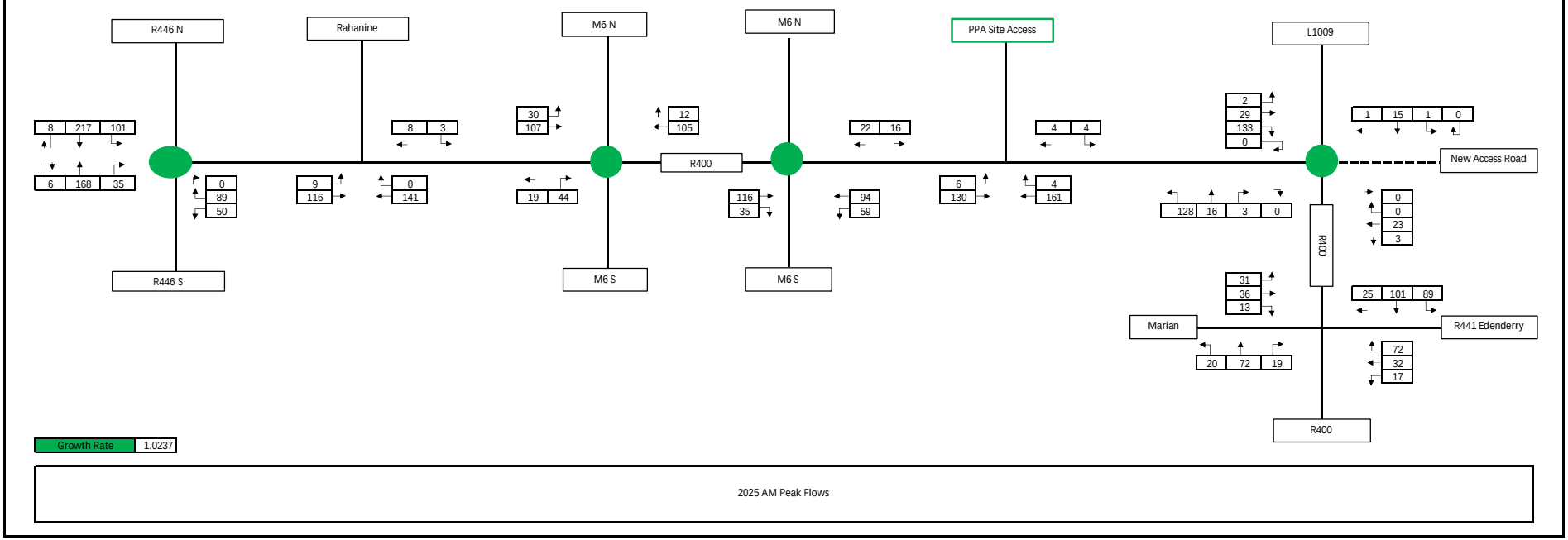
Growth Rate 1.0118
2024 PM Peak Flows


R446 N
Rahanine
M6 N
M6 N
PPA Site Access
L1009
New Access Road
R400
R446 S
M6 S
M6 S
R400
Marian
R441 Edenderry
8 217 101
6 168 35
0 89 50
8 3
9 116
0 141
30 107
19 44
12 105
116 35
22 16
94 59
6 130
4 4
4 161
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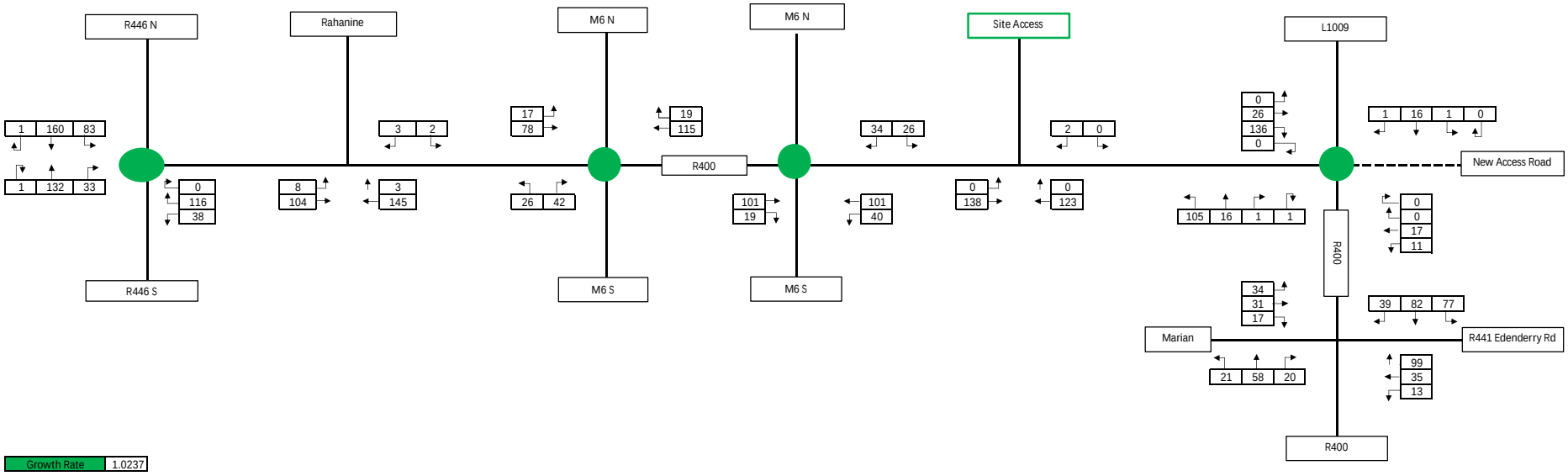
72 32 17
Growth Rate 1.0237
2025 AM Peak Flows



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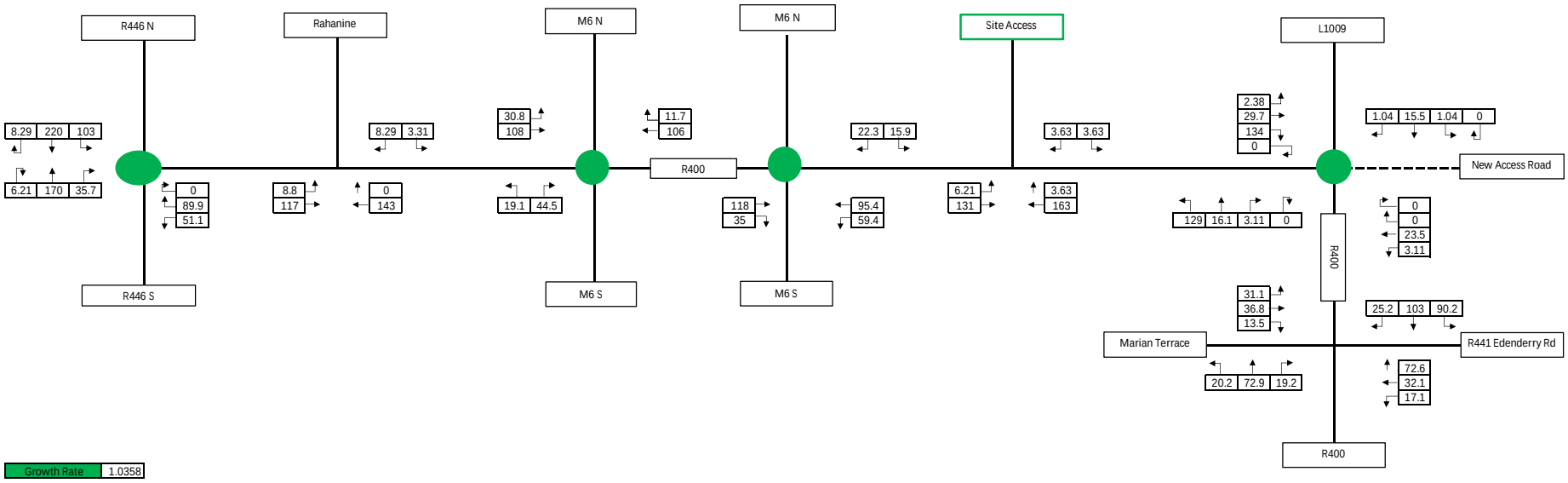
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Rahanine
M6 N
M6 N
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R446 S
8.29 3.31
8.8
117
0
143
30.8
108
11.7
106
19.1 44.5
M6 S
R400
118
35
22.3 15.9
95.4
59.4
M6 S
3.63 3.63
6.21
131
3.63
163
2.38
29.7
134
0
129 16.1 3.11 0
1.04 15.5 1.04 0
New Access Road
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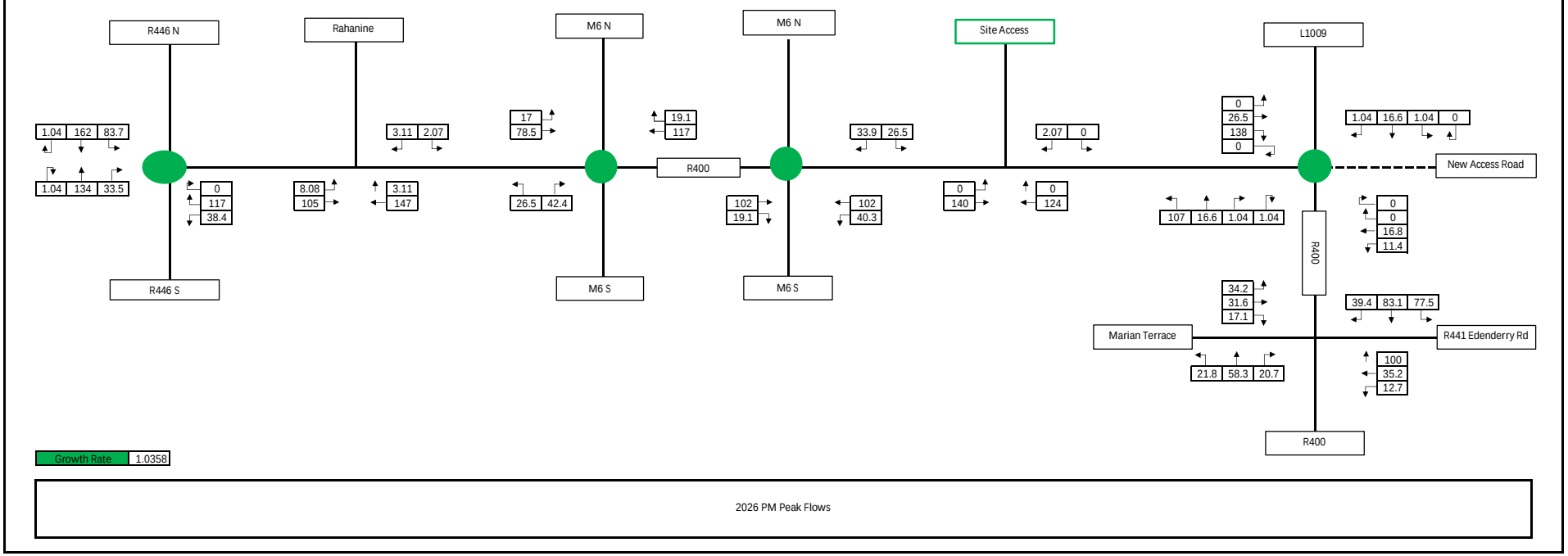
0
23.5
3.11
R400
31.1
36.8
13.5
Marian Terrace
20.2 72.9 19.2
25.2 103 90.2
R441 Edenderry Rd
72.6
32.1
17.1
R400
Growth Rate 1.0358
2026 AM Peak Flows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3.11 2.07
17 78.5
26.5 42.4
19.1 117
R400
102 19.1
102 40.3
33.9 26.5
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R400
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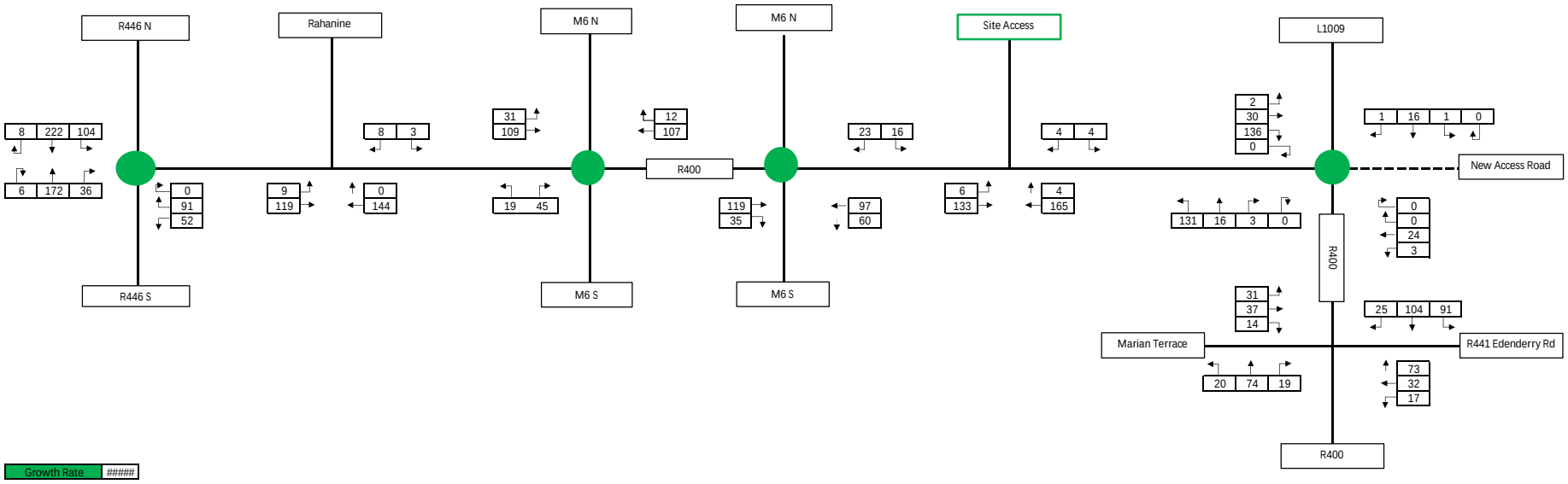

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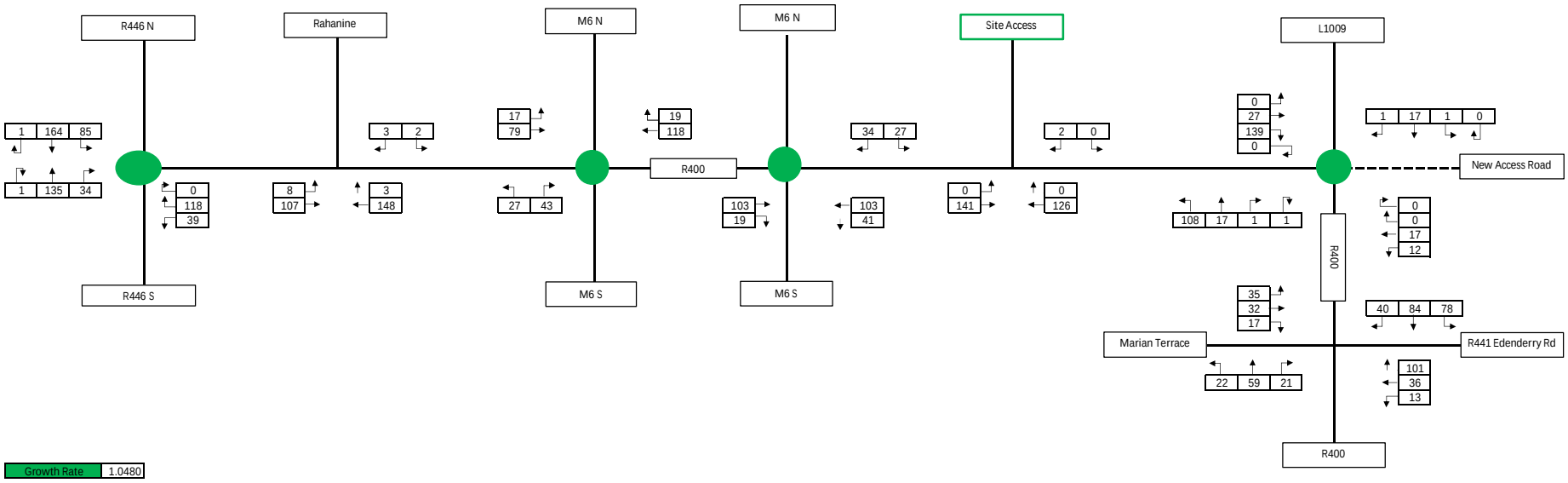
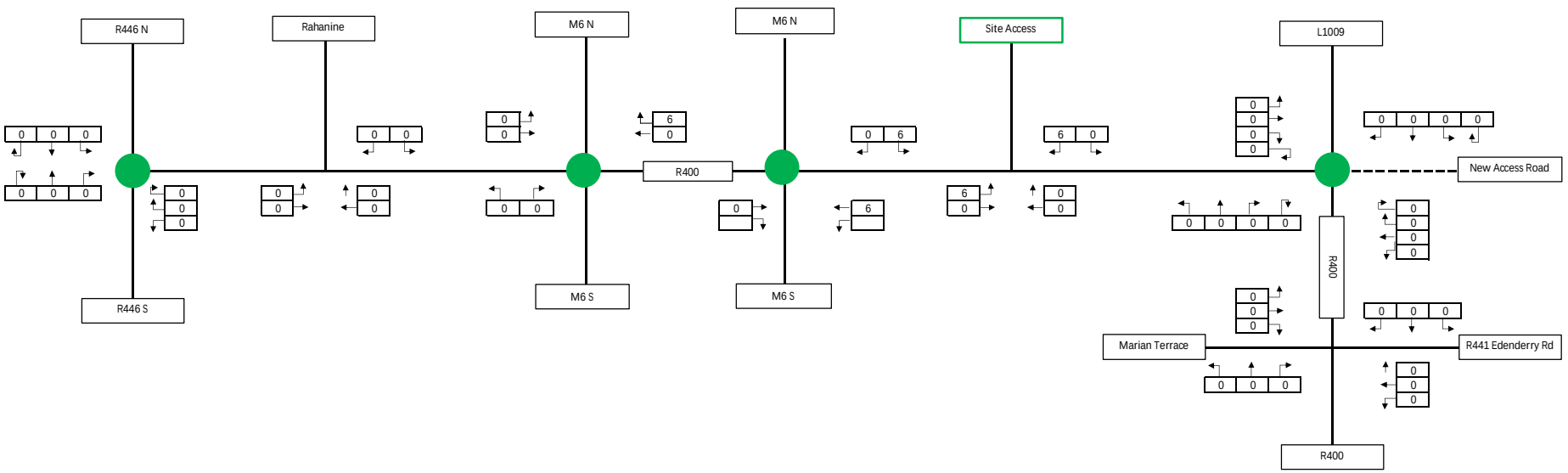
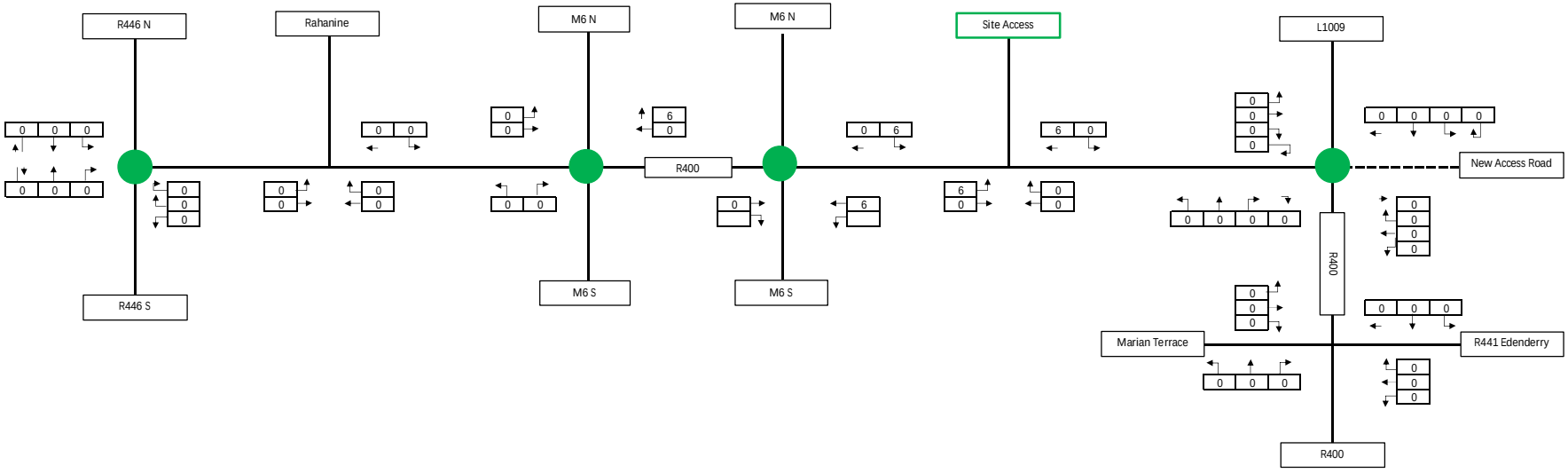


2027 PM Peak Flows

Power Plant Area Trips



Power Plant Area - Total Development Trips AM (LGV+HGV)



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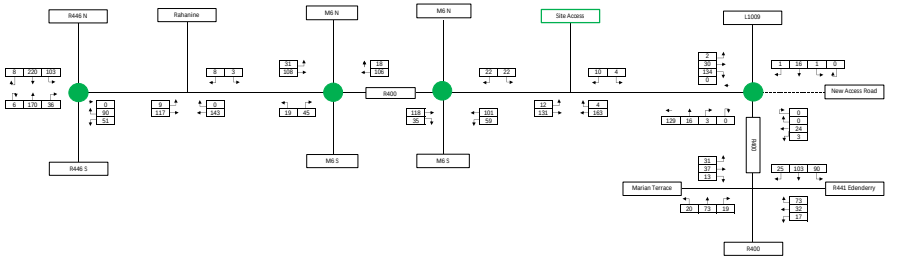
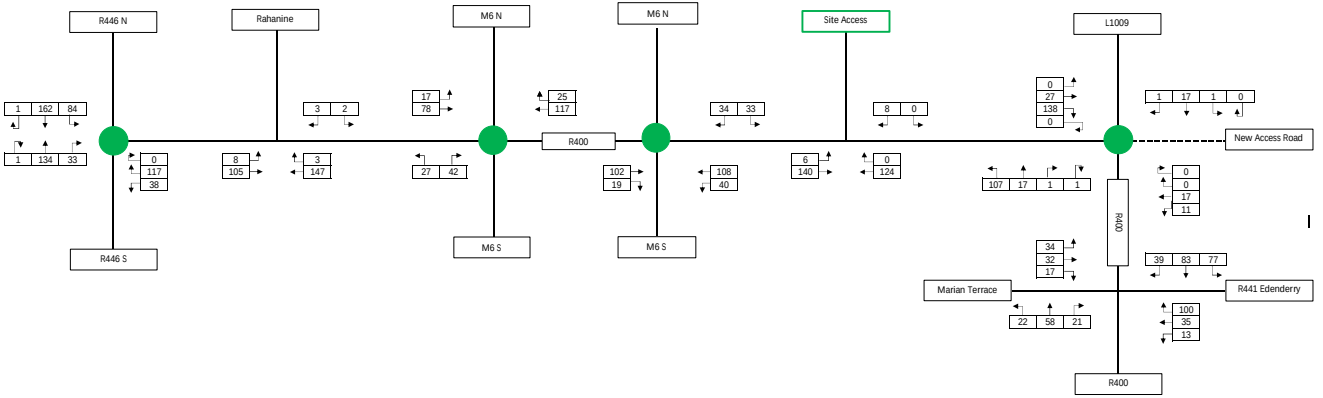
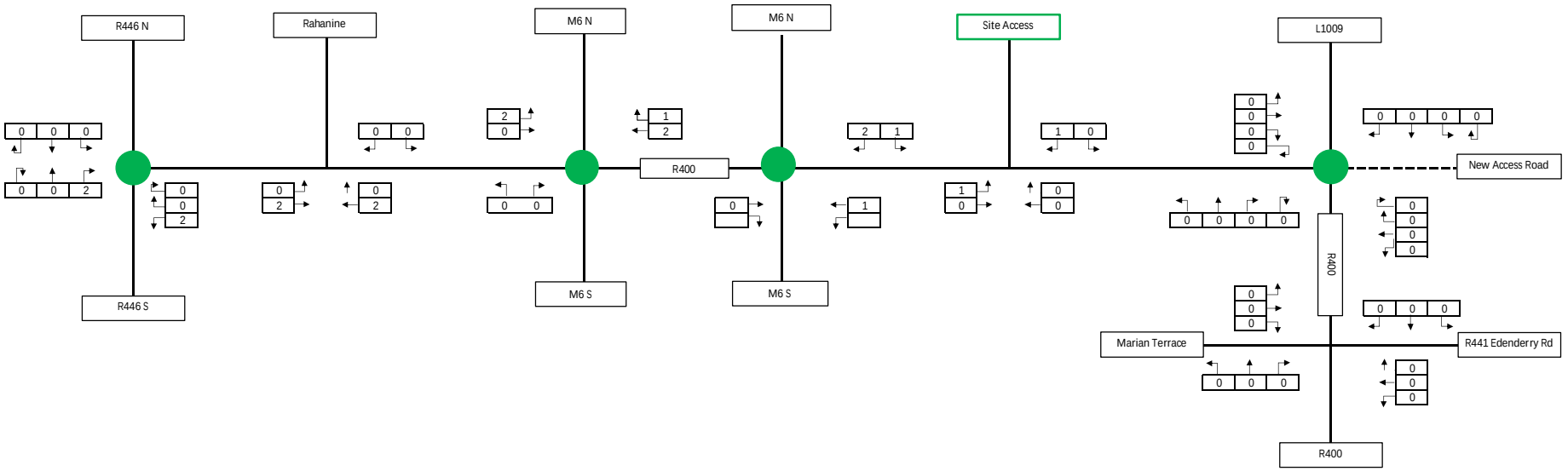


Power Plant Area - 2026 Baseline + Development Trips - AM PEAK

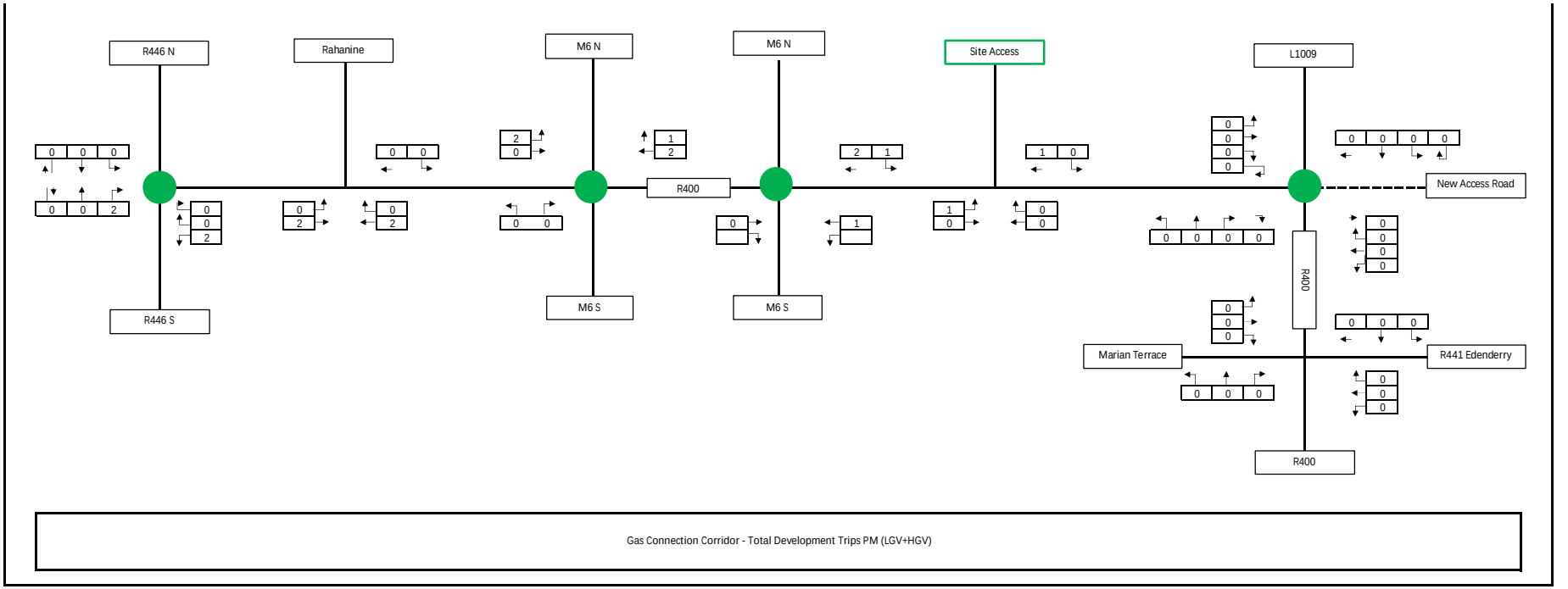


Power Plant Area - 2026 Baseline + Development Trips - PM PEAK

Gas Connection Corridor Trips



Gas Connection Corridor - Total Development Trips AM (LGV+HGV)



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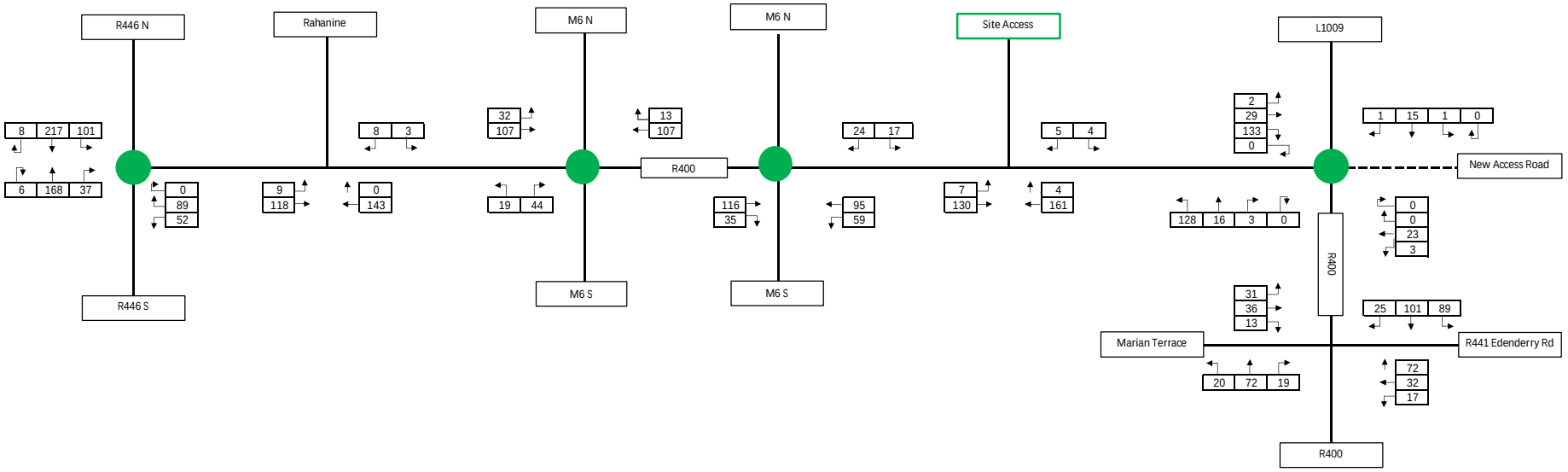

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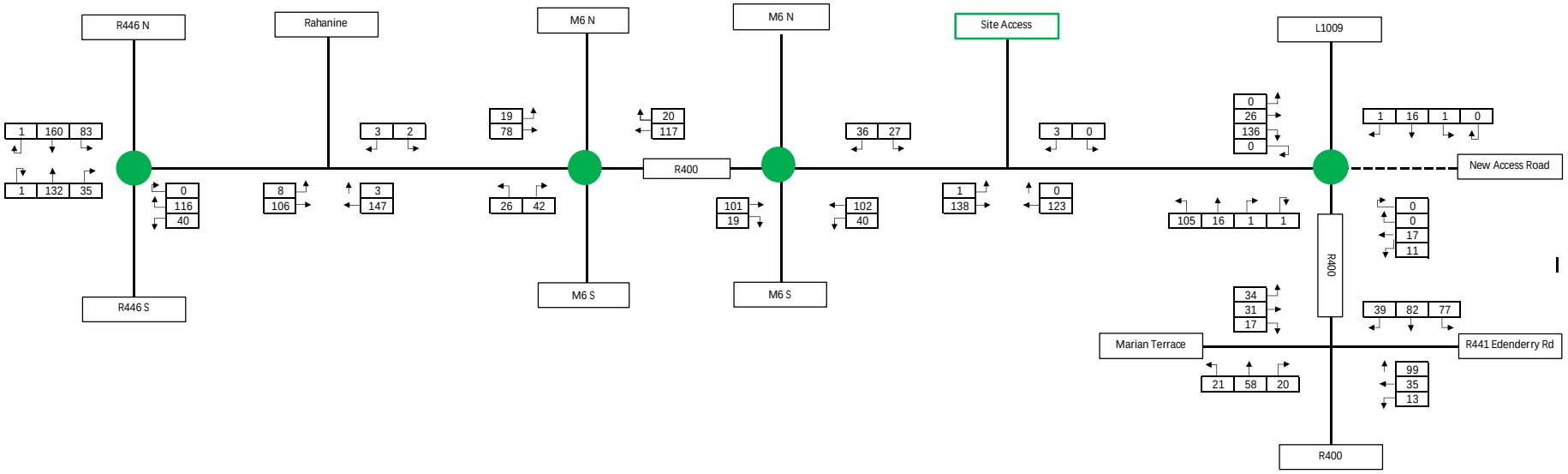
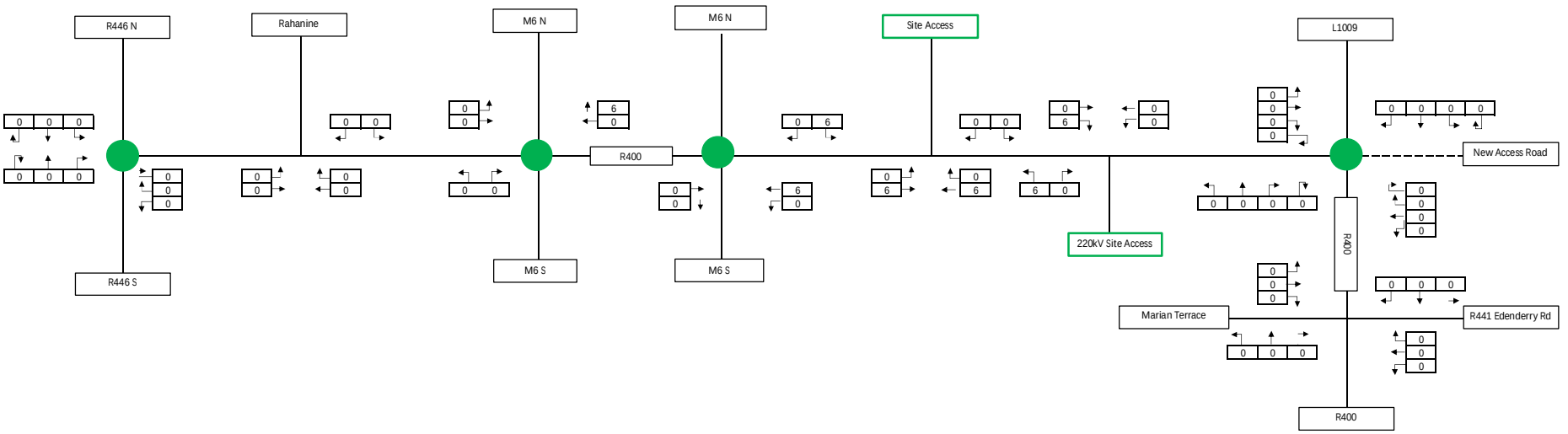


Gas Connection Corridor - 2025 Baseline + Development Trips - PM PEAK

Electric Grid Connection - 220kV Station



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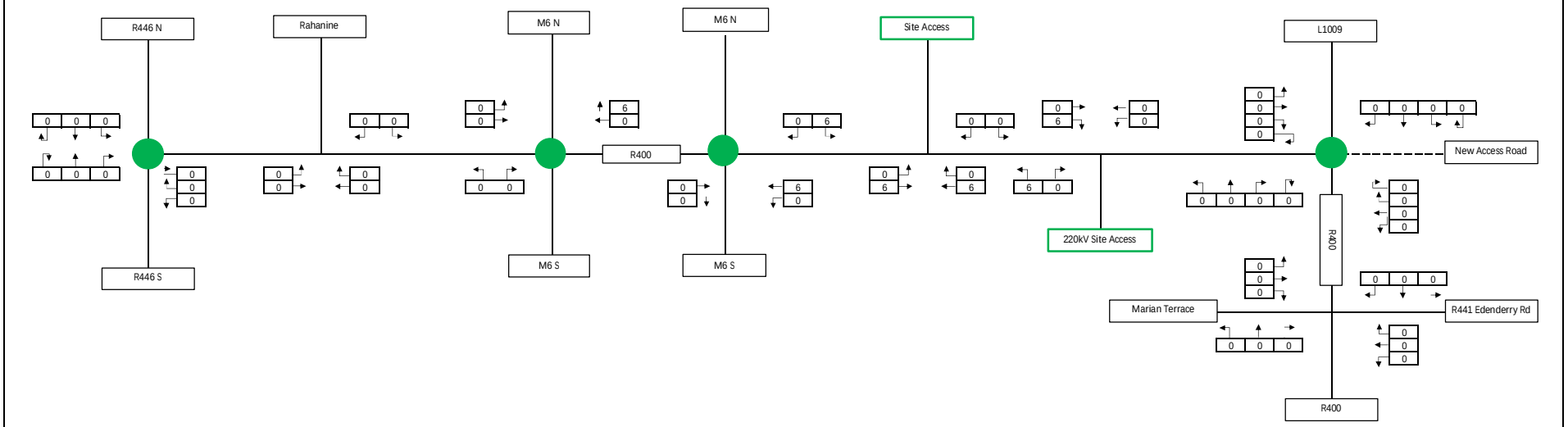

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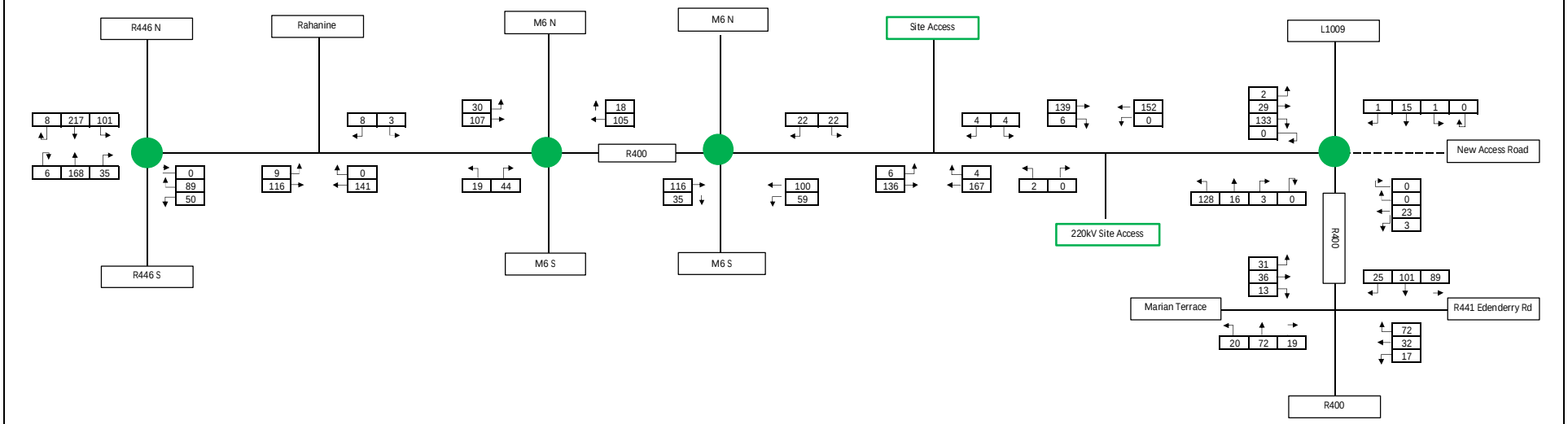
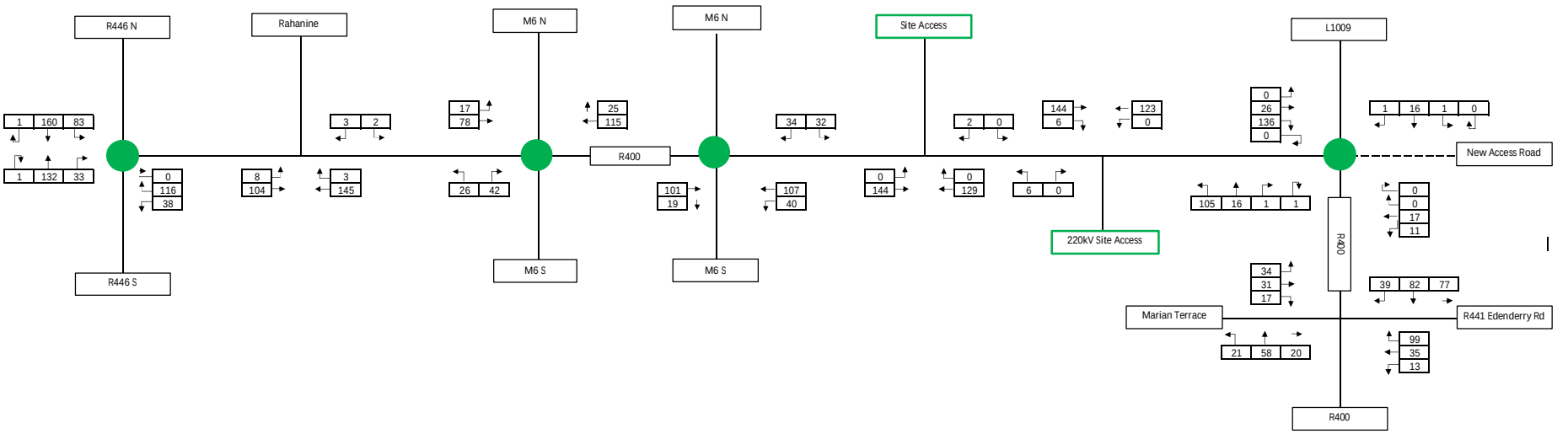


Electricity Grid Connection - 220kV Station -2025 Baseline + Development Trips - AM PEAK



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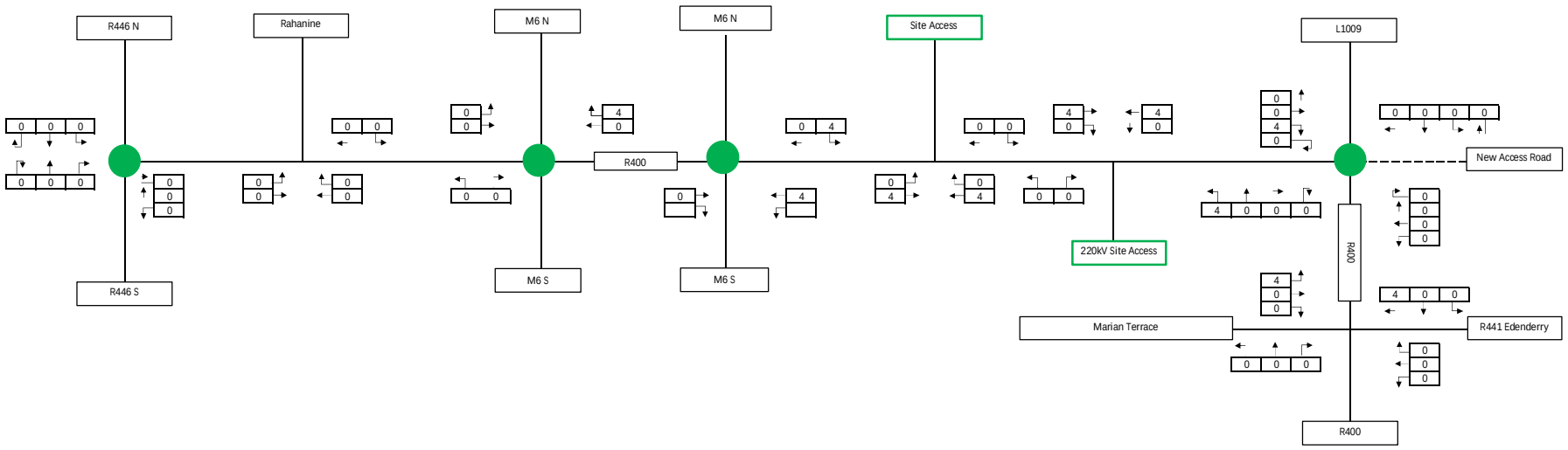
Electric Grid Connection - 400kV Station



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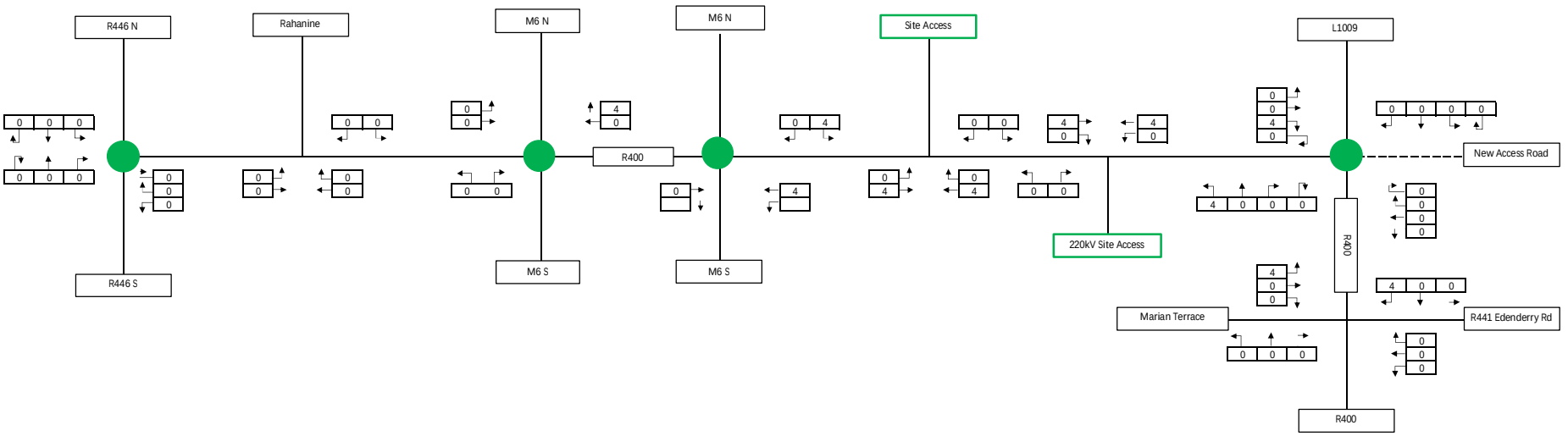

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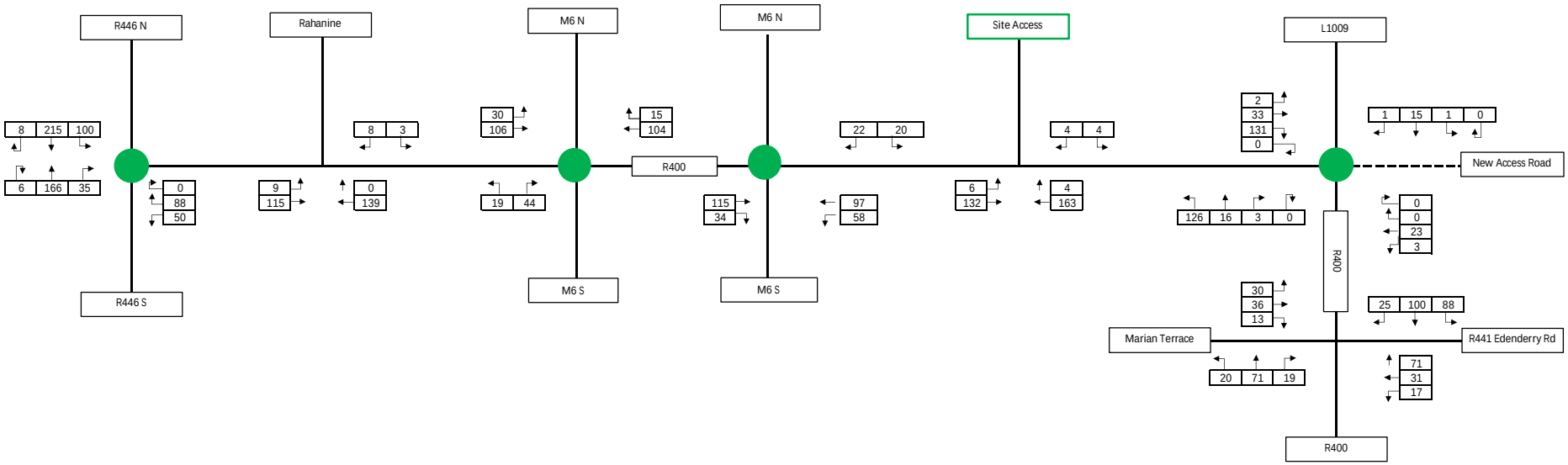

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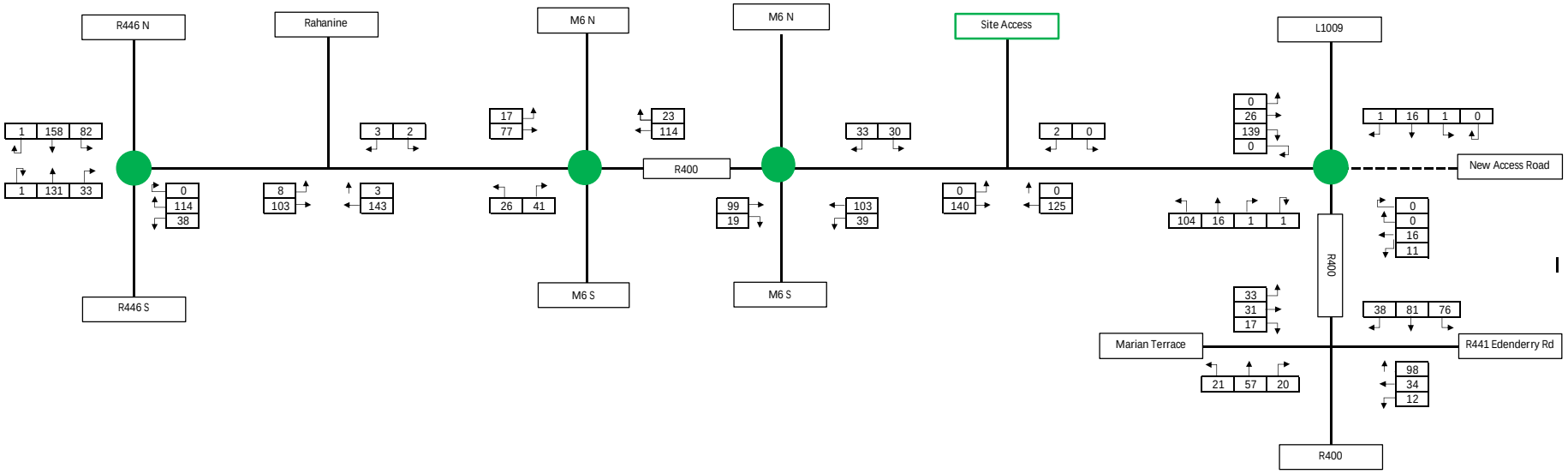
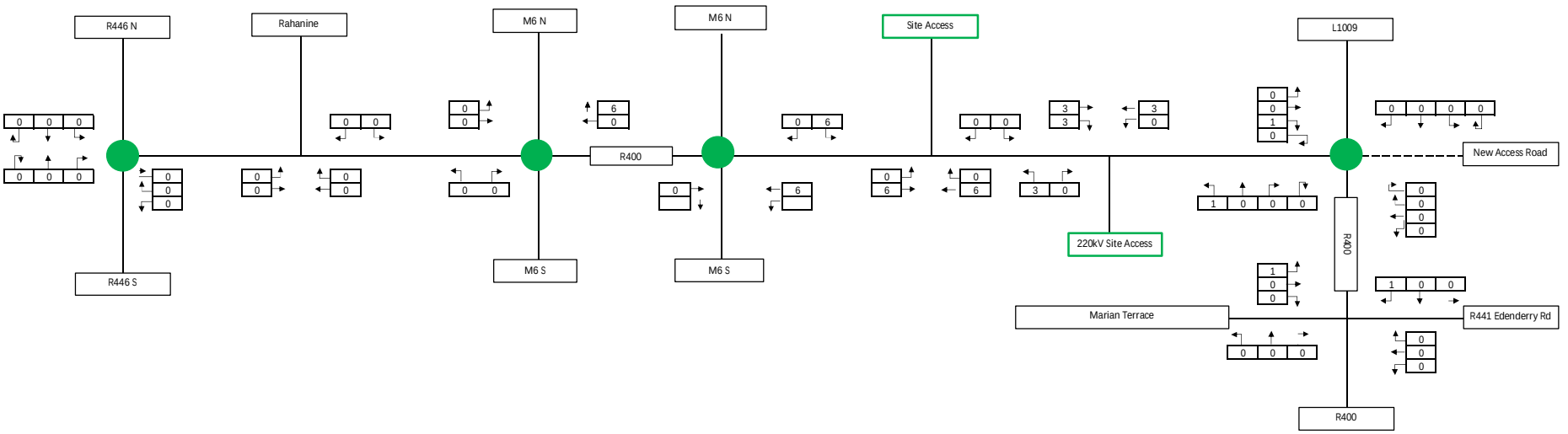
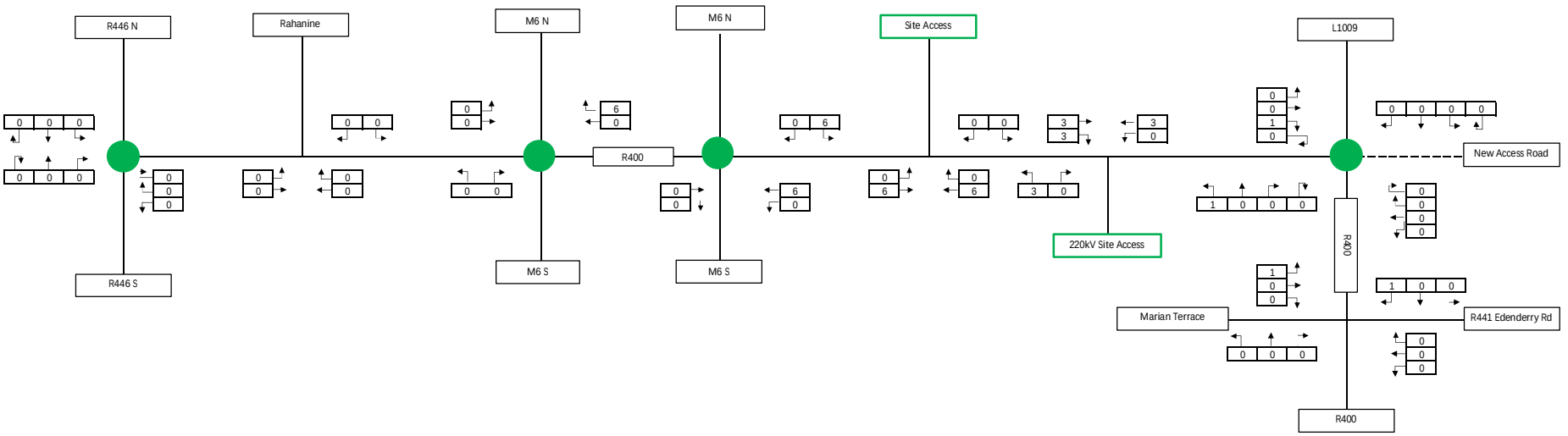


Electricty Grid Connection - 400kV Station - 2024 Baseline + Development Trips - PM PEAK

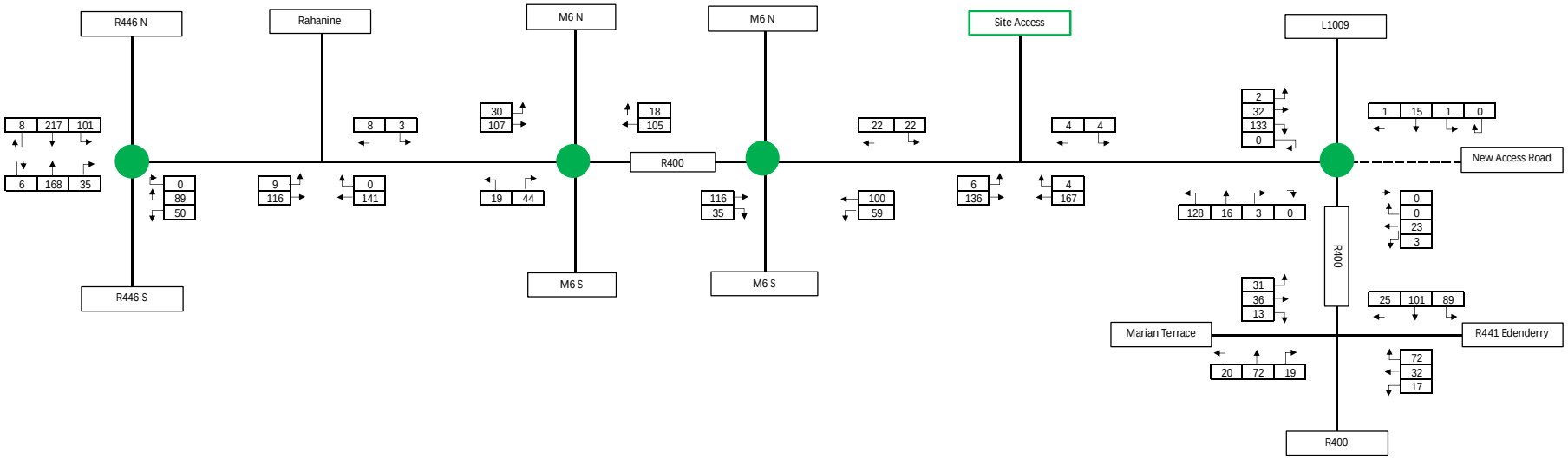
Electric Grid Connection - Grid Route



Electric Grid Connection - Grid Route - Total Development Trips AM (LGV+HGV) - Note that the Quarry access used for some delieveries is not shown. This is located between 220kV access and L1009/R400 Roundabout (Coolcor Roundabout)



Electric Grid Connection - Grid Route - Development Trips Total - Note that the Quarry access used for some delieveries is not shown. This is located between 220kV access and L1009/R400 Roundabout (Coolcor Roundabout)



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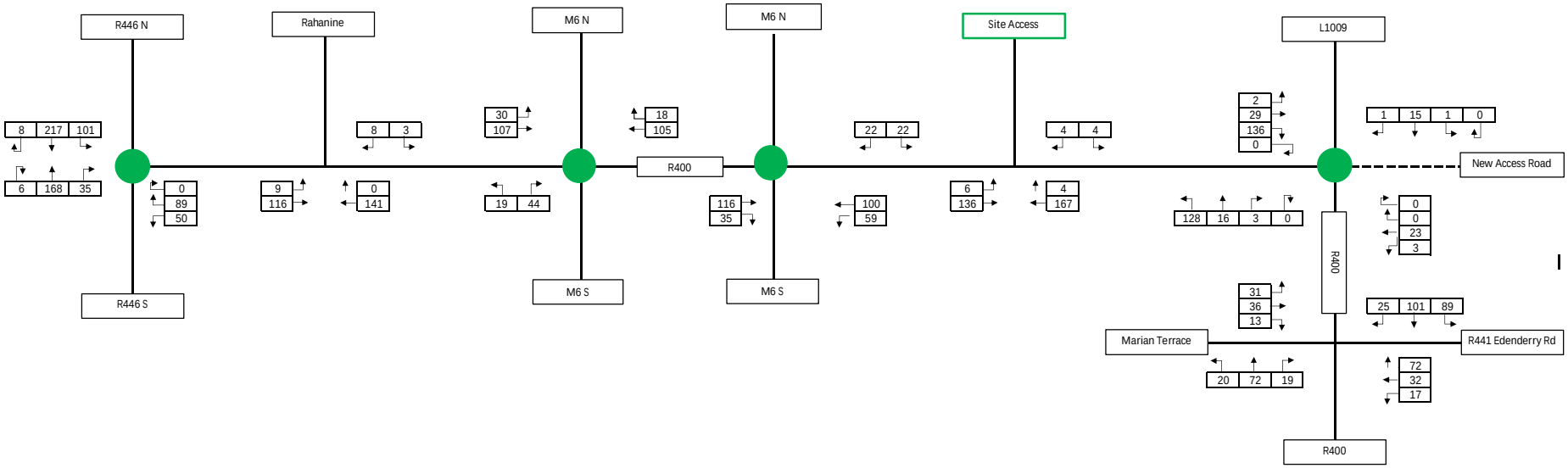

Electricty Grid Connection - Grid Route - 2025 Baseline + Development Trips - PM PEAK

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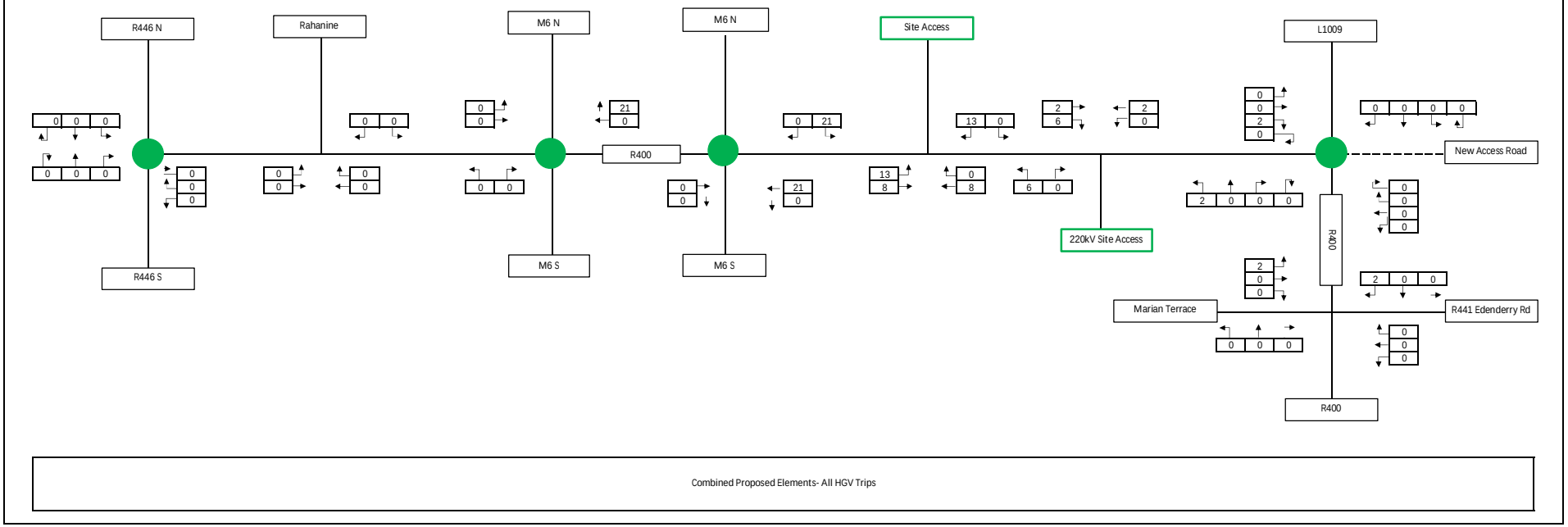
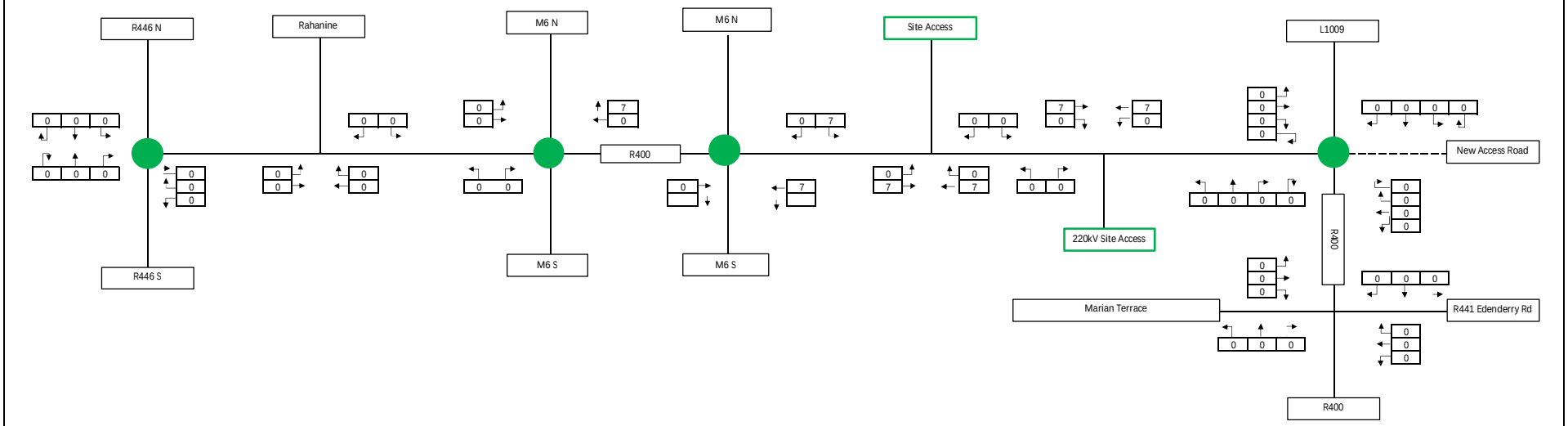
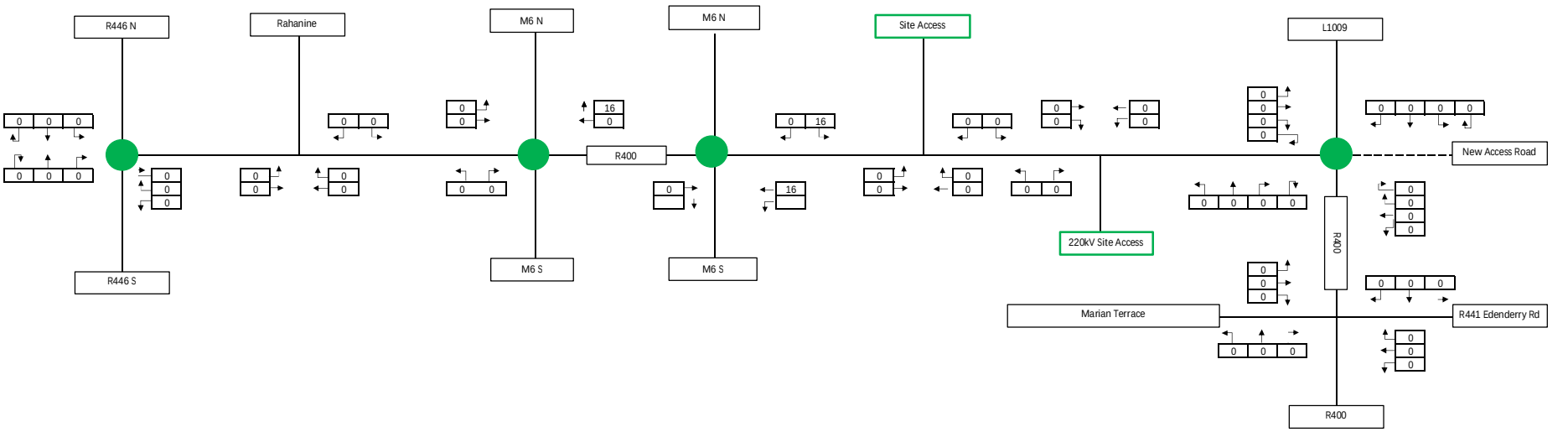


Combined Proposed Elements- All HGV Trips

Cumulative Impact Assessment



Cumulative Trips associated with application 22490



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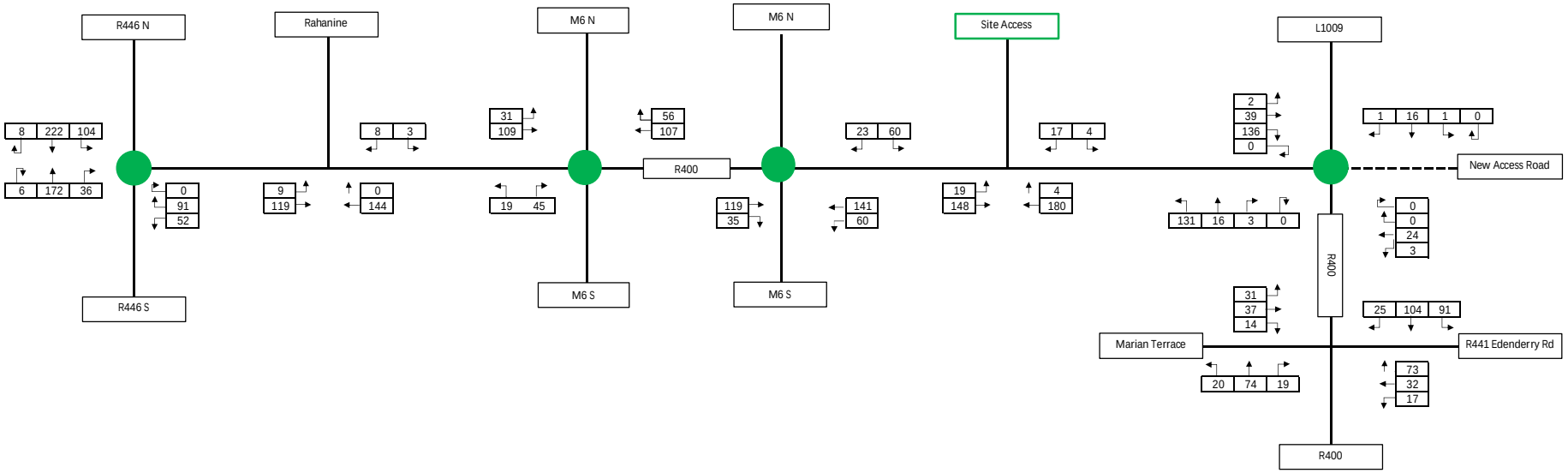
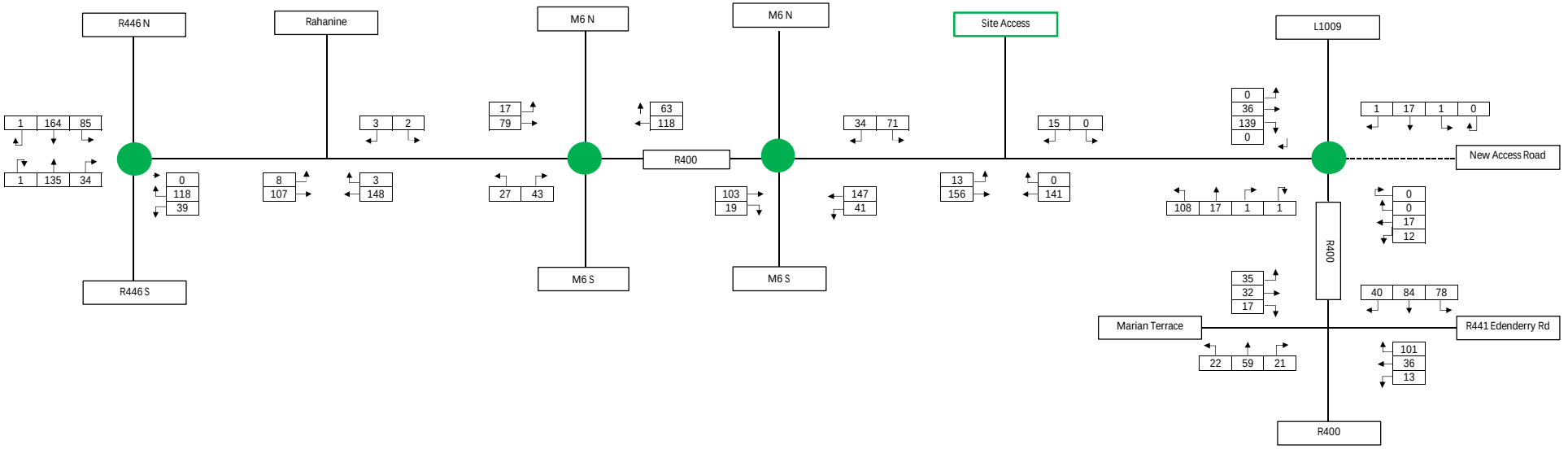


Cumulative Assessment - 2027 Base + Combined Proposed Development Trips + Cumulative Trips



Cumulative Assessment - 2027 Base + Combined Proposed Development Trips + Cumulative Trips

Appendix H Construction Environmental Management Plan (CEMP)

Proposed Derrygreenagh Power Project, Co. Offaly

Construction Environmental Management Plan

Bord na Móna Powergen Limited

Project number: 60699676

January 2024

Delivering a better world

Quality information

Prepared by	Checked by	Verified by	Approved by
POC	POC	Aldona Binchy	Aldona Binchy

Revision History

Revision	Revision date	Details	Authorized	Name	Position
Rev 0	Jan 24	Final	POC	Peter O'Connor	TD

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1. Introduction

1.1 Background

AECOM Ireland Limited (hereafter referred to as 'AECOM') has been appointed on behalf of Bord na Móna Powergen Limited (hereafter referred to as the 'Applicant') to prepare a Construction Environmental Management Plan (CEMP) in relation to a planning application to An Bord Pleanála (ABP) for a Combined Cycle Gas Turbine (CCGT) unit and an Open Cycle Gas Turbine (OCGT) unit (Power Plant Area), and Electricity Grid Connection including substations and associated buildings and infrastructure ('the Proposed Development') on land within a subset of the Derrygreenagh bog group in Co. Offaly (hereafter referred to as the 'Site').

The Proposed Development will also require a Gas Connection Corridor to facilitate the operation of the Power Plant Area. The underground gas connection is not being applied for in the planning application for the Proposed Development (as it will be applied for by Gas Networks Ireland (GNI) under separate consenting processes). The route of the Gas Connection Corridor is the preferred route, as indicated by GNI, at the time of writing but may be subject to change as part of the detailed design process to be carried out. As such, detailed design, construction methodologies and proposed mitigation for the construction, operation and decommissioning of the Gas Connection Corridor will be defined by GNI at a later date and included in a CEMP to accompany their future planning applications.

1.1.1 The Applicant

The Applicant, Bord na Móna Powergen Ltd., is a subsidiary of Bord na Móna PLC.

Bord na Móna PLC is a publicly owned company, originally established in 1946 to develop and manage some of Ireland's extensive peat resources on an industrial scale, in accordance with government policy at the time. Bord na Móna lands extend to approximately 80,000 hectares (ha) in total and are located mainly in the Irish midlands. Bord na Móna currently manages and operates a portfolio of thermal and renewable assets, namely Edenderry Power Plant a peat / biomass co-fired electricity generating unit, Cushaling peaking plant, Cloncreen Sliabh Bawn Bellacorick, Mountlucas, Bruckana and Oweninny wind farms, Derrinlough windfarm (under construction), Timahoe North solar farm (under construction) and the Drehid landfill gas facility.

The Applicant is primarily a climate solutions company and is developing renewable energy projects (wind, solar, biomass and biogas) across its landbank to make a significant contribution to Ireland's ambitious targets for net zero greenhouse gas emissions by 2050. Bord na Móna is seeking to contribute towards the target of increasing the proportion of renewable electricity to 80% by 2030, through accelerating the development of renewable energy by providing up to 2GW of renewable energy generating assets by 2030 in support of national climate and energy policy targets.

1.2 Overview of the CEMP

This CEMP has been prepared to outline the proposed management and administration of site activities during the construction phase of the Proposed Development, to ensure that all construction activities are undertaken in an environmentally responsible manner. This CEMP summarises the environmental commitments of the construction phase, and the measures to ensure compliance with legislation and the requirements of statutory bodies, all as detailed in the Environmental Impact Assessment Report (EIAR) and Natura Impact Statement (NIS) submitted with the planning application.

The CEMP contains an overview of the Proposed Development and existing site conditions. The CEMP also provides mitigation measures to be adhered to during the construction phase. However, these are not exhaustive and will be refined through additional consideration of local circumstances and conditions during preparation of the final CEMP.

This CEMP will be used by the appointed contractor ('Contractor') as the basis for the development of a Contractor's / final CEMP, which will be prepared prior to construction and will include any additional mitigation requirements as and when they arise. It will be the Contractor's responsibility to update this CEMP into a Contractor's CEMP with items such as an Environmental Method Statements and an Environmental Risk Assessment (ERA) for the proposed works.

This CEMP will be updated by the Contractor and will be signed off by Offaly County Council and Westmeath County Council prior to construction works commencing. The Contractor's CEMP will take account of this CEMP and any planning conditions upon grant of permission for the Proposed Development.

This CEMP will be a live document and will be reviewed and updated, as necessary. This CEMP should be read in conjunction with the EIAR, NIS, Planning Statement and Drawings produced for this planning application.

The following relevant guidance has been referenced in the preparation of this CEMP:

- British Standards Institution (BSI) (2014). *BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise.*
- Construction Industry Research and Information Association (CIRIA) (2023). *Environmental good practice on site guide (5th edition) (C811).*
- Construction Industry Research and Information Association (CIRIA) (2006). *Control of water pollution from linear construction projects. Site guide (C649)*.
- Environmental Protection Agency (EPA) (2021). *Best practice guidelines for the preparation of resource & waste management plans for construction & demolition projects.*
- Environmental Protection Agency (EPA) (2022). *Guidelines on the Information to be contained in Environmental Impact Assessment Reports.*
- Inland Fisheries Ireland (IFI) (2016). *Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters.*
- Institute of Air Quality Management (IAQM) (2014). *Guidance on the Assessment of Dust from Demolition and Construction.*
- National Roads Authority (NRA) (2007). *Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan.*
- National Roads Authority (NRA) (2008). *Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes.*

The Contractor will include a full list of all guidance and legislation relevant to the construction phase of the Proposed Development within the Contractors CEMP.

1.3 Aims and Objectives

The **aims** of this CEMP are:

- To ensure the project is undertaken in accordance with best practice guidance for the management of the environment during construction works.
- To ensure that mitigation measures to protect all aspects of the environment as set out in the EIAR and NIS are put in place.
- To ensure that construction activities are carried out in accordance with all planning conditions for the proposed development.
- To carry out the proposed works with minimal impact on the environment.

The objectives of this report are to ensure the above aims are achieved during the construction phase. The following will be implemented during the construction phase by the Contractor and will be set out as part of the Contractors objectives:

- Appointment and delegation of responsibility to an individual for monitoring environmental compliance and adherence to this CEMP.
- Updating the CEMP on a continuous basis in accordance with regular environmental auditing and site inspections.

- Providing adequate environmental training and awareness to all project personnel.
- Establishing documented schedules and records for monitoring and inspections.
- Establishing reporting procedures for any incidents on site with potential to impact on the environment.
- Providing opportunities for site staff, operatives and community feedback and submission of complaints.
- Adopting a sustainable and socially responsible approach to construction.

1.4 Revisions of the CEMP

This CEMP has been prepared at the planning stage of the Proposed Development, with the EIAR, NIS and planning drawings.

All the elements of this CEMP will be included in the Contractor's CEMP, which will be produced prior to construction by the Contractor. The CEMP will be updated prior to the commencement of the development, to include any additional mitigation measures, conditions and or alterations to the EIAR and application documents that may emerge during the course of the planning process. The final CEMP will be submitted to the Planning Authority for written approval in advance of commencement of any construction works on site. The CEMP will be subject to ongoing review throughout the construction phase of the Proposed Development, through regular environmental auditing and site inspections.

The Contractor is required to include further details and / or confirmation in the Contractor's CEMP which will include:

- Details of emergency plan including personnel and contact numbers.
- Details of fuel storage areas (including location and bunding).
- Site and traffic signage.
- Method statements.

The appointed Contractor shall also agree and implement monitoring measures to monitor the effectiveness of the CEMP.

2. Description of the Proposed Development

2.1 Introduction

The Proposed Development is located in the townlands of Knockdrin, Derrygreenagh, Derryarkin, Derryiron, Ballybeg, Coolcor, Barrysbrook, Clonin, Togher and Coole. The total area of the red line application boundary of the Proposed Development is c. 312 ha.

The Proposed Development comprises a Combined Cycle Gas Turbine (CCGT) unit and an Open Cycle Gas Turbine (OCGT) unit, gas Above Ground Installation (AGI), water abstraction and water treatment infrastructure, respective surface and process water discharge connection routes, and the Electricity Grid Connection, refer to **Section 2.2**.

The characteristics of the surroundings of the Proposed Development vary, but it is mostly low density agricultural and residential development with either scattered houses and farming buildings, or dwellings clustered along busier roads. The location of the Proposed Development and overall surrounding environs are illustrated below on **Figure 2.1**. Further details of the Proposed Development, including layout drawings, are provided in Chapter 5 (Proposed Development and Overall Project), Volume I of the EIAR, submitted with this application.

The following terms are used to describe the Proposed Development and its wider project context:

- **'Proposed Development'** – relates to the components for which planning permission is being sought (*i.e.,* the 'red line boundary') – this includes the Power Plant Area and Electricity Grid Connection as defined below.
- **'Power Plant Area'** – relates to the main thermal power plant area east of the R400 road, which includes Combined Cycle Gas Turbine (CCGT) and Open Cycle Gas Turbine (OCGT) plant; a gas Above Ground Installation (AGI) ('Derrygreenagh AGI'); water abstraction and water treatment infrastructure; respective surface and process water discharge connection routes; and a permanent peat and spoil deposition area for overburden material excavated from the Power Plant Area. The process water discharge pipe will extend west of the R400 road before ultimate discharge south into the Yellow River.
- **'Electricity Grid Connection'** - this is part of the Proposed Development and will consist of the 220 kV substation west of the R400 road, pylon towers, overhead lines, Line-cable Interface compound, underground cabling, associated cabling and a new loop-in 400kV substation and compound.
- **'Gas Connection Corridor'** - this is part of the Overall Project, as defined below, and will enable the Proposed Development to connect to the existing high pressure Gas Pipeline to the West (BGE/77), north of the Power Plant Area via an AGI at the tie-in location and an underground pipeline. The underground gas connection is not being applied for in the planning application for the Proposed Development (as it will be applied for by Gas Networks Ireland (GNI) under separate consenting processes).
- **'the Overall Project'** - relates to the Proposed Development (i.e. the components for which planning permission is being sought) and, includes the Gas Connection Corridor as described above.

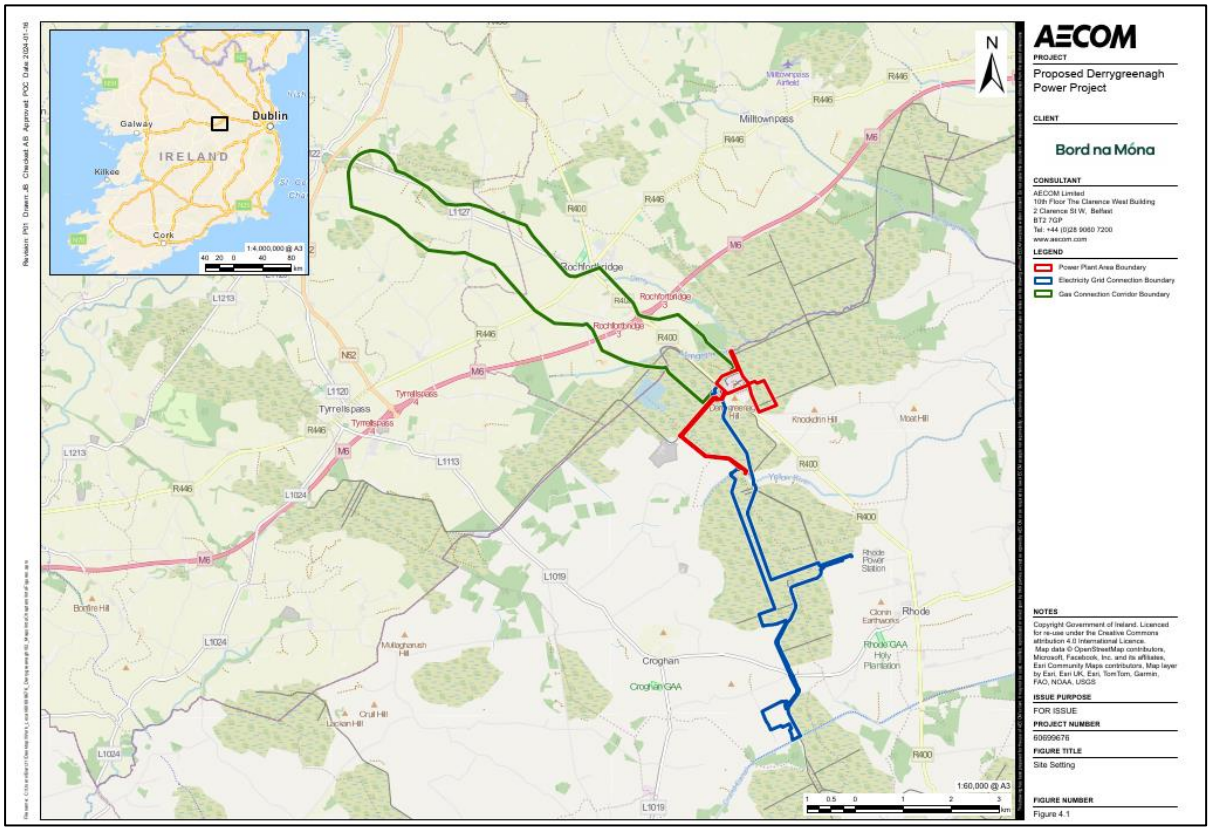

Figure 2-1. Location of the Proposed Development and Surrounding Environs

2.2 Existing Site

The majority of the Proposed Development is located within a subset of the Derrygreenagh bog group termed Bord na Móna Derrygreenagh Bog Group.

2.2.1 Power Plant Area

The Power Plant Area is located on a brownfield site known locally as Derrygreenagh Works. There are currently a number of buildings associated with Bord na Móna Derrygreenagh Works, such as workshops, stores, and offices; paved and concreted areas, outhouses, car-parking facilities, and machinery yards. The site also contains mature trees, hedges, and grassland; and a narrow railway, part of a network of railways connecting the site to the surrounding bog complex. The area was formerly used for servicing and repairing peat harvesting and transport equipment, it is currently servicing equipment required for post peat extraction activities required for site management and environmental monitoring. The existing operations at the Derrygreenagh Works site will be decommissioned and a number of buildings and structures will be demolished prior to the construction of the power plant. The proposals for discharge pipelines from the power plant are for the treated process water to discharge to the Yellow River to the southwest of the Power Plant Area, and clean surface water to discharge to the Mongagh River northeast of the Power Plant Area; both are to have respective routing along existing railway lines and machine pass corridors.

2.2.2 Electricity Grid Connection

The route of the proposed Electricity Grid Connection route starts to the west of the Power Plant Area, on the western side of the R400 road. The proposed overhead line and towers will traverse from the 220 kV Substation south for c. 5km over peat bogs within lands owned by the Applicant, crossing the Yellow River and a haul road associated with Kilmurray S&G, before being undergrounded at a compound c. 1km north of the L1010 Togher Road. An underground cable route will then continue south, beneath the L1010 Togher Road via existing railway underpass, following the route of the existing narrow railway which crosses Coolcor Stream, before connection to a proposed 400 kV Substation located on agricultural land in close proximity to the existing electricity 400 kV overhead route transmission network.

2.2.2.1 220kV Substation – Site Description

The site of the proposed 220 kV Substation is located west of the R400 road in close proximity to the Power Plant Area. The area is located on a brownfield site on the existing narrow gauge railway route on a mixture of made ground and bare peat on relatively flat ground c. 81mOD. There is an existing refuelling station to the northeast. The site of the proposed Contractor Compound will be located north of the proposed Substation site.

2.2.2.2 Overhead Electricity Grid Connection – Site Description

The overhead Electricity Grid Connection route will be located within Bord na Móna Derrygreenagh Bog Group on Derryarkin Bog and Ballybeg Bog. These bogs are served by installation of surface water drainage (incorporating a pump station east of Ballybeg Bog), silt ponds and drain channels as well as rail network (including rail lines, underpasses / bridges and ancillary infrastructure) and machine passes alongside. Drainage is by gravity flow, however in Ballybeg Bog, there is a pumped system used to drain the bog. The required pump station was located at low points in larger drains and are used to direct surface water to the outfall locations via silt ponds in accordance with the Licence Reg No. P0501-01 requirements.

The route of the 220 kV double circuit overhead line will extend from the 220 kV Substation across Derryarkin bog taking an angled route south into Ballybeg Bog, utilising as straight a line as possible before connecting in with the Line-Cable Interface Compound.

Derryarkin Bog has regenerated in recent years to form a scrub and immature woodland mosaic in between patches of bare peat. The lower end of Derryarkin bog contains land that can be prone to flooding. The top half of Ballybeg Bog is a patchwork of bare peat and areas that have begun to regenerate into bog woodland, scrub, immature woodland of mixture or broadleaf and conifer type; the lower end of Ballybeg Bog is bare peatland.

2.2.2.3 Underground Electricity Grid Connection – Site Description

The 220 kV overhead line will transition to a 220 kV underground cable via a double circuit Line-Cable Interface Compound. The cable compound location has been proposed in proximity to the existing railway line and machine pass access track and there is proximity to an existing tree line to the south reducing its visibility from surrounding dwellings.

The underground cable will be routed within an existing railway line and machine pass corridor on Bord na Móna lands for c. 2.8 km before routing through c. 550 m of third-party agricultural land before linking into the 400kV substation site area. There are a number of houses adjacent to the cable route where it dissects the L1010 road and in proximity at Taylors Cross in the townland of Togher.

2.2.2.4 400 kV Substation – Site Description

The site of the proposed 400 kV Substation is located on agricultural land to the west of the Ballybeg Remnant bog south of the L1010 road c. 450m north of the Grand Canal. The existing site is predominantly improved grassland, with perimeter mature trees and hedgerow.

Access to the 400 kV Substation site is currently via agricultural land units to the west however the proposed construction and operational access route will be from the historic railway line to the east. The site of the proposed Contractor Compound will be located north of the proposed 400 kV Substation site, immediately west of Bord na Móna lands. There are nine houses within 750m of the proposed Substation site. There is a permanent soil deposition area proposed to the north-west of the s-Substation and Contractor Compound for storage of excess soils from the substation site during the construction phase.

2.3 Power Plant Area

The Proposed Development will include the following components in relation to the Power Plant Area as per **Table 2.1**.

Table 2-1: Power Plant Area Components

Proposed Element	Component / Details
Combined Cycle Gas Turbine (CCGT) Plant	CCGT Turbine Hall and buildings
	Heat Recovery Steam Generator (HRSG) and associated cladding
	1 no. Emissions Stack (CCGT) 60m high and CEMS monitoring station and platforms
	Air Cooled Condensers (ACC)
	Air Intake (CCGT)
Open Cycle Gas Turbine (OCGT) Plant	OCGT Turbine Hall and Buildings
	Air Intake (OCGT)
	Emissions Stack (OCGT) 45m high
Secondary Fuel Storage and Unloading Facility	2 No. Fuel Storage Tanks and unloading area
	Fuel pumping and cleaning plant
	Fuel transfer system
Subsidiary items of plant/ equipment	Blowdown Tank
	Boiler Feed pumps
	Turbine blowdown tank
	Drains recovery tank
	Deaerator and feedwater storage tank
	Auxiliary Boiler
	Propane Ignition System
	Transformer Cooling Banks
	Emergency Diesel Generator
	Firefighting systems
	Fire Suppression Skid
	2 No. Ammonia storage tanks
	Raw/Fire Water Tank
	Process water treatment & pre-treatments infrastructure including water abstraction and discharge
	2 No. Demineralised water tanks
	Main and Auxiliary Transformers
	Silencers, vents and drains
	Underground / Overground Services (gas, sewage, process water, storm water drainage, water, secondary fuel, electrical services distribution etc.)
	Associated ancillary equipment
	Fuel Gas Performance Heater
Gas Connection Above Ground Infrastructure (AGI) Compound	Regulator building
	Boiler and instrumentation houses
	Gas analyser kiosk
	Pressure reduction system
	Security fencing and Boundary Treatment (gates)
	AGI Site Access - The AGI compound will be served by access point off the R400 road which also serves the power plant area.
	Gas compressor building

Proposed Element	Component / Details
Gas receiving facility	Fin fan coolers
	Pressure reducing station
Associated buildings and infrastructure	Administration Building
	Workshop
	Control Room
	Stores
	Car Parking
	Maintenance Compounds
	Abstraction wells
	Water Treatment Plant
	Process Wastewater Treatment Plant
	Foul Water Treatment System
	Surface water drainage attenuation
	Water Discharge Points
	Firewater Retention and Shutdown Facility
	Power Plant Area Site Access and Internal roads
	External lighting
	Security fencing and Boundary Treatment(gates)
	Utilities (pipes, cables, surface water drainage systems, oil- water separators, including channelling, culverting, crossings etc.)
	Landscape Mitigation
Demolition works	Demolition of a number of existing buildings and structures within the existing Derrygreenagh Works site is included in the Temporary Construction Phase Works. While the effects of the demolition will be permanent, the works activity will be temporary and related to site preparation.
Peat Deposition Area / Soil Deposition Area	Permanent storage of peat or soil from excavations as a result of the construction phase of the Power Plant Area. The peat and soil deposition area will not exceed 1m above ground level and will be suitably profiled to eliminate risk of movement or slippage of material.
Temporary Construction Phase Works	The Power Plant Area element of the Proposed Development will include the following Temporary Construction Phase Works: • Temporary Contractor compounds and welfare facilities • Temporary facilities and stores • Temporary vehicle parking facilities for construction phase • Temporary security fencing and gates • Temporary external lighting • Temporary Signage and Traffic Management

2.4 Electricity Grid Connection

The Proposed Development will include the following components in relation to the Electricity Grid Connection as per **Table 2.2**.

Table 2-2: Electricity Grid Connection Components

Proposed Element	Component / Details
220 kV Substation	Hybrid gas insulated switchgear (GIS) - air insulated switchgear (AIS) Substation design.
1 no. Telecommunication Mast for 220 kV Substation	36m telecommunication mast/steel lattice tower adjacent to 220 kV Substation
220 kV Overhead Line	Overhead line (OHL) facilitated by double circuit suspension pylon towers (13 No.) and strain pylon towers (6 No.).
220 kV Line-Cable Interface Compound	Interface compound to facilitate connection from overhead line to underground connection.
220 kV Underground Cable Connection	220 kV double circuit Underground Cable (UGC) Connection with paved and gated service road and associated 12 no. cable joint bays to facilitate construction and service of underground cables.
400 kV Substation	1 no. 400 kV GIS loop-in substation adjacent to the existing Oldstreet-Woodland 400 kV overhead line. Includes site access off L1010 road.
2 No. 400 kV Strain Towers	Strain towers to facilitate connection from the 400 kV Substation to the existing Oldstreet-Woodland 400 kV overhead line.
1 no. Telecommunication Mast for 400 kV Substation	36m telecommunication mast/steel lattice tower adjacent to 400kV400 kV Substation
Peat Deposition Area / Soil Deposition Area	Permanent storage of peat and soil from excavations arising during the construction phase of the Electricity Grid Connection. The peat and soil deposition area will not exceed 1m above ground level and will be suitably profiled to eliminate risk of movement or slippage of material.
Tree Replanting Area	Suitably sized areas totalling c. 17.5 Hectares for tree replanting have been identified, located in the vicinity of the 220kV line-cable interface compound and the 220 kV substation. These areas will compensate for all tree felling requirements associated with the Proposed Development.
Temporary Construction Phase Works	The Electricity Grid Connection will include the following Temporary Construction Phase Works: • Temporary Contractor compounds and welfare facilities • Temporary facilities and stores • Temporary construction staff vehicle parking facilities for the duration of the construction phase • Temporary security fencing and gates • Temporary External lighting • Temporary Signage and Traffic Management.

3. Overview of the Demolition and Construction Phase Works

3.1 Introduction

It is anticipated that the overall construction phase for the Proposed Development and Overall Project will be approximately 3 years, the final details of which will be determined by the Contractor and presented in the Contractor's CEMP, which will be agreed with Offaly County Council and Westmeath County Council prior to commencement of construction works.

The construction phase for the Power Plant will be approximately 3 years months and approximately 2.5 years for the Electricity Grid Connection. The construction of the Power Plant Area and Electricity Grid Connection will be managed by separate contractors.

Table 3.2 provides an overview of the construction programme for the Proposed Development.

3.2 General Construction Site Management

3.2.1 Roles and Responsibilities

The Contractor will employ a suitably experienced and qualified CEMP Coordinator (CEMPC) or Environmental Manager to undertake coordination and implementation of the Contractor's CEMP, in respect of all environmental requirements. The CEMPC / Environmental Manager will be present onsite whenever work is in progress.

The CEMPC / Environmental Manager will be the point of contact for dealing with environmental issues for the Local Authority, Contractor's employees, subcontractors, relevant regulatory authorities / environmental bodies, and members of the public. The CEMPC / Environmental Manager will also be responsible for controlling the construction impacts arising from the activities of the Contractor and their subcontractors in accordance with the CEMP.

The CEMPC / Environmental Manager will maintain a daily log, recording all environmental issues, events, and dealings with third parties.

The CEMPC / Environmental Manager will prepare, implement, manage, review, and revise the versions of the CEMP with the sole purpose of ensuring that the environment is safeguarded at all times from anticipated or unexpected adverse impacts during construction.

In general, the duties of the CEMPC / Environmental Manager will include the following:

- Implementation of the CEMP procedures.
- Routine environmental monitoring, recording, and reporting.
- Maintaining and auditing the CEMP and documents that underpin it.
- Environmental training including daily Toolbox Talks to the construction staff and design staff.
- Any other activities that may be necessary in order to protect wildlife and the environment during the works.

Some of the indicative key contractor team roles and responsibilities are set out below in **Table 3.1**. Additional specialist input will be included as required (*i.e.,* archaeologist).

Table 3-1: Key contractor Team Roles and Responsibilities (Indicative)

Role	Responsibilities
Contractor's Project Director	• Assign specific environmental duties to competent member of the Contractor's team. • Identify the environmental training needs of personnel under their control and arrange appropriate training programmes and ensure records are being maintained. • Ensure that significant environmental aspects identified for the proposed development are managed. • Promote the continual improvement of environmental performance.
Contractor's Project Manager	• Ensure that the CEMP is produced, maintained, and implemented and distributed to all relevant parties. • Monitor the completion of corrective actions by the Site Manager and take action as required to expedite completion. • Ensure that all personnel for whom they are responsible are aware of the CEMP and implement the relevant requirements. • Evaluate the competence of all subcontractors and suppliers and ensure that they are made aware of and comply with the CEMP and associated procedures. • Establish a consultation and communication system with all relevant interested parties associated with the proposed development, including employees, partners, sub-contractors, designers and third parties, etc., where relevant.
CEMP Coordinator (CEMPC) / Environmental Manager	• Develop, maintain, and audit the CEMP (and supporting documents / plans) to ensure all aspects, impacts, statutory requirements, and EIAR and NIS commitments, etc., are reflected. • Develop and implement a programme of regular environmental inspections, monitoring, recording, and reporting, in accordance with procedures set out in the CEMP. • Ensure that the works are constructed in line with the CEMP. • Liaise with the Local Authority. • Attend regular construction meetings to ensure environmental issues are discussed and addressed by the Contractor's Team. • Comply with duties under relevant legislation and company procedures in relation to environmental incident investigation and reporting. • Provide support and training to the workforce with regard to understanding environmental aspects, impacts, regulatory requirements, best practice, constraints and methods of working. • Appoint environmental specialists as required. • Ensure identified environmental specialists are in attendance on-site as required by the CEMP. • Complete programme of regular environmental inspections, monitoring, recording, and reporting in accordance with the CEMP. • Provide direction on corrective action to be taken by the Site Manager in response to identified non-conformances. • Report all identified non-conformances separately to the Site Manager. • Ensure that corrective actions are completed fully by the Site Manager. • Maintain daily records of environmental issues, events, and consultations with third parties. • Ensure identified environmental specialists are in attendance on-site as required by the CEMP. • Maintain records of environmental awareness training / inductions delivered to site staff.
Site Manager	• Ensure that all personnel undergo suitable and sufficient environmental induction before starting work, and periodic refresher environmental awareness training throughout the construction phase. • Ensure staff attend the appropriate environmental courses that are organised by the CEMPC. • Ensure the CEMPC is maintaining records of training delivered to site staff. • Monitor the performance of personnel and activities under their control and ensure arrangements are in place so that all personnel can work in a manner which minimises risks to them and to the environment. • Undertake a programme of regular environmental inspections in liaison with the Environmental Manager.

Role	Responsibilities
	• Provide resources and support to complete corrective actions identified by the Environmental Manager. • Assist and support the CEMPC and statutory bodies in the investigation of any incidents. • Notify the Environmental Manager of all environmental issues or incidents arising over the course of operations.
Safety, Health, Environment and Quality (SHEQ) Officer	• A suitably qualified SHEQ Officer will be appointed by the contractor for the duration of the construction period. • The SHEQ will ensure compliance with all relevant Health and Safety regulations, environmental regulations, and quality control on-site during the construction stage. • The SHEQ will be on-site full time during the construction phase. • The SHEQ Officer, or other suitably qualified person, will fulfil the role of Project Supervisor Construction Stage (PSCS) in accordance with the requirements of the Safety, Health and Welfare at Work (Construction) Regulations 2013, as amended and will liaise with the Project Supervisor Design Process (PSDP) in the discharge of their duties under the Regulations.
Ecological Clerk of Works (ECoW)	• The Ecological Clerk of Works (ECoW) will hold a relevant degree in ecology and have appropriate relevant experience. • Provision of specialist input and supervision (licensed or otherwise), where necessary, of construction in relation to protected species including roosting bats. • Training of construction staff regarding measures to protect nesting birds and roosting bats. • Attend site as required to monitor the protection of asset in accordance with the requirements of relevant legislation, the construction contract and the CEMP. • Identify potential risks to wildlife and develop suitable control measures. • Provide status reports and updates to the Environmental Manager in the completion of their activities. • Liaison with the NPWS, Local Authority and other nature conservation agencies on ecological matters where required.

3.2.2 Safety and Security

All activities carried out by the Contractor on the Site will be in accordance with the requirements of the *Safety, Health and Welfare at Work Act 2005*, as amended, and Regulations made under this Act.

The scale and scope of the Proposed Development will require the appointment of a Project Supervisor Design Process (PSDP) and Project Supervisor Construction Stage (PSCS) in accordance with the provisions of the *Safety, Health and Welfare at Work (Construction) Regulations 2013 (S.I. No. 291 of 2103),* as amended. These persons will be appointed by Applicant and notified to the Health and Safety Authority (HSA) prior to commencement of detailed design works (in the case of the PSDP) and prior to commencement of construction (in the case of the PSCS).

The PSDP will prepare a Preliminary Health and Safety (H&S) Plan which will identify any particular risks, residual risks and particular sequences of work that are envisaged during the design of the works. Prior to construction works commencing, the Preliminary H&S Plan will be provided to the Contractor and the PSCS will further develop the document to prepare a construction phase H&S Plan. This H&S Plan will also provide relevant contact details and emergency response procedures for the Proposed Development. Mitigation and control measures will be implemented to minimise the identified risks.

Evidence of completion of construction safety training, typically in the form of a Safepass Card, will be required for all construction personnel prior to commencing onsite. A record of Safepass Cards and personnel approved for entrance to the Site will be completed as part of a site induction process. The Contractor's H&S Plan will detail the site induction and access requirements. Where relevant, equipment operators or specialist works will require personnel to hold a valid Construction Skills Certificate Scheme Card. All equipment and machinery used onsite will be appropriately certified for its intended purposes.

The perimeter of the construction compounds will be surrounded by palisade security fencing, c. 2m in height. There will be additional security fencing around specific areas of the Site, for added security and safety.

There will be temporary security cabins at access points onto the substation sites during the construction phase, with CCTV and gates with locks at access points on the transmission sites. The security cabins will be located close to the proposed temporary and permanent site entrances and at crossing points on local roads from one bog to another.

For Power Plant Area site security, there will be a single point of entry to the Site for all construction personnel. The Site entrance gates will be securely locked outside of construction hours to prevent unauthorised entry and will be monitored during construction hours to regulate access to the Site for authorised personnel. Public access to the Site during the construction phase will be prohibited.

The security cabins will be prefabricated structures and will serve as the check-in and check-out point for staff and visitors during the construction phase. The security cabins will be removed as part of the post-construction reinstatement works of the Proposed Development.

3.2.3 Environmental Training and Awareness

To ensure environmental awareness and compliance throughout the construction phase of the Proposed Development, this CEMP and its contents will be communicated to all site personnel, including management staff, operatives and subcontractors.

3.2.3.1 Site Induction

All personnel working on the Proposed Development (including all site personnel, management staff, operatives, contractors, subcontractors and visitors attending the Site) will attend a mandatory site induction before they commence work on site and, where appropriate, the Contractor(s) will identify specific training needs for the construction workforce and will ensure that appropriate training requirements are fulfilled. The key elements of this CEMP will form part of the Site induction. Personnel attending such an induction will complete a site induction record acknowledging attendance and confirming that they understand and agree to comply with the requirements of the Site. Copies of all certificates of competency, licences and other qualifications as deemed necessary by the Contractor will be copied and documented. The environmental induction will run concurrently with safety awareness training.

Key environmental considerations and objectives will be incorporated into this induction and a baseline level of environmental awareness will be established. The Site induction will include the following as a minimum:

- An introduction to the Environmental Manager.
- A description of the CEMP and consequences of non-compliance.
- An overview of the goals and objectives of the environmental policy and CEMP;
- Identification of environmental constraints.
- Information in relation to the environmental risk associated with the Proposed Development and methods of avoiding environmental risks as identified within the CEMP, the planning conditions, and any other relevant plans, documents, or reports;
- An overview of conditions of consents, permits and licences, including environmental control measures and commitments.
- Procedures associated with emergency and spill management, incident notification and reporting, including procedures for dealing with damage to the environment.
- Information of roles and individual responsibilities and environmental constraints to specific jobs;
- Location of any sensitive receptors on or adjacent to the Site;
- Location of habitats and species to be protected during construction, how activities may affect them and methods necessary to avoid impacts, controls to minimise noise and the importance of pollution

prevention measures to protect nearby watercourses and sensitive receptors including residential properties;

- Information on the environmental emergency response procedure to be followed onsite, should an environmental emergency occur, including contact details for key Site personnel to contact in an emergency; and
- Information on the storage locations of spill kits across site and on the correct use of spill kits.

3.2.3.2 Toolbox Talks

Environmental toolbox talks will be provided to all site personnel and sub-consultants on a regular basis. These will be targeted at particularly sensitive environmental issues such as:

- Protection of sensitive ecological habitats and key ecological receptors.
- Works close to waterbodies.
- Water pollution and silt control.
- Water pollution in relation to cement and concrete handling.
- Spill prevention and control.
- Dust management.
- Sensitive archaeological sites.
- Waste management.

In addition to the above, toolbox talks will be provided in advance of works which are considered to present an increased environmental risk. Toolbox talks will inform site personnel of any mitigation measures and working procedures which must be adopted specific to the works to be carried out.

3.2.4 Consents and Licences

All statutory consents and licences required to commence on-site construction activities will be obtained ahead of works commencing, allowing for the appropriate notice period. It will be the responsibility of the Contractor to ensure all consents and licences required are in place prior to the start of construction. These will include, but are not limited to:

- Site notices.
- Construction commencement notices.
- Licence to connect to existing utilities (including water) and mains sewers, where required.
- Abstraction and / or discharge licenses, where required (unless applied for separately under IE Licence to the EPA).
- Road opening / closure licences.

The CEMPC / Environmental Manager will oversee and advise the Contractor on compliance with additional requirements to the CEMP including licensing requirements, mitigation measures, and monitoring requirements specified in documents including, but not limited to, the following:

- Construction Traffic Management Plan (CTMP).
- Dust Management Plan (DMP).
- Invasive Species Management Plan (ISMP).
- Water Quality Management Plan.
- Emergency Response Plan.
- Resource and Waste Management Plan (RWMP).

3.2.5 Emergency Management

3.2.5.1 Emergency Response Plan

The Contractor will be responsible for developing a detailed Emergency Response Plan (ERP) for the proposed works, to cover health and safety emergencies as well as environmental emergencies, as part of the H&S Plan.

The ERP will be in accordance with legislative requirements including COMAH and IE Licence, which will include a fire strategy and appropriate training procedures.

Procedures will be in place for the ERP to clearly detail the responsibilities, actions and communication channels for staff and personnel on how to deal with emergencies should they occur. Staff will also receive the level of training required for their role and position. This will include dealing with events such as fires, explosions, spillages, flooding etc.

The ERP will be activated in the event of an emergency such as an accident, fire, spillage, collapse etc. and will provide details on who is required to be notified, first aid facilities and closest hospitals. The ERP will also include details of all personnel inducted and authorised to work on the Site as well as next of kin contact details and relevant medical information.

In the event of an emergency, the SHEQ Officer, CEMPC and Project Manager will be notified immediately and will determine the scale of the emergency and the requirement for the assistance of emergency services. Works will cease in the area of the incident and contact will be maintained with the emergency services to direct them to the scene of the incident as required. As part of the ERP, an evacuation drill will be carried out on a regular basis to make all personnel aware of the procedure to be followed in the event of an emergency where a full site evacuation is required.

Emergency point(s) will be identified at suitable locations in the construction compounds and the ERP will outline the persons responsible for checking names at the safety muster points. Records will be maintained of such drills.

The ERP must include contact names and telephone numbers for the relevant local authorities (all sections / departments) including ambulance, fire brigade, An Garda Siochána and the HSA. Reporting of environmental emergencies to the Local Authority will be required as well as other relevant stakeholders such as the NPWS, IFI or the EPA.

3.2.5.2 Spill Control and Response

Emergency spill kits with oil boom and absorbent materials will be kept on-site in the event of an accidental spill. Spill kits will be kept in the construction compounds. Spill kits and oil absorbent material will be carried by mobile plant and located at vulnerable locations (e.g., near oil filled equipment). Booms will be held on-site for works near waterbody/ drains. Spill kits will contain a breakable tie to show use and indicates whether it needs to be replenished. The Site Manager and Environmental Manager will be responsible for replenishing spill kits.

All construction personnel will be notified of where the spill kits are located as part of the site induction and will be trained on the site procedures for dealing with spills. In the event of a leak or a spill in the field, the spill kits will be used to contain and absorb the pollutant and prevent any further potential contamination. The absorbed pollutants and contaminated materials will be placed into leak proof containers and transferred to a suitable waste container for hazardous materials in the construction compounds. Where a leak has occurred from machinery, the equipment will not be permitted to be used further until the issue has been resolved.

The SHEQ Officer (or equivalent appointed person) will be notified of any spills on-site and will determine the requirement to notify the relevant authorities. Refer to **Section 5.7.1.3 and 5.7.1.5** for further mitigation on refuelling and spills.

3.2.5.3 Incidents

All safety or environmental incidents associated with the Proposed Development will be reported and investigated in line with the ERP. The following procedures will be followed in the event of an incident:

- Works will stop immediately where safe to do so.
- The SHEQ Officer, CEMPC and Project Manager and will be contacted.
- The size of the incident will be assessed and determined if it can be controlled by site staff or if emergency services are required to attend.
- The appropriate enforcing authority will be contacted.
- The SHEQ Officer will investigate after the incident.
- The findings will be sent to the appropriate authority.
- An action plan will be prepared to set out any modifications to working practices required to prevent a recurrence.
- All operatives and staff to be briefed on the updated working practices / procedures.

3.2.6 Complaints

A Complaints Register, detailing any and all complaints received from the general public in respect of the operation of the facility, will be maintained at the site. This register will also record complaints occurring from construction activity at the Site.

All complaints received regarding the construction works will be recorded and categorised (e.g., noise, property damage, traffic, dust etc.) within the Complaints Register.

When a complaint is received (telephone calls and letters of complaint etc.), the following information must be taken as a minimum:

- Name, address and contact details of the complainant (with the complainant's permission).
- Brief outline of the complaint.
- Date of complaint.
- Name of person receiving complaint details.

A mechanism for managing stakeholders' questions, concerns, and grievances from local residents and stakeholders' will be implemented, appropriate conflict resolution processes will be implemented to ensure any issues are heard by the developer. All complaints received from external sources and incidents must be reported to the CEMPC and the appropriate site personnel. Measures will include but will not be limited to:

- Complying with the requirements of the Data Protection Act, and other relevant legislation, the Contractor will record all Complaints, Comments and Queries (correspondence) received during construction. Stored data will be secured against theft, intrusion, or modification by malicious third parties in-line with current best practice.
- The Contractor will record any actions, including further correspondence, taken in respect of any Complaint, Comment or Query.
- The following timescales will apply in the Contractor's management of correspondence following submission:
  - within eight working hours from receiving the complaint, an acknowledgement will be sent to the correspondent; and
  - within 72 hours, the Contractor will issue a response to any correspondence detailing further actions to be undertaken.

- The Contractor will aim to have completed and implemented their actions within seven working days of receiving correspondence.
- The Contractor will have a means by which to explore the Complaints, Comments and Queries interface within the reception area of the site offices, to allow access to the records during normal working hours.

All complaints received by the Applicant will be communicated to the Contractor immediately so that the potential source(s) of the complaint can be stopped or shut down while the complaint is investigated. All complaints will be followed up and resolved in so far as is practicable. The complainant, Contractor and other stakeholders will be kept informed of the progress in resolving the complaint.

3.2.7 Monitoring and Inspections

Environmental focused monitoring and inspection activities will be carried out throughout the construction phase. The frequency of monitoring and inspection activities will be agreed in advance of construction with the Applicant and will be in line with planning conditions, the documentation and reports submitted with the planning application such as the EIAR, and any preconstruction surveys. Additional monitoring and inspection will take place outside of the agreed frequency where an incident occurs or where activities that can have a significant environmental impact are occurring.

Regular site inspections will be undertaken by the Contractor's CEMPC / Environmental Manager to monitor compliance with the CEMP and record inspection results. It is anticipated that a daily visual check and a detailed weekly check will be carried out and these records will be available to the Local Authorities upon request.

3.2.8 Community Consultation and Liaison

There shall be an ongoing commitment by the Project Team to maintain community consultation and liaison throughout the construction period for the Proposed Development. Signage will be provided at Site entrances which shall have a Project contact telephone number where the public will be able to leave messages in relation to the Proposed Development construction.

A liaison officer will be appointed to manage the calls / messages and any subsequent actions pertaining to these.

Details of community engagement and consultation to date is defined in EIAR Chapter 6: Consultation.

3.3 Demolition Works

Demolition of a large section of the existing Derrygreenagh Works is included in the Proposed Development in order to facilitate the construction of the Power Plant Area. While the effects of the demolition will be permanent, the demolition work activities themselves will be temporary and related to site preparation.

The following buildings and structures to be demolished on the Power Plant Area include:

- Site Offices
- Boiler House
- Workshop #1
- Workshop #2
- Water Tank
- Storage Unit.

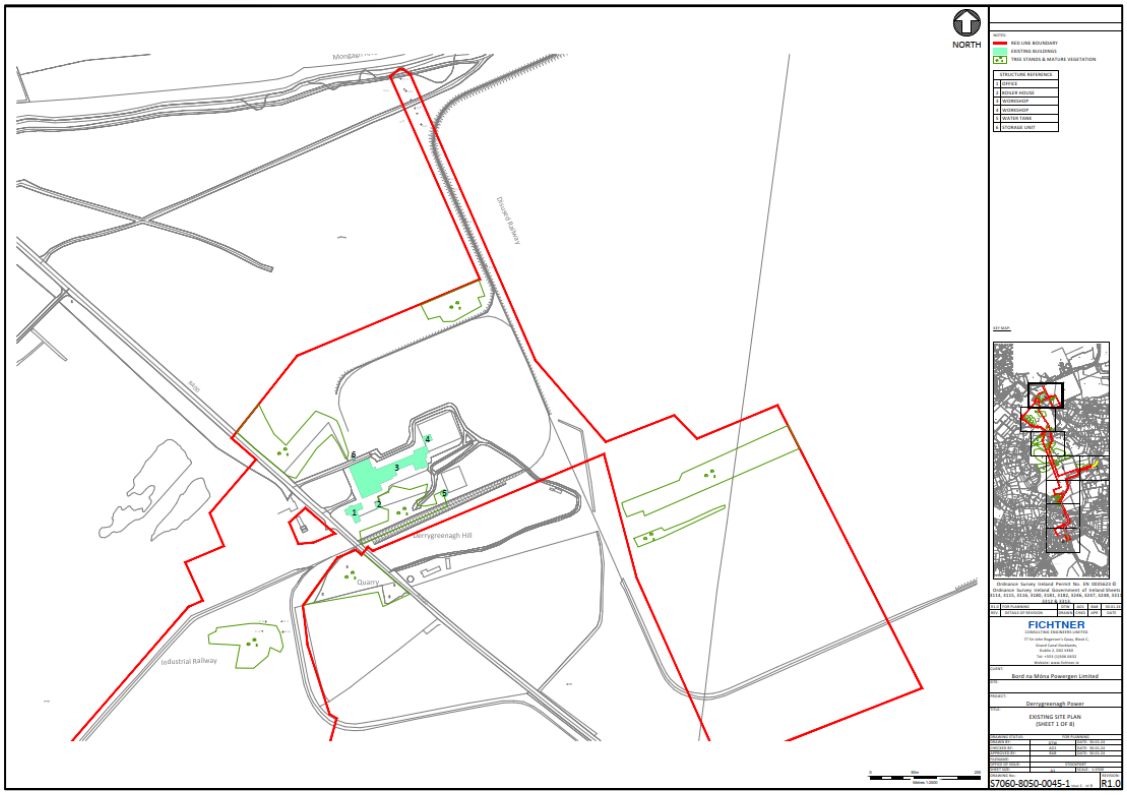

Figure 3-1. Location of the Structures to be Demolished.

Ahead of the dismantling and demolition works, certain activities and surveys / inspections will need to be undertaken to determine if there are any hazardous materials etc present. The reports from these surveys/inspections will be made available to the demolition contractors.

Asbestos will be progressively removed throughout the works in full compliance with current regulations. The removal of all hazardous materials is to be carried out prior to demolition work commencing and disposed of in line with the relevant legislation. The coating on the external sheeting is known to contain some asbestos bearing material.

The proposed demolition process will be undertaken in the following general stages:

- Removal of re-usable plant.
- Progressive stripping and disposal of asbestos (if present).
- Stripping out of internal equipment and fittings for scrap.
- Breaking up of the internal concrete floors.
- Demolition of external components and structures.

The demolition works will include a number of different methodologies and it is anticipated that a combination of the following demolition methods will be used:

- Manual removal of asbestos and asbestos containing materials (if / where required).
- Dismantling (reverse installation).
- High Reach Demolition Plant.
- Hot Works (cutting) to enable dismantling.
- Cranage.
- Vibration Pecker to break out concrete into smaller manageable sections.

- Manual gas / plasma cutting - cutting electrically conductive materials like mild steel, stainless steel, copper, aluminium.
- Hydraulic shears / crushers – used to demolish reinforced concrete and other materials.

Plant and equipment will be required and will include heavy duty earthmoving plant and excavating equipment. Vehicles and equipment will be securely stored within the Power Plant Area.

Refer to **Section 5.11.2** for details regarding the demolition waste management.

Table 3-2: Construction Phase Programme (Subject to planning permission timeline)

Activity	Year 1				Year 2				Year 3				Year 4			
	Q4 2024	Q1 2025	Q2 2025	Q3 2025	Q4 2025	Q1 2026	Q2 2026	Q3 2026	Q4 2026	Q1 2027	Q2 2027	Q3 2027	Q4 2025			
Power Plant Area																
Enabling works and mobilisation (inc. site clearance and demolition)	x	x														
Civil and Structural (Inc. ground works, piling and foundations)			x	x	x	x	x	x	x							
Erect steelwork and cladding				x	x	x	x	x	x							
Mechanical and electrical works					x	x	x	x	x	x	x	x				
Commissioning and testing								x	x	x	x	x	x			
Electricity Grid Connection																
Enabling works and site mobilisation	x	x	x													
Civil Works - Substation (220 kV + 400 kV) and interface compound	x	x	x													
Cabling and tower works									x	x	x					
Mechanical and electrical fitout			x	x	x	x	x									
Commissioning and testing								x	x	x	x					
Energisation											x					

Source: Fichtner Consulting Engineers Limited (2023)

3.4 Construction Phase for the Power Plant Area

3.4.1 Overview

The Applicant will appoint an Engineering Procurement Construction (EPC) Contractor for the construction of the Power Plant Area. The Contractor will appoint sub-contractors to undertake all the specific construction and civil works. The Applicant is committed to ensure a safe working environment for all employees and contractors.

Any vegetation clearance works required will commence outside the breeding bird season, which runs from the 1st of March to the 31st of August, to avoid any potentially significant effects on nesting birds. Construction may commence from September to March so that construction activities are ongoing by the time the next bird breeding season comes around and can continue throughout that bird breeding season.

3.4.2 Construction Programme / Phasing

The construction phase for the Power Plant Area will be approximately 39 months, the final details of which will be determined by the EPC Contractor and presented in the Contractors CEMP. **Table 3.2** provides an overview of the construction programme for the Power Plant Area.

3.4.3 Construction Hours

Construction works will typically take place during the hours of 0700 hrs to 1900 hrs (Monday to Friday) and 0800 hrs to 1300 hrs (Saturday) with the exception of commissioning and specific engineering works (e.g., Non-destructive testing, internal erection concrete pours) which could take place outside these hours, as and when agreed with the planning authority.

Specific internal erection activities may be required to be carried out on a 24 hr 7 day per week basis, to ensure that optimal use is made of good weather period or at critical periods within the programme (i.e., concrete pours) or to accommodate delivery of large turbine component along public routes it could be necessary on occasion to work outside of these hours. Any such out of hours working will be agreed in advance with the Local Authorities.

3.4.4 Construction Staff

Levels of employment will vary throughout the construction phase with peak levels of employment likely to be 400 staff average with a peak employment of approximately 750 staff.

Staff will comprise engineering, management, skilled and semi-skilled workers during the construction programme.

3.4.5 Temporary Construction Compounds

The temporary construction compound will be located on the west and north sides of the Power Plant Area. The construction compound will be used for the unloading and storage of construction materials, temporary site offices and welfare facilities, and will have availability for some construction staff vehicle parking. Refer to **Section 3.3.6** for further details on traffic management and parking.

The EPC contactor will carry out all works associated with preparing the areas for use and installing all required services. The arrangement of the contractor compounds will evolve over the duration of the project. Detailed requirements and designs will therefore be developed during the detailed design phase by the EPC contractor.

Wastewater from temporary construction phase welfare facilities will be directed to a sealed storage tank, with all wastewater tankered off site by an appropriately consented waste collector to a licensed disposal plant. The temporary wastewater storage tanks will be fitted with an automated alarm system that will provide sufficient notice that the tank requires emptying. All construction chemicals, oil and grease etc. will be stored in appropriate containers, cabinets and bunded areas.

Construction vehicles and equipment will be parked on hard standing and/or provided with drip trays as appropriate.

The compound will not be used for long-term storage of materials, and storage will be for the duration of the construction phase only. At the end of each shift, mobile plant will be returned to a secure overnight plant storage area within the construction compound where drip trays will be utilised under the various types of plant. Storage areas for flammable / toxic / corrosive materials will be located in a separate, locked, impermeable bunded and fenced off area. Material data sheets will be available for all these materials, as well as a copy of the relevant Risk Assessment for the task and control measures set therein, all subject to the Applicant's approval.

The contractor will be responsible for ensuring that all vehicles egressing the site have used the wheel wash facilities. A road sweeper will be available if any section of the surrounding public roads becomes soiled by vehicles associated with the Proposed Development.

Laydown requirements and construction phasing will be developed during the detailed design phase by the Contractor.

Construction security is the responsibility of the EPC Contractor. There will be security fencing around the construction compounds and specific areas of the site for access control, safety and security. Refer to **Section 3.2.2**, for further details on site security.

A construction phase temporary lighting scheme will be designed to provide safe working conditions in all areas of the Site during construction. The lighting scheme will aim to reduce light pollution and a visual impact on sensitive receptors and the local environment. The construction phase lighting scheme will be developed by the EPC contractor. The lighting system will comply with the guidance provided by HSG38 Lighting at Work, the Society of Light and Lighting guides and EN 12464-2.

The location of the construction compounds is shown on planning drawings submitted with the planning application**.**

3.4.5.1 Construction Facilities and Storage

The area to the immediate north and west of the Power Plant Area will be used for the unloading and storage of construction materials, temporary site offices and welfare facilities, and construction staff vehicle parking (refer to Planning Drawings). Some pre- fabrication of materials and components will also be undertaken in these areas. This area will have availability for approximately 100 No. cars and 36 No. minibuses, which will be adequate space for the peak staff construction vehicles, refer to **Section 3.3.6**.

Some pre-fabrication of materials and components will also be undertaken in this area. The temporary construction compound is currently underlain by made ground such that it provides a level surface that allows surface water and rainwater to percolate through it; no hazardous materials will be stored unbunded within this area.

3.4.6 Construction Materials

The construction of the Power Plant Area will require the relevant personnel, machinery and materials. **Table 3.3** outlines the equipment and materials.

Table 3-3: Power Plant Area – Estimated Construction Works

Equipment	Materials
• JCB Type excavators (20, 25, 35 ton) • 360˚ tracked excavators (13 ton normally, 22 tonne for rock breaker) • Tracked / wheeled dumpers / tractors and trailers • Compactors and rollers • Piling rigs • Telehandlers • Wheeled, tracked and fixed cranes • Hoists • Pumps • Power and hand tools • Generators	• Stone • Asphalt • Geotextile • Lighting fixtures and fittings • Paving • Fencing • Steelworks • Concrete • Timber • Cladding • Doors • Piping inc. fixtures and fittings

Equipment	Materials
• Cutting and welding equipment • Scaffolding	• Cabling inc. fixtures and fittings • Switchgear • Instrumentation and control systems

3.4.7 Construction Traffic and Site Access

It is expected that the extent of HGV (Heavy Goods Vehicle) movements will vary at different stages of the construction works in response to the activities taking place at any given time.

Traffic management and road signage will be in accordance with the Department of Transport: *Traffic Signs Manual - Chapter 8: Temporary Traffic Measures and Signs for Road Works* and in agreement with Offaly and Westmeath County Councils. All work on public roads will be subject to the approval of a road opening license application. The Contractor will prepare detailed Construction Traffic Management Plans (CTMP) for inclusion as part of the road opening licence applications.

All traffic management measures will comply with those outlined in the CTMP, which was submitted as part of the planning application for the Proposed Development. The CTMP submitted as part of the application for the Proposed Development will be finalised in consultation with Offaly and Westmeath County Councils, before construction commences.

The peak HGV movements during the construction of the Power Plant Area are associated with cut and fill movements. HGV trips associated with cut and fill material are expected to arrive between December 2024 – May 2025.

It is proposed that abnormal loads will be delivered to site via the M4/M6 motorway, exiting at Junction 3 before traveling south on the R400 road and onto the site. These abnormal loads are expected to arrive between Months 19 and 24. An Abnormal Loads report has also been (completed as part of the EIAR) to identify mitigation measures required for movement of abnormal loads. This is provided in Appendix 14B, Volume II of the EIAR. Access to the Site will be east off the R400 road via an existing access site which will be developed for use in the construction phase.

Based on the location of proposed development at Derrygreenagh, the proposed route for the delivery of any abnormal loads is to be via Dublin Port.

In relation to HGV trip distribution all deliveries to the Site will be directed to approach the site along the R400 road from the direction of the junction with the M6. Therefore, HGV trips are expected to approach the site from the direction of the M6 motorway. This may include HGV traffic from the nearby sand and gravel quarries to the north of the Site, though materials may be sought from quarries south of the Power Plant Area within the sphere of the Proposed Development.

The CTMP will be agreed with the Local Authorities and An Garda Síochána prior to construction works commencing onsite.

Refer to **Section 5.9** for details on the construction traffic mitigation measures and the CTMP in **Appendix 1A**.

3.4.7.1 Parking

Parking will be available onsite to allow all construction staff vehicles to park at once. Therefore, no extraneous parking is to be expected.

The Contractor will organise minibuses to and from site to a number of locations and will encourage all construction staff to travel to site by minibus to limit the number of vehicles entering the site.

As noted in **Section 3.3.4**, levels of employment will vary throughout the construction phase. Based on a 1.5 car occupancy, it is expected that there will be 100 No. staff cars (LGVs: light good vehicles) arriving to the Site each day during the peak months (200 LGV two-way trips), during peak employment.

3.4.8 Construction Waste Management

Refer to **Section 5.11** for the full demolition and construction waste mitigation measures.

Waste will be generated during all stages of construction. All waste products (general waste, plastic, timber, etc.) arising during the construction phase will be managed and disposed of in accordance with the provisions of the Waste Management Act, as amended, and associated amendments and regulations.

A Construction & Demolition Resource and Waste Management Plan (RWMP) (to be incorporated into the Contractor's CEMP) will be prepared and all relevant contractors will be required to seek to minimise waste arising at source and, where such waste generation is unavoidable, to maximise its recycling and reuse potential. Recycling of materials will take place offsite at appropriately licensed facilities where noise and dust are more easily managed and less likely to impact on surrounding properties.

During the civil construction works, the Site boundary will be clearly marked with high visibility tape and the Contractor will not be permitted to use any areas outside the identified Site boundary for any activity relating to construction.

The construction compounds will be provided with drainage systems designed in accordance with EN 12056 and provided with silt traps and, if required, hydrocarbon interceptors. The surface water will infiltrate into the ground and/or be discharged into the local area drainage system. A detailed drainage plan for the construction phase will be developed during the detailed design phase by the EPC contractor. Additional information is provided in **Section 5.7.1.2**.

3.4.8.1 Peat and Soil Waste Management

The approximate quantity of peat and non-peat material (soil) requiring management on the Site of the Power Plant Area has been calculated, as presented in **Table 3.3**. These quantities were calculated as part of the Peat and Soil Management Plan, refer to **Appendix 2A**.

Table 3-4: Power Plant Area - Peat / Soil Excavation (for onsite Deposition Areas)

Development Element	Average Peat / Soil Depth	Peat / Soil Volume (m^3) Excavated	Peat / Soil Volume (m^3) Factored For Bulking (20%)
Power Plant Area (Main)	1.0	119,700	144,000
Power Plant Area (AGI)	0.0	0.0	0.0
Power Plant Area – Discharge Routes	1.0	8,000	9,600

Source: Appendix 2A: Peat and Soil Management Plan

Note, a factor of 20% (bulking factor of 15% and contingency factor of 5%) has been applied and is included to the excavated peat and soil volumes above to allow for expected increase in volume upon excavation and to allow for a variation in ground conditions across the site.

The following recommendations / best practice guidelines for the placement of peat and non-peat soil alongside the proposed infrastructure elements will be considered and taken into account during construction.

- Any surplus excavated material (peat and non-peat) will be reused, either in profiling/landscaping or constructing berms as close to the excavation areas as possible. Peat present in the north and east of the Power Plant Area is largely drained peat covered in a layer of fill material.
- The placement of excavated peat and soil is to be avoided without first establishing the adequacy of the ground to support the load. The placement of peat and soil within the placement areas may require the use of long reach excavators, low ground pressure machinery and possibly bog mats in particular for drainage works.
- The most environmentally sensitive and stable way of handling and moving of peat is its placement across the site and at locations as close as possible to the excavation areas. A peat deposition area

and soil deposition area has been included to facilitate the construction phase of the Power Plant Area site.

- All placed soil will be allowed to revegetate naturally from the extensive seed source of the plants that have already colonised in the area. Alternatively, if significant areas of bare soil are still evident after a three-year period and possibly in addition, seeding of the placed soil could be carried out which would aid in stabilising the placed soil in the long term.

3.5 Construction Phase for the Electricity Grid Connection

3.5.1 Overview

The Applicant will appoint an EPC Contractor for the works on the Electricity Grid Connection.

The Contractor will appoint subcontractors to undertake all the specific construction and civil works. The Applicant is committed to ensure a safe working environment for all employees and contractors.

Any vegetation clearance works required will commence outside the breeding bird season, which runs from the 1st of March to the 31st of August, to avoid any potentially significant effects on nesting birds. Construction may commence from September to February so that construction activities are ongoing by the time the next bird breeding season comes around and can continue throughout that bird breeding season.

3.5.2 Construction Programme / Phasing

The construction phase for the Electricity Grid Connection will be approximately 2.5 years the final details of which will be determined by the EPC Contractor and presented in the Contractor's CEMP.

The final connection to the 400 kV line would take place during the appropriate period to avoid disruption to the electricity network in consultation with transmission service operators (TSO).

Estimates for the duration of the construction works are presented in **Table 3.2**.

3.5.3 Construction Hours

Refer to **Section 3.4.3** for the construction hours for the Proposed Development.

3.5.4 Construction Staff

Levels of employment will vary throughout the construction phase. Peak staffing for the 220kV station is due to be during March 2025 – August 2026 when 40 staff are on site. Peak staffing for the 400kV power station is during March 2025 – November 2026 when 40 staff are on site each day. Peak staffing for the grid route construction is during March 2026 – May 2027 when 40 staff are on site. There will be a peak of 120 staff numbers in construction across the Electricity Grid Connection

Staff will comprise engineering, management, skilled and semi-skilled workers during the 33-month construction programme.

3.5.5 Temporary Construction Compounds

During the construction of the Electricity Grid Connection substations (the 220 kV and 400 kV substations), there will be two temporary construction compounds - north of the 220 kV substation and north of the 400 kV substations. In addition, there will be two satellite temporary compounds along the overhead line (OHL) transmission route. The temporary construction compounds will include temporary site offices, parking, stores, and laydown areas.

Welfare facilities during the construction phase will be located within the construction compound. The wastewater will be directed to a sealed storage tank and will be tankered offsite by an appropriately consented waste collector, to a WWTP. The temporary wastewater storage tanks will be fitted with an automated alarm system that will provide sufficient notice that the tank requires emptying.

The contractor will be responsible for ensuring that all vehicles egressing the site have used the wheel wash facilities. A road sweeper will be available if any section of the surrounding public roads becomes soiled by vehicles associated with the Proposed Development.

Laydown requirements and construction phasing will be developed during the detailed design phase by the Contractor.

The perimeter of the compound will be surrounded by palisade security fencing, refer to **Section 3.6.2**, for further details on site security.

The construction phase lighting scheme will be developed by the EPC contractor and designed to provide safe working conditions for the development whilst reducing light pollution and the visual impact on sensitive receptors and the local environment. The lighting system will comply with the guidance provided by HSG38 Lighting at Work, the Society of Light and Lighting guides and EN 12464-2. Upon completion of the Electricity Grid Connection, the construction compounds will be decommissioned by covering with landscape fill and topsoil or peat.

The location of the construction compounds is shown within planning drawings submitted with the planning application.

3.5.5.1 Construction Facilities and Storage

During the construction phase Electricity Grid Connection, there will be two construction compounds: north of the 220 kV substation and north of the 400 kV substation respectively. In addition, there will be 2 No. satellite temporary construction compounds along the OHL transmission route.

These areas will include temporary site offices, parking, stores, and laydown areas.

3.5.6 Construction Materials

The proposed construction scope of the Electricity Grid Connection will require the relevant personnel, machinery and materials which is as follows for the substation sites.

Table 3-5: Electricity Grid Connection – Substations Estimated Construction Works

Equipment	Materials
• Approximately 10 No. Electrical / Civil Crews • Wheeled and Tracked Excavators • 360˚ tracked excavators (13 ton normally, 22 tonne for rock breaker) • Tracked dumpers / tractors and trailers • Cranes • Hoists • Generators • Scaffolding • Pumps • Power and Hand Tools • Cutting and Welding Equipment • Piling Rigs	• Stone • Asphalt • Geotextile • Lighting fixtures and fittings • Paving • Fencing • Steelworks • Concrete • Timber • Cladding • Doors • Piping inc. fixtures and fittings • Cabling inc fixtures and fittings • Switchgear • Instrumentation and control systems

The proposed construction scope will require the relevant personnel, machinery and materials which is as follows for the OHL.

Table 3-6: Electricity Grid Connection – OHL Estimated Construction Works

Equipment	Materials
• 5 No. operatives • 4x4 vehicle • Winch • Tractor and trailer • Crane • Teleporter	• Lattice steel mast • Insulators • Electrical connections • Concrete (foundation) • Aggregate • Geotextile

Equipment	Materials
• Chains / small tools • Tracked Excavator • Tracked Dumper • Sheet Piling Rig	

The proposed construction scope will require the relevant personnel, machinery and materials which is as follows for the underground cable.

Table 3-7: Electricity Grid Connection – Underground Cable Estimated Construction Works

Equipment	Materials
• 5 No. operatives • 4x4 vehicle • Tractor and trailer • Teleporter • Chains / small tools • Tracked Excavator • Tracked Dumper	• Insulators • Steel guy ropes • Connection clamps • Electrical connections • Crushed rock and timber (foundation) • Crushed rock and concrete (alternative foundation) • Geotextile

3.5.7 Construction Traffic and Site Access

It is expected that the extent of HGV (Heavy Goods Vehicle) movements will vary at different stages of the construction works in response to the activities taking place at any given time.

Traffic management and road signage will be in accordance with the Department of Transport: *Traffic Signs Manual - Chapter 8: Temporary Traffic Measures and Signs for Road Works* and in agreement with Offaly and Westmeath County Councils. All work on public roads will be subject to the approval of a road opening license application. The Contractor will prepare detailed Construction Traffic Management Plans (CTMP) for inclusion as part of the road opening licence applications.

All traffic management measures will comply with those outlined in the accompanying CTMP, refer to **Appendix 1A** of the CEMP. The CTMP submitted as part of this application but will be finalised in consultation with Offaly and Westmeath County Councils, before construction commences.

For the 220 kV Substation, peak HGV movements are expected during March 2025 – May 2025 with 61 No. HGV arrivals daily. For the 400 kV Substation, peak HGV movements are expected during September 2024 – February 2025 with 44 No. HGV arrivals daily.

It is proposed that the large substation components will be delivered to the Site via the M6 motorway, exiting at Junction 3 onto the R400 road and onto the Site, c. 2.2km to the south.

The Site entrance for the 220 kV substation site is off the R400 road. The Site entrance to the 400 kV substation site will be through existing site access south from the L1010 Togher Road across Bord na Móna lands and then west into the substation site. These existing entrances will be developed to facilitate the construction phase of the Electricity Grid Connection.

Refer to **Section 3.6.2** for details on site safety and security.

In addition to the above, the Electricity Grid Connection an entrance via an existing haul route west off the R400 road to the intersection between Derryarkin Bog and Ballybeg Bog, and another entrance north from the L1010 road (opposite the entrance to the 400 kV substation site) onto Ballybeg Bog; will be utilised in both instances to facilitate the delivery of construction materials and construction staff.

To provide internal access to the Site a number of internal access floating roads will need to be constructed to connect the OHL to the existing network of internal roads. These internal roads will be required at the north (access via 220 kV entrance west of R400 road) and south of the OHL in Derryarkin

(access via existing haul route), north of Ballybeg (access via existing haul route) and south on Ballybeg (access north from L1010 road). There will be a requirement to upgrade existing internal roads (machine passes) for development of floating road access to the OHL satellite compounds.

All HGVs will be required to travel to the site via the M6, exiting at Junction 3 onto R400 Regional road. The proposed route for the delivery of any abnormal loads is to be via Dublin Port.

It is proposed that all abnormal loads will travel to the site via the M4/M6 and exit via Junction 3 before travelling south on R400 Regional Road. The deliveries will travel to a number of different access points as follows:

- 220kV access – located on R400. All vehicles will turn right into this access.
- 400kV access – located south off L1010 Togher Road. Travel to this access will require turning right at the Coolcor roundabout towards Rhode village. A right turn will then be taken at the Rhode crossroads onto L1010 Togher Road. A further left turn will then be taken on to an unnamed road.
- Grid Connection access – travel to this access point will follow a similar path to the 400kV access, except a right turn will be made off L1010 Togher Road rather than a left turn.

The CTMP will be agreed with the Local Authority and An Garda Síochána prior to construction works commencing onsite.

Refer to **Section 5.9** for details on the construction traffic mitigation measures and the CTMP, refer to **Appendix 1A**.

3.5.7.1 Parking

Parking will be available onsite to allow all construction staff vehicles to park at once.. Therefore, no extraneous parking is to be expected.

The Contractor will organise minibuses to and from site to a number of locations and will encourage all construction staff to travel to site by minibus to limit the number of vehicles entering the site. As noted in **Section 3.4.4**, levels of employment will vary throughout the construction phase. Based on a 1.5 car occupancy, it is expected that there will be 27 No. staff cars (LGVs) arriving to the Site during the construction of the 220 kV Substation, each day during the peak months.

As noted in **Section 3.4.4**, levels of employment will vary throughout the construction phase. Based on a 1.5 car occupancy, it is expected that there will be 27 No. staff cars (LGVs) arriving to the Site during the construction of the 400 kV Substation, each day during the peak months.

3.5.8 Construction Waste Management

Refer to **Section 5.11** for the construction waste mitigation measures.

A RWMP (to be incorporated into the Contractor's CEMP) will be prepared and all relevant contractors will be required to seek to minimise waste arising at source and, where such waste generation is unavoidable, to maximise its recycling and reuse potential. Recycling of materials will take place offsite at appropriately licensed facilities where noise and dust are more easily managed and less likely to impact on surrounding properties.

3.5.8.1 Peat and Soil Waste Management

The approximate quantity of peat and non-peat material (soil) requiring management on the Site of the Electricity Grid Connection has been calculated, as presented in **Table 3.7**. These quantities were calculated as part of the *Peat and Soil Management Plan*, refer to **Appendix 2A**.

Table 3-8: Electricity Grid Connection – Peat / Soil Excavation (for onsite Deposition Areas)

Development Element	Average Peat / Soil Depth	Peat / Soil Volume (m^3) Excavated	Peat / Soil Volume (m^3) Factored For Bulking (20%)
Electricity Grid Connection - 220kV Substation	1.6	33,458	40,150
Electricity Grid Connection - Towers	3.5	5,954	7,144
Electricity Grid Connection - Line-cable Interface Compound	1.6	1,914	2,297
Electricity Grid Connection – Underground Cable Route	1.5	3,600	4,320
Electricity Grid Connection - 400kV Substation	0.5	21,484	25,780

Source: Appendix 2A: Peat and Soil Management Plan

Note, a factor of 20% (bulking factor of 15% and contingency factor of 5%) has been applied and is included to the excavated peat and soil volumes above to allow for expected increase in volume upon excavation and to allow for a variation in ground conditions across the site.

The Site which is generally flat consists predominantly of bare, locally re-vegetated cutaway peat and shallow peat with an established drainage network. The site has been harvested by Bord na Móna using mechanical harvesting equipment. Bord na Móna has experience managing peat in similar terrain, both during peat production operations and during renewable energy construction projects. These projects have demonstrated safe and effective methods for peat management and storage. The proposed methodology is outlined in the Peat and Soil Management Plan (**Appendix 2A**). General recommendations for good construction practice as outlined within the Peat and Soil Management Plan are summarised below.

The following recommendations / best practice guidelines for the placement of peat and non-peat spoil alongside the proposed infrastructure elements will be considered and taken into account during construction.

- All excavated peat will be reused where possible for reinstatement or by being placed/spread alongside the proposed infrastructure elements on-site.
- The peat and soil placed adjacent to the proposed infrastructure elements will be restricted to a maximum height of 1m over a 10m wide corridor on both sides of the proposed infrastructure elements. It should be noted that the designer will define / confirm the maximum restricted height for the placed peat and soil within the indicated parameters.
- The placement of excavated peat and soil is to be avoided without first establishing the adequacy of the ground to support the load. The placement of peat and soil within the placement areas may require the use of long reach excavators, low ground pressure machinery and possibly bog mats in particular for drainage works.
- Where a peat stability analysis following the confirmatory ground investigation reveals areas with an unacceptable risk of peat instability, then no material shall be placed on to the peat surface.
- The most environmentally sensitive and stable way of handling and moving of peat is its placement across the site and at locations as close as possible to the excavation areas. A peat deposition area and soil deposition area has been included to facilitate the construction phase of the 220 kV and 400 kV sites. Side casting methods of deposition will be used for excavations on the transmission route.
- The surface of the placed peat and soil is shaped to allow efficient run-off of surface water. Where possible, shaping of the surface of the peat and soil should be carried out as placement of peat and soil within the placement area progresses. This will reduce the likelihood of debris run-off and ensure stability of the placed peat and soil.

- Finished / shaped side slopes in the placed peat and soil shall be not greater than 1 (v): 3 (h). This slope inclination will be reviewed during construction, as appropriate. Where areas of weaker peat and soil are encountered then slacker slopes will be required.
- The acrotelm shall be placed with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation at the surface of the placed peat within the placement areas.
- All placed soil will be allowed to revegetate naturally from the extensive seed source of the plants that have already colonised in the area. Alternatively, if significant areas of bare soil are still evident after a three-year period and possibly in addition, seeding of the placed soil could be carried out which would aid in stabilising the placed soil in the long-term.
- Movement monitoring instrumentation may be required adjacent to the access road where peat has been placed. The locations where monitoring is required will be identified by the designer on site if required.
- An interceptor drain will be installed upslope of the designated soil placement areas to divert any surface water away from these areas. This will help ensure stability of the placed soil and reduce the likelihood of debris run-off.
- All the above-mentioned general guidelines and requirements will be confirmed by the designer prior to construction.

3.6 Peat Deposition Areas

3.6.1 Power Plant Area

A permanent Peat Deposition Area (PDA) is provided in the vicinity the Power Plant Area to store excess overburden material which cannot be used in localised landscaping or backfill. Excavated peat and soil arising from the formation of the foundations will be placed in a designed and dedicated deposition area in close proximity on land to the east of the Power Plant Area (refer to Planning Drawings).

It is estimated that approximately 153,000m^3 of excess peat and soil will be required to be stored within the permanent PDA.

Peat will be deposited to a maximum height of 1m above ground level across a 225,000m² area. Once excavations are completed and following the commissioning of the project, the PDA will be allowed to naturally revegetate.

3.6.2 Electricity Grid Connection

A permanent PDA is provided in the vicinity of the 220kV Substation to store excess overburden material which cannot be used in localised landscaping or backfill. Excavated peat and soil arising from the formation of the substation foundation will be placed in a designed and dedicated deposition area in close proximity on land to the north of the 220 kV Substation.

It is estimated that approximately 48,000m^3 of excess peat and soil will be required to be stored within the permanent PDA.

Peat will be deposited to a maximum height of 1m above ground level across an area of approximately 50,200 m². Once excavations are completed and following the commissioning of the project, the PDA will be allowed to naturally revegetate.

4. Construction Methodology

4.1 Introduction

Prior to commencement of construction works, the Contractor will draw up detailed Method Statements which will be informed by this Outline Construction Methodology, environmental protection measures included within the planning application, measures proposed within the CEMP, and the guidance documents and best practice measures listed below.

This method statement will be adhered to by the contractors and will be overseen by the Project Manager, Environmental Manager and ECoW where relevant.

The following documents will contribute to the preparation of the method statements in addition to those measures proposed below:

- CIEEM (2018). *Guidelines for Ecological Impact Assessment in the UK and Ireland (updated 2022).*
- Construction Industry Research and Information Association (CIRIA) (2006). *Control of water pollution from linear construction projects. Technical guidance (C648D).*
- Construction Industry Research and Information Association (CIRIA) (2006). *Control of water pollution from linear construction projects. Site guide (C649).*
- Construction Industry Research and Information Association (CIRIA) (2001). *Control of water pollution from construction sites. Guidance for consultants and contractors (C532).*
- Construction Industry Research and Information Association (CIRIA) (2023). *Environmental good practice on site guide (5th edition) (C811).*
- Construction Industry Research and Information Association (CIRIA) (2016). Environmental good practice on site pocketbook (4th edition) (C762).
- EirGrid (2012). *Ecology Guidelines for Electricity Transmission Projects, A Standard Approach to Ecological Impact Assessment of High Voltage Transmission Project.*
- Enterprise Ireland (unknown). *Best Practice Guide (BPGCS005) Oil storage guidelines.*
- Inland Fisheries Ireland (IFI) (2016). *Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters.*
- Inland Fisheries Ireland (IFI) (2016). *Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters.*
- Murphy, D. (2004). *Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites. Eastern Regional Fisheries Board (ERFB).*
- National Roads Authority (NRA) (2008). *Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes.*
- National Roads Authority (NRA) (2019). *Guidelines for assessment of Ecological Impacts of National Road Schemes.*
- Scottish Natural Heritage (2016). *Guidance – Assessment and mitigation of impacts of power lines and guyed meteorological masts on birds.*
- Smith *et al.*, (2011). *Best Practice Guidance for Habitat Survey and Mapping.*

The proposed works will be carried out by employing accepted good work practices during construction, and environmental management measures such as those discussed below.

Please note that the following measures will be supplemented by further specific environmental protection measures that will be included in Method Statements prepared for specific tasks during the works and will form part of the detailed Contractor's CEMP that will be provided prior to construction. This Construction Methodology's measures listed below are non-exhaustive and should be read in

conjunction with the EIAR and all its mitigation measures as well as the NIS and all other reports that accompany the planning application.

- All materials will be stored at the construction compound and transported to the works zone immediately prior to construction. Refer to **Sections 3.3.5** and **3.4.5**.
- Weather conditions will be taken into consideration when planning construction activities to minimise risk of runoff from the Site.
- Provision of 50m exclusion zones and barriers (silt fences) between any excavated material and any surface water features to prevent sediment washing into the receiving water environment.
- If dewatering is required as part of the proposed works e.g., in wet areas, water must be treated prior to discharge.
- The Contractor shall ensure that silt fences are regularly inspected and maintained during the construction phase.
- If very wet ground must be accessed during the construction process bog mats / aluminium panel tracks will be used to enable access to these areas by machinery. However, works will be scheduled to minimise access requirements during winter months.
- The Contractor shall ensure that all personnel working on site are trained in pollution incident control response. Refer to **Section 3.2.5**. A regular review of weather forecasts of heavy rainfall is required, and the Contractor is required to prepare a contingency plan for before and after such events.
- The contractor will carry out regular visual examinations of local watercourses that may be impacted by the proposed works during the construction phase to ensure that sediment is not above baseline conditions. In the unlikely event of water quality concerns, the Environmental Manager and ECoW will be consulted.
- Excavations will be left open for minimal periods to avoid acting as a conduit for surface water flows.
- Only emergency breakdown maintenance will be carried out on site. Emergency procedures and spillage kits will be available and construction staff will be familiar with emergency procedures. Refer to **Section 3.2.5**.
- Appropriate containment facilities will be provided to ensure that any spills from vehicles are contained and removed off site, refer to **Section 3.2.5.3**. Adequate stocks of absorbent materials, such as sand or commercially available spill kits shall be available.
- Concrete or potential concrete contaminated water run-off will not be allowed to enter any watercourses. Any pouring of concrete (delivered to site ready mixed) will only be carried out in dry weather. Washout of concrete trucks shall not be permitted on site. Refer to **Section 5.7.1.4**.
- Entry by plant equipment, machinery, vehicles and construction personnel into watercourses or wet drainage ditches shall not be permitted. All routes used for construction traffic shall be protected against migration of soil or wastewater into watercourses.
- Cabins, containers, workshops, plant, materials storage and storage tanks shall not be located near any surface water channels and will be located beyond the 50m hydrological buffer at all times.

4.2 Construction Methodology for the Power Plant Area

For the Power Plant site, the construction methodology and sequencing will be decided by the EPC contractor in line with their construction philosophy, equipment delivery schedules and site constraints.

The general construction methodology and sequencing is anticipated to be as follows.

- The EPC contractor will prepare and level the Power Plant site, followed by piling and excavation for main foundations, e.g., stack, HRSG, turbine hall etc. The lighter buildings may be piled or have raft foundations.
- Underground services such as drainage and earthing will be installed, and the foundations constructed.

- Once the foundations are complete erection of equipment (HRSG, ACC, Storage tanks, OCGT modules etc) and building structures (Turbine Hall, water treatment plant, administration building etc) will commence.
- Once the building structure is in place the EPC contractor will commence the erection of the plant within them. In some cases, e.g., the CCGT gas and steam turbines and generator, the erection may take place before the structure is complete for constructability reasons.
- As plant and systems are completed, they will be commissioned until the whole plant is commissioned.
- Temporary construction works will generally be removed and remediated and landscaping of the Power Plant Area completed in line with the agreed landscaping plan.
- Once commissioning is complete the plant will undergo testing before handover from the EPC contractor to Bord na Móna Powergen Limited.

4.2.1 Volumes of Material for Construction of Power Plant Area

The volumes of granular fill (sand and stone) required for the construction of the Power Plant Area, outlined in **Table 4.1**, have been calculated based on the Power Plant Area element footprints, the anticipated excavation levels to suitable formation or suitable subgrade, and the proposed final levels for the infrastructure components. Construction grade granular fill and higher quality, final surfacing fill (including sand) will both be required for the construction of the Proposed Development.

Granular fill volumes have been estimated using the following methodology:

- The peat beneath the Power Plant Area site, all proposed hardstanding areas including temporary construction compounds will be excavated and replaced with construction grade granular fill up to the existing ground level.
- The hardstanding areas and roads will be constructed to the 100-year flood level. Roads will generally comprise approximately 650mm of granular fill and approximately 150mm of final surfacing layer (or capping). Geotextiles separators will be placed on the subgrade and geogrids will be installed within the road build-up.
- The peat and unsuitable soil excavated beneath the Power Plant Area footprint will be replaced with select granular fill. The final 250mm shall comprise capping material.

Table 4-1: Power Plant Area - Volume of Granular Fill Required

Development Component	Stone Fill Required Volume (m^3)
Power Plant Area - Main	162,300
Power Plant Area - AGI	22,000
Power Plant Area - Discharge Routes	8,000

4.3 Construction Methodology for the Electricity Grid Connection

4.3.1 220 kV & 400 kV Substations

For the 220 and 400 kV Substations the construction methodology and sequencing will be decided by the EPC contractor in line with their construction philosophy, equipment delivery schedules and site constraints.

The general construction methodology and sequencing is anticipated to be as follows.

- The EPC contractor will prepare and level the substation sites, followed by piling and excavation for main foundations.
- Underground services such as drainage and earthing will be installed, and the foundations constructed.

- Once the foundations are complete erection of equipment (Air Insulated Switchgear, Communications towers etc) and the building structures will commence.
- Once the building structure is in place the EPC contractor will commence the erection of the plant within them.
- As equipment and systems are completed, they will be commissioned until each substation is commissioned.
- Once commissioning is complete the substation will undergo testing.
- Temporary construction works will generally be removed and remediated and landscaping of the substation areas completed in line with the agreed landscaping plan. On completion of testing of the Electricity Grid Connection the substation is handed over from the EPC contractor to Bord na Móna Powergen Limited.

4.3.1.1 400 kV Substation

The 400 kV substation will be constructed to Loop-In the existing Oldstreet - Woodland overhead line and the proposed 220 kV GIS-AIS substation will be constructed to terminate the 220 kV OHL and connect to the gas-fired power plant. The respective substations will be made up of a control building, transformer compound and busbar compound. The control building works will consist of foundation works, block work, roofing, low voltage electrical fit out, cladding and building finishing works. The transformer, cable chair and structural steelwork will be installed in the transformer compound. The busbar compound structural steelwork will be erected, and gantries installed. Substation electrical equipment will be installed once the control building and compound is complete. Palisade fencing will be erected around the compound for security / protection and a concrete post and rail fence to mark the substation boundary.

The 400 kV GIS compound is to be constructed with a compound level of 78.45m and a finished floor level of 78.60mm.

The 400 kV substation construction scope will include:

- The 400 kV substation will be in a compound with a secured high palisade fence.
- The 400 kV substation compound and drainage will be marked out by a qualified engineer.
- A drainage system will be excavated and installed around the compound area.
- Topsoil and subsoil will be removed from the footprint of the compound using an excavator. The excavated material will be temporarily stored in adjacent berms for later use during reinstatement works.
- A layer of geotextile material will be laid over the footprint of the compound.
- Using an excavator, a base layer of Clause 804 material will be laid followed by a 6F2 capping layer which will provide the finished surface.
- Each layer will be compacted using a vibrating roller.
- Earthing cable will be laid underground around the substation for connection to the various electrical components during the electrical fit out phase.
- The construction of the substation compound comprising of 2 No. GIS buildings, 2 No. 400 kV Gantries and associated outdoor electrical equipment, including 2 No. 400 / 220 kV transformers along with all associated internal access tracks, 2.6m high station perimeter fencing and concrete post and rail property boundary fence will be built.
- Adequate lighting will be installed around the compound on the lighting masts.
- Lightning protection will be installed on the top of buildings to protect the station from direct lightning strikes.

- 2 No. 400 kV gantries and associated line equipment will be required to connect the 400kV overhead lines into the substation. The support structures will be located outdoors. The electrical installation is expected to take 20 weeks and includes the following:
  - Delivery and installation of 400 / 220 kV transformers. These are unusually large and the deliveries will be managed in accordance with regulations governing the movement of large (abnormal) loads.
  - Delivery and installation of all other HV equipment.
  - Wiring and cabling of HV / LV equipment, protection and control cabinets.
  - Commissioning of all newly installed equipment.

4.3.1.2 220 kV GIS - AIS Substation

The 220 kV GIS – AIS compound is to be constructed with a compound level of 82.5m with a finished floor level of 82.65m. This is greater than 1m above local road heights.

The 220 kV GIS - AIS substation construction scope will include:

- The 220 kV GIS - AIS substation will be in a compound with secured high palisade fence.
- The substation compound and drainage will be marked out by a qualified engineer.
- A drainage system will be excavated and installed around the compound area.
- Topsoil and subsoil will be removed from the footprint of the compound using an excavator. The excavated material will be temporarily stored in adjacent berms for later use during reinstatement works.
- A layer of geotextile material will be laid over the footprint of the compound.
- Using an excavator, a base layer of Clause 804 material will be laid followed by a 6F2 capping layer which will provide the finished surface.
- Each layer will be compacted using a vibrating roller.
- Earthing cable will be laid underground around the substation for connection to the various electrical components during the electrical fit out phase.
- The construction of the substation compound comprising of 1 No. GIS building, 2 No. 220 kV Gantries and associated outdoor electrical equipment, along with all associated internal access tracks, 2.6m high station perimeter fencing and concrete post and rail property boundary fence will be built.
- Adequate lighting will be installed around the compound on the lighting masts.
- Lightning protection will be installed on the roof of buildings to protect the station from direct lightning strikes.
- 2 No. 220 kV gantries and associated line equipment will be required to connect the 220 kV overhead lines into the substation. The support structures will be located outdoors. The electrical installation is expected to take 20 weeks and includes the following:
  - Delivery and installation of all HV electrical equipment.
  - Wiring and cabling of HV equipment, protection and control cabinets.
  - Commissioning of all newly installed equipment.

There will be a requirement for 19 No. of double circuit 220 kV pylon towers (13 No. suspension pylons and 6 No. strain pylons) along a route corridor of c. 5km through Derryarkin Bog and Ballybeg Bog. There is also a requirement for 2 No. 400 kV strain towers.

The proposed pylon structure locations have been selected based on ground surveys, ground profiles, allowable angles, and ruling span checks. For the OHL route there will be 2 tower types required. Type 223 Strain Tower and Type 222 Suspension Tower.

4.3.2 220 kV Overhead Line

For the 220 kV Overhead Line the construction methodology and sequencing will be decided by the EPC contractor in line with their construction philosophy, equipment delivery schedules and site constraints.

The general construction methodology and sequencing is anticipated to be as follows.

- The removal of vegetation (hedges and trees), topsoil stripping and storage, pre-construction drainage measures and construction of temporary roads etc.
- The EPC contractor will prepare and level each tower site followed by excavation for the tower foundations.
- An earth mat will be installed, and the foundations constructed.
- Construction of the transmission tower bases and erection of the transmission tower steelwork. The base and body sections etc of each tower will be assembled next to their respective foundations. The towers sections are lifted into place and joined together.
- Installation of the insulators and stringing of the conductors and earth wire.
- Temporary construction works will be removed and reinstatement works will be carried out.

On completion of testing of the Electricity Grid Connection the overhead line is handed over from the EPC contractor to Bord na Móna Powergen Limited.

4.3.3 400 kV Overhead Line Loop-In

The construction methodology of the new 400 kV towers for the loop in from the existing Oldstreet - Woodland 400 kV line will be the same as for the 220 kV towers. There will be additional safety precautions in place reflecting working in the vicinity of a live line and to mitigate any potential risk to the operational line during construction works.

Disconnection of existing conductors and connection of the new towers to the existing grid will be carried out by ESBN and at that point in time live commissioning and testing of the Electricity Grid Connection can start.

4.3.4 220 kV Underground Connection

For the 220 kV underground connections the construction methodology and sequencing will be decided by the EPC contractor in line with their construction philosophy, equipment delivery schedules and site constraints.

The ducts for the cables of the underground connections will primarily be installed using an open cut trenching technique.

The general construction methodology and sequencing is anticipated to be as follows.

- The removal of vegetation (hedges and trees), topsoil stripping and storage, pre-construction drainage measures and construction of temporary roads etc.
- The EPC contractor will prepare and level the line-cable interface compound and joint bays areas followed by excavation and construction of the compound foundations and the joint bays.
- The equipment and structures of the line-cable interface compound are installed.
- Excavation of the cable trenches, installation of the duct bedding and ducts, backfilling and reinstatement will generally take place in short sections. The short sections minimise the amount of ground disturbed at any one time and minimises the potential for drainage runoff to pick up silt or

suspended solids. There may be more than one work front for this activity depending on schedule requirements.

- Once the trenching works is complete between joint bays cable installation can take place.
- Cables are supplied on large drums. Each drum contains a single length of cable. The length of the cable is equal to the distance between a pair of joint bays plus an installation and jointing margin.
- A drum is placed adjacent to a joint bay and the cable pulled from the drum though a duct to the receiving joint bay by a draw cable attached to a winch. The operation is repeated until all cables are installed in their ducts between the joint bays. Cable pulling then proceeds to what was the receiving joint bay and the cables are pulled from there to the next joint bays on the route until the cables are installed over the complete route.
- The cable sections between the joint bays will be tested and the six cable ends in each joint bay joined together by a specialist machine and the joints tested. Once testing is complete the covers of the joint bays will be installed.
- At the line-cable interface compound and the 400 kV Substation the cables will be terminated onto the interfacing equipment cable sealing ends and tested.
- The permanent access road will then be completed, temporary construction works will removed and reinstatement works will be carried out.

On completion of testing of the Electricity Grid Connection the overhead line is handed over from the EPC contractor to Bord na Móna Powergen Limited.

4.3.5 Pylon Towers

Mast or pylon sites are scanned for underground services such as cables, water pipes etc. Consultation with the landowners (as required) will help to identify hazards and ensure there are no unidentified services in the area.

For each leg of the 21 No. masts (84 legs in total) a foundation c. 4.5m x 4.5m x 3.5m deep is required. To allow for safe construction where ground conditions are good the excavation will be stepped back which requires additional area to be excavated. In the cut away bog where conditions are poor sheet piles will be used. The formation levels (depths) will be checked by the onsite engineer. The excavated material will be temporarily stored close to the excavation and excess material will be used as berms along the site access roads.

To aid construction, a concrete pipe is placed into each excavation to allow operatives level the pylon at the bottom of the excavation. The frame of the reinforcing bars will be prepared and strapped to a concrete pipe with spacers as required. The reinforcing bars will be lifted into each excavated foundation using the excavator and chains / slings. The base and body section of each mast will then be assembled next to the excavation.

In areas of poor ground and high-water table it may be necessary to use sheet piles supported by hydraulic frame(s) to prevent collapse of the sides and also to prevent the excavation becoming too large. In this case the requirement for a concrete pipe (which is normally used in tower foundations) is removed. During any dewatering activities a standard water filtration system will be utilised to control the amount of sediment in surface water runoff.

A setting template is used to set and hold the tower stubs in position while the concrete is being poured and cured. Any water in the excavation is pumped out prior to any concrete being poured into the foundation.

Concrete trucks will pour concrete directly into each excavation in distinct stages.

A final pour for the pylon is the encasing of the mast leg which will be finished 300mm over finished ground level. The leg of the pylon is required to be shuttered with metal panels to form the required shape.

Once the concrete is set after five days the shuttering is removed and if used sheet piles removed.

The pylon foundations will be backfilled one leg at a time with the material already excavated at the location. The backfill will be placed and compacted in layers. All dimensions will be checked following the backfilling process. All surplus excavated material will be removed from the mast locations and stored in berms for reuse across the construction site.

An earth mat consisting of copper wire will be laid c. 600mm below ground around the mast. The earth mat is a requirement for the electrical connection of the equipment on the mast structure. The exact details of the earth mat will be completed at detailed design stage.

Once the base section of each mast is completed and the concrete sufficiently cured, it is ready to receive the mast body.

A hardstand area for the crane will be created by laying geogrid material on the ground surface and overlaying this geogrid with a suitable grade of aggregate. A physical barrier (fence boundary) will be put in place to restrict plant from coming too close to the OHL. The pylon will be constructed lying flat on the ground beside the recently installed pylon base. The pylon section will be lifted into place using the crane and guide ropes. The body sections will be bolted into position.

Stringing of the shield wire and phase conductors will use tension stringing methods. A pulling rope will be run out between structures using a quad bike or drone and the rope lifted into position in running blocks on each tower. Tension stringing machines and conductor drums will be set up at tension masts and the pulling rope used to haul the conductors through. The conductor is then made off at the angle / tension masts and connected into the suspension insulators ready for ESB to commission.

4.3.6 Underground Cables

Underground cables (UGC) will be constructed in accordance with EirGrid policy CDS-GFS-00-001-R1 underground cable functional specification.

The 220 kV double circuit underground cable route ranges from approximately 2.4 km - 3.3km long and runs predominantly in Bord Na Móna lands. The proposed UGC will consist of a 2 No. trenches each containing 3 No. 200mm diameter HDPE power cable ducts, 2 No. 125mm diameter HDPE communications duct and 1 No. 63mm diameter Earth Continuity Conductor (ECC) duct to be installed in an excavated trench, typically 825mm wide by 1425mm deep, with variations on this design to adapt to service crossings and watercourse crossings, etc. The power cable ducts will accommodate 3 No. power cables.

The communications duct will accommodate a fibre cable to allow communications between the 400 kV substation site and the 220 kV substation. The ducts will be installed, the trench reinstated in accordance with appropriate specification, and then the electrical cabling / fibre cable is pulled through the installed ducts in approximately 550-750m sections. Construction methodologies to be implemented and materials to be used will ensure that the UGC is installed in accordance with the requirements and specifications of EirGrid and ESB.

Consultation has been made with Irish Water, Gas Networks Ireland and Offaly County Council Roads Engineer to notify them of the Proposed Development and any specific requirements considered in detailed design.

The conductors in underground HV cables must be heavily insulated to avoid a short circuit between the conductor and the ground around the cable. The proposed underground cable for 220 kV comprises cross linked polyethylene (XLPE) insulated electrical conductors, typically surrounded by HDPE (High Density Polyethylene) with diameter of approximately 110mm. Three separate cables are required for each circuit. Installation of the underground cable requires burial in a trench of approximately 1.1m width, at a depth of approximately 1m. Cables are installed directly into the ground in an excavated trench. The cable is installed in ducts, in a flat formation, surrounded by approximately 300mm of cement bound material. The trench is be backfilled and reinstated, as appropriate.

The underground cable will follow existing railway track and machine pass routes within the bog area. The cable route will avoid changes of line and direction as much as possible and any changes in direction will not exceed a radius greater than the minimum installation radius per manufacturer instructions.

Transmission cable routes comprise sections of cable that are connected using a cable joint. Cable joints are installed in joint bays which are typically concrete structures buried underground, occurring generally every 550m - 750m along an alignment, and ranging in size up to 8m long, 2.5m wide and 1.75m deep.

In association with Joint Bays, Communication Chambers are required at every joint bay location to facilitate communication links between substations.

- Earth Sheath Link Chambers are also required at every joint bay along the cable route.
- Earth Sheath Links are used for earthing and bonding cable sheaths of underground power cables, so that the circulating currents and induced voltages are eliminated or reduced.
- Earth Sheath Link Chambers and Communication Chambers are located in close proximity to Joint Bays.
- Earth Sheath Link Chambers and Communication Chambers will typically be pre-cast concrete structures with an access cover at finished surface level.

The precise siting of all Joint Bays, Earth Sheath Link Chambers and Communication Chambers is subject to approval by ESBN. Marker posts will be used on non-roadway routes to delineate the duct route and joint bay positions.

Before starting to construct, the area around the edge of the proposed joint bay which will be used by heavy vehicles will be surfaced with a terram cover if required and stone aggregate to minimise ground damage. Any roadside drains within the temporary works area will be culverted and check dams made from stone or sandbags covered with terram will be inserted upstream and downstream of these culverts to intercept any solids generated during the insertion or which wash out during the works. If the ground slopes from the working area toward a watercourse or if there is evidence of solids washing off the works area toward nearby watercourses or drains, a silt fence with straw bales, will be interposed between the works area and the watercourse.

All excavated material will be stored near the excavations and reused for reinstatement works. Any soil required for reinstatement that will be temporarily stockpiled on site will be placed at least 15m back from the nearest watercourse on level ground and will be ringed at the base by silt fencing and be regularly monitored by a designated competent person for signs of solids escape; in which case an additional line of silt fencing with straw bales will be added in line with the relevant ECM.

If the joint bay needs to be dewatered, this will be pumped to a percolation area if the soil is not saturated, otherwise a settlement tank will be used to remove any solids from the dewatering process to comply with the ECM.

The risk of concrete reaching surface waters is considered very low given that all concrete will be poured into the pit excavated for the joint bay so that spills will be contained. The basic requirement therefore is that all pouring operations be constantly supervised to prevent accidental spillages occurring outside the pit.

Temporary storage of cement bound sand (if required) will be on hardstand areas only where there is no direct drainage to surface waters and where the area has been bunded *e.g.*, using sand-bags and geotextile sheeting or silt fencing to contain any solids in run-off.

The following steps outline the methodology for joint bay construction and reinstatement:

- The Contractor will excavate a pit for joint bay construction, including for a sump in one corner.
- Grade and smooth floor; then lay a 75mm depth of blinding concrete (for in-situ construction) or 50mm thick sand (for pre-cast concrete construction) on 200mm thick Clause 804 granular material.
- In situ construction 200mm thick reinforced concrete floor slab with sump and starter bars placed for walls.
- In-situ construction, 200mm thick reinforced concrete sidewalls.

- In-situ construction, remove formwork and backfill with suitable backfill material in grassed areas or Clause 804 material once ducting has been placed in the bay. Backfill externally with granular material to County Council / TII Specification for Roadworks.
- Where joint bays are located under the road surface the joint bay will be backfilled with compacted layers of Clause 804 and the road surface temporarily reinstated as specified by the local authority.
- Precast concrete covers may be used as temporary reinstatement of joint bays at off road locations. These covers are placed over the constructed joint bay and are then removed at the cable installation stage of the project.
- At a later date to facilitate cable installation and jointing, reinstate traffic management signage, secure individual sites, re-excavate three consecutive joint bays and store excavated material for reuse.
- The cable is supplied in pre-ordered lengths on large cable drums.
- Installing “one section” of cable normally involves pulling three individual conductors into three separate ducts. The cable pulling winch must be set at a predetermined cut off pulling tension as specified by the designer. The cable will be connected to the winch rope using approved suitably sized and rated cable pulling stocking and swivel or the pulling head fitted by the cable manufacturer. A sponge may also be secured to the winch rope to disperse lubricant through the duct. Lubrication is also applied to the cable in the joint bay before it enters the duct.
- Once the “two sections” of cable (total of 6 conductors) are pulled into the joint bay, a jointing container is positioned over the joint bay and the cable jointing procedure is carried out in this controlled environment.
- Following the completion of jointing and duct sealing works in the joint bay, place, and thoroughly compact cement-bound sand in approximately 200mm layers to the level of the cable joint base to provide vertical support. Install additional layers of cement-bound sand and compact each layer until the cement-bound sand is level with the top of the joint. Install an additional 100mm cement-bound sand layer. Install cable protection strip. Backfill with cement-bound sand to a depth of 250mm below surface and carry out permanent reinstatement including placement of warning tape at 400mm depth below finished surface.

The cables are pulled through the ducts in sections of around 500m which is the approximate length of cable that can be shipped on a standard size cable drum. The sections of cable would be jointed at specially selected joint bay positions, which would also be backfilled and reinstated after jointing to complete the installation. Approximately 30-50m per day of underground cable can be installed requiring no more than 50m of the road / track to be open at any one time. A joint bay, which is larger in size than the standard trench required to be installed, would be at approximately 500m intervals.

The cable route will transect Coolcor stream watercourse. The watercourse has already been traversed by the existing machine pass and railway line. In this case where the cable is being trenched along an existing crossing, there is adequate overburden in the deck of the bridge at the point of crossing to continue the cable over the bridge without any need for off-road or in-stream works.

Cable trenches are typically constructed in short, controlled sections, thereby minimising the amount of ground disturbed at any one time and minimising the potential for drainage runoff to pick up silt or suspended solids. Each short section of trench is excavated, ducting installed and bedded, and backfilled with the appropriate materials, before work on the next section commences. This operation normally occurs over a period of 2-4 hours. To efficiently control drainage runoff from cable trench works areas, excavated material is stored on the up-gradient side of the trench and is temporarily sealed / smoothed over, using the back of the excavator bucket. Should any rainfall cause runoff from the excavated material, the material is therefore collected and contained in the downgradient cable trench. Excess subsoil is removed from the cable trench works area immediately upon excavation, and in the case of the Proposed Development, used for landscaping and reinstatements on other areas elsewhere on site.

Durable robust route markers shall be provided at agreed positions (line of sight, at bends location and property boundaries) along the route (Route Markers to have height 1700mm, width 92mm, weight 3.5kg).

4.3.7 Volumes of Material for Construction of Electricity Grid Connection

The volumes of granular fill (sand and stone) required for the construction of the Electricity Grid Connection, outlined in **Table 4.2**, have been estimated based on the Electricity Grid Connection element footprints, the anticipated excavation levels to suitable formation or suitable subgrade, and the proposed final levels for the infrastructure components. Construction grade granular fill and higher quality, final surfacing fill (including sand) will both be required for the construction of the Proposed Development.

Granular fill volumes have been estimated using the following methodology:

- The peat and/or unsuitable soil beneath the substations, Line Interface compound and all associated hardstanding areas, including temporary construction compounds, will be excavated and replaced with construction grade granular fill up to the existing ground level.
- The main 220kV and 400kV substations will be accessed directly off existing roads during construction and will not require roadways crossing soft ground, however access to the Line Interface Compound may require a short section of floating road due to the presence of peat along the access route from the existing Bord na Mona service track to the south).
- The substation and interface compounds and associated hardstanding areas will be constructed to the 100-year flood level and greater than 1m above local road heights. Roadways will generally comprise approximately 650mm of granular fill and approximately 150mm of final surfacing layer (or capping). Geotextiles separators will be placed on the subgrade and geogrids will be installed within the road build-up.
- The peat and unsuitable soil excavated beneath the substation and interface compounds footprints will be replaced with select granular fill of Clause 804 material in accordance with Eirgrid requirements. The final 250mm shall comprise capping material of site-won 6F2 material.
- The internal site underground cable trenches will be approximately 1200mm in depth. The cable trench will be backfilled up to approximately 600mm with sand, within which the ducting will be placed. Suitable materials from the excavations of the trenches will be reinstated to form the final layer of the trench.

Table 4-2: Electricity Grid Connection - Volume of Granular Fill Required

Development Component	Granular Fill Required Volume (m^3)
220 kV Substation	33,458
OHL, Line Cable Interface Compound	3,654
Underground Cable Route	3,600
OHL tower foundations	33,306
400 kV Substation	43,928

4.3.8 Construction Access Tracks

Temporary access tracks (required due to ground conditions and / or landowner requirements) will consist of timber or aluminium bog mats or crushed rock on a geotextile fabric to spread the weight of machinery over a greater area to prevent damage to the ground. If necessary, a low ground pressure excavator may also be utilised to spread weight across a wider area thereby reducing the pressure exerted on the ground. No invasive works will be undertaken when placing the matting.

Upon completion of the works, all mats will be removed immediately. Access routes will be carefully selected to avoid any damage to land. Local consultation will be carried out with the relevant landowners to ensure that any potential disturbance will be minimised. Prior to the commencement of construction, the contractor will assess all access routes and determine the requirement for bog mats. Any such requirements will be incorporated into the relevant method statement.

Once all construction works are complete, the work areas will be reinstated with excavated soil and either seeded out with native species, allowed to vegetate naturally or reinstated with excavated grass turves and will be restored to their original condition.

Transitions between the Site floating tracks and excavated tracks (or other forms of track not subject to long term settlement) will be gentle (e.g., 1:10 basal transition slope) in order to minimise likelihood of track failure at the boundary between construction types.

The internal road construction preliminary design has taken into account the following key factors as outlined in the Peat and Soil Management Plan, refer to **Appendix 2A**.

- Buildability considerations.
- Serviceability requirements for construction and wind turbine delivery and maintenance vehicles.
- Minimise excavation arisings.
- Requirement to minimise disruption to peat hydrology.

Whilst the above key factors are used to determine the track design, the actual construction technique employed for a particular length of track will be determined on the prevailing ground conditions encountered along that length of track.

The general construction methodology for upgrading of existing section of excavated roads or tracks is summarised below:

- The edge of the existing tracks will be cut back by 1m and a Combigrid™ (a geocomposite stabilisation and reinforcement geogrid product) placed over the proposed area to be widened. The cutting back of the existing track allows an anchorage of the Combigrid under the existing track.
- Granular fill will be placed in layers to match the depth of stone on the existing track and in accordance with the contractor's specification. A geogrid will be applied at this level across the existing and widened road area.
- The surface of the existing/widened access track will be overlain with up to a 300mm of selected granular fill.
- A layer of geogrid/geotextile may be required at the surface of the existing access road and in the widened section of road, where excessive rutting is anticipated (to be confirmed by contractor and onsite engineer).
- Where excavations in peat are required, side slopes shall be not greater than 1 (v): 2 or 3 (h). This slope inclination will be reviewed during construction, as appropriate. Where areas of weaker peat are encountered then slacker slopes will be required. Battering of the side slopes of the excavations will be carried out as the excavation progresses.
- The finished road width will be approximately 5m.
- If required, interceptor drains will be installed upslope of the access road alignment to divert any surface water away from the construction area.

A final capping layer shall be placed over the existing access track, as per design requirements, to provide a suitable road profile and will be graded to accommodate construction traffic and HGV movements.

The construction techniques proposed to be used for the tracks across the Site are shown in the Peat and Soil Management Plan, refer to **Appendix 2A**.

4.4 Invasive Species

Refer to **Section 5.4.5** of this CEMP, the NIS submitted with the planning application and the Invasive Species Action Plan (to be prepared by the Contractor).

4.5 Surface Water Runoff and Drainage Management

The routes of any natural drainage features will not be altered as part of the Proposed Development.

4.5.1 Power Plant Area

Temporary stilling / settlement ponds will be used to attenuate runoff from works areas *(i.e.*, hardstand areas, construction compounds, and the substations) of the Site during the construction phase. The purpose of the temporary stilling ponds is to intercept runoff potentially laden with sediment and to reduce the amount of sediment leaving the disturbed area by reducing runoff velocity.

General surface water management measures are detailed within the CEMP and summarised below:

- The existing surface water management system, such as drains, settlement ponds, outfalls and interceptors / separators, will be inspected and confirmed to be in suitable working order prior to any Power Plant Area works commencing on the Site.
- Additional new drainage installations will be installed in early stages of construction, alongside the remaining existing drainage facilities, which can be used to treat runoff for silt and hydrocarbons early on in the programme. Daily weather forecasting will also be used to inform the works schedule, ensuring excavation works do not coincide with high intensity or extreme rainfall events.
- The proposed surface water management system, including existing and proposed infrastructure, will be inspected and confirmed to be of sufficient capacity to treat any additional water generated by the Power Plant Area, including runoff from dust suppression, prior to discharge.
- Washout from power cleaning of drainage lines, oil interceptors or any other pipework which may contain pollutants will be collected and treated. No contaminated washout will be allowed enter any water body or be discharged to ground.
- There will be regular monitoring and prompt maintenance of the overall surface water management system throughout the Power Plant Area. This will ensure that the drainage system continues to function as designed.
- There will be no direct discharge to any water body at any time during the construction phases. All surface water run-off within the Site will be directed to this drainage system.

The final drainage design prepared for the Power Plant Area prior to commencement of construction will have to provide for reactive management of drainage measures. The effectiveness of drainage measures designed to minimise runoff entering works areas and capture and treat silt-laden water from the works areas, will be monitored continuously. Appropriate response to changing weather, ground or drainage conditions on the ground as the project proceeds, to ensure the effectiveness of the drainage design is maintained. This may require the installation of additional check dams, interceptor drains or swales as deemed necessary on-site. In the event that works are giving rise to siltation of watercourses, works will stop in the immediate area around where the siltation is evident. The source of the siltation will be identified and additional drainage measures such as those outlined above will be installed in advance of works recommencing.

An inspection and maintenance plan for the drainage system onsite will be prepared in advance of commencement of any works. Regular inspections of installed drainage features will be necessary, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water within the system where it is not intended.

All environmental protection measures contained within this CEMP, will be incorporated into the detailed Contractor's CEMP and construction method statements prior to the commencement of development and will be implemented in full during the construction phase.

The Project Manager and Site Manager will be responsible for the implementation of measures following consultation with the Environmental Manager and ECoW where necessary.

4.5.2 Electricity Grid Connection

The Electricity Grid Connection and associated new roadways are designed to avoid interference with natural watercourses, using existing roads wherever possible. There will not be any direct discharges to any natural watercourses in the construction of the Electricity Grid Connection, with all drainage waters being dispersed as overland flows. All discharges from the proposed works areas will be made over vegetation filters at an appropriate distance from natural watercourses. Buffer zones around the existing natural drainage features have been used to inform the layout of the Electricity Grid Connection.

The surface of the cutover bog is drained by a network of parallel field drains that are typically spaced every 15 - 20m. The field drains are approximately 0.5 - 1.5m deep and in most areas, they intercept the mineral subsoil underlying the peat. These field drains mostly feed into larger main drains which drain the bogs towards the outfall locations. There are a number of shorter cross drains (sometimes piped below ground in lower lying areas) which intersect the small field drains. There are various outfalls on the bog boundaries. Surface water draining from the site is routed via settlement ponds (in accordance with the IPC licence requirements) prior to discharge into off-site drainage channels, streams and rivers.

Runoff control and drainage management are key elements in terms of mitigation measures to reduce potential effects on downstream surface waterbodies. Drainage management with the proposed site will be risk based, and will employ various methods, building on the existing drainage systems within the proposed site. The main tenet of the proposed drainage plan is ensuring to 'keep clean water clean' by avoiding unnecessary or significant disturbance to existing drainage features, minimising any works in or around artificial drainage features, and diverting clean surface water flow around excavations, construction areas and temporary storage areas through the construction of interceptor drains. Where possible (depending on orientation), existing field drains can be used as interceptors drains. Otherwise, new interceptor drains will be excavated, and they will outfall to field drains downstream of the works areas.

A second method involves collecting construction area runoff and routing that water through new proposed temporary settlement ponds (or stilling ponds) prior to controlled release into the existing field drain network. There will be no discharges to the existing field drains without prior treatment from construction areas.

A collector drain may be used during construction phase, or over the edge (OTE) drainage to allow runoff from access tracks to flow into local field drains and be managed via the existing site drainage system. OTE drainage will only occur where topography allows, and it is only proposed in areas of low risk and remote from outfall locations (at least 150m from bog outfall locations. Silt traps and check dams will be installed in field drains downstream of OTE drainage areas, and these will provide attenuation and treatment of dirty water.

During the construction phase, all runoff from works areas *(i.e.*, dirty water) will be attenuated and treated prior to being released within the proposed site. All drainage outfall from the proposed site is routed through existing settlement ponds that remain in-situ from the previous site use.

A preliminary drainage design for the Electricity Grid Connection, incorporating all principles and measures outlined below, has been prepared, and is included in **Drawing Ref. S7060-8050-0044.**

Interceptor drains will convey clean runoff water around works areas to the existing downstream drainage system (field drains and main drains). Where required, interceptor drains will be installed in advance of any construction works commencing. This will ensure that clean water is kept clear by diverting surface water flow around excavations, construction areas and temporary storage areas. Where possible (depending on orientation), existing field drains can be used as interceptors drains. The interceptor drains will be installed in advance of any main construction works commencing. The material excavated to make the drain will be compacted on the downslope edge of the drain to form a diversion dike. On completion of the construction phase works, it is envisaged that the majority of the interceptor drains will be removed, with the exception being where original field drains were used. At that stage (*i.e.,* after the construction phase is complete), there will be no open excavations or large areas of exposed ground that are likely to give rise to large volumes of potentially silt-laden run off. Any areas in which works were carried out to construct roads, hardstands, will have been built up with large grade hardcore, which even when compacted in place, will retain sufficient void space to allow water to infiltrate the subsurface of these constructed areas. Roadways or other installed site infrastructure will not intercept ground-conveyed surface water runoff to any significant extent that would result in scouring

or over-topping or spill over. Where the drains are to be removed, they will be backfilled with the material from the diversion dike.

Collector drains will be used to intercept and collect runoff from construction areas (from hardstand areas, construction compounds, and the substation). During the construction phase temporary settlement ponds will be used to attenuate and treat runoff from the construction areas (hardstand areas, construction compounds, and the substation) and treated water will then discharge into existing field drains and main drains. Temporary settlement ponds will be removed at the end of the construction phase, and runoff will discharge into existing field drains and main drains.

A swale is an excavated drainage channel located along the downgradient perimeter of construction areas, used to collect and carry any sediment-laden runoff to a sediment-trapping facility and stabilised outlet. Swales are proven to be most effective when a dike is installed on the downhill side. They are similar in design to interceptor drains and collector drains described above.

Check dams will restrict flow velocity, minimise channel erosion and promote sedimentation behind the dam. The check dams will be installed as the interceptor drains are being excavated. Check dams may also be installed in some of the existing field drains on the proposed site, downstream of where drainage swales connect in. The proposed check dams will be made up of straw bales or stone, or a combination of both depending on the size of the drainage swale it is being installed in. Where straw bales are to be used, they will be secured to the bottom of the drainage swale with stakes. Clean 4 to 6-inch stone will be built up on either side and over the straw bale to a maximum height of 600 mm over the bottom of the interceptor drain. In smaller channels, a stone check dam will be installed and pressed down into place in the bottom of the drainage swale with the bucket of an excavator. The check dams will be installed at regular intervals along the interceptor drains to ensure the bottom elevation of the upper check dam is at the same level as the top elevation of the next down-gradient check dam in the drain. The centre of the check dam will be approximately 150 mm lower than the edges to allow excess water to overtop the dam in flood conditions rather than cause upstream flooding or scouring around the dams. Check dams will not be used in any natural watercourses, only artificial drainage channels (field drains) and interceptor/collector drains. The check dams will be left in place at the end of the construction phase to limit erosive linear flow in the drainage swales during extreme rainfall events. Check dams are designed to reduce velocity and control erosion and are not specifically designed or intended to trap sediment, although sediment is likely to build up. If necessary, any excess sediment build up behind the dams will be removed. For this reason, check dams will be inspected and maintained regularly to insure adequate performance during construction. Maintenance checks will also ensure the centre elevation of the dam remains lower than the sides of the dam.

Dewatering silt bags allow the flow of water through them while trapping any silt or sediment suspended in the water. The silt bags provide a passive non-mechanical method of removing any remaining silt contained in the potentially silt-laden water collected from works areas within the site. Dewatering silt bags are also used where water is pumped temporarily from excavations (e.g., pylon bases). Water is pumped into the silt bags, and then arising discharge is filtered through the silt bag fabric and flows into local collector drains. Dewatering silt bags can also be used as an additional filtration measure downgradient of stilling ponds, wherever it is deemed appropriate, throughout the site. The water will flow, via a pipe, from the stilling ponds into the silt bag. The silt bag will allow the water to flow through the geotextile fabric and will trap any of the finer silt and sediment remaining in the water after it has gone through the previous drainage measures. The dewatering silt bags will ensure that there will be no loss of peaty silt into any field drain / main drain. The dewatering silt bag that will be used will be approximately 3m in width by 4.5m in length and will be capable of trapping approximately four tonnes of silt. The dewatering silt bag, when full, will be removed from site by a waste contractor with the necessary waste collection permit / license, who will then transport the silt bag to an appropriate, fully licensed waste facility.

Silt fences will be installed as an additional water protection measure around existing watercourses in certain locations, particularly where works are proposed within the 50-metre buffer zone of a stream. Silt fences will be installed as single, double or a series of triple silt fences, depending on the space available and the anticipated sediment loading. The silt fence designs follow the technical guidance document *'Control of Water Pollution from Linear Construction Projects'* (No. C648D, 2006) and '*Control of Water Pollution from Linear Construction Projects – Site guide'* (No. C649, 2006) published by CIRIA. Silt fence material will comprise Terrastop™ Premium material, and silt fences will be installed as per the manufacturer's guidelines. Silt fences will be inspected on a regular basis to ensure that they are operating effectively.

Silt traps will be installed in field drains downstream of drainage outfalls from works areas. The purpose of the silt traps is to capture silt by means of slowing water flow within the field drains. The existing field drains have a low gradient already, and with the installation of local silt traps drainage water from the wind farm works will be filtered and treated on its onward journey towards the existing settlement ponds. The peat ditch silt traps will be constructed using stacked timber logs, or marine plywood. These can also be covered in geotextile to enhance filtration. The majority of peat ditch silt traps will be left in-situ following the construction phase.

Temporary stilling / settlement ponds will be used to attenuate runoff from works areas (i.e., hardstand areas, construction compounds, and the substations) of the site during the construction phase. The purpose of the temporary stilling ponds is to intercept runoff potentially laden with sediment and to reduce the amount of sediment leaving the disturbed area by reducing runoff velocity. Reducing runoff velocity will allow larger particles to settle out in the stilling ponds, before the run-off water is discharged to field drains / main drain within the proposed site. Stilling ponds will be located towards the end of collector drains, close to where the treated water will be discharged to field drains/main drains.

During the construction phase, a water level indicator such as a staff gauge will be installed in each stilling pond with marks to identify when sediment is at 10% of the stilling pond capacity. Sediment will be cleaned out of the still pond if it exceeds 10% of pond capacity. Stilling ponds will be inspected weekly and following rainfall events. Inlet and outlets will be checked for sediment accumulation and anything else that might interfere with flows. Temporary stilling ponds (at main works areas) will be removed at the end of the construction phase. They will not be needed beyond that point, as there is an existing drainage system, and boundary settlement ponds already located within each bog.

All materials and equipment necessary to implement the drainage measures detailed above, will be brought on-site in phases as they are required during the construction phase. A sufficient number of straw bales, clean drainage stone, terram, stakes, etc. will be kept on site at all times to implement the drainage design measures as necessary. The drainage measures detailed in the above will be installed prior to, or at the same time as the works they are intended to drain. The works programme for the groundworks part of the construction phase of the project will take account of weather forecasts and predicted rainfall. Large excavations, large movements of overburden or large- scale overburden or soil stripping will be suspended or scaled back if heavy rain is forecast. The extent to which works will be scaled back or suspended will relate to the amount of rainfall forecast.

The final drainage design prepared for the Electricity Grid Connection prior to commencement of construction will have to provide for reactive management of drainage measures. The effectiveness of drainage measures designed to minimise runoff entering works areas and capture and treat silt-laden water from the works areas, will be monitored continuously. Appropriate response to changing weather, ground or drainage conditions on the ground as the project proceeds, to ensure the effectiveness of the drainage design is maintained. This may require the installation of additional check dams, interceptor drains or swales as deemed necessary on-site. In the event that works are giving rise to siltation of watercourses, works will stop in the immediate area around where the siltation is evident. The source of the siltation will be identified and additional drainage measures such as those outlined above will be installed in advance of works recommencing.

An inspection and maintenance plan for the drainage system onsite will be prepared in advance of commencement of any works. Regular inspections of installed drainage features will be necessary, especially after heavy rainfall, to check for blockages, and ensure there is no build-up of standing water within the system where it is not intended.

Check dams will be inspected and maintained weekly during the construction phase of the project to insure adequate performance. Maintenance checks will also ensure the centre elevation of the dam remains lower than the sides of the dam. Any excess sediment build-up behind check dams will be removed. Drainage swales (interceptor and collector drains) will also be inspected for evidence of erosion along the length of the swale. If evidence of erosion is detected, additional check dams will be installed to limit the velocity of flow in the channel. Peat ditch silt traps will be inspected and maintained monthly during the construction phase ensure adequate performance. Any excess sediment build-up behind silt traps will be removed. A water level indicator such as a staff gauge or level marker will be installed in each temporary stilling ponds with marks to identify when sediment is at 50% of the ponds capacity. Sediment will be cleaned out of the stilling pond when it exceeds 50% of pond capacity. Stilling ponds will be inspected weekly during the construction phase of the project and following rainfall events.

Inlet and outlets will be checked for sediment accumulation and impediments to flow. Any excess sediment build-up behind inlets and outlets will be removed.

5. Environmental Management

5.1 Introduction

This section of the CEMP outlines the environmental procedures that have been identified to ensure appropriate environmental management of specific aspects of the proposed works.

These environmental procedures have been prepared in accordance with the design and mitigation measures set out in the EIAR and the NIS, submitted with the planning application for the Proposed Development. The requirements outlined within the following sections are a summary of key implementation constraints, site specific obligations and best practice requirements with which the Contractor shall comply. The construction methodology for the Proposed Development is set out in Section 4 of this CEMP.

Construction of the Proposed Development will be carried out in line with best practice guidance in all areas of potential environmental impact and these specific guidance documents are identified within the following sections. Across the full project duration, the Contractor will utilise the general guidelines set out in the CIRIA *C811 Environmental Good Practice on Site Guide (5th Edition)*.

Following grant of planning for the Proposed Development, the appointed Contractor will further develop this CEMP into the Contractor's CEMP which will incorporate any additional measures identified during the planning assessment process, specified in planning conditions and associated post-planning statutory body consultation for the management of the environment during the construction works. Any mitigation and/or monitoring measures identified during preconstruction surveys and reports will also be incorporated into the Contractor's CEMP.

The Contractor's CEMP will include an updated and refined construction phase programme of works and will set out specific timings and requirements for surveys and monitoring prior to and throughout the construction works.

The Contractor's CEMP will be a dynamic document and will be continuously reviewed and updated throughout the construction works to ensure it takes account of all environmental auditing and site inspections.

5.2 Air Quality

5.2.1 General Mitigation Measures

The Contractor will have due regard to the relevant guidance and those outlined within the EIAR relevant to construction phase:

- Greater London Authority (GLA) (2014). *Control of Dust and Emissions during Construction and Demolition.*
- Institute of Air Quality Management (IAQM) (2023). *Guidance on the assessment of dust from demolition and construction. Version 2.1.*
- National Roads Authority (NRA)[1] (2011). *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes.*

5.2.2 Power Plant Area

During the construction phase, **dust** or **air** pollutants generated from the Power Plant Area will typically arise from:

- Wind generated dust from stockpiles, exposed unconsolidated soils and roads.
- Movement of construction vehicles.
- Transportation of construction materials to and within the Site.

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- Excavation and crushing of rock.
- Piling operations.
- Excavation, movement and placement of soil stockpiles.

An assessment of the potential effects of construction **traffic** movements associated with the Power Plant Area is presented in Chapter 7 (Air Quality) and Chapter 14 (Traffic) of the EIAR, Vol. I.

In order to minimise emission of pollutants from plant and equipment, the following measures will be implemented during the construction phase:

- Regular maintenance of plant and equipment will be carried out to ensure that the equipment is operated efficiently and generating minimal air emissions.
- Minimising vehicle and plant idling as far as is practical (*i.e.*, when not in use).
- Locating static plant in a central area of the Site away from sensitive boundaries or receptors.

The greatest potential impact on air quality during the construction phase will be from dust emissions associated with the construction works, refer to **Section 5.2.2.1**. The proactive control of fugitive dust, rather than an inefficient attempt to control dust once released will ensure the prevention of significant emissions.

5.2.2.1 Dust Suppression

In periods of extended dry weather, dust suppression may be necessary along haul roads to ensure dust does not cause a nuisance. If necessary, water will be taken from stilling ponds in the Site's drainage system and will be pumped into a bowser or water spreader to dampen down haul roads and site compounds to prevent the generation of dust. Silty or oily water will not be used for dust suppression. Water bowser movements will be monitored to limit increased runoff.

Emissions of dust and particulates from the construction phase of the Power Plant Area will, however, be controlled in accordance with standard good working practices regularly employed in the construction industry on sites of this type.

Based on the assessment of the area of sensitivity to dust impacts and the likely risk of impacts arising from each of the key construction activities (demolition, earthworks, construction and trackout of material onto roads), appropriate standard mitigation measures to be implemented during construction (good site techniques drawn from the 'low risk' site schedule in IAQM guidance) that have been identified are:

- Storage of sand and aggregates in bunded areas and storage of cement powder and fine materials in silos.
- Use of water suppression and regular cleaning, as necessary, to minimise mud on roads.
- Covering of vehicles leaving the construction site that are carrying construction waste materials (note: the transfer of any excavated material offsite will be minimised).
- Employment of a wheel wash system at exits from the Site during the construction phase.
- Minimising storage duration of spoil during construction as far as is practical.
- Prohibiting open fires on Site.

A Dust Management Plan (DMP) has been prepared which sets out the measures that will be implemented by the Contractor to minimise and control dust emissions, set out in **Section 5.2.2.1.1**.

This DMP will be updated by the Contractor in the Contractor's CEMP to account for any additional measures identified in Planning Conditions.

5.2.2.1.1 Dust Management Plan

The potential for dust to be emitted depends on the type of construction activity being carried out in conjunction with environmental factors including levels of rainfall, wind speeds and wind direction.

The potential for impact from dust depends on the distance to potentially sensitive locations and whether the wind can carry the dust to these locations. The majority of any dust produced will be deposited close to the potential source and any impacts from dust deposition will typically be within 200m of the construction area.

It is noted that the during the construction phase of the Power Plant Area there will be no human health, amenity or ecological receptors within 250m of the Power Plant Area site or the access point.

During the construction phase of the Electricity Grid Connection, all Ramsar sites, SPAs, SACs and NHAs are further than 50m from the construction works. There are a small number of human receptors within 500m of the site.

In order to ensure mitigation of the effects of dust nuisance, a series of measures will be implemented. Site access roads will be regularly cleaned and maintained as appropriate; dry sweeping of large areas shall be avoided. Hard surface access roads will be swept to remove mud and aggregate materials from their surface while any un-surfaced access roads shall be restricted to essential site traffic only. Furthermore, any road that has the potential to give rise to fugitive dust must be regularly watered, as appropriate, during dry and / or windy conditions. Vehicles using site access tracks shall have their speeds restricted where there is a potential for dust generation.

Vehicles delivering material with dust potential to an off-site location shall always be enclosed or covered with tarpaulin to restrict the escape of dust.

Vehicles exiting the Site, prior to the local road crossing point, will make use of a wheel wash facility prior to entering onto public roads to ensure mud and other wastes are not tracked onto public roads. Public roads outside the Site will be regularly inspected for cleanliness daily and cleaned using a street sweeper, as necessary. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions. On-site haul routes shall be inspected for integrity and necessary repairs to the surface instigated as soon as reasonably practicable.

Table 5.1 outlines the embedded construction phase mitigation measures as outlined in the Appendix 7A, Air Quality Impact Assessment, Vol. II of the EIAR, submitted with the planning application.

This DMP will be reviewed at regular intervals during the construction phase to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust using best practices and procedures.

Table 5-1: Embedded Construction Phase Mitigation Measures

Phase	Mitigation Measure
Communications	Develop and implement a stakeholder communications plan that includes community engagement before work commences onsite. Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager / engineer or the site manager.
	Display the head or regional office contact information.
	Develop and implement a Dust Management Plan (DMP), approved by the Local Authorities. The level of detail will depend on the risk, and will include as a minimum the highly recommended measures in this CEMP and the EIAR submitted with the planning application. The desirable measures will be included as appropriate for the site.
Site Management	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
	Make the complaints log available to the local authority when asked.

Phase	Mitigation Measure
	Record any exceptional incidents that cause dust and / or air emissions, either on- or offsite, and the action taken to resolve the situation in the logbook.
Monitoring	Undertake daily on-site and off-site visual inspections, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100m of site boundary, with cleaning to be provided if necessary.
	Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.
	Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
	Agree dust deposition, dust flux, or real-time PM_{10} continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences onsite or, if it is a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.
Preparing and maintaining the site	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
	Erect solid screens or barriers if required around dusty activities or the site boundary that are at least as high as any stockpiles on site.
	Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
	Avoid site runoff of water or mud.
	Keep site fencing, barriers and scaffolding clean using wet methods.
	Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
	Cover, seed or fence any stockpiles to prevent wind whipping.
Operating vehicle / machinery and sustainable travel	Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
	Ensure all vehicles switch off engines when stationary - no idling vehicles
	Avoid the use of diesel- or petrol-powered generators and use mains electricity or battery powered equipment where practicable.
	Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
Operations	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g., suitable local exhaust ventilation systems.
	Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
	Use enclosed chutes and conveyors and covered skips.
	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.

Phase	Mitigation Measure
	Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
Measures specific to earthwork	Re-vegetate earthworks and exposed areas / soil stockpiles to stabilise surfaces as soon as practicable.
	Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
	Only remove the cover in small areas during work and not all at once.
Measures specific to construction	Avoid scabbling (roughening of concrete surfaces) if possible.
	Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
	Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
	For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust.
Waste Management	Avoid bonfires and burning of waste materials.
Measures specific to track-out	Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site.
	Avoid dry sweeping of large areas.
	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
	Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
	Record all inspections of haul routes and any subsequent action in a site logbook.
	Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
	Implement a wheel washing system.
	Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
	Access gates to be located at least 10m from receptors where possible.

Also see Section 5.9 for additional mitigation measures associated with dust management during the construction phase.

5.2.3 Electricity Grid Connection

The same air and dust mitigation measures will be in place during construction of the Electricity Grid Connection to minimise the potential for adverse impacts from dust, air pollutants or traffic to environment and sensitive receptors.

5.3 Cultural Heritage

5.3.1 Power Plant Area

The following mitigation measures are for the construction phase of the Power Plant Area.

- Should planning permission be obtained for the Proposed Development, the Applicant will appoint a suitably qualified archaeologist as the Project Archaeologist to oversee the construction phase activities. Archaeological testing will be carried out at the pre-construction phase in areas identified in the construction impacts (refer to Chapter 8 of the EIAR (section 8.5)), where the Proposed Development has the potential to impact upon archaeological remains.

- This testing will take the form of mechanically excavated test trenches. These will be excavated under the constant supervision of a suitably qualified and licensed archaeological contractor who will be appointed to carry out the archaeological fieldwork. Relevant licenses will be acquired from the Department for Housing, Local Government and Heritage (DHLGH) / NMS and the National Museum of Ireland (NMI) for all archaeological works. These will be carried out in accordance with an Overarching Method Statement for Archaeological Works prepared by the Project Archaeologist and agreed with the NMS. It is anticipated that all archaeological works will be completed prior to the commencement of construction activities.

- The programme of pre-development archaeological testing will consist of the mechanical excavation of test trenches down to sterile glacial tills and bedrock, by means of a smooth toothless bucket. These will be undertaken at specified locations within the Proposed Development. The Project Archaeologist will undertake full-time monitoring of the excavation of the test trenches and where appropriate, carry out archaeological investigation.

- Should archaeological material / features be encountered during the archaeological testing, the use of machinery shall cease and further archaeological investigation (by hand) shall be carried out to determine the nature and extent of the archaeological remains. Archaeological deposits shall not be removed as part of the assessment process.

- The testing will be undertaken in advance of construction to allow adequate time to evaluate, record and, where necessary, mitigate any archaeological features that may be revealed. In the event that any archaeological features are uncovered during construction, the Project Archaeologist and the National Monuments Service will be consulted to determine the appropriate mitigation measures. These may include preservation in situ, preservation by record through systematic archaeological excavation, and / or archaeological monitoring of specific construction activities during the construction phase.

- Archaeological issues will be resolved where possible, at the pre-construction phase of the development, although areas within peat bog may require evaluation during the construction phase with groundworks carried out under archaeological supervision. If unexpected archaeological remains or artefacts are discovered during construction work, work in that area will cease and the area will be protected. An unexpected finds procedure will be included in the Overarching Method Statement for Archaeological Works. The Project Archaeologist and NMS will be notified, and the unexpected finds procedure will be implemented.

5.3.2 Electricity Grid Connection

The following mitigation measures are for the construction phase of the Electricity Grid Connection.

- If after planning is consented and the project proceeds, the Applicant will appoint a suitably qualified archaeologist as the Project Archaeologist. Archaeological testing will be carried out at the pre-construction phase in areas, identified in the construction impacts section of Chapter 8, section 8.5 of the EIAR submitted with the planning application, where the Proposed Development has the potential to impact upon archaeological remains. These include the substation areas, construction compounds, hardstandings, pylon bases, underground cable and new access tracks Figure 8.5 of the Vol. II of the EIAR.

- This testing will take the form of mechanically excavated test trenches. This will be undertaken under the constant supervision of a suitably qualified and licensed archaeological contractor who will be appointed to carry out the archaeological fieldwork. Relevant licenses will be acquired from the Department for Housing, Local Government and Heritage (DHLGH) / National Monument Services (NMS) and the National Museum of Ireland (NMI) for all archaeological works. These will be carried out in accordance with an Overarching Method Statement for Archaeological Works prepared by the Project Archaeologist and agreed with the NMS. It is anticipated that all archaeological works will be completed pre-construction.

- The programme of pre-development archaeological testing will consist of the mechanical excavation of test trenches down to sterile glacial tills and bedrock, by means of a smooth toothless bucket. These will be undertaken at specified locations within the Proposed Development. The Project Archaeologist will undertake full-time monitoring of the excavation of the test trenches and, where appropriate, carry out archaeological investigation.

- Should archaeological material / features be encountered during the archaeological testing, the use of machinery shall cease and further archaeological investigation (by hand) shall be carried out to determine the nature and extent of the archaeological remains. Archaeological deposits shall not be removed as part of the assessment process.

- The testing will be undertaken in advance of construction to allow adequate time to evaluate, record and where necessary mitigate any archaeological features that may be revealed. In the event that any archaeological features are uncovered during construction, the Project Archaeologist and the NMS will be consulted to determine the appropriate mitigation measures. These may include preservation in situ, preservation by record through systematic archaeological excavation, and / or archaeological monitoring of specific construction activities during the construction phase.

- Archaeological issues will be resolved where possible at the pre-construction stage of the development, although the elements of the scheme associated with the overhead powerline and the underground cable trench, within peat bog, may require evaluation during the construction phase with groundworks carried out under archaeological supervision. If unexpected archaeological remains or artefacts are discovered during construction work, work in that area will cease and the area will be protected. An unexpected finds procedure will be included in the Overarching Method Statement for Archaeological Works. The Project Archaeologist and NMS will be notified, and the unexpected finds procedure will be implemented.

5.4 Biodiversity

Key themes underpinning the mitigation measures are:

- Pre-construction surveys for protected species, where required/necessary, to determine if any breeding or resting sites have become established in the period between baseline survey and construction works commencing will be carried out, and for the presence of any non-native invasive species. Any surveys which require licensing (e.g. inspection of bat roosts) will be supported by a specific mitigation plan. All pre-construction surveys will be completed immediately prior to vegetation clearance (i.e. weeks/days leading up to clearance to ensure recency/robustness of information).

- Safeguarding of retained habitats.

- Safeguarding of protected or notable species known or likely to occur within the Proposed Development Site.
- Commission/appointment of an appropriately experienced ecologist to undertake an Ecological Clerk of Works (ECoW) role, which will be to oversee and advise both contractors and site operators during times of major works within particularly sensitive ecological windows (e.g., breeding bird season) during both the construction phase, and as part of monitoring during the operational phases.
- Approach to the Identification of Ecological Constraints.

5.4.1 Environmental / Ecological Clerk of Works (EcoW)

The following general measures will be taken to minimise potential effects on the local and regional biodiversity during construction:

- Prior to commencement of construction, a suitably experienced ECoW, will be appointed by the Contractor.
- The ECoW shall be appointed sufficiently in advance of the Proposed Development to arrange for any mitigation requirements to be incorporated into the Contractor's site-specific Method Statements and programme as well as overseeing the implementation of the CEMP.
- The ECoW will ensure compliance during the construction phase with all mitigation measures and planning conditions related to ecology and with wildlife law.
- The ECoW will be engaged and consulted on a regular basis by the Environmental Manager.

5.4.2 General Mitigation Measures

The Proposed Development must consider and engage the following mitigation hierarchy where there is potential for impacts on relevant ecological receptors.

1. Avoidance: seek options that avoid harm to ecological features (e.g., locating to an alternative site).
2. Mitigation: negative effects will be avoided or minimised through mitigation measures, either through the design of the project or subsequent measures that can be guaranteed (e.g., through a condition or planning obligation).
3. Compensation: where there are significant residual negative ecological effects despite the mitigation proposed, these will be offset by appropriate compensatory measures e.g., by providing suitable habitats elsewhere on the client-owned parts of the wider site.
4. Enhancement: seek to provide net benefits for biodiversity over and above requirements for avoidance, mitigation, or compensation.

This hierarchy requires the highest level to be applied where possible. Only where this cannot reasonably be adopted should lower levels be considered. The rationale for the proposed mitigation and/ or compensation will be provided as part of the Contractors CEMP and method statements, including sufficient detail to show that these measures are feasible and how they would be implemented.

The appointed contractor will protect the Site, the works, and the general environment including the watercourses and waterbodies, against pollution and sedimentation during the construction phase of the Proposed Development. The Contractor will comply with all relevant legislation in relation to the control of hazardous substances and pollutants during the works.

The appointed contractor will, at all times, work within and comply with all relevant environmental regulations and pollution prevention guidelines. The use of oils, chemicals and other potential pollutants onsite requires significant care and attention. All construction works will be carried out by employing accepted good work practices during construction, and environmental management measures such as the following will be implemented:

- All materials will be stored at the construction compound and transported to the works zone immediately prior to construction.

- Weather conditions will be taken into consideration when planning construction activities to minimise risk of runoff from the Site.
- Provision of 50m exclusion zones and barriers (silt fences) between any excavated material and any surface water features to prevent sediment washing into the receiving water environment.
- If dewatering is required e.g., in wet areas, water will be treated prior to discharge.
- The contractor shall ensure that silt fences are regularly inspected and maintained during the construction phase.
- If very wet, ground must be accessed during the construction process bog mats / aluminum panel tracks will be used to enable access to these areas by machinery. However, works will be scheduled to minimize access requirements during winter months.
- The contractor shall ensure that all personnel working on site are trained in pollution incident control response. A regular review of weather forecasts of heavy rainfall is required, and the Contractor is required to prepare a contingency plan for before and after such events.
- The contractor will carry out visual examinations of local watercourses during the construction phase to ensure that sediment is not above baseline conditions. In the unlikely event of water quality concerns, the Environmental Manager and ECoW will be consulted.
- Excavations will be left open for minimal periods to avoid acting as a conduit for surface water flows.
- Only emergency breakdown maintenance will be carried out onsite. Emergency procedures and spillage kits will be available and construction staff will be familiar with emergency procedures.
- Appropriate containment facilities will be provided to ensure that any spills from vehicles are contained and removed offsite. Adequate stocks of absorbent materials, such as sand or commercially available spill kits shall be available.
- Concrete or potential concrete contaminated water run-off will not be allowed to enter any watercourses. Any pouring of concrete (delivered to site ready mixed) will only be carried out in dry weather. Washout of concrete trucks shall not be permitted onsite.
- Entry by plant equipment, machinery, vehicles and construction personnel into watercourses or wet drainage ditches shall not be permitted. All routes used for construction traffic shall be protected against migration of soil or wastewater into watercourses.
- Cabins, containers, workshops, plant, materials storage, and storage tanks shall not be located near any surface water channels and will be located beyond the 50m hydrological buffer at all times.
- All oils, fuels, lubricants, or other chemicals will be stored in appropriate bunded containers in suitable storage areas, with spill kits provided at the storage location and relevant places across the Proposed Development. There will be no storage of any oils, fuels, lubricants or other chemicals within 30m of watercourses.
- Controls and contingency measures to manage run-off from construction areas and fine sediment will be implemented;
- All refuelling and servicing of vehicles and plant will be carried out in designated bunded areas with impermeable bases, which will be situated at least 30m from watercourses.
- The use of concrete will only occur outside the set-back zone of 30m from watercourses and will be carefully controlled to avoid the release of dust and contaminated run-off. No on-site batching should occur. Washout from concrete chutes will be only carried out in designated impermeable areas.
- Temporary storage of excavated materials will be located at least 30m from watercourses.
- Soil exposure during the construction works will be minimized and exposed soil will be reinstated as rapidly as possible.

- The Contractor will be required to implement appropriate communications including reporting of environmental practice on-site, Toolbox Talks, daily briefings, an environmental noticeboard (with ecological information, spill/emergency response and refuelling area / procedure) and signage (including ecological exclusion areas).
- All site personnel involved in the construction of the Proposed Development will be made aware of the ecological features present and the mitigation measures and working procedures which must be adopted. This will be achieved as part of the site induction process through the delivery of a Toolbox Talk with particular focus on high-risk works (e.g. soil excavations and safe materials storage). In addition, briefings will be provided to all site personnel in advance of those works which are considered to present an increased risk of impacting upon ecological features.
- The Contractor's CEMP will include a Pollution Prevention Plan (PPP) (or similar document) which will set out procedures and diagrams for:
  - Identification if a water quality incident has occurred and any remedial actions to be undertaken.
  - Dewatering of excavations to designated treatment area / sustainable drainage system (SuDS) treatment area.
  - Temporary soil storage.
  - Fuel storage / refuelling.
  - Concrete wash-out area.
  - Preventing existing drainage features becoming pathways for construction run-off.
  - Reducing soil exposure and reinstating as rapidly as possible.
  - Temporary construction mitigation measures / SuDS such as ditches with check dams, clean water ditches, settlement ponds, silt fencing and straw bales.
  - Contingency measures.
- The Contractor will not be permitted to use materials that could lead to run-off containing heavy metals, sulphides, acids and must use aggregates free of excessive fines clays.
- Lighting, where necessary, will be kept to essential locations only (particularly near waterbodies), with the position and direction of lighting designed to minimise intrusion and disturbance to waterbodies. Using full cut-off lanterns would minimise light spillage through directional lighting (directing the cone of light downward) and not allowing light across the horizontal plane. Furthermore, all lighting will have the minimum brightness and power rating to perform the required function.
- Excavations near riverbanks will either be covered or fenced off at the end of each working day, or include a means of escape for trapped animals (e.g., mammal ramps or ladders).
- Root protection zones will be established around retained trees, in accordance with the relevant guidance. These will be clearly demarcated, and no machinery will enter these areas, nor will any material be stored within them.
- Any seeding of grass along verges should include native local flowering species that provide food for pollinators, such as plants that produce pollen and nectar throughout the year.
- Pre-works check for invasive species will be conducted by a suitably experienced ecologist / ECoW. Also see Section 5.4.5 of this CEMP
- Standard measures for protected species and wildlife in general will be implemented, including:
  - Sightings of protected or notable species within the Site or immediate surroundings will be recorded. If any evidence or sightings of protected or notable species occur within 30m of works, then works in that area will stop immediately and advice will be sought from the ECoW.

- Any excavations will be left with a method of escape for any animal that may enter overnight and will be checked at the start of each working day to ensure no animals are trapped within them.
- Wherever possible, tree felling and vegetation removal works which will directly impact upon areas of vegetation which could be used by nesting birds will be undertaken outside the breeding season (taken to be March to August, inclusive). Where this cannot be achieved, a pre-works check for active nests will be conducted by a suitably experienced ornithologist. Each new construction/felling area will be checked not more than 72 hours prior to commencement of works as nests can be quickly established. Where any active nests are identified, suitable exclusion zone(s) will be established and maintained until the ornithologist determines that the breeding attempt(s) have concluded.
- Any pipes will be capped or otherwise blocked at the end of each working day, or if left for extended periods of time, to ensure no animals become trapped.

5.4.3 Power Plant Area – Detailed Mitigation

5.4.3.1 Sites with Statutory Designations (European and National Sites)

Watercourses, ditches surrounding the Power Plant Area are hydrologically connected to the River Boyne and River Blackwater SAC and SPA. Measures for pollution prevention and safeguarding of local watercourses detailed within **Section 5.4.2, Section 5.4.5 and Section 5.7** and will ensure safeguarding of watercourses and waterbodies from impacts of pollution and sedimentation.

5.4.3.2 Habitats

Habitat Replacement, Compensation, and Enhancement

Within the Power Plant Area, there will be unavoidable loss of habitats to facilitate the Proposed Development, including losses to amenity grassland, dry meadows and grassy verges, scrub and immature woodland, and bog woodland.

Habitat loss will be kept to a minimum where possible, by only removing habitat required to facilitate the construction footprint, including working, storage areas and laydown areas etc. Where habitats are disturbed, removed, or damaged for temporary construction compounds and within the Peat Deposition Area, these will be reinstated naturally through succession and left unmanaged following construction.

Landscape mitigation is proposed for the Power Plant Area. Full details are presented in the Landscape Mitigation Strategy (Volume I, Chapter 10 Landscape and Visual, Volume II Appendix 10B of the EIAR submitted with the planning application, also see Volume I chapter 09 Biodiversity).

An area of approximately 17.5 ha will be planted with trees, over five areas. The largest within an area of bare cutover bog to the west of the line-cable interface compound within Ballybeg Bog, and two areas of vegetated cutover bog to the east of the 220kV overhead line, and then in two strips along the boundary with the old railway track through Derryarkin (See Volume II Appendix 9K of the EIAR). This is to replace for the loss of trees, in particular bog woodland, as a result of the construction of the Proposed Development, including the Power Plant Area and Electricity Grid Connection. Replanting will aim to create an area of bog woodland, dominated by downy birch, but include to a lesser extent include holly, rowan, Scots pine, oaks Quercus spp. and willows, which aligns with the Ballybeg Cutaway Bog Decommissioning and Rehabilitation Plan and Derryarkin Cutaway Bog Decommissioning and Rehabilitation Plan (see Volume II Appendix 9J of the EIAR). Full details are presented in the Habitat Management Plan (see Volume II Appendix 9K of the EIAR).

Habitats – Pollution and Water Quality

Watercourses, ditches, and waterbodies are present within and surrounding the Power Plant area. Measures to safeguard watercourses and waterbodies from impacts of pollution have been included within this CEMP in **Section 5.7** and will be implemented within the Contractor's CEMP for the Power Plant Area.

5.4.3.3 Fauna

5.4.3.3.1 Bats

Eight bat roosts of four different bat species (soprano pipistrelle, common pipistrelle, Natterer's bat and brown long-eared bat), were confirmed within six buildings and one structure within or directly south of the Power Plant Area. Roosts present within B4, B4a, B5 and S1 will require derogation licences prior to exclusion of bats from these roosts to proceed with demolition works required.

All works to demolish buildings with known bat roosts must be carried out under the supervision of a suitably experienced and licensed ecologist or the project ECoW.

The loss of these bat roosts will be compensated with the provision of alternative roosting sites. To mitigate for the loss of these known bat roosts, Building B2 (which will be retained) located approximately 85m to the south of the Power Plant Area and outside the Proposed Development boundary, will be further enhanced. This building is already known to contain a maternity colony of Natterer's bats, but through the safeguarding of this structure and provision of suitable enhancement measures as presented below, it is envisaged that this structure can support additional roosting bat populations.

Various bespoke artificial bat roosts will be included within and on the exterior of this building to provide roosting opportunities for both soprano and common pipistrelle, as well as for brown long-eared bats.

In addition, it is also proposed to erect ten artificial bat roost boxes, to be mounted on poles across the wider Site (e.g five Sku pole mounted roost maternity double bat box or similar), either within the Site or within Bord na Móna's ownership/control in appropriate locations to compensate for the loss of the roosts (see Volume I, Figure 9.10, of the EIAR). The provision of bat boxes across the Site will also provide additional roosting opportunities throughout the wider site.

These must be erected prior to commencement of construction and therefore the demolition of existing roost sites in the Power Plant Area.

Buildings B1 and B3 are considered to be used as either night roosts or feeding perches, in particular by brown long-eared bats. These are located outside of the Proposed Development boundary and will be retained.

Bats are particularly sensitive to lighting, and whilst B1, B2 and B3 are outside the Proposed Development footprint, the following mitigation (following BCT/ILP: GN08/2023) regarding lighting must be adhered to in relation to these retained roosts and the surrounding habitat on this southern boundary with the Proposed Development during the construction:

- Lighting will be minimised in terms of number of lights and the power of the lights (lux level) along this southern boundary of the Proposed Development, with light reaching these buildings not greater than 1 lux to avoid roost disturbance; similarly using powerful lighting on wildlife corridors can, for some species, effectively sever connectivity.
- Directional lighting, facing and located away from these roosts and surrounding vegetation along this southern boundary is proposed.
- Lighting will be turned off when not in use except to meet the minimum requirements for Health and Safety and Security.

5.4.3.3.2 Badger

As badgers are mobile species which are active within the vicinity of the Proposed Development, it is possible that badger may establish new setts prior to construction. Therefore, pre-construction badger surveys will be carried out within the ZoI of the Proposed Development no sooner than one month prior to works commencing, to determine if any setts have become newly established since baseline surveys. The ECoW will provide advice in the event that additional setts are identified, including potential requirements under licence on a temporary or permanent basis.

If piling is required within 150m of BA01 or BA02, south of the Proposed Development, then these setts will require temporary closure, until works are complete. Otherwise, these setts will be retained.

The use of artificial lighting during construction has likelihood to deter badger from retained habitats. Lighting design will ensure no light spill in excess of one lux on semi-natural habitats, and particularly in proximity to badger setts.

To alleviate a range of general likely significant effects to badger during the construction phase of the Proposed Development, the following mitigation will be adhered to:

- A Badger Management Plan will be devised and implemented by the appointed contractor (with input from the ECoW). The Badger Management Plan will include the mitigation presented within this Section and Volume I Chapter 09: Biodiversity of the EIAR. This Plan will ensure all sett locations, immediately prior to the commencement of the construction phase are known to the relevant personnel (with congnisance to the preferred confidentiality) and drawings of sett locations and protection zones will be prepared.
- All works will be largely restricted to daylight hours ((07:00 – 19:00), where working schedules permit, to reduce as far as possible disturbance to badger.
- The use of artificial lighting during the construction period will be limited and lighting will be kept to essential locations only, with the position and direction of lighting being designed to minimise intrusion and disturbance to semi-natural habitats and their conservation value. Use of full cut-off lanterns are proposed to minimise light spillage onto adjacent areas. All lighting will have the minimum brightness and power rating to perform the required function.
- Drainage and attenuation ducts will restrict badger entry, and any excavation/trench which is liable to entrap wildlife will be covered, fenced off at the end of the day or have a means of escape for any animal which may fall in (e.g., mammal ladder or ramps).
- Water sources which may be used by badger will be safeguarded by the pollution prevent measures outlined throughout this CEMP.

5.4.3.3.3 Otter

Construction phase impacts to otter associated with the Proposed Development comprise pollution of watercourses and waterbodies, disturbance and displacement caused by increased human presence, noise, artificial lighting, and vibrations; injury or entrapment due to any unsecured open trenching / excavation pits; and exposure to oils and other toxic materials. Construction safeguards in respect of badger will also alleviate risk of mortality or injury to otter, should they be present within the Site during the construction.

No additional or specific mitigation for otter is required.

5.4.3.3.4 Other Protected Mammals

Mitigation during the construction phase for safeguarding badger (**Section 5.4.3.3.2**) is also relevant to pine marten, Irish hare, stoat, and red squirrel and will safeguard these species from negative impacts during the construction phase should they be present. No specific mitigation is proposed for red squirrel or pine marten, as the habitats to be impacted within the Proposed Development are not considered suitable to support dreys or dens.

Potential impacts to hedgehog and stoat will be mitigated by avoidance. Prior to construction works commencing that have the potential to disturb these species (*i.e.*, within woodland and scrub), the footprint of the works area will be subject to a robust walkover by the ECoW to ensure that there are no hedgehogs or stoats are present and at risk from machinery.

Hedgehogs hibernate over winter typically under log piles or tree roots, or within dense vegetation and scrub. Should construction works be undertaken during winter months, such vegetation or potential hibernacula at risk of disturbance or removal will be inspected by the ECoW for the presence of hibernating hedgehog prior to any removal.

5.4.3.3.5 Marsh Fritillary

Habitats within the Site are suitable for marsh fritillary, although no larval webs were identified in this area. Removal of this habitat will only take place following checks for larvae of marsh fritillary between August and September when larval webs on devil's-bit scabious are conspicuous and before larvae begin to hibernate.

Should marsh fritillary larval webs be recorded within the Power Plant Area, these will be translocated if avoidance is not feasible during construction. This will be advised and carried out by the ECoW, and a licence will be required. The method will normally include the following provisions:

- The proposed donor and recipient areas will be surveyed by a suitably experienced ecologist / ECoW to identify suitable areas with devil's-bit scabious and habitat structure.
- The ECoW will monitor the translocation operations and deliver toolbox talks to relevant site personnel.
- Translocation will take place in autumn or winter (October-December), when plants are dormant and outside of the bird breeding season. It is best to avoid such work when soil conditions are very wet, to avoid damage and disruption to the habitat.
- Low ground-pressure tracked vehicles such as bog masters must be used to avoid compacting and smearing peat or soil during translocation.
- A specialist machine operator will be appointed for the translocation operations (removal, translocation, and placement of turves), who will be suitably experienced with the required machinery and equipment.
- The recipient area (the area where the translocated turves are to be re-established) should be similar to the donor site in terms of soil conditions and hydrology. The recipient area will be prepared before the turves are removed from the donor site, so that the turves can be translocated and put in place as quickly as possible, minimise drying out or other disruption.
- A flat-bottomed digger bucket will be used for removal of the turves from the donor site. The turves should be 20-25cm in thickness, and as large in area as can be accommodated by the digger bucket. Turves will be neatly and vertically cut along their edges as much as possible, to ensure turves are as large as possible with clean edges for best reinstatement.
- Operations will be planned so that turves are moved from the donor area to the recipient area in a single movement, so that temporary storage is not needed.
- Translocated turves will be placed in the prepared recipient area at the same depth as they were previously situated, so that their upper surface is flush with the surrounding ground surface.
- A monitoring plan will be put in place to assess the degree of success of the translocation.
- Any areas of marsh fritillary habitat lost will be replaced, ideally within the Site boundary.

5.4.3.3.6 Amphibians

Mitigation for smooth newt and common frog will focus on safeguarding their breeding habitat from damage and / or disturbance, avoiding impacts to breeding smooth newt and common frog, and minimising disturbance impacts to terrestrial smooth newt and common frog during construction.

Robust mitigation is required to protect smooth newt and common frogs from impacts arising from construction works on Site. The ponds to be retained supporting smooth newt populations, and potentially common frog populations must remain intact and untouched by potential pollution. This will require a full suite of pollution prevention measures during the construction phase, including silt fencing around the ponds to prevent sediment runoff, and a buffer of at least 10m between the pond and construction works and refuelling of machinery and plant.

Pond 3 will be removed to facilitate the construction of the Power Plant Area. To reduce the risk of injury or mortality of amphibians during the construction phase, it will be necessary to ensure that individuals are absent from the construction footprint of the Power Plant Area and retained within a safe 'refuge area' prior to construction commencing. This will be achieved using capture and exclusion methods. Standard techniques for these methods are described for great crested newt in the Great Crested Newt Mitigation Guidelines (English Nature, 2001) and Great Crested Newts: Survey and Mitigation for Development Project (Natural England, 2015). Published literature on smooth newt mitigation is not currently available.

The precise method by which the capture and exclusion will be achieved will be detailed in a Species Protection Plan which will be required as part of the licensing process with NPWS. The method will normally include the following provisions:

- The recipient pond(s) will be surveyed by a suitably experienced ecologist / ECoW during the breeding season (March to June inclusive) to determine suitability and presence of resident breeding newts or frogs.
- Amphibian fencing will be installed around the recipient waterbodies within a 'refuge area' in late January/early February prior to the translocation exercise commencing (weather dependent, it is best to avoid such works when soil conditions are very wet, to avoid damage and disruption to the habitat). The refuge area will encompass areas of habitat required by smooth newts at all times of year, including waterbodies for breeding and terrestrial areas.
- Prior to installation of amphibian fencing, and where necessary, vegetation will be removed from along a 1m corridor following the route of the amphibian fence. This will be done mechanically (e.g. strimming or clearance of scrub) and following checks for presence by the ECoW.
- The amphibian fencing will be designed to ensure that amphibians can remain in the refuge area and that they can continue to move between terrestrial and aquatic habitats. It will however serve to prevent amphibians from re-entering the construction areas of the Power Plant Area.
- If present, amphibians will be translocated (through netting and torching) from Pond 3 to the recipient pond(s) within the refuge area. Translocation will take place during the amphibian breeding season (March to June inclusive). Operations will be planned so that newts and/or frogs are moved from the donor pond to the recipient pond in a single movement. Following translocation, the pond to be removed will be lost drained carefully, ensuring no amphibians remain in the pond.
- On completion of construction works, the amphibian fencing will be removed, and amphibians will be free to move around.
- Low ground-pressure tracked vehicles such as bog masters must be used to avoid compacting and smearing peat or soil during translocation.

Removal of the grassland and scrub on Site within 200m of ponds may potentially injure or kill hibernating smooth newts and common frogs and therefore should only be removed following checks of these habitats for presence by the ECoW. These areas will be cleared in stages – firstly by cutting back vegetation to around 5-10cm to facilitate easier and more effective searches for these species, and following searches this vegetation can be removed entirely.

Peat storage areas will be checked by the ECoW for the presence of smooth newt and common frog before any deposition commences.

5.4.3.3.7 Breeding Birds

Any removal of vegetation will be restricted to the non-breeding season (i.e., carried out from September to February inclusive), unless carried out under the supervision of a suitably experienced ecologist / ECoW who must survey the vegetation for breeding birds immediately prior to removal. For the avoidance of doubt, it should be noted that birds may nest in grass and low scrub, in addition to trees. Birds can also nest in buildings, which must be checked for nests if the buildings are to be demolished in the breeding season. If nests are found, work must stop immediately until birds fledge and cease to return to the nest and the ECoW will advise the contractor of any exclusion zones around potential or confirmed nests.

The loss of vegetation may displace breeding birds, and this loss of habitat may require them to move to the wider area where there is ample foraging and nesting habitat. Likewise, the loss of some buildings on site will remove nesting opportunities on site. Although new buildings will be constructed, it is possible they will be maintained to a higher standard reducing the opportunities for breeding birds. Therefore, nest cups suitable for house martin and swallow must be provided on new buildings in similar locations to existing nests These must be installed under the direction a suitably experience ecologist / ECoW. . Sufficient nest boxes suitable for those species breeding in the natural habitats to be removed on Site must also be provided.

5.4.3.3.8 Wintering Birds and Other Protected and Notable Species

No other specific mitigation in addition to that already outlined within this CEMP, the NIS and Volume I Chapter 9 Biodiversity of the EIAR submitted with the planning application is proposed or recommended.

5.4.3.4 Aquatic Ecology

Mitigation for fish and other aquatic species will focus on the protection given to the water environment as outlined throughout the CEMP.

Careful design and management of site drainage based on the principal of Sustainable Urban Drainage Systems (SUDS) during construction will mitigate the risk of polluted surface run-off to watercourses.

Any in-stream river work will be avoided during the main salmonid spawning season and egg incubation phases (October-April inclusive).

All construction and operation lighting will be directed away from watercourses to prevent light spill.

5.4.4 Electricity Grid Connection

5.4.4.1 Sites with Statutory Designations (European and National Sites)

Watercourses, ditches surrounding the Electricity Grid Connection are hydrologically connected to the River Boyne and River Blackwater SAC and SPA.

The use of oils, chemicals, sediment and other potential pollutants on-site requires significant care and attention. The Contractor will comply with all relevant legislation, guidance, and mitigation measures in relation to the control of hazardous substances and pollutants during the works, ensuring safe handling and storage of potential contaminants to prevent accidental release to the surface water and groundwater environments and all standard guidance will be followed, as outlined in the CEMP. Measures for pollution prevention and safeguarding of local watercourses detailed within Section 5.4.2, Section 5.4.5 and Section 5.7 and will ensure safeguarding of watercourses and waterbodies from impacts of pollution and sedimentation.

5.4.4.2 Habitats

Habitat Replacement, Compensation, and Enhancement

Within the lands associated with the Electricity Grid Connection, there will be unavoidable loss of habitats to facilitate the Proposed Development, including losses to cutover bog (both bare peat and partly vegetated), mixed woodland, bog woodland and scrub.

Habitat loss will be kept to a minimum where possible, by only removing habitat required to facilitate the construction footprint, including working, storage areas and laydown areas etc. Where habitats are disturbed, removed, or damaged for working and laydown areas, these will be reinstated naturally through succession if left unmanaged following construction.

Landscape mitigation is proposed around both the 220 kV and 440 kV substation compounds. For the 220 kV substation compound a mix of deciduous tree will be planted to the east along the R400 to screen the lower parts of the development from the road and enhance visual aesthetics. A grassland mix will be planted on areas that are currently hard standing. Around the 440 kV substation compound a band of deciduous trees will be planted along the southern and eastern side of the compound to provide screening for views north of the Grand Canal. A grassland mix will be planted along the eastern entrance, as well as the northern, western and southern boundary of the substation compound. Full details are presented in the Landscape Mitigation Strategy (Volume I, Chapter 10 Landscape and Visual, Volume II Appendix 10B of the EIAR submitted with the planning application, also see Volume I chapter 09 Biodiversity).

An area of approximately 17.5 ha will be planted with trees, over five areas. Further information is provided in Section 5.4.3.2 of this CEMP, and in Volume II Appendix 9J and 9K of the EIAR.

Habitats – Pollution and Water Quality

Watercourses, ditches, and waterbodies are present within and in the area surrounding lands associated with the Electricity Grid Connection. Measures for pollution prevention and safeguarding watercourses and waterbodies from impacts of pollution have been included throughout this CEMP and within **Section 5.7** and will be implemented within the Contractor's CEMP for the Electricity Grid Connection. The use of SuDs during construction will mitigate the risk of surface run-off to watercourses.

Similarly, raised bog adjacent the southern section of the Electricity Grid Connection will be protected from runoff through measures outlined in this CEMP.

5.4.4.3 Fauna

5.4.4.3.1 Bats

Construction works in the vicinity of building B6 immediately adjacent to the Electricity Grid Connection, and construction work adjacent to the treelines and hedgerows in the south of the Electricity Grid Connection have potential to disturb and displace roosting and foraging/commuting bats.

Works must be restricted to the daylight hours (07:00 – 19:00), and lighting used during construction will not illuminate any natural habitats used by roosting, foraging or commuting bats.

Bats are particularly sensitive to lighting, and whilst B6 is outside the Proposed Development footprint, the following mitigation regarding lighting (following BCT/ILP: GN08/2023) must be adhered to in relation to this retained roost and the surrounding habitat during the construction:

- Lighting will be minimised in terms of number of lights and the power of the lights (lux level), with light reaching these buildings not greater than 1 lux to avoid roost disturbance; similarly using powerful lighting on wildlife corridors can, for some species, effectively sever connectivity.
- Directional lighting, facing and located away from this roost and surrounding vegetation.

5.4.4.3.2 Lighting will be turned off when not in use except to meet the minimum requirements for Health and Safety and Security. Badger

Subsidiary sett BA03 will require permanent closure for works to proceed. Outlier sett BA04 is within the 50m distance stated by the NRA guidance within which no works should take place during the breeding season (December to June). If works are required within the breeding season, this sett should be temporarily closed, but the sett can remain open if works are to take place in the non-breeding season as the sett is more than 30m away from the works. If there is piling within 150m of outlier sett BA02, this sett will require temporary closure. Sett closure will require a licence and be overseen by a suitably qualified ecologist / ECoW.

As badgers are a mobile species which are active within the vicinity of lands associated with the Electricity Grid Connection, it is possible that badger may establish new setts prior to construction. Therefore, preconstruction badger surveys must be carried out within the ZoI of the Electricity Grid Connection no sooner than one month of the works commencing, to determine if any setts have become newly established since baseline surveys. The ECoW will provide advice in the event that additional setts are identified, including potential requirements under licence on a temporary or permanent basis.

The use of artificial lighting during construction has likelihood to deter badger from retained setts and habitats. Lighting design will ensure no light spill in excess of one lux on semi-natural habitats, and particularly in proximity to any retained badger setts.

To alleviate a range of general likely significant effects to badger during the construction phase of the Electricity Grid Connection, the following mitigation will be adhered to:

- A Badger Management Plan will be devised and implemented by the appointed contractor with input from the ECoW to include the mitigation presented within this Section. This Plan will ensure all sett locations are known to the relevant personnel (with cognisance to the preferred confidentiality) prior to construction and drawings of sett locations and protection zones will be prepared.
- All works will be largely restricted to daylight hours (07:00 – 19:00), where working schedules permit, to reduce as far as possible disturbance as possible to badger.

- The use of artificial lighting during the construction period will be limited and lighting will be kept to essential locations only, with the position and direction of lighting being designed to minimise intrusion and disturbance to semi-natural habitats and their conservation value. Use of full cut-off lanterns are proposed to minimise light spillage onto adjacent areas. all lighting will have the minimum brightness and power rating to perform the required function.

- Drainage and attenuation ducts will restrict badger entry, and any excavation / trench which is liable to entrap wildlife will be covered, fenced off at the end of the day or have a means of escape for any animal which may fall in (*e.g.*, mammal ladder or ramps).

- Water sources which may be used by badger will be safeguarded by the pollution prevention measures outlined in this CEMP (pollution guidance will be adhered to).

5.4.4.3.3 Otter

Construction phase impacts to otter associated with the Electricity Grid Connection comprise pollution of watercourses and waterbodies, disturbance and displacement caused by increased human presence, noise, artificial lighting, and vibrations; injury or entrapment due to any unsecured open trenching / excavation pits; and exposure to oils and other toxic materials. The implementation of the measures outlined within this CEMP will ensure these habitats are safeguarded from pollution. Construction safeguards outlined in Section 5.4.3.3.2 and Section 5.4.4.3.2 in respect of badger will also apply to otter, should they be present within the site during the construction.

5.4.4.3.4 Other Protected Mammals

Mitigation during the construction phase for safeguarding badger is also relevant to pine marten, Irish hare, stoat, and red squirrel and will safeguard these species from negative impacts during the construction phase should they be present. No specific mitigation is proposed for red squirrel or pine marten, as the habitats to be impacted within the Electricity Grid Connection are not considered suitable to support dreys or dens.

Potential impacts to hedgehog and stoat will be mitigated by avoidance. Prior to construction works commencing that have the potential to disturb these species (i.e., within woodland and scrub), the footprint of the works area will be subject to a robust walkover by the ECoW to ensure that there are no hedgehogs or stoats are present and at risk from machinery.

Hedgehog hibernate overwinter typically under log piles or tree roots, or within dense vegetation and scrub. Should construction works be undertaken during winter months, such vegetation or potential hibernacula at risk of disturbance or removal will be inspected by the ECoW for the presence of hibernating hedgehog prior to any removal.

5.4.4.3.5 Marsh Fritillary

Habitats within the lands associated with the Electricity Grid Connection are suitable for marsh fritillary, with larval webs identified in this area. Removal of this habitat must only be completed following checks for larvae of marsh fritillary between August and September when larval webs on devil's-bit scabious are conspicuous and before larvae begin to hibernate. Should larval webs be found in areas of grassland to be removed, these areas must remain intact to provide future breeding habitat for this declining species.

Where marsh fritillary habitat within the lands associated with the Electricity Grid Connection are to be impacted, these will be translocated if it is not feasible to avoid these during construction. The methodology will normally include the following provisions:

- The proposed donor and recipient areas will be surveyed by a suitably experienced ecologist / ECoW to identify suitable areas with devil's-bit scabious and habitat structure.

- The ECoW will monitor the translocation operations and deliver toolbox talks to relevant site personnel.

- Translocation will take place in autumn or winter (October – December), when plants are dormant and outside of the bird breeding season. It is best to avoid such work when soil conditions are very wet, to avoid damage and disruption to the habitat.

- Low ground-pressure tracked vehicles such as bog masters must be used to avoid compacting and smearing peat or soil.
- A specialist machine operator will be appointed for the translocation operations (removal, translocation and placement of turves), who will be suitably experienced with the required machinery and equipment.
- The recipient area (the area where the translocated turves are to be re-established) should be similar to the donor site in terms of soil conditions and hydrology. The recipient area will be prepared before the turves are removed from the donor site, so that the turves can be translocated and put in place as quickly as possible, in order to minimise drying out or other disruption.
- A flat-bottomed digger bucket will be used for removal of the turves from the donor site. The turves should be 20-25cm in thickness, and as large in area as can be accommodated by the digger bucket. Turves will be neatly and vertically cut along their edges as much as possible, to ensure turves are as large as possible with clean edges for best reinstatement.
- Operations will be planned so that turves are moved from the donor area to the recipient area in a single movement, so that temporary storage is not needed.
- Translocated turves will be placed in the prepared recipient area at the same depth as they were previously situated, so that their upper surface is flush with the surrounding ground surface.
- A monitoring plan will be put in place to assess the degree of success of the translocation.
- Any areas of marsh fritillary habitat lost will be replaced, ideally within the Site boundary.

5.4.4.3.6 Amphibians

Mitigation for smooth newt and common frog will focus on safeguarding their breeding habitat from damage and / or disturbance, avoiding impacts to breeding smooth newt and common frog, minimising disturbance impacts to terrestrial smooth newt and common frog during construction, and creating amphibian friendly habitats for the operational stage.

Pond 1, which was confirmed to support sooth newt, is located within the 220kV substation compound and at the southern boundary of the proposed substation infrastructure of the Electricity Grid Connection. In addition, further suitable terrestrial and aquatic habitat is present within the Electricity Grid Connection. Robust mitigation is therefore required to protect smooth newt and common frogs from impacts arising from construction works.

To ensure terrestrial and aquatic amphibian habitats are protected, a full suite of pollution prevention measures as outlined in this CEMP will be adhered to.

A capture and exclusion exercise will be carried out, whereby amphibians within Pond 1 will be translocated to a safe ‘refuge’ area prior to construction commencing. To reduce the risk of injury or mortality of amphibians during the construction phase, it will be necessary to ensure that individuals are absent from the construction footprint of the Electricity Grid Connection and retained within a safe ‘refuge area’ prior to construction commencing. This will be achieved using capture and exclusion methods. Standard techniques for these methods are described for great crested newt in the Great Crested Newt Mitigation Guidelines (English Nature, 2001) and Great Crested Newts: Survey and Mitigation for Development Project (Natural England, 2015). Published literature on smooth newt mitigation is not currently available.

The precise method by which the capture and exclusion will be achieved will be detailed in a Species Protection Plan which will be required as part of the licensing process with NPWS. The method will normally include the provisions previously outlined in Section 5.4.3.3.6.

Removal of the grassland and scrub may potentially injure or kill terrestrial smooth newts and common frogs and therefore should only be removed following checks of these habitats for presence by the ECoW. These areas will be cleared in stages – firstly by cutting back vegetation to around 5-10cm to facilitate easier and more effective searches for these species, and following searches this vegetation can be removed entirely.

Peat Deposition Areas will be checked by the ECoW for the presence of smooth newt and common frog before any deposition commences.

Robust mitigation is required to protect smooth newt and common frogs from impacts arising from construction works on Site. Any ponds potentially supporting smooth newt populations, and potentially common frog populations must remain intact and untouched by potential pollution. This will require a full suite of pollution prevention measures during the construction phase, including silt fencing around the ponds to prevent sediment runoff, and a buffer of at least 10m between the pond and construction works and refuelling of machinery and plant.

5.4.4.3.7 Breeding Birds

Any removal of vegetation will be restricted to the non-breeding season (i.e., carried out from September to February inclusive), unless carried out under the supervision of a suitably experienced ecologist / ECoW who must survey the vegetation for breeding birds immediately prior to removal. For the avoidance of doubt, it should be noted that birds may nest in grass and low scrub, in addition to trees. Birds can also nest in buildings, which must be checked for nests if the buildings are to be demolished in the breeding season. If nests are found, work must stop immediately until birds fledge and cease to return to the nest and the ECoW will advise the contractor of any exclusion zones around potential or confirmed nests.

5.4.4.3.8 Wintering birds and Other Protected and Notable Species

No other specific mitigation in addition to that already outlined within this CEMP, the NIS and Volume I Chapter 9 Biodiversity of the EIAR submitted with the planning application is proposed or recommended.

5.4.4.4 Aquatic Ecology

Mitigation for fish and other aquatic species will focus on the protection given to the water environment as outlined within this CEMP during the construction phase. Use of SuDs during construction will mitigate the risk of surface run-off to watercourses.

Any in-stream river work will be avoided during the main salmonid spawning season and egg incubation phases (October – April inclusive).

All construction lighting will be directed away from watercourses to prevent light spillage.

5.4.5 Invasive Species

Invasive species can be introduced into a location by contaminated plant, machinery and equipment which were previously used in locations that contained invasive species. Good site organisation and hygiene management shall be maintained always on site, and best practice measures will be implemented, as follows:

- The Contractor will prepare an Invasive Species Action Plan to be implemented during construction, and all personnel will be made aware of the requirements.
- Plant and machinery will be inspected upon arrival and departure from site and cleaned / washed as necessary to prevent the spread of invasive aquatic / riparian species such as Japanese knotweed *Fallopia japonica* and *Himalayan Balsam Impatiens glandulifera*. A sign off sheet will be maintained by the contractor to confirm the implementation of measures.
- Site hygiene signage will be erected in relation to the management of non-native invasive material.

5.5 Landscape and Visual

5.5.1 Power Plant Area

Proposed landscape mitigation measures are detailed in the Landscape Strategy Report included in Volume II, Appendix 10B of the EIAR submitted with the planning application. A synopsis is provided below:

The Power Plant is located east along the R400 with a low-lying landscape as a backdrop. The proposed landscape mitigation and enhancement measures involve the introduction of the following specific elements:

- Mix of Deciduous Trees: Positioned to the west of the site, these clusters aim to screen the lower parts of the development and the area around the site entrance. Their placement is intended to enhance visual aesthetics and promote integration with the natural environment.
- Woodland Mix and Grass Mix: To the south of the site, a combination of woodland mix and grass mix will be introduced. This aims to facilitate better integration with the existing scrubland adjacent to the site, extending beyond the site boundary, and to enhance the screening of the lower section of the PPA over time when the woodland mix matures.
- Retention of existing vegetation: Clusters of existing semi-mature and mature vegetation in the northern section of the existing site entrance east of the R400 shall be retained and protected during construction.

Landscape mitigation in areas to the north and east of the PPA and within the redline boundary will not be suitable for replanting due to the location of the contractors compounds.

Habitat Replacement Areas

There will be unavoidable loss of habitats within the Power Plant Area to facilitate the construction phase, including losses to amenity grassland, dry meadows and grassy verges, scrub and immature woodland, and bog woodland. Habitat loss will be kept to a minimum where possible, by only removing habitat required to facilitate the construction footprint, including working, storage areas and laydown areas etc. Where habitats are disturbed, removed, or damaged for temporary construction compounds, these will be reinstated naturally through succession and left unmanaged following construction.

An area of approximately 8 hectares will be planted with trees, located to the west of the line-cable interface compound within Ballybeg Bog. This is to replace the loss of trees, in particular bog woodland, as a result of the construction of the Proposed Development, including the Power Plant Area and Electricity Grid Connection. Refer to Volume II, Appendix 10B (Landscape Mitigation Strategy) of the EIAR submitted with the planning application for the location and extent of the replanting lands to compensate for tree felling requirement as well as Chapter 8 (Biodiversity) and its associated appendices of the EIAR submitted with the planning application.

Replanting will aim to create an area of bog woodland, dominated by downy birch, but include to a lesser extent Holly, Rowan, Scots pine, Oaks and Willows, which aligns with the Ballybeg Cutaway Bog Decommissioning and Rehabilitation Plan (see Volume II, Appendix 9J of the EIAR submitted with the planning application). Full details are presented in the Habitat Management Plan (refer to Volume II, Appendix 9K of the EIAR submitted with the planning application).

5.5.2 Electricity Grid Connection

220 kV Substation

Proposed landscape mitigation measures are detailed in the Landscape Strategy Report included in Volume II, Appendix 10B of the EIAR submitted with the planning application. A synopsis is provided below:

The Electricity Grid Connection is located west of the R400 with a low-lying landscape as a backdrop. The proposed landscape mitigation and enhancement measures involve the introduction of the following specific elements:

- Mix of Deciduous Trees: Positioned to the east along the R400, additional clusters of deciduous trees will aim to screen the lower parts of the development from the road and the area around the site entrance. Their placement is intended to enhance visual aesthetics and promote integration with the natural environment.
- Grass Mix: Areas to the north and east of the substation compound shall be planted with a grass mix. This aims to increase the biodiversity in this area which his currently mostly hardstanding. Considering the required underground services and overground lattice structures, the establishment of a woodland mix will not be feasible in the vicinity of the substation.
- Retention of existing vegetation: Existing regenerating bog vegetation west of the proposed substation compound shall be retained and protected during construction works.

400 kV Substation

Proposed landscape mitigation measures are detailed in the Landscape Strategy Report included in Volume II, Appendix 10B of the EIAR submitted with the planning application. A synopsis is provided below:

The Electricity Grid Connection is located north of the Grand Canal and south of the L1010 Togher. The site is adjacent to agricultural fields to the west, south and north. Areas of regenerating bog are located to the east. The proposed landscape mitigation and enhancement measures involve the introduction of the following specific elements:

- Woodland Mix: A band of trees is to be planted along the southern and eastern side of the substation compound and separated by a band of grassland from the compound fence. This is to provide screening of the lower section of the substation building and to pick up the pattern of bands of trees along field boundaries. Additional screen planting in form of bands of trees will be provided along the western and southern redline boundary in order to enhance screening in views north from the Grand Canal.
- Grass Mix: A band of grassland will be created along the eastern (entrance area), northern, western and southern boundary of the substation compound. Other areas associated with former access tracks and agricultural fields located within the southern tip of the redline boundary are to become grassland.
- Retention of existing vegetation: Existing bands of trees along field boundaries north of the substation compound as well as a wide strip south of the substation compound is to be retained.

Overhead Transmission Line and underground cable

Proposed landscape mitigation measures are detailed in the Landscape Strategy Report included in Volume II, Appendix 10B of the EIAR submitted with the planning application.

<u>Location of Proposed OHL and UGC</u>

- Avoidance of locating the Proposed OHL where there was a specific conflict with a view or amenity;
- Restricting the siting of structures close to a road unless it could be screened by an adjoining hedgerow or hedgerow trees. Towers to be set back well from the edges of local roads, where practical, especially where there was a lack of hedgerows.
- Avoidance of running the Proposed OHL close and parallel to a road;
- Place UGC within existing road / access track corridors where possible;
- Avoidance of placing overhead transmission line structures on axial views, or where there was a change in direction of a road;
- Taking advantage of existing tall hedgerows, bands of trees, or stands of trees that enclosed fields within the study area - using them either as a background or to screen the overhead transmission line;
- Minimise construction impact on adjoining vegetation;

- Avoidance of placing the overhead transmission line structures on rising ground where they will break the skyline, where possible;
- Alignment of the Proposed OHL as straight as possible in order to minimise the requirement for angle towers;
- Micro-siting of proposed towers/pole-sets in order to avoid mature trees;
- Where possible, location of tower structures near or on field boundaries in order to retain the visual appearance of existing field pattern; and
- Avoidance of traversing relevant roads in a perpendicular manner.

Vegetation

- Retention of existing mature tree planting where possible;
- Minimising removal or pruning of hedgerows and trees/woodland areas; and
- Minimising the removal of roadside vegetation where the Proposed OHL crosses.

Lattice Tower locations

Careful analysis has been undertaken for all tower positions in areas where towers are likely to give rise to significant visual effects. These locations will be reviewed at construction stage to ensure optimum micro-siting is achieved with regard to visual effects.

5.6 Noise and Vibration

5.6.1 General Mitigation Measures

The Contractor will be required to have regard to the following and those outlined within the EIAR relevant to construction phase noise and vibration:

- British Standards Institution (BSI) (2014). *Code of practice for noise and vibration control on construction and open sites* BS 5228:2009+A1:2014.
- Environmental Protection Agency (EPA) (2016). *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities*.
- National Roads Authority (NRA) (2004). *Guidelines for the Treatment of Noise and Vibration in National Road Schemes*.
- Health and Safety Authority (HSA) (2007). *Guide to the Safety, Health and Welfare at Work (General Application) Regulations 2007: Chapter 1 of Part 5: Control of Noise at Work.*
- UK Highways Agency (UKHA) (2020). *Design Manual for Roads and Bridges (DMRB) LA 111 Sustainability and Environmental Appraisal LA 111 Noise and Vibration Revision 2*.

An assessment of construction phase noise emissions has been carried out in Volume I, Chapter 11 of the EIAR, and outlines the predicted noise levels from construction activities at the closest noise sensitive locations (sensitive receptors).

The Environmental Manager will supervise the works to ensure compliance with the noise and vibration limits set out in the Standards document referred above and those references within the EIAR.

The Contractor will address noise and vibration, through measures such as the following where appropriate:

- A site representative and designated noise liaison responsible for matters relating to noise and vibration will be appointed prior to construction on site.
- Prior to particularly noisy construction activity, e.g., excavation close to a property, the Site contact will inform the nearest noise sensitive locations of the time and expected duration of the works.

- Any complaints will be logged, investigated, and followed up in a prompt fashion and, where required, measures taken to ameliorate the source of the noise complaint. The Contractor will develop a complaints and corrective action procedure to be adhered to throughout the construction phase. This will outline timeframes within which complaints should be logged, investigated and complaints resolved, taking into account the timeframes outlined in section 3.2.6 of this CEMP.
- The site representative and designated noise liaison will also liaise with environmental advisors, relevant authorities / environmental bodies, and the local community as required with respect to noise and vibration impacts during the construction phase.
- Good community relations shall be established and maintained throughout the construction process. This shall include informing residents on progress and ensuring measures are put in place to minimise noise and vibration impacts.
- The Contractor will highlight through Method Statements and / or risk assessment specific activities that will create significant noise and vibration levels. Contractors will demonstrate how they will mitigate / manage these emissions. The Contractor will implement mitigation measures where noise sources are located near sensitive receptors and where required onsite. Where significant noise or vibration levels are expected, this will be communicated with any affected parties.
- The Contractor shall select construction plant with low inherent potential for generation of noise and / or vibration.
- The hours of working will be planned, and account will be taken of the effects of vibration upon persons in areas surrounding Site operations and upon persons working on site, taking into account the nature of land use in the areas concerned, the duration of work, and the likely consequence of any lengthening of work periods.
- Where reasonably practicable, low vibration working methods will be employed. Consideration should be given to use of the most suitable plant, reasonable hours of working for operations which might give rise to perceptible vibrations, and economy and speed of operations.
- Measures shall be put in place to ensure that employees know that minimisation of noise will be important at the Site.
- Any machinery which is in intermittent use shall be shut down in intervening periods of non-use or where this is impracticable, it shall be throttled back to a minimum.
- All plant and vehicles shall be maintained in good mechanical order and fitted with the appropriate silencers, mufflers or acoustic covers where applicable.

5.6.2 Power Plant Area

To ensure noise and vibration levels are kept to a minimum and to reduce the risk of cumulative impacts, it is recommended that measures including the following are adopted during the construction phase:

- Standard construction working hours will be adhered to, *i.e.,* 0700 hours - 1900 hours weekdays and 0800 hours - 1300 hours Saturdays, with no working on Sundays or Bank Holidays (including site deliveries) unless agreed with the local planning authority. Any activities that are required to be undertaken outside of standard construction hours our will be discussed with the relevant authorities in advance.
- Selection of quiet and low vibration equipment and methodologies in accordance with the principles of ‘best practicable means’.
- Fixed and semi-fixed ancillary plant such as generators, compressors and pumps will be located away from receptor locations wherever possible.
- The appointed Contractor for the construction phase will be provided with electrical power which minimises the requirement for diesel generators at the Site.
- Diesel generators, if and when required, will be enclosed in sound proofed containers to minimise the potential for noise impacts.

- All plant used on site will be regularly maintained, paying attention to the integrity of silencers and acoustic enclosures.
- Compressors will be of the “sound reduced” models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers.
- All noise generating construction plant will be shut down when not in use.
- The loading and unloading of materials will take place away from residential properties, ideally in locations which are acoustically screened from nearby NSRs.
- Materials shall be handled with care and placed rather than dropped where possible. Drop heights of materials from lorries and other plant shall be kept to a minimum.
- Modern plant shall be selected which complies with the latest European Commission noise emission requirements. Electrical plant items (as opposed to diesel powered plant items) shall be used wherever practicable. All major compressors shall be low noise models fitted with properly lined and sealed acoustic covers. All ancillary pneumatic percussive tools would be fitted with mufflers or silencers of the type recommended by the manufacturers.
- Site operations and vehicle routes will be organised to minimise the need for reversing movements, and to take advantage of any natural acoustic screening present in the surrounding topography.
- No employees, subcontractors and persons employed on the site will cause unnecessary noise from their activities, e.g., excessive 'revving' of vehicle engines, music from radios, shouting and general behaviour etc. All staff inductions at the site shall include information on minimising noise and reminding them to be considerate of the nearby residents.
- As far as practicable, noisier activities shall be planned to take place during periods of the day which are generally considered to be less noise-sensitive or when existing ambient noise levels are higher to help mask the construction noise, i.e., not particularly early or late in the day.

5.6.3 Electricity Grid Connection

To ensure noise and vibration levels are kept to a minimum and to reduce the risk of cumulative impacts, it is recommended that mitigation measures outlined in Sections 5.6.1, 5.6.2 and 5.6.4 as well as those listed throughout this CEMP are implemented during the construction phase of the Electricity Grid Connection.

5.6.4 Noise and Vibration Limits

The Contractor will be responsible for compliance with these prescribed noise and vibration levels, which will be agreed between the Contractor and the Local Authorities during the post-planning stage, prior to any works commencing on Site. This shall apply to all works carried out by the Contractor and any sub-contractors under their control. Any deviation from the threshold noise levels agreed with the Local Authority will only be allowed in exceptional circumstances and when prior written approval has been received from the Local Authority. The requirement whether or not to undertake noise and vibration monitoring will be agreed with the Local Authority.

Transport Infrastructure Ireland (TII) is the only government body in Ireland to publish construction noise limits, which are presented in the document ‘Guidelines for the Treatment of Noise and Vibration in National Road Schemes’ (NRA 2004) (NRA Guidelines). It is acknowledged that the limits presented relate to construction works for road schemes, however it is considered reasonable and pragmatic to assume that noise sensitive receptors (NSR) are likely to be equally sensitive to construction noise from other project types, like the Proposed Development. Construction noise and vibration limits set out by the NRA Guidance (2004) are set out in **Table 5.2**. Criteria given in both the NRA Guidelines and BS 5228-1 will be considered during the construction phase.

Table 5-2: Maximum Permissible Noise Levels at the Facade of Dwellings During Construction

Day & Time	Noise Levels dB(A)	
	$L_{Aeq\ 1\ hour}$	$L_{AMax,slow}$ dB
Monday to Friday 07:00 to 19:00	70	80
Monday to Friday 19:00 to 22:00	60[2]	65[2]
Saturday 08:00 to 16:30	65	75
Sundays and Bank Holidays 08:00 to 16:30	60[2]	65[2]

5.7 Water Management

5.7.1 Power Plant Area

To minimise the potential for adverse impacts to groundwater, surface water quality and geomorphology during construction, the following is an outline of the general mitigation measures that will be in place. Water quality monitoring of surface water courses will be undertaken pre and during-construction. Also see Section 5.8 for additional mitigation measures.

5.7.1.1 Surface Water Management

During the construction phase of the Proposed Development surface water quality measures will be installed and maintained in accordance with the following guidance:

- Construction Industry Research and Information Association (CIRIA) (2001). *Control of water pollution from construction sites. Guidance for consultants and contractors (C532).*
- Construction Industry Research and Information Association (CIRIA) (2006). C*ontrol of water pollution from linear construction projects. Technical guidance (C648D).*
- Construction Industry Research and Information Association (CIRIA) (2023). *Environmental good practice on site guide (5th edition) (C811).*
- Eastern Regional Fisheries Board (ERFB) (2004). *Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites.*
- Inland Fisheries Ireland (IFI) (2016). *Guidelines on the Protection Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters.*
- Inland Fisheries Ireland (IFI) (2016). *Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites.*
- Institute of Geologists of Ireland (IGI) (2013). *Guidelines for Preparation of Soils, Geology, Hydrogeology Chapters of Environmental Impact Statements.*
- National Roads Authority (NRA) (2008). *Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes.*
- National Roads Authority (NRA) (2009). *Guidelines on Procedures for Assessment Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes.*
- Transport Infrastructure Ireland (TII) (2015). *Road Drainage and the Water Environment (DN-DNG-03065).*

General surface water management and good practice are detailed below:

- All construction works will be confined to within the Proposed Development site boundary. No works will be undertaken outside of this area.

[2] Construction activity at these times, other than that required in respect of emergency works, will normally require the explicit permission of the relevant local authority.

- The existing surface water management system, such as drains, settlement ponds, outfalls and interceptors / separators, will be inspected and confirmed to be in suitable working order prior to any Power Plant Area works commencing on the Site.
- Additional new drainage installations will be installed in early stages of construction, alongside the remaining existing drainage facilities, which can be used to treat runoff for silt and hydrocarbons early on in the programme. Daily weather forecasting will also be used to inform the works schedule, ensuring excavation works do not coincide with high intensity or extreme rainfall event
- The proposed surface water management system, including existing and proposed infrastructure, will be inspected and confirmed to be of sufficient capacity to treat any additional water generated by the Power Plant Area, including runoff from dust suppression, prior to discharge.
- Washout from power cleaning of drainage lines, oil interceptors or any other pipework which may contain pollutants will be collected and treated. No contaminated washout will be allowed enter any water body or be discharged to ground.
- There will be regular monitoring and prompt maintenance of the overall surface water management system throughout the Power Plant Area. This will ensure that the drainage system continues to function as designed.
- There will be no direct discharge to any water body at any time during the construction phases. All surface water run-off within the Site will be directed to this drainage system.

5.7.1.2 Sedimentation of Surface Waters

The proposed works will be carried out by employing accepted good work practices during construction, and environmental management measures such as those outlined below:

- All materials will be stored within temporary compounds, refer to the temporary construction compound details (see Section 3.4.5 and Section 3.5.5 of this CEMP, also see the EIAR submitted with the planning application), and transported to the works zone immediately prior to construction.
- Weather conditions will be taken into consideration when planning construction activities to minimise risk of run off from site.
- Provision of 50m exclusion zones and barriers (silt fences) between any excavated material and any surface water features to prevent sediment washing into the receiving water environment.
- The contractor shall ensure that silt fences are regularly inspected and maintained during the construction phase.
- Any silt fencing will be erected as per the manufacturer's guidelines, under the ECoW supervision and will be maintained until all ground disturbance has ceased and vegetation re-established. Once installed the contractor shall ensure that silt fences are regularly inspected and maintained during the construction phase, inspections will occur more frequently during heavy rainfall events. The ECoW will also supervise the removal of the silt fences following the completion of the works.
- If very wet ground must be accessed during the construction process bog mats / aluminium panel tracks will be used to enable access to these areas by machinery. However, works will be scheduled to minimise access requirements during winter months.
- The contractor shall ensure that all personnel working on site are trained in pollution incident control response. A regular review of weather forecasts of heavy rainfall is required, and the Contractor is required to prepare a contingency plan for before and after such events.
- The contractor will carry out regular visual examinations of local watercourses that may be impacted by the proposed works during the construction phase to ensure that sediment is not above baseline conditions. In the unlikely event of water quality concerns, the Environmental Manager and ECoW will be consulted.
- Excavations will be left open for minimal periods to avoid acting as a conduit for surface water flows.

- Only emergency breakdown maintenance will be carried out on site. Emergency procedures and spillage kits will be available throughout Site and construction staff will be familiar with emergency procedures.
- Appropriate containment facilities will be provided to ensure that any spills from vehicles are contained and removed off site. Adequate stocks of absorbent materials, such as sand or commercially available spill kits shall be available. Any used spill kit materials will be disposed of using a licenced hazardous waste contractor in accordance with relevant legalisation.
- Entry by plant equipment, machinery, vehicles and construction personnel into watercourses or wet drainage ditches shall not be permitted. All routes used for construction traffic shall be protected against migration of soil or wastewater into watercourses.
- Cabins, containers, workshops, plant, materials storage and storage tanks shall not be located near any surface water channels and will be located beyond the 50m hydrological buffer at all times.
- Unnecessary clearing and grading will be avoided.
- Clearing of adjacent drainage channels will be minimised.
- Silt control measures will be installed along the perimeter of the excavation areas adjacent to drainage channels and at locations along the proposed discharge pipeline routes, where there is a potential impact on drains or the Yellow River (process water discharge) and Castlejordan River (surface water discharge).
- Construction activities phased to minimise soil exposure, with large areas of grading avoided to minimise erosion potential.
- Soils are to be stabilised as soon as is practicable.
- To prevent chemical pollution, all liquid fuels and chemicals will be stored in suitable containers within bunds in designated areas away from the main construction site activities. The designated areas will be located an appropriate distance away from drainage channels and onsite boreholes.
- On-site refuelling is to be carried out in designated bunded areas only.
- Spill kits are to be maintained near working areas. All spills / leaks are to be cleaned up immediately. The Contractor will prepare and implement an emergency response plan. The plan will detail the measures to be undertaken should pollution be identified, and will be detailed within the Contractors CEMP.
- Equipment will be regularly maintained, and leaks repaired as soon as is practicable. If the equipment cannot be repaired, it will be removed from the site. Accidental spillages will be contained and cleaned up immediately.
- Contained chemical portaloo toilets will be used on site during the construction phase. All sewage will be removed from the site to an authorised treatment plant.
- Construction of the discharge pipe placement will be carried out in accordance with the Inland Fisheries Ireland *Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites (2016*). The guidelines will also be consulted regarding discharge pipes (process water and surface water) placement to avoid disruption to the river during the most sensitive stages of salmonid or lamprey development.
- If dewatering is required as part of the proposed works e.g. in wet areas, water will be pumped from excavations via settlement tanks or collection basins where any solids can settle out before discharging to drains or watercourses. The settled solids will be removed from the tank/basin as required and disposed offsite by licensed hauliers. Suitable best practice de-watering methods will be used.
- Run-off from spoil heaps will be prevented from entering watercourses by diverting it through settlement ponds and removing material off-site as soon as possible to designated storage areas.

- Silt traps will be placed at any crossing points to avoid siltation of drainage channels and, if the need arises, silt fences will be used during the course of works in order to reduce the potential for pollution of watercourses. These will be maintained and cleaned regularly throughout the construction phase.

- Surface water run-off from working areas will not be allowed to discharge directly to local watercourses.

5.7.1.3 Fuel, Refuelling and Chemical Handling

- Fuel and chemical handling will be carried out by employing accepted good work practices during construction, and environmental management measures such as those discussed below: Oils and lubricants will be required to be stored at least 50m away of a watercourse where practical and stored in vessels designed to hold 110% of the capacity of the largest tank / container within the bunded area. All plant and equipment shall be checked for leaks of fuel and lubricants before being allowed onto the Site. The Contractor will allow for regular checks and maintenance as required.

- Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles, will take place in designated impermeable refuelling areas isolated from surface water drains. Spill kit facilities will be provided at the fuelling area in order to provide for any accidental releases or spillages in and around the area. Any used spill kit materials should be disposed of via a hazardous waste contractor.

- Drainage from the bunded area will be diverted for collection and safe disposal. All containers within the storage area will be clearly labelled so that appropriate remedial action can be taken in the event of a spillage. When moving drums from the bunded storage area to locations within the Site, a suitably sized spill pallet will be used for containing any spillages during transit.

- All equipment and machinery will be checked for leaks and other potential sources of contaminants before arriving on-site and on a daily basis. Any equipment or machinery likely to introduce contaminants will not be brought on-site or will be removed from the Site immediately if any leak is discovered. Spill kits will be available to machine operators, and they will be trained in their use. Any used spill kit materials will be disposed of via a hazardous waste contractor.

- The storage of hazardous substances will be necessary during construction and a number of considerations will need to be made to reduce the potential for pollution from these sources. Fuel will be required to be stored at least 50m from a water body and refuelling will only take place in designated areas, on hardstanding by appropriately trained personnel.

- Adequate stocks of hydrocarbon absorbent materials (e.g., spill-kits and / or booms) will be held on-site in order to facilitate response to accidental spills.

- Spill-kits and hydrocarbon absorbent packs will be stored in the cabin of all construction vehicles. All machine operators and site staff will be fully trained in the use of this equipment.

- Spill kits and oil absorbent material will also be located at vulnerable locations (e.g., near oil filled equipment). Booms will be held on-site for works near waterbody / drains. Spill kits will contain a breakable tie to show use and indicates whether it needs to be replenished. The Site Manager and Environmental Manager will be responsible for replenishing spill kits.

- A limited amount of fuel will have to be stored on site in bunded areas. On-site refuelling of machinery will be carried out at dedicated refuelling locations using a mobile double skinned fuel bowser or fuel truck, away from watercourses and surface water drains. The fuel bowser will be parked on a level area in the construction compound when not in use. Only designated trained and competent operatives will be authorised to refuel plant.

- Mobile measures such as drip trays, spill kits and fuel absorbent mats will be available and will be used when required during all refuelling operations.

- All machinery will be regularly maintained and checked for leaks and services will only be undertaken within the construction compound or offsite.

5.7.1.4 Control of Concrete and Lime (Including Concrete Deliveries and Pours)

Concrete will be used to construct the Proposed Development and will therefore need to be managed to reduce the potential for pollution. The control of concrete and lime will be carried out by employing accepted good work practices during construction, and environmental management measures such as those discussed below.

Ready-mixed concrete will be used during the construction phase, with all concrete being delivered from local batching plants in sealed concrete delivery trucks. The use of ready-mixed concrete deliveries will eliminate any potential environmental risks of on-site batching. Before leaving site, washing of the delivery truck chute will be minimised and restricted to designated wash out areas only. No wash-down or wash-out of ready-mix concrete vehicles during the construction works will be carried out at the Site within 20m of an existing surface water drainage point. Washing of the concrete lorry's chute will only be allowed to take place in designated areas with an impervious surface or offsite at a licensed facility. Concrete truck bodies will not be washed out on the Site, concrete trucks will be washed out fully at their off-site batching plant, where facilities are already in place.

The small volume of water that will be generated from washing of the concrete lorry's chute will be directed into a lined impermeable containment area, or a Siltbuster-type concrete wash unit or equivalent. This type of Siltbuster unit catches the solid concrete and filters and holds wash liquid for pH adjustment and further solids separation. The residual liquids and solids will be removed off-site by an appropriately authorised waste collector for disposal at an authorised waste facility. Where temporary lined impermeable containment areas are used, such containment areas are typically built using straw bales and lined with an impermeable membrane.

The areas are covered when not in use to prevent rainwater collecting. In periods of dry weather, the areas can be uncovered to allow much of the water to be lost to evaporation. At the end of the concrete pours, any of the remaining liquid contents will be tankered off-site and transported to an appropriately authorised facility. Any solid contents that will have been cleaned down from the chute will have solidified and can be broken up and disposed of along with other construction waste.

The risks of pollution arising from concrete deliveries will be further reduced by the following:

- Site roads will be constructed to the required standard to allow transport of materials to the Site, concrete delivery trucks will be able to access all areas where the concrete will be needed. No concrete will be transported around the Site in open trailers or dumpers to avoid spillage while in transport.
- The arrangements for concrete deliveries to the site will be agreed with suppliers before work starts, agreeing routes, prohibiting on-site washout and to agree emergency procedures.
- Clearly visible signage will be placed in prominent locations close to concrete pour areas specifically stating washout of concrete lorries is not permitted on the site.
- Contractor will be required to manage and mitigate concrete works ensuring that no concrete is laid during wet weather if achievable, so to reduce the risk of concrete being washed off the site and into the surface water drains or water bodies.
- Using weather forecasting to assist in planning large concrete pours and avoiding large pours where prolonged periods of heavy rain is forecast.
- Restricting concrete pumps and machine buckets from slewing over watercourses (including drains and ditches) while placing concrete.
- Ensuring that excavations are sufficiently dewatered before concreting begins and that dewatering continues while concrete sets.
- Ensuring that covers are available, and used, when necessary, for freshly placed concrete to avoid the surface washing away in heavy rain.
- Surplus concrete after completion of a pour will be taken off-site and disposed of at an appropriately authorised / licenced facility.

- Concrete mixing will be undertaken in designated impermeable areas, at least 10 m away from a water body or surface water drain to reduce the risk of runoff entering a water body, or the sub-surface, or groundwater environment.

5.7.1.5 Accidental Spillage, Flooding or Other Emergencies

Accidental spillages, flooding, or other emergencies will be avoided by employing accepted good work practices during construction, and environmental management measures such as those discussed below:

- Leaking or empty oil drums will be removed from site immediately and disposed of via an appropriately licensed waste disposal contractor.
- Spill kits and oil absorbent material will be carried by mobile plant and all machine operators and site staff will be fully trained in the use of this equipment.
- Spill kits and oil absorbent material will also be located at vulnerable locations (e.g., near oil filled equipment). Booms will be held on-site for works near waterbody / drains. Spill kits will contain a breakable tie to show use and indicates whether it needs to be replenished. The Site Manager and Environmental Manager will be responsible for replenishing spill kits.
- An Emergency Response Plan (ERP) including a spill clean-up plan will be prepared by the Contractor and included in the CEMP and construction workers trained to respond to spillages.
- A copy of the ERP will be kept in the Site Emergency Information File (along with other safety emergency preparedness plans) together with the results of any test of the plan.
- Oil interceptors will be required for refuelling areas; runoff from washing areas that contains detergents which may prevent oil interceptors from working correctly will be prevented from entering oil separators by providing separate designated areas for washing and refuelling.
- Discharge with oils and chemicals from vehicle washing areas will be considered as trade effluent and therefore will be disposed off-site.
- The installation of protective bunds along all waterbody boundaries and drains during construction will filter contaminants and prevent adverse runoff.
- Any plant, machinery or vehicles will be regularly inspected and maintained to ensure they are in good working order and clean for use.
- Any site welfare facilities will be appropriately managed, and all foul waste disposed of by a licenced contractor to a suitably permitted facility.
- During the construction phase, the Contractor will monitor weather forecasts on a monthly, weekly, and daily basis, and plan works accordingly. The Contractor will describe in the Emergency Response Plan the actions it will take in the event of a possible flood event. These actions will be hierarchal meaning that as the risk increases the Contractor will implement more stringent protection measures. This is important to ensure all workers, the construction site and third-party land, property and people are adequately protected from flooding during the construction phase.

5.7.2 Electricity Grid Connection

The same general mitigation measures that will be in place during construction of the Electricity Grid Connection as that of the construction of the Power Plant Area to minimise the potential for adverse impacts to groundwater, surface water quality and geomorphology, and off-site receptors and construction workers, will be in place during the construction phase of the Electricity Grid Connection.

5.8 Soils and Geology

Also see Section 5.7 for additional mitigation measures.

5.8.1 Power Plant Area

- To minimise the potential for adverse impacts to soil structure and quality during construction, the following general mitigation measures will be in place: Soil material will be stored temporarily within the Site in managed stockpiles that will not be allowed to dry out, to avoid generation of wind-blown dust.

- Any stockpiled material will be managed in accordance with best practise guidelines (such as *Construction Code of Practice for the Sustainable Use of Soils on Construction Sites* (defra 2009)). When required, pre-earthwork drainage will be put in place to avoid sediment being washed off-site as outlined in **Sections 4.5** and **5.7.**

- The Contractor will be required to prepare a final Construction Traffic Management Plan (CTMP) to minimise site traffic and, if relevant, damage to soil structure from smearing and compaction. Refer to **Appendix 1A.**

To minimise the potential for adverse impacts to soil chemistry and to water quality during construction, the following is an outline of the general mitigation measures that will be in place (also see Section 5.7).

- The Contractor will be required to include measures in the Contractor's CEMP for minimising erosion by reducing disturbance and stabilising exposed materials. The CEMP will also consider control measures to minimise the release of mobilised sediment such as stockpile profiling, silt dams on water courses and silt fences. The Contractor's CEMP will also include methods of handling and storing chemicals and fuels, followed by an Emergency Response Plan (ERP) to be implemented in the event of a spill or leak.

- Water quality monitoring of surface water courses will be undertaken pre and during-construction, details of which will be included in the contractors CEMP. This will be based on a combination of visual observations, in situ testing using handheld water quality probes, and periodic sampling for laboratory analysis.

- The Contractor will be required to ensure the safe storage of any hazardous materials or chemicals required onsite. Storage areas for flammable/ toxic/ corrosive materials will be located in a separate, locked, impermeable bunded and fenced off area. Material data sheets will be available for all these materials and the COSHH (Control of Substances Hazardous to Health) assessments kept within the relevant Risk Assessment for the task, all subject to the Applicant's approval. Storage will not be within 50m of a watercourse and designated storage areas will be bunded to 110% of storage capacity to contain the effects of any spills. These areas will be cleared and re-instated following completion of the Site.

- A RWMP will be prepared and incorporated into the Contractor's CEMP, and all relevant Contractors will be required to seek to minimise waste arising at source and, where such waste generation is unavoidable, to maximise its recycling and reuse potential. Recycling of materials will primarily take place off-site where noise and dust are more easily managed and less likely to impact on surrounding properties. Refer to **Section 5.11** of this CEMP for waste management mitigation measures.

- Should significant contamination occur as a result of construction stage activities, Offaly County Council and the EPA will be notified, and appropriate corrective actions will be agreed and undertaken.

- If water is encountered during below ground construction, suitable best practice de-watering methods will be used. Depth to water in all site investigation trial pits and boreholes undertaken at the Power Plant Area site in mid-2023 was greater than 4.0m below ground, other than at TP205 where groundwater ingress was associated with a peat layer, therefore significant groundwater dewatering is not anticipated but, if required, will be undertaken as outlined in Section 5.7.

- Construction works will be carried out in such a way as to prevent, contain, or limit, as far as reasonably practicable, any adverse effects arising from the presence of contaminated land or materials (if encountered) in compliance with the CEMP. Examples of these measures are as follows:

- The Contractor will ensure that any significant contamination not identified during previous site investigations is recorded and dealt with in line with the EPA's "*Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites*".
- Should ground with significant levels of unknown contamination be encountered during construction, working methods and procedures for handling and disposal of material will be employed to minimise risk in line with the EPA's "*Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites*". If required, the material will be disposed of at a suitably licensed waste facility.
- 'Clean' and 'dirty' (contaminated) work areas will be divided by internal fencing where contamination is encountered.
- Personal Protective Equipment (PPE) will be worn by ground workers and other staff (see below for more detail on PPE).
- Those potentially at risk will be made aware of potential site hazards via site safety induction procedures.
- No excavated material will be exported off site without a Soil Waste Classification assessment to determine the correct disposal route compliant with waste regulations.

To minimise the potential for adverse impacts to off-site receptors and construction workers, the following is an outline of the general mitigation measures that will be in place.

- The Contractor has a duty under the Safety, Health and Welfare at Work Act 2005 and the Control of Substances Hazardous to Health (COSHH) Regulations 2002 to protect their employees against hazardous substances encountered at work.
- To that end and in accordance with CIRIA guidance R132 *A guide for safe working on* contaminated *sites* (1996), the Contractor will be required to undertake a COSHH assessment before any work is carried out at the Site which is likely to expose staff to substances hazardous to health.
- No hazardous substances were identified during the site investigation; however, it would be best practice for the Contractor to ensure that all employees (construction workers) are issued with PPE appropriate to the hazards identified. PPE could consist of hazard-specific gloves, eye protection and respiratory protective equipment (RPE).
- The Contractor will implement measures to minimise the amount of dust produced during the construction phase, including the preparation of a Dust Management Plan (DMP) and refer to **Section 5.2.2.1** of this CEMP. There will be a Duty of Care on the Contractor to ensure that dust-raising activities are located away, and upwind where possible, from sensitive receptors, the duration be kept to a minimum when in proximity to a receptor, and the spread of dust be controlled by judicious use of water, the most effective and efficient way being in the form of a fine spray.
- Comprehensive site investigations have been undertaken and the existing ground conditions are therefore understood and have informed the siting and layout of the Proposed Development.
- The Proposed Development will be constructed in accordance with current engineering standards, including site investigation and understanding of ground conditions to inform construction works and design. No excavated material will be exported off site.

5.8.2 Electricity Grid Connection

The same general mitigation measures that will be in place in the CEMP during construction of the Power Plant Area to minimise the potential for adverse impacts to soil structure and quality, soil chemistry and to water quality, and off-site receptors and construction workers, will be in place during the construction phase of the Electricity Grid Connection.

5.8.2.1 Excavation of Borrow Pits, Processing of Materials and Reinstatement

No borrow pit locations are envisaged to be required for the Proposed Development and aggregates for temporary and permanent works will be source from local aggregate providers.

5.8.2.2 Construction of Access Routes

Access routes will be carefully selected to avoid damage to land. Local consultation will be carried out with the relevant landowners to ensure that any potential disturbance will be minimised. The routes will be constructed as floating roads only. Founded roads are excavated down to and constructed up from a competent geological stratum, whereas floated roads are built directly on top of the peat and soft soils.

Prior to the commencement of construction, the contractor will assess all access routes and determine the requirement for bog mats. Any such requirements will be incorporated into the relevant method statement.

Temporary access tracks on the consented land (only if required due to ground conditions and/or landowner requirements) will consist of timber or aluminium bog mats (on peatland) or crushed rock on a geotextile (on mineral soils) to spread the weight of machinery over a greater area to prevent damage to the ground.

If necessary, low ground pressure machinery may also be utilised to spread the vehicle's weight across a wider area thereby reducing the pressure exerted on the ground.

No invasive works, such as removal of peat or topsoil, will be undertaken when placing the matting.

Upon completion of the works, all mats will be removed immediately.

Access routes for construction traffic will be carefully selected to avoid any damage to land. Local consultation will be carried out with the relevant landowners to ensure that any potential disturbance will be minimised. Prior to the commencement of construction, the contractor will assess all access routes and determine the requirement for bog mats. Any such requirements will be incorporated into the relevant method statement.

5.8.2.3 Management of Excavated Materials

The following measures will be supplemented by further specific environmental protection measures that will be included in method statements prepared for specific tasks during the works and will form part of the contractors CEMP that will be provided prior to construction.

- All materials shall be stored either at the construction compound, refer to **Section 3.4.5**, or within the substation sites and transported to the works zone immediately prior to construction.
- Weather conditions will be taken into consideration when planning construction activities to minimise risk of run off from site.
- Provision of 50m exclusion zones and barriers (silt fences) between any excavated material and any surface water features to prevent sediment washing into the receiving water environment.
- If dewatering is required as part of the proposed works e.g., in wet areas, water will be treated prior to discharge.
- The Contractor shall ensure that silt fences are regularly inspected and maintained during the construction phase.
- If very wet ground must be accessed during the construction process, bog mats / aluminium panel tracks will be used to enable access to these areas by machinery. However, works will be scheduled to minimise access requirements during winter months.
- The Contractor shall ensure that all personnel working on site are trained in pollution incident control response. A regular review of weather forecasts of heavy rainfall is required, and the Contractor is required to prepare a contingency plan for before and after such events.
- The contractor will carry out visual examinations of local watercourses from the proposed works during the construction phase to ensure that sediment is not above baseline conditions. In the unlikely event of water quality concerns, the Environmental Manager and ECoW will be consulted.
- Excavations will be left open for minimal periods to avoid acting as a conduit for surface water flows.

- Only emergency breakdown maintenance will be carried out on site. Emergency procedures and spillage kits will be available and construction staff will be familiar with emergency procedures.
- Appropriate containment facilities will be provided to ensure that any spills from vehicles are contained and removed off site. Adequate stocks of absorbent materials, such as sand or commercially available spill kits shall be available.
- Concrete or potential concrete contaminated water run-off will not be allowed to enter any watercourses. Any pouring of concrete (delivered to site ready mixed) will only be carried out in dry weather. Washout of concrete trucks shall not be permitted on site.
- Entry by plant equipment, machinery, vehicles and construction personnel into watercourses or wet drainage ditches shall not be permitted. All routes used for construction traffic shall be protected against migration of soil or wastewater into watercourses or areas of standing water or fenland.
- Cabins, containers, workshops, plant, materials storage and storage tanks shall not be located near any surface water channels and will be located beyond the 50m hydrological buffer at all times.

5.8.2.4 Excavation for Tower Foundations

- To allow for safe construction, where ground conditions are good, the excavation will be stepped back, which requires additional area to be excavated.
- In the cut away bog, where ground conditions are likely be poor, sheet piles will be used to support the mast foundation excavations.
- The excavated material will be temporarily stored close to the excavation and excess material will be used as berms along the site access roads.
- Concrete trucks will pour concrete directly into each excavation in distinct stages and the mast footings will be finished 300mm above the finished ground level.
- All surplus excavated material will be removed from the mast locations and stored in berms for reuse across the construction site.
- No soil removal to form the hardstand crane pads is envisaged. The aggregate and geogrid will be removed once the mast is in place.

5.8.2.5 Hardstanding, Substations and Line-Cable Interface Compound Foundations

At the Substation and Line-Cable Interface Compound sites, a drainage system will be excavated and installed around the compound area. Topsoil and subsoil will be removed from the footprint of the compound and will be temporarily stored in adjacent berms for later use during reinstatement works.

A layer of geotextile material will be laid over the footprint of the compound and an aggregate base layer of Clause 804 material will be laid, followed by a 6F2 capping layer which will provide the finished surface. Both layers will be compacted using a vibrating roller.

5.8.2.6 Cable Route

Prior to excavations for installation of Joints Bays, Communication Chambers and Earth Sheath Link chambers, the area around the chamber to be used by heavy vehicles will be surfaced with a geotextile cover if required and stone aggregate to minimise ground damage.

Any roadside drains within the temporary works area will be culverted and check dams made from stone or sandbags covered with terram will be inserted upstream and downstream of these culverts to intercept any solids generated during the insertion or which wash out during the works.

If the ground slopes from the working area toward a watercourse or if there is evidence of solids washing off the works area toward nearby watercourses or drains, a silt fence with straw bales, will be interposed between the works area and the watercourse. All excavated material will be stored near the excavations and be reused for reinstatement works. Any soil required for reinstatement that will be temporarily stockpiled on site will be placed at least 15m back from the nearest watercourse on level ground and will be ringed at the base by silt fencing and be regularly monitored by a designated competent person

for signs of solids escape. In which case an additional line of silt fencing with straw bales will be added in line with the relevant ECM.

If a joint bay needs to be dewatered, the abstracted water will be pumped to a percolation area if the soil is not saturated, otherwise a settlement tank will be used to remove any solids from the water abstracted for the dewatering process to comply with the ECM.

The risk of concrete reaching surface waters is considered very low given that all concrete will be pre-mixed offsite and will be poured into the pit excavated for the joint bay so that any spills will be contained. The basic requirement therefore is that all pouring operations be constantly supervised to prevent accidental spillages occurring outside the chamber pit.

Temporary storage of cement bound sand (if required) will be on hardstand areas only where there is no direct drainage to surface waters and where the area has been bunded e.g. using sand-bags and geotextile sheeting or silt fencing to contain any solids in run-off.

5.9 Traffic Management

5.9.1 General Traffic Mitigation Measures

General traffic mitigation measures are applicable to both the Power Plant Area and the Electricity Grid Connection. The Contractor will adhere to the relevant guidance, including the following:

- Department of Transport (2019). *Traffic Management Guidelines.*
- Department of Transport (2019). *Traffic Signs Manual Chapter 8: Temporary Traffic Measures and Sign Roadworks.*
- Environmental Protection Agency (EPA) (2022). *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports*
- Transport Infrastructure Ireland (TII) (2014). *Traffic* and *Transport Assessment Guidelines*
- Transport Infrastructure Ireland (TII) (2016). *Unit 16.1 (Expansion Factors for Short Period Traffic Counts) of the Project Appraisal Guidelines.*
- Transport Infrastructure Ireland (TII) (2019). *TII PE-PAG-02017 Project Appraisal Guidelines for National Roads Unit 5.3: Travel Demand Projections.*

The Contractor shall establish the control measures necessary to manage all traffic activities and risks associated with construction works effectively and efficiently. It will be the Contractor's responsibility to enact these measures in advance of any works and monitor them on a regular basis to ensure that they are being adhered to and targets are being met. Every effort shall be made to ensure that the safety of the local road users is maintained. The Contractor will implement and adhere to any planning conditions upon grant of permission for the Proposed Development.

In terms of general traffic management measures, typical controls will include barriers defining footways and safety zones to prevent construction vehicles encroaching on pedestrian areas, segregated pedestrian routes (where appropriate), temporary warning signs erected to highlight particular hazards, and include Site accesses and temporary traffic management measures.

The CTMP will be updated by the contractor prior to the commencement of work on site and will be finalised in consultation with Offaly County Council and Westmeath County Council.

No works shall commence until such time that the full CTMP has been approved by Offaly County Council and Westmeath County Council.

The Contractor will be required to accommodate and make provision for access and egress to local residential premises, paying particular attention to the provision of pedestrian/disabled/cyclist safe access and egress for the entire duration of the construction phase. The contractor will identify alternative routes for pedestrians and vehicles in the event that public roads or right of ways are closed during works, though this is not expected to be required. The CTMP will also include measures to limit the amount of queuing required by construction vehicles outside the site boundaries.

All licensing and administration matters should be directed through the Roads Department in Offaly County Council and Westmeath County Council. Construction debris, particularly site clearance, spoil removal and dirty water run off can have a significant impact on footpaths and roads adjoining a construction site, if not adequately dealt with and these matters will be fully addressed in the contractors full CTMP.

Site Management

The site activities will be undertaken with due consideration of the surrounding environment and the close proximity of sensitive receptors such as residents and pedestrians. Dust management during the construction phase will be the most important aspect in terms of minimising the impacts of the project on the surrounding air quality. The following measures will be implemented to ensure impacts are minimised:

- Complaint registers will be kept detailing all telephone calls and letters of complaint received in connection with construction activities, together with details of any remedial actions carried out;
- Equipment and vehicles used on site will be in good condition such that emissions from diesel engines etc. are not excessive;
- Pre-start checks will be carried out on equipment to ensure they are operating efficiently and that emission controls installed as part of the equipment are functional;
- Monitoring and control of demolition/construction traffic during construction works; and
- The use of prefabricated elements to minimise on site fabrication and assembly thereby reducing the numbers of site operatives required.

Dust deposition levels will be monitored on a regular basis in order to assess the impact that site activities may have on the local ambient air quality. The following procedures will be implemented:

- The dust deposition rate will be measured by positioning Bergerhoff Dust Deposition Gauges at strategic locations near the boundaries of the site for a period of 30 (+/- 2) days. Monitoring should be conducted as required during periods when the highest levels of dust are expected to be generated i.e., during site preparation works and soil stripping activities.
- The exact locations will be determined after consideration of the requirements of VDI standard 2119 with respect to the location of the samplers relative to obstructions, height above ground and sample collection and analysis procedures.
- After each 30 (+/- 2 days) exposure period, the gauges will be removed from the sampling location, sealed and the dust deposits in each gauge will be determined gravimetrically by an accredited laboratory and expressed as a dust deposition rate in mg/m2/day in accordance with the relevant standards.
- Technical monitoring reports detailing all measurement results, methodologies and assessment of results shall be subsequently prepared and maintained by the Site Manager.

Dust Control Measures

The aim is to ensure good site management by avoiding dust becoming airborne at source. This will be done through good design, planning and effective control strategies. The timing of construction activities including stockpiling will take note of the location of sensitive receptors and prevailing wind directions in order to minimise the potential for significant dust nuisance. In addition, good site management will include the ability to respond to adverse weather conditions by either restricting operations on-site or using effective control measures quickly before the potential for nuisance occurs.

- During working hours, technical staff will be available to monitor dust levels as appropriate; and
- At all times, the dust management procedures put in place will be strictly monitored and assessed.

The dust minimisation measures will be reviewed at regular intervals during the construction phase to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust generation. In the event of dust nuisance occurring outside the site boundary, site activities will be

reviewed, and procedures implemented to rectify the problem. Specific dust control measures to be employed are presented below.

Also see Section 5.2 for additional dust control mitigation measures.

Site Routes

Site access routes (particularly unpaved areas) can be a significant source of fugitive dust from construction sites if control measures are not in place. The most effective means of suppressing dust emissions from unpaved roads is to apply speed restrictions. Studies show that these measures can have a control efficiency ranging from 25% to 80%.

- A speed restriction of 20 km/hr will be applied as an effective control measure for dust for on-site vehicles or delivery vehicles within the site construction boundaries;
- Bowsers will be available during periods of dry weather throughout the construction period. Research has shown that the effect of surface watering is to reduce dust emissions by 50%. The bowser will operate during dry periods to ensure that unpaved areas are kept moist. The required application frequency will vary according to soil type, weather conditions and vehicular use; and
- Any hard surface roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced areas shall be restricted to essential site traffic only.

Excavation

Excavation works during periods of high winds and dry weather conditions can be a significant source of dust.

- During dry and windy periods, and when there is a likelihood of dust nuisance, watering shall be conducted to ensure moisture content of materials being moved is high enough to increase the stability of the soil and thus suppress dust; and
- During periods of very high winds (gales), activities likely to generate significant dust emissions should be postponed until the gale has subsided.

The movement of truck containing materials with a potential for dust generation to an off-site location will be enclosed or covered.

Also see Section 5.8 for additional mitigation measures.

Stockpiling

The location and moisture content of stockpiles are important factors which determine their potential for dust emissions. The following measures will be put in place:

- Overburden material will be protected from exposure to wind by storing the material in sheltered parts of the site, where possible;
- Regular watering will take place during dry/windy periods to ensure the moisture content is high enough to increase the stability of the soil and suppress dust;
- Should short-term stockpiles be required these will be located at least 50 m away from any watercourse. Slopes of these stockpiles will be made stable and regularly checked by the contractor or appointed staff member. Stockpiles shall be stored on impermeable surfaces and covered using tarpaulin.

Also see Section 5.8 for additional mitigation measures.

Site Traffic on Public Roads

Spillage and blow-off of debris, aggregates and fine material onto public roads will be reduced to a minimum by employing the following measures:

- Vehicles delivering material with potential for dust emissions to an off-site location shall be enclosed or covered at all times to restrict the escape of dust;

- Any hard surface site roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced roads shall be restricted to essential site traffic only;
- A power washing facility or wheel cleaning facility will be installed near to the site compound for use by vehicles exiting the site when appropriate;
- Road sweepers will be employed to clean the site access route as required.

Traffic Management Measures

Proposed traffic management measures to be adopted into the Contractor's detailed CTMP are listed below. Please note that this is not an exhaustive list, and it will be updated by the appointed contractor:

- Clear signage of any temporary diversions to existing motorised and non-motorised routes (e.g., pedestrians and cyclists).
- Safe and secure pedestrian facilities are to be provided where construction works obscure any existing pedestrian footways. Alternative pedestrian facilities will be provided in these instances, supported by physical barriers to segregate traffic and pedestrian movements, and to be identified by appropriate signage. Pedestrian facilities will cater for vulnerable users including mobility impaired persons.
- Warning signs / Advanced warning signs will be installed at appropriate locations in advance of the construction access locations. For example, warnings advise other road users of times of slow-moving vehicles during abnormal load deliveries.
- Consideration will be given to reduce the volume of construction traffic accessing the site through reduce – reuse and recycle methods. Delivery control will also be adopted to reduce potential heavy vehicle convoys.
- Temporary signage designating permissible HGV routes
- Road closures and restrictions should be planned in agreement with the appropriate stakeholders.
- Plan deliveries to the Site. Material deliveries and collections from site will be planned, scheduled and staggered to avoid unnecessary build-up of demolition/construction works related traffic. Haulage routes, delivery timings, and access arrangements will continuously be reviewed throughout the construction phase of the Proposed Development to ensure smooth operation.
- Outline measures to limit the amount of queuing required by construction vehicles outside the Site boundaries.
- HGV trips are anticipated to arrive and depart the site at a uniform rate throughout the day to avoid pressure on the morning and evening peak hour periods
- Ensure that the roads and footways in the vicinity of the construction site are kept clear of debris, soil, spoil removal, dirty water, and other materials.
- Construction and delivery vehicles will be instructed to use only the approved and agreed means of access, and movement of construction vehicles will be restricted to these designated routes.
- Appropriate vehicles will be used to minimise environmental impacts from transporting construction material, for example, the use of dust covers on trucks carrying dust producing material.
- Speed limits of construction vehicles to be managed by appropriate signage, to promote low vehicular speeds within the Site.
- Parking of site vehicles will be managed and will not be permitted on public road. Refer to **Sections 3.4.7.1** for details on the parking arrangements.
- A road sweeper will be employed to clean the public roads adjacent to the Site of any residual debris that may be deposited on the public roads leading away from the construction works.
- On site wheel-washing will be undertaken for construction trucks and vehicles to remove any debris prior to leaving the Site and to remove any potential debris on the local roads.

- All vehicles will be suitably serviced and maintained to avoid any leaks or spillage of oil, petrol or diesel. Spill kits will be available on site. Any used spill kits will be disposed of using a hazardous waste disposal contractor and in accordance with all relevant EU and Irish waste management legislation. Refer to **Section 5.7**.
- All scheduled maintenance carried out off-site will not be carried out on the public highway.
- Using Garda escorts for abnormal loads where required.

5.9.2 Power Plant Area

The R400 road, east of the M6 Motorway forms part of the haulage route for HGVs travelling to and from the Site. As this is a regional road, it is built to allow for HGV travel, however, not in large volumes.

A CTMP has been submitted as part of the planning application, refer to **Appendix 1A**, but will be finalised in consultation with Offaly and Westmeath County Councils, before construction commences.

The CTMP will ensure work activities in, near, or having impact upon the public highway, are undertaken safely and with minimal impact on traffic movement and existing infrastructure throughout the works programme. The CTMP covers the following points:

- Identify haulage routes.
- Set out preferred routes for travel to and from the site for staff.
- Identify designated parking locations.
- Set out start and finish times to ensure traffic restriction outside of core hours.
- Set out the provision of additional measures such as wheel wash facilities (if required).
- Provision of construction signage and convex mirrors at the site entrance / junctions (subject to agreement with the local authority through the CEMP). This will increase driver awareness at the junction during the temporary construction period (39 months).
- An Abnormal Loads report has also been completed to identify mitigation measures required for movement of abnormal loads. This is provided in Volume II, Appendix 14B of the EIAR submitted with the planning application.

5.9.3 Electricity Grid Connection

The information set out in Section 5.9.2 Power Plant Area is also applicable to the Electricity Grid Connection.

5.10 Material Assets

5.10.1 General Mitigation Measures

The Contractor will adhere to the relevant guidance, including the following:

- Environmental Protection Agency (EPA) (2022). Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.
- Institute of Environmental Management and Assessment (IEMA) (2020). *IEMA Guide to Materials and Waste in Environmental Impact Assessmen*t.

5.10.2 Power Plant Area

Material Assets - Land Use and Utilities

Demolition and construction phase mitigation measures include avoidance, reduction, and remedy measures to reduce or eliminate any significant adverse impacts identified.

As good practice, an up-to-date utilities plan will be produced and submitted to the local authority prior to construction showing all utilities present on the existing Power Plant Area Site before construction begins.

The following mitigation measures will be implemented in order to reduce the likelihood of any impacts on utilities.

- As with any excavations there is a potential to disrupt local underground services. A confirmatory survey of all existing services will be carried out prior to construction and identify the precise locations of any services. The developer will liaise with the service provider where such services are identified. These will be mapped and communicated to all contractors working on the Power Plant Area.
- All utilities work shall be carried out in accordance with the relevant requirements of the respective service providers / authorities (i.e., ESB, GNI, Eir, Virgin Media and any others of relevance). These works will be carried out in a manner that is safe, and which avoids or minimises interruptions of service which might affect local residents and businesses and adjacent development.
- Works during the construction phase, including service diversions and realignment will be carried out in accordance with relevant guidance documents, including GNI's publication 'Safety advice for working in the vicinity of natural gas pipelines'; the ESB's 'Code of Practice for Avoiding Danger from Overhead Electricity Lines', and the Health and Safety Authorities (HSA) 'Code of Practice for Avoiding Danger from Underground Services'.
- All new infrastructure will be installed in accordance with the applicable standards, guidelines and codes of practice.
- The timing of local domestic connections will be addressed between the developer / Contractor and the local community at the detailed design stage.

Wastewater Services (Foul, Process and Surface Water)

Foul water during the construction phase will be collected and periodically removed from the Site by road tanker to a licensed water treatment plant.

All utilities work shall be carried out in accordance with the relevant requirements of the respective service providers / authorities (i.e., Irish Water). These works will be carried out in a manner that is safe, and which avoids or minimises interruptions of service which might affect local residents and businesses, and adjacent development.

The construction phase surface water mitigation measures are presented in **Section 5.7**.

5.10.3 Electricity Grid Connection

The general mitigation measures for the Electricity Grid Connection are the same as those described for the Power Plant Area.

Wastewater Services (Foul, Process and Surface Water)

The final drainage design prepared for the Electricity Grid Connection prior to commencement of construction will have to provide for reactive management of drainage measures.

5.11 Waste Management

5.11.1 General Mitigation Measures

The Contractor will adhere to the relevant guidance, including but not limited to the following:

- Construction Industry Research and Information Association (CIRIA) (1997). *Waste minimisation in construction - site guide (SP133).*
- Construction Industry Research and Information Association (CIRIA) (1999). *Waste minimisation and recycling in construction - technical review.*
- Department of the Environment, Climate and Communications (DECC) (2020). *A Waste Action Plan for a Circular Economy – Ireland's National Waste Policy 2020-2025.*
- Eastern-Midlands Region (EMR) (2015). *Eastern-Midlands Region Waste Management Plan 2015-2021.*
- Enterprise Ireland (unknown). *Best Practice Guide (BPGCS005) Oil storage guidelines.*
- Environmental Protection Agency (EPA) (2019). *Guidance on Soil and Stone By-products (in the context of Article 27 of the European Communities (Waste Directive) Regulations 2011).*
- Environmental Protection Agency (EPA) (2020). *(Draft) By-product - Guidance Note* (in the context of Article 27 of the European Communities (Waste Directive)).
- Environmental Protection Agency (EPA) (2021). *Best Practice Guidelines for the Preparation of Resource and Waste Management Plans for Construction and Demolition Projects.*
- Environmental Protection Agency (EPA) (2022). *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.*
- Environmental Protection Agency (EPA) (2022). *Hazardous Waste Statistics for Ireland.*
- Environmental Protection Agency (EPA) (2022). *National Waste Statistics Summary Report for 2020*.
- Government of Ireland (GOI) (2020). *Waste Action Plan for a Circular Economy, Ireland's National Waste Policy 2020-2025.*
- Institute of Environmental Management and Assessment (IEMA) (2020). *IEMA Guide to Materials and Waste in Environmental Impact Assessment*.

Given the nature of the Proposed Development and the volume of wastes that will be generated, wastes will be classified, segregated, stockpiled, recycled and disposed of from the Site to appropriately licensed receiving facilities. All waste generated from the proposed development will be managed in accordance with the provisions of the Waste Management Act 1996 as amended and associated Regulations.

Having regard to the provisions of *"A Waste Action Plan for a Circular Economy – Ireland's National Waste Policy 2020–2025",* and the *"Best Practice Guidelines for the Preparation of Resource and Waste Management Plans for Construction and Demolition Waste Projects"*, a RWMP will be prepared by the Contractor prior to work commencing to help manage site waste more effectively, reducing potential harm to the environment and human health, refer to **Section 5.11.5**.

Typical waste streams (including material-related streams such as metals, paper and cardboard, plastics, wood, rubber, textiles, bio-waste and product-related streams such as packaging, electronic waste, batteries, accumulators and construction waste) will be managed, collected, segregated and stored in separate areas at the construction compounds and removed off site by a licensed waste management contractor at regular intervals for the duration of the construction works. Skips and bins of appropriate sizes will be stored in construction compounds and used to maximise source segregation of waste materials. This will include food and packaging waste from welfare facilities. Appropriate control of food waste in the compound will minimise the potential for pests and rodents to visit the area.

Any contaminated materials used for spills and equipment maintenance works will be separately stored in a suitable container for collection by an authorised hazardous waste contractor.

The Contractor will encourage all of the construction teams to minimise waste generation and to maximise the segregation of waste at source. Material wastage will be avoided by delivering only the required quantities of material to site and utilising off-site manufacturing of steel reinforcement cages and concrete materials as much as possible. The Contractor will establish 'just-in-time' deliveries to avoid excess material storage at the site which can lead to waste generation. Delivery drivers will be encouraged to remove any excess packaging from materials delivered to site and remove unused timber pallets where possible.

The SHEQ Officer, or other appropriate person, will be appointed as the Waste Manager for the duration of the project in accordance with the general guidance set out in the EPA 2021 Guidelines - *Best Practice Guidelines for the Preparation of Resource Management Plans for Construction and Demolition Waste Projects.*

During construction, the practicalities of waste prevention, salvaging re-useable materials, and the need to synchronise the recycling of waste materials through the timing of their use in the new construction works will be emphasised by the Waste Manager.

The Waste Manager will be responsible for auditing waste handling and storage throughout the project and for advising construction personnel on best practices.

All waste collections and records of waste movement off-site will be collated by the Waste Manager and retained in the site office.

5.11.2 Demolition Waste Management

The demolition of existing buildings and the removal of all other structures will be necessary. The demolition within the construction phase will include the removal of the existing Derrygreenagh Works within the Power Plant Area which consists of offices, workshops and associated buildings, as well as the removal of all other structures deemed necessary. The buildings and structures to be demolished are presented on the drawings submitted with the planning application.

The single storey office building is a load bearing masonry structure with a concrete tiled roof, and the demolition process will follow that of a domestic house. Plant and machinery will breakdown the roof and walls and waste materials will be removed offsite to a waste facility. Following this, the concrete foundations will be dug up, cut out and disposed of accordingly. However, depending on the depth, some buried foundations may need to remain. Any excavations will be backfilled with imported gravel and the site will be levelled.

The workshops and boiler house are cladded steel frame structures. There is the potential for asbestos cladding in some areas of the workshop. The total potential asbestos cladding to be removed is c. 2,400m^2. This will be removed first by a competent asbestos contractor, and the remaining cladding will be removed and disposed of accordingly. The steel frames will be dismantled and recycled, and the foundations will be dug out and removed. Any excavations will be backfilled with imported gravel and the site will be levelled.

The estimated demolition waste is presented in **Table 5.3**.

Table 5-3: Estimated Demolition Waste

Waste Type	Low Code	Estimated Quantities
Strip Concrete	17 01 01	375 m^3
Floor slab concrete	17 01 01	1,650 m^3
Masonry	17 03 02	800 m^3
Asbestos containing cladding	17 06 01	2,400 m^2
Cladding area	17 06 04	6,475 m^2

There will be concrete material generated from the demolition of structures onsite, and consideration at design stage has been given to recovering, crushing and reusing this concrete material as inert backfill in a number of underground voids.

If any of the material is to be reused on-site as a product (and not as a waste), this will be done in accordance with the relevant regulatory approval as required.

It is anticipated that a large proportion of the materials resulting from the demolition will be recycled and a record will be kept demonstrating that the maximum level of recycling and reuse has been achieved. Plant and equipment that can be used elsewhere on other Bord na Móna sites will be transferred to the appropriate sites.

The precise composition and volume of this waste is dependent on several factors and will be further informed by the contractor, based on their experience of similar demolition works. It is assumed that all demolition waste will require off-site management.

In addition, site clearance will be required including soil, vegetation and hardstanding. Where possible, uncontaminated material will be reused on-site and if deemed unsuitable for reuse on-site, an outlet for offsite reuse will be sought.

Excavation earthwork impacts will relate to removal of made ground and peat, including any superficial peats. Infill earthwork will mainly relate to the import and compaction of acceptable fill material to achieve the required engineering design and grades.

Where possible excavated materials will be reused on-site. If the material is considered unsuitable for reuse on-site an outlet for offsite reuse will be sought. If reuse is not possible the material will be removed to an authorised facility by authorised waste contractors for composting or disposal as appropriate.

A permanent PDA will be designed and constructed provided on cut-over peatland to the north-east of the Power Plant Area to store excess peat and overburden soil material which cannot be used in localised landscaping or as backfill. It is estimated that excess peat and soil from across the entire Proposed Development will be required to be stored within the permanent PDA (See Section 3.6 of this CEMP).

Peat will be deposited to a maximum height of 1m above ground level across an area of a cut-over peatland. Once excavations are completed and following the commissioning of the project, the PDA will be allowed to naturally revegetate (See Section 3.6 of this CEMP).

The footprint of the proposed facility will require clearing and levelling after the initial works. There is a difference in level of approximately 8m across the Site. The topsoil layer, including any superficial peats, will be cleared across the Site. Where possible this material will be reused on-site. If the material is considered unsuitable for reuse on-site an outlet for offsite reuse will be sought. If reuse is not possible the material will be removed to a licensed facility by licensed waste contractors for composting or disposal as appropriate.

Bulk soil, subsoils or other material will be stored in designated areas only. Only uncontaminated material will be used on-site for the purpose of fill and site levelling. General housekeeping and packaging will also generate waste materials, as well as typical municipal wastes generated by construction employees, including food waste.

All demolition activities will be carried out in accordance with the waste hierarchy and the circular economy. Materials and waste produced during decommissioning and demolition will be stored in segregated areas within the Power Plant Area to maximise reuse and recycling. All materials that cannot be reused or recycled will be removed from the site and transferred to suitably permitted waste recovery / disposal facilities.

Segregation of waste will be carried on-site to maximise the potential for waste recycling and minimise any potential for impacts on waste services. A licensed waste collector will be used to remove any waste that does occur on-site to a licenced / permitted wate facility.

The Contractor will regularly review and update where required the assumptions on waste arisings and management and record and implement procedures for assessing, managing and recording waste arising on site. Opportunities for on-site and offsite reuse, recycling and recovery of excavated material

and waste will be identified where feasible. Where required, an Article 27 by-product notification will be prepared and submitted for the necessary approvals prior to the commencement of construction works.

5.11.3 Power Plant Area

Waste will be generated during all stages of the construction works. **Table 5.4** summarises the types of waste materials that will be used and the waste that is likely to arise during the construction phase of the Power Plant Area.

Table 5-4: Estimated Types of Material Use and Waste Arising from the Construction of the Power Plant Area

Activity	Material Use	Waste Arising
Construction	Main construction materials including: • Aggregates (including well graded materials, granular fill, backfill, pipe bedding and drainage media). • Asphalt and bituminous materials. • In-situ cast concrete. • Steel reinforcing bar (for reinforced concrete). • Precast concrete products (components, kerbs, drainage pipes, chambers and channels). • Lighting • Stone • Paving • Fencing	• Excess, offcuts and broken / damaged construction materials. • Packaging from materials delivered to site. • Construction worker wastes from offices and rest areas / canteens. • Waste oils from construction plant.

During the construction phase, waste will be produced from surplus materials such as broken or off-cuts of timber, plasterboard, concrete, tiles, bricks, etc. Waste from packaging (cardboard, plastic, timber) and oversupply of materials may also be generated. The Contractor will be contractually required to ensure that oversupply of materials is kept to a minimum and opportunities for reuse of suitable materials is maximised.

Waste will also be generated from construction phase workers *e.g.* organic / food waste, dry mixed recyclables (waste paper, newspaper, plastic bottles, packaging, aluminium cans, tins and Tetra Pak cartons), mixed non-recyclables and, potentially, sewage sludge from temporary welfare facilities provided on-site. Waste printer / toner cartridges, waste electrical and electronic equipment (WEEE) and waste batteries may also be generated in small volumes from site offices.

The precise quantity, composition, and management route of construction waste is dependent on several factors and will be further informed by the contractor, based on their experience of similar developments. It is assumed that all construction waste will require off-site management.

Hazardous waste arisings are expected to comprise small quantities of oils, chemicals and similar materials typically used as part of construction activities. Procedures for the storage and management of these wastes will be set out in the Contractor's RWMP. Copies of all Waste records and Hazardous Waste Transfer Forms for wastes removed from site will be retained by the contractor for the timeframe required under legislation.

Ready-mixed concrete will be used during the construction phase, with all concrete being delivered from local batching plants in sealed concrete delivery trucks. The use of ready-mixed concrete deliveries will eliminate any potential environmental risks of on-site batching.

Concrete pours will be required for the construction of the facility. A concrete chute wash-out facility will be provided onsite and will be clearly signposted, self-contained, and leak-proof. Where the facility is required to be emptied, the contaminated waters will be taken off-site for treatment and disposal at a suitably licenced facility.

All waste removal from Site will be undertaken by fully licensed waste carriers and taken to licensed waste facilities.

5.11.4 Electricity Grid Connection

Waste will be generated during all stages of the construction works. Table 5.5 summarises the types of waste materials that will be used and the waste that is likely to arise during the construction phase of the Electricity Grid Connection.

Table 5-5: Estimated Types of Material Use and Waste Arising from the Construction of the Electricity Grid Connection

Activity	Material Use	Waste Arising
Construction	Main construction materials including: • Stone • Asphalt • Geotextile • Lighting fixtures and fittings • Paving. • Fencing. • Steelwork • Concrete • Timber • Cladding • Doors • Piping inc. fixtures and fittings • Cabling inc. fixtures and fittings • Switchgear • Instrumentation and control system	• Excess, offcuts and broken / damaged construction materials. • Packaging from materials delivered to site. • Construction worker wastes from rest areas. • Waste oils from construction plant. • Surplus excavated materials. • Surplus topsoil and subsoil. • Unsuitable and made ground and excavated materials, including peat and unsuitable soil excavated beneath the Power Plant Area. • Vegetation from site clearance.

During the construction phase, waste will be produced from surplus materials such as broken or off-cuts of timber, plasterboard, concrete, tiles, bricks, etc. Waste from packaging (cardboard, plastic, timber) and oversupply of materials may also be generated. The Contractor will be contractually required to ensure that oversupply of materials is kept to a minimum and opportunities for reuse of suitable materials is maximised.

Waste will also be generated from construction phase workers, *e.g.,* organic / food waste, dry mixed recyclables (waste paper, newspaper, plastic bottles, packaging, aluminium cans, tins and Tetra Pak cartons), mixed non-recyclables and, potentially, sewage sludge from temporary welfare facilities provided on-site. Waste printer / toner cartridges, waste electrical and electronic equipment (WEEE) and waste batteries may also be generated in small volumes from site offices.

The precise quantity, composition, and management route of construction waste is dependent on several factors and will be further informed by the contractor, based on their experience of similar developments. It is assumed that all construction waste will require off-site management.

Hazardous waste arisings are expected to comprise small quantities of oils, chemicals and similar materials typically used as part of construction activities. Procedures for the storage and management of these wastes will be set out in the contractor's RWMP. Copies of all Waste records and Hazardous Waste Transfer Forms for wastes removed from site will be retained by the contractor for the required timeframe under legislation.

The waste management facilities to be utilised during demolition and construction are not yet known and suitability will be determined by the Contractor.

5.11.5 Resource Waste Management Plan (RWMP)

A Resource and Waste Management Plan (RWMP) (to be incorporated into the Contractor's CEMP) will be prepared and all relevant contractors will be required to seek to minimise waste arising at source and, where such waste generation is unavoidable, to maximise its recycling and reuse potential. Recycling of materials will take place offsite at appropriately licensed facilities where noise and dust are more easily managed and less likely to impact on surrounding properties.

The Contractor / Waste Manager will be required to identify measures for the avoidance and reduction of waste materials during the construction works in accordance with the waste hierarchy. Segregated

waste skips will be provided in the construction compound to enforce source segregation. Skips will be maintained in good condition, labelled as to the type of waste to be placed in each and the area around skips will be kept clean. Smaller wheelie bins will be provided for storage of waste from the welfare facilities.

The Contractor's RWMP will set out measures relating to waste management that will be implemented during construction of the Power Plant Area and will include design and construction measures that apply the waste hierarchy principles and minimise effects on waste. These include:

- Planning for the temporary on-site storage of soils, excavated materials and other materials to facilitate reuse.
- Reusing excavated materials within the construction of the Proposed Development, where possible, to minimise the need to import and export material.
- Considering the importation to site of recycled aggregate material, as an alternative to primary aggregate, and establishing procedures to ensure it is uncontaminated.
- Establishing Key Performance Indicators (KPIs) for monitoring and reporting data on waste arising and diversion from landfill.

The RWMP will set out measures relating to waste management that would be implemented during construction of the Proposed Development. The Contractor will be required to develop the detailed RWMP in accordance with the EPA 2021 Guidelines - *Best Practice Guidelines for the Preparation of Resource Management Plans for Construction and Demolition Waste Projects* and DECC 2021 Plan - *A Waste Action Plan for a Circular Economy – Ireland's National Waste Policy 2020-2025.*

The Waste Manager will regularly review and update where required the assumptions on waste arisings and management and record and implement procedures for assessing, managing and recording waste arising on site.

Opportunities for on-site and offsite reuse, recycling and recovery of excavated material and waste will be identified where feasible. Where required, an Article 27 by-product notification will be prepared and submitted for the necessary approvals prior to the commencement of construction works.

5.12 Climate

A number of mitigation measures have been considered in the design of the Proposed Development which mitigate the effects of its GHG emissions and climate change risks.

With regards to climate change risks, mitigation measures refer to measures which reduce the impact of climate change risks on the Proposed Development.

With regards to greenhouse gas (GHG) emissions, mitigation measures refer to measures to reduce the amount of GHG emissions associated with the Proposed Development.

5.12.1 Power Plant Area

5.12.1.1 Climate Change Risk Assessment

The following climate change risk mitigation measures are embedded in the design of the Power Plant Area and are applicable for mitigating climate change risks during the construction phase.

- Flood protection designed to withstand 1:1000-year flood.
- For periods of drought, site water abstraction is capable of exceeding the daily site water requirement.
- Infrastructure is to be maintained and monitored for degradation due to extreme temperatures.
- Emergency procedures are to be implemented against extreme weather events.

5.12.1.2 Greenhouse Gas Assessment

The following GHG mitigation measures are embedded in the design of the Power Plant Area and are applicable to the construction phase:

- Implement policies to source materials locally where possible.
- Use of secondary aggregates and lower carbon materials.
- Implement a green procurement policy that considers life cycle analysis of materials.

5.12.2 Electricity Grid Connection

5.12.2.1 Climate Change Risk Assessment

The following climate change risk mitigation measures are embedded in the design of the Electricity Grid Connection and are applicable for mitigating climate change risks during the construction phase.

- Flood protection designed to withstand 1:1000-year flood.
- Infrastructure is to be maintained and monitored for degradation due to extreme temperatures.
- Emergency procedures are to be implemented against extreme weather events.

5.12.2.2 Greenhouse Gas Assessment

The following GHG mitigation measures are embedded in the design of the Electricity Grid Connection and are applicable to the construction phase:

- Implement policies to source materials locally where possible.
- Use of secondary aggregates and lower carbon materials.
- Implement a green procurement policy that considers life cycle analysis of materials.

Appendices

Appendix 1A Construction Traffic Management Plan (CTMP)

Proposed Derrygreenagh Power Project

Construction Traffic Management Plan (CTMP)

Bord na Mona

January 2024

Delivering a better world

Quality information

Prepared by	Checked by	Verified by	Approved by
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Revision History

Revision	Revision date	Details	Authorized	Name	Position
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Figures

1. Introduction

1.1 Background

AECOM have been commissioned by Bord Na Móna, to provide a Construction Traffic Management Plan (CTMP) to accompany the proposals for their development at Derrygreenagh Power Station, Co. Offaly ('the Site').

This document is a live working document and will therefore be updated with more detail by the contractor once appointed. Reference will therefore be made throughout to a 'full construction traffic management plan', this refers to the CTMP once the contractor has provided input.

1.2 Site Location

The site on which the Proposed Development will be located is in the townlands of Derrygreenagh, Derryarkin, Derryiron, Ballybeg, Barrysbrook, Togher and Coole. The Power Plant Area (PPA) site (with the exception of the process & surface water discharge pipelines) will be predominantly located on the site of existing Derrygreenagh Works east of the R400 road. The location of the existing Bord Na Mona facility is shown in Figure 1. The proposed site boundary is shown in **Appendix A.**

Figure 1 - Site Location

The Proposed Development and Overall Project will consist of three elements:

- Power Plant Area;
- Electric Grid Connection; and
- Gas Corridor Connection.

The Gas Connection Corridor, which runs from the Dublin-Galway high pressure gas network (BGE/77) to the Power Plant Area, is not included as part of this planning application but is integral to the Overall Project and so is considered throughout the EIAR in so far as reasonably practicable. The Gas Connection Corridor may be subject to change during the detailed design and consenting process to be carried out by Gas Networks Ireland (GNI). The location of site entrances and transport routes for the construction phase of the Gas Connection Corridor cannot be established until the design has been further progressed by GNI.

This CTMP is therefore, by necessity, associated only with the Proposed Development i.e., the Power Plant Area and Electric Grid Connection. It is envisaged that a separate CTMP for the Gas Connection Corridor will be developed and submitted as part of the future consenting process by GNI. Any future CTMP for the Gas Connection Corridor will also consider the Proposed Development (i.e., Power Plant Area and Electricity Grid Connection).

2. Proposed Development Overview

The Proposed Development includes a Power Plant Area which comprises a Combined Cycle Gas Turbine (CCGT) unit and an Open Cycle Gas Turbine (OCGT) unit, and an Electricity Grid Connection which includes 220kv and 400kV substations and associated buildings, grid connection cabling in the form of overhead lines and underground cabling and all associated infrastructure. The Proposed Development is located in County Offaly, predominantly on Bord na Móna land within the Derrygreenagh bog group.

The Proposed Development will support Bord Na Mona's portfolio of renewable energy and associated intermittent renewable generation but will also support the security of supply for the National Grid network by allowing for replacement of older conventional power systems with lower carbon gas-fired technology. The Proposed Development will also have the capability to operate off renewable gas blends as supply chains for hydrogen and biogas develop in accordance with the Hydrogen Strategy for Ireland and subject to future fuel mixes which will be provided by GNI through a high-pressure gas pipeline.

3. Outline Construction Traffic Management Plan

3.1 General

This CTMP deals directly with the impacts of construction of the Proposed Development. This document is considered to be a live working document and will therefore be appropriately updated by the contractor once appointed. Reference to the 'final' CTMP relates to any changes or revisions which may be made to this live document once the contractor has provided more detailed input.

The purpose of this CTMP is to outline measures to manage the expected construction traffic activity during the construction period.

3.2 Construction Programme and Phasing

The preliminary works are scheduled to commence in Q3 2024. The construction process for the entirety of the Proposed Development is expected to take 39 months.

The contractor will be required to update this document if any programme changes are made.

3.3 Construction Route

All HGVs will be required to travel to the site via the M6, exiting at Junction 3 onto R400 Regional road.

Any potential future deviations from this route will be agreed in advance between the contractor and the Local County Councils prior to the commencement of the construction phase.

The M6 and R400 in relation to the site are shown in Figure 1.

3.4 Parking

Parking areas are available for construction staff at the Power Plant Area, 220kV and 400kV sites. These parking areas are shown in **Appendix A.**

3.5 Mitigation Measures

This CTMP will be updated by the contractor prior to the commencement of work on site and will be finalised in consultation with Offaly County Council (OCC) and Westmeath County Council (WCC).

No works shall commence until such time that the full CTMP has been approved by OCC and WCC. Details of anticipated vehicle volumes are noted within this report, however final confirmation on movements and trip distribution will be set out in the final CTMP.

The Contractor will be required to accommodate and make provision for access and egress to local residential premises, paying particular attention to the provision of pedestrian/disabled/cyclist safe access and egress for the entire duration of the construction phase. The contractor will identify alternative routes for pedestrians and vehicles in the event that public roads or right of ways are closed during works, though this is not expected to be required. The CTMP will also include measures to limit the amount of queuing required by construction vehicles outside the site boundaries.

All licensing and administration matters should be directed through the Roads Department in OCC and WCC.

Construction debris, particularly site clearance, spoil removal and dirty water run off can have a significant impact on footpaths and roads adjoining a construction site, if not adequately dealt with and these matters will be fully addressed in the contractors full CTMP.

3.5.1 Site Management

The site activities will be undertaken with due consideration of the surrounding environment and the close proximity of sensitive receptors such as residents and pedestrians. Dust management during the construction phase will be the most important aspect in terms of minimising the impacts of the project on the surrounding air quality. The following measures will be implemented to ensure impacts are minimised:

- Complaint registers will be kept detailing all telephone calls and letters of complaint received in connection with construction activities, together with details of any remedial actions carried out;
- Equipment and vehicles used on site will be in good condition such that emissions from diesel engines etc. are not excessive;
- Pre-start checks will be carried out on equipment to ensure they are operating efficiently and that emission controls installed as part of the equipment are functional;
- Monitoring and control of demolition/construction traffic during construction works; and
- The use of prefabricated elements to minimise on site fabrication and assembly thereby reducing the numbers of site operatives required.

Dust deposition levels will be monitored on a regular basis in order to assess the impact that site activities may have on the local ambient air quality. The following procedures will be implemented:

- The dust deposition rate will be measured by positioning Bergerhoff Dust Deposition Gauges at strategic locations near the boundaries of the site for a period of 30 (+/- 2) days. Monitoring should be conducted as required during periods when the highest levels of dust are expected to be generated i.e., during site preparation works and soil stripping activities.
- The exact locations will be determined after consideration of the requirements of VDI standard 2119 with respect to the location of the samplers relative to obstructions, height above ground and sample collection and analysis procedures.
- After each 30 (+/- 2 days) exposure period, the gauges will be removed from the sampling location, sealed and the dust deposits in each gauge will be determined gravimetrically by an accredited laboratory and expressed as a dust deposition rate in mg/m^2/day in accordance with the relevant standards.
- Technical monitoring reports detailing all measurement results, methodologies and assessment of results shall be subsequently prepared and maintained by the Site Manager.

3.5.2 Dust Control Measures

The aim is to ensure good site management by avoiding dust becoming airborne at source. This will be done through good design, planning and effective control strategies. The timing of construction activities including stockpiling will take note of the location of sensitive receptors and prevailing wind directions in order to minimise the potential for significant dust nuisance. In addition, good site management will include the ability to respond to adverse weather conditions by either restricting operations on-site or using effective control measures quickly before the potential for nuisance occurs.

- During working hours, technical staff will be available to monitor dust levels as appropriate; and
- At all times, the dust management procedures put in place will be strictly monitored and assessed.

The dust minimisation measures will be reviewed at regular intervals during the construction phase to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust generation. In the event of dust nuisance occurring outside the site boundary, site activities will be reviewed, and procedures implemented to rectify the problem. Specific dust control measures to be employed are presented below.

3.5.3 Site Routes

Site access routes (particularly unpaved areas) can be a significant source of fugitive dust from construction sites if control measures are not in place. The most effective means of suppressing dust emissions from unpaved roads is to apply speed restrictions. Studies show that these measures can have a control efficiency ranging from 25% to 80%.

- A speed restriction of 20 km/hr will be applied as an effective control measure for dust for on-site vehicles or delivery vehicles within the site construction boundaries;
- Bowsers will be available during periods of dry weather throughout the construction period. Research has shown that the effect of surface watering is to reduce dust emissions by 50%. The bowser will operate during dry periods to ensure that unpaved areas are kept moist. The required application frequency will vary according to soil type, weather conditions and vehicular use; and

- Any hard surface roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced areas shall be restricted to essential site traffic only.

3.5.4 Excavation

Excavation works during periods of high winds and dry weather conditions can be a significant source of dust.

- During dry and windy periods, and when there is a likelihood of dust nuisance, watering shall be conducted to ensure moisture content of materials being moved is high enough to increase the stability of the soil and thus suppress dust; and
- During periods of very high winds (gales), activities likely to generate significant dust emissions should be postponed until the gale has subsided.

The movement of truck containing materials with a potential for dust generation to an off-site location will be enclosed or covered.

3.5.5 Stockpiling

The location and moisture content of stockpiles are important factors which determine their potential for dust emissions. The following measures will be put in place:

- Overburden material will be protected from exposure to wind by storing the material in sheltered parts of the site, where possible;
- Regular watering will take place during dry/windy periods to ensure the moisture content is high enough to increase the stability of the soil and suppress dust;
- Should short-term stockpiles be required these will be located at least 50 m away from any watercourse. Slopes of these stockpiles will be made stable and regularly checked by the contractor or appointed staff member. Stockpiles shall be stored on impermeable surfaces and covered using tarpaulin.

3.5.6 Site Traffic on Public Roads

Spillage and blow-off of debris, aggregates and fine material onto public roads will be reduced to a minimum by employing the following measures:

- Vehicles delivering material with potential for dust emissions to an off-site location shall be enclosed or covered at all times to restrict the escape of dust;
- Any hard surface site roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced roads shall be restricted to essential site traffic only;
- A power washing facility or wheel cleaning facility will be installed near to the site compound for use by vehicles exiting the site when appropriate;
- Road sweepers will be employed to clean the site access route as required.

3.6 Hours of Operation

Working hours, will be in line with Council requirements and/or planning conditions and are to be agreed in advance with WCC and OFF**.** The hours are expected to be as follows, subject to approval:

- 07:00 hours to 19:00 hours Monday to Friday;
- 08:00 hours to 13:00 hours Saturday.

There may be circumstances when construction activities may need to be completed outside of these hours, and these activities and times will be discussed and agreed in advance with appropriate stakeholders on a case by case basis.

During the commissioning of the development at the onset of the Operational Phase, commissioning activities will be required outside of normal working hours and may result in 24 hour operation during the latter stages of commissioning.

3.7 Traffic Management Measures

Below is a list of the proposed traffic management measures to be adopted during the construction works. Please note that this is not an exhaustive list, and it will be updated by the appointed contractor:

- Warning signs / Advanced warning signs will be installed at appropriate locations in advance of the construction access locations. For example, warnings advise other road users of times of slow-moving vehicles during abnormal load deliveries;
- Consideration will be given to reduce the volume of construction traffic accessing the site through reduce – reuse and recycle methods. Delivery control will also be adopted to reduce potential heavy vehicle convoys.
- Temporary signage designating permissible HGV routes;
- Material deliveries and collections from site will be planned, scheduled and staggered to avoid unnecessary build-up of demolition/construction works related traffic;
- HGV trips are anticipated to arrive and depart the site at a uniform rate throughout the day to avoid pressure on the morning and evening peak hour periods;
- Speed limits of construction vehicles to be managed by appropriate signage, to promote low vehicular speeds within the site;
- Parking of site vehicles will be managed and will not be permitted on the public road, unless proposed within a designated area that is subject to traffic management measures and agreed with OCC and WCC;
- A road sweeper will be employed to clean the public roads adjacent to the site of any residual debris that may be deposited on the public roads leading away from the construction works;
- On site wheel washing will be undertaken for construction trucks and vehicles to remove any debris prior to leaving the site, to remove any potential debris on the local roads;
- All vehicles will be suitably serviced and maintained to avoid any leaks or spillage of oil, petrol or diesel. Spill kits will be available on site. All scheduled maintenance carried out off-site will not be carried out on the public highway;
- Safe and secure pedestrian facilities are to be provided where construction works obscure any existing pedestrian footways. Alternative pedestrian facilities will be provided in these instances, supported by physical barriers to segregate traffic and pedestrian movements, and to be identified by appropriate signage. Pedestrian facilities will cater for vulnerable users including mobility impaired persons; and
- Using Garda escorts for abnormal loads where required.

The mitigation measures will therefore ensure that the presence of construction traffic will not lead to any significant environmental degradation or safety concerns in the vicinity of the proposed works. Furthermore, it is in the interests of the construction programme that deliveries, particularly concrete deliveries are not unduly hampered by traffic congestion, and as a result continuous review of haulage routes, delivery timings and access arrangements will be undertaken as construction progresses to ensure smooth operation.

3.8 Staff Travel

During the site construction, the staff will be required to adhere to staff travel to work restrictions.

These restrictions are as follows:

- All PPA construction staff will be encouraged to travel to the site in minibuses to limit the number of vehicles entering the site. These minibuses will be organised by the contractor and will pick up staff at a range of different locations where parking is available. Pick up locations will be confirmed once the contractor staff are confirmed.
- For those PPA construction staff travelling to site in private vehicles the contractor will promote and organise a car sharing scheme.
- Staff working on the EGC sites will be permitted to drive to work, however, will also be encouraged to car share to limit vehicle arrivals. Once appointed, the contractor will identify staff living within close proximity to each other to organise car sharing groups.

3.9 Predicted Construction Traffic

The anticipated level of construction phase HGV traffic has been based on an assumed and preliminary outline construction methodology. The construction HGV traffic will be scheduled around the construction sequencing and avoid or minimise deliveries during the morning and afternoon traffic peaks.

Appendix 14B sets out the daily total trips expected each month during construction.

The maximum/peak combined construction traffic volumes are expected to occur between December 2025 and February 2026 when there are expected to be 828 two-way trips generated (412 of which are HGVs). However, the peak HGV traffic generation is expected between March 2025 and May 2025 when there are 454 two-way HGVs trips generated.

3.10 Abnormal Loads

During the construction of the Power Plant Area there are expected to be abnormal load deliveries for the following components:

- CCGT Gas Turbines Circa 350 tonnes;
- CCGT Generator 400 tonnes;
- CCGT Steam turbine modules;
- OCGT modules;
- OCGT and CCGT Generator Transformers; and
- HRSG modules.

During the Construction of the Electric Grid Connection there are expected to be abnormal load deliveries for the following components:

- 2 no. Transformers.

Abnormal load assessments have been completed on the local road network to identify where vehicle movements will require alternations to the road network, such removal of street furniture/ signage. The route assessed covers travel from the M6 to as far as the 400kV access i.e., from the M6, along R400, and through Rhode then along L1010 to the 400kV access. The contractor will undertake a detailed assessment of the full route once appointed.

WCC, OCC, TII, MMARC and An Garda Síochána will need to be informed of and approve any abnormal load movement before they take place as these may require road closures or other temporary measures.

Appendix A – Red Line Boundary

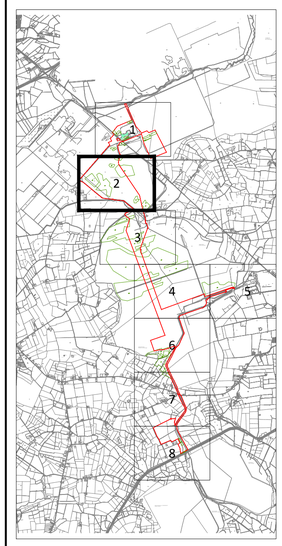
NORTH

NOTES:

RED LINE BOUNDARY

TREE STANDS & MATURE VEGETATION

KEY MAP:



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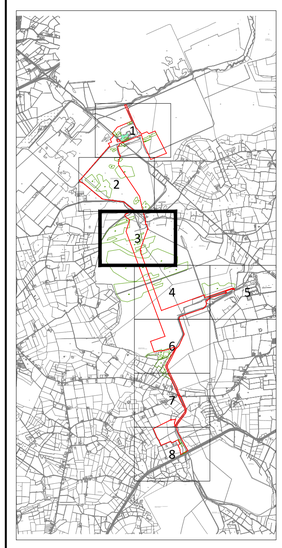
RED LINE BOUNDARY

TREE STANDS & MATURE VEGETATION

KEY MAP:



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RED LINE BOUNDARY

TREE STANDS & MATURE VEGETATION

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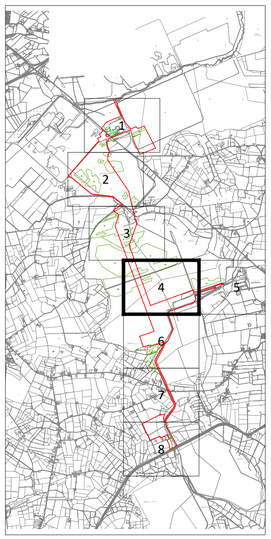

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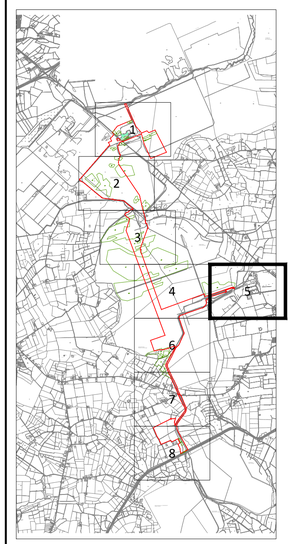
NOTES:

RED LINE BOUNDARY

TREE STANDS & MATURE VEGETATION

KEY MAP:



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NORTH

BARRYSBROOK
Sruthán an Bharraigh

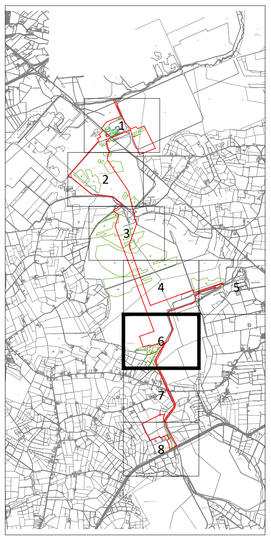
Killaragh

NOTES:

RED LINE BOUNDARY

TREE STANDS & MATURE VEGETATION

KEY MAP:



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NORTH

NOTES:

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TREE STANDS & MATURE VEGETATION

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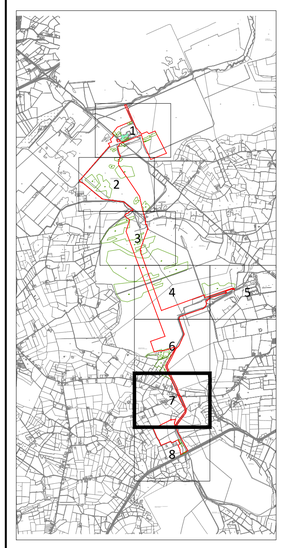

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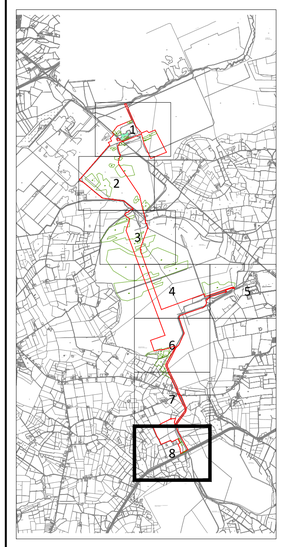
NOTES:

- RED LINE BOUNDARY
- TREE STANDS & MATURE VEGETATION

KEY MAP:



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SITE:

PROJECT: Derrygreenagh Power

TITLE: EXISTING SITE PLAN (SHEET 8 OF 8)

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Appendix 2A Peat and Soil Management Plan (PSMP)

Proposed Proposed Derrygreenagh Power Project, Co. Offaly

Peat & Spoil Management Plan

Bord na Móna Powergen Limited

Project number: 60699676

January 2024

Delivering a better world

Quality information

Prepared by	Checked by	Verified by	Approved by
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Revision History

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1. Introduction

1.1 Background

AECOM Ireland Limited (hereafter referred to as 'AECOM') has been appointed on behalf of Bord na Móna Powergen Limited (hereafter referred to as the 'Applicant') to prepare a Peat & Soil Management Plan (PSMP) in relation to a planning application to An Bord Pleanála (ABP), for a Combined Cycle Gas Turbine (CCGT) unit and an Open Cycle Gas Turbine (OCGT) unit, and electricity grid connections including substations and associated buildings and infrastructure ('the Proposed Development') on land within the Derrygreenagh bog group in Counties Offaly, Westmeath and Meath (hereafter referred to as the 'Site'). Derrygreenagh bog group consists of the lands of Derryhinch Bog, Drumman Bog, Derryarkin Bog and Ballybeg Bog which have been designated for development of energy generation projects. These lands are termed as Bord na Móna Energy Park (c. 3,000 hectares (ha)) for communication purposes.

The Scottish Government published the guidance document *'Guidance on Developments on Peatland – Site Surveys'* in 2014, where peat is defined as:

> *"Peat is defined as the partially decomposed remains of plants and soil organisms which have accumulated at the surface of the soil profile. Peat accumulates where the rate of input of organic material from the surface exceeds the rate of decomposition and 'turn-over' of this new material. A peat layer does not include a mineral fraction (hence being differentiated from topsoil).*
>
> *Peat soil is an organic soil which contains more than 60 per cent of organic matter and exceeds 50 centimetres in thickness."*

Peat instability in this report is defined as a mass movement of a body of peat that would have a significant adverse impact on the surrounding environment. Peat instability excludes localised movement of peat that would occur below a floating access road, creep movement or localised erosion type events.

1.2 Objective

The role of the PSMP is to demonstrate that the management of peat excavated during construction phase of the Proposed Development has been considered and will be treated appropriately. Adherence to the PSMP should also reasonably minimise the potential for all such peat movements. The PSMP outlines the overall design approach that has been applied to the Proposed Development to minimise peatland disruption and aims to ensure that all opportunities to minimise peat disturbance and extraction during construction will be taken. The PSMP identifies appropriate and industry-proven methods for the reuse of excess peat without significant environmental or health and safety implications, to restore the effects of construction activities and reduce the release of carbon and minimise risk in terms of human health.

This PSMP also includes general recommendations for good construction practice which will be implemented during the construction phase of the Proposed Development and a contingency plan should peat instability/failure occur at the Site. The PSMP acts as a live document arising from information presented during the consenting process, planning conditions, and the content of which will be updated as work is carried out on-site via a full Contractor's PSMP, to be prepared prior to commencement of construction.

1.3 Guidance

The legislation and guidance regarding the management of peat includes:

- Department of Housing, Local Government and Heritage (2023), *'National Peatlands Strategy Mid-Term Review and Implementation Plan'*;
- EPA (2011), *'BOGLAND: Sustainable Management of Peatlands in Ireland'*;

- Scottish Environment Protection Agency (SEPA) (2010), '*Regulatory Position Statement – Developments on Peat*';
- SEPA (2017), *'Developments on Peat and Off-Site Uses of Waste Peat'*;
- Scottish Government (2014), *'Guidance on Developments on Peatland – Site Surveys'*;
- Scottish Natural Heritage (2011), *'Floating Roads on Peat'*; and
- Scottish Renewables and SEPA (2014), *'Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste'*.

Many of the publications listed above have been developed by the Scottish Government. The Scottish documents are considered to be best practice in Ireland and are therefore appropriate for use within this PSMP.

SEPA has provided a hierarchy of management approaches in which the effectiveness of the approach to peat management is optimised at development sites as summarised below (SEPA, 2010 & 2014):

1. Prevention: avoiding generating excess peat during construction (e.g., by avoiding peat areas or by using construction methods that do not require excavation, such as floating tracks);
2. Reuse: re-use peat produced on-site in habitat restoration of hardstanding or landscaping;
3. Recycling/recovery/treatment: modify peat produced on-site for use as fuel, or as a compost/soil conditioner, or dewater peat to improve its mechanical properties in support of reuse; and
4. Storage: temporarily store peat on-site (for example, during short periods in the construction phase) and then reuse.

This SPMP has been prepared in accordance with the principles set out by the aforementioned Scottish Renewables and SEPA (2014) Guidance document for Stage 1 and proposes that prevention and reuse are the most appropriate means of managing peat excavated during construction at this Site. This report details the methodologies required to assess all potential surplus materials and presents the expected volume of excavated materials and required reuse volumes for reinstatement and restoration purposes.

2. Peat Description

Organic material less than 0.5m depth is not defined as peat. This is in accordance with guidance from:

- Scottish Government, Scottish Natural Heritage, SEPA (2017) Peatland Survey. Guidance on Developments on Peatland states that '*Peat soil is an organic soil which contains more than 60 per cent of organic matter and exceeds 50 centimetres in thickness*'; and
- The James Hutton Institute define shallow peat as having '*a prescribed depth of organic matter of 50 – 100 cm*[1]'

Also, The Forestry Commission use 45 cm as the critical depth for peat to occur ('*Understanding the greenhouse gas (GHG) implications of forestry on peat soils in Scotland*', 2010[2]);

- Peat can therefore be classified as organic material over 0.5m in depth.

Peat can be separated into three main layers: acrotelm (the upper living layer), catotelm (the middle to lower layer) and occasionally amorphous (lower layer) peat:

- Acrotelm peat is the living layer of the peat including the peat turf or turve being a thin, floating vegetation mat layer. The acrotelm is found within the top layer of peat (often less than 0.5m) depending on the degree of decomposition and fibrous nature of the peat (H1 to H6 on the von post classification scale). The acrotelm is generally of high permeability, decreasing with depth. The water table fluctuates in this layer and conditions vary from aerobic to anaerobic. Material may be fibrous or pseudofibrous (plant remains recognisable), spongy, and when excavated strength is lost but retains integral structure and can stand unsupported when stockpiled >1m.
- Catotelm peat is the dead layer of peat found deeper than acrotelm peat which has some remnant plant structures. Material has high water content and is permanently below the water table (saturated) therefore organic matter decomposes anaerobically. Some plant structures may be recognisable but are highly humified losing most of their characteristics (approximately H6 to H9 on the von post classification scale) and strength. Water flow in the catotelm is slow unless peat structures such as sink holes or peat pipes are present.

The best management option to minimise potential surplus peat is to prevent its production. Therefore, the design of the project has aimed to minimise peat excavation where possible.

In relation to the SEPA guidance, the following has been applied to the design and construction of the proposed project:

1. Floating tracks are proposed along temporary construction access tracks to tower locations with suitable gradients.
2. Reuse of excavated material is proposed for landscaping and restoration of excavations such as at tower sites, along the underground cable route and at the power plant and substations.
3. Off-site recycling/recovery of excavated materials is not appropriate or required on this site; and
4. Temporary storage and reuse of excavated peat is proposed (to the east of the power plant area).

[1] https://www.hutton.ac.uk/learning/exploringscotland/soils/organicsoils
[2] https://www.forestresearch.gov.uk/publications/understanding-the-greenhouse-gas-ghg-implications-of-forestry-on-peat-soils-in-scotland/

3. Proposed Development Description

3.1 Components of the Proposed Development

The Proposed Development is situated in Derrygreenagh and adjacent townlands (Derryarkin, Derryiron, Ballybeg, Barrysbrook, Togher and Coole), Co. Offaly, Ireland (Irish Grid Reference N49525 38259). The components of the Proposed Development include the Thermal Power Plant, gas above ground installation (AGI), water abstraction and water treatment infrastructure, respective surface and process water discharge connection routes, and the Electricity Grid Connection. The latter will consist of a 220kV substation, pylon towers, overhead lines, undergrounding compound, underground cabling, associated cabling and connections to a new loop-in 400-220kV (herein '400kV substation site') substation site and compound. The location of the Proposed Development and overall surrounding environs are illustrated below in Figure 3-1.

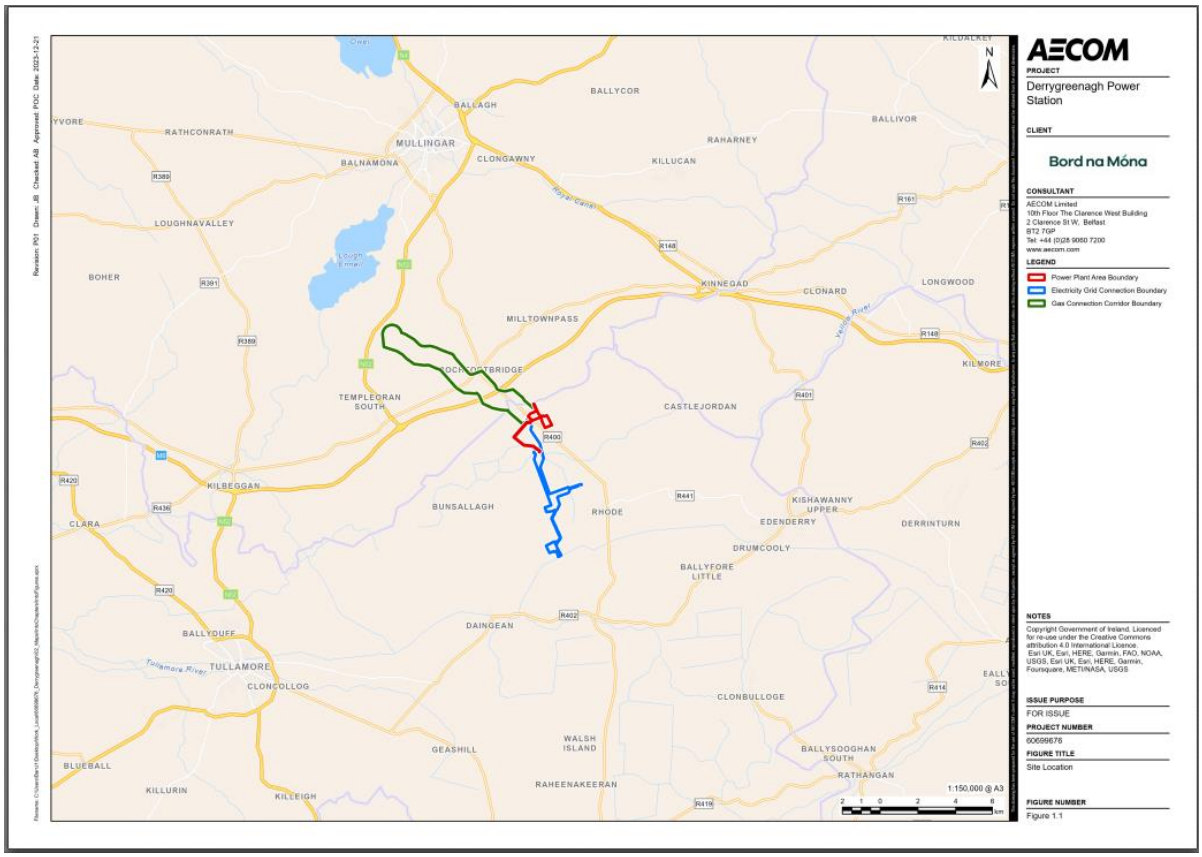

Figure 3-1. Proposed Development Location and Surrounding Environs

Temporary works to facilitate construction of the Proposed Development will include contractor compound for AGI, upgrade to public roads, upgrade to machine passes, peat deposition areas, pipe dumps, floating access tracks, bog mats and tower hard stands. Respective areas within and adjacent to the Site will be used for the contractor's compound, material storage and laydown, parking, and office areas during the construction phase.

For a detailed description of the components of the Proposed Development, refer to Chapter 5: Proposed Development of the EIAR prepared for this application.

3.2 Site Description

The Power Plant Area containing CCGT and OCGT units and supporting is located within Drumman bog on the existing Derrygreenagh Works site east of the R400 road. There are currently a number of buildings associated with Bord na Móna Derrygreenagh Works, such as workshops, stores, and offices; paved and concreted areas, outhouses, car-parking facilities, and machinery yards. The site also contains mature trees, hedges, and grassland; and a narrow railway, part of a network of railways connecting the site to the surrounding bog complex. The area was formerly used for servicing and

repairing peat harvesting and transport equipment, it is currently servicing equipment required for site management and environmental monitoring of post-peat extraction activities.

The existing operations at the Derrygreenagh Works site will be decommissioned prior to the construction of the power plant. The proposals for discharge pipelines from the power plant are for the treated process water to discharge to the Yellow River to the southwest of the Power Plant Area, and clean surface water to discharge to the Mongagh River northeast of the Power Plant Area; both are to have respective pipeline routing along existing railway lines and machine pass corridors.

The proposed Electricity Grid Connection 220kV substation is located west of the R400 road within a brownfield site in the wider Derryarkin bog complex with limited mature trees and grassland, and cutover bogs with varying degrees of vegetation, with the narrow railway crossing from west to east into the Power Plant Area via underpass below the R400 road. It is proposed that 220kV overhead lines from the 220kV substation will run for approximately 5 km via a series of double circuit pylon tower sets with three conductors hanging either side, through bogs associated with historic peatland harvesting in the area, crossing the haul road leading into Kilmurray S&G (active quarry) and the Yellow River (between Derryarkin Bog and Ballybeg Bog). The route design of the proposed overhead lines is angled at the passage from Derryarkin Bog to Ballybeg Bog, so as to comply with EirGrid's policy on wind turbine clearance to overhead lines in respect of consented wind turbine locations under development. The overhead lines traverse through Ballybeg Bog before linking into a proposed underground cabling connection at the south end of Ballybeg Bog. The underground connection follows the route of an existing peat railway for approximately 2.6 km south, including a crossing of Coolcor stream, crossing the L1010 Togher road via an existing underpass, until it links into the 400kV substation on agricultural land adjacent to the west side of the Bord na Móna Energy Park lands and south of the L1010 road.

4. Peat Conditions

4.1 Peat Conditions on Site

The site was assessed for peat vegetation in desktop review of maps and plans, previous SI data, site walkovers by ecologists and hydrologists in 2023; and in intrusive site investigation in 2023 which included:

- Drilling and trial pit excavation, including coring to bedrock, at the locations of the 18 proposed overhead powerline towers along the largely peatland northern section of the Electricity Grid Connection route,
- Trial pits along the along the southern underground section of the Electricity Grid Connection route
- Drilling and trial pitting at the 2x substations, the interface compound and power plant which are located on non-peatland areas.

The total area within the planning boundary of the Proposed Development is c. 312 hectares.

The Power Plant area is at an elevation between 82 and 87 metres OD (Ordnance Datum Malin Head) with the proposed 220kV Substation Site to the west of the R400 roadway at between 79 and 84 metres OD. The Electricity Grid Connection route ranges in altitude between just over 74 and 81 mOD, with the southern 400kV substation at an elevation of 81mOD.

The Power Plant site and Substation is an island of mineral soils surrounded by peatlands, whereas the Electricity Grid Connection route is characterised by drained cutover peatland with few areas of standing water.

The land cover for the Electricity Grid Connection route comprises of highly degraded, cutover peatland with some intact peat in the surrounding area. The majority of the natural vegetation has been removed resulting in extensive areas of bare peat. Harvesting is likely to have been halted very recently in some areas and recolonization by native species is taking place. This results in a mosaic of habitats representing various stages in ecological succession, including bare peat, scrub, immature woodland, and bog woodland. The climax habitat type along the Electricity Grid Connection route will likely be bog woodland (see Chapter 09 Biodiversity).

The peat is generally <1.0m thick, with the majority of the central portion of the Electricity Grid Connection route (between trial pits TPT 04 and TPT 15) reporting logged peat thicknesses of less than 0.5m, and therefore not strictly classified as ‘peat’, according to the guidance cited in Section 2 of this report. Thicker peat is logged at the northern and southern ends of the Electricity Grid Connection route (logged as over 2.0m thick in BHT 01, BHT 02, BHT 17, TPT 01, TPT 02, and TPT 17 which may represent areas of unharvested peat close to the edges of Derrygreenagh and Ballybeg Bogs.

The peat layer overlies silt-, sand- or gravel-dominated subsoils.

4.2 Data Collection Methodology

To obtain a detailed understanding of the spatial and depth distribution of peat and its properties, a series of tasks have been completed which include:

- Habitat mapping detailed within the Chapter 6 - Biodiversity.
- Drilling and trial pit excavation (see Appendix 15A) as follows:
  - At the power plant site,
  - At the 220kV and 400kV substations
  - At overhead cable pylon locations (x18),
  - Along the underground cable route and
  - At the proposed peat stockpile area;

- Measurement and description of peat layers.
- Collection of peat samples for laboratory analysis, including moisture content;
- Development of a peat depth map to indicate the maximum depth of peat at all investigated points across the proposed Electricity Grid Connection route development;
- Calculation of the maximum potential peat volumes that will be removed due to excavation for infrastructure based on the depth penetration probing results; and,
- Examination of areas where peat is re-used to allow calculation volumes.

A comparison of the peat depth with the site infrastructure footprint. These data indicate that peat (>0.5m depth) is present across <50% of the Electricity Grid Connection route.

Peat Characteristics

The peat encountered was generally less than 0.5m thick along the overhead section of the Electricity Grid Connection route but was up to 2.6m thick at the northern and southern ends of the overhead route (trial pits TPT 01, TPT 02, TPT 03, TPT 05, TPT 17, TPT18). The peats encountered along the Electricity Grid Connection overhead route were generally described as pseudo-fibrous brown/black peat and rootlets were commonly identifiable, up to 20mm thick in TPT07. The decomposition state of the peats along the overhead route was generally assessed as H4 to H6 on the Von Post scale.

The site investigations at the Interface Compound (trial pit TP CC 01) and along the proposed underground route, which follows an existing peatland access track way (trial pits TP C 01 to TP C 09), encountered peat up to 4+ m thick and largely assigned a grade of H4 to H6. In places, this peat was overlain by made ground up to 0.9 m thick associated with the existing access track.

At the Power Plant site, peat soils between 2.45 to 4.50m thick was reported along the northern and eastern edges of the proposed development (at trial pits TP201 to TP203 and at TP205 and at Boreholes BH102, BH104, BH109, BH116, BH117, BH118) and the composition was variable, with both highly decomposed amorphous peat (H8/H9) and lighter fibrous peat (H2/H3) containing tree stumps reported.

Across the central and southern portions of the Power Plant are (trial pits TP204 and TP206A to TP212) peat was only reported as a buried layer beneath existing Made Ground at TP204 (1.1 m thick, H2) and TP206A (0.35m thick, H6) in the north west of the proposed Power Plant area.

Elsewhere across the Power plant area, in the east of the 220kV Substation site (trial pits TP213 to TP215) and at the former waste disposal area, outside the southern boundary of the proposed Development (trial pits TP206 to TP220) no peat was encountered, consistent with the description of the Derrygreenagh Works being on an island of mineral soils within the surrounding peat land.

No clear basal layer of amorphous peat (H9/H10) was observed was observed in any trial pit. Tree roots were frequently encountered on the site at the peat-subsoil boundary. The peat characterisation studies concluded that the site comprises drained cut-over peatland across much of the route.

These values have been used in calculations of volumes of peat across the site where the peat contour map indicates that peat is present (e.g., >0.5m proven depth).

Habitat Conditions

Habitat mapping was undertaken by Project Ecologists and is detailed within Chapter 9 Biodiversity of the EIAR. Full details of the habitat survey carried out by Woodrow APEM are presented and discussed in Appendix 9B.

The majority of the Power Plant and 220kV substation areas are occupied by artificial surfaces (BL3), cutover peat (PB4a and PB4b) habitat, dry meadows and grassy verges (GS2), amenity grassland (GA2) and bog woodland (WN7).

The overhead Electricity Grid Connection route to the south crosses cut-over peatland with significant areas of re-vegetating peatland mapped as Scrub and Immature Woodland Mosaic (W) to the north of the Yellow River, and with areas of Bog Woodland (WN7), Scrub (WS1 Immature Woodland (WS2),

Mixed Broadleaf/Conifer Woodland (WD2) and Cutaway Bog (partly vegetated, PB4b) to the south of the Yellow River.

The underground cable route is bordered to the west by a mix of Improved Grassland (GA1), Hedgerow (WL1) and Buildings and Artificial Surfaces (BL3) and on the east by Improved Grassland (GA1), Cutaway Bog (mainly bare peat, PB4a) and an area of degraded Raised Bog (PB1 (7120) – a priority Annex 1 habitat)

The majority of peatland systems recorded in the Power Plant Area are highly degraded, where the natural vegetation has been removed resulting in extensive areas of bare peat. Harvesting is likely to have been halted very recently in some areas and recolonization by native species is taking place. This results in a mosaic of habitats representing various stages in ecological succession, including bare peat, scrub, immature woodland, and bog woodland. The climax habitat type here will likely be bog woodland.

The peat depth is but is deep (>80cm) in places, so the peat resource has not been exhausted. In places the peat surface is loose and milled, while in others it is more compact and drier. For the purposes of habitat mapping, a distinction was made between areas of cutover bog which are still mainly bare peat (PB4a) and cutover areas which are at least partly colonised by vegetation (PB4b).

4.3 Site Conditions

Chapter 13: Soils & Geology carried out an assessment of current Site conditions which has informed this PSMP. The PSMP should be read in conjunction with the EIAR as the information presented herein refers only to findings relevant to this report.

Establishment of the baseline environment involved reference to existing data sources, consultation with statutory bodies and other organisations, and fieldwork surveys. The following sources of information were reviewed:

- Geohive website for historical Ordnance Survey of Ireland (OSI) maps of 1:2,500 scale and 1:10,560 scale (1837 to 1913) and aerial photographs (1995, 2000, 2005, 2013 and 2018);
- Geological Survey Ireland (GSI) website for Public Viewer Geoheritage, Geotechnical, Geochemistry, Geohazards, Natural Resources (Minerals/Aggregates) and Groundwater mapping;
- EPA website for groundwater, industrial licencing and land use information;
- Environmental Sensitivity Mapping (ESM) website for soil and water data;
- Previous site investigation reports (Glover 2008, Bord na Mona 2009, Anua 2013);
- Local authority web portals;
- Previous environmental impact statements for the site (Mott McDonald 2008 EIAR and interpretive reports); and
- Information was also obtained from a geo-environmental site walkover undertaken by AECOM on 22 March 2022 and from ground investigation undertaken by IDL at the site during the period 13th April 2023 to 31st July 2023, comprising trial pits, cone penetrometer boreholes, cable percussion boreholes, rotary boreholes, well installations, geophysical surveys and infiltration tests.

The purpose of the ground investigations was to supplement previous site investigation findings at the power station site and obtain an overview of the ground and groundwater conditions present at the Power Plant Site and along the Electricity Grid Connection, including the presence or otherwise of soil and groundwater contamination.

5. Peat and Spoil Management Plan

5.1 Construction Activities Covered by the PSMP

The overall layout of the proposed project is shown in Figure 1-1 of the EIAR. This figure shows the proposed locations of the wind turbines and associated hardstanding areas, substation, meteorological mast, temporary construction compounds, peat deposition areas, borrow pits, internal access roads and the main site entrance.

The following activities will generate peat and spoil or are considered to have potential for possible peat stability problems during the construction phase of the Proposed Development:

- Excavation in peat for:
  - Power Plant Foundations;
  - Hardstanding foundations;
  - Interface Compound foundations;
  - Surface and process water discharge connection routes;
  - Construction compounds;
  - Underground cables;
  - Overhead powerlines foundations;
  - Peat Deposition Area(s)
  - All other infrastructure foundations;
- Construction of new temporary floating access tracks over peat;
- Upgrade of existing access tracks (excavate and replace tracks); and

5.2 Proposed Measures

In relation to the SEPA Guidance documents published in 2010 and 2014, the following has been applied to the design and construction of the Proposed Development:

- Floating tracks are proposed along access tracks with suitable gradients;
- Reuse of material is proposed for landscaping and restoration of borrow pits;
- Recycling/recovery is not appropriate on this Site; and
- Temporary storage and reuse are proposed (outside of borrow pits).

This methodology includes procedures that are to be included in the construction phase to minimise peat excavations. The methodology is not intended to cover all aspects of construction such as drainage and environmental considerations.

The Principal Contractor (hereafter referred to as the ‘Contractor’) will produce a detailed Method Statement identifying where and how excavated peat will be used in reinstatement or landscaping works. Specific requirements for the excavation, handling, storage, and reinstatement of peat will be outlined in this Method Statement. The Contractor will consider potential impacts on downstream receptors and the potential for instability issues with the excavated material.

Some of the requirements to be contained within this are outlined below. The majority of the Site comprises drained cut-over peatland and mineral soils. No founded roads are proposed for access to construction sites on peatland, such as the overhead cable pylon foundations and the Interface Compound, and only temporary floating roadways will be used, except in areas with shallow peat and highly trafficked areas (e.g., site entrances and access roads in and out of borrow pits). Works will be scheduled to minimise access requirements to areas of soft/wet ground during winter months.

Classification of excavated materials will depend on their identified reuse in reinstatement works. At this Site, it is anticipated that the material to be excavated will comprise peat, made ground (at Derrygreenagh Works) and mineral subsoils of variable composition.

A total of 5-7km of temporary access tracks for the overhead route are proposed at the Site, with the existing 2.4km of Bord na Mona track alongside which the underground cable route runs being upgraded to a 4m wide paved and gated service road.

Ground investigation in the form of trial pitting has been carried out at the power plant area, at the substations and along the entire Electricity Grid Connection Route consisting of trial pits and/or boreholes at suitable locations to inform the depth of excavation and upfill required.

Volume calculations provide an approximate estimation of fill required for all of the hardstanding foundations. It is calculated that 245,764m^3 of peat and spoil material will be generated as part of the Power plant and Electricity Grid Connection elements of the Proposed Development (as tabulated below). This material will be reused on-site or deposited at a thickness of up to 1m in the Peat Deposition Area or Soil Deposition Area.

Table 1: Power Plant Area - Peat/Soil Excavation (for onsite Deposition Areas)

DEVELOPMENT COMPONENT	AVERAGE PEAT/SPOIL DEPTH (m)	PEAT/SPOIL VOLUME (m^3) EXCAVATED	PEAT/SPOIL VOLUME (m3) FACTORED FOR BULKING (20%)
Power Plant Area - Main	2.0	132,000	158,400
Power Plant Area - AGI	1.0	39,354	47,225
Power Plant Area – Discharge Routes	1.0	8,000	9,600

Table 2: Electricity Grid Connection - Peat/Soil Excavation (for onsite Deposition Areas)

DEVELOPMENT COMPONENT	AVERAGE PEAT/SPOIL DEPTH (m)	PEAT/SPOIL VOLUME EXCAVATED (m^3)	PEAT/SPOIL VOLUME FACTORED FOR BULKING (m^3) (20%)
Electricity Grid Connection -220kV Substation	1.6	33,458	40,150
Electricity Grid Connection -Towers	3.5	5,954	7,144
Electricity Grid Connection - Line-cable Interface Compound	1.6	1,914	2,297
Electricity Grid Connection – Underground Cable Route	1.5	3,600	4,320
Electricity Grid Connection - 400kV Substation	0.5	21,484	25,780
Totals		**66,410**	**77,691**

Peat management of the above construction activities are covered individually in this report.

5.2.1 Excavation in Peat for Power Plant Foundations?

The volumes of granular fill (sand and stone) required for the construction of the Power Plant Area are based on the Power Plant Area element footprints, the anticipated excavation levels to suitable formation or suitable subgrade, and the proposed final levels for the infrastructure components. Construction grade granular fill and higher quality, final surfacing fill (including sand) will both be required for the construction of the Proposed Development.

Granular fill volumes have been estimated using the following methodology:

- The peat beneath the Power Plant Area site and all associated proposed hardstanding areas, including temporary construction compounds, will be excavated and replaced with construction grade granular fill up to the existing ground level.
- The hardstanding areas and roads will be constructed to the 100-year flood level. Roads will generally comprise approximately 650mm of granular fill and approximately 150mm of final surfacing layer (or capping). Geotextiles separators will be placed on the subgrade and geogrids will be installed within the road build-up.
- The peat and unsuitable soil excavated beneath the Power Plant Area footprint will be replaced with select granular fill. The final 250mm shall comprise capping material.

Table 3: Power Plant Area - Volume of Granular Fill Required

DEVELOPMENT COMPONENT	STONE FILL REQUIRED VOLUME (m^3)
Power Plant Area - Main	132,000
Power Plant Area - AGI	39,354
Power Plant Area - Discharge Routes	8,000

Temporary stilling ponds/settlement ponds will be used to attenuate runoff from works areas (i.e., hardstand areas, construction compounds, and the substations) of the site during the construction phase. The purpose of the temporary stilling ponds is to intercept runoff potentially laden with sediment and to reduce the amount of sediment leaving the disturbed area by reducing runoff velocity.

Constructed Peat Deposition Areas (PDAs) are required in the vicinity the Power Plant Area. Excavated Peat arising from the formation of the foundations will be placed in designed and dedicated deposition areas in close proximity on cut-over peat land to the east of the Power Plant Area (see Figure xxx). Peat will be deposited to a maximum depth of 1m across these areas. Once excavations at the Power Plant site are completed and following the commissioning of the project, the PDAs will be allowed to naturally re-vegetate.

5.2.2 Excavation in Peat for Substation Foundation

The peat and/or unsuitable soil beneath the substations, Line Interface compound and all associated hardstanding areas, including temporary construction compounds, will be excavated and replaced with construction grade granular fill up to the existing ground level.

The main 220kV and 400kV substations will be accessed directly off existing roads during construction and will not require roadways crossing soft ground, however access to the Line Interface Compound may require a short section of floating road due to the presence of peat along the access route from the existing Bord na Mona service track to the south).

The substation and interface compounds and associated hardstanding areas will be constructed to the 100-year flood level and greater than 1m above local road heights. Roadways will generally comprise approximately 650mm of granular fill and approximately 150mm of final surfacing layer (or capping). Geotextiles separators will be placed on the subgrade and geogrids will be installed within the road build-up.

The peat and unsuitable soil excavated beneath the substation and interface compounds footprints will be replaced with select granular fill of Clause 804 material in accordance with Eirgrid requirements. The final 250mm shall comprise capping material of site-won 6F2 material.

The internal site underground cable trenches will be approximately 1200mm in depth. The cable trench will be backfilled up to approximately 600mm with sand, within which the ducting will be placed. Suitable materials from the excavations of the trenches will be reinstated to form the final layer of the trench.

Table 4: Electricity Grid Connection – Substations - Volume of Granular Fill Required

DEVELOPMENT COMPONENT	STONE FILL REQUIRED VOLUME (m^3)
Electricity Grid Connection - 220kV Substation	33,458
Electricity Grid Connection - Line Cable Interface Compound	3,654
Electricity Grid Connection - 400kV Substation	43,928

All discharges from the proposed works areas will be made over vegetation filters at an appropriate distance from natural watercourses. Buffer zones around the existing natural drainage features have been used to inform the layout of the Electricity Grid Connection.

Temporary stilling ponds/settlement ponds will be used to attenuate runoff from works areas (i.e., hardstand areas, construction compounds, and the substations) of the site during the construction phase. The purpose of the temporary stilling ponds is to intercept runoff potentially laden with sediment and to reduce the amount of sediment leaving the disturbed area by reducing runoff velocity.

Once all construction works are complete, the work areas will be finished with a 6F2 capping layer, which will provide the finished surface within the compound fence line.

A constructed soil deposition area is required in the vicinity of and to the west of the 400kV substation site. Excavated soil arising from the formation of the substation foundations will be placed in designed and dedicated deposition areas in close proximity. Soil will be deposited to a depth of up to 1m across these areas. Once construction works are completed and following the commissioning of the project, the soil deposition area will be allowed to naturally revegetate.

5.2.3 Excavation in Peat for Surface and Process Water Discharge Connection Routes

The planned process wastewater discharge pipe is to extend west of the R400 road and discharge to the Yellow River at approximately 3km southwest of the Power Plant Area (Easting 649758, Northing 736426) (Chapter 12).

Surface water run-off will be discharged northward to the Mongagh River in accordance with Sustainable Urban Drainage System (SUDs) guidance. The planned rain/surface water discharge, consisting of stormwater runoff from hardstanding areas within the power plant site, is be treated in an on-site stormwater system, incorporating oil interceptors, to enable the legislative limits to be achieved, prior to controlled discharge to the Mongagh River at approximately 700m north of the Power Plant Area (Easting 649504 Northing 738976) (Chapter 12). Surface water will be conveyed directly to the discharge point on the Mongagh River via a pipeline following a former bog railway line across cutover peatland, to eliminate the possibility of sediment entrainment.

Foul water will be treated in a proprietary secondary treatment system on the site and discharged via pipeline to the Yellow River (Chapter 12 Water of the EIAR Volume I) .

5.2.4 Excavation in Peat for Construction Compounds

For the Electricity Grid Connection substations (both the 220kV and the 400kV substations) the construction and laydown area will be 2 No. temporary construction compounds - north of the 220kV substation and north of the 400kV substations. In addition, there will be 2 No. satellite compounds along the OHL transmission route.

At the commencement of the relevant construction phase, a construction compound will be constructed to provide temporary office space, parking, stores, welfare facilities, concrete wash out areas, hardstand laydown areas for storing materials and hazardous materials, which are within the red-line boundary but outside the existing substation fence line. The hardstanding areas shall be constructed to the 100-year flood level average heights of 0.5m above existing ground level and greater than 1m above local road heights.

Volume calculations in the descriptions of the Power Plant and Substations excavations include an estimation of fill required for the temporary compound areas. It is likely that the fill material volume to surface the temporary construction compounds will be sourced on site and/or imported from locally approved quarries.

The construction of the substation foundation will require removal of peat and soil to a competent founding layer and upfilling with concrete or structural fill to the required finished floor level. Ground investigations at the substation location have been undertaken and have been used to inform the depth of excavation and upfill required. Peat/peaty soil is present on the northern and eastern sides of the Power Plant area at the proposed locations of Construction compounds. Peat is between 2.8 and 4.5m thick beneath the proposed northern construction compound and 0.3 to 2.6 m thick beneath the eastern proposed construction compound. TP 214 is the only site investigation location in the proposed construction compound to the north of the proposed 220kV substation and west of the Power Plant Area and reported a peat thickness of 1.0m.

During construction, peat will be excavated to the substrate to make room for concrete foundations, and for a small working area surrounding the foundation footprint. Once excavated, peat will be reused to batter the edges of platforms grading the bases into the local topography.

5.2.5 Excavation in Peat for Underground Cables

It is EirGrid policy that for environmental and engineering reasons the routing of underground cables through peatland shall be avoided if at all possible.

To a large extent, underground cable routes will utilise existing railway line and machine pass infrastructure and was chosen with cognisance of nearest sensitive receptors and crossing utilities. It is proposed to excavate the trenches for the underground cable at a uniform level in peat or overburden material. The trenches will typically be 1.2m wide and 1.2m deep. These existing access tracks will be upgraded to form 5m wide paved roads to permit heavy vehicle access to the cable joint chambers on the underground cable route and to the interface compound.

This methodology includes procedures that are to be included during the construction phase to minimise any adverse impact on peat stability. The methodology is not intended to cover all aspects of construction such as drainage and environmental considerations.

With respect to placement of arisings from excavation, the guidelines below are to be followed.

- All excavations within peat are to be adequately supported or peat slopes are to be battered to a safe slope inclination typically of 1 (v): 2 or 3 (h). This slope inclination will be reviewed during construction, as appropriate;
- Where areas of weaker peat are encountered then slacker slopes will be required;
- Excavations shall always be kept reasonably free from water; and
- Backfill requirements for the cable trench will be decided as part of the detailed design/construction.

All cable laying works will be carried out as per ESBN requirements, but it is assumed that initially the Contractor will excavate cable trenches and then lay high density polyethylene (HDPE) ducting in the trench in a surround of CBM (cement bound material). A rope will be inserted into the ducts to facilitate cable-pulling later. The as-constructed detail of the cable duct locations will be carefully recorded. Cable marker strips will be placed 75mm above the ducts with two communication ducts also laid.

An additional layer of cable marker strips will be laid above the communication ducts and the trench backfilled. Back-filling and reinstatement in public roads will be to a specification to be agreed with the road authority.

Table 5: Electricity Grid Connection – Underground Cable Route - Volume of Granular Fill Required

DEVELOPMENT COMPONENT	STONE FILL REQUIRED VOLUME (m^3)
Electricity Grid Connection - Underground Cable Route	3,600

A similar construction methodology will apply for cable trenches laid within the Site access tracks. In this case the cable-ducts will generally be laid after the track has been constructed and will be within the Site access tracks. The trenches within these locations will generally be backfilled using the excavated material.

5.2.6 Excavation in Peat for Overhead Powerlines Foundations

Temporary access tracks (required due to ground conditions and/or landowner requirements) to the pylon locations will consist of timber or aluminium bog mats or crushed rock on a geotextile fabric along the 5km overhead cable route to spread the weight of machinery over a greater area to prevent damage to the ground. If necessary, a low ground pressure excavator may also be utilised to spread weight across a wider area thereby reducing the pressure exerted on the ground.

To provide internal access to the Electricity Grid Connection overhead powerline route to facilitate the delivery of construction materials and construction staff, a number of short, internal floating access roads will also need to be constructed to connect the OHL route to the existing network of internal and local roads. These internal access roads will be required at:

- the north end of the OHL at Derrygreenagh Hill (access via 220kV entrance west of R400 road)
- south end of the OHL in Derryarkin (access via an existing Bord na Mona haul route)
- at the north of Ballybeg (access via existing Bord na Mona haul route) and
- south on Ballybeg (access north from the L1010 road).

There will be a requirement to upgrade existing internal access roads (machine passes) for development of floating road access to the OHL satellite compounds.

Access routes will be carefully selected to avoid any damage to land. Local consultation will be carried out with the relevant landowners to ensure that any potential disturbance will be minimised. Prior to the commencement of construction, the contractor will assess all access routes and determine the requirement for bog mats. Any such requirements will be incorporated into the relevant method statement.

For each leg of the 21 No. masts (84 legs in total) a foundation circa. 4.5m x 4.5m x 3.5m deep is required. To allow for safe construction where ground conditions are good, the excavation will be stepped back, which requires additional area to be excavated. In the cut away bog where conditions are poor (i.e., poor ground and/or high water table) it may be necessary to use sheet piles supported by hydraulic frame(s) to prevent collapse of the sides and also to prevent the excavation becoming too large.

The excavated material will be temporarily stored close to the excavation and excess peat or soil material will be used as berms along the site access roads.

To aid construction, a concrete pipe is placed into each excavation to allow operatives level the pylon at the bottom of the excavation. If sheet piles are used, the requirement for a concrete pipe (which is normally used in tower foundations) is removed.

A setting template is used to set and hold the pylon stubs in position while the foundation concrete is being poured direct from a concrete tuck and cured. Any water in the foundation excavation is pumped out prior to any concrete being poured. During such dewatering activities for pylon leg foundations, a standard water filtration system will be utilised to control the amount of sediment in surface water runoff.

Once the concrete has set the excavated area around the pylon foundations will be backfilled one leg at a time with the material previously excavated at the location. This backfill will be placed and

compacted in layers, with an earth mat, consisting of copper wire, laid circa 600mm below ground around the mast.

Table 6: Electricity Grid Connection – Overhead Powerlines Foundations - Volume of Granular Fill Required

DEVELOPMENT COMPONENT	STONE FILL REQUIRED VOLUME (m^3)
Electricity Grid Connection - OHL tower foundations	5,954

All surplus excavated material will be removed from the mast locations and stored in berms for reuse across the construction site.

Construction of the mast body will require a hardstand area for the crane will be created at each pylon location by laying geogrid material on the ground surface and overlaying this geogrid with a suitable grade of aggregate. The base and body section of each pylon will be constructed lying flat on the ground beside the recently installed pylon base. The pylon section will be lifted into place using the crane and guide ropes. The body sections will be bolted into position.

Upon completion of the works, all hardstand areas and roadway mats will be removed.

All discharges from the proposed works areas will be made over vegetation filters at an appropriate distance from natural watercourses. Buffer zones around the existing natural drainage features have been used to inform the layout of the Electricity Grid Connection.

Temporary stilling ponds/settlement ponds will be used to attenuate runoff from works areas (i.e., hardstand areas, construction compounds, and at the substations) of the site during the construction phase. The purpose of the temporary stilling ponds is to intercept runoff potentially laden with sediment and to reduce the amount of sediment leaving the disturbed area by reducing runoff velocity.

Once all construction works are complete, the work areas will be reinstated with excavated peat or soil as appropriate and either seeded out with native species, allowed to vegetate naturally or reinstated with excavated grass turves and will be restored to their original condition.

5.2.7 Excavation in Peat for Borrow Pits

It not proposed to open borrow pits for the construction of the Proposed Development.

5.2.8 Construction of Temporary Floating Access Tracks Over Peat

Access tracks will be needed to accommodate the construction works and provide access to 18 Overhead cable pylons and the Interface Compound during the Construction Phase of the Proposed Development. Approximately 10km of temporary access tracks are to be constructed which will provide access to necessary locations along the Electricity Grid Connection route.

The access tracks in peatland areas will be constructed as floating roads only, built directly on top of the peat and soft soils, except in arras of very thin peat or at heavily trafficked area such as entrances/junctions.

Ground investigation, in the form of trial pitting and borehole drilling, has been carried out along the proposed access Electricity Grid Connection route to inform the depth of peat present. No peat material is proposed to be excavated to construct roadways.

5.2.8.1 Track Construction Types

To provide access within the Site and to connect pylons, substations and associated infrastructure, new tracks will need to be constructed or existing tracks upgraded. The identification of the access track layout is an iterative procedure. Where practical, tracks on-site will be constructed on mineral soil or along the route of existing Bord na Mona tracks/railways, there are some locations where construction on peat will be required.

The track construction preliminary design has considered the following key factors:

- Requirement to minimise disruption to peat hydrology;
- Minimise excavation arisings;
- Serviceability requirements for construction, delivery, and maintenance vehicles; and
- Buildability considerations.

Whilst the above key factors are used to determine the track design the actual construction technique employed for a particular length of track will be determined on the prevailing ground conditions encountered along that length of track.

The majority of Electricity Grid Connection and discharge pipeline construction will utilise a temporary access track networks for access and egress, and this access will be constructed in advance of other ground works in a sequential manner.

It is intended that the access tracks will be constructed using will consist of either timber or aluminium bog mats or crushed rock on a geotextile fabric Site-won material as subbase and unbound crushed aggregates and incorporate drainage to maintain the performance of the pavement during wet weather. No invasive works will be undertaken when placing the matting. The access tracks shall be constructed to average heights of 0.5m above existing ground level.

Ground investigations in the form of trial pitting has been carried out along the proposed Electricity Grid Connection route to inform upfill required for the access tracks. The discharge pipeline routes largely follow existing constructed Bord na Mona tracks or railway lines.

Table 7: General Construction of Access Tracks

Construction Method	Typical Site Conditions		
	Description	Typical Peat Depth	Typical Slope Inclination
Construction of new excavated tracks in peat	Flat slopes with relatively shallow peat	Typically, less than 0.5m, locally up to 1m	Less than 3 degrees
Construction of new floating tracks over peat	Flat slopes with relatively deeper peat	>1m	Less than 3 degrees

It should be noted that Table 7 summarises the general track construction techniques only. Prior to the construction of any access tracks, on-site a detailed design will be carried out.

5.2.8.2 Excavated Track Construction Methodology

Given the flat topography and relatively shallow peat on-site, temporary floated access tracks are deemed an appropriate construction technique for the majority of the Electricity Grid Connection and excavated tracks are not proposed to be used, except in localised areas with shallow peat and highly trafficked areas (e.g., site entrances and junctions).

For any excavated track sections required, the following methodology will be used:

- Interceptor drains will be installed upslope of the access track alignment to divert any surface water away from the construction area;
- Excavation of tracks shall be to the line and level given in the design requirements. Excavation will take place to a competent stratum beneath the peat (as agreed with the site designer);
- Track construction, where required, will be carried out in sections of approximately 50m lengths or shorter; i.e., no more than 50m of access track will be excavated without re-placement with stone fill unless otherwise agreed with the resident engineer on-site;
- All excavated peat shall be placed/spread alongside the excavations or placed in the PDA;

- Side slopes in peat shall be not greater than 1 (v): 2 or 3 (h). This slope inclination will be reviewed during construction, as appropriate. Where areas of weaker peat are encountered then slacker slopes will be required. Battering of the side slopes of the excavations will be carried out as the excavation progresses;
- The surface of the finished excavated access track will be finished above current ground level;
- A layer of geogrid/geotextile may be required at the surface of the competent stratum (to be confirmed by the designer);
- At transitions between floating and excavated tracks a length of track of about 10m shall have all peat excavated and replaced with suitable fill. The surface of this fill shall be graded so that the track surface transitions smoothly from floating to excavated track;
- If slopes of greater than 5 degrees are encountered along with relatively deep peat (i.e., greater than 1.5m) and where it is proposed to construct the access track perpendicular to the slope contours, it is best practice to start construction at the bottom of the slope and work towards the top, where possible. This method avoids any unnecessary loading to the adjacent peat and greatly reduces any risk of peat instability. It should be noted that slopes greater than 5 degrees are not envisaged along the Electricity Grid Connection route access tracks; and
- A final surface layer shall be placed over the excavated track, as per design requirements, to provide a track profile and graded to accommodate construction and delivery traffic.

Access tracks require careful monitoring to ensure that there is no significant standing water forming, which would lead to potholes in the surface. If areas of track are causing concern, repairs will be carried out in favourable, preferably dry, conditions, to ensure that there is no saturation of the surface of the track.

5.2.8.3 Construction of new Floating Tracks over Peat

Floating roads are built directly on top of the peat and soft soils. As peat of variable thickness is present along the majority of the Overhead Line section of the Electricity Grid Connection route and only construction stage vehicular access is envisaged, temporary floating roads will be used on peatland areas, other than where proposed infrastructure follows existing constructed trackways or railway lines.

The access tracks shall be constructed to average heights of up to 0.5m above existing ground level. It is expected that floated tracks will constitute the majority of the access roads at the Site, however founded tracks may be used in localised, heavily trafficked areas like entrances and junctions.

Floating track sections will be designed by a geogrid manufacturer, or by a consultant assisted by a geogrid manufacturer. It can also be designed in-house by a contractor with experience in track construction over peat. The design will have a geotechnical input to fully understand the principles at work in the floating track. Design can be by calculation or, more usually by the application of semi-empirical rules based on experience of the European standard (EN) Eurocode 7: Geotechnical design (EN 1997).

5.2.8.4 Floating Access Track Construction Methodology

This methodology includes procedures that are to be included in the construction phase to minimise any adverse impact on peat stability. The methodology is not intended to cover all aspects of construction such as drainage and environmental considerations. Note that details of geogrid arrangement will be provided by the specialist geogrid provider/designer.

For temporary floating track sections, the following methodology will be used:

- Temporary access tracks (required due to ground conditions and/or landowner requirements) will consist of timber or aluminium bog mats or crushed rock on a geotextile fabric to spread the weight of machinery over a greater area to prevent damage to the ground.
- If necessary, a low ground pressure equipment may also be utilised to spread weight across a wider area, thereby further reducing the pressure exerted on the ground.
- No invasive works will be undertaken when placing the matting/geotextile.

- Upon completion of the works, all mats, fill and/or geotextile will be removed immediately. Temporary access routes will be carefully selected to avoid any damage to land.
- Local consultation will be carried out with the relevant landowners to ensure that any potential disturbance will be minimised.
- Prior to the commencement of construction, the contractor will assess all access routes and determine the requirement for bog mats. Any such requirements will be incorporated into the relevant method statement.
- Once all construction works are complete, the work areas will be reinstated and either seeded out with native species, allowed to vegetate naturally or reinstated with excavated grass turves and will be restored to their original condition.
- Transitions between the Site floating tracks and excavated tracks (or other forms of track not subject to long term settlement) will be gentle (e.g., 1:10 basal transition slope) in order to minimise likelihood of track failure at the boundary between construction types.

The typical make-up of new floating access track is generally between 600mm and 1000mm of selected granular fill with 2 no. layers of geogrid with possibly the inclusion of a geotextile separator. This may vary depending on designer requirements.

Following the detailed design of the floating access tracks it may be deemed necessary to include pressure berms either side of the access track in some of the deeper peat areas. The inclusion of a 2 to 5m wide pressure berm (typically 0.5m in height) either side of the access track will reduce the likelihood of potential bearing failures beneath the access track.

The finished track width will be approximately 6m (to be confirmed by the designer). Stone delivered to the floating track construction shall be end-tipped onto the constructed floating track. Direct tipping of stone onto the peat shall not be carried out. To avoid excessive impact loading on the peat due to concentrated end-tipping all stone delivered to the floating track shall be tipped over at least a 10m length of constructed floating track. Where it is not possible to end-tip over a 10m length of constructed floating track then dumpers delivering stone to the floating track shall carry a reduced stone load (not greater than half full) until such time as end- tipping can be carried out over a 10m length of constructed floating track.

Following end-tipping suitable machinery shall be employed to spread and place the tipped stone over the base geogrid along the line of the track. A final surface layer shall be placed over the floating track, as per design requirements, to provide a track profile and graded to accommodate construction and delivery traffic.

5.2.9 Upgrade of Existing Access Tracks

The general construction methodology for upgrading of existing section of excavated roads or tracks is summarised below:

- The edge of the existing tracks will be cut back by 1m and a Combigrid™ (a geocomposite stabilisation and reinforcement geogrid product) placed over the proposed area to be widened. The cutting back of the existing track allows an anchorage of the Combigrid under the existing track.
- Granular fill will be placed in layers to match the depth of stone on the existing track and in accordance with the contractor's specification. A geogrid will be applied at this level across the existing and widened road area.
- The surface of the existing/widened access track will be overlain with up to a 300mm of selected granular fill.
- A layer of geogrid/geotextile may be required at the surface of the existing access road and in the widened section of road, where excessive rutting is anticipated (to be confirmed by contractor and onsite engineer).

- Where excavations in peat are required, side slopes shall be not greater than 1 (v): 2 or 3 (h). This slope inclination will be reviewed during construction, as appropriate. Where areas of weaker peat are encountered then slacker slopes will be required. Battering of the side slopes of the excavations will be carried out as the excavation progresses.
- The finished road width will be approximately 5m.
- If required, interceptor drains will be installed upslope of the access road alignment to divert any surface water away from the construction area.

A final capping layer shall be placed over the existing access track, as per design requirements, to provide a suitable road profile and will be graded to accommodate construction traffic and HGV movements.

5.2.10 Peat Deposition Area

Peat reuses around and within infrastructure areas is an important aspect of the Proposed Development as it allows an opportunity to maintain the integrity of the excavated peat and enhance habitats. Any landscaping or road batters will be limited to the areas of ground already disturbed.

Three Peat Deposition Areas (PDAs) are proposed within the Overall Project (see Chapter 5):

- A permanent PDA is provided on cut-over peatland to the east of the Power Plant Area, as a result of the construction phase of the Power Plant Area, to store excess overburden material which cannot be used in localised landscaping or backfill. Excavated peat and soil arising from the formation of the foundations will be placed in the designed and dedicated deposition area in close proximity on land to the east of the Power Plant Area (refer to planning drawings). Peat deposition in this area will be carried out by an approved contractor, under the management of Bord na Móna, in accordance with the requirements of any planning conditions. The peat and soil deposition area will not exceed 1m above ground level across the 222,410m² main PPA PDA area and will be suitably profiled to eliminate risk of movement or slippage of material. Once excavations are completed and following the commissioning of the project, the PDA will be allowed to naturally revegetate.
- A permanent PDA is provided in the vicinity of the 400kV Substation to store excess overburden material which cannot be used in localised landscaping or backfill. Excavated peat and soil arising from the formation of the substation foundation will be placed in a designed and dedicated deposition area in close proximity on land to the north of the 400kV substation (refer to planning drawins).
- A permanent PDA is provided in the vicinity of the 220kV Substation to store excess overburden material which cannot be used in localised landscaping or backfill. Excavated peat and soil arising from the formation of the substation foundation will be placed in a designed and dedicated deposition area in close proximity on land to the southwest of the 220kV substation (refer to planning drawings).

It is proposed to construct internal access routes within the PDAs, in order to minimise the handling and disturbance of any underlying cut-over peat. The roads will be constructed by laying a geotextile reinforcing material directly on the native peat and depositing compacted rockfill to form the haul roads. Trucks will deliver and unload the peat at the PDA. The peat will then be placed using low ground bearing pressure trailers for dispersal within the deposition area to a maximum thickness of 1 metre.

Reinstatement of vegetation will be focused on natural regeneration utilising peat vegetated turfs. To encourage stabilisation and early establishment of vegetation cover, where available or other vegetation turves in keeping with the surrounding vegetation type will be used to provide a dressing for the final surface.

Appropriate drainage will be required where peat is used in reinstatement, so that the deposited peat will be maintained in a saturated condition.

5.2.11 Excavation and Storage of Peat and Soil

It will be necessary to extract peat and subsoil on-site as part of the construction phase. This will largely consist of areas of peat due to the nature of the Site. Bedrock is covered with thick glacial deposits, resulting in local variations in topography such as Derrygreenagh Hill. The majority of the Site is located on relatively flat-lying areas, currently overlain by cutover blanket peat bog.

It is intended that peat and unsuitable founding soils will be side cast, i.e., placed adjacent to works locations, with the balance placed in Peat Deposition areas. Considering the relatively flat topography, it should be appropriate to do this across most of the Site, subject to geotechnical assessment.

The following recommendations / best practice guidelines for the placement of peat and non-peat soil alongside the proposed infrastructure elements will be considered and taken into account during construction.

Any surplus excavated material (peat and non-peat) will be reused, either in profiling/landscaping or constructing berms as close to the excavation areas as possible. The northern 5km of the Electricity Grid Connection route crosses cut-over peatland that has been drained, resulting in extensively trafficked, partly-revegetated peat. Peat present in the north and east of the Power Plant area is largely drained peat covered in a layer of fill material.

The placement of excavated peat and soil is to be avoided without first establishing the adequacy of the ground to support the load. The placement of peat and soil within the placement areas may require the use of long reach excavators, low ground pressure machinery and possibly bog mats in particular for drainage works.

The most environmentally sensitive and stable way of handling and moving of peat is its placement across the site and at locations as close as possible to the excavation areas. A peat deposition area and soil deposition area has been included to facilitate the construction phase of the Power Plant Area site.

All placed soil will be allowed to revegetate naturally from the extensive seed source of the plants that have already colonised in the area. Alternatively, if significant areas of bare soil are still evident after a three-year period and possibly in addition, seeding of the placed soil could be carried out which would aid in stabilising the placed soil in the long term.It is a goal of the Proposed Development to incorporate sustainability into its design and construction phases as much as practically possible. Where mineral soils are encountered in the excavation and construction of the Power Plant area, Site roads, Substations, Construction Compounds, bases, etc., this material will be stockpiled for assessment and subsequent reuse, where possible. Where mineral soil is not directly suitable for construction, it will be used for reinstatement works and will be geo-engineered as necessary.

In addition to the Peat Deposition Area, a Soil Deposition area is proposed to the west of the 400kV substation site, for deposition of unsuitable or unneeded mineral soils, which will be deposited to a maximum thickness of 1 m.

5.2.11.1 Excavation and Storage of Arisings Methodology

This methodology includes procedures that are to be included in the construction phase to minimise any adverse impact on peat stability. The methodology is not intended to cover all aspects of construction, such as drainage and environmental considerations. Prior to any excavations, the Contractor will produce a detailed Method Statement identifying where and how excavated peat will be used in reinstatement or landscaping works. Specific requirements for the excavation, handling, storage, and reinstatement of peat will be outlined in the excavation Method Statement. The Contractor will consider potential impacts on downstream receptors and the potential for instability issues with the excavated material.

Some of the requirements to be contained within the Method Statement are outlined below. The majority of the Power Plant Area Site comprises mineral soils, with any areas of peat covered by a layer of fill material, whereas the northern 5 km section of the Electricity Grid Connection route consists of bare or revegetating cut-over peat bog, of varying thickness. Areas of peat or unsuitable soil within the footprint of proposed excavations will have the top layer of made ground or vegetation stripped prior to construction by an experienced specialist sub-contractor. Underlying peat or bare peat will then be removed.

Classification of excavated materials will depend on their identified reuse in reinstatement works. At this Site, it is anticipated that the material to be excavated will comprise granular fill, peat and mineral subsoil.

The handling, management and reuse of excavated materials are of importance during the construction phase of the Proposed Development. Excavated material will arise from all infrastructure elements of the Proposed Development. Areas where the peat is noted to extend to a depth of 2m bgl or greater have been identified on-site (At the northern and eastern edges of the Derrygreenagh Plant at the northern and southern ends of the Overhead Line section of the Electricity Grid Connection route. As such, these areas may not prove suitable for certain aspects of the Proposed Development due to the large quantities of peat that would require removal to avoid instability issues.

It is intended that unsuitable founding soils and peat will be side-casted, bermed and profiled, i.e., placed adjacent to works locations or transported to the designated Peat Deposition or Soil Deposition Areas. It is anticipated that the height of berms and thickness of peat and unsuitably found soils that are either side casted or disposed of in the designated deposition areas will not be greater than 1m in general.).

Excavated peat will only be moved short distances from the point of extraction and used locally for landscaping. In total, approximately 66,410m^3 of peat will be excavated and either reused close to the source or placed in the designated peat deposition area.

Excess material will be used on the Site of the Proposed Development for landscaping and reinstatement. Where contaminants are found, the material will be removed from the Site and disposed at an appropriately licenced facility.

Landscaping areas will be sealed and levelled using the back of an excavator bucket to prevent erosion. Where possible, the upper vegetative layer will be stored with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation at the surface of the landscaped peat. These measures will prevent the erosion of peat in the short and long term. Peat, overburden, and rock will be reused where possible on-site to reinstate excavations where appropriate.

Peat soils will be either side casted on to the existing cutover bog or placed in the Peat deposition area. Where side casting occurs, it is anticipated that the existing vegetation extensive area and existing drainage system will remove any risk from generation of silt to surface water bodies. At the larger excavation locations, such as pylon leg foundations and substations, silt control measures will be incorporated into work area drainage with the discharge onto cutover bog rather than directly to surface water, which will provide additional silt control.

It is anticipated that peat deposition to the designated peat deposition area will be required, which is located on level cut-over peatland east of the Power Plant area. It is anticipated that deposited peat thickness will not exceed 1m. The deposition area will be designed to be completed in phases and will include specific drainage and silt controls. On completion the peat deposition area surfaces will be stabilised by the establishment of natural peat land vegetation.

5.2.12 General Recommendations for Good Construction Practice

The following measures outline an overview of the tasks for the construction phase on peatland:

- Applicant’s Geotechnical Engineer to provide a Geotechnical Induction to all contractor supervisory staff;
- Applicant to appoint a Site Geotechnical Supervisor to carry out supervision of site works as required. The Site Geotechnical Supervisor will be required to inspect that works are carried in accordance with the requirements of the Peat Stability Risk Assessment (PSRA), identifying new risks and ensuring all method statements for works are in place and certified;
- Retain a Site Geotechnical Folder which contains all the information relevant to the geotechnical aspects of the Site including but not limited to Site Investigation information, Method Statements, etc.;
- Contractor to develop a Method Statement for the works to be carried out in each of the PSRA areas cognisant of the required mitigating measures;

- Applicant's Geotechnical Engineer/Site Geotechnical Supervisor to approve the method statement;
- Contractor to provide Toolbox Talks and on-site supervision prior to and during the works;
- Daily sign off by supervising staff on completed works; and
- Implementation of emergency plan and unforeseen event plan by the Contractor.

In addition to the above, the following best practice guidelines for the placement of peat alongside the Proposed Development's different infrastructure elements will be adhered to during construction:

- All excavated peat will be reused where possible for reinstatement or by being placed/spread alongside the proposed infrastructure elements on-site;
- The peat placed adjacent to the proposed infrastructure elements should be restricted to a maximum height of 1m over a 10m wide corridor on both sides of the Proposed Development's elements (pylon footings or underground cable route. It should be noted that the designer should define/confirm the maximum restricted height for the placed peat;
- The placement of excavated peat and spoil is to be avoided without first establishing the adequacy of the ground to support the load. The placement of peat within the deposition area will likely require the use of long reach excavators, low ground pressure machinery and possibly bog mats in particular for drainage works;
- Where a peat stability analysis following the confirmatory ground investigation reveals areas with an unacceptable risk of peat instability, then no material shall be placed on to the peat surface;
- The surface of any placed peat will be shaped to allow efficient run-off of surface water. Where possible, shaping of the surface of the peat should be carried out as placement of peat within the placement area progresses. This will reduce the likelihood of debris run-off;
- Finished/shaped side slopes in the placed peat shall be not greater than 1 (v): 3 (h). This slope inclination will be reviewed during construction, as appropriate. Where areas of weaker peat and spoil are encountered then slacker slopes will be required;
- The acrotelm shall be placed with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation at the surface of the placed peat within the placement areas;
- Movement monitoring instrumentation may be required adjacent to areas where peat has been placed. The locations where monitoring is required will be identified by the designer on-site;
- An interceptor drain will be installed upslope of the designated peat placement areas to divert any surface water away from these areas. This will help reduce the likelihood of debris run-off; and
- All the aforementioned general guidelines and requirements should be confirmed by the designer prior to construction.

The following outlines an overview of the tasks for the operation and maintenance phase:

- Communication of residual peat risk to appropriate site operatives; and
- Ongoing monitoring of residual risks and maintenance, if required. Such items would consist of regular inspection of drains and culverts to prevent blockages and inspections of specific areas such as settlement ponds and floated access roads after a significant rainfall event.

5.3 Summary of Excavated Peat Volumes On-Site

The breakdown and combined total of excavated peat volume estimated to be required on-site for the completion of the Proposed Development is summarised in Table 8 and Table 9. Note, a factor of 20% (bulking factor of 15% and contingency factor of 5%) has been applied and is included in the excavated peat and soil volumes below to allow for expected increase in volume upon excavation and to allow for a variation in ground conditions across the site.

Table 8: Excavated Peat Volume Summary

DEVELOPMENT COMPONENT	PLAN AREA (m2)	ASSUMED PEAT/SPOIL DEPTH TO BE EXCAVATED (m)	PEAT/SOIL VOLUME TO BE EXCAVATED (m^3)	PEAT/SOIL VOLUME (m3) FACTORED FOR BULKING (20%)
Power Plant Area – Contractor's Compound (1m of fill over geotextile layer - no peat excavation envisaged)	37,360	0.0	0	0
Power Plant Area – Additional Parking (0.5m of fill over geotextile layer - no peat excavation envisaged)	12,405	0.0	0	0
Power Plant Area – Central equipment area	66,000	1.5	99,000	118,800
Power Plant Area – AGI (2m of fill over geotextile layer - no peat excavation envisaged)	11,000	0.0	0	0
Power Plant Area – Green Areas	39,354	0.5	19,677	23,612
Power Plant Area – Discharge Routes	8,000	1.0	8,000	9,600
Total – Power Pant Area	**174,119**	**0.0 to 1.5m**	**126,677**	**152,012**
Electricity Grid Connection - 220kV Substation (excavations to between 1.0 and 2.0 m)	20,656	1.0 to 2.0	29,756	35,707
Electricity Grid Connection - 220kV Substation access road (excavation to 2.0 m)	1,851	2.0	3,702	4,442
Electricity Grid Connection -Tower bases (3.5m excavation envisaged)	1,701	3.5	5,954	7,144
Electricity Grid Connection -Tower Access roads (1.5m of fill over geotextile layer, floating road - no peat excavation envisaged)	18,235	0.0	0	0
Electricity Grid Connection - Line-cable Interface Compound	1,160	1.65	1,914	2,297
Electricity Grid Connection – Underground Cable Route	2,400	1.5	3,600	4,320
Electricity Grid Connection - 400kV Substation (excavations to between 0.2 and 0.5 m)	31,300	0.2 to 0.5	6,806	8,167
Electricity Grid Connection - 400kV Substation access road (excavation to 2.0 m)	9,785	1.5	14,678	17,613
Total – Electricity Grid Connection	**87,088**	**0.0 to 3.5m**	**66,410**	**79,690**
Totals (PPA and EGC Components)	**261,207**	**0.0 to 3.5m**	**193,087**	**231,702**

The three proposed Peat Deposition Areas have the following plan areas and calculated peat and spoil storage capacities:

Table 9: Peat Deposition Area Summary

DEVELOPMENT COMPONENT	PDA PLAN AREA (m2)	MAXIMUM PEAT/SOIL THICKNESS TO BE DEPOSITED (m)	PEAT/SOIL DEPOSITION CAPACITY AVAILABLE (m^3)	ESTIMATED PEAT/SOIL STORAGE REQUIREMENT (m^3)
Power Plant Area PDA	222,500	1.0	222,500	153,000
Electricity Grid Connection - 220kV Substation PDA	50,200	1.0	50,200	48,000
Electricity Grid Connection - 400kV Substation PDA	75,300	1.0	75,300	33,000
Totals	**348,000**	**1.0 m**	**348,000**	**234,000**

The three peat and soil deposition areas will therefore have sufficient capacity for the total estimated peat and soil storage requirement arising from the PPA and EGC components of the project, even allowing for the bulking and contingency assumptions outlined above, and this conservative conclusion does not assume any on-site re-use of excavated peat and soil.

Peat will be deposited to a maximum height of 1m above ground level in all three PDAs and will be allowed to naturally revegetate once excavations are completed and following the commissioning of the project.

6. Summary

The total volume of excavated peat and soil associated with the Power Plant footprint, substations, Waste water discharge routes and the overhead and underground sections of the Electricity Grid Connections Route, including access routes, has been calculated at about 193,087m^3 (equivalent to approximately 231,702m^3 of material requiring deposition, allowing for excavated materials bulking and contingency assumptions), predominately drained lowland blanket bog in a revegetating cutover bog site.

The potential reuse of excavated peat and soil has been calculated and will be reused on-site. Based on the peat depth, characteristics, and distribution investigations undertaken across the Site and the layout of the Proposed Development, a surplus of peat and soil is expected to be generated by the Proposed Power Plant Development. Where possible, excavated peat will be reused for restoration work during the construction, operation, and decommissioning phases, with any additional peat to be relocated to designed, dedicated Peat Deposition Areas on cut-over peatland.

The three PDAs have a combined peat and spoil deposition capacity of up to 234,000m^3, which exceeds the conservative calculated bulked peat and soil storage requirement of 231,702m^3.

Floating roads and other measures are utilised on-site to minimise the volume of excavation. An ECoW will maintain a record of actual peat volumes excavated and the subsequent peat reuse volumes. This record during the construction, operation, decommissioning phases of the Proposed Development will be made available for review by regulatory authorities as required.

The full Contractor's PSMP will be prepared prior to commencement of construction and with the approval of the Applicant and ABP. Additionally, the PSMP should be read in conjunction with the EIAR and outline CEMP prepared for the Proposed Development.

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