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DESIGNING AND DELIVERING
A SUSTAINABLE FUTURE

POWERSTOWN BIOENERGY

Appropriate Assessment Screening Report and Natura Impact Statement

Prepared for:

Greengate Biogas 001 Ltd.

Greengate Biogas

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1. INTRODUCTION

Fehily Timoney and Company (FT) has prepared this Screening for Appropriate Assessment (AA) and Natura Impact Statement (NIS) on behalf of Greengate Biogas 001 Ltd. who are applying to An Coimisiún Pleanála (ACP) for planning permission to construct and operate the proposed development Powerstown Bioenergy at Mary Kelly's Pit, an operational and partially restored sand and gravel quarry, encompassing 9.19 hectares (ha), located at Powerstown, Milford, County Carlow. In addition to the proposed development, the Project includes a gas pipeline which is outside the boundary for development consent (red line boundary). Gas Networks Ireland as the Statutory Undertaker will be responsible for obtaining development consent to construct and operate the proposed gas pipeline route.

In this NIS, the following terminology is used:

- The 'proposed development' refers to all elements of the proposed commercial anaerobic digestion (AD) plant and ancillary works within the red line boundary.
- The 'proposed gas pipeline route' is the proposed route of the gas pipeline and all supporting activities.
- The ''Project' considers the proposed development and the proposed gas pipeline route.

The proposed development is an anaerobic digestion facility for the production of 250 GWh per annum of renewable natural gas and biogenic liquefied carbon dioxide from agricultural residues, including liquid farmyard manures and solid farmyard manures, collectively referred to as 'feedstocks'. The application seeks a planning permission that has a duration of 10 years from the date of grant. The proposed development will consist of the following:

- 2 no. site entrances off L3045, and a Weighbridge and Weighbridge Office (Gross Floor Area {GFA} 20 sqm, 3.85 m high).
- Circulation Yard (33,000 sqm) including: a Liquids Reception Building (GFA 735 sqm, 9.25 m high); a Solids Reception Building (GFA 2,386 sqm, 14.25 m high); a Solid Digestate Building (GFA 1,160 sqm, 12.85 m high); an Administration Building (GFA 459 sqm, 5.45 m high with a roof access area at 7.15 m high); a Heating Centre (GFA 1,314 sqm, 15.45 m high), with an exhaust stack (20 m high); 2,200 sqm of roof mounted solar panels on the Heating Centre, Administration Building, Liquids Reception Building and Solids Reception Building; and an Odour Abatement System including a stack (651 sqm, stack 35 m high).
- Bunded Tank Farm (19,075 sqm) including: 6 no. Primary Digesters (28.3 m high); 3 no. Secondary Digesters (28.3 m high); 1 no. Tertiary Digester (18 m high); 1 no. Post Digestion Liquid Digestate Storage Tank (21 m high); 1 no. Liquid Pre-Storage Tank (21 m high); 1 no. Digestate Storage Tank (17.6 m high); 3 no. Pasteurisation Tanks (11.9 m high); and Tank Farm Building (GFA 410 sqm, 5.5 m high).
- Gas Upgrade Area including: a Desulphurisation Plant (10.75 m high); a Gas Upgrade Plant (24.0 m high); a CO_2 Liquefaction plant (13.9 m high); a Biomethane Network Entry Facility (147 sqm, containers 2.975 m high, infrastructure 5.175 m high); and 2 no. Gas Flares Units (11.1 m stack height).
- Drainage Infrastructure and a Storm Water Lagoon (5,733 sqm).
- 1 no. Digestate Loading Tank (3.5 m high); 2 no. Buffer Storage Tanks (5.75 m high); and 2 no. Process and Fire Water Storage Tanks (4.6 m high).
- 2 no. ESB Substations (20 kV substation and a 38 kV substation).
- Ancillary Infrastructure including: Storage of Chemicals; Process and Fire Water Supply; Site Security; Lighting; Landscaping; and Car Parking (48 no. spaces).

The construction of a gas pipeline which will be developed within existing road servitudes, crossing the Ballynaboley Stream (crossing IDB1), the River Barrow (horizontal directional drilling (HDD) under the river) near the Cardinal Moran Bridge (IDB2), the unnamed tributary at Rathornan Bridge at crossing IDB3 (referred to in this report as Rathornan Stream), and an unnamed tributary to the River Barrow (IDB4) (referred to as the Tributary to the River Barrow). The gas pipeline also crosses two culverted land drains (IDB5 and IDB 6 respectively), which were dry over summer 2026. The gas pipeline terminates at an existing Gas Networks Ireland (GNI) above ground installation (AGI) in Clogrennan, Co. Carlow.

The Project has been screened for Appropriate Assessment (AA) (provided as Section 4 of this report), in which it was determined that significant effects to European sites could not be ruled out. FT has therefore prepared this NIS which presents a focused and detailed examination, analysis and evaluation of the implications of the Project, alone and in-combination with other plans and projects, on the integrity of a European site in view of that site's conservation objectives.

This NIS report has been prepared to inform the competent authority (in this case ACP) in completing their statutory obligations in relation to Appropriate Assessment, as required by Article 6(3) under Council Directive 92/43/EEC (as amended) (Habitats Directive) and under planning law, Section 177U (1) and (2) of the Planning and Development Act 2000 (as amended).

1.1 Legislative Context

Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the Habitats Directive) (European Communities, 1992) provides the principal legal framework for the protection of habitats and species of European importance. The Habitats Directive requires that Member States designate and ensure that particular protection is given to sites (Special Areas of Conservation) which are made up of or support particular habitats and species listed in annexes to this Directive. Its overall objective is to maintain or restore the 'favourable conservation status' of habitats and species of Community interest. These habitats and species are listed under the Habitats Directive and the Birds Directive (Council Directive 2009/147/EC on the Conservation of Wild Birds) (European Union, 2009)

Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) are designated under these Directives to protect habitats and species of European importance. Together, they form a network of protected sites known as 'European sites' or the Natura 2000 Network.

The Directives are transposed into Irish law by the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011), as amended. Regulation 42 of these Regulations gives effect to Article 6(3) of the Habitats Directive, which provides 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 light of the conclusions of that assessment, 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".

Accordingly, an AA must be undertaken for any plan or project that could, alone or in combination with other plans or projects, have significant effects on a European site. The purpose of AA is to assess whether the plan or project will adversely affect the integrity of any European site, having regard to its conservation objectives. The Commission notice- Assessment of plans and projects in relation to Natura 2000 sites - Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC (EC, 2021) prescribes the content of the Appropriate Assessment and notes the following:

- It must be ensured that the Appropriate Assessment addresses all elements contributing to the European site's integrity as specified in the European site's conservation objectives and Standard Data Form and is based on the best available scientific knowledge in the field.
- The information required should be up to date.
- The Appropriate Assessment should also include a comprehensive identification of all the potential effects of the Project likely to be significant on the European site, taking into account in-combination and other effects likely to arise as a result of the combined action of the plan or project under assessment with other plans or projects.
- It should apply the best available techniques and methods to assess the extent of the effects of the plan or project on the integrity of the site(s).

Under Regulation 42(6) and (9) of S.I. No. 477 of 2011:

"(6) The public authority shall determine that an Appropriate Assessment of a plan or project is required where the plan or project is not directly connected with or necessary to the management of the site as a European Site and if it cannot be excluded, on the basis of objective scientific information following screening under this Regulation, that the plan or project, individually or in combination with other plans or projects, will have a significant effect on a European site.

(9) Where a public authority is required to conduct an Appropriate Assessment pursuant to paragraph (6) in relation to a plan or project that it proposes to undertake or adopt, it shall:

Prepare a Natura Impact Statement;

Compile any other evidence including, but not limited to, scientific evidence that is required for the purposes of the Appropriate Assessment; and

Submit a Natura Impact Statement together with evidence compiled under subparagraph (b) to the Minister not later than six weeks before it proposes to adopt or undertake the plan or project to which the Natura Impact Statement and evidence relates".

1.2 Statement of Authority

This report was prepared by Kate O'Regan. Kate is a Project Ecologist with three years' experience in consultancy with FT. She holds a first-class BSc. in Zoology and first-class MSc in Marine Biology from University College Cork. Since joining Fehily Timoney, Kate has prepared Appropriate Assessments and Ecological Impact Assessments for waste facilities and road improvement schemes along with ornithological chapters and collision risk models for renewable energy projects. Kate has previous experience in data management, statistical analysis, mapping and technical report writing. Kate has also completed a wide range of site work including habitat, ornithological, bat, freshwater aquatic, intertidal, subtidal, insect and mammal surveys.

This report was reviewed by Barbara Kasl. Barbara holds a BSc. (Hons) in Zoology and a PhD in Animal, Plant and Environmental Sciences from University of the Witwatersrand (Johannesburg, South Africa). She has over 20 years' experience in the environmental consulting sector as a terrestrial fauna specialist and behavioural ecologist, with experience in impact assessment and technical reporting for various projects [renewable energy, mining and processing, servitudes (roads, pipelines, powerlines), supporting infrastructure and town-related development (housing and industrial)], including NIS for large infrastructure and renewable energy developments.

This report was approved by Rita Mansfield. Rita holds a B.Sc. (Hons) in Applied Ecology and a H. Dip Environmental Protection and Pollution Control. Rita is a Principal Ecologist and Associate Director with 22 years' experience as a technical ecology lead within the environmental and planning services sector. She specialises in statutory consent and environmental assessment for large scale public infrastructure projects in the energy, water (including flood relief schemes) and transport sectors. She is a qualified ecologist with responsibility for environmental impact assessment, planning applications (conventional and strategic infrastructure development), Appropriate Assessment, foreshore licensing, and stakeholder engagement for large scale plans and projects in Ireland, including for renewable energy projects. Rita has undertaken and managed a wide range of ecological field assessments including mammal, herpetofauna, bird, fishery, invertebrate and habitat assessments. Rita has held numerous licences under the Wildlife Act and Habitats Directive for disturbance to species which included mitigation (e.g. construction of artificial otter holt, bat exclusion). Rita has provided advice on ecological / environmental design to various private and public sector clients

Hydrology assessments of the Project were completed by Sara Hernandez Sosa and reviewed by Pablo Delgado of Fehily Timoney and Company.

Sara Hernandez Sosa is a Senior Engineer and Chartered Engineer with a master's degree in civil engineering from Alfonso X El Sabio University (Spain). She has eight years of experience across civil engineering projects, including urban development, transport infrastructure, drainage design, and infrastructure planning. She has also contributed to renewable energy projects. Early in her career, she gained broad multidisciplinary experience, and over the past five years she has specialized in hydraulics. She also contributed previously to the EIAR preparing the Surface Water and Hydrology chapter for a major scheme: the Ten-T Priority Route Improvement Project in Donegal.

Pablo Delgado, Principal Engineer and Chartered Civil Engineer, has accumulated more than 8 years of professional experience in the hydraulic engineering domain. His specific area of expertise lies in the planning, design, and construction of hydraulic infrastructure projects, where he closely collaborates with Clients and Contractors. Pablo's primary focus centres around producing practical and efficient designs while proactively addressing any challenges that may arise throughout the project's execution. He possesses extensive knowledge in hydraulic design, enabling him to develop industry-leading guidelines and exhibit a high level of proficiency in drainage design, standards, and tools. Additionally, Pablo has a successful track record of delivering drainage designs within diverse project environments such as Design and Build (D&B) and Public-Private Partnership (PPP), including contributions to hydrologic and hydraulic chapters for Environmental Impact Assessments (EIAR). His project portfolio encompasses engagements in the United Kingdom, Ireland, and Spain.

Hydrogeology assessments of the Project were completed by Ian Higgins and reviewed by Tom Clayton. Ian Higgins is a Technical Director with over 25 years' experience working in geotechnical engineering. Ian holds an honours degree in Engineering Geology from the University of Sunderland and a master's degree in Geotechnical Engineering from Heriot-Watt University. He is a member of Engineers Ireland, the Geological Society of London and Institute of Geologists of Ireland. Ian has been responsible for the preparation of land, soil, geology and hydrogeology chapters for EIARs for a range of developments including biogas plants, renewable energy developments, SID applications and other infrastructure.

Tom Clayton MEng. (Distinction) Civil Engineering - a Chartered Engineer with 17 years of experience within the geotechnical sector. Tom has expertise in large infrastructure projects including transport geotechnics (for road, rail, underground rail schemes, active travel and greenway schemes), deep excavations and shafts and Energy Geotechnics. Tom has experience in assessment of soils, geology and hydrogeology for EIAR for a variety of project types including renewable energy and strategic infrastructure developments.

Noise assessments of the Project were completed by John Cullen and reviewed by Maureen Marsden. John Cullen is an Environmental and Acoustic Engineer with over eight years' experience working in the assessment of environmental noise and vibration, including the preparation and review of EIAR noise and vibration chapters for a range of industrial, waste and renewable energy projects in Ireland. John holds an honours degree in Agri-Environmental Science from University College Dublin, a Post Graduate Diploma in Environmental Engineering from Trinity College Dublin and a Diploma in Acoustics and Noise Control from the Institute of Acoustics. He is a member of the Institute of Acoustics, Institute of Environmental Sciences and Institute of Engineers Ireland.

Maureen Marsden holds a Master of Engineering degree in Acoustics and Vibration from Southampton University (Institute of Sound and Vibration Research). She has 28 years of postgraduate experience and is currently a Senior Project Engineer with Fehily Timoney. Maureen specialises in environmental noise including industrial, energy infrastructure projects and transportation projects. Maureen has a broad range of experience in noise and vibration across a variety of sectors including building, transport, industrial, waste and energy sector projects. She is a member of the Institute of Acoustics and Engineers Ireland.

Air quality modelling of the Proposed Development was completed by Dr. Jovanna Arndt, a Principal Environmental Consultant in the Air Quality & Climate section of AWN Consulting. Jovanna holds a BSc. in Environmental Science and a Ph.D. in Atmospheric Chemistry from University College Cork. She is an Associate Member of both the Institute of Air Quality Management and the Institute of Environmental Sciences. She has been specialising in the area of air quality and climate over 9 years and has prepared air quality and climate assessments for inclusion within EIARs for residential developments such as Twenties Lane (Planning Application Ref: 22713), Cherrywood T13 (Planning Application Ref: DZ23A/0028), Corballis Donabate LRD (Planning Application Ref: LRD0017/S3), commercial and industrial developments by Dublin Airport Authority, Zoetis, Ipsen, Merck Millipore, Greener Ideas Limited and Abbvie, as well as renewable energy developments such as Codling Wind Park and the Cúil Na Móna Anaerobic Digestion Facility. She also specialises in assessing air quality impacts using air dispersion modelling of transportation schemes such as BusConnects Dublin, major Highways England Road schemes and major rail infrastructure in the form of High Speed 2 (HS2 in the UK). She has prepared air dispersion modelling assessments of emissions from data centres, energy centres and the chemical industry as part of Environmental Protection Agency (EPA) Industrial Emissions Licences for Microsoft, Greener Ideas Limited, Merck Millipore, Lilly Limerick, Chemifloc, Takeda, Kingspan and Kilshane Energy. She has also provided Air Quality Action Plan (AQAP) and Air Quality Management Area (AQMA) support to several UK councils and assessed the air quality impacts of potential Clean Air Zones in the UK.

1.3 Methodology

The purpose of Appropriate Assessment is to assess the implications of a plan or project on any European site in view of that designated site's conservation objectives, individually and in combination with other plans or projects.

This NIS presents the detailed information on the Project and provides a scientific examination and analysis of the potential significant effects identified in the AA Screening Report, in relation to the potential for significant adverse effects on the integrity of the European sites (in other words, whether the conservation objectives of the European site could be undermined).

Potential significant adverse effects are identified and assessed in view of best scientific knowledge, based on objective information in relation to the Project, including the proposed avoidance, reduction and preventive measures.

1.3.1 Guidance

The assessment was conducted in accordance with the following guidance:

- Assessment of plans and projects in relation to Natura 2000 sites - Methodological guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC. Official Journal of the European Union, C 437, 28 October 2021. Information and Notices: Volume 64. Commission Notice 2021/C 437/01, Brussels, (EC, 2021).
- Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin (2009, updated 2010) (DEHLG, 2009, updated 2010).
- Managing Natura 2000 sites. The provisions of Article 6 of the Habitats Directive 92/43/EEC. European Commission. Brussels, (2019/C 33/01). OJ C 33, 25.1.2019 (EC, 2019).
- Interpretation Manual of European Union Habitats. Version EUR 28 (EC, 2013).
- OPR Practice Note PN01 Appropriate Assessment Screening for Development Management, (OPR, 2021).

1.3.2 AA Screening Methodology

AA screening is necessary to determine whether an AA is required for a particular plan or project regarding its potential adverse effects on European sites. AA screening is carried out in accordance with the following steps:

1. Establish whether the Project is directly connected with or necessary for the management of a European site, in accordance with Article 6(3) of the Habitats Directive.
2. Describe the Project and, based on the nature of the Project, establish zones of influence for potential impacts arising from the Project.
3. Identify which European sites may be affected by determining connectivity / overlap between the Project's established zones of influence and each of the European sites, and the ecology and distribution of the relevant Qualifying Interests (Qis).
4. Identify the impacts of the Project that may result in significant effects (from the Project in isolation) on relevant European site(s).
5. Assess whether significant effects may arise from the Project in combination with other plans/projects.
6. Determine the requirement of AA, based on whether significant effects are deemed likely, or possible (in accordance with the precautionary principle).

Having regard to the European Commission Communication on the Precautionary Principle (European Commission, 2021) the:

> *"absence of scientific evidence on the significant negative effect of an action cannot be used as justification for approval of this action. When applied to Article 6(3) procedure, the precautionary principle implies that the absence of a negative effect on Natura 2000 sites has to be demonstrated before a plan or project can be authorised. In other words, if there is a lack of certainty as to whether there will be any negative effects, then the plan or project cannot be approved".*

Where significant effects are determined to be likely, or where there is uncertainty regarding the likelihood of significant effects, the Project will be required to undergo Appropriate Assessment, which will require the preparation of a Natura Impact Statement (NIS).

The process of determining the likelihood of significant effects from a Project on European sites is an iterative process centred around a Source-Pathway-Receptor (S-P-R) model (OPR, 2021). In order for an effect 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 significance.

- Source(s) – source of effect e.g., pollutant run-off, noise, removal of vegetation, etc.
- Pathway(s) – functional link, or ecological pathway e.g., groundwater connecting to nearby qualifying wetland habitats.
- Receptor(s) – the qualifying habitats and species of European sites and ecological resources supporting those habitats/species.

In the context of this report, a source is any identifiable element of the Project that is known to interact with the receiving environment. A receptor is the Qualifying Interests (QI)[1] for an SAC/cSAC or Special Conservation Interests (SCI)[2] for an SPA/cSPA or an ecological feature that is known to be utilised by / support the QI/SCI. In practice, the term QI also applies to SCIs (and is used to represent both throughout in this NIS). A pathway is any connection or link between the source and the receptor.

The Commission Notice on the Assessment of plans and projects in relation to Natura 2000 sites – Methodological guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC (EC, 2021), states that in identifying European sites (Natura 2000 sites), which may be affected by the Project, the following should be identified:

- Any European sites geographically overlapping with any of the actions or aspects of the project in any of its phases, or adjacent to them.
- Any European sites within the likely zone of influence (ZoI) of the Project. European sites located in the surroundings of the Project (or at some distance) that could still be indirectly affected by aspects of the Project, including as regards the use of natural resources (e.g., water) and various types of waste, discharge or emissions of substances or energy.
- European sites whose connectivity or ecological continuity can be affected by the plan or project.

[1] SACs are areas designated under the Habitats Directive to conserve habitats listed in Annex I of the Directive and plant and animal species listed in Annex II. Collectively these are referred to as the 'Qualifying Interests' or 'QIs' of the SAC / cSAC.

[2] SPAs are sites classified under the Birds Directive to protect rare or vulnerable bird species listed in Annex I to the Directive as well as regularly occurring migratory species and wetlands. Wetland habitats that support internationally important populations of migratory birds may be coastal or inland. Collectively, these species and habitats are referred to as the 'Special Conservation Interests' of the SPA / cSPA.

1.3.2.1 Sites of Overlap

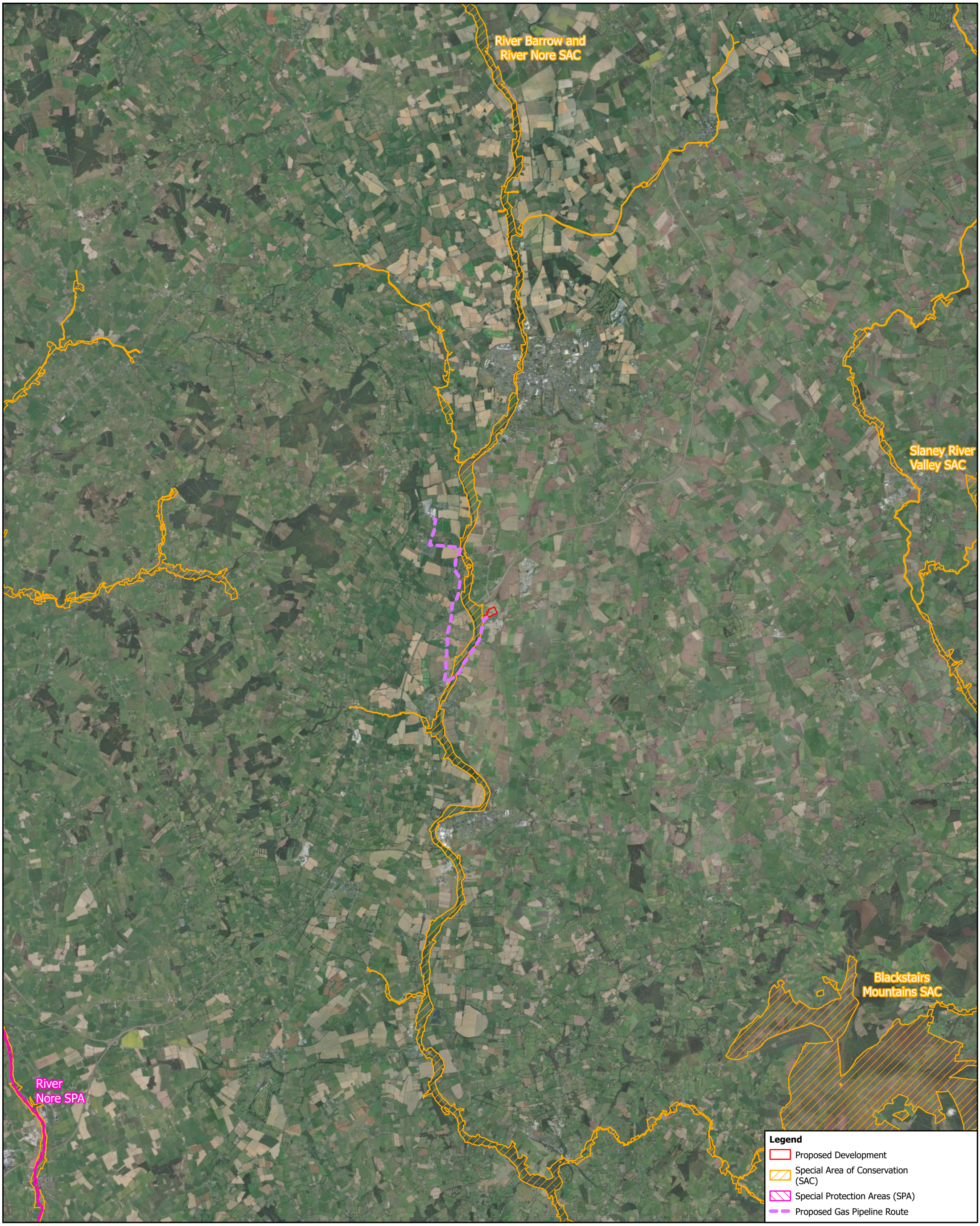
The proposed development is located wholly outside of any European site. The River Barrow and River Nore SAC boundary is located c. 20m west of the proposed development (the western boundary of the proposed development is c. 300m from the River Barrow).

The Powerstown (Stream) (BARROW_180) flows in a southwest direction, 200m north of and parallel to the northern boundary of the proposed development. The stream then flows into the River Barrow.

The proposed gas pipeline route, which remains in-road along its length, crosses under the River Barrow via HDD at the Cardinal Moran Bridge, which is located within the River Barrow and River Nore SAC boundary.

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TITLE: European Sites in Vicinity of the Project	**FIGURE NO:** 1.1		
	CLIENT: Greengate Biogas		
PROJECT: Powerstown Biogas	**SCALE:** 1:115,000	**REVISION:**	0
	DATE: 01/07/2026	**PAGE SIZE:**	A3

N W E S

0 1 2 4 6 8 Kilometers

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1.3.2.2 Zone of Influence

The proposed development and the proposed gas pipeline route are considered in terms of direct effects on habitats, flora and fauna. Effects on habitats, flora and fauna can extend beyond boundaries and the extent of this zone of influence (ZoI) needs to be determined to inform the ecological survey areas. The ZoI is initially defined by desktop assessment and refined through the specialist investigations and modelling exercises undertaken in support of the application for the Project. The ZoI considered for the Project and the outcomes on the S-P-R as a result of the ZoI is as follows:

Terrestrial habitats

- The potential for direct biophysical change by damage / degradation to terrestrial habitats is taken as the footprint of the works.

Aquatic habitats

- Inland Fisheries Ireland (2020) guidelines[3] on the protection of watercourses through the use of buffer zones states that to protect waterbodies, "*the recommended buffer zone width from larger river channels (>10m) is 35m to 60m and from smaller channels (<10m) is 20m or greater*". For the purpose of this assessment, it is assumed that where the construction works occur within 60m of a watercourse then there is potential for construction related material to enter the watercourse e.g. sediment runoff and hydrocarbons. Studies on sedimentation pressures on the aquatic environment (e.g. (Ashdown, et al., 2022) and (Williams, RD et al., 2022)) demonstrate that construction-phase effects are typically localised to the source but are likely ecologically significant in that zone (depending on receptor sensitivity), with the highest risk zone generally within the first few tens of metres (assessed in the literature as between 10m and 80m) downstream of the source (in this case the watercourse crossings along the proposed gas pipeline route). The above distances are taken as the potential ZoI of impacts on the aquatic environment.

Groundwater dependent terrestrial ecosystems (GWDTE)

- A 250m construction stage ZoI has been considered for potential groundwater dependent terrestrial ecosystems (GWDTE) having regard to 'Guidance on Assessing the Impacts of Developments on Groundwater Dependent Terrestrial Ecosystems' (SEPA, 2024). These guidelines prescribe the following distances of dewatering effects in assessing risk to Groundwater Dependent Terrestrial Ecosystems GWDTE: 10m for all construction works activities, 100m for subsurface activities <1m deep and 250m for subsurface activities >1m depth (provided the dewatering rates do not exceed 10m3/day, which is the case for the proposed development). As such a ZoI of 250m has been adopted when assessing the potential for impacts on GWDTE.

[3] Inland Fisheries Ireland (2020) 'Planning for Watercourses in the Urban Environment: A Guide to the Protection of Watercourses through the use of Buffer Zones, Sustainable Drainage Systems, Instream Rehabilitation, Climate / Flood Risk and Recreational Planning'.

- For operation phase effects on GWDTE it is noted that a groundwater source of 120m3/day of process water may be required at the site when water is not available at the surface water lagoon. A pump test was undertaken as part of the ground investigation to confirm the capacity of the underlying aquifer to supply the required process water for the operational phase of the proposed development. A pumping rate of 10m3/hour (equivalent to 240m3/day) was maintained throughout the 72-hour pump test, which recorded a 1.0m fall in the water level within the pumping well during the pump test. The results of the pump test show that the required 120m3/day of process water can be supplied by the pump well within the site. The groundwater level recovered to the pre-pump test level within 30 minutes of completion of the test. Monitoring at two of the installed standpipes across the site indicated no change in the groundwater level at those two locations, i.e. there was localised draw down only confined to the well location. The results indicate that the proposed development will have no pathway for effect on groundwater flows or recharge in the catchment or beyond the site.

Air Quality

- The International Air Quality Institute (IAQM, 2024) states that for ecological receptors, effects from dust soiling are 'High' to 'Medium' up to 20m from the source (depending on sensitivity of ecological receptor) and reduces to 'Medium' to 'low' over 50m from the source. The guidelines state that ecological receptors should be considered within 50m of the project and within 250m of site entrances where trackout[4] may occur. A such a 250m ZoI for dust effects is considered from the Proposed Development.
- In relation to the potential ZoI of traffic to the proposed development site during construction, operation and decommissioning, TII guidelines states that road links meeting specific changes in traffic criteria (types and / or quantities of vehicles, speed or road alignment) can be defined as being 'affected' by changes in traffic. However, the construction (including decommissioning) and operational phase of the project will not meet these specific changes in the nature of traffic to an extent that will contribute to emission-related effects that could cause significant deterioration of ecological receptors.
- The EPA Note (IN2) on Assessing the Impact of Ammonia Emissions to Air and Nitrogen Deposition from EPA licensable activities on European Sites (DRAFT) (EPA, 2024) stipulates that a detailed air dispersion model is required where a European site is within 250m of a proposed development. As such a 250m potential ZoI has been initially adopted, and an air dispersion model has been prepared. The process contributions (PC) from the proposed development have been modelled at ecological receptors within the model study area and were compared to the relevant critical level (in line with guidance from the IAQM (IAQM, 2020), UK Environment Agency (Environment Agency (UK), 2025) and the EPA (EPA, 2024) guidance). As per the IN2 guidance where a PC is greater than 1% of the critical level, the effects of the operation of the proposed development must be further assessed. The output of the model indicates that PCs are greater than 1% of the relevant critical level within the River Barrow and River Nore SAC for the NO_X modelling results, NH_3 modelling results, nitrogen deposition modelled results, and the modelled results for acid deposition (as N). No other European sites are in the ZoI for air quality impacts.
    - Figure 1-2 shows the extent of the area, as a concentration contour, within which NO_X concentrations from the proposed development are greater than 1% of the lowest critical load.
    - Figure 1-3 shows the extent of the area, as a concentration contour, within which NH_3 concentrations from the proposed development are greater than 1% of the lowest critical load.
    - Figure 1-4 shows the extent of the area, as a concentration contour, within which nitrogen deposition from the proposed development are greater than 1% of the lowest critical load.
    - Figure 1-4 shows the extent of the area, as a concentration contour, within which acid deposition (as N) from the proposed development are greater than 1% of the lowest critical load.

[4] The movement of dust and dirt from a construction/demolition site onto the public road network.

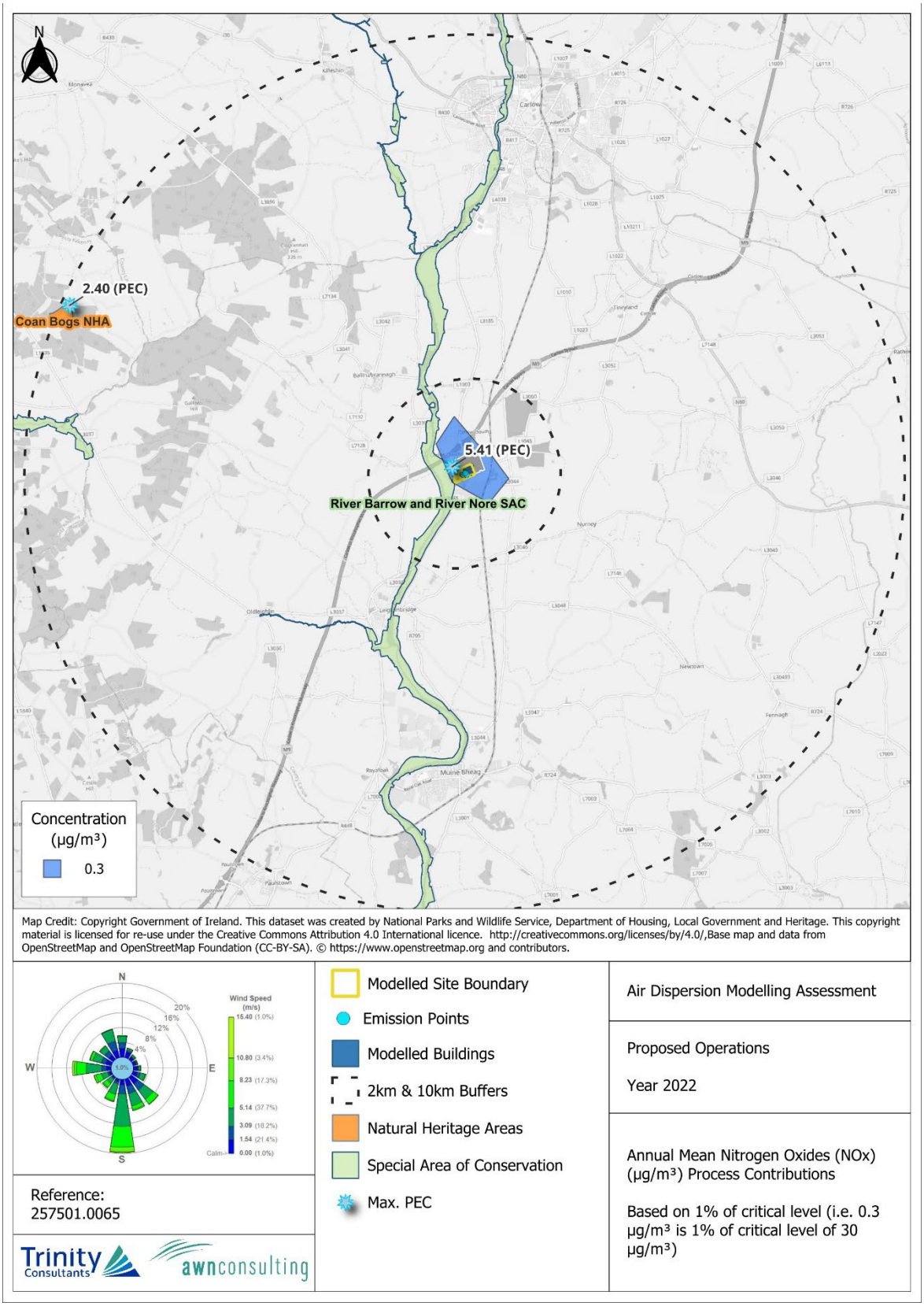


Figure 1-2: Proposed Operations Scenario - NO_x Process Contributions as 1% of Critical Level

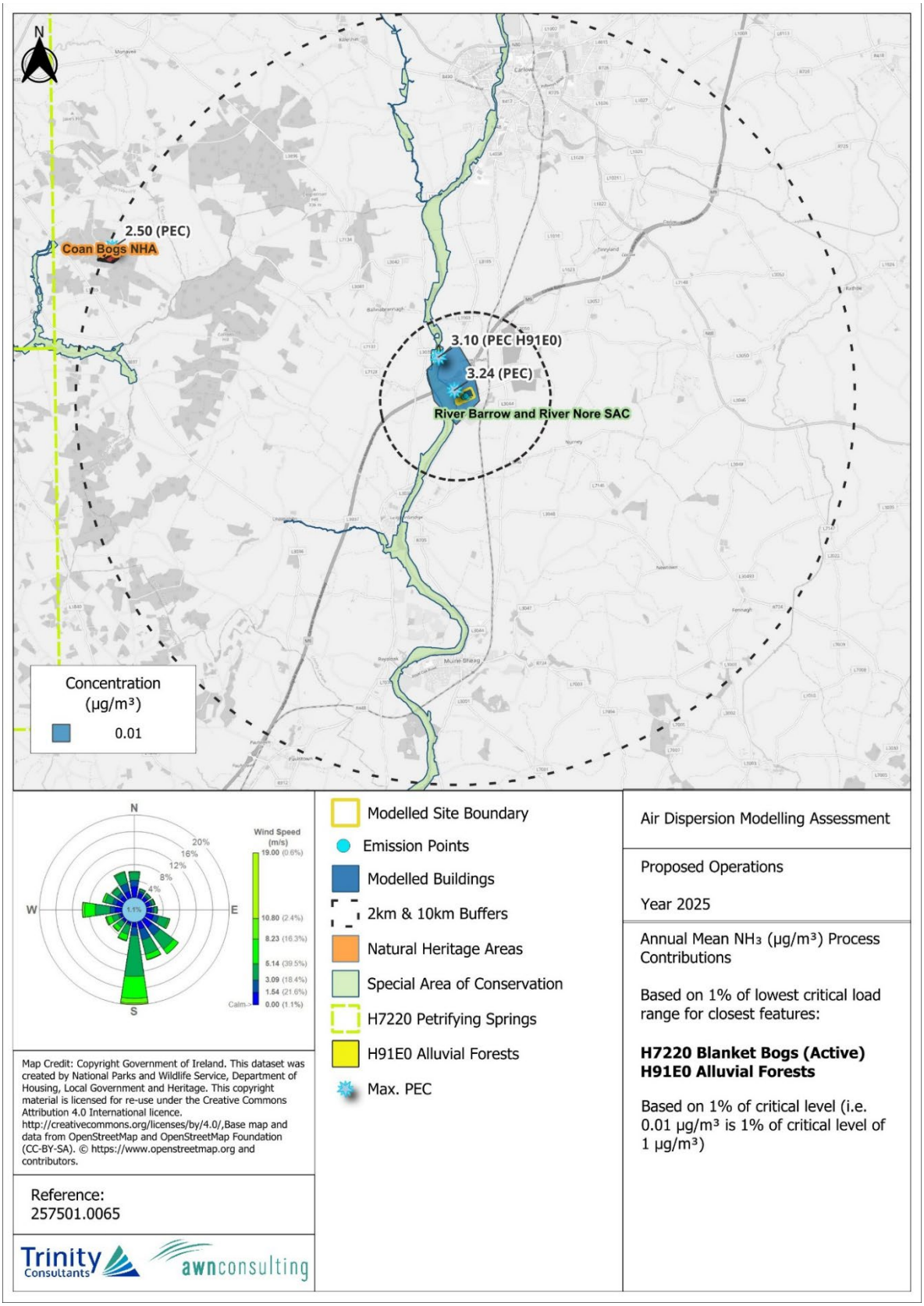


Figure 1-3: Proposed Operations Scenario – NH_3 Process Contributions as 1% of Critical Level

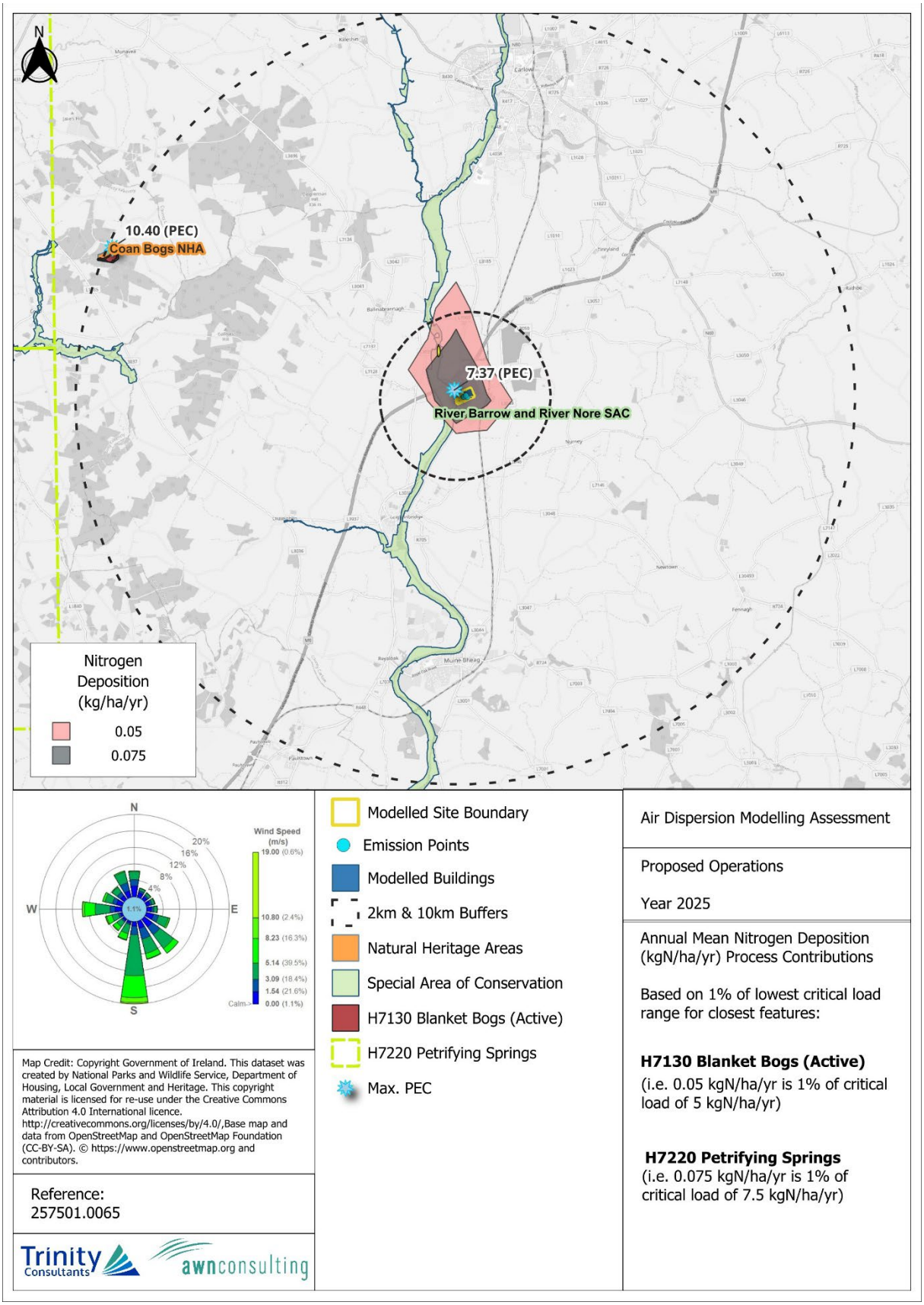


Figure 1-4: Proposed Operations Scenario – Nitrogen Deposition Process Contributions as 1% of Critical Load

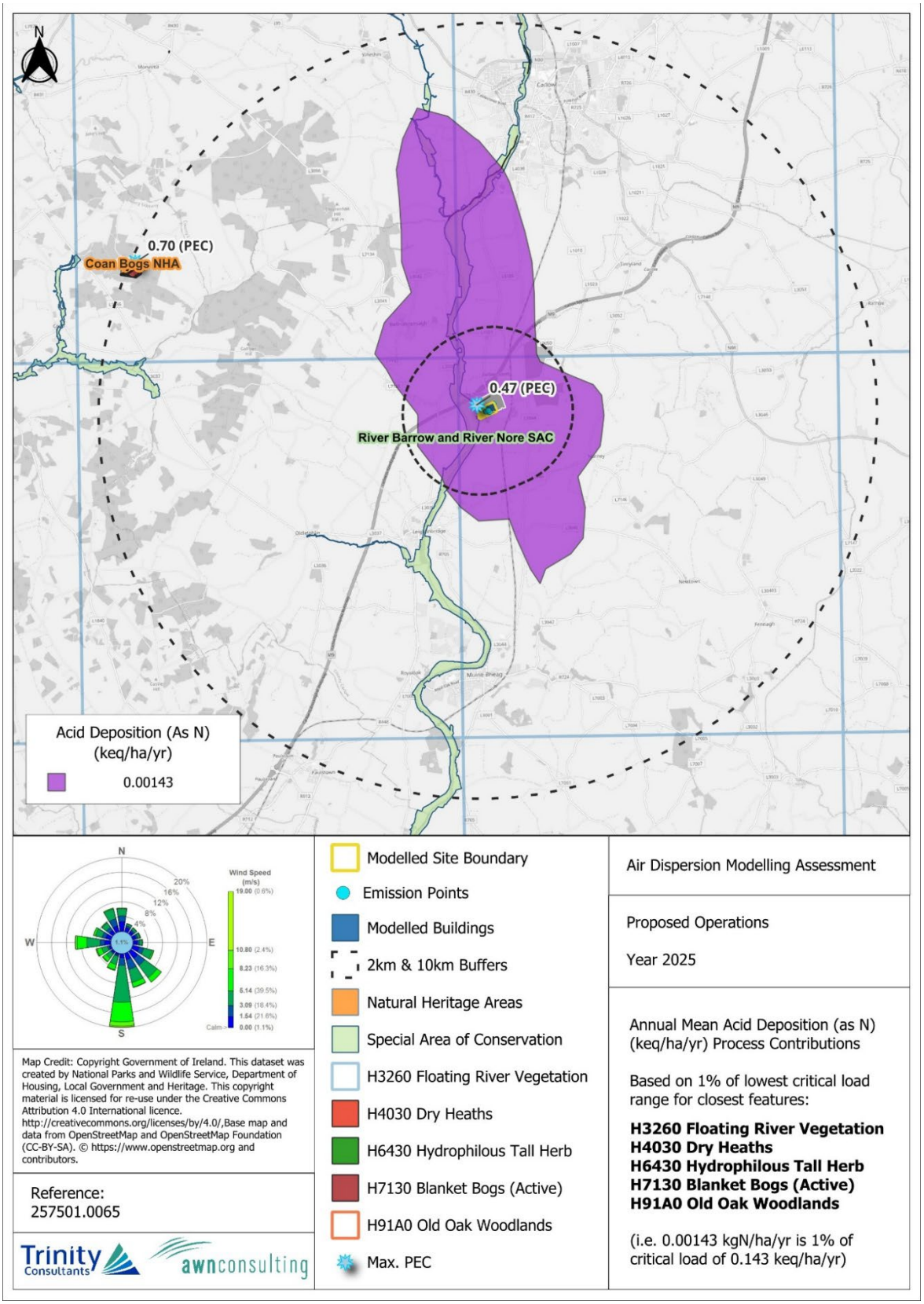


Figure 1-5: Proposed Operations Scenario –Acid Deposition (as N) Process Contributions as 1% of Critical Load

Noise and Visual Disturbance

- The potential disturbance (noise and visual disturbance) to birds beyond the proposed development has been established as 500m, having regard to (Goodship, et al., 2022).
- A 150m disturbance ZoI was considered for otters based on the 'Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes (TII, 2006, reissued 2025).
- The Project is outside the accepted distribution range for lesser horseshoe bat and lesser horseshoe bats are not considered further in this NIS

It is noted that the adoption of the above ZoIs has not inadvertently excluded relevant pathways—particularly in relation to hydrological connectivity, sediment pollution transport pathways, and landscape connectivity, as where such ZoIs have been applied their suitability for adoption in the context of the project has been assessed as well the ecological sensitivity of the receiving environment.

1.3.2.3 Connectivity or Ecological Continuity

Connectivity or ecological continuity refers to the degree to which different parts of a landscape, ecosystem, or habitat are physically or functionally linked, allowing the movement of organisms, nutrients, energy, or ecological processes across space. Consideration is therefore given to whether there could be landscape[5] or ecological connectivity[6] to any QI or SCI species of European sites.

Consideration is given to the potential for the habitats within the ZoIs of the project (as described above) to be part of the ecological continuity of habitat for protected bird species. Regards is had to the Guidance on 'Assessing Connectivity with Special Protection Areas (SPAs)' (SNH, 2016) which prescribes dispersal and foraging distances for a range of bird species, and allows for assessment of significance of the effects of temporary displacement/disturbance of bird species from the habitats within the ZoI relative to the likely importance of these habitats as part of the broader ecological continuity in the environment. As such, the core foraging ranges of SPA birds as prescribed in this guidance document and their dominant feeding, roosting and breeding habitat associations are considered to determine the potential for the habitats within the 500m disturbance distance of the project to support SPA species. Consideration is given to the potential for the habitats within the ZoI of the Project to be part of the ecological continuity of habitat for otter. Otter (Lutra lutra) is a mobile species with a potential territory of 20 km in food poor areas e.g. upland streams (Marnell, et al., 2011). However, in areas with an abundance of food and other resources (as is the case in the River Barrow, ref. IFI WFD monitoring data) territories are smaller, with NPWS noting that 'otters only need to maintain small territories (1- 2km)' in such food-rich circumstances. As such, it is assumed that otter are likely to hold smaller territories in the Barrow catchment (where they are present)

[5] Landscape connectivity is a combined product of structural and functional connectivity, i.e. the effect of physical landscape structure and the actual species use of the landscape.
[6] Connectivity is defined as a measure of the functional availability of the habitats needed for a particular species to move through a given area. Examples include the flight lines used by bats to travel between roosts and foraging areas or the corridors of appropriate habitat needed by some slow colonising species if they are to spread.

1.3.3 Desktop Assessment

A desk study was carried out to inform the AA screening and NIS and to collate available information on special conservation interests of SPAs and qualifying interests of SACs. Desktop data referenced and used to support assessment and findings this report are as follows:

- Various mapping and web-based data sources:
    - Aerial imagery of the proposed development through drone footage (2025) Greengate Biogas 001 Ltd.
    - Tailte Éireann National Land Cover Map
    - OSI Aerial photography and 1:50000 mapping
    - Geological Survey Ireland (GSI) maps and data
    - OPW drainage and flood maps
    - Flora (Protection) Order Map Viewer – Vascular Plants, Charophytes and Lichen
    - Flora Protection Order Map Viewer – Bryophytes
    - Spatial data of EU Habitats Directive, Annex Habitats as per Article 17 Report (NPWS, 2025) - Terrestrial Habitats Storymap (only the 2019 mapping available at time of compilation)
    - Wetland survey Ireland wetland maps
    - GIS dataset for Irish Semi-natural Grassland Survey 2007-2012 (updated in 2025) and National Survey of Native Woodlands (updated in 2025).
- National Biodiversity Data Centre:
    - The NBDC website[7] was accessed on the 18 May 2026 to obtain historical (the last two decades) ecological data for the proposed development (2km^2 Grid S76E) and the proposed gas pipeline route (2km^2 grids S76D, S66Y, S66Z and S67V).
    - The NBDC Bat Landscapes tool[8] was used to obtain species-specific information for bats, accessed in March 2026.
- Botanical Society of Britain and Ireland (BSBI):
    - BSBI Plant Atlas 20209 was accessed April 2026 for botanically significant species.
- National Parks and Wildlife Services:
    - A request for sensitive species information was sent on 20 January 2026. The data was received the 14 April 2026. None of the records fall within the proposed development's 2km^2 Grid S76E and records are only relevant to the proposed gas pipeline route.
- Birdwatch Ireland: The Irish Wetland Bird Survey (I-WeBS):
    - I-WeBS Data Request was made via e-mail on the 22 January 2026 and the information received on the 2 March 2026.
- Inland Fisheries Ireland
    - Historical fish records and data was obtained from the IFI's website accessed on the 20 January 2026[10].

[7] Generated reports at https://maps.biodiversityireland.ie/Map for the relevant 2km^2 grids
[8] Access the 'Bat Landscapes' layer at https://maps.biodiversityireland.ie/Map
[9] Available at: https://plantatlas2020.org/
[10] Obtained from the 'WFD Fish Ecological Status for Rivers, Lakes and Transitional Waters 2008 to Recent' accessed from 'Apps & Maps' at https://opendata-ifigeo.hub.arcgis.com/

- EPA catchment data[11], including Q values[12] and EPA Maps[13] and associated information links:
    - The Q values for the River Barrow from upstream to downstream monitoring stations accessed the 21 January 2026.
    - The EPA maps was used for WFD and EPA information related to hydrology and hydrogeology.

1.3.4 Field Assessment

Ecological field survey was conducted / guided in accordance with the following:

- Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2018, updated 2024).
- Best Practice Guidance for Habitat Survey and Mapping (Smith, G F; O'Donoghue, P; O'Hora, K; Delaney, E, 2011).
- Guidelines for Assessment of Ecological Impacts of National Road Schemes (TII, 2009, republished 2025).
- PE-ENV-01113 - Ecological Surveying Techniques for Protected Flora and Fauna During the Planning of National Road Schemes (TII, 2008, republished 2025).
- River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003 (EA, 2003, reprinted 2022).
- River habitat assessment and hydromorphology assessment (RHAT) in accordance with BS EN 14614:2004 and RHAT Training Manual (Murphy, et al., 2014).
- Visual assessment for the presence of aquatic invasive alien species listed on the Third Schedule of the European Communities (Birds & Natural Habitats) Regulations 2011 as amended (S.I. No. 477 of 2011).
- Habitat appraisal, specifically focusing on salmonids *Salmo* spp. (Hendry, *et al.*, 2003), lamprey *Lampetra* spp. (Maitland, 2003), white-clawed crayfish *Austropotamobius pallipes* (Holdich, 2003) and (Peay, 2003) and freshwater pearl mussel *Margaritifera margaritifera* (Skinner, et al., 2003).
- Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes (TII, 2006, reissued 2025).
- Guidance on Assessment and Construction Management in *Margaritifera* Catchments in Ireland (Atkinson, S; Magee, M; Moorkens, EA; Heavey, M, 2023).
- Guidelines for the crossing of watercourses during the construction of national road schemes (TII, 2005, reissued 2025).
- Guidelines on protection of fisheries during construction works in and adjacent to waters (IFI, 2016).

[11] https://www.catchments.ie/data/
[12] https://epawebapp.epa.ie/qvalue/webusers/
[13] https://gis.epa.ie/EPAMaps/

The field surveys were designed following the findings of the desk study and scoping consultation. Table 1-1 provides details of the surveys undertaken at the proposed development and along the gas pipeline servitude (referred to as the proposed gas pipeline route). Table 1-1 also indicates the dates surveys were undertaken and the ecological survey areas relevant to each specialist study (referred to generally as the survey area in this NIS). Survey methodologies are set out in the sections below the Table 1-1. The Zone of Influence (ZoI) is described in Section 1.3.2.2.

Table 1-1: Ecological surveys undertaken within the defined survey areas by Fehily Timoney and Company ecologists

Ecological Survey	Site	Gas pipeline
Habitats & flora species, including invasive species	29 May 2025 13 & 14 May 2026 Encompassed semi-natural and natural habitats within 500m buffer.	23-25 Sep 2025 Encompassed 10m buffer where natural/seminatural/linear habitat was present, supported by aerial imagery
River habitat survey, including Invasive species; Aquatic species (fish and macro-invertebrates); Otters; Kingfishers; and riverine birds	29 May 2025 Powerstown Stream was surveyed as part of overall habitat survey. 10-12 Mar 2026 Follow up survey of the length of the Powerstown Stream 150m up- and down-stream of the R448 road crossing.	23-25 Sep 2025 Encompassed 150m up and downstream of crossings IDB1 to IDB4 to identify suitable fisheries / mammal / bird habitat within the river. 10-12 Mar 2026 Follow up survey of the crossings IDB1 to IDB4.

During surveys, any ecological features or species encountered were recorded, even if these were not part of the targeted surveys.

During surveys all points of interests, animal sightings, linear features and habitat areas were captured directly into GIS application, ArcGIS Field Maps, with appropriate ecological technical notes and observations. This was directly available on ArcGIS Pro for analysis and assessment.

In general, weather conditions did not hamper or affect ecological surveys, but the frequent storms and severe flooding did influence scheduling of surveys.

Path: R:\Map Production\2024\P24-188\Workspaces\P24_188_Chapter_NIS_Figures\P24_188_Chapter_NIS_Figures.aprx

Watercourse Crossing Locations:
Watercourses: Environmental Protection Agency
World Imagery: Microsoft, VantorCreative and Commons Attribution 4.0 International (CC BY 4.0) licence https://creativecommons.org/licenses/by/4.0/ [INPUT SOURCE HERE];
If Applicable: Mapping Reproduced Under Licence from the Ordnance Survey Ireland Licence No. CYAL50368274 © Government of Ireland



TITLE: Mammal Survey Areas	**FIGURE NO:** 1.6		
	CLIENT: Greengate Biogas		
PROJECT: Powerstown Bioenergy	**SCALE:** 1:16,000	**REVISION:**	0
	DATE: 01/07/2026	**PAGE SIZE:**	A3

N W E S

0 0.13 0.25 0.5 0.75 1 Kilometers

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1.3.4.1 Habitats and Flora

All habitats within the habitat survey area associated with the proposed development (Figure 1-1) and the proposed gas pipeline route were initially delineated based on desktop assessment and detailed drone survey and OSI Aerial photography. The habitat survey area was assessed (where access was permissible) (Table 1-1) using methodology based on the Heritage Council's Best Practice Guidance for Habitat Survey and Mapping (Smith, G F; O'Donoghue, P; O'Hora, K; Delaney, E, 2011) and CIEEM's Good Practice Guidance for Habitats and Species (CIEEM, 2021).

The classification of habitats recorded during the field survey is based on the A Guide to Habitats in Ireland (Fossitt, 2000). The guide classifies habitats according to a hierarchical framework with Level 1 habitats representing broad habitat groups, Level 2 representing habitat subgroups and Level 3 representing individual habitat types. The field survey focused on identifying habitats to Level 3 of the Guide to Habitats in Ireland (Fossitt, 2000).. Any other records of interest (e.g., invasive plant species) were also marked on ArcGIS Field Maps. The DAFOR scale was used to record species abundance within relevés: Dominant, Abundant, Frequent, Occasional and Rare (DAFOR). All species were readily identifiable during the survey. Plant nomenclature for vascular plants follows New Flora of the British Isles (Stace, 2019), while mosses and liverworts nomenclature follow Mosses and Liverworts of Britain and Ireland - a field guide (British Bryological Society, 2010).

Each habitat was assessed for its ecological significance based on the NRA guidelines (TII, 2009, republished 2025) and its suitability to support protected species. A survey was undertaken for Flora Protection Order[14] (FPO) and rare and threatened red-listed plant species. Where appropriate, vegetation was sampled by taking botanical quadrats/relevés which were undertaken to analyse potential links with Annex I habitat types. The Interpretation Manual of European Union Habitats (EC, 2013) and NPWS Article 17 report (NPWS, 2025a) were used to evaluate links with Annex I habitats.

During habitat surveys, a search for non-native invasive species was undertaken. The survey focused on the identification of invasive species listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (As Amended).

1.3.4.2 Aquatic Ecology

No water courses are present within the proposed development. The nearest watercourse, the Powerstown Stream (200m north of proposed development), is the receiving water body for any runoff from the local area, but the proposed development, at its lowered topography, does not contribute any runoff to this stream. The proposed gas pipeline route will cross over the River Barrow at the Cardinal Moran Bridge (IDB2) and three tributaries (crossings IDB1, IDB3 and IDB4) of the River Barrow (as summarised in Section 1 and detailed in Section 2).

The Powerstown Stream, the River Barrow and the three tributary crossings for the proposed gas pipeline route were surveyed 150m upstream and downstream as part of the aquatic ecology surveys undertaken at proposed development and along the proposed gas pipeline route (Table 1-1) as follows:

- The indicated length of the stream was assessed for riverine habitat and the following was recorded: substrate type, water depth, flow type / velocity, bank / channel width, bankside habitat, artificial features, instream vegetation and fishery habitat suitability.
- At sample points along the river, suitability for fish and lamprey (spawning, juveniles, adults), white-clawed crayfish and freshwater pearl mussel, was recorded.
- White-clawed crayfish sampling was undertaken where suitable habitat was observed and where safe to do so.

[14] S.I. No. 235/2022 - Flora (Protection) Order 2022 provides legal protection for a wide range of plant species across Ireland

Survey methodology included an upstream to downstream walkover of the watercourses, following Check-Clean-Dry biosecurity measures, to characterise the river habitats. Wading with a bathyscope was completed to assist in determining stream characteristics of importance to aquatic ecology.

Two non-water framework directive (WFD) land drains (IDB5 and IDB6) were inspected but dry at the time of the inspections in May 2026.

1.3.4.3 Otters

Otter surveys included recording sightings, tracks or any other signs of mammals (scat, feeding signs, resting sites) within the designated surveys areas for aquatic ecology (Section 1.3.3.2 and Table 1-1) to determine the likely presence of species, potential presence of breeding / rearing couches / holts and overall habitat suitability to support otters.

1.3.5 Consultation

Consultation commenced in early 2025 with the initial stakeholder consultation information document sent to various stakeholders in April 2025, followed by a public consultation event in Carlow in April 2025. A revised stakeholder consultation document was sent in November 2025. Biodiversity-relevant private and public stakeholders included the Department of Housing, Local Government and Heritage and the National Parks and Wildlife Services (NPWS), Inland Fisheries Ireland (IFI), Local Authority heritage and biodiversity officers, Bat Conservation Ireland, Birdwatch Ireland, Irish Wildlife Trust, and Biodiversity Ireland. Only limited responses have been received to date from the consultation process (Table 1-2).

In addition to written consultation, a pre-application consultation meeting with NPWS was held on Thursday, 15 January 2026 14:00-15:00.

Table 1-2: Stakeholder Consultation Responses relevant to ecology and biodiversity

Consultee and Date of Response	Summary of Comments Provided
Development Application Unit, National Parks and Wildlife Service Response 1: No Response Response 2: 19 November 2025 Consultation Meeting: 15 January 2025	Response: NPWS agreed to meet regarding the Project. Consultation Summary: A consultation meeting was held between the project coordinators and the NPWS on 15 January 2026, which included a short presentation on the Project, and a presentation on the status of ecological studies to date. Topics discussed included ecological surveys around birds, flora, fauna, and habitats. Ecological surveys discussed included consideration of specific species and groups such as plant species (including knapweed and bee orchid), herpetofauna (including newts), mammals (including badgers and bats), invasive alien species (including Japanese knotweed), and invertebrates (including the small skipper butterfly). Queries were made regarding the potential for Annex I habitats within the ZoI for air emissions and related impacts, and potential for impacts around lighting, cumulative effects (such as emissions from the Project in combination with emissions from traffic and agriculture), effects of wheel washing and leaking trucks on streams, and potential effects should culvert/water crossing removal be required. **In terms of specific queries related to the Habitats Directive, additional surveys have been undertaken in line with NPWS queries on Annex I habitats with findings incorporated in Section 3.2 and a full in combination assessment is presented in Section 5.4.**

Consultee and Date of Response	Summary of Comments Provided
Bat Conservation Ireland Response 1: 02 April 2025 Response 2: 20 November 2025	Response: Unfortunately, as Bat Conservation Ireland is a very small organisation, with limited resources, we do not have the capacity to get involved in planning issues.
Birdwatch Ireland Response 1: No response Response 2: 19 November 2025	Response: Email forwarded to Birdwatch Ireland's Policy Officer.
Irish Wildlife Trust Response 1: 03 April 2025 Response 2: 19 November 2025	Response: We do not have the staff capacity to respond to this consultation at the moment but we will endeavour to respond if possible.
Heritage Officer, Carlow County Council	No response to date
Inland Fisheries Ireland	No response to date
Biodiversity Ireland	No response to date

2. DESCRIPTION OF THE PROPOSED DEVELOPMENT

The description of the existing and proposed development including the proposed gas pipeline is included in Appendix 3 of this report.

3. EXISTING ENVIRONMENT

3.1 European Sites Within the ZoI or with Connectivity or Ecological Continuity

The only European site that has been identified as being located within the potential ZoI / where ecological connectivity could be impacted by the Project is the River Barrow and River Nore SAC (see Section 1.3.2 for details of the various ZoIs / connectivity considered).

The River Barrow and River Nore SAC is designated for the following habitats and species:

- 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]
- Killarney fern (*Trichomanes speciosum*) [1421]
- Desmoulin`s whorl snail (*Vertigo moulinsiana*) [1016]
- Freshwater pearl mussel (*Margaritifera margaritifera*) [1029],
- White-clawed crayfish (*Austropotamobius pallipes*) [1092]
- Sea lamprey (*Petromyzon marinus*) [1095]
- Brook lamprey (*Lampetra planeri*) [1096]
- River lamprey (Lampetra fluviatilis) [1099]
- Twaite shad (*Alosa fallax*) [1103]
- Atlantic salmon (*Salmo salar*) [1106]
- Otter (*Lutra lutra*) [1355]

An overview is provided hereunder of the ecological and environmental baseline of the Project lands. , This information is relied upon in this AA Screening Report / NIS in determining any potential source pathway receptor (S-P-R) relationship of the Project to European Sites qualifying interest or a habitat / species / feature that can support a qualifying interest.

The estuarine / coastal qualifying interests (QIs) of the SAC are beyond the ZoI of the Project and the Project lands provide no ecological continuity or connectivity to these habitats given the coastal nature of these habitats.

Ecological field assessments to inform the Appropriate Assessment were focussed on habitats and species protected under the Habitats Directive and were designed following the considerations of the findings of the desk study and having regard to scoping consultation (Section 1.3.4).

3.2 Baseline Overview

The proposed development is located along the L3045, which is accessed from the Carlow to Kilkenny road - the R448 Regional Road. The proposed development is located directly to the south of Carlow County Council's closed Powerstown Landfill site (referred to as the landfill) and to the west of the operational Recycling Centre, co-located on the landfill site both of which are under an EPA licence (Waste Licence no. W0025-04).

The River Barrow and River Nore SAC boundary is located 20m west of the proposed development.

The proposed development lands are currently in use as an operational quarry, quarried by Kilcarrig Quarries Ltd. and has been partially restored[15] (6.5 ha) by backfilling with soil and stone and profiled, but still at a lower lying topography, with the remaining area being quarried for sand and gravel. With the implementation of the latest consented conditions[16] the development lands would be infilled and profiled to obtain restoration levels (still lower than original topography), with soil deposited in preparation for seeding for grassland establishment, with the aim of returning the site to agricultural use. The entire proposed development lands are at a lower topography than the surrounding properties and all water falling on the proposed development's footprint is retained on site, with no direct interaction with the surrounding hydrological regime.

This site has perimeter fencing and has two access points off the L3045 road. The first entrance is c. 100 m from the R448 junction and was previously used as an access route into the quarry (the area which has now been restored). There is a property with associated out-buildings located adjacent to this entrance, within the boundary and ownership of the existing quarry, excluded from the proposed development's RLB. The second entrance is c400 m east of the R448 junction and is currently used as the main entrance to the proposed development. This entrance is fenced and controlled by a gate; a wheel wash facility is located at the entrance.

3.2.1 Geology

The proposed development is located in a quarry site, 9 hectares (ha) in area, which has been operated under planning permission (P01/300, ACP (PL01.129838)) by Kilcarrig Quarries Ltd. since 2002. As such the site is depressed with respect to the surrounding lands with steep slopes from the site up to the boundaries with adjacent lands. The majority of the quarry site (6.5 ha) has been partially restored by backfilling with soil and stone with the remaining area being quarried for sand and gravel.

[15] Planning References: PL 01/300 upheld by An Bord Pleanála (ABP - 01.129838), PL 11/206 upheld by ABP (01.129838)
[16] Planning Reference: 13/187



Figure 3-1: View from south shows ongoing restoration of former quarry

The Geological Survey of Ireland (GSI) 1:100,000 scale bedrock geology map shows that the proposed development is underlain by both the Millford Formation and the Ballysteen Formation. The Millford Formation is described as comprising a dolomitised peloidal calcarenitic limestone. The Ballysteen Formation is described as a dolomitised dark-grey muddy limestone.

Intrusive ground investigations were undertaken at the proposed development site by Causeway Geotech Ltd (CGL) under the supervision of an Engineering Geologist from FT during December 2024 and October 2025. The geology encountered in the exploratory holes comprises Made Ground overlying cohesive and granular glacial deposits. The Made Ground is comprised of interbedded cohesive and granular deposits. Made Ground was recorded to a depth of between 1.3 and 4.7m bgl. The cohesive glacial deposits generally comprise stiff to very stiff sandy slightly gravelly or sandy gravelly Silt or Clay with low to medium cobbles, while the in-situ granular glacial deposits generally comprise sandy or silty sandy Gravel with cobbles and boulders of sandstone/limestone lithology. Bedrock was encountered at depths ranging from 14m to 20 mbgl.

The proposed gas connection route alignment is in made Ground along the road network, which is underlain by Millford Formation and the Ballyadams Formation geology and associated Quaternary Geology. The Ballyadams Formation comprises a crinoidal wackestone/packstone limestone.

3.2.1.1 Groundwater Bodies

The proposed development site and the proposed gas pipeline route are located within the Athy-Bagenalstown Gravels groundwater body (GWB), (also referred to as the Bagenalstown GWB by the GSI).

The GSI has classified the bedrock beneath the proposed development as a Regionally Important Aquifer - Karstified (diffuse) (Rkd). However, there are no karst features documented or recorded through desktop or field surveys within 2km the Project, including any springs or estavelles. As such the qualifying feature 'Petrifying springs with tufa formation (Cratoneurion) [7220]' is not within the ZOI of the Project.

During the ground investigation at the proposed development site minor shallow groundwater seepage was recorded during borehole installation and trial pits. Otherwise, the remainder of site investigation locations, including rotary holes, were noted as being dry.

Groundwater well monitoring was conducted at the proposed development site in the winter of 2024/25 (see Table 3-1 and Figure 3-3 for locations) and indicates groundwater levels between 33 mOD and 41.5 mOD

- The deepest excavation required is for the construction of the proposed stormwater lagoon. The excavation will extend to 44 mOD in this area; groundwater was detected between 33 mOD and 41.5 mOD, and as such is below the extent of the excavation. The stormwater lagoon is an earthen structure with a liner. There are no concrete works below the liner.
- The tank farm bund will require excavations of soil to 45m OD. The closest boreholes to this are BH01 and BH 02 which show average groundwater levels of 42.75 mOD, i.e. 2.25 m below the level of excavation.
- In areas such as the circulation yard, very limited excavation of soil is required. The surface of the circulation yard will be at an elevation of 49.25 mOD. This requires a subbase and slab thickness of 0.48 m. Groundwater levels are on average at 41 m OD, which is below the excavation levels.

Having regard to Table 3-1 relative to the above-mentioned construction requitements, significant dewatering of excavations will not be required to control groundwater during the construction of the proposed development.

Table 3-1: Summary of Groundwater Readings

Borehole	Ground Elevation mOD	Groundwater Levels mOD			
		19/12/2024	09/01/2025	13/02/2025	27/02/2025
BH01	50.78	45.28	n/a	42.21	42.85
BH02	44.13	n/a	41.93	42	42.2
BH03	49.43	41.98	n/a	42.22	42.27
BH04	46.57	n/a	33.3	41.29	41.52



Figure 3-2: Site Investigation Exploratory Hole Location Plan

The GSI states that diffuse groundwater recharge will occur via rainfall percolating through the subsoil or areas of outcropping rock. The groundwater flows to the west northwest, towards the River Barrow, with a shallow groundwater gradient. It is inferred that the river has hydraulic continuity with the water table. A groundwater source of 120m3/day of process water may be required at the site when water is not available at the surface water lagoon. A pump test was undertaken as part of the ground investigation to confirm the capacity of the underlying aquifer to supply the required process water for the operational phase of the proposed development. A pumping rate of $10m^3$/hour (equivalent to $240m^3$/day) was maintained throughout the 72-hour pump test, which recorded a 1.0m fall in the water level within the pumping well during the pump test. The results of the pump test show that the required 120m3/day of process water can be supplied by the pump well within the site. The groundwater level recovered to the pre-pump test level within 30 minutes of completion of the test. Monitoring at two of the installed standpipes across the site indicated no change in the groundwater level at those two locations, i.e. there was localised draw down only. The results indicate that the proposed development will have no pathway for effect on groundwater flows or recharge in the catchment or beyond the site. Notwithstanding the lack of a pathway for effect on groundwater flow or recharge, it is noted that in any case there are no records of GWDTEs within the 250m preliminary ZoI of the Project, and none were confirmed through ecological field survey.

According to classification work carried out as part of the Water Framework Directive and published by the EPA, the Bagenalstown groundwater body is classified as having 'Good' status in terms of water quality and quantity. The Groundwater Vulnerability within the proposed development site boundary is classified by the GSI as 'High' and ranges from 'Medium' to 'Extreme' along the proposed gas pipeline route(noting however that the gas route will be in road for the entirety of its length, and the proposed development site has been infilled as made ground). As per Section 2, fresh concrete will be poured on site as part of foundation works. However, as per Table 3-1 a pathway for effects on groundwater quality is unlikely given the groundwater levels on site relate to excavation and foundation levels, coupled with the industry standard requirement under CIRIA, BS EN 206 not to carry out concrete works under heavy rainfall conditions.

Terrestrial Habitats and Species

The proposed development is surrounded by a mixture of treelines, hedgerows and scrub on embankments which will be retained in situ. The proposed development lands support ephemeral pools / ponds. The remainder of the habitat on site constitutes scrub, disturbed and developed ground. The habitats in the immediate surrounds are dominated by agricultural grasslands, quarries, treelines, hedgerows and grassy areas.

The proposed gas pipeline route is proposed within the built environment of the road and road verge for the entirety of its length, and includes the HDD crossing under the River Barrow, where the entry and exit pits are proposed in-road. The adjacent areas include a variety of habitats, but dominated by hedgerows, treelines, agricultural grassland and wooded areas. At the watercourse crossings the habitats also include scrubs, riparian treelines and amenity grasslands alongside the rivers and reedbeds.

Records for Rare and Protected Habitats and Species

The National Biodiversity Data Centre (NBDC) and Botanical Society of Britain and Ireland (BSBI) hold records for rare or protected flora species (FPO) within the 2km^2 grid for the proposed development (S76E) and the proposed gas pipeline route (S76D, S66Y, S66Z and S67V) (Table 3-2).

Table 3-2: NBDC rare and/or protected flora records for the last two decades for the proposed development and the proposed gas pipeline route

Species (Latin Name)	Data Source	Latest record & location for the proposed development	Latest record & location for the gas pipeline	Designation
Fragrant Agrimony (*Agrimonia procera*)	NBDC	01/06/2015 One occasion, 210m east of the proposed development boundary.	N/A	Near threatened (IRL 2016)
Greater Knapweed (*Centaurea scabiosa*)	NBDC	14/06/2020 Two locations along the verge of the R448 adjacent to the proposed development but not within the proposed development.	14/06/2020 One location near the beginning of the proposed gas pipeline route (accuracy of 100m) (area of overlap with the proposed development).	Near threatened (IRL 2016)

Species (Latin Name)	Data Source	Latest record & location for the proposed development	Latest record & location for the gas pipeline	Designation
Basil thyme (*Clinopodium acinos*)	BSBI	Not specified (2000-2019)	-	Near threatened (IRL 2016)
Dwarf spurge (*Euphorbia exigua*)	BSBI	Not specified (2000-2019)	-	Near threatened (IRL 2016)

The above flora species are not indicator species for any of the QI habitats of the River Barrow and River Nore SAC.

There are no records for Killarney fern (*Trichomanes speciosum*), a QI of the River Barrow and River Nore SAC.

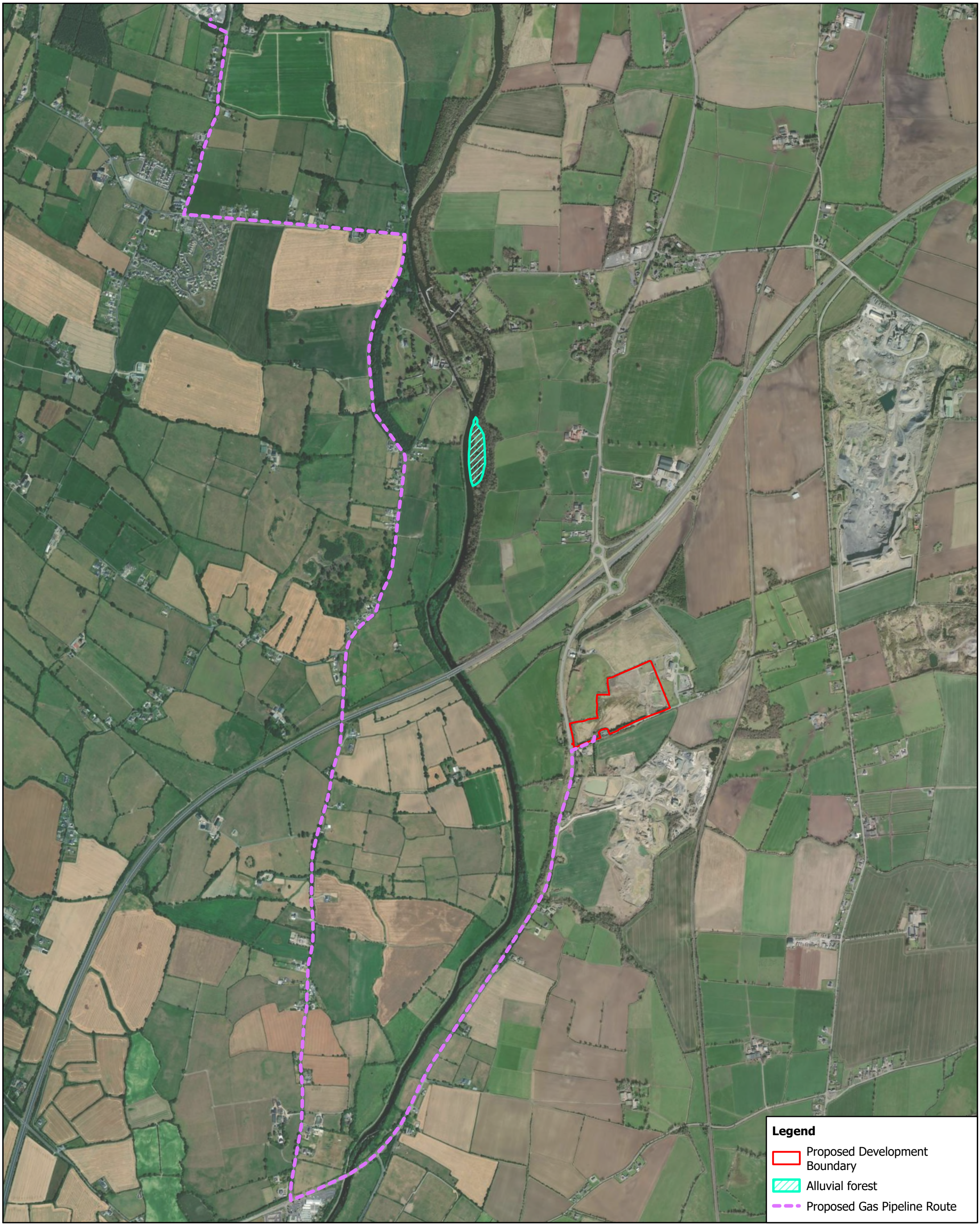
Similarly, there are no records for European dry heaths [4030], Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0] or Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] within the potential ZoI of the Project.

The NPWS Article 17 habitat mapping shows 91E0 Alluvial woodland, c.1.1km northwest of the proposed development. The habitat is a QI habitat of River Barrow and River Nore SAC (002162) and at this location is within the SAC boundary (Figure 3-3), but is wholly outside of the ZoI for air quality impacts or direct disturbance, noting the following outputs from the air quality assessment and modelling completed for the Project (see Chapter 8 of the EIAR for full air model report, noting that the relevant information informing the AA Screening report and NIS are set out hereunder):

- At the worst-case model location within the River Barrow and River Nore SAC, there are no features sensitive to ammonia. The Alluvial woodland located c.1.1km northwest is not within the 1% contour of the relevant critical level.

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TITLE: Article 17 Annex I Alluvial forests (91E0)	**FIGURE NO:** 3.3		
	CLIENT: Greengate Biogas		
PROJECT: Powerstown Bioenergy	**SCALE:** 1:16,000	**REVISION:**	0
	DATE: 01/07/2026	**PAGE SIZE:**	A3

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3.2.1.2 Records for Invasive/Non-native Flora

Unless specified otherwise, the term "invasive species" in this NIS refers to Third schedule species to the European Communities (Bird and Natural Habitat) Regulations 2011 (as amended). The Regulations make it an offence to plant, disperse, allow or cause to disperse, spread, or otherwise cause to grow any of the scheduled species. Other non-native species to Ireland mentioned discussed.

The invasive/non-native species listed in Table 3-3 have been recorded within the 2km grid square for the proposed development (S76E) and for the proposed gas pipeline route (S76D, S66Y, S66Z and S67V). Five invasive or non-native plant species have been recorded for the proposed development and for the proposed gas pipeline route.

Table 3-3: NBDC invasive species /non-native flora records for the last two decades within 2km grid squares associated with the proposed gas pipeline route

Species (Latin Name)	Latest record: Proposed development	Latest record: Proposed gas pipeline route	Designation
Butterfly-bush (*Buddleja davidii*)	10/07/2015		Medium Risk Invasive Species (2013 Report)
Cherry Laurel (*Prunus laurocerasus*)		30/03/2019	High Risk Invasive Species (2013 Report)
Giant Hogweed (*Heracleum mantegazzianum*)	19/04/2019		EU Invasive Alien Species Regulation No. 1143/2014 & Invasive Species: Regulation S.I. 374/2024
Himalayan Balsam (*Impatiens glandulifera*)	21/08/2022	18/09/2022	EU Invasive Alien Species Regulation No. 1143/2014 & Invasive Species: Regulation S.I. 374/2024 - High risk (2013 Report)
Japanese Knotweed (*Fallopia japonica*)	10/04/2021		EU Invasive Alien Species Regulation No. 1143/2014 & Invasive Species: Regulation S.I. 374/2024 - High risk (2013 Report)
Nuttall's Waterweed (*Elodea nuttallii*)		31/12/2010	EU Invasive Alien Species Regulation No. 1143/2014 & Invasive Species: Regulation S.I. 374/2024 - High risk (2013 Report)
Sycamore (*Acer pseudoplatanus*)	21/05/2016	30/03/2019	Medium Risk Invasive Species (2013 Report)
Water Fern (*Azolla filiculoides*)		31/12/2021	EU Invasive Alien Species Regulation No. 1143/2014 & Invasive Species: Regulation S.I. 374/2024 - Moderate risk (2013 Report)

3.2.1.3 Field Survey

Habitat and flora botanical surveys of the Project were conducted by Fehily Timoney ecologists in May 2025. September 2025 and May 2026. The classification of habitats recorded during the field survey is based on the A Guide to Habitats in Ireland (Fossitt, 2000). The habitats were mapped based on the Heritage Council's Best Practice Guidance for Habitat Survey and Mapping (SNH, 2016) and the Good Practice Guidance for Habitats and Species (CIEEM, 2021). Habitats were assessed to determine the potential correlation with Annex I type habitats with particular focus on the qualifying interest (QI) habitats of the nearby River Barrow and River Nore SAC. None of the habitats recorded are habitats which are qualifying interests of the SAC.

Figure 3-1 shows the extent of the habitats mapped at the proposed development, along the proposed gas pipeline route and in the surrounds (this is presented as per A Guide to Habitats in Ireland (Fossitt, 2000)).

3.2.1.3.1 Proposed Development

A mosaic of dry calcareous and neutral grassland (Fossitt code: GS1) and dry meadow and grass verges (Fossitt code: GS2) occurs along the southern boundary of the proposed development on both sides of the site entrance (Figure 3-1). Based on the base-rich soils, there are calcareous/neutral grasslands with common bird's-foot-trefoil, common sedge, field wood-rush, common mouse-ear, creeping buttercup and cock's foot, there are some patches dominated by false oat grass, cock's-foot and black medick.

While it has some calcareous grassland character, given the mosaic nature and the scarcity of high quality and positive indicators, this mosaic habitat does not qualify as any Annex I habitat including Semi-natural dry grasslands & scrub facies on calcareous substrates (6210); important orchid sites (*6210).

The dry grassland (GS1) located on the opposite side (west) of the R448 road to the proposed development is located within the boundary of the River Barrow and River Nore SAC and was assessed for its potential to correlate to any Annex I type habitat including Semi-natural dry grasslands & scrub facies on calcareous substrates (6210) or important orchid sites (*6210). Given the inadequate numbers of positive indicators, the recent artificial origin of the substrate, the agricultural disturbance and the encroachment of negative indicator species, it does not qualify as the Annex I habitat type 6210 or *6210.

Notwithstanding the conclusion that the habitats within and surrounding the proposed development do not correlate to any Annex I type habitats including habitat type 6210 or *6210, those habitat types are not listed as QIs for the SAC nor are they called out in the Natura 2000 Data Form under 'Other important species of flora and fauna'. As such the calcareous grasslands within and opposite the proposed development are not considered further in the context of NIS.

During the May 2026 survey, 13 individuals of greater knapweed plants were identified along the roadside verges of R448 (adjacent to the western boundary of the site but outside the site boundary). On the west side of the proposed development entrance, bee orchid (*Ophrys apifera*) was recorded in May 2025. Neither of these plants are QI species of the nearby River Barrow and River Nore SAC and are not called out in the Natura 2000 Data Form for as 'Other important species of flora and fauna'. As such they are not considered further in the context of this NIS.

The Powerstown Stream located 200m north of the proposed development has been classified as a depositing/lowland river (Fossitt code: FW2) but does not qualify as any Annex I habitats type, including Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (6430) and Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260], due to the absence of indicator species (Article 17 report (NPWS, 2025a)) and the tall herb and species rich structure.

In relation to invasive/non-native flora, one terrestrial Third Schedule invasive species, Himalayan balsam, was observed within the proposed development during habitat surveys in May 2025, on the bank along the northern boundary of the proposed development (Figure 3-6). This was a single stand, 2m tall by 5m wide, located at the base of a steep embankment.



Plate 3-1: Himalayan balsam recorded within proposed development

3.2.1.3.2 Proposed Gas Pipeline Route

The entire proposed gas pipeline route is within the road and road verge that runs alongside hedgerows, treelines, scrub and agricultural crops and grasslands. Other habitats neighbouring the proposed gas pipeline route include grassy verges and meadows, an area of mixed broadleaf/conifer woodland and an area of wet willow-alder-ash woodland.

Local watercourses, including the River Barrow, support depositing/lowland rivers (Fossitt code: FW2) and reed and large sedge swamps (Fossitt code: FS1).

The qualifying interest Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260] occurs in the main channel of the River Barrow.

The reed and large sedge swamp habitats (Fossitt code: FS1) occur along both banks of the River Barrow, including at the Cardinal Moran Bridge (crossing IBD2), where the habitat forms islands within the River. Common reed (*Phragmites australis*) dominates the habitat along this section of River Barrow which precludes it from any affiliation with Annex I habitat Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (6430) (NPWS, 2025). This habitat is located outside of the ZoI of the Project, however, was assessed for suitability of support Desmoulin's Whorl Snail (*Vertigo moulinsiana*). There are no desktop records for the Desmoulin's whorl snail from the NBDC records or NPWS sensitive species information for this location. The conservation objectives for this QI of the River Barrow and River Nore SAC place the nearest recorded population near Borris, County Carlow, approximately 18km directly south of this location.

Desmoulin's whorl snail requires tall-structured vegetation containing tall riparian grasses and sedges (reed sweet-grass (*Glyceria maxima*), common reed (*Phragmites australis*), greater pond-sedge (*Carex riparia*) and great fen-sedge (*Cladium mariscus*)) and stable hydrology with the water table at, or slightly above, the ground surface for much of the year (NPWS, 2025a). During ecology surveys completed for the proposed gas pipeline route, tall riparian habitat was observed along the River Barrow which meets the structural habitat requirements of Desmoulin's whorl, but the reedbeds were observed to be under prolongued floodwater inundation of the majority of the winter. While whorl snail exhibits behavioural adaptations (e.g. vertical migration onto emergent vegetation) that enable persistence during short-term or seasonal inundation, it is not tolerant of prolonged flooding where vegetation remains submerged. Therefore, the habitat along the stretch of the River Barrow is not suitable to support Desmoulin's whorl snail.

During the surveys in May 2026, 5 individual greater knapweed plants were identified in proximity to the gas pipeline in grassy verges on the west facing slope of the earth bank along the public road, R448 immediately south of the L3045 junction. This is not a QI of the any European site and is not called out in the Natura 2000 Data Form for the nearby River Barrow and River Nore SAC as 'Other important species of flora and fauna'. As such it is not considered further in the context of this NIS.

During field surveys, the Third Schedule invasive species *Rhododendron ponticum* was recorded in the front garden of a residential property which borders the proposed gas pipeline route, at a distance of 18m from the pipeline.

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TITLE: Habitat Map (Project)	**FIGURE NO:** 3.4		
	CLIENT: Greengate Biogas		
PROJECT: Powerstown Bioenergy	**SCALE:** 1:2,000	**REVISION:**	0
	DATE: 01/07/2026	**PAGE SIZE:**	A3

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3.2.2 Watercourses and Aquatic Habitats and Species

The Project lies within the same Water Framework Directive (WFD) Catchment as the River Barrow. East of the river the proposed development and the proposed gas pipeline route share the same Sub-Catchment Barrow_SC_100, and west of the River, the proposed gas pipeline route lies within Sub-Catchment Barrow_SC_110.

The following waterbody features are near the proposed development:

- Powerstown Stream 200m north of the proposed development
- River Barrow, 300m west of the proposed development

The Powerstown Stream confluences with River Barrow approximately 480m west of the R448. The proposed development is within a topographical depression and does not contribute to this stream through runoff. There is no direct path for construction stage runoff from the proposed development to the local watercourses.

As indicated in Section 2, the only circumstances for connectivity to the local watercourses during operation is when storm water will be directed from the proposed development to the Powerstown Stream. This will only occur rarely during the operational phase where a 1 in 30-year storm event and coincides with circumstances where the stormwater lagoon and fire and process water tanks are full. This storm water will be collected in a segregated drainage network and will be passed through treatment systems (petrol/oil interceptor and settlement in the lagoon) and released at greenfield runoff rates via controlled discharge arrangements. The discharge will be in accordance with limits set under the Industrial Emissions (IE) Licence which must be obtained from the EPA for the operation of the facility.. The water contribution from the proposed development during the storm water event at this outlet will be 9 % of the available pipe capacity. During a 1 in 30 year storm event, the discharge from the proposed development plus the discharge from the road network will use just 28% of the total pipe capacity. Given the rarity, water quality and volume of the operational stage storm water discharge from the proposed development, there will be no potential for such a discharge to alter the hydromorphological, ecological or chemical status of the Powerstown Stream, or downstream River Barrow. As such the operation of the proposed development will have no effect on the WFD status of these waterbodies.

The proposed gas pipeline route will cross the River Barrow (River Barrow (Barrow_180) / EU Code: IE_SE_14B012700) via an HDD crossing at the Cardinal Moran Bridge (crossing IDB2). The proposed gas pipeline route will also cross three tributaries of the River Barrow by trenching in road within the existing bridge/culvert crossings at the Ballynaboley Stream_010 (EU Code: IE_SE_14B080700) at crossing IDB1, the Rathornan Stream (Rathornan _010) (IE_SE_14R430830) at crossing IDB3, and an unnamed tributary to the River Barrow (River Barrow (Barrow_180) (EU Code: IE_SE_14B012700)) at crossing IDB4 (Figure 3-4). Additionally, the proposed gas pipeline route crosses over two culverted land drains (IDB5 and IDB6) on the L3043 road. These two crossings will be constructed in road by trenching or by HDD. There will be no requirement for in-stream works for any of the proposed waterbody crossings along the gas pipeline route. While all drain/waterbody crossings will be within the curtilage of the road, having regard to Section 1.3.2.2 on ZoI, it is assumed on a that there is potential for runoff of from the works areas or frac-out from HDD works into the drains/waterbody, which are either part of or flow into the River Barrow and River Nore SAC.

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Watercourse Crossing Locations:
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TITLE: Project Layout in Relation to Local Watercourses	**FIGURE NO:** 3.5		
	CLIENT: Greengate Biogas		
PROJECT: Powerstown Bioenergy	**SCALE:** 1:25,000	**REVISION:**	0
	DATE: 01/07/2026	**PAGE SIZE:**	A3

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0 0.25 0.5 1 1.5 2 Kilometers

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3.2.2.1 Desktop Assessment

Desktop data for the Powerstown Stream is limited, with more extensive historical surveying completed for the River Barrow. The length of the River Barrow upstream of Carlow town, upstream of proposed development and downstream of proposed development was considered in terms of desktop assessments.

The most recent available biological assessment of surface water quality in the Powerstown Stream is from the landfill monitoring from January 2025. The results indicate that the stream has a Q-Value of 3 (Poor WFD Status). The latest (2023) EPA Q Values for the length of the River Barrow is 3-4, indicating a 'Moderate' WFD Status and 'Slightly Polluted' condition for the river[17].

The Conservation Objectives document for the River Barrow and River Nore SAC has not mapped the extent of QI habitat Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260].

The Inland Fisheries Ireland fish records[18] showed mostly moderate and poor fish status at monitoring stations along the River Barrow, upstream to downstream of proposed development. IFI data shows historical salmon records in the River Barrow upstream (monitoring site Bestfield_A in 2015, approximately 2km north of the N80, north of Carlow town) of proposed development and downstream (monitoring site Leighlinbridge_A in 2012), approximately 900m south of Cardinal Moran Bridge (proposed HDD crossing IDB2). Recent records show salmon upstream of Carlow town (Bestfield_A in 2021), but downstream records only indicate salmon at Goresbridge (approximately 14km south of Cardinal Moran Bridge in 2021). Salmon is also confirmed in the Rathornan Stream (2020), approximately 1.2 km west and upstream of the crossing (IBD3). No other tributaries within the ZoI have been surveyed as part of the IFI WFD fisheries assessment.

According to NBDC historical records and NPWS species information, white-clawed crayfish were regularly recorded along the River Barrow catchment and confirmed from the Ballynaboley Stream (IDB1), with the last record in September 2011. White-clawed crayfish (September 2014) have been recorded at the Cardinal Moran Bridge (IDB2) with scattered records up- and downstream along the River Barrow and its tributaries.

NBDC data (August 2017) also show records of crayfish plague (*Aphanomyces astaci*) within the Barrow catchment, near where the Powerstown Stream enters a culvert beneath the R448. This record was of a dead white-clawed crayfish, suspected to have crayfish plague but not confirmed by DNA analysis.

NBDC historical records show otter records across all the overlapping grids with the latest record near Ballynaboley Stream (IDB1) in 2015 and at the River Barrow Cardinal Moran Bridge (IDB2) in January 2023. From the 'Otter survey of Ireland 2004 & 2005' and the 'Atlas of Mammals in Ireland 2010-2015' datasets[19], otter signs and at least signs of an individual along the River Barrow and Ballynaboley Stream. Only other records were along the Rathornan Tributary approximately 2.7km upstream from IDB3. None of the historical records indicate presence of holts or couches.

[17] https://gis.epa.ie/EPAMaps/Water
[18] https://opendata-ifigeo.hub.arcgis.com/apps/6f48cedf09b84d2e8b40100d85743c5b/explore
[19] NBDC otter dataset at Maps - Biodiversity Maps

3.2.2.2 Field Survey

3.2.2.2.1 Proposed Development

The Powerstown Stream is a depositing/lowland river and a moderately polluted water course (Q-value of 3 in 2025) (Poor WFD Status). The river does not support QI habitat Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260].

The river habitat provides overhanging vegetation and shade, but it does not have suitable spawning habitats for salmonids and lamprey species. A single fish (unidentified) was briefly sited during surveys, and the stream is considered to have limited fish populations.

The stream has limited suitability for white-clawed crayfish, limited to stretches upstream of the culvert. There is one record of a dead specimen (suspected to have crayfish plague) and none were noted during surveys.

The Powerstown Stream provides suitable cover for commuting otter, however forage potential is low due to lack of fish and crayfish populations. No otter signs were observed along the surveyed length of the river and no holts or couches were observed. Upstream of the culvert, a scrubby bank concealed the ground (240m north of the RLB of the proposed development) and the area, at best, is considered to have low suitability to support a holt/couch site. The Powerstown Stream may have some value for commuting otter although no otter signs nor activity (evidence of breeding, feeding, scat, footprints or resting sites) were noted during the assessment of stream.

3.2.2.2.2 Proposed gas pipeline route

The proposed gas pipeline route crosses the River Barrow (the Cardinal Moran Bridge - IDB2) by HDD and its tributaries (IDB1, IDB2 and IDB4) within the existing bridge deck / head space of culverts. The QI habitat Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260] is absent from the tributaries, but present in the main channel of the River Barrow.

The River Barrow and its tributaries are utilised by commuting otters as evidenced by recent tracks observed along the sections of watercourses surveyed, which reflect the historical desktop records. It is suspected that tributaries offer limited forage potential (poor quality water at time of surveys along with barriers in watercourses that would limit fish populations), and the River Barrow is the main forage area for otters in the locality. Despite the recent tracks, no other evidence of breeding activity, activity of small family groups or regular feeding or scat signs were noted. Along with the lack of couches and holts observed, breeding otter are not considered to be active in the surveyed areas.

<u>Ballynaboley Stream (IDB1)</u>

The Ballynaboley Stream (IDB1) is within a narrow corridor of wet willow-alder-ash woodland (WN6), neighboured by agricultural fields and flows west under the culverted R448 towards the River Barrow (Plate 3-2). The banks are slightly sloped, heavily vegetated with algae-covered rocks. The substrate is considered a mix of silt, pebble and rock.

The stream is considered to have moderate potential for fish and suitability for juvenile lamprey given the presence of suitable soft, fine sediments. Habitat is suitable for white-clawed crayfish as evidenced by historical records.

The riparian habitat provides good cover for commuting otters. No holts or couches were noted upstream of the crossing nor was any otter signs, suggesting no recent use in the surveyed section of the watercourse. Otter tracks were observed along the river downstream of the crossing, which is in proximity to the River Barrow at this location. The river has value for commuting and has potential to support other otter foraging activities, but the quality of upstream water, stagnant and foul smelling from abundant algal growth, may deter otter from using this river at the time of the survey and would not support prey species.



Plate 3-2: Ballynaboley Stream crossing (IDB1)

River Barrow around the Cardinal Moran Bridge (IDB2)

The River Barrow around the Cardinal Moran Bridge (IDB2) supports a variety of terrestrial habitats along its banks (Plate 3-3) with improved agricultural grasslands, reeds (including reed islands) and a pedestrian amenity path with scrub adjacent to road downstream of the bridge. Wooded habitat dominated upstream of the bridge. The river was deep and slow flowing, but where visible, the substrate was composed of silt covering rocks and boulders.

The River Barrow is assessed as having high fishery potential based on historical fish records. Habitat is suitable for white-clawed crayfish as evidenced by historical records. No otter tracks or signs were observed along the surveyed length of the river, and no holts or couches were observed. No signs or evidence of recent activity was observed during the surveys.

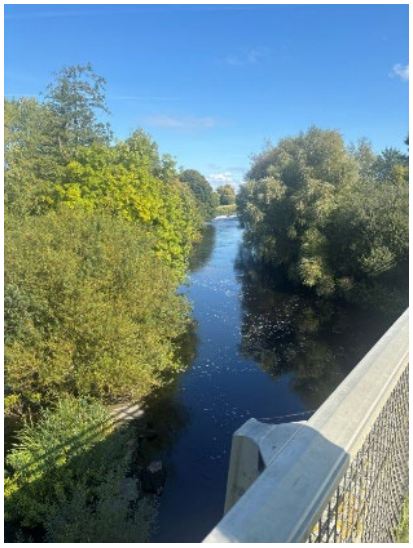




Plate 3-3: River Barrow (IDB2), downstream, upstream and at the Cardinal Moran Bridge respectively

Rathornan Stream (IDB3)

The Rathornan Stream (IDB3) flows under the tree-lined L3038 surrounded by agricultural fields (crops and grazing lands) and flows east towards the River Barrow (Plate 3-4 and Plate 3-5).

The river is fed by agricultural drainage ditches and downstream has a bridge and concrete bricks damming a drainage ditch on south bank. The river has a substrate of mixed gravel, pebbles and cobbles and moderate to high flow rates with ripples. The river is shaded and shows signs of eutrophication.

The river has moderate fisheries potential, specifically for lamprey juveniles in fine, soft sediment and adults in the gravel/pebble substrates. The river is blocked / restricted downstream by footpaths and fish movement might be very restricted reducing the fish populations in this river.

Habitat is not considered suitable for white-clawed crayfish given the limited cobble habitat and general nature of the river. The riverine corridor has enough cover for commuting otters, but no signs of otter were noted. The river offers potential for forage, but the paucity of fish due to downstream barriers reduces the forage value for otters.



Plate 3-4: Rathornan Stream (IDB3) upstream (west) of the L3038



Plate 3-5: Rathornan Stream (IDB3) downstream (east) of the L3038

Tributary to the River Barrow (IDB4)

The tree-lined tributary to the River Barrow (IDB4) flows east into the River Barrow, through agricultural fields west of the L3039 and mixed broadleaved/conifer woodland (WD2) east of the local road (Plate 3-6). The river is shallow with a substrate dominated by cobbles, with gravel substrate also present and no in-stream algae.

The tributary has good fisheries habitat, including for lamprey and salmonid spawning. The river drains into a canal with sluice gates which my limit mobility of fish into this river and limit the fish populations.

The habitat is suitable for white-clawed crayfish, proving suitable cobbled substrate. The riverine corridor has enough cover for commuting otters, but no signs of otter were noted. There is some forage potential for otters, but it is suspected that the downstream conditions and sluice gate may limit fish prey species.





Plate 3-6: Tributary to the River Barrow (IDB4)

Land Drains (IDB5 and IDB6)

Both land drains are culverted under the local road and have no fishery potential and do not support any of the qualifying interests of the River Barrow and River Nore SAC.



Plate 3-7: Land Drain IDB5



Plate 3-8: Land Drain IDB6

3.3 Baseline Summary

While there will be a permanent loss of habitats associated with the project, they are not supporting habitats for the QIs of the SAC nor of any other habitats or species which are integral to the structure and function of the SAC. The habitats that will be directly lost as a result of the project are not functionally linked to the conservation objectives of the SAC.

The alluvial woodland located 1.1km northwest of the proposed development and within the boundary of the River Barrow and River Nore SAC, is as qualifying feature of the SAC, but is beyond the ZoI of the Project and there is no connectivity between the project and the habitat.

The main channel of the river Barrow supports QI habitat Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260].

No other QI habitats of the River Barrow and River Nore SAC are within the ZoI of the Project.

The River Barrow and its tributaries support otter, however no resting or breeding places are present within the ZoI of the Project. The habitats to be removed to provide for the proposed Project are not part of the ecological connectivity or continuity for otter, i.e. they comprise road verge vegetation and removal of vegetation from an old quarry site.

Near the Project lands, the River Barrow and its tributaries support White-clawed crayfish, lamprey species, and salmon.

4. SCREENING FOR APPROPRIATE ASSESSMENT

This section of the report examines whether the Project is likely to have a significant effect upon European sites, either alone or in combination with other plans or projects.

4.1 S-P-R Assessment

The River Barrow and River Nore SAC (0002162) is within the ZoI of the Project.

No other EU sites occur within the ZoI and no other European sites are considered further.

The potential sources of impacts from the Project are identified as sediment laden / contaminated surface water runoff from construction works areas at or near the proposed drain and watercourse crossings along the gas pipeline route.

No pathways for effects have been identified from the proposed development site on the basis of the following:

- deep excavations are not required
- excavation depths are shallower than groundwater levels, as such dewatering will be minimal and will not impact hydrogeological regime
- stone piles will be used for foundations
- a groundwater pump test has established the groundwater well can supply the required yield without creating drawdown
- the baseline assessment has established no evidence of contamination in soil or groundwater environment
- best practice engineering / construction industry standard CIRIA (CIRIA, 2023), (CIRIA, 2016) (CIRIA, 2001) and BS EN 206 (BSI, 2026) requires that concrete should not be poured during heavy rainfall or uncontrolled wet conditions. As such the risk of contaminating the overburden during construction will be negligible given the industry requirement for concrete works in essentially dry works conditions, coupled with the groundwater level being below excavation level.

No operational stage sources of impacts are identified (given the European Site is beyond the ZoI of the proposed development site).

River Barrow and River Nore SAC is considered further in relation to the potential pathways for effects emanating from the potential source of impacts (including consideration of connectivity or ecological continuity) and considers the QI (receptor) species which are likely to be affected. The SAC at its nearest point is located c. 20m west of the proposed development, and the proposed gas pipeline route is within the SAC boundary at the proposed Cardinal Moran Bridge (IDB2) watercourse crossing (albeit crossing is within the road curtilage) .

Table 4-1: Source Pathway Receptor Assessment

List of Qualifying Interests	Source-Pathway-Receptor Assessment	S-P-R connectivity (Y/N)
• 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]	**Surface Water Runoff** The construction works at the proposed development Site have no potential connectivity to this SAC given its isolation from the SAC due to topography and geology. During operation, stormwater discharge from the proposed development has no pathway for effect given stormwater volume and quality will not be such that it could affect downstream ecological status or hydromorphology. The majority of the gas pipeline works will be in-road, with only limited pathway for runoff into the SAC given that the local road drainage is over the edge drainage to grassed swales. Similarly, as the HDD launch and exit pits will be located in-road with very limited potential for runoff to the SAC. Notwithstanding it is assumed for the purpose of this assessment that contaminated surface water runoff may enter the drain and watercourse crossings on the proposed gas pipeline route. Additionally, HDD can result in frac-out[20], which if it were to enter the river Barrow or its tributaries would result in degradation of the aquatic environment.	Yes - Due to potential for degradation in water quality and sedimentation of the River Barrow, part of the River Barrow and River Nore SAC, from drain and watercourse crossing works during the proposed gas pipeline construction. Yes – Due to potential for brief disturbance to commuting / foraging otter during the drain and watercourse crossing works during the proposed gas pipeline construction. No S-P-R connectivity between the Proposed Biogas Development site and any European Site.

[20] The unintended release of drilling fluid (usually bentonite slurry) into surrounding soils or surface water when pressure causes a fracture in the ground. It occurs when subsurface conditions cannot contain the drilling fluid, allowing it to escape to the surface or nearby waterbodies.

List of Qualifying Interests	Source-Pathway-Receptor Assessment	S-P-R connectivity (Y/N)
• 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] • *Vandenboschia speciosa* (Killarney Fern) [6985]	The aquatic qualifying interests within the ZOI associated with the River Barrow which would be sensitive to degradation in water quality and sedimentation, and for which there is a pathway for effect are Lamprey, Atlantic salmon, White-clawed Crayfish and Floating river vegetation. No works will take place directly within the SAC (noting that the HDD crossing will be below the river and launch and exit pits are outside of the SAC). The riparian habitats along watercourses at the proposed gas pipeline route watercourse crossings will not be impacted as works will be within the road/road verge. There is no pathway for habitat loss/degradation effects from the works. One terrestrial Third Schedule invasive species, Himalayan balsam (*Impatiens glandulifera*), was recorded within the proposed development site boundary. The species occurs on the top bank along the northern boundary of the proposed development and there should be no direct interaction with the species. There is therefore no contact at source and no pathway for spreading the species into the neighboring terrestrial. Two terrestrial Third Schedule invasive species, and *Rhododendron ponticum* in a residential property 18m from the pipeline and Himalayan balsam (*Impatiens glandulifera*) along the banks of the River Barrow, c. 110m from the proposed gas pipeline route. There will be no direct or indirect interaction with these species and no adverse effects on the integrity of the River Barrow and River Nore SAC. No works are proposed within the SAC boundary. As such, there is no potential for unintentional translocation of invasive plant species into the SAC.	

List of Qualifying Interests	Source-Pathway-Receptor Assessment	S-P-R connectivity (Y/N)
	Disturbance / Displacement There will be no in-stream works within the River Barrow, or within drains / waterbodies which flow into the SAC. As such there is no potential pathway for disturbance effects on the aquatic QI species lamprey, salmon or crayfish (noting that pearl museel and twaite shad are not within the ZoI). No otter resting or breeding places occur within the ZoI of any of the in-road watercourse crossings or at the HDD crossings, or near (within 150m of) the gas pipeline route. No disturbance effects on population are likely. However, otter may commute and forage in the locality, as such there is potential for brief effects during drian/watercourse crossing works. No operational stage impacts will occur.	

4.2 Consideration of In-Combination Effects with other Plans or Projects

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".*

It is therefore required that the likely significant effects of the Project are considered in-combination with any other plans or projects within the zone of influence.

The consideration of in-combination effects with other plans or projects, focused on the sources of impacts identified for the Project in Section 4.2 and ecological pathways identified in Section 4.1.

Only impacts to water quality and associated aquatic ecosystems are considered further.

The following sources were referred to (last reviewed May 2026):

- Carlow County Council Planning Enquiry System[21]
- An Coimisiún Pleanála website and database[22]
- Department of Housing, Planning, and Local Government's EIA Portal[23]
- National Development Plan 2021-2030 (Department of Public Expenditure, NDP Delivery and Reform, 2021)
- EPA licensed facilities[24]

4.2.1 Overview of Cumulative Impact Sources

The planning search encompassed a search for wind farm, solar farm and other large-scale developments within 10km (these are included within Appendix 2 of this NIS). There are no existing or proposed anaerobic digestion facilities within 10 km of the proposed development boundary.

The risks associated with the Project include deterioration of water quality during the construction phase which could affect the aquatic ecosystems (within the SAC and as ex-situ habitats) that support QI habitats and species of the River Barrow and River Nore SAC. There are no operational risks from the Project that could compromise the integrity of the SAC.

4.2.2 Existing Operational Developments and Permitted Facilities

Existing operational developments and permitted facilities presented in Appendix 2 of this NIS were considered in the cumulative assessment and in-combination statement.

The existing and licensed developments are reasonably expected to be compliant with their consenting / authorisation conditions and will not pose cumulative risks to water quality of a duration that will cause any significant effects on local aquatic ecosystems (flowing waters will flush affected areas, with the accumulation of water through the downstream catchment reducing the concentrations to acceptable thresholds), which will be detected and actioned through their water quality monitoring programmes. Other discharges will be during storm events when level of dilution of impact is proportionately increased by higher flow levels and volumes and will also not cause cumulative risks to water quality of a duration that will cause any significant effects on local aquatic ecosystems.

There is no risk for potential in combination effects with the existing consented and licensed developments sharing the River Barrow catchments with the Project during the construction phase of the Project.

[21] https://www.eplanning.ie/CarlowCC/searchtypes
[22] https://www.pleanala.ie/en-ie/case-search
[23] Accessed via: EIA Portal
[24] https://gis.epa.ie/EPAMaps/default

4.2.3 Future Developments

Consented developments (not operational) and developments awaiting decisions on planning consent as presented in Appendix 2 are considered in the cumulative assessment and in-combination statement. Most of the future developments support the renewable energy sector, including solar and wind farms, electrical supporting infrastructure (grids, substations and BESS). Other developments are related to maintenance and upkeep of roads and waterways and in support of activities and developments for the existing quarries.

As the construction phases of these projects may overlap with the Project's construction phase, there is potential for cumulative effects on water quality (and the associated aquatic ecosystem) from construction phases of future developments in the absence of mitigation.

4.3 Assessment of Likely Significant Effects

This section of the report explains the metrics used when assessing if the potential impacts of the Project are likely to result in significant effects on European sites.

The European site with pathways for potential effects arising from the sources for impact from Project is the River Barrow and River Nore SAC and the information on this site was sourced from the following valid site-specific conservation objectives (SSCO): Conservation Objectives: River Barrow and River Nore SAC 002162. Version 2. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage (NPWS, 2025b).

The EC (2021) guidance document notes that the significance of the effects will vary depending on factors such as the magnitude of impact, the type, extent, duration, intensity, timing, probability, in-combination effects and the vulnerability of the habitats and species concerned. The guidance document outlines the following criteria for assessing significance, indicators of significance, in view of the site-specific conservation objectives e.g.:

- Degree of habitat loss (absolute, relative), changes in habitats structure;
- Risk of species populations' displacement, level of disturbance, reduction of species home range, feeding area, refuge areas, alteration of favourable condition for breeding;
- Importance of the habitats and species affected, e.g. representativeness, local variety;
- Importance of the site (e.g. limit of distribution area for certain habitats and species, stepping stone, important for ecological connectivity);
- Disruption or alteration of ecological functions;
- Changes to key ecological features of the site (e.g. water quality).

These criteria are considered in determining significance of effect relative to the pathway for effect and the sensitivity of the European site's qualifying interests to the effects of the impacts.

Table 4-2: Assessment of likely significant effects on the European sites

Site Name (Site Code)	Criteria for assessing potential changes that may occur at a European site, which may result in effects on the function of the site:[25]	Likely Significant Effect
River Barrow and River Nore SAC (002162)	Impacts identified relate to surface water runoff into the river Barrow and drains/tributaries of the river from construction works or from frac-out from HDD works, and also brief disturbance of commuting or foraging otter during watercourse crossing works. The significance of these impacts is considered hereunder: **Habitat loss (absolute, relative), changes in habitats structure:** Potential for deterioration in fishery habitat value in the event of frac-out or construction area surface water runoff into the River Barrow or its tributaries. Effects of sedimentation / pollution would likely be localised and temporary, however species present (crayfish, lamprey and Atlantic salmon) would be sensitive to such impacts, with local population level effects possible whereby spawning gravels or resting places were impacted. **Species populations' displacement, level of disturbance, reduction of species home range, feeding area, refuge areas, alteration of favourable condition for breeding;** Accidental pollution of the River Barrow and its tributaries due to construction runoff could result in temporary localised reduction in quality and extent of habitat for crayfish, lamprey and salmon. However, temporary degradation of the local aquatic environment would be unlikely to have a significant effect on white-clawed crayfish given their relative tolerance of sedimentation/poorer water quality. Temporary disturbance of otter during construction would be unlikely to result in significant effects through displacement given the absence of breeding or resting places for otter. Additionally, the works activities are not likely to overlap significantly with otter activity, with otter being largely nocturnal and crepuscular, i.e. being most active around dawn and dusk, as such the works will not inhibit access to habitat. Also, the works will take only a number of days to complete near any of the drains / watercourses.	Uncertain. Effects are likely to be localised only, however on a precautionary basis significant effects are assumed.

[25] Taken from the EC (2021) Guidelines

Site Name (Site Code)	Criteria for assessing potential changes that may occur at a European site, which may result in effects on the function of the site:[25]	Likely Significant Effect
	Importance of the habitats and species affected, e.g. representativeness, local variety, and Importance of the site (e.g. limit of distribution area for certain habitats and species, stepping stone, important for ecological connectivity); The Barrow catchment several aquatic species but is not a particular site of importance or an isolated stronghold for any of these species relative to national extent. **Disruption or alteration of ecological functions;** A temporary and localised reduction in water quality / aquatic habitat would be expected in the event of accidental pollution given the scale of the Project works. Such deterioration could have temporary effects on the local fishery population. This effect would be unlikely to result in significant effects on otter in terms of reduction in availability of fish biomass, and would be unlikely to affect mean catchment-wide abundance of salmon and lamprey. **Changes to key ecological features of the site:** As above, a reduction in water quality and aquatic habitat quality would be expected on a local level which would have a brief to temporary duration and unlikely to affect wider populations within the SAC.	

4.4 Screening Conclusion

In the absence of mitigation measures (which have not been considered at this screening stage), likely significant effects on the European sites cannot be excluded beyond reasonable scientific doubt and on the basis of objective scientific information and in light of the conservation objectives of the relevant European site(s).

A Natura Impact Statement has been completed in respect of the Project which assesses the potential for adverse effects on the integrity of the River Barrow and River Nore SAC (002162), for which likely significant effects have been identified.

5. NATURA IMPACT STATEMENT

5.1 Introduction

This Natura Impact Statement (NIS) has been prepared to support the competent authority (ACP) in carrying out their Appropriate Assessment of the Project. The conclusions presented in this NIS are intended to enable the competent authority to ascertain whether the Project (alone or in combination with other plans or projects) will adversely affect the integrity[26] of the European site(s) with a potential for Source-Pathway-Receptor connectivity to the Project, in view of the site(s) conservation objectives. Measures are identified to mitigate adverse effects on the integrity of European sites.

An Appropriate Assessment involves the following steps:

- Collecting information on the Project and on the European site (upon which it has been determined that there is potential for likely significant effects)
- Assessing the implications of the Project in view the European site's conservation objectives, individually or in combination with other plans or projects
- Ascertaining whether the Project, individually and in combination with any other plans and projects, is likely to have adverse effects on the ecological integrity of the European site
- Considering mitigation measures (including their monitoring) to avoid or reduce impacts to a level where they will no longer adversely affect the integrity of the European site.

Information on the Project is presented in Section 2. of this report. A description of the baseline environment is presented in Section 3. and the only European site identified in the AA screening report (Section 4.) that has potential for significant effects is the River Barrow and River Nore SAC and is further assessed for adverse effects on site integrity in this NIS.

5.2 Impact Prediction

Section 4.3 of this report identifies the likely significant impacts from the construction (inclusive of decommissioning) and operational phases of the proposed development and proposed gas pipeline route. Likely significant impacts identified are as follows:

- Contamination to the River Barrow and its associated aquatic environment through frac-out of drilling fluid during HDD crossings on the proposed gas pipeline route.
- Sediment loading / contamination of the watercourses and associated aquatic environment through construction runoff at / near the watercourse crossing activities on the proposed gas pipeline route.

[26] The 'integrity of the site' can be defined as the coherent sum of the site's ecological structure, function and ecological processes, across its whole area, which enables it to sustain the habitats, complex of habitats and/or populations of species for which the site is designated. European Commission Notice (2019/C 33/01) notes that the integrity of the site involves its constitutive characteristics and ecological functions. The decision as to whether it is adversely affected should focus on and be limited to the habitats and species for which the site has been designated and the site's conservation objectives.

5.3 Implications for Conservation Objectives and Site Integrity

An overview of the European site identified through the AA screening as having potential for significant effects is provided hereunder and consideration is given to whether the Project could affect the European site's conservation objectives (CO) and by association the European site's integrity.

The European site has valid and up to date site-specific conservation objectives (SSCOs), which have been examined as part of this assessment:

- Conservation Objectives: River Barrow and River Nore SAC 002162. Version 2. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage (NPWS, 2025b).

European and national legislation places a collective obligation on Ireland to maintain or restore habitats and species in the Natura 2000 Network to favourable conservation condition.

Conservation objectives for European sites relate to the site and the QI/SCI for which they are designated. NPWS defines the favourable conservation status of an Annex I habitat or Annex II species as 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.
- The conservation status of its typical species is favourable.

The favourable conservation status of habitats and species is achieved through the maintenance or restoration of conservation status according to the Conservation Objectives of the site, as set out relative to the attributes and targets prescribed.

5.3.1 River Barrow and River Nore SAC (002162)

5.3.1.1 Synopsis

The River Barrow and River Nore SAC was proposed in January 1998 (Natura 2000 - Standard Data Form). The SAC consists of freshwater stretches of the Barrow and Nore river catchments, reaching as far upstream as the Slieve Bloom Mountains. The SAC also include tidal stretches incorporating the estuary as far downstream as Creadun Head, Waterford. The site traverses eight counties – Offaly, Kildare, Laois, Carlow, Kilkenny, Tipperary, Wexford and Waterford. The River Barrow and River Nore both rise in Old Red Sandstone in the Slieve Bloom Mountains and pass through Carboniferous shales and sandstones. Habitats associated with the rivers include deciduous and mixed woodland, dry heath, wet grassland, swamp and marsh vegetation, salt marshes, dune systems, biogenic reefs, intertidal sand and mudflats as well as areas of improved grassland, arable land and coniferous plantations.

The site is very important for the presence of a number of EU Habitats Directive Annex II animal species including freshwater pearl mussel, white-clawed crayfish, salmon, twaite shad, three lamprey species – sea lamprey, brook lamprey and river lamprey, the Desmoulin's whorl snail and otter.

5.3.1.2 Threats and pressures

The site is vulnerable to threats and pressures which are identified in the Natura 2000 Data Form as occurring both inside and outside of the SAC boundary (Table 5-1). The Project could contribute to the following existing pressures:

- Pollution to surface waters: ranked as high threat: PK01: Mixed source pollution to surface and ground waters (limnic and terrestrial).

Table 5-1: Threats and Pressures listed for the River Barrow and River Nore SAC cross refenced to the current (2019-2024) codes and descriptions

Original Code [current code[27]]	Threats and Pressures [current description 28]	Rank*	Location**
B07	**Other forestry activities**	M	B
[PB26]	[Other forestry activities, excluding those relating to agro-forestry]		
[PB18]	[Use of other pest control methods in forestry (e.g. physical plant protection)]		
[PB23]	[Physical alteration of water bodies for forestry (including dams)]		
[PB25]	[Forest plantations for renewable energy production]		
[PB26]	[Other forestry activities, excluding those relating to agro-forestry]		
A04.01.01	**Intensive cattle grazing**	M	I
[PA07]	[Intensive grazing or overgrazing by livestock]		
C01.03	**Peat extraction**	M	O
[PC05]	[Peat Extraction]		
D03.01	**Port areas**	L	I
[PE03]	[Shipping lanes, ferry lanes and anchorage infrastructure (e.g. canalisation, dredging)]		
[PF15]	[Modification of coastline, estuary and coastal conditions for built-up areas]		
F02.03	**Leisure fishing**	L	I
[PG01]	[Marine fish and shellfish harvesting causing reduction of species/prey populations and disturbance of species (professional)]		
[PG07]	[Freshwater fish and shellfish harvesting (recreational)]		
B02.01.01	**Forest replanting (native trees)**	L	B
[PB02]	[Conversion from one type of forestry land use to another]		

[27] A guide to cross reference codes from prior reporting periods to the 2019-2024 reporting period as obtained from https://cdr.eionet.europa.eu/help/natura2000
[28] A guide to cross reference codes from prior reporting periods to the 2019-2024 reporting period as obtained from https://cdr.eionet.europa.eu/help/natura2000

Original Code [current code[27]]	Threats and Pressures [current description 28]	Rank*	Location**
I01	**Invasive alien species.**	M	I
[PI01]	[Invasive alien species of Union concern]		
[PI02]	[Other invasive alien species (other than species of Union concern)]		
E02	**Industrial or commercial areas**	L	O
[PD05]	[Development and operation of energy production plants (including infrastructure)]		
[PF01]	[Conversion from other land uses to built-up areas]		
[PF02]	[Construction or modification (e.g. of housing and settlements) in existing built-up areas]		
[PF13]	[Drainage, land reclamation and conversion of wetlands, marshes, bogs, etc. for built-up areas]		
[PF17]	[Active abstraction of water for built-up areas]		
A02.01	**Agricultural intensification**	H	B
[PA02]	[Conversion from one type of agricultural land use to another (excluding drainage and burning)]		
[PA06]	[Mowing or cutting of grasslands]		
[PA07]	[Intensive grazing or overgrazing by livestock]		
[PA12]	[Harvesting of crops and cutting of croplands]		
C01.01.01	**Sand and gravel quarries**	L	B
[PC01]	[Extraction of minerals (e.g. rock, metal ores, gravel, sand, shell)]		
J02.12.02	**Dykes and flooding defense in inland water systems**	H	I
[PF14]	[Modification of flooding regimes, flood protection for built-up areas]		
[PL04]	[Development and operation of dams (mixed or unknown drivers)]		
A10.01	**Removal of hedges and copses or scrub**	L	I
[PA04]	[Removal of small landscape features for agricultural land parcel consolidation (hedges, stone walls, rushes, open ditches, springs, solitary trees, etc.)]		
J03.02.01	**Reduction in migration or migration barriers**	M	I
[PD02]	[Hydropower (dams, weirs, run-off-the-river and respective infrastructure)]		
[PE01]	[Roads, paths, railroads and related infrastructure]		
[PF16]	[Construction or development of reservoirs and dams for built-up areas]		
[PL04]	[Development and operation of dams (mixed or unknown drivers)]		
F02.01.02	**Netting**	L	I

Original Code [current code[27]]	Threats and Pressures [current description 28]	Rank*	Location**
[PG01]	[Marine fish and shellfish harvesting causing reduction of species/prey populations and disturbance of species (professional)]		
[PG06]	[Freshwater fish and shellfish harvesting (professional)]		
[PG13]	[Bycatch and incidental killing (due to fishing and hunting activities)]		
F01.01	**Intensive fish farming, intensification**	L	I
[PG19]	[Marine aquaculture generating marine pollution]		
[PG23]	[Other activities related to aquaculture and extraction or cultivation of biological living resources not referred to above]		
[PG20]	[Freshwater aquaculture generating pollution to surface or ground waters (including marine)]		
[PG23]	[Other activities related to aquaculture and extraction or cultivation of biological living resources not referred to above]		
H01	**Pollution to surface waters**	H	B
[PK01]	[Mixed source pollution to surface and ground waters (limnic and terrestrial)]		
[PK02]	[Mixed source marine water pollution (marine and coastal)]		
J02.02.01	**Dredging/ removal of limnic sediments**	M	I
[PL06]	[Physical alteration of water bodies (mixed or unknown drivers)]		
F02	**Fishing and harvesting aquatic resources**	M	O
[PG01]	[Marine fish and shellfish harvesting causing reduction of species/prey populations and disturbance of species (professional)]		
[PG03]	[Marine fish and shellfish harvesting activities causing physical loss and disturbance of seafloor habitats]		
[PG06]	[Freshwater fish and shellfish harvesting (professional)]		
[PG07]	[Freshwater fish and shellfish harvesting (recreational)]		
[PG09]	[Management of fishing stocks and game]		
[PG13]	[Bycatch and incidental killing (due to fishing and hunting activities)]		
J02.05.02	**Modifying structures of inland water courses**	H	I
[PA21]	[Active abstraction of water for agriculture]		
[PL06]	[Physical alteration of water bodies (mixed or unknown drivers)]		
M01	**Abiotic changes (climate change)**	M	I
[PJ01]	[Temperature changes and extremes due to climate change]		
[PJ03]	[Changes in precipitation regimes due to climate change]		
[PJ04]	[Sea-level rise due to climate change]		
[PJ10]	[Change of habitat location, size, and / or quality due to climate change]		

Original Code [current code[27]]	Threats and Pressures [current description 28]	Rank*	Location**
[PJ14]	[Other climate related changes in abiotic conditions]		
B02	**Forest and plantation management & use**	M	B
[PB02]	[Conversion from one type of forestry land use to another]		
[PB03]	[Introduction and spread of new species for forestry purposes (including GMOs)]		
[PB04]	[Abandonment of traditional forest management]		
[PB06]	[Logging or thinning (excluding clear cutting)]		
[PB07]	[Removal of dead and dying trees (including debris)]		
[PB08]	[Removal of old trees (excluding dead or dying trees)]		
[PB09]	[Clear-cutting, removal of all trees]		
[PB06]	[Logging or thinning (excluding clear cutting)]		
[PB14]	[Forest management reducing old growth forests]		
[PB18]	[Use of other pest control methods in forestry (e.g. physical plant protection)]		
J02	**Changes in water bodies conditions**	M	B
[PA22]	[Drainage for use as agricultural land]		
[PA23]	[Physical alteration of water bodies (including dams, channels, etc.)]		
[PA21]	[Active abstraction of water for agriculture]		
[PL01]	[Abstraction from groundwater, surface water or mixed water (mixed or unknown drivers)]		
[PL02]	[Drainage (mixed or unknown drivers)]		
[PL04]	[Development and operation of dams (mixed or unknown drivers)]		
[PL05]	[Modification of hydrological flow (mixed or unknown drivers)]		
[PL06]	[Physical alteration of water bodies (mixed or unknown drivers)]		
J02.06	Water abstractions from surface waters	M	I
[PA21]	[Active abstraction of water for agriculture]		
[PC01]	[Extraction of minerals (e.g. rock, metal ores, gravel, sand, shell)]		
[PC04]	[Coal mining]		
[PC05]	[Peat extraction]		
[PC12]	[Abstraction of surface and ground water for resource extraction]		
[PD02]	[Hydropower (dams, weirs, run-off-the-river and respective infrastructure)]		
[PD13]	[Abstraction of surface and ground water for energy production (excluding hydropower)]		

Original Code [current code[27]]	Threats and Pressures [current description 28]	Rank*	Location**
[PE03]	[Shipping lanes, ferry lanes and anchorage infrastructure (e.g. canalisation, dredging)]		
[PF17]	[Active abstraction of water for built-up areas]		
[PG17]	[Active abstraction of water bodies for aquaculture]		
[PL01]	[Abstraction from groundwater, surface water or mixed water (mixed or unknown drivers)]		
[PL06]	[Physical alteration of water bodies (mixed or unknown drivers)]		
B05	**Use of fertilizers (forestry)**	M	B
[PB16]	[Application of natural or synthetic fertilisers in forestry]		
K01.01	**Erosion**	H	I
[PM07]	[Natural processes without direct or indirect influence from human activities or climate change]		

***RANK: Medium (M), High (H), Low (L)**
****LOCATION relative to the SAC: Inside (I), Outside (O), Both (B)**

5.3.1.3 Qualifying Interests - Specific Information

The QIs for which the River Barrow and River Nore SAC is designated, and their conservation objectives (NPWS, 2025b) are assessed below. For each QI a brief statement is made regarding the potential for overlap with the ZoI of the Project and the potential for adverse effects on each QI is then assessed in Table 5-24.

5.3.1.3.1 [1130] Estuaries

According to the SSCO, estuaries extend throughout the transitional waters of the lower reaches within the SAC as shown in Map 2 of the SSCO. Estuary is considered a Transitional Water Body (referred to as transitional waters) as defined by the EPA under the Water Framework Directive[29]. The estuary within the SAC extends from New Ross to Creaden Head and Broomhill Point. Annex I estuarine habitat covers a large physiographic feature that incorporate other Annex I habitats including mudflats and sandflats.

As per Article 17 Report (NPWS, 2025a), the overall status of the habitat is assessed as 'Bad'. This has changed from 'Inadequate' since 2019 as a result of improved knowledge as opposed to a genuine change and the trend is assessed as stable.

Targets and Attributes

The conservation objective of estuaries is "To maintain the favourable conservation condition of Estuaries in the River Barrow and River Nore SAC".

[29] https://www.npws.ie/sites/default/files/publications/pdf/002162_Barrow_Nore_SAC_Marine_Supporting_Doc_V2.pdf

Table 5-2: Targets and Attributes of estuaries

Attribute	Target
Habitat area	Habitat area was estimated using OSI data and the defined Transitional Water Body area under the Water Framework Directive as 3856ha.
Community distribution	The likely area of sediment community types was derived from a combination of intertidal and subtidal surveys undertaken in 2008, 2009, 2010 and 2024.
Community structure: extent	Conserve the extent of Sabellaria alveolata reef community, subject to natural processes.
Community structure: quality	Based on site-specific surveys in 2010 and 2024 (NPWS internal files), there was a high percentage of clearly defined and intact honeycomb reef structures.

Estuaries lie 53km (as the crow flies) south of the Cardinal Moran Bridge and is outside the ZoI of the Project and has no landscape or ecological connectivity to the Project. As such, the Project will not result in any potential delay or interruption in the achievement of the Conservation Objective for this QI, as defined by its Attributes and Targets.

5.3.1.3.2 [1140] Mudflats and sandflats not covered by seawater at low tide

According to the SSCO, these QI habitats extend throughout the transitional waters of the lower reaches within the SAC as shown in Map 3 of the SSCO. Sandflats are found in the southern margins of the SAC from Creaden Head to Passage East on the western shore and on the eastern shore from Black Point to Duncannon Fort. Mudflats occur on the western and eastern shore areas at Shelbourne Bay and Fisherstown Flats.

As per Article 17 Report (NPWS, 2025a), the overall status of the habitat is assessed as 'Inadequate'. This has changed from 'deteriorating' since 2019 as a result of improved knowledge as opposed to a genuine change and the trend is assessed as stable.

Targets and Attributes

The conservation objective of this QI is "*To maintain the favourable conservation condition of the Mudflats and sandflats not covered by seawater at low tide in the River Barrow and River Nore SAC*".

Table 5-3: Targets and Attributes of Mudflats and sandflats not covered by seawater at low tide

Attribute	Target
Habitat area	The permanent habitat area is stable or increasing, subject to natural processes.
Community distribution	Conserve the following community types in a natural condition: Muddy estuarine community complex; Sand to muddy fine sand community complex.

This QI lies 38km (as the crow flies) south of IDB2 of the Cardinal Moran Bridge and is outside the ZoI of the Project and has no landscape or ecological connectivity to the Project. As such, the Project will not result in any potential delay or interruption in the achievement of the Conservation Objective for this QI, as defined by its Attributes and Targets.

5.3.1.3.3 [1170] Reefs

According to the SSCO, reefs are located within the lower reaches of the SAC as shown in Map 4a of the SSCO. This habitat is recorded intertidally in Waterford estuary, primarily consisting of boulders. Reefs also include small areas of subtidal *Laminaria*-dominated reef (Conservation objectives supporting document - Marine Habitats, 2025).

As Article 17 Report (NPWS, 2025a), the overall status of the habitat is assessed as 'Bad'. This has changed from 'Inadequate' since 2019 as a result of availability of accurate data as opposed to a genuine change.

Targets and Attributes

The conservation objective for reefs is *"To maintain the favourable conservation condition of Reefs in River Barrow and River Nore SAC".*

Table 5-4: Targets and Attributes of Reefs

Attribute	Target
Habitat area	The permanent area is stable or increasing, subject to natural processes.
Distribution	The distribution of reefs is stable or increasing, subject to natural processes.
Community extent	Conserve the following community type in a natural condition: Sheltered to moderately exposed intertidal reef community complex in a natural condition, subject to natural processes.
Community structure: extent	Conserve the extent of Sabellaria alveolata reef community, subject to natural processes.
Community structure: quality	Conserve the high quality of the Sabellaria alveolata reef community, subject to natural processes.

This QI is associated with the estuarine transitional waters, over 55km (as the crow flies) south of the Project, and outside the ZoI of the Project and has no landscape or ecological connectivity to the Project. As such, the Project will not result in any potential delay or interruption in the achievement of the Conservation Objective for this QI, as defined by its Attributes and Targets.

5.3.1.3.4 [1310] Salicornia and other annuals colonising mud and sand

According to SSCO (NPWS, 2025), there is one sub-site located at Ringville, in Map 5 of the SSCO, which accounts for an area of 0.03ha.

According to Article 17 Report (NPWS, 2025a), the overall status is assessed as "Bad" a decline from "favourable" from the last 2019 report. This is as a result of a reduced range and area of habitat predominantly due to the invasion by cord-grasses (S*partina* spp.).

Targets and attributes

The conservation objective for Salicornia and other annuals colonising mud and sand is "To maintain the favourable conservation condition of Salicornia and other annuals colonizing mud and sand in the River Barrow and River Nore SAC".

Table 5-5: Targets and Attributes of Salicornia and other annuals colonising mud and sand

Attribute	Target
Habitat area	Area stable or increasing, subject to natural processes, including erosion and succession. For the one sub-site mapped: Ringville - 0.03ha.
Habitat distribution	No decline, subject to natural processes.
Physical structure: sediment supply	Maintain or where necessary restore natural circulation of sediments and organic matter, without any physical obstructions
Physical structure: flooding regime	Maintain natural tidal regime
Physical structure: creeks and pans	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession
Vegetation structure: zonation	Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession.
Vegetation structure: vegetation height	Based on (McCorry, et al., 2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Based on (McCorry, et al., 2009). See coastal habitats supporting document for further details
Vegetation composition: typical species and subcommunities	See coastal habitats supporting document for further details
Vegetation structure: negative indicator species: Spartina anglica	Based on (McCorry, et al., 2009). See coastal habitats supporting document for further details

This QI is associated with the transitional waters, over 40km (as the crow flies) south of the Project, and outside the ZoI of the Project and has no landscape or ecological connectivity to the Project. As such, the Project will not result in any potential delay or interruption in the achievement of the Conservation Objective for this QI, as defined by its Attributes and Targets.

5.3.1.3.5 [1330] Atlantic salt meadows (Glauco-Puccinellietalia maritimae) and [1410] Mediterranean salt meadows (Juncetalia maritimi)

The QIs tend to occupy similar settings and are discussed together. According to the SSCO (NPWS, 2025b), the Atlantic salt meadow occurs at four sub-sites within the SAC: Dunbrody Abbey - 1.25ha, Killowen - 2.59ha, Rochestown - 17.50ha, and Ringville - 6.70ha. The Mediterranean salt meadow occurs at three sub-sites within the SAC: Dunbrody Abbey - 0.08ha, Rochestown - 0.04ha, Ringville - 6.70ha. These are illustrated in Map 5 of the SSCO.

According to Article 17 Report (NPWS, 2025a), the overall status of Atlantic salt meadows is assessed as "Bad" which represents a deterioration since 2019 reporting driven by agricultural pressure and invasion by *Spartina.* The overall status of Mediterranean salt meadow is assessed as "Inadequate" with a "deteriorating" trend as a result of pressures associated with invasion of Spartina and agriculture.

Targets and Attributes

The conservation objective for Atlantic salt meadows is "To restore the Favourable conservation condition of Atlantic salt meadows in the River Barrow and River Nore SAC".

Table 5-6: Targets and Attributes of Atlantic salt meadows

Attribute	Target
Habitat area	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Dunbrody Abbey - 1.25ha, Killowen - 2.59ha, Rochestown - 17.50ha, Ringville - 6.70ha.
Habitat distribution	No decline, subject to natural processes.
Physical structure: sediment supply	Maintain/restore natural circulation of sediments and organic matter, without any physical obstructions
Physical structure: flooding regime	Maintain natural tidal regime
Physical structure: creeks and pans	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession
Vegetation structure: zonation	Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession.
Vegetation structure: vegetation height	Maintain structural variation within sward
Vegetation structure: vegetation cover	Maintain more than 90% of area outside creeks vegetated
Vegetation composition: typical species and subcommunities	Maintain range of subcommunities with typical species listed in Saltmarsh Monitoring Project (McCorry, et al., 2009)
Vegetation structure: negative indicator species: *Spartina anglica*	No significant expansion of Spartina. No new sites for this species and an annual spread of less than 1% where it is already known to occur

The conservation objective for Mediterranean salt meadows (*Juncetalia maritimi*) is "To restore the favourable conservation condition of Mediterranean salt meadows in the River Barrow and River Nore SAC".

Table 5-7: Targets and Attributes of Mediterranean salt meadows (*Juncetalia maritimi*)

Attribute	Target
Habitat area	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Dunbrody Abbey - 0.08ha, Rochestown - 0.04ha, Ringville - 6.70ha.
Habitat distribution	No decline, subject to natural processes.
Physical structure: sediment supply	Maintain or where necessary restore natural circulation of sediments and organic matter, without any physical obstructions
Physical structure: flooding regime	Maintain natural tidal regime
Physical structure: creeks and pans	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession
Vegetation structure: zonation	Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession.
Vegetation structure: vegetation height	Maintain structural variation within sward

Attribute	Target
Vegetation structure: vegetation cover	Maintain more than 90% of area outside creeks vegetated.
Vegetation composition: typical species and subcommunities	Maintain range of subcommunities with typical species listed in Saltmarsh Monitoring Project (McCorry, et al., 2009)
Vegetation structure: negative indicator species: *Spartina anglica*	No significant expansion of Spartina. No new sites for this species and an annual spread of less than 1% where it is already known to occur

These QIs are associated with the transitional waters, over 40km (as the crow flies) south of the Project, and outside the ZoI of the Project and has no landscape or ecological connectivity to the Project. As such, the Project will not result in any potential delay or interruption in the achievement of the Conservation Objective for these QIs, as defined by their Attributes and Targets.

5.3.1.3.6 [3260] Water courses of plain to montane levels with the *Ranunculion fluitantis* and Callitricho-Batrachion vegetation

As per the SSCO (NPWS, 2025b), the full distribution of this QI habitat is unknown within the SAC. However, there are several aquatic vegetation surveys of the River Barrow, including the OPW/NPWS Barrow Navigation survey (Dromey, 1994) covering the reaches between Carlow and Leighlinbridge, which confirm the presence of channel macrophyte assemblages characteristic of lowland base-rich rivers. These include communities dominated by *Ranunculus* spp. (e.g. *Ranunculus penicillatus*) and associated taxa, which correspond directly with Annex I Habitat 3260 (floating river vegetation). Additionally, ecological walkover survey of the proposed gas pipeline route, observed *Ranunculus* and *Callitriche* species (not identified to species level) within the River Barrow upstream and downstream of Cardinal Moran Bridge. This habitat is assumed to be QI Water courses of plain to montane levels with the *Ranunculion fluitantis* and Callitricho-Batrachion vegetation for the purposes of this NIS.

As set out in Section 3. , none of the tributary or drain crossings surveyed support floating river vegetation.

According to Article 17 Report (NPWS, 2025a), the overall status of this QI habitat is assessed as "Inadequate" and "deteriorating". This is consistent with previous assessment periods and can be attributed to morphological change, eutrophication and other pollution.

Targets and Attributes

The conservation objective for water courses of plain to montane levels with the *Ranunculion fluitantis* and Callitricho-Batrachion vegetation is "To maintain the favourable conservation condition of Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation in the River Barrow and River Nore SAC".

Table 5-8: Targets and Attributes of water courses of plain to montane levels with the *Ranunculion fluitantis* and Callitricho-Batrachion vegetation

Attribute	Target
Habitat distribution	No decline, subject to natural processes
Habitat area	Area stable or increasing, subject to natural processes
Hydrological regime: river flow	Maintain appropriate hydrological regimes
Hydrological regime: groundwater discharge	The groundwater flow to the habitat should be permanent and sufficient to maintain tufa formation
Substratum composition: particle size range	The substratum should be dominated by large particles and free from fine sediments
Water chemistry: minerals	The groundwater and surface water should have sufficient concentrations of minerals to allow deposition and persistence of tufa deposits
Water quality: suspended sediment	The concentration of suspended solids in the water column should be sufficiently low to prevent excessive deposition of fine sediments
Water quality: nutrients	The concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition
Vegetation composition: typical species	Typical species of the relevant habitat sub-type should be present and in good condition
Floodplain connectivity	The area of active floodplain at and upstream of the habitat should be maintained

The proposed crossing at Cardinal Moran Bridge will be via HDD crossing under the River Barrow. There is potential in the absence of mitigation for frac-out to occur or for surface water runoff from entry and exit pits to enter the watercourse. Such sources of impacts have potential to increase sedimentation levels and alter substratum composition on a temporary to long-term basis, and as such could result in a negative effect on the target for Substratum composition and Water quality.

5.3.1.3.7 [4030] European dry heaths

As per SSCO (NPWS, 2025b), the distribution of European dry heaths is not fully mapped but indicated to occur on steep, free-draining, river valley sides especially along the River Barrow and within tributaries of the Blackstairs Mountain. Within this SAC, this QI habitat occurs on nutrient poor soils and is characterised by gorse and open acid grassland areas.

According to Article 17 Report (NPWS, 2025a), the overall status of dry heath is assessed as "Bad" and "deteriorating". This is a marked change from reportedly "stable" in 2019.

Targets and Attributes

The conservation objective for European dry heaths is "To maintain the favourable conservation condition of European dry heaths in the River Barrow and River Nore SAC".

Table 5-9: Targets and Attributes of European dry heaths

Attribute	Target
Habitat distribution	No decline from current habitat distribution, subject to natural processes
Habitat area	Area stable or increasing, subject to natural processes. Habitat area is not known but estimated as less than 400ha of the area of the SAC, occurring in dispersed locations
Physical structure: free-draining, acid, low nutrient soil; rock outcrops	No significant change in soil nutrient status, subject to natural processes. No increase or decrease in area of natural rock outcrop
Vegetation structure: subshrub indicator species	Cover of characteristic subshrub indicator species at least 25%: gorse (*Ulex europaeus*) and where rocky outcrops occur bilberry (*Vaccinium myrtillus*) and woodrush (*Luzula sylvatica*). Some rock outcrops support English stonecrop (*Sedum anglicum*), sheep's bit (*Jasione montana*) and wild madder (*Rubia peregrina*) as well as important moss and lichen assemblages
Vegetation structure: senescent gorse	Cover of senescent gorse less than 50%
Vegetation structure: browsing	Long shoots of bilberry with signs of browsing collectively less than 33%
Vegetation structure: native trees and shrubs	Cover of scattered native trees and shrub less than 20%
Vegetation composition: positive indicator species	Number of positive indicator species at least 2 e.g. gorse and associated dry heath/ acid grassland flora
Vegetation structure: positive indicator species	Cover of positive indicator species at least 60%. This should include plant species characteristic of dry heath in this SAC including gorse, bilberry and associated acid grassland flora
Vegetation composition: bryophyte and non-crustose lichen species	Number of bryophyte or non-crustose lichen species present at least 2
Vegetation composition: bracken (*Pteridium aquilinum*)	Cover of bracken less than 10% - however see 'Notes'
Vegetation structure: weedy negative indicator species	Cover of agricultural weed species (negative indicator species) less than 1%
Vegetation composition: nonnative species	Cover of non-native species less than 1%.
Vegetation composition: rare/scarce heath species	No decline in distribution or population sizes of rare, threatened or scarce species, including Greater Broomrape (Orobanche rapum-genistae) and the legally protected clustered clover (*Trifolium glomeratum*)
Vegetation structure: disturbed bare ground	Cover of disturbed bare ground less than 10% (but if peat soil less than 5%)
Vegetation structure: burning	No signs of burning within sensitive areas

This terrestrial habitat was not recorded within ZoI of the Project and the Project will not affect the conservation objectives of this QI.

5.3.1.3.8 [6430] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels

According to SSCO (NPWS, 2025b), the distribution of this QI habitat is unknown within the SAC and considered to occur with some riverside woodlands, unmanaged river islands and along the floodplain of slow-flowing stretches of river.

As per Article 17 Report (NPWS, 2025a), the overall status of this QI habitat is assessed as "Bad" with a "deteriorating" trend in the last assessment period.

Targets and Attributes

The conservation objective for hydrophilous tall herb fringe communities of plains and of the montane to alpine levels is "To maintain the favourable conservation condition of Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels in the River Barrow and River Nore SAC".

Table 5-10: Targets and Attributes of hydrophilous tall herb fringe communities of plains and of the montane to alpine

Attribute	Target
Habitat distribution	No decline, subject to natural processes
Habitat area	Area stable or increasing, subject to natural processes
Area stable or increasing, subject to natural processes	Maintain appropriate hydrological regimes
Vegetation structure: sward height	30-70% of sward is between 40 and 150cm in height
Vegetation composition: broadleaf herb: grass ratio	Broadleaf herb component of vegetation between 40 and 90%
Vegetation composition: typical species	At least 5 positive indicator species present
Vegetation composition: negative indicator species	Negative indicator species, particularly non-native invasive species, absent or under control- NB Indian balsam (*Impatiens glandulifera*), monkeyflower (*Mimulus guttatus*), Japanese knotweed (*Fallopia japonica*) and giant hogweed (*Heracleum mantegazzianum*)

This habitat was not recorded during habitat surveys, and is not within the ZoI of the Project. The Project will not affect the conservation objectives of this QI.

5.3.1.3.9 [7220] Petrifying springs with tufa formation (Cratoneurion)

As per SSCO (NPWS, 2025b), the full distribution of this QI habitat is unknown. There is one record described in the woodlands at Dysart between Thomastown and Inistioge, within the River Nore catchment.

According to Article 17 Report (NPWS, 2025a), the overall status for petrifying springs is assessed as "Inadequate". The overall trend is reportedly "stable" rather than previously deteriorating due to increased data accuracy.

Targets and Attributes

The conservation objective for petrifying springs with tufa formation (Cratoneurion) is "To maintain the favourable conservation condition of Petrifying springs with tufa formation (Cratoneurion) in the River Barrow and River Nore SAC".

Table 5-11: Targets and Attributes for petrifying springs with tufa formation (Cratoneurion)

Attribute	Target
Habitat area	Area stable or increasing, subject to natural processes
Habitat distribution	No decline. See map 6 for recorded location
Hydrological regime: height of water table; water flow	Maintain appropriate hydrological regimes
Water quality	Maintain oligotrophic and calcareous conditions
Vegetation composition: typical species	Maintain typical species

This habitat was not recorded within ZoI of the Project and the Project will not affect the conservation objectives of this QI.

5.3.1.3.10 [91A0] Old sessile oak woods with Ilex and Blechnum in the British Isles

Map 6 of the SSCO (NPWS, 2025b) indicated the distribution of woodland within the SAC, although it is stated in the SSCO that the habitat may be present in unsurveyed areas.

As per Article 17 Report (NPWS, 2025a), the overall status for this QI is assessed as "Bad" with a deteriorating trend. This remains unchanged since 2019. The strongest pressures include the threat of invasive nonnative species such as *Rhododendron ponticum*, Cherry Laurel (*Prunus laurocerasus*) and Beech (*Fagus sylvatica*), and overgrazing by deer.

Targets and Attributes

The conservation objective for old sessile oak woods with Ilex and Blechnum in the British Isles is "To restore the favourable conservation condition of Old oak woodland with Ilex and Blechnum in the River Barrow and River Nore SAC".

Table 5-12: Targets and Attributes for old sessile oak woods with Ilex and Blechnum in the British Isles

Attribute	Target
Habitat area	Area stable or increasing, subject to natural processes, at least 85.08ha for sub-sites surveyed: see map 6
Habitat distribution	No decline. Surveyed locations shown on map 6
Woodland size	Area stable of increasing. Where topographically possible, "large" woods at least 25ha in size and “small” woods at least 3ha in size
Woodland structure: cover and height	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semimature trees and shrubs; and well-developed herb layer

Attribute	Target
Woodland structure: community diversity and extent	Maintain diversity and extent of community types
Woodland structure: natural regeneration	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy
Woodland structure: dead wood	At least 30m³/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter
Woodland structure: veteran trees	No decline
Woodland structure: indicators of local disctinctiveness	No decline
Vegetation composition: native tree cover	No decline. Native tree cover not less than 95%
Vegetation composition: typical species	A variety of typical native species present, depending on woodland type, including oak (Quercus petraea) and birch (Betula pubescens)
Vegetation composition: negative indicator species	Negative indicator species, particularly non-native invasive species, absent or under control

The nearest habitat mapped in the SSCO, is more than 22km south of the Project and outside the ZoI. There were no oak woodlands recorded within the ZoI of the Project. Therefore, the Project will not affect the conservation objectives of this QI.

5.3.1.3.11 [91E0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)

According to SSCO (NPWS, 2025b), there 181.54ha (of surveyed sites) of alluvial forests within the SAC as shown in Map 6 of the SSCO. These woodlands occur on heavy soils on the banks of lowland river channels or on river islands. They experience periodic inundation by the rise of water levels and primarily have submerged tree roots.

As per the Article 17 Report (NPWS, 2025a), the overall status if assessed as "Bad" with a deteriorating trend which remains unchanged since 2019.

Targets and Attributes

The conservation objective for alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) is "To restore the favourable conservation condition of Alluvial forests with Alnus glutinosa and Fraxinus excelsior".

Table 5-13: Targets and attributes for alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)

Attribute	Target
Habitat area	Area stable or increasing, subject to natural processes, at least 181.54ha for sites surveyed
Habitat distribution	No decline in surveyed locations
Woodland size	Area stable of increasing. Where topographically possible, "large" woods at least 25ha in size and “small” woods at least 3ha in size
Woodland structure: cover and height	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semimature trees and shrubs; and well-developed herb layer
Woodland structure: community diversity and extent	Maintain diversity and extent of community types
Woodland structure: natural regeneration	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy
Hydrological regime: flooding depth/height of water table	Appropriate hydrological regime necessary for maintenance of alluvial vegetation
Woodland structure: dead wood	At least 30m³/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter (greater than 20cm diameter in the case of alder)
Woodland structure: veteran trees	No decline
Woodland structure: indicators of local distinctiveness	No decline
Vegetation composition: native tree cover	No decline. Native tree cover not less than 95%
Vegetation composition: typical species	A variety of typical native species present, depending on woodland type, including ash (*Fraxinus excelsior*) alder (*Alnus glutinosa*), willows (*Salix* spp) and locally, oak (*Quercus robur)*
Vegetation composition: negative indicator species	Negative indicator species, particularly non-native invasive species, absent or under control

As per Section 3.2 there is 91E0 alluvial woodland located approximately 1.1. northwest of the proposed development. At this distance it is outside the ZoI of the Project, including any air-quality related effects for which it was specifically considered. Therefore, the Project will not affect the conservation objectives of this QI.

5.3.1.3.12 [6985] Killarney Fern *Vandenboschia speciosa*

As per the SSCO (NPWS, 2025b), there are three known locations of Killarney fern within terrestrial environments of the SAC. These are located in the lower reaches of the SAC.

According to Article 17 Report (NPWS, 2025a), the overall status of Killarney fern is assessed as "favourable" which remains unchanged over the last three assessments.

Targets and Attributes

The conservation objective for Killarney fern is "To maintain favourable conservation condition of Killarney Fern in the River Barrow and River Nore SAC".

Table 5-14: Targets and Attributes of Killarney Fern

Attribute	Target
Distribution	No decline. Three locations known, with three colonies of gametophyte and one sporophyte colony. See map 7
Population size	Maintain at least three colonies of gametophyte, and at least one sporophyte colony of over 35 fronds
Population structure: juvenile fronds	At least one of the locations to have a population structure comprising sporophyte, unfurling fronds, 'juvenile' sporophyte and gametophyte generations
Habitat extent	No loss of suitable habitat, such as shaded rock crevices, caves or gullies in or near to, known colonies. No loss of woodland canopy at or near to known locations
Hydrological conditions: visible water	Maintain hydrological conditions at the locations so that all colonies are in dripping or damp seeping habitats, and water is visible at all locations
Hydrological conditions: humidity	No increase. Presence of desiccated sporophyte fronds or gametophyte mats indicates conditions are unsuitable
Light levels: shading	No changes due to anthropogenic impacts
Invasive species	Absent or under control

The known locations of Killarney fern within the SAC are more than 22km (as the crow flies) south of the Project and outside the ZoI. The QI does not occur within ZoI of the Project and the Project will not affect the conservation objectives of this QI.

5.3.1.3.13 [1016] Desmoulin's Whorl Snail *Vertigo moulinsiana*

According to Map 7 in the SSCO (NPWS, 2025b), there are two known sites where Desmoulin's whorl snail occurs: at Borris Bridge (Co. Carlow, S711503, approximately 17km south, as the crow flies, of the Cardinal Moran Bridge) and Boston Bridge, Kilnaseer (Co. Laois, S338774), which is part of the River Nore catchment.

According to the Article 17 Report (NPWS, 2025a), the overall status of this species is assessed as 'Inadequate' and 'deteriorating'. This remains unchanged since 2019.

Targets and Attributes

The conservation objective for Desmoulin's whorl snail is ”To maintain the favourable conservation condition of Desmoulin’s whorl snail in the River Barrow and River Nore SAC".

Table 5-15: Targets and Attributes for Desmoulin's Whorl Snail

Attribute	Target
Distribution: occupied sites	No decline at two known sites: Borris Bridge, Co. Carlow S711503; Boston Bridge, Kilnaseer S338774, Co. Laois.
Population size: adults	At least 5 adults snails in at least 50% of samples.
Population density	Adult snails present in at least 60% of samples per site.
Area of occupancy	Minimum of 1ha of suitable habitat per site.
Habitat quality: vegetation	90% of samples in habitat classes I and II (Moorkens, et al., 2011).
Habitat quality: soil moisture levels	90% of samples in moisture class 3-4 (Moorkens, et al., 2011)

Both sites known to support Desmoulin's whorl snail are outside the ZoI for the Project and will not be affected by the Project. Having regard to Section 3.2,There is no suitable habitat for Desmoulin's whorl snail along the River Barrow within the ZoI of the Project.

5.3.1.3.14 [1029] Freshwater Pearl Mussel *Margaritifera margaritifera*

According to the SSCO (NPWS, 2025b)and Map 8, freshwater pearl mussel occurs with the aquatic habitat of the SAC, with known populations located at Mountain, Ballymurphy and Nore catchments.

As per the Article 17 Report (NPWS, 2025a), the overall status of freshwater pearl mussel is assessed as ' Bad' with a deteriorating trend, which remains unchanged since the 2019 report.

Targets and Attributes

The conservation objective for freshwater pearl mussel is "To restore the favourable conservation condition of the freshwater pearl mussel (Margaritifera margaritifera) in River Barrow and River Nore SAC."

Table 5-16: Targets and Attributes for freshwater pearl mussel

Attribute	Target
Distribution: Ballymurphy	Restore distribution at 3.91km. See map 8
Distribution: Mountain	Restore distribution at 9.45km. See map 8
Distribution: Nore	Restore distribution at 21.13km. See map 8
Population size: Ballymurphy	Restore Ballymurphy population to at least 1,000 adult mussels
Population size: Mountain	Restore Mountain population to at least 4,000 adult mussels
Population size: Nore	Restore Nore population to at least 5,000 adult mussels
Population structure: recruitment	Restore to at least 20% of population no more than 65mm in length; and at least 5% of population no more than 30mm in length
Population structure: adult mortality. Ballymurphy	No more than 5% decline from previous number of live adults counted; dead shells less than 1% of the adult population and scattered in distribution

Attribute	Target
Population structure: adult mortality. Mountain	No more than 5% decline from previous number of live adults counted; dead shells less than 1% of the adult population and scattered in distribution
Population structure: adult mortality. Nore	No more than 5% decline from previous number of live adults counted; dead shells less than 1% of the adult population and scattered in distribution
Suitable habitat: extent	Restore suitable habitat in more than 3.91km in the Ballymurphy, 5.3km in the Mountain and 16.72km in the Nore system (see map 8) and any additional stretches necessary for salmonid spawning
Suitable habitat: condition	Restore condition of suitable habitat
Water quality: macroinvertebrates and phytobenthos (diatoms)	Restore water qualitymacroinvertebrates: EQR greater than 0.90 (Q4-5 or Q5); phytobenthos: EQR greater than 0.93
Substratum quality: filamentous algae (macroalgae); macrophytes (rooted higher plants)	Restore substratum quality- filamentous algae: absent or trace (less than 5%); macrophytes: absent or trace (less than 5%)
Substratum quality: sediment	Restore substratum quality- stable cobble and gravel substrate with very little fine material; no artificially elevated levels of fine sediment
Substratum quality: oxygen availability	Restore to no more than 20% decline from water column to 5cm depth in substrate
Hydrological regime: flow variability	Restore appropriate hydrological regime
Host fish	Maintain sufficient juvenile salmonids to host glochidial larvae
Fringing habitat: area and condition	Restore the area and condition of fringing habitats necessary to support the population

The Nore catchment is outside the River Barrow catchment and outside the ZoI for the Project. The Mountain and Ballymurphy populations occur in tributaries of the River Barrow more than 17km south (as the crow flies) of Cardinal Moran Bridge and are outside the ZoI of the Project. None of the known freshwater pearl mussel populations will be affected by the Project.

Consideration is given to the fact that the salmonids are critical to the freshwater mussel life cycle (assessed under salmon).

5.3.1.3.15 [1092] White-clawed Crayfish *Austropotamobius pallipes*

As per the SSCO document (NPWS, 2025b) and MAP 7 of the SSCO, white-clawed crayfish is present throughout the SAC, including scattered records up- and downstream of proposed development in the River Barrow. The NBDC historical records show white-clawed crayfish regularly recorded from the Ballynaboley Stream (IBD1), with the last record in September 2011. White-clawed crayfish (September 2014) have been recorded at the River Barrow crossing (IBD2) with scattered records up- and downstream along the River Barrow and its tributaries. NBDC data (August 2017) also show records of a dead white-clawed crayfish, suspected to have crayfish plague (*Aphanomyces astaci*) but not confirmed by DNA analysis where the Powerstown Stream enters a culvert beneath the R448.

According to the Article 17 Report (NPWS, 2025a), the overall status of the species is assessed as 'Bad' with a deteriorating trend, unchanged from the 2019 assessment.

Targets and attributes

The conservation objective for white-clawed crayfish is "To maintain the favourable conservation condition of white-clawed crayfish in the River Barrow and River Nore SAC."

Table 5-17: Targets and attributes for white-clawed crayfish

Attribute	Target
Distribution	No reduction from baseline. See map 7
Population structure: recruitment	Juveniles and/or females with eggs in at least 50% of positive samples
Negative indicator species	No alien crayfish species
Disease	No instances of disease
Water quality	At least Q3-4 at all sites sampled by EPA
Habitat quality: heterogeneity	No decline in heterogeneity or habitat quality

The River Barrow and the tributaries will be traversed by the Project and are considered in the ZoI for the Project and all have suitable habitat for white-clawed crayfish, except for the surveyed section of the Rathornan Stream (IDB3) where the cobbled substrate was finer and the river was narrow with downstream barriers. However, no live crayfish were recorded during field survey at any of these locations. It is assumed that this is due to crayfish plague. However this assessment is based on the assumption that recovery of this population from crayfish plague is possible over time. The Barrow River and Ballynaboley Stream are confirmed to support white-clawed crayfish (based on historical records) and as such it is assumed that these locations, as well as the other tributaries to be crossed along the proposed gas pipeline route can support crayfish again in the future.

5.3.1.3.16 1095] Sea Lamprey *Petromyzon marinus*

According to SSCO (NPWS, 2025b), sea lamprey are known to occur within the aquatic habitat of the SAC. No specific distribution map is available within the SSCO. According to the National Barriers Programme[30] (IFI), there are multiple barriers to sea lamprey migration including sluices and weirs along the River Barrow. As such, sea lamprey distribution is likely restricted the lower reaches of the SAC.

As stated in the Article 17 Report (NPWS, 2025a), the overall status of this species is assessed as 'Bad' with a change in trend from 'stable' to 'deteriorating' since 2019.

Targets and attributes

The conservation objective for sea lamprey is "To restore the favourable conservation condition of sea lamprey in the River Barrow and River Nore SAC".

[30] https://www.arcgis.com/apps/dashboards/335889cdf4bc466eb2a5eea30a5e06a6

Table 5-18: Targets and Attributes of sea lamprey

Attribute	Target
Distribution: extent of anadromy	Greater than 75% of main stem length of rivers accessible from estuary
Population structure of juveniles	At least three age/size groups present
Juvenile density in fine sediment	Juvenile density at least 1/m²
Extent and distribution of spawning habitat	No decline in extent and distribution of spawning beds
Availability of juvenile habitat	More than 50% of sample sites positive

Sea lamprey tend to remain in the estuaries, transitional waters and main river stems (King, JL; et al, 2011) (near to these) and will not occur in the ZoI of the Project, supported by historical NBDC records of sea lamprey across Ireland[31].

5.3.1.3.17 [1096] Brook Lamprey *Lampetra planeri and* [1099] River Lamprey *Lampetra fluviatilis*

The QIs often co-exist and are discussed together. The river lamprey is a mostly a migrating species and adults come from the coastal waters to rivers to spawn (King, JL; et al, 2011). The brook lamprey in non-migratory remaining in the rivers (King, JL; et al, 2011).

According to SSCO (NPWS, 2025b), brook lamprey and river lamprey are known to occur within the aquatic habitat of the SAC. No specific distribution map is available within the SSCO. Artificial migration barriers are currently preventing juvenile lampreys from accessing the full extent of suitable habitat. As such, lampreys are more restricted to spawning in the lowers reaches of the SAC.

According to Article 17 Report (NPWS, 2025a), the overall status for brook lamprey is assessed as 'Favourable' and remains unchanged for the last three reporting periods and for river lamprey as 'Inadequate' which has changed from an unknown status in previous reporting periods.

Suitable lamprey habitats were recorded within the Ballynaboley Stream (IDB1), Rathornan Stream (IDB3), Tributary to the River Barrow (IDB4) and assumed to be using the River Barrow at Cardinal Moran Bridge (IDB2).

Targets and Attributes

The conservation objective for brook lamprey is ″To restore the favourable conservation conditions of brook lamprey in the River Barrow and River Nore SAC".

[31] Sea Lamprey (Petromyzon marinus) - Detail - Biodiversity Maps

Table 5-19: Targets and Attributes for brook lamprey

Attribute	Target
Distribution	Access to all watercourses down to first order streams
Population structure of juveniles	At least three age/size groups of brook/river lamprey present
Juvenile density in fine sediment	Mean catchment juvenile density of brook/river lamprey at least 2/m²
Extent and distribution of spawning habitat	No decline in extent and distribution of spawning beds
Availability of juvenile habitat	More than 50% of sample sites positive

The conservation objective for river lamprey is ''To restore favourable conservation condition of river lamprey in the River Barrow and River Nore SAC".

Table 5-20: Targets and Attributes for river lamprey

Attribute	Target
Distribution: extent of anadromy	Greater than 75% of main stem and major tributaries down to second order accessible from estuary
Population structure of juveniles	At least three age/size groups of river/brook lamprey present
Juvenile density in fine sediment	Mean catchment juvenile density of brook/river lamprey at least 2/m²
Extent and distribution of spawning habitat	No decline in extent and distribution of spawning beds
Availability of juvenile habitat	More than 50% of sample sites positive

The River Barrow and the tributaries will be traversed by the Project and are considered in the ZoI for the Project. The rivers are considered to host lamprey with suitable habitats for spawning, juveniles and adults recorded across the surveyed sections of watercourse.

5.3.1.3.18 [1103] Twaite Shad *Alosa fallax fallax*

As per the SSCO (NPWS, 2025b), twaite shad occurs in the aquatic habitat within the SAC. No distribution map is provided within the SSCO. Artificial barriers prevent upstream migration and therefore restricting their distribution to the lower stretches of the SAC. According to Article 17 Report (NPWS, 2025a), the overall status is assessed as 'Bad' with a 'deteriorating' trend. This has changed from a stable trend in 2019.

Targets and Attributes

The conservation objective for twaite shad is "To restore the favourable conservation condition of twaite shad in the River Barrow and River Nore SAC".

Table 5-21: Targets and Attributes of twaite shad

Attribute	Target
Distribution: extent of anadromy	Greater than 75% of main stem length of rivers accessible from estuary
Population structure: age classes	More than one age class present
Extent and distribution of spawning habitat	No decline in extent and distribution of spawning habitats
Water quality: oxygen levels	No lower than 5mg/
Spawning habitat quality: Filamentous algae; macrophytes; sediment	Maintain stable gravel substrate with very little fine material, free of filamentous algal (macroalgae) growth and macrophyte (rooted higher plants) growth

Twaite shad is a coastal species that comes into the tidal waters, estuaries and transitional waters for spawning (King, JL; et al, 2011) and remain in the transitional and coastal waters of the SAC. The transitional waters and estuarine areas of the SAC our outside the ZoI of the Project.

5.3.1.3.19 [1106] Salmon *Salmo salar*

As per the SSCO (NPWS, 2025b), salmon is known to occur within the aquatic habitat of the SAC. No specific distribution map is available for this species within the SSCO. However, it is noted that there are artificial barriers blocking salmon upstream migration and therefore limiting the species to the lower stretches of the rivers and restricting access to spawning areas.

IFI data[32] shows historical salmon records in the River Barrow upstream (monitoring site Bestfield_A in 2015, approximately 2km north of the N80, north of Carlow town) of proposed development and downstream (monitoring site Leighlinbridge_A in 2012), approximately 900m south of Cardinal Moran Bridge (proposed HDD crossing IDB2). Recent records show salmon upstream of Carlow town (Bestfield_A in 2021), but downstream records only indicate salmon at Goresbridge (approximately 14km south of Cardinal Moran Bridge in 2021). Salmon is also confirmed in the Rathornan Stream (2020), approximately 1.2 km west and upstream of the crossing (IBD3).

According to the Article 17 Report (NPWS, 2025a), the overall status of this species is assessed as 'bad' and 'deteriorating' which showed a decline from the 2019 assessment.

Targets and Attributes

The Conservation Objective for salmon is to "To restore the favourable conservation condition of salmon in the River Barrow and River Nore SAC".

[32] Obtained from the 'WFD Fish Ecological Status for Rivers, Lakes and Transitional Waters 2008 to Recent' accessed from 'Apps & Maps' at https://opendata-ifigeo.hub.arcgis.com/

Table 5-22: Targets and Attributes for salmon

Attribute	Target
Distribution: extent of anadromy	100% of river channels down to second order accessible from estuary
Adult spawning fish	Conservation limit (CL) for each system consistently exceeded
Salmon fry abundance	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 min sampling
Out-migrating smolt abundance	No significant decline
Number and distribution of redds	No decline in number and distribution of spawning redds due to anthropogenic causes
Water quality	At least Q4 at all sites sampled by EPA

The River Barrow and the tributaries will be traversed by the Project and are considered in the ZoI for the Project. The rivers are considered to host salmon, having moderate (Ballynaboley Stream), to good (Rathornan Stream and the Tributary to the River Barrow) to high (River Barrow) fisheries potential with suitable spawning habitat and habitat for adults. There are barriers in the tributaries (Rathornan Stream (crossing IBD3) and the Tributary to the Barrow River (crossing IBD4) have barriers before confluence with the River Barrow) that may impede movement.

5.3.1.3.20 [1355] Otter *Lutra lutra*

As per the detailed SSCO document (NPWS, 2025b), otter is known to occur within the marine and freshwater habitats of the SAC.

According to the Article 17 Report (NPWS, 2025a), the overall status of this species is assessed as 'Favourable' with a stable trend. This shows a slight change from the improving trend recorded in 2019.

Targets and Attributes

The conservation objective for otter is "To restore the favourable conservation conditions of otter in the River Barrow and River Nore SAC".

Table 5-23: Targets and Attributes for otter

Attribute	Target
Distribution	No significant decline
Extent of terrestrial habitat	No significant decline. Area mapped and calculated as 122.8ha above high water mark (HWM); 1136.0ha along river banks / around ponds
Extent of marine habitat	No significant decline. Area mapped and calculated as 857.7ha
Extent of freshwater (river) habitat	No significant decline. Length mapped and calculated as 616.6km
Extent of freshwater (lake) habitat	No significant decline. Area mapped and calculated as 2.6ha
Couching sites and holts	No significant decline
Fish biomass available	No significant decline

No holts or couches were observed along the 300m transects along the River Barrow and its tributaries. Therefore no breeding or rearing of young is occurring within 150m of any oof the proposed crossings. As discussed in Section 3.2, all the rivers and streams provide adequate to good commute for otters, although water quality (slicks and odours) in the Powerstown Stream and Ballynaboley Stream (IDB2) may have dissuaded use of these at the time of the survey. All rivers but the Powerstown Stream are considered to provide good forage potential, but may be limited by water quality (Ballynaboley Stream) and barriers (Rathornan Stream and the Tributary to the River Barrow). The River Barrow within the location of the Cardinal Moran Bridge (IBD2) serves as a corridor and forage area for otter, with no evidence of, nor suitability for, couches and holts.

5.3.1.4 Potential for Adverse Effects on the integrity of the SAC

The preceding section sets out site-specific conservation objectives for the qualifying interests of the River Barrow and River Nore SAC along with the national conservation status for the QIs as per Article 17 Report (NPWS, 2025a), with a preliminary statement regarding the QIs location within the Project's ZoI.

There are no pathways that could impair the conservation objectives of the following QIs that could compromise the integrity of the River Barrow and River Nore SAC, and these are not further assessed:

- [1130] Estuaries
- [1140] Mudflats and sandflats not covered by seawater at low tide
- [1170] Reefs
- [1310] Salicornia and other annuals colonising mud and sand
- [1330] Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
- [1410] Mediterranean salt meadows (*Juncetalia maritimi*)
- [4030] European dry heaths
- [7220] Petrifying springs with tufa formation (Cratoneurion)
- [91A0] Old sessile oak woods with Ilex and Blechnum in the British Isles
- [91E0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)
- [6430] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels
- [6985] Killarney Fern *Vandenboschia speciosa*
- [1016] Desmoulin's Whorl Snail *Vertigo moulinsiana*
- [1029] Freshwater pearl mussel *Margaritifera margaritifera*
- [1095] Sea lamprey *Petromyzon marinus*
- [1103] Twaite shad *Alosa fallax fallax*

Of the QIs assessed within the ZoI of the Project the Project could affect the targets and attributes of the following QIs:

- [3260] Water courses of plain to montane levels with the *Ranunculion fluitantis* and Callitricho-Batrachion vegetation
- [1092] White-clawed crayfish *Austropotamobius pallipes*
- [1096] Brook lamprey *Lampetra planeri*

- [1099] River lamprey *Lampetra fluviatilis*
- [1106] Salmon *Salmo salar*
- [1355] Otter *Lutra lutra*

5.4 In Combination Assessment

A review of permitted and proposed developments within the wider landscape was undertaken in order to assess the potential for cumulative impacts on European sites. The developments assessed are listed in Appendix 2 of the NIS.

The potential for permitted and proposed developments to act in combination with the Project to act cumulatively with the Project-related impacts is discussed hereunder relative to the impacts, which are associated with the construction phase of the proposed gas pipeline route (water quality and associated aquatic ecosystems).

5.4.1 Potential for the In-Combination Effects on Water Quality / Aquatic Environment

When assessing the potential for cumulative effects from combined runoff impacts to water quality, the future developments at construction phase within the shared catchment of the Project need to be taken into consideration. Once operational, any effects from projects will be subject to the strict controls of conditions related to the consent or licensing requirements, restricted to high rainfall events when the level of dilution of impact is proportionately increased by higher volumes and retention time is reduced by higher flows.

Despite the potential impact to water quality during the construction phase, it is possible to control construction-related effects on water quality through implementation of known good standard practices and management measures and therefore significant effects, either individually or cumulatively, will rarely occur.

Considering existing regulation regarding water bodies, there are controls (policy requirements and consenting conditions) on how developments are constructed and operated so that potential effects on water bodies are prevented through design requirements. Even in cases where there is a rare occurrence of a cumulative effect, it is unlikely to have any significant cumulative effect.

Therefore, only other developments that lie in the same catchment as the Project that have the potential to have their construction stage overlap with the Project's construction stage are considered (future consented developments that have not yet been constructed and application for future developments that may coexist spatially and temporarily with the Projects construction phase, specifically the proposed gas pipeline route).

The larger developments include the windfarms and solar farms and one upgrade of the N80 road. A list of the developments within 10km of the site are considered below (distances are approximate as the crow flies from the Project to the nearest boundaries):

- Ballyloo Solar Farm c 192 ha In the townlands of Ballybar Upper Ballyloo Ballyryan , Garryhundon and Linkardstown, County Carlow (2.3km east of the proposed gas pipeline route 1.8km east of the proposed development) granted by ACP Ref 322347 September 2025. Natura Impact Statement has been submitted with application.
- Bilboa Wind Farm (5 turbines) at Boolyvannanan & Coolnakisha, Bilboa, Co. Carlow (3.3km west of the proposed gas pipeline route 5.3km west of the proposed development). ACP PL01.318271 grant to Boolyvannanan Renewable Energy Ltd. in 2023. Grant permission with revised conditions in 2024 (planning ref 318295). Natura Impact Statement has been submitted with application. Open case on a point of detail ACP planning ref: 323639

- Connection of Seskin Wind Farm to the national electricity grid by an underground cable (4.9km west of the proposed gas pipeline route 5.6km west of the proposed development). First party appeal by EDF Renewables to ACP granted 2025 (322225) and Seskin Wind Farm for 7 wind turbines permission granted to EDF Renewables following 1st Party appeal to ACP (320354). Natura Impact Statement has been submitted with application.
- Seskin Wind Farm by EDF Renewables Ireland Ltd. 7 wind turbines and all associated works in the townlands of Ridge, Agharue, Coolnakisha and Seskinrea, Co. Carlow. First Party appeal to ACP (ACP ref PL01.320453) granted November 2025.
- Proposed development along the N80 known as the N80 Leagh Bends in the Townlands of Graiguenaspiddogue, Castletown, Leagh, Ballybeg, Kilballyhue and Kilcoole, County Carlow (6.8km east of the proposed gas pipeline route 6.3km east of the proposed development). ACP grant 2025 (ref 321416). This is road improvement works by Carlow County Council . A Natura Impact Statement (NIS) accompanies this application.
- Solar Farm at Garreenleen , Bendinstown Tinnaclash and , Ardbearn, Co Carlow by Terra Solar Ltd. 1st party appeal to ACP granted (planning ref 307891) (8.3km east of the proposed gas pipeline route 7.8km east of the proposed development). Natura Impact Statement has been submitted with application.
- Electrical substation permission granted by ACP for Garreenleen Solar Farm Ltd. in townlands of Bendinstown, Gilbertstown, Kellistown East, Kellistown West, Ballycurragh, Ardbearn and Ballynunnery, Co. Carlow (8.3km east of the proposed gas pipeline route 7.8km east of the proposed development). Granted 2022.
- White Hill Wind Farm (7 wind turbines) (6.8km west of the proposed gas pipeline route 8.4km west of the proposed development) granted by ACP (planning ref 315365) and permission for electrical substation and 8.8 km of underground electricity line grated in 2025 by ACP (planning ref 322078), approximately 7 km south west of proposed development. Natura Impact Statement has been submitted with application.
- Elgin Energy Services Ltd., Friarstown, Co. Carlow (10km north east of the Project) 17.6ha solar farm, planning ref 2138, granted 2022. A Natura Impact Statement (NIS) has been prepared and will be submitted to the planning authority with the planning application.
- Battery Energy Storage System (BESS), Orsted Onshore Ireland Midco Limited (10km north east of the Project). First Party Appeal ACP Ref PL01.501034. A Natura Impact Statement (NIS) accompanies the application

For the larger developments, NIS have been / will be prepared for these projects, which will subject them to Appropriate Assessment. These developments have shown that impacts are fully mitigated with no residual impacts to the European sites, including the River Barrow and River Nore SAC under the mitigated scenario and there is no opportunity for cumulative impact with the Project regarding effects to water quality and associated aquatic ecosystems.

All other potential cumulative projects within the shared Project waterbody catchment relate to residential developments, agricultural developments, amendments or extensions to existing structures, amendment to existing activities / structures within the existing quarries / larger existing developments, and maintenance work. The consented developments have been subjected to AA screening and under most circumstances screened out from requiring a Stage Two Appropriate Assessment as there are no S-P-R links between the projects and the European sites, or have similarly prepared NIS (as for the larger developments discussed in the preceding paragraph). Under these circumstances there is no opportunity for cumulative impact with the Project regarding effects to water quality and associated aquatic ecosystems.

When considering the limited ZoI for sedimentation of water courses (Section 4.1.2 - 80m downstream), the impact is very localised spatially and will be limited to 1 day at each of the 6 crossings. None of the future (consented or under planning review) projects occur within 1km of the Project's watercourse crossings and therefore there is no potential for cumulative impacts or any in combination effects on any European site.

5.5 Mitigating Adverse Effects

Mitigation is prescribed in accordance with mitigation by avoidance as a first approach. Where this is not feasible, measures to prevent impacts from giving rise to adverse effects should be adopted (e.g. management of surface water runoff). Where impacts cannot be avoided mitigation by reduction of impact is required to limit the exposure of the receptor to an acceptable level (often achieved by interrupting the pathway between the source and receptor).

5.5.1 Mitigation Measures to be Implemented for the Project

Mitigation has regard to the following documents and guidelines:

- Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors (C532). Construction Industry Research and Information Association, London (CIRIA, 2001).
- Control of Pollution from Linear Construction Project; Technical Guidance (C648). Construction Industry Research and Information Association, London (CIRIA, 2006).
- Environmental Good Practice on Site (4th edition) (C741). Construction Industry Research and Information Association, London (CIRIA, 2015b).
- Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes (TII, 2005, reissued 2025).
- Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters (IFI, 2016).
- Guidance for Pollution Prevention, dealing with spills: PPG 22 (EA, 2011)
- Temporary Construction Methods - SEPA (WAT-SG-29) (SEPA, 2009)
- Guidance for Pollution Prevention: Works and maintenance in or near water: GPP 5 (UK Guidance Note).
- Guidelines For the Treatment of Otters Prior to the Construction of National Road Schemes (TII, 2006, reissued 2025)
- Atkinson, S., Magee, M., Moorkens, E.A. & Heavey, M. (2024). Guidance on Assessment and Construction Management in *Margaritifera* Catchments in Ireland (Atkinson, S; Magee, M; Moorkens, EA; Heavey, M, 2023)[33]

Mitigation measures are set out in accordance with the guidance (EC, 2021). Mitigation is described with respect to:

- How the measures will avoid / prevent / reduce the adverse impacts on the proposed development to an acceptable level.
- The expected results from implementing and degree of confidence in their likely success.
- The timescale, relative to the Project, when they will be implemented and by whom.
- How and when the measures will be monitored.

[33] https://e-mussels.eu/europe/conservation-guidelines

An Environmental / Ecological Clerk of Works (EnCoW / ECoW) will be appointed by the Developer with responsibility for monitoring during the construction phase of the Project. The Clerk of Works will have the authority to temporarily stop works to prevent negative effects on European sites or to ensure corrective action is taken to mitigate adverse effects.

Table 5-24: Measures to Protect Water Quality / Aquatic Habitat

To ensure no adverse effects on the integrity of the River Barrow and River Nore SAC (002162); the Loughans SAC (000407); and Lower River Suir SAC (002137)						
Impact	**Measure**	**How the measure will contribute to avoiding/reducing the effects on the integrity of the site**	**How it will be implemented and by whom**	**Demonstrate its effectiveness (e.g. based on scientific evidence / expert rationale)**	**Timescale of implementation, relative to the Project**	**Proposed monitoring scheme and reporting requirements.**
Escape of drilling fluid during HDD crossings under the River Barrow and the drain crossings	The HDD crossing will be carried out outside of the salmonid and lamprey spawning seasons.	This will be done to ensure access to spawning habitat for salmon and lamprey QI species during their spawning seasons and ensure no impact on species populations.	Measures will be implemented by the Contractor.	This is a standard method prescribed by IFI to avoid impacts on fisheries (IFI, 2016).	HDD works will only be carried out during the open season i.e. from 1st July to 30th September to avoid impacting aquatic habitat during fish/lamprey spawning season.	The Environmental Manager / ECoW will monitor the implementation of the mitigation measures with regular reporting to client.
	A "fail-safe" approach to HDD will be implemented which will focus on three pillars of environmental protection: mechanical stabilisation of borehole integrity, fluid non-toxicity, and physical containment.	Controlled HDD works will prevent frac-out (release of drilling fluid through cracks/fissures) and prevent accidental degradation of the aquatic habitat, which supports QI species.	Specialist drilling contractors will be employed with experience in working in gravel aquifers. **Implementation of this measure is fully detailed in Section 5.5.2.1**	This methodology is a standard best practice measure for HDD works in gravels and has been successfully employed in multiple projects across Ireland and Europe.	To be implemented for HDD crossings.	The Contractor will report daily to the Developer's Engineer and the Engineer will also be present on site to supervise all HDD works.

To ensure no adverse effects on the integrity of the River Barrow and River Nore SAC (002162); the Loughans SAC (000407); and Lower River Suir SAC (002137)						
Impact	**Measure**	**How the measure will contribute to avoiding/reducing the effects on the integrity of the site**	**How it will be implemented and by whom**	**Demonstrate its effectiveness (e.g. based on scientific evidence / expert rationale)**	**Timescale of implementation, relative to the Project**	**Proposed monitoring scheme and reporting requirements.**
	The HDD works will be informed by detailed geotechnical investigations prior to drilling. Drilling tools and mud programme will be selected to match soil/rock conditions.					
Surface water runoff from works areas	In addition to the standard best practice construction measures, a DOUBLE ROW of silt fences will be established along the perimeter of source areas of contaminated runoff at the following works locations: • Surrounding the works area at the HDD launch and exit pits for all the drain /waterbody crossings	Silt fencing will prevent the runoff of sediment into the local watercourses from the works areas.	Silt fencing will be installed by the construction contractor in advance of the works. Silt fencing will consist of a UV-stabilized geotextile membrane (e.g., Hy-Tex Terrastop Premium or similar) attached to wooden posts.	The use of silt fencing is a standard environmental protection technique and is set out in industry guidelines. Measures will be in accordance with IFI guidelines (IFI, 2016), and Control of water pollution from construction sites (CIRIA, 2001).	The silt fencing will be left in place until the works are completed (which includes removal of any temporary ground treatment). Silt fences will not be removed during heavy rainfall.	The integrity of the silt fencing will be checked daily and after poor weather conditions (rain or wind) and any failures rectified immediately. Any build-up of sediment along the fence will be removed in accordance with manufacturers requirements.

To ensure no adverse effects on the integrity of the River Barrow and River Nore SAC (002162); the Loughans SAC (000407); and Lower River Suir SAC (002137)						
Impact	**Measure**	**How the measure will contribute to avoiding/reducing the effects on the integrity of the site**	**How it will be implemented and by whom**	**Demonstrate its effectiveness (e.g. based on scientific evidence / expert rationale)**	**Timescale of implementation, relative to the Project**	**Proposed monitoring scheme and reporting requirements.**
	• For all in-road open cut crossings of drains and watercourses		The fabric will be buried at least 100-250mm below ground level and anchored, with clean drainage stone, to prevent undercutting.		The silt fence will not be pulled from the ground but cutaway at ground level and posts removed.	A record of when it was installed, inspected and removed will be maintained.

5.5.1.1 Implementation of a "Fail-Safe" Approach to HDD

Mechanical Stabilisation in the gravelly, non-cohesive aquifer, will be managed by installing steel conductor casing through the shallow gravels to bypass the cover zone (i.e. the material above the bore depth) where fluid would be most likely to breach the surface. This casing acts as a physical barrier, protecting the riverbed from pressure spikes and ensuring returns are directed back to the entry pit rather than into the sensitive substrate.

The drilling fluid/bentonite will be non-toxic and naturally biodegradable (i.e., Clear Bore Drilling Fluid or similar will be used). Biocompatible Drilling Fluids (European Standards) utilize NSF/ANSI Standard 60 or CE-marked additives which are high-performance, biodegradable viscosifiers and will be used to provide the necessary "gel strength" to suspend heavy gravel cuttings. Fluid loss will be controlled using biodegradable sealants, which create a thin, flexible filter cake on the borehole wall to prevent fluid migration into the aquifer. These products break down naturally, ensuring no permanent alteration to the hydraulic conductivity of the aquifer. These products break down naturally, ensuring no permanent alteration to the hydraulic conductivity of the aquifer or the delicate micro-habitats of QIs.

Real-time annular pressure monitoring will be mandatory. By keeping pressures below the Delft Equation limits, operators can detect lost circulation before it becomes a surface fracture blow-out (frac-out release of drilling fluid through cracks/fissures/weaknesses in the substrate).

5.6 Conclusions on Post-Mitigation Impacts

The potential for adverse effects on each of the individual Qualifying Interests (QIs) and Special Conservation Interests (SCIs) that were identified as being at risk of potential effects are assessed in view of the Conservation Objectives of those habitats and species. Mitigation measures have been incorporated into the Project for the avoidance of impacts as fully described in this NIS.

The potential for residual adverse effects are discussed:

- All potential pathways for direct and indirect deterioration in aquatic environment which supports QI habitats (Water courses of plain to montane levels with the *Ranunculion fluitantis* and Callitricho-Batrachion vegetation , QI aquatic species (white-clawed crayfish, brook lamprey, river lamprey and salmon) and prey of QI species (otters) have been prevented (Table 5-255-25). A range of bespoke mitigation measures have been prescribed in terms of water quality to ensure that no impacts will occur to cause affects to community, extent, structure or distribution of aquatic QI species of any SAC as a result of the Project and no deterioration in the condition of aquatic habitat will occur due to the proposed works.

Based on the above, following the implementation of mitigation measures, it can be concluded, in view of the best scientific knowledge and based on objective information, that the Project will not adversely affect the integrity of any European site.

6. CONCLUSION

The assessment presented in this NIS has determined that the Project will not cause significant adverse effects on the integrity of European sites under the mitigation scenario. An evaluation of plans and projects within the ZoI shows that this Project will not contribute to any adverse effects to the River Barrow and River Nore SAC when considered alongside other plans or projects.

Therefore under the mitigated scenario, in the light of the best scientific knowledge in the field, and considering all aspects of the Project by itself and in combination with other plans or projects, it is concluded that the Project does not pose a risk of, directly or indirectly, adversely affecting the conservation objectives that support QI habitats and species of River Barrow and River Nore SAC on its own or in combination with plans or projects and will not impair the integrity of any European site.

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APPENDIX 1

Relevé Data for Habitat Assessment

Table A: Relevés collected within Dry calcareous and neutral grassland (GS1) within 500m of the site (Martin, et al., 2018)

Scientific Name	Common Name	Plot no. for relevé / Coverage (%)								
		P1	P2	P3	P4	P5	P6	P7	P8	P9
Plot Size		2mx2m	2mx2m	2mx2m	2mx2m	2mx2m	2mx2m	2mx2m	2mx2m	2mx2m
Vascular Plants										
Achillea millefolium	Yarrow		1	1	0.3	5	2		2	0.5
Agrostis capillaris[34]	Common Bent				2					0.3
Anthyllis vulneraria[35]	Kidney Vetch	2	1	3						
Arrhenatherum elatius	False Oat-grass		3							
Bellis perennis	Daisy					1	1	0.5	1	
Blackstonia perfoliata	Yellow-wort				1	0.1				
Bromus hordeaceus	Soft-brome	4								
Carex nigra	Common Sedge			2						
Cerastium fontanum	Common Mouse-ear				0.1			0.1		
Common Ragwort	Jacobaea vulgaris								0.5	
Crepis vesicaria	Beaked Hawk's-beard	1			1					0.1
Dactylis glomerata	Cock's-foot	1			6	2	2	0.5	0.5	0.5
Daucus carota[36]	Carrots		3							1
Erigeron acris	Blue Fleabane		1		0.3	4				2

[34] Red indicates negative indicator species for 6210/*6210
[35] Green indicates high quality indicator species for 6210/*6210
[36] Amber indicates positive indicator species for 6210/*6210

Scientific Name	Common Name	Plot no. for relevé / Coverage (%)								
		P1	P2	P3	P4	P5	P6	P7	P8	P9
Euphrasia	Eyebrights	0.1								
Festuca rubra agg.	Red Fescues		20	5	1	3	5	1	6	
Galium verum	Lady's Bedstraw								3	
Hypericum sp.	St. John's-wort sp.							0.5		
Hypochaeris radicata	Cat's-ear					4				
Jacobaea vulgaris	Common Ragwort								0.1	0.1
Leucanthemum vulgare	Oxeye Daisy	1	3	1		1	1	3	2	4
Lotus corniculatus	Common Bird's-foot-trefoil			0.3		0.3				
Luzula campestris	Field Wood-rush	0.1	0.5	2		3	7	1		
Medicago lupulina	Black Medick				0.3		0.5	0.1		0.5
Myosotis discolor	Changing Forget-me-not	0.3	0.1	0.1	0.1			0.1	0.1	0.3
Oenothera sp.	Evening-primrose sp.									1
Ononis repens	Common Restharrow				0.3					
Orchidaceae	Orchid spp.					8.5			2	
Pilosella officinarum	Mouse-ear-hawkweed	8	6	60	3	4	4	12	55	40
Plantago lanceolata	Ribwort Plantain					1	2		0.5	
Poa pratensis	Smooth Meadow-grass			10						
Quercus robur	Pedunculate Oak						0.1			
Ranunculus repens	Creeping Buttercup								0.1	
Saxifraga tridactylites	Rue-leaved Saxifrage	0.1								
Taraxacum	Dandelion	0.5			0.1	0.3				

Scientific Name	Common Name	Plot no. for relevé / Coverage (%)								
		P1	P2	P3	P4	P5	P6	P7	P8	P9
Valerianella locusta	Common Cornsalad	1	3							
Veronica chamaedrys	Germander Speedwell					0.1				
Vicia sativa	Common Vetch			0.1					0.1	0.3
Bryophytes										
Homalothecium lutescens	Yellow Feather-moss	75	20		1		90	80		
High quality and Positive species criteria to assess in the field										
Number of High quality species present ≥ 2 within Plot + include 20 m surrounding area		Fail	Fail	Fail	Fail	Pass	Pass	Pass	Pass	Fail
Total number of positive indicator and high-quality species present ≥ 7 within Plot + include 20 m surrounding area		Fail	Fail	Fail	Fail	Fail	Fail	Fail	Fail	Fail
Negative indicator species data										
Record the % collective cover of scrub, bracken and heath (woody species) (Pass ≤ 5%) within Plot		Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Record the % collective cover of the negative indicator species (Pass ≤ 20%) within Plot		Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
% forb cover within Plot		14	18	65.5	6.5	29.3	9.5	16	66.4	49.8
% graminoid cover within Plot		5	23.5	19	9	8	14	2.5	6.5	0.8
Record % cover of litter (Pass ≤ 25%) within Plot		Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Record Y or N, for if the proportion of the sward between 5-40 cm tall is ≥ 30% within Plot (Cannot be assessed due to most of the species being at the vegetative stage)		-	-	-	-	-	-	-	-	-
Record the % cover of bare soil (Pass ≤ 10%) within Plot		Fail	Pass	Pass	Fail	Fail	Pass	Fail	Pass	Fail

Scientific Name	Common Name	Plot no. for relevé / Coverage (%)								
		P1	P2	P3	P4	P5	P6	P7	P8	P9
Record Y or N, for if the area of the habitat showing signs of serious grazing within Local Vicinity		Pass	Pass	Pass	Pass	Fail	Fail	Fail	Fail	Pass
Overall Pass/Fail		Fail	Fail	Fail	Fail	Fail	Fail	Fail	Fail	Fail

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APPENDIX 2

List of Plans and Projects Considered for In-Combination Assessment

In terms of assessing the potential for cumulative effects in this NIS, a review of *"reasonably foreseeable"* actions (EPA, 2022), approved projects and existing or approved operations was carried out. The range and nature of existing or approved projects is topic specific. The material for the cumulative assessment was gathered through a search of the following listed source. Relevant EIA and NIS documents, planning application details and planning drawings were reviewed, which served to identify the locations of existing and approved projects and projects pending a decision from the planning authority, or An Coimisiún Pleanála. The relevance of the projects was considered on a case-by-case basis in each chapter as necessary depending on the interaction and likelihood of in combination impacts.

- Carlow County Development Plan (Carlow County Council 2022)
- An Coimisiún Pleanála website and database (https://pleanala.ie)
- Department of Housing, Planning, and Local Government's EIAR Portal
- National Development Plan 2021-2030 (Department of Public Expenditure, NDP Delivery and Reform, 2021)
- EPA licensed facilities www.epamaps.ie

There are no existing or proposed anaerobic digestion facilities within 10 km of the proposed development boundary.

The following activities were identified for consideration in the cumulative assessment, as follows :

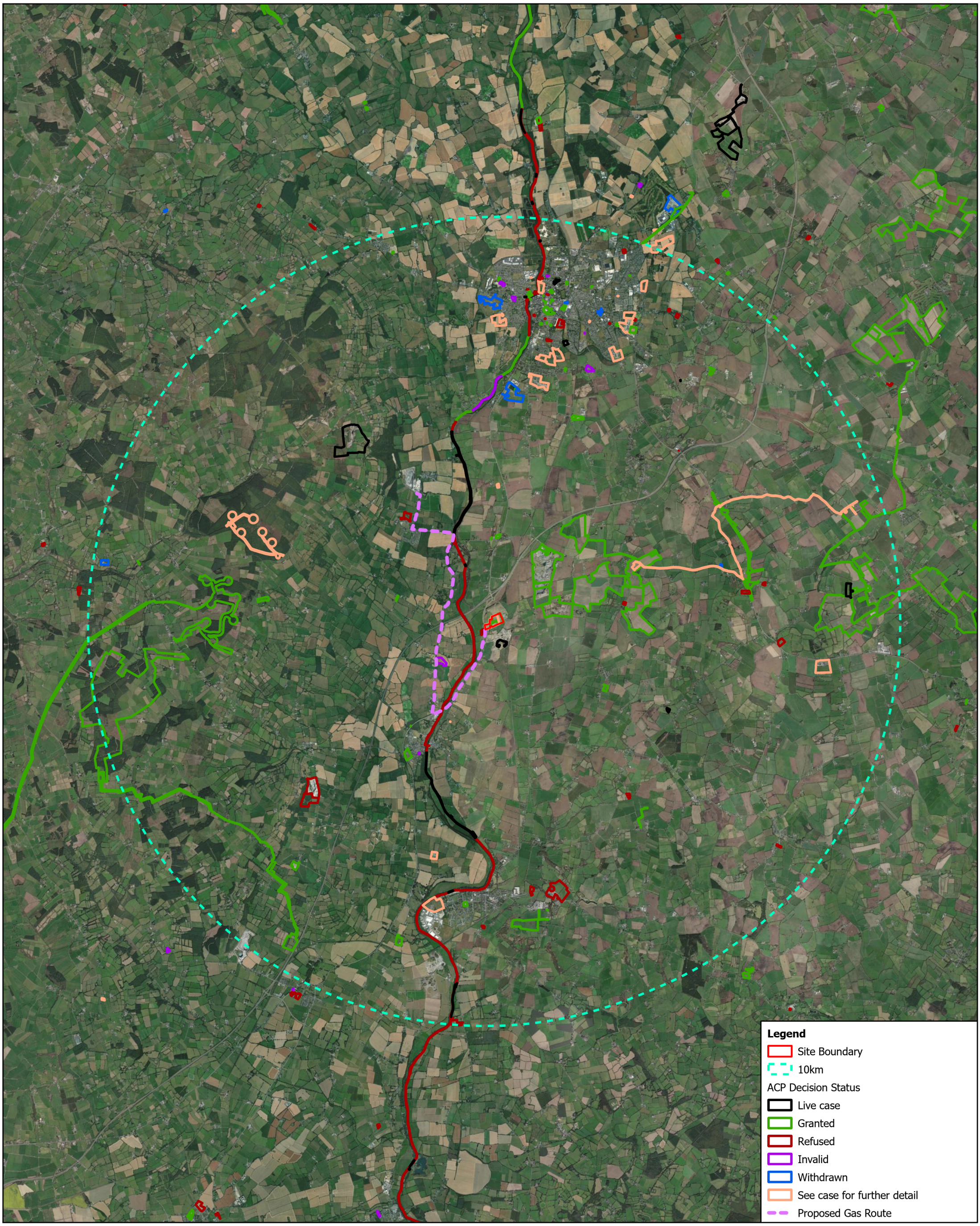
- Existing Operational Developments
    - The existing site known as Mary Kelly's Pit Kilcarrig Quarries/Milford Quarries, Powerstown EPA extractive register QS0660
    - Powerstown Landfill (closed and restored) and Recycling Centre (operational) immediately north and east EPA Licence 20025-02
    - Kilcarrig Quarries Ltd., (Ovington) Powerstown, operational quarry 300 m south and accessed off Regional Road R448 EPA extractive industries register no. QS0472. Case Reference PL01.500902, 3rd party appeal on planning authority case reference 2560436 for retention of a rock splitter and associated ancillary works.
    - Clogrennanne Lime Ltd., lime processing facility, 3.5 km north west of proposed development in Clogrennane Co. Carlow.
    - Redrock Quarries, Clogrennan, 6km north east EPA extractive industries register no. QS0473
    - Dan Morrisey and Company, Clonmelsh 81 ha operational quarry 1 km north east and east of proposed development accessed off Local Road L3050 EPA extractive industries register no. QS0651, planning ref LQ0001 (substitute consent) /Receivers Grant Thornton, ACP planning ref 300034 (substitute consent) for quarry a Clonmelsh and Garryhundon, Nurney, Co. Carlow
    - Kilcarrig Quarries, Bagenalstown, 7.5 km south west, EPA extractive register QS0481
    - Dan Morrissey ltd. Fenniscourt, Bagenalstown, 8km south east EPA extractive register QS0479
    - Old Leighlin Quarry, Kilkenny Limestone (Stone Developments Ltd. Sisk Group) Co. Carlow (6km), EPA extractive register no. QS0678 (also has Section 4 discharge licence DL/ S4/2016/1-2)
    - Existing local road L3049, regional road R448 and junction 6 of M9 motorway 420 m north

- Consented Developments (not operational)
- Bilboa Wind Farm (5 turbines) at Boolyvannanan & Coolnakisha, Bilboa, Co. Carlow. ACP PL01.318271 grant to Boolyvannanan Renewable Energy Ltd. in 2023. Grant permission with revised conditions in 2024 (planning ref 318295). Open case on a point of detail ACP plannning ref) 323639
- White Hill Wind Farm (7 wind turbines) granted by ACP (planning ref 315365) and permission for electrical substation and 8.8 km of underground electricity line grated in 2025 by ACP (planning ref 322078), approximately 7 km south west of proposed development.
- Connection of Seskin Wind Farm to the national electricity grid by an underground cable. First party appeal by EDF Renewables to ACP granted 2025 (322225) and Seskin Wind Farm for 7 wind turbines permission granted to EDF Renewables following 1st Party appeal to ACP (320354)
- Seskin Wind Farm by EDF Renewables Ireland Ltd. 7 wind turbines and all associated works in the townlands of Ridge, Agharue, Coolnakisha and Seskinrea, Co. Carlow. First Party appeal to ACP (ACP ref PL01.320453) granted November 2025.
- 100 MV battery energy storage at Kellistown East, Co. Carlow, ACP Ref 303821, Engie Developments Ireland Ltd.
- Proposed 110kV electrical substation and grid connection located within the townlands of Friarstown, Grangeford Old, Grangeford, Moanalow, Glenoge, Rathnashannagh, Inchisland Or Moatalusha, Rathtoe, Kellistown East, Ballycurragh and Kellistown West, County Carlow. Prt Solar Limited
- Ballyloo Solar Farm c 192 ha In the townlands of Ballybar Upper Ballyloo Ballyryan , Garryhundon and Linkardstown, County Carlow granted by ACP Ref 322347 September 2025.
  - 1km from proposed development boundary to eastern boundary of solar farm.
- Solar farm at Kilcarrig, Bagenalstown granted in 2024 by ACP (planning ref 318306) to EEPV8 following a 1st party appeal. 7 km south east of proposed development
- Solar Farm at Garreenleen , Bendinstown Tinnaclash and , Ardbearn, Co Carlow by Terra Solar Ltd. 1st party appeal to ACP granted (planning ref 307891). 10 km east of the proposed development
- Electrical substation permission granted by ACP for Garreenleen Solar Farm Ltd. in townlands of Bendinstown, Gilbertstown, Kellistown East, Kellistown West, Ballycurragh, Ardbearn and Ballynunnery, Co. Carlow. Granted 2022. C 10 km east of proposed development
- Solar Farm, Ballon, Co. Carlow. 1st party appeal to ACP granted to Orsted Onshore Ireland Midco Ltd in 2026. 10 km from proposed development and adjacent to Terra Solar Ltd. consented development.
- Proposed development along the N80 known as Leagh Bends in In the Townlands of Graiguenaspiddogue, Castletown, Leagh, Ballybeg, Kilballyhue and Kilcoole, County Carlow. ACP grant 2025 (ref 321416). This is road improvement works by Carlow County Council .
- Tinyrland WWTP Planning Ref 2460332, granted 2025, demolition of old structures and construction of new and a rising main along L1023 and N80
- Elgin Energy Services Ltd., Friarstown, Co. Carlow 17.6ha solar farm, planning ref 2138, granted 2022
- Elgin Energy Services Ltd., Friarstown, Co. Carlow 68.8ha solar farm, planning ref 2149 granted 2023
- Downings, Tullow Planning Ref 2366, granted

- Developments awaiting decisions on planning consent
    - Milford Quarries Ltd. substitute consent application for a quarry in Clogrennane Co. Carlow ACP Ref FD01.324015 and ACP Ref QD01.324014. This application is in respect of Redrock Quarries (see existing operational developments) c 6 km north east of the proposed development.
    - Battery Energy Storage System, Orsted Onshore Ireland Midco Limited. First Party Appeal ACP Ref PL01.501034
    - Application to ACP for an electrical substation by Ballyloo Solar Farm Ltd. in townloads of Ballyloo, Knockbower, Linkardstown, Kilballyhue, Graiguenspiddoge, Castletown, Moyle Big, Leagh or Ballybeg, Kellistown West & Kellistown East, County Carlow. ACP Ref 45849.
    - Third Party Appeal to ACP for maintenance and repair works to The River Barrow navigation by Waterways Ireland Planning Ref PL01.322059
- Nearest Seveso Site c.7 km south Royal Oak Distillery, Bagenalstown (Lower Tier)
- IE and IPPC licenced sites located within 10km of the proposed development
    - EPA Licence 20025-02 as referenced above (adjacent)
    - EPA Licence P0400-03 Clongrennane Lime, Balinabranna, Carlow (3.5km)
    - EPA Licence P0825-01 Pig rearing unit, Moanmore, Bagenalstown, Carlow (8km)
    - EPA Licence W0284 O'Toole Composting, Fenagh, Carlow (8km)
    - EPA Licence P0222 Irish Sugar (restoration and aftercare), Carlow Town (10km)
    - EPA Licence P0185 Fair Oak Foods Ltd. Royal Oak Bagenalstown, Co. Carlow (demolished factory) (8km)
- Licensed Discharges Surface Water (Section 4)
    - Royal Oak Distillery, Section 4 Discharge DL/S4/2018/01, Bagenalstown, Co. Carlow (7km)
    - Section 4 Discharge Old Leighlin Quarry, Kilkenny Limestone DL/S4/2016/1-2, Co. Carlow (6km), EPA extractive register no. QS0678
    - Section 4 RPS04 Morrissys Quarry Clonmelsh, Co. Carlow (2km)
- Waste Facility Permits
    - WFP-CW-17-005-02 (Kilcarrig Quarries, Kilrea, Bagenalstown and EPA extractive register QS0695)

Cases: An Coimisiún Pleanála, National Planning Application Database (NPAD), Planning Authorities,
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TITLE: Planning Application within 10km of the Site	**FIGURE NO:** 1.3		
	CLIENT: Greengate Biogas		
PROJECT: Powerstown Bioenergy	**SCALE:** 1:85,000	**REVISION:**	0
	DATE: 22/06/2026	**PAGE SIZE:**	A3

N W E S

0 0.75 1.5 3 4.5 6 Kilometers

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APPENDIX 3

Description of the Existing and Proposed Development

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EIAR FOR POWERSTOWN BIOENERGY

Volume 2 - Main body of the EIAR

Chapter 3 - Description of the Existing and Proposed Development

Prepared for:
Greengate Biogas 001 Ltd.

Greengate Biogas

Date: **June 2026**

Document No:
P24188-FT-EN-ZZ-RP-EN-0001

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3. DESCRIPTION OF THE EXISTING AND PROPOSED DEVELOPMENT

3.1 Introduction

This chapter incudes a description of the existing quarry and the proposed development including proposed infrastructure, operations and construction. There is a glossary of terms in Chapter 1 of Volume 2 of this EIAR.

The existing and proposed layout drawings are included in Volume 4 of this EIAR, the first in the set is a Drawing Index Sheet which lists all drawing numbers and names.

The proposed development is located in the townland of Powerstown, Co. Carlow. The EIAR also includes an assessment of the proposed gas pipeline route in the townlands of Powerstown, Orchard, Ballynaboley, Rathvinden, Glebe, Rathornan, Tomard Upper/Lower, Ballygowan, Ballinabranagh, Fonthill and Raheendoran.

The proposed development is outlined in red and the proposed gas pipeline is shown in blue in Figure 3-1.

This chapter was prepared by James O' Neill, Tanya Ruddy and Bernie Guinan.

James is a Chartered Engineer and a Technical Director with Fehily Timoney and Company with 17 years post qualification experience working on waste management and landfill related projects. James holds an MSc in Civil Engineering from Trinity College Dublin (2009) and a BEng (Hons) in Civil Engineering from University College Dublin (2008). James is a Chartered Member of the Institute of Engineers Ireland and a Chartered Waste Manager with the Chartered Institute of Wastes Management. James' primary experience relates to the resource and waste management sector, in particular waste infrastructure design including anaerobic digestion, environmental & operational management of waste processing facilities, landfill remediation and aftercare works, remediation of contaminated lands, leachate and landfill gas management and civic amenity site design. James was responsible for the preparation of the drawings in Volume 4 of this EIAR. He has experience in similar roles on other AD plants, renewable energy infrastructure and strategic infrastructure developments as listed in his CV.

Tanya is a Chartered Scientist and holds a BA in Environmental Science and a MSc in Environmental Management. She is a Chartered Waste Manager (MCIWM). Tanya has 25 years post qualification experience in consultancy. She is experienced in project management of complex projects for both the public and private sector including the management and coordination of planning applications to An Coimisiún Pleanála and local planning authorities, licence applications to the EPA and waste facility permit applications to local authorities. Tanya is a Technical Director in the Circular Economy and Environment group in Fehily Timoney and Company.

Bernie Guinan is a Director of Fehily Timoney and Company and is responsible for the Circular Economy and Environment group. She has 25 years' experience in delivering and managing projects in environmental sector. Bernie has extensive experience in the preparation of Planning Applications, Environmental Impact Assessment Reports, Appropriate Assessments for a wide range of biowaste, waste management and biomethane infrastructure developments for Waste Contractors, Renewable Energy Contractors and Local Authorities. She has experience delivering expert testimony at Oral Hearings and Court Cases.

CVs are included in Appendix 1.1 of Volume 3 of this EIAR.

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TITLE: Site Location Map	**FIGURE NO:** 3.1		
	CLIENT: Greengate Biogas		
PROJECT: Powerstown Biogas	**SCALE:** 1:48,000	**REVISION:**	0
	DATE: 11/12/2025	**PAGE SIZE:**	A3

N W E S

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3.2 Existing Development

Drawing No. P24188-FT-XX-XX-DR-CE-0103 Existing Site Layout is in Volume 4 of this EIAR.

The site known as Mary Kelly's Pit is 9 hectares (ha) and is located at Powerstown, Milford, County Carlow, approximately 2.5 km north of Leighlinbridge, approximately 6 km north of Bagenalstown, approximately 2.5 km north-west of Nurney village, 8 km south of Carlow town centre and 15 km south-west of Tullow.

The site is located along the L3045, which is accessed from the Carlow to Kilkenny road - the R448 Regional Road. The site is located directly to the south of Carlow County Council's closed Powerstown Landfill site and to the west of the operational Recycling Centre, co-located on the landfill site both of which are under an EPA licence (Waste Licence no. W0025-04).

The site has been quarried by Kilcarrig Quarries Ltd. and has been partially restored[1]. This site has perimeter fencing and has two access points off the L3045 road. The first entrance is c. 100 m from the R448 junction and was previously used as an access route into the quarry (the area which has now been restored). There is a property with associated out-buildings located adjacent to this entrance, within the boundary and ownership of the existing quarry . This will not be included within the proposed development boundary.

The second entrance is c400 m east of the R448 junction and is currently used as the main entrance to the site. This entrance is fenced and controlled by a gate; a wheel wash facility is located at the entrance.

The following features are near the site (measured as shortest distance from closest boundary(s)):

- M9 Motorway (Junction 6) 420 m north
- Powerstown Stream 200m north
- Railway Line (Dublin to Waterford) 320 m east
- River Barrow SAC Boundary 20m west
- River Barrow, 300m west
- 38 kV Powerline 2.5 km west
- Nearest Seveso Site c.7 km south[2]
- Powerstown Landfill (closed and restored) and Recycling Centre (operational) immediately north and east EPA Licence 20025-02
- GNI Cork Dublin gas distribution pipeline running south north c3km west
- Kilcarrig Quarries Ltd. Operational quarry 300 m south and accessed off Regional Road R448
- Dan Morrisey and Company operational quarry 1 km northeast accessed off Local Road L3050

The existing site is an operational quarry, and the majority of the quarry site (6.5 ha) has been partially restored by backfilling with soil and stone with the remaining area is being quarried for sand and gravel. An overview of the sites planning history and waste facility permit authorisation is presented in Section 3.2.1. An overview of existing operations is included in the following sub-sections.

[1] Planning Ref's.: 01/300 and PL01.129838 see Chapter 1
[2] Lower Tier: Royal Oak Distillery Ltd Clorusk Lower, Royal Oak, Bagenalstown, Co. Carlow

3.2.1 Planning History and Waste Authorisation

The planning history for the existing quarry is described in Chapter 1.

3.2.2 Site Topography

The sites topography is characteristic of its former use as a sand and gravel quarry which has been partially backfilled. The site is depressed with respect to the surrounding lands with steep slopes from the site up to the boundaries with adjacent lands. A landscaping berm exists beyond the western boundary of the site along the R448. The southern boundary slopes from the site upwards to the L3045. The internal site topography is characterized by irregular stockpiles or infilling to the eastern portion of the site associated with overburden from sand and gravel quarrying. The western portion of the site is generally more regular falling west to east to the lowest point of the site is located centrally along the northern boundary. Figure 3-2 to Figure 3-4 show views of the existing site.



Figure 3-2: View from southwest (restored area in fore and mid ground)



Figure 3-3: View from southeast (active quarrying in foreground)



Figure 3-4: View from south shows ongoing restoration of former quarry

3.2.3 Site Entrance and Access

The site is enclosed by a mixture of hedge lines, treelines and perimeter fencing and is accessed via two entrance points off the L3045, which connects to the R448 Regional Road. The western entrance, located approximately 100 metres from the R448 junction, was historically used for quarry operations and now serves a property with associated outbuildings situated within the existing quarry site boundary. This entrance is not used for current operational activities related to the quarry and soil recovery facility. It consists of a short block wall on either side of farm gates and a concrete apron on road site of the gates. The property is listed as a commercial property on the Eircode database. The eastern entrance, located approximately 300 metres east of the western entrance, is the primary operational access point. There is a concrete apron outside the gate and a short concrete roadway inside the gate. It is secured by wire mesh fencing and a farm gate and includes a wheel wash facility. There is CCTV.

3.2.4 Existing Site Infrastructure

There is one small concrete building on site which is not in use. It is single storey with no windows, one door and a flat roof. It was an electricity supply building, but it now disconnected.

There is one groundwater well which was installed by the landowner. Greengate Biogas 001 Ltd. installed 3 no. groundwater wells as part of site investigation works for the proposed development.

There is a small cluster of buildings, including a residence and outbuildings adjacent to the L3045 near the western access. It has an electricity supply. This is registered as a commercial property on the Eircode database. It is within the existing landownership of the quarry but is not included within the proposed development boundary. It will not be used as a residence during the operational phase. The applicant Greengate Biogas 001 Ltd. will take vacant possession of this property including all buildings upon approval of the application for development consent.

There is no other permanent infrastructure on the existing quarry.

3.2.5 Existing Quarry Operations

The operator uses the site to supply small property developers/builders with sand and gravel and accepts waste soils from these same developers/builders. The facility is operated on an ad hoc basis as materials are ordered or supplied to site. According to the operator, activity levels are low, the majority of sand and gravel is exhausted and soil import is imported based on local arisings c 1,000 tonnes per annum.

The existing topography is shown in the Drawings in Volume 4 of this EIAR.

The site is being gradually restored as per its planning consent (planning reference PL13/187). As can be seen from Figure 3-2 to Figure 3-4 the western portion of the site has been restored, and restoration is ongoing at the eastern end of the site. The existing planning boundary is shown on Drawing Number P24188-FT-XX-XX-DR-CE-0107 in Volume 4 of this EIAR along with the existing ownership boundary.

3.2.6 Existing Availability and Management of Feedstocks

3.2.6.1 Feedstock Availability

The proposed feedstock is agricultural residues including cattle and pig slurries, farmyard manures (e.g. cattle and horse) and poultry manure of which there is significant generation in Ireland. Table 3-1 shows the feedstock availability within 35 km of the proposed development. Refer to Chapter 2, Section 2.8.2 for further information.

Feedstock is divided into two main subcategories:

- Liquid Farmyard Manures (LFYMs)
  - cattle slurry
  - pig slurry
  - duck slurry
- Solid Farmyards Manures (SFYMs)
  - poultry manure
  - farmyard manures
- High Grade Farmyard manures (HFYM)

The Applicant has selected the feedstock mix as described in Section 3.4.3.

Table 3-1: Feedstock Availability within 35 km of the Proposed Development

County	Tonnes of Feedstock	No. Farms
Carlow	820,510	1,723
Kildare	303,653	634
Kilkenny	1,120,646	1,787
Laois	679,376	1,281
Wicklow	192,684	-
Wexford	528,162	866
Totals	3,645,031	6,382

3.2.6.2 Existing Management of the Proposed Feedstocks

Currently, animal manures, i.e. solid farmyard manures (SFYM) and liquid farmyard manures (LFYM) are spread to land in accordance with the Nitrate Regulations (See Section 2.6.2.1 of Chapter 2). Farmers collect and store SFYM and LFYM in the closed season (16-20 weeks) and spread in open season[3]. Intensive agricultural operators engage contractors to collect and store manures for spreading on contracted spreadlands[4] in open season. Table 3-2 shows the existing tillage and pastoral areas available for land spreading within the catchment. It shows the total area of agricultural land within Carlow and surrounding counties. The table was generated using data from CSO and DAFM.

Table 3-2: Existing Agricultural Holdings

County	Tillage (ha)	Horticultural & Fruit (ha)	Grassland (ha)	Total farmed (ha)	Percentage of Land Area within 35 km	Land Area (ha) Available wihtin 35km
Carlow	16,875	3,450	50,817	71,142	100%	67,692
Kildare	30,405	3,900	81,115	115,460	25%	27,880
Kilkenny	17,305	3,900	144,722	165,977	50%	81,014
Laois	16,920	3,150	103,104	123,174	40%	48,010
Wexford	47,936	9,750	117,693	183,651	20%	33,125
Total	**129,441**	**24,150**	**497,451**	**659,404**		**257,721**

3.2.6.3 Existing Management of Liquid Farmyard Manures: Cattle Slurry

Cattle slurry is a suspension of the liquid and solid faecal matter of cattle collected during indoor housing typically in the winter period as part of agricultural dairy and beef enterprises. Typically, cattle slurries from suckler, dairy and beef finishing enterprises are managed entirely on-farm. They are stored in slurry tanks on the farms where they are produced and spread onto the farm's lands during the slurry spreading season in accordance with the European Union (Good Agricultural Practice for Protection of Waters)(Amendment) Regulations 2026 - S.I. No. 119 of 2026 (Nitrates Regulations) and the farms' Nutrient Management Plan (NMP). Where the generating farm does not have capacity to spread all or some of the slurry arising it is exported to other farms and spread in accordance with the Nitrates Regulations and the receiving farms NMP.

[3] The closed period for slurry spreading is a feature of the Nitrates Directive and the periods for Ireland are 1st October to January 12th /15th/31st depending on which part of the country a farm is located. For example, the closed season for Carlow is 1st October to January 12th but weather and soil conditions should be suitable for spreading after the closed season. Refer to Chapter 2, Section 2.6.2 for details on the Nitrates Regulations and Nutrient Management Plans (NMPs).
[4] Spreadlands is a term used to describe lands on which manures and slurries are spread

3.2.6.4 Existing Management of Poultry/Duck Slurry

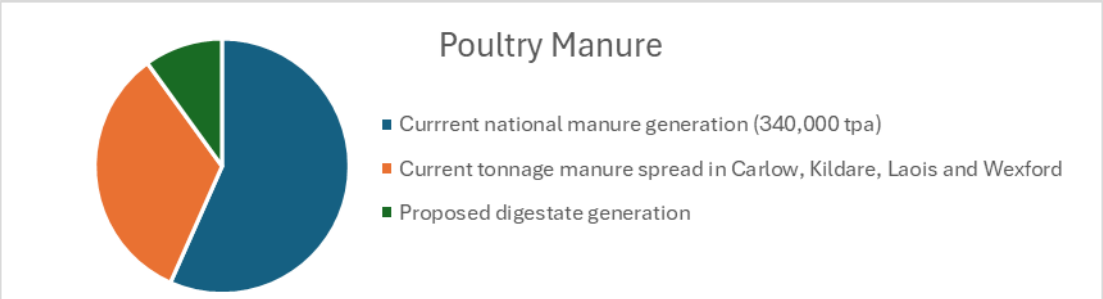
Duck slurry is a suspension of the liquid and solid faecal matter of ducks collected during year-round indoor housing associated with duck rearing enterprises. Poultry manure is a straw-based manure generated from broiler house bedding associated with the intensive rearing of poultry for meat production. Intensive poultry farmyards use limited bedding and therefore poultry manure is mainly faecal matter with limited straw content.

Poultry manure is rich in essential nutrients such as N, P and K, making it a highly potent fertiliser for tillage crops in Ireland[5]. The facilities that will supply this manure to the proposed development are geographically concentrated, in Limerick, Monaghan, and Cavan[6]. Duck slurry is generated in Monaghan and poultry manure in Monaghan, Limerick and Cavan. Agricultural land especially in the Cavan / Monaghan Region is not as suitable for land spreading these slurries and manures as tillage land in the southern Leinster Region due to their soil type, topography and existing soil nutrient loading . The poultry and duck units typically engage Aggregators to collect, store and transport manures from these areas to tillage farms for landspreading in the Eastern Region. 26% of all tillage farms in Ireland are located in Carlow, Kilkenny, Waterford, Kildare and Laois whereas the border counties have just 2% of all tillage farms (Central Statistics Office)[7]. Where an aggregator is engaged to deliver manures, they are spread by the receiving farmer in accordance with its NMP.

The operation of intensive agricultural activity (>40,000 bird places), e.g. poultry and duck units are regulated by an Industrial Emissions (IE) Licence issued by the EPA.

Licensees are bound to operate in accordance with the conditions and schedule of the IE licence. Typical licence conditions stipulate handling requirements and requirements for reporting of movements of organic fertiliser generated by the installation.

The existing movement of poultry manure from source to spreadlands is conditioned by the IE licence and typically managed by aggregators on behalf of the IE licence holder. The aggregator delivers the manures to the receiving spreadlands in accordance with Nutrient Management Plans and by the Nitrates Regulations. The receiving farmer spreads the manures to fertilise their lands. There are guidelines on Good Farming Practice: Spreading of Poultry Litter (Deparment of Agriculture). The chart shows the proportion of digestate generated from poultry manure to be managed in comparison to total poultry manure generation and the current quantity managed in Carlow, Kildare, Laois and Wexford. Data was compiled by the Applicant using CSO data and industry expertise.

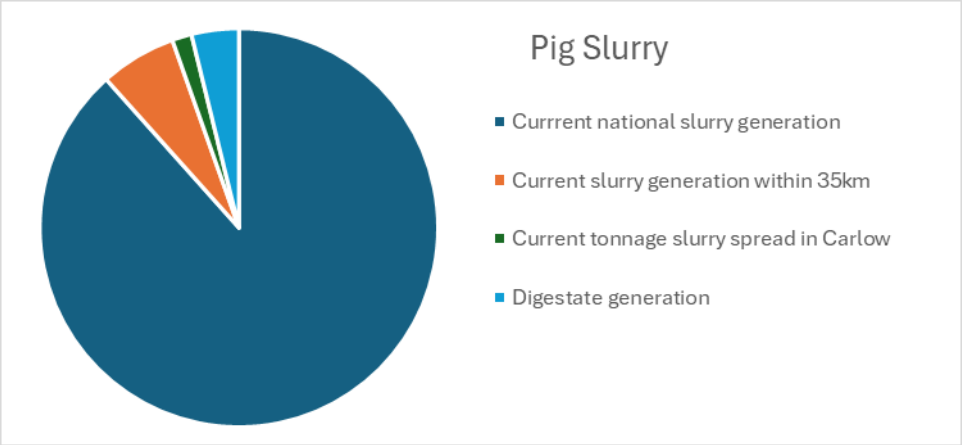


[5] https://teagasc.ie/news--events/daily/broiler-litter-as-a-fertiliser-in-tillage-systems/
[6] As per the LOI's signed
[7] According to CSO Around 6 in 10 Specialist Tillage farms were in the South-East, Mid-East and Dublin regions.https://www.cso.ie/en/releasesandpublications/ep/p-fss/farmstructuresurvey2023/farmstructure/

3.2.6.5 Existing Management of Pig Slurry

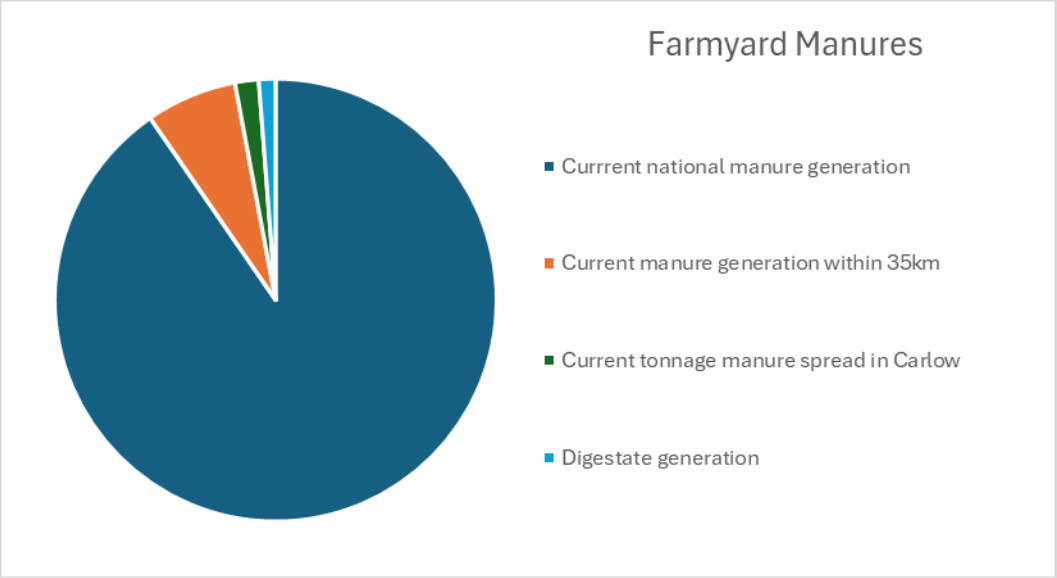
Pig slurry is a suspension of the liquid and solid faecal matter of pigs collected during year-round indoor housing associated with intensive pig rearing enterprises. These are concentrated in specific areas of the country e.g., northern, mid-west region and the south west region (Central Statistics Office, n.d.) and there are piggeries located within 35km of the proposed development. The pig farmers have access to their own landbanks which is an effective management strategy that involves a beneficial relationship with tillage farms. The pig farms provide their excess slurry to tillage farms in need of the fertilising benefits. The receiving farms benefit from a consistent supply of organic fertiliser for their soils. Piggeries often fall into intensive agriculture, requiring and IE licence in accordance with the First Schedule of the EPA Act 1992 as amended. Typical conditions in recent IE licences include requirements for handing and reporting of movement of organic fertilisers.

The existing movement of pig slurry from piggeries to spreadlands is conditioned by the IE licence, the receiving spreadlands' Nutrient Management Plan and by the Nitrates Regulations. The pie chart shows the proportion of pig slurry generated in Ireland compared to the proportion generated and managed in Carlow.



3.2.6.6 Existing Management of Farmyard Maure and High Grade Farmyard Manure

Farm Yard Manure (FYM) is straw based manure generated mainly from suckler cattle farms and beef finishing lots where animals are housed on straw-covered concrete floors during calving season or rearing of young animals and for over wintering. The straw bedding is periodically removed for fresh straw. FYM is therefore a mixture of urine wetted straw and solid faecal matter. High Grade Farmyard Manure (HGFYM) is from stabling of horses associated with the bloodstock and horse racing industries. The replacement of straw in racehorse stables is a daily event resulting in a manure with a high straw content and low faecal matter content. HGFYM has similar energy properties to fresh straw. Existing management of this feedstock is via landspreading in accordance with Nutrient Management Plans, either at farm of origin or on agricultural lands in need of fertiliser in compliance with the Nitrates Regulations.



3.2.7 Existing Utilities

There is a Gas Networks Ireland (GNI) transmission network pipeline (operating pressure 70 bar) in the vicinity of the existing site to the west of the M9 motorway running north south. There is an existing Above Ground Installation (AGI) at Clogrennane Lime Works with a 4 bar 100mm connection for the lime kiln. The location is shown in in Figure 3-1.

There are existing overhead electricity lines in the vicinity of the site with a 38 kV circuit running north south 3km east of the site.

There are no utilities on the existing site.

Utilities along the proposed pipeline route include electricity, telecommunications, water and foul water.

3.2.8 Existing Route of the Proposed Gas Pipeline

The proposed pipeline route is in the servitude of the existing road network:

- L3045 road for 100 m from proposed development to junction of R448
- R448 road travelling south from the site for c. 2 km to junction with L3038
- L3038 / L3039 road northwards for c. 4.5 km before turning westerly along Milford Park Road.
- along Milford Park Road for c. 1 km before turning north along the L3043 road for c. 900 m.
- c. 160 m on L7031 road turning into Clogrennane Lime Works to an existing AGI.

It is shown in Figure 3 2 and in the drawings in Volume 4 of this EIAR.

3.3 Proposed Development and Project

The public notice states:

In accordance with Section 37E of the Planning and Development Act 2000 (as amended), Greengate Biogas 001 Ltd. gives notice of its intention to make an application to An Coimisiún Pleanála (the 'Commission') for permission for development comprising the construction and operation of an anaerobic digestion facility at Powerstown, Milford, Co. Carlow.

The proposed development is covered by the provisions of the Renewable Energy Directive III (Directive 2023/2413) and the planning application is subject to a completeness check under section 37JA of the Planning and Development Act 2000 (as amended). The proposal is considered a 'Renewable Energy Development' under the definition introduced by S.I. 274 of 2025 into Section 2 of the Planning and Development Act 2000, as amended. When a notice issues in accordance with section 37JA(b), the provisions of Article 26A of the Planning and Development Regulations 2001 to 2025 shall apply.

The proposed development is an anaerobic digestion facility for the production of 250 GWh per annum of renewable natural gas and biogenic liquefied carbon dioxide from agricultural residues, including liquid farmyard manures and solid farmyard manures, collectively referred to as 'feedstocks'. The application seeks a planning permission that has a duration of 10 years from the date of grant. The proposed development will consist of the following:

- 2 no. site entrances off L3045, and a Weighbridge and Weighbridge Office (Gross Floor Area {GFA} 20 sqm, 3.85 m high).
- Circulation Yard (33,000 sqm) including: a Liquids Reception Building (GFA 735 sqm, 9.25 m high); a Solids Reception Building (GFA 2,386 sqm, 14.25 m high); a Solid Digestate Building (GFA 1,160 sqm, 12.85 m high); an Administration Building (GFA 459 sqm, 5.45 m high with a roof access area at 7.15 m high); a Heating Centre (GFA 1,314 sqm, 15.45 m high), with an exhaust stack (20 m high); 2,200 sqm of roof mounted solar panels on the Heating Centre, Administration Building, Liquids Reception Building and Solids Reception Building; and an Odour Abatement System including a stack (651 sqm, stack 35 m high).
- Bunded Tank Farm (19,075 sqm) including: 6 no. Primary Digesters (28.3 m high); 3 no. Secondary Digesters (28.3 m high); 1 no. Tertiary Digester (18 m high); 1 no. Post Digestion Liquid Digestate Storage Tank (21 m high); 1 no. Liquid Pre-Storage Tank (21 m high); 1 no. Digestate Storage Tank (17.6 m high); 3 no. Pasteurisation Tanks (11.9 m high); and Tank Farm Building (GFA 410 sqm, 5.5 m high).
- Gas Upgrade Area including: a Desulphurisation Plant (10.75 m high); a Gas Upgrade Plant (24.0 m high); a CO_2 Liquefaction plant (13.9 m high); a Biomethane Network Entry Facility (147 sqm, containers 2.975 m high, infrastructure 5.175 m high); and 2 no. Gas Flares Units (11.1 m stack height).
- Drainage Infrastructure and a Storm Water Lagoon (5,733 sqm).
- 1 no. Digestate Loading Tank (3.5 m high); 2 no. Buffer Storage Tanks (5.75 m high); and 2 no. Process and Fire Water Storage Tanks (4.6 m high).
- 2 no. ESB Substations (20 kV substation and a 38 kV substation).
- Ancillary Infrastructure including: Storage of Chemicals; Process and Fire Water Supply; Site Security; Lighting; Landscaping; and Car Parking (48 no. spaces).

An Environmental Impact Assessment Report (EIAR) and a Natura Impact Statement (NIS) have been prepared in relation to the project and accompany the planning application. The proposed development comprises an activity requiring an Industrial Emissions licence from the Environmental Protection Agency. The proposed development will be classified as a Lower Tier Control of Major Accident Hazards (COMAH) establishment and therefore falls under the scope of S.I. No. 209 of 2015 Chemicals Act (Control of Major Accident Hazards involving Dangerous Substances Regulations 2015).

The EIAR and NIS have been prepared in respect of the construction, operation and, decommissioning of the project, including a gas pipeline for which permission is not being sought. The gas pipeline route is 9.6 km from the anaerobic digestion facility (for which permission is being sought) to an existing Above Ground Installation at Clogrennanne Lime Works, in the townland of Raheendoran, Co. Carlow. The gas pipeline route traverses the following townlands: Powerstown, Orchard, Ballynaboley, Rathvinden, Glebe, Rathornan, Tomard Upper/Lower, Ballygowan, Ballinabranagh, Fonthill and Raheendoran, all of which are within Co. Carlow.

As stated in the public notice, in addition to the proposed development, the Project includes a gas pipeline which is outside the boundary for development consent (red line boundary). Gas Networks Ireland as the Statutory Undertaker will be responsible for obtaining development consent to construct and operate the proposed gas pipeline. The assessment of the gas pipeline route is included in this EIAR. The gas pipeline route as provided by GNI to Greengate Biogas 001 Ltd. is 9.6 km from the anaerobic digestion plant biomethane network entry facility (BNEF) to an existing AGI at Clogrennanne Lime Works, Co. Carlow.

The pipeline will be laid in the R448 road travelling south from the site for c. 2 km. The gas pipeline will then follow the L3038 / L3039 road northwards for c. 4.5 km before turning westerly along Milford Park Road.

The pipeline will travel along Milford Park Road for c. 1 km before turning north along the L3043 road for c. 900 m. The gas pipeline will connect to the Clogrennan AGI, located just off the L7031 road. It is shown in Figure 3-1 and in the drawings in Volume 4 of this EIAR.

An electricity supply is required to power the proposed development. The route or nature of the electricity supply has not been determined by ESB. Greengate Biogas 001 Ltd. submitted a grid connection application in May 2025. ESB will be responsible for obtaining development consent for the electricity supply as the Statutory Undertaker.

Each element of the proposed development is described in the following sections.

A detailed overview of the proposed feedstock menu is given in Section 3.4.3. The AD process will produce a raw biogas and digestate. The raw biogas generally consists of 50-75% methane and 25-50% carbon dioxide, along with smaller amounts of water vapor, hydrogen sulphide, and other trace gases. The raw biogas will be conditioned, desulphurised, separated into biomethane for injection into the local gas network as RNG and liquefied into biogenic CO_2 for export off site. This section describes the operation of the proposed development, the proposed feedstocks, the production of biogas and digestate and the proposed built infrastructure. A very simple flow chart of the process is shown in Figure 3-5 and a more detailed flow chart is included as Figure 3-6.

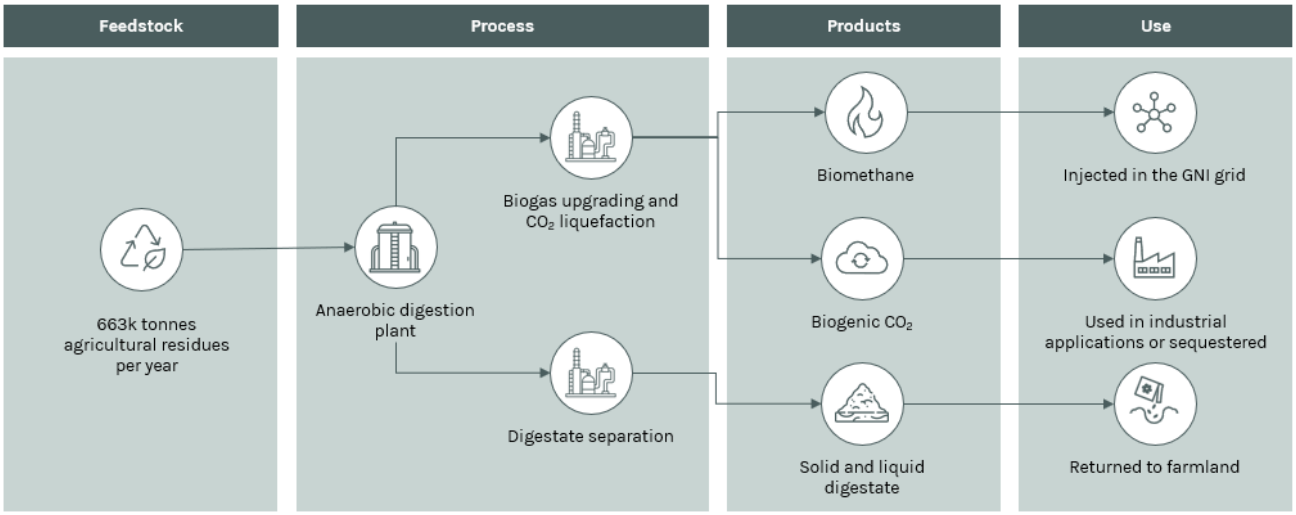
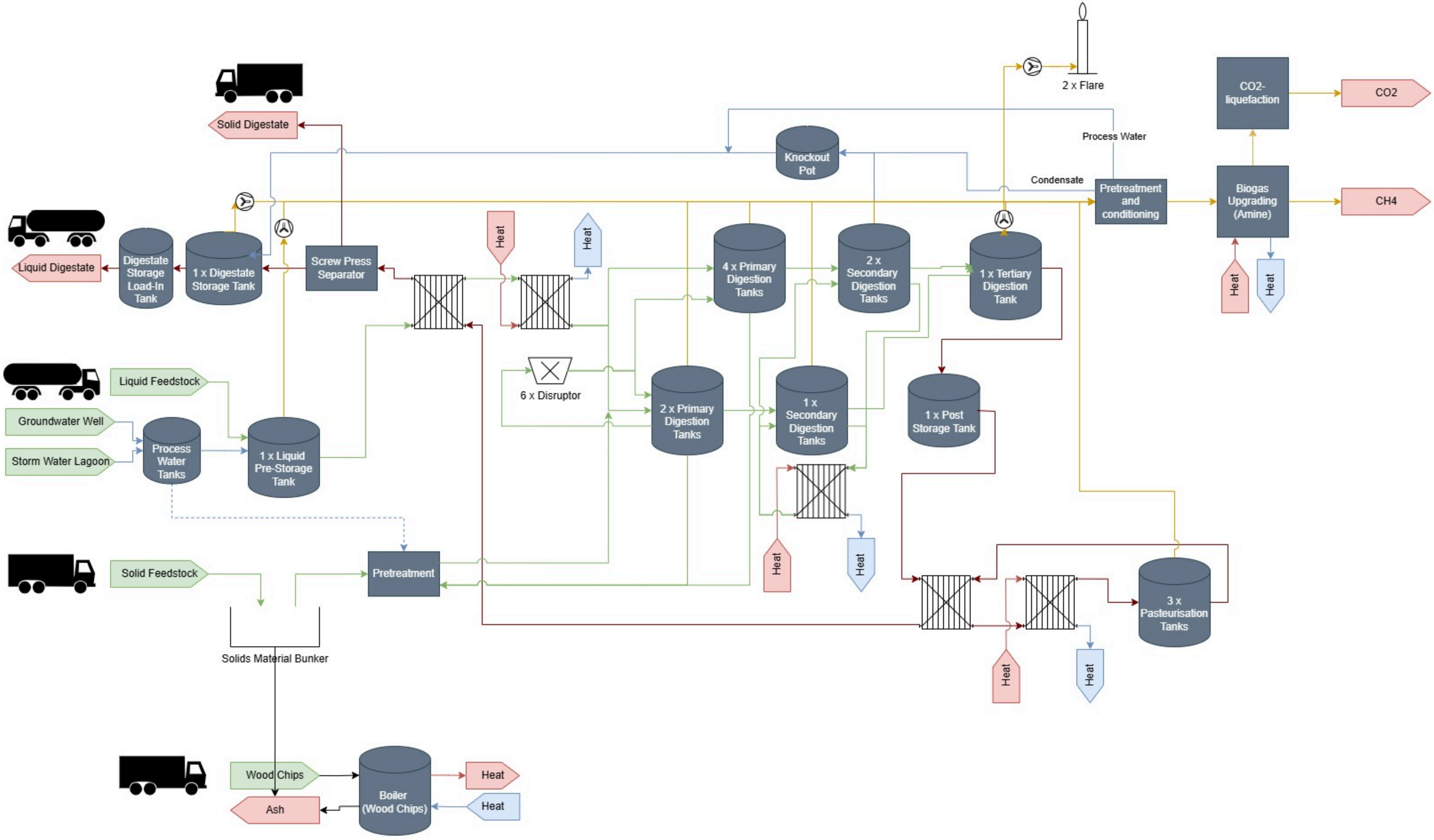


Figure 3-5: Anaerobic Digestion Simple Flow Chart


Solid Digestate
Liquid Digestate
Digestate Storage Load-In Tank
1 x Digestate Storage Tank
Screw Press Separator
Heat
Heat
Knockout Pot
2 x Flare
Process Water
Condensate
Pretreatment and conditioning
CO2-liquefaction
CO2
Biogas Upgrading (Amine)
CH4
Heat
Heat
4 x Primary Digestion Tanks
2 x Secondary Digestion Tanks
1 x Tertiary Digestion Tank
6 x Disruptor
2 x Primary Digestion Tanks
1 x Secondary Digestion Tanks
1 x Post Storage Tank
Liquid Feedstock
Groundwater Well
Storm Water Lagoon
Process Water Tanks
1 x Liquid Pre-Storage Tank
Heat
Heat
Heat
Heat
Solid Feedstock
Pretreatment
Solids Material Bunker
3 x Pasteurisation Tanks
Heat
Heat
Wood Chips
Ash
Boiler (Wood Chips)
Heat
Heat

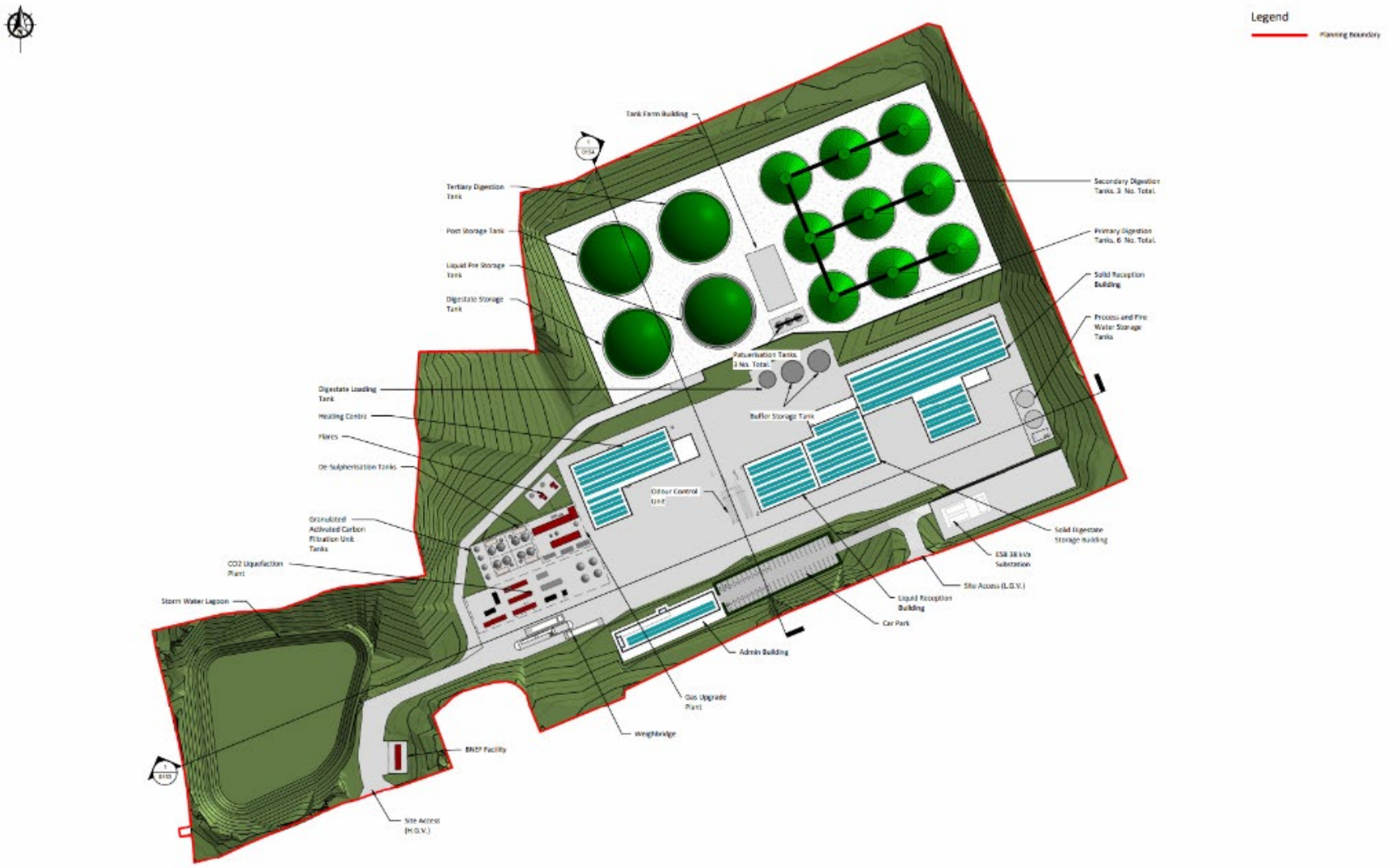


Figure 3-7: Proposed Site Layout

(See Drawing No. P24188-FT-XX-XX-DR-CE-0110 Proposed Site Layout Plan is in Volume 4 of this EIAR.)

3.3.1 Site Entrance and Access

The proposed Heavy Goods Vehicle (HGV) entrance is the existing western entrance. The second entrance to the east will be used only by cars and vans (LGV's)accessing the site. The proposed entrances which are accessed directly off local road L3045 which is in turn accessed off regional road R448. The local road L3045 junction onto the regional road R448 is <1 km from junction 6 of the M9 Dublin to Waterford motorway.

The proposed HGV entrance will be upgraded with a setback from the L3045, creating a dedicated internal stacking lane that allows HGVs to pull completely off the public road before reaching the security gates, ensuring the existing ghost junction to facilitate turning off the R446 remains unobstructed. The access point features wide turning radii and clear visibility splays to accommodate heavy articulated traffic safely. Security is maintained by 2.4m high powder-coated steel palisade fencing and automated gates, supplemented by a high-speed rising arm barrier for daytime traffic control. The proposed LGV entrance will be upgraded with new fencing and gates as at the HGV entrance. There will be an upgrade of road markings on the L3045 to clearly sign the site entry. The entrance itself will have high-visibility directional signage and lighting. Permission is sought to add appropriate advance warning signage for both accesses on the L3045. Examples of the signs are included in Section 6,8 of Chapter 6 Traffic and Transportation.

Drawing No. P24188-FT-XX-XX-DR-CE-0310 Proposed Plans and Elevations HGV Entrance and Drawing No. P24188-FT-XX-XX-DR-CE-1803 Site Entrance Sightlines are in Volume 4 of this EIAR.

The existing property consisting of cottages, sheds and outbuildings located on the site of the quarry is not included in the proposed planning boundary. Upon grant of planning, Greengate Biogas 001 Ltd. will take vacant possession of this property. Any future use of the property will be in compliance with the Guidance on technical land-use planning advice (HSA, 2023) and with planning legislation.

The proposed development does not introduce a new access onto the public road network. Rather, it makes use of two existing accesses, both of which have previously been accepted by the Planning Authority to serve the former quarry development, including HGV traffic associated with quarry operations. The current proposal retains the existing quarry access for future use by light vehicle access to the AD Plant and upgrades the former quarry access for HGVs, with both accesses providing the required visibility splays and operating sightlines. The receiving L3045 and its junction with R448 previously served the landfill and continue to serve the civic amenity site.

In these circumstances, it is considered that the principal road safety considerations associated with the haul route and access arrangements have already been established through the previous planning consent and the demonstrated operation of the accesses. The current proposal does not involve any fundamental change to the geometry of the public road or the manner in which traffic enters or exits the site. Accordingly, any road safety matters that might be identified through a Road Safety Audit are unlikely to be fundamental to the acceptability of the proposed development and would more likely relate to detailed design matters capable of being addressed through the detailed design process post decision.

It is also noted that the requirement for a Road Safety Audit was not identified during pre-planning engagement or subsequent consultation with Carlow County Council. Nevertheless, should the Planning Authority consider that a Road Safety Audit would be beneficial, the Applicant would have no objection to a condition requiring the completion of a Road Safety Audit and the implementation of any reasonable recommendations agreed with the Planning Authority at the detailed design stage prior to the commencement of development.

3.3.2 Weighbridge and Weighbridge Office

All vehicles entering the facility will enter via an at-grade automated weighbridge located on the southern boundary of the proposed development on the access road. The at-grade weighbridge will be of steel construction, mounted on load cells within a reinforced concrete pit chamber. A weighbridge office will be centrally located, elevated to be level with incoming HGV cabs to allow the operator to converse with all truck drivers. Access during operational hours will be controlled via traffic barriers.

The weighbridge office, centrally located between the weighbridges will be a cladded structure. It will contain furniture as required for the weighbridge operator, all electronic hardware necessary for operation of the weighbridge and appropriate storage for filing of paper-based records.

Drawing No. P24188-FT-XX-XX-DR-CE-1765 and 1766 Weighbridge Building Entrance Plans and Elevations and are in Volume 4 of this EIAR

3.3.3 Circulation Yard

All incoming solid and liquid feedstocks will be directed to the circulation yard. The circulation yard will be constructed using reinforced concrete to ensure durability, a drainage system is integrated in the design to manage storm water runoff, preventing pooling. The yard will have clear road markings and signage for safety and efficient traffic flow, alongside dedicated lighting to ensure safe operation during the hours of darkness.

3.3.4 Solids Reception Building

The solids reception building is for the reception of solid feedstocks. It is located at the eastern end of the site. The Solids Reception Building will be a portal frame building surrounded by a concrete circulation yard to facilitate access and egress of incoming and outgoing solid FYM delivery vehicles. The roof will accommodate solar panels.

There are five elements to the building:

- Solids Reception Hall
- Solids Material Bunker
- Solids Infeed Area
- Solids Pretreatment Shredding Area
- Electrical and Control Area

All areas of the solids reception building excluding the internally separated electrical and control area) will be connected via pipework to the odour abatement system (See Section 3.3.8).

Drawing No.s P24188-FT-XX-XX-DR-CE-1700-1703 Solids Reception Building (Plans, Elevations and Sections) are in Volume 4 of this EIAR

3.3.4.1 Solids Reception Hall

The solids reception hall will be constructed with a structural steel frame, reinforcement steel and insulated composite wall and roof panels with a concrete floor. The face of the building looking north has a 1 m section of translucent wall panel across the length of it to allow for sunlight to enter.

The hall will have 4 no. rapid entry roller doors and 4 no. internal roller shutter doors.

3.3.4.2 Solids Material Bunker

The solids material bunker will comprise a reinforced concrete bunker structure approximately 4m lower than the solids reception hall. The bunker will be internally compartmentalised from the reception hall by internal cladding and accessible by internal roller shutter door during the tipping of materials. The bunker will be capable of storing up to four days' worth of feedstocks to allow for continual automatic feeding of the plant during periods where feedstocks are not being accepted e.g. Sundays, Bank Holidays etc. Two overhead gantry cranes will be used to mix and stack incoming solid feedstocks in preparation for deposition to the solids pretreatment area.

3.3.4.3 Solids Pretreatment Area

The solids pretreatment area will be a standard steel structural frame, clad with insulated composite wall and roof panels on a concrete floor. Two identical pretreatment areas are proposed to either side of the solids materials bunker. Each pretreatment area will contain a shredder and two solids bio mixers. The installed gantry cranes will be able to feed each shredder. Access roller doors will be provided to each side of the solids biomixer areas for service and maintenance of the shredders, biomixers and gantry cranes.

3.3.4.4 Electrical and Control Area

The electrical and control area will be built using concrete walls, and a concrete floor. Access is provided through two entrances: one leading from the solid infeed area, and the other directly from the exterior of the building.

3.3.5 Liquids Reception Building

Liquid feedstocks will be delivered to site in sealed tankers to the liquid reception building. It is located central to the site. It will be constructed as a steel portal frame structure, with insulated cladding on the walls and roof. The north and east facades include a continuous translucent wall panelling to allow daylight in. There are 4 no. rapid entry roller doors on the side of the building looking south and another 4 no. rapid entry roller doors on the opposite side of the building looking north. There is an access single door on the side of the building looking south and another on the side of the building looking north. On the facade of the building looking east there are 2 no. access double doors and 1 no. access single door. The roof will accommodate solar panels. The liquids reception building has 4 no. lanes each separated by raised kerbing. Each lane contains:

- two spigot valve connection points, one to unload feedstocks and one to load digestate
- pump system to assist in loading of digestate
- pipework for the transfer of digestate or LFYM between the specialist liquid tankers and their respective storage tanks
- an odour abstraction hood in each lane, immediately above the tanker venting system to control point source emissions
- steel stairs and gangways to allow driver access about the tanker for cleaning operations

Within the liquids reception building there is a separate enclosed area with concrete walls and a hollowcore concrete roof. This enclosed area is divided into the following three sections:

- Laboratory and Sample store
- Mechanical room
- Electrical room

All areas of the liquids reception building excluding the internally separated electrical and control area) will be connected via pipework to the odour abatement system (See Section 3.3.8.) Drawing No.s P24188-FT-XX-XX-DR-CE-1715-1716 Liquid Reception Building (Plan and Section) are in Volume 4 of this EIAR

3.3.6 Solid Digestate Building

The Solid Digestate Building will be used for the separation of digestate into solid and liquid digestate following the anaerobic digestion process. Post separation all solids digestate will be stored and transferred offsite from within the solid digestate building. The facility is in an enclosed steel-frame building with insulated wall and roof panelling. Translucent wall panelling is included to allow daylight to enter.

The solid digestate building is divided in four main areas:

- Solid Digestate Loading Bay
- Solid Digestate Storage Area
- Separator Loft
- Mechanical and Electrical Area

All areas of the building excluding the mechanical and electrical area is connected via pipework to the odour abatement system . (See Section 3.3.8 and Section 3.4.4.) Drawing No.s P24188-FT-XX-XX-DR-CE-1710-1711 Solids Digestate Storage Building (Plans and Elevations) are in Volume 4 of this EIAR.

3.3.6.1 Solid Digestate Loading Bay

The solid digestate loading bay is within the solids digestate building. The digestate loading bay will be physically separated from the digestate storage area by a reinforced concrete stub wall to maintain physical separation. Hot power washing equipment will be located within the loading area for cleaning operations. A drainage system is installed in the floor to capture wash water runoff. This wash water is recycled back into the anaerobic digestion process.

3.3.6.2 Solid Digestate Storage Area

The solid digestate storage area will comprise a large open area of reinforced concrete floor. Reinforced concrete retaining walls approximately 5m in height will contain the stored solid digestate. A stub wall will provide separation between the digestate loading area described previously. A roller shutter door will provide access to loading area by a high-tip wheeled loading shovel used for loading operations. This wheeled loader will only be used for the loading of solid digestate. A conveyor arrangement suspended from the roof structure of the solid storage area will allow for solid digestate exiting the screw press dewatering system to be transferred about the entire floor plan of the solid digestate store. The conveyor system will be designed to allow solid digestate to be stored to an average height of 4m across the floor area. A total of approximately 4 days solid digestate storage will be provided to allow for continued operation of the digestate dewatering process during periods where solid digestates are not being transferred offsite e.g. Sundays, Bank Holidays etc.

3.3.6.3 Digestate Separation Loft

A loft space will be constructed to the rear of the Solid digestate storage area. The separator loft will contain the 4 no. screw press separators (See Figure 3-8 and Figure 3-9) used to dewater digestate into its solid and liquid fractions The screw press separators will use a rotating screw to push the digestate material upwards through a cylindrical screen. As digestate is compressed against the screen the liquid fraction is filtered out, flowing downward with the solid fraction exiting at the end.

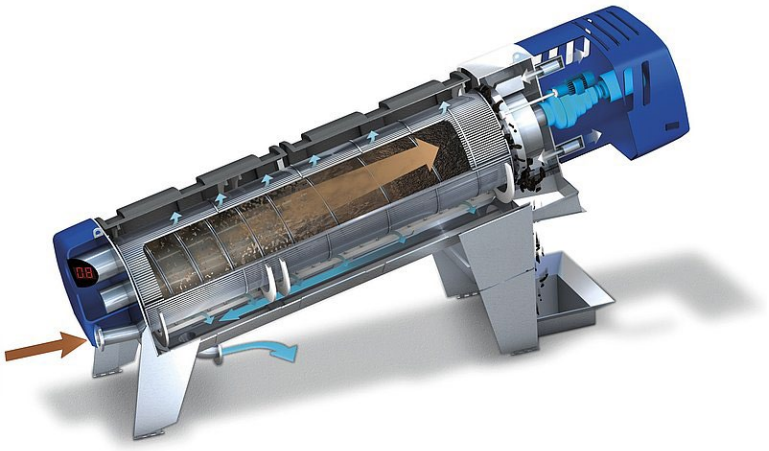


Figure 3-8: Screw press Separator Illustration (huber, 2025)

The liquid digestate will be transferred to the Post Digestion Liquid Digestate Storage Tank in the tank farm bunded area, awaiting collection for transfer offsite via the Liquids Reception Building (See Section 3.3.5). The solid digestate will drop downward through an open hatch in the loft to the automatic conveying system below(Figure 3-10). The conveyor system will automatically allow for stockpiling of solid digestate to the floor of the solid digestate storage area described previously.



Figure 3-9:Screw Press Separator Units



Figure 3-10:Solid Digestate Elevated Conveyor System

3.3.6.4 Mechanical and Electrical Area

The mechanical and electrical area will be constructed using reinforced concrete walls and has two access points from the outside. Internal stairs will access the digestate separation loft area. The main floor for the mechanical and electrical area is divided into three rooms: plant spares, small parts store and an electrical and control room.

3.3.7 Bunded Tank Farm

Drawing No. P24188-FT-XX-XX-DR-CE-1725-Tank Farm Layout is in Volume 4 of this EIAR.

The proposed bunded tank farm will comprise a large concrete bund area, lower locally to the surroundings fully encircled by a reinforced concrete wall. The bund will be access via a ramp that form part of the overall bund structure. The concrete bund will be designed and constructed in accordance with the requirements of

- EPA Guidance on the Storage and Transfer of Materials for Scheduled Activities (EPA, 2004)
- BS 8007 Code of practice for design of concrete structures for retaining aqueous liquids (BSI, 1987)
- CIRIA C736 Containment systems for the prevention of pollution (CIRIA, 2014)

The bunded area will be capable of retaining 110% of the largest tank volume or 25% of the total installed tank volumes (whichever is the greatest) with an appropriate freeboard depth. The bund will be subject to integrity testing prior to commissioning. The bund will provide impermeable secondary containment in the highly unlikely event of a tank failure or leakage.

The tank farm will comprise 16 no. tanks required for the anaerobic digestion process, these include 6 no. Primary digester tanks, 3 no. Secondary digester tanks and 1 no. Tertiary digester tanks. Additionally, there will be 1 no. Post Digestion Liquid Digestate Storage Tank, 1 no. post storage/digestion tank 1 no. Liquid Pre-Storage Tank and 3 no. Pasteurisation tanks located in the tank farm. A list of tanks is included in Table 3-3, and further detail is provided in the following sections. The buffer storage tanks (2 no.) and the digestate loading tank (1 no.) are located between the feedstock reception buildings and the tank farm.

The tanks are shown on the tank farm layout, tank farm details and elevations drawings (Drawing No's P24188-FT-XX-XX-DR-CE-1726-1730) are in Volume 4 of this EIAR.

Biogas will be collected from each digestion tank via gas piping. Sloping of the pipes and condensate wells will be installed at different areas of the plant as required. The condensate will be discharged to the liquid pre storage tank.

Table 3-3: Tank Farm Schedule

Tank	Number of Tanks	Internal Diameter (m)	Height (m)	Liquid Storage Volume (m3)
Primary Digester	6	23.9	28.3	10,408
Secondary Digester	3	23.9	28.3	10,408
Tertiary Digester	1	33	10* Note 1	7,356
Post Digestion Liquid Digestate Storage Tanks	1	35	9.6 * Note 4	12,026
Liquid Pre-Storage Tank	1	35	9.6 * Note 4	12,026
Pasteurisation Tank	3	4	10.7*note 5	135
Digestate Storage Tank	1	35	9.6 *Note 2	8,274
Buffer Storage Tanks Note 3	2	11	5.75	500
Digestate Loading Tank Note 3	1			150

Note 1 Tank Wall height; Total Height including Gas Balloon 18m
Note 2 Tank Wall height; Total Height including Gas Balloon 17.6m
Note 3 Tanks outside tank farm in dedicated bund
Note 4 Tank wall height; total height 21 m
Note 5 11.5m with gantry

3.3.7.1 Primary Digesters

There are 6 no. Primary digester tanks. Primary digesters will be constructed in steel. The steel digesters are constructed using coated (painted C2) steel plates for the liquid zone and stainless steel (AISI316) for the top gas zone (top ring and roof). The digesters will feature a reinforced concrete flat bottom. Insulation will be mounted on the outside tank and appropriately painted. The roof will be made of stainless steel, clad in insulation with a painted finish. There is a centrally located top mounted agitator on the tank's roof accessed by external stairs. The digester will be externally heated via an externally mounted heat exchanger to maintain the thermophilic process temperature range

3.3.7.2 Secondary Digesters

There are 3 no. secondary digester tanks. Secondary digestion tanks will be constructed identical to the Primary Digesters previously described.

A stair arrangement by a spiral staircase externally mounted to the primary and secondary digesters will allow access to the roof area and central stirrer motor. There will be a walkway between the tanks. The stairs and walkways will be constructed in hot galvanized steel according to relevant standards. There will be a minimum of two spiral access stairs to allow for separate access and egress points from the tank roof area. The digester will be externally heated via an externally mounted heat exchanger to maintain the thermophilic process temperature range

3.3.7.3 Tertiary Digesters

There is 1 no. tertiary digester tank. The tertiary digester tank will be constructed in concrete with a twin layered gas membrane domed roof. The tertiary digester will be externally heated via an externally mounted heat exchanger to maintain the thermophilic process temperature range. A twin layered gas membrane domed roof will be used to cover the tank. The concrete tank will be clad with insulation with a painted finish. Paddle mixers or submerged agitators will continually mix feedstocks within tertiary digestion tank.

3.3.7.4 Liquid Pre-Storage Tank

There is 1 no. tank with 4 no. days storage. The tank is constructed from reinforced concrete and is sealed to prevent odour emissions. It is located in the tank farm bunded area, connected via pipework. The tank will have several submerged mixers to keep particulate matter suspended in the slurry. The tanks are covered with a membrane gas cover and will connected to the gas system for collection of gas. These tanks will not be heated or insulated.

3.3.7.5 Post Digestion Liquid Digestate Storage Tank

Liquid digestate will be stored in a reinforced concrete tank with several submerged mixers to ensure that digestate can be mixed prior to pasteurisation. This is referred to as a Post Storage Tank on drawings in Volume 4 of this EIAR. A twin layered gas membrane domed roof will be used to cover the tank. The concrete tank will be clad with insulation with a painted finish. Paddle mixers or submerged agitators will continually mix feedstocks within post digestion liquid storage tank. The tank will be insulated to maintain digestate temperature pre-pasteurisation.

3.3.7.6 Pasteurisation Tanks

Digestate will be pastuerised in accordance with Animal By-Product Regulations (>70^{o}c, >60mins) in three pasteurisation tanks. Pasteurisation tanks will be constructed in stainless steel and externally insulated. Pasteurisation tanks will be mixed by a centrally mounted vertical mixer. Each pasteurisation tank will be fitted with a minimum of three temperature probes to monitor temperature within the process. Internal heating coils will be used to heat the digestate. The three tanks will operate on a rotational/batch basis, each serving a specific rotating function i.e. Step 1 receiving the digestate, Step 2 holding and heat, and Step 3 empty by pumping to the digestate storage tank. This rotation cycle shifts hourly (i.e. >60mins).

3.3.7.7 Digestate Storage Tank

Pastuerised digestate will be stored in a reinforced concrete tank with several submerged mixers to ensure that digestate can be mixed prior to collection by trucks. The digestate storage tank will be uninsulated. The roof will be a twin layer gas membrane domed roof with gas collection to the gas system. Digestate storage capacity will be minimum 4 days at full production.

3.3.7.8 Buffer Storage Tanks

Two buffer storage tanks will be provided to allow for efficient site operation for the transfer of liquid feedstocks. Liquid feedstock will if required be pumped to buffer storage in advance of the Liquid Pre Storage Tank. The buffer storage tanks will be constructed in reinforced concrete with submerged mixers. The buffer storage tanks will be uninsulated. Buffer storage capacity will be approximately 1,000m^3 (2 x 500m^3). The buffer storage tanks will be connected to the Odour Abatement system (See Section 3.3.8).

3.3.7.9 Digestate Loading Tank

A digestate loading tank will be provided to allow for efficient pumping and transfer of digestate. Pastuerised digestate will be pumped from the digestate storage tank and the digestate loading tank. The digestate loading tank will be constructed in reinforced concrete with submerged mixers to ensure that digestate is mixed prior to collection by trucks. The digestate tank will be uninsulated. The roof will be flat with a connection to the Odour Abatement system. Digestate storage capacity will be approximately 150m^3, i.e. 6-7 liquid vacuum tankers loads.

3.3.7.10 Tank Farm Building

There will be a building within the tank farm as shown in Drawing No. P24188-FT-XX-XX-DR-CE-1790 in Volume 4 of this EIAR. It will be used for mechanical and electrical equipment and controls for the tank farm.

3.3.7.11 Tank Farm Bund

The tank farm bund is designed in accordance with Guidance to Storage and Transfer of Materials for Scheduled Activities (EPA, 2004). The tank farm will be bunded in its entirety to ensure enough containment is provided in the unlikely event of a leak at the facility. The bund will measure 18,900 m^2 with a depth of 2.15m (including 0.25m freeboard) giving a total capacity of 35,910 m^3.

The tank farm bund will be impermeable and provide the required storage volume for the proposed tank farm i.e. the greater of; 110% of the largest single tank volume (110% of 12,206 m^3 = 13,229 m^3) or 25% storage of the sum of all tanks (25% of 133,904 m^3 = 33,476 m^3) contained within the bund. The tank farm bund will be designed and submitted to the EPA for approval in advance of construction in accordance with the conditions of the IE licence. It will be subject submission of construction quality assurance certification to the EPA prior to operation and regular integrity testing as a licence condition.

The bunded area will be at a lower level than the surrounding areas and will be accessed via a dedicated access ramp.

Rainwater falling within the bunded area will drain to a collection sump, from where bund water will be pumped to the process water tanks or storm water storage lagoon (See Section 3.4.11). Pumping from the bunded area will be automatically controlled via level sensors. Water pumps will activate whenever collected rainwater exceeds a predetermined “high level” in the collection sump and the pumps will continue to pump until the predetermined "low level" is achieved.

To maintain the integrity of the bunded area and prevent pumping during unlikely events such as fire and/or a tank leakage the following control measures will be employed. The rainwater pumps will be programmed (via the site SCADA system) to automatically disable in the event of a site alarm e.g. fire alarm, leakage alarm.

Independent to this system it is proposed that a Continuous Emissions Monitor (CEM) will be installed within the bunded area rainwater collection sump. The CEM will monitor a set parameter or number of parameters (e.g. electroconductivity, pH) on a continuous basis. The default automatic pump control status will be OFF. Only if all sensors are measuring within preset operational criteria (i.e. those expected for rainwater) will the CEM allow the installed pumps to switch to ON status and start pumping.

3.3.8 Odour Abatement System

The solids reception, liquid reception and solid digestate building will be maintained under continuous negative air pressure via connection to the odour abatement system.

The ventilation and odour abatement system is designed to achieve a minimum of two air changes per hour in all areas with three air changes proposed in the solid reception building bunker area.

The odour abatement system will be designed to treat 100,000 m^3/hr with an odour destruction efficiency of 95-99.5%. The maximum odour concentration from the odour treatment system is 1,000 OU/m^3. The stack height is 35 m above ground. The odour abatement system performance will be operated in accordance with the conditions in the EPA IE licence.

Details with respect to building footprints, heights, volumes and design abstraction rates are shown in Table 3-4. The total treatment volume will be lower than shown as air changes per hour are dependent on time of day. During days, doors are opened to allow feedstock unloading and digestate loading and air change is higher than night time when all doors closed and no feedstock handling. Total air volume for treatment is 100,000 m^3/hr.

Table 3-4: Odour Unit Metrics

Area	Volume (m^3)	Air Changes per Hour	Treatment Volume (m^3/hr)
Solids Reception Building - Bell Jar	7,956	2	15,912
Solids Reception Building - Bunker Area	12,002	3	36,006
Solids Reception Building - Pretreatment Area	12,025	2	24,050
Solid Digestate Storage Area	8,932	2	17,864
Liquid Reception Building	6,076	2	12,152

The proposed odour abatement system will be BAT compliant and is widely employed in the UK, Sweden and Denmark in waste treatment and anaerobic digestion facilities dealing with odour laden exhaust gas streams.

The abatement system includes a combination of Ammonia (NH_3) Scrubbing, High Intensity Ultraviolet (UV), Photo Chemical Oxidation and Activated Carbon Filtration technologies enabling the system to achieve high levels of odour removal for all odorous species that could be generated from the onsite activities. Selected air streams will also be subject to advanced Hydrogen Sulphide Pre-Filtration. Drawing No. P24188-FT-XX-XX-DR-CE-1720 Odour Abatement Unit: Elevation Section and Details is in Volume 4 of this EIAR.

3.3.8.1 Ammonia Scrubber

The process can give rise to ammonia emissions. An ammonia scrubber is used for an efficient ammonia removal. It consists of two "packed towers", filled with inert packing materials. Water conditioned with sulphuric acid referred to as a scrubbing liquor is also used in the system. The ammonia containing airstream is introduced at the base of the tower and flows upward through the packing. The acidic scrubbing liquor is distributed evenly from the top and flows downward by gravity. As the air and liquid pass counter-currently over the inert packing, ammonia transfers from the gas phase into the liquid and reacts with the acid to form a stable ammonium salt (e.g. ammonium sulphate).

The packing materials provide a larger surface area for the necessary chemical reaction, promotes turbulence, increases residence time, and ensures efficient mass transfer within a compact footprint. The water which contains ammonium sulphate is drained when concentration reaches a threshold (25%) and will discharge to the anaerobic digestion process for treatment.

Once treated by the ammonia scrubber; the air undergoes further treatment via high intensity UV, photo chemical oxidation and activated carbon filtration. Some air streams will be pre-treated before the ammonia scrubber, as described in the next subsections.

3.3.8.2 Photo Chemical Oxidation

Photo Chemical Oxidation oxidises volatile organic compounds (VOCs) and eliminates odour through high intensity ultraviolet (UV) light, ozone, and photo chemical oxidation supported by special purpose catalysts. The UV reactor achieves odour reduction of up to 90% on its own. Using photolysis, the UV reactor breaks down particles, creates ozone and converts ozone into free oxygen radicals. The radicals react with the odours compounds to neutralise the odour. The dual bed activated carbon filters act as a polishing step in the odour treatment process prior to discharge to the atmosphere via the stack.

3.3.8.3 Activated Carbon Filtration

Activated carbon filtration removes odorous compounds by adsorbing them onto the surface of porous carbon media. Odorous air is drawn through a vessel containing granular or pelletised activated carbon with a very high internal surface area. As the air passes through the carbon bed, odour-causing gases such as hydrogen sulphide and volatile organic compounds (VOCs) are physically and chemically bound to the carbon surface. Carbon media is replaced or regenerated once adsorption capacity is exhausted.

3.3.8.4 Hydrogen Sulphide Pre-Filtration

Selected odour sources will be subject to hydrogen sulphide prefiltration prior to entering the ammonia scrubber tower. These sources include the buffer storage tanks The hydrogen sulphide prefiltration system is a specialist iron based media used for the removal of odorous sulphur compounds, primarily hydrogen sulphide (H_2S). Odorous air is passed through a vessel containing the granular hydrogen sulphide prefiltration iron oxide media. As the air flows through the bed, hydrogen sulphide reacts chemically with the iron oxide within the media to form stable, non-odorous iron sulphide compounds. This irreversible reaction removes sulphur based odours effectively at ambient temperatures without the use of chemicals or liquids. The iron oxide media is replaced once its reactive capacity is exhausted.

An Odour Management Plan (OMP) will be implemented as part of the Environmental Management system (EMS) for the IE licence. As noted above, odour will be controlled in accordance with the conditions of the EPA IE licence.

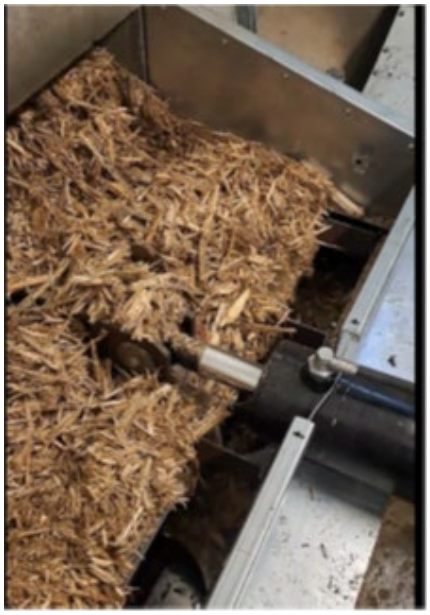
3.3.9 Heating Centre

The proposed heating centre will be a reinforced concrete substructure with a cladded, steel portal frame. The roof will accommodate solar panels.

It will provide renewable heat for use within the biogas upgrading and anaerobic digestion process. Heat will be generated by 2 No. 4 MW wood biomass boilers. Approximately 13,000 tpa of biomass will be required to produce the heat demand of the proposed development. From an energy point of view, biomass is defined as organic matter (based on carbon, hydrogen and oxygen) of non-fossil origin that has an intrinsic chemical energy content. It includes all terrestrial and aquatic vegetation, better known as virgin biomass, and all the biodegradable organic waste, such as municipal solid waste, animal waste, agricultural and forestry residues, and certain types of industrial waste. The biomass boiler at the proposed development will utilise indigenously sourced virgin wood chips, RED III compliant for heat generation. Wood chips are shown in the photograph (KSM Bioenergy) in this section.

The principal consumer of heat generated in the heat centre will be the biogas upgrading plant for the regeneration of amine (See Section 3.4.16). It also provides heat for the digestion and pasteurisation processes. The heating centre will contain the following:

- Biomass Delivery Bunkers
- Biomass Storage Bunker
- Biomass Boilers
- Biomass Boiler Exhaust Air Treatment System
- Heating Centre Exhaust Stack
- Ash Handling System



Each of these are described in the following sections. Drawing No's P24188-FT-XX-XX-DR-CE-1745 - 1748 Heating Centre Plans, Elevations, Sections and Details are in Volume 4 of this EIAR.

3.3.9.1 Biomass Delivery Bunkers

Biomass will be delivered to site by articulated or fixed body tipper or walking floor trailers. The biomass delivery vehicle will reverse into position at the biomass delivery bunkers external to the heating centre building. Two delivery roller access doors will open, and biomass will be emptied by walking floor into two below ground bunkers made of reinforced concrete. A screw conveyor or gantry crane will then empty the delivery bunker into the main biomass storage bunker within the heating centre. An external type of delivery bunker is shown in Figure 3-11.



Figure 3-11: Biomass Delivery Bunker (Lin-Ka Energy)

3.3.9.2 Biomass Storage Bunkers

The biomass storage bunker will comprise a reinforced concrete structure contained within the main heating centre building. The bunker will provide approx. 4 days storage of biomass materials to allow for continue boiler operations during non-delivery periods e.g. Sundays and Bank Holidays.

3.3.9.3 Biomass Boiler

Biomass will be fed by a pusher into the biomass boiler combustion chamber. The combustion chamber is designed to ensure complete and efficient combustion of the biomass. Air will be forced into the combustion chamber by a ventilator fan to drive combustion. Heat generated within the boiler will be transferred via a heat exchanger to water for use elsewhere. Ash generated from combustion known as bottom ash will be collected in the base of the combustion chamber and augured to the ash handling system. Flue gas will travel onward to the exhaust air treatment system.

3.3.9.4 Exhaust Air Treatment System

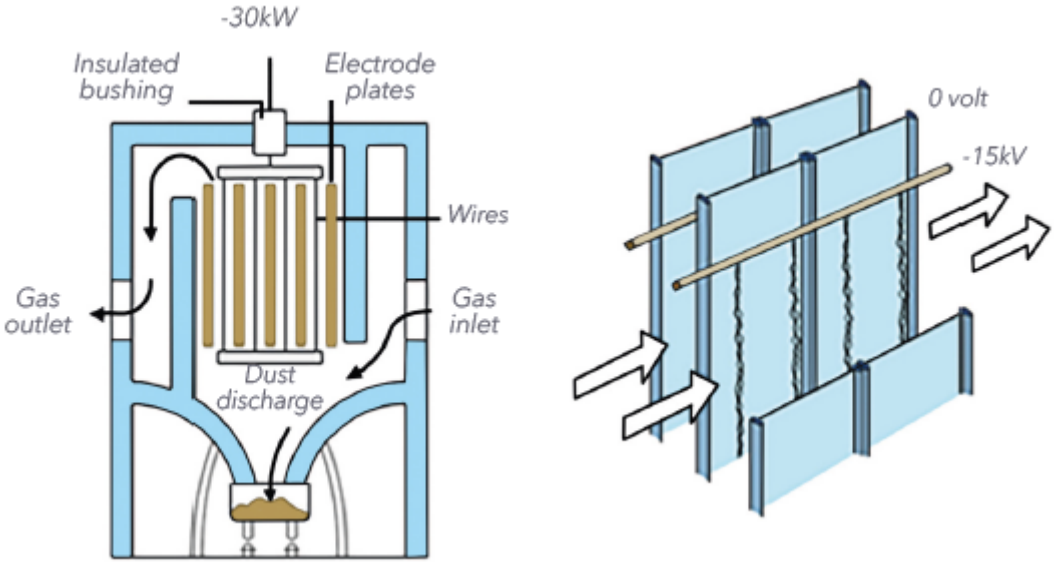


Figure 3-12: Electrostatic Precipitator Diagrammatic (Lin-Ka Energy)

The flue gas system cleans exhaust gases from the boiler to mitigate any potential emissions to air. The gas passes through two main cleaning stages; a multicyclone and an electrostatic precipitator (ESP) before a flue fan moves it safely out through the heating centre stack. Together, these components ensure particle emissions stay below 30 mg/Nm³.

1. Multicyclone

The hot flue gas leaves the boiler through insulated pipes and enters the multicyclone. This device spins the gas so that larger dust particles are separated and collected. It is built from heat-resistant steel and includes two access hatches for cleaning. Collected ash falls into an outlet where an auger transfers it to the boiler's ash system.

2. ESP (Electrostatic Precipitator) Filter

After the multicyclone, the gas enters the ESP, which removes the fine particles that the cyclone cannot capture. The ESP uses electrical charging to trap these particles, and it cleans itself automatically. A small air supply is required for operation. With the ESP installed, emissions stay below 30 mg/Nm³ (compared to about 150 mg/m³ without it). All collected dust is discharged into a shared ash container.

3. Flue Fan

The flue fan sits after the ESP and maintains the correct negative pressure in the combustion chamber. It is frequency-controlled and built with 20% extra capacity to handle sudden changes in system demand. Heat-resistant sleeves and rubber mounts reduce vibration and noise. A cleaning flap on the fan housing allows easy maintenance.

3.3.9.5 Heating Centre Exhaust Stack

Treatment exhaust air emissions will be exhausted to atmosphere via the heating centre exhaust stack. The exhaust stack will be fitted with a range of continuous emissions monitors (CEMs) for, NO_X and dust to ensure compliance with limits in the European Union (Medium Combustion Plant) Regulations 2017 (S.I. 595 of 2017).

The heating exhaust stack will be one chimney containing 2 no. 20 m high and 500mm diameter stacks. Emissions from this stack will be conditioned by the EPA IE licence.

3.3.9.6 Ash Handling System

Bottom ash from the biomass boiler and fly ash collected within the ESP will be conveyed to one of two ash storage containers. Approximately, 133 tpa of ash will be produced from biomass combustion. Containers will have a capacity of approximately 10 tonnes and will be transported by a standard "hook lorry" under a waste collection permit for recovery or disposal offsite at an appropriately authorised facility (see Figure 3-13 for typical ash handling container). The ash is non-hazardous as generated only from combustion of biomass (woodchip).



Figure 3-13: Typical Ash Handling Container (KSM Bioenergy)

3.3.10 Desulphurisation Plant

The desulphurisation plant is located to the west of the site, and west of the gas upgrade plant. It consists of a series of 8 no. hydrogen sulphide filtration towers which are constructed using insulated cladding material. The tanks are 3.6m diameter and 10m high. Each roof has a manhole and an inspection hole. Near the base of each tank there is a manhole and a gas outlet. There are 4 no. control units, each one servicing 2 no. hydrogen sulphide filtration towers and 1 no. activated carbon filter unit. All the tanks and containers are built on reinforced concrete foundations. See Volume 4 Drawings.

3.3.11 Granulated Activated Carbon Filter Plant

The granulated activated carbon filter plant is located to the west of the site, adjacent the desulphurisation plant. It consists of 4 no. filter towers. The towers are constructed in steel and are 2.6m in diameter and 8.3m high. The towers are built on reinforced concrete foundations.

3.3.12 Gas Upgrade Plant

The proposed biogas upgrading plant is an Amine based technology. It is located in front of the desulphurisation plant. It is built on a reinforced concrete foundation. It consists of a raw biogas inlet that feeds into 3 no. blower units, which flows to the granulated activated carbon to the absorption column which separates the carbon dioxide by Amine liquid. From here methane is sent to the renewable gas container (for odourisation and conditioning). The rest is sent to the stripper column which uses heat to remove the carbon dioxide from the enriched amine. There is a heat controller container connected to this to control it and process cooling equipment to control the temperatures. There are an additional 2 no. granulated carbon filters. See Volume 4 Drawings.

3.3.13 Carbon Dioxide Liquefaction Plant

The carbon dioxide liquefaction plant is located directly south and adjacent to the desulphurisation plant and the gas upgrade plant. It will liquefy the carbon dioxide generated in the AD process so that it can be transported off site as a renewable source of biogenic CO_2. The plant It is built on reinforced concrete foundations, and it consists of equipment to compress and cool carbon dioxide to covert it from a gaseous state into a liquefied state. See Volume 4 Drawings. The equipment includes:

- Liquid CO_2 Tanks
- Air Cooler Units
- Compressor Containers
- Process Containers
- Refrigeration Container
- H_2S adsorber
- CO_2 scrubber
- CO_2 distiller
- Deodouriser
- Gas Dryer
- Dust filters
- Gas Cooler Unit
- Superheater

3.3.14 Biomethane Network Entry Facility (BNEF)

A BNEF will be constructed onsite in accordance with Gas Networks Ireland (GNI) specifications and requirements. The BNEF will comprise a single container unit within a secure fence compound. The unit will be sized to manage a maximum of 3,300 m^3/hr of biomethane and a minimum of 2,700 m^3/hr. Average gas flow through this unit will be 2,600 m^3/hr. See Volume 4 Drawing No's P24188-FT-XX-XX-DR-CE-2600 and 2601 Proposed Grid Entry Unit (Plan and Elevations).

See Section 3.3.20 for details off the proposed gas network connection.

3.3.15 Gas Flares

Two emergency gas flare will be located to the west of the bunded tank farm. A gas flare is a self-contained unit with a stack with gas is combusted at over 850 °C for a specific retention time to ensure combustion of methane to carbon dioxide and destruction of trace including odours. It is powered by electricity and has a SCADA system to control the operational parameters. Each of the flares will be capable of treating 3,000 m³ of gas per hour. Gas flaring will be used in event that the gas injection unit is inoperable, and gas storage has reached capacity. The installed flares will have an over operational capacity of the expected hourly biogas production (6,000 m³/hr) and will ensure the safe and complete combustion of the raw biogas during an emergency,

Flaring of gas will only be considered as a last resort and will only occur during abnormal operating conditions e.g. system breakdown, rejection of gas by BNEF or during extended maintenance periods. There is capacity under normal operating conditions to recycle gas back into system, upgraded again and store for 3-4 hours before re-entry into BNEF. It is estimated that in a normal year the gas flare will operate for approximately 200 hours, principally during planned maintenance periods and for periodic flare testing. A typical enclosed gas flare is shown in Figure 3-14.

The operation of the flare during abnormal conditions and flare emissions will be regulated by the IE Licence issued by the EPA. There will be continuous monitoring of the flare during operations, recording percentage of methane, carbon dioxide, oxygen and hydrogen sulphide along with flow, temperature and pressure. See Volume 4 Drawings.



Figure 3-14: Typical Enclosed Flares (Himmel)

3.3.16 Administration Building

A dedicated administration building will provide for all site operations and administration staff. The building will include the following.

- IT/server room
- 4 No. Management offices
- 2 No. open plan offices (capable of seating 20 people collectively)
- Reception office
- Reception Area/ Foyer
- Conference Room
- 2 No. W.C.'s inc. 1 No. accessible
- Canteen
- Storeroom
- Male Changing Room including
    - Accessible W.C. and Shower Room
    - Externally Accessible W.C.
    - Shower Facilities
- Locker and Changing AreaFemale Changing Area
    - Accessible W.C. and Shower Room
    - W.C.
    - Locker and Changing Area
- Open-air viewing platform accessed from an internal staircase.

The building is orientated and glazed so staff can view the near entire site. The roof will accommodate solar panels. The open-air viewing platform is designed for visitor access. See Volume 4 Drawing No.s P24188-FT-XX-XX-DR-CE-1740 to 1742.

3.3.17 Drainage Infrastructure

Drawing No's P24188-FT-XX-XX-DR-CE-0500 to 0506 in Volume 4 of this EIAR show the proposed drainage layout. The proposed development includes the installation of a comprehensive, segregated drainage network for the facility. The infrastructure consists of collection, control, and storage systems for:

- storm water/rainwater
- wash water
- process water
- foul water

The drainage strategy for the proposed development has been designed to physically interrupt potential pollution pathways, control runoff rates, and provide multiple, redundant stages of treatment, containment, and isolation.

Figure 3-23 in Section 3.4.11 illustrates the water management strategy. This section describes the drainage infrastructure. Section 3.4.11 describes the operation of the drainage infrastructure.

3.3.17.1 Storm and Rain Water Collection Areas

The proposed development has a fully separated drainage system for clean storm and rain water, comprising distinct hydraulic networks. The networks include;

- a drainage network serving the yard and circulation areas
- a drainage network serving the bunded tank farm
- a roof water drainage network collecting rainwater runoff from building roofs
- an interceptor drainage network collecting clean overland flows from surrounding lands and quarry cut areas

All storm and rain water is collected in the proposed storm water lagoon. The storm water lagoon is described in Section 3.3.17.4.

Water collected from the yard and circulation areas is collected via a network of linear drainage channels and gulleys. No feedstock or digestate handling activities will be conducted externally as all unloading and loading takes place indoors. Collected yard area water is gravity fed via a Class 1 Full Retention Oil interceptor to the main collection chamber. The interceptor is included for the separation of any potential minor hydraulic oil spills or leaks from rainwater draining across the yard area.

Water collected in the tank farm bund drains to one of two sumps in the bund. If it is determined that the bund water is clean (See Section 3.3.7.11), collected water is pumped directly to the storm water lagoon.

Water collected from the roof areas is gravity fed to the main collection chamber.

The proposed facility is located in a local depression due to past quarrying. Overland water flows from the surrounding higher areas and quarry cut are collected in an interceptor drain and flows via gravity to the main collection chamber.

The main collection chamber is located to the east of the storm water lagoon. The reinforced concrete chamber will be equipped with three high-capacity pumps (2x duty and 1 x standby). An automated SCADA control system will control the pumping of water to the storm water lagoon during rainfall events. Storm water pumps will be electrically operated. An automatic diesel generator will provide back-up power to these pumps in the event of a power supply interruption.

The proposed development has a significant daily water demand; most of this demand will be supplied from the storm water lagoon. An outlet pump chamber controls the flow of water from the storm water lagoon back to the AD process water tanks under normal operating conditions. There is an automated valve in the outlet pump chamber that allows discharge under specific conditions to the external drainage network. Those conditions are detailed in Section 3.4.11.

3.3.17.2 Wash Water and Process Water Collection Areas

The internal building drainage network will collect wash water and runoff from the solid feedstocks or digestate storage areas and convey it to the process dedicated drainage collection area in each building i.e. Solid Reception, Liquids Reception, and Solid Digestate Storage buildings)

The internal drainage network will drain via gravity to dedicated wash-water collection sumps. A sealed pipe network and pumping system will transfer collected wash water from the internal sumps directly to the Liquid Feedstock Reception Tank for use in the anaerobic digestion process. See Section 3.3.7.4

3.3.17.3 Foul Water

Foul water i.e. municipal wastewater will be collected from administration building and site welfare units. All foul water will be directed to a Foul Storage Tank. Foul storage tanks will be provided three locations across the site. Each tank will serve the following welfare infrastructure

- Administration Building – Canteen and Welfare Facilities
- Solid and Liquid Reception Building - Welfare Facilities
- Heating Centre - Welfare Facility

A dedicated foul drainage network will connect the welfare facilities to the three proposed foul water tanks.

3.3.17.4 Storm Water Lagoon

The proposed storm water lagoon will be located in the southwest of the site at the entrance. The storm water lagoon will be constructed with an earthen embankment i.e. a raised embankment made from compacted soil. The lagoon will be lined with a 1mm LLDPE Basal liner. The lagoon will also include a 1mm LLDPE floating cover to minimise the potential for microbial or algae growth. The floating cover will be equipped with a surface rainwater recovery pump discharging to the to the main collection chamber. This recovery pump will collect rainwater falling on the lagoon cover.

The effective lagoon depth is 3.0 m, with a total depth of 3.6 m. This includes a 0.30 m freeboard and a 0.30 m sump for particle sedimentation. The lagoon inlet level is fixed at the lowest level of 44.00 m. Since the gravity discharge system is approximately 1 m above this level, an overflow pump and pressure pipes are required to transfer excess water into the lagoon when the water level rises from 1 m up to 3 m. The gravity outfall will also be fitted with a flap valve to prevent reverse flow.

The design flows—and therefore the maximum volume of water to be managed within the lagoon using an additional pump station—corresponds to the 30 year return period event. This pump station (2 x duty pumps and 1 x standby pump) will operate both as a process water pump and as a drainage/dewatering pump. It will extract water from the lagoon and supply the process tank, with an approximate hourly demand of 2.12 L/s when dewatering for large storm events, it will assist the lagoon extract any excess water when the water depth reaches 3 m or greater. Under normal conditions storm water from the lagoon will be pumped via a dedicated internal rising main to the process water storage tanks located at the far eastern extent of the site, opposite the Solids Reception Building.

In the scenario where the storm water lagoon is at capacity, the process water tanks are at capacity and there is a one in 30 year storm event, clean excess water will be discharged to the existing drainage system in the R448 that flows to Powerstown Steam at greenfield rates over a 24 hour period. Refer to Section 3.4.11 for the operation of the drainage system.

3.3.17.5 Process and Fire Water Tanks

Process water tanks will act as the primary water supply for the anaerobic digestion process. The proposed process water tanks will be used to provide all wash down water required on site. The process water tanks will supply water as required to solids feedstocks post biomixing (See Section 3.4.4) to aid in pumping i.e. to partially liquefy the solid feedstock. The primary water supply for these tanks is from the storm water lagoon.

A groundwater supply well has been installed on site. The groundwater well will provide the balance of the process water to the AD process.

3.3.18 ESB Substation

The proposed facility includes for the provision of two ESB substations:

- 10-20 kVa Medium Voltage Substation – Construction and Early-Stage Commissioning Phase
- 38 kVa Medium Voltage Substation – Operational Phase

The 10-20 kVa substation is proposed to provide a temporary power import capacity during the construction and early-stage commissioning phases of the development of up to 2MW. See Drawing No. P24188-FT-XX-XX-DR-CE-1770.

The 38 kVa network is proposed to provide permanent power import for the operational phase of the development of up to 7MW. See Drawing No's P24188-FT-XX-XX-DR-CE-1780-1783 in Volume 4 of this EIAR.

The ESB substation will be located in the south of the site, adjacent the LGV entrance. The ESB substation will be designed as per ESB Specifications. The proposed substation will be constructed to the requirements of ESB Networks.

3.3.19 Ancillary Infrastructure

3.3.19.1 Storage of Chemicals

Cleaning agents and process chemicals will be used at the proposed facility. They will be stored onsite in bunded areas in accordance with best practice and in compliance with the relevant regulations. Chemicals to be used at the proposed development and their method of storage are as follows:

Chemicals	Volume Per Annum	Location
Window spray (400 ml)	15 x	Administration building
Cleaning agent	10 x	Administration building; workshop; feedstock building
Polyamine-liquid to boiler water	200 L	Bunded pallet in Boiler building
Hydrocarbon/CO2 cooling agent	3000 L	IBC CO2 liquefaction unit and heating area
Inhibted Sulphuric acid	2000 L	IBC Feedstock building
Sodium hydroxide	1000 L	IBC Feedstock building
Ferric powder	2000 kg	Bunded pallet Feedstock building

Chemicals	Volume Per Annum	Location
Inhibited hydrochloric acid	2000 L	IBC Feedstock building
NPK fertilizer for biofilters	3,000 L	IBC Gas cleaner, upgrading area, airtreatment area
Kuvette test	10 kg	Bunded pallet Laboratory
Calibration liquid x3	5 kg	Bunded pallet Laboratory
Sulphuric acid (Laboratory)	5 L	Bunded pallets Liquid reception, laboratory
Hydrochloric acid (Laboratory)	5 L	Bunded pallets Liquid reception, laboratory
Anti-foam	100 L	Bunded pallet Upgrading area
Glycol cooling liquid	2,500 L	IBC Upgrading area or boiler room
Salt tablets	100 kg	Bunded pallet Upgrading area or boiler room
Drying agent (Sorbead)	2000 kg	Bunded pallet Upgrading area or boiler room
Amine-liquid	12,000 L	Bunded pallet Upgrading area, inside container
Biogas storage	34,278 m3	Various gas storages
Gearoil	2,000 L	Bunded pallets in Workshop
Hydraulic oil	500 L	Bunded pallets in Workshop
Brake cleaner (400ml)	15 x	Bunded pallets in Workshop
Motor oil	200 L	Bunded pallets in Workshop
Gasoline	5 L	Bunded pallets in Workshop
Silicone spray (400 ml)	20 x	Bunded pallets in Workshop
Ceramic paste (400 ml)	20 x	Bunded pallets in Workshop
Cockpit spray (400 ml)	15 x	Bunded pallets in Workshop
Grease on tube (400 ml)	15 x	Bunded pallets in Workshop
Autoshampoo (400 ml)	50 L	Bunded pallets in Workshop
Universal grease (400 ml)	40 x	Bunded pallets in Workshop
Windshield wiper fluid	100 L	Bunded pallets in Workshop
Adblue	1000 L	Bunded pallets in Workshop
Diesel for wheel loader and vehicles	5000 L	Bunded Diesel Tank
Anti-rust, WD-40 (400 ml)	20 x	Workshop; feedstock building
H2SO4, Sulphuric acid 96%	79 m^3	Bunded Tank at Odour Control Unit
NaOH, Sodium Hydroxide	280 m^3	Bunded Tank at Odour Control Unit
H2O2, Hydrogen Peroxide	114 m^3	Bunded Tank at Odour Control Unit
Activated Carbon	23 tonnes	Bunded Pallet in Workshop
hydrogen sulphide prefiltration (Sulphared)	1.5 tonnes	Bunded Pallet in Workshop

All chemicals will be stored in accordance with IPC Guidance Note on Storage and Transfer of Materials for Scheduled Activities (EPA, 2004) and will be conditioned by the EPA IE licence.

3.3.19.2 Fire Water Supply

Fire water supply will be provided form the Process Water Tanks (See Section 3.3.17.5). Process Water Tanks will be controlled to at all times maintain the minimum fire water supply design volume (240 m^3). The process water tanks will supply a series of fire hydrants located about the site. Hydrants will be supplied by a 150mm rising main by means of an electrical pump operating at 3-4 bar operating pressure[8]. Additional water supply can be provided by the surface water lagoon or groundwater pump supply. Emergency diesel power electrical generation will be used to power the groundwater and fire hydrant pumps in the event of power failure.

3.3.19.3 Firewater Retention

Firewater retention will be provided in accordance with the Guidance on Retention Requirements for Fire Water Runoff (EPA, 2019). In accordance with the Fire Water Risk Assessment (see Appendix 3.2 of Volume 3 of this EIAR) undertaken for the proposed development the worst-case scenario the overall amount of firewater retention capacity required at the proposed facility is 2,101 m^3.

Fire water retention will be provided within the storm water lagoon. In the event of a fire, automated drainage controls system (See Section 3.3.17) will pump firewater to the surface water lagoon for retention. Post event the storm lagoon would be emptied and transferred off site by an authorised contractor for treatment at an appropriately authorised facility. In that case, the storm water lagoon would be cleaned, before refilling with groundwater or stormwater. The storm water lagoon provides 2,385 m^3 of fire water storage.

3.3.19.4 Site Security

The proposed facility will include CCTV across all site areas internally and externally including the site access route and boundaries. It is proposed that CCTV will be monitored by site staff during operational hours and supported by a remote monitoring service outside operational hours. A 2.4 m high powder-coated steel palisade will be installed along the L3045. The existing post and wire fence will be removed, and the hedge line will be retained. Any hedge trimming required to facilitate the installation of the fence will be carried out outside of bird nesting season (March to August).

[8] Fire Water Volume and Hydrant Supply requirements as per the requirements of the Carlow Fire and Rescue Service.

3.3.19.5 Lighting

The facility will be appropriately illuminated internally and externally by appropriate energy efficient lighting. The facility lighting will be designed to minimise light pollution beyond the facility boundary. It is assumed that the facility will always be illuminated during set operational hours with task lighting provided in key operations areas. Outside operational hours, passive infrared (PIR) or movement detection sensors will be installed to control lighting around the site for security purposes. Installed lighting types will be dependent on the area to be illuminated. Typical lighting designs for key areas are described as follows:

- The solids reception building, liquid reception building, solid digestate building and heating centre will be internally illuminated by high bay energy efficient LEDs. This high bay lighting will provide a high level of light internal to the building.
- The circulation yard will be illuminated by high efficiency LED lighting mounted to the building envelope where available, alternatively 6-8m lighting columns will be placed at 20-40m spacings about the yard perimeter.
- The tank farm and gas upgrade plant area will be illuminated at a low level only (<2m) in and around the key tank components and infrastructure such as pumps valves etc.
- The administration and welfare building, and weighbridge will be illuminated internally with energy efficient lighting. Externally these areas will be illuminated during operational and waste acceptance. Externally car park areas will be down lighted from medium height columns (4-6m).

3.3.19.6 Landscaping

Soft landscaping including native hedging will be implemented on site. This is detailed in Drawing No. P24188-FT-XX-XX-DR-CE-3000 Proposed Landscaping Plan included in Volume 4 Drawings prepared by the landscape and visual impact and biodiversity competent experts.

3.3.19.7 SCADA

A supervisory control and data acquisition (SCADA) system is a system of software and hardware elements that allows the following:

- control industrial processes locally or at remote locations
- monitor, gather, and process real-time data
- directly interact with devices such as sensors, valves, pumps, motors etc. through human-machine interface software
- record events into a log file system
- provide warning and system alarms

The SCADA will be used to monitor and control the anaerobic digestion process, biogas upgrade, heating centre, grid entry unit, process water control, flares and continuous emissions monitoring devices.

3.3.19.8 Process Water Supply

A groundwater well has been installed on site to provide the required process water supply. The volume of water is below the threshold for an abstraction licence.

A yield test has confirmed supply and environmental testing confirmed water quality is fit for purpose.

Refer to Chapter 12 Soils, Geology and Hydrogeology for further information.

The majority of process water will be captured via rainwater harvesting. See Section 3.4.11.

3.3.19.9 Solar Panels

Solar panels covering a total area of 2,200 m^2 or approx. 1,300 panels will be installed across all available roof areas at the site. The proposed solar panels will be connected to the site "and will supply part of the overall site electrical demand during daytime hours. Solar power export from the site is not expected during standard operations. The solar panels are shown on the roof plans of the various buildings in Volume 4 Drawings of this EIAR.

The total estimated power provided by solar will be 430,000 kWh per annum.

3.3.19.10 Car Park

Based upon the maximum number of personnel that may potentially be on site at any one time (at shift changeover) the proposed development allows for a total of 40 no. regular staff parking spaces in addition to 2 no. disabled parking spaces. Of the total number of spaces, 25% (12 no.) are allocated as EV charging spaces, with the infrastructure designed to allow expansion to 100% EV charging provision in future years if required.

In addition, provision is made of 6 no. visitor spaces and 2 no. motorcycle parking spaces will be available for staff to use. There is bicycle parking in this area.

Cumulatively there are 48 no. car parking spaces, 2 no. motorcycle parking spaces and bicycle parking.

3.3.20 Proposed Gas Pipeline Route

Renewable natural gas (RNG) will be exported from the site via a gas pipeline. The proposed gas pipeline route is subject to a separate statutory consent. GNI is the Statutory Undertaker responsible for obtaining development consent for the proposed gas pipeline from the Commission for Regulation of Utilities (CRU). Separate consents are required for the construction and the operation of the pipeline. GNI has provided Greengate Biogas 001 Ltd. with a route that follows the road network. Drawing No. P24188-FT-XX-XX-DR-CE-2602 Proposed Gas Pipeline Route is in Volume 4 of this EIAR.

The proposed gas pipeline will be laid in the road network. The pipeline will be laid in the L3045 for 100 then turning onto R448 road travelling south from the site for c. 2.65 km to the intersection of the R448 and the L3038. The gas pipeline will then follow the L3038 / L3039 road northwards for c. 4.75 km before turning westerly along Milford Park Road (L7031). The pipeline will travel along Milford Park Road for c. 1 km before turning north along the L3043 road for c.1 km. The gas pipeline will connect to the Clogrennan AGI, located just off the L7031 road (c. 100m).

The route of the proposed pipeline will cross the River Barrow and the M7 motorway. The current road infrastructure crosses both of these features in overbridges. As the gas pipeline route is subject to a separate statutory consent and preliminary design has not yet been completed, this EIAR includes options for crossing watercourses and the M7 motorway as requested by GNI. GNI will be responsible for obtaining the necessary approvals from Carlow County Council and TII for the construction of the proposed gas pipeline.

Locations where the gas pipeline may deviate off the road are described in the following subsections:

3.3.20.1 Motorway Crossing

TII Structure (Eirspan Name Tomard Lower Road Overbridge 2 Ref no CW-M09-012.00) see Figure 3-15 to Figure 3-17. The L3038 crosses the M9 motorway within this structure.



Figure 3-15: Location of L3038 Overbridge across M9 Aerial View



Figure 3-16: Location of L3038 Overbridge across M9 Streetview



Figure 3-17: Location of L3038 Overbridge across M9 Motorway View

1. Based on pre application consultation with TII, it is proposed to by pass the structure by a trenchless construction methodology. It is assumed that Horizontal directional drilling (HDD) will be used to divert the gas pipeline under the M9 motorway. The appointed contractor may select an alternative trenchless construction technique if considered more appropriate. The final crossing methodology will be determined at detailed design by GNI for the consent application.

GNI will require a proposed motorway works consent under Section 53 of the Roads Act 1993 as amended to permit new infrastructure adjoining and under the motorway.

GNI will be required to seek approval from TII for the proposed network crossing. The proposed network crossing will be in accordance with TII publications as listed below and any updates:

- Requirements for the Reinstatement of Openings in National Roads CC-PAV-04007 (TII, 2019)
- Design for Durability DN-STR-03012 (TII, 2024)
- Specifications for Road Works - Trenchless Installation of Road Drainage and Service Ducts CC-SPW-02800 – Series 2800 (TII, 2009)
- CC-GSW-02800 Notes for Guidance on the Specification for Road Works Series NG280 (TII, 2009)
- CC-SPW-00500 —Specification for Road Works - Drainage & Service Ducts (TII, 2024)
- Technical Approval of Road Structures on Motorways and Other National Roads for structures (DN-STR-03001) (TII, 2025)

In consultation, TII stated, “where pipeline routing involves proposals to cross a Motorway Works Specific Deeds of Indemnities, arrangements for third party access or consent from TII in accordance with Section 53 of the Roads Act, 1993, is required. If deemed appropriate, the preferred method of necessary national road network crossings is by horizontal directional drilling (HDD) outside of the motorway reservation”.

Figure 3-18 shows the location of the crossing point. All works to install the pipeline will be outside of the Motorways Maintenance and Renewals Contract (MMaRC) boundary.

GNI will be responsible for obtaining the necessary approvals from Carlow County Council such as a road opening licence for the works in the L3037.

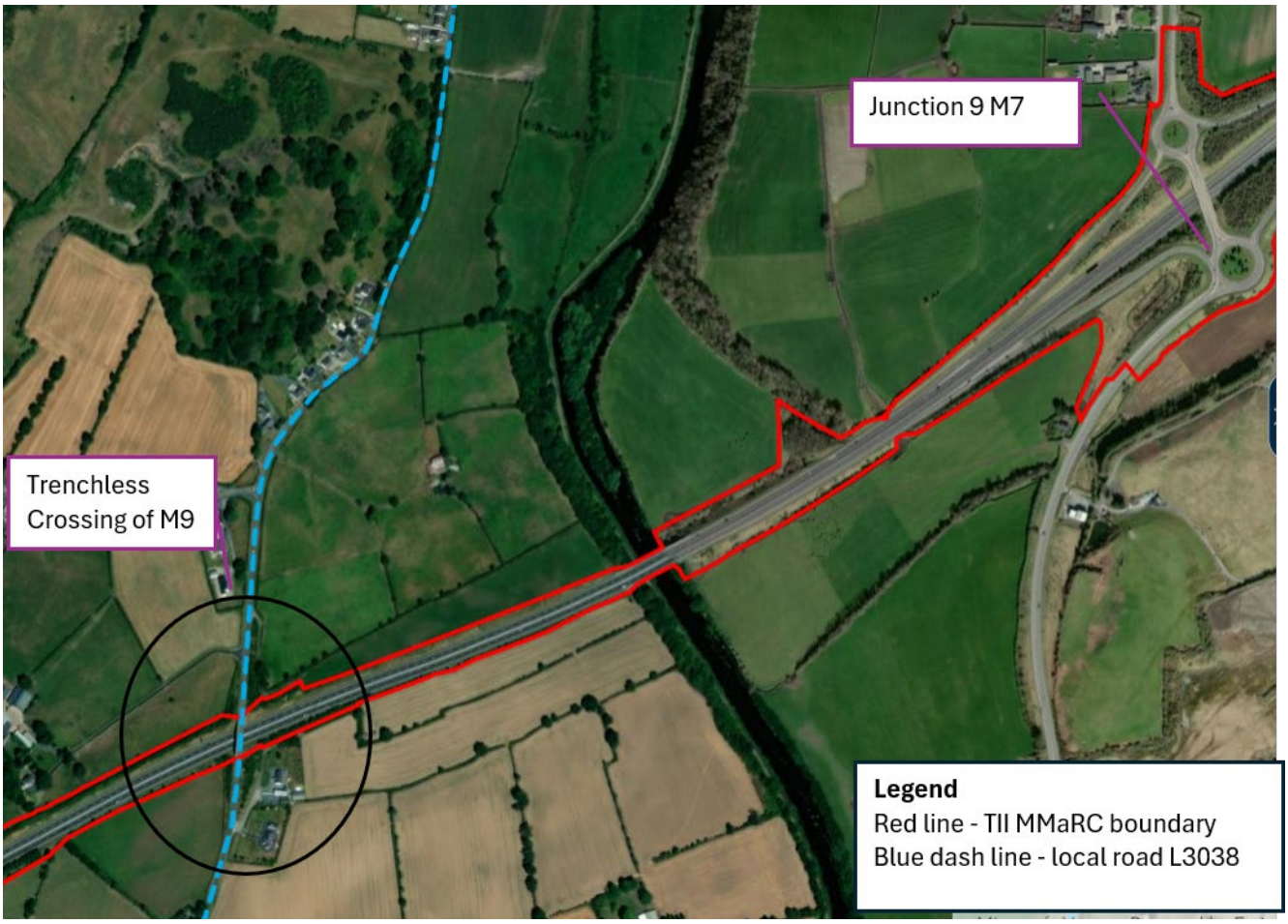


Figure 3-18: Location for Trenchless Crossing of M9

3.3.20.2 Cardinal Moran Bridge R448 crossing of River Barrow

The R448 is a regional road under the remit of Carlow County Council who stated in pre application consultation that the Council will not permit the use of the bridge to carry the proposed gas pipeline. This EIAR therefore includes an assessment of a trenchless construction methodology such as HDD to cross under the river and avoid the bridge.

The bridge is shown in Figures Figure 3-19 to Figure 3-21.



Figure 3-19: Cardinal Moran overbridge aerial view



Figure 3-20: Cardinal Moran overbridge street view



Figure 3-21: Cardinal Moran overbridge river view

3.3.20.3 Land Drains in L3043

There are two land drains crossing under the existing L3045 in Clogrennan. They were dry on each site visit but local knowledge suggests their existence. It is proposed to cross the two land drains using HDD. These are identified as crossing IDs B5 and B6.

3.4 Proposed Operation of the Proposed Development

The process flow for the proposed development is shown in Figure 3-6 and will broadly comprise the following operations.

3.4.1 Operational Hours and Staff

The proposed hours of operation are shown in the following table. Operational hours will be a condition of the EPA IE licence.

It is proposed that no import or export of feedstocks or products would take place on Sundays or Bank Holidays.

The following staff will be employed:

- 14 no. administrative/office based staff
- 14 no. operatives in 2 shift, 7 no. per shift
- 12 no. HGV drivers

Table 3-5: Operational Hours

Operations	Start Time	Finish Time
Plant operation including solid feedstock feeding, liquid feedstock feeding, odour management system and heating centre	Continuous	
Feedstock acceptance i.e. traffic movements	07:00 Monday-Saturday	19:00 Monday to Friday 14:00 Saturdays
Export of digestate	07:00 Monday-Saturday	19:00 Monday to Friday 14:00 Saturdays
Export of liquefied CO_2	07:00 Monday-Saturday	19:00 Monday to Friday 14:00 Saturdays
Export of biomethane	Continuous	

3.4.2 Transport

The transport of feedstock and digestate will be controlled by Greengate Biogas 001 Ltd. A fleet of 12 bulk haulers and tankers will transport feedstock and digestate from and to farms under contract. Starting at opening time, the vehicles will leave the facility via the weighbridge loaded with digestate, drive to farms, unload the digestate and refill with feedstock and return to the AD plant. Each liquid tanker will be equipped with on board pumps and a robotic arm for loading and unloading on farm and at the anaerobic digestion plant.

On arrival at Powerstown Biogas, the automatic number plate recognition system will log the details of the arriving load. From the weighbridge drivers will proceed to the solids reception or liquids reception buildings to unload feedstock materials. Where aggregators are contracted to supply feedstock, the vehicles will be registered on the automatic number plate system.

The circulation yard will allow for the manoeuvring of all vehicles entering or exiting the solid and liquid reception building and solid digestate building. Vehicles entering the solids reception building will be directed to reverse to one of four reception bays in the solids reception hall. The liquid reception building has four reception lanes with drive though access. Therefore, eight vehicles can be loaded or unloaded at any one time.

The circulation yard will have space to accommodate vehicle queuing in the unlikely event of wait times to enter the reception building during peak delivery times.

Refer to Chapter 6 Traffic and Transportation for a description of traffic.

3.4.3 Proposed Feedstocks and RED III Compliance

The feedstocks are manures made up of beef, dairy, pig, poultry, horse and farmyard manures. These feedstocks are listed in Annex IX (Feedstocks for the production of biogas for transport and advanced biofuels) of RED III, EU Directive 2023/2413 as (f) animal manures and (e) straw. The application for development consent will include the feedstock menu. No feedstocks will be accepted that are not compliant with Annex IX.

Greengate Biogas 001 Ltd. has over 650 no. farmers under Letters of Intent (LOI) to supply 1.9 M tonnes of feedstocks and receive digestate from Powerstown Bioenergy. The Applicant coordinated these LOIs during 2024 and 2025 through a dedicated campaign to source feedstock. The team visited farms, collected samples for laboratory testing and agreed supply and return mechanisms. Seasonal variation in the supply of feedstock is a factor in Ireland due to the prolonged grazing season influenced by the temperate climate.

The applicant has identified double the quantity of feedstock which is required for the proposed diet. This surplus allows for flexibility of supply, futureproofing against changing farm practices and supplier changes etc.

The proposed feedstock mix is presented in

Table 3-6.

Table 3-6: Proposed Feedstock Mix

Feedstock	% of feedstock category in mix
Cow Slurry (Dairy)	8%
Cow Slurry (Beef)	25%
Pig Slurry	33%
Duck Slurry	6%
Chicken Manure	9%
FYM	12%
HG FYM	7%
Maximum Intake Feedstocks (tpa)	663,000

The maximum intake will be 663,000 tonnes per annum. The intake will be managed to ensure there is capacity in digestors, storage tanks and gas export. There will seasonal variations in the supply of feedstocks to the site. The main variation will be associated with the winter housing of dairy and beef cattle. Cattle slurry quantities will be highest during the winter months. The strategy to manage this is two fold:

- to contract with controlled finishing units (CFU) otherwise known as beef lots or cattle finishers in the catchment area who house mature beef cattle ready for slaughter all year round, and as such have a ready supply of slurry in the open season when other grazing cattle are out at grass, and
- dairy farms also produce slurry all year round with c.15% of the annual volume available at the milking parlour each day during the summer months

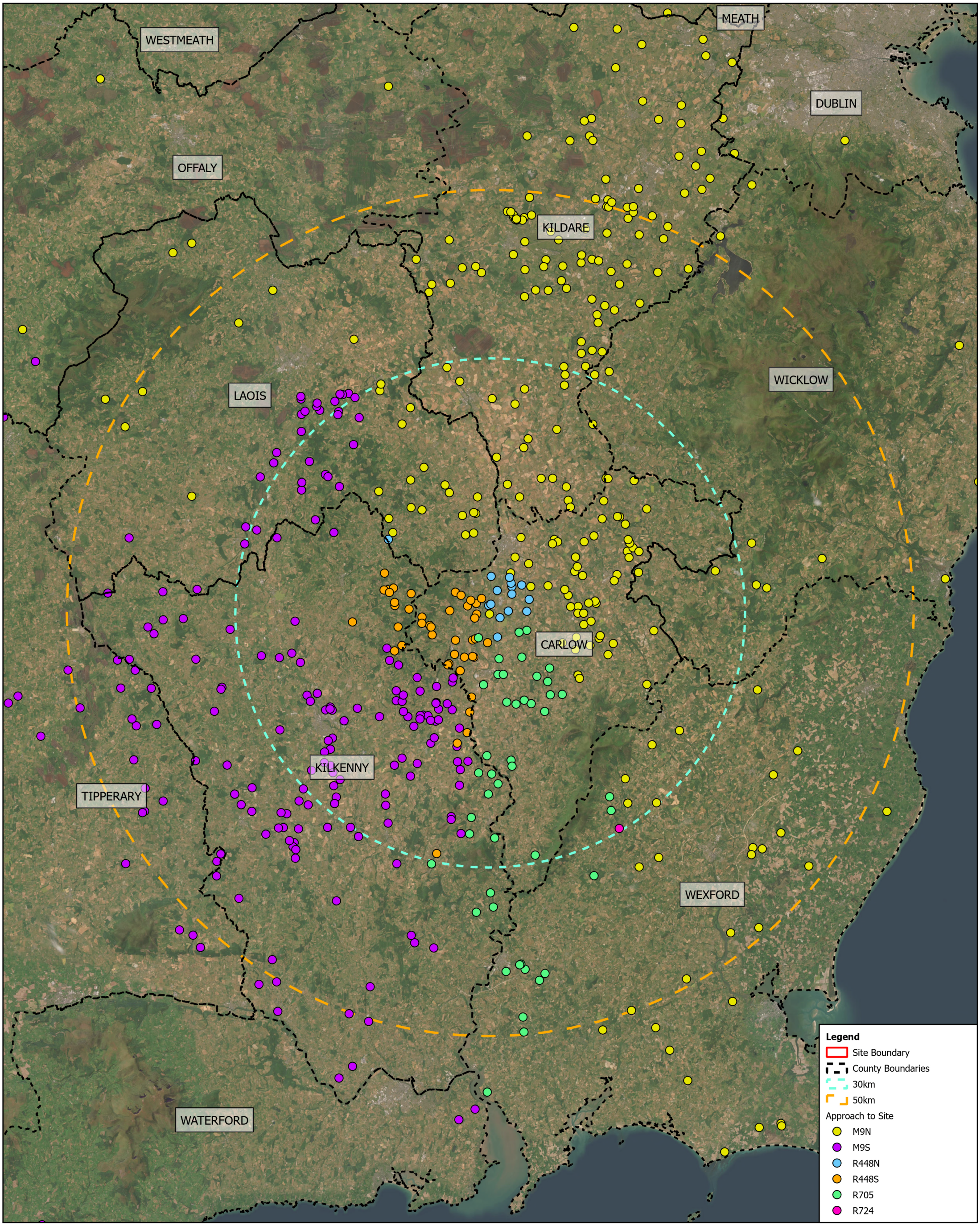
The proposed feedstocks are described in the following sections. The assessment of traffic movement of feedstocks is included in Chapter 6 Traffic and Transportation. Figure 3-6 shows the majority of feedstock suppliers who have signed letters of intent to supply the proposed development with feedstocks and receive digestate. Each dot represents a supplier, and the colours of the dots represent the transport routes. The dash line circles show a 35km radius and a 50 km radius from the proposed development.

County Boundaries : This data was collected by Ordnance Survey Ireland and can be found at

https://data.gov.ie/dataset/counties-osi-national-statutory-boundaries-20191

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TITLE: Feedstock Facilities within Proximity of the Site	**FIGURE NO:** 3.22		
	CLIENT: Greengate Biogas		
PROJECT: Powerstown Bioenergy	**SCALE:** 1:400,000	**REVISION:**	0
	DATE: 22/06/2026	**PAGE SIZE:**	A3

N W E S

0 2.5 5 10 15 20 Kilometers

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3.4.3.1 Proposed Feedstock Cattle Slurry

Cattle slurry will be collected from the network of supplier farms in specialised articulated vacuum tankers controlled by the Applicant for transport to site.

3.4.3.2 Proposed Feedstock Pig Slurry

Pig slurry will be collected from a network of supplier farms in specialised articulated vacuum tankers controlled by the Applicant for transport to the proposed development.

3.4.3.3 Proposed Feedstock Duck Slurry

Duck slurry will be collected by aggregators in specialised articulated vacuum tankers for transport to the proposed development.

3.4.3.4 Proposed Feedstock Poultry Manure

Poultry manure will be collected from aggregators contracted by the Applicant typically in articulated or fixed body tipper trailers for transport to the proposed development.

3.4.3.5 Proposed Feedstock Farmyard Manures

Farmyard manures (FYM) will be collected from a network of supplier farms typically in articulated or fixed body tipper trailers controlled by the Applicant for transport to the proposed development.

3.4.3.6 Proposed Feedstock High Grade Farmyard Manures

HGFYM will be collected from a network of supplier farms typically in articulated or fixed body tipper trailers controlled by the Applicant for transport to the proposed development.

3.4.4 Solid Feedstock Handling

Solid feedstocks arriving in articulated or rigid body tipping trailers will reverse into the solid reception building as described in Section 3.3.4.

The entire solids reception building will be maintained under negative area pressure for the control of odour. See Section 3.4.20 for Odour Abatement System details. Negative air abstraction will be optimised by fabric detailing (leakage prevention) and internal segregation of high odour potential areas i.e. solids storage bunker.

Vehicles entering the solids reception building will be directed to reverse to one of four reception bays in the solids reception hall. The solids reception hall will operate a bell jar system for odour abatement. The bell jar system concept is described as follows

- Rapid shutter doors will allow access to the solids reception hall for incoming vehicles to reverse into the reception hall.
- Once the incoming vehicle is fully within the reception hall the reception hall door will close.
- Once closed, an internal roller shutter doors will open to allow access to the solids storage bunker.
- The incoming vehicles will reverse to the bunkers edge, tipping their load into the bunker area.

Once tipping is complete the now empty incoming vehicle will move forward and appropriate bunker roller door will close.

- Once the internal door is closed, the rapid reception bay roller shutter door will reopen, and the HGV will exit the reception hall.
- The bell jar system will ensure that at no time are the bunker area doors and a reception hall door open at the same time, optimising the efficiency of the odour abatement system by minimising the total building volumes from which air will be extracted and compartmentalising the bunker solids storage bunker for odour control purposes.

Two dedicated overhead gantry cranes will be used to mix and load solid wastes deposited in the solids bunker. The overhead cranes will feed one of two pre-shredders located to either side of the solids bunker.

Solid feedstock will be conveyed from the shredder to a bio-mixers. The shredder will tear apart the solid feedstock breaking it into smaller particle sizes. Solid feedstock will be diluted within the bio-mixer with process water to facilitate pumping to the primary digestion tanks.

3.4.5 Liquid Feedstock Handling

All liquid feedstocks will be accepted in the liquids reception building which is described in Section 3.3.5. Incoming liquid farmyard manures (LFYM) tankers will enter the liquids reception building via one of four rapid roller doors. Each roller door will allow entry into a single liquids reception lane. Each lane will contain two spigot valve connection points. A robotic arm from the specialised articulated vacuum will connect to the infeed spigot. Once connected, LFYMs will be pumped from the tanker into the liquids pre-storage tank located in the bunded tank farm.

Once all LFYM is unloaded from the tanker the robotic arm will disconnect from the liquid intake spigot and connect to the liquid digestate offtake spigot. Once connected, loading of liquid digestate will commence. The liquid feedstock intake spigot and digestate offtake spigot will be located immediately adjacent each other. A system of non-return valves will ensure that there is no possibility of LFYM being pumped to the Digestate Storage Tank or LFYM being loaded into the vacuum tanker. Once fully loaded with digestate tankers will exit the liquids reception building via the rear doors.

The liquid infeed pumping system will include a fine cut macerator unit to reduce wear within the process and to remove foreign bodies/contaminant e.g. stones, grit from the liquid feedstocks. Liquid pre-storage tanks will be continually mixed to ensure the LFYMs received remain in suspension.

Liquid feedstocks will be pumped from the pre storage tanks to the primary digestion tanks via a set of heat exchangers. Heat exchangers will raise the liquid feedstock temperature from its, ambient temperature to just above the thermophilic process temperature range (i.e. 48-55°C). The liquid feedstock will be heated to above the process temperature range to account for heat losses due to the introduction of the ambient temperature solid feedstocks into the primary digester.

3.4.6 Primary Digestion

The primary digestion phase will be undertaken in the six primary digestion tanks. Primary digestion tanks will operate in two parallel groups of three tanks in series.

The primary digestion phase is the main stage of biogas production. Each primary digester will operate within a thermophilic environment of 48-55°c. The digesters will operate as continuously stirred tank reactors (CSTRs). Mixing of the digesters contents is by by one central top mounted agitator on the tank's roof.

Digestate discharge from each primary digester to the secondary digester will be facilitated by a cavity pump through a pipe situated at the bottom of the digester.

Tanks will be equipped with over/under pressure valves for safety. The valves will be dimensioned according to the gas production for the respective tank +100%. To prevent liquid overflow from the tanks, multiple level measurements will be installed in the tanks.

3.4.7 Secondary Digestion

The secondary digestion phase will be undertaken in the three secondary digestion tanks. Secondary digestion uses the same type of tank and follows the same process as outlined in the primary digestion Section 3.4.6, operating in the same thermophilic environment of 48-55°C. Digestate discharge from secondary digester to the tertiary digester will be facilitated by a cavity pump through a pipe situated at the bottom of the digester.

3.4.8 Tertiary Digestion

Paddle mixers or submerged agitators will continually mix feedstocks within the tertiary digestion tanks operating in the same thermophilic environment of 48-55°C.

Total retention time for the entire digestion process (i.e. primary, secondary and tertiary) will average 58-60 days.

3.4.9 Hygienisation/Pasteurisation

Post digestion all digestate will be pastuerised in accordance with the European Union (Animal By-Products) Regulations 2014 Refer to Section 1.5.4 in Chapter 1 of this EIAR.

Digestate will be pumped into one of three pasteurization tanks, where it will be retained for >60 minutes at a temperature >70°c. The three tanks will operate on a rotational/batch basis, each serving a specific function: one for receiving the digestate, one for holding it, and one for pumping it to the downstream digestate storage. This rotation cycle shifts after the required 60 minutes minimum temperature hold time has been achieved.

Similar to the digesters, these pasteurization tanks are heated reactors, maintaining a temperature of >70°C via overheating (≥ 2°C) of the incoming stream in external heat exchangers. The pasteurisation tanks shall be equipped with several temperature transmitters, to monitor that the required temperature is maintained throughout the tanks, minimum 3 at different levels of the tank. An alarm is required in case the material falls to or under 70°C at any time of the minimum required 1-hour cycle. If the required temperature is not met as measured at any of the installed sensors for the time required an alarm notification will be raised and an event recorded. The pasteurisation process will restart automatically.

The tanks will be installed with SCADA systems that ensure that tank material is only released when the temperature has met at all temperature transmitters. The SCADA system will be non by-passable meaning it cannot be accessed and changed by operating personnel.

The pasteurisation tanks will be insulated to reduce heat demand. After the pasteurisation tanks, the digestate will be separated into a solid and liquid fraction in the loft of the solid digestion storage building. (See Section 3.3.6.3)

3.4.10 Digestate Storage

A total of 4 days liquid digestate storage will be available onsite in the post digestion Liquid Digestate Storage Tank and a total of 4 days solid digestate storage will be available onsite in the Solid Digestate Building.

3.4.10.1 Solid Digestate

Post digestion the spent feedstock mix called digestate will be separated into liquid digestate and solid digestate. Separation will be carried out by screw press separation. The screw press separators will be located in elevated loft area within the Solid Digestate Building. Solid digestate will be conveyed away from the screw presses and dropped to the floor of the solids digestate building. The conveyor system will be able to operate in automatic mode controlling the placement of digestate in a stockpile with an average height of 4.5m. A wheel loader will transfer solid digestate into tipper haulage trucks waiting in the loading lane.

Covered articulated or fixed body tipper trailers will enter the solids digestate building via a rapid roller shutter door. The digestate loading area will be physically separated from the digestate storage area by a 1m stub wall to maintain physical separation, limiting transfer of solid digestate into the loading area. The loading area will be regularly cleaned of any solid digestate accidentally spilled during loading operations. Hot power washing equipment will also be immediately available within the loading area. Drivers will undertake hot washdown operations immediately after loading. Once fully loaded, drivers will exit via opposing rapid roller shutter door.

Solid digestate will be returned to the supplier farms, tillage farms and contract spreaders as an organic fertiliser/soil conditioner. (See Section 0)

3.4.10.2 Liquid Digestate

Liquid digestate will be returned to one of the post digestion liquid digestate storage tank located in the bunded tank farm.

Liquid digestate will be pumped from the post digestion liquid digestate storage tank to the digestate loading tank located beside the liquid reception building. Liquid digestate will be pumped from this loading tank to an articulated vacuum tanker. The articulated vacuum tankers having first unloaded their liquid feedstock as described in Section 3.3.5 will undergo a wash down procedure. Once fully unloaded of feedstock and externally washed down, the robotic arm will disconnect from the liquid intake spigot and connect to the liquid digestate offtake spigot within the same liquids reception building. The liquid feedstock intake spigot and digestate offtake spigot will be located immediately adjacent to each other, such that the articulated vacuum tanker does not need to move from its unloading/loading position within the liquids reception building. Liquid digestate will be returned to the supplier farm as an organic fertiliser. See Section 0.

3.4.11 Drainage Infrastructure

The site drainage strategy is designed to segregate water streams based on their origin and potential contamination risk, ensuring that all water is either recovered for reuse within the process or treated safely to remove contamination.

It is calculated the water consumption of the facility significantly exceeds the projected total volume of storm water and rainwater collected on-site. Therefore, there is no requirement under normal operations to discharge water off-site. In the unlikely event of contamination within the storm water lagoon, the contents will be contained, removed via tanker, and transported to an authorised wastewater treatment facility.

The estimate process water usage will be 62,000 m^3/year (170 m^3/day) sourced from rainwater harvesting onsite (65-130 m^3/day (Avg. Monthly)) and the proposed groundwater well (100-120 m^3/day (Avg. Monthly)). The proposed drainage infrastructure, storm water and process water infrastructure and operation is described in Section 3.3.17.

The operation of the system is Summarised in Figure 3-23.

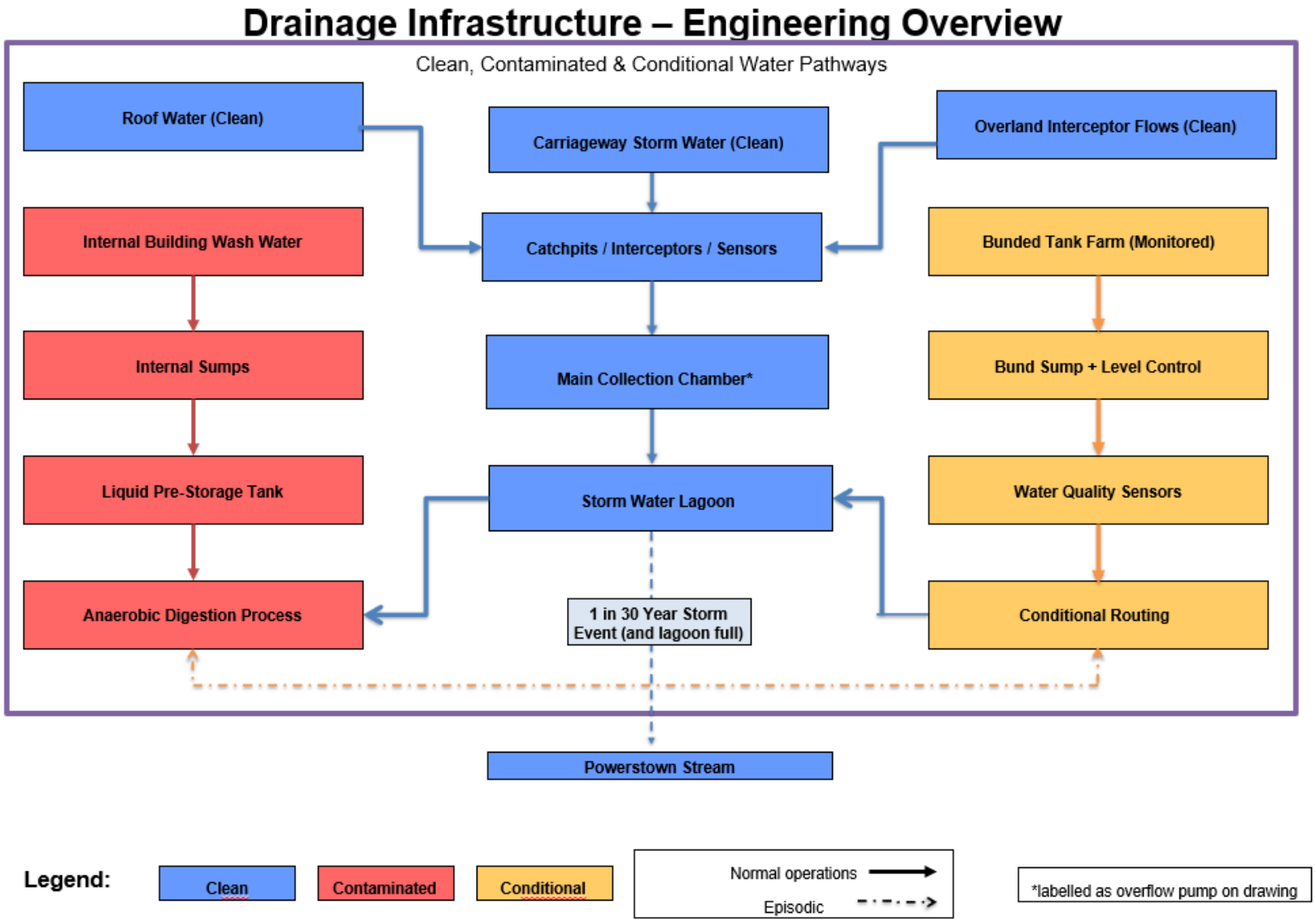


Figure 3-23: Proposed Water Management Systems

3.4.11.1 Water Collection Areas

Bunded Tank Farm

Rainwater accumulating within the tank farm bund drains via gravity to two dedicated storm water sumps located in the southern side of the bunded tank farm area. From here, the water is pumped directly to the storm water lagoon. The pumping of this water is controlled by autonomous level monitoring. and is strictly governed by Continuous Emission Monitoring (CEM) system to ensure quality control, preventing contaminated water being pumped to the storm water lagoon.

The stormwater will be conveyed via a dedicated pumped system into the storm water lagoon:

- The pumped system will also be fitted with water-quality sensors to continuously monitor runoff collected within bunded areas.
- Where contamination is detected, the pump will automatically prevent discharge to the stormwater lagoon, ensuring isolation of potentially contaminated water within the bund.

In the unlikely event of contamination, water will be tankered off site.

Roof Area

Rainwater from building roofs, which is deemed uncontaminated, drains via a separate rainfall collection gulley network on each building which flows to a separate drainage network under the yard area which connects to the main collection chamber[9].

- Roof runoff will be conveyed through catchpits with sumps, allowing settlement of debris and fine particulates and providing access for inspection and maintenance.
- As roof water is uncontaminated, no hydrocarbon interception is required; however, the inclusion of catchpits provides additional resilience and operational control.
- Roof water will discharge to the storm water lagoon, contributing to overall flow balancing and attenuation.

Yard and Circulation Areas

Storm water from the internal road network and circulation areas is collected via a gravity-fed drainage network to a Class 1 Full Retention Interceptor, which alerts of any potential hydrocarbon spills, such as oil, diesel, or petrol a. It is then drained to the main collection chamber as it is deemed uncontaminated.

Once the rainwater from the roof and the storm water from the yard reaches the main collection chamber, water is pumped to the stormwater lagoon. From there it is pumped back to the process water tanks to be used as supply for the facility.

- Runoff from plant carriageways and circulation areas will be collected via gullies, eco-drains and drainage kerbs incorporating sumps, providing primary sediment control at source.
- Flows will discharge into TII-specified catchpits with a minimum sump depth of 300 mm, providing secondary sediment settlement.

[9] Referred to as overflow pump chamber on drawing

- A Class 1 Full Retention petrol/oil interceptor, designed in accordance with TII specifications, will be installed to remove hydrocarbons from runoff generated in trafficked and operational areas.
- The plant drainage network will be equipped with water-quality sensors designed to continuously monitor the characteristics of water collected within the system.
- Penstocks will be installed downstream of the interceptor and upstream of the lagoon .
    - Under normal operating conditions, uncontaminated runoff will be permitted to pass through the drainage network.
    - In the event that CEM indicate the presence of contamination or a spillage, the penstocks will automatically close to prevent discharge to the lagoon.
    - Contaminated runoff will instead be automatically diverted to the dedicated spillage containment system, thereby ensuring full isolation of polluted flows from the wider drainage system.
- A dedicated spillage containment system with a minimum capacity of 50 m^3 will be provided to retain large spillages. This system will be located at a lower level than the drainage network to prevent reverse flows and to facilitate safe recovery and removal of contaminated material off site to an appropriately licensed facility.

This combination of continuous monitoring, automatic isolation, and controlled diversion provides an active and fail-safe layer of protection against accidental pollution.

Interceptor Drainage Network

Overland flows from the surrounding lands and the existing quarry cut will be intercepted downslope of the operational areas via a dedicated interceptor drainage system. It will primarily comprise of vegetated swales, designed to reduce flow velocities and promote sediment settlement. Check dams will be installed at regular intervals along the swales to:

- reduce runoff velocities
- increase hydraulic residence time
- promote settlement of suspended solids
- improve water quality prior to discharge

Where space constraints prevent the use of swales, filter drains will be provided as an alternative interceptor element. Interceptor drainage flows will discharge to the lagoon via the main collection chamber.

Internal Building Drainage

Drainage from internal operational areas (the Liquids Reception Building, Solid Reception Building, and Solid Storage Building) is separated from the external storm water networks. Wash water from these buildings is collected via a dedicated internal drainage network leading to specific dedicated sumps. This water is pumped to the Liquid Pre-Storage Tank, where it is used as process water for the anaerobic digestion process and ultimately pastuerised.

Foul Water

Foul water generated from the administration building and site welfare facilities (located in the liquid reception building and the heating centre) is managed independently. It drains to sealed underground storage tanks. These tanks will be automatically monitored and periodically emptied by a licensed waste contractor via tanker for off-site treatment at a private licensed wastewater facility. The Applicant has received letters of support from private wastewater contractors to provide treatment capacity for the foul water.

See Appendix 3.3 in Volume 3 of this EIAR.

3.4.11.2 Water Storage Areas

Process Water Tanks

The Process Water Tanks, which supply the site's operations, are filled using recovered water from the storm water lagoon and the main collection sump, supplemented by the site's groundwater well.

Storm water Lagoon

As described in Section 3.3.17.4, there is an engineering stormwater lagoon on site for the management of clean storm water. In the scenario where the storm water lagoon is at capacity, the process water tanks are at capacity and there is a one in 30 year storm event, clean excess water will be discharged to the existing drainage system in the R448 that flows to Powerstown Steam at greenfield rates over a 24 hour period.

- Clean water from the plant carriageway areas, roof areas and overland flow is attenuated in the covered sealed stormwater lagoon.
- A forebay will be provided at the lagoon inlet to manage first-flush runoff and capture residual sediment.
- The lagoon will include a settling zone, sufficient storage volume, and a minimum freeboard of 300 mm.
- It will be designed for the 1-in-30-year storm event plus 20 % climate change allowance.
- Due to the quarry setting, the lagoon will operate as a drainless system, with exceedance flows managed by pumping.
- Pumping of exceedance flows will be restricted to the greenfield runoff rate for the combined tributary catchments and will be controlled such that the total exceedance volume is discharged gradually over a minimum period of 24 hours (minimum retention time) recommended to the TII specifications or best practice, ensuring:
    - prevention of sudden downstream flooding;
    - replication of greenfield runoff behaviour; and
    - enhanced sedimentation and water-quality improvement prior to discharge.
- The pump station associated with the lagoon will be equipped with water-quality sensors designed to continuously monitor lagoon water prior to pumping exceedance flows.
    - Pumping of exceedance flows will only occur where monitoring confirms acceptable water quality in accordance with conditions set by the IE licence from the EPA.
    - Where monitored parameters indicate contamination or abnormal conditions, the pump system will automatically inhibit discharge, ensuring retention of potentially contaminated water within the lagoon for further treatment and management.

These integrated, multi-stage and actively controlled design measures provide a robust, fail-safe approach to storm water management and significantly reduce the likelihood of adverse impacts on surface water quality, hydrological regimes, and downstream receptors.

3.4.12 Biogas Management

Methane generated will be captured and conveyed to the gas grid. Gas storage will be included on top of reinforced concrete tanks in domes. The gas system will be designed to ensure that the gas flows in the correct direction, meaning support blowers will be installed where relevant.

There will be flow meters on the individual process tanks (primary, secondary and tertiary).

3.4.13 Biogas Treatment

Raw biogas will be collected from all primary digestion, secondary digestion, tertiary digestion and post storage tanks for upgrading to biomethane and biogenic CO_2. The raw biogas will first undergo a gas conditioning process which includes the compression and chilling of the gas. The chilling or cooling of the warm gas leads to the formation of a liquid condensate which will be pumped to the Liquid Pre-Storage Tank. Following biogas treatment, conditioning and upgrading, the biomethane must meet quality requirements for the national gas grid which are set out in Table 3-9.

Table 3-7: Proposed Raw Biogas Process Design Parameters

Parameter	Range	Unit
Pressure (mbar)	2-5	mbar
Temperature	20 - 55	°c
CH_4	50 - 62	% v/v
CO_2	38 - 50	% v/v
O_2	0.3 - 0.5*	% v/v
H_2S	desulphurised 0 – 100/200	ppm

*after oxygen injection

3.4.14 Desulphurisation

The biogas will go through a two-step desulphurisation process to remove hydrogen sulphide within the desulphurisation plant. The first step will be a biological process. The biogas will pass upwards through a vertical column where where sulphur oxidising bacteria will feed on the hydrogen sulphide available within the raw biogas. At the same time that raw biogas is moving upward, a mixture of process water and NPK fertiliser will be allowed to trickle downwards to both support bacterial growth and flush out the excreted byproducts of the bacteria. This will generate a product known as condensate. Condensate will be pumped from the base of the gas column to the digestate tank. This biological cleaning step will reduce hydrogen sulphide concentrations.

3.4.15 Granulated Activated Carbon Filtration

Post conditioning, the raw biogas will pass through a granulated activated carbon (GAC) filter for the removal of Hydrogen Sulphides (H2S), VOCs and other trace contaminants. Activated carbon filtration removes hydrogen sulphide by adsorbing it onto the surface of porous carbon media. The raw biogas is drawn through the tower containing granular activated carbon with a very high internal surface area. As the raw biogas passes through the carbon bed, hydrogen sulphide and volatile organic compounds (VOCs) are physically and chemically bound to the carbon surface. Carbon media is replaced or regenerated once adsorption capacity is exhausted.

3.4.16 Gas Upgrading

The upgrading process will separate the desulphurised raw biogas mixture into biomethane (CH_4) and biogenic carbon dioxide (biogenic CO_2).

Biogenic CO_2 is CO_2 derived and captured for utilisation from carbon previously absorbed and stored within organic matter.

The desulphurised raw biogas is passed through an amine solution within an absorber tower. Acidic gases (e.g. CO_2 and trace H_2S) are physically absorbed into the amine solution in the absorber tower forming an amine solution. Methane being a non-acidic hydrocarbon does not react with the amine solution and thus remains in the gas phase allowing for its collection as a purified biomethane product. The amine solution (containing the acidic gases) is transferred to a stripper tower, where it is heated to its boiling point (105 °c @ approx. 70 mbar(g) and 84°c @ approx. -500 mbar(g) depending on stripper pressure design) to regenerate the amine, releasing biogenic CO_2 and any remaining H_2S impurities for separate collection. The regenerated amine is then recycled via a cooling chamber back to the absorber. Heat is provided by means of hot water or steam generated at the Heating Centre.

Typical amine solutions are Diethanolamine (DEA), Monoethanolamine (MEA) or Methyldiethanolamine (MDEA), or a mix.

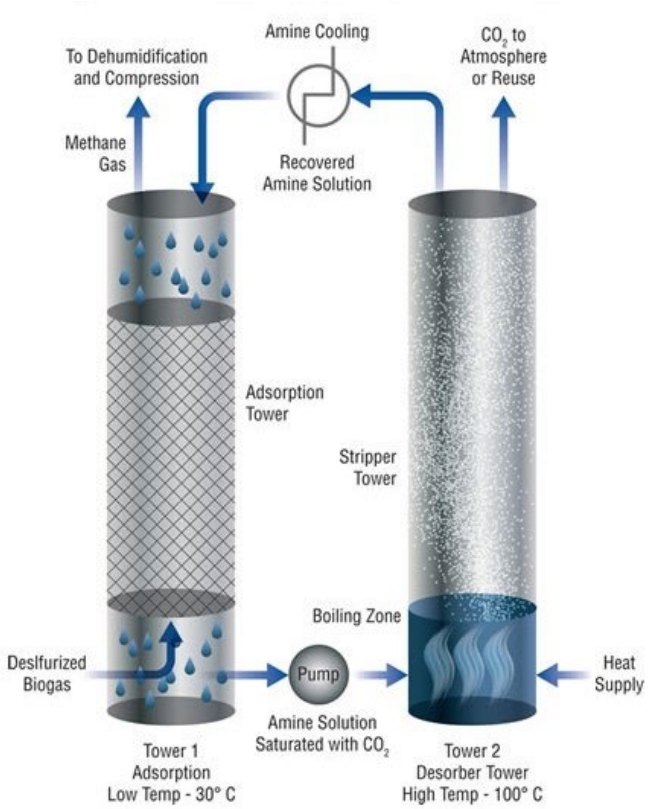


Figure 3-24: Amine Separator Illustration (Atmos Power, 2026)

3.4.17 CO_2 Liquefaction

Biogenic CO_2 then undergoes CO_2 liquefaction, it is compressed and cooled forming liquid CO_2. This liquid CO_2 is stored in insulated tanks for transport offsite as a food grade CO_2 product. The proposed Liquefied CO_2 Quality Parameters are set out in Table 3-8.

The raw biogenic CO_2 (separated by the Biogas Upgrading Plant) will contain impurities like moisture, sulphur compounds, and trace hydrocarbons. The raw gas will first undergo purification using molecular sieves, activated carbon filters, and chemical scrubbers.

Next, the purified biogenic CO_2 gas will be compressed in multistage compressors, raising its pressure to around 15–25 bar. Intercoolers between each compression stage will remove excess heat. The compressed gas is then pre-cooled to near 0°C using chillers or heat exchangers. The core liquefaction phase involves cooling the biogenic CO_2 below its critical temperature (around -20°C) under pressure using cryogenic heat exchangers and refrigerants (ammonia). This condenses the gas into a dense liquid.

The final liquid CO_2 will be stored in vacuum-insulated pressure vessels. Specialist trucks will be then used to transport the liquefied biogenic CO_2 offsite for sale as a product in Ireland and abroad. Trucks will be filled using one of two dedicated CO_2 filling points.

Table 3-8: Proposed Liquefied CO_2 Quality Parameters*

Parameter	Requirement	Unit
Carbon Dioxide (CO_2)	>99.9	% v/v
Water (H_2O)	<20	ppmv
Oxygen (O_2)	<30	ppmv
Carbon Monoxide (CO)	<10	ppmv
Ammonia (NH_3)	<2.5	ppmv
Total Sulphur (Total S)	<0.5	ppmv

Food and beverage level quality. Source: Carbon dioxide food and beverages grade, source qualifications, quality standards and verification, EIGA Doc 70/17.

3.4.18 Biomethane Grid Entry Facility (BNEF)

Biomethane will enter the BNEF from the Gas Upgrade Plant (See Section 3.4.16). The BNEF will continually monitor the biomethane produced against GNI network standards. The general gas parameters will be continually analysed within the BNEF as set out in Table 3-9.

Biomethane meeting the required quality parameter will be metered and allowed entry the gas transmission network as Renewable Natural Gas.

In the event that the biomethane produce fails to meet the required standard the gas transmission network valve will close and the rejected biomethane will be returned to the digestion plant via an internal gas return loop. The rejected biomethane will be then either reprocessed (re-entering as raw biogas i.e. to the desulphurisation plant) or flared (See Section 3.3.15) until such time that the GNI quality parameters are met and the network valve "reopens".

GNI are responsible for development of proposed gas pipeline to convey gas from the BNEF to the GNI AGI located in Clogrennan (at Clogrennane Lime Works) (See Section 3.3.20). The BNEF will continually measure and monitor the biomethane produced on site to ensure it meets the RNG requirements classification. The required RNG grid entry quality requirements are set out in Table 3-9.

Table 3-9: GNI RNG Grid Entry Quality Requirements

Parameter	Entry Requirements	Units
Total Sulphur	< 50 mg/m^3 (including H2S)	mg/m^3 (including H_2S)
Oxygen	≤ 0.2 mol% see RNG note 1	mol%
Carbon Dioxide	≤ 2.5 mol% See note 1	mol% See Note 1
Hydrogen Sulphide	≤ 5 mg/m^3	mg/m^3
Water Content	≤ 50 mg/m^3	mg/m^3
Gross Calorific Value (Real Gross Dry)	36.9 – 42.3	MJ/m^3
Wobbe Index (Real Gross Dry)	47.2 – 51.41	MJ/ m^3
Contaminants and Odor	See Note 2 and 3	
Incomplete combustion factor	< 0.48	
Delivery Temperature	1- 38	°C
Hydrogen	< 0.1 mol%	mol%
Soot Index	< 0.60	
Organo Halides	< 1.5 mg/m^3	mg/m^3
Radioactivity	< 5 Becquerels/g	Becquerels/g
Ethane	< 12 mol%	mol%
Nitrogen	≤ 5 mol%	mol%
Hydrocarbon Dewpoint	≤ -2°C up to 85 barg	

Reference Conditions

All measurements at 15° Celsius and 101.325kPa

Note 1 The CO_2 limit of 2.5% will not be considered breached if the total inerts (including CO_2) in the gas is less than 8% where: nerts" in natural gas means carbon dioxide (CO_2), nitrogen (N2), helium (He), argon (Ar), and oxygen (O_2).

Note 2 Natural Gas shall not contain solid liquid or gaseous material which may interfere with the integrity or operation of pipes or any Natural Gas appliance which a consumer or transporter could reasonably be expected to operate. With respect to Mist, Dust, Liquid, gas delivered shall be technically free in accordance with BS3156 11.0 [1998].

Note 3 Natural Gas shall have no odour that might contravene the obligation of the Transporter to transmit gas which possesses a distinctive and characteristic odour. Where the Transporter requires gas to be odourised, the gas shall be odourised in accordance with the following specification:

- Odour intensity of 2 olfactory degrees on the SALES Scale (Ref-IGE/SR/16/1989), or
- such other specification determined by the Transporter acting as an RPO

Emergency Gas Quality Specification In the event of an Emergency, and at the sole discretion of the National Gas Emergency Manager, gas outside of the Entry Specification may be admitted to the system. Without prejudice to the generality of this, the emergency limits as outlined in the Natural Gas Emergency Plan NGEP may be adopted by the Transporter.

Renewable Natural Gas Notes

1. Oxygen content for gas derived from Renewable Natural Gas at an RNG Entry Point connected to the Distribution System shall be up to **1 mol%** where there is provision for automatic discontinuation of gas flows for non-compliance with the applicable Entry Specification. Such automatic discontinuation shall comprise of the discontinuation of gas flow based on preprogrammed criteria, such criteria determined by the Transporter and embodied in an automated process, all as outlined in the applicable CSA.
2. The CSA in respect of any RNG Delivery Facility may subject to the approval of the Commission specify additional gas quality parameters (which may for avoidance of doubt be subsets of the parameters set out above) and associated limits in respect of such parameters to apply at the individual RNG Entry Point or category of RNG Entry Point in which case the gas quality parameters so specified shall (subject to Renewable Natural Gas Note 1 above) apply at such RNG Entry Point(s) in addition to the parameters set out above.

3.4.19 Gas Flares

There are two gas flares on site to manage biomethane in the event that it cannot be transferred to the grid. They are enclosed gas flares which will combust methane at >850◦C for 5 seconds retention time to ensure conversion of methane to carbon dioxide. The operation of these flares will be conditioned by the IE licence with annual testing. The flares will be run periodically as part of the maintenance schedule which is estimated at 200 hours. Digestate Management

3.4.19.1 Digestate Product

As per Chapter 2 (Waste Framework Directive) the anaerobic digestion of manures generates a waste product. The Applicant has identified two routes to achieve end of waste status:

Route 1

The digestate will comply with the EU Fertiliser Product Regulations 2019 (Regulation (EU) 2019/1009 of the European Parliament and of the Council of 5 June 2019 laying down rules on the making available on the market of EU fertilising products and amending Regulations (EC) No 1069/2009 and (EC) No 1107/2009 and repealing Regulation (EC) No 2003/2003) (EU FPR). Article 19 of this regulation states “This Regulation lays down criteria in accordance with which material that constitutes waste, as defined in Directive 2008/98/EC, can cease to be waste, if it is contained in a compliant EU fertilising product. In such cases, the recovery operation under this Regulation will be performed before the material ceases to be waste, and the material shall be considered to comply with the conditions laid down in Article 6 of that Directive and therefore to have ceased to be waste from the moment that the EU declaration of conformity was drawn up”.

Route 2

The applicant will seek a licence condition (under EPA IE licence) as per the following condition in other AD licences recently granted, e.g. condition 8.15

“8.15 Quality of digestate (soil improver)

8.15.1 Digestate must comply with the requirements of the EU Fertilising Products Regulation (EU) 2OL9/7009 and the quality standard as set out in Schedule E: Standards for Digestate Quality of this licence or an alternative quality standard as approved by the Agency.

8.15.2 Treated waste that fails to meet the requirements of Condition 8.15.1-, must be either be reused in the process or treated as waste.

8.1-5.3 Treated bio-waste that fails to meet the quality standard for digestate as set out in Table E.2-L Maximum Metal Concentration Limits of schedule E: Standards for Digestate Quality of this licence must be handled as waste and must not be reused in the process."

3.4.19.2 Proposed Digestate Management

Digestate Management will comply with the commitments as outlined in the Biomethane Environmental Sustainability Charter, 2025.

In most cases, under the supplier contracts, the feedstock supplier is responsible for the take back and management of the digestate[10] in accordance with their responsibilities under the Nitrates Regulations. The beef sector will operate on the supply return agreement, as will the majority of the dairy sector. The pig and equine sector digestate will be managed by a contract land spreader on behalf of the Applicant and transported and spread on tillage or grasslands in need of the fertilising benefits and in line with their current spreading arrangements. Digestate will be returned to the duck and poultry spreadlands as per existing arrangements. The existing management of feedstock is described in Section 3.2.6.2.

Under the terms of contracts with the biogas facility the farmer/ feedstock supplier is responsible for the receiving back and the management of the digestate in accordance with their responsibilities under the Nitrates Regulations. Exceptions to this may be some livestock farmers from the poultry and equine sectors who may not have sufficient suitable land associated with their holding for the receipt of organic materials/digestate.

These farmers routinely export organic materials as standard practice to other farm holdings in accordance with the Nitrates Regulations.

Surplus digestate will be managed by a contract land spreader appointed by the Applicant, with this digestate being transported to and spread on suitable tillage land or grassland in accordance with the Nitrates Regulations.

The closed spreading season is 16-20 weeks depending on location and 16 weeks in Carlow, therefore storage is required, as per existing practice by farmers for 230,000 t of digestate to cover an 18 week period. During the open season, as digestate is returned to farms, it will be land spread. Farms secured under letter of intent (LOI) within the effective catchment area of 35km radius of the proposed .... development have storage capacity for all digestate produced during the closed season.

3.4.19.3 Spreading of Liquid and Solid Digestate

Liquid digestates arising from the proposed development will be spread on lands belonging to the farmers supplying the plant with LFYM or by licensed landspreading contractors to farms where a nutrient demand exists e.g. tillage farms. All landspreading activities will be undertaken by farmers or their appointed contractors with the benefit of detailed Nutrient Management Plans (NMP) prepared in accordance with the Nitrates Regulations

The landbanks for landspreading will largely comprise arable lands in areas of Carlow, Kildare, Laois, Wexford and Kilkenny as per Table 3-2.

[10] The supplier contracts include for digestate return typically calculated on a nutrient-to-nutrient basis (N to N or P to P), compensating for the increased concentration of key nutrients in the digestate relative to the initial feedstock (depending on supplier, e.g. cattle slurry supplier will receive a more nutrient rich product, whilst the poultry supplier landbanks will receive a less concentrated product. Consequently, while the nutrient tonnage (N or P) returned will be equivalent to that supplied.

The landspreading activity is not included in the scope of this EIAR because it is regulated under separate regulations.

The recipients of the digestate have an obligation to comply with statutory regulations outside the remit of

planning legislation but under the Nitrates Regulations the requirements of which are as described in Section 2.6 of this EIAR.

As outlined in Section 1.5.3 of this EIAR and in addition to requiring Planning Permission, the proposed development activity falls within the remit of the Industrial Emissions (IE) Directive (2010/75/EU), as implemented by the European Union (Industrial Emissions) Regulations (S.I. 138 of 2013), which amend the First Schedule of the 1992 EPA Act. As such, the applicant will submit an Industrial Emissions Directive (IE) licence application to the Environmental Protection Agency (EPA).

In accordance with Section 99F of the Environmental Protection Agency Act 1992 (as amended) and Section 54 of the Waste Management Act 1996 (as amended), no conditions controlling emissions from the operation of the proposed activity, including the prevention, limitation, elimination, abatement or reduction of those emissions, or controlling emissions related to or following the cessation of the operation of the activity may be imposed by the planning authority. That is because those matters are determined by the EPA through the IE Licensing process.

3.4.20 Odour Management

Please refer to Section 3.3.8.

3.4.21 Commissioning and Maintenance

The proposed development will be commissioned in accordance with construction contracts and to comply with the IE licence. Commissioning will take place on a phased basis as components are completed.

3.4.22 Emergency Response

The IE licence will require an Emergency Response Plan (ERP) and procedures. An outline ERP is included in the CEMP in Appendix 3.1 of Volume 3 of this EIAR. Potential emergency situations that could arise during construction, operation or decommissioning of the proposed development will be included in the ERP e.g.:

- Fire
- Explosion
- Flood
- Environmental Pollution
- Severe Weather Event
- Health and Safety -Major Accident

The plan will make provision for:

- emergency response liaison and reporting
- procedure for reporting emergencies and raising the alarm
- designated responder and medical protocol

- location and contact information for the nearest Emergency (A&E) facilities including:
    - accident & emergency (A&E)
    - ambulance service
    - fire services
    - local Garda Station, district and divisional headquarters
- escape and evacuation procedure
- prevention of illness/injury of site staff due to weather and elements
- environmental emergency procedure
- fire-fighting water supply and firewater management

3.4.23 Operational Consents

Refer to Chapter 1 for detail on operational consents.

3.5 Construction Methodology Proposed Development

The following section outlines the proposed construction methodology for the main construction elements of the proposed development.

The key construction elements (listed in chronological construction order) are as follows:

- Advanced Works (site clearance), Site Entrances, and Contractors Compound
- Storm Water Management
- Earthworks
- Solids Reception Building
- Liquids Reception Building
- Solid Digestate Building
- Circulation Yard
- Bunded Tank Farm
- Desulphurisation Plant
- Gas Upgrade Plant
- CO_2 Liquefaction Plant
- Heating Centre
- Biomethane Network Entry Facility
- Administration Building
- Weighbridge and Weighbridge Office
- Mechanical and Electrical

The construction timeline and works sequencing is discussed in Section 3.5.1.

The construction methodology for the proposed gas network connection is detailed in Section 3.6.

3.5.1 Preliminary Construction Programme

The proposed construction timeline is 24 months as shown in Table 3-10.

3.5.1.1 Construction Working Hours

The proposed hours of construction are:

- Daytime (07:00 – 18:00)
- Saturdays (08:00 – 14:00)
- No construction Sundays or bank holidays

Table 3-10: Construction Timeline

Activity	Month																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Weighbridge																				■				
Stormwater Lagoon - Earthworks	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■									
Yard Area		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■							
Solid Waste Reception Building		■	■	■	■	■	■	■	■	■	■	■	■	■										
Liquid Reception Building				■	■	■	■	■	■	■	■	■	■	■	■									
Solid Digestate Building				■	■	■	■	■	■	■	■	■	■	■	■									
Heating Centre						■	■	■	■	■	■	■	■	■	■	■	■							
Primary Digester		■	■	■	■	■	■	■	■	■														
Secondary Digester			■	■	■	■	■	■	■	■	■													
Tertiary Digester				■	■	■	■	■	■	■	■	■												
Digestate Storage							■	■	■	■	■	■	■	■	■									
Pasteurisation												■	■	■										
Tank Farm Base		■	■	■	■	■	■	■	■	■	■													
De-sulphurisation plant												■	■	■										
CO_2 Liquefaction Plant													■	■	■	■	■	■						
Gas Upgrade Plant												■	■	■	■	■	■							
Odour Unit																	■	■	■					
Admin Building												■	■	■	■	■	■							
ESB sub station									■	■	■													
Car park																		■	■	■				
Gas Flare												■	■	■										
Solar Panels																		■	■	■				
Site Staff	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

Note: B* – Building, P* - Plant

3.5.2 Construction Traffic: Proposed Development

The construction of the proposed development will generate construction-related traffic on the roads in the proximity of the development. It will include:

- site personnel driving to the work site/construction compound (by car, van and 4x4)
- delivery of materials, tanks, prefabricated units steel, cladding and other construction materials by van and HGV
- movement of construction equipment and refuelling trucks to and around the site export of excess excavated soils
- import of engineering fill material and concrete

A Traffic Management Plan has been prepared and will be updated by the contractor prior to the commencement of the construction work for inclusion in the Construction Environmental Management Plan (CEMP) in Appendix 3.1 of Volume 3 of this EIAR. The plan will be prepared in in consultation with Carlow County Council roads department. Written procedures will also be put in place to deal with refuelling machinery in line with best practice.

3.5.3 Environmental Management during Construction

A Construction Environmental Management Plan (CEMP) has been prepared and is included in Appendix 3-1 of Volume 3 of this EIAR. It specifies environmental controls that the Contractor will be required to undertake during the construction phase. The Contractor will be required to update the CEMP for approval to commence construction. Please refer to the CEMP for:

- storm water management and sediment control during construction
- management of noise
- management of earthworks, concrete works and handling of fuels, chemicals and materials
- traffic management
- emergency response
- dust management
- resources and waste materials management
- health and safety during construction

3.5.4 Advanced Works, Site Entrances and Contractors Compound

Advanced site works will be required prior to full site mobilisation and will include general clearance of the site area, construction of storm water settlement lagoons, site entrances and establishment of construction stage site services e.g. generators, temporary potable water supplies and storage areas. Daily visual inspections of all settlement lagoons will be carried out with checks twice daily during periods of heavy rainfall. The stormwater lagoon will be one of the first pieces of infrastructure constructed on site.

A construction compound will be required for the duration of the construction cycles. It will typically consist of a hardcore area surrounded by secure fencing, comprising site offices, canteen, toilet facilities, storerooms and staff parking areas. Fuel/oil storage areas will be bunded in accordance with best practice.

The temporary construction compound will be located within the red line boundary and will move to accommodate various elements of the build.

Temporary welfare facilities will be required for construction workers. These will consist of temporary 'portaloo' type chemical toilets located within the construction site compound. Advanced site works will be completed using track excavators for general clearance, articulated wheeled dumpers for earth movements, fixed body tipper trailers for the delivery of virgin aggregates, roller compactors for the formation and compaction of hardstanding areas and truck mounted cranes used for unloading site containers and support infrastructure.

3.5.5 Earthworks

The footprint of the site will be excavated to the necessary formation levels for construction. Excavated materials will be used onsite for reprofiling and embankment construction. Excess materials will be exported office for recovery/disposal as appropriate.

The volume of materials to be excavated, retained on site and exported are shown here:

- excavation and moved on site approx. 98,900 m3
- retained on site approx. 93,900 m3
- exported (excess materials) approx. 5,000 m3

Refer to Drawing No's: P24188-FT-XX-XX-DR-CE-0300-0303 in Volume 4 of this EIAR.

Excavation works (cutting and filling) will be undertaken by 360° excavators and tracked bulldozer. Internal soil movements will be completed using articulated dump truck with offsite removal of excess materials completed using rigid tipper lorries.

3.5.6 Storm water Lagoon

The storm water lagoon will be constructed as an earthwork embankment. The footprint will be excavated to the required depth and the grading of internal slopes to ensure structural stability. The subgrade will be prepared and cleared of sharp debris, a high-density 1mm LLDP primary liner will be installed and seam-welded to create an impermeable barrier. The lagoon will be integrated into the wider site infrastructure via a pipe network consisting of gravity-fed inlets from the tank farm sump and the main collection sump. Water collected during the construction phase will be used for construction. There will be no discharge of water from the stormwater lagoon during the construction phase. If required, water will be transported off site.

3.5.7 Storm Water Management During Construction Phase

The stormwater lagoon will be the first piece of infrastructure constructed on site. It is described in the following section.

3.5.7.1 Stormwater Lagoon

- During operation, all three hydraulic networks will discharge to a sealed lagoon, preventing infiltration to groundwater. During construction, all stormwater generated on site will discharge to the sealed lagoon.
- A forebay will be provided at the lagoon inlet to manage first-flush runoff and capture residual sediment.
- The lagoon will include a settling zone, sufficient storage volume, and a minimum freeboard of 300 mm.
- It will be designed for the 1-in-30-year storm event plus a 20% climate change allowance.
- Due to the quarry setting, the lagoon will operate as a drainless system, with exceedance flows managed by pumping during the operational phase. During construction, the lagoon will be emptied by tanker as required, ensuring that no stormwater is discharged from the site.
- A temporary version of the operational phase pump station associated with the lagoon will be equipped with water-quality sensors designed to continuously monitor lagoon water prior to reuse of stormwater as a construction water source. Reuse of stormwater will only occur where monitoring confirms acceptable water quality. Where monitored parameters indicate contamination or abnormal conditions, water will be tankered off site for further treatment and management at an authorised facility.
- During construction, mitigation will focus on controlling sediment mobilisation, managing temporary drainage arrangements, and preventing accidental pollution. The construction of the proposed development includes the construction of the drainage system. There will be no discharge of stormwater from the site during the construction phase. All stormwater generated on site will be directed to and contained within the lined stormwater lagoon for containment, settlement, reuse where appropriate, and tankering off site where required. Monitoring of stormwater within the lagoon will be undertaken to determine its suitability for reuse as a construction water supply.
- A temporary drainage treatment train will be implemented throughout the construction phase. Surface runoff generated within disturbed areas of the site will be collected and conveyed through a sequence of treatment measures comprising temporary interceptor drains, check dams, sediment traps, the stormwater lagoon forebay and the stormwater lagoon settlement zone prior to storage within the lagoon. The treatment train can be summarised as follows:
- Runoff → Temporary Interceptor Drains → Check Dams → Sediment Traps → Lagoon Forebay → Lagoon Settlement Zone
- This treatment sequence will progressively reduce flow velocities, promote sediment settlement, capture suspended solids at multiple stages and minimise the risk of polluted runoff entering the stormwater lagoon. The lagoon will provide the final stage of sediment settlement and water quality management prior to reuse on site or removal by tanker where required.
- The following measures will be implemented during construction:
- Phased construction of drainage infrastructure to ensure that permanent drainage and treatment features are operational at the earliest practicable stage. The stormwater lagoon will be constructed in advance of earthworks.
- Installation of temporary sediment control measures, including silt fences, sediment traps, settlement areas, and temporary interceptor drains with check dams.
- Protection of the stormwater lagoon from uncontrolled inflows and excessive sediment loading during early construction phases through the use of temporary diversion ditches, check dams and sediment-control measures.
- Discharge from the stormwater lagoon to sealed tankers for off-site treatment and disposal where water quality monitoring identifies contamination or where excess volumes require removal.

- Water will be treated through a sequence of drainage elements, including the temporary and permanent sediment-control measures described above. The lagoon will provide additional treatment through settlement within the forebay and settlement zone.
- All temporary drainage measures, including interceptor drains, check dams, sediment traps, settlement areas and the stormwater lagoon, will be inspected regularly and following significant rainfall events. Accumulated sediment will be removed as required to maintain the effectiveness of the drainage system and preserve available storage capacity.
- Construction activities will be planned with consideration of forecast weather conditions. Activities with an increased risk of sediment mobilisation may be modified, suspended or rescheduled during periods of prolonged or intense rainfall where necessary to minimise pollution risk.
- Management of excavations and exposed soils to minimise erosion, including temporary stabilisation where required.
- Temporary stockpiles of soil and excavated material will be located away from drainage features where practicable and managed to minimise erosion and sediment runoff. Additional protection measures will be implemented where required during periods of prolonged or intense rainfall.
- Storage of fuels, oils and chemicals in bunded, sealed and designated areas, with refuelling restricted to controlled locations.
- Provision of spill kits and training of construction personnel in spill response procedures.
- An emergency pollution response procedure will be implemented on site. In the event of a spill, leak or other pollution incident, the source will be isolated immediately, contaminated material will be contained and recovered, and any contaminated water will be removed from site by an authorised contractor for treatment and disposal at an appropriately authorised facility.
- Strict control of concrete works to prevent alkaline runoff. All concrete wash out water will be collected in a dedicated tank and transported off Site by a permitted contractor to an authorised private WWTP.
- No direct discharge of stormwater to groundwater, surface water bodies or off-site drainage systems will occur during the construction phase.
- Protection of watercourse crossings along the gas pipeline route, with works undertaken at existing culverts or bridges in accordance with Inland Fisheries Ireland (IFI) guidance and OPW.

3.5.8 Portal Frame Buildings

This section is applicable to the following structures:

- solids reception building including a solids bunker constructed from reinforced concrete and odour abatement
- liquids reception building including odour abatement
- solid digestate building including odour abatement
- heating centre
    - to include a biomass storage bunker. The storage bunker will be constructed from reinforced concrete utilising similar methods to that described for the solids bunker, See Section 1.4.3 for details.
    - The proposed biomass boiler and biomass boiler exhaust air treatment system will be prefabricated off site, delivered by truck to site and craned into place within the Heating Centre.

3.5.8.1 Foundations

Relevant to all portal frame buildings and the tank bund farm, the gas upgrade plant, the gas desulphurisation plant, the CO_2 liquification plant, the odour abatement area, the admin building and the gas flares area.

Prior to the construction, a grid of stone reinforced columns will be used to improve the strength, stiffness, bearing capacity and settlement characteristics of the existing ground at the site. Construction typically begins by penetrating the ground to the required depth using a vibrating probe. Penetration may be achieved by vibration alone or assisted by air or water jetting, depending on soil conditions.

Once the target depth is reached, graded crushed stone or gravel is introduced either from the ground surface (top-feed method) or through the probe (bottom-feed method). The stone is placed in stages, and at each stage the vibrating probe is partially withdrawn and reinserted to compact the stone laterally into the surrounding soil. This process forms a dense, cylindrical column of stone while simultaneously improving the confinement and density of the adjacent ground. The sequence is repeated until the column reaches ground level. See Figure 3-25.

The finished stone columns act as stiff inclusions that carry load, reduce settlement, and provide drainage paths that accelerate consolidation of soft soils under applied loads.

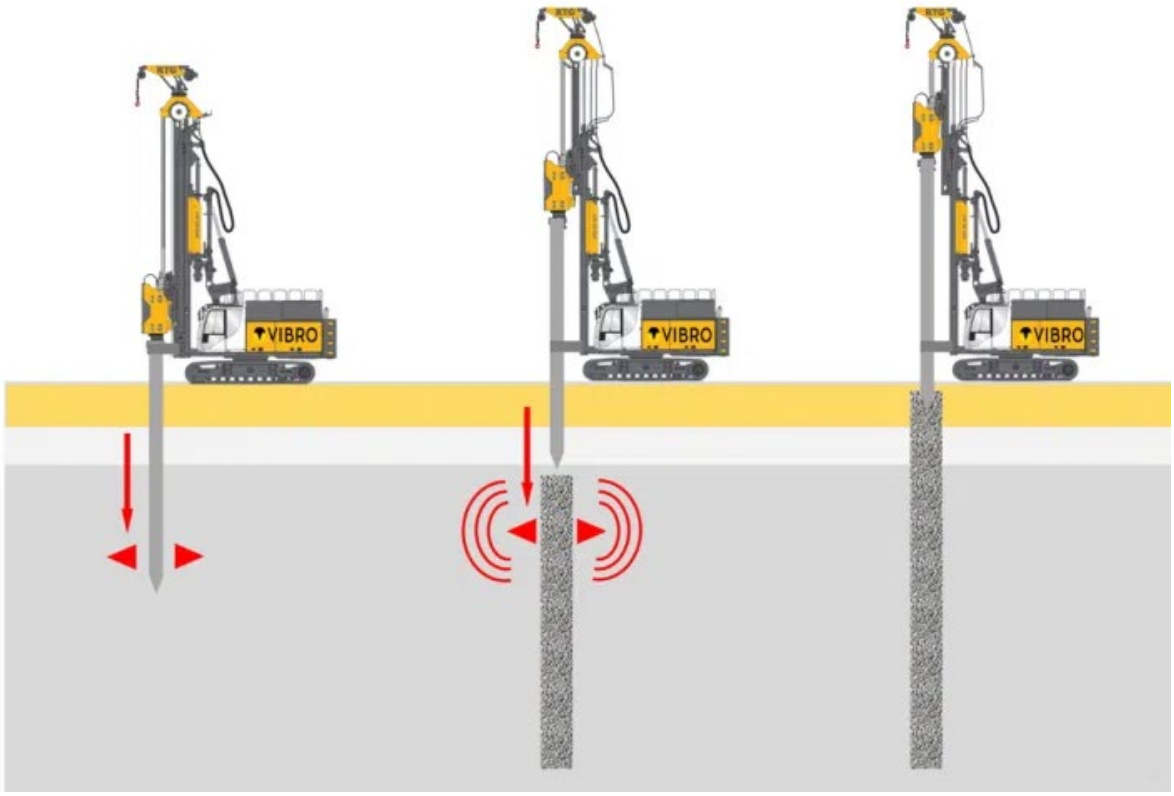


Figure 3-25: Vibro Stone Columns: Construction Sequence Schematic

All foundations will be ground bearing reinforced concrete pads/strips on a suitable stratum or stone column grid dependant on loading and settlement requirements.

3.5.8.2 Preparation for and Management of Concrete Pour

Hard standing formation will consist of hardcore on geo-textile membrane. The construction methodology for hard standings will be as follows:

- The formation will be prepared to receive the geotextile membrane.
- Stone (sourced locally from licensed quarries) will be placed and compacted in layers.
- Drainage ditches will be formed, within the excavated width and along the sides of the hard standing.

The extent of the excavation will be marked out.

Around the perimeter of the foundation formation a shallow interceptor drain will be formed and settlement pond / swale constructed.

The base of the foundations will be excavated to competent bearing strata. This will typically be within the upper 5 m but will be confirmed on-site by the Site Engineer.

Where necessary, temporary pumps and sumps may be required to maintain a dry, clean formation. Pumped water will be directed to the settlement ponds prior to entering the drainage system to the stormwater lagoon.

A layer of concrete blinding (lean mix) will be laid 75 mm thick directly on top of the newly exposed formation to provide a level platform.

Formwork and reinforcement will be fixed.

Ductwork will be installed as required for cables, and formwork erected around the steel cage.

Concrete will be placed using a concrete pump in accordance with the requirements of the Structural Engineer and compacted using vibrating pokers.

Concrete would typically be in two pours, the first pour being the main base, which is approximately 90% of the foundation; the second and remaining 10% forming the plinth section which sits on the top of the main base.

Concrete foundations will be poured using a concrete pump feed by imported ready mixed concrete. Concrete will arrive to site in concrete mixing wagons which will empty to the concrete pump. Workers will direct the flow of pumped concrete as required and the concrete will be levelled in place by a suitable level machine or screed. See Figure 3-28.

Upon completion of the concreting works the foundation base will be covered against precipitation.

Steel shutters will be used to pour the upper plinth section.

Once the concrete is set the earthing system is put in place and the foundation is backfilled with suitable material to tie in with the required level of the hardstanding.

The foundation will be backfilled with a cohesive material, where possible using the material arising during the excavation.

3.5.8.3 Buildings

Imported structural fill will be a granular engineered fill, compacted to provide a suitable subgrade for the building floors. Floors will be constructed using steel or fibre reinforced concrete founded on a suitable depth of compacted granular fill. As per the foundations concrete will be pumped into place (See Figure 3-28) and suitably compacted. The floor finish will be achieved by a vibratory screed followed by steel power floats post initial curing.

The steel frame portal will be erected on the reinforced concrete substructure. The frame will consist of rolled steel columns and rafters typically at 5-7m spacing. Steel erectors will use a crane and typically two mobile elevated work platforms to construct the steel structure (See Figure 3-26). The crane will be used to lift and manoeuvre the steel elements as required. Workers on the elevated access platforms will then bolt the prefabricated members together forming the steel superstructure.

Cold rolled light gauge steel purlins and cladding rails will be fixed to the main columns and rafters. The frame will be cladded with insulated cladding.

The cladding will be appropriately detailed with flashings and seals to ensure maximum airtightness is achieved about the building envelope to maximise the efficiency of the odour abatement system.

For concrete walls, once the foundations are poured, rising walls will be constructed. These will be comprised of a mixture precast concrete walls and reinforced concrete “push walls”.

Precast concrete wall sections will be delivery to site prefabricated, the wall sections will be lifted into place by crane and suitably affixed to the building steel superstructure by structural connections.

Reinforced concrete walls will be constructed sectionally, reinforcement bars will be tied in place manually by steel fixers. Post completion of the reinforcement steel, metal formworks will be lifted into place by crane and will be suitably jointed and supported/propped in place. Imported Ready-mix concrete will be pumped into the construction formwork; vibratory pokers will be used to ensure the concrete is fully compacted and left to set. After a few days, the formwork will be stripped from the concrete walls to be reused in the proceeding sections.

Push walls will be designed to retain the weight of stockpiled material and the pushing forces associated with the operation of front-loading vehicles. Internal retaining walls will also be required in some buildings to accommodate the split-level nature of certain areas.



Figure 3-26: Steel erection: Crane and Mobile Elevated Work Platforms (Wall Steel, 2026)

Works to affix purlins and cladding will progress similarly to the erection of the steel structure by using a crane to lift and position materials and mobile elevated work platforms to allow workers fix materials as depicted in Figure 3-27.



Figure 3-27: Cladding Installation Portal Frame (Steel Construction Info, 2026)

External cladding will be affixed to the steel frame when completed. Roof drainage will consist of gutters and downpipes draining the pitched roofs to the storm water management system.



Figure 3-28: Placement of Reinforced Concrete Floors (Concrete Pumping Ltd., 2026)

3.5.9 Circulation Yard and Drainage Infrastructure

Refer to Sectio 3.5.8.2. The construction of the circulation yard and drainage will commence with excavation to the formation level. The area will be backfilled with a Class 6F1 sub-base material, laid and compacted to provide a stable foundation.

During this phase, the subsurface drainage network will be installed. This includes the placement of carrier pipes within the Class 6F1 layer, with vertical risers (up-pipes) positioned at designated collection points to interface with the surface drainage gullies.

Following the installation of services, a secondary layer of Class 804 granular material will be applied and blinded to provide a level sub-grade. The final structural layer will consist of reinforced concrete, incorporating steel mesh or bar reinforcement as per the structural design to accommodate heavy vehicular loading. The slab will be cast with a power-floated or brushed finish to ensure a durable, smooth, and slip-resistant surface. Upon completion of the curing process, road markings will be applied to delineate traffic flow, designated turning areas, and pedestrian exclusion zones.

3.5.10 Bunded Tank Farm

The tank farm is constructed within a fully contained lowered bunded area to prevent the escape of liquids in the unlikely event of a major tank failure or spillage The concrete bund will be designed and constructed in accordance with the requirements of

- IPC Guidance Note on Storage and Transfer of Materials for Scheduled Activities (EPA, 2004)
- BS 8007 Code of practice for design of concrete structures for retaining aqueous liquids (BSI, 1987)
- CIRIA C736 Containment systems for the prevention of pollution (CIRIA, 2014)

The bunded area will be capable of retaining 110% of the largest tank volume or 25% of the total installed tank volumes (whichever is the greatest) with an appropriate freeboard depth. Refer to Section 3.3.7.11.The bund will provide impermeable secondary containment and will be subject to integrity testing prior to commissioning.

The tank farm and bunded area will consist of a series of insitu concrete raft style tank foundations (refer to Figure 3-29) within a larger concrete area.

Refer to Section 3.5.8.2. The proposed bund farm area will be locally excavated to formation level. The proposed tank foundation and bund floor formation will typically comprise a layer of lean mix concrete blinding, atop Cl804 compacted aggregate, atop Cl 6F1 aggregate. Aggregates will be placed in layers and compaction will be achieved using a vibratory roller compactor.

The formation will be locally deepened in areas to accommodate the tank foundations. Tank foundations will be typically 300mm to 500mm in depth dependant on the overall tank loading and up to 36m in diameter.

Similar to other concrete works, post completion of the placement of reinforcement steel (manually tied in place), formworks will be constructed/installed atop the individual tank foundations. Concrete pumping will be used to place the concrete within the forms which will be compacted using a vibratory poker. The surface will be allowed to cure prior to power floating to achieve the required finish.



Figure 3-29: Construction of Digester Tank Foundations (BioWatt, 2026)

Post completion of all tank foundations the reinforced concrete bund floor will be poured and placed around the tank foundation to form a singular monolithic impermeable base for the bund area. A reinforced concrete wall will then be constructed about the entire bund perimeter. The bund wall will include integrated reinforced concrete access ramp for vehicular and crane access to the bund area. The reinforced concrete bund wall will be constructed sectionally, reinforcement bars will be tied in place manually by steel fixers. Post completion of the reinforcement steel, metal formworks will be lifted into place by crane and suitably supported/propped. Imported Ready-mix concrete will be pumped into the construction formwork; vibratory pokers will be used to ensure the concrete is fully compacted and left to cure/harden. After a few days, the formwork will be stripped from the concrete walls to be reused in the proceeding sections.

Storm water and drainage from the bund area are discussed Section 3.3.17 and Section 3.4.11.

3.5.10.1 Primary and Secondary Digesters

Primary and Secondary digesters will be constructed in steel. The steel digesters are constructed using coated steel plates for the liquid zone and stainless steel (AISI316) for the top gas zone (top ring and roof). The steel plates will be delivered to site in segments.

The digester roof will be constructed first. Individual stainless steel roof sections will be bolted together along spines radiating between two concentric circles forming the conical tank roof (See Figure 3-30). Once the conical roof is constructed at ground level a series of hydraulic jacks will be connected to the structure. The hydraulic jacks will raise the roof so that a single tank ring section can be constructed beneath. Once the top ring is complete, the jacks will lower the roof, and the roof and top ring section will be bolted together. The lifting process is repeated with ring after ring of tank being added until it reaches its final height.



Figure 3-30: Stainless Steel Roof - Ground Level Construction (Balmoral Tanks, 2026)

Insulation will be mounted on the outside tank wall and finished with trapezoid cladding as the tank is raised. A top mounted agitator will be installed on the tank's roof by crane.



Figure 3-31: Digester Tank Construction (Biogas Consulting , 2026)

3.5.10.2 Tertiary Digesters and Liquid Pre Storage Tank

The construction of concrete tanks will require manual fixing of reinforcement steel followed by the installation of appropriate steel formworks using a crane. The steel forms will be bolted together and appropriately propped (See Figure 3-32). A concrete pump will be fed via a ready-mix concrete wagon to deliver concrete to the forms.

The concrete will be suitably compacted by use of a vibratory poker. Post curing of the concrete, the steel formwork will be removed and cleaned for reuse in the next lift i.e. the used formwork will be reinstalled atop the newly formed wall to allow placement of the next concrete lift.



Figure 3-32: Climbing Concrete Formwork (RSB formwork technology, 2026)

Post completion of the concrete works the tank will be external clad with an insulated metal cladding. The cladding will be affixed to the entire external perimeter of the tank. Mechanical plant will be installed within the tanks. The double layer gas membrane roof will be installed to seal the entirety of the tank roof forming a gas tight flexible dome.

3.5.10.3 Post Digestion Liquid Digestate Storage Tank and Digestate Storage Tank

The Post Digestion Liquid Digestate Storage Tank will be constructed in an identical fashion to the Tertiary Digestion Tanks excluding the addition of external insulated cladding.

3.5.11 Desulphurisation Plant, Gas Upgrade Plant, CO_2 Liquefaction Plant

The proposed desulphurisation plant components, gas upgrade plant components, and CO_2 Liquefaction plant components will be prefabricated off site, delivered by truck to site and craned into place. Electrical and mechanical connections will be made on site aided by mobile cranes and Mobile Elevated Word Platform (MEWP). Post completion of all connections and instrumentation and period of commissioning will be completed including testing, cold commissioning and hot commissioning.



Figure 3-33: Biogas Desulphurisation Plant Source (CSO Group, 2026)



Figure 3-34: Amine Biogas Upgrader – Ammongas (World Biogas Association, 2026)



Figure 3-35: CO_2 Liquefaction Plant (Tonder Biogas)

3.5.12 Biomethane Network Entry Facility

The proposed Biomethane Network Entry Facility (BNEF) will be prefabricated off site, delivered by truck to site and craned into place. Electrical and mechanical connections will be made on site aided by mobile cranes and MEWP. The BNEF contains telemetry and analysers to measure the parameters listed in Table 3-9. Odour is added to the biomethane at this point. Pipework will be installed within trenches excavated on site backfill to GNI specifications with respect to minimum cover. The BNEF infeed pipe will run between the Gas Upgrade Plant and the BNEF. The BNEF return pipe (rejecting non specification biomethane) will run between the BNEF and the Tertiary digesters (See Section 3.3.7.3). Approximately 3-4 hours of gas storage will be available within tertiary digester domes. In the event of gas dome storage being exhausted, reject gas will be flared (See Section 3.3.15)

Internal gas pipe trenches will be excavated and backfilled using and excavator. Pipes will be welded together onsite and suitably pressure tested.

Post completion of all connections and instrumentation and period of commissioning will be completed including testing, cold commissioning and hot commissioning.



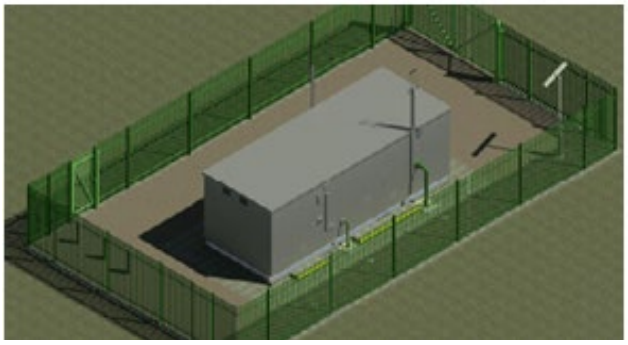


Figure 3-36: Biomethane Network Entry Facility (Prefabricated Unit - Illustration) (Gas Networks Ireland)

3.5.13 Administration Building and Weighbridge Office

These will be of a standard concrete construction with the inclusion of rooms to include offices, storerooms, laboratory, conference room etc as detailed in Section 3.3.16.

3.5.14 Weighbridge

The weighbridge will be prefabricated off site, delivered by truck to site and craned into place on a poured reinforced concrete foundation. Electrical and mechanical connections will be made on site aided by mobile cranes and MEWP. Post completion of all connections and instrumentation and period of commissioning will be completed

3.5.15 Mechanical and Electrical

A mechanical and electrical (M&E) contractor will be appointed by Greengate Biogas 001 Ltd. to install and commission all M&E plant.

3.5.16 Ancillary Infrastructure

All ancillary infrastructure will be installed and commissioned in strict accordance with the original equipment manufacturer specifications and the designated supplier's technical requirements.

3.5.17 Landscaping

Landscaping will be carried out in accordance with the Landscape Plan included in Volume 4 of this EIAR.

3.6 Construction Methodology: Renewable Natural Gas - Network Connection

GNI will be responsible for extending the gas pipeline to the proposed development site and a road opening licence will be required to be obtained by GNI from Carlow County Council (CCC) to undertake these works. GNI is responsible for detailed design and for obtaining all consents from regulatory bodies not limited to utility providers, OPW, Carlow County Council and TII in advance of the submission of an application for development consent. At construction stage, all consents will be in place and GNI will have detailed drawings showing all services in the area. All Uisce Éireann assets along the proposed pipeline route must be identified. Uisce Éireann does not permit build over of its assets. Separation distances from public infrastructure, as per Uisce Éireann's Standards, Codes and Practices must be achieved. GNI must obtain a Confirmation of Feasibility from Uisce Éireann Diversions team prior to the lodgement of a planning application if it seeks to build under/over or divert Uisce Éireann's assets.

It is planned that the gas pipe will be laid in the grass verge alongside the existing road (where possible) or under the existing road itself. The final route will be determined by GNI at detailed design stage.

The pipe will be laid at approximately 100 metres per day by open cut method. Residents affected will be notified by GNI via a letter drop approximately 1 week before the works are due to start with disruption kept to a minimum and access to properties will be maintained.

A site-specific traffic management plan will be prepared by a specialist traffic management team. This will be required by Carlow County Council to obtain the road opening licence. Reinstatement will be as specified by Carlow County Council as a condition of the road opening licence.

The proposed gas pipeline connection will require both standard cut and cover construction (i.e. excavate trench, place pipe, cover pipe and reinstate surface finish) and horizontal directional drilling methods of installation.

3.6.1 Trenchless Construction - Horizontal Directional Drilling (HDD)

HDD is a construction method that can be used to advance a pipeline where open cut trenching construction is not preferable.

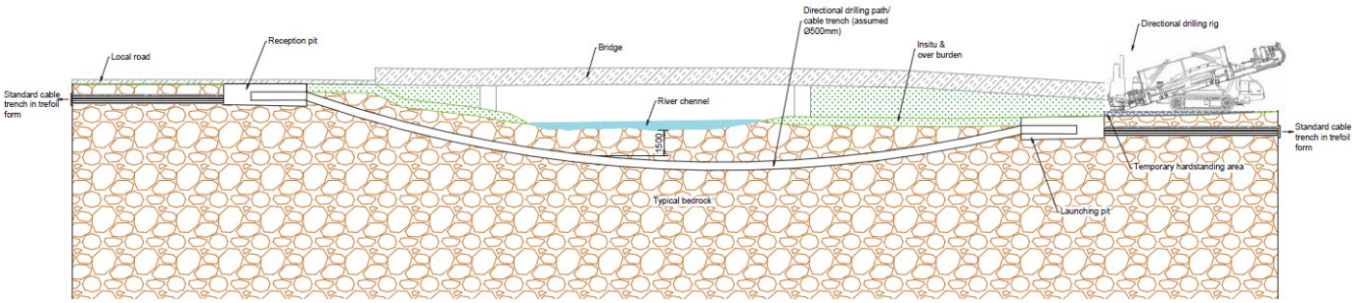


Figure 3-37: HDD Activity Profile

In HDD, a drill head is driven through the ground in the desired alignment and depth, which can be measured precisely. Drilling is done from a launch pit (2 m x 5m) at one end of the reception put at the other end of the area (2 m x 5m).

A pilot hole will be bored as per the agreed alignment and will be tracked and controlled using a transmitter in the drill head. By tracking the depth, position and pitch of the drill head the operator can accurately steer the line of the drilling operation. The drilling operation is lubricated using a fluid. When the pilot hole has been drilled to the correct profile, its diameter is increased if necessary to match the external diameter of the protective pipe duct.

To avoid damage to the gas pipe that must pass through the borehole, the gas pipe is placed in a protective pipe (PE). The protective pipe, with the gas pipe (250 mm diameter), is then pulled through the bore. The works areas around the launch and reception pits is 40 m^2. This allows for the drill rig and winch, drilling rods, room to weld pipe before pulled into bore and space for traffic management around works area.

The drilling rig will be securely anchored to the ground by means of anchor pins which will be attached to the front of the machine. The drill head will then be secured to the first drill rod, and the operator will commence to drill into the launch pit to a suitable angle which will enable the excavation to obtain the depths and pitch required to the line and level of the required profile. Drilling of the pilot bore will continue with the addition of 3.0 m long drill rods, mechanically loaded and connected into position.

During the drilling process, a mixture of a natural, inert and fully biodegradable drilling fluid such as Clear Bore™ (environmentally friendly product (not toxic to aquatic organisms)) and water is pumped through the centre of the drill rods to the reamer head and is forced into void and enables the annulus which has been created to support the surrounding sub soil and thus prevent collapse of the reamed length. Depending on the prevalent ground conditions, it may be necessary to repeat the drilling process by incrementally increasing the size of the reamers.

When the reamer enters the launch pit, it is removed from the drill rods which are then passed back up the bore to the reception pit and the next size reamer is attached to the drill rods and the process is repeated until the required bore with the allowable tolerance is achieved.

The use of a natural, inert and biodegradable drilling fluid such as Clear Bore™ is intended to negate any adverse effects arising from the use of other, traditional polymer-based drilling fluids and will be used sparingly as part of the drilling operations. It will be appropriately stored prior to use and deployed in the required amounts to avoid surplus. Should any excess drilling fluid accumulate in the reception or drilling pits, it will be contained and removed from the site in the same manner as other subsoil materials associated with the drilling process to an approved disposal site. Backfilling of launch and reception pits will be conducted in accordance with the normal specification for backfilling excavated trenches and joint bays.

Once the drilling is complete, the gas pipeline lies in the ground surrounded by the protective pipe.

3.6.1.1 Motorway Crossing

As per Section 3.3.20, it is proposed to traverse beneath both carriageways of the M9 using a trenchless construction methodology such as HDD. It is the preferred option of TII for motorway crossings. All works are subject to TII approval.

The locations of the launch and reception pits will be adequately spaced from the carriageway and outside of the MMaRC contract boundary as per Figure 3-18 to ensure the bore is at such depth as not to conflict with the drainage or surface of the motorway or associated embankments. The section of pipe under the motorway will be seamless, i.e. no joints.

3.6.1.2 River Barrow Crossing

As per Section 3.3.20, a trenchless construction methodology such as Horizontal directional drilling (HDD) will be used to traverse the River Barrow to avoid any works in the Cardinal Moran Bridge carrying the R448 across the River Barrow.

The locations of the launch and reception pits will be located to ensure the bore is at such depth as not to conflict with the riverbed, any drainage R448 or foundations of the bridge. GNI will be responsible for obtaining the necessary approvals from Carlow County Council such as a road opening licence.

It is proposed to use HDD to cross two existing land drains under the L3034.

3.6.1.3 Construction Phase HDD

The operation will take place from one side of the watercourse or motorway within the public road corridor and will be carried out by an experienced HDD specialist.

In the case of HDD operations within the public road corridor, the works will be carried out in accordance with measures described in the Traffic Management Plan contained within the CEMP in Appendix 3.1 of Volume 3 of this EIAR.

The process will involve setting up a small, tracked drilling rig on one side of the watercourse or motorway. In the case of the River Barrow crossing, launch and reception pits will be located in R448. In the case of the motorway, the pits will be located at a sufficient distance to drill under the motorway, which is in a cut and outside of the motorway reservation.

A shallow starter pit will be excavated at the point of entry and will be located at a sufficient distance from the watercourse or motorway to achieve a minimum clearance depth below the bed of the watercourse and motorway foundation and services. A pilot hole will be bored as per the agreed alignment and will be tracked and controlled using a transmitter in the drill head. By tracking the depth, position and pitch of the drill head the operator can accurately steer the line of the drilling operation. The drilling operation is lubricated using a fluid. When the pilot hole has been drilled to the correct profile, its diameter is increased by a reaming process to match the external diameter of the gas pipeline (250 mm. The flexible plastic ducting is then pulled through the pre-drilled hole and sealed at each end until required for the gas pipe.

Minimum environmental protection measures to be implemented on site will include the following:

- A site-specific drilling design, risk assessment and method statement will be prepared by the contractor prior to the works.
- Utility plans are available on site. The presence of all buried utilities will be confirmed and marked on the ground.
- Where overhead and underground services have been identified the ESB Code of Practice for Avoiding Danger from Over Head Electricity Lines and the HSA Code of Practice for Avoiding Danger from Underground Services are complied with.
- If drilling fluids are required, a biodegradable fluid such as Clear Bore™ will be used rather than Bentonite.
- HDD operations to be limited to daytime hours and conditions when low levels of rainfall are forecast.
- The depth of the bore will be at least 3m below the bed of the watercourse and as per TII instruction under motorway.
- A field response plan to minimize loss of returns of drilling fluid and actions to restore returns will be provided.
- Silt fences will be constructed around proposed work areas prior to commencement of works.
- No refuelling will take place within 50m of the watercourse or any sensitive habitats. Pre-construction verification surveys will take place at drilling sites to confirm the presence of any sensitive species.
- The Contractor will provide full time supervision of the HDD and installation of the pipe by appropriate qualified personnel, i.e. in HDD and gas pipe installation.

A detailed survey of buried services within the public road to confirm the conditions predicted in this EIAR will be carried out by the contractor prior to commencement of the operation. Site investigation will be required to inform detailed design.

Carlow County Council and TII will be made aware in advance of the operation and invited to oversee the activity.

3.6.1.4 Commissioning of the Gas Pipeline

GNI has full and sole responsibility for commissioning and operating the proposed gas pipeline.

3.7 Construction Environmental Management Plan

A Construction Environmental Management Plan (CEMP) has been prepared for the proposed development and is included in Volume 3, Appendix 3.1.

The CEMP will be updated prior to construction to take account of any amendments arising during the consenting process and relevant conditions attached to the planning permission and will be implemented for the duration of the construction phase of the project. The EOP will be a live document and will be reviewed and updated as required.

3.8 Use of Materials

Natural resources will be consumed/used during the construction and operational phases of the proposed development.

3.8.1 Construction Phase Material Use Proposed Development

Table 3-11 outlines the principal quantities of natural resources/materials to be used in the construction of the facility. The table outlines the material usage for the principal site components. Assumptions, where used, are noted.

Table 3-11: Use of Natural Resources

Category	Element	Natural Resources	Quantity	Units
Circulation Yard	Yard Area	Concrete	10,920,000	kg
		Steel Reinforcement	56,420	kg
		Subbase Cl 804	3,639,090	kg
		Sub Grade Cl 6F1	5824000	kg
Solid Waste Reception Building	Materials Bunker area	Concrete Floor	847,200	kg
		Uplift concrete for foundation	84,720	kg
		Reinforcement Steel	35,300	kg
		Uplift concrete for foundations	3,530	kg
		Subbase Cl 804	188,220	kg
		Sub Grade Cl 6F1	338,880	kg
	Bunker Retaining Walls	Area		
		Concrete	558,749	kg
		Uplift for Retaining Wall toe concrete	335,249	kg
		Reinforcement steel	34,922	kg
		Uplift for Retaining Wall toe steel	20,953	kg
	Solids Infeed Areas	Concrete floor	1,249,920	kg
		Reinforcement Steel	6,458	kg
		Subbase Cl 804	347,113	kg
		Sub Grade Cl 6F1	694,400	kg

Category	Element	Natural Resources	Quantity	Units
	Structure	Primary Structural Steel	170940	kg
		Secondary Structural Steel	17094	kg
		Roof Cladding	1758.24	panels
		Wall Cladding	3042.01875	panels
Liquid Reception Building	Main Area	Concrete Floor	547,063	kg
		Foundations	54,706	kg
		Steel Reinforcement	12,537	kg
		Subbase Cl 804	151,924	kg
		Sub Grade Cl 6F1	303,924	kg
		Raised curbed area	129,276	kg
	Rooms	Walls		
		Concrete blocks	1,002	blocks
		Hollow core Precast floor	37	panel
	Structure	Reinforcement Steel	27,353	kg
		Structural Steel	273,532	kg
		Secondary Steel	27,353	kg
		Roof Cladding	608	panels
		Cladding	999	panels
Solid Digestate Building	Stub wall	Concrete	23,530	kg
		Uplift for concrete	14,118	kg
		Reinforcement steel	1,471	kg
		Uplift for steel	882	kg
	Retaining wall	Concrete	367,248	kg
		Uplift for concrete	220,349	kg
		Reinforcement Steel	22,953	kg
		Uplift for steel	13,772	kg
		Concrete Floor	758,160	kg
		Foundations	75,816	kg
		Steel Reinforcement	17,375	kg
		Subbase Cl 804	210,547	kg
		Sub Grade Cl 6F1	421,200	kg
	Digestate storage Structure	Reinforcement Steel	51,244	kg
		Structural Steel	512,435	kg
		Secondary Steel	51,244	kg

Category	Element	Natural Resources	Quantity	Units
		Roof Cladding	616	panels
		Cladding	1529.5525	panels
	Electrical Building Structure	Reinforcement Steel	7,641	kg
		Structural Steel	76,410	kg
		Roof Cladding	226	panels
		Cladding	502.659	panels
		Concrete Floor	946,080	kg
		Foundations	94,608	kg
		Steel Reinforcement	4,888	kg
		Subbase Cl 804	262,734	kg
		Sub Grade Cl 6F1	525,600	kg
	Retaining wall	Concrete	661,440	kg
		Uplift for concrete	396,864	kg
		Reinforcement Steel	41,340	kg
		Uplift for steel	24,804	kg
	Full height Walls	Concrete blocks	4180.3125	blocks
	Half Height Walls	Concrete blocks	2446.09375	blocks
		Hollow core Precast Roof	106	panel
	Entire Building except Ash Container Structure	Reinforcement Steel	123,480	kg
		Structural Steel	1,234,800	kg
		Secondary Steel	123,480	kg
		Roof Cladding	960	panels
		Cladding	1981.77375	panels
	Ash Container Structure	Reinforcement Steel	3,976	kg
		Structural Steel	39,758	kg
		Roof Cladding	82	panels
		Cladding	649.267875	panels
Tank Farm Bund	Foundation Primary Digester	Concrete	5,690,012	kg
		Steel Reinforcement	355,626	kg
		Subbase Cl 804	1,264,131	kg
		Sub Grade Cl 6F1	2,276,005	kg
	Foundation Secondary Digester	Concrete	5,161,008	kg
		Steel Reinforcement	322,563	kg
		Subbase Cl 804	1,146,604	kg

Category	Element	Natural Resources	Quantity	Units
		Sub Grade Cl 6F1	2,064,403	kg
	Foundation Tertiary Digester	Concrete	1,154,535	kg
		Steel Reinforcement	72,158	kg
		Subbase Cl 804	256,499	kg
		Sub Grade Cl 6F1	461,814	kg
	Foundation Digestate Storage	Concrete	1,290,252	kg
		Steel Reinforcement	80,641	kg
		Subbase Cl 804	286,651	kg
		Sub Grade Cl 6F1	516100.8	kg
	Foundation Pasteurisation	Concrete	411,264	kg
		Steel Reinforcement	21,420	kg
		Subbase Cl 804	114,211	kg
		Sub Grade Cl 6F1	205632.0	kg
Tank Farm Base	Tank Foundation	Concrete	14311562	kg
		Steel Reinforcement	73943	kg
		Subbase Cl 804	4769328	kg
		Sub Grade Cl 6F1	7632833	kg
Gas upgrade Area	Foundation De-sulphurisation plant	Concrete	296,640	kg
		Steel Reinforcement	1,533	kg
		Subbase Cl 804	82,379	kg
		Sub Grade Cl 6F1	164,800	kg
	Foundation CO2 liquefaction plant	Concrete	950,400	kg
		Steel Reinforcement	4,910	kg
		Subbase Cl 804	263,934	kg
		Sub Grade Cl 6F1	528,000	kg
	Foundation Gas Upgrade	Concrete	252,000	kg
		Steel Reinforcement	1,302	kg
		Subbase Cl 804	69,983	kg
		Sub Grade Cl 6F1	140000	kg
Admin Building	Main Area	Concrete Floor	316,800	kg
		Steel Reinforcement	7,260	kg
		Subbase Cl 804	87,978	kg
		Sub Grade Cl 6F1	176,000	Kg
	Rooms	Concrete blocks	58750.3125	blocks

Category	Element	Natural Resources	Quantity	Units
		Hollow core Precast Roof	262	panel
	Structure	Reinforcement Steel	8,415	kg
		Structural Steel	84,150	kg
		Roof Cladding	352	panel
		Cladding	530.8	panel
ESB sub station	Main Area	Concrete Floor	43,200	kg
		Steel Reinforcement	990	kg
		Subbase Cl 804	11,997	kg
		Sub Grade Cl 6F1	24,000	kg
	Structure	Reinforcement Steel	1,148	kg
		Structural Steel	11,475	kg
		Cladding	149.2	panel
		Roof Cladding	48	panel
Car park	Surface Finish	HRA	302,400	kg
	Foundation	Subbase Cl 804	83,979	kg
		Sub Grade Cl 6F1	168000	kg

Please note some of the above materials/quantities have been mitigated during the climate assessment. Mitigation measures are documented in Chapter 9 of Volume 2 of this EIAR.

3.8.2 Construction Phase Material Use and Generation Gas Pipeline

Gas Network Ireland will supply all materials for the construction of the gas pipeline and will be responsible for the management of any waste generated. At 9.6 km long, the estimated materials used and generated are included in Table 3-12.

Table 3-12: Construction Materials Gas Pipeline

Category	Element	Quantity	Units
Construction	Gas Pipes	9.6	km
	Sand	6,998,400	kg
	Subbase Cl 804	5,182,704	kg
	HRA	5,414,400	kg

3.8.3 Operational Phase Material Use

Natural resource consumption during the operational phase will include:

- Diesel fuel for site machinery
- Groundwater
- Woodchip
- Power

Diesel consumption per year, assuming the average loading shovel consumes on average 11.5 litres/hour[11] and operates for 275 days per year, 6 hours per day average will be 20,500 litres per year.

Water usage will be from an onsite groundwater well and from rainwater harvested from clean areas of the site. The estimate process water usage will be 62,000 m3/year (170 m3/day) sourced from rainwater harvesting onsite (65-130 m3/day) and the proposed groundwater well (100-120 m^3/day avg.)

Potable water will be supplied by a drinking water delivery. The estimated potable water usage for 28 Full Time Employee equivalents at 140 litres/day, 275 days/year will be 770 m^3/year.

The proposed biomass boiler will consume approximately 13,000 tonnes per annum of indigenously sourced woodchip (RED compliant).

The primary power demand on site will be from the operation of the process plant and ancillary usage e.g. lighting to site offices and perimeter lighting.

The total estimated power usage will be approximately 30,660 MWh per annum. This includes the total estimated power that will be provided by solar at 430 MWh per annum.

The construction and operation of the proposed facility will produce various waste streams requiring recovery or disposal. A resource and materials management plan is included in the CEMP in Appendix 3.1 of Volume 3 of this EIAR. This plan states how resources, materials and wastes will be managed throughout the construction and operational phase of the proposed development.

3.8.4 Operational Phase Proposed Development Material Generated

As per the CEMP and during the operation of the facility the IE Licence will require the implementation of an Environmental Management System (EMS) which will include detailed procedures for the management of all operational waste generation. The main wastes that will be generated, their sources, quantities and their proposed destination is outlined in Table 3-13.

[11] Caterpillar Performance Handbook, Cat 950M Waste Handler

Table 3-13: Operational Waste Management Schedule

Operational Waste Type	Description and Source	Quantity (Tonnes/Yr.)	Destination
Physical Contaminants	Stones, Grit, Horse shoes and other physical contaminants removed from liquid and solid feedstock streams	<500	Non-Hazardous Landfill
Biomass Boiler Ash	Ash generated from the proposed biomass boiler	133	Non-Hazardous Landfill
Spent Activated Carbon	Spent activated carbon sourced from the proposed Odour Abatement System and the Desulphurisation plant	28	Specialist Hazardous Waste Treatment Specialist
Spent Amine Solution	Spent Amine solution sourced from the proposed biogas upgrading plant	6	Specialist Hazardous Waste Treatment Specialist
Canteen and Office Waste	Waste generated from staff on site in offices and canteen	5	Waste recycling/recovery facility
Septic Tank Waste	Waste from wastewater system	385	Wastewater treatment plant

This waste will be removed off site by waste collection contractors holding valid Waste Collection Permits to approved authorised facilities.

3.9 Decommissioning

The expected lifetime of the facility is 30 years. Upon cessation of anaerobic digestion activities at the site, the facility will be decommissioned in accordance with a Closure Plan for the facility, which will be prepared as a condition of the IE licence for the proposed development.

The following closure and decommissioning tasks will be completed under this Closure Plan:

i) All feedstock supply will cease. Digestion will continue for the full retention period (60 days) All treated digestate will pasteurised and transferred back to farm.
i) All wastewaters collected on-site will be collected and removed for treatment at authorized wastewater treatment plant
i) All hard-standing areas and drainage systems including interceptors and underground tanks/chambers will be cleaned and washed down.
i) Plant, equipment and tanks will be safely decontaminated/cleaned using standard procedures and competent contractors/staff e.g. desulphurisation plant, CO_2 liquefaction plant, gas upgrade plant, flares, BNEF.
i) All plant and equipment present on-site will be decommissioned and either resold, reutilized at a separate site operated by the applicant, or scrapped.
i) Office and staff facilities will be cleaned and emptied of all documents and IT equipment previously associated with the operation of the proposed development.

i) The buildings, concrete hardstanding, weighbridge, drainage systems, boundary/treatment/landscaping and fencing may be left in-situ if value for sale or dismantled for recovery, recycling and reuse as appropriate.
i) Environmental monitoring, inspection and management will be undertaken during closure to confirm that closure and decommissioning tasks do not generate emissions to environmental harmful to receiving environmental media (e.g., ambient air, soil, groundwater, storm water).
i) Records relating to material management, and environmental management, monitoring and assessment will be retained by the applicant.

The closure plan will be submitted to the EPA for approval, following by a closure audit. Only upon completion of all licensed steps, will the EPA grant a licence surrender.

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