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Introduction

- 3.1 This Environmental Impact Assessment Report (EIAR) provides supporting information to accompany a planning application by Roadstone in respect of a proposed development at their existing Killough quarry facility in Gaile townland, Holycross, Co. Tipperary.
- 3.2 A full description of the proposed development is provided in EIAR Chapter 1 Introduction, but in summary, the proposed development will consist of:
- An overall planning application site area of c. 6.3 hectares consisting of a proposed bio-renewables production facility, buffer screening, ancillary facilities and site access via the existing permitted quarry entrance.
 - The proposed bio-renewables production facility (incorporating anaerobic digestion) compound will cover an area of c. 4 hectares with c. 16,821.5m² of new buildings consisting of an administration building; a dry matter reception building; a workshop; a bio-conversion building; a pre-treatment, equalisation and gas upgrading building; a digestate handling building; a warehouse storage building; a bio-filling station building; an odour abatement and pumping station building; a linear generator building; and an ESB sub-station building.
 - Ancillary site facilities to be provided will include, a wheelwash; a weighbridge; surface water and fire water storage ponds; storage tanks for water, silage feed, cattle manure, potale and spent grain, maize and chicken litter and gas; effluent collection and storage tanks; staff and visitor car parking and bicycle storage; HGV parking; hydrocarbon interceptors; roof mounted solar panels; wastewater treatment equipment; bunding and surface treatments; boundary treatments and fencing; lighting; services; drainage; landscaping; and all associated ancillary works.
- 3.3 The purpose of this chapter is to present the reasonable alternative considered by the developer during the design and pre-application stages of the Proposed Development.

Legislation

- 3.4 Annex IV (2) of the EIA Directive 2014/52/EU requires the consideration of reasonable alternatives which are relevant to the project and take into account the effects of the project on the environment. An EIAR must contain *“...a description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment.”*
- 3.5 The Planning and Development Regulations, 2001 (as amended) in Schedule 6 sets out the information which is to be contained in an EIAR and Part 1 (d) of Schedule 6 states that *“A description of the reasonable alternatives studied by the person or persons who prepared the EIAR, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the proposed development on the environment.”* shall be included.
- 3.6 The EPA Guidelines (2022), note that different types of alternatives may be considered at several key stages during the process. As environmental issues emerge during the preparation of the EIAR, alternative designs may need to be considered early on in the process or alternative mitigation options may need to be considered towards the end of the process. The Guidelines state that *“the objective is for the developer to present a representative range of the practicable alternatives considered. The alternatives should be described with ‘an indication of the main reasons for selecting the chosen option’.* It is

generally sufficient to provide a broad description of each main alternative and the key issues associated with each, showing how environmental considerations were taken into account in deciding on the selected option. A detailed assessment (or 'mini-EIA') of each alternative is not required."

- 3.7 The EPA Guidelines further note that *"it is generally sufficient to provide a broad description of each main alternative and the key issues associated with each, showing how environmental considerations were taken into account in deciding on the selected option. A detailed assessment (or 'mini-EIA') of each alternative is not required."*
- 3.8 This chapter sets out the need for the development and addresses alternatives under the following headings:
- Do Nothing Scenario;
 - Alternative Locations;
 - Alternative Designs and Layouts; and
 - Alternative Technical Configurations.

Need for the Development

- 3.9 Leading international initiatives relating to mitigation of Climate Change have come from the EU as summarised on their policy documents on Green Deal, Renewable Energy Directive (RED II and REDIII), Circular Economy Action Programme (CEAP) etc. In Ireland the Renewable Transport Fuel Obligation (RTFO) is in effect with the Renewable Heat Obligation (RHO) at the end of its consultation phase. The central ethic now coming online is based on regional sustainable developments across Ireland. This brings the advantages of low carbon fuel supply, reuse of CO₂, with GHG reduction, and resulting soil improvement due to carbon sequestration using organic fertilisers.
- 3.10 To align themselves with the requirements and recommendations in the documents mentioned, Roadstone have decided to initiate a full-scale bio-renewables plant at its Killough Quarry outside Thurles, Co. Tipperary and the infrastructure can be installed on an area within the existing quarry site.
- 3.11 The proposed development provides a new alternative renewable energy source in Ireland, which supports the need to reduce carbon emissions in accordance with EU, National, Regional and Local Policy and will assist in meeting the EU's renewable energy target by 2030. Additionally, the proposed development will support the rural economy, reduce greenhouse gas emissions, and provide for better waste management.
- 3.12 The recently published National Biomethane Strategy (NBS) outlines that *"Ireland is recognised by the European Commission as having one of the largest potentials for biomethane production in Europe on a per capita basis due to its substantial agriculture sector. The development of a new agri-centric biomethane industry can engender cross sectoral benefits for Ireland"*.
- 3.13 Ireland is now legally committed to reducing greenhouse gases to net-zero emissions no later than 2050, the DECC has published a target of up to 10% of national gas demand to come from biomethane by 2030 as part of the Sectoral Emissions Ceilings.
- 3.14 Gas Networks Ireland (GNI) have highlighted that the use of biomethane can significantly reduce greenhouse gas emissions, contributing to the overall goal of achieving carbon neutrality by 2045. It is considered a key player in decarbonizing the gas network.
- 3.15 EU, National, Regional and Local Policy all highlight urgent need to diversify Irelands energy sources to provide a carbon neutral and sustainable energy sector in Ireland. The proposed

development will support these policies targets by providing a facility which will provide renewable energy production, support the circular economy and the effective management of waste.

Consideration of Alternatives

Do Nothing Scenario

- 3.16 The EU guidance on the preparation of the EIA Report (2017) states that the EIA should involve the assessment of *“an outline of what is likely to happen to the environment should the Project not be implemented – the so-called ‘do nothing’ scenario.”*
- 3.17 In implementing this ‘Do-Nothing’ scenario, the bio-renewables facility would not be developed and there would be no changes made to existing land-use practices. The site would continue to be used for quarrying activities.
- 3.18 The Climate Action and Low Carbon Development (Amendment) Act 2021 has committed Ireland on a legally binding path to net-zero emissions by no later than 2050, and to a 51% reduction in emissions by 2030. Locally produced biomethane will play a substantial role in enabling a transition to a net-zero economy as biomethane can be used to displace fossil gas in many hard-to-decarbonise sectors, such as the transport sector, particularly for heavy goods vehicles (HGVs) that are harder to electrify and the extractive industries where high energy value added products such as asphalt and concrete are produced as is the case at Killough quarry, while also playing a role in the decarbonisation of the agriculture sector. In the ‘Do-Nothing’ scenario, the opportunity to capture a volume of local bioenergy resource for the production of biomethane to supply the operations at Killough quarry with clean renewable energy would be missed.
- 3.19 Widely available agricultural silage and slurries will be sourced from agricultural operators within a c. 20km radius of the Proposed Development and accounts for c. 90% of the feedstock supplies. The balancing 10% feedstock supply will come from chicken litter waste mainly sourced in Limerick and spent grain and pot ale mainly sourced in Carlow. In the ‘Do-Nothing Scenario’ these agricultural wastes would not be treated through the AD process. Untreated and unpasteurised litter and slurries would continue to be applied directly to the land at current volumes, with the continued addition of chemical fertiliser. Furthermore, the associated CH₄ would not be captured within the AD process.
- 3.20 The Proposed Development will provide important construction and operational stage employment. The construction phase will also have secondary and indirect ‘spin-off’ impacts on ancillary support services in the area of the site. The operational stage will offer direct employment in the Bio-Renewables Facility, while also supporting existing employment opportunities on surrounding farms. Further indirect employment will be created by the development such as surrounding businesses catering for employee subsistence and hauliers, transporting materials to the facility. The Proposed Development will be of considerable benefit to the area in terms of employment provision and economic gain leading to a positive, long-term impact which is significant in the context of its rural location.
- 3.21 The Proposed Development is expected to deliver c. 20 jobs during the construction stage, and when operational, the facility is expected to generate c. 15-20 direct and long-term jobs to the immediate area. Under the ‘Do-Nothing’ scenario the opportunity to generate direct and indirect local employment would not arise. It would lead to a missed opportunity for an increase in employment opportunities in the area generally, and a missed opportunity for rural employment objectives of the County Development Plan to be fulfilled.

Alternative Locations

- 3.22 Roadstone, a company within the CRH Group, is committed to reducing carbon emissions at all its centres by 30% by 2030 (using 2021 as a baseline) and achieving net zero emissions by 2050. This demonstrates their proactive approach to addressing environmental challenges set globally. The recent validation of CRH's revised targets by the Science-Based Targets initiative (SBTi) in early 2023 underscores the alignment of their goals with the latest scientific advancements in climate action.
- 3.23 In Ireland, regulatory mechanisms like the Renewable Transport Fuel Obligation (RTFO) are currently operational, while the Renewable Heat Obligation (RHO) is undergoing consultation. Also, the National Biomethane Strategy has been passed by the Dail. A notable shift in focus involves the adoption of regional sustainable development strategies throughout Ireland. This approach leverages benefits such as the provision of low carbon fuel, CO2 reuse, greenhouse gas (GHG) reduction, and soil enhancement through carbon sequestration facilitated by organic fertilizer use in place of synthetic fertilisers.
- 3.24 It is acknowledged that the former mine complex, located at Lisheen, is now designated as the National Bioeconomy Campus as identified in the Tipperary County Development Plan 2022–2028 and is c. 20km northeast of the application site at Killough as the crow flies. The Council is one of a number of stakeholders who are working towards the delivery of the vision for this area; other stakeholders include the Technological University of the Shannon (TUS), the Irish Bioeconomy Foundation (IBF) and key private stakeholders. The National Bioeconomy Campus is supported by the Mid-West Regional Enterprise Plan to 2024, and it is stated that *'the campus is a critical piece of infrastructure which will enable diversification of business activities in the agri-food and marine sectors in the rural economy, attracting and retaining workers and businesses in the region and in turn driving innovation and investment'*.
- 3.25 The National Climate Action Plan (DECC,2019) (Action 165) states that each local authority in Ireland is required to identify and develop plans for one Decarbonisation Zone (DZ) within their respective administrative area. A DZ is a spatial area, in which a range of potential climate change mitigation, adaptation and biodiversity measures are identified. It is the purpose of the DZs to act as a demonstration area for possible decarbonising and positive climate action at a local and community level. A 'Register of Opportunities' and 'Actions' are to be set out to help deliver this objective.
- 3.26 Within the DZ area, it is the purpose of local authorities to work collaboratively with stakeholders and communities, and help to promote exploration, co-creativity, innovation and new learnings in delivering climate action, as well as the economic and social benefits of decarbonising, such as just transition and health.
- 3.27 The Mid-Tipperary Decarbonising Zone is centred around the National Bioeconomy Campus at Lisheen, and encompasses a wide rural hinterland that incorporates parts of both the Thurles and Carrick on Suir Municipal Districts. The entire DZ area is located in the EU JTF area. The Mid-Tipperary DZ was designated by the Council in 2021 and subsequently was incorporated as an objective of the Tipperary County Development Plan 2022–2028¹. The Mid-Tipperary DZ is the only inland, rural DZ in the country, and is shown in **Plate 3-1** below.

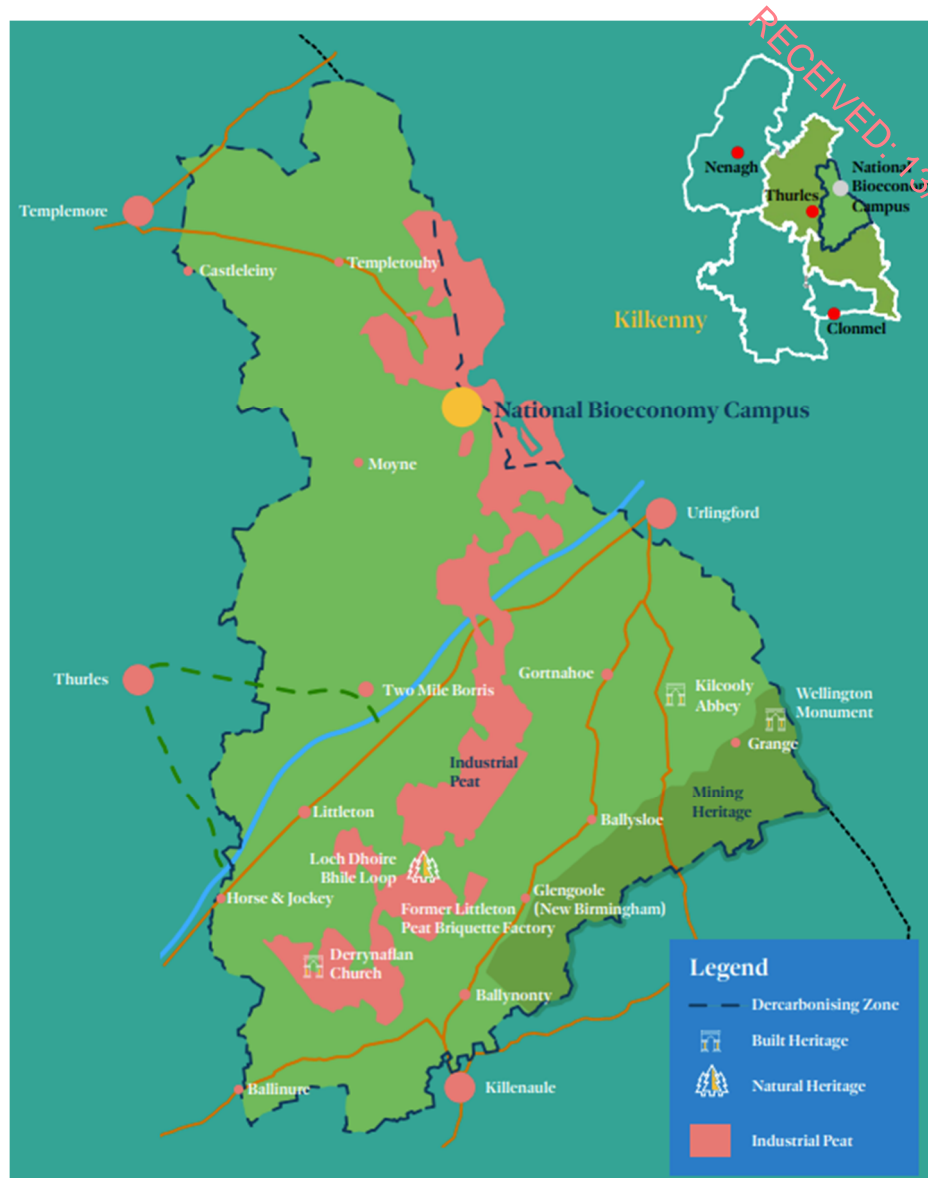


Plate 3-1: Mid Tipperary Decarbonisation Zone

(extract from Figure 6-1 of Tipperary County Council Climate Action Plan 2024-2029)

3.28 Roadstone is Ireland’s leading supplier of aggregates, construction and road building materials. The company currently operate at approximately 65 locations throughout the country. The Killough Bio-Renewables Project will be the first of a number of such sustainability projects to be initiated by Roadstone at their larger facilities, and in particular facilities which include energy intensive asphalt and concrete manufacturing operations such as at Killough quarry, to reduce Carbon Footprint (CF) and greenhouse gas (GHG) emissions while also addressing the changeover to regenerative agriculture utilising organic fertilisers to increase carbon sequestration. Operating bio-renewable facilities ‘on-site’ and within their existing operational facilities is seen as the best use of resources for Roadstone to achieve their net-zero emission targets by 2030 and 2050 respectively, rather than at a location off site such as the Bioeconomy Campus at Lisheen. In addition, the majority of AD facilities in Ireland are located whereby they can or will be able to connect directly and supply into the gas network. There is no gas network route in the vicinity of the quarry site and the proposed development is different in this regard.

- 3.29 The recently published National Biomethane Strategy which sets the goal of producing up to 5.7 TWh of biomethane annually by 2030, through the establishment of 140 to 200 new anaerobic digestion facilities across the country is recognition of the need for multiple AD facilities across every county in Ireland.
- 3.30 Volume 3, Appendix 2 of the Tipperary County Development Plan: the Tipperary Renewable Energy Strategy, at Section 6.6 states:
- “The Council encourages the sustainable development of the bio-energy sector in the county due to the positive contribution it can make to the economy and to the achievement of renewable energy targets”.*
- “Mixed biomass processing facilities may involve processes such as anaerobic digestion, combustion, pyrolysis, gasification, wood pellet manufacture etc. from biomass resources on a commercial scale and may require large scale plant and machinery and activities that are industrial in nature. Therefore, the preferred location for such processes will typically be on land zoned for industrial uses, suitable ‘Brownfield’ sites in rural areas and sites in rural areas that have a proven capacity (environmental and infrastructural) to accommodate for the proposed development. As stated, the proximity of such processes to their raw material sources and energy markets, and the impact on traffic movement are a critical aspect in site selection. Visual, noise and odour impact on adjacent residential property will also be key considerations when assessing any such proposals.*
- 3.31 The application site at Killough Quarry is considered a suitable location due to:
- its location within the existing and long established quarry site, i.e. a brown field site in a rural area with an industrial use already;
 - within an appropriate topographic setting i.e. well screened from surrounding areas;
 - rural location, but with good access to the regional and national roads network with long established HGV traffic movements on the local road network;
 - located directly where a majority of the energy and by-products generated will be used, i.e. the asphalt and concrete plants at the existing quarry;
 - over 80% of the feedstock (cattle slurry and silage) can be sourced locally, i.e. within a c. 20km radius of the proposed development;
 - similarly, there is a local market for use of the organic fertilisers which will be a by-product of the anaerobic digestion process, pelleted fertiliser for use by farmers in place of synthetic fertilisers;
 - best practice industry standard methodology and standards can be used; and
 - the proposed development will provide renewable energy production, support the circular economy and the effective management of waste in line with EU, National, Regional and Local Policy which all highlight urgent need to diversify Irelands energy sources to provide a carbon neutral and sustainable energy sector in Ireland.

Alternative Designs and Layouts

- 3.32 The overall design process has been an iterative process between the design team and Roadstone with inputs from engineering, planning, environmental, hydrological and traffic specialists. This process was implemented to design out any potential significant environmental impacts by avoidance in accordance with relevant EIA guidelines.
- 3.33 Alternative design revisions were considered and are shown in **Plates 3-2 to 3-5** below. These design changes primarily relate to sizing of plant and equipment, and reconfiguring of



Plate 3-4: Design Revision

Selection of Preferred Design

3.34 The preferred design option is shown in **Plate 3-5** below and on EIAR **Figure 2-2** in Chapter 2. This layout is considered the most suitable due to:

- Unloading processes are located furthest away from the site boundary and close to the air handling unit for odour control;
- Processes with larger motors and noise are farthest from the site boundary;
- The ponds are located at the lowest part of the site to assist with drainage flow;
- Firewater is stored at the highest part of the site;
- Water storage is closest to the concrete plant (within the quarry site) which will utilise it;
- A ring road reduces the need for reversing and removes traffic from the access road;
- The flow of materials dictated what processes should be close to each other;
- The dimensions of the buildings are to allow for flexibility of internal processes during detailed design; and
- All buildings and tanks being fully enclosed.

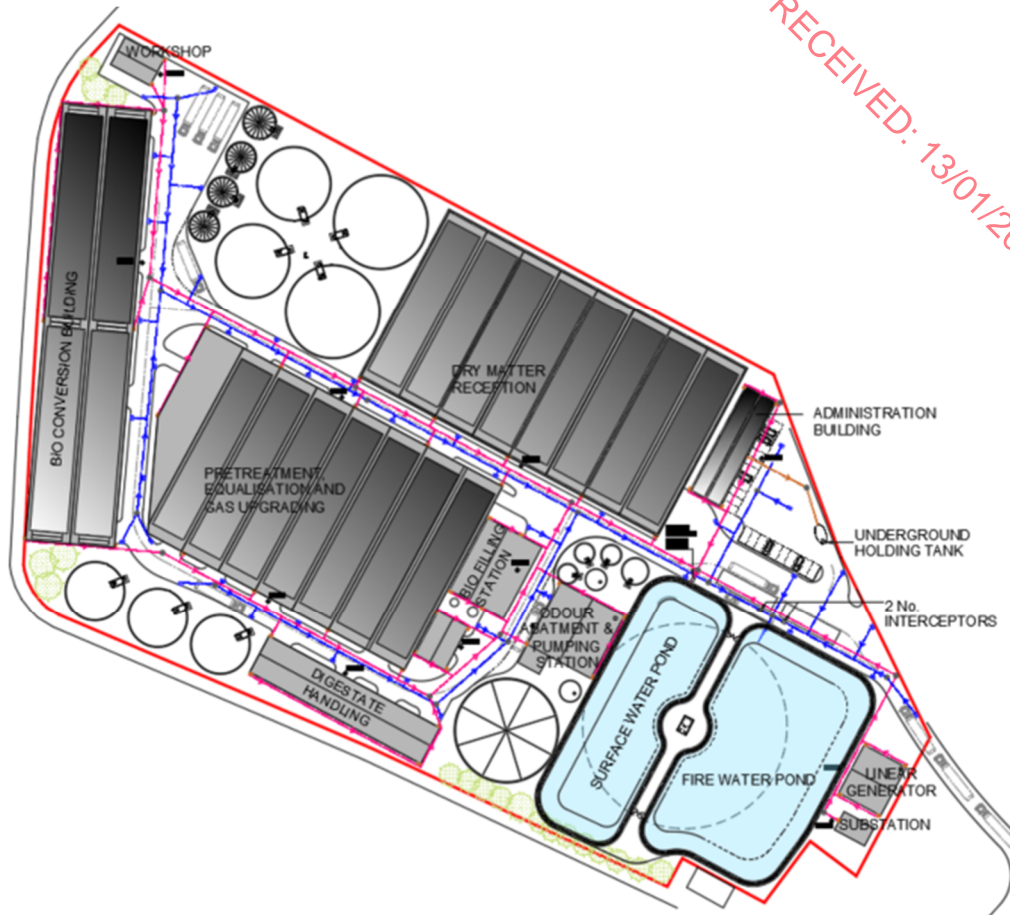


Plate 3-5: Final Design

Alternative Technical Configurations

- 3.35 Technical Configurations were considered as part of the design process for the proposed development.
- 3.36 The process configurations around which AD systems may be designed differ from site to site. Typical factors considered when making design decisions included whether the process is 'batch' or 'continuous' feed, whether it is a 'dry' or 'wet' system, whether it is a 'single stage' or 'multi- stage' process and whether the anaerobic digester is operated at 'mesophilic' or 'thermophilic' temperatures.

Process Configuration

- 3.37 A 'Batch' Flow system involves the single addition of feedstock to a digester at the start of the process. When the feedstock has been placed in the digester, the unit is sealed for the duration of the process with no more material added. The process was ruled out as it is deemed unsuitable given the characteristics of the agricultural slurries, crop-based feedstocks and brewery residues available.
- 3.38 In contrast, Continuously Stirred Tank Reactor (CSTR) systems have feedstock added consistently or in stages with substrate displaced as new material is added. The AD technology chosen utilizes plug flow AD technology and also incorporates internal high rates of reaction due to high intimate contact area. This maximises series performance of the hydrolytic, acidification and methanogenic bacterial groupings. The plug flow reactor type

technology has been researched, patented and proven over years by Antec Biogas. It allows the development of an AD plant that offers a small footprint versus biogas yield with a tight control of the hydrolysed feedstock to the anaerobic bioreactors. The system will also include ammonia stripping to allow for increased processing of high-energy by-products.

Operating Temperature

- 3.39 Consideration was given to operation of the AD process under mesophilic or thermophilic temperature conditions.
- 3.40 Mesophilic conditions were selected over thermophilic conditions for the following reasons:
- Mesophilic anaerobic digestion is considered more robust and stable compared to thermophilic digestion. This is particularly important for handling agricultural feedstocks which can be variable in composition due to seasonality. The agricultural feedstocks identified for this project are more readily digestible compared to the products which may require thermophilic conditions especially when coupled with the hydrolysis stage proposed by the technology suppliers upstream of the digesters.
 - Mesophilic digesters require less energy for heating compared to thermophilic systems. This makes mesophilic digestion more energy-efficient and cost-effective for large-scale operations.

Biomethane gas

- 3.41 Upgrading the biogas to Biomethane was always the priority for this project. Ireland's Biomethane strategy outlines the need for biomethane in the national gas grid and capturing the biogenic carbon dioxide allows the carbon intensity of the renewable fuel to be reduced further.
- 3.42 Biomethane is a relatively efficient energy vector with a market available in Ireland. Electricity generation was discounted due to the need for a combustion fuel for the quarry site and a view that electricity generation from wind and solar is a better option in terms of efficiency and environmental impact.
- 3.43 A gas to liquid fuel (GTL) process was considered for this site but biomethane production was selected over the GTL process due to its higher efficiency, lower environmental impact, versatility, compatibility with existing infrastructure, economic benefits, and technological maturity.

Best Available Technology (BAT)

- 3.44 The processes outlined in EIAR Chapter 2: Project Description were selected following a thorough review of Best Available Techniques (BAT) and regulatory requirements. The chosen techniques and technologies are industry-standard, support the effective implementation of emission control measures, and are well-established and proven within the industry.