BORD NA MÓNA

Naturally Driven

PROPOSED DEVELOPMENT AT

DREHID WASTE MANAGEMENT FACILITY

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Natura Impact Statement

November 2018

TOBIN CONSULTING ENGINEERS

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Natura Impact Statement

PROJECT: **Proposed Development at Drehid Waste Management Facility**

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CLIENT: **Bord na Móna Plc**
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DOCUMENT AMENDMENT RECORD

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Project:	Proposed Development at Drehid Waste Management Facility
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1 INTRODUCTION

This document presents a screening report and Natura Impact Statement (NIS) (Stage 2 Assessment) to inform the Appropriate Assessment process for the Proposed Development at the existing Bord na Móna Drehid Waste Management Facility (WMF) at Drehid, County Kildare. The report has been prepared in compliance with Bord na Mona's obligations pursuant to Section 177U and V of the Planning Development Act 2000 in respect of the proposed development. The proposed development is located within Bord na Móna cut-over peatlands, where extraction has ceased, and new land use is proposed.

An Appropriate Assessment (AA) is a requirement of Article 6 of the Council Directive 92/43/EEC of 21 May 1992 on the Conservation of Natural Habitats and of Wild Fauna and Flora (as amended) (hereafter referred to as the "Habitats Directive"). The overall aim of the Habitats Directive is to maintain or restore the "Favourable Conservation Status" of habitats and species of European Community Interest. These habitats and species are listed in the Habitats and Birds Directives (Council Directive 2009/147/EC on the conservation of wild birds) with Special Areas of Conservation and Special Protection Areas designated to afford protection to the most vulnerable of them. These two designations are collectively known as European Sites.

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European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The State and its agencies are responsible for the implementation and enforcement of regulations (in particular Part XAB of the Planning and Development Act 2000 (as amended) and the European Communities (Birds and Natural Habitats) Regulations, 2011 (S.I. 477) (often referred to as the Habitats Regulations)) to ensure the ecological integrity of these sites.

An Appropriate Assessment 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. An Appropriate Assessment aims to identify, in view of best scientific knowledge, all aspects of the proposed development which either individually or in-combination with other plans or projects would adversely affect the integrity of a European site. An Environmental Impact Assessment Report (EIAR) has also been submitted for the proposed development. This Report accompanies the application under consideration for approval, to provide detailed consideration of European Sites and their conservation objectives, those details which are the primary consideration for AA.

The project design to date has been an iterative approach which has sought to, insofar as is possible, avoid effects on European Sites. This document considers the proposed project design, including the

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construction and operational phases of the development. The screening report determines whether likely effects will occur, the NIS then addresses whether there will be adverse effects on the integrity of European Sites where likely effects have been identified.

This report has been prepared by experienced and appropriately qualified TOBIN ecologists. An experienced TOBIN hydrogeologist, with a scientific background in determining potential water quality risk sources, provided additional input to potential impacts affecting hydrology and aquatic-dependant ecological receptors.

This report was produced with specific reference to the existing environmental and ecological data available for the site. The current assessment refers to reporting prepared for the existing and proposed development including the following documents:

- Drehid Waste Management Facility Intensification and Extension: Environmental Impact Statement (TOBIN, 2008);
- Drehid Mechanical Biological Treatment Facility: Appropriate Assessment Screening (TOBIN, 2012);
- Drehid Mechanical Biological Treatment Facility: Environmental Impact Statement (TOBIN, 2012); and
- Drehid Waste Management Facility: Environmental Impact Assessment Report (TOBIN, 2017).

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This report has been carried out in accordance with the guidance set out in Section 1.3 in order to determine the necessity for AA.

1.1 LEGISLATIVE CONTEXT

An Appropriate Assessment 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. An Appropriate Assessment aims to identify, in view of best scientific knowledge, all aspects of the proposed development which either individually or in-combination with other plans or projects would adversely affect the integrity of a European Site. These sites consist of Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) and provide for the protection and long-term survival of Europe's most valuable and threatened species and habitats. The AA Screening and Natura Impact Statement (NIS) reports have been prepared for the purposes of the planning application for the proposed development.

Council Directive 92/43/EEC of 21 May 1992 on the Conservation of Natural Habitats and of Wild Fauna and Flora - 'The Habitats Directive', has been transposed into Irish law by The European Community

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(Natural Habitats) Regulations 2011 (S.I. No. 477). 'The Birds Directive', Directive 2009/147/EC of the European Parliament and of the Council, seeks to protect birds of special importance by the designation of SPAs whereas the Habitats Directive does the same for habitats and other species groups with SACs. The Planning and Development Act 2000 (Sections 177U and 177V) governs the requirement to carry out an AA. Furthermore, the requirement of AA is outlined in Article 6(3) and 6(4) of the EU Habitats Directive. Article 6(3) of the Habitats Directive requires that:

> *"Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public."*

Furthermore, Article 6(4) of the Habitats Directive requires that:

> *"If, in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, the Member State shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted."*

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If, despite a negative assessment of the implications for the site and the absence of alternative solutions, it is proposed that a plan or project may proceed to be carried out, then for "Imperative Reasons of Overriding Public Interest", including those of a social or economic nature, the Member State shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 network is protected.

It shall inform the Commission of the compensatory measures adopted. Where the site concerned hosts a priority natural habitat type and/or a priority species, the only considerations which may be raised are those relating to human health or public safety, to beneficial consequences of primary importance for the environment or, further to an opinion from the Commission, to other imperative reasons of overriding public interest.

AA is based on best scientific knowledge and Planning Authorities should ensure that scientific data (ecological and hydrological expertise) is utilised in making their determination.

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1.2 SOURCE-PATHWAY-RECEPTOR MODEL

Ecological impact assessment of potential impacts on European Sites is conducted utilising a standard 'Source-Pathway-Receptor' model, where, in order for an impact to be established all three elements of this mechanism must be in place. The absence or removal of one of the elements of the mechanism is sufficient to conclude that a potential effect is not of any relevance or significance. This report determines if direct, indirect and cumulative adverse effects will arise from the proposed development.

- Source(s) – e.g. pollutant run-off from proposed works via surface-water / storm water runoff, commercial and domestic effluents, dust and fine material releases.
- Pathway(s) – e.g. groundwater connecting to nearby qualifying wetland habitats, proximity to designated European Sites.
- Receptor(s) – Qualifying habitats and species of European sites.

Measures are proposed within the AA reporting to identify both impact source and pathways in order to address the potential for significant adverse effects.

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1.3 GUIDANCE

This report has been carried out using the following guidance:

- Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities. Circular NPWS 1/10 & PSSP 2/10;
- Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities. (Department of Environment, Heritage and Local Government, 2010);
- Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg (EC 2000);
- Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg (EC 2001);
- Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC – Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interest, compensatory measures, overall coherence, opinion of the commission. Office for Official Publications of the European Communities, Luxembourg (EC 2007); and
- Flora (Protection) Order, 1999 (As amended 2016).

In addition, a detailed online review of published scientific literature was conducted. This included a detailed review of the National Parks and Wildlife Service website including mapping and available reports

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for relevant sites and, in particular, sensitive qualifying interests described and their conservation objectives. The EPA Envision Map-viewer (www.epa.ie) and available reports were also reviewed.

Definitions of conservation status, integrity and significance used in this assessment are defined in accordance with 'Managing Natura 2000 sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC' (EC, 2000), as follows:

"The conservation status of a natural habitat is defined as the sum of the influences acting on a natural habitat and its typical species that may affect its long-term natural distribution, structure and functions as well as the long-term survival of its typical species;

The conservation status of a species is defined as the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its population;

The integrity of a European Site is defined as the coherence of the site's ecological structure and function, across its whole area, or the habitats, complex of habitats and/or populations of species for which the site is or will be classified;

Significant effect should be determined in relation to the specific features and environmental conditions of the protected site concerned by the plan or project, taking particular account of the site's conservation objectives."

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There are four main stages in the AA process; the requirements for each depending on likely impacts to European Sites (SAC/ SPA).

Stage One: Screening – the process which identifies the likely impacts upon a European Site. Its purpose is to determine, on the basis of a preliminary assessment and objective criteria, whether a plan or project which is not directly connected with or necessary to the management of the site as a European Site, individually or in combination with other plans or projects is likely to have a significant effect on the European Site. It is not appropriate, at this screening stage, to take account of the measures intended to avoid or reduce the harmful effects of a plan or project on European Sites (as per clarification provided by the Court of Justice of the European Union (CJEU) in Case 323-17 *People Over Wind and Peter Sweetman v Coillte*).

Stage Two: Appropriate Assessment – consideration is given to whether the impact of the project or plan would adversely affect the integrity of surrounding European Sites, either alone or in combination with other projects or plans, with respect to the site's structure and function and its conservation objectives. Additionally, where adverse impacts have been identified, an assessment

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of the potential mitigation to reduce/minimise/avoid such impacts is required. This stage is the responsibility of the planning authority which is informed by a Natura Impact Statement. This stage is required where uncertainty of effect arises, or a potential effect has been defined which requires further procedures/ mitigation to remove uncertainty of a defined impact.

Stage Three: Assessment of Alternative Solutions – the process which examines alternative ways of achieving the objectives of the project or plan that avoid adverse impacts on the integrity of the European Site; and

Stage Four: Assessment Where Adverse Impacts Remain – an assessment of compensatory measures where, in the light of an assessment of Imperative Reasons of Overriding Public Interest (IROPI), it is deemed that the project or plan should proceed.

This AA Screening considers likely effects on European Sites of the project either alone or in combination with other plans and/or projects and considers whether these effects are likely to be significant.

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2 SCREENING FOR APPROPRIATE ASSESSMENT

2.1 INTRODUCTION TO SCREENING

This stage of the process identifies whether there is the potential for significant impacts upon designated European Sites from the proposed project, either alone or in combination with other projects or plans. The screening phase was progressed in the following stages. A series of questions are asked during the Screening Stage of the AA process in order to determine:

- An Appropriate Assessment 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.
- An Appropriate Assessment aims to identify, in view of best scientific knowledge, all aspects of the proposed development which either individually or in-combination with other plans or projects would adversely affect the integrity of a European Site.

An important element of the AA process is the identification of the 'Qualifying Interests' of European Sites requiring assessment. Qualifying Interests are the habitats and species for which each European Site has been designated and afforded protection. It is also vital that the threats to the ecological / environmental conditions that are required to support Qualifying Interests are considered as part of the assessment. Site specific conservation objectives have been designed to define favourable conservation status for a particular habitat or species at that site. According to the European Commission interpretation

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document 'Managing Natura 2000 sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC', paragraph 4.6(3) states:

"The integrity of a site involves its ecological functions. The decision as to whether it is adversely affected should focus on and be limited to the site's conservation objectives."

Favourable conservation status of a habitat is achieved when:

- Its natural range, and area it covers within that range, are stable or increasing;
- The specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future; and
- The conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats;
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

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2.2 DESCRIPTION OF THE PROPOSED DEVELOPMENT

2.2.1 Receiving Environment

The proposed development will be situated within the Bord na Móna landholding adjacent to the existing Drehid WMF. This area was previously used by Bord na Móna for commercial peat extraction.

There are no designated European Sites, i.e. Special Areas of Conservation (SACs) and Special Protection Areas (SPAs), located within the footprint of, or directly adjacent to, the proposed development.

Habitats on the proposed development site are typical of re-vegetating cutover bog, with heath/scrub/woodland habitats on a relatively well-drained portion of the overall Bord na Móna landholding. Habitats were classified in accordance with Fossitt (2000) '*A guide to habitats in Ireland. Heritage Council'*. Eight habitat classes and habitat mosaics (i.e. where a habitat consists of a mix of habitat classes) were determined including:

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- Drainage ditches (FW4);
- Wet heath (HH3);
- Bog woodland (WN7);
- Scrub (WS1);
- Bog woodland (WN7), Wet heath (HH3) / Scrub (WS1) mosaic;
- Wet heath (HH3) / Scrub (WS1) mosaic;
- Dry meadows and grassy verges (GS2); and
- Spoil and bare ground (ED2).

2.2.2 Project Overview

2.2.2.1 Summary of the existing Waste Management Facility

At present, the Drehid WMF comprises a permitted landfill, composting facility, administration area, car park, access roads, weighbridge, settlement lagoons and ancillary infrastructure. The landfill is currently permitted to accept municipal waste for disposal at the facility, which is limited to a maximum of 120,000 TPA until the end of the life of the currently permitted facility in 2028. The composting facility is currently permitted to accept a maximum of 25,000 TPA until 2028.

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In March 2013, following an Oral Hearing, Bord na Móna was granted planning permission for the development of a Mechanical Biological Treatment (MBT) facility which would primarily accept and process municipal solid waste (MSW) and provided for an overall capacity of 250,000 tonnes per annum (TPA). MBT, through a combination of mechanical processing and biological treatment (such as composting and anaerobic digestion), reduces the volume of waste which requires treatment by disposal in landfill or incineration. To date, this facility has not been constructed.

2.2.2.2 Summary of the Proposed Development

The proposed development requires planning permission and a revised EPA licence to facilitate the following works:

- Changes to the volume and nature of wastes to be accepted at the landfill disposal facility;
- Development of additional Non-Hazardous and a new Hazardous Landfill capacity to provide for sustainable landfill of these waste streams for a period of twenty-five years;
- Pre-treatment or processing of certain waste streams prior to landfill;
- Increasing the volume of waste to be accepted at the composting facility and the removal of the restriction on the operating life of the composting facility contained in Condition 2(2) of ABP Ref No. PL.09.212059;
- On-site treatment of leachate; and
- Development of associated buildings, plant, infrastructure and landscaping.

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As well as the existing permission for the disposal of non-hazardous municipal solid waste, it is proposed to provide capacity for the sustainable landfill of 250,000 TPA of non-hazardous wastes including incinerator bottom ash (IBA), construction and demolition (C&D) waste including soil and stone and stabilised waste arising from the biological treatment of the biodegradable fraction of municipal waste. It is also proposed that provision will be made for the onsite recovery of approximately 15,000 TPA of metals prior to landfilling of the residual IBA.

In addition, it is proposed that capacity be provided, for a period of 25 years, for the pre-treatment (where required) and sustainable landfill of 85,000 TPA of hazardous wastes, including incinerator fly ash, flue gas treatment residues, contaminated soil and asbestos, as well as other hazardous waste streams which are currently exported from this country and subsequently landfilled. It is also proposed to construct a facility for the pre-treatment/solidification of the fly ash and flue gas treatment residues prior to landfilling.

Additional Non-Hazardous Landfill Capacity and Pre-Processing

Non-Hazardous Landfill

Capacity

The proposed capacity of the Non-Hazardous Landfill is 250,000 TPA for 25 years. On the basis of the density of the material and including cover material it is envisaged that there is a requirement for c.200,000 m^3 of landfill capacity each year for the 25 years. This equates to 5,000,000 m^3 or 6,250,000 tonnes over the 25-year life.

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Footprint

The footprint is envisaged to be 20.9 hectares (ha).

Height

The final maximum waste level is expected to be 115.75 mOD. The surrounding ground is in the region of 84-85 mOD.

Operation

It is envisaged that the Non-Hazardous Landfill will operate for a period of 25 years. The landfill will be divided into 12 phases of approximately equal volume. Each phase will cater for approximately 2.5 years waste.

The operation of each phase will be as follows:

- Construction 0.5 year
- Operation 2.5 years

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- Capping 2 years

Incinerator Bottom Ash Processing Facility

IBA is the non-combustible material left over after incineration of municipal solid waste. This material is collected at the end of the grate of a Waste to Energy plant. Depending on the waste being incinerated, IBA can contain varying quantities of glass, ceramics, brick, concrete and metals in addition to clinker and ash.

The IBA Processing Facility includes a waste reception and maturation area and a metal recovery building. A combination of screening and metal separation technology within the IBA Processing Facility will separate ferrous and non-ferrous metals from the IBA itself. Ferrous and non-ferrous metals can be recovered from this material, the quantity which can be recovered being approximately 10% by weight. The metals will then be exported from the site for recycling. Residual IBA will then be placed into a vehicle and transported internally within the site to the Non-Hazardous Landfill, included as part of this proposed development, for disposal.

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Operation

Covered HGVs will deliver the IBA to the Processing Facility. Vehicles will reverse up to the maturation area where they will deposit the IBA material. The delivery vehicle will then leave site via the wheel wash and weighbridge and the material will be moved into the storage bay stockpiles by front wheel loader.

The maturation area will be covered to prevent an increase in moisture content, resulting from precipitation; however, it is also left open at the sides and ends to allow an airflow through the maturation area.

At the end of the designated maturation period the maturation bays are unloaded by front wheel loaders and the matured IBA will be transferred to the IBA processing building, where it will undergo numerous steps to remove metals.

Hazardous Landfill Capacity and Pre-processing

Hazardous Waste Landfill

Capacity

The proposed capacity of the Hazardous Landfill is 85,000 TPA for 25 years. On the basis of the density of the material and including cover material it is envisaged that there is a requirement for 79,000 m^3 of landfill capacity each year for the 25 years. This equates to 1,980,000 m^3 or 2,125,000 tonnes over the 25-year life.

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Footprint

The footprint is envisaged to be 10.8 ha.

Height

The final maximum waste level is expected to be 115.75 mOD. The surrounding ground is in the region of 84-85 mOD.

Operation

It is envisaged that the Hazardous Landfill will operate for a period of 25 years. The landfill will be divided into 10 phases of approximate equal volume. Each phase will cater for approximately 2.5 years waste. The operation of each phase will be as follows:

- Construction 0.5 years
- Operation 2.5 years
- Capping 2 years

Hazardous Waste Solidification Facility

The Hazardous Waste Solidification Facility provides pre-treatment to fly ash and flue gas treatment residues in advance of disposal in the Hazardous Landfill facility. The solidification plant will include the following:

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- Process building:
  - Waste reception bays – 4 number
  - Process area with a mixing unit and a weighing scales
  - Solidified material outgoing bay
- External storage silos to store waste materials awaiting solidification
- External storage silos to store ground material (Cement)
- External bunded acid tanks
- External bunded leachate storage tank

The solidification process is carried out in a fully enclosed building with rapid closing doors.

Operation

Enclosed bulk silo trucks will deliver the waste, in powder form, to the facility where it will drive into the building and the contents will be pumped into the storage silos, by a fully enclosed piped system. The truck will then leave site via the wheel wash and weighbridge.

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From the silos, the material is pumped to the mixing unit where it is combined with leachate/acid/water to predetermined ratios through an electronically controlled batch process where it is batched into the solidified material (which has a granular form). This material is then placed into a site vehicle and transported to the landfill for deposition. At no stage will the road tankers enter the landfill.

Composting Facility

This planning application proposes to increase the volume of waste to be accepted at the existing Composting Facility by 20,000 TPA from the currently permitted 25,000 TPA (without the need for any physical development) and to remove the restriction on the operating life of this facility, which is currently aligned with the municipal solid waste landfill life. In addition, it is proposed to extend the existing facility to provide for the acceptance of an additional 45,000 TPA. The latter will require an approximate doubling of the currently permitted footprint of this facility.

Capacity

The existing composing facility can cater for a waste acceptance of 45,000 TPA; the extended facility will also be able to accept 45,000 TPA.

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Footprint

The footprint of the extension to the composting facility is approximately 6,900 m^2.

Height

The height of the building is 12 m above ground level.

Operation

Once the extension is constructed and commissioned, it will operate within the licensed operating hours of the facility. The composting facility operates on a closed water balance and there is no excess leachate generated within it.

Proposed Site Infrastructure

The following infrastructure will form part of the application:

Site Access

The roads will be designed to cater for the HGV traffic. Appropriate drainage such as filter drains will be provided. High risk areas will be positively drained and passed through oil interceptors in accordance with PPG3 [1] guidance.

[1] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/485175/pmho0406biyl-e-e.pdf

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Roads and parking areas will typically be designed as bituminous macadam pavements or, where appropriate, as concrete pavements. Concrete hardstand areas will be provided at the waste reception areas (hazardous, non-hazardous and composting) and the fuel storage area.

Water Supply

There will be a requirement for water supply for toilets, sinks, fire-fighting, process water, wash-down etc. There is currently a water supply borehole on site and it is proposed to use this in conjunction with surface water collected in on-site attenuation lagoons. Water for potable use will be provided from bottled water imported to the site.

Waste Control Area and Weighbridges

A designated area for management of all waste vehicles delivering to the site has been provided; this will incorporate truck parking, waste control building and weighbridges.

Leachate and Process Waste Water Infrastructure

Predicted leachate volumes are provided in Table 2.1 and 2.2.

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Table 2.1 Estimated Average Rates of Leachate Generation from Non-Hazardous Landfill

Year	Annual	Daily	
	Volume m^3	Volume m^3	
2020	4,671.73	12.80	Year 1
2021	11,010.13	30.16	Year 2
2022	18,933.13	51.87	Year 3
2023	22,102.33	60.55	Year 4
2024	14,971.63	51.87	Year 5
2025	22,197.33	60.81	Year 6
2026	15,256.63	52.65	Year 7
2027	22,577.33	61.86	Year 8
2028	15,636.63	53.69	Year 9
2029	22,957.33	62.90	Year 10
2030	16,016.63	54.73	Year 11
2031	23,337.33	63.94	Year 12
2032	16,396.63	55.78	Year 13
2033	23,717.33	64.98	Year 14
2034	16,776.63	56.82	Year 15
2035	24,097.33	66.02	Year 16
2036	17,156.63	57.86	Year 17
2037	24,477.33	67.06	Year 18
2038	17,536.63	58.90	Year 19
2039	24,857.33	68.10	Year 20
2040	17,916.63	59.94	Year 21
2041	25,237.33	69.14	Year 22
2042	18,296.63	60.98	Year 23
2043	25,617.33	70.18	Year 24
2044	12,338.23	44.66	Year 25
2045	14,987.20	41.06	Year 26
2046	4,085.00	11.19	Year 27
2047	4,465.00	11.71	Year 28
2048	4,560.00	12.23	Year 29

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Table 2.2 Estimated Average Rates of Leachate Generation from Hazardous Landfill

Year	Annual Volume m^3	Daily Volume m^3	Year
2020	4,237.17	11.61	Year 1
2021	7,292.28	19.98	Year 2
2022	7,407.48	20.29	Year 3
2023	7,522.68	20.61	Year 4
2024	7,637.88	20.93	Year 5
2025	7,753.08	21.24	Year 6
2026	7,868.28	21.56	Year 7
2027	7,983.48	21.87	Year 8
2028	8,098.68	22.19	Year 9
2029	8,213.88	22.50	Year 10
2030	8,329.08	22.82	Year 11
2031	8,444.28	23.14	Year 12
2032	8,559.48	23.45	Year 13
2033	8,674.68	23.77	Year 14
2034	8,789.88	24.08	Year 15
2035	8,905.08	24.40	Year 16
2036	9,020.28	24.71	Year 17
2037	9,135.48	25.03	Year 18
2038	9,250.68	25.34	Year 19
2039	9,365.88	25.66	Year 20
2040	9,481.08	25.98	Year 21
2041	9,596.28	26.29	Year 22
2042	9,711.48	26.61	Year 23
2043	9,826.68	26.92	Year 24
2044	9,941.88	27.24	Year 25
2045	2,822.40	7.73	Year 26
2046	2,822.40	7.73	Year 27
2047	2,822.40	7.73	Year 28
2048	2,822.40	7.73	Year 29

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The proposed leachate treatment plant design is based on a modified version of the Sequencing Batch Reactor (SBR) aerobic biological treatment process, which has been applied successfully to the treatment of many hundreds of similar leachates during the last four decades. The process is described in detail in Chapter 3 of the EIAR, but comprises aerobic and anoxic phases of treatment, with incorporation of ultrafiltration membranes for separation of biological solids from a very clear final effluent. A process schematic for the leachate WWTP, with a photo of a similar installation are presented in Figures 2.1 and 2.2.

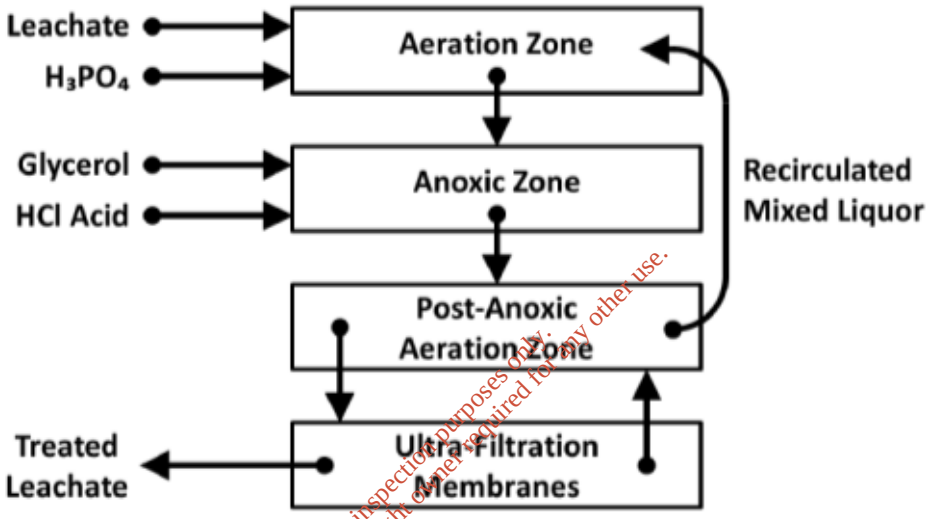

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Figure 2.1 Process schematic of design adopted for full nitrification and denitrification of leachates

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Figure 2.2 Typical Layout of Leachate Treatment Facility

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The treated leachate will then be transported off site by road tankers, for safe disposal at an approved Irish Water WWTP such as Osberstown WWTP for final treatment and disposal (with Leixlip and Ringsend WWTPs as backup). It is noted that the maximum volume of leachate would constitute less than 1% of the hydraulic load at the inlet to this WWTP, as the leachate will be pre-treated at the Drehid WMF, it is not expected that the proposed volumes of treated leachate will have any effect on the WWTP.

Maintenance Building

The Maintenance Building will be constructed as a steel portal framed structure with a proprietary cladding and incorporating roller shutter doors. Internally the floors will be reinforced concrete floor slabs. This building will be fitted with secure storage areas to accommodate power tools, other small plant and equipment. A proprietary bunded container, compliant with EPA requirements, will be provided for the storage of hydraulic and engine oils. The building will be supplied by 3-phase power and will include both security and fire alarm systems.

It is proposed to provide a laboratory in the Maintenance Building which will allow for the carrying out of the routine monitoring requirements at the site.

Haulage Routes

There are a number of haulage routes proposed for HGVs accessing the facility which are discussed in Chapter 10 and outlined in Figure 10.1 of the EIAR. Seven of these haul routes have previously been permitted for use in accordance with the existing facility, although two routes (Haul Route No.'s 1.1 and 2) are not currently permitted due to weight restrictions across Caragh Bridge on the R409. There are

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four new proposed haulage routes as outlined in Section 10.2.2 of the EIAR and as delineated on Figure 10.1 of the EIAR. The first additional proposed route is along the R407 running into the R408 from Junction 8 on the M4 to Prosperous. The second additional proposed route is along the R406 which leads onto R403 from Junction 7 on the M4 to Clane. The third additional proposed route is along the R415 from Junction 13 on the M7 to the R416 at Milltown. The fourth additional proposed route runs south of Enfield starting at the roundabout on the R148 and Johnstown Road, continuing along the R148 to its signalised junction with the R402. The proposed haul routes will use existing national and regional road infrastructure to access the site.

The proposed development will result in an overall increase in traffic on the haul routes during the construction and operational phases with the highest increase in traffic volume occurring where the haul routes converge on the R403 north and south of the entrance to the Drehid WMF. Based on recent traffic surveys carried out at the existing facility (May, June, September and October 2016), the existing operational traffic distribution from the site entrance is typically 33% to the north and 67% to the south.

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2.3 DESKTOP STUDIES

In October 2018, the ecological desktop study completed for the proposed development comprised the following elements:

- Identification of designated European Sites within the zone of influence of the proposed development, e.g. a European site can be considered within the zone of influence of a site if it, inter alia, is hydrologically connected to the proposed development;
- Review of the NPWS site synopsis and conservation objectives for designated European Sites with identification of potential pathways from the proposed development;
- Review of records of rare and protected flora and fauna including information obtained from an NPWS data request, and those available in NPWS reports and on the National Biodiversity Data Centre (NBDC) website;
- A review of available EPA water quality reports and mapping [2] and Water Framework Directive [3] Water Quality data;
- Review of Ordnance Survey maps and aerial photography in order to determine broad habitats that occur within the study area; and
- Review of any other relevant ecological reports and literature including previous EIS reporting (TOBIN, 2008; TOBIN, 2012) for previous developments adjacent to the site.

[2] http://gis.epa.ie/Envision/
[3] http://www.wfdireland.ie/

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2.4 CONSULTATION

Consultation letters were sent to relevant statutory bodies and other relevant organisations on the 10th June 2016. All project consultation is detailed in Chapter 1 of the EIAR and all responses received are presented in Appendix 1.2 of the EIAR. Consultation regarding the site and proposed development was also undertaken with Bord na Móna's Ecology Team. Consultation responses specifically regarding ecology are outlined in Table 2.3. All relevant consultation responses have been fully taken into account in preparing this report.

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Table 2.3 Summary of Consultees Responses of Specific Relevance to AA

Consultee	Summary of Consultee Response
Environmental Protection Agency	The main points raised by the EPA include the following: • LandSim modelling will be required for the geological / groundwater assessment • EPA will consider whether the current proposal is a review of the existing licence or will require a new licence application • Components of basal liner proposed, particularly for the proposed hazardous waste element of the landfill will be critical • The submission for a licence review / application can only be made following acknowledgement by An Bord Pleanála of the submission of the planning application • Revised CRAMP and ELRA will be required
Department of Arts, Heritage and Gaeltacht; Correspondence to NPWS	No response from NPWS Development Application Unit was issued correspondence. Response received from National Monuments but none from NPWS.
Irish Water	The scoping response from Irish Water included the following: • Impacts of the development on the capacity of water services (do existing water services have the capacity to cater for the new development if required). • Any up-grading of water services infrastructure that would be required to accommodate the development. • In relation to a development that would discharge trade effluent - any upstream treatment or attenuation of discharges required prior to discharging to an IW collection network • In relation to the management of surface water; the potential impact of surface water discharges to combined sewer networks & potential measures to minimise/stop surface waters from combined sewers • Any physical impact on IW assets - reservoir, treatment works, pipes, pumping stations, discharges outfalls etc. including any relocation of assets • Any potential impacts on the assimilative capacity of receiving waters in relation to IW discharge outfalls including changes in dispersion /circulation characteristics

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Consultee	Summary of Consultee Response
	• Any potential impact on the contributing catchment of water sources either in terms of water abstraction for the development (and resultant potential impact on the capacity of the source) or the potential of the development to influence/ present a risk to the quality of the water abstracted by IW for public supply. • Where a development proposes to connect to an IW network and that network either abstracts water from or discharges waste water to a "protected"/sensitive area, consideration as to whether the integrity of the site/conservation objectives of the site would be compromised. • Mitigation measures in relation to any of the above
An Taisce	None received
The Heritage Council	None received
Coillte	The scoping response from Coillte includes the following: • The proposed area adjoining Coillte properties to be fenced off to protect the forest properties. • Any streams/rivers or watercourses leaving the purposed area flowing, into Coillte properties, to be protected against any pollutants entering the water. • A monitoring programme to protect against fly tipping.
Irish Peatland Conservation Council (IPCC)	The scoping response from IPCC includes the following: • IPCC object to any development that has potential to damage a wetland habitat. • Within the land holding of this development a number of sites have been highlighted through the Bog Allen Habitat and Heritage Survey, Kildare Wetland Survey and by the Bord na Móna Ecology Team. • These sites need to be screened in the EIA and protected. • IPCC urge you to contact the Bord na Móna ecology team who have done extensive survey work. • The IPCC would also appreciate a copy of the EIS on completion.
GSI	None received
BirdWatch Ireland	None received
Teagasc	None received
Irish Wildlife Trust	None received
Irish Native Woodland Trust	None received

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Consultee	Summary of Consultee Response
Inland Fisheries Ireland (IFI)	On the 15th of February 2018 IFI raised concerns relevant to the proposed development and lands within the applicant's control and consequent impacts on the overall River Barrow and River Nore SAC catchment.

2.5 FIELD STUDIES

A series of site visits have been conducted for the current planning application for approval. Ecological site surveys for the current planning application were carried out on the 1st, 2nd, 17th, 24th and 27th of June 2016 and on the 9th August 2016 to collect survey data as part of the ecological impact assessment for the proposed development.

During the surveys, particular attention was given to the possible presence of habitats and/or species which are legally protected in Ireland under European legislation and which may be associated with designated European Sites. Potential pathways for effects on designated European Sites at a distance from the development footprint were also investigated. Digitised field maps with aerial imagery and electronic data recording using ArcGIS Online were utilised in the field to ensure accurate location and extents of ecological features of interest.

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2.5.1 Terrestrial Habitats and Flora

The habitat survey was conducted within the redline boundary and took in adjacent land in accordance with The Heritage Council's methodology '*Best Practice Guidance for Habitat Survey and Mapping*' (Smith *et al.*, 2011). Habitats were classified according to The Heritage Council's *A Guide to Habitats in Ireland* (Fossitt, 2000) and following the EU *Habitats Interpretation Manual for Annex 1 Habitats*. Plant identification and nomenclature principally follows Webb *et al*. (1996) [4]. Grass and fern identification and nomenclature was further assisted by Rose (1989) [5]. The predominant plant species for each habitat type were recorded in order to accurately determine habitats present on the site.

2.5.2 Terrestrial Fauna

Mammal surveys involved recording sightings, tracks and signs (droppings, resting places, burrows/setts/dens) of mammal species during site walkover surveys. Survey guidelines for protected species followed NRA (2009) '*Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes*'. Sightings of invertebrates, reptiles and amphibians were also recorded. Areas of the plant Devil's-bit scabious *Succisa pratensis* were evaluated as habitat potential

[4] Webb, Parnell & Doogue (1996). *An Irish Flora*.
[5] Rose (1989) Colour Identification Guide to the Grasses, Sedges, Rushes and Ferns of the British Isles and north-western Europe.

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for the Annex II listed Marsh fritillary butterfly. Potential for bat roosts to occur was also included in the site evaluation.

2.6 IDENTIFICATION OF RELEVANT EUROPEAN SITES

An initial distance of 15 km from the proposed site boundary was used for consideration of designated European Sites in accordance with the Department of Environment, Heritage and Local Government guidance (DoEHLG, 2010). Figure 2.3 identifies the designated relevant European Sites. European Sites in excess of 15 km with potential linkages to the proposed development were screened for potential impacts using the source-pathway-receptor model, taking account of the conservation objectives for these designations. Designated European Sites within the zone of influence of the proposed development are listed in Table 2.4 and further detailed, including the Qualifying Interests of each site, in Table 2.5. There are no designated European sites within the footprint of the proposed development; nor are there any sites directly adjacent to the site boundary.

Table 2.4 European Sites within the Zone of Influence and an approximate distance from the proposed development

European Site	Approx. distance (km)
Ballynafagh Bog SAC (000391)	5.9
Ballynafagh Lake SAC (001387)	5.9
The Long Derries, Edenderry SAC (000925)	7
Moulds Bog SAC (002331)	11.1
Pollardstown Fen SAC (000396)	13.9
River Boyne and River Blackwater SAC (002299)	14.4
River Boyne and River Blackwater SPA (004232)	14.4
River Barrow and River Nore SAC (002162)	22.6

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The closest European Sites, Ballynafagh Lake SAC and Ballynafagh Bog SAC, are located approximately 6 km south east of the proposed development.

Ballynafagh Lake SAC, is an artificial lake/reservoir and feeder canal, constructed as part of the Grand Canal, and is located >5.8 km south east of the proposed development. Since the closure of the feeder canal, much of the open water of the reservoir and canal has transitioned to drier vegetation with natural infilling and revegetation occurring.

Although no physical restoration management actions such as drain blocking have been carried out at Ballynafagh Bog, the NPWS has engaged in negotiation with landowners. Some turbary and ownership

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rights have been bought and this has contributed to the fact that peat cutting no longer takes place at Ballynafagh Bog.

Consideration has also been given to the potential impact on European Sites of additional traffic generated by the proposed development on the existing road network in the proximity of the site. As noted in Section 2.2.2.2, the highest increase in traffic volumes (and as a result traffic related air and noise emissions) will occur along the R403 closest to the site entrance before traffic is further distributed along the proposed haul routes. On this basis, consideration has been given to the potential impact of increased traffic related emissions on Ballynafagh Lake SAC (which passes under the R403) and Ballynafagh Bog SAC.

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Mount Hevey Bog SAC

River Boyne and River Blackwater SAC

Rye Water Valley/Carton SAC

The Long Derries, Edenderry SAC

Ballynafagh Lake SAC

Ballynafagh Bog SAC

Ballynafagh Lake SAC

Mouds Bog SAC

Red Bog, Kildare SAC

Pollardstown Fen SAC

Poulaphouca Reservoir SPA

River Barrow and River Nore SAC

River Barrow and River Nore SAC

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Legend

- Site Boundary
- Bord na Móna Ownership Boundary
- 15 Km Buffer

Protected Sites

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

0 2.5 5
Kilometres

NOTES

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING
2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE
3. ENGINEER TO BE INFORMED OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES
4. ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

Rev A	NOV'18	AA Issue	F.H.	R.H
Issue	Date	Description	By	Chkd.

Client: BORD NA MÓNA Naturally Driven

Project: PROPOSED DEVELOPMENT AT DREHID WASTE MANAGEMENT FACILITY

Title: Designated Eurpoean Sites within 15 kilometre study area and wider potential zone of influence

Scale @ A3: 1:130,000

Prepared by:	Checked:	Date:
F.Healy	A. Austin	December 2017

Project Director: D.Grehan

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Rev: A

Figure 2.3

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2.7 POTENTIAL SIGNIFICANT EFFECTS ON EUROPEAN SITES

This section documents the final stage of the screening process. It is vital that an assessment of potential source-pathway-receptor links is undertaken to assess potential impact links between the receptor (European Sites) and source (Proposed Development) to establish the risk of any likely significant effects. This section uses the information collected on the sensitivity of the Qualifying Interests of each European Site and describes any likely significant effects from the construction, operation, demolition and decommissioning works arising from the proposed development.

As noted previously in Section 1.3, it is not appropriate, at this screening stage, to take account of the protective measures proposed as part of the proposed development which are intended to avoid or reduce the harmful effects of a plan or project on European Sites.

The site synopses for each of the European Sites considered below are included in Appendix A.

2.7.1 Potential for Direct Impacts

As stated previously, there are no designated European Sites within the footprint of the proposed development nor are there any European Sites directly adjacent to the site boundary.

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The closest European sites, Ballynafagh Bog SAC and Ballynafagh Lake SAC, are located approximately 6 km south-east of the proposed development. With respect to the qualifying interests of these designations (as detailed in Table 2.5) and taking account of the separation distance between the proposed development and these sites, there is no potential for direct impacts on these European Sites including from traffic related emissions on the haul routes.

Similarly, on account of the separation distance and a lack of connectivity between the proposed development and the remaining designated sites identified within the zone of influence in Table 2.5, there is no potential for direct impacts on these European Sites, i.e. no substantiated link for direct effects exist between these European Sites and the proposed development. Therefore, the construction and operation of the proposed development will not directly impact on a designated site.

2.7.2 Potential for Indirect Impacts

Potential indirect impacts arising from the proposed development are identified with respect to the Source-Pathway-Receptor Model. Taking account of the size and scale of the proposed development, as well as the distance to the nearest designated European Site, a number of the pathways for potential indirect impacts have been screened out, as discussed below.

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2.7.2.1 Construction Phase

2.7.2.1.1 Potential Emissions

Dust and water quality perturbations associated with construction activities have the potential to impact upon ecologically sensitive waterways and species in the vicinity of the development. Local waterways which have pollutants released into them can act as vectors of pollution to downstream areas. Construction activities could potentially lead to the release of large amounts of suspended solids/ silt laden run-off, pollutants (hydrocarbons) and/ or alter surface water pH within the European Sites.

2.7.2.2 Operational Phase

2.7.2.2.1 Potential Emissions

Non-Hazardous Landfill

- Foul water – leachate will be generated from active phases;
- Air – There is also the potential for dust emissions from the landfill as well as traffic and equipment related air emissions; and
- Noise – there is the potential for noise emissions from delivery vehicles, waste placement vehicles, excavators and dozers.

Incinerator Bottom Ash Processing Facility

- Surface water – it is not anticipated that there will be any waste water generated through the process, with the exception of occasional wash down water and any runoff from the maturation area;
- Air – there is the potential for air quality impacts to result from the proposed development, particularly related to onsite machinery; and
- Noise – there is potential for noise emissions from delivery vehicles, mechanical equipment in the process – conveyors, screens, magnets, collection vehicles for by-products, vehicles for transferring residual bottom ash to landfill.

Hazardous Waste Landfill

- Foul water – leachate will be generated from active phases;
- Air – there is also the potential for dust emissions from the landfill as well as traffic and equipment related air emissions; and
- Noise – there is potential for noise emissions from delivery vehicles of waste from solidification area, waste placement equipment – excavators and dozer.

Ash Solidification Facility

- Surface water – run-off from the yard around the facility;

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- Air – there is also the potential for dust and ash emissions from the ash solidification facility as well as traffic and equipment related air emissions; and
- Noise – there is potential for noise emissions from delivery vehicles, pumps for transferring material to silos, vibrators on the silos, mixing plant and batching of solidified waste.

Composting Facility

- Foul water – leachate will be generated in the facility which will be recycled for reuse within the composting process, as per current procedures;
- Air – there is the potential for quality impacts to result from the proposed development, particularly related to onsite machinery; and
- Noise – there is potential for noise emissions from fans, loading shovels, HGV waste vehicles and mechanical equipment such as conveyors, shredders.

Proposed Site infrastructure

- Surface water – run-off from hard stand and parking areas within the site, e.g. potentially containing fuel.

Waste Control Area and Weighbridges

- Surface water – run-off from hard stand and parking areas within the site, e.g. potentially containing fuel;
- Air – there is potential for air quality impacts, particularly related to waste vehicle operation; and
- Noise – there is potential for noise emissions from HGV waste vehicles – slow moving/starting and stopping.

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Leachate and Process Waste Water Infrastructure

- Surface water – run-off from hard stand areas;
- Foul water – from loading areas;
- Air – Point source gaseous emissions are only likely at the raw leachate balance tanks; and
- Noise – there is potential for noise emissions from aerators/pumps in the treatment process and from HGV tankers required for collection of stored treated leachate.

Maintenance Building

- Surface water – run-off from hard stand areas;
- Air – there will be no significant air or dust emissions from this element of the proposed development, given that machinery will not be in operation while in the maintenance building; and
- Noise – there is potential for noise emissions from typical workshop equipment including compressors, hoists, drills etc.

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Haulage Route

- Air – there will be an increase in emissions to air generated from additional traffic on the road as a result of the proposed development; and
- Noise – there will be an increase in noise emissions from the additional road traffic generated by the proposed development.

2.7.2.3 Impact Assessment

Dust: Depending on the particle size and weather conditions, fine particles (<10 µm) of dust generally travel up to 1 km, although ultrafine particles (< 2.5 µm) can travel further [6]. It is noted in the DoEHLG (2004) Quarry guidelines that the most severe dust conditions are likely to be experienced within about 100 m of the dust source, with potential effects extending 0.5 km from the source [7]. Therefore, on the basis of best scientific knowledge no link exists between the proposed development and any European Site given the nearest designated European Site is approximately 6 km south east of the proposed development, i.e. the European Sites are too far away to be affected. Therefore, significant effects can be excluded as a result of dust during either the construction or operational phase.

Air Quality: All vehicles accessing the proposed development will use the existing regional and national road network on which there is considerable existing traffic. The increase in vehicle emissions to air from the additional traffic that will be generated by the proposed development will not impact on the qualifying interests of Ballynafagh Lake SAC (Alkaline Fens, Desmoulin's Whorl Snail or Marsh Fritillary). The (qualifying interest) habitats of the Ballynafagh Bog SAC have been identified as being susceptible to air quality impacts. Nitrogen deposition is stated as a risk factor for active raised bogs, as per the conservation objectives of the SAC. The section of R403 at the entrance to the proposed development is where all vehicles will access the site and this location is therefore considered to be subject to the highest levels of vehicular exhaust emissions. The separation distance between the proposed development and the Ballynafagh Bog SAC at this location exceeds the threshold distance for air quality assessment [8]. Therefore, no link exists between this section of the R403 and the SAC, therefore significant effects can be excluded from further consideration.

Noise: Given that habitats are not impacted by noise disturbance, the only designated European Sites containing qualifying interests potentially disturbed by noise impacts are the River Boyne and River Blackwater SAC and SPA (designated for otter and kingfisher as well as protected habitats), which are location over 14 km away. Otter are considered to be impacted by the noise and the activity of machinery

[6] http://www.ltu.se/cms_fs/1.85152!/file/3.3%20Dust%20from%20Landfill%202%200%20.pdf
[7] http://www.housing.gov.ie/sites/default/files/migratedfiles/en/Publications/DevelopmentandHousing/Planning/FileDownLoad,1606,en.pdf
[8] TII (2011) Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes.

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at a distance of 150 m [9], while birds that are sensitive to disturbance may be disturbed at 750 m away [10]. On the basis of the separation distance between the proposed the development (including the convergence of the haul routes) and the nearest relevant European Site, no links exist; therefore, significant effects can be excluded.

Surface water: Uncontrolled emissions of pollutants such as silt and fuel in road run-off to sensitive surface water-dependant receptors (e.g. river or lake habitats) can lead to significant impacts to SACs or SPAs.

All surface water from the proposed development will drain to the Cushaling River, which is a tributary of the Figile River. The existing access road from the R403 to the Drehid WMF passes through the sub-catchment of the Abbeylough River, which is also a tributary of the Figile River. The Figile River is a sub-catchment of the River Barrow. Chapter 7 of the EIAR provides further details on the local and regional hydrology.

The River Barrow and River Nore SAC is hydrologically linked to the proposed development. This SAC is located more than 22 km from the proposed development over land and this distance increases when the meandering nature of the hydrological links is considered. However, significant impacts to the SAC cannot be conclusively ruled out as a pathway for potentially significant effects exists i.e. uncontrolled emissions of pollutants from the proposed development to sensitive surface water-dependant receptors (e.g. river or lake habitats) could lead to significant effects to this SAC. Surface water pollutants may include foul water, leachate, silt/grit, fuel/oil and other surface run-off from the proposed development infrastructure. The predicted potential increase in concentrations of suspended solids, and the possible occurrence of hydrocarbons, in surface run-off and/or an alteration of pH, could affect the quality of the receiving watercourses. The predicted decline in water quality would likely have an effect on populations of the following species including inter alia: Atlantic salmon, lamprey spp. (sea, Brook and river lamprey) and freshwater pearl mussel spp. (*Margaritifera margaritifera* and *Margaritifera durrovensis*) within the SAC. Threats to these species include siltation, eutrophication (from an excess of nutrients) and diffuse pollution. Furthermore, a reduction in water quality is likely to reduce the availability of prey for otter within the SAC. Therefore, it cannot be excluded that the proposed development is likely to have a significant effect on the River Barrow and River Nore SAC and thus it is necessary to proceed to Stage 2 Appropriate Assessment.

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[9] National Roads Authority (NRA) (2008b). Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes
[10] Scottish Natural Heritage (2016) Dealing with construction and birds.

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Ballynafagh Lake SAC, an artificial lake/reservoir, constructed as part of the Grand Canal feeder system is located c. 5.9 km south east of the proposed development, and influenced by the local geology and hydrogeology in the immediate vicinity of the lake. The Blackwood Feeder links the Ballynafagh Lake SAC to the Grand Canal and runs approximately 5 km south to the Grand Canal. In the vicinity of the site, the habitat here can be described as broadleaved woodland. Ballynafagh Lake SAC contains important wetland features and populations of the Marsh Fritillary butterfly. Populations of the snail, *V. moulinsiana* occur in the SAC. A survey of the lake around 2010 assessed the snail population in the SAC as 'unfavourable declining' after being 'favourable' in 2007. This is due to 'natural' drying out of the lake which is changing the local hydrology – changes which the snail is exceptionally sensitive to (Moorkens & Killeen, 2011). The proposed development is not hydrologically linked to Ballynafagh Lake (i.e. there is no connecting river or stream), therefore significant effects on the European Sites can be excluded from further consideration.

Groundwater: Ballynafagh Lake is influenced by the local geology and hydrogeology in the immediate vicinity of the lake. A review of surface water drainage patterns, topography, soils and bedrock indicates that Ballynafagh Lake is fed from surface water and a number of small springs which rise in the northeast of the lake. This was confirmed during a walkover at Ballynafagh Lake in June 2007 and November 2011 where groundwater was seen to discharge to deep drainage ditches to the northeast of the lake. The source area of the springs to the lake are up-gradient lands to the north, northeast and east of the lake. It is not possible for groundwater at the proposed development site to flow to the lake. Ballynafagh Lake is in a separate catchment based on surface water patterns, soils and topography. A layout of the inferred groundwater contours (as presented in Figure 6.8 of the EIAR) is included in Appendix B.

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Uncontrolled emissions to groundwater impacting sensitive groundwater-dependant receptors (e.g. Fen habitats) can lead to significant impacts to SACs or SPAs. Given the groundwater flow in the site is towards the River Cushaling, it is not possible for the proposed development to impact on Ballynafagh Lake SAC. Detailed site investigations at the Drehid site confirms the relatively low permeability of the deep subsoils and Locally Important aquifer classification (as per www.gsi.ie) of the underlying geology at the Bord na Móna landholding. The localised nature of the cone of depression [11], generated by the pumping test, demonstrates the poor and localised nature of the permeability in the bedrock underlying the Bord na Móna landholding. In simple terms, the proposed development and Ballynafagh SACs are in separate catchments and the SAC is upstream of the development; therefore, there is no pathway for potential impacts. Therefore, significant effects on the European Site can be excluded.

[11] Groundwater capture zone to the borehole.

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Invasive species: Introduction and/or spread of non-native invasive species within the proposed development site, extending to roadside and designated European Sites can lead to significant impacts to SACs or SPAs. Those haul routes which are proposed to follow the R403, will pass less than 200 m south of Ballynafagh Bog SAC. Further haul routes pass 1 km east of Moulds Bog SAC and less than 200 m north of Pollardstown Fen SAC along the R416. Ballynafagh Bog is at least 6 km from the proposed development via the closest haul routes. Moulds Bog is approximately 13 km from the proposed development and Pollardstown Fen SAC is 16 km away via the closest haul routes respectively. No invasive species were identified during ecological field surveys. Given the distance of each SAC from the proposed development and the absence of invasive species on site, no links are considered to exist to these SACs, therefore significant effects on the European Sites can be excluded .

The potential for significant adverse effects with respect to pathways for impacts between the development and designated European Sites is presented in Table 3.3 below.

2.7.3 Potential In-Combination Effects

A review was carried out of the Kildare County Council Development Plan 2017-2023 in relation to existing plans and objectives of relevance to the assessment, as well as a planning review of the Kildare County Council planning website, and An Bord Pleanála website for any planning applications in the vicinity of the proposed development. No additional European Sites were identified for assessment when the proposed development was considered in-combination with these identified projects.

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The proposed Timahoe North Solar Farm will consist of a solar photovoltaic (PV) array and associated infrastructure, inverters, access roads and parking, site compounds and security fencing, amenity trails and landscaping, peat and subsoil storage areas (repositories), site drainage and all associated works. The proposed project will also include the construction of a 110 kV substation within the site with a battery storage compound adjacent this. It is then envisaged to connect from this substation to the Derryiron-Maynooth 110 kV overhead line that traverses the southern section of the Timahoe North site. This development has the potential to result in in-combination effects with the proposed development during the construction phase of the solar farm. The construction of the solar farm could result in the uncontrolled release of sediment laden water and hydrocarbons into local water courses.

The permitted Wilson Wright Solar Farm at Timahoe West consists of a solar PV panel array consisting of up to 66,000 m^2 of solar panels on ground mounted steel frames, 2 no. electricity control cabins, 10 no. inverter units, underground cable ducts, hardstanding area, boundary security fence site entrance. This development has the potential to result in in-combination effects with the proposed development during the construction phase of the solar farm. The construction of the solar farm could result in the uncontrolled release of sediment laden water and hydrocarbons into local water courses.

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The Drehid-Hortland cluster of the proposed Maighne Wind Farm was considered in terms of cumulative effects in the preparation and submission of the EIAR for the proposed development in December 2017. However, the proposed Maighne Wind Farm has since been refused permission and, therefore, is not considered further.

The existing Drehid WMF and permitted MBT Facility reduce the amount of land available for soakage of surface water on the land holding and potential exists for dust and silt to reach surface water bodies during times of high rainfall. In accordance with EPA licensing requirements, each of these developments are and will be required to limit and monitor emissions to air and water. Settlement lagoons are currently located at the existing facility to deal with all of the requirements for preliminary surface water treatment. However as noted previously, protective measures have not been considered during the screening stage of the assessment.

The discharges from the Timahoe South Bog surrounding the proposed development and other Bord na Móna bogs in the River Barrow catchment are currently and have been regulated and controlled by the EPA under the IPC Licensing process. In the short term, drains will continue to be maintained and cleaned (if required) to prevent silt run-off from the site during rehabilitation of the Bord na Móna bogs within the relevant River Barrow catchment. The existing boglands boundary drains and red line boundary drains will be maintained in the long term (post closure) to prevent flooding of the area inside the red line boundary. However, as previously stated, protective measures have not been considered during the screening stage of the assessment.

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The proposed development includes best practise construction phase protective measures, e.g. silt fencing. Similarly, the proposed development includes a wide range of protective measures which are designed to minimise the potential for waste material placed in the proposed landfills to have an impact on the soil and groundwater environmental during operation. These protective measures, which include inter alia a low permeability minimum 0.5 m deep compacted soil barrier, HDPE liner, leachate collection system and landfill capping, are considered an integral part of the proposed development and are intrinsic elements of an engineered landfill. However, protective measures have not been considered during the screening stage of the assessment. Without these typical protective measures, the possibility of significant effects cannot be excluded. In particular, there is potential for in-combination effects on surface water quality to result from the proposed development and the proposed Timahoe North Solar Farm, the consented Wilson Wright solar farm, the existing Drehid WMF, the Drehid MBT Facility and discharges from cutaway bog within the wider landholdings of Bord na Móna. These in-combination effects have the potential to be significant on the River Barrow and River Nore SAC.

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In conclusion an AA is required, given in-combination effects resulting from uncontrolled emissions from the proposed development and the proposed Timahoe North Solar Farm, the consented Wilson Wright solar farm, the existing Drehid WMF, the Drehid MBT Facility and discharges from cutaway bog within the wider landholdings of Bord na Móna cannot be excluded on the basis of objective information, without the consideration of protective measures.

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Table 2.5 Screening Impact Assessment of European Sites and their Qualifying Interests.

European Site	Qualifying Interests	Approx. distance (km)	Description of potential impacts from the proposed development	Potential for significant adverse effects, either alone or in-combination?
Ballynafagh Bog SAC (000391)	Active raised bogs [7110] Degraded raised bogs still capable of natural regeneration [7120] Depressions on peat substrates of the Rhynchosporion [7150]	5.9	Ballynafagh Bog is not linked hydrologically to the proposed development as the groundwater and site drainage flows west to the River Cushaling. Therefore, significant effects on the European Site can be excluded.	No pathways for potential significant adverse effects
Ballynafagh Lake SAC (001387)	Alkaline fens [7230] Vertigo moulinsiana (Desmoulin's Whorl Snail) [1016] Euphydryas aurinia (Marsh Fritillary) [1065]	5.8	Ballynafagh Lake is not linked hydrologically to the proposed development as the groundwater and site drainage flows west to the River Cushaling. Therefore, significant effects on the European Site can be excluded.	No pathways for potential significant adverse effects
The Long Derries, Edenderry SAC (000925)	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) [6210]	7	Terrestrial Qualifying Interest at a distance of 7 km in a separate river catchment. Therefore, significant effects on the European Site can be excluded.	No pathways for potential significant adverse effects
Moulds Bog SAC (002331)	Active raised bogs [7110] Degraded raised bogs still capable of natural regeneration [7120] Depressions on peat substrates of the Rhynchosporion [7150]	11.1	Moulds Bog is not linked hydrologically to the proposed development as the site drainage flows west to the River Cushaling Therefore, significant effects on the European Site can be excluded. Given the distance of the SAC from the proposed development and the absence of	No pathways for potential significant adverse effects

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European Site	Qualifying Interests	Approx. distance (km)	Description of potential impacts from the proposed development	Potential for significant adverse effects, either alone or in-combination?
			invasive species on site, no links exist to this SAC, therefore, significant effects on the European site can be excluded.	
Pollardstown Fen SAC (000396)	Calcareous fens with Cladium mariscus and species of the Caricion davallianae [7210] Petrifying springs with tufa formation (Cratoneurion) [7220] Alkaline fens [7230] Vertigo geyeri (Geyer's Whorl Snail) [1013] Vertigo angustior (Narrow-mouthed Whorl Snail) [1014] Vertigo moulinsiana (Desmoulin's Whorl Snail) [1016]	13.9	Pollardstown Fen is not linked hydrologically to the proposed development as the site drainage flows west to the River Cushaling away from this SAC. Therefore, significant effects can be excluded. Given the distance of the SAC from the proposed development and the absence of invasive species on site, no links exist to this SAC, therefore, significant effects on the European Site can be excluded.	No pathways for potential significant adverse effects
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] Lampetra fluviatilis (River Lamprey) [1099] Salmo salar (Salmon) [1106] Lutra lutra (Otter) [1355]	14.4	The River Boyne and River Blackwater is not linked hydrologically to the proposed development as the site drainage and groundwater flows west to the River Cushaling. Therefore, the Qualifying Interests for which this SAC is designated can be excluded from consideration of significant effects.	No pathways for potential significant adverse effects

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European Site	Qualifying Interests	Approx. distance (km)	Description of potential impacts from the proposed development	Potential for significant adverse effects, either alone or in-combination?
River Boyne and River Blackwater SPA (004232)	Kingfisher (Alcedo atthis) [A229]	14.4	The River Boyne and River Blackwater is not linked hydrologically to the proposed development as the site drainage flows west to the River Cushaling. Therefore, the Qualifying Interests for which this SAC is designated can be excluded from consideration of significant effects	No pathways for potential significant adverse effects
River Barrow and River Nore SAC (002162)	<u>Coastal Annex I Habitats</u> Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330] Mediterranean salt meadows (Juncetalia maritimi) [1410] <u>Terrestrial/Freshwater Annex I Habitats</u> Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260] European dry heaths [4030] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]	22.6	The proposed development includes protective measures which are considered an integral part of the development, e.g. the landfill capping and liner as per standard landfill design measures. However protective measures have not been considered during the screening stage of the assessment. Without these typical protective measures significant adverse effects cannot be excluded, e.g. uncontrolled emissions of pollutants from the proposed development to sensitive surface water-dependant receptors (e.g. river or lake habitats). Although the separation distance involved limits the potential for ecologically significant effects.	Yes

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European Site	Qualifying Interests	Approx. distance (km)	Description of potential impacts from the proposed development	Potential for significant adverse effects, either alone or in-combination?
	Petrifying springs with tufa formation (Cratoneurion) [7220] Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0] Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0] <u>Annex II Species</u> Vertigo moulinsiana (Desmoulin's Whorl Snail) [1016] Margaritifera margaritifera (Freshwater Pearl Mussel) [1029] Austropotamobius pallipes (White-clawed Crayfish) [1092] Petromyzon marinus (Sea Lamprey) [1095] Lampetra planeri (Brook Lamprey) [1096] Lampetra fluviatilis (River Lamprey) [1099] Alosa fallax fallax (Twaite Shad) [1103] Salmo salar (Salmon) [1106] Lutra lutra (Otter) [1355] Trichomanes speciosum (Killarney Fern) [1421] Margaritifera durrovensis (Nore Pearl Mussel) [1990]			

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2.8 SCREENING CONCLUSION

The proposed development is not located within, or directly adjacent to, any European Site. The Appropriate Assessment screening process considered potential impacts which may arise during the construction and operational phases of the proposed development.

Protective measures that would avoid/ reduce predicted impacts have not been considered during the screening assessment.

It is considered that an Appropriate Assessment is required as it cannot be excluded, on the basis of objective information, that the development, individually or in combination with other plans or projects will have a significant effect on the River Barrow and River Nore SAC. Indirect effects have been identified from the proposed development both alone and in-combination with other existing and permitted developments and discharges from cutaway bog within the wider landholdings of Bord na Móna.

Consequently, a Natura Impact Statement has been prepared for the River Barrow and River Nore SAC.

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3 NATURA IMPACT STATEMENT

3.1 INTRODUCTION

This section of the report, the Natura Impact Statement, addresses the possibility of the proposed development having an adverse effect on the European Sites identified in the screening report above (Section 3). There was one site identified for further assessment:

- River Barrow and River Nore SAC (002162).

3.2 DESCRIPTION OF THE PROPOSED DEVELOPMENT

3.2.1 Receiving Environment

The proposed development will be situated within the Bord na Móna landholding adjacent to the existing Drehid WMF. This area was previously used by Bord na Móna for commercial peat extraction.

There are no designated European Sites, i.e. Special Areas of Conservation (SACs) and Special Protection Areas (SPAs), located within the footprint of, or directly adjacent to, the proposed development.

Habitats on the proposed development site are typical of re-vegetating cutover bog, with heath/scrub/woodland habitats on a relatively well-drained portion of the overall Bord na Móna landholding. Habitats were classified in accordance with Fossitt (2000) '*A guide to habitats in Ireland. Heritage Council'*. Eight habitat classes and habitat mosaics (i.e. where a habitat consists of a mix of habitat classes) were determined including:

- Drainage ditches (FW4);
- Wet heath (HH3);
- Bog woodland (WN7);
- Scrub (WS1);
- Bog woodland (WN7), Wet heath (HH3) / Scrub (WS1) mosaic;
- Wet heath (HH3) / Scrub (WS1) mosaic;
- Dry meadows and grassy verges (GS2); and
- Spoil and bare ground (ED2).

3.2.2 Project Overview

3.2.2.1 Summary of the existing Waste Management Facility

At present, the Drehid WMF comprises a permitted landfill, composting facility, administration area, car park, access roads, weighbridge, settlement lagoons and ancillary infrastructure. The landfill is currently

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permitted to accept municipal waste for disposal at the facility, which is limited to a maximum of 120,000 TPA until the end of the life of the currently permitted facility in 2028. The composting facility is currently permitted to accept a maximum of 25,000 TPA until 2028.

In March 2013, following an Oral Hearing, Bord na Móna was granted planning permission for the development of a Mechanical Biological Treatment (MBT) facility which would primarily accept and process municipal solid waste (MSW) and provided for an overall capacity of 250,000 tonnes per annum (TPA). MBT, through a combination of mechanical processing and biological treatment (such as composting and anaerobic digestion), reduces the volume of waste which requires treatment by disposal in landfill or incineration. To date, this facility has not been constructed.

3.2.2.2 Summary of the Proposed Development

The proposed development requires planning permission and a revised EPA licence to facilitate the following works:

- Changes to the volume and nature of wastes to be accepted at the landfill disposal facility;
- Development of additional Non-Hazardous and a new Hazardous Landfill capacity to provide for sustainable landfill of these waste streams for a period of twenty-five years;
- Pre-treatment or processing of certain waste streams prior to landfill;
- Increasing the volume of waste to be accepted at the composting facility and the removal of the restriction on the operating life of the composting facility contained in Condition 2(2) of ABP Ref No. PL.09.212059;
- On-site treatment of leachate; and
- Development of associated buildings, plant, infrastructure and landscaping.

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As well as the existing permission for the disposal of non-hazardous municipal solid waste, it is proposed to provide capacity for the sustainable landfill of 250,000 TPA of non-hazardous wastes including incinerator bottom ash (IBA), construction and demolition (C&D) waste including soil and stone and stabilised waste arising from the biological treatment of the biodegradable fraction of municipal waste. It is also proposed that provision will be made for the onsite recovery of approximately 15,000 TPA of metals prior to landfilling of the residual IBA.

In addition, it is proposed that capacity be provided, for a period of 25 years, for the pre-treatment (where required) and sustainable landfill of 85,000 TPA of hazardous wastes, including incinerator fly ash, flue gas treatment residues, contaminated soil and asbestos, as well as other hazardous waste streams which are currently exported from this country and subsequently landfilled. It is also proposed to construct a facility for the pre-treatment/solidification of the fly ash and flue gas treatment residues prior to landfilling.

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Additional Non-Hazardous Landfill Capacity and Pre-Processing

Non-Hazardous Landfill

Capacity

The proposed capacity of the Non-Hazardous Landfill is 250,000 TPA for 25 years. On the basis of the density of the material and including cover material it is envisaged that there is a requirement for c.200,000 m^3 of landfill capacity each year for the 25 years. This equates to 5,000,000 m^3 or 6,250,000 tonnes over the 25-year life.

Footprint

The footprint is envisaged to be 20.9 hectares (ha).

Height

The final maximum waste level is expected to be 115.75 mOD. The surrounding ground is in the region of 84-85 mOD.

Operation

It is envisaged that the Non-Hazardous Landfill will operate for a period of 25 years. The landfill will be divided into 12 phases of approximately equal volume. Each phase will cater for approximately 2.5 years waste.

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The operation of each phase will be as follows:

- Construction 0.5 year
- Operation 2.5 years
- Capping 2 years

Incinerator Bottom Ash Processing Facility

IBA is the non-combustible material left over after incineration of municipal solid waste. This material is collected at the end of the grate of a Waste to Energy plant. Depending on the waste being incinerated, IBA can contain varying quantities of glass, ceramics, brick, concrete and metals in addition to clinker and ash.

The IBA Processing Facility includes a waste reception and maturation area and a metal recovery building. A combination of screening and metal separation technology within the IBA Processing Facility will separate ferrous and non-ferrous metals from the IBA itself. Ferrous and non-ferrous metals can be recovered from this material, the quantity which can be recovered being approximately 10% by weight. The metals will then be exported from the site for recycling. Residual IBA will then be placed into a vehicle

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and transported internally within the site to the Non-Hazardous Landfill, included as part of this proposed development, for disposal.

Operation

Covered HGVs will deliver the IBA to the Processing Facility. Vehicles will reverse up to the maturation area where they will deposit the IBA material. The delivery vehicle will then leave site via the wheel wash and weighbridge and the material will be moved into the storage bay stockpiles by front wheel loader.

The maturation area will be covered to prevent an increase in moisture content, resulting from precipitation; however, it is also left open at the sides and ends to allow an airflow through the maturation area.

At the end of the designated maturation period the maturation bays are unloaded by front wheel loaders and the matured IBA will be transferred to the IBA processing building, where it will undergo numerous steps to remove metals.

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Hazardous Landfill Capacity and Pre-processing

Hazardous Waste Landfill

Capacity

The proposed capacity of the Hazardous Landfill is 85,000 TPA for 25 years. On the basis of the density of the material and including cover material it is envisaged that there is a requirement for 79,000 m^3 of landfill capacity each year for the 25 years. This equates to 1,980,000 m^3 or 2,125,000 tonnes over the 25-year life.

Footprint

The footprint is envisaged to be 10.8 ha.

Height

The final maximum waste level is expected to be 115.75 mOD. The surrounding ground is in the region of 84-85 mOD.

Operation

It is envisaged that the Hazardous Landfill will operate for a period of 25 years. The landfill will be divided into 10 phases of approximate equal volume. Each phase will cater for approximately 2.5 years waste. The operation of each phase will be as follows:

- Construction 0.5 years

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- Operation 2.5 years
- Capping 2 years

Hazardous Waste Solidification Facility

The Hazardous Waste Solidification Facility provides pre-treatment to fly ash and flue gas treatment residues in advance of disposal in the Hazardous Landfill facility. The solidification plant will include the following:

- Process building:
  - Waste reception bays – 4 number
  - Process area with a mixing unit and a weighing scales
  - Solidified material outgoing bay
- External storage silos to store waste materials awaiting solidification
- External storage silos to store ground material (Cement)
- External bunded acid tanks
- External bunded leachate storage tank

The solidification process is carried out in a fully enclosed building with rapid closing doors.

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Operation

Enclosed bulk silo trucks will deliver the waste, in powder form, to the facility where it will drive into the building and the contents will be pumped into the storage silos, by a fully enclosed piped system. The truck will then leave site via the wheel wash and weighbridge.

From the silos, the material is pumped to the mixing unit where it is combined with leachate/acid/water to predetermined ratios through an electronically controlled batch process where it is batched into the solidified material (which has a granular form). This material is then placed into a site vehicle and transported to the landfill for deposition. At no stage will the road tankers enter the landfill.

Composting Facility

This planning application proposes to increase the volume of waste to be accepted at the existing Composting Facility by 20,000 TPA from the currently permitted 25,000 TPA (without the need for any physical development) and to remove the restriction on the operating life of this facility, which is currently aligned with the municipal solid waste landfill life. In addition, it is proposed to extend the existing facility to provide for the acceptance of an additional 45,000 TPA. The latter will require an approximate doubling of the currently permitted footprint of this facility.

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Capacity

The existing composing facility can cater for a waste acceptance of 45,000 TPA; the extended facility will also be able to accept 45,000 TPA.

Footprint

The footprint of the extension to the composting facility is approximately 6,900 m^2.

Height

The height of the building is 12 m above ground level.

Operation

Once the extension is constructed and commissioned it will operate within the licensed operating hours of the facility. The composting facility operates on a closed water balance and there is no excess leachate generated within it.

Proposed Site Infrastructure

The following infrastructure will form part of the application:

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Site Access

The roads will be designed to cater for the HGV traffic. Appropriate drainage such as filter drains will be provided. High risk areas will be positively drained and passed through oil interceptors in accordance with PPG3 [12] guidance.

Roads and parking areas will typically be designed as bituminous macadam pavements or, where appropriate, as concrete pavements. Concrete hardstand areas will be provided at the waste reception areas (hazardous, non-hazardous and composting) and the fuel storage area.

Water Supply

There will be a requirement for water supply for toilets, sinks, fire-fighting, process water, wash-down etc. There is currently a water supply borehole on site and it is proposed to use this in conjunction with surface water collected in on-site attenuation lagoons. Water for potable use will be provided from bottled water imported to the site.

Waste Control Area and Weighbridges

[12] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/485175/pmho0406biyl-e-e.pdf

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A designated area for management of all waste vehicles delivering to the site has been provided; this will incorporate truck parking, waste control building and weighbridges.

Leachate and Process Waste Water Infrastructure

Predicted leachate volumes are provided in Table 3.1 and Table 3.2.

Table 3.1 Estimated Average Rates of Leachate Generation from Non-Hazardous Landfill

Year	Annual Volume m^3	Daily Volume m^3	
2020	4,671.73	12.80	Year 1
2021	11,010.13	30.16	Year 2
2022	18,933.13	51.87	Year 3
2023	22,102.33	60.55	Year 4
2024	14,971.63	51.87	Year 5
2025	22,197.33	60.81	Year 6
2026	15,256.63	52.65	Year 7
2027	22,577.33	61.86	Year 8
2028	15,636.63	53.69	Year 9
2029	22,957.33	62.90	Year 10
2030	16,016.63	54.73	Year 11
2031	23,337.33	63.94	Year 12
2032	16,396.63	55.78	Year 13
2033	23,717.33	64.98	Year 14
2034	16,776.63	56.82	Year 15
2035	24,097.33	66.02	Year 16
2036	17,156.63	57.86	Year 17
2037	24,477.33	67.06	Year 18
2038	17,536.63	58.90	Year 19
2039	24,857.33	68.10	Year 20
2040	17,916.63	59.94	Year 21
2041	25,237.33	69.14	Year 22
2042	18,296.63	60.98	Year 23
2043	25,617.33	70.18	Year 24
2044	12,338.23	44.66	Year 25
2045	14,987.20	41.06	Year 26
2046	4,085.00	11.19	Year 27
2047	4,465.00	11.71	Year 28
2048	4,560.00	12.23	Year 29

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Table 3.2 Estimated Average Rates of Leachate Generation from Hazardous Landfill

Year	Annual	Daily	Year
	Volume m^3	Volume m^3	
2020	4,237.17	11.61	Year 1
2021	7,292.28	19.98	Year 2
2022	7,407.48	20.29	Year 3
2023	7,522.68	20.61	Year 4
2024	7,637.88	20.93	Year 5
2025	7,753.08	21.24	Year 6
2026	7,868.28	21.56	Year 7
2027	7,983.48	21.87	Year 8
2028	8,098.68	22.19	Year 9
2029	8,213.88	22.50	Year 10
2030	8,329.08	22.82	Year 11
2031	8,444.28	23.14	Year 12
2032	8,559.48	23.45	Year 13
2033	8,674.68	23.77	Year 14
2034	8,789.88	24.08	Year 15
2035	8,905.08	24.40	Year 16
2036	9,020.28	24.71	Year 17
2037	9,135.48	25.03	Year 18
2038	9,250.68	25.34	Year 19
2039	9,365.88	25.66	Year 20
2040	9,481.08	25.98	Year 21
2041	9,596.28	26.29	Year 22
2042	9,711.48	26.61	Year 23
2043	9,826.68	26.92	Year 24
2044	9,941.88	27.24	Year 25
2045	2,822.40	7.73	Year 26
2046	2,822.40	7.73	Year 27
2047	2,822.40	7.73	Year 28
2048	2,822.40	7.73	Year 29

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The proposed leachate treatment plant design is based on a modified version of the Sequencing Batch Reactor (SBR) aerobic biological treatment process, which has been applied successfully to the treatment of many hundreds of similar leachates during the last four decades. The process is described in detail in Chapter 3 of the EIAR, but comprises aerobic and anoxic phases of treatment, with incorporation of ultrafiltration membranes for separation of biological solids from a very clear final effluent. A process

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schematic for the leachate WWTP, with a photo of a similar installation are presented in Figures 3.1 and 3.2.

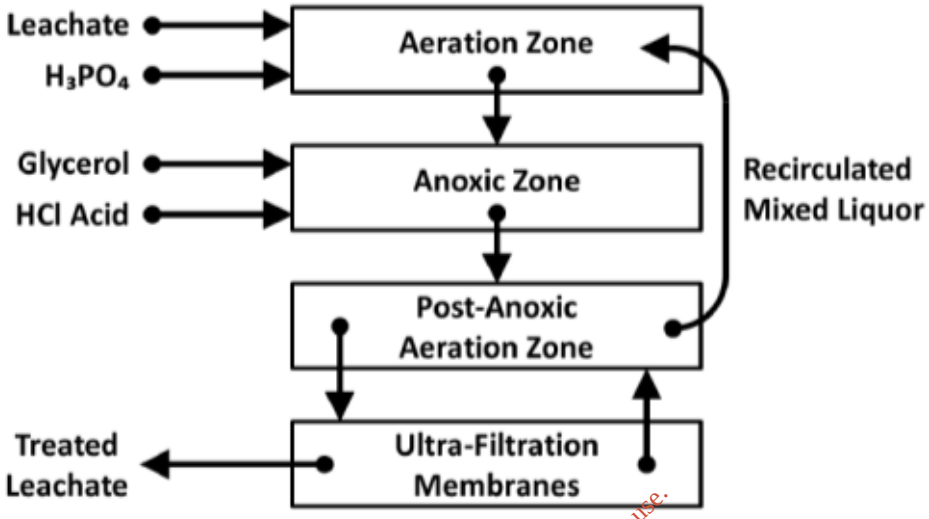

Figure 3.1 Process schematic of design adopted for full nitrification and denitrification of leachates

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Figure 3.2 Typical Layout of Leachate Treatment Facility

The treated leachate will then be transported off site by road tankers, for safe disposal at an approved Irish Water WWTP such as Osberstown WWTP for final treatment and disposal (with Leixlip and Ringsend WWTPs as backup). It is noted that the maximum volume of leachate would constitute less

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than 1% of the hydraulic load at the inlet to this WWTP, as the leachate will be pre-treated at the Drehid WMF, it is not expected that the proposed volumes of treated leachate will have any effect on the WWTP.

Maintenance Building

The Maintenance Building will be constructed as a steel portal framed structure with a proprietary cladding and incorporating roller shutter doors. Internally the floors will be reinforced concrete floor slabs. This building will be fitted with secure storage areas to accommodate power tools, other small plant and equipment. A proprietary bunded container, compliant with EPA requirements, will be provided for the storage of hydraulic and engine oils. The building will be supplied by 3-phase power and will include both security and fire alarm systems.

It is proposed to provide a laboratory in the Maintenance Building which will allow for the carrying out of the routine monitoring requirements at the site.

Haulage Routes

There are a number of haulage routes proposed for HGVs accessing the facility which are discussed in Chapter 10 and outlined in Figure 10.1 of the EIAR. Seven of these haul routes have previously been permitted for use in accordance with the existing facility, although two routes (Haul Route No.'s 1.1 and 2) are not currently permitted due to weight restrictions across Caragh Bridge on the R409. There are four new proposed haulage routes as outlined in Section 10.2.2 of the EIAR and as delineated on Figure 10.1 of the EIAR. The first additional proposed route is along the R407 running into the R408 from Junction 8 on the M4 to Prosperous. The second additional proposed route is along the R406 which leads onto R403 from Junction 7 on the M4 to Clane. The third additional proposed route is along the R415 from Junction 13 on the M7 to the R416 at Milltown. The fourth additional proposed route runs south of Enfield starting at the roundabout on the R148 and Johnstown Road, continuing along the R148 to its signalised junction with the R402. The proposed haul routes will use existing national and regional road infrastructure to access the site.

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The proposed development will result in an overall increase in traffic on the haul routes during the construction and operational phases with the highest increase in traffic volume occurring where the haul routes converge on the R403 north and south of the entrance to the Drehid WMF. Based on recent traffic surveys carried out at the existing facility (May, June, September and October 2016), the existing operational traffic distribution from the site entrance is typically 33% to the north and 67% to the south.

3.3 CHARACTERISATION OF EUROPEAN SITES

The conservation objectives of the relevant European Site are to maintain the favourable conservation status of the key species/ habitats for which the Site has been designated. These are laid out in the Table

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3.3 below. In addition, a key target for the (freshwater) aquatic species and habitats for which the site has been designated is to maintain or restore water quality and restore substratum quality.

Table 3.3 Key species/ habitats for the European Site potentially impacted by the proposed development

European Site	Conservation Objectives
River Barrow and River Nore* SAC (002162)	Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and the Annex II species which the SAC has been selected: Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Reefs [1170] Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330] Mediterranean salt meadows (Juncetalia maritimi) [1410] Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260] European dry heaths [4030] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Petrifying springs with tufa formation (Cratoneurion) [7220] Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0] Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0] Vertigo moulinsiana (Desmoulin's Whorl Snail) [1016] Margaritifera margaritifera (Freshwater Pearl Mussel) [1029] Austropotamobius pallipes (White-clawed Crayfish) [1092] Petromyzon marinus (Sea Lamprey) [1095] Lampetra planeri (Brook Lamprey) [1096] Lampetra fluviatilis (River Lamprey) [1099] Alosa fallax fallax (Twaite Shad) [1103] Salmo salar (Salmon) [1106] Lutra lutra (Otter) [1355] Trichomanes speciosum (Killarney Fern) [1421] Margaritifera durrovensis (Nore Pearl Mussel) [1990]

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3.4 POTENTIAL EFFECTS

As stated previously, there are no designated European Sites within the footprint of the proposed development nor are there any European Sites directly adjacent to the site boundary. There will be no direct effects on the European Site resulting from the proposed development in light of the separation distance between the River Barrow and River Nore SAC and the proposed development. .

Uncontrolled emissions of surface water pollutants such as foul water, leachate, silt/ grit, fuel/ oil and run-off from the proposed development infrastructure to sensitive surface water-dependant receptors (e.g. river or lake habitats) can lead to significant indirect effects to European Sites.

All surface water from the proposed development will drain to the west to the Cushaling River, which is a tributary of the Figile River. The existing access road from the R403 site entrance to the Drehid Waste Management Facility passes through the sub-catchment of the Abbeylough River, which is also a tributary of the Figile River. The Figile River is a sub-catchment of the River Barrow. The Cushaling River, Abbeylough River and Figile are the pathway for potential effects from the proposed development to the River Barrow and River Nore SAC. Surface water pollutants may include foul water, leachate, silt/ grit, fuel/ oil and run-off from the proposed development infrastructure. The predicted potential increase in concentrations of suspended solids, and the possible occurrence of hydrocarbons, in surface run-off and/ or an alteration of pH, could affect the quality of the receiving watercourses. The predicted decline in water quality would likely have an adverse effect on populations of the following species including inter alia: Atlantic salmon, lamprey spp. (sea, Brook and river lamprey) and freshwater pearl mussel spp. (*Margaritifera margaritifera* and *Margaritifera durrovensis*) within the SAC. Threats to these species include siltation, eutrophication (from an excess of nutrients) and diffuse pollution. Furthermore, a reduction in water quality is likely to reduce the availability of prey for otter within the SAC. Potential sources of emissions are as follows:

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Construction Phase

Water quality perturbations associated with construction activity have potential to impact upon the ecologically sensitive waterways and species in the vicinity of the development. Local waterways which have pollutants released into them can act as vectors of pollution to downstream areas. Surface water links exist between the River Barrow and River Nore SAC and the proposed development site. Construction activities could also potentially lead to the release of large amounts of suspended solids/ silt laden run-off, pollutants (hydrocarbons) and/ or alter surface water pH within the SAC. The potential increase in concentrations of suspended solids, and the possible occurrence of hydrocarbons, in surface run-off and/ or an alteration of pH (from the use of concrete within the proposed development site), unless mitigated, could adversely affect the quality of the receiving watercourses.

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Operational Phase

Uncontrolled pollutant run-off (including foul water, leachate, silt/ grit and fuel/ oil) from the following areas of the proposed development could affect the quality of the receiving watercourses:

- Non- Hazardous Waste Landfill;
- Incinerator Bottom Ash Processing Facility;
- Hazardous Waste Landfill;
- Hazardous Waste Solidification Facility;
- Proposed Site Infrastructure;
- Waste Control Area and Weighbridges;
- Leachate and Process Waste Water Infrastructure; and
- Welfare and Maintenance Buildings;

Watercourses in the surroundings of the site provide a pathway for impacts from the proposed development to the River Barrow and River Nore SAC. If unmitigated, such a pollution event could result in indirect water quality impact for the key aquatic species and habitats for which this Site has been designated.

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Although the River Barrow and River Nore SAC is hydrologically linked to the proposed development, the SAC is located more than 22 km from the proposed development over land and this distance increases when the meandering nature of the hydrological links is considered. The separation distance between the proposed development and this SAC limits the potential for ecologically adverse effects to the integrity of the European Site. Protective measures are detailed in Section 3.5 to further reduce/ avoid adverse effects on this SAC.

3.5 PROTECTIVE MEASURES

The following protective measures have been designed in consultation with the project hydrologist (John Dillon) and Bord na Móna. The proposed development will be constructed in accordance with the requirements of the EU Landfill Directive and the EPA Landfill Design Manual (2000) [13], ensuring the isolation of the deposited waste at the site. The protective measures outlined below have been designed to reduce or avoid adverse effects on the environment and European Sites listed in Section 3.3, regarding their site's specific conservation objectives. Protective measures are listed for each element of the proposed development.

[13] EPA (2000) Landfill Manuals - Landfill Site Design

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3.5.1 Construction Phase

Wash down and washout of concrete transporting vehicles will take place at a designated bin area to prevent cementitious material and water entering the surface water network. Waste material generated during construction activities will be removed from site to an appropriately licensed or permitted waste facility to avoid potential for waste or litter to enter the surface water network.

A number of drainage ditches will be excavated to divert existing surface water drainage away from the proposed excavations and construction activities. The collected water in these drains will flow to the east of the proposed development, from where the captured water will be discharged to the existing attenuation lagoons, to allow further settlement of particles prior to discharge to the receiving environment. This will ensure the reduction in suspended solids concentration of the captured water and, as a result, the receiving waterbody.

In order to reduce the risk of sediment laden water adversely impacting surface water, measures will be implemented during the construction stage to divert such water through treatment systems (attenuation lagoons and Integrated Constructed Wetlands (ICWs)) prior to discharge to receiving waters. During the construction period all water pumped from the base of excavations will be delivered to temporary/mobile sediment control devices, comprising grit traps or devices of similar efficiency. The contract documents will specify the necessity for the contractor to take all precautions necessary to prevent silt laden run-off discharging directly to watercourses. Upper limits of sediment in discharges will be specified in contract documents. Frequent sampling of discharges will be a requirement of the contract. It is proposed to construct a separate attenuation lagoon and an ICW area early in the construction phase to optimise the treatment of surface water for the remainder of the construction stage.

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The proposed attenuation lagoons and ICWs are designed to reduce the potential impact at source. It should be noted that the overall capacity of the proposed attenuation lagoons has been designed to accommodate all impermeable areas at the proposed development (including hardstanding areas and roofed areas) and to cater for a 1 in a 100-year storm event. An existing surface water attenuation lagoon will provide further attenuation prior to the discharge of surface water run-off to the Cushaling River. The surface water quality of all water discharged from the proposed development works will be monitored daily to ensure that the receiving water quality is not impaired.

To minimise any potential impact on the surface water and groundwater environments from material spillages, all fuel oils and other oils used during the construction phase will be stored within bunded areas. The design of all bunds will conform to EPA bunding specifications. The retention capacity of bunded areas will be 110% of the capacity of the largest tank or drum to be stored within the bunded area. Spill kits will be retained on-site to ensure that all spillages or leakages are dealt with immediately and staff will be trained in their proper use. Any servicing of vehicles on-site will be confined to designated areas.

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The presence of significant numbers of workers on site during the construction period will lead to the generation of foul sewage from temporary showers, toilets, canteens and washing facilities. This foul sewage will be stored onsite in suitable tanks prior to being tankered off-site for disposal at a licensed waste water treatment facility. This will ensure that domestic effluent is kept separate from the surface water network.

Contractors will be required to ensure that the public roads in the vicinity of the site are maintained free from all mud, dirt and rubbish, which may arise from or by reason of the execution of the works. To facilitate this, contractors will be instructed to use a temporary wheel wash which will be installed at the site of the proposed development and will minimise the potential for sediments to enter the surface water network.

The above protective measures have been proposed to prevent leachate entering the surface water network, ensure the limiting of sediment laden run-off discharging from the site and to avoid the potential for contaminants to enter the local hydrological environment. These measures will ensure there is no deterioration of the water quality in the vicinity of the site and, as a consequence, ensure there will be no residual effects from the construction of the proposed development which could adversely affect the integrity of the River Barrow and Nore SAC.

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In conclusion, when these protective measures are taken into consideration, there will be no significant effects arising from the construction phase which may adversely affect the integrity of the River Barrow and River Nore SAC and it may be concluded that the construction phase of the proposed development will not adversely affect the integrity of the River Barrow and River Nore SAC.

3.5.2 Operational Phase

3.5.2.1 Non-Hazardous Waste Landfill

The low permeability natural mineral subsoil will be overlain by a 0.5 m thick barrier layer of Bentonite Enhanced Soil (BES), which is processed to achieve a permeability of less than or equal to 5 x 10^{-10} m/s. The BES will in turn be overlain by a geomembrane HDPE liner in the Non-Hazardous Landfill, to prevent leakage of leachate. A high permeability drainage blanket will overlie the geomembrane, with leachate collection pipework embedded. This drainage blanket and pipework will create a fast-track for leachate movement to leachate collection sumps, thus further reducing the risk to the groundwater environment. This system is designed in accordance with the EPA Landfill Design Manual [14], and in such a way to prevent liquid levels rising to such an extent that they can spill over and cause uncontrolled pollution to

[14] EPA (2000) Landfill Manuals - Landfill Site Design

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ditches, drains, watercourses etc. Leachate generated within the Non-Hazardous Landfill body will be treated on-site and subsequently exported from the site to an approved wastewater treatment plant.

3.5.2.2 Hazardous Waste Landfill

The low permeability natural mineral subsoil will be overlain by a 0.5 m thick barrier layer of Bentonite Enhanced Soil (BES), which is processed to achieve a permeability of less than or equal to 1 x 10^{-10} m/s. The BES will in turn be overlain by a geomembrane HDPE liner in the Hazardous Landfill, to prevent leakage of leachate. A high permeability drainage blanket will overlie the geomembrane, with leachate collection pipework embedded. This drainage blanket and pipework will create a fast-track for leachate movement to leachate collection sumps, thus further reducing the risk to the groundwater environment.
It is proposed to collect wastewater from the Hazardous Landfill through a leachate collection system. This system is designed in accordance with the EPA Landfill Design Manual (as above), and in such a way that will prevent liquid levels rising to such an extent that they can spill over and cause uncontrolled pollution to ditches, drains, watercourses etc.

All leachate generated within the Hazardous Landfill will be collected, pumped and retained in a bunded holding tank for use in the Ash Solidification Facility. This leachate will be reused in the ash solidification process prior to this waste being placed in landfill. Based on the proposed design, it is not anticipated that excess leachate will be generated during the operational phase of the Hazardous Landfill. However, if any excess leachate is generated during the operational phase and following the closure of the Hazardous Landfill, this leachate will be transferred to the on-site Leachate Treatment Facility for treatment, prior to export by tanker to an appropriate licensed wastewater treatment plant.

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3.5.2.3 Surface Water

Rainwater falling on impermeable areas (including hardstanding areas and roofed areas) will be collected, stored and discharged to the receiving waters in a controlled manner (i.e. to replicate greenfield runoff rates) in accordance with the principles set down by the Greater Dublin *Strategic Drainage Study* (GDSDS). The control of the surface water discharge rate to the receiving environment can be classified as a SuDs (sustainable urban drainage) measure.

The attenuation lagoons have been designed to provide an adequate retention time to allow suspended solids to fall out of suspension prior to discharge of surface water to the receiving environment. The attenuation lagoons will also serve as a fire water supply and as a supply of fresh water, thereby allowing reuse and recycling of water within the proposed development site. Water will be recycled within the proposed development where possible.

It is proposed to construct a total of seven additional attenuation lagoons and four ICWs. All water collected will first pass through an appropriately sized oil interceptor and grit trap. The surface water

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runoff will subsequently pass through attenuation lagoons and integrated constructed wetlands which have adequate retention time to allow suspended solids to fall out of suspension and provide stormwater storage during extreme rainfall events.

The attenuation lagoons will be constructed from suitable material sourced on-site and compacted to ensure stability. Following the completion of earthworks associated with the formation of the attenuation lagoons, the integrity of the lagoons will be further secured by the installation of a HDPE geomembrane liner.

The provision of a storm water freeboard has been accounted for in the design of the attenuation lagoons, thereby providing for storage of storm water in the event of intense rainfall events. The attenuation lagoons are sized to provide enough retention time to facilitate adequate settlement of suspended solids prior to discharge through integrated constructed wetlands to the surface water environment.

The extreme rainfall event chosen for the sizing of the attenuation lagoons is a 1 in 100-year return period and takes into account potential increase in rainfall due to climate change.

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The surface water management system is designed to capture and control the runoff and allow outflow to receiving waters at a regulated rate.

It is proposed that the maximum outfall rate from the proposed development will be set at 5.84 litres/second/ha of land drained (using a flow constriction). The surface water discharge system has been designed as follows:

- The surface water attenuation lagoons will cater for the 1:100 yr storm event [and include for process requirements and firefighting requirements]; and
- The surface water attenuation lagoons will have a minimum free board of 1 m.

In extreme rain fall events, the storm water freeboard in the attenuation lagoons will provide enough storage to maintain a regulated discharge rate (i.e. greenfield run off rate) to receiving waters.

The design of the attenuation lagoon complete with integrated constructed wetlands is based on creating a low energy water environment to settle out suspended solids from aqueous suspension. The theory behind the design of the attenuation lagoons is the application of Stoke's Law [15]. The attenuation lagoons have been designed to provide sufficient retention time and a low velocity environment to allow

[15] A formula which calculates the settlement characteristics of a given particle due to gravity

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suspended solids of a very small particle size to fall out of suspension prior to allowing the water to outfall to the receiving environment. Interpretation of Stoke's Law of settlement indicates that a 12-hour retention time will allow 100% removal of sand and silt down to 10 µm.

The attenuation lagoons are sized to provide adequate capacity for a 100-year storm event, to meet facility fire-fighting water requirements and to provide water to meet process demands when necessary. Overflow from these attenuation lagoons will be diverted through ICWs to provide an additional step in the treatment train, prior to discharge to the peatland drainage system. The attenuation lagoon design calculations do not account for the additional settlement provided in the existing Bord na Móna settlement attenuation lagoon located downgradient of the proposed development. The proposed ICWs are designed to polish surface water runoff from the waste management facility site. The ICW ponds will be densely planted with appropriate wetland emergent species, such as Carex riparia, Typha latifolia and Iris pseudacorus. The ICWs for the proposed development are being designed to provide greater management of surface water runoff while also ensuring that the concentration of parameters, such as ammonium, do not exceed the emission limit values set on the discharge. The ICWs have been designed so that they will provide continuous treatment and management of the surface water runoff at the facility in order that the quality of the discharge does not exceed the emission limit values, including ammonium concentration of 0.5 mg/l. ICWs have consistently shown high treatment efficiency for a wide range of parameters, with ammonia treatment efficiency at 99% being achieved through processes such as nitrification and denitrification.

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All surface water discharged from the proposed development will comprise clean treated surface water. The water discharged will be diverted through attenuation lagoons and wetlands to reduce any potential for siltation of the river channel. Wetlands will be installed to provide further treatment of the surface runoff from the proposed landfill areas. While elevated concentrations of ammonia occur in peatlands, there is no evidence of increasing ammoniacal nitrogen at the discharge point to the Cushaling River over the last 13 years of monitoring data. Ammoniacal nitrogen levels at the Bord na Móna landholding are naturally high due to the peat environment. However, the monitoring results of the surface water discharge from the overall Bord na Móna landholding are generally in compliance with the appropriate surface water discharge standards specified in the IPC licence (P0503-01) for the surrounding peatlands. Ammoniacal nitrogen concentrations in the surface water runoff from the existing landfill are on average lower than the runoff from the remainder of the peatlands and those downgradient of the site.

During the operational phase, the attenuation lagoons will capture and treat rainwater which naturally has low ammonium levels, and discharge to the surface water network. The construction of the attenuation lagoons and ICWs is therefore likely to reduce the overall ammonium concentration in the surface water discharging from the boundary of the proposed facility.

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The surface water quality of all water discharged from the proposed development will be continuously monitored to ensure that there is no negative impact on the receiving water quality. Continuous monitoring will take place at the inlet and outlet of the surface water attenuation lagoons. Instrumentation linked to a SCADA system will continuously monitor the following parameters (as per IED Licence W0201-03):

- Dissolved Oxygen; and
- Electrical Conductivity.

An actuated valve at the surface water attenuation lagoon outlets will be controlled by the SCADA system. This valve will be programmed to close should any of the above parameters fall outside permitted levels. The volume of surface water discharged to the surrounding environment will also be controlled through the same actuated valve and SCADA system.

Leachate, process wastewater or any other potentially contaminated material from the proposed development will be fully contained and isolated from the surface water collection system. As such, the physico-chemical assimilative capacity of the Cushaling River will not be impacted. The Cushaling River is a tributary of the River Barrow River and River Nore SAC.

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All vehicles exiting the proposed development will be required to divert through a wheel wash located along the access road of the proposed development. This infrastructure will ensure that vehicles do not cause soiling of roads. Water will be recycled within the wheel wash facility to minimise the water requirement. A tank will store water for washing purposes; a pump will re-circulate the water back into the tank during washing. Solids that settle at the base of the tank will be removed by a vacuum tanker. Water will only be discharged to the foul water system during the periodic replenishment of the used process water with fresh water.

To minimise any impact on surface water from material spillages, all fuel oils, other oils, chemicals and process water used during operations will be stored within bunded areas. The design (volume and construction) of all bunds will conform to EPA bunding specifications. The retention capacity of bunded areas will be 110% of the capacity of the largest tank or drum to be stored within the bunded area. Spill kits will be retained on-site to ensure that all spillages or leakages are dealt with immediately & staff will be trained in their proper use. Any servicing of vehicles on-site will take place within the bunded Maintenance Building.

The collection, storage, treatment and monitoring of surface water prior to being discharged at greenfield run off rates is considered the principal protective measure to ameliorate the predicted and potential impact of the development post-construction. The measures outlined above will ensure there is no reduction in the overall surface water quality in the vicinity of the proposed development.

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3.5.2.4 Foul Sewerage

It is proposed to collect, screen and pump foul sewerage to the Leachate Treatment Facility and ultimately dispose of it offsite at an approved wastewater treatment plant. All wastewater will be fully contained in the leachate management system at the proposed development and no wastewater or leachate discharge will occur to groundwater or the River Cushaling.

3.5.2.5 Summary

The above protective measures have been proposed to prevent leachate entering the surface water network and to avoid the potential for contaminants to enter the local hydrological environment. The protective measures will also limit suspended solids concentration in the surface water drainage network. These measures will ensure there is no deterioration of the water quality in the vicinity of the site and, as a consequence, ensure there will be no residual effects from the proposed development which could adversely affect the integrity of the River Barrow and Nore SAC.

In conclusion, when these protective measures are taken into consideration, there will be no significant effects arising from the operational phase which may adversely affect the integrity of the River Barrow and River Nore SAC and it may be concluded that the operational phase of the proposed development will not adversely affect the integrity of the River Barrow and River Nore SAC**.**

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Protective measures will be implemented to ensure that the receiving surface water network is protected and the conservation objectives of the River Barrow and River Nore SAC are not negatively affected by the proposed development. There are therefore, no residual direct or indirect impacts associated with the proposed development that could adversely affect the integrity of the River Barrow and River Nore SAC.

3.6 IN-COMBINATION EFFECTS

Uncontrolled emissions from the proposed development have the potential to reduce water quality downstream in-combination with other pollution sources, e.g. proposed Timahoe North Solar Farm, consented Wilson Wright Solar Farm, existing Drehid WMF, the Drehid MBT facility and discharges from cutaway bog within the wider landholdings of Bord na Móna.

The Timahoe North Solar Farm will consist of a solar PV array and associated infrastructure, inverters, access roads and parking, site compounds and security fencing, amenity trails and landscaping, peat and subsoil storage areas (repositories), site drainage and all associated works. The proposed project will also include the construction of a 110 kV substation within the site with a battery storage compound adjacent this. It is then envisaged to connect from this substation to the Derryiron-Maynooth 110 kV overhead line that traverses the southern section of the Timahoe North site. This proposed development has the potential to result in in-combination effects with the proposed development during the construction phase of the solar farm. The construction of the solar farm could result in the uncontrolled release of

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sediment laden water and hydrocarbons into local water courses. However, any planning consent associated with Timahoe North Solar Farm must adhere to overarching environmental protective policies, these policies will ensure adversely effects are avoided. Furthermore the proposed development will not result in adverse effects following the successful implementation of protective measures as outlined in Section 3.5. As adverse effects are not predicted for either site, therefore in-combination effects are not predicted. Therefore, there is no potential for this project to adversely affect the integrity of the River Barrow and River Nore SAC in-combination with the proposed development.

The permitted Wilson Wright Solar Farm at Timahoe West consists of solar PV panel array consisting of up to 66,000 m^2 of solar panels on ground mounted steel frames, 2 no. electricity control cabins, 10 no. inverter units, underground cable ducts, hardstanding area, boundary security fence site entrance. This development has the potential to result in in-combination effects with the proposed development during the construction phase of the solar farm. The construction of the solar farm could result in the uncontrolled release of sediment laden water and hydrocarbons into local water courses. However, any planning consent associated with this solar farm must adhere to overarching environmental protective policies, these policies will ensure adversely effects are avoided. Furthermore, the proposed development will not result in adverse effects following the successful implementation of protective measures as outlined in Section 3.5. As adverse effects are not predicted for either site, therefore in-combination effects are not predicted. Therefore, there is no potential for this project to adversely affect the integrity of the River Barrow and River Nore SAC in-combination with the proposed development.

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In accordance with the EPA IED Licences, the existing Drehid WMF and permitted MBT facility are required to limit and monitor emissions to air and water, i.e. the Emission Limit Values (ELVs). These developments include a wide range of protective measures which are designed to minimise the potential for waste material placed in the landfill and accepted to the MBT facility to have an impact on the soil and groundwater environment. These protective measures in the landfill include a low permeability minimum 0.5 m deep compacted soil barrier, HDPE liner, leachate collection system and landfill capping. In the MBT facility, protective measures include concrete flooring and leachate collection drainage in the building floor.

Ammonia, and in particular free non-ionised ammonia, is a toxic compound that can adversely affect fish health. The nature and degree of toxicity depends on many factors, including the chemical form of ammonia, the pH and temperature of the water, the length of exposure and the life stage of the exposed fish. The ELV (0.5 mg/l as NH_4 (total ammonium)) is well within the permitted level set by the *European Communities (Quality of Salmonid Waters) Regulations 1988* (S.I. No. 293 of 1988) of 1 mg/l of Total Ammonium. This ELV for ammonium equates to 0.01 mg/l non-ionised ammonia at a pH of 7.5 and a temperature of 18°C and is within the limits set by the *European Communities (Quality of Salmonid*

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Waters) Regulations 1988 of 0.02 mg/l. ICWs are incorporated into the landfill design to limit and reduce ammonium concentrations that may be associated with the existing facility.

In relation to the ELVs, the existing operational Drehid WMF is compliant within its IED Licence conditions. The permitted MBT facility has not yet been built and, the facility will be operated in accordance with relevant licence conditions. These developments are therefore not considered to result in adverse effects on the conservation objectives of the River Barrow and River Nore SAC. In-combination effects are therefore not predicted with these developments.

The discharges from the proposed development area and other Bord na Móna bogs within the River Barrow catchment are and have been regulated and controlled by the EPA under the IPC Licensing process. These Licences have been examined and revised by the EPA, as required, in line with the objectives of the Water Framework Directive.

Within the *River Basin Management Plan 2018 – 2021* (released in April 2018), peatland areas are identified as a significant pressure on a catchment scale basis. As is detailed in the *River Basin Management Plan 2018 – 2021*, Bord Na Móna is in the process of phasing out the extraction of peat for energy production before 2030. Bord Na Móna expects to rehabilitate cutaway bogs and will look to implement best-available mitigation measures to further reduce water quality impacts caused by peat extraction while the phasing-out process is taking place in accordance with the *Strategic Framework for the Future Use of Peatlands* publication. Commercial peat extraction has ceased at the Timahoe North and South Bog since the 1980's. The surrounding peatlands will continue to be managed in accordance with their relevant EPA IPC Licences.

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In conclusion, there is no potential for any other plan or project to adversely affect the integrity of the River Barrow and River Nore SAC in-combination with the proposed development.

3.7 CONCLUSIONS OF APPROPRIATE ASSESSMENT

It is considered, on the basis of objective information and in light of best scientific knowledge in the field, that the development individually or in combination with other plans or projects will not have an adverse effect on the integrity of the River Barrow and River Nore SAC in view of the site's structure, function and conservation objectives.

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APPENDIX A

NPWS Natura 2000 Site Synopses

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SITE SYNOPSIS

Site Name: Ballynafagh Bog SAC

Site Code: 000391

This site is a raised bog situated about 1 km west of Prosperous in Co. Kildare. The area is directly underlain by muddy, fossiliferous limestones, interbedded with calcareous shales. The subsoils are predominantly clay-rich tills. All are of low permeability. The site comprises a relatively small core of uncut high bog (approx. 70 ha), which is surrounded by a more extensive area of cutover bog (approx. 90 ha). The high bog area can be divided into a wet core of active bog which covers an area of 23 ha, surrounded by approximately 44 ha of degraded raised bog which is experiencing drying-out at present.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[7110] Raised Bog (Active)*
[7120] Degraded Raised Bog
[7150] Rhynchosporion Vegetation

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Active raised bog comprises areas of high bog that are wet and actively peat-forming, where the percentage cover of bog mosses (*Sphagnum* spp.) is high, and where some or all of the following features occur: hummocks, pools, wet flats, *Sphagnum* lawns, flushes and soaks. Degraded raised bog corresponds to those areas of high bog whose hydrology has been adversely affected by peat cutting, drainage and other land use activities, but which are capable of regeneration. The Rhynchosporion habitat occurs in wet depressions, pool edges and erosion channels where the vegetation includes White Beak-sedge (*Rhynchospora alba*) and/or Brown Beak-sedge (*R. fusca*), and at least some of the following associated species, Bog Asphodel (*Narthecium ossifragum*), sundews (*Drosera* spp.), Deergrass (*Scirpus cespitosus*) and Carnation Sedge (*Carex panicea*).

In the wet, active area towards the centre of Ballynafagh Bog, a system of tear pools occurs, grown over with bog mosses (*S. capillifolium* and *S. magellanicum*). There is a small pool-and-hummock system, with pools colonised by another species of bog moss, *S. cuspidatum*. White Beak-sedge, Cottongrasses (*Eriophorum* spp.) and the insectivorous Great Sundew (*Drosera anglica*) are abundant in wet channels. Bog-rosemary (*Andromeda polifolia*) and Cranberry (*Vaccinium oxycoccos*) are found on the hummocks.

The vegetation of the degraded raised bog tends to be dominated by Heather (*Calluna vulgaris*), Deergrass, Bog Asphodel, Cross-leaved Heath (*Erica tetralix*) and

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Hare's-tail Cottongrass (*Eriophorum vaginatum*). In places there is some colonization by low bushes of Downy Birch (*Betula pubescens*) and Gorse (*Ulex europaeus*) which demonstrates the locally dry peat conditions which exist. In the driest marginal areas of the high bog dome the moss *Hypnum cupressiforme* may be locally abundant along with Heather.

A large portion of the site contains old cut-away bog colonised by rushes (*Juncus* spp.) and Common Cottongrass (*Eriophorum angustifolium*), with Downy Birch forming patches of scrub/woodland.

The site is within the territory of a breeding pair of Merlin, a species listed on Annex I of the E.U. Birds Directive. Several pairs of Curlew and Snipe breed on the bog. Scrub species such as Stonechat, Redpoll and Long-tailed Tit occur on the cut-away.

The bog has been damaged by afforestation, mechanised peat-cutting and drainage. These three activities pose the main threats to the survival of raised bogs. In addition, a significant proportion of the bog surface was badly damaged by fire in the mid-1990s.

Ballynafagh Bog is of conservation importance as it contains examples of the Annex 1 habitats active raised bog, degraded raised bog and Rhynchosporion vegetation. Of particular note is that the bog is one of the most easterly examples of a relatively intact raised bog in Ireland and, together with Mouds bog, is one of only two such systems in Co. Kildare.

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SITE SYNOPSIS

Site Name: Ballynafagh Lake SAC

Site Code: 001387

Ballynafagh Lake is located about 2 km north-west of Prosperous in Co. Kildare. It is a shallow alkaline lake with some emergent vegetation. The Blackwood Feeder, which connects Ballynafagh Lake to the Grand Canal, is also included in the site.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[7230] Alkaline Fens
[1016] Desmoulin's Whorl Snail (*Vertigo moulinsiana*)
[1065] Marsh Fritillary (*Euphydryas aurinia*)

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Ballynafagh Lake is a shallow alkaline lake with patches of emergent vegetation in the middle, as well as around the shore. Submerged plants include starworts (*Callitriche* spp.) and Lesser Bladderwort (*Utricularia minor*), with Common Duckweed (*Lemna minor*) and the liverwort *Riccocarpus natans* occurring on the surface.

Alkaline fen vegetation occurs at the lake edge, including a plant community dominated by Blunt-flowered Rush (*Juncus subnodulosus*) and Black Bog-rush (*Schoenus nigricans*), and with frequent sedges (e.g. *Carex lepidocarpa* and *C. rostrata*). Other species in this area include Marsh-marigold (*Caltha palustris*), Marsh Lousewort (*Pedicularis palustris*), Marsh Arrowgrass (*Triglochin palustris*), Water Mint (*Mentha aquatica*) and Bulrush (*Typha latifolia*). Extensive stands of Common Reed (*Phragmites australis*), Bulrush and Bottle Sedge (*Carex rostrata*) occur around the open water. A stand of Great Fen-sedge (*Cladium mariscus*) occurs in the western corner.

The lake is surrounded by acid grassland, heath and bog. Here the vegetation includes Common Bent (*Agrostis capillaris*), Purple Moor-grass (*Molinia caerulea*), Bog-myrtle (*Myrica gale*), Bracken (*Pteridium aquilinum*), Gorse (*Ulex europaeus*) and Heather (*Calluna vulgaris*). Wet woodland of birch (*Betula* spp.), willow (*Salix* spp.) and Alder (*Alnus glutinosa*) occurs in the north-west corner of the lake.

The Blackwood Feeder connects Ballynafagh Lake to the Grand Canal and is of particular conservation significance for the populations of two rare snail species, *Vertigo moulinsiana* and *Pisidium pseudosphaerium*, that it supports. The former species is listed on Annex II of the E.U. Habitats Directive, while the latter has previously been recorded only from sites along the Royal Canal. *Vertigo moulinsiana* also occurs

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in wetland vegetation by Ballynafagh Lake itself. A high diversity of molluscan species is found on the site (42 species recorded in 1997).

A wide diversity of insects is also found at Ballynafagh Lake, including the Marsh Fritillary butterfly, a species listed on Annex II of the E.U. Habitats Directive.

Breeding birds of the lake include Little Grebe, Mallard, Moorhen, Coot, Snipe and Water Rail. In May 1993 a pair of Curlew was observed holding territory. Sedge Warbler, Reed Bunting and Whitethroat breed within the site. Black-headed Gulls formerly bred at the lake but only single birds were observed in 1993. Wintering waterfowl include: Whooper Swan 20, Teal 114, Mallard 110, Golden Plover 40 and Curlew 117 (all counts average peaks, 1 season 1984/85 - 86/87).

The main land use at the site is fishing in the lake. There is a 'No Shooting Area' Order on the site.

Although originally a reservoir, Ballynafagh Lake has developed a very natural vegetation with some interesting plant communities, including alkaline fen, a habitat that is listed on Annex I of the E.U. Habitats Directive. The site supports a high diversity of molluscan species, with some rare species recorded, including *Vertigo moulinsiana*, a species that is listed on Annex II of the E.U. Habitats Directive. The site is also of ornothological importance.

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SITE SYNOPSIS

Site Name: The Long Derries, Edenderry SAC

Site Code: 000925

The Long Derries is located approximately 5 km south-east of Edenderry in Co. Offaly and is part of a low esker ridge running from Edenderry to Rathdangan. It consists primarily of glacial gravels interspersed with loam and peat soil.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[6210] Orchid-rich Calcareous Grassland*

The dominant habitat at the Long Derries is dry calcareous grassland. This can be observed towards the north-western end where Carline Thistle (*Carlina vulgaris*), Marjoram (*Origanum vulgare*), Wild Thyme (*Thymus praecox*) and Cowslip (*Primula veris*) grow. An interesting feature is a number of used and unused gravel pits which are host to plants such as Mountain Everlasting (*Antennaria dioica*) and the rare Fine-leaved Sandwort (*Minuartia hybrida*), among others.

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In places, invading Hawthorn (*Crataegus monogyna*) forms blocks of scrub interspersed with open areas of calcareous grassland, as can be viewed in the eastern section. The eastern boundary grades into peatland where calcareous runnels are interspersed with miniature peat flushes. Here calcicole plant species are mixed with calcifuge ones such as Heather (*Calluna vulgaris*), Tormentil (*Potentilla erecta*), Lousewort (*Pedicularis sylvatica*) and Devil's-bit Scabious (*Succisa pratensis*).

An important aspect of this site is the presence of the rare, Red Data Book species Blue Fleabane (*Erigeron acer*) and Green-winged Orchid (*Orchis morio*), as well as the legally protected (Flora (Protection) Order, 1999), Basil Thyme (*Acinos arvensis*). A large population of the latter species occurs in the grassland communities, including those in the transition to peatland zone. Blue Fleabane is found in grassland and gravel pits on the site, the latter habitat also supporting Basil Thyme.

The summer birdlife of this area includes Sand Martin, Whinchat, Whitethroat and Cuckcoo. Nightjar, a rare species listed in Annex I of the E.U. Birds Directive, breeds on the site. Partridge, an endangered species in Ireland and one listed in the Red Data Book, is known from the site. Badgers have setts along some of the mature hedgerows.

At the western section of this site activities connected with the harvesting of peat occur. The eastern section of the site is grazed by cattle and horses. Grazing is

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essential for the preservation of the rare orchid, but over-grazing needs to be avoided. Shooting and motorbike scrambling are other activities occurring. Although gravel extraction has helped create habitats for some plant species, this could result in excessive damage if uncontrolled. Dumping of rubbish and old railway tracks is undesirable, as is interference with Badger setts.

The Long Derries is of botanical importance due to the presence of good quality dry, calcareous grassland, an interesting gravel pit flora and the presence of three rare plant species, two of which are legally protected. The presence of an interesting transition habitat from esker to peatland, and a varied bird population, including the rare Nightjar and Partridge, adds to the importance of the site.

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SITE SYNOPSIS

Site Name: Mouds Bog SAC

Site Code: 002331

Mouds Bog is located about 3 km north-west of Newbridge in Co. Kildare, close to the Hill of Allen, and includes amongst others, the townlands of Grangehiggin, Barretstown and Hawkfield. The site comprises a raised bog that includes both areas of high bog and cutover bog. Much of the margins of the site are bounded by trackways.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[7110] Raised Bog (Active)*
[7120] Degraded Raised Bog
[7150] Rhynchosporion Vegetation

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Active raised bog comprises areas of high bog that are wet and actively peat-forming, where the percentage cover of bog mosses (*Sphagnum* spp.) is high, and where some or all of the following features occur: hummocks, pools, wet flats, *Sphagnum* lawns, flushes and soaks. Degraded raised bog corresponds to those areas of high bog whose hydrology has been adversely affected by peat cutting, drainage and other land use activities, but which are capable of regeneration. The Rhynchosporion habitat occurs in wet depressions, pool edges and erosion channels where the vegetation includes White Beak-sedge (*Rhynchospora alba*) and/or Brown Beak-sedge (*R. fusca*), and at least some of the following associated species, Bog Asphodel (*Narthecium ossifragum*), sundews (*Drosera* spp.), Deergrass (*Scirpus cespitosus*) and Carnation Sedge (*Carex panicea*).

This site consists of two basins of high bog separated by a central ridge. Otherwise the bog is flat, with slopes at its margins. An area of wet quaking bog with well-developed pools occurs either side of the central ridge. The western high bog supports a number of small flush areas along with a wet quaking soak with scattered Downy Birch (*Betula pubescens*). The margins have extensive areas of cutover, especially to the west.

This is an example of a Midland Raised Bog at the eastern extremity of its current range. It supports typical species including Heather (*Calluna vulgaris*), along with Bog-rosemary (*Andromeda polifolia*) and Cranberry (*Vaccinium oxycoccos*). The central high bog supports wet flat quaking areas on both sides of the mineral ridge with frequent small pools supporting bog mosses (*Sphagnum cuspidatum*, *S. magellanicum* and *S. capillifolium*) and Great Sundew (*Drosera anglica*). Abundant Heather

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dominates the drier central ridge. The three flush areas along the southern perimeter of the east and west dome support a hummock/hollow system with Heather, Bog-myrtle (*Myrica gale*) and in places Crowberry (*Empetrum nigrum*). The wet hollows support a variety of bog mosses, including *S. tenellum*. A wet quaking soak to the south supports abundant bog moss (*S. cuspidatum*) and tall Common Cottongrass (*Eriophorum angustifolium*). Cutover areas to the north-east support Purple Moor-grass (*Molinia caerulea*), Soft Rush (*Juncus effusus*) and there is encroaching Downy Birch and Gorse (*Ulex europaeus*) in places.

Red Grouse, a Red Listed species and one that is becoming increasingly rare in Ireland, has been recorded on this site. Other birds noted on the site include Skylark, Meadow Pipit, Curlew and Kestrel.

Current land use on the site consists of peat-cutting, with extensive active industrial peat moss production in the western section of the remaining high bog. Domestic turf cutting is widely practised along the southern margin of the bog, in the south-west corner and in the centre of the northern edge. Apart from the western cutover margin, the high bog is not being actively drained. Some small areas of the cutover have been reclaimed for agriculture in recent years. Burning has taken place in the recent past, and there is extensive damage in the west of the site due to industrial peat production. These are all activities that have resulted in loss of habitat and damage to the hydrological status of the site, and pose a continuing threat to its viability. Despite the damaging effects the high bog has retained some wet areas largely due to the topography of the site.

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Mouds Bog is significant in terms of its high bog area and geographical location as it is at the eastern extreme of the range of raised bogs in Ireland. It is a site of considerable conservation significance comprising a large raised bog, a rare habitat in the E.U. and one that is becoming increasingly scarce and under threat in Ireland. This site supports a good diversity of raised bog microhabitats including hummock/hollow complexes, pools and flushes, and cutover, all of which add to the diversity and scientific value of the site. Active raised bog is listed as a priority habitat on Annex I of the E.U. Habitats Directive. Priority status is given to habitats and species that are threatened throughout the E.U. Ireland has a high proportion of the total E.U. resource of this habitat type (over 60%) and so has a special responsibility for its conservation at an international level.

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SITE SYNOPSIS

Site Name: Pollardstown Fen SAC

Site Code: 000396

Pollardstown Fen is situated on the northern margin of the Curragh of Kildare, approximately 3 km north-west of Newbridge. It lies in a shallow depression, running in a north-west/south-east direction. About 40 springs provide a continuous supply of water to the fen. These rise chiefly at its margins, along distinct seepage areas of mineral ground above the fen level. The continual inflow of calcium-rich water from the Curragh, and from the limestone ground to the north, creates waterlogged conditions which lead to peat formation. There are layers of calcareous marl in this peat, reflecting inundation by calcium-rich water. This peat-marl deposit reaches some 6 m at its deepest point and is underlain by clay.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[7210] *Cladium* Fens*
[7220] Petrifying Springs*
[7230] Alkaline Fens
[1013] Geyer's Whorl Snail (*Vertigo geyeri*)
[1014] Narrow-mouthed Whorl Snail (*Vertigo angustior*)
[1016] Desmoulin's Whorl Snail (*Vertigo moulinsiana*)

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Pollardstown Fen is unusual in Ireland as it is an extensive area of primary and secondary fen peat, lacking scrub vegetation on its surface. The fen vegetation is generally from 0.5 - 1.5 m high and consists mainly of Great Fen-sedge (*Cladium mariscus*), Common Reed (*Phragmites australis*), Blunt-flowered Rush (*Juncus subnodulosus*) and a variety of sedges (*Carex* spp.). The vegetation is quite varied and species-rich, with numerous well-defined plant communities and several rare or scarce species. These include Narrow-leaved Marsh-orchid (*Dactylorhiza traunsteineri*), Fly Orchid (*Ophrys insectifera*) and Broad-leaved Cottongrass (*Eriophorum latifolium*). Of particular interest is the occurrence of the moss, *Homalothecium nitens* - a boreal relict species which is rare in Ireland. Species and communities characteristic of more nutrient-rich conditions occur on the fen margins where the water first emerges from the ground (these correspond with 'alkaline fen'), while the central fen area is dominated by more uniform and less nutrient-demanding vegetation types. Some of the springs correspond to the habitat 'petrifying springs', and tufa mounds have been noted.

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Damp pastures occur on wet mineral soils and partly-drained peats on the fen margins. These are reasonably species-rich, with particularly good displays of orchids in some areas.

The fen has ornithological importance for both breeding and wintering birds. Little Grebe, Coot, Moorhen, Teal, Mallard, Mute Swan, Water Rail, Snipe, Sedge Warbler and Reed Bunting all breed annually within the fen vegetation. Reed Warbler and Garganey, both rare breeding species in Ireland, have been recorded at Pollardstown and may have bred. In recent years two very specialised bird species associated with fens, Marsh Harrier and Savi's Warbler, have been seen at Pollardstown.

An area of reclaimed land was reflooded in 1983 and has now reverted to open water, swamp and regenerating fen. Since the reflooding of the fen and the development of the shallow lake, wintering waterfowl have been attracted in increased numbers. Maximum counts during winter 1984/85 were as follows: Little Grebe 24; Teal 161; Mallard 220; Coot 81 and Snipe 68.

Otter and Brook Lamprey (*Lampetra planeri*), two species listed in Annex II of the E.U. Habitats Directive, occur at Pollardstown.

Various groups of the invertebrate fauna have been studied and the system has been shown to support a true fen fauna. The species complexes represented are often rare in Ireland, with the sub-aquatic organisms are particularly well-represented. A number of internationally important invertebrates (mostly Order Diptera, i.e. two-winged flies) have been recorded from the site. Of particular conservation importance, however, is the occurrence of all three of the Whorl Snails (*Vertigo* spp.) that are listed on Annex II of the E.U. Habitats Directive. Pollardstown is the only known site in Ireland (or Europe) to support all three species (*Vertigo geyeri*, *V. angustior* and *V. moulinsiana*), and it therefore provides a unique opportunity to study their different habitat and hydrological requirements.

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Much of the site with fen vegetation is now owned by the Office of Public Works and is a Statutory Nature Reserve.

Pollardstown fen is the largest spring-fed fen in Ireland and has a well-developed and specialised flora and fauna. Owing to the rarity of this habitat and the numbers of rare organisms found there, the site is rated of international importance.

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SITE SYNOPSIS

Site Name: River Boyne and River Blackwater SAC

Site Code: 002299

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. These riverine stretches drain a considerable area of Meath and Westmeath, and smaller areas of Cavan and Louth. The underlying geology is Carboniferous Limestone for the most part, with areas of Upper, Lower and Middle well represented. In the vicinity of Kells Silurian Quartzite is present while close to Trim are Carboniferous Shales and Sandstones. There are many large towns adjacent to but not within the site, including Slane, Navan, Kells, Trim, Athboy and Ballivor.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[7230] Alkaline Fens
[91E0] Alluvial Forests*
[1099] River Lamprey (*Lampetra fluviatilis*)
[1106] Atlantic Salmon (*Salmo salar*)
[1355] Otter (*Lutra lutra*)

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The main areas of alkaline fen in this site are concentrated in the vicinity of Lough Shesk, Freehan Lough and Newtown Lough. The hummocky nature of the local terrain produces frequent springs and seepages which are rich in lime. A series of base-rich marshes have developed in the poorly-drained hollows, generally linked with these three lakes. Open water is usually fringed by Bulrush (*Typha latifolia*), Common Club-rush (*Scirpus lacustris*) or Common Reed (*Phragmites australis*), and this last species also extends shorewards where a dense stand of Great Fen-sedge (*Cladium mariscus*) frequently occurs. This in turn grades into a sedge and grass community (*Carex* spp. and Purple Moor-grass, *Molinia caerulea*), or one dominated by Black Bog-rush (*Schoenus nigricans*). An alternative aquatic/terrestrial transition is a floating layer of vegetation. This is normally based on Bogbean (*Menyanthes trifoliata*) and Marsh Cinquefoil (*Potentilla palustris*). Other species gradually become established on this cover, especially plants tolerant of low nutrient status e.g. bog mosses (*Sphagnum* spp.). Diversity of plant and animal life is high in the fen and the flora includes many rarities. Plants of interest include Narrow-leaved Marsh-orchid (*Dactylorhiza traunsteineri*), Fen Bedstraw (*Galium uliginosum*), Cowbane (*Cicuta virosa*), Frogbit (*Hydrocharis morsus-ranae*) and Least Bur-reed (*Sparganium minimum*). These species tend to be restricted in their distribution in Ireland. Also notable is the

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abundance of aquatic stoneworts (*Chara* spp.) which are characteristic of calcareous wetlands.

The rare plant Round-leaved Wintergreen (*Pyrola rotundifolia*) occurs around Newtown Lough. This species is listed in the Red Data Book and this site represents its only occurrence in Co. Meath.

Wet woodland fringes many stretches of the Boyne. The Boyne River Islands are a small chain of three islands situated 2.5 km west of Drogheda. The islands were formed by the build-up of alluvial sediment in this part of the river where water movement is sluggish. All of the islands are covered by dense thickets of wet, willow (*Salix* spp.) woodland, with the following species occurring: Osier (*S. viminalis*), Crack Willow (*S. fragilis*), White Willow (*S. alba*), Purple Willow (*Salix purpurea*) and Rusty Willow (*S. cinerea* subsp. *oleifolia*). A small area of Alder (*Alnus glutinosa*) woodland is found on soft ground at the edge of the canal in the north-western section of the islands. Along other stretches of the rivers of the site Rusty Willow scrub and pockets of wet woodland dominated by Alder have become established, particularly at the river edge of mature deciduous woodland. Ash (*Fraxinus excelsior*) and Downy Birch (*Betula pubescens*) are common in the latter, and the ground flora is typical of wet woodland with Meadowsweet (*Filipendula ulmaria*), Wild Angelica (*Angelica sylvestris*), Yellow Iris (*Iris pseudacorus*), horsetails (*Equisetum* spp.) and occasional tussocks of Greater Tussock-sedge (*Carex paniculata*).

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The dominant habitat along the edges of the river is freshwater marsh, and the following plant species occur commonly in these areas: Yellow Iris, Creeping Bent (*Agrostis stolonifera*), Canary Reed-grass (*Phalaris arundinacea*), Marsh Bedstraw (Galium palustre), Water Mint (*Mentha aquatica*) and Water Forget-me-not (*Myosotis scorpioides*). In the wetter areas Common Meadow-rue (*Thalictrum flavum*) is found. In the vicinity of Dowth, Fen Bedstraw (*Galium uliginosum*), a scarce species mainly confined to marshy areas in the midlands, is common in this vegetation. Swamp Meadow-grass (*Poa palustris*) is an introduced plant which has spread into the wild (naturalised) along the Boyne approximately 5 km south-west of Slane. It is a rare species which is listed in the Red Data Book and has been recorded among freshwater marsh vegetation on the banks of the Boyne in this site. The only other record for this species in the Republic of Ireland is from a site in Co. Monaghan.

The secondary habitat associated with the marsh is wet grassland and species such as Tall Fescue (*Festuca arundinacea*), Silverweed (*Potentilla anserina*), Creeping Buttercup (*Ranunculus repens*), Meadowsweet and Meadow Vetchling (*Lathyrus pratensis*) are well represented. Strawberry Clover (*Trifolium fragiferum*), a plant generally restricted to coastal locations in Ireland, has been recorded from wet grassland vegetation at Trim. At Rossnaree river bank on the River Boyne, Round-Fruited Rush (*Juncus compressus*) is found in alluvial pasture, which is generally periodically flooded during the winter months. This rare plant is only found in three counties in Ireland.

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Along much of the Boyne and along tributary stretches are found areas of mature deciduous woodland on the steeper slopes above the floodplain marsh or wet woodland vegetation. Many of these are planted in origin. However the steeper areas of King Williams Glen and Townley Hall wood have been left unmanaged and now have a more natural character. East of Curley Hole the woodland has a natural appearance with few conifers. Broadleaved species include oaks (*Quercus* spp.), Ash, willows, Hazel (*Corylus avellana*), Sycamore (*Acer pseudoplatanus*), Holly (*Ilex aquifolium*), Horse-chestnut (*Aesculus hipposcastanum*) and the shrubs Hawthorn (*Crataegus monogyna*), Blackthorn (*Prunus spinosa*) and Elder (*Sambucus nigra*). South-west of Slane and in Dowth, some more exotic tree species such as Beech (*Fagus sylvatica*), and occasionally Lime (*Tilia cordata*), are seen. The coniferous trees Larch (*Larix* sp.) and Scots Pine (*Pinus sylvestris*) also occur. The woodland ground flora includes Barren Strawberry (*Potentilla sterilis*), Enchanter's-nightshade (*Circaea lutetiana*) and Ground-ivy (*Glechoma hederacea*), along with a range of ferns. Variation occurs in the composition of the canopy - for example, in wet patches alongside the river, White Willow and Alder form the canopy.

Other habitats present along the Boyne and Blackwater include lowland dry grassland, improved grassland, reedswamp, weedy waste ground, scrub, hedge, drainage ditch and canal. In the vicinity of Lough Sheske the dry slopes of the morainic hummocks support grassland vegetation which, in some places, is partially colonised by Gorse (*Ulex europaeus*) scrub. Those grasslands which remain unimproved for pasture are species-rich, with Common Knapweed (*Centaurea nigra*), Creeping Thistle (*Cirsium arvense*) and Ribwort Plantain (*Plantago lanceolata*) commonly present. Fringing the canal alongside the Boyne south-west of Slane are areas with Reed Sweet-grass (*Glyceria maxima*), Great Willowherb (*Epilobium hirsutum*) and Meadowsweet.

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The Boyne and its tributaries form one of Ireland's premier game fisheries and the area offers a wide range of angling, from fishing for spring salmon and grilse to seatrout fishing and extensive brown trout fishing. Atlantic Salmon (*Salmo salar*) use the tributaries and headwaters as spawning grounds. Although this species is still fished commercially in Ireland, it is considered to be endangered or locally threatened elsewhere in Europe and is listed on Annex II of the Habitats Directive. Atlantic Salmon run the Boyne almost every month of the year. The Boyne is most important as it represents an eastern river which holds large three-sea-winter fish from 20-30 lb. These fish generally arrive in February, with smaller spring fish (10 lb) arriving in April/May. The grilse come in July, water permitting. The river gets a further run of fish in late August and this run would appear to last well after the fishing season. The salmon fishing season lasts from 1st March to 30th September.

The Blackwater is a medium sized limestone river which is still recovering from the effects of the arterial drainage scheme of the 1970s. Salmon stocks have not recovered to the numbers that existed pre-drainage. The Deel, Riverstown, Stoneyford and Tremblestown Rivers are all spring-fed, with a continuous high volume of water. They are difficult to fish because some areas are overgrown, while others have been affected by drainage with resultant high banks.

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This site is also important for the populations of two other species listed on Annex II of the E.U. Habitats Directive which it supports, namely River Lamprey (*Lampetra fluviatilis*), which is present in the lower reaches of the Boyne River, and Otter (*Lutra lutra*), which can be found throughout the site. In addition, the site also supports many more of the mammal species occurring in Ireland. Those which are listed in the Irish Red Data Book include Pine Marten, Badger and Irish Hare. Common Frog, another Red Data Book species, also occurs within the site. All of these animals, with the addition of the Stoat and Red Squirrel, which also occur within the site, are protected under the Wildlife Act, 1976.

Whooper Swans winter regularly at several locations along the Boyne and Blackwater Rivers. Known sites are at Newgrange (approx. 20 in recent winters), near Slane (20+ in recent winters), Wilkinstown (several records of 100+) and River Blackwater from Kells to Navan (104 at Kells in winter 1996/97, 182 at Headfort in winter 1997/98, 200-300 in winter 1999/00). The available information indicates that there is a regular wintering population of Whooper Swans based along the Boyne and Blackwater River valleys. The birds use a range of feeding sites but roosting sites are not well known. The population is substantial, certainly of national, and at times international, importance. Numbers are probably in the low hundreds.

Intensive agriculture is the main land use along the site. Much of the grassland is in very large fields and is improved. Silage harvesting is carried out. The spreading of slurry and fertiliser poses a threat to the water quality of this salmonid river and to the lakes. In the more extensive agricultural areas sheep grazing is carried out.

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Fishing is a main tourist attraction on the Boyne and Blackwater and there are a number of Angler Associations, some with a number of beats. Fishing stands and styles have been erected in places. The Eastern Regional Fishery Board have erected fencing along selected stretches of the river as part of their salmonid enhancement programme. Parts of the river system have been arterially dredged. In 1969 an arterial dredging scheme commenced and disrupted angling for 18 years. The dredging altered the character of the river completely and resulted in many areas in very high banks. The main channel from Drogheda upstream to Navan was left untouched, as were a few stretches on the Blackwater. Ongoing maintenance dredging is carried out along stretches of the river system where the gradient is low. This is extremely destructive to salmonid habitat in the area. Drainage of the adjacent river systems also impacts on the many small wetland areas throughout the site. The River Boyne is a designated Salmonid Water under the E.U. Freshwater Fish Directive.

The site supports populations of several species listed on Annex II of the E.U. Habitats Directive, and habitats listed on Annex I of this Directive, as well as examples of other important habitat types. Although the wet woodland areas appear small there are few similar examples of this type of alluvial wet woodland remaining in the country, particularly in the north-east. The semi-natural habitats, particularly the strips of woodland which extend along the river banks, and the marsh and wet

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grasslands, increase the overall habitat diversity and add to the ecological value of the site, as does the presence of a range of Red Data Book plant and animal species and the presence of nationally rare plant species.

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SITE SYNOPSIS

SITE NAME: RIVER BOYNE AND RIVER BLACKWATER SPA

SITE CODE: 004232

The River Boyne and River Blackwater SPA is a long, linear site that comprises stretches of the River Boyne and several of its tributaries; most of the site is in Co. Meath, but it extends also into Cos Cavan, Louth and Westmeath. It includes the following river sections: the River Boyne from the M1 motorway bridge, west of Drogheda, to the junction with the Royal Canal, west of Longwood, Co Meath; the River Blackwater from its junction with the River Boyne in Navan to the junction with Lough Ramor in Co. Cavan; the Tremblestown River/Athboy River from the junction with the River Boyne at Kilnagross Bridge west of Trim to the bridge in Athboy, Co. Meath; the Stoneyford River from its junction with the River Boyne to Stonestown Bridge in Co. Westmeath; the River Deel from its junction with the River Boyne to Cummer Bridge, Co. Westmeath. The site includes the river channel and marginal vegetation.

Most of the site is underlain by Carboniferous limestone but Silurian quartzite also occurs in the vicinity of Kells and Carboniferous shales and sandstones close to Trim.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive of special conservation interest for the following species: Kingfisher.

A survey in 2010 recorded 19 pairs of Kingfisher (based on 15 probable and 4 possible territories) in the River Boyne and River Blackwater SPA. A survey conducted in 2008 recorded 20-22 Kingfisher territories within the SPA. Other species which occur within the site include Mute Swan (90), Teal (166), Mallard (219), Cormorant (36), Grey Heron (44), Moorhen (84), Snipe (32) and Sand Martin (553) – all figures are peak counts recorded during the 2010 survey.

The River Boyne and River Blackwater Special Protection Area is of high ornithological importance as it supports a nationally important population of Kingfisher, a species that is listed on Annex I of the E.U. Birds Directive.

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SITE SYNOPSIS

Site Name: River Barrow and River Nore SAC

Site Code: 002162

This site consists of the freshwater stretches of the Barrow and Nore River catchments as far upstream as the Slieve Bloom Mountains, and it also includes the tidal elements and estuary as far downstream as Creadun Head in Waterford. The site passes through eight counties – Offaly, Kildare, Laois, Carlow, Kilkenny, Tipperary, Wexford and Waterford. Major towns along the edge of the site include Mountmellick, Portarlington, Monasterevin, Stradbally, Athy, Carlow, Leighlinbridge, Graiguenamanagh, New Ross, Inistioge, Thomastown, Callan, Bennettsbridge, Kilkenny and Durrow. The larger of the many tributaries include the Lerr, Fushoge, Mountain, Aughavaud, Owenass, Boherbaun and Stradbally Rivers of the Barrow, and the Delour, Dinin, Erkina, Owveg, Munster, Arrigle and King's Rivers on the Nore.

Both rivers rise in the Old Red Sandstone of the Slieve Bloom Mountains before passing through a band of Carboniferous shales and sandstones. The Nore, for a large part of its course, traverses limestone plains and then Old Red Sandstone for a short stretch below Thomastown. Before joining the Barrow it runs over intrusive rocks poor in silica. The upper reaches of the Barrow also run through limestone. The middle reaches and many of the eastern tributaries, sourced in the Blackstairs Mountains, run through Leinster Granite. The southern end, like the Nore runs over intrusive rocks poor in silica. Waterford Harbour is a deep valley excavated by glacial floodwaters when the sea level was lower than today. The coast shelves quite rapidly along much of the shore.

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The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[1130] Estuaries
[1140] Tidal Mudflats and Sandflats
[1170] Reefs
[1310] *Salicornia* Mud
[1330] Atlantic Salt Meadows
[1410] Mediterranean Salt Meadows
[3260] Floating River Vegetation
[4030] Dry Heath
[6430] Hydrophilous Tall Herb Communities
[7220] Petrifying Springs*
[91A0] Old Oak Woodlands

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[91E0] Alluvial Forests*

[1016] Desmoulin's Whorl Snail (*Vertigo moulinsiana*)
[1029] Freshwater Pearl Mussel (*Margaritifera margaritifera*)
[1092] White-clawed Crayfish (*Austropotamobius pallipes*)
[1095] Sea Lamprey (*Petromyzon marinus*)
[1096] Brook Lamprey (*Lampetra planeri*)
[1099] River Lamprey (*Lampetra fluviatilis*)
[1103] Twaite Shad (*Alosa fallax*)
[1106] Atlantic Salmon (*Salmo salar*)
[1355] Otter (*Lutra lutra*)
[1421] Killarney Fern (*Trichomanes speciosum*)
[1990] Nore Freshwater Pearl Mussel (*Margaritifera durrovensis*)

Good examples of alluvial forest (a priority habitat on Annex I of the E.U. Habitats Directive) are seen at Rathsnagadan, Murphy's of the River, in Abbeyleix estate and along other shorter stretches of both the tidal and freshwater elements of the site. Typical species seen include Almond Willow (*Salix triandra*), White Willow (*S. alba*), Rusty Willow (*S. cinerea* subsp. *oleifolia*), Crack Willow (*S. fragilis*) and Osier (*S. viminalis*), along with Iris (*Iris pseudacorus*), Hemlock Water-dropwort (*Oenanthe crocata*), Wild Angelica (*Angelica sylvestris*), Thin-spiked Wood-sedge (*Carex strigosa*), Pendulous Sedge (*C. pendula*), Meadowsweet (*Filipendula ulmaria*), Common Valerian (*Valeriana officinalis*) and the Red Data Book species Nettle-leaved Bellflower (*Campanula trachelium*).

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A good example of petrifying springs with tufa formations occurs at Dysart Wood along the Nore. This is a rare habitat in Ireland and one listed with priority status on Annex I of the E.U. Habitats Directive. These hard water springs are characterised by lime encrustations, often associated with small waterfalls. A rich bryophyte flora is typical of the habitat and two diagnostic species, *Palustriella commutata* and *Eucladium verticillatum*, have been recorded.

The best examples of old oak woodlands are seen in the ancient Park Hill woodland in the estate at Abbeyleix; at Kyleadohir, on the Delour, Forest Wood House, Kylecorragh and Brownstown Woods on the Nore; and at Cloghristic Wood, Drummond Wood and Borris Demesne on the Barrow, though other patches occur throughout the site. Abbeyleix Woods is a large tract of mixed deciduous woodland which is one of the only remaining true ancient woodlands in Ireland. Historical records show that Park Hill has been continuously wooded since the 16th century and has the most complete written record of any woodland in the country. It supports a variety of woodland habitats and an exceptional diversity of species including 22 native trees, 44 bryophytes and 92 lichens. It also contains eight indicator species of ancient woodlands. Park Hill is also the site of two rare plants, Nettle-leaved

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Bellflower and the moss *Leucodon sciuroides.* The rare Myxomycete fungus, *Licea minima* has been recorded from woodland at Abbeyleix.

Oak woodland covers parts of the valley side south of Woodstock and is well developed at Brownsford where the Nore takes several sharp bends. The steep valley side is covered by oak (*Quercus* spp.), Holly (*Ilex aquifolium*), Hazel (*Corylus avellana*) and Downy Birch (*Betula pubescens*), with some Beech (*Fagus sylvatica*) and Ash (*Fraxinus excelsior*). All the trees are regenerating through a cover of Bramble (*Rubus fruticosus* agg.), Foxglove (*Digitalis purpurea*), Great Wood-rush (*Luzula sylvatica*) and Broad Buckler-fern (*Dryopteris dilatata*).

On the steeply sloping banks of the River Nore, about 5 km west of New Ross, in Co. Kilkenny, Kylecorragh Woods form a prominent feature in the landscape. This is an excellent example of relatively undisturbed, relict oak woodland with a very good tree canopy. The wood is quite damp and there is a rich and varied ground flora. At Brownstown, a small, mature oak dominated woodland occurs on a steep slope. There is younger woodland to the north and east of it. Regeneration throughout is evident. The understorey is similar to the woods at Brownsford. The ground flora of this woodland is developed on acidic, brown earth type soil and comprises a thick carpet of Bilberry (*Vaccinium myrtillus*), Heather (*Calluna vulgaris*), Hard Fern (*Blechnum spicant*), Common Cow-wheat (*Melampyrum pratense*) and Bracken (*Pteridium aquilinum*).

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Borris Demesne contains a very good example of a semi-natural broadleaved woodland in very good condition. There is quite a high degree of natural re-generation of oak and Ash through the woodland. At the northern end of the estate oak species predominate. Drummond Wood, also on the Barrow, consists of three blocks of deciduous woods situated on steep slopes above the river. The deciduous trees are mostly oak species. The woods have a well-established understorey of Holly, and the herb layer is varied, with Bramble abundant. The whitebeam *Sorbus devoniensis* has also been recorded here.

Eutrophic tall herb vegetation occurs in association with the various areas of alluvial forest and elsewhere where the floodplain of the river is intact. Characteristic species of the habitat include Meadowsweet, Purple Loosestrife (*Lythrum salicaria*), Marsh Ragwort (*Senecio aquaticus*), Ground Ivy (*Glechoma hederacea*) and Hedge Bindweed (*Calystegia sepium*). Indian Balsam (*Impatiens glandulifera*), an introduced and invasive species, is abundant in places.

Floating river vegetation is well represented in the Barrow and in the many tributaries of the site. In the Barrow the species found include water-starworts (*Callitriche* spp.), Canadian Pondweed (*Elodea canadensis*), Bulbous Rush (*Juncus bulbosus*), water-milfoils (*Myriophyllum* spp.), the pondweed *Potamogeton* x *nitens*, Broad-leaved Pondweed (*P. natans*), Fennel Pondweed (*P. pectinatus*), Perfoliated Pondweed (*P. perfoliatus*) and crowfoots (*Ranunculus* spp.). The water quality of the Barrow has improved since the vegetation survey was carried out (EPA, 1996).

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Dry heath at the site occurs in pockets along the steep valley sides of the rivers especially in the Barrow Valley and along the Barrow tributaries where they occur in the foothills of the Blackstairs Mountains. The dry heath vegetation along the slopes of the river bank consists of Bracken and Gorse (*Ulex europaeus*) with patches of acidic grassland vegetation. Additional typical species include Heath Bedstraw (*Galium saxatile*), Foxglove, Common Sorrel (*Rumex acetosa*) and Creeping Bent (*Agrostis stolonifera*). On the steep slopes above New Ross the Red Data Book species Greater Broomrape (*Orobanche rapum-genistae*) has been recorded. Where rocky outcrops are shown on the maps Bilberry and Great Wood-rush are present. At Ballyhack a small area of dry heath is interspersed with patches of lowland dry grassland. These support a number of clover species, including the legally protected Clustered Clover (*Trifolium glomeratum*) - a species known from only one other site in Ireland. This grassland community is especially well developed on the west side of the mud-capped walls by the road. On the east of the cliffs a group of rock-dwelling species occur, i.e. English Stonecrop (*Sedum anglicum*), Sheep's-bit (*Jasione montana*) and Wild Madder (*Rubia peregrina*). These rocks also support good lichen and moss assemblages with *Ramalina subfarinacea* and *Hedwigia ciliata*.

Dry heath at the site generally grades into wet woodland or wet swamp vegetation lower down the slopes on the river bank. Close to the Blackstairs Mountains, in the foothills associated with the Aughnabrisky, Aughavaud and Mountain Rivers there are small patches of wet heath dominated by Purple Moor-grass (*Molinia caerulea*) with Heather, Tormentil (*Potentilla erecta*), Carnation Sedge (*Carex panicea*) and Bell Heather (*Erica cinerea*).

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Salt meadows occur at the southern section of the site in old meadows where the embankment has been breached, along the tidal stretches of in-flowing rivers below Stokestown House, in a narrow band on the channel side of Common Reed (*Phragmites australis*) beds and in narrow fragmented strips along the open shoreline. In the larger areas of salt meadow, notably at Carrickcloney, Ballinlaw Ferry and Rochestown on the west bank; Fisherstown, Alderton and Great Island to Dunbrody on the east bank, the Atlantic and Mediterranean sub types are generally intermixed. At the upper edge of the salt meadow in the narrow ecotonal areas bordering the grasslands where there is significant percolation of salt water, the legally protected species Borrer's Saltmarsh-grass (*Puccinellia fasciculata*) and Meadow Barley (*Hordeum secalinum*) are found. The very rare and also legally protected Divided Sedge (*Carex divisa*) is also found. Sea Rush (*Juncus maritimus*) is also present. Other plants recorded and associated with salt meadows include Sea Aster (*Aster tripolium*), Thrift (*Armeria maritima*), Sea Couch (*Elymus pycnanthus*), Spear-leaved Orache (*Atriplex prostrata*), Lesser Sea-spurrey (*Spergularia marina*), Sea Arrowgrass (*Triglochin maritima*) and Sea Plantain (*Plantago maritima*).

Glassworts (*Salicornia* spp.) and other annuals colonising mud and sand are found in the creeks of the saltmarshes and at the seaward edges of them. The habitat also occurs in small amounts on some stretches of the shore free of stones.

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The estuary and the other E.U. Habitats Directive Annex I habitats within it form a large component of the site. Extensive areas of intertidal flats, comprised of substrates ranging from fine, silty mud to coarse sand with pebbles/stones are present. Good quality intertidal sand and mudflats have developed on a linear shelf on the western side of Waterford Harbour, extending for over 6 km from north to south between Passage East and Creadaun Head, and in places are over 1 km wide. The sediments are mostly firm sands, though grade into muddy sands towards the upper shore. They have a typical macro-invertebrate fauna, characterised by polychaetes and bivalves. Common species include *Arenicola marina*, *Nephtys hombergii*, *Scoloplos armiger*, *Lanice conchilega* and *Cerastoderma edule*. An extensive area of honey-comb worm biogenic reef occurs adjacent to Duncannon, Co. Wexford on the eastern shore of the estuary. It is formed by the polychaete worm *Sabellaria alveolata.* This intertidal *Sabellaria alveolata* reef is formed as a sheet of interlocking tubes over a considerable area of exposed bedrock. This polychaete species constructs tubes, composed of aggregated sand grains, in tightly packed masses with a distinctive honeycomb-like appearance. These can be up to 25cm proud of the substrate and form hummocks, sheets or more massive formations. A range of species are reported from these reefs including: *Enteromorpha* sp.; *Ulva* sp.; *Fucus vesiculosus*; *Fucus serratus*; *Polysiphonia* sp.; *Chondrus crispus*; *Palmaria palmate*; *Coralinus officialis*; *Nemertea* sp.; *Actinia equine*; *Patella vulgate*; *Littorina littorea*; *Littorina obtusata* and *Mytilus edulis*.

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The western shore of the harbour is generally stony and backed by low cliffs of glacial drift. At Woodstown there is a sandy beach, now much influenced by recreation pressure and erosion. Behind it a lagoonal marsh has been impounded which runs westwards from Gaultiere Lodge along the course of a slow stream. An extensive reedbed occurs here. At the edges is a tall fen dominated by sedges (*Carex* spp.), Meadowsweet, willowherbs (*Epilobium* spp.) and rushes (*Juncus* spp.). Wet woodland also occurs.

The dunes which fringe the strand at Duncannon are dominated by Marram (*Ammophila arenaria*) towards the sea. Other species present include Wild Clary/Sage (*Salvia verbenaca*), a rare Red Data Book species. The rocks around Duncannon ford have a rich flora of seaweeds typical of a moderately exposed shore and the cliffs themselves support a number of coastal species on ledges, including Thrift, Rock Samphire (*Crithmum maritimum*) and Buck's-horn Plantain (*Plantago coronopus*).

Other habitats which occur throughout the site include wet grassland, marsh, reedswamp, improved grassland, arable land, quarries, coniferous plantations, deciduous woodland, scrub and ponds.

Seventeen Red Data Book plant species have been recorded within the site, most in the recent past. These are Killarney Fern (*Trichomanes speciosum*), Divided Sedge, Clustered Clover, Basil Thyme (*Acinos arvensis*), Red Hemp-nettle (*Galeopsis angustifolia*), Borrer's Saltmarsh-grass, Meadow Barley, Opposite-leaved Pondweed (*Groenlandia densa*), Meadow Saffron/Autumn Crocus (*Colchicum autumnale*), Wild Clary/Sage, Nettle-leaved Bellflower, Saw-wort (*Serratula tinctoria*), Bird Cherry

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(*Prunus padus*), Blue Fleabane (*Erigeron acer*), Fly Orchid (*Ophrys insectifera*), Ivy Broomrape (*Orobanche hederae*) and Greater Broomrape. Of these, the first nine are protected under the Flora (Protection) Order, 2015. Divided Sedge was thought to be extinct but has been found in a few locations in the site since 1990. In addition plants which do not have a very wide distribution in the country are found in the site including Thin-spiked Wood-sedge, Field Garlic (*Allium oleraceum*) and Summer Snowflake. Six rare lichens, indicators of ancient woodland, are found including *Lobaria laetevirens* and *L. pulmonaria.* The rare moss *Leucodon sciuroides* also occurs.

The site is very important for the presence of a number of E.U. Habitats Directive Annex II animal species including Freshwater Pearl Mussel (both *Margaritifera margaritifera* and *M. m. durrovensis*), White-clawed Crayfish, Salmon, Twaite Shad, three lamprey species – Sea Lamprey, Brook Lamprey and River Lamprey, the tiny whorl snail *Vertigo moulinsiana* and Otter. This is the only site in the world for the hard water form of the Freshwater Pearl Mussel, *M. m. durrovensis,* and one of only a handful of spawning grounds in the country for Twaite Shad. The freshwater stretches of the River Nore main channel is a designated salmonid river. The Barrow/Nore is mainly a grilse fishery though spring salmon fishing is good in the vicinity of Thomastown and Inistioge on the Nore. The upper stretches of the Barrow and Nore, particularly the Owenass River, are very important for spawning.

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The site supports many other important animal species. Those which are listed in the Irish Red Data Book include Daubenton's Bat, Badger, Irish Hare and Common Frog. The rare Red Data Book fish species Smelt (*Osmerus eperlanus*) occurs in estuarine stretches of the site. In addition to the Freshwater Pearl Mussel, the site also supports two other freshwater mussel species, *Anodonta anatina* and *A. cygnea*.

Three rare invertebrates have been recorded in alluvial woodland at Murphy's of the River. These are: *Neoascia obliqua* (Order Diptera: Syrphidae), *Tetanocera freyi* (Order Diptera: Sciomyzidae) and *Dictya umbrarum* (Order Diptera: Sciomyzidae). The rare invertebrate, *Mitostoma chrysomelas* (Order Arachnida), occurs in the old oak woodland at Abbeyleix and only two other sites in the country. Two flies (Order Diptera) *Chrysogaster virescens* and *Hybomitra muhlfeldi* also occur at this woodland.

The site is of ornithological importance for a number of E.U. Birds Directive Annex I species, including Greenland White-fronted Goose, Whooper Swan, Bewick's Swan, Bar-tailed Godwit, Peregrine and Kingfisher. Nationally important numbers of Golden Plover and Bar-tailed Godwit are found during the winter. Wintering flocks of migratory birds are seen in Shanahoe Marsh and the Curragh and Goul Marsh, both in Co. Laois, and also along the Barrow Estuary in Waterford Harbour. There is also an extensive autumnal roosting site in the reedbeds of the Barrow Estuary used by Swallows before they leave the country. The old oak woodland at Abbeyleix has a typical bird fauna including Jay, Long-eared Owl and Raven. The reedbed at Woodstown supports populations of typical waterbirds including Mallard, Snipe, Sedge Warbler and Water Rail.

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Land use at the site consists mainly of agricultural activities – mostly intensive in nature and principally grazing and silage production. Slurry is spread over much of the area. Arable crops are also grown. The spreading of slurry and fertiliser poses a threat to the water quality of the salmonid river and to the populations of E.U. Habitats Directive Annex II animal species within the site. Many of the woodlands along the rivers belong to old estates and support many non-native species. Little active woodland management occurs. Fishing is a main tourist attraction along stretches of the main rivers and their tributaries and there are a number of Angler Associations, some with a number of beats. Fishing stands and styles have been erected in places. Both commercial and leisure fishing takes place on the rivers. There is net fishing in the estuary and a mussel bed also. Other recreational activities such as boating, golfing and walking, particularly along the Barrow towpath, are also popular. There is a golf course on the banks of the Nore at Mount Juliet and GAA pitches on the banks at Inistioge and Thomastown. There are active and disused sand and gravel pits throughout the site. Several industrial developments, which discharge into the river, border the site. New Ross is an important shipping port. Shipping to and from Waterford and Belview ports also passes through the estuary.

The main threats to the site and current damaging activities include high inputs of nutrients into the river system from agricultural run-off and several sewage plants, over-grazing within the woodland areas, and invasion by non-native species, for example Cherry Laurel (*Prunus laurocerasus*) and Rhododendron (*Rhododendron ponticum*). The water quality of the site remains vulnerable. Good quality water is necessary to maintain the populations of the Annex II animal species listed above. Good quality is dependent on controlling fertilisation of the grasslands, particularly along the Nore. It also requires that sewage be properly treated before discharge. Drainage activities in the catchment can lead to flash floods which can damage the many Annex II species present. Capital and maintenance dredging within the lower reaches of the system pose a threat to migrating fish species such as lamprey and shad. Land reclamation also poses a threat to the salt meadows and the populations of legally protected species therein.

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Overall, the site is of considerable conservation significance for the occurrence of good examples of habitats and of populations of plant and animal species that are listed on Annexes I and II of the E.U. Habitats Directive. Furthermore it is of high conservation value for the populations of bird species that use it. The occurrence of several Red Data Book plant species including three rare plants in the salt meadows and the population of the hard water form of the Freshwater Pearl Mussel, which is limited to a 10 km stretch of the Nore, add further interest to this site.

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APPENDIX B

Inferred Groundwater Contours

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N

Clonagh

Parsonstown

Loughnacush

Drumachon

Industrial Railway

Derrylea

Timahoe East

Timahoe Cross Rds

Timahoe West

Timahoe

Church

Burial Ground

Windmill Cross Rds

Kilkeaskin

Dillon's Br

Drummond

Ballynakill Lower

Ballynakill Upper

Abbeylough Br

Killinagh Lower

Coolcarrigan

Corduff

Sch

Groundwater Divide

82.6

82.6

80.8

80mOD

81mOD

82mOD

83mOD

83.7

GW1S &D

GW5AS &D

GW5S &D

GW11S &D

GW12S &D

GW13S &D

GW4S &D

GW9s

GW10s

GW3AD

GW3S &D

GW2S &D

GW7

GW6

34

33

32

30

29

79

88

93

90

87

86

84

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Legend

- Site Boundary
- Bord na Móna Ownership Boundary
- Existing MSW Landfill
- Consented MBT Facility
- Proposed Development
- Groundwater Divide
- Rivers
- Groundwater Contours
- EPA Monitoring Wells

0 125 250 500 750 1,000

Metres

NOTES

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING
2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE
3. ENGINEER TO BE INFORMED OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES
4. ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

Issue	Date	Description	By	Chkd.
Rev A	NOV '17	EIAR Issue	F.H	J.D.

Client: BORD NA MÓNA Naturally Driven

Project: PROPOSED DEVELOPMENT AT DREHID WASTE MANAGEMENT FACILITY

Title: INFERRED GROUNDWATER CONTOURS

Scale @ A3: 1:20,000

Prepared by:	Checked:	Date:
F.Healy	J. Dillon	November 2017

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Rev: A

Figure 6.8

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